



# PHILCO



## Radio Service Bulletin No. 77

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**TYPE CIRCUIT:** Five valve Superheterodyne Unit-constructed Receiver with full A.V.C. and Quiescent Pentode Output (1 watt) for operation on Short, Medium and Long Wavebands. Built-in connections for Philco All-Wave Aerial—aerial selector built into and operated by the wave-change switch—alternative link connections, "B" for ordinary aerial, "C" for Philco All-wave Aerial. 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.

**POWER SUPPLY:** Low Tension, Accumulator 2 volts, size 5 in. by 4 3/8 in. by 5 in. height; combined High Tension 135 volts tapped at 90 volts approx. and Grid Bias 9 volts in 1.5 volt steps, size 10 1/2 in. by 6 13/16 in. by 3 5/16 in. Suitable types are Exide 5v. Accumulator, type DK9 or OZ65 (double capacity) and Exide type H-1138 or Siemens "Pull-o'-Power" type 1316 or "Britannia" type 111 H.T. and G.B. Battery.

**WAVE-BANDS:** COVERAGE: Three: (a) Long, 2,000-850 metres (150-353 Kc.); (b) Medium, 550-175 metres (545.4-1714.2 Kc.); (c) Short 5.75-18 Mc. (62-16.6 metres).

**TUNING DRIVE:** Two-speed gear drive—ratios 8-1 and 40-1 for slow and accurate tuning. Glowing beam station indicator and new spread band 270 degree scale.

**TOPE CONTROL:** This is continuously variable, enabling a fine degree of tone between brilliant and mellow to be obtained. The on-off switch is combined with this control, thus allowing a particular setting of the separate volume control to be maintained.

**LOUDSPEAKER:** An 8 in. diameter permanent magnet moving coil speaker employing the latest nickel aluminium alloy gives the highest efficiency audio output and greater bass response is obtained due to the large baffle.

**INTERMEDIATE FREQUENCY:** 470 Kc.

**I.F. REGENERATION:** A control is incorporated for varying the amount of I.F. gain. This adjustment is pre-set and should only require very slight alteration (if necessary) when a new I.F. valve (VP.21) is fitted.

**POWER CONSUMPTION:** L.T. current, 0.7 amp.; H.T. current, 12 milliamps quiescent, 15 milliamps average and 20 milliamps on maximum signal.

**TABLE 1—VOLTAGES**

Valve socket readings to chassis taken with an 065 or 077 Philco Set Tester, using the 250 and 100 volts ranges. Volume control at minimum, tone control fully brilliant, wave-change switch in M.W. position and no aerial connected.

POSITION.	VALVE.	ANODE.	SCREEN.
1st Detector and Oscillator S.3 ...	IC.6	Pin 3. 135 v. " 4. 100 v.*	Pin 6. 50 v.
I.F. Amplifier, S.5 ...	VP.21	Cap 135 v.	Pin 7. 40 v. approx.
2nd Detector, A.V.C. and 1st L.F. Amplifier, S.4 ...	2102	Pin 3. 80 v.	—
2nd L.F. Amplifier, S.2 ...	30	Pin 3. 50 v.	—
Quiescent Pentode Output, S.1 ...	2103	Pin 3. 135 v. " 7. 135 v.	Pin 5. 135 v.

\*Oscillator Anode Volts.  
Filament voltage for each valve and L.P.1, 2 volts.

**TABLE 2—RESISTANCES OF COILS.**

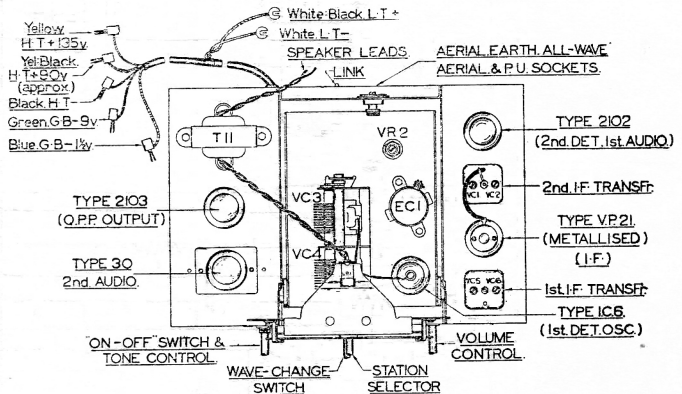
(Link on TB.3 to be in socket "B.")

