

PHILCO SERVICE SUPERVISOR



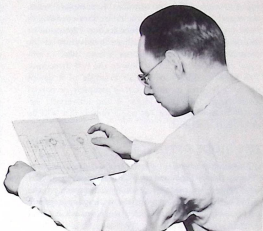
MAY 1953

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AM DIODE DETECTORS



THE purpose of a detector in a radio receiver is to reproduce the intelligence transmitted on a modulated radio wave. Most systems of radio communication, with the exception of FM, transmit the intelligence by amplitude modulating, or varying the amplitude of, the radiated wave. The process of detection or demodulation must, therefore, produce a voltage output that varies in proportion to the amplitude modulated signal. This result is accomplished by rectifying the modulated signal so that a pulsating, direct current is obtained whose magnitude is proportionate to the original signal.

A perfect detector should reproduce, as its output voltage, the intelligence impressed upon the original wave, unaltered in any way. Should the circuit fail in any respect, distortion is present in one of several forms. These forms of distortion are as follows: Frequency distortion occurs when the system discriminates against some of the modulating frequencies so that the output is also dependent upon frequency instead of solely upon amplitude. Amplitude distortion is a condition which

(Continued on Next Page)

(Continued from Front Cover)

exists when the output contains frequencies that were not a part of the modulated signal as originally transmitted. Phase distortion is the last form and is present when the frequency components of the transmitted signal are reproduced in changed or altered phase relationship.

Detection of modulated voltage waves is performed by some form of rectifier which is a device or circuit which gives unequal changes of current in response to changes of voltage of equal amplitude but opposite sign. This rectification is complete when the signal is impressed upon a device that conducts in only one direction. Partial rectification (detection or demodulation) occurs when there is curvature of the current-voltage characteristic or where there is unequal resistances to current flow in the two directions. The high vacuum diode is an example of a device that may be used to obtain either complete or partial rectification. Since the diode is the universally accepted form of detector for home radios, this will be the circuit described.

THE DIODE DETECTOR

The simplest form of detector is the diode or two-element tube. Since current only flows through the tube when the plate is positive in respect to the cathode, this tube, in conjunction with an appropriate circuit such as illustrated in figure 1, makes an ideal rectifier or detector.

In Figure 1, the RC combination is the load across which the rectified output voltage is developed. The mode of operation of a diode detector with a signal voltage applied can be understood with the aid of figure 2. Diode current flows only for an instant at the peak of the carrier voltage in the forward direction. The pulses of current charge up the load by-pass condenser, C, to nearly the same voltage as the

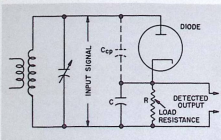


FIGURE 1

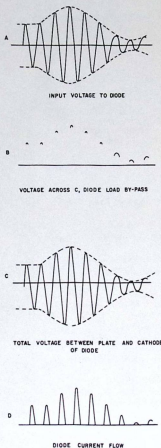


FIGURE 2. Wave Forms Showing Detector Action

carrier envelope, and bias the diode beyond cutoff except during the short pulses. Between carrier peaks, the plate of the diode is less positive than the cathode as a result of the negative charge on condenser C, so that the tube is cut off—no current flow through the diode. Since the reverse current which flows in a high vacuum diode is so infinitesimal, it may be considered as a perfect rectifier. Therefore, neglecting the slight high frequency variation between pulses, the voltage across the load resistance is proportional to the carrier envelope.

During this interval, when the signal is on its downward swing and then rising to approach the charge across C, some of the charge upon condenser C leaks off through the resistance R. This loss of charge across C is replenished at the next peak of the modulated wave. When a state of equilibrium exists, the voltage charge across the load by-pass condenser C is sufficiently less than the peak voltage of the applied signal so that the difference between the two, which is actually the voltage between the plate and cathode of the diode, is just sufficient to produce the plate-current pulses needed to recharge the condenser by that amount which has leaked off between crests. Or, the same result is accomplished when the charge, which is replenished at each pulse, leaks off sufficiently before the following crest to allow the bias voltage (the charge across condenser C) to follow the carrier envelope at its maximum slope.

In the usual circuit R, the load resistance is much greater than the diode plate resistance. Consequently, the above-mentioned equilibrium corresponds to a voltage charge across condenser C that is only a bit less than the crest value of the impressed radio-frequency signal. In this case, the voltage appearing across the load resistance R is in proportion to that of the peak amplitude of the input wave. Therefore, as the envelope amplitude changes due to the modulation, the voltage across R will change proportionally, thereby faithfully reproducing the modulation envelope and converting the intelligence modulated on the r-f carrier wave into an audio voltage.

DETECTION EFFICIENCY

In the design and operation of diode detectors there are several characteristics worth consideration. One of these is the detection efficiency which is equal to the ratio of the d-c output voltage, E_d , which is developed across the load resistance R to the peak value

of the applied voltage E_s —thus $n = \frac{E_d}{E_s}$. It can be

shown mathematically that the detection efficiency can

be made high by making the load resistance R large in comparison with the diode plate resistance R_p . Under conditions normally employed in practical cir-

cuits the ratio $\frac{R}{R_p}$ is of the magnitude of 20 to 100

which would correspond to an efficiency of between 80 and 95%. This efficiency can be easily ascertained by impressing a sine wave signal voltage to the input of the detector and measuring the voltage output resulting in direct current flowing in load resistance R. This determination may be made using an audio voltage and a value of C large enough to be an efficient by-pass across the load resistance R for the audio frequency employed. Ideally, a diode which has a linear relationship between plate current and plate voltage will exhibit an efficiency which only depends upon

the ratio $\frac{R}{R_p}$ and is not effected by the amplitude of

signal voltage. However, with the slightly curved characteristics of actual diode tubes, the efficiency increases somewhat as the signal strength increases.

POWER ABSORPTION

Like any other device, a detector absorbs power from the input signal voltage and thus has a definite loading effect upon the input circuit, which in most cases is the secondary of an i-f transformer. This loading of the input circuit by the detector can be represented as a resistance shunted in parallel with the diode input circuit. Where the detection efficiency n is high, this equivalent input resistance is nearly

equal to $\frac{R}{2n}$ and thus the equivalent loading resist-

ance is slightly greater than one-half the load resistance R. This input loading can be shown by developing the equation for power loss as follows: Diode current only flows when the signal voltage is at or near its crest value. This is shown in figure 2. The power absorbed by the detector input is, therefore, only slightly less than the product of the peak signal voltage and the average current through the diode.

Since the average current is equal to $\frac{nE}{R}$, where the

output voltage across R is equal to nE and E is the crest value of the signal voltage, the power loss can be written as follows:

$$\text{Power loss} = \frac{nE^2}{R} = \frac{(\text{effective signal})^2}{\frac{R}{n^2}}$$

The denominator of this last term represents the equivalent input resistance to the signal, which is as

$$\text{above } \frac{R}{Z_n}.$$

It can be seen from the above equations that a high load resistance reduces the power absorbed by the detector circuit because with a high load resistance the energy dissipated in the load is less in proportion to the voltage across it. The input resistance of a diode detector tends to be independent of the signal voltage in the case of an ideal tube. But, since in practical tubes the diode characteristics exhibit some curvature, the input resistance tends to drop to some extent with small applied signal voltages.

