

PHILCO SERVICE SUPERVISOR



APRIL 1953

AUTO RADIO—

Bringing You Up to Date on
Auto Radio Cover

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BRINGING YOU UP TO DATE ON AUTO RADIO



We would like to give you some supplementary in-
formation to the Service Manual, PR-2408, covering the
Philco-Chrysler Models P-5206; D-5207; and C-5209.

ACCESSORY INTERFERENCE WITH NEW PHILCO-CHRYSLER RADIO

In order to overcome interference set up by car accessories in the Chrysler Corporation's new "F" series automobiles, a .5 MFD condenser, Philco part No. 61-0183, is being added to our present production of P-5206, D-5207, and C-5209 radios as shown in Figure 1. The interference is not satisfactorily removed by installing the condenser on the accessory leads, therefore, the condenser must be installed *inside* the radio for satisfactory reduction of the noise.

(Continued on Next Page)

Bringing You Up To Date On Auto Radio

(Continued from Front Cover)

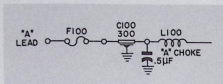


FIGURE 1

The .5 MFD condenser can be installed without removing the RF chassis from the case. To make the installation:

1. Remove the cover plate over the tubes.
2. Solder one lead of the condenser to the junction of the feed-through condenser and choke coil.
3. Partially remove the screw holding the feed-through condenser in place. Insert the lead of the condenser under the screw and tighten the screw so that both the lead and feed-through condenser are well grounded to the case. (Figure 2.)
4. The choke should be vertical and as far from the push-button tuner as the length of the leads will allow. *Make certain this is not altered during this operation.*
5. Replace tube cover plate.

When car dealers report interference problems on radios installed, suggest the installation of this condenser as a means of correcting the problem (the condenser was not used on early production).



FIGURE 2

VOLTAGE REFERENCE

The voltage reference in the Service Manual, PR-2408, is determined from an input voltage of 6.6 volts. This voltage is used because it is the average normal operating voltage of the radio in the automobile. It is not always easy to duplicate this voltage on the repair bench due to the available power, therefore, we are listing below voltages that might be expected from the average set where the input voltage is 6.0 volts, 6.3 volts, and 6.6 volts as indicated in the Service Manual.

VOLTAGES WITH 6.0 VOLTS INPUT

TUBE TYPE	PLATE	SCREEN	CATHODE
6BA6 (r-f)	180	49	1.0
6BE6	205	49	
6BA6 (i-f)	205	49	1.4
6AV6	95		
6C4	113		92
6AQ5 (2)	218	205	15.1
6X4			220
Filter output—205			

VOLTAGES WITH 6.3 VOLTS INPUT

TUBE TYPE	PLATE	SCREEN	CATHODE
6BA6 (r-f)	193	51	1.05
6BE6	217	51	
6BA6 (i-f)	217	51	1.5
6AV6	98		
6C4	118		97
6AQ5 (2)	232	217	16
6X4			235
Filter output—217			

VOLTAGES WITH 6.6 VOLTS INPUT

TUBE TYPE	PLATE	SCREEN	CATHODE
6BA6 (r-f)	206	54	1.1
6BE6	230	54	
6BA6 (i-f)	230	54	1.6
6AV6	102		
6C4	125		100
6AQ5 (2)	245	230	17
6X4			250
Filter output—230			

CORRECTIONS TO THE PARTS LIST

Under the miscellaneous parts for Model D-5207 there might be some confusion where the part number of the "bezel" is desired. It is called "bezel overlay," part No. 54-8769, this actually consists of a one piece moulding which includes the window, frame, and push button escutcheon.

PUSH BUTTON CAP RETAINING SPRING BREAKAGE

We have had some reports of breakage of the push button cap retaining spring on the new P-5206, D-5207, and C-5209 radios. This is the spring indicated in Figure 3. The part number of this spring isn't shown on the Service Manual. If you need this spring it is part No. 56-6709 and is available from your distributor.

Push Button Rattle

Some complaints have been received of push button rattle on the Chrysler, Dodge, and Plymouth radios. We have, therefore, changed the size of the deadening felt located under the push button slide bars which helps put a little more pressure at that point, and reduces any possibility of rattle.

This felt strip was originally 1/2" wide and now has been increased to 9/16", therefore, if this complaint comes to your attention we would suggest to use the new size felt which is part No. 54-7842-3.

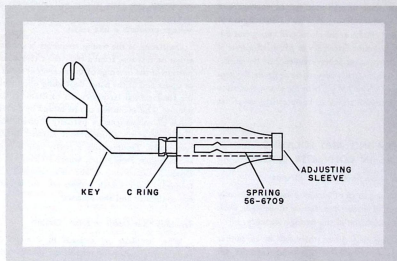


FIGURE 3

Trouble-Shooting Techniques (Part 3—Conclusion)

CONVERTER (OSCILLATOR AND MIXER) CIRCUITS

General Function of Converter Circuits

The function of the converter is to supply an unmodulated r-f signal of a fixed amplitude and of a frequency different from (and usually higher than) the incoming broadcast signal by exactly the amount of the intermediate frequency. It also beats the r-f input signal against the signal of the oscillator stage to produce the intermediate-frequency signal.

Localizing Trouble to the Converter Circuits

NOTE: The checks in this section are based on the assumption that the power supply, audio, i-f, detector, and a-v-c circuits are functioning normally.

The circuit diagram of a typical converter is shown in Figure 7. The test points are indicated by the letters A, B, and C.

To determine whether the oscillator section of the converter is at fault set the receiver on 700 kc., and using a signal generator, inject a modulated signal of slightly less than 700 kc. at the mixer grid (test point B). As the signal-generator frequency is advanced a note is heard in the loudspeaker at the frequency of the modulating signal and gradually disappears again as the generator frequency passes 700 kc. If by the above procedure the oscillator section is shown to be operating, the mixer section is at fault.

ISOLATING AND LOCATING TROUBLE IN CONVERTER CIRCUITS

Troubles That Occur in Oscillator Circuits

Trouble localized to an r-f oscillator stage is frequently found to be one of three types: failure to oscillate, weak oscillation, or oscillation at the wrong frequency.

