PHILCO SERVICE SUPERVISOR

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NORMAL AND ABNORMAL SEALED UNIT SYMPTOMS

WHEN SERVICING the Philco refrigerator and its sealed unit refrigeration system, an important phase of the repair procedure is to accurately determine and report the exact nature of the defect which makes it necessary to replace the sealed unit assembly.

To do this efficiently, we must be capable of recognizing the common troubles which may be found in the sealed unit system.

A thorough inspection of the refrigerator is necessary to determine whether the trouble actually exists in the sealed unit or its allied components.

Of course, before we can determine that the unit is not operating properly, it is necessary to know normal unit characteristics. This information may be gained from the service manual that applies to the particular model in question, or a check may be made of a refrigerator that is known to be functioning properly.

To check the refrigerator, allow the unit to operate through a few cycles until the evaporator is frosted. When the evaporator is frosted, freeze a thermometer into the bottom center of the evaporator so that it can be easily read. With the unit operating, the various points of the system which show variations in temperature should be checked to determine normal operating temperatures. These points are: the evaporator, suction line, the motor compressor dome assembly, compressor discharge line, the condenser from point of entry to the strainer, the capillary, and the drier. In conjunction with temperature indications, the normal power requirements

(Continued on next page)

for the refrigerator should be noted and compared to the power consumption charts in the service manual.

This information, together with the normal frosting of the evaporator and substantiated by the frozen-in thermometer readings, permits you to make a complete study of the refrigerators.

FROST BACK

With the evaporator level (refrigerator level) and after the unit has run long enough so that the unit is not operating under extreme load, frost formations on either the capillary tubing and/or the suction line should not extend beyond the point of contact of the heat exchanger. For various models the exact line of frost back is indicated in the service manual.

FROSTING OF THE EVAPORATOR

For a normal evaporator, the frost accumulation will be evenly distributed over the complete evaporator as a covering of white frost. This formation should not have a smooth icy appearance unless the unit is being operated with the evaporator exposed to an abnormal heat load, such as having the refrigerator door open for a very long period of time.

TEMPERATURE CONDITIONS

Motor Compressor

The motor compressor and dome assembly will be uncomfortably hot to the touch after a few minutes of normal operation. For this reason, care should be taken to maintain the natural air movement pattern around the unit and through the condenser flue to dissipate this heat.

Discharge Line

The discharge line from the compressor to the condenser will be very warm at any time the unit is operating and will cool quickly when the unit ceases to operate.

Condenser

The condenser should be quite warm throughout its entire length, with the first few passes of tubing showing a higher temperature than the discharge or capillary side. When the unit stops, the condenser temperature quickly equalizes to that of the room ambient.

Capillary and Heat Exchanger

The capillary tube and suction line which are parallel and joined together to make up the heat exchanger, will remain within a few degrees of room temperature throughout the operating cycle. There will be a slight period of flash cooling of the lines when the motor compressor first starts to operate. The return line from the evaporator to a point between 8 to 12 inches towards the heat exchanger junction will normally be frosted over. This frost formation varies for different models, the exact terminating point is indicated in the service manual for the various refrigerators.

Drier

The drier which is located at the point of entry to the evaporator will be very cold and have a frost formation on it at all times.

A drier, which is positioned in the condenser to capillary line will, when the unit is operating be approximately the same temperature as the condenser itself, since condensation is actually taking place in the drier itself. However, when the unit is turned off, it will be noted that the drier cools much more rapidly than the condenser. The reason for this, is that the drier holds a small amount of liquid during the normal cycle and, therefore, vaporizes when the unit is shut off and the pressure in the system is equalized.

Evaporator

With the refrigerator operating normally and a thermometer frozen in the bottom of the evaporator a temperature of zero degrees or below will be indicated, depending on the model under test.

Pressure Equalization

To check the motor compressor and sealed unit assembly for pressure equalization time, remove the service cord from the power outlet and allow the unit to remain idle for two minutes. At the end of this time, the pressure throughout the system will be equalized. To determine if equalization has taken place, plug the service cord into the power source and check to see if the motor compressor starts immediately, or if it trips the overload protector.

The overload protector clicking *on* and *off*, would indicate high head pressure in the motor compressor.

In case of a partial restriction, the time required for pressure equalization will be extended to several minutes.

DETERMINING THE CAUSE OF FAILURE

Visual Check

Examine the unit for broken or damaged tubing, the condition of the evaporator and the evaporator finish, oil spots or discolorations of components, etc.

Operational Check

A check of unit operation will immediately permit you to classify the defective unit into one of three groups.

1. Unit runs but does not refrigerate
2. Unit runs and refrigerates
3. Unit does not run.

Unit runs but does not refrigerate

Make a leak test of the sealed unit system using a halide torch, paying particular attention to the brazed joints and the motor compressor terminal seals. Normally a point of leakage will be indicated by an oil formation around it.

Unit runs and refrigerates

Check the sealed unit assembly to determine if it has a restriction, undercharge, overcharge, or is objectionably noisy. The sealed unit assembly must be replaced to remedy all these defects.

Restriction (High Side)

In the case of the restriction before the capillary the only actual effect is that of slowing down the entire movement of refrigerant. The charge of refrigerant is sufficient so that the evaporator is full at all times, thus causing it to frost evenly to whatever extent the reduced capacity due to the slowing down of circulation will allow.

By virture of slowing down the movement of refrigerant in the system, there is a tendency toward filling the condenser, or at least the lower passes of the condenser with condensed liquid. This liquid cuts down the efficiency of the condenser by cutting down the amount of area of the condenser that is devoted to removing heat from the vapor that is being pumped into it. The ultimate result therefore is much the same as if possibly one-half of the condenser was covered so as to stop the flow of air through that portion of the condenser.

With the reduced capacity it is entirely possible that the unit will lower the temperature of the evaporator to such an extent that the unit will shut off if the temperature control is set on one of the warmer positions. If the unit does shut off the evaporator warms rapidly. However, since warm liquid refrigerant trapped in the condenser continues to flow past the restriction through the capillary and to the evaporator, it must be remembered at this point that we have two conditions that will undoubtedly bring about a stalling condition at each start of the unit. In the first case, we have a rapid warming of the evaporator cutting down the off cycle. In the second case, we have a restriction in the system that does not let the pressures in the system equalize as rapidly as they would under ordinary conditions. Therefore, it is entirely possible that the unit will stall at the beginning of each cycle until such time as the pressures have equalized.

With the reduced capacity it is quite likely that the unit will never pull down to a point where the temperature control will shut off on the colder settings. If it will, however, the on cycle will be unusually long as compared to the off cycle. In either case, there will probably be stalling at the next start.

We mentioned the cutting down of the efficiency of the condenser by filling a portion of it with liquid refrigerant. The extent to which the condenser is filled with liquid is apparent by feeling the various tubes of the condenser. At some point on the condenser, it will be noticed that there is a distinct change in temperature. This indicates quite clearly the level of the liquid in the condenser which in most cases will be found to be at least one-half way up on this part.

Restriction (Low Side)

It will be noted that the indication of restriction on the low side of the capillary tube will be very much the same as a restriction on the high side before the capillary tube. In both cases, there will be reduced capacity with the result that the evaporator temperature will never be as low as it would on a normal unit.

There is one definite distinguishing point, and that is the frost on the capillary tube. Normally and in the case of a restriction on the high side there is a certain amount of frost on the capillary tube before it enters the evaporator, the reason of course being that expansion starts to take place before the actual outlet of the capillary tube. In a case of this kind, however, where the outlet of the tube is restricted, no expansion takes place before the point of restriction. The result is that there is no frost on the capillary tube itself.

There is sufficient refrigerant in a system of this kind, however, so that any frost that accumulates on the evaporator will be evenly distributed and will be of a uniform depth. With the reduced capacity due to the loading of the condenser with liquid there is a possibility of there being short cycles on the warmer temperature control settings with the possibility of stalling at each start. It is not likely that the unit will cycle on the colder settings of the control because of the reduced capacity. The pressure equalizing time will be long, much the same as the high side restriction, the reason again being that the restriction does not allow a normal flow of refrigerant through the

tube requiring a greater length of time for pressure equalization.

The temperature conditions on the high side will be much the same as that for a high side restriction, the portion of the condenser that is full of liquid being quite cool and that portion that has hot vapor in it being extremely hot.

Undercharge

If the unit is short of refrigerant there is not sufficient liquid refrigerant at any time to completely fill the evaporator. The result is that the evaporator is partially frosted, being frosted only on that section of the evaporator that is coming in contact with the vaporizing liquid.

However, since there is not the maximum amount of liquid vaporizing, the compressor is able to remove what vapor is being given off very fast and the result is a lower than normal back pressure bringing about lower than normal temperature on that portion of the evaporator that is being frosted. This accounts for two things; one, the variation in the depth of the frost around the evaporator, and the other, the fact that in many cases the unit short of refrigerant will actually cycle.

That portion of the evaporator to which the temperature control feeler tube is attached is ordinarily frosted in the case of shortage, and, since as pointed out previously, that portion is ordinarily colder than normal, it is readily apparent why the unit will shut off. The "off" cycle, however, in many cases is shorter than the "on" cycle. Since once the unit has shut off the frosted portion of the evaporator warms very rapidly, the reason for this being that one portion of the evaporator and the entire interior of the refrigerator is considerably warmer than it would be under ordinary circumstances.

Overcharge of Refrigerant

You will note in checking this particular symptom that much depends upon the extent of overcharge. The reason for this is that the actual effect of overcharge is to cause the evaporator to be so full of liquid refrigerant that a certain portion of this liquid finds its way into the suction line and vaporizes in that line. When this happens, heat is being absorbed not only from the interior of the refrigerator, but also from the room in which the refrigerator is placed. Therefore, if the overcharge is slight it is readily apparent that there will be very little effect on the unit. However, if there is no appreciable overcharge and a great deal of vaporization is taking place in temperatures that are considerably warmer than the cabinet temperature, the result will be a considerable increase in the heat load on the unit and as a result the back pressure would be quite high.

In extreme cases, the back pressure may remain high enough that the boiling liquid in the evaporator itself will never reach a low enough temperature to cause the temperature control to shut off. Because of the increased load on the unit, the line from the compressor to the condenser, the condenser itself and the drier will all be at a reasonably uniform temperature but that temperature will be higher than it would be if these parts were only dissipating heat that was removed from the interior of the refrigerator. By the same token, with the higher working pressures in the evaporator or low side, there will not be the same tendency for the liquid refrigerant in the drier to vaporize. That means that while the drier will cool much the same as it would in a normal unit, the cooling will not be as rapid or as noticeable, particularly so, in the extreme cases.

Low Capacity Pump

In a low capacity unit, it merely becomes a case of not being able to remove vapor from the boiling refrigerant in the evaporator fast enough to bring about a lowered temperature. There is sufficient refrigerant in the evaporator, however, with the result that the evaporator temperature is uniform whether it is actually frosting or is merely cooling off enough to cause condensation.

