



Model 21

SPECIFICATIONS

TYPE OF CIRCUIT: Model 21 is an electric Push-Button and dial tuned radio incorporating the new Philco Built-in Super Aerial system which eliminates an outside aerial and reduces local static interference to a minimum. This model is also designed to receive the sound of a television program tuned in by special type Philco Television Sets.

PHILCO BUILT-IN SUPER AERIAL SYSTEM:

Included in the built-in aerial system is a statically shielded loop for broadcast band reception and a short wave receiving loop. The 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.

Model 21 uses 10 tubes.

In addition, other features of design are: Continuously variable tone control; three tuning ranges covering the frequencies listed below; automatic bass compensation and degenerative push-pull pentode audio output circuit. Outside aerial connections are also provided for remote localities where station signal strength is very weak.

The receiver is equipped with eight electric tuning push buttons for automatically selecting stations. Seven of the push buttons are used for broadcast stations and one push button (left hand push button preferably) may be set up to receive the sound programs tuned in by Special Philco Television sets, when such are available.

POWER SUPPLY: 115 Volts, 25 and 60 cycle A. C.

POWER CONSUMPTION: 110 watts.

FREQUENCY TUNING RANGES: (Three)
540 to 1550 K. C. 1.5 to 4.0 M. C. 6.0 to 18 M. C.

INTERMEDIATE FREQUENCY: 460 K. C.

AUDIO OUTPUT: 5 watts.

PHILCO TUBES USED: Model 21.

1232E, R. F.; 6J8EG, Converter; 7B7E, I. F.; 7C6, Second Detector, A. V. C., and First Audio; 37, Phase Inverter; two 37, Drivers; two 42E Audio Power Outputs; 80, Rectifier.

CABINET DIMENSIONS:	Height	Width	Depth
Model 21 type "XX"....	38"	29 1/2"	13 3/4"

ADJUSTING ELECTRIC PUSH BUTTON TUNING

In order to adjust the electric push buttons accurately for reception of broadcast stations, a vacuum tube voltmeter such as Philco Model 028 should be used. In addition, an insulated padding screw driver part No. 45-2610 and Loktal aligning adapter part No. 45-2767 are required. With this equipment at hand proceed as follows:

Select eight of the most popular stations received in the locality. 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 is placed in the button on the extreme right. Each push button is adjusted by two set screws located on the rear of the push button unit. Each set of screws is numbered and covers a frequency range as follows:

Push-Button	Frequency-Range
1, 2, 3	540-1030 K.C.
4, 5	670-1160 K.C.
6, 7, 8	900-1600 K.C.

Looking at the front of the cabinet, the first button on the left is adjusted by set screw No. 1. The next push button by set screw No. 2 and the remaining push buttons in order.

1. Remove the 7C6 A.F. tube from its socket and insert the aligning adaptor, then replace the tube in the adaptor. Connect the negative terminal of the vacuum tube voltmeter to the wire which protrudes from the side of the adaptor. Attach the positive terminal of the voltmeter to the chassis.

2. Turn the receiver on and set the tuning range disc to "Broadcast" (Manual Tuning).

3. Set up the Model 177 Signal Generator about 3 feet from the receiver and connect a loop constructed out of about 6 feet of wire 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". Manually tune in the first station to be set up on push button No. 1. After doing this set the indicator of the 177 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. Turn the receiver tuning range disc to "Push Button" and press in No. 1 button. Using the insulated screw driver turn the No. 1 "Osc." screw until the broadcast station identified by the signal generator is heard; at this point, turn the indicator of the signal generator away from the frequency of the station. Readjust No. 1 "Osc." and "Ant." screws for maximum deflection of the vacuum tube voltmeter pointer. Station No. 1 is now adjusted properly. After setting up the first station the same procedure as outlined above is used for the remaining stations.

When this model is to be set up to receive the sound of a television program tuned in by the special type Philco television sets, when available, push-button No. 1 should be used. To tune in these programs, the same procedure as given for ordinary broadcast stations as outlined above is used.

Further details for setting up this receiver for operation with Philco Television sets will be supplied with the instruments, when they become available.

