PHILCO
SERVICE SUPERVISOR

PHILCO Factory-Supervised Service

PUBLISHED MONTHLY BY THE PHILCO CORPORATION, SERVICE DIVISION, IN THE INTERESTS OF INDEPENDENT PHILCO SERVICEMEN THROUGHOUT THE NATION

October, 1952

PHILCO SERVICE WORLD-WIDE

At Milan, Italy, Philco Field Service Engineer Mike Ferrani holds chassis as he gets finer points of television servicing across to the Italian servicemen attending Philco training course. Note latest test equipment, schematics, and Philco receivers with which trainees worked.

ACCUSTOMED as we are to thinking of appliance servicing in terms of an American monopoly, it is surprising to learn the degree of progress that has been attained in service throughout the rest of the world.

Not only are Philco Distributor organizations operating in Latin America and Europe, but they have spread throughout the Middle East and Asia where the name Philco has become a by-word for quality performance.

And today, the tremendous impact created by television in the United States has infected the international scene. Europe is leading the way with England, France, and Italy already telecasting. But the potential saturation that will come about through world-wide television facilities is too staggering to even estimate. Global television is not just a dream, but it is a bright reality predicted for the not too distant future.

Just as they have pioneered service on the American scene, Philco is again leading the way abroad. Every serviceman in the United States will be interested to learn of the great strides being accomplished in servicing wherever television has been introduced. And Philco is again in the forefront using its supervision facilities to inaugurate service as it appears overseas.

Recently in Italy, the first successful television service course in that country was conducted under the auspices of Philco, in the city of Milan. With the cooperation of "Thermofrigor Italiana", the Philco Distributor for Italy, a Philco Factory-Supervised Service Field Engineer conducted 126

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PHILCO SERVICE WORLD-WIDE!

(*Continued from Front Cover*)

Above left: Trainees presented this attractive scroll to Mike Ferrani at a farewell dinner, in gratitude for his fine supervision of the Philco television service course. Above right: This photograph of a Philco television receiver operating in a dealer's showroom was taken in Brescia, over 70 air miles from the station in Milan. Reception was reported as perfect!

hours of television training for radio servicemen. The 22 servicemen, members of large dealer operations in Milan, were selected for their excellent servicing backgrounds and received primarily the same type of training that is offered to Philco Servicemen in this country.

Developed exclusively by Philco personnel, the course consisted of 90 hours of actual bench practice, and only 36 hours of theory. Upon completion of the course, these radio servicemen became qualified television technicians, capable of efficiently servicing all types of Philco receivers.

Mike Ferrani, the Philco Field Service Engineer conducting the course, informed us that the Italian trainees proved extremely adaptable in every technical respect and mastered the new television techniques with facility. These Milanese servicemen were amazed to learn that they would be permitted to actually work on chassis under actual field servicing conditions. Previous courses that they had attended in servicing had only included long lectures and demonstrations by the instructors. More proof of Philco's practical approach to training!

Revisions had to be made throughout the course to coincide with the conflicting transmission requirements in Italy. Radio Italiana (call letters "RAI"), the station in Milan has an overall bandwidth of 7 megacycles compared to our 6; a video intermediate of 5-1/2 megacycles to our 4; and a line rate of 625 to our 525.

In Italy today only 1,000 television sets are in operation, but more and more are being added. In addition, two new stations are being constructed to extend television coverage even further. Italy is fast on the way to a television blanket of its own and Philco Service will be playing a major role in keeping it running. And the pioneer servicemen in this operation will be Philco-trained!

Elsewhere throughout the world Philco service supervision is paving the way to provide better transmission facilities for the public and more knowledge for the serviceman. While appliance servicing abroad has never come close to the high degree of perfection reached in America, it has afforded the people of the world with a highly favorable picture of Philco products and service.

Philco Factory-Supervised Service has gained an enviable record in our native land, and it is continuing to build that same type of reputation wherever electrical appliances are sold.

Watch for newer and more advanced developments in television from Philco and the rest of the industry. Watch for greater interest in this greatest of all entertainment mediums from the rest of the world. You'll soon find you're in the greatest business of them all . . . and the whole world wants it!

SHOP PRACTICES AND SERVICE TECHNIQUES—*ELECTRIC RANGE*

OWNERS' INSTRUCTION MANUAL . . . Sure Cure For Many Range Complaints

Many customers' complaints are based not on mechanical failures, but on the failure of the customer to fully understand the operation of the range and other factors which contribute to successful baking.

The Philco Owners' Instruction Manual is carefully revised each year to include all the new features and their proper usage. This is done at considerable expense to the company as a service to consumers to aid them in securing the best possible results. Despite this fact, the new user frequently neglects to look at the manual or to follow the instructions provided. Yet the range is blamed for poor results — not the cook!

Poor quality, unevenly browned cake was blamed on the old stove. Now, using the same old pans and the same old procedures, prize-winning cakes are expected of the new range. Actually, poor results may be caused by many factors — the cake batter, size and color of pans, placement in oven, and baking temperature are only a few of the elements which contribute to perfect or imperfect results.

Let's see what may have caused poor results even in a new, mechanically perfect Philco Range:

Figure 1 is a two egg butter cake. It was made according to the standard recipe for test cakes used by all manufacturers, magazine household equipment women and utility home service women in checking baking performance of ovens. It is the shape, texture and color most people like. Top and bottom are the same even degree of brown. Layers are uniform in size and straight across the top. There are no cracks. The layers were baked in medium weight, shiny aluminum pans like the one shown. This is the standard layer cake pan recommended by the Bureau of Standards for best results. Other factors contributed to these perfect results. The oven was allowed to reach the proper temperature and the signal light had gone out before the pans were placed on the racks. The pans were placed in the oven to allow free circulation of baking heat, with at least one inch of space between pans and the oven side walls.

There are many of these old pans in use which should have been discarded long ago. Chances are that homemakers who use them blamed their old stove for imperfect results. Better results would be achieved in any range with proper pans and perfect results can never be achieved with warped pans. This applies to any range and does not mean that the purchase of a new Philco range necessitates buying new pans. Many utility home service women carry standard cake pans with them when making a complaint call on a new user. If the cause of the complaint is due to the use of old beaten-up pans, the home service woman bakes a cake in her own standard cake pans to prove to the user that it is not her oven which is at fault.

Notice how the top of the layer at the right in figure 2 is burned and did not raise properly. This failure was caused by placing the cake at the right in the oven before it had reached the required temperature. The cake on the left was placed in the oven after the oven had reached temperature. To preheat the Philco Electric

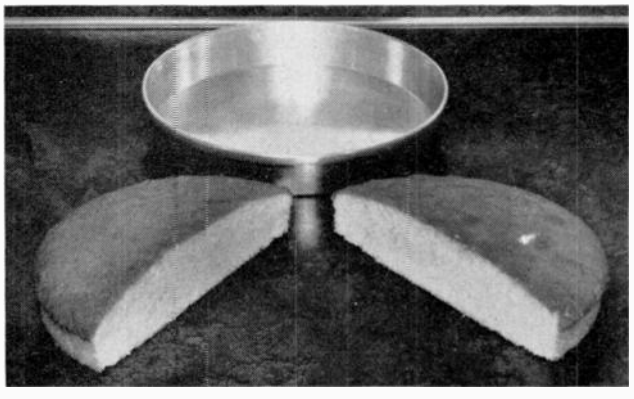


FIGURE ONE — Standard layer cake and pan.

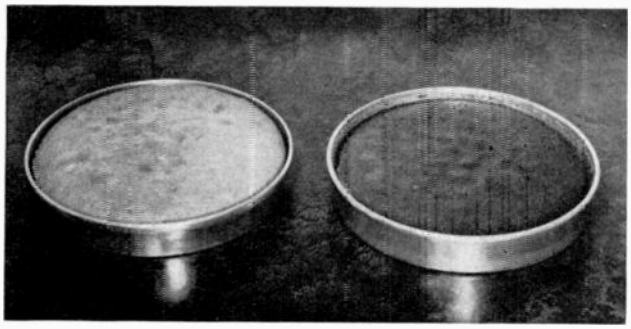


FIGURE TWO — The cake at the right is burned and did not raise properly. The failure was caused by placing the cake in the oven before it had reached the required temperature while on preheat.

Banquet Oven, turn the automatic oven switch *first* to Broil, then directly back to the temperature desired. The small red signal light comes on and stays on until the oven has reached the temperature set, then the signal light goes out. This means the top unit has automatically turned off and the oven is ready to receive the food. When the food is placed in the oven *before* the signal light goes out, the 3,000 watt top unit is still on. This causes the top of the layer to burn and prevents proper raising of the batter.

Cake batter is often over-mixed. This frequently happens when a homemaker changes from hand mixing to mechanical mixing. It is difficult for her to realize how quickly mixing can be done mechanically.

When too much flour is used in the cake batter, it raises, then cracks on top. A cake recipe should specify cake flour or all purpose flour. If the recipe calls for cake flour and all purpose flour is used, the cake will contain too much flour.

Standard measuring cups and measuring spoons are recommended for best baking results. When a recipe calls for 1 cup of flour, it means a standard measuring cup. If a teacup or coffee cup is used for measuring, the same results will not be obtained. This accounts for many poor baking products in the home.

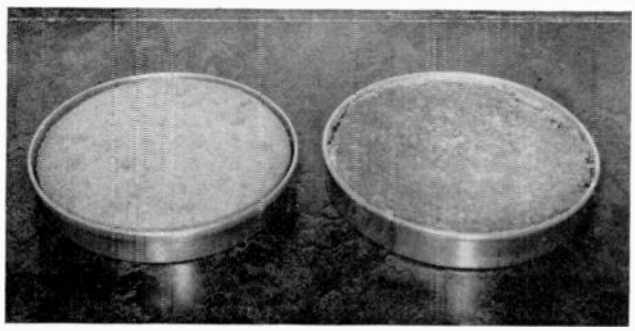


FIGURE THREE — The cake at the right contained too much sugar.

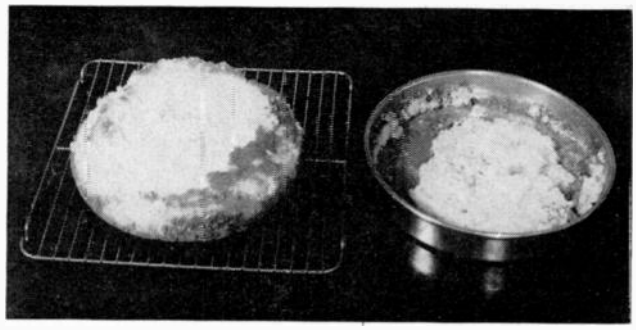


FIGURE FOUR — The cake stuck to the pan because it had been greased with butter instead of salt-free shortening.

The cake on the right in figure 3 contains too much sugar. It is very heavy and grainy. The top will often be too brown. Compare the top of this layer with the standard layer on the left.

Again, to get standard products in any range oven, standard measurements must be used.

The layer of cake in figure 4 stuck to the bottom of the pan and the bottom was slightly burned. The pan was greased with butter instead of with salt-free vegetable shortening. Butter burns at a lower temperature than a vegetable shortening.

For perfect results, the bottom of pan should be greased lightly with vegetable shortening and dusted lightly with flour. Some homemakers prefer to cut a circle of wax paper, place it in the bottom of a greased pan, then grease the paper. A pan prepared this way insures removal of the cake without sticking or breaking.

Black bottomed pans absorb heat more readily than shiny aluminum ones. The layer of cake at the left in figure 5 was baked in the pan on the right. Notice that the darker half is burned on the edges. Black bottomed pans are not recommended for baking cakes. The top will brown properly, but the bottom is always much darker and often burned.

When four layers of cake are baked at one time, the pans should be arranged so that no two pans are directly over each other.

Staggering the pans in the manner shown in figure 6 allows the heat from top and bottom to circulate evenly around all four pans and the four layers will bake uniformly.

Pies should be arranged on the racks in the same way.

"Broil-Under-Glass" is a patented, exclusive feature on Philco ranges.

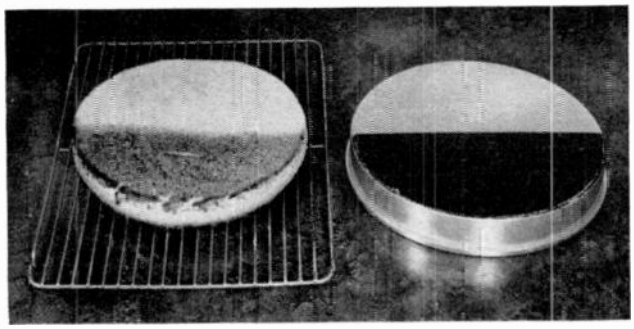


FIGURE FIVE — Black bottom pans are not recommended for baking cakes. Notice that the darker half is burned.

