Instructions

COLOR CAMERA CHANNEL

MODEL 4PE350A3

EBI-6350
(Volume 2 of 3)

GENERAL ELECTRIC

INSERTS
(Volume 2)

EBI-6351 Color Camera, Model 4PC19D3
EBI-6209 Angenieux Zoom Lens, Type 10X18J-1
Plumbicon* Tube Bulletin XQ1020

*Registered trademark of N.V. Philips' Gloeilampenfabrieken of the Netherlands.

GENERAL SERVICE INFORMATION

SAFETY NOTICE

WARNING

VOLTAGES USED FOR THE OPERATION OF THIS EQUIPMENT ARE DANGEROUS TO HUMAN LIFE.

This instruction manual is written for the general guidance of maintenance and service personnel who are familiar with and aware of the dangers of handling electric and electronic circuits. It does not purport to include a complete statement of the safety precautions which should be observed in servicing this or other electronic equipment. The servicing of this equipment by inadequately trained or inexperienced personnel involves risks to such personnel and to the equipment for which the manufacturer can not accept responsibility. Personnel servicing this equipment should familiarize themselves with first-aid treatment for electrical burns and electrical shock.

PRODUCTION CHANGES

From time to time it becomes necessary to make changes in the equipment described in this book. Such changes are made to improve performance or meet component shortages and are identified by a revision letter following the model number stamped on the nameplate. The changes in the equipment as they affect the instruction book are listed on a Production Change Sheet included in the book. If no Production Change Sheet is included, no changes have been made. The revision letter appearing on the title page indicates the equipment revision to which the book corresponds.

This information is provided as a servicing aid; it should not be used to modify earlier equipments to incorporate later revisions except under specific instructions. Please mention the revision letter in any correspondence.

REPLACEMENT PARTS

The parts list contained in this book includes all principal replacement parts. The symbol numbers are the same as those appearing on elementary and other drawings. Whenever possible, replacement parts should be obtained from a local electronics supply dealer. If it is necessary to order a part (other than a tube or transistor) from the General Electric Company, please include the symbol number, description, and drawing number of the part and model number of the unit. Orders may be sent to the nearest office appearing on the list at the end of the book or the General Electric Company, Visual Communication Products, Electronics Park, Syracuse, N.Y.

REPLACEMENT TUBES AND TRANSISTORS

In all cases replacements must be ordered from a local distributor.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

VISUAL COMMUNICATION PRODUCTS DEPARTMENT
CONSUMER ELECTRONICS DIVISION
GENERAL ELECTRIC
ELECTRONICS PARK, SYRACUSE, N. Y.

EBI-17C (1M)

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WARRANTY

The General Electric Company (hereinafter called the Company) warrants to the Purchaser that the equipment will be free from defects in material, workmanship, and title, and will be of the kind and quality designated or described in the contract. The foregoing warranty is exclusive of all other warranties whether written, oral, or implied (including any warranty of merchantability or fitness for purpose. If it appears within one year from the date of shipment by the Company that the equipment described in this instruction book does not meet the warranties specified above and the Purchaser notifies the Company promptly, the Company shall thereupon correct any defect, including non-conformance with the specifications, at its option, either by repairing any defective part or parts or by making available at the Company's plant, a repaired or replacement part. In lieu of the foregoing, the standard published tube warranties in effect on the date hereof shall apply to new electronic tubes. If the equipment is installed, or its installation supervised, by the Company said one year shall run from the completion of installation provided same is not unreasonably delayed the Purchaser. The conditions of any test shall be mutually agreed upon and the Company shall be notified of and may be represented at all tests that may be made. The liability of the Company to the Purchaser (except as to title) arising out of the supplying of the said equipment, or its use, whether on warranty, contract or negligence, shall not in any case exceed the cost of correcting defects in the equipment as herein provided and upon the expiration of said one year, all such liability shall terminate. The foregoing warranty does not apply to any used equipment supplied under contract or any equipment supplied under contract which bears a trademark of a manufacturer other than that of the Company. Because of the more restrictive warranties expressed by other manufacturers, the Company under contract can only make available to the Purchaser the warranty of the manufacturer on all such equipment. The Company will secure for the Purchaser at his request copies of the manufacturer's standard published warranty applicable to all such equipment. Used equipment is sold as is without warranty unless otherwise specifically provided in writing in the sales contract. The foregoing shall constitute the sole remedy of the Purchaser and the sole liability of the Company.

INSTRUCTIONS

COLOR CAMERA

MODEL 4PC19D3, RLC-B

EBI-6351

VISUAL COMMUNICATION PRODUCTS DEPARTMENT
CONSUMER ELECTRONICS DIVISION
GENERAL ELECTRIC
ELECTRONICS PARK, SYRACUSE, N. Y.

9/69 (350)

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ILLUSTRATIONS

INSERTS

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PRODUCTION CHANGE SHEET

COLOR CAMERA

MODEL 4PC19D3

RLC-A

MECHANICAL

The locations of the tally lights have been changed to make them visible when the lens shade is used. To effect this change on Cameras shipped before this Production Change, communicate with VCPD Service Engineering Section.

RLC-B

MECHANICAL

The sync adder board, PL-7782689G1, was relocated just inside the hatch in the top of the Camera, adjacent to J10 (see Fig. 5) and the opposite side of the partition to the viewfinder video amplifier board, PL-7672681G3.

PRODUCTION CHANGE SHEET

COLOR CAMERA
MODEL 4PC19D3

CHROMINANCE VIDEO AMPLIFIER BOARD
PL-7674505G1

RLC-A

Schematic Diagram, Fig. 25

The values of resistors R122 and R123 were changed from 7500 and 820 ohms to 3600 and 680 ohms, respectively, to increase the gain of the red channel.

Parts List

Symbol	Was	Changed To
R122	Composition; 7500 ohms ± 5%, $\frac{1}{4}$ w. GE Drawing C-3R152-P752J.	Composition; 3600 ohms ± 5%, $\frac{1}{4}$ w. GE Drawing C-3R152-P362J.
R123	Composition; 820 ohms ± 5%, $\frac{1}{4}$ w. GE Drawing C-3R152-P821J.	Composition; 680 ohms ± 5%, $\frac{1}{4}$ w. GE Drawing C-3R152-P681J.

PRODUCTION CHANGE SHEET

COLOR CAMERA
MODEL 4PC19D3

VIEWFINDER VIDEO AMPLIFIER BOARD
PL-7672681G3

RLC-A

Parts List and Schematic Diagram, Fig. 51

Symbol	Was	Changed To
R5	Composition; 1800 ohms ± 5%, $\frac{1}{4}$ w. GE Drawing C-3R152-P182J.	Composition; 680 ohms ± 5%, $\frac{1}{4}$ w. GE Drawing C-3R152-P681J
R6	Composition; 2200 ohms ± 5%, $\frac{1}{4}$ w. GE Drawing C-3R152-P222J.	Composition; 3300 ohms ± 5%, $\frac{1}{4}$ w. GE Drawing C-3R152-P332J

INTRODUCTION

The General Electric Color Camera, Model 4PC19D3, is designed to provide a live pickup color television signal through the use of separate mesh Plumbicon tubes and a sophisticated optical system. The Color Camera contains an Angenieux Zoom lens designed by the Television Zoomar Company. The lens system provides a faster Color Camera, color separation, and mechanical simplicity, in addition to the flexibility of a 10:1 zoom lens with custom engineered controls. The maneuverability and balance of the Color Camera, after mounting, along with precise micromanipulation of its range and focus control, give it a versatility for both indoor and outdoor television coverage.

EQUIPMENT

The following items are supplied.

Electronic

Quantity	Name	Identification
1	Preamplifier Board	PL-7674511G1
3	Preamplifier Board	PL-7674511G2
1	Luminance Video Amplifier Board	PL-7674514
1	Chrominance Video Amplifier Board	PL-7674505
1	Timing and Calibration Generator Board	PL-7674517
1	Camera Sweep Board	PL-7674641
1	Skew Generator Board	PL-7781890
1	Camera Power Supply Board	PL-7674504G2
1	Registration Control Panel	PL-7672688G3
1	Local Camera Control Panel	PL-7674510
1	Viewfinder Switcher Board	PL-7674431
1	Sync Adder Board	PL-7782689
1	Viewfinder Video Amplifier Board	PL-7672681G3
1	Viewfinder Sweep Board	PL-7673797G2
1	Viewfinder High-Voltage Power Supply Board	PL-7781684G2
1	Iris Control Servo Amplifier Board	PL-7782027G2
1	Iris Control Servo Power Supply Board	PL-7672613
1	Intercom Amplifier Board	PL-7781675

Optical

1	Neutral Splitting Prism	7172603P4
1	Neutral Splitting Mirror	7499976P3
2	First Surface Mirror	7992237P8
1	First Surface Mirror	7992237P9
1	Blue Reflecting Dichroic	7499976P1
1	Red Trimming Filter	7499978P2

Quantity	Name	Identification
1	Green Trimming Filter	7499978P3
1	Blue Trimming Filter	7499978P1
1	First Relay Lens	7176463P1
2	Second Relay Lens	7176463P3
1	Second Relay Lens	7176463P4
1	Filter, Position 1	7172908P5
1	Filter, Position 2	7172908P8
1	Filter, Position 3	7172908P9
1	Filter, Position 4	7172908P10
1	Filter, Position 5	7172908P1
1	Filter, Position 6	7172908P3
1	Filter, Position 7	7172908P11
1	Filter, Position 8	7172908P12

TECHNICAL SUMMARY

Color Camera, Model 4PC19D3

ELECTRICAL

1. Power Input

   115 volts d-c.

2. Signal Inputs

   15 kHz Sine Wave:

   20 volts peak-to-peak minimum.

   Vertical Drive:

   4.0 volts ± 0.5 peak-to-peak into 75 ohms.

3. Signal Outputs

   One 51-ohm for each channel.

MECHANICAL

1. Length

   44.65 inches, including zoom lens handle.

   Add 13 to 14 inches without the extender.
   Add 15 to 16.5 inches with the 2X extender.
   Add 17 to 18.5 inches with the 3X extender.

2. Width

   17.55 inches, less zoom lens handle.

3. Height

   29.0 inches, including tally light and zoom lens handle.

4. Weight

   Approximately 155 pounds.

OPERATING CONDITIONS

1. Maximum Room Ambient for Continuous Operation

   45 C (113 F).

2. Maximum Relative Humidity

   95 percent.

3. Altitude

   10,000 feet.

Preamplifier Board, PL-7674511G1, G2

ELECTRICAL

1. Power Inputs

   +600 volts d-c.
   +100 volts d-c.

+20 volts d-c.
-20 volts d-c.
-6 volts d-c.

2. Signal Inputs

Camera Blanking:

60 volts ± 5.0 peak-to-peak.

Calibrate:

15-kHz sawtooth, adjustable from 0.4 to 1.0 volt peak-to-peak.

Control Voltage-Beam:

Plumbicon Grid 1.

Control Voltage-Focus:

Plumbicon Grid 3.

Filament Voltage:

-6.0 volts d-c.

3. Signal Output

Typically 0.20 volt peak-to-peak into 51 ohms (luminance) and 0.30 volt peak-to-peak into 75 ohms (chrominance).

MECHANICAL

Length: 7.00 inches
Width: 2.50 inches
Height: 1.00 inch

Luminance Video Amplifier Board, PL-7674514

ELECTRICAL

1. Power Inputs

+20 volts d-c.
-20 volts d-c.

2. Signal Inputs

Video:

Typically 0.20 volt peak-to-peak.

Squash Pulse:

4.0 volts ± 0.5, 15-kHz rate, 7 microseconds wide, negative going.

3. Signal Outputs

Luminance Video:

0.7 volt ± 0.1 peak-to-peak into 51 ohms.

Video Level:

0.7 volt d-c, across 100,000 ohms (d-c metering).

MECHANICAL

Length: 9.00 inches
Width: 2.50 inches
Height: 1.00 inch

Chrominance Video Amplifier Board, PL-7674505

ELECTRICAL

1. Power Inputs

+20 volts d-c.
-20 volts d-c.

2. Signal Inputs

Video from Red, Blue, and Green Preamplifiers:

Typically 0.30 volt peak-to-peak.

Squash Pulse:

4.0 volts ± 0.5, 15-kHz rate, 7 microseconds wide, negative going.

3. Signal Outputs

Red, Blue, Green Video, Two Outputs Each:

0.7 volt ± 0.1 peak-to-peak into 51 ohms.

Video Level (Red, Blue, and Green; DC Metering):

0.7 volt d-c across 100,000 ohms.

MECHANICAL

Length: 9.00 inches
Width: 5.25 inches
Height: 1.00 inch

Timing and Calibration Generator Board, PL-7674517

ELECTRICAL

1. Power Inputs

+20 volts d-c.
-20 volts d-c.
28 volts a-c.

2. Signal Inputs

Camera Sine Wave:

15-kHz sine wave, approximately 20 volts peak-to-peak.

Horizontal Blanking:

Approximately 4.0 volts peak-to-peak.

Auxiliary Video:

Noncomposite, approximately 0.7 volt peak-to-peak.

3. Signal Outputs

Calibration Signal:

15-kHz sawtooth, adjustable from 0.4 to 1.0 volt peak-to-peak.

To High-Voltage Power Supply:

15-kHz sine wave, approximately 20 volts peak-to-peak.

To Camera Sweep:

15-kHz, approximately 20 volts peak-to-peak.

To Viewfinder Sweep:

15-kHz sine wave, phaseable over a range of 5 microseconds.

Squash Pulse:

15-kHz pulse, 4.0 volts ± 0.5 peak-to-peak, 7 microseconds wide, negative going.

Camera Power Supply Trigger:

15-kHz pulses, -15 to -20 volts peak-to-peak, approximately one microsecond wide, negative going.

Tally Light Supply:

20 volts.

MECHANICAL

Length: 9.25 inches
Width: 2.50 inches
Height: 1.25 inches

Camera Sweep Board, PL-7674641

ELECTRICAL

1. Power Inputs

+100 volts d-c.
+20 volts d-c.
-20 volts d-c.
-6 volts d-c.
-1.5 volts d-c.

2. Signal Inputs

Vertical Drive:

4.0 volts ± 0.5 peak-to-peak.

Horizontal Sine Wave:

At least 20 volts peak-to-peak.

3. Signal Outputs

Vertical Sweep:

Sweep HEIGHT control set fully CW (clockwise), 3.0 volts peak-to-peak.
Sweep HEIGHT control set fully CCW (counterclockwise) 5.0 volts peak-to-peak.

Horizontal Sweep:

Sweep WIDTH control set fully CW, 32 volts peak-to-peak.
Sweep WIDTH control set fully CCW, 54 volts peak-to-peak.

Camera Blanking:

60 volts ± 5.0 peak-to-peak.

Focus Current:

180 milliamperes ± 5.0

Skew Vertical Sawtooth:

1.5 volts peak-to-peak.

Horizontal Blanking:

4.0 volts peak-to-peak.

MECHANCAL

Length: 9.25 inches
Width: 5.25 inches
Height: 1.70 inches

Skew Generator Board, PL-7781890

ELECTRICAL

1. Power Input

+20 volts d-c.

2. Signal Input

Vertical sawtooth approximately 1.5 volts peak-to-peak.

3. Signal Outputs

W, R, B, and G skew adjustable to 1.25 volts peak-to-peak.

MECHANICAL

Length: 7.25 inches
Width: 1.375 inches
Height: 1.00 inch

Camera Power Supply Board, PL-7674504G2

ELECTRICAL

1. Power Input

115 volts d-c.

2. Power Outputs

+600 volts d-c.
-300 volts d-c.
+100 volts d-c.
+20 volts d-c.
-20 volts d-c.
-6 volts d-c.
-1.5 volts d-c.

3. Signal Inputs

Trigger Pulse:

15 kHz pulses, -15 to -20 volts peak-to-peak, approximately 1.0 microsecond wide, negative going.

Vertical Drive:

4.0 volts ± 0.5 peak-to-peak.

4. Signal Output

30-hertz square wave.

MECHANICAL

Length: 9.25 inches
Width: 5.25 inches
Height: 1.50 inches

Viewfinder Switcher Board, PL-7674431

ELECTRICAL

1. Power Inputs

+20 volts d-c.
-20 volts d-c.

2. Signal Inputs

Red Video:

0.7 volt ± 0.1 peak-to-peak.

Blue Video:

0.7 volt ± 0.1 peak-to-peak.

Green Video:

0.7 volt ± 0.1 peak-to-peak.

Luminance Video:

0.7 volt ± 0.1 peak-to-peak.

Auxiliary Video:

0.7 volt ± 0.1 peak-to-peak.

3. Signal Outputs

Auxiliary Monitor Output:

0.7 volt peak-to-peak into 75 ohms.

Viewfinder Output:

0.7 volt peak-to-peak.

MECHANICAL

Length: 8.00 inches
Width: 2.50 inches
Height: 0.875 inch

Sync Adder Board, PL-7782689

ELECTRICAL

1. Power Input

-20 volts d-c.

2. Signal Input

60-volt peak-to-peak pulses (from the viewfinder sweep board).

3. Signal Output

Typically 0.5 to 1.0 volt peak-to-peak pulses.

MECHANICAL

Length: 1.90 inches
Width: 1.40 inches
Height: 1.00 inch

Viewfinder Video Amplifier Board, PL-7672681G3

ELECTRICAL

1. Power Inputs

+100 volts d-c.
+20 volts d-c.
-6 volts d-c.

2. Signal Input

Noncomposite video signal (white positive), with an amplitude of between 0.3 and 0.7 volt peak-to-peak (adjustable with viewfinder CONTRAST control.)

3. Signal Output

Noncomposite high-impedance video signal (white negative), with an amplitude of 50 volts nominal peak-to-peak.

MECHANICAL

Length: 6.125 inches
Width: 2.50 inches
Height: 1.00 inch

Viewfinder Sweep Board, PL-7673797G2

ELECTRICAL

1. Power Inputs

+100 volts d-c.
+20 volts d-c.
-20 volts d-c.
-1.5 volts d-c.

2. Signal Inputs

Horizontal Sine Wave:

Greater than 20 volts peak-to-peak.

Vertical Drive:

4.0 volts ± 0.5 peak-to-peak.

3. Signal Outputs

Horizontal Sweep:

Sweep WIDTH control set fully CW, 210 volts or less.

Sweep WIDTH control set fully CCW, 240 volts or more.

Vertical Sweep:

Sweep HEIGHT control set fully CW, less than 20 volts peak-to-peak.
Sweep HEIGHT control set fully CCW, at least 50 volts peak-to-peak.

Blanking:

At least 55 volts peak-to-peak of mixed horizontal and vertical blanking.

NOTE

When the horizontal or vertical pulse is removed, the blanking should go to zero.

MECHANICAL

Length: 9.375 inches
Width: 5.25 inches
Height: 1.50 inches

Viewfinder High-Voltage Power Supply Board, PL-7781684G2

ELECTRICAL

1. Power Inputs

   +100 volts d-c.
   +20 volts d-c.
   -20 volts d-c.

2. Signal Input

   15 kHz sine wave, at least 20 volts peak-to-peak.

3. Power Output

   16,000 volts d-c regulated.

MECHANICAL

Length: 5.41 inches
Width: 4.00 inches
Height: 2.28 inches

Iris Control Servo Amplifier Board, PL-7782027G2

ELECTRICAL

1. Power Inputs

   +20 volts d-c regulated.
   -20 volts d-c regulated.

2. Signal Output

   Motor drive voltage (reversible).

MECHANICAL

Length: 4.25 inches
Width: 2.75 inches
Height: 1.70 inches

Iris Control Servo Power Supply Board, PL-7672613

ELECTRICAL

1. Power Input

   117 volts a-c ± 10%, 50/60 hertz.

2. Power Outputs

   +20 volts d-c regulated.
   -20 volts d-c regulated.

MECHANICAL

Length: 6.00 inches
Width: 2.50 inches
Height: 1.50 inches

Intercom Amplifier Board, PL-7781675

POWER INPUT

-20 volts d-c.

MICROPHONE GAIN

40 decibels.

RECEIVER GAIN

15 decibels.

DESCRIPTION

General

The General Electric Color Camera, Model 4PC19D3, consists of fully transistorized printed circuit boards that are secured in place by captive screws. The control panels are readily accessible for setup, operation, and maintenance. A controlled optical system of selectable filters and lenses facilitates the pickup of live color television signals for transmission.

Access to the boards, Plumbicons, viewfinder tube, and related circuitry, and mechanical components is made by lowering the back panel, and both side panels. The physical location of the boards and tubes is shown in Figs. 1 through 5.

A fan is used for cooling and to exhaust any excessive heat that may be present in the Camera chamber.

Red indicating lights on the top front, in the lens shroud, and rear operating panel cue actors and operating personnel that the Camera is on the air.

Signal Flow

Refer to Fig. 6.

A ten-to-one zoom lens is mounted on the Camera head front panel through which the light from the scene to be televised enters the Camera. A motor-driven iris governed by a servo amplifier regulates the amount of light entering the lens, and a manual gear drive focuses the lens.

The light enters the Camera, passing through one of eight optical filters mounted in a detented wheel which permits a rapid and accurate change of the filters to accommodate different light conditions.

The light image is split into two segments by the 30/70 neutral splitting prism, so that 30 percent of the light is transmitted to the luminance channel and 70 percent is reflected to the red, blue, and green channels. The luminance channel is direct-imaging, whereas the chrominance channels are color-split in a 1:3/4 reduced-image relay system.

The first relay lens, directly in back of the first mirror, is one focal length from the image plane, which is the object to be relayed. Because the object is one focal length away, the image for the first relay lens is at infinity or parallel light.

The luminance light image is passed directly through the neutral splitting prism, then to the luminance Plumbicon pickup tube, located on the right-hand side of the Camera. The dichroic mirror and trimming filters associated with the chrominance channels, located on the left-hand side of the Camera, shape the spectral response of the reflected and transmitted light.

The light encounters the blue reflecting dichroic, which allows passage of the red and green light but reflects the blue component upward. The blue light is reflected to a first surface mirror, which, in turn, reflects the blue light image into the associated second relay lens. The blue light is shaped by a blue trimming filter mounted in front of the second relay lens. The blue light is then focused on the face of the blue Plumbicon pickup tube.

After passage of the red and green light through the blue reflecting dichroic, these two light components encounter a neutral splitting mirror which reflects 20 percent of the light downward to a first surface mirror. The light is reflected by this mirror to its related second relay lens. The red component is removed, and the green is finally shaped by a green trimming filter mounted in back of the second relay lens. The green light is then focused on the face of the green Plumbicon pickup tube. The 80-percent light component which passed through the neutral splitting mirror encounters its second relay lens. The green component is removed, and the red component is shaped by a red trimming filter mounted in front of its second relay lens. The red light is then focused on the face of the red Plumbicon pickup tube.

Each of the four Plumbicon tubes has its target lead feeding the resultant video signal into its associated preamplifier, where the amplitude is raised in level to approximately 0.25 volt.

The video output of each of the four preamplifiers is fed to a corresponding inter-

mediate video amplifier. The video amplifiers are all quite similar in that here the signal is amplified, its level adjusted and metered, and its base clamped to a definite reference. The luminance intermediate video amplifier differs in that it also contains circuits to correct for the slight diffusing of vertical edges due to a finite aperture size. This is the "horizontal aperture correction" feature and enables the Channel response to be increased several times at 400 lines.

The four video outputs from the intermediate video amplifiers are fed to two places. One set of outputs feeds through a switching matrix to the Camera viewfinder where each picture may be observed by depressing the corresponding or associated push button. (It should be noted at this time that the Camera viewfinder is an integral part of the Camera. It contains its own high-voltage power supply, sweep generators, and video amplifier.) The other output goes out through coaxial cables in the main Camera cable to the Camera control unit.

Relay Optics

Refer to Fig. 7.

The Color Camera has a relay type system that forms a single primary image, which is transferred to the individual separate mesh Plumbicon tubes through the optical network. In addition to a reflecting dichroic, a neutral splitting prism, a neutral splitting mirror, first surface mirrors, and trimming filters, the optical system employs four relay lenses. One (110mm, f2.2) is located in back of the neutral splitting prism. The other three (82.5mm, f1.6) are positioned in front of the red, blue, and green Plumbicon pickup tubes. The first relay lens is placed one focal distance from the primary image of the zoom lens. The image produced by the first relay lens is at infinity. The second relay lens also produces an image one focal distance away. The light between these two lenses is collimated.

Preamplifier Board, PL-7674511G1, G2

There are four separate preamplifiers used in conjunction with the Plumbicon tubes. PL-7674511G1 is specifically the W (luminance) PREAMPLIFIER. PL-7674511G2 includes the R (chrominance) PREAMPLIFIER, the B (chrominance) PREAMPLIFIER, and the G (chrominance) PREAMPLIFIER.

The group 1 (G1) preamplifier is a wideband amplifier with a flat frequency response of 6.0 mHz ± 0.5 db. The W (luminance) PREAMPLIFIER is used to provide amplification and peaking to drive the LUMINANCE VIDEO amplifier.

The group 2 (G2) preamplifier is a high-gain, wideband amplifier with a flat frequency response of 3.0 mHz ± 1.0 db. The 3.0-mHz bandwidth functions as a noise suppressor. The R, B, and G (chrominance) PREAMPLIFIERS provide amplification and peaking to drive their respective VIDEO amplifiers.

Luminance Video Amplifier Board, PL-7674514

The luminance video amplifier board is located on the right side of the Camera below the chrominance video amplifiers. It accepts the luminance channel video from the luminance preamplifier and clamps the black levels (using the squash pulse from the timing and calibration generator). Like the chrominance amplifiers, it provides both input level and bandwidth adjustment and a peak voltage detector to permit d-c metering of the output video level.

An additional feature is provided in the luminance amplifier which is not needed in the chrominance amplifier. This is aperture correction, which enhances the capabilities of the luminance channel to resolve and reproduce fine detail in the white portion of the picture. Because of the finite size of the electron beam in the Plumbicon tube, the response of the tube to small detail information, such as a narrow vertical black line, is such that the generated video signal has rounded rather than sharp edges, and the leading and trailing edges change in illumination, or contrast. The result, when viewed on a picture monitor, lacks a sharp appearance and tends to blur the fine detail of the picture. The aperture correcting circuits selectively boost the high frequencies needed to sharpen these pulses

and produce a more crisp and pleasing black and white picture.

Chrominance Video Amplifier Board, PL-7674505

The chrominance video amplifier is located on the right side of the Camera. It accepts red, blue, and green video from the three color preamplifiers and amplifies it in three separate, though identical, video amplifiers. Black levels are clamped using the squash pulse from the timing and calibration generator, PL-7674517. Both input level and bandwidth adjustments are provided. A peak voltage detector is furnished for each video output to permit d-c metering of video levels.

