

SERVICE MANUAL

MODELS P-5703, C-5707, C-5709

PHILCO
Factory-Supervised
Service

SPECIFICATIONS

CIRCUIT 6-tube superheterodyne (plus transistor)

FREQUENCY

RANGE 540 kc. to 1605 kc.

AUDIO OUTPUT ... 4 watts

PUSH BUTTONS ... 5 station selectors plus 2 search buttons

POWER INPUT 2 amp. at 13.8 volts, d.c.
2.5 amp. when search mechanism is operating

AERIAL Vertical whip, fender mounting (40mmf. series, 40 mmf. shunt)

FREQUENCY

INTERMEDIATE . 262.5 kc.

PHILCO TUBES 12BL6, r-f ampl.; 12AD6, converter; 12BL6, i-f ampl.; 12F8, 2nd det., a.g.c., 1st audio; 12AD6, trigger det.; 12K5, audio driver, relay trigger

PHILCO

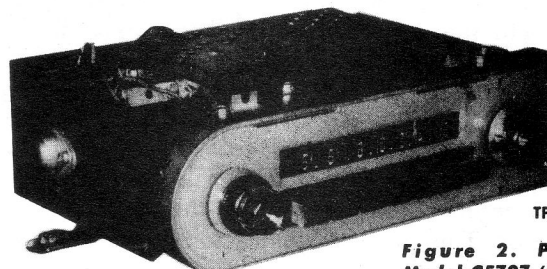
TRANSISTOR AR6, audio output

IMPORTANT: When connecting radio to "A" supply, either in car or on test bench, polarity must be observed. "A+" lead is positive, "A—" is chassis ground.



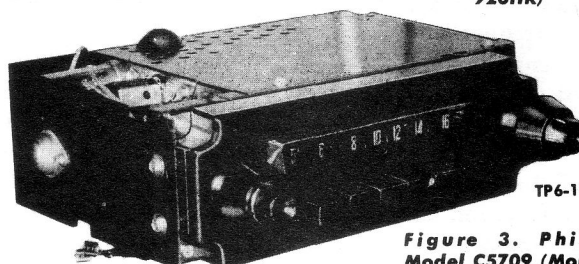
TP6-1493

Figure 1. Philco Model P5703 (Chryco 917HR)



TP6-1492

Figure 2. Philco Model C5707 (Chryco 920HR)



TP6-1902

Figure 3. Philco Model C5709 (Mopar 921HR)

CIRCUIT DESCRIPTION

GENERAL

Models P5703 (Chryco 917HR), C5707 (Chryco 920HR), and C5709 (Mopar 921HR) are electrically identical except that Models C5707 and C5709 have two pilot lamps, a rear-seat-speaker socket, a fader control, and a foot switch socket.

All the power to these receivers, including the plate and screen circuits, is supplied directly by the car battery. This is made possible by utilizing newly developed tubes especially designed to operate at very low plate and screen voltages.

The 12K5 tube supplies the audio driving power for the transistor, and acts as a relay control tube during search operation. This tube incorporates a new design feature; although it has four elements, it actually functions as a triode. It has an auxiliary grid, next to the cathode, which operates at a positive potential, and thus becomes a virtual cathode; this design enhances the control characteristics of the control grid, and provides a high transconductance in proportion to plate potential.

SEARCH TUNING

This feature enables the listener to change stations automatically. After depressing either of the search buttons marked LOC and DIST, the tuning mechanism is rotated to the next higher or lower frequency station, depending upon the initial direction of the motor. When the tuning mechanism reaches either the high or low end of the band, its direction is automatically reversed by the motor reversing switch.

When the search button is depressed, the speaker is shorted to ground, thus muting the receiver and energizing the starting coil of the relay. The relay, when energized, removes the d-c voltages from the following: the primary of T3 (which is the plate load of the 12K5 audio driver, relay trigger tube), the AR6 (audio output transistor), and the screen grid of the 12F8 (which functions as a 2nd detector, a-g-c, audio amplifier tube). At the same time it applies these voltages to the following: the magnetic clutch, the screen grid of the 12AD6 trigger detector tube, the tuner drive motor, and the

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relay holding coil (which acts as the 12K5 plate load during search operation). The magnetic clutch couples the tuning mechanism to the motor, and the receiver begins to search for the next station. The 12K5 plate current through the relay holding coil will keep the relay energized, even though the search button is released, until the next station is tuned in.

Since the plate current through the 12K5 tube is now keeping the relay in the energized position, a negative pulse on the control grid of the 12K5 relay trigger tube will be required to de-energize the relay. Also, this pulse should reach sufficient amplitude to de-energize the relay slightly before (approx. 2.5 kc.) the tuner reaches the station frequency, in order to allow for relay contact closing time. (See figure 5)

As the tuner approaches the station frequency, an i-f signal voltage, which is gradually increasing in amplitude, is developed across T2 (the second i-f transformer) and is coupled to pin 1 of the 12F8 tube. This diode section of the tube is operating as a conventional audio detector. The signal is also coupled through C15 to the grid of the 12AD6, which is operating as a trigger detector by virtue of the adjustable bias applied to its cathode through dropping resistor R30 and across R29**. The 12AD6 tube will then conduct only during the positive peaks of the incoming signal, and will thus produce a negative pulse across R16, the common plate load resistor. This pulse is applied to the control grid (pin 2) of the 12K5, reducing its plate current, de-energizing the relay, and stopping the tuner at the new station's frequency.