When broiling steaks, the oven switch should be turned to the "Broil" position and the glass should be preheated for 5 minutes. It is not necessary to preheat the glass for broiling any other food. Steaks and other foods to be broiled should be placed closer to the glass and unit than in other makes of broilers.

Figure 7 shows the chart found in the range instruction book entitled "How To Use and Enjoy Your Philco Electric Range", which is packed with each range. Complete directions for preheating the broiler and proper rack positions for steaks, chops, fish, chicken, ham, bacon and liver of various thicknesses are included in the chart. Approximate lengths of time for each side are listed on the right. There will be no failures in broiling under glass if the user will refer to this chart. The door is always left ajar when broiling in an electric range. A special door stop position for broiling is provided in the range.

Some homemakers remove the Jiffy Griddle when broiling. The griddle should be left in place because it acts as a baffle over the unit. When the griddle is removed, too much heat is lost and steaks do not broil properly. The Philco range is so designed that the Jiffy Griddle need not be removed when broiling or baking. It is stored in the top of the range over the unit. It should be pulled out only for grilling or frying, or when it is to be washed. The griddle should be washed after each use. If it is pushed back into the oven after using, the grease burns on and causes smoking. It is not necessary to wash the glass under the unit each time.

Remember these simple rules when broiling (see figure 7);

1. Wipe and trim meats to be broiled; score fat around edges to prevent curling.
2. For steaks, *preheat* the Philco Broiler about 5 minutes. Preheating is not necessary for foods which require thorough cooking, such as ham, chicken, lamb chops, liver, and bacon.
3. Arrange meat on rack on the broiling pan. Place the pan on properly located oven rack, under the broiler heat unit. Refer to recommended rack position and distance from the broiler in the guide on page six.
4. Place oven door in partially open, or BROIL, position.

FIGURE SIX — Staggering the pans allows the heat to circulate evenly from top to bottom.

FOOD	THICKNESS	RACK AND POSITION NUMBER			APPROXIMATE INCHES FROM TOP OF FOOD TO BROILER	MINUTES	
		BANQUET OVEN	BANQUET OVEN WITH JIFFY GRIDDLE	THRIFT OVEN		1ST SIDE	2ND SIDE
Steaks	¾" to 1"	Straight rack, Position 5	Reversible rack down, Position 5	Reversible rack down, Position 2	¾ to 1	8 to 12	5 to 9
Steaks	1¼" to 1½"	Reversible rack up, Position 4	Straight rack, Position 4	Reversible rack down, Position 1	2	16 to 18	10 to 12
Steaks	2" to 2½"	Reversible rack down, Position 4	Reversible rack up, Position 3	Bottom of oven	2½ to 3	20 to 23	14 to 17
Bacon	Thin Slices	Straight rack, Position 5	Reversible rack up, Position 4	Reversible rack down, Position 2	2	6 to 9	2 to 4
Ham	1" slice	Reversible rack up, Position 4	Straight rack, Position 4	Reversible rack up, Position 1	1½ to 2	12 to 18	8 to 10
Chicken	Broilers, in halves	Straight rack, Position 3	Reversible rack up, Position 2	Bottom of oven	4½ to 5	20 to 25	12 to 15
Liver	¼" to ½"	Reversible rack up, Position 5	Straight rack, Position 5	Reversible rack down, Position 2	1 to 1¼	8 to 13	3 to 4
Lamb chops	1" to 1½"	Reversible rack down, Position 5	Reversible rack up, Position 4	Reversible rack up, Position 1	1 to 1½	15 to 17	8 to 9
Salmon steaks	½" to ¾"	Reversible rack up, Position 5	Reversible rack down, Position 5	Reversible rack down, Position 2	1 to 1¼	11 to 15	5 to 7
Whole small fish, split	1" to 1½"	Straight rack, Position 5	Reversible rack up, Position 4	Reversible rack up, Position 1	¾ to 1	8 to 10	6 to 8
Fish fillets	½"	Reversible rack up, Position 5	Straight rack, Position 5	Reversible rack down, Position 2	¾ to 1	11 to 13	6 to 7

FIGURE SEVEN — BANQUET AND THRIFT OVEN "BROIL-UNDER-GLASS" GUIDE.

All food authorities recommend roasting meats at low temperatures. When a roast is cooked at a high temperature, there is a great deal of spattering. Notice the burning of the fat in the bottom of the broiler pan, and the spattered oven liner. Meats — especially lamb, pork and ham — spatter fat in the oven when roasted at a high temperature and this causes a great deal of smoking.

The two legs of lamb roasts in figure 8 were identical; taken from the same animal, the same weight.

The roast on the right was cooked at a temperature of 450°. Notice that some of the fat has burned onto the bottom of the broiler pan. The fat and juice which was in the pan is shown in the measuring cup. It measures a little more than 1/2 cup and is very dark in color.

The roast on the left was cooked at a temperature of 325°. There is no burned fat in the broiler pan. There was no spattering in the oven and no smoking. More of the juice is left in the meat. The measuring cup contains only 1/3 cup of fat and juice.

The roast cooked at 450° lost 1/2 pound more in weight than the roast cooked at 325°.

If directions for roasting in the range instruction book are followed, there will be more juicy meat for the family and less cleaning of the oven.

Foods containing a lot of liquid and cooked uncovered in the oven may cause excessive moisture. Vegetables and most casserole dishes when cooked in the oven should be covered. A nut bread, for instance, which requires browning, will not brown when a combination of foods such as this is cooked at the same time without covers. There is too much moisture coming from the open vegetable dish, meat dish and macaroni. Many times, complaints on excessive moisture in the oven are caused by cooking too many moist foods uncovered rather than by a loose fitting door.

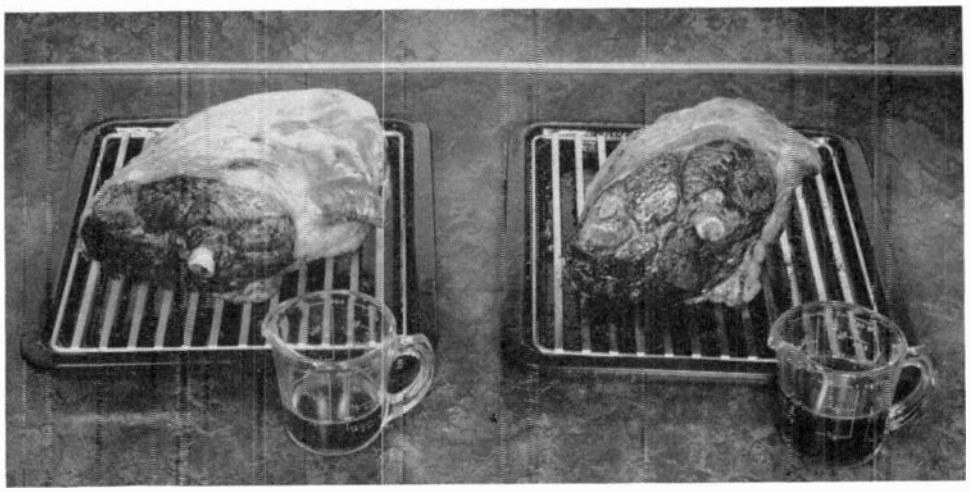


FIGURE EIGHT — The roast at the right was cooked at 450° — the left at 325°. Notice that the roast cooked at the lower temperature retained its size and its juices and did not burn.

Notice that the drip pan underneath the surface unit in figure 9 has been covered with foil. The oven vent is located directly under this right front unit and is designed to carry off the steam and moisture from the oven. Covering up the hole in the center may cause damage to the range after long usage. If foil must be used, it is recommended that the hole be left open to permit escape of the steam.

Believe it or not, sometimes the Thrift Oven unit is switched into the banquet oven and vice versa. This happens occasionally when both units are removed for cleaning, then are accidentally replaced into the wrong oven. These units are built for one particular oven and will not give proper heat distribution if placed in the other oven.

The Philco Electric Range is as mechanically perfect as modern engineering can make it. Each feature is thoroughly tested for months before it is incorporated into the range. Even so, final results depend primarily upon the user.

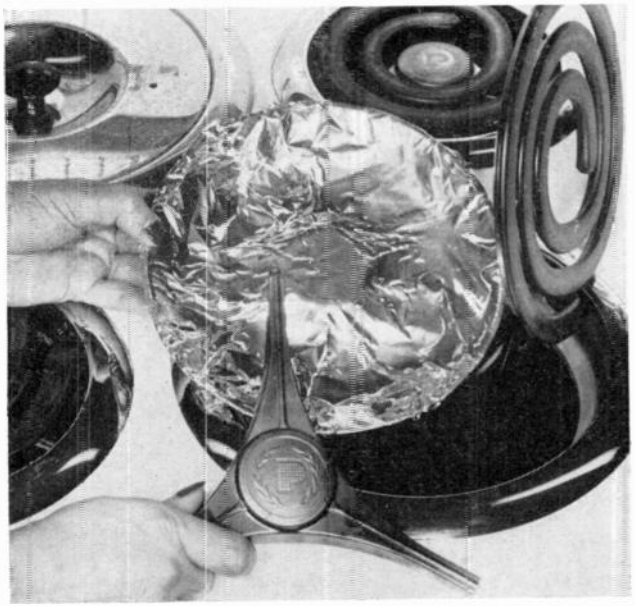


FIGURE NINE — Covering up the hole in the center of the right front drip-pans does not allow the oven vent to function properly.

SHOP PRACTICES AND SERVICE TECHNIQUES—*TELEVISION*

TROUBLE-SHOOTING PROCEDURES FOR THE NEW '53 CIRCUITS

Trouble-shooting of the new circuits incorporated in the TV-90 TV receivers is not difficult nor complicated. It is necessary only to know thoroughly the operations and functions of these circuits for efficient and speedy servicing.

The phase comparer circuit is not a new circuit to the electronics industry but has been used in many ways during the last war. This type of control circuit for a horizontal oscillator provides excellent lock-in range even under adverse conditions.

Review briefly the operation of the phase comparer. Figure 1. A positive going sync pulse is applied to the plate of V1 through condenser C1 while a negative going sync pulse is applied to the cathode of V2 through C2. The cathode of V1 and the plate of V2 are tied directly together. A saw tooth shaped wave form is fed to the junction of these two elements. The source of this wave form is from the horizontal output circuit, therefore, its frequency is the same as that of the horizontal oscillator. When the incoming sync pulses are in phase with the saw tooth wave form, both diodes conduct equally and develop an equal voltage but of opposite polarity across R3 resulting in no voltage output from the circuit. However, if the phase relationship is changed, the conduction of one diode will be greater than the other producing a larger voltage drop across R3 of one polarity than the other resulting in a correction voltage output whose polarity and magnitude is dependent upon the direction and amount of frequency shift of the horizontal oscillator.

By following the operation of this circuit through, it can readily be seen that a balanced condition must exist between the circuits of V1 and V2 for proper performance. Hence, R1 and R2 must be of equal value and within close tolerance to produce this condition. Also, the amplitudes of the incoming sync pulses must be equal and the condition of both diodes be similar. The resistors can easily be checked with an ohmmeter, the diodes by means of a good tube checker or by substitution and the sync pulses by the use of an oscilloscope.