Timing and Calibration Generator Board, PL-7674517

The timing and calibration generator board is located on the right side of the Camera. It accepts the 15-kHz horizontal rate sine wave from the drive converter board, PL-7674581, and a horizontal blanking pulse from the Camera sweep board. The outputs include a buffered sine wave (for the Camera sweep board, the viewfinder sweep board, and the high-voltage power supply), a horizontal rate squash pulse (for the chrominance and luminance video amplifier boards) and a power supply trigger pulse (for the Camera power supply board). In addition this board contains the calibration sawtooth generator and the tally light control circuitry.

Camera Sweep Board, PL-7674641

The Camera sweep board furnishes the vertical sweep, the horizontal sweep, the blanking pulses and sweep protection, and the focus regulation for the Camera Plumbicon tubes. A vertical rate sawtooth is also provided for the skew generator, PL-7781890, and horizontal blanking is provided for the timing and calibration generator, PL-7674517.

Skew Generator Board, PL-7781890

The skew generator is used to provide an electrical correction voltage to the horizontal sweep windings of the four Plumbicon tube yokes to compensate for any skew that may be present.

Camera Power Supply Board, PL-7674504G2

The Camera power supply operates as a d-c to d-c converter from a regulated source which is controlled by series regulation, drawing its power from a nonregulated source. The power supply furnishes high, intermediate, and low voltages at nominal currents to the various boards. A 30-hertz square wave used for the alignment of the Plumbicon tubes is also generated by this power supply.

Registration Control Panel, PL-7672688G3

This panel contains the WIDTH, H CENT, H LIN, HEIGHT, V CENT, and V LIN control potentiometers with color keyed knobs. An access door to the chrominance Plumbicon tube sockets is located on the left side. The back of the panel houses the components, wiring, and the registration printed circuit board.

Local Camera Control Panel, PL-7674510

This panel contains the Camera POWER switch, BEAM, FOCUS, H ALIGN, V ALIGN, and SKEW potentiometers on the right center section. The EXP SELECT switch, iris control potentiometer, ALIGN, and CALIB switches are located at the bottom. The left section contains the METER SELECT switch and the meter. The meter board, resistors, wiring, and the skew generator are located on the back of the panel. The Camera sweep board is located at the top.

Viewfinder Switcher Board, PL-7674431

The viewfinder switcher enables all video switching for the viewfinder to be accomplished by d-c controlled diode switches. The switcher board contains five identical amplifiers and eight identical diode switching networks. Two of the amplifier stages, luminance and auxiliary, are operated as emitter followers. The remaining three stages, red, blue, and green, are used as both emitter collector followers in order to obtain both polarities of these signals. A coaxial connector for an external monitor output is furnished and is located at the rear of the Camera under the registration control panel.

Sync Adder Board, PL-7782689

The sync adder board is used to provide sync pulses for triggering an external monitor. There sync pulses are not NTSC but are adequate to drive a monitor.

Viewfinder Video Amplifier Board, PL-7672681G3

The viewfinder video amplifier is a fixed-gain, broadband video amplifier designed to drive the cathode of the viewfinder picture tube.

Viewfinder Sweep Board, PL-7673797G2

The viewfinder sweep board furnishes the horizontal and vertical sweep and blanking for the viewfinder cathode-ray tube. The horizontal and vertical sweep voltages are adjustable by using the horizontal and the vertical sine controls.

Viewfinder High-Voltage Power Supply Board, PL-7781684G2

This power supply is designed to provide regulated 16 kilovolts for the Camera viewfinder cathode-ray tube from a 15,750-hertz sine wave input.

Iris Control Servo Amplifier Board, PL-7782027G2

The iris control servo amplifier is designed to drive a motor which in turn rotates the lens iris. The servo amplifier can be remotely controlled.

Iris Control Servo Power Supply Board, PL-7673613

This board contains a transformer and related components necessary to generate +20 and -20 volts d-c. Both of these positive and negative supplies are well regulated. Two sets of rectifiers are connected in opposite polarity and supply the positive and negative unregulated voltages for application to the two series regulated circuits.

Intercom Amplifier Board, PL-7781675

An intercom amplifier board is located on the left side of the Camera. The audio gain control is panel-mounted under the registration control panel at the rear of the Camera and is used to raise or lower the headset volume. Telephone type dual jacks are provided as inputs to the Camera headsets.

117-Volt AC Outlet

A 117-volt a-c outlet and switch, provided at the back of the Camera on the intercom panel, may be used for a lead light, soldering iron, etc.

INSTALLATION

General

The Color Camera, Figs. 1 through 5, has been tested and inspected before shipment and should be ready for operation when installed. Exercise care when handling the Camera because of the optical and deflection assemblies. Be careful not to dis-

turb the components or wiring. After receiving the Camera, inspect it for possible shipping damage. In the event of damage, notify the shipping company immediately before making parts replacements.

CAUTION

DO NOT PULL THE CARRYING HANDLES STRAIGHT OUT FROM THE BASE. BE CERTAIN THAT THE SPRING-LOADED HANDLE RELEASE GUIDE PINS ARE ENGAGED IN EITHER SET OF SLOTS IN THE CARRYING HANDLE BARS. REFER TO FIG. 8.

V Wedge Mounting, PL-7499942 (Standard)

Refer to Fig. 9.

The Houston Fearless V Wedge Mounting is installed in the following manner:

NOTE

Before installing the Camera, be sure that the tilt-lock pins are engaged with the balance cams. The spring-loaded tilt-lock pins, located on each side and to the rear of the mount, are actuated by pulling them outward and rotating them.

1. Using a man on each side, lift the Camera by the carrying handles, and set the point of the male wedge on the base of the female wedge.
2. Holding the Camera absolutely level, slide it forward into the wedge.
3. The correct position is reached when the spring-loaded locking pin and threaded stud engage in the hole. A slight maneuvering of the Camera and locking pin may be necessary to accomplish alignment.
4. Place the nut on the locking pin threaded stud and tighten it until there is no lateral movement to the locking pin.

Cone Mounting (Accessory)

Refer to Fig. 10.

1. Remove the wedge supplied with the Camera from the Camera base plate.
2. Secure the cone to the Camera base plate, using the screws and lockwashers provided.
3. Secure the base mating plate to the friction head top plate with the $\frac{1}{4}$-20 socket head screws and lockwashers provided.
4. Using a man on each side, lift the Camera by the carrying handles, and set it down gently on the base so that the cone fits into the recess provided in the base mating plate.
5. Maneuver the Camera slightly until the dowel pin on the base plate aligns itself with the slotted hole in the cone. The cone has a 3/8-16 steel PEM nut, press-fitted into its exact center.
6. Use the knob on the 3/8-16 spring-loaded captive screw to tighten the cone to the base plate and friction head.
7. If the Houston Fearless Corporation HFCH Cam-Head Mount is used, consult their instruction book for using the pedestal.

Vinton Wedge Mounting, PL-7496998G2 (Accessory)

Refer to Fig. 11.

The W. Vinton Ltd. wedge is installed using the following procedures:

1. Remove and discard the wedge mounted to the base of the Camera. Save the hardware.
2. Using the same hardware, mount the new adapter plate. There are three $\frac{1}{4}$-20 socket head cap screws.
3. Assemble the male wedge to the adapter plate, using the $\frac{1}{4}$-20 pan head screws and lockwashers. Discard the wedge plate and hardware supplied with the Camera.
4. The customer must supply the female wedge for the Camera mount.
5. Using a man on each side, lift the Camera by the carrying handles, and mate the wedges.
6. Slide the Camera into position while holding it level.
7. After positioning, lock the wedges into place with the appropriate hardware.

Panhandle

Refer to EBI-6209, included as an insert in this book.

Flywheel Zoom Control

Refer to EBI-6209, included as an insert in this book.

Plumbicon Tubes

The W, R, B, and G Plumbicon tubes have identical installation procedures except for their physical locations in the Camera chamber.

Access to the rear of the Plumbicon tube deflection assemblies is achieved by opening the rear door of the Camera and the left-hand door on the registration control panel. Further access is gained by opening the left and right side doors of the Camera.

NOTE

The Plumbicon tubes must always be kept in a horizontal or vertical position with reference to the glass button on the front of the tube. This prevents damage to the optical surface.

Use the following procedures to install the Plumbicon tubes.

1. Rotate the shield which covers the tube connector CCW and remove it. Note the orientation of the wires in relation to the slots on the shield.
2. Set the tube socket in a position that prevents it from interfering with the tube installation.
3. Before inserting the tube into the deflection assembly, note the white line on the pin cap (rear) of the tube and be certain it is positioned approximately toward the top of the Camera during installation.
4. Gently insert the tube into the yoke assembly. An insertion position is reached when the tube requires added pressure to seat it.

CAUTION

IF THE PLUMBICON HAS TO BE ROTATED, GRASP THE BASE OF THE TUBE RATHER THAN THE SOCKET.

5. Apply this pressure with a slight rotational motion until the pins protrude approximately $\frac{1}{4}$ inch from the rear of the deflection assembly shield. DO NOT force the tube into the deflection assembly.
6. Install the tube spacer over the pins of the tube.

NOTE

Extra Plumbicon tube spacers, PL-7122587P1, are available as an accessory to the Color Camera.

7. Install the tube socket on the tube, exercising extreme care not to force or twist the pins.
8. Install the socket shield and be certain that it is securely fastened in place.

Lens Shroud

This cover is used to protect the zoom lens assembly. It also houses a pair of tally lights on its front plate. Insert the tally lamps and jewels into the sockets. The plug cap is plugged into the socket on the Color Camera face plate. Install the lens shroud by exerting a slight pressure on the sides and sliding it over the lens assembly. The shroud is secured to the Camera face plate by using the Camloc screws located at each corner of the shroud.

Tally Light Cover

Insert the tally light lamps into their sockets and snap the red plastic cover into place. Tighten the two thumbscrews on each side of the cover.

Camera Cable

The Camera cable is connected to the Camera by a keyed female Cannon plug. Be

certain that the cable plug is not tipped or off-center when inserted.

Zoom Lens Extenders

The installation and/or setting of a lens extender (to be done only after tracking the zoom without an extender has been completed) is accomplished as follows:

1. Remove the lens access cover (in the top of the shroud).
2. Loosen the two thumbscrews (accessible through slots in the bottom of the shroud on the lens mount.
3. Slide the lens forward.
4. Insert the extender by threading onto the rear of the zoom lens (internal thread on the extender).
5. Slide the lens with the extender towards the Camera case so that the extender seats against the casting.
6. Move the zoom control so that the lens is at wide angle.
7. Rotate the positioning nut on the extender until the image is in focus and the shoulder of the extender is seated against the Camera casting.
8. Lock down, using the three set screws in the extender positioning nut.
9. Check the tracking from wide angle to narrow angle.
10. Tighten the lens mount thumbscrews.
11. Reassemble the lens access cover.

NOTE

Follow these procedures for both the 2X and 3X extenders (PL-7782019G1 and G2). This setting should not change unless the extender is mated with a different zoom lens.

When the sunshade is used, remove the lens cover. The sunshade slips over the lens.

Filter Disk

The eight filters associated with the filter disk are held in place by flat bar spring tabs. The filter is slipped under the spring tab and seats in the retaining shouldered groove. It is recommended that lint-free gloves be used so that fingerprints will not smudge the glass.

NOTE

Lint-free gloves may be ordered from Neumade Products Corporation, 9-16 37th Avenue, Long Island City, New York, 11701.

OPERATION

Refer to Figs. 12, 13, and 14.

CAUTION

PRIOR TO OPERATING THIS EQUIPMENT, STUDY THE CONTENTS OF THIS SECTION PAYING PARTICULAR ATTENTION TO THE PURPOSE OF THE VARIOUS CONTROLS AND INDICATORS AS WELL AS TO THE NOTES, CAUTIONS, AND WARNINGS. OPERATORS SHOULD BE AWARE THAT ATTEMPTS TO SHORTCUT PROCEDURES AS OUTLINED IN THIS SECTION WILL GENERALLY RESULT IN SUBSTANDARD PERFORMANCE AND CAN CAUSE DAMAGE TO THE EQUIPMENT.

The following operating procedures should be adhered to sequentially during the initial operation of this equipment.

CAUTION

TURN THE FOUR BEAM POTENTIOMETERS, W, R, B, AND G, COUNTERCLOCKWISE FOR BEAM CUTOFF. THE IRIS DELEGATE SWITCH IS IN THE LOCAL POSITION.

Voltage Readings

1. Set the Camera POWER switch to the ON position.
2. Turn the METER SELECT switch to H.S.W. The meter pointer reads mid-scale within the green, indicating the horizontal sweep voltage.
3. Turn the METER SELECT switch to V.S.W. The meter pointer reads within the green, indicating the vertical sweep voltage.
4. Turn the METER SELECT switch to +100. The meter pointer reads mid-scale on the red line, indicating the +100 volts d-c.
5. Turn the METER SELECT switch to +20. The meter pointer reads mid-scale on the red line, indicating +20 volts d-c.
6. Turn the METER SELECT switch to -20. The meter pointer reads mid-scale on the red line, indicating -20 volts d-c.
7. Turn the METER SELECT switch to +600. The meter pointer reads mid-scale on the red line, indicating +600 volts d-c.
8. Turn the METER SELECT switch to -300. The meter pointer reads mid-scale on the red line, indicating -300 volts d-c.
9. Sight the Camera on the resolution test chart.

Beam Control

1. Depress the EXPosure SELECT push button, if necessary, to obtain local control of the beam control.
2. Turn the METER SELECT switch to W under BEAM.
3. Depress the W push button on the Camera viewfinder panel.

NOTE

In the BEAM positions, the meter is only an indication that the BEAM controls are functioning and should not necessarily read within the green.

4. Adjust the W BEAM control until the test pattern appears on the viewfinder and the whites are discharged.
5. Adjust the CONTRAST, BRIGHTNESS, and FOCUS controls on the viewfinder panel for maximum resolution.
6. Repeat the previous BEAM control procedures for the R, B, and G channels.

Timing

1. Depress the W push button on the viewfinder panel.
2. Observe the picture and adjust C12, located on the timing and calibration generator board, until the edges are centered within the Camera blanking.

Focal Length

The focal length (using the flywheel zoom control) of the zoom lens is monitored on a focal length meter mounted on the Camera viewfinder panel. This meter is calibrated in steps from 18mm to 180mm.

Optical Focus

Using the panhandle grip, adjust the optional focus for maximum resolution as seen on the viewfinder.

Focus Control

1. Turn the METER SELECT switch to W under FOCUS.
2. Adjust the W FOCUS control for maximum resolution as seen on the viewfinder.
3. Repeat steps 1 and 2 for the R, B, and G chrominance channels.

Align Control

1. Depress the W push button on the viewfinder panel.
2. Focus the Camera lens on the Resolution Chart using the Camera panhandle grip. Adjust the optical focus for maximum resolution.
3. Set the ALIGN test signal switch in the ON position.
4. Adjust the W H ALIGN and W V ALIGN controls for the least amount of movement in the center of the viewfinder picture.

5. Depress the appropriate push button on the viewfinder panel and repeat steps 2 through 4, above, for the R, B, and G chrominance channels.

6. Set the ALIGN test signal switch in the off position.

Video Level Set

1. Turn the METER SELECT switch to W under VIDEO.

2. Set the CALIBration switch in the ON position.

3. Adjust the level control, R2, on the LUMINANCE VIDEO amplifier board until the meter pointer reads mid-scale on the red line.

4. Set the CALIBration switch in the off position.

5. Depress the EXPosure SELECT push button, if necessary, to obtain local control of the exposure control.

6. While observing the Resolution Chart, adjust the EXPosure control until the meter pointer reads mid-scale on the red line.

7. Depress the R push button on the viewfinder panel.

8. Turn the METER SELECT switch to R under VIDEO.

9. Observe the Resolution Chart and adjust the level control, R102, on the R CHROMINANCE VIDEO amplifier board until the meter pointer reads mid-scale on the red line.

10. Depress the B push button on the viewfinder panel.

11. Turn the METER SELECT switch to B under VIDEO.

12. Observe the Resolution Chart and adjust the level control, R302, on the B CHROMINANCE VIDEO amplifier board until the meter pointer reads mid-scale on the red line.

13. Depress the G push button on the viewfinder panel.

14. Turn the METER SELECT switch to G under VIDEO.

15. Observe the Resolution Chart and adjust the level control, R202, on the G CHROMINANCE VIDEO amplifier board until the meter pointer reads mid-scale on the red line.

16. Depress the W push button on the viewfinder panel.

17. Set up the EIA Linearity Chart.

18. Adjust the zoom lens until the arrows on the EIA Linearity Chart are just showing on the viewfinder.

19. Depress the TEST 1 push button on the monitor selector panel to apply a crosshatch signal from the Model 4TC68B1 panel to the Camera. The crosshatch signal is superimposed on the EIA test pattern. It is a primary check of the positioning of the luminance yoke.

20. Ascertain that the chart is level and rotate the yoke by use of the knob on the side of the preamplifiers until the center horizontal row of balls is parallel with the grating pattern.

21. Adjust the SKEW control on the local Camera control panel until the center vertical row of balls is parallel with the grating pattern.

22. Adjust the horizontal linearity control, R67, on the Camera sweep board until the vertical grating lines fall as close as possible to the centers of the middle row of horizontal circles.

23. Adjust the vertical linearity control, R10, and the top linearity control, R12, on the Camera sweep board until the horizontal grating lines fall as close as possible to the centers of the middle row of vertical circles.

NOTE

Set the bias control on the Camera sweep board so that the voltage at the emitter of Q7 is zero.

24. Depress the VF VID TEST button on the monitor selector panel to cancel the crosshatch signal.

Registration

1. Set up the EIA Registration Chart.

2. Adjust the size and centering controls of the luminance channel for approximately the correct size as determined by the amount of corners desired.

3. Depress the W-R push button on the viewfinder panel.

NOTE

The luminance test pattern is displayed with its polarity unreversed and the chrominance test pattern with its polarity reversed.

4. Rotate the red yoke to superimpose the center horizontal line.
5. Adjust the R SKEW control to superimpose the center vertical line.
6. Adjust the six red channel controls on the registration control panel to superimpose the R channel on the luminance channel.
7. Depress the W-B push button on the viewfinder panel.
8. Repeat steps 4, 5, and 6, using the blue controls.
9. Depress the W-G push button on the viewfinder panel.
10. Repeat steps 4, 5, and 6, using the green controls.
11. Depress the WRBG push button on the viewfinder panel. There should be no evidence of misregistration in a central area equal to 0.8 of the picture height.

Luminance Aperture Correction

1. Using a wideband oscilloscope, observe the output of the luminance amplifier, with the calibration pulse on.
2. Adjust the aperture correction control, R25, to its mid-position.
3. Adjust the aperture correction balance control, R31, to its mid-position.
4. Adjust the aperture correction clipper, R12, so that correction occurs only on the top 40 percent of the calibration pulse.
5. Remove the pulse and observe the Resolution Chart.
6. Set the iris to produce 0.7 volt on the white area of the Resolution Chart.
7. Set up the oscilloscope in the line select mode.
8. Observe the 400-line point on the wedge and adjust the aperture correction control, R25, until the peak whites are at 100% (0.7 volt).
9. Observe the W channel on the Camera viewfinder and adjust the aperture correction balance control, R31, to produce equal whites on each edge of the vertical black lines.
10. Recheck the 400-line point on the wedge for 100% response and readjust if necessary.

NOTE

The procedure outlined previously should be used for initial setup. Once the Channel has been completely aligned, the picture and waveform monitor, Model 4TM22A1, can be used in place of the oscilloscope mentioned previously.

THEORY AND CIRCUIT ANALYSIS

Preamplifier Board, PL-7674511G1, G2

Refer to the Waveforms, Fig. 15, the Printed Circuit Diagram, Fig. 16, and the Schematic Diagram, Fig. 17.

The input stage of the preamplifier is a cascode configuration using a field effect transistor, Q1, and a conventional transistor, Q2. The signal is further amplified by Q3 and Q4 and a negative feedback is applied to the amplifier input through load resistors R11 and R12. The feedback lowers the input impedance of the amplifier to approximately 2500 ohms and thus greatly reduces the amount and time constant of the high peaking required to compensate for the input shunt capacity.

Q5 serves as a buffer to drive the remainder of the amplifier. Q6 is an amplifier stage that incorporates the peaking circuits required to make the overall amplifier response flat to 6.0 mHz. Q7 is another buffer amplifier and Q8 is an inverting output stage.

The normal output level of the preamplifier is typically 0.20 volt peak-to-peak into 51 ohms for the luminance and 0.30 volt peak-to-peak into 75 ohms for the chrominance.

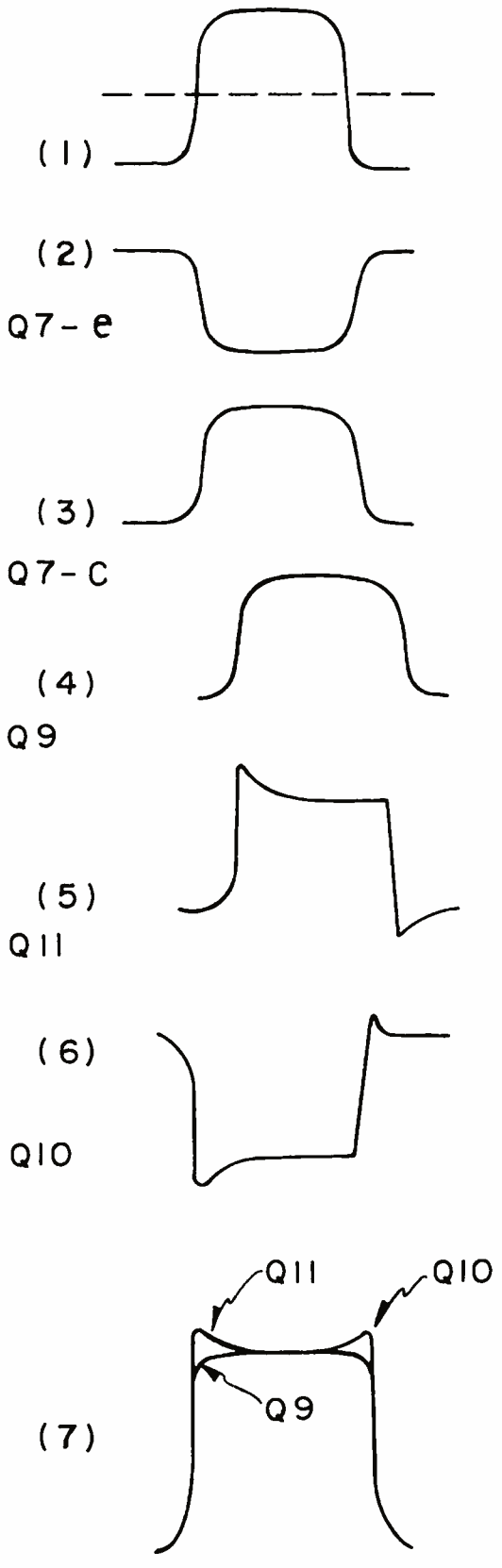
Luminance Video Amplifier Board, PL-7674514

Refer to the Waveforms, Figs. 18 and 19, the Printed Circuit Diagram, Fig. 20, and the Schematic Diagram, Fig. 21.

Transistor Q1 is a video amplifier with an approximate gain of 9.3. The frequency response of this stage is +1 db to 8 mHz and 3 db down at 10 mHz. Capacitor C2 is used to adjust the frequency response of the amplifier. Q2 is an emitter follower which provides a low impedance for the clamped amplifier, Q4. Transistor Q3 is used as a squasher/clamp. This differs from a regular clamp in that it operates for most of the horizontal blanking interval. When used in conjunction with a series resistance such as R11, it reduces the horizontal interval interference by a large factor. The remainder of the amplifier is devoted to aperture correction.

It is preferable from a signal-to-noise standpoint for an aperture correction circuit (as used in this Camera) to be amplitude-dependent, that is to limit the aperture correction so that only the white parts of the picture are corrected. This is desirable because the noise level is inherently raised when aperture correction is accomplished, and since noise is more apparent in the gray and black regions of the picture than in the light or white regions, it follows that the noise in the dark regions should not be increased.

In the nonaperture-corrected mode of operation, the video is applied through delay line L8 to L13, etc, to the base of Q9 and then to the feedback output stages, Q12 and Q13. The output of Q6 is applied to the clipper, CR2 and CR3. This clipper is so arranged that only the white part of the picture is passed through and the gray and black portion is clipped away. The clipping point is adjustable by varying R12. The remaining portion of the signal is applied through R25 to the base of the phase splitter, Q7. To illustrate how the remainder of the circuit operates, assume that the video consists of a single pulse as shown in Sketch A (1). This video has rounded corners because of the finite spot size of



Sketch A

the scanning beam. The video has been clipped at the point shown by the dotted line in Sketch A (1). The output of Q7 appears like that shown in Sketch A (2) at the emitter and in Sketch A (3) at the collector. The emitter output is coupled to the base of Q10. The collectors of Q9, Q10, and Q11 are common and have a common load. Therefore, any signal that appears at the bases of these transistors is mixed as a single common output as shown in Sketch A (4). The collector output of Q7 is delayed by L2-L7, etc., an amount equal to the delay of Q8. This delay is equal to the maximum rise time of the video pulses. This delayed video is applied to the base of Q11 and is also given a rising frequency response by C19 on the base of Q11. It results in the pulse shown in Sketch A (5). The network on the emitter of Q10 (L15 and C18) boosts the high frequencies, which results in the pulse shown in Sketch A (6).

It can be seen that when all of these are added in the common collector circuits, the by-product looks like that shown in Sketch A (7). The consequence is an increase in rise time of the video, which gives an increase in apparent resolution. This combined output is applied to the feedback stages, Q12 and Q13.

R25 is used to adjust the amount of aperture correction, and R31 is used to adjust the balance between the leading and trailing edge correction.

A sample of the video is rectified by the peak-to-peak detector, CR5 and CR6, to produce a d-c voltage proportional to the video level. This voltage is applied to the video level meter.

Chrominance Video Amplifier Board, PL-7674505

Refer to the Waveforms, Figs. 22 and 23, the Printed Circuit Diagram, Fig. 24, and the Schematic Diagram, Fig. 25.

It should be noted that there are three identical video amplifier circuits on the chrominance video amplifier board. The circuit analysis that follows applies to the red chrominance video amplifier. The blue and green amplifiers are the same, except that the blue amplifier uses the 200-series and the green amplifier the 300-series of component numbers.

The input circuit of the chrominance video amplifier provides a 75-ohm termination impedance for the preamplifier board and a level setting potentiometer for the succeeding stages. A voltage gain of 10 is realized in the first stage, Q101, which represents the major part of the gain of the amplifier. An emitter follower, Q102, furnishes the buffering for the clamped stage, Q104, while Q103 is the squasher/clamp. A phase inverter, Q106, precedes the feedback stage, Q107 and Q108. The nominal output voltage of Q108 is 0.7 volt peak-to-peak, when properly terminated. A peak-to-peak detector using diodes CR103 and CR104 is employed at the output to provide a d-c voltage which is proportional to the video for video metering.

Timing and Calibration Generator Board, PL-7674517

Refer to the Waveforms, Figs. 26 through 28, the Printed Circuit Diagram, Fig. 29, and the Schematic Diagram, Fig. 30.

