



PHILCO



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Model U-647 Baby Grand and Concert Grand

TYPE CIRCUIT: Six-valve Superheterodyne Unit-Constructed Receiver with full delayed A.V.C. and Pentode Output (4 watts), for operation on Long, Medium and two Short wave-bands. Built-in connections for Philco All-Wave Aerial—aerial selector built into and operated by the wave-change switch. Provision is made for connecting a pick-up which may be left permanently connected to the receiver if desired, as the gramophone operation is controlled by the extreme clockwise rotation of the wave-change switch. Provision is also made for connecting an external speaker of the permanent magnet moving coil type having an impedance of 2-3 ohms.

POWER SUPPLY: The circuit is so arranged that connection may be made to either A.C. or D.C. mains from 190 to 260 volts without discrimination or adjustment, and on A.C. mains the circuit is independent of periodicity between the limits of 40-100 cycles. A type 35RE rectifying valve is employed in the receiver and is used as a half-wave rectifier on A.C. and as a resistance on D.C.

WAVE-BANDS: COVERAGE: Four: (a) Long, 148-320 Kc. (2,026-937.5 metres); (b) Medium, 530-1,750 Kc. (566-171.4 metres); (c) Short, 1,75-5.75 Mc. (171.4-52 metres); (d) Short, 5.75-18.2 Mc. (52-16.4 metres).

TUNING DRIVE: Two-speed drive—ratios 8:1 and 40:1 for slow and accurate tuning. Glowing beam station indicator, new spread band 270 degrees scale and Shadowmeter tuning device.

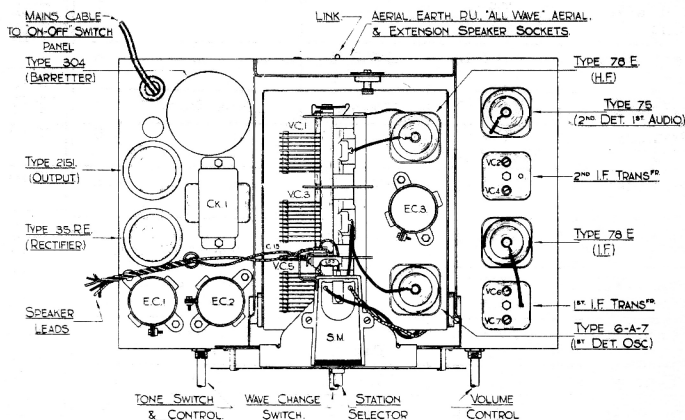
TONE CONTROL: This is a combined tone switch and control which is continuously variable, enabling a fine degree of tone between brilliant and mellow to be obtained. In the extreme anti-clockwise position the bass response is reduced; this improves clarity on speech. Turning the knob in a clockwise direction operates the switch and reproduction is then normal. Further clockwise rotation of the knob will make the reproduction progressively more mellow.

ON-OFF SWITCH: This is separately mounted and allows particular settings of the controls to be maintained.

LOUDSPEAKER: An 8 in. diameter permanent magnet moving coil speaker employing the latest nickel aluminium alloy is used, which, in conjunction with the Philco system of "audio degeneration," gives the highest efficiency audio output, and greater bass response is obtained due to the large baffle.

INTERMEDIATE FREQUENCY: 451 Kc.

POWER CONSUMPTION: Approx. 85 watts.



TOP CHASSIS DIAGRAM.

TABLE I - VOLTAGES.

Valve socket readings to chassis taken with an 065 or 077 Philco Set Tester, using the 500, 250 and 10 volt ranges. Volume control at minimum, tone control fully brilliant, wave-change switch in M.W. position, and no aerial connected. A.C. line 230 volts 50 cycles.