The type of cycle will naturally be governed by the extent of the reduction of capacity of the pump. In extreme cases, the unit may never be pulled down to a low enough temperature to cause the unit to cycle. It may in some cases, however, cause the unit to cycle on the warmer settings. If it does, however, it will be noticed that the "on" cycle is extremely long as compared to the "off" cycle.

The pressure equalizing time is below normal since in most cases with a reduced capacity pump the differential between the high and low pressure is slight as compared to a unit operating normally. Therefore, with a low head pressure and a high back pressure and possibly a poor compressor valve causing the low capacity, very little time is required for pressure equalization.

Since with the low capacity of the compressor very little heat is being removed from the interior of the refrigerator, there is very little that need be removed from the vapor. The result is that most of the heat is removed in the line between the compressor and the condenser so that the condenser itself is actually cool all during the cycle.

Repairing the Automatic Tuning Section of Philco-Mopar Radios

The 1953 Philco-Mopar auto radios (Models P-5206, D-5207, C-5209, C-5211, C-5212) may have different components in the automatic tuning section. This also applies to the 1951-52 sets (P-5106, D-5107, C-5109, C-5110, C-5111). To identify the assemblies you will find stamped on this section part numbers (76-6632, 76-6632-1, 76-6632-2 and 76-6632-3). Some of the differences are such that components used on one part number assembly cannot be used on another. The best way to insure the ordering of the proper parts is to note the part number on the frame and order parts according to the information following. Parts not listed will be found in the Service Manual for the sets in question and are interchangeable.

COILS FOR ABOVE ASSEMBLIES

Nos. 76-6632 and 76-6632-2

Osc. coil #1 (with both cores)	32-4179-5
Osc. coil #2 (with both cores)	32-4179-6
Osc. coil #3 (with both cores)	32-4179-7
Osc. coil #4 (with both cores)	32-4179-8
Osc. coil #5 (with both cores)	32-4179-9
76-6632 only—antenna coil and padder assembly	76-4602-1
76-6632-2 only—antenna coil and shield assembly	76-4602-2

Nos. 76-6632-1 and 76-6632-3

Osc. coil #1 (with both cores)	318-5318-1
Osc. coil #2 (with both cores)	318-5318-2
Osc. coil #3 (with both cores)	318-5318-3
Osc. coil #4 (with both cores)	318-5318-4
Osc. coil #5 (with both cores)	318-5318-5
76-6632-1 only—antenna coil and padder assembly	318-5319
76-6632-3 only—antenna coil and padder assembly	318-5319-1

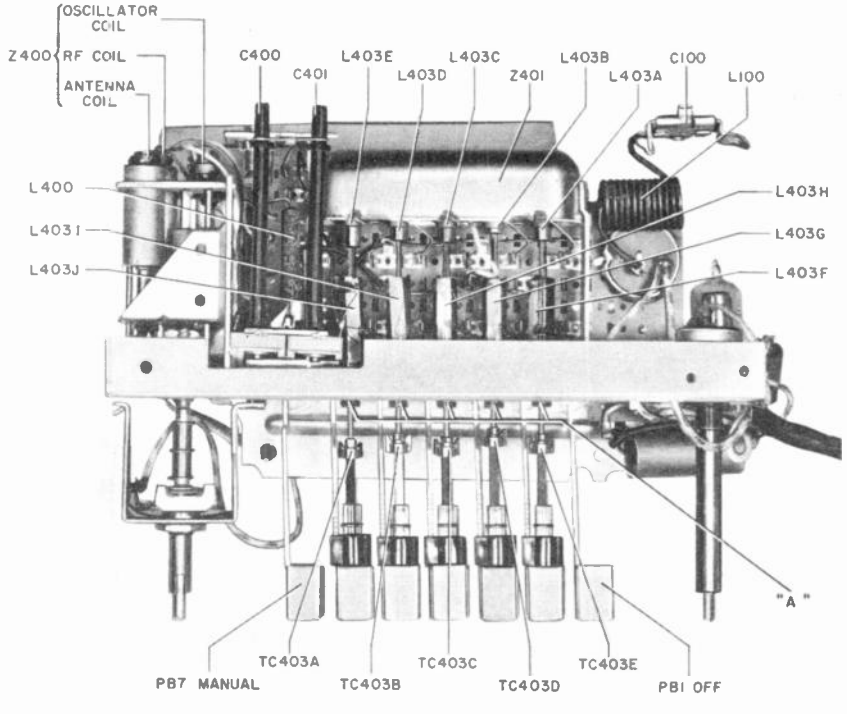

FIGURE 1

ADJUSTMENT OF P. B. OSCILLATOR AND ANTENNA COILS

If either the antenna coil assembly (Z401 in Fig. 1) or one of the oscillator coils (L403F-J) has been replaced, it may be necessary to adjust that portion of the tuning assembly to obtain optimum results. The tuning range of each push button circuit is as follows:

PB #2	530-1020KC
PB #3	610-1200KC
PB #4	700-1410KC
PB #5	740-1480KC
PB #6	840-1605KC

1. Using a dummy antenna of 40 mmf. series and 40 mmf. shunt capacity between the signal generator and the radio antenna socket, inject a signal with a frequency below but *near* the high limit of the push button to be adjusted.

2. Depress the push button and adjust the slotted tuning core shaft (TC403A-E in Fig. 1) for maximum output.

3. The threaded shaft and nut, in conjunction with the cup and coil spring at the base of each oscillator coil (see "A" in Fig. 1), afford a means of varying the relative position between any oscillator coil and its associated

antenna coil by loosening or tightening the above-mentioned nut. This tunes the antenna coil alone as *both* slugs are carried with forward or backward motion of the oscillator coil and, therefore, no change occurs in the oscillator setting. Vary this adjustment for maximum output.

4. If the antenna coil assembly has been changed, it may be necessary to check all five coils in this manner.

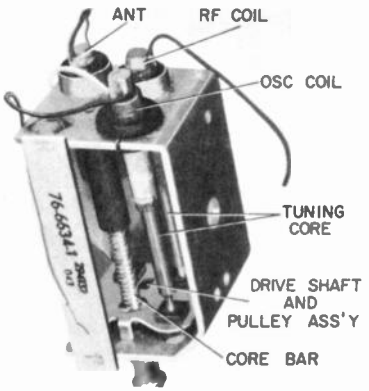

FIGURE 2

ALIGNMENT OF MANUAL TUNING UNIT

If the complete manual unit is replaced or needs alignment, the following general procedure should be carried out, using a dummy antenna as previously described.

1. Depress the "Dial" push button and set the tuning unit to the extreme high frequency position as in Fig. 2.

2. Set the signal generator to 1605 KC and adjust the oscillator padder (Schematic No. C405C) for maximum output.

3. Set the generator to 1400 KC and tune the set to this frequency. Adjust the RF and antenna (manual tuning) padders (Schematic Nos. C405B and C401) for maximum signal.

4. Set signal generator to 600 KC and tune the manual tuner to receive it. Adjust the core (TC402) of the oscillator shunt coil (L402 in Fig. 3) for maximum while rocking the tuning control back and forth. If a large adjustment is necessary, repeat steps 2 and 3.

5. If the dial calibration is off frequency slide the pointer along its cable to coincide with the proper frequency.

ALIGNMENT PROCEDURE WHEN THE ANTENNA COIL OR CORE IS REPLACED

1. After replacement of the coil or core, set the core so its leading edge (farthest from the core bar) is inside the coil *form* but not yet into the coil with the core bar in its extreme "out" position (as in Fig. 2). Set the generator to 1605 KC using a dummy antenna, and adjust the antenna padder (manual tuning C401—Figs. 1 and 3) for maximum signal.

2. Set the generator to 1400 KC and tune the manual tuner to receive it. Screw the antenna core in and out for maximum signal.

3. If a large movement of the core is necessary, repeat steps 1 and 2 and then go through steps 1 to 5 under general alignment.

ALIGNMENT PROCEDURE WHEN THE RF COIL OR CORE IS REPLACED

This procedure is the same as for the antenna coil except that, in step 1, the RF padder is used in place of the antenna padder.

ALIGNMENT PROCEDURE WHEN THE OSCILLATOR COIL OR CORE IS REPLACED

1. Perform step 1 as under "Antenna Coil Replacement" but adjust all three padders (oscillator, RF and antenna) for maximum signal.

2. Set the generator to 1400 KC and adjust the tuner to receive it. Adjust the antenna and RF cores for maximum signal (do not move the oscillator core after the initial setting).

3. If a large movement of the two cores is necessary repeat steps 1 and 2 and then go through steps 1 to 5 under general alignment.

COILS AND CORES FOR MANUAL TUNING UNITS

76-6634, 76-6634-1, 76-6634-2 and 76-6634-3

Coil, antenna	312-5129
Coil, RF	312-5129-1
Coil, oscillator	312-5131
Tuning Core (for any coil)	218-5170-13

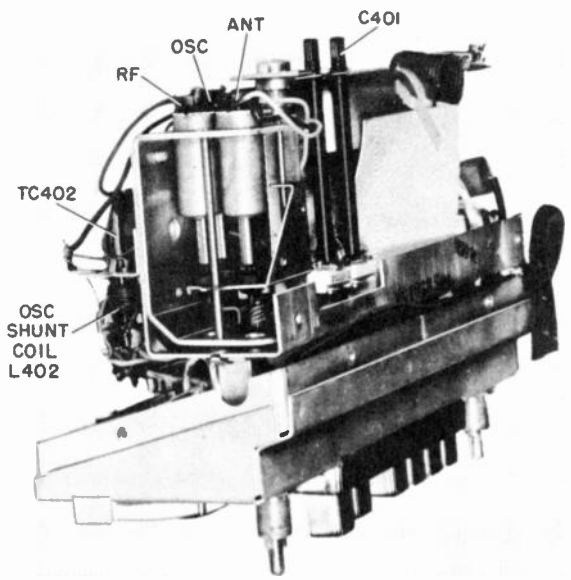

FIGURE 3

T.V.I.—Cause, Effect and Cure—Part I

The term T.V.I. is used quite loosely by the television industry and covers a multitude of different types of interference. In addition to referring to the interferences caused to television reception, it refers to television receivers interfering with other types of radio communication. With this article, it is our intention to aid the television service technician in becoming familiar with the many sources of T.V.I. and avail him of the latest information on how to minimize or eliminate the elusive problem of T.V.I.

For a clearer understanding of the problems encountered when dealing with T.V.I., it is best to give consideration to the design of, and frequencies used in a television receiver. The tuner, I.F. system and 2nd detector design play an important part in possible causes for T.V.I. Of equal importance and requiring additional attention, are the frequencies dealt with in the television receiver. The television tuner must handle almost all of the frequencies between 54 mc. and 216 mc. for VHF reception and if the receiver is adapted to UHF, there are the additional frequencies from 470 mc. to 980 mc. The I.F. systems handle frequencies in the 20 mc. and 40 mc. range. At the output of the 2nd detector, there remains a 4.5 mc. signal to be dealt with. Hence, it is quite easy to see that there are many different frequencies and mixtures of frequencies that, in connection with the oscillators, mixers and detectors in a television receiver, can give rise to a great variety of interferences and disturbances caused to and by the television set.

