GENERAL ELECTRIC

INSTALLATION INSTRUCTIONS

(FOR USE BY GENERAL ELECTRIC SERVICE UNITS ONLY)

FOR

MODEL 803

TELEVISION-RADIO RECEIVER

CAUTION

High voltages are used in the operation of this receiver. The back cover, while in place, prevents accidental contact with these high voltages and should not be removed except by a qualified television service engineer.

The picture tube is a high vacuum tube and, if it is broken, pieces of glass may fly with force in all directions. Any weakening of the glass such as may be encountered by chipping, scratching, or subjection to more than moderate pressure may cause this tube to break. The use of gloves and goggles is recommended when it is necessary to remove or replace this picture tube.

Installation of the Model 803 combination television and radio receiver requires (1) unpacking and set-up of the receiver, (2) antenna and lead-in installation, (3) adjustment of the operating controls, and (4) readjustment of the preset controls. Since careful installation is extremely important in order to realize the fine picture detail that is inherently built in this receiver, *only competent television service personnel should attempt the subsequent adjustments.*

UNPACKING AND SET-UP OF THE RECEIVER

UNPACKING—Remove the control knobs and felts from the envelope in which they are packed. Install the knobs on the control shaft, placing a felt washer on the shaft before installing the knob. Dual control knobs are used on three of the shaft assemblies. A felt should also be installed between the inner and outer knobs.

Unwind the power cord, and the receiver is ready to plug into the power outlet.

LOCATION OF RECEIVER—In locating the receiver in a room, the following factors are listed in their order of importance and should be considered:

1. The antenna lead-in must be kept as short as possible. See later paragraphs on antenna and lead-in installation.

2. Accessibility to an a-c outlet.

3. Locate so that the room illumination in daytime or nighttime can be controlled easily. If the daylight illumination cannot be controlled easily, locate the receiver in such a position that the light from a window does not fall directly on the picture-tube screen. For nighttime use, it is unnecessary to turn out all lights when viewing.

4. Leave about a three-inch air space, if possible, between the wall and receiver. This provides good ventilation and permits better sound reproduction.

TUBES—The picture tube is installed into operating position as it leaves the factory and does not require further adjustment upon installation. Remove the back cover of the receiver (see caution note above) and make sure the socket of the picture tube is firmly in place on the tube base. Check that all other tubes are pressed down firmly in their respective sockets and that the tube caps are in place at the dome terminals of the proper tubes. The tube locations are shown on a label affixed to the cabinet.

GROUND CONNECTIONS—The television receiver should have a good ground connection connected to the "G" terminal at the antenna-ground terminal board. This is essential to carry off any static charges built up on the antenna installation. This ground connection should be as short and direct as possible, and should preferably be made to a coldwater pipe or to a 5-foot length of pipe driven in moist ground.

ANTENNA AND LEAD-IN INSTALLATION

Unlike the ordinary broadcast receiver, the proper selection and installation of the antenna system is the most important item in assuring good pictures. For this purpose, a General Electric antenna Cat. No. UKA002 is made available which has been designed to provide optimum results with the Model 803 receiver. Full installation instructions accompany each antenna and these instructions should be followed very carefully. The antenna lead-in is connected to terminals No. 1 and No. 2 at the antenna terminal board. The following general installation instructions should be observed.

ORIENTING THE ANTENNA—Television antennas have decided directional characteristics. This makes it necessary to orient the antenna in such a way that it provides most efficient reception from the stations which are to be received. This problem of orientation is relatively simple if reception is to be had from only one station. When a number of stations are to be received, the problem becomes more complicated and requires careful and intelligent consideration. Received signals may come from several points of the compass and at different frequencies. The complications produced by transmitters at different locations are obvious because of the directional characteristics of the antenna. The problem involved due to different frequencies, however, may prove more complex since the directional characteristics of an antenna change with frequency. As an example, the antenna may be oriented for maximum signal from the west on channel No. 1, whereas the same antenna may provide a minimum of pick-up from the same direction on some higher frequency channel.

With each antenna there will be included a chart, making it possible to select in advance the most desirable antenna orientation. These charts will show the field patterns for different frequencies. In selecting the antenna direction, it is desirable to have a *lobe* point directly at the station being received although considerable tolerance is permissible. Avoid directing a *node* at the station to be received because when this is done, theoretical pick-up would be a minimum. If several stations are to be received, a compromise will have to be made as it may not be possible to direct a lobe squarely at each station.

