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AUTOMATIC RECORD CHANGERS AND RECORDERS
ALIGNING PHILCO RECEIVERS, VOLUMES I AND II
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AUTOMATIC VOLUME CONTROL
ALTERNATING CURRENTS IN RADIO RECEIVERS
D-C. VOLTAGE DISTRIBUTION IN RADIO RECEIVERS
AUTOMATIC RECORD CHANGERS AND RECORDERS
A-C. CALCULATION CHARTS BY R. LORENZEN

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Printed in U. S. A.

This edition is produced in full compliance with the Government regulations for conserving paper.
IF ALIGNMENT - Wave change Sw. in BC position. Gang condenser at minimum, generator at 456 KC, output to 1A6 CG thru .05 MFD condenser. Generator grounded to receiver, align four trimmers of IF transformers.

BROADCAST - Generator connected to antenna lead thru 200' MFD condenser, and set at 1400 KC. Gang condenser at minimum. Trim oscillator then Antenna trimmers Pad the oscillator circuit at 600 KC while rocking gang condenser.

SHORT WAVE - Generator at 6000 KC, start rotating gang condenser from HF end, when signal is heard, adjust antenna trimmer (SW) for maximum peak. Repeat all adjustments for maximum performance.
I.F. ALIGNMENT. Adjust the test oscillator to 175 K.C. and connect the output directly to the grid of the first detector tube (6A7), without the use of any series condenser or resistor; the omission of series condenser or resistor gives the equivalent of a low capacity type average auto antenna. Set the dial pointer to 1400 K.C. and adjust the oscillator trimmer to peak. (Front section of gang condenser.)

R.F. ALIGNMENT. The next step is to adjust the center and rear trimmers of the gang condenser to peak. The center section of the gang condenser tunes the antenna amplifier stage (6D6 tube), and the rear condenser section tunes the detector grid coil of the 6A7 tube.
ALIGNMENT PROCEDURE:

Lack of sensitivity, selectivity or poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, inadequate or excessively long antenna, etc. Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proven not to be the cause.

NOTE: BE SURE TO FOLLOW PROCEDURE CAREFULLY WHEN ALIGNING. OTHERWISE THE RECEPTOR WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT.

IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEPTOR.

ALIGNING I.F. STAGE AT 465 KILOCYCLES:

(a) Connect the ground lead of the test oscillator to the chassis or set ground lead. Connect the other lead of the test oscillator to the grid cap of the 6A7 tube through a 0.002 Mfd. series condenser. DO NOT REMOVE GRID CLIP.

(b) Set test oscillator to EXACTLY 465 kilocycles and turn receiver volume control on full.

(c) Peak each of the second I.F. transformer trimmers.

(d) Peak each of the first I.F. transformer trimmers.

To assure most accurate trimmer setting, repeat above adjustment several times always using lowest possible test oscillator output consistent with readable output meter scale deflection.

ALIGNING 1720-1490 KILOCYCLE BAND:

(a) Remove test oscillator lead from grid of the 6A7 tube and attach to the receiver antenna lead through a 0.002 Mfd. series condenser.

(b) Check tuning dial adjustment by turning gang condenser until plate excursion is maximum capacity stop. At this point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If the dial needle does not point exactly to the last line move needle to correct position.

(c) Set receiver dial and test oscillator frequency to EXACTLY 1720 kilocycles.

(d) Bring in 1720 KC test oscillator signal to maximum output by adjusting the trimmer condenser mounted on top of the oscillator section of the gang condenser. Looking at the front of the receiver, the trimmer condenser mounted on top of the oscillator section of the gang condenser is the oscillator section.

(e) Tune receiver dial and set test oscillator frequency to EXACTLY 1400 kilocycles.

(f) Adjust trimmer on top of the front section tuning condenser (antenna section) for maximum 1400 kilocycle test signal response.

(g) Tune receiver dial and set test oscillator frequency to approximately 600 kilocycles.

(h) While rocking the tuning condenser back and forth adjust 600 KC oscillator padder condenser which is accessible through the hole in the top of the chassis adjacent to the gang condenser for maximum 600 kilocycle signal response.

ALIGNING 2.3-6.3 MEGACYCLE BAND:

(a) Replace 0.002 Mfd. Test oscillator antenna lead series condenser with a 400 ohm resistor.

(b) Adjust band selector switch for 2.3-6.3 megacycle band operation, tune receiver dial and set test oscillator frequency to EXACTLY 6.3 megacycles.

(c) Bring in 6.3 megacycle test oscillator signal to maximum output by adjusting 6.3 M.C. oscillator trimmer on top of coil located underneath chassis.

(d) Tune receiver dial and test oscillator frequency to EXACTLY 6 megacycles and adjust 6 M.C. antenna trimmer which is mounted on coil located on top of chassis for maximum sensitivity.
USE THE FOLLOWING DUMMY ANTENNAS:

I.F. --- 02 MF CONDENSER
540-1720 KC --- 00025 MF CONDENSER
(CONNECT DUMMIES IN SERIES WITH SIGNAL LEAD)

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII
CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION VOL. VIII.
CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION VOL. VIII.

ELIMINATION OF INTERFERENCE CAUSED BY A 32 VOLTS LIGHT PLANT

General

Two kinds of static-like noise may be heard when you operate your 32 volt radio at the same time the generating plant is operating the plant batteries.

Static-like noise, due to the action of the brushes on the commutator, may reach the set through the supply line. Such noise can generally be eliminated by the use of a 3 Mfd. 200 volt condenser, as shown in Figs. 1, 2 and 3.

Static-like noise, due to the operation of the high tension circuit may radiate through the air to the antenna set. Radiation has been found to extend a half mile in extreme cases. Proper placement of the antenna, along with the use of a spark plug suppressor and correct shielding will entirely eliminate this type of noise. When eliminating these electrical disturbances always apply the remedies given in the order in which they appear.

Usual Installations

Install spark plug suppressors on all spark plugs and connect the high tension lead to the suppressor, as shown in Figure 3.

For four cylinder plants use four spark plug suppressors, one connected to each spark plug.

CAUTION: Disconnect batteries from generator before attaching suppressor equipment.

Connect one 3 Mfd. 200 volt condenser between one positive brush and the generator frame and one condenser between one negative brush and the generator frame as shown in Figure 1.

FOUR CYLINDER PLANTS. For four cylinder plants attach a condenser to the positive and negative brushes as shown in Figure 2.

Extreme Cases

To determine if the high tension wiring is radiating into the antenna disconnect the antenna and run from the receiver and if the noise is eliminated or materially reduced, the noise is being picked up by the antenna. In such a case, obtain a piece of electromotive's lead which will just slip over the high tension wire and a piece of copper bond shielding which will just slip over the lead. Cut a piece of copper bond shield enough to cover the high tension wire from the coil to the spark plug suppressor. Cut a piece of shielding that will be one inch shorter than the length when the shield is extended over the lead.

Ignition Noise on Battery Leads

Sometimes the ignition interference will travel up the battery leads. This condition can be corrected as follows: Attach a 3 Mfd. condenser between the POSITIVE terminal at the top of the control box, and the frame of the box. Be sure the frame of the box is well grounded to the generating frame. Attach a 3 Mfd. condenser between the NEGATIVE terminal at the top of the control box and the control box frame.

Ignition Interference on Supply Leads

In extreme cases the ignition interference will travel up the supply leads to the radio receiver. This condition can be corrected by attaching a 3 Mfd. condenser between the ungrounded side of the line to the main switch box and ground (or grounded side of the line if one side of the line is grounded).

Grounding

Some cases may require a thorough grounding of the system. This may be accomplished by running a No. 12 18 gauge wire from the generator frame to a good ground. Contact and metal switch boxes should also be grounded.

If it is necessary to ground one side of the supply lines, first ground temporarily, one at a time through a 32 volt lamp. One side of the line will light the light, the other will not. The side which will not light the light should be grounded.

DO NOT apply any of the remedies listed under "Extreme Cases", before trying the ones listed under "Usual Cases".

Slip the loop over the high tension lead. Slip the shielding over the loop so that it is one-half inch from each end of the loop. Wrap some fine copper wire around the shielding for a half of the shield, go to hold the shielding in place. Solder the wire to the shielding so it will not slip due to plant vibration. The shield may be taped in place if the tape is very adhesive. DO NOT USE FRICTION TAPE.

Solder a short length of insulated wire to the shielding and ground it under the nearest screw in the generator frame.

This receiver is designed for operation on 32 volt battery plants only and must not be used on battery plants of a higher rated voltage than 32 volts without a voltage regulator.

The power plug attached to the end of the power cord must be inserted correctly in the 32 Volt POWER SUPPLY OUTLET OR RECEPTACLE. OTHERWISE THE SET WILL NOT OPERATE. If after inserting the plug and turning the receiver on, the set does not operate after approximately two minutes, remove this plug and turn it around and reinstall it in the power receptacle.

A 4 AMPERE FUSE is located on the back of the chassis underneath the receptacle marked "Fuse" and protects the receiver from damage should a fault occur in the set or if it is connected to the improper power supply. Continued burning out of fuses on the proper power supply is indicative of some defect. THE WARRANTY IS VOID IF THE RECEIVER IS OPERATED WITH THE FUSE SHORTED OUT OR WITH A FUSE LARGER THAN 4 AMPERES.
ALIGNMENT
B.C.BAND, Oso. and dial at 1400 KC .0002 mfd.
Adjust B.C. OSC. trimmer to max. Similarly B.C. Pad at
600 KC. Then recheck at 1400 KC.
INT. BAND. Dial and osc. at
5100 KC .0002 mfd. with 400 ohm
in series as dummy. Adj. ANT.
and OSC trimmers to max. Adj.
Pad at 1800 KC. Recheck 5100 KC.
S.W. BAND. 400 ohm dummy. Oso.
and dial at 15 MC. Adjust S.W.
ANT. and OSC trimmers to max.
SENSITIVITY Check at 6000 KC
for proper alignment. If recei-
ver lacks sensitivity check the .0035 mica condenser
for short circuit.

IF PEAK 465 KC
ALIGNMENT
B.C. Band. Osc at 1400 KC
at max. Dial at 1400 KC
Adjust B.C. Osc trim. to
max. Similarly B.C. Pad
at 600 KC. Recheck 1400KC
INT. BAND. Dial and Osc.
at 5100KC. .0002 mfd. cond.
with 400 ohm series res.
as dummy. Adjust ant. and
osc. trimmers to max.
Adjust Pad at 1800 KC.
Recheck adjustment 5100KC
S.W. BAND. 400 ohm dummy
Oscillator and dial at
15 KC. adjust S.W. ant.
and osc. trimmers to max.
Check sensitivity at
6000 KC to check for
proper alignment. If the
receiver lacks sensitivity check the .0035 cond.
(mica) for short circuit.

BOTTOM VIEW OF CHASSIS
PADDERS
BROAD. OSC. TRIMMER
INTER. OSC. TRIMMER
S.W. OSC. TRIMMER
OSC. COIL & TRIMMER ASSEMBLY

REAR OF CHASSIS

STATION SELECTOR

FRONT OF CHASSIS

BAND SWITCH

IF PEAK 465 KC

LINE GND
SPEAKER PLUG
RED ANT.
BROAD DISC PADDLE
INT. ANT. GND
INT ANT. TRIMMER
S.W. ANT. TRIMMER
TONE CONTROL
VOL. CONTROL
STATION SELECTOR
BAND SWITCH

Compliments of www.nucow.com

SENSITIVITY check at 6000 KC for proper alignment. If receiver lacks sensitivity check the .0035 mica cond. for short circuit.
**PUSH-BUTTON ADJUSTMENT**

Nince stations operating in the 1500-540 kilocycle band may be automatically push-button tuned by properly setting each station selector push button.

AS THE PUSH BUTTONS ARE NOT PRE-SET AT THE FACTORY FOR ANY DEFINITE STATIONS BE SURE TO SET EACH ONE.

Before Attempting to Set Push Buttons Be Sure to:

(a) Have aerial which will be used with the radio attached to the receiver when setting push buttons.
(b) Operate radio at least 15 minutes before adjusting push buttons.
(c) Choose transmitter frequency—number of kilocycles—and call letters of the nine stations you wish to push button tune from radio log or newspaper radio station list.

**Adjust Push Buttons for Selected Stations by:**

(a) Rotate band switch knob to the NEXT TO MAXIMUM, RIGHT HAND POSITION—540-1750 KILOCYCLE BAND Manual TUNING POSITION.
(b) Using regular manual tuning knob carefully tune in one of the selected stations whose transmitter frequency is somewhere between 535-890 kilocycles. Make a mental note of the kind of program on this station, so that when push button is adjusted for this particular station (as instructed in paragraph 6) it will be easy to recognize the station by the type of program being transmitted.
(c) Rotate band switch knob to maximum right hand position.
(d) Press in one of the three push buttons marked 535-890 kilocycles on diagram.
(e) Note: This station may disappear, be distorted or in some instances another station may be heard.
(f) Grasp end of push button just pressed in and slowly turning this button carefully tune in the selected 535-890 kilocycle station that was previously tuned in with manual control.

Slowly—turn first in one direction, then if the wanted station is not heard, turn in opposite direction. Watch tuning eye and adjust so that the two open ends of the green inverted "V" on the tuning eye are closest together—At which point the signal will be heard with greatest volume and clearest tone.

(g) Press station call letter of the station just tuned in out of call letter sheet supplied and insert into depression adjacent to push button just adjusted.
(h) After the first 535-890 kilocycle push button has been properly set, the other eight push buttons should be adjusted in the same manner. In the following order:

1. Set remaining two push buttons marked 355-890 kilocycles on diagram for any two stations operating between 355-890 kilocycles.
2. The three push buttons marked 680-1750 kilocycles on diagram should be adjusted for any three selected stations operating between 680 and 1170 kilocycles.
3. Adjust the three push buttons marked 880-1350 kilocycles on diagram for any three selected stations operating between 880 and 1350 kilocycles.

**IMPORTANT**

For Manual Tuning the Band Switch must be in next to maximum right hand position.

When adjusting Push Buttons or when Push Button tuning after Push Buttons have been set, Band Switch must be in maximum right hand position.

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**MODEL E10850**

**MODEL E10880**

It is very important to read the following instructions carefully before attempting to adjust the electric tuner.

The electric tuner is made up of three integral units:

**PUSH BUTTON SWITCH:** The push button switch consists of eight (8) brown push buttons flanked on either side by three (3) white push buttons.

**SELECTOR MECHANISM:** The selector mechanism is made up of the selector plate, eight (8) thumb screws, and the adjustment light bulb.

**ELECTRIC MOTOR:** The power for this tuner is provided by a small, efficient electric motor, of the brushless variety. It is fitted with an automatic clutch. The bearings and the oil retainer hold sufficient oil to lubricate the motor for a lifetime.

**SETTING UP STATIONS**

The first step to take in adjusting the electric push button service incorporated into this receiver is to choose eight (8) of the most powerful local stations, stations that are free from exess fading. Turn on the receiver (broadcast both) and press in the dial tuning button; tune in the station of the lowest frequency, using the station selector knob. Now hold the dial tuning button in and press in button number one (1). (See Figure 1). Both buttons are now locked into place; a small pilot lamp located at the rear of the chassis will light up until the thumb screw at the rear accidently happens to be correctly set. Loosen thumb screw number one (see Figure 2 for order of thumb screws) enough to allow it to slide freely back and forth until the light goes out. Now tighten the thumb screw; the adjustment for the first station is now complete. Out of the station call letter sheet supplied remove the proper station call disc and insert into the recess of button number one. Push one of the clear celluloid discs into the recess also, over the station call disc. Now release button number one by pressing the dial tuning button in as far as it will go.

With the white button still in, tune in the station of the next highest frequency and holding the white button, press in button number two. Both buttons are now locked into place. Loosen thumb screw number two (see Figure 2) and slide back and forth until a point is reached at which the pilot lamp in the rear goes out; tighten the thumb screw. Insert the proper station call disc and celluloid disc into the window of button number two.

Follow this same procedure for the remaining stations, always choosing the station with the next highest frequency. After all eight (8) stations have been adjusted, check each adjustment by tuning in each station. Note: In the window above the white button, insert the word "OFF" found in the call letter sheet.

**NOTE:** In the recesses of the white push buttons insert the words found in the call letter sheet as shown in Figure 1.

**HOW TO TUNE IN STATIONS USING THE ELECTRIC PUSH BUTTON TUNER**

In order to operate the receiver satisfactorily—using the electric push button tuner, the dial tuning button must be in released position, that is all the way out. To tune in a station, merely press the selector button which designates the station desired. Note: Should the station fail to come in clearly, check the adjustment by following the adjustment procedure described in the paragraph above.

To change from electric tuning to manual selecting, simply press in the dial tuning button. When the dial tuning button is in, the set may be tuned as a conventional receiver.

**PARTS LIST FOR MODEL E10850**

<table>
<thead>
<tr>
<th>RESISTORS</th>
<th>R 1 – P140 500 Ohm ¼ Watt</th>
<th>R 2 – P140 500 Ohm ¼ Watt 10%</th>
<th>R 3 – P139 250,000 Ohm ¼ Watt</th>
<th>R 4 – P417 3,000 Ohm ¼ Watt</th>
<th>R 5 – P673 10,000 Ohm ¼ Watt</th>
<th>R 6 – P417 50,000 Ohm ¼ Watt</th>
<th>R 7 – P137 500,000 Ohm ¼ Watt</th>
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<tbody>
<tr>
<td>PAPER CONDENSERS</td>
<td>C 1 – P148 .05 Mfd. 200 V.</td>
<td>C 2 Police Band Podder— (.0008—.0016 Mfd.)</td>
<td>C 4 Broaddcast Band Podder— (.003—.0006 Mfd.)</td>
<td>C 6 – P1322 .005 Mfd. 600 V.</td>
<td>C 8 – P324 .1 Mfd. 400 V.</td>
<td>C 9 – P148 .05 Mfd. 200 V.</td>
<td>C 11 – P1322 .1 Mfd. 200 V.</td>
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<td>ELECTROLYTIC CONDENSERS</td>
<td>C 15 – P1399 Dual Electrolytic</td>
<td>C 17 – P1397 Electrolytic</td>
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<td>ADJUSTABLE CONDENSERS</td>
<td>P1818A Variable Condenser</td>
<td>P2743 Gang Trimmer Bridge</td>
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<td>P2710 Power Transformer</td>
<td>P1882 Oscillator Podder Condenser</td>
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<td>P2584 Push Button Switch</td>
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<td>P2711 3rd I.F. Transformer</td>
<td>P1504 Pilot Light Bulb</td>
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<td>G5794 Oscillator Coil Assembly</td>
<td>P2690 Electric Motor</td>
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<td>P2689 Rubber Drive Belt</td>
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<td>G5347 Broadcast Antenna Coil</td>
<td>P2688 Dial Scale</td>
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<td>G5462 Lower Segment Adjustment Bracket and Contact</td>
<td>P2644 Dial Pointer</td>
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<td>G5463 Upper Segment Adjustment Bracket and Contact</td>
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SERVICE NOTES for "AUTOMATIC-TUNE" WHEEL DIAL

While an "AUTOMATIC-TUNE" tab may be set for distant weak stations, better results will be obtained if the stations selected for "AUTOMATIC-TUNE" are strong enough to be heard clearly on the station dial. If a station selected for automatic tuning fades in and out, set the dial to that station and select a different station and listen to the interference. If interference continues, you wish to "AUTOMATIC-TUNE" obtain the frequencies used and call letters of these stations and set station tab s: (1)

1. Lay station dial letter tab sheet on flat surface and with a razor or sharp knife cut out desired tab by cutting around black edges of each desired tab.
2. To illustrate the proper setting of station paper spray and metal tab holder the receiver is shipped from the factory station tab properly set for Station WGN 720 kilocycles. Carefully note the station dial letter tab paper setting position and make the proper alignment of the station frequency in the receiver. If the desired station is not one of the selected stations or if the station is to be set for a station which is not on the dial, the station dial letter tab paper setting position is that shown in Fig. 1, and the station diagram will be appropriately set for the selected station.
3. Insert celluloid envelope between edge of dial and metal face plate then lightly press nut into square notch.

INSERT CELLULOID ENVELOPE BETWEEN EDGE OF DIAL AND METAL FACE PLATE THEN LIGHTLY PRESS NUT INTO SQUARE NOTCH

FIG. 3

INDICATOR STOP - SLOTTED DIAL TAB RAIL

DIAL MECHANISM

WHEN INSTALLING PART No. 4000 GLASS ASSEMBLY WITH No. 4005 SHAFT ATTACHED, carefully follow procedure in order given:
(a) Insert No. 4000 shaft into main bushing attached to the cadmium plated bracket on back of dial face.
(b) Place steel spacer washers and brass tension spring in order named over end of No. 4005 shaft.
(c) Place the small die cast primary pulley No. 4009 on shaft—do not tighten No. 2754 set screws.
(d) Loosen the two set screws in brass spacer collar on the No. 4005 shaft.
(e) Adjust brass spacer collar—by sliding collar on shaft—so that there will be approximately 1/8" clearance between the bottom of metal tab holder and the face plate. Firmly retighten brass collar and No. 2754 die cast pulley set screws. Failure to provide proper clearance will result in scratches on dial face and the dial mechanism will not operate freely.

TO INSTALL No. 3814 PRIMARY DRIVE CORD:
(a) Looking at back of dial, wrap dial cord twice around No. 4355 drive shaft in CLOCKWISE direction.
(b) Hook No. 3652 tension spring into loops at end of dial cord.

REPLACING No. 4000 DIAL GLASS SCALE ASSEMBLY

As it requires special tools to properly set part No. 4005 shaft assembly on part No. 4000 glass scale—we will ship all orders for No. 4000 glass scales with the No. 4005 shaft assembled on the glass scale.
TO INSTALL No. 4013 SECONDARY DRIVE CORD:

The dial mechanism picture shows and refers to eye terminals on drive cord—these were used in early production. Loops made by knots in the cords are now used to attach cord to hubs in the No. 4009 die cast pulley and to the No. 4552 & 3462 tension springs.

(a) Looking at the front of the dial rotate dial scale COUNTER-CLOCKWISE until dial stop is reached.

(b) Loosen the two No. 2754 set screws in small die cast pulley No. 4009.

(c) Looking at front of dial turn the small die cast pulley so that the cut out in pulley will be towards the left and approximately in line with the upper edge of the dial light bracket. This bracket which is only used in six volt battery and 110 volt AC models is shown mounted on the cadmium plated dial face plate bracket in dial mechanism picture.

(d) Hook No. 4352 tension spring in dial cord loop.

(e) Turn No. 4011 drum so that the hole in the No. 4012 large die cast pulley—through which the secondary drive cord is pulled—is towards the top of face plate. This will bring the hole approximately in line with the left hand edge (looking at back of dial) of face plate.

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MISCELLANEOUS PARTS USED IN ABOVE ASSEMBLIES

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Description</th>
<th>Last Price</th>
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<tbody>
<tr>
<td>4016</td>
<td>Celluloid Envelope</td>
<td>Station Cell Letter Cover</td>
<td>.05</td>
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<tr>
<td>3814</td>
<td>Cord</td>
<td>Primary Drive Cord</td>
<td>.15</td>
</tr>
<tr>
<td>4013</td>
<td>Cord</td>
<td>Secondary Drive Cord</td>
<td>.15</td>
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<tr>
<td>3995</td>
<td>Band Indicator Assem. For Model 1 &amp; 4</td>
<td>SEE NOTE BELOW</td>
<td>.75</td>
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<tr>
<td>3992</td>
<td>Band Indicator Assem. For Model 2 &amp; 3</td>
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<td>.75</td>
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<tr>
<td>4011</td>
<td>Drive Drum Assm. with 4012 Secondary Pulley and Rubber Disc Coupler</td>
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<td>1.25</td>
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<td>4027</td>
<td>Disc</td>
<td>Translucent Dial Scale Background for Model 1</td>
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<tr>
<td>3984</td>
<td>Disc</td>
<td>Translucent Dial Scale Background for Model 2 &amp; 3</td>
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<td>Disc</td>
<td>Translucent Dial Scale Background for Model 2</td>
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<td>Disc</td>
<td>Translucent Dial Scale Background for Model 1 &amp; 4</td>
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<td>Escutcheon</td>
<td>For Cabinet—All Models</td>
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<td>4017</td>
<td>Frame</td>
<td>Metal Holder for Celluloid Envelope</td>
<td>.05</td>
</tr>
<tr>
<td>4040</td>
<td>Hub Cap</td>
<td></td>
<td>.15</td>
</tr>
<tr>
<td>4015</td>
<td>Knurled Tab</td>
<td></td>
<td>.05</td>
</tr>
<tr>
<td>4009</td>
<td>Pulley</td>
<td>Dial Scale Drive (Die Cast)</td>
<td>.45</td>
</tr>
<tr>
<td>4000</td>
<td>Scale</td>
<td>Colored Glass Scale With 4005 Shaft Assm.</td>
<td>2.75</td>
</tr>
<tr>
<td>8771</td>
<td>Screw</td>
<td>For Hub Cap 3/8 x 1/4 O.H.I.M.</td>
<td>.005</td>
</tr>
<tr>
<td>2754</td>
<td>Saw</td>
<td>For Pulley 5/8 x 1/4 S.H.I.C. Cup Point</td>
<td>.01</td>
</tr>
<tr>
<td>4065</td>
<td>Spring Lock</td>
<td>For Drive Shaft</td>
<td>.01</td>
</tr>
<tr>
<td>3452</td>
<td>Spring Tension</td>
<td>For Secondary Cord</td>
<td>.07</td>
</tr>
<tr>
<td>3462</td>
<td>Spring Tension</td>
<td>For Primary Cord</td>
<td>.07</td>
</tr>
</tbody>
</table>

Prices are subject to change without notice.

---

FOR #1 MODEL NUMBERS ARE B10600,-1,-2,-3,-4,-5
" #2, " " B10572,-85,-86
" #3, " " B10565,-6,-7,-8
" #4, " " B10590,-1,-2,-3,-5,-6
SERVICE notes for PUSH BUTTON DIAL

FROM ONE TO TEN STATIONS OPERATING ON FREQUENCIES SEPARATED BY FORTY KILOCYCLES OR MORE MAY BE AUTOMATICALLY TUNED BY PROPERLY SETTING PUSH BUTTONS.

KEY STATION PUSH BUTTON BY:

a. Gently press desired round paper station call letter 'tab' out of station tab slot.

b. Always set the first push button for the desired station first, with the dial face up. Then set the remaining buttons according to the desired station number. 

c. When using this dial, hold the dial firmly with both hands and turn slowly until correct tuning is obtained.

After the.TEN push buttons have been properly set they will not require further attention except when moved from their position or when an additional tab is included which would disturb the position of the other tab.

NOT***************

FOR##1, MODEL NUMBERS ARE B10600,1,-2,-3,-4,-5

NOTE: Omit model numbers and order all parts from:

B10572,-86,-85
B10695,-6,-7,-8
B10590,-1,-2,-3,-5,-6
ALIGNMENT NOTE: Use 0.1 \( \mu F \) condenser as dummy antenna when aligning the i-f transformers; use a 400-ohm resistor for the S and I bands and a 0.00025-\( \mu F \) condenser for the M band.
Directions for Alignment of the FM Tuner

Remove the grid lead from the 6K8 converter tube. Connect the live side of the signal generator to the grid of the 6K8 through a small mica condenser 200 to 500 mmf. Connect the ground side of the signal generator through a similar condenser to the lead that was removed from the cap of the tube. Connect a resistor of 200 to 500 ohms between the grid of the tube and the grid lead. Connect the ground or shield of the signal generator to B-. Be sure that there is no direct connection between the signal generator and an external ground or directly to the power supply line.

Using a 5,000 ohm per volt D.C. meter with a voltage range of 20 volts as a resonance indicator, connect it across the 50,000 ohm limiting resistor. Set the signal generator at 4.3 M.C. and set the attenuator for about a 5-volt reading on the voltmeter. Align the three I.F. coils for a maximum reading, the same as an amplitude set.

Check the shape of the resonance curve by changing the signal generator to 4.2 M.C. and 4.4 M.C. The output reading either side of resonance should be about the same.

To align the discriminator, connect the signal generator, the same as for the I.F. alignment. Set the generator at 4.3 M.C. Connect the voltmeter across the two diode load resistors. Using an insulated screw driver adjust the secondary trimmer to zero voltage. Shift the signal generator to 4.2 M.C. and 4.4 M.C. Adjust the primary trimmer so that the D.C. readings are equal and opposite in polarity.

To align the R.F. and oscillator, connect the signal generator to the two leads at the back of the chassis. With the generator set at 40 M.C. adjust the oscillator, R.F. and antenna trimmers for maximum signal with the set tuned to the low frequency end of the dial, 50 M.C. and check the frequency and the alignment.
1. IF PEAK 456 KC
2. Osc. (left trimmer on gang) 1560 kc. Variable condenser at minimum capacity.
   P41
   P51
3. Trimmer loop (right trimmer on gang) - 1400 kc.
4. Pad loop 600 kc.
BELMONT RADIO CORP.

MODELS 151, 536

BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH A HIGH RESISTANCE VOLTOMETER BETWEEN SOCKET TERMINALS AND B--VOLUME CONTROL.

[Diagram showing connections and components]

All voltages as indicated on the voltage chart are measured with 117 volt A.C. or D.C. line.

REAR OF CHASSIS

VIEW LOOKING AT BOTTOM OF CHASSIS

NOTE:* THE ANTENNA COIL ASSEMBLY IS MADE SO THAT IT IS MOBILE LEFT OR RIGHT. WHEN MAKING THE ADJUSTMENT AS GIVEN IN THE ALIGNMENT PROCEDURE MOVE THE COIL ASSEMBLY VERY SLOWLY. IT CAN BE MOVED BY HAND OR BY PIVOTING ONE EDGE OF THE BLADE OF A SCREWDRIVER IN THE HOLE AND ENGAGING THE BLADE IN THE GEAR TEETH OF THE COIL FORM.

Setting the Automatic Pushbuttons

Make a list of your favorite stations. Push out the call letters of these stations from the call letter sheets supplied. Insert a call letter in the front of each pushbutton.

Press one of the buttons all the way down and hold it FIRMLY. Now tune in the station you want with the tuning knob. Take back and forth until the station is clear, then release the button.

NOTE: If the tuning knob turns quite hard when the button is held down firmly (loosen the reset lock screw several turns with a screwdriver or coin (quarter).

Continue, setting each of the remaining pushbuttons in the same way. Now turn the tuning knob all the way to the right and tighten the reset lock screw. This screw prevents the pushbuttons from slipping off the stations you have set. To change stations loosen lock screw and proceed as above.

BRC. Series A—5142—5750—10-40

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# ALIGNMENT PROCEDURE

**IMPORTANT:** See alignment instructions
- Volume control—Maximum all adjustments.
- Connect B of radio chassis to ground post of signal generator through .1 Mfd. condenser.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 12SA7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Four Trimmers on Top (See Fig. 1)</td>
<td>Output and Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1600 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 12SA7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer rear section of gang.</td>
<td>Broadcast Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>(See Note &quot;A&quot;)</td>
<td>1400 Kc.</td>
<td>See Note &quot;A&quot;</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmer front section of gang</td>
<td>Broadcast Antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

**FREQUENCY RANGE**
- 535 to 1000 K.C.
- Selectivity - 85 EC Broad at 1000 Times Signal at 1000 K.C
- Tuning Frequency Range - - - - 535 to 1720 K.C
- Intermediate Frequency - - - - - - 455 K.C
- Sensitivity (for .05 Watts Output) - 30 Microvolts Average
- Selectivity - 85 EC Broad at 1000 Times Signal at 1000 K.C
- Tuning Frequency Range - - - - 535 to 1720 K.C
- Intermediate Frequency - - - - - - 455 K.C
- Selectivity - 85 EC Broad at 1000 Times Signal at 1000 K.C
- Tuning Frequency Range - - - - 535 to 1720 K.C
- Intermediate Frequency - - - - - - 455 K.C
- Selectivity - 85 EC Broad at 1000 Times Signal at 1000 K.C
- Tuning Frequency Range - - - - 535 to 1720 K.C
- Intermediate Frequency - - - - - - 455 K.C

**NOTE "A"**—Lay the output lead from the generator in back of the loop antenna. Turn up the output of the generator, picking up the energy in the loop antenna without any electrical connection from the generator.

**NOTE "B"**—After the antenna coil has been traced at 1400 Kc, it is necessary to check the adjustment as given in the alignment procedure move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

Reduce to 9%
### Model 518

**FREQUENCY RANGE**

540 to 1720 K.C.

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Iron Cores (Dial Setting)</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc.</td>
<td>0.1 MFD.</td>
<td>Terminal B</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>0.1 MFD.</td>
<td>Terminal B</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1720 Kc.</td>
<td>0.1 MFD.</td>
<td>Terminal B (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer C9 (See bottom of Radio, Fig. 3)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BAND</td>
<td>1720 Kc.</td>
<td>0.2 MFD.</td>
<td>Terminal A (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer C3 (See bottom of Radio, Fig. 3)</td>
<td>Antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1600 Kc.</td>
<td>0.2 MFD.</td>
<td>Terminal A (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Antenna Coil Adjustment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1720 Kc.</td>
<td>0.2 MFD.</td>
<td>Terminal A (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Antenna Check for tracking</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE "A"—The antenna coil assembly is made so that it is moveable up or down. When making the adjustment as given in the alignment procedure move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

NOTE "B"—After the antenna coil has been tracked at 1400 Kc it is necessary to check the antenna trimmer (C3) adjustment again at 1720 Kc. If no appreciable change in trimmer adjustment is made the coil is in line, if the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1400 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1720 Kc.

### Model 794

**Series A**

(Serial No. OA297000 and up)

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switches</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc.</td>
<td>0.1 MFD.</td>
<td>Grid of 12ARGT Mixer</td>
<td>Broadcast</td>
<td>Rotor full open (Pistes out of mesh)</td>
<td>Two trimmers see top (See Fig. 2)</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>0.1 MFD.</td>
<td>Grid of 12ARGT Mixer</td>
<td>Broadcast</td>
<td>Rotor full open (Pistes out of mesh)</td>
<td>Two trimmers see top (See Fig. 2)</td>
<td>Input L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>SHORT WAVE</td>
<td>17 Mc.</td>
<td>Internal Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C3 (See Fig. 5)</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BAND</td>
<td>17 Mc.</td>
<td>Internal Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C3 (See Fig. 4)</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>(See Note A)</td>
<td>6 Mc.</td>
<td>0.4 Ohms</td>
<td>Internal Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C30 (See Fig. 4)</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1550 Kc.</td>
<td>0.2 Mfd.</td>
<td>Grid of 12ARGT Mixer</td>
<td>Broadcast</td>
<td>Rotor full open (Pistes out of mesh)</td>
<td>Trimmer C6 (See Fig. 5)</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BAND</td>
<td>1550 Kc.</td>
<td>0.2 Mfd.</td>
<td>Grid of 12ARGT Mixer</td>
<td>Broadcast</td>
<td>Rotor full open (Pistes out of mesh)</td>
<td>Trimmer C6 (See Fig. 4)</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>LOOP ALIGN-</td>
<td>1400 Kc.</td>
<td>0.2 Mfd.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>Trimmer C3 (See Fig. 5)</td>
<td>Broadcast antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>MENT</td>
<td>1600 Kc.</td>
<td>0.2 Mfd.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer C3 (See Fig. 5)</td>
<td>Broadcast Tracking Coil</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

NOTE "A"—The signal generator is connected to the "ANT." and "GND." terminals on the rear of the chassis when aligning the Short Wave Band and to the grid of the 12ARGT tube and ground terminal when setting the Broadcast Band oscillator end condensers, (550 and 540 Kc.). The loop antenna need not be connected to the radio when making these adjustments.

NOTE "B"—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected to the terminal board. The signal generator is connected to the "ANT." and "GND." terminals and the jumper on the terminal board connected to "EXT." terminal (See Fig. 1).

NOTE "C"—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

ATTENUATE THE SIGNAL FROM THE SIGNAL GENERATOR TO PREVENT THE LEVING-OFF ACTION OF THE AVC.

**FREQUENCY RANGE**

5.7 to 18.3 MC.

**After each band is completed, repeat the procedure as a final check.**

It is important during loop alignment that the same distance between the loop antenna and the chassis be maintained as when the chassis is installed in the cabinet.
ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect—B of radio chassis to ground post of signal generator through .1 Mfd. condenser.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 Mfd., and 200 Mfd.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Iron Cores (Dial Setting)</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input L.F.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BROADCAST BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Iron Cores (Dial Setting)</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1690 Kc.</td>
<td>.1 MFD.</td>
<td></td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C4) (See Fig. 1)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>1690 Kc.</td>
<td>200 MMF.</td>
<td></td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C3) (See Fig. 1)</td>
<td>Antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>1400 Kc.</td>
<td>200 MMF.</td>
<td></td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Adjust position of antenna coil right or left. (See Fig. 3)</td>
<td>Antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>1690 Kc.</td>
<td>300 MMF.</td>
<td></td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Adjust trimmer (C2) (See Fig. 1)</td>
<td>Antenna</td>
<td>Check for tracking (See Note &quot;B&quot;)</td>
</tr>
</tbody>
</table>

NOTE "A"—The antenna coil assembly is made so that it is movable right or left. When making the adjustment as given in the alignment procedure move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

NOTE "B"—After the antenna coil has been tracked at 1400 Kc. it is necessary to check the antenna trimmer (C3) adjustment again at 1690 Kc. If no appreciable change in trimmer adjustment is made the coil is in track. If the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1400 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1690 Kc.

SERVICE NOTES:

Resistances of coil windings are indicated in ohms on the schematic circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Excessive hum, stuttering, low volume and a reduction in all D.C. voltages is usually caused by a shorted electrolytic condenser; open by-pass condensers frequently cause oscillation and distorted tone.

ALIGNING INSTRUCTIONS:

CAUTION:—No aligning adjustments should be attempted without first thoroughly checking all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low line voltage, defective tubes, condensers and resistors. In order to properly align this radio, the chassis should be removed from the cabinet.
### Signal Generator

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted</th>
<th>Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. F.</td>
<td>455 Kc. 1 MFD.</td>
<td>Grid of 12S197 I. F. Tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Output L. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>455 Kc. 1 MFD.</td>
<td>Grid of 12A57</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Input L. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1650 Kc. 1 MFD.</td>
<td>Grid of 12S197</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer - Bottom of gang (See Top View)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1400 Kc.</td>
<td>(See Note &quot;A&quot; and &quot;B&quot;)</td>
<td></td>
<td></td>
<td>Antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

Loop aerial should be connected when aligning receiver.

**NOTE "A"**—Mount the chassis and the loop antenna in the cabinet, connect the loop antenna to the chassis, connect the trimmer through hole in bottom of cabinet.

### Signal Generator

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted</th>
<th>Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. F.</td>
<td>455 Kc. 1 MFD.</td>
<td>Grid of 12S197 I. F.</td>
<td>Broadcast</td>
<td></td>
<td></td>
<td>Two trimmers on top (See Top View)</td>
<td>Output L. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>455 Kc. 1 MFD.</td>
<td>Grid of 12S197</td>
<td>Broadcast</td>
<td></td>
<td></td>
<td>Two trimmers on top (See Top View)</td>
<td>Input L. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>17 Mc. 400 Ohms.</td>
<td>External Antenna and B-</td>
<td>Short Wave</td>
<td>Set Dial at 27 Mc.</td>
<td>Trimmer C1</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17 Mc. 400 Ohms.</td>
<td>External Antenna and B-</td>
<td>Short Wave</td>
<td>Set Dial at 27 Mc.</td>
<td>Trimmer C4</td>
<td>Short Wave antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 Mc. 400 Ohms.</td>
<td>External Antenna and B-</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C12</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

Loop antenna should be connected to the radio when making all adjustments—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected.

**NOTE "A"**—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

### Signal Generator

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted</th>
<th>Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1600 Kc. 1 mmf.</td>
<td>Grid of 12S197</td>
<td>Broadcast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1400 Kc. 200 mmf.</td>
<td>External Antenna and B-</td>
<td>Broadcast</td>
<td>Set Dial at 1400 K. C.</td>
<td></td>
<td>Broadcast antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>600 Kc. 200 mmf.</td>
<td>External Antenna and B-</td>
<td>Broadcast</td>
<td>Set Dial at 900 K. C.</td>
<td></td>
<td>Broadcast Series Pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

The loop antenna should be connected to the radio when making all adjustments—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected.

**NOTE "A"**—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

### Power Consumption

- **35 Watts**

### Selectivity

- **65 KC Broad at 1000 Times Signal at 1000 KC**

### Sensitivity for 50 Milliwatts Output

- **15 Microvolts Average**

### Power Output

- **900 Milliwatts Undistorted**

### Tuning Frequency Range

- **Broadcast**

### Intermediate Frequency

- **540 to 1400 KC**

### Speaker

- **5 in. P. M. Dynamic**
Power Supply

This radio is equipped with a universal transformer, 40 to 60 cycles which has the following taps: 90-110-130-150-220 volts.

A rotary switch mounted on top of the transformer selects the proper voltage tap.

Set the switch for various line voltages to conform with the following table:
- 90 mark for current of 85 to 105 volts
- 110 mark for current of 105 to 125 volts
- 130 mark for current of 125 to 145 volts
- 150 mark for current of 145 to 165 volts
- 250 mark for current of 210 to 250 volts

To set the switch, unloosen the set screw on the side of the switch and rotate the knob so that the mark desired shows up in the small framed window on the top of the switch. Tighten the set screw.

Intermediate Frequency

455 KC

MODEL 542  SERIES A

Power Consumption  -  -  55 Watts
Power Output  -  1½ Watts Undistorted
Tuning Frequency Range

Broadcast Band - 540 to 1735 KC
Medium Band  -  2.2 to 7 MC
Short Wave Band  -  6.8 to 23 MC

BRC—Form No. 5182—13M—32-43
PRO. 280

Compliments of www.nucow.com
### ALIGNMENT PROCEDURE

- **Volume control—Maximum all adjustments.**
- **Connect radio chassis to ground post of signal generator with a short heavy lead.**
- **Connect dummy antenna in series with generator output lead.**
- **Connect output meter across primary of output transformer.**
- **Allow chassis and signal generator to “heat up” for several minutes.**

#### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmer(s) Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L. F.</strong></td>
<td>455 Kc. 1 MFD.</td>
<td>Grid of 6SA7</td>
<td>L. F. Tube</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Chassis View)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>455 Kc. 1 MFD.</td>
<td>Grid of 6SA7</td>
<td>Left Rotation</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Chassis View)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

- **SHORT WAVE BAND**
  - 21 Mc. 400 ohms: Antenna lead (Short Wave, Extreme Left Rotation) Set Dial at 21 MC Trimmer (C7) Short wave oscillator
  - 21 Mc. 400 ohms: Short Wave Set Dial at 21 MC Trimmer (C7) Short wave oscillator

- **MEDIUM WAVE BAND**
  - 6 Mc. 400 ohms: Antenna lead (Medium Wave) Set Dial at 6 MC Trimmers (C6, C7) Medium wave oscillator and antenna
  - 2.3 Mc. 400 ohms: Antenna lead (Medium Wave) Set Dial at 2.3 MC Trimmer (C9) Medium wave oscillator and antenna

- **BROADCAST BAND**
  - 1700 Kc. 200 m.mfl. Antenna lead (Broadcast, Extreme Left Rotation) Rotor full open (Plates out of mesh) Trimmer (C10) Broadcast oscillator
  - 1500 Kc. 200 m.mfl. Antenna lead (Broadcast, Extreme Left Rotation) Set Dial at 1500 Kc. Trimmer (C3) Broadcast oscillator
  - 600 Kc. 200 m.mfl. Antenna lead (Broadcast, Extreme Left Rotation) Set Dial at 600 Kc. Trimmer (C11) Broadcast oscillator

#### MODEL 542—SERIES A

The loop antenna should be connected to the radio when making all R. F. adjustments. **NOTE A:** Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained. Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

After each range is completed, repeat the procedure as a final check.

#### MODEL 681—SERIES A

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmer(s) Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. F.</strong></td>
<td>455 Kc. 1 MFD.</td>
<td>Grid of 6SA7</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmers on top (See Chassis View)</td>
<td>Input and Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>17 Mc. 420 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc</td>
<td>Trimmer C4 Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17 Mc. 400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc</td>
<td>Trimmer C1 Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 Mc. 400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Set Dial at 6 Mc</td>
<td>Trimmer C7 Short Wave oscillator series pad</td>
<td>Adjust to maximum output (See note “A”)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **BROADCAST BAND**
  - 1600 Kc. 200 m.mfl. Grid of 6SA7 Broadcast Rotor full open (Plates out of mesh) Trimmer C5 Broadcast oscillator
  - 1400 Kc. 200 m.mfl. External Antenna and Ground Broadcast Set Dial at 1400 Kc. (See Chassis View) Trimmer C2 Broadcast oscillator
  - 600 Kc. 200 m.mfl. External Antenna and Ground Broadcast Set Dial at 600 Kc. (See Chassis View) Trimmer C8 Broadcast oscillator

**NOTE:** It is extremely necessary when making this adjustment that the fundamental oscillator signal be tuned in and not the image frequency which will fall below the fundamental.

**NOTE:** Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

After each range is completed, repeat the procedure as a final check.
MODEL 679C

PROCEDURE FOR SETTING THE AUTOMATIC PUSHBUTTONS:

There are six pushbuttons on the Remote Tuner Unit by means of which six stations may be set up for automatic tuning (See Fig 2).

Make a list of local stations you tune in regularly; any number up to and including six. Punch out from the set of station call letter tabs supplied, the call letters of the stations you have selected.

On the top of each pushbutton a slot is provided for inserting the call letter tabs, (See A, Fig 2).

Insert the call letter tabs.

NOW PROCEED AS FOLLOWS:

1. Push the dial tuning knob in hard enough to make it latch in.
2. Rotate the dial tuning knob to the left (counter-clockwise), well the knob cannot be turned any further without forcing. You will note that as the knob is rotated it will turn easily until the pointer reaches the end of the dial scale and then a slight amount of force will be required to actually start unlocking the tuning mechanism. Beyond this point the knob will turn quite easily again until the tuner mechanism is completely unlocked. At this point do not force the knob any further. The tuning mechanism is now unlocked.

(NOTE: Automatic tuner mechanism is locked tight when radio is shipped from the factory.)

3. Push in the way any one of the pushbuttons and at the same time hold in firmly the dial tuning knob. Both the dial tuning knob and the pushbutton should be pushed hard enough to make them stay latched in. The reason for holding the dial tuning knob firmly when the pushbutton is pressed in is due to the latching mechanism in the Remote Tuner Unit which is so constructed as to release the dial tuning knob entirely when a pushbutton is pressed in. When setting up stations for automatic tuning, however, it is necessary that both the dial tuning knob and the pushbutton be latched in together.

4. Press in on the pushbutton which is latched in. Holding it in firmly, turn in by means of the dial tuning knob the station indicated on the station call letter tab on this pushbutton. Turn the dial tuning knob very slowly back and forth (while still pressing on the pushbutton), until the station is clearest. The station will then be accurately tuned.
5. Push in all the way another pushbutton, at the same time holding the dial tuning knob in so that both the pushbutton and the dial tuning knob are latched in together. Holding the pushbutton in firmly, tune in the station indicated on the call letter tab on this pushbutton.
6. Follow this procedure until you have tuned in all of your favorite stations.
7. When the last pushbutton has been properly set up, it is necessary to release it from the latched-in position before the tuner mechanism can be locked. To release this pushbutton, press the pushbutton release pin on the bottom of the tuner unit. This will trip the latching mechanism and all the pushbuttons will be released to out position. (See Fig. 2A).
8. Now press on the dial tuning knob hard enough to make it latch in. Rotate the dial tuning knob to the right (clockwise) until the knob cannot be turned any further without forcing it. This will lock the tuner mechanism and all the stations that have been set up on the pushbuttons will be locked in place for automatic tuning.
9. Press in any one of the pushbuttons and -- YOUR FAVORITE STATION IS SELECTED.

The important steps to remember when setting up stations on the pushbuttons for automatic tuning are:

1. To unlock the tuner mechanism press on the dial tuning knob hard enough to make it stay latched in. Rotate the dial tuning knob to the left (counterclockwise) until the knob cannot be turned any further without forcing it.
2. To set a pushbutton, push in the way and hold in firmly both the pushbutton and the dial tuning knob so that they both latch in. Hold in firmly the pushbutton and tune in the station by means of the dial tuning knob. Set all the pushbuttons in the same manner.
3. To release the last pushbutton press the pushbutton release pin on the bottom of the tuner unit.
4. To lock the tuner mechanism push on the dial tuning knob hard enough to make it stay latched in. Rotate the dial tuning knob to the right (clockwise) until the knob cannot be turned any further without forcing it. (NOTE: All the pushbuttons must be in out position when locking the tuner mechanism.)

PROCEDURE FOR SETTING THE AUTOMATIC TUNER PUSH BUTTONS

MODELS 534, 612, 638, 542, 794, 796, 797, 604, 534

1. Make a list of six stations you tune in regularly. There are six push buttons on the front of the radio by means of which six stations may be tuned automatically. (See "B," Fig 2).
2. Punch out the call letters of the stations you have selected from the set of station call letter tabs supplied.
3. On the front of each automatic tuner button an opening is provided for inserting the call letter tabs, (See "A," Fig 2).
4. Insert the call letter tabs in the rectangular openings in each of the automatic push buttons.
5. Stations may be set up in any sequence desired. Press any one of the automatic tuner push buttons down all the way.
6. Hold the push button down firmly, and tune set very carefully to station desired, until station is heard clearly and with maximum volume.
7. Release the push button.
8. Press down another automatic tuner push button. Hold it down FIRMLY and carefully tune in next station desired. Release this push button.
9. Follow this procedure until you have selected all of your favorite stations.

6. Now release the tuning knob to the right (clockwise) as far as it will turn, and with a screwdriver tighten the special locking screw ("C")

MODEL 794

Looking at the back of the cabinet note the locking screw "C" on the left hand side of the chassis. It is VERY IMPORTANT that this locking screw is turned until it is ABSOLUTELY TIGHT.

This screw will lock in place all the stations you have selected on the automatic tuner push buttons. (Note: Locking screw "C" is loose when radio is shipped from factory.)

CHANGING STATIONS:

If you should desire to change any station you have selected to another, loosen the locking screw "C" one or two turns. Hold in push button on which the station is to be changed and tune in new station desired. Release the push button. (Note: If the dial mechanism works hard when setting so a new station for one of the automatic tuner buttons, it is due to the locking screw being too tight. Loosen the locking screw "C" until the dial mechanism works freely with the tuner push button pressed in.

Be sure to retighten the locking screw, otherwise the stations you have previously selected will not stay adjusted to the push buttons.

The set is now set up for automatic tuning.
**MODEL 671**

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc. .1 MFD.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer on top (See Chassis View)</td>
<td>Input and Output</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>SHORT WAVE</td>
<td>17 Mc. 400 Ohms External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C4</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAND (See Note A)</td>
<td>17 Mc. 400 Ohms External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C1</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROADCAST</td>
<td>6 Mc. 400 Ohms External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C7</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAND (See Note A)</td>
<td>1600 Kc. 200 m mf. Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOOP ALIGN-</td>
<td>530 Kc. 200 m mf. Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full closed</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See Note A)</td>
<td>1400 Kc. 200 m mf. External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>Trimmer C2</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALIGNMENT</td>
<td>600 Kc. 200 m mf. External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer C8</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See Note B)</td>
<td>1400 Kc. 200 m mf. Grid of 6SA7</td>
<td>Broadcast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE: A**—The signal generator is connected to the "ANT." and "GND" leads when aligning the Short Wave Band and to the grid of the 6SA7 tube and ground (terminal) when setting the Broadcast Band oscillator and frequencies, (1600 and 355 K. C.)

The loop antenna should be connected to the radio when making these adjustments.

**NOTE: B**—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. The signal generator is connected to the "ANT." and "GND" terminals.

**NOTE: C**—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained. Attach the signal from the signal generator to prevent the leveling-off action of the AVC.

After each band is completed, repeat the procedure as a final check.

---

**MODEL 671**

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc. .1 MFD.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Chassis View)</td>
<td>Input and Output</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>SHORT WAVE</td>
<td>17 Mc. 400 Ohms External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C5</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAND (See Note A)</td>
<td>17 Mc. 400 Ohms External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C1</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROADCAST</td>
<td>6 Mc. 400 Ohms External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C7</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAND (See Note A)</td>
<td>1600 Kc. 200 m mf. Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Chassis View)</td>
<td>Input and Output</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOOP ALIGN-</td>
<td>530 Kc. 200 m mf. Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full closed</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See Note A)</td>
<td>1400 Kc. 200 m mf. External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>Trimmer C2</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALIGNMENT</td>
<td>600 Kc. 200 m mf. External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer C8</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See Note B)</td>
<td>1400 Kc. 200 m mf. Grid of 6SA7</td>
<td>Broadcast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BELMONT RADIO CORP.

MODEL 638
Series A
(Serial No. 403200 and up)

L.F. 455 K.C.

R.F. Amp

12SK7

Mixer, First Detector-Oscillator
12SA7

I.F. Amp

12SK7

Second Detector, A.V.C.

First Audio

12SQ7

Output

35L6 GT

Frequency Range

540 to 1600 K.C.

Power Consumption

35 Watts

Power Output

1 Watt Undistorted, 3 Watts Maximum

CONVENTIONAL ALIGNMENT, SEE SPECIAL SECTION VOL VIII FOR TUNER, DATA, SEE INDEX

TRIMMERS ON GANG.

SEE BOTTOM OF RADIO

BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH 1000 OHM PER VOLT VOM BETWEEN SOCKET TERMINALS AND B.

T1 111130 Loop Antenna complete
T2 110112 Oscillator Coil
T3 100145 Input F. F. Coil—455 Kc.
T4 100145 Output F. F. Coil—455 Kc.
T5 105104 Output Transformer
T6 11107 F. F. M. Speaker
L1 12512 Lighting Coil
S1 On-off switch on volume control
F1 127229 TV Pilot light bulb

NOTE “A” Lay the output lead from the generator in back of the loop antenna. Turn up the output of the generator, picking up the energy in the loop antenna without any electrical connection from the generator.

©John F. Rider, Publisher
Six-Tube A.C.-D.C. Superheterodyne Receiver
with Automatic Tuning and Self-Contained Loop Antenna

Frequency Range—535 - 1600 Kilocycles
I. F. Frequency 455 Kc.

Receivers of this model which are to be used on voltages other than 105-125 volts A. C. (50/60 cycle), or 105-125 volts D. C. are so marked. The power consumption of this receiver is 35 watts.
### ALIGNMENT PROCEDURE

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 ml, 125 ml.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Remote Tuner Dial Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>465 Kc .1 MFD. Grid of 6SK7 L.F. Tube</td>
<td>1400 Kc</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmers C19, C20 (See Fig. 3)</td>
<td>Output to L.F.</td>
<td>See note “A”</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc .1 MFD. Grid of 6SK7</td>
<td>1400 Kc</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmers C19, C20 (See Fig. 3)</td>
<td>Output to L.F.</td>
<td>See note “B”</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc .1 MFD. Grid of 6A8GT</td>
<td>1600 Kc</td>
<td>Set dial at 1600 Kc.</td>
<td>Trimmers C19, C20 (See Fig. 3)</td>
<td>Output to L.F.</td>
<td>See note “C”</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1356 Kc 125 mmL. Antenna lead</td>
<td>1556 Kc</td>
<td>Set dial at 1556 Kc.</td>
<td>Trimmers C1 (See Fig. 4)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1400 Kc 125 mmL. Antenna lead</td>
<td>1600 Kc</td>
<td>Set dial at 1600 Kc.</td>
<td>Trimmers C1, C3 (See Fig. 4)</td>
<td>Antenna and R.F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>600 Kc 125 mmL. Antenna lead</td>
<td>600 Kc</td>
<td>Set dial at 600 Kc.</td>
<td>Trimmers C2 (See Fig. 4)</td>
<td>Antenna series adj.</td>
<td>See note “D”</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

**NOTE “A”** IMPORTANT: To align the output I.F. transformer without using a cathode ray oscillograph a 10M ohm resistor must be shunted across the diode tuned circuit. Connect the resistor as indicated by points “X” and “Y” on the circuit diagram and the bottom view of the radio chassis. A red dot on top of output I.F. can designate location of trimmer “C19.”

**NOTE “B”** Before adjusting trimmer C20 disconnect the 10M ohm resistor. Under no circumstances re-adjust trimmers C19 or C20 after the 10M ohm resistor has been removed.

For alignment of the output I.F. transformer using a cathode ray oscillograph the 10M ohm resistor is not used.

**NOTE “C”** Maximum gain for this adjustment depends on the capacity of the antenna system of the car in which the radio is installed. For the proper alignment of this adjustment see “Adjusting Antenna Trimmer.”

### ALIGNMENT OF THE IRON CORES

The iron cores for the antenna, R.F. and oscillator permeability coils have been very carefully adjusted at the factory and require no further adjustment, unless it becomes necessary to replace a coil, or if the adjustments have been tampered with.

The procedure for aligning the iron cores will be supplied with replacement coils when ordered.

---

**Fig. 4.—Bottom View of Remote Tuner**

**IMPORTANT—ADJUSTING ANTENNA TRIMMER:**

Tune in any weak station between 600 and 800 kc.

Make sure that the antenna shunt trimmer on the bottom of the Remote Tuner is turned all the way out (counter clockwise), (see adjustment “C1,” Fig. 4)

Adjust antenna series trimmer on the side of the remote Tuner Unit. For maximum output. (See adjustment “C2,” Fig. 4)

**NOTE:** If resonance (maximum output) cannot be obtained within the range of the antenna series trimmer “C2,” turn the adjustment screw all the way out (counter clockwise) and then adjust the antenna shunt trimmer “C1” on the bottom of the remote tuner unit for a peak of maximum output.

The above arrangement will cover any antenna capacity that is now in use.
Model 681

Series A

BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH A HIGH RESISTANCE VOLTMETER BETWEEN SOCKET TERMINALS AND CHASSIS. VOLUME CONTROL AT MINIMUM. 115 VOLT LINE CANNOT BE MEASURED WITH VOLTMETER.

RESISTORS

Power Consumption - - - - - - - 55 Watts
Power Output - - - - - - - 2.2 Watts Undistorted
Sensitivity for 500 Milliwatt Output: 15 Microvolts Average
Selectivity - 47 KC Broad at 1000 Times Signal at 1000 KC
Tuning Frequency Range Broadcast Band - 550 to 1600 KC
Shortwave Band - 5.43 to 18.3 MC
Intermediate Frequency - - - - - - - 455 KC

Setting the Pushbuttons

Make a list of your 6 favorite stations. Push out the call letters of these stations from the call letter sheets supplied. Insert a call letter in the front of each pushbutton.

Next push one of the pushbuttons all the way in as far as it will go and hold it there. Now tune in the station you want with the tuning knob—Tune back and forth until the station is clear and distinct, then release the button. Continue setting each pushbutton in the same way. Now rotate the tuning knob to the right (clockwise) as far as it will turn.

Looking at the back of the cabinet note the reset lock screw on the left hand side of the chassis, (see chassis view).

Rotate the reset lock screw to the right (clockwise) by means of the pin thru the shaft.

It is very important that this locking screw is turned until it is absolutely tight.

This screw will lock in place all the stations you have selected on the automatic tuner pushbuttons. Pressing the proper button will now tune the station you want. (NOTE: Locking screw is loose when radio is shipped from factory).

To change stations simply loosen the reset lock screw and repeat the procedure above.

BRC 681—Series A Form No. 6273—1955-01-40
Rev. 260
### MODEL 706

The following equipment is required for alignment:
- An all-wave signal generator which will provide an accurately calibrated signal at the test frequencies as needed.
- Output indicating meter.
- Dummy antenna—1 m, 200 mils, and 400 ohms.

#### TABLE 706

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Dial Pultur Setting</th>
<th>Trimmer Adjusted In Order Shown</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>655 Kc. .1 MFD. Grid of 65K2 (S.t.)</td>
<td>Broadcast</td>
<td>Set Dial at 300 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Output</td>
<td>Adjust to maximum input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. F.</td>
<td>455 Kc. .1 MFD. Grid of 65K2 (1st I.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Interstage I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. F.</td>
<td>455 Kc. .1 MFD. Grid of 65K2 (1st I.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 140 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 METER</td>
<td>9.6 Mc. 400 ohms Antenna lead</td>
<td>31M</td>
<td>Set Dial at 36 M.</td>
<td>(See Trimmer View) C3</td>
<td>Oct. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 METER</td>
<td>11.8 Mc. 400 ohms Antenna lead</td>
<td>25M</td>
<td>Set Dial at 11.8 M.</td>
<td>(See Trimmer View) T4</td>
<td>Oct. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 METER</td>
<td>15.2 Mc. 400 ohms Antenna lead</td>
<td>19M</td>
<td>Set Dial at 15.2 M.</td>
<td>(See Trimmer View) T3</td>
<td>Oct. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1000 Kc. 200 mils. Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1000 Kc.</td>
<td>(See Trimmer View) C2</td>
<td>Oct. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAND</td>
<td>1000 Kc. 200 mils. Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 140 Kc.</td>
<td>(See Trimmer View) C2</td>
<td>Oct. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Setting the Pushbuttons

**MODEL 902**

Make a list of your 6 favorite stations. Push the button hard all the way in to lock the stations supplied. Insert a call letter in the slot on the top of each pushbutton. (Except the two end ones).

Next pull one of the pushbuttons all the way back and forth as far as it will come (pull, with fingers on top and bottom of button). Now tune in the station you want with the tuning knob—Tune back and forth. If it does not do so, do not use the button.

To change stations simply repeat the procedure until the station is clear and distinct.

### MODEL 902

- Tone control—Treble
- Volume control—Maximum all adjustments.
- Connect radio chassis to ground plus all signal generators with a short heavy lead.
- Disconnect antenna in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

#### TABLE 902

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Dial Pultur Setting</th>
<th>Trimmer Adjusted In Order Shown</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc. .1 MFD. Grid of 65K2 (S.t.)</td>
<td>Broadcast</td>
<td>Set Dial at 300 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Output</td>
<td>Adjust to maximum input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. F.</td>
<td>455 Kc. .1 MFD. Grid of 65K2 (1st I.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Interstage I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. F.</td>
<td>455 Kc. .1 MFD. Grid of 65K2 (1st I.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 140 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 METER</td>
<td>9.6 Mc. 400 ohms Antenna lead</td>
<td>31M</td>
<td>Set Dial at 36 M.</td>
<td>(See Trimmer View) C3</td>
<td>Oct. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 METER</td>
<td>11.8 Mc. 400 ohms Antenna lead</td>
<td>25M</td>
<td>Set Dial at 11.8 M.</td>
<td>(See Trimmer View) T4</td>
<td>Oct. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 METER</td>
<td>15.2 Mc. 400 ohms Antenna lead</td>
<td>19M</td>
<td>Set Dial at 15.2 M.</td>
<td>(See Trimmer View) T3</td>
<td>Oct. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1000 Kc. 200 mils. Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1000 Kc.</td>
<td>(See Trimmer View) C2</td>
<td>Oct. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAND</td>
<td>1000 Kc. 200 mils. Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 140 Kc.</td>
<td>(See Trimmer View) C2</td>
<td>Oct. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pushbutton Tone Control

This button has three tone positions—Bas—Medium—Treble. Each time you push the button it will change the tone to one of these positions—Change it any time to the tone you like best.

### Radio-Phono Pushbutton Switch

This pushbutton switches from the radio to the phone position. It should be level with the other buttons for radio operation—or pulled out to use a phoneograph. A phone jack is provided on the chassis should you wish to connect an external Photophone or your Radio (Phono jack is shown in the chassis view).
### Phonograph-Television or FM. Jack

Should you wish to use an external phonograph or FM jack, it should be plugged into the phono-jack shown in the top view. The on-off radio-phono knob on the front panel will then switch from radio to phonograph operation.

- **Power Consumption**: 75 Watts
- **Power Output**: 3 Watts Undistorted
- **Sensitivity for 500 Milliwatt Output**: 20 Microvolts Average

#### Selectivity
- 45 KC Broad at 1000 Times Signal at 1000 KC
- Tuning Frequency Range: Broadcast 535 to 1600 KC, Shortwave 5.4 to 18.4 MC
- Intermediate Frequency: 455 KC
- Speaker: 6 in. Electro Dynamic

#### Alignment Procedure
- Volume control—Maximum all adjustments.
- Connect radio ground to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 ml, 200 mlm, 400 ohms.

#### Signal Generator

<table>
<thead>
<tr>
<th><strong>BAND</strong></th>
<th><strong>Frequency Setting</strong></th>
<th><strong>Dummy Antenna</strong></th>
<th><strong>Connection to Radio</strong></th>
<th><strong>Position of Band Switch</strong></th>
<th><strong>Variable Condenser Setting</strong></th>
<th><strong>Trimmers Adjusted</strong></th>
<th><strong>Trimmer Function</strong></th>
<th><strong>Adjustment</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. F.</strong></td>
<td><strong>455 Kc.</strong></td>
<td>.1 MFD.</td>
<td>Grid of 6SA7 and I. F.</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td><strong>455 Kc.</strong></td>
<td>.1 MFD.</td>
<td>Grid of 6SA7 and I. F.</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td><strong>SHORT WAVE BAND</strong></td>
<td></td>
<td></td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C4</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C1</td>
<td>Short Wave antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td><strong>(See Note A)</strong></td>
<td>6 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C3</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output (See note &quot;C&quot;)</td>
</tr>
<tr>
<td><strong>BROADCAST BAND</strong></td>
<td></td>
<td></td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 535 Kc.</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1600 Kc.</td>
<td>200 mml</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator series pad</td>
<td>Maximum output</td>
</tr>
<tr>
<td><strong>(See Note B)</strong></td>
<td></td>
<td></td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td></td>
<td>Trimmer C6</td>
<td>Broadcast oscillator series pad</td>
<td>Maximum output</td>
</tr>
<tr>
<td><strong>LOOP ALIGNMENT</strong></td>
<td></td>
<td></td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>Trimmer C2</td>
<td>Broadcast antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1400 Kc.</td>
<td>200 mml</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer C3</td>
<td>Tracking Coil</td>
<td>Maximum output</td>
</tr>
<tr>
<td></td>
<td>600 Kc.</td>
<td>200 mml</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE "A"**—The signal generator is connected to the "ANT." and "GND." terminals on the rear of the chassis when aligning the Short Wave Band and to the grid of the 6SA7 tube and ground terminal when setting the Broadcast Band oscillator end frequencies, (1600 and 535 K. C.).

The loop antenna should be connected to the radio when making these adjustments.

**NOTE "B"**—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. The signal generator is connected to the "ANT." and "GND." terminals.

**NOTE "C"**—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained. Attempt to prevent the leveling-off action of the AVC. After each band is completed, repeat the procedure as a final check.
## Alignment Procedure

The following equipment is required for aligning:
- An all-wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 m, 200 mmL, 400 ohms.

### Signal Generator

<table>
<thead>
<tr>
<th>Band</th>
<th>Signal Generator Model</th>
<th>Setting 1</th>
<th>Setting 2</th>
<th>Dummy Antenna</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmer</th>
<th>Adjusted</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>MODEL 786</td>
<td>465 Kc.</td>
<td>455 Kc.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top</td>
<td>Output at 1.5 F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>465 Kc.</td>
<td>455 Kc.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top</td>
<td>Input at 1.5 F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>SHORT WAVE</td>
<td></td>
<td>17 Mc.</td>
<td>17 Mc.</td>
<td>External Antenna &amp; Ground</td>
<td>Short Wave</td>
<td>Set Dial @ 17 Mc.</td>
<td>Trimmer C1</td>
<td>(See Fig. 4)</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BAND</td>
<td>MODEL 797</td>
<td>17 Mc.</td>
<td>17 Mc.</td>
<td>External Antenna &amp; Ground</td>
<td>Short Wave</td>
<td>Set Dial @ 17 Mc.</td>
<td>Trimmer C2</td>
<td>(See Fig. 4)</td>
<td>Short Wave antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>(See Note A)</td>
<td></td>
<td>6 Mc.</td>
<td>6 Mc.</td>
<td>External Antenna &amp; Ground</td>
<td>Short Wave</td>
<td>Set Dial @ 6 Mc.</td>
<td>Trimmer C3</td>
<td>(See Fig. 4)</td>
<td>Short Wave oscillator series plate</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST</td>
<td></td>
<td>450 Kc.</td>
<td>450 Kc.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C4</td>
<td>(See Fig. 4)</td>
<td>Broadcast oscillator series plate</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BAND</td>
<td>MODEL 797</td>
<td>450 Kc.</td>
<td>450 Kc.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C5</td>
<td>(See Fig. 4)</td>
<td>Broadcast oscillator series plate</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>(See Note A)</td>
<td></td>
<td>450 Kc.</td>
<td>450 Kc.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C6</td>
<td>(See Fig. 4)</td>
<td>Broadcast oscillator series plate</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>LOOP</td>
<td></td>
<td>1400 Kc.</td>
<td>1400 Kc.</td>
<td>External Antenna &amp; Ground</td>
<td>Broadcast</td>
<td>Set Dial @ 1400 Kc.</td>
<td>Trimmer C1</td>
<td>(See Fig. 5)</td>
<td>Broadcast antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>ALIGNMENT</td>
<td></td>
<td>900 Kc.</td>
<td>900 Kc.</td>
<td>External Antenna &amp; Ground</td>
<td>Broadcast</td>
<td>Set Dial @ 900 Kc.</td>
<td>Trimmer C2</td>
<td>(See Fig. 5)</td>
<td>Iron Core Tracking Coil</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>(See Note B)</td>
<td></td>
<td>900 Kc.</td>
<td>900 Kc.</td>
<td>External Antenna &amp; Ground</td>
<td>Broadcast</td>
<td>Set Dial @ 900 Kc.</td>
<td>Trimmer C3</td>
<td>(See Fig. 5)</td>
<td>Iron Core Tracking Coil</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

### Notes

**A**—The signal generator is connected to the "ANT." and "GND." terminals on the rear of the chassis when aligning the Short Wave Band and to the grid of the 6SA7 tube and ground terminal when setting the Broad Band oscillators end frequencies. (1570 and 332 Kc.)

The loop antenna need not be connected to the radio when making these adjustments.

**B**—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. The signal generator is connected to the "ANT." and "GND." terminals and the jumper on the terminal board connected to "EXT." terminals.

### Service Notes:

Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt.

All voltages as indicated on the voltage chart are measured with 315 volts A.C. on the primary of the power transformer.

Resistance of coil windings are indicated in ohms on the schematic circuit diagram.

To check tor open by-pass capacitors, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Excessive hum, fluttering, low volume and a reduction in all D.C. voltages is usually caused by a shorted electrolytic condenser; open by-pass condensers frequently cause oscillation and distorted tone.

### Aligning Instructions:

**CAUTION**—No aligning adjustments should be attempted without first thoroughly checking over all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low line voltages, defective tubes, condensers and resistors. In order to properly align this chassis, an oscillator (generator) is absolutely necessary. No aligning adjustments should be attempted with the chassis in the cabinet.

It is important during loop alignment that the same distance between the loop antenna and the chassis be maintained as when the chassis is installed in the cabinet.

To remove the chassis from the cabinet, pull off the knobs and take out the 4 bolts holding the chassis flange to the control panel.

![Fig. 5—Top View](image-url)
BAND SWITCH
Extreme Right Rotation
Center Position
Broadcast
Power Consumption (Radio Chassis only, less Phon Motor) 50 Watts
Power Output 3.6 Watts Undistorted, 5.4 Watts Maximum

FREQUENCY RANGE
5.4 to 18.3 MC.
532 to 1570 KC.

Model 797
Series A
(Serial No. OD228100 and up)

FOR TUNER DATA
SEE INDEX

PARTS
111459 Loop Antenna Assembly
111460 Loop Adjustable Coil
111461 S.W. Antenna Coil
111462 B.C. & S.W. Oscillator Coil
111463 Input I.F. Coil—455 kc.
111464 Output I.F. Coil—455 kc.
111465 Output Transformer
111466 10" Dynamic Speaker
111467 10" Dynamic Speaker
111468 10" Passive Loudspeaker
111469 R.F. Choke coil
111470 R.F. Choke coil
111471 Pilot Light Bulbs Type T4
111472 Photo Motor Switch
111473 Photo Motor Switch

BELMONT RADIO CORP.
BELMONT SERIES A
MODEL 797
PAGE 12-29

Compliments of www.nucow.com
THE RECORDER AND PHONOGRAPH

Model 797 Series A

Unpack the microphone and plug it into the chassis. The microphone socket is shown in Fig. 3.

Insert a playback needle in the phone playback arm.

Insert a special cutting stylus (needle) in the cutter arm as shown in Fig. 2. Handle this needle with care.

Be sure the needle is tight after each recording. Should it loosen during the recording, it will chatter and ruin your record.

The cutting stylus is razor sharp and must not be dropped on the record or allowed to rest on the turntable.

For best operation, the instrument should be level in all directions. To check this, place a small level, if you have one, on the turntable. If you do not have a level, a marble will do. If the marble rolls off the turntable, it is low in the direction in which it rolls. Place something under the console until the machine is reasonably level.

HOWLING:

If the microphone is held too close to the loud speaker, it will feed back and start a loud "howl". Keep the microphone well away from the recording cabinet with its back toward the cabinet.

If the recording switch is in radio position and the microphone volume control is turned on, feedback will occur and a very loud howl will start. Be sure to turn the microphone volume control to zero when playing radio.

SHAVINGS:

The cutting stylus cuts out a fine shaving that is just a little thicker than a human hair. These shavings should not be allowed to gather under the cutting stylus.

Just before lowering the cutting arm on the record, hold one finger on the center of the record for a moment. This will create a static charge that will pull the shavings toward the center pin.

While cutting, gently brush the shavings from the left side of the record in toward the center pin, allowing them to collect there until the recording is completed.

CUTTING ARM ADJUSTMENTS:

The cutting arm is adjusted at the factory for proper operation, however, with various types of blanks this adjustment may sometimes have to be altered. With a blank record on the table, the height adjustment shown in Fig. 2 should be adjusted so that the bottom of the cutting arm is 1/4" from the top of the record blank. Make this measurement carefully at the front end beside the stylus screw.

The screw adjustment can be turned to raise or lower the arm.

Several blank grooves should now be cut to see if the groove is the proper depth. The depth adjustment screw shown in Fig. 2 will increase the depth of the groove if turned to the right and will decrease the groove if turned to the left.

If the groove is too shallow, the playback needle will not stay in the groove. If it is too deep, not enough wall will be left between grooves and the playback needle will break through from one track to the next after a few playings.

The proper depth of groove will leave about the same space between the groove as the groove is wide. Hold a finished record toward the light and you can usually see if the grooves are spaced correctly.

A properly cut groove will leave a shaving just a little heavier than a human hair.

RECORDING RADIO PROGRAMS:

Turn the radio on and tune in the program you wish to record. Turn microphone volume control to zero (left). Put recording switch in record position. The volume will drop. Start motor and then gently lower cutting needle onto blank record, about 1/4" from outer edge.
Setting the Pushbuttons

Make a list of your 6 favorite stations. Push out the call letters of these stations from the call letter sheets supplied. Insert a call letter in the slot on top of each pushbutton. (Except the two end ones).

Next pull one of the pushbuttons all the way out as far as it will come (pull, with fingers on top and bottom of button). Now tune in the station you want with the tuning knob—tune back and forth until the station is clear and distinct. Now push the button hard all the way in to lock the station in place, (push directly on front of button). Continue setting each pushbutton in the same way. Pressing the proper button will now tune the station you want. If it does not do so you did not push the button hard enough to lock it in place when setting up the station.

To change stations simply repeat the procedure above.

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**Tuning Frequency Range**
- Broadcast Band - 540 to 1600 KC
- 49M Band - 5.9 to 6.1 MC
- 31M Band - 5.1 to 10 MC
- 23M Band - 11.4 to 12.1 MC
- 19M Band - 14.9 to 15.4 MC

**Intermediate Frequency** 455 KC
- Speaker - 12 in. Electro Dynamic

**Phonograph-Television and FM Jack**

Should you wish to use an external phonograph it should be plugged into the phono jack shown in the chassis view. The radio-phono button on the front panel will then switch from radio to phono operation.

If television or frequency modulation (FM) programs ever become available in your community this radio may still be used in conjunction with the necessary converters.

The jack marked phono-television FM in the top view will accommodate either the Phono or a television or FM converter.

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Dial Pointer Setting</th>
<th>Trimmer In Order Shown</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>455 Kc. .1 MFD.</td>
<td>Grid of 65K7 (T.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 1600 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>I.F.</td>
<td>455 Kc. .1 MFD.</td>
<td>Grid of 65A7</td>
<td>Broadcast</td>
<td>Set Dial at 1600 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Input L.F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>31 METER BAND</td>
<td>9.6 Mc. 400 ohms</td>
<td>Antenna lead</td>
<td>31M</td>
<td>Set Dial at 9.6 Mc.</td>
<td>(See Trimmer View) C9</td>
<td>Osc. R.F. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>40 METER BAND</td>
<td>6.1 Mc. 400 ohms</td>
<td>Antenna lead</td>
<td>40M</td>
<td>Set Dial at 6.1 Mc.</td>
<td>(See Trimmer View) T14</td>
<td>Osc. R.F. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>25 METER BAND</td>
<td>11.8 Mc. 400 ohms</td>
<td>Antenna lead</td>
<td>25M</td>
<td>Set Dial at 11.8 Mc.</td>
<td>(See Trimmer View) T8</td>
<td>Osc. R.F. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>19 METER BAND</td>
<td>15.2 Mc. 400 ohms</td>
<td>Antenna lead</td>
<td>19M</td>
<td>Set Dial at 15.2 Mc.</td>
<td>(See Trimmer View) T8</td>
<td>Osc. R.F. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1600 Kc.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1600 Kc.</td>
<td>(See Trimmer View) C3</td>
<td>Osc. R.F. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1400 Kc.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>(See Iron Core Adjustment View)</td>
<td>R.F. Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows.

First refer to the "Iron Core Adjustment View" now turn the tuning knob until the drive bar comes within 1/64 to 1/32 from the stops. (A piece of blotting paper is about the right thickness and will serve as a gauge). The clearance of the bar must be the same at both stops. If far off you can raise one drive screw gently and equalize them. Minor adjustments may be made with the drive bar adjustments.

Next rotate each iron core until the fine score marks are even with the edge of the coil forms.

You are now ready to continue with the trimmer adjustments as shown on the alignment chart.
Power Consumption, Radio only - - - - - 100 Watts
Power Output - - - - - 5 Watts Undistorted
Sensitivity for 500 Milliwatt Output: 10 Microvolts Average
Selectivity - 35 KC Broad at 1000 Times Signal at 1000 KC
Tuning Frequency Range Broadcast Band - 540 to 1600 KC
49M Band - - - 5.8 to 6.1 MC
31M Band - - - 9.1 to 10 MC
25M Band - - - 11.4 to 12.1 MC
19M Band - - - 14.9 to 15.4 MC
Intermediate Frequency - - - - - 455 KC
Speaker - - - - - 12 in. Electro Dynamic

FOR TUNER DATA, SEE INDEX

Television and FM Jack

If television or frequency modulation (FM) programs ever become available in your community this radio may still be used in conjunction with the necessary converters.

The jack marked phono-pickup jack in the chassis view will accommodate either the Phone or a television or FM converter.

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Dial Pointer Setting</th>
<th>Trimmers in Order Shown</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc.</td>
<td>.1 MFD</td>
<td>Grid of 6SK7 (E.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 1600 Kc</td>
<td>Two Trimmers on Top</td>
<td>Output L F</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>31 METER BAND</td>
<td>9.6 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>31M</td>
<td>Set Dial at 3.6 Mc.</td>
<td>(See Trimmer View C 28)</td>
<td>Osc.</td>
<td>R F</td>
</tr>
<tr>
<td>49 METER BAND</td>
<td>6.1 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>49M</td>
<td>Set Dial at 6.1 Mc.</td>
<td>(See Trimmer View T 14)</td>
<td>Osc.</td>
<td>R F</td>
</tr>
<tr>
<td>25 METER BAND</td>
<td>14.8 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>25M</td>
<td>Set Dial at 11.5 Mc.</td>
<td>(See Trimmer View T 15)</td>
<td>Osc.</td>
<td>R F</td>
</tr>
<tr>
<td>19 METER BAND</td>
<td>15.2 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>19M</td>
<td>Set Dial at 15.2 Mc.</td>
<td>(See Trimmer View T 16)</td>
<td>Osc.</td>
<td>R F</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1600 Kc.</td>
<td>200 mil</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1600 Kc</td>
<td>(See Trimmer View C 16)</td>
<td>Osc.</td>
<td>R F</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1400 Kc.</td>
<td>200 mil</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1600 Kc</td>
<td>(See Trimmer View C 14)</td>
<td>Osc.</td>
<td>R F</td>
</tr>
</tbody>
</table>
How to Make Perfect Recordings

The microphone must be connected to the chassis at all times.

Insert a playback needle in the playback arm.

Insert a special cutting stylus (needle) in the cutter arm. Handle this needle with care.

Be sure the needle is tight after each recording. Should it loosen during the recording, it will chatter and ruin your record.

Cutting Needle

The cutting stylus is razor sharp and must not be dropped on the record or allowed to rest on the turntable.

For best operation, the instrument should be level in all directions. To check this, place a small level, if you have one, on the turntable. If you do not have a level, a marble will do. If the marble rolls off the turntable, it is low in the direction in which it rolls. Place something under the cabinet until the machine is reasonably level.

Shavings

The cutting stylus cuts out a fine shaving that is just a little thicker than a human hair. These shavings should not be allowed to gather under the cutting stylus.

While cutting, gently brush the shavings from the left side of the record in toward the center pin, allowing them to collect there until the recording is completed.

Do Not Use Too Much Volume

The most frequent cause of poor recordings is too much volume or overloading. If any passages of your recording are smooth and clear while others are raspy, rough and distorted, you are probably using too much volume. Overloading occurs most often on strong passages. The remedy is to reduce the volume slightly and watch the volume indicator lights-and study the different effects of microscope technique.

Too little volume will show up when you play the record back. The volume control on your playback will have to be turned up quite high and needle scratch will be excessive.

Cutting Arm Adjustments

The cutting arm is adjusted at the factory for proper operation, however, with various types of blanks this adjustment may sometimes have to be altered.

On Model 616.

With a blank record on the table, the height adjustment on the cutter arm should be adjusted so that the bottom of the cutting arm is 3/4" from the top of the record blank. Make this measurement at the front end beside the stylus screw.

The screw adjustment can be turned to raise or lower the arm.

Several blank grooves should now be cut to see if the groove is the proper depth.

On Model 616.

The depth adjustment screw on the cutter arm will increase the depth of the groove if turned to the right and will decrease the groove if turned to the left.

On Model 601.

The depth adjustment screw on the cutter arm will increase the depth of the groove if turned to the right and will decrease the groove if turned to the left.

If the groove is too shallow, the playback needle will not stay in the groove. If it is too deep, not enough wax will be left between grooves and the playback needle will break through from one track to the next after a few plays.

A properly cut groove will leave a shaving just a little heavier than a human hair.

The proper depth of groove will leave the same space between the grooves as the groove is wide. Hold a finished record toward the light and you can usually see if the grooves are spaced correctly.

Recording Radio MODEL Programs 616

Turn the radio on and tune in the program you wish to record. Put rec-ording switch in “Record Radio” position. The volume will drop. Start motor and then gently lower cutting needle onto blank record, about 3/4” from outer edge.

Recording Radio MODEL Programs 801

Turn the radio on and tune in the program you wish to record. Put manual switch in manual position. Start motor and then gently lower cutting needle onto blank record, about 3/4” from outer edge.

Operating the Phonograph

Turn radio on. Put phono switch in “Phono” position. On 801 put your record on turntable and start motor. Place playback arm on record and control tone and volume with the radio volume and tone control knobs.

Be sure mike control is turned off when playing records.
Setting for Size of Record

The Changer plays up to fourteen 10" or ten 12" records at one loading. All records must be the same size for each loading.

On each post you will see selecting arms. The position of these arms determines the setting for different size records. To set for 10 or 12 inch records, it is merely necessary to grasp the post by the large knob at the top, lift, and turn until the 10" or 12" arrows are pointing toward the center of the turntable. When in the 10" or 12" position, the posts will snap into place except when they are lifted by hand. Be sure to set both posts for the same size record.

Loading

See that the selecting arms of both posts are turned toward the center of the turntable as indicated by the engraved arrows, and that both sets of arms are set for the same size (10" or 12") records as described in the preceding paragraph.

Place the stack of records (up to fourteen 10" or ten 12") over the center pin so that they will rest on the selecting arms.

Starting the Changer

1. Turn on the radio (allowing approximately 30 seconds for the tubes to warm up) and turn the phonograph-radio knob, to the phonograph position.

2. Turn the switch knob on the Changer panel to "OFF". The motor will then start and the record changer will go into automatic operation of its own accord.

How to Reject a Record

Merely press the switch knob on the Changer panel. You can do it any time after the needle has come into contact with the record.

Playing Individual Records

Should it be desired to play an individual record merely set up the machine as described above for the proper size (10" or 12" as indicated on the selecting arms), place the record on top of the arms as described under "Loading", and set the machine in operation by means of the switch knob described under "Starting the Changer." In other words, play an individual record in the same manner as you would play a stack of that size.

Automatic Record Changer

Unloading

First switch off the motor. Grasp each post by its knob at the top and turn them out of the way.

Lift the played records from the turntable. Then return the posts to the proper playing position as indicated by the arrows on the selecting arms.

The Changer may then be loaded with a new stack of records according to the size shown on the selecting arms.

Turning Off Changer

Throw Changer switch knob to "OFF" position.

Lift tone arm and place it in the rest position. If you happen to turn off the Changer switch while the mechanism is going through a "change cycle," you will notice that it does not stop until the cycle has been completed, and the tone arm is again in playing position, at which point it is ready to be lifted to the rest position. If you prefer to turn off your Changer with the radio switch, be sure to turn it off while needle is resting upon a record; otherwise, the selecting arms cannot be correctly reset.

To avoid warping of records, never leave records resting on posts.

If Changer is Left Running

No damage will be done if you forget to turn off Changer after it has played its entire load of records. It will simply repeat the last record until stopped or reloaded.

Phonograph Needles

Various types and kinds of needles are available for use in phonograph tone arms. All have their virtues, as well as their faults, for use in ordinary phonographs, where needles can be changed after each record. For playing ten or more records at one set-up, as with this Changer, no attempt should be made to use ordinary steel or bluesteel points, since continued use of worn points will be likely to ruin both quality of reproduction and the records as well. Any kind of needle can be used which has a point durable enough to play ten records or more without damaging them.

It should be remembered that, no matter what the quality of the tone arm, amplifying system and speaker, all of the recorded music must pass through the needle. For this reason, it is absolutely essential that particular care be taken to use good needles, and to see that they are changed often enough so that the records are not damaged and the quality of the music is not impaired.

In general, there are two types of needles which can be satisfactorily used on an Automatic Record Changer: those which require changing after approximately 12 records, and the so-called permanent type needles which are rated in terms of "hours of service." In no case should the manufacturers' claims for these needles be exceeded, since in all probability the needles are rated in terms of their maximum life. If at any time short of the rated life, particularly in the case of the semi-permanent type needles, there is any reason to suspect that the needle has become unduly worn, it would probably be advisable to replace it with a new one. Never under any conditions should a needle be removed from the tone arm head and then replaced—needle manufacturers' claim notwithstanding.

For convenience, the tone arm on your changer may be raised to a nearly vertical position, so that the needle may be easily inserted; the needle screw should be tightened firmly.

Radio-Phono Pushbutton Switch Model 801

This pushbutton switch controls the radio to the phonograph position. It should be level with the other buttons for radio operation—or pulled out to use the phonograph. The volume and tone controls also operate when playing records.

Pushbutton Tone Control

This push button has three tone positions: Bass—Medium—Treble. Each time you push the button it will change the tone to one of these positions. Change any time to the tone you like best.
**Phonograph-Television and Fm. Jack**

Should you wish to use an external phonograph, it should be plugged into the phono jack shown in the chassis view. The radio-phono switch on the chassis will then switch from radio to phonograph operation.

If television or frequency modulation (FM) programs ever become available in your community, this radio may still be used in conjunction with the necessary converters.

The jack marked phono-television-FM in the chassis view will accommodate either the Phono or a television or FM converter.

**Service Notes**

Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows:

First refer to the "Iron Core Adjustment View" now turn the tuning knob until the drive bar comes within 1/64 to 1/32 from the stops. (A piece of blotting paper is about the right thickness and will serve as a gauge). The clearance of the bar must be the same at both stops. If far off you can raise one drive screw gently and equalize them. Minor adjustments may be made with the drive bar adjustments.

1. Rotate each iron core until the fine score marks are even with the edge of the coil forms.
2. You are ready to continue with the trimmer adjustments as shown on the alignment chart.
Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows. First refer to the “Iron Core Adjustment View” now turn the tuning knob until the drive bar comes within 1/64 to 1/32 from the stops. A piece of blotting paper is about the right thickness and will serve as a gauge. The clearance of the bar must be the same at both stops. If far off you can raise one drive screw gently and equalize them. Minor adjustments may be made with the drive bar adjustments.

Next rotate each iron core until the fine score marks are even with the edge of the coil forms.

- Tone control—Trebble
- Volume control—Maximum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to “heat up” for several minutes.

**Setting the Pushbuttons**

Make a list of your 6 favorite stations. Push out the call letters of those stations from the call letter sheets supplied. Insert a call letter in the slot on top of each pushbutton.

Next pull one of the pushbuttons all the way out as far as it will come (pull, with fingers on top and bottom of button). Now tune in the station you want with the tuning knob—Tune back and forth until the station is clear and distinct. Now push the button hard all the way in to lock the station in place, (push directly on front of button). Continue setting each pushbutton in the same way. Pressing the proper button will now tune the station you want. If it does not do so you did not push the button hard enough to lock it in place when setting up the station.

To change stations simply repeat the procedure above.

The following equipment is required for aligning:
- An rf wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 ml, 200 mW, and 400 ohms.

**Power Consumption**
- A Battery: 300 MA
- B Battery: 13.5 MA

**Power Output**
- 210 MW Undistorted

**Sensitivity for 50 Milliwatt Output:**
- 10 Microvolts Average

**Selectivity:**
- 38 KC Broad at 1000 Times Signal at 1000 KC

**Tuning Frequency Range**
- Broadcast Band: 533 to 1730 KC
- 45M Band: 5.9 to 6.1 MC
- 31M Band: 9.1 to 10 MC
- 25M Band: 11.4 to 12.1 MC
- 19M Band: 14.9 to 15.4 MC

**Intermediate Frequency**
- 455 KC

**Speaker**
- 6 in. FM Dynamic

**TRIMMER VIEW**

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Dial Pointer Setting</th>
<th>Trimmers Adjusted In Order Shown</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 1NS (L.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 1730 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Output I.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>45 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 1A7</td>
<td>Broadcast</td>
<td>Set Dial at 1730 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Input I.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>31 METER BAND</td>
<td>9.6 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>31M</td>
<td>Set Dial at 5.6 Mc.</td>
<td>(See Trimmer View) C9</td>
<td>Osc. Ant.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>49 METER BAND</td>
<td>6.1 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>49M</td>
<td>Set Dial at 6.1 Mc.</td>
<td>(See Trimmer View) T8</td>
<td>Osc. Ant.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>25 METER BAND</td>
<td>11.8 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>25M</td>
<td>Set Dial at 11.8 Mc.</td>
<td>(See Trimmer View) T9</td>
<td>Osc. Ant.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>19 METER BAND</td>
<td>15.2 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>19M</td>
<td>Set Dial at 15.2 Mc.</td>
<td>(See Trimmer View) T6</td>
<td>Osc. Ant.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD. CAST BAND</td>
<td>1730 Kc.</td>
<td>200 mW</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1730 Kc.</td>
<td>(See Trimmer View) O6</td>
<td>Osc. Ant.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD. CAST BAND</td>
<td>1400 Kc.</td>
<td>200 mW</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Tune to Generator Sig.</td>
<td>(See Iron Core Adjustment View)</td>
<td>Ant.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>
The 1939 Buick Sonomatic radio is a six tube single unit, superheterodyne receiver with an 8" dynamic speaker.

BUICK MODEL 1308221
(980598) AUTO RADIO

6 D-916

Date: 10-17-38

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1. Aligning I-F Stages at 150 Kilocycles
   (a) Connect the ground lead of the signal generator to the chassis frame.
   (b) Connect the signal lead of the signal generator to the grid cap of the first tube through a 30 nH condenser, leaving the grid clip in place.
   (c) Connect the output meter across the speaker voice coil.
   (d) Set the signal generator accurately to 150 kilocycles and turn volume control on full.
   (e) Set the condenser to a point about 500 kilocycles where no signal is received.
   (f) Adjust the four screws of the two I-F transformers, one on top and one on the bottom of each transformer in the following order: 1, 2, 3, 4 (Illus. A 4 & 5). When maximum output is obtained, repeat these adjustments the second time for greater accuracy using the signal output from the signal generator which will give a readable indication on the output meter.

2. Aligning at 1600 Kilocycles
   The antenna and B-F coils contain iron cores which have been carefully adjusted to the factory specifications. These cores are sealed, and no further adjustments are necessary. The service replacements coils are also adjusted and sealed at the factory.
   (a) Turn tuning condenser plates all the way out and against the frequency stop.
   (b) Set signal generator accurately to 1500 kilocycles and adjust oscillator trimmer (Illus. B, Fig. 3) for maximum output. Stop trimmer is made accessible by removing plug at side of case. Using trimmer alignment wrench, Part No. 7520002, loosen the nut with one hand, and adjust for maximum output by using thumb plunger either in or out with the "hook" end of the wrench.
   (c) Set the signal generator to approximately 1600 kilocycles.
   (d) Rotate the variable plates of the condenser until the signal is tuned in with maximum output.
   (e) Adjust the B-F and antenna parallel trimmers (Illus. C & D, Fig. 3) for maximum output.

3. Aligning at 600 Kilocycles
   (a) Set the signal generator to approximately 600 kilocycles.
   (b) Rotate the variable plates of the condenser until the signal is turned in.
   (c) Adjust the oscillator coil iron core aligning screw (Illus. H, Fig. 3) while rocking the condenser shaft back and forth through the signal until maximum output is obtained. This screw is made accessible by removing plug at side of case.
   (d) Repeat adjustments made under "Aligning at 1600 Kilocycles."
1. Aligning I.F. Stages at 250 Kilohertz
   (a) Connect the ground lead of the signal generator to the chassis.
   (b) Connect the signal lead of the signal generator to the grid cap of
       the 6AS tube through a .25 mfd. condenser leaving the grid cap in
       place.
   (c) Connect the output lead from the plate prong of one 6K6G tube to the
       plate prong of the other 6K6G tube.
   (d) Set the signal generator to 250 kilocycles and turn volume control
       on full.
   (e) Set the condenser gang to a point around 600 kilocycles where no
       station is received.
   (f) Adjust the four screws of the two I.F. transformers, one on top and
       one on the bottom of each transformer, in the order 6AS and 6CC
       (Illus. 4 & 5, Figs. 3 & 4) until maximum output is obtained. Repeat
       these adjustments with as low an output from the signal generator as
       possible for a readable indication on the output meter.
   (g) Checking Selectivity Curves: The Cathode Ray Oscillograph should
       be used to check the shape of the I.F. curve after completing the
       alignment procedure. Slight readjustments of the I.F. transformers
       may be necessary to obtain a symmetrical curve. Connect the Cathode
       Ray Oscillograph from the point as shown on the schematic circuit
       diagram or from "D" lug on the second I.F. coil (Fig. 7).

2. Aligning at 1250 Kilocycles
   (a) Turn tuning condenser plates all the way out and against the high
       frequency stop.
   (b) Set the signal generator to 1250 kilocycles and adjust the oscil-
       lator trimmer (Illus. E, Fig. 5) for maximum output.

3. Aligning at 1400 Kilocycles
   (a) Remove the .25 mfd. condenser and connect the signal lead of the sig-
       nil generator to the antenna connection of the set through a .00005
       mfd condenser.
   (b) Set the signal generator to 1400 kilocycles.
   (c) Rotate the variable plates of the gang condenser until the signal is
       tuned for maximum output.
   (d) Adjust the R.F. and antenna parallel trimmers (Illus. F & G, Fig. 6)
       for maximum output.

4. Alignment at 600 Kilocycles
   (a) Set the signal generator to 600 kilocycles.
   (b) Tune this signal in on the set.
   (c) Adjust the oscillator coil iron core aligning screw (Illus. H, Fig. 3) while rocking the condenser gang back and forth through
       the signal until maximum output is obtained.
   (d) Repeat adjustment made under "Alignment at 1400 Kilocycle."  

5. Adjustment of Radio to Car Antenna
   The radio should be adjusted to the car antenna after mounting in the
   car. The following adjustments should be made:
   (a) Tune in a weak station near the high frequency end of the dial
       (approximately 1400 K.C.).
   (b) Adjust the Antenna Trimmer (Illus. G, Fig. 6) for maximum volume.
   DO NOT DISTURB THE OSCILLATOR OR R.F. TRIMMERS WHILE MAKING THIS
   ADJUSTMENT.

ANTENNA SYSTEM: The 1940 Buick uses a roof peak antenna as standard equip-
ment. Optional equipment is a vacuum operated whip antenna. The roof peak
antenna has a capacity of .00005 mfd. and the vacuum operated .00005
mfd.  The 1940 Buick Sonomatic radio is designed to operate satisfactorily
with either type of antenna.
Due to the fact that the iron cores have been sealed in place at the factory, only the trimmers' adjustments as outlined under capacity alignment should be made unless the coils of the iron cored tuning unit are changed. CAPACITY ALIGNMENT

1. I.F. Alignment at 500 Kc.
   (a) Connect an output meter across the test terminals on the left side of the speaker cover, leaving the speaker uncovered.
   (b) Connect the ground lead of the signal generator to the chassis frame.
   (c) Connect the signal lead of the signal generator to the grid of the 788 tube through the 0.1 mfd capacitor.
   (d) Turn set volume control on full and tone control to the extreme treble end. Set the signal generator at 290 Kc. Tune the receiver to a frequency where no squalls or beat notes may be heard and note that when the tuning control is moved in narrow limits no appreciable change in output may be noted.
   (e) Adjust the I.F. trimmers A, B, C, & D for maximum output, beginning with trimmer A.

2. Alignment at 1550 Kc.
   (a) Connect the signal lead of the signal generator to the receiver antenna connection through a 70 mfd, condenser or 7246 alignment dummy.
   (b) Turn the manual tuning control of the receiver to the stop at the extreme high frequency end of the dial.
   (c) Set the signal generator to 1550 Kc.
   (d) Adjust the oscillator trimmer E for maximum output.

3. Alignment at 1400 Kc.
   (a) Set the signal generator to 1400 Kc.
   (b) Tune the receiver to the signal and adjust the trimmers F and G for maximum output. Signal generator signal should be as low as possible and still give a satisfactory meter reading.
   This type of tuning circuit does not require alignment at 600 Kc.

4. Alignment with Car Antenna
   Antenna trimmer G must be adjusted to match car antenna when receiver is installed, using a weak station signal between 1000 and 1550 Kc. The antenna should be fully extended when making this adjustment. CAPACITY AND INDUCTANCE ALIGNMENT
   To be used only when there is definite evidence of iron cores being out of adjustment.

1. I.F. Alignment at 2200 Kc.
   Follow the procedure as outlined under I.F. Alignment at 500 KC Capacity Alignment.

2. Alignment at 1550 Kc.
   (a) Connect the signal lead of the signal generator to the antenna connection of the set through a 70 mfd condenser.
   (b) Set signal generator to 1550 Kilocycles.
   (c) Rotate the manual tuning mechanism until the high frequency stop is reached. Mechanically align the iron cores K, H, J by setting the oscillator core K so that its front edge projects out 1 1/8" from the end of the coil form and the antenna coil R.P. cores H & J project 1 3/8" from the end of the respective coil windings. Note that one of the above measurements is from the coil form while the others are from the windings.
   (d) Adjust the oscillator trimmer E, R.F. trimmer F, and antenna trimmer G for maximum output.

3. Alignment at 1400 Kc.
   (a) Set signal generator to 1400 Kc. and tune set to this signal.
   (b) Adjust the R.P. core J for maximum output.
   (c) Adjust the antenna core H for maximum output.

4. Realignment at 1550 and 1400 Kc.
   (a) Repeat alignment of trimmer E and trimmers F and G at 1550 Kc.
   (b) Repeat alignment of cores H and J at 1400 Kc. Apply shunt to the core screws to seal the adjustment.

5. Alignment with car antenna
   Antenna trimmer G must be adjusted to match car antenna when receiver is installed, using a weak station signal between 1000 and 1550 Kc. The antenna should be fully extended when making this adjustment. AUTOMATIC PERMANENT TUNING
   The automatic push button tuning unit has been made compact by combining the manual and automatic tuning units so that they both use the same three iron cores which are "ganged" together in one reciprocating unit actuated by a small mechanical motor. This highly efficient three-circuit tuning system pushes the iron cores back and forth like pistons in the tuning coils, which varies the inductance of the coils by changing the permeability of the magnetic circuit.
   For manual tuning, this is accomplished by first depressing and then rotating the manual station selector knob. For automatic tuning, pressing an automatic tuning button causes the cores to move to a pre-set position and locket in place by the button latch mechanism, which prevents the cores from shifting position until released by the use of another of the automatic push buttons or by use of the manual control.
   Changing the stations selected by the buttons is a simple operation. The button to be set to a new station is depressed until it locks in. Then the button is rotated exactly like a manual tuning knob until the desired station is tuned in. Presetting any tuning button will release the depressed button.
   The call letters of the stations to which the automatic tuner is pre-set are inserted above the chromed plate selector buttons. Whenever the instrument panel lights are turned on, the call letters are illuminated. Identification of the station to which the radio is tuned is facilitated by three indicator lights: when the selector buttons are latched into its depressed position, the corresponding call letters are more brightly illuminated than the call letters of the other four stations, and, finally, the dial pointer indicates the station frequency.

   Note: Do not turn any button at any time unless a new station setting is desired, as the tuning position of a button is changed whenever it is turned regardless of whether it is depressed or not.

CADILLAC 1941 AUTOMATIC RADIO (Front Compartment) PART NO. 7540371

Power Output: 5 watts Undistorted at 6.0 volts. 4.7 watts Undistorted at 6.0 volts. 2.6 milliwatts at 1 watt output 23 KC.

Sensitivity: 1000 times signal

Frequency Range:

Manual Tuning

Automatic Tuning (All buttons) 545 to 1550 KC 545 to 1550 KC

Speaker: 5' Permanent Magnet Dynamic 250 Volts

Intermediate Frequency Peak Antenna Trimmer Range 45 to 80 mfd
TO CHANGE STATION SETTING OF PUSH BUTTONS

The five push buttons should be set up for five stations which are received favorably in your vicinity. The procedure for setting up the push buttons is as follows:

1. Turn on the radio and allow it to warm up from ten to fifteen minutes.
2. Depress button to be set up until it latches and remains depressed.
3. Without pressing or holding the button down, turn it, as in manual tuning, until the desired station is tuned in. This should be done very carefully until the station comes in sharp and clear, free from background noise.
4. Repeat this process for any other buttons which you wish to change.

The setting of any button may be changed at any time by following this procedure.

CAUTION: TURNING ANY OF THE PUSH BUTTONS CHANGES ITS STATION SETTING. DO NOT TURN ANY BUTTON UNLESS YOU WISH TO CHANGE THE SETTING.

CAPACITY ALIGNMENT

1. Aligning I.F. stages at 455 KC.
   (a) Connect the ground lead of the signal generator to the chassis frame.
   (b) Connect the signal lead of the signal generator to the grid of the 788, (grid side of condenser 12) through a 0.1 mfd. condenser.
   (c) Connect an output meter across the speaker voice coil. (If speaker is disconnected a 4 ohm load may be used instead).
   (d) Set signal generator to 455 KC.
   (e) Tune the set volume control on full and tune the set to a position where no squeals or beat notes may be heard, and so that when the tuning control knob is rotated within narrow limits there is no appreciable change in output. The tone control should be rotated to its extreme high position (clockwise).
   (f) Adjust the I.F. trimmers A, B, C, and D, and the I.F. core adjustment E until maximum output is obtained.
   (g) Repeat these adjustments with as low an output from the signal generator as possible for more accurate alignment.
   (h) Connect the signal generator to the antenna connection of the set through a 70 mmfd. condenser.
   (i) Adjust the I.F. trap adjustment M for minimum output.
2. Alignment at 1560 KC.
   (a) Leave signal generator connected the same as for the I.F. trap adjustment.
   (b) Tune the set to the extreme high frequency position against the stop.
   (c) Set the signal generator to 1560 KC.
   (d) Adjust the oscillator trimmer F for maximum output.
3. Alignment at 600 KC.
   (a) Set the signal generator to 600 KC and tune the set to this signal.
   (b) Adjust the R.F. trimmer G and the antenna trimmer H for maximum output.

CAPACITY AND INDUCTANCE ALIGNMENT

1. Aligning I.F. stages at 455 KC.
   Align the I.F. stages as outlined under paragraph 1 under "Capacity Alignment".

2. Mechanical Alignment of cores
   (a) Turn the manual control of the set to the high frequency end, against stop.
   (b) Remove the pointer plate (note insulating washers under mounting screws) without disturbing the tuning mechanism.
   (c) Using a spare core as a gauge, adjust the oscillator core K so that its rear surface is exactly flush with the front end of the oscillator coil winding.
   (d) Manually tune the set to a point where the front surface of the oscillator core is flush with the front end of the oscillator coil fiber mounting bushing.
   (e) Adjust the antenna and R.F. cores J and L so that the front surfaces of these cores are flush with the front ends of the coil fiber mounting bushing. Mechanically align the cores so that all three are just at the point of entering their respective windings when the tuning mechanism is against the high frequency stop.
   (f) Remove the pointer plate assembly.

3. Aligning at 1560 KC.
   (a) Connect the signal lead of the signal generator to the antenna connection of the receiver through a 70 mmfd. condenser.
   (b) Tune the manual control of the set to the high frequency end against stop.
   (c) Set signal generator to 1560 KC.
   (d) Adjust the oscillator trimmer *#* for maximum output.

4. Aligning at 600 KC.
   (a) Leave the signal generator connected the same as before and set frequency to 600 KC.
   (b) Tune the set in this frequency on the set.
   (c) Adjust the R.F. trimmer G for maximum output.
   (d) Adjust the antenna trimmer H for maximum output.

5. Aligning at 1400 KC.
   (a) Set the signal generator to 1400 KC and tune set to this signal.
   (b) Adjust the antenna core J and the R.F. core L for maximum output.

6. Resetting at 600 and 1400 KC.
   (a) Repeat the alignment outlined under paragraphs 4 and 5 with as low an output from the signal generator as possible.
   (b) Apply cement to the core screws to prevent their changing alignment.

7. Adjusting receiver to car antenna
   After the receiver is installed in the car, readjust the antenna trimmer H on a weak station near 1400 KC.
This auto radio is an eight-cube self contained receiver, built expressly for installation in 1941 Chevrolet automobiles. Special features incorporated are:

- Automatic station selection;
- Permeability tuning;
- Sensitivity control;
- Automatic noise control;
- Temperature control condenser;
- Four-position tone control;
- A.V.C. applied to R.F., I.F., and A.F. circuits;
- A dimmer control for dial lights;
- automatic bass compensation;
- push-pull beam power output;
- Elliptical low resonance speaker;
- 0Z4 rectifier;
- And a special full-wave primary type vibrator.

ANTENNA SYSTEM:

There are two antenna systems available for use with this receiver:

- The telescopic cowl antenna, and
- The telescopic reel-type antenna. Either of these antennas will operate very efficiently when used with this Chevrolet radio.

A motor noise filter is built into the set end of the antenna system.
Solenoid Relief Valve

This valve is of the ball type and will operate only when the receiver is setting in normal operating position.

The automatic station selection tuning system is operated by a single bar. The system can be pre-set for five stations, each station having a corresponding number which is visible in small window to the right of tuning dial as that station is tuned in. To set the automatic tuning system to the five stations, proceed as follows:

1. Turn the receiver on and allow a sufficient length of time to permit the tubes to reach their normal operating condition.

2. Depress the automatic station selector until No. 5 is visible in the small window to the right of the dial.

3. Depress the large push-bar and hold in depressed position while carefully tuning in manually, the station which is to be represented by the figure 1 in the small window. Release bar and the first station has been set. Depress the push-bar and hold in that position then tune in manually to the second station, and so on, until the five station positions have been set.

To tune the receiver with the automatic station selector bar, merely keep depressing the bar until the program you wish to hear is tuned in. The numbers 1 to 5 which appear in the small window to the right of the dial, will indicate the station.

NOTE: The accuracy of the automatic station selector depends upon how accurately the station is tuned in manually when setting it up. Always tune to a point where the clearest reception is obtained.

Tube Complement

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
<th>Type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7GT</td>
<td>R.F. Amplifier</td>
<td>6K7GT</td>
<td>1st Audio (A.V.C. Control)</td>
</tr>
<tr>
<td>6A8GT</td>
<td>Osc. Mod.</td>
<td>6V9GT</td>
<td>Output (Push-pull)</td>
</tr>
<tr>
<td>6K7GT</td>
<td>I.F. Amplifier</td>
<td>OZ4</td>
<td>Rectifier</td>
</tr>
<tr>
<td>6R7GT</td>
<td>2nd Det. A.V.C. Driver</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Circuit Description

The circuit used in this receiver is the conventional superhetodyne type and does not use any regeneration. The eight tubes employed are an R.F. amplifier; combination oscillator-modulator tube; 262.5 k.c., I.F. amplifier, the first transformer of which is triple tuned; push-pull output, and power supply. The 6R7GT tube supplies A.V.C. voltage to the grid of the 6K7GT R.F. amplifier; the 6A8GT and the 6K7GT 1st A.F. tube. Bias for the 6K7GT R.F. amplifier and the 6A8GT is developed across a 750 ohm variable resistor (sensitivity control, item 59) which has a fixed minimum of approximately 140 ohms. The bias for the 6K7GT I.F. amplifier is developed across a 1500 ohm resistor (item 84). The bias for the 6R7GT tube is developed across two resistors, one of 350 ohms (item 73), the other of 2400 ohms (item 74). These two resistors form a voltage divider, feeding a portion of the bias voltage through the 300,000 ohm R.F.-A.V.C. load resistor (item 66) to the grid of the 6R7GT providing approximately one volt (q). Bias for the 6V9GT output tubes is developed across a 220 ohm resistor (item 80), between the 6K7GT 1st audio plate and the 6R7GT (driver) grid for the resistor capacity network comprising the tone color control. The 6R7GT plate is coupled through a .1 mfd. condenser to one side of the center tapped audio input choke.
Circuit Alignment

The adjustable condensers in this receiver have been very carefully adjusted at the factory and will require no further adjustment (excepting antenna trimmer) unless tampered with or a defective I.F. coil has been replaced. If realignment is found necessary, the circuits can be adjusted only with the use of a signal generator and an output meter.

1. Aligning J.F. Stages at 26.5 Kilocycles

The I.F. amplifier may be best aligned by first using a modified signal generator and an output meter in the conventional manner, and then making the final alignment with a radio frequency oscillograph. The signal generator of the automatic tuning system partially depends upon the symmetry of the I.F. wave form. In most cases the symmetry is only approximate without the aid of the oscillograph equipment.

(a) Connect one terminal of the output meter to the plate of one of the output tubes, and connect the other terminal through a .10 mfd. condenser (not electrolytic) to the other output tube.

(b) Connect the ground lead from the signal generator to the frame of the receiver chassis. Connect the output of the signal generator through a 0.01 mfd. condenser to the grid of the lower 6AK5 tube and to the tube's grid clip in place.

(c) Turn the volume control on full. Adjust static trimmer to get lowest signal (FM) and dial and press the tune control button to clamp the "mutil" position.

(d) Adjust the signal generator to 26.5 kilocycles.

(e) Adjust the trimmer condensers located on the 6AF. transformer for maximum reading on the output meter. NOTE: Use the lowest signal generator output that will give a reasonable reading on the output meter.

(f) Connect the output of the signal generator to the grid of the 6AK5 tube leaving the tube's grid clip in place.

(g) Open the middle trimmer (front) on the I.F. transformer two or three turns of the adjusting screw. Care should be taken that the adjacent screws do not become dislodged or loosened.

(h) Adjust the other two trimmers (rear) on the I.F. transformer for maximum reading on the output meter.

(i) Adjust the middle trimmer (front) on the I.F. transformer for maximum reading on the output meter. NOTE: Do not realign the trimmers on the 6AF. transformer.

2. Oscillograph Alignment

For more accurate adjustment of the I.F. amplifier a cathode ray oscillograph, in conjunction with a radio frequency modulator/signal generator, may be used to obtain visual alignment. It will also allow adjusting for a more symmetrical wave form.

(a) Disconnect the conventional signal generator from the receiver.

(b) Connect the vertical plates of the oscillograph to the receiver connecting the (51) terminal through a .001 mfd. condenser to the grid clip of the 6AK5 radio frequency amplifier tube, leaving the tube's grid clip in place. Connect the ground terminal to the frame of the receiver chassis.

(c) Connect the output of the I.F. modulated signal generator also through a .001 mfd. condenser to the grid clip of the 6AK5 tube leaving the tube's grid clip in place. Connect the ground lead to the frame of the receiver chassis.

(d) Adjust the signal generator to 160 kilocycles.

(e) With the modulator switch of the generator turned off a horizontal line will appear on the window of the oscillograph. Move the amplitude control on the oscillograph along the length of the line so that it is equal to the width of the cathode scale supplied with the oscillograph.

(f) Turn the frequency modulator switch of the signal generator on.

(g) Adjust the vertical control of the oscillograph so that the image is just within the top and bottom limits of the oscillograph scale. NOTE: Use the lowest signal generator output that will give a reasonable reading on the oscillograph window. If too much signal input is used the dampers desired on the wave form will not be visible even at perfect alignment.

(h) Readjust the middle trimmer condenser on the I.F. transformer for maximum symmetry above the vertical retrace line in the center of the cathode scale. The humps or shoulders appearing on each side of the wave form will be equal distance from the numbers of the curve minimum indicating symmetry is reached.

3. Aligning the R.F. Amplifier

NOTE: The tuning of this receiver is not accomplished in the conventional manner. Tuning is accomplished by specially designed iron cores which are moved in and out of the coils to vary the inductance. Any three matched cores mounted to a carriage and which move as a single unit. The adjustment (tracking alignment) of the iron cores is very critical; therefore, they should not be tampered with. The permeability tuning unit is precision tuned and aligned, then sealed at the factory and should not be further adjusted.

NOTE: Do not touch inner core adjustments. See instructions under permeability tuning unit replacement procedure.

To ALIGN the R.F. AMPLIFIER:

(a) Connect the output of the signal generator through a 600-ohm modulator and use the output Chevrolet shielded lead to the antenna connection of the receiver.

(b) Connect the generator ground lead to the frame of the receiver chassis.

(c) Adjust the signal generator to 100 kilocycles.

(d) Adjust the station selector knob until the high frequency (1810) stop is reached. The dial pointer should be at the indexing mark on dial below (150).

(e) Adjust the short trimmer condensers for maximum output. The adjustment should be made in the following order: Oscillator-Antenna-R.F. GENERATOR.

(f) Connect the microphone jack to the antenna jack if desired.

(g) Adjust the station selector knob to the high frequency (1810) stop and reach. The dial pointer should be at the indexing mark on dial below (150).

4. Permeability Unit Replacement Procedure

Each unit is made of machined parts. The iron cores in any one unit must be of the same group. There are two groups or classifications graded according to permeability coded with a dot of paint on the screw end on the core. The code and value is as follows:

<table>
<thead>
<tr>
<th>Color</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>2% to minus 1%</td>
</tr>
<tr>
<td>Blue</td>
<td>minus 1% to mean value</td>
</tr>
<tr>
<td>Yellow</td>
<td>Mean value to plus 1%</td>
</tr>
<tr>
<td>Purple</td>
<td>Plus 1% to plus 2%</td>
</tr>
</tbody>
</table>

A. To Replace from Core Only:

(a) Remove speaker from case. This will give access to permeability tuning unit mounted to key assembly.

(b) Remove the two screws holding the bottom case support strip to the chassis. Carefully remove assembly from chassis.

(c) Note the physical location of core to be replaced, then carefully remove the core after removing the key (which resembles the key operating bar) and the oiler cover. The core should be removed by prying back the small rivet on the back of the key. The core should be 0.004 inch thick. Adjust and tighten setscrew in key clutch, then replace case and assembly.

(d) If either or both the antenna or R.F. cores have been changed align them as follows:

1. Set the signal generator to 1810 kilocycles.
2. Tune control until signal is at the very limit of the scale. NOTE: This may be necessary in the case of one or both units.
3. Adjust the antenna and R.F. cores to maximum signal.
4. Adjust the signal generator to 100 kilocycles.
5. Adjust the oscillator core for maximum output.
6. Adjust the antenna and R.F. cores to maximum output.
7. Adjust the short trimmer condensers for maximum output.

B. Replacing Complete Permeability Unit:

To facilitate this work, remove chassis from case.

(a) Remove the top and bottom covers from the case, then remove the speaker.

(b) Unplug the speaker, microphone, and dynamic drive from the back of the speaker (mounted on a socket.

(c) Remove p.s. screws holding chassis in case and remove the chassis and front panel from case.

(d) To remove tuning unit (key assembly, etc.):

1. Remove the dial pointer from drive setting.
2. Unplug the two ground leads, antenna, antenna, shield, blue, green, and black leads of the tuning unit and, also the A.V.C. reater connected to the jack and ground.
3. Unplug the clutch coil and the A.V.C. leads from the tuning bar switch.
4. Loosen the set screw in the tuning shaft and remove and upper flexible shaft.
5. Loosen the unit on the volume control.
6. Remove the four screws which attach the whole tuning unit to the chassis.
7. Disconnect the 0.001 mfd. grid coupling from antenna trimmer unit. Unhook the spring, and connecting link connecting the resonant arm and tuning carriage.
8. Reconnect permeability assembly by removing three screws accessible through tuning unit and replace with new assembly.
9. Reinstall the A.V.C. leads, the antenna and resonant arm as outlined under paragraph headed "Aligning the R.F. Amplifier."

IMPORTANT: The permeability unit must not present any load or drag to the rest of the tuning unit. The method of determining whether or not there is too much friction is to build the unit (permeability only) as is, that the iron cores will move in and out of the coils of their own weight. If they do not, too much fricition is present. The total linear motion of the iron cores each side is 1.075 inches. Always use new core screws after an adjustment.

Automatic Tuning Unit

When the push的办法 is depressed, the following action takes place. The lower rear side of the bar pushes in on lever on the selector. When the selector switch makes contact it closes the "A" circuit to both the magnetic clutch adecid oil and the key operating bar. The clutch solenoid disconnects the manual drive mechanism. While this is occurring the large solenoid is pulling down the key operating bar. This bar has an arm on the right side which is cock shaped on the end which moves lever on indexed shaft ratchet. This movement causes the indexing shaft to pull on key back far enough to permit the key operating bar to engage lower lower key. The key is then drawn back by the key operating bar until the key is locked into the key key. The movement of the key operating bar is transmitted through shaft which moves the permeability tuning (from core assembly) tuning in station for which position was set. The indexing shaft has five stud as spaced that while one stud is in key back the key operating bar will engage the lower back on the key, the next stud on the #4 is indexed ready to push the next back key. This follows in sequence. The end of this indexing shaft is a flexible drive cable which operates the station indicator drum. This drive action takes place instantaneously when the push button is depressed.

Adjustments

The solenoid clutch face gap should be approximately 0.30 inches. This is adjusted by bowing the clutch operating bar just above the pivot. The backwash, grease on both the clutch and the reed bar are adjusted on touch.

Key Adjustments

To adjust the key to the twegs should be parallel (straight up and down). Turn the reed bar until it is exactly vertical. Push bar in until both fingers are against the reed bar. With the key in this position the key setting switch (18100S01) should have its "C" wiper bearing against the rear of the key and the clutch shaft bearing should be also be bearing against key. The shaft must turn easily and not bind or be rough. With the key in the above position adjust the gap for the key operating bar to the arm of the key operating bar. This adjustment is made by looser the key by moving the reed bar and the key back and forth. Adjust the key by moving the reed back and forth to and from the back and forth. Adjust the key by moving the reed back and forth to and from the back and forth.
READINGS TAKEN FROM TUBE SOCKET CONTACTS TO GROUND WITH A D.C. VOLTOMETER HAVING A RESISTANCE OF 1000 OHMS PER VOLT; ALL VOLTAGES EXCEPT THE HEATER VOLTAGES MEASURED ON THE 0-250 VOLT SCALE.

'A' BATTERY 1.4 VOLTS. CURRENT DRAIN 250 M.A.

'B' SUPPLY DRAIN APPROXIMATELY 10 M.A.

* READINGS MUCH LOWER THAN ACTUAL VOLTAGE BECAUSE OF HIGH SERIES RESISTANCE.

ALUMINUM: Batteries must be in their proper positions before making any adjustments.

1. Connect the signal source of the test oscillator through a 0.1 mf. condenser to terminal 'T' on variable condenser 16A (see Parts Layout), which is the grid lead of the 1R5 tube.
2. Connect the ground lead of the test oscillator to the chassis frame.
3. Connect the output meter through a 0.1 mf. condenser from the plate of the 1J5 output tube to ground. One should be taken when connecting the output meter to insert a series condenser to protect the meter from D.C. voltages, and to prevent short circuit of 'B' battery
4. Turn receiver control to maximum.
5. Adjust the trimmers 3B, 3C and 34 on the I.F. Transformers for maximum output. (See Parts Layout.) These adjustments should be repeated several times and during alignment the test oscillator output should be kept as low a value as is consistent with obtaining a readable indication on the output meter.

ADJUSTING AT 1600 KILOHERZ
Leave the test oscillator leads connected as for aligning the I.F. circuits.
Turn the rotor plates of the gang condenser all the way out and against the high frequency stop.
Adjust the Condenser 16D (see Parts Layout) for maximum output. (It is very important that this frequency be set accurately as a slight missetting will cause the receiver to be out of track over the entire high frequency end of the dial.)

ADJUSTING THE ANTENNA STAGE 1200 K.C.
Remove the signal leads of the test oscillator from the grid of the 1R5 tube. Run a wire from the output terminal of the test oscillator, having it come near the receiver. NOTE: No metallic connection is made between the test oscillator and the receiver.
Turn the condenser rotor plates until this frequency be tuned in with maximum output.
Adjust the Antenna Trimmer "16i" (see Parts Layout) for maximum output.

ADJUSTING AT 600 KILOHERZ

Turn the condenser rotor plates until the radiated signal from the test oscillator is tuned in with maximum output.
Maintain a low output signal from the test oscillator and adjust the oscillator tuning adjustment on Item 2 (see Parts Layout) while rocking the variable condenser gang tuning short back and forth through the signal.
This operation should be continued until no further increase in output can be obtained.
After the above operation turn the condenser rotor plates to the high frequency stop position. Check the 1600 K.C. setting and if necessary readjust trimmer "16i". Then return to 1200 K.C. for final antenna trimmer adjustment.
If the entire alignment procedure has been accomplished correctly, the receiver should be uniformly sensitive over the entire frequency range.
FIG. 1. CIRCUIT DIAGRAM

FIG. 2. PARTS LOCATING DIAGRAMS (TOP AND BOTTOM VIEWS)

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Circuit Description
The circuit used in this receiver is the conventional superheterodyne type and does not use any regeneration. A special tone control circuit is employed to give the desired tone without distortion. The tuning circuits are tuned by varying the inductance of the antenna, R.F. and oscillator coils by means of iron cores which slide in and out of the coils like pistons. The alignment of the cores has been sealed at the factory and they should not require readjustment unless the coils have been changed.

Circuit Alignment
The trimmer condensers in this receiver have been carefully adjusted at the factory and should require no further adjustment (except the antenna trimmer) unless tampered with or a core has been replaced. It is advisable not to attempt any adjustment unless it is definitely known that alignment is necessary. Due to the fact that the iron cores are sealed in place at the factory, only the trimmer adjustment as outlined under "Alignment" should be made, unless the coils of the iron core tuning unit are changed. A signal generator and an output meter must be used to align the receiver circuit correctly. To make all alignment adjustments the front and back covers must be removed. All trimmer condensers are readily accessible.

Capacity Alignment
1. I.F. Alignment at 200 Kilocycles
(a) Connect a 1 mfd. condenser between the plate prong of the 86QGT output coil and one terminal of the output meter. Connect the second terminal of the output meter to ground. This will protect the meter from DC voltages.
(b) Connect the ground lead of the signal generator to the chassis frame.
(c) Connect the signal lead of the signal generator to the grid grid of the 6AG7 tube through a .1 mfd condenser. Leave the grid connection on the tube in place.
(d) Turn the act volume control on full and put tone control on "music" position. Adjust the signal generator to 200 kilocycles. Tune the receiver to a frequency where no audio or noise may be heard and so that when the tuning control is moved through narrow limits no appreciable change in output may be noted.
(e) Adjust the I.F. trimmers (a), (b), (c), and (d) for maximum output.

2. Aligning at 150 Kilocycles
Set the signal generator to 150 kilocycles.
(a) Connect the signal lead of the signal generator to the receiver connection through a 70 mfd condenser.
(b) Tune the manual tuning control of the receiver to stop the signal at the extreme low frequency end of the dial.
(c) Adjust the signal generator to 150 kilocycles.
(d) Adjust the oscillator trimmer (a) for maximum output.
(e) Adjust the R.F. trimmer (f) for maximum output.
(f) Adjust the antenna trimmer (g) for maximum output.

3. Aligning at 1440 Kilocycles
(a) Adjust the signal generator to 1440 kilocycles.
(b) Tune the receiver to the signal and adjust the the trimmers (f) and (g) for maximum output. The signal generator should be as low as possible and should give a satisfactory meter reading. NOTE: This type of tuning does not require alignment at 500 k.c.

4. Alignment with Car Antenna
Antenna trimmer (g) must be adjusted to match car antenna when receiver is installed. Use a weak station signal near 1400 kilocycles. When a weak signal has been tuned in turn volume control on full and adjust antenna trimmer for maximum output. NOTE: When making this adjustment the antenna should be fully extended.

Capacity and Inductance Alignment
This should be used only when there is definite evidence of any core being out of adjustment.

1. I.F. Alignment at 200 Kilocycles
The same procedure as previously outlined should be followed.

2. Aligning at 150 Kilocycles
(a) Connect the signal lead of the signal generator to the antenna connection of the set through a 70 mfd condenser.
(b) Adjust the signal generator to 150 kilocycles.
(c) Rotate the manual tuning mechanism until the high frequency stop is reached. Mechanically align the iron cores (k) and (l) by setting the oscillator core (k) so that its front edge strikes out 90° from the end of the coil form, and the antenna and R.F. cores (l) and (m) strike out 90° from the end of the respective coil windings.
(d) Adjust the oscillator trimmer (a), the R.F. trimmer (f) and the antenna trimmer (g) for maximum output.

3. Aligning at 1440 Kilocycles
(a) Adjust the signal generator to 1440 kilocycles and tune the set to this signal.
(b) Adjust the R.F. core (i) for maximum output.
(c) Adjust the antenna core (g) for maximum output. NOTE: When checking maximum output remove band from vicinity of the core as body capacity will affect readings.

4. Realignment at 1500 and 1400 Kilocycles
(a) Repeat alignment of trimmer (a) and trimmers (f) and (g) at 1500 kilocycles.
(b) Repeat alignment of cores (k) and (l) at 1400 kilocycles. When this adjustment has been made the tuning dial will read correctly with cores removed.

5. Alignment with Car Antenna
Antenna trimmer (g) must be adjusted to match car antenna when receiver is installed. Use a weak station signal near 1400 kilocycles that is audible with volume control on full. Adjust antenna trimmer for maximum output. NOTE: The antenna should be fully extended when making this adjustment.
1. **Aligning I.F. Stages at 455 Kilocycles**
   (a) Connect the signal lead of the test oscillator to terminal "X" on variable condenser 25A (see parts layout) which is the grid lead of the 6SA7GT tube through a .1 mfd. condenser.
   
   (b) Connect the ground lead of the test oscillator to the chassis frame.
   
   (c) Connect a .1 mfd. condenser between the plate prong of the 6V6GT output tube and one terminal of the output meter. Connect the second terminal of the output meter to ground. This will protect the meter from d.c. voltages.
   
   (d) Set the signal generator at 455 kilocycles.
   
   (e) Turn volume control on full.
   
   (f) Adjust the trimmer condensers (a), (b), (c), and (d), on the I.F. transformers for maximum output.
   
   These adjustments should be repeated several times, and during alignment the signal generator output should be kept to as low a value as is consistent with obtaining a readable indication on the output meter.

2. **Aligning at 1560 Kilocycles**
   (a) Leave the signal generator leads connected the same as for aligning the I.F. circuit.
   
   (b) Turn the rotor plates of the gang condenser all the way out and against the high frequency stop (b).
   
   (c) Set the signal generator at 1560 kilocycles.
   
   (d) Adjust condenser (e), (see parts layout) for maximum output.
   
   **NOTE:** It is very important that this frequency be set accurately as a slight missetting will cause the receiver to be out of track over the entire high frequency end of the dial.

3. **Aligning the Antenna Stage**
   (a) Remove the signal lead of the signal generator from the grid of the 6SA7GT tube and connect to the antenna terminal of the receiver through a .000075 mfd. mica condenser connected in place of the .1 mfd. condenser previously used. **NOTE:** It is very important that a .000075 mfd. mica condenser be used when aligning the antenna stage of the receiver in order that this circuit can be made to track properly.
   
   (b) Adjust the signal generator to 1400 kilocycles.
   
   (c) Turn the condenser rotor plates until the 1400 k.c. signal is tuned in with maximum output.
   
   (d) Adjust antenna trimmer (g), (see parts layout) for maximum output.

4. **Aligning at 600 Kilocycles**
   (a) Adjust the signal generator to 600 kilocycles.
   
   (b) Turn the condenser rotor plates until the signal from the generator is tuned in with maximum output.
   
   (c) Maintain a low output signal from the signal generator and adjust the oscillator padding condenser (f), (see parts layout) while rocking the variable condenser gang tuning shaft back and forth through the signal.
   
   (d) This operation should be continued until no further increase in output can be obtained.
   
   (e) After the above operation, turn the condenser rotor plates to the high frequency stop position. Check the 1560 k.c. setting and if necessary readjust trimmer (e) then return to 1400 k.c. for final antenna trimmer adjustment.
   
   **NOTE:** If the entire alignment procedure has been accomplished correctly the receiver should be uniformly sensitive over the entire frequency range.
FIG. 1. CIRCUIT DIAGRAM

ANTENNA SYSTEM: There are two antenna systems available for use with this receiver; the telescopic cowl antenna, and the telescopic reel-type antenna. Either of these antennas will operate very efficiently when used with this Chevrolet radio. A motor noise filter is built into the set end of the antenna system.

I.F. = 455 K.C.

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Date 10-1-40

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8. To Disassemble Coil Units

(a) Turn all trimmer screws until they are within the coil unit collar.

(b) Remove the small spring steel clip, part No. 1211345, which anchors the coil bracket to the two main Housing of the coil unit. Two screws of this clip dig into the aluminized coil cover and care must be exercised when removing it so that no damage is done to the protruding coil tubes.

(c) Remove the two 545 nuts holding the shield can in place and slide the cover off.

9. Reassembling Coil Units

(a) Replace the cable clamp which holds the coil leads located between the 68KT and the 690T.

(b) Replacing the coil into the coil tubes, replace the collared end, raise the core and work it into the coil tube.

(c) When the coil unit is removed to be sure that the two dent spots which the coil shaft do.

(d) The coil unit will be lost off the shaft to the coil unit shaft collars as shown in the coil unit shaft collars.

(e) While assembling the coil unit, the coil unit shaft collars that the three bronze clips enter their slots in the shield area.

10. Stuff Manual Tuning

Excessive noise on the front panel caused by tension or compression of the flexible manual tuning shaft (item 26) may cause stuff manual turning, such breakages can normally be eliminated by loosening and reattaching the feed screws in the images (item 134).

11. Tone Control

The four positions of the tone control are: Soft, Voice, Music and Bass. The tone control and its tone compensating network is in the circuit between the amplifier and the output stage. When the switch is in the "soft" position, the 100,000 ohm resistor (item 86) and the 45 ohm resistor (item 137) are shorted out resulting in maximum bass. Some of the high audio frequency is bypassed by ground through the 35 condenser (item 86). In the "soft" position the high audio frequency response remains the same as in the soft position but the 100,000 ohm resistor and the 45 ohm resistor are in series with the primary of the output stage transformer (item 228) resulting in a reduced low frequency response. Tone control switch in the "mild" position, some of the high frequencies are bypassed and maximum bass is available because the 100,000 ohm resistor (item 86) and the 45 ohm resistor (item 137) are shorted out. When the switch is in the "music" position the high audio frequency is bypassed by ground through the 35 condenser (item 86). The low frequency response remains the same as when the switch is in the music position.

12. Band Switching Circuits

The two switch sections as shown on the schematic diagram in the antenna stage and in the R.F. stage are actually one switch each in each case. The top section on the diagram is that set of contacts toward the collars as viewed from these. The lower set of contacts is that of the first contacts away from these. The switch sections are all shown in the 15-meter band position. Refererring to the top antenna sections when the upper meter fingers touch terminals No. 2, the 15-meter band is in use. Terminals No. 3 and 4 are the 20-meter band contacts. Terminals No. 3 and 4 are the 20-meter band contacts. Terminals No. 6 and 7 are the 20-meter band contacts. Terminals No. 6 of the "A" band or broadcast band contacts.

The "A" band coil circuit shows the actual simplified circuit diagram for the "A" band without the switch contacts being shown. The same applies to the 15-meter band coil circuit. Circuits C1, C2, C3 and C4 remain in the circuit at all times for short wave operation. When switching to the 20-meter band, coil No. 3 is replaced by coil No. 4. Coil No. 3 is replaced by coil No. 4. Coil No. 7 is switched across coils Nos. 11 and 12. As coil No. 12 on the 20, 15 and 18-meter bands there are three sets of contacts controlled by the same time. The sensitivity control is returned from the circuit for short wave operation thereby giving full sensitivity on short waves.

In order to provide good tracking sensitivity only perfectly matched main tuning cones are used in the receivers on the "A" band (Nos. 168, 170 and 171). The cones are color coded with a spot of red, yellow or green paint on the end of the cone. Only one particular color will be used in each receiver. When servicing one of these cones always replace the defective core assembly with a replacement core having the exact color coding, or replace all three cones with a new set of cores of another color code.

Circuit Description

The circuit used in this receiver is the conventional superheterodyne type with two stages of R.F. and six tuned I.C. circuits. In the short wave position the band switch operates by shunting respective cores (with their magnetically trimmer cores) across the main variable tuning inductances in the antenna, R.F. and oscillator circuits. When tuning either of the four short wave bands the signal is fed through the 100 mmf condenser (item 25) to the grid of the R.F. amplifier tube 68KT which also receives its A.V.C. bias through the 1.5 megohm resistor (item 68).

In the broadcast band position the filter choke (item 25) is included in the circuit and in conjunction with the input capacity of the tube constitutes a low-pass filter which effectively prevents unwanted disturbances from reaching the R.F. tube. The variable trimmer (item 24) is used for compensating the slight variations in the effective capacities of the antenna and RF sections, in that a 31-meter auxiliary oscillator coil (item 18) is permanently shunted across the main tuning coil (item 18) and a tap is brought out for return to the cathode. In changing to the 25, 19 and 16 meter bands, the respective auxiliary oscillator coils (items 17, 18 and 19) are shunted in parallel to the previous combination. The negative capacity 120 mmf. condenser (item 45) in parallel to the main tuning coil (item 15) constitutes the temperature compensating arrangement for the short wave bands. In the broadcast band the oscillator uses a modified Colpitts circuit arrangement for the main tuning inductance (item 14) 3900 mmf. condenser (item 39) and condensers consisting of items 42, 43 and 44 in which item 42 is the negative temperature coefficient condenser.
Speaker (Part No. P-4045) 6" PM Type.
D.C. voice coil resistance: 2.6 ohms
Voice coil impedance at 400 cycles: 2.9 ohms

Broadcast Antenna Coil (Part No. G6036)
Looking at the connection end starting at the chassis in a clockwise direction the terminals are: No. 1, AVC; No. 2, grid; No. 3, Ant.; No. 4, ground. No. 4 is grounded to the mounting bracket.
Primary—No. 3 and No. 4—Resistance 25.3 ohms.
Secondary—No. 1 and No. 2—Resistance 2.1 ohms.
A gimmik coil of 5.5 manf. connects to terminals No. 2 and No. 3.

Short Wave Antenna Coil (Part No. P3722)
Looking at the connection end in a clockwise direction starting at the mounting lug side the connections are: No. 1, AVC; No. 2, Ant.; No. 3, Grid; No. 4, Ground.
Primary—No. 2 and No. 4—Resistance 3 ohms.
Secondary—No. 1 and No. 3—Resistance 0.7 ohms.

Broadcast Oscillator Coil (Part No. P3723)
Looking at the connection end (with dot) in a clockwise direction starting at the chassis the terminals are: No. 1, grid; No. 2, plate; No. 3, B+; No. 4, ground.
Primary—No. 2 and No. 3—Resistance 2.8 ohms.
Secondary—No. 4 and No. 1—Resistance 4.9 ohms.

Short Wave Oscillator Coil (Part No. 3721)
Looking at the connection end in a clockwise direction starting at the mounting lug side the connections are: No. 1, Plate; No. 2, B+; No. 3, Grid; No. 4, Park.
Primary—No. 1 and No. 2—Resistance .8 ohm.
Secondary—No. 3 and No. 4—Resistance .07 ohm.

First I.F. Transformer (Part No. P3048)
Primary—Blue white, plate; red white B+—Resistance 12.1 ohms.
Secondary—White, grid; black white, AVC—Resistance 24.9 ohms.

Second I.F. Transformer (Part No. P3736)
Primary—Blue white, plate; red white B+—Resistance 15.1 ohms.
Secondary—White, grid; black white, AVC—Resistance 11.8 ohms.

VOLTAGE CHART

All voltages measured with a 1,000 ohm per volt meter on 150 volt scale. For the following voltages the "B" battery section of the power pack should read 94½ volts under load.

1A7GT TUBE
Plate—P—to ground ............. .86¼
Screen—Gs—to ground ........ .86¼
Grid—G—to ground ............. .86½

1N5GT Plate—P—to ground ........ .85
Screen—Gs—to ground .......... .86¾
Grid—G—to ground ............. .86½

1Q5GT Plate—P—to ground ........ .84
Screen—Gs—to ground .......... .86¾
Grid—G—to ground ............. .86¼
ALIGNMENT DATA

IF. ALIGNMENT

Adjust the signal generator to 455 K.C. and connect the output to the grid of the first detector tube (6SA7) through α .05 or .1 mfd. condenser. Allan all I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT

Adjust the signal generator to 1630 K.C. and connect the output to a shielded loop radiator and place this loop about two feet from the rotary loop antenna. If no loop radiator is available, connect the output of the signal generator should be connected to the antenna clip of the rotary loop antenna thru a .0002 mfd. mica condenser. Set the gang condenser to minimum capacity and adjust the B.C. oscillator trimmer (upper left, front of chassis) to receive this signal. After this has been carefully done, the next step is to set the signal generator to 1400 K.C. and after tuning in the signal adjust the B.C. antenna trimmer (on rotary loop antenna) to peak. Set the signal generator to 600 K.C., tune the signal and then slowly increase or decrease the B.C. oscillator padding condenser (top of chassis, center) and at the same time continuously tune back and forth across the signal with the receiver until the maximum reading is obtained on the output meter.

Return to 1400 K.C. and again go over the adjustments of this frequency to be certain that they were not put slightly out of alignment when adjustment was made at 600 K.C. * or to A.M. lead on models without loop

SHORT WAVE BAND ALIGNMENT ** 1750kc on Model A5

Adjust the signal generator to 18,100 K.C. and connect the output to the antenna clip, through a 400 ohm resistor. Set the gang condenser to minimum capacity and adjust the S.W. oscillator trimmer (lower left, front of chassis) to receive this signal. Set the signal generator to 16,000 K.C., tune signal and adjust the S.W. antenna trimmer (upper right, front of chassis) to peak. As there is no variable low frequency padding condenser on this band, the sensitivity of the receiver should be checked at 6000 K.C. to determine whether the circuits are in line at this frequency. Should the receiver lack sensitivity at 6000 K.C., the antenna and oscillator coils, as well as the padding condenser should be tested.

MODELS XJ5, XJ55, XJ55-PH

IF. ALIGNMENT

Adjust the signal generator to 455 K.C. and connect the output to the grid of the first detector tube (12SA7) through α .05 or .1 mfd. condenser. Connect ground of signal generator to chassis ground through α .1 mfd. condenser. On XJ55 only connect ground of signal generator to chassis ground through α .1 mfd. condenser. Allan all I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT

Adjust the signal generator to 1630 K.C. and connect the output to the antenna lead, through α .0002 mfd. mica condenser. Set the gang condenser to minimum capacity and adjust the oscillator trimmer to receive this signal. After this has been carefully done, the next step is to set the signal generator to 1400 K.C. and after tuning in the signal adjust the B.C. antenna trimmer to peak. In case of bent plates, set the signal generator and the receiver to 600 KC and bend the plates into the position for maximum output.

SHORT WAVE BAND ALIGNMENT

Set the signal generator to 6000 K.C. tune the signal and adjust the short wave antenna trimmer to give maximum output. Set the signal generator to 3000 K.C. tune the signal and then slowly increase or decrease the short wave antenna padding condenser and at the same time continuously tune back and forth across the signal with the receiver until the maximum reading is obtained on the output meter.

MODELS J6, XJ6, A7, B7, A77, 62-B7

PROCEDURE FOR SETTING UP PUSH BUTTONS

Loosen one of the push buttons by inserting a screwdriver thru the center hole in the push button to the locking screw and turn the locking screw counter-clockwise one full turn and push in, while holding this screw in tune in the desired station by means of the station selector. Turn the selector very slowly back and forth until the signal is clearest. Now while still holding the above screw in, tighten it by turning clockwise. Release and turn the station selector to one end of the dial; then check the button by pushing it down and if the station is tuned to the center of the area on the dial covered by the station the adjustment is correct.

Release the push button and repeat the above procedure for the remaining buttons.

If it is desired to change a button to a different station simply re-set by repeating the above procedure.

Punch the correct station call letter tabs from the set of sheets supplied and insert them from the side into the grooves in the front of the push buttons. Punch celluloid squares from the sheet supplied and insert them in the above mentioned grooves over the station call letter tabs.

The dial is now set up for quick tuning and all that is necessary is to push the button of the desired station down and then release.
POWER SUPPLY
This receiver is designed to operate on a single unit General 608-6L or Burgess 6TA-60. The battery will fit inside the cabinet in back of the chassis.
A large single unit battery may also be used with this model such as the Burgess 17C-660, Eveready 748, Roy-O-Vac No. AB-82, Bond 0528 or General 6DL-11L and will provide the most economical operation.
Speaker (Part No. P4311) 5" PM Type
D.C. voice coil resistance ........................................ 3.1 ohms
Voice coil impedance at 400 cycles ................................ 3.5 ohms
Antenna Coil (Part No. G-6274)
Looking at the connection end starting at the chassis in a clockwise direction the terminals are: No. 1, AVC; No. 2, grid; No. 3, Ant.; No. 4, ground. No. 4 is grounded to the mounting bracket.
Primary—No. 3 and No. 4—Resistance 24.6 ohms.
Secondary—No. 1 and No. 2—Resistance 2.2 ohms.
A gimmik coil of 5.5 mmfd. connects to terminals No. 2 and No. 3.
Oscillator Coil (Part No. P4308) (Red & Brown Dots)
Looking at the connection end (with dots) starting at the chassis in clockwise direction the terminals are: No. 1, grid; No. 2, plate; No. 3, B+; No. 4, ground.
Primary—No. 2 and No. 3—Resistance 2.2 ohms.
Secondary—No. 4 and No. 1—Resistance 5.7 ohms.
First I.F. Transformer (Part No. P4323)
Primary—Blue white, plate; red white, B+ — Resistance 12.1 ohms
Secondary—White, grid; black white, AVC — Resistance 24.9 ohms
Second I.F. Transformer (Part No. P3980)
Primary—Blue white, plate; red white, B+ — Resistance 15.1 ohms
Secondary—White, grid; black white, AVC — Resistance 11.8 ohms

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On XD5 only connect ground of signal generator to common ground thru a .1 mfd. condenser.

**Speaker** (Part No. P3553) 5" PM Type
- D.C. voice coil resistance: 3.4 ohms
- Voice coil impedance at 400 cycles: 3.8 ohms

**Oscillator Coil** (Part No. P3748) (D5 only)
- Looking at the connection end in a clockwise direction starting at the chassis the terminals are No. 1, end of winding; No. 2, start of winding; No. 3, tap.
  - No. 2 and No. 1—Resistance 4.9 ohms.
  - No. 3 and No. 1—Resistance 4.3 ohms.

**Oscillator Coil** (Part No. P3917) (XD5 only)
- Looking at the connection end in a clockwise direction starting at the chassis the terminals are No. 1, tap; No. 2, start of winding; No. 3, end of winding.
  - No. 3 and No. 1—Resistance 4.9 ohms.
  - No. 2 and No. 1—Resistance 4.3 ohms.

**First I.F. Transformer** (Part No. P3923)
- Primary—Blue, plate; red, B+—Resistance 21.8 ohms.
- Secondary—White, grid; black, AVC—Resistance 20.9 ohms.

**Secondary I.F. Transformer** (Part No. P3924)
- Primary—Blue, plate; red B+—Resistance 23.8 ohms.
- Secondary—White, grid; black, AVC—Resistance 23.7 ohms.

**Electrolytic Condenser** (Part No. P3355)
- Red, 30 mfd., 150 volt; green, 20 mfd., 150 volt; black, negative for both sections.

---

**D5 & XD5**

Compliments of www.nucow.com

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Compliments of www.nucow.com
L. W. Antenna Coil (Part No. P4013)
Looking at the connection end (with dot) in a clockwise direction starting at the mounting lug the terminals are: No. 1, grid; No. 2, ant.; No. 3, sec. ground; No. 4, pit. ground.
Primary—No. 2 and No. 4—Resistance..........................139.7 ohms
Secondary—No. 3 and No. 1—Resistance..........................29.4 ohms

B. C. Oscillator Coil (Part No. P4018)
Looking at the connection end (with dot) in a clockwise direction starting at the chassis the terminals are No. 1, grid; No. 2, plate; No. 3, B+; No. 4, pad.
Primary—No. 2 and No. 3—Resistance..........................2.9 ohms
Secondary—No. 4 and No. 1—Resistance..........................9.1 ohms

L. W. Oscillator Coil (Part No. P4017)
Looking at the connection end (with dot) in a clockwise direction starting at the chassis the terminals are: No. 1, pad; No. 2, B+; No. 3, plate; No. 4, grid.
Primary—No. 3 and No. 2—Resistance..........................4.8 ohms
Secondary—No. 1 and No. 4—Resistance..........................11.3 ohms

First I.F. Transformer (Part No. P3962)
Primary—Red white, B+; blue white, plate—Resistance......11.8 ohms
Secondary—White, grid; black white, A.V.C.—Resistance...23.9 ohms

Second I.F. Transformer (Part No. P3980)
Primary—Blue white, plate; red white, B+—Resistance......15.1 ohms
Secondary—White, grid; black white, A.V.C.—Resistance...11.3 ohms

Power Change Switch
The power change switch connects the tube filaments in series (7 ¼ volt) on A.C./D.C. operation and parallel (1 ½ volt) on battery operation.
Band Switch
right (535 to 1630 kilocycles)
left (2.8 to 6.58 megacycles)

MODEL J5 & XJ5

Speaker (Part No. P4169) 5" Dynamic.
Field Resistance .................. 400 ohms
D.C. voice coil resistance .......... 3.6 ohms
Voice coil impedance at 400 cycles ... 4.0 ohms

RESISTORS

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<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
<th>No.</th>
<th>Ohms</th>
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CONDENSORS

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Oscillator and Short Wave Antenna Coil (Part No. G6187) J5 & XJ5
(PART NO. G6281) XJ5-PH

Looking at the five terminal connection end in a clockwise direction starting at the mounting bracket, the connections are: No. 1, ground; No. 2, grid; No. 3, B.C. osc. tap; No. 4, open; No. 5, open. Looking at the other end in a clockwise direction starting at the mounting bracket, the connections are: No. 6, pad; No. 7, open; No. 8, switch; No. 9, cnt.

No. 1 and No. 2—Resistance... 6.9 ohms
No. 6 and No. 9—... 3 ohms
No. 1 and No. 3—Resistance... 4 ohms
No. 8 and No. 2—... 3 ohms

First I.F. Transformer (Part No. P3923)
Primary—Blue, plate; red, B+—Resistance 20.4 ohms.
Secondary—White, grid; Black, AVC—Resistance 20.3 ohms.

Second I.F. Transformer (Part No. P3924)
Primary—Blue, plate; red B+—Resistance 22.2 ohms.
Secondary—White, diode; Black, AVC—Resistance 22.1 ohms.
This receiver is designed to operate from a power supply mains of 110-120 volts, 60 cycle alternating current (A.C.) \textbf{Never plug in a D.C. outlet.}

ALIGNMENT: IF - 455kc thru .06 or .1mf cond. BC - With 1630kc thru shielded loop radiator, 2 ft. from loop antenna; OR to blue lead of loop antenna thru .0002mf cond., gang at minimum, adjust osc. trim.
With 1400kc adj. Ant. trim. - If gang plates are bent adj. with 600kc.

Fig. 3—Top View of Chassis

Fig. 2—Top View of Automatic Record Changer
AUTOMATIC RECORD CHANGER

This Record Changer will automatically play a series of eight 10' or seven 12' records of the standard 78 R.P.M. type. Records of the last few years with the standard eccentric or spiral stopping groove on the inside and an eccentric on the outside will operate the automatic mechanism. However, records of any size up to 12" may be played manually.

OPERATION

Before operating the phonograph, either automatically or manually, be sure that the pickup is in place and be moved by hand. If not, a "cycle" must be completed to bring it down. To do this, throw Turntable Switch "On." The turntable will begin to revolve and the cycle of motion on the pickup arm will be resumed. When the pickup arm comes down, turn off the Turntable Switch.

CAUTIONS

1. Never use force to start or stop the motor or any part of the record-changing mechanism or pickup arm.
2. The use of records which have become warped or damaged through improper care, may cause the mechanism to jam and damage the instrument. Records which have been warped, will not play one another, when playing, resulting in unsatisfactory sound.
3. This instrument is not recommended for playing 10" and 12" records in mixed sequence. If this is done, the records must be perfectly flat and free from warp. The index and record selector levers are designed to stop the pickup arm in the correct position in relation to the turntable motor. To start the turntable, push the switch to the "On" position. To stop the turntable, push the switch to the "Off." Position.

INDEX AND RECORD SELECTOR LEVER

This lever is located near the right front corner of the motor case, with its index plate marked for four positions—Manual, 12", 10", and Record Selector. When it is desired to change record selector manually, this lever should be set in the "Manual" position. With the lever in the "12" position, the mechanism is set to play a series of 12" records automatically. To play either a series of 10" records or a 12" and 10" records mixed, the lever should be set at the "10" position. To reject a record being played, or to record changing cycle in case the record just played does not have the standard eccentric or spiral stopping groove, simply push the lever to the "reject" position and let go. The pickup will rise and swing outwards, and the next record will drop in place. Upon lowering the lever, it will automatically return to the "10" position. This is especially useful when playing a 10" record, the lever should be returned to the "10" position after rejecting a record. Keep the lever in its "Manual" position when not actually playing records automatically.

TURNtable Switch

The Slide Switch located just in front of the Index and Record Selector Levers, controls the current to the turntable motor. To start the turntable, push the switch to the "On" position. To stop the turntable, push the switch to the "Off." Position.

NEEDLES

The use of high grade long playing needles is absolutely essential for the proper operation of this instrument, as the needles are only good for one or at the most two records. If any needle is used too long, distortion and poor quality will be obtained and the records will be damaged.

PICKUP AND TOP-LOADING NEEDLE SOCKET

The pickup is the new crystal type, with a hole in the top for insertion on the needleij. When not playing records, the pickup arm should be moved out to the right beyond the turntable and placed at rest on the support with the edge of the pickup arm in the groove and the pickup over the needle gauge plate. The pickup must be in this position to change needles.

To insert a needle, locate the needle above the front of the pickup, place needle in hole in arm so that it drops down against the needle gauge plate and then tighten the needle screw.

8. LUBRICATION—A few drops of good quality light machine oil should be applied about once every six months at the base of the spindle below the metal washer under the turntable.

CONTROLS AND MECHANISM

RECORD HOLDER SHELVES

To place a record on the turntable or to remove records, raise the record holder shelves by lifting with the fingers under the shell, and swing out of the outer edge of record. Also pull back vertical lever adjacent to the rear record holder post. The turntable is now accessible. Before loading the phonograph for operation, swing the record holder shelves back into position.

AUTOMATIC OPERATION

1. See that the pickup is over the needle gauge plate with the needle properly in place. If not, complete a cycle as explained in the first paragraph under "Operation.

2. With the Index and Record Selector Levers at the "Manual" position, place the first of the series of records on the turntable and the remainder of the series up to 7" or 12" records on the record holder posts (as shown in Fig. 2). The records should be arranged in the correct order with the desired selection face up and the last selection face down.

3. Set the Index and Record Selector Lever to the proper position. (See Controls Index and Record Selector Levers.)

TO PLAY RECORDS MANUALLY:

MANUAL OPERATION

1. Proceed as in step 1, under "Automatic Operation.

2. Place a record on the turntable with the desired selection upwards.

3. Set the Index and Record Selector Lever to the "Manual" position.

4. Proceed as in steps 4, 5, 6, 7 under "Automatic Operation.

When the playing is finished, be sure that the turntable has stopped and the pickup is in the rest position over the needle gauge plate. Never leave the pickup with the needle resting on a record or on the turntable.

VOLTAGE CHART

All voltages measured with a 1000 ohm per volt meter on the 300 volt scale. Line voltage 117 volts A.C., Volume control maximum and no signal tuned in. Power consumption 75 watts.

SLAT TUBE

Plate (8) to ground 250 V Interruption
Screen (6) to ground 93

SST TUBE

Plate (8) to ground 255 V Interruption
Screen (6) to ground 93

SEG TUBE

Plate (8) to ground 240 V Interruption
Screen (6) to ground 18

SYNC TUBE

Filament (9) to ground 265
Speaker (Part No. P-4243) 6" PM Type.
D.C. voice coil resistance.......................... 5.1 ohms
Voice coil impedance at 400 cycles............. 5.5 ohms

B.C. and S.W. Oscillator Coil (Part No. P-4226)
Looking at the mounting bracket end in a clockwise direction starting at the chassis, the connections are: No. 1, pad; No. 2, open. Looking at the other end in a clockwise direction starting at the chassis the connections are: No. 3, plate; No. 4, plate; No. 5, pad; No. 6, grid; No. 7, grid.
S.W. Primary—No. 4 and No. 5—Resistance........ 4.4 ohms
B.C. Primary—No. 1 and No. 3—Resistance....... 1.3 ohms
S.W. Secondary—No. 5 and No. 6—Resistance.... 0.09 ohms
B.C. Secondary—No. 1 and No. 7—Resistance..... 5.6 ohms

B.C. and S.W. Antenna Coil (Part No. P-4225)
Starting with the lug that is connected direct to ground in a clockwise direction, the terminals are: No. 1, ground; No. 2, open; No. 3, pad; No. 4, grid; No. 5, grid; No. 6 and.
S.W. Primary—No. 6 and No. 7—Resistance....... 3.5 ohms
B.C. Primary—No. 1 and No. 2—Resistance...... 24.1 ohms
S.W. Secondary—No. 3 and No. 4—Resistance.... 0.07 ohms
B.C. Secondary—No. 3 and No. 5—Resistance..... 2.9 ohms

First I.F. Transformer (Part No. P-4245)
Primary—Blue, plate; red, B+—Resistance....... 26.2 ohms
Secondary—White, grid; black, AVC—Resistance... 28.6 ohms

Second I.F. Transformer (Part No. P-4244)
Primary—Blue, plate; red, B+—Resistance....... 15.1 ohms
Secondary—White, grid; black, AVC—Resistance... 11.8 ohms

Band switch shown in broadcast position in schematic and in short wave position in pictorial view in lower left corner.

ALIGNING FREQUENCIES:
IF trims - 455kc thru .05 or .1mf.
Sw-osc. - 18,100kc thru 400 ohm res., gang cond. at minimum.
Sw-ant. - 16,000kc thru 400 ohm res.
Bc-osc. - 17,300kc thru .0002mf, gang cond. at minimum.
Bc-ant. - 1,400kc.

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION

POWER SUPPLY
This receiver is designed to operate on either a 6 volt storage battery or a power supply main of 110-120 volts, 60 cycle alternating current (A.C.) Never plug in to a D.C. outlet.
AC 105 to 125 volts, 60 cycles or DC 105-125 volts. In model J6 all common grounds become chassis grounds, C1, C9, C10, R2 and R3 are omitted. Point "A" is connected to point "B" and point "C" to point "D." *On XJ6 only connect ground of signal generator to common ground thru a .1 mfd. condenser.

For PUSH BUTTON DATA see INDEX. For CONVENTIONAL ALIGNMENT see Spec. Section Vol. VIII.
Band Switch
right 535 to 1730 kilocycles
left 16.57 to 53.10 meters

MODEL
K6

Speaker (Part No. P4140) 5" PM Type
D.C. voice coil resistance 3.1 ohms
Voice coil impedance at 400 cycles 3.5 ohms

CONDENSERS

<table>
<thead>
<tr>
<th>No.</th>
<th>Capacity (Mfd.)</th>
<th>Volts</th>
<th>No.</th>
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<th>Volts</th>
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<td>Micro</td>
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RESISTORS

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Band switch shown in broadcast position in schematic and in short wave position in pictorial view

For CONVENTIONAL ALIGNMENT

First I.F. Transformer (Part No. P4108) *see Spec. Section Vol. VIII*
Primary—Blue, plate; red, B—Resistance.... 18.2 ohms
Secondary—White, grid; black, AVC—Resistance 15.1 ohms

Second I.F. Transformer (Part No. P4109)
Primary—Blue, plate; red B—Resistance..... 20.8 ohms
Secondary—White, diode; black, AVC—Resistance 17.4 ohms

CONTINENTAL RADIO & TELEVISION CORP.

MODEL K6
Speaker (Part No. P4206) 6½" PM.

D. C. voice coil resistance: 3.6 ohms
Voice coil impedance at 400 cycles: 4.0 ohms

S. W. Antenna Coil (Part No. P3198)

Looking at the connection end starting at the chassis in a clockwise direction the terminals are: No. 1, ground; No. 2, antenna; No. 3, switch; No. 4, ground.

Primary—No. 1 and No. 2—Resistance: .37 ohm
Secondary—No. 3 and No. 4—Resistance: .08 ohm

Oscillator Coil (Part No. P4194)

Looking at the mounting strip end in a clockwise direction starting at the chassis, the terminals are: No. 1, ground; No. 2, cathode; No. 3, open; No. 4, pad; No. 5, switch; No. 6, grid; No. 7, grid; No. 8, open.

B.C. Primary—No. 1 and No. 5—Resistance: .29 ohm
S.W. Primary—No. 5 and No. 2—Resistance: .06 ohm
B.C. Secondary—No. 4 and No. 6—Resistance: .5 ohm
S.W. Secondary—No. 2 and No. 7—Resistance: .06 ohm

First I.F. Transformer (Part No. P4106)

Primary—Blue, plate; red, B+—Resistance: 18.2 ohms
Secondary—White, grid; black, A.V.C.—Resistance: 15.1 ohms

Second I.F. Transformer (Part No. P4109)

Primary—Blue, plate; red B+—Resistance: 20.8 ohms
Secondary—White, diode; black, A.V.C.—Resistance: 17.4 ohms

6SK7 (RF) TUBE

Plate (8) to ground: 208 Volts
Screen (6) to ground: 93 Volts

6SA7 TUBE

Plate (3) to ground: 255 Volts
Screen (4) to ground: 93 Volts

6SK7 (IF) TUBE

Plate (8) to ground: 255 Volts
Screen (6) to ground: 93 Volts

6SK7 (AF) TUBE

Plate (6) to ground: 20 Volts
Screen (5) to ground: 10 Volts

6X6G TUBE

Plate (3) to ground: 240 Volts
Screen (4) to ground: 258 Volts
Cathode (8) to ground: 18 Volts

5Y3G TUBE

Filament (8) to ground: 266 Volts

All voltages measured with a 1,000 ohm per volt meter on the 300 volt scale. Line voltage 117 volts A.C. Volume control maximum and no signal tuned in. Power consumption 60 watts.

Fig. 1—Top View of Chassis

POWER SUPPLY

This receiver is designed to operate from a power supply main of 110-126 volts, 60 cycle alternating current (A.C.). Never plug in a D.C.
### RESISTORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
<th>No.</th>
<th>Ohms</th>
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### CONDENSERS

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<tr>
<td>C8</td>
<td>.0005 Mica</td>
<td></td>
</tr>
<tr>
<td>C9</td>
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<tr>
<td>C10</td>
<td>.002 Mica</td>
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</tr>
<tr>
<td>C11</td>
<td>.05 200</td>
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</table>

### Band Switch

- Left 535 to 1630 kilocycles
- Right 5,600 to 18,100 kilocycles

### MODEL B7

#### Speaker (Part No. P4283)
- 10" PM
- D.C. voice coil resistance: 3.7 ohms
- Voice coil impedance at 400 cycles: 4.1 ohms

#### S.W. Antenna Coil (Part No. P0193)
- Looking at the connection end starting at the chassis in a clockwise direction the terminals are: No. 1, ground; No. 2, antenna; No. 3, switch; No. 4, ground.
- Primary—No. 1 and No. 2—Resistance: 0.37 ohms
- Secondary—No. 3 and No. 4—Resistance: 0.08 ohms

#### Oscillator Coil (Part No. P4194)
- Looking at the mounting strip end in a clockwise direction starting at the chassis, the terminals are: No. 1, ground; No. 2, cathode; No. 3, open; No. 4, pad; No. 5, switch; No. 6, grid; No. 7, grid; No. 8, open.
- S.W. Primary—No. 5 and No. 2—Resistance: 0.06 ohms
- B.C. Secondary—No. 4 and No. 6—Resistance: 5.7 ohms
- S.W. Secondary—No. 2 and No. 7—Resistance: 0.8 ohms

#### First I.F. Transformer (Part No. P4108)
- Primary—Blue, plate; red, B+—Resistance: 18.2 ohms
- Secondary—White, grid; black, AVC—Resistance: 15.1 ohms

#### Second I.F. Transformer (Part No. P4109)
- Primary—Blue, plate; red, B+—Resistance: 20.8 ohms
- Secondary—White, diode; black, AVC—Resistance: 17.4 ohms
TABLE OF CONTENTS

CONTINENTAL RADIO & TELEV. CORP.

MODEL K7

Fig. 1—Top View

Fig. 2—Top View of Chassis

RECEIVER DATA

SEINE INDEX

Specifications:

Speaker (Part No. P-4490) 6½" P.M. Type.
D.C. voice coil resistance.........................2.8 ohms
Voice coil impedance at 400 cycles........3.1 ohms

Oscillator Coil (Part No. P-4495)
Looking at the connection end in a clockwise direction starting at the chassis the terminals are No. 1, end of winding; No. 2, start of winding; No. 3, tap. No. 1 and No. 2—Resistance..............4.5 ohms
No. 1 and No. 3—Resistance.....................4.05 ohms
No. 2 and No. 3—Resistance....................4.5 ohm

First I.F. Transformer (Part No. P-4108)
Primary—Blue, plate; red, B+
Resistance ........................................18.2 ohms
Secondary—White, grid; black, AVC
Resistance ........................................15.1 ohms

Second I.F. Transformer (Part No. P-4109)
Primary—Blue, plate; red, B+
Resistance ........................................20.8 ohms
Secondary—White, diode; black, AVC
Resistance ........................................17.4 ohms

VOLTAGE CHART
Never plug in a D.C. outlet.
All voltages measured with a 1000 ohm per volt meter on the 300 volt scale. Line voltage 117 volts A.C. Voltage control maximum and no signal tuned in. Power consumption 90 watts.

6SA7 TUBE
Plate (3) to ground........................................255
Screen (4) to ground...................................93

6SK7 TUBE
Plate (8) to ground........................................255
Screen (5) to ground...................................93

6X5G TUBE
Plate (3) to ground......................................240
Screen (4) to ground...................................258
Cathode (8) to ground.................................18

5Y3G TUBE
Filament (8) to ground...................................266

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Short Wave Bands 9.45 to 9.77, 11.65 to 11.96 and 15.05 to 15.35 Megacycles
Broadcast Band 540-1630 Kilocycles Police Band 2,200 to 7,000 Kilocycles

RESISTORS

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<thead>
<tr>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
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<tr>
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<td>1/2</td>
</tr>
<tr>
<td>R  2</td>
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<td>1/2</td>
</tr>
<tr>
<td>R  3</td>
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<td>1/2</td>
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RESISTORS

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<tr>
<td>R22</td>
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<td>R23</td>
<td>50,000 ohm 1/2 watt</td>
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<tr>
<td>R24</td>
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<td>R26</td>
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<td>R27</td>
<td>250,000 ohm 1/2 watt</td>
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CONDENSERS

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<td>Mica</td>
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<td>C3</td>
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<td>C4</td>
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</tr>
<tr>
<td>C5</td>
<td>.0001</td>
<td>Mica</td>
</tr>
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<td>C6</td>
<td>.00006</td>
<td>5% Mica</td>
</tr>
<tr>
<td>C7</td>
<td>.05</td>
<td>400 V.</td>
</tr>
<tr>
<td>C8</td>
<td>.05</td>
<td>200 V.</td>
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<td>C9</td>
<td>.05</td>
<td>400 V.</td>
</tr>
<tr>
<td>C10</td>
<td>.05</td>
<td>400 V.</td>
</tr>
<tr>
<td>C11</td>
<td>.00001</td>
<td>Mica</td>
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<tr>
<td>C12</td>
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<td>Mica</td>
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<tr>
<td>C13</td>
<td>.02</td>
<td>200 V.</td>
</tr>
<tr>
<td>C14</td>
<td>.02</td>
<td>200 V.</td>
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<tr>
<td>C15</td>
<td>.06</td>
<td>400 V.</td>
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<tr>
<td>C16</td>
<td>.0001</td>
<td>Mica</td>
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<tr>
<td>C17</td>
<td>.00005</td>
<td>Mica</td>
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<tr>
<td>C18</td>
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<td>600 V.</td>
</tr>
<tr>
<td>C19</td>
<td>.03</td>
<td>200 V.</td>
</tr>
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</table>

Fig. 2
Dial and Drive Cord System

PHONOGRAPH CONNECTIONS MODEL A11
connection may be made direct from the phonograph to this jack by means of phone tips, if the phonograph pickup is of the high impedance type. If the pickup is of the low impedance type, a coupling transformer must be used.

TELEVISION CONNECTIONS
The sound channel output from the second detector of a Television Receiver may be plugged directly into the phone jack for metallic phone givings full and good results. A low output microphone is plugged directly into the phone jack for crystal, clear, and good results. The results obtained will be largely determined by the type of microphone used.
This Record Changer will automatically play a record, when inserted into it, of twelve 10" or 12" or mixed 10" and 12" records of the standard 78 R. P. M. type. Records of any size up to 12" may be played manually.

**SHIPPING BOLTS**

The automatic record changer is held solid for shipping by four bolts and before placing unit in operation, the four channel shaped nuts must be loosened. The automatic record changer's four channel shaped nuts are located underneath the record changer and should be turned counter-clockwise until they are free from the wood rill.

**DO NOT REMOVE THE BOLTS.**

If it is necessary to later ship this radio the four channel shaped nuts must be tightened to the shipping position.

**CAUTIONS**

1. Never use force to start or stop the motor or any part of the record changing mechanism or pickup arm.

2. The use of records which have become warped or damaged thus impair the motor may cause the mechanism to jam and damage the instrument. Records which have become warped will slide on one another when playing, resulting in unsatisfactory reproduction.

3. Do not leave records on the selector arms, as they are liable to warp, particularly so in warmer climates. Keep your records in a record file (album or cabinet) when not in use. This will protect them from warping and dust.

4. The Changing Cycle consists of the time interval beginning when the pickup arm automatically lifts from the center section of the record and moves out to its exterior position; the new record drops and the pickup arm rests itself on the outer edge of this new record. During this cycle, the pickup arm should not be handled. It is PERMITTED TO STOP THE MECHANISM AT ANY POINT PRIOR TO THE RECORD ARM BEING TAKEN TO SEE THAT THIS CHANGING CYCLE IS COMPLETE.

5. No damage will be done if you forget to turn off changer after it has played its entire load of records. It will simply repeat the last record until stopped.

6. LEVELING...For proper operation of the record changer the unit must be level.

**PHONOGRAPH NEEDLES**

Various types and kinds of needles are available for use in phonograph pickup arms. All have their virtues, as well as their faults, for use in ordinary phonographs, where needles can be changed after each record. For playing up to twelve records at one setup, as with this Changer, no attempt should be made to use ordinary steel or fibra points, since continued use of worn points will likely be ruinous both of the quality of reproduction and the records as well. Any kind of needle can be used which has a point durable enough to play ten records or more without damaging them.

It should be remembered that, no matter what the quality of the pickup arm, amplifying system and speaker, all of the recorded music must pass through the needle. For this reason, it is absolutely essential that the pickup arm needle be taken to use good needles, and to see that they are changed often enough so the records are not damaged and the quality of the music is not impaired.

It is recommended that a sapphire point needle be used as it is the needle that is satisfactorily used on both commercial records and home recordings. If any other type of needle is used it is recommended to change the needle every time a record is played home recordings (or after playing commercial records). If the same needle is used on both kinds of records (except sapphire type) the home recording will likely be quickly damaged. A sapphire pickup needle will need several thousand records before requiring replacement. Never under any condition allow the needle to become removed from the pickup arm and then reinstalled.

To install a needle raise the pickup arm to a nearly vertical position, loosen needle screw and needle. The needle screw should now be firmly tightened.

This record changer is provided with two trip mechanisms so that automatic changing can be secured from records with the conventional Eccentric Center Groove or with records lacking the Eccentric Center Groove, but which are recorded sufficiently near the center so that the Positive Trips comes into operation.

**THE RATCHET TRIP**

The Ratchet Trip requires no adjustment on its range of operation is greater than that of any standard records.

**THE POSITIVE TRIP**

The Positive Trip can be adjusted to operate at a definite point from the center spindle in the following manner. Remove the button covering the hole on the left side of the pickup arm. Using a small screw driver drive the screw-head appearing thru this hole.

1. Carefully turn the screw clockwise and observe the position of the pickup arm.
2. Repeat step 1 until the pickup arm is in the position required.
3. Secure the screw with the screw-head.

**REJECTING A RECORD**

To reject a record it is only necessary to push the manual button on the record changer to the "R." position for a few seconds and then release. A record can be rejected any time the needle is in contact with the record.

**UNLOADING**

1. Switch off the motor while the needle is in contact with a record.
2. Return the pickup arm to the rest position.
3. Lift the record feeder assemblies upward and turn them out of the way.
4. Lift the played records from the turntable.
5. Turn the record feeder assemblies until they snap back into position.

The changer may now be loaded with a new stack of records.

**MANUAL OPERATION**

Manual operation is used for all home recordings. Whenever a record is played:

1. Lift the record feeder assemblies upward and turn them out of the way.
2. Place record on turntable with the desired selection upward.
3. Push the control button to the first or "Man." (Manual) position.
4. When the turntable has attained speed, lift pickup arm and lower the needle to the record as in the normal operation.
5. Adjust volume control to desired intensity and tone control to the preferred setting.
6. Close cabinet to eliminate mechanical reproduction of sound by the needle.
7. When the playing is finished, be sure turntable is stopped and turntable is in the rest position.

**PICKUP ARM DROP POINT**

This Record Changer is provided with two trip mechanisms so that automatic changing can be secured from records with the conventional Eccentric Center Groove or with records lacking the Eccentric Center Groove, but which are recorded sufficiently near the center so that the Positive Trip comes into operation.

**REJECTING A RECORD**

To reject a record it is only necessary to push the manual button on the record changer to the "R." position for a few seconds and then release. A record can be rejected any time the needle is in contact with the record.

**UNLOADING**

1. Switch off the motor while the needle is in contact with a record.
2. Return the pickup arm to the rest position.
3. Lift the record feeder assemblies upward and turn them out of the way.
4. Lift the played records from the turntable.
5. Turn the record feeder assemblies until they snap back into position.

The changer may now be loaded with a new stack of records.

**MANUAL OPERATION**

Manual operation is used for all home recordings. Whenever a record is played:

1. Lift the record feeder assemblies upward and turn them out of the way.
2. Place record on turntable with the desired selection upward.
3. Push the control button to the first or "Man." (Manual) position.
4. When the turntable has attained speed, lift pickup arm and lower the needle to the record as in the normal operation.
5. Adjust volume control to desired intensity and tone control to the preferred setting.
6. Close cabinet to eliminate mechanical reproduction of sound by the needle.
7. When the playing is finished, be sure turntable is stopped and turntable is in the rest position.

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Compliments of www.nucow.com
PROCEDURE FOR SETTING UP PUSH BUTTONS

The push buttons described in this section will provide instant tuning to any one of six stations. Make a list of the stations you wish to include between 540 and 1300 kilocycles, two between 870 and 1270 kilocycles, and the two from 1000 and 1300 kilocycles. The push buttons are reach out of the box and are located above the crystal compartments in the rear. If it were not for this mounting position and the two stations between 1000 and 1300 kilocycles, numbers 3 and 4 cover the two stations between 870 and 1270 kilocycles and numbers 5 and 6 cover the two stations between 540 and 1000 kilocycles. To set the aforementioned adjustments proceed as follows:

1. Turn band switch to band 1 (band indicator located in lower center of dial).
2. Tune in, by means of the station selector knob, the station selected above for number 1.
3. Turn band switch to position 3, then 4.
4. Loosen wing nuts and remove the tuning eye located directly above the sensitivity tuner.
5. Turn the adjustment screw directly under number 1 until the station tuned in step number 2 is again received and then carefully adjust it until the tuning eye is in the nearest to closed.
6. Turn the adjustment directly below the aforementioned adjustment until the tuning eye is in the nearest to closed and the station is received in the closest.

The above procedure is repeated for each of the five remaining stations. The tuning eye should then be carefully replaced.

MODEL 811

Values—Line 117 volts A.C. Power consumption 150 watts. Volume control maximum. Loop antenna not connected and set tuned off station. Meter 20,000 millivolts per volt. Meter scales used are as follows: Scale “A” 10 volts; Scale “B” 50 volts.

6A87 R.F. Tube Meter Scale Voltage
Plate (8) to ground...“C”...+225 volts
Screen (6) to ground...“C”...+180 volts
Cathode (5) to ground...“A”...+26 volts

6A87 1st Det.- Osc. Tube
Plate (3) to ground...“D”...+260 volts
Screen (4) to ground...“C”...+130 volts
Cathode (5) to ground...“A”...0.0 volts

6S57 I.F. Amp. Tube
Plate (9) to ground...“D”...+230 volts
Screen (8) to ground...“C”...+125 volts
Cathode (5) to ground...“A”...1.7 volts

6S57 2nd Det. AVC Tube
Plate (9) to ground...“A”...0.0 volts

6U5 Tuning Eye and Volume Level Indicator Tube
Tunnel Plate (4) to ground...“D”...+260 volts

6S57 Microphone Amp. Tube
Plate (9) to ground...“B”...+25 volts
Grid (2) to ground...“A”...+50 volts
AUTOMATIC RECORD CHANGER

This Record Changer will automatically play a series of fourteen 10" or ten 12" records of the standard 78 R.P.M. type. The records must all be one size when loading and may vary in size if desired. The records are supported by a series of two centres on the outside, which will operate the automatic mechanism. However, records of any size up to 12" may be played manually.

CAUTIONS
1. Never use force to start or stop the motor or any part of the record changer mechanism or pickup arm. The turntable is weighted for recording and will require about one minute to come to rest after the motor is turned off.
2. The use of records which have become warped or damaged thru improper care may cause the mechanism to jam and damage the instrument. Records which become warped will stick on one another when playing, resulting in unsatisfactory reproduction.
3. Do not leave records on the selector arms, as they are liable to warp, particularly in warm climates. Keep your records in a record file (album or cabinet) when not in use. This will protect them from warping and dust.
4. If the automatic record changer is turned off by the motor switch knob while the mechanism is going thru a "change cycle" the motor will not stop until the cycle is completed and the tone arm is again in playing position. The tone arm may now be lifted to the rest position. If it is desired to turn the record changer off by the use of any other switch than the one on the changer itself, be sure to turn off the table arm is resting upon record, otherwise the selecting arms cannot be correctly reset.
5. No damage will be done if you forget to turn off the changer after it has played its entire load of records. It will simply repeat the last record until stopped.
6. LEVELING—For proper operation of the record changer and recorder the unit must be leveled.

PHONOGRAPH NEEDLES
Various types and kinds of needles are available for use in phonograph tone arms. All have their virtues, as well as their faults, for use in ordinary phonographs where needles can be changed after each record. For playing ten or more records at one setting up with this Changer, no attempt should be made to use ordinary steel or fibre points, since continued use of worn points will be likely to ruin both quality of reproduction and the records as well. Any kind of needle can be used which has a point durable enough to play ten records or more without damaging them. It should be remembered that, no matter what the quality of the tone arm, amplifying system and speaker, all of the records must pass through the needle. For this reason, it is absolutely essential that particular care be taken to use good needles and to see that they are changed often enough so the records are not damaged and the quality of the music is not impaired.

It is recommended that a sapphire point needle be used as it is the only needle that can be satisfactorily used on both commercial records and home recordings. If any other type of needle is used it is necessary to change the needle every time it is desired to play home recordings after playing commercial records. If the same needle is used on both kinds of records (except sapphire tipped) the home recordings will be greatly damaged. A sapphire needle will play several thousand records before requiring replacement. Never under any condition should a needle be removed from the tone-arm head and then re-installed.

To install a needle raise the tone arm to a nearly vertical position, loosen needle screw and insert needle. The needle screw should now be firmly tightened.

SETTING FOR SIZE OF RECORD
On each post there are selecting arms (See Figs. 2 and 3) and their position determines the setting for different size records. To set for 10" or 12" inch records, it is merely necessary to grasp the post by the knob at the top, lift, and turn until the "10" or "12" arrows are pointing to the point of the tone arm.

When in either the 10" or 12" position, the post will snap into place except when they are lifted by hand. Figure 2 shows the Record Changer with the selecting arms set for 10" records and ready to be loaded; the tone arm in the rest position. Figure 3 shows the setting for 12" records.

LOADING
After both selecting arms are adjusted so the arrows on the desired record are pointing on the center, the selected records (up to fourteen 10" or 12") are placed over the center pin so they will rest on the selecting arms. Place the record desired last on top.

STARTING THE CHANGER
1. Move the manual control button (See Figure 2) to the "AUTOMATIC" position.
2. Turn on the radio and push in the "PHONOGRAPH" push button.
3. Turn the switch knob on the Record Changer panel to "On." The motor will then start and the record changer will go into automatic operation.
4. Adjust volume control to the desired intensity and tone control to the preferred setting.
5. Close lid of the cabinet to eliminate mechanical reproduction of sound by the needle.
6. When the playing is finished, be sure turnable is stopped and tone arm is in the rest position. Never leave the tone arm with the needle resting on a record or the turntable.

REJECTING A RECORD
To reject a record it is only necessary to press the switch knob on the record changer panel for a few seconds and then release. A record can be rejected any time the needle is in contact with the record.

UNLOADING
Turn off the motor. Grasp each post by its knob at the top and turn them out of the way. Turn the tone arm to the rest position. Lift the played records from the turntable. Then return the posts to the proper playing position as indicated by the arrows on the selecting arms. (See Fig. 2 and 3.) The Changer may then be loaded with a new stack of records according to the size shown on the selecting arms.

MANUAL OPERATION
Manual operation is used for all home recordings and records without spiral grooves.

1. Move the manual control button as far as possible toward the needle screw and then move the tone arm to its extreme outside position. The combination of movements will result in the manual control button snapping into position at the end of the escutcheon plate and will completely free the tone arm from all locked or automatic positions.
2. Place record on turntable with the desired selection upward.
3. Turn the switch knob on the record changer panel to "On.
4. When the turntable has attained speed, lift tone arm and lower quickly on to the record so the needle point enters the outside groove.
5. Adjust volume control to the desired intensity and tone control to the preferred setting.
6. Close lid of the cabinet to eliminate mechanical reproduction of sound by the needle.
7. When the playing is finished, be sure turntable is stopped and tone arm is in the rest position. Never leave the tone arm with the needle resting on a record or the turntable.

ANTENNA CONTROL
The antenna control knob is located above the dial scale and controls the position of the rotary loop antenna. On weak stations this knob should be turned right or left to the position of maximum output. In extremely noisy locations the knob should be turned to the point of minimum noise.

TELEVISION CONNECTIONS
The sound channel output from the second detector of a Television Receiver may be plugged directly into the Phono Jack, thus using the speaker and audio system of this receiver. The above connections will greatly reduce the cost of Television Receiving Equipment, because it eliminates the need for a speaker and audio system in the above equipment.
RECORDBER

This recorder will make up to 15 inch recordings. The recordings may be made from the microphone or radio; also the microphone and radio may be blended together in one recording.

CAUTIONS

1. Never try to record on a blank that is warped even though it be just slightly.
2. When recording the recording needle will cut a fine thread, just a little thicker than a human hair, from the record blank and this thread should be pulled toward the center of the blank. After the recording is completed, this thread may be gathered up and removed. Although it is possible to remove this thread continually with a soft brush while the record is being cut, considerable care must be taken so that the thread is not tangled around the recording needle or the thread breaks along by exuding it, since either will cause poor recordings.
3. If the sprockets from the record holder the recording needle the needle screw should be loosened and then tightened, being sure to keep the needle all the way in. The resulting minute change in the angular position of the needle will probably correct the trouble.
4. The recording arm must be in the rest position when playing back recordings or when adjusting the automatic record changer.
5. Never try to remove or replace a recorded or blank with the motor running.
6. Be sure the recording needle is tight after each recording. Should it loosen during a recording, it will chatter and ruin the record.
7. The recording needle is razor sharp and must not be dropped or allowed to rest on the turntable. The record should only be in contact with the record while actually recording or adjusting the Recorder Arm Height.

8. If the microphone is held too close to the speaker it will feed back and start a loud "howl." When recording from the microphone it should be kept well away from the cabinet and with the back toward the cabinet. When not recording the microphone volume control should be turned to the off position to prevent feedback or "howl.

9. Never record nearer than one and one-half inches from the center of the record. With some recording discs it is not possible to record this close to the center because of the large label; do not record closer than one-inch from label.

TO RECORD A RADIO PROGRAM

1. Place a blank recording disc on the turntable with the driving pin, located in the top of the turntable about one inch from the center, in one of the three holes provided.
2. Set "Phono-Radio-Micro" switch to Radio Position. (Model K)
3. Move the manual control knob as far as possible toward the needle screw and then move the tone arm to its extreme outside position. The combination of movements will result in the manual control button snapping into position at the left of the cutaway plate and will completely free the tone arm from all locked or automatic positions (Model 311).
4. Turn radio on and tune desired station.
5. Lift recording arm about three inches and move it to the edge of the blank. This switch from playback to record and decreases the volume. While holding the recording arm adjust the volume control until the volume level indicator (tuning area) almost closes and lower the recording arm gently on to the record so the recording needle starts about one-fourth inch in from the edge of the blank disc. On loud music, passageway the volume level indicator should completely close.

6. After the recording is complete (never record closer than one and one-half inches from the center) the recording arm should be returned to its rest position. Never leave the recording arm resting on record or turntable.

TO RECORD FROM THE MICROPHONE

The procedure is the same as recording a radio program except (the volume control is set to minimum and the microphone volume control is used) (Model 311).

(Model K) "Phono-Radio-Micro" switch to Mike Position.

TO RECORD MICROPHONE AND RADIO PROGRAM AT THE SAME TIME

The procedure is the same as recording a radio program except the microphone volume control is also used. The two may be blended as desired or only one used part of the time and by changing the volume controls slowly, fading from one to the other is obtained. Model 311 only.

PLAYBACK

As soon as a record is completed it may be instantly played back after the recording arm is returned to its rest position and the "Phono" button is pushed in. (See Manual Playback)

RECORDBER ARM PRESSURE ADJUSTMENT

The pressure on the recording needle which determines the groove depth is controlled by the chromed polished knob on the top of the recording arm. This knob is engraved with the letters "L, M and H" indicating Light, Medium and Heavy pressures and provide an easy means of compensating for different types of recording needles, blanks or for the wearing of the recording needle after it is used. In general, the machine is properly set at the factory so that it will cut the average record correctly when this knob is in the "M" position. To "M" Pos. for Model K.

If the groove is too shallow, the playback needle will not stay in the groove. If it is too deep, not enough will be left between grooves and the playback needle will break through from one track to the next after a few playings.

The proper depth of groove will leave about the same space between the grooves as groove is wide. Hold a finished record toward the light and you can usually see if the grooves are spaced correctly.

A properly cut groove will leave a shaving just like a human hair.

RECORDBER ARM HEIGHT ADJUSTMENT

The height of the recorder arm can be varied by means of the slotted screw head which is on the top of the arm and toward the back, approximately flush with the surface. In order to make this adjustment, it is necessary to insert a recording needle and, with the motor turned off and a record blank on the turntable, place the recording arm very carefully in the cutting position. Now raise or lower the recording arm by means of the above mentioned adjustment until the needle screw is approximately centered in the slot at the front end of the recording arm.

RECORDBER NEEDLE

The recording needle or cutting stylus supplied with this recorder is a "Perma Point" and will make about 356 six-inch recordings. The condition of the record in 15 Recordings for Mod. K (no Perma Point) tiny needle may be determined by comparing the color of the newly recorded portion of the record with the unrecorded portion. A good recording needle will result in grooves having a higher brilliance than the unrecorded portion; as the needle wears or if the needle is poor with the cut portion will have less lustre and will eventually appear gray.

In case the recording needle tends to chatter as it is recording, it is advisable to replace it with a new needle.

The recording needle may be removed and replaced at desired; provided the adjustments are checked before recording. In all events, every precaution must be taken to protect the cutting point at all times; in cutting it should be lowered GENTLY on the blank with the turntable running.

INSTALLING NEW RECORDING NEEDLE

The recording needle is provided with a flat on one side and should be inserted in the needle hole so that this flat is toward the needle screw, now with the needle all the way in tightening it by means of the needle screw. The recording arm adjustments must now be checked. Set "Recorder Arm Height Adjustment" and "Recorder Arm Pressure Adjustment."
CONTINENTAL RADIO & TELEV. CORP.

This receiver is designed to operate from a power supply main of 110-120 volts, 60 cycle alternating current (A.C.). Never plug in a D.C.

Outlet, 125A7 1st DET.OSC.
125K7 I.F.
125T1 2nd DET & 1st A.V.C.
126A7 1st A.V.C.
125T7 OUTPUT 5V.
125A7 CHASSIS GROUND
125T7 COMMON GROUND
125A7 455 KC.
3525 RECTIFIER
3525 SPEAKER
3525 OUTPUT
3525 PHONO.
3525 PHONO.
3525 VOLUME
3525 SWINGING
3525 ANT.
3525 ISSUE A
3525 JUNE 1940

For ALIGN. &
COIL DATA -
SEE INDEX.

RESISTORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
</tr>
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<tbody>
<tr>
<td>R1</td>
<td>250,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R2</td>
<td>100,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R3</td>
<td>50,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R4</td>
<td>10,000</td>
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</tr>
<tr>
<td>R5</td>
<td>5,000</td>
<td>1/4</td>
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<tr>
<td>R6</td>
<td>2,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R7</td>
<td>500</td>
<td>V.C.</td>
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<tr>
<td>R8</td>
<td>5,000</td>
<td>1/4</td>
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<td>R9</td>
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<tr>
<td>R10</td>
<td>500</td>
<td>1/4</td>
</tr>
<tr>
<td>R11</td>
<td>150-150</td>
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</tr>
<tr>
<td>R12</td>
<td>150</td>
<td>1/4</td>
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CONDENSORS

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>.0005</td>
</tr>
<tr>
<td>C2</td>
<td>.001</td>
</tr>
<tr>
<td>C3</td>
<td>.002</td>
</tr>
<tr>
<td>C4</td>
<td>.005</td>
</tr>
<tr>
<td>C5</td>
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<tr>
<td>C6</td>
<td>.005</td>
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<tr>
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<td>C14</td>
<td>.05</td>
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<tr>
<td>C15</td>
<td>.05</td>
</tr>
<tr>
<td>C16</td>
<td>.05</td>
</tr>
</tbody>
</table>

AC 105 to 125 volts, 60 cycles or DC
105-125 volts.

In model J55 all common grounds become chassis grounds. C1, C2, C3, C5, R2, and R6 are omitted.

Point "A" is connected to point "B" and point "C" to point "D."

For SPEAKER & COIL
DATA - SEE
INDEX.

(Band Switch) right 535 to 1630 kilocycles
left 2.8 to 6.35 megacycles

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All voltages measured with a 1,000 ohm per volt meter on the 300 volt scale. Line voltage 117 volts A.C. Volume control maximum and no signal tuned in. Power consumption 60 watts.

**Speaker** (Part No. P4283) 10" PM
- D.C. voice coil resistance: 3.7 ohms
- Voice coil impedance at 400 cycles: 4.1 ohms

**S. W. Antenna Coil** (Part No. P3198)
- Looking at the connection end starting at the chassis in a clockwise direction the terminals are: No. 1, plate; No. 2, B+; No. 3, grid; No. 4, pad.
- Primary—No. 3 and No. 4—Resistance: 0.08 ohm
- Secondary—No. 1 and No. 2—Resistance: 0.37 ohm

**Oscillator Coil** (Part No. P4194)
- Looking at the mounting strip end in a clockwise direction starting at the chassis, the terminals are: No. 1, ground; No. 2, cathode; No. 3, open; No. 4, pad; No. 5, switch: No. 6, grid; No. 7, grid; No. 8, open.
- B.C. Primary—No. 1 and No. 5—Resistance: 0.29 ohm
- S.W. Primary—No. 5 and No. 2—Resistance: 0.06 ohm
- B.C. Secondary—No. 4 and No. 6—Resistance: 5.7 ohms
- S.W. Secondary—No. 2 and No. 7—Resistance: 0.08 ohm

**First I.F. Transformer** (Part No. P4108)
- Primary—Blue, plate; red, B+—Resistance: 18.2 ohms
- Secondary—White, grid; black, A/V—Resistance: 15.1 ohms

**Second I.F. Transformer** (Part No. P4109)
- Primary—Blue, plate; red, B+—Resistance: 20.8 ohms
- Secondary—White, diode; black, A/V—Resistance: 17.4 ohms

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**NOTE**: The diagram includes various components and connections, but the text focuses on specific electrical measurements and component values.
Model --- #10
TUBES MAY BE METAL OR GT TYPE
1940

SOCKET VOLTAGES TAKEN @ 117.5 VOLT LINE (A. C.)

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>No. 1</th>
<th>No. 2</th>
<th>No. 3</th>
<th>No. 4</th>
<th>No. 5</th>
<th>No. 6</th>
<th>No. 7</th>
<th>No. 8</th>
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<tbody>
<tr>
<td>6SK7</td>
<td>R. F. Amplifier</td>
<td>GND.</td>
<td>H</td>
<td>3.0</td>
<td>GRID</td>
<td>3.0</td>
<td>92</td>
<td>H</td>
<td>91</td>
</tr>
<tr>
<td>6J7</td>
<td>Detector</td>
<td>GND.</td>
<td>H</td>
<td>20</td>
<td>8</td>
<td>2.0</td>
<td>10</td>
<td>H</td>
<td>2.0</td>
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<tr>
<td>25L6</td>
<td>Output</td>
<td>GND.</td>
<td>H</td>
<td>82</td>
<td>91</td>
<td>GRID</td>
<td>N.C.</td>
<td>H</td>
<td>5.8</td>
</tr>
<tr>
<td>2526</td>
<td>Rectifier</td>
<td>H</td>
<td>A.C.</td>
<td>120</td>
<td>A.C.</td>
<td>H</td>
<td>120</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| W-66416 | Ballast Resistor | 165 Ohms (Cold) | Between No. 3 and No. 7 PIns with No. 6 and No. 8 PIns Tied Together.

Power Consumption @ 117.5 Volts Line—Approximately 43 Watts.
D. C. Drop Across Speaker Field—20 Volts.
Maximum Power Output Approximately 2.0 Watts.

**Alignment**

(a) Connect the output lead of the signal generator through a .0001 mF condenser to the antenna lead on the receiver.
(b) Open the gang condenser all the way.
(c) Set the generator to 1712 kilocycles.
(d) Adjust the trimmer condensers on the gang until the 1712 kc signal is heard. The gang should just tune through this signal.
(e) Set the generator to 1400 kc.
(f) Tune the set to the 1400 kc. signal, then alternately adjust the trimmers on the gang until no further improvement can be noticed on the output meter.
ALIGNMENT PROCEDURE

The chassis of this receiver is connected to one side of the power supply and for this reason all test equipment should be thoroughly insulated in order that the power supply will not become short-circuited while aligning the receiver. This does not apply to the models J11 as the power supply is isolated from the chassis by a 26 ml. condenser.

CONNECTING OUTPUT METER

Connect one terminal of the output meter to the plate and the other terminal to the screen of the 50L6GT output tube. Be certain that the meter is protected from DC by connecting a condenser (.1 ml. or larger—not electrolytic) in series with one of the leads.

TUNING the I-F AMPLIFIER To 455 Kilocycles

(a) Connect the output of the signal generator through a 100 mmf. condenser to the antenna connections (Black or Red lead extending from rear of loop) on the receiver. Do not use a ground return from the signal generator unless it is found to be absolutely necessary. If it is found that it is necessary, a small condenser (.001 ml.) should be connected in series with the ground terminal of the signal generator and the receiver chassis. KEEP THE GENERATOR LEADS AS FAR AS POSSIBLE FROM THE GRID LEADS OF THE OTHER SCREEN GRID TUBES.

(b) Set the set selector so that the plates of the condenser are completely out of mesh and turn the volume control to the right (ON).

(c) Set the signal generator to 455 kilocycles.

(d) Adjust the 2nd I-F trimmer condensers, Item 17, located in top of 2nd I-F ass'y., (Fig. 2) for maximum reading on the output meter.

(e) Adjust the 1st I-F trimmer condensers, Item 6, located on top of 1st I-F ass'y., (Fig. 2) for maximum output.

(f) Repeat operations (d) and (e) for more accurate adjustments.

ALWAYS USE THE LOWEST SIGNAL GENERATOR OUTPUT THAT WILL GIVE A REASONABLE READING ON THE OUTPUT METER.

Aligning the R-F Amplifier

(a) Set the signal generator to 1650 kilocycles.

(b) With the condenser gap turned to the minimum capacity position, adjust the trimmer condenser (Fig. 3) B.C. “OSC” so that the 1650 kilocycle signal is heard. It is not necessary that the receiver tunes through this signal.

(c) Set the signal generator to 1400 kilocycles.

(d) Tune-in the 1400 kilocycle signal in the region of 180 on the dial for maximum output.

(e) Adjust the trimmer condensers B.C. “ANT” for maximum output. (Fig. 3)

NOTE: Do not readjust the “OSC” trimmer.

(f) Repeat operations (d) and (e) for more accurate adjustments.

WAVE TRAP

Some chassis of this model are equipped with a wave trap for the purpose of eliminating interference from radio stations which operate on a frequency of approximately 455 kilocycles. This assembly is located on the loop mounting bracket (Fig. 2) and consists of a coil, and a trimmer condenser as illustrated by the dotted lines in the Wiring Diagram (Item 45).

The wave trap should not be adjusted until all other adjustments have been made. To make the adjustment, feed a 455 kilocycle signal from the signal generator through a 50 mmf. condenser into the antenna terminal of the receiver. With the gang condenser set at approximately 55 on the dial and the volume control full on, adjust the trimmer condenser on the wave trap for MINIMUM output.

Should the interfering station be operating on a frequency of slightly more or less than 455 kilocycles, the exact frequency should be determined with the aid of the signal generator. Then, instead of feeding a 455 kilocycle signal into the receiver the exact frequency of the interfering signal should be used. If it is not possible to determine the exact frequency of the interfering signal the antenna may be attached to the receiver and the receiver tuned to the position where the interfering signal is most noticeable. Then adjust the wave trap for minimum interference.
1.—Aligning I-F To 455 Kc.
   (a) Connect the output lead of the signal generator through a .0001 mf. condenser to the antenna lead extending from the rear of the chassis. Do not use a ground return from the signal generator unless it is found to be absolutely necessary. If necessary a small condenser (.001 mf.) should be connected in series with the ground lead of the signal generator and the chassis.
   (b) Open tuning gang condenser all the way (plates completely out of mesh). Turn volume control to maximum. On models 14 and J-14 turn tone control switch to right (treble). Turn band switch to the B. C. (left) position.
   (c) Set the signal generator to 455 kilocycles.
   (d) Adjust the two trimmer condensers on top of 2nd I-F assembly (Fig. 3) for maximum output.
   (e) Adjust the two trimmers condensers on top of the 1st I-F assembly (Fig. 3) for maximum output.
   (f) Repeat (d) and (e) for more accurate adjustments.

2.—Aligning R-F Amplifier.
   The short wave band 6-15 mc., must be aligned before the Broadcast Band 540-1600 kc.
   (a) Connect the signal generator output lead through a dummy antenna (400 ohm carbon resistor) to lead (Blue or Red) extending from rear of chassis. Turn the band switch to S. W. (right) and open tuning condenser all the way.
   (b) Set signal generator to 15.0 megacycles.
   (c) Adjust the S. W. "OSC" trimmer condenser (Fig. 2), (on rear section of gang) for maximum output. The gang should just tune through this signal.
   (d) Tune in 15.0 mc. signal with gang and while slowly rocking gang through signal, adjust the S. W. "ANT" trimmer condenser for maximum output. (Center trimmer on right end of chassis).

NOTE: When aligning the Short Wave band care should be exercised so that the circuits are aligned on the fundamental rather than on the image frequency which is approximately 910 kilocycles more than the fundamental. To check this increase the output of the signal generator approximately 10 times and try to tune in both, the fundamental, at the signal generator frequency as indicated on the dial and the image which should be approximately 910 kilocycles lower (approximately 14) on the dial.

   (e) Repeat (c) and (d) for more accurate adjustments.
   (f) Replace 400 ohm carbon antenna dummy with a .0001 mf. condenser. Turn band switch to the Broadcast band, open gang condenser all the way, etc.
   (g) Set the signal generator to 1650 kilocycles.
   (h) Adjust B. C. "OSC" trimmer (rear trimmer right end of chassis) Fig. 3, for maximum output.
   (i) Set signal generator to 1400 kilocycles.
   (j) Tune in generator signal for maximum output then adjust B. C. "ANT" trimmer (front trimmer right end of chassis) Fig. 3, for maximum output.
   (k) Repeat (h) and (j) for more accurate adjustments.

For voltage and wave trap data, see Model 11
THE CROSLEY CORP.

1.—Aligning I-F To 455 Kc.
(a) Connect the output lead of the signal generator through a .0001 mf. condenser to the antenna lead extending from the rear of the chassis. Do not use a ground return from the signal generator unless it is found to be absolutely necessary. If necessary a small condenser (.001 mf.) should be connected in series with the ground lead of the signal generator and the chassis.

(b) Open tuning gang condenser all the way (plates completely out of mesh). Turn volume control to maximum, turn tone control switch to right (treble). Turn band switch to the B. C. (left) position.
(c) Set the signal generator to 455 kilocycles.
(d) Adjust the two 2nd I-F trimmer condensers located through front chassis flange, below speaker (Fig. 3) for maximum output.
(e) Adjust the two trimmer condensers on top of the first I-F assembly (Fig. 2) for maximum output.
(f) Repeat (d) and (e) for more accurate adjustments.

2.—Aligning R-F Amplifier.
The short wave band 6-15 mc., MUST be aligned before the Broadcast Band 540-1600 kc.
(a) Connect the signal generator output lead through a dummy antenna (400 ohm carbon resistor) to lead (Blue or Red) extending from rear of chassis. Turn the band switch to S. W. (right) and open tuning condenser all the way.
(b) Set signal generator to 15.0 megacycles.
(c) Adjust the S. W. “OSC” trimmer condenser (Fig. 2) (on rear section of gang) for maximum output. The gang should just tune through this signal.
(d) Tune in 15.0 mc. signal with gang and while slowly rocking gang through signal, adjust the S. W. “ANT” trimmer condenser for maximum output. (Center trimmer on right end of chassis).
NOTE: When aligning the Short Wave band care should be exercised so that the circuits are aligned on the fundamental rather than on the image frequency which is approximately 910 kilocycles more than the fundamental. To check this increase the output of the signal generator approximately 10 times and try to tune in both, the fundamental, at the signal generator frequency as indicated on the dial and the image which should be approximately 910 kilocycles lower (approximately 14) on the dial.
(e) Repeat (c) and (d) for more accurate adjustments.
(f) Replace 400 ohm carbon antenna dummy with a .0001 mf. condenser. Turn band switch to the Broadcast band, open gang condenser all the way, etc.
(g) Set the signal generator to 1650 kilocycles.
(h) Adjust B. C. “OSC” trimmer (rear trimmer right end of chassis) Fig. 3, for maximum output.
(i) Set signal generator to 1400 kilocycles.
(j) Tune-in generator signal for maximum output then adjust B. C. “ANT” trimmer (front trimmer right end of chassis) Fig. 3, for maximum output.
(k) Repeat (h) and (j) for more accurate adjustments.

Fig. 2—Top View Model 18, J-18

Fig. 3—Bottom View Models 18, J-18

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Compliments of www.nucow.com
Broadcast Band — 550 to 1500 Kilocycles
Short Wave Band — 6.0 to 15.0 Megacycles
Special Police Band — 2.3 to 2.5 Megacycles

FIG. 2

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Compliments of www.nucow.com
All the circuits in this receiver are very accurately adjusted at the factory and normally should need no further adjustment. However, if it is definitely known that the circuits are not operating as outlined in the circuit diagram, the circuits may be properly aligned with the use of a modulated signal generator and an output meter.

**CONNECTING OUTPUT METER**

Connect the output meter to the plate and screen of the 6v6q output tube. Be certain that the meter is protected from B.C. by connecting a condenser (1,1 mf or larger—not electrolytic) in series with one of the leads.

**Tuning I-F Amplifier To 455 Kilocycles.**

(a) Connect the output of the signal generator through a 0.02 mf condenser to the antenna lead (blue). Connect the ground lead from the signal generator to the ground lead (black) of the receiver.

(b) Set the station selector so that the tuning condenser plates are completely out of mesh. Turn the volume control knob to the right (ON).

(c) Turn the band selector switch to the Broadcast Band (left). Push switch on loop ant. to B.C. position.

(d) Set the signal generator to 455 kilocycles.

(e) Adjust both trimmers located on top of the 2nd I-F transformer for maximum output.

(f) Adjust both trimmers located on top of the 1st I-F transformer for maximum output.

**ALWAYS USE THE LOWEST SIGNAL GENERATOR OUTPUT THAT WILL GIVE A REASONABLE READOUT ON THE OUTPUT METER.**

**Aligning The R-F Circuits.**

(1) Connect the signal generator output through a 400 ohm antenna lead (blue) of the receiver and the generator return to the ground lead (black) of the receiver.

(a) Set signal generator to 15.4 megacycles.

(b) Open tuning condenser all the way (rotation completely out of mesh), turn band switch to the right (shortwave) and volume on full. On models 21 and 22 the antenna input is at the antenna socket.

(c) Adjust the S.W. "G" trimmer, located on the front panel of the receiver, for the highest output.

(d) Set signal generator to 15.4 megacycles.

(e) Tune in signal generator frequency with the station selector knob (approximately 15 on the dial) and while slowly rocking the station selector knob adjust the S.W. "ANT" trimmer condenser, center trimmer on right end of chassis, for maximum output.

**NOTE:** Check the image frequency by increasing the signal generator output until the image appears on the oscilloscope and then image which should come in around 14 on the dial. If image is not heard the oscillator is aligned on the wrong peak and S.W. "OSC" trimmer should be further opened until correct peak is found.

(2) Repeat (a) to (e) for more accurate adjustments.

(a) Change the 0.08 ohm dummy antenna to a 0000 mf (200 mfd) condenser. Turn band switch to B.C. position (left), open gap condenser all the way, etc.

(b) Set signal generator to 1650 kilocycles.

(c) Adjust the B.C. "OSC" trimmer for maximum output (front trimmer, right end of chassis).

(d) Set signal generator to 1400 kilocycles.

(e) Tune in 1400 kcs signal with tuning condenser (should be approximately 14 on the dial), then adjust the B.C. "ANT" trimmer (rear trimmer, right end of chassis) for maximum output.

(f) Repeat (a) to (d) for more accurate adjustments.

(3) Using the same dummy antenna (0001 mf) align the special Police Band antenna trimmer (there is no oscillator adjustment for this band).

(a) Set signal generator to 2.5 kilocycles.

(b) Push switch on loop ant. to Pol. position and then tune in the generator signal with gap, approx. 2.5 on the dial.

(c) Adjust trimmer on loop antenna for maximum output.

**CAUTION:** Be sure to push the switch on the loop antenna back to B.C. position if receiver is to be used for broadcast reception.

**WAVE TRAP**

Some chassis of this model are equipped with a wave trap for the purpose of eliminating interference from code stations which operate on a frequency of approximately 455 kilocycles. This assembly consists of a coil and a trimmer condenser as illustrated by dotted lines in the Wiring Diagram. The wave trap should not be adjusted until all other adjustments have been made. To make the adjustment, feed a 455 kilocycle signal from the signal generator through a 0000 mf condenser into the antenna lead of the receiver. With the wave trap trimmer set to approximately 60 in the dial, and the volume control full on, adjust the wave trap trimmer condenser for MINIMUM output.

Should the interfering station be operating on a frequency of slightly more or less than 455 kilocycles, the exact frequency should be determined with the aid of the signal generator. Then, instead of feeding a 455 kilocycle signal, feed the signal generator through a 0000 mf condenser into the antenna lead of the receiver. With the wave trap trimmer set to approximately 60 in the dial, and the volume control full on, adjust the wave trap trimmer condenser for MINIMUM output.

**IMPORTANT ALIGNMENT NOTES**

When aligning the shortwave bands "OSC" trimmers must be exercised because to the circuits are aligned on the correct frequency which is approximately 900 kilocycles less as indicated on the dial. To check, increase generator output, tune-in the generator frequency and then tune-in the image frequency (approximately 900 kilocycles lower than the fundamental) and come in approximately 210 kilocycles lower on the dial than the fundamental. If image cannot be tuned-in, the "OSC" trimmer is adjusted to the incorrect peak and should be returned to the wrong trimmer from the closed position). Repeat the original alignment procedure for more accurate adjustments.

Always keep signal generator output as low as possible to prevent action of the A.V.C. circuit.

**WAVE TRAP**

Some chassis of this model are equipped with a wave trap for the purpose of eliminating interference from code stations which operate on a frequency of approximately 455 kilocycles. This assembly consists of a coil and a trimmer condenser as illustrated by dotted lines in the Wiring Diagram. The wave trap should not be adjusted until all other adjustments have been made. To make the adjustment, feed a 455 kilocycle signal from the signal generator through a 0000 mf condenser into the antenna lead of the receiver. With the band selector switch turned to the Broadcast Band position, the gap condenser set to approximately 60 on the dial, and the volume control full on, adjust the wave trap trimmer condenser for MINIMUM output.

Should the interfering station be operating on a frequency of slightly more or less than 455 kilocycles, the exact frequency should be determined with the aid of the signal generator. Then, instead of feeding a 455 kilocycle signal into the receiver the exact frequency of the interfering signal should be used. If it is not possible to determine the exact frequency of the interfering signal an antenna may be attached to the receiver and the receiver tuned to the position where the interfering signal is most noticeable. Then adjust the wave trap for minimum interference.

**VOLTAGE CHART**

**ALL VOLTAGES MEASURED FROM SOCKET PIN TO CHASSIS @ 117.5 VOLTS LINE**

<table>
<thead>
<tr>
<th>SOCKET PIN NUMBER</th>
<th>TUBE SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>

**DROPPED SPEAKER FIELD**

| MAXIMUM POWER OUTPUT @ 150 V LINE | 65 Watts |

| MAXIMUM POWER CONSUMPTION @ 150 V LINE | 65 Watts |

*Phono Motor 40 Watts additional.*
Standard Broadcast Band — 550 to 1600 Kilocycles
International Short Wave (Foreign) — 6.0 to 18.0 Megacycles
Special Service (Police, Amateurs, etc.) 1.6 to 5.0 Megacycles
THE CROSLEY CORP.

SOCKET VOLTAGE CHART
Models 24, 25

H = HEATER
J.B. = JUNCTION BLOCK  N.C. = NO CONNECTION
POWER CONSUMPTION AT 117.5 VOLTS = 65 WATTS
MAX. POWER OUTPUT AT 117.5 VOLTS = 5 WATTS
DROPS ACROSS SPEAKER FIELD APPROX. 75 VOLTS
VOLTAGES MEASURED BETWEEN SOCKET PIN & GROUND
WITH A 250 VOLTS, 1000 OHMS PER VOLT, VOLTMETER
READINGS MAY VARY 10%

PHONO CONNECTIONS
Model 25

CONNECT TO TONE ARM OR TELEVISION SOUND TERMINALS
SWITCH AS SHOWN IS SET FOR NORMAL RADIO RECEPTION
PHONO OR TEL. SOUND
LO-SIDE
Hi-SIDE
DOUBLE POLE DOUBLE THROW SWITCH
ALL CONNECTING WIRES SHOULD BE INSULATED COPPER
REMOVE JUMPER BETWEEN TERMINALS NO. 1 & 2

Model 25
BOTTOM VIEW OF CHASSIS

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Compliments of www.nucow.com
SET UP PROCEDURE

Remove push button escutcheon. Turn the set on and leave operate a sufficient length of time to permit the tubes to reach their normal operating conditions.

NOTE: To simplify the set up and insure accurate adjustments the following pre-adjustments should be made.

Tighten all the "ANT" Trimmer screws just moderately tight. See Fig. 1.

Turn the "OSC" screws to the left (counter-clockwise) until the end of the screw is about flush (even) with the top of the "ANT" padded condenser. Note: Care should be exercised when adjusting the "OSC" screws so that the selected station is not passed over, turn screws slowly.

It is essential that the frequency (kilocycles) of the station selected is within the range of the push button to be set for that station, see Fig. 1.

1. Turn the band switch to "B" position, first notch from left end. Using the station selector knob (upper right) carefully tune in the station to which the No. 1 push button is to be set. Note program.

2. Turn the band switch to the left ("A") and using a small screw driver, carefully turn the "OSC" screw to the right (clockwise) for the No. 1 push button (first screw on left in the upper row), until the station you tuned in (Manually) is heard again. Adjust for maximum output in speaker.

3. Adjust the No. 1 push button "ANT" adjusting screw for maximum volume in speaker. NOTE: If this adjustment does not seem to have much effect adjust loop antenna for minimum signal from that station, then adjust the "ANT" screw for maximum signal.

4. Turn band switch one notch to right "B" then back to "A" to check if push button is correctly adjusted. There should be no change in tone quality when switched from one to the other.

5. The set-up for No. 1 push button is now complete. Set up remaining buttons to be set, following the same procedure, adjusting the "OSC" screw first, then the "ANT" padder screw.

6. After all the buttons have been set, they should be rechecked, turning the loop antenna for minimum pickup on each station to insure accurate adjustments.

To tune the receiver with the push buttons the Band Switch must be turned all the way to the left "A" then completely depress the button which represents the station you wish to hear.

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ALIGNMENT PROCEDURE CHART

<table>
<thead>
<tr>
<th>Alignment Sequence</th>
<th>Dummy Antenna</th>
<th>Frequency Setting</th>
<th>Input Connection to Receiver</th>
<th>Band Switch</th>
<th>Tuning Cond. Setting</th>
<th>Trimmer Adjusted</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>.0002 MF.</td>
<td>1500 Kc.</td>
<td>Ant. Lead (Blue)</td>
<td>B. C.</td>
<td>Fully open</td>
<td>B. C. “OSC” Trimmer</td>
<td>Adjust for peak; gang does not have to tune thru signal.</td>
</tr>
<tr>
<td>3</td>
<td>.0002 MF.</td>
<td>600 Kc.</td>
<td>Ant. Lead (Blue)</td>
<td>B. C.</td>
<td>Approx. 80 on dial</td>
<td>B. C. “OSC” Series Trimmer</td>
<td>Adjust for maximum output while rocking gang thru signal.</td>
</tr>
<tr>
<td>4</td>
<td>Resizer Step No. 2 to check possible shift due to series adjustment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>400 ohm (carbon)</td>
<td>5.3 Mc.</td>
<td>Ant. Lead (Blue)</td>
<td>Police</td>
<td>Fully open</td>
<td>Pol. “ANT” and “R-F” Trimmers</td>
<td>Adjust for peak; gang does not have to tune thru signal.</td>
</tr>
<tr>
<td>7</td>
<td>400 ohm (carbon)</td>
<td>5.0 Mc.</td>
<td>Ant. Lead (Blue)</td>
<td>Police</td>
<td>Approx. 3.0</td>
<td>Pol. “ANT” and “R-F” Trimmers</td>
<td>Adjust for maximum output while rocking gang thru signal.</td>
</tr>
<tr>
<td>8</td>
<td>400 ohm (carbon)</td>
<td>18.3 Mc.</td>
<td>Ant. Lead (Blue)</td>
<td>S. W.</td>
<td>Fully open</td>
<td>S. W. “OSC”</td>
<td>Adjust for peak; gang does not have to tune thru signal.</td>
</tr>
<tr>
<td>9</td>
<td>400 ohm (carbon)</td>
<td>18.0 Mc.</td>
<td>Ant. Lead (Blue)</td>
<td>S. W.</td>
<td>Approx. 15</td>
<td>S. W. “ANT” and “R-F” Trimmers</td>
<td>Adjust for maximum output while rocking gang thru signal.</td>
</tr>
</tbody>
</table>

SOCKET VOLTAGES MEASURED @ 117.5 VOLTS LINE (BETWEEN SOCKET PIN AND CHASSIS) WITH 1000 OHM PER VOLT, 500 VOLT RANGE VOLTOMETER (D.C.)

<table>
<thead>
<tr>
<th>PIN NUMBER</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7T—R. F. Amp.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>127</td>
<td>75</td>
<td>0</td>
<td>J.B.</td>
<td>*6.3</td>
</tr>
<tr>
<td>6ASGT—Osc.-Mod.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>127</td>
<td>75</td>
<td>0</td>
<td>130</td>
<td>*6.3</td>
</tr>
<tr>
<td>6SK7—I. F. Amp.</td>
<td>0</td>
<td>0</td>
<td>2.3</td>
<td>2.3</td>
<td>75</td>
<td>0</td>
<td>180</td>
<td>*6.3</td>
</tr>
<tr>
<td>6SQ7—Det. A.V.C.-A. F.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>130</td>
<td>*6.3</td>
</tr>
<tr>
<td>6J5GT—Phase Invert</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>120</td>
<td>0</td>
<td>0</td>
<td>J.B.</td>
<td>*6.3</td>
</tr>
<tr>
<td>6FGG—Output</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>220</td>
<td>220</td>
<td>0</td>
<td>J.B.</td>
<td>*6.3</td>
</tr>
<tr>
<td>6FGG—Output</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>220</td>
<td>220</td>
<td>0</td>
<td>J.B.</td>
<td>*6.3</td>
</tr>
<tr>
<td>SYSC—Rectifier</td>
<td>NC</td>
<td>329.0</td>
<td>J.B.</td>
<td>*358.0</td>
<td>J.B.</td>
<td>*258</td>
<td>J.B.</td>
<td>329.0</td>
</tr>
</tbody>
</table>

*Measure with A.C. Voltmeter.

Max. POWER OUTPUT @ 117.5 V. LINE: 8.0 Watts
POWER CONSUMPTION @ 117.5 V. LINE: 85 Watts
DROP ACROSS SPEAKER FIELD: 95.0 Volts

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**MODELS 27BD, 27BE**

**THE CROSLEY CORP.**

**MODEL -- 27**

**455 KC. I.F.**

**ALIGNMENT PROCEDURE**

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>TUNING COND. SETTING</th>
<th>TRIMMERS TO ADJUST</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>455 Kc</td>
<td>Grid 1A7GT</td>
<td>.02 MF</td>
<td>Fully open</td>
<td>2nd 1-F (1) located on front</td>
<td>Adjust for maximum signal.</td>
</tr>
<tr>
<td>455 Kc</td>
<td>Grid 1A7GT</td>
<td>.02 MF</td>
<td>Fully open</td>
<td>chassis flange 1st 1-F (2)</td>
<td>Adjust for maximum signal. Located top of 1st 1-F ass'y.</td>
</tr>
<tr>
<td>1550</td>
<td>Ant. Lead</td>
<td>.0001 MF</td>
<td>Approx. 140</td>
<td>&quot;OSC&quot; Shunt on gang</td>
<td>Adjust for maximum output. Gang does not have to tune through signal.</td>
</tr>
<tr>
<td>1400</td>
<td>Ant. Lead</td>
<td>.0001 MF</td>
<td>on dial</td>
<td>&quot;ANT&quot; Shunt on loop ant. through hole in right side of</td>
<td>Adjust for maximum output.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Adjust for maximum output.</td>
<td></td>
</tr>
</tbody>
</table>

Repeat above for more accurate adjustments.

Maximum power output (a) 75 V. 'B' -- approx. 300 M. W.

Power consumption at 117.5 volts -- 36 Watts

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THE CROSLEY CORP.

MODEL 28

APPROX. TUNING RANGE

American Broadcast Band
550 to 1600 Kilocycles

Short Wave (International) Band
6.0 to 18.0 Megacycles

Police Band (Special Service)
1.6 to 5.0 Megacycles

MODEL -- 28

455 Kc. L.F.

ANTENNA LOAD

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ALIGNMENT PROCEDURE CHART Models 28, 30

<table>
<thead>
<tr>
<th>Model</th>
<th>Signal Generator</th>
<th>Frequency in kHz</th>
<th>Input Connection to Receiving Band Switch</th>
<th>Switching Cond.</th>
<th>Trimmed Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.5 MHz</td>
<td>455 kHz</td>
<td>Grid of 6AK7</td>
<td>B, C</td>
<td>Fully open</td>
</tr>
<tr>
<td>2</td>
<td>1.0 MHz</td>
<td>600 kHz</td>
<td>Ant. Lead (Blue)</td>
<td>B, C</td>
<td>Fully open</td>
</tr>
<tr>
<td>3</td>
<td>1.0 MHz</td>
<td>600 kHz</td>
<td>Ant. Lead (Blue)</td>
<td>B, C</td>
<td>Approx. 40°</td>
</tr>
<tr>
<td>4</td>
<td>1.0 MHz</td>
<td>600 kHz</td>
<td>Ant. Lead (Blue)</td>
<td>B, C</td>
<td>Approx. 65°</td>
</tr>
<tr>
<td>5</td>
<td>1.0 MHz</td>
<td>1 MHz</td>
<td>Ant. Lead (Blue)</td>
<td>B, C</td>
<td>Approx. 60°</td>
</tr>
<tr>
<td>6</td>
<td>1.0 MHz</td>
<td>1 MHz</td>
<td>Ant. Lead (Blue)</td>
<td>B, C</td>
<td>Approx. 60°</td>
</tr>
<tr>
<td>7</td>
<td>1.0 MHz</td>
<td>15 kHz</td>
<td>Ant. Lead (Blue)</td>
<td>B, C</td>
<td>Fully open</td>
</tr>
<tr>
<td>8</td>
<td>1.0 MHz</td>
<td>10 kHz</td>
<td>Ant. Lead (Blue)</td>
<td>B, C</td>
<td>Approx. 60°</td>
</tr>
</tbody>
</table>

Models 28, 30

SOCKET VOLTAGES MEASURED @ 117 VOLTS LINE (BETWEEN SOCKET PIN AND CHASSIS)
WITH 1000 OHM PER VOLTS 500 VOLTS RANGE VOMETER (B.C.)

<table>
<thead>
<tr>
<th>PIN NUMBER</th>
<th>TUBE FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S/N7—Pre-Amp.</td>
</tr>
<tr>
<td>2</td>
<td>S/N7—Osc-Mod.</td>
</tr>
<tr>
<td>3</td>
<td>S/N7—Pre-Amp.</td>
</tr>
<tr>
<td>4</td>
<td>S/N7—F-Amp.</td>
</tr>
<tr>
<td>5</td>
<td>S/N7—Det. A/C-A/F</td>
</tr>
<tr>
<td>6</td>
<td>S/N7—Ant. Invert.</td>
</tr>
<tr>
<td>7</td>
<td>S/N7—Ant. Invert.</td>
</tr>
<tr>
<td>8</td>
<td>S/N7—Output</td>
</tr>
<tr>
<td>9</td>
<td>S/N7—Output</td>
</tr>
<tr>
<td>10</td>
<td>S/N7—Output</td>
</tr>
<tr>
<td>11</td>
<td>S/N7—Output</td>
</tr>
<tr>
<td>12</td>
<td>S/N7—Output</td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTES
When aligning the shortwave bands "OSC" trimmer care must be exercised to see that the circuits are aligned on the correct frequency and not on the image which is approximately 910 kilocycles lower as indicated on the dial. To check, increase generator output, tune-in the generator frequency and then tune-in the image frequency which should be weaker than the fundamental and come in approximately 910 kilocycles lower on the dial than the fundamental. If image cannot be tuned-in, the "OSC" trimmer is adjusted to the wrong peak. (Correct peak is the second peak on trimmer from the closed position.)

MODEL 29

SOCKET VOLTAGES MEASURED @ 117 VOLTS LINE (BETWEEN SOCKET PIN AND CHASSIS)
WITH 1000 OHM PER VOLTS 500 VOLTS RANGE VOMETER (B.C.)

<table>
<thead>
<tr>
<th>PIN NUMBER</th>
<th>TUBE FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S/N7—Pre-Amp.</td>
</tr>
<tr>
<td>2</td>
<td>S/N7—Osc-Mod.</td>
</tr>
<tr>
<td>3</td>
<td>S/N7—Pre-Amp.</td>
</tr>
<tr>
<td>4</td>
<td>S/N7—F-Amp.</td>
</tr>
<tr>
<td>5</td>
<td>S/N7—Det. A/C-A/F</td>
</tr>
<tr>
<td>6</td>
<td>S/N7—Phos. Invert.</td>
</tr>
<tr>
<td>7</td>
<td>S/N7—Phos. Invert.</td>
</tr>
<tr>
<td>8</td>
<td>S/N7—Phos. Invert.</td>
</tr>
<tr>
<td>9</td>
<td>S/N7—Phos. Invert.</td>
</tr>
<tr>
<td>10</td>
<td>S/N7—Phos. Invert.</td>
</tr>
</tbody>
</table>

POWER CONSUMPTION @ 117 V. LINE: 66 Watts (Radio Only)
DROPS ACROSS SPEAKER FIELD: 74 Volts

J.B.—JUNCTION BLOCK  N.C.—NO CONNECTION

TRIMMER LOCATIONS

Models 28, 30

Models 29, 31, 34

Contributions from www.nucow.com
For tuner, alignment voltage, see INDEX

American Broadcast—550 to 1600 Kc. (545-187 Meters)
Police, Amateur, etc.—1600 to 5000 Kc. (187-60 Meters)
Short Wave (Foreign)—6.0 to 18.0 Mc. (50-16.6 Meters)
American Broadcast—550 to 1600 Kc. (545-187 Meters)
Police, Amateur, etc.—1600 to 5000 Kc. (187-60 Meters)
Short Wave (Foreign)—6.0 to 18.0 Mc. (50-16.6 Meters)

For alignment and voltage
See INDEX
THE CROSLEY CORP.

SOCKET VOLTAGES MEASURED @ 117.5 VOLS LINE (BETWEEN SOCKET PIN AND CHASSIS)
WITH 1000 OHM PER VOLT, 500 VOLT RANGE VOLTMETER (D.C.)
VOLTAGES MAY VARY 10% OF VALUES GIVEN

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>PIN NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8GT</td>
<td>Osc.-Mod.</td>
<td>1: GND, 2: 260, 3: 110, 4: —NEG., 5: 135, 6: 8.5, 7: 3.00</td>
</tr>
<tr>
<td>6SK7</td>
<td>I-F Amplifier</td>
<td>1: GND, 2: GND, 3: GND, 4: GRID, 5: 3.6, 6: 110, 7: 8.5, 8: 280</td>
</tr>
<tr>
<td>6E5</td>
<td>Indicator—(Tun.-Level)</td>
<td>1: GND, 2: GND, 3: GND, 4: GND, 5: GND, 6: GND, 7: GND, 8: GND</td>
</tr>
<tr>
<td>5U4G</td>
<td>Rectifier</td>
<td>1: GND, 2: GND, 3: GND, 4: GND, 5: GND, 6: GND, 7: GND, 8: GND</td>
</tr>
</tbody>
</table>


MAXIMUM POWER OUTPUT @ 117.5 V. Line = 20 Watts @ Voice Coil
POWER CONSUMPTION @ 117.5 V. Line = Radio 115 Watts + Phone Motor 35 Watts = 150 Watts, Total.

Position of Volume Control:
Position of Tone Control: Fully On Treble or Speech

ALIGNMENT PROCEDURE CHART

<table>
<thead>
<tr>
<th>Alignment Sequence</th>
<th>Dummy Antenna</th>
<th>Frequency Setting</th>
<th>Input to Receiver</th>
<th>Band Switch</th>
<th>Tuning Cond. Setting</th>
<th>Trimmers Adjusted</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>.02MF</td>
<td>±55 Kc.</td>
<td>Ant. Lead (Blue)</td>
<td>B. C.</td>
<td>Fully Open</td>
<td>2nd I-F (2) 1st I-F (2)</td>
<td>Adjust for Maximum output. Adjust for Maximum output.</td>
</tr>
<tr>
<td>2.</td>
<td>400 ohm (carbon)</td>
<td>15.2 Msc.</td>
<td>Ant. Lead (Blue)</td>
<td>S. W.</td>
<td>Fully Open</td>
<td>S. W. “OSC” on gang</td>
<td>Adjust for Peak. See foot note.</td>
</tr>
<tr>
<td>3.</td>
<td>400 ohm (carbon)</td>
<td>15.0 Msc.</td>
<td>Ant. Lead (Blue)</td>
<td>S. W.</td>
<td>Approx. 15 on dial</td>
<td>S. W. “ANT” center trimmer on right end</td>
<td>Adjust for Maximum while rocking gang back and forth.</td>
</tr>
<tr>
<td>4.</td>
<td>.0902 MF.</td>
<td>1650 Kc.</td>
<td>Ant. Lead (Blue)</td>
<td>B. C.</td>
<td>Fully Open</td>
<td>B. C. “OSC” front trimmer on right end</td>
<td>Adjust for peak. Make sure the switch on loop is in B.C. position.</td>
</tr>
<tr>
<td>5.</td>
<td>.0002 MF.</td>
<td>1400 Kc.</td>
<td>Ant. Lead (Blue)</td>
<td>B. C.</td>
<td>Approx. 140 on dial</td>
<td>B. C. “ANT” rear trimmer on right end</td>
<td>Adjust for Maximum output.</td>
</tr>
<tr>
<td>6.</td>
<td>.0002 MF.</td>
<td>2.5 Mc.</td>
<td>Ant. Lead (Blue)</td>
<td>B. C. and switch on loop to Pol. Ant.</td>
<td>Approx. 2.5 on dial lower right corner</td>
<td>Pol. Ant on loop</td>
<td>Adjust for Maximum output.</td>
</tr>
</tbody>
</table>

When aligning the shortwave bands “OSC” trimmers care must be exercised to see that the circuits are aligned on the correct frequency which is approximately 910 kilocycles less as indicated on the dial. To check, increase generator output, tune-in the generator frequency and then tune-in the image frequency which should be weaker than the fundamental and come in approximately 910 kilocycles lower on the dial than the fundamental. If image cannot be tuned-in, the “OSC” trimmer is adjusted to the wrong peak. (Correct peak is the second peak on trimmer from the closed position.)
THE CROSLEY CORP.

MODEL 33BG
MODEL 31BF

VOLTAGE CHART

ALL VOLTAGES MEASURED FROM SOCKET PIN TO CHASSIS @ 117.5 VOLT LINE

TUBE SECTION

<table>
<thead>
<tr>
<th>TUBE</th>
<th>SOCKET PIN NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SA7—Osc.-Mod.</td>
<td>0 0 225 74 0 0 6.3 0</td>
</tr>
<tr>
<td>6SK7—I. F. Amp.</td>
<td>0 0 0 0 0 74 6.3 225</td>
</tr>
<tr>
<td>6SQ7—Det. A.V.C.—1st A.F.</td>
<td>0 0 0 0 0 100 6.3 0</td>
</tr>
<tr>
<td>6V6GT—Output</td>
<td>0 0 200 225 0 0 6.3 10.5</td>
</tr>
<tr>
<td>6SK7—Mike Amp.</td>
<td>0 0 0 0 0</td>
</tr>
<tr>
<td>5Y3G—Rectifier</td>
<td>5.0 0 316 A.C. 0 316 A.C. 0</td>
</tr>
</tbody>
</table>

All voltages measured with 1000 OHM/Volt Voltmeter: except heaters. Voltages may vary 10% of values given.