The chart in Figure 1 illustrates the numerous frequencies which concern us when dealing with T.V.I. problems.

There are multiple paths by which interfering signals can reach a receiver—by transmission through the air, by conduction through power lines and by induction from strong fields.

The devices that can cause T.V.I. are so numerous that it is impractical to list all of them; hence, the discussion of interfering devices will be limited to those articles which are more prevalent.

T.V.I. can be broken down into two categories—interference caused by a television receiver, such as, to other television receivers and to A.M. radios—and interference caused to a television receiver, such as, by electrical equipment, by amateur radio transmission, by AM and FM broadcast transmission, and by adjacent and co-channel television transmission.

To elaborate more extensively, we shall consider each category and each item under that category separately.

First, our discussion will deal with interferences caused by a television receiver. Under this heading, it was stated that a television receiver can cause disturbing interference to another television set. This trouble will be apparent almost entirely with older television sets being the cause of the interference. Because of the lack of proper and sufficient shielding in the tuners of the older receivers, the local oscillators would radiate back through the tuner to the antenna and act as a miniature transmitter. This radiated signal can travel a considerable distance and as can be seen in Figure 2, might cause a considerable amount of interference.

The interfering pattern appearing on the interfered receiver might show up on the face of the picture tube as illustrated in Figures 3 and 4.

Since the interfering frequency falls within the limits of a television channel, it is impractical to use a trap as you would be also trapping out the wanted

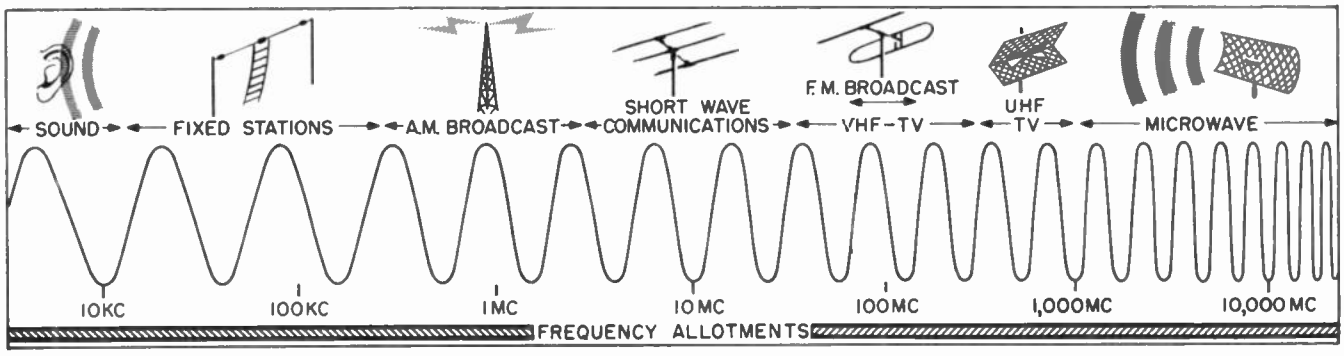

FIGURE 1

CHANNEL	CHANNEL LIMITS (MC.)	VIDEO CARRIER (MC.)	SOUND CARRIER (MC.)	LOCAL OSC. FREQ. (MC.)	LOCAL OSC. FALLS IN LIMITS OF CHANNEL NO.
2	54-60	55.25	59.75	81.85	5
3	60-66	61.25	65.75	87.85	6
4	66-72	67.25	71.75	93.85	—
5	76-82	77.25	81.75	103.85	—
6	82-88	83.25	87.75	109.85	—
7	174-180	175.25	179.75	201.85	11
8	180-186	181.25	185.75	207.85	12
9	186-192	187.25	191.75	213.85	13
10	192-198	193.25	197.75	219.85	—
11	198-204	199.25	203.75	225.85	—
12	204-210	205.25	209.75	231.85	—
13	210-216	211.25	215.75	237.85	—

NOTE: This chart is for a set using a 20 MC. I.F. system.

FIGURE 2

television signal. Therefore, the only logical method of handling the problem is to shift the local oscillator frequency slightly higher or lower so that its frequency falls outside of the channel with which it is interfering. To accomplish this, it is necessary to realign the I.F. system, shifting it higher or lower by the amount you wish to shift the local oscillator, then realign the local oscillator to tune in the television stations.

It is now common practice in the television industry to use a 40 mc. I.F. system and this has alleviated this problem. Present day tuners are also much better designed and have the necessary circuitry and shielding to prevent serious radiation.

The second item under the heading of interference caused by a television receiver is disturbance to AM radio reception. This has been one of the more aggravating types of T.V.I. and is caused by the harmonic radiation of the 15,750 cps pulses in the horizontal sweep circuit of the television set. These pulses are rather complex waveforms and therefore, contain a multitude of harmonics. It is true that the

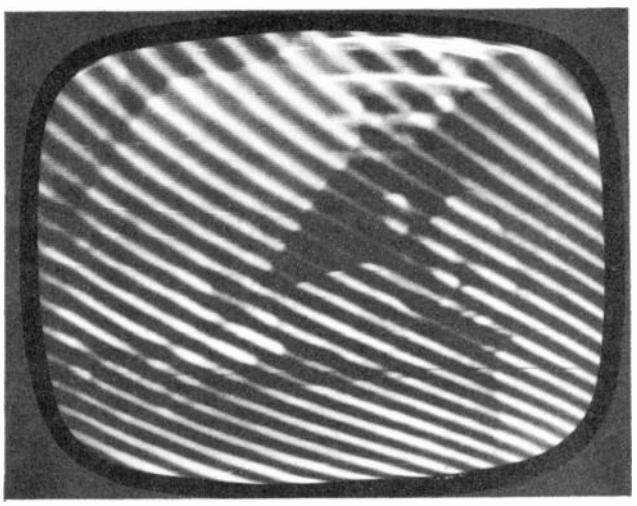

FIGURE 3—Medium Interference

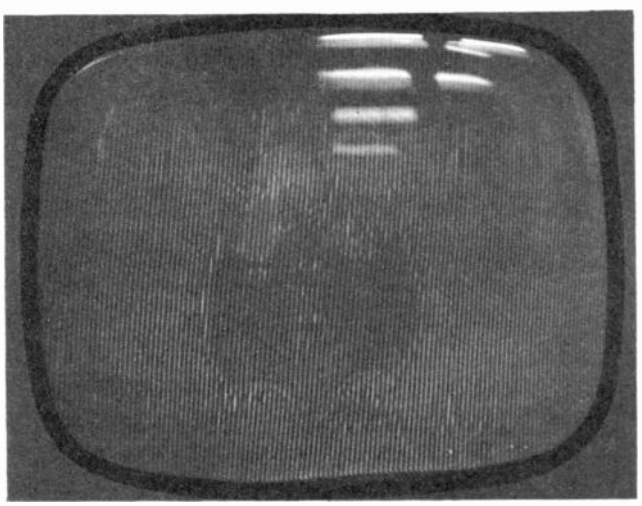

FIGURE 4—Strong Interference

magnitude of the harmonics is quite small and becomes less as the harmonic is a larger product of the 15,750 cps pulse. However, the signal strength is more than sufficient at the 35th harmonic (551.25 kc) to produce a very objectional disturbance in a nearby radio receiver in the form of squeals and distorted sound.

Normally, in a primary radio reception area, the signal strength of the radio station is sufficient to override the harmonic radiation from a television receiver, but as the signal strength of the radio station becomes less due to an increased distance from the station, the interference becomes more severe.

Under normal conditions the 15.75 kc harmonic radiations do not travel very far, often not outside of the home in which the television receiver is located. However, in addition to being radiated through the air, these harmonic signals are carried over the power lines in the home and building and hence, can reach every room in a building, such as, in an apartment house. This, as can be seen, might become a chronic problem.

There are a few things which can be done to the radio receiver to reduce this interference such as an A. C. line filter and the use of an external antenna with a shielded lead-in, but these will normally have little effect in reducing the interference to an acceptable level. Since the interfering frequencies lie within the broadcast band it is impractical to use a trap as the broadcast signals would be attenuated by the same degree as the interfering signal with no resultant reduction in the disturbance. Therefore, it is apparent that the trouble must be eliminated at its source, the television set.

The major source of horizontal radiation is the horizontal output circuit. The components in this circuit mostly concerned with this radiation are—the horizontal output tube, the horizontal output transformer, the deflection yoke and connecting leads and the aquadag coating on the cathode ray tube.

As with any other form of R.F. radiation, the only way to confine this radiation is by the use of shielding. Shielding of the above mentioned components must be done with care and forethought if it is to be effective.

In order to determine if the shielding measures taken are diminishing the radiation by a sufficient amount, it is possible to construct a simple measuring device. This can be done by using a small portable AC/DC-Batt. radio similar to the Philco Model 52-643. The radio used should have good sensitivity, selectivity and a highly directional antenna. With these requirements, the radio can be used to indicate the strength of the harmonic radiation as well as the direction from where it comes and hence the location of the offending television receiver. In order to provide a relative signal strength reading, it is necessary to make only one slight modification to the radio. This modification consists of adding a 0-25 microammeter in series with the volume control and ground. The relative signal strength of the interfering harmonic radiation can be read directly on the meter. Figure 5

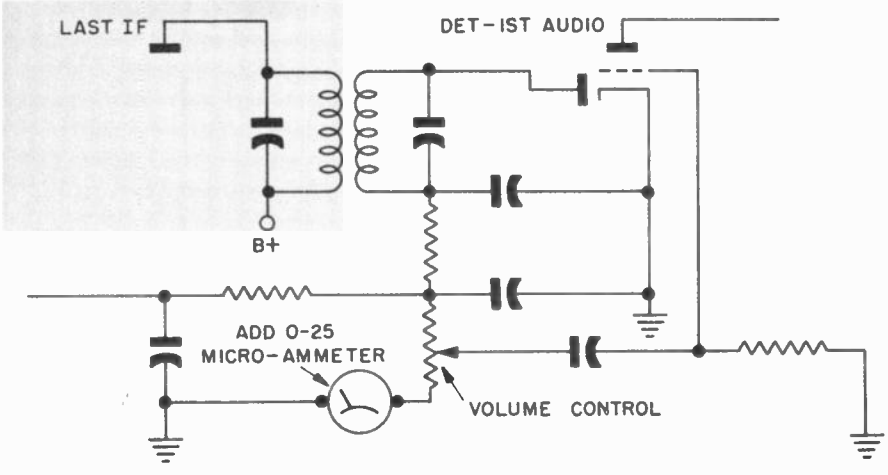

FIGURE 5

shows schematically the manner in which the micro-ammeter should be connected.

Getting back now to the problem of shielding, there are two major points where shielding will drastically reduce the horizontal harmonic radiation. These are the deflection yoke leads and the aquadag coating on the bell portion of the cathode ray tube. It is possible, in some instances, to wrap the deflection yoke leads with aluminum foil and ground the foil at both ends, to considerably reduce the radiation. But, care should be taken to note whether the added capacity between the leads and ground affects the linearity of the picture. A more satisfactory method of shielding these leads is to run the deflection yoke leads through an aluminum foil covered, one inch, cardboard mailing tube of the required length. This tube should be secured to the chassis by some type of metal clamp, thus providing a good ground. By using this method, the shielding is adequate and the additional distributed capacity is negligible.