The necessary compromises in direction will be modified in most cases by the relative signal strength of the different stations. One station may be so strong that considerable misdirection may be permissible without objectional signal strength loss so as to obtain a maximum signal from another station which is very weak.

REFLECTIONS (GHOSTS)—These reflections are caused by multipath reception of the signal when reflected from tall buildings, water towers, neighboring hills, etc., and must be taken into consideration. This trouble is prevalent usually where the signal strength is high and in downtown areas. These cannot be predicted ahead of time and it is only after a picture is received that they will appear. To correct, the antenna has to be rotated until this visual echo is removed from the picture without seriously affecting the true received signal.

The above considerations indicate that considerable experiment must be carried on relative to the antenna direction after the receiver is installed. This makes it advisable that the antenna be installed so that its direction can be changed after the picture is received. In very severe cases, the antenna may have to be removed completely and mounted in another location.

THE TRANSMISSION LINE—A properly selected and installed trans-

mission line is as important to the quality of the antenna system as the antenna is itself. An improperly installed line causes reflections and high losses. Reflections in the line destroy contrast, making it impossible to obtain clean, crisp pictures; and in severe cases, the reflections cause "smears" so that the picture appears out of focus, even when the receiver is focused perfectly. In general, the longer the transmission line, the more care required in installation.

The Model 803 receiver is designed for an input antenna terminal impedance of 300 ohms. Similarly, the terminal impedance of the antenna should be 300 ohms. Thus to provide optimum results, the transmission line must have a surge impedance of 300 ohms throughout its length. If it does not, two things happen: first, less energy will be delivered to the receiver, lowering the signal strength and thereby increasing the undesirable effects of noise and interference; second, the mismatch will permit reactive energy to travel back and forth on the line because of the lack of proper damping. These reflections destroy the character of the original signal which was picked up.

Transmission line is furnished in two types—indoor (standard) Cat. No. UWT002 and outdoor (de luxe) Cat. No. UWT003. Both are 300-ohm lines, matched properly to the antenna and the receiver. The task of the installation engineer, therefore, is to install this line so as to preserve its characteristic—he must avoid those things which tend to upset the line impedance. The comments and suggestions which follow have this object in view.

1. Length—The longer the line, the greater the danger of mismatch. In addition, a normal loss occurs in the line which loss is proportional to length. It is therefore essential to keep the line as short as is practically possible. It is worthwhile expending effort in this respect if a significant saving in length can be obtained, bearing in mind the proper technique in securing, concealing, and otherwise handling the line itself. These factors are explained later, after the characteristics of the two types of lines are explained.

2. Outdoor Line—This line is of heavy construction and was designed particularly for outdoor use. It is superior to the indoor line although it is more costly and harder to conceal and secure because of its greater stiffness. As might be surmised, this line may be used to good advantage as indoor line if it can be installed conveniently or concealed, or if its appearance is not objectionable.

Outdoor lines are recommended for outdoor runs which exceed about 20 feet or for even small runs if these runs are horizontal so that they can collect rain. Good practice calls for all outdoor runs to be made with the outdoor line.

3. Indoor Line—Indoor line is of lighter construction and is more easily handled. It is intended particularly for indoor runs where it is protected from rain and weather. It may be used outdoors if the outdoor runs do not exceed 20 feet *provided* the run is *vertical* and is *protected from direct rainfall* as it would be if it ran down the side of a building below the eaves of the roof.

4. Splicing Line—When splicing the indoor and outdoor lines (or any other breaks in the line), be careful to maintain the line impedance. This is done by stripping the two lines back about ½ inch and then twisting the respective conductors together so that the *insulation of one line butts directly against the insulation of the other.* If the splice is made with a large space between the parallel wires, the line impedance will be changed at that point and reflections may be set up. The recommended technique will avoid such an air gap. The exposed wires, which stand away from the line should be twisted tightly, soldered well, and clipped short.

5. Installing Outdoor Lines—The transmission line must not be permitted to bear against objects such as the side of a building (wood or otherwise). It should be suspended so that it clears such objects by at least an inch or two. Insulated eyelets, secured in a threaded support, are ideal for supporting the line. The line must be kept clear of metal objects and *in no case* be permitted to run against metal surfaces. Run the line as nearly vertical as possible so that rain will drain off instead of collecting in pools on the surface of the line. If horizontal lines are necessary try to run them so that they are protected by the eaves of a roof or other cover. *Do not run the line inside of pipes.* The transmission line should be pulled tight and firmly anchored at frequent intervals to prevent the wind from blowing it around. This may be accomplished by clamping it between two small blocks of wood or textolite or other suitable non-conducting materials. If the line crosses a horizontal surface (a roof), make certain that it clears the surface enough to keep it above the level of the snow in winter. Use insulated screw eyes for this purpose.