DISTORTION

The basic diode detector shown in Figure 1 may not reproduce the modulation envelope faithfully. This may be due to a lack of proportionality between the applied signal voltage to the diode and the rectified voltage which is developed across the load resistance R . Or, as a result of the inability of the developed voltage across C and R to follow the envelope of modulation when the modulation frequency is high.

The first cause of distortion, lack of proportionality between modulation envelope and developed output voltage is a result of curvature in the diode's characteristic. This causes the detection efficiency to vary in accordance with the envelope amplitude. Trouble of this form may be minimized by using a load resistance that is high as compared to that of the diode plate resistance. It is also very helpful in this respect to present a reasonably high carrier amplitude to the diode. This moves the detector operating point up from the curved portion of its characteristic. Under these conditions, the detection efficiency will then be high at all times even if not constant and the rectified voltage developed across the diode load resistance will be able to follow the modulation envelope with ease. Under practical conditions where the load resistance and signal amplitude are sufficiently high to give a detection efficiency of 80% or better, the distortion from this source is of the magnitude of 2% for 100% modulation.

The second source of detector distortion is caused by the inability of the developed charge across C to follow the modulation. The voltage across the load condenser C can die away only as fast as the charge can leak off through the load resistance R . This, therefore, sets a limit to the highest frequency of envelope modulation that can be detected without distortion.

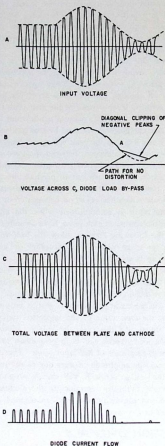


FIGURE 3. Wave Forms Showing Diagonal Clipping

This is illustrated in figure 3, where conditions are such that, beginning at the point A, the slope of the envelope drops off at a faster rate than the voltage across condenser C can leak off through the load resistance R. This results in a diagonal clipping of the modulation envelope and produces an output voltage exhibiting both amplitude and frequency distortion. This form of distortion can be eliminated by proportioning the resistor-condenser combination of the diode load so that their time constant is fast enough to allow a rate of voltage decay so as to follow the highest modulation frequency of importance. To attain this it is necessary to satisfy the equation

$$\frac{X}{R} > \frac{m}{\sqrt{1-m^2}} \text{ where } X = \text{the reactance of the}$$

effective load shunting capacity C at the modulation frequency, R = the resistance of the load resistor and m = the degree of modulation. This equation is derived as follows: The rate of change of voltage across condenser C charged to a voltage E', caused by leak-

age through a resistance R, is $-\frac{E'}{RC}$. From the equation

of the envelope of the modulated signal the rate of change of the envelope is determined. From this, the magnitude of the envelope at any time t can be given. The grid condenser rate of discharge can follow the rate of change of the modulation envelope at any

time t of the modulation cycle provided: $\frac{X}{R} =$

$$\frac{1}{2\pi fCR} > \frac{m \sin 2\pi fto}{(1+m \cos 2\pi fto)}$$

itself in a moment. The point on the modulation cycle where it is most difficult for the load condenser charge to keep up with the envelope change is at a time t, that makes the right hand member of the last equation maximum, which is when $\cos 2\pi fto = -m$. The maximum value of the right hand member of the

equation is, therefore, $\frac{m}{\sqrt{1-m^2}}$ and the charge on the condenser can decrease at least as fast as the modulation envelope changes when

$$\frac{X}{R} > \frac{m}{\sqrt{1-m^2}}$$

From this equation, it is to be noted that for $m = 1$ (100% or complete modulation) it is impossible for

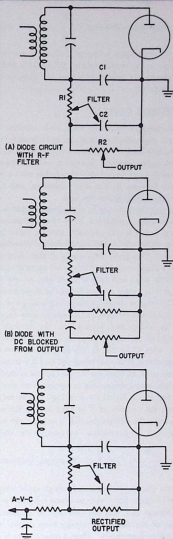


FIGURE 4. Typical Diode Detector Circuits

the output voltage to follow the modulation envelope at the troughs (point of most rapid change) of the

modulation cycle. However, if $\frac{X}{R} = 2$ or 3, it is pos-

sible for the output voltage to follow the modulation envelope up to modulations of 0.9 to 0.95, and even with completely modulated waves, the distortion will be quite small.

DETECTOR DESIGN

The desirable properties for a diode detector are as follows: high efficiency, high input resistance (to lessen loading on the tuned input circuit) and low distortion. Best over-all operating results require a reasonably large carrier voltage together with a proper balance between R , the load resistance, and C , the shunting capacity across the load.

The capacity C should be as small as possible in order to have a high reactance X to the modulation frequency, but it is also necessary that its value be five to ten times the diode plate-cathode interelectrode capacity. This latter requisite is so that most of the signal voltage available will be used up as drop across the diode tube, and only a small part of the signal voltage will appear as drop across the diode condenser C . The value of diode capacity commonly employed is between 50 and 100 mmf. This includes stray capacities such as socket and wiring and the interelectrode capacity of the diode, since these are effectively in shunt with C as far as the modulation frequency voltage that is developed across the load R is concerned. In some cases, especially when the cathode is grounded, the stray capacity from the tuned input to ground is sufficient to furnish all the shunting capacity required.

Since the capacity of C is fixed by the above considerations, the load resistance R is assigned the highest value that is permissible to satisfy the equation

$$\frac{X}{R} > \frac{m}{\sqrt{1-m^2}}. \quad \text{A high resistance increases the}$$

detector efficiency and makes for high input resistance to the i-f signal, but at the same time it limits the speed of discharge of C and can thus tend to introduce distortion of the diagonal clipping form at the higher modulating frequencies. Thus, a compromise is necessary and the resistance of R is usually such that at the

highest modulation frequency of importance $\frac{X}{R}$ is equal to from 1 to 3.

In practical detector circuits, such as those shown in figure 4, it is necessary to provide a filter so as to prevent any radio-frequency voltage components from reaching the output. In this filter the condensers C_1 and C_2 are usually equal, while R_2 may be several times larger than R_1 . With this filter added, the value of the load resistor R is now equal to $R_1 + R_2$ while the effective diode capacity C is between C_1 and $C_1 + C_2$. While the filter has the beneficial result of removing the i-f components from the output, it also

reduces the output by the factor $\frac{R_2}{R_1 + R_2}$ as a result of the voltage drop across R_1 .

COMPLEX LOADS ACROSS PRACTICAL DETECTORS

In practical detector circuits, it is often desirable to block the direct current component, developed across the diode load resistance, from the output so that only the audio voltage will be presented to the following grid. A circuit using the necessary resistance-condenser combination for d-c blocking is shown in figure 4 (b). Some circuit designs also make use of the direct current component across the load R for automatic volume control. This arrangement is shown in figure 4 (c). It can be seen that the direct voltage is picked off and the audio filtered out for a-v-c while the audio for the following amplifier is taken from the same point through a condenser, thus blocking the dc from the volume control.

These modifications cause the impedance that is offered to the modulating frequency component of the output voltage to differ from, and usually be less than, the resistance that the diode load circuit offers to the rectified direct current.