Due to the electrical characteristics of the material used for the aquadag coating on the outside of the bell portion of a cathode ray tube being rather high resistance in ohms per inch and the internal coating being the same, the two coatings on the C.R.T. separated by the glass envelope of the tube form a condenser with a very poor power factor. This condenser is used in the circuit to help filter the high voltage. Since the condenser has a poor power factor its filtering action is also very poor, hence the high voltage present on the inside aquadag coating is pulsating at 15.75 KC. This, of course, contributes to the radiation problem. By the addition of an aluminum foil shield around the bell portion of the tube, two things take place. The power factor of the condenser formed by the inside and outside aquadag coating is much improved resulting in better filtering of the high voltage and any pulsations that remain are shielded from being radiated. See figure 6.

While discussing the cathode ray tube and its associate assemblies, it would be well to mention several points in this portion of the television chassis where the use of by-pass condensers can aid in the reduction of radiation. Due to the mechanical construction of many of the cathode ray tube mounting bracket assemblies, it is possible for the focus assembly and front mounting band to be sources of horizontal harmonic radiation since they are not at A.C. ground potential. To remedy this, it is necessary to add a by-pass condenser from the front mounting band to chassis ground and add a by-pass condenser shunted with a high value resistor between the deflection yoke housing and the focus assembly. The resistor in this instance is to keep the focus assembly at D.C. ground potential so as to prevent any possibility of a charge developing on the by-pass condenser which could result in a shock when the focus assembly was touched. Figure 7 illustrates the proper placement of these components.

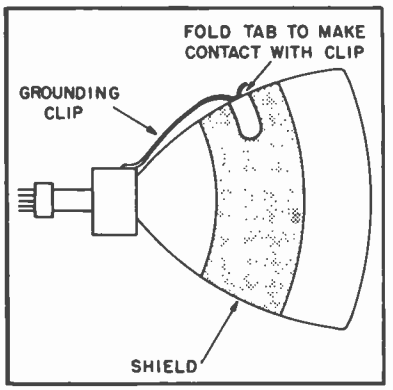

FIGURE 6

The remaining components which were classified as offenders in the horizontal harmonic radiation problem were—the deflection yoke, the horizontal output tube and output transformer. The deflection yoke is normally well shielded by its mounting bracket an

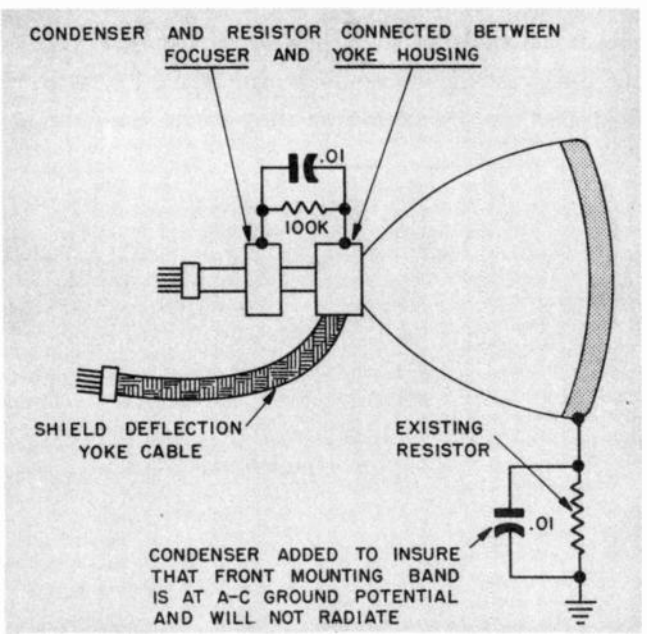

FIGURE 7

mechanical design of the yoke itself, and in many receivers both the horizontal output tube and transformer are located inside the high voltage cage which in addition to providing protection from coming personally in contact with the high voltage, also provides excellent shielding. There are some cases, however, where the horizontal output tube is located outside the high voltage cage. In these instances it is necessary to form a metal screen shield around the location of the output tube.

Earlier in this article it was mentioned that in addition to the horizontal harmonics being radiated through the air from the television receiver chassis, that these harmonics were also carried by the power lines and by the antenna transmission line from the tuner back to the antenna, and in turn radiated from the antenna and transmission line. Again it is necessary to institute some type of filtering or by-passing in these circuits to prevent this occurrence. The installation of two by-pass condensers from either side of the A. C. input to the television chassis to ground (chassis ground) will normally be sufficient to prevent any horizontal harmonics from getting into the power line. Figure 8 illustrates the proper connection of these components.

The remaining source of possible radiation is back through the antenna system. This can best be subdued by the installation of a hi-pass filter in series with the antenna lead-in at the point where it connects to the television tuner. A hi-pass filter is so constructed that all the frequencies below channel #2 are sharply attenuated, therefore not permitting the passage of the horizontal harmonics. This filter also performs a second job which, although not connected with horizontal harmonic radiation, is of much advantage. It will not pass any interfering frequencies that lie within the frequency limits of the I. F. system, hence providing additional rejection of unwanted signals entering the television receiver. Traps, such as these, are available commercially.

In the next issue this article will be continued. The next phase of T.V.I. to be covered is that of interference caused to a television receiver.

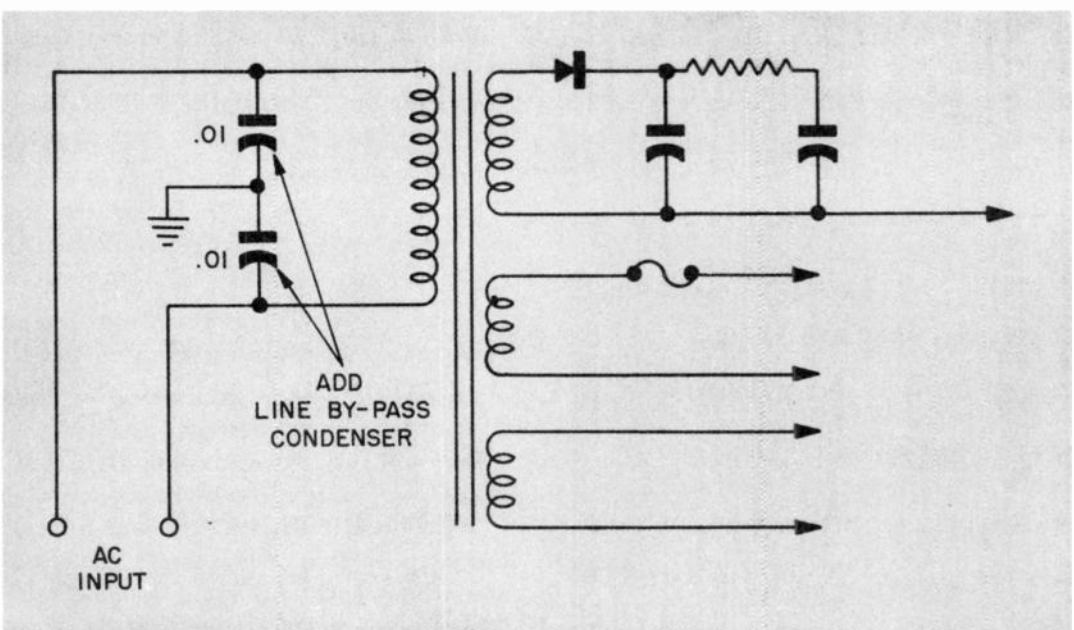

FIGURE 8

Instructing the Range Customer at Time of Installation

Successful cooking and baking has many contributing factors. Many times the customer blames poor results on mechanical failure, when actually the fault lies in not fully understanding the operation of the range.

Proper customer instruction will save the serviceman many unnecessary calls for electric range service which prove to be nothing more than lack of understanding on the part of the customer. We will explain to you in some detail the subjects we think should be covered by the serviceman so that the customer will have an adequate background for cooking.

Start instructing by talking about the top of the range and continue on, telling her about the features, uses and care of her range. The following home call procedure will show you a good routine to follow:

SURFACE OF RANGE

Thermo-Color—on Philco range models 839 and 439, we "cook with color." Philco's Thermo-Color control switches have 5 heats. The heat positions are conveniently indicated by letters as well as colored lights, which are clearly visible from anywhere in the room.

Red	indicates High
Yellow	indicates Medium
Purple	indicates Medium Low
Green	indicates Low
Blue	indicates Simmer

Most all foods are brought to the boiling point on "Red" or "High." This is very fast cooking and Red is used as a warning signal. When a stop light flashes red, you are careful to come to a full stop, and watch carefully. So "High" is used only long enough for the food to reach boiling point, then turn to "Green" or "Low." In traffic signals, "Green" means clear sailing. This is true of your "Green" heat in cooking, too. In case foods cook too fast on "Green," turn the switch to the lowest heat, or "Blue." If food cooks too slowly, turn the switch higher or to "Purple."

FIGURE 1

Thermo-color cooking is economical, too! With these cheerful color lights to remind you, you are not apt to leave the units on when you are not cooking.

Philco Surface Units—Now, there may be occasions when you are cooking large quantities of food, when "Low" will not maintain steaming. Then, you turn the switch to "Medium Low."

"Medium" heat—This is used for frying, baking, griddle cakes, or browning meat.

"Medium Low" heat—This heat is used for cooking large quantities of food, where "Low" will not maintain steaming. That's why we have five heats. One for every purpose and every type of food.

"Low" heat—Most of the cooking is done on this heat. That is, after you have started the food to cook, brought it up to steaming, then turn to "Low" to complete cooking.

"Simmer" heat—This is a very low heat and will keep foods warm until you are ready to serve.

Economy—It is more economical to use just enough heat to keep foods steaming and cooking. Too high a heat will cause foods to cook dry unless more water is used, and more current will be used when necessary.

With these five heats, you have controlled heat for every type of food. For example, you can make custard and white sauce without a double boiler. You can cook frozen vegetables with no water, using 2 or 3 tablespoons of butter. There will be no liquid to pour off.

Pots and Pans—No need to buy new pans, you can use your old ones on your Philco Range. For best results, it is a good idea to use flat bottomed straight side pans.

Always use a tight fitting cover. You will find you can use much less water in these pans, your food will taste better, the color and vitamin content will be greater. Use the unit that fits the size pan or skillet you plan to use. A large pan on the large unit—a small pan on a small unit. Good contact of unit and pan makes for economy of current.

Precaution—With top of range glass utensils, use Low or Medium Low heat, never high heat. Porcelain enamel utensils will melt at the bottom if exposed to high heat.

DEMONSTRATE EASE OF CLEANING UNITS:

FIGURE 2

Removable porcelain pans—Remove pans to show how easily it can be taken to sink for cleaning. Notice the design of the drip pan. It is curved upward at the edges so that spillage will be retained in the pan itself. The pan under the large surface unit will hold 1 cup of spillage.

