

General Electric Radio Model S-22

SERVICE NOTES S-22-Xca

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ELECTRICAL SPECIFICATIONS

Voltage Rating.....	105/125 Volts
Frequency Rating.....	50/60 Cycles, or 25/50 Cycles
Power Consumption.....	60 Cycles/100 Watts—25 Cycles/100 Watts
Recommended Antenna Length.....	25/75 Feet
Type of Circuit.....	A. C. Screen Grid Super-Heterodyne
Type and Number of Radiotrons.....	2 RCA-235, 1 UY-224, 2 UY-227, 2 UX-245, 1 UX-280, Total of 8
Number of Radio Frequency Stages.....	One
Type of First Detector.....	Tuned Input Grid Bias
Number of Intermediate Stages.....	One
Type of Second Detector.....	Power Grid Bias
Number of Audio Stages.....	One (Push-Pull)
Type of Rectifier.....	Full Wave, UX-280
Type of Loudspeaker.....	Dynamic
Wattage Dissipation in Loudspeaker Field.....	8.0 (100 Volts/80 M. A.)
Undistorted Output.....	3.0 Watts

PHYSICAL SPECIFICATIONS

Height.....	19 inches
Depth.....	10 inches
Width.....	14 inches
Weight Alone.....	37 pounds
Weight (Packed for Shipment).....	44 pounds
Packing Case Dimensions.....	16 $\frac{3}{4}$ " x 12 $\frac{7}{8}$ " x 23 $\frac{1}{4}$ "

INTRODUCTION

The General Electric Model S-22 is a compact radio receiver employing the super-heterodyne circuit. The inherent sensitivity, selectivity and tone quality of the super-heterodyne is a feature of this receiver. The unit type of construction is used (both S. P. U. and receiver assembly incorporated in the same chassis) which together with the reproducer unit results in a compact receiver of excellent performance. The entire mechanism is enclosed in a cabinet of pleasing design. Figure 1 shows a rear interior view.

Two Radiotrons UY-227, two Radiotrons RCA-235, two Radiotrons UX-245, one Radiotron UY-224 and one Radiotron UX-280 are used. The Radiotrons are shipped in their respective sockets.

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ELECTRICAL DESCRIPTION OF CIRCUIT

The schematic diagram of Model S-22 is shown in Figure 2. Starting from the antenna circuit, we find the following action taking place in the various stages.

The antenna is coupled to the grid coil of the R. F. stage by means of a high inductance coil connected from antenna to ground. This inductance has a sufficiently high value so that variations in the antenna system have but little effect on the tuning of the adjacent circuit.

The first tube is a tuned R. F. stage. This is the new Super Control Screen Grid Radiotron, RCA-235, which has a grid potential plate current curve that has no pronounced "knee." This characteristic reduces the tendency of the tube to become a detector when the control grid voltage is raised by the volume control. Such a characteristic means that secondary modulation effects will not be obtained and distortion due to high signal intensities will not develop. Also improved volume control action and elimination of the local-distant switch are obtained through the use of Radiotron RCA-235. The gain and other characteristics are approximately the same as those of Radiotron UY-224. The output of this circuit is inductively coupled to the grid coil of the first detector.

At this point the oscillator should be considered as its output is also coupled inductively to the grid coil of the first detector. This is a tuned grid circuit oscillator using a Radiotron UY-227, and having a closely coupled plate coil that gives sufficient feed-back to provide stable operation. The grid circuit is so designed that by means of a correct combination of capacity and inductance a constant frequency difference between the oscillator and the tuned R. F. circuits throughout the tuning range of the receiver is obtained.

The next circuit to examine is the first detector. The circuit is tuned by means of one of the gang condensers to the frequency of the incoming signal. In the grid circuit there is present the incoming signal and the oscillator signal, the latter being at a 175 K. C. difference from the former. The first detector is biased so as to operate as a plate rectification detector and its purpose is to extract the difference or beat frequency, produced by combining the signal and oscillator frequencies. The beat frequency—175 K. C.—appears in the plate circuit of the first detector which is accurately tuned to 175 K. C. The tube used as a first detector is Radiotron UY-224.

The next stage is that of the I. F. amplifier. A single stage is used. This requires two I. F. transformers consisting of four tuned circuits. The plate circuit of the first detector, the grid and plate circuit of the I. F. amplifier and the grid circuit of the second detector are all tuned to 175 K. C. The transformers are peaked, no attempt being made for flat top tuning. A Radiotron RCA-235 is used in this stage and its control grid voltage is also varied by means of the volume control.