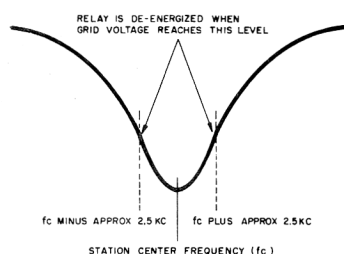
The amplitude of the signal applied to the control grid of the 12AD6, however, is dependent upon the station signal strength, as well as the setting of the tuner with respect to the station frequency. The amplitude of the pulse used to trigger the relay also depends upon the station signal strength, as well as the setting of the tuner. When the tuner is approaching the frequency of a strong station's signal, for instance, the triggering pulse can reach sufficient amplitude to de-

energize the relay and stop the tuning mechanism before it has reached the actual station frequency. It is evident, then, that the level of the 12AD6 output pulse must be maintained constant regardless of station signal strength. To accomplish this the remaining diode section (pin 6) of the 12F8 is used. The signal is taken from the primary of T2, the 2nd i-f transformer, and is coupled through C14 to pin 6. When this tube conducts, a negative clamping voltage is developed across R11, the grid resistor for the 12AD6 tube. (See figure 6). When the incoming station signals are strong there will be more clamping action, and when they are weak there will be less clamping action.

In order to compensate for extreme differences in station signal levels, a fixed bias is applied to the 12F8 tube through R13 and R14. This bias delays the clamping voltage on a weak station's signal, and effectively increases the stopping sensitivity.

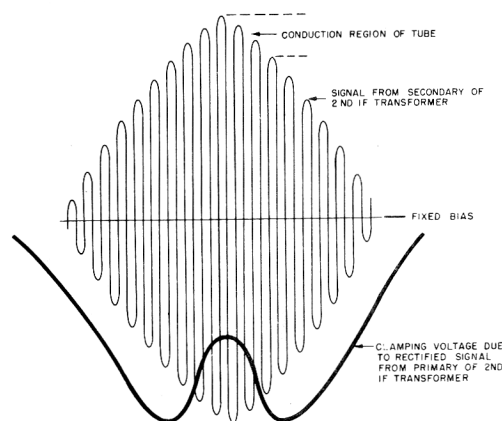
During search operation, as mentioned earlier in the text, a d-c voltage is applied to the screen grid of the trigger detector tube. This voltage is also applied across R28 and R35, connected in series, to form a voltage divider.

In LOC search operation, usually used in a metropolitan area, when the desired stations are known to be strong, the voltage developed across R35 is applied to the cathode, of the 12BL6 r-f amplifier, and is used as bias. This bias reduces the sensitivity of the tube and prevents the tuner from stopping on very weak stations. In DIST search operation, usually used in rural sections, where most of the desired stations are known to be weak, R35 is shorted to ground, removing the fixed bias from the 12BL6 r-f amplifier, and thus increasing the sensitivity of the tube.



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Figure 5. Negative Pulse Applied to Control Grid of Relay Trigger Tube (12K5)



TP6-1418

Figure 6. Signal and Voltages Present at Control Grid of Trigger Detector Tube (12AD6)

TRIGGER DETECTOR BIAS ADJUSTMENT (R29)

The purpose of R29 is to adjust the bias on V5, the 12AD6 trigger detector tube, thus compensating for differences in tube characteristics. To make this adjustment, proceed as follows:

1. Short the antenna socket (J1) to ground.
2. Turn R29 in a CW direction in order to reduce the bias and thus increase the sensitivity of V5. (The search mechanism will now stop on spurious pulses.)
3. Alternately engage the search mechanism, with the DIST search button, and turn R29 back in a CCW direction a fraction of a turn at a time just to the point where the tuner ceases to stop. Add an additional $\frac{1}{8}$ turn in the same (CCW) direction.