Non-removable pans—Explain that these can be cleaned with a little scouring powder and wiped dry.

Chromium rims on unit—Any good scouring powder or scouring pad will remove spattering. Notice that the chrome ring overlaps. This prevents crumbs from falling between the unit and the surface of the range.

Oven Vent—Very Important—Explain that the oven vent is located directly under the large front surface unit. In cooking or baking in the oven, there is some steam formed. This escapes through the vent, condenses into water, and may drop down on the drip tray. You may feel a little heat coming from this unit while using the oven, even though the surface unit is off. We mention this so you will know why. Some folks have called a serviceman, thinking there was something wrong with the range unit. This oven vent in the front of the range is easily removed for cleaning. NOTE: In two oven ranges, there are two vents—one under the front right unit and one under the right rear unit.

Drip Pan—Pull out drip pan, which is located directly under the surface units. This is to catch any spillage. Any food spilling on the Philco units will burn off. They clean themselves. Excess, such as milk, drips down on this tray. For convenience, the time and temperature chart has been embossed on this tray.

Deep Well Cooker—This is an aluminum kettle which fits into the well. It has a six-quart capacity. There are five heats on this switch, just as there are on the surface units. The main reason for a deep well cooker is the safety factor. If you have soup, tomato catsup, hot fat for french fried potatoes cooking, you needn't worry about the kettle tipping, or being pushed off the top of the range.

The deep well cooker may be used just as you would any large kettle. You will need less water than you have used before because of the controlled heat. For instance, you may wish to cook large quantities of potatoes, bake beans, sterilize baby bottles, etc. There are many uses for this feature—even complete meals may be cooked in it.

Jiffy Lift Deep Well Cooker—This is used exactly like the deep well cooker. It, too, has a six-quart capacity. The unit in the bottom can be raised to make the fourth top unit. It, too, has five heats, just like the other surface units.

Standard Automatic Timer—First of all, this is an electric clock. No need of another clock in your kitchen. The automatic timer is a great convenience. It acts as a servant, turning your oven on and off while you are away from home. There is no need to set the timer when you are at home. But, if you wish to go to church, play golf, or go to work, you can put your food in the oven, then set the timer. When you

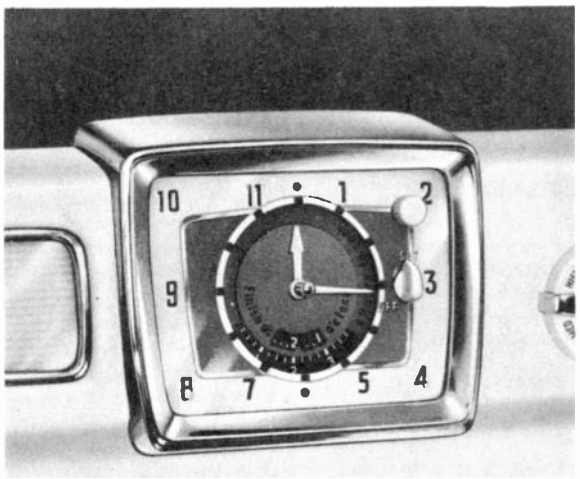

FIGURE 3

return, your food is cooked, ready to serve piping hot. (See Figure 3.)

NOTE: Use Philco instruction booklet to demonstrate the setting of the timer. The new user may forget what you have told her before she gets around actually to use it for a meal.

All you need to know when using the timer is when you want your food to stop cooking and how long you wish your food to cook.

First, check to see that the electric clock is set for the correct time of day.

After you have followed the instructions, then turn the hands of the clock to show the customer how the timer turns her oven on and off.

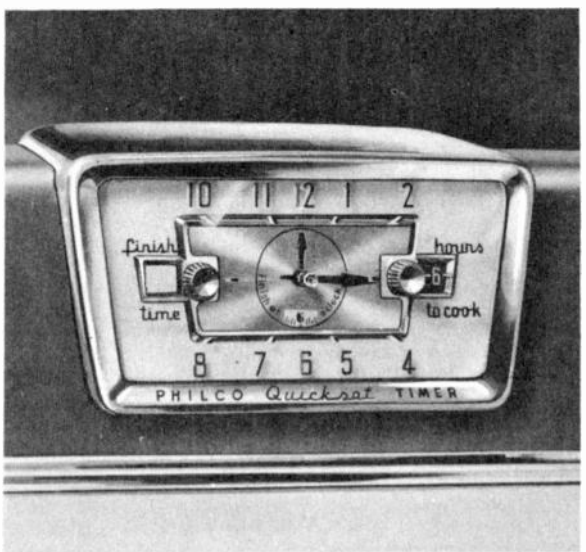

FIGURE 4

NOTE: Do not set the timer for too short a time between when you want it to turn on and when you want it to go off. Allow at least 15 minutes. The cooking timer operates the banquet oven or timed appliance outlet. (See Figure 4.)

Quickset Timer—The Quickset Timer is Philco's contribution to simplified automatic oven control. The Quickset Timer is easier to operate than previous control clocks because there are fewer steps necessary to put it into operation. Even a child can operate it. To set the Quickset Timer for automatic operation, the following steps are necessary.

1. Set the left-hand knob to the hour that the food should be ready for serving (the dial is located on the clock face).
2. Set the right-hand knob to the number of hours the food should be cooked.
3. Set the thermostat to the temperature at which the food should be cooked.

That's all! The Philco Electric Range will do the rest.

Appliance Receptacles—The customer can plug her automatic coffee maker into the timed outlet at night. Set the timer, and when she gets up in the morning, coffee will be ready. She cannot set the timer for a time lapse of more than 12 hours. The appliance receptacles can be used for any electrical appliance—waffle iron, toaster, iron, etc.

NOTE: Do not leave the customer's home until you are convinced that she knows how to operate the timer. This will eliminate another call.

Minitimer—This is a timer which you can set for the desired minutes—up to one hour—you wish to cook or bake food. It only reminds you that the cake, shall we say, is baked.

If you wish to bake a pan of biscuits for 15 minutes, set the Minitimer, winding it up past 15 then back to 15. It will not shut off the current, nor take the pan out, but just reminds you to do it.

Interval Timer—This timer is electrically operated. Just turn it to the desired number of minutes. When the time is up, it buzzes until it is turned off.

BANQUET OVEN

Automatic Preheat—Turn switch marked "oven" to baking temperature desired. During the bake period, the top bake unit and the bottom unit are on.

Signal Light—The signal light goes on when the oven switch is turned on. When the signal light goes out, the oven is up to temperature. It takes about 7

minutes to preheat the oven to 350°, or "medium." (See Figure 5.)

Automatic Heat—During the entire baking or cooking period, the oven maintains an even temperature. The signal light will come on and go off, depending on how much heat is needed to keep the oven at the temperature for which it is set. Whenever the oven signal light is out, the oven uses no current. This is

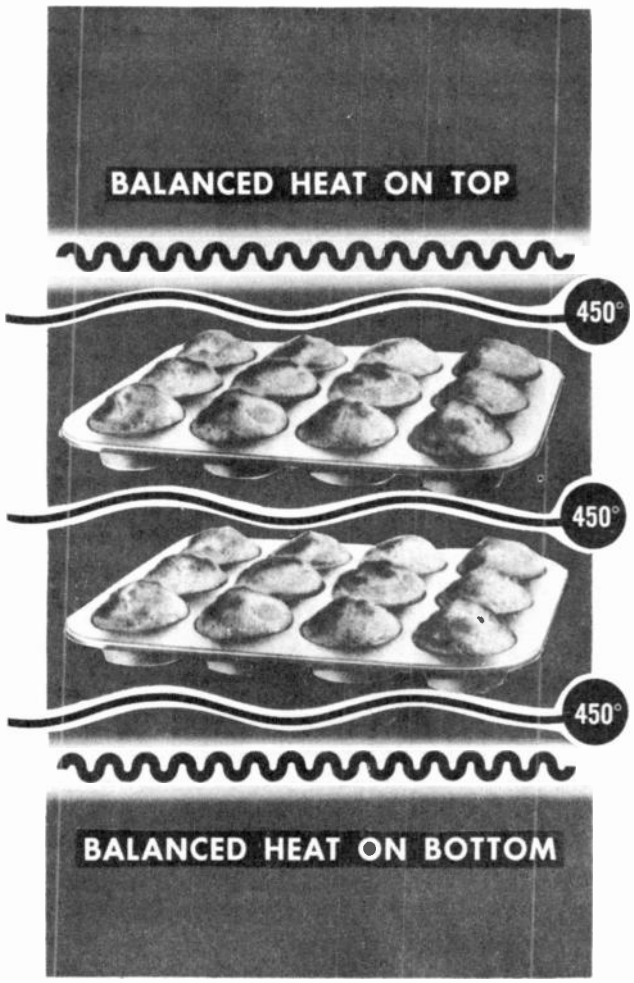

FIGURE 5

why electrical cooking is economical. After cooking is completed, leave door ajar to cool. This eliminates cooking odors.

Thrift Oven—The thrift oven is the smaller oven in the two-oven range. This has only one unit. It is adjustable, so that it can be placed in the upper position, sliding into the top set of terminals, and be used for broiling; or, it can be placed in the lower position and used for baking.

Baking Pans—Bright, shiny, medium weight cake and bread pans give a medium brown on the bottom. Dark pans will give a darker, sometimes a burned, bottom. Pyrex pie plates produce the best browning on bottom of pies in the electric oven.

Oven Temperature Charts—Draw customer's attention to the time and temperature charts in the instruction book and suggest that she follow them closely.

Broil-Under-Glass—Exclusive Philco Feature—This high-tempered glass, directly under the broiling unit, will allow you to broil foods without smoke, soot, or stain. The broil-under-glass feature can be used in either the Banquet Oven or the Thrift Oven. The glass can be left in position when baking in the Banquet Oven, but you should remove the glass when placing the unit in the lower position for baking in the Thrift Oven.

Philco Built-in Jiffy Griddle—Philco's Built-in Jiffy Griddle gives extra cooking capacity equal to two additional surface units. For the first time in any range, the heat of the broiler element is used for surface cooking, too. Radiated heat is evenly distributed beneath the entire griddle. The griddle slides out at a convenient height, ready for use.

There is an extra "stop" position on the oven door. The door is in this position when the griddle is in use.

When not in use, the griddle is out of sight. It does not rob valuable work surface on your range.

Cleaning Oven—The Philco Range, operated electrically, has a clean heat. There may be spill-overs of pie filling or spattering from meat cooking. Usually, all that is necessary is to:

1. Remove top unit. Do not put in water.
2. Remove bottom unit. Unfasten fly screw and remove reflector. The reflector can be taken to the sink and washed the same as any pan.
3. Wash inside of oven liner with soap and water. Wipe with a damp, clean cloth.
4. If a great deal of spillage and spattering has accumulated, place some paper towels or old cloth in bottom of oven. Pour household ammonia over to soften grease and spillage. It is better to allow it to remain over night. Wash with soapy water and wipe with clean, damp cloth.
5. Replace units. Push in tightly so both units make contact.

