PHILCO

REG. U.S. PAT. OFF.

Service Bulletin No. 220

Model 650

Type Circuit: Superheterodyne, with preselector R.F. amplifier, and push-pull pentode output (10 watts); built in connections for Philco All-wave aerial; aerial selector built into and operated by wave-band switch.

Power Supply: Alternating Current. Voltage and frequency as specified on chassis nameplate.

Tubes Used: 1 type 78, R.F.; 1 type 6A7, Detector-Oscillator; 1 type 78, I.F.; 1 type 75, 2d Detector and 1st A.F.; 1 type 42 Driver; 2 type 42 Push-Pull Output; 1 type 80 Rectifier.

Wave Bands: Four: (1) Long-wave (U.S. Weather Forecasts); (2) Standard (with some Police); (3) Police; (4) Short-wave.

Coverage of Each Band: Band 1, 145 to 390 K.C.; Band 2, 540-1720 K.C.; Band 3, 2.2 to 2.6 M.C.; Band 4, 5800-18000 K.C. (5.8 to 18.0 megacycles).

Tuning Drive: Dual planetary, ball bearing. 80 to 1 ratio for slow-speed tuning.

Tone Control: 4-position, with bass compensation effective in first position (counter-clockwise).

Intermediate Frequency: 460 K.C.

Power Consumption: 98 watts.

Speaker: 650B (Code 121); K-17, 650X, 650MX, 650-H, (Code 122); H-13.

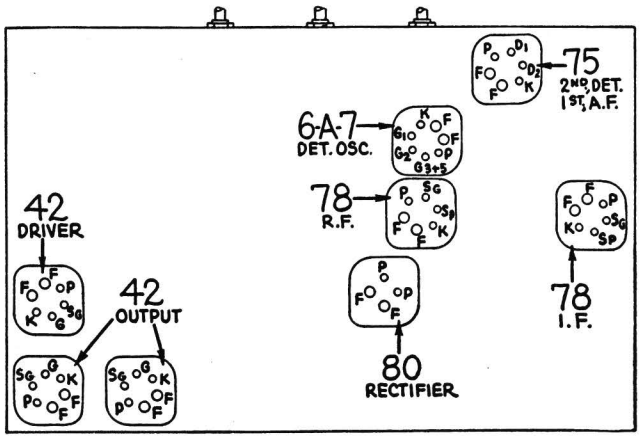

Fig. 1. Tube Sockets as viewed from bottom.

Tube Socket Voltages (Line Voltage 115)
Measured to Ground

Tube	78 R.F.	6A7 Det. Osc.	78 I.F.	75 2d Det.	42 Driver	42 Output
Point P	55	200	200	115	200	300
SG	90	90	90	...	200	300
K	2.2	2.3	2.6	...	...	...
	6A7: $G_{3\ \&\ 5}$ = 155					

Above voltages were obtained by using a PHILCO type 025 Circuit Tester (or 048A All-purpose Tester), using test prods applied to underside of chassis. Volume control at minimum; dial at 55; waveband switch counter-clockwise (band 1). Use Fig. 1 for test points. Type K-17 speaker employed.

Power Transformer Data

Terminals	A.C. Volts	Current	Circuit	Color
1–2	120	.....	Primary	White
3–5	760	140 M.A.	Secondary	Yellow
6–7	5.0	2.0 A.	Fil. Rect.	Blue
8–9	6.3	3.75 A.	Filaments	Black
4	...	.....	Center Tap of 3–5	Yellow, Green Tracer

Adjusting Compensating Condensers

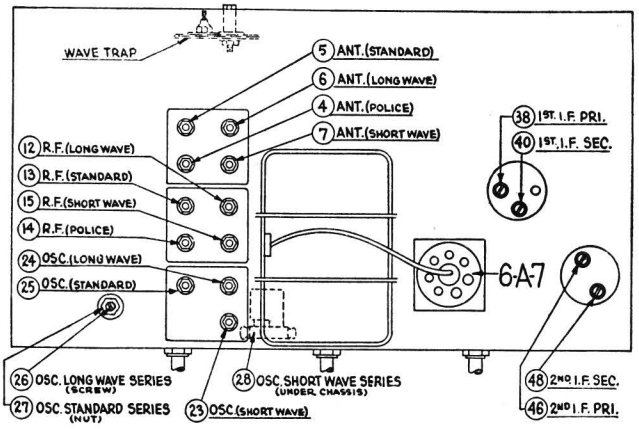

Fig. 2. Locations of Compensating Condensers

Adjustment of compensating condensers in Model 650 requires an accurate signal generator covering long-wave, standard wave, police, and short-wave frequencies. The PHILCO Model 088 All-Wave Signal Generator, having a continuous range of from 100 to 20000 K.C., is ideal for this purpose.