If the tube fails to oscillate, there will be no output from the receiver except noise. The trouble usually can be traced to an open or short-circuited coupling between the plate and grid circuit of the tube, an open or short-circuited grid resistor (R2), a short-circuited trimmer or tuning capacitor, or a faulty tube. Some tubes will be

encountered which test satisfactorily on a tube tester; yet, when placed in the circuit, fail to oscillate. The first step in isolating trouble in an oscillator stage is to check the socket voltages against the voltages indicated on the schematic for the specific receiver under test. Any material deviation from the given standards indicates trouble in that portion of the circuit where incorrect voltage occurs. Localization of the faulty component can be accomplished quickly by continuity and resistance checks with an ohmmeter. Substitution of a new tube is advisable when voltage and resistance checks fail to disclose any part failures.

Weak oscillation produces a considerable loss of sensitivity in a receiver, with an attendant drop in over-all performance. The fault generally lies in an open or partially shorted coupling between the grid and plate circuits of the tube. Where the coupling is capacitive, a leaky capacitor will decrease the amplitude of oscillation. In the case of transformer coupling, a partially short-circuited or open coupling coil will have a similar effect. Check coupling capacitors for leaks, and coils for continuity. Low plate voltage will cause weak oscillation. In converter tubes, low screen voltage or lack of screen voltage produces a like result.

Oscillation at the wrong frequency is characterized by either no response from a receiver or reception of only a portion of the coverage of the receiver at either the lower or upper end of the band, depending upon which side of the fundamental frequency the oscillator is designed to operate. This condition can be caused by a change in the value of components, a partially shorted tank coil or tuning capacitor, an incorrectly aligned oscillator, or a faulty tube. Trouble from a faulty tube is most evident at the higher frequencies, where a change in the inter-electrode capacitance of the tube elements can cause a frequency shift. Check components for value, and test for continuity and short-circuits.

Troubles That Occur in Mixer Circuits

When troubles are isolated to a mixer stage, the various frequencies and tube-socket voltages encountered must be considered. The function of a mixer stage is to beat the r-f input signal against the signal of the oscillator stage to produce the intermediate-frequency signal. To obtain this result, the tube voltages are critical; there-

fore, the first step in isolating trouble within a mixer stage is a comparison of voltage measurements with those specified on the schematic diagram for the particular receiver.

The common troubles in a mixer stage are complete inoperation, weakness, distortion, intermittent operation, and noise.

In an inoperative stage, voltage measurements at the tube socket, followed by resistance measurements of the circuits in question, will usually disclose any open or shorted components. The components to be concerned with are: shorted R2, shorted C5, open C2, or a defective converter tube.

A weak mixer stage may be caused by the changing in value or partial breakdown of any of the components mentioned above. Voltage and resistance measurements will usually disclose the defective part.

Distortion can be caused by a faulty tube or improper bias voltages. The tube should be changed if there is any doubt, regardless of its condition as indicated by a tube tester. Defective components in the cathode and control-grid circuits cause improper bias voltage, and each capacitor and resistor should be individually checked to determine its condition. The typical circuit diagram (Figure 7) should be closely followed to avoid overlooking a component in the interconnecting grid, cathode, and plate circuits.

Intermittent trouble in a mixer stage is often difficult to locate because many components and circuit conditions can cause this trouble. Service and operation reports should be studied, then the receiver should be placed in operation for a reasonable length of time to allow the trouble to appear before any circuits are disturbed. Should the radio operate correctly during this period, all wiring and components should be moved and tapped gently with an insulated prod. If the receiver cuts in and out rapidly, there is generally a loose connection in the wiring. Should this action be slow, there may be a dielectric leakage, or a circuit may be opening and closing by thermal action. Voltage measurements made when the receiver is operating will not indicate the trouble. The application of test instruments to an intermittent circuit may create a very small voltage fluctuation that would cause the circuit to resume operation. Therefore a very careful visual examination of electrical components, soldered and mechanical connections is important.

Noise which has been isolated to a mixer stage may be due to low signal gain in the r-f stages. Should a low-gain r-f signal be impressed on the mixer stage, the noise frequencies may be amplified more than the signal. This condition should be determined, as it cannot be corrected in the mixer stage.

R-F AMPLIFIER

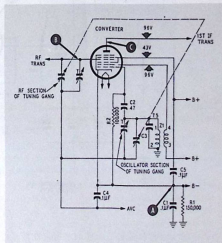
General Function of the R-F Amplifier

The r-f amplifier is designed to increase the sensitivity and selectivity of the receiver. It also contributes to noise reduction by providing a stronger input signal for the converter circuit. It improves a-v-c action and eliminates image frequencies common to radio receivers of the superheterodyne variety.

Localizing Trouble to the R-F Circuits

NOTE: The checks in this section are based on the assumption that all other circuits are operating normally.

Using an r-f modulated signal generator, inject a signal at the antenna input (test point B, Figure 8). The normal indication at the speaker, with a weak signal input, should be a loud clear signal. If the indication is abnormal the r-f amplifier may be assumed to be at fault.



Isolating and Locating Trouble in R-F Amplifier Circuits

A typical r-f amplifier is shown in Figure 8 and the test points are indicated by the letters A, B, C, and D.

Troubles That Occur in R-F Amplifier Circuits

The common troubles in r-f amplifiers are: complete inoperation, intermittent operation, weakness, oscillation, and distortion.

A stage is usually inoperative because of lack of voltage at one or more points, or because of a shorted or open circuit. The circuit components to check, and their defects are: open C1, open or shorted loop, shorted R3, open Z1, shorted C6, open C3, open or shorted TC1, or TC2, shorted C2, open R2, or a defective antenna section of the tuning gang. The usual voltage and resistance measurements should indicate the defective component quickly.

An intermittent r-f stage should receive the same treatment as intermittent mixer stages.

Low amplification in an r-f stage is generally caused

by improper voltage, partially open or shorted coil windings in Z1 or Z2, or misalignment.

A stage operating at low gain will give partial voltage and resistance readings, and extreme care should be taken to apply them logically to the apparent trouble.

Oscillation may be due to loose shielding, a defective tube, or interstage coupling. To check these conditions, place the receiver in operation and tap coil Z1 and the tube with the hand. Examine all shielded wiring for cuts, worn spots, and poor ground connections. Vacuum tubes can cause oscillation by virtue of leakage between elements, and since tube testers do not always indicate this condition, the tube should be replaced if no part failure has been found.

Distortion is usually caused by improper bias voltage, which may be traced to a defective R1, R2, C5, or other components which may be in the biasing circuits. Potentials should be measured at the tube socket, and should be followed by resistance measurements if there are any discrepancies. Close examination of all soldered connections and mounting hardware is necessary.