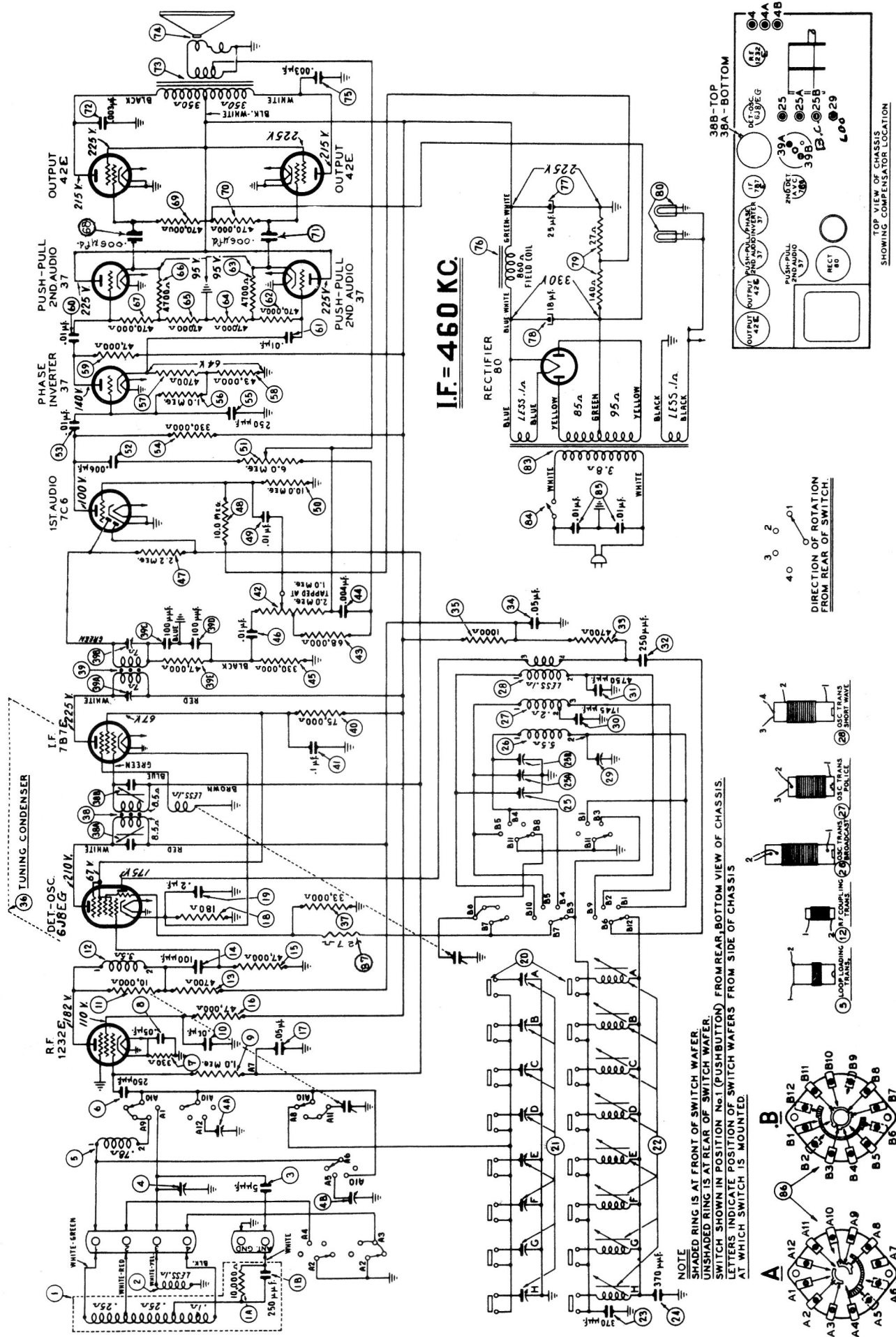


Fig. 1—Schematic Diagram—Model 21

The voltages indicated were measured with a Philco Model 028 Voltmeter (1000 ohms per volt)—Power supply 115 volts—Volume control minimum—No signal being received—Range switch “Brdest.”