Courtesy of nucow.com

The second detector is a high-plate voltage, grid-biased type, using Radiotron UY-227, which gives sufficient output to drive two Radiotrons UX-245 connected in push-pull without an intermediate audio stage. The purpose of the second detector is to extract the audio frequency component of the R. F. signal which represents the voice or musical modulations produced in the studio of the broadcasting station. The audio component is extracted and used to drive the power tubes while the R. F. current is by-passed and not used further.

A filter circuit consisting of a 0.05 mfd. condenser and 1 megohm resistor is used in the second detector grid circuit. This further reduces the small A. C. hum voltages present in the detector stage.

The power A. F. stage consists of two Radiotrons UX-245 connected in push-pull. Transformer coupling is used between the detector and the grids of the Radiotrons UX-245 as well as from the plates to the cone coil of the reproducer unit.

A tone control, consisting of a 0.0024 mfd. condenser in series with a 500,000 ohm variable resistor connected across the two grids of Radiotrons UX-245, is incorporated in this stage. The tone control functions to reduce the high frequency output as the resistance is reduced. At the extreme low position, the condenser and secondary of the A. F. transformer resonate at a low frequency and thereby further accentuate the bass response, thus partially compensating for the lack of a large speaker baffle surface.

The direct plate and grid voltages used by all the tubes are supplied from high voltage alternating current which is rectified by means of Radiotron UX-280. The filter used is of the "brute force" type using the field of the reproducer unit as the reactor. Electrolytic type condensers of 10 and 4 mfd. capacity respectively are used before and after the reactor. Two 0.5 mfd. condensers in the filter circuit function to by-pass any R. F. current that may be present. The bias voltage (50 volts) for Radiotrons UX-245 is obtained by using half the voltage drop (100 volts) across the field coil of the reproducer unit. Two 100,000 ohm resistors shunted across the field act as the voltage dividing resistor for this bias voltage.

