PHILCO
REG U.S. PAT. OFF.
Electric RADIO
"neutrodyne-plus"

Radio Service Manual

Models 86 and 82

PHILADELPHIA STORAGE BATTERY COMPANY
Ontario and C Streets
PHILADELPHIA, PA., U.S.A.

FORM 984—B

PRINTED IN U.S.A.

Philco Electric Radio Service Manual

For Models 86 and 82

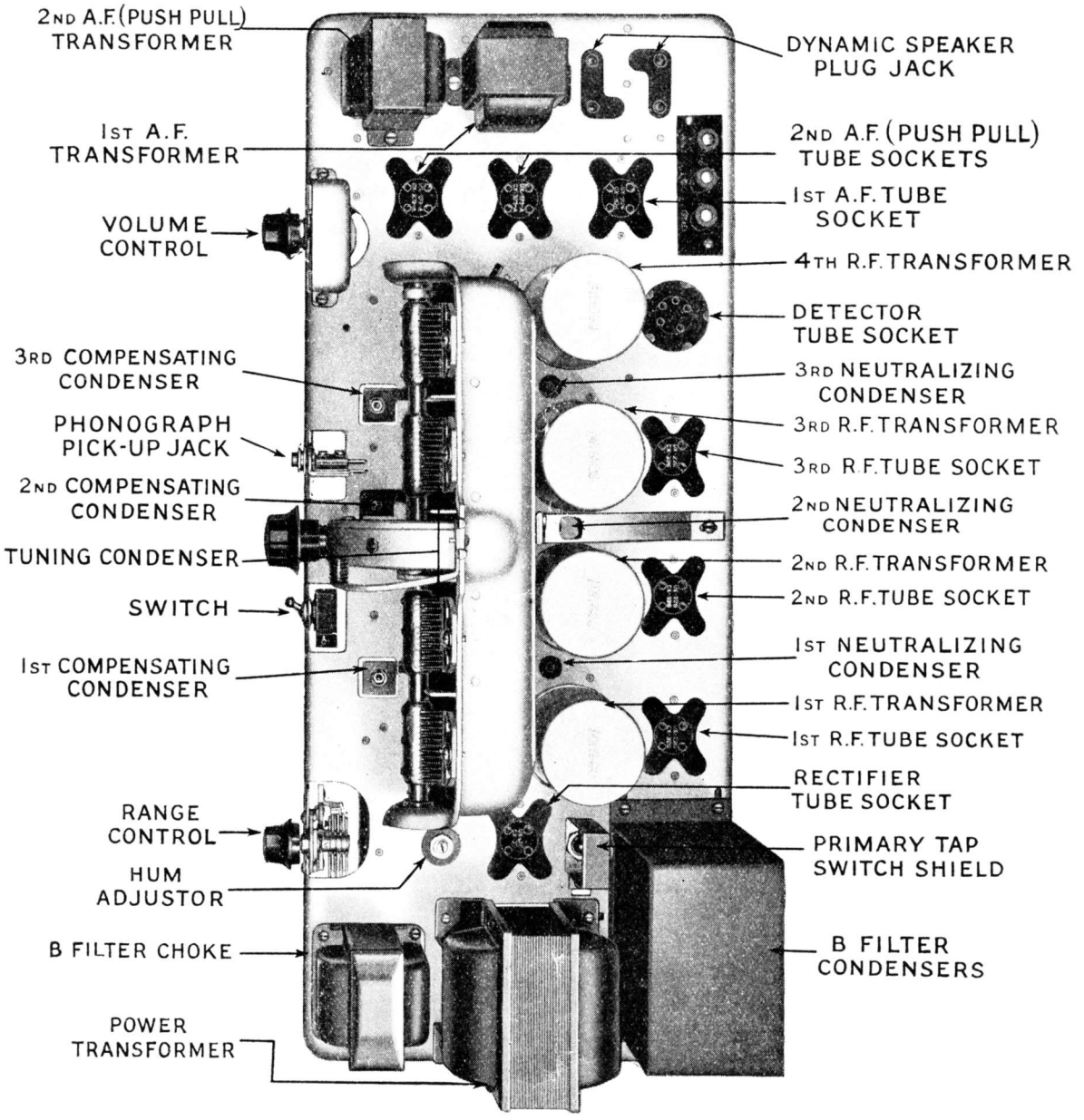


Fig. 1

Installation

The Series 8 Philco Radio Receivers (Models 86 and 82) combine the marvelous sensitivity and selectivity of the Series 5 Philcos with the enormous undistorted volume and fidelity of tone available in push-pull audio amplification properly adapted to and balanced with a high-quality electro-dynamic Speaker of advanced design.

Power Supply

These Philco Receivers are made in two models which differ only as to the kind of current supply on which they are to be used. Model 86 is for use only on 60 or 50 cycle alternating current. Model 82 is for use on 25 to 40 cycle alternating current, and may also be used on 50 or 60 cycle current if desired. Both models are designed to operate on 95 to 135 volts alternating current. Be sure that the right type of Receiver is used for each installation. Check this by the Receiver nameplate.

Line Voltages

All Philco Receivers are set at the factory for operation on 110 to 135-volt lighting circuits. In cases where the voltage at the house socket runs consistently below 110 volts, the primary tap switch setting on the Receiver should be changed by the dealer. To change this setting, loosen the screw bolt which holds the switch guard in place. Then throw the switch from the right-hand position to the left-hand position and replace the guard. With the switch thrown toward the right, the Receiver is set for operation on 110 to 135 volts. With the switch thrown toward the left, the setting is for operation on 95 to 110 volts.