Cleaning Glass Under Broiler Unit—Remove small wire protector in front of glass. Slip out each piece of glass, wash the same as any piece of glass. It is not necessary to wash after each broiling.

Recently Introduced Test Equipment

Since a Service technician's business success is greatly dependent upon his test equipment and how well it works for him, we wish to give some information on two recently introduced pieces of Philco test equipment.

PHILCO DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER, MODEL 7052

WHAT IT IS—WHAT IT DOES

The Model 7052 tube tester is used to test and measure mutual conductance values of vacuum tubes used in radio receivers and transmitting tubes delivering less than 25 watts of power.

It is fundamentally of the Dynamic Mutual Conductance type designed to provide either REPLACE—GOOD readings or mutual conductance values in micromhos. Provision is made for locating shorts and leakages between tube elements. A sensitive noise test is also provided.

Mutual conductance values in three ranges can be measured: 0-3000, 0-6000, and 0-15,000 micromhos. Included in this tube tester is an R-G reading range. By means of this range, a good tube will cause the pointer of the indicating meter to rest in the GREEN (GOOD) sector of the meter scale. A bad tube will read in the RED (REPLACE) or doubtful (?) sector.

GAS TEST

Provision is made to test amplifying vacuum tubes for gas content. Gassy tubes will ruin the automatic volume control or intermediate stages of a radio receiver.

FUNCTIONS OF THE COMPONENTS

Line Voltage Adjustment

The Model 7052 tube tester operates from A.C. power lines of 105 to 125 volts, 60 cycles. Means are provided to adjust the operating voltages of the tester to an established standard, by front panel controls with any line voltage within its operating range. This adjustment should be made with the control settings properly arranged for the tube being tested and with the tube in its test socket.

SELECTORS

The row of selector dials across the bottom of the control panel is for the purpose of conducting proper voltages to the tube's base pins. The operation of setting these dials is similar to DIALING A TELEPHONE NUMBER. The setting of each selector is indicated by a red line. The roll chart also includes data for other controls.

SHORT TEST

Turning the SHORTS switch successively through the positions 1-2-3-4-5 connects the various pairs of elements in turn across the test voltage. Tubes having shorted elements will complete the circuit and cause the neon SHORT lamp to glow. Tubes may be tested for shorts, either hot or cold.

A short is indicated by a steady glow of the neon lamp in certain positions of the SHORTS switch. A momentary flash of the lamp as the switch is turned from one position to another should be disregarded. This flashing is caused by the charging of a capacitor in the test circuit.

NOISE TEST

The short test circuit is also used in making noise tests on vacuum tubes. Connections are made from the noise test jacks to the antenna and ground posts of any radio receiver. The tube under test is tapped with the finger as the SHORTS switch is turned through positions 1-2-3-4-5.

Intermittent disturbances which are too brief to

register on the neon lamp will be reproduced by the loud speaker as static.

DYNAMIC MUTUAL CONDUCTANCE

The push switch P4 is used when testing for mutual conductance value. The indicating meter will register the tube's value in MICROMHOS in three ranges 0-3000, 0-6000 and 0-15,000. The range to be used is controlled by the MICROMHO switch. When measuring micromhos in any of the three ranges listed above, no setting of the R-G dial is required.

The fourth range, R-G, on the MICROMHO switch is used when it is desired to test the tube in terms of GOOD-REPLACE. In this case the R-G dial must be set in accordance with the figures given on the data chart under the heading, R-G range, good tubes will cause the meter pointer to read in the GOOD sector. Worn out tubes will read in the REPLACE sector. Those tubes which read in the sector marked (?) have some useful life but should be replaced soon. The R-G reading scale is also based on Dynamic Mutual Conductance. It is not an emission test.

The Micromho values printed on the data roll are average values. A small variation above or below these average values is to be expected even with new tubes.

The R-G scale is designed to make tubes read at the left edge of the GREEN (GOOD) sector when 25% below average for amplifier tubes and 35% below average for power tubes.

RECTIFIER TEST

The push switch P1, P2 and P3 are used to test various types of rectifier elements.

The push switch P1 is used when testing detector diodes. It applies a low voltage which will not injure the delicate cathode. Good diodes will cause the meter pointer to read above the mark, DIODES OK. Certain pentode tubes such as the 6AJ5 are tested with reduced screen voltage. This is accomplished by holding down P1 and pressing P4.

Push switch P2 is used when testing cold cathode rectifiers such as the OZ4. This applies a voltage sufficiently high to ionize the tube and start conduction. Good tubes will read in the GREEN (GOOD) sector of the meter.

Push switch P3 is used when testing ordinary rectifier tubes such as the 5Y3. This switch applies a medium voltage which is best adapted to reveal defects in this type of tube. Good tubes will read in the GREEN (GOOD) sector of the meter.

METER REVERSE

Directly below the indicating meter is a switch marked REVERSE-NORMAL. With certain tubes such as the 117N7, the meter, when set on NORMAL, will deflect backwards (to the left) when push switch P3 is pressed for rectifier test. In such case, turn the meter switch to REVERSE which will cause the pointer to move up the scale. After this test has been made, return the switch to NORMAL.

TOP CAPS

There are two jacks in the upper center of the control panel marked GRID and PLATE. These are used when making connection to the top cap of the tube being tested. On the data chart in the NOTATIONS column opposite tube types having top caps, is the notation CAP = G or CAP = P. G means that the top cap is connected to the GRID and P, to the PLATE jack.

NOTE: The center of the seven-pin socket is used to check pilot lamps. Voltages up to 12.6 are available for pilot lamp test. These voltages are controlled by the filament switch. No further switch setting is necessary.

PHILCO MODEL 7021, 5" WIDE BAND TV OSCILLOSCOPE

The Philco 5" TV oscilloscope will be one of the most useful pieces of test equipment in the shop. It is an extremely versatile instrument and can be used as an alignment indicator, signal tracer, to locate distortion, to measure frequency and other applications. It is a high-definition, wide-band, high-quality scope.

GENERAL SPECIFICATIONS

Electrical: Power supply requirements: 117 volts; 50-60 cycles AC; approximately 125 watts; fuse protection—3 amperes.

Vertical amplifier: Maximum input is 1000 volts peak-to-peak or 350 volts rms. Maximum sensitivity is .056 volts peak-to-peak per inch (.02 volts rms).

Maximum undistorted vertical amplification is approximately 5 inches.

The vertical amplifier will pass a 50 cps square wave with less than 10% tilt. It will pass a 1-mc square wave with negligible overshoot. The vertical rise time is approximately .2 microseconds.

Two vertical attenuators are provided: one is a continuously variable control calibrated in peak-to-peak volts per inch deflection from .1 volt peak-to-peak to 10 volts peak-to-peak; the other is a frequency-compensated step attenuator providing a multiplying factor for the continuously variable control of X1, X10 and X100.

The input impedances are as follows: X1 scale—3 megohms, 50 mmf; X10 scale—1 megohm, 28 mmf; X-100 scale—1 megohm, 22 mmf.

The response of the vertical amplifier is essentially flat from 10 cps to 4.5 mc being down only 3½ DB at 4.5 mc.

Horizontal amplifier: The input impedance for the horizontal amplifier is 2 megohms, 18 mmf. Maximum input voltage is approximately 5 volts rms. The sensitivity is .9 volts peak-to-peak per inch.

The horizontal amplifier may be used alone or with the internal sweep. The normal maximum when the internal sweep is employed is 8 inches, thus providing an oversweep on all ranges.

The built-in linear sweep is from 10 cps to 100 kc in four ranges, as follows:

10 to 100 cps
100 to 1 kc
1 kc to 10 kc
10 kc to 100 kc

A fine frequency control is provided to set the sweep frequency to any desired value on any range.

A sweep selector switch is provided which permits using the horizontal amplifier alone, or using the built-in linear sweep which may be synced either with the 60-cycle line signal, with a signal applied externally to the oscilloscope, or with the signal applied to the vertical amplifier. The sync amplitude may be easily adjusted for proper syncing with any signal. The sweep easily synchronizes and "locks-in" with a 3 megacycle sine-wave signal.

Test signal: A 2-volt peak-to-peak sinusoidal test signal is provided at a binding post on the front panel for checking the calibration of the vertical gain control (which can be readjusted by means of an internal adjustment) and for other test work.

Z Axis: Partial retrace blanking is provided when the internal sweep is used. In addition to this the crt may be intensity modulated by applying a signal to a binding post located on the front panel. This binding post is marked "Z axis." By reducing the intensity, as little as 5 volts peak-to-peak may be used for intensity modulation.

Horizontal and vertical centering controls permits adjustment of trace position so that any part of trace may be conveniently located on the screen.

Internal adjustments are provided to compensate for changes in circuit values either due to aging or parts replacement. They are low and high frequency adjustments in the vertical amplifier and frequency compensation on the vertical attenuator ranges.

Fuse Post: The fuse post is located on the rear of the chassis. An extractor type is provided.

SPECIAL FEATURES

The cathode-ray tube is magnetically shielded.

A voltage-regulated power supply is employed to eliminate excessive "bounce" due to line voltage fluctuations.

A frequency compensated step attenuator is used in the vertical input to keep the response characteristic essentially constant regardless of the setting of the vertical attenuator.

A transparent ruled scale is supplied.

Tubes: Thirteen tubes are used with types and functions as follows:

(1) 12AT7—Cathode follower input amplifier and triode voltage amplifier.
(1) 6CB6—Vertical voltage amplifier.
(1) 6C4—Vertical phase—Splitter amplifier.
(2) 6AG7—Vertical push-pull amplifier.
(1) 12AT7—multi-vibrator sweep oscillator.
(1) 6C4—horizontal voltage amplifier.
(1) 12AU7—push-pull horizontal sweep amplifier.
(1) 5UP1—short five-inch cathode-ray tube.
(1) 5U4—low-voltage rectifier tube.
(1) 5Y3—high-voltage power supply rectifier.
(2) OB2—voltage regulator tubes in low voltage power supply.

TEST LEADS REQUIRED

Supplied with the Philco TV oscilloscope is a four-foot coax cable terminated at one end with alligator clips. In some cases you can use plain test leads such as supplied with any multimeter to connect the oscilloscope to the equipment under test.

In other instances you will need a shielded lead, such as is supplied, to keep hum pick-up at a minimum.