6. Installing Indoor Lines—The indoor line should be run out through a window or wall where the outdoor line can be spliced to it. The line can enter by crossing the window sill so that the window closes down on it, provided the structure is wood. Do not run the line over a metal window ledge or through a metal conduit, unless the conduit is large enough to space the wire an inch or two from all sides. Never fold the line in order to force it through a narrow opening such as a porcelain tube. All precautions relative to the handling of outside lines apply to the handling of inside lines except that in the latter case greater care must be exercised; inside lines, having less insulation, are more affected by contact with objects.

Inside line should not be run for more than five feet under a carpet. This changes the capacity between lines, upsets its impedance, and causes loss and reflections. Outdoor line can be run up to 20 feet under a carpet. When running the line indoors, it may be tacked against wooden floor molding, but use only as many tacks as is absolutely necessary. The line is far superior electrically if it droops somewhat between tacks; i.e., it is better than having it pressed firmly against the wood surface.

An ideal way to run the line is across beams along a cellar ceiling and through the floor directly behind the television receiver. Do not pull the line around pipes, radiators, or other metal objects—space it away from these. Lastly, do not improvise window lead-in devices or connectors for the line. Splice only as explained above and run the line directly to the terminal board on the television receiver.

LIGHTNING ARRESTER—A special lightning arrester is available which will afford lightning protection for the television antenna system. This is available as Catalogue No. REM-001. The instructions enclosed with each arrester should be followed very carefully so as not to change the lead-in impedance at the point of connection.

SPECIAL ANTENNA LEAD-IN INSTALLATION—The antenna and lead-in recommendations may be altered under certain circumstances to provide more satisfactory results under these conditions than with the recommended installation described in the preceding paragraphs. This is particularly true in apartment house and tall building installations where a long lead-in is required and there is a possibility of picking up multiple reflections or man-made electrical disturbance generated in the building. The use of this cable will also permit the lead-in to be run through metal conduit pipe or ventilation shafts without changing the lead-in impedance.

Shielded cable, such as Cat. No. RWD-001 cable, recommended for television use will in many cases alleviate man-made noise interference so that satisfactory results may be obtained. Since this shielded cable has a characteristic impedance of approximately 100 ohms, special impedance matching resistance networks must be installed at both the antenna and receiver input to prevent the undesirable effects of mismatch as previously described. Figure 1 shows the resistor values and points of installation needed to match the 100 ohm transmission line to the Model 803 receiver and a 300 ohm antenna. This resistor matching network obviously will reduce signal voltage considerably so that the application must be limited to areas only with high signal strength. The capacitor connected between the cable shield and "G" terminal permits better broadcast reception when using the shielded cable.

RECEIVER CONTROLS

There are two sets of controls used for adjusting the picture details on the Model 803 receiver. They are the normal operating controls (see Figure 2) and the preset or service adjustment controls (see Figure 4).

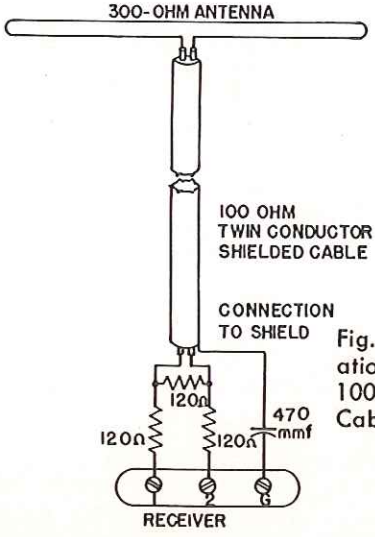


Fig. 1. Input Alterations When Using 100-Ohm Shielded Cable.