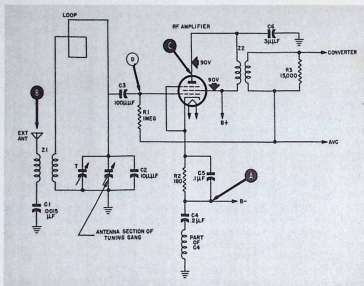


FIGURE 8

The New PHILCO Electric Spacesaver Ranges

Models 233 and 235

For 1953, Philco has completely redesigned and built a new Spacesaver Range. Hardly any parts are interchangeable with the old Spacesaver model, but several parts are now interchangeable with the large 40" Philco Ranges.

Pictured below, in figures 1 and 2, are the two newest members to the Philco Range Line. Model 235 is the deluxe model. It has the following equipment.



FIGURE 1

- 1—2100 Watt Deluxe Surface Unit—8"
- 3—1450 Watt Deluxe Surface Units—6"
- 1—Signal Light for the Surface Units
- 1—Signal Light for the Oven Units
- 1—Electric Outlet for Kitchen Appliances
- 1—Straight Oven Rack, Broil-Under-Glass Feature
- 1—Offset Oven Rack

The Model 233, as illustrated, has three (3) standard surface units only and does not come equipped with broil-under-glass, appliance outlet or signal light for the surface units. It has the same type signal oven light as the 235 and comes equipped with two straight oven racks in place of one straight and one offset as in the Model 235.

Both of these new Spacesaver Ranges are constructed similar to the large 40" Philco Range. The two side panels and front panel no longer support the range, as in the former models. We now construct the range with a front frame and rear frame tied together by cross members, diagonal braces and top and bottom panels. This construction similar to a steel building makes for a sturdy, solid frame on which to mount the panels, door,

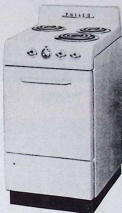


FIGURE 2

oven and table top, etc. The cross members and diagonal braces are the same as used on all Philco Ranges (see Figure 3).

Figure 4 shows a sketch of the Spacesaver or 20" range frame with the bottom panel and latch spring rollers plus door supports assembled.

The black lacquered false top on the old model has been replaced by a porcelain enameled sub top on the new range. Because this new sub top is porcelain enameled, the crumb tray has been eliminated from the range. The vent tube is still brought up in the same position, but is now held in position by two spring tabs in place of the former screws. Following is an exploded

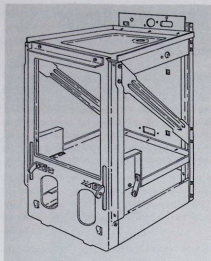


FIGURE 3

view of the 20" range which gives an excellent illustration of how the panels and working parts are assembled to the range frame. (See Figure 4.)

The side panel now standard on all Philco models can be used for either the right or left side. It is held in place by two screws in the front frame and two screws in the back frame. To remove a side panel on the Space-saver, one extra operation is required which is not necessary on the 40" models. The front of the new Space-saver table top extends down over the two upper front side panel holes. In order to have all the side panels interchangeable, the front mounting holes have been left intact, but it is an easy matter to loosen the table top and tilt it up so that the top side panel holes are accessible.

The table top is mounted in a similar manner to the 40" models, as the front is hooked into the front frame and the rear is attached to the back frame by two screws. However, the table top front flange has two tabs which hook into slots in the front frame underneath the angle iron, instead of spring clips as on the large models.

The oven has been moved up about 5 or 6 inches and a porcelain enameled bottom panel has been added to fill

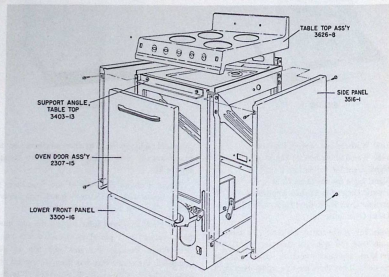


FIGURE 4

in this space. This change not only improves the appearance of the range, but it now allows the door coil springs and the latch and broil-stop springs to be serviced without tipping the range over on its back, as formerly was required on the old Spacesaver model. This bottom panel as shown in the picture is removed the same as the bottom panel on the large Model 431 range. (See Figure 5.)

There are two snap buttons on the top of the panel which can be pried out with a knife or a fine tip screwdriver. After removing these two buttons, close the oven door again and swing the panel forward and then down to release it from the two spring clips, which hook under the bottom flange of the panel. When the panel is removed two large servicing hand holes are accessible to adjust and work on the door springs.

If the broil-stop and latch springs need adjusting, the operation can be done by either of two methods. One is to remove the side panel, which makes the latch spring screws accessible. The other method is to remove the oven door and insert a screwdriver in through the slot in the front frame. The latch assembly can be held with one hand while tightening or loosening the screws with

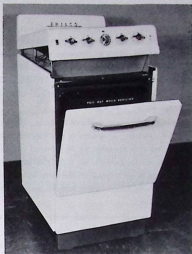


FIGURE 6

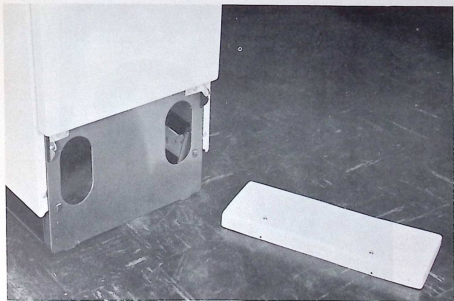


FIGURE 5

the other. However, the screwdriver required for this use, must have a shank of at least 8" in length.

The following photograph shows a picture of the range with the table top tilted in an upward position. As we mentioned previously to loosen or remove the table top, remove the two rear mounting screws. Then the table top is lifted up at the rear about 1" and pushed forward until the front mounting tabs release from slots in the front frame. (See Figure 6.)

To replace a defective appliance outlet or surface unit signal light assembly, or any major electrical work, it is recommended that the table top be loosened and tilted up as shown. When the table top is replaced in position, care should be taken to place all the wires back in position behind the front shield, and between the side baffles and side panels.

To replace a defective switch or to check all the switch and thermostat terminals, it is not necessary to loosen and tilt up the top as previously described. (See Figure 7.)

This photo shows a picture of the range with the two front surface units lifted out and the front switch shield loosened, and moved back out of position. To loosen and shift this shield it is only necessary to remove two sheet metal screws, which hold it in place. Once this shield is loosened and moved back, the switch and thermostat terminals are accessible through either of the front unit table top openings.