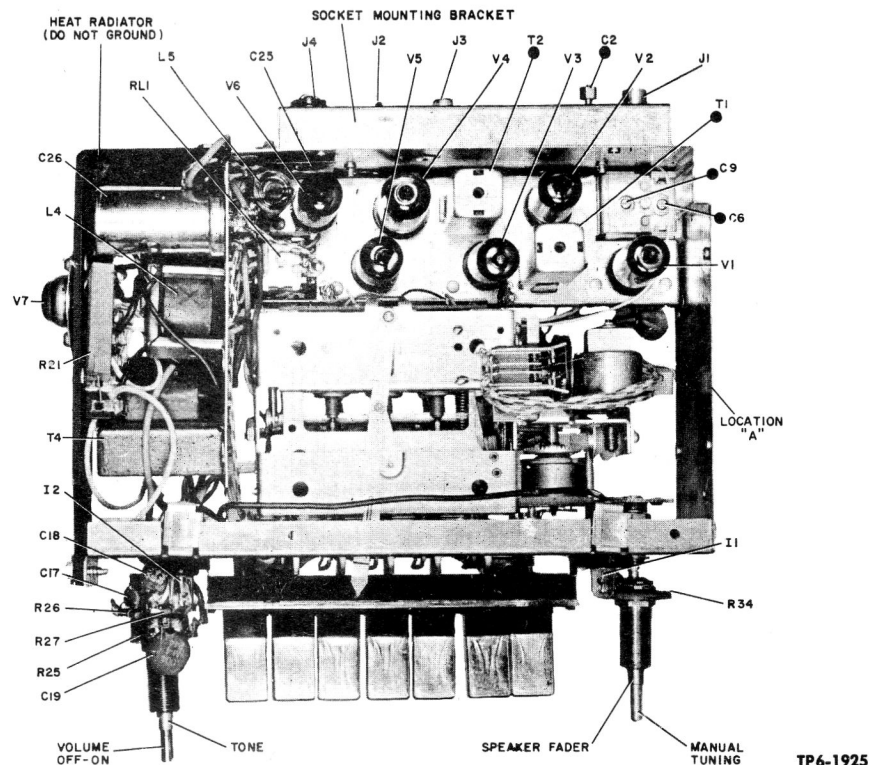


Figure 4. Top View of Philco Model C5709, Showing Alignment Points and Location of Parts.

NOTE: Models C5707 and C5709 are electrically identical. In Model P5703, the Socket Mounting Bracket, the Foot Switch Socket (J3), the Fader Control (R34), and the Rear-Seat-Speaker Socket (J4) are omitted; the Antenna Padder (C2), the Antenna Socket (J1), and the Phono Socket (J2), are placed at location "A".

R-F ALIGNMENT

Connect the test equipment as follows:

TUNING INDICATOR: A v.t.v.m., connected from pin 1, the control grid, of the 12AD6 trigger detector tube to ground. A 1000-ohms-per-volt, a-c voltmeter across the speaker voice coil may also be used.

SIGNAL GENERATOR: Use an AM r-f generator, with 30% modulation. Connect the ground lead to chassis and the output lead to the dummy antenna. Adjust the frequency to 1610 kc.

DUMMY ANTENNA: Connect the signal generator output lead through a 40-mm.f. condenser to the antenna receptacle; connect another 40-mm.f. condenser from the antenna receptacle to chassis.

To make the r-f alignment, proceed as follows:

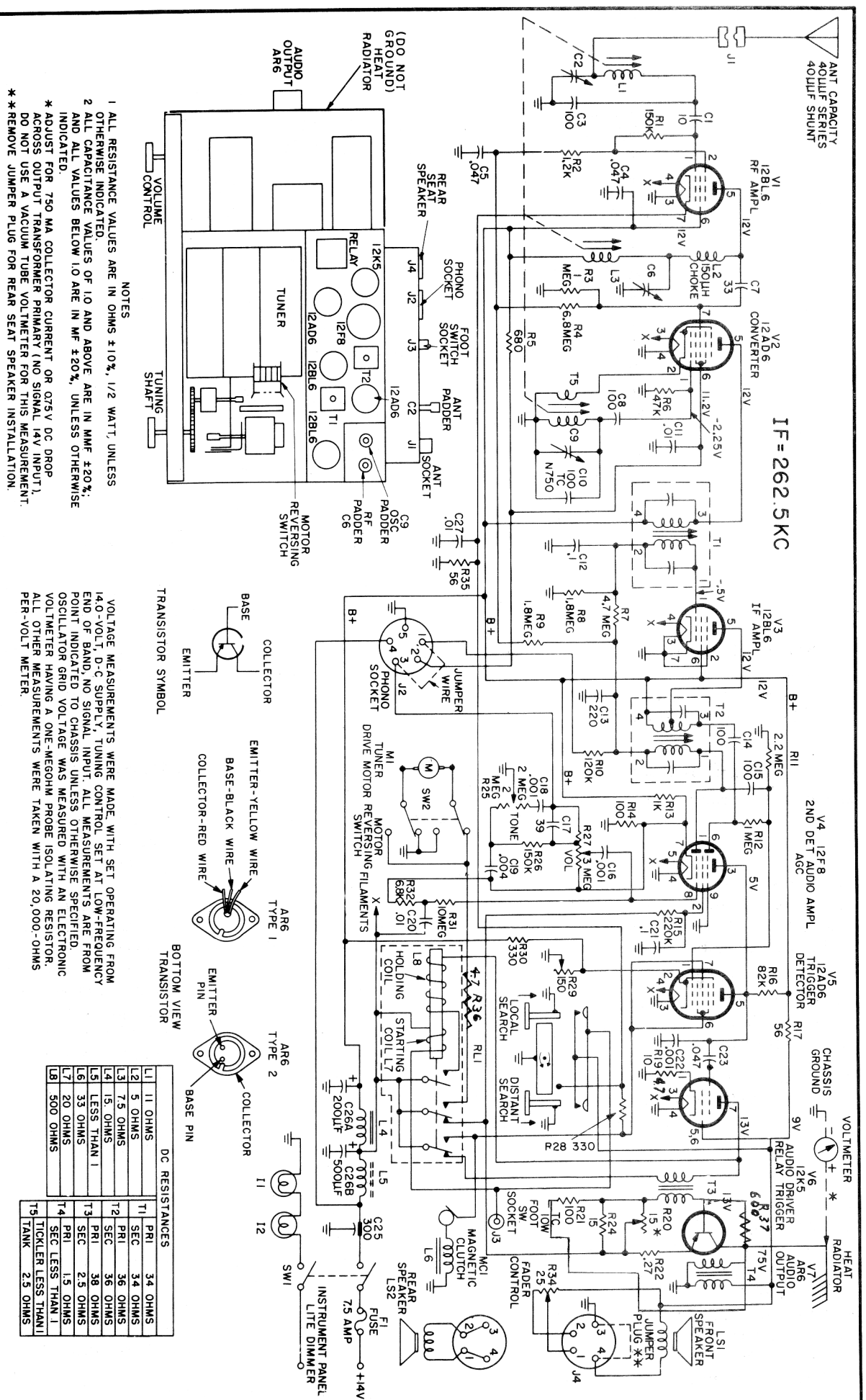
1. Set the radio dial to 1610 kc., and adjust the following for maximum indication.
 - a. C9, oscillator padder
 - b. C2, antenna padder
 - c. C6, r-f padder
2. With the radio and antenna installed in the car, adjust the following for maximum output, using a weak station near 1200 kc.:
 - a. C2, antenna padder