If the factory setting of the switch is changed in cases where the line voltage runs higher than 110 volts, the life of the radio tubes, especially of the 27 detector and 71 power tubes, will be shortened.

Tube Equipment Needed

4—CX 326 or UX 226 tubes

1—C 327 or UY 227 detector tube

2—CX 371-A or UX 171-A power amplifier tubes

1—CX 380 or UX 280 rectifier tube.

Each tube socket in the Receiver is plainly marked to indicate the correct type of tube to be used in it. Be sure that the correct type tube is used in every socket.

Insert the two 71 power tubes first. These sockets are made red to warn against the danger of burning out a 26 tube if placed therein.

Speaker

The Philco electro-dynamic Speaker is built into the cabinet and is ready to operate as received. Make sure that the special four-prong connecting plug, which is on the end of the cable coming from the Speaker, is in the special receptacle in the rear left-hand corner of the Receiver base, and fasten it in place with the set screw provided for the purpose. The plug cannot be inserted incorrectly.

Caution

Never turn on Receiver with the Speaker plug disconnected or with more than one or two tubes out of their sockets.

Better tone quality, especially at great volume, will usually be obtained if the cabinet is placed four inches or more away from the wall. Placing it away from the wall will insure good ventilaton, and also will eliminate any tendency for the detector to be microphonic.

Antenna

The Receiver is shipped with the "ANT" and "LOC" terminal posts connected together by a wire link. This in effect provides a built-in antenna which will be found very satisfactory for the reception of local or strong broadcasting. If it is desired to use an external antenna, remove this wire link and connect the antenna wire to the "ANT" terminal, leaving the "LOC" terminal post disconnected.

An outdoor antenna, consisting of a single copper wire 50 to 80 feet long, usually gives the best results. In the country, however, where there is no powerful broadcasting sta-

tion within 50 miles, a longer antenna may be used and will bring in far-away stations with somewhat greater volume. The lead-in wire is an active part of the antenna and the antenna length should always be measured from the Receiver to the insulator at the far end of the antenna. The outer end of the antenna should be as high as possible and the entire antenna should be spaced well away from trees and buildings and supported by glass or porcelain insulators.

Good results can also be obtained with an indoor antenna 25 feet or more in length. A shorter antenna may cause the Receiver to oscillate and usually will not be satisfactory. No. 18-gauge stranded copper wire having an insulating covering of a neutral color will be found most suitable for indoor use. This wire can be supported and insulated from the wall by glass push pins so as to present a neat appearance. If the walls are constructed with metal lath, however, the "LOC" post connection, described above, will usually give better results than a short indoor antenna.

Ground Connection

A good ground connection to a water pipe or radiator is essential. This can be made conveniently by means of a suitable ground clamp such as the one made by Philco.

Use separate insulated wires rather than a two-wire cord for the antenna and ground connections.

Initial Adjustments

After the antenna, ground and Speaker connections are made and all the tubes are in place, insert the AC attachment plug on the cord at the back of the Receiver into a convenient floor receptacle.

Snap the power switch of the Receiver to the ON position, that is, toward the right. The pilot lamp indicates whether or not the power is turned on. The Receiver uses less than 75 watts of current when turned on. When the switch is turned off, no power is used and the attachment plug need not be withdrawn.

Allow a few minutes for the tubes to become thoroughly heated, then turn the volume control (left knob) counter-clockwise as far as it will go. Turn the station selector (center knob) to a point at or near 100 on the scale where no broadcasting can be heard. Now while listening carefully to the A.C. hum in the Speaker reverse the attachment plug in the house socket. Leave it in the position that gives the least hum.

Next, with the controls in the positions described, turn with a screw-driver the screw of the hum adjustor, first one way then the other, leaving it in the position where the hum is reduced to a minimum.

Radio Broadcast Reception

The Receiver is now ready for use and stations can be tuned in by turning up the volume control (clockwise rotation) and turning the station selector. On distant stations the range control should be used for fine tuning after a station is brought in with the station selector. The range control will be found particularly valuable in bringing in distant stations at the high frequency (low-wave length) end of the broadcasting band.

The range control may also be used to decrease the volume of powerful local stations. When listening to such stations, set this control in the short range position by turning it counter-clockwise as far as it will go and then regulate the volume with the regular volume control. When tuning in distant stations, first tune with the station selector, as closely as possible, then rotate the range control until the maximum signal strength is obtained. The range control acts as a fine tuner in the antenna circuit and often makes possible the selection and bring-

ing in of a distant station that otherwise could not be separated from other stations of nearly the same frequency or wave length.

Never reduce the volume of a station by detuning with the station selector as this may spoil the tone quality. Always tune sharply and use the volume control, and if necessary the range control, to regulate the volume to the desired point. The tone quality is unaffected by the operation of either of these controls.

Phonograph Record Reproduction

With a good phonograph pick-up of the magnetic type and any kind of a turn-table, phonograph records may be reproduced with remarkable fidelity through the Philco Radio. With models having a jack on the front simply insert the plug of the phonograph pick-up in the jack with the Receiver turned on and all tubes in their sockets. The volume control on the Receiver should be turned off and the volume regulated by means of the special control connected with the pick-up.

