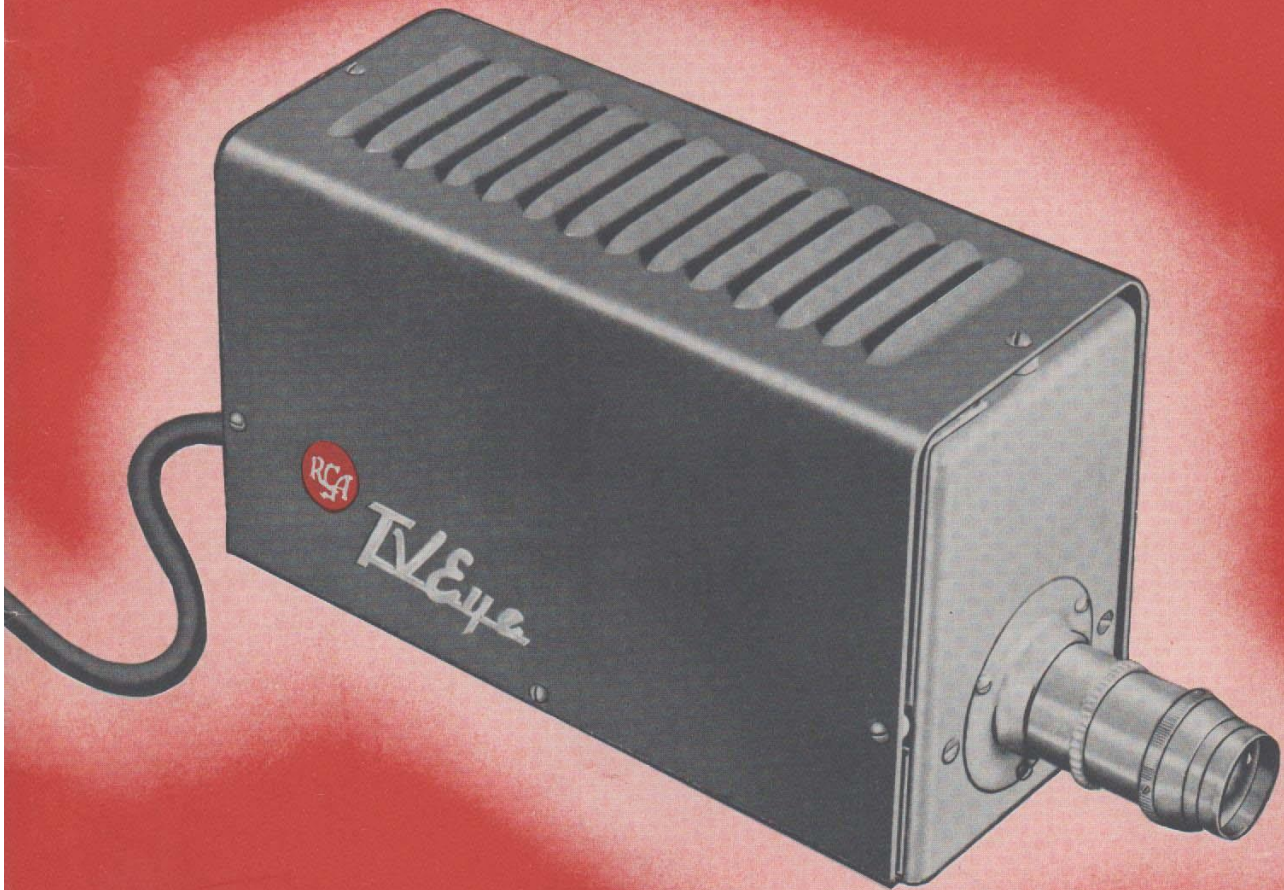


TV EYE

HC-1 Camera, MI-36250

HA-1 Control Unit, MI-36251



INSTRUCTIONS

Manufactured by

**RADIO CORPORATION OF AMERICA
ENGINEERING PRODUCTS DEPARTMENT**

Camden 2, New Jersey, U.S.A.

Radio Corporation of America-Engineering Products Department

TV EYE

1B-36174-P1

Instructions

Camden 2, New Jersey, U.S.A.

Printed in U.S.A.

Specifications

(MI-36250 Camera, MI-36251 Control Unit)

Operating requirements

| | |
|---------------------------------------------------------------------------------------|-----------------------|
| Scene Illumination, Minimum..... | 100 foot-candles |
| Approximate equivalent ASA film speed of Vidicon (exposure speed 1/25 second)..... | 50 |
| Ambient Temperature, Maximum | |
| Camera Unit..... | 50°C (122°F) |
| Control Unit..... | 50°C (122°F) |
| Camera Cable, Maximum Length..... | 500 ft. |
| Camera Lens Mount..... | Std. 16 mm., type "C" |
| Camera Base Mount..... | Screw, 1/4"-20 thd. |
| Maximum distance, camera to receiver: | |
| using RG-11/U cable..... | 2000 ft. |
| using RG-59/U cable..... | 1200 ft. |

Output rating

| | |
|------------------------------|-------------------------|
| R-F Frequency Range..... | Channels 2-6, 54-88 mc. |
| Output Voltage, Minimum..... | 0.1 volt |
| Output Impedance..... | 300 ohms |

Power Supply requirements

115 volts a.c., single phase, 60 cycles..... 100 watts

RCA Tube Complement

| CAMERA | |
|----------------|------------------------|
| TUBE | FUNCTION |
| RCA 6198 | Camera Tube |
| RCA 6U8 | 1st & 2nd Video Amp. |
| RCA 6U8 | 3rd Video Amp. & Mixer |
| RCA 6U8 | R.F. Osc. & Modulator |
| RMA type 1N34A | D.C. Restorer |
| RMA type 1N34A | Sync. Clipper |
| RMA type 1N34A | D.C. Restorer |