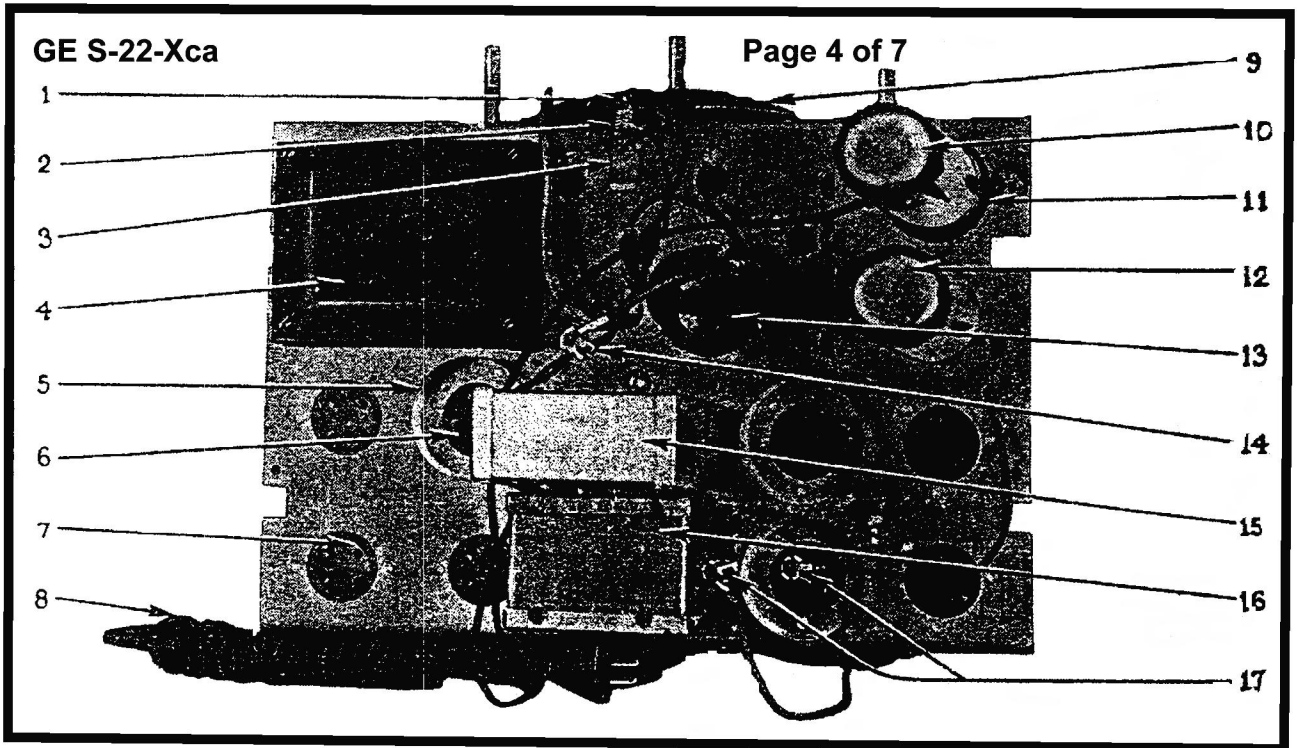


Figure 3—Top View of Chassis

Replacement Parts

Courtesy of nucow.com

Key No.	Stock No.	DESCRIPTION	List Price	Key No.	Stock No.	DESCRIPTION	List Price
CHASSIS PARTS							
1	A2429	Lamp—Dial lamp	\$0.12	15	A266	Capacitor Pack—R. F. by-pass capacitor pack	\$3.50
2	A516	Socket—Dial lamp socket . . . . .	.50	16	A35	Transformer assembly — A. F. transformer assembly complete in metal container	6.00
3	B2323	Bracket—For dial lamp socket . . . . .	.04	17	A2398	Cap—Grid contactor cap for I. F. or 1st detector tubes . . . . .	.10
4	A36	Transformer—105/125 volts, 50/60 cycles power transformer	9.00	18	A375	Resistor—150 ohms—Carbon type . . . . .	.40
	A37	Transformer—105/125 volts, 25/50 cycles power transformer	12.00	19	A369	Volume Control—Complete less knob	2.20
5	A1727	Base—Tube shield base—3 used . . . . .	.10	A2304	Knob—Volume control, station selector or tone control knob . . . . .	.30	
	A1728	Shield—Tube shield—3 used . . . . .	.18	A2710	Nut—Volume control mounting nut . . . . .	.04	
6	A522	Socket—UY Radiotron socket—Complete with insulating shield—5 used . . . . .	.40	20	A139	Coil—1st detector and oscillator coil complete with mounting bracket, screws and lock washers	2.40
7	A523	Socket—UX Radiotron socket—Complete with insulating shield—3 used . . . . .	.40	21	A272	Condenser — 745 mmfd. — Oscillator grid or series condenser . . . . .	.44
8	A1582	Cord—Power cord complete with male connector plug . . . . .	.75	22	A372	Resistor — 40,000 ohms — carbon type . . . . .	.40
9	B2326	Scale—Dial scale complete with drum and set screws . . . . .	.60	23	A373	Resistor — 6000 ohms — carbon type . . . . .	.60
	A3276	Screw—Set screw for dial scale drum—Package of 12 doz.	.24	24	A338	Resistor — 8000 ohms — carbon type . . . . .	.40
	B2324	Shaft—Drive shaft for operating dial . . . . .	.50	25	A135	Transformer—1st I. F. transformer complete with shield	3.00
10	A268	Condenser—10 mfd. electrolytic condenser	3.00	26	A136	Transformer—2nd I. F. transformer complete with shield	3.00
11	A3031	Washer—For 10 mfd. electrolytic condenser . . . . .	.10	A1729	Shield—Copper shield for I. F. transformer . . . . .	.60	
	A745	Terminal—For 10 mfd. electrolytic condenser . . . . .	.04	27	A744	Terminal—Single terminal complete with screw . . . . .	.06
12	A267	Condenser—4 mfd. electrolytic condenser	2.50	28	A959	Board—Magnetic pickup terminal board complete with terminals and screws . . . . .	.25
13	A138	Transformer—R. F. transformer complete with mounting bracket, nut and lock washer	1.90	29	A370	Tone control—Complete less knob	2.00
14	B2332	Cap—Grid contactor cap for R. F. socket					