The appliance outlet on Model 235 is accessible through the right rear surface unit opening. The fuse is a standard 15 ampere plug type fuse and protects the outlet circuit only. No fuse will be found in the Model 233 as this range does not have an appliance outlet.

The Electric Range Service Division is proud of the new spacesaver models and feels that all of our servicing members will appreciate the ease and convenience of rendering service on these models. Any door or oven adjustments required on these new 20" ranges, will now be identical with the regular full size Philco Range, with which we believe a great many of you are familiar.

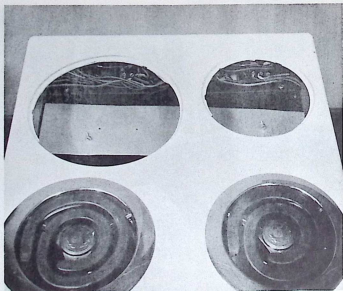


FIGURE 7

Adaption of PHILCO TV for UHF

UHF television is now a reality in many communities and therefore, there is a great demand for UHF Adaptor units. Philco has available at this time five UHF tuner-adaptors which install inside the cabinet of the television receiver and provide a means of UHF adaption for a large majority of the television receivers using the dual

chassis type of construction. The charts that appear in this article will act as a guide for the service technician so that at a glance the proper UHF tuner-adaptor may be chosen for any specific television model. In these charts are included the television set model numbers, code numbers and chassis types of the receivers that use the various types of UHF tuner-adaptors. Pay particular attention to the code number as the same model set may have two code different code numbers and hence use two different tuner-adaptors.

MODEL: UT-21A UHF ADAPTOR

Part No.: 43-6474

Service Manual: PR-2390

MODEL	CODE	CHASSIS TYPE
53-T1824	123	TV-80
53-T1825	123	TV-80
53-T1852	123	TV-80
53-T1854	123	TV-80
53-1883	123	TV-80
53-T1884	123	TV-80
53-T1886	123	TV-80
53-T2124	123	TV-80
53-T2125	123	TV-80
53-T2152	123	TV-80
53-T2226	123	TV-80
53-T2227	123	TV-80
53-T2255	123	TV-80
53-T2255	133	TV-80
53-T2260	123	TV-80
53-T2264	123	TV-80
53-T2272	123	TV-80
A-T1814	123	TV-80

MODEL: UT-21B UHF ADAPTOR

Part No.: 43-6592

Service Manual: PR-2473

MODEL	CODE	CHASSIS TYPE
A-T1816	123	TV-80
A-T1817	123	TV-80
A-T1856	123	TV-80
A-T1887	123	TV-80
A-T1888	123	TV-80
A-T2230	123	TV-80
A-T2232	123	TV-80
A-T2262	123	TV-80
A-T2272	123	TV-80
A-T2274	123	TV-80
A-T2277	123	TV-80
A-T2279	123	TV-80
A-T2288	123	TV-80
A-T2290	123	TV-80 5W

MODEL: UT-20 UHF ADAPTOR Part No.: 43-6473 Service Manual: PR-2390

MODEL	CODE	CHASSIS TYPE	MODEL	CODE	CHASSIS TYPE
53-T1827	126	TV-90	53-T2269	128	TV-90
53-T1827	128	TV-90	53-T2270	126	TV-90
53-T1853	126	TV-90	53-T2270	128	TV-90
53-T1853	128	TV-90	53-T2271	126	TV-90
53-T2127	126	TV-90	53-T2271	128	TV-90
53-T2127	128	TV-90	53-T2273	126	TV-90
53-T2228	126	TV-90	53-T2273	128	TV-90
53-T2228	128	TV-90	53-T2285	126	TV-90
53-T2266	126	TV-90	53-T2285	128	TV-90
53-T2266	128	TV-90	53-T2286	126	TV-90
53-T2268	126	TV-90	53-T2286	128	TV-90
53-T2268	128	TV-90	53-T2287	126	TV-90
53-T2269	126	TV-90	53-T2287	128	TV-90

MODEL: UT-20A UHF ADAPTOR Part No.: 43-6591 Service Manual: PR-2473

MODEL	CODE	CHASSIS TYPE	MODEL	CODE	CHASSIS TYPE
53-T2285-S	128	TV-90	A-T2271	128	TV-90
A-T1818	128	TV-90	A-T2280	128	TV-90
A-T1858	128	TV-90	A-T2281	128	TV-90
A-T2233	128	TV-90	A-T2289	128	TV-90
A-T2234	128	TV-90	A-T2292	128	TV-90 5W
A-T2266	128	TV-90	A-T2294	128	TV-90 5W

MODEL: UT-21 UHF ADAPTOR Part No.: 43-6475 Service Manual: PR-2472

MODEL	CODE	CHASSIS TYPE	MODEL	CODE	CHASSIS TYPE
52-T1802	124	TV-70	52-T2151	121	TV-40
52-T1804	124	TV-70	52-T2151	124	TV-70
52-T1808	121	TV-40	52-T2157	125	TV-45
52-T1810	121	TV-40	52-T2224	121	TV-40
52-T1812	121	TV-40	52-T2244	121	TV-40
52-T1820	121	TV-40	52-T2245	121	TV-40
52-T1820	124	TV-70	52-T2252	121	TV-40
52-T1821	124	TV-70	52-T2252	124	TV-70
52-T1822	124	TV-70	52-T2253	121	TV-40
52-T1839	121	TV-40	52-T2254	121	TV-40
52-T1840	121	TV-40	52-T2256	121	TV-40
52-T1841	121	TV-40	52-T2258	121	TV-40
52-T1842	121	TV-40	52-T2259	121	TV-40
52-T1844	121	TV-40	52-T1824	124	TV-70
52-T1850	121	TV-40	53-T1825	124	TV-70
52-T2106	121	TV-40	53-T1826	124	TV-70
52-T2108	121	TV-40	53-T1852	124	TV-70
52-T2110	121	TV-40	53-T1883	125	TV-45
52-T2120	121	TV-40	53-T1884	125	TV-45
52-T2120	124	TV-70	53-T1886	125	TV-45
52-T2122	121	TV-40	53-T2125	124	TV-70
52-T2122	124	TV-70	53-T2126	125	TV-45
52-T2140	121	TV-40	53-T2152	124	TV-70
52-T2144	121	TV-40	53-T2183	125	TV-45
52-T2145	121	TV-40	53-T2260	125	TV-45
52-T2150	121	TV-40	53-T2262	125	TV-45
52-T2150	124	TV-70	53-T2264	125	TV-45

There has been some misconception as to the manner in which the UHF and VHF antenna connections can be made on the back of the television receiver, therefore, the following illustrations have been reproduced for the purpose of clarifying these connections.