If the pick-up comes equipped with a plug like a tube base, cut the wires from this plug, and connect them to a standard telephone plug such as was formerly used for loud speakers and head phones, for use with the receivers having a pick-up jack. If the Receiver is not equipped with a pick-up jack, the plug similar to a tube base is used by removing the detector tube from the Receiver and placing the plug in the detector tube socket.

Service

Figure 2 is a schematic diagram of the Receiver. The numbers shown in circles on the schematic diagram refer to the different parts used. Table 1 lists these numbers and the apparatus which they indicate.

Figure 3 is a photographic reproduction of the unwired base of the Philco Receiver with the base-plate removed. Both the parts and terminals are numbered. As in the schematic diagram, the numbers within the circles designate the apparatus. The other numbers indicate the terminals of the apparatus.

Table 1

① Volume Control
② 1st R. F. Transformer
③ 1st Tuning Condenser
④ Range Control
⑤ 1st Neutralizing Condenser
⑥ 2d R. F. Transformer
⑦ By-Pass Condenser and Resistance
⑧ 2d Tuning Condenser
⑨ 1st Compensating Condenser
⑩ 2d Neutralizing Condenser
⑪ 3d R. F. Transformer
⑫ By-Pass Condenser and Resistance
⑬ 3d Tuning Condenser
⑭ 2d Compensating Condenser
⑮ 3d Neutralizing Condenser
⑯ 4th R. F. Transformer
⑰ By-Pass Condenser and Resistance
⑱ 4th Tuning Condenser
⑲ 3d Compensating Condenser
⑳ Grid Leak Resistor
㉑ Grid Condenser
㉒ 1st A. F. Transformer
㉓ By-Pass Condenser
㉔ R. F. Choke Coil
㉕ Phonograph Pick-Up Jack
㉖ 2d A. F. Push Pull Transformer
㉗ Power Switch
㉘ Primary Tap Switch
㉙ Filament Filter Condenser
㉚ Hum Adjustor
㉛ Pilot Lamp
㉜ Power Transformer
㉝ Plate Filter Condenser Block
㉞ Plate Filter Choke Coil
㉟ B. C. Resistor
㊱ Output Transformer
㊲ Speaker Voice Coil
㊳ Speaker Field Coil

Continuity tests, when necessary, can be made with any of the standard AC set testers on the market. The instructions furnished with the test sets explain fully how to make the tests. It is important that all tubes are in their respective sockets with the exception of the tube under test at the time test readings are taken.

Before attempting to find trouble in a Receiver make sure that the trouble is not due to some external condition such as a poor antenna or ground, poor contact in the AC receptacle, or a defective tube. If these things are found to be right, consult Table 2 under the proper classification and check the Receiver accordingly. Too much emphasis cannot be placed on seeing that the trouble present is not due to a defective tube, poor antenna or ground or too poor contact in the tube sockets or attachment plug.

Table 2

I. No Signal

1. Defective Tubes
2. No Voltage on Receiver
3. Incorrect Voltage on one or more Tubes
4. Defective Speaker
7. Poor Contact

Miscellaneous

II. Weak Signal

1. Defective Tubes
3. Incorrect Voltage on one or more Tubes
4. Defective Speaker

5. Neutralizing
6. Compensating
7. Poor Contact
Miscellaneous

III. Fading

1. Defective Tubes
7. Poor Contact

IV. Distortion

1. Defective Tubes
3. Incorrect Voltage on one or more Tubes
4. Defective Speaker
5. Neutralizing
7. Poor Contact
Miscellaneous

V. Hum

1. Defective Tubes
3. Incorrect Voltage on one or more Tubes
4. Defective Speaker
5. Neutralizing
7. Poor Contact
Miscellaneous

VI. Noisy

1. Defective Tubes
3. Incorrect Voltage on one or more Tubes
5. Neutralizing
6. Compensating
7. Poor Contact
Miscellaneous

1. Defective Tubes—Replace the tubes one at a time using a known good tube of the proper type, noting any improvement. It is always a good plan to keep on hand a set of tubes which give good normal results. Check each socket to make sure that the tube makes good contact with the socket.

2. No Voltage on the Receiver—No voltage on the Receiver indicates a poor connection or open in the AC receptacle or the AC plug and cord, a defective set switch, primary tap switch, or transformer. Make a continuity test to determine the exact location of the trouble.

Tables 3, 4, 5 and 6, give the normal voltages of the apparatus.

3. Incorrect Voltage on One or More Tube Sockets—Due to variations in tubes, the voltage readings obtained will vary slightly from those given in Table 3. Any large variations should be checked and the reason determined. For instance, an open field coil in the Speaker will raise the plate voltage on the 71 tubes but will lower the plate voltage on the other tubes. An open in the BC resistor will raise the plate voltage on the tubes, depending on which section is open. Any open in the resistor means that the plate circuit of some tube is open and will cause a rise in the plate voltage. A grounded hum adjustor will cut out the "C" bias of the 26 tubes. A loose contact on the hum adjustor will affect the plate voltage, causing either no reception if entirely open, or noisy reception if making poor contact. A grounded block condenser will result in no or low plate voltage. Properly conducted continuity tests will locate the trouble.

4. Defective Speaker—The simplest method to check Speakers is by substitution, connecting a known good Speaker to the Receiver. An open field coil will result in no plate voltage to the 26 tubes and detector, and high voltage to the 71 tubes. An open primary in a transformer will show no plate current to one of the 71 tubes. An open in the secondary winding of the transformer can be checked with an AC volt meter or with a DC volt meter and battery. The voice coil can be checked in a similar manner. The correct voltage drop across the field coil is 100 volts.