I-F ALIGNMENT

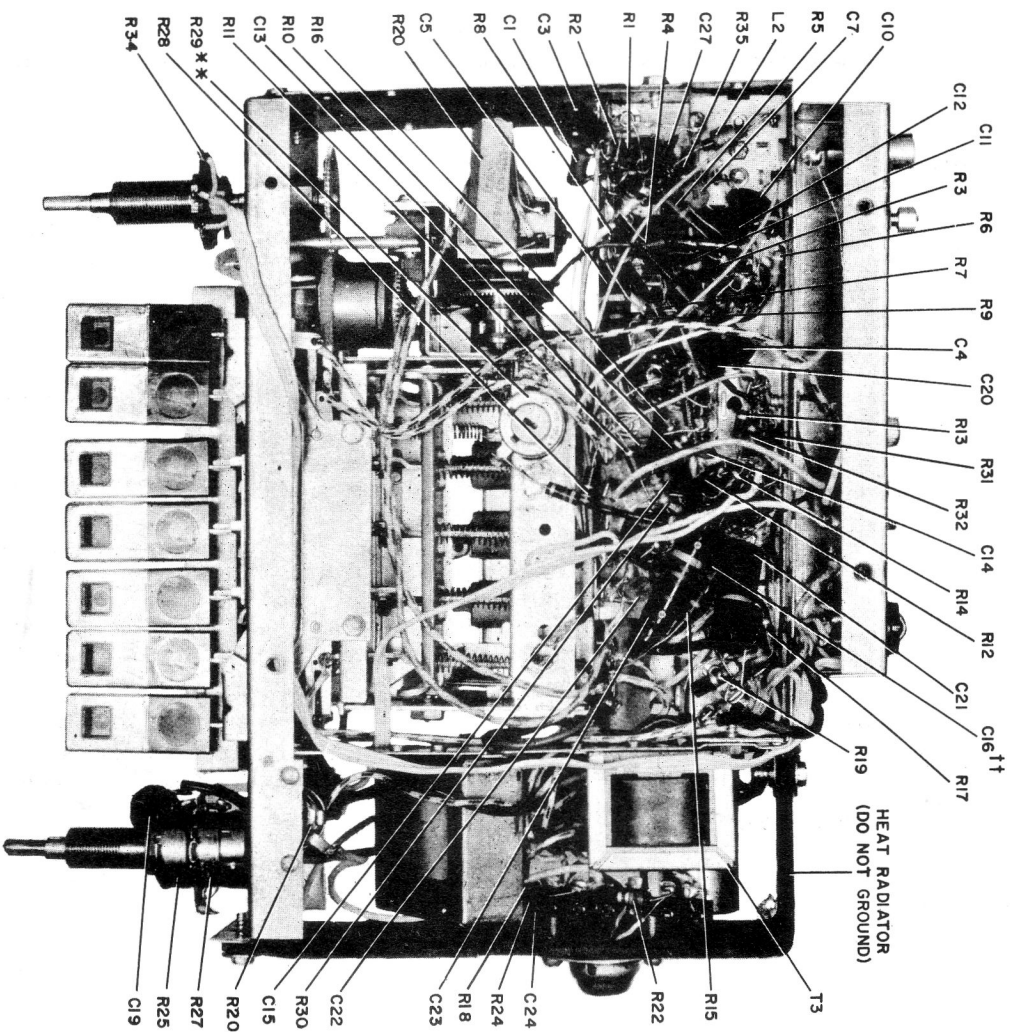
IMPORTANT: Because of the requirements of the search tuning circuit, alignment of the i-f transformers is critical and cannot be done with sufficient accuracy by the use of an output indicator across the speaker voice coil.