POSITION.	VALVE.	ANODE.	SCREEN.	CATHODE.
H.F. Amplifier, S.3	78E	Pin 3. 225v.	Pin 4. 107v.	Pin 6. —3.5v.
1st Detector and Oscillator, S.4 ...	6A7	„ 3. 250v. „ 5. 135v.*	„ 4. 107v.	„ 7. —3.5v.
I.F. Amplifier, S.6	78E	„ 3. 250v.	„ 4. 107v.	„ 6. —3.4v.
2nd Detector, A.V.C. and 1st L.F. Amplifier, S.5	75	„ 3. 95v.	—	„ 6. —3.4v.
Pentode Output, S.1	2151	„ 3. 230v.	„ 4. 240v.	„ 6. —26v.
Half-wave Rectifier, S.2	35RE	Pins 3 & 6. 225v. A.C. „ 4 & 5. 260v. D.C.	—	—
Barretter, B.1	304	Pin 1. 225v. A.C. „ 2. 85v. A.C.	—	—

* Oscillator Anode Volts. V.1 filament, 15 v. A.C.; V.2 filament, 35 v. A.C.; V. 3, 4, 5, 6, L.P.1 and L.P.2 filaments each 6.3v. A.C., measured between Pins 1 and 2 on each socket.

TABLE 2 - RESISTANCES OF COILS.

(Link on TB.5 to be in socket "B.")

REF. No.	TEST PROD 1	TEST PROD 2	RESISTANCE (OHMS)	REF. No.	TEST PROD 1	TEST PROD 2	RESISTANCE (OHMS)
T.3 Primary ...	TB.6/2	Chassis	S.W.2 L.W. 80	T.8 Secondary ...	V.4 Cap	SW.2/3 Tag 1	SW.2 M.W. 5
T.3 Primary, tapping 2 ...	TB.1/1	"	" " " 10	T.7 Primary ..	V.3/3	TB.8/11	„S.W.Band 1 12
T.3 Primary, tapping 3 ...	TB.5 Socket "C"	"	" " " 5	T.7 Secondary ...	V.4 Cap	SW.2/3 Tag 1	" " „ Gram. Zero 1
T.3 Secondary ...	SW.2/5 Tag 2	SW.2/5 Tag 9	" " " 5	T.6 Primary ...	V.3/3	TB.8/11	„S.W.Band 2 2 „ Gram. Zero
T.3 Secondary with T.5 in series	V.3 Cap	"	" " " 25	T.6 Secondary ...	V.4 Cap	Chassis	„S.W.Band 2 0.1 „ Gram.2meg.ap.
T.4 Primary ...	TB.6/2	Chassis	" M.W. 2	T.15 Primary ...	V.4/3	TB.8/10	8
T.4 Primary, tapping ...	TB.2 Socket "C"	"	" " " 1	T.15 Secondary...	V.6 Cap	Chassis	12
T.4 Secondary ...	V.3 Cap	SW.2/5 Tag 2	" " " 5	S.M.	TB.8/10	TB.8/11	3,500 approx.
T.2 Primary ...	TB.6/2	Chassis	„ S.W. Band 1 1	T.13	V.4/6	SW.2/2 Tag 6	SW.2. L.W. 16.5
T.2 Primary, tapping ...	TB.2 Socket "C"	"	" " " 0.5	T.12	"	"	" M.W. 8
T.2 Secondary ...	V.3 Cap	SW.2/5 Tag 2	" " " 0.5	T.11	"	"	„S.W. Band 1 1
T.1 Primary ...	TB.6/2	Chassis	" „ Band 2 0.2 „ Gram. Infinity	T.10	"	"	„Gram.32,000ap. 2 0.1
T.1 Primary, tapping ...	TB.2 Socket "C"	"	„S.W.Band 2 0.1 „ Gram Infinity	T.10 Reaction ...	SW.2/2 Tag 2	V.4/5	0.5
T.1 Secondary ...	V.3 Cap	SW.2/5 Tag 2	„S.W.Band 2 0.1 „ Gram. Zero	T.14 Primary ...	V.6/3	TB.8/10	12
T.9 Primary ...	V.3/3	TB.8/11	" L.W. 140	T.14 Secondary...	V.5/5	TB.8/7	8
T.9 Secondary ...	V.4 Cap	SW.2/3 Tag 1	" " " 30	T.16 Primary ...	V.1/3	TB.8/10	450 approx.
T.8 Primary ...	V.3/3	TB.8/11	" M.W. 120	T.16 Secondary...	T.16/1	T.16/2	0.2*
				Speech Coil ...	Lead 1	Lead 2	2*
				T.16 Secondary (Ex. L.S.) ...	TB.5 Socket "S"	TB.5 Socket "S"	0.2
				CK.3	B.1/1	SW.3/3	5
				CK.2	Fuse Tag 2	Chassis	5
				CK.1	TB.8/10	EC.2 Tag	150

* Resistance of T.16 Secondary alone and Speech Coil alone (taken when disconnected).