This d-c resistance to a-c impedance unbalance is caused by the variation in reactance of the d-c blocking condenser, a-v-c filter condenser, and i-f filter condensers at different modulation frequencies. This resistance to impedance unbalance can cause amplitude distortion as follows: When the modulation degree is high, the negative peaks are clipped off as shown in figure 5. An unmodulated carrier wave produces a direct current component. When the carrier is modulated, an alternating current of modulation frequency is superimposed on the direct current. The magnitude of this a-c current is such that the voltage drop across the a-c load impedance is just less than the crest a-c voltage of the modulation envelope. Since the impedance of the diode load to a-c is less than the resistance to d-c, then the a-c current through

the diode will be larger than if the a-c impedance were equal to the d-c resistance. From figure 5, it is obvious that the maximum amplitude that the a-c component can have without distortion is a peak value equal to the d-c produced by the carrier. This is due to the superposition of the a-c modulation component upon the d-c. Where the two amplitudes are equal, the current through the diode reaches zero during each modulation cycle. If the a-c amplitude is greater, the diode current will only go as far as zero, thus negative peak clipping. Therefore, the maximum degree of modulation allowable without distortion is given by this equation:

Max. allowable degree of
m for distortionless

detection $\frac{\text{—load impedance to modulation freq.}}{\text{—load resistance to DC}}$

—load resistance to DC

Whenever the degree of modulation exceeds the value above, negative peak clipping will result.

The impedance that the diode input offers to the sideband frequencies is not the same as that offered to the carrier. As we have seen, the input resistance

to the carrier is $\frac{R}{2n}$ where R is load resistance and

n is detection efficiency. The input resistance to the

sideband frequencies is $\frac{Z_m}{2n}$ where Z_m is the im-

pedance of the diode load circuit at the modulation frequency. Therefore, when the impedance of the diode load circuit is less for a-c than for d-c, the sideband components of the input modulated wave tend to be reduced. This lowers the effective degree of modulation of the applied wave below that of the actual signal by an amount depending upon the ratio

$\frac{Z_n}{R}$. When the output impedance of the source of

is high and the ratio $\frac{Z_n}{R}$ is appreciably less than

unity, the resulting reduction in degree of modulation is considerable. This effect makes it easier to satisfy the equation for maximum degree of modulation for distortionless detection and thus tends to reduce amplitude distortion that would otherwise occur at high modulation levels.

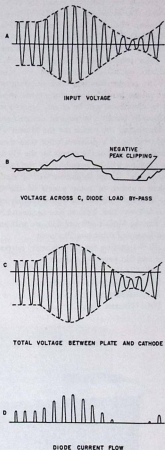


FIGURE 5. Diode Clipping When Diode Load Offers Lower Impedance to Modulation Frequency Than to Direct Current

Color Overlay Panels

This year Philco has designed five of its 1953 Electric Ranges to include "Color Overlay Panels." These panels provide four different colors for each of the five models. The Models D-839 and D-439 have the following colors: Red, Key Largo, Yellow and Platinum. The Models D-435, 437 and 835 can use Red, Yellow, Key Largo or Neutral Gray Color Overlay Panels.

The color panels will be supplied to our factory individually packed in cartons that are substantial enough to permit handling and shipping without damage to the panel. The color of the panel contained in the carton will be clearly marked on each end, either by label or by printed designation. The labels identifying the panels for the Models 435, 437 and 835, will be of a different color than those used to identify the color of the panels for the 439 and 839 ranges. Ranges will be assembled by the factory less overlay panels. Range shipments will be made with equivalent number of color panels of the dealer's choice. For your information we are identifying these colors as follows: Red, Yellow, Key Largo and Neutral Grey. For the Models 439 and 839, we will omit the Neutral Grey and substitute Platinum.

We are designating for identification purposes the 435, 437 and 835 panels as follows:

- P5R (Red)
- P5L (Key Largo)
- P5Y (Yellow)
- P5G (Neutral Grey)



FIGURE 1



FIGURE 2

The Panels for the 439 and 839 will be designated:

- P9R (Red)
- P9Y (Yellow)
- P9L (Key Largo)
- P9P (Platinum)

In this list you will note there are two types of Color Overlay Panels. Type P9, shown installed on a D-439 (Figure 1) has provisions for viewing the color control lights above the surface unit switches. To the right of the Quick Set Timer an oven indicator will be noted. The Double Oven Ranges will have an indicator light for each oven. Type P5, shown installed on a D-835 (Figure 2), has a Quick Set Timer Face-Plate installed on it as a part of the overlay panel. There are four indicator disks positioned above the surface unit switches. The 1953 Philco Electric Range has Color Overlay Panels as a part of their physical make-up to provide good interior decorating in any color kitchen. The panels must be studied from an installation standpoint.

INSTALLATION OF COLOR PANEL ON MODELS D-439 & D-839

1. Facing the front of the range, remove four (4) switch knobs and the three (3) clock knobs from the control panel.

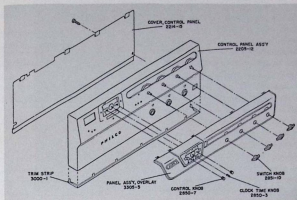


FIGURE 3

- a. Pull the switch knobs forward to remove.
 - b. Pull the two outside clock knobs forward.
 - c. Set minute hand at either 3 or 9, then unscrew center knob counter clockwise.
2. Facing the rear of the range, remove the control panel back cover by:
 - a. Taking out the thread cutting screw located on the left-edge of the control panel.
 - b. Loosen the similar screw on the right-edge of the control panel.
 - c. Slide the back cover off the control panel.
 3. Facing the rear of the range, remove the left 40 watt lamp from its socket, located under the clock. This operation is necessary to expose a screw hole used in mounting the overlay.
 - a. Remove the five (5) thread cutting screws from the top back flange of control panel.

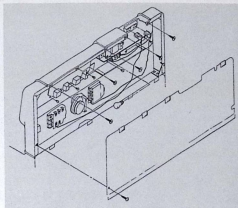


FIGURE 4

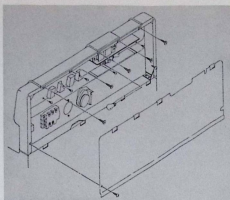


FIGURE 5

b. Slide Color Overlay Panel into position, being extremely careful that the three control shafts on the Quick Set Timer line up with the holes in the clock crystal. Do not attempt to use any force in pushing overlay panel in position, as clock crystal will crack.

c. Bend down against the control panel the five (5) tabs, also two (2) tabs on clock bezel.

d. Reinstall the five thread cutting screws removed in Step A through the overlay tabs.

4. If the gold trim on the clock does not fit into

the opening in the clock face mounted in the overlay panel,

a. Loosen the two (2) screws attaching the clock mounting bracket to the control panel.

b. Align the clock face with partial face in the bezel and retighten the screws.

5. Insert the oven pilot lamp into the plastic lamp holder located on right side of control panel, looking from the rear. The right oven lamp is to be placed

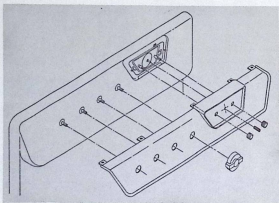


FIGURE 6

in the right hand opening. On single oven ranges the lamp is to be placed in the left opening.

a. Replace the 40 watt lamp which was removed to gain access to one of the mounting screw holes.

b. Replace back cover.

6. From in front of the range, replace the four (4) switch knobs and three (3) clock knobs.

The installation of overlays on D-435, D-437 and D-835 use the same methods described for installation on D-439 and D-839.

A breakdown on Type P9 used on Models employing Philco Thermo-Color Control is shown in Fig. 3 (TP2-3144). From this breakdown it will be a simple matter to follow a repair procedure.