5. Neutralizing—Complete instructions are given under the heading Neutralizing, on Page 11.

6. Compensating—Complete instructions are given under the heading Compensating, on Page 11.

7. Poor Contact—A poor contact in the Receiver will cause noisy reception, intermittent or fading reception, or will stop reception completely. The places to look for a loose contact are at all moving contacts, such as the volume control, set switch, the tube sockets, the hum adjustor, and the range control. Poor contacts are much more likely to develop when the connection depends on a sliding contact than at a soldered connection.

The antenna or ground connection may also cause noise. To check the antenna, use the "LOC" terminal instead of the antenna. If there is a poor connection in the antenna circuit, the trouble will be eliminated when the "LOC" terminal is used. The best method of checking the ground connection is to make a good connection on a water pipe where it enters the building, before going into the water meter. This eliminates all joints in the pipes, and should prevent noise due to a poor contact in the ground circuit.

Miscellaneous—If no signals can be received, first check to see whether the trouble lies in the R. F. or the A. F. side of the Receiver. Allow the detector tube to become thoroughly heated. Removing the detector tube from its socket will cause a loud click in the Speaker if the circuit is right beyond the detector and indicates trouble in front of it. If no click is heard, trouble lies in the A. F. portion of the Receiver.

A grounded antenna or "ANT" terminal will usually kill all reception. To test the antenna, disconnect the antenna and connect the "LOC" terminal to the "ANT" terminal. If normal reception is obtained the trouble is external. If the Receiver is still dead, the trouble is in the Receiver.

If only a weak signal can be received, check to see whether the trouble is in the R. F. or A. F. stages. If the Receiver is equipped with a pick-up jack connect a pair of good head phones to a phone plug. Insert the plug in the pick-up jack and talk into the head phones. The reproduced speech will be very loud, unless there is trouble in the audio end of the Receiver. If the Receiver is not equipped with a pick-up jack, the same test can be made by connecting the head phones to a detector socket adaptor plug, or merely plugging the cord tips into the plate and cathode terminals of the socket.

An open in the antenna circuit will diminish the signal strength so that only the most powerful stations will be audible. To verify this, disconnect the antenna from the "ANT" terminal. Attach the antenna lead-in to the end tie bar on the stator of the first tuning condenser. If normal results are obtained trouble lies between the antenna terminal and the first tuning condenser.

To test the R. F. side of the Receiver, an oscillator can be used to advantage. Connect the oscillator to a test lead. The points for test are 1st, the stator of the 4th tuning condenser; 2d, the 3d condenser; 3d, the 2d condenser; and 4th the 1st condenser. With the Receiver tuned to the oscillator frequency, the signal should be heard and should increase in strength in each succeeding position. If the signal is heard when testing at one point but not at the following one (see order above) then trouble lies between the two test points.

A grounded hum adjustor will cause an AC hum, weak and distorted signals, and low grid and plate voltages. An open or poor connection to the filament by-pass condenser will cause excessive hum. An open plate by-pass condenser in the detector stage will cause distorted and faint signals.

Be sure to keep all wires as far as possible from the tubes in the Receiver as they set up disturbances. For instance, an excessive