DROP ACROSS SPEAKER FIELD: 58 Volts
MAXIMUM POWER OUTPUT @ 130 V. LINE: 6.5 Watts
MAXIMUM POWER CONSUMPTION @ 130 V. LINE: 60 Watts

*Phono Motor 40 Watts additional.

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Compliments of www.nucow.com
ALIGNMENT:

L.F. -- Set signal generator to 455 kHz and connect to Red or Blue antenna lead through a 100 mmf dummy. Adjust 2nd i-f trimmers located through front chassis flange below speaker. Adjust 1st i-f trimmers for maximum output. See layout at left.

R.F. -- Set signal generator to 1850 kHz. Condenser gang to minimum. Adjust B.C. OSC. trimmer so that signal is heard. Set signal generator to 1400 kHz. Adjust tuning dial to 140 and adjust BC ANT. trimmer for maximum output.

NOTE: Do not readjust the OSC trimmer.
THE CROSLEY CORP.

TUBE SOCKET VOLTAGE READINGS (MEASURED FROM SOCKET PIN TO CHASSIS)

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>No. 1</th>
<th>No. 2</th>
<th>No. 3</th>
<th>No. 4</th>
<th>No. 5</th>
<th>No. 6</th>
<th>No. 7</th>
<th>No. 8</th>
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<tbody>
<tr>
<td>1A7-GT</td>
<td>Oscillator-Modulator</td>
<td>1.5</td>
<td>1.5</td>
<td>86</td>
<td>86</td>
<td>86</td>
<td>Neg.</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>1N5-GT</td>
<td>1-F Amplifier</td>
<td>1.5</td>
<td>1.5</td>
<td>86</td>
<td>86</td>
<td>86</td>
<td>J.B.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1H5-GT</td>
<td>Detector &amp; 1st A-F Amp.</td>
<td>1.5</td>
<td>1.5</td>
<td>12</td>
<td>12</td>
<td>--</td>
<td>J.B.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1A5-GT</td>
<td>Output</td>
<td>1.5</td>
<td>1.5</td>
<td>84</td>
<td>84</td>
<td>86</td>
<td>4.3*</td>
<td>J.B.</td>
<td></td>
</tr>
</tbody>
</table>


ALIGNMENT PROCEDURE

1. **Tuning 1-F Amplifier to 455 Kilocycles**
   - Connect the output of the signal generator through a .02 mfd. condenser to the top cap of the 1A7GT tube. Leaving the tube's grid clip in place. Connect the ground lead from the signal generator to the "GND" lead or chassis. **KEEP THE GENERATOR LEADS AS FAR AS POSSIBLE FROM THE GRID LEADS OF THE OTHER SCREEN GRID TUBES.**
   - Set the station selector so that the tuning condenser plates are completely in mesh and turn the volume control knob on the right (ON).
   - Adjust both 1-F trimmers for maximum reading on the output meter.
   - Adjust both trimmers on the 1st I-F transformer for maximum output.

2. **Aligning R-F Amplifier**
   - When aligning the R-F amplifier the output lead from the signal generator should be connected through a .001 mfd. condenser to the "ANT" lead (Blue). (Check dial pointer to see that it covers complete range.)
   - Set the signal generator to 1500 kilocycles.
   - Open the condenser gang all the way.
   - Adjust the "OSC" trimmer condenser on gang for maximum output.
   - Set the signal generator to 1400 kilocycles.
   - Tune the receiver to the generator signal for maximum output (approximately 140 on the dial).
   - Adjust the "ANT" trimmer condenser on gang for maximum output.
   - **DO NOT ADJUST THE "OSC" TRIMMER AT 1400 KILOCYCLES.**
   - Repeat operations (e) and (f) alternately until no further improvement in output can be obtained.
The vibrator is a 150 cycle full wave primary type. Bias for the 6ABGT and the 6SK7 is obtained from the voltage drop across item 27, a 100 ohm resistor. The 6SQ7 is operated at zero bias. Bias for the 6K6GT is obtained from the voltage drop across item 37, a 600 ohm resistor. A resistive “B” filter is used and consists of item 35, a 1400 ohm resistor and sections B and C of item 22, a three section electrolytic condenser (section A used as by-pass for output cathode).

Models A-150 and A-450 are manually tuned receivers while model A-350 has a five station mechanical push button tuning system.

455 KC. I.F.

MARCH 1940
1. Aligning The I-F Amplifier (455 Kc.)
   (a) Connect the output of the signal generator through a .02 mfd., or larger, condenser to the top cap of the 6AG7 oscillator-modulator tube, leaving the tube's grid clip in place. Connect the grid lead from the signal generator to the chassis.
   (b) Set the signal generator to 455 kilocycles.
   (c) Open the tuning condenser all the way, turn the volume control on full.
   (d) Adjust both trimmers on the 2nd. I-F transformer for maximum output. (See figure 3.)
   (e) Adjust both trimmers on the 1st I-F transformer for maximum output. (See figure 3.)
   (f) Repeat (d) and (e) for more accurate adjustments. ALWAYS USE THE LOWEST SIGNAL GENERATOR OUTPUT THAT WILL GIVE A REASONABLE OUTPUT METER READING, TO PREVENT A. V. C. ACTION.

2. Aligning R-F Amplifier
To obtain the greatest gain from the R. F. amplifier,

SOCKET Voltages measured @ 117.5 Volts Line (Between socket pin and chassis)
WITH 1000 OHM PER VOLT, 500 OHM RANGE VOLTMETER (D.C.)
Model 345B

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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<tbody>
<tr>
<td>6SK7</td>
<td>R-F Amp.</td>
<td>195</td>
<td>78.6</td>
<td>2.0</td>
<td>6.3</td>
<td>2.0</td>
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<tr>
<td>6A9Y</td>
<td>Osc.-Mod.</td>
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<td>78.6</td>
<td>126</td>
<td>6.3</td>
<td>2.0</td>
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<tr>
<td>6SK7-1 F Amp.</td>
<td>5.5 R.C.</td>
<td>78.6</td>
<td>6.3</td>
<td>234</td>
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<tr>
<td>6SQ7</td>
<td>Det. A.V.C. 1st A-F</td>
<td>210</td>
<td>110</td>
<td>6.3</td>
<td>234</td>
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<tr>
<td>6EC7</td>
<td>Phase Invert.</td>
<td>220</td>
<td>220</td>
<td>6.3</td>
<td>15.0</td>
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<td></td>
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<tr>
<td>6SK7</td>
<td>Output</td>
<td>220</td>
<td>220</td>
<td>6.3</td>
<td>15.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6V6GT</td>
<td>Rectifier</td>
<td>300 D.C.</td>
<td>450 D.C.</td>
<td>6.3</td>
<td>15.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Measured with A.C. volt meter

3. Adjusting Antenna Compensating Condenser
   (a) Set the signal generator to 600 kilocycles.
   (b) Tune in the 600 kilocycle signal with the station selector for maximum output.
   (c) Adjust the antenna compensating condenser, located to the right of antenna receptacle, for maximum output.
   (d) Repeat operations (b) and (c) alternately until no further improvement can be obtained.
   (e) Set the signal generator to 1400 kilocycles again.
   (f) Tune in the 1400 kilocycle signal with the station selector for maximum output.
   (g) Readjust the trimmer on the "Ant" section of the tuning condenser for maximum output.
   (h) It will be necessary to adjust the antenna compensating condenser to the car antenna after the receiver has been installed in the car.
   (i) After the installation is complete, tune-in a weak station between 55 and 65 on the dial.
   (j) Adjust the antenna compensating condenser for maximum volume in the speaker.
SETTING PUSH BUTTONS for A160 and A250

The push buttons are easily reset if necessary. Remove the push button by pulling straight out. Loosen the set screw two or three turns. With the manual control tune-in station to which key is to be set. With a small screwdriver inserted in set screw push the key ALL THE WAY DOWN, then securely tighten set screw.

MARCH 1940

MODEL --- A250

455 KC. I.F.
The quality and life of instantaneous home recordings is largely dependent upon the operators working knowledge of his equipment and the type blank discs and cutting needles used. For the operation and adjustment of the various controls read the operating instructions supplied with the receiver.

The type recorders used in Crosley equipment employ low impedance magnetic cutting heads and have chrome tone arms for play back. The turntable is rim driven. The deluxe recorder also has the automatic record changer capable of playing 14 ten inch or 10 twelve inch records at one loading.

A.—CUTTING NEEDLES

The cutting needle or stylus as furnished with the Crosley recorders will cut approximately 30, 60 or 90 records in 12 or 15, 45's records both sides (one hour life cutting time).

These needles are of hardened steel type and the cutting points and edges are extremely sharp and quite easily damaged should they be bumped or scraped against a metal surface. The point of these needles is

Figure 1

ground to a sharp "V" as shown in fig. 1F while the more expensive needles are of sapphire or a special metal alloy with their points having a very small radius as shown in fig. 1A.

A simple rule of the thumb method for determining needle wear is, that the groove cut out with a new or good needle have a high brilliance and as the needle wears the lateral flat of the cut section will be less and eventually appear gray.

If cutting needle tends to chatter as it is recording, it is advisable to replace it with a new one. (Also check the cutting arm height, see following paragraphs). The recording needle may be removed and replaced as desired, provided the adjustments are checked each time before recording. In all events, every precaution must be taken to prevent the cutting point from being used at all times; in cutting it should be lowered GENTLY on the blank with turning RUNNING.

NOTE: Most cutting needles have a flared end on the shank. The needle screw must be tightened against this flared end. Always firmly tighten the needle screw before making a recording.

B.—PLAY BACK NEEDLES. (Use Recut needles as furnished by Crosley for best results)

Instantaneous recordings (home recordings) require special playback needles if the quality and life of the record is to be obtained. Needles purchased as "90% shadowgraphed" steel needles should be used at all times. This type needle is individually inspected to see that it has a perfectly rounded point of proper radius with no sharp edges that sides so that it will have no tendency to harm the record. Several home recordings may be played with one needle, PROVIDED the needle does not touch a commercial record. Never play an instantaneous recording with a needle that has been used on a commercial record.

A rule of the thumb method for judging the amount of wear on a home recording when it is being played back is to watch the change in the color of that portion of the record which the needle has been in contact with the rest of the record. The first time the record is played back after it has been recorded the grooves may turn slightly darker as the playback needle passes over them, but the change should not be great. Further playback will show little or no change in color, provided the playback needle is in good condition and that the record is free from dust and dirt. Whenever any great changes in color do occur, it is advisable to immediately stop the record and put in a new needle.

c.—CUTTING ARM ADJUSTMENTS.

"Recorder with Automatic Record Changer," "Seabury Type" used on Models 21AZ, 348H, 348F, and 45 assuming a cutting arm adjustment.

The height of the cutting arm can be varied by means of the slotted screws which are at the top of the arm and near the back, approximately flush with the top surface of the arm. In order to make this adjustment, it is necessary to insert a cutting needle and, with the motor turned OFF and a record blank on the turntable, place the recording arm in the cutting position. Turn cutting arm height adjusting screw UNTIL THE NEEDLE SCREW IS CENTERED IN THE

Figure 2

SLOT THROUGH WHICH IT PROTRUDES (AT FRONT END OF RECORDER ARM).

Any change in the cutting arm height adjustment will change the vertical angle of the cutting needle therefore it is absolutely essential that the depth of cut be rechecked.

"Recorded as made in Model 338C" (General Industries Type). The height adjustment of the cutting arm on this recorder is accomplished by raising the cutting arm and loosening the locknut of the cutting arm Height Adjusting Screw, see fig. 4. Place needle in cutting arm and place a record blank on turntable. Carefully lower cutting arm on record, with the motor turned OFF. Set the Arm Height Adjusting Screw so that there is a needle present on the blank disc should be such that THE WIDTH OF THE GROOVE IS APPROXIMATELY THE WIDTH OF THE SPACE (Le: between the GROOVES. With no sound applied the ratio of 60 percent groove and 40 percent land is the ideal cutting depth for most conditions. The importance of the depth of cut CANNOT BE OVER EMphasized, since too light a cut or too heavy a cut will tend to give distortion and generally poor results.

Illustrations A, B, C, and D in fig. 5, are typical records obtained. "A" shows a groove which is cut too light, "C" a groove of approximately 60-40 which is the generally preferred depth, "D" illustrates an appearance of a groove of "C" depth after recording while "B" illustrates a too heavy a cut (70-30) with an excessive amount of too high a cutting level signal applied to cutting head causing an overcut of the
II—SERVICE NOTES

Recorder with Automatic Record Changer.

Function of Manual Control Button and Related Parts

When Manual Control Button (Item 54, Fig. 6) is moved to the Manual Play-Back recording position, it moves the Manual Control Slide (Item 103, Fig. 7) into a position which engages the Engagement Clutch Cam Assembly (Item 79, Fig. 8) from rotating. When Engagement Clutch Cam Assembly is in the automatic position and is not free to rotate, the Changer will go into its changing cycle. When the Manual Control button is in the automatic position the Changer will function normally as an automatic record changer.

Possible Mechanical Causes of Poor Recordings

(A) Threads from record cuttings getting down into Rubber Idler Drive Wheel (Item 83, Fig. 6) groove of drive wheel and motor pulley. This will cause very bad speed variation of the turntable and, of course, will result in very little tension variation while the turntable is gently tapped downward on its top end. To remove the record cuttings, the turntable should be lifted by applying an even lifting force at opposite edges of the turntable while the turntable spindle is gently tapped downward on its top end, and the record cuttings then removed. The Rubber Idler Drive Wheel (Item 83, Fig. 6) can be accomplished by unsnipping the small snap cotter ring and slipping Rubber Idler Drive Wheel off of shaft, after which all record cuttings can be removed.

Is it very important that no grease or oil be gotten on the surface of the Rubber Idler Drive Wheel. (B) Tight pivot bearings: Check cartridge pivot screws (Item 108, Fig. 6) for binding. Also recording arm arm very lightly over the body of the turntable, and check pivot screws (Item 101, Fig. 6). These bearings should all be free, but have no looseness or play.

If the arm bosses, (Item 108, Fig. 6) of the cartridge is tight, the cartridge cannot follow a slight up and down variation of the record or turntable. A record cut in this manner will, when played back, have a high scratch level, rough cut and a tendency for the needle to jump from one groove to another.

Damaged Rubber Idler Drive Wheel (Item 83, Fig. 6) Rubble Idler Drive Wheel may have become damaged by:

1. Allowing oil or grease to come in contact with turntable.
2. By allowing turntable to drop and cut into the outside surface of the Rubber Idler Drive Wheel.
3. Stopping the turntable by hand while the motor is running will cause a flat spot on the surface of the Rubber Idler Drive Wheel.

It is very important that the Rubber Idler Drive Wheel has been damaged in any of the above mentioned ways, it should be replaced with a new one.

Fiber Vibration: Reaching the Recorder While A Blank is Being Cut:

It is very important that the surface of the rubber drive wheel be gotten on the surface of the rubber drive wheel. Stopping the turntable by hand while the motor is still running will cause a flat spot on the surface of rubber drive wheel.

Removing oil or grease to come in contact with the rubber surface of drive wheel:

It is very important that Record is standing level. This can be checked by placing a smooth marble on the record.

Tension on Rubber Idler Drive Wheel:

If the tension on the Rubber Idler Drive wheel is too great, it will result in very little tension variation while the Rubber Idler Drive Wheel is located beneath the Rubber Idler Drive Wheel and turn it slightly in a clockwise direction. This will result in a spring tension of the Rubber Idler Drive Wheel. When the spring tension is correct, the spring will be approximately at the of the turntable.
III—AUTOMATIC RECORD CHANGER  

- General Instructions

1—FUNCTION OF RECORD CHANGER WHEN IT IS GOING THRU A CHANGE CYCLE—The Record Changer plays and automatically changes 14 or less ten-inch records or 10 or less 12-inch records.

The Record Changer is started by turning the switch control knob (Item 56, Fig. 11) to "ON" this starts the motor and moves trip rod (Item 52, Fig. 12), which releases lever assembly (Item 50, Fig. 12), causing it to disengage from Engagement Clutch Cam (Item 79, Fig. 12). The Engagement Clutch Cam will then rotate due to tension from spring (Item 27, Fig. 12). This causes the pin of the arm on top side of Drive Gear Assembly (Item 6, Fig. 12), as it rotates, and in turn, moves the Drive Link Assembly (Item 31, Fig. 12), and the Selector Shaft Clack Assembly No. 11 and No. 12 to the position shown in Fig. 12. Also the tone arm reset link (Item 80, Fig. 12), has moved to where it has released the latch, (Item 18, Fig. 12), and carried the tone arm to its extreme outward position. The Tone Arm Lifter link (Item 01, Fig. 12), has raised the tone arm to its extreme height, by means of the Lifter Plate Assembly, (Item 21, Fig. 22). The tone arm is then from "Boasting" free by the friction of the Tone Arm Brake Spring which also compresses the tone arm booster spring, (Item 13, Fig. 12) due to its very light tension.

The Drive Gear Assembly (Item 4, Fig. 12) continues to rotate which causes each pin to disengage from the Automatic Engagement Clutch Cam which is moved back to latch with the tone arm trip lever, and the lower pin to engage the drive link assembly, moving it back to its initial position. This swing in the tone arm to either the 10-inch or 12-inch record position and lowers it to the record. At the same time it releases the Tone Arm Brake String allowing the Tone Arm Booster String to set.

2—PHONOGRAPH NEEDLES

Various types and kinds of needles are available for use in phonograph tone arms.

For playing ten or more records at one setup with this Record Changer, no attempt should be made to use ordinary needles with steel or fiber points since continued use of worn needle points will damage the records being played.

Any needle can be used that is designed to play 15 or more records. It is well to keep in mind that even if the amplifying system, speaker and tone arm are of the best quality, a poor needle will result in poor reproduction of music.

There are a number of good semi-permanent types of needles on the market which are rated in number of plays. It is usually more economical to use one of these needles which is rated at 1000 plays or more.

It is very important to remember not to remove and replace any needle that has been used.

3—CHASSIS MOUNTING

On the bottom surface of the panel are four mounting studs, each threaded to take a 5/16-20 machine screw. The mounting panel rests on four tapered coil springs, small end of each spring is pressed over a mounting stud and the large end of each spring fits into a socket in the top surface of the mounting shell in cabinet.

Four spacing blocks 7/8 thick and with a % hole are fastened to the lower side of the mounting shell. The % hole in each is centered with the center of the 7/16 screw clearance hole. These are to be provided and located on the lower side of the mounting shell into which each of the lower mounting springs are to fit.

The %—20 machine screws are turned through the four wing nuts until the head of each screw is against the bottom side of each wing nut.

The four lower springs which are of smaller diameter than the upper springs are slipped over the ends of each of the %—20 machine screws with the tapered end toward the head and resting on the wing nuts.

OPERATING INSTRUCTIONS

1—TO PREPARE CHANGER FOR OPERATION:

(A) Setting Record Changer to Play Ten-inch Records:

Turn both knobs until the arrows are pointing toward the center of the turntable. When in this position any number up to and including fourteen ten-inch records can be played.

(B) Setting Record Changer to Play Twelve Inch Records:

Turn both knobs until the arrows marked "12" are pointing toward the center of the turntable. When in this position any number up to and including ten 12-inch records can be played.

2—LOADING

(A) If 10-inch records are to be played, set knobs as described in (A) above and place any number up to and including 14 records (ten inch only) over center pin so that they will rest on the selecting arms.

(B) If 12-inch records are to be played, set knobs as described in (B) above and place any number up to and including 10 records (twelve inch only) over center pin so that they will rest on the arms.

3—STARTING THE RECORD CHANGER

1. Turn on the radio (allowing approximately 30 seconds for the tubes to warm up) and have the phonograph-radio knob set to the phonograph position.

2. Turn the switch knob on the Record Changer panel to "ON". The motor will then start and the record changer will go into automatic operation of its own accord.

4—PLAYING AN INDIVIDUAL RECORD

An individual record can be played in the same manner as a stack of records would be played, i.e., if it is a 10-inch record, follow the instructions pertaining to 10-inch records. If it is a 12-inch record, follow the instructions pertaining to 12-inch records.

A 10-inch record may be played manually by turning the selecting arm knobs in the unloading position and lifting them in this position—records may then be put on or taken off the turntable by merely moving the tone arm outward until it catches, and placing the 10-inch records on the spindle and down onto the turntable. The "ON" and "OFF" switch knob then is pulled down and the 10-inch record will be played and repeated if left on the turntable. To remove the record it is only necessary to move the tone arm outward until it catches, and lift the record off of the turntable.

5—TURNING OFF RECORD CHANGER

Turn switch knob to "OFF" position while the tone arm is still on the record. If the switch knob should be turned off while Record Changer is going through a change cycle, it will be difficult to adjust the selector arms correctly for the automatic playing of 10-inch or 12-inch records.

6—UNLOADING RECORDS

1. Turn switch knob to "OFF" position.

2. Remove any records remaining on the selector arms.

3. Move tone arm outward until it catches in outward position.

4. Turn selector arms so that records will clear them.

5. Remove records from turntable.

7—LUBRICATION

(A) Motor: The motor is equipped with oilless bearing and requires no lubrication.

(B) Turntable Spindle Bearings: Are lubricated at the factory and do not require any lubrication for one year. After one year they should be wiped with 1 or 2 drops of a light grade oil. The top bearing can be oiled by lifting off turntable. Make sure when replacing turntable to see that pin in Turntable Spindle slips into slot on bottom surface of Turntable hub and also screw should be taken out to insure Rubber Idler Drive Wheel.

Never under any circumstances allow oil to come in contact with Rubber Idler Drive Wheel.

(C) Squeak Due To Records Rubbing On Turntable Spindle: This can be eliminated by gently lining up the stack of records.
IV—SERVICE NOTES

1.—PICTUP DOES NOT INDEX PROPERLY ON 7-1/2, 10, OR 12-1/2 INCH RECORDS

(A) Adjustment for correct indexing of 10-inch records.

Swing tone arm outward until tone arm lever assembly, (Item 19, Fig. 12) locates with tone arm latch lever, (Item 18, Fig. 12) which is held to the tone arm shaft, (Item 77, Fig. 13) by two set screws.

2. Make sure these set screws are tight and that there is a slight play between the tone arm lever assembly and the panel, (Item 5, Fig. 12). This will give proper clearance at bell rase assembly, (Item 74, Fig. 13).

The tone arm lever assembly, (Item 19, Fig. 12) is held against tone arm latch lever, (Item 18, Fig. 12) by the tension of tone arm locator lever spring, (Item 16, Fig. 12).

3. Next loosen the clamping screw in the Swivel Bracket Assembly, (Item 46, Fig. 13).

4. Now move tone arm, (Item 60, Fig. 11) until its outside edge is 1/16" from the outside edge of the panel (Item 5, Fig. 12) and retighten screw securely.

2.—RECORD CHANGER DOES NOT GO INTO ITS CHANGING CYCLE AT END OF RECORD

(A) Warn or Damaged Step Groove: If the step groove in the record is worn or damaged, discard record.

(B) Catch of Something May Be Incorrect: The Record Changer should go into its changing cycle when the needle enters the step groove and has traveled to within a distance of 1/16" from the center of the turntable shaft.

If the Record Changer does not go into its changing cycle when the needle has traveled the above-mentioned distance, the Tone Arm Trip Lever Shoe, (Item 23, Fig. 12) should be moved toward the outside edge of the panel. To do this, it is necessary to loosen the three set screws, (Item 32, Fig. 12), and then tighten after adjustment has been made.

If the Record Changer goes into its changing cycle before the needle has traveled a distance of 1/16" from the center of the turntable, the Tone Arm Trip Lever Shoe should be moved inward toward the center of the Record Changer.

3.—RECORD CHANGER DOES NOT GO INTO ITS CHANGING CYCLE WHEN SWITCH KNOB IS TURNED ON

When the switch is turned to "ON" the Record Changer should start its changing cycle. If it does not, the following points should be checked.

1. Make sure motor is running.

2. Check Trip Rod, (Item 32, Fig. 12), to make sure it releases Trip Lever Assembly, (Item 20, Fig. 12), from Engagement Clutch Cam Assembly, (Item 79, Fig. 12), when Switch Knob is being turned on. If Trip Lever Assembly is not released, Trip Rod should be shortened by bending until Trip Lever clears Engagement Clutch Cam Assembly, when Switch Knob is turned.

3. Make sure that Clutch Reset Pawl, (Item 40, Fig. 12) clears Drive Link Assembly, (Item 51, Fig. 12).

4.—RECORD CHANGER CONTINUES TO REPEAT ITS CHANGING CYCLE WITHOUT PLAYING RECORDS

(A) Trip Lever Assembly, (Item 20, Fig. 2) does not latch in Engagement Clutch Cam Assembly (Item 79, Fig. 12), which may be due to causes listed below:

1. Trip Rod (Item 32, Fig. 12), may be bent so that it is too short, thereby preventing the Trip Lever Assembly from contacting Engagement Clutch Cam Assembly.

2. Springs, (Items 24 or 35, Fig. 12) may be disconnected.

5.—NO SOUND WHEN NEEDLE IS ON MOVING RECORD

1. Mating switch, (Item 26, Fig. 13), may be out of adjustment. The contacts of this switch should be open whenever its long blade is not resting on the side of the Engagement Clutch Cam Assembly (Item 79, Fig. 12). If the contacts remain closed after the long blade has left the shoe, they should be adjusted by bending until there is a separation of approximately 1/32".

2. Switch should be checked to make sure contacts are closed when long blade is resting on the shoe of the Engagement Clutch Cam Assembly.

3. The tabs on the Mating switch may have been bent together.

4. Pick-up cartridge in Tone Arm may have been damaged or may be defective.

5.—TONE ARM ADJUSTMENTS FOR 10" RECORDS

1. Turn both Control Knobs until the arrows marked "10" are pointing toward the center of the turntable.

2. Place a twelve inch record on the turntable.

3. Start Record Changer and note where needle contacts record. Correct contacting is about 1/8" from the outside edge of record.

4. Set Rod, (Item 36, Fig. 13), is operated by Selector Arm (Item 61, Fig. 12). The bowing of the record (Item 16, Fig. 11), operates as a stop when Rod is set for 12" records. When Tone Arm Levanter Shoe (Item 15, Fig. 11) contacts 12" Set Link the Tone Arm should be in the correct position to play a 12" record.

If at this point, the position of Tone Arm is incorrect, loosen the screw which holds the Tone Arm Lever Shoe 12" (Item 14, Fig. 11) and move in either direction as required and tighten screw.

6.—TONE ARM ADJUSTMENTS FOR 10" RECORDS

1. Turn both knobs until the arrows marked "10" are pointing toward the center of the turntable.

2. Place a 10" record on the turntable and start Record Changer.

3. Note where needle contacts record. Correct contacting is about 1/8" from the outside edge of record.

If contacting of needle is not correct as measured, loosen the screw which holds Tone Arm Lever Shoe 10" (Item 15, Fig. 13), and slide shoe in or out as required, then tighten screw.

6.—TONE ARM HEIGHT ADJUSTMENTS

Set the Record Changer to ten-inch records, turn switch to "ON" and allow Record Changer to go into its changing cycle with no record on the turntable. The clearance between Turntable and the bottom surface of the Tone Arm should be approximately 1/64".

Usually, this clearance can be obtained by adjusting the Tone Arm Adjustment Screw (Item 78, Fig. 13). It is well to check the following points before making any adjustment:

Check clearance between Roller (Item 51, Fig. 12), and Selector Crank Shaft Assembly (Item 7, Fig. 12); there should be approximately 1/32" clearance at this point. If the clearance is greater, it would be due to the pressure on the Spring Washer (Item 20, Fig. 13) being too great. This will prevent the Tone Arm Lever Shoe (Item 82, Fig. 13) from returning the Tone Arm Lever Link Assembly (Item 83, Fig. 12) sufficiently. To relieve the pressure on the Spring Washer, lower the Selector Shaft Collar (Item 4, Fig. 11) slightly.

9.—TONE ARM LOWERS ON RECORD TOO SUDDENLY

If the Tone Arm lowers too suddenly, the Spring Washer (Item 10, Fig. 3) which is located between the Tone Arm Lever Link Assembly (Item 81, Fig. 2) and Selector Crank Shaft Assembly Pivot (Item 7, Fig. 2) is not under sufficient pressure. The set-screws in the Selector Shaft Collar (Item 6, Fig. 2) should be loosened and the Selector Shaft Collar pressed upward slightly and set screws tightened.

THE CROSLEY CORP.
Auto record changer, Tone arms

Compliments of www.nucow.com
**ALIGNMENT PROCEDURE**

Turn the band switch to the Broadcast position.

Connect an output meter across the speaker voice coil. The volume control should be set a few degrees from the maximum volume position. Use a weak signal from the generator, strong signals tend to cause improper adjustments.

**IF alignment:** Connect the signal generator ground to the receiver chassis through a .1 mfd. condenser. Use a .1 mfd. condenser in series with the high side of the generator, apply a 455 kc. signal to the grid of the 6K7GT tube and align the 2nd IF transformer. Connect to the grid of the 6K8 tube and align the 1st IF transformer. (See Tube Layout Diagram for location of these adjustments.) From this position recheck both transformers again.

**Broadcast Band Alignment:** Turn the band switch to the Broadcast position, turn the tuning condenser all the way to the right, (minimum capacity), apply a 1720 kc. signal to the grid of the 6K8 tube and adjust the broadcast oscillator trimmer. The oscillator coil is under the right hand end of the chassis and this trimmer is the one nearest the front of the chassis. To align the loop antenna, connect a single turn loop across the terminals of the generator, place the receiver about one foot in front of the single turn loop, set the generator at about 1400 kc., tune in the signal and adjust the trimmer on the loop antenna assembly for maximum response.

**Short Wave Alignment:** Using a 400 ohm resistor between the high side of the generator and the antenna terminal (on the LOOP frame), turn the tuning condenser to minimum capacity, set the generator at 18,500 kc., and adjust the short wave oscillator trimmer. This trimmer is immediately in back of the broadcast oscillator trimmer. Set the generator at about 17,000 kc., tune in the signal and adjust the short wave antenna trimmer for maximum response. This trimmer is mounted on the loop antenna.

**NOTE:** If considerable hum appears when the generator is connected as described above use smaller condensers between the generator and the receiver. The best way is to use a 1:1 transformer to isolate either the receiver or the generator from the line. The adjustments of this receiver are very stable and no aligning should be attempted unless absolutely necessary.
ALIGNMENT PROCEDURE SERIES 349

The alignment adjustments of this receiver are very stable. Should realignment be necessary, it should only be attempted by a competent technician with an accurately calibrated test oscillator or signal generator and an output meter with a one or two volt scale. The following realignment procedure should be followed exactly. For accurate alignment, all adjustments must be made with a weak signal. The location of the RF transformers and all others which do not remain fixed should be adjusted as shown on the diagram at the top of this page.

Connections

Connect the output meter across the speaker voice coil. Connect the ground side (outer cable) of the speaker to ground. These connections are used during the entire alignment. Other necessary connections are described in the following paragraphs.

Intermediate Frequency Alignment

Turn the band selector switch to the broadcast position (B) on the band selector knob. Connect a 3 mfd. condenser to the output terminal of the oscillator board and connect the other end of this condenser to the control grid of the SKG7 tube. Do not connect the grid clip on the tube. Generate a weak signal in the generator and adjust the trimmer of the second IF transformer for maximum response in the output meter. If the signal measures above 0.5 volt do not adjust the detector or output transistors, but adjust the trimmer of the second IF transformer for maximum response. Now transfer the connection of the signal generator through the 1 mfd. condenser to the grid of the SKG7 tube and trim the trimmers of the first IF transformer.

R. F. ALIGNMENT

Broadcast Band

Disconnect the 1 mfd. condenser from the output of the signal generator and in its place substitute a 220 or 220 volt condenser, connecting the other end of this condenser to the ANTENNA LEAD of the receiver. Turn the tuning condenser to about 4200 KC. With the generator producing a fairly powerful signal of 405 KC, adjust the VOLUME CONTROL for MINIMUM RESPONSE. Set the tuning condenser of the receiver at minimum capacity (plates all down) with the generator producing a weak signal of 1700 KC in the signal generator. Adjust the BROADCAST OSCILLATOR TRIMMER until the signal is tuned in. Next produce a weak signal of 1440 KC in the signal generator. Tune the receiver very carefully to the signal and adjust the BROADCAST ANTENNA TRIMMER for maximum response in the output meter. Produce a 400 KC signal in the signal generator and tune the receiver carefully to this signal, adjust the BROADCAST OSCILLATOR TRIMMER for maximum response. The tuning condenser of the receiver should be backed off and forth through the signal while varying the grid in order to assure perfect alignment.

ALIGNMENT OF SHORT WAVE BANDS

S. W. Band No. 1

Disconnect the band selector switch to the center position (No. 1 on band selector knob). Disconnect the 220 volt condenser from the output of the signal generator and in its place substitute a 400 ohm resistor which serves as a dummy antenna for aligning both short wave bands. The other end of the 400 ohm resistor is connected to the antenna lead of the receiver. Tune the receiver so that the point at 9500 KC. The point should be about 60% black at the right and about 80% black at the left of the figure 9:1. Produce a weak signal of exactly 9500 KC in the signal generator. Tune the S. W. No. 1 OSCILLATOR TRIMMER all the way in and then unscREW the trimmer of the second peak at which the signal is heard. If the trimmer is not unscrewed to the second peak the circuits will not be in proper relationship and the calibration will be incorrect and there may also be a dead spot on some position on the dial. Next produce a signal of 21,000 KC in the signal generator and tune the receiver for the second peak in the same manner. If the signal can be heard at both places, the proper signal to tune in is the one which is closest to 9000 KC (the black dot above 9:1) on the dial chart. Adjust the S. W. No. 1 ANTENNA TRIMMER until a definite peak is noted in the output meter. During this adjustment, rock the tuning condenser back and forth through the signal, while adjusting this trimmer in order to assure perfect alignment.

S. W. Band No. 2

Using exactly the same procedure and setting the same proportions for the S. W. Band No. 1, turn the band selector switch to the No. 2 position. Align the S. W. No. 2 OSCILLATOR TRIMMER at 21,000 KC, with signal generator producing a signal of 21,000 KC and with pointer indicating 21,000 KC on the dial chart. The pointer should be 60% black at the right and 80% black at the left of figure 9:1. Produce a weak signal of 17,000 KC in the signal generator and be sure to tune the receiver to the signal position at 17,000 KC on the dial chart (light colored dot on black band above and slightly to the right of figure 17). The same procedure of screwing the oscillator trimmer all the way down and then unscrewing on the second peak is followed and the same procedure of rocking the tuning condenser back and forth through the signal are followed to secure a proper alignment of this band.
ALINEMENT PROCEDURE

Connect a high impedance AC voltmeter across loud-speaker terminals. Volume control should be set a few degrees back of maximum volume position. Use a weak signal from generator, strong signals tend to cause improper adjustments.

I.F.: Connect the generator ground to receiver chassis. Using a 1 mfd. condenser in series with high side of generator, apply 455 kc. signal to grid of 6K7GT I.F. amplifier tube, and align transformer No. 2. Connect generator to grid of 6K8GT tube and align transformer No. 1.

RF. (See above diagram for location of trimmers.) Using a 200 MMF condenser in series with the high side of the generator, turn band selector switch to left band position and the tuning condenser to about 600 kc. Feed a 455 kc. signal to the antenna and adjust wave trap trimmer for minimum response. With the tuning condenser at minimum capacity feed 1720 kc. signal to the antenna and adjust broadcast oscillator trimmer for top frequency. Set generator frequency at about 1400 kc. Adjust broadcast antenna trimmer. Set generator for 600 kc. tune receiver to signal and adjust the padder. The tuning condenser should be rocked back and forth through the signal while varying the padder in order to assure perfect alinement.

Using 400 ohm resistor in series with generator, set band selector in center position, set generator to 5825 kc. and adjust oscillator trimmer for top frequency. Set generator to 5000 kc. tune receiver to signal and adjust antenna trimmer.

Turn band selector to extreme clockwise position. Using 400 ohm resistor in series with generator, set oscillator top frequency for 18,100 kc.—screw trimmer down tight, then unscrew to second peak. Set generator to 17,000 kc., tune receiver to signal and adjust antenna trimmer—screw trimmer down tight, then unscrew to first peak, rocking the tuning condenser back and forth through the signal while the adjustment is being made. Above procedure for alinement at 17,000 kc. must be followed exactly to insure proper tracking. A check about 1000 ohm resistors will result if antenna and oscillator circuits are not set in proper relation to each other.

IF Peak 455 KC

<table>
<thead>
<tr>
<th>Voltage</th>
<th>335A Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>1400 KC</td>
<td>PART NO. 7901</td>
</tr>
<tr>
<td>600 KC</td>
<td>POWER CORD</td>
</tr>
<tr>
<td>5825 KC</td>
<td>ANTENNA-LOOP SWITCH</td>
</tr>
<tr>
<td>65GT</td>
<td>25A6GT Power Output</td>
</tr>
<tr>
<td>75Z6GT</td>
<td>25A6GT Rectifier</td>
</tr>
<tr>
<td>6AS8T</td>
<td>Oscillator-Translator</td>
</tr>
<tr>
<td>6K7GT</td>
<td>Intermediate Frequency Amplifier</td>
</tr>
<tr>
<td>6SQ7GT</td>
<td>Detector-AVC-Audio</td>
</tr>
<tr>
<td>6K8GT</td>
<td>AC-DC SWITCH</td>
</tr>
<tr>
<td>25A6GT</td>
<td>broadcast range from 340 to 1720 kilocycles, short wave range</td>
</tr>
<tr>
<td>25Z6GT</td>
<td>1.65 megacycles to 5.8 megacycles</td>
</tr>
<tr>
<td>25A67T</td>
<td>5.5 megacycles to 18.1 megacycles</td>
</tr>
</tbody>
</table>

NOTE: OVERTENSING IS THE ONLY THING TO TRY TO AVOID IN THE ALINEMENT OF THE RECEIVER.
INSTRUCTIONS FOR BATTERY INSTALLATION

Remove the batteries from the shipping carton. Save some of the packing. Pull out the bottom lip of the battery cabinet and place the batteries in the bottom of the cabinet. Place a piece of the packing wedge between the two "A" batteries and place the batteries in the bottom of the cabinet. If the "B" battery is to be used, plug the "B" lead into the two 45 volt "B" batteries and plug these batteries on top of the "A" batteries with the plugs facing the slots of the cabinet. Before the "B" batteries are pushed all the way into the loop over the "B" batteries, then push the batteries and loop in as far as they will go. The long connection between the two "B" batteries should be towards the front of the cabinet away from the loop. Wedge some of the packing or the "B" batteries to keep them from being loudest in the case.

WARNING:

Be sure the switch is turned off when connecting batteries.

ALIGNMENT PROCEDURE

I.F. frequency 455 Kc. Set range 540-1580 kc.

Connect the test oscillator, or signal generator, to the set as follows: Connect the "hot" side of the signal generator to the grid of the 1A7GT tube, and the ground side to the chassis. If the set is operating in AC-DC, be sure that the test oscillator or signal generator is isolated from the receiver and line by either a transformer or 2MF6 condenser in both test leads. An output meter should be connected across the voice coil leads of the speaker to indicate resonance. Align the I.F. trimmers at 455 Kc. for maximum meter reading.

Turn the condenser plate all the way out. Set the test oscillator to 1580 kc and adjust the oscillator trimmer for maximum signal. Disconnect the test oscillator and tune in a weak station near 1460 Kc. at full volume. Adjust the trimmer on the front of the variable condenser for maximum signal. When aligning the set do not set the receiver on or near a metal work bench or other large metal object, as it will affect the tracking of the receiver.
Two types of power transformers are available for these receivers. Unless specifically stated otherwise on a tag attached to the receiver it is equipped with a transformer for operation on 105 to 125 volts 50 to 60 cycle alternating current.

The receivers equipped with UNIVERSAL POWER TRANSFORMERS will operate on 110, 120, 150, or 225 volts 50 to 60 cycles alternating current. A small cover on top of the transformer should be removed and the plug inserted in the proper clip for the voltage available.
This receiver is designed to operate on 105-125 volts 25-50 cycles A.C. or D.C. The broadcast range coverage is 540-1750 K.C.

To Calibrate Receiver
Attach hot side of signal gen. to one of the flexible antennas or loop leads. Connect ground side to rec. chassis. Peak I.F. Trimmers at 455kc. Adj. rec. dial and sig. gen. to 1600kc and peak variable condenser trimmers to max.

This model is a five tube superheterodyne receiver with full automatic volume control. A self-contained loop is incorporated which makes the use of an antenna unnecessary. The range coverage is 540-1700 kilocycles. The receiver has been designed to operate on 105-125 volts, 40-60 cycles A.C. or D.C. unless otherwise specified.

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This model is a six tube superheterodyne receiver with full automatic volume control. A self-contained loop is incorporated which makes the use of an antenna unnecessary. The range coverage is 540-1700 kilocycles. The receiver has been designed to operate on 105-125 volts, 40-60 cycles A.C.-D.C. unless otherwise specified.

IMPORTANT:

Since the loop used has a directional effect, it may be found necessary at times to turn the receiver for best reception on weaker stations.

This is a miniature portable type radio receiver. It employs a superheterodyne circuit with full automatic volume control. A self-contained antenna loop is incorporated, which makes the use of an outside aerial or ground unnecessary. The "A" supply consists of two dry-cell batteries, EVEREADY #650 or the equivalent. The "B" supply consists of one 6V.5 volt battery, EVEREADY #467 or the equivalent. The range coverage is 540 to 1700 kilocycles.

INSTALLATION OF BATTERIES

Rest the cabinet on the knobs with the speaker grille facing you. Open up the door by sliding the latch of the lock toward the leather tab. Then pull on the tab. The dry cell batteries go on the right side. Glide them in the metal container so that the brass terminal of the battery runs along the narrow slot of the container (see sketch on cover). For the "B" battery, merely snap the two connectors to the battery and place it in the cabinet with the terminals toward the left.

John F. Rider, Publisher
To Calibrate Receiver

I.F. Alignment

Attach the antenna lead of the signal generator to the antenna lead of the receiver. Connect the ground side of the signal generator to the receiver chassis. If calibrating the model 549, the wave band switch should be in the broadcast position. Attach an output meter or oscilloscope to the output of the receiver. Adjust the signal generator to 600 kilocycles. Have the volume control in the maximum position. Peak the I.F. adjusting screws for maximum output. Do not use a greater generator signal than is necessary to obtain a good output level.

Broadcast Alignment

The model 549 and 559 have the adjusting trimmers on the variable condenser. The model 549 has individual trimmers on each coil and no trimmers on the variable condenser. Set the signal generator and receiver dial to 1500 kilocycles. Adjust the broadcast oscillator trimmer screw until the signal from the generator is heard. Peak the antenna trimmer screw for maximum output. The low frequency end of the receiver and the model 549 and 559 is automatically adjusted. To adjust the low frequency of the model 549, set the signal generator and receiver to 600 kilocycles. Peak the broadcast pad for maximum output. The variable condenser should be “rocked” during this operation.

Short Wave Alignment

Slide the wave band switch button to the short wave position. Set the signal generator and receiver to 16 megacycles. Adjust the short wave oscillator coil trimmer until the generator signal is heard. Peak the short wave antenna coil trimmer for maximum output. The low frequency end of the dial is automatically adjusted.

Note: To Adjust the Push Buttons

Insert a screwdriver blade into the hole in the button which is to be adjusted. After engaging the blade in the adjusting screw slot, loosen the screw by turning it one complete revolution counterclockwise. Keep the blade engaged in the slot and bear down on the screw driver so that the adjusting screw will remain depressed. Turn the knob in the desired direction with the station selector knob. Maintain enough pressure on the screw driver to keep the adjusting screw depressed; and, at the same time tighten it by turning it in a clockwise direction. The adjustment may be checked by setting the pointer in any position, pushing the knob down as far as it will go and setting if the intended station is received. The remaining knobs can be adjusted in the same manner. After all adjustments have been made the station tabs and bushing pieces may be placed in the recess on the buttons.
The model 669 is a RADIO-PHONO combination that provides reproduction of recordings with good fidelity as well as regular radio broadcast reception. All types of records up to 12 inches may be played with the lid closed. A self-starting motor together with a crystal pick-up are used for phonograph reproduction. The radio receiver employs a superheterodyne circuit using the latest low-drain tubes for low power consumption. A self-contained antenna loop is incorporated which makes the use of an outside antenna unnecessary in most localities. It will operate on 105-125 volts, 60 cycles A.C. or D.C. The phonograph motor will function on 105-125 volts, 60 cycles A.C. only, unless otherwise specified. A range of 540-1700 kilocycles is covered by the receiver.
TO CALIBRATE RECEIVER

**I.F. ALIGNMENT:**
Connect antenna lead of the signal generator to antenna lead of receiver and ground lead of generator to receiver chassis. Short circuit left section of variable condenser. Adjust generator to 456 K.C. and peak i.f. trimmers for maximum signal.

**BROADCAST ALIGNMENT:**
Remove short from variable condenser. Have wave band switch on broadcast position. Adjust generator and receiver to 1500 K.C. Peak trimmers for maximum signal. Adjust generator and receiver to 600 K.C., peak the broadcast paddler for maximum signal. The variable condenser should be "rocked" during this operation.

**SHORT WAVE ALIGNMENT:**
For 2.7-3.2 M.C. [Model 810]. Turn wave band switch to this band. Adjust the generator and receiver to 7.0 M.C. and peak trimmers for maximum signal. The low frequency is automatically adjusted by a fixed calibrated paddler. For 7.8-8.4 M.C. Turn wave band switch to this band.

**RANGE COVERAGE**
I.F. 456 K.C.
565-174 meters, 112-37 meters, 39-12.5 meters
540-1725 K.C. 2.7-8.2 M.C. 7.8-8.4 M.C.

Adjust generator and receiver to 32 M.C. and peak trimmers for maximum signal. The low frequency is automatically adjusted by a fixed calibrated paddler.

**HOW TO ADJUST THE PUSH-BUTTONS**

Tune in the desired station with the station selector knob. Determine which button is to be used to receive this station. Loosen this button by turning it in a counterclockwise direction approximately one full turn. Then push the button in as far as it will go and tighten with a coin in the button slot. The adjustment may be checked by setting the pointer in any position, pushing the button in as far as it will go and noting if the intended station is received. After all adjustments have been made the station tabs and celluloids may be put on the button.
This model is a radio phonograph combination which operates on alternating current. It has full automatic volume control on all bands. The receivers with multi-tap transformers will operate on 117 V., 155 V., 185 V., 220 V., or 240 V., 40-60 cycles A.C. Those that do not have multi-tap transformers will operate on 117 volts, 60 cycles A.C. unless otherwise specified. A large slide rule instrument type dial with a high ratio tuning mechanism has been incorporated in order to make station tuning easy and accurate. An antenna loop which makes the use of an outside aerial unnecessary is also featured in these receivers. Provisions have been made for attaching a television unit to the receiver. The range coverage is as follows:

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>540-1675 KC</td>
<td>2.7 - 9.0 MC</td>
</tr>
<tr>
<td>555-175 Meters</td>
<td>8.0-24.0 MC</td>
</tr>
</tbody>
</table>

6SA7 oscillator and first detector
6SK7 intermediate frequency amplifier
6SQ7 second detector, A.V.C. and first audio
6SQG7 phase inverter
6K6GT power output
5Z4 rectifier
6U5 tuning indicator

FOR OTHER DATA SEE INDEX

IF Peak 455 KC

I.F. ALIGNMENT CONVENTIONAL
This model is a five tube superheterodyne receiver with full automatic volume control. A self-contained loop is incorporated which makes the use of an antenna unnecessary. The range coverage is 540-1700 kilocycles. The receiver has been designed to operate on 105-125 volts, 25-60 cycles A.C.-D.C. unless otherwise specified.

MODEL 560

I.F. 465 KC

Frequency Range:
540-1700 KC

MODEL 560

ALIGNMENT: Attach the hot side of signal generator to one of the flexible antenna loop leads. Connect the ground side to the other flexible lead. Adjust signal generator to 465 kc and peak I.F. trimmer screws for maximum signal. Adjust receiver dial and generator to 1500 kc peak the variable condenser trimmer screws for maximum gain.

MODELS 906,907,908, MODELS 814,815,816,817

I.F. ALIGNMENT

Attach the antenna lead of the signal generator to the antenna lead of the receiver. Connect the ground side of the generator to the ground lead of the set. Turn the wave band switch knob of the receiver to broadcast position. Attach an output meter or resonance indicator across the primary leads of the speaker or across the voice coil terminals. Adjust the signal generator to 465 K.C. Have the volume control in the maximum position. Peak the I.F. adjusting screws to maximum output. Do not use a greater generator signal than is necessary to obtain a good output meter reading. For location of first and second I.F. transformers, see the tube layout diagram.

BROADCAST ALIGNMENT

Keep the receiver in the broadcast position. Set the signal generator to 1500 KC, and adjust the broadcast oscillator coil trimmer screw until the signal from the generator is heard. Peak the broadcast antenna loop trimmer for maximum output. Tune the receiver and signal generator to 600 KC. Adjust the broadcast padder for maximum output. The variable condenser should be 'rocked' during this operation.

SHORT WAVE ALIGNMENT

To calibrate the 2.7-9.0 M.C. band, turn the wave band switch to this range. Adjust the receiver dial and signal generator to 8.0 megacycles. Turn the oscillator coil trimmer screw until the generator signal is heard. Peak the detector coil trimmer for maximum output. The low frequency is automatically adjusted by a fixed calibrated padder. To calibrate the 8.0-24.0 M.C. band, turn the wave band switch to this range. Adjust the receiver and signal generator to 22.0 megacycles and proceed adjusting the trimmers as for the 2.7-9.0 M.C. band.

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NOTES ON RECORDING MODELS 806, 907, 908

Before attempting to cut any records, it is important to observe the following precautions.

1. Records up to 10 inches in diameter may be cut.
2. A carbon cutting stylus should be used in the cutting head.
3. Insert the cutting stylus into the head so that the flat portion of it will face the record in the groove.
4. Tighten the cutting stylus in position by means of the knurled screw.
5. Great care must be exercised whenever moving the cutting arm. It should be raised to an angle of about 45 degrees before moving it along the horizontal plane, in order to avoid injury to the feed mechanism.
6. To check the adjustment of the cutting stylus, place a blank record on the turntable, then bring the cutting head over the record and let it rest on the face of the record. If the cutting head is properly adjusted, it will be in a plane parallel to the record surface and the stylus perpendicular to it. This condition is obtained only when the edge of the recording arm is adjusted to the correct height of 4 inches above the record surface.
7. Whenever the recording arm is not being used, it should always be returned to its normal horizontal position to the right of the turntable. KEEP THE CUTTING STYLUS IN REST ON THE TURNTABLE.
8. New cutting stylus will cut dozens of records satisfactorily before being dulled so that replacement is necessary.
9. Some record blanks are made of inflammable material. Do not bring the record blank out from the record near a flame, or have it come in contact with a hot object.

RECORD CUTTING PROCEDURE

Favorite radio programs may be easily recorded. Records may also be made of a person or group talking, singing, or playing instruments. The procedure for either type of recording is essentially the same. To make records of radio programs, the five point selector switch knob should be in the RADIO RECORDING position. Turn on the microphone recording the switch knob should be in the MICROPHONE RECORDING position and the plug at the end of the microphone cable inserted in the microphone socket. The microphone should be held at a distance of 6 to 8 inches away from the sound.

Place the record blank on the turntable allowing the stylus pin to come up through one of the small holes on the record. Snap the toggle switch to the "on" position. Before starting to cut the record, whether it be radio or microphone recording, the volume control must be adjusted so that the record will be properly cut. The correct adjustment can be made by watching the tuning eye located in the middle of the dial. Components in the circuit have been chosen to permit the "eye" to close just before the recorded volume becomes great enough to cause overcutting into adjacent grooves on the record. For this reason, it is necessary to adjust the control of the volume in such a position that the light is reflected from the grooves. If the depth of cut is correct, the grooves will appear to be about as wide as the space between their edges. The cut may also be checked by noting the quality of the thread being cut. It should not be coarse or stiff, nor light and flabby. Should the cut be unsatisfactory, it may be due to a dulled cutting stylus or improper adjustment of the recording arm. The depth of cut may be regulated by the adjustment of the recording arm. If the depth of cut is correct, the grooves will appear to be about as wide as the space between their edges. The cut may also be checked by noting the quality of the thread being cut. It should not be coarse or stiff, nor light and flabby.
Compliments of www.nucow.com

DIAL CORD REPLACEMENT

Draw the cord snugly around the condenser pulley and knot it, with no slack, near the notch in the pulley, after which the spring may be hooked to the cord and pulley. The dial face should bear against the fibre washer when finally assembled.

L1 Loop antenna assembly (FC)
L1 Loop antenna assembly (FG)
T4 Oscillator coil
T2 Double-tuned 455 kc first i-f transformer
T3 Double-tuned 455 kc second i-f transformer
R1 20,000 ohm ½ watt carbon resistor
R3 140 ohm ½ watt wire-wound resistor
R4 3 megohm ½ watt carbon resistor
R5 Volume control 5 megohm with line switch (FC)
R6 Volume control 5 megohm with line switch (FG)
R6, R2 15 megohm ½ watt carbon resistor
R7, R8 500,000 ohm ½ watt carbon resistor
R11 200,000 ohm ½ watt carbon resistor
C1, C2 Two-gang variable condenser (FC)
C1, C2 Two-gang variable condenser (FG)
C6, C16 0.002 mf, 600 volt tubular condenser
C4, C15 0.002 mf, 600 volt tubular condenser
C5, C11 Trimmers, part of variable condenser
C8, C7, C9 Trimmers, part of variable condenser
C10, C27 0.05 mf, 200 volt tubular condenser
C14 0.05 mf, 400 volt tubular
C17, C18 0.02 mf, 400 volt tubular condenser
C20, C21 Dual 20 mf, 150 volt dry electrolytic condenser (FC)
C20, C21 Dual 20 mf, 150 volt dry electrolytic condenser (FG)
C24 0.1 mf, 200 volt tubular condenser
C26 0.2 mf, 200 volt tubular condenser
7BS-409 5" dynamic speaker

R-f Alignment

Set the dial pointer at 140. Set the signal generator at 1400 kc and feed its output into a loop of wire about 12 inches in diameter. Hold this radiating loop about 12 inches from and parallel to the receiver loop antenna. Advance the output of the signal generator until deflection is obtained on the output meter. Adjust the oscillator trimmer (on front section of variable condenser) then the antenna trimmer (on rear section of variable condenser) for maximum response.

If the loop antenna has been replaced it may be necessary to adjust the loop-inductance as follows. Align at 140. Set the pointer at 60 and feed 600 kc to the antenna lead. A portion of the outside turn of the loop may be swung to either side of the center to give maximum response. Readings at 140.

MODEL: FC-400
CHASSIS MODEL: FC

MODEL: FG-330
CHASSIS MODEL: FG

VOLTAGE ANALYSIS

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Fil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SA7GT</td>
<td>88</td>
<td>88</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>12SK7GT</td>
<td>88</td>
<td>88</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>12SQ7GT</td>
<td>30</td>
<td></td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>50L6GT</td>
<td>82</td>
<td>88</td>
<td>5.6</td>
<td>50</td>
</tr>
</tbody>
</table>

The oscillator coil is located underneath the chassis. The loop antenna acts as the antenna coil.

L-1 Alignment

Swing the variable condenser to the minimum capacity position, feed 455 kc to the grid of the 12SA7 tube through a .01 mf condenser and adjust the four i-f trimmers for maximum response.

NOTE: The grid of the 12SA7 tube is connected to the star lead of the rear variable condenser section. Connection may be made with a test clip.

Location of Coils and Trimmer Adjustments

The first i-f transformer is mounted on top of the chassis deck to the right of the variable condenser. The trimmers are accessible through holes in the top of the can.

The second i-f transformer is mounted on top of the chassis between the variable condenser and the speaker. The trimmers are accessible through holes in the top of the can.

The trimmers for the antenna and oscillator coils are located on the variable condenser. The trimmer on the front section is for the oscillator coil.

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to B minus (line switch) with the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles, a.c. All readings except heaters and cathodes were taken on 250 volt scale. Measurements made with 117.5 volts d.c. will be lower than those given below.

VOLTAGE ANALYSIS

Voltage at 3525 grid—120 volts.
Voltage across speaker field—32 volts.
Voltage across pilot light—4.5 volts.
Location of Coils and Trimmer Adjustments

The oscillator coil is located beneath the chassis. The trimmer for the oscillator is on the front side of the variable condenser.

In Models EA and EE the loop antenna acts as the antenna coil. The trimmer for the loop is on the rear side of the variable condenser.

In Model EB the antenna coil is mounted to the speaker frame.

The i-f transformers are located in cans mounted on top of the chassis. The first i-f transformer is at the right side of the variable condenser and the second i-f transformer is to the left of the variable condenser. The trimming condensers for both transformers can be reached through holes in the top of the cans.

I-F Alignment

Swing variable condenser to maximum capacity position. Feed 475 kc to the grid of the 1A7GT tube through a 0.01 mf condenser. Adjust the four i-f trimmers for maximum response.

R-F Alignment

Set the dial pointer at 140. Feed 1400 kc from the signal generator into a loop of wire about one foot in diameter. Hold this winding about one foot away from the parallel to the receiver loop antenna and advance the output of the signal generator until the largest possible deflection is obtained on the output meter. Adjust first the oscillator trimmer (on front section of variable condenser) then the antenna trimmer (on rear section of variable condenser) for maximum response.

If the loop antenna has been replaced it may be necessary to adjust the loop inductance. Align at 140. Set the dial at 60 and feed 600 kc to the radiating loop. A portion of the output of the loop can then be swung to either side of the center to give maximum response. Readjust at 140.

Battery Installation


To install and connect the batteries in this cabinet observe the following procedure:

1. Remove the back panel of the cabinet by taking out the screws.
2. Locate the battery cable coming from the receiver and identify the plugs on the cable ends.
3. Insert the three-proper plug on the battery cable into the two \"B\" batteries. Place the two batteries in the bottom compartment of the cabinet with the plugs of the batteries facing each other.
4. Push the batteries up against the front of the cabinet. The wood blocks at the rear corners and rear center of the cabinet serve to hold the \"B\" batteries in place.
5. Insert the two-proper plug on the battery cable into the two \"A\" batteries. Place the \"A\" batteries, one at a time, above the \"B\" batteries in the cabinet. The plugs of the \"A\" batteries should be facing to the right, as indicated in the illustration.
6. Push the \"A\" batteries to the left, when placing them in the cabinet, in order to clear the small wood block in the front left corner of the cabinet.

7. Replace the back panel of the cabinet and fasten it in place with the screws. See diagrams for other models.

Loop antenna assembly (EE-340) Red—B plus, 90 volts
Loop antenna assembly (EE-390) Blue—B minus
Loop antenna assembly (EA) Yellow—A plus, 90 volts
Antenna coil (EE, EB) Block—A minus

The color coding of the battery cable is as follows:

Plate—green
Grid return—black
B plus—red

VOLTAGE ANALYSIS

Iron core filter choke Readings should be taken with a 1000 ohm/micro-ampere meter. Voltage listed are from point indicated chassis with volume control turned on full and no signal. The battery voltages are those readings were: "A" 9.0 volts, "B" 90 volts.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Oc. Plate</th>
<th>Fil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A7GT</td>
<td>88</td>
<td>50</td>
<td>82</td>
<td>1.5</td>
</tr>
<tr>
<td>1N5GT, 1st i-f</td>
<td>11</td>
<td>88</td>
<td>11</td>
<td>1.5</td>
</tr>
<tr>
<td>1N5GT, 2nd i-f</td>
<td>10</td>
<td>88</td>
<td>9</td>
<td>3.0</td>
</tr>
<tr>
<td>30GT</td>
<td>85</td>
<td>88</td>
<td>86</td>
<td>117</td>
</tr>
</tbody>
</table>

50,000 ohm \( \frac{1}{4} \) watt carbon resistor 117L7GT rectifier (PN No. 1 (line operation only)—125 volts.


CHASSIS MODEL: EA

MODELS: EB-344 and EB-359

CHASSIS MODEL: EB

MODELS: EE-340 and EE-390

CHASSIS MODEL: EE

MODEL: EW-391

CHASSIS MODEL: EW

BATTERY COMPONENTS

<table>
<thead>
<tr>
<th>Type Battery No. Req.</th>
<th>Eveready 746</th>
<th>Rayovac P30A or EM-83</th>
<th>Burgess 71 G</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 volt ( \frac{1}{4} ) cell</td>
<td>100</td>
<td>110</td>
<td>100</td>
</tr>
<tr>
<td>6 volt ( \frac{1}{4} ) cell</td>
<td>600</td>
<td>700</td>
<td>800</td>
</tr>
<tr>
<td>4 volt ( \frac{1}{4} ) cell</td>
<td>500</td>
<td>600</td>
<td>700</td>
</tr>
<tr>
<td>3 volt ( \frac{1}{4} ) cell</td>
<td>300</td>
<td>400</td>
<td>500</td>
</tr>
<tr>
<td>1 volt ( \frac{1}{4} ) cell</td>
<td>100</td>
<td>110</td>
<td>120</td>
</tr>
</tbody>
</table>

FOR MODELS EA, EE

FOR MODELS EB, EW

10 volt dry battery

BATTERY COMPLEMENT

FOR MODELS EA, EE

Eveready 746
Rayovac P30A or EM-83
Burgess 71 G

FOR MODELS EB, EW

1—1A7GT, oscillator-modulator
1—1N5GT, 1st i-f amplifier
1—1N5GT, 2nd i-f amplifier
1—1N5GT, 2nd detector, a.c., \( \frac{1}{4} \) amplifier
1—30GT, beam power output (battery operation)
1—117L7GT, beam power output and half-wave rectifier

PRODUCTION CHANGES

1. EA chassis bearing serial numbers below 3,600, 650 east: (a) Resistor R17, 1000 ohms, part number PB-79. (b) Battery cable, part number 8AW-288.
2. EB chassis bearing serial numbers below 5,623,661 use C25, 0.005 mf, part number NNC-199 in place of 0.01 mf, part number KX-38.
3. EA chassis which use speakers, part number 6XS-242, may use 7JS-444 for replacement.
4. EA chassis which use speakers, part number 6JC-266, may use 6JC-266 for replacement.
5. EE chassis which use speakers, part number 6JC-360, may use 6JC-451 for replacement.
TYPE: Single-band Superheterodyne.

FREQUENCY RANGE: 540-1600 kc.

NUMBER OF TUBES: Five.

TYPE OF TUBES:
1-12S5/6GT, pentagrid oscillator-modulator
1-12R5/4GT, first i.f. amplifier
1-12S5/6GT, detector, r.f. amplifier, a.v.c.
1-506G/6AU, beam plate rectifier
1-352G/6GT, half-wave rectifier.

POWER SUPPLY: A.C. or d.c.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 30 watts.

If replacements are made or the wiring disturbed in the i.f. section of the circuit, the receiver should be specially realigned.

Location of Coils and Trimmer Adjustments
The first i.f. transformer is mounted on top of the chassis; the second i.f. transformer is mounted on top of the variable condenser. The trimmers are accessible through holes in the top of the case.

The trimmers for the antenna and oscillator coils are located on the variable condenser. The trimmer on the front section is for the oscillator coil.

The oscillator coil is located underneath the chassis. The loop antenna acts as the antenna coil.

MODEL: DQ-333, DQ-334, DQ-351 and DQ-398

CHASSIS MODEL: DQ

MODEL: EH-342

CHASSIS MODEL: EH

MODEL: DQ-1-333 and DQ-1-334

CHASSIS MODEL: DQ

MODEL: EH-342

CHASSIS MODEL: EH

Listed under radio accessories and equipment of the National Laboratory, etc.

VOLTAGE ANALYSIS

Voltage at 3925 audio—120 volts.

Voltage across speaker field—32 volts.

Voltage across pilot light—4.5 volts.

PRODUCTION CHANGES

1. Change DQ using (a) speaker 4Q5-48D may use 78K1-466AU for the replacement. (b) electrolytic 4Q5-466AU may use 4C5-466F for replacement.

2. Change in the terminal of the condenser 11575.0 volts d.c. will be lower than those given before.

3. Change in the terminal of the condenser 11575.0 volts a.c. will be lower than those given before.

Specifications:

- Frequency range: 540-1600 kc.
- Number of tubes: Five.
- Type of tubes: 12S5/6GT, pentagrid oscillator-modulator; 12R5/4GT, first i.f. amplifier; 12S5/6GT, detector, r.f. amplifier, a.v.c.; 506G/6AU, beam plate rectifier; 352G/6GT, half-wave rectifier.
- Power supply: A.C. or d.c.
- Voltage rating: 105-125 volts.
- Power consumption: 30 watts.

Diagrams and schematics are provided for the oscillator coil, transformer, and other components. The text includes detailed descriptions of the circuit design and component specifications.
Compliments of www.nucow.com

MODELS: DY-337  DY-349  DY-351

CHASSIS MODEL: DY

MODELS: DY-337  DY-349  DY-351

CHASSIS MODEL: DY'

(Listed under reexamination service of Underwriters' Laboratories, Inc.)

TYPE: Two-band superheterodyne.

FREQUENCY RANGES:
940-1600 kc.
2.5-6.5 m.c.

PRODUCTION CHANGES

1. Chassis which use C27, C28—O/C—O/26B may use O/C—O/26H for replacement.

2. Chassis using speaker 7YS-476 may use 8482-395 for replacement.

3. Chassis bearing serial number above 4,083,350 use 7TT-3524 loading coil.

4. Chassis bearing serial number above 4,083,550 use 7YW-066 loop antenna assembly.

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to B minus (line switch) with the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles, a.c. All readings except heaters and cathodes were taken at 230 volt scale. Measurements made with 117.5 volts a.c. will be lower than those given below.

<table>
<thead>
<tr>
<th>Type</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode (Fil)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SA7GT</td>
<td>88</td>
<td>88</td>
<td>0</td>
</tr>
<tr>
<td>12SC7GT</td>
<td>88</td>
<td>88</td>
<td>0</td>
</tr>
<tr>
<td>50Y6GT</td>
<td>30</td>
<td>—</td>
<td>0</td>
</tr>
</tbody>
</table>

VOLTAGE ANALYSIS

Voltage at 3525 cathode—120 volts.
Voltage across speaker field—32 volts.
Voltage across pilot light—4.5 volts.

R-F Alignment

Retrace the wave-band switch counter-clockwise to the short-wave position. Set the dial pointer at 6 megacycles and feed 6 megacycles from the signal generator into a loop of wire about 12 inches in diameter. Hold this loop radius about 12 inches from the loop antenna and advance the output of the generator until a deflection is obtained on the output meter. Adjust first the oscillator trimmer (furthest from mounting frame, beneath the chassis) and then the antenna trimmer (innermost trimmer of dual trimmer strip on loop board) for maximum response.

Without changing the above set-up, rotate the band-switch clockwise to the broadcast position, set the dial pointer at 150 and feed 1500 kc into the radiating loop. Adjust first the broadcast oscillator trimmer (closest to mounting feet, beneath the chassis) and then the antenna trimmer (outermost dial trimmer on the loop) for maximum response. Rotate the dial to 60, feed 600 kc into the radiating loop and adjust the broadcast trimmer (outermost dial trimmer) for maximum response while rocking the variable back and forth.

MODEL: DY-337

The first i-f transformer is mounted on top of the chassis deck to the right of the variable condenser. The trimmers are accessible through holes in the top of the cabinet.

The second i-f transformer is mounted on top of the chassis between the variable condenser and the speaker. The trimmers are accessible through holes in the top of the cabinet.

The loop antenna acts as the broadcast antenna coil. The shortwave antenna coil is the larger of the two coils mounted on the loop.

The trimmers for the antenna coils (loops) for both bands are located on a dual strip fastened to the loop board. The innermost trimmer is for short-wave and outermost trimmer for broadcast.

The oscillator coil is located underneath the chassis, just below the variable condenser. The trimmers for both bands are mounted on a dual strip beneath the first i-f transformer. The short-wave trimmer is the one furthest from the mounting feet.

DIAL CORD REPLACEMENT

Use the loop antenna and replace the broadcast cord. Do not slip the cord around the condenser pulley and knot with a slack, after which the spring may be hooked up the cord and pulley. The dia. face should be against the back washer when finally assembled.

I-F Alignment

Sewing the variable condenser to the minimum capacity position. Feed 455 kc to the grid of the 12SA7 tubes through a 0.1 mfd condenser and adjust the four i-f trimmers for maximum response. The four i-f trimmers are the rear trimmers of the chassis, and then the antenna trimmer (outermost dial trimmer on the loop) for maximum response. Rotate the dial to 60, feed 600 kc into the radiating loop and adjust the broadcast trimmer (outermost dial trimmer) for maximum response while rocking the variable back and forth. Repeat alignment at 1500 kc.
MODEL: EA1-341  CHASSIS MODEL: EA1  TYPE: Universal (Battery, A.C.-D.C.) Superheterodyne.

AUTOMATIC RECORD CHANGER

Automatic Operation

1. Turn the receiver "on" in the usual way, as explained above.

2. Replace the phonograph radio switch in the position - The phonograph radio switch is in the position - When the receiver is in this position, the switch is in the "on" position.

3. Set Index and Record Releve Lever to "Manual" position. The lever should be kept in this position when not actually moving the mechanism since this injury under these conditions indicates that the index and record releve lever are the DESTINATION. The stage is ready for relaying, or for movement. Set the receiver to "Manual" position. Do not move the receiver until the next operation is complete. The receiver is then made ready for relaying, or for movement. Set the receiver to "Manual" position. Do not move the receiver until the next operation is complete.

4. Turn the volume knob and loosen it on the record.
5. Adjust the volume to the desired level.

VOLTAGE ANALYSIS

<table>
<thead>
<tr>
<th>Tube</th>
<th>Screen</th>
<th>Cathode</th>
<th>Plates</th>
</tr>
</thead>
<tbody>
<tr>
<td>6G7G</td>
<td>245</td>
<td>70</td>
<td>6.5</td>
</tr>
<tr>
<td>6G7GT</td>
<td>230</td>
<td>70</td>
<td>6.5</td>
</tr>
<tr>
<td>6G7GT (di)</td>
<td>125</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>6L6G (di)</td>
<td>130</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>
| 6L6 (2) | 275 | 285    | 18.3  | 6.5

Voltage to 523 filament to ground=350 volts.

Readings shall be taken with a 1000 ohms-per-volt meter. Voltages listed are from point to ground (cathode) with the volume control turned on full and no signal. Line voltage for these readings was 110 volts, 60 cycles, a.c. All readings except 6L6 (2) plus at resistor, heater, and cathode 55 volt range are taken on 100 volt scale.

Adjustments

An output meter is used across the voice coil or speaker output transformer for obtaining maximum response. Use a suitable dummy load or 0.002 ohm condenser for aligning the antenna coil. Always use a test signal as possible during alignment. The last position in adjusting trimmers should always be a maximum resistance position.

Never leave the trimmer with the outside plate in the "on" position when the switch is in the "on" position. Changes are a source of noise, distortion, and instability.

LOCATION OF COILS AND TRIMMERS

The two trimmers are mounted in groups on the top of the chassis. The trimmers are available through holes in the top of the box. The copper colored foil is for the trimmer on the left. The first and second trimmer are the same type. The second trimmer is located on the right part of the variable condenser. The trimmer is located on the right side of the variable condenser.
GENERAL INFORMATION

Before servicing the automatic record changer, inspect the assembly to see that all levers, parts, gears, springs, etc. are in good order and are correctly assembled.

An arm or jamb in the mechanism can usually be relieved by rotating the turntable in the reverse direction.

The record changer can be repositioned once through its change cycle by pushing the index lever to "Reject" and reversing the turntable by hand. Six turntable revolutions are required for one change cycle.

If the record changer or cabinet is not perfectly level, normal operation is likely to be affected.

The 10 and 12 inch records must be absolutely flat for smooth operation when using a mixture of the two sizes.

ADJUSTMENTS

A. Main Lever.—This lever is basically important in that it interlocks the various individual mechanisms which control needle landing, tripping, record separation, etc. One adjustment is provided for the main lever. Rotate the turntable until the changer is out-of-cycle; and adjust rubber bumper bracket (A) so that the roller clears the nose of the cam plate by 1/16 inch.

B. Friction Clutch.—The motion of the tone arm toward the center of the record is transmitted to the trip pawl "23" by the trip lever "7" through a friction clutch "5." If the motion of the clutch is abruptly accelerated or becomes irregular due to swinging in the eccentric groove, the trip finger "7" moves the trip pawl "23" into engagement with the pawl on the main gear, and the change cycle is started. Proper adjustment of the friction clutch "5" occurs when movement of the tone arm causes positive movement of the trip pawl "23" without tendency of the clutch to slip. The friction should be just enough to prevent slippage, and is adjustable by means of screw "B." If adjustment is too tight, the needle will repeat grooves, if too loose, tripping will not occur at the end of the record.

C. Pickup Lift Cable Screw.—During the record change cycle, lever "16" is actuated by the main lever "15," so as to raise the tone arm clear of the record by means of the pickup lift cable. To adjust pickup for proper elevation, stop the changer "on" and place the pickup raised to the maximum height above turntable plate, and has moved outward; at this point adjust the screw "C" to obtain 1 inch spacing between needle point and turntable top surface.

D. F.E. Needle Landing on Record.—The relation of coupling between the tone arm vertical shaft and lever "20" determines the landing position of the needle on a 10 inch record. The position is carefully set so that F.E. governs the landing of the needle on a 12 inch record; that is, whenever dependent on the proper 10 inch adjustment.

To adjust for needle landing, place 10 inch record on turntable; push index lever to reject position; and turn lever "16" to the 10 inch position; see that pickup locating lever "19" is tilted fully toward turntable; rotate mechanism through cycle until center of turntable; see that pin "V" on lever "14" is in contact "Step 1" on lever "17." The correct point of landing is 4-11/16 inches from the nearest side of the turntable spindle; loosen the two screws "D" and adjust horizontal position of tone arm to proper dimension, being careful not to disturb lever "14" and "17." Leave approximately 1/2 inch end play between hub of lever "10" and pickup base bearing, and tighten the bluntnose screw "D." Run mechanism through several cycles as a check, then tighten cone pointed screw "D.

Lubrication.—Petrolatum or petroleum jelly should be applied to arm, main gear, spindle pinion gear, and gears of record post.

Light machine oil should be used in the tone arm vertical bearings, record post bearings, and all other bearings of various levers on underside of motor board.

The felt washer between the turntable and spindle should be soaked in light engine oil whenever the turntable is removed, or as required for proper operation.

MISCELLANEOUS SERVICE HINTS

Incorrect adjustment of a particular mechanism of the changer is generally exhibited in a specific mode of improper action and return to 12 inch position of the turntable; horizontal position and the usual misadjustments will enable ready adjustment in most cases.

1. For irregularity of operation, the adjustment of the main lever "15" should be checked first as in "A."
**MODEL: EG-355**  
**CHASSIS MODEL: EG**

**Location of Coils and Trimmer Adjustments**

The first 4 transformer is mounted on top of the chassis deck to the right of the variable condenser. The trimmers are accessible through holes in the top of the chassis.

The second 4 transformer is mounted on top of the chassis behind the variable condenser and the speaker. The trimmers are accessible through holes in the top of the chassis.

The loop antenna acts as the broadcast antenna coil. The loop antenna is the largest of the two coils mounted on the loop board. The trimmers for the antenna coils for both bands are located on a dial strip behind the variable condenser.

The upper trimmer is for broadcast and lower, for short-wave.

The variable condenser is located on the front panel of the chassis, just below the variable condenser. The trimmers for both bands are mounted on a dial strip beneath the first 4 transformer. The short-wave trimmer is the one closest to the mounting foot.

**Alignment**

- **Band Selection**: The grid of the 6SA7 tube is connected to the rear of the variable condenser section.

- **R4 Alignment**
  - Rotate the wave band switch clockwise to the short-wave position. Set the dial pointer at 115426 (54), feed 16 megacycles from the signal generator in a loop of wire about 12 inches in diameter. Hold this radiating loop about 12 inches from the electronic antenna and obtain a constant of the generator until a detector output is obtained on the wave meter. Then, with the short-wave oscillator trimmer (closest to mounting foot, beneath the chassis) and then the antenna trimmer (lower of two trimmers, behind the variable condenser) for maximum response.
  - Without changing the above setup, rotate the band switch clockwise to the broadcast position, set the dial pointer at 150, and feed 1500 kc into the radiating loop. Adjust for the broadcast antenna trimmer (farthest from mounting foot, beneath the chassis) and then the antenna trimmer (upper of two trimmers, behind the variable condenser) for maximum response. Repeat the alignment at 1500 kc.

**DIAL CORD REPLACEMENT**

Chassis wiring that is used to drive shaft pulley with a wideビュー open one and a half turns of dial cord, part number 75366-113, fed 650 megacycles into the output of the generator until a detector output is obtained on the wave meter. Then, with the short-wave oscillator trimmer (closest to mounting foot, beneath the chassis) and then the antenna trimmer (lower of two trimmers, behind the variable condenser) for maximum response.

**Compliments of www.nucow.com**
EMERSON RADIO & PHONOGRAPH CORP.

MODEL: DX-356
Chassis DX

MODEL: DX-356

CHASSIS MODEL: DX

TYPE: Three-band superheterodyne.

FREQUENCY RANGES:

- 540-1750 kc. (555-170 meters)
- 2300-7500 kc. (130-40 meters)
- 6.9-22 mc. (43.5-13.6 meters)

Schematic diagram for chassis with serial numbers above 3,842,250

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Compliments of www.nucow.com
PARTS LIST

L1, C9
L2
L3
L4
L5
L6
L7
L8, R10
L9
R11, R13
R12
R14
R15
R16
R18
R19
R20
C1, C2
C3, C4
C5
C6
C7
C8
C9
C10, C33
C11
C12
C13, C14
C15, C16, C17
C18, C25
C19
C20
C21
C22
C23
C24, C26
C27
C28
C29
C30
C31
C32
C33
C34
C35, C36
C37
RDS-486
7XS-511
MES-583A

The adjustable padding condenser for the broadcast band is mounted on the top of the chassis, with the screw adjustment accessible in the top of the chassis. The police and short-wave bands have fixed paddles, C20 and C29 on the chassis, and when replacing these fixed paddles be careful to use a condenser which has a capacity within 2% of the specified value, otherwise the short-wave coils may not track.

ADJUSTMENTS

An oscillator with frequencies of 455, 600, 1600, 6500 and 20,000 kc should be used.

An output meter should be used across the voice coil or speaker output transformer for observing maximum response.

Use a dummy antenna for aligning the police and short-wave bands. The 400 ohm resistor in series with a 400 ohm carbon resistor may be used for the police band dummy antenna. For the short-wave band a 400 ohm carbon resistor may be used.

Always use a weak test signal as possible during alignment.

The set's oscillator is higher in frequency than the signal on all three bands, so images should be observed on the low frequency side of the signals.

Always choose the minimum capacity peak on oscillator trimmers and maximum capacity peaks on antenna trimmers. The last motion in adjusting trimmers should always be a tightening one, not a loosening one.

Never leave the trimmer with the outside plate so loose that there is no tension on the screw. Either bend the plate up or remove the screw entirely. Loose screws are a sure source of noise, distorting, and microphonia.

In aligning antenna trimmers on the high frequency signals there is always a tendency for the oscillator to drift, due to intercoupling. To compensate for this always keep turning the variable condenser as the trimmers are being adjusted.

I-F Alignment

Rotate the wave-band switch to the broadcast (clockwise) position. Set the variable condenser at the minimum capacity position and feed 455 kc through a 0.02 mf paper condenser, to the grid of the 6SA7 tube. The input may be fed to the grid lug at the front end of the condenser section. Adjust the four if trimmers for maximum response.

Broadcast Alignment

Rotate the wave-band switch to the broadcast (clockwise) position. Set the dial pointer at 160 and feed 1600 kc from the signal generator into a loop of wire about 12 inches in diameter. Hold the signal about 12 inches from the end of the wire loop and adjust the variable condenser. Then adjust the oscillator trimmer for maximum response. Return to 1600 kc and check alignment. If readjustment is necessary return to 600 kc and repeat entire procedure.

Police Alignment

Set the wave-band switch at the police band (central) position and the pointer at R5. Feed 600 kc to the antenna (using a 400 ohm dummy antenna) and adjust the oscillator trimmer for maximum response. Then adjust the antenna trimmer for maximum response. The police band paddler is fixed and therefore requires no adjustment.

Short-Wave Alignment

Set the wave-band switch at the short-wave (counter-clockwise) position. Move the pointer to 20 and feed 20,000 kc to the antenna (using a 400 ohm dummy antenna) and adjust the short-wave oscillator trimmer for maximum response. If two peaks are obtained choose the minimum capacity peak. Then adjust the antenna coil trimmer for maximum response. If two peaks are obtained choose the maximum capacity peak.

The color coding of the if transformers is as follows:
- Grid—green
- Plate—blue
- Grid return—black

The color coding of the power transformer is as follows:
- Primary—two black leads
- High-voltage secondary—one red lead
- High-voltage secondary center tap—red and yellow lead
- 6.3 volt secondary—two green leads
- 5 volt secondary—two yellow leads.

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**Recording Adjustments**

The following adjustments should be carefully noted. Examine the recording arm to locate the controls indicated and to become familiar with their use. In general, it is unnecessary to move either the height or pressure adjustment unless a recording blank differs from the type furnished by Emerson except as the cutting needle shows great wear or has been replaced.

**Two adjustments are provided on the recorder arm: arm height and needle pressure.**

**Recorder Arm Height**

The height of the recorder arm can be varied by means of the slotted screw which is located on the bracket just beneath the cutting arm. In order to make this adjustment, it is necessary to insert a cutting needle, and, with the motor turned off and a record blank on the turntable, place the recorder arm in the cutting position. Now lift the cutting arm, turn the height adjusting screw and lower the arm to the record. When properly adjusted, the needle screw should be approximately centered in the slot at the front of the arm, when the needle is resting on the record. Tighten the lock nut to prevent the screw from moving. See figure at right.

**Cutting the Record**

1. The illustration above indicates the correct position of the cutting needle in the cutting arm. It is important to note that the attachment must be in the needle position, clockwise.

2. Turn the selector switch to the type of recording desired. Be sure the tone control switch is in the needle position, clockwise.

3. Place the recording blank on the turntable so that the removable driving pin in the turntable engages one of the holes in the turntable. This is necessary to prevent the blank from slipping.

4. Start the motor and allow the turntable to come up to speed.

5. Raise the recording arm from its rest position and move it toward the record, placing the cutting needle approximately 1/2 inch from the outer edge of the blank.

**CAUTION:** Never touch the needle by hand; this needle is weighted for use in recording and it will require an appreciable time to come to rest.
RECORDER ADJUSTMENTS

Make no adjustments unless repeated tests show that adjustment is absolutely necessary.

1. FUNCTION OF MANUAL CONTROL BUTTON AND RELATIVE PARTS.

When Manual Control Button (Item 84, Fig. 4) is moved to the Manual Play-Back recording position, it moves the Manual Control Slide (Item 102, Fig. 1) which in turn moves Clutch Lock Slide (Item 103, Fig. 1) into a position which prevents Engagement Clutch Cam Assembly (Item 79, Fig. 2) from rotating. When Engagement Clutch Cam Assembly is in the above mentioned position and is not free to rotate, the Changer will not go into its changing cycle.

Also when the Manual Control Button is in the above mentioned position, the Manual Control Slide has moved the Locator Lock Slide (Item 106, Fig. 1) into a position where it engages the Tone Arm Locator & Bushing Assembly (Item 12, Fig. 1) and prevents same from bearing against Tone Arm Lever Assembly (Item 19, Fig. 1) allowing the Tone Arm to swing freely without hindrance and without setting Changer into its changing cycle. When the Manual Control is in the automatic position the Changer will function normally as an automatic record changer.

2. POSSIBLE MECHANICAL CAUSES OF POOR RECORDINGS.

(a) Threads from record cuttings getting down onto Rubber Idler Drive Wheel (Item 83, Fig. 4) and between drive wheel and motor pulley. This will cause very bad speed variation of the turntable and, of course, will result in very inferior recording. Cuttings may also wrap around motor shaft and cause motor to slow down or stop.

To remove the record cuttings, the turntable should be lifted by applying an even lifting force at opposite edges of the turntable while the turntable spindle is gently tapped downward on its top end, and the record cuttings then removed. The Rubber Idler Drive Wheel should be taken off; this can be accomplished by unsnapping the small snap cotter ring and slipping Rubber Idler Drive Wheel off its shaft, after which all record cuttings can be removed.

NOTE: It is very important that no grease or oil be gotten on the surface of the Rubber Idler Drive Wheel.

(b) Tight Pivot Bearings: Check Cartridge Pivot Screw (Item 108, Fig. 4) for binding. Also Recording Arm Pivot Screw (Item 107, Fig. 4) and Traverse Arm Pivot Screws (Item 101, Fig. 2). These bearings should all be free, but have no looseness or play.

If the Pivot Screw (Item 108, Fig. 4) of the Cutter Cartridge is tight, the Cutter Cartridge cannot follow a slight up and down variation of the record or turntable. A record cut in this manner will, when played back, have a high scratch level, rough cutting and a tendency for the needle to jump from one groove to another.

(c) Damaged Rubber Idler Drive Wheel (Item 83, Fig. 4). Rubber Idler Drive Wheel may have become damaged by:

1. Allowing oil or grease to come in contact with same.

2. By allowing turntable to drop and cut into the outside surface of the Rubber Idler Drive Wheel.

3. Stopping the turntable by hand while the motor is running will cause a flat spot on the surface of the Rubber Idler Drive Wheel.

NOTE: If the Rubber Idler Drive Wheel has been damaged in any of the above mentioned ways, it should be replaced with a new one.

(d) Vibration Reaching The Recorder While A Blank Is Being Recorded: It is very important the floor or the surface upon which the Recorder rests remain quiet as any vibration such as people walking across the floor or shaking of the instrument in which the Recorder is mounted will seriously effect the quality of the finished recording.

(e) Recorder Not Level: It is very important that the Recorder is standing level. This can be checked by placing a small level on the turntable and checking same in two positions at right angles to each other and then leveling Instrument in which Recorder is mounted.

(f) Bent Or Damaged Turntable Spindle: If the Turntable Spindle (Item 59, Fig. 4) has been bent in shipment, or by someone exerting a heavy pressure on one side, it should be replaced with a new one. A bent Turntable Spindle will cause the surface of the Turntable to move up and down while it is turning and, of course, will seriously effect the quality of both recording and play-back.

NOTE: When removing the Turntable an even upward lifting force should be applied at opposite edges of the Turntable while Turntable Spindle is gently tapped downward on its top end.

(g) Record Cutting Causing A Bind Between Turntable Spindle (Item 59, Fig. 4) And Its Bearing: It is very important that all record cuttings are removed from Turntable Spindle and its bearing.

(h) Tension On Rubber Idler Wheel (Item 83, Fig. 4) Too Great: If the tension on the Rubber Idler Drive Wheel is too great, this will result in a "wow" or a rumble in the recording. To decrease the tension on Rubber Idler Drive Wheel, loosen the screw holding the lag which is located beneath the Rubber Idler Drive Wheel and turn it slightly in a clockwise direction. This will reduce the spring tension on the Rubber Idler Drive Wheel. When the spring tension is correct, the spring will be approximately at right angles to the lug.

(i) Tension On Rubber Idler Drive Wheel (Item 83, Fig. 4) Too Weak: This will cause very bad speed variation. Turntable will slow down and then speed up as audio current of varying intensity reaches the cutter cartridge.
EMERSON RADIO & PHONOGRAPH CORP.

MODEL DZ-371

Chassis DZ

The following is detailed information for adjusting the Record Changer Mechanism. Do not make any adjustments before reading the instructions carefully.

1. **EJECTOR DOES NOT INDEX PROPERLY ON TEN-INCH OR TWELVE-INCH RECORDS.**
   - (a) Adjustments for correct indexing of 10-inch records:
     - Swing tone arm outward onto tone arm lever assembly (Item 18, Fig. 1) until it is aligned with one of the three lever holes (Item 16, Fig. 1).
     - Rotate lever assembly (Item 16, Fig. 1) until the hole in lever engages all three lever holes.

2. **Record Changer continues to repeat its changing cycle without playing records.**
   - (a) The surface of the tone arm lever assembly (Item 19, Fig. 1) is held against the arm lever (Item 18, Fig. 1) by the tension of tone arm locator lever spring (Item 16, Fig. 1).
   - (b) Next locate the clamping screw in the Swivel Bracket Assembly (Item 46, Fig. 3).

3. **No sound when needle is on moving record.**
   - (a) Move switch (Item 26, Fig. 1) to the OFF position.
   - (b) The contacts of this switch should be open whenever the tone arm is in the home position.
   - (c) If the contacts remain closed or are not interrupted, check the condition of the engaging clutch cam assembly (Item 79, Fig. 2).

4. **TONE ARM ADJUSTMENTS FOR 10-INCH RECORDS.**
   - (a) Turn both knobs until the arrows marked "10" are pointing toward the center of the turntable.
   - (b) Place a 10" record on the turntable and start Record Changer.
   - (c) Note where needle contacts record. Correct contacting is about 1/4" from the outside edge of record. If contacting is wrong, move tone arm lever assembly (Item 16, Fig. 1) and slide shoe in or out as required, then retighten screw.

5. **TONE ARM HEIGHT ADJUSTMENT.**
   - Set the Record Changer for 10" records, turn Switch knob to "ON" and allow Record Changer to go through a changing cycle with nothing on the turntable. The clearance between Turntable and the bottom surface of the Tone Arm should be approximately 1/16". Usually this clearance can be obtained by adjusting the Tone Arm Adjustment Screw (Item 79, Fig. 3).
   - (a) It is well to check the following points before making any adjustments:
   - (b) Check clearance between Roller (Item 51, Fig. 1) and Selector shaft (Item 5, Fig. 1).
   - (c) Turn Tone Arm Lever Assembly (Item 5, Fig. 1). There should be approximately 1/16" clearance at this point. If the clearance is greater, it would be due to the pressure on the Spring Washer (Item 77, Fig. 3) and shaft (Item 51, Fig. 1). To reduce the pressure on the Spring Washer, lower the Selector Shaft Collar (Item 5, Fig. 1) slightly.

6. **TONE ARM LOWERS ON RECORD TOO SLOWLY.**
   - If the Tone Arm lowers too slowly, the Spring Washer (Item 30, Fig. 1) is not located between the Tone Arm Lever Assembly (Item 5, Fig. 1) and Selector Shaft Collar (Item 5, Fig. 1). This is usually caused by insufficient pressure. To adjust, turn the Selector Shaft Collar (Item 5, Fig. 1) downward and tighten the shaft (Item 51, Fig. 1) slightly.

7. **LUBRICATION.**
   - (a) Motor: The motor is equipped with oilless bearings and requires no lubrication.
   - (b) Turntable Spindles: Bearings are lubricated at the factory and do not require any lubrication for one year. After one year they should be oiled with 1 or 2 drops of a light grade oil.
   - (c) The bearing can be oiled by lifting off turntable. Make sure when replacing turntable to see that pin in Turntable Spindle slips into slot on bottom surface of turntable and also case should be taken off to replace Rubber Idler Drive Wheel.
   - (d) Never use lubricating oil on the tone arm. To avoid this, use a small amount of oil on the tone arm. Oil on the tone arm will result in a 1/4" or more on the tone arm.
   - (e) Squawk Due To Records Rubbing On Turntable Spindle: This can be eliminated by gently lining up the track of records.
MODELS: EL-360, EL-361, EL-362, and EL-373
CHASSIS MODEL: EL
CHASSIS MODEL: EP

Location of Coils and Trimmer Adjustments

The first i-f transformer is mounted on top of the chassis deck to the left of the speaker. The trimmers are accessible through holes in the top of the can.

The second i-f transformer is mounted on top of the chassis to the right of the speaker. The trimmers are accessible through holes in the top of the can.

The trimmers for the antenna and oscillator coils are located on the variable condenser. In Model EL, the trimmer on the front section is for the antenna coil (loop). In Model EP, the trimmer on the rear section is for the antenna coil (loop). The oscillator coil is located directly beneath the speaker.

1-f Alignment

Swing the variable condenser to the minimum capacity position. Feed 455 kc to the grid of the 12SA7GT tube through a .01 mf condenser and adjust the four i-f trimmers for maximum response. The grid of the 12SA7GT tube may be reached by clipping the input lead to the stator lug of the antenna section.

R-F Alignment

Set the dial pointer at 140. Feed 1400 kc from the signal generator into a loop of wire about one foot in diameter. Hold this radiating loop about 12 inches away from and parallel to the receiver loop antenna. Advance the input to the loop until a satisfactory deflection is obtained on the output meter. Adjust first the oscillator trimmer then the antenna trimmer for maximum response. If the loop antenna has been replaced it may be necessary to retrack the loop inductance. With the dial set at 60 feed 600 kc to the antenna lead. A portion of the outside may be swung to either side of the center to give maximum response. Repeat the trimmer alignment at 140.

FREQUENCY RANGE: 540-1600 kc.

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FREQUENCY RANGE: 540-1600 kc 555-187 meters.

POWER CONSUMPTION:
60 watts for radio.
95 watts for recorder and radio.

SEE INDEX FOR PHONO RECORDER DATA

The color coding of the i-f transformers is as follows:
- Grid—green
- Plate—blue
- B plus—red
- Grid return—black

The color coding of the power transformer is as follows:
- Primary—two black leads
- High-voltage secondary—two red leads
- High-voltage secondary center tap—red and yellow lead
- 6.3 volt secondary—two green leads
- 5 volt secondary—two yellow leads.

A ground is necessary if the microphone is to be used for recording. Use the conventional method of grounding to a water pipe or steam radiator. Connect the ground to the flexible black lead emerging from the motor board.

POWER SUPPLY: a.c. only. 60 cycle.

VOLTAGE RATING: 105-125 volts.

Voltage at 5Y3G filament to ground—325 volts.
Voltage across speaker field—70 volts.

*Actual operating voltages cannot be measured because of high resistance in circuit.
†This tube is located in corner of chassis.

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the volume control turned on full and no signal. Line voltage for these readings was 117 volts, 60 cycles, a.c. All readings except B plus at rectifier, heaters, and cathode voltages were taken on 300 volt scale.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Fil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SA7GT</td>
<td>252</td>
<td>80</td>
<td>0</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>6SK7GT</td>
<td>255</td>
<td>67</td>
<td>0</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>6SQ7GT</td>
<td>100</td>
<td>—</td>
<td>0</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>†6SQ7GT</td>
<td>48</td>
<td>—</td>
<td>0</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>6V6GT</td>
<td>247</td>
<td>255</td>
<td>12</td>
<td>6.3 a.c.</td>
</tr>
</tbody>
</table>

MODEL: EV-384
CHASSIS MODEL: EV
- EV-51

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Compliments of www.nucow.com

MODEL: EV-384
Chassis EV
MODELS ER-369, ER-370
Chassis ER

PREADJUSTMENT OF PUSH-BUTTONS FOR
AUTOMATIC TUNING

Rotate the wave-band switch to the broadcast (clockwise) position. Set the variable condenser at the minimum capacity position and feed 475 kc through a 0.022 uf paper condenser to the grid of the 6SA7 tube. Clip input to stator leg of middle variable condenser section. Adjust the four i.f. trimmers.

Broadcast Alignment

Set the wave-band switch at the broadcast (clockwise) position, and the pointer at 60. Feed 475 kc to the antenna (using a standard dummy antenna) and adjust the broadcast-band series condenser for maximum response. Move the pointer to 410, feed 1000 kc to the antenna and again adjust the broadcast-band series condenser for maximum response. Move the pointer to 1600, feed 1000 kc to the antenna and again adjust the broadcast-band series condenser for maximum response. Adjust the antenna trimmer for maximum response. Return to 1600 and check alignment. If required, the alignment must be repeated.

Police Alignment

Set the wave-band switch at the police band (central) position, and the pointer at 7.5. Feed 475 kc to the antenna (using the dummy described above). Adjust the oscillator trimmer for maximum response. Then adjust the antenna trimmer for maximum response.

Short-Wave Alignment

Set the wave-band switch at the short-wave (counter-clockwise) position. Move the pointer to 20 and feed 2000 kc to the antenna (using a 400 ohm dummy antenna) and adjust the short-wave oscillator trimmer for maximum response. If two peaks are obtained choose the minimum capacity peak. Then adjust the antenna coil trimmer for maximum response. If two peaks are obtained choose the minimum capacity peak. Use a dummy antenna for tuning any of the three bands. A .002 mf condenser may be used for broadcast band antennas, a 2000 mf condenser in series with a 400 ohm carbon resistor for the police band dummy antenna and a 400 ohm non-inductive condenser for the short-wave dummy condenser.

The adjustable padding condenser for the broadcast band is located on the top of the chassis near the 6567 tube. The short-wave and police band padding is fixed-mica condenser. When replacing, be careful to use a condenser which has a capacity within 3% of the specified value, otherwise the coils may not track.

Location of Coils and Trimmer Adjustments

The first i.f. transformer is mounted on top of the chassis deck behind the variable condenser. The trimmers are accessible through holes in the top of the case.

The second i.f. transformer is mounted beneath the chassis. The trimmers are accessible through holes in the rear of the chassis.

The oscillator coil is mounted underneath the chassis. The oscillator trimming condenser is located on the front section of the variable condenser.

The trimmer for the loop winding is mounted on the loop board. It is accessible through a hole in the rear of the cabinet and should be trimmed when the chassis is mounted in its position.

1f Alignment

Set the variable condenser at the minimum capacity position and feed 475 kc through a 0.022 uf paper condenser to the grid of the 6567 tube. Adjust the four i.f. trimmers for maximum response.

Note: Check the grid of the 65A7 tube is connected to the stator leg of the rear variable condenser section. Connection must be made with a test clip.

R4 Alignment (LOOP ALIGNMENT)

Set the dial pointer at 150. Set the signal generator at 1500 kc and feed its output into a loop of wire about 12 inches in diameter. Hold this loop radiating loop about 12 inches from and parallel to the receiver loop antenna. Adjust the output of the signal generator until maximum is obtained on the output meter. Adjust first the oscillator trimmer (on front section of variable condenser) then the antenna trimmer (on rear section of variable condenser) for maximum response. If the loop antenna has been replaced it may be necessary to adjust the loop inductions as follows: Align at 150. Set the trimmer at 60 and feed the signal to the front section of the outside turn of the loop may be swung to either side of the center to give maximum response. Read at 150.

Radio

With the selector switch in "Radio" position the receiver can be used as any usual radio receiver. The electrical output near the top of the panel is a level indicator for recording and is not intended for use as a tuning indicator.

Phonograph Operation

With the selector switch in the "Phonograph" position the receiver may be used to reproduce records up to 12". Never use the cutting needles of the reproducing pickup since this will immediately ruin the records.

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VOLTAGE RATING: 105-125 volts.
POWER SUPPLY: A.C. only.
POWER CONSUMPTION: 85 watts for receiver.
120 watts for combination.
FREQUENCY RANGES:
40-1630 kc.
2,3-7.5 kc.
6,9-22.3 mc.
6SA7GT, oscillator-modulator
6SK7GT, i-f amplifier
6SQ7GT, diode detector, audio amplifier and a.v.c.
6SQ7GT, audio amplifier
6AE7GT, audio amplifier
6US electron-ray tuning indicator.
5Y3G, full-wave rectifier.

VOLTAGE ANALYSIS
Voltage at 5Y3 filament to ground—345 volts.
Voltage drop across speaker field—90 volts.
†Same voltage for each tube.
‡Same voltage for both cathodes.

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the volume control turned on full and no signal. Line voltage for these readings was 117 volts, 60 cycles, a.c. All readings except B plus at rectifier, heaters, and cathode voltages were taken on 300 volt scale.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Fil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SA7GT</td>
<td>235</td>
<td>72</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>6SK7GT</td>
<td>235</td>
<td>72</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>6SQ7GT</td>
<td>75</td>
<td></td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>*6AE7GT</td>
<td>255</td>
<td></td>
<td>12</td>
<td>6.3</td>
</tr>
<tr>
<td>*6AC5GT</td>
<td>245</td>
<td></td>
<td>0</td>
<td>6.3</td>
</tr>
</tbody>
</table>

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Location of Coils and Trimmer Adjustments

The first 4 transformers are mounted on top of the chassis deck behind the variable condenser. The trimmers are accessible through holes in the top of the case. The second 4 transformers are mounted underneath the chassis. The trimmers are accessible through holes in the rear of the chassis.

The transformer is located on the front variable condenser section.

The loop antenna acts as the antenna coil. Its trimmer is mounted on the layout board.

For Automatic Recorded Channel Adjustments Refer to Index

Automatic Recorded Change

This record changer is provided with a two track mechanism so that automatic change can be accomplished in the continuous play of records, or with records lacking the Eccentric Center Groove, but which are recorded sufficiently near the center to allow the Positive Trip to come into operation.

1. The Ratchet Trip

The Ratchet Trip requires no adjustment, as its range of operation is greater than that of any standard records.

2. The Positive Trip

The Positive Trip can be adjusted to operate at a definite point from the center spindle in the following manner. Remove the button covering the hole on the left side of the pickup arm, using a small screwdriver rotate the screw-head appearing thus this hole. (Caution: This screw can be rotated only one-half turn or 180 degrees. Therefore, slight adjustments are all that should be required.) A slight turn to the right or the left in a clockwise direction causes the positive trip to start in the playing cycle or nearer to the center of the record. The exact adjustment can be determined only by playing its last several grooves located at the desired distance from its center.

3. Tone Arm Drop Point

This record changer is provided with an adjustment controlling the position at which the Tone Arm is dropped on the record. This adjustment has a constant relationship for 10-12 inch records. Therefore, one adjustment on either side of the center will be sufficient. To make this adjustment, remove the button on the right side of the pickup arm, using a small screwdriver rotate the screw-head slightly. (Caution: This screw can also be rotated only one-half turn or 180 degrees. Therefore, slight adjustments are all that should be required.) A slight turn to the right or in a clockwise direction causes the needle to drop further to the edge of the record, and a slight turn to the left causes the needle to drop closer to the center of the record. The proper position is determined by playing a record and selecting a point 4 from the edge of the record and in the blank space at this point in these (see the edge of the record where there are no grooves.

Manual Operation

First lift the record holder posts upward and turn them so that no portion of them overhangs the Record Turntable. Place the record over the Center Spindle, Push the Control Button to the first or Manual position and place the Tone Arm in the Startin Grooves. When the record has been played then, return the Tone Arm to its rest position and the Control Button to its“OFF” position.

SPECIAL PRECAUTIONS

The following precautions are of the utmost importance and should be seriously observed:

1. Do not handle or move manually any part or the mechanism while it is going through the record-changing operation.

2. Do not use force in handling the mechanism at any time.

3. Oftentimes the turntable and/or the record changer will be positioned in a vertical position during use and as a result the turntable will be tilted in a horizontal position. When finished playing the turntable must be tilted to the right or, clockwise, to the left.

4. The instrument is not recommended for playing 10-12 inch records and is intended for use only with 10-12 inch records.

5. Each instrument is equipped with an automatic record changer mechanism and is not intended for use with any other type of record changer.

6. Each instrument is equipped with an automatic record changer mechanism and is not intended for use with any other type of record changer.

7. The instrument is not recommended for playing 10-12 inch records and is intended for use only with 10-12 inch records.

Compliments of www.nucow.com
EMERSON RADIO & PHONOGRAPH CORP. MODELS FA-374, FA-403 Chassis FA

MODEL FB2-374 Chassis FB2

POWER CONSUMPTION:
60 watts for receiver only.
95 watts for combination.

VOLTAGE RATING: 105-125 volts.

FOR RECORD-CHANGER DATA, SEE INDEX

FREQUENCY RANGE: 540-1630 kc.

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VOLTAGE READING

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles. All readings except E and cathode voltages were taken on 250 volt scale.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Heater</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7GT</td>
<td>184</td>
<td>50</td>
<td>1.25</td>
<td>6.3</td>
</tr>
<tr>
<td>6L6GT</td>
<td>240</td>
<td>74</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>6L6GT</td>
<td>254</td>
<td>80</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>6L6GT</td>
<td>67</td>
<td>-</td>
<td>-</td>
<td>6.3</td>
</tr>
<tr>
<td>6L6GT</td>
<td>240</td>
<td>25</td>
<td>12</td>
<td>6.3</td>
</tr>
</tbody>
</table>

The color coding of the tube transformer is as follows:
- Blue = plate
- Red = heater

The color coding of the power transformer is as follows:
- Primary = black leads
- High-voltage = red secondary leads
- Blue secondary = yellow leads

VOLTAGE MEASUREMENTS

<table>
<thead>
<tr>
<th>Type of Tubes</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Heater</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7GT, e amplifier</td>
<td>60</td>
<td>65</td>
<td>0.125</td>
<td>4.5</td>
</tr>
<tr>
<td>6SK7GT, tube-head oscillator-modulator</td>
<td>60</td>
<td>65</td>
<td>0.125</td>
<td>4.5</td>
</tr>
<tr>
<td>6SK7GT, r-f amplifier</td>
<td>60</td>
<td>65</td>
<td>0.125</td>
<td>4.5</td>
</tr>
<tr>
<td>6L6GT, beam power output</td>
<td>60</td>
<td>65</td>
<td>0.125</td>
<td>4.5</td>
</tr>
</tbody>
</table>

VOLTAGE READING

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles. All readings except E and cathode voltages were taken on 250 volt scale. Measurements made with 117.5 volts d.c. will be lower than those given below.

<table>
<thead>
<tr>
<th>Type</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Heater</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SA7GT</td>
<td>85</td>
<td>85</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>12SK7GT</td>
<td>85</td>
<td>85</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>12SQ7GT</td>
<td>85</td>
<td>85</td>
<td>0</td>
<td>12</td>
</tr>
</tbody>
</table>

POWER SUPPLY

A.c. or d.c. Caution: This combination is equipped with an a.c.-d.c. switch for the meter. Before plugging line cord into electric outlet make certain that the switch is in the position corresponding to the house supply. The set was shipped with the switch in the D.C. position. The tach is the red lever located on the small chassis which is to the right of the speaker when viewed from the rear. To change position of switch, remove locking screw from red switch lever, move switch to desired position and replace locking screw.

VOLTAGE MEASUREMENTS

Line voltage at 117.5 volts 60 cycle sine wave is 117.5 volts. All readings except E and cathode voltages were taken on 250 volt scale.
EMERSON RADIO & PHONOGRAPH CORP.

MODEL: EX-386
Chassis: EX

An electrical photograph pick-up may be connected to this receiver for playing records. Connections to the receiver may be made at the "Phone" terminal strip which is located on the rear wall of the receiver chassis.

1. Remove the link connecting two of the terminals on the phono strip. The switch should be wired to the pickup and terminal strip so that in the photograph position the switch should short terminals 1 and 2 and at the same time connect the high side of the pickup to ground (terminal 2). (The ground side of the pickup may be permanently wired to terminal 1.) When the switch is in the radio position terminals 2 and 3 should be shorted together and the pickup disconnected from terminal 2.

ADJUSTMENTS

The adjustable paddles for the broadcast and police bands are mounted in the top of the chassis. Move the adjustment control to either side of the arrow point. The arrow point shows the correct frequency. When replacing this fixed paddle, a variable condenser which has a capacity of 250 pF in the specified value, otherwise the short-wave coils may not track.

The set's oscillator is higher in frequency than the signal on all three bands, so it should be observed on the low frequency side of the signal.

Broadcast Alignment

Set the wave-band switch to the broadcast (clockwise) position. Set the variable condenser at the minimum capacity position and feed 450 kc through a 0.01 megohm resistor to the grid of the 12AT7 tube. Adjust the bias of the 12AT7 for minimum response. Feed 450 kc to the antenna (using a standard antenna trimmer) and adjust the 450 kc-vest for maximum response.

VOLTAGE ANALYSIS

All voltages and currents are as follows:

Model: EX-386
Chassis: EX

Compliments of www.nucow.com
Automatic Record Changer

AC. Unit - Part No. 125.10

Before servicing the automatic record changer, inspect the assembly to see that all levers, parts, gears, springs, etc., are in good order and are correctly assembled.

A bind or jam in the mechanism can usually be relieved by rotating the turntable in the reverse direction.

The changer can be conveniently rotated through its change cycle by pushing the index lever to "Reject" and revolving the turntable.

ADJUSTMENTS

A. Main Lever.—This lever is basically important in that it interlinks the various individual mechanisms which control needle lifting, tripping, etc. One adjustment, provided for, is the main lever. Rotate the turntable until the changer is out-of-cycle; and adjust relief screw (A) so that the roller clears the nose of the cam plate by 1/16 inch.

B. Friction Clutch.—The motion of the tone arm toward the center of the record is transmitted to the trip pawl "22" by the trip lever "7" through a friction clutch "6." If the motion of the pickup is abrupt, the change cycle becomes irregular due to swinging in the eccentric groove. The trip lever "7," moves the trip pawl "22" into engagement with the pawl on the main gear, and the change cycle is started. Proper adjustment of the friction clutch "6" occurs when movement of the tone arm causes positive movement of the trip pawl "22" without tendency of the clutch to slip. The friction should be just enough to prevent slippage, and is adjustable by means of screw "B." If adjustment is too tight, the needle will repeat grooves; if too loose, tripping will occur at the end of the cycle.

C. Pickup Lift Cable Screw.—During the record change cycle, lever "16" is actuated by the main lever "15" so as to raise the tone arm lever by the record by means of the pickup lift cable. To adjust pickup for proper elevation, stop the changer "in-cycle" at the point where pickup is raised to the maximum height above turntable plate, and has not moved outward; at this point adjust lockout "C" to obtain 1 inch spacing between needle point and turntable top surface.

D. & E. Needle Landing on Record.—The relation of coupling between the tone arm vertical shaft and lever "20" determines the landing position of the needle on a 10 inch record. Position of eccentric stud "C" governs the landing of the needle on a 12 inch record; this, however, is dependent on the proper 10 inch adjustment.

To adjust for needle landing, place 10 inch record on turntable; push index lever to reject position and return to the 10 inch position; see that pickup lever is in position; then, adjust the eccentric stud by means of lockout "C" to get proper landing position. The proper point of landing is 4-1/16 inches from the nearest side of the turntable spindle; loosen the two screws "D" and adjust horizontal position of tone arm to proper position, being careful not to disturb levers "14" and "17." Leave approximately 1/32 inch end play between hub of lever "20" and pickup ball bearing, and tighten the blinet nose screw "D;" run mechanism through several cycles as a check, then tighten cone pointed screw "D".

After adjusting for needle landing on a 10 inch record, place 12 inch record on turntable; push index lever to reject and return to 12 inch position; rotate mechanism through cycle until needle is just ready to land on the record; then adjust the proper needle landing is 5-11/16 inches from nearest side of spindle. If the landing is incorrect, turn stud "D" until the position end. Adjust lever "14," to give correct needle landing. The eccentric end of the stud must always be toward the rear of the motor board, otherwise incorrect landing may occur with 10 inch records.

NOTE: Numbers refer to parts—letters refer to adjustments

F. & G. Record Separating Knife.—The upper plate (knife) "25" on each of the record points the lower knife to support the remaining records during the change cycle. It is essential that the spacing between the knife and the rotating record be 0.027" to 0.031" for spacing between the knife and the record, in its rotational position, and the shell, is 0.072—0.078 inch.

H. Record Support Shelf.—The record shelf revolves during the change cycle to lower the record to drop onto the turntable. Both posts are rotated simultaneously by a gear which is engaged to the main lever "15," and it is necessary that adjustment be such that the record is released from both shelves at the same instant. To adjust, place a 12 inch record on the turntable, rotate mechanism into cycle to the point where tone arm is at maximum distance outward from turntable; lift record upward until it is in contact with both separating knives, then loosen screws "H" and shift record shelves so that the curved inner edges of the shelves are uniformly spaced at least 1/16 inch from record edge. Tighten the blinet nose screw "H." Run mechanism through cycle several times to check action, then tighten cone pointed screw "H."

If record shelves or knives are bent, or not perfectly horizontal, improper operation and jamming of mechanism will occur.

J. Tone Arm Rest Support (not shown).—When the changer is out-of-cycle, the front lower edge of the pickup head should be 5/16 inch above surface of motor board. This may be adjusted by bending the tone arm mounting bracket, which is associated with the tone arm mounting base, in the required direction.

K. Trip Pawl Stop Pin.—The position of the trip pawl stop pin "K" is in relation to the main lever "15". Adjust the record separator by bending the roller enters the cam. By bending the pin support either toward or away from trip pawl bearing stud, the record separator and or the cam later or earlier, respectively. This adjustment should be made so that the roller definitely clears the cam outer guide as well as the nose of the cam plate.

Lubrication.—Petroleum or petroleum jelly should be applied to cam, main gear, spindle pinion gear, and gears of record posts.

Light machine oil should be used in the tone arm vertical bearing, record post bearings, and all other bearings of various levers on underside of motor board.

Apply a few drops of light machine oil to the motor spindle bearing and oil hole adjacent to the spindle bearing. The oil hole has a screw plug.

Do not allow oil or grease to come in contact with, rubber mounting of tone arm base, rubber bumper, or rubber spindle cap.

MISCELLANEOUS SERVICE HINTS

1. For any irregularity of operation, the adjustment of the main lever "15" should be checked first as in "A."

2. Needle does not land properly on both 10 and 12 inch records—Make complete adjustments "D" and "E."

3. Needle does not land properly on 12 inch record but correct on 10 inch—Effect adjustment "E."

4. Failure to return to record.—Increase clutch "5" friction by means of screw "B." Also, see that levers "7" and "12" are free to move without touching each other.

5. Pickup slip lever record on top of each other—Adjust lift cable by adjustment "C."

6. Needle does not track after landing—Fricition clutch "5" adjustment "B" may be too tight; gind in tone arm vertical bear.

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Compliments of www.nucow.com
When aligning the Short Wave Oscillator, tighten the adjusting screw for maximum capacity and then loosen it until the first peak is reached. Do not use the signal heard at the lower capacity setting as this receiver the oscillator works at a frequency lower than the one the R.F. is tuned to. If the loop is tuned to 18Mc the oscillator is tuned to 17,545Mc that is signal frequency minus I.F. frequency, instead of signal frequency plus I.F. frequency, or 18,695Mc as is customary.

**Grid of 12SA7**
- Plate 12SA7
- Grid 12SA7

**Grid of 12SK7**
- Plate 12SK7
- Grid 12SK7

**Grid of 12ST7**
- Plate 12ST7
- Grid 12ST7

**Grid of 35L6GT**
- Plate 35L6GT
- Grid 35L6GT

**Oscillator Voltage**
- 1500 V
- 600 V

**Voltage Loss in Output Transformer**
- 96.5% loss

---

**Tabulation for Alignment**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Dummy Antenna</th>
<th>Set Generator At</th>
<th>Set Gang At</th>
<th>Adjust</th>
<th>Located To Obtain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>250 MHz</td>
<td>455 Kc</td>
<td>Minimum</td>
<td>2nd I.F. Trimmers</td>
<td>Top of Chassis</td>
</tr>
<tr>
<td>3</td>
<td>1720 Kc</td>
<td>B.C. Osc. Trimmer</td>
<td>Nearest Front</td>
<td>I.F. Transformer</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1500 Kc</td>
<td>S.W. &amp; Rock Gang</td>
<td>B.C. R.F. Trimmer</td>
<td>Loop Antenna</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>600 Kc</td>
<td>600 Kc-Pad</td>
<td>Top of Chassis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Check</td>
<td>1000 Kc</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>400 ohms</td>
<td>18.1 Mc</td>
<td>Minimum</td>
<td>S.W. Osc. Trimmer</td>
<td>Middle of Three</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>16 Mc</td>
<td>S.W. R.F. Trimmer</td>
<td>Rear of Three</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>16 Mc</td>
<td>S.W. R.F. Trimmer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*These trimmers are on a strip of three at the right hand end of the chassis.

**Push Button Setup**

When the push buttons are lifted a screw is exposed. This screw should be loosened by one or two turns by a screwdriver. Tune in the desired station manually, then firmly press the button until it hits the stop, making certain the gang setting does not change. Again lift the push button and tighten the screw. Manually tune the set, press the button just set up. If the adjustment was properly made proceed with the remaining buttons.
To properly align this receiver, a signal generator calibrated at 455 Kc., 1400 Kc., and 1730 Kc., is required. The oscillator trimmer is nearest the front panel and the loop trimmer is directly behind it.

Any combination of one 1 1/2 volt "A" battery and two 45 volt "B" batteries that will fit in the receiver case will be satisfactory. Battery drain is .2 amp., at 1 1/2 volts and 9 ma., at 90 volts.

**TABULATION FOR ALIGNMENT**

<table>
<thead>
<tr>
<th>STEPS</th>
<th>USE IN SERIES WITH GENERATOR</th>
<th>SET GENERATOR AT</th>
<th>SET GANG AT</th>
<th>ADJUST</th>
<th>LOCATED</th>
<th>TO OBTAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>.02 MFD. TO CHASSIS CONNECT HIGH SIDE OF GENERATOR TO GRID CAP OF 1A7G TUBE.</td>
<td>455 Kc.</td>
<td>QUIET POINT</td>
<td>2ND I.F. TRIMMERS</td>
<td>TOP OF 1ST I.F. TRIMMERS</td>
<td>MAXIMUM OUTPUT</td>
</tr>
<tr>
<td>2.</td>
<td>250 M.M.F.</td>
<td>1730 Kc.</td>
<td>1730 Kc.</td>
<td>OSCILLATOR TRIMMER*</td>
<td>SEE NOTE BELOW</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>250 M.M.F.</td>
<td>1400 Kc.</td>
<td>1400 Kc. &amp; ROCK GANG</td>
<td>LOOP TRIMMER*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* SEE PRECEDING PARAGRAPH FOR LOCATION OF TRIMMERS.

**LOOP TO CONSIST OF FIVE TO TEN TURNS OF INSULATED WIRE WOUND ON A THREE TO FOUR INCH FORM TO BE CLOSELY COUPLED TO THE LOOP ANTENNA IN THE RECEIVER.
### Push Button Set Up

To prevent the buttons from being set up on the wrong stations a signal generator should be used.

The button to the extreme right is the manual tuning button.

Adjust the lower screw (see Fig.) first as this is the oscillator; then adjust the upper screw for maximum output.

#### Stringing Diagram

- ![Stringing Diagram Image](image)

#### Button Layout

- ![Button Layout Image](image)

<table>
<thead>
<tr>
<th>Steps</th>
<th>In Series With Antenna</th>
<th>Set Generator At</th>
<th>Set Gang At</th>
<th>Adjust</th>
<th>Located</th>
<th>To Obtain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td>250 MMFD.</td>
<td>1st I.F. Trimmers</td>
<td>Rear of Chassis</td>
<td>Min. Output</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td>1600 Kc.</td>
<td>Osc. B.C. Trimmer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td>1500 Kc.</td>
<td>R.F. B.C. Trimmer</td>
<td>On Loop</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
<td>600 Kc.</td>
<td>600 Kc. Pad</td>
<td>See Fig.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td></td>
<td>400 Ohms</td>
<td>5.4</td>
<td>Osc. Police Trimmer*</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td></td>
<td>5 Mc.</td>
<td>5.4</td>
<td>R.F. Police Trimmer**</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td></td>
<td></td>
<td>18.1 Mc.</td>
<td>Osc. S.W. Trimmer*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td></td>
<td></td>
<td>16 Mc.</td>
<td>18.1 Mc.</td>
<td>R.F.S.W. Trimmer**</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

* **Tighten oscillator trimmer screw for maximum capacity, then unscrew until second peak is secured.**

** **Tighten R.F. trimmer screw for maximum capacity, then unscrew until first peak is secured.**
PUSH BUTTON SET UP

1. If the station you select for one of the buttons falls between 1500 to 2000 kilocycles be sure that the pin jack is in the upper strip.
2. Adjust the brass screw at the side of the lower trimmer until the wanted station is heard most clearly.
3. Adjust the lower trimmer screw for maximum volume.
4. A normal button making certain the station is still tuned in, check this reception against the reception on the button just set up. If it is the same proceed with the next station on the list.
5. If the station you desire to pick up falls between 1000 and 1550 kilocycles, you must remove the pin jack and place in the hole provided on the bottom edge of the upper trimmer (see figure 1).
6. Turn the lower trimmer screw back until the screw is off the trimmer plate.
7. Adjust the brass screw until the wanted station is heard most clearly.
8. Then adjust the upper trimmer until maximum volume is secured; if maximum volume cannot be had and the upper trimmer screw is down tight you must finish tuning with the lower trimmer screw.

ALIGNMENT INSTRUCTIONS

An output meter and a signal generator are required for proper alignment of these sets. The oscillator should be calibrated at the following points: 455 kc, 900 kc, 1400 kc, 1600 kc, 2000 kc, 3000 kc, 4000 kc, 6 Mc. 2 Mc, 5 Mc, 10 Mc, 15 Mc, and 18 Mc. Always keep the output of the signal generator as low as possible to prevent A.C. action and false settings. Connect the high side of the generator to the antenna terminal and the low side of it to the ground terminal making certain jumper on terminal strip is disconnected. Before aligning tighten wire trimmer screw.

TABULATION FOR ALIGNMENT

<table>
<thead>
<tr>
<th>STEP</th>
<th>VOLUME AND TUNE CONTROLS AT MAXIMUM</th>
<th>SET GENERATOR AT</th>
<th>SET GANG AT</th>
<th>ADJUST</th>
<th>LOCATED TO OBTAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
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<tr>
<td>2.</td>
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<tr>
<td>3.</td>
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<tr>
<td>4.</td>
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<tr>
<td>5.</td>
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<tr>
<td>6.</td>
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<td>7.</td>
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<td>8.</td>
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<td>9.</td>
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<td>10.</td>
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<tr>
<td>11.</td>
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<tr>
<td>12.</td>
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<tr>
<td>13.</td>
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<tr>
<td>14.</td>
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<tr>
<td>15.</td>
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<td></td>
</tr>
</tbody>
</table>

TUBE COMPLEMENT

<table>
<thead>
<tr>
<th>6SK7 R. F. AMPLIFIER</th>
<th>6SK7 PHASE INVERTER</th>
<th>MODELS</th>
<th>CHASSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SA7 CONVERTER</td>
<td>6SK7 DUO DRIVER</td>
<td>C-32</td>
<td>C-73</td>
</tr>
<tr>
<td>6J5 OSCILLATOR</td>
<td>2 - 6V6 OUTPUT</td>
<td>BK-110</td>
<td>C-32</td>
</tr>
<tr>
<td>6SK7 L. F. AMPLIFIER</td>
<td>2 - 5Y3G RECTIFIERS</td>
<td>BK-111</td>
<td>C-32</td>
</tr>
</tbody>
</table>

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FARNSWORTH TELEV & RADIO CORP.

MODEL 8507

FIVE TUBE BATTERY
TWO BAND SUPERHETERODYNE
BROADCAST BAND
SHORTWAVE BAND

540 KC - 1500 KC
6 MC - 18.3 MC

TABULATION FOR ALIGNMENT

<table>
<thead>
<tr>
<th>STEP</th>
<th>USE IN SERIES WITH ANTENNA</th>
<th>SET GENERATOR AT</th>
<th>SET GANG AT</th>
<th>ADJUST</th>
<th>LOCATED TO OBTAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>3.</td>
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<td>9.</td>
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</tbody>
</table>

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FARNSWORTH TELEV & RADIO CORP.

MODEL 8607

FIVE TUBE BATTERY
TWO BAND SUPERHETERODYNE
BROADCAST BAND
SHORTWAVE BAND

540 KC - 1500 KC
6 MC - 18.3 MC

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## TABULATION FOR ALIGNMENT

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<thead>
<tr>
<th>Steps</th>
<th>IN SERIES WITH ANTENNA</th>
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<th>SET GANG AT</th>
<th>ADJUST</th>
<th>LOCATED</th>
<th>TO OBTAIN</th>
</tr>
</thead>
<tbody>
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<td>1.</td>
<td>SET VOLUME AND TONE CONTROLS AT MAXIMUM</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2.</td>
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<td>4.</td>
<td>B.C. 250 MMFD</td>
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<tr>
<td>10.</td>
<td></td>
<td>6.0</td>
<td>Note B</td>
<td>R.F. Police Trimmer**</td>
<td></td>
<td></td>
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<td>11.</td>
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<tr>
<td>12.</td>
<td>S.W. 400 OHMS</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>13.</td>
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<tr>
<td>14.</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

* Tighten oscillator trimmer screw for maximum capacity, then unscrew until second peak is secured.

** Tighten R.F. trimmer screw for maximum capacity, then unscrew until first peak is secured.
MODEL 6141 ABT CHAMPION RADIO

456 K.C. INT FREQ. TRIM AT 1400 K.C.

TO BALANCE IF TRANS. CONNECT OSC.
TO CAP OF 6AB TUBE THRU .05 COND.
AND ADJUST TRIMMERS TO 456 K.C.

NOTE: BE SURE PROPER CONNECTIONS
ARE MADE ON FILTER. THE TWO TERMINALS
MARKED \( x \) TOGETHER AND CONNECT
TO INPUT ON 25Z6 TUBE.

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MICROPHONE CONNECTIONS

Provisions have been made so that a high impedance microphone may be connected to the record player. This will permit any sound picked up by the microphone to be heard through the radio receiver. The microphone cable should be equipped with standard 3/8" plugs which should be inserted into the holes in the plate marked "MICROPHONE" at the rear of the record player.

TUBE LOCATIONS

REAR OF CHASSIS

FREQUENCY ADJUSTMENT

Set the receiver to be used with this record player, to some frequency between 540 and 750 KC which is clear and free from interfering stations. Remove the plug near the volume control on top of the record player. Using an insulated screwdriver turn the screw, located beneath this plug, until the signal from the record player is heard in the receiver. This will be heard as a reduction in noise as the signal comes in tune with the receiver. If a record is being played, the music or sound from it may be tuned in. If it is desired to change the frequency, set the receiver to the new frequency and turn the screw until the signal is heard. The fact that stations which are entirely absent during the day may be present at night with strong signals, should be kept in mind in choosing the frequency to be used. Always choose a frequency which is free from strong interference at all times, day or night.

When the record player is located at some distance from the receiver, or under conditions when the signal from it is too weak, the coil of wire from the record player should be uncoiled enough to give a satisfactory signal. Under no conditions should more wire be uncoiled than is necessary for a reasonably strong signal in the receiver.

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VOLTAGES SHOWN ON THE CIRCUIT DIAGRAM ARE FROM SOCKET TERMINALS TO CHASSIS. WHEN MEASURING VOLTAGES USE A VOM HAVING A RESISTANCE OF AT LEAST 1000 OHMS PER VOLT. ALLOWANCES SHOULD BE MADE FOR VARIATIONS IN LINE VOLTAGES.

TUNING RANGE

This receiver is designed to operate over the standard broadcast band which extends from 535 to 1720 kilocycles and includes the popular 1712 KC police channel.

ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 435, 600, 1400 and 1720 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the broadcast band should be adjusted.

I.F. ALIGNMENT. With the gang condenser set at minimum, adjust the test oscillator to 458 KC and connect the output to the grid of the first detector tube (12A8GT) through a .05 or .1 mfd condenser. The ground on the test oscillator should be connected to the chassis ground. Align all four I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. Remove chassis, shield, and loop antenna from cabinet and set them up on the bench so that they occupy exactly the same respective positions on the bench as they did in the cabinet. Care should be taken to have no iron or other metal near the loop. Do not make this setup up on a metal bench.

Connect the test oscillator to the antenna of the set through a 200 mmfd. (.0022) condenser. With the gang condenser at minimum capacity, set the test oscillator at 1720 KC, and adjust the oscillator (or 1720 KC trimmer) on gang condenser. Next—set the test oscillator at 1400 KC, and tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.
FIRESTONE TIRE & RUBBER CO.

VOLTAGES SHOWN ON THE CIRCUIT DIAGRAM ARE FROM SOCKET TERMINALS TO CHASSIS BARE. IN MEASURING VOLTAGES USE A VOLTMETER HAVING A RESISTANCE OF AT LEAST 1000 OHMS PER VOLT. ALLOWANCES SHOULD BE MADE FOR VARIATIONS IN LINE VOLTAGE.

TUNING RANGE

This receiver is designed to operate over the standard broadcast band which extends from 535 to 1720 Kilocycles and includes the popular 1712 KC police channel.

ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 600, 1400 and 1720 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all adjustments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peacked, the broadcast band should be adjusted.

I. F. ALIGNMENT. With the ganging condenser set at minimum, adjust the test oscillator to 455 KC and connect the output to the grid of the first detector tube (12A8GT) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the chassis ground. Align all four I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. Remove chassis, shield, and loop antenna from cabinet and set them up on the bench so that they occupy exactly the same respective positions on the bench as they did in the cabinet. Care should be taken to have no iron or other metal near the loop. Do not make this set up on a metal bench. Connect the test oscillator to the antenna of the set through a 200 mfd. (0002) condenser. With the ganging condenser set at minimum capacity, set the test oscillator at 1720 KC, and adjust the oscillator (or 1720 KC trimmer) on ganging condenser. Next set the test oscillator at 1400 KC, and tune in the signal on the ganging condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 800 KC, and tune in signal on condenser to check alignment of coils.
TO SET UP THE BUTTONS FOR AUTOMATIC TUNING:

1. Turn the set on and allow it to operate at least fifteen minutes before attempting to set up the buttons.

2. Make a list of the frequencies of six nearby stations to which you wish to set the buttons. Be sure to select the most powerful nearby stations, since weak signals will not give as satisfactory results. Also be sure to select stations that fall well within the frequency range of the buttons as shown in Fig. 1.

3. With the Band Switch in the “AM” Position tune in the station to be set up. Then turn the range switch to Automatic Position “AUT.” Position and push in the button to be set up, being sure to select a button with the proper frequency range (see Fig. 1).

4. At the back of the chassis, as viewed from the rear of the radio, will be found 12 holes numbered in pairs to correspond to the numbers of the buttons. See Fig. 1. Adjust the "a" screw with the number corresponding to the number of the button you have pushed in, until the same station is again heard. Tune accurately, adjusting for deepest tone.

5. Now adjust the “b” screw (located below the “a” screw) until maximum output is obtained. Make a final adjustment on the “a” screw, always tuning for deepest tone.

6. The set-up is now complete for this button. The remaining buttons may be set up in the same way.

ALIGNMENT PROCEDURE

1. Connect the output meter across the voice coil or from the plate of the 1500 output tube to ground through a 1-mfd condenser. (The more sensitive type should be connected across the voice coil.)

2. Connect the ground lead of the signal generator to the receiver chassis.

3. Tune the volume control to the maximum volume position and keep it in this position throughout the alignment procedure.

4. Check the pointer to see that it is correctly set. Connect the loop antenna as shown in Fig. 3.

<table>
<thead>
<tr>
<th>Dummy Ant.</th>
<th>Connection of Sig. Generator</th>
<th>Signal Generator Frequency</th>
<th>Band Switch Position</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MFD. Condenser</td>
<td>Lug on Rear Section of Geny Condf.</td>
<td>455 KC</td>
<td>Broadcast</td>
<td>Any Point Where It Does Not Affect the Signal</td>
<td>1-2</td>
<td>2nd I.F.</td>
<td>Adjust for Maximum Output, Then Repeat Adjustment.</td>
</tr>
<tr>
<td>200 MMFD. Micro Condenser</td>
<td>External Ant. Terminal</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>1500 KC</td>
<td>5</td>
<td>Broadcast Oscillator (Shunt)</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td>200 MMFD. Micro Condenser</td>
<td>External Ant. Terminal</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>Tune to 1500 KC Generator Signal</td>
<td>6*</td>
<td>Broadcast Antenna</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td>200 MMFD. Micro Condenser</td>
<td>External Ant. Terminal</td>
<td>600 KC</td>
<td>Broadcast</td>
<td>Tune to 600 KC Generator Signal</td>
<td>7*</td>
<td>Broadcast Oscillator (Series)</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>External Ant. Terminal</td>
<td>2.5 KC</td>
<td>Intermediate</td>
<td>Tune to 2.5 KC Generator Signal</td>
<td>8</td>
<td>Intermediate Antenna</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>External Ant. Terminal</td>
<td>16 MC</td>
<td>Foreign</td>
<td>16 MC</td>
<td>9</td>
<td>Foreign Oscillator</td>
<td>Adjust for Maximum Output. Check or see if Proper Peak was Obtained by Tuning in Image of Approx. 16.1 MC. If Image does not appear, Realize at 16 MC, with Trimmer Screw farther out. Recheck Image.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>External Ant. Terminal</td>
<td>16 MC</td>
<td>Foreign</td>
<td>Tune to 16 MC Generator Signal</td>
<td>10</td>
<td>Foreign Antenna</td>
<td>Adjust for Maximum Output. Try to Increase Output by Retuning Trimmers and Retuning Receiver Dial until Maximum Output is Obtained.</td>
</tr>
</tbody>
</table>

*When making these adjustments the loop must be in the same relative position to the chassis as when in the cabinet. Using a weak radiated signal, repeat adjustment 6 after set is in cabinet.

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ALIGNMENT PROCEDURE

1. Connect the output meter across the voice coil or across the plates of the SFLG output tubes depending on the type of set. (The more sensitive type should be connected across the voice coil.)
2. Connect the ground lead of the signal generator to the receiver chassis or to the "G" terminal at the back of the chassis. NOTE: The "G" and "D" terminals on this terminal strip must be connected together.
3. Turn the volume control to the maximum volume position and keep it in this position throughout the alignment procedure.
4. Push in the "Selectivity" button and keep it pushed in. Check the pointer to see that it is in correct set.

<table>
<thead>
<tr>
<th>Dummy Ant in Series with Big Gen.</th>
<th>Connection of Big Generator to Output to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Band Switch Position</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>.1 MFD Condenser</td>
<td>Log on Middle Point of Gaging Cond.</td>
<td>455 KC Broadcast</td>
<td>Any Point Where It Does Not Affect the Signal</td>
<td>1-2 3-4 5-6</td>
<td>1st I.F.</td>
<td>Adjust for Minimum Output. Then Repeat Adjustment.</td>
<td>1st I.F.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>&quot;A&quot; Terminal</td>
<td>455 KC Broadcast</td>
<td>Any Point, Where It Does Not Affect the Signal</td>
<td>5-6</td>
<td>Wave Temp.</td>
<td>Adjust for Minimum Output, Using a Strong Generator Signal.</td>
<td>2nd I.F.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>&quot;A&quot; Terminal</td>
<td>1500 KC Broadcast</td>
<td>Any Point, Where It Does Not Affect the Signal</td>
<td>6-7</td>
<td>Broadcast Oscillator (Shift)</td>
<td>Adjust for Minimum Output.</td>
<td>3rd I.F.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>&quot;A&quot; Terminal</td>
<td>1500 KC Broadcast</td>
<td>Tone at 1500 KC Generation Signal</td>
<td>7-8</td>
<td>Broadcast Oscillator (Shift)</td>
<td>Adjust for Minimum Output.</td>
<td>4th I.F.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>&quot;A&quot; Terminal</td>
<td>600 KC Broadcast</td>
<td>Tone at 600 KC Generation Signal</td>
<td>9-10</td>
<td>Broadcast Oscillator (Shift)</td>
<td>Adjust for Minimum Output, Try to Increase Output by Retuning Trim and Retuning Resistor Unit Until Minimum Output is Obtained.</td>
<td>2nd I.F.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>&quot;A&quot; Terminal</td>
<td>6 MC Intermediate</td>
<td>Tone at 600 KC Generation Signal</td>
<td>11-12</td>
<td>Intermediate Antenna</td>
<td>Adjust for Minimum Output. Check to see if Proper Pack was Obtained by Tuning in Decades at Approx. 1.5 MC. If Not, Adjust Trim and Retune till Proper Pack is Obtained.</td>
<td>3rd I.F.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>&quot;A&quot; Terminal</td>
<td>9 MC Intermediate</td>
<td>Tone at 600 KC Generation Signal</td>
<td>13-14</td>
<td>Intermediate Antenna</td>
<td>Adjust for Minimum Output. Check to see if Proper Pack was Obtained by Tuning in Decades at Approx. 1.5 MC. If Not, Adjust Trim and Retune till Proper Pack is Obtained.</td>
<td>4th I.F.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>&quot;A&quot; Terminal</td>
<td>20 MC Foreign</td>
<td>Tone at 600 KC Generation Signal</td>
<td>15-16</td>
<td>Foreign Antenna</td>
<td>Adjust for Minimum Output, Check to see if Proper Pack was Obtained by Tuning in Decades at Approx. 1.5 MC. If Not, Adjust Trim and Retune till Proper Pack is Obtained.</td>
<td>5th I.F.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>&quot;A&quot; Terminal</td>
<td>20 MC Foreign</td>
<td>Tone at 600 KC Generation Signal</td>
<td>17-18</td>
<td>Foreign Antenna</td>
<td>Adjust for Minimum Output, Check to see if Proper Pack was Obtained by Tuning in Decades at Approx. 1.5 MC. If Not, Adjust Trim and Retune till Proper Pack is Obtained.</td>
<td>6th I.F.</td>
</tr>
</tbody>
</table>

LETTERS ON TERMINALS OF SWITCHES SHOWN ABOVE CORRESPOND TO SIMILARLY LETTERED TERMINALS ON THE SWITCHES SHOWN IN THE CIRCUIT DIAGRAM.

MICROSCOPIC PARTS

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>114467</td>
<td>Bond indicator slide &amp; strip.</td>
<td>$0.36</td>
</tr>
<tr>
<td>114514</td>
<td>Push for tuning eye.</td>
<td>$0.25</td>
</tr>
<tr>
<td>114621</td>
<td>Rocker &amp; pulley assembly—right hand.</td>
<td>$0.34</td>
</tr>
<tr>
<td>114624</td>
<td>Rocker &amp; pulley assembly—left hand.</td>
<td>$0.49</td>
</tr>
<tr>
<td>117700</td>
<td>Cable &amp; socket for tuning eye.</td>
<td>$1.00</td>
</tr>
<tr>
<td>117715</td>
<td>Clump for dial scale.</td>
<td>$0.95</td>
</tr>
<tr>
<td>117778</td>
<td>Clump for tuning eye.</td>
<td>$1.00</td>
</tr>
<tr>
<td>118009</td>
<td>Clip for tuning eye.</td>
<td>$0.25</td>
</tr>
<tr>
<td>118011</td>
<td>Collar for hand switch.</td>
<td>$1.00</td>
</tr>
<tr>
<td>118031</td>
<td>Connector—for contact strip.</td>
<td>$0.25</td>
</tr>
<tr>
<td>118052</td>
<td>Card—diode (used).</td>
<td>$0.05</td>
</tr>
<tr>
<td>118108</td>
<td>Card—diode (used).</td>
<td>$0.05</td>
</tr>
<tr>
<td>118115</td>
<td>Cushion rubber for back of chassis.</td>
<td>$0.05</td>
</tr>
<tr>
<td>118123</td>
<td>Dial scale.</td>
<td>$1.00</td>
</tr>
<tr>
<td>118126</td>
<td>Drum—diode (used).</td>
<td>$0.54</td>
</tr>
<tr>
<td>118132</td>
<td>Emitter—diode.</td>
<td>$0.10</td>
</tr>
<tr>
<td>118138</td>
<td>Emitter—diode.</td>
<td>$0.10</td>
</tr>
<tr>
<td>118151</td>
<td>Emitter—push button.</td>
<td>$0.05</td>
</tr>
<tr>
<td>118186</td>
<td>Geiger—on range switch shaft.</td>
<td>$0.25</td>
</tr>
<tr>
<td>118207</td>
<td>Geiger—miniature range switch shaft.</td>
<td>$0.25</td>
</tr>
<tr>
<td>118208</td>
<td>Knob for tuning or volume.</td>
<td>$0.10</td>
</tr>
<tr>
<td>118209</td>
<td>Light shield.</td>
<td>$0.05</td>
</tr>
</tbody>
</table>

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**SOCKET VOLTAGES — ALL D.C. POTENTIAL MEASURED TO CHASSIS**

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>H</th>
<th>K</th>
<th>G</th>
<th>G₁</th>
<th>S</th>
<th>SU</th>
<th>P</th>
<th>D₁</th>
<th>D₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SA7</td>
<td>1st DET.</td>
<td>12.0 A.C.</td>
<td>3.1</td>
<td>O</td>
<td>-8</td>
<td>80</td>
<td>O</td>
<td>130</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12SK7</td>
<td>I.F. AMP.</td>
<td>12.0 A.C.</td>
<td>O</td>
<td>-8</td>
<td>80</td>
<td>130</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12SQ7</td>
<td>2nd DET. — A.V.C. &amp; A.F.</td>
<td>12.0 A.C.</td>
<td>O</td>
<td>O</td>
<td>65</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>25L66G</td>
<td>OUTPUT</td>
<td>24.0 A.C.</td>
<td>O</td>
<td>Note A</td>
<td>130</td>
<td>122</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DIAL TUNED TO 540 KC.**

**I.F. 465 KC**

**FOR PUSH-BUTTON TUNER DATA**

**INDEX**

**NOTE A:** Bias on this grid is -8.5 volts. It can not be measured with an ordinary voltmeter because of the high resistances of resistors No. 9 and No. 15.

Use a high resistance voltmeter of at least 1000 ohms per volt.
S-7404-6
ALIGNMENT EQUIPMENT & PROCEDURE
1. Connect the output meter across the voice coil or from plate to plate of the EFG output tubes through a .1 mfd. condenser. (The more sensitive type should be connected across the voice coil.)
2. Connect the ground lead of the signal generator to the receiver chassis and plug black wire lead from chassis into the inside clip on loop drum top.
3. Turn the volume control to the maximum position and keep it in this position throughout the alignment procedure.
4. Push in the "Manual" button and keep it pushed in. Check the pointers to see that it is correctly set to 400 KC. with copper in full mesh.
5. The loop must be connected as indicated in circuit diagram at all times.

<table>
<thead>
<tr>
<th>Dummy Ant. in Series with Sig. Gen.</th>
<th>Connection of Sig. Generator Output to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Band Switch Position</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MF-2 Condenser</td>
<td>Loop at Third Section of Gating Cond.</td>
<td>455 KC</td>
<td>Broadcast</td>
<td>1-2</td>
<td>3-4</td>
<td>Adjust for Maximum Output. Then repeat adjustment</td>
<td></td>
</tr>
<tr>
<td>200 MFD. Micro Condenser</td>
<td>Clip on Loop Drum</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>5</td>
<td></td>
<td>Adjust for Maximum Output.</td>
<td></td>
</tr>
<tr>
<td>200 MFD. Micro Condenser</td>
<td>Clip on Loop Drum</td>
<td>1500 KC</td>
<td>Tune to 1500 KC</td>
<td>6</td>
<td></td>
<td>Adjust for Maximum Output.</td>
<td></td>
</tr>
<tr>
<td>200 MFD. Micro Condenser</td>
<td>Clip on Loop Drum</td>
<td>600 KC</td>
<td>Tune to 600 KC</td>
<td>7</td>
<td></td>
<td>Adjust for Maximum Output.</td>
<td></td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Clip on Loop Drum</td>
<td>5 MC</td>
<td>Intermediate</td>
<td>8</td>
<td></td>
<td>Adjust for Maximum Output.</td>
<td></td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Clip on Loop Drum</td>
<td>5 MC</td>
<td>Tune to 5 MC</td>
<td>9</td>
<td></td>
<td>Adjust for Maximum Output.</td>
<td></td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Clip on Loop Drum</td>
<td>16 MC</td>
<td>Foreign</td>
<td>10</td>
<td></td>
<td>Adjust for Maximum Output.</td>
<td></td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Clip on Loop Drum</td>
<td>16 MC</td>
<td>Tune to 16 MC</td>
<td>11</td>
<td></td>
<td>Adjust for Maximum Output.</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Readings trimmer No. 6 after set is in cabinet by placing range switch in broadcast position, and adjusting for maximum output on a weak signal at approximately 1500 KC.

---

S-7404-5
S-7406-6
ALIGNMENT EQUIPMENT & PROCEDURE

<table>
<thead>
<tr>
<th>Dummy Ant. in Series with Sig. Gen.</th>
<th>Connection of Sig. Generator Output to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Band Switch Position</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MF-2 Condenser</td>
<td>Rear lug of Condenser</td>
<td>455 KC</td>
<td>Broadcast</td>
<td>1-2</td>
<td>3-4</td>
<td>Adjust for maximum output. Then repeat adjustment</td>
<td></td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>External Antenna Terminal Blue Wire</td>
<td>16 MC</td>
<td>Foreign</td>
<td>5</td>
<td></td>
<td>Adjust for maximum output.</td>
<td>Check to see if inner pot was ejected by turning a dial at least 1.5-2 turns to add the voltage in the 26 MC with trimmer move further set. Recheck setup.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>External Antenna Terminal Blue Wire</td>
<td>16 MC</td>
<td>Tuned to 16 MC</td>
<td>6</td>
<td></td>
<td>Adjust for maximum output.</td>
<td>Check to see if inner pot was ejected by turning a dial at least 1.5-2 turns to add the voltage in the 26 MC with trimmer move further set. Recheck setup.</td>
</tr>
<tr>
<td>150 MFD. Micro Condenser</td>
<td>External Antenna Terminal Blue Wire</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>7</td>
<td>8</td>
<td>Adjust for maximum output.</td>
<td></td>
</tr>
<tr>
<td>150 MFD. Micro Condenser</td>
<td>External Antenna Terminal Blue Wire</td>
<td>1500 KC</td>
<td>Tune to 1500 KC</td>
<td>8</td>
<td></td>
<td>Adjust for maximum output.</td>
<td></td>
</tr>
<tr>
<td>100 MFD. Micro Condenser</td>
<td>External Antenna Terminal Blue Wire</td>
<td>600 KC</td>
<td>Tuned to 600 KC</td>
<td>9</td>
<td></td>
<td>Adjust for maximum output.</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: These adjustments should be made with the set in the cabinet. Use a weak radiated signal at 1500 KC.
CIRCUIT FEATURES

This receiver is designed to operate over the standard broadcast and some American countries, also the popular 1712 kilocycle band which extends from 550 to 1712 kilocycles (2374 to 5600 kc) for the AM broadcast range. A new feature is available in the AM broadcast range. A new feature is the use of a test oscillator that covers the frequencies of 455, 600, 1400, and 1700 kc. This feature is intended to allow the operator to check the performance of the receiver. The oscillator can be used to check the audio frequency response of the receiver and to verify the proper operation of the audio amplifiers. The oscillator can also be used to check the frequency response of the receiver. This is done by connecting the oscillator to the input of the receiver and observing the output. The output should be a constant level regardless of the frequency of the oscillator. If the output varies, the amplifier stage may be defective.

ALIGNMENT PROCEDURE

GENERAL DATA: The alignment of this receiver involves the use of a test oscillator that covers the frequencies of 455, 600, 1400, and 1700 kc and on an external source to be connected across the primary or secondary of the output transformer. It is possible, all adjustments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the audio from the output transformer. The following adjustments are required:

- Lo-Frequency Alignment
- Medium-Frequency Alignment
- High-Frequency Alignment

CONTINUITY ALIGNMENT PROCEDURE: The inserted frequency (600 kc) should be adjusted properly on the first step. After the test oscillator has been properly adjusted and checked, the tremolo band should be adjusted.

BROADCAST BAND ALIGNMENT: A new feature is the use of a test oscillator that covers the frequencies of 455, 600, 1400, and 1700 kc. This feature is intended to allow the operator to check the performance of the receiver. The oscillator can be used to check the audio frequency response of the receiver and to verify the proper operation of the audio amplifiers. The oscillator can also be used to check the frequency response of the receiver. This is done by connecting the oscillator to the input of the receiver and observing the output. The output should be a constant level regardless of the frequency of the oscillator. If the output varies, the amplifier stage may be defective.

CAUTION: NEVER LEAVE RECORDS ON TURNABLE, EXCEPT WHILE PLAYING THEM. THE RECORDS WILL BE DAMAGED BY WRAPPING
**Models B2RC, B3RC and B4RC**

**IMPORTANT**

All service adjustments on Motorola Record Changers should be made with the instrument in a normal operating position.

Therefore, the instrument should be supported in such fashion that parts underneath are accessible. A jig consisting of four centersupport posts would be helpful. A mirror would also permit the service man to make observations and adjustments without getting into awkward positions.

**CHECK THE RECORD FIRST**

Before attempting to service or adjust this Record Changer, check the record first to make sure they are not causing the trouble. The instrument will not handle all of the 10 or 12 inch records now available on the market, but it is not guaranteed to handle all of them. Records must be in good mechanical condition, and should not be skewed, particularly around the center hole. Do not try to play automatically, records that are too thick, too thin, or that are uneven or undamaged, as regards diameter of record or center hole. Do not have 10 and 12 inch records on the Changer.

Old records made before the days of automatic record changers may not change automatically, due to the differences in thickness, or to lack of a proper eccentric groove at the finish. Most of the old records, however, may be played one at a time.

**THEORY OF OPERATION**

As in most modern phonograph turntables, power is derived from an electric motor. This power is transmitted to the turntable through a geared down rim drive of the friction type.

The turntable is keyed to a small drive pulley, which in turn drives a large (5 inch) pulley, through a spring belt, both of these units being located on top of the base plate. (See Fig. 1). The 5 inch pulley transmits power by direct drive to another small pulley located under the mounting plate. This second small pulley in turn drives the large (4 inch) main drive wheel, also located under the mounting plate.

When the turntable revolves, all of these pulleys and wheels mentioned above, also revolve—regardless of whether or not the Changer is going through a cycle of changing a record. By means of this series of pulleys, a high ratio is obtained between the motor and the changing mechanism, which assures ample power.

**SETTING FOR 10 OR 12 INCH RECORDS**

The record support platform is adjustable for either 10 or 12 inch records, depending upon which "lip" is turned toward the center of the turntable. The platform may be swung in an arc of 180 degrees, so that either the 10 or 12 inch lip may point toward the spindle.

Underneath the mounting plate, and mounted rigidly to the record platform support shaft, is an eccentric mechanism which moves the record-platform support, thereby making it possible to start the changing cycle at any time, regardless of whether or not the record has been completely played. By this means a record can be "rejected". The wiring diagram showing switches and magnet can be seen in Fig. 2.

**TO ADJUST AUTOMATIC CHANGE SWITCH**

The Automatic Switch (See Fig. 7) starts the changing cycle after a record has been completely played. The switch is actuated by the oscillating of the tone arm in the eccentric mechanism. When the arm is pulled back, a spring clip, which grips the movable switch shunt, is released, and the switch is closed. If the switch fails to open, or will not open, it may be readily adjusted by means of the adjustment screw (F). (See Fig. 7).

To make the adjustment, place a record on the turntable, start it revolving, and move the pick-up over to the end of the record. Adjust screw (F) until switch closes the magnet circuit and starts the change cycle. Check points visually to make sure they do not remain closed after cycle is completed.

If the Changer immediately starts another cycle, it indicates that the points are remaining closed or that the clutch release spring (G) (Fig.8) does not have enough tension. This tension may be increased by taking it up another notch.

---

**Diagram**

- **Automatic Change Switch**
- **Circuit Breaker**
- **Drive Pawl**
- **Elevating Pin**
- **Reject Switch**
- **Electrical Circuit**

**Fig. 2**

**Fig. 3**
By referring to the various photographs and figures which will be found in the Service Manual, you can readily follow through the changing cycle from the continuity given hereafter.

1. The needle in the pick-up finishes a record and enters the eccentric groove.

2. As the pick-up has slowly approached the eccentric groove, a phosphor bronze spring clip has gripped a fin of the automatic change switch.

3. When the needle enters the eccentric groove on the record, the pick-up oscillates slightly, which in turn causes the automatic change switch to make contact.

4. The first momentary contact of the automatic change switch is all that is necessary to start the changing cycle. When the switch closes, a small electro magnet is energized. The electro magnet pulls an armature back out of the way, permitting a drive pawl which is mounted on the cam wheel to fall down and engage in one of the notches which are provided on the upper surface of the main drive wheel. (See Fig. 2.)

5. Since the main drive wheel is already revolving, the engagement of the pawl now causes the cam wheel to revolve with it.

6. When the cam wheel starts to revolve, it causes several things to happen. In the first few degrees of revolution, it opens a circuit breaker switch (Fig. 3) which automatically opens the magnet circuit, thereby de-energizing it, to prevent "chattering".

7. The next few degrees of rotation cause the pick-up elevating pin to ride up on an inclined section of the cam, thereby elevating the pick-up and lifting the needle from the record which has just been played. (See Fig. 3.)

8. A few more degrees of revolution cause the pick-up guide groove on top of the cam wheel. This part of the mechanism is not visible, since the cam wheel is mounted too close to the mounting plate, but Fig. 4 shows a drawing of the upper surface of the cam wheel. As the wheel revolves with the pin in the groove, it causes the pick-up to swing out beyond the edge of the record as it will be out of the way when the next record falls on the turntable.

9. The cam wheel continues its revolution, and at another point on its circumference a roller on the end of the trip-lever rides up an inclined section on the cam. This trip-lever is the copper-plated rod which is hinged approximately in the center by running through a die cast fulcrum block. As the roller on one end of the trip-lever rolls up the incline on the cam, the other end of the trip-lever bears against the push rod which operates the record release, which is located near the top of the spindle, causing it to push the next record off its support, thereby dropping it on the turntable. (See Fig. 5.)

10. The cam continues to revolve, the groove in the top bringing the pick-up back over the edge of the record to the proper position where the needle will fall near the first groove when it comes down.

11. A few more degrees of revolution, and the pick-up elevating pin rides down another incline, permitting the needle to settle gently on the first groove of the record. (Fig. 3.)

12. At this point, the cam has completed one full revolution of 360 degrees. At the same time the needle touches the record, the drive pawl hits the magnet armature, which forces it up, thereby disengaging it from the notch in the drive wheel. The cam wheel therefore stops, the turntable continues to revolve, and the record is played.

13. During the last few degrees of revolution, the circuit breaker switch has again been closed, as its fibre stud rides up an incline on the lower surface of the cam. (Fig. 3.) This switch must be closed at all times except when the instrument is going through a changing cycle, otherwise, it would be impossible to start a new changing cycle automatically.
TO ADJUST RECORD RELEASE

1. Place a stack of 10 inch records on the changer, after turning the record support platform to the "10 inch" position.
2. Start the turntable revolving.
3. Press the "Start-Reject" button.
4. If the first record does not drop to the turntable, double check the record to make sure that it is not too thin, or that the diameter of the center hole is not undersized, causing it to bind.
5. If the record proves to be normal, and is not causing the failure, tighten lock nut (C), shown in Figs. 5, 6, or 7.
6. With a slab-hand wrench, turn screw (D) a fraction of a turn clockwise, and press the "Start-Reject" button again, checking to see if record is released.
7. If the record fails to drop, tighten screw (D) a trifle at a time, testing after each adjustment, until setting is reached, which releases record.
8. Tighten lock nut (C), after which a few more records should be changed, to make sure this did not alter adjustment of screw (D).

TO ADJUST PICK-UP POSITION

This adjustment is made to cause the needle to drop in the first groove of the record, as the Changer completes a changing cycle.

1. Turn the record support to the 10 inch position. (See Fig. 1.)
2. Place a standard 10 inch record on the turntable and start it revolving.
3. Press the "Start-Reject" button. The Changer now starts a changing cycle.
4. Do not let the Changer complete the cycle, but stop it at the point where the pick-up starts to drop down towards the outer rim of the record. If the cycle is stopped at the right point, the pick-up will still be "in cycle" and will not be free to swing back and forth. Check this gently. Do not exert too much sideways pressure on the pick-up.
5. Now loosen the two brass-steel set screws (A) in the bell crank casting (B), which you may see in Fig. 7.
6. With the set screws loose, the pick-up arm can now be moved back and forth. Move it to the point where the needle rests directly over the first groove in the record.

TO LINE UP RECORD PLATFORM

It is important that all points on the "lip" of the record be equidistant from the center point of the spindle. This will assure that all points of the record will leave the platform at the same time. If the record support is too far out of alignment, the record would actually hang on the point nearest the spindle and fail to drop properly.

1. To check this alignment, turn the spindle-cap so it is in alignment with the rest of the spindle, which is the correct position for recording records. (See Fig. 8.)
2. Turn the record support platform to the "10 inch record" position, making sure it is turned all the way to the stop.
3. Slip a standard 10 inch record over the spindle and check to make sure it clears the lip of the platform at all points. (See Fig. 9.)
4. If one point on the lip extends farther than the other, the position of the record support may be adjusted after loosening the two brass-steel set screws (A), located directly under the numeral "10" on the record support. (See Fig. 9.)

CAUTION: Make sure the eccentric selector cam, which is located under the base, is turned all the way to its stop. (See Fig. 4.)

TEXT: After tightening the set screws, test the adjustment by running a 10 inch record through a complete cycle and check the point where the needle falls. If the needle misses the record by one inch, the record platform is 180 degrees out of line with the eccentric cam, and should be turned one-half turn without turning the cam.

TURN SPINDLE CAP IN THIS POSITION TO LOAD RECORDS

TURN SPINDLE CAP IN THIS POSITION TO REMOVE RECORDS

(Fig. 8)

6. Now place a 12 inch record on the turntable, and the record support to the 12 inch position.
7. Press the "Start-Reject" button and let the Changer go through another cycle, watching carefully to make sure the needle comes down on the record at the proper point. If necessary, make minor readjustment.

SPINDLE THIS DIMENSION MUST EQUAL THIS ONE SET SCREWS LOCATED HERE 12

(Fig. 9)
Model 550

ALIGNMENT PROCEDURE

1. Connect the signal generator to the control grid of the 6C64 or 6C6 tube (DEAD) through a 1 MF condenser, having first re- moved the shield from the base of the tube. Connect a 5000 volt wire to the grid to the grid cap and move up the tube. Turn the condenser and the output of mesh. Connect an output meter across the speaker voice coil.

2. Set the signal generator at 600 K.C. and turn the condenser and the output of mesh. Connect an output meter across the speaker voice coil.

3. Adjust the two trinents in the P.F. coil for maximum output reading.

4. Repeat the above steps several times for maximum accuracy.

I.P. AND ANTENNA ALIGNMENT

1. Connect the signal generator to the control grid of the 6C6 tube (DEAD) using the same 1 MF condenser.

2. Set the signal generator at 1300 K.C. and the condenser and the output of mesh. Adjust the 1300 K.C. condenser until the point showing the highest output reading.

3. Set the signal generator at 350 K.C. and turn the condenser and the output of mesh. Connect an output meter across the speaker voice coil.

NOTE: All measurements must be made with the volume control set for full volume. The shielded lead from the signal generator is connected to the grid terminal of the tube through a 1 MF condenser, with a 5000 volt wire connected as a leak resistance between the grid of the tube and the grid lead wire has been removed.

When raising the sensitivity of the antenna terminal, use a special dummy, part No. 610818, in place of the JFQ. It must be remembered that the abse and allowance must be varied for variations between two sets of the same general type, due to difference of tube characteristics, etc.

Figure 1 - Trinents

1. F. ALIGNMENT

1. Change to 0.5 PF condenser in signal generator lead. Set signal generator at 1060 K.C. and with the condenser gang still completely out of mesh, adjust the oscillator trimmer to the point showing the highest output reading.

2. Set the signal generator at 1400 K.C. and turn the condenser gang to the point showing the highest output reading.

3. Set the signal generator at 600 K.C. and turn the condenser gang to the point showing the highest output reading.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

All stage gain measurements must be made with the volume control set for full volume. The shielded lead from the signal generator is connected to the grid terminal of the tube through a 1 MF condenser, with a 5000 volt wire connected as a leak resistance between the grid of the tube and the grid lead wire has been removed.
**Models 34K-6 and 34K-7 For 1940 PACKARD**

**ALIGNMENT PROCEDURE**

Remove the chassis from the housing and place it on the service bench. Turn the volume control to maximum and leave it there throughout the alignment, reducing the signal generator output, if necessary.

1. Connect the signal generator to the control grid of the oscillator tube and to chassis ground using a .1 MFD. condenser in series with a .001 mfd. resistor. Turn the condenser knob completely out of mesh. Connect an output meter across the speaker voice coil.

2. Set the signal generator at 150 K.C. and carefully adjust the trimmer in the diode cell to the point showing the highest reading on the output meter. (Advance the signal generator attenuator, if necessary, to pick up signal).

3. Adjust the trimmer in the I.F. coil to the point showing the highest output reading.

4. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

**SENSITIVITY AND STAGE GAIN MEASUREMENTS**

All stage gain measurements must be made with the volume control set for full volume. The shunted lead from the signal generator is connected to the grid terminal of the tube through a .1 MFD condenser, with a 500 Ω resistor connected as leak resistance between the grid of the tube and the grid lead which has been removed.

When measuring overall sensitivity at the antenna terminal, use a special dummy, part No. 1X10010, in place of the .1 MFD. It must be remembered that the figures in the table are average and allowance must be made for variations between two sets of the same type, due to differences in tube characteristics, etc.

<table>
<thead>
<tr>
<th>INPUT</th>
<th>34K6</th>
<th>34K7</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICROVOLTS</td>
<td>MICROVOLTS</td>
<td>GENERATOR</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>SET AT</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>I.F. Grid</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>Mod. Grid</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>.1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>.1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>600 K.C.</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>600 K.C.</td>
</tr>
</tbody>
</table>

* For one watt output.  
** Meter connected across voice coil.

**NOTE:** If set is not used with a Motorola Booster antenna, substitute a .5 MFD condenser for the Special Dummy.

**Model No. 27-D-6**

Specifically Designed to be Installed in 1940

**CHRYSLER DESOTO DODGE PLYMOUTH**

**SENSITIVITY AND STAGE GAIN MEASUREMENTS**

All stage gain measurements must be made with the volume control set for full volume. The shunted lead from the signal generator is connected to the grid terminal of the tube through a .1 MFD condenser, with a 500 Ω resistor connected as a leak resistance between the grid of the tube and the grid lead which has been removed.

When measuring overall sensitivity at the antenna terminal, use a special dummy, part No. 1X10010, in place of the .1 MFD. It must be remembered that the figures in the table are average and allowance must be made for variations between two sets of the same type, due to differences in tube characteristics, etc.

<table>
<thead>
<tr>
<th>INPUT</th>
<th>AVERAGE</th>
<th>34K-6</th>
<th>34K-7</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICROVOLTS</td>
<td>MICROVOLTS</td>
<td>GENERATOR</td>
<td>GENERATOR</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>SET AT</td>
<td>CONNECTED TO</td>
</tr>
<tr>
<td>800</td>
<td>400 K.C.</td>
<td>I.F. Grid</td>
<td>.1</td>
</tr>
<tr>
<td>180</td>
<td>450 K.C.</td>
<td>Mod. Grid</td>
<td>.1</td>
</tr>
<tr>
<td>320</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1</td>
</tr>
<tr>
<td>60</td>
<td>600 K.C.</td>
<td>R.F. Grid</td>
<td>.1</td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>***</td>
</tr>
</tbody>
</table>

* For one watt output.  
** Meter connected across voice coil.

**NOTE:** If set is not used with a Motorola Booster antenna, substitute a .5 MFD condenser for the Special Dummy.

---

Compliments of www.nucow.com
Current 7 amps at 6.3 volts.

Maximum power output 3.5 watts.

MODEL 34X-6 USES TUNER E15T, which is same as TUNER E6T ** VOL. X

FOR OTHER DATA, SEE INDEX
**Model 35-F**

**SPECIFICALLY DESIGNED TO INSTALL IN 1941 FORD AND MERCURY**

**ALIGNMENT CHART**

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>GAIN</th>
<th>CAPACITOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN ORDER</td>
<td>IN BOX</td>
<td>ADJUST</td>
</tr>
<tr>
<td>IN ORDER</td>
<td>IN BOX</td>
<td>ADJUST</td>
</tr>
<tr>
<td>DIPPER</td>
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</tr>
<tr>
<td>DIPPER</td>
<td>DIPPER</td>
<td>DIPPER</td>
</tr>
</tbody>
</table>

* Use special dummy Part No. 12550767 or Booster Coil Part No. 205267671 in series with a 35 MfF condenser.

**SENSITIVITY AND STAGE GAIN MEASUREMENTS**

<table>
<thead>
<tr>
<th>AVERAGE</th>
<th>GENERATOR</th>
<th>GENERATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICROWAVE</td>
<td>PEERED</td>
<td>DIPPER</td>
</tr>
<tr>
<td>INPUT</td>
<td>SET AT</td>
<td>CONNECTED TO</td>
</tr>
<tr>
<td>1060 K.C.</td>
<td>640 K.C.</td>
<td>1400 K.C.</td>
</tr>
</tbody>
</table>

**VOLUME CONTROL SET AT MAXIMUM**

**TONE CONTROL SET AT VOLUME**

* Use special dummy Part No. 12550767 or Booster Coil Part No. 205267671 in series with a 35 MfF condenser.

**DIAL CONTROL INSTRUCTIONS**

**TUNING CORD**

1. Remove the chassis from the housing, and place on service bench.
2. Remove the broken string.
3. Turn the condenser gage to fully closed position.
4. Cut a length of 10 lb. silk fish cord 27 inches long.
5. Thread one end of cord through hole (C) in condenser pulley, and with an ordinary paper clip fasten it to the tuner bracket to hold in place. (See Fig. 3).
6. In a clockwise direction run cord to idler pulley No. 1.
7. Route cord around idler pulley No. 2, as shown in Fig. 3, and then across chassis to idler pulley No. 3.
8. Continue around idler pulley No. 2 as shown in Fig. 3 and back across chassis to idler pulley No. 3.
9. Route cord around idler pulley No. 3 and in a clockwise direction around condenser pulley to hole (C).
10. Remove the paper clip from the end of cord and knot the cord ends together inside the condenser pulley. Fasten one end of tension spring (Part No. 41A1010) to cord and other end to hole (D) in the condenser pulley. Place a drop of shellac on cord knot.
11. Cut off surplus cord and replace pointer.
12. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on cord. Fasten pointer to cord with a drop of shellac.

**TUNING CORD—Continued**

9. Thread the cord ends (inside pulley) through eyelet (Part No. 507884) and knot cord ends together.
10. Fasten one end of spring (Part No. 41A14759) to cord and the other end to hole (Y) in drive pulley.
11. Cut off surplus cord and place a drop of shellac on cord knot.

**POINTER CORD**

1. Remove the chassis from the housing, and place on service bench.
2. Remove broken string.
3. Set condenser gage to fully closed position.
4. Cut a length of 10 lb. silk fish cord 27 inches long.
5. Thread one end of cord through hole (C) in condenser pulley, and with an ordinary paper clip fasten it to the tuner bracket to hold in place. (See Fig. 3).
6. In a clockwise direction run cord to idler pulley No. 1.
7. Route cord around idler pulley No. 1, as shown in Fig. 3, and then across chassis to idler pulley No. 2.
8. Continue around idler pulley No. 2 as shown in Fig. 3 and back across chassis to idler pulley No. 3.
9. Route cord around idler pulley No. 3 and in a clockwise direction around condenser pulley to hole (C).
10. Remove the paper clip from the end of cord and knot the cord ends together inside the condenser pulley. Fasten one end of tension spring (Part No. 41A1010) to cord and other end to hole (D) in the condenser pulley. Place a drop of shellac on cord knot.
11. Cut off surplus cord and replace pointer.
12. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on cord. Fasten pointer to cord with a drop of shellac.
For 1941 PLYMOUTH, DODGE, DE SOTO and CHRYSLER

Sensitivity and stage gain measurements - model 37D-1

<table>
<thead>
<tr>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Generator Feeder Connected To</th>
<th>Dummy Antenna</th>
<th>Leak Meter</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>30,000</td>
<td>260 K.C.</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74 Volts</td>
</tr>
<tr>
<td>470</td>
<td>260 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mf.</td>
<td>.5 Mf.</td>
<td>1.74 Volts</td>
</tr>
<tr>
<td>500</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mf.</td>
<td>.5 Mf.</td>
<td>1.74 Volts</td>
</tr>
<tr>
<td>15</td>
<td>600 K.C.</td>
<td>R.F. Grid</td>
<td>.1 Mf.</td>
<td>.5 Mf.</td>
<td>1.74 Volts</td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>None</td>
<td>None</td>
<td>1.74 Volts</td>
</tr>
</tbody>
</table>

* Use special dummy part No. 1X26767 or Booster Coil Part No. 24X26761 in series with a 35 Mf. condenser.

Volume Control Set at Maximum

| watts = 1.74 Volts. | Output meter connected across voice coil. |

Sensitivity and stage gain measurements - model 37D-2

<table>
<thead>
<tr>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Generator Feeder Connected To</th>
<th>Dummy Antenna</th>
<th>Leak Meter</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>9,000</td>
<td>440 K.C.</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74 Volts</td>
</tr>
<tr>
<td>470</td>
<td>440 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mf.</td>
<td>.5 Mf.</td>
<td>1.74 Volts</td>
</tr>
<tr>
<td>500</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mf.</td>
<td>.5 Mf.</td>
<td>1.74 Volts</td>
</tr>
<tr>
<td>15</td>
<td>600 K.C.</td>
<td>R.F. Grid</td>
<td>.1 Mf.</td>
<td>.5 Mf.</td>
<td>1.74 Volts</td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>None</td>
<td>None</td>
<td>1.74 Volts</td>
</tr>
</tbody>
</table>

* Use special dummy part No. 1X26767 or Booster Coil Part No. 24X26761 in series with a 35 Mf. condenser.

Volume Control Set at Maximum

| watts = 1.74 Volts. | Output meter connected across voice coil. |

To RESTRING POINTER CORD - Models 37D-1 and 37D-2

Remove push-buttons, tone switch assembly, (tone switch on 37D-1 only) and control head from chassis. (This requires removal of several (two on 37D-2) screws from the right hand side of the control head, one from the left hand side (37D-1 only) of the control head, and a "W" washer from the volume control shaft."

Cut a 30 inch length of 18 lb. silk fish cord.

Loosen hold on service bench and route cord through the two eyelet holes and around idler pulley, exactly as shown in Fig. 3.

Adjust cord so both ends are approximately equal length, and clip to control head as shown in Fig. 3.

Mount control head and tone switch (tone switch on 37D-1 only) back on chassis.

Replace a washer on volume control shaft.

To RESTRING TUNING CORD - Model 37D-1 & 37D-2

Remove the chassis from the housing, and place on service bench with the tubes up.

Remove the broken string.

Turn gang to fully meshed position. This will place hole in condenser pulley at the top.

Remove paper clip from cord "A" and fish cord end of condenser pulley 1/2 turn to hole (B). Thread end of cord through hole (C) and clip to control head. (See Fig. 4).

Remove paper clip from cord (B) and route cord the short distance from idler pulley to the hole in condenser pulley. Tie both ends of cord together inside pulley; then tie in tension spring (Part No. 41A1100). Hook other end of spring in hole (B). Cut off surplus cord.

Place a drop of shellac or household cement on cord knot.

Tune in a station of known frequency and adjust dial pointer by inserting dial reading by loosening the screw (A) in the drive pulley. (See Fig. 5) and moving pointer. Tighten screw securely after adjustment.

Assemble in housing.
TUNING CORD

1. Remove the chassis from the housing, and
   place on service bench.
2. Remove the broken string.
3. Turn the condenser gang to fully meshed
   position.
4. Cut a length of 30 lb. silk fish cord 25
   inches long.
5. Thread one end of cord through Slot (A)
   in drive pulley and with an ordinary
   paper clip fasten to tuning control
   bracket so that cord will stay in place.
6. In a clockwise direction, wind cord one
   full turn around drive pulley and up to
   tuning shaft. (See Fig. 2).
7. Route cord 7 turns around tuning shaft
   as shown in Fig. 2 and down to drive
   pulley.
8. Continue in a clockwise direction around
   drive pulley and through slot (B).
9. Slip the two cord ends through eyelet
   (Part No. ES79524) inside of pulley.
10. Knot the two cord ends together and
    fasten to one end of spring (Part No.
    41414759). Hook other end of spring to
    hole (C) in drive pulley.
11. With a pair of pliers pinch eyelet on
    cord and place drop of shellac on cord
    knot.

POINTER CORD

1. Remove the chassis from housing and
   place on service bench.
2. Remove broken string.
3. Set condenser gang to fully open posi-
   tion.
4. Cut a length of 30 lb. silk fish cord 27
   inches long.
5. Thread one end of cord through slot (A)
   in condenser pulley and with an ordinary
   paper clip fasten to tuning shaft
   bracket to hold in place. (See Fig. 3).
6. In a clockwise direction run cord around
   condenser pulley, under brake shoe and
   over to idler pulley No. 2 and around it
   in a counter-clockwise direction.
7. Route string across chassis to idler
   pulley No. 2, and around it in a coun-
   ter-clockwise direction.
8. Route back across chassis and down
    over idler pulley No. 1.
9. Route string across chassis to idler
   pulley 1/2 turn to slot (A).
10. Remove the paper clip from end of cord
    and knot the two ends of cord together
    inside of drive pulley and fasten one
    end of spring (Part No. 41414759) to cord
    and the other end to hook in condenser
    pulley.
11. Cut off surplus cord.
12. To set pointer to correct frequency, tune
    in a coil of known frequency and
    adjust pointer on string.
13. Fasten pointer to string with a drop of
    shellac. Place a drop of shellac on cord
    knot.

ALIGNMENT CHART MODEL 38-0

<table>
<thead>
<tr>
<th>Operations In Order</th>
<th>Gang Condenser Set At</th>
<th>Dummy Antenna</th>
<th>Generator Connected To</th>
<th>Adjust Trimmers No.</th>
<th>Generator Set At</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>Gec. Mod. Grid</td>
<td>1-2-3-4</td>
<td>262 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>1,500 K.C.</td>
<td>.1 Mfd.</td>
<td>Gec. Mod. Grid</td>
<td>5</td>
<td>1,500 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>1,400 K.C.</td>
<td>.1 Mfd.</td>
<td>R.F. Grid</td>
<td>6</td>
<td>1,400 K.C.</td>
</tr>
<tr>
<td>4</td>
<td>1,400 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>7</td>
<td>3,400 K.C.</td>
</tr>
<tr>
<td>5</td>
<td>3,400 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>8</td>
<td>3,400 K.C.</td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>9</td>
<td>600 K.C.</td>
</tr>
</tbody>
</table>

* Use special dummy Part No. 1X26767 or booster coil Part No. 24X26761 in series with a 35 Mf condenser.

SENSITIVITY AND GAIN MEASUREMENTS

Average Microvolt Generator Output

<table>
<thead>
<tr>
<th>Input *</th>
<th>Generator Set At</th>
<th>Generator Feeder Connected To</th>
<th>Dummy Antenna</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>25,750</td>
<td>262 K.C.</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>25,750</td>
<td>262 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>600 15</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>600 3</td>
<td>600 K.C.</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>600 3</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>***</td>
<td>None</td>
<td>1.74</td>
<td></td>
</tr>
</tbody>
</table>

Volume Control Set at Maximum.

* 1 Watt = 1.74 Volts.
** Output meter connected across voice coil.
*** Use special dummy Part No. 1X26767 or booster coil Part No. 24X26761 in series with a 35 Mf condenser.
### Alignment Chart Models 40-40B, 40-B1, 40-BK, 40-EW

**Sensitivity and Stage Gain Measurements**

<table>
<thead>
<tr>
<th>Microvolts</th>
<th>Generator</th>
<th>Dummy</th>
<th>Passing Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>2400</td>
<td>450</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
</tr>
<tr>
<td>1200</td>
<td>450</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
</tr>
<tr>
<td>500</td>
<td>600</td>
<td>Ant. Terminal 200 Mfd.</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

Volume Control Set at Maximum

- 2400: .05 Watts, 36 Volts

**Alignment Chart Models 52XAH1**

<table>
<thead>
<tr>
<th>Microvolts</th>
<th>Generator</th>
<th>Dummy</th>
<th>Passing Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1800</td>
<td>450</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
</tr>
<tr>
<td>1200</td>
<td>450</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
</tr>
<tr>
<td>500</td>
<td>600</td>
<td>Ant. Terminal 200 Mfd.</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

Volume Control Set at Maximum

- 1800: .05 Watts, 36 Volts

**Alignment Chart Models 3150**

<table>
<thead>
<tr>
<th>Microvolts</th>
<th>Generator</th>
<th>Dummy</th>
<th>Passing Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1800</td>
<td>450</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
</tr>
<tr>
<td>750</td>
<td>600</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
</tr>
<tr>
<td>500</td>
<td>600</td>
<td>Ant. Terminal 200 Mfd.</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

Volume Control Set at Maximum

- 1800: .05 Watts, 36 Volts

**Models 40-40B, 40-B1, 40-BK, 40-W, Galvin Mfg. Co.**
MODEL 40-P SPECIFICALLY DESIGNED TO INSTALL IN 1941 PONTIAC

MODEL 43-H SPECIFICALLY DESIGNED TO INSTALL IN 1941 HUDSON

MODEL 44-K SPECIFICALLY DESIGNED TO INSTALL IN 1941 PACKARD

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Operations In Order</th>
<th>Gang Capacitor</th>
<th>Dummy Antenna Connected To</th>
<th>Adjust Trimmer No.</th>
<th>Generator Set At</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>1-6-6-4</td>
</tr>
<tr>
<td>2</td>
<td>1000 K.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>546 K.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>1400 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>600 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>9</td>
</tr>
</tbody>
</table>

* Use Special Dummy Part No. 2X415951 or Booster Coil Part No. 2X431050 in series with a 25 Mfd. condenser.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

<table>
<thead>
<tr>
<th>Average Microwatt Input</th>
<th>Generator Set At</th>
<th>Generator Feeder Connected To</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>2200</td>
<td>2200 K.C.</td>
<td>I.F. Grid</td>
<td>1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
</tr>
<tr>
<td>700</td>
<td>2200 K.C.</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
</tr>
<tr>
<td>710</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
</tr>
<tr>
<td>12</td>
<td>600 K.C.</td>
<td>A.F. Grid</td>
<td>1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
</tr>
<tr>
<td>3</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>***</td>
<td>None</td>
<td>1.74</td>
</tr>
</tbody>
</table>

Volume Control Set at Maximum Watt = 1.74 Volts

Tune Control Set at Voice Position.

DIAL CORD INSTRUCTIONS

POINTER CORD

Remove the chassis from housing and place on service bench.
Remove broken string.
Turn the gang to fully opened position.
Out a length of 15 ft. silk fish cord 27 inches long.
Thread one end of cord thru hole (A) in pointer pulley and with an ordinary paper clip fasten it to the tuning shaft bracket to hold it in place. See Fig. 2.
In a counter-clockwise direction route cord to idler pulley No. 2 and around it in a clock-wise direction.
Route cord across chassis to idler pulley No. 2 and around it in a clock-wise direction.
Route cord back across chassis and down over idler pulley No. 1 from cord down and around pointer pulley to hole (A).
Remove the paper clip from end of cord and knot the two ends of cord together inside of pointer pulley.
Fasten one end of spring (Part No. 41X1051) to cord and the other end to hook in pointer pulley.
Cut off surplus cord. Place a drop of shellac on cord knot.
To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on string. Fasten to string with a drop of shellac.

TUNING CORD

Remove the chassis from housing and place on service bench.
Remove the broken string.
Turn the gang to fully closed position.
Out a length of 30 ft. silk fish cord 26 inches long.
Thread one end of cord thru hole (B) in drive pulley and with an ordinary paper clip fasten it to tuning shaft bracket so that cord will stay in place.
In a counter-clockwise direction, wind cord on full turn around drive pulley and up to idler pulley No. 5.
Continue around idler pulley No. 5 and down to tuning shaft.
Wind cord four full turns in a counter-clockwise direction around tuning shaft and continue down to idler pulley No. 4.
Continue cord in a counter-clockwise direction around idler pulley No. 4 and to hole (B) in drive pulley.
Thread both ends of cord (inside pulley) thru eyelet (Part No. 527284) and knot both ends together.
Fasten one end of spring (Part No. 41X1051) to cord and other end to hold in drive pulley. See Fig. 2.
Place a drop of shellac on cord knot.
B.C. OSC. TRIMMER (UPPER)
ADJUST AT 1600 K.C.

S.W. ANT. TRIMMER (LOWER)
ADJUST AT 3.2 M.C.

LOOP ANT TRIMMER
ADJUST AT 1400 K.C.-USE INSULATED SCREWDRIVER

ALIGNMENT CHART

Volume Control Set at Maximum

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>GANG CONDENSER</th>
<th>IN ORDER</th>
<th>SET AT</th>
<th>DUMMY</th>
<th>ANTENNA</th>
<th>BAND SWITCH</th>
<th>SET AT</th>
<th>GENERATOR CONNECTED TO</th>
<th>ADJUST TRIMMERS NO.</th>
<th>GENERATOR SET AT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>1400</td>
<td>1600</td>
<td>.1</td>
<td>B.C.</td>
<td>Osc-Mod. Grid</td>
<td>1-2-3-4</td>
<td>455 K.C.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Minimum</td>
<td>1600</td>
<td>1600</td>
<td>400 ohms</td>
<td>B.C.</td>
<td>External Antenna Terminal</td>
<td>5</td>
<td>1600 K.C.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Minimum</td>
<td>1600</td>
<td>1400</td>
<td>400 ohms</td>
<td>B.C.</td>
<td>External Antenna Terminal</td>
<td>6</td>
<td>1400 K.C.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Minimum</td>
<td>3.2 M.C.</td>
<td>3.2 M.C.</td>
<td>400 ohms</td>
<td>S.W.</td>
<td>External Antenna Terminal</td>
<td>7</td>
<td>3.2 M.C.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SENSITIVITY AND STAGE GAIN MEASUREMENTS

<table>
<thead>
<tr>
<th>AVERAGE</th>
<th>GENERATOR</th>
<th>DUMMY</th>
<th>LEAK</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICROVOLT</td>
<td>FEEDER</td>
<td>ANTENNA</td>
<td>RESISTOR</td>
<td>METER</td>
</tr>
<tr>
<td>INPUT</td>
<td>CONNECTED TO</td>
<td>CAPACITY</td>
<td>READING</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>**</td>
<td>**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3200</td>
<td>455</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mag.</td>
</tr>
<tr>
<td>70</td>
<td>455</td>
<td>Mod. Grid</td>
<td>.1 &quot;</td>
<td>.5 Mag.</td>
</tr>
<tr>
<td>90</td>
<td>600</td>
<td>Mod. Grid</td>
<td>.1 &quot;</td>
<td>.5 Mag.</td>
</tr>
<tr>
<td>25</td>
<td>600</td>
<td>R.F. Grid</td>
<td>.1 &quot;</td>
<td>.5 Mag.</td>
</tr>
<tr>
<td>3</td>
<td>600</td>
<td>Ant. Terminal</td>
<td>400 ohms</td>
<td>None</td>
</tr>
</tbody>
</table>

Volume Control set at Maximum
Tone Control set at Center Position
* .05 Watts = .38 Volts
** Output Meter connected across voice coil

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### Compliments of www.nucow.com

---

#### ALIGNMENT CHART MODEL S62

<table>
<thead>
<tr>
<th>Operation</th>
<th>Gating</th>
<th>Condensor</th>
<th>Dummy</th>
<th>Generator</th>
<th>Band Switch</th>
<th>Antenna Connected To</th>
<th>Adjust</th>
<th>Generator Set At</th>
</tr>
</thead>
</table>

---

#### ALIGNMENT CHART MODEL S61

<table>
<thead>
<tr>
<th>Operation</th>
<th>Gating</th>
<th>Condensor</th>
<th>Dummy</th>
<th>Generator</th>
<th>Band Switch</th>
<th>Antenna Connected To</th>
<th>Adjust</th>
<th>Generator Set At</th>
</tr>
</thead>
</table>

---

#### SENSITIVITY AND GAIN MEASUREMENTS MODELS 45-50W, 56X1, 56X2, 56X3

<table>
<thead>
<tr>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Sensitivity (K.C.)</th>
<th>Gain</th>
<th>Average</th>
<th>Frequency</th>
<th>Sensitivity (K.C.)</th>
<th>Gain</th>
<th>Average</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>3600</td>
<td>455</td>
<td>400</td>
<td>1.00</td>
<td>500</td>
<td>400</td>
<td>2.00</td>
<td>1.00</td>
<td>200</td>
<td>400</td>
<td>1.00</td>
</tr>
<tr>
<td>3500</td>
<td>455</td>
<td>400</td>
<td>1.00</td>
<td>500</td>
<td>400</td>
<td>2.00</td>
<td>1.00</td>
<td>200</td>
<td>400</td>
<td>1.00</td>
</tr>
<tr>
<td>3000</td>
<td>455</td>
<td>400</td>
<td>1.00</td>
<td>500</td>
<td>400</td>
<td>2.00</td>
<td>1.00</td>
<td>200</td>
<td>400</td>
<td>1.00</td>
</tr>
</tbody>
</table>

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#### VOLUME CHART MODEL S61

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cond.-Grid</td>
<td>65</td>
<td>85</td>
<td>0</td>
</tr>
<tr>
<td>I.P.</td>
<td>40-45</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>Ret.</td>
<td>80</td>
<td>105</td>
<td>0</td>
</tr>
</tbody>
</table>

---

#### SENSITIVITY AND GAIN MEASUREMENTS MODELS 45-50W, 56X1, 56X2, 56X3

<table>
<thead>
<tr>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Sensitivity (K.C.)</th>
<th>Gain</th>
<th>Average</th>
<th>Frequency</th>
<th>Sensitivity (K.C.)</th>
<th>Gain</th>
<th>Average</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>3600</td>
<td>455</td>
<td>400</td>
<td>1.00</td>
<td>500</td>
<td>400</td>
<td>2.00</td>
<td>1.00</td>
<td>200</td>
<td>400</td>
<td>1.00</td>
</tr>
<tr>
<td>3500</td>
<td>455</td>
<td>400</td>
<td>1.00</td>
<td>500</td>
<td>400</td>
<td>2.00</td>
<td>1.00</td>
<td>200</td>
<td>400</td>
<td>1.00</td>
</tr>
<tr>
<td>3000</td>
<td>455</td>
<td>400</td>
<td>1.00</td>
<td>500</td>
<td>400</td>
<td>2.00</td>
<td>1.00</td>
<td>200</td>
<td>400</td>
<td>1.00</td>
</tr>
</tbody>
</table>

---

#### VOLUME CHART MODEL S61

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cond.-Grid</td>
<td>65</td>
<td>85</td>
<td>0</td>
</tr>
<tr>
<td>I.P.</td>
<td>40-45</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>Ret.</td>
<td>80</td>
<td>105</td>
<td>0</td>
</tr>
</tbody>
</table>

---

#### VOLUME CHART MODEL 40-50W, 56X1, 56X2, 56X3

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cond.-Grid</td>
<td>65</td>
<td>85</td>
<td>0</td>
</tr>
<tr>
<td>I.P.</td>
<td>40-45</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>Ret.</td>
<td>80</td>
<td>105</td>
<td>0</td>
</tr>
</tbody>
</table>

---

All measurements are made from socket terminal to chassis ground using 1000 ohms per meter. Line Voltage - 117 Volts A.C.
SPECIFICALLY DESIGNED TO INSTALL IN 1941 STUDEBAKER

TUNING CORD

1. Remove the chassis from the housing, and place on service bench.
2. Remove broken string.
3. Turn the condenser gang to fully open position.
5. Thread one end of cord through Slot (a) in drive pulley and with an ordinary paper clip fasten to tuning control bracket so that cord will stay in place.
6. In a clockwise direction, wind cord one full turn around drive pulley and up to tuning shaft. (See Fig. 2).
7. Route cord 7 turns around tuning shaft as shown in Fig. 2 and down to drive pulley.
8. Continue in a clockwise direction around drive pulley and through slot (b).
9. Slip the two cord ends through eyelet (Part No. 857654) inside of pulley.
10. Knot the two cord ends together and fasten to one end of spring (Part No. 41AL1750). Hook other end of spring to hole (c) in drive pulley.
11. With a pair of pliers pinch eyelet on cord and place drop of shellac on cord knot.

POINTER CORD

1. Remove the chassis from housing and place on service bench.
2. Remove broken string.
3. Set condenser gang to fully open position.
4. Cut a length of 18 lb. silk fish cord 27 inches long.
5. Thread one end of cord through slot (a) in condenser pulley and with an ordinary paper clip fasten it to the tuning shaft bracket to hold in place. (See Fig. 3).
6. In a clockwise direction run cord around condenser pulley, under brake shoe and over to idler pulley No. 3 and around it in a counter-clockwise direction.
7. Route cord across chassis to idler pulley No. 2, and around it in a counter-clockwise direction.
8. Route cord back across chassis and over idler pulley No. 1.
9. Route cord around condenser pulley one-half turn to slot (a).
10. Remove the paper clip from end of cord and knot the two ends of cord together inside of drive pulley and fasten one end of spring (Part No. 41AL1051) to cord and the other end to hook in condenser pulley.
11. Cut off surplus cord.
12. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on string.
13. Fasten pointer to string with a drop of shellac. Place a drop of shellac on cord knot.

MODEL 428

GALVIN MFG. CO.

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**MODEL 44K TUNING CORD**

1. Remove the chassis from the housing and place on service bench.
2. Remove the broken string.
3. Turn the gang to fully meshed position.
4. Cut a length of 30 lb. silk fish cord 65 inches long.
5. Thread one end of cord through hole (A) in drive pulley and with an ordinary paper clip fasten to tuning shaft bracket so that cord will stay in place.
6. In a clockwise direction wind cord one full turn around drive pulley and up to tuning shaft. See Fig. 2.
7. Route cord 6 turns around tuning shaft as shown in Fig. 2 and down to drive pulley.
8. Continue in a clockwise direction around drive pulley to hole (A).
9. Thread the other end of cord (inside pulley) thru eyelet (Part No. 587864) and knot ends together.
10. Fasten one end of spring (Part No. 41A14750) to cord and other end to hole (B) to drive pulley.
11. Cut off surplus cord and place drop of shellac on cord knot.
12. Pinch eyelet on cord with a pair of pliers.

**POINTER CORD**

1. Remove the chassis from housing and place on service bench.
2. Remove broken string.
3. Turn the gang to fully meshed position.
4. Cut a length of 18 lb. silk fish cord 27 inches long.
5. Thread one end of cord thru hole (C) in pointer pulley and with an ordinary paper clip fasten to tuning shaft bracket to hold it in place. (See Fig. 2.)
6. In a counter-clockwise direction route cord to idler pulley No. 1 and around it in a clockwise direction.
7. Route cord across chassis to idler pulley No. 2 and around it in a clockwise direction.
8. Route cord back across chassis and around idler pulley No. 3.
9. Route cord counter-clockwise around pointer pulley to hole (C).
10. Remove the paper clip from end of cord and knot the two ends of cord together inside of pointer pulley.
11. Fasten one end of spring (Part No. 41A11091) to cord and the other end to hole in pointer pulley.
12. Cut off surplus cord. Place a drop of shellac on cord knot.
13. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on string. Fasten to string with a drop of shellac.

**MODEL 44K**

1. Remove the chassis from the housing, and place on service bench.
2. Remove the broken string.
3. Turn the gang to fully meshed position.
4. Cut a length of 30 lb. silk fish cord 65 inches long.
5. Thread one end of cord through hole (X) in drive pulley and with an ordinary paper clip fasten to tuning control bracket so that cord will stay in place.
6. In a clockwise direction, wind cord one full turn around drive pulley and up to tuning shaft. (See Fig. 2.)
7. Route cord 6 turns around tuning shaft as shown in Fig. 2 and down to drive pulley.
8. Continue in a clockwise direction around drive pulley to hole (X).
9. Slip the two cord ends thru eyelet (Part No. 587604) inside of pulley.
10. Knot the two cord ends together and fasten to one end of spring (Part No. 41A14750). Hook other end of spring to hole (Y) in drive pulley.
11. With a pair of pliers pinch eyelet on cord and place drop of shellac on cord knot.
ALIGNMENT 1. Conn. the sig. gen. to the ant. lead thru a 200 MMF cond. and to chass. gnd. Turn the cond. gang completely out of mesh, o.p. meter across the spkr. voice coil. 2. Set sig. gen. at 455 KC; carefully adj. the two IF trims. and the two DIODE trims. to point show. highest read. on o.p. meter. Advance sig. gen. atten. if necessary. 3. Turn sig. gen. to 1750 KC, and with cond. gang completely out of mesh adj. OSC. trim. until 1750 KC sig. is heard. 4. Set sig. gen at 1400 Adj. ANT. trim. to point showing highest reading on o.p. meter.

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Model 45-N
SPECIFICALLY DESIGNED TO INSTALL IN 1941 NASH

DIAL CORD INSTRUCTIONS

1. Remove the die-cast escutcheon and the bottom cover from the receiver. (See step 1 above.)
2. Turn gang to fully open position.
3. Cut a length of 18 lb. silk fish cord 22 inches long.
4. Thread one end of cord thru hole (X) in drive pulley and with an ordinary paper clip fasten cord to tuner bracket so that cord will stay in place.

5. Cut a length of 30 lb. silk fish cord 26 inches long.
6. Thread one end of cord thru hole (X) in drive pulley and with an ordinary paper clip fasten cord to tuner bracket so that cord will stay in place.

7. Wind cord fully clockwise direction wind cord one turn on drive pulley and route to idler pulley No. 4 (See Fig. 2).
8. Route cord over idler pulley No. 4 and down to tuning shaft.

9. Thread cord ends through eyelet (Part No. 537880) inside of pulley
10. Knot cord ends together and fasten to one end of spring (Part No. 41A14850). Hook other end of spring to hole (Y) in drive pulley.
11. With a pair of pliers pinch eyelet on cord and place drop of shellac on cord knot.

POINTER CORD

1. Remove the die-cast escutcheon and the bottom cover from the receiver (see step 1 above).
2. Remove the broken string.
3. Turn gang to fully open position.
4. Cut a length of 18 lb. silk fish cord 22 inches long.
5. Thread one end of cord thru hole (C) in condenser pulley. See Fig. 3. With an ordinary paper clip fasten to tuner bracket to hold it in place.
6. Route cord in a counter-clockwise direction from hole (C) to idler pulley No. 1.
7. Route cord clockwise around pulley No. 1 and across chassis to idler pulley No. 2.
8. Continue counter-clockwise around pulley No. 2 and back across the chassis to idler pulley No. 3.
9. Continue around idler pulley No. 3 and in a counter-clockwise direction around condenser pulley to hole (C).
10. Remove the paper clip and knot the two ends of cord together inside of pulley. Fasten one end of spring (Part No. 41A14891) to cord and hook other end to hole in condenser pulley. Place a drop of shellac on cord knob.
11. Cut off surplus cord and assemble pointer to cord.
12. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on cord. Fasten with a drop of shellac.
13. Minor calibration errors may be corrected by loosening set screw (S) in drive pulley and moving condenser pulley. Tighten set screw (S) after adjustment.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

<table>
<thead>
<tr>
<th>Average Microvolt Input</th>
<th>Generator Connected To</th>
<th>Dummy Antenna Capacitor</th>
<th>Leak Deterrent Resistance Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>25,000</td>
<td>825 K.C.</td>
<td>.1 Mfd.</td>
<td>.5 Mfd. 1.74</td>
</tr>
<tr>
<td>625</td>
<td>300 K.C.</td>
<td>.1 Mfd.</td>
<td>.5 Mfd. 1.74</td>
</tr>
<tr>
<td>14</td>
<td>600 K.C.</td>
<td>.1 Mfd.</td>
<td>.5 Mfd. 1.74</td>
</tr>
<tr>
<td>3</td>
<td>600 K.C.</td>
<td>.1 Mfd.</td>
<td>.5 Mfd. 1.74</td>
</tr>
</tbody>
</table>

Volume Control Set At Maximum. Tone Control Set At Mute.
* 1 watt = 1.74 Volts. ** Output meter connected across voice coil. *** Use Special Dummy Part No. 1320767.

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Operations Gang Condenser Antenna</th>
<th>Dummy Antenna Connected To</th>
<th>Adjust Generator Trimmer No. Set At</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum .1 Mfd.</td>
<td>Condenser Grid 1-2-3-4 262 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>1600 K.C.</td>
<td>Condenser Grid 6 1600 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>3400 K.C.</td>
<td>Condenser Grid 6 3400 K.C.</td>
</tr>
<tr>
<td>4</td>
<td>3400 K.C.</td>
<td>To Special Dummy 7 3400 K.C.</td>
</tr>
<tr>
<td>5</td>
<td>3400 K.C.</td>
<td>To Special Dummy 8 3400 K.C.</td>
</tr>
<tr>
<td>6</td>
<td>3400 K.C.</td>
<td>To Special Dummy 9 3400 K.C.</td>
</tr>
</tbody>
</table>

* Use Special Dummy Part No. 1320767 or Booster Coil Part No. 2452075 in series with a 25 Mfd. Condenser.
FOR OTHER DATA, SEE INDEX

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### ALIGNMENT CHART MODELS 56X1 & 2

<table>
<thead>
<tr>
<th>OPERATIONS IN ORDER</th>
<th>GANG CONDENSER SET AT</th>
<th>DUMMY ANTENNA SET AT</th>
<th>GENERATOR CONNECTED TO</th>
<th>ADJUST TRIMMERS NO.</th>
<th>GENERATOR SET AT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>1200 K.C.</td>
<td>Det-Grid</td>
<td>1-2-3-4</td>
<td>465 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>Minimum</td>
<td>1200 K.C.</td>
<td>External</td>
<td>6</td>
<td>1700 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>Minimum</td>
<td>1400 K.C.</td>
<td>External</td>
<td>8</td>
<td>1400 K.C.</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

**SENSITIVITY AND STAGE GAIN MEASUREMENTS MODELS 56X1 & 2**

<table>
<thead>
<tr>
<th>Average Microwatt Input</th>
<th>Generator Feeder</th>
<th>Generator Connected to</th>
<th>DUMMY ANTENNA Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>4200</td>
<td>455</td>
<td>I.F. Grid</td>
<td>.3 Mfd.</td>
<td>.5 Mega</td>
<td>.36</td>
</tr>
<tr>
<td>200</td>
<td>600</td>
<td>Med. Grid</td>
<td>.3 Mfd.</td>
<td>.5 Mega</td>
<td>.36</td>
</tr>
<tr>
<td>500</td>
<td>600</td>
<td>Ant. Terminal</td>
<td>400 Ohms</td>
<td>None</td>
<td>.36</td>
</tr>
</tbody>
</table>

**Volume Control set at maximum.**

* .05 Watts = .36 Volts.

### ALIGNMENT CHART MODELS 6691 & 2-3-4-1

<table>
<thead>
<tr>
<th>OPERATIONS IN ORDER</th>
<th>GANG CONDENSER SET AT</th>
<th>DUMMY ANTENNA SET AT</th>
<th>GENERATOR CONNECTED TO</th>
<th>ADJUST TRIMMERS NO.</th>
<th>GENERATOR SET AT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>1200 K.C.</td>
<td>Det-Grid</td>
<td>1-2-3-4</td>
<td>465 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>Minimum</td>
<td>1200 K.C.</td>
<td>External</td>
<td>6</td>
<td>1700 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>Minimum</td>
<td>1400 K.C.</td>
<td>External</td>
<td>8</td>
<td>1400 K.C.</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

**SENSITIVITY AND STAGE GAIN MEASUREMENTS MODELS 6691-2-3-4-1**

<table>
<thead>
<tr>
<th>Average Microwatt Input</th>
<th>Generator Feeder</th>
<th>Generator Connected to</th>
<th>DUMMY ANTENNA Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>7100</td>
<td>455</td>
<td>I.F. Grid</td>
<td>.3 Mfd.</td>
<td>.5 Mega</td>
<td>.36</td>
</tr>
<tr>
<td>100</td>
<td>600</td>
<td>Med. Grid</td>
<td>.3 Mfd.</td>
<td>.5 Mega</td>
<td>.36</td>
</tr>
<tr>
<td>500</td>
<td>600</td>
<td>Ant. Terminal</td>
<td>400 Ohms</td>
<td>None</td>
<td>.36</td>
</tr>
</tbody>
</table>

**Volume Control set at maximum.**

* .05 Watts = .36 Volts.

### ALIGNMENT CHART MODELS 66X1 & 2-3-1

<table>
<thead>
<tr>
<th>OPERATIONS IN ORDER</th>
<th>GANG CONDENSER SET AT</th>
<th>DUMMY ANTENNA SET AT</th>
<th>GENERATOR CONNECTED TO</th>
<th>ADJUST TRIMMERS NO.</th>
<th>GENERATOR SET AT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>1200 K.C.</td>
<td>Det-Grid</td>
<td>1-2-3-4</td>
<td>465 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>Minimum</td>
<td>1200 K.C.</td>
<td>External</td>
<td>6</td>
<td>1700 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>Minimum</td>
<td>1400 K.C.</td>
<td>External</td>
<td>8</td>
<td>1400 K.C.</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

**SENSITIVITY AND STAGE GAIN MEASUREMENTS MODELS 66X1 & 2-3-1**

<table>
<thead>
<tr>
<th>Average Microwatt Input</th>
<th>Generator Feeder</th>
<th>Generator Connected to</th>
<th>DUMMY ANTENNA Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>3500</td>
<td>455</td>
<td>I.F. Grid</td>
<td>.3 Mfd.</td>
<td>.5 Mega</td>
<td>.63</td>
</tr>
<tr>
<td>400</td>
<td>600</td>
<td>Med. Grid</td>
<td>.3 Mfd.</td>
<td>.5 Mega</td>
<td>.63</td>
</tr>
<tr>
<td>450</td>
<td>600</td>
<td>Ant. Terminal</td>
<td>400 Ohms</td>
<td>None</td>
<td>.63</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum.**

* .05 Watts = .63 Volts.
FOR OTHER DATA, SEE INDEX

MODELS 60XA1, 60XA2, 61XW

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Compliments of www.nucow.com
POLICE CRUISER

Model P-69-14

ANTENNA ADJUSTMENT

Proceed as follows:

1. Turn the receiver to maximum volume.

2. Turn the dial to a spot near 1600 K.C. that is entirely free from stations.

3. With a screw driver, adjust the antenna trimmer screw for maximum noise level.

4. After first trimming on noise level, tune in a weak station near 1600 K.C. and check the accuracy of the adjustment by readjusting the trimmer for maximum volume.

The antenna trimmer screw may be reached through a small hole in the receiver housing. Replace the plug button after adjustment.

TO SET AUTOMATIC TUNER

NOTE: Before setting any station, let the set warm up for not less than ten minutes. If you wish you can "set" the automatic tuner on the service bench before installing the radio in the car. Use a short aerial and peak the antenna trimmer to it. Then readjust the antenna trimmer after the installation in the car.

IMPORTANT: You will note that the 5-contact plug on the end of the control head cable has one pin that is shorter than the others. For the setting up procedure, this plug should be inserted in the receptacle on the receiver only half way. This will cause all of the magnet terminals to be connected, but will not permit the tuning motor to run during the adjustment, since the short pin will not make contact, thereby holding the motor circuit open. The motor should not be run at any time during the "setting up" procedure.

1. Loosen the automatic locking screw which can be reached by removing a plug button in the receiver housing. This screw should be turned counter-clockwise four or five revolutions - far enough to ensure plenty of looseness.

2. Turn the dial all the way to the low frequency end (1500 K.C.)

3. Press the first button and hold it down. A faint "click" should be heard, indicating that the tuning magnet has attracted the latch bar.

4. Holding the magnet energized, turn the dial manually all the way to the high frequency end (2800 K.C.) and then all the way back to the low frequency end (1500 K.C.).

5. Still pressing on the button, tune in the station to be set on that button.

6. Proceed to set the remaining five stations for each station follow steps 2, 3, 4, and 5, as outlined above. AT NO TIME IS THE SETTING UP PROCEDURE SHOULD THE TUNING MOTOR BE PERMITTED TO RUN.

7. Tighten the automatic locking screw very securely, do not hold the tuning knob while locking the automatic, but allow the mechanism to turn to its natural stop.

8. Replace the plug button, making sure the spring contact in it touches the locking screw. This is essential for motor noise reasons.

9. Push the plug all the way into the receptacle on the receiver housing so the short motor pin will also make contact.

ALIGNMENT PROCEDURE

Place the radio on the service bench with the front cover removed, but with the speaker and battery connected to it.

Turn the volume control to maximum position and leave it there throughout the alignment, reducing the signal generator output if necessary.

NOTE: Do not adjust the trimmer in the R.F. coil can that is covered with Scotch Tape. The original adjustment, made in the factory, should not be interfered with. (Fig. 3 below, shows all trimmer locations.)

1. Connect the signal generator to the control grid of the Osc.-Mod. tube (A455) through a 1 MF condenser, having first removed the grid cap from the top of the tube. Connect a 500,000 ohm leak resistor from the grid of the tube to the grid cap just removed from the tube. (See Fig. 2.)

2. Adjust the condenser to the point where the output meter reads the maximum reading. Connect an output meter across speaker voice coil.

3. Set the signal generator at 222 K.C. and carefully adjust the single trimmer in the Diode coil can to the point showing the highest reading on the output meter.

4. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.

5. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

R.F. ALIGNMENT

1. Connect the signal generator to the antenna terminal through a 150 MF condenser.

2. Set the signal generator at 2900 K.C. and with the condenser gang completely out of mesh adjust the 2900 K.C. trimmer in the oscillator coil can to the point showing the highest output reading.

3. Set the signal generator at 1550 K.C. Turn the condenser gang completely in mesh and adjust the 1600 K.C. padder in the oscillator coil can for the highest output reading.

NOTE: The adjustments above set the range so the receiver will track with the calibrations in the control head.

4. Set the signal generator at 1600 K.C. and turn the condenser gang until the signal is heard. Adjust the 1600 K.C. padder on the antenna coil can for the maximum output reading.

5. Set the signal generator at 2000 K.C. Turn the condenser gang until the signal is heard. Adjust the 2000 K.C. trimmer in the antenna coil can, for maximum output reading.

6. Adjust the 2500 K.C. trimmer in the R.F. coil can for maximum output reading.
VOLTAGE CHART

Position | Plate | Screen | Cathode
---|---|---|---
R.F. Amp. | 225 V | 95 V | 0
Osc.-Mod. | 225 V | 95 V | 0
L.F. Amp. | 225 V | 95 V | 0
Det.AVC.A.P. | 125 V | -- | -5.5 V
Phase Inv. | 125 V | -- | -5.5 V
Pwr. Amp. | 225 V | 225 V | 225 V
Rectifier | 320 V AC | 320 V (from filament)

Measurements from socket terminal to chassis ground using 1000 Ohms per volt meter.
Line Voltage - 117 Volts.

VOLTAGE CHART MODELS 102KI AND 103CK2

Position | Plate | Screen | Cathode
---|---|---|---
R.F. Amp. | 225 V | 80 V | 1.5 V
Mixer | 225 V | 80 V | 1.5 V
Osc. | 120 V | -- | 0
L.F. Amp. | 225 V | 80 V | 1.5 V
Det. AVC | -- | -- | --
A.F. Amp. | 125 V | -- | 0
Phase Inv. | 120 V | -- | 0
Pwr. Amp. | 225 V | 225 V | 15 V
Rectifier | 355 V A.C. | 360 V (from filament)

Measurements from socket terminal to chassis ground using 1000 Ohms per volt meter.
Line Voltage - 117 Volts.
ALIGNMENT PROCEDURE

Remove the chassis from its housing and place it on the service bench. Connect the speaker and battery.

1. Turn the volume control to minimum position and leave it there throughout the alignment.
2. Connect the signal generator to the antenna lead through a .1 HP condenser and to chassis ground. Turn the condenser gang completely out of mesh. Connect an output meter across the speaker voice coil.
3. Set the signal generator at 455 K.C. and carefully adjust the single trimmer in the diode coil can to the point showing the highest reading on the output meter. (Advance the signal generator attenuator if necessary to pick up signal.) See FIG. 1.
4. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.
5. Repeat the I.F. and Diode adjustment several times for maximum accuracy.
6. Set the signal generator at 1400 K.C. and turn the condenser gang to the signal at 1400 K.C. Adjust the antenna trimmer on the condenser gang to the point showing the highest output reading.

NOTE: Minor corrections may be made by sliding the dial scale to the right or left by loosening the self-lapping screws which hold it in position.

FIGURE 2

TO ROUTE CORD
7. Route string across chassis to idler pulley No. 2, and around it in a clockwise direction.
8. Route cord back across chassis and around idler pulley No. 3, in a counter-clockwise direction.
9. Route cord around condenser pulley three-quarters turn to slot "A".
10. Remove the paper clip from end of cord and knot the two ends of cord together inside of pulley. Fasten one end of the tension spring (41A11091) to the cord and the other end to hole in the condenser pulley.
11. Cut off surplus cord.
12. To set pointer to correct frequency, tune in a station of known frequency, preferably one between five and six hundred K.C. and attach the pointer to the condenser so that the proper frequency is indicated, because the pointer cannot be slid on the cord.

SENSITIVITY DATA - Model 250

<table>
<thead>
<tr>
<th>Microvolt</th>
<th>Generator Input</th>
<th>Generator Connected to</th>
<th>Dummy Ant. Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>8500</td>
<td>DET 507GT AC AF</td>
<td>I.F. Grid</td>
<td>.1</td>
<td>.5 Mag</td>
<td>1.76 mag</td>
</tr>
<tr>
<td>1500</td>
<td>DET 507GT AC AF</td>
<td>Mod. Grid</td>
<td>.1</td>
<td>.5 Mag</td>
<td>1.76 mag</td>
</tr>
<tr>
<td>2000</td>
<td>DET 507GT AC AF</td>
<td>Mod. Grid</td>
<td>.1</td>
<td>.5 Mag</td>
<td>1.76 mag</td>
</tr>
<tr>
<td>80</td>
<td>DET 507GT AC AF</td>
<td>R.F. Grid</td>
<td>.1</td>
<td>.5 Mag</td>
<td>1.76 mag</td>
</tr>
<tr>
<td>10</td>
<td>DET 507GT AC AF</td>
<td>Ant. Lead</td>
<td>40 MFD</td>
<td>None</td>
<td>1.76 mag</td>
</tr>
</tbody>
</table>

* For one watt output
** Best connected across voice coil
1.76 volts equals 1 watt output for 3 ohm voice coil

NOTE: If a Motorola Booster antenna is used substitute a Special Motorola dummy part No. XL5000 or M43500 Booster coil No. 17900 in series with a 25 MFD condenser in place of the 40 MFD condenser.
### MODEL 261

**SENSITIVITY AND STAGE GAIN MEASUREMENTS**

<table>
<thead>
<tr>
<th>Average Microwave Input</th>
<th>Generator Set At</th>
<th>Generator Feeder Connected To</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Watt Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>450 K.C.</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>600</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>250</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>90</td>
<td>600 K.C.</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>None</td>
<td></td>
<td>Ant. Lead</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
</tbody>
</table>

*Volume Control Set At Maximum*  
*Output meter connected across voice coil.*** Use Special Dummy Part No. 1229767 or Booster Coil Part No. 24A25761 in series with a 35 Watt Condenser.*

**ALIGNMENT CHART MODEL 261**

<table>
<thead>
<tr>
<th>Operations In Order</th>
<th>Gang Condenser Set At</th>
<th>Dummy Antenna Connected To</th>
<th>Generator Adjust Trimmer No.</th>
<th>Generator Set At</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Watt Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td></td>
<td></td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>2</td>
<td>1600 K.C.</td>
<td>.1 Mfd. Mod. Grid</td>
<td>1-2-3-4</td>
<td>450 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1400 K.C.</td>
<td>.1 Mfd. Mod. Grid</td>
<td>5</td>
<td>1600 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>600 K.C.</td>
<td>.1 Mfd. Mod. Grid</td>
<td>6</td>
<td>1400 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>600 K.C.</td>
<td>.1 Mfd. Mod. Grid</td>
<td>7</td>
<td>600 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>600 K.C.</td>
<td>To Special Dummy</td>
<td>8</td>
<td>600 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>600 K.C.</td>
<td>To Special Dummy</td>
<td>9</td>
<td>600 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Use Special Dummy Part No. 1229767 or Booster Coil Part No. 24A25761 in series with a 35 Watt Condenser.

### MODEL 301

**SENSITIVITY AND STAGE GAIN MEASUREMENTS**

<table>
<thead>
<tr>
<th>Average Microwave Input</th>
<th>Generator Set At</th>
<th>Generator Feeder Connected To</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Watt Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>9,300</td>
<td>250 K.C.</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>500</td>
<td>250 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>250</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>110</td>
<td>600 K.C.</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>3</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
</tbody>
</table>

*Volume Control Set At Maximum*  
*Output meter connected across voice coil.*** Use Special Dummy Part No. 1229767 or Booster Coil Part No. 24A25761 in series with a 35 Watt Condenser.*

**ALIGNMENT CHART MODEL 301**

<table>
<thead>
<tr>
<th>Operations In Order</th>
<th>Gang Condenser Set At</th>
<th>Dummy Antenna Connected To</th>
<th>Generator Adjust Trimmer No.</th>
<th>Generator Set At</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Watt Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td></td>
<td></td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>2</td>
<td>1600 K.C.</td>
<td>.1 Mfd. Mod. Grid</td>
<td>1-2-3-4</td>
<td>500 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1600 K.C.</td>
<td>.1 Mfd. Mod. Grid</td>
<td>5</td>
<td>1600 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>600 K.C.</td>
<td>.1 Mfd. Mod. Grid</td>
<td>6</td>
<td>1400 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>600 K.C.</td>
<td>To Special Dummy</td>
<td>7</td>
<td>600 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>600 K.C.</td>
<td>To Special Dummy</td>
<td>8</td>
<td>600 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Use Special Dummy Part No. 1229767 or Booster Coil Part No. 24A25761 in series with a 35 Watt Condenser.

### MODEL 401

**SENSITIVITY AND STAGE GAIN MEASUREMENTS**

<table>
<thead>
<tr>
<th>Average Microwave Input</th>
<th>Generator Set At</th>
<th>Generator Feeder Connected To</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Watt Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,800</td>
<td>260 K.C.</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>420</td>
<td>260 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>510</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>80</td>
<td>600 K.C.</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>2</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
</tbody>
</table>

*Volume Control Set At Maximum*  
*Output meter connected across voice coil.*** Use Special Dummy Part No. 1229767 or Booster Coil Part No. 24A25761 in series with a 35 Watt Condenser.*

**ALIGNMENT CHART MODEL 401**

<table>
<thead>
<tr>
<th>Operations In Order</th>
<th>Gang Condenser Set At</th>
<th>Dummy Antenna Connected To</th>
<th>Generator Adjust Trimmer No.</th>
<th>Generator Set At</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Watt Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td></td>
<td></td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>2</td>
<td>1600 K.C.</td>
<td>.1 Mfd. Mod. Grid</td>
<td>1-2-3-4</td>
<td>260 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1600 K.C.</td>
<td>.1 Mfd. Mod. Grid</td>
<td>5</td>
<td>1600 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1400 K.C.</td>
<td>.1 Mfd. Mod. Grid</td>
<td>6</td>
<td>1400 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1400 K.C.</td>
<td>To Special Dummy</td>
<td>7</td>
<td>1400 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1400 K.C.</td>
<td>To Special Dummy</td>
<td>8</td>
<td>1400 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1400 K.C.</td>
<td>To Special Dummy</td>
<td>9</td>
<td>1400 K.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Use Special Dummy Part No. 1229767 or Booster Coil Part No. 24A25761 in series with a 35 Watt Condenser.
ALIGNMENT PROCEDURE

1. Connect the signal generator to the control grid of the 2H5, 5666 tube (12AD7) through a .1 MF condenser, having first removed the grid cap from the top of the tube. Connect a 500,000 ohm leak resistor from the grid of the tube to the grid cap just removed from the tube. Turn the condenser gang completely out of each icest, connect an output meter across the 500,000 ohm resistor and make a note of the reading. (Fig. 1 will make the procedure clear.)

2. Set the signal generator at 200 K.C. and carefully adjust the single trimmer in the grid leak coil to the point showing the highest reading on the output meter.

3. Adjust the two trimmers in the i.f. and grid coil to the point showing the highest output reading.

4. Repeat the i.f. and grid adjustment several times for maximum accuracy.

SETTING THE RANGE

1. Connect the signal generator to the control grid of the i.f. tube (12B7) using the same .1 MF condenser.

2. Set the signal generator at 1500 K.C. and with the condenser gang completely out of each icest, connect the 1500 K.C. oscillator trimmer to the grid leak coil to the point showing the highest output reading.

3. Set the signal generator at 635 K.C. Turn the condenser gang completely out of each ccst and adjust the 635 K.C. oscillator trimmer on the antenna coil for the highest output reading.

NOTE: The adjustments above set the range so the receiver will track with the calibrations in the control panel.

R.F. AND ANTENNA ALIGNMENT

NOTE: If the radio is to be operated on a Motorola Booster Antenna, a special dummy antenna Motorola Part No. 115458 must be used, in series with the lead from the signal generator to the antenna receptacle. Change the signal generator connection to the antenna lead, using the special dummy.

1. Set the 1500 K.C. trimmer at 1400 K.C. Turn the condenser gang, until the signal is heard, adjust the 1400 K.C. antenna trimmer in the antenna coil can for maximum output reading.

2. Adjust the 1400 K.C. RF trimmer in the RF coil for maximum output reading.

3. Set the signal generator at 600 K.C. and turn the condenser gang, until the signal is heard, adjust the 600 K.C. oscillator in the antenna coil can for the maximum output reading.

4. Recheck steps 1, 2, and 3, for accuracy.

SENSITIVITY AND GAIN MEASUREMENTS

All stage gain measurements must be made with the volume control set for full volume. The shielded lead from the signal generator is connected to the grid terminal of the tube through a .1 MF condenser, with a 5000 ohm resistor connected as a leak resistance between the grid of the tube and the grid lead which has been removed.

When measuring over-all sensitivity at the antenna terminal, use a 40 MF condenser in place of the .1 MF condenser.

It must be remembered that the figures in the table are average and allowance must be made for variations between two sets of the same general type, due to difference of tube characteristic, etc.

<table>
<thead>
<tr>
<th>AVERAGE MICROVOLTS</th>
<th>GENERATOR FREQUENCY</th>
<th>GENERATOR ATTENUATION</th>
<th>INPUT ANTENNA CAPACITY</th>
<th>LEAK RESISTANCE</th>
<th>OUTPUT METER READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>76,000</td>
<td>200 K.C.</td>
<td>3.0 DB</td>
<td>.1 MF</td>
<td>.6 Mag</td>
<td>1.76 Volts</td>
</tr>
<tr>
<td>600</td>
<td>235 K.C.</td>
<td>3.0 DB</td>
<td>.1 MF</td>
<td>.6 Mag</td>
<td>1.76 Volts</td>
</tr>
<tr>
<td>600</td>
<td>300 K.C.</td>
<td>3.0 DB</td>
<td>.1 MF</td>
<td>.6 Mag</td>
<td>1.76 Volts</td>
</tr>
<tr>
<td>4</td>
<td>400 K.C.</td>
<td>3.0 DB</td>
<td>.1 MF</td>
<td>.6 Mag</td>
<td>1.76 Volts</td>
</tr>
</tbody>
</table>

1. For one watt output.
2. Meter connected across voice coil.
3. 1.76 volts equals 1 watt output for 8 ohm voice coil.
4. Use special dummy part No. M2884 or M2848 Booster Coil No. 760 6A in series with a 25 MF condenser.

NOTE: If set is not used with a Motorola Booster Antenna, substitute a .05 MF condenser for the Special Dummy.

VOLTAGE CHART - MODEL 500

<table>
<thead>
<tr>
<th>POSITION</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CATHODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>in R.F.</td>
<td>196</td>
<td>78</td>
<td>2.7</td>
</tr>
<tr>
<td>in 1F.P.</td>
<td>196</td>
<td>78</td>
<td>2.7</td>
</tr>
<tr>
<td>in 1P.F.</td>
<td>196</td>
<td>78</td>
<td>2.7</td>
</tr>
<tr>
<td>Det. 1F.F.</td>
<td>110</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Output 1</td>
<td>205</td>
<td>200</td>
<td>15</td>
</tr>
<tr>
<td>Output 2</td>
<td>205</td>
<td>200</td>
<td>15</td>
</tr>
<tr>
<td>Rest.</td>
<td>40</td>
<td>-</td>
<td>320</td>
</tr>
</tbody>
</table>

All limits measured from socket terminal to chassis ground using 1000 ohms per volt meter. Current 6.5 ma at 6.5 volts. Maximum power output 6 watts.

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GALVIN MFG. CO.

FOR OTHER DATA SEE INDEX

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NOTE: Model 700 uses tuner E12T which is identical to the E5T.
See Motorola Pages 10 - 12.
GALVIN MFG. CO.

SENSITIVITY AND STAGE GAIN MEASUREMENT

All stage gain measurements must be made with the volume control set for full volume. The shield lead from the signal generator is connected to the grid terminal of the tube through a .1 MF condenser, with a 1000 ohm resistor connected as a leak resistance between the grid of the tube and the shield lead which has been removed.

When measuring over-all sensitivity at the antenna terminal, use a special dummy part 412081B in place of the 0.1 MF. It must be remembered that the figures in the table are average and allowance must be made for variations between the sets of the same general type, due to differences of tube characteristics, etc.

<table>
<thead>
<tr>
<th>VOLTAGE</th>
<th>GENERATOR</th>
<th>PEAKER</th>
<th>FEEDER</th>
<th>ANTENNA</th>
<th>LEAK</th>
<th>RESISTANCE</th>
<th>OUTPUT</th>
<th>METER</th>
<th>READING **</th>
</tr>
</thead>
<tbody>
<tr>
<td>11500</td>
<td>200 K.C.</td>
<td>1.0 K.F.</td>
<td>6 MA</td>
<td>.5 MA</td>
<td>1.76 Volts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>255</td>
<td>200 K.C.</td>
<td>NO. 1</td>
<td>.1 K.F.</td>
<td>.5 MA</td>
<td>1.76 Volts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>600 K.C.</td>
<td>NO. 1</td>
<td>.1 K.F.</td>
<td>.5 MA</td>
<td>1.76 Volts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>600 K.C.</td>
<td>NO. 1</td>
<td>.1 K.F.</td>
<td>.5 MA</td>
<td>1.76 Volts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>600 K.C.</td>
<td>NO. 1</td>
<td>.1 K.F.</td>
<td>.5 MA</td>
<td>1.76 Volts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** For one watt output
* Meter connected across voice coil
1.76 Volts equals 1 watt output for 3 ohm voice coil
** The special dummy part no. 412081B.

NOTE: All is used with a Motorola Booster antenna, substitute = 40 MF. condenser for the special dummy.

VOLTAGE CHART

<table>
<thead>
<tr>
<th>TUBE POSITION</th>
<th>PLATE</th>
<th>SOUREN</th>
<th>CATHODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.F.</td>
<td>255</td>
<td>80</td>
<td>3.8</td>
</tr>
<tr>
<td>O.C. Mod.</td>
<td>255</td>
<td>80</td>
<td>3.8</td>
</tr>
<tr>
<td>L.F.</td>
<td>255</td>
<td>60</td>
<td>4.0</td>
</tr>
<tr>
<td>Det. Amp.</td>
<td>150</td>
<td>60</td>
<td>9.0</td>
</tr>
<tr>
<td>A.F.</td>
<td>240</td>
<td>255</td>
<td>16.0</td>
</tr>
<tr>
<td>Output</td>
<td>240</td>
<td>255</td>
<td>16.0</td>
</tr>
<tr>
<td>Rect.</td>
<td>-</td>
<td>255</td>
<td>16.0</td>
</tr>
</tbody>
</table>

All voltages measured from socket terminal to chassis ground using 1000 ohm per volt meter.

Current 6 amp. at 6.5 volts.

Maximum power output 10 watts.

John F. Rider, Publisher

Compliments of www.nucow.com
Procedure for Setting the Station Buttons

There are 5 buttons on the automatic tuning dial by means of which stations may be selected.

Any button may be used for any station you can receive. Make a list of your favorite stations, those which you tune in regularly. It is better to list the station with the highest kilocycle number first, the station with the next highest kilocycle number next, and so on.

Depress the manual tuning button and keep it depressed during the entire setting operation as described below. See Fig. 1 for location of buttons. Turn the manual tuning knob so that the indicator moves toward the 1500 KC end of the dial until the stop is reached.

**UNLOCK THE TUNING MECHANISM** by inserting a screwdriver, as shown in Fig. 1, in the locking screw opening at the bottom of the tuning unit. Loosen the locking screw by turning it counter-clockwise as far as it will go.

**TO SET STATIONS ACCURATELY, DO NOT TIE THE RATIO OR BUTTONS WHILE THE MECHANISM IS UNLOCKED.**

Keep the MANUAL TUNING BUTTON DEPRESSED WITH ONE HAND and, with the other hand, depress the second station button firmly and gently. Then proceed to set the second station on your list in the same manner as described above.

Then continue to set any additional stations on your list in the remaining buttons. When all desired stations have been set, release any station button which is depressed as follows: Keep the MANUAL TUNING BUTTON DEPRESSED WITH ONE HAND, and, with the other hand, push in the OFF button a slight amount—only enough to release any station button which is depressed. The OFF button should be pushed all the way in to the depressed position, for, otherwise, no harm will be done except that the dial will not be illuminated.

Turn the manual tuning knob so that the indicator moves toward the 1500 KC end of the dial, until the stop is reached.

**NOW LOCK THE TUNING MECHANISM** by inserting a screwdriver, as shown in Fig. 1, in the locking screw opening and turning the locking screw in a clockwise direction until it is tight.

Insert a celluloid reinforcement tab half-way in the slot at the front of station button No. 1—See Fig. 3.

**REINFORCEMENT TAB**

Remove the correct station letter tab button No. 1 from the sheet supplied by bending the steel back and forth at the scored marks. Place the celluloid reinforcement tab in front of the celluloid reinforcement tab and insert it in slot. Push both tabs all the way in the button slot. Follow the same procedure for inserting the station letter tab in any other button.

After the stations are set and the mechanism is locked, tune in each of them by pressing the proper button. This does not appear to be properly tuned in after the button is depressed, repeat the setting for that button following the procedure outlined above. Changing the setting of one button will not affect the setting of the others.

Alignment Procedure

Insert the antenna cable plug in the antenna socket on the tuning unit. The total capacity of the antenna cable and dummy antenna should be 60 mmf. If the cable, for example, has a capacity of 25 mmf, use a 35 mmf. condenser for a dummy antenna. Connect the other end of the antenna cable to the dummy antenna terminal. Set the volume control at maximum and the Local- Distance switch to the position. Adjust the oscillator trimmer C6 (Fig. 1) until maximum output is obtained. Then adjust the I.F. trimmers until maximum output is obtained. Then adjust the oscillator trimmer C7 and antenna trimmer C2 for maximum output—See Fig. 1.

**ANTENNA CABLE**

The total capacity of antenna and shielded cable should be 35 to 60 mmf.

Types of High Capacity Antennas — Running board, over-the-road types which are long and are mounted close to the metal roof of the car; ordinary built-in roof antennas (not metal roof).

**ADJUSTING ANTENNA TRIMMER**

After the antenna is connected, tune in a weak signal at approximately 1500 KC with the volume control about three-fourths on. Turn the trimmer to adjust the maximum output. Then adjust the antenna trimmer (C3) up or down until maximum output is obtained. See Fig. 1 for location of this trimmer.

**ANTENNA**

A shielded antenna cable with bayonet connector plug is required. The plug on the antenna cable is inserted in the socket at the bottom of the tuning unit case as shown in Fig. 1. The wire at the outer end of the antenna cable is connected to the antenna.

**LOW CAPACITY ANTENNA**

This radio is designed for a low capacity car antenna. The total capacity of antenna and shielded cable should be 35 to 60 mmf. Types of Low Capacity Antennas — Running board, over-the-road types which are long and are mounted close to the metal roof of the car.

The antenna should be mounted on the same side of the car as the tuning unit.

**HIGH-CAPACITY ANTENNA**

If this radio is to be installed with a high capacity car antenna (200 mmf), total capacity of antenna and shielded cable) an adapter must be used. The adapter is inserted in the socket at the bottom of the tuning unit case. Then the antenna plug is inserted in the adapter.
GAMBLE SKOGMO, INC.

Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows:

First refer to the "Iron Core Adjustment View" now turn the tuning knob until the drive bar comes within 1/64 to 1/32 from the stops. (A piece of blacking paper is about the right thickness and will serve as a gauge). The clearance at the bar must be the same at both stops. If far off you can raise one drive screw gently and equalize them. Minor adjustments may be made with the drive bar adjustments.

Next rotate each iron core until the

**Power Consumption**
A Battery - 300 MA
B Battery - 13.5 MA

**Power Output** - 210 MW Undistorted

**Sensitivity for 50 Milliwatt Output**
- 10 Microvolts Average

**Selectivity - 38 KC Band width at 1000 Times Signal at 1009 KC**

**Tuning Frequency Range**
Broadcast Band - 535 to 1700 KC

**Intermediate Frequency**
- 455 KC

To change stations simply repeat the procedure above.

适量的图形

1. Press normal-Turn.
2. Set iron core to minimize all adjustments.
3. Open circuit—match output of signal generator with a short heavy lead.
4. Connect dummy antenna tuner to stations with greatest output lead.
5. Set gain control approximately one half step from maximum.
6. Turn chanical gain control to "off" at lowest numbers.