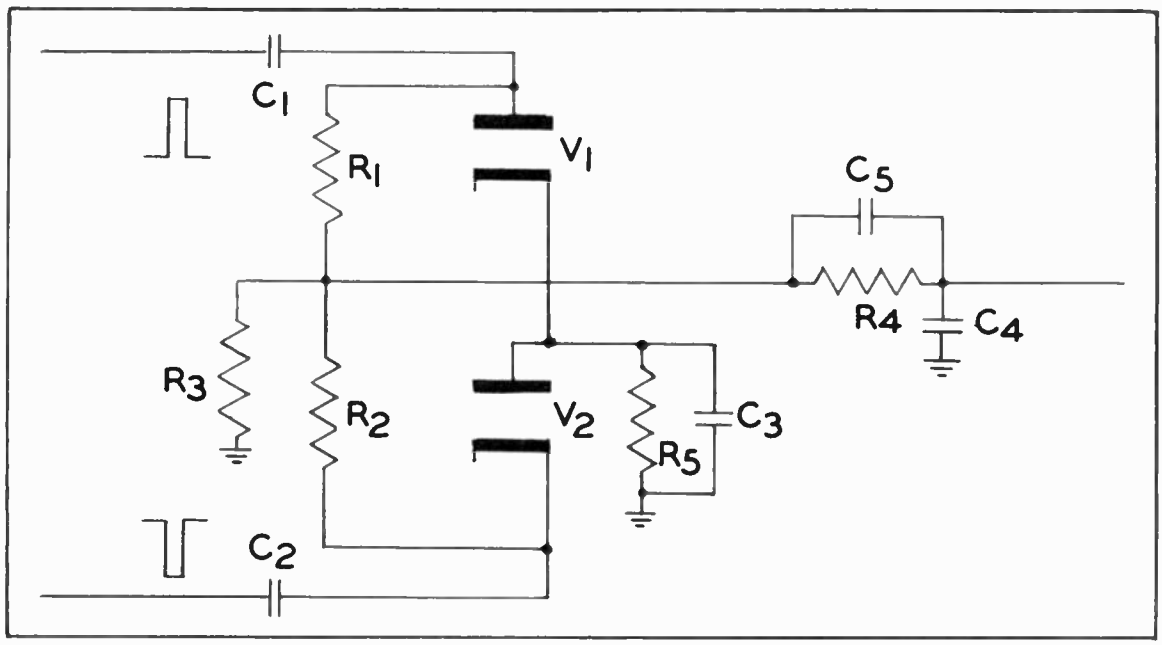


FIGURE ONE

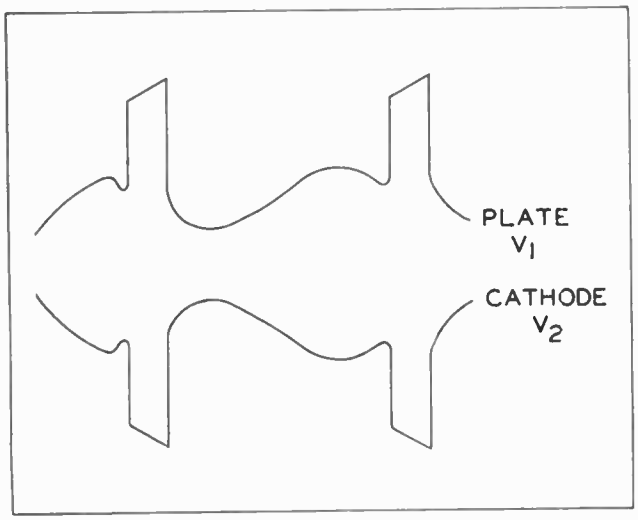


FIGURE TWO

The oscilloscope is of prime importance in checking the phase comparer circuit. The entire trouble-shooting procedure is built around its use. The first step is to determine whether sync pulses are arriving at the phase comparer plate and cathode circuits. Place the scope lead on the plate of V1 and then on the cathode of V2. If the circuit is functioning normally, the wave forms at these two points will appear as shown in figure 2.

A saw tooth shaped wave form should appear on the cathode of V1 and plate of V2. These two elements being tied together, the scope may be placed on either one to obtain the wave form shown in figure 3.

Since the horizontal oscillator is constantly slightly varying in frequency, the scope attached across load resistor R3 would not produce a clean wave form. It would be very fuzzy and not constant in amplitude, therefore, it is of no consequence in our servicing technique.

One point of warning might be brought out at this time. Condenser C4 is a filter condenser for the correction voltage received from the phase comparer. If this condenser should open or become excessively low in capacity, the horizontal sync becomes very jittery and unstable. The top portion of the picture tries to tear out and may cause ripples throughout the remainder of the picture. Either a meter or scope attached to the circuit will stop this condition due to their interval capacity, therefore, check this condenser with a bridge or by substitution.

Before getting into the trouble-shooting procedures for the "Gated AGC" circuits, it will be well to review its operation and that of its associated circuits.

The "Gated AGC" derives its name from its action. It performs as a gate or door that only opens and permits signal through (conduction) at definite specified moments. By utilizing this characteristic it is possible to develop an AGC voltage that is dependent entirely on the amplitude of the sync pulses. These being a constant predetermined at the television transmitter and whose amplitude will change only with signal strength. This will result in an AGC system that is very stable even under adverse conditions such as excessive noise or low flying airplanes.

Figure 4A is a simplified schematic diagram of the AGC gate circuit. The amount of conduction of the gate tube is controlled by the voltage drop across R1 which is part of the plate load resistor of the 1st video amplifier. The time at which the tube may conduct is

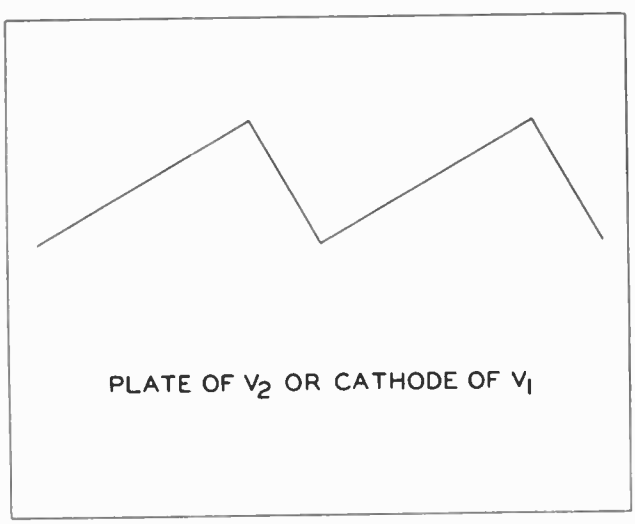


FIGURE THREE

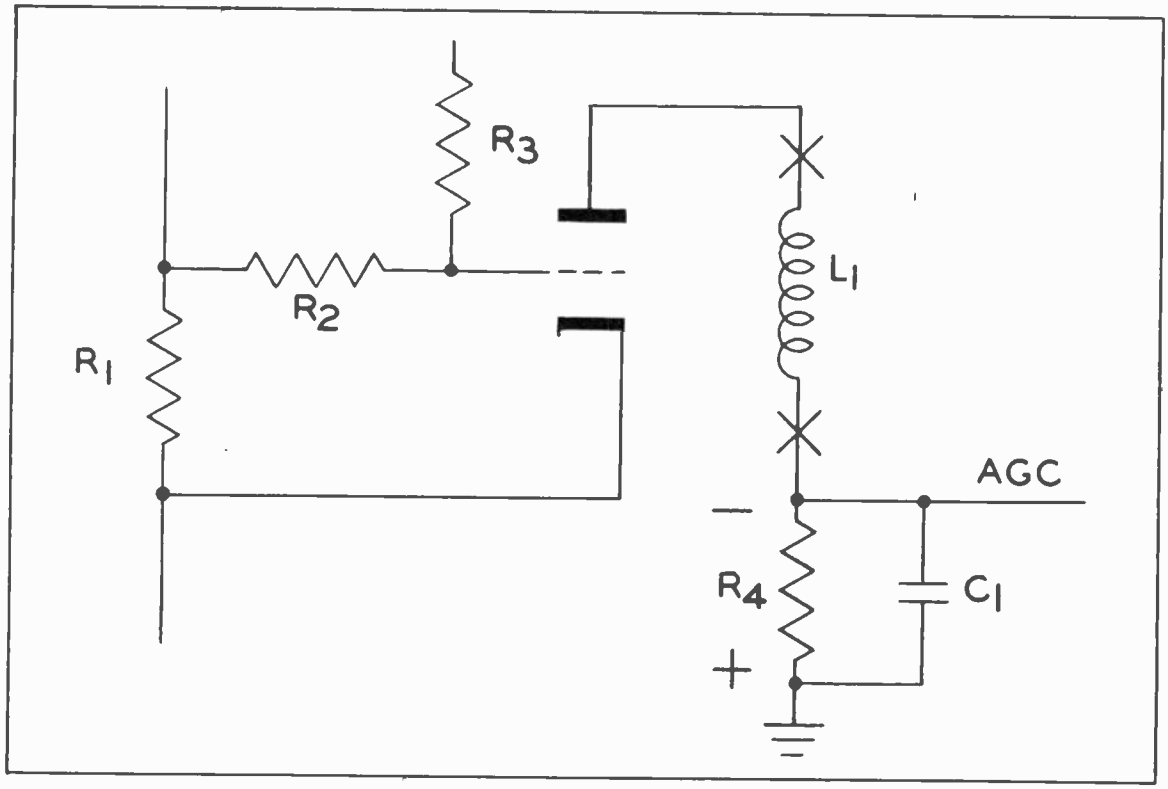


FIGURE FOUR-A

determined by a pulse voltage applied to the plate of the gate tube. This pulse is obtained from a special winding on the horizontal output transformer (L1), which by interchassis wiring, is connected in series with the plate circuit. During conduction the current flows through the gate tube, L1 and R4 to ground, thus, developing a negative voltage across R4 which is filtered by C1 and applied as AGC to the RF and IF stages. Here again the first step in trouble-shooting is to use the oscilloscope and check the wave forms. A composite video signal should appear at the grid of the AGC gate tube and a pulse of approximately 500 volts peak to peak should be measured at the plate. This pulse should be checked by calibrating the oscilloscope as the amplitude is important.

In order to isolate the trouble in the AGC gate circuit, it is advisable to apply a fixed bias to the AGC bus by using a bias box or battery. Approximately 7.5 volts applied to pin No. 1 of the video test jack will render the operation of the set relatively normal. There are rather few possibilities for trouble in this circuit and should therefore prove easy to service, however, there are several precautions. The gate tube derives its bias from the plate load resistor of the video amplifier which is in series with the 1st sound IF tube, consequently, any defect in the 1st sound IF circuit which can cause this tube to not draw any current may disable the AGC gate circuit. It is possible for a break to occur in the leads from the horizontal output transformer to the plate circuit of the gate tube, removing the gate pulse from the plate and resulting in no AGC voltage developed. Since the gate pulse is taken from the horizontal output circuit, any defect within the horizontal oscillator or output circuits will effect the operation of the AGC gate tube. It is like a dog chasing its own tail but by utilizing a fixed bias on the AGC, the trouble can be quickly isolated.

The third new circuit incorporated in the TV-90 is the noise inverter circuit. Again, review of circuit description is advisable before following the servicing techniques. The purpose of the noise inverter is to provide the sync separator circuit with a noise free signal. This is accomplished by sampling the noise present in the composite video signal, separating it, amplifying and inverting it, then mixing it with the composite signal, thus resulting in cancellation of all noise information. Figure 4B is a simplified diagram at the noise inverter and gated leveler circuits.

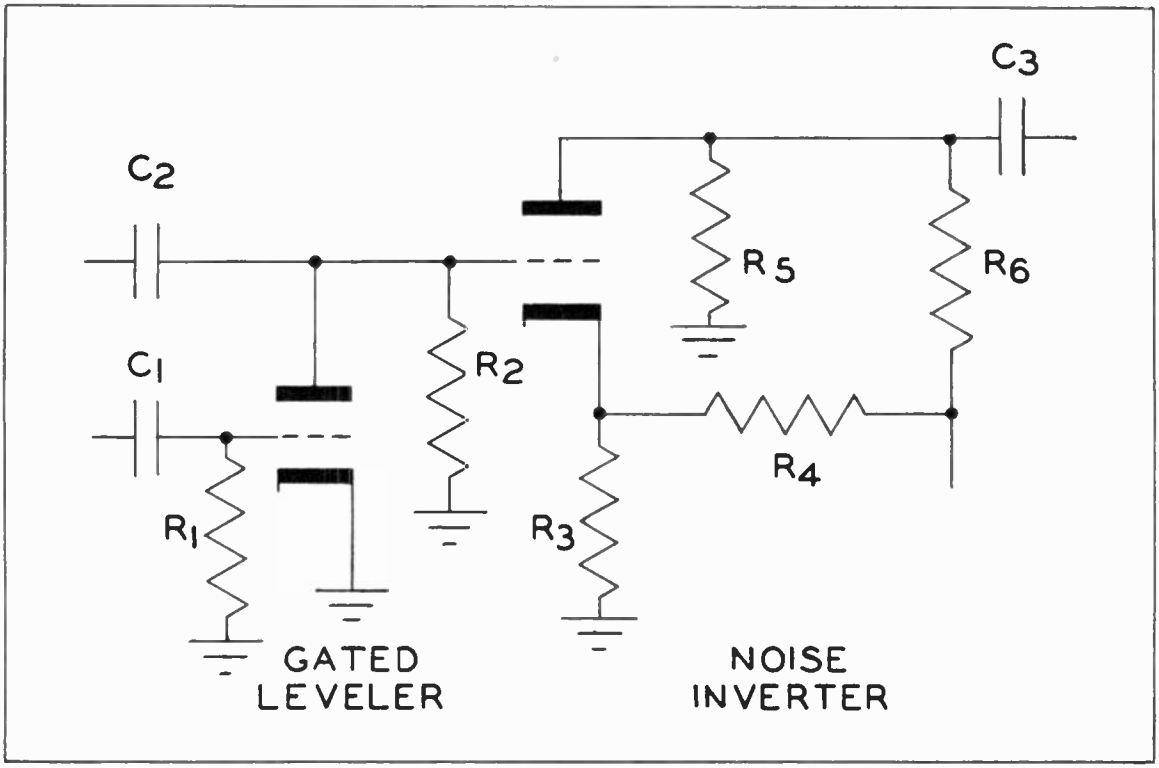


FIGURE FOUR-B

The gated leveler is an integral part of the noise inverter circuit. Its action is similar to that of a DC restorer and in this instance is pulsed by a sampling from the gate pulse so as to function only during horizontal sync time, thus, maintaining the same DC reference level of the sync tips.