It is suggested that a v.t.v.m. having a 2.2 meg. isolating resistor in the d-c probe be used. Since these probes are usually equipped with a 1-meg. isolating resistor, an additional 1.2 meg. resistor should be connected between the probe tip and the test point, using very short leads. Do not touch the resistor or the probe tip while making alignment, as body capacity will affect the circuit impedance. To make the i-f alignment, proceed as follows:

1. Set the radio tuning control to 1610 kc.
2. Connect the d-c probe of the v.t.v.m., through the series resistor, to pin 1, (control grid) of V5 the trigger detector tube. (Use the 1-volt or 3-volt, d-c range.)
3. Feed a 262.5-kc. signal (with 30% modulation), through a .047 -mf condenser, to pin 7 (control grid), of V2 the converter tube.
4. Adjust the following for maximum indication:
 - a. T1 (bottom), 1st i-f primary.
 - b. T1 (top), 1st i-f secondary.
 - c. T2 (bottom), 2nd i-f primary.
5. Adjust T2 (top), 2nd i-f secondary, for maximum dip.
6. Repeat step 4c and step 5.







††] SEE SERVICE PRECAUTIONS
**]

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Figure 7. Bottom View of Philco Model C5709, Showing Location of Parts

SERVICING PRECAUTIONS

A-C leakage from measuring instruments or soldering irons may damage the transistor. All transistor measurements should be made with a battery-operated instrument. When soldering is necessary, disconnect set from power source.

Do not operate these receivers with the speaker disconnected, as transient voltages across an unloaded output transformer may damage the transistor.

When installing a new transistor, a good physical and electrical contact must be established between the collector and the heat radiator; care must be exercised when soldering, since excessive heat may melt the internal junctions. To adjust the bias, first make sure that the bias control, R20, is set at the center of its range. (Use an insulated screwdriver.) Then adjust the bias control for 750 ma. collector current, or for .75 volt, d-c., across the output transformer primary, with no input signal.

** R29 consists of a 100 ohm potentiometer in series with a 47 ohm resistor. †† The placement of C16 is critical, the lead to the grid of the 12F8 tube must be dressed between pins 2 and 3 of this tube.

SETTING PUSH BUTTONS

Stations may be set up in any order. However, for convenience in remembering, it is suggested that stations be set up in frequency sequence.

NOTE: In metropolitan areas, it is recommended that the push buttons be set up in a shielded place where signals are weak, such as under a viaduct or in a steel-constructed building. In this way, accuracy of adjustment is assured.

1. Turn radio on and allow it to operate for fifteen minutes. Antenna should be fully extended.
2. Unlock push buttons by pulling them out.
3. Accurately tune in a station with manual tuning knob.
4. Lock one push button to that station by pushing firmly in.
5. Repeat above procedure for remaining push buttons.