REPLACEMENT PARTS—Continued

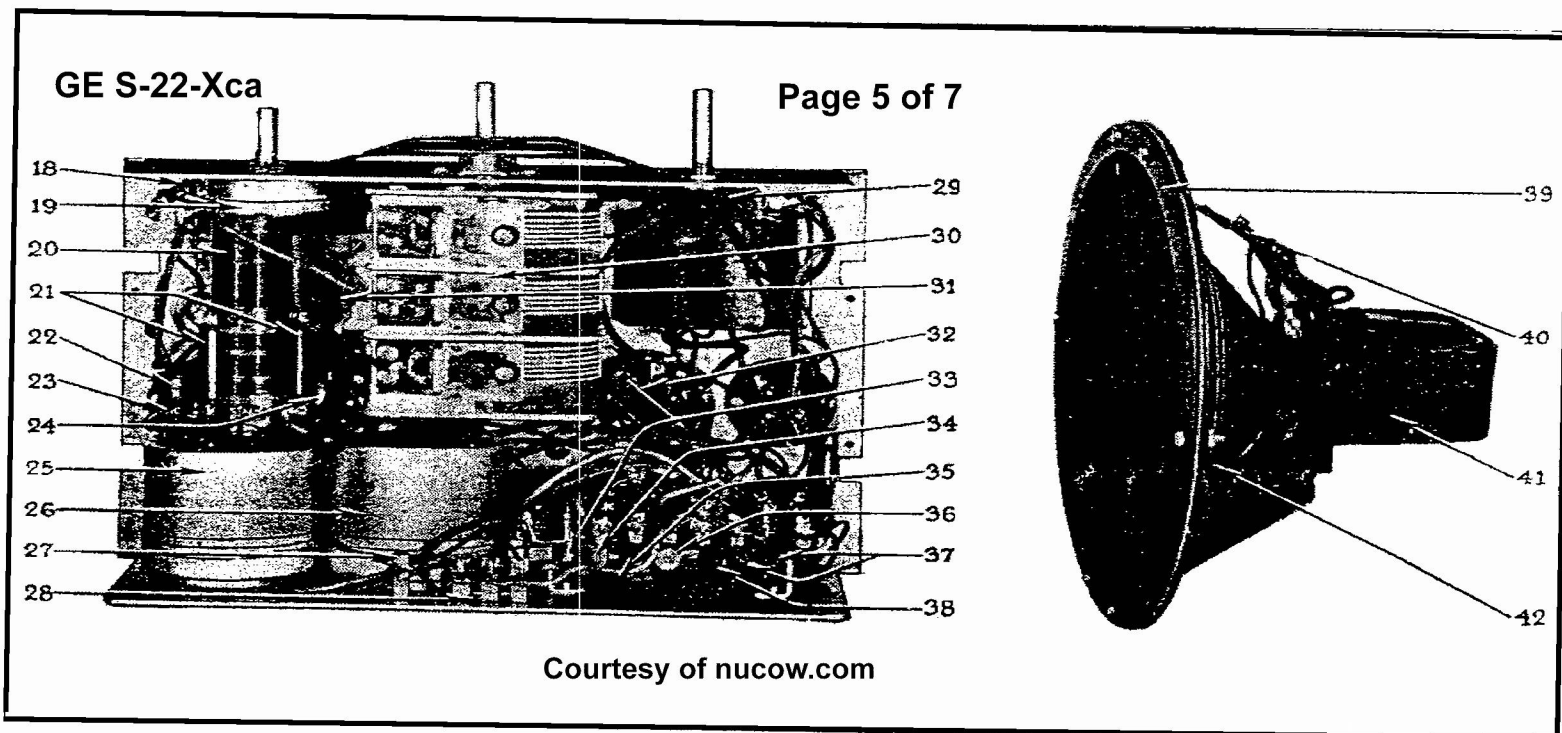
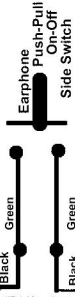