This board contains circuits for several different functions. It generates a squash pulse, a power supply trigger pulse, a calibration sawtooth, and a buffered 15-kHz sine wave for other boards. The board also includes the circuit for the Camera tally lights.

Q8 and Q9 are common emitter stages which amplify and shape the horizontal blanking pulses. These pulses are used to drive Q10, a ringing circuit. The ringing frequency is determined by L3 and C31. CR6 is a damper diode used to clip the negative half of the cycle. CR8 and CR19 further clip the remaining half sine wave to form a pulse. Q11 is a phase splitter. The negative pulse (collector) is used as the squash pulse, and the positive (emitter) is differentiated and then amplified by Q14 and used as the Camera power supply trigger. A second output from Q11 is fed to Q1.

Q1 and Q2 are used to generate a sawtooth wave shape. The pulses from Q11 are applied to the base of Q1, which is normally turned

off. C1 is discharged through Q1. C2 and R6 form a boot-strap circuit to make the sawtooth more linear. The negative-going part of the sawtooth is clipped by diode CR2. The clipping level of CR2 can be adjusted by R10, which is used to adjust the level of the calibration sawtooth. Q3 is an emitter follower with a center-tapped emitter load to provide two levels of calibration signal. Q7 is the output emitter follower. The calibration signal should be set for 0.7 volt as read at TP1, with switch S1 in the up position and the CALibrate switch ON.

The output of the calibration generator is fed through the contacts of relays K1 and K2 to a precision divider network. This network is used to set the levels of the calibration signal to the correct ratio of the signal currents in the various color channels. The signal is finally applied to the test inputs of the preamplifiers.

Q4, Q5, and Q6 are emitter follower buffers for the 15-kHz sine wave to the other boards in the Camera. Q6 has a phasing adjustment, C12, to adjust the phase of the sine wave used to drive the viewfinder sweep circuit.

Q12 and Q13 are used to turn the tally lights on and off. The tally light control voltage from the Camera switcher board is applied to the base of Q12. This control voltage can either be +20 volts or +200 volts, depending on the tally control system requirements. If +200 volts is used, the jumper across R59 must be removed. Q12 is turned on by the control voltage, which turns Q13 on. The tally lamps, in series with the collector of Q13, are lighted by the current flowing through Q13.

CAUTION

When +200 volts is used as an input for the light circuit, the jumper across resistor R1 on the Tally Switch Module, EBI-3693, must also be removed.

Camera Sweep Board, PL-7674541

Refer to the Waveforms, Figs. 31 through 34, the Printed Circuit Diagram, Fig. 35, and the Schematic Diagram, Fig. 36.

CAUTION

DO NOT REMOVE THIS BOARD OR ANY TRANSISTORS FROM IT WHILE POWER IS ON.

VERTICAL SWEEP CIRCUIT

The input vertical drive pulse from the drive converter board, PL-7674581, is amplified and inverted by transistor Q1 as an output to Q2. Transistors Q2 and Q3 generate a sawtooth waveform. The sawtooth from the emitter of Q3 is fed back to the negative side of charging capacitor C4. Capacitor C5 is used to linearize the sawtooth waveform. The amount of sawtooth correction is determined by the linearity potentiometer, R10. A small pulse is developed across potentiometer R12 to further improve the linearity at the top of the sweep. R12 also varies the amplitude of this pulse.

The output of the sawtooth generator is applied through the HEIGHT control potentiometer, located on the registration control panel, to the base of Q4. Transistor Q4 drives the base of phase splitter Q5 which in turn drives the bases of Q5 and Q6. A feedback signal is used from the emitter of Q6 to the emitter of Q4 to eliminate any distortion in the output amplifier. A sawtooth signal is furnished at the emitter of Q4 for the skew generator.

HORIZONTAL SWEEP CIRCUIT

The buffered 15,750-hertz sine wave from the timing and calibration generator board, PL-7674517, is applied to the base of Q14 through the phase shift network consisting of inductor L2 and capacitor C19. Diode CR3 clips half of the sine wave; the other half is clipped by Q14. The resulting square wave is amplified and inverted by Q14, which in turn is coupled to the driver transformer, T1, by Q15. Transistor Q16 is the sweep output stage. The negative half of the sine wave produced by the yoke resonance is damped by diode CR4. The sweep output stage, Q16, has its collector biased to a slightly different voltage from the damper diode, CR4, by the -1.5 volt d-c input.

A circuit consisting of Q17, Q18, and Q19 is utilized to overcome the nonlinearity due

to yoke resistance. A sample of the sweep is applied to the base of Q19. The signal is then coupled to transformer T3 by Q19. The output of T3 drives a push-pull stage consisting of Q17 and Q18, whose output feeds transformer T2. The secondary of T2 is, in effect, in series with a main sweep current; therefore, the correction current is fed in series with the main sweep current. Potentiometer R67 is used to adjust the linearity of the sweep. The width is controlled by the WIDTH potentiometer on the registration control panel, which governs the d-c voltage on Q16.

CAMERA BLANKING CIRCUIT

A circuit is provided to produce Camera blanking and sweep failure protection. This circuit is so arranged that if either sweep is missing, the Plumbicon tube is turned off to prevent damage. The blanking voltage is applied to the cathode of the Plumbicon tubes; therefore, a positive voltage cuts off the tube and, conversely, a negative voltage turns it on.

Q9 and Q12 have a common collector load. Therefore, whatever signal is present on either base appears on the common collector. Without a signal to either base, the collectors are at +40 volts because both transistors are in saturation. Since this plus, or positive, voltage is d-c coupled by Q10 to the cathode of the Plumbicon, the tube is turned off.

As long as both sweeps are present, the collectors operate between cutoff and saturation, which turns on the tube during the active part of blanking and turns it off during the blanked-off time. If either the horizontal or vertical sweep is missing, its corresponding transistor is in saturation and the collector voltage is at +40 volts.

Q8 is used to shape the vertical portion of blanking, and Q13 is used for the horizontal portion.

Q23 is a voltage regulator used to obtain +40 volts from +100 volts.

FOCUS REGULATOR CIRCUITS

A focus current regulator is provided to compensate for current changes due to resistance changes in the focus yokes.

Q20 is a dual transistor which is used as a differential amplifier. The voltage on one base is fixed by a divider, R76 and R77, one percent resistors. The voltage on the other base of Q20 is fixed by the voltage drop across R74. This resistor is in series with the focus current; therefore, the base voltage is proportional to this current. Any change in focus current unbalances the differential amplifier, and the voltage at the base of Q21 changes. Q22 is a series regulator, so that a change in base voltage causes a change in focus current. The circuit is so arranged that when focus current changes occur, the voltage applied to the base of the series regulator is in the direction to correct the original change.

Skew Generator Board, PL-7781890

Refer to the Waveforms, Fig. 37, the Printed Circuit Diagram, Fig. 38, and the Schematic Diagram, Fig. 39.

The input signal to the skew generator is a vertical rate sawtooth with an amplitude of 1.5 volts, peak-to-peak, derived from the Camera sweep board. The input stage of the generator, Q1, is a unity gain device that provides an inverted and noninverted form of this input. These inputs are routed along two bus lines that have four potentiometers, R5, R7, R9, and R11, connected across them. The potentiometers are used to select the amount and polarity of the correction needed. Following each potentiometer control is an emitter-follower buffer, which serves as an output stage. The skew voltage is de-coupled through the chokes to prevent horizontal sweep from entering the system.

The maximum output of the positive or negative polarity is 1.2 volts, peak-to-peak.

Camera Power Supply Board, PL-7674504G2

Refer to the Waveforms, Figs. 40 and 41, the Printed Circuit Diagram, Fig. 42, and the Schematic Diagram, Fig. 43.

The d-c to d-c converter power supply portion of this board operates from a +100 volt source controlled by a series regulator

drawing its power from a non-regulated nominal 115-volt d-c source.

The differential amplifier, Q8 and Q9, provides a high degree of amplification to voltage changes appearing on the +100 volt bus. The correction signal necessary to restore the supply to its original operating condition is applied in the proper phase to the base of Q5 through emitter follower Q6.

If the voltage drop across the one-ohm resistor, R22, increases because of an overload and exceeds the threshold voltage set by R26 by an amount that triggers unijunction Q10, it triggers the SCR, Q7, which reduces the voltage on the base of Q6 to zero and turns off Q5 so that the voltage output is zero.

To recycle the supply, it must first be turned off. If the overload condition still exists, the supply does not turn on until the condition has been corrected.

Z1 is a flip-flop 2 to 1 microcircuit counter operating from a 15,750-hertz pulse. The output from Z1 is applied to the base of square wave generator Q11 at a 7.875-hertz rate. This allows power switching to occur during the blanking interval of a normal broadcast television system.

Q11, Q1, and Q2 form a square wave oscillator with feedback from the base circuit of power switching stages Q3 and Q4. The power stage drives T2, whose secondary winding provides several secondary voltages. The voltages for use with constant loads are rectified and filtered, whereas voltages for varying loads have additional regulation through series type regulators. Q13, Q14, and Q15 are the regulators for the +20 volt circuit, and Q16 and Q17 are the regulators for the -20 volt circuit.

Q12 and Q18 form a flip-flop 2 to 1 counter circuit triggered by a 60-hertz vertical drive signal. The output is a 30-hertz square wave which is applied to the Plumbicon tube beam focus electrode, aiding in Plumbicon tube alignment.

Viewfinder Switcher Board, PL-7674431

Refer to the Waveforms, Figs. 44 and 45, the Printed Circuit Diagram, Fig. 46, and the Schematic Diagram, Fig. 47.

All video switching for the Camera viewfinder is accomplished by d-c controlled diode switches, CR1 through CR6. The five stages which make up the switcher are all identical, as are the eight diode switching networks.

Stages Q4 (luminance) and Q5 (auxiliary) are emitter followers, while Q1 (red), Q2 (green), and Q3 (blue) are used as phase splitting stages in order to obtain outputs which are of opposite polarity.

Because of similarity between stages, only the red circuit is analyzed. Diodes CR1 and CR2 are connected back-to-back between the emitter of Q1 and the output bus which terminates at J8-9. When a small voltage is applied to the cathodes of CR1 and CR2, through R41, the diode is in the off or non-conducting state.

To obtain an output from the red circuit, a negative voltage is applied to the cathodes of CR1 and CR2, through R40, turning them on. Once this occurs, an output is provided from the emitter of Q1 which is in phase with the signal on its base. This red signal appears at J8-R.

To display a color difference signal, such as W-R, diodes CR3 and CR4 are turned on, as are diodes CR13 and CR14. This allows the phase-inverted collector output from Q1 (red) to appear at J8-12 and the in-phase emitter output from Q4 to appear at J8-M, thereby providing the color difference signal, W-R.

To obtain a display from all circuits simultaneously, namely WRBG, all four diode pairs, CR1 through CR4, CR5 through CR8, CR9 through CR12, and CR13 through CR16, must be turned on.

A monitor output coaxial connector permits a video output to be displayed at another monitoring location.

Sync Adder Board, PL-7782689

Refer to Figs. 48 and 73.

The 60-volt pulses from the viewfinder sweep board are used in a combination isolation and mixing stage. The pulses are decreased to approximately 3.0 volts by a resistive divider and fed to the base of Q1. Q1 is an emitter follower and low driving

impedance. The pulses are fed from the emitter to J30, located under the registration control panel, where they are mixed with the video from the viewfinder switcher board and fed into the 75-ohm load of the monitor. These monitor trigger pulses have a typical amplitude of 0.5 to 1.0 volt peak-to-peak.

Viewfinder Video Amplifier Board, PL-7672681G3

Refer to the Waveforms, Fig. 49, the Printed Circuit Diagram, Fig. 50, and the Schematic Diagram Fig. 51.

This video amplifier has been adjusted for an overall voltage gain of 100. Should greater gain be required for specific applications, it can be obtained by reducing the value of the Q1 emitter resistor, R3.

The input noncomposite video signal is a-c coupled to the base of Q1, which provides a voltage gain of approximately five times. The collector input of Q1 is d-c coupled to the base of Q2, which provides a high-impedance coupling to the video output of Q1 and a low-impedance drive to the base of Q3.

The low-impedance drive from the emitter of Q3 is a-c coupled to a feedback group consisting of Q3, Q4, and Q5, which provides an overall voltage gain of approximately 20. Diode CR1 in the base circuit of Q3 restores the d-c level to the video signal, thereby preventing changes in the background level for variations in the video duty cycle. Also located in the base circuit of Q3 is the BIAS ADJ control, R10, which sets the bias of Q3 to avoid clipping the video signal. Zener diode CR2 provides a low-impedance emitter bias supply for Q3, which maintains a relatively constant base-to-emitter (base) potential without the use of a bypass capacitor.

The video output signal at the collector of Q5 is applied to the cathode of the picture tube. A portion of the output signal is also coupled through R13 and C10 and applied to the emitter of Q3 as a feedback signal to adjust gain and bandwidth of the output amplifier group. C12 and C18 are used to facilitate viewfinder peaking.

Viewfinder Sweep Board, PL-7673797G2

Refer to the Waveforms, Figs. 52 through 55, the Component Diagram, Fig. 56, and the Schematic Diagram, Fig. 57.

The 15,750-hertz horizontal driving signal from the drive converter board, PL-7674581, is applied to the base of emitter follower Q1. Phase adjustment of the viewfinder sweep is performed externally to the board.

Q1 shapes the input sine wave into a square wave, with the output being applied to Q2, which amplifies the square wave and drives Q3 and Q4 between saturation and cutoff. CR1 is a diode clipper restricting the peak of the horizontal input signal to a specific reference level.

During the time interval when Q3 and Q4 are cut off, a damped sine wave is generated by the resonant circuit, L2, C12, and C13, with damper diode CR2 restricting the signal to positive excursions only.

This pulse is capacitively coupled to the viewfinder yokes to produce a sawtooth current. Because of the resistance inherent in an inductor, the sawtooth has an exponential characteristic which produces a nonlinear display. The pulse voltage is sampled and reformed by C14 and L4, which drives Q5.

A sample of the output current from T3 is also applied to the base of Q5, further shaping the driving pulse. The driving pulse is amplified by Q5, Q6, and Q7, with the correction waveform being added to the yoke current through the secondary of T3.

The vertical drive signal is applied to the base of Q12, which phase-inverts the signal and biases Q13 on. When Q13 conducts, C24 and C25 discharge through the transistor, developing a sawtooth voltage. Optimum linearity is provided by the feedback stage, Q14. The time constant of R41, C24, and C25 is such that a linear charging slope, up to the point of discharge, is obtained. Q15, Q16, Q17, and Q18 provide additional amplification. The output from the collector of Q17 and the emitter of Q18 is applied to the vertical yoke coil.

Because Q15, Q16, Q17, and Q18 are all d-c coupled, centering current can be added to the base of Q15. Centering current am-

plification is accomplished concurrently with signal amplification.

The blanking signals are obtained by applying the vertical signal to the base of Q19 and the horizontal signal to the base of Q22. Both signals are amplified and mixed in stages Q20 and Q21, providing a composite blanking output signal. The amplitude of the viewfinder sweep blanking signal is at least 55 volts peak-to-peak of mixed horizontal and vertical blanking.

The circuit is so arranged that if one or both sweeps are missing, the viewfinder picture tube is cut off to prevent damage to the viewfinder tube.

Viewfinder High-Voltage Power Supply Board, PL-7781684G2

Refer to the Component Board Diagram, Fig. 58, and the Schematic Diagram, Fig. 59.

The power supply is designed to provide regulated 16 kilovolts for the Camera viewfinder from a 15,750-hertz sine wave input. The sine-wave input is applied to the base of Q3, which, in conjunction with Q4 and Q5, amplifies the signal. The primary of T2, the collector load for Q4 and Q5, is tuned to resonate at 15,750-hertz per second for maximum efficiency. T2 is a step-up transformer, stepping the 15,750-hertz signal to approximately two kilovolts peak-to-peak. The rectifier voltage multiplier arrangement provides a multiplying factor of eight to increase the two kilovolts to 16 kilovolts.

The emitters of Q4 and Q5 are returned to ground through Q2. By controlling the current through Q2, the gain and output voltage of sine-wave amplifiers Q3, Q4, and Q5 can be controlled. A portion of the output signal is rectified by CR2 and CR10, then applied to the base of Q1 to control the drive voltage on the base of Q2. Any change in the output voltage provides compensation of the drive voltage on Q4 and Q5 to correct for the change in the output voltage.

Iris Control Servo Amplifier Board, PL-7782027G2

Refer to the Printed Circuit Diagram, Fig. 60, and the Schematic Diagram, Fig. 61.

The iris control servo amplifier is a high-gain d-c amplifier used in a closed loop circuit to position the Camera lens iris. Position sensing is accomplished by a differential amplifier, Q1 and Q2, used in conjunction with two external potentiometers. These potentiometers are the EXPosure control, which is the Camera operator's control, and the IRIS follow-up. Adjustment of the EXPosure control causes the base voltage of Q1 to change, and this change appears as a voltage of the same polarity at the collector of Q2. After buffering in an emitter follower, Q3, this voltage is amplified and inverted by Q4 and passes to another emitter-follower buffer, Q5, and then to the output stages, Q6 and Q7. The polarity of the voltage appearing at the emitter of Q5 determines which output transistor turns on and, consequently, what polarity voltage appears at the point feeding the servo motor. Potentiometers R2 and R5 are used to set the limits of the two external potentiometers. R7 is the gain control.

The two EXPosure control potentiometers used in this system are located for convenient operation at two points: one on the local Camera control panel and the other at the remote control desk. The selection of the operating point at each location is accomplished with illuminated push-push switches which operate an external relay to switch the desired control into the circuit.

Iris Control Servo Power Supply Board, PL-7672613

Refer to the Component and Schematic Diagram, Fig. 62.

This dual power supply is designed to provide regulated positive and negative 20 volts d-c to the servo amplifier.

The negative section, through diodes CR1 and CR2, develops -31.5 volts d-c. This voltage is applied to the collector of the series regulator, Q1. The collector current for Q2 and the base voltage for Q1 are furnished by R1 and R2. Since the base current of Q1 is of low level, the base voltage of Q1 is determined primarily by the collector current of Q2, which in turn, is de-

pendent upon the base current of Q2. The base current of Q2 is derived from the output voltage, forming a closed-loop circuit. A decrease in the output voltage causes the base current of Q2 to drop, which results in a decrease in the collector current of Q2 and the base voltage of Q1. The increased base voltage on Q1 turns it on harder and causes the output voltage to rise, returning the voltage to its set value.

The operation of the positive section of the power supply 20-volt regulator, Q3 and Q4, and related components, is identical with the negative section described previously.

Intercom Amplifier Board, PL-7781675

Refer to the Component Diagram, Fig. 63, and the Schematic Diagram, Fig. 64.

The intercom amplifier, is used to provide two-way amplification for the intercom headsets. The unit consists of a microphone amplifier, Q1, and a receiver amplifier, Q2. The microphone stage is a common emitter amplifier having a gain of approximately 40. The output of this stage is direct-coupled to the green and black wires of the input/output transformer, T1.

The receiving stage is a common emitter amplifier having a gain of approximately 15. The input signal for this stage is direct-coupled from the yellow and white wires of T1. The output of Q2 drives the headset receiver button. Sidetone cancellation is accomplished by feeding a small amount of the microphone output through the receiver input winding of T1. The phases of the voltage are such that this voltage counteracts the voltage induced into the receiver winding by potentiometer R5.

The secondary of transformer T1 has an impedance of 600 ohms and is normally connected to the party line bus of the intercom system.

MAINTENANCE

General

To obtain maximum life and operating efficiency from the Color Camera, follow a regular preventive maintenance schedule.

Periodically, inspect the Camera for any evidence of component overheating which would discolor resistors and wiring insulation, thereby causing breakage and erroneous operation. If suitable test equipment is available, give transistors a leakage and beta (gain) test. Replace any questionable component.

When conducting a maintenance analysis or troubleshooting this equipment, the input signal must be checked first because most of the Camera boards receive their input signals from other boards within the Camera and from external sources.

Keep the equipment as clean and dry as possible. An air blower or brush with long, soft bristles makes an excellent dust remover. A high-pressure air hose is <u>not</u> recommended since it can cause dust particles to scratch the optical surfaces.

Before installing any replacement parts, check the circuit to determine the cause of failure. When replacing components, select the proper replacement from the Parts List. All components are listed by symbol number and have their General Electric drawing number and description given.

Preamplifier Board, PL-7674511G1, G2

Refer to Figs. 15 through 17.

1. Check the d-c input voltages. They should read +600, +100, +20 -20, and -6 volts d-c.

2. Check the Camera blanking input. It should read 60 volts ± 5.0 peak-to-peak.

3. Check the calibrated 15-kHz sawtooth. It should be adjustable from 0.4 to 1.0 volt peak-to-peak.

4. Check the signal output. It should be typically 0.20 volt peak-to-peak into 51 ohms for luminance and 0.30 volt peak-to-peak into 75 ohms for chrominance.

Luminance Video Amplifier Board, PL-7674514

Refer to Figs. 18 through 21.

SIGNAL INPUTS

Using the oscilloscope, check the squash pulse at the input side of C12. It should be 4.0 volts ± 0.5, 7 microseconds wide, at a 15-kHz rate.

Check the W video input at TP-1. The input video should be typically 0.20 volt.

BANDWIDTH

Set R18 fully CW, R25 fully CCW, and R31 to mid-range. Using a video sweep generator, apply sweep to the input and adjust the level for 0.7 volt peak-to-peak at the output, TP-2. The sweep should be flat to 8.0 mHz ± 1.0 db and down 3.0 db at 10 mHz. If necessary, readjust C2 for the best bandwidth, using these two points as reference.

GAIN

Using a Camera signal such as a gray chart, set the video level control, R2, to give an amplitude of 0.15 volt peak-to-peak at R2-2. The output of the luminance amplifier should be 0.7 volt ± 0.1 at TP-2.

APERTURE CLIPPER

Set R12 to the center of its range. Using an ordinary Camera signal, adjust R2 to produce a 0.7 volt peak-to-peak output at TP-2. Set R25 and R31 to mid-range. Using the oscilloscope, check the signal on the emitter of Q7. It should be possible to go from no clipping to full clipping by adjusting R12. Repeat, checking the signal on the emitter of Q11.

VIDEO LEVEL

With an output of 0.7 volt peak-to-peak, the d-c voltage at the video level pin, J1-6, to ground should be 0.7 volt ± 0.1 as read on a 20,000 ohm-per-volt meter.

TEST POINTS

Refer to the Schematic Diagram for the location of the test points which are used to facilitate setup and maintenance.

Chrominance Video Amplifier Board, PL-7674505

Refer to Figs. 22 through 25.

SIGNAL INPUTS

Using the oscilloscope, check the squash pulses at the input side of C104, C204, and C304. The squash pulse should be 4.0 volts ± 0.5 and 7 microseconds wide at a 15-kHz rate.

Check the red, green, and blue video inputs at TP-101, TP-201, and TP-301, respectively. The input video signal should be 0.30 volt ± 0.1.

GAIN CHECK

Adjust the video level control, R102, R202, or R302, to give an amplitude of 0.15 volt peak-to-peak at R102-2, R202-2, or R302-2. The output of the chrominance video amplifier should be 0.7 ± 0.1 volt peak-to-peak at J1-A, J1-F, or J1-M.

BANDWIDTH

Using a video sweep generator, check the bandwidth of the amplifier at the 5- and 10-mHz points. It should be 0.5 db at 5 mHz and 3.0 db ± 1.0 at 10 mHz. If necessary, adjust C102, C202, and C302 for the best bandwidth, using these two points as reference.

VIDEO LEVEL

With an output of 0.7 volt peak-to-peak, the d-c voltage at the video level pins, J1-1, J1-4, and J1-13, should be 0.7 volt ± 0.1 as read on a 20,000 ohm-per-volt meter.

TEST POINTS

Refer to the Schematic Diagram for the location of the test points which are used to facilitate setup and maintenance.

Timing and Calibration Generator Board, PL-7674517

Refer to Figs. 26 through 30.

CALIBRATION PULSE OUTPUT

1. Check for horizontal blanking at TP-3. It should be approximately 4.0 volts peak-to-peak.
2. Check the calibration sawtooth at TEST POINT TP-1. It should be adjustable from 0.4 volt to 1.0 volt peak-to-peak, using the CALIB ADJ control, R10.
3. Turn the CALibrate switch on the local Camera control panel ON.
4. Set the amplitude of the calibration sawtooth to 0.7 volt peak-to-peak.
5. Using an oscilloscope, check the amplitude of the calibration pulse at the following points:

Output	Test Point	Amplitude
White	J1-14	0.70 v p-p, ± 1%
Red	J1-R	0.24 v p-p, ± 1%
Blue	J1-P	0.24 v p-p, ± 1%
Green	J1-13	0.24 v p-p, ± 1%

SQUASH PULSE AND POWER SUPPLY TRIGGER OUTPUT

1. Check for a 15-kHz sine wave voltage (from the drive converter board, PL-7674581) at TP-2. It should be at least 20 volts peak-to-peak.
2. Check the squash pulse at TP-4. It should be 4.0 volts ± 0.5 peak-to-peak. The pulse width should be 7.0 microseconds ± 0.5 at the tip.
3. Check the power supply trigger voltage at J1-B. It should be 20 volts ± 1.0 peak-to-peak. The pulse width should be 1.0 microsecond ± 0.5 at the tip.

SINE WAVE BUFFERS

1. Measure the sine wave at J1-6 (viewfinder high-voltage power supply). It should be 20 volts ± 1.0.
2. Measure the sine wave at J1-7 (Camera sweep). It should be 20 volts ± 1.0.
3. Check the sine wave at J1-F (viewfinder sweep). It should be 20 volts ± 1.0.
4. Adjusting the V F PHASE control, R12, the sine wave should be phaseable over a range of 5.0 microseconds. The amplitude of this signal changes approximately four volts, from 10 to 15 volts peak-to-peak.

TALLY LIGHT CIRCUIT

When +20 volts is applied to J1-D, the tally lights should light.

RELAY OPERATION

1. Closing the CALibrate switch on the local Camera control panel should apply +20 volts to J1-M; relay K2 should close, allowing signals to appear at the calibration outputs.
2. Depressing a TEST (2 or 3) push button on the monitor selector panel, Model 4TC68B1, should apply +20 volts to J1-9. Relay K1 should close, followed by relay K2. The appropriate test video input signal at J1-K should appear at the outputs of the Camera preamplifiers, J1-14, J1-R, J1-P, and J1-13.

TEST POINTS

Additional test points may be located by referring to the Schematic Diagram. These test points further facilitate setup and maintenance.

Camera Sweep Board, PL-7674641

Refer to Figs. 31 through 36.

1. Check for the 15-kHz sine wave voltage from the drive converter board at J1-V. It should be at least 20 volts peak-to-peak.
2. Check the horizontal sweep with the WIDTH control set at maximum. It should be greater than 60 volts peak-to-peak.
3. Check the vertical sweep with the HEIGHT control set at maximum. It should be greater than 7.0 volts peak-to-peak.
4. Check the voltage across R74. It should be 4.2 volts ± 0.5.
5. Check the vertical sawtooth skew amplitude. It should be 3.5 volts ± 0.05 peak-to-peak.