CONTROL UNIT

| TUBE | FUNCTION |
|-------------------------------------------------|--------------------------------------|
| RCA 12AU7 | Vertical Osc. & Output |
| RCA 12AT7 | Horiz. Osc. & Sweep |
| RCA 12AT7 | Vert. Sync. & Horiz. Amp. |
| RCA 6BQ6GT | Horiz. Output |
| RCA 6AS6 | Relay Control Tube |
| RCA 12AT7 | Cathode Follower & Vert. Sweep Rect. |
| RCA OA2 | Voltage Stabilizer |
| RMA type 1N158 or 1N94 (RCA Stock No. 98726) | Voltage Doubler Rect. |
| Selenium Rectifier (RCA Stock No. 98727) | Bias Rect. |
| RMA type 1N34A | Horiz. Sweep Rectifier |

OVERALL DIMENSIONS

| COMPONENT | Height | Width | Depth | Weight |
|--------------|--------|--------|---------|---------|
| CAMERA | 5¼ in. | 4 in. | 11¾ in. | 4½ lbs. |
| CONTROL UNIT | 7¾ in. | 11 in. | 8½ in. | 18 lbs. |

Introduction

TV Eye's "magic" ability to let you see without being present is the result of years of RCA research in television, of vast experience with broadcast apparatus and receivers, and of painstaking factory workmanship. The amazingly compact TV camera and the ingenious control unit which constitute TV Eye have been engineered to perform a thousand remote viewing assignments dependably with only negligible maintenance over a long time.

The TV Eye can be installed best by someone familiar with adjusting TV receivers.

It is essential that a high quality television receiver in excellent working order be used if best results are to be obtained with the TV Eye equipment. A TV receiver which has full 4-megacycle bandwidth is strongly recommended; but the minimum bandwidth which will produce an acceptable picture is 3.2 megacycles.

The best pictures will be obtained after proper technique in TV Eye adjustment is developed through practice.

Like all precise electronic mechanisms, TV Eye has limitations. It should not be used in temperatures in excess of 122 degrees F nor lower than 0 degree F without special housing; it may not be placed near large magnetic materials; it should not be exposed to the elements without special protective devices; and it is not built to withstand severe shock. Neither the TV Eye camera nor control unit is built for safe use in explosive atmospheres. Explosion-proof housings will be required in hospital operating rooms, bomb filling operations, or other potentially explosive environments. For satisfactory pictures, the TV Eye equipment requires approximately the same amount of light as is required for an ordinary camera in which Verichrome or equivalent film is used with an exposure speed of 1/25 of a second.

Installation and adjustment

The installation procedures and the precautions given in this book will enable the user to make TV Eye function at its "magic" best. Read carefully, and check each step as you accomplish it. With your help, your TV Eye can take its place as one of the most reliable of your electronic servants.

The initial adjustments of the TV Eye camera, control unit, and TV receiver are most conveniently handled if these units are temporarily located close to each other.

Before proceeding with the installation MAKE CERTAIN that the TV receiver, which is to become part of your "private-wire" television, is in proper working order.

The following tools and materials are required to install the TV EYE:

- "Neut stick" (A screwdriver with a shaft of insulating material and a small metallic tip approximately $\frac{1}{8}$ " wide and $\frac{1}{32}$ " thick).
- Straight blade screwdriver with a blade $\frac{1}{4}$ " wide.
- 6-inch scale.
- Pocket knife.
- 100-watt soldering iron and solder.
- Long-nose pliers.
- $\frac{3}{16}$ " socket wrench or equivalent.
- Wire cutting pliers.
- Voltmeter (10 volt a.c. scale).

The following cables are required to connect the camera to the control unit. Lengths required will depend upon distance between the two.

- 12 conductor cable, No. 22 stranded wire, insulated for at least 300 volts may be used for distances up to 250 feet. For greater distances one pair of these wires

must be No. 18.

- RG-59A/U or RG-59/U Coaxial Cable
- RG-58A/U Coaxial Cable

The following cable is required to connect the control unit to the receiver. Lengths required will depend upon the distance between the two.

- 300-ohm twin lead transmission line for distances up to 10 feet. For distances beyond 10 feet, either shielded 300-ohm twin lead or coaxial cable should be used. Coaxial cable, type RG-59/U, which can be used for camera-to-receiver distances

up to approximately 1200 feet (of which a maximum of 500 feet may be between the camera and control unit), will require a transformer, RCA MI-6898 or equivalent, at the TV REC terminals to convert the 300-ohm output impedance to 72 ohms.

Wiring the TV EYE camera to the control unit

First disassemble camera plug, following the steps shown in series of illustrations. (Figure 1.)

Remove bottom cover of control unit by removing two self-tapping screws at each end of plate.

Insert one end of each cable through the clamp in the disassembled plug and the other end of each cable through the grommet on the rear panel of the control unit (located just below TV ANT terminal board).

Note that terminals 1, 7, and 14 are identified by numbers stamped in the metal

plate which supports the terminal board. Care should be exercised to identify the terminal numbers accurately in making the connections.

Solder the connections to the terminal board inside the control unit and to the camera plug terminals as indicated on diagram. (Figure 2.)

Connect r-f cable to selector switch as illustrated. (Figure 3.)

Reassemble the camera plug and tighten the cable clamp screws.