Figure 4—Bottom View of Chassis and Reproducer Unit

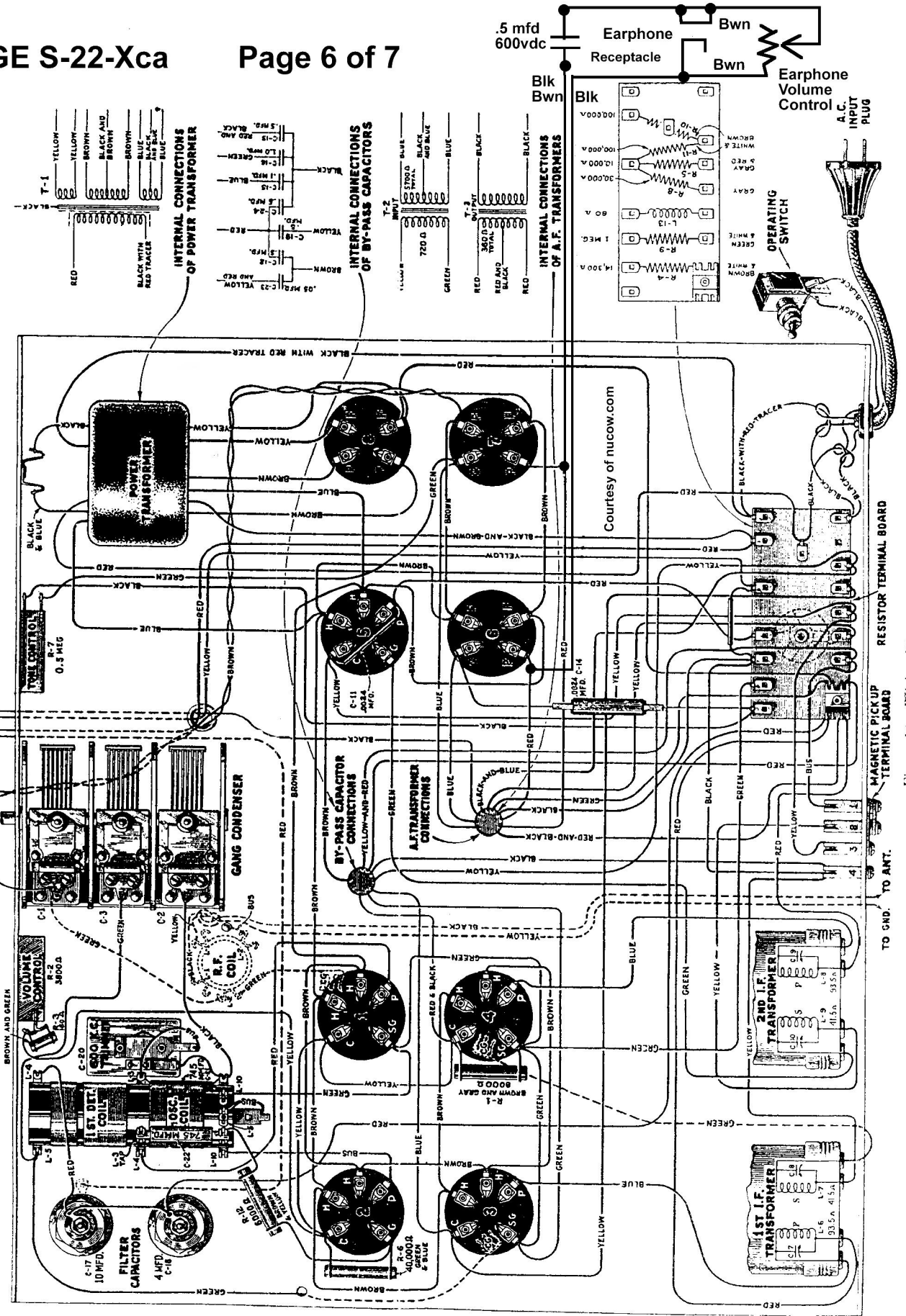
Key No.	Stock No.	DESCRIPTION	List Price	Key No.	Stock No.	DESCRIPTION	List Price
30	A269	Condenser—Three gang tuning condenser—Complete with line-up condensers and mounting screws.....	\$8.00		A2702	Nut—For cone mounting screw—Package of 12.....doz.	\$ 0.06
31	A270	Condenser—Adjustable oscillator trimming condenser.....		1.00		A3136	Screw—Cone centering screw—Package of 12.....doz.	.24
	A3275	Screw—Adjusting screw for oscillator trimming condenser — Package of 10.....	.50		A2993	Washer—For cone centering screw —Package of 12.....doz.	.12
32	A271	Condenser—.0024 mfd. fixed condenser—Used as tone control or 2nd detector by-pass condenser	.80		A3277	Screw—Special head screw for mounting loudspeaker to cabinet—Package of 12.....doz.	1.20
33	A371	Resistor — 14,300 ohms — Carbon type.....	.60	40	A942	Board — Loudspeaker terminal board.....	.16
34	A329	Resistor—1 megohm—Carbon type	.40	41	8653	Coil Assembly—Field coil, core and cone support.....	5.00
35	A137	Coil—2nd detector R. F. choke coil complete with rivet.....	.50	42	A2446	Cone—Loudspeaker cone.....	3.00
36	A313	Resistor—30,000 ohms—carbon type	.40	TOOLS			
37	A368	Resistor—100,000 ohms—carbon type—two used.....	.40	A6000	Screwdriver—Non-metallic screwdriver for oscillator and I. F. adjustments.....	.70	
38	A374	Resistor—10,000 ohms—carbon type	.40	A6001	Wrench—Socket wrench for R. F. line-up condenser adjustments.	.75	
	A960	Board—Resistor mounting board complete with terminals and mounting bracket—less resistors	1.00	SPECIAL PARTS SUPPLIED ON ORDER ONLY (Not to be stocked)			
	B2325	Insulator — For chassis shield — complete with rivets.....	.02	G-9500	Cabinet—Cabinet complete with baffle board, grille cloth and escutcheon (Walnut).....	15.00	
	B2330	Support—Rubber chassis support	.06	G-7800	Handle — Carrying handle complete with screws.....	1.00	
	A427	Switch—Operating switch complete with mounting nuts.....	.68	B2329	Loudspeaker—Dynamic loudspeaker complete.....	8.70	
	G-7801	Escutcheon—Dial scale escutcheon	.60	B2328	Chasis—Receiver chassis complete —less loudspeaker.....	40.00	
	G-8900	Board — Baffle board complete with grille cloth.....	1.00	8654	Transformer—220 Volt, 50-60 cycle power transformer.....	11.00	
LOUDSPEAKER PARTS							
39	A2421	Ring—Cone retaining ring.....	.35				
	A3226	Screw—Cone mounting screw—Package of 12.....doz.	.12				
	A2987	Washer—Lock washer for mounting cone—Package of 12...doz.	.10				