There are five different combinations of antenna hook-

ups for UHF and VHF. Each one has its particular use and one of the five will satisfy any possible antenna connection need. The various antenna hook-ups shown in figures 1 through 5 are possible with any of the five UHF tuner-adaptors mentioned in this article.

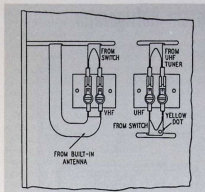


FIGURE 1
Common Built-In Antenna

FIGURE 2
Common External Antenna

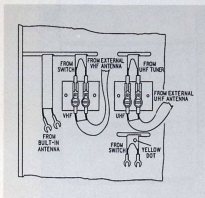
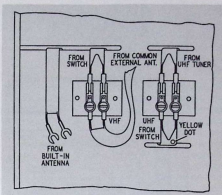


FIGURE 3
Separate External Antennas

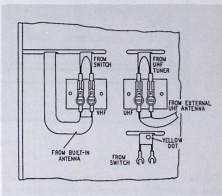
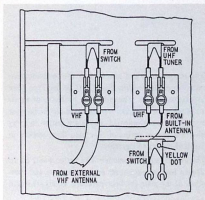


FIGURE 4
VHF Built-In and UHF External Antennas

FIGURE 5
VHF External and UHF Built-In Antennas

Servicing the Automatic Refrigerator

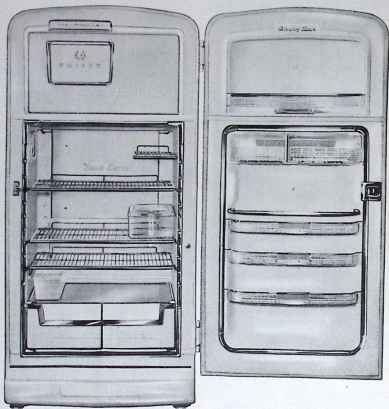


FIGURE 1

The new automatic refrigerators are truly self-controlled, in that there is no need for manual control of temperature, humidity, or defrosting. The only time that it becomes necessary to turn them off is for that period once or twice a year when the refrigerator should be cleaned for sanitary reasons.

The refrigerator compartment for the storage of fresh foods is automatically maintained at a temperature of 38° to 40° regardless of climatic conditions, or seasonal changes.

The temperature and humidity in the food compartment is controlled within close limits by the True Zone refrigeration system. Therefore, the problems of excessive dehydration or excessive moisture in the refrigerator compartment are eliminated. Foods are tastier and stay fresh for a longer period of time than those stocked in a standard model refrigerator.

The Philco automatic models have better than 2 cu. ft. of frozen food storage space entirely separate and independent of the main food compartment. Foods are stored

in this freezer compartment at zero zone temperatures or may be quickly frozen at 20° below zero. Since this area is separately sealed and insulated, freezer temperatures are never affected by the automatic defrosting of the True Zone plate in the lower refrigerator compartment.

Refrigeration is adequately maintained by a $1/4$ H. P. hermetically sealed unit in the model H-1238. In the models H-1137 and H-1138, the refrigeration system is powered by a $1/5$ H.P. unit.

Automatic control of the super power system is achieved through the use of a three position regulator (off, on, and sharp freeze) which is located in a recessed housing in the left hand food tank wall (Fig. 1). The operation of the automatic refrigeration system was outlined in the March edition of the Service Supervisor. If you have not as yet read this article, might we suggest that you do so, for a thorough understanding of the operation of the system will be necessary to efficiently diagnose malfunction of the refrigerator.

Electrical System

The electrical system for the automatic refrigerator is shown in figure 2. This schematic diagram is for the models H-1137 and H-1138. It also applies to the double door model H-1238 with the exception of the wiring connection for the dew point compensator. In the single

door automatic models, there is no center rail compensator and the dew point compensator circuits are completed through the terminal strip connector terminals "W" and "R" which are respectively the high and return side of the power line. Examination of the diagram in figure 2 will disclose that these two components in the single door models utilize separate return lines. In the model H-1238 the lamp and dew point compensator circuits are modified to utilize a common return line with the dew point compensator tied into the lamp return with a wire nut. This wire nut connection which is located in the lamp housing, has been incorporated into the circuit so that the dew point compensator may be disconnected when the refrigerator is used for display purposes.

With the exception of the plate thermal regulator and the solenoid valve, which we will discuss in detail, the schematic diagram for the automatic models is exactly the same as that for the standard model Philco refrigerator. Test procedures as outlined in previous editions of the Service Supervisor and service manuals would apply to the standard portion of the circuits. A continuity check through the various components of the circuits may be made, as indicated in figure 3. To use the continuity buzzer which is incorporated into the model #5007 Philco appliance checker, the service cord of the refrigerator must be removed from the wall outlet. Re-

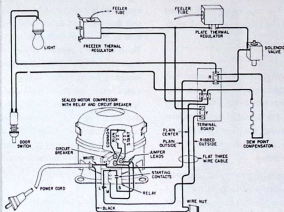


FIGURE 2

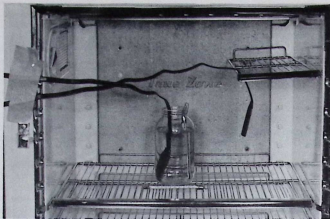


FIGURE 4

move the rear cover plate and sufficient insulation to expose the refrigerator wiring panel, as shown in figure 3. An individual circuit may then be isolated by removing one of the lead wire spring connectors from the terminal panel. By placing one of the test probes on the free lead and the other probes on the terminating binding post for the individual circuit, the buzzer will sound to indicate a complete circuit.

Thermal Regulators

The Philco automatic refrigerators are equipped with two thermal regulators; one to control the freezer compartment at zero and sub zero temperatures and the other to control the solenoid valve assembly which bypasses the flow of refrigerant through the True Zone plate or around it to maintain an average temperature of 40° in the refrigerator compartment.