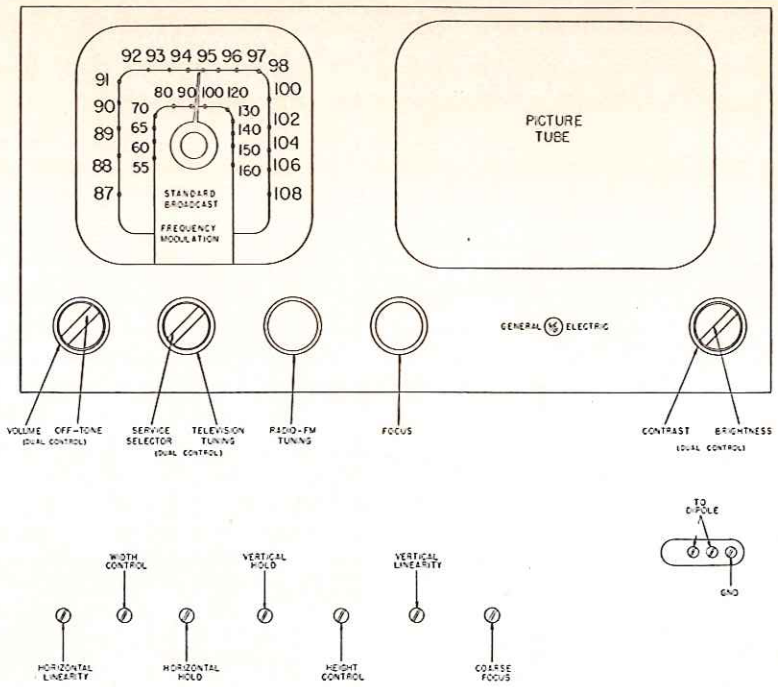


Fig. 2. Operating Control Location

OPERATING CONTROL ADJUSTMENTS

On the front of the cabinet are the only operating controls needed to adjust the vision and sound sections of the receiver for optimum results. Three of these knobs are dual; the location and names are shown in Figure 2.

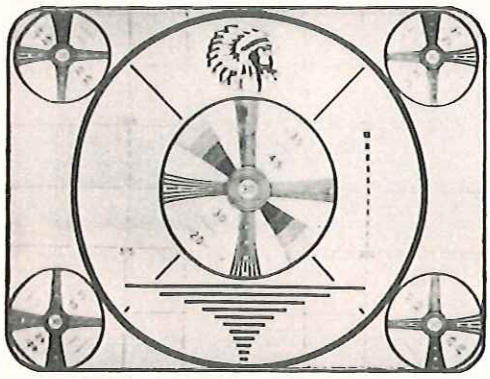
SERVICE SELECTOR—Positions 1 through 13 of this switch permit selection of the television program channels. The radio positions are labeled "AM" and "FM" and their selection permits operation in the standard broadcast and frequency modulation bands respectively.

Satisfactory reception at each television channel position is dependent upon a number of factors, including the location of the receiver from the transmitter and upon receiving conditions. Program listings in most newspapers will probably give the channel number and frequency. The assigned channel numbers and their frequency coverage are given in the table on page 4.

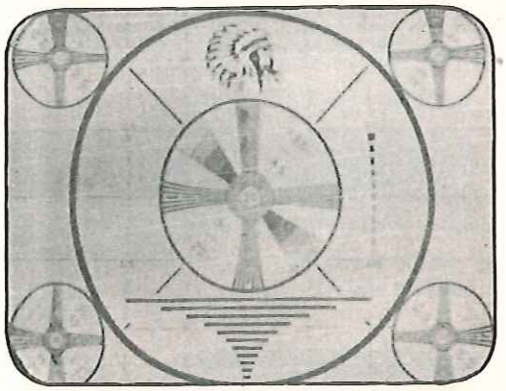
Although the Model 803 receiver is designed to operate in all of the listed channels, it should be noted that station assignments may not be made on all the channels in your locality.

To tune for a particular channel, merely turn the Service Selector until the index is opposite the channel number desired. This selection of the channel adjusts the tuning circuits approximately. For fine adjustment, the Television Tuning control, described in a following paragraph, must be properly adjusted.

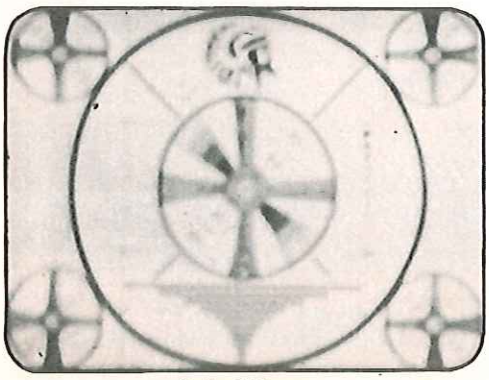
TELEVISION TUNING—This tuning control is the larger knob of a dual control and adjusts the frequency to the television band being received. Correct adjustment is essential for optimum picture detail and satisfactory sound reception.