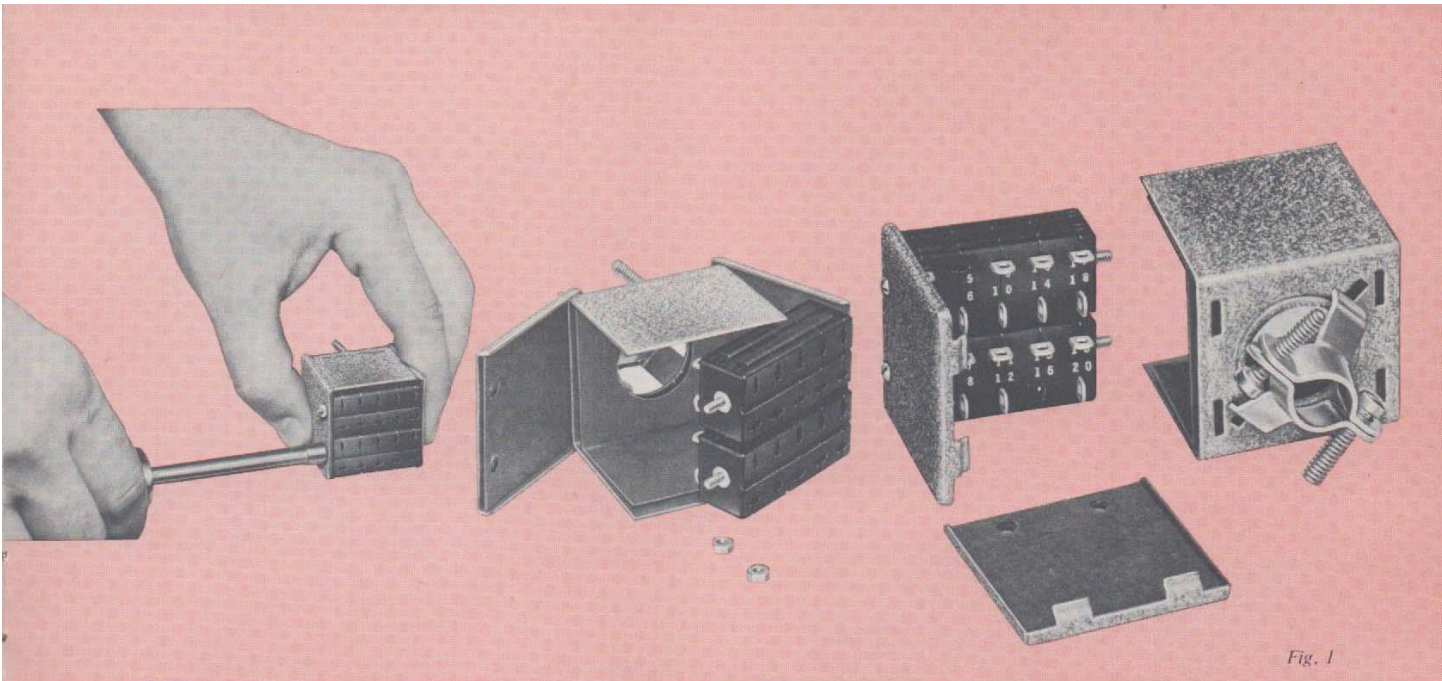


Fig. 1

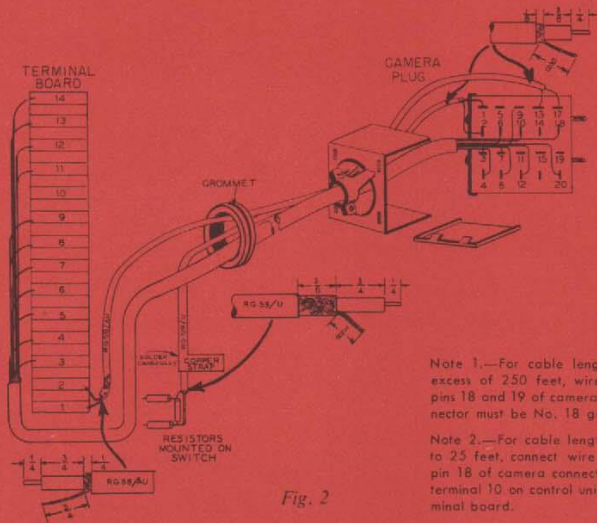


Fig. 2

WIRING CONNECTIONS

| PIN NO. | | Type of Wire |
|-----------------------------|-------------|-------------------------------------------------|
| Control Unit Terminal Board | Camera Plug | |
| 1 | 13 | Braid of RG-58A/U |
| 2 | 17 | Center Conductor of RG-58A/U |
| 3 | 20 | No. 22 |
| 4 | 3 | No. 22 |
| 5 | 8 | No. 22 |
| 6 | 7 | No. 22 |
| 7 | 12 | No. 22 |
| 8 | 4 | No. 22 |
| 9 | 19 | See Note 1 |
| 10 | | See Note 2 |
| 11 | 18 | See Notes 1 and 2 |
| 12 | 9 | No. 22 |
| 13 | 10 | No. 22 |
| 14 | 6 | No. 22 |
| Selector Switch | 1 2 | Center Conductor of RG-59/U Braid of RG-59/U |

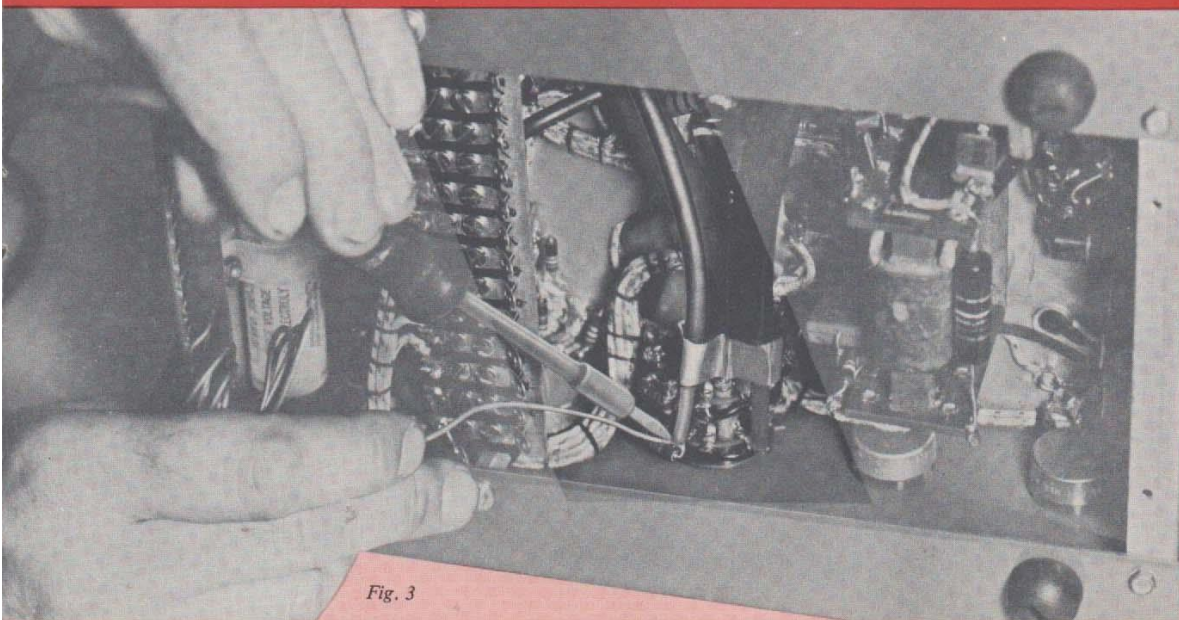


Fig. 3

Mounting the camera

The TV Eye camera may be mounted on any camera tripod.