To check the freezer thermal regulator, set the freezer regulator to the "on" position and freeze a bulb of a thermometer or an appliance tester to the bottom center of the evaporator where the front connecting tube is located between the series and parallel passes of the evaporator. Remove the light housing frame to gain access to the plate thermal regulator. Remove the regulator from its mounted position and by-pass the control

with a test clip, or remove the leads from the control and connect them together, leaving the plate control out of the system. If the refrigerator will not start so that cut-on and cut-off temperatures can be taken, rotate the freezer regulator to the "sharp freeze" position so that the evaporator will call for additional refrigerant. If the unit still does not start, an alternate procedure of applying heat to the control feeler tube may be used to start it. To do so place a container of warm water in the bottom front edge of the evaporator where the feeler tube clamp mounting screws project through the evaporator. The added heat at this point should cause the regulator contacts to close and start the unit. If the unit still does not start, rotate the control through the "off" and "on" positions; a click should be heard indicating that the control is operating. If no click is heard, a continuity check will show that the control is inoperative and it should be replaced with one having the same part number.

When the system is operating properly as indicated by an even distribution of frost on the evaporator, temperature readings should be taken after the evaporator temperature is fully stabilized. Normal cut-on temperatures are between $+8^{\circ}$ and -2° F. and cut-off temperatures between -7° and -17° F.

True Zone Plate Thermal Regulator

The plate thermal regulator, part no. 5530-112, controls the flow of refrigerant through the True Zone plate. The control feeler tube is installed in a well on the left hand edge of the True Zone plate (Fig. 1) where it senses both the cabinet air temperature and the plate temperature. A rise in cabinet temperature causes the control bellows and switch to be activated (this portion of the control is located under the light housing, Fig. 3) opening the control circuit which causes the solenoid valve to stay closed. When the freezer thermal regulator causes the sealed unit to operate, the closed valve permits refrigerant to flow through the True Zone plate. As the plate reduces the temperature of the refrigerator compartment, the plate control senses this colder temperature. Since it is sensitive to a combination of cabinet air and the plate temperature, when the plate temperature reaches approximately zero degrees, the control is activated causing the switch contacts to close. The solenoid valve is energized, opening the by-pass line so that the refrigerant by-passes the True Zone plate and flows directly to the freezer evaporator.

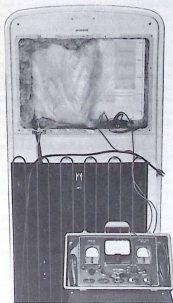


FIGURE 3

True Zone Regulator Check

High or low refrigeration cabinet temperatures may indicate malfunction of the True Zone control or the solenoid valve assembly.

To check reports of abnormal food temperatures in the lower food compartment, have the housewife place a quart container of water in the refrigerator overnight (Fig. 4), in order to have the water at the refrigerators lowest stabilized temperature. During this stabilization period, the housewife should be cautioned to open the refrigerator door only when absolutely necessary, for numerous door openings will cause the water load to give a false high temperature indication.

The service call should be made as early as possible in the morning, otherwise the water temperature may rise above its low point. Figure 4 shows two ways of checking this temperature. A column type thermometer or a resistance bulb in conjunction with a model 5007 appliance tester may be used.

With the resistance bulb it should be submerged in pure water (electrically pure). For example, salt water

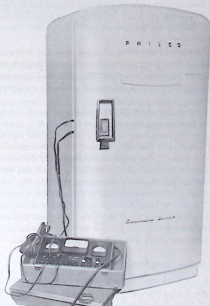


FIGURE 5

will affect the resistance element. The temperature recorded should be within 34° to 42 degrees Fahrenheit. When taking refrigerator temperature, check to see if the True Zone plate is frosted. If the unit is not running, start the unit as explained in the paragraph on freezer regulator operation. With the unit operating, frosting should appear on the plate within ten minutes. If the plate does not frost up, adjust the plate regulator as outlined in the refrigeration article in the March Service Supervisor. When adjusting the plate regulator for a cooler cabinet temperature, turn the adjustment a small amount at a time. (Counter clockwise for a cooler setting). Over-adjustment in the cooler direction may prevent the True Zone plate from defrosting completely.

If it becomes necessary to make this adjustment, the freezer regulator altitude correction should be changed to coincide with the plate control setting.

Solenoid Valve Coil

The solenoid valve which controls the flow of refrigerant to the True Zone plate is an electro-magnetic valve. The valve coil, when energized, lifts the valve armature, which is the valve shaft. This shaft, when in the de-energized position closes the by-pass line around the True Zone plate and causes the plate to be refrigerated, before the refrigerant can pass on the freezer evaporator.

If the coil of this valve is open or otherwise defective, the True Zone plate will receive refrigerant through the complete cycle of unit operation. The food compartment will therefore be maintained at too low a temperature.

A continuity check of the solenoid valve coil can be made by removing the power cord from the A. C. source. Remove the lamp housing cover and the regulator mounting screws and pull the regulator out of its mounting recess. Remove the terminal insulation and disconnect one of the control leads. Insert the power cord and with the sealed unit assembly operating, touch the free control lead to the one connected to the regulator terminal. A click will be heard from the solenoid valve as it opens. If no click is heard and the True Zone plate does not refrigerate, the valve is jammed or the coil may be open. A continuity check will determine if the coil is open.

Abnormal Temperatures and Their Causes

A low food compartment temperature could occur in foods, if the container were placed adjacent to the True Zone plate. For example, foods in a large dish placed so that the dish touches the True Zone plate would act as an air scoop to block the downward draft of cool air and possibly cause the foods to become frozen.

The altitude setting of the True Zone plate thermal regulator may be incorrectly adjusted which would cause the refrigerant to be cut off at too low a temperature.

A solenoid valve that is stuck closed would cause freezing of the foods stored in the refrigerator. This condition may sometimes be corrected by tapping the valve lightly. A stuck valve that cannot be cleared will necessitate replacing the sealed unit assembly.

One of the conditions that can be caused by incorrect wiring is that of excessive cooling in the lower food storage compartment.

Color coding and the various component leads should be checked against the schematic diagram to determine if they are properly wired. An open lead wire or defective coil in the solenoid valve circuit would cause freezing in the lower refrigerator compartment.

If the solenoid valve were stuck open, no refrigerant would be supplied to the True Zone plate, therefore, the refrigerator temperature would rise beyond the normal operating temperatures. This jammed condition can occasionally be remedied by tapping the valve assembly lightly.

A loss of charge from the control feeler tube and bellows would also result in no refrigeration to the True Zone plate. A continuity check would indicate a closed circuit, when normally a warm feeler tube or cabinet temp. would open the regulator contacts.