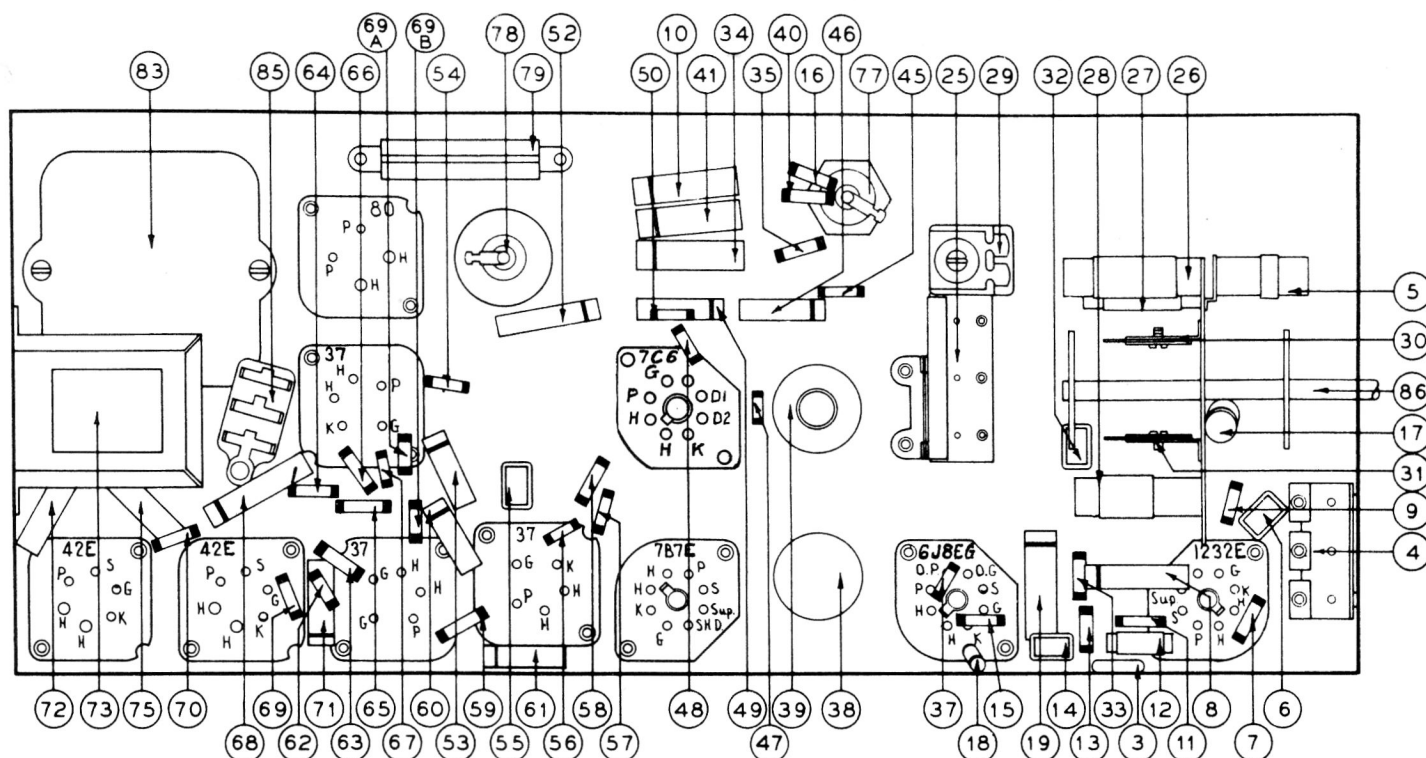


Fig. 2

REPLACEMENT PARTS - MODEL 21

Schem. No.	Description	Part No.	Schem. No.	Description	Part No.
1	Loop Ass'y (Broadcast).....	38-9881	44	Tubular Cond. (.004 Mfd.).....	30-4334
1A	Resistor (10,000 ohms, $\frac{1}{2}$ watt).....	33-310344	45	Resistor (330,000 ohms, $\frac{1}{2}$ watt).....	33-433344
1B	Mica Condenser (250 Mmfd.).....	61-0033	46	Tubular Condenser (.01 Mfd.).....	30-4572
2	Loop Ass'y (Short Wave).....	38-9867	47	Resistor (2.2 Meg., $\frac{1}{2}$ watt).....	33-522344
3	Mica Condenser (5 Mmfd.).....	30-1097	48	Resistor (10.0 meg., $\frac{1}{2}$ watt).....	33-610344
4	Compensator (3 section).....	31-6305	49	Tubular Cond. (.01 Mfd.).....	30-4572
5	Loop Loading Coil.....	32-3252	50	Resistor (10.0 Meg., $\frac{1}{2}$ watt).....	33-610344
6	Mica Condenser (250 Mmfd.).....	61-0033	51	Tone Control (6 Meg.).....	33-5325
7	Resistor (330 ohms, $\frac{1}{2}$ watt).....	33-133331	52	Tubular Cond. (.006 Mfd.).....	30-4445
8	Tubular Condenser (.05 Mfd.).....	30-4444	53	Tubular Cond. (.01 Mfd.).....	30-4572
9	Resistor (1.0 meg., $\frac{1}{2}$ watt).....	33-510344	54	Resistor (330,000 ohms, $\frac{1}{2}$ watt).....	33-433344
10	Tubular Condenser (.01 Mfd.).....	30-4572	55	Mica Condenser (250 Mmfd.).....	61-0033
11	Resistor (10,000 ohms, $\frac{1}{2}$ watt).....	33-310344	56	Resistor (1.0 Meg., $\frac{1}{2}$ watt).....	33-510344
12	R.F. Coupling Coil.....	32-3194	57	Resistor (4,700 ohms, $\frac{1}{2}$ watt).....	33-247344
13	Resistor (4,700 ohms, $\frac{1}{2}$ watt).....	33-247344	58	Resistor (47,000 ohms, $\frac{1}{2}$ watt).....	33-347344
14	Mica Condenser (100 Mmfd.).....	30-1128	59	Tubular Cond. (.01 Mfd.).....	30-4572
15	Resistor (47,000 ohms, $\frac{1}{2}$ watt).....	33-347344	60	Tubular Cond. (.01 Mfd.).....	30-4572
16	Resistor (47,000 ohms, $\frac{1}{2}$ watt).....	33-347344	61	Resistor (470,000 ohms, $\frac{1}{2}$ watt).....	33-447344
17	Tubular Condenser (.05 Mfd.).....	30-4519	62	Resistor (4,700 ohms, $\frac{1}{2}$ watt).....	33-247344
18	Resistor (180 ohms, $\frac{1}{2}$ watt).....	33-118331	63	Resistor (47,000 ohms, $\frac{1}{2}$ watt).....	33-347344
19	Tubular Condenser (.2 Mfd.).....	30-4536	64	Resistor (47,000 ohms, $\frac{1}{2}$ watt).....	33-347344
20	Push Button Switch.....	42-1515	65	Resistor (4,700 ohms, $\frac{1}{2}$ watt).....	33-247344
21	Compensator Strip.....	31-6313	66	Resistor (47,000 ohms, $\frac{1}{2}$ watt).....	33-447344