An output meter is also needed. PHILCO Model 025 Circuit Tester includes a high grade output meter.

Philco No. 3164 fibre wrench and No. 27-7059 fibre-handled screwdriver complete the equipment needed for making these adjustments. The locations of the various compensating condensers is shown in Fig. 2. Connect the output meter to the plate contacts of the 42 output tubes (using the adapters provided with the "025") and set it at the 0-30 volt range.

I.F.—Set the Signal Generator at 460 K.C., and attach its antenna lead to the grid cap of the 6A7 tube on the Model 650 (having removed the grid clip from the tube). Connect the ground terminal of the Signal Generator to the ground terminal of the set. Turn on the set, turn the waveband switch to second position (standard) and set dial at 55. Now with the fibre screwdriver, adjust condensers (46) and (48) (2d I.F.) and then (38) and (40) (1st I.F.) until maximum reading is obtained in the output meter. Turn down the "attenuator" on the signal generator if the output meter needle goes off the scale.

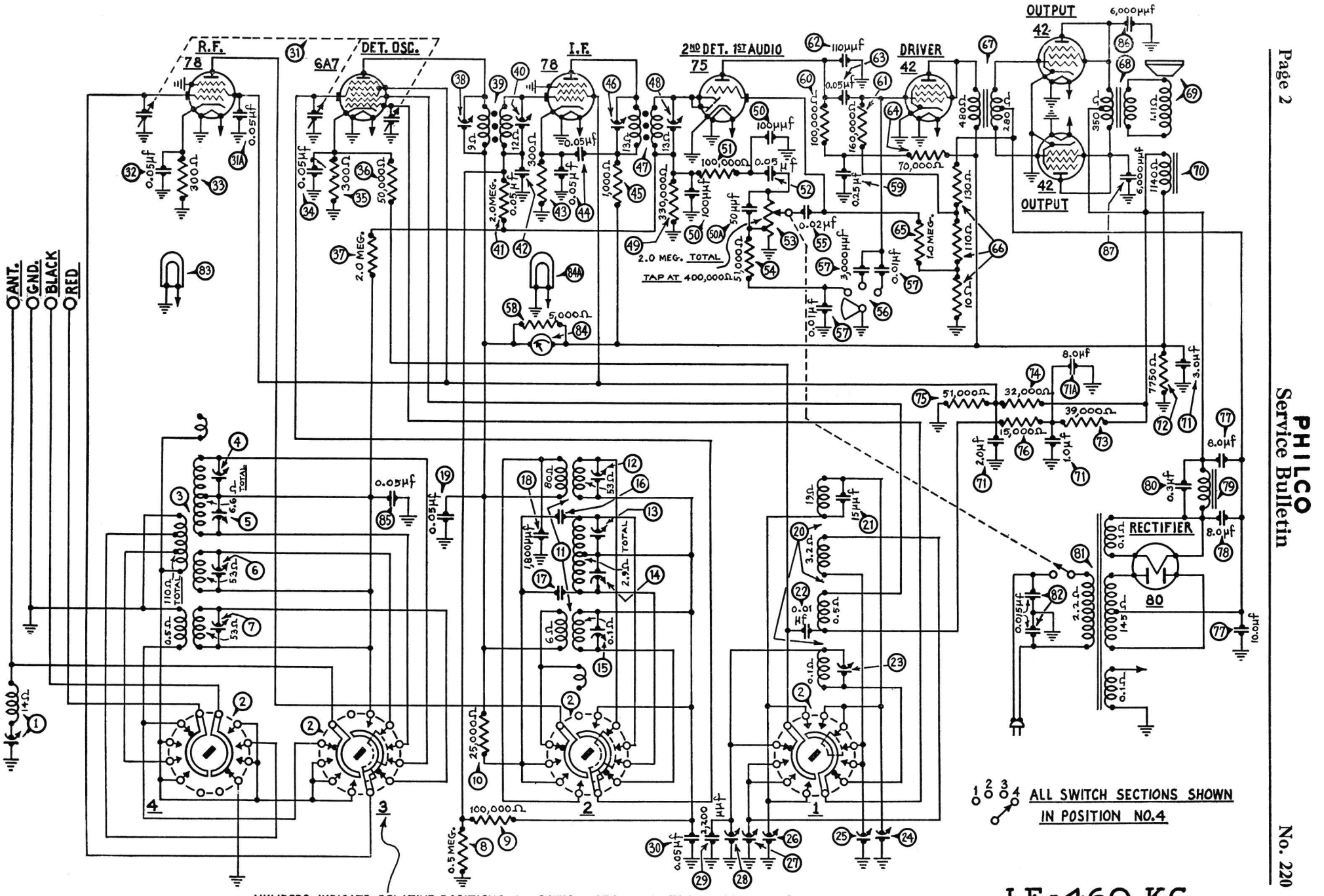

Fig. 2. Schematic Diagram of Model 650

Replacement Parts—Model 650

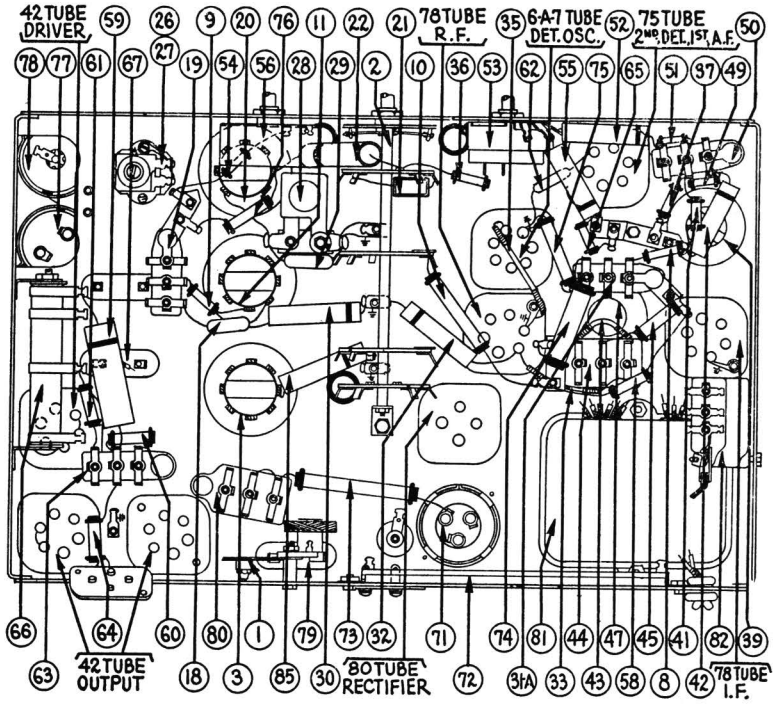

Fig. 3. Bottom View of Chassis

	Description	Part No.	List Price
(1)	Wave Trap	38-6850	$1.10
(2)	Waveband Switch	42-1114	2.50
(3)	Antenna Transformer	32-1708	4.00
(4)	Compensating Condenser (Ant.) (Police)	Part of (3)	....
(5)	Compensating Condenser (Ant.) (Standard)	Part of (3)	....
(6)	Compensating Condenser (Ant.) (Longwave)	Part of (3)	....
(7)	Compensating Condenser (Ant.) (Shortwave)	Part of (3)	....
(8)	Resistor (.5 meg.) (Yellow-White-Yellow)	▲6097	.20
(9)	Resistor (100000 ohms) (White-White-Yellow)	6099	.20
(10)	Resistor (25000 ohms) (Red-Green-Yellow)	3656	.20
(11)	R.F. Transformer	32-1709	3.75
(12)	Compensating Condenser (R.F. Longwave)	Part of (11)	....
(13)	Compensating Condenser (R.F. Broadcast)	Part of (11)	....
(14)	Compensating Condenser (R.F. Police)	Part of (11)	....
(15)	Compensating Condenser (R.F. Shortwave)	Part of (11)	....
(16)	Condenser	Part of (11)	....
(17)	Condenser	Part of (11)	....
(18)	Condenser (.0018 Mfd. Mica)	6018	.40
(19)	Condenser (.05 Mfd. Bakelite Block)	3615-SG	.35
(20)	Oscillator Transformer	32-1710	3.00