If the altitude adjustment of the plate control is set for an elevation higher than the actual altitude at which the refrigerator is being used, the food temperature in the lower refrigerator compartment will be higher than the temperature given in the service manual (34° to 42°F.)

A condition which would cause high food temperature would be improper positioning of the control feeler tube in the mounting well fastened to the side of the True Zone plate. If the feeler tube bulb projects beyond the end of the feeler tube well and touches the True Zone plate or its refrigerated tubing passes, the control will sense a colder temperature than it should, thus causing the refrigerant to be prematurely by-passed to the freezer evaporator.

Incorrect wiring of the control or valve assembly may cause the valve to remain in the energized position, the True Zone plate will be starved of refrigerant, therefore, high temperatures will prevail in the lower refrigerator compartment.

The above paragraphs outline a few of the conditions which may exist to cause malfunction of the refrigerator. It is suggested that the serviceman read thoroughly the "H" line refrigeration service manual (PR-2427) to better understand the operation of this new type refrigerator.

The New PHILCO Thermo-Cool Air Conditioner

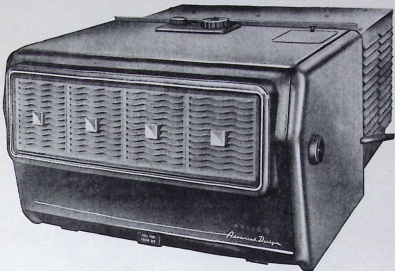


FIGURE 1

The new Philco Thermo-Cool air conditioners for 1953 make available to the public an air conditioner that not only cools a room in the summer time, but also is capable of producing heat, thus its utility is greatly expanded.

Thermo-Cool, the first practical "reverse cycle" air conditioner, cools in hot weather and heats in cool weather. (Fig. 1.)

The major disadvantage of room air conditioners in the past was that they were usually inoperative in the spring and fall. This low use factor is unwarranted in those areas which have mild winters where many homes do not have central heating systems.

Air conditioners having the new Thermo-Cool feature can be operated to maintain comfort conditions when the temperature outside falls below 70°F. While in very cold weather, a Thermo-Cool air conditioner cannot replace a central heating system, it will produce heat and comfort when the temperature drops as low as 40°.

Air Conditioning and Thermo-Cool Control

In physics we know that an unbalanced condition will tend to equalize itself. Therefore, a point to remember is that while air may be cold, it contains heat as compared to a colder object. If a warm object is placed in a

colder ambient, it will transfer part of its heat to the colder surrounding air, and conversely a colder object will absorb heat from a warmer ambient. It is by this phenomenon that an air conditioner can be made to extract heat from one area and discharge it to another.

Air Conditioning and Thermo-Cool

The air conditioner is a mechanical device comprised of a compressor, a condenser, a flow control device and an evaporator with a volatile liquid (refrigerant) circulating through them. (Fig. 2.) For purposes of discussion, it will be assumed that the air conditioner refrigeration cycle starts at the compressor. The compressor compresses the refrigerant vapor, thus raising its pressure and temperature. The compressed gas passes to the condenser, which has forced air directed over its external surfaces. Since the vapor is at a higher temperature than the air, heat is transferred from the vapor to the air. The heat extracted by the air is in excess of the latent heat of condensation of the vapor, and since the pressure is sufficient from the transformation at this temperature, the vapor is reduced to a liquid. The liquid refrigerant flows through the capillary tube to expand in the evaporator. Since the pressure in the evaporator is low and its temperature is above the boiling point of

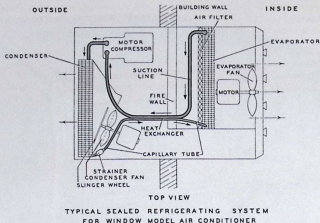


FIGURE 2

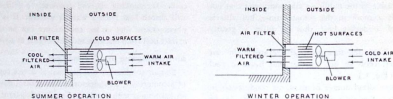


FIGURE 3

the liquid refrigerant, the liquid boils and absorbs heat from the air passing through the evaporator. The evaporator chills the air passing through it sufficiently to condense part of the water vapor it contains. Thus the air passing over the evaporator is cooled, dehumidified and then distributed by the ventilating fan. The refrigerant vapor then passes back to the compressor, completing the refrigeration cycle.

From the foregoing paragraphs, it can be seen that when the air conditioner is operated to cool a room, the

heat in the room is absorbed by the cold evaporator and dissipated by the hot condenser to the outside air.

When the air conditioner is equipped with the "reverse cycle" heating feature, the flow of refrigerant through the system is reversed and the condenser or outside coil becomes the evaporator and the evaporator or inside coil becomes the condenser. Figure 3 is a simple illustration of both of these systems in operation.

The air conditioner models 86J and 106J employ a special valve (Figure 4) to reverse the flow of refrigerant

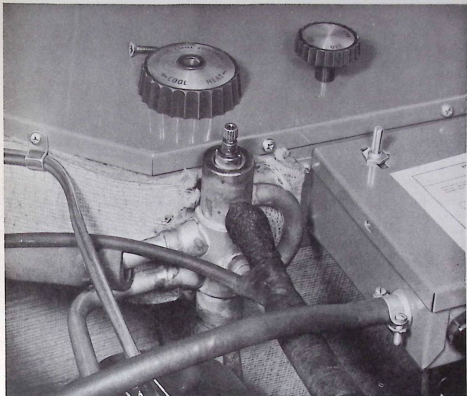


FIGURE 4

through the sealed unit assembly. It is necessary to use a four-way valve because there are four connections required to reverse the flow of refrigerant through the system. When this valve is positioned at one end of its travel (clockwise), the unit will cool the room, i.e. heat in the room is absorbed by the cold evaporator and dissipated by the hot condenser to the outside air. When the valve is positioned at the other end of its travel (counter clockwise) the unit will heat the room, i.e., heat in the outside air is absorbed by the cold evaporator and dissipated into the room by the hot condenser.

For efficient operation of the air conditioner it is necessary that it have a very definite charge of refrigerant

in the sealed unit assembly. The four way valve is operated through a hermetically sealed metal bellows to prevent the leakage of any refrigerant from the system.