The most important piece of equipment to be used in servicing these circuits is the oscilloscope. Without the use of a scope the trouble-shooting of these circuits would be very difficult and very impractical.

The first test, and a very simple one, is to remove the noise inverter tube from its socket while the set is turned on and noise in the signal. If no apparent change is noticeable in sync stability, the noise inverter circuit is inoperative and warrants farther checking. This is when the scope comes into use. The key test point in the noise inverter circuit is the cathode of the noise inverter tube. The wave form viewed there will determine the manner in which the noise inverter is functioning. If the noise inverter has failed completely the wave form will appear as in figure 5. There will be composite video information and large noise pulses extending both in a negative and positive direction comprising this wave form.

Figure 6 is the wave form as seen on the cathode of the noise inverter if the circuit is operating normally and noise is present in the received signal. Notice the greatly amplified noise pulses extending in a positive direction. These pulses are present in the plate circuit shifted 180° in phase and cancel existing noise pulses in the composite video signal. In order to see this more clearly place the oscilloscope at the input to the sync separator stage. With the noise inverter tube removed and noise constituting part of the received signal, the wave form appearing on the oscilloscope will be similar to figure 7. Now, replace the noise inverter tube in its socket and under the same operating conditions, view the scope wave form again.

This time the scope will show (figure 8) the noise completely eliminated from the composite video signal providing a noise free signal to the sync circuits. The degree to which the noise inverter circuit is defective can be determined by the condition of the cathode wave form as compared to figure 5 and figure 6.

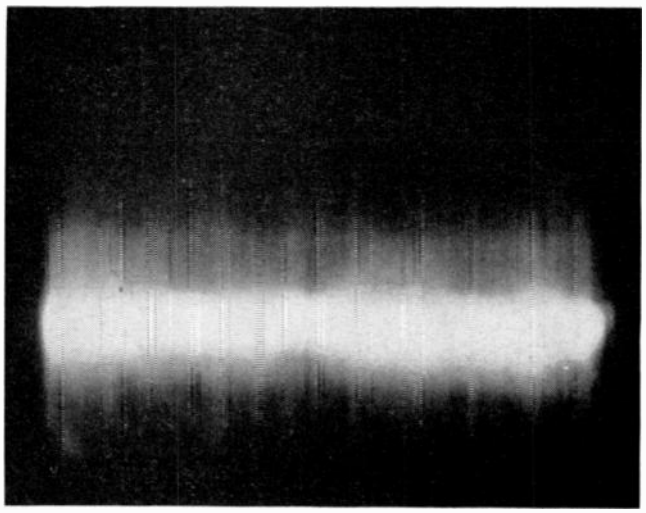


FIGURE FIVE

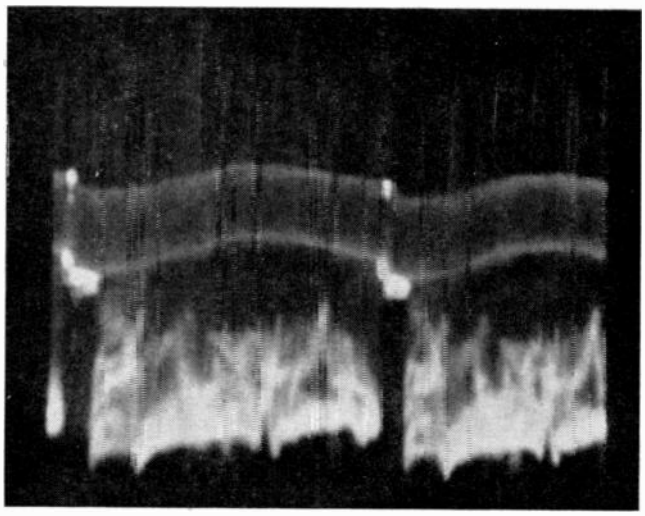


FIGURE SEVEN

The amount of video information appearing in the wave form obtained at the cathode will ascertain the effectiveness of the gated leveler tube. There should be little or no video information present at this point. The more video signal present, the poorer the operation of the gated leveler circuit. The pulse which is applied to the grid of this tube should be checked for its presence and peak to peak amplitude. It is normally 2 to 3 volts peak to peak. The scope must be calibrated for this test.

The voltmeter is used for the final checks on these circuits. The voltages, especially on the plate and cathode of the noise inverter are very important as they determine the point on the Eg Ip curve that this tube operates. Any appreciable deviation from the specified voltages will upset the circuits' operation radically.

To become thoroughly familiar with these circuits and the indications obtained under different operating conditions, take a normal receiver and go through these circuits with a scope and observe the effects with noise, without noise and with the noise inverter tube in and out of its socket.

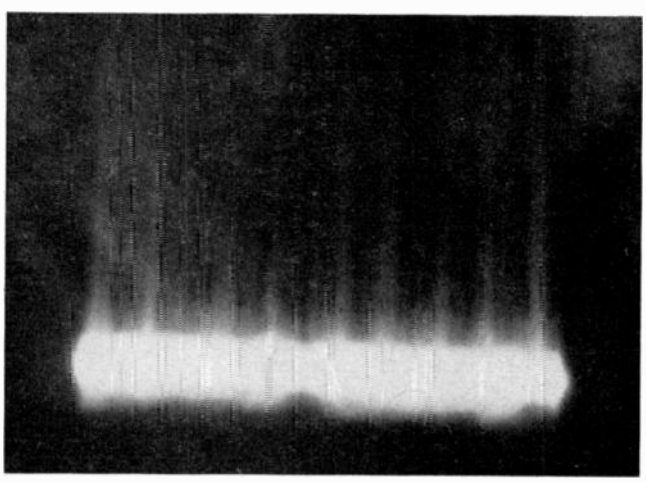


FIGURE SIX

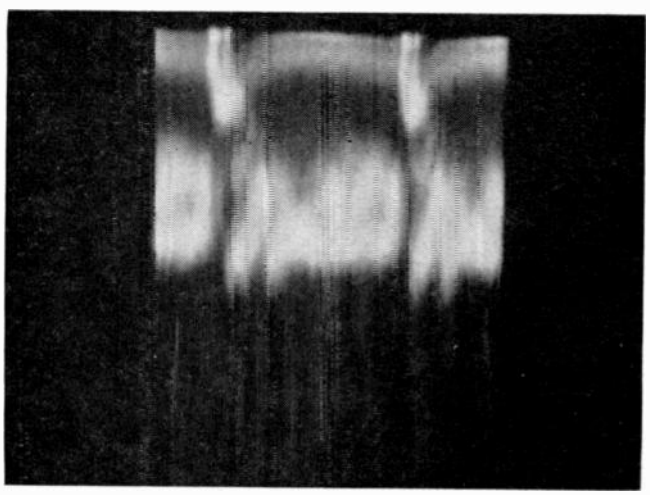


FIGURE EIGHT

SHOP PRACTICES AND SERVICE TECHNIQUES—*HOME RADIO*

OSCILLATOR FAILURE AND WHAT HAPPENS

Have you had a radio for service lately that cuts out, "seemingly" motor boats, or birdies badly after having applied the standard practices for these troubles such as checking audio and RF coupling and by-pass condensers, filter condensers and experimenting with lead dress of adjacent or parallel plate and grid leads? Your trouble *can* be the local oscillator.

A strong RF signal must be produced by the local oscillator in order to have sufficient signal of the intermediate frequency available, after beating with the incoming signal, so that the IF amplifier can do its full job of building up this signal to a usable level.

The signal fed to the grid of the first IF stage is, in amplitude, the vector sum of the incoming signal and that produced by the local oscillator. A healthy oscillator is important to overall gain of a superheterodyne receiver.

Two common causes of oscillator failure, besides the tube of course, are a decreased or no feed back coupling, be it capacitive or inductive, and value of the grid resistor changing with age, either increasing or decreasing in resistance.

The quickest and simplest method to determine whether or not an oscillator is working is to check the grid voltage. The oscillator operates as a class "C" amplifier and a portion of its output is fed back to the control grid, either inductively or capacitively to cause oscillations to be sustained. The fed back voltage is rectified during the positive excursion of the grid and the resulting DC voltage can be read directly at the oscillator grid. If there is no voltage the oscillator is dead.

Oscillator cut-out occurs primarily in the portable or farm type battery sets and the complaint is usually referred to as "short battery life" by the customer. After making a check of the battery under load, and finding it to be down only 10% or 15%, you can suspect the oscillator tube, circuitry or both if the complaint is "cut-out." Oscillator action is dependent upon good emission, proper balance between the grid leak and grid condenser and sufficient plate voltage to cause amplification to take place. The oscillators in Philco battery and portable type sets are designed to operate on voltages of between 50% and 55% of the full rated voltage of the batteries recommended. In other words, a battery should not be discarded if down 10% to 15%. The oscillator is probably at fault. The set may cut-out in certain areas of the tuning band. Change the tube first. If this doesn't solve the problem check the grid leak and grid coupling condenser. Values and tolerances of these two units must be held closely so that optimum oscillator action is obtained over the full range of tuning.

At the beginning of this article we referred to "seemingly" motor boating. What may be wrongly diagnosed as motor boating is really squegging of the oscillator and usually its symptoms appear at the low frequency end of the dial; at broadcast frequencies, somewhere between 650 KC's and 550 KC's. This may be caused by an unbalance of feed back and grid leak components. If the grid resistor has increased in value it cannot bleed off the grid condenser charge at the RF rate that the oscillator is operating. The condenser will then take a negative charge so great that the tube will be cut off for some period of time longer than the repetition rate of frequency of the tuned circuit and blocking can occur for durations of time down into the audio spectrum. It is then heard at the low frequency end of the band as mentioned before. As the dial is moved toward the high frequency end the sound increases in pitch until it becomes RF or inaudible. After inaudibility is reached, the blocking, still present but at an RF rate, can cause birdies since many unwanted RF frequencies are then present in the oscillator output to beat with incoming signals which, when mixed produce multitudes of frequencies.

To sum up — check values of components in the oscillator circuit with a good ohmmeter or by substitution of known good parts if your facilities will not read low capacities and high resistances. Always suspect tubes first.

SHOP PRACTICES AND SERVICE TECHNIQUES — *AUTO RADIO*

AUTO RADIO PREVIEW . . .
For Chrysler's Forthcoming Cars

CHRYSLER **PLYMOUTH** **DODGE**

FIGURE ONE—Philco-Mopar Auto Radios

Philco has recently gone into production on three new custom built auto radios for the Chrysler Corporation's new Chrysler, Dodge and Plymouth automobiles.

They are two unit sets. One section houses the R.F. and Converter stages, I.F., Detector, 1st Audio, Automatic Tuning and AVC Circuits. The other section has the Vibrator and Rectifier, Phase Inverter, and Output Circuits. The Speaker is also mounted on this unit.

The model numbers for the respective cars are — P5206 for Plymouth, D5207 for Dodge, and C5209 for Chrysler.

Electrically they are the same, but due to different instrument panel styling, color, mounting, etc., the sets are not interchangeable. Figure 1 shows the difference in the models.

They are 8 tube sets using a 6BA6 tube as an R.F. amplifier, a 6BE6 as a converter, a 6BA6 in the I.F. The Detector and 1st audio uses a 6AV6, the phase inverter a 6C4, and the output two 6AQ5 tubes. The rectifier tube is a 6X4.