NOTE.—Reference numbers for valves should be read in conjunction with the socket numbers, e.g., V.1-S.1.

ALIGNMENT PROCEDURE.

Before leaving the Factory, all Philco receivers are accurately aligned, but if mis-alignment is suspected through damage, it should not be attempted without instruction in the correct adjustment of the trimming and padding condensers. It should only be carried out with the aid of an accurately calibrated Signal Generator, and for this purpose the PHILCO ALL-PURPOSE SET TESTER MODEL 077 is recommended.

Connect the Output Meter across the Primary of the Output Transformer, i.e., green and white leads. With gang condenser fully open, check that indicator reads on index line (above 1,750 Kc.). Set wave-change switch in second position from left (M.W.), turn volume control fully clockwise and tone control as far counter-clockwise as possible without operating the tone switch.

Note.—The link on TB.5 must be placed in socket "B."

INTERMEDIATE FREQUENCY.—The I.F. trimmers (VC's 2, 4, 6 and 7) should first be carefully adjusted by feeding in a 451 Kc. signal from the Signal Generator to the grid cap of the 6A7 valve (with grid lead connected) and the Signal Generator earthed to the receiver earth socket. Adjust the Signal Generator Attenuator to give a half-scale reading on the Output Meter. The I.F. trimmers must then be adjusted for maximum output.

Transfer Signal Generator lead via a Standard Dummy to the aerial socket.

LONG WAVES.—Turn wave-change switch to L.W. position (fully counter-clockwise rotation) and set gang at 290 Kc. Feed in a signal of 290 Kc. and trim VC's 19, 18 and 17 underneath chassis in that order for maximum output.

Feed in and tune a 160Kc. signal. Rock gang and pad VC.20 (nut) for maximum output. Readjust VC.19 at 290 Kc. and padding at 160 Kc. until no further improvement is obtainable.

MEDIUM WAVES.—Turn wave-change switch to second position clockwise (M.W.) and set gang at 1,400 Kc. Feed in a signal of 1,400 Kc. and trim VC's 16, 15 and 14 underneath chassis in that order for maximum output.