Base of camera is tapped for a $\frac{1}{4}$ "-20 bolt.

In special situations it may be desirable to construct a bracket for holding the

camera. Aluminum or other non-magnetic material must be used and the camera must be kept at least 3" away (in every direction) from magnetic material.

The camera should be so mounted as to avoid excessive vibration.

Inserting the Vidicon in the camera

CAUTION

The Vidicon is a Highly Evacuated Electron Tube. Extreme care should be exercised by personnel handling this tube to prevent possible injury and/or damage to the equipment.

Loosen 8 retaining screws then remove outside cover from the camera.

Remove lens mounting plate by removing screws.

Loosen clamp (indicated in photo) around Vidicon socket and slide socket forward. (Figure 4.)

Insert pronged end of Vidicon in socket. Make certain that short pin is aligned with groove adjacent to notch in socket.

Using soft lint-free tissue, wipe off any fingerprints from face of Vidicon.

Replace lens mounting plate. Set distance between outer face of this plate and face of Vidicon accurately at $\frac{5}{8}$ ". (Figure 5.)

See the lens data on page 14 for explanation of field sizes and the effect of varying this $\frac{5}{8}$ -inch dimension.

Tighten the Vidicon socket clamp.

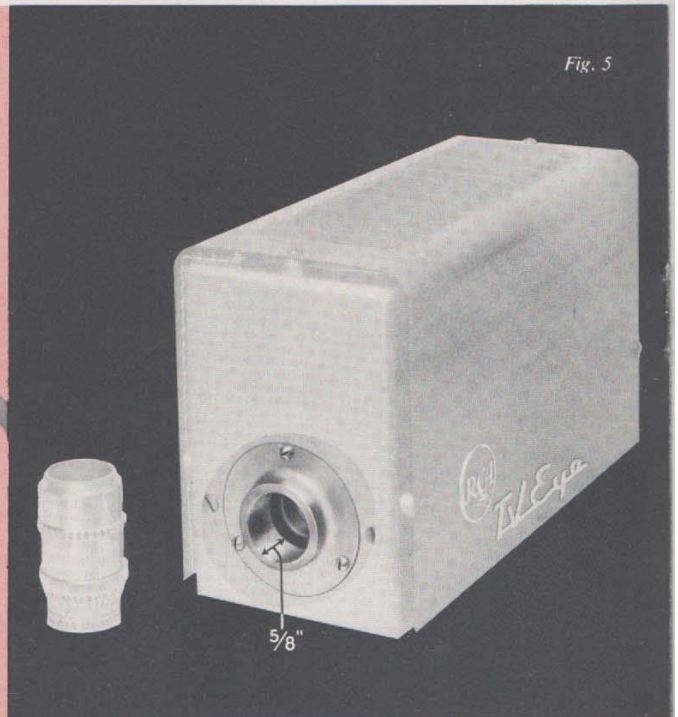
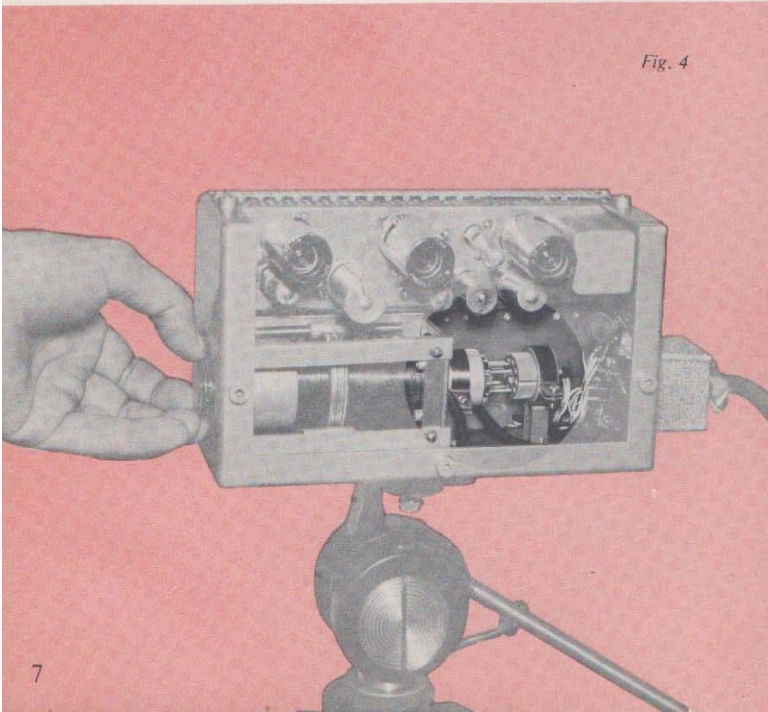




Fig. 6



Fig. 7

Wiring the control unit to the receiver

Disconnect the outside antenna from the receiver.

Connect 300-ohm transmission line between the TV REC terminals (located on back of the TV Eye control unit) and the

antenna terminals on the TV receiver. (Figure 6.)

If standard TV broadcasts are desired, connect antenna lead-in to the TV ANT (antenna) terminals on the back of the TV Eye control unit.

Take these precautions before activating the equipment for the first time

Adjust the controls on the TV Eye control unit as follows:

Turn SELECTOR switch to OFF and turn BEAM and TARGET controls to zero on the dial. (Figure 7.) Turn STABILITY control to 20 on the dial.