(21)	Condenser (.000015 Mfd. Mica)	30-1030	.35
(22)	Condenser (.01 Mfd. Tubular)	#30-4145	.25
(23)	Compensating Condenser (Osc. S.W.)	Part of (22)	....
(24)	Compensating Condenser (Osc. Longwave)	Part of (22)	....
(25)	Compensating Condenser (Osc. B.C. & Police)	Part of (22)	....
(26)	Compensating Condenser (Osc. L.W. Series)	Part of 31-6044	.50
(27)	Compensating Condenser (Osc. B.C. Series)	Part of 31-6044	
(28)	Compensating Condenser (Osc. S.W. Series)	04000-R	.45
(29)	Condenser (.0022 Mfd. Mica)	30-1057	.40
(30)	Condenser (.05 Mfd. Tubular)	30-4020	.35
(31)	Tuning Condenser Assembly	31-1555	4.50
(31)a	Condenser (.05 Mfd. Bakelite Block)	3615-SG	.35
(32)	Condenser (.05 Mfd. Tubular)	30-4020	.35
(33)	Resistor (300 ohms) (Orange-Black-Black)	33-3010	.20
(34)	Condenser (.05 Mfd. Tubular) (On top of chassis)	30-4327	.20
(35)	Resistor (300 ohms Flexible) (Orange-Black-Black)	33-3010	.20
(36)	Resistor (50000 ohms) (Green-Brown-Orange)	6098	.20
(37)	Resistor (2 Megs.) (Red-Black-Green)	33-1025	.20
(38)	Compensating Condenser (1st I.F. Primary)	Part of (39)	....
(39)	1st I.F. Transformer	32-1711	2.00
(40)	Compensating Condenser (1st I.F. Secondary)	Part of (39)	....
(41)	Resistor (2 Megs.) (Red-Black-Green)	33-1025	$0.20
(42)	Condenser (.05 Mfd. Tubular)	30-4020	.35
(43)	Resistor (300 ohms Flexible) (Orange-Black-Black)	33-3010	.20
(44)	Condenser (.05 Mfd. Twin Bakelite Block)	3615-DU	.40
(45)	Resistor (1000 ohms) (Brown-Black-Red)	5837	.20
(46)	Compensating Condenser (2d I.F. Primary)	Part of (47)	....
(47)	2d I.F. Transformer	32-1712	2.00
(48)	Compensating Condenser (2d I.F. Secondary)	Part of (47)	....
(49)	Resistor (330000 ohms) (Orange-Orange-Yellow)	33-1200	.20
(50)	Condenser (.00011 Mfd. Twin Bakelite Block)	8035-DG	.25
(50)a	Condenser (.00005 Mfd. Mica) (Not shown Fig. 3)	30-1029	.35
(51)	Resistor (100000 ohms) (White-White-Orange)	6099	.20
(52)	Condenser (.05 Mfd. Tubular)	30-4020	.35
(53)	Volume Control and On-Off Switch	33-5108	1.45
(54)	Resistor (51000 ohms) (Green-Brown-Orange)	6098	.20
(55)	Condenser (.02 Mfd. Tubular)	30-4113	.30
(56)	Tone Control	30-4343	.75
(57)	Condensers in Tone Control	Part of (56)	....
(58)	Resistor (5000 ohms) (Green-Black-Red)	5310	.20
(59)	Condenser (.25 Mfd. Tubular)	30-4134	.40