6. The focus regulating voltage across R74 should not change more than 0.004 volt with an eight percent change of focus coil resistance.

7. There should be 60 volts ± 2.0 peak-to peak of horizontal and vertical blanking. If either or both horizontal and vertical drives are removed, this output should go to zero. The d-c component of the blanking should be such that the black tips are set at the d-c voltage applied to the blanking level pin on the plug.

Skew Generator Board, PL-7781890

Refer to Figs. 37 through 39.

1. Check the +20 volt d-c power input at pin 5.

2. Using an oscilloscope, check the vertical sawtooth at the base of Q1.

3. Use the oscilloscope to make the following checks with the SKEW controls set to one end of their range:

a. Check the W SKEW at pin H. It should read 1.25 volts peak-to-peak.

b. Check the R SKEW at pin 7. It should read 1.25 volts peak-to-peak.

c. Check the B SKEW at pin 6. It should read 1.25 volts peak-to-peak.

d. Check the G SKEW at pin 1. It should read 1.25 volts peak-to-peak.

Camera Power Supply Board, PL-7674504G2

Refer to Figs. 40 through 43.

The Camera power supply board is located on the right-hand side of the Camera in the upper right corner.

WARNING

LETHAL VOLTAGES ARE USED ON THIS BOARD. EXTREME CARE MUST BE EXERCISED DURING ADJUSTMENTS.

1. Turn the METER SELECT switch to +100. The meter pointer reads at mid-scale on the red line. Failure to obtain this reading indicates that the Camera power supply +100 volt d-c potentiometer (R20, located lower right of center on the printed circuit board) requires adjustment. Use a small, insulated screwdriver until the meter pointer reads on the red line.

2. Turn the METER SELECT switch to +20. The meter pointer reads at mid-scale on the red line. Failure to obtain this reading indicates that the +20 volt d-c potentiometer (R44, located lower left of center on the printed circuit board) requires adjustment. Use a small, insulated screwdriver until the meter pointer reads on the red line.

3. The overload circuit is reset by R26, which influences the threshold voltage used to trigger unijunction Q10. Should overload adjustment become necessary, proceed as follows:

a. To recycle the supply, first turn it off.

b. Turn the METER SELECT switch to +100.

c. Using an insulated screwdriver, turn R26 fully CW to ascertain a starting point.

d. Advance R26 CCW approximately 180 degrees.

e. Set the Camera POWER switch to ON.

f. Observe the viewfinder to see if the raster returns and the +100 volts is present at the meter. Failure to obtain the picture and voltage indicates that R26 should be advanced more CCW.

g. Cycle the Camera power off and on and observe that the power supply remains on. Arbitrary minor adjustments of R26 may be made to cause triggering within a 30-degree span of the desired operating point.

h. If, after adjustment of R26, the overload still exists, the supply will not turn on until the condition causing it has been corrected.

Viewfinder Switcher Board, PL-7674431

Refer to Figs. 44 through 47.

1. Check the +20 volt d-c input at J8-K.

2. Check the -20 volt d-c input at J8-8.

3. Check the auxiliary video input at J8-1. It should read 0.7 volt ± 0.1 peak-to-peak.

4. Check the W (luminance) video input at J8-2. It should read 0.7 volt ± 0.1 peak-to-peak.

5. Check the blue video input at J8-3. It should read 0.7 volt ± 0.1 peak-to-peak.
6. Check the green video input at J8-4. It should read 0.7 volt ± 0.1 peak-to-peak.
7. Check the red video input at J8-5. It should read 0.7 volt ± 0.1 volt peak-to-peak.
8. Check the output bus at J8-9. It should read 0.6 volt ± 0.1 peak-to-peak.

Sync Adder Board, PL-7782689

Refer to Figs. 48 and 73.
1. Check the -20 volt d-c at S1-E1.
2. Check the signal input pulse at J10-U. It should read 60 volts peak-to-peak.
3. Check the signal output pulse at J30. It should read typically 0.5 to 1.0 volt peak-to-peak.

Viewfinder Video Amplifier Board, PL-7672681G3

Refer to Figs. 49 through 51.
1. Terminate the output of a video sweep generator, or equivalent, in a 51-ohm resistor and connect it to J1-H.
2. Connect the detector probe from a Tektronix Model 545 Oscilloscope, or equivalent, to J2.
3. Adjust the output of the sweep generator so that there is no clipping.
4. Observe the oscilloscope waveform and adjust L1, C9, and C10 for a flat frequency response to 15 mHz ± 1.0 db with a gradual taper to 20 mHz.
5. Remove the sweep generator and detector probe.
6. Terminate a video signal in the 51-ohm resistor.
7. Connect the X10 probe of the oscilloscope to J1-H and adjust the video level to produce an input signal of 0.2 volt peak-to-peak.
8. Remove the probe from J1-H and connect it to J2. The video output signal should be approximately 20 volts peak-to-peak.
9. Remove the input signal.
10. Set the bias adjust control, R10, for 55 volts d-c at the output jack, J2.

Viewfinder Sweep Board, PL-7673797G2

Refer to Figs. 52 through 57.
1. The amplitude of the horizontal rate sine wave appearing at P1-V should be 12 volts peak-to-peak with the positive portion of the waveform appearing on the emitter of Q1.
2. The amplitude of the horizontal rate square wave on the collector of Q2 should be 25 volts peak-to-peak.
3. A positive going pulse of approximately 140 volts should be present on the emitter of Q3; if it is not, readjust R10.
4. The vertical drive pulse should be 4.0 volts ± 0.5 at P1-X.
5. With the HEIGHT control at the maximum CCW position, the voltage at the collectors of Q17 and Q18 should be less than 20 volts peak-to-peak.
6. With the HEIGHT control at the maximum CW position, the voltage at the collectors of Q17 and Q18 should be at least 50 volts peak-to-peak.
7. At least 55 volts of mixed horizontal and vertical blanking should be measured at P1-H.
8. When either or both horizontal and vertical sweep are removed, the blanking should go to zero.

Viewfinder High-Voltage Power Supply Board, PL-7781684G2

Refer to Figs. 58 and 59.
1. The 15-kHz sine wave voltage on the base of Q4 and Q5 should be 4.0 volts, and the two waveforms should be 180 degrees out of phase.
2. Remove Q2 and place a clip lead from the emitter of Q5 to ground.
3. Remove F1 and place a 0-100 milliampere meter in its place. The minimum current is 30 milliamperes; if it is not, adjust C10.
4. Remove the meter and replace F1.
5. The amplitude of the sine wave voltage on the collectors of Q4 and Q5 is 180 volts.
6. Remove the clip lead and replace Q2.

WARNING

HIGH VOLTAGE IS BEING MEASURED IN THE FOLLOWING

STEPS THEREFORE, EXERCISE EXTREME CAUTION TO PREVENT ACCIDENTAL SHOCK.

7. Using a high-voltage rated meter or meter probe, the voltage at the viewfinder picture tube anode should be between 15 KV and 16 KV.

8. While monitoring the output high voltage and adjusting the raster brightness from 0-200 foot-candles, adjust the Camera power supply voltage regulator control, R2, to obtain a constant voltage over this brightness range.

9. The voltage on the emitter of Q2 should vary between +2 and +8 volts to obtain regulation over this brightness range.

NOTE

If it becomes necessary to replace a component in the viewfinder high-voltage power supply, necessitating the removal of the silicone potting compound, use only General Electric RTV-615 clear silicone potting compound as a replacement. It is available directly from the General Electric Silicon Products Department, Waterford, New York. When ordering, be sure to ask for the brochure describing this product, since it gives the methods of preparing the compound.

Iris Control Servo Amplifier Board, PL-7782027G2

Refer to Figs. 60 and 61.

1. Operate the lens EXPosure control fully CW and observe that the iris opens to its maximum position.

2. Operate the lens EXPosure control fully CCW and observe that the iris closes to its minimum position.

3. Operation of the EXPosure control should cause a minimum of hunting in the system. If hunting is noted, check the setting of the gain potentiometer, R7, on the servo amplifier as follows:

a. Turn the EXPosure control fully CW and observe that the lens iris opens fully; adjust R5, if necessary, until this condition is reached.

b. Turn the EXPosure control fully CCW and observe that the lens iris closes to its minimum position; adjust R2, if necessary, until the condition is attained.

c. Turn R7 fully CW.

d. Turn the EXPosure control to its mid-position and no further.

e. Adjust R7 until iris hunting action stops.

f. Recheck the operation of the EXPosure control and watch for hunting action; reset R7 slightly, if necessary, to minimize hunting.

Iris Control Servo Power Supply Board, PL-7672613

Refer to Fig. 62.

1. Using a 20,000 ohm-per-volt meter, check the -20 volt d-c supply at J1-B on the power supply.

2. Adjust R5 for -20 volts ± 1.0.

3. Check the +20 volt d-c supply at J1-A.

4. Adjust R10 for +20 volts ± 1.0.

NOTE

Always check the -20 volt supply first, since it is used as a reference for the +20 volt adjustment.

Intercom Amplifier Board, PL-7781675

Refer to Figs. 63 and 64.

1. Check the -20 volt d-c input to the amplifier.

2. If the microphone has little or no output, give Q1 a leakage and beta (gain) check.

3. If the receiver has little or no output, give Q2 a leakage and beta (gain) check.

4. Check the other components for opens or shorts.

5. If intermittent operation is encountered, give the wiring a continuity check from the receiver and microphone to the telephone plug.

Registration Control Panel, PL-7672688G3

Refer to Figs. 65 through 68.

The primary function of this panel is to facilitate Camera registration. With the proper setting of the WIDTH control, the nominal peak-to-peak voltages for the horizontal sweep return may be monitored by using an oscilloscope for the W, R, B, and G channels. The resulting voltages may be compared with the waveforms for the registration control panel.

The HEIGHT control settings and waveforms for the vertical sweep return may be checked in the same manner as described previously.

The other potentiometers on this panel can be checked, using the oscilloscope and observing that the control has the proper operating characteristics. These controls should turn from CW to CCW, or vice versa, without drag or skipping. Replace any questionable component using the Parts List in this instruction book.

Local Camera Control Panel, PL-7674510

Refer to Figs. 69 and 70.

This panel is the central setup and readout point containing the various potentiometers, switches, and a meter.

The input and output voltage and video level readings are monitored through the d-c metering printed circuit board. Periodic inspection of open switch contacts for dirt and scoring insures satisfactory operation. Check toggle switches for make and break operation during the course of normal operation. The potentiometers can be checked, using an oscilloscope and observing that they have the proper operating characteristics. They should turn from CW to CCW, or vice versa, without drag or skipping. Replace any questionable component using the Parts List in this instruction book.

Camera Vertical Transformer

Refer to Figs. 71 and 72.

Use an oscilloscope to make the following voltage checks:

1. The voltage at terminal 6 should read 2.0 volts ± 0.5 peak-to-peak at the vertical rate.
2. The voltage at terminal 1 should read 4.0 volts ± 1.0 peak-to-peak at the vertical rate.
3. The voltage at terminal 5 should read 16 volts ± 4.0 peak-to-peak at the vertical rate.
4. The voltage at terminal 4 should read 14 volts ± 4.0 peak-to-peak at the vertical rate.

NOTE

The transformer readings are dependent upon the setting of the vertical HEIGHT control which accounts for the wide tolerances.

Filter Disk

Refer to Fig. 3

The filter disk is located in front of the prism. It contains eight filters which are selected by the numbered control wheel.

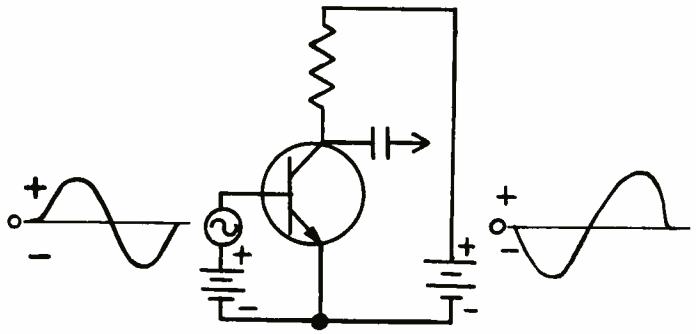
The filter disk control wheel is located and protrudes from the right-hand Camera door. A numbered chart corresponding to the numbers on the control wheel designates each filter function relative to the lighting conditions encountered when using the Color Camera.

Voltage Waveform Phase Relationships

When using waveforms as a means for troubleshooting transistor circuitry, there are certain basic transistor characteristics which should be understood by service personnel. These exist between common emitter, common collector, and common base amplifier stages. For the sake of simplicity, a positive going sine wave is used as the reference voltage waveform; the same principles, however, apply to any other form of voltage waveform.

COMMON EMITTER AMPLIFIER

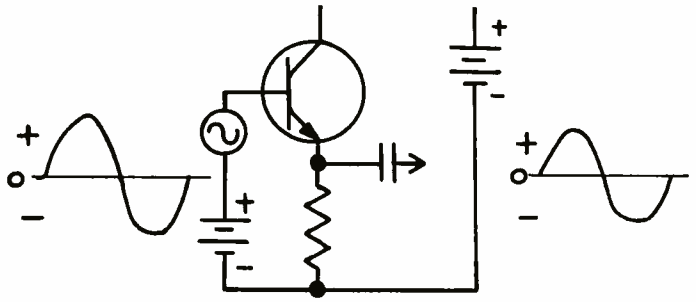
A positive-going voltage waveform applied to the base of this amplifier results in a voltage waveform on its collector which is 180 degrees out-of-phase with that on its base as shown in Sketch B.



Sketch B

COMMON COLLECTOR AMPLIFIER

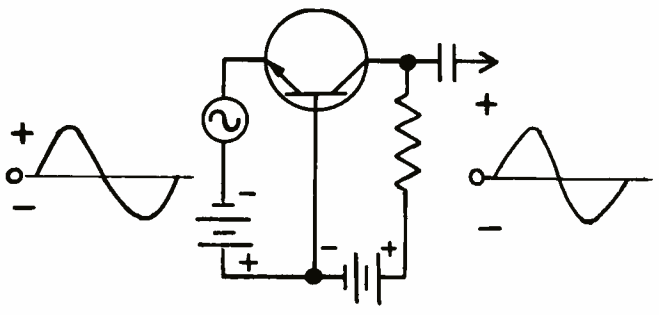
This amplifier is commonly referred to as an emitter follower. A positive-going voltage waveform applied to the base of this amplifier results in a voltage waveform on its emitter which is of the same phase as that on its base. The gain for this amplifier is approximately 0.98 as shown in Sketch C.



Sketch C

COMMON BASE AMPLIFIER

A positive-going voltage waveform applied to the emitter of this amplifier results in a voltage waveform on its collector which is of the same phase as that on its emitter as shown in Sketch D.



Sketch D

Transistor Abuses

GENERAL

A manufacturer's transistor specification sheet not only describes the device, but, what is more important, warns of its limitations and assumes that the user is somewhat familiar with the type of device described as well as the area of its application. Where this knowledge is lacking, additional information is available in the form of application notes, technical tips, articles in technical periodicals, promotional material, manuals, etc.

However, no matter how carefully he prepares his specification sheet, the manufacturer cannot guarantee his device against mechanical and electrical abuses.

Although transistors have acquired a reputation for high reliability and ruggedness there are limitations that the user must become familiar with if he is to maintain reliable semiconductor circuits.

The following are some of the more common abuses to which transistors are subjected.

MECHANICAL ABUSES

1. Shock

Semiconductor material is hard and brittle and can be damaged by high impact shock. For example, dropping a transistor $4\frac{1}{2}$ inches onto a hardwood bench subjects the device to around 500g; a drop of 30 inches onto concrete may increase the impact shock from 7000 to 20,000g; snapping rather than sliding a transistor into a clip causes a shock of 600g; and carelessly clipping a transistor lead may generate a shock wave of several thousand g. Any high impact shock, therefore, can cause fracture of the semiconductor material, or lead breakage, resulting in complete ruin of the transistor.

2. Lead Bending

Several sharp back-and-forth bends of a wire will usually cause it to break, or at least fracture. This is especially true of

transistor leads at the point where they enter, or attach to, the header. Some leads bent during testing or handling may easily break later since the bending life of the lead has already been spent. Plated leads subjected to excessive bending and twisting can generate cracks at the header; such cracks offer openings for moisture to enter and contaminate the device, thereby causing gradual degradation of gain and voltage characteristics. To insure against this, always allow for a clearance of at least 1/16 to 1/8 inch between the header and the start of the lead bend.

3. Overheating

If, during soldering, the maximum specified junction temperature of a device is exceeded, the device can be destroyed. Heat transmitted over connecting leads and printed circuit board leads to the header can also be destructive. Junctions can be shorted. Lead connections may open. Unequal expansion between the header and the package may break the hermetic seal. Safety precautions include the removal of the transistor from the immediate socket to which heat is being applied, keeping in mind that the heat can quickly travel along connecting wires to neighboring sockets, the use of heat shunts (clips, pliers, etc.) connected between the heat source and the device, and the use of a soldering iron of heat delivery adequate for the job to be done. Most small-signal transistor circuit work can be accomplished by use of a 20- to 50-watt iron. Larger irons can be used, of course, but with increased chance of damage to the device. At any rate, it is always best to "heat-shunt" to insure against damage and to solder cleanly and quickly.

ELECTRICAL ABUSES

1. Excessive Voltage

Do not ever exceed the absolute maximum voltage (usually specified at 25 C) given by the manufacturer. In signal amplifier circuits this means that peak-to-peak voltage swings should not exceed the inter-element absolute maximum voltages of the transistor. A good rule is to use a supply voltage equal to half the maximum voltage rating. Maximum inter-element voltages can also be exceeded by voltage transients (inductive and capacitive kicks, etc.) when connecting a transistor into a hot circuit. BEFORE REMOVING OR REPLACING A TRANSISTOR IN A CIRCUIT, ALWAYS TURN THE POWER OFF. Transistor testing by use of an ohmmeter can also cause damage by application of excessive voltage. Since the emitter-base reverse breakdown voltage for most transistors is from one to five volts, the transistor can easily be damaged when subjected to the high-voltage ranges of an ohmmeter (many use $22\frac{1}{2}$- to 30-volt batteries). When measuring breakdown voltage, always use a current limiting resistor. Voltage spikes can cause a build-up of impurities concentrated at a point in the collector or emitter junctions and can result in punch-through (internal short from collector to emitter) across the base region.

2. Excessive Power

Exceeding the maximum junction temperature of a transistor can permanently change the gain and breakdown voltage, and cause opens and shorts. To guard against such damage when testing for gain at excessive power dissipation levels, use a protective heat sink or test with a low duty cycle pulse.

3. Miscellaneous

When a transistor is used in the common emitter configuration, opening the base while voltages are still applied can result in junction heating, thermal-runaway, and eventual burn-up of the transistor. Even the right conditions of applied voltage, current gain, and reverse leakage can be destructive, particularly to germanium transistors, where leakage currents may be a thousand or more times greater than in silicon transistors. With the base disconnected, the collector-to-emitter leakage (I_{ceo}, base open) equals the collector-to-base leakage (I_{cbo}, emitter open) magnified by the forward current gain (beta) of the transistor. High values of I_{ceo}

can flow when inductive collector loads, exhibiting low resistance paths, are part of the associated circuitry. Where current limiting is not a part of the external circuitry, disconnect supply power whenever the base is open-circuited.

Blower Motor Oiling

The Color Camera utilizes a single muffin blower located at the top of the Camera front plate. To insure longer life and more efficient operation from this blower, use the following lubrication procedures.

Oil the motor at least once every six months. An oil injector and a can of lubricant to be used specifically for this purpose are furnished with it.

1. Remove the cap from the end of the oil injector.
2. Place the needle in the center (at a 45 degree angle to the surface) of the gold label of the fan and the concealed self-sealing rubber cap located under it.
3. Pierce the rubber cap to approximately $\frac{1}{4}$ inch.
4. Depress the oil injector plunger to allow one graduation of oil to escape.

Viewfinder Tube Replacement

Refer to Figs. 3, 4, and 5.

Use the following procedures in the event it is necessary to replace the viewfinder picture tube.

1. Open the right-hand Camera door.
2. Turn the Camera POWER switch off.
3. Open the left-hand and rear Camera doors. The top cover may be opened also for better accessibility.
4. Disconnect the three coaxial connectors located at the left end of the CHROMINANCE VIDEO amplifier board. The connector caps are red, blue, and green.
5. Unscrew the five captive screws holding the CHROMINANCE VIDEO amplifier board and carefully disconnect the board from the connector.
6. Unfasten the three screws holding the blank back-up panel which the amplifiers were resting against, and remove the panel.
7. Disconnect the tube socket from the tube cap.
8. Free the yoke by unscrewing the yoke clamp.
9. Disconnect the anode cap from the picture tube.
10. Unscrew the outer set of four corner Phillips-head screws which hold the viewfinder dress panel.
11. Remove the entire viewfinder panel, which includes the viewfinder picture tube. Provide adequate support while handling so that the tube assembly, especially the neck, is not dropped or bumped. Withdraw the unit carefully.
12. The unit may now be placed on a bench or similar surface.
13. If necessary, loosen the four inner Phillips-head corner screws on the viewfinder dress panel. These screws hold the corner brackets.
14. Disconnect the four retaining springs at each corner of the retaining collar.
15. Carefully remove the picture tube from the dress plate and mask.
16. Follow the aforementioned procedures in reverse order to install a new picture tube.

NOTE

During the installation of a new picture tube, be certain that it is properly positioned in relation to the yoke. You may be required to further loosen the yoke clamp screws holding the yoke and to move the picture tube into the correct position. Tighten the yoke clamp screw.

Care and Cleaning of Optical Components

GENERAL

It is extremely important that the following suggestions and methods for cleaning the optical surfaces associated with the Camera be followed. These cleaning procedures have been proven by lens manu-

facturers, and any deviation from them will result in scratching the optical surfaces.

CAUTION

UNDER NO CIRCUMSTANCES MAY ANY TYPE OF CLEANING POWDERS BE USED FOR CLEANING THE OPTICAL SURFACES. ALSO, DO NOT USE STRONG LIQUID CLEANING AGENTS SUCH AS ALCOHOL.

CARE OF ANGENIEUX ZOOM LENS

Refer to EBI-6209.

CARE OF COATED LENS SURFACES

Any water or oil accidently spilled on optical surfaces must be immediately removed; otherwise, a distorted or imperfect image will be evident when the signal is transmitted.

The recommended lens cleaning agents are the following:

1. A gentle blast of air from a hand-held syringe.
2. A camel-hair brush.
3. A soft cloth free of dust and lint.
4. A film of moisture from the breath together with a dust- and lint-free cloth.
5. Warm, pure distilled water.
6. Warm water and mild soap suds which are suitable for babies. After application of this solution, the lens must be thoroughly rinsed off with clean warm water.

CLEANING THE LENS SURFACES

1. Before applying any lens cleaning agent, first remove all dust particles by using a syringe or by blowing. If this method fails, use a soft camel's hair brush; however, it is suggested that the brush be tapped on the edge of the Camera pedestal to remove the accumulated dust particles after each pass of the brush.

A soft, clean, dust-free cloth wrapped around the finger can also be used to remove dust particles. Rotate the finger when wiping. If you are cleaning the optical surfaces from left to right, rotate the finger counterclockwise, and if wiping right to left, rotate the finger clockwise.

2. Apply moisture from the breath to the optical surface to remove the remainder of the scum and dirt. If this fails, apply a heavier dose of water to the optical surface on a cloth or surgical cotton (nearly dry), followed by wiping off the excess water with a piece of cotton or dust-free cloth to dry the optical surface.

3. If dirt or grease marks are still in evidence on the optical surface, use a mild common detergent solution dissolved in warm water. After application of this cleaning agent, clean the optical surface with clean, lukewarm water and then thoroughly dry.

Camera Wiring Diagram

Fig. 73 shows the wiring and electrical relationship between the various printed circuit boards, viewfinder panel, registration control panel, local Camera control panel, and other ancillary equipment within the Camera chamber. The point-to-point wiring diagram is useful in analyzing or troubleshooting this Camera.