Adjust slide wire resistor located on back of the control unit to minimum filament voltage position by moving resistor slider

to extreme right as illustrated. Slide wire resistor can be uncovered by removing box-like cover from rear of control unit. (Figure 8.)

Turn WIDTH and HEIGHT controls on rear of TV Eye control unit to maximum scan position (overscanning) by turning shafts full clockwise (screwdriver adjustment—Figure 9).

Initial adjustment of the TV EYE

CAUTION

Never operate the equipment with the camera disconnected. Do not remove any tube from the camera with power applied to the unit.



Fig. 8

Insert wired plug into camera. Plug power cord of the TV Eye control unit into a 115 volt A.C. outlet.

If a TV broadcast is available, adjust the horizontal and vertical hold controls on the TV receiver to secure a stable picture. If a TV broadcast is not available, adjust the horizontal and vertical hold controls on the receiver to the mid-point of their ranges. If the receiver has an AGC control (automatic gain control), set it at mid-range initially.

Turn SELECTOR switch on the control unit to the TV EYE position.

Connect the voltmeter leads between camera plug terminal 18 and ground, as illustrated and adjust the slide wire resistor so that the voltmeter registers 6.3 volts. Tighten slider. Disconnect voltmeter from camera and replace resistor cover on rear of control unit. (Figure 10.)

This adjustment is provided to compensate for the different cable lengths that may be used between the camera and control unit. If the cable is changed, the slide-wire resistor must be readjusted.

The TV Eye camera permits operation on channels 2 to 6 inclusive. Set the TV receiver channel selector to an unused channel in this range. The camera is shipped from the factory tuned for channel 2. Since the fine tuning range varies among TV receivers of different manufacture, it is advisable to retune the camera oscillator slightly to secure the best possible picture.