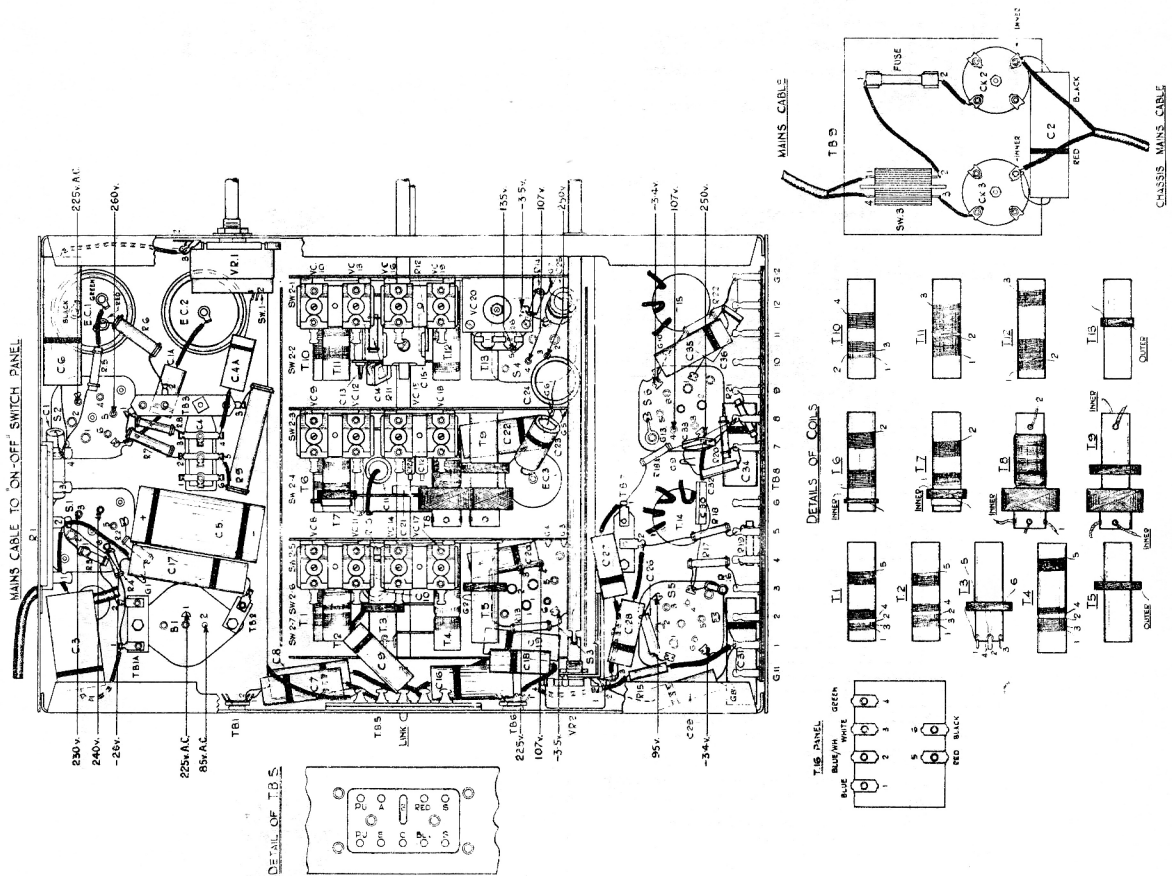
Feed in and tune a signal of 600 Kc. Rock gang and pad VC.20 (screw) for maximum output. Readjust VC.16 at 1,400 Kc. and VC.20 (screw) at 600 Kc. until no further improvement results, finally adjusting VC.16 at 1,400 Kc. Check calibration at 1,750 Kc.

Note.—VC's 15 and 14 must not be readjusted after final trimming of VC.16.

SHORT WAVES: BAND 1.—Turn wave-change switch to third position clockwise (S.W.1). Substitute a 400 ohms resistor for the Standard Dummy and feed in a 5.5 Mc. signal. Set gang at 5.5 Mc. and adjust VC.13 underneath chassis for the second signal heard from tight (care is necessary as the two peaks are narrowly spaced). Then adjust VC's 12 and 11 underneath chassis in that order for maximum output.

Check that the 5.5 Mc. image is received at approximately 4.6 Mc.

Feed in and tune a signal of 2 Mc. and check for correct reading on scale. It should not be necessary to adjust the semi-fixed tracker (C.15), but if sensitivity is found to be low at 2 Mc., very slight adjustment only may be made while rocking the gang. Finally re-trim VC.13 at 5.5 Mc.



UNDER-CHASSIS DIAGRAM.

ALIGNMENT PROCEDURE (Continued).

SHORT WAVES: BAND 2.—Turn wave-change switch to fourth position clockwise (S.W.2) and set gang at 18 Mc. Feed in a signal of 18 Mc. and trim VC.10 underneath chassis for the second signal heard from tight (care is necessary, as the two peaks are narrowly spaced).