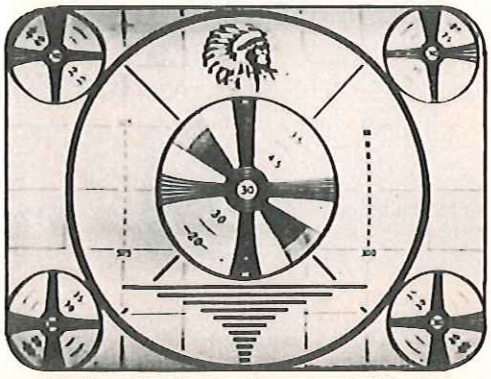
Proper Picture Adjustment



Increase Contrast—Reduce Brightness



Adjust Focus



Reduce Contrast—Increase Brightness

Fig. 3. Picture Adjustments with Operating Controls

Service Switch Position	Channel	Frequency Band
AM	Broadcast	540–1600 kc
FM	FM	88–108 mc
1	1	44–50 mc
2	2	54–60 mc
3	3	60–66 mc
4	4	66–72 mc
5	5	76–82 mc
6	6	82–88 mc
7	7	174–180 mc
8	8	180–186 mc
9	9	186–192 mc
10	10	192–198 mc
11	11	198–204 mc
12	12	204–210 mc
13	13	210–216 mc

Turn the Volume and Contrast controls about halfway up; then adjust the Television Tuning control to that point where the sound reproduction of the program is the clearest. In general, this is the point where the program is the loudest and the extraneous noise is the least. In strong signal areas, three closely spaced tuning points may be noted where the sound will be heard. The correct adjustment is the center of the middle tuning point. This tuning point for the sound automatically insures the proper adjustment of the vision channel. Should this adjustment produce excess sound volume, reduce the Volume control setting; *never reduce volume by detuning.*

CONTRAST CONTROL—This is the larger knob of the right-hand dual control and its adjustment is dependent upon your location in respect to the transmitter. For a weak signal, this control may have to be operated nearly full clockwise, while for a strong local station the control may be operated almost fully counterclockwise or at minimum. As the name suggests, this control adjusts the black and white contrast between the various picture elements. Turn this control until the picture remains stationary on the screen but not so high that the gradation between black and white is lost. Too much contrast is apparent when the picture is lacking in gradations between black and whites or the picture loses form. Too little contrast causes the picture to appear faded so that it seems composed entirely of grays. A properly adjusted picture is shown in an accompanying photograph in Figure 3.

BRIGHTNESS CONTROL—This control must be adjusted simultaneously with contrast as it regulates the brilliance of the received picture. Too much brilliance will have the same effect as too little contrast, making it advisable to strike a proper balance between the Contrast control and Brilliance control settings. Since the proper operation of the Contrast and Brightness controls cannot be adequately described in words, photographs in Figure 3 show examples of maladjustments and their effects on the received picture.

FOCUS CONTROL—As the name implies, this control focuses the received picture on the screen. It is merely necessary to adjust this control to the point which gives the sharpest definition in the picture.

VOLUME CONTROL—This control adjusts the volume to the desired listening level. In the extreme counterclockwise position the volume of the sound receiver will be at a minimum. With clockwise rotation the volume may be increased to any degree until the full output of the sound receiver is obtained.

OFF-TONE CONTROL—This control turns "on" and "off" the power and adjusts the tone quality of the amplifier for the most pleasing reproduction. Slight rotation from the extreme counterclockwise position turns "on" power and by further clockwise rotation, the tone is varied from maximum treble to maximum bass.

PRESET (OCCASIONAL ADJUSTMENT) CONTROLS

The preset controls are located at the rear of the chassis. See Figure 4. Except for the Centering and Ion Trap adjustments, they are available through holes in the back cover without removing the cabinet back. Slotted shafts permit ease in adjustments by means of a screwdriver.

These controls are adjusted for optimum performance at the factory and should require very little attention after installation and over very long periods of operation. However, all controls should be adjusted at the time of installation to correct for any shift in control settings during shipment. Study the illustrations, shown in Figure 5, for maladjustment of the various controls and their means of remedy. These adjustments must be made during the transmission of a test pattern, as shown in the illustrations.

ION TRAP ADJUSTMENT—The ion trap may be approximately located as shown in Figure 4; however, its final adjustment must be made with the television receiver operating.