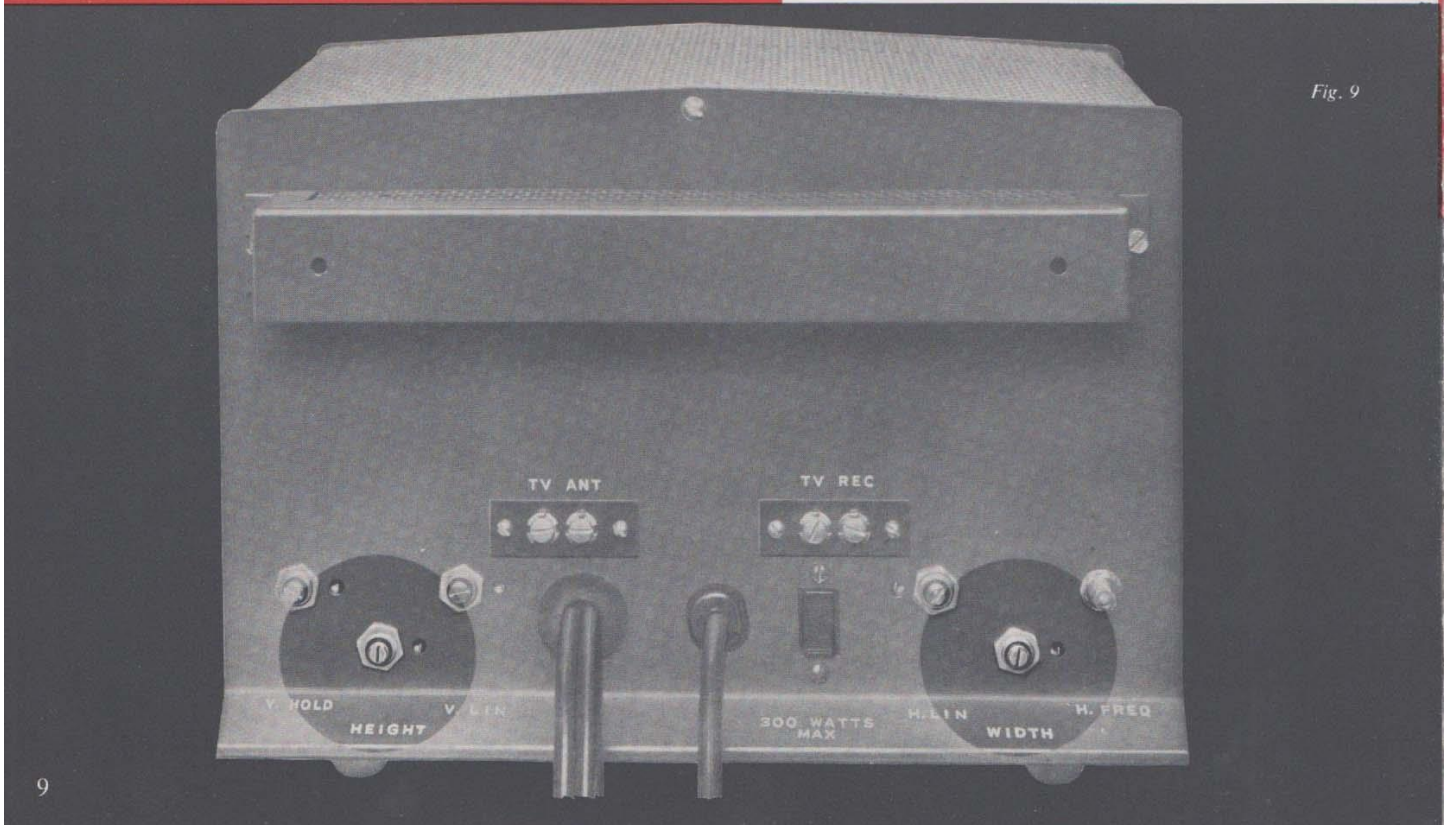


Fig. 9

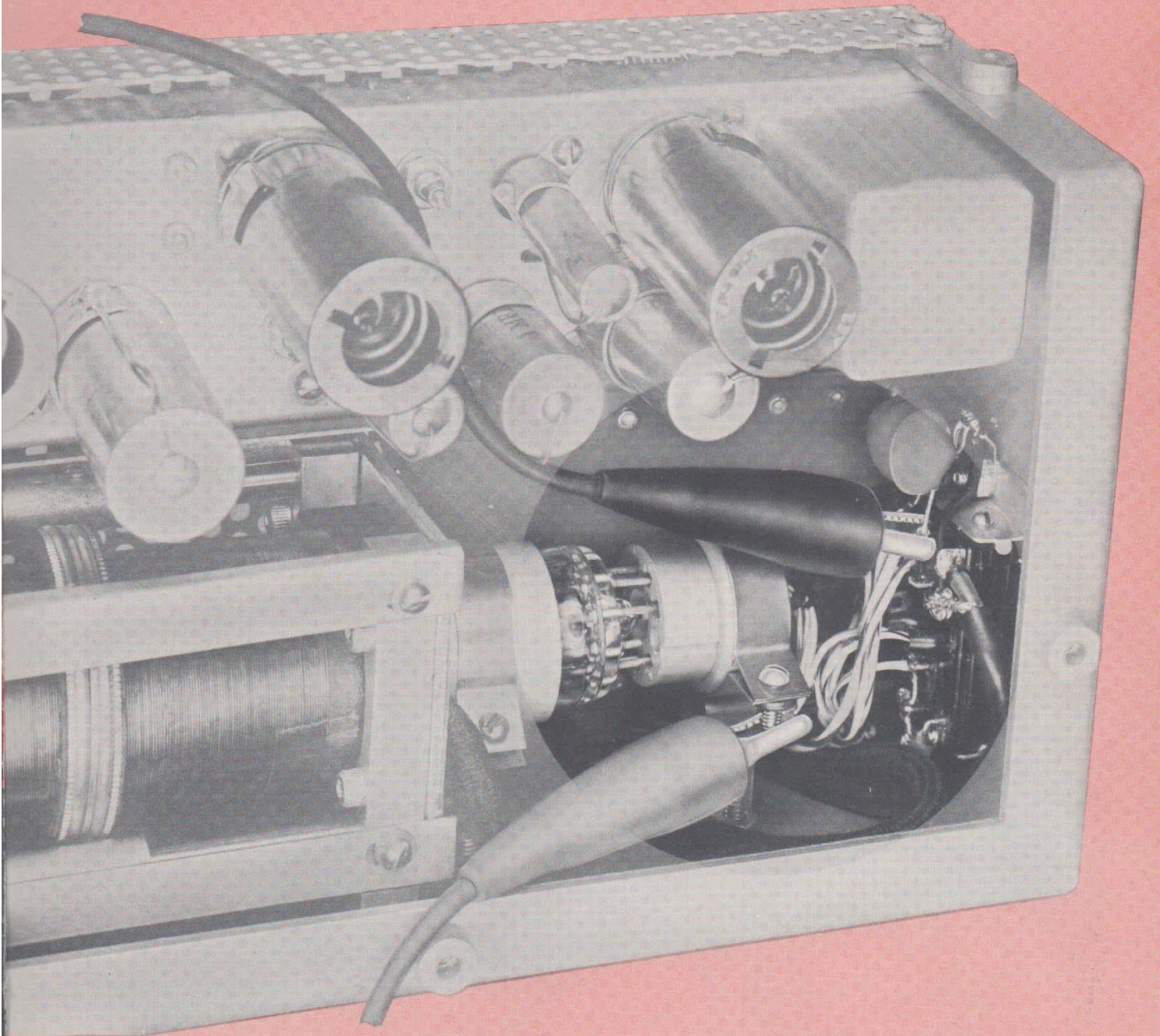


Fig. 10

Carefully adjust the oscillator tuning capacitor located in the camera until a snow-free screen appears on the TV receiver. (Figure 11.) The tuning adjustment permits tuning from channel 2 to channel 6 in less than half a turn, so that precise tuning requires very careful adjustment of the capacitor.

Screw lens into lens mount on front of camera.

Open the lens iris by turning the knurled ring to the lowest "f" number.

On the control unit, turn BEAM control to 15 on the dial and the TARGET control clockwise until an image appears. The image should be a bright white ring (which represents the outer edge of the Vidicon face) and may or may not have picture content in the center.

If the image "rolls", adjust the V. HOLD (vertical hold) control on the rear panel of control unit. If screen is covered with diagonal lines, adjust H. FREQ (horizontal frequency) control.

Centralize the bright white ring on the TV screen by turning the knurled rings of the two centering magnets located near center of Vidicon mounting assembly. If a large amount of centering is necessary, turn the knurled rings so that the two gaps are adjacent and then rotate both rings together until the desired centering is achieved. If this provides too strong a centering action, rotate the rings separately to reduce the force and then rotate both rings to center the pattern accurately.

Turn HEIGHT and WIDTH controls on back panel of control unit counter-clockwise until bright white ring just disappears off the TV screen.

Adjust the FOCUS control located on front of control unit until sharpest picture appears. If the lens employed has facilities for optical focus, set to position which produces sharpest image.

Adjust the lens iris for best detail in the gray areas, without excessive flare in the brightly highlighted areas. High values of illumination will require higher "f" number settings.

Note that the entire picture rotates slightly with operation of the FOCUS control. Because of variations in Vidicons, it may be necessary to re-orient the deflection yoke to make the picture appear upright at the sharp-focus setting.

To re-orient the picture, loosen the clamp directly behind the metal frame housing the Vidicon. (Figure 4.) Rotate the silvered tube to the point at which vertical lines in the subject appear as vertical lines in the picture. Do not attempt to turn the yoke by pulling on the cables near the clamp; turn only by the silvered tube to avoid damage to the yoke and Vidicon. Tighten the clamp when satisfactory orientation is achieved.

Adjust the STABILITY control located on the control unit for a stable picture with pleasing contrast. If the receiver is equipped with an AGC control, adjust this control for greatest improvement in picture quality.