Any shielded lead used should not be any longer than is necessary because the capacity will reduce the high frequency response of the oscilloscope. Try to

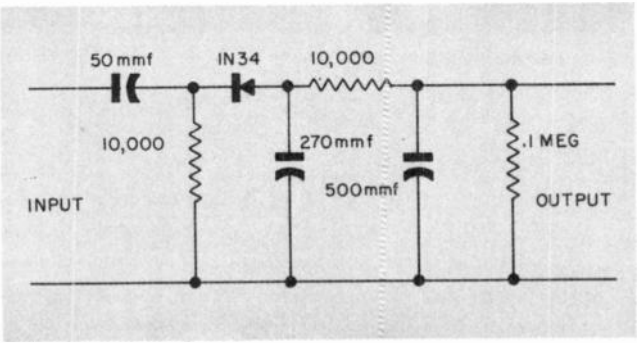

FIGURE 1

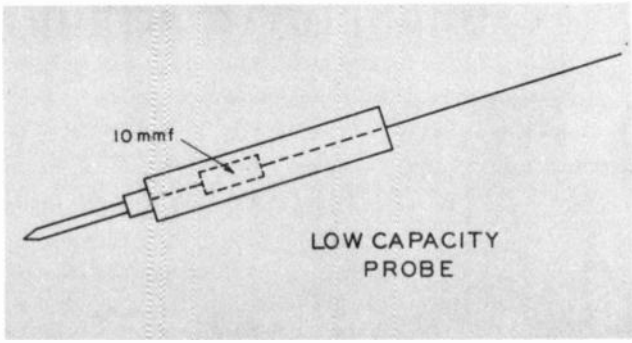

FIGURE 3

keep the length of the coax to about five feet, this will be long enough in most cases. A shielded test lead is recommended for audio amplifier servicing. At audio frequencies the capacity of the lead will not affect the performance of the oscilloscope and it will keep hum pick-up at a minimum.

To view a signal in the video I.F. stages of a Television receiver a detector probe will be needed. A schematic diagram of a suitable proble is shown in figure 1.

The probe can be built up on a 5-lug terminal panel as shown in figure 2. The ends of the lugs are cut off to reduce the size of the assembly as much as possible. All parts are laid right on the strip. After wiring and soldering, a small cardboard sheath is placed around the probe and then the entire unit is placed inside a miniature tube shield. The shield is connected to the ground lug of the terminal panel.

In some circuits the input capacity of the oscilloscope (even though it is very small) may affect the performance of the circuit under test. When this situation is encountered, a low capacity probe should be used. One can be easily constructed simply by connecting a small capacitor in series with the test lead to the Vertical terminal. The smaller the capacity of the condenser, the less the scope input capacity will affect the circuit under test. A 10 mmf. condenser is usually used. If hum is encountered it will be necessary to use a shielded line. A probe may be built by using a small ceramic condenser and placing it inside a test probe as shown in figure 3.

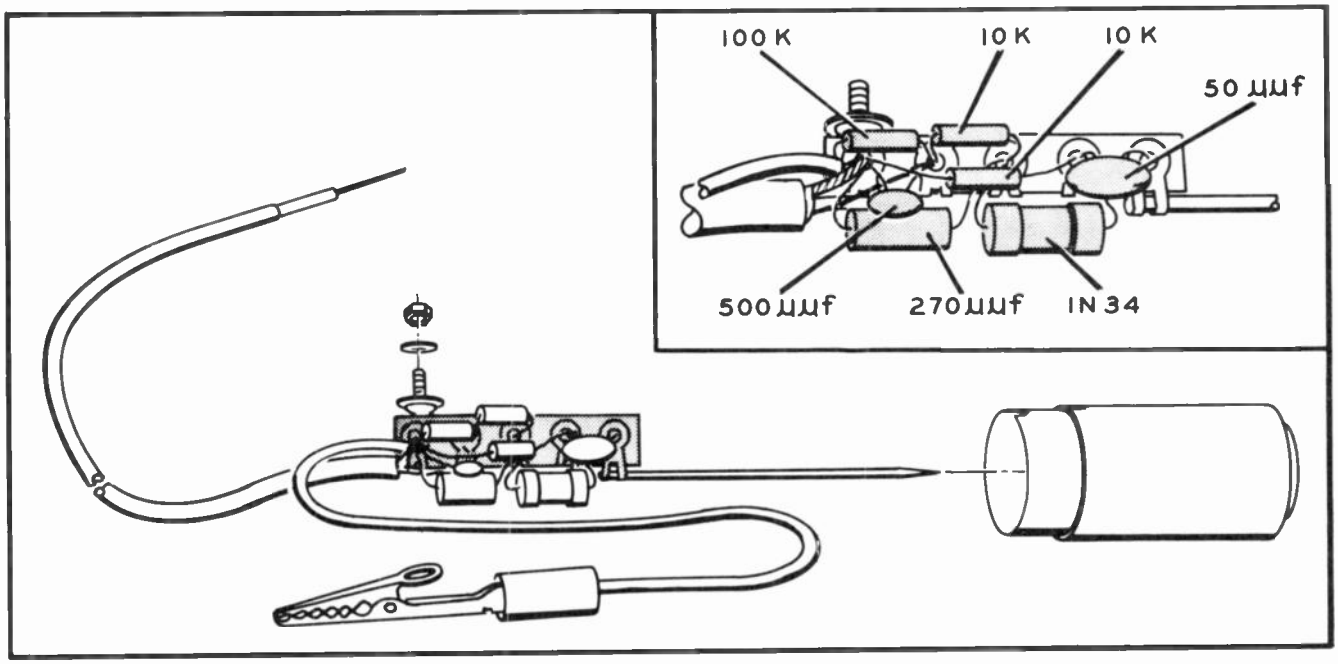

FIGURE 2

Consolette Window Adaptor Installation

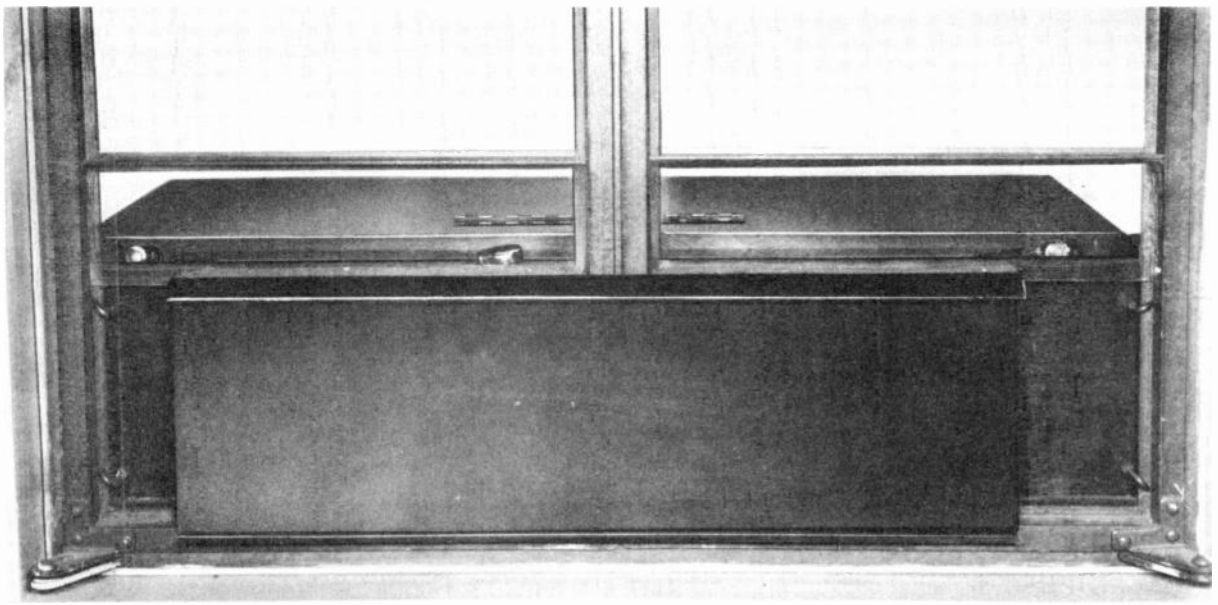

FIGURE 1

Throughout the country there are thousands of older office and public buildings which, due to local restrictions and building codes may not have equipment installed in them which projects beyond the building line.

To air condition these buildings with a central system would involve expenditures of very large sums of money. Yet they can and are being air conditioned very economically.

Where room requirements are such as to show a need for a ¾ or 1-ton air conditioner, Philco consolette models 180J, 184J, 1100J, and 1104J fill all requirements as to cost, installation, maintenance and service rendered.

To compare the cost factor of air conditioning, the owners of the Gulf Oil Building in Pittsburgh, Pa., had an engineering estimate for a central air conditioning system which would include the necessary duct work.

For this type system, the estimated cost was between $1,500,000 and $2,000,000. The Philco room air conditioners which are being installed in this building will cost between $225,000 and $300,000. Upon completion of the installation of all of the room type air conditioners, this building will be 90% air conditioned.

With the installation of the consolette air conditioner, it is not necessary to run an elaborate duct system, nor make radical building modifications. The room type unit may be adapted to fit any type of casement or double-hung window.

Where building modifications or renovations have been made to increase the useful space in a room, it is a simple matter to move the equipment from one location to another, or to add to it when additional air conditioning is required.

The desirable features of the individual air conditioner is the complete flexibility that it offers to any installation. The room air conditioner does a very good job dehumidifying the room air. It maintains far greater all-year round comfort, in that at any time, with the proper setting of the controls, outside fresh, filtered air is available. The user can be as hot, cool or as cold as he or she wishes to be.

Casement Window Adaptor Kit

The casement window adaptor kit, part no. ±4920-27, for the installation of consolette air con-

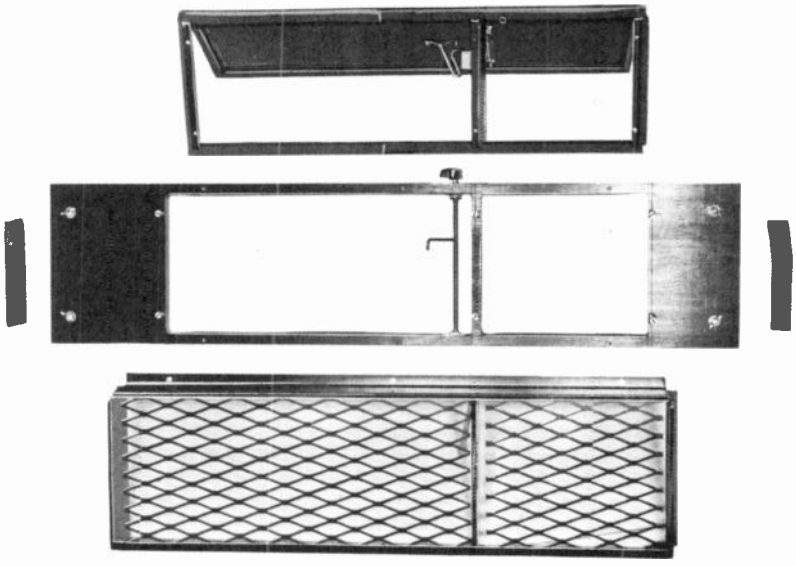

FIGURE 2

ditioners is supplied with the necessary window adaptor board, storm hood, adaptor air duct and foam rubber sealing strips (Fig. 2). It may be noted that the top and bottom of the adaptor board is equipped with a one-inch thick pliable sponge rubber for sealing of the board against the window glass and sash frame. To prepare the window for the adaptor, remove sufficient glass from the bottom of the window to provide an opening of at least 7″ high by 27½″ wide. The most convenient way of doing this is to remove the panes of glass from the window frame, cut the glass to the size required and re-install.