To replace indicator window or indicator window bezel,

a. Remove switch knobs.

b. Remove rear control panel.

c. Remove Color Overlay Panel.

d. Remove the indicator window bezel by bending the mounting tabs.

e. Remove the bezel and remove the window.

The overlay panels have undergone severe tests in Philco Labs. They were tested for strength of material, lasting quality of the paint. It's resistance to heat, boiling hot fats and steam. All these tests had to be passed before the Color Overlay Panel could become part of the Philco Line for '53.

ADVANTAGES OF ELECTRIC COOKING

In addition to the actual service we render our customers in the form of repairs and adjustments to their appliances, the service man is often called upon to keep appliances sold through conversation with the customer. This can only be accomplished by knowing the advantages the appliance has over other features offered by competitive products.

In the case of electric ranges, the service man should be able to convince his customer that he has made the proper choice in her purchase of an electric range.

There are many advantages electric ranges can claim over any other type of cooking equipment on the market today.

ELECTRIC COOKING IS CLEANER

Philco's high speed electric heating units are flameless, free of soot and apply heat directly to the cooking utensils. Cooking utensils such as pots and pans need not be scoured or scrubbed to remove soot and stain. These utensils may be washed in ordinary soap and water to restore their original gleaming finish. Kitchen cabinets, curtains and walls remain clean in an electric kitchen. The electric range never produces the greasy scum on kitchen surfaces which are always associated with flame type cooking devices. The new Philco Range is constructed with one piece porcelain enameled steel panels which are as smooth and white as the china plates from which food is eaten. Philco Electric Ranges are easy to keep clean, as the oven elements and surface units are removable and food spillage can be easily wiped from the reflecting pans beneath. Contrast this feature with food spillage in the gas range. The food spillage on a gas burner can often times extinguish the flame and more often clog the burners, creating deposits of soot and carbon, to say nothing of the safety and health hazards created.

ELECTRIC COOKING IS HEALTHFUL

Food cooked the modern electrical way preserves the food values to a much greater extent than any other method. When food loses a large part of its vitamin and mineral content as well as some of its flavor during the cooking process, its value decreases. Many tests have been made by independent dietitians and by organizations such as the Home Economics Institute. Results of the tests prove that modern electric cooking loses an average of 9.0% of vitamins A, B, B² (G), C and PP. Gas cooking, on the other hand, loses an average of 33.7% of these same vitamins or over 3½ times the loss of valuable vitamins.

The reasons why electric cooking retains more food nutrition than gas is because food can cook with little or no water in covered utensils without stirring. Cooking can be started faster and cooked quicker, and violent boiling can be avoided. Direct contact with the cooking utensil makes cooking with little or no water possible. Intense surface unit heat bringing vegetables to steam in the high position is responsible for the speed. Accurate heat control eliminates violent boiling. Even heat distribution permits cooking in covered containers without stirring. All these advantages are available through electric cooking alone. A plus value not obtained by any other method.

Freezer Major Component Reference

FREEZER MODEL	SEALED UNIT PART NO.	SEALED UNIT MODEL NO.	STARTING RELAY PART NO.	OVERLOAD PART NO.	TEMP. CONTROL PART NO.	FAN MOTOR PART NO.
H-183	5251-1		5192-39	5198-26	5530-115	5104-11
GH-122	5250-304	RU4R-16	5192-33	5198-16	5530-83	5104-5
GH-82	*5250-303	RU5R-16	5192-35	5198-13	5530-83	5104-6
GH-825	*5250-303	RU5R-16	5192-35	5198-13	5530-124	5104-6
FH-81	*5250-303	RU5R-16	5192-5	5198-13	5530-83	5104-6
EH-121	*5250-304	RU4R-16	5192-7	5198-16	5530-83	5104-5
DV-301	5250-255	RU3R-16	5192-6	5198-7	5530-76	
DV-151	5250-254	RU2R-16	5192-7	5198-8	5530-76	
DH-81	5250-253	RU4H-16	**	***	*5530-67	
DH-41	5250-252	RU2L-16	**	***	5530-67	
AV-75	5250-202	RU1M-16	5195-13	***	5530-44	
AH-51	5250-201	RU1H-16	5195-13	***	5530-41	
AH-50	5250-201	RU1H-16	**	***	5530-61	
AH-25	5250-200	RU1L-16	5195-15	***	5530-45	
AH-24	5250-200	RU1L-16	**	***	5530-60	

	LID LINER PART NO.	HANDLE	LATCH	STRIKE	BREAKER FRAME	
					FRONT OR TOP	REAR OR BOTTOM
H-183	6012-128	6193-15	6051-28	6058-37	6141-388	6141-388
GH-122	6012-181	6193-15	6051-28	6058-37	6141-518	6141-518
GH-82	6012-178	6193-15	6051-28	6058-37	6141-517	6141-517
GH-825	6012-182	6192-97	6051-28	6058-37	6141-524	6141-524
FH-81	6012-106	6193-15	6051-28	6058-25	6141-339	6141-340
EH-121	6012-108	6193-15	6051-28	6058-25	6141-328	6141-331
DV-301	L.H. 6012-97 R.H. 6170-96	L.H. 6170-18 R.H. 6170-17	6051-25	6058-24	L.H. 6141-306 R.H. 6141-307	L.H. 6141-308 R.H. 6141-306
DV-151	6012-96	6170-17	6051-25	6058-24	6141-307	6141-308
DH-81	6012-92		6051-23	6058-15	6141-279	6141-279
DH-41	6012-93		6051-23	6058-15	6141-281	6141-281
AV-75	6012-62	6170-10	6051-17	6062-14		BREAKER FRAME
AH-51	6012-48		6051-16	6058-14		BREAKER FRAME
AH-50	6012-78	6192-68			6140-132	6140-133
AH-25	6012-57		6051-16	6058-14		BREAKER FRAME
AH-24	6012-57	6192-68				BREAKER FRAME

ALARM SYSTEM

When making a service call, you will be giving the customer the plus service which she will appreciate when you have checked the alarm system battery. This will assure her that the alarm system is operating perfectly, to warn her of interrupted freezer operation.

The battery operated warning bell will ring continuously if the temperature within the freezer should rise to approximately twelve (12°) degrees above zero. The alarm battery should be checked at least once a year. This can easily be done by shorting out the bell terminals on the back of the temperature control, to ring the alarm bell.

On the model H-183 and future models, an alarm test button is provided on the control panel. If the bell does not ring, the battery should be replaced immediately.

CABINET HEATER PART NO.	LID OR DOOR SEAL GASKET PART NO.	LID OR DOOR PANEL PART NO.
6450-29	6007-111	6246-113
6450-28	6007-123	6246-94
6450-27	6007-122	6246-95
6450-27	6007-122	6246-162
	6007-98	6246-95
	6007-97	6246-94
	6007-94	L.H. 6011-81 R.H. 6011-80
	6007-94	6011-80
	6007-90	6246-79
	6007-89	6246-80
	6007-45	6245-55
	6007-78	6246-47
	6007-85	6246-67
	6007-79	6446-48
	6007-79	6246-68

SEAL STRIP		STARTING CAPACITOR
RIGHT SIDE	LEFT SIDE	
6141-476	6141-476	5190-7
6141-476	6141-476	
6141-476	6141-476	
6141-525	6141-525	
6141-329	6141-330	
6141-329	6141-330	
6141-305 Center 6141-303	6141-305 Center 6141-309	5190-6
6141-305	6141-304	
6141-280	6141-280	
6141-282	6141-282	
6236-27		
6236-21		
6140-134	6140-135	
6236-22		
6236-22		

NOTES

* Replacement for original component.