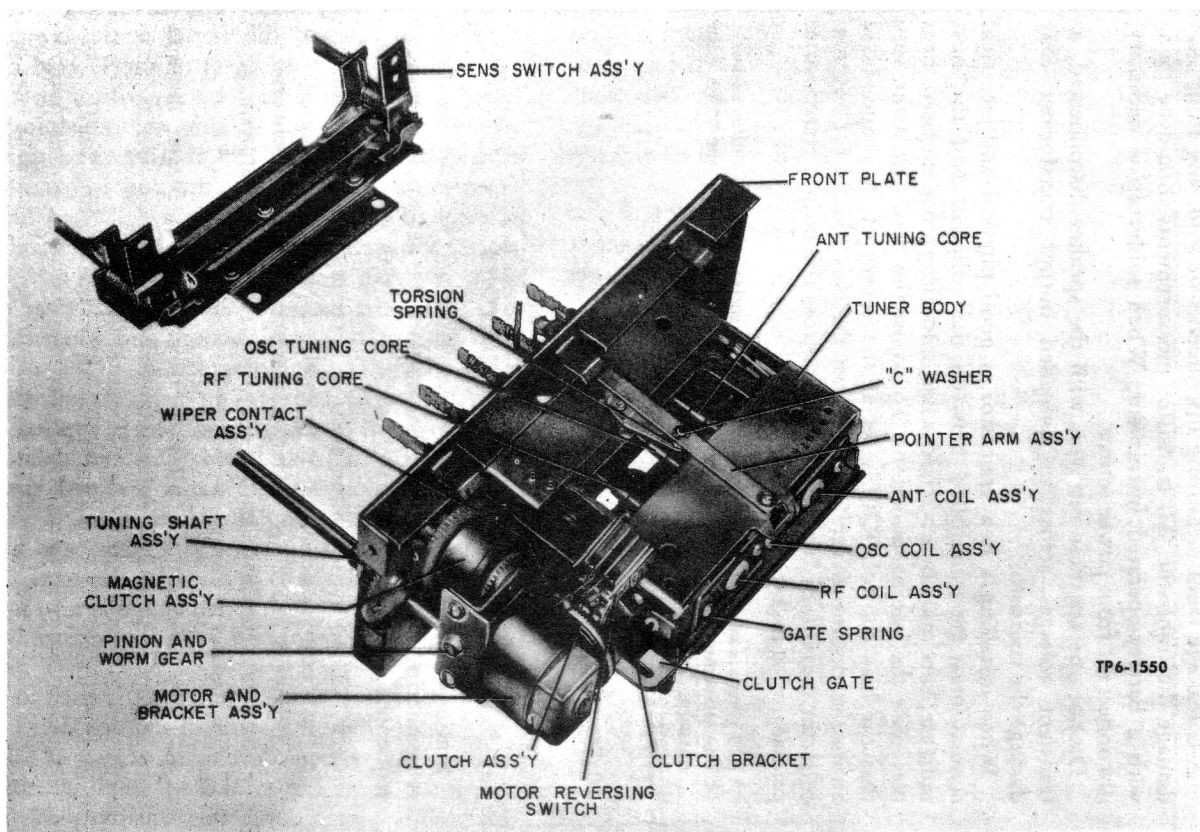


Figure 9. Tuner Used in Philco Model P5703, Showing Replacement Parts

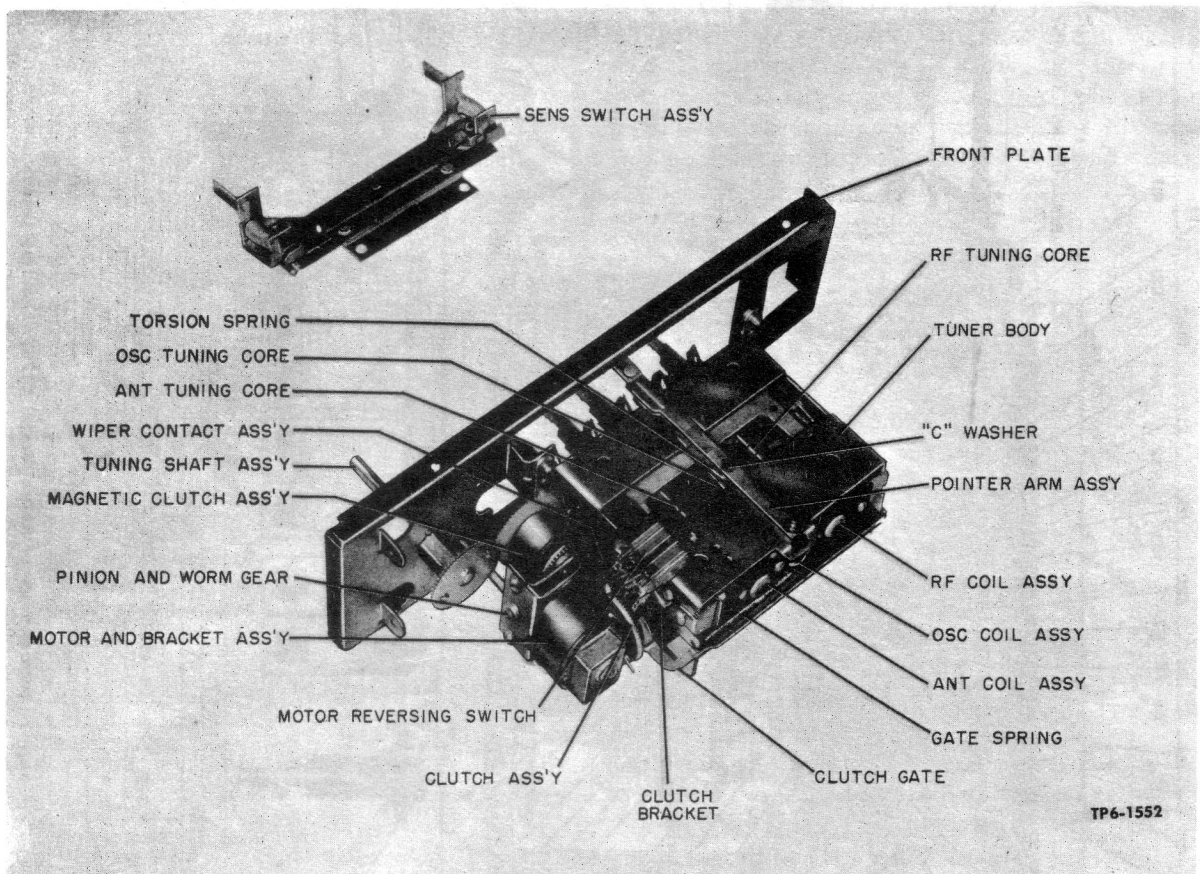


Figure 10. Tuner Used in Philco Models C5707 and C5709, Showing Replacement Parts

REPLACEMENT PARTS LIST—MODELS P-5703, C-5707, AND C-5709

NOTE: All resistors are 1/2 watt, 10% unless otherwise specified.