REF. No.	TEST PROD. 1.	TEST PROD. 2.	RESISTANCE (OHMS)	REF. No.	TEST PROD. 1.	TEST PROD. 2.	RESISTANCE (OHMS)
T.1 Primary ...	TB.3 Socket "1"	Chassis	SW.2 L.W. 80	T.9 Primary ...	V.2/3	TB.4/11	8
T.1 Primary Tapping 2 ...	TB.3 Socket "Red"	"	" " 10	T.9 Secondary ...	TB.4/8	V.4/2	12
T.1 Primary Tapping 3 ...	TB.3 Socket "C"	"	" " 5	T.9 Reaction ...	V.4/3	Chassis	0.1
T.1 Secondary ...	SW.2/4 tag 8	TB.4/8	5	T.7 ...	V.2/5	S.W.2/2 tag 7	S.W.2. L.W. 16.5
T.1 Secondary with T.5 in series	V.2 Cap	"	25	T.6 ...	"	"	" M.W. 8
T.3 Primary ...	TB.3 Socket "A"	Chassis	" M.W. 2	T.5 ...	"	"	" S.W. 0.1 Gram. 92.000 approx.
T.3 Primary Tapping ...	TB.3 Socket "C"	"	" " 1	T.5 Reaction ...	V.3/4	SW.2/2 tag 4	0.5
T.3 Secondary ...	V.2 Cap	TB.4/8	" " 5	T.8 Primary ...	V.4 Cap	TB.4/11	12
T.2 Primary ...	TB.3 Socket "A"	Chassis	" S.W. 0.2 Gram. Infinity	T.8 Secondary ...	V.3/5	TB.4/6	8
T.2 Primary Tapping ...	TB.3 Socket "C"	"	" S.W. 0.1 Gram. Infinity	T.10 ...	V.1/4 V.1/6	TB.2	850 approx. 850 "
T.2 Secondary ...	V.2 Cap	TB.4/8	" SW. 0.1 Gram. Zero	T.11 Primary ...	V.1/3 V.1/7	TB.4/11	250 approx 250 "
				T.11 Secondary ...	TB.1/1	Chassis	0.2*
				L.S ...	Tag 1	Tag 2	2*

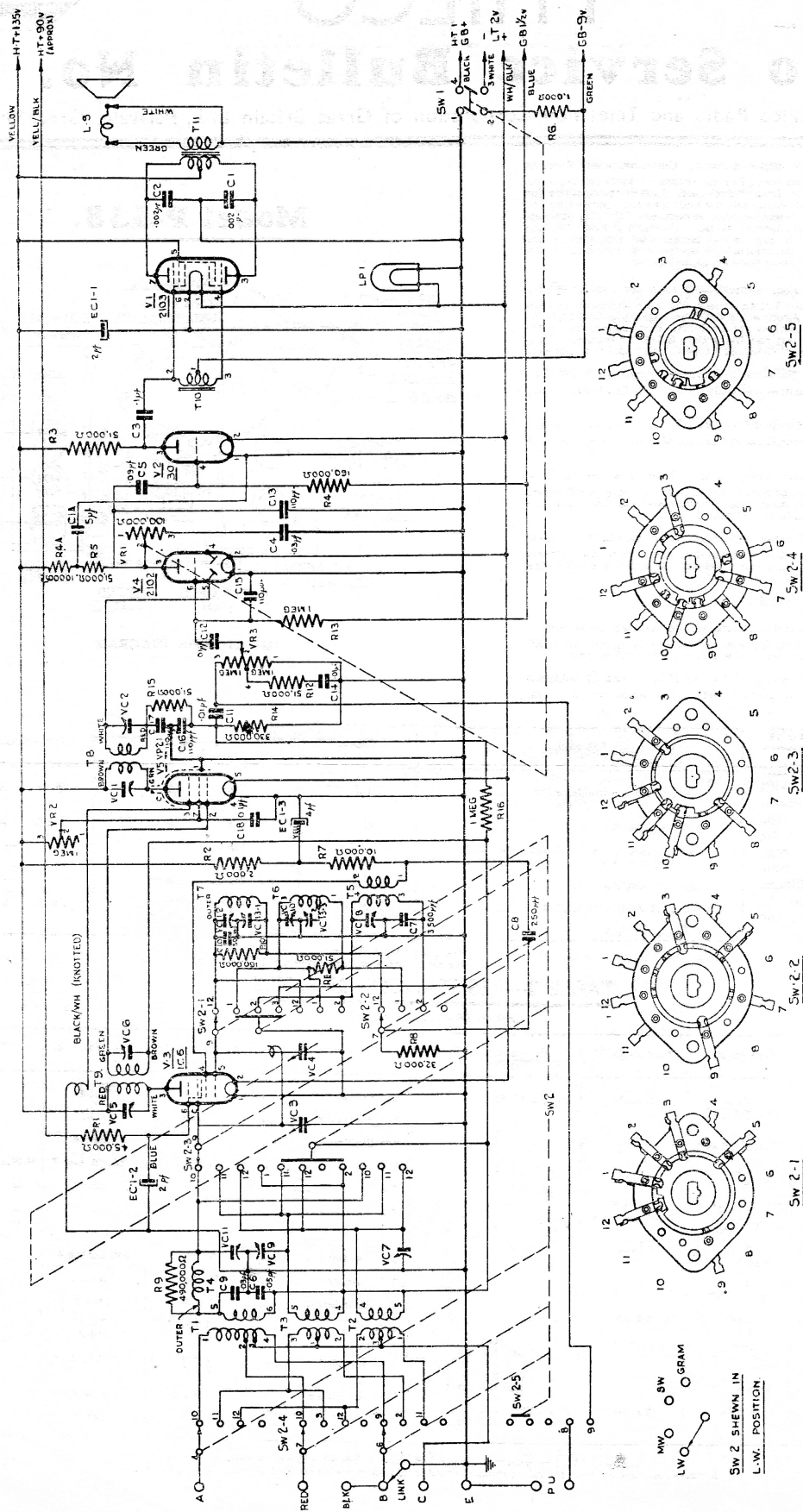
\* Resistance of T.11 Secondary alone and L.S. alone (taken when disconnected).