In this type of system where a single reverse flow valve is used in which hot compressed gasses and cold suction gasses pass through the valve body, it is impossible to prevent some leakage from the high pressure side of the system to the low pressure side, therefore, for a very small loss in refrigeration can be noted if this type unit is compared to an air conditioner that is not a reverse cycle system. However, this loss will not exceed 3 per cent. To eliminate any losses through the valve the customer must be instructed to firmly tighten the valve when it is positioned to either the heat or cool position.

It is interesting to note that the efficiency of the 3/4 H.P. (Fig. 1) Philco air conditioner operating in the Thermo-Cool position, when compared with a heater of the electric type, will produce 2.2 times as much heat and consume the same amount of power with an outside temperature of 60°F. Of course, as the outside temperature falls the heating efficiency diminishes somewhat. When the temperature outdoors becomes sufficiently low, accompanied by a high relative humidity, the systems efficiency will be reduced slightly. This would result through the accumulation of frost on the evaporator or outdoor coil. This frost accumulation on the evaporator will act as an insulation and seriously reduce the ability of the outside coil to absorb heat from the outside air.

4-Way Valve

The valve that governs the directional flow of the refrigerant through the system (Fig. 5 and 6) is a precision device, but is of rugged construction. In either of its two positions, the valve opens two ports for the refrigerant to flow through and also closes two ports that make a seal between the high-pressure and low-pressure refrigerants. If the valve is not tightened firmly in either of its two positions, the high-pressure refrigerant will by-pass, and the unit will neither cool nor heat properly. Under such conditions the valve can be likened to a water valve that is not closed tightly, and is permitted to leak. Continued leakage could ruin the valve, so that it cannot be made to seal properly again. Also, a valve that is not firmly tightened may become noisy, due to leakage vibration. The customer should be warned of these facts, and should be instructed to always tighten the valve firmly.

Performance Testing

The cooling capacity of Thermo-Cool air conditioner models will be checked by the usual method—by measuring the temperature split of the re-circulated room air and the total power consumption. The heating capacity of these models will be checked in a similar manner. Tables will be provided in the Philco Service Manuals

giving values of temperature split of the re-circulated room air and total power consumption for the various operating temperature and humidity conditions under which it may be necessary to test these models in the field.

Frosted or Iced Condenser

As previously mentioned, under certain conditions of low outdoor temperature and high relative humidity, frost will accumulate on the cold outdoor evaporator coil. As this frost accumulation increases, the heating efficiency of the air conditioner may decrease sufficiently to result in a service complaint. When such a complaint is received, it will be necessary to explain to the customer that this frost accumulation is normal, and is to be expected when the air conditioner is operated under adverse temperature and humidity conditions. It should be pointed out to the customer that, in order to restore the heating action of the air conditioner, it will be necessary to set the Thermo-Cool valve for cooling, and to allow the unit to operate in this manner for a sufficient period to defrost the outdoor coil. When the cooling function is placed in use, the flow of refrigerant is reversed; the condenser operates as the evaporator, and vice-versa. Thus, hot gas passes through the frosted outdoor coil, and melts the frost.

Condensate Accumulation

When the air conditioner is operated for heating, a certain amount of water is condensed on the cold outdoor evaporator coil.

For proper operation of a window-model unit operating on cooling, it is necessary to retain a certain level of condensate in the bottom pan. This level is normally sufficiently high that the bottom of the slinger wheel is submerged. Philco window models should not be operated when the outdoor temperature is at or below 32°F. At this temperature the fan motor cannot operate, because the slinger wheel becomes frozen in the condensate. If the power is turned on, the overload circuit breaker in the fan motor will shut it off.

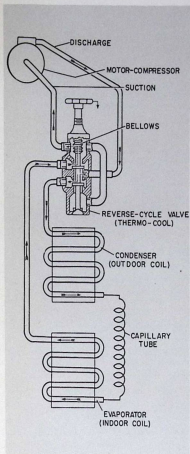


FIGURE 5
Refrigerating System—
Thermo-Cool Valve Set for Cooling

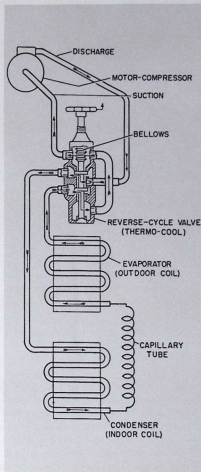


FIGURE 6
Refrigerating System—
Thermo-Cool Valve Set for Heating



This month . . .

PAUL GATES, Philco Service District Representative for the Allegheny Division, gives us his ideas on the wisdom of including radio and record changer service in the Television Service Shop. Paul first became interested in electronics while in the Army. After getting his discharge he entered a radio and television school in Chicago. Following his graduation he opened his own service shop, but in time decided that he needed a sounder background in television and electronics service . . . so, he joined Philco Service Division in 1948 starting in the service shop and going up through various assignments to his present position.

In my opinion . . .

. . . the majority of the good television service technicians are missing the boat by refusing to do service work on radio receivers and record changers; thus losing out on a very lucrative service business.

Sure, the grass looks greener on the other side of the fence, but before you take the leap over that fence to a strictly one product service, let's just analyze the possibilities of a combined service shop where radio receivers, record changers and television receivers are repaired.

First, just ask yourself, "How many radio receivers are there, on the average, in every home? How many record changers and how many television receivers?" The answers to these questions are quite evident to you I am sure, so we won't discuss them further.

But now, ask yourself just one more question. If you were the consumer and had two radios, one record changer and one television receiver in your home, whom would you call for service—if you knew of two different service shops, one of which did just television service, and one which did radio, record changer and television work?

Since, for the moment, you are in the consumer's shoes I believe that your answer would be the same as that of the big majority of the other consumers. You too would call the second service shop because here, you would reason, is a service shop that will take care of any of my electronic products that might fail regardless of which one.

Now suppose you are the man who operates this *all around* service shop. Since you do *all types* of electronic service work you immediately have a much better opportunity to get new customers because your potential customer list is much greater. You have a better opportunity to prove, to new customers and old customers alike, that your shop is the place for their service work, because your shop is a *one stop shop*. Your customers do not have to worry about who to call for each type of service because they know you and you know them. Yes, even that initial service job on a new customer's small radio can mean added business for you in the future. If the customer likes your radio service and his television should fail he is bound to call you for this service also.

Remember, it's not always the profit made on the first job that counts, but the confidence created in the customer's mind that will insure your future. Build your service business on customer confidence and you will always have work for years to come. And remember, **RADIO NEEDS YOU AND YOU NEED RADIO!**