PARTS LIST

Symbol	Description	GE Drawing
	COLOR CAMERA MODEL 4PC19D3	
	MOTORS	
B1	Gear motor, miniature. Globe Industries motor and gear Type 43A. Operates from 27 v d-c supply, output speed 30 to 40 rpm at 27 v (no load), motor speed 10,000-13,000 rpm (no load).	B-7499544-P1
B2	Rotron Mfg. Co. whisper venturi fan; operates on 115 v, 50-60 Hz, 1 phase.	C-7781073-P4
	CAPACITORS	
C1 and C2	Electrolytic, solid tantalum type; 47 mfd ± 20%, 20 v d-c w. Texas Instrument Type SCM476GP020C4, Sprague Type 150D476X0020R2.	B-7493471-P15
C5	Ceramic, Hi-K disk; 0.1 mfd +80% -30%, 50 v d-c w. Sprague Cat. #36C172.	A-7161189-P2
C6 thru C9	Ceramic, Hi-K disk; 0.1 mfd +80% -25%, 500 v d-c w. Sprague Cat. #36C190A.	B-7488160-P3
C10 thru C13	Ceramic, Hi-K disk; 0.1 mfd +80% -30%, 50 v d-c w. Sprague Cat. #36C172.	A-7161189-P2
C14 and C15	Metalized, plastic; 4.0 mfd ± 20%, 200 v d-c w. Sprague Cat. #118P40502S4.	B-7489159-P16
C16	Tantalum type; 3.3 mfd ± 10%, 20 v d-c w.	C-7782324-P39
C21 and C22	Ceramic, Hi-K disk; 0.1 mfd +80% -30%, 50 v d-c w. Sprague Cat. #36C172.	A-7161189-P2

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED)	
C23	Silver mica, epoxy dipped; 910 pf ± 2%, 500 v d-c w. Electromotive Type DM15.	B-7496932-P207
C24 and C25	Metalized plastic; 0.1 mfd ± 20%, 1000 v d-c w. Sprague Type 118P.	B-7380088-P1
C26	Mylar, dielectric; 0.1 mfd ± 5%, 50 v d-c w.	B-7496934-P206
C27	Mylar, dielectric; 0.1 mfd ± 10%, 100 v d-c w.	C-7777865-P159
	RECTIFIERS	
CR1 thru CR3	Germanium rectifiers; 200 PIV max. GE Type 1N92.	C-7777664-P2
	ADAPTER	
CP1	Amphenol Cat. #83-1AP, Signal Corps #M-359.	M-2R22-P2
	BUZZER	
DS1	Operating voltage 6 to 28 v d-c. "Sonalert" Type SC-628, Electropac Inc., Peterborough, New Hampshire.	B-7497192-P1
	INDICATOR LIGHTS	
I1 and I2	GE Type 1829.	A-7164423-P36
I3	GE Type 327.	A-7164423-P14
I5 thru I13	GE Type 327. (Part of S1.)	A-7164423-P14
I14 and I15	GE Type 327.	A-7164423-P14

Symbol	Description	GE Drawing
	CONNECTORS	
J1	Cannon Cat. #LKTMA-A85C6-32S with coax plug for RG-174/U cable.	C-7781907-P4
J2	34 contacts. Burndy Corp. Cat. #MS34R58.	C-7782035-P14
J3	20 contacts. Burndy Corp. Cat. #MS20R60.	C-7779846-P12
J4	50 contacts. Burndy Corp. Cat. #MS50R58.	C-7782035-P16
J5	15 double row contacts. AMP. Inc. Part #582762-3.	C-7781889-P2
J6	8 double row contacts. AMP. Inc. Part #582760-3.	C-7781889-P1
J7 thru J9	15 double row contacts. AMP. Inc. Part #582762-3.	C-7781889-P2
J10	26 contacts. Burndy Corp. Cat. #MS26R60.	C-7779846-P13
J11	20 contacts. Burndy Corp. Cat. #MS20R60.	C-7779846-P12
J14 thru J17	8 double row contacts. AMP. Inc. Part #582760-3.	C-7781889-P1
J18 thru J21	20 contacts. Burndy Corp. Cat. #MS20R60.	C-7779846-P12
J22 thru J25	Jacks. Carter Cat. #J6-3.	A-7171975-P1
J26	Cinch Cat. #54A12844.	A-7128081-P1
J27	8 double row contacts. AMP. Inc. Part #582760-3.	C-7781889-P1
J28	9 contacts. Elco Part #PCV2-9-A-3-1/16-0.	C-7777466-P3
J29	8 double row contacts. AMP. Inc. Part #582760-3.	C-7781889-P1
J30	Amphenol Cat. #83-1R, Signal Corps #SO-239.	M-2R22-P3
J31 and J32	4 female contacts. Winchester Code #M4S-LRN, Continental Type C4-20S-VRN.	B-7489243-P1

Symbol	Description	GE Drawing
	RELAYS	
K1	Time delay relay; 60 sec delay ± 15% over temp range, 6.3 v coil voltage, NO. contacts, heater power $2\frac{1}{2}$ w nom.	B-7380085-P1
K2	24 v d-c nom, 19.2 v d-c pickup, 300 ohms coil resistance, current 0.08 amp, 1.9 w power, operate time 15 m sec, release time 5.0 m sec, inductance 0.6 h at 1000 hertz, 3pdt.	C-7782323-P1
	YOKE ASSEMBLIES	
L1B	Yoke assembly. Includes: Yoke.	PL-7781922-G3 D-7674692-P1
L1G	Yoke assembly. Includes: Yoke.	PL-7781922-G3 D-7674692-P1
L1R	Yoke assembly. Includes: Yoke.	PL-7781922-G3 D-7674692-P1
L1W	Yoke assembly. Includes: Yoke.	PL-7781922-G4 D-7674692-P1
L2	Deflection yoke. Penn-Tran Type EX-633.	B-7496516-P2
L3 and L4	RF coils; inductance 39 uh ± 10%, d-c resistance 2.0 ohms max. Jeffers Cat. #4422-11.	B-7498929-P50
L5	Inductance 200 uh ± 10%, d-c resistance 3.8 ohms max. Aladdin Part #22-223.	B-7493492-P1
	METERS	
M1	Elapsed time indicator; 115 v ± 10%, 50 Hz, 2.5 w nom, hours up to 9999.9 in 1/10 hr steps. Haydon Mfg. Co. Cat. #ED72 (not hermetically sealed).	B-7494576-P1
M2	Meter panel .	B-7499648-P1
	PLUGS	
P1LAW	Part of W1.	

Symbol	Description	GE Drawing
	PLUGS (CONTINUED)	
P1PAB	Part of W3.	
P1PAG	Part of W4.	
P1PAR	Part of W2.	
P1PAW	Part of W1.	
P2PAB	Part of W7.	
P2PAG	Part of W8.	
P2PAR	Part of W6.	
P2PAW	Part of W5.	
P2VFV	Plug. Automatic Metal Products Cat. #0711-40.	C-7781541-P4
P12	Miniature, rectangular; 8 contacts. Winchester Code #MRE-8S-K.	C-7777759-P3
P13	20 contacts. Burndy Corp. Cat. #MS20R60.	C-7779846-P12
P18	Part of L1W.	
P19	Part of L1R.	
P20	Part of L1B.	
P21	Part of L1G.	
P31 and P32	4 pin male. Winchester Code #M4P-LS-H10C, Continental Type C4-20P-VS-C4HC.	B-7489243-P4
P101R	Part of W2.	
P201B	Part of W3.	
P301G	Part of W4.	
	RESISTORS (Composition, ± 5%, ½ w, unless otherwise specified.)	
R1	Potentiometer, carbon film; 1000 ohms ± 20%, 0.3 w, linear taper. Chicago Telephone Supply Series 70 control.	C-5494774-P2

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ½ w, unless otherwise specified.)	
R2 and R3	1500 ohms, ¼ w.	C-3R152-P152J
R4	Potentiometer, composition; 500 ohms ± 20%, 2.25 w, linear taper. Allen Bradley Type J.	M-2R73-P6
R5	0.62 megohm.	C-3R77-P624J
R6	0.20 megohm.	C-3R77-P204J
R7	Potentiometer, carbon composition, push-pull; 2.5 megohm ± 30%, 1 w, linear taper, spst switch open when shaft is pushed in, closed when shaft is pulled out.	B-7494134-P3
R8 and R9	0.30 megohm.	C-3R77-P304J
R10	62,000 ohms.	C-3R77-P623J
R11	Potentiometer, composition; 250,000 ohms ± 20%, 2.25 w, linear taper. Allen Bradley Type J.	M-2R73-P22
R12	0.62 megohm.	C-3R77-P624J
R13	0.36 megohm.	C-3R77-P364J
R16 thru R19	750 ohms, ¼ w.	C-3R152-P751J
R20	Potentiometer, precision, wirewound; 1000 ohms ± 5%, 2 w, linearity ± 0.5%, continuous rotation. Helipot Type G.	B-7495571-P2
R21 thru R24	750 ohms, ¼ w.	C-3R152-P751J
R25	100 ohms, ¼ w.	C-3R152-P101J
R27	Variable, precision, linear; 10,000 ohms ± 3%, 1.5 w. Bourns Co. Cat. #3520S-1-103.	B-7499637-P1

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ½ w, unless otherwise specified.)	
R30	Potentiometer, carbon film; 1000 ohms ± 30%, ¼ w. Chicago Telephone Supply Type X201.	B-7497175-P4
R31 and R32	6800 ohms.	C-3R77-P682J
R33	3900 ohms.	C-3R77-P392J
R34	1000 ohms.	C-3R77-P102J
R35 thru R38	51 ohms.	C-3R77-P510J
R39	5100 ohms, 2 w.	C-3R79-P512J
	SWITCHES	
S1	Push-button type, illuminated; 2 form A contacts for stations 6, 7, 8, and 9; 3 form A contacts for stations 1, 2, 3, 4, and 5; 5 form A contacts for station 2; interlock with lock-out; GE Cat. #327 indicator lamp. Switchcraft frame Part #37091. CAUTION: Outside shell connection of lamp may short to plunger and ground with button removed on single lamp station.	D-7674029-P6
S2	Circuit breaker, miniature; rated 5.0 amp, 240 v a-c, 60 cycles, Series type trip, delay curve 2, nom coil resistance 0.047 ohm d-c, nom coil a-c impedance 0.042 ohms. Heinemann Type VP3.	B-7495079-P9
S5	Part of R7.	
	TRANSFORMERS	
T1	Audio output. Pri: 0.3 ohm d-c ± 10%; sec #1: 29 ohms d-c ± 10%; sec #2: 0.4 ohm d-c ± 10%. Audio Development Part #A12961.	B-7493632-P1

Symbol	Description	GE Drawing
	TRANSFORMERS (CONTINUED)	
T2	Filament, single phase. Pri: 117 v, 50/60 cycles. sec: 25.2 v, 1.0 amp.	B-7493628-P1
	TUBES	
V1B	Philips Plumbicon Type XQ1020B. (Amperex)	A-7164425-P59
V1G	Philips Plumbicon Type XQ1020G. (Amperex)	A-7164425-P58
V1R	Philips Plumbicon Type XQ1020R. (Amperex)	A-7164425-P57
V1W	Philips Plumbicon Type XQ1020L. (Amperex)	A-7164425-P56
V2	GE Type 8RP4.	A-7164415-P54
	CABLE ASSEMBLIES	
W1	Cable assembly, 39.50" length. Includes: Plugs, black color. Cinch Cat. #15H16704. (qty 2.) Cable. MIL Type RG174/U.	C-7782124-P48 K-7104941-P3
W2	Cable assembly, 42" length. Includes: Plug, red color. Cinch Cat. #15H16704. (qty 2.) Cable. MIL Type RG174/U.	C-7782124-P41 K-7104941-P3
W3	Cable assembly, 36" length. Includes: Plugs, blue color. Cinch Cat. #15H16704. (qty 2.) Cable. MIL Type RG174/U.	C-7782124-P40 K-7104941-P3
W4	Cable assembly, 43.50" length. Includes: Plugs, green color. Cinch Cat. #15H16704. (qty 2.) Cable. MIL Type RG174/U.	C-7782124-P39 K-7104941-P3
W5	Cable assembly, 14" length. Includes: Plug, black color. Cinch Cat. #15H16704. Cable. MIL Type RG174/U.	C-7782124-P49 K-7104941-P3

Symbol	Description	GE Drawing
	CABLE ASSEMBLIES (CONTINUED)	
W6	Cable assembly, 45" length. Includes: Plug, red color. Cinch Cat. #15H16704. Cable. MIL Type RG174/U.	C-7782124-P42 K-7104941-P3
W7	Cable assembly, 40.50 length. Includes: Plug, blue color. Cinch Cat. #15H16704. Cable. MIL Type RG174/U.	C-7782124-P43 K-7104941-P3
W8	Cable assembly, 47" length. Includes: Plug, green color. Cinch Cat. #15H16704. Cable. MIL Type RG174/U.	C-7782124-P44 K-7104941-P3
	INDICATOR LIGHT SOCKETS	
XI1 and XI2	EF Johnson Cat. #147-610.	B-7487665-P1
XI3 thru XI15	Red lens cap. Dialight assembly Type 184-9830-1871-604.	B-7499694-P1
	RELAY SOCKET	
XK1	9 pin miniature. Elco Part #BRTL169PHSPTD, Code #91662.	B-7494154-P4
	TUBE SOCKETS	
XV1B	Amperex Cat. #56020.	B-7499677-P1
XV1G	Amperex Cat. #56020.	B-7499677-P1
XV1R	Amperex Cat. #56020.	B-7499677-P1
XV1W	Amperex Cat. #56020.	B-7499677-P1
XV2	Eby. Co. Part #9859-2.	A-7178402-P1

PREAMPLIFIER BOARD
PL-7674511G1, 2

CAPACITORS
(Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)

Symbol	Description	GE Drawing
C1	Mylar, dielectric; 0.1 mfd ± 5%, 50 v d-c w.	B-7496934-P206
C2	1.0 mfd, 50 v d-c w. Kemet Type J.	C-7781529-P20
C3	Mylar, dielectric; 0.1 mfd ± 5%, 50 v d-c w.	B-7496634-P206
C4	Silver mica, epoxy dipped; 220 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P35
C5	22 mfd. Kemet Type J.	C-7781529-P18
C6 and C7	47 mfd. Kemet Type J.	C-7781529-P19
C8 and C9	6.8 mfd. Kemet Type J.	C-7781529-P17
C10	100 mfd, 20 v d-c w. Kemet Type J.	C-7781529-P16
C11	22 mfd. Kemet Type J.	C-7781529-P18
C12	Ceramic, variable; 8 to 50 pf -100% +0% min, -0% +50% max, -750 temp coef. Erie Series 557, Dielectric Type Code E. (PL-7674511G1 only.)	B-7493393-P102
C14	Ceramic, variable; 8 to 50 pf -100% +0% min, -0% +50% max, -750 temp coef. Erie Series 557, Dielectric Type Code E.	B-7493393-P102
C15	22 mfd. Kemet Type J.	C-7781529-P18
C16	6.8 mfd. Kemet Type J.	C-7781529-P17
C17	47 mfd. Kemet Type J.	C-7781529-P19
C18	Silver mica, epoxy dipped; 680 pf ± 5%, 500 v d-c w. (PL-7674511G1 only.)	B-7496933-P3
C18	Silver mica, epoxy dipped; 1000 pf ± 2%, 500 v d-c w. (PL-7674511G2 only.)	B-7496933-P207

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C19	100 mfd, 20 v d-c w. Kemet Type J.	C-7781529-P16
C20 thru C22	Ceramic, Hi-K disk; 20,000 pf +80% -20%, 1000 v d-c w.	B-7493821-P5
C23	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C24 and C25	Ceramic, Hi-K disk; 20,000 pf +80% -20%, 1000 v d-c w.	B-7493821-P5
C26 thru C28	Ceramic, Hi-K disk; 0.1 mfd +80% -25%, 500 v d-c w. Sprague Cat. #36C190A.	B-7488160-P3
C29	Silver mica, epoxy dipped; 10,000 pf ± 5%, 500 v d-c w.	B-7496933-P31
	RECTIFIERS	
CR1	Zener diode; 15 v ± 5%, 1 w. GE, Motorola, Continental Devices, Dickson or Transitron Type 1N1775A.	A-7164424-P179
CR2	Zener diode; 12 v ± 5%, 1 w. GE, Motorola, Continental Devices, Dickson or Transitron Type 1N1773A.	A-7164424-P178
CR3 and CR4	Zener diodes; 150 v. Motorola Type 1N3817.	A-7164424-P123
CR5	Silicon diode. Hughes Type 1N629.	C-5494923-P5
CR6	Zener diode. Motorola Type 1N4004.	A-7164424-P110
	CONNECTORS	
J1 and J2	Phono jacks. Connector Corp. Cat. #107E65.	B-7380175-P1

Symbol	Description	GE Drawing
	INDUCTORS	
L1	Inductance 68 uh ± 5%, max d-c resistance 4.7 ohms. Essex Part #RFC-S-68.	B-7493491-P4
L2	RF coil; inductance 10 uh ± 10%, max d-c resistance 0.6 ohm. Jefers Cat. #4421-7. (PL-7674511G1 only.)	B-7498929-P16
	TRANSISTORS	
Q1	Texas Instrument Type 2N3823.	A-7164451-P207
Q2 and Q3	GE Type 2N3856A.	A-7164451-P205
Q4 thru Q6	Fairchild Type 2N3638.	A-7164451-P184
Q7 and Q8	GE Type 2N3856A.	A-7164451-P205
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R1	0.51 megohm.	C-3R152-P514J
R2	1.0 megohm.	C-3R152-P105J
R3	0.27 megohm.	C-3R152-P274J
R4	51 ohms.	C-3R152-P510J
R5	620 ohms.	C-3R152-P621J
R6 thru R8	0.62 megohm. (PL-7674511G1 only.)	C-3R152-P624J
R6 thru R8	1.3 megohm. (PL-7674511G2 only.)	C-3R152-P135J
R9	3300 ohms.	C-3R152-P332J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ¼ w, unless otherwise specified.)	
R10	1500 ohms.	C-3R152-P152J
R11 and R12	0.24 megohm. (PL-7674511G1 only.)	C-3R152-P244J
R11 and R12	0.75 megohm. (PL-7674511G2 only.)	C-3R152-P754J
R13	47 ohms. (PL-7674511G1 only.)	C-3R152-P470J
R13	10 ohms. (PL-7674511G2 only)	C-3R152-P100J
R14	910 ohms. (PL-7674511G1 only.)	C-3R152-P911J
R14	2700 ohms. (PL-7674511G2 only.)	C-3R152-P272J
R15	100 ohms.	C-3R152-P101J
R16	4700 ohms.	C-3R152-P472J
R17	470 ohms.	C-3R152-P471J
R18	560 ohms.	C-3R152-P561J
R19	75 ohms.	C-3R152-P750J
R20	68,000 ohms.	C-3R152-P683J
R21	15,000 ohms.	C-3R152-P153J
R22	1800 ohms.	C-3R152-P182J
R23	3300 ohms. (PL-7674511G1 only.)	C-3R152-P332J
R24	1000 ohms. (PL-7674511G1 only.)	C-3R152-P102J
R24	2000 ohms. (PL-7674511G2 only.)	C-3R152-P202J
R25	620 ohms. (PL-7674511G1 only.)	C-3R152-P621J
R25	430 ohms. (PL-7674511G2 only.)	C-3R152-P431J
R26	100 ohms.	C-3R152-P101J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R27	36,000 ohms.	C-3R152-P363J
R28	22,000 ohms.	C-3R152-P223J
R29	47 ohms.	C-3R152-P470J
R30	3300 ohms.	C-3R152-P332J
R31 and R32	22,000 ohms.	C-3R152-P223J
R33	1500 ohms.	C-3R152-P152J
R34	2200 ohms. (PL-7674511G1 only.)	C-3R152-P222J
R34	910 ohms. (PL-7674511G2 only.)	C-3R152-P911J
R35	68 ohms.	C-3R152-P68[illegible]
R36	10,000 chms.	C-3R152-P103J
R37	47,000 ohms.	C-3R152-P473J
R38	0.15 megohm.	C-3R152-P154J
R39	20,000 ohms.	C-3R152-P203J
R40	0.10 megohm.	C-3R152-P104J
R41	0.75 megohm.	C-3R152-P754J
R42	0.15 megohm, 2 w.	C-3R79-P154J
R43	10,000 ohms.	C-3R152-P103J
R44	1.0 megohm.	C-3R152-P105J
R45	2000 ohms, 2 w.	C-3R79-P202J
R46	2000 ohms, 1 w.	C-3R78-P202J
	TRANSISTOR SOCKETS	
XQ1	Transistor socket assembly.	PL-7380029-G3

Symbol	Description	GE Drawing
	TRANSISTOR SOCKETS (CONTINUED)	
XQ2 and XQ3	Transistor socket assemblies.	PL-7380029-G1
XQ4 thru XQ6	Transistor socket assemblies.	PL-7380029-G2
XQ7 and XQ8	Transistor socket assemblies.	PL-7380029-G1
	TUBE SOCKET	
XV1	Amperex Cat. #56020.	B-7499677-P1

LUMINANCE VIDEO AMPLIFIER BOARD PL-7674514

	CAPACITORS (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C1	Silver mica, epoxy dipped; 68 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P23
C2	Variable, ceramic; 8 to 50 pf -100% +0% min, -0% +50% max, -750 temp coef. Erie Series 557, Dielectric Type Code E.	B-7493393-P102
C3	10 mfd, 20 v d-c w. Texas Instrument Type SCM106BP020C4, Sprague Type 150D106X0020B2.	B-7493471-P3
C4	6.8 mfd. Kemet Type J.	C-7781529-P17
C5	Mylar, dielectric; 0.01 mfd ± 5%, 50 v d-c w.	B-7496934-P201
C6	Silver mica, epoxy dipped; 10 pf ± 0.5 pf, 500 v d-c w. Electromotive Type DM15.	B-7496931-P6
C7	100 mfd, 20 v d-c w. Texas Instrument Type SCM107HP020C4, Sprague Type 150D106X0020S2.	B-7493471-P14

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C8 and C9	Silver mica, epoxy dipped; 47 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P19
C10	Mylar, dielectric; 0.047 mfd ± 5%, 50 v d-c w.	B-7496934-P204
C11	Silver mica, epoxy dipped; 47 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P19
C12	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C13	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C14 thru C16	Silver mica, epoxy dipped; 47 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P19
C17	Silver mica, epoxy dipped; 100 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P27
C18 and C19	Silver mica, epoxy dipped; 220 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P35
C20	Silver mica, epoxy dipped; 82 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P25
C21	100 mfd, 10 v d-c w. Texas Instrument Type SCM107GP010C4, Sprague Type 150D107X0010R2.	B-7493471-P10
C22	Silver mica, epoxy dipped; 220 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P35
C23	100 mfd, 20 v d-c w. Texas Instrument Type SCM107GP020C4, Sprague Type 150D107X0020S2.	B-7493471-P14
C24 and C25	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C26	Mylar, dielectric; 0.047 mfd ± 5%, 500 v d-c w.	B-7496934-P204

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C27	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C28	Silver mica, epoxy dipped; 22 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P11
C29	Ceramic, Hi-K disk; 0.002 mfd +100% -0%, 500 v d-c w.	C-7774750-P6
C30 thru C33	Silver mica, epoxy dipped; 47 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P19
C34	Silver mica, epoxy dipped; 82 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P25
C35	10 mfd, 20 v d-c w. Texas Instrument Type SCM106BP020C4, Sprague Type 150D106X0020B2.	B-7493471-P3
	RECTIFIERS	
CR2 and CR3	Hughes Type HD5001.	A-7164424-P71
CR4	Zener diode; 10 v ± 10%. Transitron Type 1N765.	A-7166198-P5
CR5 and CR6	Germanium diodes; 80 PIV max. Hughes Type HD2151.	C-7777146-P12
	CONNECTOR	
J1	Phono jack. Connector Corp. Cat. #107E65.	B-7380175-P1
	INDUCTORS	
L1	Inductance 220 uh ± 10%, d-c resistance 3.8 ohms max. Aladdin Part #22-223.	B-7493492-P1
L2	RF choke; inductance 6.8 uh ± 10%, d-c resistance 0.4 ohm max. Jeffers Cat. #4421-5.	B-7498929-P14

Symbol	Description	GE Drawing
	INDUCTORS (CONTINUED)	
L3 thru L6	RF chokes; inductance 12 uh ± 10%, d-c resistance 1.0 ohm max. Jeffers Cat. #4421-8.	B-7498929-P17
L7 and L8	RF chokes; inductance 6.8 uh ± 10%, d-c resistance 0.4 ohm max. Jeffers Cat. #4421-5.	B-7498929-P14
L9 thru L12	RF chokes; inductance 12 uh ± 10%, d-c resistance 1.0 ohm max. Jeffers Cat. #4421-8.	B-7498929-P17
L13	RF choke; inductance 6.8 uh ± 10%, d-c resistance 0.4 ohm max. Jeffers Cat. #4421-5.	B-7498929-P14
L14	RF choke; 2.2 uh ± 10%, d-c resistance 1.0 ohm max. Jeffers Cat. #4411-12.	B-7498929-P14
L15	RF choke; inductance 2.7 uh ± 10%, d-c resistance 1.2 ohms max. Jeffers Cat. #4411-13.	B-7498929-P9
L16	Inductance 220 uh ± 10%, d-c resistance 3.8 ohms max. Aladdin Part #22-223.	B-7493492-P1
	TRANSISTORS	
Q1	Fairchild Type 2N3638.	A-7164451-P184
Q2	GE Type 2N3856A.	A-7164451-P205
Q3	Texas Instrument Type TIS-50.	A-7164451-P293
Q4	GE Type 2N3856A.	A-7164451-P205
Q6	Fairchild Type 2N3638.	A-7164451-P184
Q7 thru Q11	GE Type 2N3856A.	A-7164451-P205
Q12	Fairchild Type 2N3638.	A-7164451-P184
Q13	GE Type 2N914.	A-7164451-P206

Symbol	Description	GE Drawing
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R1	100 ohms.	C-3R152-P101J
R2	Potentiometer assembly. Includes: Potentiometer, miniature; 100 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	PL-7176646-G1
R3 and R4	1500 ohms.	C-3R152-P152J
R5	68 ohms.	C-3R152-P680J
R6	1300 ohms.	C-3R152-P132J
R7	1500 ohms.	C-3R152-P152J
R8	10,000 ohms.	C-3R152-P103J
R9	100 ohms.	C-3R152-P101J
R11	100 ohms.	C-3R152-P101J
R12	Potentiometer, composition; 5000 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P3
R13	75,000 ohms.	C-3R152-P753J
R14	3900 ohms.	C-3R152-P392J
R15	51 ohms.	C-3R152-P510J
R16	2000 ohms.	C-3R152-P202J
R19	510 ohms.	C-3R152-P511J
R21	18,000 ohms.	C-3R152-P183J
R22	100 ohms.	C-3R152-P101J
R23	910 ohms, $\frac{1}{2}$ w.	C-3R77-P911J
R24	1000 ohms.	C-3R152-P102J
R25	Potentiometer, miniature; 1000 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	B-7779134-P4

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ¼ w, unless otherwise specified.)	
R26	100 ohms.	C-3R152-P101J
R27	0.12 megohm.	C-3R152-P124J
R28	510 ohms.	C-3R152-P511J
R29	20,000 ohms.	C-3R152-P203J
R30	0.22 megohm.	C-3R152-P224J
R31	Potentiometer, miniature; 500 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P3
R32	22,000 ohms.	C-3R152-P223J
R33 and R34	2000 ohms.	C-3R152-P202J
R35	5100 ohms.	C-3R152-P512J
R36 and R37	510 ohms.	C-3R152-P511J
R38	1500 ohms, ½ w.	C-3R77-P152J
R39	100 ohms.	C-3R152-P101J
R41	620 ohms.	C-3R152-P621J
R42	10,000 ohms.	C-3R152-P103J
R43	620 ohms, ½ w.	C-3R77-P621J
R44	180 ohms.	C-3R152-P181J
R45	5100 ohms.	C-3R152-P512J
R46	180 ohms.	C-3R152-P181J
R47	5100 ohms.	C-3R152-P512J
R48	62,000 ohms.	C-3R152-P623J
R49	3000 ohms.	C-3R152-P302J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ¼ w, unless otherwise specified.)	
R51	510 ohms.	C-3R152-P511J
R52	1000 ohms.	C-3R152-P102J
R53	100 ohms.	C-3R152-P101J
R54	Precision, wirewound; 365 ohms ± 1%, 2.5 w.	C-7778027-P128
R55	Precision, wirewound; 475 ohms ± 1%, 2.5 w.	C-7778027-P127
R56 and R57	51 ohms.	C-3R152-P510J
R58	0.10 megohm.	C-3R152-P104J
R59	390 ohms.	C-3R152-P391J
	TRANSISTOR SOCKETS	
XQ1	Transistor socket assembly.	PL-7380029-G2
XQ2 thru XQ4	Transistor socket assemblies.	PL-7380029-G1
XQ6	Transistor socket assembly.	PL-7380029-G2
XQ7 thru XQ11	Transistor socket assemblies.	PL-7380029-G1
XQ12 and XQ13	Transistor socket assemblies.	PL-7380029-G2

CHROMINANCE VIDEO AMPLIFIER BOARD PL-7674505

	CAPACITORS (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C101	Silver mica, epoxy dipped; 330 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P39