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

### Model P-538.

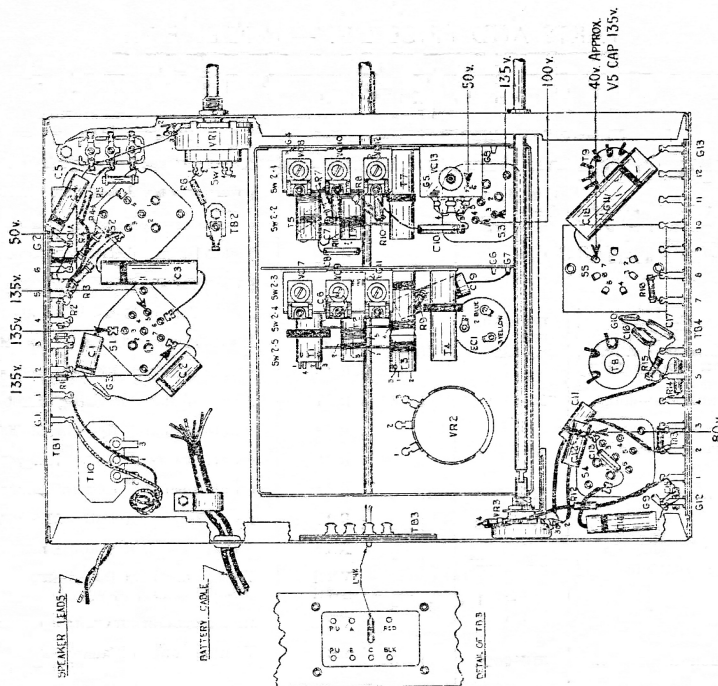


TOP CHASSIS DIAGRAM.



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

SCHEMATIC DIAGRAM—MODEL P-538.



UNDER CHASSIS DIAGRAM.  
MODEL P-538.

### ALIGNMENT PROCEDURE.

Before leaving the factory, all Philco receivers are accurately aligned, but if mis-alignment is suspected through damage, no alteration should be made 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., V1/3 and V1/7. With gang condenser fully open, check that indicator reads on index line (above 18Mc.). 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 switching off.

NOTE—The link on TB.3 must be placed in socket " B."

INTERMEDIATE FREQUENCY.—The I.F. trimmers (V.C.'s 1, 2, 5 and 6) should first be carefully adjusted by feeding in a 470 Kc. signal from the Signal Generator to the grid cap of the 1C6 valve (with grid-lead connected) and the Signal Generator earthed to the receiver chassis. 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. If instability is present, turn the I.F. Regeneration control (VR2) counter clockwise until stability is obtained and then trim. Adjust VR2 for maximum sensitivity without instability and retrim V.C.'s 1, 2, 5 and 6.