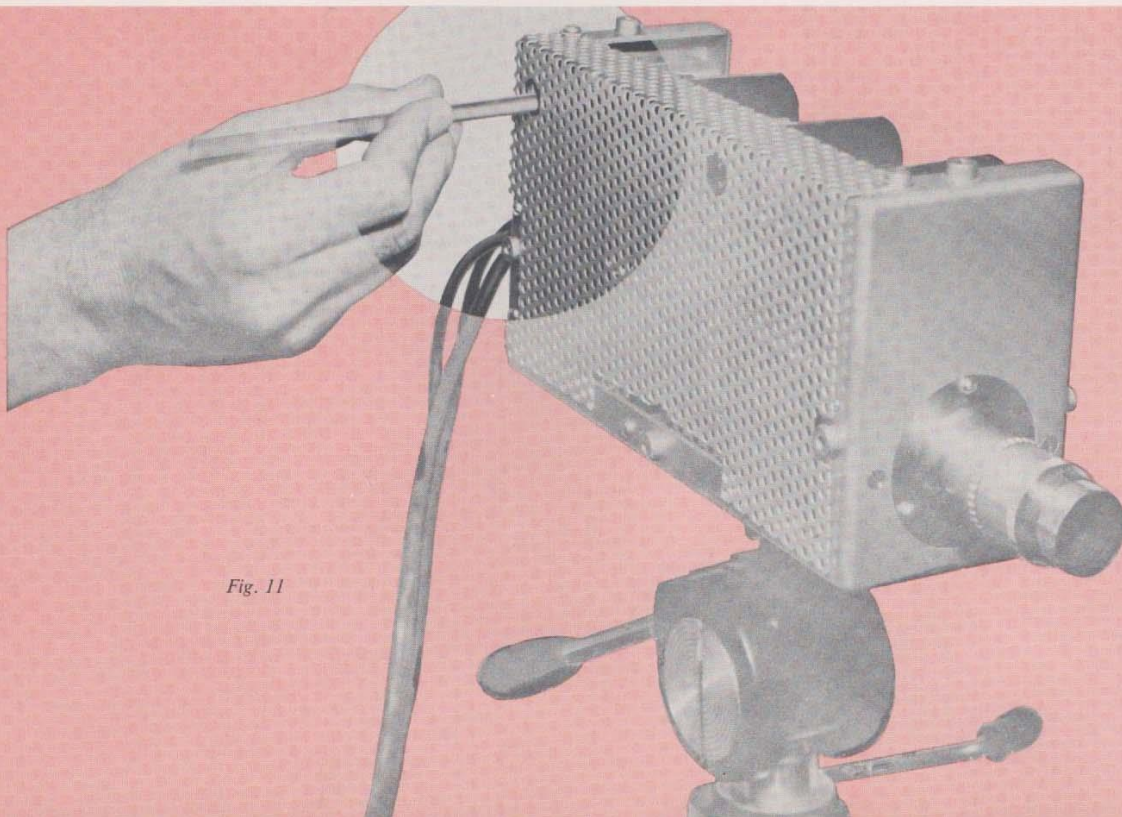


Fig. 11

If no AGC is available on the receiver and the picture is too black and cannot be stabilized by the TV Eye controls, a suitable attenuator pad should be purchased from the local RCA Electronics Distributor.

Readjust the BEAM, TARGET, and STABILITY controls for optimum picture quality, adjusting the BEAM control last.

Focus camera on any circular object which will fill approximately half the screen. Readjust HEIGHT and WIDTH controls until best possible representation of circular object is achieved. If necessary, the H. LIN (horizontal linearity) and V. LIN (vertical linearity) controls may be adjusted. The H. LIN and V. LIN controls may need to be adjusted since the linearity settings vary somewhat with height and width.

Replace cover on camera and bottom cover on control unit.

IF NO PICTURE IS OBTAINED

Check that the power cord is plugged into a "live" socket and that the SELECTOR switch is in the TV EYE position.

Check that the TV set is capable of receiving a picture if standard broadcast is available. Otherwise, turn TV receiver contrast control full clockwise and adjust brightness to make the raster visible. If no snow appears, the receiver is defective.

If an AGC control is available on the back of the TV receiver, check that this control is set initially to the middle of its range.

Check that the control unit vacuum tube filaments are lit, and that the camera filaments are energized with 6.3 volts, measured to ground. The glow of the Vidicon filament should be visible from the socket end of the tube.

Check that the line fuse in the control unit is intact and firmly in place.

Check that the connections to both TV REC terminal board on the control unit and the TV receiver antenna terminals are tight and correctly made.

Check that the RG-59/U coaxial line in the Control Unit is connected to the SELECTOR switch as illustrated.

Check that all interconnections are made according to the instructions in Figure 2.

Slowly vary the oscillator tuning capacitor in the camera to a point at which the snow disappears from the TV receiver screen. The TV receiver must be tuned to a channel between 2 and 6.

Gently tap the front 6U8 tube in the camera with the "neut" stick. Broad horizontal bars should appear on the TV receiver screen. This verifies that the camera amplifier and r-f unit can perform normally.

Remove the lens mounting plate and look carefully at the metal ring around the Vidicon face plate. Check that the three spring contacts are firmly against this ring.

Check the adjustment procedure on pages 9 to 11 to verify that all controls have been set as prescribed to produce a picture.

If no picture is obtained after the above steps, turn off the equipment and let it cool for a few minutes. Then turn the SELECTOR to TV EYE again and listen at the top center of the back panel of the Control Unit. After 10 to 20 seconds an audible click should be heard as the protective circuit relay operates. If no click is heard, verify that the HEIGHT and WIDTH controls are turned full clockwise, and listen again.

If no picture is obtained after these steps, consult your TV Eye service man.

Operation

After the preceding adjustments have been made, normal operation of the TV Eye equipment is as follows:

Turn the SELECTOR switch to the TV EYE position and allow the equipment to "warm up" for two minutes.

Apply power to the TV receiver.

Set channel selector on TV receiver to the channel selected for TV Eye operation. (2 to 6 inclusive.)

Adjust the TV receiver Fine Tuning control for a snow-free screen.