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C102	Variable, ceramic; 5 to 25 pf -100% +0% min, -0% +50% max. Erie Series 557, Dielectric Type Code A.	B-7493393-P104
C103	2.2 mfd, 20 v d-c w. Texas Instrument Type SCM225FP020C4, Sprague Type 150D225X0020A2.	B-7493471-P13
C104	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C105	10 mfd, 20 v d-c w. Texas Instrument Type SCM106BP020C4, Sprague Type 150D106X0020B2.	B-7493471-P3
C106	47 mfd. Texas Instrument Type SCM476HP035C4, Sprague Type 150D476X0035S2.	B-7493471-P11
C107	Silver mica, epoxy dipped; 100 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P27
C108	100 mfd, 20 v d-c w. Texas Instrument Type SCM107HP020C4, Sprague Type 150D107X0020S2.	B-7493471-P14
C109	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C110	Silver mica, epoxy dipped; 22 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P11
C111	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C112	Mylar, dielectric; 0.047 mfd ± 5%, 50 v d-c w.	B-7496934-P204
C113	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C114	Ceramic, Hi-K disk; 0.002 mfd +100% -0%, 500 v d-c w.	C-7774750-P6
C201	Silver mica, epoxy dipped; 330 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P39
C202	Variable, ceramic; 5 to 25 pf -100% +0% min, -0% +50% max. Erie Series 557, Dielectric Type Code A.	B-7493393-P104

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C203	2.2 mfd, 20 v d-c w. Texas Instrument Type SCM225FP020C4, Sprague Type 150D225X0020A2.	B-7493471-P13
C204	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C205	10 mfd, 20 v d-c w. Texas Instrument Type SCM106BP020C4, Sprague Type 150D106X0020B2.	B-7493471-P3
C206	47 mfd. Texas Instrument Type SCM476HP035C4, Sprague Type 150D476X0035B2.	B-7493471-P11
C207	Silver mica, epoxy dipped; 100 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P27
C208	100 mfd, 20 v d-c w. Texas Instrument Type SCM107HP020C4, Sprague Type 150D107X0020S2.	B-7493471-P14
C209	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C210	Silver mica, epoxy dipped; 22 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P11
C211	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C212	Mylar, dielectric; 0.047 mfd ± 5%, 50 v d-c w.	B-7496934-P204
C213	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C214	Ceramic, Hi-K; 0.002 mfd +100% -0%, 500 v d-c w.	C-7774750-P6
C301	Silver mica, epoxy dipped; 330 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P39
C302	Variable, ceramic; 5 to 25 pf -100% +0% min, -0% +50% max. Erie Series 557, Dielectric Type Code A.	B-7493393-P104
C303	2.2 mfd, 20 v d-c w. Texas Instrument Type SCM225FP020C4, Sprague Type 150D225X0020A2.	B-7493471-P13
C304	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C305	10 mfd, 20 v d-c w. Texas Instrument Type SCM106BP020C4, Sprague Type 150D106X0020B2.	B-7493471-P3
C306	47 mfd. Texas Instrument Type SCM476HP035C4, Sprague Type 150D476X0035S2.	B-7493471-P11
C307	Silver mica, epoxy dipped; 100 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P27
C308	100 mfd, 20 v d-c w. Texas Instrument Type SCM107HP020C4, Sprague Type 150D107X0020S2.	B-7493471-P14
C309	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C310	Silver mica, epoxy dipped; 22 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P11
C311	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C312	Mylar, dielectric; 0.047 mfd ± 5%, 50 v d-c w.	B-7496934-P204
C313	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C314	Ceramic, Hi-K disk; 0.002 mfd +100% -0%, 500 v d-c w.	C-7774750-P6
	RECTIFIERS	
CR102	Zener diode; 10 v ± 10%. Transitron Type 1N765.	A-7166198-P5
CR103 and CR104	Germanium diode; 80 PIV max. Hughes Type HD2151.	C-7777146-P12
CR202	Zener diode; 10 v ± 10%. Transitron Type 1N765.	A-7166198-P5
CR203 and CR204	Germanium diodes; 80 PIV max. Hughes Type HD2151.	C-7777146-P12
CR302	Zener diode; 10 v ± 10%. Transitron Type 1N765.	A-7166198-P5

Symbol	Description	GE Drawing
	RECTIFIERS (CONTINUED)	
CR303 and CR304	Germanium diodes; 80 PIV max. Hughes Type HD2151.	C-7777146-P12
	CONNECTORS	
J101	Phono jack. Connector Corp. Cat. #107E65.	B-7380175-P1
J201	Phono jack. Connector Corp. Cat. #107E65.	B-7380175-P1
J301	Phono jack. Connector Corp. Cat. #107E65.	B-7380175-P1
	INDUCTORS	
L1 and L2	Inductance 220 uh ± 10%, d-c resistance 3.8 ohms max. Aladdin Part #22-223.	B-7493492-P1
L102	Inductance 27 uh ± 10%, d-c resistance 0.65 ohm. Aladdin Part #22-272.	B-7493492-P12
L202	Inductance 27 uh ± 10%, d-c resistance 0.65 ohm. Aladdin Part #22-272.	B-7493492-P12
L302	Inductance 27 uh ± 10%, d-c resistance 0.65 ohm. Aladdin Part #22-272.	B-7493492-P12
	TRANSISTORS	
Q101	Fairchild Type 2N3638.	A-7164451-P184
Q102	GE Type 2N3856A.	A-7164451-P205
Q103	Texas Instrument Type TIS-50.	A-7164451-P293
Q104	GE Type 2N3856A.	A-7164451-P205
Q106	GE Type 2N3856A.	A-7164451-P205
Q107	Fairchild Type 2N3638.	A-7164451-P184
Q108	GE Type 2N914.	A-7164451-P206
Q201	Fairchild Type 2N3638.	A-7164451-P184

Symbol	Description	GE Drawing
	TRANSISTORS (CONTINUED)	
Q202	GE Type 2N3856A.	A-7164451-P205
Q203	Texas Instrument Type TIS-50.	A-7164451-P293
Q204	GE Type 2N3856A.	A-7164451-P205
Q206	GE Type 2N3856A.	A-7164451-P205
Q207	Fairchild Type 2N3638.	A-7164451-P184
Q208	GE Type 2N914.	A-7164451-P206
Q301	Fairchild Type 2N3638.	A-7164451-P184
Q302	GE Type 2N3856A.	A-7164451-P205
Q303	Texas Instrument Type TIS-50.	A-7164451-P293
Q304	GE Type 2N3856A.	A-7164451-P205
Q306	GE Type 2N3856A.	A-7164451-P205
Q307	Fairchild Type 2N3638.	A-7164451-P184
Q308	GE Type 2N914.	A-7164451-P206
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R101	91 ohms.	C-3R152-P910J
R102	Potentiometer, miniature; 500 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P3
R103 and R104	2200 ohms.	C-3R152-P222J
R105	100 ohms.	C-3R152-P101J
R106	2200 ohms.	C-3R152-P202J
R107	100 ohms.	C-3R152-P101J
R108	10,000 ohms.	C-3R152-P103J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R109	100 ohms.	C-3R152-P101J
R110	5100 ohms.	C-3R152-P512J
R111	10,000 ohms.	C-3R152-P103J
R112	1500 ohms.	C-3R152-P152J
R113	9100 ohms.	C-3R152-P912J
R114	6200 ohms.	C-3R152-P622J
R115	3000 ohms.	C-3R152-P302J
R121	1000 ohms.	C-3R152-P102J
R122	7500 ohms.	C-3R152-P752J
R123	820 ohms.	C-3R152-P821J
R124 and R125	3000 ohms.	C-3R152-P302J
R126	5100 ohms.	C-3R152-P512J
R127	75,000 ohms.	C-3R152-P753J
R128	5100 ohms.	C-3R152-P512J
R129	100 ohms.	C-3R152-P101J
R131	Precision, wirewound; 365 ohms ± 1%, 2.5 w.	C-7778027-P128
R132	Precision, wirewound; 475 ohms ± 1%, 2.5 w.	C-7778027-P127
R133 and R134	51 ohms.	C-3R152-P510J
R135	0.10 megohm.	C-3R152-P104J
R136	390 ohms.	C-3R152-P391J
R201	91 ohms.	C-3R152-P910J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R202	Potentiometer, miniature; 500 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P3
R203 and R204	2200 ohms.	C-3R152-P222J
R205	100 ohms.	C-3R152-P101J
R206	2000 ohms.	C-3R152-P202J
R207	100 ohms.	C-3R152-P101J
R208	10,000 ohms.	C-3R152-P103J
R209	100 ohms.	C-3R152-P101J
R210	5100 ohms.	C-3R152-P512J
R211	10,000 ohms.	C-3R152-P103J
R212	1500 ohms.	C-3R152-P152J
R213	9100 ohms.	C-3R152-P912J
R214	6200 ohms.	C-3R152-P622J
R215	3000 ohms.	C-3R152-P302J
R221	1000 ohms.	C-3R152-P102J
R222	7500 ohms.	C-3R152-P752J
R223	820 ohms.	C-3R152-P821J
R224 and R225	3000 ohms.	C-3R152-P302J
R226	5100 ohms.	C-3R152-P512J
R227	75,000 ohms.	C-3R152-P753J
R228	5100 ohms.	C-3R152-P512J
R229	100 ohms.	C-3R152-P101J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R231	Precision, wirewound; 365 ohms ± 1%, 2.5 w.	C-7778027-P128
R232	Precision, wirewound; 475 ohms ± 1%, 2.5 w.	C-7778027-P127
R233 and R234	51 ohms.	C-3R152-P510J
R235	0.10 megohm.	C-3R152-P104J
R236	390 ohms.	C-3R152-P391J
R301	91 ohms.	C-3R152-P910J
R302	Potentiometer, miniature; 500 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P3
R303 and R304	2200 ohms.	C-3R152-P222J
R305	100 ohms.	C-3R152-P101J
R306	2000 ohms.	C-3R152-P202J
R307	100 ohms.	C-3R152-P101J
R308	10,000 ohms.	C-3R152-P103J
R309	100 ohms.	C-3R152-P101J
R310	5100 ohms.	C-3R152-P512J
R311	10,000 ohms.	C-3R152-P103J
R312	1500 ohms.	C-3R152-P152J
R313	9100 ohms.	C-3R152-P912J
R314	6200 ohms.	C-3R152-P622J
R315	3000 ohms.	C-3R152-P302J
R321	1000 ohms.	C-3R152-P102J
R322	7500 ohms.	C-3R152-P752J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R323	820 ohms.	C-3R152-P821J
R324 and R325	3000 ohms.	C-3R152-P302J
R326	5100 ohms.	C-3R152-P512J
R327	75,000 ohms.	C-3R152-P753J
R328	5100 ohms.	C-3R152-P512J
R329	100 ohms.	C-3R152-P101J
R331	Precision, wirewound; 365 ohms ± 1%, 2.5 w.	C-7778027-P128
R332	Precision, wirewound; 475 ohms ± 1%, 2.5 w.	C-7778027-P127
R333 and R334	51 ohms.	C-3R152-P510J
R335	0.10 megohm.	C-3R152-P104J
R336	390 ohms.	C-3R152-P391J
	TRANSISTOR SOCKETS	
XQ101	Transistor socket assembly.	PL-7380029-G2
XQ102 thru XQ104	Transistor socket assemblies.	PL-7380029-G1
XQ106	Transistor socket assembly.	PL-7380029-G1
XQ107 and XQ108	Transistor socket assemblies.	PL-7380029-G2
XQ201	Transistor socket assembly.	PL-7380029-G2
XQ202 thru XQ204	Transistor socket assemblies.	PL-7380029-G1

Symbol	Description	GE Drawing
	TRANSISTOR SOCKETS (CONTINUED)	
XQ206	Transistor socket assembly.	PL-7380029-G1
XQ207 and XQ208	Transistor socket assemblies.	PL-7380029-G2
XQ301	Transistor socket assembly.	PL-7380029-G2
XQ302 thru XQ304	Transistor socket assemblies.	PL-7380029-G1
XQ306	Transistor socket assembly.	PL-7380029-G1
XQ307 and XQ308	Transistor socket assemblies.	PL-7380029-G2

TIMING AND CALIBRATION GENERATOR BOARD PL-7674517

	CAPACITORS (Mylar, dielectric, ± 5%, 50 v d-c w, unless otherwise specified.)	
C1 and C2	Silver mica, epoxy dipped; 20,000 pf ± 2%, 500 v d-c w.	B-7496933-P232
C3	Silver mica, epoxy dipped; 680 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496932-P4
C4	Electrolytic, solid tantalum type; 22 mfd ± 20%, 25 v d-c w. Kemet Type J.	C-7781529-P18
C5	0.01 mfd.	B-7496934-P201
C6	0.022 mfd.	B-7496934-P202
C7	0.01 mfd.	B-7496934-P201
C8	0.022 mfd.	B-7496934-P202
C9	0.01 mfd.	B-7496934-P201

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Mylar, dielectric, ± 5%, 50 v d-c w, unless otherwise specified.)	
C11	0.022 mfd.	B-7496934-P202
C12	Variable, ceramic; 7 to 45 pf, 500 v d-c w. Erie Style 503.	B-7484389-P6
C13	Dipped mica; 470 pf ± 1%, 500 v d-c w. Elmenco Type DM15.	B-7496935-P17
C18	0.47 mfd ± 20%.	B-7496934-P10
C19	Electrolytic, solid tantalum type; 1.0 mfd ± 20%, 35 v d-c w. Texas Instrument Type SCM105FF035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C21	Mylar, dielectric; 0.1 mfd ± 20%, 50 v d-c w.	B-7496934-P6
C22	Electrolytic, solid tantalum type; 22 mfd ± 20%, 35 v d-c w. Kemet Type J.	C-7781529-P18
C23	Electrolytic, solid tantalum type; 1.0 mfd ± 20%, 35 v d-c w. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C24	Polyester, tubular; 0.047 mfd ± 20%, 100 v d-c w. GE Type 61F.	B-7491930-P108
C26	Electrolytic, solid tantalum type; 1.0 mfd ± 20%, 35 v d-c w. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C27	Electrolytic, solid tantalum type; 6.8 mfd ± 20%, 35 v d-c w. Texas Instrument Type SCM685BP035C4, Sprague Type 150D685X0035B2.	B-7493471-P7
C29	Ceramic, Hi-K disk; 0.1 mfd +80% -30%, 50 v d-c w. Sprague Cat. #36C172.	A-7161189-P2
C31	Silver mica, epoxy dipped; 3600 pf ± 2%, 500 v d-c w.	B-7496933-P220
C34	Electrolytic, solid tantalum type; 47 mfd ± 20%, 35 v d-c w. Kemet Type J.	C-7781529-P19

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Mylar, dielectric, ± 5%, 50 v d-c w, unless otherwise specified.)	
C35	Silver mica, epoxy dipped; 330 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P39
C36	Mylar, dielectric; 0.1 mfd ± 20%, 50 v d-c w.	B-7496934-P6
C37	Electrolytic, solid tantalum type; 1.0 mfd ± 20%, 35 v d-c w. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
	RECTIFIERS	
CR1	Germanium diode; 60 PIV max. Hughes Type 1N90.	C-7777146-P3
CR2	GE Type 1N4454.	A-7164424-P104
CR4	GE Type 1N4454.	A-7164424-P104
CR6	Unitrode Type UT234.	A-7164424-P68
CR8	Germanium diode; 80 PIV max. Hughes Type HD2151.	C-7777146-P12
CR11 thru CR14	Zener diodes. Motorola Type 1N4004.	A-7164424-P110
CR16	Zener diode. Motorola Type 1N4004.	A-7164424-P110
CR17 and CR18	Germanium diodes; 60 PIV max. Hughes Type 1N90.	C-7777146-P3
CR19	Germanium diode; 80 PIV max. Hughes Type HD2151.	C-7777146-P12
	RELAYS	
K1	Max pull-in current 13 ma, resistance 1000 ohms ± 10%, max operate time 18 milliseconds, max release time 8.0 milliseconds, 4 form C contacts. Allied Control Type TSP154.	C-7781099-P5

Symbol	Description	GE Drawing
	RELAYS (CONTINUED)	
K2	Coil voltage range 20 to 30 v d-c, 15 v d-c max allowable pickup, 11 v d-c max allowable dropout, coil resistance 700 ohms ± 10% at 25 C. GE Type 3SA1001A1, Leach Type M250-A1-112.	B-7499252-P1
	INDUCTORS	
L2	Inductance 220 uh ± 10%, d-c resistance 3.8 ohms max. Aladdin Part #22-223.	B-7493492-P1
L3	Toroid inductor; inductance 2.0 mh ± 1%, d-c resistance 1.0 ohms max. Torotel Part #15316.	B-7499504-P3
L4	Toroid inductor; inductance 200 mh ± 1%, d-c resistance 140 ohms max.	B-7499504-P23
	TRANSISTORS	
Q1 thru Q12	GE Type 2N1711.	A-7164451-P164
Q13	GE Type 2N2192A.	A-7164451-P182
Q14	GE Type 2N1711.	A-7164451-P164
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R1	10,000 ohms.	C-3R152-P103J
R2	20,000 ohms.	C-3R152-P203J
R3	27,000 ohms.	C-3R152-P273J
R4	100 ohms.	C-3R152-P101J
R5	20,000 ohms.	C-3R152-P203J
R6	5100 ohms.	C-3R152-P512J
R7	3900 ohms.	C-3R152-P392J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ¼ w, unless otherwise specified.)	
R8	1000 ohms.	C-3R152-P102J
R9	1800 ohms.	C-3R152-P182J
R10	Potentiometer, composition; 25,000 ohms ± 20%, 0.4, linear taper. Allen Bradley Type O.	B-7493391-P5
R11	3900 ohms.	C-3R152-P392J
R12	10,000 ohms.	C-3R152-P103J
R13	2000 ohms.	C-3R152-P202J
R14	Precision; 249 ohms ± 1%, ¼ w.	C-3R166-P2490
R15	200 ohms.	C-3R152-P201J
R16	Precision; 249 ohms ± 1%, ¼ w.	C-3R166-P2490
R17 thru R19	Precision; 100 ohms ± 1%, ¼ w.	C-3R166-P1000
R20	200 ohms.	C-3R152-P201J
R21	10,000 ohms.	C-3R152-P103J
R22	470 ohms.	C-3R152-P471J
R23	1200 ohms.	C-3R152-P122J
R24	10,000 ohms.	C-3R152-P103J
R25	200 ohms.	C-3R152-P201J
R26	470 ohms.	C-3R152-P471J
R27	1200 ohms.	C-3R152-P122J
R28	10,000 ohms.	C-3R152-P103J
R29	470 ohms.	C-3R152-P471J
R31	1200 ohms.	C-3R152-P122J
R32	56,000 ohms.	C-3R152-P563J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ¼ w, unless otherwise specified.)	
R33	4300 ohms.	C-3R152-P432J
R34	390 ohms, 1 w.	C-3R78-P391J
R36	510 ohms, 1 w.	C-3R78-P511J
R37	33,000 ohms.	C-3R152-P333J
R38	30,000 ohms.	C-3R152-P303J
R39	300 ohms.	C-3R152-P301J
R41	2200 ohms.	C-3R152-P222J
R42	22,000 ohms.	C-3R152-P223J
R43	4700 ohms.	C-3R152-P472J
R44	100 ohms.	C-3R152-P101J
R46	1000 ohms.	C-3R152-P102J
R47	1000 ohms, ½ w.	C-3R77-P102J
R48	620 ohms.	C-3R152-P621J
R53	30,000 ohms.	C-3R152-P303J
R54	15,000 ohms.	C-3R152-P153J
R56	100 ohms.	C-3R152-P101J
R59	75,000 ohms, 2 w.	C-3R79-P753J
R61	6800 ohms.	C-3R152-P682J
R62	1000 ohms.	C-3R152-P102J
R63	1000 ohms, ½ w.	C-3R77-P102J
R64	10 ohms, 1 w.	C-3R78-P100J
R65 and R66	1200 ohms.	C-3R152-P122J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R67	2000 ohms.	C-3R152-P202J
R68	470 ohms.	C-3R152-P471J
R69	100 ohms.	C-3R152-P101J
R70	7500 ohms.	C-3R152-P752J
R71	10,000 ohms.	C-3R152-P103J
R72	4700 ohms.	C-3R152-P472J
	SWITCH	
S1	Toggle type, spdt, toggle position-on-none-on. C&K Components Inc. Part #7101PC.	C-7782321-P1
	TRANSISTOR SOCKETS	
XQ1 thru XQ14	Transistor sockets assemblies.	PL-7380029-G2

CAMERA SWEEP BOARD
PL-7674641

	CAPACITORS (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C1	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C2	2.2 mfd, 20 v d-c w. Texas Instrument Type SCM225FP020C4, Sprague Type 150D225X0020A2.	B-7493471-P13
C3	Mylar, dielectric; 0.1 mfd ± 20%, 500 v d-c w.	B-7496934-P6
C4 and C5	6.8 mfd. Texas Instrument Type SCM685BP035C4, Sprague Type 150D685X0035B2.	B-7493471-P7

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C6	220 mfd, 10 v d-c w. Texas Instrument Type SCM227HP010C4, Sprague Type 150D227X0010S2.	B-7493471-P9
C7	10 mfd, 50 v d-c w. Kemet Type J.	C-7781529-P26
C8	220 mfd, 10 v d-c w. Texas Instrument Type SCM227HP010C4, Sprague Type 150D227X0010S2.	B-7493471-P9
C9	47 mfd. Texas Instrument Type SCM476HP035C4, Sprague Type 150D476X0035S2.	B-7493471-P11
C10	Silver mica, epoxy dipped; 1000 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496932-P8
C11	47 mfd. Texas Instrument Type SCM476HP035C4, Sprague Type 150D476X0035S2.	B-7493471-P11
C12	Mylar, dielectric; 0.22 mfd ± 20%, 500 v d-c w.	B-7496934-P8
C13	Mylar, dielectric; 0.01 mfd ± 20%, 500 v d-c w.	B-7496934-P1
C14	10 mfd, 50 v d-c w. Kemet Type J.	C-7781529-P26
C15	Mylar, dielectric; 0.01 mfd ± 5%, 50 v d-c w.	B-7496934-P201
C16	Silver mica, epoxy dipped; 22 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P11
C17	Silver mica, epoxy dipped; 470 pf ± 5%, 300 v d-c w. Electromotive Type DM15.	B-7496931-P43
C18	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C19	Silver mica, epoxy dipped; 150 pf ± 2%, 500 v d-c w. Electromotive Type DM15.	B-7496932-P201
C20	Mylar, dielectric; 0.01 mfd ± 20%, 50 v d-c w.	B-7496934-P1
C21	2.2 mfd, 20 v d-c w. Texas Instrument Type SCM225FP020C4, Sprague Type 150D225X0020A2.	B-7493471-P13
C22	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C24	100 mfd, 10 v d-c w. Texas Instrument Type SCM107GP010C4, Sprague Type 150D107X0010R2.	B-7493471-P10
C25 and C26	Silver mica, epoxy dipped; 8200 pf ± 5%, 500 v d-c w.	B-7496933-P29
C27	10 mfd, 20 v d-c w. Texas Instrument Type SCM106BP020C4, Sprague Type 150D106X0020B2.	B-7493471-P3
C28 and C29	680 mfd, 6 v d-c w.	B-7493471-P22
C30	47 mfd. Texas Instrument Type SCM476HP035C4, Sprague Type 150D476X0035S2.	B-7493471-P11
C31	Silver mica, epoxy dipped; 47 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P19
C32	Silver mica, epoxy dipped; 4700 pf ± 5%, 300 v d-c w. Electromotive Type DM15.	B-7496932-P24
C33	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C34	680 mfd, 6 v d-c w.	B-7493471-P22
C35	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C36	Mylar, dielectric; 0.47 mfd ± 20%, 50 v d-c w.	B-7496934-P10
C37	100 mfd, 20 v d-c w. Texas Instrument Type SCM107HP020C4, Sprague Type 150D107X0020S2.	B-7493471-P14
C38	Mylar, dielectric; 0.047 mfd ± 20%, 50 v d-c w.	B-7496934-P4
C39	Mylar, dielectric; 0.1 mfd ± 20%, 50 v d-c w.	B-7496934-P6
C40	Silver mica, epoxy dipped; 680 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496932-P4
C41	0.47 mfd, 50 v d-c w. Kemet Type J.	C-7781529-P27

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C42	0.47 mfd. Texas Instrument Type SCM474FP035C4, Sprague Type 150D474X0035A2.	B-7493471-P4
C43	22 mfd. Kemet Type J.	C-7781529-P18
C44	Mylar, dielectric; 0.01 mfd ± 5%, 50 v d-c w.	B-7496934-P201
C45	Silver mica, epoxy dipped; 300 pf ± 2%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P238
	RECTIFIERS	
CR1 and CR2	GE Type 1N4454.	A-7164424-P104
CR3	Germanium diode; 80 PIV max. Hughes Type HD2151.	C-7777146-P12
CR4	Unitrode Type UTR22 or 1N677.	A-7164424-P124
CR5	GE Type 1N4454.	A-7164424-P104
CR6	Germanium diode; 80 PIV max. Hughes Type HD2151.	C-7777146-P12
CR7	Silicon rectifier; 50 PIV. Motorola Type 1N4001.	A-7164424-P159
CR8	GE Type 1N4454.	A-7164424-P104
CR9	Zener diode; 43 v ± 5%, 2.5 w. Dickson Type 1N5039A.	A-7164424-P195
CR10	Zener diode; 3.3 v ± 10%, 1.0 w. JEDEC Type 1N4728, Motorola Type 1M3.3ZS.	A-7172767-P1
	CONNECTOR	
J1	Miniature, rectangular; 20 male contacts. Winchester Code #MRE-20PT-G.	C-7777759-P49
	INDUCTORS	
L1	Inductance 220 uh ± 10%, d-c resistance 3.8 ohms max. Aladdin Part #22-223.	B-7493492-P1

Symbol	Description	GE Drawing
	INDUCTORS (CONTINUED)	
L2	Toroid inductor; inductance 200 mh ± 1%, d-c resistance 140 ohms max.	B-7499504-P23
L3	Toroid inductor; inductance 2.0 mh ± 1%, d-c resistance 1.0 ohm max. Torotel Part #15316.	B-7499504-P8
L4	Inductance 220 uh ± 10%, d-c resistance 3.8 ohms max. Aladdin Part #22-223.	B-7493492-P1
	TRANSISTORS	
Q1	GE Type 2N1307.	A-7164451-P117
Q2 thru Q4	GE Type 2N1711.	A-7164451-P164
Q5	Motorola Type 2N3134.	A-7164451-P150
Q6 and Q7	Motorola Type 2N1547.	A-7164451-P120
Q8	GE Type 2N1711.	A-7164451-P164
Q9	Motorola Type 2N4236.	A-7164451-P296
Q10	GE Type 2N1893.	A-7164451-P172
Q11	Motorola Type 2N4236.	A-7164451-P296
Q12	Motorola Type 2N3493, Texas Instrument Type 2N3494.	A-7164451-P314
Q13 thru Q15	GE Type 2N1711.	A-7164451-P164
Q16	Texas Instrument Type 2N1908.	A-7164451-P108
Q17 and Q18	GE Type 2N2192A.	A-7164451-P182
Q19	GE Type 2N1711.	A-7164451-P164
Q20	GE Type 2N2480A.	A-7164451-P208