REPRODUCER UNIT TERMINAL BOARD



TO DIAL LAMP

LOWER CAPACITOR TERMINAL



RESISTOR TERMINAL BOARD

MAGNETIC PICK-UP TERMINAL BOARD

TO GND. TO ANT.

Figure 14—Wiring Diagram

General Electric Radio Models S-22, S-22X and S-42 S-22-Xca With Pentode Tubes

The General Electric Radio, models S-22, S-22-X, S-42, are eight tube screen grid Super-Heterodynes similar to earlier models, S-22, S-22-X and S-42 with the exception that the new Pentode Radiotrons, RCA-247 are used in the push-pull output stage instead of Radiotrons UX-245. Use of these tubes, with their associated circuits, results in greater sensitivity, greater power and better tone quality.

Referring to Figure 1, the schematic circuit diagram, the audio circuit functions in the following manner:

The output of the detector is coupled to the grids of the Radiotrons RCA-247 through an audio transformer. Shunted across the secondary of this transformer are two 0.0004 mfd. condensers, connected in series with the center connection grounded. The purpose of

these two condensers is to prevent any audio oscillation and to provide a high frequency cut-off for the stage. Also across the secondary of the input transformer is shunted the resistor and capacitor that constitutes the tone control. This is a 200,000 ohm variable resistor and a 0.008 mfd. condenser connected in series. The tone control functions to reduce the high frequency output as the resistance is decreased. At the extreme low position, the condenser and secondary of the A. F. transformer resonates at a low frequency and thereby accentuates the bass response. A 0.005 mfd. condenser connected in series with a 10,000 ohm resistor is placed across the primary of the output transformer. This functions to reduce the third harmonic distor-

tion, an inherent characteristic of the Pentode tube. The bias voltage for Radiotrons RCA-247 is obtained by using a portion of the drop across the reproducer field. One 160,000 ohm and one 40,000 ohm resistor act as voltage dividers.

SERVICE DATA

Figure 1 shows the schematic diagram and Figure 2 the wiring diagram. The voltage readings are shown on the reverse side and the replacement parts below.

Reference to the General Electric Radio, model S-22 Service Notes should be used for service data applying to the R. F., oscillator and I. F. stages as well as general service data on this type of receiver.