22	Coil Strip (Complete).....	32-3253	67	Resistor (470,000 ohms, $\frac{1}{2}$ watt).....	33-447344
22A	Coil No. 1 (540 to 1030 K.C.).....	32-3042	68	Tubular Condenser (.006 Mfd.).....	30-4591
22B	Coil No. 2 (540 to 1030 K.C.).....	32-3042	69	Resistor (470,000 ohms, $\frac{1}{2}$ watt).....	33-447344
22C	Coil No. 3 (540 to 1030 K.C.).....	32-3042	70	Resistor (470,000 ohms, $\frac{1}{2}$ watt).....	33-447344
22D	Coil No. 4 (670 to 1160 K.C.).....	32-3042	71	Tubular Cond. (.006 Mfd.).....	30-4591
22E	Coil No. 5 (670 to 1160 K.C.).....	32-3042	72	Tubular Cond. (.003 Mfd.).....	30-4469
22F	Coil No. 6 (900 to 1600 K.C.).....	32-3041	73	Output Transformer.....	32-7981
22G	Coil No. 7 (900 to 1600 K.C.).....	32-3041	74	Cone & Voice Coil Ass'y.....	30-4469
22H	Coil No. 8 (900 to 1600 K.C.).....	32-3041	75	Tubular Condenser (.003 Mfd.).....	30-4469
23	Silver Mica Condenser (370 Mmfd.).....	30-1110	76	Field Coil (Replace spkr #36-1450).....	30-2333
24	Silver Mica Condenser (370 Mmfd.).....	30-1110	77	Electrolytic Cond. (25 Mfd.).....	30-2333
25	Compensator (3 section).....	31-6092	78	Electrolytic Cond. (18 Mfd.).....	33-3376
26	Broadcast Oscillator Coil.....	32-3240	79	B.C. Resistor.....	33-3376
27	Police Oscillator Coil.....	32-3052	80	Pilot Lamps.....	34-2064
28	Short Wave Oscillator Coil.....	32-3242	81	Power Transformer (110 V. 60 cycle).....	32-8059
29	Compensator.....	31-6230	82	Power Transformer (110 V. 25 cycle).....	32-8080
30	Tracking Cond. (1.745 Mmfd.).....	31-6307	84	A.C. Switch.....	42-1517
31	Tracking Cond. (4750 Mmfd.).....	31-6306	85	Line Cond. (.01-.01 Mfd., Bakelite).....	3903DG
32	Mica Condenser (250 Mmfd.).....	61-0033	86	Wave Switch.....	42-1507
33	Resistor (4,700 ohms, $\frac{1}{2}$ watt).....	33-247344	87	Resistor (27 ohms, $\frac{1}{2}$ watt).....	33-027344
34	Tubular Cond. (.05 Mfd.).....	30-4518			
35	Resistor (1,000 ohms, $\frac{1}{2}$ watt).....	33-210344			
36	Tuning Condenser Ass'y.....	31-2389			
37	Resistor (33,000 ohms, $\frac{1}{2}$ watt).....	33-333344			
38	1st I.F. Trans. Ass'y.....	32-3243			
39	2nd I.F. Trans. Ass'y.....	32-3250			
39E	Resistor (47,000 ohms, $\frac{1}{2}$ watt).....	33-347344			
40	Resistor (75,000 ohms, $\frac{1}{2}$ watt).....	33-375344			
41	Tubular Condenser (.1 Mfd.).....	30-4455			
42	Volume Control (2 Meg.).....	33-5286			
43	Resistor (68,000 ohms, $\frac{1}{2}$ watt).....	33-368344			