** To determine the correct replacement relay or circuit breaker for any other model, it is necessary to note the number in block 5 of the motor-compressor code plate, and to refer to the following chart. The code plate is attached to the motor-compressor foot that is directly below the relay terminal box; block 5 is at the lower right-hand corner of the code plate (figure 1).

NOTE: The number in block 5 of the motor-compressor code plate is the suffix portion of the motor-compressor part number. By combining this number with the base number, 5001, the complete part number of the motor-compressor is obtained. Example: 5001-111.



TP-4097

FIGURE 1. Motor-Compressor Code Plate

MOTOR-COMPRESSOR and RELAY COMBINATIONS	
MOTOR-COMPRESSOR PART NUMBER	RELAY PART NUMBER
5001-71	
5001-74	5195-15
5001-50	
5001-54	5195-21
5001-77	5195-28
5001-78	5195-23
5001-24	
5001-48	5195-18
5001-92	5195-27
5001-90	5195-18
5001-116 5001-126 5001-111	5192-1
5001-109 5001-117 5001-127	5192-2
5001-118	5192-5
5001-112	5192-21

*** Part of Relay.

Report on UHF Field Surveys

The old adage that "anything new creates a panic" has never received stronger confirmation than that resulting from the nervous tensions that have built up around UHF. A great deal of misinformation liberally larded with out-right rumor has received wide circulation. This article deals only in facts—actual surveys of existing conditions—in an attempt to set the record straight.

Let us make clear at the outset that the performance of UHF has almost from the beginning exceeded all expectations. Naturally, however, in any new system there are "bugs" to be shaken out. At present the shakedown process is well advanced, and UHF has taken its place beside VHF as a thoroughly dependable system.

Philco has recently conducted UHF TV reception surveys (using TV-90 and TV-80 receivers) in the areas surrounding eight cities where UHF transmitters, with approximately 20KW, effective radiated power have been placed in operation. These cities together with the channel numbers of the UHF stations are listed below.

1. Atlantic City—Channel 46.
2. Jackson, Miss.—Channel 25.
3. New Britain, Conn.—Channel 30.
4. Portland, Ore.—Channel 27.
5. South Bend, Ind.—Channel 34.
6. Wilkes-Barre, Pa.—Channel 28.
7. York, Pa.—Channel 43.
8. Youngstown, Ohio—Channel 27.

In all but one of the areas surveyed operation appeared normal. The exception was the Atlantic City area. When the Atlantic City UHF transmitter first began operating, its performance was considered normal, in view of the overly cautious engineering estimates of the capabilities of UHF. As other stations came on the air it became increasingly apparent that Engineering estimates were being clearly exceeded, and that, for reasons which are as yet not clear, the Atlantic City area was not following the pattern established in these other areas.

In order to provide the servicemen with some sort of yardstick by means of which he can estimate the reliability of UHF reception at different distances from the transmitter and in the presence of different types of intervening terrain, three of these surveys have been selected for discussion—the Jackson, Miss., Youngstown, Ohio, and Portland, Ore., surveys. It is felt that in the areas surrounding these cities a sufficient variety of terrain features is available to permit the serviceman to locate a transmission path which closely approximates the particular condition in his own locality regarding which he desires information as to the type of reception possible. By noting the type of reception obtained in the survey along this path, the serviceman can estimate the reliability of reception at the particular point in his own locality in which he is interested.

The Jackson area will be considered first. A pictorial representation of the major terrain features of the area surrounding the city is shown in figure 1. The terrain is pictured as it might appear from an altitude of about fifty miles at 10 o'clock on a cloudless day. Distances from the transmitter are indicated by the concentric rings, and the type of reception obtained at various points is indicated by the letters A, B, C, D and X, according to the following code:

TYPE OF RECEPTION		PICTURE QUALITY
CLASS	A	Snow free picture with set operating at maximum contrast.
CLASS	B	Practically snow free picture possible at reduced contrast.
CLASS	C	Reliable, fringe type signals stable, easy to read, but containing snow.
CLASS	D	Picture and sound obtainable, but snow makes picture unusable.
CLASS	X	No signal.

Reception is Class A out to 30 miles from the transmitter because the terrain is extremely flat. The only



FIGURE 1

appreciable hill is at a distance of 20 miles on the transmission path to Mendenhall (32 mi., S. E.). The terrain at this point rises gradually to an elevation about 200 feet greater than that at Mendenhall, and the reduced signal strength at Mendenhall dramatically illustrates the shielding effect of such a terrain feature. At a point about 8 miles farther along this path the signal is again Class A, indicating that this point is beyond the "shadow" cast by the higher ground. Throughout the remainder of the area surveyed the signal strength decreases with distance exactly as would be expected over an area where variations and elevations are small.

The only exceptions are Forest (43 mi. E.) and the area beyond an irregular line running through Yazoo City (41 mi. N.), Vicksburg (36 mi. W.). A sharp drop, from an average elevation of 350 feet to an average elevation of 95 feet, occurs along this line, and the

terrain does not arise again until a considerable distance. Most of Yazoo lies on this slope and severe shielding is evident in the poor reception obtained in the low parts of the city. At Louise (52 mi.) 11 miles further on the same transmission base, the signal is normal although the elevation of Louise is not very different from that of the low sections of Yazoo city. At Vicksburg (36 mi. W.) the situation is similar; the low parts of the city are severely shielded. Delta (39 mi.) 3 miles further along the same base is severely shielded. Mound (44 mi.) and Tallulah (55 mi.) receive normal signals for points at their receptive distances from the transmitter.

The main exceptions are Forest (43 mi., E.) which is slightly shielded by higher ground, Vicksburg (36 mi., W.) which is quite hilly and Yazoo City (41 mi., N.), which is mostly on the far side of a 185-foot hill.

In general, the area surrounding Jackson is as nearly

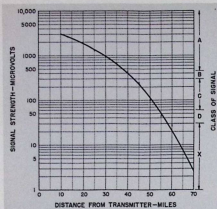


FIGURE 2

ideal for UHF transmission as one is likely to find anywhere. Therefore, the ranges at which satisfactory reception was obtained in this survey represent the maximums that may be expected with present levels of radiated power.

The Chart in figure 2 may be useful to the serviceman in establishing performance, purely on the bases of distance from the transmitter along a transmission base where the terrain is essentially flat. The Chart was prepared from the result of a survey in the Jackson area, using a corner-reflector type of antenna at a height of 65 feet during daytime.

Now consider the Youngstown area, which is shown in figure 3. Class A reception is obtained out to 20 miles except at Salem (16 mi., S. W.), E. Palestine (17 mi., S.) and Lisbon (21 mi., S.). The reception in these three locations falls to Class C because of hills in the transmission path. In the low sections of Lisbon reception falls off to Class D. Continuing in a southerly direction to E. Liverpool (32 mi.) we see that further intervening hills render the signal unusable. At Canton (43 mi., S. W.) a Class D signal is obtainable because the signal path skirts the hills around Salem. Alliance (27 mi.) which is closer on the same path, receives a Class A signal. At Akron (45 mi., W.) a Class C Signal can be obtained on the tops of the hills which are higher than those between this city and the transmitter; but the signal does not reach the low sections of the city. Actually, the terrain in this part of Ohio is generally considered to be flat; however, there are low, rolling hills present, and these

severely restrict UHF reception. At Kinsman (26 mi., N.) Class B reception is obtained because there are no appreciable hills in the transmission path, while at Greenville, to the east, reception varies from Class C to X because the city itself is quite hilly—the signal is strong on the hilltops and weaker in the low areas. At Mercer (24 mi., E.) similar situations prevail. Meadville (47 mi. N. E.) is completely surrounded by hills, and therefore no reception is possible. On the hilltops west of Meadville Class C reception is obtained. Grove City (30 mi. E.), itself is not very hilly and the transmission path is fairly level; therefore, the signals here are constantly Class B.