Figure 2 is a Phantom view of a Plymouth instal-

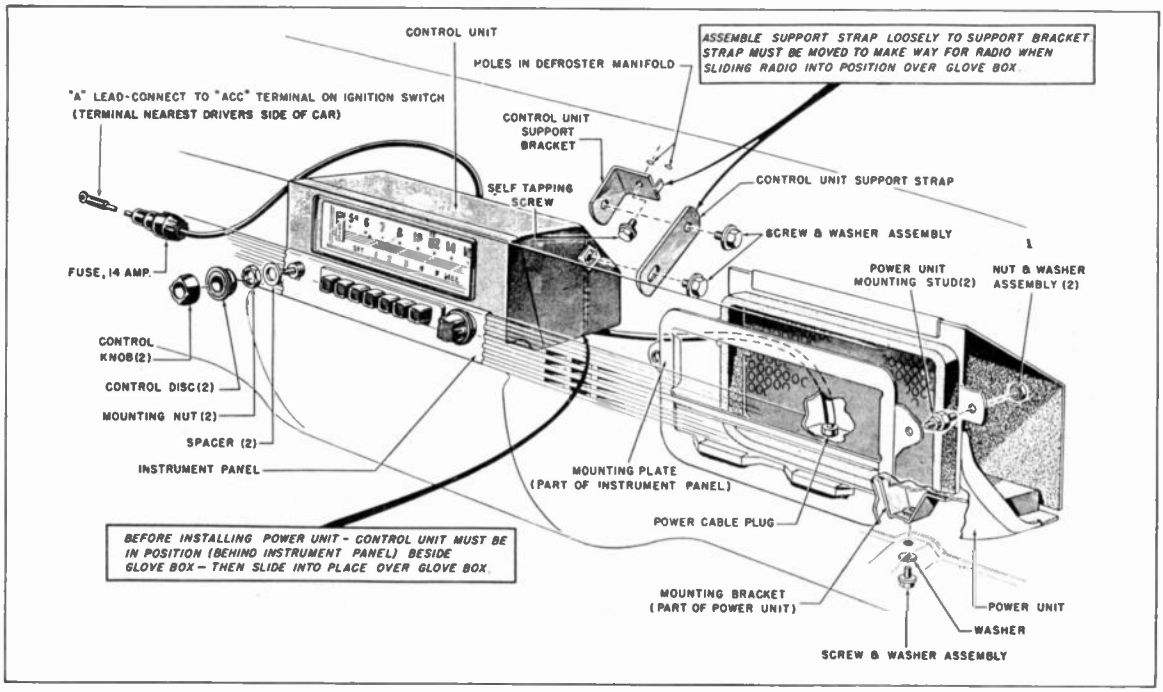


FIGURE TWO—Plymouth

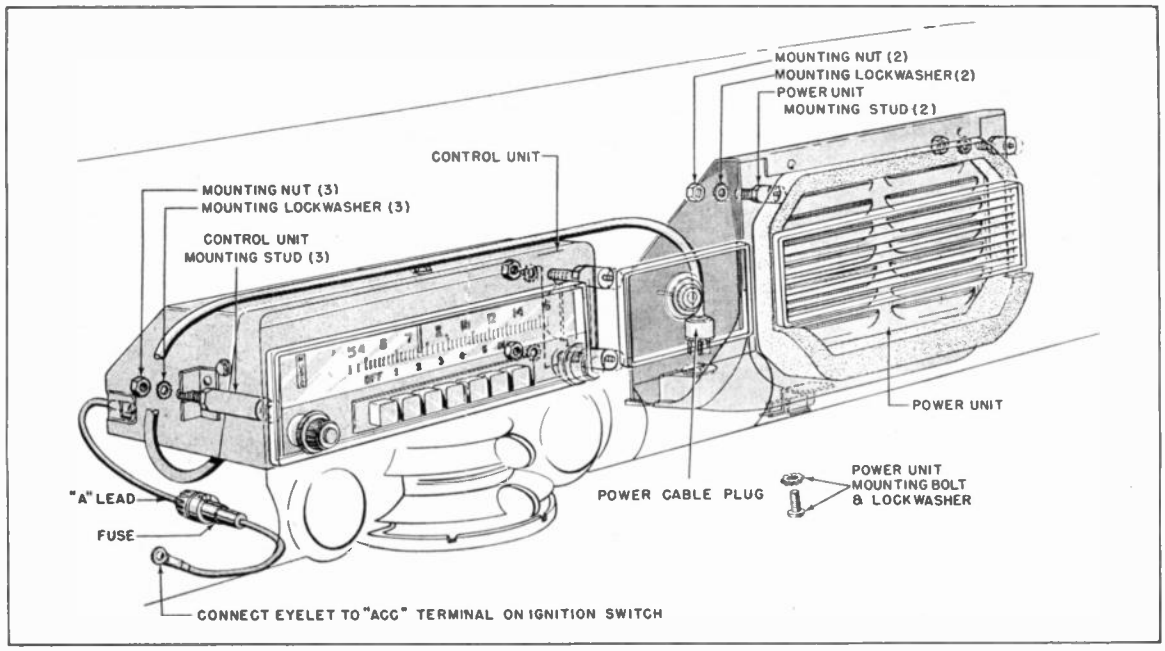


FIGURE THREE—Chrysler

lation with the radio mounted behind the instrument panel. Few installation parts are required. Note the mounting brackets used. They are peculiar to Plymouth as they are not used on the other cars.

Figure 3 shows the Chrysler installation. Instead of mounting brackets, mounting studs are used on the control unit. Note that the Chrysler Control Unit is provided with brackets on the side for the studs to fasten to.

Figure 4 is the Dodge installation. Note the mounting brackets used on the radio control chassis which is peculiar to the Dodge installation.

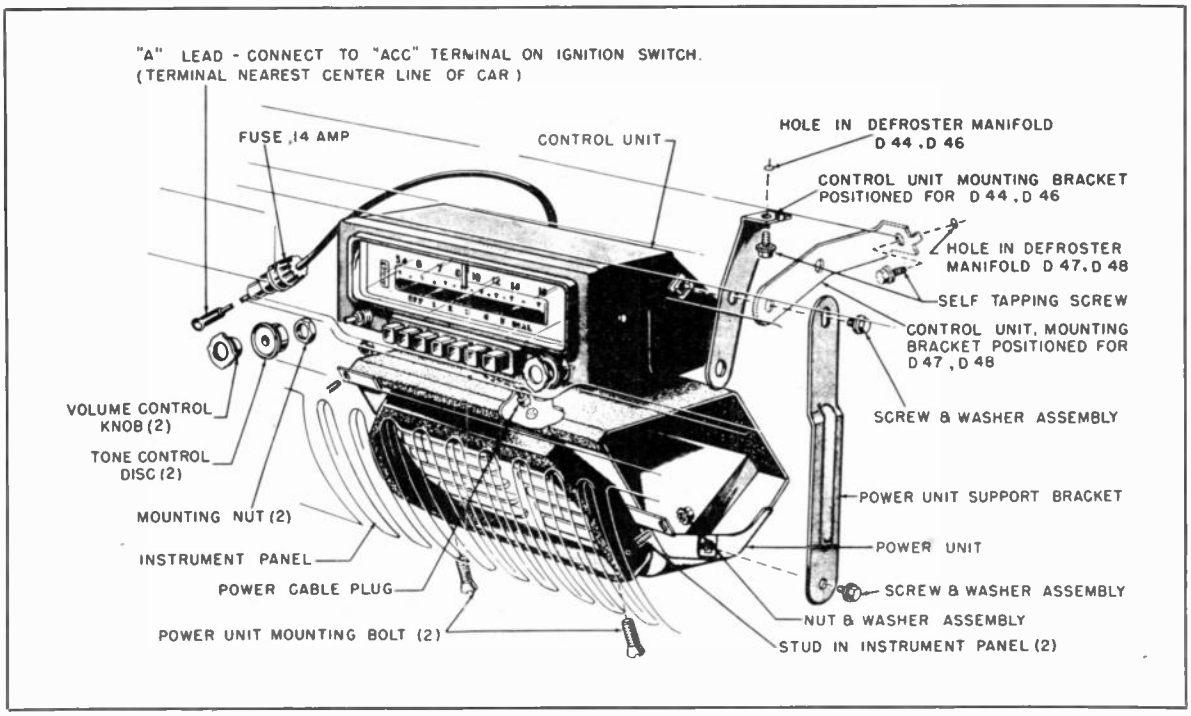


FIGURE FOUR—Dodge

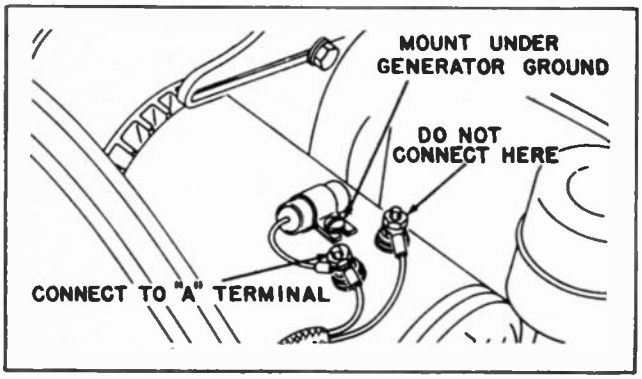


FIGURE FIVE-A—Generator

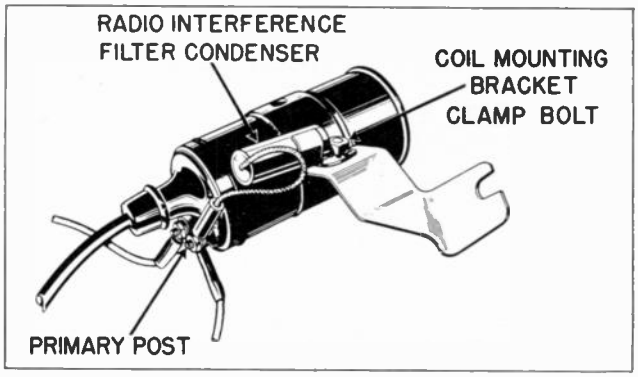


FIGURE FIVE-B—Coil

NOISE SUPPRESSION

As all Chrysler Corporation cars are equipped with suppressor type spark plugs, noise suppression work is reduced to a minimum. A standard installation usually only requires a condenser on the generator and a condenser on the ignition coil as shown in figure 5.

GENERATOR CONDENSER

Mount generator condenser under ground-wire screw of generator, and connect condenser lead to "A" armature terminal (figure 5-A).

COIL CONDENSER

Install coil interference condenser on Coil Mounting Clamp Bolt. Connect to Coil Primary Wire Terminal as illustrated (figure 5-B).

SCHEMATIC DIAGRAM

Figure Six is the circuit diagram of all three sets as they are electrically the same.

Considerable thought has been spent in the design of these sets to make them easy to service. For example, the push button tuning is accomplished by electrical switching of pre-tuned coils, yet there is no push button assembly that has to be removed to service this section as all parts are replaceable and easily accessible. The sides and cover can be removed by removing a few screws making all sides of the chassis available for easy testing or repair. The power unit is open so that even the replacement of tubes or vibrator can be made without removing a screw.