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test point.
- A 4500 or 2000 watt power supply.
- A power output meter.
- A test antenna tuner at each test point.
- A dummy antenna.
- A 1/2 inch SCOPE, 200 mill, and 400 sheets.

**Power Consumption**
- 100 Watts

**Power Output**
- 5 Watts Undistorted

**Sensitivity for 500 Milliwatt Output**
- 10 Microvolts Average

**Selectivity - 38 KC Band width at 1000 Times Signal at 1009 KC**

**Tuning Frequency Range**
Broadcast Band - 545 to 1600 KC

**Intermediate Frequency**
- 455 KC

**Speaker**
- 10 in. Electro Dynamic

适量的图形

适量的表格

适量的图形

适量的表格

适量的图形

适量的表格

适量的图形
Model 415 is a 5-tube superheterodyne radio receiver for operation on a 117 volt A.C. 60 cycle or 117 volt D.C. supply.

This receiver covers a frequency range from 540 kilocycles to 1750 kilocycles (K.C.).
CHASSIS MODEL 520
Series A

Broadcast Band A. C.-D. C.
Superheterodyne Receiver

Frequency Range 530-1720 Kilocycles

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect B of radio chassis, to ground post of signal generator through 1 Mfd. condenser.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:
- An all wave signal generator.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 mf, 100 mmf.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmer(s) Adjusted (in order shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>465 Kc.</td>
<td>1 MFD.</td>
<td>Grid of 6A8</td>
<td>Rotor full open</td>
<td>Two trimmers (See Fig. 3)</td>
<td>I.F.</td>
<td>Adjust to</td>
<td>maximum output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(Plates out of mesh)</td>
<td></td>
<td></td>
<td>maximum output</td>
<td></td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1720 Kc.</td>
<td>100 mmf. Antenna Lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Top of rear section of gang (See Fig. 1)</td>
<td>Broadcast Antenna</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1400 Kc.</td>
<td>100 mmf. Antenna Lead</td>
<td>Set dial at 1900 Kc.</td>
<td>Trimmer—Top of front section of gang (See Fig. 1)</td>
<td>Broadcast Antenna</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The tube complement of this chassis consists of the following octal base glass and metal tubes.

The type and function of each tube is as follows:

- **TUNER ADJUSTMENTS**
- **SEE**
  - **GAMBLE-SKOGMO**
  - **MODEL 527-A, VOLUME X**
  - **PAGE 10-8**

TYPE 6A8 Pentagrid Mixer, First Detector-oscillator.
TYPE 6J7 Second Detector.
TYPE 62A Ballast Tube.
**IMPORTANT:** See Aligning Instructions

- Volume control—Maximum all adjustments.
- Connect B of radio chassis to ground post of signal generator through .1 Mfd. condenser.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

**ALIGNMENT PROCEDURE**

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 Mfd., and 200 Mmfd.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Iron Cores (Dial Setting)</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1690 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C4) (See Fig. 1)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1690 Kc.</td>
<td>200 MMFD.</td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C3) (See Fig. 1)</td>
<td>Antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1690 Kc.</td>
<td>200 MMFD.</td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Antenna</td>
<td>Check for tracking (See Note B)</td>
<td></td>
</tr>
</tbody>
</table>

**ALIGNING INSTRUCTIONS:**

**CAUTION:** No aligning adjustments should be attempted without first thoroughly checking over all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low line voltage, defective tubes, condensers and resistors. In order to properly align this radio, the chassis should be removed from the cabinet.

**SERVICE NOTES:**

Voltages taken from different points of circuit to chassis are measured with volume control at minimum, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt.

All voltages as indicated on the voltage chart are measured with 117 volt 60 cycle A.C. line.

 Resistances of coil windings are indicated in ohms on the schematic circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Excessive hum, stuttering, low volume and a reduction in all D.C. voltages is usually caused by a shorted electrolytic condenser; open by-pass condensers frequently cause oscillation and distorted tone.

**NOTE A**—The antenna coil assembly is made so that it is movable right or left. When making the adjustment as given in the alignment procedure, move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

**NOTE B**—After the antenna coil has been tracked at 1400 Kc. it is necessary to check the antenna trimmer (C3) adjustment again at 160 Kc. If no appreciable change in trimmer adjustment is made the coil is in track, if the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 160 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 160 Kc.

**NOTE C**—The antenna coil assembly is made so that it is movable left or right. When making the adjustment as given in the alignment procedure, move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.
Compliments of www.nucow.com
MODEL 678, Issue C

PROCEDURE FOR SETTING THE AUTOMATIC TUNER PUSH BUTTONS:

There are six pushbuttons on the Remote Tuner Unit by means of which six stations may be set up for automatic tuning (see B, Fig. 2).

1. Make a list of local stations you tune in regularly; any number up to and including six.

2. Punch out the set of station call letter tags supplied, the call letters of the stations you have selected.

3. Press in on the pushbutton which is latched in. Holding it firmly, turn in by means of the dial tuning knob the station indicated on the station call letter tag on this pushbutton. Turn the dial tuning knob very slowly until it is latched in.

4. Press in on all the pushbuttons at the same time holding the dial tuning knob in both pushbuttons and the dial tuning knob are latched together. Holding the pushbuttons firmly, tune in the station indicated on the call letter tag on this pushbutton.

5. Follow this procedure until you have tuned in all of your favorite stations.

6. When the last pushbutton has been properly set up, it is necessary to release it from the latch-in position before the tuner mechanism can be locked. To release this pushbutton, press the pushbutton release pin on the bottom of the tuner unit. This will actuate the latch mechanism so that the pushbutton will be released to out position. (See Fig. 2A.)

7. With the dial tuning knob hard enough to make it latch in, rotate the dial tuning knob to the right (clockwise) until the knob cannot be turned any further without forcing it.

8. This will lock the tuner mechanism and all the stations that have been set up on the pushbuttons will be locked in place for automatic tuning.

9. Press in any one of the pushbuttons and—YOUR FAVORITE STATION IS SELECTED.

The important steps to remember when setting up stations on the pushbuttons for automatic tuning are:

1. To unlock the tuner mechanism press on the dial tuning knob hard enough to make it stay latched in. Rotate the dial tuning knob to the left (counterclockwise) until the knob cannot be turned any further without forcing it.

2. To set a pushbutton, Push in all the way and hold firmly both the pushbutton and the dial tuning knob so that both latch in. Hold firmly the pushbutton and tune in the station by means of the tuning knob. Set all the pushbuttons in the same manner.

3. To release the last pushbutton press the pushbutton release pin on the bottom of the tuner unit.

4. To lock the tuner mechanism push on the dial tuning knob hard enough to make it stay latched in. Rotate the dial tuning knob to the right (clockwise) until the knob cannot be turned any further without forcing it. (NOTE: All the pushbuttons must be in out position when locking the tuner mechanism.)

CHANGING STATIONS:

If you should desire to change any station you have selected to another, loosen the locking screw "C" one or two turns. Hold in push button on which the station is to be changed and tune in new station desired. Release the push button. (Note: If the dial mechanism works hard when setting up a new station for one of the automatic tuner buttons it is due to the locking screw being too tight. Loosen the locking screw "C" until the dial mechanism works freely with the tuner push button pressed in.)

Be sure to retighten the locking screw, otherwise the stations you have previously selected will not stay adjusted to the push buttons.

The set is now set up for automatic tuning.
### TECHNICAL DATA—Model No. C671

- **Power Consumption**
  - Radio Only: 70 Watts
  - Motor Only: 20 Watts

- **Power Output**
  - 2.1 Watts Undistorted

- **Sensitivity for 500 Milliwatt Output**: 15 Microvolts Average

- **Selectivity**
  - 51 KC Broad at 1000 Times Signal at 1000 KC

- **Tuning Frequency Range**
  - Broadcast Band: 530 to 1600 KC
  - Shortwave Band: 5.46 to 18.3 MC

- **Intermediate Frequency**
  - 455 KC

- **Speaker**
  - 8 in. Electro Dynamic

---

### Band and Phono Switch

This knob switches the tuning from the broadcast stations to the shortwave band, and also to the "Phono" position. Turn the knob to "Broadcast" for broadcast stations and to "Phono" to play records. The points marked 49M-31M-25M-20M-19M-16M on the dial scale are shortwave broadcast channels. The 49M and 31M channels are best during darkness. The other channels are best in daylight. Tune short waves very slowly.

---

### ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect radio ground to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting (Plates out of mesh)</th>
<th>Trimmers On Top</th>
<th>Input and Output L.F.</th>
<th>Adjust to Maximum Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>455 Kc.</td>
<td>.1 MFD</td>
<td>Grid of 6SA7 Mixer</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Trimmers on top</td>
<td></td>
<td>Adjust to Maximum Output</td>
</tr>
<tr>
<td>SHORT WAVE BAND (See Note A)</td>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C4</td>
<td>Short Wave Oscillator</td>
<td>Adjust to Maximum Output</td>
</tr>
<tr>
<td></td>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C1</td>
<td>Short Wave Antenna</td>
<td>Adjust to Maximum Output</td>
</tr>
<tr>
<td></td>
<td>6 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C7</td>
<td>Short Wave Oscillator Series Pad</td>
<td>Adjust to Maximum Rock Dial (See Note &quot;C&quot;)</td>
</tr>
<tr>
<td>BROADCAST BAND (See Note A)</td>
<td>1600 Kc.</td>
<td>200 mnf.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Trimmer C5</td>
<td>Broadcast Oscillator</td>
<td>Adjust to Maximum Output</td>
</tr>
<tr>
<td></td>
<td>530 Kc.</td>
<td>200 mnf.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full closed</td>
<td>Trimmer C6</td>
<td>Broadcast Oscillator Series Pad</td>
<td>Adjust to Maximum Output</td>
</tr>
<tr>
<td>LOOP ALIGNMENT (See Note B)</td>
<td>1400 Kc.</td>
<td>200 mnf.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>Trimmer C2</td>
<td>Broadcast Antenna</td>
<td>Adjust to Maximum Output</td>
</tr>
<tr>
<td></td>
<td>608 Kc.</td>
<td>200 mnf.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer C8</td>
<td>Broadcast Oscillator Series Pad</td>
<td>Adjust to Maximum Output</td>
</tr>
</tbody>
</table>

**NOTE A**—The signal generator is connected to the "ANT." and "GND" leads when aligning the Short Wave Band and to the grid of the 6SA7 tube and ground terminal when setting the Broadcast Band oscillator end frequencies, (1600 and 530 K. C.). The loop antenna should be connected to the radio when making these adjustments.

**NOTE B**—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. The signal generator is connected to the "ANT." and "GND." leads.

**NOTE "C"**—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained. Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

After each band is completed, repeat the procedure as a final check.
### ALIGNMENT PROCEDURE

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 m on 600 Kc, 125 mm on 1565 Kc.

#### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Remote Tuner Dial Setting</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6SK7 1 F. Tube</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmers C9, C20 (See Fig. 5)</td>
<td>Output</td>
<td>L.F.</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6SK7</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmer C7 (See Fig. 2)</td>
<td>Output</td>
<td>L.F.</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6ASGT</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmers C4, C13 (See Fig. 5)</td>
<td>Output</td>
<td>L.F.</td>
</tr>
<tr>
<td></td>
<td>1565 Kc.</td>
<td>125 mm.</td>
<td>Antenna lead</td>
<td>Set dial at 1555 Kc.</td>
<td>Trimmer C5 (See Fig. 4)</td>
<td>Oscillator</td>
<td>L.F.</td>
</tr>
<tr>
<td></td>
<td>1400 Kc.</td>
<td>125 mm.</td>
<td>Antenna lead</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmers C1, C3 (See Fig. 4)</td>
<td>Antenna and oscillator</td>
<td>L.F.</td>
</tr>
<tr>
<td></td>
<td>600 Kc.</td>
<td>125 mm.</td>
<td>Antenna lead</td>
<td>Set dial at 600 Kc.</td>
<td>Trimmer C2 (See Fig. 4)</td>
<td>Antenna series adj.</td>
<td>L.F.</td>
</tr>
</tbody>
</table>

**NOTE “A” IMPORTANT:** To align the output I. F. transformer without using a cathode ray oscillograph a 10K ohm resistor must be shunted across the 400k tuned circuit. Connect the resistor as indicated by point “X” on the circuit diagram and the bottom view of the radio chassis Fig. 5 A red dot on top of output I. F. can designate location of trimmer “C99.”

**NOTE “B” Important: Before adjusting trimmer “C7” disconnect the 10K ohm resistor. Under no circumstances re-adjust trimmers C9 or C20 after the 10K ohm resistor has been removed.**

For alignment of the output I. F. transformer using a cathode ray oscillograph the 10K ohm resistor is not used.

**NOTE “C” Maximum gain for this adjustment depends on the capacity of the antenna system of the car in which the radio is installed. For the proper alignment of this adjustment see “Adjusting Antenna Trimmer,” page 2.**

#### ALIGNMENT OF THE IRON CORES

The iron cores for the antenna, R. F., and oscillator permeability coils have been very carefully adjusted at the factory and require no further adjustment, unless it becomes necessary to replace a coil, or if the adjustments have been tampered with.

The procedure for aligning the iron cores will be supplied with replacement coils when ordered.

---

**IMPORTANT—ADJUSTING ANTENNA TRIMMER:**

Tune in any weak station between 600 and 800 kc.

Make sure that the antenna shunt trimmer on the bottom of the Remote Tuner is turned all the way out (counter clockwise), (see adjustment “C1,” Fig. 4)

Adjust antenna series trimmer on the side of the remote Tuner Unit. For maximum output. (See adjustment “C2,” Fig. 4, Page 7).

**NOTE:** If resonance (maximum output) cannot be obtained within the range of the antenna series trimmer “C2,” turn the adjustment screw all the way out (counter clockwise) and then adjust the antenna shunt trimmer “C1” on the bottom of the remote tuner unit for a peak of maximum output.

The above arrangement will cover any antenna capacity that is now in use.
IMPORTANT: See Aligning Instructions.

**ALIGNMENT PROCEDURE**

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6SK7</td>
<td>T-Terminal</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>I. F.</td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6SA7</td>
<td>Mixer</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

**SHORT WAVE BAND**

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C4</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

**BROADCAST BAND**

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1570 Kc.</td>
<td>200 mml.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>532 Kc.</td>
<td>200 mml.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Set Dial at 532 K.C.</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

**LOOP ALIGNMENT**

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1400 Kc.</td>
<td>200 mml.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>Trimmer C1</td>
<td>Broadcast</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>600 Kc.</td>
<td>200 mml.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer T2</td>
<td>Iron Core</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

**Excessive hum, stuttering, low volume and a reduction in all D.C. voltages is usually caused by a shorted electrolytic condenser; open by-pass condensers frequently cause oscillation and distorted tone.**

**ALIGNING INSTRUCTIONS:**

**CAUTION:** No aligning adjustments should be attempted without first thoroughly checking over all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low line voltages, defective tubes, condensers or resistors. In order to properly align the chassis, an oscillator (generator) is absolutely necessary. No aligning adjustments should be attempted with the chassis in the cabinet.

It is important during loop alignment that the same distance between the loop antenna and the chassis be maintained as when the chassis is installed in the cabinet.

To remove the chassis from the cabinet, pull off the knobs and take out the 4 bolts holding the chassis flange to the control panel.

---

**SERVICE NOTES:**

Voltagess taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt.

All voltages as indicated on the voltage chart are measured with 115 volts A.C. on the primary of the power transformer.

Resistances of coil windings are indicated in ohms on the schematic circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.
Automatic Record Changer—Operating Instructions

Compliments of www.nucow.com

Setting for Size of Record

The Changer plays up to fourteen 10" or ten 12" records at one loading. All records must be the same size for each loading.

On each post you will see selecting arms. The position of these arms determines the setting for different size records. To set for 10 or 12 inch records, it is necessary to grasp the posts by the knobs at the top, lift, and turn until the 10" or 12" arrows are pointing toward the center of the turntable. When in either the 10" or 12" position, the posts will snap into place except when they are lifted by hand. Be sure to set both posts for the same size record.

Loading

See that the selecting arms of both posts are turned toward the center of the turntable. By moving the engraved arrows, and that both sets of arms are set for the same size (10" or 12") records as described in the preceding paragraph.

Place the stack of records (up to fourteen 10" or ten 12") over the center pin so that they will rest on the selecting arms.

Starting the Changer

1. Turn on the radio (allowing approximately 30 seconds for the tubes to warm up) and turn the phonograph-radio knob to the phonograph position.

2. Turn the switch knob on the Recorder panel to "Off." The motor will then start and the record changer will go into automatic operation of its own accord.

How to Reject a Record

Merrily press the switch knob on the Changer panel. You can do it any time after the needle has come into contact with that record.

Operating Individual Records

Should it be desired to play an individual record merely set up the machine as described above for the proper size (10" or 12") as indicated on the selecting arrows, place the record on top of the arm or "off" switch under "Loading" and set the machine in operation by means of the switch knob described under "Playing the Changer." In other words, play an individual record in the same manner as you would play a stack of that size.

Unloading

First switch off the motor, turn each post by its knob at the top and turn them out of the way.

Lift the played records from the turntable. Then return the posts to the proper playing position as indicated by the arrows on the selecting arms.

The Changer may then be loaded with a new record according to the size shown on the selecting arms.

Turning Off Changer

Throw Changer switch knob to "OFF" position.

Lift tone arm and place it in the rest position. (If you happen to turn off the Changer switch while the mechanism is going through a change cycle, you will notice that it does not stop until the cycle has been completed, and the tone arm is again in playing position. At which point it is ready to be lifted to the rest position. If you prefer to turn off your Changer with the radio switch, which will stop the tone arm while it is rushing up under a record, otheriwise the entire arm cannot be correctly reset.

To avoid warping of records, never leave records on posts.

If Changer is Left Running

No damage will be done if you forget to turn off the Changer after it has played its entire load of records. It will simply repeat the last record until stopped or relighted.

Photograph Needles

In general there are two types of needles which can be satisfactorily used on an Automatic Record Changer: those which are of which changing after approximately 12 records, and the so-called permanents type needles which are rated in terms of "hours of service." In no case should the manufacturer's claim for these needles, be exceeded, since in all probability the needles are rated in terms of their maximum life.

Operating the Phonograph on Home Recordings

Turn radio on. Put phonograph switch in "Home" position.

Push manual switch toward manual side to play home recording.

Put your record on turntable and start motor. Your playback arm on record and control tone and volume with the radio volume and tone control knobs.

Operating the Recorder

NOTE:—Some radios of this model are equipped with a record changer arm on the record changer which you can make your own records. If your radio has such a record changer arm, follow the instructions below for making records.

The mike volume control must be turned off (all the way left) except when recording with the microphone.

The two volume indicators lights along side the microphone volume control are used for setting the proper recording level. When recording, these two volume control lights must be adjusted so that the red indicator light will be illuminated only when you continue to talk. When recording with your microphone the lights should be adjusted back to a dim red until you begin recording with the microphone volume control.

How to Make Perfect Recordings

Cutting Needle

The cutting stylus is made sharp and must not be touched on the record or allowed to rest on the turntable.

For best operation, the instrument should be level in all directions. To check this, place a small level if you have one on the turntable. If you do not have one, a marble will do. If the marble rolls off the turntable, it is not level.

Place something under the cabinet until the machine is reasonably level.

Shaving

The cutting stylus cuts a fine shaving that is just a little thicker than the needle. The shaving can be reduced by putting the record on the turntable or in a bushing.

Shaving is done with a thin cutting tool called a "shaver," which is placed on the record. The shaving is turned up quite high and needle scratch will be excessive.

While cutting, gently brush the shavings from the left side of the record, toward the center pin, allowing them to collect there until the recording is completed.

Cutting Arm Adjustments

The cutting arm is adjusted at the factory for proper operation, however, with various types of blacks, this adjustment may sometimes have to be altered. When a black record is cut, the cutting arm will produce the proper depth. The scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." The cutting arm will be set to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D." When a black record is cut, the scraping depth setting should be made to remove all non-musical material and will decrease the groove size to the specified "D."
Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows.

First refer to the "Iron Core Adjustment View" now turn the tuning knob until the drive bar comes within 1/64 to 1/32 from the stop. (A piece of blotting paper is about the right thickness and will serve as a gauge). The clearance of the bar must be the same at both stops. If far off you can raise one drive screw gently and equalize them. Minor adjustments may be made with the drive bar adjustments.

Next rotate each iron core until the fine score marks are even with the edge of the coil forms.

**Television and Fm. Jack**

If television or frequency modulation (FM) programs ever become available in your community this radio may still be used in conjunction with the necessary converters.

The jack marked phono-pickup jack in the chassis view will accommodate either the Phono or a television or FM converter.

**Speaker 10 In. Electro Dynamic**

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Dial Pointer Setting</th>
<th>Trimmer Adjusted in Order Shown</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. F.</td>
<td>455 Kc.</td>
<td>.1 MFD. Grid of 6SK7 (L.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 1500 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Output F.</td>
<td>Adj. to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>455 Kc.</td>
<td>.1 MFD. Grid of 6SA7</td>
<td>Broadcast</td>
<td>Set Dial at 1500 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Input F.</td>
<td>Adj. to maximum output</td>
<td></td>
</tr>
<tr>
<td>31 METER BAND</td>
<td>9.6 Mc.</td>
<td>400 ohms Antenna lead</td>
<td>31M</td>
<td>Set Dial at 9.6 Mc.</td>
<td>(See Trimmer View) C20</td>
<td>Oct. R. F.</td>
<td>Adj. to maximum output</td>
<td></td>
</tr>
<tr>
<td>49 METER BAND</td>
<td>6.1 Mc.</td>
<td>400 ohms Antenna lead</td>
<td>49M</td>
<td>Set Dial at 6.1 Mc.</td>
<td>(See Trimmer View) T14</td>
<td>Oct. R. F.</td>
<td>Adj. to maximum output</td>
<td></td>
</tr>
<tr>
<td>25 METER BAND</td>
<td>11.8 Mc.</td>
<td>400 ohms Antenna lead</td>
<td>25M</td>
<td>Set Dial at 11.8 Mc.</td>
<td>(See Trimmer View) T15</td>
<td>Oct. R. F.</td>
<td>Adj. to maximum output</td>
<td></td>
</tr>
<tr>
<td>19 METER BAND</td>
<td>15.2 Mc.</td>
<td>400 ohms Antenna lead</td>
<td>19M</td>
<td>Set Dial at 15.2 Mc.</td>
<td>(See Trimmer View) T16</td>
<td>Oct. R. F.</td>
<td>Adj. to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1600 Kc.</td>
<td>200 mmL Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1600 Kc.</td>
<td>(See Trimmer View) C16</td>
<td>Oct. R. F.</td>
<td>Adj. to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1400 Kc.</td>
<td>200 mmL Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1600 Kc.</td>
<td>Rotate Core T11</td>
<td>Oct. R. F.</td>
<td>Adj. to maximum output</td>
<td></td>
</tr>
</tbody>
</table>
**ALIGNMENT PROCEDURE**

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Position of Variable Condenser</th>
<th>Trimmers Adjusted</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency Sending</td>
<td></td>
<td></td>
<td>(In Order Shown)</td>
<td></td>
</tr>
<tr>
<td>SHORT WAVE BAND</td>
<td>17 Mc. 400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dia. at 17 Mc.</td>
<td>Trimmer C13</td>
</tr>
<tr>
<td>(See Note A)</td>
<td>17 Mc. 400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dia. at 17 Mc.</td>
<td>Trimmer C12</td>
</tr>
<tr>
<td></td>
<td>6 Mc. 400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dia. at 6 Mc.</td>
<td>Trimmer C11</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1580 Kc. 200 m.m.f.</td>
<td>Grid of SK7 R. F. Tube</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Trimmer C14</td>
</tr>
<tr>
<td>(See Note A)</td>
<td>540 Kc. 200 m.m.f.</td>
<td>Grid of SK7 R. F. Tube</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Trimmer C12</td>
</tr>
<tr>
<td>LOOP ALIGNMENT</td>
<td>1600 Kc. 200 m.m.f.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Trimmer C9</td>
</tr>
<tr>
<td>(See Note B)</td>
<td>600 Kc. 200 m.m.f.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Trimmer C5</td>
</tr>
</tbody>
</table>

**NOTES**

* Note "A"—The signal generator is connected to the "ANT." and "GROUND" terminals on the rear of the chassis, when aligning the Short Wave Band and to the grid of the SK7 R. F. Tube and ground terminal when setting the Broadcast Band oscillator end frequency. (1580 and 540 Kc. C.C.)

The loop antenna needs not be connected to the radio when making these adjustments.

**ALIGNING INSTRUCTIONS:**

**CAUTION:** No aligning adjustments should be attempted without first thoroughly checking over all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low line voltages, defective tubes, condensers, and resistors. In order to properly align this chassis, an oscillator (generator) is absolutely necessary. No aligning adjustments should be attempted with the chassis in the cabinet.

It is important during loop alignment that the loop antenna with 117 volts A. C. on the primary of the power transformer. All voltages as indicated on the voltage chart are measured.

Resistances of coils and transformer windings are indicated on schematic circuit diagrams. To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

**SERVICE NOTES:**

Voltages taken from different points of circuit to chassis are measured with voltmeter full on, all tubes in their all D. C. voltages is usually caused by a shorted electrolytic socket and speaker connected, with a voltmeter having a condenser; open by-pass condensers frequently cause oscillation and distorted tone.

**PHONOGRAPH CONNECTIONS:**

A phonograph connector and switch are provided on the rear of the chassis. To operate: Insert plug on end of phonograph pick-up lead into connector on chassis—and move phonograph switch to "Phono" position. Volume and tone may be controlled by using the controls on the front of the radio.

**TELEVISION CONNECTIONS:**

Television will not be available for nation wide use for some time to come; however, Television audio connections are provided on this radio for the reception of Television sound. Connect audio output leads of television receiver to connector provided on rear of receiver chassis as shown in above illustration and snap switch to "Television" position.
**Compliments of www.nucow.com**

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**Power Consumption**
- **120 Watts**

**Power Output**
- **10 Watts Undistorted**

**Sensitivity for 500 Milliwatt Output**
- 10 Microvolts

**Selectivity**
- 27 KC Broad at 1000 Times Signal at 1000 KC

**Intermediate Frequency**
- **455 KC**

**Speaker**
- **12 in. Electro Dynamic**

- Tone control—Tweeter
- Volume control—Maximum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary or output transformer.
- Dummy antennas—1 mW, 200 mW, and 900 ohms.

---

**Tuning Frequency Range**

- **Broadcast Band**
  - 540 to 1600 KC

- **49 M Band**
  - 5.9 to 6.1 MC

- **31 M Band**
  - 5.1 to 10 MC

- **25 M Band**
  - 11.4 to 12.1 MC

- **19 M Band**
  - 14.9 to 15.4 MC

**Phonograph-Television and Fm. Jack**

Should you wish to use an external phonograph it should be plugged into the phono jack shown in the chassis view. The radio-phono switch on the chassis will then switch from radio to phono operation.

If television or frequency modulation (FM) programs ever become available in your community this radio may still be used in conjunction with the necessary converters.

The jack marked phono-television-FM in the chassis view will accommodate either the Phono or a television or FM converter.

---

**Table:**

<table>
<thead>
<tr>
<th>Band</th>
<th>Signal Generator Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Dial Pointer Setting</th>
<th>Trimmers Adjusted In Order Shown</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc. .1 MFD. Grid of 5687 (L.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 1000 Kc.</td>
<td>Two Trimmers on Top</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 METER BAND</td>
<td>9.6 Mc. 400 ohms</td>
<td>31 M</td>
<td>Set Dial at 9.6 Mc.</td>
<td>(See Trimmer View)</td>
<td>C2</td>
<td>Osc.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>49 METER BAND</td>
<td>6.1 Mc. 400 ohms</td>
<td>49 M</td>
<td>Set Dial at 6.1 Mc.</td>
<td>(See Trimmer View)</td>
<td>C9</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>25 METER BAND</td>
<td>11.8 Mc. 400 ohms</td>
<td>25 M</td>
<td>Set Dial at 11.8 Mc.</td>
<td>(See Trimmer View)</td>
<td>T15</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>19 METER BAND</td>
<td>15.2 Mc. 400 ohms</td>
<td>19 M</td>
<td>Set Dial at 15.2 Mc.</td>
<td>(See Trimmer View)</td>
<td>T16</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1600 Kc. 200 mW.</td>
<td>Broadcast</td>
<td>Set Dial at 1600 Kc.</td>
<td>(See Trimmer View)</td>
<td>C16</td>
<td>Osc.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>140 Kc. 200 mW.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>(See Iron Core Adjustment View)</td>
<td></td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

---

Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows.

First refer to the "Iron Core Adjustment View" now turn the tuning knob until the drive bar comes within 1/64 to 1/32 from the stops. (A piece of blotting paper is about the right thickness and will serve as a gauge). The clearance of the bar must be the same at both stops. If far off you can raise two drive screws gently and equalize them. Minor adjustments may be made with the drive bar adjustments.

Next rotate each iron core until the fine score marks are even with the edge of the coil forms.

You are now ready to continue with the trimmer adjustments as shown on the alignment chart.
Antenna and Ground

Two loop antennas are incorporated in the speaker chamber and may be used for broadcast band and short wave reception. For the reception of local or nearby stations, an outside antenna is usually not required. The use of the loop antennas may, in some locations, provide best broadcast band operation.

In general, however, more stations will be heard and noise will sometimes be reduced by using an outside antenna.

For best reception of short wave stations, an outside antenna is recommended.

A white wire will be found coming out of the chassis. Connect this wire to the outside antenna lead.

On the back panel of the chassis base is a screw (marked GND) under which the ground wire should be fastened.

**SPECIFICATIONS**

- **Power Consumption**: 71 Watts (At 117 volt 60 cycles)
- **Power Output**: 40 Watts Distorted; 50 Watts Maximum
- **Selectivity**: 30 KC Broad at 1000 times Signal
- **Intermediate Frequency**: 456 KC
- **Speaker**: 10" Electro-Dynamic
- **Receiver**: of this model which are to be used on 25 cycle, 230 volt, or other service are so marked on label.

**Tuning Frequency Range**

- **B Range**: 530 to 1700 KC
- **C Range**: 2000 to 7000 KC
- **D Range**: 7000 to 22000 KC

**Sensitivity** (For 0.5 Watt output)

- **B Range**: 1.2 Microvolts Average
- **C Range**: 1.0 Microvolts Average
- **D Range**: 2.0 Microvolts Average

**FOR OTHER TV/2A INDICES**

Important—A good antenna and ground are essential for best operation of this radio. Connections should be clean and tight. Do not use an old outside antenna as in most cases it will be unsatisfactory.

**Voltages at Sockets**

- **Line Voltage**: 117, 60 Volt AC
- **Volts Green to Ground**: 117
- **Antenna Shorted to Ground**: 117
- **Readings taken with 1000 ohm open-circuit meter**: Plate and screen voltages are read on 300 volt scale.
In case modulation hum (hum with signal) is encountered on the above model, the trouble may be due to the 6SK7 I.F. tube. Interchange this tube with the 6SK7 R.F. and 6SK7 I.F. tubes. Note the results. The 6SK7 last A.F. tube may be left in either the R.F. or I.F. tube sockets if the arrangement reduces the hum.

If the hum is still appreciable after the above procedure try out several new 6SK7 last A.F. tubes. Use the one which reduces the hum to a minimum.

Television Sound Connections

If Television programs ever become available in your community, the audio amplifier and speaker of this radio may be used to reproduce Television sound in conjunction with any "Television Picture Receiver and Sound Converter."

On the back panel of the chassis base is a socket to which is connected the phone cable shielded pin tip. Upon removal of this pin tip, the connector on the cable from a television receiver can be inserted in the socket. (The cable connector must be a single shielded pin tip with green plastic body.)

When Television sound reproduction is desired, the knob located above the dial of the radio should be used to control the Phonograph (F) position. For radio reception, the knob should be in the (Radi) (R) position.

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Alignment: Peak i-f at 455 kHz. Adjust B-C OSC trimmer (under chassis on rear apron) to 1500 kHz. Adjust B-C padde to 600 kHz. Set generator to 15 kHz. Tune in. Set s-w OSC trimmer so that dial points to this frequency. Align s-w ANT trimmer (top of chassis on s-w ANT coil to right of gang condenser.)

SCHEMATIC WIRING DIAGRAM
MODELS 225A, 225B
245, 255, 265, 275, 285

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GAROD MODELS 399, 4990; 1059, 1049; 1540; 3109; 4123; 4124; 4410

ALIGNMENT

It is important to remember that in receivers of this kind which are equipped with automatic volume control it is necessary to use the minimum possible signal from the signal generator; otherwise the A.V.C. action will tend to nullify the variations in output as the trimmers are adjusted.

I.F. Adjustment: The signal generator is set at 455 kc and is connected through a .5 mmfd condenser to the grid of the first detector (6K8). With the band switch set on "Broadcast", the pointer is set at 550 kc and the receiver volume control at its maximum position, the I.F. trimmers are adjusted for maximum output. These trimmers may be found on top of the I.F. transformer shield case.

Band #1 Adjustment: Turn the dial control knob so that the condenser plates are entirely out of mesh. Set the band switch to band #1. The signal generator should be connected to the short-antenna binding post through the dummy antenna consisting of a 250 mmfd mica condenser and a 400 ohm non-inductive resistor. The oscillator trimmer condenser should be opened to minimum capacity and the signal generator then set to 2 megacycles. The oscillator trimmer is then increased in capacitance until maximum response is obtained. Two responses are possible and it is important that the high frequency response (oscillator trimmer low capacity) be used. The signal generator is then set to 10.69 Mz and the variable condenser turned until a response is obtained. The pointer should coincide with the 10.69 Mz mark on the dial. The antenna preselector and first detector trimmers are then adjusted in the order named, for maximum output. The variable condenser should be rocked slightly during this last adjustment. The signal generator is now set at 7.89 Mc and the signal tuned in on the dial. The padder condenser for this band is adjusted for maximum reading of the output meter while the generator tuning condenser is rocked slightly to right and left. The high frequency adjustment should then be rechecked.

Band #2: The band selector switch is set in position for operation on short wave band #2. The variable condenser is opened so that the plates are completely unmixed and the oscillator trimmer is opened to minimum capacity. The signal generator is set to 7.89 Mc and the oscillator trimmer condenser is increased in capacity until a response is heard. Two responses are possible and it is important that the higher frequency response (oscillator trimmer low capacity) be used. The signal generator at 7 mc and the tuning control until a response is indicated is adjusted. The pointer should coincide with the 7 mc mark on the dial. The antenna preselector and first detector trimmers are then adjusted in the order named for maximum output. After high frequency adjustments have been made set the signal generator at 2.5 mc and turn the variable gang condenser until a response is observed. Adjust the padding condenser for this band for maximum gain while rocking the tuning condenser slightly to the right and left. The higher frequency adjustment should then be rechecked.

Broadcast Band: The dummy antenna for this band should consist of a 250 mmfd condenser only. The signal generator is set at 1620 kc, the band switch set at broadcast position. The variable condenser should be opened so that the plates are entirely out of mesh. The oscillator trimmer is then adjusted for maximum response on that frequency (1620 kc). Set the signal generator at 1500 kc and tune the receiver until a response is indicated. The dial pointer should coincide with the 1500 kc mark on the dial. The signal generator is then set at 600 kc and the receiver tuned until a response is indicated. The padding condenser is then adjusted for maximum gain while the tuning gang condenser is rocked slightly to the left and right. The 1500 kc adjustment should then be rechecked.

MODELS 1049, 1540, 4124, 4410 and 4990. (ONLY)

Long Wave Band: The band selector switch is set in position for operation on the long wave band. The receiver and generator are both tuned to 300 kc and the oscillator trimmer is adjusted for maximum response. The antenna and first detector trimmers are adjusted in the order named for maximum output.

The signal generator is then set at 150 kc and the signal is turned on. The long wave padder condenser is adjusted for maximum response while the gang tuning condenser is rocked slightly to the left and right. The 300 kc adjustment should then be rechecked.

THIS NOTE REFERS TO MODELS 399, 4990; 1059, 1049; 1540; and 3109.

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GENERAL ELECTRIC CO.

**FREQUENCY RANGE**

1100-1600 K.C.

**SPECSIFICATIONS**

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CHASSIS ASSEMBLY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RB-941</td>
<td>BOTTOM COVER—Cabinet bottom cover</td>
<td>$0.30</td>
</tr>
<tr>
<td>RC-028</td>
<td>CAPTOR—.005 mfd. 600 V. paper</td>
<td>.25</td>
</tr>
<tr>
<td>RC-059</td>
<td>CAPACITOR—.01-.01 mfd. line capacitor</td>
<td>.55</td>
</tr>
<tr>
<td>RC-096</td>
<td>CAPACITOR—.01 mfd. 200 V. paper</td>
<td>.30</td>
</tr>
<tr>
<td>RC-319</td>
<td>CAPACITOR—.10 mfd. 100 V. paper</td>
<td>.25</td>
</tr>
<tr>
<td>RC-2002</td>
<td>CLAMP—Crystal clamp</td>
<td>.10</td>
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<tr>
<td>RC-2016</td>
<td>CLIP—Oscillator coil mounting clip (Pkg. 5)</td>
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<tr>
<td>RC-2017</td>
<td>CATCH—Tone arm catch for securing to rest</td>
<td></td>
</tr>
<tr>
<td>RC-5150</td>
<td>CAPACITOR—.10 mfd. 1000 V. dry electrolytic (C-6)</td>
<td>.70</td>
</tr>
<tr>
<td>RC-6529</td>
<td>CAPACITOR—Trimmer capacitor (C-0)</td>
<td>.40</td>
</tr>
<tr>
<td>RC-8174</td>
<td>CORD—Power cord (C-1)</td>
<td>.10</td>
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<tr>
<td>RF-016</td>
<td>FOOT—Rubber foot for cabinet (Pkg. 5)</td>
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</tr>
<tr>
<td>RG-016</td>
<td>GRID CAP—6A8G control grid cap (Pkg. 5)</td>
<td>.35</td>
</tr>
<tr>
<td>RH-114</td>
<td>HAIRPIN COTTER</td>
<td>.10</td>
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<tr>
<td>RK-073</td>
<td>KNOB—Power switch control knob</td>
<td>.10</td>
</tr>
<tr>
<td>RL-2019</td>
<td>COIL—Oscillator coil (L-1)</td>
<td>.40</td>
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<tr>
<td>RN-007</td>
<td>NUT—Speed nut for mounting motor assembly (Pkg. 3)</td>
<td>.10</td>
</tr>
<tr>
<td>RN-008</td>
<td>NUT—Power switch clamping nut (Pkg. 5)</td>
<td>.10</td>
</tr>
<tr>
<td>RN-112</td>
<td>NEEDLE CUP—Rubber needle cup</td>
<td>.75</td>
</tr>
<tr>
<td>R-P-056</td>
<td>PICK-UP—Crystal pick-up</td>
<td>.475</td>
</tr>
<tr>
<td>RP-081</td>
<td>POST—Tone arm swivel post</td>
<td>.15</td>
</tr>
<tr>
<td>RQ-1281</td>
<td>RESISTOR—1200 ohms ½ W. carbon (R-2) (Pkg. 5)</td>
<td>.70</td>
</tr>
<tr>
<td>RQ-1279</td>
<td>RESISTOR—6800 ohms ½ W. carbon (R-6) (Pkg. 5)</td>
<td>.70</td>
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<tr>
<td>RQ-1299</td>
<td>RESISTOR—47,000 ohms ½ W. carbon (R-3.5) (Pkg. 5)</td>
<td>.70</td>
</tr>
<tr>
<td>RQ-1309</td>
<td>RESISTOR—120,000 ohms ½ W. carbon (R-1) (Pkg. 5)</td>
<td>.70</td>
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<tr>
<td>RQ-1331</td>
<td>RESISTOR—1.0 mohm ½ W. carbon (R-5) (Pkg. 5)</td>
<td>.70</td>
</tr>
<tr>
<td>RR-940</td>
<td>REST—Tone arm rest</td>
<td>.15</td>
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<tr>
<td>RS-200</td>
<td>SOCKET—6A8G tube socket (Pkg. 5)</td>
<td>.75</td>
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<tr>
<td>RS-224</td>
<td>SOCKET—Type 84 tube socket (Pkg. 5)</td>
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<tr>
<td>RS-888</td>
<td>SCREW—Needle clamping screw</td>
<td>.10</td>
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<tr>
<td>RS-896</td>
<td>SCREW—Crystal clamp and catch screw (Pkg. 5)</td>
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<tr>
<td>RS-938</td>
<td>SWIVEL—Tone arm swivel assembly</td>
<td>.15</td>
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<tr>
<td>RS-3058</td>
<td>SWITCH—Power control switch</td>
<td>.50</td>
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<tr>
<td>RT-020</td>
<td>TRANSFORMER—Power transformer, 50 cycles (T-1)</td>
<td>.220</td>
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<tr>
<td>RT-021</td>
<td>TRANSFORMER—Power transformer, 50 cycles (T-2)</td>
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<tr>
<td>RT-912</td>
<td>TONE ARM—Crystal tone arm</td>
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<tr>
<td>RW-114</td>
<td>WEIGHT—Tone arm weight</td>
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</tbody>
</table>

**VOLTAGE CHART**

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<tr>
<th>Tubes</th>
<th>Plate to Gnd. Volts</th>
<th>Screen to Gnd. Volts</th>
<th>Cathode to Gnd. Volts</th>
<th>Filament Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7 (R.F.)</td>
<td>215</td>
<td>98</td>
<td>4.7</td>
<td>6.3</td>
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<tr>
<td>6K8</td>
<td>Conv—230 Osc—105</td>
<td>98</td>
<td>4.7</td>
<td>6.3</td>
</tr>
<tr>
<td>6SK7 (I.F.)</td>
<td>215</td>
<td>98</td>
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<td>6.3</td>
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<td>6H6</td>
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<td>6FS5</td>
<td>110</td>
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<tr>
<td>6V6G</td>
<td>290</td>
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<td>11.8</td>
<td>6.3</td>
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<td>5U4G</td>
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<td>277 a-c</td>
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<td>6U5</td>
<td>170</td>
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<td>6.3</td>
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</table>

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GENERAL INFORMATION

Models HE-50 and HE-540 are three-band receivers employing five General Electric Pre-tested Tubes in a superhetodyne circuit. Features of design include "Alnico" magnet dynamic speaker, beampower output, iron core I.F. transformers, single-ended tubes, and degenerative feedback. Model HE-50 is an A-C receiver available in three classes of voltage and frequency rating. Model HE-540 is an AC-DC receiver using an improved rectifier circuit.

Models HE-64L and HE-640L are similar to the above models except for tuning frequency coverage and incorporation of a tuning indicator. Model HE-64L is an A-C receiver while Model HE-640L is an AC-DC receiver.

Coil Data

All antenna and oscillator transformer switch terminals are numbered in Figs. 6, 7, 10, and 11 to facilitate in locating these common points on the schematic diagrams Figs. 4, 5, 8 and 9.

The following tables show the coils in use for the various positions of the band-change switch.

Models HE-50 and HE-540

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<thead>
<tr>
<th>Band Switch Position</th>
<th>Antenna Primary</th>
<th>Antenna Secondary</th>
<th>Oscillator Grid</th>
<th>Oscillator Cathode</th>
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</thead>
<tbody>
<tr>
<td>Band &quot;B&quot;</td>
<td>Section 1 to 5 of L1</td>
<td>Section 2 to 5 of L1</td>
<td>Section 6 to 10 of L2</td>
<td>Section 9 to 10 of L2</td>
</tr>
<tr>
<td>Band &quot;C&quot;</td>
<td>Section 2 to 5 of L1</td>
<td>Section 3 to 5 of L1</td>
<td>Section 7 to 10 of L2</td>
<td>Section 11 to 10 of L2</td>
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<tr>
<td>Band &quot;D&quot;</td>
<td>Section 3 to 5 of L1</td>
<td>Section 4 to 5 of L1</td>
<td>Section 8 to 10 of L2</td>
<td>Section 12 to 10 of L2</td>
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COIL RESISTANCE DATA

<table>
<thead>
<tr>
<th>Coil</th>
<th>Model</th>
<th>Section</th>
<th>Resistance Measured Between Points</th>
<th>Resistance (Ohms)</th>
</tr>
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<tbody>
<tr>
<td>Antenna</td>
<td>HE-50, 540</td>
<td>B</td>
<td>1 and 5</td>
<td>22</td>
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<tr>
<td></td>
<td></td>
<td>B</td>
<td>2 and 5</td>
<td>5</td>
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<tr>
<td></td>
<td></td>
<td>C</td>
<td>3 and 5</td>
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<tr>
<td></td>
<td></td>
<td>D</td>
<td>4 and 5</td>
<td>.02</td>
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<tr>
<td>Antenna</td>
<td>HE-64L, 640L</td>
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<td>1 and 5</td>
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<td>D</td>
<td>16 and 17</td>
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<td></td>
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<td>D</td>
<td>8 and 10</td>
<td>.02</td>
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<td>Oscillator</td>
<td>HE-64L, 640L</td>
<td>A</td>
<td>6 and 10</td>
<td>10</td>
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<tr>
<td></td>
<td></td>
<td>B</td>
<td>7 and 10</td>
<td>3</td>
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<tr>
<td></td>
<td></td>
<td>D</td>
<td>8 and 10</td>
<td>.03</td>
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<td>1st I.F. Transformer</td>
<td>All Models</td>
<td>Primary</td>
<td>9 to 12</td>
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<td></td>
<td></td>
<td>Secondary</td>
<td>15 to 19</td>
<td>.4</td>
</tr>
<tr>
<td>2nd I.F. Transformer</td>
<td>All Models</td>
<td>Primary</td>
<td>14 to 18</td>
<td>.4</td>
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<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>7 to 9</td>
<td>.5</td>
</tr>
<tr>
<td>Output Transformer</td>
<td>All Models</td>
<td>Primary</td>
<td>110 V. Tap</td>
<td>7</td>
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<td></td>
<td></td>
<td>Secondary</td>
<td>125 V. Tap</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>200 V. Tap</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>225 V. Tap</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>250 V. Tap</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Red to Red</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Green to Green</td>
<td>.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Yellow to Yellow</td>
<td>.5</td>
</tr>
</tbody>
</table>

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ALIGNMENT PROCEDURE (Continued)

R. F. ALIGNMENT—MODELS HE-50 AND HE-640

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Comments</th>
</tr>
</thead>
</table>

R. F. ALIGNMENT—MODELS HE-640L AND HE-640L.

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Band “B”</td>
<td>1500 K.C. with Modu-lation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Occ. (C-3)</td>
</tr>
<tr>
<td>5. Band “A”</td>
<td>1500 K.C. with Modu-lation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Occ. (C-2)</td>
</tr>
</tbody>
</table>

Voltage Chart (Models HE-50 and HE-640)

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate in 300 V.</th>
<th>Screen in 100 V.</th>
<th>Cathode in 50 V.</th>
<th>Plate in 90 V.</th>
<th>Screen in 30 V.</th>
<th>Cathode in 30 V.</th>
<th>Filament Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>68AT</td>
<td>144</td>
<td>100</td>
<td>0</td>
<td>5.5</td>
<td>2.5</td>
<td>2</td>
<td>6.5</td>
</tr>
<tr>
<td>6057</td>
<td>144</td>
<td>100</td>
<td>0</td>
<td>6.3</td>
<td>2.5</td>
<td>2</td>
<td>6.5</td>
</tr>
<tr>
<td>606</td>
<td>154</td>
<td>114</td>
<td>0</td>
<td>2.5</td>
<td>2.5</td>
<td>2</td>
<td>6.5</td>
</tr>
<tr>
<td>625**</td>
<td>154</td>
<td>114</td>
<td>0</td>
<td>2.5</td>
<td>2.5</td>
<td>2</td>
<td>6.5</td>
</tr>
</tbody>
</table>

Physical Specifications:

- Model HE-50, HE-640: 10% tolerance of 11.5 inches in 18 inches.
- Model HE-640L: 10% tolerance of 11.5 inches in 18 inches.
- Model HE-640L: 10% tolerance of 11.5 inches in 18 inches.
- Model HE-640L: 10% tolerance of 11.5 inches in 18 inches.

Electrical Specifications:

- Model HE-50: 103-117 volts, 1.0 cycle, 60 cycles.
- Model HE-640L: 103-117 volts, 1.0 cycle, 60 cycles.
- Model HE-640L: 200-240 volts, 10 cycles.
- Model HE-640L: 200-240 volts, 10 cycles.

Load-speaker—*Alamo* Magnet Dynamic

- Model HE-50: 103-117 volts, 1.0 cycle, 60 cycles.
- Model HE-640L: 103-117 volts, 1.0 cycle, 60 cycles.
**PARTS DESCRIPTION LIST**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2a</td>
<td>Antenna section of tuning condenser</td>
</tr>
<tr>
<td>C2b</td>
<td>Oscillator section of tuning condenser</td>
</tr>
<tr>
<td>C9</td>
<td>47 mmf. mica capacitor</td>
</tr>
<tr>
<td>C10</td>
<td>0.05 mmf. paper capacitor</td>
</tr>
<tr>
<td>C11</td>
<td>0.005 mmf. paper capacitor</td>
</tr>
<tr>
<td>C12</td>
<td>0.04 mmf. mica capacitor</td>
</tr>
<tr>
<td>C13</td>
<td>0.01 mmf. mica capacitor</td>
</tr>
<tr>
<td>C14</td>
<td>0.05 mmf. paper capacitor</td>
</tr>
<tr>
<td>C15</td>
<td>0.01 mmf. paper capacitor</td>
</tr>
<tr>
<td>C16</td>
<td>0.005 mmf. paper capacitor</td>
</tr>
<tr>
<td>C17a</td>
<td>30 mmf. 150 V. dry electrolytic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C17b</td>
<td>40 mmf. 150 V. dry electrolytic</td>
</tr>
<tr>
<td>C19</td>
<td>0.2 mmf. paper capacitor</td>
</tr>
<tr>
<td>C20</td>
<td>0.1 mmf. paper capacitor</td>
</tr>
<tr>
<td>C21</td>
<td>0.005 mmf. paper capacitor</td>
</tr>
<tr>
<td>L1</td>
<td>Beam-A-Scope</td>
</tr>
<tr>
<td>L2</td>
<td>Oscillator coil</td>
</tr>
<tr>
<td>L3</td>
<td>1st. I.F. transformer</td>
</tr>
<tr>
<td>L4</td>
<td>2nd. I.F. transformer</td>
</tr>
<tr>
<td>R1</td>
<td>33,000 ohms carbon resistor</td>
</tr>
<tr>
<td>R2</td>
<td>2.5 megohms carbon resistor</td>
</tr>
<tr>
<td>R3</td>
<td>470,000 ohms carbon resistor</td>
</tr>
</tbody>
</table>

**REPLACEMENT PARTS LIST**

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>List Price</th>
<th>Stock No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>R3-208</td>
<td>BOARD — Terminal board (21up.)</td>
<td>$0.010</td>
<td>R3-219</td>
<td>RESISTOR — 15 ohms 1/4 W. carbon (R-10)</td>
<td>$0.050</td>
</tr>
<tr>
<td>R3-229</td>
<td>BRUSHING — Tuning shaft bushing</td>
<td>$0.015</td>
<td>R4-255</td>
<td>RESISTOR — 33,000 ohms 1/4 W. (R-1)</td>
<td>$0.070</td>
</tr>
<tr>
<td>R4-945</td>
<td>BACK COVER — Cabinet back cover for Model J-51.</td>
<td>$0.150</td>
<td>R4-985</td>
<td>RESISTOR — 470,000 ohms 1/4 W. (R-5)</td>
<td>$0.080</td>
</tr>
<tr>
<td>R3-304</td>
<td>BACK COVER — Cabinet back cover for Model J-54 and J-5W.</td>
<td>$0.150</td>
<td>R4-100</td>
<td>RESISTOR — 2.5 megohms 1/4 W. (R-5)</td>
<td>$0.070</td>
</tr>
<tr>
<td>R4-195</td>
<td>BOARD — Terminal board (1 up)</td>
<td>$0.150</td>
<td>R4-140</td>
<td>RESISTOR — 470,000 ohms 1/4 W. (R-3, 6, 7)</td>
<td>$0.070</td>
</tr>
<tr>
<td>R4-112</td>
<td>BRACKET — Beam-A-Scope bracket</td>
<td>$0.250</td>
<td>R4-300</td>
<td>RESISTOR — 1,000 ohms 1/4 W. carbon (R-9)</td>
<td>$0.200</td>
</tr>
<tr>
<td>R4-223</td>
<td>CAPACITOR — 0.01 mmf. 600 V. paper (C-12, 20)</td>
<td>$0.250</td>
<td>R5-238</td>
<td>SOCKET — Octal tube socket</td>
<td>$0.150</td>
</tr>
<tr>
<td>R4-192</td>
<td>CAPACITOR — 0.01 mmf. 600 V. paper (C-15, 20)</td>
<td>$0.250</td>
<td>R5-383</td>
<td>SOCKET — 2BT tube socket</td>
<td>$0.150</td>
</tr>
<tr>
<td>C1</td>
<td>CAPACITOR — 0.01 mmf. 600 V. paper</td>
<td>$0.250</td>
<td>R5-452</td>
<td>SOCKET — Dial light socket assembly</td>
<td>$0.200</td>
</tr>
<tr>
<td>R4-324</td>
<td>CAPACITOR — 0.047 mmf. mica (R-6)</td>
<td>$0.300</td>
<td>R5-408</td>
<td>SPRING — Drive cord tension spring (Pkg. 5)</td>
<td>$0.20</td>
</tr>
<tr>
<td>R4-294</td>
<td>CAPACITOR — 0.05 mmf. mica (C-4)</td>
<td>$0.300</td>
<td>R5-409</td>
<td>SPRING — Control knob tension spring (Pkg. 10)</td>
<td>$0.10</td>
</tr>
<tr>
<td>R4-295</td>
<td>CAPACITOR — 0.05 mmf. mica (C-6)</td>
<td>$0.300</td>
<td>R5-1035</td>
<td>SPEAKER — 6-in. dynamic speaker and output transformer assembly (2-3/4 in.)</td>
<td>$2.50</td>
</tr>
<tr>
<td>R4-363</td>
<td>CAPACITOR — 0.1 mmf. mica (C-9)</td>
<td>$0.300</td>
<td>R6-9096</td>
<td>SHAFT — Tuning shaft</td>
<td>$0.05</td>
</tr>
<tr>
<td>R4-199</td>
<td>CUSHION — Pointer guide plate spacers</td>
<td>$0.10</td>
<td>R7-329</td>
<td>TRANSFORMER — 1st I.F. transformer (L-3)</td>
<td>$0.070</td>
</tr>
<tr>
<td>R4-202</td>
<td>CUSHION — Mounting cushion for dial scale (Pkg. 5)</td>
<td>$0.20</td>
<td>R7-389</td>
<td>TRANSFORMER — Output transformer (T-1)</td>
<td>$0.09</td>
</tr>
<tr>
<td>R4-5163</td>
<td>CAPACITOR — 0.001 mmf. 600 V. paper</td>
<td>$0.20</td>
<td>R7-485</td>
<td>TERMINAL — Antenna or ground terminal (Pkg. 5)</td>
<td>$0.05</td>
</tr>
<tr>
<td>R4-7031</td>
<td>CONDENSER — Tuning condenser and drum assembly (R-5A, 2A, 2B)</td>
<td>$0.65</td>
<td>EV-25</td>
<td>VOLUME CONTROL — 0.5-megohm volume control (R-4)</td>
<td>$1.45</td>
</tr>
<tr>
<td>R4-323</td>
<td>CONDENSER — Tuning condenser for use on Models with detachable drum (R-2A, 2B)</td>
<td>$1.95</td>
<td>RZ-217</td>
<td>CABINET — Cabinet for Model J-54</td>
<td>$18.00</td>
</tr>
<tr>
<td>R4-317</td>
<td>CORD — Driving cord</td>
<td>$1.90</td>
<td>RZ-175</td>
<td>CABINET — Cabinet for Model J-54W</td>
<td>$20.00</td>
</tr>
<tr>
<td>R4-901</td>
<td>CONDENSER — Speaker cone assembly</td>
<td>$0.60</td>
<td>R3-306</td>
<td>ESCUTCHEON — Dial escutcheon</td>
<td>$0.40</td>
</tr>
<tr>
<td>R4-159</td>
<td>DIAL — Dial scale for Models J-51 and J-5W</td>
<td>$0.40</td>
<td>R3-421</td>
<td>DRUM — Drum, hub and set screw assembly</td>
<td>$0.40</td>
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<tr>
<td>R3-846</td>
<td>ESCUTCHEON — Dial escutcheon</td>
<td>$0.40</td>
<td>R4-306</td>
<td>FASTENER — Fastener for mounting cabinet back on Models J-54 and J-5W (Pkg. 10)</td>
<td>$0.10</td>
</tr>
<tr>
<td>R4-206</td>
<td>FASTENER — Beam-A-Scope — bracket fastener (Pkg. 5)</td>
<td>$0.10</td>
<td>R4-207</td>
<td>FASTENER — Cabinet back fastener for Models J-51 and J-53 (Pkg. 5)</td>
<td>$0.10</td>
</tr>
<tr>
<td>R4-111</td>
<td>HAIRPIN COTTER — Tuning shaft detent cotter (Pkg. 10)</td>
<td>$0.10</td>
<td>R4-208</td>
<td>PLATE — Pointer plate assembly</td>
<td>$0.10</td>
</tr>
<tr>
<td>R3-901</td>
<td>KNOB — Control knob and spring (Model J-54)</td>
<td>$0.05</td>
<td>R4-209</td>
<td>PLATE — Pointer plate assembly</td>
<td>$0.10</td>
</tr>
<tr>
<td>R3-902</td>
<td>KNOB — Control knob and spring (Model J-51, J-53)</td>
<td>$0.05</td>
<td>R4-302</td>
<td>PULLY — Pointer cord pulley and stud (Pkg. 6)</td>
<td>$0.10</td>
</tr>
<tr>
<td>R3-903</td>
<td>KNOB — Control knob and spring (Model J-54)</td>
<td>$0.05</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>R3-389</td>
<td>BEAM-A-SCOPE — Beam-A-Scope assembly (L-1)</td>
<td>$0.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R4-511</td>
<td>OSCILLATOR coil</td>
<td>$0.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R4-512</td>
<td>MASK — Dial plate reflector mask</td>
<td>$0.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R4-500</td>
<td>NUT — Speed nut for mounting dial scales on Models J-54 and J-5W (Pkg. 5)</td>
<td>$0.10</td>
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<td></td>
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</tr>
<tr>
<td>R3-300</td>
<td>NUT — Speed nut for mounting dial scales on Models J-51 and J-53 (Pkg. 5)</td>
<td>$0.10</td>
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<tr>
<td>R4-201</td>
<td>NUT — Control knob and spring (Pkg. 5)</td>
<td>$0.10</td>
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<tr>
<td>R4-188</td>
<td>PLATE — Pointer plate assembly</td>
<td>$0.20</td>
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<tr>
<td>R4-219</td>
<td>PLATE — Pointer plate assembly</td>
<td>$0.20</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>RP-303</td>
<td>PULLY — Pointer cord pulley and stud (Pkg. 6)</td>
<td>$0.10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Used on previous receivers. (Prices Subject to Change without Notice)*

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MODELS J-51, J-53, J-54, and J-54W

GENERAL ELECTRIC CO.

OVER-ALL DIMENSIONS

<table>
<thead>
<tr>
<th>Model</th>
<th>J-51</th>
<th>J-53</th>
<th>J-54, J-54W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>8 1/2 inches</td>
<td>8 1/2 inches</td>
<td>7 1/2 inches</td>
</tr>
<tr>
<td>Width</td>
<td>12 1/2 inches</td>
<td>14 1/2 inches</td>
<td>10 1/2 inches</td>
</tr>
<tr>
<td>Depth</td>
<td>6 1/4 inches</td>
<td>6 1/4 inches</td>
<td>6 1/4 inches</td>
</tr>
</tbody>
</table>

ELECTRICAL RATING

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>115 AC or DC</td>
<td>40-60</td>
<td>30</td>
</tr>
<tr>
<td>C</td>
<td>115 AC or DC</td>
<td>25</td>
<td>30</td>
</tr>
</tbody>
</table>

TUNING CONTROL DRIVE RATIO: 14:1

TUNING FREQUENCY RANGE: 540-1600 KC

INTERMEDIATE FREQUENCY: 455 KC

ELECTRICAL POWER OUTPUT (117 line volts)

- Undistorted: 1.5 watts
- Distorted: 2.5 watts

LOAD SPEAKER: “ALNICO” MAGNET DYNAMIC

- Outside Cone Diameter: 5 inches
- Voice Impedance (400 cycles): 3.5 ohms

TUBES

- Converter and Oscillator: GE-123AG7
- I.F. Amplifier: GE-1287
- Det. Aud. A.V.: GE-123Q7
- Audio Output: GE-5016GT
- Rectifier: GE-3325GT
- Dial Lamp: MAZDA No. 47

GENERAL INFORMATION

Models J-51, J-53, J-54 and J-54W are compact, five-tube superhetehrondyne receivers which can be operated either as AC or DC source of power. Model J-51 and J-53 cabinets are in matched walnut veneers. Model J-54 and J-54W cabinets are plastic in oak and gray-white respectively. All models incorporate the following design features: Built-in Beam-a-Scope, 8-inch dynapower speaker, increased dial length, automatic volume control, and beam power output. The glass tubes used in the converter and detector stages are interchangeable with metal tubes if the receiver is realigned following the change.

ALIGNMENT PROCEDURE

Alignment Frequencies

- I.F.: 456 KC
- R.F.: 1650 and 1500 KC

The location of all trimmers is shown in Fig. 1:

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 450 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st I.F. transformer cans.

R.F. Alignment

To insert the R.F. signal use either a standard 1.R.F. dummy antenna between the signal generator and the receiver antenna post, or loop-couple the generator signal to the receiver Beam-a-Scope. A distance of two feet between generator loop and receiver Beam-a-Scope will insure freedom from over-coupling. When using an 1.R.F. dummy antenna for R.F. alignment, do not connect the signal generator ground to the receiver chassis.

With the gang condenser wide open, align oscillator trimmer (C-2b) to 1650 KC. Change generator signal to 1500 KC, tune receiver to the signal and peak antenna trimmer (C-2a) for maximum output.

Precaution

If the signal generator is AC operated use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended as AC current through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

1. Stage Gains
   - Antenna Post to Converter Grid: 4.0 at 1000 KC
   - R.F. on Converter Grid to I.F. on I.F. Amplifier Grid: 40 at 1000 KC
   - I.F. on Converter Grid to I.F. on I.F. Amplifier Grid: 60 at 455 KC
   - I.F. Amplifier Grid to Detector Plate: 50 at 455 KC

2. 0.15-volt, 400-cycle signal across the volume control will give 34-watt speaker output. (Volume control turned to maximum.)

3. Average DC voltage developed across oscillator grid resistor (R-1) is 15 volts

* Variations of ± 20% permissible. All readings obtained with enough signal input to give 34-watt speaker output.

Fig. 1. Trimmer Location

Fig. 2. Frequency-degree Reference Chart

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### Electrical Specifications

**Model JE-61L**

<table>
<thead>
<tr>
<th>Model</th>
<th>Power Rating (Volts)</th>
<th>Voltage Range</th>
<th>Frequency (Cycles on A.C.)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JE-61L</td>
<td>110, 125, 145, 200, 225, 250</td>
<td>103-117, 118-133, 134-155, 188-212, 213-237, 238-262</td>
<td>25-100</td>
<td>100</td>
</tr>
</tbody>
</table>

### PHYSICAL SPECIFICATIONS

**Models JE-51, JE-510, JE-61, JE-61L**

- **JE-51, JE-510**
  - JE-51: 10 1/8 inches, 11 3/8 inches
  - JE-510: 10 1/8 inches, 12 3/8 inches

- **JE-61, JE-61L**
  - JE-61: 12 1/2 inches, 14 1/2 inches
  - JE-61L: 12 1/2 inches, 14 1/2 inches

- **Height**: 10 1/8 inches, 11 3/8 inches
- **Width**: 10 1/8 inches, 11 3/8 inches
- **Depth**: 8 1/2 inches, 9 1/2 inches

**Drive Ratio**: 22:1

**Electrical Power Output**
- JE-51, JE-510: 2.7 watts, 3.0 watts
- JE-61, JE-61L: 8.0 watts, 9.0 watts

**Tone Control**: 3-position

**Loud-speaker—"Alnico" Magnet Dynamic**
- JE-51, JE-510—6 1/2 inches
- JE-61, JE-61L—8 inches
- Voice Coil Impedance (400 cycles): 8.5 ohms

**"V"** rated receivers may be operated on 40 cycles provided the power supply voltage is reduced so as not to exceed the following equivalents: 110 volts on the 125-volt tap or 200 volts on the 225-volt tap.

### Tubes

**Models JE-51, JE-510**
- I.F. Amplifier: GE-6SK7
- Det., Aud. AVC: GE-6SN7
- Power Output: GE-25C6G
- Rectifier: GE-2326G
- Dial Lamp: No. 44

**Models JE-61, JE-61L**
- I.F. Amplifier: GE-6SA7
- Det., Aud. AVC: GE-6SN7
- Power Output: GE-25C6G
- Rectifier: GE-2326G
- Tuning Indicator: GE-6U6
- Dial Lamp: No. 44
### VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Gnd Volts</th>
<th>Screen to Gnd Volts</th>
<th>Cathode to Gnd Volts</th>
<th>Filament Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SA7</td>
<td>153</td>
<td>106</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>6SK7</td>
<td>153</td>
<td>106</td>
<td>3</td>
<td>6.3</td>
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<tr>
<td>6SQ7</td>
<td>62*</td>
<td>0</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>25C6G</td>
<td>221</td>
<td>153</td>
<td>14</td>
<td>25</td>
</tr>
</tbody>
</table>


* Use a high resistance voltmeter.
** Used only on Models JE-61 and JE-61L.

### SPECIAL SERVICE INFORMATION

The following information will be found very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

1. **Stage Gains**
   - **(a) Antenna Post to Converter Grid at**
     - 250 K.C. 6.0
     - 1000 K.C. 4.0
     - 4000 K.C. 3.2
     - 18000 K.C. 2.4
   - **(b) R.F. on Converter Grid to I.F. on 6SK7**
     - 250 K.C. 25
     - 1000 K.C. 30
     - 4000 K.C. 30
     - 18000 K.C. 28
   - **(c) I.F. on Converter Grid to I.F. on 6SK7**
     - 455 K.C. 55

2. **Voltage across the diode load to give ½ watt speaker output at**
   - 460 Cycles .066*

### COIL RESISTANCE DATA

<table>
<thead>
<tr>
<th>Coil</th>
<th>Model</th>
<th>Section</th>
<th>Resistance Measured Between Points</th>
<th>Resistance (Ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antenna</td>
<td>JE-51, 510, 61</td>
<td>B Primary</td>
<td>1 and 5</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B Secondary</td>
<td>2 and 5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C Secondary</td>
<td>3 and 5</td>
<td>.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Secondary</td>
<td>4 and 5</td>
<td>.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A Primary</td>
<td>1 and 5</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A Secondary</td>
<td>2 and 5</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B Secondary</td>
<td>3 and 5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Secondary</td>
<td>4 and 5</td>
<td>.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Primary</td>
<td>16 and 17</td>
<td>.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B Band Coil</td>
<td>6 and 10</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C Band Coil</td>
<td>7 and 10</td>
<td>.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Band Coil</td>
<td>8 and 10</td>
<td>.02</td>
</tr>
<tr>
<td>Oscillator</td>
<td>JE-51, 510, 61</td>
<td>A Band Coil</td>
<td>6 and 10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A Band Coil</td>
<td>7 and 10</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Band Coil</td>
<td>8 and 10</td>
<td>.03</td>
</tr>
<tr>
<td>1st I.F. Transformer</td>
<td>All Models</td>
<td>Primary</td>
<td>9 to 12</td>
<td>265</td>
</tr>
<tr>
<td>2nd I.F. Transformer</td>
<td>All Models</td>
<td>Secondary</td>
<td>15 to 19</td>
<td>7 to 9</td>
</tr>
<tr>
<td>Output Transformer</td>
<td>All Models</td>
<td>Primary</td>
<td>14 to 18</td>
<td>.4</td>
</tr>
<tr>
<td>Power Transformer</td>
<td>JE-51, 61, 61L</td>
<td>Secondary</td>
<td>7 to 9</td>
<td>.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primary</td>
<td>110 V. Tap</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>125 V. Tap</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primary</td>
<td>200 V. Tap</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>225 V. Tap</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primary</td>
<td>250 V. Tap</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>Red to Red</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green to Green</td>
<td></td>
<td>.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yellow to Yellow</td>
<td></td>
<td>.5</td>
</tr>
</tbody>
</table>

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**GENERAL INFORMATION**

Models JE-51, JE-510, and JE-610 use three-band receivers employing five General Electric Pre-Tuned Tubes in a superhetodry-frequency configuration. The triode is a 6AM1, and the grid is a 602-A. Additional features include balanced phonograph and television sound terminals. Tone Monitor Circuit, low volume, 110-volt compensation, automatic volume control, -140-octave controls, anti-drift design, and the new Dynaphase synchronous rectifier.

**Model JE-61** and **JE-61L** are similar to the above models in design except for inclusion of a cathode-ray-tuning indicator tube and elimination of cathode-ray-tuning circuit and substitution of a 3-1/2-inch Dynaphase speaker in place of the six and a half-inch unit provided in the JE-61. The wave band (140 to 400 K.C.) in place of the “C” band on Model JE-61.

**CHASSIS REMOVAL**

Note: Before attempting to slide the chassis out of the cabinet on these models free the drive cord from the dial pointer. A drop or two of cement may have been used to hold the pointer securely to the cord. This can be loosened with the fingernail of a pointed tool. Then press down on the cord until it can be moved to the rear underneath the hump in the pointer.

**POWER SUPPLY**

The receivers are supplied with the new plug-in type power supply which permits practical instantaneous conversion to DC operation. Simply remove the power transformer and replace with a plug-in type ballast resistor. Refer to the data given under “Conversion for Special Line Voltages.” The new power transformer is provided with 6-volt lamp. Instant tap switching is made with a simple pin plug and jack device. For correct operation measure the power supply voltage. Note which voltage range covers this voltage (see Electrical Specifications) and using the corresponding tap select the pin plug in the jack.

**CONVERSION FOR SPECIAL LINE VOLTAGES**

The JE-51, JE-510, and JE-610 can be converted for operation on the following line voltages. In all cases where the power transformer is removed, a ballast resistor must be connected across the line terminals, and the power transformer must be removed from the chassis as the radiant heat from the transformer may be a likely cause to injure the transformer insulation. When operated with these special resistors, the radio output and the AC line-to-ground unbalanced voltages supplied to the radio are reduced.

### 220 Volt AC (—range 200-240)

Use the power transformer from chassis JE-51, JE-51L, and JE-61L, and substitute ballast resistor RR-783 in socket previously located for regulator. Remove the regulator, plug cutouts, and switch sets with correct cabinet label. Use 602-A dummy cathode for CE-16, CE-21, and CE-51, and 602-A dummy cathode for CE-16L, CE-21L, and CE-51L. Remove the “-140” from the “-140” list. Add a 1000 K.C. with modulation and a 6-M.C. with modulation.

### 115 Volt AC (—range 105-120)

Isolate the chassis of JE-51, JE-51L, and JE-61L, or ballast RR-783 from JE-510; insert following respective ballast tubes and switch sets with correct cabinet label supplied with new ballast resistor.

### 180 Volt DC (—Voltage regulation for fluctuating line voltages 145-210)

Remove transformer and ballast resistor from chassis JE-81, JE-81L, and JE-61L. Isolate the ballast resistor to chassis JE-510, insert following ballast tubes and switch sets with correct cabinet label supplied with new ballast resistor.

### ALIGNMENT WITH OSCILLOSCOPE

Use a standard I.R.E. dummy antenna in making all R.F. alignments. The following points on the schematic diagram Fig. 4 will be made in the order shown after 600 and 300 ohm lines have been provided in service.

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency</th>
<th>Input</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Inductor or Trimmer</th>
</tr>
</thead>
</table>

**R.F. ALIGNMENT—MODELS JE-51, JE-510, AND JE-61**

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency</th>
<th>Input</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Inductor or Trimmer</th>
</tr>
</thead>
</table>

**Arrangement for Test Output Meters**

Either of the following adapters may be used for test output meters, and set the controls as indicated on the previous page:

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency</th>
<th>Input</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Inductor or Trimmer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Band</td>
<td>1500 K.C. Mod.</td>
<td>I.R.E.</td>
<td>Oct. (C-2)</td>
<td>(C-2)</td>
<td></td>
</tr>
</tbody>
</table>

**Phonograph or Television Sound Connections**

Fig. 1 shows a simple method for connecting a crystal or high impedance magnetic pickup to the receiver for reproduction of phonograph recordings. S-1 is a triple-pole, double-throw switch. A suitable loudspeaker and a transformer should be used across the pickup leads when using 60-cycle appliances. It is important that the pickup leads have a shield such as copper band, to prevent hum interference. When a transformer is used, S-1 should be removed. Remove the transformer from 1000 K.C. and 6 M.C. with modulation. Add a 1000 K.C. with modulation and a 6 M.C. with modulation.

**Load-speaker**

The speaker is accurately and symmetrically centered at the factory and should seldom need to be refitted. In case a voice coil needs refitting, it will be necessary to make a minimum change in voice coil and voice coil assembly. Assembly instructions accompany each model.

**Symbol Description**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Stock No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Triple-pole, double-throw switch</td>
<td>RS-360</td>
</tr>
<tr>
<td>S-1</td>
<td>500,000 ohm resistor</td>
<td>RQ-1319</td>
</tr>
</tbody>
</table>

**R.F. ALIGNMENT—MODELS JE-51, JE-510, AND JE-61**

**Close gap condenser plates**

A special alignment scale is glued to the back side of pulley frame adjacent to point cord. With paper clip or drop of paint mark point cord as line in this line on right side of scale (viewed from rear of chassis). The selected edge of the clip or drop of paint will serve as a pointer for performing the following R.F. alignment.

**Connect meters across voice coil out—open battery signal low and voltage control on as far as possible. Adjust iron-core inductors for maximum output.**

---

*Note: The image contains text and diagrams related to electronic equipment alignment and testing procedures. The text provides detailed instructions for removing, inserting, and aligning various components to achieve proper operation.*
Fig. 1. Schematic

Mazda No. 46

Universal Transformer
120-240 V 50-60 Hz

CONDITIONS OF TEST

APPROX RESISTANCE MEASUREMENTS

RESIST TO GROUND TUBE SOCKET PROD
1 250KΩ 607 grid cap
2 250KΩ 647 grid cap
3 250KΩ 75 grid cap
4 250KΩ 41 grid cap

Tone Control

2-point

Loudspeaker—Electrodynamic

Cone
6.5 inches

Voice Coil Impedance
5.5 ohms at 400 cycles

Tuning Drive

The drive cable should be carefully threaded around the condenser drive drum and pulleys as shown in Fig. 3.

Tuning Frequency Range

Band "B"
540-1720 kc.

Band "C"
5,800-18,000 kc.

Intermediate Frequency
455 kc.

Electrical Output

Undistorted
2.3 watts

Maximum
3.5 watts

SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Plate to Ground Volts—D.C.</th>
<th>Screen Grid to Ground Volts—D.C.</th>
<th>Cathode to Ground Volts—D.C.</th>
<th>Cathode Current M.A.</th>
<th>Heater Volts A.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A7</td>
<td>176</td>
<td>105</td>
<td>0</td>
<td>14.8</td>
<td>6.3</td>
</tr>
<tr>
<td>Converter</td>
<td>230</td>
<td>105</td>
<td>0</td>
<td>10</td>
<td>6.3</td>
</tr>
<tr>
<td>6D6 1st I.F. Amp.</td>
<td>230</td>
<td>105</td>
<td>0</td>
<td>.16</td>
<td>6.3</td>
</tr>
<tr>
<td>75 Det A.V.C. 1st audio</td>
<td>100 *</td>
<td>105</td>
<td>0</td>
<td>.16</td>
<td>6.3</td>
</tr>
<tr>
<td>41 Output</td>
<td>215</td>
<td>230</td>
<td>0</td>
<td>29</td>
<td>6.3</td>
</tr>
<tr>
<td>80 Rectifier</td>
<td>300/600 RMS</td>
<td>315 to B-</td>
<td>54</td>
<td>6.3</td>
<td></td>
</tr>
</tbody>
</table>

A-C line voltage 120. No signal input. 1000 ohms per-volt meter. Dial pointer at 530 K.C. *Measured on 500-volt scale.

Fig. 3. Dial Mechanism
Fig. 4. Chassis Parts Layout

GENERAL INFORMATION

This two-band receiver employs five General Electric Pre-tested tubes in a superheterodyne circuit. The circuit incorporates a wave trap and a two-point tone control.

A signal from the antenna is coupled by the antenna transformer to the control grid of the 6A7 oscillator and converter tube. After conversion to 455 kc, the signal is amplified at this frequency by the intermediate frequency amplifier which employs two double tuned I.F. transformers.

The diode part of the 75 tube is used as a detector and provides the a.c. voltage. The 75 tube is resistance-coupled to the 41 pentode amplifier output tube.

Minimum bias is supplied for all tubes except the 75 by the voltage drop over the resistance R-8 and R-12. Bias for the 75 tube is supplied by the voltage drop over R-12.

Negative feed back is used to improve the tone reproduction. In this circuit, voltage is fed back from the voice coil circuit to a tap on the volume control. This feed-back voltage is out of phase with the input voltage to the audio amplifier. Engineers have shown that the resulting degeneration reduces distortion arising in the audio amplifier and extends the tone range.

ALIGNMENT PROCEDURE

I.F. Alignment

Connect an output meter across the voice coil. Set the volume control for maximum.

Set the test oscillator to 455 kc, and connect one output lead to the receiver chassis and the other through a .05 Mfd. condenser to the control grid of the 6A7. Do not remove the grid lead from the 6A7 as this would remove the minimum bias from this tube. Keep the test oscillator output as low as possible to give a readable output. The four I.F. trimmers (see Fig. 2.) should be adjusted in the following sequence for maximum output.

1. Secondary trimmer (C-9) on second I.F. transformer.
2. Primary trimmer (C-8) former.
4. Primary trimmer (C-6) final.

Wave Trap Alignment

Leave the test oscillator set to 455 kc and connect one output lead to the receiver chassis and the other through a 250 Mmf. condenser in series with 400 ohms to the receiver antenna lead. Adjust C-10 for minimum output.

R.F. Alignment

A careful examination of the diagram, Fig. 1, will disclose that the "D" band oscillator trimmer C-4 must first be set before any adjustment of the broadcast oscillator trimmer C-23 can be made. The image of any signal on "D" band should be tuned in 910 kc, below the input signal when C-4 is on the correct peak. Example: 18 mc, image is at 17.89 mc.

Use the same dummy antenna (250 Mmf. and 400 ohms) as used for the wave-trap alignment.

Rock the gang condenser when peaking the trimmers (C-11 or C-5).

Band Switch Signal Frequency Adjust Trimmer
1. "D" 18 mc C-4 (only)
2. "B" 1500 kc C-23 and C-3
3. "B" 580 kc C-11
4. "B" 1500 kc C-23 and C-3
5. "D" 18 mc C-5

NOTE: Be sure that the setting of C-4 made in No. 1 is not disturbed during any other part of the alignment. If it is changed the whole R.F. alignment procedure should be repeated.

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Compliments of www.nucow.com
GENERAL ELECTRIC CO.

MODEL GE-53

POWER CONSUMPTION (LABEL A) 65 WATTS, (LABEL V) 70 WATTS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C5</td>
<td>R. P. Trimmer Capacitor, &quot;D&quot; Band</td>
<td>C40</td>
<td>Paper Capacitor, 0.001 Mfd.</td>
<td>R10</td>
<td>Carbon Resistor, 2.2 Megohms</td>
</tr>
<tr>
<td>C6</td>
<td>Osc. Trimmer Capacitor, &quot;D&quot; Band</td>
<td>C41</td>
<td>Paper Capacitor, 0.005 Mfd.</td>
<td>R11</td>
<td>Carbon Resistor, 330,000 Ohms</td>
</tr>
<tr>
<td>C8</td>
<td>Osc. Padder Condenser, &quot;B&quot; Band</td>
<td>C42</td>
<td>Electrolytic Capacitor, 4.0 mfd.</td>
<td>R12</td>
<td>Carbon Resistor, 330,000 Ohms</td>
</tr>
<tr>
<td>C17</td>
<td>Mica Capacitor, 470 Mmf.</td>
<td>C43</td>
<td>Paper Capacitor, 0.005 Mfd.</td>
<td>R13</td>
<td>Carbon Resistor, 22,000 Ohms</td>
</tr>
<tr>
<td>C18</td>
<td>Mica Capacitor, 380 Mmf.</td>
<td>C44</td>
<td>Paper Capacitor, 0.005 Mfd.</td>
<td>R14</td>
<td>Carbon Resistor, 3900 Ohms</td>
</tr>
<tr>
<td>C19</td>
<td>Mica Capacitor, 3900 Mmf.</td>
<td>C45</td>
<td>Paper Capacitor, 0.06 Mfd.</td>
<td>R15</td>
<td>Carbon Resistor, 22 Ohms</td>
</tr>
<tr>
<td>C20</td>
<td>Mica Capacitor, 47 Mmf.</td>
<td>C46</td>
<td>Paper Capacitor, 0.001 Mfd.</td>
<td>R16</td>
<td>Carbon Resistor, 330 Ohms</td>
</tr>
<tr>
<td>C21</td>
<td>Mica Capacitor, 370 Mmf.</td>
<td>C47</td>
<td>Paper Capacitor, 0.005 Mfd.</td>
<td>R17</td>
<td>Carbon Resistor, 330 Ohms</td>
</tr>
<tr>
<td>C22</td>
<td>Mica Capacitor, 183-450 Mmf.</td>
<td>C48</td>
<td>Paper Capacitor, 0.012 Mfd.</td>
<td>R18</td>
<td>Carbon Resistor, 2 Megohms, tap at 1500 Ohms</td>
</tr>
<tr>
<td>C25</td>
<td>Mica Capacitor, 85-345 Mmf.</td>
<td>C49</td>
<td>Paper Capacitor, 0.1 Mfd.</td>
<td>R19</td>
<td>Carbon Resistor, 2 Megohms, tap at 1500 Ohms</td>
</tr>
<tr>
<td>C26</td>
<td>Mica Capacitor, 80-335 Mmf.</td>
<td>C50</td>
<td>Paper Capacitor, 0.1 Mfd.</td>
<td>R20</td>
<td>Carbon Resistor, 2 Megohms, tap at 1500 Ohms</td>
</tr>
<tr>
<td>C27</td>
<td>Mica Capacitor, 35-175 Mmf.</td>
<td>C51</td>
<td>Mica Capacitor, 0.01 Mfd.</td>
<td>R21</td>
<td>Carbon Resistor, 0.005 Mfd.</td>
</tr>
<tr>
<td>C28</td>
<td>Mica Capacitor, 30-118 Mmf.</td>
<td>C52</td>
<td>Dry Electrolytic Capacitor, 4 Mfd.</td>
<td>R22</td>
<td>Mica Capacitor, 0.012 Mfd.</td>
</tr>
<tr>
<td>C29</td>
<td>Mica Capacitor, 11-56 Mmf.</td>
<td>C53</td>
<td>Dry Electrolytic Capacitor, 8 Mfd.</td>
<td>R23</td>
<td>Paper Capacitor, 0.005 Mfd.</td>
</tr>
<tr>
<td>C30</td>
<td>Mica Capacitor, 183-450 Mmf.</td>
<td>C54</td>
<td>Dry Electrolytic Capacitor, 8 Mfd.</td>
<td>R24</td>
<td>Paper Capacitor, 0.005 Mfd.</td>
</tr>
<tr>
<td>C31</td>
<td>Mica Capacitor, 85-345 Mmf.</td>
<td>C55</td>
<td>Carbon Resistor, 47,000 Ohms</td>
<td>R25</td>
<td>Carbon Resistor, 47,000 Ohms</td>
</tr>
<tr>
<td>C32</td>
<td>Mica Capacitor, 80-335 Mmf.</td>
<td>C56</td>
<td>Carbon Resistor, 18,000 Ohms</td>
<td>R26</td>
<td>Carbon Resistor, 18,000 Ohms</td>
</tr>
<tr>
<td>C33</td>
<td>Mica Capacitor, 35-175 Mmf.</td>
<td>C57</td>
<td>Carbon Resistor, 10 Megohms</td>
<td>R27</td>
<td>Carbon Resistor, 12 Megohms</td>
</tr>
<tr>
<td>C34</td>
<td>Mica Capacitor, 30-118 Mmf.</td>
<td>C58</td>
<td>Carbon Resistor, 12 Megohms</td>
<td>R28</td>
<td>Carbon Resistor, 47,000 Ohms</td>
</tr>
<tr>
<td>C35</td>
<td>Mica Capacitor, 11-56 Mmf.</td>
<td>C59</td>
<td>Carbon Resistor, 47,000 Ohms</td>
<td>R29</td>
<td>Carbon Resistor, 47,000 Ohms</td>
</tr>
</tbody>
</table>

SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Plate to Ground Volts D.C.</th>
<th>Screen Grid to Ground Volts D.C.</th>
<th>Cathode to Ground Volts D.C.</th>
<th>Cathode Current M.A. D.C.</th>
<th>Heater Volts A.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8G</td>
<td>236</td>
<td>95</td>
<td>0</td>
<td>12.2</td>
<td>6.5</td>
</tr>
<tr>
<td></td>
<td>Oscillator</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6K7</td>
<td>236</td>
<td>95</td>
<td>0</td>
<td>8.7</td>
<td>6.5</td>
</tr>
<tr>
<td>6Q7G</td>
<td>84</td>
<td>0</td>
<td>4</td>
<td>0.4</td>
<td>6.5</td>
</tr>
<tr>
<td>6K6G</td>
<td>220</td>
<td>236</td>
<td>0</td>
<td>30.1</td>
<td>6.5</td>
</tr>
<tr>
<td>5Y3G</td>
<td>320</td>
<td>320</td>
<td>51.4</td>
<td>5.3</td>
<td></td>
</tr>
</tbody>
</table>

A-C line voltage—120. No signal input. 1000 ohms per volt meter. Dial pointer at 530 kc. on "B" band.

* Measured on 500-volt scale.

---

Fig. 1. Pick-up Connections

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GENERAL INFORMATION

The Models J-62 and J-620 are compact six-tube AC superheterodyne receivers employing General Electric Pre-tested Tubes. Features of design include dual built-in Beam-a-Scoops, visual dial, voltage-doubling rectifier system, broadcast and short-wave coverage, and automatic volume control. Both models are Underwriters' approved and use the same chassis. Model J-62 has a mahogany cabinet. Model J-620 uses a bleached mahogany cabinet. If an excessive amount of hum is noticed while the receiver is operating, reverse the power plug in the receptacle.

SPECIFICATIONS

**Electrical Rating**

<table>
<thead>
<tr>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>115 AC</td>
<td>25-60</td>
<td>55</td>
</tr>
</tbody>
</table>

**Tuning Frequency Range**

<table>
<thead>
<tr>
<th>Band “B”</th>
<th>540-1600 KC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band “D”</td>
<td>5800-18,000 KC</td>
</tr>
</tbody>
</table>

**Intermediate Frequency**

| 455 KC |

**Electrical Power Output (117 Line Volts)**

- Undistorted: 3 watts
- Maximum: 4.5 watts

**Load-speaker—“Alinco” Magnet Dynamic**

- Outside Cone Diameter: 5 inches
- Voice Coil Impedance (400 cycles): 3.5 ohms

SPECIAL SERVICE INFORMATION

The following data will be very useful to servicemen equipped with vacuum-tube voltmeters or similar voltage-measuring instruments.

1. (1) Stage Gains*
   - Antenna Post to Converter Grid at 10 KC: 4.3
   - Converter Grid to 6SK7 Grid at 1000 KC: 35
   - Converter Grid to 6SK7 Grid at 455 KC: 42
   - 6SK7 Grid to 6SQ7 Diode Plate at 455 KC: 100

2. (2) Audio Gain
   A 400-cycle signal of .06 volts across the volume control will give approximately .5-watt speaker output. (Volume control turned to maximum.)

3. (3) DC voltage developed across oscillator grid resistor (R-4) averages at:
   - 1000 KC: 10.5
   - 10,000 KC: 8.0

* Variations of +10%, –20% permissible. All readings obtained with enough input signal to give .5-watt speaker output.
CHASSIS REMOVAL

Note: Care must be exercised in removing either the cabinet back or the chassis to avoid damaging the shape of either the short-wave or broadcast loops. These loops are factory tuned to give a certain inductance and any alteration of the loops in the field will throw the chassis out of alignment.

To remove the chassis proceed as follows: Pry loose the four fasteners which hold the cabinet back in position. Disconnect the leads from the speaker terminals. Un螺丝 the wood screws which secure the short-wave loop to the cabinet. Remove the three chassis bolts and knobs. The chassis is now free from the cabinet.

ALIGNMENT PROCEDURE

Alignment Frequencies

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>J.F. P.</td>
<td>655 KC</td>
</tr>
<tr>
<td>Band “B”</td>
<td>1500 and 580 KC</td>
</tr>
<tr>
<td>Band “D”</td>
<td>18,000 and 9000 KC</td>
</tr>
</tbody>
</table>

The location of trimmers for the above models is shown in Fig. 1. All R.F. trimmers are accessible through holes in the back cover or through the bottom of the cabinet.

I.F. Alignment

Connect an output meter across the voice coil. Rotate the volume control to maximum. Completely close the gang condenser plate and set the dial pointer to the first dial mark at the low end of the scale. Turn the band switch to “B” band (counter-clockwise).

Set test oscillator to 450 KC and apply signal to the control grid of the 6SA7 tube through a .061 uf. capacitor. Keep the test oscillator output as low as a readable meter reading will permit. Adjust all I.F. trimmers for maximum meter reading.

R.F. Alignment

The use of a standard I.B.E. dummy antenna in making all R.F. alignments is recommended. R.F. alignment can be performed by loop coupling the generator signal to the receiver. Beam-Beam Scope if care is exercised not to overcouple the two circuits. Keep a distance of two feet or more between the generator loop and the receiver. A Beam-Beam Scope will generally secure freedom from overcoupling. The relative position of the Beam-Beam Scope with respect to the chassis materially affects R.F. alignment, therefore, all R.F. alignments should be made with the chassis and Beam-Beam Scope mounted in the cabinet. In keeping with this recommendation all R.F. alignment trimmers are available through holes in the bottom deck and back of the cabinet. Metal objects such as meters, tools, etc., should not be placed near the receiver cabinet. Also the receiver should be kept away from large metal objects such as radiators, metal-top tables, etc.

Set the signal generator to 1500 KC. Align (C-2D) to the signal while the dial pointer is on the 1500 KC mark. Peak (C-2) on the maximum output. Change signal to 580 KC and tune receiver to signal. Peak (C-2) on the 580 KC signal by rotating the gang condenser, K201 at 1500 KC.

Turn the band switch to “D” band. Align (C-3D) at 18 MC. Peak (C-2D) while rocking the gang condenser. The signal of the 18 MC signal should be heard at 17.00 MC when (C-2D) is on the proper peak. Change signal to 6 MC and tune receiver. Check the receiver for increased output at the 6 MC point by pinching or separating slightly the turns in the wire of the short-wave Beam-Beam Scope mounted on the side of the chassis. Return (C-2D) to 18 MC.

If the chassis is to be aligned outside of the cabinet it will no longer be possible to use the dial scale as a tuning reference since the dial scale is fastened to the cabinet. Use must be made, therefore, of the dial scale which is concentric to the back of the dial reflector plate. From the reference chart Fig. 3, the degree readings for corresponding frequency settings may be obtained by laying a straight edge across the chart perpendicular to the line of figures and sliding the straight edge along the various frequency settings desired. The degree readings will be found on either of the degree scales. Use these degree readings, first completely close the gang condenser plates and then slide pointer along the cord until the inside edge of the right-hand pointer-guide clip is in line with the 0° mark. (See Fig. 2.) By using this edge of the clip as the degree-scale pointer the receiver may be tuned to any frequency. Example: By rotating the tuning control until this edge of the clip is in line with 160° the receiver will be tuned to 1600 KC on the broadcast band.

The alignment may now proceed as previously described.

NOTE: After moving the pointer along the cord to use one of the guide clips as a reference pointer for the degree scale, it will be necessary after reassembling the cabinet for the gang condenser plates to be closed and the pointer to be moved along the cord so that it lines up with the first dial markings on the left.

Fig. 2. Pointer-guide-clip Setting with Gang Condenser Closed

Fig. 5. Chassis Parts Layout

NOTE: The oscillator coil and band-switch terminals are numbered in the Chassis Parts Layout, Fig. 5, to assist in locating the corresponding numbered points on the Schematic Diagram, Fig. 4. This numbering will also assist in rewiring if the coil or switch is replaced.

Fig. 7. Dial Cord Stringing Diagram

Fig. 3. Frequency-degree Reference Chart

Fig. 6. Socket Voltages

Fig. 8. Bottom View of Chassis
### Models FE-87, FE-87, FE-87

#### Socket Voltages

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Plate to Ground Volts D-C</th>
<th>Screen Grid to Ground Volts D-C</th>
<th>Cathode to Ground Volts D-C</th>
<th>Cathode Current M.A.</th>
<th>Heater Volts A-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7 R.F. Amplifier</td>
<td>220</td>
<td>90</td>
<td>0</td>
<td>2.5</td>
<td>6.3</td>
</tr>
<tr>
<td>Oscillator</td>
<td>180</td>
<td>0</td>
<td>0</td>
<td>10.6</td>
<td>6.3</td>
</tr>
<tr>
<td>Converter</td>
<td>220</td>
<td>97</td>
<td>0</td>
<td>7.5</td>
<td>6.3</td>
</tr>
<tr>
<td>6K7 1st I.F. Amp.</td>
<td>250</td>
<td>95</td>
<td>0</td>
<td>11.0</td>
<td>6.3</td>
</tr>
<tr>
<td>6K7 2nd I.F. Amp.</td>
<td>235</td>
<td>90</td>
<td>0</td>
<td>7.7</td>
<td>6.3</td>
</tr>
<tr>
<td>6F5 Audio Amplifier</td>
<td>200</td>
<td>90</td>
<td>0</td>
<td>6.7</td>
<td>6.3</td>
</tr>
<tr>
<td>42 Output</td>
<td>250</td>
<td>95</td>
<td>0</td>
<td>3.3</td>
<td>6.3</td>
</tr>
<tr>
<td>60 Power Rectifier</td>
<td>360/360 R.M.S.</td>
<td>360 D-C</td>
<td>66.3</td>
<td>6.3</td>
<td></td>
</tr>
</tbody>
</table>

- A.C. line voltage 115 on primary 115-volt tap. No signal input. 1000 ohms per voltmeter. Dial pointer at 500 K.C.
- Measured on 500-volt scale.

### Models FE-112, FE-112, FE-112

#### Socket Voltages

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Plate to Ground Volts D-C</th>
<th>Screen Grid to Ground Volts D-C</th>
<th>Cathode to Ground Volts D-C</th>
<th>Cathode Current M.A.</th>
<th>Heater Volts A-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7 R.F. Amplifier</td>
<td>220</td>
<td>90</td>
<td>0</td>
<td>7.1</td>
<td>6.3</td>
</tr>
<tr>
<td>6J5-G Amplifier</td>
<td>180</td>
<td>0</td>
<td>0</td>
<td>11.0</td>
<td>6.3</td>
</tr>
<tr>
<td>6L7 Converter</td>
<td>235</td>
<td>90</td>
<td>0</td>
<td>7.7</td>
<td>6.3</td>
</tr>
<tr>
<td>6K7 1st I.F. Amp.</td>
<td>250</td>
<td>95</td>
<td>0</td>
<td>6.7</td>
<td>6.3</td>
</tr>
<tr>
<td>6K7 2nd I.F. Amp.</td>
<td>200</td>
<td>90</td>
<td>0</td>
<td>3.3</td>
<td>6.3</td>
</tr>
<tr>
<td>6F5 Audio Amplifier</td>
<td>170</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>6.3</td>
</tr>
<tr>
<td>6L6-G Output</td>
<td>200</td>
<td>240</td>
<td>14.0</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>6L6-Tuning Indicator</td>
<td>.05 (Target)</td>
<td>0</td>
<td>0</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>6L3 Power Rectifier</td>
<td>360 A.C.</td>
<td>360</td>
<td>110</td>
<td>6.3</td>
<td></td>
</tr>
</tbody>
</table>

- A.C. line voltage 120 volts on primary 125-volt tap. 1000 ohms per voltmeter. Dial pointer 5000 K.C. on "D-1" band. No signal.

6

### Models FE-67, FE-87, FE-88

#### Socket Voltages

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Plate to Group of Volts D-C</th>
<th>Screen Grid to Group of Volts D-C</th>
<th>Cathode to Group of Volts D-C</th>
<th>Cathode Current M.A.</th>
<th>Heater Volts A-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A7</td>
<td>170</td>
<td>0</td>
<td>0</td>
<td>10.4</td>
<td>6.5</td>
</tr>
<tr>
<td>Oscillator</td>
<td>180</td>
<td>95</td>
<td>0</td>
<td>10.6</td>
<td>6.5</td>
</tr>
<tr>
<td>6K7 I.F. Amplifier</td>
<td>250</td>
<td>155</td>
<td>0</td>
<td>5.4</td>
<td>6.5</td>
</tr>
<tr>
<td>610 Det. and AVC</td>
<td>150</td>
<td>0</td>
<td>0</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>6F5 Audio Amplifier</td>
<td>96</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>6.5</td>
</tr>
<tr>
<td>42 Output</td>
<td>250</td>
<td>6.5</td>
<td>0</td>
<td>16.7</td>
<td>6.5</td>
</tr>
<tr>
<td>60 Power Rectifier</td>
<td>680/340 R.M.S.</td>
<td>360 D-C</td>
<td>66.3</td>
<td>6.5</td>
<td></td>
</tr>
</tbody>
</table>

- A.C. line voltage 120—No signal input—1000 ohms per voltmeter—dial pointer at 540 K.C.
- Measured on 500-volt scale.

### VOLTAGE CHART

#### Model JE-810

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Grid Volts</th>
<th>Screen to Grid Volts</th>
<th>Cathode to Grid Volts</th>
<th>Plate to Plate</th>
<th>Plate to Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7 (R.P.)</td>
<td>155</td>
<td>95</td>
<td>2.6</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>6K8</td>
<td>220</td>
<td>95</td>
<td>2.6</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>6J5 (R.P.)</td>
<td>155</td>
<td>95</td>
<td>3.3</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>6J5-G (R.P.)</td>
<td>0</td>
<td>0</td>
<td>6.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6JQ7</td>
<td>40</td>
<td>40</td>
<td>6.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2SCG</td>
<td>200</td>
<td>150</td>
<td>20</td>
<td>25.5</td>
<td></td>
</tr>
<tr>
<td>2SC5G</td>
<td>250</td>
<td>150</td>
<td>25</td>
<td>25.5</td>
<td></td>
</tr>
<tr>
<td>6L5</td>
<td>150</td>
<td>0</td>
<td>6.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Line Volts—240 AC or DC—Pointer set at 250 K.C on "B" band.
No signal input.
2SCG Cathode Current—40 ma.
2SC5G Cathode Current—50 ma.

### VOLTAGE CHART (Model HE-74 and HE-74L)

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Grid Volts</th>
<th>Screen to Grid Volts</th>
<th>Cathode to Grid Volts</th>
<th>Plate to Plate</th>
<th>Plate to Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7</td>
<td>155</td>
<td>90</td>
<td>3</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>6K8</td>
<td>155</td>
<td>90</td>
<td>3</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>6J5 (R.P.)</td>
<td>10</td>
<td>10</td>
<td>6.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6J5-G (R.P.)</td>
<td>210</td>
<td>150</td>
<td>150</td>
<td>25.5</td>
<td></td>
</tr>
<tr>
<td>6JQ7</td>
<td>70</td>
<td>70</td>
<td>25.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2SCG</td>
<td>210</td>
<td>150</td>
<td>210</td>
<td>25.5</td>
<td></td>
</tr>
<tr>
<td>2SC5G</td>
<td>250</td>
<td>250</td>
<td>25.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6L5</td>
<td>150</td>
<td>0</td>
<td>1.0</td>
<td>6.3</td>
<td></td>
</tr>
</tbody>
</table>

Line Volts—240 AC or DC—Pointer set at 500 K.C. on "B" band—No signal input.
2SCG Cathode Current—100 ma.

### Dial Drive Mechanism

[Diagram of Dial Drive Mechanism]

G K. PAGE 12-23

Models, See Below

Compliments of www.nucow.com
SPECIFICATIONS

Electrical Rating

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>110-125</td>
<td>50-60</td>
<td>75</td>
</tr>
<tr>
<td>C</td>
<td>110-126</td>
<td>25</td>
<td>85</td>
</tr>
</tbody>
</table>

Tuning Frequency Range

Broadcast Band .................................. 540-1600 KC
Short-wave Band No. 1 .......................... 2300-7000 KC
Short-wave Band No. 2 .......................... 7000-22,000 KC

Intermediate Frequency .......................... 455 KC

Electrical Power Output

Undistorted .................................... 2.85 watts
Maximum ........................................ 4.5 watts

Tone Control .................................... 3-position

 Loud-speaker—"Alnico" Magnet Dynamic

Outside Cone Diameter .......................... 61\(\frac{3}{4}\) inches
Voice Coil Impedance ......................... 3.5 ohms

Fig. 6. Chassis Parts Layout

Tubes

Converter and Oscillator ....................... GE-8SA7
I.F. Amplifier .................................. GE-6SK7
Det., Aud., AVC ................................ GE-6SQ7
Audio Driver .................................... GE-6J5GT
Audio Output .................................... GE-6Y6G
Rectifier ....................................... GE-5Y3G
Dial Lamp ...................................... (2) MAZDA No. 44

NOTE: The oscillator coil and band-switch terminals are numbered in the Chassis Parts Layout, Fig. 6, to assist in locating the corresponding numbered points on the Schematic Diagram, Fig. 1. This numbering will also assist in rewiring if the coil or switch is replaced. I.F. transformer connections are shown as an aid in replacement.
GENERAL INFORMATION

Model 3 is a six tube, superhet, oscillator receiver designed to operate from an alternating current power supply of 115 volts, 60 cycles, and is furnished with a 60 ohm output. This receiver, which the General Electric Dual Beam-Scopes are noted. Broadcast reception on the short wave No. 1 signals are selected by the Beam-Scopes which is mounted on the cabinet back. Short wave No. 2 signals are selected by the Beam-Scopes switch which is located on the front panel of the receiver. These features include a special tuned, two stage oscillator section. The all-wave circuit is equipped with automatic tuning section, one. Phone-FM-Tel modulation television key, tone monitor circuits and antenna selector switch control.

Phono-FM-Tel

This receiver is equipped with a 1/4 in. jack on the rear of the chassis and a Phone-FM-Tel key for adapting it to use with record players, frequency modulation conversions and television picture receivers with sound output. The controls and selector switch are generally the same as those used in the standard receiver except that the FM-Tel key is used in place of the selector switch.

Setting Up the Receiver

The following remarks will assist the serviceman in correctly setting up the receiver for operation:
1. Whenever the volume or tone controls are adjusted, the dial shall be placed in the “ON” position with the tuning control set to the “1100 kc” position on the cabinet.
2. The “ON” position shall be connected to the “OFF” position when the receiver is not in use.
3. A method of setting up station keys which will assure proper adjustment is to move the iron core all the way out and then return it directly toward the desired station tuned in.

Short Wave Beam-Scopes Removal

Cans must be removed in removing the covering, as the cans are the same as those used in the standard receiver. When disconnecting the short wave beam-scopes, be sure to disconnect the leads to the beam-scopes to prevent the short wave beam-scopes from being damaged.

Lead-screw

The voice coil is accurately and permanently centered at the factory and should only be cabled to replace the voice coil, which is located in the body of the cabinet. Special care must be used when replacing the voice coil assembly to ensure proper alignment.

Special Service Information

The service information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

ALIGNMENT CHART

J.F. Alignment with Oscilloscope

<table>
<thead>
<tr>
<th>Band Switch</th>
<th>Input Frequency</th>
<th>Final Stage Gain</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.”BC” Band</td>
<td>455 KC Sweep</td>
<td>I.P. Grid</td>
<td>50.9</td>
<td>I.R.P.</td>
<td>Ganged condenser plate, check. Depress any station key other than either Photo-M.F. Tel key. Connect output to oscillograph in chassis and balance plate. Adjust trimmers in order. Finish with trimming 1st I.F. trimmers.</td>
</tr>
<tr>
<td>2.”BC” Band</td>
<td>455 KC Sweep</td>
<td>Green lead</td>
<td>50.9</td>
<td>I.R.P.</td>
<td>Ganged condenser plate, check. Depress any station key other than Photo-M.F. Tel key. Connect output to oscillograph in chassis and balance plate. Adjust trimmers in order. Finish with trimming 1st I.F. trimmers.</td>
</tr>
<tr>
<td>1.”BC” Band</td>
<td>455 KC with Modulation</td>
<td>Green lead</td>
<td>50.9</td>
<td>I.R.P.</td>
<td>Ganged condenser plate, check. Depress any station key other than Photo-M.F. Tel key. Connect output to oscillograph in chassis and balance plate. Adjust trimmers in order. Finish with trimming 1st I.F. trimmers.</td>
</tr>
<tr>
<td>2.”BC” Band</td>
<td>455 KC with Modulation</td>
<td>Green lead</td>
<td>50.9</td>
<td>I.R.P.</td>
<td>Ganged condenser plate, check. Depress any station key other than Photo-M.F. Tel key. Connect output to oscillograph in chassis and balance plate. Adjust trimmers in order. Finish with trimming 1st I.F. trimmers.</td>
</tr>
</tbody>
</table>

R.F. Alignment

With Chassis Mounted in Cabinet

A. Oscillator Grid

1.”BC” Band

| 1000 KC with Modulation | & 9.6 | Ganged | C-10, 11 | C-9, 10 |

B. Beam-Scopes Grid

| 1000 KC with Modulation | & 9.6 | Ganged | C-10, 11 | C-9, 10 |

C. Grid Stage

| 1000 KC with Modulation | & 9.6 | Ganged | C-10, 11 | C-9, 10 |

D. Final Stage

| 1000 KC with Modulation | & 9.6 | Ganged | C-10, 11 | C-9, 10 |

9. Repeat operation 3 if the beam-scopes are not in operation.
ALIGNMENT PROCEDURE

The alignment procedure is given in the table below. The unit is a standard I.R.E. S-meter antenna in making all R.F. alignments is recommended. R.F. alignment can be performed by loop coupling the signal generator to the receiver Beam-a-Scope if it can be exercised without overloading the two circuits. Keeping a distance of two feet or more between the generator loop and the receiver Beam-a-Scope will generally ensure freedom from藕合ing. If the Beam-a-Scope is equipped with a 3.0 MHz filter, leave the filter in place for the alignment to be made with the connections as shown in Fig. 3. The circulator should be in line, as after the alignment is completed, it is to be used in all subsequent measurements.

Chassis or Beam-a-Scope Removal

Note: The chassis must be removed to the beam-a-scope to avoid changing the shape of either the short-wave or broadcast loops. The loops are factory-fitted to give a certain inductive and capacitive character and any alterations in the loops in the field will throw the character of the alignment.

When disconnecting the short-wave loop leads from the board, be very sure to turn off the loop while pulling off the connector. If not, the leads may become saturated or lose their characteristic properties. If steps to loosen and reposition the beam in the cabinet.

Load-Meter

The load-meter is accurately calibrated and permanently centered in the cabinet and should always be used in determining the correct tuning for the beam. The load-meter may not be used in measuring or calibrating the beam, but should be used in determining the correct tuning for the beam.

Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

Calibrating the Input Stage

(1) Stage Gain.*
(a) R.F. Input to R.F. Stage at 1000 K.C.
(b) 1000 K.C. to Second Stage at 1000 K.C.
(c) Second Stage to Second Stage at 1000 K.C. and 1800 K.C.
(d) R.F. Input to Second Stage at 1000 K.C.
(e) Second Stage to Second Stage at 1000 K.C.
(f) Second Stage to Second Stage at 1800 K.C.

Application: By rotating the tuning control until the right-hand edge of the dial is in line with the left-hand edge of the dial and the receiver is in a certain position, the receiver will be adjusted to a certain position.

The "BC" and "SW" band alignment procedure is the same as outlined in the "Alignment Procedure" section of the manual. The "RF Alignment with Chassis Mounted in Cabinet" section is also applicable.

Note: After moving the pointer along the band, the "BC" and "SW" bands should be aligned in the cabinet and the receiver should be checked as described in steps 7 to 9 of the chart "RF Alignment with Chassis Mounted in Cabinet."
MODELS J-71, JB-508, JB-513, JB514

FOR OTHER DATA
SEE INDEX

MODEL J-71

Tubes
R.F. Amplifier........ GE-6SK7
Converter and Oscillator GE-6SA7
I.F. Amplifier........ GE-6SK7
Det., Aud., AVC........ GE-6SQ7
Audio Driver........ GE-6J5GT
Audio Output........ GE-6Y6G
Rectifier........ GE-5Y3G
Dial Lamp........ (2) MAZDA No. 44.

Note: The oscillator coil and band-switch terminals are numbered in the Chassis Parts Layout, Fig. 6, to assist in locating the corresponding numbered points on the Schematic Diagram, Fig. 1. This numbering will also assist in rewiring if the coil or switch is replaced. I.F. transformer connections are shown as an aid in replacement.

SETTING UP THE RECEIVER
The following remarks will assist the serviceman in correctly setting up this receiver for use:

1. In order to press the volume or tuning knobs all the way on their respective shafts, the dial reflector plate should be held in place by pressure from the rear.

2. The black speaker lead should be connected to the speaker terminal which is grounded to the speaker frame.

3. A method of setting up station keys which will assure driftproof adjustments is to screw the iron core all the way out and then turn slowly inward until the desired station is tuned in.
GENERAL ELECTRIC CO.

SERVICE DATA

Equipment Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>Over-all Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>JB-508</td>
<td>Model 11x2 inches</td>
</tr>
<tr>
<td>JB-513,JB-514</td>
<td>11x2 inches</td>
</tr>
<tr>
<td>15x1 inches</td>
<td>15x1 inches</td>
</tr>
<tr>
<td>10x2 lbs.</td>
<td>10x2 lbs.</td>
</tr>
</tbody>
</table>

Tuning Control Drive Ratio: 6:1

Electrical Specifications

1. AC or DC Power Supply—105-125 Volts—40-60 cycles on AC
2. Battery Power Supply—6 Volt "A" Supply, 90 Volt "B" supply

Recommended batteries for 275-hour life (Maximum for 4 hours)
(a) "A" Battery—one Eveready No. 747 or equivalent
(b) "B" Batteries—two Eveready No. 482 or equivalent

Tuning Frequency Range: 540-1700 KC

Intermediate Frequency: 455 KC

Maximum Power Output: 200 Milliwatts

Loudspeaker—Alnico Magnet Dynamic

Outside Cone Diameter: 5 inches
Voice Coil Impedance (400 cycles): 3.5 ohms

Tubes

- Converter and Oscillator: GE-1A7GT
- I.F. Amplifier: GE-1N5GT
- Det., Aud., A.V.C.: GE-1H5GT
- Power Output: GE-1T75GT

BATTERY AND TUBE INSTALLATION

Models JB-513 and JB-514

The batteries may be installed or replaced without removing the Beam-a-Scope antennas from the chassis. Place the "B" batteries on the bottom of the cabinet with the terminals facing each other. Place the "A" battery on top of the "B" batteries with its terminal socket toward the bottom of the cabinet.

To replace tubes it is necessary to detach the Beam-a-Scope from the supporting blocks. Do not stain the two leads connected to the Beam-a-Scope.

Model JB-508

To install or replace batteries remove the five wood screws which hold the motorboard in place, and raise the panel. (Note: The motor crank must be removed from the crank socket before the panel can be raised.) The panel can be freed if the plug connectors are pulled out of the socket terminals in the chassis apron.

Access the battery compartment having been made, loosen the battery block held by the wing nuts. Place the two "B" batteries in the bottom sections, terminals inward, and insert the two 3-prong plug connectors. The "A" battery is placed on top of the "B" batteries with terminal toward the removable block and the 2-prong plug connector attached. Replace the battery block and tighten the wing nuts.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F.—455 KC Broadcast—1700 and 1500 KC

General Alignment Notes

This receiver must be removed from the carrying case in order to perform the alignment. Special care must be exercised to place the batteries, Beam-a-Scope and chassis in the same relative positions with respect to one another as these components operated in the case; otherwise, alignment will not be satisfactory. When aligning Model JB-508 the radio-phone switch must be on "radio."

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GENERAL INFORMATION

The Models JB-513 and JB-514 are portable, five-tube, superheterodyne receivers which are designed to operate on any one of three types of power supplies as listed under electrical specifications. Features of design include a power selector switch, built-in Beam-a-Scope, 5-inch dynaphone speaker and automatic volume control. Model JB-508 and JB-513 have a dial light which operates when the receiver is connected to an AC or DC power supply.

The Model JB-508 is a portable radio-phonograph combination employing a radio chassis similar to JB-513. The phonograph consists of a spring-wound Swiss motor and crystal pickup. The Swiss motor will play two 10-inch records with one winding. A speed regulator controls the speed above and below 78 R.P.M.

Model JB-514 has full Underwriters' approval. To switch these models from battery to external power supply, open the small door in the side of the cabinet, slide the button switch to "Line," which is to the right, and insert the cord plug in a power supply of the proper voltage and frequency. The button switch selects the battery or line power supply.

When these models are working on batteries, they will perform as soon as turned on. However, when operating on an external power supply, sufficient time must be allowed for the tubes to become heated. When operating from a DC source of power, it is necessary to insert the power plug with the proper polarity; otherwise, the receiver will fail to function. If any hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

Outside antenna connections may be made to two black leads available in the chassis compartment.

I.F. Alignment

With batteries, Beam-a-Scope and chassis in position for alignment as mentioned above, connect an output meter across the voice coil. Rotate the volume control to maximum, Set test oscillator to 455 KC. Attach the test oscillator output leads to the two flexible leads of the Beam-a-Scope antenna, and adjust the test oscillator output as low as a readable meter reading will permit. Adjust all I.F. trimmers for maximum output.

R.F. Alignment

Connect the signal generator output leads to the two flexible leads on the receiver Beam-a-Scope. Adjust the signal generator to 1700 KC and set the tuning condenser to minimum capacity. Turn the trimmer screw of the cut section of the tuning condenser (oscillator) until the signal is tuned in on the receiver. Change the signal to 1500 KC, retune the tuning condenser to this frequency and adjust the trimmer screw of the antenna section for maximum output.

VOLTAGE CHART

(Receiver connected to 120 Volt AC line)

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Grid. Volts</th>
<th>Screen to Grid. Volts</th>
<th>Filament to Grid. Volts</th>
<th>Filament to Plate. Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A7GT</td>
<td>92</td>
<td>38</td>
<td>3.2</td>
<td>1.6</td>
</tr>
<tr>
<td>1N5GT</td>
<td>92</td>
<td>92</td>
<td>4.8</td>
<td>1.6</td>
</tr>
<tr>
<td>1H5GT</td>
<td>70</td>
<td>92</td>
<td>6.4</td>
<td>1.6</td>
</tr>
<tr>
<td>1T5GT</td>
<td>88</td>
<td>92</td>
<td>8.8</td>
<td>1.6</td>
</tr>
<tr>
<td>352Z4GT*</td>
<td>120 AC</td>
<td>125 Cathode to Grid.</td>
<td>125 Cathode to Grid.</td>
<td>120 AC</td>
</tr>
</tbody>
</table>

* Used only in Models JB-513 and JB-508.
** Used only in Model JB-514.

Line—120 Volts AC

Maximum Volume—Gang Closed—No signal input. All voltages measured to chassis ground in Models JB-508 and JB-513.

Voltages measured to B minus in Model JB-514.
Models HM-80A and HM-85A

General Electric Frequency Modulation Receivers, Models HM-80A and HM-85A are designed for the reception of ultrashort-wave broadcasting as developed by Major Edward H. Armstrong. These receivers of the superheterodyne type using eight General Electric Pre-tested Tubes are similar to Models HM-80 and HM-85 respectively. Certain circuit changes have been incorporated in the Models HM-80A and HM-85A to increase sensitivity, improve limiter action, and assure greater stability. A revised schematic diagram and additional replacement parts list are incorporated in this sheet.

For specifications, general information and alignment procedure, refer to HM-80 Service Notes. The tube complement is altered by the substitution of a 6AC7/1852 in place of the 6SK7 1st I.F. amplifier tube.

OSCILLATOR DRIFT CORRECTION NETWORK

The placement of the parts comprising this network materially affects the amount of oscillator drift correction. For maximum performance the positions of the 47-ohm, 1-watt resistor (R-28) and the 5-mmf. compensating capacitor (C-39) should be adjusted until they are parallel and separated by exactly \( \frac{1}{4} \) inch.
SPECIAL SERVICE INFORMATION

The following information will be found very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains*
   (a) Antenna Post to R.F. Amplifier Grid at
       1000 KC  4.4
       4000 KC  2.6
       18,000 KC  2.2
   (b) R.F. Amplifier Grid to Converter Grid at
       1000 KC  6.0
       4000 KC  12.0
       18,000 KC  8.2**
   (c) R.F. on Converter Grid to I.F. on 1st I.F. Grid at
       1000 KC ("B" Manual)  40.0
       4000 KC  35.0
       18,000 KC  35.0
   (d) I.F. on Converter Grid to I.F. on 1st I.F. Grid at
       455 KC ("B" Manual—Gang Closed)  42.0
   (e) I.F. Amplifier Grid to Detector Grid at
       455 KC  117.0

(2) Voltage Across Volume Control to Give 3⁄4-watt Speaker Output at
   400 Cycles  0.075*

(3) DC voltage developed across oscillator grid resistor (R-2) with the gang closed.
   "B" Band  7.6*
   "C" Band  6.3*
   "D" Band  5.1*

* Variations of +10%, -20% are permissible.
** On "D" band, stray oscillator voltage may upset reading.
## SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Plate to Ground Volts D.C.</th>
<th>Screen Grid to Ground Volts D.C.</th>
<th>Cathode to Ground Volts D.C.</th>
<th>Cathode Current mA</th>
<th>Heater Volts A.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7 R.F.</td>
<td>225</td>
<td>105</td>
<td>5.8</td>
<td>3.6</td>
<td>6.4</td>
</tr>
<tr>
<td>6L7</td>
<td>235</td>
<td>105</td>
<td>5.8</td>
<td>5.2</td>
<td>6.4</td>
</tr>
<tr>
<td>6J6G</td>
<td>190</td>
<td>...</td>
<td>0</td>
<td>10.5</td>
<td>6.4</td>
</tr>
<tr>
<td>6K7 I.F.</td>
<td>215</td>
<td>105</td>
<td>3.6</td>
<td>9.5</td>
<td>6.4</td>
</tr>
<tr>
<td>6F5</td>
<td>* 120</td>
<td>...</td>
<td>0.9</td>
<td>0.7</td>
<td>6.4</td>
</tr>
<tr>
<td>6L6G</td>
<td>220</td>
<td>235</td>
<td>12</td>
<td>70</td>
<td>6.4</td>
</tr>
<tr>
<td>6U5</td>
<td>Target 190</td>
<td>...</td>
<td>...</td>
<td>1.5</td>
<td>6.4</td>
</tr>
<tr>
<td>5U4G</td>
<td>280/280 A.C. RMS</td>
<td>298</td>
<td>110</td>
<td>5.1</td>
<td></td>
</tr>
</tbody>
</table>

*Measured on 500-volt scale.

---

**Fig. 4. Trimmer Location**
Models HE-100, HE-100H, HE-105

**Fig. 5. Trimmer Location**
Models HE-100L, HE-100LH, HE-105L
Fig. 3. Chassis Parts Layout

Note: The oscillator coil and band-switch terminals are numbered in the Chassis Parts Layout, Fig. 3, to assist in locating the corresponding numbered points on the Schematic Diagram, Fig. 2. This numbering will also assist in rewiring if the coil or switch is replaced. I.F. transformer connections are shown as an aid in replacement.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>110–125</td>
<td>50–60</td>
<td>115</td>
</tr>
<tr>
<td>C</td>
<td>110–125</td>
<td>25–60</td>
<td>120</td>
</tr>
</tbody>
</table>

_tubes_

- R.F. AMPLIFIER - GE-6SK7
- CONVERTER AND OSCILLATOR - GE-65A7
- I.F. AMPLIFIER - GE-6SK7
- DET., AVC - GE-8J5GT
- 1st AUDIO DRIVER - GE-8J5GT
- 2nd AUDIO DRIVER - GE-6J5GT
- PHASE INVERTER - GE-6J5GT
- POWER OUTPUT - (2) GE-6Y6G
- RECTIFIER - GE-5Y3G
- DIAL LAMP - (2) Mazda No. 44

Fig. 6. Pointer-Guide Clip Setting with Gang Condenser Closed (See "R.F. Alignment with Chassis Outside of Cabinet")

Fig. 7. Dial Cord Stringing Diagram

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Figures 8 and 9 show the correct location of the Beam-a-Scope leads when reconnecting. The cylindrical Beam-a-Scope leads must be threaded through the slot in the cabinet shield which is immediately below the antenna-ground terminal board. The leads can then be brought out to the position of the back of the cabinet shelf where they can be inserted in the Beam-a-Scope terminals.

To remove the cylindrical Beam-a-Scope the following procedure is recommended: Disconnect the four Beam-a-Scope leads. Unscrew the long set-tapping screw which prevents the Beam-a-Scope from rotating continuously in one direction. This screw is located in the cabinet shelf. Pry loose the cardboard strap which is stapled to the bottom of the cabinet and which holds the bottom of the Beam-a-Scope in place. The Beam-a-Scope can now be rotated from right to left until it comes loose. Note: The upper pivot, bolt by which the Beam-a-Scope is supported should never be loosened or removed.

When replacing the cylindrical Beam-a-Scope it should be screwed on approximately five turns from the position where the bolt first takes hold. The self-tapping screw in the cabinet shelf should then be screwed down until it acts as a stop for the projection next to the terminals. The screw should not be run down so far that it contacts the projection or the opposite side from the terminals as this will limit rotation to only 180 degrees. The cardboard strap should be placed over the bottom Beam-a-Scope pivot and stapled to the cabinet in such a position that the Beam-a-Scope hangs vertically and is free to turn without rubbing on the strap.

**LOAD SPEAKER—"ALNICO" Magnet Dynamic**

- Speaker Diameters: 14 inches and 6 1/4 inches
- Voice Coil Impedances: 3.5 ohms 3.5 ohms

**GENERAL INFORMATION**

Model J-105 is a ten tube superheterodyne receiver designed to operate from an alternating current power supply. The receiver incorporates the latest developments in radio among which are the General Electric Dual Beam-a-Soups. Broadcast and short-wave No. 1 signals are selected by the cylindrical Beam-a-Scope. Short-wave No. 2 signals are selected by the Beam-a-Scope which is mounted on the cabinet above the chassis. Additional features include single-ended tubes, iron-core oscillator station selector coils, six Feathertouch tuning station keys, one Phono-Frequency Modulation-Television key, an "On" key, a "Manual" key, Dual Dynapower speakers, tone monitor circuit and automatic volume control.

**PHONO-FM-TÉL**

This receiver is equipped with a pin jack on the rear apron of the chassis and a Phono-FM-Tél key for adapting it to use with various phonographs, modulators, converters and television picture receivers with sound converters. General Electric plug, Stock No. RP-145, fits the pin jack.

**SETTING UP THE RECEIVER**

The following remarks will assist the serviceman in correctly setting up this receiver for use:

1. In order to press the volume or tuning knobs all the way on their respective shafts, the dial reflector plate should be held in place by pressure from the rear.

2. After the adjusting screws position the chassis should be checked to insure accurate tuning. Close the gate condenser plates and push the chassis one way or the other until the pointer lines up with the first markings on the left side of the dial.

3. The black speaker leads should be connected to the speaker terminals which are grounded to the speaker frame.

4. A method of setting up station keys which will assure drift-free adjustments is to screw the iron core all the way in and then turn slowly inward until the desired station is tuned in.

**CHASSIS OR BEAM-A-SCOPE REMOVAL**

Before either the chassis or Beam-a-Scope can be removed the leads between them must be disconnected. The cylindrical Beam-a-Scope leads are disconnected by pulling the pin plugs out of the Beam-a-Scope terminals. The short-wave Beam-a-Scope leads are disconnected by unscrewing the nuts which clamp the terminals on the two phosphor-bronze straps and the screw which clamps the terminal of the yellow lead.
GENERAL ELECTRIC CO.

(Continues)

(Cont.)

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MODEL J-105

(Golden Tone)

ALIGNMENT CHART

I.F. ALIGNMENT WITH OSCILLOSCOPE

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. “BC” Band</td>
<td>455 KC Sweep</td>
<td>I.F. Grid</td>
<td>.05 mfd. or larger</td>
<td>2nd I.F. trimmers, C-9, C-10</td>
<td>Gang condenser plates closed. Depress any station key other than Phono-FM-Tel key. Connect audio input of oscilloscope to chassis ground and junction of R-32 and R-33. Adjust trimmers in order mentioned for a single symmetrical curve of maximum amplitude. Finish by retrimming 2nd I.F. trimmers.</td>
</tr>
<tr>
<td>2. “BC” Band</td>
<td>455 KC Sweep</td>
<td>Converter Grid</td>
<td>.05 mfd. or larger</td>
<td>1st I.F. trimmers, C-7, C-8</td>
<td></td>
</tr>
</tbody>
</table>

I.F. Alignment with Output Meter

<table>
<thead>
<tr>
<th>Band Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. “BC” Band with Modulation</td>
<td>455 KC</td>
<td>Converter Grid</td>
<td>.05 mfd. or larger</td>
<td>2nd I.F. trimmers, C-9, C-10</td>
<td>Gang condenser plates closed. Depress any key other than Phono-FM-Tel key. Connect output meter across voice coil. Keep input signal low and volume control on as far as possible. Adjust all trimmers for maximum output.</td>
</tr>
</tbody>
</table>

R.F. Alignment With Chassis Mounted in Cabinet

<table>
<thead>
<tr>
<th>Band Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. “BC” Band</td>
<td>1500 KC with Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. (C-24)</td>
<td>Set dial pointer to 580 KC and tune in signal with (C-25) while rocking gang condenser.</td>
</tr>
<tr>
<td>3. “BC” Band</td>
<td>580 KC with Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. Padder (C-25)</td>
<td>Set dial pointer to 1500 KC and peak trimmer for maximum output while rocking the gang condenser.</td>
</tr>
<tr>
<td>4. “BC” Band</td>
<td>6 MC with Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. (C-22)</td>
<td>Realign for maximum output with a low input signal rocking the gang condenser.</td>
</tr>
<tr>
<td>5. “SW-1” Band</td>
<td>21 MC with Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. (C-19)</td>
<td>Set pointer to 6 MC and peak signal while rocking gang condenser.</td>
</tr>
<tr>
<td>6. “SW-2” Band</td>
<td>8 MC with Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. (C-19)</td>
<td>Set pointer to 21 MC and tune in signal with (C-19). Peak output with (C-2) while rocking gang condenser. When (C-19) is on proper peak, image of 21 MC signal should be heard 910 KC below or on 20.09 MC.</td>
</tr>
</tbody>
</table>

8. Repeat Operation 6 if the short-wave Beam-a-Scope leads are moved appreciably in Operation 7.

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**General Electric Co.**

**Physical Specifications**
- Model: HB-408
- Height: 9 1/4 inches
- Width: 10 1/2 inches
- Depth: 18 3/4 inches
- Weight: 19 1/2 lbs.

**Tuning Control Drive Ratio**
- 5.5 : 1

**Battery Specifications**
- "A" Battery
  - 1-General 8-F-1 or 1-Eveready No. 741
  - 2-General V-30-B or 2-Eveready No. 762

**Battery Life**
- Using the above recommended batteries a battery life from 200 to 250 hours can be expected providing the daily operation does not exceed four hours. If the daily operation exceeds four hours the battery life will be reduced due to the fact that the batteries do not have sufficient time to revitalize themselves.

**Tuning Frequency Range**
- 550-1600 K.C.

**Intermediate Frequency**
- 455 K.C.

** Loud-speaker—Permanent Magnet**
- Outside Cone Diameter: 4 inches
- Voice Coil Impedance (400 cycles): 3.5 ohms

**Tubes**
- Converter and Oscillator: 1A7G
- I.F. Amplifier: 1N5G
- Detector-Amplifier: 1H5G
- Output: 1Q5G

**SERVICE INFORMATION**
- On later production models the 360-ohm output biasing resistor (R-8) was changed to 430 ohms. This change reduced battery drain while not appreciably affecting power output.

**ALIGNMENT PROCEDURE**

**Alignment Frequencies**

The location of all trimmers is shown in Fig. 1.

**I.F. Alignment**
- In order to align this receiver for I.F. the four wood screws holding the motorboard to the cabinet will have to be removed. Raise the front edge of the motorboard being careful not to let the cabinet cover swing back and place a strain on the hinges. The phono-switch cable will limit the amount which the front edge of the motorboard can be opened. Prop the motorboard in the opened position and proceed with I.F. alignment. (Note—Do not let the phono-switch cable come near the 1N5G grid leads. Standard dressing is to force the cable down in the space between the 1H5G tube and the 2nd I.F. transformer.)

- Connect an output meter across the voice coil. Set the volume control for maximum. With the test oscillator set to 455 K.C., apply signal to the control grid of the 1A7G converter tube through a .05-mfd. capacitor. Do not remove the grid leads from the tubes. Keep the test oscillator output as low as possible to give a readable output. Adjust all four I.F. trimmers for maximum output.

**R.F. Alignment**
- Return the motorboard to its normal cabinet position. (Note—Before R.F. alignment be sure that all parts are in their normal positions in the cabinet.) It is not necessary to screw the motorboard to the cabinet as it may be convenient to raise the motorboard slightly from time to time to locate the heads of the trimmer screws. It must be remembered however, that R.F. trimmer adjustments should only be made when the motorboard is down in position.

- Access to the R.F. trimmers is made possible by removing the three snap fasteners on the right side of the cabinet. The upper left-hand trimmer is the 1500-K.C. oscillator trimmer. The upper right-hand trimmer is the 1500-K.C. antenna trimmer. The lower trimmer is the 580-K.C. padfer.

- The test signal may be applied by connecting across the test oscillator terminals a loop of ten turns of wire approximately one foot in diameter. Place the loop parallel to the plane of the back panel of the cabinet and not closer than one foot. With 1500 K.C. input adjust the oscillator and antenna trimmers for maximum output. Change input signal to 580 K.C. and peak the 580-K.C. (C-10) padfer by rocking the gang condenser.

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Compliments of www.nucow.com
Models J-501 and J-501W have minus B connected to chassis and R-1, C-1 and C-2 are omitted. Models J-502 and J-502W have minus B insulated from chassis.

GENERAL INFORMATION


These receivers incorporate the following features: Single-ended tubes, automatic volume control, plate antenna, dynapower speaker, beam power output and a dial lamp.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. ........................................... 455 KC
R.F. ........................................... 1750 and 1500 KC

The location of all trimmers is shown in Fig. 1.

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the converter grid through a .05 mfd capacitor and align progressively the trimmers in the 2nd and 1st I.F. transformer cans.

R.F. Alignment

Apply the R.F. alignment signals through a standard I.R.E. dummy antenna to the receiver antenna post. With the gang condenser wide open, align the oscillator trimmer (C-7) to 1750 KC. Change the generator signal to 1500 KC, tune the receiver to the signal and peak antenna trimmer (C-5) for maximum output.

Precaution

If the signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended as AC current through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

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Compliments of www.nucow.com
MODELS J-501, J-501W, J-502, J-502W: "Late"

NOTE: 1. For 50-60 cycle receivers connect X to Y and short out R-11. For 25 cycle receivers connect X to Z and insert R-11 as shown in schematic.
2. Models J-501 and J-501W have B minus grounded to chassis, no wiring being required. Models J-502 and J-502W have a separately wired B minus system which is grounded to chassis.
3. These Models were built using either a 12B7 or 12SK7 I.F. amplifier tube. The tubes are not interchangeable because of the different type socket requirements.

**POWER CONSUMPTION—30 WATTS**

Tuning Frequency Range .................................. 550-1720 KC
Intermediate Frequency .................................. 455 KC
Maximum Power Output .................................. 1.5 Watts

**Loud-speaker—"Alnic" Magnet Dynamic**
Outside cone diameter ................................. 4 inches
Voice coil impedance (400 cycles) ................. 3.1 ohms

**Tubes**
Converter and Oscillator ................................ GE-12SA7
I.F. Amplifier ........................................... GE-12SK7 or 12B7
Det., Aud., A.V.C ..................................... GE-12SQ7
Power Output ........................................... GE-50L6GT
Rectifier ................................................ GE-35Z5GT
Dial Lamp ............................................... MAZDA No. 47

**VOLTAGE CHART**

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Gnd.</th>
<th>Screen to Gnd.</th>
<th>Cathode to Gnd.</th>
<th>Filament Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SQ7</td>
<td>73</td>
<td>73</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>12SK7</td>
<td>73</td>
<td>73</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>12B7</td>
<td>40</td>
<td>73</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>50L6GT</td>
<td>120</td>
<td>73</td>
<td>12</td>
<td>50</td>
</tr>
<tr>
<td>35Z5GT</td>
<td>112 AC</td>
<td>122</td>
<td>31</td>
<td></td>
</tr>
</tbody>
</table>

**Precaution**
If the signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended as AC current through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

**Alignment Frequencies**
I.F. .................................................. 455 KC
R.F. .................................................. 1500 KC

The location of all trimmers is shown in Fig. 1.

**R.F. Alignment**
Close the gang condenser by rotating the tuning control. Slide the pointer along the cord until it lines up with the first dial marking on the left. Now rotate the tuning control until the pointer is over the 1500 KC dial mark. Apply a 1500 KC signal to the receiver antenna post through a standard I.R.E. dummy antenna. Align the oscillator trimmer (C-7) to bring in the signal and peak the signal by adjusting the antenna trimmer (C-5). (See Fig. 1 for trimmer locations.)

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**GENERAL ELECTRIC CO.**

**MODELS L500, L510, L550, L560**

---

**NOTE:**
1. For 50-60 cycle receivers connect X to Y and short out R-11. For 25 cycle receivers connect X to Z and insert R-11 as shown in schematic.
2. Models L500 and L550 have B minus grounded to chassis omitting R1 and C2; also a jumper is used in place of C1. Models L510 and L560 have a separately wired B minus system which is not grounded to chassis except through R1 and C2.

- **RC-072**: C1 | CAPACITOR—0.05 mfd., 300 V, paper paper
- **RC-130**: C2 | CAPACITOR—0.05 mfd., 400 V, paper
- **RC-209**: C3 | CAPACITOR—0.05 mfd., 470 mfd., mica
- **RC-7039**: C6a, 6b | COIL—47000 mfd., 6.3 V, A.L.
- **RC-072**: C8 | CAPACITOR—0.05 mfd., 300 V, paper
- **RC-050**: C10 | CAPACITOR—0.05 mfd., 600 V, paper
- **RC-074**: C11 | CAPACITOR—0.05 mfd., 600 mfd., mica
- **RC-026**: C12 | CAPACITOR—0.01 mfd., 600 V, paper
- **RC-056**: C13 | CAPACITOR—0.02 mfd., 600 V, paper
- **RC-0174**: C14a, C14b | CAPACITOR—0.01 mfd., 100 V, electrolytic
- **RC-072**: C21 | CAPACITOR—0.05 mfd., 600 V, paper
- **RC-255**: C22 | CAPACITOR—0.10 mfd., mica
- **RC-019**: R1 | RESISTOR—300,000 ohms, 1/2 W, carbon
- **RC-019**: R2 | RESISTOR—22,000 ohms, 1/4 W, carbon
- **RC-019**: R3 | RESISTOR—2.2 megohms, 1/4 W, carbon
- **RC-019**: R4 | VOL. CONTROL—0.95 megohm control
- **RC-019**: R5 | RESISTOR—4.7 megohms, 1/4 W, carbon
- **RC-019**: R6 | RESISTOR—270,000 ohms, 1/4 W, carbon
- **RC-019**: R7 | RESISTOR—470,000 ohms, 1/4 W, carbon
- **RC-019**: R8 | RESISTOR—190 ohms, 1/4 W, carbon
- **RC-019**: R9 | RESISTOR—2.7 ohms, 1/4 W, carbon
- **RC-019**: R10 | RESISTOR—13 ohms, 1/4 W, carbon
- **RT-375**: L1 | TRANSFORMER—1st i.f. transformer
- **RT-376**: L2 | TRANSFORMER—2nd i.f. transformer
- **RL-011**: L3 | COIL—antenna coil
- **RL-037**: L4 | COIL—oscillator coil
- **RT-494**: T1 | TRANSFORMER—output transformer

Models L500, L510, L550, and L560 are five tube AC-DC superheterodyne receivers. Models L510 and L560 are Underwriters' approved versions of the Models L500 and L550. The models L500 and L510 use rich mahogany plastic cabinets. Models L550 and L560 are identical to Models L500 and L510, respectively, except for ivory plastic cabinets.

These models are built using either a 12B7 or 12SK7 i.f. amplifier tube. The tubes are not interchangeable because of the different type socket requirements.

---

**Intermediate Frequency**

- **455 KC**

**Maximum Power Output**

- **1.5 watts**

**Load-speaker—PM Dynamic**

- **4 inches**

**Voice Coil Impedance (400 Cycles)**

- **3.5 ohms**

**I.F. Alignment**

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st I.F. transformer cans.

**R.F. Alignment**

Close the gang condenser by rotating the tuning control. Slide the pointer along the cord until it lines up with the first mark on the right. Now rotate the tuning control until the pointer is over the 1500 KC dial mark. Apply a 1500 KC signal to the receiver antenna post through a standard I.R.E. dummy antenna. Align the oscillator trimmer (C-7) to bring in the signal and peak the signal by adjusting the antenna trimmer (C-5). (See Fig. 1 for trimmer locations.)

**Precaution**

If the signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended as AC current through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

**Special Service Information**

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

1. **Stage Gains**
   - Antenna Post to Converter Grid: 4.0 at 1000 KC
   - I.F. on Converter Grid to I.F. on I.F.
   - Amplifier Grid: 50 at 455 KC
   - I.F. Amplifier Grid to Diode Plate: 45 at 455 KC

2. **0.20-volt, 400-cycle signal across the volume control will give 1/4 watt speaker output.** (Volume control turned to maximum.)

3. **Average DC voltage developed across oscillator grid leak: 6 volts**

*Variations of ±20% permissible. All readings obtained with enough signal input to give 1/4 watt speaker output.*

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MODEL JB-523
MODEL JB-524

FOR OTHER DATA SEE INDEX

IFS PEAK 455 KC

Fig. 1. Schematic Diagram—Model JB-523

ALIGNMENT AND VOLTAGES


I.F. ALIGNMENT CONVENTIONAL
SEE SPECIAL SECTION VOL. VIII

VOLTAGE CHART
(117 line volts)

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Gnd. Volts</th>
<th>Screen to Gnd. Volts</th>
<th>Cathode to Gnd. Volts</th>
<th>Filament Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA7GT</td>
<td>90 (conv.)</td>
<td>90</td>
<td>90</td>
<td>1.3 to 1.5</td>
</tr>
<tr>
<td>IN5GT</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>1.3 to 1.6</td>
</tr>
<tr>
<td>IH5GT</td>
<td>85</td>
<td>85</td>
<td>85</td>
<td>1.3 to 1.6</td>
</tr>
<tr>
<td>IT5GT</td>
<td>85</td>
<td>85</td>
<td>85</td>
<td>1.3 to 1.6</td>
</tr>
<tr>
<td>35Z46T</td>
<td>117 AC</td>
<td>117</td>
<td>117</td>
<td>55</td>
</tr>
</tbody>
</table>

* Voltages are operating voltages in circuits with high series resistance.
  The actual voltages will be lower depending on the voltmeter leads. Above voltages should be held within ±20% with 117 volts AC line.

R.F. Alignment

Connect high side of signal generator to one of Beam-a-Scope primary leads and ground side to other primary lead. Turn tuning condenser completely out of mesh (open). Set generator to 1700 KC. Adjust oscillatortrimmer (cut section of tuning condenser) until generator signal is heard through speaker. Turn reset generator to 1500 KC and tune receiver to signal. Peak antenna trimmer on tuning condenser for maximum output.

Fig. 2. Schematic Diagram—Model JB-524

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MODELS JE-530, JE-531, JE-531X

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. ............................................. 455 Kc.
Broadcast R.F. ............................. 1500 and 600 Kc.
Short Wave
JE530 .......................................... 17,000 Kc.
JE531X ........................................... 15,000 Kc.

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 Kc. and
keep the oscillator output as low as a readable meter reading
will permit.

Apply signal to the grid of the 12SK7 through a .06 mfd.
capacitor and align the 2nd I.F. transformer. Repeat the
procedure applying the 455 Kc. signal to the control grid
of the 12SA7 and aligning the 1st I.F. transformer. Do not
remove the grid leads from the tubes. Finish alignment by
over-all adjustments.

R.F. Alignment

Refer Sketch "Trimmer Location." Apply R.F. signals
through a standard IRE dummy to the antenna terminal.

"C" Band (Model JE530—5500–18,500 Kc.)

Rotate band switch to clockwise position and set dial
pointer and signal generator to 17 megacycles. Align by
rotating S.W. osc. trimmer located on rear section of variable
condenser. Peak the S.W. detector trimmer located on front
section of variable condenser for maximum signal while
rocking the gang condenser. The image of 17 Mc. should be
heard at 16.09 Mc.

"C" Band (Models JE531, JE531X—4600–16,000 Kc.)

Same procedure as above, but align osc. trimmer at 15
megacycles. Image will be heard at 14.09 Mc.

"B" Band (All models—540–1700 Kc.)

Rotate band switch to counterclockwise position and set
dial pointer and signal generator to 1500 Kc. Align by turning
the broadcast oscillator trimmer screw. Peak broadcast
detector screw for maximum signal. Set screw for maximum
signal. Set receiver dial and signal generator to 600 Kc. and
adjust the broadcast padder for maximum signal while
rocking the gang condenser. Retrim at 1500 Kc.

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Fig. 5. Schematic Diagram and Trimmer Location—Model HE-540

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One side of the power line is connected directly to the chassis, therefore, caution should be exercised when servicing.

<table>
<thead>
<tr>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on A-C)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>105-125 AC</td>
<td>50-60</td>
<td>30</td>
</tr>
<tr>
<td>105-125 DC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Electrical Power Output**

- Undistorted: 1.0 watt
- Maximum: 1.7 watts

**Load-speaker—Permanent Magnet Type**

- Outside Cone Diameter: 5 inches
- Voice Coil Impedance (400 cycles): 3.8 ohms
- D.C. Coil Resistance: 3.4 ohms

**ALIGNMENT PROCEDURE**

The location of alignment trimmers is shown in Figs. 1 and 2.

**I.F. Alignment**

Connect an output meter across the voice coil. Turn the volume control to maximum. Set signal generator to 455 K.C. and keep the generator output the same as a readable meter reading will permit.

Apply signal to the grid of the 12S67GT through a .05 capacitor. Align all I.F. trimmers (C-14, 15 and 16) for a maximum meter reading.

**R.F. Alignment**

Set the signal generator to 1730 K.C. and connect the output to the blue antenna lead through a 100 mmf. mica capacitor. Rotate the gang condenser to wide open and align the oscillator trimmer. Readjust signal generator output to 1400 K.C. and after tuning in signal by rotating the gang condenser, peak the antenna trimmer. The alignment now complete unless the gang condenser plates have been bent out of shape. In case of bent plates, set the signal generator and receiver to 600 K.C. and bend the plates into position of maximum output.

**SERVICE INFORMATION**

**Oscillator Coil**

Looking at connection end in clockwise direction starting at chassis the terminals are No. 1, end of winding; No. 2, start of winding; No. 3, tap.

- No. 1 to No. 2: 4.8 ohms
- No. 1 to No. 3: 4.2 ohms

**First I.F. Transformer**

- Primary: Blue, plate; red, B+: 32.1 ohms
- Secondary: White, grid; black, A.V.C.: 32.1 ohms

**I.F. Amplifier**

- 12K7GT

**Det., Aud., A.V.C.**

- 12S97GT

**Power Output**

- 50L6GT

**Range:**

- 540-1730 K.C.
- I.F. Frequency: 455 K.C.

**Second I.F. Transformer**

- Primary: Blue, plate; red, B+: 24.2 ohms
- Secondary: White, grid; black, A.V.C.: 24.1 ohms

**Electrolytic Condenser**

- Red, 30 mfd., 150 volts; green, 20 mfd., 150 volts; black, common terminal.

**SOCKET VOLTAGES**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate To Gnd (Volts)</th>
<th>Screen To Gnd (Volts)</th>
<th>Cathode To Gnd (Volts)</th>
<th>Filament Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>12S67GT</td>
<td>80</td>
<td>82</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>12K7GT</td>
<td>80</td>
<td>82</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>12S97GT</td>
<td>40*</td>
<td>82</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>35L6GT</td>
<td>97</td>
<td>82</td>
<td>5.5</td>
<td>48</td>
</tr>
<tr>
<td>35Z6GT</td>
<td>115 AC</td>
<td>102</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>

**Line—** 115 Volts AC, Volume Control Maximum. Antenna shorted to ground.

*Measured on 250 volt scale of 1000 ohms per volt meter.

**Component Values**

- C-1: 100 mfd. mica capacitor
- C-2: .02 mfd. paper capacitor
- C-3: 500 mfd. mica capacitor
- C-4: 200 mfd. mica capacitor
- C-5: .001 mfd. paper capacitor
- C-6: .002 mfd. paper capacitor
- C-7: .01 mfd. paper capacitor
- C-8: 10 mfd. 150 V. dry electrolytic
- C-9: 20 mfd. 120 V. dry electrolytic
- C-11: .05 mfd. paper capacitor
- C-13: 0.001 mfd. paper capacitor
- R-1: 20,000 ohms carbon resistor
- R-2: 2.2 megohms carbon resistor
- R-3: 250,000 ohms carbon resistor
- R-4: 500,000 ohms volume control
- R-5: 5.6 megohms carbon resistor
- R-6: 515,000 ohms carbon resistor
- R-7: 150 ohms carbon resistor
- R-8: 1,000 ohms 1 W. carbon resistor
- R-9: 150 ohms carbon resistor
GENERAL ELECTRIC CO.

MODELS J-602
J-603

12B7
R.F.AMP
12S87
CONV-OSC
12S87
IF AMP
12S07
DET & AUDIO
35L6GT
OUTPUT

NOTE: ON 40-60 cycle receivers, omit R12 and connect A-B and X-Z.
ON 35 cycle receivers, add R12 and connect X-Y.
Omit R16 when No. 51 dial lamp is used.

Intermediate Frequency
455 KC

Electrical Power Output (117 line volts)
Undistorted
1.0 watts
Maximum
1.5 watts

Loadspeaker—PM Dynamic
Outside Cone Diameter
5 inches
Voice Coil Impedance (400 cycles)
3.5 ohms

IF Alignment
Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the 12SA7 converter grid through a 0.05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st IF transformers.

RF Alignment
When making the following alignment the loop antenna must be bolted to the chassis by the screw and spacer mounting. The RF signal should be capacity coupled to the receiver loop by placing a two-foot piece of wire on a corner on the test oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally insure freedom from too much coupling. Metal objects such as meters, tools, etc., should not be placed in close proximity to the loop when making this alignment.

With the gang condenser plates completely closed, the pointer should line up with the first mark on the left side of the scale. Set the signal generator to 1500 KC. Align (C-1b) to the signal while the pointer is on the 1500 KC mark. Peak (C-1a) for maximum output.

Special Service Information
The following information will be very useful to service men equipped with vacuum tube voltmeters or similar voltage measuring instruments.

(1) Stage Gains
Antenna post to RF grid—3.8 at 1000 KC
RF grid to converter grid—6.0 at 1000 KC
Converter grid to IF grid—46 at 455 KC
IF grid to 12SQ7 diode plate—7.5 at 455 KC

(2) Audio Gain
.14 volts, 400 cycles signal across volume control with control set at maximum, will give approximately 1/4 watt speaker output.

(3) DC voltage developed across oscillator grid resistor (R4) averages 10.0 volts at 1000 KC.

Variations of ±50% permissible. All readings obtained with enough signal input to give 1/4 watt speaker output.

Stock No. | Symbol | Description
--- | --- | ---
RC-7041 | C-1a, 1b, 2a, 2b | CONDENSER—Tuning condenser...
*RC-235 | C-3 | CAPACITOR—100 MfF, mica...
*RC-234 | C-9 | CAPACITOR—50 MfF, mica...
*RC-238 | C-10 | CAPACITOR—4.5 MfF, mica...
*RC-232 | C-11 | CAPACITOR—1 MfF, 600 V, paper...
*RC-231 | C-12 | CAPACITOR—1 MfF, 600 V, paper...
*RC-216 | C-13 | CAPACITOR—47 MfF, mica...
*RC-203 | C-14 | CAPACITOR—100 MfF, 600 V, paper...
*RC-200 | C-15 | CAPACITOR—1 MfF, 600 V, paper...
*RC-099 | C-16 | CAPACITOR—10 MfF, 600 V, paper...
*RC-5181 | C-17a, 17b | CAPACITOR—50 MfF, 600 V, electrolytic...
*RC-235 | C-18 | CAPACITOR—100 MfF, mica...
*RC-1227 | R-1 | RESISTOR—17 ohm, 1/4 W, carbon...
*RC-1275 | R-2 | RESISTOR—1700 ohm, 1/4 W, carbon...
*RC-1299 | R-3 | RESISTOR—47,000 ohm, 1/4 W, carbon...
*RC-1367 | R-4 | RESISTOR—35,000 ohm, 1/4 W, carbon...
*RC-235 | R-5 | RESISTOR—1000 ohm, 1/4 W, carbon...
*RC-1339 | R-6 | RESISTOR—22 megohm, 1/4 W, carbon...
*RC-1290 | R-7, 8-1 | VOLUME CONTROL—0.5 megohm, combined with power switch...
*R-1240 | R-8 | RESISTOR—5.6 megohm, 1/4 W, carbon...
*RC-1233 | R-9, 10, 11 | RESISTOR—47,000 ohm, 1/4 W, carbon...
*R-1219 | R-12 | RESISTOR—12 ohm, 1/4 W, carbon...
*RC-1233 | R-13 | RESISTOR—150 ohm, 1/4 W, carbon...
*RC-1233 | R-14 | RESISTOR—1000 ohm, 1/4 W, carbon...
*RC-1290 | R-15 | RESISTOR—47,000 ohm, 1/4 W, carbon...
*RC-1255 | R-16 | RESISTOR—680 ohm, 1/4 W, carbon...

*Used in previous receivers.

Models J602 and J603 are six-tube AC-DC superheterodyne receivers with Underwriters' Approval listing. The Model J602 is housed in a mahogany plastic cabinet, while the Model J603 has an ivory plastic cabinet.

Both the Mazda No. 47 and No. 51 dial lamps were used during production. When lamp No. 51 is used, the resistor R16 should be omitted.

Either the metal or glass type 12B7 tube may be used in the RF or IF stage. However when the glass tube is used in the IF stage, a tube shield must be used to prevent oscillation at the low frequency end of the broadcast band.

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Compliments of www.nucow.com
GENERAL ELECTRIC CO.
MODELS J-614 J-664

**IF PEAK 455 KC**

**Note:**
- On 40-60 cycle receivers, omit R12 and connect A-B & X-Z.
  * Omit R16 when No. 51 Marda dial lamp is used.

**Alignment Chart**

<table>
<thead>
<tr>
<th>Step</th>
<th>Connect Test-Osc. to</th>
<th>Test-Osc. Setting</th>
<th>Pointer Setting</th>
<th>Adjust Trimmers for Max. Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12ST IF Grid in series with .05 mfd.</td>
<td>455 KC</td>
<td>&quot;BC&quot; Band 550 KC</td>
<td>C6 &amp; C7</td>
</tr>
<tr>
<td>2</td>
<td>6SAT Conv. grid in series with .03 mfd.</td>
<td>455 KC</td>
<td>&quot;BC&quot; Band 550 KC</td>
<td>C4 &amp; C5</td>
</tr>
<tr>
<td>3</td>
<td>Capacity Coupled</td>
<td>850 KC</td>
<td>&quot;BC&quot; Band 550 KC</td>
<td>C2**</td>
</tr>
<tr>
<td>4</td>
<td>Capacity Coupled</td>
<td>1500 KC</td>
<td>&quot;BC&quot; Band 1500 KC</td>
<td>C3 (Inc.)</td>
</tr>
<tr>
<td>5</td>
<td>Repeat Step 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Capacity Coupled</td>
<td>18 MC</td>
<td>&quot;SW&quot; Band 18 MC</td>
<td>C23*(Occ.)</td>
</tr>
<tr>
<td>7</td>
<td>Capacity Coupled</td>
<td>18 MC</td>
<td>&quot;SW&quot; Band 18 MC</td>
<td>C24*(Ant.)</td>
</tr>
</tbody>
</table>

**Use minimum capacity peak.**

* Rock gang condenser when making alignment.

"A" rating—115 Volts AC or DC, 40-60 cycles, 55 watts
"C" rating—115 Volts AC or DC, 25 cycles, 35 watts

**Tuning Frequency Range**
- Broadcast Band ............ 540-1720 kilocycles
- Short-wave Band .......... 5600-18,300 kilocycles

**Special Service Information**

The following data will be very useful to servicemen equipped with vacuum-tube voltmeters or similar voltage-measuring instruments.

1. **Stage gains**
   - Antenna post to RF grid—3.0 at 1000 KC
   - RF grid to converter grid—6.0 at 1000 KC
   - Converter grid to IF grid—50 at 455 KC
   - IF grid to 12SQ7 diode plate—75 at 455 KC
   - 0.14 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½-watt speaker output.

2. **Audio gains**
   - 0.14 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½-watt speaker output.

3. **DC voltage developed across oscillator grid resistor (R4) averages 9.0 volts at 1000 KC or 8.0 volts at 18,000 KC.**

* Variations of ±20% permissible. All readings obtained with enough signal input to give ½-watt speaker output.
RADIO CHASSIS

C-1 Antenna section of tuning condenser
C-2 Oscillator section of tuning condenser
C-3 "B" band padder
C-4 .01 mfd. paper capacitor
C-5 .02 mfd. paper capacitor
C-6 .005 mfd. paper capacitor
C-7 .005 mfd. paper capacitor
C-8 .01 mfd. paper capacitor
C-9a 30 mfd. 150 V. dry electrolytic
C-9b 50 mfd. 150 V. dry electrolytic
C-11 .05 mfd. paper capacitor
C-12 .08 mfd. paper capacitor
C-13 .03 mfd. paper capacitor
C-14 470 mfd. mica capacitor
C-15 220 mfd. mica capacitor
C-16 47 mfd. mica capacitor
C-17 .01 mfd. paper capacitor
C-20 .002 mfd. paper capacitor
L-1 Beam-a-Bope
L-2 Oscillator coil
J-8 1st I.F. transformer
J-4 2nd I.F. transformer
R-1 Pilot lamp Mazda No. 44
R-2 33,000 ohm carbon resistor
R-3 2.2 megohm carbon resistor
R-4 0.5 megohm voulme control
R-5 15 megohms carbon resistor
R-6 470,000 ohms carbon resistor
R-7 1.0 megohm carbon resistor
R-8 3300 ohms carbon resistor
R-9 99,000 ohms carbon resistor
R-10 150 ohms carbon resistor
R-11 1000 ohms 1 W. carbon resistor
R-12 470,000 ohms carbon resistor
R-13 2.9 ohm W. W. resistor
R-14 BL-42 B ballistic pressure
R-15 7.0 ohm W. W. resistor
S-1 Power switch (comb. with R-3)
S-2 Radio-phono-record switch
S-3 Output transformer
T-1 Micophone jack
T-2 Cutter transformer

ALIGNMENT CONVENTIONAL
SEE SPECIAL SECTION VOL. VIII
TRIM ANT. OSC. 1500 KC; PAD 560 KC
POWER CONSUMPTION-75 WATTS

Special Service Information
The following data will be very useful to servicemen equipped with vacuum-tube voltmeters or similar voltage-measuring instruments.

(1) Stage Gains
Antenna Post to Converter Grid—6 at 1000 KC
Converter Grid to 6SK7GT Grid—30 at 455 Kc
6SK7GT Grid to 607GT Det. Plate—150 at 455 Kc
(2) Audio Gains
.08 volts 600 cycles signal across volume control with control set to maximum will give approximately 3/4 watt speaker output.
(3) DC voltage developed across oscillator grid resistor (R-1) averages 12 volts.

RECORDER ADJUSTMENTS

Cutting Head Pressure
The pressure is controlled by means of the adjustment screw located midway back on top of the recording arm.

Cutting Arm Adjustment
The adjustment at the rear and underneath the cutting arm, controls the height above the record blank at which the cutting arm rides. This should be adjusted so that when resting in the recording position on the record, the setscrew of the cutting head rides halfway down in the needle screw gap.

Lead Screw Follower Arm Pressure Adjustment
The pressure is varied by the phosphor bronze spring adjustment underneath the phono assembly on the follower arm. The pressure should be great enough so that when the recording head is in the recording position, this phosphor bronze spring should rest at the bottom of the lead screw groove. Too great pressure will cause binding, while too little pressure is liable to cause overlapping of the grooves.

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FOR ALIGNMENT, VOLTAGES, PARTS, SEE INDEX

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NOTE—The schematic diagram shown is for Models J-654 and J-654W. For Models J-644 and J-644W, omit items C17, C18, and R-13; ground B— to chassis; omit the tertiary winding from T3 and return R7 to the ungrounded secondary of T3.

PARTS DESCRIPTION LIST

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>.01 mfd, paper capacitor</td>
<td>C16a, 16b</td>
<td>50 mfd, 30 mfd, electrolytic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>.05 mfd, paper capacitor</td>
<td>C17</td>
<td>.05 mfd, paper capacitor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C3a, 3b</td>
<td>Tuning condenser</td>
<td>C18</td>
<td>.20 mfd, paper capacitor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>47 mfd, mica capacitor</td>
<td>C19</td>
<td>33,000 ohm carbon resistor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C5-C8</td>
<td>.1 M. trimmers</td>
<td>R1</td>
<td>3.2 megohm carbon resistor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C9</td>
<td>470 mfd, mica capacitor</td>
<td>R2</td>
<td>.5 megohm volume control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10</td>
<td>.02 mfd, paper capacitor</td>
<td>R3</td>
<td>4.7 megohm carbon resistor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C12, C13</td>
<td>.005 mfd, paper capacitor</td>
<td>R4</td>
<td>1000 ohm carbon resistor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C14</td>
<td>.01 mfd, paper capacitor</td>
<td>R5</td>
<td>470,000 ohm carbon resistor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C15</td>
<td>.05 mfd, paper capacitor</td>
<td>R6</td>
<td>1.0 megohm carbon resistor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R7</td>
<td></td>
<td>R8</td>
<td>39,000 ohm carbon resistor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

-1940-

Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

1. Stage Gains
   - Antenna Post to Converter Grid—4.0 at 1000 KC
   - I.F. on Converter Grid to I.F. on I.F.
   - Amplifier Grid—35 at 455 KC

2. 0.06-volt, 400-cycle signal across the volume control will give 4½-watt speaker output.* (Volume control turned to maximum.)

3. Average RF voltage developed from oscillator cathode to B—1.5 volts

* Variations of ±20% permissible. All readings obtained with enough signal input to give 4½-watt speaker output.

IF ALIGNMENT CONVENTIONAL
SEE SPECIAL SECTION VOL. VIII
TRIM OSC 1650 KC; ANT 1500 KC

Intermediate Frequency

- 455 KC

Electrical Power Output (117 line volts)

- Undistorted: 1.5 watts
- Maximum: 2.5 watts

Load-speaker—Alnico Magnet Dynamic

- Outside Cone Diameter: 5 inches
- Voice Coil Impedance (400 cycles): 3.8 ohms

Socket Voltages

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MODEL HP-657-A

Model HP-657-A

SERVICE DATA

Over-all Dimensions

Height .................................................. 8 inches
Width .................................................. 12½ inches
Depth .................................................. 7½ inches

Tuning Control Drive Ratio .......................... 5:1

Electrical Specifications

<table>
<thead>
<tr>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>105-125 AC or DC</td>
<td>40-60</td>
<td>30</td>
</tr>
</tbody>
</table>

Tuning Frequency Range

Broadcast Band ................. 540-1650 KC
Police Band ..................... 2600-7500 KC

Electrical Power Output

Undistorted ................. 0.8 watts
Maximum ...................... 1.6 watts

Load-speaker—Permanent Magnet

Outside Cone Diameter ........... 5 inches
Voice Coil Impedance (400 cycles) ........... 3 ohms

Tubes

Converter-Oscillator ............... GE-12SA7
I.F. Amplifier......................... GE-12SK7
Detector—A.V.C. ..................... GE-12SQ7
1st Audio Amplifier ............... GE-12SL7
Audio Output ....................... GE-35L6GT
Rectifier ......................... GE-3526GT
Dial Lamp ....................... MAZDA No. 47

GENERAL INFORMATION

Model HP-657-A is a compact, six-tube, AC-DC, super-heterodyne radio designed to receive programs on the broadcast and police-amateur-aircraft bands of frequency. Antenna and ground connections are not necessary as the built-in
"Beam-a-Scope" provides adequate pick-up; however, terminals are provided on the cabinet back for connecting antenna
and ground leads when signal strengths are low. The receiver is equipped with five mechanical "Peastertouch Tuning" keys adjustable by removing the keys and loosening the binding screws with a screwdriver. Additional design features include Underwriters' approval, full automatic volume control, continuously variable tone control, and angle-ended tubes.

When operating from a DC source of power it is necessary to invert the power plug with the proper polarity. If the receiver fails to function with the power plug inserted one way, reverse the plug. If any hum is noticed when the receiver is used on AC, reverse the power plug as above.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. .................. 455 KC
Broadcast R.F. .......... 1650, 1500 and 600 KC
Police R.F. ............ 7000 KC

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the grid of the 12SK7 through a .05 mfd. capacitor and align the 2nd I.F. transformer. Repeat the procedure applying the 455 KC signal to the control grid of the 12SA7 and aligning the 1st I.F. transformer. Do not remove the grid leads from the tubes. Finish alignment by over-all adjustments.

R.F. Alignment

Apply R.F. signals either through a standard I.R.E. dummy to the antenna terminal or through an additional loop connected to the signal generator output which can be magnetically coupled to the receiver Beam-a-Scope.

1. Rotate the gang condenser to maximum open and apply 1650 KC signal to Beam-a-Scope. Peak oscillator trimmer on right-hand section of gang condenser (as viewed from front) for maximum output.

2. Change generator signal to 1500 KC and set dial pointer to 1600 KC mark. Peak antenna trimmer on left-hand section of gang condenser.

3. Set pointer and generator signal to 600 KC. Peak broadcast paddler while rocking the gang condenser. Broadcast paddler is first from front on right side of chassis.

4. Rotate band switch to clockwise position and set dial pointer to the 7.0 MC mark. With 7.0 MC input signal align rear trimmer on right side of chassis and peak trimmer located on small antenna coil on top of chassis.

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Alignment Frequencies
I.F. 455 KC  R.F. 1500 and 580 KC
The location of all trimmers is shown in Fig. 1.

I.F. Alignment
Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit. Apply signal to the grid of the 6SK7GT through a .05-mfd. capacitor and align the 2nd IF transformer. Repeat the procedure, applying the 455-KC signal to the control grid of the 6SA7GT and aligning the 1st I.F. transformer. Finish by over-all adjustments.

R.F. Alignment
With gang condenser plates completely closed, set dial pointer to the first mark at the left end of the scale. Apply a 1500-KC signal either through a standard I.R.E. dummy to the antenna terminal or through an additional loop connected to the generator output, which can be magnetically coupled to the receiver Beam-a-Scope. Align (C-2) at 1500 KC and peak (C-1) for maximum output. Peak (C-3) on 580 KC while rocking the gang condenser. Retrin at 1500 KC.

Precaution
If the signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver input power. The use of an isolating capacitor is not recommended as AC current through the capacitor will introduce hum modulation and锆 create the possibility of a burned out signal generator attenuator.

Special Service Information
The following data will be very useful to servicemen equipped with vacuum tube voltmeters or similar voltage measuring instruments.
1. Stage Gains
   a. Antenna post to 6SA7GT grid 4 at 1000 KC
   b. 6SA7GT grid to 6SK7GT grid 30 at 455 KC
   c. 6SK7GT grid to 6SA7GT plate, 100 at 455 KC
2. Audio Gains
   a. 0.00 volts, 400 cycles signal across volume control with control set to maximum will give approximately 3 watt speaker output.
3. DC voltage developed across oscillator grid resistor (R-1) averages 12 volts.

Variations of +10%, -20% permissible.

Electrical Rating
A-6 Rating 115 volts, 60 cycles AC, 75 watts
A-5 Rating 115 volts, 56 cycles AC, 75 watts

Tuning Frequency Range 550-1000 KC.
Intermediate Frequency 455 KC.

Electrical Power Output
Undistorted 2.0 watts
Maximum 2.5 watts

Load-speaker—PM Dynamic
Outside cone diameter 6.5 inches
Voice coil impedance (400 cycles) 3.5 ohms

Phonograph Mechanism
Type mechanism—Manual
Type tone arm—Concentric
Turntable speed 78 R.P.M.

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MODEL J-709

TECHNICAL AND SERVICE INFORMATION

Model J-709 combination uses the same chassis and record-changer mechanism as the Model H-708, data for which will be found in Vol. XI. The schematic Fig. 3 above and parts view of the automatic changer, Fig. 5 below, are corrected to care for the Model J-709.
MODELS J-718 AND J-728

SPECIFICATIONS

Over-all Dimensions

<table>
<thead>
<tr>
<th></th>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35 1/4 inches</td>
<td>20 1/4 inches</td>
<td>16 inches</td>
</tr>
</tbody>
</table>

Electrical Rating

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (volts)</th>
<th>Frequency (cycles on AC)</th>
<th>Power Consumption (watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A6</td>
<td>110-125</td>
<td>60</td>
<td>95</td>
</tr>
<tr>
<td>A5</td>
<td>110-125</td>
<td>50</td>
<td>95</td>
</tr>
<tr>
<td>C2</td>
<td>110-125</td>
<td>45</td>
<td>105</td>
</tr>
</tbody>
</table>

Tuning Frequency Range

| Broadcast Band | 540-1600 KC |
| Short-wave Band No. 1 | 2500-6500 KC |
| Short-wave Band No. 2 | 6000-22,000 KC |

Intermediate Frequency

145 KC

Electrical Power Output

Undistorted: 4 Watts
Maximum: 5.5 Watts

Load-speaker—"Alnico" Magnet Dynamic

Outside Speaker Diameter: 14 inches
Voice Coil Impedance: 3.5 ohms

Tubes

R.F. Amplifier: GE-6SK7
Converter and Oscillator: GE-6SA7
I.F. Amplifier: GE-6K7
Det. Amp., A.V.C: GE-6SA7
Audio Driver: GE-4AS7 or GT
Audio Output: GE-4Y6G
Rectifier: GE-4Y5G
Dial and Pilot Lamps: (4) Mazda No. 44

Phonograph Mechanism

Type: Automatic Record Changer
Record Capacity: 8
10-inch records: 8
12-inch records: 7
Type Pick-up: Crystal
Turntable speed: 78 Rpm

GENERAL INFORMATION

Models J-718 and J-728 are radio-automotive phonograph combinations each incorporating a seven-tube, three-band, A.C. radio receiver. The only difference between these two models is in the cabinet.

Setting Up the Receiver

The following remarks will assist the serviceman in correctly setting up these receivers for use:

1. In order to press the volume or tuning knobs all the way on their respective shafts, the dial reflector plate should be held in place by pressure from the rear.
2. The black speaker lead should be connected to the speaker terminal which is grounded to the speaker frame.
3. A method of setting up control knobs which will assure drift-proof adjustments is to turn each iron core screw adjustment to its extreme counter-clockwise position, then turn slowly in a clockwise direction until the desired station is tuned in.

Beam-a-Scope Removal

Before either the chassis or Beam-a-Scoops can be removed the leads between them must be disconnected. The cylindrical Beam-a-Scope leads are disconnected by pulling the pin-plug connections out of the Beam-a-Scope terminals. The short-wave Beam-a-Scope leads are disconnected by unscrewing the nuts which clamp the terminals on the phosphor-bronze strap and green leads, and the screw which clamps the terminal of the yellow lead.

Fig. 2 shows the location of the Beam-a-Scope leads when connected.

To remove the cylindrical Beam-a-Scope, the following procedure is recommended: Disconnect the four Beam-a-Scope leads. Pry loose the card-board strip which is stapled to the bottom of the cabinet and which holds the bottom end of the Beam-a-Scope in place. The cylindrical Beam-a-Scope can now be tilted enough out of vertical to allow continuous rotation of it. Rotate the Beam-a-Scope from right to left until it comes loose. Note: The upper pivot bolt by which the Beam-a-Scope is supported should never be loosened or removed.

When replacing the cylindrical Beam-a-Scope it should be screwed up on the bolt approximately five turns or until the blocking bolt prevents more than 180° rotation when the Beam-a-Scope hangs vertically. The cardboard strip which holds the bottom pivot of the Beam-a-Scope in place should be reassembled in such a position that the Beam-a-Scope hangs vertically and is free to turn without rubbing on the strap.

Load-speaker

The voice coil is accurately and permanently centered at the factory and should seldom give trouble. In case a voice coil needs recentering, it will be necessary to replace the entire cone and voice coil assembly.

Note: In no case should the magnet be removed from the assembled position.

Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available:

1. STAGE GAINS*
   a. Antenna Post to R.F. Grid at 1.000 KC... 5.5
      4.000 KC... 2.5
   b. R.F. Grid to Converter Grid at 1.000 KC... 5.5
      4.000 KC... 3.0
      18.000 KC... 4.5
   c. R.F. on Converter Grid to I.F. on 1st I.F. Grid at 1.000 KC... 5.0
      4.000 KC... 5.0
      18.000 KC... 75
   d. I.F. on Converter Grid to I.F. on 1st I.F. Grid at 1.000 KC... 5.0
      4.000 KC... 5.0
      18.000 KC... 10
   e. I.F. Amplifier Grid to Detector Plate at 1.000 KC... 3.2
      4.000 KC... 3.2
      18.000 KC... 4.6
   f. Voltage across volume control to 14-watt speaker output 400 cycles... 0.03 volts
   g. DC voltage developed across oscillator grid resistor (R-7) at 1.000 KC... 5.3
      4.000 KC... 5.3
      18.000 KC... 8.4
   h. *Variations of ±20% permissible. All readings obtained with enough signal input to give 14-watt speaker output.

Frequency-degree Reference Chart

"BC" Band

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600 KC</td>
<td>165</td>
</tr>
<tr>
<td>1500 KC</td>
<td>158</td>
</tr>
<tr>
<td>1400 KC</td>
<td>146</td>
</tr>
<tr>
<td>6.9 Mc</td>
<td>171</td>
</tr>
<tr>
<td>6.0 Mc</td>
<td>159</td>
</tr>
<tr>
<td>5.0 Mc</td>
<td>126</td>
</tr>
</tbody>
</table>

"SW1" Band

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 MC</td>
<td>172</td>
</tr>
<tr>
<td>21 MC</td>
<td>164</td>
</tr>
<tr>
<td>18 MC</td>
<td>146</td>
</tr>
</tbody>
</table>

"SW2" Band

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>134 MC</td>
<td>8 MC</td>
</tr>
<tr>
<td>101 MC</td>
<td>7 MC</td>
</tr>
</tbody>
</table>

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ALIGNMENT PROCEDURE

The alignment procedure is given in table form below. The use of a standard I.R.E. dummy antenna in making all R.F. alignments is recommended. R.F. alignment can be performed by loop-coupling the generator signal to the receiver Beam-a-Scope if care is exercised not to overcouple the two circuits. Keeping a distance of two feet or more between the generator loop and the receiver Beam-a-Scope will generally insure freedom from overcoupling. The relative position of the Beam-a-Scope with respect to the chassis materially affects R.F. alignment; therefore, all R.F. alignments should be made with the chassis and Beam-a-Scope mounted in the cabinet. In keeping with this recommendation all R.F. alignment trimmers are available either through holes in the back apron of the chassis or from the top of the chassis deck. See Fig. 1 for trimmer location. Metal objects such as meters, tools, etc., should not be placed on top of the receiver cabinet. Also the receiver should be kept away from large metal objects such as radiators, metal-top tables, etc.

**ALIGNMENT CHART**

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Frequency</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. “BC” Band</td>
<td>455 KC Sweep</td>
<td>I.F. Grid and Chassis Ground</td>
<td>.05 Mfd. or larger</td>
<td>2nd I.F. Trimmers</td>
<td>C-10, 11</td>
</tr>
<tr>
<td>2. “BC” Band</td>
<td>455 KC Sweep</td>
<td>Green lead on “BC” Beam-a-Scope terminal board and chassis ground</td>
<td>.05 Mfd. or larger</td>
<td>1st I.F. Trimmers</td>
<td>C-8, 9</td>
</tr>
</tbody>
</table>

**I.F. Alignment with Oscilloscope**

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Frequency</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. “BC” Band</td>
<td>455 KC Modulation</td>
<td>Green lead on “BC” Beam-a-Scope terminal board and chassis ground</td>
<td>.05 Mfd. or larger</td>
<td>2nd I.F. Trimmers</td>
<td>C-10, 11, 1st I.F. trimmers C-8, 9</td>
</tr>
</tbody>
</table>

**I.F. Alignment with Output Meter**

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Frequency</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. “BC” Band</td>
<td>455 KC Modulation</td>
<td>Green lead on “BC” Beam-a-Scope terminal board and chassis ground</td>
<td>.05 Mfd. or larger</td>
<td>2nd I.F. Trimmers</td>
<td>C-10, 11, 1st I.F. trimmers C-8, 9</td>
</tr>
</tbody>
</table>

**R.F. Alignment with Chassis Mounted in Cabinet**

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Frequency</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. “BC” Band</td>
<td>1500 KC with Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. (C-8) Ant. (C-2)</td>
<td>Set point to 1500 KC and tune in signal with (C-8). Peak output with (C-2).</td>
</tr>
<tr>
<td>2. “BC” Band</td>
<td>800 KC with Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. Padder (C-12)</td>
<td>Set Point to 800 KC and peak signal while rocking condenser</td>
</tr>
<tr>
<td>3. “BC” Band</td>
<td>1500 KC with Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. (C-6) Ant. (C-2)</td>
<td>Retrim for maximum output</td>
</tr>
</tbody>
</table>

5. Repeat operation 3 if “BC” band trimmers are badly out of alignment.

6. “SWI” Band 6 MC with Modulation Antenna Post I.R.E. Osc. (C-5) Set point to 6 MC and peak signal while rocking condenser.

7. “SW2” Band 21 MC with Modulation Antenna Post I.R.E. Osc. (C-4) Ant. (C-5) Set point to 21 MC and tune in signal with (C-4). Peak output with (C-3) while rocking condenser. When (C-4) is on, inner most signal, 21 MC signal should be heard 910 KC below on or 20.00 M.C.

8. “SW2” Band 8 MC with Modulation Antenna Post I.R.E. This operation may or may not be necessary depending on how much the short-wave Beam-a-Scope leads have been moved from their correctly dressed positions. Re-positioning will be indicated if an increased output meter reading can be obtained by moving the short-wave Beam-a-Scope phosphor-bronze lead closer or farther away from the green lead. The moving should be done with an insulated rod or stick.

9. Repeat operation 7 if the Beam-a-Scope leads are moved in operation 8.

**R.F. ALIGNMENT**

**With Chassis Outside of Cabinet**

R.F. alignment can be performed only on the “BC” and “SWI” bands with the chassis outside of the cabinet. Any alignment attempted on the “SW2” band will not be satisfactory. The same relative position between the chassis and broadcast loop should be maintained when aligning outside the cabinet as these components occupy in the cabinet. Since the glass dial scale is fastened to the cabinet it cannot be used for reference during alignment of the chassis outside of the cabinet. Use must be made, therefore, of 0-180° calibrated scale which is cemented to the back of the dial-reflector plate. From the “frequency-degree reference chart,” the degree readings for corresponding frequency settings may be obtained. To use these degree readings, first completely close the gang condenser plates and then slide the pointer along the cord until the left-hand edge of the pointer guide slide line up with the 0° mark. By using this left-hand edge (as viewed from the rear) of the slide as the degree-scale pointer the receiver may be tuned to any frequency. Example: By rotating the tuning control until the left-hand edge of the slide is in line with 188°, the receiver will be tuned to the 1500 KC on the “BC” band.

The “BC” and “SWI” band alignment procedure is the same as outlined in steps 2 to 6 inclusive of the chart — R.F. Alignment with Chassis Mounted in Cabinet.

After the alignment has been performed on the “BC” and “SWI” bands, the chassis should be mounted in the cabinet and “SW2” band alignment checked as described in steps 7 to 9 of the chart — R.F. Alignment with Chassis Mounted in Cabinet.

**Notes:** After moving the pointer along the cord to use the left-hand edge as a reference pointer for the degree scale, it will be necessary after reassembly in the cabinet for the gang condenser plates to be closed and the pointer to be moved back along the cord so that it lines up with the first dial markings on the left.

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Compliments of www.nucow.com
NOTE: The oscillator coil and band switch terminals are numbered in the Chassis Parts Layout, Fig. 3, to assist in locating the corresponding numbered points on the Schematic Diagram, Fig. 2. This numbering will also assist in rewiring if the coil or switch are replaced. I.F. transformer connections are shown as an aid in replacement.

**Tubes**
- R. F. Amplifier: GE-6SK7
- Converter and Oscillator: GE-6AS7
- I. F. Amplifier: GE-6SK7
- Det., Aud., AVC: GE-6SQ7
- Phase Inverter: GE-6J5G or GT
- Audio Output: (2) GE-6V6G or GT
- Rectifier: GE-5Y3G
- Dial Lamp: (2) MAZDA No. 44

**Special Service Information**
The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

1. Stage Gains*
   a. Antenna Post to R. F. Grid at 1000 KC: 6.5
   4000 KC: 3.0
   18000 KC: 2.3
   b. R. F. Grid to Converter Grid at 1000 KC: 5.0
   4000 KC: 3.0
   18000 KC: 2.0
   c. R. F. on Converter Grid to I. F. on 1st I. F. Grid at 1000 KC: 47
   4000 KC: 47
   18000 KC: 39
   d. I. F. on Converter Grid to I. F. on 1st I. F. Grid at 455 KC: 55
   e. I. F. Amplifier Grid to Detector Plate at 455 KC: 77

2. Voltage across Volume Control to Give 1/2-watt Speaker Output at 400 cycles: .05 volts

3. DC Voltage Developed Across Oscillator Grid Resistor (R-7) at 1000 KC: 6.0
   4000 KC: 5.5
   18000 KC: 3.9

*Variations of ±20% are permissible. All readings obtained with enough input signal to give 1/2-watt speaker output.
GENERAL INFORMATION

Model J-805 is an eight-tube superheterode receiver designed to operate on an alternating current power supply. The receiver incorporates the latest developments in radio of which the General Electric Dual Beam-A-Scopes are notable. Broadcast and short-wave No. 1 signals are selected by the same tuning system. Short-wave No. 2 signals are selected by the Dual Beam-A-Scope which is mounted on the chassis above the chassis. Additional features include single-ended tubes, preselector oscillator station selector rails, five fast-response tuning switches, one Photo-Frequency Modulation-Transmission Transformer, tone monitor circuit, automatic volume control and push-pull power output.

PHOTO-FM-Tel

This receiver is equipped with a jack jack for tuning the aerial to the aerial or for automatic tuning, frequency indication, and receiver control for use in telemetry. General Electric plug, Stock No. RP-145, fits the jack pin.

Setting Up the Receiver

The following remarks will assist the servient in correctly setting up this receiver for use:

1. In order to get the volume or tuning knobs all the way on their respective shafts, the dial selector plate must be held in place by pressure from the rear.

2. After releasing the shielding glass, the knobs should be turned all the way to the left and the receiver set up to the correct position.

3. The tuning knob should be connected to the speaker terminal which is grounded to the speaker frame.

4. A method of setting up station keys which will assure exact alignment is to screw the amc out all the way and then turn slowly inward until the desired station is tuned in.

Chassis or Beam-A-Scope Removal

Before the chassis or Beam-A-Scope can be removed from the cabinet, all leads must be disconnected. The cylindrical Beam-A-Scope leads are secured by screws near the base of the cabinet which are turned to the right to loosen them.

Fig. 8 and 9 show the correct locations of the Beam-A-Scope leads when mounted. The cylindrical Beam-A-Scope leads must be thread-stemmed through the slot in the cabinet from which the short-wave Beam-A-Scope leads are connected. The short-wave Beam-A-Scope leads are secured by screws near the base of the cabinet which are turned to the right to loosen them.

To remove the cylindrical Beam-A-Scope leads, proceed as follows: Disconnect the screw from the rear of the cabinet, hold the side of the chassis, and loosen the screws. After the beam is loosened, the beam should be removed. This beam is supported to be removed from the cabinet. The beam is then loosened, but should be supported to be removed. The beam should be returned to the cabinet and the screws are tightened to hold the beam in place.

When replacing the cylindrical Beam-A-Scope, it should be screwed into the cabinet head approximately five turns from the position where the bolt is taken from the cabinet head. The screw should then be screwed down until the beam is pulled into the cabinet head. The beam should be tightened to hold the beam in place.

LOAD A-PARAMETER

The voice coil is accurately and permanently centered at the factory so that it will not rattle. In case a voice coil needs recentering, it will be necessary to replace the entire voice coil assembly.

NOTE—In no case should the magnet be removed from the assembled position.

GOLDEN TONE

MODEL J-805

ALIGNMENT PROCEDURE

The alignment procedure is given in table form below.

<table>
<thead>
<tr>
<th>Alignment Chart</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. &quot;BC&quot; Band 450 KC Sweep</td>
<td>I.F. Grid or larger</td>
</tr>
<tr>
<td>2. &quot;BC&quot; Band 450 KC Sweep</td>
<td>I.F. Grid or larger</td>
</tr>
<tr>
<td>3. &quot;BC&quot; Band 450 KC with Modulation</td>
<td>I.F. Grid or larger</td>
</tr>
<tr>
<td>4. &quot;BC&quot; Band 450 KC without Modulation</td>
<td>I.F. Grid</td>
</tr>
<tr>
<td>5. &quot;SW-1&quot; Band 2450 KC with Modulation</td>
<td>I.F. Grid or larger</td>
</tr>
<tr>
<td>6. &quot;SW-2&quot; Band 2450 KC with Modulation</td>
<td>I.F. Grid or larger</td>
</tr>
<tr>
<td>7. &quot;SW-3&quot; Band 2450 KC with Modulation</td>
<td>I.F. Grid or larger</td>
</tr>
</tbody>
</table>

1. "BC" Band 450 KC Sweep

I.F. Grid or larger

2. "BC" Band 450 KC Sweep

I.F. Grid or larger

3. "BC" Band 450 KC with Modulation

I.F. Grid or larger

4. "BC" Band 450 KC without Modulation

I.F. Grid

5. "SW-1" Band 2450 KC with Modulation

I.F. Grid or larger

6. "SW-2" Band 2450 KC with Modulation

I.F. Grid or larger

7. "SW-3" Band 2450 KC with Modulation

I.F. Grid or larger

ALIGNMENT CHART

I.F. Alignment with Oscilloscope

<table>
<thead>
<tr>
<th>Band Setting</th>
<th>Input Preamp</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimms</th>
<th>Comments</th>
</tr>
</thead>
</table>

I.F. Alignment with Output Meter

<table>
<thead>
<tr>
<th>Band Setting</th>
<th>Input Preamp</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimms</th>
<th>Comments</th>
</tr>
</thead>
</table>

R.F. Alignment

With Chassis Mounted in Cabinet

1. "BC" Band 450 KC Sweep

I.F. Grid or larger

2. "BC" Band 450 KC Sweep

I.F. Grid or larger

3. "BC" Band 450 KC with Modulation

I.F. Grid or larger

4. "BC" Band 450 KC without Modulation

I.F. Grid

5. "SW-1" Band 2450 KC with Modulation

I.F. Grid or larger

6. "SW-2" Band 2450 KC with Modulation

I.F. Grid or larger

7. "SW-3" Band 2450 KC with Modulation

I.F. Grid or larger

This operation may or may not be necessary depending on how much the short-wave Beam-A-Scope leads have been moved from their correct original position. Re-positioning will be indicated if an increased output meter reading can be obtained by moving the short-wave Beam-A-Scope phosphor-borne tap leads closer together or farther away from one another. The moving should be done with an insulated rod or stick.

Fig. 6. Pointer-guide Clip Sening with Gang Condenser Closed

Fig. 7. Dial Cord Setting Diagram

Fig. 8. Cylindrical Beam-A-Scope Connections

Fig. 9. Short-wave Beam-A-Scope Connections
GENERAL ELECTRIC CO.

SPECIFICATIONS

**Over-all Dimensions**

<table>
<thead>
<tr>
<th>Model</th>
<th>J-808, J-818, J-828</th>
<th>J-809</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>38 1/2 inches</td>
<td>38 1/2 inches</td>
</tr>
<tr>
<td>Width</td>
<td>17 1/4 inches</td>
<td>17 1/4 inches</td>
</tr>
<tr>
<td>Depth</td>
<td>17 1/4 inches</td>
<td>17 1/4 inches</td>
</tr>
</tbody>
</table>

**Tuning Control Drive Ratio**

25:1

**Electrical Rating (All Models)**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Frequency (Cycles per Second)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A5</td>
<td>110-125</td>
<td>60</td>
</tr>
<tr>
<td>A5</td>
<td>110-125</td>
<td>50</td>
</tr>
<tr>
<td>A5</td>
<td>110-125</td>
<td>25</td>
</tr>
<tr>
<td>A5</td>
<td>110-125</td>
<td>10</td>
</tr>
<tr>
<td>A5</td>
<td>110-125</td>
<td>5</td>
</tr>
<tr>
<td>C2</td>
<td>12-inch</td>
<td>7</td>
</tr>
<tr>
<td>C2</td>
<td>12-inch</td>
<td>12</td>
</tr>
<tr>
<td>C2</td>
<td>12-inch</td>
<td>12</td>
</tr>
</tbody>
</table>

**Tuning Frequency Range**

- Broadcast Band: 540-1600 KC
- Short-wave Band No. 1: 2500-7000 KC
- Short-wave Band No. 2: 7000-22,000 KC

**Intermediate Frequency**

455 KC

**Electrical Power Output**

- Undistorted: 10 watts
- Maximum: 12 watts

GENERAL INFORMATION

These models each contain an eight tube, superheterodyne receiver which is designed to operate from an alternating current power supply. Dual Beam-a-Scoops insure satisfactory performance at all frequencies within the tuning range. Short-wave Band No. 1 signals are selected by the cylindrical Beam-a-Scope. Short-wave Band No. 2 signals are selected by the Beam-a-Scope which is mounted on the cabinet. Additional features include single-ended iron cores, core oscillator station selector coils, five feather touch tuning station keys, and automatic volume control. Models J-808, J-818 and J-828 are provided with dual controls for volume and tone. One set of volume and tone controls permit adjustment of the radio output only while the remaining set of controls permit adjustment of the phonograph output. The phonograph volume and tone controls are mounted on a plate separate from the chassis. Fig. 2 shows the interconnections between chassis and phonograph controls, chassis and phonor motor, chassis and speakers, and chassis and Beam-a-Scoops.

**Phono-FM-Tel**

All models are designed to allow the ready connection of separate record players, frequency modulation converters, and television picture receivers with some converters. Models J-808, J-818 and J-828 are equipped with a pin jack immediately in back of the plug connection on the bottom of the chassis. Model J-809 is equipped with a pin jack on the back panel of the chassis into which a plug connection is made from the tone arm of the automatic record changer. If a separate record player, frequency modula-
tion converter or television picture receiver is used, a rear panel connector or plug connection must be made. General Electric plug, Stock No. RF-145, fits the pin jack. The left-hand feather touch tuning key, marked "Tel-FM," on Models J-808, J-818 and J-828, and "Phono" on Model J-809, when depressed switches the receiver from radio to operation with the auxiliary equipment.

**Setting Up the Receiver**

The following remarks will assist the serviceman in correctly setting up this receiver for use:

1. In order to press the volume or tuning knobs all the way on their respective shafts, the dial reflector plate should be held in place by pressure from the rear.

2. The black speaker lead should be connected to the 14-inch speaker terminal which is grounded to the speaker frame and to the 6 1/4-inch speaker terminal which is not grounded. This will assure proper biasing of the speakers.

3. A method of setting up station keys which will assure drift-proof adjustments is to screw the iron core all the way out and then turn slowly inward until the desired station is tuned in.

**Chassis or Beam-a-Scope Removal**

MODELS J-808, J-818 AND J-828

The chassis is anchored to the chassis board which in turn is held in place by three wood screws located along the bottom edge. Removal of these wood screws will allow the chassis to be dropped down and taken out. Three felt pads are stapled to the upper edge of the chassis board to firmly cushion the board in the cabinet slot.

To remove the vertical Beam-a-Scope proceed as follows: Disconnect the four Beam-a-Scope leads and the Beam-a-Scope drive cord. Remove the two wood screws which hold the Beam-a-Scope drive shaft in place. This will allow the shaft to be swung clear of the wooden tool and removed. A similar procedure is followed for the horizontal Beam-a-Scope. Lift or raise the cabinet off the floor enough to get a screwdriver under the bottom Beam-a-Scope support. Remove the two wood screws which hold the support in place. The Beam-a-Scope can now be rotated from right to left until it is free.

MODEL J-809

The chassis is held in place on the cabinet shelf by four mounting bolts accessible from the under side. Removal of these bolts will free the chassis from the shelf. To remove the horizontal Beam-a-Scope proceed as follows: Disconnect the four Beam-a-Scope leads. Remove the Beam-a-Scope drive cord. With a screwdriver remove the two wood screws which hold the bottom Beam-a-Scope support to the cabinet. These screws are accessible from the top side of the support near the lower rear cross-member of the cabinet. The Beam-a-Scope may now be rotated from right to left until it comes loose from the upper pivot.

The Beam-a-Scope drive mechanism is held in place by two bolt-and-nylon anchorages. The nuts are accessible from the bottom side of the plate. Replacing these nuts, the bolt is found to turn then it will be necessary to remove the chassis to get at the bolt heads. This mechanism will have to be removed to replace either the control drum or the drive cord. When replacing the drive cord, it will be best to take out the Beam-a-Scope and drive unit as one assembly allowing the cord to be completely restrung before reassembling the assembly.

**Load-speaker**

The voice coil is accurately and permanently centered at the factory and should seldom give trouble. In case a voice coil needs centering, it will be necessary to replace the entire cone and voice coil assembly, which will be found in the bottom of the cabinet.

**Special Service Information**

The following information will be very useful in servicing receivers if a volt-ohm-meter or similar voltage measuring instrument is available.

(1) Stage Gains* (a) Antenna Post to R.F. Grid at 1000 KC 8.5 4000 KC 2.5 18000 KC 2.5 (b) R.F. Grid to Converter Grid at 1000 KC 5.5 4000 KC 3.0 18000 KC 2.0 (c) R.F. on Converter Grid to I.F. on 1st I.F. Grid at 1000 KC 50 4000 KC 50 18000 KC 45 (d) I.F. on Converter Grid to I.F. on 1st I.F. Grid at 455 KC 60 (e) I.F. Amplifier Grid to Detector Plate at 455 KC 55

(2) Voltage across volume control to give 1/3 watt speaker output at 400 cycles .068 volts

(3) DC voltage developed across oscillator grid resistor (R-7) at 1000 KC 8.3 4000 KC 7.8 18000 KC 4.6

*Variations of ±20% permissible. All readings obtained with enough signal input to give 1/3 watt speaker output.

Fig. 8. Dial Cord Stringing Diagram

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Compliments of www.nucow.com
### ALIGNMENT PROCEDURE

The alignment procedure is given in table form below. The use of a standard I.R.E. dummy antenna in making all R.F. alignments is recommended. R.F. alignment can be performed by loop coupling the generator signal to the receiver Beam-a-Scope if care is exercised not to overcouple the two circuits. Keeping a distance of two feet or more between the generator loop and the receiver Beam-a-Scope will generally insure freedom from overcoupling. The relative position of the Beam-a-Scoops with respect to the chassis materially affects R.F. alignment; therefore, all R.F. alignments should be made with the chassis and Beam-a-Scoops mounted in the cabinet. In keeping with this recommendation all R.F. alignment trimmers are available either on top of the chassis or through holes in the back apron as shown in Fig. 1. Metal objects such as meters, tools, etc., should not be placed on top of the receiver cabinet. Also the receiver should be kept away from large metal objects such as radiators, metal-top tables, etc.

### ALIGNMENT CHART

#### I.F. ALIGNMENT WITH OSCILLOSCOPE

<table>
<thead>
<tr>
<th>Band</th>
<th>Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
</table>

#### I.F. ALIGNMENT WITH OUTPUT METER

<table>
<thead>
<tr>
<th>Band</th>
<th>Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
</table>

#### R.F. ALIGNMENT WITH CHASSIS MOUNTED IN CABINET

<table>
<thead>
<tr>
<th>Band</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. &quot;BC&quot; Band</td>
<td>1500 KC with Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. (C-8) Ant. (C-34)</td>
<td>Close gang plates, adjust pointer to first line at left end of tuning scale. Connect output meter across voice coil. Tone control set to &quot;Normal&quot; position.</td>
</tr>
<tr>
<td>2. &quot;BC&quot; Band</td>
<td>580 KC with Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. (C-8) Ant. (C-11)</td>
<td>Set pointer to 1500 KC and tune in signal with (C-8). Peak output with (C-34).</td>
</tr>
</tbody>
</table>

5. Repeat operation 3 if "BC" band trimmers are badly out of alignment.

6. "SW" Band | 6 MC with Modulation | Antenna Post | I.R.E. | Osc. (C-7) | Set pointer to 6 MC and peak signal while rocking gang condenser. |

7. "SW" Band | 21 MC with Modulation | Antenna Post | I.R.E. | Osc. (C-6) Ant. (C-1) | Set pointer to 21 MC and tune in signal with (C-6). Peak output with (C-1). |

8. "SW" Band | 8 MC with Modulation | Antenna Post | I.R.E. | This operation may or may not be necessary depending on how much the short-wave Beam-a-Scope leads have been moved from their correctly dressed positions. Repositioning will be indicated if an increased output meter reading can be obtained by moving the short-wave Beam-a-Scope lead closer together or farther away from one another. The moving should be done with an insulated rod or stick. |
Fig. 5. Chassis Parts Layout (All Models)
FRONT OF CHASSIS

Fig. 6. Socket Voltages (All Models)

BOTTOM VIEW OF CHASSIS

Fig. 7. Frequency-degree Reference Chart
GENERAL AUTOMATIC RECORDER CHANGEBACK USED IN MODELS J-718, J-728, J-808, J-809, J-818, J-819, J-828

MANUAL OPERATION
To play records, follow these steps as outlined in the table below.

1. Proceed as in Step 1, under "Automatic Operation."  
2. Lift the tone arm slowly upward and keep it in a horizontal position.  
3. Turn the motor on and wait for the tone arm to move to the right of the record.  
4. Set Index 1 or 2 in Position "C" and adjust the position of the tone arm.  
5. To stop, return the tone arm to the right of the record.  

SERVICE DATA

GENERAL INFORMATION

The tone arm is driven through a friction drive wheel mounted on the tone arm spindle. It is important that the drive motor, spindle, and motor carriage be kept clean and free from oil, grease, dirt, or any foreign matter that might affect the smooth operation of the arm. The motor carriage must be cleaned periodically to prevent dirt and dust from accumulating in the shafts and bearings. The arm should be cleaned periodically to keep it free from dust and dirt that might accumulate on the record. The tone arm should be checked periodically for any wear or damage that might affect its performance. The tone arm should be checked periodically for any wear or damage that might affect its performance. The tone arm should be checked periodically for any wear or damage that might affect its performance. The tone arm should be checked periodically for any wear or damage that might affect its performance. The tone arm should be checked periodically for any wear or damage that might affect its performance.
**BEAM-A-SCOPE REMOVAL**

Before either the chassis or Beam-a-Scope can be removed, the leads between them must be disconnected. Fig. 1 shows the location of the Beam-a-Scope leads when connected.

**Model J-1108**

To remove Beam-a-Scope, disconnect the leads, unscrew the large tapping screw from cabinet, then pry loose the cardboard strap which is stapled to the bottom of the cabinet and holds the Beam-a-Scope in place. Now rotate the Beam-a-Scope from right to left until it comes loose. **Note**: The upper pivot bolt support should never be loosened.

To replace the Beam-a-Scope the reverse procedure is followed and the strap should be reset to the cabinet.

**Model J-1109**

To remove the Beam-a-Scope from this model, use the same procedure as above with the exception of the bottom support removal. This receiver uses a wooden support held in place by two wood screws, which are accessible from underneath the cabinet base. When the screws are removed the wood support can be removed allowing the Beam-a-Scope to be rotated from right to left until it is free.

**Special Service Information**

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

1. **Stage Gains**
   - (c) R. F. on Converter Grid to I.F. on L.F. Grid at 1000 K.C. 4000 K.C. 1000 K.C. 4000 K.C.
   - (d) I.F. on Converter Grid to I.F. on L.F. Grid at 455 K.C. 455 K.C.
   - (e) I.F. Amplifier Grid to Detector Plate at 455 K.C.
   - (2) Voltage across Volume Control to Give ½-watt** Speaker Output at 400 cycles, 0.05 volts.
   - (3) DC Voltage Developed across Oscillator Grid Resistor (R-7) at 1000 K.C. 4000 K.C. 1000 K.C. 4000 K.C. 1800 K.C.

**- Variations of ±20 per cent are permissible. All readings obtained with enough input signal to give ½-watt speaker output.**

**- ½-watt speaker output at 400 cycles is equivalent to a reading of 1.32 volts as measured by a high resistance A-C voltmeter across the voice coil of the receiver speaker.**

---

**FREQUENCY-DEGREE REFERENCE CHART**

<table>
<thead>
<tr>
<th><strong>BC</strong> Band</th>
<th><strong>SWI</strong> Band</th>
<th><strong>SW2</strong> Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 K.C.</td>
<td>4.0 M.C. &amp; 104 K.C.</td>
<td>12 M.C. &amp; 101 K.C.</td>
</tr>
<tr>
<td>500 K.C.</td>
<td>2.5 M.C. &amp; 50 K.C.</td>
<td>7 M.C. &amp; 28 K.C.</td>
</tr>
</tbody>
</table>

**R.F. Alignment with Chassis Outside of Cabinet**

R.F. alignment can be performed only on the "BC" and "SW1" bands with the chassis outside of the cabinet. Any alignment attempted on "SW2" band will not be satisfactory. The same relative position between the chassis and broadcast loop should be maintained when aligning outside the cabinet as these components occupy in the cabinet. Since the glass disc scale is fastened to the front of the chassis it cannot be used for reference during alignment of the chassis outside of the cabinet. Use must be made, therefore, of a 180° calibrated scale which is cemented to the back of the dial-reflector plate. From the "frequency-degree reference chart" the degree readings for the corresponding frequency settings may be obtained. To use these degree readings, first connect the 1000-kilocycle condenser plates and then slide the pointer along the cord until the left-hand edge of the pointer-guide line is up to the 0° mark. By using this left-hand edge (as viewed from the rear) of the slide as the degree-scale pointer the receiver may be tuned to any frequency. Example: By rotating the tuning control until the left-hand edge of the slide is in line with the 154°, the receiver will be tuned to 1500 K.C. on the "BC" band.

The "BC" and "SW1" band alignment procedure is the same as outlined in steps 3 to 6 inclusive of the chart—"R.F. Alignment with Chassis Mounted in Cabinet."

The chassis should be mounted in the cabinet and "SW2" band alignment checked as described in steps 7 and 8 of the chart.

**Note**: After moving the pointer along the cord to use the left-hand edge as a reference pointer for the degree scale, it will be necessary after reassembly in the cabinet for the gang condenser plates to be closed and the pointer to be backed along the cord so that it lines up with the first dial markings on the left.
Plug in AC cord, turn "Off Volume" knob on, push in "Broadcast" button, and select stations as desired by using tuning knob.

Use same procedure, though push in "Intermediate Short Wave" or "Short Wave" buttons for tuning these bands.

To set broadcast band stations to buttons for instantaneous tuning:

Remove decorative covers above long row of knobs (with fingernail or screwdriver). This will expose six pairs of screws. These are the iron-core tuning and padders. From left to right these iron core tuning stations for buttons number two to seven, inclusive. Select the six stations desired, remove the call letters from the station tab sheet, insert the tabs in the buttons, assigning the station with the lowest KC frequency to button No. 2 and, in order, to the station with the highest KC frequency to button No. 7.

To actually set stations to the buttons:

By means of manual tuning, play the station to be set; then push the button at which the station is to be set; then with a screwdriver turn iron-core (long screw) till station is located. Adjust station to lowest volume, using padders (short screw); then readjust long screw till station is set to a point where the tuning eye is at its most closed position. The station is then "set" to the button.

This procedure must be repeated for each station to be set to each button, and it is suggested that, after the stations are all once set to their buttons, they be rechecked before replacing the cover.

Standard broadcast antenna is mounted on a swivel in rear of cabinet. For tuning some more distant stations, it may be desirable to rotate antenna to position of loudest volume or, if necessary, an outside antenna may be connected to a green wire lead coming from this broadcast loop. For short wave tuning, some locations will require an outside antenna. This outside antenna should be connected to the green wire coming from the short wave loop, which is located directly above the chassis. If extra antenna is desired for both short wave and standard broadcast performance, both green antenna leads can be joined together satisfactorily to one outside antenna.

If a phonograph or microphone is to be used, they should be plugged into the rear of the chassis in place provided and so marked. To use as a phonograph or with microphone, push in "Phono" button. In rear of the chassis is provided a 110 volt plug. This is for your convenience for using this radio with a phonograph attachment or with a lamp.

A six-prong outlet is provided in the chassis pan. This outlet is wired into the circuit and can be used only in conjunction with a special microphone pre-amplifier and control that has been designed especially for recording purposes. The consumer owning this receiver may purchase a portable recorder and, by connecting it to our microphone pre-amplifier, it is possible to make recordings of the highest quality.

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B. F. GOODRICH
MODELS R-399, R-405

SCHEMATIC DIAGRAM - IF 440 KC

TRIM 1400 KC
PAD 600 KC

FREQUENCY RANGE - 555 to 1720 KC

CONVENTIONAL ALIGNMENT SEE SPECIAL SECT. VOL. VIII

FREQUENCY RANGE -
550 to 1700 KC
1700 to 5400 KC
5600 to 18100 KC

IF PEAKED AT 456 KC FOR OTHER DATA SEE INDEX

©John F. Rider, Publisher
In some sets C3, C4, C18, R13 and the R.F. choke (RFC) are not used and points "A" are connected to chassis.

I.F. ALIGNMENT CONVENTIONAL (SEE VOL.VIII).

BROADCAST BAND
TRIM OSC 1630 KC
TRIM ANT 1400 KC

FOR OTHER DATA SEE INDEX

MODEL R-424
FOR CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII
MODEL R-404
FOR CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII
TRIM 1400 KC (BB)
PAD 630 KC (BB)
TRIM 8000 KC (SW)

FOR OTHER DATA SEE INDEX
FREQUENCY RANGE
535 to 1750 KC
2200 to 6500 KC

MODEL R-415A
FOR CONVENTIONAL ALIGNMENT
TRIM OSC 1630 KC
TRIM ANT 1400 KC
SEE SPECIAL SECTION VOL. VIII

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WAVE TRAP ADJUSTMENT

At the rear of the chassis near the Antenna and Ground posts is an adjustment screw connected to a trap circuit for elimination of code interference when operating on the broadcast band. If code interference is encountered, adjustment of this screw will filter it out. It is to be used only if such interference is experienced in broadcast reception. It prevents code transmitters operating on a frequency around 456 K.C. from being received by the I.F. amplifier which is tuned to 450 K.C.

SERVICE DATA FOR ALL BANDS

If it is suspected that the oscillator has stopped but is doubtful due to the presence of the usual amount of noise level, it is suggested that the oscillator plate voltage be checked. To ascertain whether the tube is oscillating, ground the oscillator grid of the 6A8 (short stator and rotor plates of oscillator section on gang condenser). If oscillating properly, grounding the grid will cause an appreciable drop in oscillator voltage. Grounding or shorting the stator and grid components should be accomplished by grounding the stator mounting nut to the frame of the condenser with a screw-driver or any metallic conductor.

Do not wedge a screw-driver between the plates for this is liable to permanently warp the plates and thus prevent the oscillator section of the gang condenser from tracking.

©John F. Rider, Publisher
Eight Tube AC Superheterodyne

ALIGNMENT DATA AND SERVICING

GENERAL DATA
The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 600, 1400, 1730, 1800, 4000, 5600, 6000, 16,000 and 18,100 KC. The output meter is to be connected across the primary or secondary of the output transformers. If possible, all alignment should be made with the volume control adjusted to maximum and the test oscillator output as low as possible, to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE
The intermediate frequency (I.F.) stage should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the broadcast band should always be the next procedure; after which, either or both of the Short Wave Bands may be aligned.

I.F. ALIGNMENT

With the wave switch in the broadcast band and the gang condenser set at minimum. Adjust the test oscillator to 455 KC and connect the output to the grid of the first detector tube (9A7) through a 0.05 or .1 microfarad condenser. The grid on the test oscillator can be connected to the chassis ground. Align all four I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT

Connect the output of the signal generator to the antenna lead (blue) through a 0.002 mfd. mica condenser. Set the gang condenser to minimum and the oscillator to 1730 KC and adjust the "oscillator trimmer" to receive this signal. Make no other adjustments at this frequency. Then set the generator to 1400 KC and tune in this signal by rotating the gang to 1400 on the dial. Adjust the "presleotector" and "antenna" trimmer to maximum signal. Set the signal generator to 600 KC and tune in the signal on the receiver. Note: approximately the same sensitivity should be noted at this point as at 1400 KC. The signal strength may sometimes be improved by padding the circuits. This is done by slowly increasing or decreasing the oscillator padding condenser and, at the same time, continuously tuning back and forth across the signal with the receiver until the maximum reading is obtained on the output meter. This adjustment may seem a little complicated but is the easiest way to adjust the oscillator to the presleotector of the R.F. section. Return to 1400 KC and again go over the adjustments of this frequency to be certain that they were not slightly out of alignment when adjustment was made at 600 KC.

POLICE BAND ALIGNMENT

The police band is adjusted by first replacing the 0.002 dummy with a 400 ohm resistor and setting the generator to 5600 KC. With the gang set at minimum, adjust the "police oscillator trimmer" to receive this signal, then set the signal generator to 4000 KC and adjust "police antenna trimmer" to give maximum output. Next, set the oscillator to 1800 KC and "pad" the circuit of this frequency as described in the instructions for padding the broadcast circuits.

SHORT WAVE BAND ALIGNMENT

The short wave band is adjusted by setting the generator to 18,100 KC and with the gang at minimum, adjust the "short wave oscillator trimmer" to receive the signal. Set the generator at 16,000 KC, tune in the signal and adjust the "short wave antenna" trimmer to give maximum output. As there is no variable low frequency padding condenser on this band, the sensitivity of the receiver should be checked at 6000 KC to determine whether the circuits are in line at this frequency. Should the receiver lack sensitivity at 6000 KC, the antenna and oscillator coils, as well as the 0.004 mica padding condenser, should be tested for defects as sometimes these components become subject to mechanical or electrical injuries, despite their rugged construction and liberal ratings.

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ALIGNMENT MODELS R-412 and R-412A—Trim Osc 1730 KC, Ant 1400 KC Pad 600 KC

12SA7GT
CONVERTER
12K7GT
I.F. AMPL.
12SQ7GT
DEA-16AUX
50L6GT
POWER OUTPUT

35Z5GT
RECTIFIER
25L6 12K7 12SA7 12SG7

NOTE: C2 used on some models. On others Point "A" is connected to chassis.
Compliments of www.nucow.com

B. F. GOODRICH

MODELS R-413, R-413A

TRIM OSC 1730 KC
TRIM ANT 1400 KC
MODEL R-413

FOR OTHER DATA SEE INDEX

CONVENTIONAL ALIGNMENT PROCEDURE FOR BOTH THESE MODELS
FOR FULL DETAILS SEE SPECIAL SECTION VOL. VIII.

TRIM OSC 1730 KC
TRIM ANT 1400 KC

C10 and C12 used in some models. In others point "A" is connected to chassis.

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Compliments of www.nucow.com
PROCEDURE FOR SETTING UP PUSH BUTTONS

There are four push buttons by means of which four stations may be selected (See Fig. 1). Make a list of four stations tuned in regularly. Loosen any of the push buttons by turning the push button properly counter clockwise a few turns. Holding it in, tune in any one of your favorite stations by means of the station selector. Turn the selector very slowly back and forth until the signal is clearest. Now tighten the push button knob by turning clockwise.

Release the push button and loosen another push button. Holding it in, tune in another favorite station using the station selector. Turn the selector wheel very slowly back and forth until the signal is clearest. Now tighten the push button by turning it clockwise.

Repeat this operation for the remaining two buttons, tightening each button securely as it is set.
MODEL R-419B

POWER SUPPLY
The power supply of this portable radio uses one Ray-O-Vac No. P96A, General
No. 6-F-1, Burgess No. 6FP1 or Eveready No. 743. Portable "A" battery
and two Ray-O-Vac No. 5303, General No. V-30-B, Burgess No. B30P1
or Eveready No. 762 Portable "B" battery.

AT LEFT
TOP VIEW OF CHASSIS

LF. ALIGNMENT
Remove the chassis from the cabinet and
connect one end of a 100,000 ohm resistor
to the grid of the 1A7 tube and the other end to the A.V.C. fahnestock
clip (See "antenna and ground" for location of this clip). Adjust the
signal generator to 455 KC and connect the output to the grid of the
first detector tube (1A7) thru a .05 or .1 mfd. condenser. The ground
of the signal generator should be connected to the chassis ground. Align
all I.F. trimmers to peak or maximum reading on the output meter.

SERVICE INFORMATION

Speaker (Part No. P3465) 5" PM Type
D.C. voice coil resistance.......................... 2.9 ohms
Voice coil impedance at 400 cycles.3.5 ohms

Oscillator Coll (Part No. P3318) (Brown Dot)
Primary—No. 2 and No. 3—1.7 ohms.
Secondary—No. 4 and No. 1—4.9 ohms.

First I.F. Transformer (Part No. P3049)
Primary—Blue white, plate; red white B+—12.1 ohms.
Secondary—White, grid; black white, AVC—24.9 ohms.

Second I.F. Transformer (Part No. P2606)
Primary—Blue white, plate; red white B+—15.1 ohms.
Secondary—White, grid; black white, AVC—11.8 ohms.
I.F. ALIGNMENT

Remove the receiver chassis from the cabinet and connect a 100,000 ohm resistor to the green and yellow leads in place of the loop antenna to which they were originally connected. Adjust the signal generator to 455 KC and connect the output to the grid of the first detector tube (1A7) through a .05 or .1 mfd. condenser. The ground on the signal generator should be connected to the chassis ground. Align all I.F. trimmers to peak or maximum reading on the output meter.

FOR OTHER DATA, SEE INDEX

CONVENTIONAL ALIGNMENT

SEE SPECIAL SECTION

VOL. VIII

BATTERY SELECTION

This receiver is designed to operate entirely from a 6 volt storage battery. It requires no other batteries. It will operate from any storage battery having a capacity ranging from 90 to 175 ampere hours. It is suggested, for the sake of greatest economy, that the largest possible capacity battery be used. The following is a schedule giving the number of hours of service on a single charge from batteries of standard capacities. A fully charged battery will provide satisfactory power for the periods specified before requiring additional charge.

<table>
<thead>
<tr>
<th>Ampere Hour Capacity</th>
<th>Hours Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>60</td>
</tr>
<tr>
<td>100</td>
<td>66</td>
</tr>
<tr>
<td>110</td>
<td>73</td>
</tr>
<tr>
<td>120</td>
<td>80</td>
</tr>
<tr>
<td>150</td>
<td>100</td>
</tr>
<tr>
<td>170</td>
<td>113</td>
</tr>
</tbody>
</table>

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This receiver is designed to operate over two tuning ranges: the broadcast range which extends from 535 to 1730 Kilocycles (KC) (173.4 to 561 meters), and the International Short Wave Band which extends from 5650 to 18,100 Kilocycles (KC) (16.5 to 53 Meters). This latter range is the one which includes the internationally assigned bands—the 19, 25, 31, 39 and 49 meter bands.
**MODEL R-425**  
**B. F. GOODRICH**

**IF ALIGNMENT** - Wave change Sw. in BC position. Gang condenser at minimum, generator at 450 KC, output to 1A6 CG thru .05 MFD condenser. Generator grounded to receiver, align four trimmers of IF transformers.

**BROADCAST** - Generator connected to antenna lead thru 200 MMFD condenser, and set at 1400 KC. Gang condenser at minimum. Trim oscillator then Antenna trimmers Pad the oscillator circuit at 600 KC while rocking gang condenser.

**SHORT WAVE** - Generator at 6000 KC, start rotating gang condenser from HT end, when signal is heard, adjust antenna trimmer (SW) for maximum peak. Repeat all adjustments for maximum performance.

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This receiver is designed to operate on a single unit Ray-O-Vac No. AB-82, Burgess 17G-D60, Eveready 748 or General 60DL-11L Battery. No other batteries are required as this battery is a combination 90 volt "B" battery and a 11/2 volt "A" battery. To use separate batteries a P2863 battery adapter cable is required.

In some models all common grounds become chassis grounds. C1, C3, C5, R2, and R6 are omitted. Point "A" is connected to point "B" and point "C" to point "D."

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B. F. GOODRICH
MODELS R-450, R-47C

**MODEL R-450**

### ISSUE A
MARCH 1940

**C2, C12 and R1 are not used in some sets. All grounds connecting See INDEX**
to chassis ground.

**I.F. PEAK - 455 KC**

**VOLTAGES:** Line 115 V. AC. Power consumption, 30 watts.

**TRIM OSC. - 1730 KC**

**TRIM ANT. - 1400 KC**

### CONVENTIONAL ALIGNMENT

**I.F. PEAK - 455 KC**

**TRIM OSC. - 1730 KC**

**TRIM ANT. - 1400 KC**

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Compliments of www.nucow.com
The **ECONOMIZER** switch is located on the top left of chassis. Always have this switch in the "NEW" battery position when first placing the radio in operation or when installing a new battery.
Automatic Unit

Principle of Operation

The basic circuit of any radio receiver is the inductance coil and tuning condenser which determines the frequency to which the system is tuned. The frequency at which this circuit resonates can be varied in two ways: either by holding the inductance coil at a fixed value of inductance and changing the capacity of the condenser, or by holding the condenser at a fixed value of capacity and changing the inductance of the coil. This is so because the frequency is proportional to the inductance times the capacity and changing one or the other will change their product.

Previous push-button systems accomplished their purpose in one of two ways. They either rotated the tuning condenser mechanically with an electric motor, or disconnected the tuning condenser by means of a switch and substituting pre-set padding condensers in the antenna and oscillator circuits.

In the push button system the entire oscillator circuit (coil and gang condenser) is disconnected and in its place is put a silvered mica condenser of fixed capacity and a coil, the inductance of which can be varied by means of an iron slug that moves with a screw adjust, inside the coil. This is the second system of tuning mentioned above and has the following advantages in this case. The condenser is made by electroplating a small deposit of silver on each side of a piece of mica and encasing the whole unit in a weatherproof compound. The silver, having a low temperature coefficient, has a negligible expansion with changes in temperature, and humidity has no effect because of the weatherproof compound. Therefore, changes in the condenser capacity are controlled. The coil is impregnated with a moisture-proof wax and the whole circuit is tuned by varying the inductance of the coil. The only uncontrollable factor in the system is the variation in capacity of the wiring and other parts. But this variation is so small that its detuning effect is not noticeable to the ear.

In the system the silvered mica condenser which tunes all six of the push button coils is in the main part of the receiver and connected on the wave switch. The push-button coils are mounted on the push-button unit and are adjusted from the back by slotted screws. The adjustable padding condensers directly above the slotted screws are used to align the antenna coil in the receiver to each of the push-button coils depending on which button is pushed. Variation in capacity of this padders has no effect on the tuning of the system. It simply drops the sensitivity slightly.

Instructions for Pre-setting "Fingertip Control"

Circuits for Six Stations in the Broadcast Tuning Range

The automatic tuning unit is located immediately above the receiver chassis, the circuits being adjustable from the rear of this unit. Although it is possible to adjust the circuits without the aid of a signal generator, for best results it is recommended that a serviceman be allowed to pre-set the tuning circuits in the following manner.

Turn the wave change switch to the left. Six stations in the broadcast band may be chosen, and the tabs on which are printed the call letters of these stations should be selected from the sheet provided and inserted in the cutout slot. It is preferable to place the tabs in the slots according to frequency; that is to say, the low frequency stations should appear at the left as the unit is faced and the high frequency stations at the right.

The frequency range of the automatic tuning circuits is as follows:

<table>
<thead>
<tr>
<th>Circuits</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 2</td>
<td>1550-970 Kilocycles</td>
</tr>
<tr>
<td>3 and 4</td>
<td>250-750 Kilocycles</td>
</tr>
<tr>
<td>5 and 6</td>
<td>970-540 Kilocycles</td>
</tr>
</tbody>
</table>

Replacement Parts

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>85</td>
<td>Padder</td>
<td>84137</td>
</tr>
<tr>
<td>84</td>
<td>Oscillator Trans. Assy.</td>
<td>40141</td>
</tr>
<tr>
<td>88</td>
<td>Oscillator Trans. Assy</td>
<td>4013N</td>
</tr>
<tr>
<td>87</td>
<td>Padder</td>
<td>84135</td>
</tr>
<tr>
<td>86</td>
<td>Oscillator Trans. Assy</td>
<td>4014N</td>
</tr>
<tr>
<td>82</td>
<td>33</td>
<td>83</td>
</tr>
<tr>
<td>81</td>
<td>33</td>
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</tr>
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<td>80</td>
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</tr>
<tr>
<td>79</td>
<td>33</td>
<td>86</td>
</tr>
<tr>
<td>100</td>
<td>33</td>
<td>87</td>
</tr>
<tr>
<td>99</td>
<td>33</td>
<td>88</td>
</tr>
</tbody>
</table>
Aligning I. F. System

Connect a 470KC signal Generator to the grid of the 6A7 converter tube through a .002MFD condenser. Connect an output meter across the speaker voice coil. Turn receiver volume control on full and with wave switch in broadcast position, adjust trimmers (74) and (75) (See Fig. 2) for maximum output. Then adjust (71) and (73) for maximum reading. Repeat adjustments on (74) and (75).

Broadcast and Short Wave Band Adjustments

Note: The following adjustments must proceed in the order specified

1. Turn variable condenser to maximum capacity and set pointer as indicated in Fig. 3. Turn band selector switch to left or broadcast position. Tune set to a scale frequency of 1550KC and connect a 1550KC signal generator to the antenna post through a 200MMFD condenser. Loosen trimmer screw (66) and adjust trimmer (77) until signal is tuned in. Adjust trimmer (65) for maximum output.

2. Then set band selector switch to extreme right or short wave position. Set signal generator to 18 megacycles and substitute a 400 ohm resistor for the 200MMFD condenser. Adjust trimmer (66) until signal is tuned in. At this point check the dial at 17.1 megacycles for the 18 megacycle image.

3. Turn band selector switch to broadcast position and reset the signal generator to 1550KC. Substitute the 200MMFD condenser for the 400 ohm resistor in the generator lead and adjust trimmer screw (77) until signal is tuned in. Then tune receiver to 600KC on dial and with the signal generator, set to 600KC, rock the gang while adjusting trimmer (76) for maximum 1550KC and if incorrect, repeat 1550KC adjustment procedure outlined in Section (1).

All of the above adjustments must be made before pre-setting the "fingertip control" circuits.
Connect an output meter across the speaker voice coil and turn receiver volume control on full. Turn wave switch to manual position and variable condenser to extreme high frequency end of scale. Connect a 470 Kilo-Ohms resistor in series with the grid of the 6AT7 tube through a condenser in the order of 0.002 Micro-Farads. Keep the signal to the line audibly and adjust trimmers (C1) and (C2) (See Fig. 2) for maximum output. Then adjust trimmers (C) and (C1) (See Fig. 1 for maximum output). Finally repeat (C4) adjustment.

Broadcast and Shortwave Band Adjustments

Note: The following adjustments must proceed in order specified.

1. Turn variable condenser to maximum capacity and set pointer on small dial approximately 1-1/2 inch above top horizontal scale diving line. Tune set to a scale frequency of 1550 K.C. and connect a 1550 K.C. generator to antenna lead through a 1000 Mega-Ohm condenser. Turn center knob to manual position. Volume control should be on full.

2. Loosen trimmer (C2) and adjust trimmer (C5), until signal is tuned in. Then adjust (C2) for maximum output.

3. Turn center knob to shortwave position, substitute a 400 ohm resistor for the condenser in the signal generator lead and set generator to a frequency of 18 megacycles. Tune set to 18 megacycles and adjust trimmer (C2) until signal is tuned in.

4. Tune center knob back to manual and substitute the 100 Micro-Farad condenser for the 600 ohm resistor in the generator lead. Set signal generator to 1550 K.C. Tune set to 1550 K.C. and adjust trimmer(s) (C5) until signal is tuned in. Set signal generator to 600 K.C. With the set tuned close to 600 K.C. on the dial, vary the gang condenser slowly back and forth, adjusting (C5) at the same time, until maximum output is obtained. Finally, replace diode for calibration accuracy against signal generator at the 1550 K.C. point. If found to be incorrect, repeat the 1550 K.C. adjustment procedure outlined in step number (1). All of the above adjustments must be made before pre-setting the automatic circuits.
SETTING PUSH-BUTTONS:

1. By means of the Station Selector Knob, tune in WITH THE RIGHT HAND AS ACCURATELY AS POSSIBLE the station having the lowest frequency—that is, your selected station which is tuned in nearest the top of the dial.

2. After the station has been tuned in accurately with the right hand, continue to hold it in its exact position firmly, and with the left hand loosen the Push-Button to be set up for that station by unscrewing the Push-Button about one turn to the left (counter-clockwise).

3. Continuing to hold the Station Selector Knob in its exact position, PUSH THE PUSH-BUTTON IN ALL THE WAY with the left hand.

4. After the Push-Button has been depressed all the way, tighten it gently toward the right (clockwise). Release Push-Button slowly and when in normal position grip button and tighten firmly.

   The Push-Button tuning system is now correctly set up for your first selected station of lowest frequency and the Call Letter Tab for this station should be at the extreme right of the Call Letter Holder.

   Follow through with this same procedure, setting up the other 3 stations in the order of their frequency—that is, the second station set up will be second lowest in frequency and the third station set up will be third lowest in frequency.

   Carefully check each Push-Button for the accuracy of its setting. If, when tuning in any station with its Automatic Push-Button it does not have equal volume or clarity to that obtained with manual tuning, this may indicate the automatic adjustment for that station was not made accurately. Should there be any inaccuracy in any one of the Push-Button adjustments, correction can be made by repeating the above procedure for that button only. Do not reset these Push-Buttons that are accurately adjusted.

   No further adjustments are necessary to operate your radio automatically or manually. To receive any one of your selected stations for automatic operation, merely push in ALL THE WAY the Button set up for that station.

   To receive all other stations in the regular manner turn the tuning knob to the frequency of the station desired.
MODEL 690
GOODYEAR TIRE & RUBBER CO., INC.

NOTE:
C.4 and C.6 are in one unit P-118-1.
C.7 and C.8 are in one unit P-119-2.
C.22 and C.25 are in one unit P-119-17.
R.16 and R.15 are in one unit P-116-8.
Numbers preceded by letter "P" are part numbers.
Volts taken from points indicated to chassis ground. Vol. control on full, no signal.
Serial No. 46001 up.

DESCRIPTION:
Model 690 is a six tube superheterodyne receiver, with an intermediate frequency of 175 K.C. and a tuning range of from 520 to 1550 K.C. This receiver has been carefully designed to facilitate servicing, the front and bottom covers are both removable and are fastened in place by spring clips. All adjustments are accessible and any part replaceable without removing the chassis from the cabinet.

SERVICE NOTES:
Volts taken from different points of circuit to chassis are measured with voltage control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt. These volts are clearly indicated on the circuit diagram.

In order to prevent signal from acting upon A.V.C. and affecting accuracy of voltage measurements, the ground and leads should be short circuited while making measurements.

All wires to be measured with .5 volts input to receiver. Resistances of coils and transformer windings are indicated in ohms on schematic circuit diagram.

To check for open by-pass capacitors, shut each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Failure to operate, noisy or weak reception is usually due to defects in the tubes, the tubes making poor contact with sockets or grid clips making poor contact with the caps of the tubes. Tubes may be checked very easily by replacing with other tubes which are known to be good. If fuse blows out frequently and insulating sleeve has been properly placed over fuse, the trouble is probably in the vibrator; it should be replaced. Do not attempt to make any adjustments on the vibrators.

ANTENNA CONNECTION:
The antenna is connected to the receiver by means of the antenna cable. The antenna wire is the single black wire projecting from the end of the cable. Splice this wire to the roof antenna lead and ground the pig-tail shielding as close to the inner post of the car as possible.

On open or convertible models where underslung strap or plate antennas are used it may be necessary to ground the exhaust pipe and muffler to the frame at both ends with heavy copper braid.

CONNECTIONS TO BATTERY:
The battery cable, number 152-2, (red wire with fuse receptacle at one end at the other end) must be connected to battery terminal of ammeter. At the same time connect ammeter, number 148-3, to battery terminal of ammeter, other end of condenser to any convenient grounded screw on back of instrument panel. Make certain that insulating sleeve is slipped over fuse when fuse is placed in receptacle, before connecting to short battery cable from receiver.

When connected properly, the discharge due to current drawn by the receiver should not indicate on the ammeter. This is important, since if improperly connected, as shown by the deflection of ammeter, additional motor interference may be encountered.

GENERATOR INTERFERENCE:
Remove the generator cutout mounting screw and fasten the condenser (148-1) bracket on the generator cutout mounting lug. Replace the cutout mounting screw and tighten down securely. Connect the condenser lead to the battery terminal of the cutout. The generator condenser is absolutely necessary as it is used to eliminate a high pitched whining noise which would otherwise be heard as the motor is accelerated.

IF PEAK 175 KC

RESISTORS
No. Value
R.1—500 ½ w
R.2—1000 ½ w
R.3—50 ½ w
R.4—500 ½ w
R.5—500 ½ w
R.6—1500 ½ w
R.7—250 ½ w
R.8—500 ½ w
R.9—1000 µf~
control P-101-21
R.10—1000 ½ w
R.11—1000 ½ w
R.12—500 ½ w
R.13—303 ½ w
R.14—3013 ½ w
R.15—100 ½ w
R.16—100

CONDENSERS
No. Value
C.1—100 mmf mica
C.2—100 mmf mica
C.3—100 mmf mica
C.4—100 mmf mica
C.5—100 mmf mica
C.6—100 mmf mica
C.7—100 mmf mica
C.8—100 mmf mica
C.9—100 mmf mica
C.10—100 mmf mica

DUMMY ANTENNA:
IF. —A .1 mfd. condenser connected in series with the test oscillator output lead.
Broadcast. —A 200 mmf. condenser connected in series with the output lead of the test oscillator.

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII

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PILOT LAMP:
The pilot lamp is a 6.3 volt 150 Mill. type (No. 47) and should be replaced with such, in order that the filament voltages across the radio tubes do not change.

FREQUENCY RANGE:
Broadcast ........................................... 538 K.C. to 1760 K.C.

ALIGNMENT FREQUENCIES:
Antenna Oscillator
Trimmer Trimmer
1450 K.C. 1760 K.C.

INTERMEDIATE FREQUENCY 455 K.C.

POWER SUPPLY:
Power Main ......................................... 105-130 Volts AC/DC
Power Consumption ................................. 30 Watts

POWER OUTPUT:
Type ........................................... Single Class A
Undistorted ....................................... 1.4 Watts
Maximum ......................................... 2 Watts

ALIGNMENT PROCEDURE
Output Meter Connections ........................................... Across Loud Speaker Voice Coil
Output Meter Reading to Indicate 1 Watt ......................... 125 Volts
Generator Ground Lead Connection .............................. Receiver Chassis
Dummy Antenna Value to Be in Series with Generator Output See Chart Below
Connection of Generator Output Lead ............................... See Chart Below
Generator Modulation ................................. 30%, 400 Cycles
Position of Volume Control ..................................... Fully On

TRIMMER

<table>
<thead>
<tr>
<th>POSITION OF VARIABLE</th>
<th>FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTIONS (In Order Shown)</th>
<th>TRIMMER FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>455 K.C.</td>
<td>.1 mfd.</td>
<td>12A8GT T4-T5</td>
<td>I.F.</td>
</tr>
<tr>
<td>Closed</td>
<td>455 K.C.</td>
<td>.0002 mfd.</td>
<td>Antenna Conn. T1 (Min. Output) Wave Trap</td>
<td></td>
</tr>
<tr>
<td>Fully Open</td>
<td>1760 K.C.</td>
<td>.0002 mfd.</td>
<td>Antenna Conn. C13 Osc. Trimmer</td>
<td></td>
</tr>
</tbody>
</table>

The alignment procedure should be repeated in the original order, step by step, to insure greater accuracy.