Reference Symbol	Description	Service Part No.	Reference Symbol	Description	Service Part No.
C1	Condenser, antenna coupling, 10 MMF	30-1251-6	R10	Resistor, i-f filter, 120K	66-4128340
C2	Condenser, variable, antenna padder	31-6533-1	R11	Resistor, trigger detector grid, 2.2 meg.	66-5228340
C3	Condenser, antenna tank, 100 μ uf.	30-1251-22	R12	Resistor, isolation, 1 meg.	66-5108340
C4	Condenser, screen bypass, .047 μ f.	30-4650-45	R13	Resistor, bias voltage dropping, 1K	66-2108340
C5	Condenser, a-g-c filter, .047 μ f.	30-4650-45	R14	Resistor, 2nd detector cathode, 100 ohms	66-1108340
C6	Condenser, variable, r-f padder	31-6522-8	R15	Resistor, audio amplifier screen dropping, 220K	66-4228340
C7	Condenser, converter grid coupling, 33 μ uf.	30-1251-9	R16	Resistor, audio amplifier and trigger detector plate load, 82K	66-3828340
C8	Condenser, oscillator grid, 100 μ uf.	Part of C9	R17	Resistor, audio driver and relay trigger voltage dropping, 56 ohms	66-0568340
C9	Condenser, variable, oscillator padder	31-6522-8	* R18	Resistor, audio feedback, 680K	66-4688340
C10	Condenser, oscillator tank, 100 μ uf., temp. comp. (N750)	30-1251-22	R19	Resistor, audio amplifier cathode, 10 ohms	66-0108340
C11	Condenser, converter screen bypass, .01 μ f.	30-1238-3	R20	Resistor, variable, transistor bias, 15 ohms	33-5590-2
C12	Condenser, a-g-c filter, .1 μ f.	30-4650-47	R21	Resistor, transistor bias divider, 100 ohms, temp. comp., 10w.	33-1367-2
C13	Condenser, i-f filter, 220 μ uf.	30-1238-4	R22	Resistor, emitter current stabilizing, .27 ohm	66-8273360
C14	Condenser, coupling, 100 μ uf.	30-1238-11	* R23	Resistor, tuner drive motor, 20 ohms, 7w	33-1335-143
C15	Condenser, coupling, 100 μ uf.	30-1238-11	R24	Resistor, transistor protection, 15 ohms	66-0158340
C16	Condenser, audio amplifier grid coupling, .001 μ f.	30-1238-3	R25	Resistor, variable, tone control, 2 meg. each side of open center	33-5580-15*
C17	Condenser, tone compensation, 39 μ uf.	30-1251-21		For P5703	33-5580-13*
C18	Condenser, tone compensation, .001 μ f.	30-1238-3		For C5707	33-5580-14*
C19	Condenser, tone compensation, .004 μ f.	30-1238-18		For C5709	66-4158340
C20	Condenser, phono hum bucking, .01 μ f.	30-1238-2	R26	Resistor, tone compensation, 150K	66-1338340
C21	Condenser, audio amplifier screen bypass, .1 μ f.	30-4650-47	R27	Resistor, variable, volume control, 3 meg.	33-5580-15*
C22	Condenser, audio driver grid, .001 μ f.	30-1238-3		For P5703	33-5580-13*
C23	Condenser, audio driver grid, .047 μ f.	30-4650-45		For P5707	33-5580-14*
* C24	Condenser, audio feedback, 220 μ uf.	30-1262-2	R28	Resistor, trigger detector screen grid, 330 ohms	66-1338340
C25	Condenser, spark noise filter, 300 μ uf.	30-1254-1	R29	Resistor, variable, trigger detector cathode, 150 ohms	33-5591-3**
C26	Condenser, electrolytic, 2 sections	61-0086-9	R30	Resistor, trigger detector cathode voltage dropping, 330 ohms	66-1338340
C26A	200 μ uf., 18v.		R31	Resistor, audio amplifier grid, 10 meg.	66-6108340
C26B	500 μ uf., 18v.		R32	Resistor, phono hum bucking, 6.8K	66-2688340
C27	Condenser, r-f amplifier cathode, .01 μ f.	30-1238-2	R33	Resistor, pilot lamp voltage dropping, 27 ohms, 2w. Repaces I2 in Model P-5703	66-0276340
F1	Fuse, 7.5 amp.	45-2656-53	R34	Resistor, variable, speaker fader, 25 ohms (C5707, C5709)	30-5576-5
I1	Pilot lamp, 6v	34-2064	R35	Resistor, r-f amplifier cathode, 56 ohms	66-0568340
I2	Pilot lamp, 6v (C5707, C5709) (Replaced by R33 in Model P-5703)	34-2064	RL1	Relay	42-4032
J1	Socket, antenna	57-1243FA3	SW1	Switch, power off-on	33-5580-15*
J2	Socket, phono	27-6252-18		For P5703	33-5580-13*
J3	Socket, rear seat speaker (C5707, C5709)	27-6273-17		For P5707	33-5580-14*
J4	Socket, foot switch (C5707, C5709)	27-6186	SW2	Switch, motor reversing	Part of tuner assy.
L1	Coil, antenna tuning	Part of tuner assy.	T1	Transformer, 1st i-f	32-4676-2
L2	Choke, r-f ampl. plate, 150 μ h	32-4480-24	T2	Transformer, 2nd i-f	32-4677-3
L3	Coil, r-f tuning	Part of tuner assy.	T3	Transformer, driver	32-8794
L4	Choke, line filter	32-8788	T4	Transformer, output	32-8793
L5	Choke, spark noise filter	32-4720-3	T5	Coil, oscillator	Part of tuner assy.
LS1	Speaker	36-1670-2			
LS2	Speaker, rear seat (C5707, C5709)	36-1670-2			
M1	Drive motor, tuner	Part of tuner assy.			
MC1	Magnetic clutch	Part of tuner assy.			
R1	Resistor, r-f amplifier grid, 150K	66-4158340			
R2	Resistor, a-g-c isolation, 1.2K	66-2128340			
R3	Resistor, converter grid, 1 meg.	66-5108340			
R4	Resistor, a-g-c divider, 6.8 meg.	66-5688340			
R5	Resistor, B+ dropping, 680 ohms	66-1688340			
R6	Resistor, oscillator grid, 47K	66-3478340			
R7	Resistor, a-g-c filter, 4.7 meg.	66-5478340			
R8	Resistor, i-f amplifier grid, 1.8 meg.	66-5188340			
R9	Resistor, a-g-c filter, 1.8 meg.	66-5188340			

NOTE * Components in Model C5709 only.