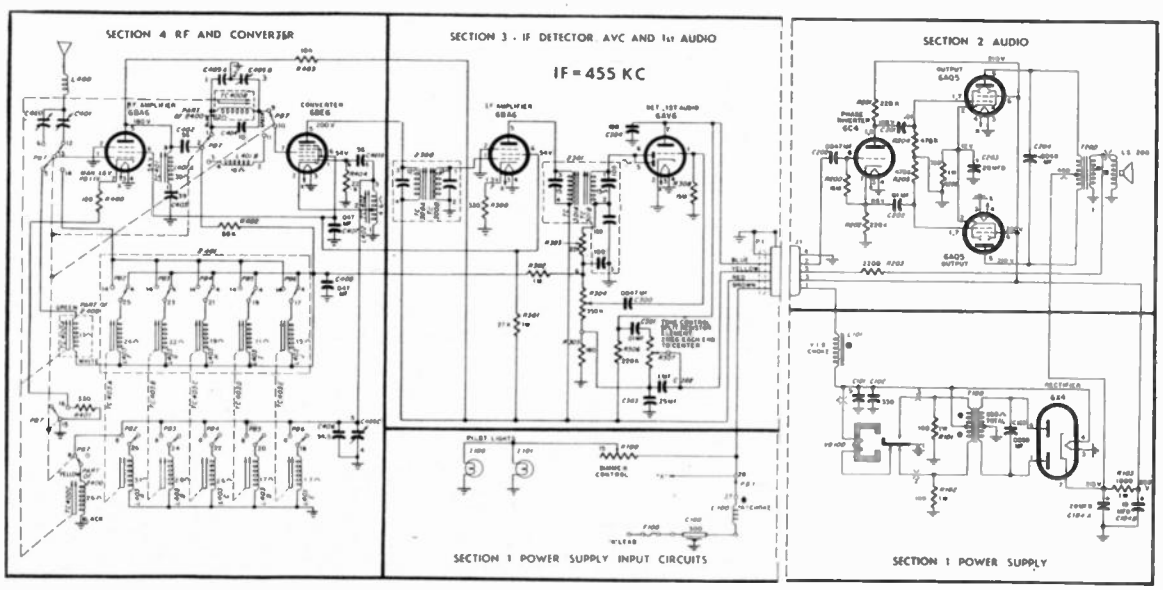
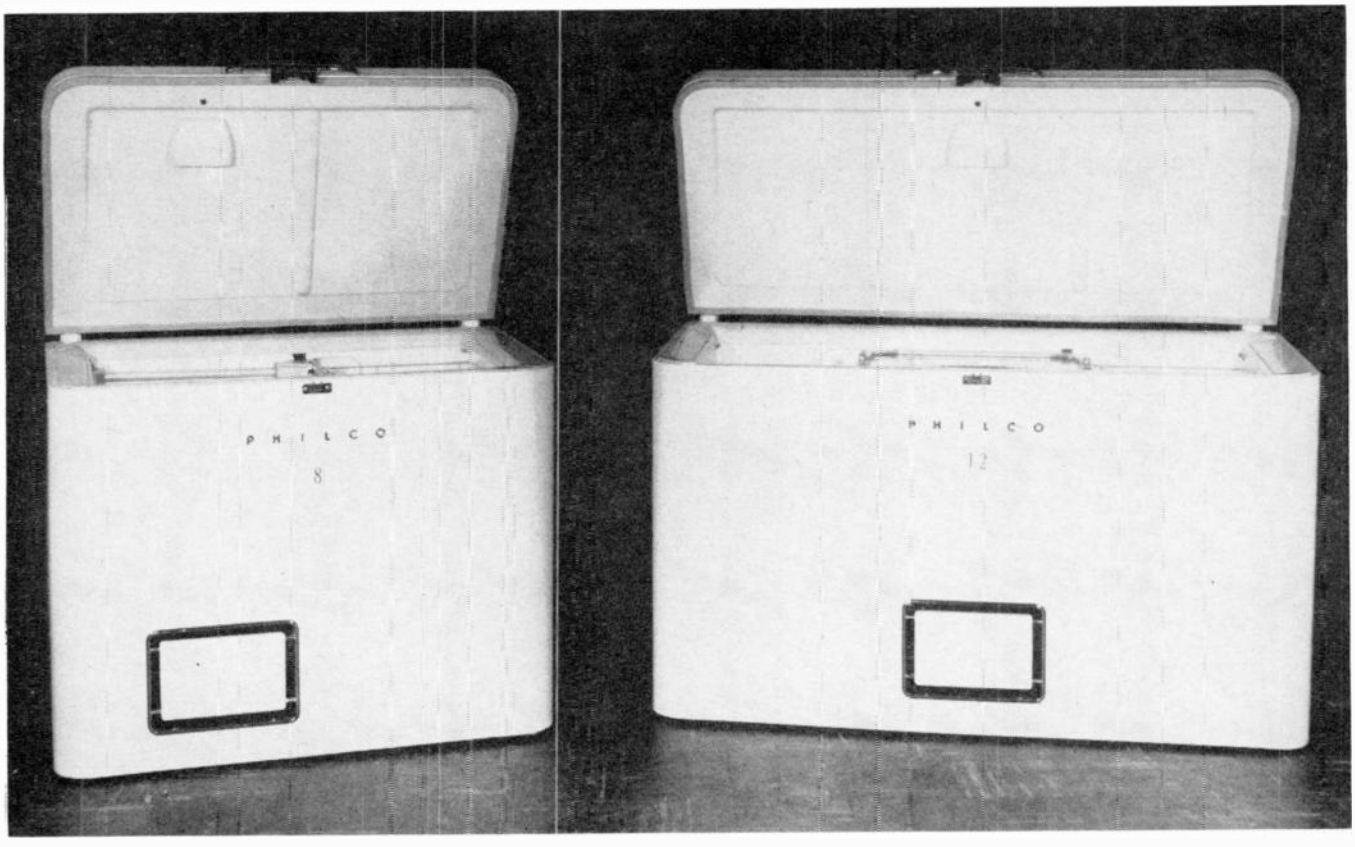


FIGURE SIX

NEW PRODUCT NEWS—*REFRIGERATION*

NEW INFORMATION For Easier Servicing Of The GH Line Freezers



Philco Freezer Model GH-82 (left), and GH-122 (right)

Since the Home Freezer has been made available to the housewife, she has had the opportunity to use the finest method of food preservation ever discovered. It is the safest method and also the easiest. The Serviceman who has maintained service on the Philco Freezer has also found out that this piece of equipment is simplified for ease of repair. The rules of preventative maintenance are few and simple. Upon installation, the freezer should be installed in a location where adequate power is supplied and where unrestricted air circulation is permitted. The cabinet should be leveled, to prevent air leakage from the storage compartment, due to a warped lid or poor gasket seal. The lid counterbalance adjustment should be checked to determine if the lid is held open when raised completely and will close gently and automatically when the lid is lowered.

A periodic inspection of the condenser should be made to prevent lint or animal hair from clogging the condenser fins, which would cause poor freezer operation. The fan should also be inspected. A binding or stalled fan will cause an excessive load on the compressor.

The temperature and alarm system should be checked periodically to determine if it is operating properly.

UNPACKING AND INSTALLATION

The importance of care and proper handling in unpacking a piece of equipment cannot be stressed too much. An ounce of precaution in removing the freezer from its packing will save a large amount of time in adjusting minor damages incurred by improper or hasty unpacking. To properly remove the GH-82 and GH-122

Freezers from their packing the following procedure should be used:

1. Tilt crate forward and remove two rear screws from crate base.
2. Tilt crate backward and remove two front screws from base.
3. Dismantle crate being careful not to mar finish on cabinet.
4. Carefully shift freezer until adjustable feet are clear of counterbored holes in crate base.
5. Slide freezer off crate base.
6. Remove steel banding which secures food compartment door, cut banding at point on underside of cabinet, hold banding on both sides of cut to prevent the banding from whipping.

Each Philco product is supplied with a packing list, against which you can check the items you remove from the freezer to inspect them for breakage or damage of any kind.

After the housewife has chosen a convenient location for her freezer, check to make sure there is sufficient clearance to lift the food compartment lid, and is located in a spot which will permit the unit to receive adequate ventilation. With the freezer in position, check the level. Leveling is accomplished by adjusting the leveling feet of which there are four, which can be screwed in or out to compensate for an uneven floor.

With the freezer in a permanent position and level, the lid seal should be checked. A simple test of correct lid seal can be made with a piece of paper, two inches by six inches, insert it between the gasket and the cabinet, with the lid closed. If it can be removed easily, the lid seal is not positive and will result in the loss of operating efficiency. This check should be made at several places around the cabinet.

FREEZER CONTROLS

In the construction of the Philco Freezer there has been no provision made for an on-off switch. This switch has been left out of the freezer so that it cannot be turned off accidentally. To put the freezer into operation, plug the power cord into the A.C. outlet.

The Temperature Control is a single automatic control used for both temperature and alarm; only one Feeler Tube from the control to the evaporator is used. This control is concealed in the unit compartment, as shown in figure 2. To gain access to the control, which is located in the center front portion of the freezer, raise the panel slightly and tilt out from the top. The location of the control inside the compartment tends to prevent accidental change in its setting.

The temperature may be set for two (2) ranges of cabinet temperatures, either STORAGE or FREEZE and may also be used to turn off the automatic warning bell.

STORAGE

This position which is the normal temperature control setting, produces approved sub-zero temperatures suitable for frozen food.

FREEZE

This position is used when freezing foods, it causes the unit to run continuously, thus creating temperatures as low as 15°F. below zero, within the cabinet. These low temperatures result in shorter freezing time.

ALARM OFF

This position is used to turn off the warning bell. With the switch in the off position, the cabinet temperature obtained is the same as in the storage position. Never leave the control switch in the ALARM OFF position after the cabinet is cold, since the warning bell cannot ring with the switch in this position.

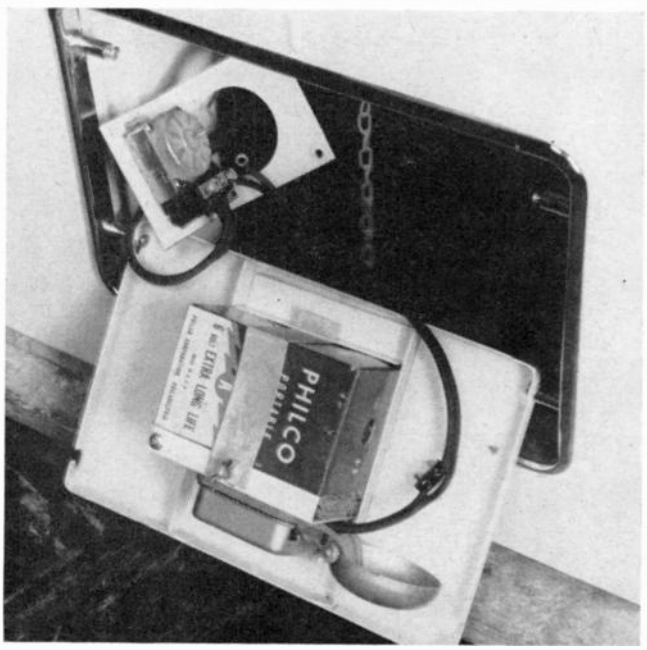


FIGURE TWO—Alarm Assembly and Temperature Control

INITIAL RUNNING PERIOD

During the initial running period, the alarm switch should be turned off, or the bell will ring until the freezer has cooled to approximately 12°F. After the freezer has cooled down sufficiently, to prevent the bell from ringing, the alarm switch should be set to the storage position. It must be in this position to give warning of any future temperature rise within the cabinet.

AUTOMATIC WARNING BELL

The battery operated warning bell gives warning of a rise in temperature within the cabinet that would be detrimental to the frozen foods. The bell will ring when such a rise in temperature occurs, if the temperature control is in either the FREEZE or STORAGE position. Once the bell is set in operation, it will sound continuously for 48 hours unless it is shut off by setting the control to the ALARM OFF position. This setting will stop the ringing of the bell, but will not remove the cause of the warning. Some of the conditions which will cause the bell to ring are:

1. Blown fuse.
2. Accidental removal of the power cord plug from the electrical outlet.
3. Exceptionally large quantities of warm food placed in the freezer at one time.
4. Temporary failure of the electrical power source. Any of these four conditions, can easily be corrected. After this is done, allow the freezer to operate until it has cooled to a safe temperature and reset the control to the STORAGE or FREEZE position, as the housewife may desire.

Since the warning bell is constantly standing guard over a large investment in frozen food, it is advisable that the owner of a freezer be shown how to test the operation of the warning bell system. This can be easily accomplished by leaving the temperature control knob set to the STORAGE position during the warm-up for total defrosting. When the bell sounds, reset the control to ALARM OFF. If the bell fails to ring, renew the battery and test again (battery Philco Part No. P-4F4R). It is advisable to renew the battery each year.

ELECTRICAL SYSTEM

Many electrical parts utilized in the Freezer Models GH-82 and GH-122 are similiar to those used in refrigerators. Most of the testing procedures for servicing freezers are similar to those used in checking a refrigerator.

The electrical system for the Models GH-82 and GH-122 are similar. Figure 3 shows a wiring diagram of these two freezers. The difference in the two freezers is that the Model GH-82 uses a one-fifth horse power motor compressor assembly and the GH-122 makes use of a one-fourth horse power motor compressor unit. The control and protective devices are engineered for the capacity of the motor compressor. Any required replacements should be made in accordance with the parts list for the freezer being serviced.

OPERATING AND CONTROL CIRCUITS

It can be seen by figure 3 that a complete electrical analysis of the freezer can be made through the terminal strip and the motor compressor terminal box.

The appliance power cord supplies current from the source to terminals No. 1 and No. 2 of the wiring panel. Assuming that the temperature control switch contacts are closed, power is delivered to the motor compressor starting relay from terminal No. 2 of the wiring panel, the start and run winding of the motor compressor are energized. The current leaves the motor compressor through the common terminal, passes through the overload protector, then flows to terminal No. 3 of the wiring panel.

The current path from terminal No. 3 is through the closed switch contacts of the temperature control, which completes the circuit to the source of voltage at terminal No. 1 of the terminal strip.

With the temperature control contacts closed to complete the circuit to the motor compressor, power is also being supplied to the condenser fan motor from terminal No. 3 and is returned to the source at terminal No. 2. The dewpoint compensator (which isn't shown in figure 3) also draws current from terminals 2 and 3 during the unit operating cycle.

When the cabinet lid is opened the light switch contacts are closed completing the cabinet lamp circuit from terminal 1 to terminal 2 of the wiring panel.