NOTE—VR2 should not be readjusted after final trimming of V.C.'s 1, 2, 5 and 6. 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 240 Kc. (dot at 1,250 metres on scale). Feed in a 240 Kc. signal and trim V.C.'s 12 and 11 underneath chassis in that order for maximum output.

Set gang at 160 Kc. (dot at 1,875 metres on scale) and feed in a 160 Kc. signal. Rock gang and pad V.C.13 (nut) for maximum output. Readjust trimming at 240 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. (dot at 214 metres on scale). Feed in a signal of 1,400 Kc. and trim V.C.'s 10 and 9 underneath the chassis in that order for maximum output.

Feed in and tune a signal of 600 Kc. ("500" on scale). Rock gang and pad V.C.13 (screw) for maximum output. Readjust trimming at 1,400 Kc. and padding at 600 Kc. until no further improvement results.

SHORT WAVES.—Turn wave-change switch to third position clockwise (S.W.). Substitute a 400 ohms resistor for the Standard Dummy and feed in an 18 Mc. signal. Set gang at 18 Mc. and adjust V.C.8 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 V.C.7 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 V.C.8 tag and chassis and tune it (about half open) for signal at 18 Mc. Trim V.C.7 underneath chassis for maximum output. Disconnect shunt condenser and retrim V.C.8.

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.7), 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 V.C.8 at 18 Mc.

Check calibration.