Place the adaptor board against the window (Fig. 3) with the grille centered on the opening formed by the removed window panes. The divider of the adaptor duct should be clear of the vertical window mullions.

In cases where the window is wider than the adaptor board, the board should be marked and then cut off one inch past the first upright window mullion beyond each end of the adaptor board grille opening. If the window width is less than the length of the window adaptor board, it should be cut to fit the window frame, as shown in figure 3.

With the window board temporarily held in position, apply pressure to it so that the rubber strips are pressed tightly against the window panes and vertical mullions. Mark the sponge rubber seal strips at each

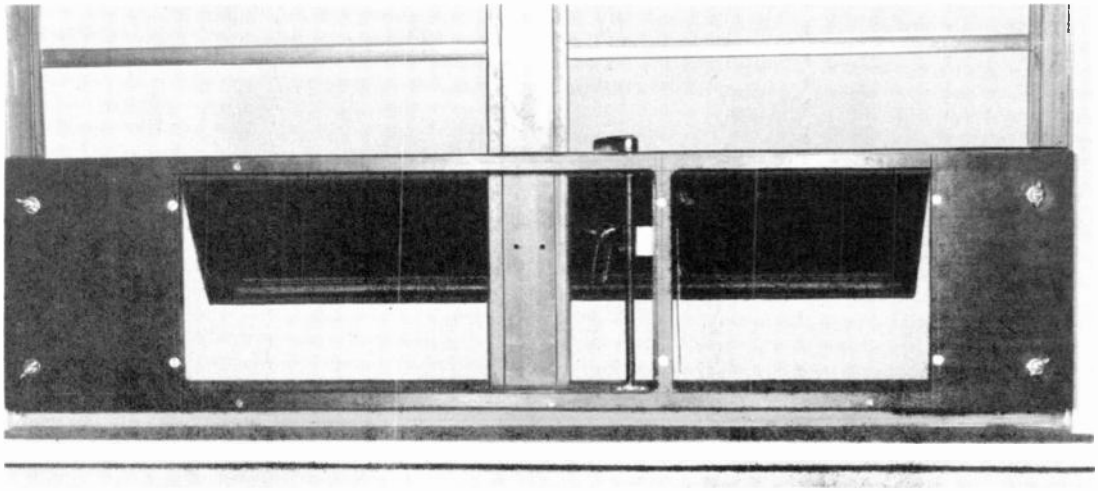

FIGURE 3

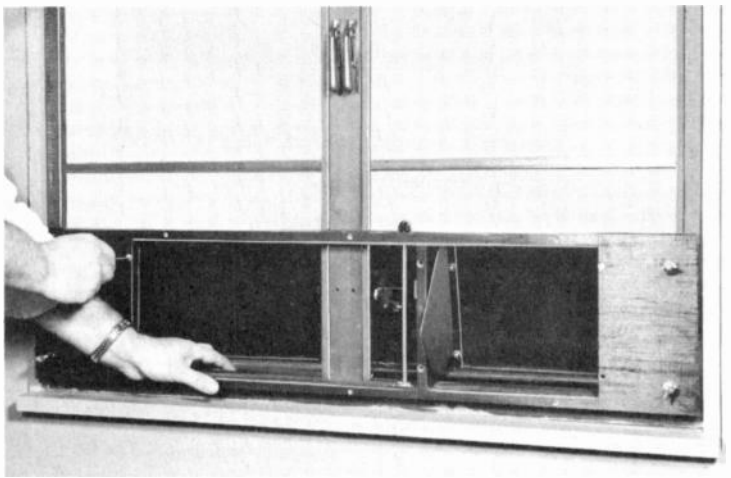

FIGURE 4

point where they come in contact with the vertical mullions. Remove the adaptor board and cut the rubber strips to a depth of a quarter-inch at a time until a snug fit around the window mullions is obtained. A sharp knife that has been dipped in water will make a clean cut in the sponge rubber strip. The adaptor board, when properly fitted and pressed against the window will seal itself around the mullions and engage the surfaces of the window panes and sill to insure an air tight, weather-proof adaptor to window seal.

Drill two holes in each end of the adaptor board in line with the mullions or window sill to accommodate the window adaptor board mounting hooks (Fig. 3). Install the two short pieces of sponge rubber on the ends of the adaptor board to seal against the window panes or sill to make the installation weather tight.

Affix the adaptor board to the window with the hook bolts; tighten them just enough to hold the board in place. Secure the storm hood to the outside of the adaptor board with the six 1½ inch machine screws on the center piece and end sections (Fig. 4).

Assemble the storm hood closing mechanism, as shown in figure 5. Fit the linkage arm loop over the lever assembly hook, place the washer on it and secure it in place with the cotter pin. The lever assembly will lock the storm hood in either the open or closed position.

Lock the storm hood in the closed position and in-

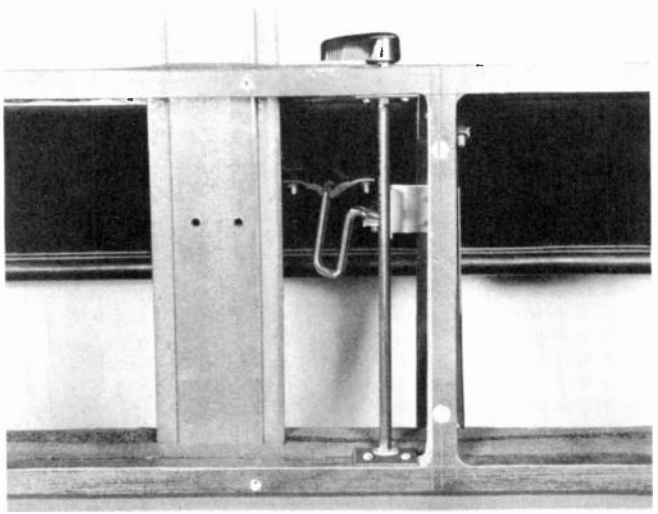

FIGURE 5

stall the window adaptor grille frame on the inside of the window board, making sure that the storm hood partition does not bind on the adaptor, the screen or the partition.

The window adaptor is now ready to have the air conditioner connected to it. If the adaptor is used in an installation where the window sills are wide, extension ducts may be added to the adaptor.

Double-Hung Window Adaptor

The standard installation kits supplied with the consolette air conditioners are for double-hung sash type windows, part no. #4920-26. They may be installed in window openings having a width of between 27 and 48 inches. By setting the adjustable legs on the air conditioner, window sill heights between 22 and 36 inches will accommodate the unit.

To install the double-hung window adaptor, assemble all fittings, sliding channels and filler boards, but not the top seal gasket prior to mounting it in the window. The filler board supplied is of the proper height, but must be cut to the proper width. To determine the exact width for the two end filler boards, measure the window width between the side moldings of the window frame. From this figure subtract 25¼" and divide the remainder in half. To cut the filler board, use a sharp instrument and score the board deeply on both sides to the required width. Use a straight edge when scoring to assure a true line.

By placing the board firmly on a flat surface with its scored mark at the straight leading edge, pressure can then be applied to the extended portion of the board to make a clean break. Insert the filler board in the side channels at each end of the adaptor. Cut the top and bottom seal gaskets to the full width of the window, as previously determined. Install the bottom seal gasket on the adaptor assembly. Place the complete adaptor, less the top seal gasket in the window aperture. Make sure that the outer edge of each side channel is flush with the window slide so that if need be, the window may be closed.

Seat the adaptor firmly in the window to properly position the bottom seal gasket, and mark the window frame molding for the four channel mounting screws. Remove the adaptor and use a drill that is slightly smaller than the size of the mounting screws to drill guide holes to prevent splitting of the window sill. Insert the adaptor in the window and secure it with the four wood screws that are supplied. Affix the top seal gasket on the adaptor to complete the installation. Lower the window completely and check for proper closure of the storm hood. With the window adaptor properly installed (Fig. 6) the top sliding channels and the adaptor top seal gasket must be flush against the window frame molding.

Between Window Seal

A felt strip is provided in the double-hung window adaptor kit to seal the upper and lower sash. Cut the strip to the width of the window and cut out a small semi-circle in the center of the strip to clear the window latch. Tack the felt strip to the top of the lower window frame with a number of small nails spaced about four inches apart to make an air tight seal between the upper and lower windows.

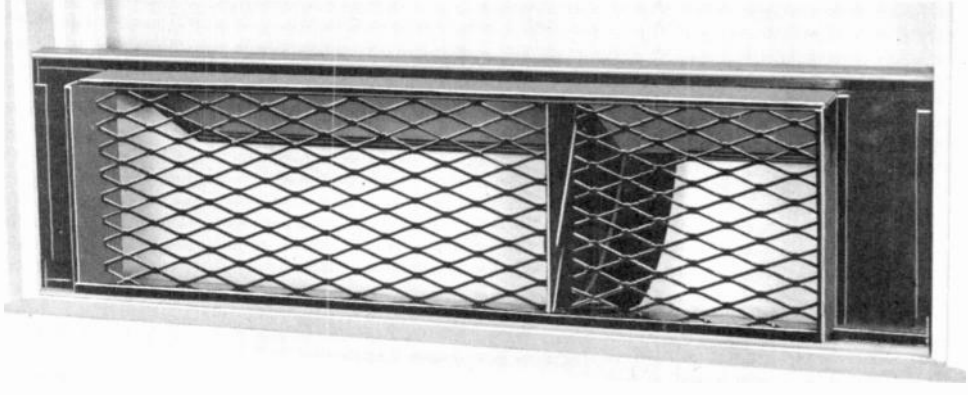

FIGURE 6

This month . . .

VIC HAUGEBERG, Philco Service District Representative for the Central Division, discusses you and your service shop. Vic joined Philco in 1946 in the TechRep Division. For a period of four years he served as Field Service Representative for our Los Angeles Distributor, covering all Philco products. In 1952 he returned to Service Headquarters in his present capacity.

In my opinion . . .

. . . your customer's first impression of you and your service shop is long lasting and usually correct as to your ability and the quality of your work.

Stand back and take an objective view of yourself and your working area. If you were the customer would it give you the impression of a thorough and conscientious service technician? Can you say to yourself the first impression would inspire confidence in your ability? In this objective picture do you see a person who looks like a progressive business man? If not, you are making a poor impression. Now turn to your service-shop. Can you look at it and say it appears to be intelligently operated? If you cannot say this in honesty to yourself, what can you do to insure the trust and confidence of present and future customers with a minimum of financial expense and time?

You are operating a business either for yourself or for someone else exactly the same as any other business organization. Do you act and dress that way, with a ready smile and a shop or work coat as needed? You will contact customers not only in your shop but in their home so your appearance is doubly important. They have the right to expect no less of you.

In your shop, a few minutes a day devoted to keeping your records properly, your tools in a place provided for them, thoroughly cleaning your working area including the floor and a neat arrangement of unfinished as well as completed work will pay many dividends.

The above will not make a good service technician out of a mediocre one, but it will increase customer confidence in you and your work. This will give you an opportunity to up-grade the work you do, consequently increasing your financial return. More important, however; it will instill in you more personal confidence. This will lead directly to more customer satisfaction . . . the basis of your business!

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