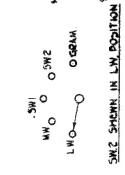
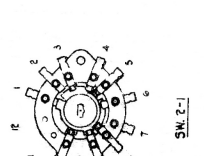
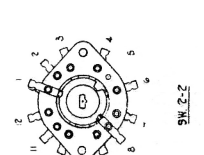
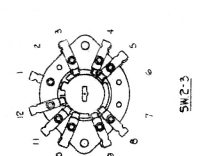
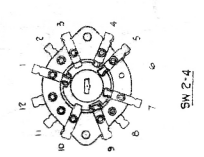
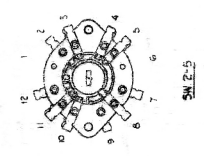
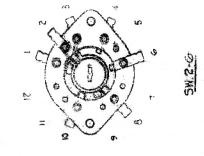
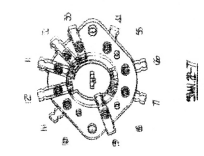
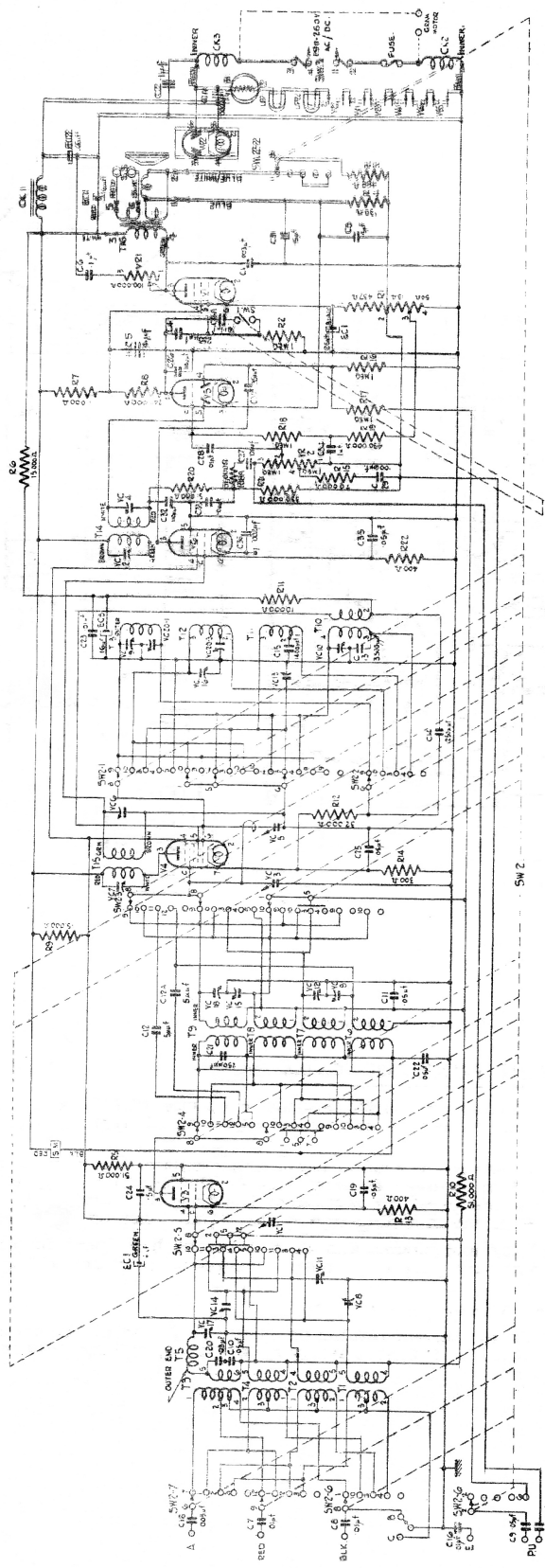
Note.—Due to the very small difference between the pre-selector and oscillator frequencies, the adjustment of VC's 9 and 8 will have a tendency to "pull" or change the frequency of the oscillator. By shunting a 21-plate variable condenser (approx. .00035 mfd.) across the oscillator section of the gang and tuning it so that the second harmonic instead of the fundamental beats with the incoming signal, this "pull" can be minimised.

Connect the shunt condenser between VC.10 tag and chassis and tune it (about half open) for the signal at 18 Mc. Trim VC's 9 and 8 underneath chassis in that order for maximum output. Disconnect shunt condenser and re-trim VC.10.

Check that the 18 Mc. image is obtained at approximately 17.1 Mc.

Feed in and tune a signal of 6 Mc. and check for correct reading on scale. It should not be necessary to adjust the semi-fixed tracker (C.13), but if sensitivity is found to be low at 6 Mc., very slight adjustment only may be made while rocking the gang. Finally re-trim VC.10 at 18 Mc.