MISCELLANEOUS PARTS

Bezel Ass'y.....	40-6490
Drum Shaft Bearing.....	56-1036FA3
Line Cord.....	L-2778
Speaker Cable.....	43-3444
Tuning Condenser Coupling.....	31-2291
Tuning Scale.....	27-5513
Dial Clamp.....	56-1034FA3
Dial Gasket.....	27-9224
Rubber Band.....	3622
Dial Pointer.....	56-1033

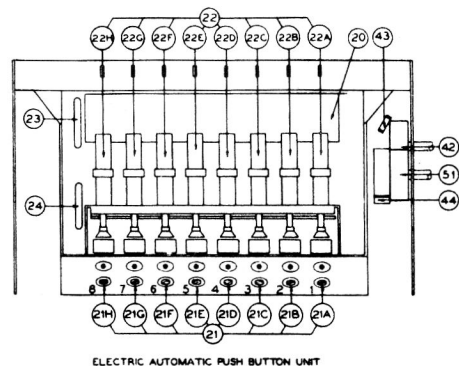


Fig. 3

Description	Part No.
Dial Drive Cord (Long).....	31-2316
Dial Drive Cord (Short).....	31-2350
Dial Drive Cord Spring.....	28-8913
Tuning Drum.....	27-4798
Wave Switch Drum Ass'y.....	318-1039
Tone Control Drum.....	27-4764
Volume Control Drum.....	27-4765
Drum Ass'y (Tuning Condenser).....	38-9716
Drum Bracket & Bearing Ass'y.....	38-9662
Shaft (Control Drums).....	28-6924
Pilot Lamp Ass'y (Right Hand).....	38-9694
Pilot Lamp Ass'y (Left Hand).....	38-9695
6 Prong Standard Socket.....	27-6036
5 Prong Standard Socket.....	27-6035
4 Prong Standard Socket.....	27-6044
8 Prong Octal Socket.....	27-6120
8 Prong Loktal Socket.....	27-6131
Complete Speaker.....	36-1450
Station Tab Kit.....	40-6501
Grommet (Mtg. P.R. Switch).....	27-4596
Grommet (Mtg. Tuning Unit Ass'y) with shoulder.....	3914
Grommet (Mtg. Tuning Unit Ass'y) without shoulder.....	3915
Mounting Nut (A.C. switch).....	W1575PA4
Washer (A.C. switch).....	W894FA9
Nut (Speaker Mounting).....	W124FA3
Washer (Speaker Mounting).....	27-7467
Screw (Chassis Mounting).....	W-1345FA3
Rubber Washer (Chassis Mounting).....	27-4571
Steel Washer (Chassis Mounting).....	28-5114PA3
Screw, Bezel Mounting.....	W1820PB26
Push Button Knob.....	27-4866

ALIGNING OF COMPENSATING CONDENSERS EQUIPMENT REQUIRED

(1) Signal Generator. In order to properly adjust this receiver an accurately calibrated signal generator such as Philco Model 177 is required. This signal generator covers a frequency range of 540 to 36,000 K. C. (2) Indicating Device, to obtain maximum signal strength and accurate adjustment of the padders a vacuum tube voltmeter and circuit tester such as Philco Model 028 is recommended.