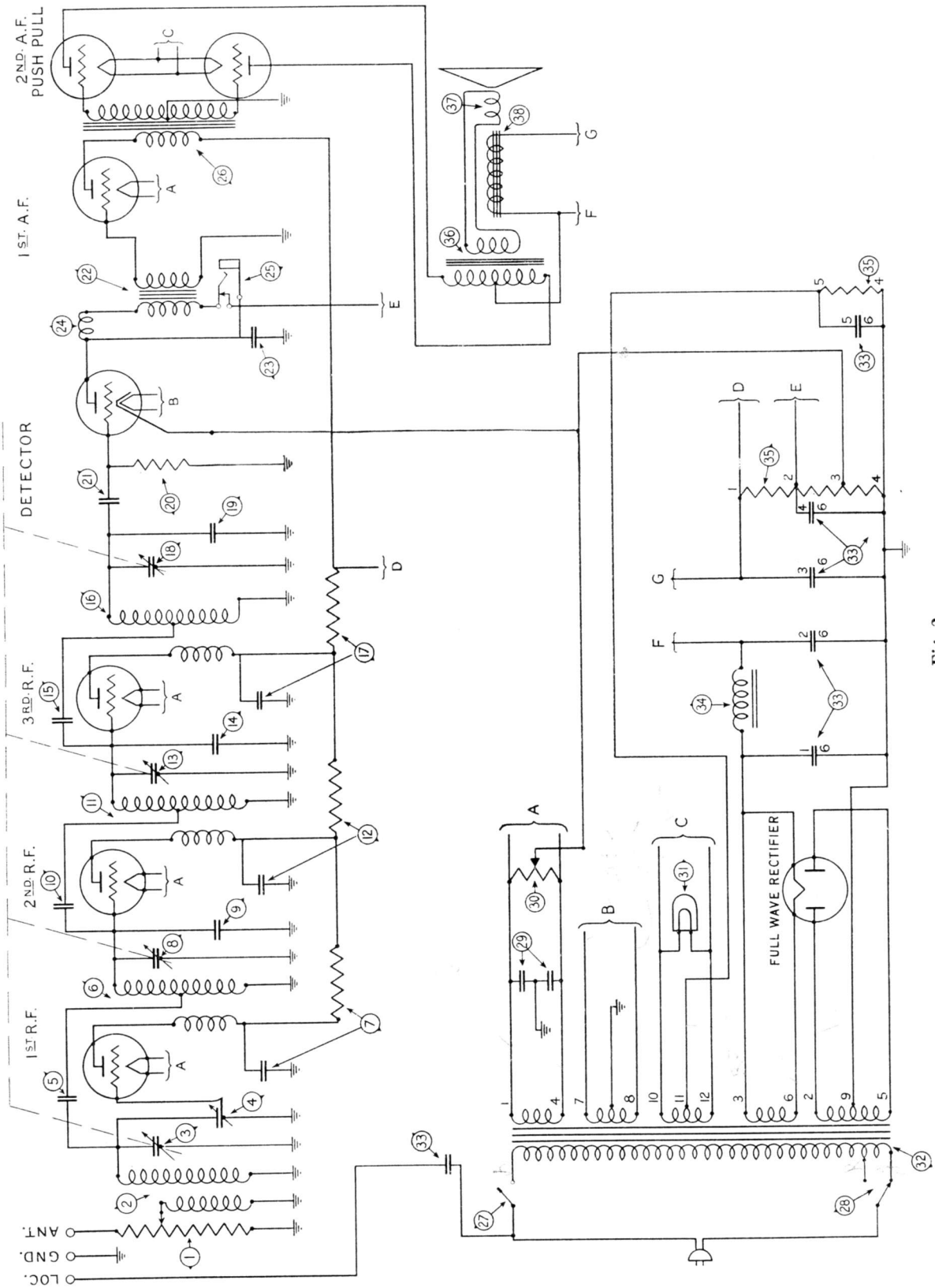

2ND. A.F. PUSH PULL
1ST. A.F.
DETECTOR
3RD. R.F.
2ND. R.F.
1ST. R.F.
ANT.
GND.
LOC.
FULL WAVE RECTIFIER

Fig. 2

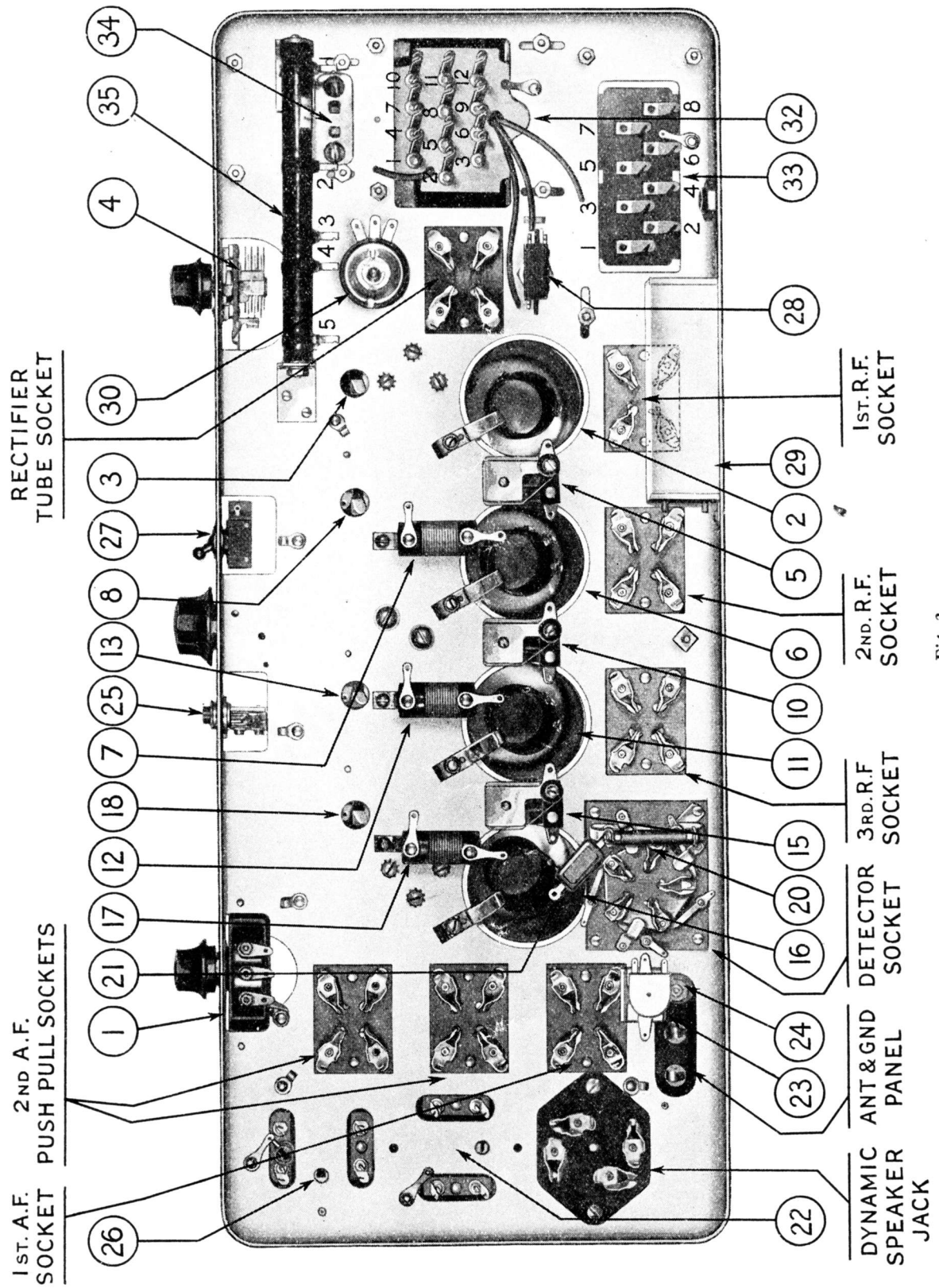

RECTIFIER TUBE SOCKET
2ND A.F. PUSH PULL SOCKETS
1ST. A.F. SOCKET
1ST. R.F. SOCKET
2ND. R.F. SOCKET
3RD. R.F SOCKET
DETECTOR SOCKET
ANT & GND PANEL
DYNAMIC SPEAKER JACK
34
35
4
30
3
27
8
13
25
7
18
12
17
21
1
26
28
32
33
29
2
5
6
10
11
15
20
16
24
23
22