(60)	Resistor (100000 ohms) (White-White-Orange)	6099	.20
(61)	Resistor (160000 ohms) (Brown-Blue-Yellow)	33-1191	.20
(62)	Condenser (.00011 Mfd. Mica)	30-1031	.35
(63)	Condenser (.05 Mfd. Bakelite Block)	3615-SU	.35
(64)	Resistor (70000 ohms) (Violet-Black-Orange)	5385	.20
(65)	Resistor (1 Meg.) (Brown-Black-Green)	33-1096	.20
(66)	B.C. Resistor (Wirewound) (10 ohms, 110 ohms, 130 ohms)	33-3137	.30
(67)	Input Transformer	32-7114	2.00
(68)	Output Transformer	32-7078	1.40
(69)	Cone and Voice Coil Assembly (H-13)	02625	1.20
	Cone and Voice Coil Assembly (K-17)	02996	.90
(70)	Field Coil and Pot Assembly (H-13 or K-17)	36-3104	2.70
(71)	Condenser (Electrolytic—3 Mfd., 1 Mfd., 2 Mfd.)	30-2122	1.85
(72)	Resistor (Wirewound) (7750 ohms)	33-3211	1.60
(73)	Resistor (39000 ohms) (Orange-White-Orange)	33-1027	.20
(74)	Resistor (32000 ohms) (Orange-Red-Orange)	33-1026	.35
(75)	Resistor (51000 ohms) (Green-Brown-Orange)	4237	.20
(76)	Resistor (15000 ohms) (Brown-Green-Orange)	6208	.20
(77)	Condenser (Electrolytic—8 Mfd., 10 Mfd.)	30-2045	1.80
(78)	Condenser (Electrolytic—8 Mfd.)	†30-2025	1.10
(79)	Filter Choke	32-7115	1.80
(80)	Condenser (.3 Mfd. Bakelite Block)	*6287-DU	.40
(81)	Power Transformer 110 Volts 60 Cycles	32-7402	4.50
	Power Transformer 110 Volts 25 Cycles	32-7403	9.00
	Power Transformer 230 Volts 50 Cycles	32-7404	7.50
(82)	Condenser (.015 Mfd. Twin Bakelite Block)	3793-DG	.40
(83)	Pilot Lamp (Dial)	34-2064	.09
(84)	Shadow Tuning Meter	**45-2086	2.00
(84)a	Pilot Lamp (Shadowmeter)	Part of (84)	....
(85)	Condenser (.05 Mfd. Tubular)	30-4020	.35
(86)	Condenser (.006 Mfd. Tubular)	30-4125	.25
(87)	Condenser (.006½ Mfd. Tubular)	30-4125	.25
	Dial Scale	27-5103	.30
	Dial Hub and Set Screw Assembly	31-1550	.15
	Dial Spring Clamp	28-2837	.10
	Tube Shield	28-2726	.10
	Tube Shield Base	28-2725	.03
	Socket (4-Prong)	27-6034	.10
	Socket (6-Prong)	27-6036	.11
	Socket (7-Prong)	27-6037	.11
	Socket (Speaker Plug)	27-6033	.08
	Knob (Station Selector)	27-4206	.12
	Knob (Fine Tuning)	27-4207	.10
	Knob (Waveband)	27-4219	.10
	Knob (Volume Control or Tone Control)	27-4208	.10
	Bezel	28-2933	.35
	Glass	27-7931	.60
	Chassis Mtg. Screw	W-1495	1.50 per C
	Chassis Mtg. Washer	27-4198	.01
	Chassis Mtg. Rubber Bumper	27-4197	....