Symbol	Description	GE Drawing
	TRANSISTORS (CONTINUED)	
Q21	Motorola Type 2N3134.	A-7164451-P150
Q22	Delco Type 2N553.	A-7164451-P80
Q23	GE Type 2N2197.	A-7164451-P24
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R1	1000 ohms.	C-3R152-P102J
R2	10,000 ohms.	C-3R152-P103J
R3	1000 ohms.	C-3R152-P102J
R4	100 ohms.	C-3R152-P101J
R5	200 ohms.	C-3R152-P201J
R6	4700 ohms.	C-3R152-P472J
R8	8200 ohms.	C-3R152-P822J
R9	100 ohms.	C-3R152-P101J
R10	Potentiometer, composition; 1000 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P2
R11	820 ohms.	C-3R152-P821J
R12	Potentiometer, composition; 100 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P9
R13	100 ohms.	C-3R152-P101J
R14	3300 ohms.	C-3R152-P332J
R15	100 ohms.	C-3R152-P101J
R17	Potentiometer, composition; 5000 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P3
R18	12,000 ohms.	C-3R152-P123J
R19	560 ohms.	C-3R152-P561J
R21	6800 ohms.	C-3R152-P682J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ¼ w, unless otherwise specified.)	
R22	180 ohms.	C-3R152-P181J
R23	100 ohms.	C-3R152-P101J
R24	2700 ohms.	C-3R152-P272J
R25	360 ohms.	C-3R152-P361J
R26	1500 ohms, ½ w.	C-3R77-P152J
R27	11 ohms, 2 w.	C-3R79-P110J
R28	Precision, wirewound, 22 ohms ± 1%, 5 w.	C-7778027-P309
R30	2700 ohms.	C-3R152-P272J
R32	6800 ohms.	C-3R152-P682J
R33	2200 ohms.	C-3R152-P222J
R34	110 ohms.	C-3R152-P111J
R35	18,000 ohms.	C-3R152-P183J
R36 and R37	0.10 megohm.	C-3R152-P104J
R38	2200 ohms, 2 w.	C-3R79-P222J
R39	0.15 megohm.	C-3R152-P154J
R40	1000 ohms.	C-3R152-P102J
R41 and R42	2200 ohms.	C-3R152-P222J
R43	22,000 ohms.	C-3R152-P223J
R44	3600 ohms	C-3R152-P362J
R45	1000 ohms.	C-3R152-P102J
R46	47,000 ohms.	C-3R152-P473J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R47	3300 ohms.	C-3R152-P332J
R48	2200 ohms.	C-3R152-P222J
R49	3300 ohms.	C-3R152-P332J
R50	75 ohms.	C-3R152-P750J
R51	1000 ohms.	C-3R152-P102J
R53	180 ohms, $\frac{1}{2}$ w.	C-3R77-P181J
R54	10 ohms.	C-3R152-P100J
R55	Wirewound; 6.8 ohms ± 5%, 2 w. IRC Type BWH.	C-7779228-P36
R57	330 ohms.	C-3R152-P331J
R58 and R59	3.3 ohms.	C-3R152AA-P3R3J
R61	330 ohms.	C-3R152-P331J
R62	27 ohms.	C-3R152-P270J
R63	680 ohms.	C-3R152-P681J
R64	10,000 ohms.	C-3R152-P103J
R65	3000 ohms.	C-3R152-P302J
R66	470 ohms.	C-3R152-P471J
R67	Potentiometer, composition; 100 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P9
R68	100 ohms.	C-3R152-P101J
R70	360 ohms.	C-3R152-P361J
R71	Precision, metal film; 4750 ohms ± 1%, $\frac{1}{4}$ w.	C-7781654-P103
R72	47 ohms.	C-3R152-P470J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ¼ w, unless otherwise specified.)	
R73	Wirewound; 0.56 ohm ± 5%, 2 w. IRC Type BWH.	C-7779228-P10
R74	Precision, wirewound; 29 ohms ± 1%, 3.5 w.	C-7778027-P203
R75	Precision, metal film; 1960 ohms ± 1%, ¼ w.	C-7781654-P111
R76	Precision, wirewound; 464 ohms ± 1%, ¼ w.	B-7497034-P3
R77	Precision, wirewound; 1500 ohms ± 1%, ¼ w.	B-7497034-P6
R78	22 ohms, 2 w.	C-3R79-P220J
R79	3.3 ohms.	C-3R152AA-P3R3J
R80	3000 ohms, 2 w.	C-3R79-P302J
R81	Wirewound; 120 ohms ± 5%, 7 w. Sprague Type 244E1215.	B-7380227-P1
	THERMISTOR	
RT1	Thermistor; ambient temp range -40 C to +100 C, resistance 8000 ohms ± 10% at 25 C. Fenwall Code #JA38J1.	B-7496556-P2
	TRANSFORMERS	
T1	Buffer transformer assembly.	4VM4426-G2
T2	Transformer assembly.	PL-7497166-G6
T3	Transformer assembly.	PL-7497166-G3
	TRANSISTOR SOCKETS	
XQ1 thru XQ5	Transistor socket assemblies.	PL-7380029-G2
XQ6 and XQ7	Transistor mtg assemblies. Include: Socket. United International Dynamics Corp. Cat. #PTS-1 with base, collector and emitter identified.	PL-7167056-G1 A-7174319-P1

Symbol	Description	GE Drawing
	TRANSISTOR SOCKETS (CONTINUED)	
XQ8 thru XQ15	Transistor socket assemblies.	PL-7380029-G2
XQ16	Transistor mtg assembly. Includes: Socket. United International Dynamics Corp. Cat. #PTS-1 with base, collector and emitter identified.	PL-7167056-G1 A-7174319-P1
XQ17 and XQ18	Elco Cat. #3303.	B-7495897-P1
XQ19	Transistor socket assembly.	PL-7380029-G2
XQ20	Nugent Electronics Co. Cat. #LP-5178.	B-7497081-P1
XQ21	Transistor socket assembly.	PL-7380029-G2
XQ22	Transistor mtg assembly. Includes: Socket. United International Dynamics Corp. Cat. #PTS-1 with base, collector and emitter identified.	PL-7167056-G1 A-7174319-P1

SKEW GENERATOR BOARD PL-7781890

	CAPACITORS	
C1	Electrolytic, solid tantalum type; 100 mfd ± 20%, 20 v d-c w. Kemet Type J.	C-7781529-P16
C2 thru C5	Silver mica, epoxy dipped; 2200 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496932-P16
	INDUCTORS	
L1 thru L4	Toroid inductors; inductance 30 mh ± 1%, d-c resistance 18.4 ohms max. Torotel Part #15321.	B-7499504-P8

Symbol	Description	GE Drawing
	TRANSISTORS	
Q1 thru Q5	Texas Instrument or GE Type 2N697.	A-7164451-P72
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R1	30,000 ohms.	C-3R152-P303J
R2	20,000 ohms.	C-3R152-P203J
R3 and R4	510 ohms.	C-3R152-P511J
R5	Potentiometer, miniature; 2500 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P16
R6	1000 ohms.	C-3R152-P102J
R7	Potentiometer, miniature; 2500 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P16
R8	1000 ohms.	C-3R152-P102J
R9	Potentiometer, miniature; 2500 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P16
R10	1000 ohms.	C-3R152-P102J
R11	Potentiometer, miniature; 2500 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P16
R12	1000 ohms.	C-3R152-P102J
	TRANSISTOR SOCKETS	
XQ1 thru XQ5	Transistor socket assemblies.	PL-7380029-G2

Symbol	Description	GE Drawing
	CAMERA POWER SUPPLY BOARD PL-7674504G2	
	CAPACITORS (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C1 and C2	Mylar, dielectric; 0.01 mfd ± 5%, 50 v d-c w.	B-7496934-P201
C3 and C4	0.47 mfd. Texas Instrument Type SCM474FP035C4, Sprague Type 150D474X0035A2.	B-7493471-P4
C5 and C6	Tantalum type; 1.2 mfd ± 15%, 250 v d-c w. GE Type 29F2221.	B-7494224-P16
C7	Mylar, dielectric; 0.1 mfd ± 20%, 200 v d-c w. Good-All Type 663-UW.	C-7777865-P209
C8	Tantalum, slug type; 9.0 mfd ± 20%, 125 v rated. Sprague Type 109D905X0125F2.	C-7779620-P10
C9	Tantalum, slug type; 25 mfd ± 20%, 125 v rated. Sprague Type 109D256X0125T2.	C-7779620-P11
C10	1.0 mfd, 50 v d-c w. Kemet Type J.	C-7781529-P20
C11	330 mfd, 6 v d-c w. Kemet Type J.	C-7781529-P4
C12	Mylar, dielectric; 0.068 mfd ± 10%, 200 v d-c w. Good-All Type 663-UW.	B-7777865-P268
C13	Mylar, dielectric; 0.033 mfd ± 5%, 50 v d-c w.	B-7496934-P203
C14	Tantalum, slug type; 25 mfd ± 20%, 125 v rated. Sprague Type 109D256X0125T2.	C-7779620-P11
C16	Mylar, dielectric; 0.047 mfd ± 5%, 50 v d-c w.	B-7496934-P204
C17 and C18	Metalized paper, oil impregnated; 0.022 mfd ± 20%, 1000 v d-c w. Sprague Cat. #196P223010S4.	B-7380137-P1
C19	Mylar, dielectric; 0.047 mfd ± 5%, 50 v d-c w.	B-7496934-P204

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C20 and C21	Metalized paper, oil impregnated; 0.022 mfd ± 20%, 600 v d-c w. Sprague Cat. #196P22306S4.	B-7380137-P2
C22 and C23	220 mfd, 10 v d-c w. Kemet Type J.	C-7781529-P8
C24	Metalized paper, oil impregnated; 0.022 mfd ± 20%, 1000 v d-c w. Sprague Cat. #196P223010S4.	B-7380137-P1
C25	330 mfd, 6 v d-c w. Kemet Type J.	C-7781529-P4
C26 thru C30	47 mfd. Kemet Type J.	C-7781529-P19
C31 and C32	6.8 mfd. Kemet Type J.	C-7781529-P17
C33	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C34	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C35 and C36	Silver mica, epoxy dipped; 270 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P37
C37	Tantalum, slug type; 4.7 mfd ± 20%, 100 v rated. Sprague Type 109D475X0100C2.	C-7779620-P9
	RECTIFIERS	
CR1	Zener diode; 12 v. Unitrode Type UZ812.	A-7164424-P117
CR2	GE Type 1N4454.	A-7164424-P104
CR3	Zener diode; 40 v. Unitrode Type UZ840.	A-7164424-P118
CR4 and CR5	Fast switching rectifiers. Unitrode Type UTR31.	A-7164424-P105

Symbol	Description	GE Drawing
	RECTIFIERS (CONTINUED)	
CR6	Unitrode Type UT234.	A-7164424-P68
CR7	Zener diode; 12 v. Motorola Type 1N942A.	A-7164424-P119
CR8 thru CR10	Unitrode Type UT234.	A-7164424-P68
CR11	Zener diode; 110 v. Unitrode Type UZ111.	A-7164424-P120
CR12	Unitrode Type UT234.	A-7164424-P68
CR13	Zener diode; 10 v. Unitrode Type UZ810.	A-7164424-P121
CR14	Zener diode; 12 v. Motorola Type 1N942A.	A-7164424-P119
CR15 thru CR17	Silicon rectifiers; 1000 PIV. Motorola Type 1N4007.	A-7164424-P216
CR19 thru CR22	Matched set of two Silicon rectifiers; 100 PIV. EDI Co. Type RIB010, GE Drawing B-7380376-P1. (Matched V_f at 2A at 25 C within ± 25 mv - packaged to prevent separation.)	B-7380376-P2
CR19A thru CR22A	Part of CR19 thru CR22.	
CR19B thru CR22B	Part of CR19 thru CR22.	
CR27 and CR28	Germanium diodes; 80 PIV max. Hughes Type HD2151.	C-7777146-P12
CR29	Germanium diode; 60 PIV max. Hughes Type 1N90.	C-7777146-P3
	INDUCTORS	
L1 thru L4	Toroid inductors; 0.27 mh ± 20%, d-c resistance 0.2 ohm max. Torotel Part #15601.	B-7499504-P14

Symbol	Description	GE Drawing
	TRANSISTORS	
Q1 and Q2	Texas Instrument Type 2N3036.	A-7164451-P163
Q3 thru Q5	Bendix or Delco Type DTS423.	A-7164451-P179
Q6	RCA Type 2N3584.	A-7164451-P177
Q7	GE Type 2N2326.	A-7164451-P171
Q8 and Q9	GE Type 2N1893.	A-7164451-P172
Q10	GE Type 2N1671B.	A-7164451-P178
Q11 and Q12	GE Type 2N699.	A-7164451-P136
Q13	Motorola Type 2N1545.	A-7164451-P122
Q14	Texas Instrument Type 2N1038.	A-7164451-P53
Q15	GE Type 2N2192A.	A-7164451-P182
Q16	Motorola Type 2N1545.	A-7164451-P122
Q17	Motorola Type 2N3134.	A-7164451-P150
Q18	GE Type 2N699.	A-7164451-P136
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R1	Wirewound; 2000 ohms ± 5%, 3 w. Sprague Type 242E2025.	B-7498590-P2
R2	3300 ohms, $\frac{1}{2}$ w.	C-3R77-P332J
R3	4700 ohms.	C-3R152-P472J
R4	2200 ohms.	C-3R152-P222J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R5 and R6	27,000 ohms.	C-3R152-P273J
R7	1000 ohms.	C-3R152-P102J
R8 and R9	470 ohms.	C-3R152-P471J
R10 and R11	47 ohms.	C-3R152-P470J
R12	Wirewound; 10,000 ohms ± 5%, 3 w. Sprague Type 242E1035.	B-7498590-P3
R13	3.3 ohms.	C-3R152AA-P3R3J
R14	39,000 ohms, $\frac{1}{2}$ w.	C-3R77-P393J
R15	10,000 ohms.	C-3R152-P103J
R16	39,000 ohms, $\frac{1}{2}$ w.	C-3R77-P393J
R17	4700 ohms.	C-3R152-P472J
R18	6200 ohms.	C-3R152-P622J
R19	Precision, metal film; 10,000 ohms ± 1%, $\frac{1}{4}$ w.	C-7781654-P105
R20	Trim potentiometer, wirewound; 2000 ohms ± 5%, 1 w, resolution 0.27%. IRC Model 100 Circitrim.	B-7496557-P6
R21	Precision, metal film; 36,500 ohms ± 1%, $\frac{1}{4}$ w.	C-7781654-P107
R22	Wirewound; 1.0 ohm ± 5%, 2 w. IRC Type BWH.	C-7779228-P16
R23	150 ohms.	C-3R152-P151J
R24	100 ohms.	C-3R152-P101J
R25	Precision, metal film; 4750 ohms ± 1%, $\frac{1}{4}$ w.	C-7781654-P103
R26	Trim potentiometer, wirewound; 5000 ohms ± 5%, 1 w, resolution 0.18%. IRC Model 100 Circitrim.	B-7496557-P8

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ¼ w, unless otherwise specified.)	
R27	Precision, metal film; 6810 ohms ± 1%, ¼ w.	C-7781654-P104
R28	1 000 ohms.	C-3R152-P102J
R29	30,000 ohms, ½ w.	C-3R77-P303J
R30	15,000 ohms.	C-3R152-P153J
R31	4700 ohms, ½ w.	C-3R77-P472J
R32	22,000 ohms.	C-3R152-P223J
R33 and R34	15,000 ohms.	C-3R152-P153J
R35	22,000 ohms.	C-3R152-P223J
R36	4700 ohms, ½ w.	C-3R77-P472J
R37	15,000 ohms.	C-3R152-P153J
R38	15,000 ohms, ½ w.	C-3R77-P153J
R39	Precision, metal film; 40, 200 ohms ± 1%, ¼ w.	C-7781654-P108
R40	Precision, metal film; 10,000 ohms ± 1%, ¼ w.	C-7781654-P105
R41	180 ohms.	C-3R152-P181J
R42	Precision, metal film; 9090 ohms ± 1%, ¼ w.	C-7781654-P118
R43	Precision, metal film; 49,900 ohms ± 1%, ¼ w.	C-7781654-P109
R44	Trim potentiometer, wirewound; 2000 ohms ± 5%, 1 w, resolution 0.27%. IRC Model 100 Circitrim.	B-7496557-P6
R45	20,000 ohms, 1 w.	C-3R78-P203J
R46	5100 ohms, 2 w.	C-3R79-P512J
R47	22 ohms.	C-3R152-P220J
R48	180 ohms.	C-3R152-P181J
R49	20,000 ohms.	C-3R152-P203J

Symbol	Description	GE Drawing
	TRANSFORMERS	
T1	Converter driver transformer.	B-7497171-P1
T2	Converter transformer.	B-7497172-P2
	TRANSISTOR SOCKETS	
XQ1 and XQ2	Transistor socket assemblies.	PL-7380029-G2
XQ7 thru XQ12	Transistor socket assemblies.	PL-7380029-G2
XQ14 and XQ15	Transistor socket assemblies.	PL-7380029-G2
XQ17 and XQ18	Transistor socket assemblies.	PL-7380029-G2
	HYBRID MICROCIRCUIT MODULE	
Z1	Hybrid microcircuit module, toggle flip-flop. Intellux, Inc., Type FF1514B.	C-7781729-P4

REGISTRATION CONTROL PANEL PL-7672688G3

	CAPACITORS (Electrolytic, solid tantalum type, ± 20%, 10 v d-c w, unless otherwise specified.)	
C1	Film polycarbonate; 0.47 mfd ± 20%, 200 v rated.	B-7497484-P14
C2	47 mfd, 35 v d-c w. Kemet Type J.	C-7781529-P19
C3	Film polycarbonate; 0.47 mfd ± 20%, 200 v rated.	B-7497484-P14
C4 thru C6	220 mfd. Kemet Type J.	C-7781529-P8

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Electrolytic, solid tantalum type, ± 20%, 10 v d-c w, unless otherwise specified.)	
C7	Film polycarbonate; 0.47 mfd ± 20%, 200 v rated.	B-7497484-P14
C8	220 mfd. Kemet Type J.	C-7781529-P8
C9	Film polycarbonate; 0.47 mfd ± 20%, 200 v rated.	B-7497484-P14
C10 and C11	330 mfd, 6 v d-c w. Kemet Type J.	C-7781529-P4
C12 and C13	Mylar, dielectric; 0.022 mfd ± 20%, 50 v d-c w.	B-7496934-P202
C14 and C15	10 mfd, 20 v d-c w. Texas Instrument Type SCM106BP020C4, Sprague Type 150D106X0020B2.	B-7493471-P3
	RECTIFIERS	
CR1	Zener diode; 10 v ± 5%. JEDEC Type 1N2974B, Motorola Type 10M10Z5.	B-7172768-P105
CR2 thru CR5	GE Type 2N4454.	A-7164424-P104
	INDUCTORS	
L1	Variable; inductance 55 to 80 uh, d-c resistance 1.7 ohms max. Gowanda Part #9075.	B-7493196-P26
L2	Toroid inductor; inductance 30 mh ± 1%, d-c resistance 18.4 ohms max. Torotel Part #15321.	B-7499504-P8
L3	Variable; inductance 310 to 590 uh, d-c resistance 4.0 ohms max. Delevan Part #8032-25.	B-7493196-P25
L4	Toroid inductor; inductance 30 mh ± 1%, d-c resistance 18.4 ohms max. Torotel Part #15301.	B-7499504-P8

Symbol	Description	GE Drawing
	INDUCTORS (CONTINUED)	
L5	Variable; inductance 310 to 590 uh, d-c resistance 4.0 ohms max. Delevan Part #8032-25.	B-7493196-P25
L6	Toroid inductors; inductance 30 mh ± 1%, d-c resistance 18.4 ohms max. Torotel Part #15321.	B-7499504-P8
L7	Variable; inductance 310 to 590 uh, d-c resistance 4.0 ohms max. Delevan Part #8032-25.	B-7493196-P25
L8	Toroid inductor; inductance 30 mh ± 1%, d-c resistance 18.4 ohms max. Torotel Part #15321.	B-7499504-P8
L9	Toroid inductor; 6.0 mh ± 1%, d-c resistance 1.51 ohms. Torotel Part #13685.	B-7494599-P13
	PLUGS	
P1	22 double row contacts. AMP Inc. Part #582766-3.	C-7781889-P4
P2	34 contacts. Burndy Corp. Cat. #MS34P-57.	C-7782035-P4
	RESISTORS (Composition, ± 5%, $\frac{1}{2}$ w, unless otherwise specified.)	
R1	Potentiometer, wirewound; 10,000 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P22
R2	Precision, wirewound; 700 ohms ± 1%, 2.5 w.	C-7778027-P105
R3	Precision, 2430 ohms ± 1%, $\frac{1}{2}$ w.	C-3R167-P2431
R4	Potentiometer, wirewound; 10,000 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P22
R5	Precision, wirewound; 4000 ohms ± 1%, 2.5 w.	C-7778027-P103
R6	Precision; 12,000 ohms ± 1%, $\frac{1}{2}$ w.	C-3R167-P1212
R7	Potentiometer, wirewound; 10,000 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P22
R8	Precision, wirewound; 700 ohms ± 1%, 2.5 w.	C-7778027-P105

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ½ w, unless otherwise specified.)	
R9	Precision; 2430 ohms ± 1%, ½ w.	C-3R167-P2431
R10	Potentiometer, wirewound; 10,000 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P22
R11	Precision, wirewound; 4000 ohms ± 1%, 2.5 w.	C-7778027-P103
R12	Precision; 12,100 ohms ± 1%, ½ w.	C-3R167-P1212
R13	Potentiometer, wirewound; 10,000 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P22
R14	Precision, wirewound; 700 ohms ± 1%, 2.5 w.	C-7778027-P105
R15	Precision, 2430 ohms ± 1%, ½ w.	C-3R167-P2431
R16	Potentiometer, wirewound; 10,000 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P22
R17	Precision, wirewound; 4000 ohms ± 1%, 2.5 w.	C-7778027-P103
R18	Precision; 12,100 ohms ± 1%, ½ w.	C-3R167-P1212
R19	Potentiometer, wirewound; 10,000 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P22
R20	Precision, wirewound; 700 ohms ± 1%, 2.5 w.	C-7778027-P105
R21	Potentiometer, composition; 10,000 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P22
R22	Precision, wirewound; 4000 ohms ± 1%, 2.5 w.	C-7778027-P103
R23	Precision, 12,100 ohms ± 1%, ½ w.	C-3R167-P1212
R24	Potentiometer, composition; 100 ohms ± 20%, 2.25 w, linear taper. Allen Bradley Type J.	M-2R73-P2
R25	Wirewound; 120 ohms ± 5%, 7 w. Sprague Type 244E1215.	B-7380227-P1
R26	Deposited carbon on ceramic; 7.5 ohms ± 1%, ½ w. IRC Type DCC.	C-7774319-P5
R27	200 ohms.	C-3R77-P201J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ½ w, unless otherwise specified.)	
R28	Precision; 20,000 ohms ± 1%, ½ w.	C-3R167-P2002
R29	Potentiometer, composition; 500 ohms ± 20%, 2.25 w, linear taper. Allen Bradley Type J.	M-2R73-P6
R30	Precision, wirewound; 625 ohms ± 1%, 2.5 w.	C-7778027-P136
R31	Potentiometer, wirewound; 100 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P21
R32	15 ohms.	C-3R77-P150J
R33	430 ohms.	C-3R77-P431J
R34	Potentiometer, miniature; 100 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P1
R35	100 ohms.	C-3R77-P101J
R36	Precision, 10,000 ohms ± 1%, ½ w.	C-3R167-P1002
R37	Potentiometer, wirewound; 50,000 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P23
R38	Potentiometer, wirewound; 100 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P21
R39	Precision, wirewound; 1000 ohms ± 1%, 2.5 w.	C-7778027-P119
R40	10 ohms.	C-3R77-P100J
R41	Potentiometer, wirewound; 100 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P21
R42	430 ohms.	C-3R77-P431J
R43	15 ohms.	C-3R77-P150J
R44	100 ohms.	C-3R77-P101J
R45	Precision; 10,000 ohms ± 1%, ½ w.	C-3R167-P1002
R46	Potentiometer, wirewound; 50,000 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P23

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ½ w, unless otherwise specified.)	
R47	Potentiometer, wirewound; 100 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P21
R48	Precision, wirewound; 1000 ohms ± 1%, 2.5 w.	C-7778027-P119
R49	10 ohms.	C-3R77-P100J
R50	Potentiometer, wirewound; 100 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P21
R51	430 ohms.	C-3R77-P431J
R52	15 ohms.	C-3R77-P150J
R53	100 ohms.	C-3R77-P101J
R54	Precision; 10,000 ohms ± 5%, ½ w.	C-3R167-P1002
R55	Potentiometer, wirewound; 50,000 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P23
R56	Potentiometer, wirewound; 100 ohms ± 3%, 3 w, linear taper. J. Fluke Type 23A.	C-7779724-P21
R57	Precision, wirewound; 1000 ohms ± 1%, 2.5 w.	C-7778027-P119
R58	Precision; 2430 ohms ± 1%, ½ w.	C-3R167-P2431
R59	100 ohms.	C-3R77-P101J
R60	10 ohms.	C-3R77-P100J
R61	1600 ohms.	C-3R77-P162J
R62	360 ohms.	C-3R77-P361J
R63	150 ohms, 2 w.	C-3R79-P151J
R64	2000 ohms, ¼ w.	C-3R152-P202J
R65	0.15 megohm, ¼ w.	C-3R152-P154J
R66	33,000 ohms, ¼ w.	C-3R152-P333J

Symbol	Description	GE Drawing
	LOCAL CAMERA CONTROL PANEL PL-7674510	
	CAPACITOR	
C1	Metalized plastic; 1.0 mfd ± 20%, 200 v d-c w. Sprague Cat. #118P10502S4.	B-7489159-P13
	INDICATOR LIGHT	
I1	GE Type 327.	A-7164423-P14
	CONNECTOR	
J1	22 double row contacts. AMP Inc. Part #582766-3.	C-7781889-P4
	RELAY	
K1	Nom coil voltage 24 v d-c, max coil voltage 32 v d-c, pull-in 18 v d-c or less, drop-out 0.5 to 9.0 v d-c, resistance 430 ohms ± 10%, operate time 15 millisec, break time 8 millisec, 6 pdt, 6 form C contacts. Allied Control Type T154, 6PDT, 24VDC.	C-7781099-P8
	METER	
M1	Microammeter; rated 50 ua d-c, terminal resistance 1580 ohms ± 20%.	C-7777689-P21
	PLUG	
P4	50 contacts. Burndy Corp. Cat. #MS50P-57.	C-7782035-P6
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R1	Potentiometer, miniature; 500,000 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P12