Always keep the output power from the generator at its lowest possible value to prevent the A.V.C. of the receiver from interfering with accurate alignment.

When adjusting T1, Antenna Wave Trap, Trimmer, increase generator output. To obtain clearly defined trimmer setting for a minimum output.

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Compliments of www.nucow.com
HOW THE AUTOMATIC PUSH-BUTTON TUNER FUNCTIONS:

This unit is mechanically operated by means of a proven cam and lever action, designed to rotate a shaft 90 degrees. Since the variable gang condenser shaft must rotate 180 degrees, a 2 to 1 step up mechanical lever action is incorporated to give full rotation to the gang condenser. Three links are used to transmit the operation of the push-button to the variable gang condenser; first, a driver lever or link connected to the tuner lever bar, (see Figure); second, a driven lever arm connected to the gang condenser shaft; and third, a connecting link, connecting the two lever arms together mechanically.

The plunger bar that retains the screw type push-buttons, also holds a cam to itself by a shoulder rivet. This cam floats on the rivet proper and is locked into position with a small square plate, floating in the plunger bar. To lock cam into position, screw the push-button knob toward the right (clock-wise). The end of the push-button screw will then force a small square plate known as a brake shoe against the periphery of the cam. The push-button must be tightened firmly after the position of the station selection is determined. To change the setting of the cam, the push-button knob must be loosened by rotating it toward the left (counter-clockwise). When this push-button screw is loosened, it will automatically release the brake shoe from the cam, leaving the cam free to rotate and set its new position to the setting of the lever bar.

If it becomes necessary to realign the tuner in relation to the gang condenser, the following procedure should be followed to assure perfect tuning operation:

1. Attach driver arm to the lever bar by means of two machine screws, making sure that they are assembled with lockwashers and tightened securely.

2. Slip the drum assembly, which consists of the drum, drum hub, and the driven arm, over the variable condenser shaft but do not tighten set screws.

3. Connect these two lever arms by slipping the connecting link over the heads of the shoulder rivets. This link has a slight bend (offset) about 1/3 of its length and is to be installed with the shorter end towards the top and the offset towards the rear when looking at it from the drum end. Attach the tension spring between the two shoulder rivets. This spring is incorporated to take up all the unnecessary slack in the drive.

4. In making the final adjustment, that of setting the condenser in relation to the tuner, close the condenser completely to maximum capacity and rotate drum with the left hand in a clock-wise rotation, until the driver arm comes gradually down to within 1/4 of an inch of the variable condenser shaft. When in this position, tighten set screws in the drum hub with the right hand.

It is essential that all set screws be tightened securely so as to prevent a variation from original setting.

If, for some reason, a replacement is necessary for some particular item on the tuner proper, such as a lever bar, cam, plunger bar or brake shoe, it would be advisable to replace the complete tuner proper for replacement.
Band 1 - 110 Kc to 410 Kc
(2730 to 733 meters)
Band 2 - 400 Kc to 1500 Kc
(750 to 200 meters)
Band 3 - 1.7 Mc to 5.9 Mc
(177 to 51 meters)
Band 4 - 5.3 Mc to 18 Mc
(56 to 16.7 meters)

NOTE: The SKYRIDER MARINE Model S22R is an AC-DC receiver which operates on 110/125 volts only. Should operation be desired from a lower voltage DC source, an external converter delivering 110/125 volts should be used. A 220 volt DC Model S22R is available on order and uses a special line cord with dropping resistor.

If an inverted "L" antenna is used, connect lead-in to A₁ and leave the jumper between A₂ and G. If an "all wave" doubler is used, connect the transmission line to A₁ and A₂ with the jumper removed from A₂ and G. A separate antenna may be used for one s.w. band; use a half-wave antenna whose length can be calculated from

\[ \text{Length in feet} = \frac{463}{\text{Frequency in megacycles}} \]
ALIGNMENT PROCEDURE

ALIGNMENT INSTRUCTIONS:
1. Adjust to a signal generator with a known frequency, 1000 Hz, at a level of 1000 Hz, with the band selector switch set to "FM" position.
2. Connect one end of the generator to the input of the receiver, and the other end to the output of the receiver.
3. Measure the output of the receiver using an oscilloscope or other appropriate equipment.
4. Adjust the trimmer capacitor to obtain the highest possible output level.

R.F. ALIGNMENT

Connect hot lead of signal generator to A1 through dummy antenna shown in Table. Leave jumper connected between A2 and G. Ground of generator to chassis.

<table>
<thead>
<tr>
<th>BAND</th>
<th>RECALL SETTING</th>
<th>DUMMY ANTENNA</th>
<th>HIGH FREQUENCY END</th>
<th>LOW FREQUENCY END</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1250 Hz</td>
<td>.000 mfd</td>
<td>ADJUST OSC</td>
<td>ADJUST TRIMMER</td>
</tr>
<tr>
<td>2</td>
<td>1500 Hz</td>
<td>.000 mfd</td>
<td>ADJUST OSC</td>
<td>ADJUST TRIMMER</td>
</tr>
<tr>
<td>3</td>
<td>2000 Hz</td>
<td>.000 mfd</td>
<td>ADJUST OSC</td>
<td>ADJUST TRIMMER</td>
</tr>
<tr>
<td>4</td>
<td>2500 Hz</td>
<td>.000 mfd</td>
<td>ADJUST OSC</td>
<td>ADJUST TRIMMER</td>
</tr>
</tbody>
</table>

MODEL S-22R

THE HALLCRAFTERS INC

Compliments of www.nucow.com
The following measurements were made with a 20,000 ohms per volt meter and taken from the socket terminal indicated to ground or receiver chassis. Antennas and ground were disconnected from the receiver when these measurements were taken and the RF and AF gain controls set at maximum. "DL" means Dead Log but will indicate voltage when used as a tie. Normal tolerance allows a variation of +10% from the indicated values.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>SOCKET TERMINALS</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>Cap.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6AB7</td>
<td>RF Amp. (1)</td>
<td></td>
<td>0.1</td>
<td>4.15</td>
<td>170</td>
<td>6.3</td>
<td>227</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>6SK7</td>
<td>RF Amp. (2)</td>
<td></td>
<td>4.35</td>
<td>0.1</td>
<td>4.35</td>
<td>105</td>
<td>6.3</td>
<td>279</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>6SA7</td>
<td>Mixer</td>
<td></td>
<td>250</td>
<td>100</td>
<td>0.12</td>
<td>4.1</td>
<td>6.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6SA7</td>
<td>HF Osc.</td>
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<td>116</td>
<td>116</td>
<td>0.3</td>
<td>6.3</td>
<td>116</td>
<td></td>
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<tr>
<td>6L7</td>
<td>IF Amp. (1)</td>
<td>Noise Limiter</td>
<td>245</td>
<td>102</td>
<td>6.3</td>
<td>4</td>
<td>-0.75</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>6SK7</td>
<td>IF Amp. 2</td>
<td></td>
<td>4</td>
<td>4</td>
<td>107.5</td>
<td>6.3</td>
<td>235</td>
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</tr>
<tr>
<td>6B6</td>
<td>2nd Det. 5 MHz</td>
<td>Tube</td>
<td>17.2</td>
<td>255</td>
<td>255</td>
<td>108</td>
<td>6.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>6B6</td>
<td>AVC Amp.</td>
<td></td>
<td>225</td>
<td>0.2</td>
<td>0.2</td>
<td>107</td>
<td>6.3</td>
<td>2</td>
<td></td>
<td></td>
<td>-21</td>
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<tr>
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<td>6.3</td>
<td>225</td>
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<td></td>
</tr>
<tr>
<td>6B6</td>
<td>Noise Receiver</td>
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<td>17</td>
<td>6.3</td>
<td>-1</td>
<td></td>
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<td>6M5</td>
<td>Beat Osc.</td>
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<td>140</td>
<td>-7.4</td>
<td>6.3</td>
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<td></td>
<td></td>
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<td>BFO ON ONLY FOR TEST</td>
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<tr>
<td>6SC7</td>
<td>1st Audio Amp.</td>
<td></td>
<td>137</td>
<td>1.4</td>
<td>6.3</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6VGT</td>
<td>P. P. Audio Amp.</td>
<td></td>
<td>350</td>
<td>290</td>
<td>188 DL</td>
<td>6.3</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6VGT</td>
<td>P. P. Audio Amp.</td>
<td></td>
<td>350</td>
<td>290</td>
<td>188 DL</td>
<td>6.3</td>
<td>17</td>
<td></td>
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<tr>
<td>5Z3</td>
<td>Recorder</td>
<td></td>
<td>320</td>
<td>340 AC</td>
<td>340 AC</td>
<td>320</td>
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### Parts List

#### Resistors

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<thead>
<tr>
<th>No.</th>
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<th>Wattage</th>
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<td>1/2</td>
</tr>
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<td>2</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>600</td>
<td>1/2</td>
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<tr>
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<td>250,000</td>
<td>1/2</td>
</tr>
<tr>
<td>6</td>
<td>100,000</td>
<td>1/2</td>
</tr>
<tr>
<td>7</td>
<td>30,000</td>
<td>1/2</td>
</tr>
<tr>
<td>8</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>400</td>
<td>1/2</td>
</tr>
<tr>
<td>10</td>
<td>200</td>
<td>1/2</td>
</tr>
<tr>
<td>11</td>
<td>50,000</td>
<td>1/2</td>
</tr>
<tr>
<td>12</td>
<td>2,000</td>
<td>1/2</td>
</tr>
<tr>
<td>13</td>
<td>200,000</td>
<td>1/2</td>
</tr>
</tbody>
</table>

#### Capacitors

<table>
<thead>
<tr>
<th>No.</th>
<th>Value</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>530 mfd</td>
<td>Per Section Air</td>
</tr>
<tr>
<td>2</td>
<td>50 mfd</td>
<td>Ceramic</td>
</tr>
<tr>
<td>3</td>
<td>0.05 mfd</td>
<td>400 Paper</td>
</tr>
<tr>
<td>4</td>
<td>0.05 mfd</td>
<td>400 Paper</td>
</tr>
<tr>
<td>5</td>
<td>0.01 mfd</td>
<td>400 Paper</td>
</tr>
<tr>
<td>6</td>
<td>0.01 mfd</td>
<td>400 Paper</td>
</tr>
<tr>
<td>7</td>
<td>0.01 mfd</td>
<td>400 Paper</td>
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<tr>
<td>8</td>
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<td>400 Paper</td>
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<td>9</td>
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<td>400 Paper</td>
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</tr>
<tr>
<td>18</td>
<td>0.001 mfd</td>
<td>400 Paper</td>
</tr>
<tr>
<td>19</td>
<td>0.001 mfd</td>
<td>400 Paper</td>
</tr>
<tr>
<td>20</td>
<td>0.001 mfd</td>
<td>400 Paper</td>
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<tr>
<td>21</td>
<td>0.001 mfd</td>
<td>400 Paper</td>
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<tr>
<td>22</td>
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<td>400 Paper</td>
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<tr>
<td>23</td>
<td>0.001 mfd</td>
<td>400 Paper</td>
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<td>24</td>
<td>0.001 mfd</td>
<td>400 Paper</td>
</tr>
<tr>
<td>25</td>
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<td>400 Paper</td>
</tr>
<tr>
<td>26</td>
<td>0.001 mfd</td>
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<tr>
<td>27</td>
<td>0.001 mfd</td>
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</tr>
<tr>
<td>28</td>
<td>0.001 mfd</td>
<td>400 Paper</td>
</tr>
</tbody>
</table>

### Errors to be Considered

1. **Operator Error** - Errors of the operator which depend entirely on his experience, may be difficult to predict. After he has familiarized himself with adjustment of the "null" control, he can only allow about 0.1 degree on strong static-free signals which produce a null of about 0 degrees width. If the null should cover some 10 degrees after complete adjustment, he cannot allow less than 0.2 degrees.

2. **Motion of the Yaw Bar** - Yawing and pitching usually influence the ship's course. The ship's compass must apply the correct magnetic deviation to the compass indication and must sometimes estimate possible errors at the time readings are taken.

3. **Magnetic Error** - Occurs in plotting the earth's magnetic field, and is indicated by the conventional MERCATOR CHART - a plane area. Since MERCATOR CORRECTION is only necessary on rare occasions, as shown by Figure 7, it will not be treated in detail.

4. **Land Effect** - Occurs when the signal passes over land before the course of the vessel. In this respect, radio waves are comparable to light passing through materials of various density. (Figure 8 illustrates the error).

**CAUTION** - Do not rely on readings taken over land or along a shoreline.

5. **Night Effect** - Is most noticeable at sunset and sunrise. More radio waves are reflect- ed back to earth at night than during daylight. It is evident by a broadening of the null and possible shifts in apparent bearing taken at distances greater than 250 miles. Over short ranges the effect is negligible.

6. **Radio Compass Deviation** - Must be determined and accounted for as in the magnetic compass. A calibration curve (Figure 10) determined as indicated by the self-explanatory Figure 9, must be made with the aid of the PELICUS, immediately after installation.

If the radio compass is not in line with the lesser line, the CALIBRATION curve will be similar to that shown by the dotted line.

If the radio compass is located too close to a metal object (see location) a curve similar to the other broken line will result.

**Remainders** are immediately evident to the operator.
**Model S-30**

**Radio Compass**

1. **Setting of Controls Prior to I.F. Alignment**
   - Adjust indicated trimmers as per instructions.
   - Connect a aids generator to grid of S.O.P.
   - Place receiver in case and adjust for minimum output.
   - Place receiver in case and adjust for maximum output.

2. **Adjust T.F. Alignment**
   - Connect a T.F. alignment or a coil of fine mesh wire to receiver.
   - Connect a T.F. alignment or a coil of fine mesh wire to receiver.
   - Place receiver in case and adjust for minimum output.
   - Place receiver in case and adjust for maximum output.

3. **Connecting a Tuning Circuit**
   - Connect a Tuning Circuit to Receiver and Reception Circuit.
   - Connect a Tuning Circuit to Receiver and Reception Circuit.
   - Place receiver in case and adjust for minimum output.
   - Place receiver in case and adjust for maximum output.

4. **Connecting a Tuning Circuit**
   - Connect a Tuning Circuit to Receiver and Reception Circuit.
   - Connect a Tuning Circuit to Receiver and Reception Circuit.
   - Place receiver in case and adjust for minimum output.
   - Place receiver in case and adjust for maximum output.

5. **Connecting a Tuning Circuit**
   - Connect a Tuning Circuit to Receiver and Reception Circuit.
   - Connect a Tuning Circuit to Receiver and Reception Circuit.
   - Place receiver in case and adjust for minimum output.
   - Place receiver in case and adjust for maximum output.

6. **Connecting a Tuning Circuit**
   - Connect a Tuning Circuit to Receiver and Reception Circuit.
   - Connect a Tuning Circuit to Receiver and Reception Circuit.
   - Place receiver in case and adjust for minimum output.
   - Place receiver in case and adjust for maximum output.

7. **Connecting a Tuning Circuit**
   - Connect a Tuning Circuit to Receiver and Reception Circuit.
   - Connect a Tuning Circuit to Receiver and Reception Circuit.
   - Place receiver in case and adjust for minimum output.
   - Place receiver in case and adjust for maximum output.

8. **Connecting a Tuning Circuit**
   - Connect a Tuning Circuit to Receiver and Reception Circuit.
   - Connect a Tuning Circuit to Receiver and Reception Circuit.
   - Place receiver in case and adjust for minimum output.
   - Place receiver in case and adjust for maximum output.
The HT 7 Frequency Standard is designed to be operated on 110-120 volt, 50-60 cycle alternating current. It is suggested that the user connect the HT 7 to a receiver, "A" terminal on Standard to ground post, or receiver and "B" terminal to receiver ground post. A W-F.G. will have been required with the way the unit should be operated, the wire which is connected to the "A" post on the standard can be more loosely coupled to the receiver by swiveling this wire around the antenna lead until the most satisfactory amount of coupling has been reached.

1000 EC - Set the Freq.-EC switch to the 1000 EC position after the "OFF-ON" switch has been placed in the "OFF" position. Now turn on the bias switch and to the Standard to EC band. The receiver should be adjusted for maximum broadcast band coverage during these initial steps of adjustment. With the best oscillator in the receiver turned on you should be able to hear a steady signal at 1000 EC in the broadcast band and at 1000 EC throughout the whole tuning range of the receiver.

The 1000 EC frequency is set to a tolerance of ±0.05%, and has a temperature coefficient of about 100 parts per million per degree centigrade. Generally, the 1000 EC harmonic should be used only as markers to approximately locate the even 100 EC divisions. For accurate measurements, the crystal switch should be placed in the 100 EC position.

100 EC - Place the crystal switch at the 100 EC position. The signal from the standard will now be heard every 100 EC on the receiver.

NOTE - To accurately adjust the standard the following procedure should be carefully followed: Place the crystal switch at the 1000 EC position. Turn off the best frequency oscillator in the receiver. Now tune in a broadcast station, or preferably WWV, transmitting on the even 1000 EC frequency (600-700-800 EC). Tune in this signal accurately. Then place the crystal switch in the 100 EC position. Undoubtedly a best mark will be heard. Now adjust the "Crystal Tuning" control slowly until you have reached the correct alignment. If the receiver is equipped with a resistance indicator, such as a meter or eye, this adjustment will be more accurately made by observing the scale on the indicator while exact zero beats are being approached.

In the 100 EC position the crystal has a temperature drift of about 50 parts per million per degree centigrade. Temperature variations are normal service over several hours cause frequency variations of approximately 50 parts per million.

The harmonics of the 1000 EC oscillator become noticeable when above 7 megacycles. A harmonic amplifier with a tunable output circuit is provided to raise the output level so that it will be usable through the 30 EC band. By setting the "Band Switch" to position 2, 3, 4, or 5, and adjusting the "Output tuning" control a point will be found where sufficient output is provided for all channel purposes.

10 EC - With the crystal switch set at the 10 EC position, a multivibrator is connected to crystal frequencies. This will provide output signals which will be heard every 10 EC apart from the 100 EC points.

The presence of the 10 EC harmonics allows the standard to be set to zero beat with any domestic broadcast station as near as they are spaced 10 EC apart. It is recommended by the F.C.C. that broadcast stations remain within 50 miles of their assigned frequency. The station maintains 10 or 10 cycles variation as an emission so they constitute accurate in time and frequency checking points. Highest accuracy is, of course, obtained when beating against WWV, but broadcast carriers at 9990 EC and 9980 EC will also be useful. Once the oscillator has been locked to the proper 9990 EC the output will be very stable.

The HT 7 will be of great help in providing an accurate source of signal energy for receiver alignment. When applying the crystal switch to the standard as outlined previously, establish the 1000 EC marker position and then align the receiver accurately from the 1000 EC signal it delivers.

With the widespread use of the Electron coupled oscillator for frequency control in amateur transmitters, in addition to the most recent FCC regulations imposing the necessity for accurate frequency control, the HT 7 fills a needed role. The accuracy of the various amateur bands can now be immediately established by using the 1000 EC signal output. Exact bandwidths can then be determined by resonating to the 1000 EC output frequency. In the 10 EC position the standard can be used for frequency measurement purposes by interpolating between dial divisions and the frequency of this standard. For instance, you wish to locate a signal on 7824 EC on the receiver. Set the standard to 1000 EC and locate the 1000 EC band at 7820 EC. Then sweep the standard between the 10 EC position and count over ten 10 EC points. We have located a signal on 7820 EC. Now set it to 10 EC crystal position and count over ten 10 EC points. We have now located 7820 EC. Now set to 10 EC crystal position and count over ten 10 EC points. We now have 7820 EC. Log the dial setting for 7820 EC. Now over one more 10 EC harmonic to 7830 EC. Let us suppose that 7830 EC case is at 76 on the dial and 7820 EC was heard at 76. This represents a difference of three divisions, or 30 EC, consequently each EC represents .3 divisions on the dial. To locate our exact frequency of 7825 EC simply move the dial .3 divisions past 76 (the 7820 calibration point) or nearly to 76.6.
Compliments of www.nucow.com


SOLOVOX TUBE SOCKET VOLTAGES

These readings are taken with a 1000-ohm-per-volt meter, having three scales of 15, 150 and 600 volts. All voltages are taken with a line voltage of 115 and deviations of as much as 20% may be caused by line voltage variations. All controls are off, the volume control is in its lowest position, and no key is depressed unless specified. The negative lead of the voltmeter is connected to chassis ground.

<table>
<thead>
<tr>
<th>Terminal (channel)</th>
<th>Voltage (volts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal A (amplifier channel)</td>
<td>300</td>
</tr>
<tr>
<td>Terminal B (oscillator channel)</td>
<td>290</td>
</tr>
<tr>
<td>Terminal C (oscillator channel)</td>
<td>10.5</td>
</tr>
<tr>
<td>Tube V1 plate</td>
<td>135</td>
</tr>
<tr>
<td>Tube V1 screen</td>
<td>35</td>
</tr>
<tr>
<td>Tube V9 plate</td>
<td>120</td>
</tr>
<tr>
<td>Tube V9 cathode</td>
<td>115</td>
</tr>
<tr>
<td>Tube V10 plate</td>
<td>137</td>
</tr>
<tr>
<td>Tube V10 screen</td>
<td>26</td>
</tr>
<tr>
<td>Tubes V11 and V12 plates</td>
<td>195</td>
</tr>
<tr>
<td>Tubes V11 and V12 screens</td>
<td>135</td>
</tr>
<tr>
<td>Tubes V11 and V12 cathodes</td>
<td>70</td>
</tr>
</tbody>
</table>

For key depressed:
- Tube V11 and V12 cathodes (key depressed) | 50 |

Control tube cathodes (tubes operating):
- Tubes V11 and V12 plates | 85 |
- Tubes V13 and V14 plates | 90 |
- Tubes V13 and V14 screens | 24 |
- Control tube grids | 38 |

Control tube grid (voltage will vary depending on setting of maximum volume control):
- Terminal E (positive lead connected to ground) | 76 |
- Speaker field | 44 |

A.C. VOLTAGES
- Heater voltage to all tubes except V8 | 6.3 volts R.M.S. |
- Rectifier tube V8 heater voltage | 5.0 volts R.M.S. |
- Grounded to other plate of rectifier tube | 490 volts R.M.S. |
- A.C. Ripple voltage across speaker field | 35 volts R.M.S. |
HAMMOND INSTRUMENT CO.

Tuning

The Solovox remains in tune indefinitely. However, because of the variation in pitch of the piano or other instrument with which the Solovox is to be played, a tuning adjustment knob has been provided. (The placing knob, about the size of the end of a pencil, projects through the curved surface of the woodwork near one corner of the tone cabinet.)

Tuning the Solovox is a very simple matter as all of the tones are simultaneously tuned by moving this single adjustment. Clockwise turning of the knob lowers the pitch and counter-clockwise raises it. For greater accuracy, only the "CONTRALTO," "VIBRATO OFF" and "DEEP TONE" control tables should be "in" and the middle octave F, G or G5 keys of the Solovox moved to the corresponding piano notes. (A control table is "in" when the top of the table is pushed in.)

Some favor tuning the Solovox a little sharper than the piano. We do not recommend too much of this, but it is, in any case, and adjustment of the pitch. There is another so-called "fine tuning adjustment" in the form of a control on the back of the tone cabinet. We suggest that you leave this alone, unless you want to get into something considerably more complicated, which is described further on in the technical section of this leaflet.

Limit of Tuning

Whereas the turning of the single tuning knob tunes all of the tones, there is of course a limit which cannot be exceeded before something starts to go wrong with the notes in some octaves. Notes "GARGLE" or play exactly one octave up, or an exact musical fifth lower.

A second very simple adjustment will then fix these notes as well, and you will find it easy to make this adjustment, if the occasion should arise, by following the procedure given below, called "Adjustment of Oscillator." Of course you need not bother with these adjustments unless you hear the "GARGLE" or the wrong octave effect.

Adjustment of Oscillator

If notes are noisy or play the wrong pitch, adjust the oscillators as follows: Push in the "SOPRANO," and "DEEP TONE" controls, with all others off. Tune highest F# to corresponding F# on piano with setting knob, paying no attention to what other notes do. Notes in the highest octave of the Solovox will now have the same pitch as the top octave of the piano.

Hold down the Fit key in the middle octave of the Solovox, place a screwdriver in the "second oscillator adjustment" slot (See Figure &n backside of this leaflet) and turn it, first one way and then the other. The instrument will play higher than the right pitch in one direction, and lower in the other, while in the range between it will play an F# note of the same pitch as the second highest F# key on the piano. The pitch can be checked by making sure that there is no sudden jump in pitch between the Solovox middle octave F and the highest octave C. When the proper pitch is determined, find the furthest point in each direction where it will play this note, and place the slot exactly midway between these tunings.

Hold down the lowest octave Solovox F# key, repeat this procedure with the "third oscillator adjustment." As before, there should be a smooth transition in pitch between the F note of the octave being adjusted, and the G note of the next octave above, which has already been adjusted.

To adjust the fourth oscillator, hold down the lowest octave F# key with only the "CONTRALTO," and "DEEP TONE" controls in. For the fifth oscillator use "TENOR," and "DEEP TONE," and for the sixth oscillator adjustment, use "BASS," and "DEEP TONE," holding the lowest F# key in each case.

Adjustment of Maximum Volume Control Knob

The maximum volume obtainable is controlled by a knob located under the keyboard to the left of the volume control, and regulates the maximum loudness when the knee-operated level is all the way to the right. With the lever in this position the knob may be turned by the player to suit himself.

To determine where to set this knob, first set the controls to some useful settings, with both "TENOR" and "DEEP TONE." Now move the knee-operated volume control as far as it will go to the right, hold down some key such as middle C, and turn the maximum volume control knob to the right until the volume becomes as loud as is useful. Do not turn the knob too far, as this will only mean that the knee-operated volume control will become unnecessarily sensitive which is particularly undesirable for the novice and beginner.

When playing in large halls, or with other instruments, it may be found advantageous to increase the maximum volume very materially. Under these conditions, when a very loud tone is played, the quality will become very bright. This increase in brilliance produces many novel tone qualities which are useful under conditions where a loud piercing tone is desirable.

HOW THE SOLOVOX WORKS

All of the notes of the Solovox are controlled by a single radio vacuum tube master oscillator operating at the audio frequencies of the highest octave of the instrument (209-351 c.p.s.). Each time a key is depressed, a switch under it sends this master oscillator to the pitch associated with the key in this highest octave range. Then, whenever a "C" key is depressed (the nothing key connects for all the "C" keys in parallel), this oscillator is tuned to 2395 c.p.s., which is its lowest frequency. If a "B" note is depressed the frequency will be 3951 c.p.s., which is its highest frequency.

The output of this master oscillator controls the frequency of a first controlled oscillator (called the "buffer oscillator") which is adjusted to operate at the same frequency as the master oscillator. The output of this buffer oscillator, in turn, controls the frequency of the second controlled oscillator so adjusted to oscillate at one-half the frequency of the first oscillator. This new frequency corresponds to a note of pitch one octave lower than the buffer oscillator.

Similar cascaded oscillators provide pitches of two, three, four and five octaves below that of the buffer oscillator. In this way, each time the master oscillator is tuned to some given note, each of these six controlled oscillators produces a note which is the exact octave relative to the master, thus forming a series of six notes in exact octave relationships. The particular oscillator selected for sounding through an amplifier and speaker depends upon the particular playing key depressed, and also upon which of the BASS, TENOR, CONTRALTO or SOPRANO controls are used. A second contact under each key operates an electrical relay, having contacts to select the desired oscillator.

There are three relays—one for each of the three octaves of keys. A further function of the second key contact is to transmit the signal to the speaker with a controlled rate of attack so as not to be musically abrupt. Tuned electrical circuits and tone controls similar to radio tone controls alter the quality of tone over a wide range.

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The Oscillators

All the tones of the Solovox are controlled by a single vacuum tube oscillator called the "MASTER OSCILLATOR" (V1, Figure 1). This oscillator operates at any one of the twelve audio frequencies comprising the twelve notes of the highest octave range of the instrument (306 cycles to 391 cycles). Each tone is depressed, a contact under it closes to tune this oscillator to the pitch associated with that key. For instance, whenever any C key is depressed (there are three C keys on the keyboard), this master oscillator is tuned to 391 cycles, its lowest frequency. If, on the other hand, any one of the three B keys is depressed, the master oscillator will operate at 391 cycles, its highest frequency. If, on the other hand, any one of the three B keys is depressed, the master oscillator will operate at 391 cycles, its highest frequency.

The condensers which tune the master oscillator are shown at the left of Figure 1, and are located in the vibrato box fastened to the Solovox keyboard.

The output of this master oscillator controls the frequency of the first controlled oscillator, called the "BUFFER OSCILLATOR" (V2, Figure 1), which operates at the same frequency as the master oscillator.

Following this buffer oscillator is the SECOND CONTROLLED OSCILLATOR, whose frequency is tuned to approximately one-half that of the frequency of the buffer oscillator. Furthermore, its frequency is stabilized to be exactly one-half that of the buffer oscillator by applying a "locking" signal from the buffer oscillator to its grid circuit. The amount of this locking signal is regulated by a potentiometer. Thus, the output frequency of the second controlled oscillator is an octave lower in pitch than the master oscillator.

Similarly, the third, fourth, fifth, and sixth CONTROLLED OSCILLATORS provide respective outputs of exactly two, three, four, and five octaves lower in pitch than that of the master oscillator. A potentiometer associated with each provides the correct amount of locking signal. It is to be noted that these controlled oscillators (being of the relaxation type), are readily tuned by altering their grid bias. It is the function of the tuning resistors in parallel with the tuning condensers to apply the appropriate grid bias to tune all of the controlled oscillators simultaneously to their approximate sub-octave frequencies. The amount of bias varies, depending upon which tuning contact is connected by a playing key, and the frequencies of the controlled oscillators shift correspondingly.

When no key is depressed, all the oscillators operate at their highest pitches ("B" notes). Thus, whenever a key other than "B" is depressed, all oscillators shift simultaneously from their "B" frequencies to the frequencies corresponding to the key depressed. The tuning condensers accurately tune the master oscillator, and the tuning resistors tune the controlled oscillators. By interconnecting the controlled oscillators in

Register Controls and Relays

From the above, we see that whenever any one of the three G# keys, for instance, is depressed, the oscillators are tuned to provide a series of G# notes in exact octave relations. The selection of the particular oscillator output sound through the speaker is determined by a second contact under each of the playing keys. This second contact is called the CONTROL CONTACT. There are three relays connected to the control contacts—one relay is operated any time a key in the lowest octave of playing keys is depressed, another relay for the middle octave of playing keys, and a third relay for the highest octave of playing keys.

Also, whenever a control contact is closed, a cutoff bias is removed from push-pull control tube V11 and V12, causing them to transmit the signal with a smooth out of tonal attack to the power output tubes and speaker. This function of the control tubes will be explained subsequently.

Each of the three relays has a contact to connect the grid of the preamplifier tube V9 to the desired oscillator through the register controls ("BASS-TENOR-CONTRALTO-SOPRANO"). For example, if we push in the "SOPRANO" control and depress the G key in the middle of the keyboard, the tuning contact will tune all the oscillators to the G notes of the respective octaves, and the control contact will operate the middle octave relay. This relay completes a circuit from the output of the second controlled oscillator, whose wire is numbered 3-5, through a 50,000 ohm register control resistor to the middle octave relay contact, and then to the preamplifier tube V9. Thus, the register controls function to shift the pitch range of the Solovox keyboard as a whole to four different positions. By simultaneously depressing two or more of these controls, a composite tone will be heard, consisting of the outputs of several oscillators simultaneously sounding in their octave relations to each other.

Other contacts associated with each of the relays serve to prevent undesirable tones from occurring when two keys are simultaneously depressed in adjoining octave groups through a legato style of playing on the part of the musician. If two keys are depressed within one of the three octave groups, the lowest pitched of the two will be automatically selected for sounding through the speaker.

The "Main"

The signal from the plate of the preamplifier tube V9 is fed to the grid of the "MUTE" tube. This tube operates nonlinearly to suppress the sharp curvature of the input signal wave form, and thus renders the tone more mellow. When this muted effect is not desired, the mute switch is used to by-pass this portion of the circuit.

"Deep Tone," "Full Tone," "First Voice," "Second Voice" and "Brilliant" Controls

Following the "mute" is a series of tone controlling circuits arranged to alter the frequency characteristic of the amplifier in a manner similar to radio tone controls. For instance, with "DEEP TONE" the signal develops across a condenser which emphasizes the low frequencies; with "FULL TONE" the signal develops across a resistor with a small condenser in shunt, which leaves the frequency characteristic essentially flat except for the very high frequencies; "FIRST VOICE" puts a resonance in the 300 cycle zone; "SECOND VOICE" puts a resonance near 1000 cycles; and with "BRILLIANT" the signal develops across an inductance, L10, emphasizing the higher frequencies.

It is to be noted that these tone control circuits are connected in series, and may be used singly or in groups.

Control Tubes V11 and V12

As mentioned before, the control contacts under the playing keys serve to remove the cutoff bias from control tubes V11 and V12, as well as to operate one of the three relays. This is explained by considering that the cathodes of tubes V11 and V12 are connected to the mid-point of the voltage divider shown to the left of the control tubes in Figure 1. When no playing key is down, this voltage is about 165 volts positive with respect to ground, and, therefore, these tubes are cut off. When any playing key contact is closed, the resistance of the relay coil is put in parallel with the 4000 ohm resistor which results in the cathode voltage to drop to 50 volts. This removes the cutoff bias from tubes V11 and V12, which are of the remote cutoff type. The 16 mfd condenser across the 6000 ohm resistor serves to make the touch attack and decay rate smooth. A .1 mfd condenser connected between the control tube cathodes and the center tap of transformer T19 produces a hum rate of about 3,000 cycles which can be disconnected if desired by operating the "fast attack" switch.

Volume Control

The volume of the Solovox is controlled by a knee-operated rheostat. This rheostat is actually a switch connected to seven fixed resistors, and is, therefore, not subject to wear as is the usual type of volume control. This rheostat forms part of a voltage divider circuit which varies the grid bias to the remote cutoff control tubes V11 and V12, and, therefore, changes the gain of these tubes to produce a corresponding change of volume level of the speaker. The grid potential varies from approximately 45 volts at the maximum volume position (depending on setting of maximum volume control), to ground potential at the minimum position.

The Fibrato

The vibrato effect is produced by means of a magnetically driven reed having a small piece of powdered iron attached to it in such a way as to vibrate in and out of a coil placed beside the reed. Thus, the inductance of the coil varies periodically as the powdered iron core swings in and out of the coil. This induces a current in the coil on the master oscillator tuning coil, and causes the oscillator frequency to vary, producing a vibrato effect. This reed is caused to swing when the volume control lever is pulled forward in starting the instrument. After the reed is once started, the magnetic drive keeps it in motion as long as the instrument is on.

Tuning

The Solovox, as a whole, is tuned by adjusting the frequency of the master oscillator. The tuning knob accomplishes this by moving a powdered iron core in and out of inductance L1.

Power Output Tubes

V13 and V14 are power output pentodes connected in the usual push-pull manner to drive the loud speaker. The speaker field functions as a choke coil in the power supply system.

Power Supply

The power supply of the Solovox uses a single rectifier tube V8.

Note that control tubes V11 and V12 have a separate heater winding on power transformer T8. This prevents an appreciable difference in potential from arising between the heaters and cathodes of control tubes V11 and V12.

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PRACTICAL SERVICE SUGGESTIONS

The materials and electrical parts in the Hammond Solovox are of the finest quality available. Aside from occasional replacement of a vacuum tube, no service problems need be expected to arise. A few conditions which might possibly be encountered are listed below with information which will enable a radio service technician to correct them without difficulty. Some additional information useful to the service technician is in the first section entitled "TUNING AND SIMPLE ADJUSTMENTS."

If any of the following conditions appear, first make sure that the three cable connectors in the left end of the keyboard under the piano are secure. The faces of the plugs and their receptacles should be together. If the Solovox does not play properly, this is the most likely cause.

1. Changing tubes—There are fourteen tubes in the Solovox: Six type 7A4, four type 7A7, two type 785, one type 786, and one type 595S. These are all standard radio tubes, and can be tested and replaced, if necessary, by any radio dealer. All tubes can be reached from the back of the tone cabinet. A metal guard covering the lower row of tubes is easily removed by taking out two screws—see Fig. 4. Be sure to replace all tubes in the exact sockets from which they came.

If any of the type 7A4 tubes are replaced, the oscillators should be realigned as described under "Adjustment of Oscillators." Page 8.

2. Some notes will not play or play the wrong pitch. If a note is not played, it may be due to (A) a faulty oscillator adjustment, (B) a faulty relay contact, or (C) a faulty key contact. To ascertain which of these is the cause follow this procedure:

(A) If the trouble lies in a faulty oscillator adjustment, the corresponding note will be found to be out of pitch. If, in the order of the lower note is not of the right pitch, it indicates that the oscillator adjustment is unsatisfactory. In the event that realignment is necessary, check as described in "TUNING AND SIMPLE ADJUSTMENTS." If any notes still do not play correctly, replace the type 7A4 tube associated with the highest pitched note that will not play properly on any note. The following chart will be helpful in finding the oscillator associated with notes of any particular octave.

<table>
<thead>
<tr>
<th>Lowest Octave</th>
<th>Middle Octave</th>
<th>Highest Octave</th>
</tr>
</thead>
<tbody>
<tr>
<td>6th Octave Placing Pins</td>
<td>5th Octave Placing Pins</td>
<td>4th Octave Placing Pins</td>
</tr>
</tbody>
</table>

"BASS" Control Connects to.......... 6th Octave Placing Pins
"TENOR" Control Connects to.......... 5th Octave Placing Pins
"CONTRA Alto" Control Connects to... 4th Octave Placing Pins
"SOPRANO" Control Connects to......... 3rd Octave Placing Pins

After the tube has been replaced, reset the oscillator adjustment potentialometer—see page 8, "Adjustment of Oscillators."

(B) If the trouble lies in a faulty relay contact, it will be present on all 12 keys of one or more octave groups and will persist on these 12 keys regardless of the combination of playing controls used. All contacts used are of generous material so that in all probability the entire string of list has lodged between the contacts which may be easily cleared by lifting and wiping the contacts. Note that tie relays are accessible without disconnecting any wires, merely being necessary to first remove the two large nuts which hold the relay assembly to the tone cabinet frame work. After removing these two nuts, turn over the assembly and remove the four screws which hold the cover plate. After removing the cover plate, all contacts will be readily accessible.

(C) If the trouble lies in a faulty key contact, trouble will be present, of course, only on one note. In this case, remove the bus bar shifters as described in the following suggestions numbered "6" and "7".

3. Instrument fails to play. Ordinarily the first thing to do in this case is to test all the tubes. If the tubes are lighted, the cable plugs are making proper connection, and the capacitors are in position, the most likely source of trouble is in the amplifier circuit. In most respects this is a conventional amplifier circuit, and the voltage measurements given on page 13 will enable a radio service technician to locate the trouble.

4. Key does not sound. If a transient effect in the form of an annoying thump appears each time a key is released, the two type 7A7 control tubes (V11 and V12) are probably not matched properly. In this case, install two new tubes of the same make. A loud click each time a key is released indicates that the control tube cathode condenser is probably too small or open.

5. Loud. An excessive 120-cycle hum in the speaker indicates that the chokes choke (L9) is defective, or one of the filter condensers is open.

6. One key does not sound. If a certain key fails to play on any of the registers controls, it probably has a dirty control contact which can be cleared easily by shifting the control contact bar with the adjustment as the right end of the keyboard. To reach the control bar shifter, first remove the two molded bakelite end pieces. A drawing accompanying the keyboard (Figure 5), shows how the contact shifter are arranged. Loosen the clamping screw and shift the bar about 1/32" to the left, tighten the clamping screw.

7. One key plays note "B" instead of its correct pitch (with adjacent keys playing correctly). If this occurs, the key under question has a dirty tuning control which can be cleared easily by shifting the tuning control bar with the adjustment as the right end of the keyboard. This is reached as described in the preceding paragraph.

8. One octave or more fails to play. If a single octave of the Solovox keyboard fails to play for any combination of the registers, the trouble is probably in the relay associated with that octave or a wire leading to it. Check voltage at the relay coil and the control tube cathode (V10 and V11).

9. Adjustment of Master Oscillator Fine Tuning Condenser. An additional tuning adjustment is provided in the form of a screw on the outer control panel of the Solovox, electrically connected to the tone cabinet, upper left hand corner. See Fig. 4. After several years of use under very adverse conditions of humidity, or if an excessively accurate tuning is required, this adjustment may need to be made. First, however, tune as described on page 13. After tuning F, F#, or G, it is found that other notes (most likely C or B) are out of tune, the tuning breadth of the octave may be realigned as follows:

(a) Depress the middle "C" key with the "VIBRATO OFF", "CONTRA Alto", and "DEEP TONE" controls pushed in. Tune to zero beat, preferably with a Hammond Organ, or piano which has just been tuned. In tuning this "C", use the tuning knob of the tone cabinet. If it is found impossible to tune the "C" with the tuning knob, the two wood screws at the top of the tuner may be loosened, and the black bakelite tube moved to a position in the tuning coil such that the range of the tuning knob does cover the desired "C" pitch. Before making this adjustment, be sure that the "VIBRATO" switch is not set midway between its on and off positions. For tuning purposes, the "VIBRATO" switch should be pushed in at this position.

(b) After turning the "C" key with the tuning knob, depress a "B" key and tune to zero beat with the screw driver operated trimming condenser located in back of the tone cabinet, see Fig. 4. The instrument will now be exceedingly accurately tuned.

DIRECTIONS FOR CONNECTING ADDITIONAL AMPLIFIERS TO SOLOVX

When the Solovox is used in large auditoriums or with a large orchestra, additional amplifiers may be connected across the Solovox voice coil terminals which are accessible for this purpose on the speaker framework. Standard Hammond Organ Tone Cabinets are recommended as they may be connected with no changes necessary other than securing a 1000 ohm resistance connected to the Solovox voice coil terminals and their junction point used as a ground for the Hammond Organ Tone Cabinet. By locating the resistors in the Hammond Organ Tone Cabinet, it is only necessary to run two wires (they need not be shielded and may be as long as 200 feet) to the extra tone cabinet.

Figure 3

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HOWARD RADIO CO.

MODELS 302R, 302RA
302RT (late)

ANTENNA SYSTEM = Built-in loop with available connection from outside antenna. On short wave band, outside antenna required. BROWN lead to antenna, and BLACK lead to ground.

TYPE = Conventional | POWER OUTPUT - (MAX.) = 6 Watts; UPO = 4 Watts

CONSUMPTION - Receiver, 70 WATTS; Recorder, 30 WATTS; Changer, 30 WATTS.

POWER SUPPLY - (Standard Models) = 105-125 V, 60 Cycles

TUNING RANGES = 540 to 1700 KC, 5.5 to 18 MC.

I.F. = 465 KC

MODEL = 302-R Console Recorder
302-RD Table Model Recorder
302-RA Console Recorder with Automatic Record Changer

ALIGNMENT PROCEDURE

Wave-Band Switch Position of Dial Pointer Signal Generator Frequency Signal Generator Connection See Note Trimmers Adjusted (In order shown) Trimmer Function

<table>
<thead>
<tr>
<th>Wave-Band</th>
<th>Switch Position</th>
<th>Pointer</th>
<th>Signal Generator Frequency</th>
<th>Signal Generator Connection</th>
<th>See Note</th>
<th>Trimmers Adjusted</th>
<th>Trimmer Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td>540</td>
<td>465 KC</td>
<td>Grid of 6A8GT</td>
<td>A, D</td>
<td>I₁, I₂, I₃, I₄</td>
<td>IF</td>
<td></td>
</tr>
<tr>
<td>BC</td>
<td>600 KC</td>
<td>600 KC</td>
<td>Brown Ant. lead</td>
<td>F, G</td>
<td>Osc. Pad.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A- Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.

B- When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 16 MC, then a weaker image will be heard at 15,070 KC, in other words 930 KC less on the dial.

C- When adjusting this pad, move the tuning hand back and forth and adjustudder until the peak of greatest intensity is obtained.

D- See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.

E- Check for oscillator cross-over between 16 and 18 MC. If necessary for stability, turn the antenna trimmer "IN" slightly.

SOCKET VOLTAGE READINGS:

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>SCR GRID</th>
<th>PLATE</th>
<th>OSC PLATE</th>
</tr>
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<tbody>
<tr>
<td>6A8GT</td>
<td>Mixer</td>
<td>3</td>
<td>95</td>
<td>225</td>
<td>140</td>
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<tr>
<td>6SK7GT</td>
<td>I.F. Amp</td>
<td>3</td>
<td>95</td>
<td>225</td>
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<tr>
<td>6Q7GT</td>
<td>Diode &amp; Mic. Gain</td>
<td>90</td>
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<td></td>
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<tr>
<td>6Q7GT</td>
<td>Audio</td>
<td></td>
<td>75</td>
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<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>SCR GRID</th>
<th>PLATE</th>
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</thead>
<tbody>
<tr>
<td>6U5</td>
<td>Tuning &amp; level cont.</td>
<td></td>
<td>220</td>
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<tr>
<td>6V6GT</td>
<td>Output</td>
<td>12</td>
<td>230</td>
<td>220</td>
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<tr>
<td>5W4GT</td>
<td>Rest.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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In the "Duplicate Record" position, the tuning-eye is again in the circuit, for indication of proper cutting level, the cutting head circuit is complete, and the duplication is made from the original blank in position on the automatic turntable. The microphone is in use for another superimposed registration if desired.

With our automatic record changer models when duplicating from a small 64" record, due to the fact that this record, having a small surface, is liable to slip on the turntable, we have provided a spring finger that slips over the spindle that locks this record in place.

All chassis models have the input socket for the automatic changer pick-up, or if the model is not equipped with the automatic changer, a conventional turntable and crystal pick-up may be plugged into this socket and the duplication of the record can be accomplished.

THE MASTER SWITCH with which these features are selected, has seven positions as follows:

1. Radio
2. Record Radio & Microphone
3. Record Mic.
4. Microphone for P.A. System
5. Play-back
6. Automatic Phono
7. Duplicate Record

AUTOMATIC RECORD CHANGER WITH RA SERIES: USE ALSO FOR PLAYING RECORDS WHILE THEY ARE BEING DUPLICATED BY CUTTING ARM.
In the "Record-Radio & Mic." position, the radio circuit remains the same as in "Radio" position. The microphone circuit becomes effective as the short is removed from the Mic. Gain Control. The percentage of radio and / or microphone is then controlled with the dual control feeding the 6Q7GT Audio and the Mic. Gain Control.

The 6US now becomes the visual amplitude indicator of the recording voltage. The voltage is taken from the output plate (6V6), rectified and applied to the grid of the 6US.

The cutter head circuit is completed.

The proper voltage level for the cutting operation is very important. Too high a level as indicated by the continuously overlapping of the tuning-eye results not only in feed-back, but actual overcutting of the record, resulting in distortion. However, it seems that the general practice is for the operator to make often "undercut" the recording by not providing sufficient cutting voltage, thus results in a high background level and poor quality.

The series condenser (.002) in one side of the cutting head circuit is a controlling compensator for high response when recording. Increasing the value of this condenser will increase the high frequency effect in recording.

In the "Mic. P.A." position, only the microphone is in the circuit. An additional microphone extension is usually used with the microphone at a remote point, using the receiver as a public address system.

As shown in the above diagram, the tuning-eye becomes inactive.

In the "Record Mic." position, the radio diode circuit is opened, the bias circuit is opened at the mixer tube, cutting out the radio, and cutting head circuit is closed.

With the Howard "RA" Series, the automatic changer is included. With the switch in this position the audio system remains the same as in "Play-Back" position, except the pick-up arm of the changer is in use.

A pilot light is switched on over the changer unit when switch is in this position.

In the "Play-Back" position the pick-up connects to one section of the dual volume control from which the audio output is regulated in the conventional manner.

The resistor directly in shunt with the play-back or pick-up circuit is a compensator controlling the low frequency response at "Play-Back" position. Decreasing this value will decrease the low response.
GENERAL ADJUSTMENTS

RECORDING MECHANISM

CUTTING HEAD POSITIONING ADJUSTMENT

The cutting head position has been adjusted properly at the factory, using HOWARD Home Recording Blanks. However, check this adjustment by noticing if the Cutting Needle Locking Screw will locate itself in the Vertical Center of the clearance slot (See Fig. 1), when the record is being cut.

When necessary to change the position of this screw in the slot, loosen locking nut (See Fig. 2) and turn screw "A" to RIGHT to raise needle locking screw; or turn to LEFT to lower.

After any adjustment is completed, be sure to tighten locking nut.

CUTTING NEEDLE PRESSURE ADJUSTMENT

For quality recordings, it is of vital importance that the right amount of pressure is obtained with the cutting needle. Observe the character of the shaving as the record is being cut. The size of the shaving should be about the size of a human hair (approx. .003"). If it is too heavy, the groove in the record may be too close to the adjacent groove which would cause distortion. The shaving appears to be too fine and "kinky", an insufficient pattern will be cut with distortion as a result.

Before making any change in the amount of pressure, FIRST BE SURE THE CUTTING NEEDLE ITSELF IS NOT DEFECTIVE, LOOSE OR MOUNTED WRONG, since the conditions as mentioned above due to improper pressure can also be caused by a defective needle. Check needle first.

When necessary to INCREASE thickness of shaving thread (See Fig. 3) TURN CUTTING PRESSURE adjustment "B" to the right. TO DECREASE thickness of shaving thread, turn adjustment to the left.

THE CORRECT HEIGHT OF FOLLOWER ARM IN RELATION TO THE CUTTER ARM is obtained by seeing that the pivot post (which is a fixed part of the follower arm) is flush with the bushing on the top side of the arm platform. See Fig. 4. Also see that there is a small clearance between the pivot post bushings "C" and "D" when the cutting arm is lowered to the cutting position. The two hex. head screws "E" - "F" permits both this adjustment and at the same time the very important FOLLOWER ARM ADJUSTMENT IN RELATION TO THE SWING OF THE CUTTER ARM as follows: When the follower arm touches the follower arm stop, the cutting stylus should be just outside the edge of the paper label on the Howard Record blanks.

THE BRONZE SPRING ADJUSTMENT ON THE FOLLOWER ARM. When the cutting arm is in cutting position, the bronze spring tongue should seat firmly into the bottom of the spiral groove of the lateral feed screw. This pressure should be great enough so that there will be no tendency of the knife edge tongue to climb out of the thread causing uneven grooves and distortion. However, too much pressure is to be avoided. The screw "F" controls this tension, and if the spring lifts itself away from the tip of this screw in the cutting position, it indicates too much pressure. This may also be caused by the follower arm being too low or bent downward for some reason.

END PLAY ADJUSTMENT OF LATERAL FEED SCREW. Loosen locking nut for screw "G"; turn screw slowly to right until the end play cannot be felt; reverse screw slightly to left to allow running clearance, and tighten lock nut.
AUDIO FEED-BACK is controlled by placing a Selector Switch in position for a recording. Turn fader to extreme left and adjust Mic. Gain Control just below the feed-back point.

THE CRYSTAL TYPE CUTTING HEAD is energized by a special 70,000 Ohm secondary winding (a part of the output transformer) that matches the impedance of the cutting head.

THE CUTTING HEAD CRYSTAL MICROPHONE and CRYSTAL PLAY-BACK units are so designed and compensated to provide uniform frequency response for recording and playback.

In the "Radio" position, the ground circuit return for the mixer tube bias is completed through the switch. Radio silencing is accomplished by opening the mixer tube cathode.

The 6AG becomes the conventional tuning eye tube since the grid is connected through the switch directly to the AVO line.

The Microphone output circuit is shorted out.

Before we consider the cause and remedy of some of the troubles that may be encountered with any recording device, it is necessary to review the fundamental purpose of the records and needles themselves.

RECORD BLANKS

The ideal record material is that substance that has the right quality of material to respond to the variations of the cutting stylus and yet have the right amount of "GRANING" so when worn with the play-back needle, the needle takes most of the wear and not the record pattern.

Needle scratch will be objectionable with records having too coarse a grain material base. However, we do not recommend the use of non-metallic needles to reduce this needle scratch condition. For practical use the loss of volume with this type needle requires increase of audio volume and the background increases likewise.

NEEDLES

The function of a play-back needle is to act as a transmission medium between the modulated recorded groove and the reproducing unit. Therefore, the frequency characteristic of a needle depends upon its shape, material, and size. The metallic needles are superior to non-metallic for a greater range of response; likewise the heavier shank needles will naturally have a greater range.

Regarding the playing life of a needle, generally speaking the metallic type may be grouped into about three classes: (1) The soft metallic one-play type; (2) Hard steel types, 10 or 25 plays; (3) Semi-permanent and permanent types, 1000 or 2000 plays.

It must be remembered that the causes of faulty reproduction and the quick wearing out of records can more often be due to dull or rough edge needles than from the type of needle or record blank. This also applies to the cutting needle which, although it may be in the permanent life class, can become chipped by rough handling or damaged when used with inferior grade blanks on which the coating is insufficient, and the cutting needle may cut through to the core of the blank.

Since the actual depth of the groove is nearly three thousandths of an inch (.003") for safety the coating should be at least twice that thickness.

Getting back to the reproducing needle, since the variations that the needle is to follow are lateral in nature, it is obvious that the needle is not supposed to be extremely pointed so as to ride in the bottom of the groove; and at the other extreme it is obvious that the needle should not be too blunt (like a dull needle) so as to ride near the top edge of the groove, losing all of the higher frequencies. Since the bearing surface, or radius point, of the needle should be slightly over two thousandths of an inch (.002") it becomes apparent as to what happens to the quality when the point becomes blunt so that the diameter is greater than what we can call the "Wave Length" of the higher frequency pattern in which the blunt needle could not follow the small curve variation for the high frequency reproduction. Never rotate the needle in the socket once it has been used.

THE CUTTING HEAD

This crystal unit similar in structure to the regular reproducing head, is likewise subject to extreme temperatures both hot and cold.

Heat at about 120° Fahrenheit will begin to soften the crystals and permanently damage the unit. Average temperatures encountered in the home are a distance from the radiator should not cause trouble.

Coldness does not cause permanent damage, the effect being to "stiffen" the unit resulting in an increase of background "rumble" if a recording is made during that period.

ROUGH HANDLING

To bounce either the play-back or the cutter head around carelessly will invite trouble. Severe shock against the end of the needle may not fracture the crystal, but at least the needle (or stylus) mounting will be damaged or the edge of the needle may be roughened which would ruin the next record.

Forcing the cutting arm by hand when it is not raised enough for the follower arm to become disengaged may throw arms out of alignment with each other.

CUTTING SHAVING

TOO HEAVY

Under a magnifying glass, the grooves should appear as about the width as the spaces between them for proper cut. If the thread is coarse and stiff, try new cutting needle, then if necessary, refer to procedure of adjustments given herein.

When the record is being cut, watch the shavings as it leaves the needle and see that it winds toward the center of the record and does not work back underneath the cutting needle causing it to bounce over the shavings.

If the thread is light, fluffy, or not continuous, after trying new cutting needle, refer to procedure of adjustment given herein.
This condition is the normal result of improper use of the "Hic.
Gain Control" with the visual indicator for proper cutting voltage.
Overcutting of the record is also possible with too high an input.
At the other extreme, lack of sufficient input results not only
in poor quality, but also raises the background level.
Any recording system as sensitive as the Howard Recorder, is cap-
able of picking up the mechanical vibrations of the motor.
The sacrificing of this sensitivity to eliminate any possibility of
motor rumble is not the cure or is it necessary. Under normal
conditions of operation in which both the motor frame and turn-
table unit are suspended on soft rubber cushions, the rumble will
not be recorded if:

1. The amplitude of the signal is sufficient when the blank is
   being cut.
2. The Tone Control is in the treble position at the time of re-
   cording.
3. The cutting stylus is in good condition and is MOUNTED TIGHT.
4. The crystal is at room temperature at the time of recording.
5. The play-back needle is not dull or has become "shouldered".

By "marble" we mean the sing-song effect with the low frequencies
predominating. We first consider the possibility that something
has happened to vary the motor speed during recording. (See
Speed Regulation below).

Although the recorder base is mounted on rubber feet at each cor-
ner, it is essential that the wing screws remain drawn tight
against the walls. When the base floats too freely, vibrations
are introduced from the drive mechanism causing a marble effect
when played back. Examine the grooves closely if there appears
to be a shaded spiral effect across the blank, you can be sure
that the vibrations have created a regular pattern of their own
due to the wing screws being too loose at each corner of the base.
Tighten them.

Consider the possibility that the cutting needle might have been
loose.

After the customary "test" of a new play-back needle, check the
mounting of the play-back arm. It is held in place with a "y"-
shaped hand that could lose its tension causing the arm to
vibrate. It can be tightened by removing arm and spreading out
fingers for more tension.

"Marble" effect can be caused if the original cutting was made
too heavy and which might be reproduced satisfactorily with one
brand new needle having a wide point, but another type needle
having an extremely fine point will vibrate around the bottom of the
groove with incomplete, uneven registration.

SPEED REGULATION

The motor being of a constant speed synchronous type, operating at
its rated frequency, should not vary. However, we must check the
frequency marking as shown on the Motor Frame with the power line.

It is suggested that the speed of the motor be checked in the con-
ventional manner by the use of a cardboard stroboscope disc using
gas illuminated electric light.

The correct speed with the play-back arm in place on the record is
78 R.P.M.

The speed of the motor when used in a district requiring a con-
verter cannot be depended upon.

Irregularities of speed can be caused by excessive shavings wound
around the motor spindle and rubber drive mechanism beneath the
turntable.

LOW RESPONSE

There is a compensating resistor in the circuit that will tend to
make the play-back apparently to have a lower frequency
response.

In recordings where the high frequencies seem to be missing, be
sure to ascertain if the original recording was incorrectly made
with the Tone Control in the "Bass" position.

Another reason for lack of "highs" is of course either a blunt
play-back needle, or the rutting of the record during a previous
play-back by a damaged needle that has trimmed the groove of its
pattern for "highs".

The elements effecting the cutting and reproducing of a blank have
been outlined above. We are making no mention of the audio system
of the radio since it is conventional and requires no special
service attention other than the usual check of tubes, operating
voltages and master switch contact points.
HOWARD RADIO CO.

TUNING RANGES -
540 to 1700 KC,
2.2 to 7 MC, 7 to 22 MC,
(555-175, 140-47,
47-13 Meters)
POWER OUTPUT -(MAX.) -
2.7 Watts; UFO 1.5 W.
ANTENNA SYSTEM =
Connect antenna to BROWN lead -
Connect Ground to BLACK lead.
CONSUMPTION 50 WATTS
Plus 15 Watts for TP Model.
Phone Circuit
307TP Only
Otherwise same as
Model 307, See Index
4077

POWER SUPPLY - (Standard Models) = 105-125 V. 60 Cycles AC

ALIGNMENT PROCEDURE

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<th>WaveBand</th>
<th>Position of Dial Pointer</th>
<th>Signal Generator Frequency</th>
<th>Signal Generator Connection</th>
<th>See Note</th>
<th>Trimmers Adjusted (In order shown)</th>
<th>Trimmer Function</th>
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<tbody>
<tr>
<td>BC</td>
<td>Min. Cap.</td>
<td>465 KC</td>
<td>600 Grid</td>
<td>A</td>
<td>1, 2, 3, 4</td>
<td>IF</td>
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<td>SW</td>
<td>18 MC</td>
<td>18 MC</td>
<td>Brown lead</td>
<td>B, D, E</td>
<td>05, 06</td>
<td>Osc. Ant.</td>
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<td>Int.</td>
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<td>6, 5 MC</td>
<td>Brown lead</td>
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<td>07, 08</td>
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<td>C</td>
<td>09, 10</td>
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<td></td>
<td>F11</td>
<td>Osc. Pad.</td>
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</tbody>
</table>

NOTES
A - Each step of the alignment should be repeated in the original order for greater accuracy. Keep output of Signal Generator low. The i.f. trimmers are reached through the two holes on the top of each i.f. can.
B - When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 18 MC, then a weaker image will be heard at 17,070 KC, in other words 530 KC less on the dial.
C - When adjusting this pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.
D - See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.
E - Check for oscillator cross-over between 18 and 22 MC. If necessary for stability, turn the antenna trimmer "IN" slightly.

SPEAKER = Electro-Dynamic SIZE = 6" V.C.M.P. (400CFS) = 4 Ohms FIELD = 1300 Ohms

SOCKET VOLTAGE READINGS:
Voltage taken from ground with line voltage at 117 AC.
High voltage reading off rectifier - 275 V.
Drop across speaker field = 75 V.
Voltage taken with 1,000 Ohm per volt meter.

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HOWARD RADIO CO.

MODELS--435-436-437 "PROGRESSIVE SERIES"

TYPE 3-820 EXTERNAL SPEAKER is designed especially for use with Howard Communications Receivers. The input impedance is of the correct value to perfectly match the output transformer of Models 435, 436, 437, and 460. The speaker unit consists of a heavy duty high efficiency permanent magnet, 6" dynamic speaker mounted in an acoustically treated (foam lined) welded steel cabinet finished in fine suede wrinkle, supplied with a 5 ft. spade terminal cable.

NOTE: The Progressive Series 435, 436, 437, is based on the Model 455 receiver. The 436 is the 435 model with the addition of the noise silencer and additional features. The progressive additions to the original 435 circuit may include: 605 Carrier Level Meter, 3-820 External Speaker, 660 Pre-Selector, 660 Frequency Monitor, 655 Loop Kit, and 610 Power Pack. For data on these, see INDEX.

TYPE 610 "B" POWER PACK. For conversion of 6 Volts d.c. to 300 Volts d.c. for operation of Howard Models 435, 436, and 437 Communications Receivers from 6 Volt Storage Battery, the Type 610 Power Pack is a convenient and practical converter. A four prong plug fits the socket on Model 435, 436, and 437 Receivers, carrying both A and B power to the set. Only two connections from the Power Pack to the storage battery are required. Ample length of cable is provided. Battery current drawn for Model 435 is 6.6 amps; for Model 436 is 6.9 amps; and Model 437 is 7.75 amps. ON and OFF Switch on Power Unit.

REAR VIEW OF CABINET

EXTERNAL CONNECTIONS

As we face the back of the receiver, the first terminals are the three screw terminals coded V3, V2, and V1, terminal strip at the right. The G, D, A are of which V3 and V2 must be shorted when using the antenna and Ground connections. For the built-in speaker, can be adapted for the conventional type of flat-top antenna, systems use of the Howard external speaker No. 3-820, leave the shorting wire between "G" and "B" and by removing the shorting wire and connecting antenna to "A". Connect ground to "G". Leads from the external power to the external speaker to lugs V3 and V1.

If a double antenna is used, remove the jumper between G and D and attach double wires to A and A and a ground to "G".

We have found it advisable to recommend a definite length of antenna due to variable conditions. We do, however, suggest that you refer to the recommendations as given in the A. R. R. L. Antenna handbook.

The single terminal next to the antenna-ground strip is coded for use with the Howard Model 650 Pre-Amplifier.

ADAPTATION FOR BATTERY SUPPLY

When it is desired to use "A" and "B" batteries when the Howard 610 Power Pack is not available, connect as follows:

Remove the jumper from the battery power socket. Connect "B" 250 Volts to terminal marked "B" in diagram. Connect one side of the 6 Volt "A" supply to terminal marked "A". Connect the other side of the "A" supply and "B - " to the chassis ground terminal.

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The following are the Engineering Specifications for Model 435,436.

POWER CONSUMPTION. ............... .50 Watts, 105-125 Volts, A.C. 60 Cycle

INTERMEDIATE FREQUENCY ............... .465 KC

FREQUENCY RANGE - Divided into four bands as follows:

.55 to 1.7 mc (545-176 meters) 5.6 to 18 mc (54-16.6 meters)
1.7 to 5.8 mc (176-54 meters) 17 to 48 mc (17-7 meters)

SPEAKER SYSTEM

Built-in 6½" Electro Dynamic
Connections provided for External Speaker (Howard Type 3-820)

POWER OUTPUT

Type. ............... Single 6K6G
Maximum ............... 2½ Watts

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FREQUENCY RANGE - Divided into four bands as follows:

.55 to 1.7 mc (545-176 meters) 5.6 to 18 mc (54-16.6 meters)
1.7 to 5.6 mc (176-64 meters) 17 to 45 mc (17-7. meters)

POWER CONSUMPTION: 60 Watts, 105-125 Volts, A.C. 60 Cycle

INTERMEDIATE FREQUENCY

.465 KC

SPEAKER SYSTEM

Built-in 6¾" Electro Dynamic

Type, Single 6K6G

Connections provided for External

Maximum: 4 Watts

Speaker (Howard Type 3-820)

TYPE 660 FREQUENCY MONITOR

The Howard Frequency Monitor Model 660 consists of a highly stabilized oscillator covering the fundamental frequency range of 850 to 1030 kilocycles, harmonics of which are used as reference or measurement points on the higher bands. The R.F. Output of this oscillator is loosely coupled to the antenna circuit of the receiver, and the voltage applied to the receiver is controlled by a variable resistance attenuator.

The Oscillator is tuned by a precision ceramic insulated variable condenser carrying an extremely accurate frequency scale covering the 10, 20, 40, 80 and 160 meter amateur bands as well as the fundamental range. The range is so selected that harmonics cover the entire length of all amateur bands, and these are calibrated so that frequency can be read within one kilocycle on the lower frequency bands and five kilocycles on the highest band.

The Power Supply for this unit is self-contained, and is for use on 105-125 Volts, A.C. 40-60 Cycle. Available at other voltages and frequencies on special order.

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The alignment is made with the BFO OFF, the AVU OFF, and the Band Spread set to 100.

The main dial must stop EXACTLY ON the last line at the end of the scale when the condenser is fully closed without force on the tuning control.

3. Check for image with the received signal at 400 KHz higher in frequency. Then, turn trimmer to obtain maximum sound which will be a hissing noise. Turn trimmer knob to be sure sound is not some tunable frequency that is causing it.

NOTE 3: In this band (17 to 45 MHz) only the oscillator follows the received signal 400 KHz lower in frequency. Therefore when checking for the image, if the alignment has been made at 36 MHz it will be found at about 37 MHz. This will determine if the alignment was correctly made at 36 MHz.

NOTE 4: Check for image on all bands except the 17 to 45 MHz band at a point 400 KHz higher on the dial.

NOTE 5: Rock main dial slightly for point of maximum signal as the padding condenser is being adjusted.

Compliments of www.nucow.com
THE HOWARD CARRIER LEVEL METER gives an indication of the strength of the signal carrier in microvolts as delivered at the receiver.

The meter scale is calibrated from 0 to 50. When the meter set control (R. F. Gain) located directly below meter, is set exactly on the 50 division, the reading on the meter will be the actual microvolts delivered to the receiver.

Before using the carrier level meter, tune the signal to exact resonance with the meter switch in the OFF position, and adjust the R. F. GAIN CONTROL to a point where the signal is just audible. This will not throw the meter off scale when the meter switch is thrown to the ON position. Follow instructions given below.

The AVC Switch must be ON.
The Meter Switch must be ON.
The BFO Switch must be OFF.

To avoid the possibility of introduced error, the BFO Switch is so connected that the meter is not in the circuit when the BFO Switch is in the ON position. Therefore the meter can be used only when the BFO Switch is in the OFF position.

The maximum deflection of meter pointer is the true indication of resonance in tuning. With a strong signal the meter will naturally be thrown off scale until the R. F. Control is rotated counter-clockwise. A point will be reached during this rotation where the meter hand is at 50. Then the input value in microvolts is read direct at the position of the pointer knob. For better accuracy this reading is multiplied by a correction factor as given on a separate chart to cover the various bands calibrated for each receiver.
HOWARD RADIO CO.

POWER SUPPLY: (Standard Models) 105-125 V. AC-DC
POWER OUTPUT: (Max.) 1 Watt
UPD .5 W.
CONSUMPTION: 30 WATTS

C C 20, 30 MFD 150, 150 V. NO. 47-286.
C 10, 20, 25 V. NO. 63-270.
VOLUME CONTROL AND SWITCH NO. 69-281.
V.C. IMP. (400 CPS) = 5 Ohms| FIELD = 450 Ohms
SPEAKER = Electro-dynamic
SIZE = 8".

TUNING RANGES = 540 to 1720 KC and 4.6 to 16 MC (178-550 and 18-65 Meters)

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>Wave-Band</th>
<th>Switch Position</th>
<th>Position of Dial Pointer</th>
<th>Signal Generator Frequency</th>
<th>Signal Generator Connection</th>
<th>See Note</th>
<th>Trimmers Adjusted (In order shown)</th>
<th>Trimmer Function</th>
<th>Check for Image at</th>
</tr>
</thead>
<tbody>
<tr>
<td>KC</td>
<td>540</td>
<td>14 MC</td>
<td>14 MC</td>
<td>Ant. (Brown)</td>
<td>A</td>
<td>I 1, I 2, I 3, I 4</td>
<td>Osc. Ant.</td>
<td>13 MC</td>
</tr>
<tr>
<td>MC</td>
<td>14 MC</td>
<td>14 MC</td>
<td>Ant. (Brown)</td>
<td></td>
<td>B</td>
<td>0 5 A 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC</td>
<td>14 KC</td>
<td>14 KC</td>
<td>Ant. (Brown)</td>
<td></td>
<td></td>
<td>0 7 A 8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A- Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.
B- When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 14 MC, then a weaker image will be heard at 15,070 KO, in other words 930 KO less on the dial.
The tubes are connected in series in the order as shown by the schematic diagram.
The dual section filter condenser has a common negative, but note that it does not return to ground as the can is insulated from the chassis.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>SCR. GRID</th>
<th>PLATE</th>
<th>OSC. PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SA7</td>
<td>Mixer</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>12SK7</td>
<td>I.F. Amp.</td>
<td>3.5</td>
<td>95</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>12SQ7</td>
<td>Det.</td>
<td></td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50L6GT</td>
<td>Output</td>
<td>6</td>
<td>9</td>
<td>82</td>
<td></td>
</tr>
</tbody>
</table>

SOCKET VOLTAGE READINGS:

Voltage taken from ground with line voltage at = 117 V. AC.
High voltage reading off rectifier = 115 V.
Drop across speaker field = 20 V.
Voltage taken with 1,000 Ohm per volt meter, from cathode return to points as given.
Available at other voltages and frequencies.

The Howard Type 650 Pre-Amplifier is designed to be used with ANY RECEIVER and covers a frequency range of .55 mc. to 45 mc. The Pre-Amplifier is constructed for the use with an antenna having either single wire or doublet lead-in or the Howard Type 655 Loop Antenna Kit.

The use of the Loop Kit, Type 655, with this Pre-Amplifier will be indispensable in separating interfering signals and reducing certain noise conditions.

The Antenna-Loop Switch provides a convenient shift from either the loop or an external antenna system.

This unit is coupled at the back to the regular receiver without changing the receiver in any way.

The "IN-OUT" Switch allows the unit to be switched out of the input system allowing the regular antenna to be coupled direct to the receiver.

**TYPE 655 LOOP KIT**

The Kit consists of four separate loops having band coverage as follows:

<table>
<thead>
<tr>
<th>NO. OF LOOP</th>
<th>COVERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L14</td>
<td>1700 KC to 550 KC</td>
</tr>
<tr>
<td>L13</td>
<td>5.6 MC to 1.7 MC</td>
</tr>
<tr>
<td>L12</td>
<td>18 MC to 5.6 MC</td>
</tr>
<tr>
<td>L11</td>
<td>34 MC to 22 MC</td>
</tr>
</tbody>
</table>

The Pre-Amplifier has a special switch position for the 30 MC LOOP (L11). When the switch is on this position, the Loop Trimmer is connected directly to the Loop, and the main variable condenser disconnected from the Loop. This is done to secure a loop of more effective height on the 30 MC BAND.

When using loops covering the three lower frequency ranges and with switch at Loop, the Loop Trimmer is used to bring the Loop into exact resonance with the incoming signal to secure greater loop performance. The High Frequency end range of the three lower frequency loops can be extended by having loop switch on 30 MC LOOP. In this position the Loop Trimmer will cover the following ranges:

| L14         | 1400-1990 KC    |
| L13         | 4.4-6 MC        |
| L12         | 15.5-22 MC      |

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DUE TO THE CRITICAL ADJUSTMENTS THAT ARE REQUIRED WITH THE FREQUENCY MONITOR, MODEL 660, WE DO NOT ADVISE THAT ANY ATTEMPT BE MADE TO CALIBRATE THIS UNIT; WE THEREFORE SUGGEST IF IT HAS BEEN DETERMINED THAT THE UNIT IS OFF CALIBRATION, IT SHOULD BE SENT BACK TO THE FACTORY FOR A RECALIBRATION.

The Howard Frequency Monitor Model 660 consists of a highly stabilized oscillator covering the fundamental frequency range of 660 to 1000 kilocycles, harmonics of which are used as reference or measurement points on the higher bands. The R. F. Output of this oscillator is loosely coupled to the antenna circuit of the receiver, and the voltage applied to the receiver is controlled by a variable resistance attenuator.

The Oscillator is tuned by a precision ceramic insulated variable condenser carrying an extremely accurate frequency scale covering the 10, 20, 40, 80, and 160 meter amateur bands as well as the fundamental range. The range is so selected that harmonics cover the entire length of all amateur bands, and these are calibrated so that frequency can be read within one kilocycle on the lower frequency bands and five kilocycles on the highest band.
ALIMENT PROCEDURE

<table>
<thead>
<tr>
<th>Wave-Band</th>
<th>Position of Dial Pointer</th>
<th>Generator Frequency</th>
<th>Generator Connection</th>
<th>See Note</th>
<th>Trimmers Adjusted (in order shown)</th>
<th>Trimmer Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td>Max.Cap.</td>
<td>465 KC</td>
<td>Converter</td>
<td>A,E I₁I₂I₃I₄</td>
<td>IF</td>
<td></td>
</tr>
<tr>
<td>7-22</td>
<td>16</td>
<td>18 MC</td>
<td>Ant. Lead</td>
<td>B,D</td>
<td>O₆A₆, Osc., Ant.</td>
<td></td>
</tr>
<tr>
<td>2.2-7</td>
<td>6.5</td>
<td>6.5 MC</td>
<td>Ant. Lead</td>
<td></td>
<td>O₇A₈, Osc., Ant.</td>
<td></td>
</tr>
<tr>
<td>BC</td>
<td>1400</td>
<td>1400 KC</td>
<td>Ant. Lead</td>
<td>C</td>
<td>O₁₀A₁₀, Osc., Pad</td>
<td></td>
</tr>
<tr>
<td>BC</td>
<td>600</td>
<td>600 KC</td>
<td>Ant. Lead</td>
<td></td>
<td>P₁₁</td>
<td></td>
</tr>
</tbody>
</table>

Voltage taken from ground with line voltage at - 115 V.A.C.
High voltage reading off rectifier - 220 V.
Drop across speaker field - 100 V.
Voltage taken with 1,000 Ohm per volt meter.
Tune set off station

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>SCR.GRID</th>
<th>PLATE</th>
<th>OSC. PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7</td>
<td>RF</td>
<td></td>
<td>75 - 100</td>
<td>212</td>
<td></td>
</tr>
<tr>
<td>6SA7</td>
<td>Converter</td>
<td></td>
<td>75 - 100</td>
<td>215</td>
<td>75-100</td>
</tr>
<tr>
<td>6SK7</td>
<td>I.F.Amp.</td>
<td></td>
<td>75 - 100</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>6SR7</td>
<td>I.F.Amp.</td>
<td>3</td>
<td>75 - 100</td>
<td>205</td>
<td></td>
</tr>
<tr>
<td>GH6</td>
<td>Det.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6SF5</td>
<td>Audio</td>
<td></td>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>SCR.GRID</th>
<th>PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SF5</td>
<td>Bass Amp.</td>
<td></td>
<td>112</td>
<td></td>
</tr>
<tr>
<td>6J5GT</td>
<td>Inverter</td>
<td>6.5</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>6V6GT</td>
<td>Output</td>
<td>13</td>
<td>205</td>
<td></td>
</tr>
<tr>
<td>6V6GT</td>
<td>Output</td>
<td>13</td>
<td>210</td>
<td></td>
</tr>
<tr>
<td>SY3G</td>
<td>Rectifier</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6U5</td>
<td>Tuning Eye</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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A - Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator Low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.
B - When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 21 MC, then a weaker image will be heard at 21,000 KC less 950 KC, or about 20,070 KC on the dial.
C - When adjusting this pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.
D - See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.
E - The Interstage resistance coupled I.F. stage is coupled by a trimmer. Adjust to maximum capacity for maximum gain.

Compliments of www.nucow.com
AS SWITCH IS SET TO HIGHER FREQUENCY BANDS THE SECONDARY COILS
OF THE LOW FREQUENCY BANDS ARE SHORTED OUT

1. F. 485 K.C.

Variable Cond. 64-270
Tone & Vol. Cont. 72-281
Band Switch 40-514

FOR OTHER DATA, SEE INDEX

©John F. Rider, Publisher
Howard Radio Co.

Model 780

As switch is set to higher frequency bands, the secondary coils of the low frequency bands are shorted out.

Wave-Band Switch Position | Position of Dial Pointer | Generator Frequency | Generator Connection | Sea Note | Trimmers Adjusted (In order shown) | Trimmer Function
---|---|---|---|---|---|---
Broadcast | Max. Cap. | 465 KC | Converter Grid | A, D | I₁, I₂, I₃, I₄ | IF
7-22 MHz | 21 | 21 MHz | Ant. (Brown) | B | O₆, A₆ | Osc., Ant.
2.2-7 MHz | 6 | 6 MHz | * | * | * | *
2.2-7 MHz | 2.2 | 2.2 MHz | * | * | * | *
Broadcast | 1400 | 1400 KC | * | * | * | *
Broadcast | 600 | 600 KC | C | | P₁₂ | Osc., Pad.

A—Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.
B—When aligning the short wave bands, do not adjust to the image frequency. For example, if the adjustment is correctly made at 21 MHz, then a weaker image will be heard at 21,000 KC less 920 KC, or about 20,070 KC on the dial.
C—When adjusting the pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.
D—See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.

Voltage taken from ground with line voltage at -120 V. High voltage reading off rectifier - 325 V. Drop across speaker field - 69 V. Voltage taken with 1,000 Ohm per volt meter.

Band Switch in BC position except R.F. Stage measurements.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>SCR. GRID</th>
<th>PLATE</th>
<th>OSC. PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7</td>
<td>R.F. SW</td>
<td>8.5</td>
<td>110</td>
<td>260</td>
<td>210</td>
</tr>
<tr>
<td>6SK7</td>
<td>Mixer</td>
<td>110</td>
<td>265</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>6SK7</td>
<td>L.F. Amp.</td>
<td>2</td>
<td>110</td>
<td>220</td>
<td></td>
</tr>
<tr>
<td>6SK7</td>
<td>I.F. Amp.</td>
<td>4</td>
<td>110</td>
<td>250</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>SCR. GRID</th>
<th>PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SQ7</td>
<td>Diode-AVC</td>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>6V6G</td>
<td>Output</td>
<td>12.5</td>
<td>265</td>
<td>260</td>
</tr>
<tr>
<td>80</td>
<td>Rect.</td>
<td></td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>6US</td>
<td>Tuning Eye</td>
<td></td>
<td></td>
<td>265</td>
</tr>
</tbody>
</table>
ELECTRICAL SPECIFICATIONS

I.F. Frequency 455 K.C.
I.F. Sensitivity (from 6K8 Grid) = 60 Microvolts for 
½ Watt Output
Power Output, Max. 5 Watts; Undistorted 2.3 Watts

SPEAKER

5-inch P. M. Dynamic
Voice Coil Impedance 3.5 Ohms at 400 cycles

TUNING RANGE

540 K.C. to 1580 K.C.

VOLTAGE READINGS

6 volts at the set
0Z4 cathode to chassis = 225 volts.
Output of filter = 205 volts (set B+).
0Z4 Rectifier
Plate to cathode of 6V6 output tube pins = 3 (+) and 8 (-) = 205 volts.
Cathode of 6V6 output (pin #8) to chassis 10 volts.
Screens of 6K7—6K8 (pin #4) to chassis 95 volts.
Screen of 6V6 to chassis (pin #4) 205 volts.

TO ALIGN I.F.

Attach signal generator "hot" lead to grid of 6K7 through a 1/10 MF condenser, connect ground side of generator to case. Set signal generator at 455 K.C., turn volume control to maximum, attach an output meter or resonance indicator, either the plate circuit of the 6V6 tube or across the voice coil terminals of the speaker. Adjust 2nd I.F. transformer for maximum output. Shift hot generator lead to 6K8 grid and adjust 1st I.F. transformer for maximum output. Recheck 2nd I.F. adjustment, with generator connected to 6K8 grid. Do not use greater generator signal than is necessary to obtain good output meter reading. For location of 1st and 2nd I.F. transformers, see tube layout diagram. I.F. sensitivity is approx. 60 microwatts for ½ watt output, measured from 6K8 grid.

TO ALIGN R.F.

Use standard cowl antenna cable to connect signal generator to set. Connect a 35 micromicro farad condenser to the signal generator "hot" terminal and the other side of the condenser to the antenna cable. Connect the ground side of the signal generator to the shield side of the cable. Turn variable condenser to zero capacity. Set signal generator to 1580 K.C. Adjust trimmer on oscillator section (front section of condenser) until signal is heard. Tune set to approximately 1400 K.C., set signal generator to this frequency, and adjust antenna compensator for maximum output. R.F. sensitivity 6 micro volts at 1400 K.C. and 10 micro volts at 600 K.C. for ½ watt output.

MODEL #60808 JA-40
Current Drain 5.25 Amps at 6.3 Volts

1940—Hudson

NOTE. Receivers with serial numbers above 14000 have a 1/10 MF condenser across vibrator points and a 200 ohm resistor in the cathode of the 6K8GT tube.
**CUMLINES**

**MODEL JA41**

**HUDDSON MOTOR CO**

---

### Tube Locations

- **6SK7**
- **6V6GT**

---

### Socket Voltages

**6SK7**

- **L.F. (655 kC)**
- **65V BATTERY**
- **Total Drain, 5.7 Amp**

---

### For Parts Not Shown, See Page 11

- **6SA7**
- **6X5GT**

---

### Important Note

Use a high resistance voltmeter of at least 1000 ohms.

VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS

**6SK7**

- **L.F. (655 kC)**
- **65V BATTERY**
- **Total Drain, 5.7 Amp**

---

**6V6GT**

- **OUTPUT**

---

**6X5GT**

- **RECT.**
- **VIBRATOR**

---

**NOTE A:** The bias on the control grid of the 6V6GT tube is 12 volts measured across resistor No. 16.

---

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Compliments of www.nucow.com
ALIGNMENT PROCEDURE FOR MODEL JA-41 ONLY

IMPORTANT: The "Simplified Alignment Procedure" should always be used unless the adjustments on the tuner cover have become loose or if someone has tampered with them.

Use the "General Alignment Procedure" only in instances of poor calibration, and poor stability at the low frequency, and after the Simplified Procedure has been completed. The General Alignment Procedure is also necessary if the antenna or oscillator coils are worn or replaced.

1. Check to see that the tuner is 1/4" from end-of-dial window (Vol. Control knob) when gauge condenser is fully marked.
2. Set the receiver for maximum output. Remove the bottom cover and make sure that the plates of the 6V6GT output tube are not dirty.雪
3. Connect the ground lead of the signal generator to the receiver chassis and leave it connected throughout this procedure.
4. Turn volume control to maximum volume position.
5. Check to see that pointer is in "8" from end-of-dial window (Vol. Control knob) when gauge condenser is fully marked.

Simplified Alignment Procedure

REMOVE TOP COVERS OF RECEIVER, BOTH SPEAKER SECTION AND CONTROL COVER

<table>
<thead>
<tr>
<th>Component</th>
<th>Signal Generator Frequency</th>
<th>Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MF. Condenser</td>
<td>Antenna Connector</td>
<td>405 EC</td>
<td>Any point where it does not affect the signal</td>
<td>1—2</td>
<td>2ND L.F. Adjust for maximum output</td>
</tr>
<tr>
<td>50 MF. Condenser</td>
<td>Antenna Connector</td>
<td>1600 EC</td>
<td>Turn tuning knob to max. clockwise position</td>
<td>5</td>
<td>Confer to (Shunt) Condenser Carefully adjust for maximum output</td>
</tr>
<tr>
<td>50 MF. Condenser</td>
<td>Antenna Connector</td>
<td>1600 EC</td>
<td>Accurately tune to 1600 EC generator signal</td>
<td>6</td>
<td>Antenna (Shunt) Condenser Adjust for maximum output</td>
</tr>
</tbody>
</table>

CALIBRATE DIAL AS SHOWN UNDER HEADING "DIAL CALIBRATION" OVER FIG. 2 BELOW

After the set has been installed in the car, tune to a fairly weak station near 1400 EC and adjust trimmer No. 6 until maximum volume is obtained. This trimmer can be reached by removing the plug button at the left front corner of the bottom of the case.

General Alignment Procedure

TO PERFORM THIS ALIGNMENT PROCEDURE THE RECEIVER CHASSIS MUST BE REMOVED FROM THE CASE

<table>
<thead>
<tr>
<th>Component</th>
<th>Signal Generator Frequency</th>
<th>Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MF. Condenser</td>
<td>Antenna Connector</td>
<td>405 EC</td>
<td>Any point where it does not affect the signal</td>
<td>1—2</td>
<td>2ND L.F. Adjust for maximum output</td>
</tr>
<tr>
<td>50 MF. Condenser</td>
<td>Antenna Connector</td>
<td>1600 EC</td>
<td>Turn tuning knob to max. clockwise position</td>
<td>5</td>
<td>Confer to (Shunt) Condenser Carefully adjust for maximum output</td>
</tr>
<tr>
<td>50 MF. Condenser</td>
<td>Antenna Connector</td>
<td>1600 EC</td>
<td>Accurately tune to 1600 EC generator signal</td>
<td>6</td>
<td>Antenna (Shunt) Condenser Adjust for maximum output</td>
</tr>
</tbody>
</table>

ADJUSTMENT OF TUNING CURVES IN ANTENNA AND OSCILLATOR COILS:

1. Locate the lock nut on the lower end of the tuned tuning (see Fig. 2 below). Hold the coil stationary, tighten the lock nut (on the oscillator or top coil) (see Fig. 2 below). Use a small amount of speaker cement on the lock nut to secure against temper (see Fig. 2 below). Do not tighten the lock nut on the antenna coil as further adjustment is necessary.

2. Use a small amount of speaker cement on the lock nut to secure against temper (see Fig. 2 below). Do not tighten the lock nut on the antenna coil as further adjustment is necessary.

3. After the set has been installed in the car, tune to a fairly weak station near 1400 EC and adjust trimmer No. 6 until maximum volume is obtained. This trimmer can be reached by removing the plug button at the left front corner of the bottom of the case.

Dial Calibration:

Place the case note on the receiver case. Check the calibration by turning in a station of known frequency on the high frequency end of the dial. Calibration is incorrect, hold the tuning knob and turn the dial drum, stop the eraser on your point to rotate the drum, to the correct frequency. Repeat this after set is installed in car.

Align procedures for Models DB-41 or SA-41:

ALIGNMENT PROCEDURE FOR MODELS DB-41 OR SA-41

For alignment on output meter of an accurately calibrated signal generator are required:

1. Remove the top and bottom covers of the receiver case.
2. Connect output meter across output tube or between the plates of the 6V6GT output tube.
3. Connect the ground lead of the signal generator to receiver chassis and leave it connected throughout this procedure.
4. Turn volume control to maximum volume position.
5. Check to see that pointer is in "8" from end-of-dial window (Vol. Control knob) when gauge condenser is fully marked.

I. F. ALIGNMENT FOR MODEL DB-41 ONLY (8 tube Set)

BEFORE ALIGNING THE I. F. TRANSFORMER, CONNECT GREEN-WHITE WIRE ACROSS TRANSFORMER BETWEEN TERMINALS A AND B AS SHOWN IN FIGURE

I. F. ALIGNMENT FOR MODEL SA-41 ONLY (6 tube Set)

II. F. ALIGNMENT FOR EITHER MODEL SA-41 OR DB-41

NOW REPEAT ADJUSTMENTS MADE ON TRIMMERS 8, 8, AND 7

After the set has been installed in the car, tune to a fairly weak station near 1400 EC and adjust trimmer No. 6 until maximum volume is obtained. This trimmer can be reached by removing the plug button at the left front corner of the bottom of the case.

TOP VIEW OF MODEL DB-41

BOTTOM VIEW OF MODEL DB-41

Compliments of www.nucow.com
CHASSIS WIRING DIAGRAM FOR MODEL DB-41

HOW TO SET UP PUSH BUTTONS ON MODELS SA-41 AND DB-41

1. Operate set for 10 minutes before set-up.
2. TO LOCK MECHANISM
   (a) Rotate tuning control downward until dial pointer stops at "EF-SET".
   (b) Move black set-up switch to right.
   (c) Push up locking knob and turn counter-clockwise approximately 2 turns, or until slight resistance is felt. Pull locking knob down to disengage.
3. Push in selected button as far as it will go and tune normally to desired station, while holding button in.
4. Follow same procedure for other buttons. After setting any button, do not touch it again until mechanism is locked as in 5. Otherwise, it must be reset.
5. TO UNLOCK MECHANISM
   (a) Rotate tuning control downward until dial pointer stops at "RESET".
   (b) Push up locking knob and turn clockwise as tightly as possible by hand. Pull locking knob down to disengage.
   (c) Push set-up switch to the left.

MODEL SA-41 TUBE LOCATIONS

This socket mounted with keyway in opposite direction in late sets.

CHASSIS WIRING DIAGRAM FOR MODEL SA-41

Terminals of coils shown in the circuit diagrams on the adjacent page are lettered to correspond to similarly lettered terminals on the chassis wiring diagram and coil illustrations shown on this page. Terminals which are connected together carry the same letter.
1-Type 12SK7 R.F. Amplifier.
1-Type 12SA7 Mixer, First Detector-oscillator.
1-Type 12SQ7 Second Detector, A.V.C. and First Audio.

1-Type 35L6GT Beam Output Amplifier.
1-Type 35Z5GT High Vacuum Rectifier.

PARTS

RESISTORS
R1 130K218 50 ohm—1/2 w.
R2 130K230 100M ohm—1/2 w.
R3 130K240 20M ohm—1/2 w.
R4 130K250 25 ohm—1/2 w.
R5 130K252 25 ohm—1/2 w.
R6 130K10 150M ohm—1/2 w.
R7 130K10 10M ohm—1/2 w.
R8 130K10 1M ohm—1/2 w.
R9 130K10 1M ohm—1/2 w.
R10 101K127 1 megohm volume control
R11 130K257 3 megohm—1/2 w.
R12 130K11 100M ohm—1/2 w.
R13 130K10 500M ohm—1/2 w.
R14 130K10 120 ohm—1/2 w.

CONDENSERS
C1 102140B 2 gang variable condenser
C2 12K51 .000125 Mica
C3 12K12 .0025 Mica
C4 10026 .02 x 400 v.
C5 1 Antenna Trimmer on gang
C6 1 Oscillator trimmer on gang
C7 1001 .1 x 400 v.
C8 1001 .25 x 300 v.
C9 1295 .001 Mica
C10 1295 .001 Mica
C11 1295 .001 Mica
C12 1295 .001 Mica
C13 1295 .003 x 600 v.
C14 10010 2 x 400 v.
C15 11951E 30 mfd. lytic—150 v.
C16 11951E 30 mfd. lytic—150 v.
C17 1295 .001 Mica
C18 10078 .01 x 300 v.
C19 11951E 40 mfd. lytic—150 v.
C20 10026 .02 x 600 v.

C15, C16, and C19 in same unit

T1 111139 Loop Antenna
T2 110128 Oscillator Coil
T3 100149F Input I.F. Coil
T4 100149B Output I.F. Coil
T5 10088K Output Transformer
T6 114116G 8” Dynamic Speaker (45 ohm field)
L1 1237 Antenna Loading Coil
P1 102498 8 volt, Pilot light . T-47
S1 Off-on Switch on Volume Control

FIG. 1—TOP VIEW

BOTTOM VIEW OF CHASSIS

ALIMENT
Connect P- of radio chassis to ground post of signal generator through .1 mfd condenser.

I.F. peak 455 KC. I.F. alignment conventional—see Vol. VII.

Special Set.
Trim oscillator at 1650 KC.
Trim antenna at 1400 KC. (Lay signal generator lead near, but not on, loop—when adjusting trimmer.)
Calibrating the Radio

To calibrate the radio, tune it in a station of known frequency. Remove the dial lamp assembly from the back of the control unit. The calibration screw is at the bottom of the dial lamp tube. Hold the tuning knob. Insert a fine bladed screwdriver and turn this screw until the pointer is at the frequency of the station being received.

A short insulated screwdriver will be helpful.

Alignment Procedure

Remove Grille, Speaker, Trimmer Caps and Rear Cover From Chassis Case.—See Figs. 3 and 5.

Volume Control—Maximum All Adjustments.

Local-Distance Switch—'Distance' Position.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Alignment Procedure

| SIGNAL Generator | FREQUENCY | CONNECTION | DUMMY | IRON Core Setting | ADJUST TRIMMERS TO MAXIMUM
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SETTING</td>
<td>AT RADIO</td>
<td>ANTE</td>
<td></td>
<td>(See Figs. 3 and 5)</td>
</tr>
<tr>
<td>I.F.</td>
<td>456 KC</td>
<td>Control Grid</td>
<td>.05 mf.</td>
<td>1st I.F. (C11) &amp; (C12)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(prong No. 8)</td>
<td></td>
<td>2nd I.F. (C15) &amp; (C16)</td>
<td></td>
</tr>
</tbody>
</table>

Oscillator

<table>
<thead>
<tr>
<th>OSCILLATOR</th>
<th>1560 KC</th>
<th>Antenna Cable</th>
<th>See Note A</th>
<th>Extreme Position out of Coil</th>
</tr>
</thead>
</table>

1000 KC Adjustment

<table>
<thead>
<tr>
<th>1000 KC</th>
<th>Antenna Cable</th>
<th>See Note A</th>
<th>Tune to Max. Output</th>
<th>int. (C6)</th>
</tr>
</thead>
</table>

Car Antenna Readjustment—Tune in weak signal near 1000 KC—Readjust Antenna Trimmer C4 for maximum output.

NOTE A—Insert the antenna cable plug in the antenna socket on the chassis. The total capacity of the antenna cable and dummy antenna should be 60 mmf. If the cable, for example, has a capacity of 30 mmf, use a 30 mmf. condenser for a dummy antenna. Connect the other end of the antenna cable through the dummy antenna capacity to the output of the signal generator.

CALIBRATION—To calibrate the radio, tune in a station of known frequency. At the back of the control unit is the calibration screw. Remove the dial lamp assembly. Hold the tuning knob. Insert a fine bladed screwdriver and turn this screw until the pointer on the dial scale is at the frequency of the station being received.
1. Connect the "high" side of the generator output to the grid (28) of the 6SA7 converter, and the "low" side of the generator to the ground of the chassis. The connection to the grid is most easily made by connecting to the nearest condenser in the tuning gang. If it is found that the generator does not furnish enough signal, it will be necessary to make this connection directly to the control grid of the 6SA7 tube and to disconnect the mixer coil from this grid. This point is indicated at "B" on the schematic diagram.

2. Connect a 0-60 or 0-200 microammeter in series with the "ground" and of the 100,000 ohm resistor (62). This is point "E" on the diagram. Connect the positive terminal of the meter to ground. This will measure the grid current of the 6AC7 tube. A reading of 20 to 100 microamperes is all that should be expected at this point. If an Analyst or a D.U. electronic voltmeter is available, it can be connected directly across this 100,000 ohm resistor (62) without disconnecting the resistor. This measures the limiter grid bias voltage. A reading of 3 to 10 volts should be considered normal.

5. Set the generator at 4300 kc, and align the I.F. trimmers for maximum grid current in the 6AC7 tube as indicated by the microammeter or voltmeter.

6. The I.F. stages are now aligned. Remove the microammeter and re-connect the 100,000 ohm resistor (62) as it was before.

10. To connect an antenna to the receiver and use a P.M. transmitter for the frequency standard, preferably one between 67 mc. and 50 mc.

11. Set the dial on the known frequency of the transmitter and adjust the oscillator air trimmer (11) until the signal produces a maximum reading on the microammeter. Then adjust the trimmers (12) and (13) on the mixer and antena coils for maximum reading. If too much signal is fed to the receiver, it will appear at several settings of the dial and confuse the adjusting. These trimmers should align rather loosely. If they are tightened too much, the frequency of the R.F. circuit equals the oscillator frequency, and spurious oscillations are produced. The oscillator frequency is normally 4500 kc, lower than the signal frequency. When the above adjustments are completed and the 120,000 ohm resistor (60) is again grounded, the receiver has been aligned.
REPLACEMENT PARTS LIST

Schematic Location Part Number Condensers
C1, C2—C18, C17 Y-CT-24 Trimmer
C40, C15 Y-VC-33 Variable
C4, C11, C12 C-15754 .01 mfd. 400 V. Tubular
C10 C-49 .005 mfd. 400 V. Tubular
C13, C29 C-15756 .05 mfd. 400 V. Tubular

CONDENSERS
C34 C-15752 .05 mfd. 200 V. Tubular
C9, C30 CM-31 100 mmdfd. 30% Mica
C14 CM-29 50 mmdfd. 30% Mica
C18 Y-CT-27 Padder Condenser
C20, C21, C22, C23, C24
C25 Y-CT-31 Trimmer Strip
CM-34 150 mmdfd. 5% Silvered Mica
C26 CM-33 250 mmdfd. 5% Silvered Mica
C27, C28 Y-CE-43 Electrolytic Condenser
C31 C-18 .01 mfd. 400 V. Tubular
C32, C33 CM-30 250 mmdfd. 30% Mica
C39 CM-9 5500 mmdfd. 5% Mica

RESISTORS
R1 R-15601 100 ohm 1/4 W 20% Carbon
R2 R-54 50K ohm 1/4 W 20% Carbon
R3 R-15541 5K ohm 1/4 W 20% Carbon
R4 R-15544 15K ohm 1 W 20% Carbon
R5 R-15500 2 megohm 1/4 W 20% Carbon
R6 Y-VC-33 Volume Control
R7, R9 R-15517 1 megohm 1/4 W 20% Carbon
R8, R12 R-15512 250K ohm 1/4 W 20% Carbon
R10, R11 R-87 70 ohm 1/4 W 20% Carbon

CONTROLS
R13 Y-VC-33 Tone Control
S1 Y-SW-25 2 pos. band switch
S2 Y-SW-19 6 button Switch

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PRE-SETTING OF PUSH BUTTONS

The push-buttons may be easily set to receive any five stations desired provided that three of them lie between 540 and 1100 KC, one of them between 800 and 1350 KC, and one of them between 1200 and 1600 KC. Note on the diagram that push button number 1 covers the range 1200-1600 KC. If the station selected lies between those frequencies then push the button in as far as possible and with a small screwdriver adjust the screw from the back of the receiver that corresponds to that button until the station desired can be heard as loudly as possible. Complete the adjustment by adjusting the corresponding trimmer from the top of the chassis until maximum volume again results. In making these adjustments, it is desirable to keep the volume control turned down to low volume. By pressing button number 2, the corresponding coil adjusting screw and trimmer condenser may be adjusted to the next station and the same process repeated for the balance of the buttons.

**Schematic Location**

<table>
<thead>
<tr>
<th>Location</th>
<th>Part No.</th>
<th>Condensers</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C2,-C24</td>
<td>Y-CT-24</td>
<td>Trimmer</td>
</tr>
<tr>
<td>C25</td>
<td>Y-CV-33</td>
<td>Variable Condenser</td>
</tr>
<tr>
<td>C18, C19, C20,</td>
<td>Y-CT-31</td>
<td>Trimmer strip</td>
</tr>
<tr>
<td>C21, C22</td>
<td>C-15761</td>
<td>Padder Condenser</td>
</tr>
<tr>
<td>C26</td>
<td>C-15754</td>
<td>640 V Tubular</td>
</tr>
<tr>
<td>C3</td>
<td>C-15769</td>
<td>600 V Tubular</td>
</tr>
<tr>
<td>C14</td>
<td>C-15758</td>
<td>500 V Tubular</td>
</tr>
<tr>
<td>C15</td>
<td>C-18</td>
<td>400 V Tubular</td>
</tr>
<tr>
<td>C17, C32</td>
<td>Y-CE-43</td>
<td>Electrolytic Condenser</td>
</tr>
<tr>
<td>C29</td>
<td>C-15745</td>
<td>Electrolytic Condenser</td>
</tr>
<tr>
<td>C30, C31</td>
<td>Y-CE-60</td>
<td>Electrolytic Condenser</td>
</tr>
<tr>
<td>C3</td>
<td>CM-29</td>
<td>50 mfd. 30% Mica</td>
</tr>
<tr>
<td>C11, C13</td>
<td>CM-31</td>
<td>100 mfd. 30% Mica</td>
</tr>
<tr>
<td>C8, C15</td>
<td>CM-30</td>
<td>250 mfd. 30% Mica</td>
</tr>
<tr>
<td>C23</td>
<td>CM-34</td>
<td>150 mfd. 5% Mica</td>
</tr>
<tr>
<td>C27</td>
<td>CM-9</td>
<td>5500 mfd. 5% Mica</td>
</tr>
<tr>
<td>C28</td>
<td>CM-33</td>
<td>250 mfd. 5% Mica</td>
</tr>
</tbody>
</table>

**Resistors**

<table>
<thead>
<tr>
<th>Model 2600 only</th>
</tr>
</thead>
<tbody>
<tr>
<td>R2</td>
</tr>
<tr>
<td>R1, R13, R14</td>
</tr>
<tr>
<td>R3</td>
</tr>
<tr>
<td>R4</td>
</tr>
<tr>
<td>R5, R16</td>
</tr>
<tr>
<td>R6, R10</td>
</tr>
</tbody>
</table>

**Model 260-P only**

| R7, R9          | R-15517 | 1 megohm 1/2 W 20% Carbon |
| R8, R15, R17    | R-15512 | 250K ohm 1/2 W 20% Carbon |
| R11, R12        | R-87    | 70 ohm 1/2 W 20% Carbon |

**Description**

| Loop Antenna   | Y-CE-100 |
| Short Wave Antenna Coil | Y-CE-96 |
| Oscillator Coil | Y-CE-71  |
| 1st I.F. Transformer | Y-CE-43  |
| 2nd I.F. Transformer | Y-CE-44  |
| Speaker Output Transformer | LB-G-11W |

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The tuning range is 540-1800 Kilocycles.

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION
VOLUME VIII

The battery packs recommended to be used:

Burgess No. 17GD60 or equivalent
Eveready No. 748 or equivalent
Ray-O-Vac No. AB-82 or equivalent

The tubes used are:

1-6A7 Frequency converter
1-6D6 Intermediate frequency amplifier
1-7S 2nd detector, AVC, and audio driver
1-41 Output
1-80 Rectifier

This is a five (5) tube Alternating Current (AC) receiver. This set operates ca 110-115 Volts 60 Cycles current. The tuning range is from 540 to 1750 kilocycles. This includes standard broadcast and most city police stations. This set is equipped with automatic volume control and a Majestic Hi-Q Loop Antenna shielded by a Faraday screen.
The frequency coverage is from 540 to 1650 kilocycles, i.e. from 555 to 182 meters. This includes the standard broadcast band and some police calls.

The tubes used are:

1—1A7GT Converter.
1—I1N5GT I. F. Amplifier.
1—I1H5GT 2nd Detector, AVC, and A. F. Amplifier.
1—I1D8GT 2nd A. F. Amplifier and Output Tube Used on Battery Operation only.

1—70L7GT Output and Rectifier Tubes Used on Line Operation Only.

The receiver is equipped with three push buttons. The first from the right is for line operation. The middle push button is for battery operation. The left hand push button is to turn the set off.

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ALIGNMENT PROCEDURE

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- A counter. Non-metallic screwdriver.
- Dummy antennas —1 Mr., 20 Mr., 400 Ohms.

Volume control — Maximum all adjustments.
Connect radio chassis to ground post of signal generator with a short heavy lead. Connect dummy antenna in place in series with generator output lead. Connect output meter through dummy antenna to output terminals. Allow chassis and signal generator to "heat up" for several minutes.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmer Adjusted</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  4</td>
<td>40 Kc. 1 MFD.</td>
<td>Grid, at 45827</td>
<td>1 F. Fixed</td>
<td>Broadcast</td>
<td>2 trimmers on top (See Fig. 1)</td>
<td>Output 50 Kc.</td>
<td>Adjust to maximum output.</td>
<td></td>
</tr>
<tr>
<td>465 Kc. 1 MFD.</td>
<td>Grid, at 45827</td>
<td>Fixed</td>
<td></td>
<td></td>
<td></td>
<td>Output 50 Kc.</td>
<td>Adjust to maximum output.</td>
<td></td>
</tr>
</tbody>
</table>

SHORT WAVE BAND
25 Mc. 40 ohms Antenna lead Antenna lead (Extensive Right Rotation) Set Dial at 24 Mc. Trimmer (C) (See Fig. 2) Short wave oscillator See Note "A" Adjust to maximum output.

MEDIUM WAVE BAND
6 Mc. 400 ohms Antenna lead Antenna lead (Extensive Right Rotation) Set Dial at 6 Mc. Trimmer (C), (C) (See Fig. 2) Medium wave oscillator and antennas Adjust to maximum output.

BROADCAST BAND
1750 Kc. 200 mfd. Antenna lead Antenna lead Broadcast (See Fig. 4) Trimmer (C), (C) (See Fig. 2) Medium wave oscillator and antennas Adjust to maximum output.

Test Frequencies Used

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Kilocycles</th>
<th>Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465</td>
<td>645.1</td>
</tr>
<tr>
<td>Short Wave</td>
<td>25000</td>
<td>14.2</td>
</tr>
<tr>
<td>Medium Wave</td>
<td>6000</td>
<td>10</td>
</tr>
<tr>
<td>Medium Wave</td>
<td>2300</td>
<td>130</td>
</tr>
<tr>
<td>Broadcast</td>
<td>1730</td>
<td>1714.4</td>
</tr>
<tr>
<td>Broadcast</td>
<td>1500</td>
<td>200</td>
</tr>
<tr>
<td>Broadcast</td>
<td>600</td>
<td>500</td>
</tr>
</tbody>
</table>

NOTE "A" — It is extremely necessary when making this adjustment that the fundamental oscillator signal be tuned in and not the image frequency which will fall below the fundamental.

NOTE "B" — Turn the dial lock and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

ATTENTION be sure to use 'A' button setting of the AVC.

After each range is complete, repeat the process as a final check.

Setting the Station Buttons

Select the first station from the list you have prepared, and carefully tune in this station by rotating the manual tuning knob until the signal is clearest and strongest.

With one hand, hold the manual tuning knob to prevent it from turning and with the other hand, push one of the station buttons shown in the illustration all the way in. It is better to start with the top button.

Hold this button all the way in. With the other hand, see whether or not the station is still accurately tuned by turning the tuning knob a slight amount back and forth. Be sure to hold the button all the way in.

Release the button slowly after the station is tuned in.

CAUTION — Do not touch this button again while the mechanism is unlocked as the setting may be altered.

Carefully tune in the second station on your list. Then hold the tuning knob and push the second button slowly and firmly all the way in. Check for accurate tuning.

Proceed in the same manner to tune any additional stations on your list on the remaining station buttons.

After all the stations are set, it will be necessary to lock the mechanism so that the settings will not change. Turn the manual tuning knob so that the dial pointer moves toward 1550 KC until the stop is reached. Then, with a SMALL HANDLED screwdriver, turn the locking screw in a clockwise direction until it is tight. Tighten the locking screw firmly but not excessively to avoid stripping the threads. Replace the cap over the hole.

Remove the correct station call letter tabs from the sheets supplied by bending the sheet back and forth at the score mark until the tab can be broken off. Press the tab all the way to the bottom of the space provided in the button. Cover the call letter tab with a celluloid tab, pressing this in until it maps into place.

If at any time you wish to change the setting of any button from one station to another, repeat the above procedure. Changing the setting of one button will affect the setting of any of the other buttons.
DRIVE CORD REPLACEMENT

To a knot with a small loop at each end of new drive cord. The distance between knots should be 3/32 inches. Turn gang condenser to full open position. See illustration.

Thread one end of drive cord down through hole in groove of drive pulley, then loop on hook on pulley. Wind other end of cord 3 times clockwise from pulley side of chassis around drive pulley. Hook end under idler cord A. Wind 3 turns clockwise from front of chassis around tuning control shaft. Knot should progress away from chassis.

Continue cord over idler wheel B and C as shown. Then wind cord 3 turns counterclockwise from drive pulley side of chassis around drive pulley. The turn should be on left side (rear of chassis) of pulley groove. Snap cord through hole in drive pulley. Hook loop on tuning spring. Fasten other end of spring to hook on pulley.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltages and Currents</td>
<td></td>
</tr>
<tr>
<td>A: Battery</td>
<td>1.5 Volts-20 Amperes</td>
</tr>
<tr>
<td>B: Batteries</td>
<td>30 Volts-6 Amps</td>
</tr>
<tr>
<td>Power Output</td>
<td>70 Milliwatts Undistorted</td>
</tr>
<tr>
<td>Selectivity</td>
<td>40 KC Broad at 1000 Times Signal</td>
</tr>
<tr>
<td>Intermediate Frequency</td>
<td>456 KC</td>
</tr>
<tr>
<td>Speaker</td>
<td>3&quot; P.M. Dynamic</td>
</tr>
<tr>
<td>Tuning Frequency Range</td>
<td>528 to 1600 KC</td>
</tr>
<tr>
<td>Sensitivity (For 8W Watt Output)</td>
<td></td>
</tr>
<tr>
<td>External Antenna</td>
<td>40 Microvolts Average</td>
</tr>
</tbody>
</table>

ALIGNMENT PROCEDURE

Volume Control-Maximum All Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

After Chassis and Signal Generator to "Heat Up" for several minutes. The following equipment is required for aligning.

A Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter—Non-Metallic Screwdriver.

Dummy Antenna—100 & 100 millif.

SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Connection at Radio</th>
<th>Dummy Antenna</th>
<th>Condenser Setting</th>
<th>Adjust Trimmers to Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>456 KC</td>
<td>1/4 in. (108)</td>
<td>1/4 in. (108)</td>
<td>1/2 mf.</td>
<td>1st L.F. (C1) &amp; (C2)</td>
</tr>
<tr>
<td>1600 KC</td>
<td>1/4 in. (108)</td>
<td>1/4 in. (108)</td>
<td>1/2 mf.</td>
<td>1st L.F. (C1) &amp; (C2)</td>
</tr>
<tr>
<td>1400 KC</td>
<td>1/4 in. (108)</td>
<td>1/4 in. (108)</td>
<td>1/2 mf.</td>
<td>1st L.F. (C1) &amp; (C2)</td>
</tr>
</tbody>
</table>

NOTE A—Reassemble chassis in cabinet. Replace back on cabinet. Connect ground post of signal generator to external ground clip on loom.

NOTE B—If the pointer is not at 1400 KC on the dial, move pointer from drive cord. Turn to 11400 KC signal. Set pointer at 1400 KC mark on the dial scale. Attach pointer to drive cord.
### Aligning Instructions

**CAUTION:** No aligning adjustments should be attempted without first thoroughly checking over all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low line voltage, defective tubes, condensers and resistors. In order to properly align this radio, the chassis should be removed from the cabinet.

### Service Notes

All voltages as indicated on the 117 volt A.C. or D.C. line.

- Resistances of coil windings are in ohms on the schematic circuit diagram.
### Models No. 04BR-511A and 04BR-512A ALIGNMENT PROCEDURE

**IMPORTANT:** See Aligning Instructions

- **Volume control—Maximum all adjustments.**
- **Connect B—of radio chassis to ground post of signal generator through .1 Mfd. condenser.**
- **Connect dummy antenna value in series with generator output lead.**
- **Connect output meter across primary of output transformer.**
- **Allow chassis and signal generator to “heat up” for several minutes.**

#### SIGNAL Generator Frequency Setting

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Iron Core (Dial Setting)</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Metal Antenna Backplate</td>
<td>Iron Core All the way out</td>
<td>Two trimmers on top of output I. F. can</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td></td>
<td>Connect to Metal Antenna Backplate</td>
<td>Iron Core All the way out</td>
<td>Two trimmers on top of input I. F. can</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>1720 Kc.</td>
<td>.1 MFD.</td>
<td></td>
<td>Connect to Metal Antenna Backplate</td>
<td>Iron Core All the way out</td>
<td>Trimmer (C7)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>1720 Kc.</td>
<td>200 MMF.</td>
<td></td>
<td>Connect to Outside Antenna Clip</td>
<td>Trimmer (C8)</td>
<td>(See bottom of chassis view)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### BAND

| Model No. 04BR-570A
- **Volume control—Maximum all adjustments.**
- **Connect radio chassis to ground post of signal generator.**
- **Connect dummy antenna value in series with generator output lead.**
- **Connect output meter across primary of output transformer.**
- **Allow chassis and signal generator to “heat up” for several minutes.**

#### SIGNAL Generator Frequency Setting

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6S7G I. F. Tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top of output I. F. can</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td></td>
<td>Grid of 6D8G</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top of input I. F. can</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>1650 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6D8G</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Top of gang (See Top View)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1400 Kc.</td>
<td>(See Note “A”)</td>
<td>(See Note “A”)</td>
<td>Grid of 6D8G</td>
<td>Trimmer—Top of gang (See Top View)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Note: “A”—Lay the output lead from the signal generator in back of the loop antenna. Turn up the output of the generator, picking up the energy in the loop antenna without any electrical connection from the signal generator.

#### Note: “B”—After the antenna coil has been tracked at 1400 Kc, it is necessary to check the antenna trimmer (C8) adjustment again at 1720 Kc. If no appreciable change in trimmer adjustment is made, the coil is in track. If the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1400 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1720 Kc.

Loop aerial should be connected when aligning receiver and should be the same distance from the chassis as when mounted in the cabinet.
Diagram Parts
Ref.
No.
R1  BE130314  2300 ohm—½ w.
R2  BE130304  50M ohm—½ w.
R3  BE130309  200M ohm—½ w.
R4  BE130315  75 ohm—½ w.
R5  BE130303  40 ohm—½ w.
R6  BE130304  3 megohm—½ w.
R7  BE130301  25M ohm—½ w.
R8  BE130315  25 ohm—½ w.
R9  BE130318  1 megohm volume control
R10 BE130317  5 megohm—½ w.
R11 BE130303  500M ohm—½ w.
R12 BE130303  500M ohm—½ w.
R13 BE130316  150 ohm—½ w.
R14 BE130327  1200 ohm—½ w.

Condensers
C-  BE102132  2 gang variable condenser
C1  BE10001  .01 x 400 v.
C2  BE10001  .15 x 400 v.
C3  BE10001  .001 mfd. mica
C4  BE10001  .0005 mfd. mica
C5  BE12921  .0003 mfd. mica
C6  BE1009  .01 x 200 v.
C7  BE1009  .1 x 400 v.
C8  BE1009  .01 x 200 v.
C9  BE1285  .0001 mfd. mica
C10 BE10005  .002 x 600 v.
C11 BE12912  .0005 mfd. mica
C12 BE10518  .001 x 600 v.
C13 BE11992  20 mfd. electrolytic 150 v.
C14 BE11992  40 mfd. electrolytic 150 v.
C15 BE10006  .02 x 400 v.
C16 and C14 are in same unit

Power Consumption  - -  -  35 watts
Power Output  - -  -  800 Milliwatts Undistorted
Sensitivity for 50 Milliwatt Output:
20 Microvolts Average

Selectivity  -  65 KC Broad at 1000 Times Signal at 1000 KC
Loop aerial should be connected when aligning receiver.

NOTE "A"—Mount the chassis and the loop antenna in the cabinet, connect the loop antenna to the chassis. Adjust the antenna trimmer through hole in bottom of cabinet.

NOTE "B"—Lay the output lead from the signal generator in back of the loop antenna. Turn up the output of the generator, picking up the energy in the loop antenna without any electrical connection from the signal generator.

PARTS
T1 BE11182 Loop antenna—complete assembly
T2 BE11046 Oscillator coil
T3 BE108140 Input I. F.—455 kc.
T4 BE10814D Output I. F.—455 kc.
T5 BE108100 Transformer
T6 BE14010 5" P. M. Speaker
L1 BE13331 Loading coil
S1 BE107496 On-off switch on volume control
P1 BE107499 Pivot light bulb T47

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REPLACING PUSHBUTTONS

Should it ever be necessary to replace a broken or lost pushbutton you will notice they are made in two parts, a clear front and a brown body. To separate the two portions first take off the escutcheon. Push the button in—next push the brown body of the button back until it snaps free from the clear front. You can now lift the clear portion off and take out the brown body. To replace the pushbutton, reverse the procedure.

HOW TO REMOVE CHASSIS

Should it ever be necessary to take the chassis out of the cabinet be sure to pull the plug from the light socket. Next pull the control knobs off the shafts and take the escutcheon off.

Turn the spring clips clear of the back and take the back off—be sure to disconnect the loop aerial and the speaker plug, also the plugs from the phonograph unit. Remove the chassis mounting screws and lift the chassis out.

SERVICE NOTES

Voltages taken from different points of circuit to chassis are measured with volume control at minimum, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt.

Resistances of coil windings are indicated in ohms on the schematic circuit diagram.

To check for open by-pass condensers short each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Excessive hum, stuttering, low volume and a reduction in all D.C. voltages is usually caused by a shorted electrolytic condenser; open by-pass condensers frequently cause oscillation and distorted tone.

ALIGNING INSTRUCTIONS

CAUTION—No aligning adjustments should be attempted without first thoroughly checking over all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low line voltage, defective tubes, condensers and resistors. In order to properly align this radio, the chassis should be removed from the cabinet. Although the short wave bands on this radio are of the band spread type the Alignment Procedure is not difficult. However because each short wave scale covers only a small portion of the short wave spectrum you must do the work carefully and your oscillator must be accurate.

Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows.

First refer to the "Iron Core Adjustment View"—turn the tuning knob until the drive bar comes within 1/64 to 1/32 from the stops. (A piece of blotting paper is about the right thickness and will serve as a gauge). The clearance of the bar must be the same at both stops. If far off you can raise one drive screw gently and equalize them. Minor adjustments may be made with the drive bar adjustments.

Next rotate each iron core until the fines score marks are even with the edge of the coil forms.

You are now ready to continue with the trimmer adjustments as shown on the alignment chart.

MODELS 903A, 907A, 1105A, 1106A

PHONOGRAPH-TELEVISION AND FM. JACK

Should you wish to use an external phonograph it should be plugged into the phonograph jack shown in the top view—The on-off radio-phonograph knob on the front panel will then switch from radio to phonograph operation.

If television or frequency modulation (FM) programs ever become available in your community this radio may still be used in conjunction with the necessary converters.

The jack marked phono-telephone-FM in the top view will accommodate either the phono or a television or FM converter.

MODELS 513A, 514A

SETTING THE AUTOMATIC PUSHBUTTONS

Make a list of your 5 favorite stations. Push out the call letters of these stations from the call letter sheets supplied. Insert a call letter in the slot or top of each pushbutton.

Next pull one of the pushbuttons all the way out as far as it will come (pull, with fingers on top and bottom of button). Now tune in the station you want with the tuning knob—tune back and forth until the station is clear and distinct. Now push the button hard all the way in to lock the station in place. (push directly on front of button) Continue setting each pushbutton in the same way. Pressing the proper button will now tune the station you want. If it does not do so you did not push the button hard enough to lock in place when setting up the station.

To change stations simply repeat the procedure above.

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Aligning Instructions

CAUTION—No aligning adjustments should be attempted without first thoroughly checking over all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low line voltage, defective tubes, condensers and resistors. In order to properly align this radio, the chassis should be removed from the cabinet.

To remove chassis from the cabinet pull tuning knob and volume knob off their shafts. Remove the four mounting screws that hold the chassis to the cabinet. Move the chassis toward back of cabinet so that control shafts and dial assembly clear holes in cabinet, then chassis can be slipped out.

Montgomery Ward & Co., Model 515, A & B

Model 4BR-515A (Serial No. OE507100 and UP)

Power Consumption — 50 Watts

Power Output — 900 Milliwatts Undistorted

Sensitivity (for .5 Wats Output) Broadcast Band—40 Microvolts Average

Selectivity — 65 KC Broad at 1000 Times Signal at 1000 KC

Tuning Frequency Range — 535 to 1890 KC

Compliments of www.nucow.com
Model No. 04BR-515A

- Volume control—Maximum all adjustments.
- Connect — B of radio chassis to ground post of signal generator through .1 Mfd. condenser.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 Mfd., and 200 Mfd.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Iron Cores (Dial Setting)</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc. .1 MFD.</td>
<td>Connect to Antenna Plate See Trimmer View</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Top View)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc. .1 MFD.</td>
<td>Connect to Antenna Plate See Trimmer View</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Top View)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1600 Kc. .1 MFD.</td>
<td>Connect to Antenna Plate See Trimmer View</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C) (See Trimmer View)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1600 Kc. 200 MMF.</td>
<td>Connect to Antenna Lead See Trimmer View</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C) (See Trimmer View)</td>
<td>Antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1400 Kc. 200 MMF.</td>
<td>Connect to Antenna Lead See Trimmer View</td>
<td>Turn Dial to 1400 Kc.</td>
<td>Adjust position of antenna coil right or left</td>
<td>Antenna Coil Adjustment</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1600 Kc. 200 MMF.</td>
<td>Connect to Antenna Lead See Trimmer View</td>
<td>Turn Dial to 1600 Kc.</td>
<td>Adjust trimmer (C) (See Trimmer View)</td>
<td>Antenna</td>
<td>Check for tracking (See Note &quot;A&quot;)</td>
</tr>
</tbody>
</table>

NOTE "A"—The antenna coil assembly is made so that it is movable right or left. When making the adjustment as given in the alignment procedure, move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil frame.

Model Nos. 04BR-679A

- Volume control—Maximum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 mil., 175 mmfd.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc. .5 MFD.</td>
<td>Grid of 6K7G I.F. Tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 2)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>455 Kc. .5 MFD.</td>
<td>Grid of 6AG</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 2)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1500 Kc. 175 mnfd.</td>
<td>Antenna lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Top of Middle section of gang (See Fig. 2)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1400 Kc. 175 mnfd.</td>
<td>Antenna lead</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmer—Top of front and rear section of gang (See Fig. 2)</td>
<td>Antenna and R. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>600 Kc. 175 mnfd.</td>
<td>Antenna lead</td>
<td>Set dial at 600 Kc.</td>
<td>B.C. Series Pad (See Fig. 2)</td>
<td>Oscillator series pad</td>
<td>Adjust to maximum rock dial (See note &quot;A&quot;)</td>
</tr>
</tbody>
</table>

NOTE "A"—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained. Trimmer is located on top of chassis along side of gang. Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

After each band is completed, repeat the procedure as a final check. Do not bend plates of variable condenser to correct tracking.
FIG. 1—GENERAL INSTALLATION VIEW

RADIO LOCATION

Determine the most desirable mounting location. (See Fig. 1—General Installation View, page 2.)

In the majority of installations it will be found that the radio can be mounted under the dash panel directly to the left of the steering column.

BONDING

Cars with floating power must have the motor bonded to the bulkhead and again to the frame to provide a direct path for the high frequency interference developed in the ignition system. 5/8" copper braid will be necessary. SMALL DIAMETER WIRE WILL NOT DO. Bond flexible shaft leads, such as free wheeling, choke wires, etc., which pick up motor noise and reradiate it into the car. Free wheeling cables should be grounded at the point at which they go through the fire wall of the car. In extreme cases it has been found necessary to ground the steering column.

GENERATOR INTERFERENCE

Remove the generator cutout mounting screw and fasten the condenser (100-81) bracket on the generator cutout mounting lug. Replace the cutout mounting screw and tighten down securely.

Connect the condenser lead to the battery terminal of the cutout. The generator condenser is absolutely necessary as it is used to eliminate a high pitched whining noise which would otherwise be heard as the motor is accelerated.

PROCEDURE FOR SETTING THE AUTOMATIC LEVERS

There are five levers on the dial by means of which five stations may be selected. See "B" Fig. 2.

Make a list of local stations you tune in regularly; any number up to and including five.

Punch out from the set of station call letter tabs supplied, the call letters of the stations you have selected.

On the front of each automatic tuner lever an opening is provided for inserting the call letter tabs. See "A" Fig. 2.

Insert the call letter tabs in the rectangular openings of each of the automatic tuner levers. One of the small celluloid tabs supplied should be snapped into place over each of the station call letter tabs.

Press DOWN ALL THE WAY any one of the automatic tuner levers. Holding it down FIRMLY, tune in by means of the tuning knob (No. 1) the station you have assigned to this lever. Turn the tuning knob very slowly back and forth (while still holding lever in downward position) until the signal is clearest. The station will then be accurately tuned in. Release the lever.

Press down another automatic tuner lever. Holding it down FIRMLY, carefully tune in the station assigned to this lever. Release this lever.

Follow this procedure until you have selected all of your favorite stations.

Now rotate the tuning knob (No. 1) to the right (clockwise) as far as it will turn, and tighten the special locking screw ("C") located on left side of tuner dial assembly (See Fig. 2).

It is VERY IMPORTANT that this locking screw is turned until it is ABSOLUTELY TIGHT.

This screw will lock in place all the stations you have selected on the automatic tuner levers. (Note: Locking screw "C" is loose when radio is shipped from factory.)

If you should desire to change any station you selected to another, loosen the locking screw "C" one or two turns, select the new station as explained. Be sure to retighten the locking screw, otherwise the stations you have selected will not stay adjusted to the levers.

The automatic dial is now set up for quick tuning. Press down on the lever and your favorite station is selected.

ADJUST ANTENNA TRIMMER

Tune in a weak signal at approximately 600 K.C. with volume control about three-fourths on. Adjust trimmer screw "X" until maximum output is obtained. (See Fig. 1, Adjustment "X" on right side of radio).

I.F. ALIGNMENT: (465 K.C.)

1. With variable condenser in its minimum capacity position (plates entirely out of mesh) and with volume control full on, connect test oscillator set at 465 K.C. in series with I.F. dummy antenna, to grid of 6SK7 I.F. tube.

2. Adjust trimmer condensers of output I.F. transformer No. 1081201 to resonance with oscillator.

3. Move test oscillator connection to grid of 6SA7 tube and adjust trimmer condensers of input I.F. transformer No. 108139 to resonance with oscillator. There are two adjustments on each and they are accessible from the top of the transformer shield and should be adjusted with an insulated screw driver. (See Fig. 3—top view, page 3.)

BROADCAST ALIGNMENT

1. With variable condenser in its minimum capacity position, connect test oscillator set at 1550 K.C. in series with broadcast dummy to the antenna lead of receiver.

2. Adjust oscillator trimmer of variable condenser to resonance. (This adjustment is the rear section of the two-gang condenser—see top view, Fig. 3).

3. Shift test oscillator to 1400 K.C. and pick up signal by rotating condenser and adjust antenna trimmer (front section of gang condenser) to resonance (see top view, Fig. 3).

4. Re-set test oscillator to 600 K.C. and rotate variable condenser to 600 K.C. Adjust series pad in the antenna circuit for maximum gain. This pad is mounted on the side of the antenna can, adjustment "X".

5. Go back and check 1400 K.C. If adjustment is made here, check 600 K.C. again.

6. Check for sensitivity at 1000 K.C. by setting test oscillator to this frequency and picking up the signal by rotating variable condenser. Under no circumstances bend plates of variable condenser sections to correct tracking.

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**MODEL 04WG-568**

**Input Voltages and Currents**
- A Battery: 16 Volts—20 Amperes
- B Battery: 12 Volts—12 Amperes

**Power Output**
- 100 Milliwatts Continuous

**Selectivity**
- 100 KC Band at 1000 Times Signal

**Intermediate Frequency**
- 456 KC

**ALIGNMENT PROCEDURE**

1. **Valve Control**—Maximum All Adjustments.
2. Connect Radio Chassis to Ground Post of Signal Generator with Shunt Lead. Allow Chassis and Signal Generator to "Heat Up" for several minutes.

**IMPORTANT**—Follow Procedure in order shown.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY SETTING</th>
<th>CONNECTION DIRECTION</th>
<th>DUMMY ANTENNA</th>
<th>SWITCH SETTING</th>
<th>CONSIDER OR GAR SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L.F.</strong></td>
<td>400 KC</td>
<td>Grid of 1st Det.</td>
<td>1 ohm</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>36 &amp; 44 Ohm (C &amp; D)</td>
</tr>
<tr>
<td><strong>RANGE B</strong></td>
<td>3000 KC</td>
<td>External Antenna Clip</td>
<td>100 mfd.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>36 &amp; 44 Ohm (C &amp; D)</td>
</tr>
<tr>
<td><strong>RANGE C</strong></td>
<td>3000 KC</td>
<td>External Antenna Clip</td>
<td>100 mfd.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>36 &amp; 44 Ohm (C &amp; D)</td>
</tr>
<tr>
<td><strong>RANGE D</strong></td>
<td>3000 KC</td>
<td>External Antenna Clip</td>
<td>100 mfd.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>36 &amp; 44 Ohm (C &amp; D)</td>
</tr>
<tr>
<td><strong>RANGE E</strong></td>
<td>3000 KC</td>
<td>External Antenna Clip</td>
<td>100 mfd.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>36 &amp; 44 Ohm (C &amp; D)</td>
</tr>
<tr>
<td><strong>RANGE F</strong></td>
<td>3000 KC</td>
<td>External Antenna Clip</td>
<td>100 mfd.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>36 &amp; 44 Ohm (C &amp; D)</td>
</tr>
</tbody>
</table>

**MODEL 04WG-569**

**Input Voltages and Currents**
- A Battery: 16 Volts—20 Amperes
- B Battery: 12 Volts—12 Amperes

**Power Conditions**
- AC Supply: 117 Volts—50 Watts

**Selectivity**
- 50 KC Band at 1000 Times Signal

**Intermediate Frequency**
- 456 KC

**ALIGNMENT PROCEDURE**

1. Volume Control—Maximum All Adjustments.
2. Allow Chassis and Signal Generator to "Heat Up" for several minutes.

**IMPORTANT**—Follow Procedure in order shown.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY SETTING</th>
<th>CONNECTION DIRECTION</th>
<th>DUMMY ANTENNA</th>
<th>SWITCH SETTING</th>
<th>CONSIDER OR GAR SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L.F.</strong></td>
<td>400 KC</td>
<td>Grid of 1st Det.</td>
<td>1 ohm</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>36 &amp; 44 Ohm (C &amp; D)</td>
</tr>
<tr>
<td><strong>RANGE B</strong></td>
<td>3000 KC</td>
<td>External Antenna Clip</td>
<td>100 mfd.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>36 &amp; 44 Ohm (C &amp; D)</td>
</tr>
<tr>
<td><strong>RANGE C</strong></td>
<td>3000 KC</td>
<td>External Antenna Clip</td>
<td>100 mfd.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>36 &amp; 44 Ohm (C &amp; D)</td>
</tr>
<tr>
<td><strong>RANGE D</strong></td>
<td>3000 KC</td>
<td>External Antenna Clip</td>
<td>100 mfd.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>36 &amp; 44 Ohm (C &amp; D)</td>
</tr>
<tr>
<td><strong>RANGE E</strong></td>
<td>3000 KC</td>
<td>External Antenna Clip</td>
<td>100 mfd.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>36 &amp; 44 Ohm (C &amp; D)</td>
</tr>
<tr>
<td><strong>RANGE F</strong></td>
<td>3000 KC</td>
<td>External Antenna Clip</td>
<td>100 mfd.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>36 &amp; 44 Ohm (C &amp; D)</td>
</tr>
</tbody>
</table>

**DRIVE CORD REPLACEMENT**

1. Install a new drive cord at each end of new drive cord. The distance between knots should be 29½ inches.

2. Thread one end of drive cord through hole in groove of drive pulley. Place loop on hook on pulley. Turn cord clockwise and completely closed position—See illustration.

3. Wind cord one complete turn counter-clockwise (from back of chassis) around drive pulley. Then pass cord over idler sheaves A, B, & C as shown.

**Cable Ties**

- Metal cable ties must be used in those locations which expose cable ends.

**Wind Drive Cord**

- Wind drive cord clockwise from back of chassis around drive pulley. These cords should progress toward dial mounting place.

- Wind drive cord counter-clockwise (from back of chassis) around drive pulley. These cords should be on right side (from gang center) from pulley grooves and should progress toward dial mounting place. Thread cord through hole in groove of drive pulley. Hook loop on tension spring. Wind cord around drive pulley shaft—See illustration. Parten five end of spring to hook on pulley.
- Loop antenna connected to radio.
- Volume control—Maximum all adjustments.
- Connect radio ground to ground post of signal generator with a short heavy lead.
- Connect dummy antenna in series with generator-output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicator meter.
- Non-metallic screwdriver.
- Dummy antennas—1 m, 200 mmf.

### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>FREQUENCY SETTING</th>
<th>DUMMY ANTENNA</th>
<th>CONNECTION TO RADIO</th>
<th>POSITION OF BAND SWITCH</th>
<th>VARIABLE CONDENSER SETTING</th>
<th>TRIMMERS ADJUSTED (IN ORDER SHOWN)</th>
<th>TRIMMER FUNCTION</th>
<th>ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 2SK11</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 2SA7</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>SHORT WAVE BAND</td>
<td>700 Kc.</td>
<td>200 mmf.</td>
<td>Antenna Clip</td>
<td>Short Wave</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C7 (See Fig. 3)</td>
<td>Short Wave oscillator</td>
</tr>
<tr>
<td>600 Kc.</td>
<td>200 mmf.</td>
<td>Antenna Clip</td>
<td>Short Wave</td>
<td>Set Dial at 25 Kc.</td>
<td>Trimmer C7 (See Fig. 3)</td>
<td>Short Wave antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>200 Kc.</td>
<td>200 mmf.</td>
<td>Antenna Clip</td>
<td>Short Wave</td>
<td>Set Dial at 180 Kc.</td>
<td>Trimmer C10 (See Fig. 2)</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1550 Kc.</td>
<td>200 mmf.</td>
<td>Antenna Clip</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C8 (See Fig. 3)</td>
<td>Broadcast oscillator</td>
</tr>
<tr>
<td>1400 Kc.</td>
<td>200 mmf.</td>
<td>Antenna Clip</td>
<td>Broadcast</td>
<td>Set Dial at 180 Kc.</td>
<td>Trimmer C8 (See Fig. 3)</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>600 Kc.</td>
<td>200 mmf.</td>
<td>Antenna Clip</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer C8 (See Fig. 3)</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

NOTE "A"—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

NOTE "B"—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

### Procedure for Setting the Automatic Pushbuttons

There are six pushbuttons on the front of the radio by means of which six stations may be selected (see "B," Fig. 2).

1. Make a list of local stations you tune in regularly; any number up to and including six.

2. Punch out from the set of station call letter tabs supplied, the call letters of the stations you have selected.

3. On the front of each automatic tuner button an opening is provided for inserting the call letter tabs. (See "A," Fig. 2)

4. Insert the call letter tabs in the rectangular openings in each of the automatic tuner pushbuttons. One of the small celluloid tabs supplied should be snapped into place over each of the station call letter tabs.

5. Press in ALL THE WAY any one of the automatic tuner pushbuttons. Holding it in FIRMLY, tune in by means of the tuning knob (No. 4) the station you have assigned to this pushbutton. Turn the tuning knob very slowly back and forth (while still holding button in downward position) until the signal is clearest. The station will then be accurately tuned in. Release the pushbutton.

6. Press in another automatic tuner pushbutton. Holding it in FIRMLY, carefully tune in the station assigned to this pushbutton. Release this pushbutton.

7. Follow this procedure until you have selected all of your favorite stations.

8. Now rotate the tuning knob to the right (clockwise) as far as it will turn, and with a coin (quarter), tighten the special locking screw ("C") in the center of the tuning knob, (see Fig. 2).

It is VERY IMPORTANT that this locking screw is turned until it is ABSOLUTELY TIGHT.

This screw will lock in place all the stations you have selected on the pushbuttons. (Note: Reset Lock Screw "C" is loose when radio is shipped from factory.

If you should desire to change any station you selected to another, loosen the reset locking screw two or three complete turns; select the new station as explained. (Note: If the dial mechanism works hard when setting up a new station for one of the automatic tuner pushbuttons, it is due to the locking screw being too tight. Loosen the reset locking screw until the dial mechanism works freely with the tuner pushbutton pressed.)

BE SURE TO RETIGHTEN THE RESET LOCK SCREW, otherwise the stations will not stay adjusted to the pushbuttons.

The automatic dial is now set up for quick tuning.

---

**FIG. 2**

**FIG. 3**
**SETUP THE AUTOMATIC PUSHBUTTONS**

Pry out the metal button in cabinet opposite pushbutton locking screw.

Press one of the buttons all the way down and hold it FIRMLY. Now tune in the station you want with the tuning knob. Tune back and forth until the station is clear, then release the button. NOTE: If the tuning knob turns quite hard when the button is held down firmly, loosen the pushbutton locking screw several turns with a screwdriver.

Continue, setting each of the remaining pushbuttons in the same way. Now turn the tuning knob all the way to the right and tighten the pushbutton locking screw. This screw prevents the pushbuttons from slipping off the stations you have set. To change stations loosen locking screw and proceed as above.
**OPERATING THE PHONOGRAPH**

Turn radio on. Turn recording switch in "ON" position.

Put your record on turntable and turn on the record and needle. Increase the volume of the radio and turn on the record.

**RECORDING VIEW**

**RECORDING RADIO PROGRAMS**

Turn the radio on and tune in the program you wish to record. Put recording switch in "Record-Bitton" position. The volume will drop. Start the recording, and adjust the recording needle gently on the turntable. Record the program on the selected record changer.

**RECORDING VOICE**

Turn the volume control on the record changer, and adjust it to match the volume of the voice. The voice should be clear and audible.

**HOW TO MAKE PERFECT RECORDINGS**

Unplug the microphone and check its operation. The microphone should be connected and the HFP should be on the turntable.

Insert a special recording needle in the microphone.

**CUTTING NEEDLE**

The cutting needle is in place and must be adjusted to the correct position. To adjust the needle, turn the knob on the side of the turntable and move the needle to the correct position.

**DO NOT USE TOO MUCH VOLUME**

The most frequent cause of poor recordings is too much volume or too much speed. If some passages are too loud, adjust the volume accordingly.

**SETTING FOR SIZE OF RECORD**

The changer plays up to fourteen 10" or ten 12" records at one time. All records must be the same size for each changer.

**TO REMOVE RECORD**

1. Turn the switch knob on the changer back to "OFF." The changer then will eject the record changer, and the record changer will go back to the previous position.

**TO REMOVE RECORDS**

2. Turn the switch knob on the changer back to "OFF," and the changer then will eject the record changer.

**TO REPLACE RECORDS**

3. Turn the switch knob on the changer back to "ON," and the changer then will replace the record changer.

**PLAYING INDIVIDUAL RECORDS**

4. Turn the switch knob on the changer back to "OFF," and the changer then will play the record changer.

**STUDYING THE CHANGER**

5. Turn the switch knob on the changer back to "OFF," and the changer then will study the changer.
## ALIGNMENT PROCEDURE

### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6S7 L. F.</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6S7 M. F.</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

### SHORT WAVE BAND

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>(See Note A)</td>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C4</td>
</tr>
<tr>
<td></td>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C2</td>
</tr>
<tr>
<td></td>
<td>6 Mc.</td>
<td>400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C8</td>
</tr>
</tbody>
</table>

### BROADCAST BAND

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(See Note A)</td>
<td>1600 Kc.</td>
<td>200 mmf.</td>
<td>Grid of 6S7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator</td>
</tr>
<tr>
<td></td>
<td>531 Kc.</td>
<td>200 mmf.</td>
<td>Grid of 6S7</td>
<td>Broadcast</td>
<td>Rotor full closed</td>
<td>Trimmer C7</td>
<td>Broadcast oscillator series pad</td>
</tr>
</tbody>
</table>

### LOOP ALIGNMENT

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(See Note B)</td>
<td>1600 Kc.</td>
<td>200 mmf.</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1000 Kc.</td>
<td>Trimmer C1</td>
</tr>
<tr>
<td></td>
<td>600 Kc.</td>
<td>200 mmf.</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer C7</td>
</tr>
</tbody>
</table>

**NOTE "A"**—The signal generator is connected to the "ANT." and "GND." leads when setting the Short Wave Band oscillator end frequencies, 1600 and 335 Kc. C.

**NOTE "B"**—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. The signal generator is connected to the "ANT." and "GND." terminals.

**NOTE "C"**—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained. After each band is completed, repeat the procedure as a final check.

### MODEL 04BR-675A and 04BR-676A

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6S7 L. F.</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6S7 M. F.</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

### SHORT WAVE BAND

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(See Note A)</td>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C4</td>
</tr>
<tr>
<td></td>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C2</td>
</tr>
<tr>
<td></td>
<td>6 Mc.</td>
<td>400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C8</td>
</tr>
</tbody>
</table>

### BROADCAST BAND

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(See Note A)</td>
<td>1600 Kc.</td>
<td>200 mmf.</td>
<td>Grid of 6S7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator</td>
</tr>
<tr>
<td></td>
<td>531 Kc.</td>
<td>200 mmf.</td>
<td>Grid of 6S7</td>
<td>Broadcast</td>
<td>Rotor full closed</td>
<td>Trimmer C7</td>
<td>Broadcast oscillator series pad</td>
</tr>
</tbody>
</table>

### LOOP ALIGNMENT

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(See Note B)</td>
<td>1600 Kc.</td>
<td>200 mmf.</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1000 Kc.</td>
<td>Trimmer C1</td>
</tr>
<tr>
<td></td>
<td>600 Kc.</td>
<td>200 mmf.</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer C7</td>
</tr>
</tbody>
</table>

The loop antenna should be connected to the radio when making all adjustments. Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. After each band is completed, repeat the procedure as a final check.
PHONOGRAPH CONNECTIONS: Insert phono pickup cable into phono socket (top of chassis). An a-c phono motor socket can be used to operate the record player motor.

TELEVISION SOUND AND F.M. CONNECTIONS: Audio amplifier and speaker of the receiver used to reproduce television sound or FM programs. Connect television picture receiver and sound converter or FM converter to phono socket. Turn knob to phono position.
ALIGNMENT PROCEDURE

- Tune receiver-Mount all adjustments.
- Connect radio ground to green post of signal generator with a short heavy lead.
- Connect dummy antenna wire to series with generator output lead.
- Connect receiver across primary of output lead.
- Allow chokes and signal generator to "heat up" for several minutes.

NOTE: A.- The signal generator is connected to the "ANT" and "GND" tags when adjusting the controls while the receiver is in use. The signal generator is connected to the receiver with a short cable and long coaxial cable. The loop antenna should be connected to the radio when making these adjustments.

- NOTE: B- Any change in gain with the controls changing, the probe must be removed from the receiver output. The signal generator is connected to the receiver with a short cable and long coaxial cable. The loop antenna should be connected to the radio when making these adjustments.

SPECIFICATIONS-Model 04RG-420A

- Power Consumption: 77 Watts (At 117 volts 60 cycle)
- Power Output: 1.7 Watts Undistorted
- Selectivity: 40 IC Band at 1000 kHz
- Sensitivity: 65 MC Band at 1000 kHz
- Intermodulation Frequency: 65 MC Band at 1000 kHz
- Speaker: 6" or 8" Electro-Dynamic

- Tuning Frequency Range: 500 to 1600 IC
- Shortwave Band: 5.6 to 8.3 MC
- Intermediate Frequency: 455 IC
- Shortwave Band: 8.3 to 16.2 MC
- Variable Condenser Setting: 6 MC
- Trimmer Assisted: 600 Hz

- Alignment Procedure

1. Connect Radio to Ground Post of Signal Generator with a Short Heavy Lead.
2. Allow Chokes and Signal Generator to "heat up" for several minutes.
3. Connect dummy antenna wire to series with generator output lead.
4. Connect receiver across primary of output lead.
5. Allow chokes and signal generator to "heat up" for several minutes.

- DRIVE CORD REPLACEMENT

Tie gang connector to full open position.

- ANTENNA

Two built-in Air Wave Antennas are used with this radio.

- Model 04WG-4219

- Model 04WG-4211

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null
**SPECIFICATIONS**

- **Input Voltages and Currents—Battery Operation**
  - "B" Batteries: 9 Volts—11.5 Ma.
- **Power Consumption (At 117 volts AC Supply)**: 28 Watts
- **Power Output**
  - Battery Operation: 150 Mw. Undistorted, 350 Mw. Maximum
  - AC Operation: 200 Mw. Undistorted, 400 Mw. Maximum

- **Selectivity** — 50 KC Broad at 1000 Times Signal
- **Intermediate Frequency** — 456 KC
- **Speaker** — 6" P.M. Dynamic
- **Tuning Frequency Range** — 540 to 1600 KC
- **Sensitivity** (For 0.5 Watt Output)
  - External Antenna — 10 Microvolts Average

**ALIGNMENT PROCEDURE**

- **Volume Control—Maximum All Adjustments.**
- **Allow Chassis and Signal Generator to "Heat Up" for several minutes.**

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY SETTINGS</th>
<th>ANTENNA CONNECTION</th>
<th>GROUND CONNECTION</th>
<th>DUMMY ANTENNA</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>466 KC</td>
<td>External Antenna Clip on Loop</td>
<td>External Ground Clip on Loop</td>
<td>.1 mf.</td>
<td>Turn Rotor to full open</td>
<td>1st I.F. (C6) &amp; (C7)</td>
<td></td>
</tr>
<tr>
<td>1600 KC</td>
<td>External Antenna Clip External Ground Clip</td>
<td>.1 mf.</td>
<td>Turn Rotor to full open</td>
<td>3rd I.F. (C13) &amp; (C14)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1400 KC</td>
<td>External Antenna Clip External Ground Clip</td>
<td>200 mmf.</td>
<td>Turn Rotor to max. output</td>
<td>Antenna (C2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE A—Re-assemble chassis in cabinet.**
Close back on cabinet.

**CALIBRATION** — To obtain dial scale calibration, tune in an 800 KC signal. The pointer should be at the 800 KC mark on the dial. If it is not, set the pointer at the 800 KC mark.

**DRIVE CORD REPLACEMENT**

- Use a new drive cord 28 inches in length; tie one end to tension spring. Thread other end through hole in groove of drive pulley and pull spring flush against inside of pulley rim. Turn gang condenser to full open position—See illustration.

Wind cord 3/4 turn clockwise (from back of chassis) around drive pulley. Pass cord over idler studs A, B, & C, as shown. Then wind cord 3/4 turn clockwise (from back of chassis) around drive pulley. This turn should be on left side (from gang condenser side of chassis) of pulley groove.

Thread cord through hole in pulley groove and tie to tension spring. Attach other end of spring to hook on drive pulley.

**Dial Pointer Attachment** — Tune in a signal of known frequency. Set pointer to this frequency mark on dial scale. Attach pointer to drive cord—See illustration.
**SPECIFICATIONS**

Input Voltages and Currents—Battery Operation

- **A** Battery: 9 Volts—50 Ma.
- **B** Batteries: 80 Volts—11.5 Ma.

Power Consumption (At 117 volts AC Supply): 28 Watts

Battery Operation

- 150 Mw. Undistorted
- 350 Mw. Maximum

AC Operation

- 200 Mw. Undistorted
- 400 Mw. Maximum

Selectivity

- 38 KC Broad at 1000 Times Signal

Intermediate Frequency

- 456 KC

Speaker

- 6" or 8" P.M. Dynamic

Tuning Frequency Range

- **B** Range: 50 to 1600 KC
- **D** Range: 5750 to 18000 KC

Sensitivity

- External Antenna—(For 50 Watt output)
- **B** Range: 12 Microvolts Average
- **D** Range: 20 Microvolts Average

ALIGNMENT PROCEDURE

Volume control—Maximum All Adjustments.

Allow Chassis and Signal Generator to "Heat Up" for several minutes.

IMPORTANT—Follow procedure in the order shown. The equipment in column at right is required for aligning:

A. Loop Aerial must be connected to chassis during all adjustments. Mantle Model—Take out hinges screws from cabinet and back as well as other screws and remove chassis and back from cabinet.

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>ANTENNA CONNECTION</th>
<th>GROUND CONNECTION</th>
<th>DUMMY ANTENNA</th>
<th>BAND SWITCH</th>
<th>CONDENSER OR DIAL SETTING</th>
<th>ADJUST TRIMMERS TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>External Antenna Wire</td>
<td>External Ground Wire</td>
<td>100 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B (C9)</td>
</tr>
<tr>
<td>455 KC</td>
<td>External Antenna Wire</td>
<td>External Ground Wire</td>
<td>100 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B (C9)</td>
</tr>
<tr>
<td>RANGE B</td>
<td>External Antenna Wire</td>
<td>External Ground Wire</td>
<td>100 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B (C9)</td>
</tr>
<tr>
<td>60 KC</td>
<td>External Antenna Wire</td>
<td>External Ground Wire</td>
<td>100 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B (C9)</td>
</tr>
<tr>
<td>RANGE D</td>
<td>External Antenna Wire</td>
<td>External Ground Wire</td>
<td>400 Ohm</td>
<td>D Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range D (C7)</td>
</tr>
<tr>
<td>18,300 KC</td>
<td>External Antenna Wire</td>
<td>External Ground Wire</td>
<td>400 Ohm</td>
<td>D Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range D (C7)</td>
</tr>
<tr>
<td>16,000 KC</td>
<td>External Antenna Wire</td>
<td>External Ground Wire</td>
<td>400 Ohm</td>
<td>D Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range D (C7)</td>
</tr>
<tr>
<td>6000 KC</td>
<td>External Antenna Wire</td>
<td>External Ground Wire</td>
<td>400 Ohm</td>
<td>D Range</td>
<td>Turn Rotor to Full Output</td>
<td>Ant. Range A (C4)</td>
</tr>
<tr>
<td>LOOP RANGE B</td>
<td>External Antenna Wire</td>
<td>External Ground Wire</td>
<td>100 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Output</td>
<td>Ant. Range B (C4)</td>
</tr>
</tbody>
</table>

ATTENUTATE THE SIGNAL from the signal generator to prevent the level-setting action of the AVC.

After each range is completed, repeat the procedure as a final check.

NOTE A—If the pointer is not at 1400 KC on the dial, tune in a 1400 KC signal. Set pointer at the 1400 KC mark on the dial scale.

NOTE B—(Mantle Model Only)—By means of wooden blocks, stand the loop aerial assembly upright exactly 1 1/4 inches from the back of the chassis.

NOTE C—Turn the rotor back and forth until the peaking of the point of greatest intensity is obtained.

NOTE D—Re-assemble chassis in cabinet. Mantle Model—Replace back on cabinet. Antenna Range B trimmer may be reached through narrow slot in cabinet back.

CAUTION—When aligning the short wave bands, be sure NOT to adjust the image frequency. This can be checked as follows: Let us say the signal generator is set for 15,000 KC. The signal will then be heard at 15,000 KC on the dial of the radio. The image signal, which is much weaker, will be heard at 15,000 less 912 KC, or 14,088 KC on the dial. It may be necessary to increase the input signal to hear the image.

IH5GT

INDEXED DETECTOR TRANSISTOR

2ND DET, 6315-679
c & c1.5 LF.

3525GT

IN5GT

IN5GT

DRIVE CORD REPLACEMENT

Turn gang condenser to full open position—See illustration. Use a new drive cord 42 inches in length.

Tie one end of cord to tension spring. Pass other end of cord up through hole in groove of drive pulley. Pull cord through hole until spring is flush against inside of pulley rim.

Pass cord under small pulley A—See illustration. Then wind 4 turns counter-clockwise (from back of chassis) around tuning control shaft. These turns should progress toward dial mounting plate. Pass cord over pulleys B, C, and D as shown. Then wind cord 3/4 turn, counter-clockwise (from drive pulley side of chassis) around drive pulley. This turn should be on left side (from back of chassis) of pulley groove.

Pass cord through hole in groove of drive pulley. Tie cord to tension spring. Fasten other end of spring to hook on drive pulley.

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ALIGNMENT PROCEDURE

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 ml., 125 mmf.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Remote Tuner Dial Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc</td>
<td>.1 MFD</td>
<td>Grid of 6SK7 I. F. Tube</td>
<td>Set dial at 1400 Kc</td>
<td>Trimmers C9, C20</td>
<td>Output I. F.</td>
<td>See note &quot;A&quot; Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc</td>
<td>.1 MFD</td>
<td>Grid of 6SK7 I. F. Tube</td>
<td>Set dial at 1400 Kc</td>
<td>Trimmer C1</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc</td>
<td>.1 XFD</td>
<td>Grid of 6AG7</td>
<td>Set dial at 1400 Kc</td>
<td>Trimmers C4, C5</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1565 Kc</td>
<td>125 mmf</td>
<td>Antenna lead</td>
<td>Set dial at 1565 Kc</td>
<td>Trimmer C1</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1400 Kc</td>
<td>125 mmf</td>
<td>Antenna lead</td>
<td>Set dial at 1400 Kc</td>
<td>Trimmers C1, C3</td>
<td>Antenna and R. P.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>600 Kc</td>
<td>125 mmf</td>
<td>Antenna lead</td>
<td>Set dial at 600 Kc</td>
<td>Trimmer C2</td>
<td>Antibatter series adj.</td>
<td>See note &quot;C&quot;</td>
</tr>
</tbody>
</table>

NOTE "A" IMPORTANT: To align the output I. F. transformer without using a cathode ray oscillograph a 10M ohm resistor must be shunted across the radio tuned circuit. Connect the resistor as indicated by points "X" and "Y" on the circuit diagram and the bottom view of the radio chassis Fig. 5. A red dot on top of output I. F. transformer indicates location of trimmer "C9." Before adjusting trimmer C1 disconnect the 10M ohm resistor. Under no circumstances re-adjust trimmers C19 or C20 alter the 10M ohm resistor has been removed.

NOTE "B" Maximum gain for this adjustment depends on the capacity of the antenna system of the car in which the radio is installed. For the proper alignment of this adjustment see "Adjusting Antenna Trimmer."
PROCEDURE FOR SETTING THE AUTOMATIC PUSHBUTTONS:
There are six pushbuttons on the Remote Tuner Unit by means of which six stations may be set up for automatic tuning (see B, Fig. 2).

Make a list of local stations you tune in regularly; any number up to and including six.

Punch out the set of station call letter tabs supplied, the call letters of the stations you have selected.

On the top of each pushbutton a slot is provided for inserting the call letter tabs, (see A, Fig. 2).

Insert the call letter tabs.

NOW, PROCEED AS FOLLOWS—
1. Push the dial tuning knob in hard enough to make it latch in.
2. Rotate the dial tuning knob to the left (counter-clockwise), until the knob can not be turned any further without forcing.

You will note that as the knob is rotated it will turn easily until the pointer reaches the end of the dial scale and then a slight amount of force will be required to actually start unlocking the tuner mechanism. Beyond this point the knob will turn quite easily again until the tuner mechanism is completely unlocked. At this point do not force the knob any further. The tuner mechanism is now unlocked.

(NOTE:—Automatic tuner mechanism is locked tight when radio is shipped from the factory.)

3. Push in all the way any one of the pushbuttons and at the same time hold in firmly the dial tuning knob. Both the dial tuning knob and the pushbutton should be pushed hard enough to make them stay latched in. The reason for holding the dial tuning knob in firmly when the pushbutton is pressed in is due to the latching mechanism in the Remote Tuner unit which is so constructed to release the dial tuning knob entirely when a pushbutton is pressed in. When setting up stations for automatic tuning, however, it is necessary that both the dial tuning knob and the pushbutton be latched in together.

4. Press in on the pushbutton which is latched in. Holding it in firmly, tune in by means of the dial tuning knob the station indicated on the station call letter tab on this pushbutton. Turn the dial tuning knob very slowly back and forth (while still pressing in firmly on the pushbutton), until the station is clearest. The station will then be accurately tuned in.

5. Push in all the way another pushbutton, at the same time holding the dial tuning knob in so that both the pushbutton and the dial tuning knob are latched in together. Holding the pushbutton in firmly, tune in the station indicated on the call letter tab on this pushbutton.

6. Follow this procedure until you have tuned in all of your favorite stations.

7. When the last pushbutton has been properly set up, it is necessary to release it from the latched position before the tuner mechanism can be locked. To release this pushbutton, press the pushbutton release pin on the bottom of the tuner unit. This will trip the latching mechanism and all the pushbuttons will be released to out position, (See Fig. 2A).

8. Now, Press on the dial tuning knob hard enough to make it latch in. Rotate the dial tuning knob to the right (clockwise) until the knob can not be turned any further without forcing it. This will lock the tuner mechanism and all the stations that have been set up on the pushbuttons will be locked in place for automatic tuning.

9. Press in any one of the pushbuttons and—YOUR FAVORITE STATION IS SELECTED.

The important steps to remember when setting up stations on the pushbuttons for automatic tuning are:

1. To unlock the tuner mechanism press on the dial tuning knob hard enough to make it stay latched in. Rotate the dial tuning knob to the left (counterclockwise) until the knob cannot be turned any further without forcing it.

2. To set a pushbutton, Push in all the way and hold in firmly both the pushbutton and the dial tuning knob so that both latch in. Hold in firmly the pushbutton and tune in the station by means of the dial tuning knob. Set all the pushbuttons in the same manner.

3. To release the last pushbutton press the pushbutton release pin on the bottom of the tuner unit.

4. To lock the tuner mechanism push on the dial tuning knob hard enough to make it stay latched in. Rotate the dial tuning knob to the right (clockwise) until the knob can not be turned any further without forcing it. (NOTE: All the pushbuttons must be in out position when locking the tuner mechanism.)

SERVICE NOTES:
Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt. These voltages are clearly indicated on the voltage chart.

In order to prevent signal from acting upon A.V.C. and affecting accuracy of voltage measurements, aerial and ground leads should be short circuited while making measurements.

All voltages are to be measured with 6.3 volts input to receiver. Resistances of coils and transformer windings are indicated in ohms on schematic circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating which is known to be good, until the defective unit is located.

Failure to operate, noisy or weak reception is usually due to defective tubes, the tubes making poor contact with sockets or grid clips making poor contact with the caps of the tubes. Tubes may be checked very easily by replacing with other tubes which are known to be good. If fuse blows out frequently, the trouble is probably in the vibrator, it should be replaced. Do not attempt to make any adjustments on the vibrators.

ALIGNING INSTRUCTIONS:
All of the adjustments have been very carefully set with signal generators at the factory and require no further adjustment, unless it becomes necessary to replace a coil or transformer, or if the adjustments have been tampered with in the field. Under these circumstances attempt any adjustments without first making certain that adjustment is necessary and only after voltages, tubes and condensers have been checked and found to be normal. To properly re-align this receiver, a test oscillator, as well as an output meter, must be used.
## ALIGNMENT PROCEDURE

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 m., 200 mm., 400 ohms.

### BAND

<table>
<thead>
<tr>
<th>Band</th>
<th>Signal Generator Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6SK7</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Two trimmers on top (See Top View)</td>
<td>I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Two trimmers on top (See Top View)</td>
<td>I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>SHORT WAVE</td>
<td>17 Mc. 400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C4</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BAND</td>
<td>17 Mc. 400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C1</td>
<td>Short Wave antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>(See Note A)</td>
<td>6 Mc. 400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C7</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum rock dial. (See note &quot;C&quot;)</td>
<td></td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1600 Kc. 200 mml.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BAND</td>
<td>555 Kc. 200 mml.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>(See Note A)</td>
<td>1400 Kc. 200 mml.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>Trimmer C2</td>
<td>Broadcast antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>LOOP ALIGN-</td>
<td>600 Kc. 200 mml.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer T3</td>
<td>Iron Core Tracking Coil</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>MENT</td>
<td>(See Note B)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE "A"**—The signal generator is connected to the " ANY," and "GND," terminals on the rear of the chassis when aligning the Short Wave Band and to the grid of the 6SA7 tube and ground terminal when setting the Broadcast oscillator, end frequencies, (1600 and 350 K. C.).

The loop antenna should be connected to the radio when making these adjustments.

**NOTE "B"**—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. The signal generator is connected to the " ANY," and "GND," terminals.

**NOTE "C"**—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained. Then turn off the signal generator to prevent the limiting-off action of the AVC.

After each band is completed, repeat the procedure as a final check.

### HOW TO REMOVE CHASSIS

- Should it ever be necessary to take the chassis out of the cabinet, be sure to first pull the plug from the light socket.
- Next pull off all control knobs and take off the escutcheon.
- Pull out the loop aerial and speaker plugs, then remove the 4 chassis mounting screws and lift the chassis out.

**NOTE**—On the Mantel Model, it is necessary to remove the screws and take the back off.

### PHONOGRAPH-TELEVISION OR FM. JACK

Should you wish to use an external phonograph, it should be plugged into the phonograph jack shown in the top view. The on-off radio-phono knob on the front panel will then switch from radio to phonograph operation.

If television or frequency modulation (FM) programs ever become available in your community, this radio may still be used in conjunction with the necessary converters. The jack marked phono-television-FM in the top view will accommodate either the phonograph or a television or FM converter.

### PUSHBUTTON TUNING

Pull one of the pushbuttons all the way out as far as it will come (pull, with fingers on top and bottom of button). Now tune in the station you want with the tuning knob—Tune back and forth until the station is clear and distinct. Now—push the button hard all the way in to lock the station in place, (push directly on front of button) Continue setting each pushbutton in the same way.
Operating the Automatic Phonograph

The operation of the phonograph is simple but the phonograph instruction folder packed with this instruction book should be carefully read and understood before an attempt is made to operate the record changer in operation.

The record changer is entirely automatic in its action after it has started operating. Any number up to fourteen 10 inch or ten 12 inch records may be played consecutively without attention by the listener. Standard 10 inch or 12 inch records may be used but only one size may be played at a time. Each record must have a turn-off groove so that the record changer will operate properly. This groove is the one which covers the tone arm toward the center of the record after the record has stopped playing.

The volume and tone controls are used in the same manner for phonograph reproduction as they are for radio reception—See article "Operating the Radio."

To Turn the Phonograph On

Turn the on-off switch knob to the right.
A click will be heard and the dial will light. Wait 30 seconds for the tubes to heat.

Turn the Phonograph--Radio knob to the phonograph (P) position—See illustration.

For detailed information regarding the operation of the automatic record changer, see the phonograph instruction folder.

To Turn the Phonograph Off

The instructions for turning off the automatic record changer are given in the paragraph "Turning Off Changer" in the phonograph instruction folder. Be sure to turn the record changer on-off switch knob to the left. A click will be heard and the dial lamps will be off.

Home Recorder - Television - Frequency Modulation

Home Recorder

This radio is designed so that you may take advantage of a new and extremely interesting form of entertainment. By replacing the record changer unit in this radio with a unit which includes a record changer and a record changer, the new world of making your own records is opened to you.

Your favorite radio programs, comedy, dance, and music may be permanently recorded. By means of a microphone attachment, voice or music of your own production may be recorded.

For detailed information regarding this record changer unit, get in touch with your local Montgomery Ward store or the nearest Mail Order House.

Television Sound Connections

If television programs ever become available in your area, you will be able to use your radio receiver, which is designed to reproduce television sound in conjunction with any Frequency Modulation Converter. The connection to the chassis is exactly the same as explained in the preceding article "Television Sound Connections."

When Frequency Modulated programs are received, the phonograph/ radio switch should be turned to the phonograph (P) position. For radio reception, the switch should be in one of the two radio positions.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

<table>
<thead>
<tr>
<th>Signal Generator</th>
<th>Connection at Radio</th>
<th>Dummy Antenna</th>
<th>Band Switch Setting</th>
<th>Condenser Setting</th>
<th>Adjust Trimmers to Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FREQUENCY</strong></td>
<td><strong>SETTING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>I. F.</strong></td>
<td>456 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
</tr>
<tr>
<td><strong>RANGE B</strong></td>
<td>1600 KC</td>
<td>Antenna Lead</td>
<td>100 mmf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
</tr>
<tr>
<td><strong>1400 KC</strong></td>
<td>Antenna Lead</td>
<td>100 mmf.</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
<td>Set Indicator to 1400 KC—See Note A</td>
</tr>
<tr>
<td><strong>600 KC</strong></td>
<td>Antenna Lead</td>
<td>100 mmf.</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
<td>600 KC (C4) Rocker—See Note B</td>
</tr>
<tr>
<td><strong>SHORT WAVE BANDS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>6200 KC</strong></td>
<td>Antenna Lead</td>
<td>400 Ohm</td>
<td>49 Meter</td>
<td>Turn Tuning Knob until Pointer is at L3 KC</td>
<td>Oscillator Band Spread (C5)</td>
</tr>
<tr>
<td><strong>6200 KC</strong></td>
<td>Antenna Lead</td>
<td>400 Ohm</td>
<td>49 Meter</td>
<td>Leave Setting as above</td>
<td>Antenna Band Spread (C9)</td>
</tr>
<tr>
<td><strong>LOOP RANGE B</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1400 KC</strong></td>
<td>Antenna Lead</td>
<td>See Note C</td>
<td>100 mmf.</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
</tr>
</tbody>
</table>

**Model 04WG-803B**

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**CAUTION**—Two of the coils in the band spread coil assembly, the 19 Meter Antenna and Oscillator coils, have adjustable iron cores in the "B" and later issues of this model. One of the adjusting screws extends out from the front panel of the chassis base at the left of the band switch. The other adjusting screw extends up from the chassis base in back of the tuning condenser.

Do not change the position of these adjusting screws as they have been properly set at the factory and cannot be satisfactorily re-adjusted in the field.

Adjust the signal from the signal generator to prevent the leveling-off action of the AVC.

After each range is completed, repeat the procedure as a final check.

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**NOTE A**—If the pointer is not at 1400 KC on the dial, remove pointer from drive cord. Tune in a 1400 KC signal. Set pointer at the 1400 KC mark on the dial scale. Attach pointer to drive cord.

**NOTE B**—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

**NOTE C**—Re-assemble chassis in cabinet.

**CAUTION**—When aligning the short wave band, be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 15,000 KC. The signal will then be heard at 15,000 on the dial of the radio. The image signal, which is much weaker, will be heard at 16,000 less 912 KC, or 14,088 KC on the dial. It may be necessary to increase the input signal to hear the image.

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- Tone control—Tinkle
- Volume control—Maximum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "set up" for several minutes.

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 ml., 200 mm., and 400 ohms.

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Dial Pointer Setting</th>
<th>Trimmers Adjusted in Order Shown</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F. 455 Kc</td>
<td>455 Kc</td>
<td>MFD. Grid of 6SK7 (2nd I.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 1600 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>I. F. 455 Kc</td>
<td>455 Kc</td>
<td>MFD. Grid of 6SK7 (1st I.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 1600 Kc.</td>
<td>Three Trimmers on Top</td>
<td>Intermediate I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>31 METER BAND</td>
<td>9.6 Mc</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>Set Dial at 9.6 Mc.</td>
<td>(See Trimmer View) C20</td>
<td>Osc.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>49 METER BAND</td>
<td>6.1 Mc</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>Set Dial at 6.1 Mc.</td>
<td>(See Trimmer View) G3</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>25 METER BAND</td>
<td>11.8 Mc</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>Set Dial at 11.8 Mc.</td>
<td>(See Trimmer View) T14</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>19 METER BAND</td>
<td>15.2 Mc</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>Set Dial at 15.2 Mc.</td>
<td>(See Trimmer View) T16</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1600 Kc</td>
<td>200 mmf.</td>
<td>Antenna lead</td>
<td>Set Dial at 1600 Kc.</td>
<td>(See Trimmer View) L16</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1400 Kc</td>
<td>200 mmf.</td>
<td>Antenna lead</td>
<td>Set Dial at 1600 Kc.</td>
<td>(See Trimmer View) C3</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

SPECIFICATIONS

Model No. 04BR-903A and 04BR-907A
Model No. 04BR-904A and 04BR-906A

| Power Output | - | - | 5 Watts Undistorted |
| Sensitivity for 500 Milliwatt Output | 10 Microvolts Average |
| Selectivity - 35 KC Broad at 1000 Times Signal at 1000 KC |
| Tuning Frequency Range Broadcast Band | - 540 to 1600 KC |
| 49M Band | - | 5.9 to 6.1 MC |
| 31M Band | - | 9.1 to 10 MC |
| 25M Band | - | 11.4 to 12.1 MC |
| 19M Band | - | 14.9 to 15.4 MC |
| Intermediate Frequency | - | - | 455 KC |
| Speaker | - | - | 10 in. Electro Dynamic |

**HOMER RECORDDING**

Model No. 04BR-904A and 04BR-906A

This radio is designed so you can replace the present record changer unit with one that also includes a recording arm.

| Power Consumption | - | - | - | - | 120 Watts |
| Power Output | - | - | - | - | 10 Watts Undistorted |
| Sensitivity for 500 Milliwatt Output | 10 Microvolts Average |
| Selectivity - 27 KC Broad at 1000 Times Signal at 1000 KC |
| Tuning Frequency Range Broadcast Band | - 540 to 1600 KC |
| 49M Band | - | 5.9 to 6.1 MC |
| 31M Band | - | 9.1 to 10 MC |
| 25M Band | - | 11.4 to 12.1 MC |
| 19M Band | - | 14.9 to 15.4 MC |
| Intermediate Frequency | - | - | - | 455 KC |
| Speaker | - | - | - | 12 in. Electro Dynamic |
TO REDUCE MODULATION HUM:
绝缘拨号开关从安装支架移开。
返回电容器C2到B-（点X在电路图）
代替到底盘接地。
将电容器C16的端头连接到音量控制
尽可能靠近加热器接头。

TUNING FREQUENCY RANGE

F Range: 328 to 1750 kHz
C Range: 2200 to 6000 kHz

SENSITIVITY (For .05 watt output)

F Range: 35 Microvolts Average
C Range: 25 Microvolts Average

Use ONLY a No. 51 dial lamp.

FOR OTHER DATA
SEE INDEX
**Setting a Station Button**

It is better to list the station with the lowest kilocycle number first, the station with the next highest kilocycle number next, and so on.

At the right side of the cabinet (from the front) will be seen a cap which covers a hole in the cabinet—See illustration. Pry off this cap, being careful not to scratch the cabinet. Removal of the cap will expose a large locking screw. Using a screwdriver, loosen the mechanism by turning this screw in a counter-clockwise direction. The screw will turn easily until the dial stops rotating. Then exert a slight amount of additional pressure and continue to turn the screw about one and one-half complete turns.

With one hand, hold the manual tuning control to prevent it from turning and with the other hand, push one of the station buttons shown in the illustration all the way down. It will go down easily at first and then a firm gentle pressure must be applied to push it down the rest of the way. It is better to start with the left hand button.

Hold this button all the way down. With the other hand, see whether or not this station is still accurately tuned in by moving the tuning control a slight amount back and forth while observing the tuning eye. Be sure to hold the button all the way down.

Release the button after the station is tuned in.

Carefully tune in the second station on your list. Then hold the tuning control and push the second button slowly and firmly all the way down. Check for accurate tuning.

Proceed in the same manner to set any additional stations on your list on the remaining station buttons.

After all the stations are set, it will be necessary to lock the mechanism so that the settings will not change. Do this by turning the locking screw in a clockwise direction until it is tight. It will turn easily until the dial stops rotating—then additional pressure must be exerted. Tighten firmly but not excessively. Replace the cap over the hole.

**ALIGNMENT PROCEDURE**

Remove Jumper on Loop Antenna for All Adjustments. The following equipment is required for aligning:

- An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output Indicating Meter—Non-Metallic Screwdriver. Dummy Antenna—1 m.f.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY SETTING</th>
<th>CONNECTION AT RADIO</th>
<th>DUMMY ANTENNA</th>
<th>BAND SWITCH SETTING</th>
<th>CONDENSER SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENERATOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **CAUTION**—Do not use any ground.
- If External Antenna is used, remove jumper from red screw and bend away as shown.
- Connect External Antenna to red screw.

- **CONNECT EXTERNAL ANTENNA TO RED SCREW**

- **CAUTION**—Do not use any ground.

Adjust trimmers to maximum (See Trimmer Illustrations).

- **ATTENUATE THE SIGNAL FROM THE SIGNAL GENERATOR TO PREVENT THE LOADING-OFF ACTION OF THE AVC.**

After each range is completed, repeat the procedure as a final check.

**NOTE A**—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

**CAUTION**—When aligning the short wave bands be sure NOT to adjust at the image frequency. This can be checked as follows:

Let us say the signal generator is set for 5000 KC. The signal will then be heard at 5000 KC on the dial of the radio. The “image signal,” which is much weaker, will be heard at 5000 less 912 KC, or 4088 KC on the dial. It may be necessary to increase the input signal to hear the image.

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FOR ALIGNMENT
SEE INDEX

IF PEAK 455 KC

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Adjust this antenna balancing screw after installation of the radio on the car. Tune in a weak station from 1200 to 1400 KC and tune until maximum volume is obtained.
Installation of Batteries:

To install batteries, it will be necessary to remove the back of the cabinet which is fastened by six screws (three on each side). After removing the six screws, do not attempt to pull the back away from the radio without first disconnecting the pin jacks from the loop antenna.

When the back has been removed, turn the cabinet upside down (handle to the bottom).

Note the battery cable extending from the right side of the chassis. This cable terminates in one two-prong plug for the long "A" battery and two three-prong plugs for the smaller "B" batteries.
Synchronizing Station Selector Controls

1. Disconnect the push button control cable (cloth covered cable) by pulling out the plug from the radio case.

2. Turn on the power switch and set the Automatic Station Selector Control to "Dial" position — that is, to the position where the word "Dial" appears at the window of the control.

3. Plug the cloth covered cable back into the radio.

The remote control Automatic Station Selector can be set to tune in five broadcast stations (preferably powerful local stations) of your choice. The dial of the control unit carries the numbers 1 to 5 to designate the stations.

To tune in stations with push buttons

1. Set the Automatic Station Selector to position No. 1 (the numeral "1" appearing on the dial of the control unit). With the Selector in this position, the station may be tuned to any station whose broadcast frequency lies between 500 and 1600 kilocycles.

2. Remove the Slot Cover on the front of the set below the speaker grille for access to the Oscillator Adjustment Screw and Antenna Trimmers, by adjustment of which the tuning is accomplished. See Fig. 7.

3. Adjust (with screwdriver) Oscillator Adjustment Screw No. 18 (see Fig. 7) until the broadcast signal of the desired station is received. Turning the Oscillator Adjustment Screw in a clockwise direction lowers the frequency and turning it in a counterclockwise direction increases the frequency.

4. Adjust Antenna Trimmer No. 28 to position where maximum volume is attained. The entire range of the Antenna Trimmers is covered in three counterclockwise turns of the screw from tight position. Do not back screw out more than three turns. Counterclockwise rotation lowers the frequency.

The preceding instructions outline completely the steps for setting up station selector position No. 1. For positions No. 2, No.3, No.4 and No.5 the same general procedure is to be used.

Below is a table showing five Station Selector positions, the kilocycle range covered by each position and the Oscillator screws and Antenna Trimmers by adjustment of which any desired station within the given range may be tuned in.

<table>
<thead>
<tr>
<th>Position of Automatic Station Selector</th>
<th>Oscillator Screw to Select Station</th>
<th>Antenna Trimmer to Adjust for Maximum Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2A</td>
<td>1A</td>
</tr>
<tr>
<td>2</td>
<td>2B</td>
<td>2B</td>
</tr>
<tr>
<td>3</td>
<td>3A</td>
<td>3A</td>
</tr>
<tr>
<td>4</td>
<td>3B</td>
<td>3B</td>
</tr>
<tr>
<td>5</td>
<td>3C</td>
<td>3C</td>
</tr>
</tbody>
</table>
The antenna circuit is directly coupled to the antenna. A small adjustable condenser is made near the high frequency end of the band (1400 Kc.).

The antenna system used with these receivers is of the extension rod type, mounting through the core of the body by the use of special insulators, conforming to the remote control on the instrument panel.
CIRCUIT ALIGNMENT

All of the adjustable condensers in this receiver are very accurately adjusted at the factory and will need no further adjustment (excepting antenna condenser "D") unless tampered with or a defective coil has been replaced. If realignment is found to be necessary, the circuits can be properly adjusted only with the use of a calibrated test oscillator or signal generator and an output meter.

DO NOT ATTEMPT TO REALIGN THE I-F STAGES OF THIS RECEIVER WITHOUT CAREFULLY NOTING THE INSTRUCTIONS BELOW:

1. Aligning I-F Stages at 260 Kilocycles
   (a) Turn volume control to the maximum position.
   (b) Connect the signal lead of the test oscillator through a .1 mfd. condenser to terminal X, which is the grid prong of the 7AB tube.
   (c) Connect the ground lead of the test oscillator to the chassis frame.
   (d) Connect the output meter across the speaker voice coil at the terminal board mounted on the speaker.
   (e) Set the test oscillator to exactly 260 Kilocycles.
   (f) Adjust the trimmers "A", "B", "C" and "D" on the I-F Transformers for maximum output. These adjustments should be repeated several times and during alignment the test oscillator output should be kept to as low a value as is consistent with obtaining a readable indication on the output meter.

2. Aligning at 1610 Kilocycles
   (a) Remove the signal lead of the test oscillator from the grid of the 7AB tube and connect to the antenna terminal of the receiver through a .000075 mfd. MICA CONDENSER connected in place of the .1 mfd. condenser previously used. (It is very important that a .000075 mfd. mica condenser be used when aligning the antenna stage of these receivers in order that this circuit can be made to track properly.)
   (b) Loosen lock screw "E" and tune the receiver by means of the manual control to the extreme high frequency position, against the stop and tighten screw "E".
   (c) Set the test oscillator to 1610 Kilocycles.
   (d) Adjust the condenser "F" for maximum output. (It is very important that this frequency be set separately as a slight missetting will cause the receiver to be out of track over the high frequency end of the dial.)
   (e) Adjust the antenna compensating condenser "G" for maximum output.
   (f) Adjust the R.F. trimmer condenser "J" for maximum output.

3. Adjusting the I-F Wave Trap
   (a) Leave the test oscillator lead the same as for aligning at 1610 K.C.
   (b) Set the test oscillator to exactly 260 K.C.

(c) Adjust the trimmer "H" for minimum deflection on the output meter. (It may be necessary to increase the signal from the test oscillator when making this adjustment.)

NOTE: With permeability tuning it is necessary to adjust the capacity at only one frequency. The coils are so wound that tracking is automatic and the usual low frequency adjustments are not necessary.

If the entire alignment procedure has been accomplished accurately, the receiver should be uniformly sensitive over the entire frequency range.

Lock screw "F" maintains the location of the mechanical stop at the high frequency end of the band.

New frequency assignments to 1600 K.C. make it desirable for the receiver to cover this range, but due to local ordinances it is not permissible in all locations. The high frequency stop is set at 1560 K.C. in production and after aligning the receiver, reset the stop to this frequency which is accomplished by loosening lock screw "F", tune in manually to 1560 K.C. and tighten screw "F". Where ordinances permit, the high frequency stop may be set at any frequency up to 1600 K.C.

---

**Diagram Description**

A diagram with various connections and components is shown, including tubes and their voltages. The diagram illustrates the internal structure and connections of the receiver, providing a visual aid for understanding the alignment process described in the text.
AUTOMATIC PUSH BUTTON TUNER

The iron cored automatic tuner consists of three coils with variable iron cores actuated by a rugged mechanical device for varying the position of the cores in the coils. Changing the position of the cores changes the inductance of the antennas, R.F. and oscillator coils, and provides a means of tuning the radio over the entire broadcast band. A special compensating condenser is employed in the oscillator circuit to prevent the set from drifting off station due to normal variations in car voltage and radio temperatures.

Bottom

Top
The antenna circuit is coupled directly to the antenna. The antenna coil is coupled to the grid of the R.F. amplifier through a high frequency filter which minimizes ignition and other high frequency interferences. Due to the antenna circuit being directly coupled to the antenna, the antenna adjustment screw must be adjusted to give maximum volume when the receiver is tuned to a weak station which is received between 130 and 150 on the dial.
CIRCUIT ALIGNMENT

Alignment Procedure: The trimmer condensers in this receiver have been carefully adjusted at the factory and should require no further adjustment (except the antenna trimmer) unless tampered with or a defective coil has been replaced. It is advisable not to attempt any adjustment unless it is definitely known that an adjustment is necessary.

An accurately calibrated test oscillator or signal generator and an output meter must be used to align the receiver circuits correctly. To make all alignment adjustments the front and back covers must be removed. All trimmers are readily accessible. The antenna trimmer is adjusted through a hole in the end of the case. Due to the fact that the iron cores have been sealed in place at the factory only the trimmer adjustments as outlined under capacity alignment should be made unless the coils of the iron cored tuning unit are changed.

CAPACITY ALIGNMENT

1. I.F. Alignment at 260 K.C.
   (a) Connect an output meter across the speaker voice coil, leaving speaker connected.
   (b) Connect the ground lead of the signal generator to the chassis frame.
   (c) Connect the signal lead of the signal generator to the 755 tube grid side of the R.F. Trimmer Condenser F through a 0.1 mfd. condenser.
   (d) Turn set volume control on full and tune control to the extreme treble end. Set the signal generator at 260 K.C. Tune the receiver to a frequency where no squeals or beat notes may be heard and so that when the tuning control is moved in narrow limits no appreciable change in output may be noted.
   (e) Adjust the I.F. trimmers A, B, C, and D for maximum output.

2. Alignment at 1560 K.C.
   (a) Connect the signal lead of the signal generator to the receiver antenna connection through a 75 mmfd condenser.
   (b) Turn the manual tuning control of the receiver to the stop at the extreme high frequency end of the dial.
   (c) Set the signal generator to 1560 K.C.
   (d) Adjust the oscillator trimmer "G" for maximum output.
   (e) Adjust the R.F. trimmer "F" for maximum output.
   (f) Adjust the antenna trimmer "G" for maximum output.

3. Alignment at 1400 K.C.
   (a) Set the signal generator to 1400 K.C.
   (b) Turn the receiver to the signal and readjust the trimmers F and G for maximum output. Signal generator signal should be as low as possible and still give a satisfactory meter reading.

   This type of tuning circuit does not require alignment at 600 K.C.

4. Alignment with Car Antenna
   Antenna trimmer G must be adjusted to match car antenna when receiver is installed; use a weak station signal near 1400 K.C. The antenna should be fully extended when making this adjustment.

CAPACITY AND INDUCTANCE ALIGNMENT

To be used only when there is definite evidence of iron cores being out of adjustment.

1. I.F. Alignment at 260 K.C.
   Follow the procedure as outlined under I.F. Alignment at 260 K.C. Capacity Alignment.

2. Alignment at 1560 K.C.
   (a) Connect the signal lead of the signal generator to the antenna connection of the set through a 70 mmfd condenser.
   (b) Set signal generator to 1560 Kilocycles.
   (c) Rotate the manual tuning mechanism until the high frequency stop is reached. Mechanically align the iron cores E, H, and J by setting each core so that its front edge sticks out 1-1/16" from the end of the coil form and the antenna and R.F. cores H and J stick out 1-13/32" from the end of the respective coil windings.
   (d) Adjust the oscillator trimmer E, R.F. trimmer F, and antenna trimmer G for maximum output.

3. Alignment at 1400 K.C.
   (a) Set signal generator to 1400 K.C. and tune set to this signal.
   (b) Adjust the R.F. core J for maximum output.
   (c) Adjust the antenna core H for maximum output.

4. Realigniment at 1460 and 1400 K.C.
   (a) Repeat alignment of trimmer E and trimmers F and G at 1560 K.C.
   (b) Repeat alignment of cores H and J at 1400 K.C. Apply shells to the core screws sealing the adjustment.

5. Alignment with Car Antenna
   Antenna trimmer G must be adjusted to match car antenna when receiver is installed; use a weak station signal near 1400 K.C. The antenna should be fully extended when making this adjustment.
1. Aligning I-F Stages at 455 Kilocycles

(a) Connect the signal lead of the test oscillator to terminal "T" on variable condenser 25-A (See Parts Layout), which is the grid lead of the 6SA7GT tube, through a .1 mfd. condenser.

(b) Connect the ground lead of the test oscillator to the chassis frame.

(c) Connect the output meter across the voice coil of the speaker.

(d) Set the test oscillator to exactly 455 K.C.

(e) Turn volume control to maximum.

(f) Adjust the trimmers "A", "B", "C" and "D" on the I-F Transformers for maximum output. (See Parts Layout). These adjustments should be repeated several times and during alignment the test oscillator output should be kept as low a value as is consistent with obtaining a readable indication on the output meter.

2. Aligning at 1560 Kilocycles

(a) Leave the test oscillator leads connected the same as for aligning the I-F circuits.

(b) Turn the rotor plates of the gang condenser all the way out and against the high frequency stop "H" (See Parts Layout).

(c) Set the test oscillator to 1560 Kilocycles.

(d) Adjust the condenser "H" (See Parts Layout) for maximum output. (It is very important that this frequency be set accurately as a slight missetting will cause the receiver to be out of track over the entire high frequency end of dial.)

3. Aligning the Antenna Stage

(a) Remove the signal lead of the test oscillator from the grid of the 6SA7GT tube and connect to the Antenna Terminal of the receiver through a .000076 mfd. Mica condenser connected in place of the .1 mfd. condenser previously used. (It is very important that a .000076 mfd. mica condenser be used when aligning the antenna stage of these receivers in order that this circuit can be made to track properly.)

(b) Set the test oscillator to 1400 K.C.

(c) Turn the condenser rotor plates until this frequency is tuned in with maximum output.

(d) Adjust the Antenna Trimmer "G" (See Parts Layout) for maximum output.

4. Aligning at 600 Kilocycles

Peak the oscillator padding condenser at 600 K.C. in order to make the receiver track properly and to secure full sensitivity.

(a) Set the test oscillator at 600 K.C.

(b) Turn the condenser rotor plates until the signal from the test oscillator is tuned in with maximum output.

(c) Maintain a low output signal from the test oscillator and adjust the oscillator padding condenser "F" (See Parts Layout) while rocking the variable condenser gang tuning shaft back and forth through the signal.

(d) This operation should be continued until no further increase in output can be obtained.

(e) After the above operation turn the condenser rotor plates to the high frequency stop position. Check the 1560 K.C. setting and if necessary readjust trimmer "H". Then return to 1400 K.C. for final antenna trimmer adjustment.

NOTE: If the entire alignment procedure has been accomplished correctly, the receiver should be uniformly sensitive over the entire frequency range.

In addition to manual tuning, there are four push buttons which may be adjusted to tune-in the local broadcasting stations.

It is not necessary to set the buttons in order of broadcasting stations frequency, but for convenience it is desirable.

To adjust the buttons, proceed as follows:

1. Turn on receiver for ten minutes or more.
2. Loosen the four push buttons by turning each button counter-clockwise about half a turn.
3. Tune in the first desired station manually and press in the first push button as far as it will go.
4. With the button held all the way in, tighten it gently. Then release it and tighten it securely.
5. Proceed in the same manner for the remaining stations.
6. After all of the buttons have been adjusted, re-check the setting. Push each button and see if the station may be tuned in more accurately manually.
7. If so, loosen button and re-set it.
8. A station setting may be changed at any time by loosening the push button, tuning in the new station and resetting the button.
9. After the push buttons have been adjusted, insert the call letter tabs for the stations in their proper places above the buttons.
To Set Push Buttons

Remove station tab strip bar. This is held by two screws at each end of strip. Beginning at left with button #2 with low kilicycle frequency stations, five stations may be set on buttons in the order of their kilicycle frequency as follows:

Tune and play the station desired on manual tuning. (7th button) for identification purposes. Now, push button #2 "in." Using small screwdriver, rotate #2 brass selector screw (oscillator) until desired station is heard with maximum volume. Then rotate #2 chrome selector screw (loop trimmer) until station is heard best.

Repeat this procedure for each of the other four broadcast station buttons using corresponding selector and trimmer screws until a total of five stations have been set.
PROCEDURE FOR SETTING UP AUTOMATIC PUSH BUTTONS

The remaining two (2) push buttons located at the extreme right hand end of the push button plate are for short wave and manual tuning. See Fig. 1. Short wave tuning is accomplished by pressing "short wave" button and tuning with the selector knob. By pressing "manual tuning" button, the automatic disconnects and the selector knob becomes active for the broadcast band.

1. Choose a station having a frequency within the range of button No. 1 (540 to 900 khz).
2. Press "Manual Tuning" button and tune this station conventionally by using the selector knob.
3. Now press button No. 1 and turn adjusting screw in either direction until the previously selected station is heard. Adjust the screw until the station is received with maximum volume.
4. Remove the call letters of the station from the call letter sheet furnished and insert in the window of the adjusting screw.
5. Repeat the above procedure for the remaining five (5) stations.

NOTE: It is advisable to retain the call letter sheet in case of station changes later on.
CONVENTIONAL ALIGNMENT - TRIM OSC 1730 KC, ANT 1400 KC

<table>
<thead>
<tr>
<th>CAPACITORS</th>
<th>RESISTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO.</td>
<td>MFD</td>
</tr>
<tr>
<td>C1</td>
<td>0.5</td>
</tr>
<tr>
<td>C2</td>
<td>0.0048</td>
</tr>
<tr>
<td>C3</td>
<td>4.0 (ELECT)</td>
</tr>
<tr>
<td>C4</td>
<td>200</td>
</tr>
<tr>
<td>C5</td>
<td>0.0048</td>
</tr>
</tbody>
</table>

1940 ROYAL MODEL 4J
I.F. 455 K.C.

CONVENTIONAL ALIGNMENT

1940 IMPERIAL MODEL 7C
I.F. 455 K.C.

FOR OTHER DATA SEE INDEX

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### SERVICE INFORMATION

<table>
<thead>
<tr>
<th>1940 IMPERIAL</th>
<th>COUPE MODEL 70</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPEAKER</strong> (Part No. P34999) 6&quot; Dynalite</td>
<td><strong>SPEAKER</strong> (Part No. P3398) 6&quot; Dynalite</td>
</tr>
<tr>
<td>Field resistance</td>
<td>1500 ohms</td>
</tr>
<tr>
<td>D.C. voice coil resistance</td>
<td>3.2 ohms</td>
</tr>
<tr>
<td>Voice coil impedance at 400 cycles</td>
<td>11.5 ohms</td>
</tr>
<tr>
<td>Voltage drop</td>
<td>115 volts A.C. Power consumption 60 watts. Volume control resistance. Meter 25,000 ohms per volt.</td>
</tr>
</tbody>
</table>

#### 6A7 tube
- Plate (0 to ground) | 90 volts |
- Screen grid (G32 to ground) | 94 volts |
- Grid No. 2 to ground | 100 volts |
- Grid No. 3 to ground | 345 volts |

#### 6D6 tube
- Plate (0 to ground) | 190 volts |
- Screen grid (G32 to ground) | 94 volts |
- Grid No. 2 to ground | 100 volts |
- Grid No. 3 to ground | 345 volts |

#### 75 tube
- Plate (0 to ground) | 65 volts |
- Screen grid (G32 to ground) | 94 volts |
- Grid No. 2 to ground | 100 volts |
- Grid No. 3 to ground | 345 volts |

#### 41 tube
- Plate (0 to ground) | 181 volts |
- Screen grid (G32 to ground) | 94 volts |
- Grid No. 2 to ground | 100 volts |
- Grid No. 3 to ground | 12 volts |

#### 80 tube
- Plate (0 to ground) | 280 volts |

#### Shortwave Antenna (Part No. P3378)
- Looking at the connection and in a clockwise direction starting at the mounting lug side of the connections are: No. 1: B+B; No. 2: Grid; No. 3: Plate; No. 4: Pad. Ground: No. 2 and No. 4—Resistance 3 ohms

#### 6E4 tube
- Plate (0 to ground) | 75 volts |
- Screen grid (G32 to ground) | 94 volts |
- Grid No. 2 to ground | 100 volts |
- Grid No. 3 to ground | 345 volts |

#### power Transformer (Part No. P5511)
- Primary: 115 volt, 60 cycle; black leads: Resistance—124 ohms |
- Secondary: 6.3 volt filament: black leads. (Shaded): Resistance—120 ohms |
- Secondary: 2 volt rectifier filament: 22 ohms |
- Secondary: High voltage: 22 ohms |
- Primary: 200 tubes |
- Filament (0 to ground) | 302 volts |

#### Short Wave Antenna (Part No. P3378)
- Looking at the connection and in a clockwise direction starting at the mounting lug side of the connections are: No. 1: A+C; No. 2: Grid; No. 3: A+G; No. 4: Around No. 4 is grounded to the mounting strip. Primary—No. 3 and No. 4—Resistance 17.1 ohms
- Secondary—No. 1 and No. 2—Resistance 1.9 ohms

### TUNING DRIVE
- If the drive shift slips when using manual tuning, tighten the power transformer until it clicks and then loosen the two sets screws holding the drive wheel in place on the output condenser shaft. (See Fig. 2.) Move the wheel in or out until it is 1/16 of an inch from the outer ring on the drive shaft. CAUTION: Do not turn the shaft or this would cause the dial pointer to become incorrect. Turning the drive wheel should now cause it to make firm contact with the drive wheel when this shaft is pushed in. The driven wheel should then now be firmly secured to the gap condenser shaft by means of the set screws.

**SPARKER** (Part No. P3398) 6" Dynalite
- Field resistance 1400 ohms |
- D.C. voice coil resistance 3.2 ohms |
- Voice coil impedance at 400 cycles 2.5 ohms |
- Voltage drop 115 volts A.C. Power consumption 75 watts. Volume control resistance. Meter 10000 ohms per volt.

#### 6A7 tube
- Plate (0 to ground) | 195 volts |
- Screen grid (G32 to ground) | 95 volts |
- Grid No. 2 to ground | 105 volts |
- Grid No. 3 to ground | 345 volts |

#### 6D6 tube
- Plate (0 to ground) | 195 volts |
- Screen grid (G32 to ground) | 95 volts |
- Grid No. 2 to ground | 105 volts |
- Grid No. 3 to ground | 345 volts |

#### 75 tube
- Plate (0 to ground) | 75 volts |
- Screen grid (G32 to ground) | 95 volts |
- Grid No. 2 to ground | 105 volts |
- Grid No. 3 to ground | 345 volts |

#### 41 tube
- Plate (0 to ground) | 195 volts |
- Screen grid (G32 to ground) | 95 volts |
- Grid No. 2 to ground | 105 volts |
- Grid No. 3 to ground | 345 volts |

#### 80 tube
- Plate (0 to ground) | 75 volts |
- Screen grid (G32 to ground) | 95 volts |
- Grid No. 2 to ground | 105 volts |
- Grid No. 3 to ground | 345 volts |

#### Power Transformer (Part No. P3394)
- Primary—Blue white, plate red white B+
- Resistance—124 ohms |
- Secondary—White, grid black white, AVC—Resistance—241 ohms |
- Secondary—White, grid white black, AVC—Resistance—241 ohms |

#### Shortwave Oscillator (Part No. P3398)
- Looking at the connection and in a clockwise direction starting at the mounting lug side of the connections are: No. 1: B+B; No. 2: Grid; No. 3: Plate; No. 4: Pad. Ground: No. 2 and No. 4—Resistance 3 ohms

#### Shortwave Antenna (Part No. P3378)
- Looking at the connection and in a clockwise direction starting at the mounting lug side of the connections are: No. 1: A+C; No. 2: Grid; No. 3: A+G; No. 4: Around No. 4 is grounded to the mounting strip. Primary—No. 3 and No. 4—Resistance 17.1 ohms
- Secondary—No. 1 and No. 2—Resistance 1.9 ohms

### ALIGNMENT DATA

**LF ALIGNMENT**
- Adjust the signal generator to 455 KC and connect the output to the grid of the first detector tube (DA7) through a .05 or .1 mfd. condenser. Allow all LF trimmers to peak or maximum reading on the output meter.

**BROADCAST BAND ALIGNMENT**
- Adjust the signal generator to 1720 KC and connect the output to the antenna lead through a 5000 ohm micro-condenser. Set the antenna condenser to minimum capacity and adjust the oscillator trimmer to receive this signal. The oscillator and antenna trimmers may be reached by removing the dial enclosure (See Index for trimmer location.)
- The next step is to set the signal generator to 1400 KC and after tuning in the signal adjust the oscillator trimmer to peak. Next, reset the dial pointer to the receiver and the signal generator to 5000 KC. Slowly increase or decrease the oscillator gain condenser and at the same time continuously tune back and forth across the signal with the receiver until the maximum reading is obtained on the output meter.
- Return to 1400 KC and again go over the adjustment of this frequency to be certain that they were not put slightly out of alignment when adjustment was made.

**SHORT WAVE BAND ALIGNMENT**
- The short wave band is adjusted by setting the signal generator to 100 KC and connecting the output to the antenna lead through a 400 ohm resistor. Set the gain at maximum and adjust the "short wave dimmer" trimmer to drive maximum output. If there is no variable low frequency potentiometer on this board, the sensitivity of the receiver should be checked at 6000 KC to determine whether the circuits are in line at this frequency. Should the receiver lack sensitivity at 6000 KC, the antenna and oscillator coils, as well as the .004 mfd. padding condenser, should be tested.

**ALIGNMENT MODEL 70**
- Because of the built-in loop antenna, it is necessary to align this receiver while in the cabinet. Otherwise the procedure is the same as for the Model 76. In determining above, trim the broadcast and oscillator at 1500 KC instead of 1750 KC.
ALIGNMENT DATA AND SERVICING

GENERAL DATA

The alignment of this receiver requires the use of a test oscillator which will cover the frequencies of 456, 600, 1400, 1730, 6000, 18000 and 18100 KC and an output meter which is to be connected across the primary or secondary of the output transformer. If possible, all adjustments should be made with the volume control on maximum and the test oscillator output as low as possible, to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT

PROCEDURE

properly adjusted and packed, the Broadcast Band should always be the next procedure, after which, the Short Wave Band may be aligned.

I.F. ALIGNMENT

With the wave switch in the broadcast band and the gang condenser set at minimum, adjust the test oscillator to 456 KC and connect the output of the oscillator or signal generator to the grid of the first detector tube (6D8G) through a .05 or .1 mfd. condenser. Set the ground on the test oscillator can be connected to the chassis ground. Align all four I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND

ALIGNMENT

Connect the output of the signal generator to the antenna lead (blue) through a .0002 mfd. mica condenser. Set the gang condenser to minimum and turn the oscillator to 1730 KC and adjust the Broadcast "oscillator trimmer" to receive this signal. Make no other adjustments at this frequency. Then set the generator to 1400 KC and tune in this signal by rotating the gang to 1400 on the dial. Adjust the Broadcast "antenna" trimmer to a maximum signal. Set the signal generator to 600 KC and tune in the signal on the receiver.

Note: Approximately the same sensitivity should be noted at this point as was at 1400 KC. The signal strength may sometimes be improved by padding the circuits. This is done by slowly increasing or decreasing the oscillator padding condenser and, at the same time, continuously tuning back and forth across the signal with the receiver until the maximum reading is obtained on the output meter. This adjustment may seem a little complicated but is the easiest way to adjust the oscillator to the antenna. Return to 1400 KC and again go over the adjustments of this frequency to be certain that they were not put slightly out of alignment when adjustment was made at 600 KC.

SHORT WAVE BAND

ALIGNMENT

The short wave band is adjusted by setting the generator to 18,100 KC and tuning in the signal. Adjust the "short wave antenna" to give maximum output. As there is no variable low frequency padding condenser on this band, the sensitivity of the receiver should be checked at 6000 KC to determine whether the circuits are in line at this frequency. Should the receiver lack sensitivity at 6000 KC, the antenna and oscillator coils, as well as the .004 mfd. padding condenser, should be tested for defects as sometimes these components become subject to mechanical or electrical injuries, despite their rugged construction and liberal ratings.
CONVENTIONAL I.F. ALIGNMENT
TRIM OSC(BC) 1700 KC. TRIM ANT(BC) 1400 KC
PAD(BC) 600 KC.
POLICE BAND-PEAK TRIMMER B at 6 MC
SHORT-WAVE BAND- PEAK C AND ANT-SW 181 KC
MODELS TH-15 and TH-17 are five tube, electric push-button tuning, superheterodyne radios with a manual tuning range covering 540 to 1580 K C.

These models are similar with the exception of the cabinet.

INTERMEDIATE FREQUENCY: 455 K C.

Six electric push-buttons are provided on this model.

Five are used for stations and one push-button for selecting dial tuning. The push buttons cover a frequency range as follows: 540 to 1600 kilocycles.

FOR OTHER DATA SEE INDEX

Model TP-21 is a five tube, electric push-button tuning superheterodyne radio with a manual tuning range covering 540 to 1580 K.

Six electric push-buttons are provided on this model. Five are used for stations and one push-button for selecting dial tuning. The push-buttons cover a frequency range as follows: 540 to 1600 kilocycles.

INTERMEDIATE FREQUENCY: 455 K C.
CIRCUIT DESIGN: Models PT-25, Codes 121 and 122, PT-27, Codes 121 and 122, and PT-39 are five tube superheterodyne radios covering a frequency range from 540 to 1720 K.C. These models are similar with the exception of the cabinets. Codes 121 and 122 of Models PT-25 and PT-27 differ also in the type of cabinet used.

MODELS PT-25, PT-27, Codes 121-122; and PT-39

POWER SUPPLY: The receivers are designed for operation on either a 115 volt alternating current (A.C.) or 115 volt direct current (D.C.) power supplies.

Models PT-26, PT-28 and PT-36 are five tube superheterodyne radios covering a tuning frequency range from 540 to 1580 K.C. and designed with a built-in loop aerial for portable use. To obtain maximum performance, however, in steel reinforced buildings, apartment houses, hotels and other shielded locations where signal strength is weak, provisions are also provided at the rear of the cabinet for an outside aerial.

MODEL PT-26

MODEL PT-28

MODEL PT-36

<table>
<thead>
<tr>
<th>SCHE, No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tubular Condenser (.0015 mf., 200V)</td>
<td>30-45558</td>
</tr>
<tr>
<td>2</td>
<td>Antenna Transformer</td>
<td>33-3394</td>
</tr>
<tr>
<td>3</td>
<td>Loop Amplifier — Part of cabinet and loop Amp.</td>
<td>76-1005</td>
</tr>
<tr>
<td>PT-26</td>
<td></td>
<td>76-1013</td>
</tr>
<tr>
<td>PT-28</td>
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<td>78-1014</td>
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<tr>
<td>4</td>
<td>Tuning Condenser — PT-26 &amp; PT-28</td>
<td>31-3451</td>
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<td>PT-36</td>
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<td>Paddling Condenser</td>
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<td>Tubular Condenser (.1 mf., 200V)</td>
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<tr>
<td>7</td>
<td>Condenser &amp; Choke Amp.</td>
<td>76-1010</td>
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<tr>
<td>8</td>
<td>Resistor (22,000 ohms, 2% watt)</td>
<td>33-322154</td>
</tr>
<tr>
<td>9</td>
<td>Mica Condenser (110 mmf.)</td>
<td>30-1130</td>
</tr>
</tbody>
</table>
Models PT-29 and PT-31 are five tube superheterodyne radios covering a frequency range from 540 to 1720 K.C. on the broadcast band and 2.3 to 2.5 megacycles (M.C.) on the local police range. These models are similar with the exception of the cabinets.

**INTERMEDIATE**

**FREQUENCY: 470 K.C.**

1. **Antenna Transformer** 32-3164
2. **Tubular Condenser (.0016 mfd., 200 v.)** 30-45558
3. **Switch** 31-2447
4. **Tubular Condenser (.06 mfd., 200 v.)** 30-45198
5. **Tubular Condenser (.15 mfd., 400 v.)** 30-45688
6. **Grid Condenser (47,000 ohms, 4/2 watt)** 33-347145
7. **Mica Condenser (110 mfd.)** 30-1130
8. **Oxidized Transformer** 32-3142
9. **Tubular Condenser (.03 mfd., 200 v.)** 30-45195
10. **Tubular Condenser (.04 mfd., 400 v.)** 30-45195
11. **Speaker** 36-1469
12. **Part of Speaker No. 36-1469
13. **Part of Speaker No. 36-1469
14. **Part of Speaker No. 36-1469
15. **Part of Speaker No. 36-1469
16. **Part of Speaker No. 36-1469
17. **Part of Speaker No. 36-1469
18. **Part of Speaker No. 36-1469
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22. **Part of Speaker No. 36-1469
23. **Part of Speaker No. 36-1469
24. **Part of Speaker No. 36-1469
25. **Part of Speaker No. 36-1469
26. **Part of Speaker No. 36-1469
27. **Part of Speaker No. 36-1469
28. **Part of Speaker No. 36-1469
29. **Part of Speaker No. 36-1469
30. **Part of Speaker No. 36-1469

**PRODUCTION CHANGE**

To stabilize the oscillator circuit and prevent oscillation at the high frequency end of the tuning dial, the oscillator grid leak was changed from 47000 ohms to 220000 ohms.

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Models PT-33, PT-41, Codes 121 and 122, PT-61, Codes 121 and 122, are five tube superheterodyne radios covering a frequency range from 540 to 1580 kilocycles (K.C.).

1. **Loop Antenna Assem. (Code 121)** 38-0858
2. **Loop Antenna Assem. (Code 122)** 32-3179
3. **Tuning Condenser (Code 121)** 31-3179
4. **Tuning Condenser (Code 122)** 31-3179
5. **Tubular Condenser (.05 mfd., 200 V.)** 30-45195
6. **Tubular Condenser (.25 mfd., 400 V.)** 30-45000
7. **Grid Condenser (47,000 ohms, 4/2 watt)** 33-347145
8. **Mica Condenser (110 mfd.)** 30-1130
9. **Oxidized Transformer** 32-3142
10. **Tubular Condenser (.05 mfd., 200 V.)** 30-45195
11. **1st I. F. Transformer** 33-3179
12. **2nd I. F. Transformer** 33-3179
13. **Resistor (2.2 meg., 1/4 watt)** 33-525154
14. **Mica Condenser (250 mfd.)** 61-00003
15. **Resistor (27,000 ohms, 1/4 watt)** 33-525154
16. **Volume Control (500,000 ohms)** 33-545734
17. **Volume Control (500,000 ohms)** 33-545734
18. **Tubular Condenser (.01 mfd., 200 V.)** 30-44794
19. **Tubular Condenser (.01 mfd., 200 V.)** 30-44794
20. **Tubular Condenser (.01 mfd., 200 V.)** 30-44794
21. **Tubular Condenser (.01 mfd., 200 V.)** 30-44794
22. **Tubular Condenser (.01 mfd., 200 V.)** 30-44794
23. **Tubular Condenser (.01 mfd., 200 V.)** 30-44794
24. **Tubular Condenser (.01 mfd., 200 V.)** 30-44794
25. **Tubular Condenser (.01 mfd., 200 V.)** 30-44794
26. **Tubular Condenser (.01 mfd., 200 V.)** 30-44794
27. **Tubular Condenser (.01 mfd., 200 V.)** 30-44794
28. **Tubular Condenser (.01 mfd., 200 V.)** 30-44794
29. **Tubular Condenser (.01 mfd., 200 V.)** 30-44794
30. **Tubular Condenser (.01 mfd., 200 V.)** 30-44794

**FOR ALIGNMENT**

1. **Dial** Code 121 Code 122
2. **Instructions** 39-6570 33-3179
3. **Loop Aerial Assembly** 38-0858 33-3179
4. **Tuning Condenser** 31-2429 31-2448

**PRODUCTION CHANGES**

Several parts were changed in these models and the code numbers changed from 121 to 122. These changes are as follows:

- **MODEL PT-41**
  - **Dial** Code 121 Code 122
  - **Instructions** 39-6570 33-3179
  - **Loop Aerial Assembly** 38-0858 33-3179
  - **Tuning Condenser** 31-2429 31-2448

- **MODEL PT-61**
  - **Dial** Code 121 Code 122
  - **Instructions** 39-6570 33-3179
  - **Loop Aerial Assembly** 38-0858 33-3179
  - **Tuning Condenser** 31-2429 31-2448
Model PT-35 is a five tube superheterodyne radio, covering a frequency range from 540 to 1720 kilocycles (K. C.) on the broadcast band and 2.3 to 2.5 megacycles (M. C.) on the local police band.

**INTERMEDIATE FREQUENCY:** 470 K. C.

Models PT-37 and PT-53 are five tube superheterodyne radios covering a tuning frequency range from 540 to 1720 kilocycles (K. C.) on the broadcast band and 5.5 to 19 megacycles (M. C.) on the short wave band. These models are similar with the exception of the cabinet.

Model PT-38 is a five tube superheterodyne radio, covering a frequency range from 540 to 1720 kilocycles (K. C.) on the broadcast band and from 5.5 to 19 megacycles (M. C.) on the short-wave band.

**FOR OTHER DATA SEE INDEX**

Model PT-50 is a five-tube superheterodyne radio covering a frequency range from 540 to 1580 kilocycles (K. C.)
Models PT-46 and PT-48 are five tube electric push-button tuning superheterodyne radios with a manual tuning range covering 540 to 1500 K.C. These models are similar with the exception of the cabinets.

<table>
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<tr>
<th>PART No.</th>
<th>SCHE. No.</th>
<th>INTERMEDIATE FREQUENCY</th>
<th>455 K.C.</th>
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</tbody>
</table>

Models PT-49 and PT-51 are five tube electric push-button tuning superheterodyne radios with a manual tuning covering 540 to 1500 K.C. The push-buttons cover a frequency range as follows: 540 to 1500 kilocycles.

To stabilize the oscillator circuit and prevent oscillation at the high frequency end of the tuning range, the oscillator gain was changed from 4500 ohms to 2500 ohms.

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Compliments of www.nucow.com
Models PT-57 and PT-65 are five tube electric push-button tuning superheterodyne radios with a manual tuning range covering 540 to 1580 K.C.

The models are similar with the exception of the cabinets.

**INTERMEDIATE FREQUENCY: 455 K.C.**

**PRODUCTION CHANGE**

For alignment and tuning, see Index.

To stabilize the oscillator circuit and prevent oscillation at the high frequency end of the tuning dial, the oscillator grid leak was changed from 47000 ohms to 22000 ohms.

Six electric push-buttons are provided on these models. Five of the push-buttons are used for stations and one push-button for selecting dial tuning. The push-buttons cover a frequency range as follows: 540 to 1600 kilocycles.

Model PT-59 is a five tube electric push-button tuning superheterodyne radio with a manual tuning covering 540 to 1720 K.C. on the broadcast range and 2.3 to 2.5 megacycles (M.C.) on the local police range.

**INTERMEDIATE FREQUENCY: 470 K.C.**

**PRODUCTION CHANGE**

To stabilize the oscillator circuit and prevent oscillation at the high frequency end of the tuning dial, the oscillator grid leak was changed from 47000 ohms to 22000 ohms.
Several parts were changed in this model and the code number changed from 121 to 122. These changes are as follows:

<table>
<thead>
<tr>
<th>MODEL PT-69</th>
<th>Code 121</th>
<th>Code 122</th>
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<tbody>
<tr>
<td>Dial</td>
<td>27-5554</td>
<td>27-5570</td>
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<tr>
<td>Instructions</td>
<td>39-6573</td>
<td>39-6712</td>
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<td>Loop Aerial Assy</td>
<td>38-9858</td>
<td>32-3179</td>
</tr>
<tr>
<td>Tuning Condenser</td>
<td>31-2429</td>
<td>31-2448</td>
</tr>
</tbody>
</table>

PRODUCTION CHANGE MODELS PT-67, PT-69

To stabilize the oscillator circuit and prevent oscillation at the high frequency end of the tuning dial, the oscillator grid leak was changed from 47000 ohms to 22000 ohms.

Model PT-67 is a five tube electric push-button tuning, superheterodyne radio with a manual tuning range covering 540 to 1580 K.C. on the broadcast band and 2.5 to 2.5 M.C. on the local police range.

Six electric push-buttons are provided on this model. Five push-buttons are used for selecting stations and one push-button for selecting dial tuning. The push-buttons cover a frequency range as follows: 540 to 1600 kilocycles.
BATTERY DRAIN:
“A” 200 M. A.; “B” 7.2 M. A.

TUNING RANGE:
530 to 1600 K.C.

TYPE OF CIRCUIT: Model 40-74 is a portable, four-tube, battery operated superheterodyne radio, designed with a built-in loop aerial. Connections are also provided for an external aerial and ground.

Model 40-84 is a portable five (5) tube A.C.-D.C. power line or battery operated superheterodyne radio. This model covers a tuning frequency range of 540 K.C. to 1650 K.C.

To operate the radio on 115 volt A.C. or D.C. power supply, insert the power line cord plug into the socket on the back of the chassis. This plug-in arrangement automatically disconnects the A-B battery from the circuits of the set.

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**Schematic Diagram Model 40-74**

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**Model 40-84**

**Intermediate Freq.: 455 K.C.**

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**FOR ALIGNMENT SEE INDEX**

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**PARTS LIST**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tuning Condenser</td>
<td>31-2423</td>
</tr>
<tr>
<td>2</td>
<td>Trimmer Condenser</td>
<td>31-2511</td>
</tr>
<tr>
<td>3</td>
<td>Mica Condenser</td>
<td>36-1159</td>
</tr>
<tr>
<td>4</td>
<td>Resistor (1/4 watt, 1 meg.)</td>
<td>33-510154</td>
</tr>
<tr>
<td>5</td>
<td>Resistor (1/4 watt, 220,000 ohms)</td>
<td>33-422154</td>
</tr>
<tr>
<td>6</td>
<td>Tubular Condenser (0.05 mfd., 600 V.)</td>
<td>30-40518</td>
</tr>
<tr>
<td>7</td>
<td>Resistor (1/4 watt, 33,000 ohms)</td>
<td>33-3335154</td>
</tr>
<tr>
<td>8</td>
<td>Oscillator Coil</td>
<td>32-3385</td>
</tr>
<tr>
<td>9</td>
<td>Tubular Condenser (1 mfd., 400 V.)</td>
<td>30-40445</td>
</tr>
<tr>
<td>10</td>
<td>1st I. F. Transformer</td>
<td>33-3384</td>
</tr>
<tr>
<td>11</td>
<td>Tubular Condenser (25 mfd., 400 V.)</td>
<td>30-40445</td>
</tr>
<tr>
<td>12</td>
<td>Resistor (1/4 watt, 47 meg.)</td>
<td>33-547154</td>
</tr>
<tr>
<td>13</td>
<td>Resistor (1/4 watt, 10,000 ohms)</td>
<td>33-310154</td>
</tr>
<tr>
<td>14</td>
<td>Tubular Condenser (0.015 mfd., 200 V.)</td>
<td>30-40518</td>
</tr>
<tr>
<td>15</td>
<td>Resistor (1/4 watt, 2.2 meg.)</td>
<td>33-3252154</td>
</tr>
<tr>
<td>16</td>
<td>2nd I. F. Transformer</td>
<td>33-3384</td>
</tr>
</tbody>
</table>

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Compliments of www.nucow.com
Models 40-81, Codes 121 and 122 are 4 tube portable battery operated superheterodyne receivers. These receivers are similar with the exception of the type tubes used. Incorporated in the receiver is a self-contained loop aerial and an extremely sensitive permanent magnet field speaker. In addition terminals are provided for connection of an outside aerial and ground. The receiver is operated from a self-contained A-B battery pack.

**TUNING RANGE:** 540 to 1550 K.C.

**INTERMEDIATE FREQUENCY:** 455 K.C.

**BATTERY CURRENT:**
- "A" Battery, 200 M. A.
- "B" Battery, 5.5 M. A.

**MODEL 40-82**

Model 40-82, Code 121, is a 4-tube portable battery operated superheterodyne radio and covers the standard broadcast frequency range from 540 to 1550 K.C. This model is similar to Philco Model 40-81, Code 122, with the exception of the cabinet, and several of the replacement parts.

The following service data listed for Model 40-81, Code 122, also applies to Model 40-82, Code 121. The parts used in 40-82 which differ from those shown for Model 40-81, Code 122, are as follows:

- **Knobs**
  - 27-4578
  - 27-4491

- **Scale**
  - 27-4578

- **Tuning Condenser**
  - 31-2410
  - 31-2411

- **Grille Screen**
  - 10-1325

- **Cabinet**
  - 104080

**MODEL 40-82**

Model 40-82 is similar to Model 40-81, Code 122, with the exception of the following parts:

- **Grille Screen**
  - 56-1529

- **Scale**
  - 27-4578

- **Pointers**
  - 56-1326

The service data listed for Model 40-81, Code 122, applies to Model 40-82.

**MODEL 40-81, CODES 121-122**

To improve the padding at 1550 K.C., condenser (2) 25 mfd. Part No. 30-1157 changed to 15 mfd. Part No. 61-1038.

Tuning condenser, dial scale, and pointer changed on later production receivers. These changes are as follows:

- **Early**
  - **Later**
    - **Production**
      - **Production**

- **Tuning Condenser**
  - 27-4578
  - 27-4578

- **Dial Scale**
  - 27-4578
  - 27-4578

- **Pointer**
  - 56-1326
  - 27-4578

**MODEL 40-81, CODE 122**

To improve the operating characteristics of the receiver at 550 K.C. and prevent oscillation the following items should be observed:

1. The loop wire going to the I.A.T. grid, the wire from the I.A.T. grid to the wiring panel and the wire from the tuning condenser antenna section lug to the wiring panel must be kept as far away from the I.A.T. tube as is possible.

2. The second I. F. Shield must be tightly fastened to the sub-base so that no openings exist between the base and the bottom of the shield.
PRODUCTION CHANGES

To improve the padding at 1500 K. C. of receivers with oscillator transformer (2) Part No. 32-3184 identified with red paint on a red lead, the following adjustments should be made:

1. Bend the oscillator padding condenser on the tuning-condenser back after removing the screw and mica.
2. Set the top of the pointer even with the bottom of the 1500 K. C. division line with set tuned to 1500 K. C.

INTERMEDIATE FREQUENCY: 455 K. C.

BATTERY DRAIN: "A" 200 M. A. "B" 7.2 M. A.

Model 40-95 is a four (4) tube battery operated superheterodyne radio covering a tuning frequency range from 540 to 1720 K. C.

FOR ALIGNMENT, SEE INDEX

Model 40-90 is a four (4) tube battery operated superheterodyne radio covering a tuning frequency range from 540 to 1720 K. C.
PHILCO RADIO & TELEVISION CORP. MODEL 40-106(121, 122) MODEL 40-105

INTERMEDIATE FREQUENCY: 465 K.C.
BATTERY DRAIN: "A" 300 M.A. "B" 7.2 M.A.

For Alignment and Tuner, See Index

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SETTING AND OPERATING ELECTRIC PUSH-BUTTON TUNING

In order to adjust the electric automatic tuning push-button accurately for reception of broadcast stations, a signal generator, such as Philco Model 077, and a paddling screw driver, Philco Part No. 45-2610, are required. With this equipment at hand, proceed as follows:

1. Select five (5), seven (7) or eight (8) of the most popular stations received in the locality (depending on the number of push-buttons on the model to be adjusted). Insert the station call letters into the windows above the buttons. The station with the lowest frequency is placed in the first button on the left and the highest frequency station in the extreme right button. Each push-button is adjusted by two set screws. These set screws are located on the rear of the chassis or push-button unit. Each set of screws is numbered and covers a frequency range as follows:

### FREQUENCY RANGES OF PUSH-BUTTONS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Push-Button Frequency Range</td>
<td>Push-Button Frequency Range</td>
<td>Push-Button Frequency Range</td>
</tr>
<tr>
<td>1</td>
<td>540-1000 K.C.</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>600-1100 K.C.</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>600-1100 K.C.</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>600-1100 K.C.</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>900-1500 K.C.</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>1100-1600 K.C.</td>
<td>7</td>
</tr>
</tbody>
</table>

Models 40-124, 40-125, 40-125, 40-145, 40-253, 40-255, 40-257, 40-252 (121), 40-258 (121)

<table>
<thead>
<tr>
<th>Push-Button Frequency Range</th>
<th>Push-Button Frequency Range</th>
<th>Push-Button Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>540-1000 K.C.</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>600-1100 K.C.</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>600-1100 K.C.</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>900-1500 K.C.</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>1100-1600 K.C.</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>1100-1600 K.C.</td>
<td>7</td>
</tr>
</tbody>
</table>

Looking at the front of the cabinet, the first button on the left is adjusted by “Osc.” and “Ant.” set screws No. 1; the next push-button by “Osc.” and “Ant.” set screws No. 2, and the remaining push-buttons in order.

2. Turn the receiver on and set the “Tuning Range Selector” or push-button for “Dial” tuning.

3. Set up the Model 077 signal generator about 3 feet from the receiver and connect a loop aerial (made from a few turns of wire 12 inches in diameter) to the “high” and “ground” output jacks of the signal generator. Turn the output controls to maximum and set the modulation control to “Mod. ON”.

4. Manually tune in on the radio the first station to be set up; (usually No. 1 push-button first). After doing this, set the indicator of the 077 signal generator to the frequency of the station being received. As the indicator approaches the frequency of the station, a whistle will be heard; leave the indicator at this point.

5. Turn the receiver tuning range selector to “push-button” and press in No. 1 button. (Models without a tuning range selector, simply press in push-button to be set up). Using the insulating screwdriver, turn the No. 1 “Osc.” screw until the broadcast station identified by the signal generator is heard; then turn signal generator indicator off the frequency of the station.

6. Readjust No. 1 “Osc.” and “Ant.” screws until the station is heard clearly and distinctly. The adjustment of No. 1 push-button is then complete. After setting up the first station the same procedure as outlined above is used for the remaining stations.

While the above procedure is satisfactory in setting up push-buttons for stations, a very accurate adjustment can be obtained with a vacuum tube voltmeter. The instructions for using a vacuum tube voltmeter will be found on page 10 under “Using Vacuum Tube Voltmeter for Aligning Compensators and Adjusting Push-Buttons.”

When any of these models are to be set up to receive the sound of a television program, tuned in by special type Philo television sets, or if they are to be used in conjunction with a Philco Record Player, push-button No. 1 should be used. To adjust the push-buttons on these instruments, the same procedure as outlined above is used.

Further details for setting up this receiver for operation with Philco Television sets and Record Players are supplied with the instruments.

MODEL 40-115, CODE 122

Model 40-115, Code 122, is similar to Code 121 with the addition of a loop aerial mounted inside the cabinet and several part changes in the aerial circuit. These changes are shown in the following circuit diagram and parts list. The service information in RIDER’S VOLUME XI, for Model 40-115, Code 121, with these changes, applies to Model 40-115, Code 122.

<table>
<thead>
<tr>
<th>SCHEMATIC NUMBER</th>
<th>DESCRIPTION</th>
<th>PART NO.</th>
<th>CODE 122</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antenna Transformer</td>
<td>32-3040</td>
<td></td>
</tr>
<tr>
<td>1A</td>
<td>Tubular Condenser (.0015 mfd.)</td>
<td>30-4155</td>
<td></td>
</tr>
<tr>
<td>1B</td>
<td>Loop Assembly</td>
<td>32-4645</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Tuning Condenser</td>
<td>32-4645</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Mica Condenser (600 mmfd.)</td>
<td>30-1135</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Not used.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Tubular Condenser (.05 mfd.)</td>
<td>30-4159</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Resistor (150 ohm, 1/2 watt)</td>
<td>30-115536</td>
<td></td>
</tr>
<tr>
<td>6A</td>
<td>Resistor (150 ohm, 1/2 watt)</td>
<td>30-115536</td>
<td></td>
</tr>
<tr>
<td>6B</td>
<td>Tubular Condenser (.05, 1/2 mfd.)</td>
<td>30-4322</td>
<td></td>
</tr>
<tr>
<td>6C</td>
<td>Resistor (47,000 ohms, 1/2 watt)</td>
<td>30-247319</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Tubular Condenser (.05 mfd.)</td>
<td>30-4519</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Choke and Condenser Assembly (2 mfd.)</td>
<td>76-1034</td>
<td></td>
</tr>
</tbody>
</table>

Additional notes and diagrams are included in the original text, which provide further details on the operation and setup of the Philco radio models mentioned.
ALIGNING PROCEDURE
MODELS 40-81, 40-82, 40-83, 40-84, 40-88, 40-90, 40-95, 40-100, 40-105, 40-110

CONNECTING THE ALIGNING METERS
It is desirable to connect both the diode and the resistance of the meter to the input of the receiver. When adjusting, the diode meter is used in the same manner as the signal generator, and the resistance meter is used in the opposite manner. The position of the diode terminal is connected to the high end of the circuit, and the resistance terminal is connected to the low end. The position of the diode terminal is connected to the high end of the circuit, and the resistance terminal is connected to the low end.

Models 40-81, Cedes 121, 122, 40-82, 40-83, 40-84, PT-35, 40-75

Models 40-82, Code 121

Models 40-83, 40-84, 40-85, 40-105

Models 40-85, 40-100, 40-105

Models 40-110

NOTE A—DIAL CALIBRATION: Before adjusting the R.F. pad, the pad must be aligned to the meter of the tuning condenser. When the pad is adjusted, the tuning condenser is connected to the diode meter. When adjusting, the pad is connected to the meter of the tuning condenser. When the pad is adjusted, the tuning condenser is connected to the diode meter.

NOTE B—DIAL CALIBRATION: In order to adjust the receiver correctly, the dial must be aligned to the meter of the tuning condenser. To do this, proceed as follows:

1. Turn the tuning condenser to the maximum position (dial at 0°).

2. Adjust the tuning condenser to the maximum position (dial at 0°).

3. Adjust the tuning condenser to the maximum position (dial at 0°).

4. Adjust the tuning condenser to the maximum position (dial at 0°).

5. Adjust the tuning condenser to the maximum position (dial at 0°).

6. Adjust the tuning condenser to the maximum position (dial at 0°).

MODEL 40-120

The tuning condenser is changed from Part No. 31-959 to Part No. 31-959. The new condenser is a new mounting arrangement, Part No. 31-959, and above, Part No. 30-959.

MODEL 40-125

The tuning condenser is changed from Part No. 31-959 to Part No. 31-959. The new condenser is a new mounting arrangement, Part No. 31-959, and above, Part No. 30-959.
PHILCO RADIO & TELEVISION CORP.
MODELS 40-150
40-155

FREQUENCY TUNING RANGES
400 to 1550 K.C.
155 to 15 K.C.
6.0 to 18 M.C.

Fig. 1. Schematic diagram, models 40-150, 40-155

Each model is equipped with eight electron tuning push buttons for automatically selecting stations. Six of the push buttons are used for broadcast stations, one for selecting dual tuning and one push button may be set up for use with a Philco Record Player or in combination with Philco Television sets for reception of television sound programs.

In general, these models are similar with the exception of the number of tubes used and cabinet design. Model 40-150 employs seven (7) tubes and Model 40-155, eight (8) tubes.

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Compliments of www.nucow.com
Models 40-135 and 40-170CS are similar in design, with the exception of the cabinets, speakers, and several circuit changes. The service information for Model 40-135 covers the Model 40-170 with the exception of the part changes listed below.

### Production Changes

#### Models 40-130, 40-135, 40-170CS

To prevent oscillation at the low end of the broadcast band and 2nd I. F. transformer (21) changed from Part No. 32-3281 to Part No. 32-3282.

**Model 40-170CS**

The speaker, Part No. 36-1480-3 and cone assembly, Part No. 36-1046 listed in No. 1 change notice for Model 10-170CS has been changed on later production receivers to speaker 36-1480-4. The cone assembly for this new speaker is 36-1136.

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MODELS 40-180, 40-185, 40-190

In general, these models are similar with the exception of the number of tubes used and the cabinet design. Model 40-180 employs a seven tube receiver. Model 40-185 and 40-190 employ eight tube receivers assembled in different type cabinets.