Adjust the BEAM, TARGET, and FOCUS controls for a good quality picture. If the lens employed has facilities for optical focus, set to position which produces sharpest image.

Adjust the TV receiver fine tuning control for best picture quality.

If the TV receiver is frequently used for entertainment as well as for TV Eye operation, it may be necessary to install an attenuator pad inside the TV Eye control unit to avoid readjusting the AGC control on the receiver each time the TV Eye is switched off. The local TV Eye service man should be consulted for installation of this attenuator.

If the WIDTH, HEIGHT, H. LIN, and V. LIN controls are badly misadjusted, so that the picture is stretched and obviously distorted, the picture may not appear when the set is next turned on. This occurs because of the Vidicon protective circuit. This circuit permits normal operation and the over-scanning referred to on page 8 and will protect the Vidicon from damage should a tube become defective.

The setting of the BEAM control will have some effect on the amount of detail seen in the picture. If printed matter is to be televised, it will usually be advisable to set the BEAM control between 5 and 15 on the dial. However, if the scene includes moving objects in bright light, the BEAM control setting should be relatively high (between 10 and 20 on the scale).

If the camera is moved to scan a scene or if a stationary camera is viewing moving objects, the image may tend to smear or lag behind the motion. This effect can be reduced by a combination of a higher setting of the BEAM control, a lower setting of the TARGET control, and turning the lens to a lower "f" number.

For the best possible pictures, the lighting of any scene should be uniform and of sufficient intensity to permit setting the TARGET control toward the low end of its range.

Changing the scene illumination to a different light intensity will necessitate a change in the iris ("f") setting.

For each degree of light intensity there will be an optimum setting of each operating control. These settings will best be learned through experience.

The resolution in the picture may be

approximated as 80 lines per megacycle of video response. For example, if the TV receiver response is 3 megacycles, only 240 lines can be resolved on a resolution chart.

A convenience outlet is provided on the rear panel of the control unit to supply power to a TV receiver with a power consumption of 300 watts or less. The power to this outlet is not switched or fused. Therefore, the outlet is energized as long as the TV Eye is plugged into a power source.

If the signal distribution is made on RG-59/U coaxial cable, the maximum distance between the camera and a single TV receiver is 1200 feet, of which a maximum of 500 feet may be between the camera and control unit. If greater separation is desired, RG-11/U coaxial cable may be used to extend the maximum distance to 2000 feet, or "booster" amplifiers may be used to give almost unlimited distribution.

More than one TV receiver can be connected to the TV Eye control unit by using the same techniques used to connect several receivers to a common antenna. The use of more than one receiver will reduce the maximum distance of distribution, so that a complicated distribution system will require the use of booster amplifiers.

TV EYE controls for a high quality picture

selector switch

The OFF position de-energizes the TV Eye equipment. It also makes a connection between the TV antenna and the TV receiver permitting standard television reception.

The TV EYE position applies power to the camera and control unit. At the same time the TV antenna is grounded to prevent broadcasting the picture, thereby maintaining the privacy of the TV Eye system.

The TV REC position connects the TV antenna to the TV receiver, permitting standard television reception. It also puts the TV Eye equipment in "standby" condition, ready to give a picture almost instantly when the SELECTOR is returned to the TV EYE position.

target

Governs the image sensitivity seen mainly as picture contrast.

focus

Regulates definition and sharpness of image.

stability

Controls the steadiness of the image.

beam

Sets operating level of Vidicon to a point where a picture can be obtained.

LENS DATA

**LENS
FOCAL
LENGTH**

DISTANCE FROM CAMERA

| | DISTANCE FROM CAMERA | | | | | |
|----------------------------|----------------------|--------|---------|--------|---------|--------|
| | 5 Feet | | 10 Feet | | 25 Feet | |
| | Width | Height | Width | Height | Width | Height |
| <i>13 mm</i> | 4.9 | 3.7 | 9.7 | 7.3 | 24.4 | 18.3 |
| <i>17 mm</i> | 3.7 | 2.8 | 7.5 | 5.6 | 18.7 | 14.0 |
| <i>25 mm (approx. 1")</i> | 2.5 | 1.9 | 5.0 | 3.7 | 12.5 | 9.3 |
| <i>50 mm (approx. 2")</i> | 1.25 | 0.94 | 2.5 | 1.9 | 6.2 | 4.7 |
| <i>75 mm (approx. 3")</i> | 0.83 | 0.62 | 1.67 | 1.25 | 4.2 | 3.1 |
| <i>100 mm (approx. 4")</i> | 0.62 | 0.46 | 1.25 | 0.94 | 3.1 | 2.3 |
| <i>6 inches</i> | 0.41 | 0.31 | 0.82 | 0.62 | 2.1 | 1.6 |

The field sizes shown are maximums possible with the Vidicon Camera and are larger than the lens manufacturer quotes because the picture area on the face of the Vidicon is larger than the frame size on 16 mm film. Width and height of fields are in feet.

Note 1. The fixed-focus lenses are designed to have objects in focus at distances between 15 feet and infinity. If operation at less than 15 feet is desired, the Vidicon tube face must be pulled back to a distance greater than the $\frac{5}{8}$ inch specified on page 7. When this adjustment is made, the lens will no longer focus on distant objects.

Note 2. On variable-focus lenses the object-distance calibration on the lens barrel should be correct when the Vidicon face is set $\frac{5}{8}$ of an inch back from the outer face of the

lens mounting plate. Variations in Vidicon tubes may require some adjustment of the tube position to secure an exact agreement between the lens calibration and the object distance.

Note 3. It is strongly recommended that a lens with a speed of not less than $f/1.9$ be used when the TV Eye camera is employed for indoor use.

RCA tubes and other TV Eye parts are rated conservatively and will operate to complete satisfaction with reasonable care. When tubes or other TV Eye components do need to be replaced, it is recommended that you obtain genuine RCA tubes and parts from your RCA Electronics Distributor.

The warranty covering your RCA TV Eye will become effective on the date of installation provided the enclosed card is properly filled out and mailed.