Fig. 3

AC hum would be caused by having the AC cord near the detector tube. Sometimes, when the Receiver is oscillating, the only audible indication will be an excessive hum at certain points on the dial. To eliminate this neutralize and compensate the Receiver.

The Philco Receiver has been designed to eliminate noise. Because of the great radio frequency pick-up or distance getting ability of the Receiver, it is possible to turn the volume control on full and pick up static and other noise from distant points that a weak or low-powered receiver will not get. However, with the volume of the broadcast program equal on the Philco Receiver and on a low-powered receiver, the amount of noise will be the same on both. If the Philco Receiver is turned up to its maximum range, it will bring in stations from distant points that the low-powered receiver will not bring in and at the same time, when turned up this way, it will also bring in noise from distant points.

A Speaker may test right electrically but still not give proper reproduction. The best check in a case like this is by the use of another Speaker unit. Since the electro-dynamic Speaker is built in as an integral part of the Receiver, electrical trouble in the Speaker will reflect on the tests made with an AC set tester.

If the Speaker has a buzz or rattle, this will probably be due to a mechanical condition, such as loose screws or loose parts.

Adjusting Neutralizing and Compensating Condensers

Neutralizing

The best method of neutralizing is by means of a dummy tube and an oscillator. A full description of a simple but useful dummy tube is given on this page.

When adjusting the neutralizing condensers use an antenna consisting of a single wire 25 feet long, supported by insulators at least two feet away from any parallel wall or floor, and a good ground connection. Connect the attachment plug to a live socket and have the switch in the ON position (to the right). Set the station selector between 40 and 50. Adjust the oscillator until the signal is heard in the Speaker, then tune the Receiver to the strongest signal. The final setting of the Receiver scale should be approximately 45. Turn the volume control to full volume.

Remove the third (next to the detector) R. F. tube (326 or 226 type) and insert the dummy tube. With the regular tube removed, the signal should be strong. When the dummy tube is inserted, the volume should diminish. The correct adjustment of the neutralizing condenser is obtained when the minimum signal point is reached. This adjustment is quite critical and should be made using a special wrench made of fibre or some other insulating material. (Philco Part No. 3164.) The neutralizing condensers can be located on Figure 1, and are adjusted from the top of the Receiver.

Repeat this procedure for the 2d R. F. and the 1st R. F. stage. It is important that the neutralizing be done with the volume control on full and with the Receiver scale setting between 40 and 50. After neutralizing in this manner, the Receiver should not oscillate at any point of the scale.

Dummy Neutralizing Tube

Select a UX 226 or CX 326 tube which gives normal results when used in a Philco Receiver. Saw off one of the filament prongs about one-eighth inch below the Bakelite base of the tube. With the prong cut off at this point it will not make contact in the socket so the filament of the tube will not light.

It is very important to carefully select the tube that is to be used for this purpose. Test a number of tubes by using them in one of the R. F. stages of a Receiver and select one which gives average normal results.

Compensating

When adjusting the compensating condensers use an antenna consisting of a single wire 25 feet long, supported by insulators at least two feet away from any parallel wall or floor and a good ground connection. Connect the attachment plug to a live socket and have the switch in the ON position (to the right). Set the station selector between 40 and 50. Turn the range control so that the rotor is meshed half way with the stator. Do not change this position throughout the adjustment. Adjust the oscillator until the signal is heard in the Speaker, then tune the Receiver to the strongest signal without changing the setting of the range control. The final setting should be approximately 45. The regular tubes are to be used in the Receiver throughout this adjustment.

Using a special wrench (Philco Part No. 3164) made of fibre or some other dielectric, turn the adjusting screws of the compensating condensers. (The compensating condensers can be located in Figure 1, and are adjusted from the top of the Receiver.)

With the volume control on full, cut down the output of the oscillator until the signal is barely audible. This can be done by moving the oscillator away from the Receiver until the proper signal strength is obtained. Then adjust each one of the three compensating condensers until the maximum volume is obtained. It is not necessary to adjust the three in any special order—simply make sure that each is adjusted for maximum signal strength.

It is very important that the Receiver be returned after each one of the compensating condensers is adjusted. Use the station selector for this tuning. A change in the adjustment of a compensating condenser will change the station selector setting one or more divisions for maximum signal strength. Do not change the position of the range control.

After adjusting the three compensating condensers as explained above, disconnect the oscillator and with the volume control of the Receiver on full, test the Receiver to see whether or not it is oscillating. Do this by turning the station selector knob slowly over the complete scale from 0 to 100.