The principal characteristic of the terrain surrounding Youngstown is the presence of low, rolling hills. When these occur close to the transmitter, the general level is low in the sector beyond. When the cities themselves are hilly, reception varies from the best that can be expected at that range to complete blackout. Low hills at considerable distances from the transmitter cause poor reception immediately behind the hills, but better reception may be expected beyond the hill's "shadow."

The Portland area is shown in figure 4. Reception is predominantly Class A out to 20 miles, except for the Oswego (7 mi. S.) and Willamette (12 mi. S.) areas. A hill close to Oswego and in line with the path from the transmitter causes generally low signal levels in this city and is probably responsible for the prevalence of ghosts. In many parts of the city where the signal level is sufficient for a good picture, the ghosts render the picture unusable. Willamette, on the same path, also experiences ghosts, but the signal level here is somewhat higher because this city is near the outer limit of the "shadow" cast by the hills near Oswego. At Molalla (27 mi., S.) and Marquam (31. m., S.), farther south on the same path, there is no longer any shadow effect, and Class A reception is obtained. Along the valley of the Willamette River to the south, an ideal transmission path exists; the terrain is quite level and it rises slowly and uniformly with increasing distance from the transmitter. The result is that the curvature of the earth is counteracted to some extent, and Salem (43 mi., S.), Monmouth (54 mi., S.), Albany (64 mi., S.) and Corvallis (71 mi., S.) receive exceptional signals for localities at their respective distances from the transmitter. McMinnville (32 mi., S. W.) does not fare so well because of several intervening hills, while at Bellevue (41 mi., S. W.), 9 miles farther along the same path, reception is no worse because this locality is beyond the "shadow" of the hills above McMinnville. The Class B reception obtainable at Amity (37 mi., S. W.)

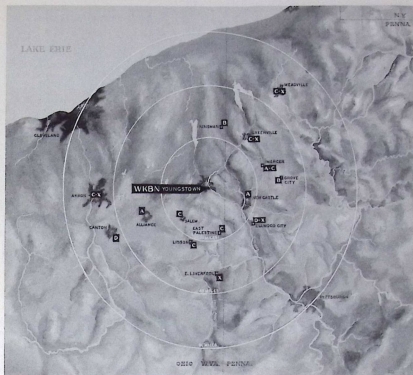


FIGURE 3

probably indicates that this locality also does not lie in the aforementioned "shadow." Naturally, the results obtained as one travels down the Yamhill River valley would not be expected to equal those obtained traveling up the Willamette River valley. Verona (33 mi., N. W.) is a typical example of a city in a valley which is completely shielded by extensive hills in the direction of the transmitter. Tillamook (55 mi., W.) of course, is not only very effectively shielded by a broad band of rugged hills, but it is also at a considerable distance from the transmitter. The fact that a slight trace of a signal was obtained here is more than a little surprising. The path through St. Helens (24 mi., N.), Woodland (27 mi., N.), Kalama (35 mi., N.), Longview (44 mi., N.) and Castle Rock (53 mi., N.) again approaches the ideal, and good signals are obtained. However, ghosts are a problem in

Kalama, Longview and Castle Rock, probably as a result of the proximity of high ground along the transmission path. The valley of the Columbia River becomes very narrow to the east, with the result that the signal does not penetrate very far along the valley. At Government Camp (49 mi., E.) a good signal is received because this point is higher than any point in the transmission path.

The Portland area is typical of as rugged a terrain as one is likely to encounter in the vicinity of a large city. Fortunately, cities in such areas are usually located at the confluence of sizable rivers, and the surrounding communities are usually located in the river valleys. Under such conditions the transmitter will be located so that the signal may travel unhindered along the valleys. Where the valleys are wide (20 miles

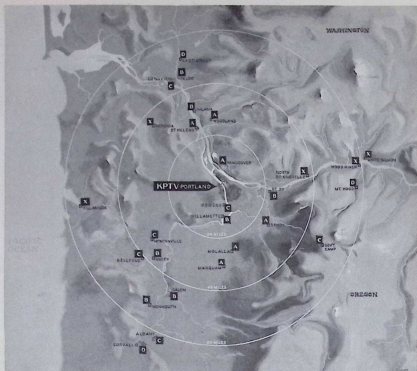


FIGURE 4

or more), excellent results are possible; the narrower the valley, the less the possible penetration. Furthermore, because of the many opportunities for the establishment of multiple transmission paths as a result of reflections from hills, ghosts are usually one of the major problems in such areas.

Now a few final words to aid the serviceman in the proper evaluation of the survey results that have been presented. The observations were made primarily during daylight, and there are definite indications that nighttime signals will be somewhat stronger, especially in the fringe areas (in one case, at 40 miles the signal doubled after sundown); therefore, during the heaviest viewing periods the signals will, in general, be better than has been indicated. Also, an all channel UHF

Corner-Reflector Antenna was used. Naturally, better results may be obtained by the use of Single Channel Yagis. Furthermore, all of the UHF stations will increase their power tenfold within the next year or so, with the result that ranges may be increased slightly and signal levels in the present service area will surely be improved.

As was expected, UHF radiation exhibits greater "stiffness" than VHF radiation; that is, it behaves more nearly like light. It has less tendency to follow the earth's curvature, and it is more seriously affected by hills and other obstructions. But on the credit side it has the definite advantage of complete freedom from the effects of electrical disturbances—natural or man-made.

Automatic Refrigerator Cabinet Adjustments

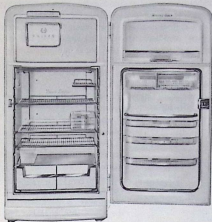


FIGURE 1

In servicing the automatic refrigerator, the importance of proper installation, cabinet adjustments and seals cannot be stressed too highly. Since all refrigerators are dependent on their ability to isolate the cold storage area from the warm kitchen, anything that causes air leakage into the cabinet will reduce the efficiency of the refrigerator.

A customer may complain of excessive sweating or that the food is not being kept at a proper temperature. In this instance, the serviceman is apt to ignore the obvious and concentrate on finding a non-existent trouble in the refrigeration system, when the cause of the trouble lies in a misaligned seal gasket or a poorly adjusted door strike.

CABINET LEVEL AND INSTALLATION

To avoid vibration and to insure that the cabinet door opens and closes properly, a refrigerator that is being installed or re-located in the kitchen or pantry should be leveled. A check should also be made to determine if the motor compressor assembly is receiving adequate ventilation.

For leveling the refrigerator, supports are provided at all four corners of the cabinet base (Fig. 2), to compensate for uneven floors. The leveling feet should be adjusted in or out so that the refrigerator

sets solidly on the floor with no side sway and no front to back tipping. Open the refrigerator door approximately ten inches; if the door swings closed of its own accord, the front of the cabinet is too high so that the front feet have to be screwed in to lower it. Conversely, if the door swings open, the forward supports will have to be screwed out. The supports should be adjusted until the door of the refrigerator will remain in any open position.