The approximate adjustment requires that the gaps in the two magnets be lined up with the break in the rubber holder. NOTE—Some ion traps have been magnetized so that it is necessary to rotate the small magnet at 180 degrees to this normal position. Then slide the assembly onto the picture tube neck so that the

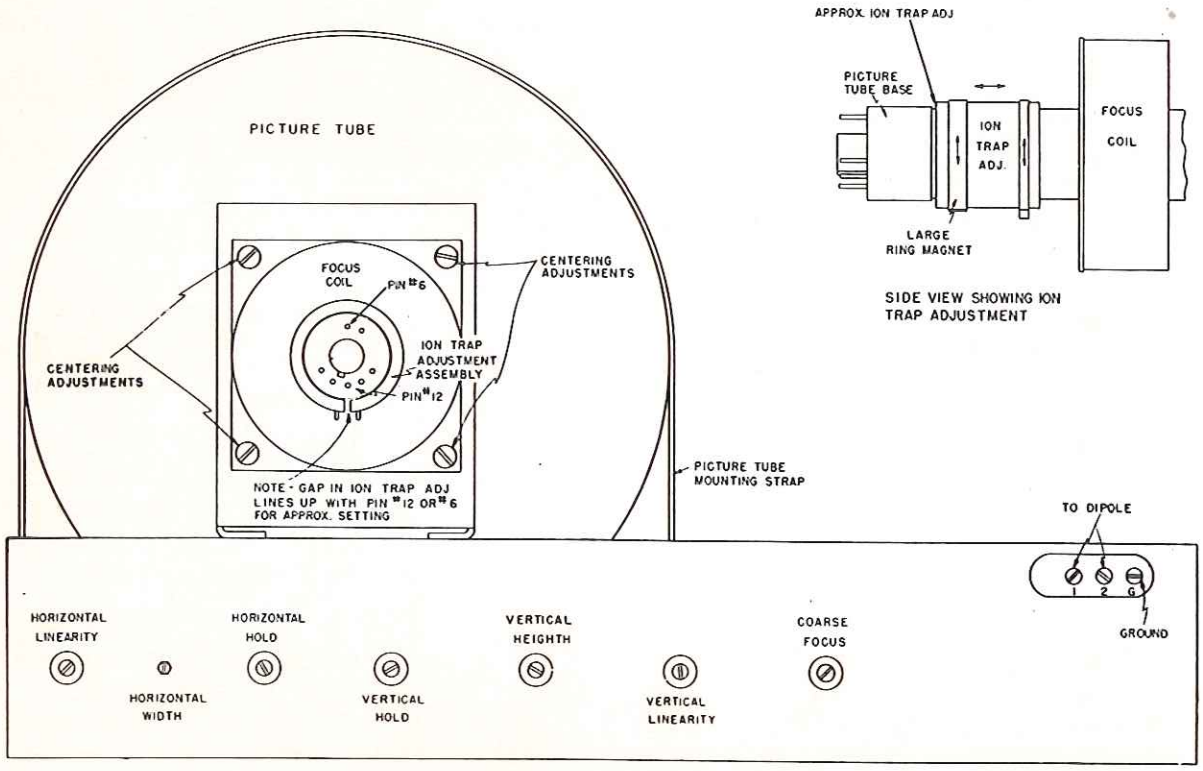
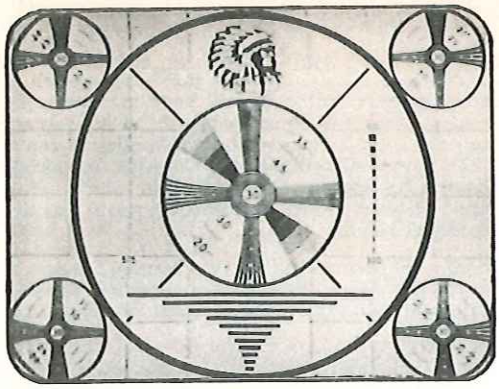
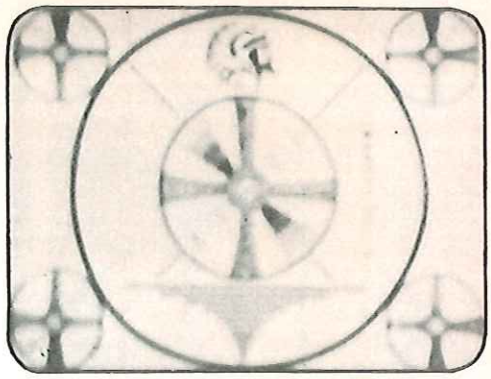