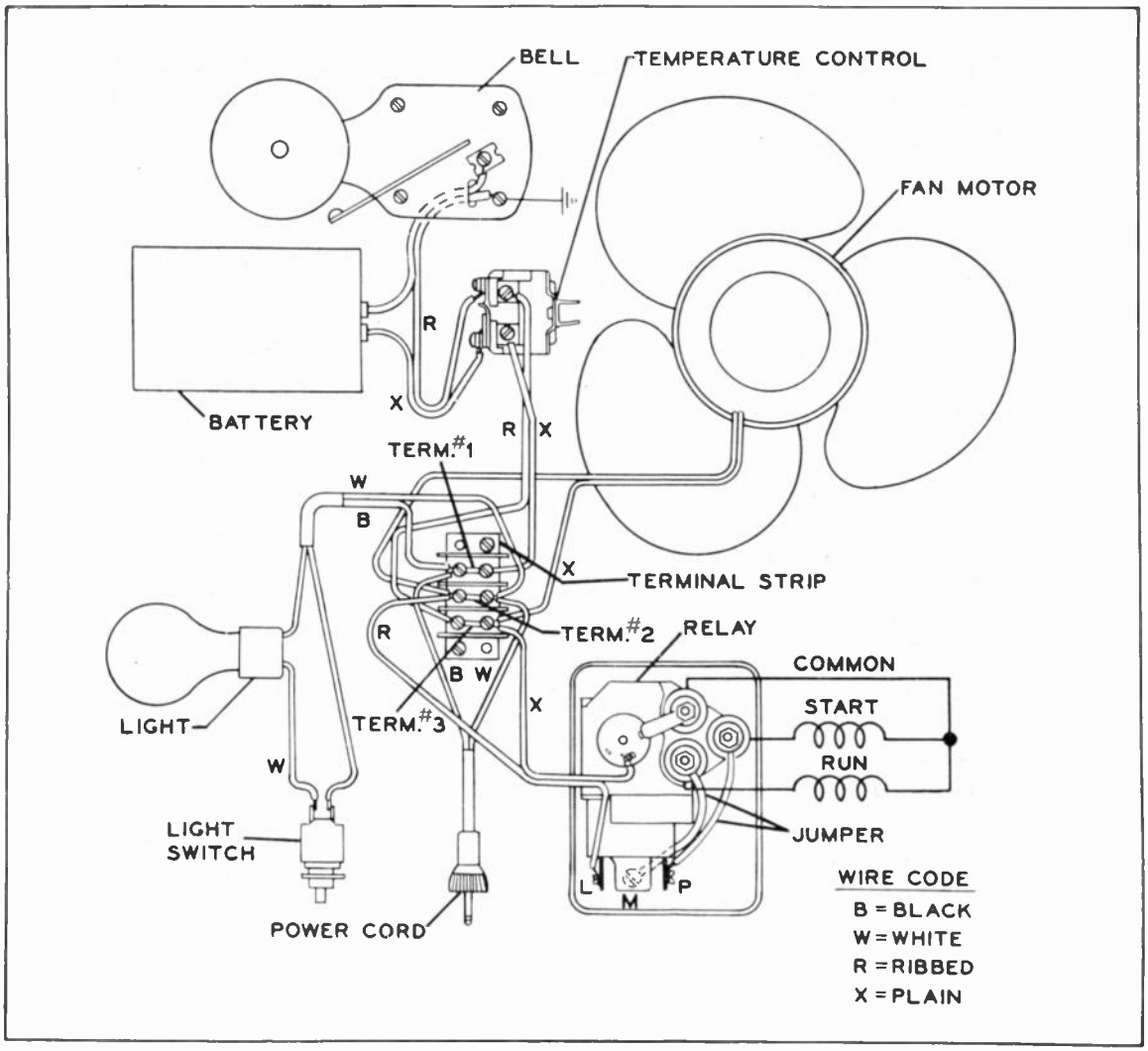


FIGURE THREE

The alarm assembly which is controlled by the temperature control feeler tube and switch is independently operated by its own battery. When the internal cabinet temperature rises above 12 degrees above zero Fahrenheit, the alarm circuit is completed. The alarm bell will ring for 48 hours unless the control switch is set to the alarm off position.

CIRCUIT TESTS

The test equipment required to check the electrical components of the freezer are a continuity tester for checking circuits and a volt wattmeter for making voltage and wattage checks.

To quickly check the electrical system:—measure the line voltage at terminals No. 1 and 2 at the terminal block with the freezer operating. The voltage measurement at these terminals must be between 105 and 125 volts.

Set the control to the storage position. Plug the wattmeter into the power outlet. Connect the freezer power cord into the wattmeter and observe the wattage on the meter. The wattage consumed by the appliance will vary with room temperature, and variations in line voltage. The running wattage for the Model GH-82 should be between 160 and 260 watts and for the Model GH-122, it should be between 200 and 300 watts. At the instant of starting, the motor compressor will draw much more power than 300 watts, but this condition is only momentary. This condition will not exist for more than three seconds.

MOTOR COMPRESSOR

A continuity check of the motor compressor circuit may be made by:—removing the service cord from the power outlet and disconnecting the common, run and start leads from the compressor terminals . . . check

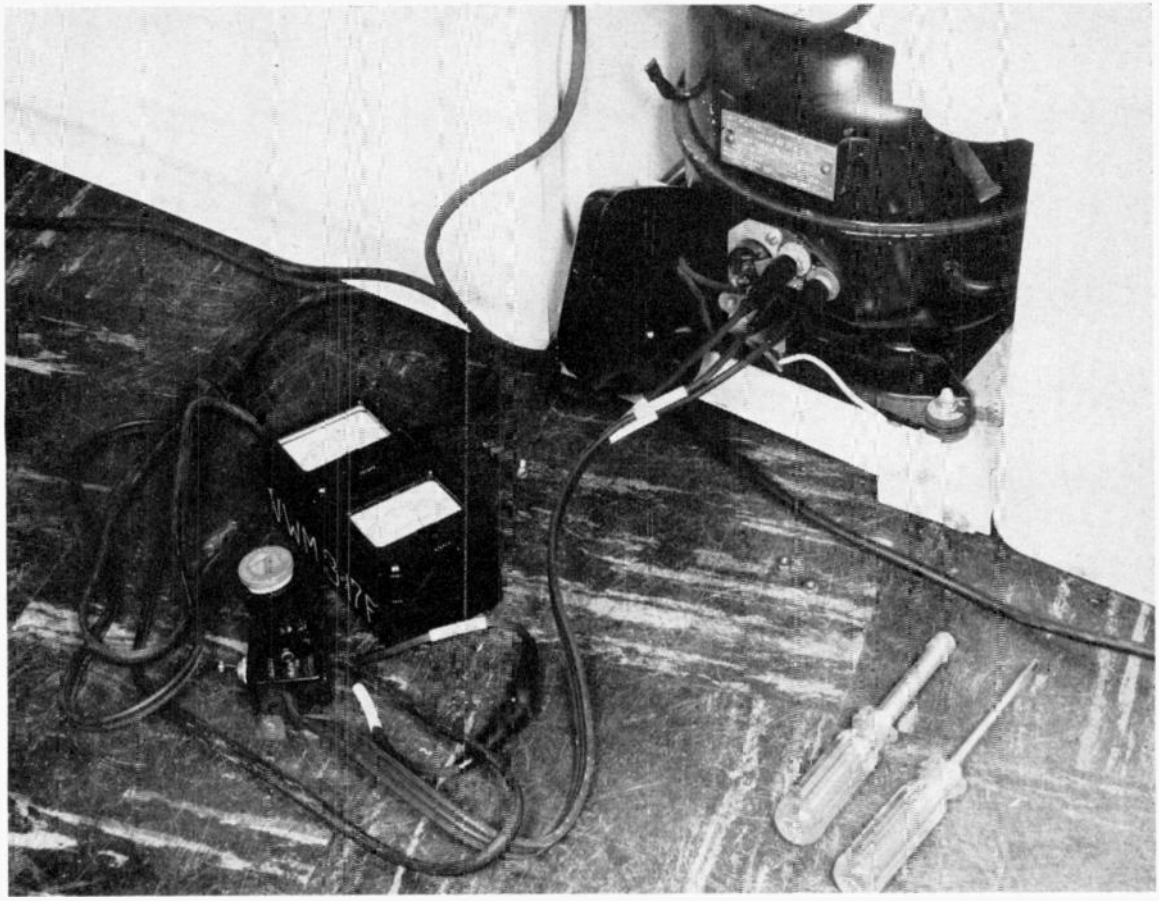


FIGURE FOUR—Continuity and Voltage Check

between common and start . . . then common and run of the motor compressor. The normal indication for these two checks should be that of a closed circuit.

An operational check may be made by substituting a refrigerator test cord in place of the wiring harness and starting relay (figure 4).

RELAY

With all leads from and to the starting relay disconnected, check between terminals L and M, which will show a closed circuit . . . between L and P which will have a normal indication of an open circuit . . . and M and P which will also be an open circuit.

An alternate check may be made by using an exact replacement in an operational test.

CIRCUIT BREAKER

Utilizing a trouble lamp, expose the circuit breaker by removing the motor compressor box cover. With the freezer plugged into the power outlet, by-pass the protector with the test lamp. If the unit operates and the lamp is illuminated, the protector is open and should be replaced.

TEMPERATURE CONTROL

A continuity check of the temperature control may be made by removing the power cord from the A.C. supply and the two lower leads from the temperature control, shown affixed to the control in figure 2 (represented in the wiring diagrams by wires R and X). Set the control to the freeze position and check across the binding post. A normal indication will be that of a closed circuit. This same check may be accomplished by removing the temperature control leads from terminal Nos. 1 and 3 of the wiring panel (figure 3) and making the continuity test across these isolated leads.

FAN MOTOR

Isolate the fan motor by removing its leads from terminals No. 2 and 3 of the wiring panel. Check continuity across the two leads that have been removed.

An additional check may be made by using a test cord to supply power to the fan motor. Before replacing the fan motor, it is advisable to disturb the fan blade setting, in case the fan is binding on the fan shroud.

TEMPERATURE CHECK

The efficiency of operation of the sealed unit assembly may be made through temperature checks:—

Locate a test thermometer just below the evaporator top mounting screw, as shown in figure 5 . . . freeze the thermometer bulb to the right hand rear flange of the evaporator in the position shown. This may be done by means of a piece of wet cloth over the thermometer bulb.

The control switch should then be set to the storage position. Close the cabinet lid and allow the freezer to operate through two cycles. Allow approximately thirty seconds after cut-off of the unit, before opening the lid, this waiting period allows for thermometer lag. The cut-on and cut-off temperature readings should be within the limits shown in the following table:

Model	Cut-On Temp. °F.		Cut-Off Temp. °F.	
	Low Limit	High Limit	Low Limit	High Limit
GH-82	-12	-2	-25	-15
GH-122	-12	-2	-25	-15