CONNECTING ALIGNING INSTRUMENTS

VACUUM TUBE VOLTMETER—To use the vacuum tube voltmeter as an alignment indicator make the following connections:

1. ADJUSTING I. F. CIRCUIT:

Remove the 1232E R. F. tube from its socket and insert the aligning adaptor, then replace the tube in the adaptor. Connect the negative terminal of the vacuum tube voltmeter to the wire which protrudes from the side of the adaptor. Attach the positive terminal of the voltmeter to the chassis.

2. ADJUSTING R. F. CIRCUIT:

To adjust the R. F. circuit, the aligning adaptor is inserted in the 7C6 A.F. tube socket. The vacuum tube voltmeter remains connected to the adaptor as given in the above paragraph.

With the voltmeter connected in this manner a very sensitive indication of the A. V. C. voltage is obtained when the padders are adjusted. If an audio output meter is used, connect it to the plate and socket terminals of the 42E type tube and adjust the output meter for the 0 to 30

When using the vacuum tube voltmeter, an aligning adaptor Philco part No. 45-2767 is necessary for connecting the A. V. C. circuit. These testers also contain an audio output meter which may also be used as an indicating device. (3) Aligning Tools, fiber handle screw driver Philco part No. 45-2610 and fiber wrench Philco part No. 7696.

A. C. scale.

After connecting the aligning indicator, adjust the compensators in the order as 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, reduce the strength of the signal from the generator.

SIGNAL GENERATOR: When adjusting the I. F. padders, the high side of the 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 signal generator is connected to the chassis of the receiver.

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 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 padders, that the receiver should be left in the cabinet.

Operations in Order	SIGNAL GENERATOR			RECEIVER			SPECIAL INSTRUCTIONS
	Output Connections to Receiver	Dummy Antenna Note A	Dial Setting	Dial Setting	Control Setting	Adjust Compensators in Order See Fig.	
1	High Side to No. 1 Ter. Loop Panel	.1 mfd.	460 K. C.	580 K. C.	Vol. Max. Range Switch "Brdcast."	39B, 39A 38B, 38A	See Note A
2	Use Loop on Generator		1500 K. C.	1500 K. C.	Vol. Max. Range Switch "Brdcast."	29B, 4B	See Note B
3	Use Loop on Generator		600 K. C.	600 K. C.	Vol. Max. Range Switch "Brdcast."	29	Roll Tuning Condenser Note C
4	Use Loop on Generator		1500 K. C.	1500 K. C.	Vol. Max. Range Switch "Brdcast."	25B, 4B	
5	Use Loop on Generator		3.5 M. C.	3.5 M. C.	Vol. Max. Range Switch "Police"	25A, 4A	
6	Use Loop on Generator		18.0 M. C.	18.0 M. C.	Vol. Max. Range Switch "S. W."	25, 4	Check Image Signal Note D

NOTE A—A "Dummy Antenna" consisting of a .1 mfd. condenser is connected in series with the signal generator output lead (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: 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 Fig. 4.

NOTE C—When adjusting the low frequency compensator of Range One (Broadcast) or the antenna and R. F. compensators of the high frequency tuning ranges; 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

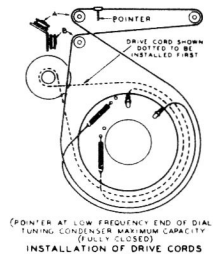


Fig. 4

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 there is no further gain in output reading.

NOTE D—To accurately adjust the high frequency oscillator compensator to the fundamental instead of the image signal, turn the oscillator compensator to the maximum capacity position (clockwise). From this position slowly turn the compensator counter-clockwise until a second peak is obtained on the output meter. Adjust the compensator for maximum output at this second peak.

If the above procedure is correctly performed, the image signal will be found (much weaker) by turning the receiver dial 920 K. C. below the frequency being used on any high frequency range.

MANY OF THE PARTS IN THIS PHILCO, SUCH AS CONDENSERS AND RESISTORS, ARE HELD TO MUCH CLOSER TOLERANCE THAN STANDARD REPLACEMENT PARTS. GENUINE PHILCO REPLACEMENT PARTS MUST BE USED TO OBTAIN SATISFACTORY PERFORMANCE OF THIS MODEL.

PHILCO PRODUCTS LIMITED

PARTS AND SERVICE DIVISION
TORONTO, ONT.