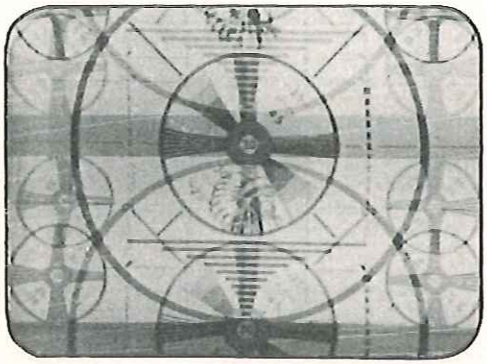
Fig. 4. Preset (Occasional Adjustment) Controls



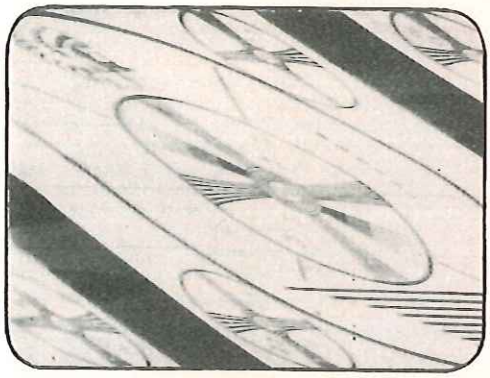
Normal Picture



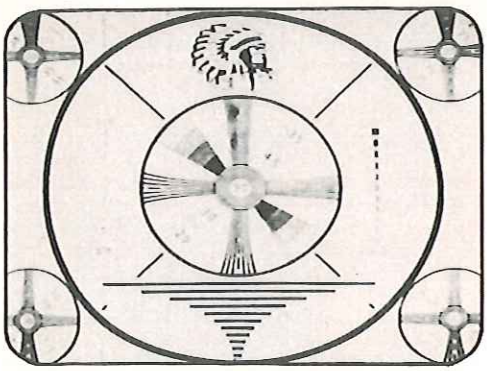
Incorrect Setting of Focus Control



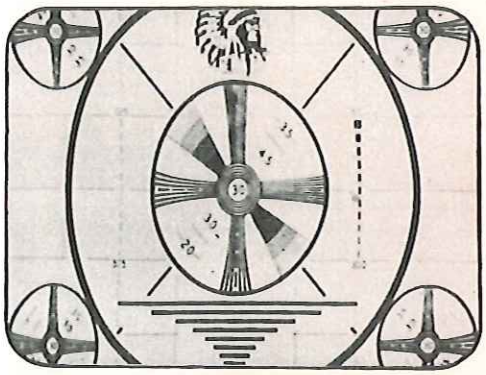
Incorrect Setting of Vertical Hold Control



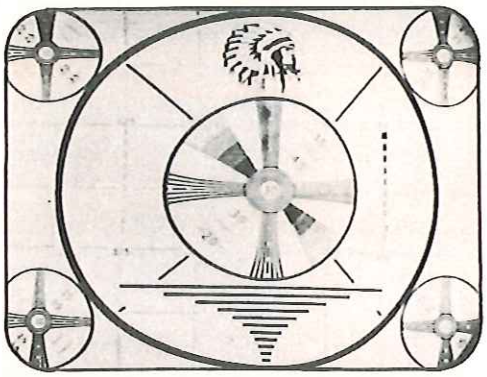
Incorrect Setting of Horizontal Hold Control



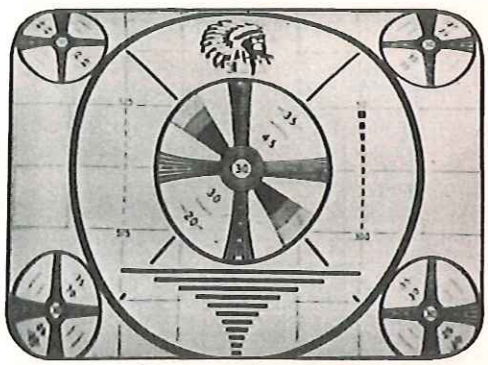
Incorrect Setting of Width Control



Incorrect Setting of Height Control



Incorrect Setting of Horizontal Linearity Control



Incorrect Setting of Vertical Linearity Control

Fig. 5. Picture Adjustments with Preset Controls

ion trap assembly slit is at the bottom or top (dependent upon picture tube) and lines up with pin 12 or 6. Slide the assembly forward on the picture tube until it is about the position shown in the illustration. NOTE—The wider of the two magnets should be located at the rear or the base end of the picture tube. The final following steps should be taken with the television receiver operating:

1. With Brilliance control advanced, turn ion trap assembly so that gap in rubber holder is faced up or down and lines up with either pin 6 or pin 12. Whichever way gives some illumination is the correct approximate orientation of assembly. If the vertical multivibrator tube, V19, is removed, it will be found much easier to adjust for maximum illumination since the resultant thin line will show on the screen where a raster will not, even though the magnets are considerably out of adjustment.