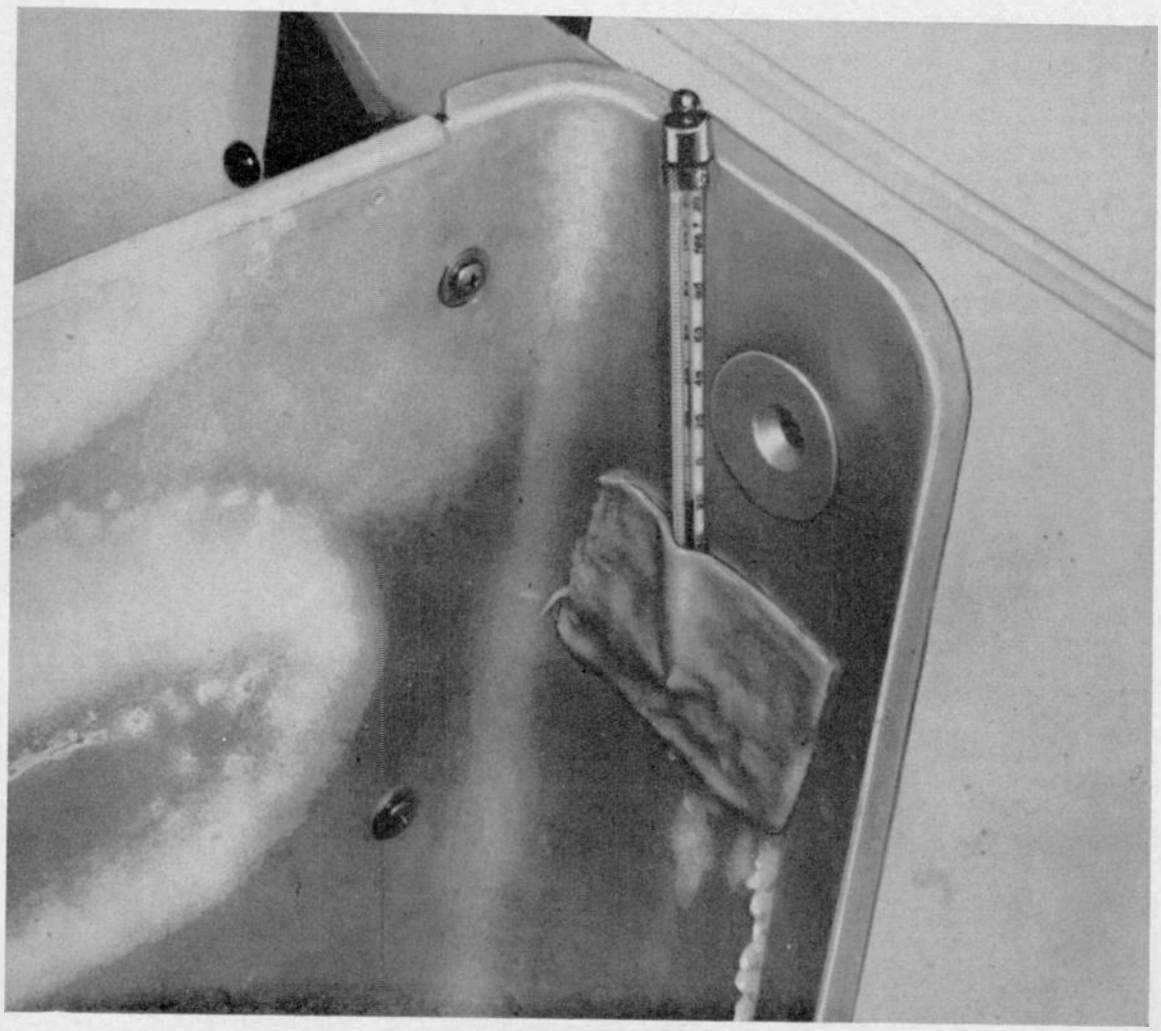


FIGURE FIVE

For each 1000 feet above sea level, the temperature control will operate approximately one degree lower. For example, the cut-on temperature for the freezer Model GH-82 will be -15 and -5, instead of -12 and -2.

If the temperature readings are not within the limits given on the table, either the temperature control or the Super Power System is at fault. If after a prolonged operation, the temperature does not reduce sufficiently to fall within the specified limits, the Super Power System is not operating at its rated capacity.

CABINET ADJUSTMENT

Efficient operation of the freezer is not only dependent upon perfect operation of the sealed unit assembly and its controls, but also, depends on proper adjustment of the freezer cabinet.

Occasionally a freezer will be found to all appearances to be out of alignment. That is, the lid, the seal gasket and the latch assembly will not have the proper relation to the cabinet. This condition is not caused by maladjustment of the lid and latch, but is caused by the freezer being improperly leveled. A check on the level of the cabinet should be made immediately when answering a call on poor cabinet adjustment.

LID SEAL

To determine whether the lid seal gasket is functioning to prevent heat leakage into the cabinet interior, one of two checks may be made:

Cut a piece of unglazed paper 1-1/2 to 2 inches wide and several inches long . . . use this paper strip as a feeler by inserting it between the seal gasket and the cabinet contact surface . . . latch the lid closed and withdraw the paper. If the test strip can be withdrawn easily without drag, the gasket is not making a positive contact with the cabinet. This check should be made at several places around the seal gasket.

A visual check may be made of the entire area of the lid and seal gasket by placing a 100 watt bulb in the

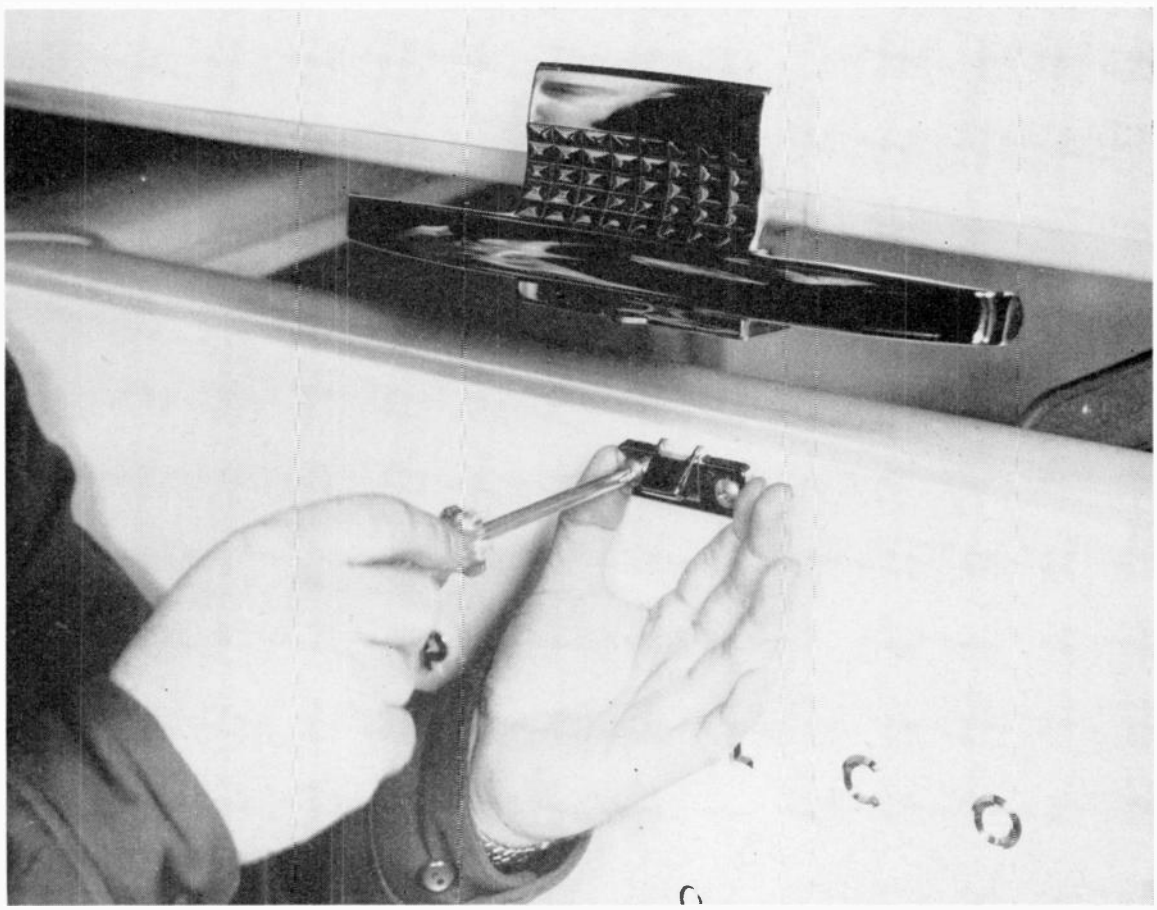


FIGURE SIX

freezer. If no light shows with the lid closed, seal gasket compression may be considered satisfactory.

Correction to tighten the seal may be made by adjusting the position of the cabinet strike and lid stays.

STRIKE

If it is necessary to adjust the position of the strike (figure 6) to obtain proper handle latch tension for positive seating of the seal gasket, loosen the two strike mounting screws and move the strike in the direction desired. Hold securely in position on the cabinet and then tighten the mounting screws. RECHECK THE SEAL.

LID STAYS

The spring loaded lid stay assembly is especially designed to hold the lid open and to close it gently and automatically when the lid is lowered. The lid stay is adjusted by running the spring tension adjustment nut (figure 8) in or out to suit the individual need.

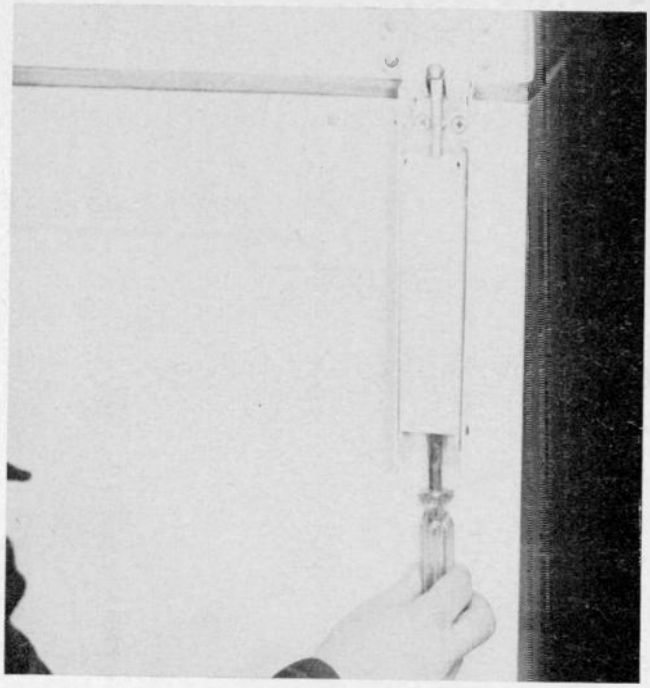


FIGURE EIGHT

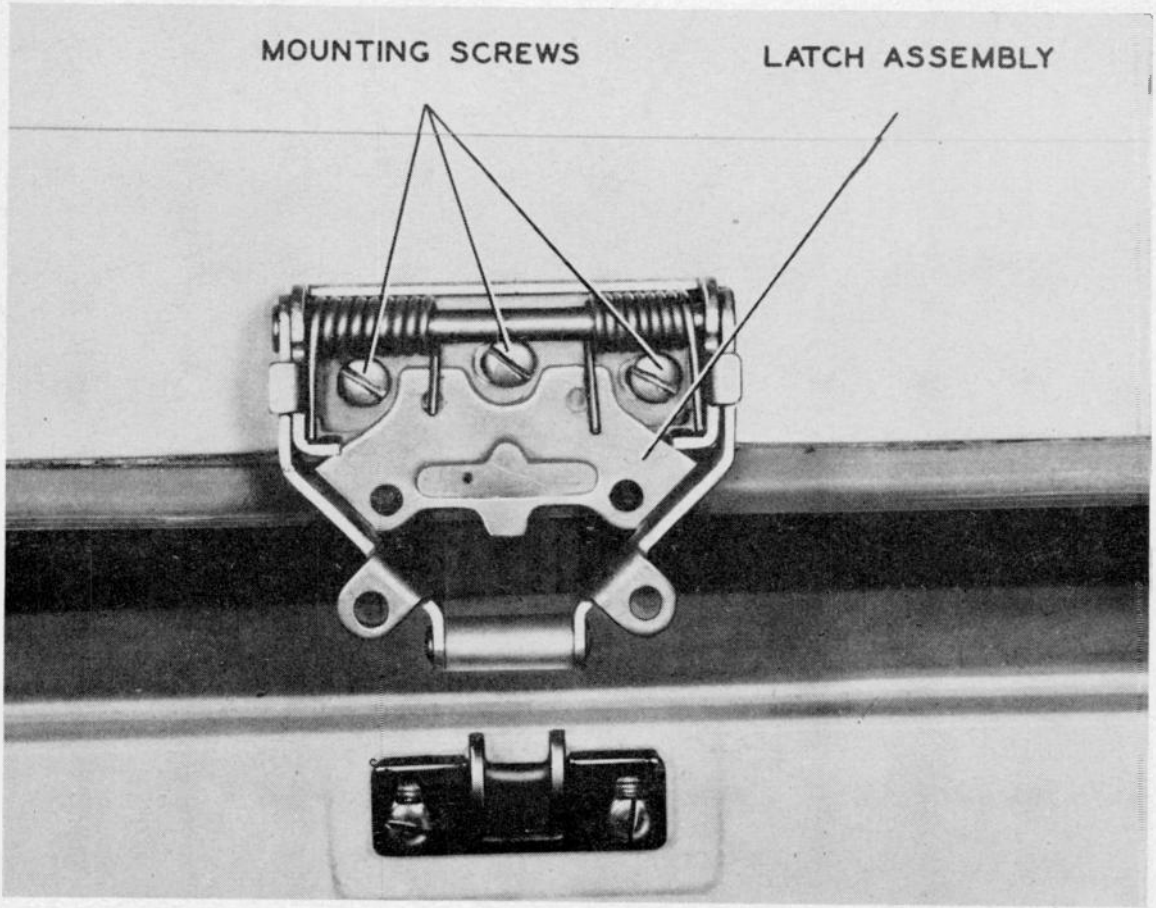


FIGURE SEVEN

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