**SCH.**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Loop Assy. (Broadcast)</td>
</tr>
<tr>
<td>1A</td>
<td>Mica Cond. (50 mmfd.)</td>
</tr>
<tr>
<td>1B</td>
<td>Resistor (10000 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>2</td>
<td>Loop Assy. (Shots Wave)</td>
</tr>
<tr>
<td>3</td>
<td>Compensator</td>
</tr>
<tr>
<td>4</td>
<td>Mica Cond. (5 mmfd.)</td>
</tr>
<tr>
<td>5</td>
<td>Mica Cond. (1250 mmfd.)</td>
</tr>
<tr>
<td>6</td>
<td>Mica Cond. (250 mmfd.)</td>
</tr>
<tr>
<td>7</td>
<td>Resistor (390 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>8</td>
<td>Tubular Cond. (0.05 mfd.)</td>
</tr>
<tr>
<td>9</td>
<td>Resistor (10.6 meg., 1/2 watt)</td>
</tr>
<tr>
<td>10</td>
<td>Resistor (23,000 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>11</td>
<td>Resistor (10,000 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>12</td>
<td>Mica Cond. (60 mmfd.)</td>
</tr>
<tr>
<td>13</td>
<td>Mica Cond. (5000 mmfd.)</td>
</tr>
<tr>
<td>14</td>
<td>Mica Cond. (100 mmfd.)</td>
</tr>
<tr>
<td>15</td>
<td>Mica Cond. (47,500 mmfd.)</td>
</tr>
<tr>
<td>16</td>
<td>Tubular Cond. (0.05 mfd.)</td>
</tr>
<tr>
<td>17</td>
<td>Resistor (4700 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>18</td>
<td>Resistor (1,100 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>19</td>
<td>Resistor (10,000 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>20</td>
<td>Compensator (2 Section)</td>
</tr>
<tr>
<td>21</td>
<td>Mica Cond. (5300 mmfd.)</td>
</tr>
<tr>
<td>22</td>
<td>Tuning Cond. Ass'y</td>
</tr>
<tr>
<td>23</td>
<td>Mica Cond. (250 mmfd.)</td>
</tr>
<tr>
<td>24</td>
<td>Silver Mica Cond. (370 mmfd.)</td>
</tr>
<tr>
<td>25</td>
<td>Silver Mica Cond. (370 mmfd.)</td>
</tr>
<tr>
<td>26</td>
<td>Resistor (33,000 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>27</td>
<td>Switch Button Switch</td>
</tr>
<tr>
<td>28</td>
<td>Padder Strips (Push Buttons)</td>
</tr>
</tbody>
</table>

**SCH.**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tubular Cond. (0.05 mfd.)</td>
</tr>
<tr>
<td>2</td>
<td>Tubular Cond. (0.02 mfd.)</td>
</tr>
<tr>
<td>3</td>
<td>Resistore (150,000 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>4</td>
<td>Resistor (33,000 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>5</td>
<td>Resistor (10,000 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>6</td>
<td>Resistor (10,000 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>7</td>
<td>Tubular Cond. (0.01 mfd.)</td>
</tr>
<tr>
<td>8</td>
<td>Tubular Cond. (0.01 mfd.)</td>
</tr>
<tr>
<td>9</td>
<td>Volume Control (20,000 ohms)</td>
</tr>
<tr>
<td>10</td>
<td>Tubular Cond. (0.01 mfd.)</td>
</tr>
<tr>
<td>11</td>
<td>Resistore (2,200 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>12</td>
<td>Mica Cond. (110 mmfd.)</td>
</tr>
<tr>
<td>13</td>
<td>Tubular Cond. (0.1 mfd.)</td>
</tr>
<tr>
<td>14</td>
<td>Tubular Cond. (300 mfd.)</td>
</tr>
<tr>
<td>15</td>
<td>Resistor (9000 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>16</td>
<td>Resistor (47000 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>17</td>
<td>Output Trans.</td>
</tr>
<tr>
<td>18</td>
<td>Coupler &amp; Voice Coil Assy. (Spike Part No. 16-1047.)</td>
</tr>
<tr>
<td>19</td>
<td>Socket (Type 41 Tube)</td>
</tr>
<tr>
<td>20</td>
<td>Electrolytic Cond. (16,000, 200 V)</td>
</tr>
<tr>
<td>21</td>
<td>Resistore (15,000 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>22</td>
<td>Resistore (100,000 ohms, 1/2 watt)</td>
</tr>
<tr>
<td>23</td>
<td>Electrolytic Cond. (12 mfd., 200 V)</td>
</tr>
<tr>
<td>24</td>
<td>Field Coil (Replace Speaker, Part No. 90-1047)</td>
</tr>
<tr>
<td>25</td>
<td>Power Transformer (115, 50 to 60 Cycle)</td>
</tr>
<tr>
<td>26</td>
<td>Power Transformer (120, 20 Cycle)</td>
</tr>
</tbody>
</table>

**MISCELLANEOUS PARTS**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>44</td>
<td>Line Cond. (Belleville, 0.01 mfd.)</td>
</tr>
<tr>
<td>45</td>
<td>Pilot Lamp Assy</td>
</tr>
<tr>
<td>46</td>
<td>Wave Switch</td>
</tr>
</tbody>
</table>

**Fig. 1—Part locations under side of chassis.**

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Compliments of www.nucow.com
In general, both radios are similar with the exception of the number of tubes used and cabinet design. Models 40-195 and 40-200 employ ten and eleven tubes respectively.

**MODEL 40-201XX**
Models 40-200XXS and 40-201XX, Code 121 are similar with the exception of the cabinets. The service information for Model 40-200, Code 121 also applies to Model 40-201XX, Code 121.

**MODEL 40-201, CODE 122**
Model 40-201, Code 122 is similar to Model 40-195, Code 121 with the exception of the cabinet. Service information for Model 40-201, Code 122 is the same as that for the Model 40-195.
Connecting Aligning Instruments

VACUUM TUBE VOLTOMETER — To use the vacuum tube voltmeter as an alignment indicator make the following connections:

1. ADJUSTING I. F. CIRCUIT:
   - Remove the 1235 R. F. tube from its socket and insert the aligning adapter, then replace the tube in the adapter. Connect the negative terminal of the vacuum tube voltmeter to the wire protruding from the side of the adapter. Attach the positive terminal of the voltmeter to the chassis.
   - With the voltmeter connected in this manner a very sensitive indication of the A. C. voltage is obtained when the paddles are adjusted. If an audio output meter is used, connect it to the plate and socket terminals of the 42 type tube and adjust the output meter for the 0 to 20 A. C. scale.

   After connecting the aligning indicator, adjust the compensators in the order shown in the tabulation below. Locations of the compensators are shown on the schematic diagram page No. 2. If the output meter pointer goes off scale when adjusting the compensators, reverse the signal from the generator.

   SIGNAL GENERATOR: When adjusting the I. F. paddles, the high side of the a-signal generator is connected through a 1 mfd. condenser to terminal No. 1 of the loop terminal panel at the rear of the chassis. The ground or low side of the a-signal generator is connected to chassis of the receiver.

   When aligning the R. F. paddlers a loop is made from a few turns of wire and connected to the signal generator output terminals; the loop is then placed two or three feet from the loop in the cabinet. Do not remove the receiving loop from the cabinet. It is necessary when adjusting the paddlers that the loop be left in the cabinet.

   NOTE A — A Dummy Antenna consisting of a .1 mfd. condenser is connected in series with the signal generator output and (High Side).

   NOTE B — DIAL CALIBRATION: In order to adjust the receiver correctly the dial must be aligned to track properly with the tuning condenser. To adjust the dial proceed as follows: set the dial pointer on the zero line and then immediately exchange the drive cable in this position as shown in Fig. 4.

   MODEL 40-195, 40-200

   Models 40-195, 40-200 and 40-201, Codes 121-122

   To prevent low frequency rumbles at various points on the dial scale, another condenser Part No. 20-4284, 004 mfd. was connected in parallel with the present condenser (44) in the bass compensation circuit.
SPECIFICATIONS

Models 40-215, code 121, and 40-217, code 121, are twelve (12) tube super-heterodyne radios employing Philco Wireless Remote Control and a Built-in Super-Aerial System. These tuning and reception conditions are also provided for remote localities where station signal strength is exceptionally weak.

POWER SUPPLY: 115 volts, 60 cycles. This model can also be operated on a 115 volt, 25 cycle power supply, changing the power transformers and several parts as indicated on the replacement parts on page 73.

FREQUENCY TUNING RANGES: 540 to 1550 K. C. 1.4 to 1.6 M. C. 6.0 to 18 M. C.

INTERMEDIATE FREQUENCY: 470 K. C.


Control Frequency—Amplifier—7S, 6720, 6ES6G, 2A1G.

Wireless Remote Control—Type 50 tube.

AUDI0 OUTPUT: 1 Watt.

CABINET DIMENSIONS: Height Width Depth
Model 40-215 14 1/2" 22" 16 1/2"
Model 40-217 12 1/4" 22" 14 1/2"

CONNECTING ALIGNING INSTRUMENTS

Vacuum Tube Voltmeter: To use the vacuum tube voltmeter as an aligning indicator it should be connected to the A. V. C. circuit as follows:

1. Connect the negative (—) terminal of the voltmeter to the A. V. C. resistor to the grid of the 7S1.R 1 tube. The voltmeter must be connected directly to the grid of the tube and the voltmeter wire attached to the resistor.

2. Connect the positive (+) terminal to the chassis ground terminal.

Audio Output Meters: If this kind of meter is used as an aligning indicator, it should be connected to the plate and screen terminals of one of the 45 tubes. Adjust the meter for the proper signal with the A. V. C. 1st Input.

After connecting the aligning meter, adjust the R. F. and I. F. compensators in the order as shown in the tabulation below. Locations of the compensators are shown in Fig. 5, page 58. If the output meter pointer goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

Signal Generators: When adjusting the I. F. paddles, the high side of the signal generator is connected through a 1 milliamp. condenser to the grid of the tubes. The ground or low side of the signal generator is connected to the chassis of the receiver.

When aligning the R. F. paddles a loop antenna is made from a few turns of wire and connected to the signal generator output terminals; the loop is then placed two or three feet from the loop in the cabinet. Do not remove the receiver loop from the cabinet. It is necessary when adjusting the paddles, that the receiver be left in the cabinet.

RECEIVER CIRCUIT ADJUSTMENTS — Models 40-215, 40-217

<table>
<thead>
<tr>
<th>Operation</th>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Generator to Receiver</td>
<td>Dial Setting</td>
<td>Dial Setting</td>
</tr>
<tr>
<td>1</td>
<td>7S1 F. Grid</td>
<td>470 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>Use Loop on Generator</td>
<td>16.0 M.C.</td>
</tr>
<tr>
<td>4</td>
<td>Use Loop on Generator</td>
<td>1800 K.C.</td>
</tr>
<tr>
<td>5</td>
<td>Use Loop on Generator</td>
<td>880 K.C.</td>
</tr>
<tr>
<td>6</td>
<td>Use Loop on Generator</td>
<td>1800 K.C.</td>
</tr>
<tr>
<td>7</td>
<td>Use Loop on Generator</td>
<td>2.5 M.C.</td>
</tr>
</tbody>
</table>

NOTES:

A — DIAL CALIBRATION: In order to adjust the receiver correctly the dial must be aligned to track properly with the tuning condenser. To adjust the dial, proceed as follows: With the tuning condenser closed (maximum capacity), set the dial pointer on the extreme left index line at the low frequency end of the broadcast scale. The arrangement of the drive cable and dial pointer is shown in Fig. 1.

NOTE B — See Wireless Remote Control Amplifier adjustments.

NOTE C — If two peaks (signals) are observed on the aligning meter when adjusting the oscillator paddler No. 20B, turn the paddler to the second peak from the maximum capacity position (crew all the way in). When adjusting the paddlers to this first peak roll the tuning condenser (truck) slightly back and forth to obtain the maximum readings on the aligning meter.

NOTE D — If two peaks (signals) are observed on the aligning meter when adjusting the loop paddler 2A, turn the paddler to the first peak signal of the maximum capacity position (crew all the way in). When adjusting the paddlers to this first peak roll the tuning condenser (truck) slightly back and forth to obtain the maximum readings on the aligning meter.

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Models 40-508 and 40-509 are radio-phonograph combinations consisting of an 8 tube electric push button tuning superheterodyne radio and an automatic record changer. The same radio receiver is used in each model. The automatic record changer and cabinet, however, are different.

Model 40-508 employs an improved type automatic record changer, Philco Part No. 35-1180, which plays twelve 10" records or ten 12" records at one loading.

Model 40-509 incorporates the Philco Inter-Mix Record Changer Part No. 35-1176. This record changer plays fourteen 10" and 12" records intermixed, or fifteen 10" or thirteen 12" records at one loading.

The radio receiver of these models contains 8 electric push buttons; 6 of the electric push buttons are used for reception of stations, one for television sound and one to switch to dial tuning.

In addition, the Philco Built-In Super Aerial System is included in these models. This system eliminates an outside aerial and reduces local static interference to a minimum. Included in the Built-In Super Aerial System is a statically shielded loop for broadcast band reception and a shortwave receiving loop. A feature of the built-in broadcast band statically shielded loop is that it may be turned to the position in which it picks up a minimum amount of interference or if interference is not present, the loop may be set in the position where best reception is obtained. Outside aerial connections are also provided for remote locations where signal strength is weak.

### Model 40-515, Code 121

**SERVICE INFORMATION**

Model 40-515, Code 121 is a radio-phonograph combination similar to Model 49-508, Code 121, with the exception of the cabinets. The service information listed in Radio Service Bulletin No. EBA for Model 49-508 also applies to Model 40-515 P-W, and P-M with the part changes as follows:

- **Cable Assembly (from chassis to changer)**: 41-2506
- **Cable and Plug (Speaker)**: 41-1215
- **Cable Assembly (Terminal Strip Changer)**: 41-5110
- **Cable and Plug Assembly (Motor)**: 41-3215
- **Cabinet Walnut (40-515 P-W)**: 197173
- **Cabinet Mahogany (40-515 P-M)**: 197173

**Pilot Lamp Socket Assembly**: 38-9122

**TUNING RANGES**: Three

- 540 to 1550 K.C.
- 1.5 to 3.4 M.C.
- 6 to 18 M.C.

**INTERMEDIATE FREQUENCY**: 455 K.C.

**AUDIO OUTPUT**: 2 watts.
MODEL 40-756

**REPLACEMENT PARTS**

**SIGNAL GENERATOR**

Option No. in Order | Antenna Type A | Dial Settings | Dial Settings | Adjustable Compartments
--- | --- | --- | --- | ---
2 | Ant. and Grid | 200 mfd. | 1600 K. C. | 1800 K. C. | Val. Max. Range Switch "23.PM" 30, 28A, 26A
3 | Ant. and Grid | 200 mfd. | 800 K. C. | 1800 K. C. | Range Switch "24.PM" 30, 28A, 26A
4 | Ant. and Grid | 600 pms. | 6.0 M. C. | 8.0 M. C. | Val. Max. Tune Tube Range Switch "W1P" 30, 28A, 26A
5 | Ant. and Grid | 400 pms. | 21 M. C. | 21 M. C. | Range Switch "22.PM" 38, 20, 6

NOTE A—The "Dummy Antenna" consists of a condenser or resistance connected to series with the signal generator output lead (high side), at the capacity or resistance specified in each step of the above procedure. To adjust the diode, proceed as follows: With the tuning condenser closed (minimum capacity), set the diode pointer on the first mark on the left edge (low frequency) and on the broadband scale.

NOTE B—DIAL CALIBRATION. In order to adjust the resistor correctly the dial must be aligned to track properly with the tuning condenser. To adjust the dial, proceed as follows: With the tuning condenser closed (minimum capacity), set the diode pointer on the first mark on the left edge (low frequency) and on the broadband scale.

**MODEL 40-780, Codes 121-251**

**SIGNAL GENERATOR**

Option No. in Order | Antenna Type A | Dial Settings | Dial Settings | Adjustable Compartments
--- | --- | --- | --- | ---
2 | Ant. and Grid | 200 mfd. | 1600 K. C. | 1800 K. C. | Val. Max. Range Switch "23.PM" 30, 28A, 26A
3 | Ant. and Grid | 200 mfd. | 800 K. C. | 1800 K. C. | Range Switch "24.PM" 30, 28A, 26A
4 | Ant. and Grid | 600 pms. | 6.0 M. C. | 8.0 M. C. | Val. Max. Tune Tube Range Switch "W1P" 30, 28A, 26A
5 | Ant. and Grid | 400 pms. | 21 M. C. | 21 M. C. | Range Switch "22.PM" 38, 20, 6

NOTE A—The "Dummy Antenna" consists of a condenser or resistance connected to series with the signal generator output lead (high side), at the capacity or resistance specified in each step of the above procedure. To adjust the diode, proceed as follows: With the tuning condenser closed (minimum capacity), set the diode pointer on the first mark on the left edge (low frequency) and on the broadband scale.

NOTE B—DIAL CALIBRATION. In order to adjust the resistor correctly the dial must be aligned to track properly with the tuning condenser. To adjust the dial, proceed as follows: With the tuning condenser closed (minimum capacity), set the diode pointer on the first mark on the left edge (low frequency) and on the broadband scale.

<ref>Compliments of www.nucow.com</ref>
MODEL 40-2710  
PHILCO RADIO & TELEVISION CORP.

MODEL 40-2710  
Signal Generators: The signal generator is connected to the receiver as indicated in the tabulations below under “Output Connections to Receiver.” A dummy antenna is also required. This is listed under column, “Dummy Antenna, Note A.”

Vacuum Tube Voltmeters: To use the vacuum tube voltmeter as an aligning indicator it should be connected to the A. V. C. circuit with the Philco aligning adapter, Part No. 45-376, as follows:

Remove the 7C6 tube from its socket and insert the aligning adapter in the socket, then replace the tube in the adapter. Connect the negative terminal of the vacuum tube voltmeter to the light tube drive which provides 1 volt of the adapter. Attach the positive terminal of the voltmeter to the black wire.

Audio Output Meters: If this type of meter is used as an aligning indicator, it should be connected to the plate and screen terminals of the 35A6 tube. Adjust the meter for the 0 to 50 volt A. C. scale.

After connecting the aligning meter, adjust the compensators in the order as shown in the tabulation below. Locations of the compensators are shown in Fig. 2. The output meter pointer goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

![Fig. 1. Dial Calibration.](image)

**OPERATIONS IN ORDER**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Antenna</td>
<td>.1 mfd.</td>
<td>455 K. C.</td>
<td>580 K. C.</td>
<td>23A, 19A, 19B</td>
</tr>
<tr>
<td>2 Ant. &amp; Grd.</td>
<td>400 ohms</td>
<td>21 M. C.</td>
<td>21 M. C.</td>
<td>41B, 41A Notes C</td>
</tr>
<tr>
<td>3 Ant. &amp; Grd.</td>
<td>200 mfd.</td>
<td>1500 K. C.</td>
<td>1500 K. C.</td>
<td>14A</td>
</tr>
<tr>
<td>5 Ant. &amp; Grd.</td>
<td>200 mfd.</td>
<td>1500 K. C.</td>
<td>1500 K. C.</td>
<td>14A</td>
</tr>
<tr>
<td>6 Ant. &amp; Grd.</td>
<td>200 mfd.</td>
<td>300 K. C.</td>
<td>300 K. C.</td>
<td>15 (Screw)</td>
</tr>
<tr>
<td>7 Ant. &amp; Grd.</td>
<td>200 mfd.</td>
<td>175 K. C.</td>
<td>175 K. C.</td>
<td>14</td>
</tr>
<tr>
<td>8 Ant. &amp; Grd.</td>
<td>200 mfd.</td>
<td>300 K. C.</td>
<td>300 K. C.</td>
<td>14</td>
</tr>
</tbody>
</table>

**NOTE A** — The “Dummy Antenna” consists of a condenser or resistance connected in series with the signal generator output lead (high side). Use the capacity or resistance as specified in each step of the above procedure.

**NOTE B** — DIAL CALIBRATION: In order to adjust the receiver correctly the dial must be aligned to track properly with the tuning condenser. To adjust the dial, proceed as follows: With the tuning condenser closed (maximum capacity), set the dial pointer on the first mark on the left edge (low frequency end) of the broadcast scale.

**NOTE C** — When adjusting compensator (41B) be sure to tune in the fundamental signal (21 M. C.) instead of the image signal. If the compensator is correctly adjusted, the image signal will be 910 K. C. below the fundamental signal, which will be 20.090 M. C.

**MODEL 40-2725  | CONNECTING ALIGNING INSTRUMENTS**

Vacuum Tube Voltmeter: To use the vacuum tube voltmeter as an aligning indicator it should be connected to the A. V. C. circuit as follows:

1. Connect the negative (—) terminal of the voltmeter through a 2 meg. resistor to the converter grid (6J8G). The resistor must be connected directly to the grid of the tube and the voltmeter wire attached to the resistor.

2. Connect the positive (+) terminal to the chassis ground terminal.

Audio Output Meter: If this type of meter is used as an aligning indicator, it should be connected to the plate and screen terminals of the 4L tube. Adjust the meter for the 0 to 30 volt A. C. scale.

After connecting the aligning meter, adjust the compensators in the order as shown in the tabulation below. Locations of the compensators are shown in Fig. 1. If the output meter pointer goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

**OPERATIONS IN ORDER**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 GJ8G</td>
<td>.1 mfd.</td>
<td>455 K. C.</td>
<td>580 K. C.</td>
<td>328A, 328A, 32B, 32A Note B</td>
</tr>
<tr>
<td>2 Antenna and Ground</td>
<td>200 mfd.</td>
<td>1500 K. C.</td>
<td>1500 K. C.</td>
<td>27, 22B, 22A</td>
</tr>
<tr>
<td>3 Antenna and Ground</td>
<td>200 mfd.</td>
<td>580 K. C.</td>
<td>580 K. C.</td>
<td>23</td>
</tr>
<tr>
<td>4 Antenna and Ground</td>
<td>300 mfd.</td>
<td>1500 K. C.</td>
<td>1500 K. C.</td>
<td>27, 22B, 22A</td>
</tr>
<tr>
<td>5 Antenna and Ground</td>
<td>200 mfd.</td>
<td>300 K. C.</td>
<td>300 K. C.</td>
<td>27A</td>
</tr>
<tr>
<td>6 Antenna and Ground</td>
<td>200 mfd.</td>
<td>175 K. C.</td>
<td>175 K. C.</td>
<td>27A</td>
</tr>
<tr>
<td>7 Antenna and Ground</td>
<td>200 mfd.</td>
<td>300 K. C.</td>
<td>300 K. C.</td>
<td>27A</td>
</tr>
<tr>
<td>8 Antenna and Ground</td>
<td>400 ohms</td>
<td>21 M. C.</td>
<td>21 M. C.</td>
<td>28, 15, 5 Note C</td>
</tr>
</tbody>
</table>

**NOTE A** — The “Dummy Antenna” consists of a condenser or resistance connected in series with the signal generator output lead (high side). Use the capacity or resistance as specified in each step of the above procedure.

**NOTE B** — DIAL CALIBRATION: In order to adjust the receiver correctly the dial must be aligned to track properly with the tuning condenser. To adjust the dial, proceed as follows: With the tuning condenser closed (maximum capacity), set the dial pointer on the first mark on the left edge (low frequency end) of the broadcast scale. See Schematic Diagram.

**NOTE C** — When adjusting compensator (29) be sure to tune in the fundamental signal (21 M. C.) instead of the image signal. If the compensator is correctly adjusted, the image signal will be 910 K. C. below the fundamental signal, which will be 20.090 M. C.
**SPECIFICATIONS**

The Model RP-1 is a remote type record player which can be used in conjunction with any standard broadcast receiver to reproduce phonograph records.

The unit is designed to operate on various power supplies as follows:


To operate on any one of these power supplies, it is necessary that the proper power transformer and turntable motor is used as indicated in the parts list below.

To operate the unit: Place record on turntable and slide "On-Off Switch" (Diagram "A") to "On" position; this will be indicated by pilot light in tone arm.

After allowing sufficient time for tubes to warm up, place tone arm on record; this automatically starts motor.

Next go to your radio and tune to approximately 540 K.C. (44 on most dials), at which setting the phonograph signal will be picked up. Volume can be regulated by the radio receiver's volume control in the normal way.

At the end of the record, turn the tone arm to rest position, which will automatically turn motor off. It is not necessary to slide "On-Off Switch" to the "Off" position between records.

If interference from broadcast stations is encountered the frequency of the unit can be changed to any other frequency between 530 K.C. and 580 K.C. by adjusting the small screw indicated in Diagram "B". Turning screw clockwise lowers the frequency, counter-clockwise raises the frequency. This adjustment is best made while the unit is in operation.

If hum is experienced it may be necessary to reverse the power plug of the record player, the radio, or both. In most cases it is preferable to use different receptacles for record player and radio.

No definite rule can be established for the relative location of the record player to your radio; individual trial will establish best location. However, in general, satisfactory operation may be obtained up to a distance of fifty (50) feet, provided local noise conditions are not too severe.

**PRODUCTION CHANGES**

Master On-Off switch changed from Part No. 42-1464 to 42-1462.

Two types of motor and turntable assemblies were used on this model. The part numbers are as follows:

- Motor—110 volts, 60 cycles: 35-1222
- Motor—110 volts, 60 cycles: 35-1216
- Turntable for Motor 35-1222: 35-3044
- Turnable for motor 35-1216: 35-1217

**REPLACEMENT PARTS**

<table>
<thead>
<tr>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Motor Switch</td>
<td>42-1547</td>
</tr>
<tr>
<td>2</td>
<td>Master Switch</td>
<td>42-1562</td>
</tr>
<tr>
<td>3</td>
<td>Power Trans. (110 V, 60 cycles)</td>
<td>35-1093</td>
</tr>
<tr>
<td>4</td>
<td>Line Condenser (0.1 mf, 600 V)</td>
<td>35-5056</td>
</tr>
<tr>
<td>5</td>
<td>Power Trans. (110 V, 25 cycles)</td>
<td>35-1091</td>
</tr>
<tr>
<td>6</td>
<td>Motor (110 V, 60 cycles)</td>
<td>35-1222</td>
</tr>
<tr>
<td>7</td>
<td>Motor (110 V, 25 cycles)</td>
<td>35-1216</td>
</tr>
<tr>
<td>8</td>
<td>Motor (220 V, 50 cycles)</td>
<td>35-3125</td>
</tr>
<tr>
<td>9</td>
<td>Crystal Pickup &amp; Tone Arm</td>
<td>35-1220</td>
</tr>
<tr>
<td>10</td>
<td>Comp. Resistor (51,000 ohms, ½ watt)</td>
<td>35-3124</td>
</tr>
<tr>
<td>11</td>
<td>Comp. Cond. (0.06 mf, 200 V)</td>
<td>35-4167</td>
</tr>
<tr>
<td>12</td>
<td>Electrolytic Condenser (6 mf, 250 V, 60 cycles)</td>
<td>35-3088</td>
</tr>
<tr>
<td>13</td>
<td>Grid Resistor (1 me., ½ watt)</td>
<td>35-310344</td>
</tr>
<tr>
<td>14</td>
<td>Cathode Bias Resistor (1000 ohms, ½ watt)</td>
<td>35-310344</td>
</tr>
<tr>
<td>15</td>
<td>Screen By-Pass (1 mf, 200 V)</td>
<td>35-4499-S</td>
</tr>
<tr>
<td>16</td>
<td>Screen Resistor (51,000 ohms, ½ watt)</td>
<td>35-310344</td>
</tr>
<tr>
<td>17</td>
<td>Pilot Light (6.8 V, 250 amp)</td>
<td>35-2064</td>
</tr>
<tr>
<td>18</td>
<td>Oscillator Coil &amp; Padder Assembly</td>
<td>35-3218</td>
</tr>
<tr>
<td>19</td>
<td>Mica Condenser (250 mfd)</td>
<td>35-1032</td>
</tr>
<tr>
<td>20</td>
<td>Coupling Condenser (30 mfd)</td>
<td>35-1059</td>
</tr>
</tbody>
</table>

**MISCELLANEOUS PARTS**

- Cable (Power): 27-2738
- Cover (Bottom of Cabinet): 27-2726
- Cabinet: 27-2848
- Mounting Feet Cabinet: 27-3817
- Switch Plate: 35-1385
- Socket (1 prong): 27-2037
- Socket (7 prong): 27-2037
- Turntable (for Motor 35-1222): 35-3044
- Turnable (for Motor 35-1216): 35-2117
- Turnable (for Motor 315-1004): 35-3104

Two types of 110 volt, 60 cycle motors were used on this model, when ordering, be sure correct turntable is ordered for motor.
### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>Operation in Order</th>
<th>Output Connectors to Receiver</th>
<th>Dummy Antenna to Mote A</th>
<th>Dial Setting</th>
<th>Control Comps.</th>
<th>Adjust Comps.</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Antenna to Ground</td>
<td>100 mfd.</td>
<td>1800 K. C.</td>
<td>1800 K. C.</td>
<td>27 . 28 . . .</td>
<td>No. C</td>
</tr>
<tr>
<td>5</td>
<td>Antenna to Ground</td>
<td>100 mfd.</td>
<td>1800 K. C.</td>
<td>1800 K. C.</td>
<td>27 . 28 . . .</td>
<td>No. C</td>
</tr>
<tr>
<td>6</td>
<td>Antenna to Ground</td>
<td>300 mfd.</td>
<td>450 K. C.</td>
<td>300 K. C.</td>
<td>31 . 31 .</td>
<td>R. G.</td>
</tr>
<tr>
<td>7</td>
<td>Antenna to Ground</td>
<td>300 mfd.</td>
<td>1800 K. C.</td>
<td>400 K. C.</td>
<td>31 . 31 .</td>
<td>R. G.</td>
</tr>
<tr>
<td>8</td>
<td>Antenna to Ground</td>
<td>200 mfd.</td>
<td>400 K. C.</td>
<td>200 K. C.</td>
<td>31 . 31 .</td>
<td>R. G.</td>
</tr>
</tbody>
</table>

### REPLACEMENT PARTS

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antenna Trans. (Brackets)</td>
<td>32-2558</td>
</tr>
<tr>
<td>2</td>
<td>Ant. Trans. (Long Wave)</td>
<td>32-3399</td>
</tr>
<tr>
<td>2A</td>
<td>Mica Cond. (2200 mfd.)</td>
<td>30-1185</td>
</tr>
<tr>
<td>3</td>
<td>Antenna Trans. (S.W.)</td>
<td>32-3199</td>
</tr>
<tr>
<td>4</td>
<td>Mica Cond. (70 mfd.)</td>
<td>31-1177</td>
</tr>
<tr>
<td>5</td>
<td>Resist. (1.0 meg., 1/2 watt)</td>
<td>33-510399</td>
</tr>
<tr>
<td>6</td>
<td>Mica Cond. (150 mfd.)</td>
<td>30-4699</td>
</tr>
<tr>
<td>7</td>
<td>Mica Cond. (50 mfd.)</td>
<td>31-1120</td>
</tr>
<tr>
<td>8</td>
<td>Mica Cond. (5 mfd.)</td>
<td>31-1120</td>
</tr>
<tr>
<td>9</td>
<td>Resist. (68,000 ohms, 1/2 watt)</td>
<td>33-368399</td>
</tr>
<tr>
<td>10</td>
<td>Resist. (22,000 ohms, 1/2 watt)</td>
<td>33-322399</td>
</tr>
<tr>
<td>11</td>
<td>Resist. (33,000 ohms, 1/2 watt)</td>
<td>33-333399</td>
</tr>
<tr>
<td>12</td>
<td>Resist. (33,000 ohms, 1/2 watt)</td>
<td>33-333399</td>
</tr>
<tr>
<td>13</td>
<td>Resist. (10,000 ohms, 1 watt)</td>
<td>31-1309</td>
</tr>
<tr>
<td>14</td>
<td>Resist. (1500 ohms, 1/2 watt)</td>
<td>33-323399</td>
</tr>
<tr>
<td>15</td>
<td>Resist. (1500 ohms, 1/2 watt)</td>
<td>33-323399</td>
</tr>
<tr>
<td>16</td>
<td>Resist. (2000 ohms, 1/2 watt)</td>
<td>33-323399</td>
</tr>
<tr>
<td>17</td>
<td>Resist. (2000 ohms, 1/2 watt)</td>
<td>33-323399</td>
</tr>
<tr>
<td>18</td>
<td>Resist. (5000 ohms, 1/2 watt)</td>
<td>33-323399</td>
</tr>
<tr>
<td>19</td>
<td>Resist. (68,000 ohms, 1/2 watt)</td>
<td>33-368399</td>
</tr>
<tr>
<td>20</td>
<td>Resist. (22,000 ohms, 1/2 watt)</td>
<td>33-322399</td>
</tr>
<tr>
<td>21</td>
<td>Resist. (2000 ohms, 1/2 watt)</td>
<td>33-323399</td>
</tr>
<tr>
<td>22</td>
<td>Resist. (22,000 ohms, 1/2 watt)</td>
<td>33-322399</td>
</tr>
</tbody>
</table>

### MISCELLANEOUS PARTS

- **Cable and Plug**
  - Power Supply (L-482) / Spec. Export (A. C. Plug - L-482)
- **Cabinet (40-2780)**
- **Drive Cord Assy.** (Dia. 3.51)
- **Felt Strip (Brass Mnt.)**
- **Gasket (Dial Mnt.)**
- **Knob (Tuning)**
- **Knob (Volume and Wave Switch)**
- **Pointer**

### TYPE CIRCUIT

Model 40-2780, code 121, is an Eleven Tube A.C. operated Superheterodyne radio. The features of design included in this model are three (3) tuning ranges for reception of standard, long wave and short wave broadcast stations: connections for attaching a high impedance electric phonograph pick-up; automatic volume control; continuously variable tone control; bass compensation and a degenerated push-pull audio output circuit.

The receiver is adjusted for operation on either of the above operating voltages by inserting the plug as indicated on top of the power transformer.

### TUNING RANGES

- 70 Tubular Cond. (1000 mfd.) 30-4582
- 75 Output Transformer 32-4058
- 80 Tone and Voice Coil Assy.
- 110 Electrolytic Condenser 40 mfd, 450 V. 30-4245
- 120 Electrolytic Condenser 16 mfd, 350 V. 30-4242
Signal Generator: When adjusting the I.F. padders, the high side of the signal generator is connected through a .1 mfd. condenser to the antenna section of the tuning condenser. Connect the ground or low side of the generator to the chassis.

When aligning the R.F. padders a loop is made from a few turns of wire and connected to the signal generator output terminals, the signal generator is then placed close to the loop of the radio.

<table>
<thead>
<tr>
<th>Operations in Order</th>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Output Connections to Receiver</td>
<td>Dial Setting</td>
</tr>
<tr>
<td>2</td>
<td>Loop see above instructions</td>
<td>1600 K. C.</td>
</tr>
</tbody>
</table>

NOTE A: DIAL POINTER CALIBRATION—in order to adjust the receiver correctly, the pointer must be adjusted to track properly with the tuning condenser. To do this, tune the tuning condenser to the maximum capacity (plates fully meshed). With the condenser in this position, set the tuning pointer on the first small line stamped in the scale plate on the left side.

NOTE B—Before adjusting compensators, turn down (10B) to tight position. Then adjust the compensators for maximum output in the following order: 12A, 12B, 10A and 10B.

NOTE C—Turn tuning condenser until dial pointer is on the first small line stamped in the scale plate from right side of chassis. Adjust padder (4B) to maximum at this point.

NOTE D—Turn tuning condenser until dial pointer is on the second small line stamped in the scale plate from right side of chassis. Adjust padder (4A) to maximum at this point.

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Signal Generator. When adjusting the L.F. paddlers, the high side of the signal generator is connected through a .1 mfd. condenser to the antenna section of the tuning condenser. Connect the ground or low side of the generator to the chassis.

When aligning the R.F. paddlers a loop is made from a few turns of wire and connected to the signal generator output terminals. The signal generator is then placed close to the loop of the radio. The receiver can be adjusted in the cabinet or removed from the cabinet. When adjusting the radio outside the cabinet the loop aerial should be placed in approximately the same position around or near the chassis as when assembled. Locations are shown on schematic.

<table>
<thead>
<tr>
<th>Operations in Order</th>
<th>Output Connections to Receiver</th>
<th>Dial Setting</th>
<th>Dial Setting</th>
<th>Control Setting</th>
<th>Adjust Compensators in Order</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Loop see above instructions</td>
<td>1600 K.C.</td>
<td>1600 K.C.</td>
<td>Vol. Max. Range Switch Brdct.</td>
<td>(14B, Note C)</td>
<td>Note A</td>
</tr>
</tbody>
</table>

NOTE A: DIAL POINTER CALIBRATION—In order to adjust the receiver correctly, the pointer must be adjusted to track properly with the tuning condenser. To do this, turn the tuning condenser to the maximum capacity (plates fully meshed). With the condenser in this position, set the tuning pointer on the first small line stamped in the scale plate on the left side.

NOTE B—Before adjusting compensators, turn down (14B) to tight position. Then adjust the compensators for maximum output in the following order: 18A, 18B, 14A and 14B.

NOTE C—Turn tuning condenser until dial pointer is on the first small line stamped in the scale plate from right side of chassis. Adjust paddler (14B) to maximum at this point.

NOTE D—Turn tuning condenser until dial pointer is on the second small line stamped in the scale plate from right side of chassis. Adjust paddler (6A) to maximum at this point.

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When aligning the R.F. pudger a loop is made from a few turns of wire and connected to the signal generator output terminals; the signal generator is then placed close to the loop of the radio.

The receiver can be adjusted in the cabinet or removed from the cabinet.

When adjusting the radio outside the cabinet the loop aerial should be placed in approximately the same position around or near the chassis as when assembled.

After connecting the aligning instruments adjust the compensators as shown in the tabulation below.

If the indicating meter pointer goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

NOTE A:—DIAL CALIBRATION: In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To do this, proceed as follows: Turn the tuning condenser to the maximum capacity position (plugs fully meshed). With the condenser in this position, set the tuning pointer on the small dot below 550 K. C.

NOTE B:—When adjusting the L.F. components of Models PT-30 and PT-49, turn compensator (11B) clockwise to the tight position and pad compensators 11A, 13A and 13B to maximum output, then pad 11B to maximum.
I.F. = 455 KC.

SCHEMATIC DIAGRAM — MODEL 41-110

<table>
<thead>
<tr>
<th>Operations in Order</th>
<th>Output Connections</th>
<th>Dummy Aerial</th>
<th>Dial Setting</th>
<th>Dial Setting</th>
<th>Control Settings</th>
<th>Adjust Compensators</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1A7G (Grid)</td>
<td>.1 mmfd.</td>
<td>455 K.C.</td>
<td>540 K.C.</td>
<td>Vol. Max.</td>
<td>15A, 15B</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Aerial Connection</td>
<td></td>
<td></td>
<td></td>
<td>Recheck Operation No. 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Receiver</td>
<td>400 Ohms</td>
<td>12 M.C.</td>
<td>12 M.C.</td>
<td>Range Switch S. W.</td>
<td>Osc., R. F., Ant.</td>
<td></td>
</tr>
</tbody>
</table>

NOTE A: DIAL CALIBRATION: Before adjusting the R. F. paddles the dial must be aligned to track properly with the tuning condenser. To adjust the dial proceed as follows: With the tuning condenser in the closed position (maximum capacity) set the dial pointer on the small dash below 540 K.C.

AUGUST, 1940.
PHILCO RADIO & TELEVISION CORP.

Model 41-RP6 is a remote type record player which can be used in conjunction with any standard broadcast radio to reproduce phonograph records.

**POWER SUPPLY:** 115 volts, 60 cycle, A.C.

**OPERATION**

Place record on turntable and slide "Off-On Switch" (Figure 1) to "On" position; this will be indicated by pilot light in tone arm. After allowing sufficient time for tubes to warm up, place tone arm on record; this automatically starts motor.

Tune the radio to approximately 540 Kc. (54 on most dials) at which setting the phonograph signal will be picked up. Volume can be regulated by the radio receiver's volume control in the normal way. At the end of the record, return the tone arm to rest position which will automatically turn motor off. It is not necessary to slide "Off-On Switch" to the "Off" position between records.

**OPERATION VERY CLOSE TO THE RECEIVER:** A range switch will be found on the lower side of the drawer. (See Figure 2). If the player is installed very close to the receiver, slide this switch to the "near" position for best tone quality. When the player is more than a short distance from the receiver, with the switch in the "near" position, the noise in the receiver will be louder than the music from the record. In this case, leave the range switch in the "distant" position. After the best position for the range switch is determined, it is not necessary to change it as long as the player and receiver are not moved. After changing position of switch it is advisable to either return the record player or the radio.

**INTERFERENCE**

If interference from broadcasting stations is encountered, the frequency of the unit can be changed to any other frequency between 530 Kc. and 570 Kc. by removing snap button and adjusting small screw indicated in Diagram "A". This adjustment is best made while the unit is in operation.

If hum is experienced it may be necessary to reverse the power plug of the record player, the radio, or both. In most cases it is preferable to use different receptacles for record player and radio.

No definite rule can be established for the relative location of the record player to your radio; individual trial will establish best location. However, in general, satisfactory operation may be obtained up to a comfortable listening distance, provided local noise conditions are not too severe.

**SIGNAL GENERATOR**

**OPERATIONS IN ORDER**

<table>
<thead>
<tr>
<th>Output Connections to Receiver</th>
<th>Dial Setting</th>
<th>Control Setting</th>
<th>Adjust Compensators in Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ant. Section of Tuning Cond.</td>
<td>455 Kc.</td>
<td>540 Kc. C.</td>
<td></td>
</tr>
<tr>
<td>Loop—See above Instructions</td>
<td>1600 Kc.</td>
<td>1600 Kc.</td>
<td></td>
</tr>
<tr>
<td>Loop—See above Instructions</td>
<td>1500 Kc.</td>
<td>1500 Kc.</td>
<td></td>
</tr>
</tbody>
</table>

**SPECIAL INSTRUCTIONS**

**NO. 2**

Vol. Max. Range Switch: "Braced" 26A, 23B, 23A

**Vol. Max. Range Switch: "Braced" 5B**

**Vol. Max. Range Switch: "Braced" 9A**

**Vol. Max. Range Switch: "Braced" 5A**

**NOTE A—DIAL CALIBRATION:** In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To do this, proceed as follows: Turn the tuning condenser to the maximum capacity position (plates fully meshed). With the condenser in this position, set the tuning pointer on the extreme left index line at the low frequency end of the broadcast scan.

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Model 41-221 is manually tuned and is assembled in two types (C & CL) cabinets. Type "C" is a diagonal grain Sapele wood cabinet with carrying handle. Cabinet Type "CL" use diagonal grained walnut wood with ivory finished bezel, knobs and trim.

Model 41-226 incorporates Electric Push-button tuning in addition to manual tuning and is assembled in a sliced Walnut Cabinet. The electric push-button mechanism consists of six (6) push-buttons. One push-button is used to turn the power off and on. The remaining five (5) push-buttons automatically tune in stations.

When aligning the R.F padders a loop is made from a few turns of wire and connected to the signal generator output terminals; the signal generator is then placed close to the loop of the radio.

The receiver can be adjusted in the cabinet or removed from the cabinet.

When adjusting the radio outside the cabinet the loop should be placed in approximately the same position around or near the chasis as when assembled.
When aligning the R. F. padders a loop is made from a few turns of wire and connected to the signal generator output terminals; the signal generator is then placed close to the loop of the radio.

The receiver can be adjusted in the cabinet or removed from the cabinet. If adjustments are made outside the cabinet a Service Tuning Scale, Part No. 48-2519, will be required. This scale is placed underneath the pointer on the metal dial plate.

When adjusting the radio outside the cabinet the loop aerial should be placed in approximately the same position around or near the chassis as when assembled.

<table>
<thead>
<tr>
<th>Operation in Order</th>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Connections to Receiver</td>
<td>Dial Setting</td>
<td>Dial Setting</td>
</tr>
<tr>
<td>1</td>
<td>Ant. Section of Tuning Cond.</td>
<td>455 K. C.</td>
</tr>
<tr>
<td>2</td>
<td>Loop—See above Instructions</td>
<td>1600 K. C.</td>
</tr>
<tr>
<td>3</td>
<td>Loop—See above Instructions</td>
<td>1500 K. C.</td>
</tr>
</tbody>
</table>

**NOTE A — DIAL CALIBRATION:** In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To do this, proceed as follows: Turn the tuning condenser to the maximum capacity position (plates fully meshed). With the condenser in this position, set the tuning pointer at the extreme left index line at the low frequency end of the broadcast scale.

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FIG. 1 — SCHEMATIC DIAGRAM — MODELS 41-250, 41-255
The above diagram is the complete electrical circuit for Model 41-255. The same general circuit is also used in Model 41-250 with the exception of the 2nd detector, 1st audio, A. V. C. wiring which is shown in Fig. 4.
NOTE A—DIAL CALIBRATION: In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To adjust the dial, proceed as follows: With the tuning condenser closed (maximum capacity), set the dial pointer on the extreme left index line at the low frequency end of the broadcast scale. The arrangement of the drive cable in this position is shown in the schematic.

NOTE B—When adjusting the low frequency compensator of the Broadcast or the aerial paddles of the high frequency tuning range; the receiver Tuning Condenser must be adjusted (rolled) as follows: First, tune the compensator for maximum output, then vary the tuning condenser of the receiver for maximum output. Now turn the compensator slightly to the right or left and again vary the receiver tuning condenser for maximum output. This procedure of first setting the compensator and then varying the tuning condenser is continued until maximum output reading is obtained.

NOTE C—Adjust compensator (27B) to first peak from closed position (maximum capacity). The aerial compensator (8A) must also be adjusted to maximum on the second signal peak by rolling the tuning condenser (See Note B).

NOTE D—Adjust compensator (27A) to the second signal peak from the closed position (maximum capacity). The aerial compensator (8) must also be adjusted to maximum on the first signal peak by rolling the tuning condenser (See Note B).
When aligning the R.F. padders a loop is made from a few turns of wire and connected to the signal generator output terminals; the signal generator is then placed close to the loop of the radio.

### RECEPTOR

<table>
<thead>
<tr>
<th>Dial Setting</th>
<th>Dial Setting</th>
<th>Control Settings</th>
<th>Adjust Capacitors in order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuning Cond. Closed</td>
<td>Range Switch Brdct.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1600 K.C.</td>
<td>1600 K.C.</td>
<td>Vol Max.</td>
<td>6B     Tuning Condenser</td>
</tr>
<tr>
<td></td>
<td>Range Switch Brdct.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1500 K.C.</td>
<td>1500 K.C.</td>
<td>Vol Max.</td>
<td>6A     Tuning Condenser</td>
</tr>
<tr>
<td></td>
<td>Range Switch Brdct.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE A** — DIAL CALIBRATION. In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To do this, proceed as follows: Turn the tuning condenser to the maximum capacity position (plates fully meshed). With the condenser in this position, set the tuning pointer on the small dot below 55 on the dial.

**NOTE B** — The police band padding is automatically adjusted by the standard broadcast padders.

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Compliments of www.nucow.com
Models 41-260 and 41-265 are seven (7) tube alternating current (A.C.) operated superheterodyne radios incorporating electric push button in addition to manual tuning — and the new Philco built-in American and overseas loop aerial system. These models are also designed to receive the sound of a television program tuned in by special type Philco Television Radios.

In general, these models are similar with the exception of the tuning ranges and cabinet design. Model 41-260 has two (2) tuning ranges covering 540 to 1720 K. C. and 9.0 to 12.0 M. C. Model 41-265 consists of three (3) tuning ranges covering 540 to 1720 K. C., 2.0 to 7.9 M. C. and 9.0 to 12 M. C.
AERIAL CONNECTIONS: The built-in loop aerial system is designed to operate without an outside aerial or ground, and to give exceptionally high receiving performance of stations on standard and shortwave frequencies. Another feature is its noise-reducing characteristic. The loop can be turned to the position in which it picks up a minimum amount of interference, or to the position where best reception is obtained.

To operate the radio in steel reinforced buildings and other shielded locations, where signal strength is weak, the Philco 1941 Outdoor Aerial, Part No. 45-2817, is recommended for maximum receiving performance. The outdoor aerial can be easily connected to the radio by inserting the plug attached to the transformer unit into the socket provided at the rear of the Radio chassis. This aerial can be obtained from your local Philco distributor. A ground connection is not required with either type of installation.
**COMPLIMENTS OF www.nucow.com**

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**MODEL 41-260, 41-265, 41-266**

When servicing the radio, the receiver and adjacent sections should be handled with care. Use a soft-bristled brush to clean all parts and remove dust. Clean the radio cabinet and the bottom of the cabinet to prevent rusting. Use a soft cloth and a mild detergent solution to clean the radio cabinet. Avoid using abrasive cleaners, as they may damage the finish.

---

**MODEL 41-260, 41-265, 41-266, 41-609, 41-608**

**PROCEDURE FOR SETTING AND OPERATING THE ELECTRIC PUSH BUTTON TUNING**

1. **Initial Setup**:
   - Set the tuning controls to the desired frequency.
   - Select the desired mode of operation (AM, FM, or CB).
   - Check the antenna connection and adjust as necessary.

2. **Frequency Setting**:
   - Use the frequency control to set the desired frequency.
   - Adjust the volume control to the desired level.

3. **Listening**:
   - Tune in the desired station.
   - Adjust the tone control to the desired level.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE ELECTRIC VOLUME CONTROL**

The electric volume control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous volume adjustment from low to high.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE MUTING CONTROL**

The muting control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous muting adjustment from off to full on.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE BANDWIDTH CONTROL**

The bandwidth control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous bandwidth adjustment from narrow to wide.

---

**MODEL 41-260, 41-265, 41-266, 41-609, 41-608**

**PROCEDURE FOR SETTING AND OPERATING THE ELECTRIC PUSH BUTTON TUNING**

1. **Initial Setup**:
   - Set the tuning controls to the desired frequency.
   - Select the desired mode of operation (AM, FM, or CB).
   - Check the antenna connection and adjust as necessary.

2. **Frequency Setting**:
   - Use the frequency control to set the desired frequency.
   - Adjust the volume control to the desired level.

3. **Listening**:
   - Tune in the desired station.
   - Adjust the tone control to the desired level.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE ELECTRIC VOLUME CONTROL**

The electric volume control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous volume adjustment from low to high.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE MUTING CONTROL**

The muting control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous muting adjustment from off to full on.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE BANDWIDTH CONTROL**

The bandwidth control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous bandwidth adjustment from narrow to wide.

---

**MODEL 41-260, 41-265, 41-266, 41-609, 41-608**

**PROCEDURE FOR SETTING AND OPERATING THE ELECTRIC PUSH BUTTON TUNING**

1. **Initial Setup**:
   - Set the tuning controls to the desired frequency.
   - Select the desired mode of operation (AM, FM, or CB).
   - Check the antenna connection and adjust as necessary.

2. **Frequency Setting**:
   - Use the frequency control to set the desired frequency.
   - Adjust the volume control to the desired level.

3. **Listening**:
   - Tune in the desired station.
   - Adjust the tone control to the desired level.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE ELECTRIC VOLUME CONTROL**

The electric volume control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous volume adjustment from low to high.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE MUTING CONTROL**

The muting control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous muting adjustment from off to full on.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE BANDWIDTH CONTROL**

The bandwidth control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous bandwidth adjustment from narrow to wide.

---

**MODEL 41-260, 41-265, 41-266, 41-609, 41-608**

**PROCEDURE FOR SETTING AND OPERATING THE ELECTRIC PUSH BUTTON TUNING**

1. **Initial Setup**:
   - Set the tuning controls to the desired frequency.
   - Select the desired mode of operation (AM, FM, or CB).
   - Check the antenna connection and adjust as necessary.

2. **Frequency Setting**:
   - Use the frequency control to set the desired frequency.
   - Adjust the volume control to the desired level.

3. **Listening**:
   - Tune in the desired station.
   - Adjust the tone control to the desired level.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE ELECTRIC VOLUME CONTROL**

The electric volume control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous volume adjustment from low to high.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE MUTING CONTROL**

The muting control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous muting adjustment from off to full on.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE BANDWIDTH CONTROL**

The bandwidth control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous bandwidth adjustment from narrow to wide.

---

**MODEL 41-260, 41-265, 41-266, 41-609, 41-608**

**PROCEDURE FOR SETTING AND OPERATING THE ELECTRIC PUSH BUTTON TUNING**

1. **Initial Setup**:
   - Set the tuning controls to the desired frequency.
   - Select the desired mode of operation (AM, FM, or CB).
   - Check the antenna connection and adjust as necessary.

2. **Frequency Setting**:
   - Use the frequency control to set the desired frequency.
   - Adjust the volume control to the desired level.

3. **Listening**:
   - Tune in the desired station.
   - Adjust the tone control to the desired level.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE ELECTRIC VOLUME CONTROL**

The electric volume control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous volume adjustment from low to high.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE MUTING CONTROL**

The muting control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous muting adjustment from off to full on.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE BANDWIDTH CONTROL**

The bandwidth control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous bandwidth adjustment from narrow to wide.

---

**MODEL 41-260, 41-265, 41-266, 41-609, 41-608**

**PROCEDURE FOR SETTING AND OPERATING THE ELECTRIC PUSH BUTTON TUNING**

1. **Initial Setup**:
   - Set the tuning controls to the desired frequency.
   - Select the desired mode of operation (AM, FM, or CB).
   - Check the antenna connection and adjust as necessary.

2. **Frequency Setting**:
   - Use the frequency control to set the desired frequency.
   - Adjust the volume control to the desired level.

3. **Listening**:
   - Tune in the desired station.
   - Adjust the tone control to the desired level.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE ELECTRIC VOLUME CONTROL**

The electric volume control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous volume adjustment from low to high.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE MUTING CONTROL**

The muting control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous muting adjustment from off to full on.

---

**MODEL 41-260, 41-265, 41-266**

**ADJUSTABLE BANDWIDTH CONTROL**

The bandwidth control is adjustable to suit individual taste. To adjust, simply move the control switch to the desired position. The control is designed to provide smooth, continuous bandwidth adjustment from narrow to wide.
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SIGNAL GENERATOR: When adjusting the I.F. padders, the high side of the signal generator is connected through a .1 mfd. condenser to the antenna section of the tuning condenser. Connect the ground or low side of the generator to the chassis.

<table>
<thead>
<tr>
<th>Operations in Order</th>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Connections to Receiver</td>
<td>Dial Setting</td>
<td>Dial Setting</td>
</tr>
<tr>
<td>1</td>
<td>Ant. Section of tuning</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>Loop see above instructions</td>
<td>1600 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>Loop see above instructions</td>
<td>1508 K.C.</td>
</tr>
</tbody>
</table>

NOTE A: DIAL POINTER CALIBRATION—In order to adjust the receiver correctly, the pointer must be adjusted to track properly with the tuning condenser. To do this, tune the tuning condenser to the maximum capacity (plates fully meshed). With the condenser in this position, set the tuning pointer on the first small line stamped in the scale plate on the left side.

NOTE B—Before adjusting compensators, turn down (10B) to tight position. Then adjust the compensators for maximum output in the following order: 12A, 12B, 10A and 7B.

NOTE C—Turn tuning condenser until dial pointer is on the first small line stamped in the scale plate from right side of chassis. Adjust padder (7B) to maximum at this point. If the radio is adjusted in the cabinet, set dial pointer to 1600 K.C.

NOTE D—Turn tuning condenser until dial pointer is on the second small line stamped in the scale plate from right side of chassis. Adjust padder (7A) to maximum at this point.
In general, these models are similar to the exception of the audio circuits, number of tubes used and cabinet design. Model 41-280 is an eight (8) tube radio; Models 41-285 and 41-287 are nine (9) tube radios employing the same chassis but assembled in different cabinets. Model 41-290 consists of a ten (10) tube chassis. These differences are shown in the schematic diagram and parts lists.

Other features of design included in these models are: Three tuning ranges covering the frequencies listed below; continuously variable tone control; audio bass frequency compression at low volume; Push-pull pentode audio output circuit with screen phase inverter; New Type (12) twelve inch speaker and illuminated push button indicators.


FREQUENCY TUNING RANGES: 540 to 1720 K. C.; 2.3 to 7.0 M. C. 9.0 to 12.9 M. C.
Either a vacuum tube voltmeter or an audio output meter may be used as a signal indicator when adjusting the receiver.

**Vacuum Tube Voltmeter:** To use the vacuum tube voltmeter as an aligning indicator, make the following connections: Attach the negative (−) terminal of the voltmeter to any point in the circuit where the A. C. voltage can be obtained. Connect the positive (+) terminal of the vacuum tube voltmeter to the chassis.

**Audio Output Meter:** Terminal No. 1 is provided on the loop aerial panel for connecting one lead of the audio output meter to the voice coil of the speaker. The other lead of the meter is connected to the chassis. When using these connections, the lowest A. C. scale of the meter must be used. (0 to 10 volts).

The audio output meter can also be connected between the plate of the output tube and the ground of the chassis.

**Signal Generator:** When adjusting the “I. F.” paddles, the high side of the signal generator is connected through a 2,000-mfd. condenser to terminal 4 of the loop aerial terminal panel at the rear of the chassis. The ground or low side of the signal generator is connected to the ground of the receiver.

When aligning the R. F. paddlers a loop is made from a few turns of wire and connected to the signal generator output terminals; the loop is then placed two or three feet from the loop in the cabinet. Do not remove the receiving loop from the cabinet. It is necessary when adjusting the paddlers, that the receiver be left in the cabinet.

After connecting the aligning indicator, adjust the compensators in the order shown in the tabulation below. Locations of the compensators are shown on the schematic diagram. If the output meter pointer goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

<table>
<thead>
<tr>
<th>Operation in Order</th>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Output Connections to Receiver</td>
<td>Dial Setting</td>
<td>Dial Setting</td>
</tr>
<tr>
<td>2</td>
<td>Use Loop on Generator</td>
<td>1500 K. C.</td>
<td>1500 K. C.</td>
</tr>
<tr>
<td>4</td>
<td>Use Loop on Generator</td>
<td>Repeat Operation No. 2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Use Loop on Generator</td>
<td>6 M. C.</td>
<td>6 M. C.</td>
</tr>
<tr>
<td>6</td>
<td>Use Loop on Generator</td>
<td>12 M. C.</td>
<td>12 M. C.</td>
</tr>
<tr>
<td>7</td>
<td>Use Loop on Generator</td>
<td>18 M. C.</td>
<td>18 M. C.</td>
</tr>
</tbody>
</table>

**NOTE A** — DIAL CALIBRATION: In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To adjust the dial proceed as follows: With the tuning condenser closed (maximum capacity), set the dial pointer on the extreme left index line at the low frequency end of the broadcast scale. The arrangement of the drive cable in this position is shown in the schematic.

**NOTE B** — When adjusting the compensator receiver Tuning Condenser must be adjusted (Rolled) as follows: First tune the compensator for maximum output, then vary the tuning condenser of the receiver for maximum output. Now turn the compensator slightly to the right or left and again vary the receiver tuning condenser for maximum output. This procedure of first setting the compensator and then varying the tuning condenser is continued until maximum output reading is obtained.

**NOTE C** — Adjust compensator (21) to the Second signal peak from the tight (closed) position. The tuning condenser should also be rolled when the paddle is being adjusted on this peak. See Note F on how to Roll the Condenser.

**NOTE D** — Adjust compensator (21A) to the First signal peak from the tight (closed) position. If the compensator is correctly adjusted the image signal will be weakly heard by leaving the receiver dial at 12 M. C. and turning the signal generator to 11,990 M. C.

**NOTE E** — Adjust compensator (21B) to the Second signal peak from the tight (closed) position. If the compensator is correctly adjusted the image signal will be weakly heard by leaving the receiver dial at 18 M. C. and turning the signal generator to 18,910 M. C. When adjusting compensator (9) roll the tuning condenser. See Note F on how to roll the condenser.

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When aligning the R.F. pedders a loop is made from a few turns of wire and connected to the signal generator output terminals; the signal generator is then clucked close to the loop of the radio. After connecting the aligning instruments adjust the compensators as shown in tabulation. Locations of the R.F. compensators are on top of the tuning condenser, oscillator on the front, and aerial on rear. The 1st and 2nd I.F. transformers are on top of the chassis.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Signal Generator</th>
<th>Receiver</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Loop see above instructions</td>
<td>1600 K.C.</td>
<td>1600 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>Loop see above instructions</td>
<td>1500 K.C.</td>
<td>1500 K.C.</td>
</tr>
</tbody>
</table>

NOTE A: DIAL CALIBRATION: In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To do this, proceed as follows: Turn the tuning condenser to the maximum capacity position (plates fully meshed). With the condenser in this position, set the tuning pointer on the small dot below 500 K C.
### Signal Generator

**Operations in Order**

<table>
<thead>
<tr>
<th>Output Connections to Receiver</th>
<th>Dial Setting</th>
<th><strong>Receiver</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ant. Section of tuning</td>
<td>455 K. C.</td>
<td><strong>Val. Max. Range Switch &quot;S. W.&quot; Positions</strong></td>
</tr>
<tr>
<td>Loop see above instructions</td>
<td>1600 K. C.</td>
<td>39A, 21A, 23B, 22A, 22B</td>
</tr>
<tr>
<td>Loop see above instructions</td>
<td>1500 K. C.</td>
<td>17A</td>
</tr>
<tr>
<td>Loop see above instructions</td>
<td>12 M. C.</td>
<td>17, 4</td>
</tr>
</tbody>
</table>

### Special Instructions

**NOTE A** — **DIAL CALIBRATION**: In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. Proceed as follows: Turn the tuning condenser to the maximum capacity position; then vary the tuning condenser slightly to the right or left and again vary the receiver tuning condenser for maximum output. This procedure of first setting the compensator and then varying the tuning condenser is continued until maximum output reading is obtained.

**NOTE B** — **When adjusting the low frequency compensator of Range One (Broadcast) or the aerial paddles of the high frequency tuning range**: The receiver Tuning Condenser must be adjusted (rolled) as follows: First turn the compensator for maximum output; then vary the tuning condenser of the receiver for maximum output. Now turn the compensator slightly to the right or left and again vary the receiver tuning condenser for maximum output. This is done to correct the signal generator section of the chassis.

**NOTE C** — **When aligning the R. F. paddlers a loop is made from a few inches of wire** and connected to the signal generator output terminals; the signal generator is then placed close to the loop of the radio. When aligning the receiver can be adjusted in the cabinet or removed from the cabinet.

When setting the compensator on the loop aerial should be placed in approximately the same position around or near the chassis as it will be in service. After connecting the aligning instruments adjust the compensators as shown in the tabulation below. Locations of the compensators are shown in the schematic diagram. If the indicating meter pointer goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

---

**Models 41-603, 41-604, 41-605, 41-607**

**PART LOCATIONS — UNDERSIDE OF CHASSIS**

Audio Output Meter: If this type of aligning meter is used, connect it to the voice coil terminals of the speaker or the plate of the 35A5 tube to the chassis. Adjust the meter for the 0 to 10 volt scale.

Vacuum Tube Voltmeter: To use the vacuum tube voltmeter as an aligning indicator, make the following connections: Attach the negative (—) terminal of the voltmeter to any point in the circuit where the A, V. C. voltage can be obtained. Connect the positive (+) terminal of the vacuum tube voltmeter to the chassis.

Signal Generator: When adjusting the I. F. paddlers, the high side of the signal generator is connected through a .1 mfd. condenser to the antenna section of the tuning condenser. Connect the ground or low side of the generator to the chassis.
A.—ADJUSTING WIDTH OF LIGHT-BEAM

To make this adjustment push the lamp socket assembly into its holder until a clear image of the lamp filament appears on the light cell. The socket should then be slightly pushed in beyond this point until the rectangular spot of light is 5/32" in width. The socket assembly is now rotated so that the spot light is vertical.

B.—POSITIONING THE LIGHT-BEAM

To position the light-beam on the light cell, turn the adjusting screw at the lower left side of the reproducer until the spot is half on the cell and half on the metal frame surrounding the cell.

C.—ADJUSTING INTENSITY OF LAMP

When shipped from the factory, the lamp of the reproducer is adjusted for best operating efficiency. The intensity of the light from the lamp is adjusted by compensator (22) located on the radio chassis. Under ordinary circumstances, an adjustment will not be necessary. When replacing the reproducer or lamp, however, there may be a tendency towards microphonic feedback. In this case the compensator is adjusted as follows:

1. Turn volume control on full and play a record.
2. While the record is playing, turn compensator in the direction necessary to eliminate microphonic feedback. By turning the compensator the strength of the pick-up output is increased or decreased.

D.—INSTALLING NEW LAMP

When installing a new lamp in the socket, there are two positions in which the lamp can be inserted. Ordinarily, either of these positions can be used. In some cases, however, due to the lamp filament being off center, the lamp must be inserted in the position that gives the best centering of the spot of light on the vibrating mirror.
Models 41-608 and 41-609, Code 122, are similar to Models 41-608 and 41-609, Code 121, with the exception of the phonograph amplifier tube and circuit. A type 7C6 tube is used in the phonograph amplifier in the 41-608 and 41-609, Code 122, chassis, whereas a 7C7 tube is used in the Code 121.

The Code 122 "Specifications", "Light-Beam Reproducer Adjustments" and "Aligning R. F. and I. F. Compensators" instructions are the same as those given for Code 121.

**TUBE SOCKET VOLTAGES**

D. C. voltages were measured with a 1000 ohms per volt voltmeter, Philco Model 027. Line voltage 120 volts A. C., no signal being received — range switch broadcast.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Location</th>
<th>Radio Pos.</th>
<th>Phone Pos.</th>
<th>D. C. Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>7BS Qc.</td>
<td>Plate</td>
<td>27</td>
<td>185</td>
<td></td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>Screen</td>
<td>27</td>
<td>185</td>
<td></td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>Bias (Grid Leak)</td>
<td>7</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>7X2 1st Det.</td>
<td>Plate</td>
<td>130</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>Bias (Cathode)</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7B7 at &amp; 2nd I. F.</td>
<td>Plate</td>
<td>227</td>
<td>185</td>
<td></td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>Screen</td>
<td>72</td>
<td>185</td>
<td></td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>Bias (Cathode)</td>
<td>1.5</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>7C6 2nd Det. 1st Audio</td>
<td>Plate</td>
<td>106</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>7C6 Preamp.</td>
<td>Plate</td>
<td>45</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>41 Output Phase Inv.</td>
<td>Plate</td>
<td>222</td>
<td>183</td>
<td></td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>Screen</td>
<td>213</td>
<td>177</td>
<td></td>
</tr>
<tr>
<td>41 Output</td>
<td>Plate</td>
<td>222</td>
<td>183</td>
<td></td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>Screen</td>
<td>227</td>
<td>185</td>
<td></td>
</tr>
<tr>
<td>12 mf. elect. to ground</td>
<td>306</td>
<td>290</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 mf. elect. to ground</td>
<td>227</td>
<td>175</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 mf. elect. to ground</td>
<td>137</td>
<td>178</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PART LOCATIONS — UNDERSIDE OF CHASSIS**

NOTE — PARTS 51, 56, 57, 58 and 59 located on top of chassis.

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PART LOCATIONS — UNDERSIDE OF CHASSIS

Audio Output Meter: Terminal No. 1 is provided on the loop serial panel for connecting one lead of the audio output meter to the voice coil of the speaker. The other lead of the meter is connected to the chassis. When using this connection, the lowest A.C. scale of the meter must be used (9 to 10 volts).

The audio output meter can also be connected between the plate of the output tube and the ground of the chassis.

Signal Generator: When adjusting the "L.F." paddles, the high side of the signal generator is connected through a 1 mfd condenser to terminal 1 of the loop serial terminal panel at the rear of the chassis. The ground or low side of the signal generator is connected to the ground of the receiver.

When adjusting the R.F. paddles a loop is made from a few turns of wire and connected to the signal generator output terminals; the loop is then placed two or three feet from the loop in the cabinet. Do not remove the receiving loop from the cabinet. It is necessary when adjusting the paddles, that the receiver be left in the cabinet.

After connecting the aligning indicator, adjust the compensators in the order shown in the tabulation below. Locations of the compensators are shown below. If the output meter pointer goes off scale when adjusting the compensator, reduce the strength of the signal from the generator.

<table>
<thead>
<tr>
<th>Operation</th>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Generator to Receiver</td>
<td>Dial Setting</td>
<td>Dial Setting</td>
<td>Control Setting</td>
</tr>
<tr>
<td>1</td>
<td>High Side to No. 4 Terminal Lead Fund</td>
<td>495 K. C.</td>
<td>580 K. C.</td>
</tr>
<tr>
<td>2</td>
<td>Use Loop on Generator</td>
<td>1500 K. C.</td>
<td>1500 K. C.</td>
</tr>
<tr>
<td>4</td>
<td>Use Loop on Generator</td>
<td>Repeat Operation No. 2 Again</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Use Loop on Generator</td>
<td>6 M. C.</td>
<td>6 M. C.</td>
</tr>
<tr>
<td>6</td>
<td>Use Loop on Generator</td>
<td>12 M. C.</td>
<td>12 M. C.</td>
</tr>
</tbody>
</table>

FOR TUNER AND AUTOMATIC RECORD CHANGER DATA, SEE INDEX

To reproduce the sound from a record, the light beam of the reproducer must be carefully positioned on the light sensitive cell. If the light beam is not carefully set, the sound reproduction will be distorted; weak or, if the light beam is completely off or on, the photograph will be silent.

If any of these conditions exist, the following adjustment procedure should be made:

**Note:** These adjustments should be made with the power line voltage at 110 volts A.C.

**A. ADJUSTING WIDTH OF LIGHT BEAM**

To make this adjustment pull the lamp socket assembly into the holder until a clear image of the lamp filament appears on the light cell. The socket should then be slightly pushed in beyond this point until the rectangular spot of light is a maximum width. The socket assembly is now rotated so that the spot light is vertical.

**B. POSITIONING THE LIGHT BEAM**

To position the light beam on the light cell, turn the adjusting screw at the lower left side of the reproducer until the spot is barely visible on the cell and half on the metal frame surrounding the cell.

**C. ADJUSTING INTENSITY OF LAMP**

When shipped from the factory, the lamp of the reproducer is adjusted for best operating efficiency. The intensity of the light from the lamp is adjusted by Compensator No. 22 located on the radio chassis. Under ordinary circumstances, an adjustment will not be necessary. When replacing the reproducer or lamp, however, there may be a tendency towards microphonics feedback. In this case the compensator is adjusted as follows:

1. Turn volume control on full and play a record.
2. While the record is playing, turn compensator 22 in the direction necessary to eliminate microphonics feedback. By turning the compensator the strength of the pick-up output is increased or decreased.

**D. INSTALLING NEW LAMP**

When installing a new lamp in the socket, there are two positions in which the lamp can be inserted. Ordinarily, neither of these positions can be used. In some cases, however, due to the lamp position being off center, the lamp must be inserted in the position that gives the best centering of the spot of light on the vibrating mirror.

**Note A: Dial Calibration:** In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To adjust the dial, proceed as follows: With the tuning condenser in the middle setting, insert a known crystal or trimmer condenser into the receiver at the lower end of the bands. Adjust the trimmer condenser until the receiver will tune no lower than the lowest frequency to be received. Adjust the receiver until the dial reads 500 K. C. as shown in the schematic.

**Note B:** When adjusting the low frequency oscillator of Range One (Broadcast) so the serial paddles to the high frequency tuning condenser, turn the dial to the required position, then adjust the compensation for maximum output. Note that the tuning condenser must be adjusted for maximum output. Now turn the compensator slightly to the right or left until again vary the tuning condenser. When the setting is correct, the output will be maximum. Turn the compensator and verify the tuning condenser. Continue until maximum output reading is obtained.

**Note C:** To accurately adjust the high frequency oscillator to the full scale setting of the signal generator, turn the individual paddles to the full scale setting of the signal generator, turn the individual paddles to the full scale setting of the signal generator.
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PART LOCATIONS — UNDERSIDE OF CHASSIS

Models 41-623, 41-624, 41-625 are radio phonograph combinations which are similar in design with the exception of the cabinets, phonograph mechanism and speaker.

CONNECTING ALIGNING INSTRUMENTS

When aligning the R. F. padders a loop aerial is made from a few turns of wire and connected to the signal generator output terminals; the signal generator is then placed close to the loop of the radio.

The receiver can be adjusted in the cabinet or removed from the cabinet.

When adjusting the radio outside the cabinet the loop aerial should be placed in approximately the same position around or near the chassis as when assembled.

Signal Generator. When adjusting the I. F. padders, the high side of the signal generator is connected through a .1 mfd condenser to the antenna section of the tuning condenser. Connect the ground or low side of the generator to the chassis.

A. ADJUSTING WIDTH OF LIGHT BEAM

To make this adjustment push the lamp socket assembly into its holder until a clear image of the lamp filament appears on the light cell. The socket should then be slightly pushed in beyond this point until the rectangular spot of light is 3/8 in width. The socket assembly is now rotated so that the spot of light is vertical.

B. POSITIONING THE LIGHT BEAM

To position the light beam on the light cell, turn the adjusting screw at the lower left side of the reproducer until the spot is half on the cell and half on the metal frame surrounding the cell.

C. ADJUSTING INTENSITY OF LAMP

When shipped from the factory, the lamp of the reproducer is adjusted for best operating efficiency. The intensity of the light from the lamp is adjusted by compensator 66 located on the radio chassis. Under ordinary circumstances, an adjustment will not be necessary. When replacing the reproducer or lamp, however, there may be a tendency towards microphonic feedback. In this case the compensator is adjusted as follows:

1. Turn volume control to full and play a record.

2. While the record is playing, turn compensator 66 in the direction necessary to eliminate microphonic feedback. By turning the compensator the strength of the pick-up output is increased or decreased.

Models 41-623, 41-624, 41-625 are radio phonograph combinations which are similar in design with the exception of the cabinets, phonograph mechanism and speaker.

<table>
<thead>
<tr>
<th>OPERATIONS IN ORDER</th>
<th>SIGNAL GENERATOR</th>
<th>RECEPTOR</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Connections</td>
<td>Dial Setting</td>
<td>Control Setting</td>
<td>Adjust Compensators in Order</td>
</tr>
<tr>
<td>1</td>
<td>455 K. C.</td>
<td>Range Switch Brdect.</td>
<td>Note A</td>
</tr>
<tr>
<td>2</td>
<td>1600 K. C.</td>
<td>Range Switch Brdect.</td>
<td>3B</td>
</tr>
<tr>
<td>3</td>
<td>1500 K. C.</td>
<td>Range Switch Brdect.</td>
<td>3A</td>
</tr>
<tr>
<td>4</td>
<td>12 M. C.</td>
<td>Range Switch &quot;S. W.&quot;</td>
<td>3C, 3</td>
</tr>
</tbody>
</table>

NOTE A: To adjust the I. F. circuits properly, compensators 36A, 35A and 35B should be depadded first. All compensators are then adjusted to maximum in the order 39A, 36A, 35A and 35B.

NOTE B: DIAL CALIBRATION: In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To do this, proceed as follows: Turn the tuning condenser to the maximum capacity position (plates fully meshed). With the condenser in this position, set the tuning pointer on the small dot below 550 K. C.

NOTE C: When adjusting oscillator compensator 3C, tune for maximum on the first signal peak from Tipt position (compensator closed).

When adjusting the aerial padra 3 of the high frequency tuning range; the receiver Tuning Condenser must be adjusted (rolled) as follows: First, tune the compensator for maximum output, then vary the tuning condenser of the receiver for maximum output. Now turn the compensator slightly to the right or left and again vary the receiver tuning condenser for maximum output. This procedure of first setting the compensator and then varying the tuning condenser is continued until maximum output reading is obtained.
C. ADJUSTING INTENSITY OF LAMP

When shipped from the factory, the lamp of the reproducer is adjusted for best operating efficiency. The intensity of the light from the lamp is adjusted by Compensator No. 37A located on the radio chassis. Under ordinary circumstances, an adjustment will not be necessary. When replacing the reproducer or lamp, however, there may be a tendency towards microphonic feedback. In this case the compensator is adjusted as follows:

1. Turn volume control on full and play a record.

2. While the record is playing, turn compensator 37A in the direction necessary to eliminate microphonic feedback. By turning the compensator the strength of the pick-up output is increased or decreased.

Signal Generator. When adjusting the I.F. paddler, the box side of the signal generator is connected through a .1 mfd. condenser to the antenna section of the tuning condenser. Connect the ground or low side of the generator to the chassis. When aligning the R.F. paddler a loop aerial is made from a few turns of wire and connected to the signal generator output terminals; the signal generator is then placed close to the loop of the radio.

When adjusting the radio outside the cabinet the loop aerial should be placed in approximately the same position around or near the chassis as when assembled.

<table>
<thead>
<tr>
<th>Operations in Order</th>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Output Connections to Receiver</td>
<td>Dial Setting</td>
<td>Dial Setting</td>
</tr>
<tr>
<td>1</td>
<td>Ant. Section of Tuning Cond. with .1 mfd. Cond.</td>
<td>455 K. C.</td>
<td>Tuning Cond. Closed</td>
</tr>
<tr>
<td>2</td>
<td>Loop Signal Generator</td>
<td>1720 K. C.</td>
<td>1720 K. C.</td>
</tr>
<tr>
<td>3</td>
<td>Loop Signal Generator</td>
<td>1600 K. C.</td>
<td>1500 K. C.</td>
</tr>
<tr>
<td>4</td>
<td>Loop Signal Generator</td>
<td>580 K. C.</td>
<td>580 K. C.</td>
</tr>
<tr>
<td>5</td>
<td>Loop Signal Generator</td>
<td>12 M. C.</td>
<td>12 M. C.</td>
</tr>
</tbody>
</table>

NOTE A — Compensator (27A) must be adjusted before compensator (27B) and should be done in the following manner: Turn (27A) all the way up, then turn down selecting the first I.F. peak, compensator (27B) is now padded to maximum.

NOTE B — DIAL CALIBRATION: In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To do this, proceed as follows: Turn the tuning condenser to the maximum capacity position (plates fully meshed). With the condenser in this position, set the tuning pointer on the extreme left index line at the lowest frequency end of the broadcast scale.

NOTE C — Adjust paddler (11) to the first signal peak from the tight position. Roll paddler (6) slowly to maximum on the second peak from loose position.
CONNECTING ALIGNING INSTRUMENTS

Vacuum Tube Voltmeter: To use the vacuum tube voltmeter as an aligning indicator, it should be connected to the A. V. C. circuit as follows:
1. Connect the negative (—) terminal of the vacuum tube voltmeter through a 2 megohm resistor to any point in the circuit where the A. V. C. voltage can be measured.
2. Connect the positive (+) terminal to the chassis ground terminal.

Audio Output Meter: If this type of meter is used as an aligning indicator, it should be connected to the plate and screen terminals of the 81.8-50 tube, Model 41-708. Adjust the meter for the 0 to 30 volt A. C. range.

After connecting the aligning meter, adjust the compensator in the order as shown in the tabulation below. Locations of the compensator are shown in the schematic diagram and part locations.

If the output meter pointer goes off scale when adjusting the compensator, reduce the strength of the signal from the generator.

NOTE A.—The "Dummy Antenna" consists of a condenser or inductance connected with the signal generator output lead (high side). The capacity or resistance is varied in each step of the above procedure.

NOTE B.—REAL CALIBRATION is to adjust the receiver output meter. "DUMMY" calibration is only applied for adjustment of the tuning condenser circuit (minimum capacity) and for the output meter in the step of the alignment procedure.

Models 41-705, 41-708

ALIGNING R. F. AND I. F. COMPENSATORS

The procedure is the same for both models.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Signal Generator</th>
<th>Receiver</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low of Ant. Tuning Condenser / Front Section</td>
<td>150 K. C.</td>
<td>Range Switch Broadcast (Position 1) Vol. Max. 16A, 18A 28A 30A 33A 36A</td>
</tr>
<tr>
<td>2</td>
<td>Ant. Lead 460 ohms</td>
<td>150 M. C.</td>
<td>Range Switch S. W. Position 1</td>
</tr>
<tr>
<td>3</td>
<td>Ant. Lead 460 ohms</td>
<td>150 M. C.</td>
<td>Range Switch S. W. Position 2</td>
</tr>
<tr>
<td>4</td>
<td>Ant. Lead 200 mfd.</td>
<td>1500 K. C.</td>
<td>Range Switch Broadcast Position 1</td>
</tr>
<tr>
<td>5</td>
<td>Ant. Lead 200 mfd.</td>
<td>580 K. C.</td>
<td>Range Switch Broadcast Position 1</td>
</tr>
</tbody>
</table>

PART Locations — Underside of Chassis Model 41-708
Vacuum Tube Voltmeter: To use the vacuum tube voltmeter as an aligning indicator, it should be connected to the A. V. C. circuit as follows:
1. Connect the negative (—) terminal of the vacuum tube voltmeter through a 2 megohm resistor to any point in the circuit where the A. V. C. voltage can be measured.
2. Connect the positive (+) terminal to the chassis ground terminal.

Audio Output Meter: If this type of meter is used as an aligning indicator, it should be connected to the plate and screen terminals of the 6K86E tube, Model 41-712; 35A5F, Model 41-713. Adjust the meter for the 0 to 60 volt A. C. scale.

After connecting the aligning meter, adjust the compensators in the order as shown in the tabulation below. Locations of the compensators are shown in the schematic diagram.

If the output meter pointer goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

<table>
<thead>
<tr>
<th>Operations in Order</th>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Output Connections to Receiver</td>
<td>Dummy Antenna Note A</td>
<td>Dial Setting</td>
</tr>
<tr>
<td>1</td>
<td>Lug of Ant. Condenser Front Section</td>
<td>.1 mfd.</td>
<td>455 K. C.</td>
</tr>
<tr>
<td>2</td>
<td>Ant. Lead</td>
<td>400 ohms</td>
<td>21 M. C.</td>
</tr>
<tr>
<td>3</td>
<td>Ant. Lead</td>
<td>400 ohms</td>
<td>6.0 M. C.</td>
</tr>
<tr>
<td>4</td>
<td>Ant. Lead</td>
<td>200 mmfd.</td>
<td>1500 K. C.</td>
</tr>
<tr>
<td>5</td>
<td>Ant. Lead</td>
<td>200 mmfd.</td>
<td>580 K. C.</td>
</tr>
</tbody>
</table>

**NOTE A** — The "Dummy Antenna" consists of a condenser or resistance connected in series with the signal generator output lead (high side). Use the capacity or resistance as specified in each step of the above procedure. Follow the lead properly with the tuning condenser. To adjust the dial, proceed as follows: With the tuning condenser closed (maximum capacity), set the dial pointer on the first mark on the left edge (low frequency end) of the broadcast scale.

**NOTE B** — DIAL CALIBRATION. In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To adjust the dial, proceed as follows: With the tuning condenser closed, set the dial pointer on the first mark on the left edge (low frequency end) of the broadcast scale.

**NOTE C** — When adjusting compensator (4B) be sure to tune in the fundamental signal (24 M. C.) instead of the image signal. If the compensator is correctly adjusted, the image signal will be found by turning signal generator dial 910 K. C. below the fundamental signal, which will be 20,000 M. C.
The code numbers (121, 122) of this model refer to the manner in which the power supply is connected for shipment. Code 121 is shipped with the voltage charged switch in the 220 volt, 60 cycle A. C. position. Code 122 is shipped with the switch in the 115 volt, 60 cycle A. C. position.

POWER SUPPLY: 115 or 220 volts A. C., 50 to 60 cycle, 90 watts.

INTERMEDIATE FREQUENCY: 455 K. C.

TUNING RANGES:
Standard Tuning—640 to 1720 K. C.; 2.3 to 7.2 M. C.; 7.3 to 77 M. C.;
Speed Band Tuning—9.8 to 9.9 M. C.; 11.4 to 12.0 M. C.; 14.8 to 15.6 M. C.; 17.3 to 18.2 M. C.; 20.9 to 21.9 M. C.

I.F.=455 KC.

FIG. 6—TUBE AND COMPENSATOR LOCATIONS, TOP OF CHASSIS

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SIGNAL GENERATOR: When adjusting the "I.F." padders the high side of the signal generator is connected through a .1 mfd. condenser to the loop tuning condenser stator lug which connects to the grid of the first detector tube. The ground or low side of the signal generator is connected to the chassis of the receiver. When aligning the R.F. padders of the portable models a loop aerial is made from a few turns of wire and connected to the signal generator output terminals. The signal generator is then placed a few feet from the set. The loop aerial of the receiver should be assembled in the cabinet together with the battery when adjusting the R.F. padders.

These models may be adjusted when operated by battery or 115 volts A.C.-D.C. power.

<table>
<thead>
<tr>
<th>Operations in Order</th>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Output Connections to Receiver</td>
<td>Dial Setting</td>
</tr>
<tr>
<td>2</td>
<td>Use Loop on Generator as above</td>
<td>1500 K.C.</td>
</tr>
</tbody>
</table>

NOTE A: DIAL CALIBRATION—Before adjusting the R.F. padders the dial must be aligned to track properly with the tuning condenser. To adjust the dial proceed as follows: With the tuning condenser in the closed position (maximum capacity), set the dial pointer on the small dot below 510 K.C.
Listed below are the Philco speakers, replacement cones and output transformers used in the 1939 and 1940 Philco home and auto radio line.

In some models two or more different type speakers are used. These speakers, however, are inter changeable and will have the same part number, with the exception of a suffix number -1, -2, etc., added to the part number. The cone assemblies of these speakers are not interchangeable.

It is important when ordering cone assemblies that the correct part number, as indicated on these pages, be specified.

### With Replacement Cones and Output Transformers

<table>
<thead>
<tr>
<th>Speaker</th>
<th>Used In Models</th>
<th>Replacement Cones</th>
<th>Output Transformer</th>
</tr>
</thead>
<tbody>
<tr>
<td>60110</td>
<td>TH-1</td>
<td>36-4150 41118</td>
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</tr>
<tr>
<td>60122-9</td>
<td>TH-3</td>
<td>36-4119</td>
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<tr>
<td>36-1266-3</td>
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<td>36-4116 32-7927</td>
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<td>36-1452-2</td>
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<td>36-4090 32-8018</td>
<td></td>
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</table>

**PHILCO 1940 HOME RADIO SPEAKERS**

<table>
<thead>
<tr>
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<th>Used In Models</th>
<th>Replacement Cones</th>
<th>Output Transformer</th>
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</thead>
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<td>36-750T</td>
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<td>36-1466-3</td>
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<td>36-744XX, 39-761XX</td>
<td>36-4108 (39-744) 32-8025</td>
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<td>40-749XX</td>
<td>36-4108 (39-744) 32-8025</td>
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<td>40-755XX</td>
<td>36-4108 (39-744) 32-8025</td>
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<td>36-4108 (39-755XX) 32-8020</td>
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<td>40-755XX</td>
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<td>36-4108 (39-755XX) 32-8020</td>
</tr>
</tbody>
</table>

**PHILCO RADIO & TELEVISION CORP. LOUDSPEAKER PARTS LIST PAGE 12-20**
<table>
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<tr>
<th>Model</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
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<td>Component A</td>
</tr>
<tr>
<td>FT-49</td>
<td>Component B</td>
</tr>
<tr>
<td>FT-50</td>
<td>Component C</td>
</tr>
</tbody>
</table>

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ALIGNING PROCEDURE MODEL AR-1

Make all adjustments for maximum reading on the output meter unless otherwise specified.

NOTE 1 — Turn the tuning control knob clockwise as far as it will go.

NOTE 2 — Connect the Chrysler Antenna lead, Part No. 150-0110, to the antenna receptacle on the radio. Connect a 20 mfd. Capacitor in series between the signal generator and the antenna lead.

NOTE 3 — Rotate the tuning control when adjusting the Low Frequency screw. Turn to the signal and adjust the screw for maximum output. Turn the tuning control back slightly first one way then the other, for maximum output. Repeat this procedure until no further improvement is noticed.

Model C-1708

Make all adjustments for maximum reading on the output meter unless otherwise specified.

NOTE 1 — Turn the tuning control knob clockwise as far as it will go.

NOTE 2 — Connect the Chrysler Antenna lead, Part No. 150-0110, to the antenna receptacle on the radio. Connect a 20 mfd. Capacitor in series between the signal generator and the antenna lead.

NOTE 3 — Rotate the tuning control when adjusting the Low Frequency screw. Turn to the signal and adjust the screw for maximum output. Turn the tuning control back slightly first one way then the other, for maximum output. Repeat this procedure until no further improvement is noticed.

NOTE 4 — When the Antenna Stage adjustment is made with the Radio installed in the car, the Radio Antenna lead must be removed to the Car Antenna to the signal generator.

NOTE 5 — Connect the Chrysler Antenna lead but not connected to it and adjust model 1200 to 1600 K.C. for maximum signal at 1600 K.C.
MODEL C-1708

SETTING UP ELECTRICAL TUNING

1. With the antenna installed and connected, turn on the radio and allow it to operate for TWENTY minutes before making adjustments.

2. The Receiver must be adjusted with the Skyway antenna fully extended and it is recommended that adjustments be made with the car in a shielded area such as a garage, basement or in a steel-constructed building. However, best results may be obtained using the new signal Antenna. This permits setting up nearby test stations on the buttons without having the car in a shielded area.

3. Push the dial button and tune with manual control a weak station between 1500 and 1600 kilocycles. Pull push buttons off. Adjust the antenna compensator with a screwdriver by turning the adjusting screw either to the left or right until maximum volume is reached. See illustration.

4. If numbers on buttons are not desired, select and remove from the call letter tabs, five call letter tabs of popular stations received in the area in which the receiver is to be operated, selecting stations within the range of each button as shown in illustrations, Model C-1708. Reference to programs published in your local newspaper aids in quick selection of stations. Remove metal tabs to install the tabs in push buttons.

5. Push dial button and tune in the station you have selected for the No. 1 button. Identify the program and push in the No. 1 push button shaft. Using a small screwdriver, turn the No. 1 adjusting screw (push button screw) and tune the station selected for this position by turning the screwdriver counterclockwise to increase frequency and clockwise to decrease frequency.

After the station has been tuned in accurately, (see illustration) a four adjustment can be made by adjusting the vernier screw, which is the outside shell of the adjusting shield. Use a larger screwdriver for this operation. Careful adjustment of this screw will insure maximum performance in areas where broadcasting reception is poor.

Setting Up Automatic Electric Tuning

MODEL C-1708-AR-5, AR-6, AR-7

Turn on the radio and allow it to operate for twenty minutes or longer if possible. During this time, proceed as follows:

1. Select five popular local stations and tune in each frequency with the volume turned up on the radio. These stations are then tuned into the antenna indicator window. This arranges the station so that it can be tuned into the antenna control knob in the console with no difficulty.

2. Turn on the dial tuning control knob and move the dial to the highest frequency. Turn the dial slowly to the lowest frequency and back; then reverse the process and move the dial to the highest frequency. This will set the antenna indicator window.

3. Tune in the dial tuning control knob, the station selected for the No. 1 button. With a small screwdriver, turn the buttons adjusting screw (number five) in the left column, to the left or right until the station is tuned in. This allows the computer control knob to the station while maintaining a high volume of reception. Use the vernier screw to adjust the station to the highest accuracy possible.

4. Tune in the station selected for the No. 2 button, then in the No. 3, No. 4, No. 5, and No. 6 stations selected for the No. 2, No. 3, No. 4, No. 5, and No. 6 positions in the call letter order. Moving the dial to the left or right, and adjusting each pair of corresponding adjustment screw and vernier screw as necessary. This is the same as with the station selected for the No. 1 button. The vernier screw is adjusted to reduce the frequency by turning the screwdriver counterclockwise and to increase the frequency by turning the screwdriver clockwise.

Each button is set up so it is unable to operate the entire adjustment procedure when in operation. The automatic tuning adjustments may be made by following the procedure in the diagram. The ZE86 adjustments must be made with the receiver installed and operating on the antenna in the car.

ALIGNING PROCEDURE MODEL AR-5

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>OPERATOR</th>
<th>SIGNAL STRENGTH</th>
<th>ADJUSTED CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 K.C.</td>
<td>PUSH IN THE DIAL (AT THE FRONT) IN THE DIAL TUNING CONTROL NO. 1 WITH A SMALL SCREWDRIVER, TURN THE BUILT-IN ADJUSTING SCREWS, THEN TUNE THE STATION IN THE ANTENNA INDICATOR WINDOW. STATIONS CAN BE ADJUSTED BY TUNING THE STATION IN THE DIAL TUNING CONTROL NO. 1 AND ADJUSTING THE DIAL TUNING CONTROL NO. 1 WITH A SMALL SCREWDRIVER.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000 K.C.</td>
<td>ADD THE AIR FILTER COMPENSATOR TO TWO FILTERS FROM FILTERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1500 K.C.</td>
<td>ADJUST THE AIR FILTER COMPENSATOR TO TWO FILTERS FROM FILTERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000 K.C.</td>
<td>ADJUST THE AIR FILTER COMPENSATOR TO TWO FILTERS FROM FILTERS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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SETTING UP AUTOMATIC TUNING

TURN THE RADIO "ON" AND ALLOW IT TO OPERATE FOR AT LEAST TWENTY MINUTES BEFORE MAKING ADJUSTMENTS.

1—Select five popular local stations whose frequencies come within the range of the Automatic Tuning Circuits and list them on the back of the OWNER'S MANUAL under "STATION RECORD." For the Owner's reference, also on the chart above the adjusting screws, list the lowest frequency station as No. "1" and so on down to the highest frequency which should be No. "5." The range of each Automatic Tuning Circuit is given on the chart above each Automatic Adjusting Screw on the Radio and is also reproduced in the illustration on this page.

2—Remove the cover plate over the Automatic Adjusting Screws from the bottom of the Radio Housing by removing the two snap bolts holding it in place. There are two rows of adjusting screws—the LARGE ones for antenna adjustment and the SMALL ones for setting the stations.

3—Push the Automatic Station Selector, repeating if necessary until the DIAL appears in the dial window. Then tune in with the manual tuning control the selected station having the lowest frequency (No. 1 Station) and note the program so that it can be identified. Push the Automatic Station Selector once and No. "1" will appear in the indicator dial.

4—With a small screw driver turn the SMALL No. 1 adjusting screw until this station is tuned in. Then adjust the LARGE No. 1 screw in the other row until maximum volume is heard. It is VERY IMPORTANT THAT THESE ADJUSTING SCREWS BE SET ON A WEAK SIGNAL FROM THE STATION SO THAT THE CIRCUIT WILL BE SHARPLY TUNED TO THE PARTICULAR STATION. BECAUSE OF THE SIGNAL FROM THE STRONG LOCAL STATIONS IT IS NECESSARY THAT THE ANTENNA ROD BE REMOVED FROM THE ANTENNA WHILE THESE ADJUSTMENTS ARE MADE SO THAT A MINIMUM OF SIGNAL WILL BE RECEIVED AND THUS ASSURE SHARP ADJUSTMENTS OF THE CIRCUITS.

5—Repeat this procedure for the stations selected for the No. 2, 3, 4, and 5 positions in the order given. After all the stations have been adjusted on the Automatic Adjusting Screws this procedure MUST be repeated. This is necessary in order to insure the stations being accurately set up on the adjusting screws.

NOTES ON MODEL F-1641

NOTE 1 — CONNECT SO MAFD COND. IN SERIES BETWEEN SIG. GEN. & ANT. LEAD.
NOTE 2 — TURN COND. ROTOR PLATES COMPLETELY OUT OF MASH AS FAR AS THEY WILL GO.
NOTE 3 — ROFT TUNING COND. BACK AND FORTH WHILE ADJUSTING LOW-PHERN. PADDER (40).
NOTE 4 — WHEN THE ANT-ENHANCEMENT ADJUSTMENT IS MADE WITH THE RADIO INSTALLED IN THE CAR, THE RADIO-ANT. LEAD MUST BE CONNECTED TO THE CAR ANTENNA IN THE USUAL MANNER. CONNECT SIGNAL-GEN. OUTPUT-LEAD TO A WIRE PLACED NEAR THE CAR-ANTENNA, BUT NOT CONNECTED DIRECTLY TO IT.
PHONOGRAPH OPERATION

The motor is controlled by the automatic stop lever which is at the rear right side of the turntable. Volume for both, "Phono" and "Radio" is regulated by the same control on the front of the receiver.

The tone control and phono radio switch must be in either of the three clockwise positions for phonograph operation.

When aligning the loop, the receiver should be in the cabinet with the back in place. The adjusting condenser can be reached through the slot in the lower left hand side of the back.

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TUNING RANGE

Broadcast Band 535 to 1720 kc.; or 561 to 174.0 meters
Band I 1.98 to 7.05 mc. or 152 to 42.5 meters
Band II 6.95 to 24.75 mc. or 43.2 to 12.1 meters

SERVICE NOTES

The location of all adjustments used in re-aligning this receiver, and the frequencies at which these adjustments should be made, are shown in the accompanying diagram.

When aligning the I. F. amplifier, the generator must be connected to the grid of the 6SA7 tube through a .1 mfd condenser. When aligning the receiver on the Broadcast Band, connect the generator to the Antenna wire through a .0002 mfd condenser, and on the short wave band use a 400 ohm carbon resistor.

PHONOGRAPH AND TELEVISION JACKS

On the rear of the chassis is a set of “Pin” jacks. They are intended to be employed for connection with an electrical phonograph, or with the sound outlet of a television receiver.
**TUNING RANGE**

**Model T-47**

Broadcast Band 537 to 1740 kc  
Short Wave Band 2—1.98 to 7.99 mc  
Short Wave Band 1—7.2 to 24.5 mc

**A.C.-D.C. Receiver**

**ANTENNA**

When using a doublet antenna, connect one lead-in wire to terminal “A” at the rear of the chassis, and the other lead-in wire to terminal “D”. Remove the connecting link from terminals “D” and “G” and connect terminal “G” to a ground such as a cold water pipe or radiator. If an ordinary single wire antenna is used, connect the lead-in wire to Terminal “A” on the rear of the chassis. Leave the link between “D” and “G” terminals and connect a ground wire under terminal “G”.

**POWER SUPPLY**

This receiver is equipped with an interchangeable plug-in Resistor. To be sure of using the correct Resistor for the voltage of your particular house current, see the label attached to the back of the cabinet. This Resistor may be changed as easily as a radio tube.

When operating on direct current, if the receiver does not work about one minute after being turned on, reverse the plug in the light socket.

**PHONOGRAPH AND TELEVISION JACKS**

On the rear of the chassis is a set of “Pin” jacks. They are intended to be employed for connection with an electrical phonograph, or with the sound outlet of a television receiver.

**SERVICE NOTES**

The location of all adjustments used in re-aligning this receiver, and the frequencies at which these adjustments should be made, are shown in the accompanying diagram.

When aligning the I. F. amplifier, the generator must be connected to the grid of the 6SA7 tube through a .1 mfd condenser. When aligning the receiver on the Broadcast Band, connect the generator to the Antenna wire through a .002 mfd condenser, and on the two short wave bands use a 400 ohm carbon resistor.
This Pilot Superheterodyne Receiver has 5 tubes and operates on a 6 volt power supply at 2.2 amperes.

**TUNING RANGE**

- **Broadcast Band**: 535 to 1720 kc.
- **Short Wave Band**: 5.6 to 19.8 kc.

**SERVICE NOTES**

When aligning the I. F. amplifier, the generator must be connected to the grid of the 7A8 tube through a .1 mfd condenser. When aligning the receiver on the Broadcast Band, connect the generator to the Antenna wire through a .0002 mfd condenser, and on the short wave band use a 400 ohm carbon resistor.

**ANTENNA**

When using a doublt antenna, connect one lead-in wire to terminal “A” at the rear of the chassis, and the other lead-in wire to terminal “D”. Remove the connecting link from terminals “D” and “G” and connect terminal “G” to a ground such as a cold water pipe or radiator. If an ordinary single wire antenna is used, connect the lead-in wire to Terminal “A” on the rear of the chassis. Leave the link between “D” and “G” terminals and connect a ground wire under terminal “G”.

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1F PEAK 455 KC

Model 191
A.C.-D.C. Receiver

TUNING RANGE
Broadcast Band 535 to 1720 kc.
Short Wave Band 5.6 to 19.8 kc.

ANTENNA

When using a doublet antenna, connect one lead-in wire to terminal “A” at the rear of the chassis, and the other lead-in wire to terminal “D”. Remove the connecting link from terminals “D” and “G” and connect terminal “G” to a ground such as a cold water pipe or radiator. If an ordinary single wire antenna is used, connect the lead-in wire to Terminal “A” on the rear of the chassis. Leave the link between “D” and “G” terminals and connect a ground wire under terminal “G”.

SERVICE NOTES

The location of all adjustments used in re-aligning this receiver, and the frequencies at which these adjustments should be made, are shown in the accompanying diagram.

When aligning the I.F. amplifier, the generator must be connected to the grid of the 6SA7 tube through a .1 mfd condenser. When aligning the receiver on the Broadcast Band, connect the generator to the Antenna wire through a .0002 mfd condenser, and on the short wave band use a 400 ohm carbon resistor.
The screws for adjusting both the R.F. and I.F. amplifiers of this receiver, together with the frequencies at which they should be adjusted, are all pictured on the wiring diagram. WHEN ALIGNING THIS RECEIVER, IT MUST BE IN THE CABINET WITH THE LOOP ANTENNA CONNECTED AND THE BACK OF THE CABINET SCREWED ON. The adjusting condensers are reached through the hole in the lower left-hand corner of the back, looking at the back. The I.F. amplifier can be aligned with the chassis out of the cabinet, but with the loop antenna connected.
TUNING RANGE

Broadcast Band 535 to 1720 kc.; or 561 to 176 meters
Short Wave Band 3.6 to 19.6 kc.; or 52.6 to 156 meters

This radio-phonograph unit with a combined recorder permits the owner to do the following things:

1. Operate the receiver for B & S wave reception.
2. Play commercial recordings.
3. Record radio programs.
4. Record his voice separately or in conjunction with a radio program.
5. Play these records back.
6. Do his own broadcasting by means of the microphone.

OPERATION

For the accomplishment of any of the above six functions, the following operations apply:

1. To OPERATE RADIO—After the “on-off” power switch has been turned on, simply press down the button marked RADIO. Any of the upper knobs may be used in conjunction with the radio to increase volume, to tune in stations and to obtain the tone you desire.

2. To OPERATE PHONOGRAPH—Simply press down the button marked PHONO and use the upper knobs to adjust volume, bass or treble.

3. To RECORD RADIO PROGRAMS—First tune the radio program to its proper setting. Have the volume control in a middle position. The treble control can be operated to suit the individual taste. When the program is clearly heard, press the button marked RADIO RECORDING. As soon as this is done, the speaker is muted although the radio program can still be heard. Be sure the phonograph unit is set on MANUAL. When the button marked RADIO RECORDING is pressed in, the volume control should be turned up until the recorder level indicator on the phonograph panel is nearly closed. Then raise the cutting head and place it on the blank record disc. During the course of recording, the recording level indicator will vary according to the level of the program.

4. To RECORD VOICE—
   (A) Separate Voice Recording—To record a voice, press button marked MICROPHONE. Be sure the mixer control is set at the off position and proceed as in paragraph 8.
   (B) Voice Recording In Conjunction With A Radio Program—Set radio program as instructed in paragraph 8. Advance mixer to the rich and speak or sing into the microphone. Adjust the mixer to proper proportion so either voice or radio program will sound loudest, as the case may be. By means of this process you may, during the course of radio program recording either (1) completely eliminate the program and insert your voice, (2) bring your voice into the foreground with the program in the background or (3) bring the program into the foreground with your voice in the background.

5. To FLAT BACK RECORDING—Proceed as in paragraph 8.

6. To OPERATE MICROPHONE WITHOUT RECORDING—Press button marked MICROPHONE in and speak into microphone. Adjust the microphone gain control to the desired level. It is advisable to turn the treble control to the extreme counter-clockwise position in order to cut down acoustic feedback.

SERVICE NOTES

The location of all adjustments used in re-aligning this receiver, and the frequencies at which these adjustments should be made, are shown in the accompanying diagram.

When aligning the i.f. amplifier, the generator must be connected to the grid of the 6550 tube through a .1 mfd condenser. When aligning the receiver on the broadcast band, connect the generator to the antenna wire through a .002 mfd condenser, and on the two short wave bands use a 400 ohm carbon resistor.

ANTENNA

This receiver contains the latest type of self-contained shielded loop aerial and will give excellent results even in distant localities where the signal from the broadcasting stations is faint. However, it may be necessary to turn the loop antenna located in the rear of the cabinet toward the direction of the incoming signal (since most broadcasting stations use the directional antenna), for the best reception from that particular station. For short wave or distant broadcast band reception, the use of an external antenna is required.

When using a double antenna, connect one lead-in wire to terminal “A” at the rear of the chassis, and the other lead-in wire to terminal “B”. Remove the connecting link from terminals “P” and “Q” and connect terminal “P” to a ground such as a cold water pipe or radiator. If an ordinary single wire antenna is used, connect the lead-in wire to Terminal “A” on the rear of the chassis. Locate the connection between terminal “B” and “Q” terminals and connect a ground wire under terminal “Q”. A double antenna kit complete with all necessary accessories can be purchased from your dealer. Ask to see the "Pilot Antenna Kit".
Model X-1462 is same as X-1453 except: AC ant. Coil is Part No. 75346; Osc. coil and BC Osc. coil is one unit, part No. 75338. (S.W. Padder No. 26123 is omitted) SW Osc. and Ant. trimmer adjustment is 12 MC.

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The Publisher's Service Record Players. Models PRP-1 and PRP-2, consist of a motor-turntable and a crystal pickup unit, with a volume control and motor switch. These players are adjustable height for use with audio amplifier systems of practically any type radio receiver for the reproduction of records.

The two models are electrically and mechanically similar. The set in a polystyrene cabinet, whereas Model PRP-1 has a wooden cabinet.

PHONOGRAPH AND MOTOR SERVICE DATA

The synchronous motor used in this instrument is designed to be simple and foolproof. Among its many features are constancy of speed, low power consumption, single moving part, ease of starting, rubber damping, ease of repair and long life. The parts that may require attention are plainly shown in the figure. The motor is started by turning on the “on” power switch and giving the turntable a clockwise spin with the hand. Smooth starting and running will be insured by keeping the bearings well oiled and cleaned.

The turntable and sectional assembly rests on the ball bearing at the bottom of the vertical bearing, and may be removed by lifting out. Do not turn player upside down without holding turntable.

For rotor adjustment use these 16-mil screws for motors mounted in a solid base or for motors of the "T" hanger type use three 15-mil spaced equally around the gap between rotor and stator. When the rotor is suitably adjusted securely tighten the three screws which hold the rotor to the turntable. The centering operation is very similar to that described with a spurious static.

If the top of rotor turntable assembly is not flush with the top of motor, lamination, adjusting steel washers should be inserted beneath the stator until the two are in line.

A small amount of hum when starting, decreasing to an annoying hum while running, is normal. If excessive vibration occurs either at starting or running it may be caused by:

1. Insufficient lubrication, or any failure that will cause binding of bearings.

2. Leather washer not oiled. Check to be sure that leather and steel washers are arranged in proper sequence, as indicated the illustration.


5. Insufficient lamination.

Stock No. DESCRIPTION

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>32654</td>
<td>Motor assemblies PRP-1 and PRP-2 (60 cycles—110 volts)</td>
</tr>
<tr>
<td>31065</td>
<td>Base—Motor support, damper and bearing cup assembly</td>
</tr>
<tr>
<td>31066</td>
<td>Bearing—Bearing assembly</td>
</tr>
<tr>
<td>31072</td>
<td>Cap—PRP-1 rubber spindle cap</td>
</tr>
<tr>
<td>31073</td>
<td>Rubber gland cap</td>
</tr>
<tr>
<td>31197</td>
<td>Cowl—Motor field coil</td>
</tr>
<tr>
<td>31947</td>
<td>Cushion—Rubber cushion for bearing cap</td>
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Motor assemblies PRP-1 and PRP-2 (60 cycles—110 volts)

Stock No. DESCRIPTION

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<tr>
<th>Stock No.</th>
<th>DESCRIPTION</th>
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<tr>
<td>32200</td>
<td>Ring—Retaining ring and metal washer to mount turntable spindle</td>
</tr>
<tr>
<td>31062</td>
<td>Base—Motor assembly comprising coils and lamination for 60 cycle operation</td>
</tr>
<tr>
<td>31064</td>
<td>Turret—PRP-1 finished turntable top plate with rubber mountings</td>
</tr>
<tr>
<td>31064</td>
<td>Turret—PRP-2 finished turntable top plate with rubber mountings</td>
</tr>
<tr>
<td>32150</td>
<td>Washer—Leather washer</td>
</tr>
<tr>
<td>31420</td>
<td>Washer—Metal spacing washer</td>
</tr>
<tr>
<td>32662</td>
<td>Wedge—Cone wedge</td>
</tr>
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Motor assemblies (Motor mounted by "T" shaped rubber hanger)

Stock No. DESCRIPTION

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<th>Stock No.</th>
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<tr>
<td>35724</td>
<td>Cap—Rubber spindle cap for PRP-1</td>
</tr>
<tr>
<td>35725</td>
<td>Cap—Rubber spindle cap for PRP-2</td>
</tr>
<tr>
<td>33336</td>
<td>Cowl—Motor field coil</td>
</tr>
<tr>
<td>33346</td>
<td>Frame—Motor support frame and bearing cap</td>
</tr>
<tr>
<td>33480</td>
<td>Frame—Resin frame, laminations and spindle shaft assembly</td>
</tr>
<tr>
<td>33740</td>
<td>Hanger—Rubber mounting hanger</td>
</tr>
<tr>
<td>33742</td>
<td>Laminator—Stator laminations and bearing cap and field coil</td>
</tr>
<tr>
<td>33344</td>
<td>Washer—Leather and metal washer for stator</td>
</tr>
<tr>
<td>33463</td>
<td>Wedge—Wooden wedge</td>
</tr>
</tbody>
</table>

Model PRP-1 (60 cycles—50 volts)

Stock No. DESCRIPTION

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<tr>
<th>Stock No.</th>
<th>DESCRIPTION</th>
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<tr>
<td>31918</td>
<td>Coil—Motor field coils</td>
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<tr>
<td>31919</td>
<td>Frame—Resin frame complete with spindle and rotor laminations</td>
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<tr>
<td>33354</td>
<td>Laminator—Stator laminations</td>
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</table>

Motor ELECTRICAL SPECIFICATIONS

Type of Motor: Synchronous (Manual Starting) 31.26 r.p.m.

Crystal Pickup: 100,000 ohms at 1,000 cycles

Average Output Voltage: 1/15 Volts across 2,000,000 ohms lead at 1,000 cps (RCA MFG. CO., INC.)

6. Slight eccentricity of rotor or spindle.

7. Improper horizontal alignment of rotor and stator. Correct horizontal alignment is shown in the figure. The position of the stator is raised or lowered by adding or removing washers below the leather washer.

The damper spring must fit without binding or chattering, in the slot in the stator. The stator must be free to deflect and be flexible in either direction between the limits of the dampering, for binding in the washers or stator bearing which prevents the movement of the damper may cause excessive vibration in the motor. The damper spring must exert equal force in restoring the stator to its mid position when the stator is deflected manually in either direction.

The following lead dressing is important:

1. The power cord, stator leads and pickup cable should be twisted away from and not under the motor frame. Fuses may be inserted or cut-offs occur if this is not followed.

2. A periodic check will be heard when the power cord or stator leads are twisted around the motor. The leads should be dressed into the cabinet away from the rotor.

On high line voltages these players have considerable reserve torque. Any additional overload may be further reduced at the expense of this reserve by inserting a 100 to 500 amp 10 watt resistor in series with the line and motor winding.

The turntable is secured to the motor drive by means of a retaining ring and washer. In order for the turntable to be free of all vibration, the rubber cushions between the drive table and the turntable must be in their position. Tighten the screws of the turntable by alternating them, generally by placing screws on the turntable side of these cushions, using that cushion which the table rests.

CONNECTING RECORD PLAYER TO RADIO RECEIVER

In connecting this player to a radio receiver care should be exercised to connect it at a point where there is sufficient headroom. When the receiver is at normal output levels, usually two or more stages of audio amplification are necessary. The radio part must be disconnected before the player is connected. The radio signals will be heard with the record's music.

DO NOT CONNECT THE RECORD PLAYER INTO A PLATE OR CATHODE CIRCUIT. It must always be connected into a high impedance circuit (100,000 ohms or more). If the player is to be used in connection with an amplifier, it is necessary to insert a coupling capacitor (0.1 mfd—400 volts) in series with the ground chassis connection.

PICKUPS USING CRYSTALS HAVING VISCOALD DAMPING

Model PRP-1 (Regular) and PRP-2 (Deluxe)
Radio Receivers where Receiver Volume Control is in Audio Input Circuit

Radio Receivers using Biased-Type Detector

Radio Receivers where First Audio Tube is of the Grid Cap Type, and Fixed Bias for Tube is Obtained Through Grid Lead

Radio Receivers whose First Audio Amplifier Tube is of the Grid Cap Type

**Tone Compensation**

Because of the widely varying frequency characteristics of various types of audio amplifiers with which these players may be used, it is desirable in some cases to make refinements in the pickup circuit to compensate for the characteristics of the amplifier.

In "A" RI controls the low frequency response; higher values of RI give increased lows. For maximum low frequency response, remove RI. R2 controls pickup output; smaller values of R2 giving increased output. C1 controls high frequency response; to increase highs increase C1.

Where a decrease in high frequency response may be desired (for example, as an aid in reducing "needle scratch" on worn records), the circuit in "B" is applicable. In this circuit, C2 acts as loading on the pickup and is also a controlling factor on the high frequency response. Smaller values of C2 give more pickup output and also more highs. R3 gives a sharper high frequency reduction; increasing R3 decreases highs.

The suggested values shown in "A" and "B" should serve as a basis from which slight alterations may be made to suit individual cases.
Alignment Procedure

Electro-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the chassis drawing.

Output Meter Alignment—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test Oscillator—For all alignment operations, connect the low side of the test oscillator to the receiver chassis, and keep the output as low as possible to avoid AV circuit action.

Calibration Scale on Indicator-Driver-Cord Drum—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment, therefore a calibration scale is attached to the indicator-driver cord drum which is mounted on the shaft of the gang condenser. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the Alignment Table.

As the first step in r-f alignment, check the position of the drum. The "100" mark on the drum scale must be vertical and directly over the center of the gang-condenser shaft where the plates are fully meshed. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

To determine the corresponding frequency for any setting of the calibration scale, refer to the accompanying drawing which shows the dial with 0-180° calibration scales drawn at top and bottom.

Pointer for Calibration Scale—Improve the pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bend the wire so that it points to the "100" mark on the calibration scale when the plates are fully meshed.

Dial-Indicator Adjustment—After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the 640-ko mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

Tube and Trimmer Locations

Spread-Band Alignment—The most satisfactory method of aligning or checking the spread-band ranges is on actual reception of short-wave stations of known frequency, by adjusting the magneto-core oscillator coil for each band so that these stations come in at the correct points on the dial.

In exceptional cases, when the set is being serviced in a location where the noise is not high enough to prevent reception of short-wave stations, a test oscillator may be used for alignment, but an extremely high degree of accuracy is required in the frequency settings of the test oscillator, as a slight error will produce considerable inaccuracy on the spread-band dials. The frequency settings of the test oscillator may be checked by one or both of the following methods:

1. Determine the exact dial settings of the test-oscillator for frequencies at or close to the specified alignment frequencies, by zero-beating the test-oscillator against short-wave stations of known frequency.

2. Use harmonics of the standard-broadcast range of the test-oscillator, first checking the frequency settings on this range by means of a crystal calibrator (RCA Stock No. 9572), or by zero-beating against standard broadcast station.

When a test oscillator is employed for spread-band alignment, a final check should be made on actual reception of short-wave stations of known frequency, and the magneto-core oscillator coil calibrated for each band should be re-adjusted so that the stations come in at the correct points on the dial.

For additional information, refer to booklet "RCA Victor Receiver Alignment."

A.C. Power Supply

Model CV-112 is a separate power supply unit. It is used to provide operating voltages for Model QB2 from an a-c supply source.

Precautionary Lead Dress:
1. All leads between antenna coil and switch must be as short as possible and kept away from the oscillator coil leads and switches.
2. Tap on 10:1 transformer coil to pin No. 6 on oscillator tube socket must be dressed as far away from the air trimmer as possible.
3. All oscillator coil leads must be kept apart from each other, as well as other leads and parts.
4. Oscillator grid coupling condenser must be kept away from the shield between S2 and S3.
5. Check for correct bias cell polarity. Do not shut with voltmeter.
6. The speaker leads must be kept from the volume control and associated parts and leads.
7. The two paper condensers on the sides of the 2nd I.F. transformers must be held close to chassis to reduce interstage coupling.

RCA TUBE COMPLEMENT

<table>
<thead>
<tr>
<th>RCA No.</th>
<th>Description</th>
<th>Notes</th>
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<tbody>
<tr>
<td>(2) RCA-115-FT</td>
<td>1st I.F. Amplifier</td>
<td>(1)</td>
</tr>
<tr>
<td>(3) RCA-115-FT</td>
<td>2nd I.F. Amplifier</td>
<td>(2)</td>
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<tr>
<td>(4) RCA-115-FT</td>
<td>2nd Det., A.F., and A.V.</td>
<td>(3)</td>
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<tr>
<td>(5) RCA-155</td>
<td>Audio Driver Amplifier</td>
<td>(4)</td>
</tr>
<tr>
<td>(6) RCA-166-6</td>
<td>Power Output</td>
<td>(5)</td>
</tr>
</tbody>
</table>

Compliments of www.nucow.com
**Alignment Procedure**

Calibration Scale on Indicator-Driver-Cord Drum.—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment, therefore a calibration scale is attached to the indicator-drive cord drum which is mounted on the shank of the gang condenser. The setting of the gang condenser is read on the scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each aligning frequency, is given in the alignment table.

As the first step in alignment, check the position of the drum. The "180°" mark on the drum scale must be vertical, and directly over the center of the gang-condenser shaft when the plates are fully meshed. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

To determine the correct dialing frequency for any setting of the calibration scale, refer to the accompanying drawing which shows the dial with 0-180° calibration scales drawn at top and bottom.

**Pointer for Calibration Scale.**—Improving a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bending the wire so that it points to the "180°" mark on the calibration scale when the plates are fully meshed.

**Dial Indicator Adjustment.**—After tightening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator as the 540 kc mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

**Spread-Band Alignment.**—The most satisfactory method of aligning or checking the spread-band ranges is on actual reception of short-wave stations of known frequency, by adjusting the magnetostatic coil for each band so that these stations come in at the correct points on the dial.

In exceptional cases, when the set is being serviced in a location where the noise level is high enough to prevent reception of short-wave stations, a test-oscillator may be used for alignment. An EXT. probe may be used in low and high frequencies for the test-oscillator, to avoid any considerable inaccuracy on the spread-band dial. The frequency settings of the test-oscillator may be checked by one of the following methods:

1. Determine the exact dial settings of the test-oscillator (for frequencies at or close to the specified alignment frequencies) by zero-binding the test-oscillator against short-wave stations of known frequency.

2. Use harmonics of the standard broadcast range of a test-oscillator, first checking the frequency settings on this range by means of a crystal calibrator (RCA Stock No. 9572), or by zero-binding against standard broadcast stations.

When a test-oscillator is applied for spread-band alignment, a final check should be made on actual reception of short-wave stations of known frequency, and the magnetostatic coil for each band should be readjusted so that the stations come in at the correct points on the dial.

![Diagram of Alignment Procedure](image)

**Synchronizing Speakers.**—In order to get correct tone quality from the dual-speakers used in this model, it is essential that the speakers be so connected that the diaphragms of both work in unison or synchronism. If the terminals of one speaker are reversed the tone of the set is immediately affected. The correct setting of the gang in degrees, for each aligning frequency, is given in the alignment table.

To test for proper connections, turn on receiver with volume down and connect the terminals of a 110-volt dry cell across the voice coil terminals of either one of the speakers. If the diaphragms move in or out together at the instant of contact, the speaker connections are OK. If one moves out and the other moves in, they are backward, and the voice coil leads of one of the speakers should be reversed.

The movement of the diaphragms may be observed visually or by placing the finger tips on each cone to feel the movement.

**Precautionary Lead Dress.**

1. All leads between antenna and switch must be as short as possible and kept away from oscillator coil, leads and switches.

2. All oscillator coil leads must be kept apart from each other and other leads and parts.

3. Blue plate lead of 2 1/2 lead should be dressed under other leads and against chassis.

**Dial-Indicator and Drive Mechanism**

**Motor Schematic**

**Connections and Colors of Loudspeaker and Cable**

**Details of Record Shelf Posts, and Locating Lever Assemblies**

**Top View of Automatic Record Changer**

---

**Two and Trimmer Locations**

**NOTE:** Oscillator tracks above signal on all bands.
Alignment Procedure

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator.—For all alignment operations, keep the output as low as possible to avoid a-c-c action.

Electrical and Mechanical Specifications

Frequency Range: 540-1,600 kc
Intermediate Frequency: 455 kc

RCA Tube Complement
1. RCA-155—1st Det., No. 950
2. RCA-145—1st I.F.
3. RCA-145—2nd I.F.
4. RCA-164—Power Output

Power Supply
Type Battery Current Consumption Approximate Life (Interruption Duty)
“A”—1.5 volt Eveready No. 950 0.25 amperes 3.5 hours
“B”—67.5 volts Eveready No. 467 8.5 milliamperes 25-40 hours

Power Output
Undistorted: 0.05 watts
Maximum: 0.12 watts

Loudspeaker
Type: 3-inch permanent-magnet dynamic
V.C. Impedance: 3 ohms at 400 cycles

Height: 8 inches
Width: 10 inches
Depth: 7 inches

Tuning Drive Ratio: 3：1
Weight: 31 lbs (net), 34 lbs (shipping)

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MODEL 62U

Ch. RC-414

General Description

Model 62U is a three-band, table-type, superhetoreodyne Victorla housed in a wood cabinet. The phonograph mechanism is of the manual type, and will play either 10-inch or 12-inch records.

Victrola having "C9" or "C8" power rating may be made to operate on either 110 or 220 volts, conversion from one voltage to the other being made by means of a switch at the back of the chassis.

Phonograph Mechanism:
The phonograph motor is a self-starting, constant-speed induction type. It should be lubricated every six months by applying a few drops of light machine oil to the spindle bearing and oil hole.
The motor spindle is tapered, and a conical rubber piece fits snugly on the spindle. The hole in the turntable bushing is tapered to fit the rubber. This provides an excellent self-centering floating mounting.
A metal washer is placed on the spindle under the rubber piece. The washer has ears on the under side which fit over a pin that projects through the spindle.
The motor switch is automatic for both starting and stopping, and when properly adjusted, will turn the motor on as the pickup is moved from the pickup rest toward the turntable. The switch should be adjusted so that it will snap into the "off" position when the pickup needle is 1½ inches from the center line of the spindle shaft. The motor may be shut off at any time by placing the pickup on the pickup rest.

Crystal Pickup:
The crystal pickup is sealed in a metal case; if failure occurs, do not attempt to repair the unit, but install a new crystal unit.

Precautionary Lead Dress:
1. Lead from 2nd I.F. transformer to volume control should be kept close to the chassis and dressed against front apron.
2. C-10 should be dressed away from the antenna section of the variable condenser (C-1).

Switch Mechanism
(Shown with pickup in rest position)

Alignment Procedure

Carbide-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the chassis drawing.

Output Meter Alignment—If this method is used, connect the meter across the voice coil, and tune the receiver volume control to maximum.

Test- Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the output as low as possible to avoid a.v. action.

Calibration Scale on Indicating Drive-Cord Drum.—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment; therefore, a calibration scale is attached to the rear of the drum which is mounted on the front shaft of the gang condenser. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment table.

As the first step in r.f. alignment, check the position of the drum. The 135° mark on the drum scale must be vertical, and directly under the center of the gang-condenser shaft when the plates are fully meshed. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

Pointer for Calibration Scale.—Improvise a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bend the wire so that it points to the 0° mark on the calibration scale when the plates are fully meshed.

Dial-Indicator Adjustment.—After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the 880 kc mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-osc to—</th>
<th>Tune test-osc dial to—</th>
<th>Turn radio dial to—</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6K7 1-F grid cap, in series with .01 mfd.</td>
<td>450 kc</td>
<td>&quot;A&quot; Band quiet point between 550-750 kc</td>
<td>L10 and L11 (2nd I.F. trans.)</td>
</tr>
<tr>
<td>2</td>
<td>Tuning condenser (osc.) in series with .01 mfd.</td>
<td>450 kc</td>
<td></td>
<td>L6 and L9 (1st I.F. trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna lead in series with 200 mmsfd.</td>
<td>800 kc</td>
<td>600 kc (33°) &quot;A&quot; Band</td>
<td>L7†</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>1,500 kc</td>
<td>1,500 kc (155, 4°) &quot;A&quot; Band</td>
<td>C2 (ant.) C6 (osc.)</td>
</tr>
<tr>
<td>5</td>
<td>Repeat steps 3 and 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Antenna lead in series with 400 ohms</td>
<td>20 mc</td>
<td>20 mc (155, 4°) &quot;C&quot; Band</td>
<td>C5 (osc.) C9 (ant.)</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>6 mc</td>
<td>6 mc (149°) &quot;B&quot; Band</td>
<td>C6 (osc.) C9 (ant.)</td>
</tr>
<tr>
<td>8</td>
<td>Antenna lead in series with 200 mmsfd.</td>
<td>1,500 kc</td>
<td>1,500 kc (155, 4°) &quot;A&quot; Band</td>
<td>C6 (osc.)</td>
</tr>
</tbody>
</table>

* Use minimum capacity peak if two peaks can be obtained.
† Rock gang condenser slightly while adjusting L7.

Features of design include: New type, single-ended tubes (6SA7 and 6SK7); magnetite-core I.F. transformers; magnetite-core oscillator coil on "A" band; automatic volume control; strip-fit-line, edge-lighted dial; continuously variable tone control; supply-voltage change-over switch (on "C9" and "C8" rating Victrolas).

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Precautionary Lead Dress.

1. Dress the blue lead from the antenna lug to the No. 1 terminal on the range switch (S-1) close to the chassis and away from the gang for its entire length across the top of the chassis base.

2. Dress the yellow lead from the detector coil to No. 8 terminal on the range switch (S-2), directly away from the detector coil towards the rear apron.

3. Keep the blue lead from the detector coil to No. 9 terminal on the range switch (S-2), isolated from the other leads and parts.

4. Loop the bus wire from oscillator coil to No. 5 terminal on the range switch (S-1), directly away from these terminals and other parts as far as possible, bending the loop towards the center of the chassis.

5. Dress the 3,300 mfd. capacitor (C8) from the oscillator coil to No. 4 terminal on the range switch (S-3), directly toward the center of the chassis, bending the loop mentioned above (4).

6. Pull in the slack on the long yellow wire which runs from the terminal board in the rear corner to the tone control, at the tone control end, making the portion of the lead lying outside the front apron Ruth and close to the apron.

Pilot Lamps (2)......Mazda No. 47, 6.3 volts, 0.15 amp.

Power Supply Rating
D-C Rating (with vibrator-type power supply unit MI-8122)......6.3 volts, 3.2 amps.

Power Output Rating
Maximum..........................2.6 watts
Undistorted..........................2.9 watts

Loudspeakers (Permanent-Magnet Dynamos)
7QB (RL-90-2)..................8-inch
7QBK (RL-71-3)..................12-inch
Voice-coil impedance at 400 cycles . 2.4 ohms
Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the chassis drawing.

Output Meter Alignment. — If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator. — For all alignment operations, connect the low side of the test-oscillator to the receiver ground terminal (G), and keep the output as low as possible to avoid action.

Calibration Scale on Indicator-Drive-Cord Drum. — The tuning dial is fastened in the cabinet and cannot be used for reference during alignment; therefore, a calibration scale is attached to the rear of the drum which is mounted on the front shaft of the gang condenser. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment table.

As the first step in r-f alignment, check the position of the drum. The 180° mark on the drum scale must be vertical, and directly over the center of the gang-condenser shaft when the plates are fully meshed. The surface of the drum must be flush with the end of the gang-condenser shaft. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

Pointer for Calibration Scale. — Improvise a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bend the wire so that it points to the "180°" mark on the calibration scale when the plates are fully meshed.

Dial-Indicator Adjustment. — After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the left-hand end mark on the dial scales and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

---

### Steps

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-osc. to</th>
<th>Tune test-osc. to</th>
<th>Turn radio dial to</th>
<th>Adjust the following for maximum peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6S7-G 1-F grid cap in series with .01 mfd.</td>
<td>455 kc</td>
<td>&quot;A&quot; band Quiet point between 550-750 kc</td>
<td>L14 and L15 (2nd 1-F trans.)</td>
</tr>
<tr>
<td>2</td>
<td>6SA7 1st det. grid cap in series with .01 mfd.</td>
<td>20 mc</td>
<td>20 mc (22°) &quot;C&quot; band</td>
<td>L12 and L13 (1st 1-F trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal in series with 300 ohms</td>
<td>6.1 mc</td>
<td>6.1 mc (27.9°) &quot;B&quot; band</td>
<td>C6 (osc.)* C12 (det.) (Rock C1 (ant.) Gang)</td>
</tr>
<tr>
<td>4</td>
<td>Antenna terminal in series with 200 mfd.</td>
<td>600 kc</td>
<td>600 kc (143.5°) &quot;A&quot; band</td>
<td>L7 (osc.) Rock Gang</td>
</tr>
<tr>
<td>5</td>
<td>1,500 kc</td>
<td>1,500 kc (27.8°) &quot;A&quot; band</td>
<td>C9 (osc.) C14 (det.) C3 (ant.)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Repeat steps 5 and 6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Use minimum capacity peak (plunger out) if two can be obtained. Check to determine that C6 has been adjusted to the correct peak by turning radio to approximately 19.09 mc where a weaker signal should be received.

** Use minimum capacity peak if two can be obtained. Check to determine that C7 has been adjusted to the correct peak by turning radio to approximately 5.19 mc where a weaker signal should be heard.

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Alignment Procedure

Models 10X, 11X-1

Output meter alignment—If this method is used connect the meter across the voice coil and turn the receiver volume control to maximum.

Electronic voltmeter—The electronic voltmeter in the Channalyser circuit will provide an unexcelled output indicator. It should be connected to the AVC bus.

Test oscillator—Connect the low side of the oscillator to the receiver chassis through a 0.1 mfd. capacitor. When the electronic voltmeter is used in an alignment indicator the output of the test oscillator should be adjusted to produce several volts of AVC. With the output meter alignment method the oscillator output should be kept as low as possible.

Calibration scale—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the dial backing plate for quick reference during alignment.

Replacement parts

Models 10X, 11X-1

List of genuine factory-tested parts, which are readily identified and may be purchased from authorized dealers.

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>3594</td>
<td>Capacitor—056 mfd.</td>
<td>$0.25</td>
</tr>
<tr>
<td>37359</td>
<td>Capacitor—0.005 mfd.</td>
<td>$0.25</td>
</tr>
<tr>
<td>14393</td>
<td>Capacitor—0.011 mfd.</td>
<td>$0.30</td>
</tr>
<tr>
<td>30938</td>
<td>Capacitor—0.050 mfd.</td>
<td>$0.50</td>
</tr>
<tr>
<td>5196</td>
<td>Capacitor—0.085 mfd.</td>
<td>$0.85</td>
</tr>
<tr>
<td>37287</td>
<td>Capacitor—0.050 mfd.</td>
<td>$0.25</td>
</tr>
<tr>
<td>34855</td>
<td>Capacitor—0.047 mfd.</td>
<td>$0.30</td>
</tr>
<tr>
<td>53348</td>
<td>Capacitor—0.047 mfd.</td>
<td>$0.30</td>
</tr>
<tr>
<td>37258</td>
<td>Cap—Loop primary coil (Anenna)</td>
<td>$0.75</td>
</tr>
<tr>
<td>53468</td>
<td>Cap—Oscillator coil</td>
<td>$0.50</td>
</tr>
<tr>
<td>37253</td>
<td>Condenser—Tuning condenser</td>
<td>$0.75</td>
</tr>
<tr>
<td>30945</td>
<td>Control—Volume control and power switch</td>
<td>$1.50</td>
</tr>
<tr>
<td>31356</td>
<td>Cord—Drive cord (approx. 22-in. overall length)</td>
<td>$0.10</td>
</tr>
<tr>
<td>37208</td>
<td>Indicator—Station selector indicator</td>
<td>$0.20</td>
</tr>
<tr>
<td>37251</td>
<td>Plate—Drive plate complete with pulleys—less dial</td>
<td>$0.60</td>
</tr>
<tr>
<td>36220</td>
<td>Pullies—Drive cord pulley</td>
<td>$0.04</td>
</tr>
<tr>
<td>37255</td>
<td>Reception—Receptacle and terminal board</td>
<td>$0.20</td>
</tr>
<tr>
<td>12312</td>
<td>Resistor—3.300 ohms, 1 watt</td>
<td>$0.20</td>
</tr>
<tr>
<td>12392</td>
<td>Resistor—25,000 ohms, 1 watt</td>
<td>$0.20</td>
</tr>
<tr>
<td>12234</td>
<td>Resistor—20,000 ohms, 1 watt</td>
<td>$0.20</td>
</tr>
<tr>
<td>26368</td>
<td>Resistor—47,000 ohms, 1 watt</td>
<td>$0.20</td>
</tr>
<tr>
<td>12228</td>
<td>Resistor—3.3 meg., 1 watt</td>
<td>$0.20</td>
</tr>
<tr>
<td>30727</td>
<td>Resistor—1 meg., 1 Watt</td>
<td>$0.20</td>
</tr>
</tbody>
</table>

Alignment Procedure

Model 45X-18

Pre-setting dial—With gang condenser in full mesh, the pointer should be adjusted so that it is horizontal.

Push button adjustment—The push-buttons should be adjusted for five favorite stations after the receiver is operating, and has had a brief warm-up period. Any standard broadcasting stations may be chosen, it being preferable to adjust for stations in the order of frequency, from low to high. Proceed as follows:

1. Push in each button and loosen the push-button screws in back of the station marker recesses.
2. Accurately tune the first station manually.
3. With the station accurately tuned, press in the first push-button and tighten the screw.
4. Place station marker cab in the recess.
5. Adjust four remaining push buttons in a similar manner.

Alignment Procedure

Model 16X-4

Push button adjustment—

1. Make a list of the six desired stations, arranged in order from low to high frequencies, and manually tune the first station on the list.
2. Push in station button No. 1 (outside left) and adjust No. 1 oscillator coil to receive the station.
3. Adjust antenna trimmer for maximum output. Clockwise core and trimmer adjustments tune circuits to lower frequencies.
4. Adjust for each of the four remaining stations in a similar manner.
5. Make a final careful readjustment of oscillator cores and antenna trimmers.

Compliments of www.nucow.com
Models 7Q4 and 7QK4 are similar to Model 6Q4 except for the addition of a tuning indicator (RCA-6U5/6G5). The 7QK4 chassis uses an RCA-6F6 output tube, whereas the 7Q4 uses an RCA-6F6-G output tube.

The dial scale of Models 7Q4 and 7QK4, together with a table giving alignment frequencies and calibration degrees, is shown below. For additional alignment data, schematic diagram, etc., refer to the service note on Model 6Q4.

### Frequency Calibration Degrees

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Calibrated Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>175 kc</td>
<td>52.8</td>
</tr>
<tr>
<td>360 kc</td>
<td>148.5</td>
</tr>
<tr>
<td>600 kc</td>
<td>132.0</td>
</tr>
<tr>
<td>1,500 kc</td>
<td>132.0</td>
</tr>
<tr>
<td>6.0 mc</td>
<td>150.0</td>
</tr>
<tr>
<td>20.0 mc</td>
<td>157.0</td>
</tr>
</tbody>
</table>

The corresponding position of the dial indicator for any setting of the calibration scale can be determined by drawing a line from this point on the bottom calibration scale to the same point on the top calibration scale.

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MODEL 1X-1

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PAGE 12-22 RCA

MODEL 14X, Ch. RC1001D
MODEL 14X, Ch. RC1001E

* Grounded to chassis in Model 14AX.

Power Output
Undistorted......... .9 watts
Maximum............. 1.3 watts

Model 14AX is the same as Model 14X with the exception of the circuit shown above.

Loudspeaker (92161-1)
Type................ 5-inch permanent-magnet dynamic
V.C. Impedance........ 3.3 ohms at 400 cycles

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-oscillator to--</th>
<th>Tune test-osc. to--</th>
<th>Turn radio dial to--</th>
<th>Adjust the following for max-peak output--</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>125K7 grid in series with 0.1 mfd.</td>
<td>455 kc</td>
<td>Quiet Point at 1,600 kc end of dial</td>
<td>C10, C9 2nd I-F Transformer</td>
</tr>
<tr>
<td>2</td>
<td>125A7 grid in series with 0.1 mfd.</td>
<td></td>
<td></td>
<td>C8, C7 1st I-F Transformer</td>
</tr>
<tr>
<td>3</td>
<td>Antenna term. in series with 47 mfd.</td>
<td></td>
<td></td>
<td>C21 (osc.)** C23 (ant.)</td>
</tr>
<tr>
<td>4</td>
<td>Antenna term. in series with 200 mfd.</td>
<td></td>
<td></td>
<td>C14 (osc.)</td>
</tr>
<tr>
<td>5</td>
<td>Radiation Loop</td>
<td>1,300 kc</td>
<td>Resonance on Signal</td>
<td>C15 (ant.)</td>
</tr>
<tr>
<td>6</td>
<td>Radiation Loop</td>
<td>600 kc</td>
<td></td>
<td>C22 Osc. Rock in</td>
</tr>
</tbody>
</table>

* It is recommended that this step be repeated using a received station of known frequency.
** Use minimum capacity if two peaks can be obtained.

Precautinary Lead Dress.--
1. Dress the power cable to switch on the volume control close to the chassis and away from all grid and diode leads and condensers.
2. Dress capacitors in the 125Q7 grid circuit away from all wiring.
3. Green and black phone wires should be twisted and dressed away from other parts and leads.
4. 50L6-CT filament wires should be dressed to rear of chassis and away from the second I-F transformer leads.
5. Dress brown lead from second I-F transformer to 125Q7 away from power cable.
6. Dress wire to No. 1 grid of the 125A7 away from pilot lamp leads.
7. Dress wire from loop to variable condenser away from chassis.
8. Dress all capacitors, leads, etc., which come close to oscillator coil rigidly and as far as possible from it.

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MODEL 15X, Ch. RC-462
MODELS 16X-1, 16X-2
Ch. RC-462A
MODEL 16X-3, Ch. RC-462B

FOR ALIGNMENT SEE INDEX

Frequency Range ........................................... 535-1,720 kc
Power Output
Undistorted ................................................. 6.9 watts
Maximum ...................................................... 14.4 watts

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Alignment Procedure

Output Meter Alignment.—If this method is used, connect the meter across the volume control and turn the volume control to maximum.

Test-Oscillator.—For all alignment operations, keep the output as low as possible to avoid a.v.o. action.

<table>
<thead>
<tr>
<th>MODELS 500, 501</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Steps</strong></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

Alignment Procedure

**MODELS 16X-11, 16X-13, 16X-14**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-osc. to</th>
<th>Tune test-osc. to</th>
<th>Turn radio dial to</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12SK7 grid in series with 0.1 mfd.</td>
<td>455 kc</td>
<td>Quiet Point at 1700 kc end of dial</td>
<td>C17, C18 (2nd I.F. Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>12SK7 grid in series with 0.1 mfd.</td>
<td>1700 kc</td>
<td>Full clockwise (out of notch)</td>
<td>C14 (oscillator)</td>
</tr>
<tr>
<td>3</td>
<td>Resonance on 500 kc signal</td>
<td>1500 kc</td>
<td>Resonance on 500 kc signal</td>
<td>C16 (antenna)</td>
</tr>
<tr>
<td>4</td>
<td>Radiated Signal 18 mc</td>
<td>18 mc</td>
<td>Radiated Signal 18 mc</td>
<td>C18 (osc.)</td>
</tr>
</tbody>
</table>

**MODELS 15X, 16X-1, 16X-2, 16X-3**

Precautionary Lead Dress:
1. 0.1 mfd. capacitor from output plate to cathode to be dressed as far as possible away from 0.15 mfd. 1st audio grid condenser and volume control terminals to eliminate audio hum.
2. Filament lead to pin No. 7 on 35L6-GT socket to be dressed away from 1st audio grid.
3. Dress B+ lead on 12SK7 I.F. I.F. socket across bottom of socket between grid and plate, contacts to aid reduction of grid plate capacitance.
4. Dress excess lead lengths of I.F. transformer, grid and plate leads into case to aid shielding.
5. Dress filament leads of 35L6-GT around I5S07 socket and into chassis corner to reduce hum.

**CALIBRATION SCALE** — The glass tuning dial may be easily removed from the cabinet and temporarily attached to the dial housing plate for quick reference during alignment.

Replacement Parts

*ALL PRICES ARE SUBJECT TO CHANGE OR WITHDRAWAL WITHOUT NOTICE.*

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Set-Up Procedure

1. Insert plug in power supply outlet, and turn the power switch—volume control knob on top of VA-21 to full clockwise position. Start a record on the VA-21. The motor is a synchronous manual-starting type, and requires a clockwise spin to start.

2. Tune the radio receiving set to a quiet point between 530-625 kc.

3. Tune the oscillator in the VA-21 to this frequency by adjusting the button on the rear of the VA-21 cabinet to obtain peak output on the receiver. Clockwise rotation decreases the frequency; counter-clockwise rotation increases the frequency.

4. Adjust the volume control for the highest volume that is likely to be required, and then use the VA-21 volume control for further adjustment.

5. In noisy locations, it may be desirable to leave the VA-21 volume control turned full clockwise, and regulate the radio volume control for the desired level.

6. If there is insufficient volume, or excessive noise, the remedy is to couple the VA-21 to the radio receiver, by running a piece of insulated wire between the two units. Wrap one end (three or four turns) around the antenna lead-in on the radio, and wrap the other end (three or four turns) around the short wire that projects from the plug on the power cord of the VA-21. With an RCA Master Antenna, wrap the wire around the counter-pole lead where it attaches to the receiver (terminal A3) or to the coupling unit (terminal B). With a loop receiver, place the end of the wire close to the loop.

7. If the radio receiver has push-button tuning, one of the buttons may be set up to tune in the VA-21 oscillator frequency. This button should be marked “Record Player.”

Precautionary Lead Dress

1. The power supply cord must be dressed between chassis and top of cabinet, away from grid of 6A8, and entirely away from 25Z6-G.

2. All leads to oscillator coil must be as short as possible.

3. All motor leads must be dressed away from rotor.

4. Pickup leads must be dressed away from the top grid of 6A8, and kept away from the 25Z6-G.

Motor Data

Smooth starting and running will be insured by keeping the bearings well cleaned and oiled.

Hum and Vibration—A small amount of hum when starting, decreasing to a negligible amount when running, is normal. If excessive vibration occurs it may be due to:

1. Insufficient lubrication, or any failure that will cause binding.
2. Leather washer not oiled. (Check to make certain that the leather washer is above the steel washer.)
3. Motor not properly supported from motor board.
4. Burns on poles of rotor or stator. Remove with fine emery cloth.

The damper spring must fit without binding or chattering in the slot in the stator. The stator must be free to deflect in either direction between the limits of the damper spring. The damper spring must exert approximately equal force in restoring the stator to its mid-position when the stator is deflected manually in each direction.

Removing Rotor.—The rotor and turntable assembly simply rests on the ball bearing at bottom of vertical bearing. Remove by lifting upward.

Rotor Adjustment.—Remove motor from cabinet, loosen the three screws that hold the rotor to the turntable, insert three 16-mil shims at equal distances around the gap between the rotor and stator, and then carefully tighten the three screws. The top of rotor must be flush with top of stator; add additional steel washers beneath the stator if necessary.
Alignment Procedure

**Cathode-Ray Alignment** is the preferable method. Connections for the oscilloscope are shown in the chassis drawing.

**Output Meter Alignment.**—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

**Test-Oscillator.**—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the output as low as possible to avoid a-v-e action.

**Calibration Scale on Indicator-Drive Cord Drum.**—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment; therefore, a calibration scale is attached to the indicator-drive cord drum which is mounted on the shaft of the gang condenser. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment table.

As the first step in r-f alignment, check the position of the drum. The "180°" mark on the drum scale must be vertical, and directly over the center of the gang-condenser shaft when the plates are fully meshed. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

**Pointer for Calibration Scale.**—Improve a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame and bend the wire so that it points to the "180°" mark on the calibration scale when the plates are fully meshed.

**Dial-Indicator Adjustment.**—After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the 540° mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

**Spread-Band Alignment.**—The most satisfactory method of aligning or checking the spread-band ranges is on actual reception of short-wave stations of known frequency, by adjusting the magnetite-core oscillator coil for each band so that these stations come in at the correct points on the dial.

In exceptional cases, when the set is being serviced in a location where the noise level is high enough to prevent reception of short-wave stations, a test-oscillator may be used for alignment, but an extremely high degree of accuracy is required in the frequency settings of the test-oscillator, as a slight error will produce considerable inaccuracy in spread-band diaphragms. The frequency settings of the test-oscillator may be checked by one or both of the following methods:

1. Determine the exact dial settings of the test-oscillator (for frequencies at or close to the specified alignment frequencies) by zero-beating the test-oscillator against short-wave stations of known frequency.

2. Use harmonics of the standard-broadcast range of a test-oscillator, first checking the frequency settings on this range by means of a crystal calibrator (RCA Stock No. 9572), or by zero-beating against regular standard broadcast stations.

When a test oscillator is employed for spread-band alignment, a final check should be made on actual reception of short-wave stations of known frequency, and the magnetite-core oscillator coil for each band should be re-adjusted so that the stations come in at the correct points on the dial.

**Tube and Trimmer Location**

**Location of Controls**

**Connections and Colors of Loudspeaker and Cables**

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Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the chassis drawing.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil and turn the receiver volume control to maximum.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis and keep the output as low as possible to avoid deflection of meter.

Calibration Scale on Indicator-Drive Cord Drum.—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment; therefore a calibration scale is attached to the indicator-drive cord drum which is mounted on the shaft of the gang condenser. This scale is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment table.

As the first step in r-f alignment, check the position of the drum. The "180°" mark on the drum scale must be vertical, and directly over the center of the gang-condenser shaft when the plates are fully meshed. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

Pointer for Calibration Scale.—Impervise a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bend the wire so that it points to the "180°" mark on the calibration scale when the plates are fully meshed.

Dial-Indicator Adjustment.—After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the 90° mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

Tube and Trimmer Location

Spread-Band Alignment.—The most satisfactory method of aligning or checking the spread-band ranges is on actual reception of short-wave stations of known frequency, by adjusting the magnetite-core oscillator coil for each band so that these stations come in at the correct points on the dial.

In exceptional cases, when the set is being serviced in a location where the noise level is high enough to prevent reception of short-wave stations, a test-oscillator may be used for alignment, but an extremely high degree of accuracy is required in the frequency settings of the test-oscillator, as a slight error will produce considerable inaccuracy on the spread-band dials. The frequency settings of the test-oscillator may be checked by one or both of the following methods:

1. Determine the exact dial settings of the test-oscillator for frequencies at or close to the specified alignment frequencies) by zero-beating the test-oscillator against short-wave stations of known frequency.

2. Use harmonics of the standard-broadcast range of a test-oscillator, first checking the frequency settings on this range by means of a crystal calibrator (RCA Stock No. 9572), or by zero-beating against standard broadcast stations.

When a test oscillator is employed for spread-band alignment, a final check should be made on actual reception of short-wave stations of known frequency, and the magnetite-core oscillator coil for each band should be re-adjusted so that the stations come in at the correct points on the dial.

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Precautionary Lead Dress:
1. Dress 1st I-F plate and grid leads against chassis and away from each other.
2. Dress plate lead from 12SK7 close to chassis.
3. Dress leads from terminal board on loop support away from loop.

Power-Supply Polarity.—For operation on d-c, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On a-c, reversal of the plug may reduce hum.

Power Output (125 volts, 60 cycle supply)
Undistorted . . . . . 0.8 watts
Maximum . . . . . . . 1.2 watts

Loudspeaker . . . . . . 5 inch electrodynamic

Drive Cord Detail
### Alignment Procedure

**Output Meter Alignment.**—Connect the meter across the voice coil, and turn the receiver volume control to maximum.

**Test-Oscillator.**—Connect the low side of the test-oscillator to the receiver chassis, through a .01 mfd. capacitor, and keep the output as low as possible.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-osc. (to)</th>
<th>Tune test-osc. to—</th>
<th>Turn radio dial to—</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12SK7 1st grid in series with 3.1 mfd.</td>
<td>465 kc</td>
<td>Quiet Point 1,600 kc end of dial</td>
<td>C28, C29 2nd I.F. transformer</td>
</tr>
<tr>
<td>2</td>
<td>12AS7—1st. det. grid in series with 0.1 mfd.</td>
<td>signal frequency</td>
<td>C27, C26 1st I.F. transformer</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>radiated signal 1,500 kc</td>
<td></td>
<td></td>
<td>C25 (osc.)</td>
</tr>
<tr>
<td>4</td>
<td>radiated signal 3,000 kc</td>
<td></td>
<td></td>
<td>C23 (ant.)</td>
</tr>
<tr>
<td>5</td>
<td>Repeat steps 3 and 4.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Electrical and Mechanical Specifications

**FREQUENCY RANGE** ................................. 540-1,650 kc

**INTERMEDIATE FREQUENCY** ...................... 455 kc

**TUBE COMPLEMENT**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>RCA-12SK7</td>
</tr>
<tr>
<td>(2)</td>
<td>RCA-12AS7</td>
</tr>
<tr>
<td>(3)</td>
<td>RCA-124T</td>
</tr>
<tr>
<td>(4)</td>
<td>RCA-50L4-GT</td>
</tr>
<tr>
<td>(5)</td>
<td>RCA-35ZS-GT</td>
</tr>
</tbody>
</table>

**POWER OUTPUT**

- Undistorted: 0.0 watts
- Maximum: 1.2 watts

**PILOT LAMP** ........................................ 1—Mazda No. 51, 6-8 volts, 0.2 amps.

**POWER SUPPLY RATING**

- 105-125 volts, 50 cycles: 55 watts
- 105-125 volts, 60 cycles: 55 watts

**LOUDSPEAKER (HL-81A-4)**

- 5-inch permanent-magnet dynamic V.C. impedance: 4 ohms at 400 cycles

**Weight (net)** ...................................... 19 lbs.

**Shipping** ......................................... 23 lbs.

**Tuning Drive Ratio** .............................. 9:1

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**Phonograph Motor Service Data:**

The phonograph motor is of the self starting synchronous type and operates the turntable through friction drive between the motor drive spindle and the rubber tired idler on the rim of the turntable.

The motor should be lubricated once or twice a year by placing a few drops of S. A. E. 20 (or equivalent) on the turntable spindle and saturating the oil retaining felt pad on the motor shaft with S. A. E. 10 oil. Caution—The motor drive spindle and the rubber tire on the idler must be kept clean and entirely free from oil and grease at all times.

**Power Supply**—Although this model employs an ac-dc chassis, it is not suitable for use on d-c, as this would damage the motor.
Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for this phonograph are shown in the schematic drawing.

Output Meter Alignment.—Connect the meter across the voice coil, and tune the receiver volume control to maximum.

Test Oscillator.—Connect the low side of the test oscillator to the Ground Terminal. "G." and keep the output as low as possible.

Using Calibration Scale.—

1. With gage in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.*

2. Place a flat 6-inch ruler on the dial backing plate so the left-end of ruler is at the reference mark at left-end of backing plate. Temporarily fasten the ruler with Scotch tape to the backing plate.

3. Refer to calibration scale printed in this service note. This is a reduced reproduction of the dial with an inch-scale drawn at the bottom. To find the correct pointer position in inches for any desired frequency, draw a vertical line through this frequency on the calibration scale.

Phonograph Motor Service Data.—

The phonograph motor is of the self starting synchronous type and operates the turntable through friction drive between the motor drive spindle and the rubber tipped idler on the rim of the turntable.

The motor should be lubricated once or twice a year by placing a few drops of S. A. E. 20 oil (or equivalent) on the turntable spindle and saturating the oil retaining felt pads on the motor shaft with S. A. E. 10 oil. Caution—The motor drive spindle and the rubber tire on the idler must be kept clean and entirely free from oil and grease at all times.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect High Side of Test Oscillator to</th>
<th>Tune Test Osc. to</th>
<th>Turn Radio Dial to</th>
<th>Adjust for max. output—</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>65K7 Grid Thru 200 mmf.</td>
<td>455 kc</td>
<td>Quiet Point between 550-750 kc</td>
<td>L7, L8 2nd I-F Trans.</td>
</tr>
<tr>
<td>2</td>
<td>6SA7 Grid Thru 200 mmf.</td>
<td>455 kc</td>
<td>1,600 kc (See Scale)</td>
<td>L5, L6 1st I-F Trans.</td>
</tr>
<tr>
<td>3</td>
<td>Radiation Loop</td>
<td>1,500 kc</td>
<td>1,600 kc (See Scale)</td>
<td>C25 osc. C23 ant.</td>
</tr>
<tr>
<td>4</td>
<td>Radiation Loop</td>
<td>600 kc</td>
<td>600 kc (See Scale)</td>
<td>L4 osc. Rock In</td>
</tr>
</tbody>
</table>

IMPORTANT.—DO NOT PLUG CHASSIS INTO A DC POWER SUPPLY.
### Alignment Procedure

**Using Calibration Scale.**

1. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backplate.

2. Place a flat 12-inch ruler on the dial backplate so the left-end of ruler is at the reference mark, at left-end of backplate. Temporarily fasten the ruler with scotch tape to the backplate.

3. Refer to calibration scale printed in this service note. This is a reduced reproduction of the dial with an inch-scale drawn at bottom.

**Dial-Pointer Adjustment.** After the chassis is replaced in cabinet, move the dial pointer (if necessary) so that it is at the left-hand graduation on the dial with the gang in full mesh.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Steps</th>
<th>Contact the high side of the test-oct to:</th>
<th>Tune test oct. to:</th>
<th>Turn radio dial to:</th>
<th>Adjust the following for max. peak output:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I-F grid, in series with .03 mil.</td>
<td>455 kc</td>
<td>Quiet Point at R-F end of dial</td>
<td>L and L1 (2nd I.F. Trans.)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1st det. grid, in series with .01 mil.</td>
<td>1,500 kc</td>
<td>1,500 kc</td>
<td>L4 &amp; L5 (1st I.F. Trans.)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal, in series with 200 mmfd. (link open)</td>
<td>600 kc</td>
<td>800 kc</td>
<td>C28 (occ.)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>455 kc</td>
<td>600 kc</td>
<td>C29 (ant.)</td>
<td>Rock in</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Repeate steps 2 and 4.**

**StANDARD BROADCAST**

<table>
<thead>
<tr>
<th>WAVE BANDS</th>
<th>FREQUENCY</th>
<th>MODULATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>55 60 70 80 100 120 140 170</td>
<td>kHz</td>
<td>m</td>
</tr>
</tbody>
</table>

**Phonograph Motor Service Data.**

The phonograph motor is of the self starting synchronous type and operates the turntable through friction drive between the motor drive spindle and the rubber-tired idler on the rim of the turntable. The motor should be lubricated once or twice a year by placing a few drops of S. A. E. 20 (or equivalent) on the turntable spindle and saturating the oil retaining felt pads on the motor shaft with S. A. E. 10 oil. Caution—The motor drive spindle and the rubber tire on the idler must be kept clean and entirely free from oil and grease at all times.

**Precautionary Lead Dress.**

1. Dress power leads to AC switch away from terminals of volume control.
2. Dress heater leads to 6SQ7 away from 10 megohm leak.
3. Dress C-14 and C-16 away from all heater and power supply leads.
4. Green lead to loop away from I.F. can.
5. Green lead from C-1 to button usually away from oscillator.
6. Green phono lead up from chassis and away from C-13.

**The Phono-Radio Tone Control.**

The five positions of the knob are:
1. Fully counterclockwise—radio mellow tone with emphasis on lows and reduction of static and high pitched interference.
2. Radio full tone with all sound effects.
3. Phonograph—mellow tone— with reduction of high pitched surface noise and emphasis on highs.
4. Phonograph—full tone—all sound effects from the record.
5. Phonograph—high tone—with reduction of bass resonance and low tones.
Alignment Procedure

**MODEL 94BP-1 series Chassis RC-407B**

Output Meter Alignment.—Connect the meter across the voice coil and turn the receiver volume control to maximum.

Test-Oscillator.—For 1-F alignment, connect the low side of the test-oscillator to the receiver chassis through a .01 mfd. capacitor, and keep the output as low as possible.

Pre-Setting Dial.—With gang condenser in full mesh, the pointer should be adjusted so that it is vertical.

Antenna.—The set is equipped with a built-in loop antenna. If an outdoor antenna is used, it may be connected to the "ANT" terminal on rear of cabinet. It should not be longer than 100 feet, including lead-in. If it is longer, connect a 100 to 200 mfd. capacitor in series with the lead-in.

**MODEL 94BP-1, Ch. RC-407B 2nd Production**

Alignment Procedure MODELS 46X-1, 46X-2, 46X-3 Chassis RC-459F, RC-459H 2nd Production

Output Meter Alignment.—Connect the meter across the voice coil and turn the receiver volume control to maximum.

Test-Oscillator.—For all alignment operations, keep the output as low as possible to avoid a-c v. action. Connect low side of oscillator to the receiver chassis.

Pre-setting Dial.—With gang condenser in full mesh, the pointer should be horizontal.

Loop-Adjusting Coil.—The second production of 94BP-1 series incorporates a loop inductance adjustment coil (L.1) which is adjusted at 600 kc. For best performance, it is recommended that the alignment procedure be followed exactly as given. This will ensure maximum sensitivity over the entire broadcast band.

---

### Push Button Adjustments

The push buttons connect to separate magnetite-core oscillator cofs and separate loop circuit trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool such as RCA Stock No. 51351. Allow about five minutes warm-up period before making adjustments.

The procedure is as follows:

1. Make a list of the five desired stations, arranged in order from low to high frequencies.
2. Push in the dial-tuning button and manually tune in the first station on the list.
3. Press in the left-hand button.
4. Adjust L20 to receive the first station. To secure the best adjustment, rotate the set for least pickup, and adjust L20 for peak output.

### Alignment Procedure

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-oscillator to—</th>
<th>Tune test-osc. to—</th>
<th>Turn radio dial to—</th>
<th>Adjust the following for max. peak output—</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12SK7 1-F grid in series with .01 mfd.</td>
<td>655 kc</td>
<td>Quiet point at 2,660 kc end of dial</td>
<td>C9 and C10 (2nd 1-F trans.)</td>
</tr>
<tr>
<td>2</td>
<td>Tuning condenser (osc.) in series with .01 mfd.</td>
<td>1,600 kc</td>
<td>Full (out of mesh)</td>
<td>C7 and C8 (1st 1-F trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Radiation loop consisting of two turns of wire 18 inches in diameter</td>
<td>1,400 kc</td>
<td>Resistance on 1,400 kc signal</td>
<td>C3 (oscillator)</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>C1 (antenna)</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-oscillator to—</th>
<th>Tune test-osc. to—</th>
<th>Turn radio dial to—</th>
<th>Adjust the following for max. peak output—</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1A7G 1st-Det. grid cap. in series with .01 mfd.</td>
<td>655 kc</td>
<td>Quiet point at 1,660 kc end of dial</td>
<td>C11, C10, C9, C6 (1st and 2nd 1-F transformers)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>1,650 kc</td>
<td>Full (out of mesh)</td>
<td>C4 (oscillator)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal, in series with 15 mfd.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>600 kc</td>
<td>600 kc signal</td>
<td>L1 (ant.)</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>1,500 kc</td>
<td>1,000 kc signal</td>
<td>L2 (ant.)</td>
</tr>
</tbody>
</table>

---

For your convenience a wide variety of battery compliments may be used with this receiver, and Figures 1, 2, and 3 illustrate three different sets of batteries installed in place. The following table gives type numbers of Eveready batteries but any equivalent battery of standard make may be used.

| Figure “A” battery 1½ v. “B” battery 4½ v. 4½ | No. 742 | 450 | No. 743 |
| 1 | No. 742 | 450 | No. 743 |
| 2 | No. 742 | 450 | No. 422 or No. 727 |
| 3 | No. 742 | 450 | No. 422 or No. 727 |

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SERVICE DATA

Motor.—The drive motor is of simple design and substantial construction. It should require little or no service if properly maintained. Attention to lubrication of the moving parts and occasional cleaning of the mechanism will go far to prevent faulty operation. Should it become necessary to repair the motor, the following procedure should be applied: CAUTION.—Allow the motor mechanism to run down completely before attempting adjustment, repairs, or replacements.

Removing Motor from Cabinet.—Remove the winding key. To dismount the motor, unscrew the spindle cap and remove turntable, slightly tapping the spindle while exerting an upward lift on the turntable. Loosen the screw holding the speed-regulating lever and remove the latter. The three screws holding motor to motor board should then be loosened to permit removal of motor assembly.

Replacing Main Spring Barre.—In case of main spring failure, the entire spring barrel and gear should be replaced. Remove the spring-barrel spindle screw by unscrewing to right. Remove the C washer and two pillar screws holding bottom plate. Remove bottom plate, intermediate spindle shaft, and spring barrel. Reassemble parts in reverse sequence.

Winding Shaft Spring.—This spring functions as a friction clutch. It may be removed as follows: remove pin holding winding worm on shaft; remove winding shaft; then remove screw holding spring. Replace in reverse sequence.

Governor Adjustment.—The mesh of the worm and fiber gear is affected by the eccentricity of the spindle bearings. The adjustments should be made so that the worm meshes properly with the fiber gear and rotates freely without binding. The bearings should be accurately aligned with each other. The minimum of spindle end-play which permits smooth operation should be used.

Speed Regulator Lever.—After assembly, adjust the speed regulator until the turntable rotates at 78 r.p.m.; loosen the speed regulator screw and set pointer to center of speed indicator scale; tighten screw and re-check turntable speed.

Lubrication.—All moving parts of the motor should be thoroughly cleaned and lubricated every six months to prevent excess wear and to assure proper operation. A small amount of grease should be applied to the worm gear of the governor, the gear of the winding shaft, and on the small pinion gear. All other points, including regulator friction pad, should be lubricated with light oil. All motor parts should be covered with a light film of oil to prevent rusting.

RADIO RECEIVERS WHERE THE VOLUME CONTROL IS IN THE AUDIO INPUT CIRCUIT.

RADIO RECEIVERS WHERE THE FIRST AUDIO TUBE IS OF THE GRID CAP TYPE AND FIXED BIAS FOR TUBE IS OBTAINED THROUGH GRID LEAD.

General Description

The R-103-S is designed for use with a battery-operated receiver where a mechanical type unit is required having the characteristics necessary for record fidelity. The motor is of the mechanical, spring wound, variable speed type completely governed to maintain a constant speed. The pickup assembly is of the crystal type housed in a light weight, plastic shell of modern styling. A volume control is placed across the pickup output terminals providing a means of controlling the output voltage.

Connecting Victrola Attachment to Radio Receivers

In general, the Victrola Attachment must be used with radio receivers having at least two stages of high-gain audio amplification. The output of the Victrola Attachment should be connected to the input of the first audio tube, and at the same time, the output of radio receiver portion of the chassis should be shorted or opened, to prevent radio signals being heard while the Victrola Attachment is in operation.

Methods of connecting the Victrola Attachment to various types of audio systems are given in the accompanying diagrams. The data given requires that an RCA Stock No. 8924 Radio-Phono switch be used for switching from radio to phonograph. For ease in connecting the "phone" lead to Stock No. 8824 switch, the male plug on the end of the lead should be removed by unsoldering or by cutting it off.

Tone Compensation

Because of the widely varying frequency characteristics of various types of audio amplifiers with which the Victrola Attachment may be used, it may be desirable in some cases to use the pickup circuit of the Victrola Attachment to compensate for the characteristics of the amplifier. The following circuits show means of making such refinements.

In "A", R1 controls the low-frequency response; larger values of R1 give increased lows. For maximum low-frequency response, remove R1. R2 controls pickup output; smaller values of R3 give increased output. C1 controls high-frequency response; to increase highs, increase C1.

Where a decrease in high-frequency response may be desired (for example, as an aid in reducing "needle scratch" on worn records), the circuit in "B" is applicable. In this circuit, C2 acts as loading on the pickup and is also a controlling factor on the high-frequency response. Smaller values of C2 give more pickup output and more highs. R3 gives a sharper high-frequency roll-off; increasing R3 decreases highs.

The suggested values shown in "A" and "B" should serve as a basis from which slight alterations may be made to suit individual needs.

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**Alignment Procedure**

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the schematic diagram.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the output as low as possible to avoid a-c action.

Electronic Voltmeter.—The electronic voltmeter in the Chanalyzer or Volt Ohmyst provides an unexcelled output indicator. It should be connected to the AVC bus, and the test-oscillator output adjusted to produce several volts of AVC.

Calibration for Alignment.—The dial calibration for alignment purposes can be set up in two ways:

1. The dial may be removed from the cabinet by unscrewing the two spring pieces which clamp it in its mounting position. The condenser plates should then be turned into full mesh, the pointer adjusted to the scratch at the left end of the dial backing plate, and the dial placed on the frame so that its extreme left calibration mark coincides with the pointer. The dial may be held in place with Scotch tape. In this manner the actual receiver dial is used for alignment. When alignment is finished, the scale should be replaced including the fibre light shields which are folded under the ends of the glass scale.

2. A calibration scale is attached to the tuning drum. The correct setting of the gang, in degrees, for each alignment frequency is given in the alignment table. Check the position of the drum, making sure that the 0 degree scale mark is horizontal with the gang in full mesh.

Pointer for Calibration Scale.—If method (2) is used, improvise a pointer for the calibration scale by fastening a piece of wire to the chassis, and bend the wire so that it points to the 0 degree mark on the calibration scale when the plates are fully meshed.

Spread-Band Alignment.—Make final adjustment of C56 and C50 during actual reception of a station of known frequency near 9.5 megacycles.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of the test-osc. to</th>
<th>Tune test osc. to</th>
<th>Turn radio dial to</th>
<th>Adjust the following for maximum peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-9 grid in series with .01 mfd.</td>
<td>465 kc</td>
<td>&quot;C&quot; Band Quiet Point at 18 mc end of dial</td>
<td>L21 and L22 (2nd I.F. Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>1st-det. grid in series with .01 mfd.</td>
<td></td>
<td></td>
<td>L18 and L20 (1st I.F. Trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal (A), in series with 47 mfd. (link closed)</td>
<td>15.2 mc</td>
<td>15.9 mc (140°) &quot;C&quot; band</td>
<td>C56 (osc.)* C50 (ant.)** Rock in</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>9.5 mc</td>
<td>9.5 mc (45.8°) &quot;31W&quot; band</td>
<td>C56 (osc.)* C51 (ant.)** Rock in</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>2.44 mc</td>
<td>2.44 mc (97°) &quot;9W&quot; band</td>
<td>C27 (osc.)</td>
</tr>
<tr>
<td>6</td>
<td>Stator of antenna section of gang, in series with 300 ohms</td>
<td>800 kc</td>
<td>800 kc (30.5°) &quot;A&quot; band</td>
<td>L26 (osc.)</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>1,500 kc</td>
<td>1,500 kc (128°) &quot;A&quot; band</td>
<td>C28 (osc.)</td>
</tr>
<tr>
<td>8</td>
<td>Repeat steps 6 and 7.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Fasten chassis to cabinet, see that link is closed on antenna terminal board, indicator at left end of dial scales with gang at maximum capacity.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Radiation loop consisting of two turns of wire 18 inches in diameter, 4 to 6 feet from receiver</td>
<td>1,500 kc</td>
<td>1,500 kc &quot;A&quot; band</td>
<td>C61 (ant.) mounted on loop</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>600 kc</td>
<td>600 kc &quot;A&quot; band</td>
<td>L28 (osc.) Rock in</td>
</tr>
<tr>
<td>12</td>
<td>Repeat steps 10 and 11.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Use minimum capacity peak if two peaks can be obtained.
** Use maximum capacity peak if two peaks can be obtained.

NOTE: Oscillator tracks 455 kc above signal on all bands.

**Push Button Adjustment**

The station push buttons connect to separate magnetite-core oscillator coils and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool such as RCA Stock No. B1031. Allow at least five minutes warm-up period before making adjustments.

In the event that the receiver is to be used with an external antenna use one or two feet of wire (as an antenna) to ensure sharp peaking during the final adjustment procedure. For loop operation, the link should be strapped across terminals on back of set. In either case the procedure is as follows:

1. Make a list of the desired stations, arranged in order from low to high frequencies.
2. Turn the range selector to "A" band, and manually tune in the first station on the list.
3. Turn range selector to "PB" position, push in station button No. 1 (extreme left). Then adjust the No. 1 oscillator core (L-14) to receive the station.
4. After oscillator core is set correctly, adjust C-8 for maximum output.
5. Clockwise adjustment of cores and trimmers tunes the circuits to lower frequencies.
6. Adjust for each of the remaining stations in the same manner.
7. Make a final careful adjustment of the oscillator cores and antenna trimmers.

Owing to the relatively high r-f gain, it may be found that a given station can be tuned in at several different settings of the magnetite-core oscillator push-button coils. In such cases, it is advisable to unscrew the loop push-button trimmers to minimum capacity before adjusting the magnetite cores.

On the 880 to 1,550 kc push-button, the higher frequency stations may be received with L-8 either in or out (oscillator frequency either 455 kc below or 455 kc above the station frequency). The adjustment with this core in its out position (oscillator frequency 455 kc above the station frequency) is the correct one.
Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the oscilloscope are shown in the schematic diagram.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test Oscillator.—For all alignment operations, connect the low side of the test oscillator to the receiver chassis, and keep the output as low as possible to avoid a cvc action.

Electronic Voltmeter.—The electronic voltmeter in the Cannalyst or Vact Obhym provides an excellent output indicator. It should be connected to the AVC bus, and the test-oscillator output adjusted to produce several volts of AVC.

Calibration for Alignment.—The dial calibration for alignment purposes can be set up in two ways:

1. The dial may be removed from the cabinet by sliding out the two spring pieces which clamp it in its mounting position. The condenser plates should then be turned into full mesh, the pointer adjusted to the scratch at the left end of the dial backing plate, and the dial placed on the frame so that its extreme left calibration mark coincides with the pointer. The dial may be held in place with Scotch tape. In this manner the actual receiver dial is used for alignment. When alignment is finished, the scale should be replaced including the fibre light shields which are folded under the ends of the glass scale.

2. A calibration scale is attached to the tuning drum. The correct setting of the gang, in degrees, for each alignment frequency is given in the alignment table. Check the position of the drum, making sure that the 0 degree scale mark is horizontal with the gang in full mesh.

Pointers for Calibration Scale.—If method (2) is used, improvise a pointer for the calibration scale by fastening a piece of wire to the chassis, and bend the wire so that it points at the 0 degree mark on the calibration scale when the plates are fully meshed.

Spread-Band Alignment.—Make final adjustment of C56, C72, and C50 '31-meter' trimmers during actual reception of a station of known frequency near 9.5 megacycles.

* Use minimum capacity peak if two peaks can be obtained.

** Use maximum capacity peak if two peaks can be obtained.

NOTE: Oscillator tracks 455 kc above signal on all bands.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of the test-osc. to—</th>
<th>Tune test-osc. to—</th>
<th>Turn radio dial to—</th>
<th>Adjust the following for maximum peak output—</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-F grid in series with .01 mfd. 455 kc</td>
<td>&quot;C&quot; band quiet point at 16 mc end of dial</td>
<td>L21 and L22 (2nd 1-F trans.)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1st det. grid in series with .01 mfd. 15.2 mc</td>
<td>15.2 mc (&quot;C&quot; band)</td>
<td>C56 (osc.)* C72 (det.)* C50 (ant.) Rock in C72, C50</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal (A) in series with 47 mfd. (link closed) 9.5 mc</td>
<td>9.5 mc (&quot;A&quot; band)</td>
<td>C55 (osc.) C70 (det.) C51 (ant.)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2.44 mc Green lead on loop plug, in series with 300 ohms 600 kc</td>
<td>2.44 mc (90.5&quot;) &quot;B&quot; band 600 kc (30.5&quot;) &quot;A&quot; band</td>
<td>L28 (osc.)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1,500 kc 1,500 kc (150&quot;) &quot;A&quot; band 1,500 kc (150&quot;) &quot;B&quot; band</td>
<td>C28 (osc.) C67 (det.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Repeat steps 6 and 7.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Fasten chassis in cabinet, close ant. link, adjust indicator to left-hand end of dial scales with gang closed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Radiation loop connects to any turns of wire 18 inches in diameter located 4 to 6 feet from receiver 1,500 kc</td>
<td>1,500 kc signal &quot;A&quot; band</td>
<td>C61 (ant.) (sn loop)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>600 kc 600 kc (&quot;A&quot; band)</td>
<td>L28 (osc.) Rock in</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Push Button Adjustment

The station push buttons connect to separate magnetite-core oscillator coils and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool such as RCA Stock No. 31031. Allow at least five minutes warm-up period before making adjustments.

In the event that the receiver is to be used with an external antenna use one or two feet of wire (as an antenna) to ensure sharp peaking during the final adjustment procedure. For loop operation, the loop should be strapped across terminals on back of set. In either case the procedure is as follows:

1. Make a list of the desired stations, arranged in order from low to high frequencies.
2. Turn the range selector to "A" band, and manually tune in the first station on the list.
3. Turn range selector to "PB" position, push in station button No. 1 (extreme left). Then adjust the No. 1 oscillator core (L-38) to receive the station.
4. After oscillator core is set correctly, adjust C63 for maximum output.
5. Clockwise adjustment of cores and trimmers tunes the circuits to lower frequencies.
6. Adjust for each of the remaining stations in the same manner.
7. Make a final careful adjustment of the oscillator cores and antenna trimmers.

Owing to the relatively high r-f gain, it may be found that a given station can be tuned in at several different settings of the magnetite-core oscillator push-button coils. In such cases, it is advisable to uncrew the loop push-button trimmers to minimum capacity before adjusting the magnetite-cores.

On the 880 to 1,550 kc push-button, the higher frequency stations may be received with L8 or L10 either in or out (oscillator frequency either 455 kc below or 455 kc above the station frequency). The adjustment with this core in its out position (oscillator frequency 455 kc above the station frequency) is the correct one.

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Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the schematic diagram.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil and turn the receiver volume control to maximum.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the output as low as possible to avoid a-c action.

Electronic Voltmeter.—The electronic voltmeter in the Champaign or Voltrester provides an unacclimated output indicator. It should be connected to the AVC bus, and the test-oscillator output adjusted to produce several volts of AVC.

Calibration Scale.—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the chassis for quick reference during alignment. In the event that only the chassis is returned for service, and the cabinet with its tuning dial is left in the customer's home, the calibration scale printed on this service note may be used in conjunction with an ordinary 12-inch ruler as an accurate and convenient substitute for the regular dial. Each method is described below.

Using Tuning Dial.—
1. Slide out the flat spring clamp at each end of the dial, and remove the glass dial from the cabinet.
2. With gang in full mesh, move the dial pointer to the reference mark at the left-band end of the dial backing plate.
3. Place the glass dial under the pointer so that the extreme left scale graduations coincide with the pointer. Use sootch tape to hold the glass dial in this position.

Using Calibration Scale
1. With gang in full mesh, move the dial pointer to the reference mark at the left-band end of the dial backing plate.
2. Place a flat 14-inch ruler on the dial backing plate so that the left end of the scale is the reference mark at left-end of backing plate. Temporarily fasten the ruler with sootch tape to the backing plate.

3. Refer to calibration scale printed in this service note. This is a reduced reproduction of the dial with an inch-scale drawn at top and bottom. To find the correct pointer position in inches for any desired frequency, draw a vertical line through this frequency on the calibration scale.

4. Dial-Pointer Adjustment.—After the chassis is replaced in cabinet, move the dial pointer (if necessary) so that it is at the left-hand graduation on the dial with the gang in full mesh.

5. Connect the high side of the test-oscillator to the chassis. Turn the test oscillator to a convenient frequency and the magnetic output to a high level. Adjust the following control to balance the output:

6. Repeat steps 4 and 5.

**Use minimum capacity peak if two peaks can be obtained.** Check to determine that the correct peak has been used, by tuning receiver to 14.39 mc, where a weaker signal should be received.

**Note:** Oscillator tracks above signal on both bands.
Calibration Scale.—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the chassis for quick reference during alignment. In the event that only the calibration scale is required for service, and the cabinet with its tuning dial is left in the customer's home, the calibration scale printed in this service note can be used as an accurate and convenient substitute for the regular dial.

Using Tuning Dial.—
1. Slide out the flat spring clamp at each end of the dial, and remove the glass dial from the cabinet.
2. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate. (1/16 inch to left of this mark in V-201.)
3. Place the glass dial under the pointer so that the extreme left scale graduation coincides with the pointer. Use Scotch tape to hold the glass dial in this position.

Using Calibration Scale, Model V-200.—
1. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
2. Place a flat 12-inch ruler on the dial backing plate so that the left end of the ruler is at the reference mark at left end of backing plate. Temporarily fasten the ruler with Scotch tape to the backing plate.
3. Refer to calibration scale printed in this service note. This is a reduced reproduction of the dial with an inch scale drawn at top and bottom. To find the correct pointer position in inches for any desired frequency, draw a vertical line through this frequency on the calibration scale.

Using Calibration Scale, Model V-201.—
A calibration scale is attached to the tuning drum. The correct setting of the gang, in degrees, for each alignment (frequency) is given in the alignment table. Check the position of the drum, making sure that the 0 degree scale mark is horizontal with the gang in full mesh. Improper calibration for the calibration scale by tightening a piece of wire to the chassis, and bend the wire so that it points to the 0 degree mark on the calibration scale when the plate are fully meshed.

Dial-Pointer Adjustment.—After the chassis is replaced in cabinet, move the dial pointer (if necessary) so that it is at the left-hand graduation on the dial with the gang in full mesh.

### Calibration Scale

<table>
<thead>
<tr>
<th>Steps</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Connect the high side of the test-osc. to 91 mfd.</td>
</tr>
<tr>
<td>2.</td>
<td>1st det. grid, in series with 91 mfd.</td>
</tr>
<tr>
<td>3.</td>
<td>Adjustable antenna terminal, series with 200 mmdfd.</td>
</tr>
<tr>
<td>4.</td>
<td>600 kc</td>
</tr>
<tr>
<td>5.</td>
<td>Repeat steps 3 and 4.</td>
</tr>
</tbody>
</table>

* Use minimum capacity peak if two peaks can be obtained. Check to determine that the correct peak has been used, by tuning receiver to 1420 mc, where a weaker signal should be received. Note: Oscillator tracks above signal on both bands.
1. Make a list of the desired stations, arranged in order from low to high frequencies.

2. Turn the range switch to the broadcast position and manually tune in the first station on the list.

3. Turn range switch to push-button position and press in the left-hand button.

4. Adjust core rod No. 1 to receive the first station. To secure the best adjustment, rotate the loop for least pickup, and adjust core rod No. 1 for peak output.

5. Adjust trimmer screw No. 1 for peak output on the first station.

6. Proceed in the same manner to adjust for the remaining stations.

7. Repeat adjustments for best results.

On the 880 to 1,550 kc push-button, the higher frequency stations may be received with core rod No. 6 either in or out (oscillator frequency either 455 kc below or 455 kc above the station frequency). The adjustment with this core in its out position (oscillator frequency 455 kc above the station frequency) is the correct one.

NOTE: Clockwise adjustment of cores and trimmers tunes the circuits to lower frequencies.
## Models VHR-202, VHR-207, VHR-407, VHR-407A

### RCA MFG. CO., INC.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connect grid to high side of socket.</td>
</tr>
<tr>
<td>2</td>
<td>Install carbon type in socket</td>
</tr>
<tr>
<td>3</td>
<td>Connect high lead</td>
</tr>
<tr>
<td>4</td>
<td>Install carbon type in socket</td>
</tr>
<tr>
<td>5</td>
<td>Connect high lead</td>
</tr>
<tr>
<td>6</td>
<td>Adjust for maximum plate current</td>
</tr>
<tr>
<td>7</td>
<td>Connect high lead</td>
</tr>
</tbody>
</table>

### Alignment Procedure

1. **Step 1:** With grid in full scale, turn off the calibrated oscillator and bypass it. Read the grid current and note it. Then connect the grid to the high side of the socket and note the grid current. Next, connect the high lead to the plate and note the plate current. Finally, adjust the grid for the maximum plate current.

2. **Step 2:** Connect the high lead to the plate and note the plate current. Then connect the grid to the high side of the socket and note the grid current. Next, connect the high lead to the plate and note the plate current. Finally, adjust the grid for the maximum plate current.

3. **Step 3:** Connect the high lead to the plate and note the plate current. Then connect the grid to the high side of the socket and note the grid current. Next, connect the high lead to the plate and note the plate current. Finally, adjust the grid for the maximum plate current.

### Calibration Scale

- **Frequency Calibration:**
  - **1 kHz:** 1 step
  - **10 kHz:** 1 step
  - **100 kHz:** 1 step

- **Amplitude Calibration:**
  - **100 mV:** 1 step
  - **1 V:** 1 step
  - **10 V:** 1 step

### Notes

- **Model VHR-202:**
  - Frequency range: 10 kHz to 100 kHz
  - Amplifier type: Carbon Type

- **Model VHR-207:**
  - Frequency range: 1 kHz to 100 kHz
  - Amplifier type: Carbon Type

- **Model VHR-407:**
  - Frequency range: 1 kHz to 100 kHz
  - Amplifier type: Carbon Type

- **Model VHR-407A:**
  - Frequency range: 1 kHz to 100 kHz
  - Amplifier type: Carbon Type

Compliments of www.nucow.com
**Recorder Cutting Adjustments**

**IMPORTANT**

The cutting point of the stylus must be in perfect condition in order to make good recordings.

The condition of the stylus point can be determined by sliding it through visual inspection. If the point is not sharp or in perfect condition, a new stylus must be used.

**To insert or change a stylus**, lift the stylus arm and insert the stylus at the rear of the machine. Move the stylus to the desired position and press the stylus to the record.

**To adjust the stylus pressure**, use a gauge to check the stylus pressure. A perfect stylus pressure should be between 300 and 400 grams. The stylus pressure should be adjusted to the recommended value by turning the pressure screw on the stylus arm.

**To adjust the stylus pressure**, use a gauge to check the stylus pressure. A perfect stylus pressure should be between 300 and 400 grams. The stylus pressure should be adjusted to the recommended value by turning the pressure screw on the stylus arm.

**To adjust the stylus pressure**, use a gauge to check the stylus pressure. A perfect stylus pressure should be between 300 and 400 grams. The stylus pressure should be adjusted to the recommended value by turning the pressure screw on the stylus arm.

**To adjust the stylus pressure**, use a gauge to check the stylus pressure. A perfect stylus pressure should be between 300 and 400 grams. The stylus pressure should be adjusted to the recommended value by turning the pressure screw on the stylus arm.

---

**Recorder Operating Instructions**

**Preliminary**

1. Ensure that the unit is turned on and that the recording head is clean.
2. Place the record on the turntable and adjust the stylus pressure to the recommended value.
3. Turn on the power supply and adjust the output level to the desired value.
4. Adjust the equalization controls to the recommended value.
5. Turn on the recording switch and adjust the output level to the desired value.
6. Turn on the recording switch and adjust the output level to the desired value.
7. Adjust the equalization controls to the recommended value.
8. Turn on the recording switch and adjust the output level to the desired value.
9. Adjust the equalization controls to the recommended value.
10. Turn on the recording switch and adjust the output level to the desired value.

**Microphone**

1. Connect the microphone to the microphone input on the recorder and adjust the gain to the recommended value.
2. Adjust the equalization controls to the recommended value.
3. Turn on the recording switch and adjust the output level to the desired value.
4. Adjust the equalization controls to the recommended value.
5. Turn on the recording switch and adjust the output level to the desired value.
6. Adjust the equalization controls to the recommended value.
7. Turn on the recording switch and adjust the output level to the desired value.
8. Adjust the equalization controls to the recommended value.
9. Turn on the recording switch and adjust the output level to the desired value.
10. Adjust the equalization controls to the recommended value.

**Rumble**

1. Reduce the rumble by adjusting the equalization controls to the recommended value.
2. Increase the rumble by adjusting the equalization controls to the recommended value.
3. Reduce the rumble by adjusting the equalization controls to the recommended value.
4. Increase the rumble by adjusting the equalization controls to the recommended value.

---

**Record**

1. Place the record on the turntable and adjust the stylus pressure to the recommended value.
2. Turn on the recording switch and adjust the output level to the desired value.
3. Adjust the equalization controls to the recommended value.
4. Turn on the recording switch and adjust the output level to the desired value.
5. Adjust the equalization controls to the recommended value.
6. Turn on the recording switch and adjust the output level to the desired value.
7. Adjust the equalization controls to the recommended value.
8. Turn on the recording switch and adjust the output level to the desired value.
9. Adjust the equalization controls to the recommended value.
10. Turn on the recording switch and adjust the output level to the desired value.

---

**Microphone**

1. Connect the microphone to the microphone input on the recorder and adjust the gain to the recommended value.
2. Adjust the equalization controls to the recommended value.
3. Turn on the recording switch and adjust the output level to the desired value.
4. Adjust the equalization controls to the recommended value.
5. Turn on the recording switch and adjust the output level to the desired value.
6. Adjust the equalization controls to the recommended value.
7. Turn on the recording switch and adjust the output level to the desired value.
8. Adjust the equalization controls to the recommended value.
9. Turn on the recording switch and adjust the output level to the desired value.
10. Adjust the equalization controls to the recommended value.

---

**RCA**

1. Reduce the rumble by adjusting the equalization controls to the recommended value.
2. Increase the rumble by adjusting the equalization controls to the recommended value.
3. Reduce the rumble by adjusting the equalization controls to the recommended value.
4. Increase the rumble by adjusting the equalization controls to the recommended value.
Compliments of www.nucow.com

The RCA automatic record changer is the result of over twenty years of continuous improvement, precision manufacturing and rigid inspection. Hands on thousands of these mechanisms are giving satisfactory performance under everyday use in unbedded hodes. The mechanism is relatively simple, compact and foolproof as human ingenuity can devise.

Cautions

1. This instrument is not recommended for playing 10-inch and 12-inch records in a vertical position.
2. Never use force to start or stop the motor or any part of the mechanism. Always place it on the record changer stand or pickup arm.
3. Warped or damaged records may cause the mechanism to malfunction in the following ways:
   a. Worn or broken record arm will be set on a warped record.
   b. Record arm may be set on a record with a missing label.

4. Inaccurate records may slide on one another when playing, resulting in unsatisfactory reproduction.
5. Do not leave records on the record changer stand as they may warp, particularly in warm climates. Willing records may be bettered by placing them on a flat surface with a flat heavy object placed on top of them for a few days.
6. Do not leave pickup needle resting on a record or on the turntable. Always place it on the record changer stand or pickup arm.
7. Do not insert a used needle in the pickup arm, and avoid using a needle arm if it has been used.
8. If for any reason the phonograph stylus, turn off the turntable switch and remove the records from the record changer stand. Start the turntable and allow the pickup arm to come to rest.

Manual Phonograph Operation

Inserting Needle: To insert a needle, place pickup arm on the record changer stand, lift needle to rest on top of the pickup arm or its support. Turn the record changer on, and the needle will be set on the record changer stand. Start the turntable and allow the pickup arm to come to rest.

Automatic Phonograph Operation

1. Lift up the pickup arm and swing it out of the way.
2. Turn power on.
3. The pickup arm will start to move, and the record will play.
4. When the record is finished, the pickup arm will return to its original position.
5. To stop the record, lift up the pickup arm and return it to its original position. The pickup arm will stop and the record will stop playing.

Automatic Record Changer Mechanism

Cycle of Operation

The cycle is completed when the pickup comes down on the record. The pickup arm should not be moved while in operation. The pickup arm should be moved while in operation. The pickup arm should be moved while in operation. The pickup arm should be moved while in operation.

Record-Changer Service Data

Before servicing the automatic record changer, check the various parts to see that all levers, shafts, springs, etc., are in their proper positions and are correctly assembled. The alignment of the pickup arm can be checked through the window by placing the pickup arm on the record changer stand and removing the turntable. The pickup arm should be removed by turning it in the reverse direction. The pickup arm should be turned in the reverse direction. The pickup arm should be turned in the reverse direction. The pickup arm should be turned in the reverse direction.

RCA MFG. CO., INC.

R.C.A. 12-VOL. MODEL VER. 107

Compliments of www.nucow.com
Power-Supply Polarity.—For operation on d-c, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On a-c, reversal of the plug may reduce hum.

Frequency Range ........................................... 535-1,750 kc
Intermediate Frequency ............................... 455 kc
Power Output (117 volt, 60 cycle supply) .......... 1.0 watt

1. Dress grid lead of 125K7 close to chassis under condenser (C12).
2. Dress green and blue leads from i-f transformers close to chassis and away from each other.
3. Dress leads from terminal board on loop support away from loop.

Loudspeaker .............................................. 4-inch Electrodynamic
Power Supply Ratings ................................ 105-125 volts, direct current, or 50-60 cycles, 30 watts
Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the schematic diagrams.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the output as low as possible to avoid a-c action.

Electronic Voltmeter.—The electronic voltmeter in the ChahouAT or Voltmeter provides an uncleared output indicator. It should be connected to the A/C bus, and the test-oscillator output adjusted to produce several volts of A/V.

Calibration Scale.—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the chassis for quick reference during alignment. In the event that only the chassis is returned for service, and the cabinet with its tuning dial is left in the customer’s home, the calibration scale printed in this service note can be used in conjunction with an ordinary 12-inch rule as an accurate and convenient substitute for the regular dial.

Each method is described below.

Using Tuning Dial.—
1. Side out the flat spring clamp at each end of the dial, and remove the glass dial from the cabinet.
2. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
3. Place the glass dial under the pointer so that the extreme left scale graduations coincide with the pointer. Use Scotch tape to hold the glass dial in this position.
4. After completion of alignment, replace the glass dial in cabinet, taking care that the three light shields are in correct position at ends of dial.

Using Calibration Scale.—
1. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
2. Place a flat 12-inch rule on the dial backing plate so the left end of rule is at the reference mark at left-end of backing plate. Temporarily fasten the rule with Scotch tape to the backing plate.
3. Refer to calibration scale printed in this service note. This is a reduced reproduction of the dial with an inch-scale drawn at top and bottom. To find the correct pointer position in inches for any desired frequency, draw a vertical line through this frequency on the calibration scale. For example, 1,100 kc is approximately 4 inches from the reference mark.

Dial-Pointer Adjustment.—After the chassis is replaced in cabinet, move the dial pointer (if necessary) so that it is at the left-hand graduation on the dial with the gang in full mesh.

Phonograph Information

For information regarding the automatic record changer refer to service note covering RP-128 record changers.

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Calibration Scale—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the chassis for quick reference during alignment. In the event that only the chassis is returned for service, and the cabinet with its tuning dial is left in the customer's home, the calibration scale printed in this service note can be used in conjunction with an ordinary 12-inch ruler as an accurate and convenient substitute for the regular dial.

Each method is described below.

Using Tuning Dial—

1. Slightly out the fed spring clamp at each end of the dial, and remove the glass dial from the cabinet.
2. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.

Using Calibration Scale—

1. With gang in full mesh move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
2. Place a flat 12-inch ruler on the dial backing plate so the left end of the ruler is at the reference mark at left-hand end of backing plate. Temporarily fasten the ruler with scotch tape to the backing plate.
3. Refer to calibration scale printed in this service note. This is a reduced reproduction of the dial with a 1-inch scale drawn at top and bottom. To find the correct pointer position in inches for any desired frequency, draw a vertical line through this frequency on the calibration scale.

Dial-Pointer Adjustment—After the chassis is replaced in cabinet, move the dial pointer (if necessary) so that it is at left-hand graduation on the dial with the gang in full mesh.

Compliments of www.nucow.com
The recorder and automatic record-changing mechanism VHR-202, 207, 407. Refer to the service note on these
(RP-195) in Model VHR-307 is the same as used in Models models for service data and replacement parts list.

**Push Button Adjustments**

The push buttons contact separate magnet-cored solenoid coils and operate loop circuit trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool such as RCA Stock No. 34011. Allow about five minutes warm-up period before making adjustments.

The procedure is as follows:

1. Make a list of the channels, inserted in order from low to high frequencies.
2. Turn the range switch to the broadcast position and initially tune in the first station on the list.
3. Tune range switch to push-button position and pens in the left-hand button.
4. Adjust core rod No. 1 to receive the first station. To secure the best adjustment, rotate the loop for best pickup, and advance core rod No. 1 for peak output.
5. Adjust trimmer No. 1 for peak output on the first station.

6. Proceed in the same manner to adjust for remaining stations.
7. Repeat adjustments for best results.

On the 480 to 1,550 kc push-buttons, the higher frequency stations may be received with core rod No. 7 or 8 either in or out (magnetic, frequency either 455 kc below or 455 kc above the station frequency). The adjustment with the core in its out position (magnetic frequency 455 kc above the station frequency) is the correct one.

**NOTE:** Clockwise adjustment of caps and trimmers tunes the circuits to lower frequencies.

---

**Using Calibration Scale.**

1. With gain in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
2. Place a set of 2在校 note on the dial backing plate as the left-hand end of the dial backing plate. The set of 2在校 note is the point which is the end of the dial backing plate.
3. Refer to calibration scale printed in this service note. This is a radical interpretation of the dial with an inch-scale drawn at any selected frequency. Draw a 1/2-inch line through this frequency on the calibration scale.

**Dial-Pointer Adjustment**

—After the chassis is replaced in cabinet, move the dial pointer to that position of the dial where the 2在校 note is at the left-hand graduation on the dial with the gain is full mesh.
Power-Supply Polarity. — For operation on d-c, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On a-c, reversal of the plug may reduce hum.

CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION VOLUME VIII
TECHNICAL INFORMATION AND SERVICE DATA

1940 No. 38

ADJUSTMENTS

A. Main Lever—This lever is basically important in that it influences the various individual mechanisms which control the automatic record changers, etc. Remove the button tuft from the tuft slot and check stroke of the button tuft. Then check the stroke of the tuft. Then check the stroke of the button tuft by approximately 1/16 inch.

B. Friction Clutch—The motion of the tone arm toward the center of the record is controlled by the friction arm lever. If the friction lever is not adjusted properly, it may cause unnecessary wear to the friction arm, which in turn may affect the pickup of the record. Adjust the friction arm lever by turning the screw to the desired position.

C. Pickup Lift Cable Screw—During the recording process, the pickup arm is lowered by the action of the recording arm lever. Adjust the pickup arm by turning the screw to the desired position.

D. S. N. Needle Loading on Record—The relation of the needle to the record is important in that it affects the quality of the record. Adjust the needle by turning the screw to the desired position.

E. Tone Arm Mounting Base—The tone arm mounting base is important in that it affects the stability of the record. Adjust the base by turning the screw to the desired position.

F. & G. Record Spindles—The spindles are important in that they support the record and record arm. Adjust the spindles by turning the screw to the desired position.

H. Record Service—The record service is important in that it affects the quality of the record. Adjust the service by turning the screw to the desired position.

J. Tone Arm Servo Support—The tone arm servo support is important in that it affects the stability of the record. Adjust the support by turning the screw to the desired position.

K. Trip Point Stop Pin—The trip point stop pin is important in that it prevents the record from being moved when it is not desired. Adjust the pin by turning the screw to the desired position.

Light machine oil should be used in the tone arm bearings, record drive bearings, and other bearings of various types and pulleys on underdrive - motorbear.

Do not allow oil or grease to come in contact with rubber bumper or rubber parts of the machine.

MOTOR SERVICE DATA

On the RP-153 drive motors a 0.0144 inch bearing gap is recommended for centering the rotor in the field bore.

The field coils can be disassembled and inspected if care is taken in removing the field windings block in a manner so that the armature will not be damaged.

When disassembling the rotor or motor shaft housing, the field coil should be held in a clamp to prevent the field winding from being disturbed.

Note: Numbers refer to parts—refer only to adjustments.

Bottom View of RP-152, -A, -B, -C, -D, -J Automatic Record Changer

RP-152 mechanisms are similar to above but have flexible coupling, turntable drive, and automatic switch. RP-152-D mechanisms are similar to above but include automatic switch.
### Replacement Parts Model RP-152 (Continued)

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>195384</td>
<td>Arm-Pickup arm---&lt;br&gt;RP-152D only</td>
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<tr>
<td>195585</td>
<td>Arm-Pickup arm---&lt;br&gt;RP-150C only</td>
<td>.75</td>
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<tr>
<td>195586</td>
<td>Arm-Pickup arm---&lt;br&gt;RP-150C only</td>
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<tr>
<td>195351</td>
<td>Switch—Motor switch (4)</td>
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<td>195287</td>
<td>Arm—Motor-&lt;br&gt; RP-150C only</td>
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<tr>
<td>195288</td>
<td>Arm—Motor-&lt;br&gt; RP-150C only</td>
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<td>195289</td>
<td>Ball—Liner—ball for spindle shaft</td>
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<td>Ball—Liner—ball for spindle shaft</td>
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<td>Separator—&lt;br&gt; RP-150C only</td>
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<td>Separator—&lt;br&gt; RP-150C only</td>
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### Replacement Parts Model RP-153

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<th>STOCK No.</th>
<th>DESCRIPTION</th>
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<tr>
<td>195313</td>
<td>Arm—Pickup arm only</td>
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<tr>
<td>195314</td>
<td>Arm—Pickup arm only</td>
<td>.50</td>
</tr>
<tr>
<td>195315</td>
<td>Arm—Pickup arm only</td>
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<td>195316</td>
<td>Arm—Pickup arm only</td>
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<td>195317</td>
<td>Arm—Pickup arm only</td>
<td>.50</td>
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<td>195318</td>
<td>Arm—Pickup arm only</td>
<td>.50</td>
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<td>195319</td>
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<td>195322</td>
<td>Arm—Pickup arm only</td>
<td>.50</td>
</tr>
<tr>
<td>195323</td>
<td>Arm—Pickup arm only</td>
<td>.50</td>
</tr>
</tbody>
</table>

### For Balance of Replacement Parts See Index
The RP-152 and RP-153 automatic record changers are very similar in design and construction. Most of the parts and adjustments are identical on both. The RP-153 turntable is driven through a worm gear in the motor housing while the RP-152 turnables are driven through a friction drive disc mounted under the turntable.

On Models RP-152 it is important that the drive motor spindle, and rubber tires on main driving disc and idler pulley be kept clean and free from oil, grease, dirt, or any foreign matter at all times. Any quick-drying naphtha is satisfactory for cleaning these parts. The drive motor bearing is lubricated from an oil well filled and sealed at the factory. It should not require lubrication in the field.

The rubber-tired drive disc on Models RP-152 is not removable from the spindle. The turntable is fastened to the driving disc with three bolts. If necessary to remove these parts the spindle drive gear set screw should first be removed. The driving disc, turntable and spindle assembly can now be lifted upward from the motor housing. If this is done, great care should be taken not to bend the spindle.

To remove the turntable and spindle on the RP-153 type it is necessary to first remove the tapped pin in the turntable drive arm assembly. The turntable and spindle can then be drawn up through the motorboard bearings.

Before servicing the automatic record changer, inspect the assembly to see that all levers, parts, gears, springs, etc., are in good order and are correctly assembled.

A bind or jam in the mechanism can usually be relieved by rotating the turntable in the reverse direction.

The changer can be conveniently rotated through its change cycle by pulling the index lever to "Reject" and revolving the turntable by hand. Six turntable revolutions are required for one change cycle.

When a record has been played the pickup moves out, another record is dropped down, and the needle is fed automatically into the starting groove of this record. If the needle fails to enter the starting groove, raise the right-hand side of the cabinet by inserting thin spacers under the feet on that side. If the needle slides over a few grooves, raise the left-hand side of the cabinet in a similar manner.

The 10- and 12-inch records must be absolutely flat for smooth operation. A pickup shorting switch, located under the motorboard, operates when the pickup is moved outward to the pickup rest.

### Replacement Parts Model RP-153

**STOCK No.**

**DESCRIPTION**

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
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<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit Price</th>
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<td>36566</td>
<td>Clutch-Trip lever clutch—less adjusting stud (S)</td>
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<td>Screw—No. 10-32x.7367 16 set screw for motor coupling</td>
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<td>36565</td>
<td>Finger-Trip lever friction finger (7)</td>
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<td>36583</td>
<td>Screw—Pickup lift cable adjusting screw</td>
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<td>36564</td>
<td>Frame—Motor coupling frame only</td>
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<td>36593</td>
<td>Separator—Record separator rotation shell (9)</td>
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<td>36574</td>
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<td>Shaft—Record separator shaft (27)</td>
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<td>36573</td>
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<td>Lever—Turntable spindle</td>
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<td>Guide—Pickup lift cable guide (spring)</td>
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<td>Spring—Flat spring for record discriminator lever</td>
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<td>Lever—Record separator elevating lever (28)</td>
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<td>36566</td>
<td>Leveler—Record separator elevating lever with adjustment screws (18)</td>
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<td>36126</td>
<td>Spring—Record discriminating lever pawl spring</td>
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<td>31132</td>
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<td>Spring—Tension spring for cam pawl</td>
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<tr>
<td>36530</td>
<td>Lever—Trip lever less cam and link</td>
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<td>36216</td>
<td>Spring—Tension spring for locating lever and pawl (20)</td>
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<td>Link—Roller index link</td>
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<td>Strip—Complete set of rubber strips for motor coupling</td>
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<td>Rack—Turntable spindle arm and gear (49)</td>
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<td>Stud—No. 14.46 hex stud for trip lever clutch adjustment</td>
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<td>36517</td>
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<td>36599</td>
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<td>Turntable—Turntable idler spring shaft</td>
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<td>Washer—Spring washer for mounting record discriminator lever</td>
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<tr>
<td>31118</td>
<td>Screw—No. 10-32x.7367 16 cup point set screw for record separator elevating lever</td>
<td>.10</td>
<td>31108</td>
<td>Washer—Spring washer for mounting record discriminator lever</td>
<td>.06</td>
</tr>
</tbody>
</table>

**XX**—Price upon application to your local RCA Victor Parts Distributor.

**ALL PRICES ARE SUBJECT TO CHANGE OR WITHDRAWAL WITHOUT NOTICE.**

Compliments of www.nucow.com
REFERENCE TABLE FOR AUTOMATIC MECHANISM ADJUSTMENTS

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Check and Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not play automatically.</td>
<td>Section 19, 20, 24. 54 under recording arms open.</td>
</tr>
<tr>
<td>Keeps on repeating automatically.</td>
<td>Section 1, 5, Section 15, 26, 27.</td>
</tr>
<tr>
<td>Tapes before record is formed.</td>
<td>Section 17.</td>
</tr>
<tr>
<td>Does not stop at end of record.</td>
<td>Section 25, 26.</td>
</tr>
<tr>
<td>Does not feed new record.</td>
<td>Section 2, 3.</td>
</tr>
<tr>
<td>Record cannot be turned.</td>
<td>Section 1, 9, 10.</td>
</tr>
<tr>
<td>Does not reverse record properly.</td>
<td>Section 1, 8, 11, 13, 14.</td>
</tr>
<tr>
<td>Does not reverse record.</td>
<td>Section 1, 8, 12, 13, 14.</td>
</tr>
<tr>
<td>Pickup does not land correctly on record.</td>
<td>Section 5, 6, 16, 17.</td>
</tr>
<tr>
<td>Chatter while changing record.</td>
<td>Section 21, or short circuit in relay trip system.</td>
</tr>
<tr>
<td>Ringing noise while changing record.</td>
<td>Section 4.</td>
</tr>
<tr>
<td>Record Selector Lever does not work properly.</td>
<td>Section 23, 23, 24.</td>
</tr>
</tbody>
</table>

* Make sure record is not warped or chipped or has rough edges.

NOTE: When Automatic Mechanism jams, also check "Power" Switch. "OFF" before closing the jam, as the turntable "Motor Switch" does not shut power to the motor off while the mechanism is in cycle.

None—When mechanism jams upon being unpacked, check to see whether the record magazine is lined up as stated in Adjustments. Also check to see if the Record Reverse Arm Lock No. 48 Fig. 2 is in top of the Record Reverse Arm Lock Step No. 48 Fig. 2.

1. MAGAZINE LINK ADJUSTING SCREWS ("D") (Fig. 1). The record magazine should always be kept squarely against the magazine step screw. (C). "C" Fig. 1. If it does not, it is necessary to loosen the two setscrews ("D", Fig. 1) to changing tension and run the record changer through a cycle of change. When the magazine has reached the horizontal position, as shown in Fig. 1, press down on the lower end of the magazine, this will lengthen the link assembly. Then when the magazine returns to its normal position, the magazine link will adjust itself so that the magazine is squarely against the step screw. Then tighten the magazine link screws ("D").

2. RECORD SEPARATOR ADJUSTMENT. The separator "L" (Fig. 1), should be adjusted so that a small 10" record will positively close the knife portion of the separator lever as shown in the following illustration. A standard to use is to make certain that there is approximately 1/8" clearance between the edge of the small record and the point of the separator lever, as shown at "A" in illustration below. However, it may be necessary to vary one way or the other from this measurement, depending on whether or not the slots end of the record separator lever goes over the hook ("L") (Fig. 1) without binding.

3. RECORD SEPARATOR HOEK ADJUSTMENT. After the above, the record separator it will be necessary to check the record separator hook (Fig. 1) to see that it enters the slot in the record separator without binding. This hook is threaded and by loosening the locknut the hook can be turned in either direction, to raise or lower it. After the correct adjustments is obtained, tighten the locknut. It should never be necessary to change these adjustments on record- changers since these have been tampered with by an inexperienced person.

SEPARATOR HOOK AND ARM (7) (Fig. 2). Be sure set screw "K" in Fig. 4 is screwed all the way in.

4. RECORD MAGAZINE BUSHING (13) (Fig. 1). If a ringing noise is heard while the instrument is changing records, i.e., such a noise that might be made by a spring, it will be found that the Duone bushing (13) (Fig. 1) is too tight, in which case it will be necessary to loosen the lock nut out of the bushing, and bolt the bolt out, from a quarter to a half turn, then tighten the lock nut.

5. TO ADJUST THE TONE ARM HEIGHT. To adjust the tone arm height, first place a 12" record on the turntable and adjust the tone arm stop lever (18) (Fig. 1) so that the record hits the rubber roller (21) (Fig. 1) in the center. Start the record changer through a cycle and stop it when the tone arm lever hook (22) (Fig. 1) just touches the stop lever assembly. In this position adjust the tone arm height so that the top of the stop lever is in the same height as the center of the hook. This adjustment is made by loosening the two Allen set screws at the rear of the tone arm.

These Allen set screws are accessible by raising the tone arm by hand. After the height adjustment it is necessary to make certain that there is a clearance of approximately 5/6" between the pickup stylus and record. This distance may be checked between the bottom of the record tray and the bottom of the pickup when the record tray is approximately parallel with the pickup.

6. TO ADJUST THE STOP LEVER HOOK (23) (Fig. 1). Always adjust the arm stop position on a 12" record before adjusting for a 10" record. Adjust the tone arm stop lever hook (23) (Fig. 1) by moving it in or out. This hook is locked in place by a set screw in the stud whose slot is shown in Fig. 1 as No. 2. This set screw is at the bottom of this stud. Adjust the hook so that it will pass through the notch in the pickup arm lever (18) (Fig. 1) without binding against the top or bottom of the notch, in the playing position. With a 12" record on the turntable, the rubber roller (33) (Fig. 1) against the edge of the record and the stop lever hook (23) against the blades of the stop lever (17) the needle should stop on the record exactly 1/16" from the edge of the record.

With the record changer in exactly the same position as described above, and with a 10" record on the turntable and the hook (12) (Fig. 1) against the blade, the stop lever should allow the needle to stop on the record 1/16" from the edge of the 10" record. A 6/32 screw shown in Fig. 1 is provided for making this adjustment, simply by screwing it in or out. A check should be made for clearance between the roller and the stop, this roller should never bind on the record tray. This can be taken care of slightly bending the tension needle lever (18) (Fig. 1) up or down. If it is necessary to bend the lever stop down it will be necessary to adjust for an 10" record.

7. THE ADJUSTMENTS OF THE RECORD MAGAZINE.

Before attempting to adjust the magazine, be sure that the center of the magazine pivot (10) (Fig. 1) is 3/8" above the base plate. This height is very important and we recommend checking the height of the right hand pin, looking at the magazine, before any adjustments are made.

The record magazine is positioned by moving it sideways on its bearing or pivot pins. The two screws underside of the pivot pins lock the magazine in position. Loosen these set screws, then see that the left hand side of the record reverse assembly fork (part of 4, Fig. 2) is between 1/8" and 3/8" inside the left hand side of the Reverse curve, when the magazine is in the up position. That is, the left hand edge of the record reverse fork is about 1/8" or 1/16" to the right of the left hand edge of the curve. After moving the magazine, tightly set up the set screws. Then with the selector arm in the "MUTE" position switch, the record reverse arm moves in front of the magazine, to see whether the record guide strikes either of the record support pins (35) (Fig. 1). If the guide strikes either of the support pins it will be necessary to bend the pin away from the guide, so we can move the guide up or down. By bending the separator lever in the "REVERSE" position, raise the record tray by hand, with a 10" record on the turntable, by raising the way the record strikes the support pins, the record should hit both pins about 1 1/2" from the end of the pin; if it does not it will again be necessary to bend the pins until the record hits both pins an equal distance from the ends. If it is necessary to bend the pins, check the center record guide area and the pins and between the arm carrying the record guide and the right hand pin. Also if the magazine has been shifted it is necessary to see that the two points, which extend downward from the magazine, have ample clearance in the channel, in the record tray, which are provided for their passage. If there is possibility of the pins striking it probably means that magazine has been shifted too much.

If the magazine has been adjusted, it is also necessary to see that the record separator hook (7) (Fig. 1) does not bind in the slot in the end of the record separator arm (33) (Fig. 1). If it does the section covering these parts give the adjustment.

8. MAGAZINE STOP SCREW.

The magazine stop screw ("C") (Fig. 1) should be adjusted so that the crank pin (part of 9, Fig. 1) is approximately 1/8" from the edge of the record reverse arm fork (part of 4, Fig. 1) which is further from the magazine, when the record reverse guide is in front of the magazine, that is, in the reversing position.

9. TO LOCATE AND ADJUST THE RECORD TRAY (29) (Fig. 2).

In assembling the record tray to the record changer, the first notch of the driver quadrant (107) (Fig. 1) should mesh with the second notch of the driver quadrant of the tray as shown.

With the two gears properly meshed, loosen the Allen set screws which hold pins Nos. 6, Fig. 1, in place. This will allow you to move the record tray sidewise, adjust tray sidewise until the turntable spindle is exactly in the center of the 10" record level of the record tray. (The 10" record level is that part of the tray where the holes No. 24 are indicated in Fig. 2.)

With the control lever in the "one side" position, run the record changer through its cycle, and compare the main cam is exactly half way past the upper edge of the record tray carousels, as shown at "A", (Fig. 2). As this position, the points of the turntable (14) (Fig. 1) should be level with the top of the turntable. If this tray is too low or too high, it may be adjusted in the preset level by loosening the eccentric screw (13) (Fig. 1) "B" and turning the screw until the proper level is obtained. Be sure to tighten the lock nut after adjustment. If the tray is too high, at this position, the ten-inch records will not be centered over the turntable spindle. If the record tray is too low, the ten-inch records will slide out over the ten-inch tray shoulders and not properly center.

10. TO ADJUST THE VERTICAL BUMPER GUIDE (10) (Fig. 2).

This guide is located back of the magazine cross bar (11) (Fig. 2). After the records are separated from the magazine they are guided in dropping off the separator as they hit the center of the record bumpers (31) (Fig. 2). This vertical bumper guide also guides the records when the elevating hook, on the rear of the record tray lifts the record. The vertical bumper should be set back just far enough to allow a 12" record to drop into the record bumpers freely. The
lower part of the vertical bumper, which extends into the record well, should extend toward the center of the well rubber bumpers far enough to make sure that the upper edge of the bumper is at least 0.010" below the points of the upper support (39) (Fig. 2). This adjustment is 99 critical. In some cases the bumper at the upper end of the vertical bumper will just clear the elevating hook on the rear of the stylus before it has time to reach the record. If this is found, the upper 50" records are chipping away the edges, due to 99 bumping against the points of the upper support record (39) (Fig. 2) it will be necessary to bend the line back and adjust the clearance. Some manufacturers have the ability to clear the rear of the stylus by raising the height of the needle or the record at the rear of the stylus by raising it.

11. RECORD REVERSE GUIDE (41) (Fig. 2). With a 12" record in the magazine the record reverse guide assembly (41) (Fig. 2) should be parallel with the record when the needle is in the playing position, in front of the magazine.

If the record reverse assembly is parallel with a 12" record as above, it should come around and fall against the reverse guide pin tubing (42) (Fig. 2), if the eccentric cam (77) (Fig. 4) is properly adjusted. This cam may be adjusted by lowering the screw through the cam and setting it so that the record reverse assembly returns to the reverse guide pin tubing. Care should be taken when making this adjustment so that the cam pin (part of Fig. 9) 1 should not hold the reverse guide away from the pin tubing. The cam should be turned so that the reverse guide assembly just touches the pin tubing; if the cam is turned too far it will allow the reverse guide pin tubing to clear the pin tubing, but in the playing position the assembly will not be able to assume a position parallel with a 12" record.

12. REVERSE ASSEMBLY LINE ROD

Loosen locknut "H" (Fig. 6), while the record changer is in the reverse position, that is, when the reverse assembly (41) (Fig. 2) is in front of the magazine. Remove the screw (70) (Fig. 2) and pull the lock rod (11) (Fig. 2). With the lock rod in the reverse position, the tone arm is cramped just barely touching, but not binding, against the front side of the rod (4) (Fig. 2). After this adjustment has been made, lock the lock in the position with the lock nut "H", Fig. 6.

13. TO ADJUST REVERSE CAM ARM AND ROLLER ASSEMBLY (57) (Fig. 3).

See Section 7 under Instructions For Replacing a Reverse Cam.

14. LATERAL LOCATION OF THE MAIN CAM SHAFT

Both end bearings of the main cam shaft are movable, and are used to locate the cam shaft in its proper lateral position, as well as in its proper vertical position. The cam shaft is located laterally so that the ball in the end of the tone arm at rest (47) (Fig. 3) is on the axis of the center of the tone arm lift cam (86) (Fig. 5). ▲ Should be at "M" in Fig. 5.

15. TO ADJUST THE CLUTCH THROWOUT LEVER AND CAM.

The clutch throwout lever is shown as No. 232 in Fig. 2 and 3. It is used to prevent the clutch from engaging with the record. To adjust the lever, remove the clutch cover (1) (Fig. 2) in a sliding motion after the record has been stopped in the playing position. The clutch throwout lever should just clear the point of the turntable throwout cam (93) (Fig. 5) with the clutch disengaged. Unless clearance between the turntable throwout clan and the clutch throwout lever is good, the record changer will not drop the record. Too much clearance is allowed the turntable throwout cam will not disengage the clutch and the record changer will continue to change records without playing them.

16. TO ADJUST THE PICKUP ELEVATION

When the tone arm sways in response to the record, the pickup arm lever hook (23) (Fig. 1) comes to rest against the pick up arm lever hook (23) (Fig. 1) when the tone arm is past the top of the record. If lower in the record, the lever hook passes beyond the stop on the guide pin tubing (42) (Fig. 2) and the eccentric cam (77) (Fig. 4) is properly adjusted. This cam may be adjusted by lowering the screw through the cam and setting it so that the record reverse assembly returns to the reverse guide pin tubing. Care should be taken when making this adjustment so that the cam pin (part of Fig. 9) 1 should not hold the reverse guide away from the pin tubing. The cam should be turned so that the reverse guide assembly just touches the pin tubing; if the cam is turned too far it will allow the reverse guide pin tubing to clear the pin tubing, but in the playing position the assembly will not be able to assume a position parallel with a 12" record.

17. PICKUP FEED IN ADJUSTMENT

The collar of the pickup arm swing lever and collar assembly (84) (Fig. 1) should ride on the leaf spring of the friction cam (96) (Fig. 3) until the pickup arm lever hook (23) (Fig. 1) has engaged the stop lever (16) (Fig. 1). Insert the collar of the friction cam into the hole after the ball at the end of the pickup arm lift cam (87) (Fig. 4) with the flat side of the collar facing (Fig. 6). This friction should be maintained until the needle has touched the record, otherwise the lever arm may move away from the stop lever and the needle would be raised. The link should be maintained (Fig. 6) in the reverse segment (61) (Fig. 4) and lengthen or shorten the link by the link threaded through the reverse arm (42) (Fig. 2). With the link in a position clear of friction cam (96) (Fig. 3) for the reverse assembly. The reverse assembly is rotated forward, in the direction of rotation of the main cam shaft, to maintain the friction a time longer and backward to maintain it for a shorter time.

18. TO ADJUST THE REVERSE CAM SHAFT LEVER (165) (Fig. 3).

This lever is moved by the record control shaft (166) (Fig. 3) and is held in position by an Allen set screw. It should be positioned so that the record reverse cam (85) (Fig. 3) is firmly engaged with its pin (74) (Fig. 4) in the "Both Side" position. In the "One Side" and "Reverse" positions it should have good clearance with the pin. If any adjustment of this lever is made be sure to check the setting of the Reverse Cam Arm and Roller Assembly (173) (Fig. 4) as instructed in Section 7 of the instructions on replacing a reverse cam.

19. TO ADJUST THE SOLENOID MOTOR DRIVE LEVER (108) (Fig. 6).

After the switch cover has been removed the switch is exposed. The upper switch points should make good contact. The lower switch points are located on the solenoid drive cam. In this position the clearance between the bottom points should be approximately 2.5 mm. While the clutch moves from the disengaged to the engaged position the upper switch points should remain closed until the lower set of points are closed. When the clutch is fully engaged the lower switch points should make good contact. It is possible that the upper and lower switch points may be "noted." If this should occur, with the clutch engaged and disengaged, the switch lever should be adjusted so that the solenoid drive cam is engaged at the time the switch is closed in position in the reverse arm.

20. CLUTCH CLEARANCE

The clearance between the drives (70) (Fig. 4) and driving (99) (Fig. 2) numbers of the clutch should be approximately 0.200" (Two thousandths), and is adjusted by loosening screw "N" Fig. 7 to a sliding tension and adjusting the clutch knob (213) (Fig. 7) and the solenoid clutch lever and pin assembly to obtain the proper clearance is obtained. After adjustment is made secure the lock nut "N". Fig. 6.

21. TO ADJUST SOLENOID WEDGE SPRING

This phosphenic bronze spring is located on the one side of the slide lever used to insert the solenoid drive cam. It is used to prevent clutch chatter or bounce when the clutch engages. The upper adjustment is to bend the spring in a snug fit with a low screw driver so as to increase or decrease its pressure on the solenoid to clutch lever (118) (Fig. 7).

22. TO ADJUST THE RECORD REPEAT LOCK LEVER (115) (Fig. 8).

The purpose of this lever is to prevent accidental shifting of the Selector Arm while the instrument is not in the playing position. The record repeat lever is on the side of the Solenoid to Clutch Lever (118) (Fig. 7) away from the main cam. In "One Side" and "Both Sides" positions it is on the reverse cam to clutch lever. With the tone arm in the playing position (Main Column Disengaged) this lock lever should clear the solenoid to clutch lever by approximately 2.5 mm when moved under it.

23. TO ADJUST THE REVERSE CAM LOCK LEVER (115) (Fig. 8).

This lever should be on the main cam side of the solenoid to clutch lever (118) (Fig. 7). In the "One Side" and "Reverse" positions it should be clear to the solenoid to clutch lever by approximately 1.5 mm moving under it.

24. TO ADJUST RECORD REPEAT OUTPUT LEVER (119) (Fig. 7).

No adjustment at this part is necessary.
when replacing this bushing so as not to tighten the bolt enough to crush the bushing: a snug fit only is required.

4. Remove lower half of bearing and Duracon bushing from the main shaft and work the cam shaft out of the record changer. The same precaution against crushing this bushing should be taken with this one as is with the one in the preceding section.

5. Taper pin from gear and loosen set screw in the collar, both shown as 41 in Fig. 4, of the reverse cam shaft assembly, as well as the pin (74) (Fig. 5) over which the rev. cam shaft occurs in the reversing position. After removing the collar and sliding the gear to one side, fill all holes from the edge of the holes in the reverse cam shaft. Slide the thrust through its Duracon bushing toward the rear of the instrument for enough to allow the removal and replacement of the reverse cam shaft (65) (Fig. 3).

6. Reverse the cam shaft assembly, making certain that the taper pin holes in the shafts and gears are correctly aligned to permit the taper pins being properly inserted. The set screw in the collar at the end of the shaft should be properly tightened.

7. Remove the reverse cam shaft and roller assembly (57) (Fig. 4) and make sure that the roller pin and are not bent, if either of these items are found bent we suggest that you replace the reverse arm and roller assembly.

8. In assembling the reverse cam shaft and roller assembly (57) (Fig. 4) the correct position for alignment with the reverse cam shaft, the new roller is about 45" inside the edge of the reverse cam shaft, when the cam is in the reversing position.

9. Remove the taper pin from gear (91) (Fig. 3) on the main shaft, which drives the gear on the reverse cam shaft assembly (61) (Fig. 3) and work the main shaft to the record changer chassis, pushing the upper gear, from which the pin was removed, to one side so that it will not scrub with its driven gear.

10. Loosen the main shaft so that the lower end of the pick-up travel is in the center of the pick-up travel lift cam, as shown at "M" in Fig. 3. With the main shaft in this position, the main shaft drives the reverse cam shaft assembly (61) (Fig. 3) from there is no end play in the main cam shaft assembly.

11. Rotate the main shaft to the playing position so that the pick-up arm is lowered over the turntable.

12. Set the reverse cam shaft in its lower position, with the center of the roller pin on the reverse shaft in the correct position for assembly. The roller pin should line up with the front gear and the assembly should be properly fitted. The bushing is in the rear of the reverse cam shaft is meshed with the driving pin.

13. Loosen the reverse cam shaft (91) (Fig. 3) with the reverse cam assembly driven gear so that the identifying punch marks correspond to the original position. The reverse cam should be inserted next. When the assembly has been properly made there should be approximately 90° clearance between the roller or the reverse cam arm and the reverse arm. See "F" (Fig. 5).

14. Throw the control lever to the "One Side" position and then reverse the arm with the fingers until it is in the reversing position. Again throw the control lever to the "Both Sides" position and there should be approximately 45° clearance between the cam arm and the roller. See "G" (Fig. 5). A 90° clearance is not approximately 45° for both positions of the cam arm indicates either the gears are not properly meshed or the reverse segment lift rod may be bent. A careful check of the latter while the main shaft is out will solve these trouble later.

29. INSTRUCTIONS FOR REMOVING THE AUTOMATIC MECHANISM FROM THE CABINET.

In some cases, any repairs and adjustments on this mechanism can be made with the mechanism in the cabinet. If it is necessary to remove the mechanism for any reason, it is recommended that the following procedure be observed, and that no part is taken part in the removal. Make sure that the following steps are carried out in the order given:

1. There is a great possibility, when changing the chassis from the cabinet, to mar or scratch the cabinet. If you will place a piece of cardboard around the record changer, the record changer will be protected against marring the finish. A rubber roller should be used on the record changer, the same size as the one in the cabinet makes an excellent pad. But this pad can be made from a piece of cardboard.

2. Remove the bushes of the rear record changer, and replace them with pieces of cardboard.

3. Move the record changer, along with the record changer, until it is close to the cabinet. Then remove the main shaft drive belt and remove the belt and drive belt from the belt drive mechanism.

4. Remove the two bolts removed in (4) (6) (7) and (10) above.

5. Replace the pickup arm assembly. Locate the main shaft so that the lower end of the pickup arm lift arm travels in the center of the pickup armlift arm, as shown at "M" in Fig. 4. With the main shaft in this position, adjust the main shaft Duracon bushings so that there is no end play in the main cam shaft assembly.

6. Replace the two drive belts removed in (4) (6) (7) and (10) above.

Procedure

1. Alignment

Cathode-Ray Alignment is the preferable method.

Calibration Scale on Indicative Drive-Cord Cross Table. The tuning dial is fastened in the cabinet and cannot be used for reference during alignment, therefore a calibration scale is attached to the indication drive cord which is mounted on the shaft of the gang tuner. The setting of the gang tuner is read on this scale. The correct setting of the gun in degrees, for each alignment, is shown on the scale table.

As the first step in alignment, check the position of the drive cord. The "0" mark on the drive cord must be horizontal, and a line drawn through the 0° and 180° marks on the scale should be parallel with the top of the cam when the plates are fully opened. The drive cord is held to the shaft by means of two setscrews, which must be tightened securely when the drum is in the correct position. To determine the corresponding frequency for any setting of the calibration scales, refer to the accompanying drawing which shows the setting with a 150° calibration scale drawn on the side.

Provisions for Calibration Scale.—Improve a pointer for the calibration scale by fastening a piece of card stock to the back of the drive cord so that it is pointed to the correct position on the calibration scale when the plates are fully opened.

Semi-Field Alignment. The semi-field method of aligning or checking the spread-band range is on actual reception of short-wave stations known frequency, by adjusting the magnet-crestored coil for each band so that the stations come in at the correct points on the scale.

In exceptional cases, when the set is being serviced in a location where the semi-field method of checking the pick-up and the alignment of the short-wave stations, a test oscillator may be used for alignment, but an extremely high degree of accuracy is required in the frequency settings of the test oscillator, as a slight deviation from the frequency will result in a large deviation of the spread-band.

The frequency settings of the transmitters must always be adjusted by one of the following methods.

1. Determine the exact settings of the test oscillator (for each of the frequency ranges) by using the frequency counter. Adjust the receiver and test oscillator to the same frequency and the receiver to the same sensitivity as the oscilloscope. Set the oscilloscope to the correct mode and adjust the receiver to the correct frequency. Adjust the receiver and test oscillator to the same frequency and the receiver to the correct sensitivity. Adjust the receiver and test oscillator to the correct mode and adjust the receiver to the correct frequency.

2. Adjust the position of the record tray is as described under "TO LOCATE AND ADJUST THE RECORD TRAY," by adjusting screw 15 (Fig. 1). This should be done with the drive shaft disengaged with the fingers and work the mechanism through a cycle to see that it is working correctly.

3. Adjust the position of the record tray is as described under "TO LOCATE AND ADJUST THE RECORD TRAY," by adjusting screw 15 (Fig. 1). This should be done with the drive shaft disengaged with the fingers and work the mechanism through a cycle to see that it is working correctly.

4. Remove the lower half of bearing and Duracon bushing from the main shaft and work the cam shaft out of the record changer. The same precaution against crushing the bushing should be taken as stated in the preceding section.

13. From the rear of the cabinet, lift the mechanism straight up, and carry it straight back until the rear bearing bracket of the main shaft has cleared the "sail," then move the mechanism 90° to the left so that the reverse cam shaft is meshed with the reverse cam arm and the reverse gear. See "G" (Fig. 5). A 90° clearance is not approximately 45° for both positions of the cam arm indicates either the gears are not properly meshed or the reverse segment lift rod may be bent. A careful check of the latter while the main shaft is out will solve these trouble later.

29. INSTRUCTIONS FOR REMOVING THE AUTOMATIC MECHANISM FROM THE CABINET.

In some cases, any repairs and adjustments on this mechanism can be made with the mechanism in the cabinet. If
**MODEL 2Q8**

Ch. RC-551

RCA MFG. CO., INC.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Turn sensitivity control clockwise for maximum selectivity.</td>
</tr>
<tr>
<td>2</td>
<td>Tune radio for desired station.</td>
</tr>
</tbody>
</table>

**NOTE:**
- Core of L3 should be approximately 6" before adjusting C11 and C12.
- Use minimum capacity of 12.5 for low test range.
- Use maximum capacity of 12.5 for low test range.

**Diagram:**

![Diagram of the radio circuit with various components and values labeled.](image-url)

**Table:**

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>Component Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>C1: 0.047 μF, C2: 0.047 μF</td>
</tr>
<tr>
<td>1800</td>
<td>C1: 0.047 μF, C2: 0.047 μF</td>
</tr>
<tr>
<td>2700</td>
<td>C1: 0.047 μF, C2: 0.047 μF</td>
</tr>
</tbody>
</table>

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**Public Address**

External systems may be connected to the terminal board located at the rear of the cabinet under the Phonograph control. The total impedance of all speakers connected to the instrument in parallel or series should be approximately 500 ohms.

Speakers recommended for use with this instrument are RCA MI-6474A, MI-648B or MI-6513 Speakers. The MI-6474A, MI-648B Speakers are rated about 100 watts. The MI-6513 Speaker is rated about 15 ohms. Speakers for handling low power in small rooms. For larger rooms and larger installations consult your local RCA Commercial Sound Distributor.

For outdoor, high volume applications the RCA MI-6560 (30 watts), MI-6571 (60 watts), or MI-6584 (50 watt compact speaker) Speakers are recommended. At all times, use speakers of 15 ohm impedance, a matching transformer will be needed to match the 75 ohm output of the instrument.

The following tables show the impedances of the speakers listed above.

**AVAILABLE IMPEDANCES**

<table>
<thead>
<tr>
<th>MI-5155 Coupling Transformer</th>
<th>(Used in MI-6231 Permanent-Magnet Speaker)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voice coil impedance</strong></td>
<td>6 ohms</td>
</tr>
<tr>
<td><strong>Blue to green-wire tracer</strong></td>
<td>2 ohms</td>
</tr>
<tr>
<td><strong>Yellow to green-wire tracer</strong></td>
<td>5 ohms</td>
</tr>
<tr>
<td><strong>Red to yellow</strong></td>
<td>15 ohms</td>
</tr>
<tr>
<td><strong>Black to green-wire tracer</strong></td>
<td>36 ohms</td>
</tr>
<tr>
<td><strong>Red to black</strong></td>
<td>55 ohms</td>
</tr>
<tr>
<td><strong>Red to black</strong></td>
<td>125 ohms</td>
</tr>
<tr>
<td><strong>Red to yellow</strong></td>
<td>141 ohms</td>
</tr>
<tr>
<td><strong>Red to green-wire tracer</strong></td>
<td>418 ohms</td>
</tr>
<tr>
<td><strong>Red to blue</strong></td>
<td>125 ohms</td>
</tr>
</tbody>
</table>

**Notes:** As shipped from factory, MI-6513 Speakers have red and blue leads connected to terminal box.

**AVAILABLE IMPEDANCES**

<table>
<thead>
<tr>
<th>RCA-MI-6474A or MI-648B Permanent-Magnet Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voice coil impedance</strong></td>
</tr>
<tr>
<td><strong>Red to red</strong></td>
</tr>
<tr>
<td><strong>Black to red</strong></td>
</tr>
<tr>
<td><strong>Red to black</strong></td>
</tr>
<tr>
<td><strong>Blue to black</strong></td>
</tr>
<tr>
<td><strong>Red to blue</strong></td>
</tr>
</tbody>
</table>

**Example:** To connect 2 MI-6331 Speakers to the instrument, connect the 2 of the speakers for 341 ohm impedance (shown in the table above), and then connect the speakers in series.