Check calibration.



PLANS OF SWITCHES FROM FRONT
CHASSIS BEING UPSIDE DOWN.
NOTE - SPINDLE LOCATING NOTCHES AT BOTTOM.

SCHEMATIC DIAGRAM.

PARTS AND PRICE LIST - MODEL U-647 B.G. & C.G.

REF. No.	DESCRIPTION.	PART No.	LIST PRICE.	REF. No.	DESCRIPTION.	PART No.	LIST PRICE.			
T.1	S.W.2 Aerial Transformer, Part No. 32-2142	Complete Unit 380-5300	21 6	VC.16	Double padder 80+80 mmfd. (Red)	31-6116	1 8			
T.2	S.W.1 Aerial Transformer, Part No. 32-2264			VC.19						
T.3	L.W. Aerial Transformer, Part No. 32-2187			VC.20	Double Padder 375+600 mmfd.	31-6060	2 0			
T.4	M.W. Aerial Transformer, Part No. 32-2108 or 320-1063			EC.1	Electrolytic Condenser, 25+4+16 mfd.	30-2156	5 3			
T.5	Rejector Coil, Part No. 32-2188			EC.2	Electrolytic Condenser, 16 mfd.	30-2126	4 3			
SW.2-5	Wave-change Switch (Aerial Section) Part No. 42-1238			EC.3	Electrolytic Condenser, 16 mfd.	30-2126	4 3			
SW.2-6				C.1	Tubular Condenser .003 mfd. ...	30-4042	7			
SW.2-7		C.1A	Tubular Condenser .002 mfd. ...	30-4177	7					
T.6	S.W.2 H.F. Transformer, Part No. 320-1131	Complete Unit 380-5301	16 6	C.2	Tubular Condenser, .1 mfd. ...	300-4024	1 2			
T.7	SW.1 H.F. Transformer, Part No. 32-2265			C.3	Tubular Condenser .5 mfd. ...	300-4025	1 3			
T.8	M.W. H.F. Transformer, Part No. 32-2105			C.4	Moulded Condenser 250 mmfd.	8317-SU	10			
T.9	L.W. H.F. Transformer, Part No. 32-2266			C.4A	Tubular Condenser .015 mfd. ...	30-4226T	7			
SW.2-3	Wave-change Switch (H.F. Section), Part No. 42-1239			C.5	Tubular Condenser 4 mfd. ...	300-2008	2 0			
SW.2-4				C.6	Tubular Condenser .1 mfd. ...	300-4024	1 2			
T.10	S.W.2 Oscillator Coil, Part No. 32-2143			Complete Unit 380-5299	15 6	C.7	Tubular Condenser .01 mfd. ...	30-4145	7	
T.11	S.W.1 Oscillator Coil, Part No. 32-2267	C.8	Tubular Condenser .01 mfd. ...			30-4145	7			
T.12	M.W. Oscillator Coil, Part No. 32-2120	C.9	Tubular Condenser .05 mfd. ...			30-4020	7			
T.13	L.W. Oscillator Coil, Part No. 32-2189	C.10	Tubular Condenser .05 mfd. ...			30-4020T	7			