REPLACEMENT PARTS

Courtesy of nucow.com

Part No.	DESCRIPTION	List Price	Part No.	DESCRIPTION	List Price
PARTS COMMON TO ALL MODELS					
2563	Resistor—6,000 ohms—Carbon type—Package of 5	\$3.00	3085	Capacitor—400 mmfd.	\$.60
2734	Capacitor—745 mmfd.—Package of 5	2.20	7054	Cord—Power cord	1.00
2745	Screw—Adjusting condenser screw—Package of 10	.50	7062	Capacitor—Adjustable oscillator trimming capacitor	1.00
2746	Socket—Dial lamp socket	.50	7241	Capacitor—3 gang tuning capacitor	8.00
2747	Cap—Grid connector cap—Package of 5	.50	7255	Transformer—Interstage and output audio transformers	4.50
2749	Capacitor—2400 mmfd.	1.50	7256	Capacitor pack—By-pass capacitor pack	3.50
2875	Knob—Tuning, volume control or tone control knob—Package of 5	1.50	8559	Ring—Cone retaining ring	.80
2881	Bracket—Dial lamp bracket—Package of 5	.50	8570	Shield—Intermediate transformer shield	.60
2882	Socket—UY Radiotron socket—7 used	.50	8601	Cone—Cone with voice coil—Package of 5	15.00
2957	Capacitor—10 mfd. electrolytic capacitor	3.00	8653	Coil—Speaker field coil, core and cone support	5.00
2963	Resistor—8,000 ohm carbon type—Package of 5	2.50	8654	Transformer—Power transformer—220 volt, 50-60 cycle	11.00
2968	Socket—UX Radiotron socket—1 used	.50	8679	Transformer—Power transformer—105-125 volt, 50-60 cycle	9.00
2973	Board—Magnetic pickup terminal board—Package of 2	.50	8680	Transformer—Power transformer—105-125 volt, 25-40 cycle	12.00
2991	Transformer—First intermediate transformer	3.00	9323	Speaker—Loudspeaker complete	8.70
2992	Transformer—Second intermediate transformer	3.00	9351	Receiver—Receiver assembly—105-125 volt, 50-60 cycle	40.00
2994	Coil—Second detector plate coil complete with mounting rivet	.60	PARTS SPECIAL TO MODEL S-22		
2995	Volume control—Complete less knob—Package of 5	6.00	G7800	Handle—Cabinet handle with mounting screws and washers	1.00
2997	Coil—R. F. coil	1.50	G7801	Escutcheon—Tuning escutcheon with mounting screws	.60
2998	Coil—Detector and oscillator coil—Complete with mounting washers and nuts	2.40	G8900	Board—Baffle board and grille cloth	1.00
2999	Drive shaft—Dial drive shaft with mounting screws and washers	.50	G9522	Cabinet—Cabinet complete—Less all equipment	15.00
3000	Scale—Dial scale and drum with set screws	.60	PARTS SPECIAL TO MODEL S-22-X		
3003	Cushions—Sponge rubber chassis support cushions—One set of 4	.50	G7806	Grille with cloth—Metal grille with grille cloth—Less clock	4.00
3005	Screw assembly—Speaker mounting screw assembly—Comprising one set of 4 screws, 4 eyelets, 4 nuts and 4 washers	.50	PARTS SPECIAL TO MODEL S-42		
3056	Shield—Radiotron shield—3 used—Package of 2	.50	3070	Bolt assembly—Speaker mounting bolts, nuts and washers—Package of 2	.50
3060	Resistor—40,000 ohm—Carbon type—Package of 5	2.50	G7802	Escutcheon—Tuning escutcheon	.60
3062	Board—Loudspeaker terminal board—Package of 3	.50	G7803	Foot	.50
3076	Resistor—1 megohm—Carbon type—Package of 5	2.50	G8901	Grille cloth and baffle board	1.00
3077	Resistor—30,000 ohm—Carbon type—Package of 5	2.50	G8902	Grille	2.00
3078	Resistor—10,000 ohm—Carbon type—Package of 5	2.50	G9502	Post—Front post L. H.	3.00
3079	Resistor—40,000 ohm—Carbon type—Package of 5	2.50	G9503	Post—Back post L. H.	2.50
3080	Resistor—160,000 ohm—Carbon type—Package of 5	2.50	G9504	Post—Front post R. H.	3.00
3081	Resistor—16,000 ohm—Carbon type	.60	G9505	Post—Back post R. H.	2.50
3082	Board—Resistor board—Less resistors, coil and capacitor	1.00	G9506	Stretcher	4.50
3083	Tone control and switch—Tone control and operating switch—Complete less knob	1.60	G9507	Top	3.25
3084	Capacitor—0.008 mfd.—For tone control	.70	G9508	Control panel	6.00
			G9523	Cabinet—Complete, less all equipment	50.00