If the refrigerator is in an alcove or enclosed space, there should be an allowance of 2 inches in back of the condenser and 6 inches over the top of the cabinet to allow the warm air to escape from the condenser.

CABINET SEAL

When checking cabinet seal on the automatic refrigerator, it is of utmost importance that the outer shell of the cabinet, including all openings and screw holes, be sealed against entrance of moisture from the room air. A check of the following places should be made for air leakage:

1. Door seal gasket.
2. Outer cover plate.
3. Tubing plugs.
4. Air leak test button.
5. Screw holes that aren't used.

Make sure that all openings and seams are completely sealed with permagum and that the door seal gasket is properly compressed all the way around the cabinet when the door is closed. The cabinet door seal gasket not only seals off the front of the cabinet from the room air, but also seals the upper portion of the door liner (Fig. 3) against the cabinet mullion (freezer seal gasket), to isolate the refrigerator compartment from the freezer area. The refrigerator door



FIGURE 2



FIGURE 3

in turn has a vapor barrier in the insulation directly under the freezer seal gasket (Fig. 3), isolating the area in front of the freezer door from the main food compartment area. Its purpose is to prevent moisture from the humid food compartment which enters the latch port from traveling upward through the insulation to the colder freezer section, where condensate would occur. The fibre-board barrier is contoured to fit between the door panel and the liner. It is completely sealed all around with permagum and odor-free asphalt to form a complete air block.

DOOR PANEL SEAL

Because of the increased temperature differential between the freezer compartment and the room air, the automatic refrigerators require a special seal around the door panel of the freezer compartment. This seal consists of a bead of permagum placed between the door panel flange and door seal gasket to prevent the entrance of room air into the insulation.

DOOR-SEAL GASKET REPLACEMENT

When replacing the door-seal gasket, first remove all liner-mounting screws, at the edge of the door liner. The screws are made accessible by folding back the gasket. Unseat the old gasket from the edge of the door liner. Next, position the new gasket so that the molded-in curvatures and corners line up properly with the outline of the door liner. Slip the rubber flange of the gasket over the edge of the door liner, being sure to line up the openings with screw holes. Then replace the liner-mounting screws.

When repairs are made to the single door automatic models, the sealing compound may be re-used, if it is kept free from dirt. It must be placed around the flange in a continuous bead, with no voids to prevent air leakage.

CHECKING DOOR-SEAL GASKET

When a refrigerator door-seal gasket has been replaced, or when a check is necessary to determine whether the gasket is functioning to prevent heat leakage into the cabinet interior, proceed as follows:

Cut a strip of unglazed paper, about 2" wide. Insert the paper strip between the seal gasket and the cabinet front. See figure 4. If the paper can be removed easily without drag, the door is not making positive contact with the cabinet. Check the seal at several places around the door.

Correction to tighten the seal on refrigerators may be made by adjusting the position of the cabinet strike as required, then checking with the paper strip, as explained above.

The correct amount of gasket compression is shown in figure 5. Too much compression causes gasket deterioration. If further adjustment is necessary on the hinge side, check as follows:

Stand near the strike, close the cabinet door slowly, and watch the gasket along the hinge side of the door. When the door is open about 2", the gasket should just touch the cabinet on the hinge side.

This condition exists when the light can no longer be seen between the cabinet and the gasket. If the door is practically closed, and light can still be seen, the hinges should be set back to tighten the gasket. If the gasket touches the cabinet when the door is open 4" or more, the gasket compression will be too great when the door is fully closed. If either of these two conditions exist, adjust the door as follows:

Take off the hinge escutcheons and remove the anchor screws, figure 6. Loosen the hinge-mounting screws, so that the door can be shifted inward or out-



FIGURE 4

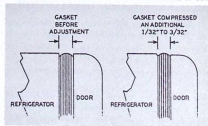


FIGURE 5

ward and tightened in place. If necessary, re-position the anchor screws in the spare hinge plate holes after the proper adjustment, as follows:

Using the spare anchor-screw hole in each hinge as a guide, drill new holes into the cabinet walls. Use a .136" diameter (No. 29) steel twist drill. Insert and tighten the self-threading anchor screws, and replace the hinge escutcheons.

NOTE: Before installing anchor screws and hinge-mounting screws, press a quantity of permagum into the screw holes and anchor holes to give a good cabinet seal. After final adjustment check the door seal.

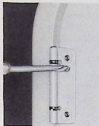


FIGURE 6

CABINET DOOR HINGES

The door hinges are fastened with machine screws to special steel tapping plates, which are secured to the inside of the door panel. The door assembly is fastened to the cabinet with machine screws through each hinge butt into an extra-heavy steel tapping plate, located inside the cabinet wall. With the door-seal gasket tightly and evenly compressed around the entire contact surface of the cabinet, the hinge-mounting screws are tightened and self-threading sheet metal screws are installed through the anchor-screw hole of each hinge into the cabinet, for permanent door and hinge alignment (Fig. 6).

An escutcheon covers each hinge. To remove the hinge escutcheon, open the cabinet door, position a screwdriver under the escutcheon and unsnap the escutcheon by pushing on its edge.

ADJUSTING CABINET DOOR HINGES

When reinstalling the door assembly on the cabinet, close and position the door so that the seal gasket is tightly and evenly compressed around the entire cabinet contact surface, and tighten the hinge-mounting screws to hold the position. If the anchor-screw hole in each hinge is in alignment with the hole in the cabinet, insert and tighten the self-threading anchor screws. If the anchor-screw holes are not aligned, use the lower spare anchor-screw hole in each

hinge as a guide. Insert and tighten the self-threading anchor screws, and snap the escutcheon covers over each hinge butt.

DOOR STRIKE ADJUSTMENT

To adjust the strike inward or outward, loosen the strike adjusting screw and move the strike inward or outward as required. To adjust laterally, loosen the two lateral-adjustment screws, and move the entire strike assembly until the nose of the strike just clears the roller when the door is closed. Tighten all screws after the adjustment is made.

To remove the entire strike assembly, proceed as follows:

1. Remove the two lateral-adjustment screws.
2. Remove the breaker strip.
3. Remove the cotter pin from the strike tapping plate, to release the strike spacer. Then replace the cotter pin in the strike tapping plate to prevent the plate from falling out of position.

INTERIOR CABINET SEAL

In order to remove traces of moisture which may be present in the insulation, louvers are provided in the inner cover plate, as well as in the food liner in the freezer area. These openings are covered with gauze, to retain the insulation while still allowing the water vapor to travel from the warmer insulation to the colder freezer area, thus tending to keep the insulation dry. These openings should never be sealed.

The outer cabinet shell is sealed, to prevent the entrance of moisture, while the inner shell, or food liner, is provided with openings, to allow the escape of any moisture that may have entered the insulation. The two air vents on the upper part (freezer area) of the food compartment door liner serve the same purpose as the louvers in the inner cover plate, as explained above.

VAPOR BARRIER, REFRIGERATOR COMPARTMENT

The refrigerator compartment is completely sealed off from the food compartment by the cabinet vapor barrier (Fig. 7), so that the temperature of one does not affect the other.