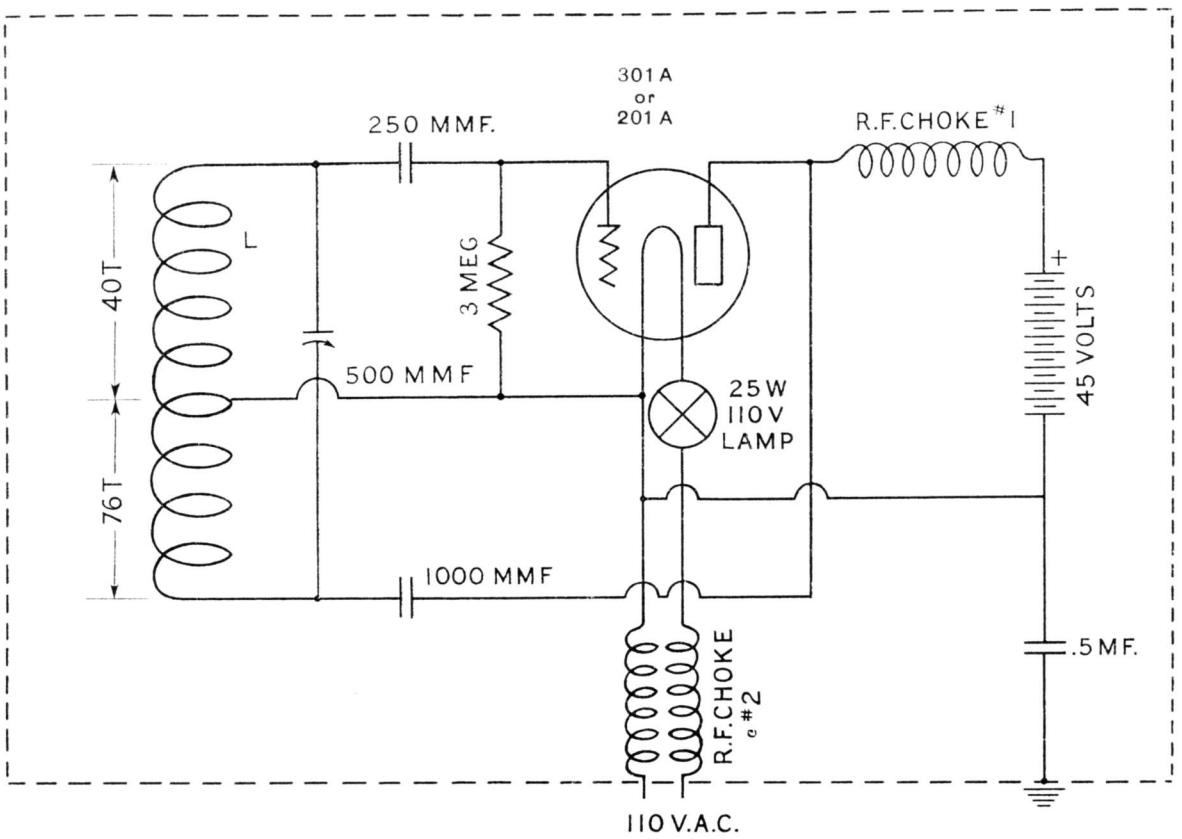
If the Receiver oscillates at any point on the scale, give the first compensating condenser (as shown in Figure 1) one-eighth to one-quarter of a turn in the clockwise direction. Do not turn it more than one-quarter of a turn, usually less will be sufficient to prevent oscillating.

If this does not stop the oscillating, recheck both the neutralizing and compensating adjustments.

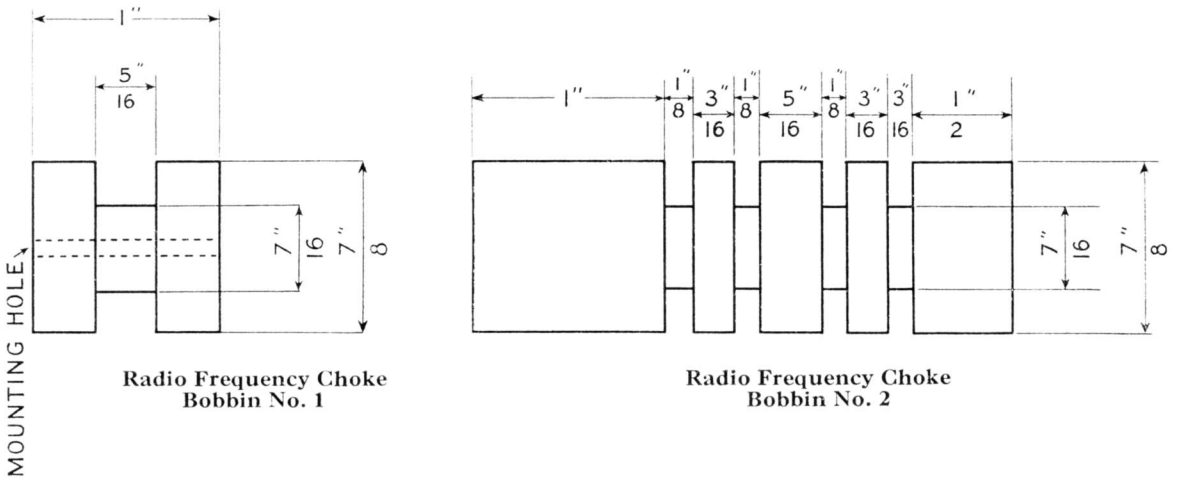
If both neutralizing and compensating condensers are to be adjusted, do the neutralizing first.