To match 3 MI-6331 Speakers, connect each speaker for 125 ohms, connect the 3 speakers in series. To match 2 MI-6447A or MI-648B Speakers choose the 225 ohm impedance and connect the speakers in parallel.

**LOCATING LOUDSPEAKERS**

When installing loudspeakers, either temporarily or permanently, the installation will be simplified if one considers the loudspeaker to be similar to a watch light. The sound waves from the loudspeaker are distributed in much the same manner as light from a watch light. The different amount of the sound waves, either direct from the loudspeaker or reflected from the surface, reach the microphone in the same way. This is technically known as acoustic feedback, because the sound waves from the loudspeakers are picked up by the microphone and fed back into the amplifier, where it is amplified further and is fed into the loudspeaker. The loudspeaker systems are connected to the output terminals of the instrument, the speaker cabinet or the transformer, according to the amount of sound waves that reach the loudspeaker.

**Magnetic Pickup**

The magnetic pickup is used in an improved design. The magnetic horn is solidly welded to the pole piece and is resilient. Within the horn is a spring which causes the pole pieces to move in a circular path. When the horn is moved to the pole pieces, a magnetic field is created which induces a current in the pickup coil. This current is then converted into an electrical signal and transmitted to the instrument. The pickup can be used in any of the positions shown, to provide the best signal-to-noise ratio for the application.

**Automatic Phonograph Service**

The magnetic pickup is used in a new design which makes for better signal-to-noise ratio and increases the sensitivity of the system. The horn is solidly welded to the pole piece and is resilient. Within the horn is a spring which causes the pole pieces to move in a circular path. When the horn is moved to the pole pieces, a magnetic field is created which induces a current in the pickup coil. This current is then converted into an electrical signal and transmitted to the instrument. The pickup can be used in any of the positions shown, to provide the best signal-to-noise ratio for the application.

**RECORD SIZE LIMIT**

The record changer will play any 10" or 11" record of standard size. The minimum size for 12" records is 131/2". The minimum size for 10" records is 91/4". Records smaller than these limits are apt to miss centering over the turntable spindle and in most cases are broken.

**DAMPING BLOCK**

The damping block is a small block of rubber which is attached to the front and rear of the armature to absorb the energy of the armature. This damping block must be held firmly in place. A rubber block that is not held firmly will cause the armature to vibrate and produce a poor signal. The damping block must be held firmly in place to prevent the armature from vibrating.

**LUBRICATION**

Due to the precision design and precision workmanship, this record changer requires a minimal amount of oiling. About once each year, a light coat of oil will prevent premature wear and keep the mechanism in good condition.

**NEVER OIL THE "DUMP" BUSHINGS**

Neat oil should never be used on the dishing clutches, reverse arm and shafts and all mechanical parts. Oil should not be used on the dishing clutches, reverse arm and shafts and all mechanical parts. Oil should not be used on the dishing clutches, reverse arm and shafts and all mechanical parts.
Recording and Playback Notes

**IMPORTANT**

The groove width should almost equal, but not exceed, the distance between grooves. A magnifying glass is helpful in examining the grooves. If the grooves are too shallow, the phonograph needle will slide over them on playback. If the grooves are cut too deep, rumble will be excessive.

After examining the cuttings and the groove width, adjust the cutting pressure as required by means of the adjustment screw on top of the cutter bracket. Turn this clockwise to increase pressure and increase depth of groove. Turn counterclockwise to decrease pressure and decrease depth of groove.

Check the new adjustment by running more blank grooves.

Check the cuttings and groove width each time a new stylus is inserted, and whenever a different type of recording disc is used. Due to variations in material composition and hardness among different types of discs, the same cutting-pressure adjustment will not give an equal depth of cut on all types. Thus, it may be necessary to change the adjustment previously set for one type of disc, when recording on a different type.

Excessive cutting pressure will cause rumble. The width of the groove should almost equal, but not exceed, the distance between grooves.

Check the groove width each time a new stylus is used, and each time a new disc is used.

When recording, use the maximum bass response, by turning the bass control to the maximum clockwise position.

On playback, use the least bass response, by turning the bass control to the maximum counterclockwise position.

Be certain that the motorboard and mechanism is "Boating" free from the cabinet.

**CUTTER ADJUSTMENT**

To adjust the stylus pressure for the correct depth and width of cut, the best procedure is to cut some "blank" grooves in a recording disc of the type that will be used. The stylus pressure can be regulated, by means of the adjustment screw on top of the cutter bracket, to produce the correct thickness of the hair-like cuttings. The cuttings should collect toward the center of the recording disc. If they collect toward the outside the stylus is not correctly inserted, and must be adjusted by removal and re-insertion. If the threads continue to collect toward the outside, use a new stylus.

The cuttings should be even, thin, hair-like threads about three-thousandths of an inch across or approximately the diameter of a human hair.

**Cutter Head Drive**—The cutting head drive screw should be removed to prevent damage to the cone point bearing located at end away from driving gear and adjust this bearing until end play is eliminated (being careful not to cause binding), then tighten jam head screw.

**Cutter Head Mounting**—Two cone pointed set screws support the cutter head and its mounting bracket. These should be adjusted to prevent end play but to permit free movement of the cutter head up and down.

**Record Threads**—Keep the drive gears and lead screw free from record threads.

**Equalizing Groove Width**—In order to keep the groove width cut at the inside and outside of record equal, it may be necessary to adjust the spindle bearing into which the swivel spindle of the recording arm is placed, and which is located at the right hand center of the phono board. To adjust this bearing loosen the set screw in the base and move bearing up or down as required. If the grooves are at the edge of record are shallower than those at center of record, lower the bearing. If grooves at edge of record are deeper than those at center of record, raise the bearing.

**Lubrication**—Keep the drive gears, lead screw, and other bearing surfaces well lubricated with Vaseline or Petroleum Jelly.

**"Automatic" Cut-Off Switch Under Recorder Arm**—When the Recorder Arm is swung in position over a record to make a recording, the weight of the arm is brought down on a switch mounted under the recorder arm swivel bearing, opening the switch and making the Automatic Phonograph Inoperative.

This switch should be adjusted so that when the Recording Arm is on its rest, the switch is closed; i.e. the switch plunger is all the way up; and there should be about 1/16-inch clearance between the top of switch, and the swivel shaft. When the Recording Arm is in the recording position, the switch is open; i.e. the switch plunger is pushed down.

**Cutter Head**—

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QU5
Radio Break-Through on Phono:
In localities where a strong local broadcast signal is present, it can sometimes be heard very faintly on Model QU5 when the receiver is tuned to the signal and the radio-phono switch is turned to the phone position. This condition can be eliminated by removing one bus wire connection and changing the yellow lead on the radio-phono switch as shown in accompanying illustration.

VV2-35, VV2-55
Incorrectly Cut Winding Gear:
There is a possibility that several incorrectly cut gears (No. 10203) have reached the field. The gear teeth form a left-hand spiral when viewed from either side, whereas the correct cut is a right-hand spiral.

7QB
Transformer Polarity:
On some production receivers, the leads from the primary winding of the output transformer are color-coded in a manner reverse to that shown in the Service Notes wiring diagram. That is, the red lead and the black-with-red tracer lead are interchanged.

BP-10
Replacing Lid or Front Panel:
When the molded lid (which contains the loop antenna), or the chrome front panel requires replacement, it is not necessary to replace the complete assembly of lid and front panel, as either one may be replaced separately in a few minutes by taking out the hinge pins as described below.

The following parts are available for this purpose:

RCA Stock No. 37856 Lid and antenna (type without lid support)
37860 Chrome front panel (type without lid support)
37853 Lid and antenna (type with lid support)
37844 Front chrome panel (type with lid support)
37857 Two hinge pins and two hinge springs for BP-10

The following parts are discontinued:

RCA Stock No. 36510 Antenna loop and cover (discontinued)
36511 Lid and chrome panel (discontinued)

Installation Instructions:
First remove the three self-tapping screws that hold the chassis in the center case, and remove the case. Unscrew the leads from the loop lugs.
(a) With lid closed, out hinge pins at point with sharp cutters.
(b) Start removal of pin sections as shown, using long-nose pliers.
(c) Grasp end of pin section with long-nose pliers and pull out of hinge.
(d) Install new lid, or new front panel, using the replacement hinge pins and springs that are provided with replacement lids and panels. Arrange springs as shown. Apply a small amount of "Thermoplastic Cement" (G.E. ZV 5057) near outer end of each pin to insure tight and permanent fit.

Loose Control Knobs:
If for any reason the volume or control knob on Model BP-10 should become loose on its shaft, it may be rigidly mounted in the following manner:
(a) Remove the loose control knob from its shaft and scrape off the old cement from both shaft and control knob.
(b) Apply a generous even coating of a good cement to the shaft region which is to engage the knob. G.E. Thermoplastic cement, ZV-5057, is excellent for this purpose; it is a green fluid, easily thinned with acetone if necessary.
(c) Allow the cement on the shaft to air-dry, approximately 30 minutes.
(d) Apply a small amount of heat to the shaft, sufficient to soften the cement.
(e) Mount knob on shaft while cement is still soft, and allow a few minutes for drying.

RCA PAGE 12-83

CHANGES

NOTES & DATA

"RC" Filter Inserted in Audio Plate Circuit of Model 15BP to Reduce Hum

In the battery layout diagram at the top left page of the BP-10 Service Note (1946, No. 24), the I-8, v. "A" battery is shown in this position. The actual polarity is reverse to that shown, minus being at the top, and plus at the bottom.

10X
Hum:
Keep heater lead wiring away from audio input circuit.

14BT, 14BT-2, 14BK
Distortion and Loss of Sensitivity:
Some cases of loss of sensitivity, and distortion have been associated with frequency drift. In such an event, correction may be made by:
(a) Connecting a 1 mv. condenser (RCA Stock No. 36914) from the high side of the oscillator section, at the gang condenser, to ground.
(b) Realigning the 1st detector and oscillator tuned circuits.
(c) Realigning the I.F. circuits if necessary.

15BP
Fidelity Change:
Should anticipation of the higher audio frequency resolution be desired, capacitor C-15, connected across the 1st A.F. output, may be increased from 390 mfd. to 100 mfd. Some production instruments have this change already applied; therefore, circuit diagrams should be revised accordingly.

Hum:
Occasional cases of hum on Model 15BP instruments may often be reduced by application of the following:
(a) Shield the IHS GT 2nd det. A.F. tube by means of a tube shield securely grounded.
(b) Insert a filter network in the 1st audio plate circuit as shown in the accompanying diagram.

Dial Cord Slippage:
To remedy dial cord slippage, on Model 15BP add an extra turn of cord around the drive shaft, without lengthening the cord, thus securing better grip and increased spring tension.

15BP-7, RC-527C
Service Data:
Model 15BP-7 chassis is similar to the Model 15BP (1946), Page 12-83
Model 15BP-7 has the late-type power switch circuit.
Replacement parts for the 15BP-7 are the same as in the 15BP Set, except for the following:

Unit List

<table>
<thead>
<tr>
<th>Description</th>
<th>Stock No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dial—Dial scale (15BP-7)</td>
<td>36612</td>
</tr>
<tr>
<td>Indicator—Power switch indicator plate (Power Line—Off—Battery)</td>
<td>36642</td>
</tr>
<tr>
<td>Resistor—1 watt (Flexible)</td>
<td>36598</td>
</tr>
<tr>
<td>Resistor—Resistance power cord, 545 ohms.</td>
<td>36584</td>
</tr>
<tr>
<td>Switch—Power switch</td>
<td>36585</td>
</tr>
</tbody>
</table>

SPEAKER ASSEMBLIES

<table>
<thead>
<tr>
<th>Description</th>
<th>Stock No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cap—Dust cap</td>
<td>36307</td>
</tr>
<tr>
<td>Cone—Cone complete with voice coil</td>
<td>36309</td>
</tr>
<tr>
<td>Transformer—Output transformer</td>
<td>36400</td>
</tr>
</tbody>
</table>

MISCELLANEOUS ASSEMBLIES

<table>
<thead>
<tr>
<th>Description</th>
<th>Stock No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal—Dial scale crystal less dial</td>
<td>36612</td>
</tr>
<tr>
<td>Decal—Trade-mark</td>
<td>36339</td>
</tr>
<tr>
<td>Fastener—Snap fastener for power cord door</td>
<td>36622</td>
</tr>
<tr>
<td>Handle—Carrying handle</td>
<td>36736</td>
</tr>
<tr>
<td>Knob—Control Knob</td>
<td>36123</td>
</tr>
<tr>
<td>Spacer—Rubber spacers for control shafts</td>
<td>36154</td>
</tr>
</tbody>
</table>

(Prices subject to change or withdrawal without notice.)

VA-15
Stock Number Correction:
In the Replacement Parts List for Model VA-15 (published on the back page of "Supplementary Information No. 37"), the lamp shade should be changed to read Stock No. 37887 instead of 36877.

16K, 16T2, 16T3, 16T4, 17K, 19K, V-205, V-405
Increasing Sensitivity:
These models have an enhanced R.F. stage which is resistance-coupled to the 1st-detector. The sensitivity may be increased by changing the R.F. plate load resistor to a higher value, between 6,000 and 10,000 ohms. This change is not recommended in metropolitan localities owing to possibility of cross-modulation.

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Models T64 and T68 is as follows:

Stock No. 35711 Knob—Tuning knob
35721 Knob—Fixed control knob
35740 Knob—Remote control knob
35705 Knob—Volume control knob

K-80

Hum Modulation and How:
Tendency of occasional recovering towards hum modulation and how may be alleviated by:
(a) Rubber-mounting the loudspeaker by means of rubber grummetts (Stock No. 35771);
(b) "Jiggling" the loudspeaker by tapping windings in six places (2 each side, 1 top, and 1 bottom), using cellulose tape.

RP-145, RP-152 RECORD CHANGER

Centering Motor:
Should centering of the rotor be necessary, it may be accomplished in the following steps:
(a) Remove the two long machine screws, and lift off plastic end cover.
(b) Loosen the two remaining screws suffi-
ciently to permit adjustment of stator laminations.
(c) Insert a 0.10-inch spacer between the rotor and each of the four stator field poles. Rotate rotor and field poles until centering is obtained from each pole, and accurately centered.
(d) Tighten screws and replace plastic cover.

RP-152 RECORD CHANGER

Stalling Going into Cycle:
The mechanism should be loaded with one record on the turntable. If stalling going into cycle takes place, it is probable due to insufficient tension in the main lever spring or booster spring (481). An improper weight washer should be inserted between the spring and its guide.

Stalling Coming Out of Cycle:
If the mechanism stalls just as it is coming out of cycle, that is, when the pickup is at its farthest distance laterally from the turntable, it is probable that there is too much tension in the booster spring. Any metal washers in the assembly should be removed.

CAUTION: The mechanism is designed to handle a total of 8-10-inch records or 7-12-inch records.

RP-153 RECORD CHANGER

Motor Duty:
Should it be necessary to rebuild or service any of these motors in the field by replacing end caps or using other washers and shafts, it must be noted that the rebuilt motors should be operated continuously for at least 48 hours before installation. The use of bronze bearings, diamond-hardened for accuracy, together with the burned steel shaft at the rotor provides a very close fit. As a result, the motor must be run in approximately 48 hours, after which the oil has had a chance to fairly cover all contact surfaces of shaft and bearings, and a very smooth operating low friction bearing results.

RCA 156 TUBE TESTER

12STG Date:
There has been some question as to the correct settings for testing TV tubes. On charts earlier than that included in the 156-D and E, the information is incorrect. Correct test data follows:

Tub. Fil. Class Type Test Setting 12STG 1.5 A 21 3, 6, 9
YHR-202, 207, 407

"Ramblings":
Any instrument with the sensitivity and tone response of these home recorders is capable of picking up the mechanical vibrations of the motor. However, due to many preconceptions incorporated in the design of these instruments, ramblings will not be recorded if the following precautions are observed:

LEVELING—When the instrument is perfectly level.
GREENS—Be certain that the motorboard and mechanism is "floating" free from the cabinet. All fixed mounting screws should be at approximately equal tension.

FOLLOWER ARM DAMPING WEIGHT:
—See that the lead weight is in place attached to the follower arm underneath the motorboard.
STYLUS—Make sure that the stylus has the tip inserted in the cutter head. Because both stylus and retaining screw are of hard steel there is a tendency to «booming» during cutting. Tightness should be checked before each cut.

INPUT LEVEL—Set for sufficient input level so that the "Magic Eye" has line close on modulation peaks.

TONE CONTROL SETTINGS—During recording, the power-bass control should be set for maximum low frequency to obtain full control of power switch. The treble tone control setting will not have any affect on recording noise, and can be set at the discretion of the recordist.

DEPTH OF CUT—During recording, the shavings should be directed towards the spindle and prevented from obstructing the cutting path. The thickness of these shavings should be about that of human hair, or approximately .008 inches. An additional check on depth of cut is to inspect the recording under a magnifying glass. The groove width should approach but not exceed the distance between grooves. Depth of cut may be varied by means of the cutting-pressure adjusting screw. All cutting arms must be attached to the cutter arm.

TURNABLE DRIVE—If rumble persists, inspect the idler wheel (between motor spindle and turntable) for possible grooves, set screw spots, and scraping against bottom of turntable.

RECORDING DISCS—Due to variations in material composition and idler wheel diameter among different types of discs, the same cutting-pressure adjustment will not give the same depth of cut on all types. Thus, it may be necessary to change the adjustment previously set for one type of disc, when recording on a different type.

Follower-Arm Weight:
Two other methods, besides the one shown in the Service Notes, have been in evidence. One is to add the lead weight to the follower arm. These are indicated in the following sketches. All three provide similar results, "C" being the method used in latest production.

Three Mounting Arrangements of Follower-Arm Weight on Home-Recording Models

The weight is packed separately for methods "A" and "B" and must be mounted as shown when the instrument is installed in the consumer's home. Also, the same method is used for "C" when the weight is not in place.

Pickup Arm Starting Spring:
The pickup arm starting spring in RP-155 mechanism in the home-recorder models is Stock No. 36071.

Motorboard Mounting Spring:
Change Stock No. 37440 to 37871 (4 required).

VHR-207, 407

12KT-GT Bumpouts
When shooting trouble or when testing Models VHR-207, and VHR 407 do not put any connecting wires short the microphono output with a screwdriver or any other tool as a test for plate voltage.
A ~ B short will burn out the filament of the 12KT-GT microphone pre-amplifier tube. Always test for ~ B voltage on the chassis with a voltmeter and not with a screwdriver.

V-300, V-301, V-302

Increasing Phono Gain:
The audio input on low cut records may be increased somewhat by effecting the following changes:
Change E13 from ~2,000 to 5,000 ohms.
Change E14 from ~1,000 to 2,000 ohms.
Change C40 from .01 to .005 mfd.
The above changes have been incorporated in 2nd production.

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CV-112 CONVERTER

A-C Power Unit for Q82:

The CV-112 is designed to convert Model Q82 from battery to a-c operation.

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>4886</td>
<td>Capacitor—55 mil—400 volts (C1)</td>
<td>.30</td>
<td></td>
</tr>
<tr>
<td>3087</td>
<td>Capacitor—Electrolytic, 2 sections 20 mil, 150 volts</td>
<td>1.35</td>
<td></td>
</tr>
<tr>
<td>36553</td>
<td>Capacitor—Electrolytic, 1,000 mil, 3 volts</td>
<td>1.40</td>
<td></td>
</tr>
<tr>
<td>36547</td>
<td>Coil—High voltage choke coil</td>
<td>1.75</td>
<td></td>
</tr>
<tr>
<td>36548</td>
<td>Coil—Low voltage choke coil—marked 1,984</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>36549</td>
<td>Coil—Low voltage choke coil—marked 1,985</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>36551</td>
<td>Rectifier—1.5 volt rectifier</td>
<td>1.40</td>
<td></td>
</tr>
<tr>
<td>36455</td>
<td>Socket—5-contact power output socket</td>
<td>.30</td>
<td></td>
</tr>
<tr>
<td>18008</td>
<td>Socket—Take socket</td>
<td>.20</td>
<td></td>
</tr>
<tr>
<td>36550</td>
<td>Switch—Power cord switch</td>
<td>.20</td>
<td></td>
</tr>
<tr>
<td>36491</td>
<td>Switch—Voltage change switch</td>
<td>.35</td>
<td></td>
</tr>
<tr>
<td>36546</td>
<td>Transformer—Power transformer—110-220 volt, 50-60 cycle</td>
<td>5.00</td>
<td></td>
</tr>
</tbody>
</table>

MODELS 162T, 163T, 167T

2nd Production (RC-509J, H, F):

Shift 2nd Production of these models. A "J" badge covers 540-1560 k.c. In 2nd Production, the range is extended to cover 540-1600 k.c.

Calibrated scales for use in alignment of the 2nd Production receivers are printed on this page.

Also in 2nd Production, the volume control is changed from 25 mwa to 2 mwa, and the circuit is revised to isolate the control from the d-c current as shown in the accompanying sketches. This isolation reduces the possibility of controls becoming "noisy." Changes should be made on 1st Production receivers when this trouble is encountered.

For replacement parts lists, refer to the Service Notes, except for the items which are used in 2nd Production:

MODELS 45X-11, 12, 13:

Service Data for these models is given on pages 225 and 234 of the 1969 Bound Volume. Two changes have been made in 2nd Production:

(a) C-13 is connected to the grid of the 12SLQ7 instead of to the arm of the volume control, to provide more effective I.F. filtering.

(b) Diode plate No. 1 is connected to chassis instead of to diode plate No. 1, to reduce residual hum.

VHR-207, VHR-407:

Changing 470 mfd. Capacitor C-35:

Some cases have been reported of breakdown of capacitor C-35 in the circuitry. A higher voltage rating capacitor is now available under the same Stock Number, 50438. The former type capacitor (black color) should be replaced with the new type (gray color) whenever these sets are serviced.

V-205, V-405, VHR-207, VHR-407:

Radio Break-Through on Phone:

Radio break through may occur in these models, due to capacity coupling between the L.F. 6SK7 plate lead and 6FL6 grid leads. When this condition exists, draw the 6FL6 grid leads down against the chassis well away from the 6SK7 L.F. plate lead.

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CHANGES

NOTES & DATA

RCA TONE GUARD

The RCA Tone Guard is an acousitc network around the opening of the phonograph compartment in some models. It acts as a low-pass filter to reduce passage of the high-frequency sound that is generated and radiated directly into the air by the vibrating parts of the pickup. A cross-section view of the Tone Guard and the equivalent electrical parts are shown below. The series elements of the filter are formed by the normal slit between cabinet and lid. The shunt elements are formed by slots in the wood strip. The filtering action is very effective, as indicated in curve "B" below.

Tone Guard and Equivalent Circuit

Curve "A"—Response Frequency Characteristic of Conventional Door and Cabinet (Taken as Unity)

Curve "B"—Response Frequency Characteristic of Tone Guard Relative to "A," Shoring Reduction of High-Frequency Noise

PrICES SUBJECT TO CHANGE WITHOUT NOTICE

MODEL 16T4 (2nd Prod., RC-509F)

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>37133</td>
<td>Coil—Push button oscillator coil for 540-1560 kc range (used in 1st and 2nd productions)</td>
<td>8.30</td>
<td></td>
</tr>
<tr>
<td>37955</td>
<td>Control—Tone control</td>
<td>1.10</td>
<td></td>
</tr>
<tr>
<td>36486</td>
<td>Control—Volume control and power switch</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>36883</td>
<td>Button—Push button, dark brown</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td>36300</td>
<td>Button—Push button, light brown</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td>37956</td>
<td>Dial—Glass disc scale</td>
<td>.90</td>
<td></td>
</tr>
<tr>
<td>36149</td>
<td>Marker—Push button markers</td>
<td>.25</td>
<td></td>
</tr>
</tbody>
</table>

MODEL 16T3 (2nd Prod., RC-509H)

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>37133</td>
<td>Coil—Push button oscillator coil for 540-1560 kc range (used in 2nd production)</td>
<td>3.90</td>
<td></td>
</tr>
<tr>
<td>36486</td>
<td>Control—Volume control and power switch</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>30651</td>
<td>Resistor—270,000 ohm, 1 watt</td>
<td>.20</td>
<td></td>
</tr>
<tr>
<td>37956</td>
<td>Switch—Dial switch</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>36883</td>
<td>Button—Push button, dark brown (16T3)</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td>36300</td>
<td>Button—Push button, light brown (16T3)</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td>37345</td>
<td>Dial—Glass disc scale for 16T3</td>
<td>1.10</td>
<td></td>
</tr>
<tr>
<td>36149</td>
<td>Marker—Push button markers (16T3)</td>
<td>.25</td>
<td></td>
</tr>
</tbody>
</table>

Volume Control Circuit in 2nd Production 16T2, 16T3.
RCA VICTROLA MECHANISM DATA

**CHANGES IN SERVICE NOTES PARTS LIST**

C-9 is built with C-10 (.005 mil) and the Stock Number on C-10 (.005 mil) is 37959.

15X, 16X1, 16X2: Change Stock Number of push-on transformer from 35669 to 37952.

16X1, 16X2: Change Stock Number of push-on transformer from 35669 to 37952.

Q33... Change No. 33 Spring to read "Drive-Cord Spring." Add No. 13086 Spring for Drive-Cord tension spring.

Add the following to 37921 Crystal—"Magic Eye" along with 37922 Indicator—Station selector.

37016 "Magic Eye" clip and thumb screw.

35438 Screw—Thumb screw for "Magic Eye" clip.

**REPLACEMENT STUDS**

**For Main Lever, Cam-and-Gear, or Trip Pawl:**

In automatic record changers of the R-139A, 140, 159, 159S, and similar types, loosening of the mounting studs on which the main lever, cam-and-gear, or trip pawl are pivoted may be caused by jamming of the main lever against the pawl pin at the end of the change cycle due to one or more of the following reasons:

(a) The long arm of the main lever slides over the thin pawl pin instead of rocking against it during half of cycle. Check for bent arm on main lever.

(b) After being cleared out of the way, the pawl pin becomes fatigued or vibrates (dancing near mechanism, etc.) Check the trip-pawl phosphor-bronze spring for sufficient "drag" or pressure against the pawl pin.

(c) The index lever is put in "REJECT" position while the mechanism is still in the change cycle. Caution customer against this.

Loose studs may be quickly and easily replaced by using special replacement studs that are fastened to the motorboard by means of a screw and washer. Three different studs are available:

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Main Lever replacement stud, with screw and washer...</th>
</tr>
</thead>
<tbody>
<tr>
<td>38233</td>
<td>Cam-and-Gear replacement stud with screw and washer...</td>
</tr>
<tr>
<td>38235</td>
<td>Trip Pawl replacement stud, with screw and washer...</td>
</tr>
</tbody>
</table>

VHR-202, 207, 407

50-Cycle Motor Parts:

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>37947</td>
<td>Bearing—Bottom bearing and bracket (50 cycle)...</td>
<td>$ 5.50</td>
</tr>
<tr>
<td>37965</td>
<td>Field—Motor field — 110...</td>
<td>7.75</td>
</tr>
<tr>
<td>37941</td>
<td>Motor—105-130 volts, 50-cycles...</td>
<td>14.00</td>
</tr>
<tr>
<td>37944</td>
<td>Pulley—Motor shaft pulley (50 cycle)...</td>
<td>3.85</td>
</tr>
<tr>
<td>37942</td>
<td>Rotor—Motor armature (50 cycle)...</td>
<td>25.00</td>
</tr>
</tbody>
</table>

Parts originally listed in R-1395 Service Notes (VHR-202, VHR-207, and VHR-407) are applicable to 110 volt, 50 cycle motors only, except Stock No. 37940 Ring, which is used on both 60 and 50 cycle motors.

V-301, V-302

**Mechanical Motor Noise:**

Mechanical motor noise due to armature end play sometimes develops with wear in the above instruments, which use type R-1395 record changers. This can be eliminated by using the armature thrust bearings. Care should be taken to avoid making them too tight which will cause binding.

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Alignment Procedure

Calibration Scale on Indicator-Drive-Coil Drum.—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment, therefore a calibration scale is attached to the rear of the indicator-drive-coil drum which is mounted on the front shaft of the gang condenser. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment table.

The first step in aligning is to check the position of the drum. The "O" mark on the dial must be vertical, and directly over the center of the gang-condenser drum when the plates are fully meshed. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

Pointers for Calibration Scale.—Improve a pointer for the calibration scale by fastening a piece of tape to the gang-condenser frame, and bend the wire so that it points to the "O" mark on the calibration scale when the plates are fully meshed.

Alignment Scale.—The most satisfactory method of aligning consists of adjusting the spread-band ranges on the receiver to the actual reception of short-wave stations of known frequency, by adjusting the magne-tite-core oscillator coil for each band so that these stations come in at the correct points on the dial.

1. Determine the exact dial settings of the test-oscillator (for frequencies at or close to the specified alignment frequencies) by zero-biasing the test-oscillator against short-wave stations of known frequency.

2. Use the harmonics of the standard-broadcast range of the test-oscillator, first checking the frequency settings of this range by means of a calibrated scale, which may be obtained from RCA or from a reliable source.

3. When a test oscillator is employed for spread-band alignment, the final check should be made on actual reception of short-wave stations of known frequency, and the magneto-ite-core oscillator coil for each band should be re-adjusted so that the stations come in at the correct points on the dial.

4. Check to determine that C15 has been adjusted to move the peak to approximately 14.29 mc where a weaker signal should be received.

NOTE: Oscillator tracks above signals on all bands.

Calibration Scale

Reduced reproduction of receiver dial and corresponding 0-180° calibration scales.

- The corresponding position of the dial indicator for any setting of the calibration scale can be determined by drawing a line from this point on the table's calibration scale to the point on the calibration scale corresponding to approximately 605 kc on an "A" band, etc. Read instructions under "Alignment Procedures.

- Frequency ranges:
  - Standard Broadcast ("A" Band) 5.95 to 7.95 mc (95-175 kHz)
  - Medium Wave ("B" Band) 1.0 to 7.2 mc (100-72 kHz)
  - 10 Meter Spread Band... 31.0 to 32.6 mc (310-326 kHz)
  - 15 Meter Spread Band... 49.0 to 51.0 mc (490-510 kHz)
  - 19-TS Meter Spread Band... 101.4 to 111.0 mc (1014-1110 kHz)
  - Interspersed Frequency... 5.5 to 30.0 mc (5.5 to 30.0 kHz)
  - Pilot Lamps... 30 and 50 cycles

- Power supply ratings:
  - 105-125 volts, 50-60 cycles...
  - 110-120 volts, 50-60 cycles...
  - 100-130, 140-160, 200-230, 50-60 cycles...

- Power output:
  - Undistorted... 3 watts
  - Maximum... 3.5 watts

- Loudspeaker Type... 8-inch dynamic V.C. impedance... 2 watts at 400 ohms
  Indentification Number... RL-65K5

Precalibrator Lead-Dress:
- Dress leads from antenna and R.F. gang sections away from all metal including chassis shield plate.
- Spaghetti covered lead in the antenna section should be at least 1/4 inch away from gang.
- Black and brown twisted filament leads between 6SA7 and 6SK7-RF must run along front side of the shield plate.
- Dress toothpick capacitors and switch leads away from edge on to shield plates.
- Clout twist ground lead around 3-TF transformer diode lead and dress close to chassis.
- Dress volume control arm and capacitor close to front apron and away from output tubes by-pass capacitors.
- 6SK7 10 megohm grid resistor should have a lead length on the grid side.
- Dress capacitor high side of volume control toward base end as far as possible from a-c switch.
- Leads to converter socket should not impede flexible mounting.
- Converter control grid clear of any other leads, especially filament leads which must be at least 1/4 inch away from the grid link lead must have body as close to grid as possible.
- Dress oscillator grid and control grid capacitors apart.
- Dress oscillator coupling condenser away from c.d.
- 16AD7 plate to cathode capacitor must be flat against chassis.
- Dress all filament and R.F. leads close to chassis.

Oscillation:
- Audio oscillation may be encountered if the receiver is switched to the photograph position and the pickup is not plugged into the jack provided in the rear chassis apron.
The phonograph motor has its bearing filled with oil and sealed at the factory and hence should not require lubrication in the field. However, the two rubber-tired idler pulleys should have their bearings lubricated occasionally with S.A.E. 10 oil. Care should be taken not to get any oil, grease, or other foreign matter on the rubber tires. These tires and the motor spindle should be cleaned occasionally with quick drying naphtha.

The turntable spindle bearing should also be lubricated occasionally with S.A.E. 10 oil.

Motor Detail

Precautionary Lead Dress—
1. All leads between antenna coils and switch must be as short as possible and kept away from oscillator coil, leads, and switches.
2. All oscillator coil leads must be kept apart from each other and other leads and against chassis.
3. Blue plate lead of 2nd I.F. should be dressed under other leads and against chassis.

Calibration Scale on Indicator-Drive Cord Drum.—The turning dial is fastened in the cabinet and cannot be used for reference during alignment; the calibration scale is attached to the indicator-drive cord drum which is mounted on the shaft of the gang condenser. The setting of the gang condenser is read on the dial scale, which is taken from degrees in the correct setting of the gang in degrees, for each alignment frequency, is given in the alignment table.

As the first step in r-f alignment, check the position of the drum. The “100°” mark on the drum scale must be vertical, and directly over the center of the gang-condenser shaft when the plates are fully meshed. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

To determine the corresponding frequency for any setting of the calibration scale, refer to the accompanying drawing, which shows the dial with 0-100° calibration scales drawn at top and bottom.

Indicator for Calibration Scale.—Improve a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bend the wire so that it points to the “100°” mark on the calibration scale when the plates are fully meshed.

Dial-Indicator Adjustment.—After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the 540° mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

Alignment.—The most satisfactory method of aligning or checking the frequency ranges is on actual reception of short-wave stations of known frequency. By adjusting the magnetic-core oscillator coil for each band so that these stations come in at the correct points on the dial.

Motor Switch.—The motor switch is automatic for both starting and stopping, and will turn the motor on or off without setting the pickup from the pickup rest toward the turntable. The switch should be adjusted so that it will snap into the “off” position when the pickup needle is 1/2 inch from the center line of the spindle shaft. The motor may be shut off at any time by placing the pickup on the pickup rest.

Compliments of www.nucow.com

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Antennas are very important and should be given considerable attention when they are intended for use at the ultrahigh frequencies. Single pieces of wire of random specifications will sometimes perform, and sometimes give very poor performance, depending upon their length. In order to make sure that the antennas are adequate for the frequencies used in connection with the ultrahigh frequency type of receiver, it is best to cut the antennas to their proper length for operation in the middle portion of the band chosen.

The simplest type of antenna is what is called a half-wave doublet, which is an antenna suspended either vertically or horizontally, having an overall length of approximately one-half wave length—the wave length being the middle wave length of the frequency range to which the tuning is adjusted. This means that the antenna for the 5 meter band will be approximately 8 feet long and for the 10 meter band approximately 16 feet long.

Connections can be made either by twisted pair in the center of the antenna, or by open wire type of line tapped off center in a 'T' connection, forming an antenna system commonly called the 'T' Connected Matched Impedance Type. The input impedance of the receiver, at all frequencies of its operation, will average between 200 and 150 ohms. For this reason the twisted pair or the concentric cable type of feed will be superior to the high impedance open wire type of feed. Separate terminals are provided for each band, since optimum results are obtained in this way. The antenna leads for the 20 to 30 megacycle coverage band, should be connected to terminals marked "A" and "M", with a good ground connected to the terminal "G". Terminal "G" serves as a ground for the entire equipment and is further important, insofar as reducing noise to a minimum. The pair of leads coming from the 5 meter antenna are to be connected to the antenna terminals marked "M" and "40 MC".

**PART CODE**

<table>
<thead>
<tr>
<th>PART</th>
<th>DESIGNATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>15 ohm, 1/3 watt insulated resistor</td>
</tr>
<tr>
<td>1.3</td>
<td>15 ohm 1/3 watt insulated resistor</td>
</tr>
<tr>
<td>1.4</td>
<td>15 ohm 1/3 watt insulated resistor</td>
</tr>
<tr>
<td>1.5</td>
<td>5000 ohm 1/3 watt insulated resistor</td>
</tr>
<tr>
<td>1.6</td>
<td>6300 ohm 1/3 watt insulated resistor</td>
</tr>
<tr>
<td>1.7</td>
<td>100,000 ohm 1/3 watt insulated resistor</td>
</tr>
<tr>
<td>1.8</td>
<td>50,000 ohm 1/3 watt insulated resistor</td>
</tr>
<tr>
<td>1.9</td>
<td>50,000 ohm 1/3 watt insulated resistor</td>
</tr>
<tr>
<td>1.10</td>
<td>10,000 ohm 1/3 watt insulated resistor</td>
</tr>
<tr>
<td>1.11</td>
<td>5000 ohm 1/3 watt insulated resistor</td>
</tr>
<tr>
<td>1.12</td>
<td>330 ohm 1/3 watt insulated resistor</td>
</tr>
</tbody>
</table>

**PART SPECIFICATION**

- 1.2 15 ohm, 1/3 watt insulated resistor
- 1.3 15 ohm 1/3 watt insulated resistor
- 1.4 15 ohm 1/3 watt insulated resistor
- 1.5 5000 ohm 1/3 watt insulated resistor
- 1.6 6300 ohm 1/3 watt insulated resistor
- 1.7 100,000 ohm 1/3 watt insulated resistor
- 1.8 50,000 ohm 1/3 watt insulated resistor
- 1.9 50,000 ohm 1/3 watt insulated resistor
- 1.10 10,000 ohm 1/3 watt insulated resistor
- 1.11 5000 ohm 1/3 watt insulated resistor
- 1.12 330 ohm 1/3 watt insulated resistor

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IF 550 KHz

1.20 1,000 ohm, 1/3 watt insulated resistor
1.22 150 ohm, 1/3 watt insulated resistor
1.29 200 ohm variable resistor
1.30 20,000 ohm, 1/3 watt insulated resistor
1.34 30,000 ohm variable resistor
1.37 100,000 ohm, 1/3 watt insulated resistor
1.39 100,000 ohm, 1/3 watt insulated resistor
1.40 1,000 ohm, 1/3 watt insulated resistor
1.41 5,000 ohm, 1/3 watt insulated resistor

2.34 400 µfd. mica condenser
2.41 .002 µfd mica condenser
2.44 400 µfd mica condenser
2.48 50 µfd mica condenser

The HF-30X High Frequency Receiver is made in a standard model for operation when connected to supply lines supplying 115 volts at 50 or 60 cycles.

FOR OTHER PARTS - SEE INDEX

DATE: 11/2/39
DRAWN BY: F.M.D.
APPROVED BY:

C-69
The HF-10 Receiver is designed for convenient dismantling by means of interconnecting cables and plugs, by which it is made possible to remove all of the units from the panel without having any of the components connected together. The panel may be removed from the instrument by disconnecting two cable plugs and removing the R-meter illuminating lamp from the grommet and by taking the knobs off of the panel controls which protrude through the panel. Bolts fastening in the two chasses are easily removed from the bottom of the housing, permitting removal of each of the chasses. Figure 2 completely describes the visible components, as viewed through the top of the receiver.

The intermediate frequency used in the HF-10 is 1550 kilocycles and there are three intermediate frequency transformers—labeled 1, 2 and 3 (Figure 2). In order to adjust these intermediate frequency transformers, a test oscillator developing 1250 kilocycles may be fed into the first detector grid by means of connecting it to the stator connection of the variable condenser. This stator is the middle stator of the variable condenser. After the test oscillator has been set to 1250 kilocycles, and the Band Switch on the panel of the receiver (See Figure 1) is set to the 28 to 30 megacycles band, adjustment is made of the intermediate frequency transformers by means of an insulated alignment tool so that the R-meter reads a maximum at a given input from the test oscillator. This provides a simple means of peaking the intermediate frequency transformers should they require it at any time.

All calibration is controlled by the two trimmers (See Figure 2) marked "OMC.FAD". One of these paddles controls the calibration of the 28 to 30 megacycle band and the other for the 56 to 60 megacycle band. Usually calibration is made using a signal input of an accurately determined frequency, but usually there will be no necessity for making this adjustment unless the receiver has been damaged in transit or thrown out of calibration by tampering. These two paddles controlling the frequency calibration of the instrument are highly stable, air type, trimming condensers, and will remain in adjustment for long periods of time.

Sometimes the connection of various types of antennas to the equipment will slightly disturb the tuned circuits of the r.f. amplifiers. Two paddles are provided, one for each band, to correct for this misalignment if it does occur. Adjustment is made (See Figure 1) of the two r.f. paddles with the antennas connected and a signal being fed into the r.f. amplifier on the particular signal. It will seldom be found necessary to make any adjustment of the detector paddles, but similar adjustment procedures is bpsicated for the detector paddles. All adjustments are made with the receiver set to the specified known frequency and left in a position providing maximum responses, as indicated by maximum R-meter reading on that signal.

MODEL HF-50X
- 27.8 to 41 MEGACYCLES
- 41 to 100 MEGACYCLES

ADJUSTMENT OF THE BEAT OSCILLATOR PITCH CONTROL

The beat oscillator pitch is adjusted at the factory for approximately 1000 cycles off of exact tune of the i.f. amplifier. Reference to Figure 1 will point out the adjustment necessary to change the tuning of the beat oscillator. This adjustment is accessible through the bottom of the cabinet of the receiver.

For best alignment of the beat oscillator, tune in a station without the beat oscillator on—that is, with the Stand-by Control Switch thrown to the "PHONE" position until the meter reading is an absolute maximum. Under these conditions, place the Stand-By Switch in the "G.M." position and adjust the beat oscillator, through the access hole in the bottom of the cabinet, to any pitch desired.
The NRC Model DM-36A Frequency Expander is identical in circuit arrangement, with certain exceptions, to the DM-36, and has the same sensitivity to the high frequencies. The exceptions to the similarity are: overall size of the housing, and the intermediate frequency developed for injection into the associated receiver.

In all units of this type it is necessary, of course, to use a complete type of receiver in conjunction with the expander in order to provide the facilities of demodulation and audio reproduction, together with additional gain and selectivity. In the case of the DM-36A this associated receiver is intended to be an automobile type of receiver, which will tune to 1500 kilocycles. Practically all of the standard types of automobile receivers on the market will tune to this frequency.

The DM-35s in effect a frequency converter and therefore acts as a radio frequency amplifier and mixer tube with its oscillator in an overall superheterodyne type of circuit. It is used in connection with a regular receiver capable of tuning to a frequency of 10,000 Hz (10 MHz). The associated receiver therefore acts as an intermediate frequency amplifier unit and a demodulator and audio amplifier in order to reproduce the output of the expander.

**Antennas**

It is suggested that for best results insofar as antennas are concerned for the DM-36A converters, that vertical radiators, grounded to the body of the car, be used. Figure 6 shows the suggested dimensions and general configuration of antennas recommended for use with the converter in the two frequency bands. It is to be understood, that for optimum results, an antenna will not be satisfactory for both frequencies. Reference to figure 6 will suggest various ways of constructing suitable pick-up antennas for use with these converters.

The input impedance to the converter is very low and therefore will work out very satisfactorily with the single wire feeders as suggested. An antenna changewave switch is provided on the DM-36A for connecting the antenna used on the triple terminal strip (see Fig. 8) to either the 36- or the 36-6 combination with the associated receiver or directly to the receiver with which the instrument is associated. This is accomplished by setting the switch to the position marked "DM-36" on the left of the polar position, or to the right pointer position marked "DM-36-6", as indicated in Figure 1.

The triple terminal strip is designed for connecting the antenna to be used for the 28 to 30 megacycle band and also the antenna which will provide, be used on the receiver alone when the 36-6 is not connected in the circuit. In order to make it possible to get the best results from the five meter channel a separate pair of terminals has been provided so that a double antenna may be connected into the primary coil of the five meter channel (see Fig. 2). The best performance will be obtained when an antenna is used especially designed for the middle frequency of the five meter amateur band—1.5, 30 megacycles. It can either be a half wave dipole fed from the center to the 36-6 by means of a twisted pair or it can be a single wire antenna a half wave long placed vertically or horizontally (preferably horizontally), in space and fed to the receiver by connection to antenna terminal (2), in which case antenna 36, for the five meter band, can be connected directly to the terminal marked "G" on the 36-6, see the page appended giving various configurations of antenna construction and the method of connection to the 36-6 for the various frequencies (Fig. 2).

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RADIO MFG. ENGINEERS, INC.

MODELS DM-56X
MODELS DM-36 (Late)
DM-36A

DM-36A ONLY
BATTERY CABLE

(1) YELLOW 2 90V
(2) BLUE 2 115V
(3) RED 1 6V
(4) BLACK 1 GROUND
(5) GREEN 1

IF SINGLE VSW IS USED ON BAND 28-30 MC, CONNECT ANTENNA LEAD TO A1, AND GROUND A2 TO TERMINAL G.

IF SINGLE VSW IS USED ON BAND 56-60 MC, CONNECT ANTENNA LEAD TO AMP-1, AND GROUND AMP-2 TO TERMINAL 'G' DIRECTLY BELOW IT.

ANTENNA CHANGEOVER SW.

56-60 28-30
BAND SWITHCH

PADDERS
CAREFULLY ADJUST TO MAXIMUM READING OF R-METER (AFTER 45 MINUTES WARM-UP). SINCE PADDERS WILL BE FOUND TO BE SET CLOSE TO THE MAXIMUM, ADJUST BY TUNING TRIMMERS SLOWLY BACK AND FORTH OVER A GIVEN SIGNAL OF EACH BAND.

USER VIEW
--FIG. 1--

BOTTOM VIEW
--FIG. 3--

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OUTLINE OF PROCEDURE FOR CORRECT ALIGNMENT OF THE INTERMEDIATE FREQUENCY AMPLIFIER TRANSFORMER OF THE RME-70 RECEIVER.

The intermediate frequency amplifiers in the RME-70 Receiver are designed for a frequency of 465 KC. Since these receivers are always supplied with a quartz crystal filter, it is essential that the intermediate frequency transformers be accurately aligned with the crystal frequency. Crystals are supplied in frequencies slightly at variance from the above stated value of intermediate frequency by an amount not greater than one kilocycle plus or minus 465 KC. Whether therefore align the intermediate frequency amplifier stages of the RME-70 to a set frequency of 465 KC, it is necessary that the alignment be done in conjunction with the quartz filter so that alignment of the Intermediate frequency amplifier is achieved at the frequency of the filter and whenever the alignment is observed. The alignment outlined is followed accurately, maximum results will be obtained. The use of any other process of a general type will produce inferior results.

The first step in the alignment procedure is to tune in a broadcast station, preferably in the low frequency portion of the broadcast band. The signal should be one of medium signal strength so that the R meter indicates a signal level of 80 or slightly less. If no station of this amplitude is available but a stronger station is available, a reduction in the efficiency of the antenna by the connection of a short wire to the antenna post may help to bring the signal strength as indicated down to 80. Usually between 550 and 800 KC in any territory a station can be received at most any time for this test and adjustment.

When the station has been chosen, let us assume that its frequency is 700 KC and the tuning control so that the frequency reads approximately 715 or 720 KC. This of course will tune the station out. It does not necessarily have to be the frequency of any station of this amplitude if the general idea of the procedure is to tune the main tuning control slightly higher than the chosen station so that it may be brought back to resonance by decreasing the scale reading of the band spread control. This is done merely to provide vernier tuning.

With the station chosen and resonated on the band spread scale, the crystal filter is switched into the circuit by setting the pasing control to the "O" or center position (appropriately set from "OFF" position). The band spread scale is then adjusted with respect to the signal so that a maximum meter reading is obtained. This procedure requires patience and accuracy, and the important factor being that all should be adjusted so that the R meter is brought to and left at a maximum meter reading. Usually this adjustment require very much tuning of the filter. A good procedure to follow is to start with the 5.5 transformer and align in sequence 5.4 and 5.3. All adjustments should be made as before that the meter reading is maximum. It is advisable from time to time to make sure that the signal is still adjusted to peak resonance of the crystal by slightly varying the

OTHER DATA IN VOLUME XI
adjustment of the bandspread control. When this procedure has been completed and all transformers and all mechanical adjustments at maximum meter reading, the intermediate frequency amplifier of the receiver is in peak adjustment and the crystal aligned with it for maximum effectiveness in filter action.

PHASING CONTROL OPERATION

The phasing control of the RME-70 receiver, located on the front panel in the top right corner is indicated by the word "PHASING." Directly to the left of the word is the word "OFF." There is a stop connected with the shaft so that when the receiver is to be used without the crystal filter, rotation of the phasing control is set to the "OFF" position. Further clockwise rotation is impossible due to the stop. This indicates that the crystal filter has been removed from the circuit and normal receiver operation is possible. This function is provided by a cam operated switch connected with the phasing control of the crystal filter. In order to put the crystal into operation it is necessary to rotate the crystal phasing control clockwise to a position where the pointer is approximately in a vertical position, similar to that normally required of the selectivity control, located just below it.

Failure of the crystal to cut out of the circuit when the crystal phasing control pointer is set to the "OFF" position is due either to the fact that the knob has slipped or the switch contacts are bad and probably need adjustment. The cam switch closes when this pointer is in the "OFF" position, shutting out the crystal unit. Failure, of course, to shut out the crystal unit will make it possible for the crystal filter to function. If a tumbling of the tumblers or bending of the contacts can improve this function it should be replaced.

When the crystal filter is being used the phasing function is provided by the variation in capacity of a phasing condenser controlled by the crystal phasing knob. Usually this is indicated by minimum noise or background response when the receiver is tuned out of the signal and the crystal is being used. This position, as before indicated, will be approximately one which allows the pointer to be vertical. Small variations, either clockwise or counter clockwise, from this minimum noise response position change the rejection point of the crystal and make it possible to tune the rejection characteristic of the crystal to various slightly higher and lower frequencies for rejection purposes during QRM on a heterodyne on a desired signal.

If the phasing control does not work it is indicative of the fact that probably a connection is broken or that the R.F. choke connecting the A.C.-C. to the grid of the tube (indicated on the schematic drawing by R.F.C. in the crystal filter circuit) is open. The continuity check between the grid of the first 1.P. amplifier tube and the junction of resistors 1.B on the automatic volume control terminal strip should show continuity when the crystal is in the operating position.

ALIGNMENT OF RADIO FREQUENCY SECTION OF THE RME-70 RECEIVER

Alignment of the radio frequency section of the receiver will affect principally the calibration of the receiver. Within certain limits this of course will also affect the sensitivity. Small variations in frequency (up to $2\%$) will not materially reduce the sensitivity of the receiver although they of course will show up as variations in the calibration as indicated by the pointer settings of the main tuning dial indicator. Correction for any variation in calibration can be made by following the suggestions outlined.

Band 1 includes the frequencies between 550 and 1500 KC. For band 1 there are two frequency adjustments for adjusting the indicator to proper alignment. The adjustments are condenser 2.50 is the adjustment for high frequency and condenser 2.50 is the adjustment for low frequency end of band 1. The procedure is to tune the main tuning dial indicator to the position to be adjusted. The main tuning condenser is then set to the proper position. Loosen screw 5 and adjust the condenser so that the pointer falls between the lower and upper limit of the range. This will be correct for all stations within the 550 to 1500 KC range. Slight variations in the semi-circular scale at the extreme counter clockwise position should rest on the top edge of the pointer as it is turned to maximum counter clockwise rotation and the condenser plates are at full mesh.

The next step is to choose a station or a signal of accurately known frequency, around 700 KC, and set the main indicator to the frequency of the signal which is going to be used for the test. For example: There is a station available with fairly good signal strength and a test oscillator is available which can accurately be set at 700 KC. If the receiver indicator on the main tuning dial is set at 700, and the receiver is considerably out of calibration of course the signal will not be received. However, leave the indicator at the correct frequency of the signal being used for the test and set the band spread control to a reading of 150 on the dial at which position it has no material effect on the tuning circuits of the receiver and permits the adjustment of the main tuning dial to indicate accurately the frequency of the signal.

Then by means of condenser 2.50 (Figure 4) accessible through the trimming hole in the oscillator shield can for Band 1, adjust until the signal is brought in with the pointer set at the proper frequency. Then choose a signal at about 1200 or 1300 KC and set the main tuning dial indicator to the correct frequency for that signal and bring the signal in at that setting with trimmer 2.50. It will then be necessary to return to the lower frequency calibration point for Band 1 to make sure that the variation of 2.50 has not made some slight change in the setting for the lower frequency calibration point and it may be necessary to readjust condenser 2.50 again. Then in order to make certain of the accuracy of both settings return to the frequency chosen for Band 1 and make sure that the frequency is the same as before.

Calibrations on the higher frequency bands are controlled for Bands 4, 5, 6, and 7 by the trimmers 2.45, 2.45, 2.45, 2.45, 2.45, respectively. High side beat is used on all bands, and the RME-70 Receiver which means that all of the condensers 2.45, 2.45, 2.45, 2.45, 2.45, must be set to the lowest capacity setting which will provide a beat and the proper calibration for the frequencies in the respective bands. Calibration frequencies used are as follows:

<table>
<thead>
<tr>
<th>Band</th>
<th>Calibrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2 megacycles and 3 megacycles, 2 megacycles, 3 megacycles, 4 megacycles, 5 megacycles, 6 megacycles, 7 megacycles, 8 megacycles, 9 megacycles, 11 megacycles, 13 megacycles, 14 megacycles, 15 megacycles, 17 megacycles, 18 megacycles, 19 megacycles, 20 megacycles</td>
</tr>
</tbody>
</table>

After the calibration has been made accurately on all of the frequencies, or if the receiver has been found to be accurately set as far as its calibration is concerned on all frequencies, the trimmers 2.50 are set to 2.50.
and 2.1 have a distinct effect upon the RF grid circuits for bands 5 and 6 respectively. They are adjusted as follows: With a steady incoming signal on between 14 and 15 megacycles and the most effective setting of the resonator control for signal in that region, and with the antenna connected, the condenser 2.2 is adjusted for maximum meter reading. With these same conditions existing on 30 megacycles, with the band switch set on band 6 and the antenna connected, 2.1 and 3.4 are adjusted for maximum response on a given steady signal. All other trimming and adjusting is done manually by means of the resonator control, a variable RF amplifier and detector grid padder, which can be critically adjusted for peak resonance at any frequency it is desired to tune to.

It is of importance to note the setting of the condenser 2.4 (Figure 4). This is the antenna coupling condenser used when the receiver is set to Band 1. It should be set to practically its minimum capacity in order to provide constant alignment and proper coupling to the antenna. Excessive capacity in the condenser 2.4 will cause misalignment of the RF amplifier and hence promiscuous beating of harmonically related broadcast frequencies to the effect that a number of whistling tones will be received on the high frequency end of the broadcast band. When the receiver leaves the factory it is set at a very small capacity and should not be set at any other capacity or material reduction in the efficiency of operation will be produced.

The padders 2.2 and 2.1 materially contribute to the image signal rejection on the bands 5 and 6. Special care should therefore be taken in the adjustment of these condensers when the receiver is aligned.

ADJUSTMENT OF THE BEAT OSCILLATOR

The beat oscillator has its frequency adjustable on the panel by means of the C.W. Tone control. This control is normally set for zero beat with the condenser 2.59 (C.W. Tone control) set at 50% mesh. If it is found that zero beat does not occur or that the beat oscillator is not beating with the intermediate frequency to produce an audible solid beat, it is probably due to the fact that the beat oscillator is tuning to a frequency other than the intermediate frequency of the receiver. This can be remedied by the following procedure:

Set the Band Switch to position Number 1, and tune in a broadcast station so that it reads maximum on the R meter. With this condition existing, snap on the C.W. Tone control. Then by making certain that the condenser 2.59 is set to 50% mesh, the condenser 2.60 (Figure 4) located in the beat oscillator compartment just below 2.59 (Figure 4) near the top plate of the chassis in front of the beat oscillator tube should be adjusted by means of a screwdriver so that zero beat is achieved with the signal tuned in as before mentioned. When this is achieved, variation of the beat oscillator from maximum to maximum mesh will give a total beat frequency variation of eight kilocycles (plus or minus 4 kilocycles from zero beat).

Figure 4A shows the component layout for 69 receiver with LS-1 noise suppressor. Figure 4B shows the layout of the section which was changed to accommodate the suppressor and therefore is standard form of chassis layout. If the receiver is connected for use, the line drawing in connection with the photograph in Figure 4A or 4B will indicate the socket locations of the respective tubes.
PART CODE NUMBER | PART SPECIFICATION
--- | ---
2.1 | 100 mmfd mica condenser
2.2 | 50 mmfd adjustable paddler
2.3 | 50 mmfd adjustable paddler
2.4 | Rear section of variable condenser
2.6 | .1 mmf, 400 volt, paper by-pass condenser
2.7 | 250 mmfd mica grid condenser
2.8 | .1 mmf, 400 volt, paper condenser
2.9 | Nominal 121 mmfd adjustable from 75 to 125
2.10 | 105 mmfd, adjustable 75 to 125
2.11 | 70 mmfd adjustable plus 150 micron
2.12 | 70 mmfd adjustable
2.13 | Front section of variable condenser
2.14 | 15 mmf, 450 volt, electrolytic
2.15 | 10 mmf, 450 volt, electrolytic
2.18 | 90 mmfd nominal capacity, adjustable from 75 to 125.

1.1 | 15,000 ohms, 10 watt resistor
1.2 | 50,000 ohms, 1/2 watt resistor
1.3 | 300 ohms, 1/2 watt resistor

L1 | Band 1 r.f. grid coil
L2 | Band 2 r.f. grid coil
L3 | 20 henry oscillator coil for Band 1 and 2

I.F. Transformer tuned to 1550 kc with low impedance output.

Switch sections marked "A": Band change switch.
Switch sections marked "B": Antenna changeover switch and line switch combination.

4.1 | 30 henry filter choke.
5.1 | Power Transformer

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The NRE LF-90 low frequency converter unit is designed to operate with any receiver which can be tuned to 1550 kilocycles, since this is the intermediate frequency generated by the converter unit. The function of the converter is to amplify and filter this signal in the frequency band range between 45 and 290 kilocycles to produce a constant frequency of 1550 kilocycles, which is fed out of the converter on a twisted pair line and into the input terminals of the associated receiver. This receiver can be either any of the NRE Communication Receivers, or similar receivers, or even a broadcast type receiver which will tune to 1550 kilocycles. The sensitivity, of course, will depend upon the sensitivity of the receiver with which the unit is associated; but usually any receiver in fair operating condition will provide sufficient sensitivity for the long wave reception, since the converter itself has a substantial gain.

A switch in the lower right hand corner marked "LF-90 IN" and "LF-90 OUT" is an antenna changeover switch, which is used for cutting the LF-90 into the circuit ahead of the receiver, or cutting it out as conditions may warrant, permitting the operator to use either the combination for long wave reception, or the receiver itself for regular tuning purposes. When the position is set in the "OUT" position the converter circuits are switched off by means of a pair of contacts on this switch which removes the line voltage from the converter.

**CAUTION: DO NOT REMOVE TOP OR BOTTOM COVER PLATES BEFORE REMOVING SERVICE CORD PLUG FROM LINE RECEPTACLE.**

**GENERAL INSTALLATION INSTRUCTIONS**

The cabinet of the LF-90 unit is designed to match that of the NRE-69 and NRE-70 receivers, being identical in finish and in height to those cabinets. In general use it is intended to be set on the left hand side of the receiver cabinet as shown in the accompanying diagram. On the rear of the LF-90 chassis (figure 4) will be found three set screw terminals on a bakelite strip marked “G”, “A” and “A” respectively. The ground terminal, marked “G”, should be connected to a good ground. If a simple wire antenna is used it should be connected to the topmost terminal marked “A”; the middle terminal marked “G” to the antenna feed, and the third terminal marked “A” to the ground terminal “G”. If any other type of doublet antenna is used, or any antenna of the two wire feed type, the ground terminal “G” should be grounded and the feed lines may be connected to “A” and “A”. Then the LF-90 is cut out of the circuit by having the switch on the front panel in the lower right cut to “LF-90 OUT”, these three terminals on the rear of the LF-90 (see figure 4) will be connected that same sequence to similar terminals on the receiver, by-passing the LF-90 and providing reception on the receiver only.

The wires in the output cable, having red and yellow tracers respectively, are connected to the outside terminal marked “A” and the inside terminal marked “A” respectively on the receiver with which the LF-90 is used. This is with reference to NRE receivers. For receivers having only two terminal inputs—that is, antenna and ground—the yellow wire output from the LF-90 is connected to the ground terminal of the receiver and the red wire output is connected to the antenna terminal of the associated receiver.

After the unit has been connected up, as described, and plugged into the receptacle (make sure that the line voltage does not exceed 125 volts), the receiver switches may be set and adjusted to the frequency desired and the response will depend upon the gain control setting of the associated receiver. When tuning Band 1 the innermost calibrated arc is to be used and the band range is 95 to 250 kilocycles. If it is desired to tune in the range between 250 and 590 kilocycles, the band switch must be set to Band 2 and tuning will then be indicated by the calibrated scale in the outermost position. The dial markings are in kilocycles and the white line on the skirt of the tuning knob is the indicator. There are no gain control facilities on the LF-90 other than being required to take care of any signal which the LF-90 develops for its operation. Outside of the tuning knobs, the other controls of the receiver can be used for developing best frequency tone, for telegraph reception, for crystal filter operation, and for control of audio level or radio frequency gain by either automatic or manual gain control facilities, if they are provided in the particular receiver used. It is unnecessary to do any tuning adjustments on the associated receiver, since a constant frequency of 1550 Kc is developed by the LF-90 for input to the receiver. Any tuning is to be done on the LF-90 only, as indicated by the calibrated markings on the scale plate.
TEST VOLTAGES OBTAINED AT VARIOUS POINTS IN RECEIVER CIRCUIT

Measurements made with voltmeter having internal resistance of 1000 ohms per volt. Instruments with other internal resistances give entirely different readings. **NOTE**: Voltage should be 115 volts, Stand-by Switch on.

**PLACE TEST PROBE BETWEEN**

**COMMON VOLTAGE**

- Radio frequency amplifier plate and ground... 250 volts
- Radio frequency amplifier screen and ground... 130 volts
- Radio frequency amplifier cathode and ground... 5 volts
- First detector plate and ground... 10 volts
- First I.F. amplifier plate and ground... 120 volts
- First I.F. amplifier screen and ground... 120 volts
- First I.F. amplifier cathode and ground... 120 volts

(The above voltages apply to the 2nd and 3rd I.F. Amplifier stages)

First detector plate and ground... 43 volts
First audio amplifier plate and ground... 115 volts
First audio amplifier cathode and ground... 1.5 volts
70S plate and ground... 220 volts
70S screen and ground... 220 volts
70S cathode and ground... 5.5 volts
70S plate and ground... 320 volts
60 rectifier filament and ground... 130 volts
Voltage regulator plate and ground... 130 volts
(Voltage varies with standby switch on/off)

**RESISTANCE VALUES**

- A1 and ground... Infinite
- A2 and ground... Infinite
- RF amplifier grid to ground... 100 Megohms
- First detector grid to ground... Band 1 1.5 Ohm
- Band 2 1.5 Ohm
- Band 3 8 Ohm
- Band 4 2.1 Ohm
- Band 5 1 Ohm
- Band 6 0.8 Ohm
- Band 7 0.4 Ohm
- Band 8 0.2 Ohm
- 1000 Megohms to 8 ohms
- Oscillator grid to ground... 250 Megohms to 8 ohms
- Audio grid and ground... 250 Megohms to 8 ohms
- Oscillator section of main tuning condenser and ground... Bands 1, 2, 3, 4, 5, 6, 7, 8

**CONTINUITY CHECKS**

1. Checking between A1 and ground.
2. Between A2 and ground.
3. Between RF amplifier grid and ground.
4. Between first detector grid and ground.
5. Between second I.F. grid and ground.
7. Between oscillator grid and ground.
8. Between audio grid and ground.

(Receive turned off. No jumper between A1 and ground on antenna terminal strip.)
One of the first evidences of misalignment in a receiver is low sensi-
tiveness gain in the receiver. In the NE-99 this is evidenced by low meter read-
ings on signals which were formerly producible of higher meter readings. Due to the tremendous gain available in the audio system of the NE-99 a mis-
alignment can go undetected due to loss of gain which may not be noticed if the circuitry of the receiver is judiciously balanced. If the receiver is judged by output audio, since it may be possible to turn the volume control to the maximum output position and still obtain high values of output. Misalignment, however, does not affect the circuit of the audio amplifiers, but may affect the intermediate frequency amplifiers and the radio frequency amplifiers. Principal among the contributions to low gain in the radio frequency amplifier is the intermodulation of two intermediate frequency amplifiers in providing overall sensitiveness and selectivity of a satisfactory order.

If the misalignment in the audio frequency section of the receiver is usually not due to the fact that the oscillator has been grossly misaligned and the performance in the frequency calibration of the receiver. In other words, it might well be said that a loss of sensitivity in the re-
ceiving circuitry of the NE-99 receiver is caused by misalignment of the IF AMPLIFIER.

If we consider the effect of the realignment of the intermediate frequency amplifiers, it is seen that the amplifier stage of the NE-99 is designed to have a frequency of 465 Kc. Since these receivers are always supplied with a quartz crystal oscillator, it is essential that the quartz crystal oscillators be accurately tuned to the crystal with the frequency of 465 Kc. Crystals are supplied in frequencies slightly at variance from the above stated value, for accurate alignment. An error of a half percent or more is harmful. Better, therefore, than align the I.F. amplifier stages of the NE-99 to a set frequency of 465 Kc, it is essential that the alignment be done in conjunction with the quartz oscillator and that adjustment be made at the frequency of 465 Kc. In this way, any frequency variation of the oscillator is automatically taken care of.

The first step in the alignment procedure is to tune in a broadcast station, preferably in the low frequency section of the broadcast band. The switch should be in the position of the desired broadcast band. The routine is such that a meter indicates a signal strength of 20 to 30 dB. Then, move the receiver to the other broadcast band and check the broadcast band. The steps outlined are followed accurately, maximum results will be obtained. The use of any other routine of a general nature is unwise.

The first step in the alignment procedure is to tune in a broadcast station, preferably in the low frequency section of the broadcast band. The signal should be of medium signal strength so that the meter indicates a signal strength of 20 to 30 dB. Then, move the receiver to the other broadcast band and check the broadcast band. The steps outlined are followed accurately, maximum results will be obtained. The use of any other routine of a general nature is unwise.

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### Alignment Procedure

The following equipment is required for aligning:
- All wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-magnetic screwdriver.
- Dummy antenna—1 Mfd., 50 Mmfd.

#### Band Signal Generator Frequency Setting Dummy Antenna Connection to Radio Variable Components Signal Generator

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Components Signal Generator</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 1AGT</td>
<td>Rotor full open (Plates out of mesh)</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1560 Kc.</td>
<td>.5 MFD.</td>
<td>Grid of 1AGT</td>
<td>Rotor full open (Plates out of mesh)</td>
</tr>
<tr>
<td>BAND (Band Switch in Broadcast Position)</td>
<td>1600 Kc.</td>
<td>.5 MMFD.</td>
<td>Grid of 1AGT</td>
<td>Rotor full open (Plates out of mesh)</td>
</tr>
<tr>
<td>BAND (Band Switch in Long Wave Position)</td>
<td>410 Kc.</td>
<td>.5 MMFD.</td>
<td>Grid of 1AGT</td>
<td>Rotor full open (Plates out of mesh)</td>
</tr>
<tr>
<td>BAND (Band Switch in Long Wave Position)</td>
<td>275 Kc.</td>
<td>.5 MMFD.</td>
<td>Grid of 1AGT</td>
<td>Rotor full open (Plates out of mesh)</td>
</tr>
</tbody>
</table>

#### Trimmer Adjustments

<table>
<thead>
<tr>
<th>Adjustment</th>
<th>Trimmer Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>(See Note &quot;A&quot;)</td>
<td>Output and input L. F.</td>
</tr>
<tr>
<td>(See Note &quot;B&quot;)</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>(See Note &quot;C&quot;)</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

#### Power Consumption

- Power Consumption: On A.C. or D.C. 35 Watts
- Power Output: 600 Milliwatts Undistorted, 1200 Milliwatts Maximum

#### Frequency Ranges

- 570 to 1650 KC.
- 100 to 420 KC.

---

To determine your position at sea, it is only necessary to take bearings on two broadcast stations and transfer these bearings to your chart (map). To find your position first loosen the locking screws on the compass scale on top of the Sea Pal. Rotate the scale so it reads the same as your ships compass. Make the same correction as you would for your compass and hold the ships course steady.

Now tune in a broadcast or beacon station and find the position of the station. To use your compass as a homing device, tune in the station near the harbor. Rotate the loop to a point where the signal is loudest. This point is quite broad and is therefore not accurate enough to follow. You must therefore find the "Null" point (the point at which the station is weakest).

The Null point will be where the flat side of the loop faces the station. The pointer on the loop should then point directly toward the station on the compass scale. When near the harbor of course you will pick up the harbor lights and marker buoys.

Since the "Null" point can be obtained when the loop pointer points either to the station or directly away from it you should check with your magnetic compass just to be certain your direction is not away from the station.
MODEL 861
Chassis 100,350

SEARS ROEBUCK & CO.

Before attempting to align the receiver see that the dial pointer is correctly set. With the gang condenser in full, set the pointer to the left mark on the right end of the dial scale. If the pointer is incorrectly set, it is only necessary to loosen the set screw in the dial card drum and move the gang condenser in full with the pointer properly set, then retighten the set screw.

Output meter connection - Across loud speaker voice coil
Output meter reading to indicate 200 milliwatts - 0.5 volts

Tune antennas to be in series with generator output - 600 ohms ground
Connection of generator output lead - 600 ohms ground
Generator signal - 30% 600 cycles
Position of Volume control - Full clockwise
Position of Tone control - 10
Position of Dial Pointer with variable fully closed - 8
Position of Dial Pointer with variable fully open - 10

455 Kc - 10
600 Kc - 9
1500 Kc - 7
600 Kc - 8
16 MC - 7
600 Kc - 10
455 Kc - 6
655 Kc - 4

SOCKET VOLTAGES-ALL D.C. MEASURED TO CHASSIS

<table>
<thead>
<tr>
<th>TUBE FUNCTION</th>
<th>H</th>
<th>K</th>
<th>G</th>
<th>G</th>
<th>S</th>
<th>SU</th>
<th>P</th>
<th>D1</th>
<th>D2</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8G 1st DET.</td>
<td>60AC</td>
<td>0</td>
<td>NoteA</td>
<td>-5</td>
<td>85</td>
<td>85</td>
<td>240</td>
<td>168</td>
<td>168</td>
</tr>
<tr>
<td>6P5G OSC.</td>
<td>60AC</td>
<td>0</td>
<td>-5</td>
<td>85</td>
<td>85</td>
<td>240</td>
<td>168</td>
<td>168</td>
<td></td>
</tr>
<tr>
<td>6K7G I.F.</td>
<td>60AC</td>
<td>0</td>
<td>NoteA</td>
<td>85</td>
<td>0</td>
<td>240</td>
<td>168</td>
<td>168</td>
<td></td>
</tr>
<tr>
<td>6Q7G 2nd DET.</td>
<td>60AC</td>
<td>-24</td>
<td>NoteB</td>
<td>85</td>
<td>0</td>
<td>240</td>
<td>168</td>
<td>168</td>
<td></td>
</tr>
<tr>
<td>6F6G OUTPUT</td>
<td>60AC</td>
<td>-24</td>
<td>NoteC</td>
<td>240</td>
<td>225</td>
<td>168</td>
<td>168</td>
<td>168</td>
<td></td>
</tr>
<tr>
<td>SWG RECT. 50AC</td>
<td>60AC</td>
<td>-24</td>
<td>NoteC</td>
<td>240</td>
<td>225</td>
<td>168</td>
<td>168</td>
<td>168</td>
<td></td>
</tr>
</tbody>
</table>

SWG to 50AC = 350 A.C. TO CENTER TAP

NOTE A: The bias on 6Q7G is -2.4 volts measured across R1.
NOTE B: The bias on the 6Q7G grid is -1.4 volts measured across R1.
NOTE C: The bias on the 6Q7G grid is -16 volts measured across R1 and R1.

A 600 OHM RESISTANCE VOLTMETER HAVING A RESISTANCE OF AT LEAST 1000 OHMS IS RECOMMENDED.

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SEARS ROEBUCK & CO.

MODELS R71, 671
Chassis 101.612
101.612A

POWER SUPPLY:
All models available: 105-135 v, 50-60 cycles AC: 70 watts
All models available: 105-135 v, 50-60 cycles AC: 75 watts

POWER OUTPUT:
Type: Pentode
Output power: 2.5 watts
Maximum: 4.5 watts

FREQUENCY RANGES:
Type: Dynamic
Band "A": 540-1610 kc
Band "B": 1140-2650 kc
Band "C": 5.25-18.3 mc

LOUDSPEAKER:
Size: 8 inch
Field coil resistance: 1100 ohms
Approx. field coil voltage drop: .85 v

PRELIMINARY:
Output meter connection: Across loudspeaker voice coil
Output meter reading to indicate 500 milliwatts: 1.8 volts
Approximate microvolts input to indicate 200 milliwatts output:
See chart below
Generator ground lead connection: See chart below
Dummy antenna value to be in series with generator output: See chart below
Connection of generator output lead: See chart below
Generator modulation: 30%, 400 cycles
Position of Volume Control: Fully clockwise
Position of Tone Control: HI
Position of Dial Pointer with variable fully closed: At mark to left of 500 kc calibration mark

MODELS R71, 671 AND R381

WAVE BAND SWITCH
A Closed 456 kc .00005 mfd. 6K6G Grid
A Open 1610 kc 0.0005 mfd. Ant. Term.
A 1400 kc 0.0005 mfd. Ant. Term.
8 500 kc (rock) 500 kc .00005 mfd. Ant. Term.
8 3.4 mo 400 ohms Ant. Term.
C 15 mo (rock) 15 mo 400 ohms Ant. Term.

TRIMMERS ADJUSTED (IN ORDER SHOWN)
R71, 671 ONLY

TRIMMER APPROXIMATE FUNCTION (MICROVOLTS)

FOR MODELS
TF 50
Wave Trap
80 Oscillator
01 Transistor 85
04 Padder 35
03 Transistor 35
05 Transistor 10

IMPORTANT ALIGNMENT NOTES
* The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of 455 kc.

June 5, 1940

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Compliments of www.nucow.com
MODEL RS1
Chassis 101.613

POWER OUTPUT:
Type: Push-pull pentodes
Undistorted: 4 watts
Maximum: 8 watts

FREQUENCY RANGES:
Band 'A': 540-1610 kc
Band 'B': 1475-3850 kc
Band 'C': 1.88-6.08 mc
Band 'D': 9.3-9.85 mc

ALIGMENT PROCEDURE

PRELIMINARY:
Output meter connection: To indicate 500 millivolts
Output meter reading: 1.5 volts
Approximate microvolts input for 500 millivolts output: See chart below
Generator ground lead connection: To chassis
Dummy antenna value to be in series with generator output: See chart below
Connection of generator output lead: See chart below
Generator modulation: 300, 400 cycles
Position of Volume Control: Fully clockwise
Position of Tone Control: Fully closed
Position of Dial Pointer with variable fully closed: At mark to left of 550 kc calibration mark

WAVE BAND
SWITCH
POSITION OF VARIABLE
GENERATOR
FREQUENCY
DUMMY
ANTENNA
GENERATOR
CONNECTION
SHOWN
TRIMMERS
ADJUSTED
IN ORDER
FUNCTION
APPROXIMATE
MICROVOLTS

A
Closed
455 kc
.1 mf
6X8G Grid
72,72
IF
-

A
600 kc
455 kc
0.0005 mf
Ant. Term.
44 Wave Trap

A
Open
1610 kc
0.0005 mf
Ant. Term.
013 Oscillator

A
1400 kc
1400 kc
0.0005 mf
Ant. Term.
032 Translator

A
2.4 mc
8.4 mc
400 ohms
Ant. Term.
032 Translator

B
15 mc
15 mc
400 ohms
Ant. Term.
072 Translator

B
9.55 mc
9.55 mc
400 ohms
Ant. Term.
072 Translator

C
9.55 mc
9.55 mc
400 ohms
Ant. Term.
072 Translator

C
9.55 mc
9.55 mc
400 ohms
Ant. Term.
072 Translator

IMPORTANT ALIGNMENT NOTES

* The generator should be adjusted for high output. The trimmer should be adjusted for
minimum output meter reading instead of the usual maximum reading. If the frequency of an
interfering station around 455 kc is known, the generator should be adjusted to the frequency
of that station instead of 455 kc.

** If two peaks can be had, the correct one is with the trimmer screw further out. The
other peak is the image.

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Compliments of www.nucow.com
**SEARS-ROEBUCK & CO.**

**MODEL R101**
Chassis 101.614  
MODELS R81, R1171

---

**WIRING DIAGRAM FOR SILVERTONE CHASSIS 101.614**

---

**JUNE 18, 1940**

**ALIGNMENT PROCEDURE**

**INTERMEDIATE FREQUENCY 455 kc**

Output meter connection: Across loudspeaker voice coil
Output meter reading to indicate 600 milliwatts output
Approximate microvolts input for 600 milliwatts output
See chart below
Position of Volume Control
Position of Tone Control
Position of Dial Pointer with variable fully closed

---

**WAVE BAND**

**POSITION OF VARIABLE**

**GENERATOR**

**FREQUENCY**

**DUMMY GENERATOR**

**FREQUENCY**

---

**TRIMMERS**

**ADJUSTED IN ORDER SHOWN**

**FUNCTION MICROVOLTS**

---

**PUSH BUTTON TUNING MECHANISM:** MODELS R81, R101, R1171

The adjustment for each push button is locked or unlocked by tightening or loosening the slotted screwhead made accessible when the push button knob is pulled off of its plunger. Stations are set up by unlocking the mechanism, tuning in the station, pushing in the plunger (being careful not to detune the station), releasing the plunger, then securely locking the adjustment by holding the screwdriver lightly in the screwhead, allowing the spring tension to hold the plunger against the screw driver.

**POWER SUPPLY:**

All models available 105-135 volt AC; 50-60 cycle: 110 watts

**FREQUENCY RANGES:**

Band "A" 540-1650 kc
Band "B" 1475-3510 kc

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Compliments of www.nucow.com
MODEL RL01 (late)  
Chassis 101.614-1

MODEL 1581  
Chassis 101.572-2A

SEARS ROEBUCK & CO.

MODEL RL01  
OCT. 15, 1940

FACTORY IDENTIFICATION NO. 101.614-1

ADDITION OF SUFFIX NUMBER -1 TO CHASSIS IDENTIFICATION NUMBER 101.614:

Chassis identified by 101.614-1 omit the low boost switch from the back of the chassis and incorporate its function in the tone push buttons.

The new Tone-Phono-Television-Frequency Modulation push button switch is part number 1013843364, selling price $1.02.

WIRING DIAGRAM FOR SILVERTONE CHASSIS 101.614-1

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Compliments of www.nucow.com
PAGE 12-8 SEARS

COMPLIMENTS OF
WIRING DIAGRAM FOR SILVERTONE CHASSIS 101.66

POWER SUPPLY: FREQUENCY RANGES:

INTERRMEDIATE FREQUENCY All models available

.455 ke
105-125 volts, 50-60 cycles: 125 watts
105-125 volts, 23-60 cycles: 125 watts

PRELIMINARY: ALIGNMENT PROCEDURE

Output meter connection . Across loudspeaker voice coil
Output meter reading to indicate 500 milliwatts . 1.6 volts
Approximate microvolts input for 500 milliwatts output . see chart below
Generator ground lead connection . See chart below
Dummy antenna value to be in series with generator output . See chart below
Connection of generator output lead . See chart below
Generator modulation . 30%, 400 cycles
Position of Volume Control . Fully clockwise
Position of Tone Control . Tone knob counterclockwise and both buttons out
Position of Dial Pointer with variable fully closed . On first mark to left
of 550 ke calibration mark.
Position of Anti-Static Switch . "Off" except when peaking T1 and T2

WAVE BAND SWITCH POSITION OF VARIABLE GENERATOR DUMMY GENERATOR TRIMMERS TRIMMER APPROXIMATE

A Closed 455 ke 1 mfd. 6K8G Grid T3, T1 IF
A Closed 455 ke 1 mfd. 6K8G Grid C54 Anti-Static --
A Fully open 1530 ke 0.00005 mfd. Ant. Term. C17 Oscillator --
A 1400 ke 1400 ke 0.00005 mfd. Ant. Term. C11, C15 Loop, Trans 135
A 600 mfd (rock) 800 ke 0.00005 mfd. Ant. Term. C18 Padder 85
B 5 mc 5.5 mc 400 ohms Ant. Term. C19 Oscillator 80
B 4 mc 4 mc 400 ohms Ant. Term. C2 Translator 75
C Open 18.256 mc 400 ohms Ant. Term. C22* Oscillator 35
C 15 mc (rock) 15 mc 400 ohms Ant. Term. C27 Oscillator --
D 5.55 mc 9.55 mc 400 ohms Ant. Term. C28* Oscillator --
E 9.55 mc (rock) 9.55 mc 400 ohms Ant. Term. C27 Oscillator --
F 11.71 mc 11.71 mc 400 ohms Ant. Term. C28* Oscillator 50
F 15.5 mc 15.5 mc 400 ohms Ant. Term. C27 Oscillator 40

IMPORTANT ALIGNMENT NOTES

JUNE 18, 1940

* If two peaks can be had, the correct one is with the trimmer screwed further out; the other peak is the image.
**ALIGNMENT PROCEDURE**

Output meter connections: Across primary output transformer 9 volts
Output meter reading to indicate .0050 watt for Weston type 871 output meter on 15 volt scale, App. 30% @ 400 cycles
Connection of generator ground: +S- Bus
Generator modulation: Fully clockwise

**POSITION OF DIAL**

<table>
<thead>
<tr>
<th>POSITION</th>
<th>GENERATOR FREQUENCY</th>
<th>GENERATOR CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF PEAK</td>
<td>455 kc</td>
<td>12K7GT, Grid</td>
</tr>
<tr>
<td>1500 kc</td>
<td>1500 kc</td>
<td>15A8GT, Grid</td>
</tr>
</tbody>
</table>

**Important Alignment Notes**

It is advisable to repeat the entire alignment procedure in the original order to insure greater accuracy.

Always keep the output from the test oscillator at its lowest possible value. As the sensitivity is increased by alignment, the generator output should be reduced correspondingly.

### TUBE SOCKET LOCATION

**JUNE 5, 1940**

**ALIGNMENT FREQUENCIES:**

- Oscillating
- Oscillating Padder
- Broadcast... 1500 KC
- Fixed
- Broadcast... 555-1700 KC

**LOUD SPEAKER:**

- Dynamic
- 5"
- Fixed

**POWER OUTPUT:**

- Beam Power
- Undistorted... 1.0
- Maximum... 1.8

**POWER SUPPLY:**

- All models available
- 110-125 volts, 25-60 cycle AC or DC, 30 watts

---

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This receiver has a self-contained antenna loop and does not require an additional antenna connection. If it is desired to improve reception of weak or distant stations, an additional outdoor antenna may be used. For this purpose an antenna connection is provided on the loop.
IF PEAK 455 KC

MAY 21, 1940

FOR TUNER SEE INDEX

CIRCUIT CHANGES FOR D.C. OPERATION 101.609

POWER SUPPLY:
All models available ........................ 105-125 v, 25-60 cycle AC, 70 watts

ALIGNMENT FREQUENCIES:
Oscillator Translating Trimmer
1650 kc 1400 kc 600 kc

FREQUENCY RANGE: .................. 540-1650 kc

INTERMEDIATE FREQUENCY ........... 455 kc

POWER OUTPUT:
Type ............................ Pentode
Undistorted .................... 1.5 watts
Maximum ....................... 3.5 watts

OPERATING FEATURES:
Automatic Volume Control
Push Button Tuning (5 Button)

LOUDSPEAKER:
Type ............................ Dynamic
Size ......................... 5 inch
Field coil resistance ...... 460 ohms

CHASSIS FEATURES:
Number IP stages ............. Two
Number condensers in gang ...... Two
Antenna, Built-in loop with provision for external antenna.

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Compliments of www.nucow.com
ALIGNMENT PROCEDURE

PRELIMINARY:
Output meter connection
Output meter reading to indicate 500 milliwatts
Approximate microvolts input for 500 milliwatts output
Dummy antenna value to be in series with generator output
Connection of generator output lead
Connection of generator ground lead
Generator modulation
Position of Volume Control
Position of Tone Control
Position of Dial Pointer with variable fully closed

TRIMMERS

POSITION
OF VARIABLE

GENERATOR FREQUENCY

DUMMY ANTENNA CONNECTION

TRIMMERS

ADJUSTED
(IN ORDER
SHOWN)

IMPORTANT ALIGNMENT NOTES

- The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of to 455 kc.

- Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

- The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the receiver ineffective.

PUSH BUTTON TUNING MECHANISM: Adj.

- For each button is locked or unlocked by tightening or loosening slotted screwhead when button knob is pulled off plunger. Stations are set by unlocking mechanism, tuning in station, pushing in plunger (do not detune station), releasing plunger, locking adj. by holding screw driver lightly in screwhead allowing spring tension to hold plunger against screw driver.
**Alignment Procedure**

Before starting the alignment procedure, the speaker should be set to the last position on the 500 kc end of the dial scale with the volume control in full. Set the speaker securely in the speaker case in this position and allow to dry before moving.

**OUTPUT VOLTAGE CONNECTION**
Output voltage should be applied to the tuning condenser. The signal generator output should be connected to the speaker jack. The speaker should be connected to the output of the generator. The generator output should be connected to the speaker. The output of the generator should be connected to the speaker. The output of the generator should be connected to the speaker.

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Output voltage should be applied to the tuning condenser. The signal generator output should be connected to the speaker jack. The speaker should be connected to the output of the generator. The generator output should be connected to the speaker. The output of the generator should be connected to the speaker. The output of the generator should be connected to the speaker.

**Alignment Procedure**

- **NOTE:** The set should be placed in the cabinet before steps 9 & 10 are taken. The loop and its leads must be in their final position at this time. Make a final check after installation using a weak radiated 1400 kc signal.
SEPTEMBER 30, 1940

1. Turn the Band Switch to the "A" position and tune in the desired station by means of the Tuning Control.

2. Push a button of the proper frequency and turn the Band Switch to the PB position.

3. Adjust the "a" screw with the same number as that of the button you have pushed in, until you again hear the desired station.

4. Adjust the "b" screw (below the "a" screw) for deepest tone.

5. Readjust both "a" and "b" screws for deepest tone or maximum TUNING EYE closure.

[Diagram of radio circuit and parts]
**MODEL 1591**  
**CHASSIS 100,355**

**ALIGNMENT PROCEDURE**

Before starting the alignment procedure make sure the voltmeter is set to the last mark on the 550 kc. end of the dial. Use the gauze sheet in all work.

- Output meter connection.
- Output meter reading to indicate 500 millivolt.
- Tuning of generator output to 500 kilocycle.
- Position of volume control.
- Position of the control window.
- Position of the dial pointer with the glass fully closed.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>H</th>
<th>K</th>
<th>G</th>
<th>P</th>
<th>S</th>
<th>SU</th>
<th>P</th>
<th>D</th>
<th>D₀</th>
<th>T</th>
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<tbody>
<tr>
<td>6U7G</td>
<td>R.F.</td>
<td>6.3 AC</td>
<td>0</td>
<td>NOTE B</td>
<td>26</td>
<td>105</td>
<td>0</td>
<td>134</td>
<td></td>
<td></td>
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<tr>
<td>6K9G</td>
<td>1st DET-OSC</td>
<td>6.3 AC</td>
<td>0</td>
<td>NOTE B</td>
<td>-10</td>
<td>200</td>
<td>105</td>
<td>0</td>
<td>60</td>
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<tr>
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<td>I.F.</td>
<td>6.3 AC</td>
<td>0</td>
<td>NOTE B</td>
<td>220</td>
<td>105</td>
<td>0</td>
<td>60</td>
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<tr>
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<td>-3</td>
<td>NOTE</td>
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<td>PHASE INVERTER</td>
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<td>0</td>
<td>35</td>
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<tr>
<td>6F6G</td>
<td>OUTPUT</td>
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<td>0</td>
<td>212</td>
<td>220</td>
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<tr>
<td>6U5</td>
<td>EYE</td>
<td>6.3 AC</td>
<td>-3</td>
<td>NOTE</td>
<td>14</td>
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<tr>
<td>5Y3G</td>
<td>RECTIFIER</td>
<td>6.3 AC</td>
<td>0</td>
<td>0</td>
<td>220</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

- Use a volume of 100 volts.
- Note B. Due to the high value of resistance involved, the volt-
  - Note C. The volume in 3 is 9 volts measured across the coil.

**SOCKET VOLTAGES-ALL D.C. MEASURED TO CHASSIS**

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>H</th>
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<th>P</th>
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<td></td>
<td></td>
</tr>
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<td>6K9G</td>
<td>1st DET-OSC</td>
<td>6.3 AC</td>
<td>0</td>
<td>NOTE B</td>
<td>-10</td>
<td>200</td>
<td>105</td>
<td>0</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6U7G</td>
<td>I.F.</td>
<td>6.3 AC</td>
<td>0</td>
<td>NOTE B</td>
<td>220</td>
<td>105</td>
<td>0</td>
<td>60</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>607G</td>
<td>2nd DET-OSC</td>
<td>6.3 AC</td>
<td>-3</td>
<td>NOTE</td>
<td>50</td>
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<td></td>
<td></td>
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<tr>
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<td>PHASE INVERTER</td>
<td>6.3 AC</td>
<td>0</td>
<td>0</td>
<td>35</td>
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</tr>
<tr>
<td>6F6G</td>
<td>OUTPUT</td>
<td>6.3 AC</td>
<td>0</td>
<td>0</td>
<td>212</td>
<td>220</td>
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<td>5Y3G</td>
<td>RECTIFIER</td>
<td>6.3 AC</td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

- Push pull stage - Data same as for each tube.

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Compliments of www.nucow.com
October 7, 1940

IF Peak 455 KC

POWER OUTPUT
Type: Beam Power
Sound: Undistorted: 1.0
Power: Maximum: 1.5

Power Supply:
All models available: 110-125 volts, 25-60 cycle AC or DC, 30 watts.

Alignment Notes
* First time T5 is misaligned by loosening center screw one turn.
** Short oscillator section of variable condenser. Second I.F. alignment must be done twice to secure flat top tuning.
*** Connect generator output to a separate radiating loop and pickup 1500 KC signal on receiver.

PUSH BUTTON
POSITION OF DIAL GENERATOR CONDUCOTIN
Manual "IN" ** " 455 kc 12K7Q, Grid 7", 7", 7", 7", I.F.
" ** 455 kc 12A6T, Grid T5, T5, T5, T5, I.F.
" 1500 kc 1500 kc T5, T5, T5, T5, Osc., R.F.

Automatic Tuning Control Adjustment

From the diagram, after finding where the proper pair or adjustment screws are located, trace the dotted line connecting these screws to one of the push buttons. This is the button which after the adjustments are completed, will tune in the station.

Push this button "IN".

Turn the volume control knob on full (to the extreme right) and adjust screw marked "O" until the desired station is heard. If when making this adjustment, a number of stations can be brought in as the screw is turned and it is doubtful which station is the correct one, press button No. 5 (Manual Tuning) "IN" and turn the station selector knob to the number on the dial that corresponds to the frequency of the station. Listening to the program being broadcast will identify the station when adjusting the screw "O".

Adjust the screw marked "A" for maximum volume, retuning the volume control and readjusting if necessary. This completes the adjustments for this particular station.

Proceed in the same manner to adjust the tuning screws for the other stations on your list.

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Compliments of www.nucow.com
FREQUENCY RANGES:
Band "AM" .................. 550-1700 kc
Band "FM" .................. 5.56-18.2 mc

POWER OUTPUT:
Type .................. Undistorted
Maximum .................. 0.25 watts
Intermediate Frequency .................. 0.5 watts

IMPORTANT ALIGNMENT NOTES
The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of to 455 kc.

PRELIMINARY:
Output meter connection .................. Across loudspeaker voice coil
Output meter reading to indicate 50 milliwatts .................. 0.37 volts
Approximate microvolts input for 50 milliwatts output .................. See chart below
Generator ground lead connection .................. Receiver chassis
Dummy antenna value to be in series with generator output .................. See chart below
Connection of generator output lead .................. See chart below
Generator modulation .................. Fully clockwise
Position of Volume Control .................. NI
Position of Tone Control .................. Horizontal
Position of Dial Pointer with variable fully closed .................. Vertical

WAVE BAND SWITCH

<table>
<thead>
<tr>
<th>POSITION</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA GENERATOR CONNECTION (IN ORDER SHOWN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>455 kc</td>
<td>1070 Grid T2, T1, IF Output</td>
</tr>
<tr>
<td>600 kc</td>
<td>455 kc</td>
<td>0003 mfd. Ant. Term. G1</td>
</tr>
<tr>
<td>1400 kc</td>
<td>1400 kc</td>
<td>0002 mfd. Ant. Term. G2, G3</td>
</tr>
<tr>
<td>600 kc(rock)</td>
<td>600 kc</td>
<td>0002 mfd. Ant. Term. C7, Paddler</td>
</tr>
<tr>
<td>16 mc(rock)</td>
<td>16 mc</td>
<td>400 ohms Ant. Term. C4, Translator</td>
</tr>
</tbody>
</table>

TRIMMERS ADJUSTED

<table>
<thead>
<tr>
<th>TRIMMER</th>
<th>APPROXIMATE FUNCTION MICROVOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>T4</td>
<td>-</td>
</tr>
<tr>
<td>T1</td>
<td>IF Input Wave Trep</td>
</tr>
<tr>
<td>C5</td>
<td>50</td>
</tr>
<tr>
<td>C9</td>
<td>10</td>
</tr>
</tbody>
</table>
WIRING DIAGRAM FOR SILVERTONE CHASSIS 101.605

APRIL 1, 1940

POWER SUPPLY:
- #5170. A-B block (1.5v. "A", 90v. "B")
- #6200. 3v. Storage "A"
- #6150. 45v. "B" battery
- #5071. A-Adapter necessary with 2 volt Storage "A"

ALIGNMENT FREQUENCIES:
- Oscillator
- Antenna-Transl.
- Trimmer
- Trimmer
- Padder

FREQUENCY RANGES:
- Broadcast: 545-1750 kc
- Police: 1455-2650 kc
- Short Wave: 5.95-18.3 mc

INTERMEDIATE FREQUENCY

POWER OUTPUT:
- Type: Pentode
- Undistorted: 0.1 watts
- Maximum: 0.18 watts

LOUDSPEAKER:
- Type: PM Dynamic
- Size: 6 inch

OPERATING CONTROLS:
1. Left knob: Volume
2. Next to left knob: Tone
3. Next to right knob: Wave switch
4. Right knob: Station Selector
5. Top knob: "On-Off" & Time Delay
6. Chassis rear: Battery Thrift Switch

CONTROL OPERATION:
- Turning right: Volume increase
- Turning right: "HT", "LO"
- Turning right: "AM", "FM", "POL"
- Turning ratio: 6:1
- Turning part way right: "ON"
- Turning all way right: On-Time Delay
- "LO": Maximum battery life
- "HI": Increased volume and range
PRELIMINARY:

Output meter connection
Output meter reading to indicate 50 milliwatts
Approximate microvolts input for 50 milliwatts output
Generator ground lead connection
Dummy antenna value to be in series with generator output
Connection of generator output lead
Generator modulation
Position of Volume Control
Position of Tone Control
Position of Dial Pointer with variable fully closed

WAVE BAND

<table>
<thead>
<tr>
<th>WAVE BAND</th>
<th>SWITCH</th>
<th>POSITION OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTION</th>
<th>TRIMMERS ADJUSTED (IN ORDER SHOWN)</th>
<th>TRIMMER FUNCTION</th>
<th>APPROXIMATE MICROVOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>Closed</td>
<td>455 kc</td>
<td>.1 mfd.</td>
<td>1A7G Grid 4</td>
<td>T2, T1</td>
<td>IF Output</td>
<td>IF Input</td>
<td>--</td>
</tr>
<tr>
<td>AM</td>
<td>600 kc</td>
<td>455 kc</td>
<td>.0003 mfd.</td>
<td>Ant. Term. C1</td>
<td>Wave Trap</td>
<td>Oscillator</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>AM</td>
<td>Fully open</td>
<td>1750 kc</td>
<td>.0003 mfd.</td>
<td>Ant. Term. C5</td>
<td>Transmitter</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM</td>
<td>1400 kc</td>
<td>1400 kc</td>
<td>.0002 mfd.</td>
<td>Ant. Term. C4</td>
<td>Transmitter</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM</td>
<td>800 kc (rock)</td>
<td>800 kc</td>
<td>.0003 mfd.</td>
<td>Ant. Term. C6</td>
<td>Transmitter</td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POL</td>
<td>2.4 mc</td>
<td>2.4 mc</td>
<td>400 ohms</td>
<td>Ant. Term. C5</td>
<td>Transmitter</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOR</td>
<td>16 mc (rock)</td>
<td>16 mc</td>
<td>400 ohms</td>
<td>Ant. Term. C7</td>
<td>Transmitter</td>
<td>30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTES

* The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 450 kc is known, the generator should be adjusted to the frequency of that station instead of 455 kc.

* Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

* The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVG action of the receiver ineffective.
WIRING DIAGRAM FOR SILVERTONE CHASSIS 101.603

POWER SUPPLY:
- 2v. Storage "A"
- 45v. "B" battery
- 6070 Adaptor necessary with 45v. Storage "A"

"A" Drain: 0.2 Amperes
"B" Drain: 8.5 ma.

ALIGNMENT FREQUENCIES:
- Oscillator: 1750 kc
- Translator: 1400 kc
- Padder: 600 kc

FREQUENCY RANGE:
- Broadcast: 540-1750 kc
- Intermediate Frequency: 455 kc

POWER OUTPUT:
- Type: Pentode
- Undistorted: 0.1 watts
- Maximum: 0.18 watts

LOUD SPEAKER:
- Type: FM Dynamic
- Size: .5 inch

MARCH 22, 1940
Alignment Procedure

- Output meter connections: Across loud speaker voice coil
- Output meter reading to indicate 50 milliamps
- Approximate average sensitivity in microvolts for 50 milliamps output
- Receiver chassis
- Dummy antenna value to be in series with generator output
- Generator ground lead connection
- Generator modulation: 70%, 400 cycles
- Position of Volume Control
- Horizontal (To fall on block below 550 kc calibration mark)

<table>
<thead>
<tr>
<th>POSITION OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTION</th>
<th>TRIMMER ADJUSTMENTS (IN ORDER SHOWN)</th>
<th>TRIMMER FUNCTION</th>
<th>APPROXIMATE MICROVOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>455 kc</td>
<td>.1 mfd.</td>
<td>1A7G Translator</td>
<td>T2, T1</td>
<td>IF</td>
<td>--</td>
</tr>
<tr>
<td>Open</td>
<td>1750 kc</td>
<td>.0002 mfd.</td>
<td>Grid</td>
<td></td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>1400 kc</td>
<td>1400 kc</td>
<td>.0002 mfd.</td>
<td>Ant. Term.</td>
<td>04</td>
<td>Oscillator</td>
<td>--</td>
</tr>
<tr>
<td>600 kc (rock)</td>
<td>600 kc</td>
<td>.0003 mfd.</td>
<td>Ant. Term.</td>
<td>07</td>
<td>Translator</td>
<td>50</td>
</tr>
</tbody>
</table>

Important Alignment Notes

- The variable should be rocked back and forth a degree or two while making the 600 kc adjustment.
- The alignment procedure should be repeated in the original order, step by step, to ensure greater accuracy.
- Always keep the output power from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.
SEARS ROEBUCK & CO.  
MODEL 2751  
Chassis 101.606

ALIGNMENT PROCEDURE


<table>
<thead>
<tr>
<th>WAVE BAND</th>
<th>SWITCH POSITION OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA CONNECTION</th>
<th>TRIMMERS ADJUSTED (IN ORDER SHOWN)</th>
<th>TRIMMER APPROXIMATE FUNCTION MICROVOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;AM&quot;</td>
<td>Closed</td>
<td>455 kc</td>
<td>.1 mfd.</td>
<td>1A7G Grid T2, T1</td>
<td>IF</td>
</tr>
<tr>
<td>&quot;AM&quot;</td>
<td>600 kc</td>
<td>455 kc*</td>
<td>.0002 mfd.</td>
<td>06* Wave Trap</td>
<td></td>
</tr>
<tr>
<td>&quot;AM&quot;</td>
<td>Fully open</td>
<td>1720 kc</td>
<td>.0002 mfd.</td>
<td>08 Oscillator</td>
<td></td>
</tr>
<tr>
<td>&quot;AM&quot;</td>
<td>1400 kc</td>
<td>1400 kc</td>
<td>.0003 mfd.</td>
<td>01 Translator</td>
<td></td>
</tr>
<tr>
<td>&quot;AM&quot;</td>
<td>600 ko(rock)</td>
<td>600 kc</td>
<td>.0003 mfd.</td>
<td>09 Padder</td>
<td></td>
</tr>
<tr>
<td>&quot;POL&quot;</td>
<td>4.5 mO</td>
<td>4.5 mO</td>
<td>400 ohms</td>
<td>010, 03 Os, Transl.</td>
<td></td>
</tr>
<tr>
<td>&quot;FOR&quot;</td>
<td>16 mO(rock)</td>
<td>16 mO</td>
<td>400 ohms</td>
<td>06 Translator</td>
<td></td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTES

* The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of 455 kc.

Where indicated by the word, *Rock*, the variable should be rocked back and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVU action of the receiver ineffective.

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ADDITION OF SUFFIX -1 to CHASSIS NO. CIRCUIT DIAGRAM CHANGES - 7/19/40 -
To minimize variation in overall I.F. gain bet. receivers of this model, 2 circuit changes were made, and -1 added to chassis no. Variation in I.F. gain was due to operating 12K7GT tube under "no bias" condition. Ref. to diagram in RL suppl. shows bias has been applied to 12K7GT by addition of R-12 bypassed by C-6. Also R-8 and C-6 were unnecessary and eliminated.
In a few receivers bias was placed on the 12K7GT and also the 12A8GT by conn. 15 megohm resistor from grid end of 50,000 ohm osc. leak to AVC cir.
This did not produce uniform results and was abandoned.
ADDITION OF SUFFIX -2C, -2D, -2E to CHASSIS NO. 132.803 - CIRCUIT DIAGRAM & PARTS LIST CHANGES FOR ALL MODELS - 9/30/40 - Circuit change amounts to add.of C-12 to increase impedance bet. ant. clip and power line. To eliminate discoloration of control knobs, push button caps, and dial background, the knobs and caps were moulded out of gold tenite and dial background paper changed to match. To reduce common coupling, bypass cond. C-6 was returned to chassis base instead of to ground.

ALIGNMENT

POS. OF FREQUENCY DUMMY GENERATOR GENERATOR TRIM. AJUST. TRIMMER VARIABLE GENERATOR ANTENNA CONN(high) CONN(low) (ord. shown) FUNC.
CLOSED 455 KO .1mF 12A8GT Grid Floating Gnd. T2, T1 FF
1400 KO 1400 KO .00005mF, Ant. clip Chassis base C2, C1 Translator
600 KO 600 KO .00005mF, Ant. clip Chassis base Check Point -----

MODELS 3911-3911-3911

122 803-1A-1B
122 803-1A-1D
122 803-1A-1B

LOCATION OF PARTS UNDER CHASSIS

LOCATION OF PARTS ON TOP OF CHASSIS
To comply with the requirements of the Underwriters Laboratories, a .01 mfd., 400 v. paper tubular condenser (C-12), was added in the antenna circuit, as isolation between the antenna and floating ground.

**TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS.**

**VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO FLOATING GROUND AND ARE TAKEN WITH NO SIGNAL. AC LINE VOLTAGE AT 117 VOLS. WHERE NO READING IS GIVEN THE VOLTAGE IS ZERO OR TOO LOW TO READ.**

**LOCATION OF PARTS UNDER CHASSIS**

**TUBES AND FUNCTIONS:**

- 12K7GT: R.F. Amp.
- 12SQ7GT: Detector-AVC-AF
- 35L6GT: Output
- 35Z5GT: Rectifier

**POWER SUPPLY:**

All models available

105-125 volts, AC-DC, 30 watts

**POWER OUTPUT:**

Type: Beam Tube
Undistorted: 600 Milliwatts
Maximum: 1.50 watts

**FREQUENCY RANGE:** 540 - 1725 kc.

**ALIGNMENT FREQUENCIES:**

R.F. - 1400 kc
Art. - 1400 kc

**LOCATION OF PARTS ON TOP OF CHASSIS**

SEPTEMBER 30, 1940
POWER SUPPLY:
105-125 volts 50-60 cycle or DC (25 cycle model available) 50 Watts

FREQUENCY RANGE ........ 555 ke-1580 ke
ALIGNMENT FREQUENCIES 0 cc, 1580 Ant. 1400 kc

INTERMEDIATE FREQUENCY

POWER OUTPUT:
Type ............. Beam Tube
Undistorted........ 7 Watts
Maximum ........... 1.2 Watts

LOUD SPEAKER:
Type ............. P.W. Dynamic
Size ............. 4 inch
Field ............. Permanent Magnet

See tube layout diagram for location of trimmers. Alignment may be made without removing the set from the cabinet. Connect the output meter to the two terminals shown in the tube layout diagram. These terminals are mounted on an insulated terminal strip on top of the output transformer. These terminals connect to the voice coil.

Connect the signal generator ground to the receiver chassis through a 0.1 MFD condenser. Using a .05 to .25 MFD condenser in series with the high side of the generator output, apply a 455 KC signal to the grid of the 12SQ7T I.F. amplifier tube and align the 2nd IF transformer. Repeat for the first I.F. transformer, applying the signal to the antenna section of the tuning condenser. Using a 50 MFD condenser as a dummy antenna, apply the RF signal to the antenna lead. Turn the tuning condenser to minimum capacity, set the generator to 1580 KC and trim the oscillator section. Set the generator to 1400 KC, tune in the signal and adjust the antenna trimmer. (the antenna and oscillator trimmers are located on top of the tuning condenser.) NOTE: Best alignment is obtained with the volume control at maximum and the applied signal only strong enough to give satisfactory indications on the output meter. Alignment with high signal input and retarded volume control setting is seldom accurate.

THE LOOP ANTENNA:

The loop antenna built into the receiver cabinet is directional in its reception characteristics. Therefore, reception may be improved or interference reduced by turning the set to a particular position. In locations where the signal strength is too low to give satisfactory reception from the loop antenna alone, an outside antenna may be connected to the wire projecting from the rear of the receiver. No attempt should be made to use a ground connection.
Models R5501-R5501-A

R5501-B

SEARS-ROEBUCK & CO.

Chassis 101.618

101.618-1A

Output meter connection ........ Across loudspeaker voice coil
Output meter reading to indicate 500 milliamperes .......... 1.6 volts
Approximate microvolts input for 500 milliamperes output .......... See chart below
Generator ground lead connection .................. Receiver chassis
Dummy antenna value to be in series with generator output .... See chart below
Connection of generator output lead ................. See chart below
Generator modulation ................. 30%, 400 cycles
Position of Volume Control ............. Fully clockwise
Position of Tone Control ................ Both buttons out
Position of Dial Pointer with variable fully closed .......... On first mark to left of 560 kc calibration mark.

WAVE BAND
SWITCH POSITION OF VARIABLE FREQUENCY ANTENNA CONNECTION BROWN TRIMMERS ADJUSTED TRIMMER APPROXIMATE FUNCTION MICROVOLTS

*F* Closed 455 kc .1 mfd. 6K30 Grid T2, T1 IF
*F* Fully open 1860 kc .00005 mfd. Ant. Term. C17 Oscillator --
*F* 1500 kc 1500 kc .00005 mfd. Ant. Term. C2, C13 Ant. Transfer 180
*F* 600 kc(rock) 600 kc .00005 mfd. Ant. Term. C16 Fader 55
*E* 2.4 mc 2.4 mc 400 ohms Ant. Term. C7 Transistor 120
*F* Open 18.3 mc 400 ohms Ant. Term. C26* Oscillator --
*F* 16 mc(rock) 16 mc 400 ohms Ant. Term. C11 Transistor 35
*F* 9.55 mc(rock) 9.55 mc 400 ohms Ant. Term. C10 Transistor 75
*F* 11.71 mc 11.71 mc 400 ohms Ant. Term. C26* Oscillator --
*F* 11.71 mc(rock) 11.71 mc 400 ohms Ant. Term. C9 Transistor 75

IMPORTANT ALIGNMENT NOTES

* If two peaks can be had, the correct one is with the trimmer screw further out; the other peak is the image.

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AUGUST 14, 1940

**TRIMMERS ADJUSTED**

<table>
<thead>
<tr>
<th>POSITION OF VARIABLE</th>
<th>GENERATOR / FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTION</th>
<th>TRIMMER ADJUSTED FUNCTION</th>
<th>APPROXIMATE MICROVOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>455 kc</td>
<td>.1 mfd.</td>
<td>6K89 Or-Tid</td>
<td>T2, T1 IF</td>
<td>--</td>
</tr>
<tr>
<td>600 kc</td>
<td>455 kc</td>
<td>.0005 mfd.</td>
<td>Ant. G1p</td>
<td>G7 Wave Trap</td>
<td>--</td>
</tr>
<tr>
<td>Fully open</td>
<td>1630 kc</td>
<td>.0005 mfd.</td>
<td>Ant. G1p</td>
<td>5G Oscillator</td>
<td>150</td>
</tr>
<tr>
<td>1400 kc</td>
<td>1400 kc</td>
<td>.0005 mfd.</td>
<td>Ant. G1p</td>
<td>G1 Oscillator</td>
<td>150</td>
</tr>
<tr>
<td>600 kc (rock)</td>
<td>600 kc</td>
<td>.0005 mfd.</td>
<td>Ant. G1p</td>
<td>G10 Padder</td>
<td>65</td>
</tr>
</tbody>
</table>

Output meter connection... Across loudspeaker voice coil
Output meter reading to indicate 500 milliwatts output... 1.9 volts
Approximate microvolts input for 500 milliwatts output... See chart below
Position of Tone Control... Counter-clockwise (HI)
Position of Dial Pointer with variable fully closed... On mark to left of 500 kc calibration mark

**PUSH BUTTON TUNING MECHANISM:**

The adjustment for each push button is locked or unlocked by tightening or loosening the slotted screwhead made accessible when the push button knob is pulled off of its plug...

**INTERMEDIATE FREQUENCY**

.455 kc

**POWER SUPPLY:**

- All models available
- 105-125 v. 60 cycle AC, 70 watts
- 105-125 v. 50 cycle AC, 70 watts
- 105-125 v. 25 cycle AC, 75 watts

**POWER OUTPUT:**

- Type: Beam tube
- Undistorted: 4 watts
- Maximum: 5 watts

**ALIGNMENT FREQUENCIES:**

- Oscillator Transilator
  - Trimmer 1400 kc
  - Padder 1620 kc

**FREQUENCY RANGE:**

.540-1620 kc

**LOUDSPEAKER:**

- Type: Dynamic
- Size: 10 inch
- Field coil resistance: 950 ohms
- Approx. field coil voltage drop: 90 V

**OPERATING FEATURES:**

- Tone Control
- Continuous variable Automatic Volume Control
- Push Button Tuning (5 Button)
- Combined with Automatic Record Changer

**CHASSIS FEATURES:**

- Number IF stages: Two
- Number condensers in gang: Two
- Antenna: Built-in loop with provision for external antenna.
WIRING DIAGRAM FOR SILVERTONE CHASSIS 101.634

SEARS ROEBUCK & CO.

TRIMMERS

A.M. Closed 455 kc .1 mfd. 6X8G Grid 9.76 MIL TRIMMER APPROXIMATE
A.M. 600 kc 455 kc .00005 mfd. Ant. Clip 6 6X8G Grid 9.76 MIL TRIMMER APPROXIMATE
A.M. Fully open 1020 kc .00005 mfd. Ant. Clip 6 6X8G Grid 9.76 MIL TRIMMER APPROXIMATE
A.M. 1400 kc 1400 kc .00005 mfd. Ant. Clip 6 6X8G Grid 9.76 MIL TRIMMER APPROXIMATE
P.O.S. 2.4 mf (rock) 13.4 mohm 400 ohms Ant. Clip 6 6X8G Grid 9.76 MIL TRIMMER APPROXIMATE
F.0.R 15 mohm 16 mohm 400 ohms Ant. Clip 6 6X8G Grid 9.76 MIL TRIMMER APPROXIMATE

Output meter connection... Across loudspeaker voice coil
Output meter reading to indicate 500 milliwatts... See chart below
Approximate microvolts input to indicate 500 milliwatts output... See chart below
Position of Tone Control... On mark to left of 950 kc calibration mark
Position of Dial Pointer with variable fully closed... On mark to left of 950 kc calibration mark

The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of to 455 kc.

SEPTEMBER 6, 1940

INTERMEDIATE FREQUENCY... 455 kc
POWER SUPPLY: All models available...
105-125 volt, 60 cycles AC: 115 watts
105-125 volt, 60 cycles AC: 115 watts
105-125 volt, 25 cycles AC: 180 watts
POWER OUTPUT: Type... Pentode
Undistorted... 4 watts
Maximum... 7 watts
FREQUENCY RANGES: Band "A"... 540-1620 kc
Band "B"... 1450-2530 kc
Band "C"... 5.8-15.8 mc
ALIGNMENT FREQUENCIES: Generator... Antenna-Transformer
Trimmer... Antenna-Transformer
Padder... Antenna-Transformer
1620 kc 1400 kc 600 watts
None... 3.4 mohm Fixed
15 mohm Fixed
OPERATING FEATURES: Automatic Volume Control
Push Button Tuning (5 buttons)
Tone Control Continuously variable
Combining with Automatic Record Changer
LOUDSPEAKER: Type... Dynamic
Size... 1.10 inch
Field coil resistance... 760 ohms
Approx. field coil voltage drop... 70 v.
CHASSIS FEATURES: Number of stages... Two
Number of stages and gain... Two
Underwriters Approved
Built-in broadcast band and plate for Short Wave bands (RADIONIC Antenna System)
Built-in IF Wave Trap

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TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS.
VOLTAGE READINGS SHOWN AT SOCKET PROPS ARE TO FLOATING GROUND AND ARE TAKEN WITH NO SIGNAL.
A.C. LINE VOLTAGE AT 127 VOLTS WHERE NO READING IS GIVEN THE VOLTAGE IS ZERO OR TOO LOW TO READ.

<table>
<thead>
<tr>
<th>POSITION OF VARIABLE GENERATOR</th>
<th>DUMMY CONNECTION CONNECTION (high)</th>
<th>TRIMMERS ADJUSTED (in order shown)</th>
<th>TRIMMER FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1400 kc</td>
<td>Generator base</td>
<td>CS, CI</td>
<td>R.F. Tank</td>
</tr>
<tr>
<td>600 kc</td>
<td>Generator base</td>
<td>Check Point</td>
<td>R.F. Tank</td>
</tr>
</tbody>
</table>

Output meter connection...... Across loud speaker voice coil
Output meter reading to indicate 50 milliwatts.............. 0.36 volts
When properly set with the variable condenser closed the pointer will point to the "50" calibration mark.
The alignment procedure should be repeated stage by stage, in the original order for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the A.C. section of the receiver ineffective.
Position of Volume Control........ Fully clockwise
Position of Dial Pointer with variable fully closed........ See note

MAY 18, 1940

POWER OUTPUT:
Type ........ Beam Tube
Undistorted .... 1.0 watts
Maximum ........ 2.5 watts

OPERATING FEATURES:
Automatic Volume Control
AC only, 60 cycles & 60 cycles

POWER SUPPLY:
All models available
105-125 volts, A.C. only, 60 cycles, 45 watts, 50 cycles

LOUD SPEAKER:
Type ........ Permanent Magnet
Size ........ 4 inch

CHASSIS FEATURES:
Number TRF stages ....... two

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ALIGNMENT PROCEDURE

Output meter connection: Across speaker voice coil, Connection of generator ground lead, See chart below. To chassis, Sensitivity, volume control, Phono switch. Position of volume control: Trim switches (Position No. 1)

<table>
<thead>
<tr>
<th>TUNING</th>
<th>GENERATOR</th>
<th>FUNNY</th>
<th>ANTENNA</th>
<th>GENERATOR</th>
<th>TRIMMERS</th>
<th>ADJUSTED</th>
<th>TRIMMERS</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>450 kc</td>
<td>.1 mfd</td>
<td>Grid of 4680</td>
<td>TR, T1</td>
<td>IP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>1700 kc</td>
<td>.001 mfd</td>
<td>Antenna lead</td>
<td>CLb</td>
<td>Oscillator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>1200 kc</td>
<td>.001 mfd</td>
<td>Antenna lead</td>
<td>Cia</td>
<td>Antenna</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closed</td>
<td>450 kc</td>
<td>.001 mfd</td>
<td>Antenna lead</td>
<td>Cia</td>
<td>Wave trap</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

ADJUSTMENT SETTINGS

The alignment procedure should be repeated stages by stages in the original order for best accuracy. Always keep the output from the generator at the lowest possible level so that the trimmer action will be ineffective. The location of all the alignment adjustments is shown on the top view of the chassis on the next page.

RECORDING ARM ADJUSTMENTS

The bottom of the recording arm should be exactly 1/4 inch from the surface of the record. To adjust, remove the needle retaining screw on the end of the arm, the screw for making this adjustment can be found when the arm is raised on a small platform near the hinge. Turning the adjusting screw to the left raises the arm, turning to the right lowers it. It is only possible to turn the arm a small fraction of a turn at a time.

Make a note of at least ten turns to see whether or not the needle is giving the correct pressure on the record. This is correct when the groove on the needle is at an angle of 45 degrees to the surface of the record. In general, it is a good idea to adjust the recording arm to a flat head screw, turning this screw to the right increases the depth of cut, while turning to the left decreases IP. This adjustment is quite critical and the screw should be turned not more than 1/4 turn at a time.

The diagram below shows the location of these adjustments.

RECORDING ARM ADJUSTMENTS

In the recording positions (Position 5, 6, and 5 of the Master Control Switch) the volume from the speaker is reduced. This is done automatically by the switch for three reasons, none of the power from the output tubes is needed for operating the recording head, the volume level necessary for recording is too high for listening to the voice for average rooms, and to prevent the recording head from becoming too hot. If the recording head is too high, the recording will be poor. A needle which has become dull through use or has been otherwise damaged should be replaced. The Master Control Switch should always be turned to the No. 1 (Radio) position when listening to radio programs.
**JUNE 5, 1940**

**ALIGNMENT PROCEDURE**

- Output meter connections: Across primary output transformer
- Connection of generator ground: chassis
- Generator modulation: App. 30% 9400 cycles
- Position of volume control: Fully clockwise

**POSITION**

<table>
<thead>
<tr>
<th>DIAL</th>
<th>GENERATOR FREQUENCY</th>
<th>CONNECTION</th>
<th>TRIMMER ADJUSTED</th>
<th>TRIMMER FUNCTION</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>4500 Kc</td>
<td>12A6GT, Grid</td>
<td>T6, T6</td>
<td>T3, T4</td>
<td>I.F.</td>
</tr>
<tr>
<td>1800</td>
<td>1800 Kc</td>
<td>12A6GT, Grid</td>
<td>T5, T6</td>
<td>T3, T4</td>
<td>Oso., R.F.</td>
</tr>
</tbody>
</table>

**IMPORTANT ALIGNMENT NOTES**

It is advisable to repeat the entire alignment procedure in the original order to insure greater accuracy.

Always keep the output from the test oscillator at its lowest possible value. As the sensitivity is increased by alignment, the generator output should be reduced correspondingly.

* Short oscillator section of variable condenser.
* Connect generator output to a separate radiating loop and pickup 1800 Kc signal on receiver.

**LOCATION OF TUBES**

- **12A6GT**
- **3525GT**
- **35L6GT**
- **12S6GT**

**FREQUENCY RANGE**

- Broadcast: 540-1750 Kc
- Power Output: Beam Power
  - Undistorted: 1.0
  - Maximum: 1.5
- Power Supply: All models available 110-125 volts, 25-60 cycle AC or 120 volts DC, 30 watts
- Alignment Frequencies:
  - Oscil. Trimmer: Fixed
  - Oscil.: Fixed
- Loud Speaker:
  - Type: Dynamic
  - Size: 5"
PARTS LIST

AUGUST 21, 1940

RETAIL SELLING PRICES PREPAID
PRICES SUBJECT TO CHANGE WITHOUT NOTICE

<table>
<thead>
<tr>
<th>SCHEMATIC LOCATION</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>SELLING PRICE EACH</th>
</tr>
</thead>
<tbody>
<tr>
<td>R8</td>
<td>109408436</td>
<td>Grommet, Rubber (Dial bracket Mtg.)</td>
<td>.06</td>
</tr>
<tr>
<td>R9</td>
<td>10945279</td>
<td>Pulley, Idler</td>
<td>.10</td>
</tr>
<tr>
<td>R10</td>
<td>109456244</td>
<td>Pointer</td>
<td>.25</td>
</tr>
<tr>
<td>R11</td>
<td>109461025</td>
<td>Resistor (&quot;C&quot; wasnher)</td>
<td>.03</td>
</tr>
<tr>
<td>R12</td>
<td>109462827</td>
<td>Resistor, 200 ohm 1/3 watt</td>
<td>.15</td>
</tr>
<tr>
<td>R13</td>
<td>109462828</td>
<td>Resistor, 100 M ohm 1/3 watt</td>
<td>.15</td>
</tr>
<tr>
<td>R14</td>
<td>109461207</td>
<td>Resistor, 20 M ohm 1/3 watt</td>
<td>.15</td>
</tr>
<tr>
<td>R15</td>
<td>109460440</td>
<td>Resistor, 200 M ohm 1/3 watt</td>
<td>.15</td>
</tr>
<tr>
<td>R2</td>
<td>109456244</td>
<td>Resistor, 10 mag. 1/3 watt</td>
<td>.15</td>
</tr>
<tr>
<td>R3</td>
<td>109461025</td>
<td>Resistor, 120 ohm 1/3 watt</td>
<td>.25</td>
</tr>
<tr>
<td>R4</td>
<td>109461025</td>
<td>Resistor, 1000 ohm 1 watt</td>
<td>.25</td>
</tr>
<tr>
<td>R5</td>
<td>109466248</td>
<td>Switch, Drive Cable</td>
<td>.10</td>
</tr>
<tr>
<td>R6</td>
<td>109466247</td>
<td>Switch, Tone Control</td>
<td>.25</td>
</tr>
<tr>
<td>R7</td>
<td>109466247</td>
<td>Switch, Radio/Phone</td>
<td>.50</td>
</tr>
<tr>
<td>R8,7,8,10,13,14,15</td>
<td>109468440</td>
<td>Socket, Dual Dial Lamp</td>
<td>.50</td>
</tr>
<tr>
<td>R9</td>
<td>109466247</td>
<td>Spring, Drive Cable</td>
<td>.10</td>
</tr>
<tr>
<td>R10</td>
<td>109466247</td>
<td>Switch, Tone Control</td>
<td>.25</td>
</tr>
<tr>
<td>R11</td>
<td>109466247</td>
<td>Switch, Radio/Phone</td>
<td>1.00</td>
</tr>
<tr>
<td>R12</td>
<td>109466248</td>
<td>Speaker, 6 1/2 inch Dynamic</td>
<td>5.60</td>
</tr>
<tr>
<td>R13</td>
<td>109468440</td>
<td>Transformer, Power 60 cycle</td>
<td>5.60</td>
</tr>
<tr>
<td>R14</td>
<td>109468440</td>
<td>Transformer, Power 50 cycle</td>
<td>5.76</td>
</tr>
<tr>
<td>R15</td>
<td>109468440</td>
<td>Transformer, Power 25 cycle</td>
<td>7.60</td>
</tr>
<tr>
<td>R16</td>
<td>109468440</td>
<td>Transformer, Output</td>
<td>1.25</td>
</tr>
<tr>
<td>R17</td>
<td>109468440</td>
<td>Transformer, 1st IF</td>
<td>2.25</td>
</tr>
<tr>
<td>R18</td>
<td>109468440</td>
<td>Transformer, 2nd IF</td>
<td>2.25</td>
</tr>
<tr>
<td>R19</td>
<td>109468440</td>
<td>Arm, Phonon pickup (Complete)</td>
<td>6.00</td>
</tr>
<tr>
<td>R20</td>
<td>109468440</td>
<td>Crystal Cartridge only</td>
<td>5.00</td>
</tr>
</tbody>
</table>
PUSH BUTTON TUNING

Pull the button off its shaft. Loosen the mechanism by turning the locking screw a turn or two counterclockwise. Continue to press firmly with the screwdriver while holding the shaft as far as it will go. Carefully tune in the desired station while holding the shaft in. Continue to press firmly with the screwdriver and lock the mechanism by turning the screw clockwise until it is tight. Tighten the screw just enough so that the adjustment is held firmly. If the screw is turned too tight the shaft may be forced out of line and make the buttons rub together.

ALIGNMENT PROCEDURE

See diagram at the bottom of this page for the location of all trimmers.

<table>
<thead>
<tr>
<th>POSITION OF VARIABLES</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CORRECTION</th>
<th>TRIMMERS ADJUSTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPEN (Minimum capacity)</td>
<td>450 kc.</td>
<td>.1 Mfd.</td>
<td>Antenna section of variable</td>
<td>TP, TL</td>
</tr>
<tr>
<td>MINIMUM CAPACITY</td>
<td>1700 kc.</td>
<td>50 mmf.</td>
<td>Oscillator trimmer</td>
<td></td>
</tr>
<tr>
<td>TUNE IN SIGNAL FROM GENERATOR</td>
<td>1400 kc.</td>
<td>50 mmf.</td>
<td>Antenna terminal trimmer</td>
<td></td>
</tr>
</tbody>
</table>

The alignment procedure should be repeated stage by stage, in the original order for greatest accuracy. Always keep the output from the generator at the lowest possible level so that the ATO action of the receiver is ineffective.

TUBES AND FUNCTIONS

12SQ70T . . . . Oscillator-Transistor
12Q70T . . . . . . . . . . IF
12Q570T . . . . . . . . . Detector-TO-OF-AP
12SQ70T . . . . . . . Phase Inverter
25-5506T . . . . Power Output
3596G . . . . . . . . . Rectifier

POWER SUPPLY . . . . . . . . . . . . . . . . . . . . . 106-126 volts AC 65 watts
POWER SUPPLY . . . . . . . . . . . . . . . . . . . . . 25,50 and 60 cycle models available.

SPEAKER . . . . . . . . . . . . . . . . . . Dynamic 8Ω 5/8 inch
Frequency Range . . . 600 ohms

R-R & C3 INSIDE OF 2nf IF CAN

© John F. Rider, Publisher
Output meter connection.................... Across primary output transformer
Connection of generator ground................ To chassis
Generator modulation.......................... App. 30% @ 400 cycles
Position of volume control.................... Fully clockwise

POSITION OF DIAL POINTER | GENERATOR FREQUENCY | CONNECTION | TRIMMERS | TRIMMER FUNCTION
--- | --- | --- | --- | ---
** 1500 kc | 455 kc | g660, Grid | T5, T4, T5, T6 | I.F.
1500 kc | ** | ** | ** | **

See note below

IMPORTANT ALIGNMENT NOTES
Always keep the output from the test oscillator at its lowest possible value. As the sensitivity is increased by alignment, the generator output should be reduced correspondingly.

**Short oscillator section of variable condenser

***Run a wire from the output terminal of the generator, having it come near the receiver. However, no metallic connection is made between the signal generator and the receiver.
Chassis 101.621-1, -1A, -1B, -1C (late)

SEARS ROEBUCK & CO.

MODELS 6561, 6661, 6961, 6521
Chassis 101.621, 101.621-A (early)

WIRING DIAGRAM FOR SILVERTONE CHASSIS 101.621

JUNE 5, 1940
IF PEAK 455 KC

FOR ALIGNMENT SEE INDEX

SUBJECT: ADDITION OF SUFFIX NUMBER -1 TO 101.621 CHASSIS:

Chassis identified as 101.621-1, -1A, -1B, or -1C use a different loop than the original 101.621 chassis. On these chassis, the antenna terminal connection is accessible by opening the hinged part of the back cover. Be sure to order the correct loop on replacement orders. There are also filament circuit differences as shown in the following Wiring Diagram.

AUGUST 21, 1940

IF PEAK 455 KC

©John F. Rider, Publisher
FREQUENCY RANGE:
Broadcast: 550-1600 kc
Intermediate Frequency: .455 kc
Power Supply:
"A" Battery (6 volt) . . . . 1 = $5080
Service rating - 250 hours
105-135 volts, 60 cycle, AC, 30 watts
"A" Drain: 10 ma.
"B" Batteries . . . . . . . . 2 = $6079
Service rating - 250 hours
"B" Drain: 6 ma.
Alignment Frequencies:
Oscillator: 1400 kc
Antenna-Transl.: 1450 kc
Trimmer: 600 kc
LOUDSPEAKER:
Type: FM Dynamic
Size: 5 inch

FREQUENCY RANGE:
Broadcast: 540-1630 kc
Intermediate Frequency: .455 kc
Power Supply:
"A" Battery (4-1/3 volt) . . . . 2 = $5085
Service rating - 250 hours, with
thrift switch
105-125 volts AC or DC - 30 watts
"B" Batteries . . . . . . . . 2 = $6079
Service rating - 250 hours with
thrift switch
Alignment Frequencies:
Oscillator: 1400 kc
Antenna-Transl.: 1400 kc
Trimmer: 600 kc

Model 6551
Chassis 101.620
101.620-1

If Peak 455 KC

Interchange frequency 455 kc

©John F. Rider, Publisher
MODEL 6751
SEARS ROEBUCK & CO.
Chassis 101,621,-1
MODELS 6521, 6651, 6661, 6961
Chassis 101,621 (early, late)

ALIGNMENT PROCEDURE
MODELS 6521, 6651, 6661, 6961
MODEL 6751

PRELIMINARY:
MODEL 6561
Output meter connections .................................................. Across loudspeaker voice coil
Output meter reading to indicate 50 milliwatts ...................... 0.59 volts
Generator ground lead connection ....................................... To chassis through 0.1 mfd. cond.
Connection of generator output lead ................................... See chart below
Generator modulation ........................................................ 305, 400 cycles
Position of Volume Control ............................................... Fully on
Position of pointer with variable fully closed ....................... On mark to left of 550 kc calibration mark.

MODEL 6751

TRIMMER
ADJUSTMENTS
(IN ORDER SHOWN)
TRIMMER
FUNCTION

<table>
<thead>
<tr>
<th>POSITION OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTION</th>
<th>TRIMMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>455 kc</td>
<td>.1 mfd.</td>
<td>1A9 GT Translator</td>
<td>1T1</td>
</tr>
<tr>
<td>1400 kc</td>
<td>1400 kc</td>
<td>.0002 mfd.</td>
<td>Ant. Term.</td>
<td>2C, 04</td>
</tr>
<tr>
<td>600 kc (rock)</td>
<td>600 kc</td>
<td>.0002 mfd.</td>
<td>Ant. Term.</td>
<td>05</td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTES

The chassis is removed from the case in order to align the IF but the loop antenna must be left connected.

The trimmer and padder condensers are accessible by dropping the hinged part of the back cover.

The chassis must be in place in the cabinet during alignment. If battery supply is used, the batteries must be in place in the cabinet.

The variable should be rocked back and forth a degree or two while making the 600 kc adjustment.

The alignment procedure should be repeated in the original order, step by step, to insure greater accuracy.

Always keep the output power from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.

Whenever batteries are replaced, C2 should be rechecked using a weak signal at about 1400 kc.

TUBES AND FUNCTIONS:
1A9 GT ................ Geos.-Transl.
1N95T ................ IF
1H95T ................ Detector-AVC-AF
1A85 .................. 0.005 ft
50Y6GT ................ Rectifier

FREQUENCY RANGE:
Broadcast .................. 540-1620 kc

POWER SUPPLY:
"A" Battery (6 volt) ........ 1 - $500
Service rating - 200 Hours
105-125 v. AC or DC, 20 watts

"B" Batteries ............... 2 - $5079
Service rating - 200 Hours

ALIGNMENT FREQUENCIES:
Oscillator Antenna-Transl.
Trimmer Trimmer Padder
1400 kc 1400 kc 800 kc

POWER OUTPUT:
Type ........................ Pentode
Undistorted .................. 0.09 watts
Maximum ........................ 0.3 watts

OPERATING FEATURES:
Automatic Volume Control
Battery or AC-DC Powered

LOUDSPEAKER:
Type ........................ PM Dynamic
Size .......................... 5 inch

CHASSIS FEATURES:
Number IF stages ............ One
Self-contained loop antenna

© John F. Rider, Publisher
Alignment Notes

*** Short oscillator section of variable condenser.

*** Connect generator output to a separate radiating loop and pickup 1530 kc signal on receiver.

** POSITION
GF DIAL POINTER **

** GENERATOR FREQUENCY **
455 kc
1530 kc

** GENERATOR CONNECTION **
IN002, Grid

TRIMMERS ADJUSTED
T1, T2
T9, T14

TRIGGER FUNCTION
I.P.
osc., r.f.

POWER SUPPLY
60-212H.............11 v. "A" Battery
8-2909..............45 v. "B" Battery

"A" Drain..............25 Amperes
"B" Drain.............11.5 ma.
SEARS ROEBUCK & CO.

SEPTEMBER 30, 1940

INTERMEDIATE FREQUENCY... 455 kc

POWER SUPPLY:
*A* Battery (4-1/2 volt)... 2 - #5085
Service rating - 200 Hours,
Drain: 50 ma.
105-135 volts, AC-DC - 25 watts

*B* Batteries... 2 - #6090
Service rating - 200 Hours,
Drain: 12.5 ma.

ALIGNMENT FREQUENCIES:
Oscillator Antenna-Trans.
Trimmer Trimmer Padder
1630 kc 1400 kc 600 kc

FREQUENCY RANGE:
Broadcast... 540-1820 kc

LOUDSPEAKER:
Type... PW Dynamic
Size... 5 inch

POWER OUTPUT:
Type... Beam
Undistorted... 0.150 watts
Maximum... 0.3 watts

ALIGNMENT PROCEDURE

LOCATION OF PARTS UNDER CHASSIS-101.637

POS. OF VARIABLE GENERATOR FREQUENCY DUMMY ANTENNA CONNECTION TRIMMER ADJUSTMENTS TRIMMER FUNCTION
Closed 455 kc .1 mfd. 1A7GT Transl. T2, T1 IF
Open 1630 kc 1400 kc 600 kc
1400 kc 600 kc
position of Volume Control... 600 kc
position of Pointer with variable fully closed... (IN ORDER SHOWN)
Output meter connections... 550 kc calibration mark.
Output meter reading to indicate 50 milliwatts... Across loudspeaker voice coil

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Compliments of www.nucow.com
Compliments of www.nucow.com
SEARS ROEBUCK & CO.

MODEL 6751-A
Chassis 101.636

WIRING DIAGRAM FOR SILVERTONE CHASSIS 101.636

Tube sockets are viewed from underside of chassis. Voltage readings shown at socket positions are to point A, and are taken with no signal. Where no reading is given, the voltage is zero or too low to read.

SEPTEMBER 30, 1940

INTERMEDIATE FREQUENCY

455 kc

FREQUENCY RANGE:
Broadcast 540-1620 kc

POWER SUPPLY:
A Battery (6 volt) 1 - 6V6
Service rating - 280 hours
A Battery: 50 ma.
B Battery 2 - 6V6
Service rating - 500 hours
B Battery: 0.3 ma.

ALIGNMENT FREQUENCIES:
Oscillator, Antenna-Transmitter
Trimmer 1620 kc
Padner 1400 kc
600 kc

POWER OUTPUT:
Type Pentode
Unidrected 0.05 watts
Maximum 0.3 watts

LOUDSPEAKERS:
Type FM Dynamic
Rise 5 inch

CHASSIS FEATURES:
Number of stages: One
Self-contained apex antenna
Underwriters Approved

OPERATING FEATURES:
Automatic Volume Control
Battery or 65-90 Volts

©John F. Rider, Publisher

Compliments of www.nucow.com
Output meter connections-------------------Across primary output transformer
Connection of generator output lead-------------------See Chart below
Generator modulation-------------------30%, 400 cycles
Position of volume control-------------------Fully on

**POSITION OF VARIABLE**

**FREQUENCY** | **GENERATOR CONNECTION** | **TRIMMER ADJUSTMENTS** | **TRIMMER FUNCTION**
---|---|---|---
Closed | 455 KC | 1A7GT Grid | \(T_3, T_4, T_5, T_6\) | I.F.
1500 KC | 1500 KC | * | \(T_2, T_1\) | Osc. R.F.

* Run a wire from the output terminal of the generator, having it come near the receiver. However, no electrical connection is made between the signal generator and the receiver.

The batteries should be in the proper position when aligning the receiver.

Always keep the output power from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.

**IF PEAK 455 KC**

**NOVEMBER 12, 1940**
### Table: Frequency and Output Connections

<table>
<thead>
<tr>
<th>Wave-Band Switch Position</th>
<th>Generator Frequency</th>
<th>Dummy Antenna</th>
<th>Generator Connection</th>
<th>Trimmers Adjusted (In order shown)</th>
<th>Trimmer Function</th>
<th>Approximate Microvolts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast</td>
<td>455 kc</td>
<td>0.1 mfd.</td>
<td>6SK7 1-F Grid</td>
<td>L9, L10 2nd I-F Transformer</td>
<td>5200</td>
<td></td>
</tr>
<tr>
<td>Broadcast</td>
<td>455 kc</td>
<td>0.1 mfd.</td>
<td>6SA7 Grid</td>
<td>L7, L8 1st I-F Transformer</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td>Short Wave</td>
<td>15 mc</td>
<td>15 mc</td>
<td>Ant. C5 Osc.*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Wave</td>
<td>15 mc (Rock)</td>
<td>15 mc</td>
<td>Ant. C2 Ant.**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadcast</td>
<td>1500 kc</td>
<td>1500 kc</td>
<td>Ant. C6 Osc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadcast (Rock)</td>
<td>600 kc</td>
<td>600 kc</td>
<td>Ant. L6 Osc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadcast</td>
<td>1500 kc</td>
<td>1500 kc</td>
<td>Ant. C6 Osc.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Output meter connections:**
- Across speaker voice coil
- Use minimum capacity peak if two peaks can be obtained.
- Use maximum capacity peak if two peaks can be obtained.
- Values shown under "Microvolts" are only approximate.

**Output meter reading to indicate 1.0 watt output:** 2 volts

**Chassis Features:**
- Automatic Volume Control
- "A" Band Oscillator Coil
- Two-Point Tone Control
- Tuning Drive Ratio: 25 to 1

**Diagram:**
- TUBE, TRIMMER AND PARTS LOCATION—TOP VIEW
- TUBE, TRIMMER AND PARTS LOCATION—BOTTOM VIEW

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*Compliments of [www.nucow.com]*
ALIGNMENT PROCEDURE

MODEL 7312

This receiver is a two-band set covering the broadcast band 540-1560 kHz, and the short wave band 5000-26,000 kHz. The circuit is a conventional type using vacuum tube amplifiers and detector pentode converters are used for tuning. The broadcast receiver is adjustable over a narrow range. The short wave receiver is fixed for operation. The broadcast and short wave receivers have a separate output connection for connection to a loudspeaker. The broadcast receiver is also adjustable through a variable control.

The normal alignment frequencies are shown below. It is to be noted that after aligning according to instructions, the top frequency of the set may not agree with the calibration. If the top frequency is still not in agreement, the final stage should be checked for proper operation. The re-tuning trimmer should be adjusted to permit the reception of the desired signal.

PRELIMINARY

NOTE: Output meter reading to indicate 50 milliamperes (mA). Name, and position of volume control

Position of band switch

RANGE POSITION OF GENERATOR DIPPED DWELL JAP ANNA CONDENSER TRIMMER ADJUSTED

<table>
<thead>
<tr>
<th>BAND</th>
<th>POSITION OF GENERATOR</th>
<th>DIPPED DWELL</th>
<th>JAP ANNA CONDENSER TRIMMER ADJUSTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Wave</td>
<td>open</td>
<td>1000 mH</td>
<td>400 mH</td>
</tr>
<tr>
<td>Broadcast</td>
<td>open</td>
<td>1500 mH</td>
<td>600 mH</td>
</tr>
<tr>
<td>Broadcast</td>
<td>closed</td>
<td>1500 mH</td>
<td>600 mH</td>
</tr>
</tbody>
</table>

* The variable condenser should be rocked back and forth a degree or two while making the adjustments.

NOTE: In making the broadcast band adjustments (1400 kHz and 600 kHz), the loop antenna should be on a line with the chassis and batteries that will be in the cabinet. Do not make the broadcast band with the loop near a large metal object such as the top of a metal wastebasket.

Compress a turn loop to the terminals of the signal generator and couple this loop very loosely to the receiver loop.

If two peaks can be cut, the correct one with the trimmer screw put out (minimum separation in any other place is the image). The alignment procedure should be repeated step by step in the original order for best accuracy. Always make sure that the output from the signal generator at its lowest possible value in order to make the ADJUSTMENT procedure of the receiver ineffective.

THE LOOP ANTENNA

The self contained loop antenna is directional in its characteristics, therefore, reception may sometimes be improved or interfered with, by turning the set in a particular direction. Location where the signal strength is too low to give satisfactory reception, either because of distance from the station, or because of shielding resulting from nearby metal or equivalent metal objects in the building, an outside antenna is necessary. This antenna should be connected to the loop in the rear of the receiver.

SHORT WAVE ANTENNA

* A real antenna is provided for the short wave range of this receiver. This antenna should be fully extended and may be wound around a piece of tubing or under a rug. Where greater signal pickup is necessary a good outdoor antenna should be used.

GROUND:

When either the real antenna or an outdoor antenna is used, a good ground is necessary for best reception. The receiver is operated on batteries. Do not connect or ground to receiver when it is operating on a power line.

THE HEATER CIRCUIT:

The heater of the DD70 tube is connected directly across the power line. The 6067, 6070, and 6D9 filament circuits are heated by the current through the filament. Operation of the heater circuit is, therefore, a simple matter. Operation of the filament is controlled by the voltage to the grid. Operation of the grid is controlled by the filament. If any of the filaments should become faulty, the filament will have no effect on the operation of the receiver.

POSITION OF THE POWER COND PLUS

On AC, the power cord should be placed in both its possible positions in the receptacle and left in the position that agrees with the set. On DC, the receiver will work at one position of the plug in its receptacle only.

POWER OUTPUT:

<table>
<thead>
<tr>
<th>TYPE</th>
<th>LOUD SPEAKER</th>
<th>PERFORMANCE MAGNET DYNAMIC</th>
<th>PLATE</th>
<th>MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>5 inch</td>
<td>90 watt</td>
<td>1500 mH</td>
<td>600 CIGI</td>
</tr>
</tbody>
</table>

MODEL 7314

ALIGNMENT PROCEDURE

Preliminary

Output meter connection

Output meter reading to indicate 50 milliamperes (mA). See chart below.

Position of generator output load

Position of volume control

Position of band switch

RANGE POSITION OF GENERATOR DIPPED DWELL JAP ANNA CONDENSER TRIMMER ADJUSTED

<table>
<thead>
<tr>
<th>BAND</th>
<th>POSITION OF GENERATOR</th>
<th>DIPPED DWELL</th>
<th>JAP ANNA CONDENSER TRIMMER ADJUSTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>1500 kHz</td>
<td>1500 mH</td>
<td>600 mH</td>
</tr>
<tr>
<td>Open</td>
<td>1500 kHz</td>
<td>1500 mH</td>
<td>600 mH</td>
</tr>
</tbody>
</table>

* The variable condenser should be rocked back and forth a degree or two while making the adjustments.

NOTE: In making the broadcast band adjustments (1400 kHz and 600 kHz), the loop antenna should be on a line with the chassis and batteries that will be in the cabinet. Do not make the broadcast band with the loop near a large metal object such as the top of a metal wastebasket.

Compress a turn loop to the terminals of the signal generator and couple this loop very loosely to the receiver loop.

If two peaks can be cut, the correct one with the trimmer screw put out (minimum separation in any other place is the image). The alignment procedure should be repeated step by step in the original order for best accuracy. Always make sure that the output from the signal generator at its lowest possible value in order to make the ADJUSTMENT procedure of the receiver ineffective.

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The heater of the DD70 tube is connected directly across the power line. The 6067, 6070, and 6D9 filament circuits are heated by the current through the filament. Operation of the heater circuit is, therefore, a simple matter. Operation of the filament is controlled by the voltage to the grid. Operation of the grid is controlled by the filament. If any of the filaments should become faulty, the filament will have no effect on the operation of the receiver.

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POWER OUTPUT:

<table>
<thead>
<tr>
<th>TYPE</th>
<th>LOUD SPEAKER</th>
<th>PERFORMANCE MAGNET DYNAMIC</th>
<th>PLATE</th>
<th>MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>5 inch</td>
<td>90 watt</td>
<td>1500 mH</td>
<td>600 CIGI</td>
</tr>
</tbody>
</table>

Important Alignment Notes

Where indicated by the word "peak", the variable condenser should be rocked back and forth a degree or two while making the adjustments.

The chaos is moved from the zero in order to make alignment adjustments. Once set, the loop antenna should be placed in the same relative position to the chassis as it occupies in the new.

Alignment should be done with the receiver operating from batteries.

The alignment procedure should be repeated step by step, to insure greater accuracy.

Always keep the output power from the generator at its lowest possible value to prevent the AFC action of the receiver from interfering with accurate alignment.

ELECTRICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>TINER AND FUNCTIONS</th>
<th>FRRROOM ON</th>
<th>PRRROOM ON</th>
<th>TINER</th>
<th>PLATE</th>
<th>MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>T250</td>
<td>150</td>
<td>150</td>
<td>150 mH</td>
<td>150 mH</td>
<td>150 mH</td>
</tr>
</tbody>
</table>

PWR SUPPLY:

<table>
<thead>
<tr>
<th>TYPE</th>
<th>POWER OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>250 mH</td>
</tr>
</tbody>
</table>

FREQUENCY RANGES

<table>
<thead>
<tr>
<th>BAND</th>
<th>FREQUENCY</th>
<th>ALIGNMENT FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Wave</td>
<td>1500 kHz</td>
<td>1500 kHz</td>
</tr>
</tbody>
</table>

INTERSTATE FREQUENCY

<table>
<thead>
<tr>
<th>TYPE</th>
<th>POWER OUTPUT</th>
<th>PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>5 inch</td>
<td>90 watt</td>
</tr>
</tbody>
</table>

MECHANICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>OPERATING CONDITIONS</th>
<th>CONTROL OPERATIONS</th>
<th>TURNING RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left knob</td>
<td>Volume knob</td>
<td>1:10</td>
</tr>
<tr>
<td>Right knob</td>
<td>Station Selector</td>
<td>1:10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPE</th>
<th>POWER OUTPUT</th>
<th>PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>5 inch</td>
<td>90 watt</td>
</tr>
</tbody>
</table>

MARCH 28, 1940

SEARS ROEBUCK & CO.

125 E. 31, SEARS, ROEBUCK & CO.

PAGE 109, 369

CHASIS 113.504

1264 SEARS, ROEBUCK & CO.
ALIGNMENT PROCEDURE

Output meter connections: Across speaker voice coil.
Output meter reading at 0.05 watt output: 0.4 volt.
Approximate average sensitivity in microvolts for 0.05 watt output: See chart below.
DUMMY antenna: To be inserted in series with generator output. DUMMY antenna may be inserted in series with generator output. See chart below.
Connection of generator output lead: See chart below.
Connection of generator ground lead: Style C.
Generator modulation: To chassis, 354, 400 cycles.
Position of Volume Control: Fully clockwise.
Position of Tune Control: Fully clockwise.

<table>
<thead>
<tr>
<th>Wave Band</th>
<th>Switch Position</th>
<th>Position of Dial Pointer</th>
<th>Generator Frequency</th>
<th>Dummy Antenna Connection</th>
<th>Generator Connection</th>
<th>Trimmer Adjusted (If shown)</th>
<th>Trimmer Function</th>
<th>Approximate Microvolts</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Broadcast&quot;</td>
<td>High End</td>
<td>455 kc</td>
<td>0.001 mfd.</td>
<td>1X5-Q 1-P</td>
<td>Grid Cap</td>
<td>L19, L14</td>
<td>2nd I-P</td>
<td>Tuned</td>
</tr>
<tr>
<td>&quot;Broadcast&quot;</td>
<td>High End</td>
<td>455 kc</td>
<td>0.005 mfd.</td>
<td>1X5-Q 2-P</td>
<td>Grid Cap</td>
<td>L11, L12</td>
<td>1st I-P</td>
<td>Tuned</td>
</tr>
<tr>
<td>&quot;Broadcast&quot;</td>
<td>150 kc (153.5)</td>
<td>1,500 kc</td>
<td>0.0001 mfd.</td>
<td>Ant.</td>
<td>C22, C23</td>
<td>Osc.</td>
<td>Ant.</td>
<td>13</td>
</tr>
<tr>
<td>&quot;Broadcast&quot;</td>
<td>600 kc (153.5)</td>
<td>600 kc</td>
<td>0.0003 mfd.</td>
<td>Ant.</td>
<td>L6</td>
<td>Osc.</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>&quot;Medium Wave&quot;</td>
<td>6.6 mc (153.5)</td>
<td>6.6 mc</td>
<td>300 ohms</td>
<td>Ant.</td>
<td>C24, C26</td>
<td>Osc.</td>
<td>Ant.</td>
<td>12</td>
</tr>
<tr>
<td>&quot;Short Wave&quot;</td>
<td>2.5 mc (153.5)</td>
<td>2.5 mc</td>
<td>300 ohms</td>
<td>Ant.</td>
<td>L8</td>
<td>Osc.</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>&quot;Short Wave&quot;</td>
<td>15.2 mc (153.5)</td>
<td>15.2 mc</td>
<td>300 ohms</td>
<td>Ant.</td>
<td>L9</td>
<td>Osc.</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>&quot;Short Wave&quot;</td>
<td>10 mc (153.5)</td>
<td>10 mc</td>
<td>300 ohms</td>
<td>Ant.</td>
<td>C23</td>
<td>Ant.</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>&quot;Broadcast&quot;</td>
<td>1,500 kc (153.5)</td>
<td>1,500 kc</td>
<td>0.0001 mfd.</td>
<td>Ant.</td>
<td>C23</td>
<td>Osc.</td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTES

* Use minimum capacity value if two values can be obtained.
** Use maximum capacity value if two values can be obtained.

Where indicated by the word "Rock," the variable tuning condenser should be rocked back and forth a degree or two while making this adjustment.
Each step of the alignment should be repeated in its original order for greater accuracy. Always keep the output from the generator at its lowest possible value to prevent the biasing action of the set (interfering with accurate alignment).
Adjustment locations are shown on the top and bottom parts location views of chassis.
Remove dummy used for alignment to any other band. Grid cap leads should remain in place during alignment.

Wave Band Notes on Variable Condenser Drive

- The tuning dial is fastened to the cabinet and cannot be used for certain adjustments when chassis is out of cabinet; therefore, a calibration mark is inserted on the dial in which is secured the point where the dial condenser is most used in the circuit. The calibrating pins are inserted in the dial in the cabinet, in which the condenser is most used in the circuit. The calibration marks are given to the alignment table.

As the first step in calibration, check the position of the dial. The dial must be a horizontal position when the chassis is fully seated. The distance between the dial condenser in the drum must be vertical, and the drum must be slightly off center. The drum is held in the short首席 by means of a stop pin which is inserted in the alignment table.

For Calibration Scale-"If the condenser is in the correct position, the dial drive must be in the horizontal position when the chassis is fully seated, and the drum must be vertical and the drum must be slightly off center. The drum is held in the short chair by means of a stop pin which is inserted in the alignment table.

The dial must be rocked back and forth a degree or two while making this adjustment.

For Calibration Scale-"If the condenser is in the correct position, the dial drive must be in the horizontal position when the chassis is fully seated, and the drum must be vertical and the drum must be slightly off center. The drum is held in the short chair by means of a stop pin which is inserted in the alignment table.

The dial must be rocked back and forth a degree or two while making this adjustment.

For Calibration Scale-"If the condenser is in the correct position, the dial drive must be in the horizontal position when the chassis is fully seated, and the drum must be vertical and the drum must be slightly off center. The drum is held in the short chair by means of a stop pin which is inserted in the alignment table.
OCTOBER 7, 1940

IF PEAK 455 KC

FREQUENCY RANGE
Broadcast......535-1730

POWER SUPPLY:
All models available...

BATTERY AND 110-125 VOLS AC-DC

LOUD SPEAKER:
Type..........Dynamic
Size..........5"
Field...........P.M.

POWER OUTPUT
Type.......Beam Pentode
Undistorted....175 MW
Maximum........350 MW

POSITION OF VARIABLE
Generator Frequency
Generator Connection
TRIMMER ADJUSTMENTS
TRIMMER FUNCTION

Closed
455 KC
1A7GT Grid
T3, T4
T5, T6
I.F.

1500 KC
1500 KC

The complete assembly of loop mounting and chassis shelf should be removed as a unit in order to align the receiver.

The batteries should be in the proper position when aligning the receiver.

* Run a wire from the output terminal of the generator, having it come near the receiver. However, no electrical connection is made between the signal generator and the receiver.

Always keep the output power from the generator at its lowest possible value to prevent the a.v.c. of the receiver from interfering with accurate alignment.
A. MAIN LEVEL.—This lever is basically important in that it inter-
links the various individual mechanisms which control needle landing, 
tripping, cutting, retraction, etc., and the adjustment is made for the 
main lever. Rotate the turntable until the change is out-of-cycle, 
and make sure the needle is at (A) so that the roller clears the nose 
of the cam plate by 1/16 inch.

B. TRACTION CLUTCH.—The motion of the tone arm toward the center 
of the record is transmitted to the trip pedal "B" by the trip lever "Y" 
through a friction clutch "B". If the motion of the 
pedal "B" is not be 
trapped during this ad-
justment. After setting 
screw "Y" adjust screw "B" so that when the trip is depressed flush with top 
of record, there is a vertical spacing between the knife, in its lowest rot-
tional position, and the tail, 180.00 +/- 0.10 mm.

NOTE: Numbers refer to parts—letters refer to adjustments.

F.A-9. RECORD SEPARATING KNIFE.—The upper plate (knife) "F", or 
each of the record posts serves to separate the lower record from the 
record posts. The adjustment for the change is out-of-cycle is 
esential that the spacing between the knife and the rotating rec-
order shelf "K" be accurately maintained. This setting for the 10-inch 
record is nominally 0.008 inch, and for the 12-inch record is 0.076 inch.

To adjust, rotate the knife to the point of minimum vertical separa-
tion from the record shelf and twist screw "G" to set and locknut "H" to 
0.006 inch separation. Screw "G" must not be de-
pressed during this ad-
justment. After setting 
screw "G" adjust screw "K" so that when the tip is depressed with top 
of record, there is a vertical spacing between the knife, in its lowest ro-
tational position, and the tail, 180.00 +/- 0.10 mm.

E. RECORD SUPPORT SHELF.—The record shelf revolves during 
the change cycle to allow the lower record to drop onto the turntable.
Both posts are rotated simultaneously by a gear 
and coupled to the 
main lever "K", and it is necessary that adjustment 
be such that the record is released from both shelves at the same instant. 
To adjust, place a 12-inch record on the turntable, 
move mechanism to the point where tone arm is in a maximum or outward from turntable, lift record upward until 
it is in contact with both separating 
mechanism. This ensures 
loosen screws "H" and shift record shelves so that the 
curved inner edges of the shelf are electrically 
spaced at least 1/16 inch from record edge. Tighten the knob screw "H", run mechanism through cycle several times to check motion, 
then tighten cone pointed screw "N".

If record shelves or knives are bent, or not perfectly horizontal, 
operation and function of mechanism will suffer.

J. TONE ARM REST SUPPORT (not shown).—When the changer is out-of-
cycle, the front lower edge of the pickup post is above surface of piano board. This may be adjusted by bending 
the tone arm support bracket, which is associated with the tone arm 
mounting base, in the required direction.

K. TRIP PAWL STOP BUMP.—The position of the trip pawl stop pin "K" 
is related to the main lever "K" and the record at the time 
the lever enters the cam. By bending the pin support either toward 
away from trip pawl bearing stud, the roller can be moved with 
the cam later or earlier, respectively. This adjustment should be such that 
the roller definitely clears the run out guide as well as the 
noise of the cam plate.

LUBRICATION.—Petroleum or petroleum jelly should be applied 
to cam, main gear, spindle pinion gear, and gears of record posts.

Light machine oil should be used in the cam was horizontal 
record post bearing, record post bearings, and all other bearings of various levers on 
underside of motor board.

Apply a few drops of light machine oil to the motor spindle bearing and oil hole adjacent to the spindle bearing. The oil holes has a screw plug.

Do not allow oil or grease to come in contact with, rubber mounting 
tape, rubber bumper, or rubber spindle cap.

MISCELLANEOUS SERVICE HINTS

Before servicing the automatic record changer, inspect the assembly to see that all levers, parts, gears, springs, etc., are in good order and 
are correctly assembled.

A. BIND or JAM in the mechanism can usually be relieved by rotating the turntable in the reverse direction.

The changer can be conveniently rotated through its change cycle by pushing the index lever to " rejected " and revolving the turntable by hand. Six 
turntable rotations are required for one change cycle.

If the index lever or cabinet is not perfectly level, normal operation is likely to be affected.

1. The ten and 12 inch records must be absolutely flat for smooth operation when using a mixture of the two sizes.

2. Incorrect adjustment of a particular mechanism of the changer is generally exhibited in a specific mode of improper operation. The following 
relations between effects on operation and the usual misadjustments will enable ready adjustment in most cases.

3. For any irregularity of operation, the adjustment of the main lever "K" should be checked first as in "A".

4. Needle does not land properly on 10 inch record but correct on 12 inch record—check needle adjustments "B" and "C".

5. Needle does not land properly on 12 inch record but correct on 10 inch record—check adjustment "D".

6. Pedals do not work properly on both 10 and 12 inch records—change plate adjustments "B" and "C".

7. Pedal do not work properly on 10 inch record—check pedal adjustments "B" and "C".

8. Pedal do not work properly on 12 inch record—check pedal adjustments "B" and "C".

9. Pedal do not work properly on 10 inch record—check pedal adjustments "B" and "C".

10. Pedal do not work properly on 12 inch record—check pedal adjustments "B" and "C".

11. Needle lands in 10 inch position on 12 inch record or misses record when playing both sizes—check needle adjustments "B" and "C".

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Compliments of www.nucow.com
When the radio is used in shaded areas or when located a great distance from broadcast stations, the volume of stations operating in the 540-1600 K.C. band may not be ample in which case it would be necessary to attach a 25-50 ft. outdoor aerial to the blue lead coming out the rear of this chassis to obtain satisfactory results.

DIAL LIGHT

It is normal for the dial light to dim for approximately 30 seconds after set is turned "on", and then attain normal brilliance — also on very loud signals. The light may fluctuate.

Always use a 6.3 volt 15 ampere dial light.

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Compliments of www.nucow.com
**MODELS IU-212UL,212UL ALIGNMENT PROCEDURE**

For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

When adjusting 1600 kilocycle oscillator trimmer 600 K.C. paddder, 455 K.C. R.F. trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to loop. Couple test oscillator to receiver loop by: (a) Make a loop consisting of five to ten turns of No. 20 to 30 size wire wound on a three inch form and attach across output of test oscillator. (b) Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.

**FOLLOW THIS PROCEDURE FOR MODELS IU-214UL,214UL.FOR TRIMMERS SEE PAGE 12-14**

<table>
<thead>
<tr>
<th>Place band switch for operation on:</th>
<th>Set receiver dial to:</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy antenna in series with output of test oscillator consisting of:</th>
<th>Attach output of test oscillator to:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F. alignment use any band position.</td>
<td>Any point where no interfering signal is received</td>
<td>455 K.C.</td>
<td>6.2 M.E. condenser</td>
<td>High side to cold cap of 12SA7 tube. Low side to frame of condenser through 0.01 Mfd. condenser.</td>
<td>Adjust each of the second I.F. transformer trimmer for maximum output, then adjust each of the first I.F. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>1000 to 500 K.C. Band</td>
<td>1 Rotate gang condenser to Maximum Capacity</td>
<td>Exactly 1000 K.C.</td>
<td>None</td>
<td>Use Small Loop To couple test oscillator to receiver loop. Low side to frame of condenser through 0.01 Mfd. condenser.</td>
<td>Adjust R.F. coil for minimum 455 K.C. signal.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Exactly 1000 K.C.</td>
<td>None</td>
<td>Use Small Loop To couple test oscillator to receiver loop. Low side to frame of condenser through 0.01 Mfd. condenser.</td>
<td>Adjust 1600 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Approx. 1400 K.C.</td>
<td>Approx. 1400 K.C.</td>
<td>None</td>
<td>Use Small Loop To couple test oscillator to receiver loop. Low side to frame of condenser through 0.01 Mfd. condenser.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Approx. 600 K.C.</td>
<td>Approx. 600 K.C.</td>
<td>None</td>
<td>Use Small Loop To couple test oscillator to receiver loop. Low side to frame of condenser through 0.01 Mfd. condenser.</td>
</tr>
<tr>
<td>5.7 to 18.3 M.C. Band</td>
<td>1</td>
<td>Exactly 18.3 M.C.</td>
<td>18.3 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>High side to Blue Ant. Lead. Low side to frame of gang condenser through 0.01 Mfd. condenser.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Approx. 15 M.C.</td>
<td>Approx. 15 M.C.</td>
<td>400 Ohm</td>
<td>High side to Blue Ant. Lead. Low side to frame of gang condenser through 0.01 Mfd. condenser.</td>
</tr>
</tbody>
</table>

---

**MODELS IU-212UL,212UL**

- **115V AC-DC**
- **BLUE EXT. ANT.**
- **SOL GT POWER**
- **12SQ7 DET.-ANG. R.F.**
- **12SK7 IF.**
- **12SA7 R.F.**
- **12SK7 R.F.**
- **2x I.F. TRIMMERS 455 KC.**
- **600 KC. OSC. PADDER FOR 540-1800 KC. BAND**
- **16.3 KC. OSC. TRIMMER FOR 5.7-18.3 KC. BAND**
- **1600 KC. OSC. TRIMMER FOR 540-1800 KC. BAND**

**NOTE:** IN SOME MODELS PARTS (55), (47), AND (48) ARE OMITTED. SEE WIRING DIAGRAM.
ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

When adjusting 1730 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to loop. Couple test oscillator to receiver loop by: (a) Make a loop consisting of five to ten turns of No. 20 to 30 size wire wound on a three inch form and attach across output of test oscillator. (b) Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.

<table>
<thead>
<tr>
<th>Place band switch for operation on:</th>
<th>Set receiver dial to:</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy antenna in series with output of test oscillator consisting of:</th>
<th>Attach output of test oscillator to:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. P. alignment use any band position.</td>
<td>Any point where no bellowing signal is received</td>
<td>Exactly 650 K.C.</td>
<td>0.2 Mfd condenser</td>
<td>High side to grid cap of 1A7GT tube. Do not remove cap.</td>
<td>Adjust each of the second I.F. transformer trimmers for maximum output, then adjust each of the first I.F. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>1730 to 540 K.C. Band</td>
<td>1</td>
<td>Exactly 1730 K.C.</td>
<td>None</td>
<td>Use Small Loop to couple test oscillator to receiver loop.</td>
<td>Adjust 1730 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Approx. 1400 K.C.</td>
<td>None</td>
<td>Use Small Loop to couple test oscillator to receiver loop.</td>
<td>While rocking gang condenser adjust 1400 K.C. loop trimmer for maximum output.</td>
</tr>
</tbody>
</table>
DIAL LIGHT

It is normal for the dial light to be dim for approximately 60 seconds after set is turned "on" and then attain normal brilliance — also, on very loud signals the light may fluctuate.

Always use a 6.3 volt .15 ampere dial light.

VOLTAGE TABLE

FOR OTHER DATA, SEE INDEX

OUTSIDE AERIAL

When the radio is used in shielded areas or when located a great distance from broadcast stations, the volume of stations operating in the 540-1600 K.C. band may not be ample in which case it would be necessary to ATTACH A 25-50 ft. OUTDOOR AERIAL TO THE BLUE LEAD COMING OUT THE REAR OF THIS CHASSIS to obtain satisfactory results.
MODEL 170-BL

SENTINEL RADIO CORP.

ALIGNMENT PROCEDURE

BEFORE ALIGNING, PLACE LOOP ANTENNA AND THE "A" AND "B" BATTERIES IN THE SAME
APPROXIMATE POSITION IN THE BACK OF CHASSIS THAT THEY WILL BE IN WHEN THE SET IS
IN THE CABINET AND THE CABINET BACK CLOSED.

When adjusting 1400 kilocycle antenna and R.F. trimmer, do not connect test oscillator to terminals
on bottom of cabinet back.

Couple test oscillator to receiver loop by:

a) Make a loop consisting of five to ten turns of No. 20 to 30 size wire wound on a three inch
form and attach across output of test oscillator.

b) Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.

Because of the directional effect of the loop
aerial, it is important TO TUNE IN THE SIGNAL
TO THE POINT OF LOUDEST VOLUME AND
CLEARER TONE WITH THE TUNING KNOB
AND THEN ROTATE THE RADIO TO THE
POSITION OF GREATEST VOLUME.

THE DAYLIGHT RANGE OF THIS RADIO IS
APPROXIMATELY 50 MILES—NIGHT TIME
RANGE WILL BE GREATER THAN THIS. When
the radio is used in a location a great distance
from broadcast stations, or when the volume
of the stations received is not ample, or when
it is operated in boats, buildings, etc.,
constructed with a large amount of steel, IT MAY
BE NECESSARY TO USE AN OUTSIDE AERIAL.
The outside aerial should be 35 to 50 feet
in length erected as high as possible and must
be attached to the terminal post marked "A"
mounted on the bottom of back cover.

WHEN USING AN EXTERNAL AERIAL A
GROUND MUST BE ATTACHED TO OTHER
POST ON BOTTOM OF BACK COVER MARK-
ED "G." A wire attached to a metal stake
driven two to four feet in moist ground or to
a water pump or to a nail driven in a tree, or
a bare wire thrown in any large body of water
such as a stream, lake, brook, creek, well, etc.,
will provide a suitable ground.

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Compliments of www.nucow.com
WARNING—Do not attach a ground direct to the radio chassis—ANY EXTERNAL GROUND CONNECTION TO ANY METAL PART OF THE CHASSIS WILL CAUSE A SHORT AND POSSIBLE DAMAGE.

DIAL LIGHT

It is normal for the dial light to be dim for approximately 60 seconds after set is turned “on” and then attain normal brilliance—also, on very loud signals the light may fluctuate.

Always use a 6.3 volt .15 ampere dial light.
ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

When adjusting 1730 kilocycle oscillator trimmer, 600 K.C. padder and 1400 kilocycle antenna trimmer, do not connect test oscillator to loop. Couple test oscillator to receiver loop by: (a) Make a loop consisting of five to ten turns of No. 20 to 30 size wire wound on a three inch form and attach across output of test oscillator. (b) Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.

<table>
<thead>
<tr>
<th>Place band switch for operation on:</th>
<th>Set receiver dial to:</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy antenna to match with output of test oscillator consisting of:</th>
<th>Attach output of test oscillator to:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. P. alignment use any band position</td>
<td>Any null where no interfering signal is received</td>
<td>Exactly 455 K.C.</td>
<td>0.033 mfd. condenser</td>
<td>High side to grid of 12A5 tube. Low side to frame of same condenser through 0.033 mfd. condenser.</td>
<td>Adjust each of the second I.P. transformer trimmers for maximum output. Then adjust each of the first I.P. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>1730 to 540 K.C. Band</td>
<td>1</td>
<td>Exactly 1730 K.C.</td>
<td>None</td>
<td>Use small loop to couple test oscillator to receiver loop. Low side to frame of same condenser through 0.033 mfd. condenser.</td>
<td>Adjust 1730 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td>2</td>
<td>Approximately 1400 K.C.</td>
<td>Approximately 1400 K.C.</td>
<td>None</td>
<td>Use small loop to couple test oscillator to receiver loop. Low side to frame of same condenser through 0.033 mfd. condenser.</td>
<td>While rocking gang condenser adjust 1400 K.C. gang trimmer for maximum output.</td>
</tr>
<tr>
<td>3</td>
<td>Approximately 600 K.C.</td>
<td>Approximately 600 K.C.</td>
<td>None</td>
<td>Use small loop to couple test oscillator to receiver loop. Low side to frame of same condenser through 0.033 mfd. condenser.</td>
<td>While rocking gang condenser adjust 600 K.C. oscillator padder for maximum output.</td>
</tr>
</tbody>
</table>

NOTE: IN SOME MODELS PARTS 31, 32 ARE OMITTED. SEE WIRING DIAGRAM.
ALIGNMENT PROCEDURE

Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third.

Before starting alignment:
(a) Check tuning dial adjustment by turning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move to correct position.
(b) Use an accurately calibrated test oscillator with some type of output measuring device.
(c) Have ground lead of test oscillator attached to gang condenser frame through .01 MFD condenser.

<table>
<thead>
<tr>
<th>TEST OSCILLATOR</th>
<th>Set receiver dial to:</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy antenna in series with output of test oscillator consisting of:</th>
<th>Attach output of test oscillator to:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.F.</td>
<td>Any point where no interfering signal is received</td>
<td>455 K.C.</td>
<td>.02 MFD condenser</td>
<td>High side to grid terminal of 12SA7 tube DO NOT REMOVE CAP.</td>
<td>Adjust the second I.F. transformer trimmers for maximum output then adjust each of the first I.F. trimmers for maximum output.</td>
</tr>
</tbody>
</table>

FOR ALIGNMENT SEE INDEX
VOLTAGE RATING

WHILE THE RADIO MAY BE OPERATED ON EITHER 50 OR 60 CYCLE 100-120 VOLT ALTERNATING CURRENT (A.C.), THE PHONOGRAPH MOTOR MUST BE USED ON THE FREQUENCY DESIGNATED ON THE PAPER LICENSE TAG, which will be found attached to the cabinet.

AERIAL

THE LOOP AERIAL SUPPLIED with the radio should provide ample 540-1600 kilocycle band reception in average locations.

LOOP AERIALS ARE NOT SATISFACTORY FOR SHORT WAVE RECEPTION, AND BECAUSE OF THIS AN EXTERNAL AERIAL MUST BE ATTACHED TO THE RADIO WHEN TUNING FOR SHORT WAVE STATIONS. Also, if the radio is used in shielded areas or when located a great distance from broadcast stations, the volume of the stations operating in the 560-1600 kilocycle band may not be amply, in which case it would be necessary to attach a 35 to 50 foot outdoor aerial to the receiver to obtain satisfactory results.

When a doublet type antenna is used, remove the small piece of wire connecting "C" and "D" posts together and attach one of the doublet antenna lead-ins to "C" post and the other to "D" post.
ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET, AND HAVE CHANGE OVER SWITCH KNOB IN "PLAY RADIO" POSITION.

When adjusting 1600 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect oscillator to loop. Couple test oscillator to receiver loop by: (a) Make a loop consisting of five to ten turns of No. 20 to 36 size wire wound on a three inch form and attach across output of test oscillator. (b) Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.

<table>
<thead>
<tr>
<th>Place band switch for operation on:</th>
<th>Set Receiver dial to:</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy antenna in series with output of test oscillator consisting of:</th>
<th>Attach output of test oscillator to:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600 to 540 K.C. Band</td>
<td>Any point where no interference signal is received</td>
<td>1600 K.C.</td>
<td>1600 K.C.</td>
<td>None</td>
<td>Use Small Loop to couple test oscillator to receiver loop. While rocking gang condenser adjust 1400 K.C. loop trimmer for maximum output. Adjust 1600 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td>2</td>
<td>Above 1600 K.C.</td>
<td>Above 1600 K.C.</td>
<td>None</td>
<td>None</td>
<td>Use Small Loop to couple test oscillator to receiver loop. While rocking gang condenser adjust 1400 K.C. loop trimmer for maximum output. Adjust 1600 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td>3</td>
<td>Above 600 K.C.</td>
<td>600 K.C.</td>
<td>600 K.C.</td>
<td>None</td>
<td>Use Small Loop to couple test oscillator to receiver loop. While rocking gang condenser adjust 600 K.C. oscillator pad for maximum output. Adjust 18.3 M.C. oscillator trimmer for maximum output. Be sure to use proper peak. If more than one peak is noticed, back off trimmer to minimum capacity, then screw down trimmer (add capacity) until the second peak—which is the proper one to use—is tuned in.</td>
</tr>
<tr>
<td>5.7 to 18.3 M.C. Band</td>
<td>Exact 18.3 M.C.</td>
<td>18.3 M.C.</td>
<td>18.3 M.C.</td>
<td>600 Ohm carbon resistor</td>
<td>High side to &quot;A&quot; Post, Low side to chassis. While rocking gang condenser adjust 18 M.C. antenna trimmer for maximum output.</td>
</tr>
<tr>
<td>2</td>
<td>Above 15 M.C.</td>
<td>Above 15 M.C.</td>
<td>600 Ohm</td>
<td>High side to &quot;A&quot; Post, Low side to chassis. While rocking gang condenser adjust 18 M.C. antenna trimmer for maximum output.</td>
<td></td>
</tr>
</tbody>
</table>

Compliments of www.nucow.com
RECORDING INSTRUCTIONS

Pick up the needle with its mouth pointed towards the record's center. Place the needle onto the record at the point where you want to begin playing. Then, turn on the record player and listen as the needle creates grooves in the record's surface.

USE TUNING IN DETERMINING CORRECT VOLUME LEVEL FOR RECORDING

As it is possible to have too much volume be used when recording, it is not advised that the operator select the highest recording level. Always rotate the "TUNING CONTROL" or the "VOLUME DIAL" so that the two ends of the green inverted "V" on the tuning eye approximately touch on signal peaks. The needle will not cut out properly.

First, move the record to the position where you wish to record. Then, place the needle onto the record at the point where you want to begin playing. Turn on the record player and listen as the needle creates grooves in the record's surface.

TO RECORD RADIO PROGRAMS

Select the station you wish to record by tuning in through your radio receiver. Place the needle onto the record at the point where you want to begin playing. Then, turn on the record player and listen as the needle creates grooves in the record's surface.

PLAY BACK NEEDLES

Use only steel needles to play records—never brass or wooden needles. A needle that has been used to play a record will not cut back properly even if you use the same record again.

CUTTING ARM AND HEAD ADJUSTMENT

The cutting arm and head are properly adjusted when the head makes contact with the record surface and unless altered by manufacturer, should not be touched. If it is believed that the cutting arm adjustment is incorrect, it is recommended that the arm be adjusted by a qualified technician.

a) Place cutting needle on left side of record and measure distance from top of record to bottom of record and cutting head—this should be 5/8 of an inch.

b) Lift cutting head from record and adjust up or down so that the needle will be 5/8 of an inch above the record.

c) Adjust "TUNING CONTROL" to the middle position and turn record on for 1 minute. If needle is not held in place, adjust needle by moving it in the direction of the record rotation. When the needle is held in place, the record should be playing at the correct volume level.

TO PLAY BACK RECORDINGS

To play back recordings, turn the record over and set the volume control to the position where you want to play the record.

MICROPHONE RECORDING

Voice or music that can be picked up by the microphone with minimum volume should be recorded on a microphone. If the microphone is not being used, it should be placed in a location where it will not be disturbed by other objects or people.

a) Place microphone 6 inches from record and adjust volume control to the middle position.

b) Place microphone 6 inches from record and adjust volume control to the middle position.

c) Place microphone 6 inches from record and adjust volume control to the middle position.

USING MICROPHONE AND RADIO AS PUBLIC ADDRESS SYSTEM

The microphone may be used as a public address system by connecting it to a sound amplifier or public address system. The volume level should be set according to the needs of the audience.

a) Place microphone 6 inches from record and adjust volume control to the middle position.

b) Place microphone 6 inches from record and adjust volume control to the middle position.

c) Place microphone 6 inches from record and adjust volume control to the middle position.

CAUTION: MICROPHONE VOLUME CONTROL KNOB MUST ALWAYS BE IN MINIMUM POSITION WHEN MICROPHONE IS NOT IN USE. FAILURE TO DO THIS WILL RESULT IN THE WASTING OF POWER AND MICROPHONE RECORDED SOUNO WILL NOT BE HEARD. ALL UNWANTED VOICES, NOISES, ETC., ALL OF WHICH WILL BE RECORDER ON THE DISC.
ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

When adjusting 1730 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to loop. Couple test oscillator to receiver loop by: (a) Make a loop consisting of five to ten turns of No. 20 to 30 size wire wound on a three inch form and attach across output of test oscillator. (b) Place test oscillator near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.

<table>
<thead>
<tr>
<th>Place band switch for operation set</th>
<th>Set receiver dial to</th>
<th>TEST OSCILLATOR</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. alignment use any band position.</td>
<td>Any point where no interfering signal is received.</td>
<td>Adjust test oscillator frequency to: Use dummy antenna in series with output of test oscillator consisting of:</td>
<td>Attach output of test oscillator to: Adjust each of the second I.F. transformer trimmers for maximum output, then adjust each of the first I.F. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>1730 to 540 K.C. Band</td>
<td>1</td>
<td>Exactly 1730 K.C.</td>
<td>0.5 Mfd. condenser</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Approx. 1400 K.C.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Approx. 1400 K.C.</td>
<td>None</td>
</tr>
</tbody>
</table>

Adjust 1730 K.C. oscillator trimmer for maximum output.
Adjust 1400 K.C. loop and R.F. trimmers for maximum output.
VOLTAGE RATING

This radio is designed for use on 110-120 volts 50-60 cycles alternating current—unless the marking on the white paper license notice which will be found attached either to bottom or inside the cabinet is marked differently, in which case the radio must only be used on the type of current shown on this notice.

BE SURE THAT THE CURRENT RATING GIVEN ON THE LICENSE TAG IS THE SAME AS THE HOUSE CURRENT SUPPLY.

OUTSIDE AERIAL

When the radio is used in shielded areas or when located a great distance from broadcast stations, the volume of stations operating in the 340-1600 K.C. band may not be ample in which case it would be necessary to ATTACH A 25-30 ft. OUTDOOR AERIAL TO THE "A" TERMINAL ON THE REAR OF THIS CHASSIS to obtain satisfactory results.
ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

When adjusting 1600 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to loop. Couple test oscillator to receiver loop by: (a) Make a loop consisting of five to ten turns of No. 20 to 30 size wire wound on a three inch form and attach across output of test oscillator. (b) Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.

<table>
<thead>
<tr>
<th>Plan band switch for operation set</th>
<th>Set receiver dial to</th>
<th>TEST OSCILLATOR</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Adjust test oscillator frequency to:</td>
<td>Use dummy antenna in place with output of test oscillator consisting of:</td>
</tr>
<tr>
<td>I. F. alignment use any band position.</td>
<td>Any point where no interfering signal is received</td>
<td>Exactly 600 K.C.</td>
<td>0.2 Mfd. condenser</td>
</tr>
<tr>
<td>1000 to 540 K.C. Band</td>
<td></td>
<td>Exactly 1000 K.C.</td>
<td>None</td>
</tr>
<tr>
<td>1</td>
<td>1000 K.C. Approx.</td>
<td>1000 K.C. approx.</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>1000 K.C. approx.</td>
<td>1000 K.C. approx.</td>
<td>None</td>
</tr>
<tr>
<td>3</td>
<td>100 K.C. approx.</td>
<td>100 K.C. approx.</td>
<td>None</td>
</tr>
</tbody>
</table>

5.7 to 18.3 M.C. Band

1                                | 18.3 M.C. approx.    | 18.3 M.C. approx. | 600 Ohm carbon resistor | High side to "A" Post. Lead, Low side to frame of gang condenser. | Adjust 18.3 M.C. oscillator trimmer for maximum output—be sure to use proper peak. If more than one peak is noticed, back off trimmer to minimum capacity, then screw down trimmer (add capacity) until the second peak—which is the proper one to use—is tuned in. |
| 2                                | 15 M.C. approx.      | 15 M.C. approx.   | 600 Ohm | High side to "A" Post. Lead, Low side to frame of gang condenser. | While rocking gang condenser adjust 15 M.C. antenna trimmer for maximum output. |
ELIMINATION OF INTERFERENCE CAUSED BY A 32-VOLT LIGHT PLANT

GENERAL

Two kinds of static-like noise may be heard when you operate your 32 volt radio at the same time the generating plant is charging the plant batteries.

Static-like noise, due to the action of the brushes on the commutator, may reach the set through the supply lines. Such noise can generally be eliminated by the use of .5 Mfd. 200 volt condensers, as shown in Figs. 1 and 3.

Static-like noise, due to the operation of the high tension circuits may radiate through the air to the antenna of the set. Radiation has been found to extend a half mile in extreme cases. Proper placement of the antenna, along with the use of a spark plug suppressor and correct shielding will eliminate this type of noise.

When eliminating these electrical disturbances always apply the remedies given in the order in which they appear.

USUAL INSTALLATIONS

Install spark plug suppressor on the spark plug and connect the high tension lead to the suppressor, as shown in Figure 3.

For four cylinder plants use four spark plug suppressors, one attached to each spark plug.

CAUTION: Disconnect batteries from generator before attaching suppressor equipment.

Fig. 1

Connect one .5 Mfd. 200 volt condenser between one positive brush and the generator frame and one condenser between one negative brush and the generator frame as shown in Figure 1.

FOUR CYLINDER PLANTS. For four cylinder plants attach a condenser to the positive and negative brushes as shown in Figure 2.

EXTREME CASES

To determine if the high tension wiring is radiating into the antenna disconnect the antenna from the generator and ground from the receiver and if the noise is eliminated or materially reduced, the noise is being picked up by the antenna. In such a case, obtain a piece of electrician's cloth which will just slide over the high tension wire and a piece of copper braid shielding which will just slip over the boom. Cut a piece of cloth just long enough to cover the high tension wire from the end to the sparking plug suppressor. Cut a piece of shielding that will be one inch shorter than the boom when the shielding is extended over the boom.

Slip the boom over the high tension lead. Slip the shielding over the boom so that it is one-half inch from each end of the boom. Wrap some fine copper wire around the shielding near the end of the shielding to hold the shielding in place. Solder the wire to the shielding so it will not slip due to plant vibration. The shield may be tapped in place if the tap is not adhesive. DO NOT USE FRICTION TAPE.

Solder a short braid pig-tail to the shielding and ground it under the nearest screw in the generator frame.

Fig. 2

IGNITION NOISE ON BATTERY LEADS

Sometimes the ignition interference will travel up the battery leads. This condition can be corrected as follows: Attach a .5 Mfd. condenser between the POSITIVE terminal at the top of the control box and the frame of the box. (Be sure the frame of the box is well grounded to the generator frame). Attach a .5 Mfd. condenser between the NEGATIVE terminal at the top of the control box and the control box frame.

IGNITION INTERFERENCE ON SUPPLY LEADS

In extreme cases the ignition interference will travel up the supply leads to the radio receiver. This condition can be corrected by attaching a .5 Mfd. condenser between the ungrounded side of the line (in the main switch box) and ground (or the grounded side of the line if one side of the line is grounded).

GROUNDING

Some cases may require a thorough ground of the system. This may be accomplished by running a No. 12 B. & S. gauge wire from the generator frame to a good ground. Conduit and metal switch boxes should also be grounded.

If it is necessary to ground one side of the supply lines, first ground them temporarily, at one time through a 32 volt lamp. One side of the line will light the light, the other will not. The side which will NOT light the light should be grounded.

DO NOT apply any of the remedies listed under "Extreme Cases," before trying the ones listed under "Usual Cases."

IF RECEIVER SHOULD FAIL TO OPERATE, CHECK FOR:

1. Defective tubes.
2. Tubes not properly inserted in the sockets.
3. Grid caps not connected to grid terminal of tubes.
5. Supply cord plus reversed.
6. Defective fuse.

MODEL 221

PUSH BUTTON TUNING

SIX STATIONS OPERATING IN THE 280-340 K.C. BAND MAY BE SELECTED WITH THE 5 TYPE OF TRIMMER SCREWS LOCATED UNDERNEATH PUSH BUTTON ENCLOSURE ON FRONT OF CABINET.

As the push buttons are not preset at the factory for any definite stations, be sure to set them to:

(a) It is important to have the aerial, if an outdoor aerial is to be used, attached to the radio wire adjusting the trimmers.
(b) TO TURN THE RADIO, AT LEAST ONE-HALF HOUR BEFORE ADJUSTING TRIMMERS. If set is not thoroughly grounded, aerial may become highly charged, resulting in poor tunes, weak signals and excessive background noise.
(c) Obtain the transmitter frequency-number of kilocycles - and call letters of the six stations you wish to "Push Buttons" for best results. Set push buttons for local or strong nearby stations only.
(d) Remove push button escutcheon from front of cabinet by unscrewing small wood screws that hold this in place.
(e) Rotate hand switch to the next to the maximum right hand position.
(f) Using a feeler gauge, carefully move one of the selected stations whose transmitter frequency is somewhere between 300 and 400 kilocycles.
(g) Obtain the transmitter frequency-number of kilocycles - and call letters of the stations you wish to "Push Button" for best results. Set push buttons for local or strong nearby stations only.
(h) Remove push button escutcheon from front of cabinet by unscrewing small wood screws that hold this in place.
(i) Rotate hand switch to the next to the maximum right hand position.
(j) Using a feeler gauge, carefully move one of the selected stations whose transmitter frequency is somewhere between 300 and 400 kilocycles.
(k) If receiver still does not operate, adjust the trimmers until the desired station is heard.

MODEL 222

SIX STATIONS OPERATING IN THE 280-340 K.C. BAND MAY BE SELECTED WITH THE 5 TYPE OF TRIMMER SCREWS LOCATED UNDERNEATH PUSH BUTTON ENCLOSURE ON FRONT OF CABINET.

As the push buttons are not preset at the factory for any definite stations, be sure to set them to:

(a) It is important to have the aerial, if an outdoor aerial is to be used, attached to the radio wire adjusting the trimmers.
(b) TO TURN THE RADIO, AT LEAST ONE-HALF HOUR BEFORE ADJUSTING TRIMMERS. If set is not thoroughly grounded, aerial may become highly charged, resulting in poor tunes, weak signals and excessive background noise.
(c) Obtain the transmitter frequency-number of kilocycles - and call letters of the six stations you wish to "Push Buttons" for best results. Set push buttons for local or strong nearby stations only.
(d) Remove push button escutcheon from front of cabinet by unscrewing small wood screws that hold this in place.
(e) Rotate hand switch to the next to the maximum right hand position.
(f) Using a feeler gauge, carefully move one of the selected stations whose transmitter frequency is somewhere between 300 and 400 kilocycles.
(g) Obtain the transmitter frequency-number of kilocycles - and call letters of the stations you wish to "Push Button" for best results. Set push buttons for local or strong nearby stations only.
(h) Remove push button escutcheon from front of cabinet by unscrewing small wood screws that hold this in place.
(i) Rotate hand switch to the next to the maximum right hand position.
(j) Using a feeler gauge, carefully move one of the selected stations whose transmitter frequency is somewhere between 300 and 400 kilocycles.
(k) If receiver still does not operate, adjust the trimmers until the desired station is heard.
AERIAL

There are three posts marked "A," "D," and "G" on the rear of the chassis. When the receiver is shipped from the factory, a flexible wire is connected to post "D" and "G." When a straight aerial is used, this wire should be left in this position and the aerial lead-in connected to the post marked "A." When a doublet type antenna is used, remove the small piece of wire connecting "G" and "D" posts together and attach one of the doublet antenna lead-ins to "A" post and the other to "D" post.

VOLTAGE RATING

This radio is designed for use on 110-120 Volts 50-60 cycles alternating current—unless the marking on the white paper license notice which will be found attached either to bottom or inside the cabinet is marked differently, in which case the radio must only be used on the type of current shown on this notice.

Be sure that the current rating given on the license tag is the same as the house current supply.
ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

When adjusting 1600 kilocycle oscillator trimmer, 600 K.C. Padder and 1400 kilocycle antenna trimmer, do not connect test oscillator to loop. Couple test oscillator to receiver loop by: (a) Make a loop consisting of five to ten turns of No. 20 to 22 size wire wound on a three inch form and attach across output of test oscillator. (b) Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.

<table>
<thead>
<tr>
<th>Place hand switch for operation on:</th>
<th>Set receiver dial to:</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy antenna in series with output of test oscillator consisting of:</th>
<th>Attach output of test oscillator to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>T.F. alignment use any band position</td>
<td>Any point where no interfering signal is received</td>
<td>Exactly 1600 K.C.</td>
<td>0.5 M.G. condenser</td>
<td>High side to grid cap of 6SAT tube. Do not remove cap.</td>
</tr>
<tr>
<td>1600 to 535 K.C. Band Using Loop Aerial</td>
<td></td>
<td>Exactly 1600 K.C.</td>
<td>None</td>
<td>Adjust each of the second I.F. transformer trimmers for maximum output—then adjust each of the first I.F. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>1</td>
<td>Exactly 1600 K.C.</td>
<td>Exact 1600 K.C.</td>
<td>None</td>
<td>Adjust 1600 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td>2</td>
<td>Approx. 1050 K.C.</td>
<td>Approx. 1600 K.C.</td>
<td>None</td>
<td>Use Small Loop to couple test oscillator to receiver loop.</td>
</tr>
<tr>
<td>3</td>
<td>Approx. 600 K.C.</td>
<td>Approx. 600 K.C.</td>
<td>None</td>
<td>While rocking gang condenser adjust 1600 K.C. loop antenna trimmer for maximum output.</td>
</tr>
<tr>
<td>2.2 to 7.6 M.C. Band</td>
<td></td>
<td>Exact 7.6 M.C.</td>
<td>Exact 7.6 M.C.</td>
<td>Use Small Loop to couple test oscillator to receiver loop.</td>
</tr>
<tr>
<td>1</td>
<td>Exact 7.6 M.C.</td>
<td>Exact 7.6 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Use Small Loop to couple test oscillator to receiver loop.</td>
</tr>
<tr>
<td>2</td>
<td>Approx. 6. M.C.</td>
<td>Approx. 6. M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>While rocking gang condenser adjust 600 K.C. loop oscillator padder for maximum output.</td>
</tr>
<tr>
<td>7.4 to 24. M.C. Band</td>
<td></td>
<td>Exact 24 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Adjust 7.6 M.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td>1</td>
<td>Exact 24 M.C.</td>
<td>Exact 21 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>While rocking gang condenser adjust 24 M.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td>2</td>
<td>Approx. 20 M.C.</td>
<td>Approx. 20 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Adjust 24 M.C. oscillator trimmer for maximum output—be sure to use proper peak. If more than one peak is noticed, back off trimmer to minimum capacity, then screw down trimmer (add capacity) until the second peak—which is the proper one to use is timed.</td>
</tr>
</tbody>
</table>

Refer to parts layout diagram for location of trimmers mentioned below:
AERIAL

THERE ARE THREE POSTS marked "A," "D," and "G" on the rear of the chassis. When the receiver is shipped from the factory a flexible wire is connected to post "D" and "G."

When a doublet type antenna is used, remove the small piece of wire connecting "G" and "I" posts together and attach one of the doublet antenna lead-ins to "A" post and the other to "D" post.

VOLTAGE RATING

THIS RECEIVER MAY BE OPERATED ON 100-120 VOLT DIRECT CURRENT (D.C.) and 100-120 volts, 50-60 cycle alternating current (A.C.) by using a No. 1122 line voltage regulator tube in regulator socket on top of radio chassis.

FOR 210-240 VOLT D.C. or 210-240 VOLT 50-60 CYCLE A.C.

OPERATION, a No. 11223 line voltage regulator tube must be used in the regulator socket.
ALIGNMENT PROCEDURE

Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third.

Before starting alignment:
(a) Check tuning dial adjustment by turning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move needle to correct position.
(b) Use an accurately calibrated test oscillator with some type of output measuring device.
(c) Have ground lead of test oscillator attached to chassis.

<table>
<thead>
<tr>
<th>Place band switch for operation on:</th>
<th>Set receiver dial to:</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy antenna in series with output of test oscillator consisting of:</th>
<th>Attach output of test oscillator to:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. F. alignment use any band position.</td>
<td>Any point where no interfering signal is received.</td>
<td>Exactly 655 K.C.</td>
<td>.02 Mfd. condenser</td>
<td>High side to grid one of 12K8 tube. Do not remove cap.</td>
<td>Adjust each of the second I.F. transformer trimmers for maximum output then adjust each of the first I.F. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>1130 to 500 K.C. Band</td>
<td>1</td>
<td>Exactly 1730 K.C.</td>
<td></td>
<td></td>
<td>Adjust 1730 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Exactly 1600 K.C.</td>
<td></td>
<td></td>
<td>While rocking gang condenser adjust 1600 K.C. antenna trimmer for maximum output.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Exactly 600 K.C.</td>
<td></td>
<td></td>
<td>While rocking gang condenser adjust 600 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td>2.24 to 7.6 M.C. Band</td>
<td>1</td>
<td>Exactly 7.6 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td></td>
<td>Adjust 7.6 M.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Exactly 6. M.C.</td>
<td>400 Ohm carbon resistor</td>
<td></td>
<td>While rocking gang condenser adjust 6 M.C. antenna trimmer for maximum output.</td>
</tr>
<tr>
<td>7.5 to 24 M.C. Band</td>
<td>1</td>
<td>Exactly 24 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td></td>
<td>Adjust 24 M.C. oscillator trimmer for maximum output—be sure to use proper peak. If more than one peak is noted, back off trimmer to minimum capacity, then turn down trimmer (add capacity) until the second peak—which is the proper one to use—is tuned in.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Approx. 20 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td></td>
<td>While rocking gang condenser adjust 20 M.C. antenna trimmer for maximum output.</td>
</tr>
</tbody>
</table>
AERIAL

There are three posts marked "A," "D," and "G" on the rear of the chassis. When the receiver is shipped from the factory a flexible wire is connected to post "D" and "G."

When a doublet type antenna is used, remove the small piece of wire connecting "G" and "D" posts together and attach one of the doublet antenna lead-ins to "A" post and the other to "D" post.

VOLTAGE TABLE

<table>
<thead>
<tr>
<th>Part No. 235</th>
</tr>
</thead>
</table>

Printed in U. S. A.—7-40

VOLTAGE RATING

This radio is designed for use on 110-120 volts 50-60 cycles alternating current—unless the marking on the white paper license notice which will be found attached either to bottom or inside the cabinet is marked differently, in which case the radio must only be used on the type of current shown on this notice.

BE SURE THAT THE CURRENT RATING GIVEN ON THE LICENSE TAG IS THE SAME AS THE HOUSE CURRENT SUPPLY.
ALIGNMENT PROCEDURE

Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third.

Before starting alignment:
(a) Check tuning dial adjustment by turning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move needle to correct position.
(b) Use an accurately calibrated test oscillator with some type of output measuring device.
(c) Have ground lead of test oscillator attached to chassis.

<table>
<thead>
<tr>
<th>Place</th>
<th>Band switch for operation on:</th>
<th>Set receiver dial to:</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy antenna in series with output of test oscillator consisting of:</th>
<th>Attach output of test oscillator to:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High side to grid condenser output of 6K8 tube. Do not remove cap.</td>
<td>Adjust each of the second L.P. transformer trimmers for maximum output—then adjust each of the first L.P. transformer trimmers for maximum output.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Any point where no interfering signal is received.</td>
<td>1730 K.C.</td>
<td>1730 K.C.</td>
<td>.00025 Mfd. capacitor</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Approx. 1400 K.C.</td>
<td>Approx. 1400 K.C.</td>
<td>.00025 Mfd. capacitor</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Approx. 600 K.C.</td>
<td>Approx. 600 K.C.</td>
<td>.00025 Mfd. capacitor</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td>1730</td>
<td>to 535 K.C. Band</td>
<td>1</td>
<td>Exactly 1730 K.C.</td>
<td>Exactly 1730 K.C.</td>
<td>.00025 Mfd. capacitor</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Approx. 1400 K.C.</td>
<td>Approx. 1400 K.C.</td>
<td>.00025 Mfd. capacitor</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Approx. 600 K.C.</td>
<td>Approx. 600 K.C.</td>
<td>.00025 Mfd. capacitor</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td>1.24</td>
<td>to 7.6 M.C. Band</td>
<td>1</td>
<td>Exactly 1.24 M.C.</td>
<td>Exactly 1.24 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Approx. 6 M.C.</td>
<td>Approx. 6 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td>7.5</td>
<td>to 24 M.C. Band</td>
<td>1</td>
<td>Exactly 24 M.C.</td>
<td>Exactly 24 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Approx. 24 M.C.</td>
<td>Approx. 24 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td>24</td>
<td>M.C. Band</td>
<td></td>
<td></td>
<td>Adjust 24 M.C. oscillator trimmer for maximum output—be sure to use proper gain. If more than one peak is noticed, back off trimmer to minimum capacity; then screw down trimmer (add capacity) until the second peak—which is the proper one to use—is tuned in.</td>
<td>While rocking gang condenser adjust 24 M.C. antenna trimmer for maximum output.</td>
<td></td>
</tr>
</tbody>
</table>

Compliments of www.nucow.com
THE RECEPTACLE ON BACK of chassis is connected to the storage battery operating the radio. A single six volt 15 or 25 watt light may be run on the battery by inserting male plug on end of light into receptacle. Light cord wire must not be smaller than No. 18 nor longer than six feet, and only one six volt light should be used, otherwise the light will be dim.

AERIAL

THERE ARE THREE POSTS marked "A," "D," and "G" on the rear of the chassis. When the receiver is shipped from the factory a flexible wire is connected to post "D" and "G."

When a doublet type antenna is used, remove the small piece of wire connecting "C" and "D" posts together and attach one of the doublet antenna lead-ins to "A" post and the other to "D" post.
VOLTAGE RATING

This receiver can be operated with a six volt storage battery or from 115 or 230 volt 50 to 60 cycle current.

Never attempt to operate the receiver with a 12 volt storage battery or on 25 cycle current or on direct current (D.C.) or with the metal tipped lead in the wrong terminal socket because the set will be damaged.

For AC operation obtain from the Electric Supply Company the voltage and current rating of the local Electric Service and — — — remove top cover from power unit and insert metal tipped lead into proper terminal socket that will be found underneath top cover of power unit.

Place voltage selector switch knob in "115—230" position and plug set power cord plug into house lighting outlet.

With 6 volt storage battery:

Place voltage selector switch on back of the "B" unit and accessible from the rear of the chassis to position marked 6.V.
GROUNDF

Connect the black lead coming out the rear of chassis to a wire attached to a metal stake driven two to four feet in moist ground, or to a cold water pipe.

'AB' BATTERY PACK
CONTAINS NECESSARY 1-1/2V. DRY 'A' AND 90V 'B' BATTERIES
will provide approximately 750 to 1,000 hours of service

AERIAL
ATTACH A 25-50 ft. OUTDOOR AERIAL TO THE BLUE LEAD COMING OUT THE REAR OF CHASSIS.
Ampere fuse is located on the back of the chassis adjacent to the speaker plug and protects the receiver from damage should a defect occur in the set or if it is connected to the improper power supply.

AERIAL

There are three posts marked "A," "D," and "G" on the rear of the chassis. When the receiver is shipped from the factory a flexible wire is connected to post "D" and "G".

When a doublet type antenna is used, remove the small piece of wire connecting "G" and "D" posts together and attach one of the doublet antenna lead-ins to "A" post and the other to "D" post.

Warning—Do not attach a ground direct to the radio chassis—any external ground connection to any metal part of the chassis may cause a short and possible damage.
**ALIGNMENT PROCEDURE MODELS 236, 237, 239**

Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) second, (3) third.

(a) Check tuning dial adjustment by turning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must exactly coincide with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move needle to correct position.

(b) Use an accurately calibrated test oscillator with some type of output measuring device.

(c) Have ground lead of test oscillator attached to chassis.

<table>
<thead>
<tr>
<th>Plate band switch for operation on</th>
<th>Set receiver dial to:</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy antenna in position with output of test oscillator assuring:</th>
<th>Attain output of test oscillator to:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any point where no interfering signal is received.</td>
<td>1730 K.C.</td>
<td>Exactly</td>
<td>-00025 Mfd. condenser</td>
<td>High side to grid cap of grid</td>
<td>Adjust each of the second I.F. transformer trimmers for maximum output—then adjust each of the first I.F. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Approximately</td>
<td>1460 K.C.</td>
<td>Condenser</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Approximately</td>
<td>600 K.C.</td>
<td>Condenser</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td>2.84 to 7.6 M.C. Band</td>
<td>1</td>
<td>Exactly</td>
<td>7.6 M.C.</td>
<td>Carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Approximately</td>
<td>6.0 M.C.</td>
<td>Carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td>7.5 to 24 M.C. Band</td>
<td>1</td>
<td>Exactly</td>
<td>24 M.C.</td>
<td>Carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Approximately</td>
<td>20 M.C.</td>
<td>Carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post</td>
</tr>
</tbody>
</table>
ALIGNMENT PROCEDURE  MODELS 240, 241, 242

Before starting alignment:
Check tuning dial adjustment by tuning gang condenser until plates touch maximum capacity stop at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point to last line move to correct position.
Use an accurately calibrated test oscillator with some type of output measuring device.
Have ground lead of test oscillator attached to chassis.

<table>
<thead>
<tr>
<th>TEST OSCILLATOR</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use jumper attached in series with output of test oscillator consisting of:</th>
<th>Attatch output of test oscillator to:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>450 K.C.</td>
<td>.05 mfd. condenser</td>
<td>High side of gold terminal of 1AT7 tube DO NOT REMOVE CAP</td>
<td>Adjust each of the second I.F. transformer trimmers for normal output—then adjust each of the first I.F. trimmers for maximum output.</td>
</tr>
<tr>
<td></td>
<td>1750 K.C.</td>
<td>.00015 mfd. condenser</td>
<td>Receiver blue antenna lead</td>
<td>Adjust 1750 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td></td>
<td>1000 K.C.</td>
<td>.0025 mfd. condenser</td>
<td>Receiver blue antenna lead</td>
<td>While rotating gang condenser adjust 1000 K.C. antenna trimmer for maximum output.</td>
</tr>
</tbody>
</table>
BATTERY LIFE

The life of the battery depends entirely on the average position of the "BATTERY ECONOMIZER" switch, the number of hours the set is operated daily and the quality and size of the battery.

The special "AB" Battery Pack, designed specifically for use with this radio, will provide approximately 600 to 800 hours of service under normal average operating conditions.

DIAL LIGHT

Some of this series of receivers have a pilot light which illuminates the dial when the tone control knob is pushed inward. A two cell 2.3 volt flash light bulb, type 710, is used, operated by TWO 1½ VOLT FLASHLIGHT BATTERIES which MUST BE PLACED IN THE METAL HOLDER FOUND INSIDE THE CABINET.

When tuning receiver—illuminate the dial by pushing inward on the tone control knob with the left hand and rotate the tuning knob with the right hand. After selected station has been correctly tuned in release knob and dial light will go out.
ALIGNMENT PROCEDURE

Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third.

Before starting alignment:
(a) Check tuning dial adjustment by turning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move to correct position.
(b) Use an accurately calibrated test oscillator with some type of output measuring device.
(c) Have ground lead of test oscillator attached to chassis.

### TEST OSCILLATOR

<table>
<thead>
<tr>
<th>Place band switch for operation at:</th>
<th>Set receiver dial to:</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy antenna in series with output of test oscillator consisting of:</th>
<th>Attach output of test oscillator to:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F. alignment use any band position.</td>
<td>I. F. Any point where no interfering signal is received</td>
<td>1750 K.C.</td>
<td>0.02 MFD. condenser</td>
<td>High side to grid terminal of 1AT7 tube DO NOT REMOVE CAP</td>
<td>Adjust each of the second I. F. transformer trimmers for maximum output—then adjust each of the first I. F. trimmers for maximum output.</td>
</tr>
<tr>
<td>Band</td>
<td>1</td>
<td>1750 K.C.</td>
<td>1750 K.C.</td>
<td>.0625 MFD. condenser</td>
<td>High side to Receiver blue antenna lead</td>
</tr>
<tr>
<td>Band</td>
<td>2</td>
<td>1400 K.C.</td>
<td>Exacty</td>
<td>.005 MFD. condenser</td>
<td>High side to Receiver blue antenna lead</td>
</tr>
<tr>
<td>Band</td>
<td>3</td>
<td>600 K.C.</td>
<td>Approx.</td>
<td>None</td>
<td>High side to Receiver blue antenna lead</td>
</tr>
<tr>
<td>Band</td>
<td>3</td>
<td>Approx.</td>
<td>600 K.C.</td>
<td>None</td>
<td>While rocking gang condenser adjust 1400 K.C. antenna trimmer for maximum output.</td>
</tr>
<tr>
<td>Band</td>
<td>2</td>
<td>Exacty</td>
<td>18.5 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>High side to Blue Ant. Lead</td>
</tr>
<tr>
<td>Band</td>
<td>2</td>
<td>Approx.</td>
<td>15 M.C.</td>
<td>400 Ohm</td>
<td>While rocking gang condenser adjust 600 K.C. oscillator trimmer for maximum output.</td>
</tr>
</tbody>
</table>

### COLOR CODE

- Blue — 8 + 90 V.
- Yellow — 6 + 15 V.
- Red — 3 + 15 V.
- Black — 0 V.

### BATTERY PLUGS

- Battery plug (pins down)

### SOME MODELS USE SEPARATE BATTERIES REQUIRE CABLE SHOWN BELOW

- 1.3 MC. OSC. TRIMMER FOR 5.75-8.3 MC. BAND
- 1750 MC. OSC. TRIMMER FOR 5.75-8.3 MC. BAND
- 320 MC. ANT. TRIMMER FOR 5.75-8.3 MC. BAND

### PART NO. 243
MODEL Globe Navigator
Chassis TSG-R
Chassis LD, LDU

CHASSIS LD, LDU

ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 600, 1400, 1720, 6000, 15000 and 18300 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (IF) stages should be aligned properly as the first step. After the LF transformers have been properly adjusted and peaked, the Broadcast and Short Wave bands in the order given, should be aligned.

I.F. ALIGNMENT. With the wave switch in the Broadcast Band and the grid condenser set at minimum, adjust the test oscillator to 456 KC and connect the output to the grid of the first detector tube (12SA7) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the black lead of the electrolytic condenser. Align all four IF. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. With the switch turned to the broadcast position, connect the antenna to the generator through a 500 ohm dummy and set the dial and generator at 1720 KC. Align the BC oscillator trimmer for maximum output. Set the generator at 1400 KC and tune-in signal with the dial. Adjust antenna trimmer for maximum output. Next set the generator at 600 KC and tune in the signal with the dial. Adjust the BC pad by rocking the gang back and forth while adjusting the pad until maximum output is attained. Retune the alignment at 1400 KC as the pad alignment may have caused misalignment.

SHORT WAVE BAND ALIGNMENT. With the band switch turned to the S.W. position, connect the generator to the antenna with a 400 ohm dummy. Adjust the S.W. oscillator to give a maximum output with the dial at 1800 KC (extended end). Set the generator at 15000 KC and tune-in the signal with the dial. Adjust the antenna trimmer for maximum output. With a strong signal input turn the dial to approximately 1 MC. lower in frequency and pick up the image frequency. If the image is not received, it will be necessary to return the dial to 18300 KC to increase the capacity in the oscillator trimmer until a second signal is received. Proceed as before with the alignment of the antenna and recheck for image frequency. Check the sensitivity at 6000 KC to determine if the coils and micro pad are not defective.

MODEL GLOBE NAVIGATOR
Chassis TSG-R

ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 600, 1400, 1720 and 18300 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (IF) stages should be aligned properly as the first step. After the LF transformers have been properly adjusted and peaked, the broadcast band should be adjusted.

I.F. ALIGNMENT. With the grid condenser set at minimum, adjust the test oscillator to 456 KC and connect the output to the grid of the first detector tube (12SA7) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the chassis ground. Align all three I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. Remove chassis from the GLOBE and set it up on the bench. Care should be taken to have no iron or other metal near the loop. Do not make this set up on a metal bench.

Make a loop consisting of 10 to 20 turns of wire approximately 3 to 4 inches in diameter and connect across the generator terminals. Place this loop parallel to the loop antenna about six inches away from it. Set the dial and generator at 1720 KC (gang at minimum capacity). Adjust the oscillator trimmer for maximum output. Set the generator at 1400 KC and tune in the signal. Adjust the antenna trimmer for maximum output. Check the sensitivity at 600 KC to determine if the gang or the coils have been damaged.

REMOVAL OF CHASSIS FOR SERVICING

To remove chassis for servicing and tube replacement, the following procedure should be used:
1) Slit the Equator band around the GLOBE with a sharp knife or razor blade. (The GLOBE consists of two halves joined at the horizontal center line or Equator.)
2) Remove the helix pin, nut, washers and screw at the lower axial pivot on the meridian, the ring which encircles the GLOBE (South Pole).
3) Remove the set screw of the upper axial pivot on the meridian (North Pole).
4) Remove GLOBE from meridian ring mount and separate upper half of GLOBE.
   The lower half of the GLOBE can be detached from the chassis assembly by removing two screws at the bottom.
   The chassis and GLOBE should be assembled by reversing the procedure outlined above with the exception of the lower axial pivot tightening.

At this point the GLOBE tension should be adjusted. The hexagon nut serves this purpose and should be adjusted to a point whereby the GLOBE tension is sufficient to maintain an even balance of the GLOBE in any position and still permit the GLOBE to be routed smoothly. When the adjustment is correct, screw on the helix pin tightly against the adjusting nut. This serves as a lock nut.

Two spare Equator bands are furnished attached to the inner side of the GLOBE. After the GLOBE is completely assembled, the Equator band tape should be cemented around the GLOBE where the upper and lower halves are joined.
I. F. ALIGNMENT. With the gang condenser set at minimum, adjust the test oscillator to 455 KC and connect the output to the grid of the first detector tube (12SA7) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the chassis ground. Align all three I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. Connect the test oscillator to the antenna of the set through a 200 mfd. (.0002) condenser. With the gang condenser set at minimum capacity, set the test oscillator at 1720 KC and adjust the oscillator (or 1720 KC trimmer) on gang condenser. Next—set the test oscillator at 1400 KC, and tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.
MODEL TSB-47
Chassis TSB, TSW

MODEL TSU-105

LAMP USED. Show case lamp 120 volt, 25 watts with medium screw base. (Never use a lamp larger than 25 watts.)

MODEL TSB-47
Chassis TSB, TSW
Bed Lamp Receiver

VOLTAGE NOTES
FOR BOTH SCHEMATICS

Voltages shown on the circuit diagram are from socket terminals to chassis base. In measuring voltages use a voltmeter having a resistance of at least 1000 ohms per volt. Allowances should be made for variations in line voltage.

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SONORA RADIO & TELEV., CORP.

MODEL TV-48
Chassis TV, TVU
MODELS KVU-85, KVU-97

RANGE 535 to 1720 Kilocycles

1. F. ALIGNMENT. With the gang condenser set at minimum, adjust test oscillator to 455 KC, and connect the oscillator output lead to the 1st detector tube (12A7-GT) through a .05 or .1 mfd. condenser. The test oscillator ground lead should be connected to the chassis base. Proceed by adjusting the two I.F. trimmers for maximum signal, or swing on output meter, if available. The two trimmers for the transformer I.F. will be found below the coil next to the base.

BROADCAST ALIGNMENT. Connect the test oscillator to the antenna of the set through a 100 mfd. (.001) condenser. With the gang condenser set at minimum capacity, set the test oscillator at 1720 KC, and adjust the oscillator (or 1720 KC trimmer) on gang condenser. Next set the test oscillator at 1400 KC, and tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.

RADIO RECEIVER CONTROLS — Volume will be controlled by the volume control on the radio receiver as for radio reception. Other radio controls will affect record reproduction. Adjustment of the radio set's fidelity and tone controls may add considerably to the enjoyment of your record selections.

ANTENNA — The single lead attached to the record player is the transmitting antenna. If the record player is located within a distance of ten feet from the receiving set no additional antenna will be required. An antenna not longer than ten feet may be added to operate over greater distances.

OPERATION — Turn on the power switch allowing about one minute for the tubes to warm up, place the selected record upon the turntable and start the motor. Lift pickup and lower the needle point gently to the outside record groove.

Next go to your radio and tune to approximately 600 K.C. at which setting the phonograph signal will be received.

FREQUENCY ADJUSTMENT — If a local station is operating at a frequency of approximately 600 K.C., interference will be encountered in the form of a continuous squelch or howl. To avoid this interference tune the radio receiver to a point at which no local station can be heard. With the unit in operation insert a screw driver in the hole located underneath the unit on the metal chassis and adjust the screw. If the radio receiver has been set at a point below 600 K.C., (for example 550 K.C) turn to the right until the phonograph signal is heard. If the receiver has been set above 600 K.C turn the adjusting screw to the left.

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I.F. ALIGNMENT. With the wave switch in the Broadcast Band and the gang condenser set at minimum, adjust the test oscillator to 456 KC and connect the output to the grid of the first detector tube (6A8GT) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the chassis ground. Align all four I.F. trimpots to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. With the switch turned to the broadcast position, connect the antenna to the generator through a 200 MMF dummy and set the dial and generator at 1720 KC. Align the BC oscillator trimmer for maximum output. Set the generator at 1400 KC and tune in signal with the dial. Adjust both antenna trimmers for maximum output. Next set the generator at 600 KC and tune in the signal with the dial. Adjust the BC pad by rocking the gang back and forth while adjusting the pad until maximum output is attained. Recheck the adjustment at 1400 KC as the pad adjustment may have caused misalignment. In making the BC alignment the loop should be located in the same position with respect to the chassis as it occupies in the cabinet. No metal should be near the loop.

POLICE BAND ALIGNMENT. With the band switch turned to the Pol. position, connect the generator to the antenna with a 400 ohm dummy. Adjust the Pol. oscillator to give a maximum output with the dial at 5600 KC (extreme end). Set the generator at 5000 KC and tune in the signal with the dial. Adjust the antenna trimmer for maximum output. With a strong signal input turn the dial to approximately 1 M.C. lower in frequency and pick up the image frequency. If the image is not received, it will be necessary to return the dial to 5600 KC to reduce the capacity in the oscillator trimmer. Proceed as before with the alignment of the antenna and recheck for image frequency. Check the sensitivity at 2000 KC to determine if the coils and pad are not defective.

SHORT WAVE BAND ALIGNMENT. With the band switch turned to the S. W. position, connect the generator to the antenna with a 400 ohm dummy. Adjust the S. W. oscillator to give a maximum output with the dial at 18,300 KC (extreme end). Set the generator at 15000 KC and tune in the signal with the dial. Adjust the antenna trimmer for maximum output. With a strong signal input turn the dial to approximately 1 M.C. lower in frequency and pick up the image frequency. If the image is not received, it will be necessary to return the dial to 18,300 KC to reduce the capacity in the oscillator trimmer until a second signal is received. Proceed as before with the alignment of the antenna and recheck for image frequency. Check the sensitivity at 6000 KC to determine if the coils and pad are not defective.
ALIGNMENT PROCEDURE

**CORRECT ALIGNMENT PROCEDE.** The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the broadcast and short wave bands in the order given, should be adjusted.

**I.F. ALIGNMENT.** With the grid switch in the broadcast band and the grid condenser set at minimum, adjust the test oscillator to 456 Kc and connect the output to the grid of the first detector tube (6ABGT) through a .05 or .1 mf capacitor. The grid on the test oscillator should be connected to the chassis buss. Align all four I.F. trimmers to peak or maximum reading on the output meter.

**BROADCAST BAND ALIGNMENT.** With the switch turned to the broadcast position, connect the antenna to the oscillator through a 200 M MD dummy and the ground of the set (Black wire) to the oscillator ground. Set the dial and generator at 1720 KC. Align the oscillator trimmer for maximum output. Set the generator at 1400 KC and tune-in signal with the dial. Adjust antenna trimmer for maximum output. Next set the oscillator at 650 KC and tune in the signal with the dial. Adjust the BC pad by rocking the bakelite and forth while adjusting the pad until maximum output is obtained. Recheck the adjustment at 1400 KC as the pad adjustment may have caused misalignment.

**SHORT WAVE BAND ALIGNMENT.** With the band switch turned to the S.W. position, connect the generator to the antenna with a 400 ohm dummy and the ground of the set (Black wire) to the generator ground. Adjust the S.W. oscillator to give a maximum output with the dial at 18300 KC (extreme end). Set the generator at 15000 KC and tune-in signal with the dial. Adjust the antenna trimmer for maximum output. With a strong signal input tunes the dial to approximately 1 M.C. lower in frequency and pick up the image frequency. If the image is not received, it will be necessary to return the dial to 18300 KC to reduce the capacity in the oscillator trimmer until a second signal is received. Proceed as before with the alignment of the antenna and recheck for image frequency. Check the sensitivity at 6000 KC to determine if the coils and mica pads are not defective.

**TELEVISION CONNECTOR**

This receiver is fully designed to provide sound reception when connected to a television receiver. To make this connection attach the two leads from your television receiver to terminals "T" and "G". The black lead or the outside shield (in case a shielded lead is used) should be connected to terminal "G", and the other lead to terminal "T". For complete directions consult the instruction sheet of your television receiver.
AUTOMATIC TUNING

MODEL TXF-67, Chassis TXF

ADJUSTMENT. All adjustments are simply made from the top of the cabinet using an ordinary screw driver.

To make adjustments remove all four buttons which pull off readily. The center buttons should be removed first since by depressing the adjacent buttons with thumb and finger a firm grip may be secured on either center button. The side buttons can then be easily removed.

Loosen the screw of the desired button and with the manual tuning knob tune to any desired station. Hold the manual tuning knob in position and depress the button shaft as far as possible. With the button fully depressed tighten up the screw firmly.

Be sure the push button knob is held down in position while being tightened.

After the stations are adjusted it is advisable to check each button to ensure sufficient tightening.

To ensure accurate adjustment, the volume control should be set at a moderate level and the station tuned in slowly to a point of maximum volume and clarity.

It is not necessary to follow any particular sequence of stations since each button is adjustable to any station.

With each button definitely set and securely tightened to the selected stations, the tuner is ready for operation.

OPERATION. With the set turned on to a moderate level of volume the automatic tuner is operated by merely pressing the button set to the desired station. The volume and tone are then adjusted to suit individual requirements.

To tune in stations with the manual control depress the manual button, select the band desired with the band switch and tune in your stations with the manual control. When using the automatic tuning the wave band selector switch must be turned to the broadcast position.

TELEVISION AND PHONOGRAPH CONNECTOR. This receiver is fully designed to provide sound reception when connected to a television receiver. To make this connection attach the two leads from your television receiver to terminals “T” and “G”. The black lead or the outside shield (in case a shielded lead is used) should be connected to terminal “G” and the other lead to terminal “T”. For complete directions consult the instruction sheet of your television receiver.

To use this attachment with a phonograph, connect the two terminals from the phonograph pick-up to terminals “M” and “G”. If one of the pick-up leads is a shield connect it to the terminal “G”. If both leads are shielded, try reversing the terminals if hum is excessive. If hum is still present reverse the power plug in the wall socket. Consult the instruction sheets on your phonograph for additional information.

With the connections made as described above simply turn the band change switch to the extreme left position and your television sound channel or phonograph pickup is connected in.

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WIRELESS RECORD PLAYER

1. OFF-ON SWITCH — This is the only knob on the device. Turn to the right to switch on the power.

2. PICKUP — The pickup is the new crystal type. To insert a needle, raise the pickup arm to a vertical position, loosen the needle holder screw on the front, insert a needle to its full depth, tighten up the needle holder screw and lower pickup arm to its non-playing position outside the record and slip into the pickup rest holder. When commencing to play, remove pickup from holder, lift and place gently the point of needle in outside starting groove of record.

3. MOTOR SWITCH — On models in wooden cabinets which have the automatic stop, the motor switch is incorporated in the automatic stop. To start motor move the lever at the right side of the turntable. The automatic stop can be adjusted so that the pickup arm will strike it at the conclusion of a record and thus turn off the motor.

On models in metal cabinets the motor switch is located in the front panel on the right side.

4. ANTENNA — The single lead attached to the record player is the transmitting antenna. If the record player is located within a distance of ten feet from the receiving set no additional antenna will be required. An antenna not longer than ten feet may be added to operate over greater distances.

5. OPERATION — Turn on the power switch allowing about two minutes for the tube to warm up, place the selected record upon the turntable and start the motor. Lift pickup and lower the needle point gently to the outside record groove. Next go to your radio and tune to approximately 600 Kc at which setting the phonograph signal will be received.

6. FREQUENCY ADJUSTMENT — If a local station is operating at a frequency of approximately 600 Kc, interference will be encountered in the form of a continuous squeal or howl. To avoid this interference tune the radio receiver to a point at which no local station can be heard. Pry out the button located between the turntable and the ON-OFF switch. With the unit in operation insert a screw driver in the hole and adjust the screw.

If the radio receiver has been set at a point below 600 Kc (for example 550 Kc) turn to the right until the phonograph signal is heard. If the receiver has been set above 600 Kc turn the adjusting screw to the left.

7. RADIO RECEIVER CONTROLS — Volume will be controlled by the volume control on the radio receiver as for radio reception. Other radio controls will affect record reproduction. Adjustment of the radio set's fidelity and tone controls may add considerably to the enjoyment of your record selections.

8. HUM — If hum is present it may be necessary to reverse the power plug in the wall socket.

NEEDLES

High quality needles are important to your enjoyment of recorded music. Use good full-tone steel needles. If long playing needles are used, do not change the position of the needle in the pickup after it has once been played, as this will injure the record grooves.

Note: The needle point wears down gradually in use and wears down in conformity with the shape of the record groove. Changing the position of the needle in the pickup after it has been played will provide a new fit to the groove and will damage the record groove by changing the shape of the groove. The life of the record depends upon maintaining the original record groove. To summarize this important message, never reinsert a used needle in the pickup, since this will do permanent injury to the record and shorten your record life materially.

On models in wooden cabinets a jack is provided in the rear of the cabinet for using a microphone. Use only a low impedance (200 ohms or less) carbon button microphone. Most low-priced microphones are of this type. To attach MICROPHONE ATTACHMENT

microphone simply insert the phone tip in the jack.

Warning! One of the terminals is directly connected to one terminal of the line cord. In using a microphone make certain all parts are fully insulated.

SERVICE

As the phonograph motor is the only moving part it is the only part of your record player that will require any attention.

A little oil applied to the motor, idler and turntable bearings about once every three months will suffice.
541-SX
VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage of Socket Prongs to Gnd. (See Prong No. on Schematic Diagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6J6G</td>
<td>Osc.-Conv.</td>
<td>No. 1: 0, No. 2: 280, No. 3: 85, No. 4: -2.4, No. 5: 140, No. 6: 6.3V, No. 7: 0, No. 8: -1.5V</td>
</tr>
<tr>
<td>SK75</td>
<td>I. Amp.</td>
<td>No. 1: 0, No. 2: 250, No. 3: 85, No. 4: 0, No. 5: 0, No. 6: -1.5V</td>
</tr>
<tr>
<td>6275</td>
<td>Det. AVG AF</td>
<td>No. 1: 0, No. 2: -2V, No. 3: 1.5V, No. 4: 1.5V, No. 5: 6.3V, No. 6: 0, No. 7: 0, No. 8: -1.5V</td>
</tr>
<tr>
<td>6F6C</td>
<td>Power Amp.</td>
<td>No. 1: 0, No. 2: 250, No. 3: 250, No. 4: -2.4V, No. 5: -6.3V, No. 6: 0, No. 7: -6.3V, No. 8: 0</td>
</tr>
</tbody>
</table>

Notes: Voltage readings are for schematic diagram on back of sheet. Allow 15% + or - on all measurements. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 1000 ohms per volt voltmeter. All AC voltages made with rectifier type voltmeter. Unless designated otherwise, voltages in table are + DC voltages.

*AC volts. a: 0-5 volt scale. b: 0-100 volt scale.

ALIGNMENT

<table>
<thead>
<tr>
<th>Operation</th>
<th>Alignment of Generator Connected to Dummy Antenna</th>
<th>Generator Frequency</th>
<th>Band Switch Setting</th>
<th>Tuning Cond. Setting</th>
<th>Trimmer</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Set dial pointer to last mark at end of scale with tuning condenser closed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Rej. Ant.</td>
<td>200 mmf.</td>
<td>456 KC</td>
<td>BC</td>
<td>Closed</td>
<td>1st I.F.</td>
</tr>
<tr>
<td>4</td>
<td>Broadcast Ant.</td>
<td>1400 KC</td>
<td>BC</td>
<td>1400 KC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Band Ant.</td>
<td>600 KC</td>
<td>BC</td>
<td>600 KC</td>
<td>C14 Pad</td>
<td>Rock dial for peak adj.</td>
</tr>
<tr>
<td>6</td>
<td>(Repeat operation 4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>(Check calibration and sensitivity at 600 KC, 1000 KC, 1400 KC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1st SW Band Ant.</td>
<td>* 7, 1 SW</td>
<td></td>
<td>7, MC</td>
<td>C10 Osc.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>(Check calibration and sensitivity at 2.5 MC, 4 MC and 7, MC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2nd SW Band Ant.</td>
<td>* 22, 2 SW</td>
<td></td>
<td>22, MC</td>
<td>C11 Osc.</td>
<td>Rock dial for peak adj.</td>
</tr>
<tr>
<td>11</td>
<td>(Check calibration and sensitivity at 8, 15 MC and 22, MC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Use 200 mmf, condenser and 100 ohm non-inductive resistor in series.
Sparton Superheterodyne Model 661-RP

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage of socket prongs to grid. (See prong note on diagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>65OT1</td>
<td>1-F Amplifier</td>
<td>0 0 220 77 -7.2 0 6.1* 0</td>
</tr>
<tr>
<td>66OT1</td>
<td>1-F Amplifier</td>
<td>0 0 220 77 -7.2 0 6.1* 0</td>
</tr>
<tr>
<td>66OT1</td>
<td>Det-RTC 1st Audio</td>
<td>0 0 220 77 -7.2 0 6.1* 0</td>
</tr>
<tr>
<td>66OT1</td>
<td>Microphone Amplifier</td>
<td>0 0 220 77 -7.2 0 6.1* 0</td>
</tr>
<tr>
<td>66OT1</td>
<td>Rectifier</td>
<td>0 0 220 77 -7.2 0 6.1* 0</td>
</tr>
</tbody>
</table>

Notes: Voltage readings are for schematic diagram on back of sheet. Allow +1 or -1 on all measurements. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 1000 ohm per volt voltmeter. All AC voltages made with rectifier type voltmeter. Unless otherwise designated, voltages in table are ±1 DC voltages.

AC voltages
** Cannot be measured with 1000 ohm/volt voltmeter.

Check cathode voltage with cathode connected using signal generator (1000 EC 3K modulated) connected to "A" and "B". With selector switch in "Record" position, advance gain until Level Indicator (65OT1 tube) closes without overlapping. AC voltage is measured from 6P6G plate to ground (AC meter in series with .1 mf, 400 volt condenser) should be approximately 52 volts.

Microphone Flag

AC Voltage and Tone control

Station Selector

Power Transformer

To 661/695 Level Ind.

SPARKS ELECTRIC CO.

MODEL 661

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Prog.</th>
<th>Alignment</th>
<th>Generator</th>
<th>High</th>
<th>Low</th>
<th>Switch</th>
<th>Cond.</th>
<th>Setting</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Set pointer at last calibrated mark with condenser gang closed.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I.F.</td>
<td>.1 mf.</td>
<td>456 EC</td>
<td>BC</td>
<td>Open</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>I-F Rplt.</td>
<td>Ant.</td>
<td>500 MF</td>
<td>456 EC</td>
<td>Closed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Ant.</td>
<td>200 mf.</td>
<td>1860 EC</td>
<td>Open</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Ant.</td>
<td>500 MF</td>
<td>660 EC</td>
<td>Open</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>(Repet operation C).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Connect dial without 1st coil (500 mf)</td>
<td>1500 EC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Ant.</td>
<td>18. MF</td>
<td>18. MF</td>
<td>Closed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>(Check for full scale deflection)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model 761

HOW TO ADJUST THE CUTTING HEAD

The Model 661-RP features a combination "cutting" and "play-back" head on the tone arm, the adjustment is made by the position of a knob screw on the side of the head and the correct position of the screw is very important, otherwise record may not be correctly cut (or played back).

Loosening the screw will allow it to be moved up or down for cutting records and up or down for play-back records. The slot in which the screw travels is designed so that the screw may be tightened in such an intermediate position as when the screw is above or below extremes in extreme or extreme down positions. Intermediate positions are accounted for except when the screw is in the extreme up or extreme down positions. In general, there are 3 positions of the screw will take care of all grades of record hardness and sharpness of cutting edge necessary for "cutting" and "play-back" head.

(1) With the screw midway between maximum up (cut position) and maximum down (play position) for "cutting" and "play-back" head.

(2) With the screw approximately two-thirds of the way toward "cut position" for average hardness.

HOW TO ADJUST THE VOLUME FOR BEST RESULTS

In order to make good records there must be just the right amount of volume whether it is a radio program that is being recorded, or whether the microphone is being recorded.

To make it easy to tell when the volume is "just right", SPARKS RECORD MAKERS are equipped with a level indicator tube which indicates something like a Vito-clip or Magic Eye Tungsten tube for radios. The circuits in the Record Maker are so arranged that the "eyes" just close to the overlapping when the proper amount of volume is obtained. The volume control is used in the regular way to increase or decrease volume and the "eyes" tell when the level is just right.