This vapor barrier is made up of a top plate, or drain pan, to collect accumulated moisture, at such time as the refrigerator is turned off for cleaning. Di-

rectly under the drain pan is a batt of fiber-glass insulation completely enclosed in a vinyl or plastic bag which is fitted snugly into the recessed top portion of the food compartment. This insulation, when properly fitted, completely isolates the freezer compartment from the food compartment. It is protected on its underside by a porcelainized metal plate supported by the side mounting runners. They also support the refrigerator compartment air deflector, which maintains air circulation across the refrigerator top to keep it clear of any condensate which might form there.

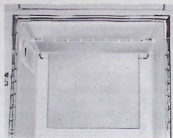


FIGURE 7

FREEZER SEAL GASKET

If the freezer seal gasket and mullion which serves to seal the freezer compartment from the food compartment, is improperly adjusted, it will permit heat leakage between the two compartments and cause condensate to be formed on the top breaker molding and the cabinet mullion. Air leakage at this point may cause ice formation and abnormally low cabinet temperatures in the food compartment.

The positioning of the mullion may be checked by placing a straight edge across the cabinet from the right side duct bend to the left duct bend in line with and parallel to the mullion. For proper freezer gasket compression, when the refrigerator door is closed, the mullion's leading edge should touch the straight edge.

A slight adjustment of the mullion may be made by removing the cabinet vapor barrier to gain access to the tank to mullion support angles which are covered by permagum, as indicated by the arrow in figure 8. Loosen the mullion angle food tank mounting screws, the mullion may then be moved forward or backward a fraction of an inch to make minor seal adjustments. The mounting screws should then be firmly tightened to secure the mullion in position.

FOOD COMPARTMENT LINER

At such times as it may be necessary to replace or adjust the food compartment liner, a check for proper liner alignment should be made. To check this alignment, all of the shelves, breaker strips, breaker moldings, the door, and the super power system should be removed from the cabinet. Place the cabinet on its back and temporarily secure each corner of the liner with its mounting screws.



FIGURE 8

Place a straight edge (or a stretched string) across the cabinet. The correct clearance between the bottom of the straight edge and the food-compartment liner at each mounting hole should be $3/16"$, as shown in the illustration. A uniform $3/16"$ clearance is necessary, in order to provide for proper gasket seal. If this clearance is not obtained when the liner-mounting screws are replaced, readjustment should be made by reducing the thickness of the spacer or adding shims. Non-rusting metal shims may be used with the hard rubber spacers.

PARTS LIST FOR CONDENSER CHECKER

T1—Power transformer	32-7111
S1—SPST SW.	42-1632
C1—20 Mfd. 450 W. V.	45-3017-30
C2—20 Mfd. 450 W. V.	45-3017-30
C3-C4—0022 MMFD. 600 W. V.	45-3505-54
C5—0033 MMFD. 600 W. V.	30-4650
C6—66 MMFD. 1000 W. V.	30-1244-6
C7—66 MMFD. 1000 W. V.	30-1244-6
C8—00035 MMFD. tuning cond. (double spaced)	
R1—7500 ohms	33-1335-20
R2—2000 ohms	33-1335-74
L1—50 turns #22 BGS on $1\frac{1}{2}"$ form (CT)	
L2—50 turns #14 BGS on $1\frac{1}{2}"$ form (CT)	
L3—50 turns #14 BGS on $1\frac{1}{2}"$ form	
L4—2 turns #14 BGS on $1\frac{1}{2}"$ form	
RFC—35 turns #22 BGS on $\frac{1}{4}"$ form	

Locating Intermittents Now Easy With Home-Made Tester

Every radio serviceman will be glad to learn about the device which is described below for quickly locating intermittent opens in a radio circuit. A problem which has caused the serviceman more grief than anything else is intermittents. Every man who had occasion to work on sets of this type can well appreciate the difficulties involved in locating such intermittent connections in a reasonable length of time. Usually, it is necessary to let the radio set "cook" for several days, and even then the serviceman may be rather doubtful as to whether or not he has located the particular difficulty.

In the service shop at the PHILCO factory, a tester is used for locating such intermittent operation of condensers.

Since most of the causes of intermittents are in fixed condensers, this device will solve practically all of the intermittent problems. The tester is simply an oscillating circuit employing two type 6L6 tubes in push-pull. The circuit is so arranged that it will oscillate

7 and 10 watts R.F. power. This is a relatively heavy R.F. current and is sufficient to break down a fixed condenser which has poor contacts of the type that produce intermittent operation. When the condenser under test is connected across the terminals of the tester, the heavy R.F. current which passes through the condenser is sufficient to start an arc at the weak joint in the contact between the condenser terminal or wire and the plates of the condenser itself. In some cases, this breakdown will occur immediately, and in other it may be necessary to leave the suspected condenser on test for as much as 4 to 5 minutes. If there is such a weak connection, however, it is certain that the heavy R.F. signal will produce the desired permanent open, and thus the faulty condenser can be eliminated.

The circuit is so arranged that the tuning condenser of the tester is placed in series with the suspected condenser. A pilot light is connected in the circuit to indicate resonance. The variable condenser is calibrated by placing several known capacities across the test terminals. It is possible, in this way, to have an accurately calibrated capacity meter, as well as to have the oscillator circuit for locating intermittents.

The circuit diagram as illustrated on this page, gives the complete circuit arrangement and indicates the various PHILCO part numbers which can be used in constructing the tester.



FIGURE 1

at approximately 4000 K.C. and will deliver between

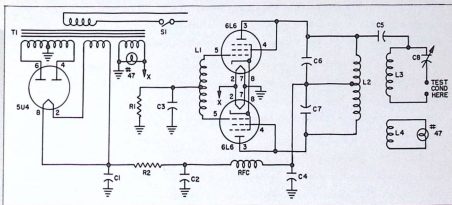
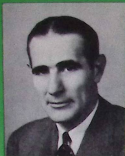


FIGURE 2



This month . . .

GLEN CUMMINS, Philco Service District Representative for the Eastern Division, expresses his ideas on the value of every service technician being a good salesman. Glen has been in the service business since 1928. In 1944 he became a Navy Field Engineer for the Philco TechRep Division. He was transferred to his present position with the Philco Service Division in the Spring of 1946.

In my opinion . . .

. . . too many top notch servicemen fail to do a good "selling" job.

Every *really* successful appliance serviceman must be a good salesman as well as a good technician. He is often called upon to correct troubles in an appliance, and if he does a good selling job while effecting a good repair, will leave the customer with the assurance that he has made a wise choice in his selection of the particular appliance.

The dissatisfied appliance owner who has lost confidence in his purchase often has to be resold on the product by the serviceman. Every serviceman who has been in business any length of time has had to cope with this kind of problem.

Building up customer confidence and keeping the customer assured that the appliance is going to operate satisfactorily is sometimes a difficult job, and the serviceman who can do so has done a better selling job, under more difficult circumstances, than anybody in the selling business.

There are a number of things which inspire customer confidence. Technical "know how" is of course, a must, but in addition to that the serviceman must have a good appearance, a business like manner, and the ability to explain when necessary, why trouble developed in the appliance. He must be able to assure the customer that the appliance is going to operate in the proper manner after repairs are completed.

It has been said many times that the good technical man was a poor salesman, and too often this is true. The appliance service business is a most important business. If the serviceman develops good sales techniques as diligently as he follows technical improvements in appliances, he will build a following which can assure him of a most successful future in his chosen profession.