SW.2-1	Wave-change Switch (Oscillator Section), Part No. 420-1018	C.11	Tubular Condenser .05 mfd. ...			30-4020T	7			
SW.2-2		C.12	Mica Condenser 5 mmfd. ...			30-1077	8			
T.14	2nd I.F. Transformer and Trimmers Assembly	320-1111	5 0			C.12A	Mica Condenser 5 mmfd. ...	30-1077	8	
VC.2				1st I.F. Transformer and Trimmers Assembly	320-1047	5 6	C.13	Mica Condenser 3.500 mmfd. ...	31-6097	1 10
VC.4	C.14	Mica Condenser 250 mmfd. ...	300-1041				6			
T.15	Output Transformer, Part No. 320-8001	Complete Speaker 360-1101†	21 3				C.15	Mica Condenser 1.400 mmfd. ...	31-6141	1 6
VC.6				Speech Coil and Cone, Part No. 360-4002	21 3	C.16	Tubular Condenser .01 mfd. ...	30-4051	6	
VC.7	Permanent Magnet ...	C.17	Tubular Condenser .05 mfd. ...			30-4123AD	9			
T.16	L.F. Smoothing Choke ...	320-7030	5 3	C.18	Tubular Condenser .003 mfd. ...	30-4042	7			
CK.1				or	320-7004	10 3	C.19	Tubular Condenser .05 mfd. ...	30-4020T	7
				or	4819	10 6	C.20	Tubular Condenser .03 mfd. ...	30-4025	7
CK.2	Mains Filter Choke ...	320-1096	1 2	C.21	Mica Condenser 250 mmfd. ...	300-1041	6			
CK.3	Mains Filter Choke ...	320-1096	1 2	C.22	Tubular Condenser .05 mfd. ...	30-4123	9			
VC.1	Three-Gang Condenser ...	31-1818	18 6	C.23	Tubular Condenser .01 mfd. ...	30-4145	7			
VC.3				C.24	Tubular Condenser .5 mfd. ...	30-4227	1 2			
VC.5				C.25	Tubular Condenser .05 mfd. ...	30-4020	7			
VC.8	Double Padder 15+30 mmfd. (Yellow)	31-6140	1 3	C.26	Mica Condenser 110 mmfd. ...	300-1040	6			
VC.11				C.27	Tubular Condenser .01 mfd. ...	30-4124	6			
VC.9	Double Padder 15+30 mmfd. (Yellow)	31-6140	1 3	C.28	Tubular Condenser .01 mfd. ...	30-4124	6			
VC.12				C.29	Tubular Condenser .006 mfd. ...	30-4125	6			
VC.10	Double Padder 30+30 mmfd. (no colour)	31-6093	1 3	C.30	Mica Condenser 35 mmfd. ...	300-1009	3			
VC.13				C.31	Tubular Condenser .15 mfd. ...	30-4191	1 6			
VC.14	Double padder 15+80 mmfd. (Green)	31-6115	1 8	C.32	Mica Condenser 110 mmfd. ...	300-1040	6			
VC.17				C.33	Mica Condenser 110 mmfd. ...	300-1040	6			
VC.15	Double Padder 15+80 mmfd. (Green)	31-6115	1 8							
VC.18										