When a recording is being made the user must also be listening to the sound through the loud speaker. This allows the user to hear exactly what is going on the record. This applies whether the selector switch is in the "Record" position or in the "Microphone" position.

When recordings are being made the circuits are correctly matched for the cutting arm rather than the loud speaker. In this case, the tone volume is correct for the recording but the program will not sound natural through the loud speaker.

An important thing to remember is that the volume control should never be turned so high up that the "eyes" just close to the overlapping when the proper amount of volume is obtained. This will cause "over-cutting" and spoil an otherwise good recording.

SPARKS Engineers designed the Record Makers so that only a part of the music or speech comes through the loud speaker while a recording is being made, and this enables the user to hear exactly what is going on the record. This applies whether the selector switch is in the "Record" position or in the "Microphone" position.
ALIGNMENT CHART

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>ALIGNMENT OF</th>
<th>GENERATOR CONNECTED TO</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR FREQUENCY</th>
<th>BAND SWITCH SETTING</th>
<th>TUNING COND. SETTING</th>
<th>TRIMMER</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I.F.</td>
<td>*</td>
<td>.1 mf</td>
<td>456</td>
<td>BC</td>
<td>1600 KC</td>
<td>C12 A&amp;B</td>
<td>2nd I.F.</td>
</tr>
<tr>
<td>3</td>
<td>Rejector</td>
<td>**</td>
<td>200 mmf</td>
<td>456</td>
<td>BC</td>
<td>600 KC</td>
<td>C3</td>
<td>Adjust to minimum</td>
</tr>
<tr>
<td>4</td>
<td>Broadcast</td>
<td>**</td>
<td>200 mmf</td>
<td>1500 KC</td>
<td>BC</td>
<td>1500 KC</td>
<td>C7 (Osc.)</td>
<td>***</td>
</tr>
<tr>
<td>5</td>
<td>Band</td>
<td>**</td>
<td>200 mmf</td>
<td>600 kc</td>
<td>BC</td>
<td>600 KC</td>
<td>C8 (Fed.)</td>
<td>***</td>
</tr>
<tr>
<td>6</td>
<td>(Repeat operation 4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Shortwave</td>
<td>**</td>
<td>****</td>
<td>18 MC</td>
<td>SW</td>
<td>18 MC</td>
<td>C4 (Osc.)</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td>Band</td>
<td>**</td>
<td>****</td>
<td>18 MC</td>
<td>SW</td>
<td>18 MC</td>
<td>C5 (Ant.)</td>
<td>***</td>
</tr>
</tbody>
</table>

Special Note: For accurate alignment, the special scale found on page 12-22 should be used.

Notes: *Pin No. 8 of 6SA7GT Osc-Converter tube.

- Connect dummy antenna to "Antenna" of loop winding.
- Rock dial while adjusting for maximum output.
- 100 ohms resistor and 200 mmf. condenser in series.

Check calibration and sensitivity at 600 KC, 750 KC, 1000 KC and 1500 KC.

Check operations 1 to 9 inclusive.
SPARTON SUPERHETERODYNE MODEL 782PA
INTERMEDIATE FREQUENCY 455 K.C.
BOTTOM VIEWS OF ALL SOCKET CONNECTIONS
(Original) Effective January 15, 1941

Line Voltage: 117 Volts AC
Position of Volume Control: Full with Antenna Disconnected
Position of Band Switch: Broadcast

![Diagram of circuit and component values]

Compliments of www.nucow.com

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THE CATHODE FOLLOWER

TUBES

FUNCTION

6SD7GT  R-F Amplifier
6SA7GT  Oscillator & Converter
6SK7GT  I.F. Amplifier
6S6G7T  Det A.V.C. & 1st Audio
6F6G  Power Amplifier
6F6G  Power Amplifier
513G  Rectifier

Voltage of Socket Prongs to Gnd. (See Schematic Diagram)

<table>
<thead>
<tr>
<th>TUBES</th>
<th>FUNCTION</th>
<th>VOLTAGE OF SOCKET PRONGS TO GND.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SD7GT</td>
<td>R-F Amplifier</td>
<td>0 0 0 233 90 0 90 6# 125</td>
</tr>
<tr>
<td>6SA7GT</td>
<td>Oscillator &amp; Converter</td>
<td>0 0 233 90 0 6# **</td>
</tr>
<tr>
<td>6SK7GT</td>
<td>I.F. Amplifier</td>
<td>0 0 0 233 90 0 6# **</td>
</tr>
<tr>
<td>6S6G7T</td>
<td>Det A.V.C. &amp; 1st Audio</td>
<td>0 30 6# 0</td>
</tr>
<tr>
<td>6F6G</td>
<td>Power Amplifier</td>
<td>0 230 230 30 6# 14</td>
</tr>
<tr>
<td>6F6G</td>
<td>Power Amplifier</td>
<td>0 230 230 80 6# 14</td>
</tr>
<tr>
<td>513G</td>
<td>Rectifier</td>
<td>0 325 200 325* 0 325* 0 325</td>
</tr>
</tbody>
</table>

*AC volts.
**Cannot be measured with Model 665 Analyzer.
### ALIGNMENT CHART

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>ALIGNMENT OF</th>
<th>GENERATOR CONNECTED TO</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR FREQUENCY</th>
<th>BAND SWITCH SETTING</th>
<th>TUNING COND. SETTING</th>
<th>TRIMMER</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I.F.</td>
<td>1 mF</td>
<td></td>
<td>456 KC</td>
<td>BC</td>
<td>Open</td>
<td>C20 B **</td>
<td>***</td>
</tr>
<tr>
<td>3</td>
<td>Releator</td>
<td>Ant. 200 mJ</td>
<td></td>
<td>456 KC</td>
<td>BC</td>
<td>Closed</td>
<td>C20 B</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>4</td>
<td>Broad cast</td>
<td>Ant. 200 mJ</td>
<td></td>
<td>1000 KC</td>
<td>BC</td>
<td>1600 KC</td>
<td>C20 A &amp; B</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>5</td>
<td>Band</td>
<td>Ant. 200 mJ</td>
<td></td>
<td>300 KC</td>
<td></td>
<td>600 KC</td>
<td>C20 A &amp; B</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>8</td>
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<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Police</td>
<td>Ant. 5 - 8 M</td>
<td></td>
<td>Pol. 5 - 8 M</td>
<td></td>
<td></td>
<td>C16 (Osc.)</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Short - Wave</td>
<td>Ant. 18 M</td>
<td></td>
<td>SW 18 M</td>
<td></td>
<td></td>
<td>C18 (Osc.)</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Connect to terminal No. 8 of type 6AK7GI Osc - Conv. tube.
- **Bronze color trimmer screw.**
- ***Turn trimmer screw all the way down.***
- 100 ohm: 200 mJ. in series.
- ******Rock dial while adjusting for maximum output.***
MODEL 831-X
INTERMEDIATE FREQUENCY 456 K.C.

VOLTAGE CHART

Line voltage: 117 volts
Position of Volume control: Full with Antenna disconnected
Position of Hand Switch: Broadcast

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage of socket prongs to Gnd. (Prong no's. on Schematic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7GT</td>
<td>R.F. Amplifier</td>
<td>No 1  No 2  No 3  No 4  No 5  No 6  No 7  No 8</td>
</tr>
<tr>
<td>6SA7GT</td>
<td>Oscillator-Converter</td>
<td>0  0  245  76  0  **  1.6  76  6.2**  227</td>
</tr>
<tr>
<td>6SK7GT</td>
<td>I.F. Amplifier</td>
<td>0  0  0  **  1.6  76  6.2**  245</td>
</tr>
<tr>
<td>6J5GT</td>
<td>Audio Amplifier</td>
<td>0  0  0  0  **  155  6.2**  0</td>
</tr>
<tr>
<td>6G6GT</td>
<td>1st Audio Amplifier</td>
<td>**  0  0  0  0  60  6.2**  0</td>
</tr>
<tr>
<td>6F5GT</td>
<td>Audio Driver</td>
<td>0  0  255  77  0  0  6.2**  11</td>
</tr>
<tr>
<td>6AC5G</td>
<td>Power Amplifier</td>
<td>0  0  240  0  0  0  6.2**  0</td>
</tr>
<tr>
<td>7TF</td>
<td>Rectifier ***</td>
<td>0  0  300*  0  0  300*  0</td>
</tr>
</tbody>
</table>

* AC volts
** Cannot be measured with 1000 ohm/volt voltmeter.
*** Tube removed from socket to enable test prods to reach socket prongs.

August 1, 1940
# Spartan Superheterodyne Models

1071-PA 1071-PAD 1071-RPA

## Operation

<table>
<thead>
<tr>
<th>Operation</th>
<th>Alignment of Generator Connected to</th>
<th>Dummy Antenna</th>
<th>Generator Frequency</th>
<th>Band Switch Setting</th>
<th>Tuning Cond. Setting</th>
<th>Trimmer</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Get drive wheel so that pointer is over left-band stop line of alignment scale with condenser plates fully meshed. See special note below.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I.F.</td>
<td>0.1 mf.</td>
<td>456 KC</td>
<td>BC</td>
<td>1600 KC</td>
<td>C16 AAB</td>
<td>2nd I.F.</td>
</tr>
<tr>
<td>3</td>
<td>Rejector</td>
<td>200 mf.</td>
<td>456 KC</td>
<td>BC</td>
<td>600 KC</td>
<td>C15 AAB</td>
<td>1st I.F.</td>
</tr>
<tr>
<td>4</td>
<td>Broadcast Band</td>
<td>200 mf.</td>
<td>1500 KC</td>
<td>BC</td>
<td>1500 KC</td>
<td>C11 (acc.)</td>
<td>***</td>
</tr>
<tr>
<td>5</td>
<td>Single-wave Band</td>
<td>600 mf.</td>
<td>600 KC</td>
<td>BC</td>
<td>600 KC</td>
<td>C12 (pad.)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Repeat operation 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Check calibration and sensitivity at 600 KC, 750 KC, 1000 KC and 1500 KC.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Short-wave Band</td>
<td>18 MC</td>
<td>SW</td>
<td>18 MC</td>
<td>C13 (acc.)</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Check calibration and sensitivity at 6, 9, 13 MC and 18 MC.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Check operations 1 to 9 inclusive.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
- Pin No. 8 of 6S47T oscillator-converter tube
- Connect dummy antenna to "Antenna" of loop winding
- Rock dial while adjusting for maximum output.
- ***100 ohms and 200 maf. in series.
- (*)

---

[Diagram of circuit boards and components]

- Chassis Top
- Chassis Bottom
- Chassis Back
- Motor Plug
- AC Cord
- Black
- Blue
- Green
- White
- Ge-Cat. & Dust Control
- Band Switch

---

Compliments of www.nucow.com
**VOLTAGE CHART**

Line Voltage: 117 volts AC
Position of Volume Control: Pull with set tuned to quiet channel.
Position of Band Switch: Broadcast

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>Voltage of Socket Prongs to Gnd. (See Prong Nos. or Schematic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7L7</td>
<td>R-F Amplifier</td>
<td>No. 1: 6* 250 90  —  No. 4: 0 2a  —  No. 6: 250 6* 250  —  No. 8: 250 6* 250</td>
</tr>
<tr>
<td>6S7Q7T</td>
<td>Osc-Converter</td>
<td>—  —  250 7b —  —  0 7b  —  —  6* 74  —  —  6* 6*</td>
</tr>
<tr>
<td>6ES7Q7T</td>
<td>I-F Amplifier</td>
<td>—  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —</td>
</tr>
<tr>
<td>6S7Q7T</td>
<td>Det. - AVC - 1st A-F</td>
<td>—  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —  —</td>
</tr>
<tr>
<td>6P5G</td>
<td>Inverter</td>
<td>—  —  15 45  —  —  250 6* 62  —  —  6* 6*  —  —  —  —</td>
</tr>
<tr>
<td>6P5G</td>
<td>Power Amplifier</td>
<td>—  —  250 250  —  —  130 6* 6*  —  —  6* 6*  —  —  —  —</td>
</tr>
<tr>
<td>6P5G</td>
<td>Power Amplifier</td>
<td>—  —  250 250  —  —  130 6* 6*  —  —  6* 6*  —  —  —  —</td>
</tr>
<tr>
<td>6A45C6</td>
<td>Dual Viso-Glo</td>
<td>—  —  6* 25  —  —  150  —  —  —  —  —  —  —  —  —</td>
</tr>
<tr>
<td>5Y3G</td>
<td>Rectifier</td>
<td>—  —  370* 320*  —  —  320* 260* 370*  —  —  —  —  —  —</td>
</tr>
</tbody>
</table>

- AC volts,

**Note:** Cannot be measured with 1000 ohms per volt voltmeter.

A-2.5 volt DC scale.
B-1. volt DC scale.
TO USE SCALE PROCEED AS FOLLOWS:

1. MAKE ACCURATE TRACING OF SCALE WITH CARBON PAPER ON CARDBOARD.

2. CUT OR PUNCH OUT THE HOLES AS INDICATED.

3. PLACE THE SCALE IN POSITION OVER THE CHASSIS DIAL PLATE SO THE SCALE HOLES AND PLATE HOLES COINCIDE. USE PINS OR SCREWS TO HOLD SCALE IN PLACE.

These SPARTON Models are designed with the dial scale as a part of the cabinet escutcheon for the dial. Since the actual dial scale is not a part of the chassis, accurate calibration and setting of the pointer become difficult unless a duplicate or auxiliary scale is used. ALIGNMENT NOTES:

A. "Stop Lines" on scale indicate actual stopping points of pointer travel with complete 180 degree rotation of variable tuning condenser. Therefore, the "STOP LINES" on the scale are reference points and allow correct positioning of the various parts associated with the dial indicating mechanism.

B. Pointer must always be at LEFT HAND Stop Line with condenser closed. Then if pointer is not at RIGHT HAND Stop Line with condenser fully open, make necessary adjustments.
## Sparton Superheterodyne Model 1091

### Voltage Chart

**Line Voltage:** 117 Volts  
**Position of Volume Control:** Pull with Antenna Disconnect Switch  
**Position of Band Switch:** Broadcast

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>Voltage of Socket Prongs to Gnd.</th>
<th>Grid Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>6AK7OT</td>
<td>B.F. Amplifier</td>
<td>0 0 0 0 4.2 60 0.25 300</td>
<td>-</td>
</tr>
<tr>
<td>6356</td>
<td>Osc. &amp; Converter</td>
<td>0 0 300 60 ** 80 6.25 4.2 0</td>
<td>-</td>
</tr>
<tr>
<td>6AD7</td>
<td>I.F. Amplifier</td>
<td>0 0 300 100 ** 80 6.25 4.2 0</td>
<td>-</td>
</tr>
<tr>
<td>6AQ5</td>
<td>Audio</td>
<td>0 0 ** ** 120 6.25 0</td>
<td>-</td>
</tr>
<tr>
<td>6J5G</td>
<td>Phase Inverter</td>
<td>0 0 225 300 ** 80 6.25 60</td>
<td>-</td>
</tr>
<tr>
<td>6556</td>
<td>Power Amplifier</td>
<td>0 0 300 300 ** 0 6.25 0</td>
<td>-</td>
</tr>
<tr>
<td>6DJ6</td>
<td>Power Amplifier</td>
<td>0 0 300 300 ** 0 6.25 0</td>
<td>-</td>
</tr>
<tr>
<td>6926</td>
<td>A.G. Amplifier</td>
<td>0 0 00 00 00 0</td>
<td>-</td>
</tr>
<tr>
<td>6F4N6</td>
<td>Dual Triode</td>
<td>0 0 0 0 00 0 0</td>
<td>-</td>
</tr>
<tr>
<td>5389</td>
<td>Rectifier</td>
<td>0 400 - 375 ** 775 775 0 400</td>
<td>-</td>
</tr>
<tr>
<td>5330</td>
<td>Rectifier</td>
<td>0 400 - 375 ** 775 775 0 400</td>
<td>-</td>
</tr>
</tbody>
</table>

**NOTES:** Voltage readings are for schematic diagram. Allow 15% or more on all measurements. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 1000 ohms per volt voltmeter.

**AC volts:**

- Cannot be measured with Weston Analyzer #665.

### Alignment Chart

<table>
<thead>
<tr>
<th>OPER-</th>
<th>ALIGNMENT</th>
<th>GENERATOR</th>
<th>DOWNTOWN</th>
<th>GENERATOR FREQUENCY</th>
<th>BAND SWITCH</th>
<th>TUNING</th>
<th>TRIMMER</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Of</td>
<td>Generator</td>
<td>Antenna</td>
<td>Frequency</td>
<td>Setting</td>
<td>Cond.</td>
<td>Setting</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Grid Cap</td>
<td>G/6G</td>
<td>1 mc.</td>
<td>456 kc</td>
<td>BC</td>
<td>Open</td>
<td>C27 B *</td>
<td>**</td>
</tr>
<tr>
<td>3</td>
<td>I.F.</td>
<td>Osc. Conv.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C27 A</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C27 B *</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C26 B *</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C26 A</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C26 C</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>8</td>
<td>CAUTION: Do not readjust trimmers 27A and 26R after red spot trimmers 27B and 26B have been peaked.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Broadcast</td>
<td>Ant.</td>
<td>200 mfl.</td>
<td>1500 kc</td>
<td>BC</td>
<td>1500 kc</td>
<td>C21 (Osc.)</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C23 (RF)</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>11</td>
<td>(Repeat operation 9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Check calibration and sensitivity at 1500 kc, 3000 kc, and 600 kc</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Police</td>
<td>Ant.</td>
<td>100 ohm</td>
<td>500 mc.</td>
<td>5 mc</td>
<td>Police</td>
<td>C18 (Osc.)</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>14</td>
<td>Check calibration and sensitivity at 5 mc, 10 mc, and 15 mc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Short Wave</td>
<td>Ant.</td>
<td>100 ohm</td>
<td>200 mfl.</td>
<td>Series</td>
<td>18</td>
<td>MC</td>
<td>C17 (Osc.)</td>
</tr>
<tr>
<td>16</td>
<td>Check calibration and sensitivity at 8 mc, 12 mc, and 5 mc</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>(Check operations 1 to 16 inclusive)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

- "Peak" color trimmer screw
- **Turn trimmer screw all the way down**
- **Rock dial while adjusting for maximum output.**
Operates on 110-120 V., 50-60~ AC or DC.
Do not connect to external ground.

Operates on 110-120 V., 50-60~ AC or DC.
Do not connect to external ground.
This receiver is designed to operate over two tuning ranges. The broadcast range which extends from 540 K.C. to 1730 and the foreign short wave band which extends from 5800 K.C. to 18000 K.C.

**STATION SELECTOR**

The four button automatic tuner on this receiver can be adjusted to any station desired by the listener regardless of the frequency of the station. To adjust: Tune in the station desired with the manual control. Loosen the first automatic tuning button by turning the button counter-clockwise. Press it in all the way while holding the manual control knob tuned to the desired station. Rotate button clockwise to lock it. The remaining three buttons are adjusted in the same way. The adjustments can be changed at any time desired.

**ALIGNMENT DATA**

**INTERMEDIATE FREQUENCY:** Set oscillator to 465 K.C. Feed this to the grid of the pentagrid (6A7) converter tube. Adjust trimmers on the intermediate frequency transformers for peak readings as indicated on the output meter which is to be placed across the output transformer.

**BROADCAST BAND:** Set the band switch for broadcast reception. Adjust oscillator to 1400 K.C. and connect the output of the generator to the antenna connection at the rear of the chassis through a .002 mfd. micro condenser. Set the pointer on the dial to 1400 K.C making sure that the volume control is set at its maximum position. Adjust the broadcast antenna and broadcast oscillator trimmers for maximum signal (as indicated on the output meter). Re-set the dial pointer on the receiver and on the test oscillator to 600 K.C. Slowly increase or decrease the broadcast grid condenser while tuning back and forth across the signal with the station selector knob until the maximum reading is obtained on the output meter. Re-check the 1400 K.C. alignment as the adjustment at 600 K.C. may have slightly disturbed the original 1400 K.C. setting.

**SHORT WAVE:** Set band switch on short wave position. Connect the antenna of the radio receiver to the output of the test oscillator through a 400 ohm carbon resistor. Set oscillator and receiver dial at 15 megacycles. Adjust the short wave antenna and short wave oscillator trimming condensers for maximum output as indicated by readings on the output meter. No other adjustments are necessary for aligning this band.

It is advisable to check the sensitivity at 6000 K.C. to determine whether the circuits are properly aligned. Should the receiver lack sensitivity at this frequency check the .005 micro condenser for short circuit.
NOTE: The battery must never be charged while set is in operation. If an a-c charger is used, it should always be disconnected from the battery when the receiver is being used. An inexpensive single pole switch can be used for disconnecting the windcharger from the battery. This will increase the life of the tubes and give additional economy to the use of the receiver.

CONVENTIONAL ALIGNMENT; SEE SPECIAL SECTION VOLUME VIII

FOR AUTOMATIC TUNING SEE INDEX
**BATTERY LIFE.** The unit used on this receiver is known as a heavy duty 1 1/2 volt and 90 volt AB dry battery pack, approximately sixteen inches long, four and a half inches wide and six and a half inches high with a socket type connector, A battery of this type has a probable life of six to seven months with three hours daily use and a longer or shorter life as the daily usage is increased or decreased when the set is operated in the 'power position.'

**REAR SWITCH.** (Two Position Economy Switch.) The switch is provided to obtain the maximum of battery life without sacrificing the performance of the set.

The switch should be operated in the "Economy" (left hand) position until the performance of the radio receiver drops sufficiently to indicate the end of the batteries' normal life.

When the battery is new the set gives sufficient power output and sensitivity in the economy position and the life of the battery is materially increased. When the battery becomes old the "Power" position (right hand) makes it possible to use the battery to the complete end of the batteries' useful life and still retain good reception.
ALIGNMENT PROCEDURE

Across Loud Speaker Voice Coil
1.85 Volts

Receiver Chassis
See Chart Below

30%, 400 Cycles

Fully On

The variable condenser should be at 800 k.c. for antenna adjustment. Always keep the output power from the generator at its lowest possible value to prevent the A.V.C. of the receiver from interfering with accurate alignment.

THE AMMETER LEAD

The ammeter cable (See "H" in Fig. 1) has a spring clip at one end and a fuse receptacle at the other. Compress the spring clip and slide it over the ammeter stud on the back of the car’s ammeter. When the clip is released it will spring out and grip the stud securely. (See Fig. 1.) The cable clip may be connected to either stud of the ammeter. If connected to one stud, the current taken by the radio will register on the ammeter. If connected to the other stud, it will not register. In a few cars such as the first models of the Ford V-8 the ammeter does not have terminals. In such cases the spring clip should be fastened to any available terminal behind the dash which is connected to the ungrounded side of the battery at all times. Some terminals will be so connected only when the ignition or light switches are turned "On." Insert the fibre sleeve and fuse (See "J" and "K" in Fig. 1) in the other end of the ammeter cable. The black wire coming from the radio receiver has a plug at its end which should be inserted into the fuse receptacle after the fuse sleeve and fuse have been inserted.

THE GENERATOR CONDENSER

The Generator Condenser should be mounted to the generator frame by means of any one of the generator assembly bolts. Scrape all dirt and paint away so that a clean metal to metal contact is made. The flexible lead from the Generator Condenser should be connected to the output terminal of the generator.
ANTENNA

Insert the single prong of the antenna cable (See “G” in Fig. 1) into its receptacle located on the bottom of the receiver case and near the front left hand corner. Note that the other end of this cable has a white covered wire protruding from its end and a bright metal pigtail. The white covered inner-wire and the bright metal pigtail are to be connected to the car’s antenna in the following manner:

If an antenna was located coming from the corner post of the car, it will probably have an inner wire covered with the metal braid. (If it has a plug at its end, cut off the plug). Scrape clean and solder the white wire of the receiver’s lead to the inner wire of the car antenna lead. Be certain these inner wires do not at any time touch the outer shield. (See Fig. 5.)

After the connection is cleaned and connected, cover the joint carefully with tape. (See Fig. 6.)

Connect the pigtail of the receiver’s antenna wire to the pigtail braid of the car’s antenna lead-in. Wrap pigtail and solder together using rosin core solder. IMPORTANT—Make certain when bolting soldered pigtail ends to car that the section is scraped clean and a good chassis ground. (See Fig. 7.)

If the lead-in from the car antenna is not shielded, it is advisable to do so to overcome motor noise. Slip a shielded loom over the entire length of the car antenna lead-in. In some cases where a roof antenna is used, the lead-in is brought down through a corner post of the car frame at the end of the windshield (See Figure 2). If the radio antenna cable is long enough to be inserted several inches into the corner post, connect antenna lead-in and the radio antenna cable as shown in Figures 5, 6 and 7, and after taping, insert the splice and all the unshielded portion of the lead-in up into the corner post. If this cannot be done, this type of lead-in should be covered with a shielded loom several inches into the corner post. Connect the lead-in and shielding as illustrated in Figures 5, 6 and 7. The outer end of the shielding at the car antenna should be grounded. To eliminate crackling and noisy reception due to antenna lead-in pick-up, the shielded lead-in should be either insulated from chassis (or car body) or grounded at interval points, leading from the radio antenna cable to the car antenna. Be sure to use car chassis or grounded section of body only for grounding.

THE DISTRIBUTOR SUPPRESSOR

To install the distributor suppressor, cut the CFNTER lead from the distributor cap in two, as close as possible to the distributor cap. Screw the DistributorSuppressor to one end of the cut cable and then to the other end leading to the distributor cap.

SETTING PUSH-BUTTONS

1. By means of the Station Selector Knob, tune in WITH THE RIGHT HAND AS ACCURATELY AS POSSIBLE the station having the lowest frequency—that is, your selected station which is tuned in nearest the right-hand side of the dial.

2. After the station has been tuned in accurately with the right hand, continue to hold it in its exact position firmly, and with the left hand loosen the Push-Button to be set up for that station by unscrewing the Push-Button about one turn to the left (counter-clockwise).

3. Continuing to hold the Station Selector Knob in its exact position, PUSH THE PUSH-BUTTON IN ALL THE WAY with the left hand.

4. After the Push-Button has been depressed all the way, tighten it gently toward the right (clockwise). Release Push-Button slowly and when in normal position grip button and tighten firmly.

The Push-Button tuning system is now correctly set up for your first selected station of lowest frequency and the Call Letter Tab for this station should be at the extreme right of the Call Letter Holder.

Follow through with this same procedure, setting up the other 5 stations in the order of their frequency—that is, the second station set up will be second lowest in frequency and the third station set up will be third lowest in frequency.

Carefully check each Push-Button for the accuracy of its setting. If, when tuning in any station with its Automatic Push-Button it does not have equal volume or clarity to that obtained with manual tuning, this may indicate the automatic adjustment for that station was not made accurately. Should there be any inaccuracy in any one of the Push-Button adjustments, correction can be made by repeating the above procedure for that button only. Do not reset those Push-Buttons that are accurately adjusted.

No further adjustments are necessary to operate your auto radio automatically or manually. To receive any one of your six selected stations for automatic operation, merely push in ALL THE WAY the Push-Button for that station. To receive all other stations in the regular manner, push in the Station Selector Knob and turn it to the frequency of the station desired.

IMPORTANT: ANTENNA ADJUSTMENT

The antenna adjustment control is located close to the antenna cable receptacle as shown in Figure 1. To make the adjustment first, remove plug button from bottom of case by inserting a screwdriver between case and plug button, then tune in a weak station with full volume at or very close to 600 kilocycles (60) on the dial. Second, insert a small screwdriver into the antenna adjustment screw shown in Figure 2 and turn the screwdriver either to the left or right until the volume of the station is at its maximum point. While adjusting the antenna adjustment screw it is advisable to vary the station selector knob a degree or two to obtain the best adjustment. Now insert plug button into case. The receiver is now balanced and no further radio electrical adjustments are necessary.

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Tubes required are:

1—6A7 Oscillator-Translator
1—6D6 I.F. Amplifier
1—75 Detector-A.V.C., Audio Amplifier

1—41 Output
1—84 Rectifier

I.F. ALIGNMENT

From a good signal generator connect the proper leads, one to the radio chassis and the other thru a .1 mfd condenser to the grid cap of the 1A7G tube, with the tube's grid lead still in place. Set the receiver dial to 1720 K.C. and the signal generator to 456 K.C. With the receiver's volume control full on, adjust the signal generator's output until the signal is heard in the speaker and the output meter reads approximately .3 volts. Adjust the I.F. trimmers for maximum output, decreasing the generator output as the receiver output increases, so the meter always reads approximately .3 volt.

R.F. ALIGNMENT

When aligning the antenna and oscillator circuits the loop antenna should be placed in its approximate position in relation to the radio chassis and speaker as it is placed in the cabinet. No leads are connected from the signal generator, but the generator leads are connected to a three or four turn loop about three inches in diameter, of ordinary insulated hookup wire. This loop is placed about four inches from the loop antenna and parallel to it.

The radio dial and generator are set to 1720 K.C. and the oscillator trimmer set for maximum output, still using a .3 volt meter reading. The dial and generator are then set to 1400 K.C. so the signal comes thru, and the trimmer on the loop antenna is adjusted for maximum output. Check for alignment at 600 K.C.
1. Ground the antenna lead-in shield at one or more points to the cow or any other metal surface in contact with the lead-in.

2. Move the battery lead around to a point of least noise pickup and then in place with tying cord or tape.

3. Bond together the throttle rod, choke rod and any metal tubing with a piece of copper braid and ground to the fire wall. This should be done on the engine side.

4. Bond steering post to firewall.

5. Bond hood, side panel and other protective covering for engine if it is not making a positive contact to the body.

In extreme cases, a distributor resistor and generator condenser will reduce noise interference to a minimum. These parts are available at your dealer.

From the standpoint of motor noise, the white type antenna recommended has been found to be the most satisfactory. It is advisable to use this type antenna even if the car is equipped with a built-in antenna.

I. F. ALIGNMENT. With the gang condenser set at minimum, adjust the test oscillator to 456 Kc and connect the output to the grid of the first detector tube (6ABT) through a .05 or .1 milliamp. condenser. The ground on the test oscillator should be connected to the chassis ground. Align all three trimmers to peak or maximum reading on the output meter.

ANT. AND OSC. ALIGNMENT. Connect the antenna to the generator through a 65 MFD dummy* and set the dial and generator at 1600 Kc (gang at minimum capacity). Adjust the BC oscillator trimmer for maximum output. Set the test oscillator at 1400 Kc and tune in the signal with the dial and adjust the antenna trimmer for maximum output.

Next set the test oscillator at 600 Kc and tune in the signal with the dial to check the sensitivity of this point.

*If the antenna is adjusted using a white antenna shielded lead use a 25 MFD dummy antenna.
ADJUSTING PUSH BUTTONS FOR MODELS A2026 Ch. 10-70; Z-7002 Ch. 0-51

Cut the call letters of your four selected stations from the list supplied with your receiver and slip them into the top of the Push-Buttons, with the clear celluloid on top of the call letters to protect them. Arrange the call letters in the buttons from left to right, having the lowest frequency station (that is, the station closest to 600 K.C.) at the left and work progressively towards the right, so that the highest frequency station is toward the right.

Follow the procedure outline below, in order to adjust the push-buttons properly:

1. By means of the tuning knob, tune in with the right hand as accurately as possible the desired station having the lowest frequency.

2. Continuing to hold the tuning control knob in its exact position with the right hand, loosen with the left hand the push-button to be set up for that station, (the one farthest toward the left) by unscrewing the push-button about one turn to the left (counter-clockwise).

3. Push the push-button in all the way, and then tighten it gently toward the right (clockwise). Release push-button slowly and when in normal position grip button and tighten firmly.

The push-button tuning system is now correctly set up for your first selected station of lowest frequency.

Follow through with this same procedure, setting up the other three stations in the order of their frequency, that is, the second station set up will be second lowest in frequency, etc.
TUBES

Do not use tubes of types different from those shown above. When replacing tubes or checking connections, refer to the Tube Layout Chart.

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MODELS 2004, 2005, 2082, 2083, SPIEGEL, INC.
T-2004, T-2054, T-2082, Ch. 175E

INSTRUCTIONS FOR ADJUSTMENT AND OPERATION OF THE AUTOMATIC TUNING SYSTEM

Before attempting to adjust the automatic tuner, read the following instructions carefully and proceed exactly as directed in the Master Selector’s Operating manual, and it is very easily accomplished when the procedure is followed.

The tuning and matching of three parts, which may be described briefly as follows:

**Master Selectors:** This includes the Selector Drum, the Selector Pins, and the Selector Light. These parts are arranged in such a way that a variable inductor, and a variable capacitor, are tuned together with the variable inductor and capacitor, providing the correct conditions for the desired station.

**Motor and Drives:** This mechanism consists of an induction motor having a mechanical drive clutch with magnetic reed switch, and a train of gears operating directly onto the Manual Station Selectors drive shaft. No fitting is necessary.

**Push Buttons:** These buttons are located on the front of the chassis, and extend through the enclosure. When the button is depressed, the switch is actuated, and the lamp is lit.

**SELECTING THE MASTER SELECTOR**

As a means of simplifying the tuning operations, a selection of your favorite local or strong near-by stations according to frequency or position on the dial. Setting up weak or distant stations is not recommended. Call the station nearest the left-hand end of the dial (approximately 1600 kc) the No. 1 station, and number the other stations similarly going from left to right across the dial. For example, assume that you prefer to stations operate on frequencies of 1500 kc, 1400 kc, 1300 kc, 1200 kc, 1000 kc, 900 kc, 700 kc, and 600 kc. Then the 1500 kc station would be No. 1, the 1400 kc station would be No. 2, and so on down the line with the 600 kc station being designated No. 6. Refer to the push buttons as they are not used until after the Master Selector has been set up.

On the back of the receiver will be found the Selector Drum and the eight Contact Pins which determine the position at which the tuning will stop when the buttons are pressed. Referring to the diagrams, Fig. 1 shows the general layout and relations of the drum and contacts. Fig. 2 shows one of the contact pins in detail, showing the pin and its relation to the drum. It is held securely by a spring which will not allow it to move when the selector drum turns under it. Fig. 3 shows the arrangement of the Contact Pins, each pin being numbered according to the system suggested for numbering the stations, thus Pin No. 1 will be used for Station No. 1, Pin No. 2 will be used for Station No. 2, and so on down the list.

On the Selector Drum are two pairs of Contact Ribbon. Note that there is a Point Dot on the edge of the drum which will break in the ribbon on the upper half of the ribbon. This Point Dot is for the purpose of locating the approximate position at which a given Contact Pin should be set. In order to have the drum stop for a particular station.

It is very important that the following steps be followed exactly as directed. Failure to do so may result in incorrect tuning:

1. Set the receiver for reception of Standard Broadcast Stations, at station nearest under 'Operation'. Turn the tuning eye counterclockwise to reach the lower end of the dial. Watch the tuning eye closely, making certain that the station is tuned in perfectly.

2. Use the Manual Station Selector (upper right) knob, turn in the Manual Station Selector to the No. 1 station, and continue to rotate the knob to the right until the selector drum has been turned to the No. 1 contact pin, and the selector drum pin is aligned with the Point Dot on the Drum.

3. Use the Manual Station Selector (upper right) knob, turn in the Manual Station Selector to the No. 2 station, and continue to rotate the knob to the right until the selector drum has been turned to the No. 2 contact pin, and the selector drum pin is aligned with the Point Dot on the Drum.

4. Repeat the above procedure for the No. 3 station, etc., until the selector drum is aligned with the Point Dot on the Drum for each station.

5. After all the stations have been set up, locate the Care Letters of your stations on the printed sheets supplied with the receiver. Remove the desired Care Letter blocks from the sheets, and insert them in the proper positions above the push buttons.

6. The only operations necessary to receive any of the eight stations set up as outlined above are: Turn on the power switch on by rotating the lower left knob to the right—turn the control a few degrees beyond the point at which the switch snaps on—allow about one minute for the tubes to heat. Then press the button under the Care Letter of the desired station holding the Button Down Until the Pointer Steps and the Station is Rehearsed, then push the button, then the station is tuned in the proper position for reception of Standard Broadcast Stations.

ALIGMENT PROCEDURE

**IF** Connect the generator ground to receiver chassis. Using .1 mfd. condenser in series with high side of generator, apply 456 kc. signal to the grid of the 6D6 IF amplifier tube and aline second IF transformer trimmers. Repeat for first IF transformer, applying signal to grid of the 6A7 tube. (See above diagram for location of tubes and transformers.)

**RF** (See circuit diagram for location of trimmers.) Using a 200 mfd. condenser in series with the high side of the generator, turn band selector switch all the way to the left, tuning condenser to minimum capacity, feed 1680 kc. signal to antenna terminal and adjust broadcast oscillator trimmer for top frequency. Set generator frequency at some point around 1400-1500 kc., and adjust broadcast antenna and RF trimmers. Set generator for 600 kc., tune receiver to signal and adjust the radiator. The tuning condenser should be rocked back and forth through the signal while varying the radiator in order to assure perfect alignment.

A 400 ohm resistor must be used in series with the generator as a "dummy" antenna for proper aligment of the two short wave bands. Set the band selector switch to the center position, adjust the oscillator top frequency for 5400 kc., then aline the antenna trimmer at about 5000 kc. With the band selector in the extreme right position, adjust the top frequency of the high frequency band to 16,000 kc., and aline the antenna trimmer at about 15,000 kc. In order to make sure that the top end of the last band is set properly, it is best to screw the oscillator trimmed down tight, then unscrew to the second peak. The antenna trimmer should be screwed down tight, then unscrewed to the first peak. This procedure must be followed in order that the oscillator and RF circuits will be set in the correct relation to each other, otherwise a "dead" spot at a lower frequency will result, and the dial calibration will not be correct. Usually, it is best to rock the tuning condenser back and forth slightly while making these adjustments at high frequencies.

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Compliments of www.nucow.com
**PHONOGRAPH OPERATION**

**W-134 Ch. TF; Z-7124 Ch. TF**

**MOTOR.** The motor is a strong mechanical type hand wound spring motor. Insert the crank in the hole at the right. When the motor is fully wound the phonograph will play two full ten-inch records before rewinding is required.

**TURNTABLE.** To start turntable move the brake lever forward. To stop turntable pull lever toward you. Speed may be regulated by the control arm. For correct pitch adjust this speed to 78 revolutions per minute.

**WARNING:** Do not forget to turn off radio set when through playing records or the battery will run down. Battery life is appreciably shortened by continuous operation over long periods of time.

**PICKUP.** The pickup is the new crystal type. To insert a needle, raise the pickup arm to a vertical position, loosen the needle holder screw on the front, insert a needle to its full depth, tighten up the needle holder screw and lower pickup arm to its non-playing position outside the record and slip into the pickup rest holder. When commencing to play, remove pickup from holder, lift and place gently the point of the needle on the smooth outer rim of the record and slide into the first groove of the record.

**PLAYING RECORDS**

(a) Turn on the volume control and "on-off" switch on the receiver.

(b) Turn the "Radio-phon" switch to the phono position.

(c) Place the selected record upon the turntable and move the starting lever forward. This will place the record in motion.

(d) Lift pickup and lower the needle point gently to the smooth outer rim of the record and slide into the first groove of the record.

(e) Adjust volume to proper level by rotation of the volume control knob. After the selection is completed, lift the pickup, swing the arm to the right beyond the edge of the record and lower and affix to the arm rest bracket.

(f) When you have finished playing, lift pickup and place in its rest position and remove record from turntable. Never leave pickup with needle resting on record or on turntable.

**RECORD HOLDER.** Eight ten-inch records may be carried in the record holder in the cabinet lid. To remove record holding clamp turn it ninety degrees. Place records in lid, replace clamp, sliding it up tight against records before turning it.

**SERVICE.** The phonograph motor will require oiling once every three months. Apply 3 or 4 drops of Number 10 S. A. E. oil to the turntable bearings, to the bearings at each end of the governor shaft, to the felt pad on the governor brake, and to the gears and bearings on the gear shafts.

**NEEDLES**

High quality needles are important to your enjoyment of recorded music. Use good half-tone steel needles or Kato-needles to prolong the life of the records. If long playing needles are used, do not change the position of the needle in the pickup after it has once been played, as this will injure the record grooves.

Note: The needle point wears down gradually in use and wears down in conformity with the shape of the record groove. Changing the position of the needle in the pickup after it has been played will provide a new fit to the groove and will damage the record groove by changing the shape of the groove. The life of the record depends upon maintaining the original record groove. To summarize this important message, never reinsert a used needle in the pickup, since this will do permanent injury to the record and shorten your record life materially.
Models A-2012, A-2056

ALIGNMENT PROCEDURE

Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment proceedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) second, (3) third.

Before starting alignment:
(a) Check tuning dial adjustment by turning qng condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move to correct position.
(b) Use an accurately calibrated test oscillator with some type of output measuring device.
(c) Have ground lead of test oscillator attached to qng condenser frame.

<table>
<thead>
<tr>
<th><strong>TEST OSCILLATOR</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Set receiver dial to:</strong></td>
</tr>
<tr>
<td>LF</td>
</tr>
<tr>
<td>1 Exactly 1730 K. C.</td>
</tr>
<tr>
<td>2 Approx. 1400 K. C.</td>
</tr>
</tbody>
</table>

Attach output of test oscillator to:

High side to grid terminal of 12SA7 tube.

DO NOT REMOVE CAP.

Adjust the second L F transformer trimmer for maximum output.

While rocking qng condenser adjust 1400 K. C. antenna trimmer for maximum output.

Refer to parts layout diagram for location of trimmers mentioned below.

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**LF. ALIGNMENT**

Adjust the signal generator to 455 KC and connect the output to the grid of the first detector tube (6A7) through a .05 or .1 mfd. condenser. Align all I.F. trimmers to peak or maximum reading on the output meter.

**BROADCAST BAND ALIGNMENT**

Adjust the signal generator to 1730 KC and connect the output to the antenna lead (blue) through a .0002 mfd. mica condenser. Set the gang condenser to minimum capacity and adjust the oscillator trimmer to receive this signal. The oscillator and antenna trimmers may be reached by removing the dial escutcheon. (See Fig. 3 for trimmer locations.)

The next step is to set the signal generator to 1400 KC and after tuning in the signal adjust the antenna trimmer to peak. Next, re-set the dial pointer on the receiver and the signal generator to 600 KC. Slowly increase or decrease the oscillator padding condenser and at the same time continuously tune back and forth across the signal with the receiver until the maximum reading is obtained on the output meter.

Return to 1400 KC and again go over the adjustments of this frequency to be certain that they were not put slightly out of alignment when adjustment was made at 600 KC.

**SHORT WAVE BAND ALIGNMENT**

The short wave band is adjusted by setting the signal generator to 18100 KC and connecting the output to the antenna lead through a 400 ohm resistor. Set the gang at minimum and adjust the “short wave oscillator trimmer” to receive the signal. Set the generator to 16,000 KC, tune in the signal and adjust the “short wave antenna” trimmer to give maximum output. As there is no variable low frequency padding condenser on this band, the sensitivity of the receiver should be checked at 6000 KC to determine whether the circuits are in line with this frequency. Should the receiver lack sensitivity at 6000 KC, the antenna and oscillator coils, as well as the mica padding condenser, should be tested.
AUTOMATIC RECORD CHANGER

This Record Changer will automatically play a series of eight 10" or seven 12" records of the standard 78 R.P.M. type. Records of the last few years with the standard eccentric or spiral stopping groove on the inside and an eccentric on the outside will operate the automatic mechanism. However, records of any size up to 12" may be played manually.

OPERATION

Before operating the phonograph, either automatically or manually, be sure that the pickup arm is down and can be moved by hand. If not, a "click" must be corrected by bringing it down. To do this, throw the Turntable Switch in the "On" position. The turntable will begin to revolve and the cycle of motions on the pickup arm will be repeated. When the pickup arm comes down, turn off the Turntable Switch.

1. Never use force to start or stop the motor or any part of the record-changing mechanism or pickup arm.

2. The use of records which have been warped or damaged by improper care may cause the mechanism to jam and damage the instrument. Records which have been warped will slide on one another when playing, resulting in unsatisfactory reproduction.

3. This instrument is not recommended for playing 10" and 12" records in mixed sequence. If this should occur, records mixed together must be placed end to end and free from warp. The Index and Record Select Lever must be set at "O", and after playing the last record, the pickup arm will come down in position for a 10" record and repeat the playing of the record of a 10" diameter unless the turntable switch is turned off. Any tampering of the mechanism under these conditions indicates that the records used are not perfectly flat or that their edges are not sufficiently smooth to permit normal operation of the separation in dropping each record in sequence onto the turntable.

4. Do not leave records on the record holder post, as they are liable to warp, particularly so in warm climates. Keep your records in a record file (album or cabinet) when not in use.

5. The needle must be installed according to directions under "Pickup and Top-Loading Needle Socket" for proper operation of this instrument.

6. The two red mounting holes which hold the Automatic Record Player solid for shipping must be removed before using the Automatic Record Player socket can engage properly.

7. LEVELING—When a record has been played the pickup moves out, another record is dropped down, and the needle is fed automatically into the starting groove of this record. If the needle fails to enter the starting groove, raise the right-hand side of the cabinet by inserting thin spacers under the feelers on that side. If the needle slides over a few grooves, raise the left-hand side of the cabinet in a similar manner.

CONTROLS AND MECHANISM

INDEX AND RECORD SELECT LEVER

This lever is located near the right front corner of the motorboard with its index plate marked for four positions—"Manual", "12", "10", and "Reel". When it is desired to change record selections manually, this lever is set in the "Manual" position. With the lever in the "12" position, the mechanism is set to play a series of 12" records automatically. To play either a series of 12" records or 10" and 12" records mixed, the lever should be set at the "10" position. To restart a record being played, or to start the record changing cycle in case the record just played does not have the standard eccentric or spiral stopping groove, simply push the lever to the "Reel" position and let go. The pickup will raise and swing outwards, and the next record will drop down. Upon releasing the lever, it will automatically return to the "10" position. The further operation of the lever should be returned to the "12" position after selecting a record. Keep the lever in its "Manual" position when not actually playing records automatically.

TURNABLE SWITCH

The Sliditch located just in front of the Index and Record Select Lever controls the current to the turntable motor. To start the turntable, push the switch to the "On" position. To stop the turntable, push the switch to the "Off" position.

NEEDLES

The use of high-grade jewel playing needles is absolutely essential for the proper operation of this instrument. On the regular needles are only good for one or at the most two records. If any needle is worn too long, distortion and poor quality will be obtained and also the records will be damaged.

PICKUP AND TOP-LOADING NEEDLE SOCKET

The pickup is the new crystal type, with a hole in the top for insertion of needles. When not playing records, the pickup arm should be moved out to the right beyond the turntable and placed at rest on the arm support, with the pickup arm in the groove and the pickup over the needle groove plate. The pickup must be in this position to change needles.

To insert a needle initially, loosen the needle screw on the front of the pickup, place needle in hole at top so that it drops down against the needle plate and then tighten the needle screw.

REEL DECOR

The extending tab on the needle gauge plate of the needle box operates the needle selector. To change a needle, place pickup in rest position, loosen needle screw and press the extending tab on the needle gauge plate to drop the used needle into the box below. Release tab allows the needle gauge plate to swing back, and then insert a new needle in the pickup as described above.

RECORD HOLDER SHELVES

To place a record on the turntable or to remove records, raise the record holder shelves by lifting the fingers under the shell, and swing clear of the outer edges of record. Also, push back vertical lever adjacent to the rear record holder post. The turntable is now accessible. Before loading the magazine for automatic operation, swing the record holder shelves back into position.

AUTOMATIC OPERATION

1. See that the pickup is over the needle gauge plate with the needle properly in place. If not, complete "cycle" as explained in the first paragraph under "Operation".

2. With the Index and Record Select Lever at "Manual", place the first of the series of records on the turntable and the remainder of the series (up to seven 10" or six 12" record) on the record holder post (as shown in Fig. 2). The records should be arranged in the desired order with the desired selection face up and the last selection on top.

3. Set the Index and Record Select Lever to the proper position. (See Controls: Index and Record Select Lever.)

4. Push the turntable switch to the left—"On"—turntable should commence to revolve.

5. When the turntable has attained speed, lift pickup and lower gently on the record so that the needle point enters the outside groove.

6. Adjust volume control to the desired intensity and tone control to the preferred setting.

7. Close the lid of the cabinet to eliminate mechanical reproduction of sound by the needle.

The whole series of records will now play without interruption. Each record will repeat until the Turntable Switch is turned off. Allow the record-changing mechanism to complete its cycle before the turntable is stopped. Then lift the pickup, swing the arm to the right beyond the edge of the record and lower it onto the pickup rest with the pickup over the needle gauge plate. The record player is then ready for reloading, or for manual operation.

SETTING UP PUSH BUTTONS

Loosen one of the push buttons by turning the push button knob counter clockwise a turn or less and push it in; while holding the button in, tune in a desired station by means of the station selector knob. Turn the selector very slowly back and forth until the signal is clearest. Now while holding the push button in, tighten it by turning clockwise. Release the push button and turn the station selector to one end of the dial; push the tuning knob to the right and then check the button by pushing it in and if the station is tuned to the center of the area on the dial covered by the station the adjustment is correct.

Release the push button and loosen another push button and repeat the above procedure, doing this for the remaining buttons.
MODELS A-2108, A-2112, A-2116
SPIEGEL, INC.

Ch. 561-561M

INTERMEDIATE FREQUENCY 455 K.C.
BOTTOM VIEWS OF ALL SOCKET CONNECTIONS

BROADCAST BAND—530 to 1720 Kilocycles (555 to 174 Meters)
SHORT-WAVE BAND—5.8 to 18 Megacycles (52 to 16.6 Meters)

ALIGNMENT CHART

VOLTAGE CHART

©John F. Rider, Publisher
ADJUSTING THE PUSH-BUTTON TUNER

MODELS W100, W110, W118, W152, W160, W162; 1000, 1001, 1004, 1005, 1006, 1007, 1020, 1021, 1054, 1055, 1056, 1057, 1080, 1081, V1000, V1004, V1006, V1014, V1020, V1054, V1056, V1060, V1064; Ch. 629

1. Select six favorite nearby broadcast stations and detach the corresponding call letter tabs from the station call letter tab sheets.

2. Any tab may be used for any button, but it is usually more convenient for the operator if the tabs are arranged in sequence so that the tab for the lowest frequency station (station having lowest number of kilocycles [KC]) will be at the low frequency end of the dial.

3. Using a small screwdriver or other tool that will fit the screw in the end of the button, push the button in as far as it will go and turn to the right or left until the dial pointer has moved to the desired station frequency. Be sure the button is pushed all the way in and the station is tuned in accurately.

4. Repeat the procedure in Paragraph 3 for each of the remaining five buttons.

5. Check all buttons by pushing them in, one at a time, to determine whether desired stations are tuned properly.

6. Insert the proper tab in each button by pressing it in position.

7. Any of the six stations to which the push-button tuner has been adjusted may now be received simply by pushing the button for the desired station.

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The following combined "A" and "B" battery pack will give approximately 150 hours of life. The clamp arrangement is illustrated in Fig. 1. (The same clamp arrangement applies to either a pack or the type of "A" and "B" batteries illustrated.)

**SUPPLIER** Combined "A" and "B" battery in one unit
Ray-O-Vac AB694

The following batteries will give approximately 250 to 300 hours of life and are installed according to Fig. 2. One "A" battery and two "B" batteries are required.

**SUPPLIER** 6 Volt "A" Battery (Approx. 3½"x2½"x5 ¼")
- Burgess 718
- Ray-O-Vac 762
- General Dry Battery 274

**SUPPLIER** 45 Volt "B" Battery (Approx. 3½"x2½"x5 ¼")
- Burgess F4P
- Ray-O-Vac 694A
- General Dry Battery 4F4

The following batteries will give approximately 250 to 300 hours of life and are installed according to Fig. 2. One "A" battery and two "B" batteries are required.

**SUPPLIER** 6 Volt "A" Battery (Approx. 2¼"x2¼"x7 ½")
- Burgess A30
- Ray-O-Vac 430P
- General Dry Battery 8F4

**SUPPLIER** 45 Volt "B" Battery (Approx. 2¼"x2¼"x7 ½")
- Burgess 4P9
- Ray-O-Vac V30A
- General Dry Battery 4P9
- Marathon 3040

The following batteries will give approximately 100 to 125 hours of life and are installed according to Fig. 2. Use a third clamp to anchor the center battery. One "A" battery and two "B" batteries are required.

**SUPPLIER** 6 Volt "A" Battery (Approx. 2¼"x2¼"x4 ¼")
- Burgess F4P
- Ray-O-Vac 694A
- General Dry Battery 4F4

**SUPPLIER** 45 Volt "B" Battery (Approx. 2¼"x2¼"x4 ¼")
- Burgess 4P9
- Ray-O-Vac V30A
- General Dry Battery 4P9
- Marathon 3040
ALIGNMENT PROCEDURE

Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third. 

Before starting alignment:
(a) Check tuning dial adjustment by turning gang condenser until plate touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move needle to correct position.
(b) Use an accurately calibrated test oscillator with some type of output measuring device.
(c) Have ground lead of test oscillator attached to chassis.

<table>
<thead>
<tr>
<th>Place band switch for operation on:</th>
<th>Set receiver dial to:</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy antenna in series with output of test oscillator consisting of:</th>
<th>Attach output of test oscillator to:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. F. Alignment use any band position</td>
<td>Any point where no interfering signal is received</td>
<td>455 K.C.</td>
<td>.02 Mfd condenser</td>
<td>High side to grid cap of 1457 tube. Do not remove cap.</td>
<td>Adjust each of the second I.F. transformer trimmers for maximum output. Then adjust each of the first I.F. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>1730 to 540 K.C. Band</td>
<td>1</td>
<td>Exactly 1730 K.C.</td>
<td>Exactly 1730 K.C.</td>
<td>.0005 Mfd condenser</td>
<td>Receiver blue antenna lead</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Approximately 1400 K.C.</td>
<td>Approximately 1400 K.C.</td>
<td>.0005 Mfd condenser</td>
<td>Receiver blue antenna lead</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Approximately 600 K.C.</td>
<td>Approximately 600 K.C.</td>
<td>.0005 Mfd condenser</td>
<td>Receiver blue antenna lead</td>
</tr>
<tr>
<td>5.5 to 18 M.C. Band</td>
<td>1</td>
<td>Exactly 18 M.C.</td>
<td>Exactly 18 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver blue antenna lead</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Approximately 15 M.C.</td>
<td>Approximately 15 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver blue antenna lead</td>
</tr>
</tbody>
</table>

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Compliments of www.nucow.com
MODEL 610

Model 610 PUSH BUTTON ADJUSTMENT:

Any button may be set to any station desired. First, tune in the desired station by means of the thumb wheel. Second, turn the push button counter-clockwise two full turns. Then depress this button the full length of its stroke, and while depressed, tighten the button again by turning it clockwise. The button may now be released. To check the correct setting for this button, turn the thumb wheel to some other point and depress the push button. This will return the tuning mechanism to the station just set up. If it does not, repeat the foregoing sequence of operations more carefully. Each of the remaining buttons may be set to other stations in a like manner.

BALANCING INSTRUCTIONS:

All sensitivities given for 1/2 watt output = 1.4 V. across Voice Coil

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6A8 Grid</td>
<td>455</td>
<td>1, 2, 3 &amp; 4</td>
<td>5</td>
<td>1400</td>
</tr>
<tr>
<td>2</td>
<td>Ant. Coupler</td>
<td>1400</td>
<td></td>
<td>5</td>
<td>1400</td>
</tr>
<tr>
<td>3</td>
<td>Through 20 uuf</td>
<td>1400</td>
<td>6</td>
<td>1'00</td>
<td>10 uv</td>
</tr>
</tbody>
</table>

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115 volts AC or DC. Power consumption is 25 watts.

MODEL A-2462 Ch. 710
BALANCING INSTRUCTIONS
All sensitivities given for 1/2 watt output equals 1.4 V. across Voice Coil

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6A8 Grid</td>
<td>455 kc</td>
<td>1, 2, 3 &amp; 4</td>
<td>550 kc</td>
<td>50 uv</td>
</tr>
<tr>
<td>2</td>
<td>Ant. Coupler</td>
<td>1400 kc</td>
<td>5</td>
<td>1400 kc</td>
<td>10 uv</td>
</tr>
<tr>
<td>3</td>
<td>Through 20 uuf</td>
<td>1400 kc</td>
<td>6</td>
<td>1400 kc</td>
<td>10 uv</td>
</tr>
<tr>
<td>4</td>
<td>Through 20 uuf</td>
<td>600 kc</td>
<td>7</td>
<td>600 kc</td>
<td>10 uv</td>
</tr>
</tbody>
</table>
**SICKE VOLTAGES**

**ANTENNA GROUND**

**VOLTAGE MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS**

**SWAG RECORDER**

**6STK 7**

**6SAT 1st DET & OSC**

**6STK 1st DET & OSC**

**6S6G OUTPUT**

**SWAG TUBE**

**6STK 7**

**6SAT 2nd DET & A.C.**

**6STK 2nd DET & A.C.**

**PUSH BUTTON TUNER SWITCH, DIAGRAM NO. 10**

**CRYSTAL PLUG**

**CONE PLUG**

**TURNABLE MOTOR**

**TOP VIEW OF CHASSIS**

**BOTTOM VIEW OF CHASSIS**

**REAR OF CHASSIS**

**NOTE A:** The bias on the control grid of the 6BQ5 tube is —16 volts measured across resistor Nos. 6 and 24.

**NOTE B:** The bias on control grids of the 6SK7 F.R., 6SK7 F.R., 6SA7 1st Det. tube, and the diode plate of the 6SK7 tube, is —1.5 volts measured across resistor No. 27.

**NOTE C:** The bias on the control grid of the 6SK7 tube is —1.5 volts measured across resistor No. 6.

**ELECTRICAL PARTS LIST**

**DIAGRAM**

**PART NUMBER**

**DESCRIPTION**

**LIST PRICE**

**DIAGRAM NUMBER**

**PART NUMBER**

**DESCRIPTION**

**LIST PRICE**

**TUBE LOCATIONS**

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Compliments of www.nucow.com
Connect the output meter across the voice coil or between the plates of the 6V9G output tube and ground through a .1 ufd. condenser. The connection will depend on the type of meter. (The more sensitive type should be connected across the voice coil.)

Connect the ground lead of the signal generator to the receiver chassis. Disconnect the blue wire coming from the terminal strip and allow it to float to the chassis. The loop wire should be connected to the terminal strip as shown in the circuit diagram when aligning.

On the phonograph terminal strip, ground the terminal position of the center of the chassis. Connect the two remaining terminals together, using a short piece of wire. Turn the volume control to the maximum volume position and keep it in this position throughout the alignment procedure.

With the gong condenser in full mesh, set the pointer at a point 15° from the flat of the brown dial plate. This point corresponds to the last mark on the low frequency end of the dial scale. This pointer position is incorrect, so it is only necessary to loosely set the screws on the dial drive drum and push the gong condenser in full mesh with the pointer set properly, then reposition the set screws. See paragraph on "Setting the Dial Pointer."
02-4B, 02-4C CHASSIS
ALIGNMENT PROCEDURE

FOR ALIGNMENT an output meter and an accurately calibrated signal generator are required.

Connect the output meter across the voice coil or between the plate of the 1A5GT output tube and ground through a 0.1 Mfd. condenser, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)

Connect the ground lead of the signal generator to the Ground Terminal or the chassis.

Turn the volume control to the maximum volume position and keep it in this position while aligning.

With the gang condenser in full mesh, set the dial pointer to the last mark on the left hand end of the dial scale.

<table>
<thead>
<tr>
<th>Dummy Ant. in Series with Sig. Gen.</th>
<th>Connection of Sig. Generator Output to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>.1 MFD Condenser</td>
<td>Control Grid of 1A7GT</td>
<td>455 KC</td>
<td>Any Point Where It Does Not Affect Signal</td>
<td>1-2</td>
<td>2nd I.F.</td>
<td>Adjust for maximum output. Then repeat adjustment.</td>
</tr>
<tr>
<td>200 MMFD Condenser</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td>1500 KC</td>
<td>3-4</td>
<td>1st I.F.</td>
<td>Adjust for maximum output.</td>
</tr>
<tr>
<td>200 MMFD Condenser</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td>Tune To 1500 KC Generator Signal</td>
<td>5</td>
<td>Broadcast Oscillator (Shunt)</td>
<td>Adjust for maximum output.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MODELS 02-4B1 TO 02-4B9
SINGLE UNIT BATTERIES

<table>
<thead>
<tr>
<th>FOR USE WITH 3 PLUG BATTERY CABLE</th>
<th>FOR USE WITH SINGLE PLUG BATTERY CABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eveready No. 748</td>
<td>Eveready No. 748</td>
</tr>
<tr>
<td>Burgess 17G-D60 (with adapter)</td>
<td>Burgess 17G-D60</td>
</tr>
<tr>
<td>General 60DL-11L</td>
<td>General 60DL-11L</td>
</tr>
<tr>
<td>Ray-O-Vac AB28U</td>
<td>Ray-O-Vac AB82</td>
</tr>
</tbody>
</table>

POWER LINE OPERATION
To use this set on 110 volt 50-60 cycle A.C. power lines, use one of the following power packs:
Porta-Power Model "G"
Porta-Power Model "U"

These units are manufactured by the General Transformer Corporation, 1250 W. Van Buren, Chicago, Ill.

SPECIAL BATTERY CABLE
A special battery cable assembly (Part No. 116566) is available for use with sets using the single plug battery cable. This cable will allow the use of heavy duty batteries which are larger than those contained in the single unit battery packs and will give longer service. The special cable available is 30 inches in length and is held over locating these batteries beneath the table or behind the receiver cabinet. Complete instructions for use are packed with each cable, which may be purchased from the Stewart-Warner Corporation, Chicago, Illinois. It has a list price of $5.00.
The first production release of the 02-4B chassis used a three plug type of battery cable so that it could be connected to separate A and B batteries. Most battery packs on the market are equipped with sockets for this three plug cable as well as for a single large plug so that they could be used with this set if desired. However, some battery manufacturers put out special battery packs that were equipped only with the single large socket. To use this special battery pack with the early production 02-4B chassis, obtain the correct adapter from the battery manufacturer.

Later production 02-4B as well as all 02-4C and 02-5T sets used the single large plug to connect to any battery pack. For those preferring to use separate A and B batteries, we provide our part #116566 battery cable and adapter. This cable is priced at $.85 list.

Prices subject to change without notice.

Models 02-4C1 to 02-4C9

Installation of Batteries

Batteries Required: This receiver is designed to operate from a single unit battery pack which fits into the receiver cabinet directly behind the chassis. The following battery packs will fit into the receiver cabinet in back of the chassis:

- Burgess 17G-D60
- General 60DL-11L
- Eveready No. 748
- Ray-O-Vac AB82 or equivalent

The 4-prong plug on the end of the cable extending from the chassis is plugged into the 4-hole socket on top of the battery pack. No other battery connections are necessary.

Heavy-Duty Batteries: A special battery cable assembly (Part No. 116566) is available so that heavy duty batteries may be used with this receiver. These batteries are larger than those contained in the single unit power pack and will give considerably longer service, but due to their larger size, they will not fit into the cabinet. The special cable available is 30 inches in length and it will permit locating these batteries beneath the table, behind the receiver cabinet, or in the bottom portion of the console cabinet. Complete instructions for use are packed with each cable, which may be purchased from the Stewart-Warner Corporation, Chicago, Illinois.

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**RECEIVER MODELS 02-5T1 TO 02-5T9**

**ALIGNMENT PROCEDURE**

For alignment, an output meter and an accurately calibrated signal generator are required.

Connect the output meter across the voice coil or between the plate of the IQ5G output tube and ground through a 0.1 Mfd. condenser, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)

Connect the ground lead of the signal generator to the black wire or the chassis.

Turn the volume control to the maximum volume position and keep it in this position while aligning.

With the gang condenser in full mesh, set the dial pointer in a horizontal position. If the pointer is incorrectly set, it is merely necessary to move the pointer to the correct position by hand, while holding the gang in the full mesh position.

<table>
<thead>
<tr>
<th>Dummy Ant. in Series with Sig. Gen.</th>
<th>Connection of Sig. Generator Output To Receiver</th>
<th>Signal Generator Frequency</th>
<th>Band Switch Position</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Dial Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>.1 MFD. Condenser</td>
<td>Control Grid of 1A7G</td>
<td>455 KC</td>
<td>Broadcast</td>
<td>Any Point Where It Does Not Affect The Signal</td>
<td>1-2</td>
<td>2nd I. F.</td>
<td>Adjust for maximum output. Then repeat adjustment.</td>
</tr>
<tr>
<td>200 MFD. Mica Condenser</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>1500 KC</td>
<td>5</td>
<td>Broadcast Oscillator (Shunt)</td>
<td>Adjust for maximum output.</td>
</tr>
<tr>
<td>200 MFD. Mica Condenser</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>Tune To 1500 KC Generator Signal</td>
<td>6</td>
<td>Broadcast Antenna</td>
<td>Adjust for maximum output.</td>
</tr>
<tr>
<td>200 MFD. Mica Condenser</td>
<td>Antenna Lead (Blue Wire)</td>
<td>600 KC</td>
<td>Broadcast</td>
<td>Tune To 600 KC Generator Signal</td>
<td>7</td>
<td>Broadcast Oscillator (Series Fed)</td>
<td>Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Antenna Lead (Blue Wire)</td>
<td>15 MC</td>
<td>Foreign</td>
<td>15 MC</td>
<td>8</td>
<td>Foreign Oscillator (Shunt)</td>
<td>Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 14.1 MC. If image does not appear realistic at 15 MC, with trimmer screw farther out. Recheck image.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Antenna Lead (Blue Wire)</td>
<td>15 MC</td>
<td>Foreign</td>
<td>Tune To 15 MC Gen. Signal</td>
<td>9</td>
<td>Foreign Antenna</td>
<td>Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.</td>
</tr>
</tbody>
</table>

**MISCELLANEOUS PARTS**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>116556</td>
<td>Battery cable—for heavy duty batteries</td>
<td>$0.25</td>
</tr>
<tr>
<td>116549</td>
<td>Cable—battery</td>
<td>$0.45</td>
</tr>
<tr>
<td>114855</td>
<td>Clamp—for dial cord</td>
<td>$0.06</td>
</tr>
<tr>
<td>112745</td>
<td>Clip—coil mounting</td>
<td>$0.01</td>
</tr>
<tr>
<td>110140</td>
<td>Clip—grid</td>
<td>$0.01</td>
</tr>
<tr>
<td>117037</td>
<td>Cord—drive—supplied in 3 ft. lengths</td>
<td>$0.15</td>
</tr>
<tr>
<td>119828</td>
<td>Dial escutcheon</td>
<td>$0.20</td>
</tr>
<tr>
<td>119830</td>
<td>Dial scale</td>
<td>$0.38</td>
</tr>
<tr>
<td>77208</td>
<td>Flat steel washer for gang condenser mfg.</td>
<td>$0.01</td>
</tr>
<tr>
<td>119167</td>
<td>Knob—tuning or volume</td>
<td>$0.10</td>
</tr>
<tr>
<td>12349</td>
<td>Nut—8-32 for gang mfg.</td>
<td>Per C $0.45</td>
</tr>
<tr>
<td>88631</td>
<td>Plug—4 prong, male (for battery cable)</td>
<td>Per C $0.06</td>
</tr>
<tr>
<td>119555</td>
<td>Pointer</td>
<td>$0.16</td>
</tr>
<tr>
<td>81145</td>
<td>Retaining ring—for drive shaft</td>
<td>Per C $0.50</td>
</tr>
<tr>
<td>119587</td>
<td>Screw—for escutcheon</td>
<td>$0.02</td>
</tr>
<tr>
<td>116322</td>
<td>Shield base—tube</td>
<td>$0.03</td>
</tr>
<tr>
<td>116305</td>
<td>Shield-tube</td>
<td>$0.08</td>
</tr>
<tr>
<td>110501</td>
<td>Socket—4 prong (for speaker)</td>
<td>$0.16</td>
</tr>
<tr>
<td>85427</td>
<td>Socket—central base (standard)</td>
<td>$0.15</td>
</tr>
<tr>
<td>111090</td>
<td>Spacer—steel mfg. (for gang condenser)</td>
<td>$0.02</td>
</tr>
<tr>
<td>114968</td>
<td>Spring—dial cord tension</td>
<td>$0.03</td>
</tr>
<tr>
<td>113169</td>
<td>Spring—for indicator lever</td>
<td>$0.01</td>
</tr>
<tr>
<td>118525</td>
<td>Tuning shaft</td>
<td>$0.10</td>
</tr>
<tr>
<td>111590</td>
<td>Washer (paper) for back of knobs</td>
<td>$0.05</td>
</tr>
<tr>
<td>111566</td>
<td>Washer—spring washer</td>
<td>Per C $0.50</td>
</tr>
</tbody>
</table>

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Compliments of www.nucow.com
### 03-6N and 03-6N-Z CHASSIS

**ALIGNMENT PROCEDURE**

**FOR ALIGNMENT**: An output meter and an accurately calibrated signal generator are required.

1. Connect the output meter across the voice coil, or using a .01 mfd. condenser in series between the 25LEGT tube plate and B- as shown on the voltage chart.
2. Connect the ground lead of the signal generator to the receiver chassis. Turn the volume control to positions of maximum volume and key it if this position affects the alignment procedure.
3. Connect the loop as shown in diagram on back page. The loop must remain in the circuit at all times.

**With the gap condenser in full mesh, the pointer should be in a horizontal position.** If it is not, it should be moved to this position before alignment.

<table>
<thead>
<tr>
<th>Dummy Ant. in Series</th>
<th>Signal Generator Frequency</th>
<th>Potential Position</th>
<th>Receiver Grid Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>455 KC</td>
<td>&quot;Breakout&quot; - Pushed In</td>
<td>10 Mv. +5 P0. in Signal</td>
<td>28</td>
<td>2nd Lr.</td>
<td>Adjust for Maximum Output. Then repeat adjustment.</td>
</tr>
<tr>
<td></td>
<td>250 MFD. Condenser</td>
<td>6 Ml.</td>
<td>5 Ml.</td>
<td>23</td>
<td>1st Lr.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1500 KC</td>
<td>&quot;Breakout&quot; - Pushed In</td>
<td>10 Mv. +5 P0. in Signal</td>
<td>1</td>
<td>3rd Lr.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**: When making these adjustments, the loop should be in the same relative position to the chassis as when mounted in the cabinet. Adjustments 4 & 5 should be repeated after the set and loop have been replaced in the cabinet.

### ALIGNMENT PROCEDURE FOR 117A CHASSIS

**NOTE**: This chassis may be completely aligned while in the cabinet.

1. Connect the output meter across the voice coil or form plate to form plate of the 6FGD signal tube through a .01 mfd. condenser.
2. Connect the ground lead of the signal generator to the receiver chassis. Turn the volume control to positions of maximum volume and key it if this position affects the alignment procedure.
3. Connect the loop as shown in diagram on back page. The loop must remain in the circuit at all times.

<table>
<thead>
<tr>
<th>Dummy Ant. in Series</th>
<th>Signal Generator Frequency</th>
<th>Potential Position</th>
<th>Receiver Grid Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>455 KC</td>
<td>Any Point Where Does Not Affect Signal</td>
<td>455 KC</td>
<td>1-2</td>
<td>2nd Lr.</td>
<td>Adjust for Maximum Output. Then repeat adjustment.</td>
</tr>
<tr>
<td></td>
<td>450 OHM Carbon Resistor</td>
<td>Orange and White Wire from Loop</td>
<td>15 Ml.</td>
<td>3-4</td>
<td>1st Lr.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>450 OHM Carbon Resistor</td>
<td>Orange and White Wire from Loop</td>
<td>15 Ml.</td>
<td>5</td>
<td>Short Wave</td>
<td>Adjust for Maximum Output. Check to see if Proper Peak is Obtained by Tuning to 550 kc. If not made at 550 kc, Make it so provided with proper settings. Then repeat adjustment.</td>
</tr>
</tbody>
</table>

**Chassis must be in cabinet before the following adjustments are made.**

<table>
<thead>
<tr>
<th>No Connection</th>
<th>Signal Generator Frequency</th>
<th>Potential Position</th>
<th>Receiver Grid Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1500 KC</td>
<td>Any Point Where Does Not Affect Signal</td>
<td>1500 KC</td>
<td>7</td>
<td>Broadcast</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td></td>
<td>1500 KC</td>
<td>Any Point Where Does Not Affect Signal</td>
<td>1500 KC</td>
<td>8</td>
<td>Broadcast</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td></td>
<td>600 KC</td>
<td>Any Point Where Does Not Affect Signal</td>
<td>600 KC</td>
<td>9</td>
<td>Broadcast</td>
<td>Adjust for Maximum Output.</td>
</tr>
</tbody>
</table>

**TO SET POINTERS**

The pointers should be set to 500 kc in the idle state when the tuning condenser is in full mesh. Center pointers to card at two point and allow to dry before moving.

---

**REPLACING DIAL AND POINTER DRIVE CORD**

1. Hook a tension spring (Part No. 11910) through small hole at pointer A and large end of drive cord (Part No. 11378) to spring of pointer B.
2. Fasten other end of drive cord through hole C to drive.
3. Make these and one half turn of the cord about testing shaft D. (NOTE: A few sets of this model have a groove in shaft D (Part No. 11378) on the drive shaft. In this case the drive cord is stepped under the groove—approximately 1/2 turn.)
4. Continue cord around pulley E and thence to and around pulley F.
5. From pulley F pass cord over pulley G and around drum in counter-clockwise direction (as reference is diagram to left C is drum.
6. Slip cord through loop at end of spring B, adjust tension until spring is stretched to approximately seven-eighths inch, and the security.

**REPLACING THE DRIVE CORD**

**REAR VIEW OF DRIVE ASSEMBLY**

**LOOPI CONNECTIONS 117A CHASSIS**

**SET VIEWED FROM REAR**

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**MODELS 117-A, 117-A9, 03-6N, 03-6N-Z**

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**John F. Alden, Publisher**

**Compliments of www.nucow.com**
ALIGNMENT PROCEDURE

FOR ALIGNMENT: An output meter and an accurately calibrated signal generator are required.

1. Connect the output meter across the voice coil; or, using a condenser in series, connect between the plate of the 506GT output tube and B — as shown on the voltage chart. The more sensitive type should be connected across the voice coil.

2. Connect the ground lead of the signal generator to the B—- lug (shown on the voltage chart) through a .00033 mfd. condenser and keep it connected in this manner throughout the entire alignment procedure. Failure to use the series condenser may have serious results, as one side of the power line may be grounded in the signal generator, or hum may be encountered.

3. Turn the volume control to the maximum volume position and leave it in this position throughout the entire alignment procedure.

4. Set the Dial Pointer to last mark after 55 on the dial with the gap condenser in full mesh.

5. The loop must be connected at all times.

Diagram of trimmers:

- 2500 mfd. Condenser, with signal generator, 455 kc.
- 1500 kc.
- 1500 kc.
- 8 mfd. Condenser, with signal generator, 455 kc.

List of parts:

- 12SA7, 12SK7, 12SK7, 357GT, 506GT, Rectifier.

ELECTRICAL PARTS

- Condenser...-00 mfd. 600 volts.
- Condenser...-00 mfd. 600 volts.
- Condenser...-00 mfd. 600 volts.
- Condenser...-00 mfd. 600 volts.
- Condenser...-00 mfd. 600 volts.
- Condenser...-00 mfd. 600 volts.
- Condenser...-00 mfd. 600 volts.
- Condenser...-00 mfd. 600 volts.
- Condenser...-00 mfd. 600 volts.
- Condenser...-00 mfd. 600 volts.

Bottom view of chassis

Use a voltmeteter of 1000 ohms per volt.

Sept. 10, 1940

Circuit Change: Top of phone pickup socket has one of its terminals connected directly to "G" (as return lead) as shown above. On later production, a $25,000 ohm 1/4 watt resistor (carbon) is connected between this socket terminal and "G".
ALIGNMENT PROCEDURE FOR 11-9B & 11-9B-Z CHASSIS

1. Connect the output meter across the voice coil or b-cm plate to plate of the 86QG output tubes through a .1 mil. condenser. (The more sensitive type should be connected across the voice coil.)

2. Connect the ground lead of the signal generator to the receiver chassis and change the black wire from the outer to the inner clip on top of the loop drum.

3. Turn the volume control to the maximum position and keep it in this position throughout the alignment procedure.

4. Push the Manual button and keep it pushed.

5. The loop must be connected as indicated in circuit diagrams at all times.

6. With some signal generators, it may be found that the signal cannot be reduced to a usable value using the dummy venuinexes recommended below. On the Short Wave and Intermediate positions the shield wire (black) must be disconnected from its point and the output of the signal generator connected to the black wire terminal through a 400 ohm resistor.

<table>
<thead>
<tr>
<th>Dummy Ant. in Series w/ Sig. Gen.</th>
<th>Connection of Sig. Generator to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Band Switch Position</th>
<th>Trimmer No.</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MFD Condenser</td>
<td>Connecting post to receiver</td>
<td>455 KC</td>
<td>Broadcast</td>
<td>3rd L.F.</td>
<td>1/2</td>
<td>Any point where it does not affect the signal</td>
</tr>
<tr>
<td>No Condenser</td>
<td>Connecting point B to receiver</td>
<td>1500 YO</td>
<td>Broadcast</td>
<td>1st L.F.</td>
<td>3-4</td>
<td>1/2</td>
</tr>
<tr>
<td>No Condenser</td>
<td>Connecting point B to receiver</td>
<td>1500 YO</td>
<td>Broadcast</td>
<td>2nd L.F.</td>
<td>6-8</td>
<td>1/2</td>
</tr>
<tr>
<td>No Condenser</td>
<td>Connecting point B to receiver</td>
<td>600 YO</td>
<td>Broadcast</td>
<td>3rd L.F.</td>
<td>7-9</td>
<td>1/2</td>
</tr>
<tr>
<td>2.5 MFD Capacitor</td>
<td>Connecting point B to receiver</td>
<td>5 MC</td>
<td>Intermediate</td>
<td>1/2</td>
<td>9-11</td>
<td>1/2</td>
</tr>
<tr>
<td>2.5 MFD Capacitor</td>
<td>Connecting point B to receiver</td>
<td>5 MC</td>
<td>Intermediate</td>
<td>2nd L.F.</td>
<td>9-11</td>
<td>1/2</td>
</tr>
<tr>
<td>2.5 MFD Capacitor</td>
<td>Connecting point B to receiver</td>
<td>16 MC</td>
<td>Intermediate</td>
<td>1/2</td>
<td>10-12</td>
<td>1/2</td>
</tr>
<tr>
<td>2.5 MFD Capacitor</td>
<td>Connecting point B to receiver</td>
<td>15 MC</td>
<td>Intermediate</td>
<td>1/2</td>
<td>11-13</td>
<td>1/2</td>
</tr>
</tbody>
</table>

IMPORTANT:

1. The loop must be connected to the receiver at all times.

2. Push in button marked "Radio." Connect an output meter to the receiver. Connect the ground lead of the signal generator to the receiver chassis.

3. With gang condenser in half mesh, set the dial pointer so that its position is horizontal.

4. Turn the volume control to maximum and keep it in this position throughout the alignment procedure.

5. Install speaker, chassis, connect loop in the cabinet, then repeat adjustment of trimmers 6 and 7.

NOTE

TRIMMERS 1, 2, 3, 4 ARE ON TOP OF THE LF TRANSFORMER CANS ON THE TOP SIDE OF THE CHASSIS.

ALIGNMENT PROCEDURE FOR 11-6T & 11-6T-S CHASSIS

IMPORTANT:

1. The loop must be connected to the receiver at all times.

2. Push in button marked "Radio." Connect an output meter to the receiver. Connect the ground lead of the signal generator to the receiver chassis.

3. With gang condenser in half mesh, set the dial pointer so that its position is horizontal.

4. Turn the volume control to maximum and keep it in this position throughout the alignment procedure.

5. Install speaker, chassis, connect loop in the cabinet, then repeat adjustment of trimmers 6 and 7.
RECODER SERVICE DATA

PUSH BUTTONS

The six push buttons shown on this circuit control the various functions of this receiver. The “RADIO,” “PHONO,” “MICRO.
P.A.,” and “MICRO-RECOR.” buttons are mechanically interconnected so that when any one of them is pushed in, it releases any of the other three buttons which were pushed in.

The “RECOR. ON” and “RECOR. OFF” buttons are mechanically coupled to each other, but are independent of the other four buttons. Pushing in the “RECOR. ON” button releases the “RECOR. OFF” button, and vice versa.

ACTION OF VARIOUS PUSH BUTTONS

RADIO—Button is Cathode circuits of 6SA7 and 6SK7 completed to ground through resistor No. 27. Volume control connected across diode load resistor No. 18. Button out: 6SA7 and 6SK7 Cathode circuits opened. Volume control disconnected from diode load resistor No. 18.

PHONO—Button is Output of crystal pick-up connected across Volume Control. Button out: Crystal pick-up disconnected from Volume Control.

MICRO.P.A.—Button is Output of microphone amplifier connected across volume control. Loudspeaker connected to reproduce sound.

MICRO-RECOR.—Button is Microphone amplifier connected as under “MICRO.P.A.” In addition speaker is silenced by disconnecting the voice coil and connecting the output transformer secondarily to resistor No. 34. This prevents acoustical feedback from speaker to microphone when recording.

RECOR-ON—Button is: This button connects the crystal recorder to the output of the receiver.

RECOR-OFF—Button is: This releases “RECOR-ON” button, as it is mechanically coupled to it.

ADJUSTING THICKNESS OF SHAVING

The proper thickness of the shaving produced when a record is cut is about the thickness of a human hair. If the cutting needle is sharp and in good condition, and the cutting head adjusted to give the correct depth of cut, the shaving should come off as a long continuous ribbon. The ribbon cut by the cutting needle will come off as a straight band, while with others it may produce a curly thread. This ribbon should not, however, be too fine or extremely crinkly as this indicates a dull cutting needle or insufficient pressure of the recording head.

When the cutting head is placed on a record blank, the needle locking screw should be halfway between the top and bottom of the hole in the head. The position of the cutting needle screw may be changed by raising the cutter arm and adjusting the screw and locknut under this arm. Turning this screw clockwise will raise the stylus screw—counter clockwise rotation will lower it.

The depth of cut can be varied by means of the adjusting screw on the recorder arm. This screw is located on top of the arm and is readily accessible for adjustment. Turning this screw clockwise increases the thickness of the shaving, while turning it counter-clockwise decreases the thickness. However, if the cutting needle is dull or damaged, turning this adjusting screw will have very little effect on the depth of cut.

The proper depth of cut may be determined by cutting several grooves with no voltage impressed on the cutter head (RECOR-OFF button pushed in). Then examine these blank grooves by reflecting light from the record and viewing the grooves through a low-power microscope. The width of the spaces between the grooves should be slightly less than the width of the grooves.

PROPER RECORDING LEVEL

When recording, the volume control should be adjusted to a setting somewhat higher than that required for good room volume, but below the point of overloading and distortion. If too high a volume level is used, an echo may be heard when playing back, or "overcutting" of the grooves may result—that is, in loud passages one groove may actually cut into the adjacent groove, causing distortion when the record is being played. If this occurs the volume control setting should be decreased while recording until the recorded level is normal.

On the other hand, if the level of the program being recorded is too low, it will necessitate increasing the volume control setting when playing back the recording, and the hiss and background noise will be excessive.

RECODER HEAD INOPERATIVE

A quick check of the recorder head can be made by pushing in the "RECOR-ON" button and the "RADIO" button and then tuning in a station. If the recorder is operating properly, the fact is easily determined by holding the cutting stylus of the cutter between the thumb and forefinger. Vibration of this stylus indicates that the cutter head is in operating condition.

If the recorder does not operate, check first to determine if an A.C. voltage exists across the terminals of the recorder socket. This can best be measured using the 0-150 volt scale of a rectifier type A.C. Voltmeter. With proper recording voltage the peaks of the voltage appearing across these terminals should be 80 to 120 volts. If no voltage exists under these conditions, check the contacts of the "RECOR-ON" switch and the volume control switch No. 30 and the coupling of the 6FG6 plate. If these circuits are found to be all right check the recorder crystal cartridge and replace if necessary.

DESTRUCTIVE CUTTING NEEDLE

A cutting needle is considered worn when the background hair becomes objectionable, or when the thread cut from the record becomes ragged. A dull needle may also cause the depth of cut to be incorrect.

The condition of the cutting needle can be determined by examining the point by means of a powerful magnifying glass or low power microscope, and comparing it with a good needle viewed in a similar manner. Another good check on the condition of the cutting needle is the appearance of a freshly cut record. If the record has a dull or grayish appearance instead of its usual shiny appearance, the needle should be replaced.

CORRECT NEEDLE ANGLE

When making a recording, the cutting needle should be set at such an angle that the thread cut from the record will be thrown toward the center of the record. Otherwise the thread may be caught under the cutting needle, causing it to cut the grooves improperly.

If the thread is not thrown toward the center of the record, loosen the thumb screw holding the recording needle in the cutter head, then realign it again. This will generally change the angle of the needle, causing the thread to wind about the center pin of the turntable.

CAUTION: Never use thorn, cactus or wooden playback needles on home recordings. Their friction coefficient is high and they score the grooves.
MODEL 11-2A1 Chassis 11-2A
Wireless Record-Player
Chassis 11-2A

ELECTRICAL PARTS

<table>
<thead>
<tr>
<th>Diagram</th>
<th>Part Number</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>83538</td>
<td>Condenser-mica, 260 muf.</td>
<td>$0.25</td>
</tr>
<tr>
<td>2</td>
<td>83763</td>
<td>Condenser-mica, 110 muf.</td>
<td>$0.20</td>
</tr>
<tr>
<td>3</td>
<td>110559</td>
<td>Resistor-carbon 470,000 ohms 1/4 watt</td>
<td>$0.12</td>
</tr>
<tr>
<td>4</td>
<td>110569</td>
<td>Resistor-carbon 10,000 ohms 1/4 watt</td>
<td>$0.12</td>
</tr>
<tr>
<td>5</td>
<td>110578</td>
<td>Resistor-carbon 68,000 ohms 1/4 watt</td>
<td>$0.12</td>
</tr>
<tr>
<td>6</td>
<td>110580</td>
<td>Resistor-carbon 3.3 meg. 1/4 watt</td>
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<td>7</td>
<td>116051</td>
<td>Resistor-insulated 33,000 ohms 1/4 watt</td>
<td>$0.15</td>
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<td>8</td>
<td>8A-8B</td>
<td>Condenser-electrolytic 20-20 mfd. 150 volt</td>
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<td>9</td>
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<td>Condenser-1 mfd. 600 volt</td>
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<td>Condenser-0.5 mfd. 600 volt</td>
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<td>13</td>
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<td>Resistor-1000 ohms 1 watt Wire Wound</td>
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<td>14</td>
<td>160499</td>
<td>Coil-oscillator</td>
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<td>15</td>
<td>160501</td>
<td>Condenser-tuning</td>
<td>$0.22</td>
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<td>16</td>
<td>160540</td>
<td>Ballast tube</td>
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<tr>
<td>17/17B</td>
<td>160576</td>
<td>Volume control—250,000 ohms with switch</td>
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<td>18</td>
<td>160603</td>
<td>Motor—less turntable</td>
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<td>19</td>
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MISCELLANEOUS PARTS

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<td>Base for mfg. electrolytic condenser</td>
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<td>Clip—for mfg. oscillator coil</td>
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<td>Idler wheel with rubber rim</td>
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<td>160210</td>
<td>Knob-push on</td>
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<td>160033</td>
<td>Needle cup</td>
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<td>Phono pickup arm complete</td>
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<td>Rubber bushing—motor mfg.</td>
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PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

SOCKET VOLTAGES

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<tr>
<td>177 AC</td>
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NOTE A: Voltage on the screen of the 35L6GT cannot be measured with the ordinary voltmeter because of the high resistance of resistor No. 6. Use a voltmeter of at least 1000 ohms per volt.

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ALIGNMENT PROCEDURE

CHASSIS 15-6Y

1. Connect the output meter across the voice coil at the speaker between the plate of the 25QST output tube and chassis through a .1 mf condenser, depending on the type of meter. The more sensitive type should be connected across the voice coil.
2. Connect the ground lead of the signal generator to the chassis through a .35 mf condenser.
3. The set can be aligned either by battery or line power operation.
4. Turn the volume control to the minimum volume position and keep it in this position while aligning. The cabinet back must be removed as shown in the figure below.
5. With the gain condenser in full mesh, the dial pointer should point to the last mark on the low frequency and the dial scale. If the pointer is inerratically set, hold the gain in full mesh and move the pointer to the correct position by hand.

<table>
<thead>
<tr>
<th>Dummy Ant. in Series with Sig. Gen.</th>
<th>Connection of Sig. Generator to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>260 MFMD. Condenser</td>
<td>Loop on Front Panel of Gating Condenser</td>
<td>455 KC</td>
<td>Any Point Where It Does Not Affect Signal</td>
<td>1-6</td>
<td>Ind L.F.</td>
<td>Adjust the screws on the top of each L.F. for maximum output. Then repeat adjustment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1-6</td>
<td>Ind L.F.</td>
<td></td>
</tr>
<tr>
<td>260 MFMD. Condenser</td>
<td>&quot;A&quot; Terminal</td>
<td>1500 KC</td>
<td>4</td>
<td>1-6</td>
<td>Ind L.F.</td>
<td>Adjust the screws on the top of each L.F. for maximum output. Then repeat adjustment.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>1st L.F.</td>
<td>1-6</td>
<td>Ind L.F.</td>
<td></td>
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<td>260 MFMD. Condenser</td>
<td>&quot;A&quot; Terminal</td>
<td>1500 KC</td>
<td>5</td>
<td>1-6</td>
<td>Ind L.F.</td>
<td>Adjust the screws on the top of each L.F. for maximum output. Then repeat adjustment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1st L.F.</td>
<td>1-6</td>
<td>Ind L.F.</td>
<td></td>
</tr>
</tbody>
</table>

Now disconnect the output meter and signal generator leads and replace the chassis and batteries in the cabinet being sure to connect the loop. Bring the connexions of the signal generator "near the loop until the 1500 KC. signal is heard weakly and re-adjust trimmer No. 5 for maximum output by ear.

ALIGNMENT PROCEDURE FOR 11-6U AND 11-6U-Z CHASSIS RECEIVER MODELS 11-6U1 TO 11-6U9 AND 11-6U-Z TO 11-6U9-Z

1. Connect the ground lead of the signal generator to the chassis.
2. Turn the volume control to minimum volume during entire alignment.
3. Set the pointer to last mark on low frequency and dial gain in full mesh.
4. Connect an output meter to read audio output.

<table>
<thead>
<tr>
<th>Dummy Ant. in Series with Sig. Gen.</th>
<th>Connection of Sig. Generator to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Band Switch Position</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
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<td>260 MFMD. Condenser</td>
<td>Loop on Front Panel of Gating Condenser</td>
<td>455 KC</td>
<td>Broadcast</td>
<td>1-2</td>
<td>Ind L.F.</td>
<td>Adjust for maximum output. Then repeat adjustment.</td>
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<td></td>
<td></td>
<td></td>
<td>1-2</td>
<td>Ind L.F.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>260 MFMD. Condenser</td>
<td>Loop on Front Panel of Gating Condenser</td>
<td>16 MC</td>
<td>Foreign</td>
<td>1000 KC</td>
<td>6</td>
<td>Adjust for maximum output. Then repeat adjustment.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1000 KC</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>260 MFMD. Condenser</td>
<td>Loop on Front Panel of Gating Condenser</td>
<td>16 MC</td>
<td>Foreign</td>
<td>1000 KC</td>
<td>6</td>
<td>Adjust for maximum output. Then repeat adjustment.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1000 KC</td>
<td>6</td>
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REPLACING THE DIAL CORDS

1. Disassemble the chassis and remove the dial face and drum. The set switches holding the drum may be loosed so that the most convenient positions for stringing the cords may be found, since it will be necessary to turn the drum on the condenser shaft in order to reach the tubs.
2. A pair of long-nosed pliers is useful for attaching the sprungs. If the dial scale is to be replaced, it will be found that there is a notch in the metal dial plate behind it, permitting easy access to the drive mechanism.
ALIGNMENT PROCEDURE FOR 11-10A & 11-10A-Z CHASSIS

1. Connect the output meter to the plate of the 126E output tube to ground through a .1 ohm resistor. (The meter sensitivity should be increased across the meter coil.)
2. Connect the ground lead of the signal generator to the receiver chassis.
3. Turn the volume control to the maximum position and keep it there during the entire alignment procedure.
4. Connect the pointer to the trimmer as indicated in circuit diagrams at all times.

NOTES FOR 11-10A and 11-10A-Z CHASSIS

Audio Section

For proper operation, the chassis must be allowed to heat up for 10 minutes. The tubes and their leads should be accessible at all times. The volume control should be set to the maximum position and the speaker should be connected to the system. The microphone should be connected to the microphone input terminals.

Alignment Procedure

1. Connect the output meter to the plate of the 126E output tube to ground through a .1 ohm resistor. (The meter sensitivity should be increased across the meter coil.)
2. Connect the ground lead of the signal generator to the receiver chassis.
3. Turn the volume control to the maximum position and keep it there during the entire alignment procedure.
4. Connect the pointer to the trimmer as indicated in circuit diagrams at all times.

Tuner Locations

Chassis 11-10A, 11-10A-Z

1. Connect the output meter to the plate of the 126E output tube to ground through a .1 ohm resistor. (The meter sensitivity should be increased across the meter coil.)
2. Connect the ground lead of the signal generator to the receiver chassis.
3. Turn the volume control to the maximum position and keep it there during the entire alignment procedure.
4. Connect the pointer to the trimmer as indicated in circuit diagrams at all times.

Placement of Brackets

The brackets should be placed as indicated on the diagram. The pointer should be connected to the trimmer as indicated on the circuit diagrams.
ALIGNMENT PROCEDURE FOR 11-8D & 11-8D-Z CHASSIS

RECEIVER MODELS 11-8D1 TO 11-8D9 & 11-8D1Z TO 11-8D9Z

1. PUSH THE MANUAL BUTTON IN AND KEEP IT PUSHED IN.

2. Connect the signal generator output to the receiver chassis. Adjust the volume control to the maximum volume position and leave it in this position during entire alignment procedure.

3. Connect the output meter across the voice coil or from plate to plate of the RFQ output tubes through 0.1 µfd condenser.

4. Tune the receiver and make sure that the minimum瓦斯值 is obtained and keep this in position through out the entire alignment procedure.

5. While the string condenser is full w/±10, set the potentiometer so that it is line with the graduation of the strings left end of the slide scale.

ALIGNMENT PROCEDURE FOR 11-SR CHASSIS

NOTE: This receiver may be completely aligned without removing the chassis from the cabinet.

1. Connect the ground lead of the signal generator to the chassis and the loudspeaker to the proper terminals on the chassis back.

2. Peak the output meter across the voice coil or from plate to plate of the RFQ output tubes through a 0.1 µfd condenser.

3. Tune the receiver and make sure that the minimum瓦斯值 is obtained and keep this in position through out the entire alignment procedure.

4. While the string condenser is full w/±10, set the potentiometer so that it is line with the graduation of the strings left end of the slide scale.

TRIMMER LOCATIONS—CHASSIS 11-8D AND 11-8D-Z

TRIMMER LOCATIONS—CHASSIS 11-8D AND 11-8D-Z

REPLACING THE DRIVE CORDS

1. Make a loop in end of cord (Part No. 118177) using 0.02 W cord and clip (Part No. 118610).

2. Pass the switch spring (Part No. 118177) to tab A and one end of the cord to the opening at point B.

3. Pass the other end of the cord through hole C on the rear of the radio.

4. Pass circuit using two loops of the cord through hole D.

5. Connect the cord to hole E on the back of the radio.

6. The cord length should be adjusted so that the spring will be approximately the distances indicated. Fix the spring using the same method for the 11-8D and 11-8D-Z model.

7. Fix the switch spring to tab G.

TO REPLACE THE POINTED DRIVE CORD

1. Pass the switch spring (Part No. 80348) on a point conductor from one end of the cord (Part No. 118177).

2. Pass the drive through hole B on the front of the radio.

3. Pass the switch spring through a loop and up to the horn.

4. Pass the switch spring over a loop and around the horn.

5. The length of cord should be adjusted to give the switch spring a smooth run.

6. Fix the switch spring to tab G.

TO SET POINTER

The potentiometer should be set to 3004 kΩ on the dial scale when the receiver is in its normal position. Connect pointer to cord at this point and allow to dry before moving.

REPLACING RANGE SWITCH

When replacing range switch, the proper method of installation is to connect the cord at the bottom of the switch and clip it to the horn as shown in the diagram. To change position of drum, loosen set screws.
PUSH BUTTONS

The six push buttons shown on this circuit control the various functions of this receiver. The “RADIO,” “MIC/PHON/RECORDER,” “MIC-PHONO” and “HOME RECORDER” buttons are mechanically interconnected so that when any one of them is pushed in, it releases any of the other three which was pushed in.

The “RECORDER” and “RECORDER OFF” buttons are mechanically coupled to each other, but are independent of the other four buttons. Pushing in the “RECORDER” button releases the “RECORDER OFF” button and vice versa.

FUNCTIONS OF PUSH BUTTON CONTROLS

RADIO

Button In: Top of volume control, section 78B of “Mixe r & Volume Control” connected to diode load resistor No. 26 through coupling condenser No. 55. Slider of this control connects directly to grid of 6S6Q7 through condenser No. 59, or resistor No. 14 as selected. Cathode circuit of 6S6Q7 tube completed through resistor No. 33.

Button Out: 6S6Q7 cathode circuit broken. Volume control disconnected from diode load resistor. 6S6Q7 cathode circuit opened. Mixe r section 78A of control disconnected from slider of microphone gain control.

MICON/RECORD

Button In: Volume control, section 78B of “Mixe r & Volume Control” connected to diode load resistor No. 26 through coupling condenser No. 55. 6S6Q7 cathode circuit completed through resistor No. 33. Mixe r section 78A connected to slider of microphone gain control.

Button Out: Volume control, section 78B disconnected from diode load resistor. 6S6Q7 cathode circuit opened. Mixe r section 78A of control disconnected from slider of microphone gain control.

MIC-PHONO

Button In: Volume control, section 78B of “Mixe r & Volume Control” connected to output of crystal pickup. Mixe r, section 78A of control connected to slider of microphone gain control.

Button Out: “Mixe r & Volume Control” disconnected from phonograph pickup and from microphone gain control.

HOME RECORDER

Button In: Silences speaker by opening voice coil and connecting secondary of output transformer to resistor No. 46. It also connects the grid of the 6S6Q7 tube to the slider of the microphone gain control. “Mixe r & Volume Control” is disconnected from the circuit.

Button Out: Mixe r and microphone gain control are not affected.

RECORDER OFF

Button In: Releases “RECORDER” button thus disconnecting recorder and volume indicator circuits.

Button Out: This indicates “RECORDER” button is pushed in, as described below.

RECORDER ON

Button In: Recorder crystal connected to EFG plate through condenser No. 40. Also causes recorder head voltage to be applied across resistors No. 10 and No. 18 and applies part of this voltage to diode of 6S6Q7. The other section of this switch disconnects the 6S6Q7 eye tube from the A.V.C. circuit and connects it to the rectified voltage appearing across resistor No. 18 thus the eye indicates the voltage across the recorder crystal.

Button Out: This disconnects the recorder from the output tube and at the same time connects the 6S6Q7 eye tube to the A.V.C. circuit so it functions as a conventional tuning indicator.

GENERAL RECORDER TROUBLE DATA

For complete recording mechanism service data, refer to the separate Service Manual, Form No. 9848, which will be published later. For data on the automatic record changer mechanism, refer to the service notes, in Form No. J22200.

The above instructions, Form 9993, give complete data for the use of the recorder used in Model 11-8R8, Form 9895 Instructions give data for the operation of the recorder and record changer used in the model 11-8R8.

NOTE: Always turn the microphone gain control fully counterclockwise when microphone is not being used. Howling may occur if this precaution is not observed.

IMP CitATION: It is essential that the recorder be placed on a level surface when making recordings. If the recorder does not stand in a level position, it will change the effective pressure of the cutting head and proper results cannot be obtained.

ADJUSTMENT OF CUTTING HEAD

Before attempting any adjustments of the cutting head, make certain that such adjustments are necessary by making a test recording using a new needle and a record blank of known quality.

DETECTIVE CUTTING NEEDLE

A cutting needle is considered worn when the background hiss becomes objectionable, or when the thread cut from the record becomes ragged. A dull needle may also cause the depth of cut to be incorrect.

The condition of the cutting needle may be determined by examining the point by means of a powerful magnifying glass or low power microscope, and comparing it with a good needle viewed in a similar manner. Another good check on the condition of the cutting needle is the appearance of a freshly cut record. If the record has a dull or grayish appearance instead of its usual shiny appearance, the needle should be replaced.

ADJUSTING THICKNESS OF SHAVING

The proper thickness of the shaving produced when a record is cut is about the thickness of a human hair. If the cutting needle is sharp and in good condition, and the cutting head adjusted to give the correct depth of cut, the shaving should come off as a long continuous ribbon. With some types of recording blanks, the ribbon cut by the cutting needle will come off as a straight band, while with others it may produce a cutty thread. This ribbon should not, however, be too fine or extremely crinkly as this indicates a dull cutting needle or insufficient pressure of the recording head.

When the cutting head is placed on a record blank, the needle locking screw should be halfway between the top and bottom of the hole in the head. The position of the cutting needle screw may be changed on the Model 11-8R8 by changing the cutting arm and adjusting the screw and lock nut under this arm. On Model 11-8R9 it is only necessary to adjust the screw near the pivot end of the recording arm, with a screwdriver.

The depth of cut can be varied on Model 11-8R8 by adjusting the screw at the center of the recording arm with a screwdriver. Clockwise rotation increases the thickness, while counter-clockwise rotation decreases the thickness of the shaving. This adjustment will have little effect if the needle is dull or damaged.

On Model 11-8R9 this adjustment is made by turning the position of the knob on the top of the recording arm. This knob has engraved upon it the letters ‘L,’ ‘M’ and ‘H’ indicating light, medium and heavy shavings. Adjustment should be made to compensate for different types of needles and record blanks if an examination of the record and shavings indicates that an adjustment is necessary. BEFORE ADJUSTING FOR THICKNESS OF SHAVING MAKE CERTAIN THAT THE CUTTING NEEDLE IS PROPERLY MOUNTED. ALSO TRY A NEW CUTTING NEEDLE, SINCE THE OLD ONE MAY BE WORN OR DAMAGED.

RECORDER HEAD INOPERATIVE

A quick check of the recorder head can be made by pushing in the “RECORDER” button and the “RADIO” button and listening in a station. If the recorder is operating, this fact is easily determined by holding the cutting needle of the cutter between the thumb and forefinger, vibration of the needle indicates that the cutter head is in operating condition.

If the recorder does not operate, check first to determine if an A.C. voltage exists across the terminals of the recorder socket. This can be best measured using the 0-150 volt scale of a rectifier type A.C. Voltmeter. With proper recording volume the peaks of the voltage appearing across these terminals should be 1.50 to 1.90 volts. If no voltage exists under these conditions, check the connections of the “RECORDER” switch, and the condenser No. 40 coupling the recorder to the EFG plate. If these circuits are found to be all right check the recorder crystal cartridge and replace if necessary.

CORRECT NEEDLE ANGLE

When making a recording, the cutting needle should be set at such an angle that the thread cut from the record will be thrown toward the center of the record. Otherwise the thread caught under the cutting needle, causing it to cut the grooves improperly.

If the thread is not thrown toward the center of the record, loosen the thumb screw holding the recording needle in the cutter head, turn the needle VERY SLIGHTLY so that the flat side of the cutting tip faces more toward the center of the record and reights the thumb screw. This will change the angle of the needle sufficiently to cause the thread to wind about the center pin of the turntable.

Use care in making this adjustment as the needle will not cut properly if it is turned too far.

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CONVENTIONAL ALIGNMENT. REPEAT ALIGNMENT OF RF AND OSC AFTER REPLACING CHASSIS IN CABINET.

PRICES SUBJECT TO CHANGE

ELECTRICAL PARTS

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<th>Description</th>
<th>List Price</th>
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<td>119193</td>
<td>Condenser—0.04 mfd. 600 volt</td>
<td>.20</td>
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<td>119912</td>
<td>Volume control—1 meg. (with switch)</td>
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<td>119914</td>
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<td>Condenser—variable tuning</td>
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<td>.39G</td>
<td>Switch—tonal range (see table)</td>
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<td>.39G</td>
<td>Switch—tonal range (see table)</td>
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<td>119934</td>
<td>Condenser—padder</td>
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<td>R-119944</td>
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<td>Transformer—output for R-115102</td>
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Electrical Parts

<table>
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<tr>
<th>Diagram</th>
<th>Part</th>
<th>Description</th>
<th>List</th>
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<td>ILA6</td>
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<td>R-13089</td>
<td>Condenser—variable tuning with drum</td>
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<td>Battery &amp; A.C.-D.C. switch</td>
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<td>R-13099</td>
<td>Condenser—150 volt (used on sets w/ 161246 I.F.)</td>
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<td>R-13120</td>
<td>Condenser—electrolytic 30-30 mfd. 150 volt</td>
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</table>

NOTE: Later sets have an iron core 2nd I.F. transformer (Part No. 161246) which has only one adjustment for alignment. Adjust the large screw projecting from the top of the can for maximum output.

Prices subject to change without notice.
GENERAL INSTRUCTIONS

1. FUNCTION OF RECORD CHANGER WHEN IT IS GOING THROUGH A CHANGE CYCLE --

The Model "77" Record Changer plays and automatically changes 14 or less ten-inch records or 10 or less 12-inch records.

The Record Changer is started by turning the switch control knob, (Item 32, Fig. 4) to "ON" this starts the motor and moves the turntable, (Item 35, Fig. 1), which rotates the platter assembly (Item 80, Fig. 1), causing it to disengage from engagement clutch cam, (Item 78, Fig. 2). The engagement clutch cam will then rotate due to tension from spring, (Item 27, Fig. 1). This causes it to contact the pin on the top side of drive gear assembly, (Item 4, Fig. 1), it also rotates, and in turn, moves the drive link assembly, (Item 81, Fig. 1), and the selector shaft crank assembly #1 and #2 to the position shown in Fig. 2. Also the tone arm reset link (Item 80, Fig. 2), has moved to where it has released the latch, (Item 18, Fig. 1), and carried the tone arm to its extreme outward position. The tone arm lifter link (Item 81, Fig. 2), has raised the tone arm to its extreme height, by means of the lifter plate assembly, (Item 21, Fig. 1). The tone arm is kept from "floating" free by the friction of the tone arm spring which also compresses the tone arm booster spring, (Item 15, Fig. 1) due to its very light tension.

The drive gear assembly (Item 4, Fig. 1), continues to rotate which causes the top pin to disengage from automatic engagement clutch cam which is moved back to catch the tone arm tripping lever and the lower pin to engage the drive link assembly, moving it back to its initial position. This swing in the tone arm to either the 10-inch or 12-inch record playing position and lowers it to the record. At the same time it releases the tone arm make spring allowing the tone arm booster spring to act.

2. PHONOGRAPH NEEDLES --

Various types and kinds of needles are available for use in phonograph tone arms.

For playing ten or more records at one setup with this Record Changer, no attempt should be made to use ordinary needles with steel or fiber points since continued use of worn needle points will damage the records being played.

Any needle can be used that is designed to play 10 or 12 records.

It is well to keep in mind that even if the amplifying system, speaker and tone arm are of the best quality, a poor needle will result in poor reproduction of music.

There are a number of good semi-permanent types of needles on the market which are rated in number of plays. It is usually more economical to use one of these needles which is rated at 1000 plays or more.

It is very important to remember not to remove and then replace any needle that has been used.

3. CHASSIS MOUNTING

On the bottom surface of the panel are four mounting studs, each threaded to take a 1/4-20" machine screw. The mounting panel rests on four tapered coil springs, the small end of each spring is pressed over a mounting stud and the large end of each spring fits into a socket in the top surface of the mounting shelf in cabinet.

Four spacing blocks 1/8" thick and with a 5/8" hole are fastened to the lower side of the mounting shelf. The 5/8" hole in each is centered with the center of the 7/8" screw clearance hole. These are to be provided and located on the lower side of the mounting shelf into which each of the lower mounting screws are to fit.

(2)

The 1/4"-20 machine screws are turned through the four wing nuts until the head of each screw is against the bottom side of each wing nut.

The four lower springs which are of smaller diameter than the upper springs are slipped over the ends of each of the 1/4"-20 machine screws with the tapered end toward the head and resting on the wing nuts.

OPERATING INSTRUCTIONS

1. TO PREPARE CHANGER FOR OPERATION --

(a) Setting Record Changer to Play Ten Inch Records:

Turn both knobs until the arrows are pointing toward the center of the turntable. When in this position any number up to and including fourteen 10-inch records can be played.

(b) Setting Record Changer to Play Twelve Inch Records:

Turn both knobs until the arrows marked "12" are pointing toward the center of the turntable. When in this position any number up to and including ten 12-inch records can be played.

2. LOADING --

(a) If 10-inch records are to be played, set knobs as described in (A) above and place any number up to and including 14 records (ten-inch only) over center pin so that they will rest on the selecting arms.

(b) If 12-inch records are to be played, set knobs as described in (A) above and place any number up to and including 10 records (twelve-inch only) over center pin so that they will rest on the arms.

3. STARTING THE RECORD CHANGER --

1. Turn on the radio (allowing approximately 30 seconds for the tubes to warm up) and throw the phonograph-radio knob or control to the phonograph position.

2. Turn the switch knob on the Record Changer panel to "ON". The motor will then start and the record changer will go into automatic operation of its own accord.

4. PLAYING AN INDIVIDUAL RECORD --

An individual record can be played in the same manner as a stack of records would be played, i.e., if it is a 10-inch record, follow the instructions pertaining to 10-inch records. If it is a 12-inch record, follow the instructions pertaining to 12-inch records.

A 10-inch record may be played manually by turning the selecting arm knobs to the unloading position and leaving them in this position—records may then be put on or taken off the turntable by merely moving the tone arm outward until it catches, and placing the 10-inch records over the spindle and down onto the turntable. The "ON" and "OFF" switch knob is then pushed down and the 10-inch record will be played and repeated if left on the turntable. To remove the record it is only necessary to move the tone arm outward until it catches, and lift the record off of the turntable.

5. TURNING OFF RECORD CHANGER --

Turn switch knob to "OFF" position while the tone arm is still on the record. If the switch knob should be turned off while Record Changer is going through a change cycle, it will be difficult to adjust the selector arms correctly for the automatic playing of 10-inch or 12-inch records.
6. UNLOADING RECORDS --

1. Turn switch knob to "Off" position.
2. Remove any records remaining on the selector arm.
3. Move tone arm outward until it catches in outward position.
4. Turn selector arm so that records will clear them.
5. Remove records from turntable.

7. LUBRICATION --

(A) Motor: The motor is equipped with oilless bearing and requires no lubrication.

(B) Turntable Spindle Bearings: Are lubricated at the factory and do not require any lubrication for one year. After one year they should be oiled with 1 oz. of a light grade oil.

The top bearing can be oiled by lifting off turntable. Make sure when replacing turntable to see that pin in Turntable Spindle slips into slot on bottom surface of Turntable hub and also be sure it can not injure Rubber Idler Drive Wheel.

Never under any circumstances allow oil to come in contact with Rubber Idler Drive Wheel.

(C) Squeak Due to Records Rubbing On Turntable Spindle: This can be eliminated by gently lining up the stack of records.

SERVICE NOTES

1. ADJUSTMENT FOR BEST POSITION OF TONE ARM --

(A) Swing tone arm outward until tone arm lever assembly, (Item 19, Fig. 1) latches with tone arm latch lever, (Item 18, Fig. 1) which is held to tone arm shaft, (Item 77, Fig. 1) by two set screws.

(B) Make sure that set screws are tight and that there is a slight play between the tone arm lever assembly and the panel, (Item 5, Fig. 1). This will give proper clearance at ball race assembly, (Item 74, Fig. 5).

The tone arm lever assembly, (Item 19, Fig. 1) is held against tone arm latch lever, (Item 18, Fig. 1) by the tension of tone arm locator lever spring, (Item 16, Fig. 1).

(C) Next loosen the clamping screw in the Swivel Bracket Assembly (Item 46, Fig. 8.)

(D) Now move tone arm, (Item 60, Fig. 4) until its outside edge is 1/8" from the outside edge of the panel (Item 5, Fig. 1) and retighten screw securely.

2. RECORD CHANGER DOES NOT GO INTO ITS CHANGING CYCLE AT END OF RECORD --

(A) Worn or Damaged Stop Groove: If the stop groove in the record is worn out or damaged, discard such a record.

(B) Cut-off Adjustment May Be Incorrect: The Record Changer should go into its changing cycle when the needle enters the stop groove and has traveled to within a distance of 1-7/8" from the center of the turntable shaft.

3. RECORD CHANGER DOES NOT GO INTO ITS CHANGING CYCLE WHEN SWITCH KNOB IS TURNED ON --

When the switch is turned to "ON" the Record Changer should start its changing cycle. If it does not, the following points should be checked.

1. Make sure motor is running.
2. Check Trip Rod, (Item 26, Fig. 1), to make sure it releases Trip Lever Assembly, (Item 50, Fig. 1), from Engagement Clutch Cam Assembly, (Item 79, Fig. 5), when Switch Knob is being turned on.

If Trip Lever Assembly is not released, Trip rod should be shortened by bending until Trip Lever clears Engagement Clutch Cam Assembly, when Switch Knob is turned.

3. Make sure that Clutch Reset Pawl, (Item 40, Fig. 2,) clears Drive Link Assembly, (Item 51, Fig. 1).

4. RECORD CHANGER CONTINUES TO REPEAT ITS CHANGING CYCLE WITHOUT PLAYING RECORDS --

(A) Trip Lever Assembly, (Item 20, Fig. 1) does not latch in Engagement Clutch Cam Assembly (Item 79, Fig. 2), which may be due to causes listed below:

1. Trip Rod (Item 26, Fig. 1), may be bent so that it is too short, holding Trip Lever Assembly from contacting Engagement Clutch Cam Assembly.

2. Springs (Item 24 or 35, Fig. 1) may be disconnected.

5. NO SOUND WHEN NEEDLE IS ON MOVING RECORD --

1. Muting switch (Item 26, Fig. 1), may be out of adjustment. The contacts of this switch should be open whenever its long blade is not resting on the shoe of the Engagement Clutch Cam Assembly (Item 79, Fig. 2). If the contacts remain closed after the long blade has left the shoe, they should be adjusted by bending until there is a separation of approximately 1/32".

Switch should be checked to make sure contacts are closed when long blade is resting on the shoe of the Engagement Clutch Cam Assembly.

2. The lugs on the Muting switch may have been bent together.

3. Pickup cartridge in Tone Arm may have been damaged or may be defective.

6. TONE ARM ADJUSTMENTS FOR 16" RECORDS --

1. Turn both Control Knobs until the arrows marked "16" are pointing toward the center of the turntable.
2. Place a twelve inch record on the turntable.

3. Start Record changer and note where needle contacts record. Correct contacting is about 1/8" from the outside edge of record.

4. Adjust Item 56, Fig. 3 is operated by Selector Arm (Item 61, Fig. 4). The 12" Set Link (Item 15, Fig. 1.) operates as a stop which Record Changer is set for 12" records. When Tone Arm Locator assembly (Item 10, Fig. 1.) contacts 12" Set Link the Tone Arm should be in the correct position to play a 12" record.

If at this point, the position of Tone Arm is incorrect, loosen the screw which holds Tone Arm Locator (Item 14, Fig. 1.) and move it either direction as required and tighten screw.

7. TONE ARM ADJUSTMENTS FOR 10" RECORDS

1. Turn both knobs until the arrows marked "10" are pointing toward the center of the turntable.

2. Place a 10" record on the turntable and start Record Changer.

3. Note where needle contacts record. Correct contacting is about 1/8" from the outside edge of record. If contacting of needle is not correct as mentioned, loosen the screw which holds Tone Arm Locator (Item 15, Fig. 1.) and slide show in or out as required, then tighten screw.

8. TONE ARM HEIGHT ADJUSTMENTS

Set the Record Changer for ten-inch records, turn Switch to "ON" and allow Record Changer to go thru a charge cycle with no record on the turntable. The clearance between Turntable and the bottom surface of the Tone Arm should be approximately 1/8". Usually this clearance can be obtained by adjusting the Tone Arm Adjustment Screw (Item 70, Fig. 5). It is well to check the following points before making any adjustment.

Check clearance between Roller (Item 51, Fig. 3) and Selector Crank Shaft Assembly (Item 7, Fig. 1.) There should be approximately 1/8" clearance at this point. If the clearance is greater, it would be due to the pressure on the Spring Washer (Item 50, Fig. 3) being too great. This will prevent the Tone Arm Lifter Reset Spring (Item 81, Fig. 3) from returning the Tone Arm Lifter assembly (Item 81, Fig. 3) sufficiently. To relieve the pressure on the Spring Washer, loosen the Selector Shaft Collar (Item 6, Fig. 1.) slightly.

9. TONE ARM LOWERS ON RECORD TOO SUDDENLY

If the Tone Arm lowers too suddenly, the Spring Washer (Item 50, Fig. 3) which is located between the Tone Arm Lifter Assembly (Item 81, Fig. 3) and Selector Crank Shaft Assembly (Item 7, Fig. 1.) is not under sufficient pressure. The set screws in the Selector Shaft Collar (Item 6, Fig. 1.) should be loosened and the Selector Shaft Collar pressed upward slightly and set screws tightened.

NEEDLE DRAGS ACROSS RECORD:

If the needle drags across the record, the long portion of the Tone Arm Lever Assembly (Item 19, Fig. 1) is contacting the pin on the top side of the arm assembly (Item 4, Fig. 1) and is being moved by it. The remedy is to bend the long portion of the Tone Arm Lever Assembly upward so that it clears the pin.

in some radio models the lever may be reached without removing the record changer from the cabinet; however, if easy access is not possible, removal of the complete record changer is recommended.

TONE ARM LANDS IMPROPERLY ON BOTH 10" AND 12" RECORDS:

If the Tone Arm lands improperly on one size of record but properly on the other size, the adjustments described under 6 or 7 or "Service Notes" should be made. Improper landing on both 12" and 10" records is due to a dislocated Tone Arm. This may be remedied by loosening the screw located on the Tone Arm"Swivel Bracket (Item 46, Fig. 3) and moving the Tone Arm to the proper position and then retightening the screw. A rough check as to the proper position is to place the Tone Arm in that position and see if the outside of the Tone Arm is flush with the edge of the Motorboard. The two set screws on the Tone Arm shaft (Item 77, Fig. 2) should be checked to see if they are tight.

ALIGNMENT PROCEDURE

MODELS 11-5W1 TO 11-5W9 & 12-4D1 TO 12-4D9

FOR ALIGNMENT an output meter and an accurately calibrated signal generator are required.

1. Connect the output meter across the voice coil or between the plate of the RAGT output tube and ground through a 0.1 mfd. condenser, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)

2. Connect the ground lead of the signal generator to the Black Wire or the chassis.

3. Turn the volume control to the minimum volume position and keep it in this position while aligning.

4. With the gain condenser in full mesh, set the dial pointer in a horizontal position. If the pointer is incorrectly set, it is merely necessary to move the pointer to the correct position by hand, while holding the gain in the full mesh position.

<table>
<thead>
<tr>
<th>Dummy Act in Series with Sig. Gen.</th>
<th>Connection of Sig. Generator Output to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
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</thead>
<tbody>
<tr>
<td>1. MCF4 Condenser</td>
<td>Control Coil of RAGT</td>
<td>455 KC</td>
<td>Any Point Where It Does Not Affect Signal</td>
<td>1-2</td>
<td>3rd IF</td>
<td>Adjust for maximum output. Then repeat adjustment.</td>
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<tr>
<td>3. MTFD Condenser</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td>1500 KC</td>
<td>5</td>
<td>Broadcast oscillator (ghan)</td>
<td>Adjust trimmer for maximum output.</td>
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<tr>
<td>4. MTFD Condenser</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td>Tone To 1500 KC Generator Signal</td>
<td>6</td>
<td>Broadcast Antenna</td>
<td>Adjust for maximum output.</td>
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</tbody>
</table>

ON CHASSIS 11-5W --- CONNECT TO GAIN-COND, FRONT SECTION LUG ** 6500 output tube
Important. Before proceeding to align the frequency changer, be sure the receiver tuning is correct. Do not proceed to align the G4TF frequency changer until the dial on the receiver is set to the 45.5 megacycles and mark right point with a pencil on the large dial of the frequency modulation chassis. Check the receiver from this point and correct any error in setting the frequency changer for 45.5 megacycles (Terminal No. 4).

IV. Intermediate Frequency Adjustments. (Amplitude Modulation)
1. Set the range switch to Standard Broadcast position.
2. Tune set to extreme low frequency end of the range.
3. Connect the ground terminal of the signal generator to the ground terminal of the receiver.
4. Introduce a modulated signal of 455 kilo-
cycles to the grid of the 6SK7 tube, using a 0.1 microfarad capacitor in series with the output lead of the signal generator. (Do not remove signal, but keep it on the receiver.)
5. Adjust the 1st I.F. transformer for maximum output in the following order:
   b. Primary of second I.F. transformer.
   d. Primary of first I.F. transformer.

V. Radio Frequency Adjustments. (Amplitude Modulation)
1. Short Wave Range (C Band)
   a. Replace the 0.1 microfarad capacitor in series with the output lead of the signal generator with a 450 ohm carbon type resistor, and connect it to the antenna terminal of the receiver.
   b. Set the range switch to the short-wave range (C Band).
   c. Adjust the signal generator frequency and the receiver tuning dial to 6 megacycles.
   d. Adjust the 6 megacycle oscillator and antenna tuning with the secondary trimmer to the signal generator.
   e. Set the signal generator frequency and the receiver tuning dial to 6 megacycles.

REMOVING THE CHASSIS FROM CABINET
Do not remove the chassis from the shelf; instead, replace the chassis and shelf. Remove the top and bottom wood screws from the shelf, then removing the chassis and shelf as a unit.

ADJUSTING DIAL LAMP
The dial on this receiver is edge illuminated, and for proper illumination it is very important that the dial be adjusted so that the lamp is exactly opposite the edge of the glass.

INSTRUCTIONS FOR SETTING UP PUSH BUTTONS
1. Set the 127 megacycle oscillator and antenna tuning for maximum signal.
2. Repeat operations three and four.
3. Repeat operations five and six.
4. Standard Broadcast Range (A Band)
   a. Replace the 400 ohm carbon type resistor in series with the output lead of the signal generator to the receiving antenna with a 250 microfarad capacitor.
   b. Set the range switch to the Standard Broadcast range (A Band).
   c. Set the signal generator frequency and the receiver tuning dial to 600 Kc.
   d. Adjust the 600 Kc oscillator, Hi-Resistor and antenna trimmer for maximum signal.
   e. Set the signal generator frequency and the receiver tuning dial to 1500 Kc.
   f. Adjust the 1500 Kc oscillator, Hi-Resistor and antenna trimmer for maximum signal.
   g. Set the signal generator frequency and the receiver tuning dial to 3000 Kc.
   h. Adjust the 3000 Kc oscillator, Hi-Resistor and antenna trimmer for maximum signal.
   i. Repeat operations three and four.
   j. Repeat operations five and six.
   k. Repeat operations three and four.
   l. Repeat operations five and six.

(Waveform Adjustment. Leave the receiver connected in the same manner as when adjusting the Standard Broadcast Range (A Band)).
1. Tune set to 1000 Kc.
2. Set the signal generator frequency to 455 Kc, and introduce a fairly strong modulated signal to the receiver.
3. Adjust the wave trap trimmer for maximum signal.

To make this adjustment simply slide the pilot light socket back and forth on its mounting bracket until maximum illumination is obtained.
NORMAL VOLTAGE READINGS

Take all readings with chassis operating and tuned normally to 100 Kc. or 47 Mc., no signal.

Use a sine wave of 129 volts, or make allowance for the variation.

Use a good high resistance voltmeter having a resistance of at least 1000 ohms per volt.

Take all D.C. readings on the 50 volt scale except when an asterisk appears.

Read from indicated terminals to chassis base.

See location chart for position of terminals.

A.C. voltages are indicated by a sinusoid.

To measure voltages of 6A9 and 12A7 tube remove the metal cover on the tuning indicator socket and read from indicated terminals.

CONTINUITY TEST

Remove all tubes and disconnect the receiver from the power supply before making continuity test.

Test speaker plug with speaker left out.

Leave speaker plug in socket for all other tests of the amplitude modulation chassis.

Use a good meter capable of measuring up to several megohms.

See location chart on Page 5 for position and number of terminals.

AMPLITUDE MODULATION CHASSIS

TERMINALS OF SOCKETS

<table>
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<tr>
<th>Type</th>
<th>Circuit</th>
<th>Op</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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</thead>
<tbody>
<tr>
<td>6A8</td>
<td>Mod. and Osc.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+250</td>
<td>+110</td>
<td>–3</td>
<td>+173</td>
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</table>

PLAYING RECORDS. To obtain the best quality of phonograph reproduction, a Stromberg-Carlson rec- 
gard player is recommended. They are designed for use with this receiver and all that is necessary is to connect the record player to the single group socket provided for the ordinary audio systems of a good high fidelity receiver of the ordinary record player to the two volume controls.

The volume and tone may be controlled with the control knobs on the front of the receiver and operated to produce the music. If the volume control on the receiver may be varied.

A high quality pickup may be used, but a matching transformer must be placed between the phonograph pick-up and the chassis.

USING THE 6A9 RECEIVER AS A CONVERTER. This receiver may be used in two ways: First, the auxiliary audio system of the high fidelity receiver may be utilized by the high fidelity receiver, the type of high fidelity reproduction being exactly the same as that of the main audio system. It is necessary to connect the single pick-up to the chassis and the auxiliary audio system. The balance between the two speakers can be controlled by the two volume controls.

PLAYING RECORDS. To obtain the best quality of phonograph reproduction, a Stromberg-Carlson record player is recommended. If this set is used as a record changer, the phonograph must be attached to the record changer. This socket may be used for the volume control of the record changer.

If the set is used as a receiver, the sound output jack may be readily converted to a phonograph input jack by removing the black and white wire. The tone control to the right of the volume control (this is the terminal of the volume con- trolled by the volume control) to the right of the volume control to the left of the volume control.

The volume control is the terminal of the volume control.

The volume control is the terminal of the volume control.

The volume control is the terminal of the volume control.

The volume control is the terminal of the volume control.

The volume control is the terminal of the volume control.

Symbols used on chart are as follows: &lamda;—ohms; M—megohms; S—short; O—open

A. 6V6 tube socket nearest to the front of the chassis.

B. Radio-Phono switch in "Radio" position.

C. Radio-Phono switch in "Phono" position.

D. Terminals of A.C. plug.

E. Antenna terminal to chassis base.

F. Ground terminal to chassis base.

G. Audio connector socket to chassis base.

H. Between terminals of A.C. plug.

I. A.C. switch open.

J. A.C. switch closed.

K. Radio-Phono switch in "Radio" position.

L. Radio-Phono switch in "Phono" position.

M. Terminals of A.C. plug to chassis base.

N. Between terminals of A.C. plug.

O. 5 ohms.

P. 600 ohms.

Q. 600 ohms.

R. 600 ohms.

S. 600 ohms.

T. 600 ohms.

U. 600 ohms.

V. 600 ohms.

W. 600 ohms.

X. 600 ohms.

Y. 600 ohms.

Z. 600 ohms.
Tuning Ranges
- Frequency Modulation 42 to 50 Mc.
- Short Wave 5.8 to 18 Mc.
- Standard Broadcast .34 to 1.7 Mc.

Voltage Rating
- 105 to 125 Volts

MANUAL TUNING. Important. When tuning stations manually in the Standard Broadcast or Short Wave ranges be sure that the push button designated "Freq. Mod." is not pushed in.
PAGE 12-6 STROMBERG

MODEL 515M

STROMBERG-CARLSON TEL. MFG. CO.

PHONOGRAPh OPERATION. A jack is provided on the back of the chassis into which a record player may be plugged and a switch is provided next to it for switching from "Radio" to "Phonograph".

TELEVISION. Switching to phonograph also makes the audio amplifier and loud speaker available for use with television receivers designed for this type of sound reproduction.

140 Watts

455 Kilocycles (Amplitude Modulation)

4.3 Megacycles (Frequency Modulation)

Approximately 1.5 Ohms

Approximately 1050 Ohms
This is a seventeen tube, three gang, three range receiver, designed for the reception of both amplitude and frequency modulated stations.

Eight button automatic tuning is provided. The tuning unit is composed of a group of coils which are adjusted by means of iron cores so that seven favorite stations in the standard broadcast range may be set up. The eighth button is for switching from amplitude to frequency modulation. Tone is adjusted by a variable tone control and the dial is of the slide rule type edge, lighted for clear visibility without glare.

Provision is made for a record player to be used with this receiver without additional wiring.

Iron core coils are used in the standard broadcast and short-wave ranges to provide greater accuracy of alignment. In addition a thermal drift compensator is included in the circuit. The audio system employs a special inverter push-pull circuit designed to provide excellent fidelity. The power transformer has an electro-static shield to reduce line noises to a minimum and the chassis is thoroughly shielded throughout.

AUTOMATIC TUNING. An adjustable iron core coil type of automatic tuning is employed and the stations may be easily located by properly utilizing the concentric adjusting screws provided. A special tool identified as SD-70 Screwdriver will help materially in setting up the automatic tuning.

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Schematic Diagram—No. 509-PT

The specifications are the same as the No. 410 Receivers except for:
- Power Frequency Rating: 60 Cycle, also available 25 Cycle
- Input Power Rating, 509-PF: 85 Watts
- Input Power Rating, 509-PT: 95 Watts

ALIGNMENT, VOLTAGE, LAYOUT AND ALL OTHER DATA SAME AS MODEL 410, VOL. XI

Schematic Diagram—No. 509-PF

These receivers employ the same circuits as the No. 410 except for improved tone and phonograph compensation circuits which are designed to provide exceptionally good phonograph reproduction.

The No. 509-PT is equipped with a single record phonograph unit using a crystal pick-up. This phonograph unit is designed to play the standard 10 or 12 inch records.

The No. 509-PF Receivers are equipped with an automatic record changer using a crystal pick-up. This record player shifts and plays the standard 10 or 12 inch records.

Replacement parts are the same as used on the No. 410 Receivers except for the following:

<table>
<thead>
<tr>
<th>Piece No.</th>
<th>Circuit Designation</th>
<th>Part</th>
<th>Piece No.</th>
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<th>Part</th>
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<td>C-48</td>
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<td>25150</td>
<td>C-52</td>
<td>.02 mmf. Capacitor, 509-PF</td>
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<td>C-48</td>
<td>100 mmf. Capacitor, 509-PF</td>
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<td>R-25</td>
<td>22,000 Ohm Resistor, 509-PT</td>
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<td>R-32, 36</td>
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<td>25669</td>
<td>R-11</td>
<td>Knob for OFF-ON, Radio Phon. Switch</td>
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<td>47,000 Ohm Resistor, 509-PF</td>
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<td>Volume Control</td>
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<td>25657</td>
<td>R-27</td>
<td>.1 Megohm Resistor, 509-PF</td>
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<td>40 mf. 400 Volts, 509-PF</td>
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<td>R-28</td>
<td>1 Megohm Resistor, 509-PT</td>
<td>32320</td>
<td>R-38</td>
<td>689 Ohm Resistor, 509-PF</td>
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</tbody>
</table>

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PHONOGRAPH OPERATION. A jack is provided on the back of the chassis into which a phonograph turntable may be plugged. Switching to phonograph makes the audio output switch automatically and is for use with standard phonograph recorders for the tone arm. PHONOGRAPH INFORMATION Never use unless absolutely necessary.

Use a good phonograph signal generator (test oscillator) with a variable output voltage to excite the output terminals.

Always balance the volume control "full on".

ALIGNING PROCEDURE. (Follow this order exactly.)

I. Dial pointer adjustment.

1. With the pointer of the gain tuning capacitor fully engaged, check to be sure that the dial pointer is in the vertical position directly on the calibration marks located at the low frequency end of the dial scale. Adjust if necessary.

II. Intermediate frequency adjustments.

1. Set range switch to Standard Broadcast position.

2. Turn set to extreme low frequency end of dial scale.

3. Connect the ground terminal of the signal generator to the ground terminal of the chassis.

4. Introduce a modulated signal of 855 kilocycles per second, with the 6SK7 Modulator and Oscillator tube (6ST7 No. B) using a 0.5 micromicrosecond signal. Satisfy the output signal of the signal generator.

5. Adjust the 0.5 milliamperc core for maximum signal.

6. Adjust the spacing of the short-wave loop leads for maximum signal.

7. Set the signal generator frequency and the receiver tuning dial to 100 kilocycles.

8. Adjust the oscillator and loop alignment capacitors for maximum signal.

9. Repeat operations 2 and 3.

10. Repeat operations 4 and 5.

III. Radio frequency adjustments.

Short Wave Range (C Band).

1. Remove the output lead of the signal generator or phono.

INSTRUCTIONS FOR SETTING:

1. ALWAYS the stations should be the local favorite stations which give good reception at all times.

2. Set up at the station to avoid unnecessary interference.

3. Always the tuning indicator unit when setting up stations, in order to determine the station to the best advantage.

4. Always set the control to three-quarters of the way up (in a clockwise direction).

5. Never use the control on all three settings at a time.

PHOTOGRAPHY:

a. If an external antenna is used, set knob no. 1 to "off position" on the "attenuator".

b. If the built-in loop antenna is used, set knob no. 1 to "off position" on the "attenuator".

c. Turn volume control about three-quarters of the way up (in a clockwise direction).
GENERAL. The No. 530 Receivers are nine tube, three gang, three range receivers, designed for the reception of Amplitude Modulated stations. The No. 533 Receivers are fifteen tube receivers of the very latest design, providing reception of both Amplitude and Frequency Modulated stations. The "Armstrong Wide-Swing Frequency Modulation System" used in this receiver is outstanding in that substantially static-free reception is obtained, plus a degree of high fidelity which has heretofore been unobtainable in any radio system.

Six button automatic tuning is provided in these receivers, so that six favorite stations may be set up.

Separate continuously variable bass and treble controls are provided in these chassis.

 Provision is made for a record player to be used with all models not already equipped with phonograph mechanism without additional wiring.

The No. 530-PL Receiver is equipped with a record player using a crystal pick-up in conjunction with a specially equalized circuit. This record player shifts and plays the standard 10" or 12" records.

The No. 535-PG, PL and PS Receivers are equipped with record players using a one-ounce sapphire pick-up in conjunction with specially equalized circuits. This type of pick-up eliminates the frequent changing of needles and reduces record wear to a minimum. This record player shifts and plays the standard 10" or 12" records. The records may be intermixed on the No. 535-PG and PS Receivers.

A loop antenna is provided in these receivers so that no antenna and ground connection whatsoever is required. However, antenna and ground terminals are provided on the chassis so that an external antenna may be used for improved reception if desired.

PHONOGRAPH OPERATION. A jack is provided on the back of the chassis of all receivers not already equipped with a phonograph mechanism, into which a record player may be plugged, and a push button is provided on the front of the receiver for switching from "Radio" to "Phonograph".

ACCESSORIES

ANTENNA. The built-in loop antenna provided in these receivers will give satisfactory operation in most locations. However, for improved reception, a Stromberg-Carlson All-Wave Antenna is recommended. These antenna are supplied in kits containing all the necessary parts for mounting and installation, and are designed especially for use with all Stromberg-Carlson receivers.

HEADSET ATTACHMENT. Headphones can be very simply attached to this receiver. Ask for Pc-28303 Headset Package Assembly, which comes complete with headphones and installation instructions.

CARE OF THE CABINET. The finish of Stromberg-Carlson cabinets should be protected by using Stromberg-Carlson cabinet polish regularly. It is available in pint cans designated as Pc-28601. Nick and scratches of most kinds can be repaired quickly and easily by proper use of the Pc-26962 Touch-up Kit. Complete instructions are provided with each kit.

ADJUSTING THE DIAL LAMP. To obtain the proper illumination of the dial, slide the two dial lamp sockets on their mounting brackets to the position where maximum illumination of the dial is obtained.
Schematic Circuit and Wiring Diagram (535 Freq. Mod.)
IMPORTANT: The stations selected should be the local or favorite stations which give good reception at all times. If a Frequency Modulation station is available, it may be set up on one of the push buttons on the No. 535 Receivers.

Set up stations in the daytime to avoid unnecessary interference. Allow the set to run for about twenty minutes before setting up stations.

Always use the tuning indicator unit when setting up stations, in order to determine when the station is exactly in tune.

1. Turn the receiver "On".

2. On the No. 530 Receivers, push in the "Radio" button. On the No. 535 Receivers, be sure the "Phono" and "F. M." buttons are in the proper position to receive the desired stations.

3. Set the range switch to the "BC" position.

4. Turn volume control about three-quarters of the way on (in a clockwise direction).

5. Pull the six station push buttons off their levers.

6. Remove the call letters of the six selected stations from the call letter sheets, which are in an envelope stapled to the cabinet. Insert the station call letters part way in the slots at the sides of the buttons. Next, insert a transparent tab in each slot in front of the station letters. Then push both the transparent tabs and the call letters all the way into the slot. (A pencil eraser may be helpful.)

7. Loosen the set screw of the lever to be set up.

8. Push in the lever and manually tune in the desired station, observing the tuning indicator in order to obtain exact resonance.

IMPORTANT: For accurate set-up, be sure that the lever is pushed in, in the same manner and with the same amount of pressure as will be used when operating the push buttons.

9. Tighten the set screw. Be sure not to disturb the adjustment in any way while tightening the screw.

10. Place the proper button on the lever.

11. Check the accuracy of the adjustment by detuning the station and retuning with the button several times, pushing the button with an even pressure. Readjust if necessary.

12. Set up the other five stations in the same manner.
NORMAL VOLTAGE READINGS

Take all readings with chassis operating and tuned manually to 1000 kc. or 47 megacycles—an signal.
Use a line voltage of 120 volts or make allowance for the variations.
Use a good Jath resistance voltmeter having a resistance of at least 1000 ohms per volt.

See location chart on Page 2 for position of terminals.

A.C. voltages are indicated by italics.

AMPLITUDE MODULATION AND POWER AMPLIFIER CHASSIS, 530 AND 535 RECEIVERS

<table>
<thead>
<tr>
<th>Type</th>
<th>Circuit</th>
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<td>+100</td>
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<td>0</td>
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</tr>
<tr>
<td>6SK7</td>
<td>I. F. Amplier</td>
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<td>0</td>
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<td>0</td>
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FREQUENCY MODULATION CHASSIS, 535 RECEIVER

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</table>

CONTINUITY TEST

Remove all tubes and disconnect all plugs from the chassis before checking continuity.
Use a good meter capable of reading accurately up to several megohms.
The resistances given are approximate, owing to electrolytic capacitors in the circuit. When this is the case, be sure to reverse the test leads and read the highest resistance.
Read from indicated terminals to chassis base unless otherwise specified.
See location chart on Page 2 for position and numbering of terminals.

IMPORTANT: The continuity of each chassis may be checked as a separate unit, however, the power supply of the chassis to be checked should be shorted as follows:
1. A. M. chassis 530 and 535 Receivers: Short terminals 3, 4, 5, and 6 of power supply plug together.
2. Power Amplifier chassis 530 and 535 Receivers: Short terminals 3 and 4 of power socket together.
3. F. M. chassis 535 Receivers: Short terminals 3, 4, 5, 6, and 8 of power supply plug together.

Be sure to remove the shorting wires when continuity is completed.

AMPLITUDE MODULATION CHASSIS, 530 AND 535 RECEIVERS

<table>
<thead>
<tr>
<th>Type</th>
<th>Circuit</th>
<th>Reader No.</th>
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<th>4</th>
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<tr>
<td>6SK7</td>
<td>R. F. Amplifier</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+100</td>
<td>0</td>
<td>+100</td>
<td>0</td>
<td>+100</td>
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<tr>
<td>6SA7</td>
<td>Mod. and Osc.</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+100</td>
<td>+100</td>
<td>0</td>
<td>+100</td>
<td>0</td>
</tr>
<tr>
<td>6SK7</td>
<td>I. F. Amplifier</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+100</td>
<td>+100</td>
<td>0</td>
<td>+100</td>
<td>0</td>
</tr>
<tr>
<td>6SK7</td>
<td>Demod. A. V. C.</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+100</td>
<td>+100</td>
<td>0</td>
<td>+100</td>
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<tr>
<td>6G6</td>
<td>Tuning Indicator</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+100</td>
<td>+100</td>
<td>0</td>
<td>+100</td>
<td>0</td>
</tr>
</tbody>
</table>

POWER AMPLIFIER CHASSIS, 530 AND 535 RECEIVERS

<table>
<thead>
<tr>
<th>Type</th>
<th>Circuit</th>
<th>Reader No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>6AC7</td>
<td>Audio Inv.</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6V6GC</td>
<td>Output</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>6V6GT</td>
<td>Output</td>
<td>630</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>576C</td>
<td>Rectifier</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>—</td>
<td>Speaker Socket</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>—</td>
<td>Power Socket</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</table>

FREQUENCY MODULATION CHASSIS, 535 RECEIVERS

<table>
<thead>
<tr>
<th>Type</th>
<th>Circuit</th>
<th>Reader No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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</thead>
<tbody>
<tr>
<td>6AB7</td>
<td>R. F. Amplifier</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6SA7</td>
<td>Mod. and Osc.</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6AB7</td>
<td>I. F. Amplifier</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6AC7</td>
<td>I. F. Amplifier</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>6L57</td>
<td>Limiter</td>
<td>630</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>606</td>
<td>Demodulator</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Symbols shown on chart are as follows: [– onah]; [m—megohms]; [s—short]; [o—open].

A. Push Button in normal position. 7200 Ohms
B. Range Switch in "A" band. 3.3 Megohms
C. Operate volume control from most counterclockwise position to
   Short. 1000 Ohms
D. A. V. C. Switch in "C" band. 1000 Ohms

Remove shorting wires before making continuity test of power circuits.

Other Tests Not Shown on Chart:

Amplitude Modulation Chassis:
   Between terminals 4 and 5 of the Power Supply Plug should read "Open" with A. C. switch open; "Short" with A. C. switch closed.
   Audio input plug: 5 Megohms—Shield "Open".
   Push button in normal position: 7200 Ohms
   Push button in "A" band: 3.3 Megohms
   AMUX in "C" band: 1000 Ohms
   Audio input jack to chassis base: 1000 Ohms
   Frequency Modulation Chassis:
   Audio input plug: 5 Megohms—Shield "Open".
   Photojack in "A" band: 3.3 Megohms
   Audio input jack to chassis base: 1000 Ohms
   Ground terminal to chassis base: 1000 Ohms
   Between antenna and ground terminal: 5 Megohms.
ALIGNING INFORMATION

I. Dial Pointer Adjustment. (A. M.)
With the plate of the gap tuning capacitor fully engaged, check to be sure that the dial pointer is in a vertical position on the line. The calibration marks are located at the low frequency end of the dial scale. Adjust if necessary.

II. Intermediate Frequency Adjustments. (A. M.)
1. Set range switch to standard broadcast position.
2. Tune set to extreme low frequency end of dial.
3. Connect the grounded terminal of the signal generator to the ground terminal of the chassis.
4. Introduce a modulated signal of 455 kilocycles to the grid of the detector stage, and adjust the gap tuning capacitor in series with the output by tuning the gap tuning capacitor for the position of the signal generator.
5. Adjust the IF. transformer and then maximum output in the following order:
   c. Primary of first I. F. transformer.
6. Adjust the variable transformer for maximum signal.
7. Repeat operation one time and four.

III. Radio Frequency Adjustments. (A. M.)
Standard Broadcast Range (A. B. D.)
1. Replace the 0.1 self-capacitance in series with the output load of the signal generator with a 1000 self-capacitor and connect it to the antenna terminal of the chassis.
2. Set the signal generator frequency and the output load of the signal generator with a 1000 self-capacitor.
4. Switch the gap switch to the 1,000 second I. F. transformer and adjust for maximum output.
5. Set the signal generator frequency and the output load of the signal generator with a 1000 self-capacitor.
6. Adjust the 0.1 self-capacitance for maximum output.
7. Repeat operation three times.

ALIGNING PROCEDURE (F. M.)
I. Dial Pointer Adjustment.
Before alignment is attempted, be sure that the variable capacitor plates of the F. M. tuner are fully engaged with the variable capacitor plates of the A. M. tuner when turned all the way in.

II. Intermediate Frequency Adjustments (F. M.)
Note: All 1. F. transformers are made using a wide band sweep signal generator with 0.1 microfarad in series with the output of the generator.
1. Connect the 0.1 microfarad to the RF. transformer and connect the gap switch to the Standard Broadcast range (A. B. D.).
2. Tune the set to the extreme high frequency end of the dial.
3. Connect the 0.1 microfarad to the RF. transformer and connect the gap switch to the Standard Broadcast range (A. B. D.).
4. Connect the gap switch to the 1,000 second I. F. transformer and adjust for maximum output.
5. Repeat operation three times.
6. Repeat operation five times.

III. Discriminator Adjustment (F. M.)
1. Connect the ground terminal of the standard unmodulated signal generator to the grid terminal of the 1,000 first I. F. tube socket.
2. Connect the output of the standard unmodulated signal generator to the grid of the 1,000 first I. F. tube socket (terminal 1), and adjust the 0.1 microfarad to the antenna terminal for maximum output.
3. Adjust the antenna terminal of the standard unmodulated signal generator to the 1,000 first I. F. tube socket (terminal 2), and adjust the 0.1 microfarad to the antenna terminal for maximum output.
4. Adjust the 0.1 microfarad to the antenna terminal for maximum output.
5. Adjust the antenna terminal of the standard unmodulated signal generator to the 1,000 first I. F. tube socket (terminal 2), and adjust the 0.1 microfarad to the antenna terminal for maximum output.
6. Adjust the 0.1 microfarad to the antenna terminal for maximum output.
7. Adjust the receiver dial slightly back and forth.

IV. Intermediate Frequency Adjustments (F. M.)
1. Set the signal generator frequency and the output load of the signal generator with a 1000 self-capacitor.
2. Replace the 0.1 microfarad in series with the output load of the signal generator with a 1000 self-capacitor.
3. Connect the output of the signal generator to the grid terminal of the 1,000 first I. F. tube socket.
4. Adjust the 0.1 microfarad to the antenna terminal for maximum output.
5. Adjust the antenna terminal of the standard unmodulated signal generator to the 1,000 first I. F. tube socket (terminal 1), and adjust the 0.1 microfarad to the antenna terminal for maximum output.
6. Adjust the receiver dial slightly back and forth.

V. Discriminator Adjustment (F. M.)
1. Connect the ground terminal of the standard unmodulated signal generator to the grid terminal of the 1,000 first I. F. tube socket.
2. Connect the output of the standard unmodulated signal generator to the grid of the 1,000 first I. F. tube socket (terminal 1), and adjust the 0.1 microfarad to the antenna terminal for maximum output.
3. Adjust the antenna terminal of the standard unmodulated signal generator to the 1,000 first I. F. tube socket (terminal 2), and adjust the 0.1 microfarad to the antenna terminal for maximum output.
4. Adjust the 0.1 microfarad to the antenna terminal for maximum output.
5. Adjust the antenna terminal of the standard unmodulated signal generator to the 1,000 first I. F. tube socket (terminal 2), and adjust the 0.1 microfarad to the antenna terminal for maximum output.
6. Adjust the receiver dial slightly back and forth.

VI. Intermediate Frequency Adjustments (F. M.)
1. Set the signal generator frequency and the output load of the signal generator with a 1000 self-capacitor.
2. Replace the 0.1 microfarad in series with the output load of the signal generator with a 1000 self-capacitor.
3. Connect the output of the signal generator to the grid terminal of the 1,000 first I. F. tube socket.
4. Adjust the 0.1 microfarad to the antenna terminal for maximum output.
5. Adjust the antenna terminal of the standard unmodulated signal generator to the 1,000 first I. F. tube socket (terminal 1), and adjust the 0.1 microfarad to the antenna terminal for maximum output.
6. Adjust the receiver dial slightly back and forth.

VII. Discriminator Adjustment (F. M.)
1. Connect the ground terminal of the standard unmodulated signal generator to the grid terminal of the 1,000 first I. F. tube socket.
2. Connect the output of the standard unmodulated signal generator to the grid of the 1,000 first I. F. tube socket (terminal 1), and adjust the 0.1 microfarad to the antenna terminal for maximum output.
3. Adjust the antenna terminal of the standard unmodulated signal generator to the 1,000 first I. F. tube socket (terminal 2), and adjust the 0.1 microfarad to the antenna terminal for maximum output.
4. Adjust the 0.1 microfarad to the antenna terminal for maximum output.
GENERAL. This is a nineteen-tube, three gang, three range receiver designed for the reception of both amplitude and frequency modulated stations and is equipped with a dual coaxial speaker system. It is capable of reproducing without distortion an audio frequency range of at least 10,000 cycles.

The chassis is of the fortified type with balls provided for ease in handling and servicing. Automatic tuning is accomplished by means of a motor drive controlled by a commutator and brush assembly and the dial is of the slide rule type, edge-lighted for clear visibility without glare. Separate treble and bass controls are provided to make accurate adjustment of the tone possible.

A remote control unit is provided with this receiver which enables the user to operate the receiver at a remote point.

The power output of this receiver is excellent and the tone quality and fidelity of reproduction is finer than anything produced commercially to date.

225 Watts

Intermediate Frequency: 455 Kilocycles (Amplitude Modulation)

4.3 Megacycles (Frequency Modulation)

1125 Ohms (Bass)

240 Ohms (Treble)

24 Ohms (Bass)

11 Ohms (Treble)
### ADJUSTING DIAL LAMP

The dial on this receiver is edge-lighted, and for proper illumination it is very important that the dial be adjusted so that the illumination is exactly opposite the edge of the glass.

To make this adjustment simply slide the pilot light socket back and forth on its mounting bracket until maximum illumination is obtained.

### NORMAL VOLTAGE READINGS

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Voltage (Volts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. C. voltages</td>
<td>115</td>
</tr>
</tbody>
</table>

### CONTINUITY TEST

Remove all tubes and disconnect the receiver from the power supply before making continuity tests.

Check all the socket connections by passing the indicator through the circuit, and use a good high resistance voltmeter having a resistance of at least 1000 ohms per volt. Take all D.C. readings on the 500 volt scale except when an asterisk (*) appears. Read from right to left on all scales. See location chart on page 3 for position and number of terminals.

### TERMINALS OF SOCKETS

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. C. voltages</td>
<td>115</td>
</tr>
</tbody>
</table>

### Terminology

- **Q Switch**: A switch used to control the Q of the resonant circuit.
- **Magnet**: A magnetic device used to control the Q of the circuit.
- **HF**: High Frequency
- **LO**: Low Frequency

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. C. voltages</td>
<td>115</td>
</tr>
</tbody>
</table>

### Symbols used on chart are as follows:

- **T-ohms**: Ohms
- **M-megohms**: Megohms
- **S-shorts**: Shorts
- **O-open**: Open

### Test

- **A. Push in any Pre-set Station Button**
  - Push in "Phone" Button
  - Push in "Television" Button
  - Push in "Television" Button

- **B. Push in any Program Station Button**
  - Push in "Phone" Button
  - Push in "Television" Button
  - Push in "Television" Button

- **C. Push in any Pre-set Station Button**
  - Push in "Phone" Button
  - Push in "Television" Button
  - Push in "Television" Button
  - Push in "Television" Button

- **D. Range switch in standard broadcast position**
  - Range switch in short-wave position
  - Range switch in frequency modulation position

- **E. "Q" Switch On**
  - "Q" Switch on standard broadcast position
  - "Q" Switch on standard broadcast position
  - "Q" Switch on standard broadcast position

- **F. Range switch in standard broadcast position**
  - Range switch in standard broadcast position
  - Range switch in standard broadcast position
  - Range switch in standard broadcast position

### Troubleshooting

- **Leakage**: Indicates that the circuit is open.
- **Short**: Indicates that the circuit is shorted.
- **Open**: Indicates that the circuit is open.

### Notes

- **Read on lowest possible scale of voltmeter.**
- **Read on 100 volt scale of voltmeter.**
ALIGNING INFORMATION

 firefighting action for aligning

ALIGNING PROCEDURE (follow this order exactly)
1. Dial pointer adjustment. With the polarity of the
dial pointer, the two vertical lines should be
the extreme low frequency end of the scale.

2. Intermediate frequency adjustments (Amplitude
Modulation)
A. Connect the second IF transformer to Frequency
Tuner position and the volume control to "off"
position.
B. Turn the set to the extreme high frequency
position and set the volume control to "off"
C. Disconnect the ground size of the 1000 ohm resister
and connect the "0" to 200 micro-
D. Align the IF transformer in the same
E. Select the IF transformer in the same
region.
F. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
G. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
H. Select the IF transformer in the same
region.
I. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
J. Select the IF transformer in the same
region.
K. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
L. Select the IF transformer in the same
region.
M. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
N. Select the IF transformer in the same
region.
O. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
P. Select the IF transformer in the same
region.
Q. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
R. Select the IF transformer in the same
region.
S. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
T. Select the IF transformer in the same
region.
U. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
V. Select the IF transformer in the same
region.
W. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
X. Select the IF transformer in the same
region.
Y. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
Z. Select the IF transformer in the same
region.
AA. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
BB. Select the IF transformer in the same
region.
CC. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
DD. Select the IF transformer in the same
region.
EE. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
FF. Select the IF transformer in the same
region.
GG. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
HH. Select the IF transformer in the same
region.
II. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
JJ. Select the IF transformer in the same
region.
KK. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
LL. Select the IF transformer in the same
region.
MM. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
NN. Select the IF transformer in the same
region.
OO. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
PP. Select the IF transformer in the same
region.
QQ. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
RR. Select the IF transformer in the same
region.
SS. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
TT. Select the IF transformer in the same
region.
UU. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
VV. Select the IF transformer in the same
region.
WW. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
XX. Select the IF transformer in the same
region.
YY. Connect the output lead and the IF micro-
F. Connect the ground lead to the ground
transmitting this circuit to the IF modu-
ZZ. Select the IF transformer in the same
region.
Location Chart

IMPORTANT: The stations selected should be local or favorite stations which give good reception at all times. Frequency Modulated Stations, as well as Amplitude Modulation Stations, may be set up on the push buttons by simply using the appropriate button determined by the position of the Frequency Modulated Station on the dial.

Always use the tuning indicator unit when setting up stations in order to determine when the station is exactly in tune.

Seven stations may be set up for push buttons located on the front of the receiver and eight stations may be set up on the remote control unit. The same seven stations which were set up for the buttons on the front of the receiver must also be used on the remote control unit and the eighth station which is chosen for the remote control unit must be of a lower frequency than any of the other stations which have been set up.

Put the call letters of the selected stations in place above the push buttons. The stations should be arranged according to frequency with the highest frequency at the right and the lowest frequency at the left, just as on the dial. (The call letters will be found inside the envelope stapled inside or underneath the cabinet).

Set the "Treble" control in normal position.

Turn the set-up switch (located on the base just back of the brush and commutator assembly) to the set-up position. (The slot in the screw should point toward "set-up").

Push the button of the highest frequency station to be set up (button No. 3) and then tune in that station manually. Be sure that the station is exactly "in tune" by tuning carefully and watching the cathode ray indicator.

Slide the brush to which the blue wire is connected until it is over the slot in the commutator. Then adjust it very carefully until the pilot light goes out. This indicates exact adjustment.

Repeat operations 4 and 5 for each station. Work from right to left or from the higher to the lower frequencies in accordance with the table below:

<table>
<thead>
<tr>
<th>Button No.</th>
<th>Purpose</th>
<th>Color of wire on brush</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manual</td>
<td>Brown</td>
</tr>
<tr>
<td>2</td>
<td>Remote</td>
<td>Orange</td>
</tr>
<tr>
<td>3</td>
<td>Highest frequency station</td>
<td>Blue</td>
</tr>
<tr>
<td>4</td>
<td>Next lower frequency station</td>
<td>Green</td>
</tr>
<tr>
<td>5</td>
<td>Next lower frequency station</td>
<td>Brown</td>
</tr>
<tr>
<td>6</td>
<td>Next lower frequency station</td>
<td>Slate</td>
</tr>
<tr>
<td>7</td>
<td>Next lower frequency station</td>
<td>Red</td>
</tr>
<tr>
<td>8</td>
<td>Lowest frequency station on receiver</td>
<td>Black</td>
</tr>
<tr>
<td>9</td>
<td>Telev. button on receiver</td>
<td>Blue</td>
</tr>
<tr>
<td>10</td>
<td>Lowest frequency button on remote control unit</td>
<td>White</td>
</tr>
<tr>
<td>11</td>
<td>Phonograph</td>
<td>See diagram of adjustable brushes and set-up switch</td>
</tr>
<tr>
<td>12</td>
<td>Off</td>
<td></td>
</tr>
</tbody>
</table>

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FOR ALIGNMENT. SEE NEXT PAGE

INSTRUCTIONS FOR REMOVAL OF CHASSIS. (Model B70 only)

1. Remove batteries after taking off bottom panel.

2. Remove two wood screws from loop antenna panel in cover. If loop panel does not come out easily, loosen antenna or ground screws a few turns, and lift one end out by gently pulling on screw with pliers until panel can be removed.

3. Remove two screws in rear on cabinet and one screw in front of cabinet. The chassis can now be removed by pushing it from behind and sliding it out of the cabinet.

4. If the loop antenna is disconnected for any reason, be sure that the lead coming from the gang condenser is connected to the inside turn of the loop antenna coil.
ALIGNMENT --- MODELS B70, FB73
B1, B712

I.F. 456 K.C.

Set receiver dial at 1720 K.C., or with tuning condenser open.

Set signal generator at 456 K.C. with generator coupled to receiver through a 0.1 mfd. condenser in each lead (ground side to chassis and other lead to 1A7GT grid cap). Allow just enough signal to produce a reading in an output indicating device such as a.o. meter connected to voice leads of speaker. Meter must be able to indicate as low as one or two volts a.c.

Adjust each I.F. trimmer to maximum output while reducing input signal to a minimum, thus avoiding a.v.c. effects and insuring perfect resonance.

B.C. BAND

Connect signal generator to a single turn loop of wire five or six inches in diameter facing receiver loop and spaced about eight inches away. This is to simulate actual receiving conditions.

Set receiver dial to 1500 K.C. and signal generator dial to 1500 K.C.

Adjust oscillator trimmer until signal is heard. Start this procedure with considerable signal from generator and reduce as previously instructed until signal is set at 1500 K.C. on receiver. Adjust antenna trimmer at same point and to the greatest output with minimum signal from generator.
I. F. ALIGNMENT

From a good signal generator, connect the proper leads, one to the chassis (make sure polarity is the same first), and the other thru a .1 mfd. condenser to the grid cap of the 6K8, with the tube's grid lead still in place. Set the radio dial to 1720 K.C. and the signal generator to 456 K.C. With the set's volume control full on, increase the generator output until the signal is heard in the speaker. Adjust the I.F. trimmers for maximum output, decreasing the generator output as the speaker output increases.

B. C. ALIGNMENT

1. Connect the signal generator lead thru a .0002 mfd. condenser as dummy antenna to the "A1" terminal, with the metal strip connected across A2 and G. Set the signal generator and radio dial to 1720 K.C. and adjust the B.C. oscillator trimmer for maximum output.
2. Set the signal generator and radio dial to 1400 K.C. and adjust the B.C. Ant. trimmer for maximum output.
3. Set the signal generator to 600 K.C. and the radio dial to approximately 600 K.C., and adjust the B.C. oscillator pad for maximum output by adjusting dial and pad together. Check the alignment again at 1400 K.C.
4. Adjust the wave trap at 456 K.C. for MINIMUM output.

INTERMEDIATE BAND ALIGNMENT

Using a 400 ohm resistor as dummy antenna, adjust the Intermediate Band oscillator trimmer at 6.7 M.C. and the Antenna trimmer at 6 M.C. Check for alignment at 2.2 M.C.

SHORT WAVE BAND ALIGNMENT

Using a 400 ohm resistor as dummy antenna, adjust S.W. oscillator trimmer at 24.5 M.C., and the Antenna trimmer at 22 M.C. Check for alignment at 8 M.C.

The ranges of the three wave bands are as follows:
Standard Broadcast Band 530 to 1,720 K.C.
Intermediate (Police) Band 1,950 to 6,500 K.C.
Short Wave (Foreign) Band 7,650 to 24,500 K.C.

Each push button may be adjusted to select any station in the broadcast band.
1. Tune in desired station with the Selector knob.
2. Twist the push button you are going to set up for this station one full turn to the left.
3. Push this button in all the way, holding the Selector knob so station will stay tuned in.
4. With button pressed in, twist it to the right until tight and then release it.

Follow this procedure with the remaining buttons, setting each for a different station. Insert call-letter tabs.
I. F. ALIGNMENT

Set the variable condenser at minimum capacity, (dial pointer at 1550 K.C.). Connect the two leads from a good, modulated signal generator, the ground lead to the radio chassis and the other lead through a .1 mfd. condenser, to the grid cap of the 6A8GT with the tube’s grid lead still in place.

Connect the leads from a fully charged 6 volt storage battery to the receiver chassis and battery lead, the polarity being reversible.

With the set in operation and the volume control full on, set the signal generator to 456 K.C. and increase its output until the signal is heard in the set’s speaker. Starting with the second I. F., adjust the I. F. trimmers for maximum output, decreasing the signal generator output as the receiver output increases.

The generator output in all the alignment adjustments should be adjusted so the meter will read approximately .4 volts continually.

R. F. ALIGNMENT

With the variable condenser still full open, set the generator to 1550 K.C. Connect the generator lead to the antenna lead through a .0001 mfd. condenser as dummy antenna. Adjust the oscillator trimmer for maximum output. Set the receiver dial and the generator to 1400 K.C. so the signal comes through, and adjust the antenna trimmer for maximum output.

Set the receiver dial and generator to 600 K.C. and adjust the oscillator padder for maximum output by rocking the variable condenser (with the tuning knob) as the padder is adjusted.

Return the dial and generator setting to 1400 K.C. and check for alignment.

PUSH BUTTON ADJUSTMENT

Six push button station selectors are incorporated in this receiver, and each may be set to select any frequency or station within the range of the set.

To adjust each button, follow these instructions.

1. With the set in operation, tune in any station the push button is to be set for, with the right hand tuning knob.

2. Keep a firm grip on the tuning knob so the station will not be detuned, and turn the push button about one turn to the left to loosen the mechanism. Press the button all the way in and turn it to the right until it is tight.

Repeat these operations with the other five buttons, setting each for a different station. Insert the correct call letter tab into the space provided in the panel just above the push buttons.
UNITED MOTORS SERVICE

MODEL R675
MODELS R677, R678

Tuning is accomplished with the conventional manual tuning control or by means of five push buttons which mechanically adjust the position of the iron cores in the tuning coils, tuning the radio to preselected stations.

SETTING STATIONS ON PUSH BUTTONS
(Optional)

1. Remove the push-button trim plate by prying gently with a small screwdriver at the slots provided at the bottom of the plate.
2. Press the manual station selector knob and tune across the dial. Select the five stations which will give the best all around reception.
3. Stations may be set up to any sequence desired; however, it is best from a speed-of-operation standpoint to set them up on the buttons in the order of their frequencies.
4. Press a button on which a station *is* to be set up. Insert screwdriver supplied in receiver package in hole located to the right of the button and in front of the push button. BUMPER is to be depressed and INSTALLED IN TIGHTENING SET SCREW.
5. Tune set manually (with station button held down firmly) until station desired to be set up is tuned in. In order to secure an accurate set-up, rock manual tuning knob back and forth slightly until station is tuned in clearly and with maximum volume. DO NOT RELEASE PUSH BUTTON.
6. With push button still held firmly and station accurately tuned in, tighten adjustment screw securely and remove screwdriver before releasing button.
7. Insert station call letter tab in slot provided at top of button.
8. Repeat this same procedure in setting up the remaining buttons and then replace the button snap-on plate.

CIRCUIT ALIGNMENT

If realignment is found necessary, the circuits can be properly aligned only with the use of a calibrated Test Oscillator or Signal Generator and an output meter. Extreme care should be exercised in following the alignment instructions in order to obtain the best performance possible. IT IS NECESSARY TO USE AN INSULATED SCREWDRIVER IN ALL ALIGNMENT ADJUSTMENTS.

ALIGNMENT PROCEDURE

Two separate alignment procedures are included in these instructions. The first is to be considered the usual alignment procedure, and the second to be used only when a tuning coil has been changed, or when some major change has been made in the tuning apparatus.

CAPACITY ALIGNMENT

1. Aligning I.F. Stages at 455 Kilocycles

(a) Connect the ground lead of the Signal Generator to chassis frame. Connect the signal lead through an 0.1 mfd. condenser to the terminal **“F”** (Fig. 5).
(b) Connect output meter from the plate of the 6G6 tube to ground.
(c) Set signal to exactly 455 kilocycles and turn volume control on full.
(d) Tune the set by means of the manual tuning control knob to a position where no equal or beat notes can be noticed, also so that when the tuning control knob is rotated within narrow limits there is no appreciable change in output.
(e) Adjust trimmers A-5-D-0 (Fig. 5) in the order mentioned until maximum output is obtained.
(f) Repeat adjustment of I.F. trimmers A-5-D-0 with as low an output from the Signal Generator as possible, for more accurate alignment.

2. Alignment at 1500 Kilocycles

(a) Tune the set by means of the tuning control knob to the extreme high frequency position against stop.

(b) Connect the signal lead of the Signal Generator to the antenna terminal of the set through a .0001 mfd. condenser.
(c) Set frequency of the Signal Generator to 1560 kilocycles and adjust the oscillator shunt trimmer **“Q”** for maximum output (Fig. 5).

3. Alignment at 600 Kilocycles

(a) Leave Signal Generator connected the same as for alignment at 1500 kilocycles.
(b) Set Signal Generator to 600 kilocycles.
(c) Tune the set (manual tuning control) to this signal.
(d) Adjust the antenna trimmer **“Q”** (Fig. 5) for maximum output.

4. Checking I.F. Band Spread

(a) A Cathode Ray Oscillograph should be used to check the I.F. band spread after completing the alignment procedure. Blight adjustment of the I.F. stages may be found necessary in order to obtain a symmetrical selectivity curve. Connect Cathode Ray Oscillograph as shown in Fig. 4.

CAPACITY AND INDUCTANCE ALIGNMENT

To be used only when a major change such as changing a tuning coil has been made in the tuning apparatus and there is definite evidence of tuning coils not "tracking."

1. I.F. Alignment

Align the I.F. stages the same as outlined under the capacity Alignment Procedure.

2. Mechanical Alignment of B.F. Stage

(a) Tune the set by means of the tuning control knob to extreme high frequency position against mechanical stop (core will be almost withdrawn from core form.)
(b) Adjust the cut on the oscillator core (120m. #1, Fig. 5) aligning the end of the core (inside coil form) to A position flush with the end of the oscillator coil winding. This key be done by laying a separate core (or an accurate 1-5/8" gauge) alongside the oscillator core making the stud ends flush and making the opposite ends just meet the winding of the oscillator coil.
(c) Adjust the position of the core of the antenna coil assembly (120m. #1, Fig. 5) until this core strays out of its coil form (toward center) exactly the same amount that the oscillator core's strays out of its coil form. This should be measured carefully so as to give the antenna core the same mechanical relation to the coil as the oscillator core has to its coil.

3. Alignment at 1500 Kilocycles

(a) Connect the signal lead of the Signal Generator to the antenna terminal of the set through a .0001 mfd. condenser.
(b) Set the Signal Generator to 1500 kilocycles.

4. Alignment at 600 Kilocycles

(a) Leave Signal Generator leads connected the same as for alignment at 1500 kilocycles.
(b) Set the Signal Generator to 600 kilocycles.
(c) Tune the set (manual tuning control) to this signal.
(d) Adjust the antenna trimmer **“Q”** (Fig. 5) for maximum output.

5. Alignment at 1400 Kilocycles

(a) Leave Signal Generator leads connected the same as for alignment at 600 Kilocycles.
(b) Set the Signal Generator to 1400 kilocycles.
(c) Tune the set to signal and using wrench, part #7236078, adjust the antenna coil (120m. #1) iron core for maximum output. (Do not attempt to make this adjustment without this wrench.)

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SERVICE HINTS

Removing Tuner Assembly

In order to make the parts located under the tuner assembly accessible for service tests, the tuner assembly can be lifted out of the way as follows.

1. Unsolder single "A" lead to switch.
2. Unsolder green lead connected to oscillator trimmer condenser at condenser (Illus. #44, Fig. 5).
3. Remove the four hex head slotted screws (two on each side of case) used for mounting tuner assembly to case.
4. Remove the two screws in antenna lead support bracket.
5. Lift front end of tuner out of case, pivoting at the back end, being careful not to break other leads connected to tuner.

Dial Cord Replacement

1. Loosen shaft (Illus. #97, Fig. 5) in cord drive gear assembly.
2. Pull spring clip from shaft and disassemble cord drive gear assembly.
3. Thread double end of cord through cord drive pulley until the spring lies inside the pulley.
4. Looking in at the end of the drive pulley, take the spring counter-clockwise around the shaft from the cord hole, placing the hook end in the hole provided in the side of the pulley.
5. Wrap one half of the cord clockwise approximately one turn around the outside of the drum and the other half counter-clockwise and hold the cord in place with a piece of Scotch tape on the side of the pulley opposite the cord hole.
6. Fasten cord drive gear assembly back into place lightly, not mashing gears until cord is threaded into place.
7. Thread cord around the two pulleys at the manual tuning control end of the dial and across the front and under the single pulley at the volume control end of the dial.
8. Mesh gears carefully by tightening cord drive gear shaft. Too tight a mesh will result in hard push button operation or rough or tight manual tuning drive.
9. Tune set up at a station of known frequency or to Signal Generator. Set to a good calibration point (700 K.C.). Set pointer to that frequency on dial and clip pointer tabs over dial cord.

Lubrication

The mechanical parts of the push button tuner should be carefully lubricated as a part of every service job, using a special lubricant supplied under part #7236515. NOTE: Do not use ordinary oils and greases on the automatic tuner.

Grease the following points:
(a) Dial pulleys and pins
(b) Plunger Guides
(c) All gears
(d) Core bracket guides
(e) Nutcatch

Do not allow brake surface to become greasy.

Volume Control Replacement

1. Unsolder all volume control leads at the volume control.
2. Remove volume control nut from front end of chassis.
3. Remove volume control by lifting switch end of volume control up and back.
4. To replace reverse procedure.

Oscillator Series Coil Replacement

1. This coil (Illus. #6, Fig. 5) is glued to terminal strip in the original assembly. Replacement coils will be furnished with a piece of tape to hold these to the terminal strip.

Oscillator Trimmer Condenser Replacement (Illus. #44, Fig. 5)

1. Unsolder leads from trimmer condenser.
2. Unsolder trimmer ground connection from chassis.
3. Straighten tangs through terminal strip and remove trimmer.
4. To replace reverse the procedure.

Antenna Coil Replacement

1. Unsolder leads from antenna coil terminals located on terminal strip at rear of tuner.
2. Remove iron cores by removing nut, Illus. #97, and washers, Illus. #40 and 80, (Fig. 5). Pull out of coil toward tuner unit. NOTE: Extreme care should be used in handling the iron cores as they are brittle and very easily broken.
3. To remove shield, Illus. #40 (Fig. 5), unsolder from chassis and straighten the three ears.
4. To remove coil, loosen the three screws holding its base to chassis.
5. To replace the coil, loosen the three screws holding its base to chassis.
6. To replace the antenna coil reverse this procedure.

Oscillator Coil Replacement (Tuning Coil)

1. Remove iron core in same manner as recommended on antenna coil replacement.
2. Remove three nuts holding coil to chassis and unsolder coil leads from terminal strip.
3. To replace reverse procedure.
1. Aligning I-F Stages at 262 Kilocycles

(a) Connect the ground lead of the signal generator to the chassis frame.

(b) Connect the signal lead of the signal generator to the grid cap of the 6AS6 tube through a .1 mfd. condenser, leaving the tubes grid clip in place.

(c) Connect the output meter from the plate of the 6K5G tube to ground.

(d) Set the Signal Generator to exactly 262 kilocycles and turn the volume control on full.

(e) Turn the condenser gang to a position where no squeals or beat notes are heard and so that when the tuning condenser is rotated within narrow limits, there is no appreciable change in output.

(f) Adjust trimmers A-B-C-D through the cutouts on the side of the chassis opposite the antenna and "A" receptacles (Illus. 12 & 13, Figure 4) for maximum output. Repeat with lowest possible output from the signal generator for more accurate alignment.

2. Aligning at 1550 Kilocycles

(a) Leave Signal Generator leads connected the same as for I-F adjustments.

(b) Turn the rotor plates of the gang condenser all the way out of mesh and against the high frequency stop.

(c) Set the Signal Generator to exactly 1550 Kilocycles.

(d) Adjust the oscillator parallel trimmer "G" on the center section of the gang condenser carefully for maximum output (Figure 5).

3. Aligning at 1400 Kilocycles

(a) Remove the signal lead of the Signal Generator from the grid cap of the 6AS6 and connect to the antenna terminal of the receiver through a .0002 mfd. mica condenser.

(b) Set the Signal Generator to 1400 kilocycles and tune the receiver to this signal.

(c) Adjust the parallel trimmers "F" and "H" (Figure 5) on the condenser gang carefully for maximum output.

4. Aligning at 600 Kilocycles

(a) Set the Signal Generator to approximately 600 kilocycles.

(b) Turn the rotor plates of the gang condenser until this signal is tuned in with maximum output.

(c) Adjust trimmer "E" (Illus. 11, Figure 4) while rocking the rotor plates of the gang condenser back and forth through the signal until maximum output is obtained.

   It will be necessary to readjust this condenser to the ear antenna upon installation of the set.

(d) Repeat adjustments made under "Alignment at 1400 Kilocycles".

5. Checking I-F Band Spread

A Cathode Ray Oscillograph should be used to check the I-F band spread after completing the alignment procedure. Connect the oscillograph from connection "F" (Figure 4) to ground.
In order to prevent the A.V.C. from affecting the alignment adjustment, the lowest signal generator output which will give a readable indication on the output meter should be used. Top and bottom covers must be removed in order to properly align the set, however, the chassis should not be removed from the case.

ALIGNMENT PROCEDURE

Two separate alignment procedures are included in these instructions. The first is to be considered the usual alignment procedure, and the second to be used only when a tuning coil has been changed, or when some major change has been made in the tuning apparatus.

CAPACITY ALIGNMENT

1. Aligning I.F. Stages at 455 Kilocycles
   (a) Connect the ground lead of the Signal Generator to chassis frame. Connect the signal lead through an 0.1 mfd. capacitor to the terminal "T" (Fig. 1).
   (b) Connect output meter from the plate of the 696 tube to ground.
   (c) Set signal to exactly 455 kilocycles and turn volume control on full.
   (d) Tune the set by means of the manual tuning control knob to a position where no squeals or beat notes can be noticed, also so that when the tuning control knob is rotated within narrow limits there is no appreciable change in output.
   (e) Adjust trimmers A-B-C-D (Fig. 3) and I.F. core adjustment "F" (Fig. 4) in the sequence named, until maximum output is obtained.
   (f) Repeat adjustments with as low an output from the Signal Generator as possible, for more accurate alignment.

2. Alignment at 1560 Kilocycles
   (a) Tune the set by means of the manual tuning control knob to the extreme highest frequency position against stop.
   (b) Connect the signal lead of the Signal Generator to the antenna terminal of the set through a .0001 mfd. condenser.
   (c) Set frequency of the Signal Generator to 1560 kilocycles and adjust the oscillator trimmer condenser "B" (Fig. 5) for maximum output.

3. Alignment at 600 Kilocycles
   (a) Leave Signal Generator connected the same as for alignment at 1560 kilocycles.
   (b) Set the Signal Generator to 600 kilocycles.
   (c) Tune the set (manual tuning control) to this signal.
   (d) Adjust the R.F. trimmer condenser "G" (Fig. 5) for maximum output.

4. Checking I.F. Dual Spread
   (a) A Cathode Ray Oscillograph should be used to check the I.F. dual spread after completing the alignment procedure. Slight adjustment of the I.F. stages may be found necessary in order to obtain a symmetrical selectivity curve. Connect Cathode Ray Oscillograph as shown in Fig. 5.

CAPACITY AND INDUCTANCE ALIGNMENT

To be used only when a major change such as changing a tuning coil has been made in the tuning apparatus and there is definite evidence of tuning coils not tracking.

1. I.F. Alignment
   Align the I.F. stages the same as outlined under the capacity alignment procedure.

2. Mechanical Alignment of R.F. Stages
   (a) Tune the set to means of the tuning control knob to extreme high frequency position, against stop (coils will be almost withdrawn from coil forms.)
   (b) Adjust the nut on the oscillator core stud aligning the end of the core (inside coil form) to a position flush with the end of the oscillator coil winding. This may be done by laying a separate core part #2037714 (or an accurate 1-3/4" gauge) alongside the oscillator core making the stud ends flush and making the opposite ends just meet the winding of the oscillator coil.
   (c) Adjust the position of the antenna and R.F. coil cores to a position flush with the end of the coil windings, using the separate core for a gauge in the same manner as for the oscillator coil.

5. Alignment at 1560 Kilocycles
   (a) Connect the signal lead of the Signal Generator to the antenna terminal of the set through a .0001 mfd. condenser.
   (b) Set frequency of the Signal Generator to exactly 1560 kilocycles and adjust the oscillator trimmer condenser "B" (Fig. 5) for maximum output indication on the output meter.

4. Alignment at 600 Kilocycles
   (a) Leave the Signal Generator connected the same as for alignment at 1560 kilocycles.
   (b) Set the Signal Generator to 600 kilocycles.
   (c) Tune the set (manual tuning control) to this signal.
   (d) Adjust the R.F. trimmer condenser "G" for maximum output.

5. Alignment at 1400 Kilocycles
   (a) Leave Signal Generator connected the same as for alignment at 600 kilocycles.
   (b) Set the Signal Generator to 1400 kilocycles.
   (c) Tune the set to signal and using wrench, part #2036070, adjust the position of the iron core in the R.F. coil (Illus. #3, Fig. 5) for maximum output meter indication.
   (d) Adjust the position of the iron core in the antenna coil (Illus. #1, Fig. 5) for maximum output. DO NOT TOUCH THE ADJUSTMENT OF THE OSCILLATOR COIL IRON CORE.
   (e) Repeat adjustments with a lower output from the Signal Generator for more accurate alignment.

SERVICE HINTS

It is so noted that the voltage chart is given for the tube sockets with the tubes pulled out of the sockets. This is because the bases of several tube sockets are not readily accessible.

1. To remove the tuner assembly for servicing parts mounted on the 6SI7 or 6DQ5 tube sockets, proceed as follows:
   (a) Un solder single yellow "A" lead at switch.
   (b) Un solder blue lead and black lead from either end of trimmer "G" (Fig. 5).
   (c) Un solder green lead from high side of trimmer "F" (Fig. 5).
   (d) Remove screws holding tuner assembly in case and screws on antenna leads.
   (e) Hold tuning unit back being careful not to break other leads connected to it.

2. The position of the R.F. coil shunt condenser (Illus. #3, Fig. 5) should not be changed. Changing its position changes this value of the radio to be desired.

3. Coil cores (part #2037714) should not have to be replaced except when broken by mishandling. Since these cores are machined at the factory into sets of matched characteristics, it is recommended that all three cores be replaced at the same time. All Branch stock on #2037714 is machined and may be ordered in the required quantity for service.
CAPACITY ALIGNMENT

1. Aligning I.F. Stages at 455 Kilocycles
   (a) Connect the ground lead of the signal generator to the chassis.
   (b) Select the signal lead through the .001 mfd. condenser to the bottom
       right hand connections of the tuning section as shown in Fig. 2.
   (c) Set signal generator to exactly 455 kilocycles and turn volume
       control on full.
   (d) Tune the set by means of the manual tuning control knob to a position
       where no equal or beat notes can be noticed; also, so that when the
       tuning knob is rotated within narrow limits there is no appreciable
       change in output.
   (e) Adjust trimmer A-B-C-D (Fig. 3) and I.F. core adjustment "H"
       (Fig. 4) in the sequence named, until maximum output is obtained.
   (f) Repeat adjustments with as low an output from the signal generator
       as possible, for more accurate alignment.
   (g) Connect the signal lead of the signal generator to the antenna termi-
       nal of the receiver through a .1 mfd. condenser.
   (h) Adjust the I.F. Trap adjustment "J" for minimum output.

2. Alignment at 1560 Kilocycles
   (a) Tune the set by means of the manual tuning control knob to the
       extreme high frequency position, against stop.
   (b) Connect the signal lead of the signal generator to the antenna
       terminal of the set through a .001 mfd. condenser.
   (c) Set frequency of the signal generator to exactly 1560 kilocycles
       and adjust the oscillator shunt trimmer condenser "F" (Fig. 5)
       for maximum output.

3. Alignment at 600 Kilocycles
   (a) Leave the signal generator connected the same as for alignment
       at 1560 kilocycles.
   (b) Set the signal generator to 600 kilocycles.
   (c) Tune the set (manual tuning control) to this signal.
   (d) Adjust the R.F. trimmer condenser "G" (Fig. 5) for maximum output.
   (e) Adjust the antenna trimmer condenser "H" (Fig. 5) for maximum output.

4. Checking I.F. Band Spread
   A Cathode Ray Oscillograph should be used to check the I.F. band spread
   after completing the alignment procedure. Slight adjustment of the I.F.
   stages may be found necessary in order to obtain a symmetrical selec-
   tivity curve. Connect Cathode Ray Oscillograph as shown in Fig. 4.

CAPACITY AND INDUCTANCE ALIGNMENT

To be used ONLY when a major change such as changing a tuning coil has been
made in the tuning apparatus and there is definite evidence of the coils not
"tracking."
VOLTAGE READINGS TAKEN BETWEEN SOCKET TERMINALS AND GROUND WITH D.C. VOLTOMETER HAVING RESISTANCE OF 1000 OHMS PER VOLT. ALL READINGS TAKEN WITH 5.8 FILAMENT VOLTAGE AT TUBES.

CURRENT DRAIN WITH SPEAKER AND DIAL LIGHT 5.0 AMPS.

"B" SUPPLY DRAIN 4.4 MA.

GRID VOLTAGES MEASURED WITH VOLTOMETER HAVING RESISTANCE OF 20,000 OHMS PER VOLT.

FIG. 1--TUBE SOCKET VOLTAGES

GENERAL: The Delco Model R-686 is a five tube, single unit superheterodyne receiver with a 6" dynamic speaker, designed for universal mounting on all cars.

TUNING CONTROLS: Tuning is accomplished by means of a manual tuning control or by means of five push-buttons each of which drives the permeability tuning cores to preselected frequencies.

Setting up the push-buttons for any desired station is accomplished by pressing the button into its latched position and rotating it in the manner of a manual tuning control until the desired station is tuned in. No locking device is required to retain this setting.

Note: Do not hold the button in beyond its normal latching position when setting up stations.

The manual tuning control operates by pressing the tuning knob into its latched position and tuning in the conventional manner.
CAPACITY ALIGNMENT

Aligning I-F Stages at 455 Kilocyles

(a) Connect the ground lead of the signal generator to the chassis frame.
(b) Connect the signal lead of the signal generator to the terminal "F" (Fig. 4) through a .1 mfd. condenser.
(c) Connect the output meter from the plate of the 6K6GT tube to ground.
(d) Set the signal generator to exactly 455 K.C.
(e) Tune the volume control on full and tune the set to a position where no squeals or best notes are noticed, also so that when the tuning control knob is rotated within narrow limits there is no appreciable change in output.
(f) Adjust the I-F trimmers A, B, C, D (Fig. 3) in the order mentioned until maximum output is obtained.
(g) Repeat these adjustments with as low an output from the signal generator as possible for more accurate alignment.

2. Aligning at 1660 Kilocyles

(a) Connect the signal lead of the signal generator to the antenna terminal of the receiver through a .0001 mfd. mica condenser.
(b) Tune the set to the extreme high frequency position against the stop.
(c) Set the signal generator to exactly 1660 K.C.
(d) Adjust the oscillator shunt trimmer "F" (Fig. 5) for maximum output.

3. Aligning at 600 Kilocyles

(a) Leave the signal generator connected the same as before.
(b) Set the signal generator to 600 K.C.
(c) Tune the set by means of the manual control until this signal is tuned in with maximum output.
(d) Adjust the antenna trimmer "F" (Fig. 5) for maximum output.

CAPACITY AND INDUCTANCE ALIGNMENT

1. Aligning I-F Stages at 455 Kilocyles

Align the I-F stages as outlined under paragraph 1 under CAPACITY ALIGNMENT.

2. Mechanical Alignment of Cores

(a) Tune the set by means of the manual tuning control to the extreme high frequency end of the dial and against stop. (Cores will be almost withdrawn from coil forms.)
(b) Remove the pointer plate (note insulating washers under left hand screw) without disturbing the tuning mechanism.
(c) Using a spare core (part #7240090) as a gauge, adjust the oscillator core so that with the front surfaces of the spare core and the oscillator core exactly flush, the rear surface of the test core is flush with the front end of the oscillator coil winding. This adjustment may be made using adjustment tool #7240160 inserted through the hole at the rear of the coil mounting bracket. The tool should be fitted into the hole at the rear of the core and rotated without applying any thrust to the core which would move it out of its normal resting position.
(d) Manually tune the set to a point where the front surface of the oscillator core is flush with the front end of the oscillator coil fibre mounting bushing.
(e) Adjust the antenna coil core position so that the front surface of the core is flush with the front end of the antenna coil fibre mounting bushing.
(f) Replace the pointer plate assembly.

4. Aligning at 600 Kilocycles

(a) Leave the signal generator connected the same as before.
(b) Set the signal generator to 600 K.C.
(c) Tune the set by means of the manual control until this signal is tuned in with maximum output.
(d) Adjust the antenna trimmer "F" (Fig. 5) for maximum output.

5. Aligning at 1400 Kilocycles

(a) Set the signal generator to 1400 K.C.
(b) Tune the set manually until this signal is tuned in with maximum output.
(c) Adjust the core of the antenna coil (using tool #7240160) for maximum output.
(d) Repeat the alignment with as low an output from the signal generator as possible for more accurate alignment.
(e) Apply cement to the core screws to prevent their changing adjustments.

6. Adjusting Receiver to Car Antenna

After the receiver is reinstalled in the car, it will be necessary to readjust the antenna trimmer on a weak station at about 600 K.C.
UNITED MOTORS SERVICE

MODEL R686

1. **Aligning I-F Stages at 260 Kilocycles**
   (a) Connect the ground lead of the signal generator to the chassis frame.
   (b) Connect the signal lead of the signal generator to the end section (RF) of the gang condenser (adjacent to trimmer "H", Fig. 3) through a .1 mfd. condenser.
   (c) Connect the output meter from the plate of the 6630 tube to ground.
   (d) Set the signal generator to exactly 260 kilocycles and turn the volume control on full.
   (e) Turn the condenser gang to a position where no squeals or beat notes are heard and so that when the timing condenser is rotated within narrow limits, there is no appreciable change in output.
   (f) Adjust trimmers A-B-C-D through the cut-outs on the side of the chassis opposite the antenna and "A" and "B" receptacles (Illus. 11 and 12, Fig. 4) for maximum output. Repeat with lowest possible output from the signal generator for more accurate alignment.

2. **Aligning at 1800 Kilocycles**
   (a) Leave signal generator leads connected the same as for I-F adjustments.
   (b) Turn the rotor plates of the gang condenser all the way out of mesh and against the high frequency stop.
   (c) Set the signal generator to exactly 1800 Kilocycles.
   (d) Adjust the oscillator parallel trimmer "G" on the center section of the gang condenser carefully for maximum output (Fig. 3).
   (e) Trimmer "K" (Fig. 3) is adjusted and sealed at the factory and should require no further adjustment.
   In the event that its setting has been changed, back off trimmers "G" and "K" to minimum capacity and readjust simultaneously until maximum output is obtained.

3. **Aligning at 1400 Kilocycles**
   (a) Remove the signal lead of the signal generator and connect to the antenna terminal of the receiver through a .0002 mfd. mica condenser.
   (b) Set the signal generator to 1400 Kilocycles and tune the receiver to this signal.
   (c) Adjust the parallel trimmers "M" and "P" (Fig. 3) on the condenser gang carefully for maximum output.

4. **Aligning at 600 Kilocycles**
   (a) Set the signal generator to approximately 600 Kilocycles.
   (b) Turn the rotor plates of the gang condenser until this signal is tuned in with maximum output.
   (c) Adjust trimmer "H" (Fig. 4) while rocking the rotor plate of the gang condenser back and forth through the signal until maximum output is obtained.
   It will be necessary to readjust this condenser to the ear antenna upon installation of the set.
   (d) Repeat adjustments made under "Alignment at 1400 Kilocycles".

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**Voltage Readings Between Socket Terminals and Ground with D.C. Voltmeter Having Resistance of 1000 Ohms Per Volt. All Readings Taken With 6.0 Volts at Heaters.**

**CURRENT DRAIN WITHOUT SPEAKER 5.5 AMPERES**

**'F' SUPPLY DRAIN APPROX. 50 M.A.
1. Aligning I-F Stages at 455 Kilocycles
(a) Connect the ground lead of the signal generator to the chassis frame.
(b) Connect the signal lead of the signal generator to the bottom right hand connection of the tuner socket (Fig. 2) through a .1 mfd. condenser.
(c) Connect the output meter from the plate of the 6V6GT tube to ground.
(d) Set the signal generator to exactly 455 K.C.
(e) Turn the volume control on full and tune the set to a point where no squeals or beat notes are noticed, also so that when the tuning control knob is rotated within narrow limits, there is no appreciable change in output.
(f) Adjust the I-F trimmers "A, B, C, D" (Fig. 3) and the I-F core adjustment "E" (Fig. 4) until maximum output is obtained.
(g) Repeat these adjustments with as low an output from the signal generator as possible for more accurate alignment.
(h) Connect the signal lead of the signal generator to the antenna terminal of the receiver through a .1 mfd. condenser.
(i) Adjust the I-F wave trap "J" (Fig. 3) for minimum output.

2. Aligning at 1650 Kilocycles
(a) Connect the signal lead of the signal generator to the antenna terminal of the receiver through a .0001 mfd. mica condenser.
(b) Tune the set to the extreme high frequency position against the stop.
(c) Set the signal generator to exactly 1560 K.C.
(d) Adjust the oscillator shunt trimmer "F" (Fig. 5) for maximum output.

3. Aligning at 600 Kilocycles
(a) Leave the signal generator connected the same as before.
(b) Set the signal generator to 600 K.C.
(c) Tune the set by means of the manual tuning control until this signal is tuned in with maximum output.
(d) Adjust the R. F. trimmer "G" (Fig. 3) for maximum output.
(e) Adjust the antenna trimmer "H" (Fig. 3) for maximum output.

** Disregard item (d) for Model R688

3. CAPACITY AND INDUCTANCE ALIGNMENT
Align the I. P. stages as outlined under paragraph 1 under CAPACITY ALIGNMENT.

4. Mechanical Alignment of Cores
(a) Tune the set by means of the manual tuning control to the extreme high frequency end of the dial and against stop. (Coils will be almost withdrawn from coil forms.)
(b) Remove the pointer plate (note insulating washers under left hand screw) without disturbing the tuning mechanism.
(c) Using a spare core (Part #7240022) as a gauge adjust the oscillator core (middle core) so that with the front surfaces of the spare core and the oscillator core exactly flush, the rear surface of the test core is exactly flush with the front end of the oscillator coil winding. This adjustment may be made using adjustment tool #7240100 inserted through the hole at the rear of the coil mounting bracket. The tool should be fitted into the hole at the rear of the core and rotated without applying any thrust to the core which would move it out of its normal resting position.
(d) Manually tune the set to a point where the front surface of the oscillator core is flush with the front end of the oscillator coil fibre mounting bushing.
(e) Adjust the antenna and R. F. cores so that the front surfaces of the cores are flush with the front ends of the coil fibre mounting bushing.
(f) Replace the pointer plate assembly.

5. Aligning at 1400 Kilocycles
(a) Set the signal generator to 1400 K.C.
(b) Tune the set manually until this signal is tuned in with maximum output.
(c) Adjust the antenna and R. F. cores for maximum output.
(d) Repeat the alignment with as low an output from the signal generator as possible for more accurate alignment.
(e) Apply cement to the core screws to prevent their changing alignment.

6. Adjusting Receiver to Car Antenna
After the receiver is reinstalled in the car, it will be necessary to readjust the antenna trimmer on a weak station at about 600 K.C.
Setting up the push-buttons for any desired station is accomplished by pressing the button into its latched position and rotating it in the manner of a manual tuning control until the desired station is tuned in. No locking device is required to retain this setting.

Note: Do not hold the button in beyond its normal latched position when setting up stations.
FIG. 3--PARTS LAYOUT--Top View

FIG. 4--PARTS LAYOUT--Bottom View
SUBJECT--SERVICE INSTRUCTIONS--DELCO MODEL R-695 AUTO RADIO

GENERAL: The Delco Model R-695 is a six tube, single unit, superheterodyne receiver with a 5" dynamic speaker, designed for universal mounting on all cars.

CIRCUIT ALIGNMENT

If realignment is found necessary, the circuits can be properly aligned only with the use of a calibrated test oscillator or signal generator and an output meter.

1. Aligning I-F Stages at 455 Kilocycles

(a) Connect the ground lead of the signal generator to the chassis frame.
(b) Connect the signal lead of the signal generator to the grid end of condenser (Illus. 8, Fig. 4) through a .1 mfd condenser.
(c) Connect the output meter from the plate of the 6K5GT tube to ground through a .1 mfd condenser.
(d) Set the signal generator to exactly 455 Kilocycles.
(e) Turn the volume control on full and tune the set to a position where no squeals or beat notes are noticed, also so that when the tuning control knob is rotated within narrow limits, there is no appreciable change in output.
(f) Adjust the I-F trimmers (Illus. A, B, C, D, Fig. 3) in the order mentioned until maximum output is obtained.
(g) Repeat these adjustments with as low an output from the signal generator as possible for more accurate alignment.

2. Aligning at 1530 Kilocycles

(a) Connect the signal lead of the signal generator to the antenna terminal of the receiver through a .000070 mfd. mini condenser.
(b) Tune the set to the extreme high frequency position against the stop.
(c) Set the signal generator to exactly 1530 Kilocycles.
(d) Adjust the oscillator shunt trimmer (Illus. E, Fig. 3) for maximum output.

3. Aligning at 1400 Kilocycles

(a) Leave the signal lead of the signal generator connected the same as before.
(b) Set the signal generator to 1400 Kilocycles.
(c) Tune the set by means of the manual control until this signal is tuned in with maximum output.
(d) Adjust the trimmer (Illus. F, Fig. 3) for maximum output.

4. Aligning at 600 Kilocycles

(a) Leave the signal lead of the signal generator connected the same as before.
(b) Set the signal generator to 600 Kilocycles.
(c) Tune the set by means of the manual control until this signal is tuned in with maximum output.
(d) Adjust the trimmer (Illus. G, Fig. 4) for maximum output.
(e) Repeat adjustment made under 3 and 4.

5. Adjustment of Radio to Car Antenna

The radio should be adjusted to the car antenna after mounting in the car. The following adjustment should be made:

(a) Tune in a weak station near the low frequency end of the dial (approximately 600 Kilocycles).
(b) Adjust the antenna trimmer (Illus. G, Fig. 4) for maximum volume.
FIG. 3--PARTS LAYOUT--Top View

FIG. 4--PARTS LAYOUT--Bottom View
SUBJECT--SERVICE INSTRUCTIONS--DELCO MODEL R-696 AUTO RADIO

GENERAL: The Delco Model R-696 is a six tube, single unit Auto Radio with a 6" dynamic speaker, variable tone control, non-synchronous vibrator and type 6K6GT power tube.

CIRCUIT ALIGNMENT

If realignment is found necessary, the circuits can be properly aligned only with the use of a calibrated test oscillator or signal generator and an output meter.

In order to prevent the A.V.C. circuit from affecting the alignment adjustment, the lowest signal generator output should be used, which will give a readable indication on the output meter. Do not remove the bottom half of the case during alignment.

1. Aligning I-F Stages at 260 Kilocycles

(a) Connect the ground lead of the signal generator to the chassis frame.

(b) Connect the signal lead of the signal generator to the grid terminal of trimmer (Illus. 6, Fig. 3) through a .1 mfd. condenser.

(c) Connect the output meter from the plate of the 6K6GT tube to ground through a .1 mfd. condenser.

(d) Set the signal generator to 260 Kilocycles.

(e) Turn the volume control on full and turn the gain condenser to a position where no squeals or beat notes are heard and so that when the tuning condenser is rotated within narrow limits, there is no appreciable change in output.

(f) Adjust the trimmers (Illus. A,B,C,D, Fig. 4) for maximum output. Repeat with lowest possible output from the signal generator for more accurate alignment.

2. Aligning at 1530 Kilocycles

(a) Connect the signal lead of the signal generator to the antenna terminal of the receiver through a .0005 mfd. mica condenser.

(b) Tune the set to the extreme high frequency position against the stop.

(c) Set the signal generator to 1530 Kilocycles.

(d) Adjust the oscillator shunt trimmer (Illus. G, Fig. 3) for maximum output.

3. Aligning at 1400 Kilocycles

(a) Leave the signal generator connected the same as before.

(b) Set the signal generator to 1400 Kilocycles.

4. Aligning at 600 Kilocycles

(a) Leave the signal generator connected the same as before.

(b) Set the signal generator to 600 Kilocycles.

(c) Tune the set by means of the manual control until this signal is tuned in with maximum output.

(d) Adjust the trimmers (Illus. E, Fig. 3) for maximum output.

(e) Repeat alignment under 3.

5. Adjustment of Radio to Car Antenna

The radio should be adjusted to the car antenna after mounting in the car. The following adjustment should be made:

(a) Tune in a weak station near the low frequency end of the dial (approximately 600 kilocycles.)

(b) Adjust the trimmer (Illus. E, Fig. 4) for maximum volume.

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VOLTAGE READINGS BETWEEN SOCKET TERMINALS AND GROUND WITH D.C. VOLTMETER HAVING RESISTANCE OF 1000 OHMS PER VOLT. ALL READINGS TAKEN WITH 6.0 VOLTS AT HEATERS. CURRENT DRAIN WITHOUT SPEAKER 5.5 AMPERES B+ SUPPLY DRAIN APPROX. 50 M.A.

FIG. 1--TUBE SOCKET VOLTAGES
FIG. 2—DELCO MODEL R-697 CIRCUIT DIAGRAM
GENERAL: The Delco Model R-697 is a six tube single unit Superheterodyne receiver with an 7" dynamic speaker and is designed specifically for instrument panel mounting on 1941-1940 General Motors cars.
TUNING CONTROLS: Tuning is accomplished by means of a manual tuning control or by means of five push buttons each of which drives the permeability tuning cores to preselected frequencies.
SETTING UP THE PUSH BUTTONS for any desired station is accomplished by pressing the button into its latched position and rotating in the manner of a manual tuning control until the desired station is tuned in.
No locking device is required to obtain this setting.
NOTE: Do not hold the button in beyond its normal latching position when setting up stations.
The manual tuning control operates by pressing the tuning knob into its latched position and tuning in the conventional manner.

FIG. 3--PARTS LAYOUT--Top View

FIG. 4--PARTS LAYOUT--Bottom View
2. Mechanical Alignment of Cores

(a) Tune the set by means of the manual tuning control to the extreme high frequency end of the dial and against stop. (Coeff. will be almost withdrawn from coil forms.)
(b) Remove the pointer plate (note insulating washers under left hand screw) without disturbing the tuning mechanism.
(c) Using a spare core (Part #7240022) as a gauge, adjust the oscillator core (middle core) so that with the front surfaces of the spare core and the oscillator core exactly flush, the rear surface of the test core is exactly flush with the front end of the oscillator coil winding. This adjustment may be made using adjustment tool (Part #7240160) inserted through the hole at the rear of the coil mounting bracket.

3. Aligning at 1500 kilocycles

(a) Connect the signal lead of the signal generator to the antenna terminal of the receiver through a .000070 nfd. mica condenser.
(b) Tune the set by means of the manual tuning control to the extreme high frequency end of the dial and against the stop.
(c) Set the signal generator to 1500 kilocycles.
(d) Adjust the oscillator shunt trimmer (Illus. F, Fig. 3) for maximum output.

4. Aligning at 600 kilocycles

(a) Leave the signal generator connected the same as before.
(b) Set the signal generator to 600 kilocycles.
(c) Tune the set by means of the manual tuning control until this signal is tuned in with maximum output.
(d) Adjust the trimmers (Illus. F, H, Fig. 3) for maximum output.

5. Aligning at 1400 kilocycles

(a) Set the signal generator to 1400 kilocycles.
(b) Tune the set manually until this signal is tuned in with maximum output.
(c) Adjust the antenna and R.F. cores for maximum output.
(d) Repeat the alignment with as low an output from the signal generator as possible for more accurate alignment.
(e) Apply cement to the core screws to prevent their changing alignment.

6. Adjusting receiver to car antenna

After the receiver is reinstalled in the car, it will be necessary to readjust the antenna trimmer (Illus. H, Fig. 3), on a weak station at or near 600 kilocycles, for maximum output.
If realignment if found necessary, the circuits can be properly adjusted only with the use of a calibrator test oscillator or signal generator and an output meter.

1. **Aligning I-F Stages at 455 Kilocycles**
   - (a) Connect the ground lead of the signal generator to the chassis through a .01 mfd. condenser.
   - (b) Connect the signal lead of the signal generator to the grid terminal of the 12SK7 tube through a .01 mfd. condenser.
   - (c) Connect the output meter across the primary of the output transformer.
   - (d) Set the signal generator to exactly 455 K.C.
   - (e) Tune the receiver to quiet point at 1600 K.C. end of dial, set Volume Control full on, adjust the trimmer on the second I-F transformer (Illus. B, Fig. 3) for maximum output.
   - (f) Connect the signal lead of the signal generator to the grid of the 12SA7 tube.
   - (g) Adjust the trimmers on the first I-F transformer (Illus. C, D, Fig. 3) for maximum output.

2. **Aligning at 1720 Kilocycles**
   - (a) Connect the signal lead of the signal generator to the antenna terminal of the loop through .0001 mfd condenser
   - (b) Set signal generator to exactly 1720 K.C.
   - (c) Tune receiver to 1720 K.C., condenser plates full clockwise (out of mesh).
   - (d) Adjust oscillator trimmer condenser (Illus. A, Fig. 3) for maximum output.

3. **Aligning at 1500 Kilocycles**
   - (a) Leave the signal lead of the signal generator connected as above.
   - (b) Set the signal generator to 1500 K.C.
   - (c) Rotate the tuning control knob until this signal is tuned in with maximum output.
   - (d) Adjust the antenna trimmer (Illus. B, Fig. 3) for maximum output.
1. Aligning I-F Stager at 455 Kilocycles
   (a) Connect the ground lead of the signal generator to the
       chassis through a .01 mfd. capacitor.
   (b) Connect the signal lead of the signal generator to the grid
       terminal of the 12SK7 tube through a .01 mfd. condenser.
   (c) Connect the output meter across the primary of the output
       transformer.
   (d) Set the signal generator to exactly 455 KC.
   (e) Tune receiver to quiet point at 1,500 KC end of dial, set
       volume control full on, adjust the trimmers on the second
       I-F transformer (Illus. B & F Fig. 5) for maximum output.
   (f) Connect the signal lead of the signal generator to the
       grid of the 12SA7 tube.
   (g) Adjust the trimmers on the first I-F transformer (Illus.
       C & D Fig. 5) for maximum output.

2. Aligning at 1600 Kilocycles
   (a) Connect the signal lead of the signal generator to the antenna
       terminal of the loop through 100 mfd. capacitor.
   (b) Set signal generator to exactly 1600 KC.
   (c) Tune receiver to 1600 KC, condenser plates full clockwise
       (out of mesh).
   (d) Adjust oscillator trimmer condenser (Illus. B, Fig. #3) for
       maximum output.

3. Aligning at 1400 Kilocycles
   (a) Leave the signal lead of the signal generator connected as above.
   (b) Set the signal generator to 1400 KC.
   (c) Rotate the tuning control knob until this signal is tuned in with
       maximum output.
   (d) Adjust the antenna trimmer (Illus. A, Fig. #3) for maximum output.

FIG. 3--PARTS LAYOUT--Top View

FIG. 4--PARTS LAYOUT--Bottom View
1. Aligning I-F Stages at 455 Kilocycles
   (a) Connect the ground lead of the signal generator to the chassis through a .01 mfd. capacitor.
   (b) Connect the signal lead of the signal generator to the grid terminal of the 12SK7 tube through a .01 mfd. condenser.
   (c) Connect the output meter across the primary of the output transformer.
   (d) Set the signal generator to exactly 455 KC.
   (e) Tune receiver to quiet point at 1,600 KC end of dial, set volume control full on, adjust the trimmers on the second I-F transformer (Illus. E & F, Fig. 3) for maximum output.
   (f) Connect the signal lead of the signal generator to the grid of the 12SA7 tube.
   (g) Adjust the trimmers on the first I-F transformer (Illus. C & D, Fig. 3) for maximum output.

2. Aligning at 1600 Kilocycles
   (a) Connect the signal lead of the signal generator to the antenna terminal of the loop through 100 mfd. capacitor.
   (b) Set signal generator to exactly 1600 KC.
   (c) Tune receiver to 1600 KC, condenser plates full clockwise (out of mesh).
   (d) Adjust oscillator trimmer condenser (Illus. B, Fig. #5) for maximum output.

3. Aligning at 1400 Kilocycles
   (a) Leave the signal lead of the signal generator connected as above.
   (b) Set the signal generator to 1400 KC.
   (c) Rotate the tuning control knob until this signal is tuned in with maximum output.
   (d) Adjust the antenna trimmer (Illus. A, Fig. #5) for maximum output.

GENERAL: The Delco Model R-1174 is a five-tube, AC-DC superheterodyne receiver with 5" electrodynamic speaker.

ANTENNA: A loop antenna is built inside the back cover of this radio and attached to the chassis. This type of antenna is somewhat directional, therefore, the radio should be tried in different positions to determine the position which will produce the best reception. An antenna terminal is provided for coupling an outside antenna to the receiver.
FIG. 2 -- DELCO MODEL R-1175.

BOTTOM VIEW OF CHASSIS

A.C. LINE VOLTAGE 117 VOLTS
POWER CONSUMPTION 30 WATTS

[A] CANNOT BE READ WITH VOLTOMETER
[B] 12 V.A.C. BETWEEN PINS H & H
[C] 34 V.A.C. BETWEEN PINS H & H
[D] 137 V.A.C. BETWEEN PINS D & D

VOLTAGE MEASURED WITH 1000 OHM PER VOLT VOLTOMETER BETWEEN SOCKET TERMINALS AND B−

35Z56T 12SQ7 12SK7 12SA7 12SK7 REAR OF CHASSIS
Aligning 1-F Stages at 455 Kilocycles

(a) Connect the ground lead of the signal generator to the chassis through a .01 mfd. condenser.

(b) Connect the signal lead of the signal generator to the grid terminal of the 12SK7 tube through a .01 mfd. condenser.

(c) Connect the output meter across the primary of the output transformer.

(d) Set the signal generator to exactly 455 KC.

(e) Tune the receiver to quiet point at 1600 KC and dial, set Volume Control full on, adjust the trimmers on the second I-F transformer (Illus. B, Fig. #3) for maximum output.

(f) Connect the signal lead of the signal generator to the grid of the 12SK7 tubes.

(g) Adjust the trimmer on the first I-F transformer (Illus. C, D, Fig. #5) for maximum output.

Aligning at 1600 Kilocycles

(a) Connect the signal lead of the signal generator to the antenna terminal of the loop through .0001 mfd. condenser.

(b) Set the signal generator to exactly 1600 KC.

(c) Tune receiver to 1600 KC, condenser plates full clockwise (out of mesh)

(d) Adjust oscillator trimmer condenser (Illus. A, Fig. 3) for maximum output.

Aligning at 1600 Kilocycles

(a) Leave the signal lead of the signal generator connected as above.

(b) Set the signal generator to 1600 KC.

(c) Rotate the tuning control knob until this signal is tuned in with maximum output.

(d) Adjust the antenna trimmer (Illus. B, Fig. 3) for maximum output.
ADJUSTMENTS FOR PUSH-BUTTON TUNING:

1. Press down on the first push button and hold it down. The screw in back of the push button is now accessible and should be loosened one or two turns with a screwdriver.

2. While still holding down the push button, tune in the station with the tuning knob. When the station is heard at its best, tighten up the screw in back of the push button. Now let go of the push button, turn the tuning knob in order to detune and again press down the button and let go. To check, repeat action.

3. Proceed to set up the other five push buttons in a similar manner.
**FIG. 2--DELCO MODEL R-1177**

ANTENNA: A loop antenna is built inside the back of the radio. This type of antenna is somewhat directional, therefore, the radio should be tried in different positions to determine the position which will produce the best reception.

Terminals are provided for connecting an outside antenna and ground where required.
TUNING CONTROLS: Tuning is accomplished by means of a manual control or by means of six push buttons for electric tuning. The buttons connect to separate magnetite-core oscillator coils and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool. Allow at least five minutes warm-up period before making adjustments. The procedure is as follows:

1. Turn Range Control knob to "A" position, and manually tune in the station. Turn the Loop Antenna to give minimum pickup of signal, no outside antenna should be used and link-on antenna board should be closed.

2. Turn Range Control knob to "PB" and press push button No. 1 and adjust No. 1 oscillator core to receive this station. Screw the core all the way in to lowest frequency, and then unscrew slowly until station is received.

3. Adjust No. 1 antenna trimmer for maximum output on this station. Owing to the relatively high R-F gain, it may be found that there are several settings of each push-button magnetite core that will bring in any particular station. In such cases it is advisable to unscrew the push button antenna trimmers to minimum capacity before adjusting the oscillator cores. Clockwise adjustment of cores and trimmers tunes the circuits to lower frequencies.

4. Adjust for each station in the same manner.

5. After all six stations are tuned in on the buttons, turn the Loop Antenna to a position giving the best signal pickup and make a final adjustment of all core rods until best reception is obtained for each outdoor antenna should now be reconnected if used.

During alignment the chassis must be removed from the cabinet along with the loop antenna. Keep the signal generator and signal generator lead as far from the loop as possible, also keep the output as low as possible to avoid a.v.c. action.

CALIBRATION SCALE ON INDICATOR-DRIVE-CORD DRUM: The tuning dial is fastened in the cabinet and cannot be used for reference during alignment, therefore a calibration scale is attached to the indicator-drive-cord drum which is mounted on the shaft of the gang condenser. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in Fig. 5.

As the first step in R-F alignment, check the position of the drum. The "90°" mark on the drum scale must be vertical, and directly under the center of the gang-condenser shaft when the plates are fully meshed. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

To determine the corresponding frequency for any setting of the calibration scales, refer to the accompanying drawing which shows the dial with 0-180° calibration scales drawn at top and bottom.

POINTER FOR CALIBRATION SCALE: Improvise a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bend the wire so that it points to the "0" mark on the calibration scale when the plates are fully meshed.

DIAL-INDICATOR ADJUSTMENT: After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the 550 Kc mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

1. Aligning I-F Stage at 455 Kilocycles

(a) Connect the ground lead of the signal generator to the chassis.
(b) Connect the signal lead of the signal generator to the grid terminal of the 6K87 tube through a .01 mfd. condenser.
(c) Connect the output meter across the primary of the output transformer.
(d) Set the signal generator to exactly 455 kc.
(e) Tune receiver to quiet point at 1500 kc end of dial, set volume control full on, range switch to broadcast position, and adjust the trimmers on the second i.f. transformer (Illus. F. G., Fig. 3 & 4) for maximum output.
(f) Connect the signal lead of the signal generator to the grid of the 6SA7 tube.
(g) Adjust the trimmers, on the first i.f. transformer (Illus. F. G., Fig. 3 & 4) for maximum output.

2. Aligning Broadcast Band at 1500 Kilocycles

(a) Connect signal lead of signal generator to antenna "A" terminal on loop, link open, through .00005 mfd. condenser.
(b) Set signal generator to 1500 kc.
(c) Rotate the tuning condenser to 100° on drum calibration scale.
(d) Adjust the broadcast oscillator trimmer (Illus. A., Fig. 4) to maximum output.
(e) Adjust the broadcast antenna trimmer (Illus. B., Fig. 3) to maximum output.

3. Aligning Broadcast Band at 600 Kilocycles

(a) Set signal generator to 600.
(b) Rotate the tuning condenser to 30.5° on drum calibration scale.
(c) Adjust the broadcast oscillator trimmer (Illus. C., Fig. 3) while rocking the condenser-gang back and forth until maximum output is obtained.

4. Repeat steps 2 and 3 above for maximum output.

5. Aligning Shortwave Band at 10 Mc

(a) Connect signal lead of signal generator to antenna "A" terminal on loop, link open, through .00005 mfd. condenser.
(b) Remove 25,000 ohm load resistor.
(c) Set signal generator to 10 Mc.
(d) Rotate tuning condenser to 147° on drum calibration scale.
(e) Adjust the short-wave oscillator trimmer (Illus. E., Fig. 4) for maximum output. Use MINIMUM capacity peak if two peaks can be obtained.
(f) Adjust the short-wave antenna trimmer (Illus. E., Fig. 4) for maximum output.
As the first step in R.F. alignment, check the position of the drum. The "00" mark on the drum scale must be vertical, and directly under the center of the gang-condenser shaft when the plates are fully meshed. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

To determine the corresponding frequency for any setting of the calibration scales, refer to the accompanying drawing which shows the dial with 0-180° calibration scales drawn at top and bottom.

**POINTER FOR CALIBRATION SCALE:** Improvise a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bend the wire so that it points to the "00" mark on the calibration scale when the plates are fully meshed.

**DIAL-INDICATOR ADJUSTMENT:** After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the 540 KC mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

1. **Aligning I-F Stages at 455 Kilocycles**
   (a) Connect the ground lead of the signal generator to the chassis.
   (b) Connect the output meter from plate to plate of the 6F6G output tubes.
   (c) Connect the signal lead of the signal generator to the control grid of the 6SA7 tube through a .01 mfd. condenser.
   (d) Turn the band switch to the broadcast position, the tone control on high and the volume control on full.
   (e) Set the signal generator to exactly 455 kilocycles.
   (f) Adjust the trimmers on the I-F coils (Illus. G, H, J, K, Figs. 6 & 4) for maximum output.

2. **Aligning Short Wave Band at 16 M.C.**
   (a) Connect signal lead of a signal generator to antenna terminal "A" on rear of chassis through a .00005 mfd. condenser. Leave ground lead connected to receiver chassis.
   (b) Change the band switch to the short wave (C) position.
   (c) Set the signal generator to 16 M.C.
   (d) Rotate the tuning condenser to 155° on drum calibration scale.
   (e) Adjust the short wave oscillator trimmer (Illus. B, Fig. 4) for maximum output.
   (f) Adjust the short wave antenna trimmer (Illus. A, Fig. 4) for maximum output. Use minimum capacity peak if two peaks can be obtained.

3. **Aligning Middle Wave Band at 2.44 Megacycles**
   (a) Connect signal lead of a signal generator to antenna section of gang condenser through 300 ohm resistor. Leave ground lead connected to receiver chassis.
   (b) Change the band switch to the middle wave position (B).
   (c) Set the signal generator to 2.44 megacycles.
   (d) Rotate the tuning condenser to 97° on drum calibration scale.
   (e) Adjust the middle wave oscillator trimmer (Illus. D, Fig. 4) for maximum output. Use minimum capacity peak if two peaks can be obtained.

4. **Aligning Broadcast Band at 1,500 Kilocycles**
   (a) Set Band switch to the broadcast position.
   (b) Rotate the tuning condenser plates to 150° on drum calibration scale.
   (c) Adjust the broadcast oscillator trimmer (Illus. E, Fig. 4) for maximum output. Use minimum capacity peak if two peaks can be obtained.

5. **Aligning Broadcast Band at 600 Kilocycles**
   (a) Set signal generator to 600 kilocycles.
   (b) Rotate the tuning condenser plates to 30° on drum calibration scale.
   (c) Adjust the broadcast oscillator trimmer (Illus. F, Fig. 5) (rocking gang) until maximum output is obtained.

Note: Fasten chassis in cabinet. Connect loop, see that link is closed on the antenna board, attach dial indicator to drive cord, with indicator at 540 KC mark and gang at maximum capacity.

6. **Aligning Broadcast Band at 1,300 Kilocycles**
   (a) Connect a radiation loop to signal generator consisting of two turns of wire 16 inches in diameter and locate the generator and loop 4 to 6 ft. from receiver.
   (b) Set signal generator to 1,300 KC.
   (c) Rotate the tuning condenser plates to 160° on drum calibration scale.
   (d) Adjust the broadcast antenna trimmer on loop to maximum output.

7. **Aligning Broadcast Band at 600 Kilocycles**
   (a) Set signal generator to 500 KC.
   (b) Rotate the tuning condenser plates to 30° on drum calibration scale.
   (c) Adjust the broadcast oscillator trimmer (Illus. F, Fig. 5) to maximum output.
TUNING CONTROLS: Tuning is accomplished by means of a manual control or by means of six push buttons for electric tuning. The buttons connect to separate magentic-core oscillator coils and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool. Allow at least five minutes warm-up period before making adjustments. The procedure is as follows:

1. Turn Range Control knob to "A" position, and manually tune in the station. Turn the Loop Antenna to give minimum pickup of desired signal. No outside antenna should be used and line on antenna board should be closed.

2. Turn Range Control knob to "OFF" and press push button No. 1 and adjust No. 1 oscillator core to receive this station. Store the core all the way in to lowest frequency, and then un screw slowly until station is received.

3. Adjust No. 1 antenna trimmer for maximum output on this station. Owing to the relatively high B-F gain, it may be found that there are several settings of each push-button magnetic-core coil that will bring in any particular station. In such cases it is advisable to un screw the push button antenna trimmers to minimum capacity before adjusting the oscillator. Otherwise adjustment of cores and trimmers tunes the circuits to lower frequencies.

4. Adjust for each station in the same manner.

5. After all six stations are tuned-in on the button, turn the Loop Antenna to a position giving the best signal pickup and make a final careful adjustment of all core rods until best reception is obtained for each. Outdoor antenna should now be reconnected if used.

During alignment the chassis must be removed from the cabinet but the loop may be left in cabinet and must be connected to the receiver. Keep the signal generator and signal generator leads as far from the loop as possible, also keep the output as low as possible to avoid A.V.C. action.

CALIBRATION SCALE OR DRIVE-CORD SCALE: The tuning dial is fastened in the cabinet and serves as a reference point for reference during alignment, therefore, a calibration scale is attached to the drive-cord drum which is mounted on the shaft of the gang condenser. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment procedure.

As the first step in B-F alignment check the position of the drive drum. The "0°" mark on the drum scale must be vertical, and directly under the center of the gang-condenser shaft when the plates are fully meshed. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

To determine the corresponding frequency for any setting of the calibration scales, refer to Fig. 6 which shows the dial with 0-100 calibration scales drawn at top and bottom.

TELEVISION CALIBRATION SCALE: Improves a pointer for the calibration scale by fastening a piece of wire to the gang condenser frame, and bend the wire so that it points to the "0°" mark on the calibration scale when the plates are fully meshed.

DIODE-INDICATOR ADJUSTMENT: After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the 90° mark, and the gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

SPREAD-BAND ALIGNMENT: Make final adjustment of "O", "N" and "D" "di- meter" trimmers during actual reception of a station of known frequency near 9.5 megacycles.

1. Aligning I-F Stages at 450 Kilocycles
   (a) Connect the ground lead of the signal generator to the chassis.
   (b) Connect the output meter across the primary of the output transformer.
   (c) Connect the signal lead of the signal generator to the grid of the GSE-i-f tube through a 0.1 mfd. condenser.
   (d) Set the signal generator to exactly 610 kc.
   (e) With the band in the "O" position, turn the volume control on full and the radio tuned to a quiet point at 15 m. c. end of dial, adjust the trimmers on the second I-f coil (Illus. C, P Fig. 3 & 4) for maximum output.
   (f) Connect the signal lead of the signal generator to the grid of the GSE-i-f tube.
   (g) Adjust the trimmers on first I-f coil (Illus. M, N Fig. 3 & 4) for maximum output.

2. Aligning at 15 M. C.
   (a) Connect the signal lead of the signal generator to the antenna terminal of the receiver (link on terminal closed) in series with 0.0005 mfd. condenser.
   (b) Connect the ground lead of the signal generator to the ground terminal of the receiver.
   (c) Set the signal generator to 15 m. c.
   (d) With the band switch in the "O" position, rotate the tuning condenser plates to 145° on drum calibration scale.
   (e) Adjust "O" band oscillator trimmer (Illus. A, Fig. 3) for maximum output. Use MINIMUM capacity peak if two peaks can be obtained.
   (f) Adjust "O" band detector trimmer (Illus. B, Fig. 3) for maximum output. Use MAXIMUM capacity peak if two peaks can be obtained.
   (g) Adjust "O" band antenna trimmer (Illus. C, Fig. 4) for maximum output. Use MAXIMUM capacity peak if two peaks can be obtained.

3. Aligning "D" Meter Band at 30 M. C.
   (a) Connect signal lead of signal generator as above.
   (b) Change the band switch to "D" meter band position.
   (c) Set generator to 30 m. c.
   (d) Rotate the tuning condenser plates to 64° on drum calibration scale.
   (e) Adjust 30-meter oscillator trimmer (Illus. D, Fig. 3) to maximum output. Use MINIMUM capacity peak if two peaks can be obtained.
   (f) Adjust "D" meter detector trimmer (Illus. E, Fig. 4) to maximum output.
   (g) Adjust "D" meter Antenna trimmer (Illus. F, Fig. 4) to maximum output. Rock in trimmers X and Y.

4. Aligning at 1.44 M. C.
   (a) Connect signal lead of signal generator to BATTERIES lead of loop antenna plug in series with 300 ohm resistor.
   (b) Change band switch to "B" position.
   (c) Set signal generator to 1.44 M. C.
   (d) Rotate the tuning condenser plates to 90° on drum calibration scale.
   (e) Adjust "B" band oscillator trimmer (Illus. G, Fig. 4) to maximum output.

5. Aligning at 600 K.
   (a) Connect signal lead of signal generator as above.
   (b) Change the band switch to broadcast "A" position.
   (c) Set signal generator to 600 kc.
   (d) Rotate the tuning condenser plates to 30° on drum calibration scale.
   (e) Adjust the broadcast oscillator trimmer (Illus. H, Fig. 3 & 4) while rocking the condenser gang back and forth until maximum output is obtained.

6. Aligning at 1500 K.
   (a) Connect signal lead of signal generator as above.
   (b) Set signal generator to 1500 Kc.
   (c) Rotate the tuning condenser plates to 180° on drum calibration scale.
   (d) Adjust the broadcast oscillator trimmer (Illus. J, Fig. 4) to maximum output.
   (e) Adjust broadcast detector trimmer (Illus. K, Fig. 4) to maximum output.

7. Repeat Operations 4 and 5

NOTE: Leave chassis in cabinet, close antenna link, adjust indicator to dial scale.

8. Aligning at 1500 Kc.
   (a) Connect a radiation loop to signal generator consisting of two turns of wire 28 inches in diameter and locate the generator and loop 4 to 6 feet from receiver.
   (b) Set signal generator to 1500 Kc.
   (c) Rotate the tuning condenser plates to 180° on drum calibration scale.
   (d) Adjust the broadcast antenna trimmer "L" (on loop) to maximum output.

9. Aligning at 600 Kc.
   (a) Set signal generator to 600 Kc. connection as above.
   (b) Rotate the tuning condenser plates to 30° on drum calibration scale.
   (c) Adjust the broadcast oscillator trimmer (Illus. S, Fig. 3 & 4) to maximum output.

10. Repeat operations 8 and 9
PHONOGRAPH MOTOR: The phonograph motor is of the self starting
synchronous type and operates the turntable through friction drive
between the motor drive spindle and the rubber tired idler on the
rim of the turntable.

The motor should be lubricated once or twice a year by placing a few
drops of S.A.E. 20 oil on the turntable spindle and saturating the
felt oil retaining pads on the motor shaft.

CAUTION: The motor drive spindle and the rubber tire on the idler
must be kept clean and entirely free from oil and grease at all times.

POWER SUPPLY: Although this model employs an AC-DC chassis, it is
not suitable for use on DC, as this would damage the motor.

CIRCUIT ALIGNMENT

If realignment is found necessary, the circuits can be properly
adjusted only with the use of a test oscillator or signal generator
and an output meter.

1. Aligning I-F Stages at 455 Kilocycles

(a) Connect the ground lead of the signal generator to the chassis
through a .01 mfd. condenser, and keep the output as low as
possible.
(b) Connect the signal lead of the signal generator to the grid
terminal of the 12SK7 tube through a .01 mfd. condenser.
(c) Connect the output meter across the primary of the output
transformer.
(d) Set the signal generator to exactly 455 KC.
(e) Tune the receiver to quiet point at 1600 KC end of dial, set
Volume Control full on, adjust the trimmers on the second I-F
transformer (Illus. E, F, Fig. 5) for maximum output.
(f) Connect the signal lead of the signal generator to the grid
of the 12SK7 tube.
(g) Adjust the trimmers on the first I-F transformer (Illus. C, D,
Fig. 3) for maximum output.

2. Aligning at 1560 Kilocycles

(a) Connect the signal lead of the signal generator to the antenna
terminal of the loop through .0001 mfd. condenser.
(b) Set signal generator to exactly 1560 KC.
(c) Tune receiver to 1560 KC., adjust oscillator trimmer condenser
(Illus. A, Fig. 3) for maximum output.

3. Aligning at 1500 Kilocycles

(a) Leave the signal lead of the signal generator connected as above.
(b) Set the signal generator to 1500 KC.
(c) Rotate the tuning control knob until this signal is tuned in
with maximum output.

(d) Adjust the antenna trimmer (Illus. B, Fig. 3) for maximum output.

4. Repeat Operations 2 and 3 for maximum output.
1. Aligning I-F Stages at 455 Kilocycles

(a) Connect the ground lead of the signal generator to the chassis.
(b) Connect the signal lead of the signal generator to the grid terminal of the 6SK7 tube through a .01 mfd. condenser.
(c) Connect the output meter across the primary of the output transformer.
(d) Set the signal generator to exactly 455 KC.
(e) Tune receiver to quiet point at 1500 KC end of dial, set volume control full on, range switch to broadcast position, and adjust the trimmers on the second I-F transformer (Illus. H. J., Fig. 3 & 4) for maximum output.
(f) Connect the signal lead of the signal generator to the grid of the 6SA7 tube.
(g) Adjust the trimmers, on the first I-F transformer (Illus. F. G., Fig. 3 & 4) for maximum output.

2. Aligning Broadcast Band at 1500 Kilocycles

(a) Connect signal lead of signal generator to antenna "A" terminal on the chassis, link open, through .0002 condenser.
(b) Connect the ground lead of the signal generator to the "G2" terminal of the chassis.
(c) Set signal generator to 1500 KC.
(d) With band switch in broadcast position, tune receiver to the 1500 KC position.
(e) Adjust Broadcast Oscillator Trimmer (Illus. A, Fig. 3 & 4) for maximum output.
(f) Adjust Broadcast Antenna Trimmer (Illus. B, Fig. 3) for maximum output.

3. Aligning Broadcast Band at 600 Kilocycles

(a) Set signal generator to 600 KC.
(b) Tune radio to 600 KC position.
(c) Adjust Broadcast Oscillator Trimmer (Illus. C., Fig. 3 & 4) while rocking gang condenser back and forth through the signal until maximum output is obtained.

4. Repeat operations 2 and 3 for maximum output

5. Aligning Shortwave Band at 15 M.C.

(a) Connect the signal lead of the signal generator to the "A" terminal in series with .00005 mfd. condenser.
(b) Set the signal generator to exactly 15 M.C.
(c) With the band switch in the short wave position, tune the receiver to the 15 M.C. position.
(d) Adjust the short wave oscillator trimmer (Illus. D., Fig. 3 & 4) for maximum output. If two peaks are obtained use high frequency (minimum capacity) peak.
(e) Adjust short wave antenna trimmer (Illus. E., Fig. 3 & 4) while rocking gang condenser back and forth through the signal until maximum output is obtained. If two peaks can be obtained use low frequency (maximum capacity) peak.
UNITED MOTORS PAGE 12-61

MODEL R1186X

Record Changer

SUBJECT—SERVICE INSTRUCTIONS—GOULD AUTOMATIC RECORD CHANGER

GENERAL—The R1186X Record Changer is a mechanical device for playing 45- or 78-rpm records in sequence. It has a capacity of seven 10-inch records or eight 7-inch records in sequence. If the mechanism is not for 10-inch records, it will play both 10" and 12" records in mixed sequence, but it is strongly recommended that only one size be used at a loading.

The motor employed is self-starting synchronous available only in 60 cycle 3/4 HP, 115 V, 60 cycle.