2. Move assembly back and forth and rotating it while viewing screen, adjust for maximum brightness.

3. If illuminated area gets very bright, reduce brightness with control and repeat step 2. If tube V19 was removed as suggested in step 1, replace it before proceeding with step 4.

4. If any shadowing of the tube neck is present after completing step 3, rotate the small (front) magnet to correct shadow and repeat steps 2 and 3. NOTE—Badly out-of-line focus coils can also cause neck shadowing. The focus coil should be symmetrical and straight before starting the ion trap adjustment.

CENTERING (FOCUS COIL) ADJUSTMENT—The four focus coil adjustment screws should all be tightened sufficiently so that the springs are always under tension. Too loose pressure on the springs will result in the picture centering being unstable. These adjustments are not readily available with the back cover in place unless a long screwdriver is used. Since each screw adjustment reacts in both the horizontal and vertical directions, a maladjustment in the centering may have to be corrected by the adjustment of one to four screws.

DEFLECTION YOKE ADJUSTMENT—Three set screws permit the deflection yoke to be loosened, permitting limited turning in either direction. If the picture does not line up horizontally or square with the picture tube mask, rotate the yoke until this condition is remedied, then tighten the set screws. On late production sets the deflection yoke is prevented from rotating by a clamp secured by two hex head cap screws located at the top center of the yoke mounting bracket. To rotate the yoke, loosen both screws not more than two full turns. Rotate yoke as desired and tighten screws to secure in place.

HORIZONTAL HOLD—This control locks the horizontal picture elements in synchronism with the transmitted picture. Improper adjustment will result in the loss of picture intelligence as shown in a picture under Figure 5. Although this control holds over a relatively wide range, for optimum performance the adjustment should be made with care. The following checks should be made after the picture is synchronized by the adjustment of this control.

1. With the picture being received, switch the Service Selector to a channel having no program and then back to the desired channel. The picture should immediately lock into position.

2. With the picture being received, turn the television receiver power "off" for two or three seconds and then turn it back "on" again. The picture should come into synchronization within ten seconds after the picture tube has been illuminated.

3. Turn the Service Selector to the "radio" position and allow the television receiver to transfer for two or three minutes to Broadcast reception and then return to the television channel transmitting a picture. The picture should synchronize immediately upon showing illumination.

4. Turn power off for three or four minutes and then "on." The picture should lock in horizontally within ten seconds after the raster becomes illuminated.

VERTICAL HOLD ADJUSTMENT—This control is used to lock the picture in synchronism with the transmitted picture in the vertical direction. When the control is maladjusted the picture will slide vertically out-of-frame or lock out-of-frame, giving overlapping vertical images or even double images in the vertical direction. After the picture is locked in vertically on a normal picture, reduce the contrast control until the picture is barely visible, then readjust the control until the picture holds in frame.

HORIZONTAL LINEARITY AND WIDTH CONTROLS—The controls react on each other so that when one control is adjusted the other may have to be. The adjustment of the Horizontal Linearity control should only be made on a test pattern signal. First, obtain the correct width by adjusting the Width control until the picture extends approximately $\frac{1}{8}$ inch outside the edge of the mask on both sides. Next, adjust the Horizontal Linearity control until the test pattern is symmetrical in the left and right direction. A slight readjustment of the Width control may now be necessary, as well as touching up of the centering adjusting screws.

VERTICAL LINEARITY AND HEIGHT CONTROLS—The Height control is adjusted until the picture extends approximately $\frac{1}{8}$ inch outside the edge of the mask on both top and bottom. Next, adjust the Vertical Linearity control until the test pattern is symmetrical from top to bottom. Readjustment of the Height and Vertical Hold controls as well as the centering adjustments may be necessary.

COARSE FOCUS—This is a three-position switch which permits approximate adjustment over wide variations of operating voltages. To adjust leave control set to the position which permits the Focus control on the front panel to focus nearest its mid-position.

GENERAL ELECTRIC COMPANY

RECEIVER DIVISION

ELECTRONICS PARK

SYRACUSE, N. Y., U.S.A.