Oscillator

A simple and effective AC oscillator which operates on the AC lighting line can be made with little expense by following the specifications and diagram given in Figure 4.



L. Wound on 1¼" Tubing No. 32 D. C. C. or No. 27E
R. F. Choke No. 1-200 T. No. 36 D. S. C.
R. F. Choke No. 2-400 T. No. 32 D. S. C., 200 T. per Slot, 2 Slots per Choke



Radio Frequency Choke
Bobbin No. 1

Radio Frequency Choke
Bobbin No. 2

Figure 4

Wiring Diagram of R. F. Oscillator for Testing Receivers

Table 3
Tube Socket Voltages

Primary Tap Switch		1st, 2d, 3d R. F. 1st A. F.			Detector		2d A. F.			Rectifier
Low	High									
A C Line Volts		F. V.	P. V.	G. V.	F. V.	P. V.	F. V.	P. V.	G. V.	F. V.
95		1.4	81	5.2	2.1	29	4.3	163	37.6	4.4
110		1.6	93	6.1	2.48	33	5.07	190	45.0	5.1
	110	1.3	79	5.0	2.0	28	4.2	160	36.0	4.3
	120	1.4	85	5.5	2.2	30	4.6	172	41.0	4.6
	135	1.6	94	6.2	2.5	33	5.2	193	46.1	5.3

Table 4
D. C. Voltage Across Filter Condenser Block

Terminals	D.C. Volts	Capacity	Circuit
1–6	252	2 Mfd.	1. to Rect. Fil. and (34)
2–6	220	4 Mfd.	2. to (34)
3–6	94	2 Mfd.	3. to 1 Terminal of (35)
4–6	40	1 Mfd.	4. to 2 Terminal of (35)
5–6	41	.1 Mfd.	5. to 11 Terminal of (32)
7–8	120 V.—A.C.	.015 Mfd.	6. to Ground
			7. to "LOC" Terminal
			8. to A.C. Cord and (27)

Table 5
Voltage Across "B-C" Resistor

Terminals	Voltage Drop	Circuit
1–2	54	1 ——— 26 Tubes Plate Supply
2–3	40	2 ——— 27 Tube Plate Supply
3–4	5.5	3 ——— B–, 26, 27 Tubes
5–4	40.0	4 ——— Ground (Grid Potential)
		5 ——— B 71A Tubes

Table 6

Power Transformer Voltages

Terminals	A.C. Volts	Secondary
2–5	560	A.C. supply to plate of Rectifier Tube
9		Center Tap
10–12	4.6	A.C. Filament of 71A Tubes
11		Center Tap
3–6	4.6	A.C. Filament Rectifier Tube
1–4	1.4	A.C. Filament 26 Tubes
7–8	2.2	A.C. Filament 27 Tube

Parts List

Replacement Parts for 60-Cycle Philco A. C. Radio Receiver Model 86

No. as Given in Figure 3 of Manual	Part Name	Part No.
(1)	Volume Control	3076
(2)	R. F. Transformer (Antenna Tuning)	3075-B
(3) – (8) – (13) – (18)	Tuning Condenser (complete with drum and scale)	3001-B
(4)	Range Control	3133
(5) – (10) – (15)	Neutralizing Condenser	3025-A
(6) – (11) – (16)	R. F. Transformer	3075-A
(7) – (12) – (17)	By-Pass Condenser (.1 mfd. with Plate Resistor Winding)	3292-A
(9) – (14) – (19)	Compensating Condensers	3282-A
(20)	Grid Leak	3083
(21)	Grid Condenser	3082
(22)	Audio Transformer	3241
(23)	By-Pass Condenser (.001 mfd.)	3081
(24)	Detector R. F. Choke	3256-A
(25)	Phonograph Pick-Up Jack	3087
(26)	Push-Pull Input Transformer	3242
(27)	Power-Toggle Switch	3253
(28)	Primary Tap Switch	3116
(29)	Filament By-Pass Condenser (2 sections .5 mfd.)	3080
(30)	6-Ohm Hum Adjuster	3096
(31)	Pilot Lamp	3105
(32)	Power Transformer (60 cycle)	3271
(33)	Filter Condenser Block (60 cycle)	3246
(34)	Filter Choke Coil	3269
(35)	B-C Section Resistor	3232
(36)	Push-Pull Output Transformer	2897
	Speaker Plug	2871-A
(37)	Speaker Cone and Voice Coil	2898
(38)	Speaker Field Coil	2896
	Cable Spring	3012
	Control Knob Tuning Condenser	3035-A
	Control Knob (Volume and Range Control)	3036-A
	226 Tube Socket	3051-A
	Condenser Drive Cable	3054-A
	Knob Spring	3103
	Fibre Adjusting Wrench	3164
	280 Tube Socket	3169-A
	171 Tube Socket	3170-A
	Pilot Lamp Socket Assembly	3202-A
	Jack Insulator Nut	3231
	Terminal Panel Assembly	3236-A
	Speaker Socket	3247-A
	227 Tube Socket, Spring Type	3263-A
	Jack Insulator	3272
	A.C. Attachment Cord and Plug	L-943-A
	Wiring Cable	L-1037
	Speaker Cable	L-1039
	Socket Wrench for Speaker Mounting Bolts	3312

***Note:*—When ordering replacements for 25-cycle Receivers (Model 82) use the following part numbers instead of those given above. All other part numbers remain the same.**

(32)	Power Transformer (25 cycle)	3278
(33)	Filter Condenser Block (25 cycle)	3279