▲ Omitted after Run 5.

*In Model 650A (115 Volts 25 Cycles) this is part No. 04357, List .75.

†In Code 122 (650X, 650MX, 650H) this is part No. 30-2014, List 1.50.

**In Code 122 (650X, 650MX, 650H) this is part No. 45-2082.

After Run 2, this is 30-1032 mica, List .35.

WAVE TRAP—Connect the Signal Generator antenna and ground leads to the antenna and ground posts of the set. Replace the grid clip on the 6A7 tube cap. With the signal generator operating at 460 K.C. and the set controls adjusted as for I.F., adjust wavetrap ① until the minimum reading is obtained in the out-put meter.

SHORTWAVE—Turn waveband switch to position 4 (extreme right). Set signal generator at 18 megacycles and dial of set at 18.0 (top scale). Now adjust the oscillator, R.F., and Antenna compensators in turn, for maximum reading. These are ㉘, ⑮ and⑦ respectively.

Turn the dial to 6.0 M.C., set the signal generator at 6.0 M.C., and adjust condenser ㉘ for maximum reading. This compensator is located underneath the chassis and reached from underneath. (See Fig. 3).

STANDARD WAVE—Turn waveband switch to position 2 (standard broadcast), set signal generator at 1500 and dial of set at 150. Now adjust the oscillator, R.F., and antenna "Standard" condensers. These are ㉕, ⑬ and ⑤ respectively.

Now turn the dial to 60, set signal generator at 600 and adjust condenser ㉗ (oscillator standard-series) (nut) for maximum reading.

POLICE BAND—Turn waveband switch to position 3 from left (police band); set dial at 2.4 and signal generator at 2400 K.C. Adjust condensers ④ and ⑭ for maxmium reading. (Antenna and R.F. Police.)

LONG WAVE (Weather) BAND—Turn waveband switch to position 1 (left) (Longwave). Set dial at 35 and signal generator at 350 K.C. Adjust condensers ㉔, ⑫ and ⑥ (oscillator, R.F., and Antenna Longwave) for maximum reading.

Turn dial to 17, signal generator to 170 and adjust condenser ㉖ (longwave series) (screw) for maximum reading.

PHILCO Headphone and Adapter Kit

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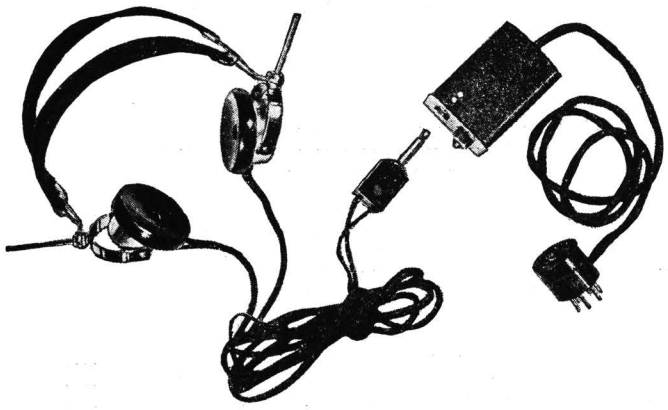

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