PARTS AND PRICE LIST - MODEL U-647 B.G. & C.C. (Continued).

REF. No.	DESCRIPTION.	PART No.	LIST PRICE.	REF. No.	DESCRIPTION.	PART No.	LIST PRICE.
C.34	Tubular Condenser .1 mfd. ...	30-4122	6	S.4	7-Prong Valve Holder ...	27-6037	5
C.35	Tubular Condenser .05 mfd. ...	30-4020	7	S.5	6-Prong valve Holder ...	27-6036	5
C.36	Tubular Condenser .002 mfd. ...	30-4177	7	S.6	6-Prong Valve Holder ...	27-6036	5
R.1	Candohm Resistor (wire-wound) 437+13+50 ohms	33-3303	1 3	B.1	Barretter Socket Assembly ...	380-5199	1 0
R.2	¼ watt Carbon Resistor, 1 megohm ± 10%	330-1018	9	LP.1	Fuse (1 amp.) ...	380-5003	3
R.3	¼ watt Carbon Resistor, 400 ohms ± 5%	330-1012	9	LP.2	Pilot Bulb ...	34-2141	1 4
R.4	¼ watt Carbon Resistor, 180 ohms ± 5%	330-1013	9		Pilot Bulb ...	34-2141	1 4
R.5	¼ watt Insulated Resistor, 51,000 ohms ± 5%	330-2004	9		Grid Clip ...	28-2214	doz. 5
R.6	½ watt Carbon Resistor, 15,000 ohms ± 10%	6208	9		Valve Shield ...	28-2726	2
R.7	½ watt Carbon Resistor, 1,000 ohms ± 10%	5837	9		Mains Cable (Chassis to On-off Switch Panel) ...	LO-1044	7
R.8	¼ watt Carbon Resistor, 240,000 ohms ± 10%	330-1017	9		Mains Cable ...	LO-1009	1 7
R.9	2 watt Carbon Resistor, 15,000 ohms ± 5%	330-1016	1 6		Speaker Cable (6-way) ...	LO-1056	6
R.10	¼ watt Insulated Resistor, 51,000 ohms ± 10%	330-2004	9		Dial Scale and Hub Assembly...	380-5256	4 0
R.11	¼ watt Carbon Resistor, 10,000 ohms ± 10%	230-1014	9		Dial Indicator Screen ...	270-5053	6
R.12	¼ watt Insulated Resistor, 32,000 ohms ± 5%	330-2021	9		Wave-band Indicator Mask ...	270-5052	1 0
R.13	¼ watt Carbon Resistor, 400 ohms ± 5%	330-1012	9		Rubber Bush ...	270-7341	1
R.14	¼ watt Carbon Resistor, 300 ohms ± 5%	330-1015	9		Rubber Buffers ...	270-7189	1
R.15	¼ watt Insulated Resistor, 70,000 ohms ± 10%	330-2034	9		Chassis Mounting Rubbers ...	5189	1
R.16	¼ watt Carbon Resistor, 1 megohm ± 10%	330-1018	9		Chassis Mounting Washers ...	29-2089	doz. 2
R.17	¼ watt Carbon Resistor, 1 megohm ± 10%	330-1018	9		Chassis Mounting Bolts ...	W-1345A	1
R.18	¼ watt Carbon Resistor, 1 megohm ± 10%	330-1018	9		Large Tuning Knob and Spring	270-4035	6
R.18A	¼ watt Carbon Resistor, 51,000 ohms ± 10%	6098	9		Large Tuning Knob Spring ...	28-1738	doz. 3
R.19	¼ watt Carbon Resistor, 490,000 ohms ± 10%	330-1020	9		Small Tuning Knob (Corona- tion Type), Grubscrew and Spring ...	270-4072	6
R.20	¼ watt Carbon Resistor, 51,000 ohms ± 10%	330-1019	9		Knob (Tone), Grubscrew and Spring ...	270-4069	5
R.21	¼ watt Carbon Resistor, 330,000 ohms ± 10%	33-1200	9		Lever Knob (Wave - change) Grubscrew and Spring ...	270-4074	6
R.22	¼ watt Carbon Resistor, 400 ohms ± 5%	330-1012	9		Knob (Volume), Grubscrew and Spring ...	270-4084	5
VR.1	Tone Control, 100,000 ohms ...	33-5167	3 6	V.1	Knob Spring ...	280-5232	doz. 2
SW.1	Tone Switch ...			V.2	Lever Knob Grubscrew ...	WB-334	doz. 4
VR.2	Volume Control, 2 megohms ... (tapped at 1 megohm)	33-5166	2 6	V.3	Knob Grubscrew ...	WB-324	doz. 4
SW.3	On-off Switch (D.P.D.T.) ...	420-1017	3 0	V.4	Red Wander Plug ...	380-5087	2
SM.	Shadowmeter ...	450-2001P	6 6	V.5	Black Wander Plug ...	380-5015	doz. 1 6
S.1	6-Prong Valve Holder ...	27-6036	5	V.6	Bezel Escutcheon ...	270-4045	10
S.2	6-Prong Valve Holder ...	27-6036	5	B.1	Bezel Glass ...	270-7285	2 9
S.3	6-Prong Valve Holder ...	27-6036	5		Bezel Spring ...	290-1160	1
					Type 2151 Pentode Output Valve	34-2146	13 6
					Type 35RE Rectifier Valve ...	34-2160	14 0
					Type 78E Variable-mu H.F. Pentode Valve	8315-E	12 6
					Type 6A7 Variable-mu Heptode Valve ...	34-2002	15 0
					Type 75 Double Diode Triode Valve ...	8002	12 6
					Type 78E Variable-mu H.F. Pentode Valve	8315-E	12 6
					Type 304 Barretter ...	340-9001	12 6

† When ordering speaker parts, the letter which will be found in the part number of the speaker must also be given.