*Part No. for assembly consisting of tone control (R25), volume control (R27), and power off-on switch (SW1).

**R29 consists of 100-ohm potentiometer, Philco Part No. 33-5591-3, in series with a 47-ohm, 1/2-watt resistor, Philco Part No. 66-0478340.

R36 Resistor, 4.7 ohm, 1/2 watt 5703-5705
R37 Resistor, 600 ohm, 1/2 watt 5703-5705
R19 Resistor, 4.7 ohm, 1/2 watt 5703-5705

TUNER ASSEMBLY

Note: The complete tuner assemblies used in these models are as follows: Model P5703 uses Philco Part No. 76-11550-1, Model C5707 uses Philco Part No. 76-11348-2, and Model C5709 uses Philco Part No. 7-11348-1.

Reference Symbol	Description	Service Part No.
L1	Ant. coil assembly	32-4730-19
L3	R-F coil assembly	32-4730-20
M1	Motor and bracket assembly	76-11381
MC1	Magnetic clutch assembly	76-11519
SW2	Motor reversing switch	76-11522
T	Osc. coil assembly	32-4730-21
	Clutch assembly	76-11514-5
	Clutch bracket	28-11733
	Clutch gate	28-11451-4
	Front plate	
	For P5703	28-11756
	For C5707	28-11766
	For C5709	28-11765
	Pinion and worm gear	54-5228
	Pointer arm assembly	
	For P5703	76-11513-6
	For C5707	76-11513-4
	For C5709	76-11513-7
	Push button, DIST	
	For 5703	54-6351-3
	For C5707	76-11387-3
	For C5709	76-11387-6
	Push button, LOC	
	For P5703	54-6351-2
	For C5707	76-11387-2
	For C5709	76-11387-5
	Push button, stations selector	
	For P5703	54-6351-1
	For C5707	76-11387-1
	For C5709	76-11387-4
	Sens. switch assembly	
	For P5703	76-11411-1
	For C5707	76-11411-2
	For C5709	76-11411-3
	Spring, gate	28-11901
	Spring, torsion	28-10592
	†Tuner body	
	For P5703	76-11515-7
	For C5707	76-11515-9
	For C5709	76-11515-8
	Tuning core, osc.	28-10591-2
	Tuning core, r-f and ant.	28-10591-3
	Tuning shaft assembly	
	For P5703	76-11521-1
	For C5707	76-11521-3
	For C5709	76-11521-2
	Washer, "C" type	28-10593
	Wiper contact assembly	76-11520

MISCELLANEOUS

Description	Service Part No.
"A" lead	41-4244-3
Background plate, dial (C5707)	28-11693-2
Background plate, dial (C5709)	28-11703
Bezel (P5703)	28-11669-2
Bezel (C5707)	28-11687
Bezel (C5709)	28-11704-2
Clutch bracket, tuner	28-11733
Cover, tube side	28-11753
Cover, wiring side (P5703)	76-11445
Cover, wiring side (C5707)	76-11390-1
Cover, wiring side (C5709)	76-11461
Dial scale (P5703)	28-11796
Dial scale (C5707)	54-9990
Dial scale (C5709)	54-9998
Filter, ultraviolet (C5709)	54-9997
Fuse	45-2656-53
Fuse lead	41-4244-2
Key, push button sensitivity switch assembly	28-11714
Knob, tone (P5703)	28-11675-1
Knob, tone (C5707)	28-11691
Knob, tone (C5709)	28-11702
Knob, tuning (P5703)	27-4687-24
Knob, tuning (C5707)	27-4687-25
Knob, tuning (C5709)	27-4687-23
Knob, volume (P5703)	76-11340
Knob, volume (C5707)	27-4687-25
Knob, volume (C5709)	27-4687-23
Knob, fader (C5707)	27-11691
Knob, fader (C5709)	28-11702
Motor and bracket assembly	76-11381
Pinion and worm gear, tuner	54-5228
Shield, tube	28-11527-1
Socket, antenna	57-1243FA3
Socket, 7-pin (center grounds)	27-6294
Socket, 7-pin (no center lug)	27-6294-1
Socket, 9-pin	27-6294-3
Socket assembly, pilot lamp (P5703)	76-2142-16
Socket assembly, dual pilot lamp (C5707, C5709)	76-11462-1
Spring, sensitivity switch key	28-11715
Switch assy., sensitivity (P5703)	76-11411-1
Switch assy., sensitivity (P5707)	76-11411-2
Switch assembly, sensitivity (C5709)	76-11411-3
Window (P5703)	54-6343
Window (C5709)	54-9996

†The tuner body is the tuner assembly minus all parts listed under the TUNER ASSEMBLY section of the parts list.