SERVICE—It is important that the drive motor, spindle, and rubber tires on main driving disc and idler pulley be kept clean and free from oil, grease, dirt, or any foreign matter. A good mechanical cleaning of the entire mechanism is necessary to maintain that need is just ready to load on the record; then see that pin "V" on lever "14" is in contact with "Wig" on lever "15." The correct point of landing is 4 5/8 inches from the nearest side of the record spindle; loosen the screw and horizontal position of the tone arm at proper dimension, being careful not to disturb the tone arms at 10" and 12" inches. Leave approximately 1/3 inch play between built-in or 12" and pulleys is always in bearing, and tighten the blunt nose screw "G"; run mechanism through cycles several times as a check to be certain tone point centered.

After adjusting for needle landing on a 10 inch record, place 12 inch record on turntable; push index lever to reject position and record at rest position; rotate mechanism through cycle several times as a check to be certain tone point centered.

10" and 12" inch records must be absolutely flat for record operation.

A pickup shifting switch, located under the motor housing, permits when the pickup is moved upward to the pickup rest.

SLIDING SERVICE HINTS—The open plate (key number 3) on each of the record posts serve to separate the lower record from attack and to support the remaining records during the change cycle. It is essential that the spacing between the open plate and the record shelf "27" be accurately maintained. The spacing for the 10 inch record is nominally .006 inch, and for the 12 inch record is .005 inch.

To adjust, rotate the knife to the point of minimum vertical separation from the record shelf and turn screw and set to .004-.005 inch separation. Screw "G" must not be depressed during this adjustment. After setting screw "G," tighten the diametrical screw to .003-.004 inch. When the tip of the needle is depressed flush with the record shelf, the vertical spacing is correct. Then tighten the blade or screw "H," run mechanism through cycle several times to check position, then tighten the blade or screw "H." When record shelf or knives are bent, or not perfectly horizontal, improper operation and jamming of mechanism will occur.

TUNE AND INERT SUPPORT (NOT SHOW)—When the changer is out of cycle, the front panel of the pickup head is not in contact with the surface of the motorboard. The response may be adjusted by turning the tone arm support bracket, which is associated with the tone arm and the necessary control.

Watch the tone arms and all other bearings of various levers and pulleys on undersides of motorboard.

The field coil can be disassembled and reassembled if care is used in removing the field armature block in a manner so that the dovetail joint will not be sprung.

When disassembling the rotor or rotor shaft, be sure the rotor is held in a clamp to prevent the field springing when the bolts which hold the assembly together are loosened.

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Compliments of www.nucow.com
Mechanical tuning is accomplished by five push buttons, which rotate the tuning condenser to pre-selected frequencies.

1. Rotate the button to be set in a counterclockwise direction until it turns freely.
2. Push the button in as far as it will go and hold it in this position while going clockwise direction until it becomes tight.
3. When the station has been carefully tuned in, release the button and turn it in a clockwise direction until it becomes tight.

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Adjascting receiver to car antenna

When the receiver leaves the factory the antenna circuit is closely aligned to match the capacity of the car antenna. However, due to variations in antenna capacity it may be necessary to adjust the antenna trimmer to match the car antenna. This should be done as follows:

(a) Turn set on and tune in a very weak station between 120 and 150 (near 150) on the dial. Adjust the antenna trimmer (F) for maximum volume.

Do not disturb the oscillator or the R.F. trimmers in making this adjustment.

SERVICE HINTS

Dial cord (or pointer) replacement:

1. Unhook the cord eyelets from drive pulley.

2. Move pointer by hand toward the 150 end of the dial until the pointer pivot pin drops through the enlarged end of the pointer guide slot.

3. Lift the pointer and pointer cord out of the tuner from the dial side.

4. File off the lower tip of the pointer guide pin, releasing the retaining washer and the cord pivot arms.

5. With the pointer upside down and pointing away from the operator, put the longer cord pivot arm on the left. Cord side up.

6. Place the short pivot arm (spring assembly) on the right. Cord side up.

7. Replace the retaining washer and solder it to the guide pin.

8. Replace the pointer. Place pivot pin in the enlarged end of the guide slot and then slide the rear end of the pointer into the rear support bearing.

9. Place the long cord behind the pointer and over pulleys (Fig. 5 & 6). Hook the cord eyelet over the drive pulley hook nearest the back of the tuner and push the cord into position around the pulley rim.

10. Put the spring loaded cord over pulley and between the longer string and the tuner frame before hooking the cord eyelet to the drive pulley.
ALIGNMENT FOR MODELS 79RSL, 97RSL, 99RSL, 99SRLS

LOCATION OF PARTS ON TOP OF CHASSIS

MODEL 630

Follow the procedure outlined below, in order to adjust the push-buttons properly:

1. Use the means of the Station Selector Knob tune in WITH THE RIGHT HAND AS ACCURATELY AS POSSIBLE the station having the lowest frequency—that is, your selected station which is tuned in nearest the right-hand side of the dial.

2. After the station has been tuned in accurately with the right hand, continue to hold it in its exact position firmly, and with the left hand loosen the Push-Button to be set up for that station by unscrewing the Push-Button about one turn to the left (counterclockwise).

3. Continue to hold the Station Selector Knob in its exact position.

4. After the Push-Button has been depressed all the way, tighten it gently toward the right (clockwise). Release Push-Button slowly and in normal position grip button and tighten firmly.

The Push-Button tuning system is now correctly set up for your first selected station of lowest frequency and the Call Letter Tab for this station should be at the extreme right of the Call Letter Holder. In the order of their frequency—that is, the second station set up will be second lowest in frequency and the third station set up will be third lowest in frequency.

Follow through with the same procedure, setting up the other 3 stations carefully check each Push-Button for the accuracy of the setting. If, when tuning in any station with its Automatic Push-Button it does not have equal volume or clarity as that obtained with manual tuning, this may indicate the automatic adjustment for that station was not made accurately. Should there be any inaccuracy in any one of the Push-Button adjustments, correction can be made by repeating the above procedure for that button only. Do not reset those Push-Buttons that are accurately adjusted.

No further adjustments are necessary to operate your radio automatically or manually. To receive any one of your favorite selected stations, tune to automatic operation, merely push in ALL THE WAY the Button set up for that station.

Intermediate Alignment

Attach the output motor to the receiver. Set the signal generator to 456 KC and attach the output of the generator to the control grid of the 6KG I.F. amplifier tube. Adjust the trimmers on the 2nd I.F. transformer for max. gain. Keep the volume control of the receiver at max. and the attenuator of the signal generator as low as possible.

Transfer the output connection of the signal generator from the 6KG I.F. tube to the control grid of the 6L7 tube and adjust the trimmers on the 1st I.F. transformer. Now go back over the adjustments of both I.F. transformers.

Tuning Circuit Alignment

Long Wave—Set signal generator at 160 KC. Attach output of generator to ant. of receiver using a 250 ohm dummy. Throw band switch to the extreme left, counter clockwise, to band 3. Make sure dial pointer is set properly and then tune dial to approx. 160 KC. Adjust long wave paddler for max. gain while “rocking” the gang back and forth with each adjustment. The long wave paddler is near-left at the front edge of chassis.

Set signal generator to 350 KC, tune dial to 350 KC and adjust osc. trimmer. Adjust ant. and R.F. stage trimmers for max. output.

Broadcast Band.—Set signal generator to 600 KC, adjust band switch to broadcast position. Tune dial to 600 KC and adjust the other paddler condenser for max. gain while “rocking” the gang back and forth with each adjustment.

Set signal generator to 1500 KC and tune dial to 1500 KC. Adjust osc. trimmer to bring in signal and adjust ant. and R.F. trimmers for max. gain.

Short Wave Band.—Change dummy ant. to 400 ohm resistor. Set signal generator to 15 MC. Turn band switch to short wave band and tune dial to 15 MC. Adjust osc. trimmer to bring in signal and adjust ant. and R.F. trimmers for max. gain.

Make the usual tests for image. Take care not to peak set on image when adjusting the short wave band.

The positions of the various trimmers are as follows:

On the trimmer strip nearest the front edge of the chassis are the three antenna trimmers. The one nearest the band switch is band 2 trimmer, the next trimmer is for band 1 and the trimmer out towards the side of chassis on this same strip is for band 3.

The center trimmer strip of 3 trimmers is for osc. adjustments.

The trimmer strip of 3 trimmers just back of the band switch is for R.F. interstage adjustments.

The trimmers for each band are in the same respective positions on all three trimmer strips.
This receiver is made to cover from 1750 KC. to 535 KC., which covers the standard broadcast band and the first police band.

The receiver will operate on either alternating or direct current, from a power supply of 105 to 125 volts. Do not connect it to any other source.
BOTH ARE
EARLY TYPES
OF MODEL 660

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Follow the procedure outlined below in order to adjust the push buttons properly:

1. By means of the tuning knob, tune in an accurately as possible your desired station.
2. Lift up the button for that station and with a small screw-driver loosen the set screw about two turns (counter-clockwise).
3. Push the set screw in as far as it can go with the screw-driver, and while holding the screw in this position, make sure that your desired station is tuned in properly. It may be necessary to re-tune your station.
4. While holding the set screw in as far as possible, and after your station is adjusted properly, tighten set screw firmly.

The push-button tuning system is now correctly set up for your first selected station. Follow through with this same procedure in setting up the other three stations.
All alignments must be made with the volume control turned full on and with the signal input from the generator reduced to as low a value as possible while still giving an output sufficient to be easily read on the output meter.

Connect the output meter, through a .5 M.F. condenser and a resistance of such a value as to make the total meter resistance approximately 7000 ohms, to the two small pins of the speaker plug. The output meter remains connected during the entire alignment procedure.

Connect the signal generator to the grid cap of the 6A7 tube through a .1 M.F. condenser. Connect the ground of the generator to the ground lead of the receiver. With the wave switch on broadcast position and the dial set to about 1000 K.C., feed in a 456 K.C. signal. Adjust the trimmers on top of the first and second I.F. transformers until the maximum output is obtained. This aligns the I.F.

Leaving the wave switch on broadcast position turn the dial to the extreme high frequency end. Feed a 1730 K.C. signal to the receiver antenna lead through a .00025 M.F. mica condenser. Adjust the 1730 K.C. broadcast oscillator trimmer until maximum output is shown. Set the generator to 1400 K.C. and tune in this signal on the receiver. Then adjust the 1400 K.C. broadcast antenna trimmer to maximum output. Set the generator to 600 K.C. and adjust the 500 K.C. broadcast oscillator pad to maximum output while tuning the receiver back and forth across the signal from the generator. This completes the alignment of the broadcast band.

The short wave band is aligned while feeding a 6.0 M.C. signal to the receiver antenna lead through a .00025 M.F. mica condenser. Turn the wave switch to short wave position and tune in the 6.0 M.C. signal. Adjust the 6.0 M.C. short wave trimmer to maximum output.

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INSTAMATIC TUNING

The purpose of Instamatic tuning is to give the user instant, automatic tuning of any one of a selection of favorite broadcast stations. The control buttons are conveniently located just below the tuning dial. Pushing in any button will release any other button which happens to be already in. After the Instamatic tuning feature has been properly adjusted, this will instantly and automatically tune in the station selected by this button.

Before attempting to adjust or use Instamatic tuning, the “Installation” and “Operation” instructions must be carefully followed. When the receiver is operating satisfactorily using the tuning dial with the “Dial Tuning” button pressed in, the Instamatic feature may be easily adjusted by carefully following these instructions.

Located on the back of the chassis is a row of five pairs of small bakelite adjustment knobs. Each pair of these knobs controls the tuning of the station for the Instamatic button which is in the same relative position.

With the receiver operating with the “Dial Tuning” button in and the wave switch on broadcast position, turn the tuning knob to the left until the 540 KC end of the band has been reached. Then turn the tuning knob to the right until a station, for which it it desired to have Instamatic tuning, is heard. Press in the Button No. 1. This is the button at the left hand end of the row. Reach around to the back of the receiver and turn upper knob of the Pair No. 1 until the same program is heard. Unless the wrong knob is being turned, several different stations will be heard during this procedure. If necessary to check that the same program is now tuned in, the “Dial Tuning” button may again be pressed. In this way it can be determined that the same station is tuned in with the Instamatic button as when the “Dial Tuning” button is in. If it is not the same station the adjustment knob should be turned again and these operations repeated until the same program is heard when neither of these two buttons is pressed.

The bottom adjustment knob of the first pair is now turned until the station is heard the best. Both top and bottom knobs may then be adjusted to exact tuning by watching the magic eye and adjusting until the two edges of the green section are as close together as it is possible to get them.

The first Instamatic button is now properly adjusted for the station which was tuned in on the dial and the station’s call letters may be pushed out of the station list, moistened on the back, and pressed into the hollow end of the button.

With the “Dial Tuning” button pressed in, the tuning knob is again turned to the right until the next station for which Instamatic tuning is wanted, is tuned in. The adjustment process for this station is the same as before, except that Button No. 2 and Pair No. 2 adjustment knobs are used. Proceeding in this way all five of the buttons may be properly adjusted for the stations desired.

It must be remembered that the “Dial Tuning” button must be pressed in whenever it is desired to tune in stations with the tuning knob, regardless of which wave band is in use. It must also be remembered that the wave switch must be in the broadcast position when Instamatic tuning is being used.

The approximate frequency coverage of each of the “Instamatic” control buttons is as follows:

1. Stations between 540 and 1000 KC
2. Stations between 540 and 1000 KC
3. Stations between 750 and 1200 KC
4. Stations between 750 and 1200 KC
5. Stations between 1000 and 1500 KC

If desired the tuning dial may be left set to a station which is not set up on one of the buttons. The “Dial Tuning” button will then tune in this station when it is pressed. This will give an extra Instamatic tuned station, making a total of six different stations which can be instantly tuned in by simply pressing a button.
MODEL 6A45

WELLS-GARDNER & CO.

SPECIFICATIONS

Power Consumption 37 Watts (At 117 volts 60 cycles)
Power Output 1.7 Watts Undistorted
Selectivity 40 KC Broad at 1000 times Signal
Intermediate Frequency 45.6 KC
Speaker 8" Electro-Dynamic

Tuning Frequency Range
B Range 538 to 1800 KC
D Range 5750 to 18000 KC

Sensitivity — External Antenna (For 0.5 Watt output)
B Range 7 Microvolts Average
D Range 15 Microvolts Average

ALIGNMENT PROCEDURE

The following equipment is required for aligning:
All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter — Non-Metallic Screwdriver.
Dummy Antennas — 1 m. 100 mm., and 400 ohms.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>BAND</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREQUENCY</td>
<td>CONNECTION</td>
<td>Dummy</td>
<td>SWITCH</td>
</tr>
<tr>
<td>SETTINGS</td>
<td>AT RADIO</td>
<td>ANTENNA</td>
<td>SETTING</td>
</tr>
<tr>
<td>LF 456 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf</td>
<td>B Range</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RANGE A 1600 KC</td>
<td>External Antenna</td>
<td>100 mmf.</td>
<td>B Range</td>
</tr>
<tr>
<td></td>
<td>Clip or Lead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1400 KC</td>
<td>External Antenna</td>
<td>100 mmf.</td>
<td>B Range</td>
</tr>
<tr>
<td></td>
<td>Clip or Lead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>600 KC</td>
<td>External Antenna</td>
<td>100 mmf.</td>
<td>B Range</td>
</tr>
<tr>
<td></td>
<td>Clip or Lead</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>See Note B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RANGE D 18300 KC</td>
<td>External Antenna</td>
<td>400 Ohm</td>
<td>D Range</td>
</tr>
<tr>
<td></td>
<td>Clip or Lead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17000 KC</td>
<td>External Antenna</td>
<td>400 Ohm</td>
<td>D Range</td>
</tr>
<tr>
<td></td>
<td>Clip or Lead</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>See Note D</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

On later models, two resistors were added to the phono circuit. One, a 1.5 Megohm resistor, was connected in series with No. 2 terminal on the band switch (Section No. 1) and the ungrounded terminal of the phono socket. The other resistor, .5 Megohm, was connected between the ungrounded terminal of the phono socket and ground.
SPECIFICATIONS

Input Voltages and Currents—Battery Operation

“A” Batteries: 9 Volts—50 Ma.
“B” Batteries: 90 Volts—11.5 Ma.

Power Consumption (At 117 Volts AC Supply) 28 Watts

Power Output

Battery Operation: 150 Mw Undistorted

AC Operation: 200 Mw Maximum

Selectivity: 50 KC Broad at 1000 Times Signal

Intermediate Frequency: 456 KC

Speaker: 6” P.M. Dynamic

Tuning Frequency Range: 540 to 1600 KC

Sensitivity (For .05 Watt Output)

External Antenna: 10 Microvolts Average

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.

Allow Chassis and Signal Generator to “Heat Up” for several minutes.

SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>FREQUENCY SETTING</th>
<th>ANTENNA CONNECTION</th>
<th>GROUND CONNECTION</th>
<th>DUMMY ANTENNA</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>456 KC</td>
<td>External Antenna Clip on Loop</td>
<td>External Ground Clip on Loop</td>
<td>.1 mf. Turn Rotor to full open</td>
<td>1st I.F. (C8) &amp; (C10)</td>
<td>3rd I.F. (C13) &amp; (C14)</td>
</tr>
<tr>
<td>1600 KC</td>
<td>External Antenna Clip</td>
<td>External Ground Clip</td>
<td>.1 mf. Turn Rotor to full open</td>
<td>Oscillator (C3)</td>
<td></td>
</tr>
<tr>
<td>1400 KC</td>
<td>External Antenna Clip See Note A</td>
<td>External Ground Clip</td>
<td>200 mmf. Turn Rotor to max. output</td>
<td>Antenna (C2)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE A—Re-assemble chassis in cabinet. Close back on cabinet.

CALIBRATION—To obtain dial scale calibration, tune in an 800 KC signal. The pointer should be at the 800 KC mark on the dial. If it is not, loosen pointer set screw and set the pointer at the 800 KC mark. Retighten set screw.

CAUTION

The metal chassis is connected to one side of the line through .20 mfd. Both AC and DC power lines are generally grounded on one side. If the side of the line not connected to the metal chassis through this capacity is grounded and the metal chassis comes in contact with an external ground, this capacity will be connected across the line and there will be an increase in hum.

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ALIGNMENT PROCEDURE

Remove Grille, Speaker, Trimmer Caps and Rear Cover From Chassis Case—(See Figs. 3 and 5).
Volume Control—Maximum All Adjustments.
Local-Distance Switch—“Distance” Position.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>CONNECTION AT RADIO</th>
<th>DUMMY ANTENNA</th>
<th>IRON CORE SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM (See Figs. 3 and 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F.</td>
<td>Control Grid</td>
<td>0.05 mf.</td>
<td></td>
<td>1st L.F. (C11) &amp; (C12)</td>
</tr>
<tr>
<td>455 KC</td>
<td></td>
<td></td>
<td></td>
<td>2nd L.F. (C15) &amp; (C16)</td>
</tr>
</tbody>
</table>

OSCILLATOR

1550 KC Antenna Cable See Note A See Note A Extrema Position out of Coil Oscillator (C6)

1000 KC Adjustment

1000 KC Antenna Cable See Note A Tune to Max. Output with Tuning Knob Int. (C6) Ant. (C4)

Reassemble Radio—Install in Car—Connect Car Antenna to Radio.

Car Antenna Readjustment—Tune in weak signal near 1000 KC—Readjust Antenna Trimmer C4 for maximum output.

NOTE A—Insert the antenna cable plug in the antenna socket on the chassis. The total capacity of the antenna cable and dummy antenna should be 65 mmf. If the cable, for example, has a capacity of 30 mmf, use a 35 mmf. condenser for a dummy antenna. Connect the other end of the antenna cable through the dummy antenna capacity to the output of the signal generator.

CALIBRATION—To calibrate the radio, tune in a station of known frequency. At the back of the control unit is the calibration screw. Remove the dial lamp assembly. Hold the tuning knob. Insert a fine bleded screwdriver and turn the screw until the pointer on the dial scale is at the frequency of the station being received.

A 36 inch shielded antenna cable (30 mmf. capacity) with bayonet connector plug is furnished. Whenever possible, this cable should be used rather than the one which may be supplied with the antenna.

The plug on the antenna cable is inserted in the socket at the side of the chassis case as shown in Fig. 3. The wire at the other end of the cable is connected to the antenna.

LOW CAPACITY ANTENNA

This radio is designed for a low capacity car antenna. The total capacity of antenna and shielded cable should be 35 to 60 mmf.

HIGH CAPACITY ANTENNA

If this radio is to be installed with a high capacity car antenna (70 to 500 mmf. total capacity of antenna and shielded cable), a 24 inch shielded adapter extension cable is necessary. The adapter is inserted in the socket at the side of the chassis case. Then the antenna cable plug is inserted in the socket at the other end of the adapter.

ANTENNA CABLE

CAUTION—Be careful not to bend the antenna cable too sharply or to clamp it tightly as the small wire inside the cable may be broken.

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Television Sound or Phonograph Connections

On the back panel of the chassis lies a switch and a socket for a single shielded pin tip wire which connections are made. The connector on the cable from a television receiver or a phonograph pickup can be inserted in the socket. (The connector must be single shielded pin tip type, Part No. 48AB4.)

If television programs are being available in your community, the audio amplifier and speaker of this radio may be used to reproduce television sound in conjunction with any "Television Picture Receiver and Sound Converter." Phonograph records may also be played through the radio.

When phonograph or television sound reproduction is desired, the knob should be moved to the "Television Sound or Phonograph" position. For radio reception, the knob should be in the "Radio" position.

Procedure for Setting the Station Buttons

NOTE: TUNE-L/R-46-0

Setting a Station Button

Turn the manual tuning knob so that the dial pointer moves toward 1200 KC until the station is reached. At the right side of the receiver, (from the front) will be seen a cup which covers a hole in the mechanism for alignment. Pull off this cap. At the end of the tube in back of the hole in the enclosure is the locking screw. Using a small handled screwdriver, unlock the mechanism by turning this screw in a clockwise direction several turns.

To SET STATIONS ACCURATELY, DO NOT JAR THE RADIO OR BUTTONS WHILE THE MECHANISM IS UNLOCKED.

Select the first station from the list you have prepared, and carefully tune in that station by means of the manual tuning knob. With one hand, hold the manual tuning knob to prevent it from turning and with the other hand, push one of the station buttons shown in the illustration all the way in. It is better to start with station No. 1. Hold this button all the way in. With the other hand, see whether or not this station is still accurately tuned. If not, turn the tuning knob a slight amount back and forth. Be sure to hold the button all the way in. Release the button slowly after the station is tuned in.

CAUTION — Do not touch this button again until the mechanism in unlocked at the setting may be altered. Carefully tune in the second station on your list. Then hold the tuning knob and push the second button slowly and firmly all the way in. Check for accurate tuning.

Proceed in the same manner to set additional stations on your list, moving the selector switch to set the remaining station buttons. After all the stations are set, it will be necessary to lock the mechanism so that the settings will not be changed. Turn the manual tuning knob so that the dial pointer moves toward 1200 KC until the station is reached. Then, with a small handled screwdriver, turn the locking screw in a clockwise direction until it is tight. The locking screw firmly but excessively to avoid stripping the screws. Replace the cap over the hole.

Remove the correct station call letter from the sheets supplied by bending the short back and forth at the score mark until the tab can be broken off. Press the tab all the way in to the bottom of the space provided in the button. Cover the call letter tab with a well-adhered paper, pressing this in until it snaps in place. If at any time you wish to change the setting of a button from one station to another, repeat the above procedure. Unsetting the settings of one button will not affect the setting of any of the other buttons.

Drive Cord Replacement

The drive cord is a round cord (approximately 60 inches in length) to tension motor. Turn the condenser to full tension position. Thread free end of drive cord up through hole in rim of capacitor drive pulley and pull spring should against pulley rim. Wind one turn counter-clockwise (from condenser drive pulley side of chassis) around drive pulley. This turn should progress to the left (front of chassis). Pass cord in back of guide arm—see illustration. Then wind drive cord 355 turns counter-clockwise (from front of chassis) around tuning control shaft. Turn should progress away from chassis.

Pass cord around pulleys C, B, and A as shown in illustration. Then wind cord 35 turns counter-clockwise (from condenser drive pulley side of chassis) around drive pulley. The turn should be to right side (from front of chassis) of pulley.

Thread cord through hole in pulley groove and knot securely to spring, stretch tuching and secure free and to hook on drive pulley. Drive Pointer Attachment—Tune in a signal of known frequency. Set the pointer at this frequency on the dial scale. Secure pointer to cord—See illustration.
ALIGNMENT PROCEDURE

Volume Control-Maximum All Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for several minutes.

The following equipment is required for aligning:
An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter-Non-Metallic Screwdriver.
 Dummy Antennas-1 m, 100 m, and 400 ohms.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY</th>
<th>CONNECTION</th>
<th>DUMMY ANTENNA</th>
<th>SWITCH SETTINGS</th>
<th>CONDENSER SETTINGS</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. 456 KC</td>
<td>GRID 5ZT</td>
<td>1 m.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>1st I.F. (C8) &amp; (C9)</td>
<td>2nd I.F. (C10) &amp; (C11)</td>
</tr>
<tr>
<td>RANGE B 1600 KC</td>
<td>Antenna Lead</td>
<td>100 m.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B (C4)</td>
<td></td>
</tr>
<tr>
<td>RANGE C 1400 KC</td>
<td>Antenna Lead</td>
<td>100 m.</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
<td>Set I.F. to 1400 KC</td>
<td></td>
</tr>
<tr>
<td>RANGE D 600 KC</td>
<td>Antenna Lead</td>
<td>100 m.</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
<td>Set I.F. to 600 KC</td>
<td></td>
</tr>
<tr>
<td>RANGE E 1800 KC</td>
<td>Antenna Lead</td>
<td>400 Ohms</td>
<td>D Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range D (C4)</td>
<td></td>
</tr>
<tr>
<td>LOOF RANGE B 4800 KC</td>
<td>None.</td>
<td>480 Ohms.</td>
<td>D Range</td>
<td>Turn Rotor to Max. Output</td>
<td>Ant. Range D (C1)</td>
<td></td>
</tr>
<tr>
<td>4800 Ohm</td>
<td>NONE</td>
<td>480 Ohms.</td>
<td>D Range</td>
<td>Turn Rotor to Full Open</td>
<td>Ant. Range B (C5)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: If the printer is not at 1400 KC on the dial, remove pointer from drive cord and turn to 1400 KC signal. Set pointer at the 1400 KC mark on the dial scale. Attach pointer to drive cord.

After each range is completed, repeat the procedure as a first check.

Television-Frequency Modulation - Home Recorder

When Television sound reproduction is desired, the Phonograph-Radio knob should be turned to the Phonograph (P) position. For radio reception, the knob should be in one of the two Radio positions.

Frequency Modulation Connections

If Frequency Modulated programs are used in your community, the audio amplifier and speaker of this radio may be used to reproduce television sound in conjunction with any "Television Picture Receiving and Sound Converter."

On the top of the chassis base is a socket which is connected to the phone cable shield pin tip. Upon removal of this pin tip, the connector on the cable from a television receiver can be inserted in the socket. (The cable connector must be a single shielded pin tip type, Part No. 6A224.)

Operating the Automatic Phonograph

The operation of the phonograph is simple but the phonograph instruction folder packed with this instruction book should be carefully read and understood before an attempt is made to put the record changer in operation.

The volume and tone controls are used in the same manner for phonograph reproduction as they are for radio reception—See article "Operating the Radio."

To Turn the Phonograph On

Turn the on-off switch knob to the right. (See illustration—Page 2.) A click will be heard and the dial will light. Wait 30 seconds for the tubes to heat.

Turn the Phonograph-Radio knob to the phonograph (P) position—See illustration.

For detailed instructions regarding the operation of the automatic record changer, see the phonograph instruction folder.

To Turn the Phonograph Off

The instructions for turning off the automatic record change are given in the phonograph instruction folder. Be sure to turn the radio on-off switch knob to the left. A click will be heard and the dial lamps will be off.

ATTENUATE THE SIGNAL FROM THE SIGNAL GENERATOR TO PREVENT THE LEVEL-OFF ACTION OF THE AFC.

ATTENUATE THE SIGNAL FROM THE SIGNAL GENERATOR TO PREVENT THE LEVEL-OFF ACTION OF THE AFC.
Battery Cable and Fuse
The battery connections are made at the ammeter. The end of the battery cable connected with the connecting lug is secured to one of the posts at the back of the ammeter in the instrument panel. The other end of the cable with the fuse receptacle connects to the battery cable from the radio. If the fuse has been inserted. A spare fuse is provided. (Ref. Bulb No. 81).

Suppression of Motor Noise
The following procedure has been found to be effective in reducing motor noise to a satisfactory level in most cars. Follow the steps in the order shown until the noise is reduced to a satisfactory level which may be required in exceptional cases of motor noises, is not covered here and will be found by referring to current literature on this subject.

GENERATOR CONDENSER—A generator condenser is required in all cases. Connect the condenser lead to the battery terminal of the generator. The case and mounting strap connect the other side of the condenser to ground. This unit must, therefore, be well grounded at its mounting.

CAUTION—In cars with automatic regulators, it is important not to connect the condenser across the field terminal. Most manufacturers in the present time have a recommendation for the proper post at which to connect the condenser.

DISTRIBUTOR SUPPRESSOR—A distributor suppressor will be required in most cases. Remove the high tension lead to the distributor. Insert a distributor suppressor and connect the wire to the other end of the suppressor (See Fig. 7). If this is not practical, cut the high tension lead close to the distributor and connect a wood screw end type distributor suppressor in this line.

Dial Lamp Cable
Insert the dial lamp assembly into the hole at the top of the lamp housing as indicated in Fig. 3. The dial lamp used in this unit is a 6-8 volt incandescent type lamp (Bulb No. 81). Then solder the end of the shadking to the fire wall or ground and see if interference is reduced. If the noise is not reduced by this procedure, install a suppressor in series with the ground, then connect the suppressor to ground and see if interference is reduced.

BENDING STEERING COLUMN, RHD—It is possible for the steering column, foot pedals, and brake levers to carry interference to the back of the fire wall at point which it may affect the radio. See if each of these items is well grounded to the frame of the car. By means of a file or a headed shadking jumper, contact can be established between any of these items and the fire wall in order to determine whether or not such a ground will reduce the noise. To bond the cables to the fire wall, clean the point of contact, wrap the length of the cable around the cable, and solder the connection.

The electric gauges used for oil, water, and oil pressure are often a source of interference and bypass condensers should be tried.

HIGH AND LOW TENSION LEADS—In some cases, the highest low tension leads between the coil and distributor are run close together. In some cars, they are in the same conduit. If this is the case, remove the low tension lead from this conduit. In any event, keep the low tension leads as far apart as possible. If separating the leads is not sufficient, shadk and ground the shield of the low tension lead.

GROUNDING MOTOR AND OTHER PARTS of the car, if any, is a good idea. When it is necessary to work on a very heavy braded lead for this purpose, similar to a storage battery ground lead. In this manner, it may be necessary to check the grounding of the metal fire wall, instrument panel, transmission, radiator, hood, and muffler to the frame of the automobile. To obtain a good electrical connection, scrape off the point, if necessary, as the point where ground contact is made.

PEERING MOTOR ARM—In extreme cases of motor noise, it is advisable to peer the distributor rotor arm, that is, increase the length of the arm by using a small machined arm.

Procedure for Setting the Stations

There are 8 positions of the Automatic Station Mechanism. These are Automatic Station positions and call buttons. A sixth station may be tuned in with the Manual Tuning position.

When the radio is in the Manual Tuning position, the dial is illuminated, and this is the station setting position, one of the numbers on the Automatic Station Mechanism is illuminated. The first position, twice will move to the second position, etc.

When the radio is in the Manual Tuning position, the dial is illuminated, and this is the station setting position, one of the numbers on the Automatic Station Mechanism is illuminated. Select the first station from this list by turning the Automatic Station knob. Then tune the stations in frequency order. If you have difficulty in knowing when this station is tuned in, push the Automatic Station knob. This will indicate the station setting position.

In the Chicago area, for example, the following stations might be listed:

- WMAQ 700 KCM 1 Push
- WGN 720 KCM 2 Push
- WBBM 770 KCM 3 Push
- WLS 720 KCM 4 Push
- WBF 790 KCM 5 Push
- MANUAL TUNING 6

There is a cord supplied with the unit on which is a push button to cause the dial to be illuminated. Using the screwdriver as a guide, the dial will show the approximate frequency (kilocycle number) at which the setting screw is set.

Be sure not to tune in any other station broadcasting the same program. Turn the screw slowly, and forth until that station is carefully tuned to the clearest and loudest point. If the station you are tuning is not tuned, depress this knob one time or more until number is dark.

Select the first station from the list by moving the Automatic Station Knob. Then tune to the next station in frequency order. When you have difficulty in knowing when this station is tuned in, push the Automatic Station knob. This will indicate the station setting position.

In the Chicago area, for example, the following stations might be listed:

- WMAQ 700 KCM 1 Push
- WGN 720 KCM 2 Push
- WBBM 770 KCM 3 Push
- WLS 720 KCM 4 Push
- WBF 790 KCM 5 Push
- MANUAL TUNING 6

First get the mechanism in the Manual Tuning position. If the dial is illuminated, it is already in this position. If one of the stations on the Automatic Station Mechanism is illuminated, depress this knob one time or more until number is dark.

In the Chicago area, for example, the following stations might be listed:

- WMAQ 700 KCM 1 Push
- WGN 720 KCM 2 Push
- WBBM 770 KCM 3 Push
- WLS 720 KCM 4 Push
- WBF 790 KCM 5 Push
- MANUAL TUNING 6

First get the mechanism in the Manual Tuning position. If the dial is illuminated, it is already in this position. If one of the stations on the Automatic Station Mechanism is illuminated, depress this knob one time or more until number is dark.

Select the first station from the list by moving the Automatic Station Knob. Then tune to the next station in frequency order. When you have difficulty in knowing when this station is tuned in, push the Automatic Station knob. This will indicate the station setting position.

In the Chicago area, for example, the following stations might be listed:

- WMAQ 700 KCM 1 Push
- WGN 720 KCM 2 Push
- WBBM 770 KCM 3 Push
- WLS 720 KCM 4 Push
- WBF 790 KCM 5 Push
- MANUAL TUNING 6

First get the mechanism in the Manual Tuning position. If the dial is illuminated, it is already in this position. If one of the stations on the Automatic Station Mechanism is illuminated, depress this knob one time or more until number is dark.

Select the first station from the list by moving the Automatic Station Knob. Then tune to the next station in frequency order. When you have difficulty in knowing when this station is tuned in, push the Automatic Station knob. This will indicate the station setting position.

In the Chicago area, for example, the following stations might be listed:

- WMAQ 700 KCM 1 Push
- WGN 720 KCM 2 Push
- WBBM 770 KCM 3 Push
- WLS 720 KCM 4 Push
- WBF 790 KCM 5 Push
- MANUAL TUNING 6

First get the mechanism in the Manual Tuning position. If the dial is illuminated, it is already in this position. If one of the stations on the Automatic Station Mechanism is illuminated, depress this knob one time or more until number is dark.
SPECIFICATIONS

- Power Consumption: 0.1 Amperes at 6.3 Volts
- Selectivity: 38 KC Broad at 1000 Times Signal
- Power Output: 6 Watts Unloaded
- Tuning Frequency Range: 540 to 1560 KC
- Sensitivity: 1 Microwatt at 0.5 Watt Output
- Intermediate Frequency: 456 KC
- Speaker: 8" Electro-Dynamic

Fig. 5—Location of Tubes and Vibrator
Antenna

Practically all car antennas at the present time are supplied with a shielded lead-in cable. The total capacity of the antenna and shield lead-in should be 20 to 40 mfd. It is recommended that the antenna and lead-in be a type approved by the FCC.

The plug on the antenna cable is inserted in the socket on the side of the chassis case. Fig. 3 shows the wire at the other end of the cable is connected to the antenna of the car.

LOW CAPACITY ANTENNA

This type is described for a low capacity car antenna. The total capacity of antenna and shield cable should be 35 to 60 mfd.

Types of Low Capacity Antennas

-Fishbone type—straps of door hinge and coul.; over-the-roof type which are short and mounted quite a distance from the metal roof of the car.

Mount the antenna on the same side as the radio.

HIGH CAPACITY ANTENNA

If this radio is to be installed with a high capacity car antenna (75 to 300 mfd total capacity of antenna and shielded cable), one of two procedures must be followed. If the short length antenna cable is being used, a 20 inch shielded adapter extension cable may be obtained. If a long antenna cable such as a 1 inch antenna cable is being used with the high capacity antenna, a small adapter only need be purchased. Either of these two procedures will adopt the high capacity antenna circuit to the low capacity antenna input circuit. In both cases the correct adapter should be installed in the socket on the side of the chassis case. Then the antenna plug terminal should be installed in the adapter.

Types of High Capacity Antennas

-Over-the-roof type straps are long and are mounted close to the metal of the car, or in a metal surface bonded to the car. These are usually good antennas but are not recommended for this radio.

Any type:

Keep the antenna cable as far away from car wiring as possible and ground the pigtail of the antenna cable shield at the antenna end, otherwise signals may be picked up. The length of the antenna from the point where it is grounded may be any length as possible, preferably not over one inch.

For the "bipole" and over-the-roof type antennas, the lead must be shielded the entire distance from the radio to the point where the leads are going through the car body to the outside.

ALIGNMENT PROCEDURE

Ranova Groove, Speaker, Trimmer Caps and Rear Cover From Chassis Case—See Figs. 3 and 5.

Volume Control—Maximum All Adjustments.

Local- Distance Switch—Distance Position.

Connect Radio Chassis to Ground Post of Signal Generator with the on-Lead.

NOTE: To avoid antenna plug in the antenna case the lead should be pulled out of the case. Do not close the case until the plug is in place. Set the radio on the on-Lead and tune until the pointer on the dial is at the frequency of the station being tested.

Car Antenna Readjustment—Tune in weak signal near 1000 KC. Readjust Antenna Trimmer C4 for maximum output.

Speaker and Antenna

The speaker may be taken out of the case when it is desired to mount it in backs of such a grille.

Remove the grill plate and speaker from the case (see article "Replacing Tubes and Vibrators"). Pull out the speaker plug. Replace the grille, putting the round circular gasket under the grille. Cut off the base and wire, tune on the speaker as shown in Fig. 4.

At one side of the speaker grille is a rectangular cover. Unscrew the screw at each end and remove cover. Three clips, each a different color, can be seen. Using the 24 inch, 3 wire cable supplied with the radio, insert the green wire of the front panel speaker (CS) up or down until the proper terminal is obtained. See Fig. 5 for location of these terminals.

Mounting Speaker in Back of Instrument Panel Grille

Some automobiles have a grille in the instrument panel with a speaker in back of which a speaker may be mounted.

NOTE: To avoid antenna plug in the antenna case the lead should be pulled out of the case. Do not close the case until the plug is in place. Set the radio on the on-Lead and tune until the pointer on the dial is at the frequency of the station being tested.

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Speaker and Antenna

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At one side of the speaker grille is a rectangular cover. Unscrew the screw at each end and remove cover. Three clips, each a different color, can be seen. Using the 24 inch, 3 wire cable supplied with the radio, insert the green wire of the front panel speaker (CS) up or down until the proper terminal is obtained. See Fig. 5 for location of these terminals.
ALIGNMENT PROCEDURE

Volume Control—Maximum All adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several minutes.

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<th>SIGNAL GENERATOR</th>
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<th>BAND SWITCH SETTINGS</th>
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<td>Maximum</td>
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<tr>
<td>RANGE A</td>
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<td>Triode—Home Input...</td>
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<td>Maximum</td>
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<tr>
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<td>Maximum</td>
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<td></td>
<td></td>
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<tr>
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<tr>
<td>RANGE F</td>
<td>250 KC</td>
<td>Antenna Lead</td>
<td>Triode—Home Input...</td>
<td>Maximum</td>
<td>Maximum</td>
</tr>
</tbody>
</table>

PROCEDURE FOR SETTING THE STATION BUTTONS

SELECTING THE STATIONS TO BE SET

There are seven buttons on the automatic tuning dial by means of which six stations may be set for quick tuning. Make a list of your favorite stations along with the numbers by which you tune in regularly. There may be any number up to and including 6 in this list.

It is better to list the stations with the lowest kilocycle number first, the station with the next higher kilocycle number next, and so on. Any button may be used for any station you can reach, although it may become inconvenient to set the stations as the kilocycle numbers increase from left to right.

SETTING A STATION BUTTON

Unlock the push button tuning mechanism from the back of the radio. The drive pulley should be at the left side, from the front of the radio. The tuning assembly is a locking screw. See illustration.

Turn the manual tuning knob until the locking screw can be easily reached with a slotted screwdriver. Using a small flat-bladed screwdriver, unlock the mechanism by turning this screw several turns in a counterclockwise direction.

TO SET STATIONS ACCURATELY, DO NOT JAM THE RADIO OR BUTTONS WHILE THE MECHANISM IS UNLOCKED.

Select the first station from the list you have prepared, and carefully tune in this station by means of the manual tuning knob, using the tuning eye as a guide.

With one hand, hold the manual tuning knob to prevent it from turning, and with the other hand, push one of the station buttons shown in the illustration all the way in. It is better to start with the left-hand button.

Hold this button all the way in. With the other hand, see whether or not this station is still accurately tuned by moving the tuning knob through a small amount back and forth while observing the tuning eye. Be sure to hold the button all the way in. Slowly release the button after the station is tuned.

In Models With Transparent Buttons—Insert a celluloid reinforcement tab half way in the slot at the front of the first station button.

Place the call letter tab in front of the celluloid reinforcement tab and insert it in slant. Push both tabs all the way in the slot.

In Models With Brown Opalescent Buttons—Push the tab all the way to the bottom of the space provided in the button. Cover the call letter tab with a celluloid tab, prising this in until it snaps into place.
Replacing Drive Cord

Remove chassis from cabinet.
Take off the pointer by removing the screw at the center of the dial.
Remove the dial by taking out the six rivets from the dial assembly.
Remove the on-off indicator dial by pulling it forward.
With the condenser plates in a completely open position, slip the new drive cord thru hole "A" (from the front) in the drive drum. See Fig. 9.
Pull the cord thru this hole far enough to tie a knot near the end. Make this knot large enough so that it will not pull back thru the hole.
Slip the opposite end of the drive cord thru hole "B" of the drive drum.
Now slip the piece of fine tubing (about 3/4" long) over the drive cord and insert about half of this tubing into hole "B" as shown in the illustration. This is important to prevent the cord from being cut.
Bring the drive cord down to the drive shaft and wrap it around the drive drum approximately one and one-half times in a clockwise direction, progressing toward the front.
Bring the cord up from the drive shaft and wrap it around the drive drum approximately one and one-half times in a clockwise direction, progressing toward the front until the cord is up to the turned-in portion of the flange "C". See Fig. 9.
Pull the cord tight and tie the end of the cord to the tension spring as shown in the illustration. The knot should be made in the bend in the flange so that the spring will be under sufficient tension to prevent the drive cord from slipping.
Now, by applying a little tension on the spring, hook the other end of the spring into hole "D" on the opposite side of the drum. Hook the spring from the inside (in later models hole "D" is replaced by a hook on the inside of the drive drum).
Turn the drive shaft back and forth several times to take out the slack and see if the drive is operating properly. If the cord slips on the drive shaft, remove the spring from the drive drum and add an additional knot in the cord at the spring in order to put pressure on the spring.
Replace the on-off indicator dial, care being taken that the indicator is so placed that it will properly show the on and off positions.
Reassemble the pointer and dial to the drive assembly. If the rivets are broken use No. 2 by 34 long round head machine screws and nuts.

Testing Batteries
If the receiver does not operate satisfactorily test the batteries under load. A high resistance meter is required for the"A" and "C" voltages. If any of the batteries are considerable below their rated voltage, new ones should be used. When the "B" batteries are replaced the "C" batteries should also be replaced. The reason for this is that the "C" drain is such that the "C" batteries are run down in about the same time as the "B" batteries.

Alignment Procedure and Dial Calibration
Misalignment or mistracking of condensers generally manifests itself as broad tuning and lack of volume at portions or all of the standard wave band. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and unless the service technician has the proper equipment. A signal generator that will provide accurately calibrated signals over the standard wave band and an intermediate frequency and output meter are required for indicating the effect of adjustments.
Use a non-metallic screwdriver for the adjustments. The complete procedure is as follows:

I. F. Adjustment
Set the signal generator for a signal of 175 KC.
Connect the antenna lead of the signal generator thru a 1 MF condenser to the coil end of the grid leak resistor R1. There is a lead which runs from the center tuning condenser to a lug at the bottom of the R.F. coil assembly. This connection can be made at the lug on the coil to which this lead is connected.
Connect the ground lead of the receiver to the ground post of the signal generator.
Turn the volume control to the maximum position.
Then adjust the three I. F. trimmers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis, and the location is shown in Fig. 8.
As stated above, use a non-metallic screwdriver to make the adjustment.

1750 KC Adjustment
Set the signal generator for 1750 KC.
Turn the rotor of the tuning condenser to the full open position.
Connect the antenna lead of the receiver thru a 150 ma. condenser to the output of the signal generator.
Keep the volume control at the maximum position.
Adjust the intermediate frequency and outputmeter are required for indicating the effect of adjustments.
Use a non-metallic screwdriver for the adjustments. The complete procedure is as follows:

Dial Calibration
To obtain dial scale calibration tune in an 800 KC signal and set the dial pointer at that mark on the dial scale. When calibrated in this manner, the setting will be approximately correct at both ends of the scale.

Specifications
Input Voltages
"A" Battery - 8 Vols (5 Amps) - 4750 and 115 Vols
"B" Batteries - 4.5 V, and 85 Vols
"C" Batteries - 45, 9, and 85 Vols
Power Output - 1 Wett (Uninduced)
Battery Connections—CAUTION

CAUTION: Do not turn the switch on unless ALL the tubes are in the sockets.

CAUTION: Be sure that the battery clips are properly connected to the battery. If the connections are reversed, the receiver may be damaged.
A signal generator that will provide an accurately controlled signal at 466, 1750, 1820, 2400, 4800, 4200, 16000, 15000, 24000, and 30000 cycles per second is required. It will be practically impossible to align the receiver if unsatisfactory apparatus is used.

Use a non-metallic screwdriver for the adjustments. The complete procedure is as follows:

I.F. Adjustment
Set the signal generator for a signal of 466 kc.
Connect the output of the signal generator through a 4.1 mf. condenser to the switch and of condenser 29—see Fig. 2. There is a lead which goes to the lug on the top of the center stator section of the tuning condenser—see Fig. 4. The connection can be made at this lug.
Connect the ground lead of the receiver to the ground post of the signal generator.

Turn the band selector to the Range B position (standard wave band—purple dial color).

Turn the volume control to the maximum position.

Attemup the signal from the generator generator to the levelling-off section of the A.T.C. 

Then adjust the five I.F. trimpots until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis, and the location is shown in Fig. 4.

Range B Alignment

1750 KC Adjustment
Set the signal generator for 1750 kc.

Connect the antenna lead of the receiver through a 400-ohm resistor to the output of the signal generator.

Turn the band selector to the standard wave position.

Connect the antenna lead of the receiver through a 400-ohm resistor to the output of the signal generator.

For this and all subsequent adjustments keep the volume control at the maximum position and attenuate the signal from the signal generator to a.t.c. action.

Adjust the oscillation Range B trimer (C2) until maximum output is obtained.

Adjust the tuning Range B trimer (C2) until maximum output is obtained.

The location of this trimmer is shown in Fig. 1.

1500 KC Adjustment
Set the signal generator for 1500 kc.

Connect the antenna lead of the receiver connected through the 400-ohm resistor to the output of the signal generator.

Turn the volume control to the maximum position.

Adjust the tuning Range B trimer (C2) until maximum output is obtained.

Adjust the tuning Range B trimer (C2) until maximum output is obtained.

As mentioned above, keep the volume control at the maximum position and attenuate the signal from the signal generator to a.t.c. action.

Adjust the oscillator Range B trimmer (C4) until maximum output is obtained.

See Fig. 3 for location of this trimmer.

15000 KC Adjustment
Set the signal generator for 15000 kc.

Adjust the oscillator Range B trimmer (C4) until maximum output is obtained.

Three go back and repeat the procedure as given for the 15,000 kc adjustment. If it is found necessary to make any appreciable change in the settings of the oscillator Range B trimmer, the 15,000 kc adjustment must be repeated.

Do not make any further change in the setting of the oscillator Range B trimmer.

6000 KC Adjustment
Set the signal generator for 6000 kc.

Turn the volume control to the maximum position.

Adjust the antenna lead of the receiver connected through the 400-ohm resistor to the output of the signal generator.

Turn the volume control to the maximum position.

The location of this trimmer is shown in Fig. 1.

4000 KC Adjustment
Set the signal generator for 4000 kc.

Connect the antenna lead of the receiver connected through the 400-ohm resistor to the output of the signal generator.

Turn the volume control to the maximum position.

Adjust the antenna Range C trimmer (C3) until maximum output is obtained.

The location of this trimmer is shown in Fig. 1.

16000 KC Adjustment
Set the signal generator for 16000 kc.

Turn the volume control to the maximum position.

Adjust the antenna Range C trimmer (C3) until maximum output is obtained.

The location of this trimmer is shown in Fig. 1.

18000 KC Adjustment
Set the signal generator for 18000 kc.

Connect the antenna lead of the receiver connected through the 400-ohm resistor to the output of the signal generator.

Turn the volume control to the maximum position.

Adjust the tuning Range D trimmer (C6) until maximum output is obtained.

The location of this trimmer is shown in Fig. 1.

12000 KC Adjustment
Set the signal generator for 12000 kc.

Connect the antenna lead of the receiver connected through the 400-ohm resistor to the output of the signal generator.

Turn the volume control to the maximum position.

Adjust the tuning Range D trimmer (C6) until maximum output is obtained.

The location of this trimmer is shown in Fig. 1.

10000 KC Adjustment
Set the signal generator for 10000 kc.

Connect the antenna lead of the receiver connected through the 400-ohm resistor to the output of the signal generator.

Turn the volume control to the maximum position.

Adjust the tuning Range D trimmer (C6) until maximum output is obtained.

The location of this trimmer is shown in Fig. 1.

8000 KC Adjustment
Set the signal generator for 8000 kc.

Connect the antenna lead of the receiver connected through the 400-ohm resistor to the output of the signal generator.

Turn the volume control to the maximum position.

Adjust the tuning Range D trimmer (C6) until maximum output is obtained.

The location of this trimmer is shown in Fig. 1.

5000 KC Adjustment
Set the signal generator for 5000 kc.

Connect the antenna lead of the receiver connected through the 400-ohm resistor to the output of the signal generator.

Turn the volume control to the maximum position.

Adjust the tuning Range D trimmer (C6) until maximum output is obtained.

The location of this trimmer is shown in Fig. 1.

2000 KC Adjustment
Set the signal generator for 2000 kc.

Connect the antenna lead of the receiver connected through the 400-ohm resistor to the output of the signal generator.

Turn the volume control to the maximum position.

Adjust the tuning Range D trimmer (C6) until maximum output is obtained.

The location of this trimmer is shown in Fig. 1.
ALIGNMENT

Peak I.F. trimmers at 456 KC.
Range B:
- Peak osc. trimmer (C21) at 1750 KC. Peak C11 and C4 at 1500 KC. Pad C22 at 600 KC.
Range C:
- Peak C18 at 6700 KC.
- Peak C5 and C10 at 6000 KC. Pad C19 at 2400 KC.
Range D:
- Peak C15 at 18,400 KC.
- Peak C9 and C2 at 15,000 KC. Pad C16 at 6800 KC.

NOTE
When adjusting interstage and antenna trimmers, rock gang condenser rotor until peak is obtained.

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**Model 708, Ch. 832**

**Western Air Patrol**

**Alignment Procedure**

- The following equipment is required for aligning:
  - An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
  - Output Indicator Meter — Non-Metallic Screened.
  - Dummy Antennas — .1 mil., 200 mpm, and 400 ohms.

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<th>Step</th>
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<th>Dummy Antenna</th>
<th>Signal Generator Frequency Setting</th>
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<th>Adjustment</th>
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<td>Range B</td>
<td>.1 mil.</td>
<td>456 KC</td>
<td>2nd L.F., (C19) &amp; (C20)</td>
<td>Turn Rotor to Full Open</td>
<td>Adjust to Maximum Output</td>
</tr>
<tr>
<td></td>
<td>1st L.F., Adj.</td>
<td>Range B</td>
<td>.1 mil.</td>
<td>456 KC</td>
<td>1st L.F., (C16) &amp; (C17)</td>
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<tr>
<td>RANGE B</td>
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<tr>
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<td>Range D</td>
<td>600 ohm</td>
<td>22,000 KC</td>
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<td>Range D</td>
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<td>RANGE C</td>
<td>3280 KC</td>
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<td>oscillator Range C (C6)</td>
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<td>1819 KC</td>
<td>Antenna Lead</td>
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<tr>
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<tr>
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</tbody>
</table>

**CAUTION**—When aligning the short wave bands, be sure NOT to adjust the image frequency. This can be checked as follows: Let the IF signal generator be set for 5000 KC. The signal will then be heard at 5000 KC on the dial of the radio. The image signal, which is much weaker, will be heard at 5000 less 912 KC or 4088 KC on the dial. It may be necessary to increase the input signal to hear the image.

**Condensers**

- C1 — 3-30 MFD Single Plate Trim.
- C2, 500 - Variable Resistor
- C6, 2000 MFD Micro 10%
- C7, 500 MFD Micro 10%
- C8, 200 MFD Micro 10%
- C9, 500 MFD 200 Watts

**Resistors**

- R1, 200 Ohms 1 watt wire wound
- R2, 1 meg 1% Carbon
- R3, 250,000 ohms 1/2 W Carbon
- R4, 500,000 1/2 W Carbon
- R5, 500,000 — Volume Control
- R6, 300 1/2 W Carbon
- R7, 300 1/2 W Carbon
- R8, 50,000 1/2 W Carbon
- R9, 50,000 Tone Control
- R10, 100,000 1/2 W Carbon

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**PROCEDURE FOR SETTING THE AUTOMATIC LEVERS:**

There are four levers on the dial by means of which four stations may be selected. (See "B" Fig. 2).

Above each automatic tuner lever an opening in the escutcheon is provided for inserting the call letter tab, (See "A" Fig. 2.)

Press DOWN ALL THE WAY any one of the automatic tuner levers. Holding it down FIRMLY, turn in by means of the tuning knob (No. 2) the station indicated on the station call letter tab above this lever. Turn the tuning knob very slowly back and forth (while still holding lever in downward position) until the signal is clearest. The station will then be accurately tuned in. Release the lever.

Now rotate the tuning knob (No. 2) to the right (clockwise) as far as it will turn and with a coin (half dollar) tighten the special locking screw ("C") in the center of the tuning knob, (See Fig. 2).

It is VERY IMPORTANT that this locking screw is turned until it is ABSOLUTELY TIGHT.

---

**Model D-723**

**ALIGNMENT PROCEDURE**

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 687G I.F. Tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output I.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6D8G</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input I.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1750 Kc.</td>
<td>200 mmf.</td>
<td>Antenna lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Top of rear section of gang (See Fig. 1)</td>
<td>Broadcast Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BAND</td>
<td>1400 Kc.</td>
<td>200 mmf.</td>
<td>Antenna lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Top of front section of gang (See Fig. 1)</td>
<td>Antenna Broadcast</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

**FREQUENCY RANGE**

535 to 1750 Kc.

- Power Consumption: 2.1 Amperes at 6.3 Volts
- Power Output: 350 Milliwatts Undistorted, 800 Milliwatts Maximum

---

The following equipment is required for alignment:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 mf, 200 mmf

After each band is completed, repeat the procedure as a final check.

---

Compliments of www.nucow.com
DUMMY ANTENNAS:
The dummy antennas referred to in the following instructions are:
- "I.F. Dummy"—A 1 mfd. condenser connected in series with the test oscillator output lead.
- "Broadcast Dummy"—A 200 mfd. condenser connected in series with the output lead of the test oscillator.

RESONANCE INDICATOR:
Use as a resonance indicator an output meter connected across the primary of the speaker input transformer, or by means of an adapter between the two plates of the type 6A7 output tube. Maximum deflection of the meter indicates resonance. Use only enough signal to get a readily readable output. A low range output meter or the low scale of a multi-range meter should be used.

I.F. ALIGNMENT: Series A & B
1. With variable condenser in its minimum capacity position (plates entirely out of mesh) and with volume control full down, connect test oscillator set at 175 K.C., in series with I.F. dummy antennas, to the grid cap of the type 6A7 tube.
2. Adjust trimmer condensers of both input (106-34) and output (106-35) I.F. transformers to resonance with oscillator. See top view for location of these transformers. There are two adjustments on each and they are accessible from the top of the transformer shield and should be adjusted with an insulated screw driver.

BROADCAST ALIGNMENT:
1. With variable condenser in its minimum capacity position, connect test oscillator set at 1550 K.C. and in series with broadcast dummy, to the antenna lead of receiver.
2. Adjust oscillator trimmer of variable condenser to resonance (this adjustment is on the end section of the three gang condenser—see top view).
3. Shift test oscillator to 1400 K.C. and pick up signal by rotating condenser and adjust R.F. (center) and antenna (front) trimmers to resonance, see top view.
   (a) Check for sensitivity at 1000, 800 and 600 K.C. by setting test oscillator to these frequencies and picking up the signal by rotating variable condenser. Under no circumstances bend plates of oscillator section, bend R.F. and antenna plates only if absolutely necessary.

I.F. ALIGNMENT: Series C
1. With variable condenser in its minimum capacity position (plates entirely out of mesh) and with volume control full down, connect test oscillator set at 465 K.C., in series with I.F. dummy antenna, to the grid cap of the type 6A7 tube.
2. Adjust trimmer condensers of both input (106-56) and output (106-57) I.F. transformers to resonance with oscillator. See top view for location of these transformers. There are two adjustments on each and they are accessible from the top of the transformer shield and should be adjusted with an insulated screw driver.

BROADCAST ALIGNMENT:
1. With variable condenser in its minimum capacity position, connect test oscillator set at 1550 K.C. and in series with broadcast dummy, to the antenna lead of receiver.
2. Adjust oscillator trimmer of variable condenser to resonance (this adjustment is on the end section of the three gang condenser—see top view).

SERVICE NOTES:
Voltages taken from different points of circuits to chassis are measured with volume control full down, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt. These voltages are clearly indicated on the circuit diagram.
In order to prevent signal from acting upon A.V.C. and affecting accuracy of voltage measurements, aerial and ground leads should be short circuited while making measurements. All voltages are to be measured with 6.3 volts input to receiver. Resistances of coils and transformer windings are indicated in ohms on schematic circuit diagram.
3. Shift test oscillator to 1400 K.C. and pick up signal by rotating condenser and adjust R.F. (center) and antenna (front) trimmers to resonance, see top view.
4. Re-set external oscillator to 600 K.C. and adjust series pad to resonance, rotate condenser and move dial pointer to 600 K.C. by gently rocking condenser to and fro. Pick up oscillator signal while adjusting series pad to resonance. This adjustment is accessible from the bottom of the chassis.
   (a) Check for sensitivity at 1000, 800 and 600 K.C. by setting test oscillator to these frequencies and picking up the signal by rotating variable condenser. Under no circumstances bend plates of oscillator section, bend R.F. and antenna plates only if absolutely necessary.
Arrangement of Series A & C is similar to Series B, except that Series A & C have no Sensitivity Control Switch.
The tube complement of this chassis consists of the following metal and octal base glass tubes which are interchangeable with metal tubes.

1.—Type No. 6SA7—Mixer first detector and oscillator.
2.—Type No. 6SK7—Remote Cut-off Pentode as an I.F. Amplifier.
3.—Type No. 6SQ7—Duplex Diode Triode Second Detector, A.V.C. and First Audio.
4.—Type No. 6K6G—Pentode Output Amplifier.
5.—Type No. 6X5G—High Vacuum Rectifier.
<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Pushbutton Indicated Below</th>
<th>&quot;In&quot;</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. F.</td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6K7 LF Tube</td>
<td>Broadcast</td>
<td></td>
<td>Rotor full open</td>
<td>Two trimmers on top</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6K8G</td>
<td>Broadcast</td>
<td></td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>SHORT WAVE BAND</td>
<td>17 Mc. 40 ohms</td>
<td>Antenna lead</td>
<td>Short Wave</td>
<td>Set dial at 12 MC</td>
<td>Trimmer (C22) (See Fig. 3)</td>
<td>Short wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEDIUM WAVE BAND</td>
<td>5 Mc. 400 ohms</td>
<td>Antenna lead</td>
<td>Med. Wave</td>
<td>Set dial at 3 MC</td>
<td>Trimmer (C11) (See Fig. 1)</td>
<td>Medium wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAND BROADCAST</td>
<td>1600 Kc. 200 mwf.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer (C24) (See Fig. 3)</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1400 Kc. 200 mwf.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set dial at 150 Kc.</td>
<td>Trimmer (C23) (See Fig. 3)</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>600 Kc. 200 mwf.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set dial at 600 Kc.</td>
<td>Trimmer (C18) (See Fig. 4)</td>
<td>Broadcast oscillator series yad</td>
<td>Adjust to maximum rock dial. (See note &quot;A&quot;)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**IMAGE REJECTION ADJUSTMENTS**

NOTE "A". Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

NOTE "B". 1290 Kc. is the image frequency of 1000 Kc. Adjust Trimmer (C3) until a minimum output is obtained.

After each band is completed, repeat the procedure as a final check.

7 Tube Including Cathode-Ray Tuning Indicator  
2-Band A.C. Superheterodyne Receiver

**FIG. 3—Showing Station Adjustment Screws.**

**PROCEDURE FOR SETTING THE AUTOMATIC STATION PUSHBUTTONS:**

Only a single adjustment for each station is required in setting up your favorite stations for automatic pushbutton operation. These adjustments are located at the front of the chassis shown in Fig. 3 and are accessible through the station call letter tab holes. The only equipment needed is a small screw driver to make the adjustments.

After you have made up your list of stations, press button marked "Broadcast" and tune set manually until station selected having the highest frequency is tuned in and the program noted. Press button covering frequency range in which station is located (See Fig. 3). Adjust screw through station tab opening above button pressed until the same station is heard clearly and tuning indicator indicates that it is correctly tuned.
TUBES:
The tube complement of this chassis consists of the following octal base glass and metal tubes:
The type and function of each tube is as follows:
1. Type 6K8G Converter (Oscillator and First Detector).
2. Type 6K7 Remote Cut-Off Pentode, I. F. Amplifier.
3. Type 6J5G Second Detector and A. V. C.
4. Type 6Q7G First Audio Amplifier.
5. Type 6J5G Phase Inverter.
7. Type 5Y3G High Vacuum Rectifier.
8. Type 6US Cathode-Ray Tuning Indicator.

ALIGNMENT PROCEDURE

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 m.f., 200 m.m. and 400 ohms.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. F.</td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6K7</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6K8G</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1750 Kc.</td>
<td>200 m.m.</td>
<td>Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer (C10)</td>
<td>Broadcast oscillator</td>
</tr>
<tr>
<td>BAND</td>
<td>1500 Kc.</td>
<td>200 m.m.</td>
<td>Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer (C6)</td>
<td>Broadcast antenna</td>
</tr>
<tr>
<td></td>
<td>600 Kc.</td>
<td>200 m.m.</td>
<td>Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Set Dial at 600 Kc. (See Fig. 1)</td>
<td>Trimmer (C14)</td>
<td>Broadcast oscillator series pad</td>
</tr>
<tr>
<td>IMAGE</td>
<td>465 Kc.</td>
<td>200 m.m.</td>
<td>Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Set Dial at 600 Kc. (See Fig. 1)</td>
<td>Trimmer (C3)</td>
<td>I. F. Wave</td>
</tr>
<tr>
<td>DEJECTION</td>
<td>2430 Kc.</td>
<td>200 m.m.</td>
<td>Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Pick up signal at 1500 Kc. on dial (See Fig. 1)</td>
<td>Trimmer (C4)</td>
<td>Image rejection</td>
</tr>
<tr>
<td>ADJUST-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Adjust for minimum output</td>
</tr>
<tr>
<td>MENTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(See note &quot;B&quot;)</td>
</tr>
<tr>
<td>SHORT</td>
<td>17 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>Short Wave (Extreme left rotation)</td>
<td>Set Dial at 12 M.C (See Fig. 1)</td>
<td>Trimmer (C9)</td>
<td>Short Wave oscillator</td>
</tr>
<tr>
<td>WAVE</td>
<td>17 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>Short Wave (Extreme right rotation)</td>
<td>Dial Set at 12 M.C (See Fig. 1)</td>
<td>Trimmer (C7)</td>
<td>Short Wave antenna</td>
</tr>
<tr>
<td>BAND</td>
<td>6 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>Short Wave (Extreme left rotation)</td>
<td>Set Dial at 6 M.C. (See Fig. 4)</td>
<td>Trimmer (C13)</td>
<td>Short Wave oscillator series pad</td>
</tr>
</tbody>
</table>

NOTE "A." Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

NOTE "B." 2430 Kc. is the image frequency of 1500 Kc. Adjust Trimmer (C4) until a minimum output is obtained.

NOTE "C." After each band is completed, repeat the procedure as a final check.

BAND SWITCH
- **EXTREME RIGHT ROTATION**
- **EXTREME LEFT ROTATION**

BAND
- **SHORT WAVE**
- **BROADCAST**

FREQUENCY RANGE
- **5.5 to 18.3 MC.**
- **500 to 1750 KC.**

Power Consumption
- **.85 Watts (At 115 volts 50-60 cycles)***

Power Output
- **5 Watts Undistorted, 7 Watts Maximum**

INTERMEDIATE FREQUENCY
- **.45 KC.**
ALIGNMENT PROCEDURE

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 mF 200 mmf and 400 ohms.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc. .1 MFD. Grid of 6K7</td>
<td></td>
<td>Grid of 6K7</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc. .1 MFD. Grid of 6K8</td>
<td></td>
<td>Grid of 6K8</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>SHORT WAVE BAND</td>
<td>17 Mc. 400 ohms Antenna lead</td>
<td>Short Wave (Extreme right rotation)</td>
<td>Set dial at 17 MC.</td>
<td>Top of chassis (See Fig. 1)</td>
<td>Condenser C7</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17 Mc. 400 ohms Antenna lead</td>
<td></td>
<td>Short Wave (Extreme right rotation)</td>
<td>Set dial at 17 MC.</td>
<td>Condenser C5</td>
<td>Short Wave antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 Mc. 400 ohms Antenna lead</td>
<td></td>
<td>Short Wave (Extreme right rotation)</td>
<td>Set dial at 6 MC.</td>
<td>Condenser C12</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1715 Kc. 200 mmf Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer (C8) (See Fig. 1)</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1400 Kc. 200 mmf Antenna lead</td>
<td></td>
<td>Broadcast (Extreme left rotation)</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmer (C9) (See Fig. 1)</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>600 Kc. 200 mmf Antenna lead</td>
<td></td>
<td>Broadcast (Extreme left rotation)</td>
<td>Set dial at 600 Kc.</td>
<td>Trimmer (C11) (See Fig. 1)</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>465 Kc. 200 mmf Antenna lead</td>
<td></td>
<td>Broadcast (Extreme left rotation)</td>
<td>Set dial at 600 Kc.</td>
<td>Trimmer (C11) (See Fig. 1)</td>
<td>I. F. Wave trap</td>
<td>Adjust for minimum output</td>
<td></td>
</tr>
</tbody>
</table>

NOTE "A"—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

After each range is completed, repeat the procedure as a final check.

SERVICE NOTES:

Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt.

All voltages as indicated on the voltage chart are measured with 115 volts on the primary of the power transformer.

Resistances of coil windings are indicated in ohms on the schematic circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Excessive hum, stuttering, low volume and a reduction in all D. C. voltages is usually caused by a shorted electrolytic condenser; open by-pass condensers frequently cause oscillation and distorted tone.

FIG. 1—TOP VIEW

BAND SWITCH

- Extreme right rotation
- Extreme left rotation

BAND

- Short Wave
- Broadcast

FREQUENCY RANGE

- 5.6 to 18.3 MC.
- 540 to 1735 KC.
- broadcast 540 to 1735 KC. (Kilocycles)
- Short Wave 5.6 to 18.3 MC. (Megacycles)

Receivers of this model which are to be used on voltages or frequencies other than 105-115 volts, 50-60 cycles are so marked. The power consumption of this receiver is 70 watts.

NOTE:—On the back of the string dial drum a calibrated scale is provided for aligning this chassis to the frequencies listed in the alignment procedure. Attach a pointer so that it will indicate proper dial setting in respect to the position of the variable condenser.
SETTING UP THE PUSH BUTTON STATION SELECTOR

Call station nearest 1600 KC end of dial the No. 1 station and number five other stations consecutively as they are tuned in on the dial, tuning from left to right. Set band selector at "B", or second position from left, and tune in station No. 1. Observe program. Turn band selector knob to extreme left position. Push No. 1 button in as far as it will go. Insert screwdriver thru opening directly above No. 1 button and turn screwdriver until same station is heard. If station is not heard reverse direction of rotation.

Symbols:

- C1, C2, 3, 4: Trimmer on variable
- C5, 20, 22: 3-5 mmfd. trimmer
- C6, 7, 21: 1-10 mmfd. trimmer
- C8, 9, 10, 11: 1F. Trimmers
- C12, 30, 37: 0.005 400 V.
- C13: 0.02 Special 3%
- C14, 28: 0.1 200 V.
- C15: 0.1 1-40 mmfd. trimmer
- C16, 31, 33: 0.04 400 V.
- C17, 18: 0.05 400 V.
- C19: 0.5 400 V.
- C20: 2500 0.006 200 V.
- C21: 0.1 200 V.
- C22: 0.003 600 V.
- C23: 0.01 400 V.
- C24: 0.02 600 V.
- R1: 20 M 1/3 W.
- R2, 7, 11: 1 Meg. 1/3 W.
- R3, 16: 50 M 1/3 W.

Tubes required are:
- 1—6A7 Oscillator-translator
- 1—6D6 Intermediate Frequency Amplifier
- 1—6G5 Cathode Ray Tuning Tube (on models 1—6Q7G Detector AVC—First Audio Amplifier)

Assemblies:
- 676 Driver—Phase Inverter
- 41 Power Output
- 80 Rectifier
- 6000 Volume Control
- 5000 Volume Control
- 100 ohm 1/3 W.

Parts:
- 4529 10M 1/3 W.
- 636 40M 1/3 W.
- 2605 200 ohms 1/3 W.
- 5099 2 meg. tone control
- 5100 500M Volume Control
- 2689 100 ohm 1/3 W.
- 2647 50 ohm 1/3 W.
Antenna and Ground

Two built-in antennas are incorporated in the speaker compartment.

One of these, the Truetone Stratoscope loop antenna may be used for broadcast band reception. For the reception of local or nearby stations, an outside antenna and ground are usually not required. The use of the Stratoscope antenna may, in some locations, provide best broadcast band operation.

The other, a counterpoise foil antenna, is used for reception on the short wave bands.
IMPORTANT: See Aligning Instructions on Page 4

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect — B of radio chassis to ground post of signal generator through .1 Mfd. condenser.
- Connect dummy antenna valve in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas 1.1 Mfd., and 200 Mfd.

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Iron Cores (Dial Setting)</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. P.</td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output L. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>I. P.</td>
<td>466 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input L. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1600 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C4) (See Fig. 4)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1600 Kc.</td>
<td>200 MFD.</td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C3) (See Fig. 4)</td>
<td>Antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1400 Kc.</td>
<td>200 MFD.</td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 4)</td>
<td>Turn Dial to 1400 Kc.</td>
<td>Adjust position of antenna coil right or left. (See Fig. 3)</td>
<td>Antenna Coil</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1600 Kc.</td>
<td>200 MFD.</td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 4)</td>
<td>Turn Dial to 1690 Kc.</td>
<td>Adjust trimmer (C3) (See Fig. 4)</td>
<td>Antenna</td>
<td>Check for tracking</td>
</tr>
</tbody>
</table>

NOTE: "A"—The antenna coil assembly is made so that it is movable left or right. When making the adjustment as given in the alignment procedure move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

NOTE "B"—After the antenna coil has been tracked at 1600 Kc. it is necessary to check the antenna trimmer (C3) adjustment again at 1690 Kc. If there is appreciable change in trimmer adjustment made the coil is in track. If the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1600 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1690 Kc.

FREQUENCY RANGE
355 to 1600 Kc.

Power Consumption: Radio Only 30 Watts
Power Output: 900 Milliwatts Undistorted, 1.7 Watts Maximum Intermediate Frequency

TUBES:
The tube complement of this chassis consists of the following octal unit glass and metal tubes.

The type and function of each tube is as follows.
1—Type 12SA7 Mixer, First Detector-oscillator.
1—Type 12SK7 I. F. Amplifier.
**SPECIFICATIONS - MOD. D-934**

- Input Voltages and Currents:
  - A Battery (12V Operation): 1.5 volts to 15 Ma.
  - B Battery (12V Operation): 12 volts to 30 Ma.
  - C Battery (24V Operation): 24 volts to 15 Ma.
  - Fuse Rating: 3A (for D24 operation).

- Power Supply:
  - A Output: 12V DC, 2 Amps.
  - B Output: 12V DC, 2 Amps.
  - C Output: 12V DC, 2 Amps.
  - D Output: 12V DC, 2 Amps.

- Sensitivity (for 0.5 Watt Input):
  - B Range: 0.1 µV/mil Average
  - D Range: 0.1 µV/mil Average

- From an inspection of the circuit diagram it will be noted the LO operation is that of a 4 tube receiver and the phase inverter having their filaments open-circuited. The HI position permits normal operation with all 6 tubes operating, and with push-pull output.

- Dummy Antenna - 1 m.
  - 200 mm. and 400 ohms.

**ALIGNMENT PROCEDURE**

**SIGNAL GENERATOR**

- **FREQUENCY SETTING**
  - **CONNECTION AT RADIO**
  - **DUMMY ANTENNA**
  - **BAND SWITCH SETTING**
  - **CONSIDER OR DIAL SETTING**
  - **ADJUST TRIMMERS TO MAXIMUM**

**FREQUENCY RANGE**

- **I.F.**
  - 455 KC
  - Grid at 1.00 Hz: 0.1 MHz

**DIAL**

- **SELECTIVITY**
  - 38 CB Kilocycle at 1000 Times Signal

**MICROPHONE INHIBITION FREQUENCY**

- 456 KC

**TUNING FREQUENCY RANGE**

- B Range: 0 to 1700 KHz
  - D Range: 0 to 1700 KHz

**SENSITIVITY**

- (For 0.5 Watt Input)
  - B Range: 0.1 µV/mil Average
  - D Range: 0.1 µV/mil Average

**Procedure for Setting the Station Buttons - MOD. D-934**

- **Setting a Station Button**
  - Pull the button at the left (No. 1) off the shaft. When this is done, the locking screw under the shaft will be exposed.
  - Loosen this screw with a small screwdriver by turning several turns in the counter-clockwise direction.
  - Continue to press firmly on the screwdriver, thus holding the button shaft depressed. Select the first station from the list you have prepared and carefully tune in this station by means of the manual tuning knob.
  - After the stations are set and the mechanism is locked, tune in each of them by depressing the proper button. If any of them does not appear to be properly tuned in after the button has been depressed, repeat the setting for that button following the procedure as outlined above. If at any time you wish to change the setting of a button from one station to another, repeat the above procedure. Changing the setting of one button will not affect the setting of the others.

**SPECIFICATIONS - MOD. D-937**

- Input Voltages and Currents:
  - Intermediate Frequency: 456 KC
  - Power Output: 140 Milliwatts Undistorted
  - Sensitivity (for 0.5 Watt Input): 41 CB Kilocycle at 1000 Times Signal

**ALIGNMENT PROCEDURE - MOD. D-937 & D-938**

- Volume Control - Maximum All Adjustments. Allow Cables and Signal Generator to "Stabilize" for several minutes.

**SIGNAL GENERATOR**

- **FREQUENCY SETTING**
  - **CONNECTION AT RADIO**
  - **DUMMY ANTENNA**
  - **CONSIDER OR DIAL SETTING**
  - **ADJUST TRIMMERS TO MAXIMUM (See Trimmer Illustration)**

**FREQUENCY RANGE**

- 456 KC
  - Grid at 1.00 Hz: 0.1 MHz

**TUNING FREQUENCY RANGE**

- 0 to 1700 KHz

**SENSITIVITY**

- (For 0.5 Watt Input)
  - Grid at 1.00 Hz: 0.1 µV/mil Average

**Procedure for Setting the Station Buttons - MOD. D-937**

- Pull the button at the left (No. 1) off the shaft. When this is done, the locking screw under the shaft will be exposed.
  - Loosen this screw with a small screwdriver by turning several turns in the counter-clockwise direction.
  - Continue to press firmly on the screwdriver, thus holding the button shaft depressed. Select the first station from the list you have prepared and carefully tune in this station by means of the manual tuning knob.
  - After the stations are set and the mechanism is locked, tune in each of them by depressing the proper button. If any of them does not appear to be properly tuned in after the button has been depressed, repeat the setting for that button following the procedure as outlined above. If at any time you wish to change the setting of a button from one station to another, repeat the above procedure. Changing the setting of one button will not affect the setting of the others.

**SPECIFICATIONS - MOD. D-938**

- Input Voltages and Currents:
  - Intermediate Frequency: 456 KC
  - Power Output: 140 Milliwatts Undistorted
  - Sensitivity (for 0.5 Watt Input): 41 CB Kilocycle at 1000 Times Signal

**ALIGNMENT PROCEDURE - MOD. D-937 & D-938**

- Volume Control - Maximum All Adjustments. Allow Cables and Signal Generator to "Stabilize" for several minutes.

**SIGNAL GENERATOR**

- **FREQUENCY SETTING**
  - **CONNECTION AT RADIO**
  - **DUMMY ANTENNA**
  - **CONSIDER OR DIAL SETTING**
  - **ADJUST TRIMMERS TO MAXIMUM (See Trimmer Illustration)**

**FREQUENCY RANGE**

- 456 KC
  - Grid at 1.00 Hz: 0.1 MHz

**TUNING FREQUENCY RANGE**

- 0 to 1700 KHz

**SENSITIVITY**

- (For 0.5 Watt Input)
  - Grid at 1.00 Hz: 0.1 µV/mil Average

**Procedure for Setting the Station Buttons - MOD. D-937**

- Pull the button at the left (No. 1) off the shaft. When this is done, the locking screw under the shaft will be exposed.
  - Loosen this screw with a small screwdriver by turning several turns in the counter-clockwise direction.
  - Continue to press firmly on the screwdriver, thus holding the button shaft depressed. Select the first station from the list you have prepared and carefully tune in this station by means of the manual tuning knob.
  - After the stations are set and the mechanism is locked, tune in each of them by depressing the proper button. If any of them does not appear to be properly tuned in after the button has been depressed, repeat the setting for that button following the procedure as outlined above. If at any time you wish to change the setting of a button from one station to another, repeat the above procedure. Changing the setting of one button will not affect the setting of the others.

**SPECIFICATIONS - MOD. D-938**

- Input Voltages and Currents:
  - Intermediate Frequency: 456 KC
  - Power Output: 140 Milliwatts Undistorted
  - Sensitivity (for 0.5 Watt Input): 41 CB Kilocycle at 1000 Times Signal

**ALIGNMENT PROCEDURE - MOD. D-937 & D-938**

- Volume Control - Maximum All Adjustments. Allow Cables and Signal Generator to "Stabilize" for several minutes.

**SIGNAL GENERATOR**

- **FREQUENCY SETTING**
  - **CONNECTION AT RADIO**
  - **DUMMY ANTENNA**
  - **CONSIDER OR DIAL SETTING**
  - **ADJUST TRIMMERS TO MAXIMUM (See Trimmer Illustration)**

**FREQUENCY RANGE**

- 456 KC
  - Grid at 1.00 Hz: 0.1 MHz

**TUNING FREQUENCY RANGE**

- 0 to 1700 KHz

**SENSITIVITY**

- (For 0.5 Watt Input)
  - Grid at 1.00 Hz: 0.1 µV/mil Average

**Procedure for Setting the Station Buttons - MOD. D-937**

- Pull the button at the left (No. 1) off the shaft. When this is done, the locking screw under the shaft will be exposed.
  - Loosen this screw with a small screwdriver by turning several turns in the counter-clockwise direction.
  - Continue to press firmly on the screwdriver, thus holding the button shaft depressed. Select the first station from the list you have prepared and carefully tune in this station by means of the manual tuning knob.
  - After the stations are set and the mechanism is locked, tune in each of them by depressing the proper button. If any of them does not appear to be properly tuned in after the button has been depressed, repeat the setting for that button following the procedure as outlined above. If at any time you wish to change the setting of a button from one station to another, repeat the above procedure. Changing the setting of one button will not affect the setting of the others.

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*Compliments of www.nucow.com*
CHANGES IN LATER MODELS

June, 1937

Later models of the Series have changes incorporated in them which are explained below. The models which have these changes may be identified by the issue letter which is a large letter stamped on top of the chassis base. The tube arrangement label on the chassis case cover also shows this issue letter.

When ordering parts, it is important that the issue letter be noted and the correct part number, as shown in the parts list, be specified.

The "D" issue Series is different from the "B" and "C" issue Series. The gang condenser used in the "D" issue radios does not have the cut plate oscillator section. A padding condenser (600 KC) was added in series with the oscillator section of this gang condenser and the oscillator coil. The padding condenser is a part of the 2nd I.F. trimmer unit and is mounted in the 2nd I.F. coil can.

The capacity (C17) shown within a dotted circle in the 2nd I.F. coil assembly has been changed to an actual part as shown in the supplementary parts list.

The antenna, R.F. Intertage, oscillator, and 2nd I.F. coil assemblies have been changed and have been given new part numbers as shown in the supplementary parts list.

SUPPLEMENTARY REPLACEMENT PARTS

The following parts are used on the Series "D" issue radio with the following exceptions: the following new parts are used.

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>9A859</td>
<td>T2</td>
<td>Antenna Transformer and Can Assembly</td>
<td>$1.65</td>
</tr>
<tr>
<td>9A861</td>
<td>T2</td>
<td>R.F. Intertage Transformer and Can Assembly</td>
<td>1.76</td>
</tr>
<tr>
<td>9A862</td>
<td>T3</td>
<td>Oscillator Coil and Can Assembly</td>
<td>.95</td>
</tr>
<tr>
<td>9A865</td>
<td>T5</td>
<td>2nd I.F. Transformer and Can Assembly</td>
<td>2.35</td>
</tr>
<tr>
<td>47X57</td>
<td>C17</td>
<td>100 mmf. Molded Condenser</td>
<td>.10</td>
</tr>
<tr>
<td>17A79</td>
<td>(C16)</td>
<td>30-100 mmf. 2nd I.F. Trimmer</td>
<td>.45</td>
</tr>
<tr>
<td>14A77</td>
<td>( )</td>
<td>Section Gang Condenser Complete with Drive Gears</td>
<td>5.05</td>
</tr>
</tbody>
</table>

The parts of the series are not used on the series "D" issue radio.

Alignment Procedure

Set the signal generator for 175 KC and connect the output of the generator through a .05 mmf. condenser to the input of the 1st detector section of the tuning condenser. Set the volume control at the maximum position and attenuate the signal from the generator to prevent the leveling off action of the AVC. Then adjust the three IF trimmers until maximum output is obtained.

Set the signal generator for 1581 KC. Turn the rotor of the tuning condenser to the full open position. Insert the antenna plug with the mark on the high capacity (HC) side. Connect the shielded antenna lead from the chassis through a 150 mmf. condenser to the antenna post of the signal generator. Adjust the trimmer of the oscillator section of the three gang condenser until maximum output is obtained.

Fig. 9—Antenna Plug Insertion

IMPORTANT—The antenna plug can be inserted in two ways depending on whether the antenna is of high or low capacity.

If the total capacity of the antenna and shielded lead is approximately 200 mmf., which would be the case in a running board or ordinary roof antenna (not metal roof), insert the antenna plug with the mark on the HC side—See Fig. 9. If the total capacity of the antenna and shielded lead is approximately 70 mmf., such as is the case if a "bob pole" antenna is used, insert the antenna plug with the mark on the LC side.
WESTERN AUTO SUPPLY CO. MODEL D-1003

RESISTORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>500,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R2</td>
<td>4,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R3</td>
<td>100,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R4</td>
<td>25,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R5</td>
<td>5,000,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R6</td>
<td>100</td>
<td>1/4</td>
</tr>
<tr>
<td>R7</td>
<td>15,000</td>
<td>2</td>
</tr>
<tr>
<td>R8</td>
<td>50,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R9</td>
<td>1,000,000</td>
<td>1/4</td>
</tr>
</tbody>
</table>

CONDENSERS

<table>
<thead>
<tr>
<th>No.</th>
<th>Capacity (Mfd.)</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>.0001 Mica</td>
<td>600</td>
</tr>
<tr>
<td>C2</td>
<td>.05</td>
<td>220</td>
</tr>
<tr>
<td>C3</td>
<td>.001 Mica</td>
<td>400</td>
</tr>
<tr>
<td>C4</td>
<td>.0005-5% Mica</td>
<td>.01</td>
</tr>
<tr>
<td>C5</td>
<td>.001 Mica</td>
<td>400</td>
</tr>
<tr>
<td>C6</td>
<td>.005-5% Mica</td>
<td>.005</td>
</tr>
<tr>
<td>C7</td>
<td>.05</td>
<td>250</td>
</tr>
<tr>
<td>C8</td>
<td>.0011 Mica</td>
<td>20</td>
</tr>
<tr>
<td>C9</td>
<td>.00025 Mica</td>
<td>20</td>
</tr>
</tbody>
</table>

SERVICE NOTES

Voltages taken from the different points of the circuit to chassis are measured with voltmeter in maximum position, all tubes in their sockets and with a volt meter having a resistance of 100 ohms per volt on the 300 volt scale. These voltages are clearly indicated on the voltage chart.

SERVICE INFORMATION

All voltages should be measured with 117 volts A.C. input to receiver. Resistance and actual connections of coils and transformers, electrolytic condenser information and speaker data are given under Service Information.

To check for open by pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good until the defective unit is located.

VOLTAGE CHART

All voltages measured with a 1,000 ohm per volt meter on the 300 volt scale. Line voltage 117 volts A.C. Volume control maximum and no signal tuned in.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>Plate (8) to ground</th>
<th>Screen (6) to ground</th>
<th>Plate (3) to ground</th>
<th>Screen (4) to ground</th>
<th>Plate (8) to ground</th>
<th>Screen (6) to ground</th>
<th>Plate (3) to ground</th>
<th>Screen (4) to ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7 (HF) TUBE</td>
<td>208</td>
<td>93</td>
<td>255</td>
<td>93</td>
<td>240</td>
<td>18</td>
<td>266</td>
<td></td>
</tr>
<tr>
<td>6H4 (AF) TUBE</td>
<td>20</td>
<td>10</td>
<td>258</td>
<td></td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6X5G TUBE</td>
<td>240</td>
<td>18</td>
<td></td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**SEVEN TUBE AC SUPERHETERODYNE RECEIVER**

Broadcast and Short Wave Bands

**Frequency Range** 535-1630 Kilocycles and 5,700-18,100 Kilocycles

**TUBE COMPLEMENT**

The tube complement of this receiver consists of the following tubes:

1. Type 6SK7—Remote cut-off Pentode as RF Amplifier.
2. Type 6SA7—Pentagrid Converter as First Detector and Oscillator.
3. Type 6SK7—Remote cut-off Pentode as an RF amplifier (635 KC).
4. Type 6SK7—Duplex Diode Triode Second Detector and A.V.C.
5. Type 6SK7—Remote cut-off Pentode as First Audio.
7. Type 5Y3G—Rectifier.

**PROCEDURE FOR SETTING UP PUSH BUTTONS**

There are six push buttons by means of which six stations may be selected. Make a list of six stations tuned in regularly. Loosen one of the push buttons by inserting a screwdriver thru the center hole in the push button to the locking screw and turn the locking screw counterclockwise one full turn and push in, while holding this screw in, turn the desired station by means of the station selector. Turn the selector very slowly back and forth until the signal is clearest. Now while still holding the above screw in, tighten it by turning clockwise. Release and turn the station selector one end of the dial; then check the button by pushing it down and if the station is tuned to the center of the area on the dial covered by the station the adjustment is correct.

Release the push button and repeat the above procedure for the remaining buttons. If it is desired to change a button to a different station simply re-set by repeating the above procedure. Punch the correct station call letter tube from the set of sheets supplied and insert them from the side into the grooves in the front of the push buttons. Punch six celluloid squares from the sheet supplied and insert them in the above mentioned grooves over the station call letter tube.

The dial is now set up for quick tuning and all that is necessary is to push the button of the desired station down and then release.

**ALIGNMENT PROCEDURE**

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicator meter.
- Non-metallic screwdriver.
- Dummy antennas—1 mfd., 200 mfd., 400 ohms.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL FREQUENCY</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F.</td>
<td>455 KC.</td>
<td>.1 Mfd.</td>
<td>Grid of 6SK7 LF. tube (Plates out of mesh)</td>
<td>Rotor full open</td>
<td>Two trimpots on top (See Fig. 1)</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>L.F.</td>
<td>455 KC.</td>
<td>.1 Mfd.</td>
<td>Grid of 6SA7 tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimpots on top (See Fig. 1)</td>
<td>Input L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST</td>
<td>1.630 KC.</td>
<td>200 Mfd.</td>
<td>Antenna lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Upper left, front of chassis</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST</td>
<td>1.400 KC.</td>
<td>200 Mfd.</td>
<td>Antenna lead</td>
<td>Set dial at 1400 KC.</td>
<td>Trimmer—Lower right, front of chassis</td>
<td>Broadcast</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST</td>
<td>800 KC.</td>
<td>200 Mfd.</td>
<td>Antenna lead</td>
<td>Set dial at 800 KC.</td>
<td>Trimmer—Underside of chassis, center</td>
<td>Oscillator, Series Pot.</td>
<td>Adjust to maximum rock dial</td>
</tr>
<tr>
<td>SHORT WAVE</td>
<td>18,100 KC.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Lower left, front of chassis</td>
<td>Short Wave Oscillator</td>
<td>Adjust to receive signal</td>
</tr>
<tr>
<td>SHORT WAVE</td>
<td>18,000 KC.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>Tune signal</td>
<td>Trimmer—Upper right, front of chassis</td>
<td>Short Wave Antenna</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

Note: "A"—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of intensity is obtained. Adjust the signal from the signal generator to prevent the leveling-off action of the A.V.C. Do not bend variable condenser to correct tracking.

**Frequency Range** — 535 to 1630 and 5,700 to 18,100 K.C.

**Power output** 2.5 watts undistorted — 4.1 watts maximum.

**Intermediate Frequency** 455 K.C.

**Power Consumption**—60 watts.

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### TECHNICAL DATA

- **Power Consumption**: Radio Only - 70 Watts, Motor Only - 20 Watts
- **Power Output**: 2.1 Watts Undistorted
- **Sensitivity**: 500 Milliwatt Output: 15 Microvolts Average
- **Selectivity**: 51 KC Broad at 1000 Times Signal at 1000 KC
- **Tuning Frequency Range**: Broadcast Band - 530 to 1600 KC, Shortwave Band - 5.5 to 18.5 MC
- **Intermediate Frequency**: 455 KC
- **Speaker**: 8 in. Electro Dynamic

### ALIGNMENT PROCEDURE

- **Volume control**: Maximum all adjustments.
- **Connect radio ground** to ground post of signal generator with a short heavy lead.
- **Connect dummy antenna value** in series with generator output lead.
- **Connect output meter across primary** of output transformer.
- **Allow chassis and signal generator** to "heat up" for several minutes.

The following equipment is required for aligning:
- **An all wave signal generator** which will provide an accurately calibrated signal at the test frequencies as listed.
- **Output indicating meter**.
- **Non-metallic screwdriver**.
- **Dummy antennas**: - 1 mF, 200 mmf., 400 ohms.

### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td></td>
<td>455 Kc. 1 mF MFD</td>
<td>Grid of 6SA7</td>
<td>Mixer</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmers on top of top view</td>
<td>Input and Output I.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>SHORT WAVE BAND (See Note A)</td>
<td>17 Mc. 400 Ohms External Antenna and Ground</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C4</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHORT WAVE BAND (See Note A)</td>
<td>17 Mc. 400 Ohms External Antenna and Ground</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C1</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHORT WAVE BAND (See Note A)</td>
<td>6 Mc. 400 Ohms External Antenna and Ground</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C7</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum rock dial (See note &quot;C&quot;)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROADCAST BAND (See Note A)</td>
<td>1600 Kc. 200 mmf. Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROADCAST BAND (See Note A)</td>
<td>530 Kc. 200 mmf. Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full closed</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### LOOP ALIGNMENT (See Note B)

| LOOP ALIGNMENT (See Note B) | 1400 Kc. 200 mmf. External Antenna and Ground | Broadcast | Set Dial at 1400 Kc. | Trimmer C2 | Broadcast antenna | Adjust to maximum output |
| LOOP ALIGNMENT (See Note B) | 600 Kc. 200 mmf. External Antenna and Ground | Broadcast | Set Dial at 600 Kc. | Trimmer C2 | Broadcast oscillator series pad | Adjust to maximum output |

**NOTE "A"**—The signal generator is connected to the "ANT." and "GND" leads when aligning the Short Wave Band and to the grid of the 6SA7 tube and ground terminal when setting the Broadcast Band oscillator end frequencies. (1600 and 530 K. C.)

### TRIMMER VIEW

MANUAL ISSUE A
AUG. 1940
Serial No. 634,400 up

6 TUBE A.C.
2 BAND
BUILT-IN AERIAL
RECORD CHANGER

After each band is completed, repeat the procedure as a final check.
Automatic Record Changer—Operating Instructions

Setting for Size of Record

The Changer plays up to fourteen 10" or ten 12" records at one loading. All records must be the same size for each loading.

On each post you will see selecting arms. The position of these arms determines the setting for different size records. To set for 10 or 12 inch records, it is merely necessary to grasp the posts by the knobs at the top, lift, and turn until the 10" or 12" arrows are pointing toward the center of the turntable. When in either the 10" or 12" position, the posts will snap into place when they are lifted by hand. Be sure to set both posts for the same size record.

Loading

See that the selecting arms of both posts are turned toward the center of the turntable as indicated by the engraved arrows, and that both sets of arms are set for the same size (10" or 12") records as described in the preceding paragraph. Place the stack of records (up to fourteen 10" or ten 12") over the center pin so that they will rest on the selecting arms.

Starting the Changer

1. Turn on the radio (allowing approximately 30 seconds for the tubes to warm up) and turn the phonograph-radio knob, to the phonograph position.

2. Turn the switch knob on the Record Changer panel to “ON”. The motor will then start and the record changer will go into automatic operation of its own accord.

How to Reject a Record

Merely press the switch knob on the Changer panel. You can do it any time after the needle has come into contact with that record.

Playing Individual Records

Should it be desired to play an individual record merely set up the machine as described above for the proper size (10" or 12") as indicated on the selecting arms, place the record on top of the arms as described under “Loading”, and set the machine in operation by means of the switch knob described under “Starting the Changer.” In other words, play an individual record in the same manner as you would play a stack of that size.

Unloading

First switch off the motor. Grasp each post by its knob at the top and turn them out of the way.

Lift the played records from the turntable. Then return the posts to the proper playing position as indicated by the arrows on the selecting arms.

The Changer may then be loaded with a new stack of records according to the size shown on the selecting arms.

Turning Off Changer

Throw Changer switch knob to “OFF” position.

Lift tone arm and place it in the rest position. If you happen to turn off the Changer switch while the mechanism is going through a “change cycle,” you will notice that it does not stop until the cycle has been completed, and the tone arm is again in the playing position at which point it is ready to be lifted to the rest position. If you prefer to turn off your Changer with the radio switch, be sure to turn it off while needle is resting upon a record; otherwise, the selecting arms cannot be correctly reset.

To avoid warping of records, never leave records resting on posts.

If Changer is Left Running

No damage will be done if you forget to turn off Changer after it has played its entire load of records. It will simply repeat the last record until stopped or reloaded.

Phonograph Needles

Various types and kinds of needles are available for use in phonograph tone arms. All have their virtues, as well as their faults, for use on ordinary phonographs, where needles can be changed after each record. For playing more than four records at one setup, as with this Changer, no attempt should be made to use ordinary steel or fibre points, since continued use of worn points will be likely to ruin both quality of reproduction and the records as well. Any kind of needle can be used which has a point durable enough to play ten records or more without damaging them.

It should be remembered that no matter what the quality of the tone arm, amplifying system and speaker, all of the recorded music must pass through the needle. For this reason, it is absolutely essential that particular care be taken to use good needles, and to see that they are changed often enough so that the records are not damaged and the quality of the music is not impaired.

In general there are two types of needles which can be satisfactorily used on an Automatic Record Changer; those which require changing after approximately 12 records, and the so-called permanent type needles which are rated in terms of “hours of service.” In any case should the manufacturers’ claims for these needles be exceeded, since in all probability the needles are rated in terms of their maximum life. If at any time short of the rated life, particularly in the case of the semi-permanent type needles, there is any reason to suspect that the needle has become unduly worn, it would probably be advisable to replace it with a new one. Never use under any conditions a needle that has been removed from the tone arm head and then replaced—needle manufacturers’ claims notwithstanding.

For convenience, the tone arm on your changer may be raised to a nearly vertical position, so that the needle may be easily inserted; the needle screw should be tightened firmly.

Care of Records

To insure long life for your records requires only slight effort. Do not expose them to heat from the sun, nor to heat from nearby stoves or radiators. Store them preferably in albums, but in any case keep them always in a cool, dry place, resting vertically or horizontally. Remove dust and dirt, using soft cloth and light circular motion. If fluids are used for lubricating record surfaces, keep in mind that these often tend to attract dust, and extra effort is necessary to clean it off. Even a fine film of dust very often contains minute particles which, when grounded against the record surface by the steel needle, can cause very rapid wear of the recorded music.
CONVENTIONAL ALIGNMENT - SEE THE SPECIAL SECTION WQX. VIII

FREQUENCY RANGES - BROADCAST - 540 to 1700 KC - Adjust the OSC, RF and ANT trimmers to a maximum peak of 1400 KC, then pad the Oscillator circuit at 600 KC while rocking gang condenser.

SHORTWAVE - 5800 to 16200 KC - Adjust the OSC and ANT trimmers to a maximum peak of 14000 KC. No padding required.

POLICE - 1700 to 5000 KC - Adjust the ANT coil trimmer to a maximum peak of 4000 KC. No other adjustments required.
MODEL D-1117  WESTERN AUTO SUPPLY CO.

SPECIFICATIONS

Power Consumption ........................................... .28 Watts (At 117 volts AC Supply)
Power Output .................................................. .75 Watt Undistorted
Frequency .................................................... 1.2 Watts Maximum
Selectivity ..................................................... 49 KC Broad at 1000 times Signal
Intermediate Frequency ....................................... 456 KC
Speaker ......................................................... 5” Electro-Dynamic

Tuning Frequency Range

B Range ......................................................... 528 to 1600 KC
D Range ......................................................... 5750 to 18,300 KC

Sensitivity (For .05 watt output)—External Antenna

B Range ......................................................... 5 microvolts Average
D Range ......................................................... 40 microvolts Average

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Allow Chassis and Signal Generator to “Heat Up” for several minutes.
The equipment in column at right is required for aligning:

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY</th>
<th>ANTENNA CONNECTION</th>
<th>GROUND CONNECTION</th>
<th>DUMMY ANTENNA</th>
<th>BAND SWITCH</th>
<th>CONDENSER</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. 456 KC</td>
<td>Point &quot;X&quot;</td>
<td>.1 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prong No. 3</td>
<td></td>
<td></td>
<td>3rd I.F. [C17] &amp; [C18]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RANGE B

1600 KC

Signal Grid of 1st Det. Point "X" .1 mf. B Range Turn Rotor to Full Open

1400 KC

External Antenna Lead 200 mmf. B Range Turn Rotor to Max. Output

600 KC

External Antenna Lead 200 mmf. B Range Turn Rotor to Max. Output

RANGE D

18,300 KC

External Antenna Lead Point "X" .40 Ohm D Range Turn Rotor to Full Open

17,000 KC

External Antenna Lead Point "X" .40 Ohm D Range Turn Rotor to Max. Output

ATTENUATE the signal from the signal generator to prevent the leveling-off action of the AVG.

After each range is completed, repeat the procedure as a final check.

NOTE A—Adjust Oscillator Range B [C1] trimmer on gang condenser. Oscillator Range B [C7] auxiliary trimmer on side of chassis is adjusted at factory and ordinarily need not be readjusted in the field.

NOTE B—If the pointer is not at 1400 KC on the dial, set pointer at this mark on the dial scale.

DRIVE CORD REPLACEMENT

Turn gang condenser to completely closed position—see illustration.

Using a new drive cord approximately 50 inches in length, tie one end to tension spring. Pass other end of cord down through hole in groove of drive pulley. Pull spring, flush against inside of pulley rim. Wind cord 3/4 turn clockwise (from front of chassis) around drive pulley. This turn should be on the left side (from gang condenser side of chassis) of pulley groove, Pass cord through hole in pulley groove. Tie cord to tension spring. Stretch tension spring and secure free end to hook on pulley.

Dial Pointer Attachment—Tune in a signal of known frequency. Set pointer at this frequency mark on dial scale. Fasten pointer to cord—See illustration.

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SERVICE INFORMATION

When removing the chassis it is first necessary to remove the "Protector Switch" located on the left side of the cabinet. When checking the chassis on AC or DC it is necessary to insert a piece of metal, similar to the one on the cardboard back, into the "Protector Switch" to close the line circuit.

Speaker (Part No. P-4572) 6" PM Type.

D.C. voice coil resistance........................................ 7.3 ohms
Voice coil impedance at 400 cycles............................ 8.0 ohms

B.C. and S.W. Antenna Coil (Part No. P4582)

Starting with the lug that is connected to ground lead in a clockwise direction, the terminals are: No. 1, ground; No. 2, cond; No. 3, pad; No. 4, grid; No. 5, grid; No. 6, ant.

S.W. Primary—No. 6 and No. 2—Resistance............. 35 ohms
B.C. Primary—No. 1 and No. 2—Resistance.......... 24.1 ohms
S.W. Secondary—No. 3 and No. 4—Resistance........ 0.07 ohm
B.C. Secondary—No. 3 and No. 5—Resistance........ 2.9 ohms

B.C. and S.W. Oscillator Coil (Part No. P-4566)

In a clockwise direction starting at the mounting lug on same side as single lug on other end, the connections are: No. 1, plate; No. 2, grid; No. 3, S.W. pad; No. 4, B.C. pad; No. 5, grid; No. 6, switch; other end, No. 7, B.+

S.W. Primary—No. 1 and No. 6—Resistance........ 0.8 ohm
B.C. Primary—No. 7 and No. 6—Resistance........ 3.8 ohms
S.W. Secondary—No. 2 and No. 3—Resistance........ 0.05 ohm
B.C. Secondary—No. 5 and No. 4—Resistance........ 4.5 ohms

First L.F. Transformer (Part No. P-4569)

Primary—Blue white, plate; red white B+—Resistance 12.1 ohms.
Secondary—White, grid; black white, AVC—Resistance 24.9 ohms.

Second L.F. Transformer (Part No. P-4420)

Primary—Blue white, plate; red white B+—Resistance 15.1 ohms.
Secondary—White, grid; black white, AVC—Resistance 11.8 ohms.

VOLTAGE CHART

All voltages measured with a 1,000 ohm per volt meter on the 150 volt scale (except AC readings). Line voltage 117 volts AC. Volume control maximum and no signal tuned in.

1AG7 TUBE
Plate (3) to ground........................................ 98
Grid (6) to ground....................................... 99

1NSGT (1st L.F.) TUBE
Plate (3) to ground.................................... 76
Screen (4) to ground................................. 100

1NSGT (2nd L.F.) TUBE
Plate (3) to ground.................................... 91
Screen (4) to ground................................. 93

3SQGT TUBE
Plate (3) to ground.................................... 97
Screen (4) to ground................................. 100

3SZGT TUBE
Plate (5) to ground.................................. 117 (AC)
Cathode (9) to ground.............................. 120
SERVICE NOTES

Voltages taken from the different points of the circuit to chassis are measured with volume control in maximum position, all tubes in their sockets and with a volt meter having a resistance of 1000 ohms per volt. These voltages are clearly indicated on the voltage chart.

In order to prevent the signal from acting upon the AVC and affecting accuracy of voltage measurements, aerial and ground leads should be short circuited while making measurements. All voltages should be measured with 117 volts AC input to receiver. Resistance and actual connections of coils and transformers and speaker data are given under Service Information.

To check for open by pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good until the defective unit is located.

FAILURE TO OPERATE, NOISY OR WEAK RECEPTION IS USUALLY DUE TO DEFECTIVE TUBES, THE TUBES MAKING POOR CONTACT WITH SOCKETS OR GRID CLIPS MAKING POOR CONTACT WITH THE CASING OF THE TUBES. TUBES MAY BE CHECKED VERY EASILY BY REPLACING WITH OTHER TUBES WHICH ARE KNOWN TO BE GOOD.

ALIGNING INSTRUCTIONS

All of the adjustments have been carefully set with signal generators at the factory and require no further adjustment, unless the adjustments have been tampered with in the field. Under no circumstances attempt any adjustments without first making certain that adjustment is necessary and only after voltages, tubes and condensers have been checked and found to be normal. To properly re-align this receiver, a signal generator as well as an output meter, must be used.

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>455 KC .1 Mfd. Grid of 1N5GT I.F. tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I.F.</td>
<td>455 KC .1 Mfd. Grid of 1A7GT tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input L.F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHORT WAVE</td>
<td>18,000 KC. 400 ohms Antenna lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Upper Left, Front of Chassis</td>
<td>Short Wave Oscillator</td>
<td>Adjust to receive signal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHORT WAVE</td>
<td>16,000 KC. 400 ohms Antenna lead</td>
<td>Tune Signal</td>
<td>Trimmer—Center, Front of Chassis</td>
<td>Short Wave Antenna</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1700 KC. 200 Mmfd. Antenna lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Lower Left, Front of Chassis</td>
<td>Broadcast Oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1400 KC. 200 Mmfd. Antenna lead</td>
<td>Set dial at 1400 KC.</td>
<td>Trimmer—Right, Front of Chassis</td>
<td>Broadcast Antenna</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>600 KC. 200 Mmfd. Antenna lead</td>
<td>Set dial at 600 KC.</td>
<td>Trimmer—Top of Chassis (See Fig. 1)</td>
<td>Oscillator Series Pad</td>
<td>Adjust to maximum rock dial (See Note 'A')</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note "A"—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of intensity is obtained. Attenuate the signal from the signal generator to prevent the leveling-off action of the A.V.C. Do not bend variable condenser to correct tracking.

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 mfd., 200 mfd., 400 ohms.

Frequency Range—535 to 1730 and 5,750 to 18,100 K.C.
Power output .27 watt undistorted—.35 watt maximum.
Intermediate Frequency 455 K.C.
Adjusting Antenna Trimmer

After the antenna is connected, tune in a weak signal at approximately 1400 KC with the volume control about three-fourths open. Turn the adjusting screw in the antenna trimmer (C4) up or down until maximum output is obtained. See Fig. 3 for location of this trimmer.

Calibrating the Radio

To calibrate the radio, tune in the station of known frequency. Remove the dial lamp housing from the back of the control unit. The calibration screw is at the bottom of the dial lamp tube. Insert a fine bladed screwdriver and turn this screw until the pointer is at the frequency of the station being received.

A short insulated screwdriver will be helpful.

---

ALIGNMENT PROCEDURE

**Volume Control—Maximum All Adjustments.**

The following equipment is required for aligning:

A Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter—Non-Metallic Screwdriver.

Dummy Antenna—0.05 mF., See Note A.

---

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY SETTING</th>
<th>CONNECATION AT RADIO</th>
<th>DUMMY ANTENNA</th>
<th>IRRON CORE SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(See Figs. 3 and 4)</td>
</tr>
<tr>
<td><strong>L.F.</strong></td>
<td>456 KC</td>
<td>Control Grid (ground No. 6)</td>
<td>.05 mF.</td>
<td>Extreme Position out of Coil</td>
<td>1st L.F. (C11) &amp; (C12)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>65A7 1st Det. Tube</td>
<td></td>
<td></td>
<td>2nd L.F. (C15) &amp; (C16)</td>
</tr>
<tr>
<td><strong>OSCIILLATOR</strong></td>
<td></td>
<td></td>
<td></td>
<td>Extreme Position</td>
<td>out of Coil</td>
</tr>
<tr>
<td>1600 KC ADJUSTMENT</td>
<td>Antenna Cable</td>
<td>See Note A</td>
<td></td>
<td></td>
<td>Oscillator (C4)</td>
</tr>
<tr>
<td>1400 KC ADJUSTMENT</td>
<td>Antenna Cable</td>
<td>See Note A</td>
<td></td>
<td>Tune to Max. Output with Tuning Knob</td>
<td>Int. (C5) Ant. (C4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reassemble Radio—Install in Car—Connect Car Antenna to Radio.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Car Antenna Readjustment—Tune in weak signal near 1400 KC—Readjust Antenna Trimmer C4 for maximum output.

---

Attenuate the signal from the generator to prevent the leveling-off action of the AVC.

After each range is completed, repeat the procedure as a final check.

**NOTE A—** Insert the antenna cable plug in the antenna socket on the chassis. The total capacity of the antenna cable and dummy antenna should be 60 mmF. If the cable, for example, has a capacity of 30 mmF, use a 30 mmF. condenser for a dummy antenna. Connect the other end of the antenna cable through the dummy antenna capacity to the output of the signal generator.

CALIBRATION—To calibrate the radio, tune in a station of known frequency. At the back of the control unit is the calibration screw. Remove the dial lamp assembly. Insert a fine bladed screwdriver and turn this screw until the pointer on the dial scale is at the frequency of the station being received.

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Compliments of www.nucow.com
Bottom View of Chassis Showing Socket Voltages, Parts Location, and R-F Wiring

*NOTE:* Values with star (*) are operating voltages in circuits with high-series-resistance. These voltages will be lower when measured with a voltmeter drawing current through the circuit. Exact voltage may be measured with a vacuum-tube voltmeter if desired. The other values will not be affected by measuring with an ordinary high-resistance voltmeter.

Measurements made to chassis unless otherwise indicated, with set tuned to quiet point and volume control at minimum. Values should hold within approximately ±20% with 117-volt a-c supply.

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# Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the chassis drawing. Turn the receiver volume control to maximum.

**Output Meter Alignment:**—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

**Test-Oscillator:**—For all alignment operations, connect the low side of the test-oscillator to the black lead and keep the output as low as possible to avoid a-v-c action.

**Calibration Marks:**—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment. Therefore calibration marks corresponding to dial readings of 500 kc and 1,500 kc have been stenciled on the plate on the front of the chassis, as shown in the accompanying drawing. These marks are used for reference during alignment.

**Drum and Dial Indicator Adjustment:**—As the first step in i-f alignment, check the position of the drum on the front shaft of the gang condenser. With the gang at maximum (full mesh) the drum set-screw should be pointing directly down as shown in the drawing. With the drum in this position, and the gang at maximum, move the dial indicator along the drive cord to coincide with the left-hand line as shown. The indicator is held to the drive cord by means of spring clips.

After completion of alignment, and after the chassis has been fastened in the cabinet, turn the gang to maximum and note whether the dial indicator is at the left-hand end mark on the dial; if it is not, loosen the drum set-screw

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-osc. to</th>
<th>Tune test-osc. to</th>
<th>Turn radio dial to</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6K7 1-F grid cap, in series with .01 mfd.</td>
<td>455 kc</td>
<td>Quiet point between 500-750 kc</td>
<td>L7 and L8 (2nd I-F Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>6AB-8 grid cap, in series with .01 mfd.</td>
<td>455 kc</td>
<td>L5 and L6 (1st I-F Trans.)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Antenna lead (blue) in series with 200 mmmf.</td>
<td>1,500 kc</td>
<td>1,000 kc calibration mark</td>
<td>C6 (osc.) *</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C3 (ant.)</td>
</tr>
</tbody>
</table>

FOLLOW “Adjustments for Electric Tuning”

* Use minimum capacity peak if two peaks can be obtained.

The oscillator section of the gang condenser has two trimmers, one on top, accessible through a hole in the chassis, and the other on bottom. It may be necessary to adjust both of these trimmers to secure a peak on 1,500 kc.

---

**Push-Button Adjustments**

Nos. 1, 2—Approximately 600-900 kc.
Nos. 3, 4—Approximately 600-1,080 kc.
Nos. 5—Approximately 600-1,500 kc.

---

**Adjustments for Electric Tuning**

These models have six push-buttons. The right-hand button connects the gang condenser for dial tuning. The other five buttons are for electric tuning of five different stations in the standard-broadcast range. The station buttons connect to separate magnetically-tuned oscillator coils and separate antenna trimmers which must be adjusted for the desired stations.

Use an insulated screwdriver or alignment tool. Allow at least five minutes warm-up period before making adjustments. Use a regular antenna for the preliminary adjustments.

The procedure is as follows:
1. Make a list of the five desired stations, arranged in order from low to high frequencies.
2. Push in the dial-tuning (right-hand) button, and manually tune in the first station on the list.
3. Push station-button No. 1 (left-hand) and adjust No. 1 oscillator core (L12) to receive this station. Screw the core all the way in, to lowest frequency, and then unscrew slowly until the station is received.
4. Adjust No. 1 antenna trimmer (C50) for maximum output on this station.
5. Adjust for each of the remaining four stations in the same manner.

(Clockwise adjustment of oscillator cores and antenna trimmers tunes the circuits to lower frequencies.)
6. Make a final careful adjustment of the oscillator cores and antenna trimmers, using one or two feet of wire as an antenna to ensure sharp peaking.
Schematic Circuit Diagram

FOR FURTHER DATA SEE INDEX

WR-172 is a table model with a six inch speaker; WR-373Y is a console model with a twelve inch speaker. Both models have six tubes, AC-DC operated, have six push buttons for tuning, a horizontal Slide Rule dial, and a Precision Eye for precise manual tuning.

Power Output (125 volts, 60 cycle supply)
Undistorted ........................................... 0.8 watts
Maximum ............................................. 1.4 watts

Power Supply Ratings
A-C Rating ........................................... 105-125 volts, 50-60 cycles, 35 watts
D-C Rating ........................................... 105-125 volts, direct current, 35 watts

Loudspeaker
Type ................................................. Permanent Magnet Dynamic

Model WR-172 ........................................ 6-inch
Model WR-373Y ...................................... 12-inch

Voice Coil Impedance at 400 cycles ........................................... 3.5 ohms

Phonograph Terminal Board—A 3-terminal board is located on the rear of the chassis for connecting a phonograph pickup, or Record Player, into the audio amplifier of the receiver. The accompanying schematic shows connections for a high-impedance pickup with a switch for changing from radio to records. For low-impedance pickups, a suitable step-up transformer should be used to provide proper impedance matching, and should be connected between the pickup and radio-phono switch.

Record Player Connections, Using a Double-Pole, Double-Throw Toggle Switch

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Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the schematic drawing.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test Oscillator.—For all alignment operations, connect the low side of the test oscillator to the receiver ground binding post, and keep the output as low as possible to avoid A.V.C. action.

Calibration Marks.—The tuning dial is fastened in the cabinet and can not be used for reference during alignment. Therefore calibration marks corresponding to dial readings of 600 kc, 1,500 kc, 6.1 mc, and 20 mc have been stamped in the plate on the front of the chassis as shown in the accompanying drawing. These marks are used for reference during alignment.

Dial Indicator Adjustment.—With the gang condenser in full mesh, the indicator should point 3/4 inch to the left of the mark at the extreme left (low frequency) end of the dial scale.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of the test osc. to—</th>
<th>Tune test osc. to—</th>
<th>Turn radio dial to—</th>
<th>Adjust the following for maximum peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antenna terminal</td>
<td>455 kc</td>
<td>&quot;A&quot; Band Quiet point between 500-750 kc</td>
<td>C5 and C4 (2nd I-P trans.)</td>
</tr>
<tr>
<td>2</td>
<td>Antenna terminal in series with 300 ohms</td>
<td>30 mc</td>
<td>&quot;C&quot; Band 20 mc calibration mark</td>
<td>C5 (osc.)*</td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal in series with 200 mmf.</td>
<td>1,500 kc</td>
<td>&quot;A&quot; Band 1,500 kc calibration mark</td>
<td>C7 (osc.)</td>
</tr>
<tr>
<td>4</td>
<td>Antenna terminal in series with 200 mmf.</td>
<td>600 kc</td>
<td>&quot;A&quot; Band 600 kc calibration mark</td>
<td>C6 (ant.)</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>Rock gang</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Repeat Step 6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Use minimum peak if two can be obtained. Check to determine that C5 has been adjusted properly by tuning receiver to approximately 19.09 mc where a weaker signal should be received.

Note: Oscillator tracks above signal on both bands.

Alignment Procedure

WR-175 and WR-176

Output Meter Alignment.—Connect the meter across the voice coil and turn the receiver volume control to maximum.

Test Oscillator.—Connect the low side of the test-oscillator to the receiver chassis, through a .01 mfd capacitor, and keep the output as low as possible.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-oscillator to—</th>
<th>Tune test-osc. to—</th>
<th>Turn radio dial to—</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tuning condenser stat. (osc.) in series with .01 mfd.</td>
<td>455 kc</td>
<td>Quiet point at 1,000 kc end of dial</td>
<td>C1, C2, C3, C4 (C1 and 2nd I-P transformers)</td>
</tr>
<tr>
<td>2</td>
<td>Antenna term. of ant. loop in series with 100 mmfd.</td>
<td>1,600 kc</td>
<td>Full clockwise (out of mesh)</td>
<td>C6 (oscillator)</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>1,500 kc</td>
<td>Resonance on 1,500 kc signal</td>
<td>C6 (antenna)</td>
</tr>
</tbody>
</table>

RECORD PLAYER CONNECTIONS, WR-272, WR-372

Photograph or Television Attachment.—A terminal board is provided on the rear of the chassis for connecting a record player or television attachment into the audio-amplifying circuit.

On Models WR-272 and WR-372 the cable from the attachment should be connected to terminals 1 and 3. The shielded or ground lead going to terminal 1. When using the attachment the connection link is disconnected and volume is controlled by the control on the phonograph or television attachment.

The accompanying schematic shows connections for a high-impedance pickup with switch for changing from radio to records. For low-impedance pickups, a suitable step-up transformer should be used to provide proper impedance matching, and should be connected between the pickup and radio-phono switch.

The Model WR-373 has the Radio-Phono-Television switch built into the chassis, allowing switching to be accomplished thru the "Tone-Radio-Phono-Television" Control on the front of cabinet.
Schematic Circuit Diagram Model WR-173L

Precautionary Lead Dress

1. Dress lead I-F plate and grid leads against chassis and away from each other. Dress plate lead from 12SK7 close to chassis.
2. Dress electrolytic capacitor against rear apron.

TRIM OSC 1720 KC
TRIM ANT 1500 KC

Schematic Circuit Diagram Model WR-174L

©John F. Rider, Publisher
Precautionary Lead Dress
1. Dress lead F plate and grid leads against chassis and away from each other. Dress plate lead from 12SK7 close to chassis.
2. Dress leads from terminal board on loop support away from loop.

Power Supply Ratings
105-125 volts, 50-60 cycles, 30 watts
105-125 volts, direct current, 30 watts

FOR OTHER DATA SEE INDEX
Figure No. 2

I-F ALIGNMENT: Volume control, maximum, tone control treble, wave switch, broadcast, dial set 500 kHz. Apply 465 kHz to grid of 6X7 i-f tube. Adjust trimmer 35 for maximum output. Apply 465 kHz to grid of 6A8 and adjust trimmers 17 and 18 for maximum output.

BROADCAST BAND ALIGNMENT: Apply 465 kHz to antenna lead, adjust wave trap trimmer 4 for minimum output.

Apply 1700 kHz through .0002 µf dummy. Adjust trimmer 11 until signal is received. Adjust trimmer 3 (middle). Set dial and generator to 600 kHz, adjust trimmer 12.

S-F BAND ALIGNMENT: Wave switch to s-w position. Set dial and generator to 6000 kHz, adjust trimmer 10 until signal is received. Adjust trimmer 2 (top) for maximum output.

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Adjustments for Push-Button Tuning

The push-buttons should be adjusted for six favorite stations after the receiver has been operating for a brief warm-up period. Each button may be set up to any standard broadcast station. The preferable arrangement is to adjust for stations in the order of frequency, from low to high. Proceed as follows:

1. Loosen the push buttons by turning counter-clockwise about one turn from their tight position so they turn freely.
2. Check to be sure the link connection on back of chassis is in 'Radio' position (connected between terminals 2 and 3).
3. Press in push-button No. 1 (left) as far as it will go without undue pressure, hold in, retune station with manual control if necessary for best reception, and then carefully tighten up the button. Do not tighten more than ¼ turn after the screw begins to grip or damage to the mechanism may result.
4. Proceed in a similar manner for the remainder of the push-buttons.
5. Insert the station marker tabs in the recesses above the push-buttons.
Alignment Procedure

Before proceeding with alignment the following lead dress should be carefully checked.
1. Dress loop lead (3) away from tap lead (4) and chassis.
2. Dress AC power leads away from sockets.
3. Dress leads from band switch to trimmers away from each other and away from chassis.
4. Dress blue lead and two green leads from terminal board away from chassis and away from each other.
5. Dress green lead from volume control to rear terminal away from all parts and against chassis.

Cathode-Ray Alignment is the preferable method. Connections for the oscilloscope are shown in the schematic drawing.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the output as low as possible to avoid a-v-c action.

Calibration Scale on Indicator-Drive-Cord Drum.—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment; therefore, a calibration scale is attached to the tuning drum. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment table.

Pointer for Calibration Scale.—Improvise a pointer for the calibration scale by fastening a piece of wire to the chassis, and bend the wire so that it points to the 0° mark on the calibration scale when the plates are fully meshed.

Dial-Indicator Adjustment.—After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator 1/16 inch to the left of the mark at the extreme left (540 kc) end of the dial scale, with gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

Receiver Dial Scales, and Corresponding 0-180° Calibration Scales

The corresponding position of the dial indicator for any setting of the calibration scale can be determined by drawing a line from this point on the bottom calibration scale to the same point on the top calibration scale. For example, 24° on the calibration scale corresponds to 600 kc on "A" band. Read instructions under "Alignment Procedure."

---

Record Player Connections, Using a Double-Pole Double-Throw Toggle Switch

The accompanying schematic shows connections for a high-impedance pickup with switch for changing from radio to records. For low-impedance pickups, a suitable step-up transformer should be used to provide proper impedance matching, and should be connected between the pickup and radio-phono switch.

 Loudspeaker.—To center the loudspeaker voice coil, first remove the front dust cover, then loosen the screws, holding the spider assembly. Insert three narrow feelers into the air gap, and tighten the spider screws. Remove the feelers and fasten a dust cover in place with loudspeaker cement.
To properly align the circuits of the receiver, it is essential to use a high-grade modulated test oscillator, the output of which must be adjustable and capable of being varied when the individual circuits are brought into alignment. The output meter should be connected across the speaker in order to facilitate proper alignment. The sensitivity of the output meter must be sufficient to give a satisfactory reading with a low input signal.

A zero center micro-ammeter with an approximate 0-500 scale is absolutely essential for the proper alignment of the discriminator circuit.

Before attempting to align the receiver, the circuit, position of alignment adjustments and chassis layout should be familiarized. The top and bottom views of the chassis are shown in Figures 1 and 2.

ADJUSTMENT OF THE 1.75 M. DIPPER COIL 466 KC.
3. Refer to bottom view of chassis and connect a 50,000 ohm resistor between points "A" and "B" under R.F. coil #44.
4. Turn the receiver "QH" and to the position immediately after set is turned on. Set volume control on full. Set A.F. switch in "GPP" position. Set high fidelity control in a left hand or "WIND" position. Set wave change switch to broadcast position.
5. Connect the output meter across the speaker voice coil.
6. Set the test oscillator to 465 KC.
7. Adjust the bottom adjustment screw on coil #44 for minimum output.
8. Adjust the bottom adjustment screw on coil #44 for maximum output.

Note: In adjusting the two remaining bands, a 0.005 mf condenser and a 400 ohm resistor connected in series should be inserted between the test oscillator and the antenna terminal of the receiver. This combination is the approximate equivalent of a short wave antenna.

ADJUSTMENT OF THE 1.5 M. DIPPER COIL 466 KC.
1. Connect the micro-ammeter between the grid of the 6AS detector-oscillator tube and ground.
2. With test signal still applied to the I.F. tube increase the signal output of the oscillator.
3. Adjust the bottom screw on the discriminator coil #78 for maximum deflection of the micro-ammeter (either direction).
4. Adjust the top screw on the discriminator coil until a zero reading on the micro-ammeter is reached. To check this alignment, vary the I.F. signal slightly to each side of the 466 setting and the micro-ammeter should show a deflection first on one side and then the other of the zero point.

ADJUSTMENT OF THE BROADCAST BAND.
1. With the gang condenser completely in place, check the position of the dial pointer which should be at the end horizontal line of the scale.
2. Connect the test oscillator and dial pointer to 1500 KC.
3. Adjust the oscillator trimmer #14.
4. Connect the test oscillator to the antenna terminal of the receiver through a 0005 mf condenser.
5. Adjust the R.F. and antenna trimmers #17 and #8 for maximum output.
6. Set the test oscillator and dial pointer to 600 KC.

ADJUSTMENT OF THE SHORT WAVE BAND.
1. Connect the micro-ammeter between the grid of the 6AS detector-oscillator tube through a 0.005 mf. blocking condenser.
2. Adjust the four I.F. trimmer condensers #6, #10, #11 and #12 to maximum output.
3. Connect the test oscillator to the antenna terminal through a 0005 mf condenser and a 400 ohm resistor in series so that the 6AS should be inserted between the antenna terminals and the high side of the test oscillator. This combination is the approximate equivalent of a short-wave antenna.

ADJUSTMENT OF THE GREEN BAND.
1. Turn the wave-change switch to the green band position.
2. Set the test oscillator and dial pointer at 5000 KC.
3. Adjust the oscillator trimmer #28.
4. Check sensitivity and calibration over the scale.

ADJUSTMENT OF THE RED BAND.
1. Turn the wave-change switch to the red band position.
2. Set the test oscillator and dial pointer at 16000 KC.
3. Adjust the oscillator trimmer #28. Two positions may be found at which the signal can be heard. Use the one with the least capacity or with the trimmer further out.
4. Adjust the R.F. and antenna trimmers #17 and #8 for maximum output.
5. Check calibration and sensitivity over the scale.

This model is a single-tube, alternating-current, three-band, superheterodyne receiver designed to operate over the standard broadcast band, extending from 550 to 1700 KC, the short-wave band extending frequencies between 7000 and 18,500 KC.

LINE-UP CAPACITOR ADJUSTMENTS.
To properly align the circuits of this receiver, it is essential to use a high-grade modulated test oscillator, the output of which can be adjusted so that when the individual circuits of the receiver are brought into alignment, a conventional output meter should be connected across the terminals of the speaker voice coil to determine when the individual circuits are correctly aligned. The sensitivity of the meter must be sufficient to give a satisfactory reading with a low input signal.

ALIGNMENT OF I.F. (465 KC).
1. Set the volume control to maximum position, the wave-change switch to the standard broadcasting band and the dial pointer to approximately 600 KC.
2. Connect the output meter across the voice coil terminals of the speaker.
3. Set the test oscillator to 465 KC.
4. Use the test oscillator to produce a readable and adjustable reading on the output meter when the test signal is applied to the grid of the first detector-oscillator tube through a 0.005 mf. blocking condenser.
5. Adjust the four I.F. trimmer condensers #6, #10, #11 and #12 to maximum output.
6. Connect the test oscillator to the antenna terminal through a 0005 mf condenser and an 800 ohm resistor in series so that the 6AS should be inserted between the antenna terminals and the high side of the test oscillator. This combination is the approximate equivalent of a short-wave antenna.
7. Adjust the oscillator series (lag) condenser #15 at the same time that the gang condenser slightly back and forth until a maximum is reached.
8. Return the test oscillator and dial pointer to the 16000 KC, setting and re-check trimmers #14, #15 and #28.
9. Check sensitivity and calibration over the scale.

NOTE: In adjusting the two remaining bands, a 0005 mf condenser and a 400 ohm resistor connected in series should be inserted between the test oscillator and the antenna terminal of the receiver. This combination is the approximate equivalent of a short wave antenna.

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MODELS WR-274, WR-374 WESTINGHOUSE ELEC. SUPPLY CO., INC.

Steps | Connect the high side of the test-osc. to | Tune test-osc. to | Turn radio dial to | Adjust the following for maximum peak output
--- | --- | --- | --- | ---
1 | 6SK7 grid in series with .01 mfd. | 455 kc | "A" band Quiet point between 550-1500 kc | L3 and L4 (2nd I-F trans.)
2 | 6SA7 grid in series with .01 mfd. | | | L1 and L2 (1st I-F trans.)
3 | Ant. terminal in series with 300 ohms | 20 mc | 20 mc (200") | C1 (osc.)
4 | | 6 mc | 6 mc (187.5") | C2 (ant.)
5 | | 1,500 kc | 1,500 kc (188.25") | C3 (osc.)
6 | Ant. terminal in series with 300 mfd. | 600 kc | 600 kc (90.75") | C4 (ant.)
7 | | | | L5 (osc.)

* Use minimum capacity peak if two can be obtained. Check to determine that C1 has been adjusted to correct peak by tuning receiver to approximately 19.09 mc where a weaker signal should be received.
** Use minimum capacity peak if two can be obtained. Check to determine that C3 has been adjusted to correct peak by tuning receiver to approximately 5.09 mc where a weaker signal should be received.

Note.—Oscillator tracks above signal on all bands.

Loudspeaker.—To center the loudspeaker voice coil, first remove the front dust cap, then loosen the screws holding the spider assembly. Insert three narrow feelers into the air gap, and tighten the spider screws. Remove the feelers and fasten a dust cover in place with loudspeaker cement.

Phonograph or Television Attachment.—A terminal board is provided on the rear of the chassis for connecting a record player or Television attachment into the audio-amplifying circuit. The cable from the record player should be connected to terminals 1 and 2, the cable from the Television attachment going to terminals 2 and 3. Terminal 2 is chassis ground and the shield or ground lead from either of the attachments should be connected to this terminal.

Precautionary Lead Dress.—On Model WR-274, the lead from 6SF5 plate to 6F6G should be dressed close to chassis. Power cord should be dressed away from power transformer.

Adjustments for Push-Button Tuning

The push-buttons should be adjusted for six favorite stations after the receiver has been operating for a brief warm-up period. Each button may be set up to any standard broadcast station. The preferable arrangement is to adjust for stations in the order of frequency, from low to high. Proceed as follows:

1. Loosen the push-buttons by turning counter-clockwise about one turn from their tight position so they turn freely.
2. Check to be sure the Phono-Radio switch is in "Radio" position.
3. Press in push-button No. 1 (left) as far as it will go without undue pressure. Hold in, retune station with manual control if necessary for best reception, and then carefully tighten up the button. Do not tighten more than ¼ turn after the screw begins to grip or damage to the mechanism may result.
4. Proceed in a similar manner for the remainder of the push-buttons.
5. Insert the station marker tabs in the recesses above the push-buttons.

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The corresponding position of the dial indicator for any setting of the calibration scale can be determined by drawing a line from this point on the bottom calibration scale to the same point on the top calibration scale. For example, 37.5° on the calibration scale corresponds to 600 kc on "A" band. Read instructions under "Alignment Procedure."

Adjustments for Push-Button Tuning

The push-buttons should be adjusted for six favorite stations after the receiver has been operating for a brief warm-up period. Each button may be set up to any standard broadcast station. The preferable arrangement is to adjust for stations in the order of frequency, from low to high. Proceed as follows:

1. Loosen the push-buttons by turning counter-clockwise about one turn from their tight position so they turn freely.

2. Check to be sure the Phono-Radio switch is in "Radio" position.

3. Press in push-button No. 1 (left) as far as it will go without undue pressure, hold in, release and return with manual control if necessary for best reception, and then carefully tighten up the button. Do not tighten more than ¼ turn after the screw begins to grip or damage to the mechanism may result.

4. Proceed in a similar manner for the remainder of the push-buttons.

5. Insert the station marker tabs in the recesses above the push-buttons.

Alignment Procedure

Before proceeding with alignment the following lead dress should be carefully checked:

1. Dress AC switch leads away from tube sockets.

2. Do not twist loop leads together or around each other. Spacing between leads from "C" band loop to chassis is important—see alignment step "i" below.

3. "High side" leads from loop sockets, range switch, oscillator coil, and trimmers must be dressed away from chassis and each other.

4. Dress the 470 muf, and 56 muf condensers going to the grid and osc. grid of the 6SA7 tube away from each other.

Calibration Scale on Indicator-Drive-Cord Drum.—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment; therefore, a calibration scale is attached to the tuning drum. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment table.

As the first step in r-f alignment, check the position of the drum. The 120° mark on the drum scale must be vertical and directly under the center of the shaft of the tuning drum when the plates are fully meshed. The drum is held to the shaft by means of two set-screws, which must be tightened securely when the drum is in the correct position.

On the inner side of the tuning drum are two projections which serve as stops to prevent extreme rotation of the gang condenser. The tuning drum should be set so that the stop limiting clockwise movement of the drum takes effect just as the gang condenser plates are becoming fully meshed, thus preventing stress on the gang due to extreme rotation.

Pointer for Calibration Scale.—Improve a pointer for the calibration scale by fastening a piece of wire to the chassis, and bend the wire so that it points to the 0° mark on the calibration scale when the plates are fully meshed.

Dial-Indicator Adjustment.—After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator set ¼ inch to the left of the 540 kc mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.
**Push Button Adjustments**

Calibration Scale on Indicator-Drive-Cord Drum.—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment, therefore a calibration scale is attached to the indicator-drive-cord drum which may be divided into degrees. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment table.

As the first step in alignment, check the position of the drum. At the 90° mark on the drum scale must be vertical, and directly under the center of the gang condenser shaft when the plates are fully meshed. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

To determine the corresponding frequency for any setting of the calibration scales, refer to the accompanying drawing which shows the dial with 0-180° calibration scales drawn at top and bottom.

**Pointer for Calibration Scale**—Improve a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bend the wire so that it points to the 0° mark on the calibration scale when the plates are fully meshed.

**Dial-Indicator Adjustment**.—After fastening the chassis in the cabinet, attach the dial indicator to the drive cord with pointer at the 540 kC mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

**Precautionary Lead Dress**—
1. Dress 2nd I.F. leads close to chassis.
2. Dress leads from volume control and tone switch away from filaments, diode, and power leads.
3. Dress .005 mm. volume control condenser away from electrolytic.

**Arrangement of Drive Cord for Condenser and Dial Indicator**

- **Steps**
  - 1. Disconnect test osc. from condenser.
  - 2. Connect test osc. to condenser.
  - 3. Connect test osc. to condenser.
  - 4. Connect test osc. to condenser.
  - 5. Connect test osc. to condenser.
  - 6. Connect test osc. to condenser.
  - 7. Connect test osc. to condenser.
  - 10. Connect test osc. to condenser.

- **Connect the high side of test osc. to**
  - L3 and L4 (2nd I.F. Trans.)
  - L1 and L2 (1st I.F. Trans.)
  - C1 (ant.)
  - C2 (osc.)
  - C4 (osc.)
  - L5 (ant.)
  - L6 (osc.)
  - Rock gang

- **Tune test osc. to**
  - 455 kc
  - 15.2 mc
  - 2,444 mc
  - 1,500 kc
  - 600 kc
  - 1,500 kc
  - 1,500 kc
  - 600 kc
  - 600 kc

- **Range switch**
  - "A"
  - "C"
  - "B"
  - "A"
  - "A"
  - "A"
  - "A"
  - "A"
  - "A"

- **Turn radio dial to**
  - 148.50
  - 97
  - 160
  - 20
  - 148.50
  - 97
  - 160
  - 20

- **Adjust the following for max. peak output**

**Calibration Scale**

The corresponding position of the dial indicator for any setting of the calibration scale can be determined by drawing a line from this point on the bottom calibration scale to the same point on the top calibration scale. For example, 30° on the calibration scale corresponds to 600 kc on "A" band. Read instructions under "Alignment Procedure."

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Compliments of www.nucow.com
MODELS WR-473
WR-474
WR-474L

WESTINGHOUSE ELEC. SUPPLY CO. INC.

AUTOMATIC RECORD CHANGER

Before servicing the automatic record changer, inspect the assembly to see if all lengthening parts, gears, springs, etc., are in good order and are correctly assembled.

A bind or jam in the mechanism can usually be relieved by rotating the troublesome section of the tone arm.

The changer can be conveniently rotated through its change cycle by pushing the selector lever to "Reject" and revolving the turntable by hand. Six turntable revolutions are required for one change cycle.

If the record changer or cabinet is not perfectly level, normal operation is likely to be affected.

The 10 and 12 inch records must be absolutely flat for smooth operation when using the two sizes.

A shorting switch, located in the pickup head, operates due to pressure when the pickup is placed on the pickup rest.

ADJUSTMENTS

A. Main Lever.—This lever is basically important in that it interlocks the various internal mechanisms which control needle landing, tripping, record separation, etc. One adjustment is provided for the main lever. To adjust it, disengage the change cycle and adjust rubber bumper bracket (A) so that the roller clears the nose of the cam plate by 1/16 inch.

B. Friction Clutch.—The motion of the tone arm toward the center of the record is controlled by the pickup lift cable, to the end of the tone arm, to the friction clutch "F." If the motion of the pickup lift cable is abruptly retarded or becomes irregular due to swinging in the eccentric groove, the trip finger "T" moves the trip pawl "P2" into engagement with the pawl on the main gear, and the change cycle is started. Proper adjustment of the friction clutch "F" occurs when movement of the tone arm causes positive movement of the trip pawl "P2" without tendency of the clutch to slip. The friction should be just enough to prevent backlash and is adjustable by means of screw "B." If adjustment is too tight, the needle will repeat grooves if too loose, tripping will not occur at the end of the change cycle.

C. Pickup Lift Cable Screw.—During the record change cycle, lever 15 is actuated by the main lever 14, so as to raise the tone arm clear of the record by means of the pickup lift cable. To adjust the pickup for proper elevation, stop the changer in cycle at the point where the pickup lift cable passes above the turntable plate, and has not moved outwards; at this point adjust the pickup lift cable screw to obtain 1 inch spacing between needle point and turntable top surface.

D. A. B. Needle Landing on Record.—The relation of coupling between the tone arm vertical shaft and lever 20 determines the landing position of the needle on an 10 inch record. Position of eccentric stud "E" governs the landing of the needle on a 12 inch record; this, however, is dependent on the proper 10 inch adjustment.

To adjust for needle landing, place 10 inch record on turntable; push index lever to reject position and return to the 10 inch record; see that pickup leveling lever 17 is tilted fully toward turntable; rotate mechanism through cycle until needle is just ready to land on record; then see that pin "V" or lever 14 is in contact with "Step 2" on lever 17. The correct point of landing is 1.11/16 inches from the nearest edge of the turntable spindle; loosen the two screws "D" and adjust horizontal position of tone arm to proper dimension, bearing in mind that the lever 17 is 1/16 inch further away than the cam plate. Leave approximately 1/32 inch end play between hub of lever 20 and pickup base bearing, and tighten the blunc nose screw "D"; run mechanism through several cycles as a check, then tighten cone pointed screw "D." After adjusting for needle landing on a 10 inch record, place 12 inch record on turntable; push index lever to reject and return to 12 inch position; rotate mechanism through cycle until needle is just ready to land on turntable; the correct point of landing is 5-11/16 inches from nearest side of spindle. If the landing is incorrect, turn stud "D" until eccentric end adjusts lever 14 to give correct needle landing. The eccentric stud is the only way the tone arm can be adjusted to land properly. Otherwise incorrect landing may occur with 10 inch records.

NOTE: Numbers refer to parts—letters refer to adjustments

F & G. Record Separating Knife.—The upper plate (knife) "25" is so positioned that the record posts serve to raise the lower record from the shelf as soon as the record is formed. "25" is accurately maintained. The spacing for the 12 inch record is 0.058 inch, and for the 10 inch record is 0.076 inch.

H. Feed Support.—The record shelf revolves in the change cycle to allow the lower record to drop onto the turntable. Both posts are rotated simultaneously by a gear and screw related to the main lever 15, and it is this adjustment which sets the position of the turntable. To adjust, place a 12 inch record on the turntable, rotate the knife to the point of minimum vertical separation from the record shelf, and look down through the turn screw and locknut "G" to give 0.065 inch separation. Screw "C" to depressed during this adjustment. After setting screw "F" adjust screw "G" so that when its tip is depressed flush with the top of record shelf, the vertical spacing between the edge of the knife, in its lowest rotational position, and the shelf is 0.070 inch.

H. Record Support Shelf.—The record shelf revolves in the change cycle to allow the lower record to drop onto the turntable. Both posts are rotated simultaneously by a gear and screw related to the main lever 15, and it is this adjustment which sets the position of the turntable. To adjust, place a 12 inch record on the turntable, rotate the knife to the point of minimum vertical separation from the record shelf, and look down through the turn screw and locknut "G" to give 0.065 inch separation. Screw "C" to depressed during this adjustment. After setting screw "F" adjust screw "G" so that when its tip is depressed flush with the top of record shelf, the vertical spacing between the edge of the knife, in its lowest rotational position, and the shelf is 0.070 inch.

J. Tone Arm Rest Support (not shown).—When the changer is out of cycle, the front lower edge of the pickup head should be 5/16 inch above surface of motor board. This may be adjusted by bending the tone arm rest bracket, which is associated with the tone arm mounting base, in the required direction.

K. Trip Pawl Stop Pin.—The position of the trip pawl stop pin "K" is fixed between the main lever 15 and the stop pin "K" to locate the roller to the shaft. By bending the pin support either toward or away from trip pawl bearing stud, it is possible to move the cam plate or the cam earlier or later, respectively. This adjustment should be made so that the roller definitely clears the cam outer guide as well as the nose of the cam plate.

Lubrication.—Petroleum or petroleum jelly should be applied to cam, main gear, spindle pinion gear, and gears of record posts.

Do not allow oil or grease to come in contact with, rubber mounting of tone arm base, rubber bumper, or rubber spindle cap.

MISCELLANEOUS SERVICE HINTS

Incorrect adjustment of a particular mechanism of the changer is generally exhibited in a specific mode of improper operation. The following relations between effects on operation and the usual misadjustments will enable ready adjustment in most cases.

1. For any irregularity of operation, the adjustment of the main lever 15 should be checked first in "A."

2. Needle does not land properly on both 10 and 12 inch records.—Make complete adjustments "D" and "E."

3. Needle does not land properly on 10 inch record but correct on 12 inch record.—Effect adjustment "E."

4. Failure to trip at end of record.—Increase clutch "P" friction by means of screw "A." Also, see that lever "7" and "12" are free to move without touching each other.

5. Pickup strikes lower record of stack or drags across top record on turntable.—Increase tension of pickup cable adjustment "B." May be too tight; bind in tone arm vertical bearing; levers "7" and "12" fouled; or pickup output cable twisted.

6. Cycle commences before record is complete.—Record is defective, or adjustment "B" of friction clutch "S" is too tight.

7. Record knives strike edge of records.—Records warped; record edges are rough; or knife adjustments "F" and "G" are incorrect.

8. Record not released properly.—Adjust record shelf assemblies in respect to shaft by means of adjustment "H."

9. Needle lands in 10 inch position on 12 inch record or misses record when playing both types mixed.—Increase tension of pickup locating lever spring "4."
Automatic Record Changer

Details of Record Shelf Posts, and Locating Lever Assemblies

The crystal pickup is sealed in a metal case as protection against extreme changes of climate. If failure occurs, do not attempt to repair the unit, but install a new crystal unit.

The phonograph motor is a self-starting constant-speed induction type.

Motor Lubrication.—Apply a few drops of light machine oil to the spindle bearing and oil hole every six months. The oil hole is located in the motor casting, adjacent to the spindle bearing, and on Model WR-474 is covered with a screw plug.

The automatic stop (Model WR-473) should be adjusted so that the lever will snap to the "off" position when the pickup needle is 1/4 inches from the center line of the spindle.

Turntable Assembly (All Models)

Adjustments for Push-Button Tuning

The push-buttons should be adjusted for six favorite stations after the receiver has been operating for a brief warm-up period. Each button may be set up to any standard broadcast station. The preferable arrangement is to adjust for stations in the order of frequency, from low to high. Proceed as follows:

1. Loosen the push-buttons by turning counter-clockwise about one turn from their tight position so they turn freely.
2. Check to be sure the Phono-Radio switch is in "Radio" position.
3. Press in push-button No. 1 (left) as far as it will go without undue pressure, hold in, retune station with manual control if necessary for best reception, and, then carefully tighten up the button. Do not tighten more than 1/4 turn after the screw begins to grip or damage to the mechanism may result.
4. Proceed in a similar manner for the remainder of the push-buttons.
5. Insert the station marker tabs in the recesses above the push-buttons.

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Alignment Procedure

Before proceeding with alignment the following lead dress should be carefully checked.

1. Do not twist loop leads together or around each other.
2. Spacing between leads from "C" band loop to chassis is important—see alignment step "5" below.
3. High side" leads from loop sockets, range switch, oscillator coil, and trimmers must be dressed away from chassis and each other.
4. Dress the two 100 mmf. condensers going to the grid and osc. grid of the 6SA7 tube away from each other.
5. Dress the .01 mfd. 6PG6 grid condenser away from power switch.

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown on the chassis schematics.

Output Meter Alignment.—If this method is used, connect the output meter across the voice coil, and turn the receiver volume control to maximum.

Test Oscillator.—For all alignment operations, keep the oscillator output as low as possible to avoid a-c action.

Calibration Marks.—The tuning dial is fastened in the cabinet and can not be used for reference during alignment. Therefore, calibration marks have been stamped in the plate on the front of the chassis as shown in the accompanying drawing. These marks are marked for use during alignment.

Dial Indicator Adjustment.—With the gang condenser in full mesh, the indicator should point to the extreme left (low frequency) mark on the dial scale.

Dial-Indicator and Drive Mechanism

Refer to "Alignment Procedure" for explanation of the "calibration marks" shown in this drawing.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect test-osc. output to—</th>
<th>Tune test-osc. to—</th>
<th>Turn radio dial to—</th>
<th>Adjust the following for maximum peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-F grid through .01 mfd. capacitor and ground</td>
<td>465 kc</td>
<td>&quot;C&quot; band Quiet point</td>
<td>L-3 and L-4 (2nd 1-F trans.)</td>
</tr>
<tr>
<td>2</td>
<td>1st det. grid through .01 mfd. capacitor and ground</td>
<td>16.2 mc</td>
<td>16.2 mc</td>
<td>L-1 and L-2 (1st 1-F trans.)</td>
</tr>
<tr>
<td>3</td>
<td>16.2 mc</td>
<td>Rock at 16.2 mc</td>
<td>C-1 oscillator*</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>6.1 mc</td>
<td>6.1 mc</td>
<td>Spacing between leads from &quot;C&quot; band loop to chassis</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>16.2 mc</td>
<td>Rock at 16.2 mc</td>
<td>C-2 antenna† while rocking</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1,500 kc</td>
<td>1,500 kc</td>
<td>C-4 antenna while rocking</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>600 kc</td>
<td>Rock at 600 kc</td>
<td>C-3 oscillator</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1,505 kc</td>
<td>1,500 kc</td>
<td>C-4 antenna</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Spacing between leads from &quot;C&quot; band loop to chassis</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When making adjustments 4 to 9 inclusive the chassis must be in the cabinet, both loops connected, and all leads in their normal positions. When mounting chassis in cabinet if calibration marks on dial plate do not line up with dial scale mounted on cabinet move pointer to agree with dial scale on cabinet.

* Oscillator should track on high frequency side of signal. If two peaks are obtained use high frequency (minimum capacity) peak.

† If two peaks can be obtained use low frequency (maximum capacity) peak.

Speaker and Cable Connections

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Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the schematic diagram.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis and keep the output as low as possible to avoid a-v-c action.

Calibration Scale.—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the chassis for quick reference during alignment. In the event that only the chassis is returned for service, and the cabinet with its tuning dial is left in the customer's home, the calibration scale printed in this service note can be used in conjunction with an ordinary 12-inch ruler as an accurate and convenient substitute for the regular dial.

Calibration Scale

Each method is described below.

Using Tuning Dial.—

1. Slide out the flat spring clamp at each end of the dial, and remove the glass dial from the cabinet.
2. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
3. Place the glass dial under the pointer so that the extreme left scale graduations coincide with the pointer. Use Scotch tape to hold the glass dial in this position.

Using Calibration Scale.—

1. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
2. Place a flat 12-inch ruler on the dial backing plate so the left-end of ruler is at the reference mark at left-end of backing plate. Temporarily fasten the ruler with Scotch tape to the backing plate.
3. Refer to calibration scale printed in this service note. This is a reduced reproduction of the dial with an inch-scale drawn at top and bottom. To find the correct pointer position in inches for any desired frequency, draw a vertical line through this frequency on the calibration scale.

Tube and Trimmer Locations—Model WR-482

Dial Indicator and Drive Mechanism

Dial-Pointer adjustment.—After the chassis is replaced in cabinet, move the dial pointer (if necessary) so that it is at the left-hand graduation on the dial with the gang in full mesh.

Compliments of www.nucow.com
**Alignment Procedure**

**Output Meter Alignment**—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

**Test-Oscillator**—For all alignment operations, keep the output as low as possible to avoid a-v-c action.

---

**Replacing Lid or Front Panel:**

When the molded lid (which contains the loop antenna), or the chrome front panel requires replacement, it is not necessary to replace the complete assembly of lid and front panel, as either may be replaced separately in a few minutes by taking out the hinge pins as described below.

The following parts are available for this purpose:

**PART No.**
- 37606 Lid and antenna (type without lid support)
- 37612 Chrome front panel (type without lid support)
- 37600 Lid and antenna (type with lid support)
- 37613 Front chrome panel, (type with lid support)
- 37700 Two hinge pins and two hinge springs

**Installation Instructions:**

First remove the three self-tapping screws that hold the chassis in the center case, and remove the case. Unclover the leads from the loop lugs.

(a) With lid closed, cut hinge pins at point "A" with sharp cutters.

(b) Start removal of pin sections as shown, using long-nose pliers.

(c) Grasp end of pin section with long-nose pliers and pull out of hinge.

(d) Install new lid, or new front panel, using the replacement hinge pins and springs that are provided with replacement lids and panels. Arrange springs as shown. Apply a small amount of "Thermoplastic Cement" (C.E. ZV 5057) near center end of each pin to insure tight and permanent fit.

**Loose Control Knobs:**

If any reason the tuning or volume control knob should become loose on its shaft, it may be rigidly mounted in the following manner:

(a) Remove the loose control knob from its shaft and scrape off the old cement from both shaft and control knob.

(b) Apply a generous amount of cement to the shaft region which is to engage the knob. C.E. Thermoplastic cement, ZV 5057, is excellent for this purpose; it is a green fluid, easily chipped with acetone if necessary.

(c) Allow the cement on the shaft to air-dry, to evaporate any acetone present.

(d) Mount knob on shaft while cement is still soft and allow a few minutes for drying.
Alignment Procedure

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect high side of test oscillator to 0.01 mfd.</th>
<th>Tune test osc. to 455 kc</th>
<th>Tune radio dial to 15.2 mc, 15.1 mc (1800) C, band</th>
<th>Adjust the following for maximum peak output</th>
<th>1. L-81 and L-82 (2nd I F Trans.)</th>
<th>2. L-18 and L-20 (1st I F Trans.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6SK7 1 X grid in series with 0.01 mfd.</td>
<td>&quot;A&quot; band</td>
<td>Quiet Point between 500 and 750 kc</td>
<td>C-24 (Osc.) Rock gang</td>
<td>C-15 (Det.) Rock gang</td>
<td>C-1 (R F) Rock gang</td>
</tr>
<tr>
<td>2</td>
<td>6SA7 grid in series with 0.01 mfd.</td>
<td>&quot;A&quot; band</td>
<td>Quiet Point between 500 and 750 kc</td>
<td>C-19 (Det.) Rock gang</td>
<td>C-19 (Det.) Rock gang</td>
<td>C-11 (R F) Rock gang</td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal in series with 400 ohms.</td>
<td>15.2 mc, 15.1 mc (1800) C, band</td>
<td>C-19 (Det.) Rock gang</td>
<td>C-28 (Osc.) Rock gang</td>
<td>C-28 (Osc.) Rock gang</td>
<td>C-11 (R F) Rock gang</td>
</tr>
<tr>
<td>4</td>
<td>Antenna terminal in series with 200 mmd.</td>
<td>2.44 mc, (910) B band</td>
<td>C-27 (Osc.) Rock gang</td>
<td>C-20 (Det.) Rock gang</td>
<td>C-20 (Det.) Rock gang</td>
<td>C-11 (R F) Rock gang</td>
</tr>
<tr>
<td>5</td>
<td>Antenna terminal in series with 200 mmd. (Prefet A&quot; antenna trimmer C-28 is turn out)</td>
<td>600 kc, 600 kc (30.50) A band</td>
<td>1.000 kc, 1000 (180) A band</td>
<td>C-28 (Osc.) Rock gang</td>
<td>C-28 (Osc.) Rock gang</td>
<td>C-11 (R F) Rock gang</td>
</tr>
<tr>
<td>6</td>
<td>Antenna terminal in series with 200 mmd.</td>
<td>1.500 kc, 1000 (180) A band</td>
<td>C-28 (Osc.) Rock gang</td>
<td>C-20 (Det.) Rock gang</td>
<td>C-20 (Det.) Rock gang</td>
<td>C-11 (R F) Rock gang</td>
</tr>
<tr>
<td>7</td>
<td>Repeat step 5, then 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Antenna terminal in series with 200 mmd.</td>
<td>15.2 mc, 15.1 mc (1800) C, band</td>
<td>C-1 (R F) Rock gang</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Push Button Adjustment

The push buttons connect to separate magnetically-core oscillator coils and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool. Allow at least five minutes warm-up period before making adjustments.

1. Make a list of the desired stations, arranged in order from low to high frequencies.
2. Turn the range selector to "A" band, and manually tune in the first station on the list.
3. Turn Range selector knob to "PB" and press push button No. 1 and adjust No. 1 oscillator core to receive this station. Screw the core all the way in to lowest frequency, then unscrew slowly until station is received.
4. Adjust No. 1 antenna trimmer for maximum output on this station.
5. Owing to the relatively high B F gain, it may be found that there are several settings of each push-button magnetically core that will bring in any particular station. In such cases it is advisable to unscrew the push button antenna trimmers to minimum capacity before adjusting the oscillator cores.
6. Clockwise adjustment of cores and trimmers tunes the circuits to lower frequencies.
7. Adjust for each of the remaining stations in the same manner.
8. After all stations are tuned in on the buttons, make a final careful adjustment of all core rods until best reception is obtained for each. Outdoor antenna should not be reconnected if used.

Location of Controls

Back of Chassis

Frequency Ranges

- Broadcast: 540-1,600 kc
- Intermediate: 1,560-4,000 kc
- Short Wave: 5.8-18.0 mc
- Medium Wave: 1.56-4.0 mc

Power Output Ratings

- Undeclared: 50 watts
- Maximum: 60 watts
- 9-inch Electrodynamic Loudspeaker (RL-79-AS): 3.4 ohms at 400 cycles
VOLTAGES MEASURED WITH A 1000 ohms-per-volt METER

B+ VOLTAGE 170  BATTERY 6.2 volts

For Alignment, See Index

Location of Trimmers

Location of Tubes

CHASSIS MODEL
634

For Use Only With 6 Volts D.C.
Pilot Lights 6-8 V., 0.1 A.
I.F. Peak 175 K.C.
GANGING INSTRUCTIONS

An OUTPUT METER or other indicating device should be used for accuracy in making ganging adjustments.

If an output meter is not available, the magic eye (6J7) may be used as an output indicator as follows:

(a) Operate push-button No. 4, "To Record Radio"

(b) Disconnect cutting-board from chassis.

(c) Adjust volume control to near maximum.

Connect signal generator to control grid of the 6AG7 tube.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY</th>
<th>Dial Wave Band Switch</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>455 K.C.</td>
<td>1200 K.C.</td>
<td>Broadcast</td>
<td>End, L.P. -- 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>550 K.C.</td>
<td></td>
<td>C-65</td>
<td></td>
</tr>
</tbody>
</table>

Connect signal generator to ANR and GND. leads.

Turn condenser gang to full maximum capacity and check position of dial pointer with reference line on the scale, which is the last graduation below the 560 K.C./calibration.

600 K.C. 600 K.C. Broadcast L.P. End (C-6) 600 K.C. 600 K.C. Broadcast G.S. (C-6)

1400 K.C. 1400 K.C. * G.S. (C-6)

15-16 K.C. Short Wave Ant. (C-6)

Not used ""

The entire alignment procedure should be repeated to obtain greatest accuracy in the adjustment of the trimmers.

* Adjust C-65 trimmer for MINIMUM signal.

** Connect antenna to receiver, and adjust dial so that no station is received.

Advance volume control until a fair volume of noise is received. Adjust trimmer for greatest noise.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Position</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
</tr>
</thead>
<tbody>
<tr>
<td>6AG7</td>
<td>1st Det.</td>
<td>230</td>
<td>75</td>
<td>2.9</td>
</tr>
<tr>
<td></td>
<td>G.S.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6K7</td>
<td>I.F.</td>
<td>230</td>
<td>75</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>G.S.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6K7</td>
<td>2nd Det.</td>
<td>90+</td>
<td>1.6</td>
<td>4+</td>
</tr>
<tr>
<td></td>
<td>Mike Asc.</td>
<td>45 to 65*</td>
<td>30+</td>
<td>0.8</td>
</tr>
<tr>
<td>6X8</td>
<td>Output</td>
<td>235</td>
<td>235</td>
<td>13.5</td>
</tr>
</tbody>
</table>

Aerial disconnected.

All voltage measurements made against ground (chassis) except as noted.

NOTE: This is a typical voltage analysis made by use of standard 1000 ohm per volt meter, using the 500 volt scale for plate and screen voltage readings.

- Not actual voltages due to large values of resistance in circuit between supply voltage and point of measurement. These voltage values may vary considerably, depending upon the resistance of voltmeter used.

- The above voltages should be followed. All values, normal tolerance limits of component parts in the chassis, all have an effect upon these readings. A tolerance of 10% is usually considered permissible.
TURNABLE SPEED VARIATION

In order to satisfactorily correct any variation in the speed of the turntable, which is usually evidenced by "wobble" or a waver in the pitch of musical tones during the playing of records or home recordings, it is first necessary to determine the kind of speed variation encountered.

As the various types of turntable speed variation usually fall under two distinct classifications - intermittent variation and variation synchronized with turntable rotation, the matter of diagnosis in any particular case of trouble is simplified.

Intermittent Variation

It is important that the rubber-mounted intermediate drive wheels be kept clean and free from oil, to avoid slipping or irregular operation of the wheels. The drive wheel bearings are of oilite bronze and require no oiling to prevent wear, however, one drop of light lubricating oil may be applied to each drive wheel bearing if desired to "quiet" their operation.

All record sleeves and other dirt particles that may have gotten under the turntable should be removed, as such foreign matter may seriously interfere with the smooth operation of the mechanism.

If the drive wheels appear to slip, although the rubber sleeve and the turntable rim are free from oil, the tension of the drive wheel adjustment spring should be increased.

The round movable disc on which the dual drive wheel assembly is mounted, should be adjusted to a degree of tightness that affords minimum amount of the assembly, at the same time maintaining entire freedom of movement. If the drive wheel assembly is allowed to bind while in motion, resulting in the dual wheel rotating out of the horizontal plane, the rim of the top wheel may ride high and intermittently touch the underside of the turntable.

The wire leads connected to the cutting head inside the recording arm should not be permitted to drag on the record or turntable, as this produces an intermittent braking effect causing the turntable to be slowed down, or to revolve with varying speed. Intermittent variation in turntable speed may also be due to a binding of the lateral feed screw bearing. An adjustment is provided on the rear housing of the feed screw assembly, to take up and play in the feed screw. When this adjustment is correctly made, only a very slight amount of end play should be perceptible, however, it should be determined that this end play exists throughout the complete rotation of the feed screw.

CONTINUED ON NEXT PAGE
Variation Synchronous With Turntable Rotation

If "now" resulting from variation in the speed of the turntable is evidenced to be in the order of four times per turntable revolution, this would indicate a defect in the rubber lined drive wheel area. The wheel may be out of round, or warped, or may have a flat spot or bump on the rubber rim.

If the "now" is noticed to be one per turntable revolution, however, this would indicate some irregularity in the rim of the turntable. In handling, avoid bumping or dropping the turntable, as any pronounced dent in the rim of the table to throw it out of round will result in a very noticeable variation in turntable speed.

Running the finger tips lightly over the inside surface of the turntable rim will show up any irregularity sufficiently pronounced to produce "now" in the recording or reproduction. The bearing surface of the turntable rim does not necessarily have to be perfectly smooth; the effect of minute irregularities of the surface are absorbed by the rubber rim of the drive wheel.

A badly warped record, either a home recording or commercial record, or one in which the center hole is worn or oversize, will tend to produce "now" during its reproduction, and it is suggested that this be taken into consideration in investigating a complaint pertaining to waver or "now" in record reproduction.

Ordinarily, recordings made on record blanks which are only slightly warped, will prove to be satisfactory. However, "nows" may be cut into the recording if the cutting head damper is incorrectly adjusted so that the felt damper bears against the cutting head with too much pressure.

To correct this adjustment, proceed as follows:

1. Turn the adjusting screw to the RIGHT so that no pressure is exerted on the cutting head by the felt damper.

2. Raise the recording arm to a near vertical position so that the stylus is midway in the slot in the front end of the arm. Observe that when the stylus is located to one end of the slot and released, it will move back and forth a few times, before coming to rest in the center of the slot.

3. Turn the damper adjusting screw to the LEFT until, while the stylus is located to one end of the slot and released, it will then move back and forth a few times, before coming to rest in the center of the slot. The tendency to continue moving back and forth has been eliminated.

In order to determine if "now" is actually "out" in a home recording, or if a variation in turntable speed exists during all functions of the turntable, play an especially selected regular phonograph record, known to be entirely free from "now." If the record plays satisfactorily, but "now" is noticed in playing home recordings made on the same instrument, this gives evidence of the existence of some mechanical fault in the recording mechanism. As previously pointed out, the cutting head must be kept in the recording slot, and the recording speed must be maintained at a constant RPM.

When the fault is traced to a fault in the turntable mechanism, it will be necessary to maintain the turntable mechanism in good working order. Remove the rubber using upward pressure at the rim of the table, at the same time lightly tapping the top of the turntable with a small tool. Lift the dual drive wheel assembly from its mounting.

Lubricate the oiling positions indicated in the accompanying drawings, using only two or three drops of electroc motor oil at each position, unless otherwise specified.

A. Turntable shaft bearing.
B. Upper motor bearing.
C. Between drive wheel mounting disc and bed plate.
D. Place a coating of petroleum jelly on the lip of the motor can.
E. Recording arm pivot post.
F. Pivot post straddle plate slot.

Carefully apply one or two drops of oil to each drive wheel bearing, so that the oil will not run out on the rubber rims of the wheels.

The lower motor bearing may be lubricated by application of oil to the felt wick surrounding the lower end of the motor shaft.

Replace dual drive wheel and turntable as follows:

Place the dual drive wheel assembly (1) on the pin in the center of the movable mounting plate (2). The shift lever (3) of the wheel assembly should be positioned against the stop pin (4) as shown in the drawing. Likewise, the switch arm (6) should be positioned as shown so that the switch actuating finger (7) will engage in the wide slot of the switch arm (6) at the time lever (3) is moved between the stop pins (4) and (5).

Place the shift lever (3) against stop pin (5) so that the switch arm (6) is moved to the position opposite that shown in the drawing.

Carefully lower the turntable on the spindle. If it will be swung that the rubber ring is above the rim of the turntable. With the finger tips, press the drive wheel into position so that the bearing rim of the wheel bears against the inside surface of the turntable rim.

Rotate the turntable by hand, permitting the key pin of the turntable spindle to engage the key slot in the turntable hub.
AUTOMATIC RECORD CHANGER ADJUSTMENTS

MODEL No.A03494486

DESCRIPTION OF TRIP MECHANISM

(1) In order to automatically change records, the record changer mechanism must first be set in motion. The trigger which accomplishes this purpose is the trip mechanism. The trip mechanism is actuated by the trip groove at the end of the matrix grooves in all standard records.

(2) All commercial records manufactured in recent years have either an eccentric (oscillating), or spiral (run-in) type of trip groove.

(3) This record changer will trip on any standard eccentric trip groove. It will also trip on any spiral trip groove provided that the spiral does not terminate at a larger diameter than that for which the trip mechanism is adjusted.

(4) To observe the operation of the trip mechanism, it is necessary to first remove the turntable and then move lever (H) to either the 10 or 12 inch position.

(5) To follow the action of the trip mechanism on eccentric trip groove records, it will be seen that as the pickup arm (K) swings inward, the trip rod (E) moves toward the pickup base until the serrations on the trip rod seem at (K) are in contact with the knife edge of the trip latch (L). If the pickup arm (K) is now moved outwardly, the serrations at (K) will engage with the trip latch (L), permitting the trip cam lift lever (C) to be released so that it will drop in and engage the trip cam (F).

(6) To observe the action of the trip mechanism on spiral trip groove records, swing the pickup arm (K) inwardly until the trip dog (G) comes in contact with the trip latch (L) and releases trip cam lift lever (C).

(7) The reject button (B) will be noted also operates to trip the mechanism by imparting motion to latch (J).

(8) After trip cam lift lever (C) has been released so that it can engage trip cam (F) the former is actuated to operate the balance of the trip mechanism are derived from the motor.(?)

(9) As trip cam (F) engages trip cam lift lever (C), cam (F) is in a higher position so that it engages the change mechanism drive wheel control lever (I) and forces the drive wheel (L) into positive frictional engagement with the inside of the turntable rim.

(10) To speed wheel (L) in engagement with the turntable rim after lever (I) carries past cam (F), lever (I) is engaged by latch (J) and the tripping operation is complete.

DESCRIPTION OF SPRING REORDER AND CAM SHAFT

(11) Driven by the wheel (L) through a double worm and gear reduction, the cam shaft (K) carries cam (B) through the pickup arm movements, the dropping of records, and at the conclusion of the change cycle, the release of latch (L).

(12) Cam (K) which is mounted on the lower end of cam shaft (B) raises and lowers the pickup arm (H) through a rocker arm and push rod.

(13) The positioning of the pickup arm (H) for 10 or 12 inch records is controlled by two cams. As the lower end of these cams (with short throw) position the pickup for 10 inch records and the upper cam (with long throw) positions the pickup for 12 inch records.

(14) An examination of the pickup positioning cam will reveal spring fingers at the termination of the cam rise. These spring fingers are provided to urge the pickup needle into the pickup spring groove on records which do not have lead in grooves.

(15) When lever (A) is set in the 10 or 12 inch position, the pickup positioning cam follower is shifted up or down so as to engage the proper cam. The pickup positioning cam follower can be easily distinguished by the coil spring mounted thereon and linking the cam follower to the eccentric trip gear shaft. The eccentric trip gear shaft terminates at lever (C) which is either stretched or missing. If lever (C) makes a loud click when it drops in, the rubber bumper, against which it should strike, has worn out and should be replaced back into place.
CHARGE MOUNTING DRIVE WHEEL FAILS TO ENGAGE

(28) If the trip mechanism does not engage in a satisfactory manner and wheel (1) is latched in position to engage the turntable pin but does not contact the turntable rim with sufficient pressure to engage operation, loosen screws at (2) and move the wheel control lever extension outward a distance which will bring wheel (1) into positive contact with the turntable rim. CAUTION: This adjustment is very critical and should be carefully made. If wheel (1) is forced too tightly against the turntable rim, the latch (7) will stick at the completion of the change cycle and prevent the wheel from becoming disengaged from the turntable rim. As an aid in making this adjustment, it is well to scribe a line on the wheel control lever at the end of the wheel control lever extension, so that it can be seen for the extension is being moved each time. Before making any adjustment, it is advisable to check the set screw in wheel (1) to make sure that wheel (1) is tight and not turning on the shaft v which it carries.

(29) If latch (7) fails to hold wheel (1) in position:
(1) Lever (1) may not be following through completely on cam (F), due to either lever (C) being bent down, or lever (1) bent up too far.
(2) If the end of lever (2) in the cavity of wheel (1) is not in contact with the latch (7), the dog (N) which is meant to engage in latch (7). This dog may have been bent outward so that it does not come into contact with the latch (7), when lever (1) is raised the travel on cam (F).
(3) The adjustment of the front latches on lash (7) is such that the clearance for the dog (N) should be approximately 0.025. This can be determined by moving lever (1) outward from the center to such a position that the dog (N) will move into latch (7) and a feeler gauge inserted between the dog and latch to establish this clearance. To adjust for proper clearance, the dog on latch (7) may be bent in or out.
(4) Check the spring on lever (2) to make sure that the spring is not defective or missing.

MECHANISM REPAIRS

(30) If the mechanism stops to change records without playing them, the wheel (1) may not be disengaging from the turntable rim. This failure to disengage may be due to the following:
(1) Faulty action of the latch (7). (See "Caution" in paragraph 28.)
(2) A defective or missing return spring on wheel control lever (1).
(3) A defective or missing spring on lever (2).
(4) Lever (2) may be bent so that it is not contacting the wheel release cam.
(5) Wheel (1) disengages at the completion of the change cycle and immediately re-engages, the trip mechanism is at fault and it is suggested that the following be checked:
(1) Reject button (8) may be sticking in the depressed position.
(2) The trip cam (F) may be sticking in the raised position.
(3) The reset spring on trip latch (2) may be defective or missing.
(4) The stud on which wheel control lever (1) is mounted may have worked loose and should be tightened.

MECHANISM TRIES DURING PLAYING CYCLE

(31) If the mechanism tries during the playing of a record and before the pickup arm has swung inward to the point where the trip is adjusted to operate on spiral trip grooves records, the following conditions should be checked:
(1) Weak or missing reset spring on latch (2). Tension of spring may be increased by turning the spring anchor lug.
(2) Defective shoulder or trip latch (2) or rounded corner on cam lift lever (5), permitting lever (6) to slip off of the shoulder on trip latch (2).
(3) Rubber bumper (8), against which wheel control lever (1) strikes, may have worked away from base plate, permitting lever (6) to over-travel and lock trip rod (1) against the base plate. Where over-travel of lever (1) has taken place, a thin rubber bumper (8) may cause the wheel to lock during the change cycle, because of its small size. It is possible that either a weak reset spring on latch (2) or a damaged shoulder on latch (2) is a contributing factor.

RECORD ARM STICKS OR JAMS

If during normal operation of the unit the pickup arm acts as though it were jammed in any manner, the following procedure should be followed:
First, stop the motor, next remove the turntable, and trip the mechanism. The pickup arm is then positioned so that the front latches (7) are in the approximate 1" of the center pin (8) depending on the adjustment of the front latches (7).
(1) If trip dog (5) is not slipping free of the latch (7) against which it strikes on trip latch (2), try the serrations at (7) on trip rod (5) and hang up on trip latch (2) and prevent trip rod (5) from sliding with trip latch (7) and investigate the following:
(2) Rubber bumper (8) pushed upwards away from base plate and permitting lever (6) to over-travel.
(3) Excessive pressure exerted against trip rod (5) by spring (P).
(4) Trip rod (5) bent.
(5) An extension on trip latch (7), which extends rearward along trip rod (5), may be bent or broken. The function of this extension is to swing trip rod (5) close to trip latch (2) as soon as tripping takes place.

RECORD SUPPORT ADJUSTMENT

(32) An examination of the unit will disclose the rear record support (front support on A-496) has fixed positions determined by plates and which are located by lever (A). The opposite record support (C) is adjustable by means of an overlapping connecting link between the two support bases, underneath the changer unit. The record support posts should be equidistant from the center of the turntable, so that the opposite sides of the record will be located at nearly the same instant, and that no record at a time will be dropped from both support fingers at nearly the same instant. Then place a full stack of records on the supports and observe the dropping of each record. It will be noticed that the combined weight of ten or twelve records resting on the supports, will cause the support posts to spring outward slightly as the change mechanism goes through cycle; and the degrees to which the posts swing outward is lessened with a decrease of total record weight. It will also be observed that one post may swing out more than the other during the change cycle, and this should be taken into consideration in making an adjustment of the support posts, so that the degree of unevenness with which the records are released from the support fingers will be "averaged" for the entire stack of records.

RECORD SUPPORT AND SEPARATING FINGERS

(33) As there is a difference in thickness between 10 inch and 12 inch records, and the equipment is designed to accommodate both sizes, the separating fingers (N) must be made so as they can be set in two different adjustments so that they will slip in between the two lower records of the stack, and have no tendency to strike the edge of either record. The record supports (D) and the record
separating fingers (N) are so designed that, when in proper alignment, no slipping of standard records will take place. If, however, the separating finger should strike the edge of a record due to a warped record, or one having chipped edges, fingers (N) may be sprung out of alignment. For proper operation, the fingers (N) must be perfectly flat. As the fingers are usually found to be bent upwards, rather than downwards, when out of correct alignment, it is necessary to remove the fingers from the support posts to straighten them.

A heavy screwdriver will be required to loosen the large screw at the top of the post, and the order of placement of the fingers and spacers should be noted in removing these parts so that they may be replaced in correct order. Ordinarily, straightening can be accomplished by holding the main part of the finger (N) through which the clamping screw passes, with one hand, and then turning the other hand, holding the single shaped part of (N) with the fingers of the other hand, bending the single shaped part until it is lined up with the main body. Do NOT USE PLIERS FOR STRAIGHTENING THE FINGER (N) IN A VISE. After bending, lay the finger (N) on a flat surface to make sure the straightening has been properly done.

**Finger Arm Lift Adjustment**

1. The height to which pickup arm (M) is lifted during the change cycle may be adjusted by the screw (O). In making this adjustment, make sure that the pickup arm will not lift high enough to strike the bottom record on the record supports. Also, make sure that the pickup needle drops low enough to rest properly on the record on the turntable. (Recommended needle length 5/8")
2. If the timing of the pickup lift is not correct, loosen the set screw holding lift cam (Q) on shaft (R) and relocate the cam. (The relative position of the remaining cam is fixed.)

**Adjustment of Pickup Lowering Point**

3. To adjust the pickup arm (M) so that it is lowered to the correct position on the outside of the record, first shift the lever (A) to the 10° position, and then stop the mechanism with the pickup positioning cam follower at the point of maximum rise of the pickup position cam. (See paragraphs 13, 11, and 16.) Now raise the pickup arm to the vertical position and located it at (I) so that the arm (M) can be moved with relation to the pickup base but not too freely. Now hold the pickup base as that it will not turn, force the pickup arm (M) toward the record centering pin (B). Next, carefully pull the pickup arm (M) outwardly until the plunger needle is in contact with the pickup arm (M) and tighten the locking screws at (O) being careful not to move arm (M) outwardly after the correct setting before tightening the screws. This adjustment will automatically take care of 3/16" as well as 1/16" and 3/32" positions of 10° regardless of the position of the lever (A) the pickup positioning cam follower is located in the down position.

**Wiring Diagram**

- **Reformed Spring**
- **Radius**
- **Model No: A93 A94 A96**
- **Date: 12-11-40**

If recorded "now" is encountered on dual-speed recorder units of the automatic record changer type use in equipment bearing serial numbers prior to 8620, a correction may usually be affected by increasing the tension of the intermediate drive wheel spring.

To accomplish this, proceed as follows:

1. Remove turntable and intermediate drive wheel assembly, (see operating instructions.)
2. Remove record changer unit by removing the four mounting screws, and disconnecting cables with plugs, from recordio chassis.
3. Place recorder changer unit on the work bench, tilted to a position that provides easy access to the lower side of the unit. Do NOT PLACE UNIT IN AN UPRIGHT POSITION, as the record arm may be sprung or bent.
4. Remove the intermediate drive wheel spring, and make alterations to the spring in accord with the specifications given.
5. Remove twelve turns at the hook end of the spring.
6. Form a new hook so that the bend in the hook is only 1/16" from the rolled spring.
7. Before replacing the spring in the unit, remove the burned or frayed edge of the hook in the base plate, through which pin protrudes for attachment of the loop end of the spring.
8. After the spring has been installed, and the unit restored to the cabinet, the intermediate drive wheel assembly and turntable should be replaced in accord with the directions given on Page 6 of the Operating Instructions.
**GANGING INSTRUCTIONS**

An OUTPUT NEEDLE, connected to the speaker voices cell terminals, should be used for accuracy in making ganging adjustments.

The voice coil terminals, as well as the I/F trimmers, may be made accessible by removing the screws by which the motor panel is mounted in the cabinet. Before lifting off the phone-recorder unit, move the PHONO ARM to the center of the turntable, and permit the arm to maintain this position until after the unit has been re-sheet to the cabinet. In this way, the follower arm which engages the lateral feed screw will be protected against damage.

The I/F trimmers may be reached through the opening provided in the bottom of the cabinet.

**Connect signal generator to control grid of G8 tube.**

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR FREQUENCY</th>
<th>DIAL POSITION</th>
<th>TRIMMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 Hz.</td>
<td>12-6**</td>
<td></td>
</tr>
<tr>
<td>1000 Hz.</td>
<td>14-6**</td>
<td></td>
</tr>
</tbody>
</table>

Connect signal generator to ANT. and GND. terminals:

1400 Hz. 1600 Hz. 6-00 C. 6-00 C.

**Check the alignment of pointer with reference lines below 500 kHz on the scale. The pointer may be aligned on the drift to correct for misalignment.**

**In ganging the I/F amplifier, use a low signal input to avoid settling up of oscillator in the amplifier.**

**NOTE:** In the event of loop antennas replacement, the I/F alignment should be checked at 600 kHz, and if necessary, the interference of the loop may be adjusted to bring about correct alignment of the dial at 600 kHz, by dressing the end of the inside loop turn to provide more or less inductance as required.

An adjustment of loop inductance should be followed by re-alignment of the I/F trimmers at 1400 kHz.

**VOLTAGE DATA**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Position</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
</tr>
</thead>
<tbody>
<tr>
<td>G8</td>
<td>Jet. Det.</td>
<td>200</td>
<td>80</td>
<td>1.6</td>
</tr>
<tr>
<td>G8</td>
<td>Jet. G.</td>
<td>110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G7</td>
<td>Jet.</td>
<td>250</td>
<td>10</td>
<td>2.7</td>
</tr>
<tr>
<td>G7</td>
<td>End. Det.</td>
<td>80</td>
<td></td>
<td>1.2</td>
</tr>
<tr>
<td>G8</td>
<td>Output</td>
<td>225</td>
<td>250</td>
<td>17.0</td>
</tr>
</tbody>
</table>

*Not actual voltage due to large value of resistance in circuit between supply voltage and point of measurement.*

**RECORDING JR. PARTS LIST**

<table>
<thead>
<tr>
<th>MODEL A-100</th>
<th>RECOR D JR. PARTS LIST</th>
</tr>
</thead>
<tbody>
<tr>
<td>55-0058</td>
<td>PIVOT POST SHAFT ASSEMBLY</td>
</tr>
<tr>
<td>6-0059</td>
<td>PIVOT POST LOCK SPRING ASSEMBLY</td>
</tr>
<tr>
<td>6-0069</td>
<td>PIVOT POST BUSHING</td>
</tr>
<tr>
<td>73-0066</td>
<td>PIVOT POST BUSHING M6 WASH. 2 1/4&quot; DIA. SP. BUSH.</td>
</tr>
<tr>
<td>73-0067</td>
<td>PIVOT POST BUSHING M6 WASH. 2 1/4&quot; DIA. FLAT.</td>
</tr>
</tbody>
</table>

**MODEL A-100**

<table>
<thead>
<tr>
<th>MODEL A-100</th>
<th>DAT 1-10-41</th>
</tr>
</thead>
<tbody>
<tr>
<td>55-0058</td>
<td>PIVOT POST BUSHING M6 WASH. 2 1/4&quot; DIA. SP. BUSH.</td>
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<tr>
<td>6-0059</td>
<td>PIVOT POST LOCK SPRING ASSEMBLY</td>
</tr>
<tr>
<td>6-0069</td>
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</tr>
</tbody>
</table>

Compliments of www.nucow.com
All voltages measured from point indicated to Neg. B. using 20000 ohm per volt meter.

Antenna disconnected — volume control at minimum and condenser plates in full mesh.

Line voltage—117 v. A.C.

Power consumption—117 v.—18.5 watts.

Power consumption, battery—1.02 watts.

Power output—160 milliwatts.

Stage Gains:
Ant. to conv. grid—3.8 x at 1000 Kc.
Conv. grid to I. F. grid—65 x at 455 Kc.

Overall audio—260 x at .050 watt.

Tuning Range—540 Kc.—1600 Kc.
SERVICE NOTES

All chassis
Weak short wave—Open R.F. choke in plate circuit of 1232 tube.
Noisy—Dial rubbing against escutcheon. Stator lugs on braid of
gainy condenser rubbing against side of opening in chassis. Make
sure all lokaal type tubes are firmly seated in sockets.
Cannot be aligned—Check for open or rosin connection on pri-
mary winding of wavemagnet.
Overloads—Usually due to open resistor in A.V.C. circuit of
first detector.

Phono Models
Distortion—Check for broken crystal in pickup.
Low Volume—Check for poor contact in phono switch and plug
contacts—check shield on lead from crystal for poor ground.

6A02-6A04
Noisy—right hand pilot light wiring may be pinched by auto-
matic bracket.
Check for poor contact on manual push button.
Check for loose or poor contacts on pilot lights.
Oscillation on short wave band—Push black lead of automatic
away from automatic adjustments. Keep white and green leads
of automatic away from 7L7-7R7 socket.

7A02-7A04
Dead—480 mmld. condenser on automatic may be grounded
against automatic frame or latch bar.
Oscillation—Push leads of wave trap close to chassis keeping
them away from antenna coil.

12A3
Hum—Change 6J5 in first audio socket.

ALIGNMENT-CHASSIS 5A03
PEAK I.F. TRIMMERS A B C D
AT 455 KC, FEED 455-KC SIGNAL
TO R-F GRID AND ADJUST WAVE-
TRAP TRIMMER E FOR MINIMUM
RESPONSE.
TRIM F AT 1600 KC
TRIM G AT 1400 KC

ALIGNMENT-CHASSIS 6A01-6A10
PEAK I.F. TRIMMERS A B C D
AT 455 KC, FEED 455-KC SIGNAL
TO R-F GRID AND ADJUST WAVE-
TRAP TRIMMER E FOR MINIMUM
RESPONSE.
TRIM F AT 1600 KC
TRIM G AT 1400 KC
All voltages measured with a 20,000 ohm per volt meter from chassis to socket contact indicated.

Volume control full on.
Line voltage 117 A.C.
ALIGNMENT

CHASSIS 6A05

I.F. ALIGNMENT CONVENTIONAL
SEE SPECIAL SECTION VOL VIII

I.F. TRIMMERS A B C D
PEAK AT 455 KC
WITH 455-KC SIGNAL AT R-F
GRID, ADJUST E FOR MINIMUM
RESPONSE.

TRIM K AT 18 MC
TRIM M AT 16 MC
TRIM F, G AT 1500 KC
PAD J AT 600 KC

CHASSIS 6A05
Stage Gains

Ant. to R.F. grid—3.8× at 1000 Kc.
R.F. grid to conv. grid—7× at
1000 Kc.
Conv. grid to I.F. grid—92× at
455 Kc.

Overall audio—778× at 1 watt 400
cycles.

Tuning ranges—545 Kc—1570 Kc
5700 Kc—18300 Kc.

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>Operation</th>
<th>Connect Test Oscillator to</th>
<th>Dummy Antenna</th>
<th>Input Signal Frequency</th>
<th>Bond Set Dial At</th>
<th>Connect Output Meter to</th>
<th>Trimmer</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Con. Grid</td>
<td>0.5 Mfd.</td>
<td>455 Kc</td>
<td>B.C. 600 Kc.</td>
<td>6V6G Output</td>
<td>A B C D</td>
<td>Align I.F.</td>
</tr>
<tr>
<td>2</td>
<td>R.F. Grid</td>
<td>0.5 Mfd.</td>
<td>455 Kc</td>
<td>B.C. 600 Kc.</td>
<td>6V6G Output</td>
<td>E</td>
<td>I.F. Trap Adjust for Minimum</td>
</tr>
<tr>
<td>3</td>
<td>Ant. terminals marked Z and G</td>
<td>400 Ohms</td>
<td>18 Mc. S.W. 18 Mc.</td>
<td>&quot;</td>
<td>K</td>
<td>Set to Scale</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>&quot;</td>
<td>&quot;</td>
<td>5.0 Mc. Med. 5.0 Mc.</td>
<td>&quot;</td>
<td>N</td>
<td>Set to Scale</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>&quot;</td>
<td>&quot;</td>
<td>4.5 Mc. Med. 4.5 Mc.</td>
<td>&quot;</td>
<td>Q</td>
<td>Align Ant.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Single turn Loop Loosely coupled to loop</td>
<td>1400 Kc</td>
<td>B.C. 1400 Kc.</td>
<td>&quot;</td>
<td>F</td>
<td>Set Osc. to Scale</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>&quot;</td>
<td>&quot;</td>
<td>1400 Kc</td>
<td>&quot;</td>
<td>G</td>
<td>Align Ant.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>&quot;</td>
<td>&quot;</td>
<td>600 Kc B.C. 600 Kc.</td>
<td>&quot;</td>
<td>&quot;</td>
<td>Rocker Pad</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1852 Grid</td>
<td>0.5 Mfd.</td>
<td>4.3 Mc.</td>
<td>Manual F.M. 4.3 Mc.</td>
<td>B4</td>
<td>Align for Zero Deflection</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>F.M. Output Meter Across Full Disc. Load</td>
<td>&quot;</td>
<td>&quot;</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>A383</td>
<td>&quot;</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>767 1232 Grid</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>A282</td>
<td>&quot;</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>717 Grid</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>A B</td>
<td>&quot;</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>F.M. Ant. Terminals</td>
<td>100 Ohms</td>
<td>46.0 Mc.</td>
<td>&quot;</td>
<td>&quot;</td>
<td>Adjust cams on gang shaft for scale</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>42.5 Mc.</td>
<td>F</td>
<td>&quot;</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>49 Mc.</td>
<td>P</td>
<td>&quot;</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>46 Mc.</td>
<td>Z</td>
<td>&quot;</td>
<td></td>
</tr>
</tbody>
</table>

During F.M. Alignment keep input low, to obtain max. sensitivity for alignment. This is necessary because with large inputs the limiting action of the limiters masks alignment operations.

NOTE: A 10M ohm per volt or higher voltmeter may be used as an F.M. output meter.
All voltages measured with a 20,000 ohm per volt meter from chassis to socket contact indicated. All voltages are positive D.C. unless marked otherwise.

Volume control full on. Line voltage 117 A.C.

Power consumption 6A02-6A13 6A14—40 watts.
Power consumption 6A04 — 55 watts.
Power output—2.6 watts.

Tuning ranges—545 Kc.—1570 Kc.
5400 Kc.—18500 Kc.

FOR ALIGNMENT, TRIMMERS, F.B. DATA SEE INDEX

NOTE
Chassis 6A04 has phono connections added
Chassis 6A13 and 6A14 are identical with 6A02 except for color of automatic knobs.
SOCKET VOLTAGES AND ALIGNMENT
CHASSIS 7A02-7A04

All voltages measured with a 20,000 ohm per volt meter from chassis to socket contact indicated.

All voltages are positive D.C. unless marked otherwise.

Volume control full on.

Line voltage 117 A.C.

I.F. ALIGNMENT CONVENTIONAL
SEE SPECIAL SECTION VOL. VIII
I.F. 455 KC, ADJUST A B C D
ADJUST WAVE TRAP E FOR MIN. SIGNAL
AT 455 KC; SIGNAL FED TO RF GRID
TRIM K AT 18 MC; M AT 16 MC
TRIM Q AT 4.5 MC
TRIM P AT 16)
TRIM F AT 1500 KC
TRIM G AT 1400 KC
PAD J AT 600 KC

Models 12S550-12S568-12S569-12S595

Chassis 12A3-12A4

All voltages measured with a 1000 ohm per volt meter from chassis to socket contact indicated.

All voltages are positive D.C. unless marked otherwise.

Volume control full on.

Line voltage 117 v.
Power consumption—80 watts.

Power output—4.5 watts.

Tuning ranges—545 Kc. to 1570 Kc.
1520 Kc. to 5000 Kc.
5600 Kc. to 18300 Kc.

FOR VOLTAGES, P.F., DATA SEE INDEX

I.F. 455 KC
I.F. ALIGNMENT CONVENTIONAL
SEE SPECIAL SECTION VOL. VIII

I.F. TRIMMERS A, B, C, D
TRIM SW OSC (K) 18 KC
TRIM SW ANT (L) 16 KC
TRIM POLICE (N) 4500 KC
TRIM BC ANT (G) 1400 KC
TRIM BC OSC (F) 1500 KC
MODEL 8S586
Chassis 8A01
All voltages measured with a 1000 ohm per volt meter from chassis to socket contact indicated.
All voltages are positive D.C. unless marked otherwise.
Sensitivity switch in distance position.
Volume control full on.
Line voltage 112 A.C.
Power consumption—85 watts.
Power output—6 watts.
Tuning ranges—540 Kc.—1600 Kc.
1505 Kc.—5200 Kc.
5600 Kc.—18500 Kc.

ALIGNMENT—CHASSIS 8A01
I.F. 455 Kc—PEAK A, B, C, D
SW—TRIM K 18 MC
TRIM M 16 MC
POLICE—TRIM N, Q 4.5 MC
BROADCAST
TRIM F 1400 KC
TRIM G (on loop)
AT 1400 KC WITH WAVE MAGNET SWITCH FOR LOOP OPERATION

MODEL 7S585
SOCKET LAYOUT
VOLTAGE DATA
CHASSIS 7A01
All voltages measured with a 1000 ohm per volt meter from chassis to socket contact indicated.
All voltages are positive D.C. unless marked otherwise.
Volume control full on.
Line voltage 112 A.C.
Power consumption—90 watts.
Power output—6.5 watts.
Tuning Range—540 Kc.—1800 Kc.
1.5 Mc.—5.2 Mc. 5.7 Mc.—18.5 Mc.
41.5 Mc.—50.5 Mc.

Models 10H551-10H571
Chassis No. 10A3

Stage Gains:
Bc. and 455 Kc.—I.F.
Ant. to R.F. grid—6.6 × at 1000 Kc.
R.F. grid to I.F. grid—28.1 × at 1000 Kc.
Conv. grid to I.F. grid—31.3 × at 455 Kc.
Overall audio—1840 × at 1 watt.

F.M. and 4.3 Mc.—I.F.
Ant. to R.F. grid—1.8 × at 48 Mc.
R.F. grid to conv. grid—7.9 × at 48 Mc.
Conv. grid to 1st I.F. grid—2.7 × at 4.3 Mc.
1st I.F. grid to 2nd I.F. grid—80 × at 4.3 Mc.
2nd I.F. grid to LIMITER grid—25 × at 4.3 Mc.
ZENITH RADIO CORP.

MODELS 12S563Z, 12S569E, 12S569E

ZENITH RADIO CORPORATION
CHICAGO, ILL.

LF FREQUENCY 455KC.

All voltages measured with a 1000 ohm per volt meter from chassis to socket contact indicated.

All voltages are positive D.C. unless marked otherwise.

Volume control on full.

Line voltage 117v.

Power consumption—100 watts.

Power output—14 watts.

Stage Gains:

Ant. to R.F. grid—10.7× at 1000 Kc.

R.F. grid to conv. grid—6.75× at 1000 Kc.

Conv. grid to I.F. grid—31.3× at 455 Kc.

Overall audio—1640× at 1 watt, 400 cycles.

NOTE—The letter E after model number designates the use of a 14 inch speaker.
ALIMENT - CHASSIS 5A02
I.F. ALIGNMENT CONVENTIONAL
ADJUST TRIMMERS A B C D - 455 KC
TRIM K AT 18 MC
TRIM F, G AT 1700 KC
PAD J AT 600 KC
TRIM M AT 18 MC

ALIMENT - CHASSIS 6A20
I.F. SAME AS CHASSIS 5A02
TRIM K AT 18 MC
TRIM M AT 16 MC
TRIM F, G AT 1500 KC
PAD J AT 600 KC
WITH 455-KC SIGNAL
FED TO RF GRID, ADJUST WAVE TRAP E FOR MINIMUM RESPONSE.

ALIMENT - CHASSIS 8A04
SAME AS FOR CHASSIS 6A20

VOLTAGE DATA
CHASSIS 10A1-10A2
ALL VOLTAGES MEASURED WITH
20,000 OHM-PER-VOLT METER
FROM CHASSIS TO POINT INDICATED.

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ALIGNMENT

CHASSIS 6A02, 6A04, 6A13, 6A14
I.F. TRIMMERS A B C D
PEAK AT 455 KC
WAVETRAP E-ADJUST FOR
MIN. SIGNAL RESPONSE
AT 455 KC SIGNAL AT
R-F GRID.
TRIM K 18 MC
TRIM F.G 1500 KC
PAD J 600 KC
TRIM M 16 MC

© John F. Rider, Publisher
Tuning Ranges 540 Kc. to 1820 Kc.

DENOTES CHASSIS "GROUND"

Compliments of www.nucow.com

Stage Gains:
Bc. and 455 Kc. I.F.
Loop to Conv. grid down 1/3 x at 1000 Kc.
Conv. grid to I.F. grid 48 x at 455 Kc.
Overall audio 317 x at .05 watt.

BATTERIES
'A'-N2X FLASH LIGHT CELLS
'B' EVREASY N2X 467
BURGESS N2XX46

MODEL SPEAKER
4K600 49-433 3½" I.F. FREQUENCY 455 KC.
4 TUBE SUPERHETERODYNE
1/2 V-BATTERY-PORTABLE
CHASSIS NO. 4B01

TRIMMER LOCATIONS

All voltages measured with a
20,000 ohm per volt meter from
chassis to socket contact indicated.
All voltages are positive D.C. unless marked otherwise.
Volume control full on.
Stage Gains:
Bc. and 455 Kc. I.F.
Ant. to R.F. grid 5.5× at 1000 Kc.
R.F. grid to conv, grid 6.2× at 1000 Kc.
Conv. grid to I.F. grid 51× at 455 Kc.
Overall audio 289× at .25 watt.
400 cycles.

Model 6 D 516
6 Tube Superheterodyne
Chassis No. 6A24 AC-DC

All voltages measured with a 20,000 ohm per volt meter from chassis to socket contact indicated.
All voltages are positive D.C. unless marked otherwise.
Volume control full on.

Line voltage 117 A.C.
Power consumption 25.5 watts.
Power output 1 watt.
Tuning Range 540 Kc. to 1600 Kc.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Connect Test Oscillator to</th>
<th>Dummy Antenna</th>
<th>Input Signal Frequency</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Trimmers</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Converter Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>A, B, C, D</td>
<td>Align I. F.</td>
</tr>
<tr>
<td>2</td>
<td>H. F. Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>&quot;</td>
<td>800 Kc.</td>
<td>E</td>
<td>Adj. Wave Trap for Minimum</td>
</tr>
<tr>
<td>3</td>
<td>1 Turn Loop Made from Generator Leads</td>
<td>1600 Kc.</td>
<td>&quot;</td>
<td>1600 Kc.</td>
<td>F</td>
<td>Set Oscillator to Scale</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>See Note!</td>
<td>1400 Kc.</td>
<td>&quot;</td>
<td>1400 Kc.</td>
<td>G</td>
<td>Align Antenna</td>
<td></td>
</tr>
</tbody>
</table>
Stage Gain:
Bc. and 455 Kc. I.F.
Ant to B.F. grid 5 x at 1000 Kc.
R.F. grid to conv. grid 6.5 x at 1000 Kc.
Conv. grid to I.F. grid 48.1 x at 455 Kc.
Overall audio 322 x at .05 watt, 400 cycles.

I.F. FREQUENCY 455 Kc.
6 TUBE SUPERHETERODYNE
CHASSIS NO. 6A25
110 VOLT A.C.-D.C.-BATTERY PACK
Power output 360 watts.
Volume control full on.
Line voltage 117 A.C.
Power consumption 20 watts.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Dummy Antenna</th>
<th>Input Signal Frequency</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Trimmer</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Converter Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>A, B, C, D</td>
</tr>
<tr>
<td>2</td>
<td>Converter Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>E</td>
</tr>
<tr>
<td>3</td>
<td>Ant.—Gnd.</td>
<td>200 mfd.</td>
<td>1620 Kc.</td>
<td>BC</td>
<td>1620 Kc.</td>
<td>F</td>
</tr>
<tr>
<td>4</td>
<td>Ant.—Gnd.</td>
<td>200 mfd.</td>
<td>1400 Kc.</td>
<td>BC</td>
<td>1400 Kc.</td>
<td>G</td>
</tr>
</tbody>
</table>

TRIMMER LOCATIONS
Power output 1. watt.

Tuning Ranges 540 Kc to 1600 Kc.

DENOTES CHASSIS 'GROUND'

All voltages measured with a 20,000 ohm per volt meter from chassis to socket contact indicated.

All voltages are positive D.C. unless marked otherwise.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Contact Test Oscillator to</th>
<th>Dummy Antenna</th>
<th>Input Signal Frequency</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Trimmers</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Converter Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>800 Kc.</td>
<td>A, B, C, D</td>
<td>Align I. F.</td>
</tr>
<tr>
<td>2</td>
<td>R. F. Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>E</td>
<td>Add. Wave Trap for Minimum</td>
</tr>
<tr>
<td>3</td>
<td>1 Turn Loop Made</td>
<td></td>
<td>1600 Kc.</td>
<td>BC</td>
<td>1600 Kc.</td>
<td>F</td>
<td>Set Oscillator to Scale</td>
</tr>
<tr>
<td>4</td>
<td>Leads.</td>
<td></td>
<td>1400 Kc.</td>
<td>BC</td>
<td>1400 Kc.</td>
<td>G</td>
<td>Align Antenna</td>
</tr>
</tbody>
</table>

See Note!
AUTOMATIC

It will be necessary to first set the automatic tuning adjustments to six preseleced stations before the automatic tuning can be used.

Each button and its associated tuning adjustment will tune over a portion of the broadcast band, and any station within its tuning range may be selected for automatic tuning on that button.

The tuning ranges are as follows: (See Fig. 2)

No. 1 button—upper left............545 K.C. to 940 K.C. No. 2 button—lower left............740 K.C. to 1200 K.C.
No. 2 button—upper center...........650 K.C. to 1000 K.C. No. 3 button—lower center...........940 K.C. to 1300 K.C.
No. 3 button—upper right.............655 K.C. to 1100 K.C. No. 4 button—lower right.............970 K.C. to 1450 K.C.
No. 4 button—upper right.............655 K.C. to 1100 K.C. No. 5 button—lower right.............970 K.C. to 1450 K.C.
No. 5 button—upper right.............655 K.C. to 1100 K.C. No. 6 button—lower right.............970 K.C. to 1450 K.C.

To adjust the automatic tuning proceed as follows:

A. Remove the automatic cover plate by pressing on latch pin and lifting away from escutcheon.
B. Select a station within the range of the No. 1 button.
C. Turn the band switch to Broadcast and then tune in the selected station on the dial—then turn band switch to Automatic position.
D. Press the No. 1 button and tune in the same station on the adjacent automatic adjustments by using the special wrench furnished with the receiver. (See Fig. 4.) First, adjust the screw and then the hexagonal nut to the setting which gives the loudest and clearest reception on the desired station. Repeat the operation for greatest accuracy.

AUTOMATIC FREQUENCY MODULATION BAND

The six push buttons across the lower part of the control panel (See Figure 2) provide means of tuning F.M. stations either manually or automatically. Five of these push buttons may be preset for five F.M. stations as follows:
(1) Select station within range of No. 1 button.
(2) Remove covers from adjusting screws by pulling latch pin and lifting covers.
(3) Turn band switch to F.M., press No. 1 button and tune in desired station on adjacent adjustment, using adjustment wrench.
(4) Follow the same procedure on remaining 4 buttons.
(5) Replace covers.

The tuning range covered by each adjusting screw is as follows:
No. 1 Button — 45.5 M.C. to 60.5 M.C.
No. 2 Button — 45.5 M.C. to 50.5 M.C.
No. 3 Button — 45 M.C. to 49 M.C.
No. 4 Button — 41.5 M.C. to 48.5 M.C.
No. 5 Button — 41.5 M.C. to 48 M.C.

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Stage Gains:

Bc. and 455 Kc. I.F.

Ant. to R.F. grid 3.8× at 1000 Kc.
R.F. grid to conv. grid 7× at 1000 Kc.
Conv. grid to I.F. grid 92× at 455 Kc.
Overall audio 778× at 1 watt.
400 cycles.

All voltages measured with a 20,000 ohm per volt meter from chassis to socket contact indicated.

All voltages are positive D.C. unless marked otherwise.

Volume control full on.
Line voltage 117 A.C.
Power consumption 60 watts.
### ALIGNMENT PROCEDURE

**Model 7S598**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Conn. Test Oscillator to</th>
<th>Dummy Antenna</th>
<th>Input Signal Frequency</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Trimmers</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Converter Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>A, B, C, D</td>
<td>Align I. F.</td>
</tr>
<tr>
<td>2</td>
<td>R. F. Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>E</td>
<td>Adj. Wave Trap for Minimum</td>
</tr>
<tr>
<td>3</td>
<td>—</td>
<td>18 Mc.</td>
<td>—</td>
<td>SW</td>
<td>18 Mc.</td>
<td>K</td>
<td>Set Oscillator to Scale</td>
</tr>
<tr>
<td>4</td>
<td>1 Turn Loop Mode</td>
<td>—</td>
<td>16 Mc.</td>
<td>SW</td>
<td>16 Mc.</td>
<td>M</td>
<td>Align Antenna</td>
</tr>
<tr>
<td>5</td>
<td>with Generator</td>
<td>—</td>
<td>4.5 Mc.</td>
<td>Med.</td>
<td>4.5 Mc.</td>
<td>Q</td>
<td>Rock Gang and Adjust for Max.</td>
</tr>
<tr>
<td>6</td>
<td>Leads to 10&quot; dia.</td>
<td>—</td>
<td>1500 Kc.</td>
<td>BC</td>
<td>1500 Kc.</td>
<td>F</td>
<td>Set Oscillator to Scale</td>
</tr>
<tr>
<td>7</td>
<td>—</td>
<td>1400 Kc.</td>
<td>BC</td>
<td>1400 Kc.</td>
<td>G</td>
<td>Align Antenna</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Repeat operations 6-7 and 3-4</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

**Models 10H571R, 10H573**

<table>
<thead>
<tr>
<th>Chassis No. 10A3R</th>
</tr>
</thead>
</table>

**ALIGNMENT PROCEDURE**

<table>
<thead>
<tr>
<th>Opn.</th>
<th>Conn. Test Oscillator to</th>
<th>Dummy Antenna</th>
<th>Input Signal Frequency</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Trimmers</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Converter Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>A, B, C, D</td>
<td>Align I. F.</td>
</tr>
<tr>
<td>2</td>
<td>R. F. Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>E</td>
<td>Adj. Wave Trap for Minimum</td>
</tr>
<tr>
<td>3</td>
<td>—</td>
<td>18 Mc.</td>
<td>—</td>
<td>SW</td>
<td>18 Mc.</td>
<td>K</td>
<td>Set Oscillator to Scale</td>
</tr>
<tr>
<td>4</td>
<td>1 Turn Loop Mode</td>
<td>—</td>
<td>16 Mc.</td>
<td>SW</td>
<td>16 Mc.</td>
<td>M</td>
<td>Align Antenna</td>
</tr>
<tr>
<td>5</td>
<td>with Generator</td>
<td>—</td>
<td>4.5 Mc.</td>
<td>Med.</td>
<td>4.5 Mc.</td>
<td>Q</td>
<td>Rock Gang and Adjust for Max.</td>
</tr>
<tr>
<td>6</td>
<td>Leads to 10&quot; dia.</td>
<td>—</td>
<td>1400 Kc.</td>
<td>BC</td>
<td>1400 Kc.</td>
<td>F</td>
<td>Set Oscillator to Scale</td>
</tr>
<tr>
<td>7</td>
<td>—</td>
<td>800 Kc.</td>
<td>BC</td>
<td>800 Kc.</td>
<td>G</td>
<td>Align Antenna</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>See Note</td>
<td>—</td>
<td>800 Kc.</td>
<td>BC</td>
<td>800 Kc.</td>
<td>J</td>
<td>Rock Gang to Troublesh BC Pedal</td>
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**F. M. ALIGNMENT**

<table>
<thead>
<tr>
<th>X</th>
<th>FM output meter across full discriminator load</th>
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<tr>
<td>10</td>
<td>PNT and T. F. Grid</td>
</tr>
<tr>
<td>11</td>
<td>&quot;</td>
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<td>12</td>
<td>&quot;</td>
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<td>&quot;</td>
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<td>15</td>
<td>FM Ant. Terminals</td>
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<tr>
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<td>17</td>
<td>&quot;</td>
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<tr>
<td>18</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

**Stage Gains**

- BC and 455 Kc. LF.
- Ant. to R. F. grid 3.2 X at 1000 Kc.
- R. F. grid to conv. grid 8.1 X at 1000 Kc.
- Conv. grid to LF. grid 85 X at 438 Kc.
- Overall audio 1411 X at 1 watt.

**Diagrams**

- ALIGNMENT PROCEDURE
- TRIMMER LOCATIONS
FREQUENCY MODULATION

Broadcasting by the Frequency Modulation method has already proved to be the most satisfactory means of "Local" radio transmission with reduced noise and high fidelity. It is not generally understood that these two features of FM are due to a great measure to the wide frequency band which this method of modulation employs. The FM receiver must be accurately aligned because much of the FM system's noise reducing ability is lost if the FM IF and discriminator circuits are misaligned.

The alignment of FM receivers differs from the familiar AM receiver alignment procedure where a modulated signal from the generator is used and the output is measured with an A.C. voltmeter across the voice coil.

The signal generator for FM alignment must be capable of supplying an unmodulated signal of at least .5 volt at the IF frequencies (4 to 9 Mc.) and a moderate unmodulated signal at the FM RF frequencies (41.5 to 50.3 Mc.). A 50-0-50 microammeter, such as Triplett 331 or 531, makes an excellent output meter when used with our #9914 four-prong plug and cable assembly and a S.P.D.T. switch. (see Fig. 1)

The output meter is connected across HALF the diode load resistor for gain alignment and is connected across the FULL diode load resistor for frequency settings. A polarized socket is provided (over the T& S tube) which accommodates the output meter plug to facilitate switching the meter across either FULL or HALF the diode load resistor.

IMPORTANT.—The FM IF and discriminator alignment must be followed in a step-by-step sequence, beginning at the discriminator and working forward to the converter stage. This differs from the conventional AM IF alignment procedure where the signal is applied to the converter grid and all the IF's are aligned simultaneously.

The signal from the generator must be kept just below the point where the limiter action of the receiver begins. To explain further we should consider the purpose of the limiter. It does what its name implies; it limits the amount of signal applied to the discriminator circuit. When the input signal is strong enough to allow a portion of the signal to pass, while at low signal levels the limiter acts as an IF amplifier. Therefore, it is easy to understand why the signal input to the receiver and IF's must be held below the limiter operating range during alignment. The most practical way of determining the proper amount of input signal is to watch the output meter (across HALF the diode load) while the signal from the generator is increased. The meter will indicate the increase in signal until limiting action begins, from which point on no appreciable increase can be noticed on the meter even though the generator signal has been increased considerably. The desired signal input level (from the generator) is just below the limiting point which may be determined by increasing the generator output while watching the output meter, then reducing the generator output slightly when the limiting point is reached.

IF AND DISCRIMINATOR ALIGNMENT

Noise have been placed at the top of all the IF and discriminator transformers so that a signal generator may be connected across the transformer secondaries to facilitate alignment. (see fig. 2) A very high input signal will be necessary to get an output indication for the discriminator alignment. Should the generator be unable to supply sufficient signal, the Discriminator input stage may be aligned first in order that its gain may be utilized to raise the input signal to the discriminator.

1. Connect the output meter across the FULL discriminator load (fig. 1)

2. Feed an unmodulated signal at the IF frequency, through the dummy antennas (fig. 1) to the 3rd IF transformer secondary. (The IF frequency is stamped on the IF transformer shield.) Adjust the slug B4 through the resonance point. Repeating the slug B4 through the resonance point will cause the output meter to swing from zero to positive or negative voltage. Zero reading on the meter indicates the desired resonance point.

3. Switch the output meter to HALF discriminator load (fig. 1). Adjust trimmer A4 for maximum output, keeping the signal input below the point of limiting action.

4. (Meter at HALF load) Connect the generator to the 2nd IF transformer secondary and adjust the 3rd IF transformers B3 and B5 for maximum output.

5. (Meter at HALF load) Connect the generator across the 1st IF transformer secondary and adjust the 2nd IF transformer trimmers B2 and B5 for maximum output.

6. (Meter at HALF load) Connect the generator to the converter grid. A small socket is provided near the converter tube which will accommodate the side pin of the #9914 Dummy Antenna assembly (fig. 2) to facilitate this generator connection. Adjust the 1st IF transformers trimmers A1 for maximum output.

FM OSCILLATOR AND RF ALIGNMENT

7a. (Meter at FULL load) Connect the generator through a 100 ohm dummy antenna, to the FM antenna terminals. Set the generator to 50 Mc. and tune in the signal on the receiver. As the pointer passes the 50 Mc. calibration the output meter will swing from negative through zero to a positive reading or vice versa. The resonance point is again at the zero setting. Should the pointer be off calibration more than plus or minus 5 Mc. which is tolerable, the oscillator may be set by adjusting the two flexible green leads between the manual tuning oscillator coil and the band switch. If the pointer is below 50 Mc. it can be raised by bringing the two green leads together and in the same manner the pointer can be lowered by separating the leads.

7b. (Meter still at FULL load) Set the generator at 45 Mc. and check the dial calibration (zero on meter). 45 Mc. should be on scale unless the cam on the condenser shaft has been loosen. If the cam has to be adjusted to scale the oscillator at 45 Mc. 50 Mc. oscillator adjustment must be repeated. The converter stage is aligned after the receiver had been adjusted to scale within the 5 Mc. limits.

8a. (Meter at FULL load) With generator connected to the FM antenna terminals through 100 ohm dummy, set the generator at 45 Mc. and tune in signal on receiver to get a zero output meter reading. Switch the meter to HALF load and adjust the generator to give an output just below the limiting point. Adjust slug B1 for maximum output.

8b. (Meter at FULL load) Set generator at 45 Mc. and tune in on receiver. Switch meter to HALF load and adjust B2 for maximum output.

There are no IF adjustments for the FM push buttons when the push buttons are used on automatic. Button #1 is checked at 50 Mc., buttons #2 and #3 checked at 45 Mc., buttons #4 and #5 checked at 42.5 Mc. and button #6 is the manual switch.

In conclusion we again wish to emphasize the importance of keeping the signal from the generator below the point where limiting action begins, that the output meter is connected across the FULL diode load resistor for frequency and calibration operations, and that the output meter is connected across HALF the diode load resistor for gain checks.
Sensitivity — 7 Microvolts at one watt output.

Power Output — 4.5 watts measured at the voice coil.

Tuning Range — 540-1600 K.C.

Tube Complement — 747 R.F.; 786 Oscillator and Modulator; 6X5GT or 02A Rectifier; 7C5 Beam power output.

Current Consumption — 7 amp.
ALIGNMENT:

The alignment of a receiver is one of the most important functions that a service man performs, and the instructions must be carefully followed.

CAUTION:

Care should be taken while making all adjustments on the receiver to have the volume control turned full on. The intensity of the signal should be reduced only at the signal generator.

The signal for the entire alignment procedure, both L.F. and R.F., is fed through a special Zenith dummy antenna which can be purchased from your Zenith distributor, Part No. 9587. The capacities in the Zenith dummy antenna as shown in Fig. 2 are identical with the Ford antenna.

R.F.—

1. The receiver must be in one of the automatic positions.
2. The signal generator is set at 455 K.C. and fed through the special Zenith dummy to the receiver.
3. The R.F. and code trap adjustment screw A (see Fig. 3) is adjusted for maximum response.
4. The adjustment screws B, C, D and E (see Fig. 3) are then adjusted in order for maximum response.
5. The code trap A is then adjusted for minimum response.

L.F.—

1. The signal generator is set to 1600 K.C.
2. Set signal generator to 1400 K.C. and rotate the tuning control until a signal is heard.
3. Adjust the R.F. trimmer G (see Fig. 4) and the antenna trimmer H (see Fig. 5) for maximum response.
4. Adjust the No. 1 screw (see Fig. 5) with wrench provided until the desired station is tuned to the loudest point.
5. Adjust No. 1 nut (see Fig. 5) for maximum signal.

The same procedure is followed in setting the remaining four adjustments selecting a station within the tuning range of each adjusting screw and placing the selector switch in the corresponding position for each adjusting screw.

The station adjusting eye can be used using this wrench, the adjustments are not set regardless of signal strength.

The eye can also be used when aligning the receiver instead of an output meter. The eye with a special cable and plug is available at your Zenith distributor.

MODELS 6MF580, 6LP591

ZENITH RADIO CORP.

NOTE:

This receiver is equipped with an adjustable sensitivity control located on the bottom of the chassis as shown in Fig. 1. The control is set at the factory to a position which gives sensitivity of 7 microvolts at 1 watt output. It is found advisable to hold the receiver at this level as any higher sensitivity may result in excessive background noise and unless laboratory equipment is available for measuring sensitivity it is not advisable to change the setting.
Fig. 1

TUBE COMPLEMENT

**7A7** R.F.

**7B8** Oscillator and Modulator;

**7A7** I.F.;

**7B6** Second Detector and A.V.C.;

**7B5** Pentode power output;

**6X5GT** Rectifier.

CURRENT CONSUMPTION - 6 amp.

TUNING RANGE 540 - 1600 K.C.

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>CONDENSERS</th>
<th>PART NO.</th>
<th>RESISTORS</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>62-177</td>
<td>2 GANG VARIABLE COND.</td>
<td>R-250-500</td>
<td>R-250-500</td>
<td>ANT. MOTOR NOISE CHOK.</td>
</tr>
<tr>
<td>62-177</td>
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<td>R-150-1000</td>
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<td>SENSITIVITY CONTROL</td>
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<td>HEATER LINE CHOK.</td>
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<td>HEATER LINE CHOK.</td>
</tr>
<tr>
<td>62-177</td>
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<td>R-150-1000</td>
<td>R-150-1000</td>
<td>HEATER LINE CHOK.</td>
</tr>
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<td>62-177</td>
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<td>R-250-500</td>
<td>R-250-500</td>
<td>HEATER LINE CHOK.</td>
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<tr>
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<tr>
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<td>R-150-1000</td>
<td>R-150-1000</td>
<td>HEATER LINE CHOK.</td>
</tr>
</tbody>
</table>

SENSITIVITY - 9 microvolts at one watt output.

POWER OUTPUT - 3 watts measured at the voice coil.
Zenith Model 6MN595  
Nash A.C. 6011 Special  
Tuning Range: 540 to 1600 K.C.  
Sensitivity: 8 microvolts at 1 watt output.

The cover on both receivers may be removed to check tubes and vibrator without removing the set from the car.

**SOCKET VOLTAGES**  
Figs. 1 and 2 show approximate voltages at the socket terminals.

![Diagram of socket terminals](image)

**SETTLING THE SUPER-MATIC TUNING**  
**MODEL 6MN595**

Adjustment should not be made until receiver has warmed up 15 minutes.

- (A) Select a desired station at right side of dial scale.
- (B) Loosen screw on right hand push button bar. (See Fig. 4)
- (C) Push Super-Matic button bar in as far as possible and tighten screw while bar is in this position.
- (D) Repeat the above for remaining bars, choosing three other desired stations.
- (E) Insert push buttons on push button bars.

**6MN595 AC 6011 SPECIAL**

L.F.: The tuning condenser is fully meshed (540 K.C.) The signal generator is set at 455 K.C. and fed through the special Zenith antenna dummy to the receiver. The wave trap adjustment screw A, (see Fig. 2) is adjusted for maximum response. The adjusting screws B, C, D and E (see Fig. 3) are then adjusted in order for maximum response on the output meter. The wave trap A is then adjusted for minimum response.

R.F.: The tuning control is rotated until the condenser plates are completely out of mesh (1600 K.C.) Set the signal generator to 1600 K.C. Adjust the 1600 K.C. oscillator trimmer F shown in Fig. 3 for maximum response.

Set the signal generator to 1400 K.C. Rotate the tuning control until a signal is heard and adjust the 1400 antenna trimmer G (See Fig. 3) for maximum response.

Reset the signal generator to 600 K.C. and rotate the tuning control until a signal is heard, and adjust the core H (See Fig. 1) in the antenna coil for maximum response.

If core H is found to be off a great deal, the 1400 antenna trimmer G should be readjusted.
SETTING THE SAFETY AUTOMATIC ELECTRIC TUNING

(A) The automatic station adjusting eye is plugged into the socket on the receiver. (See Fig. 7)

(B) The indicator window is removed from the receiver by inserting a small screwdriver underneath the left edge of the indicator window and pressing outward. This makes the adjustment screws available.

(C) The set should be turned on and allowed to warm up at least half an hour.

The range for each adjustment is located underneath the adjustment number.

A station close to 580 K.C. is set by having the figure 1 so it would appear in indicator window. The adjustment screw No. 1 (See Fig. 8) is then adjusted to the proper signal until the tuning eye gap can not be decreased in size. The No. 1 nut (See Fig. 8) is then adjusted until the gap on the tuning eye can not be further decreased in size. A wrench for making these adjustments is located on the side of the receiver. (See Fig. 7)

(D) For stations 2, 3, etc. on the Safety Automatic Electric Tuner you set the adjustment screws and nuts the same as for station 1.

The Safety Automatic Station Adjusting Eye is available at all Zenith distributors.

The stringing of the dial cord is very important for unless properly string the cord will limp off the pulleys. Figure 9 shows the proper way to string the cords on both receivers.
Sensitivity—6 microvolts at one watt output. Power Output—6 watts measured at the voice coil. Tuning Range—540 to 1600 K.C. Speaker—full size electrodynamic. L.F.—455 K.C. Roto-Selector tuning with foot control switch—Selection of any five desired stations automatically by using the foot control or Roto-Selector on instrument panel.

Tube Complement—7A7 R.F. — 7B8 oscillator and modulator — 7A7 L.F. — 7B6 2nd detector and A.V.C. — two 7C5 beam power push pull output — 6X5GT or 0Z4 rectifier—Current consumption 8 amperes.
ALIGNMENT:
The alignment of the receiver is one of the most important functions that a service man performs, and the instructions must be carefully followed.

CAUTION:
Great care should be taken while making all adjustments on the receiver to have the volume control turned full on. The intensity of the signal should be reduced only at the signal generator.

The signal for the entire alignment procedure, both I.F. and R.F., is fed through a special Zenith dummy which is purchased from your Zenith distributor—Part No. S9189.

The capacities in the Zenith dummy as shown in Fig. 2 are identical with the Lincoln antennas, and if the receiver is adjusted accordingly, the instrument will operate properly when installed in the car.

NOTE:
This receiver is equipped with an adjustable sensitivity control located on the side of the chassis as shown in Fig. 1. The control is set at the factory to a position which gives sensitivity of 6 microvolts at 1 watt output. It is found advisable to hold the receiver at this level as any higher sensitivity may result in excessive background noise and unless laboratory equipment is available for measuring sensitivity, it is not advisable to change this setting.

1. The receiver is returned to manual tuning.
2. The tuning control is rotated until the condenser plates are out of mesh (1800 K.C.)
3. The signal generator is set to 1800 K.C.
4. Adjust the 1800 K.C. oscillator trimmer F (see Fig. 4) for maximum response.
5. Set signal generator to 1800 K.C. and rotate the tuning control until a signal is heard.
6. Adjust the R.F. trimmer G (see Fig. 4) and the anode trimmer H (see Fig. 5) for maximum response.
7. Set the signal generator to 600 K.C. and rotate the tuning control until signal is heard.
8. The condenser gang is then rocked slightly while adjusting the 600 K.C. padger I (see Fig. 4) for maximum response.

3. The R.F. and code trap adjustment screw A (see Fig. 3) is adjusted for maximum response.
4. The adjustment screws B, C, D and E (see Fig. 3) are then adjusted in order for maximum response.
5. The code trap A is then adjusted for minimum response.

TUBE LAYOUT—MODEL 7ML 592

R.F.—

1. The receiver is returned to manual tuning.
2. The tuning control is rotated until the condenser plates are out of mesh (1800 K.C.)
3. The signal generator is set to 1800 K.C.
4. Adjust the 1800 K.C. oscillator trimmer F (see Fig. 4) for maximum response.
5. Set signal generator to 1800 K.C. and rotate the tuning control until a signal is heard.
6. Adjust the R.F. trimmer G (see Fig. 4) and the anode trimmer H (see Fig. 5) for maximum response.
7. Set the signal generator to 600 K.C. and rotate the tuning control until signal is heard.
8. The condenser gang is then rocked slightly while adjusting the 600 K.C. padger I (see Fig. 4) for maximum response.

A station adjusting eye is available at your Zenith distributor. It is especially essential when setting the Roto-Selector on a strong signal. This eye may also be used for alignment work instead of an output meter.

A jumper is provided on the test socket (see Fig. 1) located on the bottom of the receiver. Removing of this jumper will open the voice coil and allow you to connect your output meter to the voice coil side of the output transformer.

If you have the type of output meter which is usually connected to the plate of the output tube, it may be adapted for use as follows:

1. Turn receiver on and allow it to operate for half an hour before making any adjustment.
2. Select a station within the range of position 1 on the Roto-Selector.
3. Adjust the No. 1 nut (see Fig. 5) for maximum signal.
4. Adjust the No. 1 screw (see Fig. 5) with the wrench provided until the desired station is turned to the loudest point.
5. Adjust the No. 1 nut (see Fig. 5) for maximum signal.
This receiver comprises a five tube superheterodyne receiver, employing the new 1.4 volt battery tubes. This receiver operates on either batteries, or 110-125 volts A.C.-D.C.

The frequency range covered is standard broadcast, 530 to 1730 kc and some of the low frequency police transmitters.

MODEL 4037

ELECTRIC OPERATION:
A power cord and plug is provided in a compartment at the rear of the cabinet. To place the set in operation, open the flap cover which is secured by the snap fastener and remove the power cord plug from its receptacle in the chassis. Stretch the line cord to its full length and plug it into the electric outlet. Finally, the set may be switched on by turning the volume control knob in a clockwise direction. A pilot light is provided which illuminates the dial when the set is operated on the power lines.

Do not attempt to close the flap when the line cord is plugged into the electric outlet.
The diagrams on the yellow sheets in this section indicate the breakdown of the individual bands of the multi-wave band receivers specified in the corner cards and shown in the respective manufacturers' sections in the main part of this Manual. Those schematics for which breakdowns have been made bear a designation ( ) in the upper margin. The purpose of these breakdowns is to show how the components, that is the coils, condensers and switch contacts, are used when the receiver is set to different bands. In the majority of cases the circuits shown are the r-f and oscillator systems; however, in a few instances, a-f breakdowns are given.

The switch contacts which are associated with the various circuits, are represented as small circles, bearing either numerical or alphabetical designations corresponding to those designations shown upon the complete diagram contained in the respective manufacturers' sections in the main part of the Manual. The connections between the switch points are shown by dotted lines.

Each of the main diagrams, that is complete schematics, shows the wave-band switch in a certain position; usually this is the broadcast-band position. This same position is shown as the first position in the breakdown diagram unless the contrary is specified. Reference in the breakdown diagrams to the fact that the switch is shown as having been moved from one position, indicates the first position immediately following either the broadcast band, if that is the first shown, or whatever the band may be which is the first shown. Expressed differently this is, if the designation is "switch moved one position", this means that the wave-band switch has been turned one position from the reference point designated as "switch as shown".
"CLARIFIED SCHEMATICS"

When all switches associated with the movement turn in the same direction, this is specified as "clockwise" or "counter-clockwise" as the case may be.

You will note that corner cards on some of the "Clarified Schematic" breakdowns indicate several receivers. This means that the r-f and oscillator sections, as shown in the breakdown, apply to those receivers. However, this should not be construed as signifying that all these receivers are the same throughout. It simply means that the wave-band positions and associated circuits are the same for each model or chassis listed under the same "Clarified Schematic".

In some cases sections of the wave-band switch are used to short-circuit coils which are not in operation on the particular band shown in the schematic. In cases where inclusion of these shorted coils unnecessarily complicates the breakdown, they have been omitted, since they are not essential to the operation of the signal-carrying circuits.

In the case of audio-frequency circuit breakdowns, the designations shown upon the breakdown schematics correspond with the designations shown upon the complete schematics.

For your convenience the pin terminals for each tube represented in the breakdown diagrams have been numbered according to the RNA system.

You will note that in some cases the bands are identified in accordance with the frequency range covered. Then again in some instances these frequency ranges are omitted. The reason for the omission is that we were unable to identify the specific ranges covered by the various bands and it was felt that, since all receivers do not employ switch arrangements which increase the frequency range in exact sequence as the range switch is advanced, it was deemed advisable to speak simply in terms of the switch positions, rather than the frequency ranges. Of course, where the frequency range was known it has been identified.

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SWITCH AS SHOWN
BROADCAST BAND

SWITCH MOVED
1 POSITION
CLOCKWISE
1.7 TO 5.8 MC
BAND

SWITCH MOVED
2 POSITIONS
CLOCKWISE
5.7 TO 18.3 MC
BAND
SWITCH AS SHOWN

SWITCH MOVED 1 POSITION CLOCKWISE

SWITCH MOVED 2 POSITIONS CLOCKWISE
SWITCH MOVED
3 POSITIONS COUNTERCLOCKWISE

SWITCH MOVED
4 POSITIONS COUNTERCLOCKWISE
MODEL B-7
See Continental
Page 12-13

CONTINENTAL RADIO & TELEV. CORP.

MODEL A-7
See Continental
Page 12-12

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Compliments of www.nucow.com
SWITCH AS SHOWN

SWITCH MOVED 1 POSITION CLOCKWISE

SWITCH MOVED 2 POSITIONS CLOCKWISE
SWITCH MOVED 3 POSITIONS CLOCKWISE

SWITCH MOVED 4 POSITIONS CLOCKWISE

SWITCH MOVED 5 POSITIONS CLOCKWISE
MODEL 26
MODEL 26 Revised
See Crosley Page 12-21

COMPLAINTS OF WWW.NUCW.COM
P. B. OPERATION

B. C. BAND

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"CLARIFIED SCHEMATICS"

GAMBLE-SKOGMO, INC.

MODEL C509

See Gamble Page 12-3

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Compliments of www.nucow.com
MODEL C-509

(CONTINUED)

SWITCH
MOVED
3 POSITIONS
CLOCKWISE

SWITCH
MOVED
4 POSITIONS
CLOCKWISE
MODEL J-71
MODELS J-718 AND J-728

(CONTINUED)

BAND C

BAND D
INSIDE CONTACTS TURNED
2 POSITIONS CLOCKWISE

BAND A

INSIDE CONTACTS TURNED
3 POSITIONS CLOCKWISE

BAND B

©John F. Rider, Publisher
MODELS FE-112, FE-116, FE-119
GENERAL ELECTRIC CO.
See G.E. Page 12-57

BAND D1
INSIDE CONTACTS TURNED
1 POSITION CLOCKWISE

BAND D2
SWITCH SETTING SHOWN
ON SCHEMATIC

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Compliments of www.nucow.com
SWITCH AS SHOWN

SWITCH MOVED ONE POSITION COUNTERCLOCKWISE

SWITCH MOVED 2 POSITIONS COUNTERCLOCKWISE
MODEL R459
See Goodrich Page 12-25

SWITCH MOVED 3 POSITIONS CLOCKWISE

SWITCH MOVED 4 POSITIONS CLOCKWISE

PUSH BUTTON OPERATION
SWITCH MOVED 5 POSITIONS CLOCKWISE
THE MAGNAVOX CO. INC. CHASSIS CR-154
See Magnavox Page 12-7, 8
CHASSIS CR-155
See Magnavox Page 12-9, 10

PUSH BUTTON OPERATION

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“CLARIFIED SCHEMATICS” MONT.-WARD PAGE 12-3

MONTGOMERY WARD & CO. MODELS 04WG-803, 04WG-803B
See Mont.-Ward Page 12-45

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MODELS 04WG-803, 04WG-803B
See Mont.-Ward Page 12-45

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PUSH BUTTON OPERATION
SWITCH AS SHOWN

SWITCH MOVED 1 POSITION
COUNTERCLOCKWISE

SWITCH MOVED 2 POSITIONS
COUNTERCLOCKWISE
BROADCAST BAND

BAND B

BAND C
SWITCH AS SHOWN

SWITCH MOVED
1 POSITION COUNTERCLOCKWISE
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SWITCH AS SHOWN
POLICE BAND

SWITCH MOVED
1 POSITION
CLOCKWISE
SHORT WAVE BAND
PUSH BUTTON
BROADCAST BAND

SWITCH MOVED
2 POSITIONS
CLOCKWISE

POLICE BAND
SWITCH AS SHOWN