**PARTS AND PRICE LIST — MODEL P-538.**

REF. NO.	DESCRIPTION.	PART NO.	LIST PRICE	REF. NO.	DESCRIPTION.	PART NO.	LIST PRICE		
T.1	L.W. Aerial Transformer, Part No. 32-2187	Complete Unit 380-5222	21 0	E.4	½ watt Carbon Resistor, 160,000 ohms ...	33-1191	9		
T.2	S.W. Aerial Transformer, Part No. 32-2142			R.4a	½ watt Insulated Resistor, 10,000 ohms ...	330-2014	9		
T.3	M.W. Aerial Transformer, Part No. 320-1063			R.5	½ watt Carbon Resistor, 51,000 ohms ...	330-1019	9		
T.4	Rejector Coil, Part No. 32-2188	Complete Unit 380-5223	15 0	R.6	½ watt Insulated Resistor, 1,000 ohms ...	330-2019	9		
SW.2-3	Wave-change Switch			R.7	½ watt Carbon Resistor, 10,000 ohms ...	33-1000	9		
SW.2-4	(Aerial Section), Part No. 42-1235			R.8	½ watt Carbon Resistor, 32,000 ohms ...	33-1208	9		
SW.2-5				R.9	½ watt Insulated Resistor, 490,000 ohms ...	330-2001	9		
T.5	S.W. Oscillator Coil, Part No. 32-2143			Complete Unit 320-1088	8 6	R.10	½ watt Insulated Resistor, 160,000 ohms ...	330-2024	9
T.6	M.W. Oscillator Coil, Part No. 32-2120	R.11	½ watt Insulated Resistor, 51,000 ohms ± 5 %			330-2027	9		
T.7	L.W. Oscillator Coil, Part No. 32-2189	R.12	½ watt Insulated Resistor, 51,000 ohms ...			330-2004	9		
SW.2-1	Wave-change Switch (Oscillator Section), Part No. 42-1236	R.13	½ watt Carbon Resistor, 1 megohm ...			330-1018	9		
SW.2-2		R.14	½ watt Insulated Resistor, 330,000 ohms ...			330-2017	9		
T.8	2nd I.F. Transformer and Trimmers Assembly	R.15	½ watt Carbon Resistor, 51,000 ohms ...			330-1019	9		
VC.1	1st I.F. Transformer and Trimmers Assembly	320-1087	8 6			R.16	½ watt Carbon Resistor, 1 megohm ...	330-1018	9
VC.2		320-8016	10 6			VR.1	Tone Control 100,000 ohms ...	33-5187	5 0
T.9		320-8018	3 9			SW.1	On-off Switch (4 point) ...		
VC.5		Intervalve Choke ...	320-8016			10 6	VR.2	I.F. Regeneration Control 1 megohm ...	330-5014
VC.6	Output Transformer ...	320-8018	3 9	VR.3	Volume Control 2 megohms (Tapped at 1 megohm)	33-5166	3 6		
T.10	Speech Coil and Cone, Part No. 360-3030	360-1039†	26 6	LP.1	7-Prong Valve Holder ...	27-6037	9		
LS.	Permanent Magnet, Speaker Complete			310-1013	18 9		6-Prong Valve Holder ...	27-6036	9
VC.3	Two-gang Condenser ...	31-1821 or	2 3		4-Prong Valve Holder ...	27-6034	9		
VC.4		310-6020		2 3		7-Prong Valve Holder (English type) ...	270-6007	9	
VC.7	Triple Padder 35 + 35 + 35 mmfd. ...	310-6020	2 3		Pilot Bulb ...	34-2150			
VC.9		310-6020	2 3		Dial Screen (Wave-change) ...	270-5039	10		
VC.11		310-6020	2 3		Dial Screen (Light Slot) ...	270-5036	9		
VC.8	Triple Padder 35 + 35 + 35 mmfd. ...	31-6060	2 9		Dial Scale and Hub Assembly ...	380-5597	4 6		
VC.10		31-6060	2 9		Dial Scale Mask ...	270-5047	9		
VC.12	Double Padder 375 + 600 mmfd. ...	30-2162	4 9		Dial Scale Guard ...	27-8324			
EC.1	Electrolytic Condenser 2 + 4 + 2 mfd. ...	30-4227	1 9		Grid Clip ...	28-2214			
C.1a	Tubular Condenser .5 mfd. ...	30-4177	9		Rubber Bush ...	4126			
C.1	Tubular Condenser .002 mfd. ...	30-4177	9		Rubber Buffers ...	270-7189			
C.2	Tubular Condenser .002 mfd. ...	30-4177	9		Chassis Mounting Rubbers ...	5189			
C.3	Tubular Condenser .1 mfd. ...	30-4122	1 0		Chassis Mounting Washers ...	29-2089			
C.4	Tubular Condenser .03 mfd. ...	30-4025	9		Chassis Mounting Bolts ...	W-1345A			
C.5	Moulded Condenser .09 mfd. ...	4989 SU.	1 3		Speaker Cable ...	LO-1041	9		
C.6	Tubular Condenser .05 mfd. ...	30-4020	9		Battery Cable LO-1048 ...	Complete Assembly 410-3008	6 3		
C.7	Mica Condenser, Fixed Tracker 3,500 mmfd. ...	31-6097	2 6		Spade Tags 280-1012 ...				
C.8	Mica Condenser 250 mmfd. ...	300-1057	1 3		Yellow Plug H.T. + 135v. 380-5004 ...				
C.9	Tubular Condenser .03 mfd. ...	30-4025	9		Brown Plug H.T. + 90v. 380-5272 ...				
C.10	Mica Condenser 50 mmfd. ...	300-1045	9		Black Plug H.T.— 380-5226 ...				
C.11	Tubular Condenser .01 mfd. ...	30-4124	9		Blue Plug G.B.—1½v. 380-5020 ...				
C.12	Tubular Condenser .01 mfd. ...	30-4124	9		Green Plug G.B.—9v. 380-5021 ...				
C.13	Mica Condenser 110 mmfd. ...	300-1040	10		Bezel Escutcheon ...	270-4045	1 3		
or	Mica Condenser 120 mmfd. ...	300-1065	9		Bezel Glass ...	270-7196	3 0		
C.14	Tubular Condenser .01 mfd. ...	30-4145	9		Bezel Spring ...	290-1160			
C.15	Mica Condenser 110 mmfd. ...	300-1040	10		V.1	Type 2103 Quiescent Pentode Output Valve	34-2067		
or	Mica Condenser 120 mmfd. ...	300-1065	9		V.2	Type 30 Triode Valve ...	4191		
C.17	Mica Condenser 110 mmfd. ...	300-1040	10		V.3	Type IC6 Variable-mu Heptode Valve ...	34-2033		
or	Mica Condenser 120 mmfd. ...	300-1065	9		V.4	Type 2102 Double Diode Triode Valve ...	34-2066		
C.18	Tubular Condenser .1 mfd. ...	30-4122	1 0		V.5	Type VP.21 (Metallized) Variable-mu H.F. Pentode Valve	340-2002		
R.1	½ watt Carbon Resistor, 45,000 ohms ...	330-1027	9						
R.2	½ watt Carbon Resistor, 2,000 ohms ...	33-1029	9						
R.3	½ watt Carbon Resistor, 51,000 ohms ...	330-1019	9						

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