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ¼ w, unless otherwise specified.)	
R2	1.3 megohm, ½ w.	C-3R77-P135J
R3	Potentiometer, miniature; 500,000 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P12
R4	1.3 megohm, ½ w.	C-3R77-P135J
R5	Potentiometer, miniature; 500,000 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P12
R6	1.3 megohm, ½ w.	C-3R77-P135J
R7	Potentiometer, miniature; 500,000 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P12
R8	1.3 megohm, ½ w.	C-3R77-P135J
R9	Potentiometer, miniature; 250,000 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P11
R12	Potentiometer, miniature; 250,000 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P11
R14	Potentiometer, miniature; 250,000 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P11
R17	Potentiometer, miniature; 250,000 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P11
R19	Potentiometer, miniature; 2500 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P5
R21 thru R23	Potentiometer, miniature; 2500 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P5
R24	Precision, wirewound; 274 ohms ± 1%, 2.5 w.	C-7778027-P107
R26 thru R28	Precision, wirewound; 274 ohms ± 1%, 2.5 w.	C-7778027-P107
R29	Potentiometer, miniature; 2500 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P5

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R31 thru R33	Potentiometer, miniature; 2500 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P5
R34	Precision, wirewound; 274 ohms ± 1%, 2.5 w.	C-7778027-P107
R36 thru R38	Precision, wirewound; 274 ohms ± 1%, 2.5 w.	C-7778027-P107
R39	33 ohms, $\frac{1}{2}$ w.	C-3R77-P330J
R40	390 ohms.	C-3R152-P391J
R41	Potentiometer, miniature; 1000 ohms ± 20%, 0.8 w, linear taper. Allen Bradley Type L.	C-7779134-P4
R42	Precision; 787,000 ohms ± 1%, $\frac{1}{2}$ w.	C-3R167-P7873
R43	0.15 megohm.	C-3R152-P154J
R44	Deposited carbon on ceramic; 3.92 megohm ± 1%, $\frac{1}{2}$ w. IRC Type DCC.	C-7774319-P181
R46 and R47	0.15 megohm.	C-3R152-P154J
R48	Precision; 787,000 ohms ± 1%, $\frac{1}{2}$ w.	C-3R167-P7873
R49	0.15 megohm.	C-3R152-P154J
R51	Deposited carbon; 24.5 megohm ± 1%, 2 w.	C-7774376-P136
R52	Deposited carbon; 14.0 megohm ± 1%. IRC Type DCF.	B-7486520-P139
R53 and R54	0.15 megohm.	C-3R152-P154J
R56 and R57	Deposited carbon; 16.5 megohm ± 1%, 2 w.	C-7774376-P137
R58	0.15 megohm.	C-3R152-P154J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ¼ w, unless otherwise specified.)	
R59	Deposited carbon; 16.5 megohm ± 1%, 2 w.	C-7774376-P137
R61	0.15 megohm.	C-3R152-P154J
R62	Deposited carbon; 16.5 megohm ± 1%, 2 w.	C-7774376-P137
R63	0.15 megohm.	C-3R152-P154J
R64	Deposited carbon on ceramic; 39,000 ohms ± 1%, ½ w. IRC Type DCC.	C-7774319-P103
R66 thru R68	Deposited carbon on ceramic; 39,000 ohms ± 1%, ½ w. IRC Type DCC.	C-7774319-P103
R69	Deposited carbon on ceramic; 82,000 ohms ± 1%, ½ w. IRC Type DCC.	C-7774319-P112
R71	15,000 ohms.	C-3R152-P153J
R72	Deposited carbon on ceramic; 2.94 megohm ± 1%, ½ w. IRC Type DCC.	C-7774319-P183
R73	0.15 megohm.	C-3R152-P154J
R74	Deposited carbon on ceramic; 2.94 megohm ± 1%, ½ w.	C-7774319-P183
R75	0.15 megohm.	C-3R152-P154J
R76	Deposited carbon on ceramic; 2.94 megohm ± 1%, ½ w. IRC Type DCC.	C-7774319-P183
R77	0.15 megohm.	C-3R152-P154J
R78	Deposited carbon on ceramic; 2.94 megohm ± 1%, ½ w.	C-7774319-P183
R79	0.15 megohm.	C-3R152-P154J
R80 thru R83	0.43 megohm, ½ w.	C-3R77-P434J

Symbol	Description	GE Drawing
	SWITCHES	
S1	Rotary type, 2 sections, 2 poles, 24 positions, nonshorting contacts, 2 adjustable stops. Oak Type 222075MF2.	B-7494803AA-P1
S2	Toggle type, midget; dpst. Arrow Hart and Hegeman Cat. #20902-BJC, Carling Cat. #216-73.	C-7775772-P2
S3 and S4	Toggle type, miniature; spdt. Alco Electronics Inc. Part #MST-115D.	A-7171932-P1
S6	Push-button type, illuminated. Marco Industries Div., Oak Mfg. Co., Type 61690.	B-7498167-P1
	Yellow lens cap assembly. Marco Type 61650-12.	B-7498167-P22
	VIEWFINDER SWITCHER BOARD PL-7674431	
	CAPACITORS	
C1 thru C5	Electrolytic, solid tantalum type; 22 mfd ± 20%, 35 v d-c w. Kemet Type J.	C-7781529-P18
C6 thru C13	Electrolytic, solid tantalum type; 100 mfd ± 20%, 20 v d-c w. Kemet Type J.	C-7781529-P16
C14 thru C21	Electrolytic, solid tantalum type; 6.8 mfd ± 20%, 35 v d-c w. Texas Instrument Type SCM685BP035C4, Sprague Type 150D685X0035B2.	B-7493471-P7
C22 and C23	Electrolytic, solid tantalum type; 22 mfd ± 20%, 35 v d-c w. Kemet Type J.	C-7781529-P18
C24	Electrolytic, solid tantalum type; 100 mfd ± 20%, 20 v d-c w. Kemet Type J.	C-7781529-P16
	RECTIFIERS	
CR1 thru CR16	GE Type 1N4454.	A-7164424-P104

Symbol	Description	GE Drawing
	TRANSISTORS	
Q1 thru Q5	Motorola Type MM487/2N2218.	A-7164451-P104
Q6	GE Type 2N3856A.	A-7164451-P205
Q7	GE Type 2N914.	A-7164451-P206
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R1 thru R5	750 ohms, $\frac{1}{2}$ w.	C-3R77-P751J
R6	3600 ohms.	C-3R152-P362J
R7	750 ohms, $\frac{1}{2}$ w.	C-3R77-P751J
R8	3600 ohms.	C-3R152-P362J
R9	750 ohms, $\frac{1}{2}$ w.	C-3R77-P751J
R10	3600 ohms.	C-3R152-P362J
R11	750 ohms, $\frac{1}{2}$ w.	C-3R77-P751J
R12	3600 ohms.	C-3R152-P362J
R13	750 ohms, $\frac{1}{2}$ w.	C-3R77-P751J
R14	51 ohms.	C-3R152-P510J
R15	3600 ohms.	C-3R152-P362J
R16	750 ohms, $\frac{1}{2}$ w.	C-3R77-P751J
R17	6800 ohms.	C-3R152-P682J
R18	2400 ohms.	C-3R152-P242J
R19	82 ohms.	C-3R152-P820J
R20	200 ohms.	C-3R152-P201J
R21	300 ohms.	C-3R152-P301J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R22	6800 ohms.	C-3R152-P682J
R23	2400 ohms.	C-3R152-P242J
R24	82 ohms.	C-3R152-P820J
R25	200 ohms.	C-3R152-P201J
R26	300 ohms.	C-3R152-P301J
R27	6800 ohms.	C-3R152-P682J
R28	2400 ohms.	C-3R152-P242J
R29	82 ohms.	C-3R152-P820J
R30	200 ohms.	C-3R152-P201J
R31	300 ohms.	C-3R152-P301J
R32	6800 ohms.	C-3R152-P682J
R33	2400 ohms.	C-3R152-P242J
R34	82 ohms.	C-3R152-P820J
R35	200 ohms.	C-3R152-P201J
R36	6800 ohms.	C-3R152-P682J
R37	2400 ohms.	C-3R152-P242J
R38	82 ohms.	C-3R152-P820J
R39	200 ohms.	C-3R152-P201J
R40	1500 ohms.	C-3R152-P152J
R41	1.0 megohm.	C-3R152-P105J
R42	1500 ohms.	C-3R152-P152J
R43	1.0 megohm.	C-3R152-P105J
R44	1500 ohms.	C-3R152-P152J
R45	1.0 megohm.	C-3R152-P105J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ¼ w, unless otherwise specified.)	
R46	1500 ohms.	C-3R152-P152J
R47	1.0 megohm.	C-3R152-P105J
R48	1500 ohms.	C-3R152-P152J
R49	1.0 megohm.	C-3R152-P105J
R50	1500 ohms.	C-3R152-P152J
R51	1.0 megohm.	C-3R152-P105J
R52	1500 ohms.	C-3R152-P152J
R53	1.0 megohm.	C-3R152-P105J
R54 and R55	1500 ohms.	C-3R152-P152J
R56	1.0 megohm.	C-3R152-P105J
R57	0.12 megohm.	C-3R152-P124J
R58	18,000 ohms.	C-3R152-P183J
R59	820 ohms.	C-3R152-P821J
R60	560 ohms.	C-3R152-P561J
R61	0.13 megohm.	C-3R152-P134J
R62	10,000 ohms.	C-3R152-P103J
R63	680 ohms, 1 w.	C-3R78-P681J
R64	820 ohms, 1 w.	C-3R78-P821J
R65	47 ohms.	C-3R152-P470J
R66	75 ohms.	C-3R152-P750J

Symbol	Description	GE Drawing
	TRANSISTOR SOCKETS	
XQ1 thru XQ5	Transistor socket assemblies.	PL-7380029-G2
XQ6	Transistor socket assembly.	PL-7380029-G1
XQ7	Transistor socket assembly.	PL-7497185-G1

SYNC ADDER BOARD
PL-7782689

	CAPACITORS	
C1	Electrolytic, solid tantalum type; 22 mfd ± 20%, 35 v d-c w. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C2	Electrolytic, solid tantalum type; 100 mfd ± 20%, 10 v d-c w. Texas Instrument Type SCM107GP010C4, Sprague Type 150D107X0010R2.	B-7493471-P10
	TRANSISTOR	
Q1	Fairchild Type 2N3638.	A-7164451-P184
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R1	1000 ohms.	C-3R152-P102J
R2	0.10 megohm.	C-3R152-P104J
R3	8200 ohms.	C-3R152-P822J
R4	1000 ohms, $\frac{1}{2}$ w.	C-3R77-P102J
	TRANSISTOR SOCKET	
XQ1	Industrial Electronic Hardware Corp. Part #MPT6003-5.	C-7799601-P3

Symbol	Description	GE Drawing
	VIEWFINDER VIDEO AMPLIFIER BOARD PL-7672681G3	
	CAPACITORS (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C1	47 mfd. Texas Instrument Type SCM476HP035C4, Sprague Type 150D476X0035S2.	B-7493471-P11
C2 and C3	100 mfd, 20 v d-c w. Texas Instrument Type SCM107HP020C4, Sprague Type 150D107X0020S2.	B-7493471-P14
C4	6.8 mfd. Texas Instrument Type SCM685BP035C4, Sprague Type 150D685X0035B2.	B-7493471-P7
C5	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C6	Metallized plastic, 1.0 mfd ± 20%, 200 v d-c w. Sprague Cat. #118P10502S4.	B-7489159-P13
C7	220 mfd, 10 v d-c w. Texas Instrument Type SCM227HP010C4, Sprague Type 150D227X0010S2.	B-7493471-P9
C8	6.8 mfd. Texas Instrument Type SCM685BP035C4, Sprague Type 150D685X0035B2.	B-7493471-P7
C9	Variable, ceramic; 8 to 50 pf -100% +0% min, -0% +50% max, -750 temp coef. Erie Series 557, Dielectric Type Code E.	B-7493393-P102
C10	Variable, ceramic; 1.5 to 7 pf -100% +0% min, -0% +50% max, 0 temp coef. Erie Series 557, Dielectric Type Code A.	B-7493393-P101
C11	Ceramic, Hi-K disk; 0.1 mfd +80% -25%, 500 v d-c w. Sprague Cat. #36C190A.	B-7488160-P3
C12	Silver mica, epoxy dipped; 330 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496931-P39
C13	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2

Symbol	Description	GE Drawing
	RECTIFIERS	
CR1	Hughes Type HD2152.	A-7164424-P29
CR2	U.S. Semcor Type 1N2167.	A-7164424-P65
	CONNECTORS	
J1	Miniature, rectangular; 20 male contacts. Winchester Code #MRE-20PT-G.	C-7777759-P49
J2	Amphenol Cat. #46000, Automatic Metal Products Cat. #0740-NF.	C-7781541-P2
	INDUCTORS	
L1	Coil, variable; inductance 16 to 28 uh, d-c resistance 3.3 ohms max. Delevan Part #BP-0127-11.	B-7493196-P11
L2	RF choke coil; inductance 22 uh ± 10%, d-c resistance 1.2 ohms max. Jeffers Cat. #4422-8.	B-7498929-P47
	TRANSISTORS	
Q1 and Q2	Sprague Type 2N2048.	A-7164451-P112
Q3	Fairchild Type 2N3638.	A-7164451-P184
Q4	Texas Instrument Type 2N1143.	A-7164451-P84
Q5	RCA Type 2N2405.	A-7164451-P181
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R1	15,000 ohms.	C-3R152-P153J
R2	3900 ohms.	C-3R152-P392J
R3	510 ohms.	C-3R152-P511J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R4	1000 ohms.	C-3R152-P102J
R5	1800 ohms.	C-3R152-P182J
R6	2200 ohms.	C-3R152-P222J
R7	220 ohms.	C-3R152-P221J
R8	3300 ohms.	C-3R152-P332J
R9	270 ohms.	C-3R152-P271J
R10	Potentiometer, composition; 1000 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P2
R11	1500 ohms.	C-3R152-P152J
R12	220 ohms.	C-3R152-P221J
R13 thru R15	3900 ohms.	C-3R152-P392J
R16	100 ohms.	C-3R152-P101J
R17	Precision, wirewound; 1960 ohms ± 1%, 3.5 w.	C-7778027-P202
R18	300 ohms.	C-3R152-P301J
R19	22 ohms.	C-3R152-P220J
R20	0.10 megohm, $\frac{1}{2}$ w.	C-3R77-P104J
	TRANSISTOR SOCKETS	
XQ1 thru XQ5	Transistor socket assemblies.	PL-7380029-G2

VIEWFINDER SWEEP BOARD
PL-7673797G2

CAPACITORS
(Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)

Symbol	Description	GE Drawing
C2	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C3	2.2 mfd, 20 v d-c w. Texas Instrument Type SCM225FP020C4, Sprague Type 150D225X0020A2.	B-7493471-P13
C4	Polyester, tubular; 0.0022 mfd ± 20%, 100 v d-c w. GE Type 61F.	B-7491930-P2
C5	Polyester, tubular; 0.1 mfd ± 20%, 100 v d-c w. GE Type 61F.	B-7491930-P9
C7	47 mfd. Texas Instrument Type SCM476HP035C4, Sprague Type 150D475X0035S2.	B-7493471-P11
C8	680 mfd, 6 v d-c w.	B-7493471-P22
C11	Metalized plastic; 6.0 mfd ± 20%, 200 v d-c w. Sprague Cat. #118P60502S4.	B-7489159-P18
C12 and C13	Mylar, dielectric; 0.068 mfd ± 10%, 200 v d-c w. Good-All Type 663-UW.	C-7777865-P268
C14	Mylar, dielectric; 0.033 mfd ± 5%, 50 v d-c w.	B-7496934-P203
C15	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C16	680 mfd, 6 v d-c w.	B-7493471-P22
C17	Polyester, tubular; 0.0047 mfd ± 20%, 100 v d-c w. GE Type 61F.	B-7491930-P3
C18	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C20	Mylar, dielectric; 0.22 mfd ± 5%, 50 v d-c w.	B-7496934-P208
C21	Tantalum slug type; 9.0 mfd ± 20%, 125 v rated. Sprague Type 109D905X0125F2.	C-7779620-P10

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C22 thru C25	6.8 mfd. Texas Instrument Type SCM685BP035C4, Sprague Type 150D685X0035B2.	B-7493471-P7
C26	100 mfd, 20 v d-c w. Texas Instrument Type SCM107HP020C4, Sprague Type 150D107X0020S2.	B-7493471-P14
C27	Mylar, dielectric; 0.22 mfd ± 5%, 50 v d-c w.	B-7496934-P208
C28	6.8 mfd. Texas Instrument Type SCM685BP035C4, Sprague Type 150D685X0035B2.	B-7493471-P7
C29	Mylar, dielectric; 0.022 mfd ± 5%, 50 v d-c w.	B-7496934-P202
C30	Mylar, dielectric; 0.047 mfd ± 5%, 50 v d-c w.	B-7496934-P204
C31	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2
C32	Mylar, dielectric; 0.1 mfd ± 20%, 200 v d-c w. Good-All Type 663-UW.	C-7777865-P209
C33	Mylar, dielectric; 0.1 mfd ± 5%, 50 v d-c w.	B-7496934-P206
C34	Mylar, dielectric; 0.1 mfd ± 20%, 200 v d-c w. Good-All Type 663-UW.	C-7777865-P209
C35	Mylar, dielectric; 0.01 mfd ± 20%, 50 v d-c w.	B-7496934-P1
C36	330 mfd, 6 v d-c w. Texas Instrument Type SCM337HP006C4, Sprague Type 150D337X0006S2.	B-7493471-P12
C37	22 mfd. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
	RECTIFIERS	
CR1	Germanium diode; 80 PIV max. Hughes Type HD2151.	C-7777146-P12
CR2	Unitrode Type UTR32.	A-7164424-P160
CR3	GE Type 1N4454.	A-7164424-P104

Symbol	Description	GE Drawing
	RECTIFIERS (CONTINUED)	
CR4	Unitrode Type UTR31.	A-7164424-P105
CR5	GE Type 1N4454.	A-7164424-P104
CR6	Germanium diode; 80 PIV max. Hughes Type HD2151.	C-7777146-P12
CR7	Unitrode Type UTR40.	A-7164424-P171
CR8	Texas Instrument Type 1N750A.	A-7164424-P48
CR12	Zener diode; 62 v. Motorola Type 1N980A.	A-7164424-P125
	FUSE	
F1	Subminiature; rated $\frac{1}{2}$ amp at 125 v. Bussman Type GMW.	C-7779127-P6
	INDUCTORS	
L2	Toroid inductor; inductance 2.0 mh ± 1%, 1.0 ohm max d-c resistance. Torotel Part #15316.	B-7499504-P3
L4	Toroid inductor; inductance 100 mh ± 1%, 61 ohms max d-c resistance. Torotel Part #15322.	B-7499504-P9
L5	RF coil; inductance 130 uh ± 10%, 5.5 ohms max d-c resistance. Jeffers Cat. #1315-15.	B-7498929-P77
L6	RF coil; inductance 470 uh ± 10%, 11.1 ohms max d-c resistance. Jeffers Cat. #1331-27.	B-7498929-P76
L7	RF coil; inductance 33 uh ± 10%, 0.56 ohms max d-c resistance. Jeffers Cat. #4424-3.	B-7498929-P67
L8	Inductance 220 uh ± 10%, 3.8 ohms max d-c resistance. Aladdin Part #22-223.	B-7493472-P1
	PLUG	
P1	Miniature, rectangular; 26 male contacts. Winchester Code #MRE-26PT-G.	C-7777759-P51

Symbol	Description	GE Drawing
	TRANSISTORS	
Q1 and Q2	Motorola Type 2N3134.	A-7164451-P150
Q3 and Q4	Motorola Type 2N2833.	A-7164451-P166
Q5	GE Type 2N1711.	A-7164451-P164
Q6 and Q7	GE Type 2N2192A.	A-7164451-P182
Q12	Motorola Type 2N3134.	A-7164451-P150
Q13 thru Q15	GE Type 2N1711.	A-7164451-P164
Q16	Motorola Type 2N3134.	A-7164451-P150
Q17 and Q18	Motorola Type 2N1545.	A-7164451-P122
Q19	Motorola Type 2N3134.	A-7164451-P150
Q20 and Q21	Texas Instrument Type 2N3036.	A-7164451-P163
Q22	GE Type 2N1711.	A-7164451-P164
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R1	1000 ohms.	C-3R152-P102J
R2	47,000 ohms.	C-3R152-P472J
R3 and R4	3300 ohms.	C-3R152-P332J
R5	2200 ohms.	C-3R152-P222J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ¼ w, unless otherwise specified.)	
R6	1000 ohms.	C-3R152-P102J
R7	470 ohms.	C-3R152-P471J
R8	100 ohms, ½ w.	C-3R77-P101J
R10	Potentiometer, wirewound; 50 ohms ± 10%, 7.5 w, linear taper. Ohmite Type 4952.	B-7498834-P3
R11 and R12	3.3 ohms.	C-3R152AA-P3R3J
R13	100 ohms.	C-3R152-P101J
R14	Potentiometer, composition; 100 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P9
R15	470 ohms.	C-3R152-P471J
R17	680 ohms.	C-3R152-P681J
R18 and R19	3000 ohms.	C-3R152-P302J
R20	22 ohms.	C-3R152-P220J
R21	1800 ohms.	C-3R152-P182J
R22	3.3 ohms.	C-3R152AA-P3R3J
R23	33 ohms.	C-3R152-P330J
R24	3.3 ohms.	C-3R152AA-P3R3J
R25	6200 ohms, ½ w.	C-3R77-P622J
R29	100 ohms.	C-3R152-P101J
R32	Potentiometer, composition; 1000 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P2
R33	15,000 ohms.	C-3R152-P153J
R38	1000 ohms.	C-3R152-P102J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ¼ w, unless otherwise specified.)	
R39	100 ohms.	C-3R152-P101J
R40	10,000 ohms.	C-3R152-P103J
R41	Precision, metal film; 13,000 ohms ± 1%, ¼ w.	C-7781654-P112
R43	4700 ohms.	C-3R152-P472J
R44 and R45	100 ohms.	C-3R152-P101J
R46	820 ohms.	C-3R152-P821J
R47	3300 ohms.	C-3R152-P332J
R49	Precision, metal film; 13,000 ohms ± 1%, ¼ w.	C-7781654-P112
R50	Potentiometer, composition; 5000 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P3
R51	2200 ohms.	C-3R152-P222J
R52	100 ohms.	C-3R152-P101J
R54	Potentiometer, composition; 2500 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P10
R56	560 ohms.	C-3R152-P561J
R57	Precision, wirewound; 10 ohms ± 1%, 1 w.	C-7778027-P701
R58	1500 ohms, ½ w.	C-3R77-P152J
R59	10 ohms, ½ w.	C-3R77-P100J
R60	3.3 ohms.	C-3R152AA-P3R3J
R61	2700 ohms.	C-3R152-P272J
R62	6800 ohms.	C-3R152-P682J
R63	220 ohms.	C-3R152-P221J
R64	27,000 ohms.	C-3R152-P273J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R65	2200 ohms.	C-3R152-P222J
R66	68,000 ohms.	C-3R152-P683J
R67	2200 ohms.	C-3R152-P222J
R68	3900 ohms, $\frac{1}{2}$ w.	C-3R77-P392J
R69	68,000 ohms.	C-3R152-P683J
R70	680 ohms.	C-3R152-P681J
R72	1000 ohms.	C-3R152-P102J
R73	33,000 ohms.	C-3R152-P333J
R74	2200 ohms.	C-3R152-P222J
R75	33,000 ohms.	C-3R152-P333J
R76	0.47 megohm.	C-3R152-P474J
R77	0.10 megohm.	C-3R152-P104J
	THERMISTOR	
RT1	Ambient temp range -40 C to +100 C; resistance 8000 ohms ± 10% at 25 C. Fenwall Code #JA38J1.	B-7496556-P2
	TRANSFORMERS	
T1	Transformer assembly.	PL-7497166-G2
T2	Transformer assembly.	PL-7497166-G3
T3	Transformer assembly.	PL-7497166-G4
	FUSE HOLDER	
XF1	Subminiature. Bussman Type HWA with Type AF knob.	B-7496215-P1

Symbol	Description	GE Drawing
	TRANSISTOR SOCKETS	
XQ1 and XQ2	Transistor socket assemblies.	PL-7380029-G2
XQ5	Transistor socket assembly.	PL-7380029-G2
XQ6 and XQ7	Heatsink. International Electronic Research Corp. Cat. #TXB2P-032-037-12.	A-7171575-P5
XQ9 and XQ10	Transistor socket assemblies.	PL-7380029-G2
XQ12 thru XQ16	Transistor socket assemblies.	PL-7380029-G2
XQ19 thru XQ22	Transistor socket assemblies.	PL-7380029-G2

VIEWFINDER HIGH-VOLTAGE POWER SUPPLY BOARD PL-7781684G2

	CAPACITORS (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C1	Tantalum slug type; 9.0 mfd ± 20%, 125 v rated. Sprague Type 109D905X0125F2.	C-7779620-P10
C2	2.2 mfd ± 10%, 20 v d-c w. Texas Instrument Type SCM225FP020C2, Sprague Type 150D225X9020A2.	B-7493471-P113
C3	100 mfd, 20 v d-c w. Texas Instrument Type SCM107HP020C4, Sprague Type 150D107X0020S2.	B-7493471-P14
C4	0.47 mfd. Texas Instrument Type SCM474FP035C4, Sprague Type 150D474X0035A2.	B-7493471-P4
C5 and C6	1.0 mfd. Texas Instrument Type SCM105FP035C4, Sprague Type 150D105X0035A2.	B-7493471-P2

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED) (Electrolytic, solid tantalum type, ± 20%, 35 v d-c w, unless otherwise specified.)	
C7	Mylar, dielectric; 0.33 mfd ± 5%, 50 v d-c w.	B-7496934-P209
C8	Mylar, dielectric; 0.047 mfd ± 2%, 600 v d-c w. Good-All Type 663-UW.	C-7777865-P482
C9	Mylar, dielectric; 0.0047 mfd ± 10%, 600 v d-c w. Good-All Type 663-UW.	C-7777865-P453
C10	Adjustable padder capacitor; 1400 to 3055 pf, 500 v d-c flash breakdown.	A-7168193-P15
C11 and C12	Ceramic, Hi-K disk; 6000 pf ± 20%, 300 v d-c w.	B-7493821-P16
C13 thru C20	Ceramic, Hi-K disk; 0.0022 pf ± 20%, 6000 v d-c w.	B-7493821-P18
C21 and C22	Ceramic, Hi-K disk; 0.001 pf ± 20%, 600 v d-c w.	B-7493821-P17
C23	2.2 mfd ± 10%, 20 v d-c w. Texas Instrument Type SCM225FP020C2, Sprague Type 150D225X9020A2.	B-7493471-P113
	RECTIFIERS	
CR1	Zener diode, 12 v. Unitrode Type UZ812.	A-7164424-P117
CR2 thru CR9	Dickson Type DER-6.	A-7164424-P114
CR10	GE Type 1N4454.	A-7164424-P104
	FUSE	
F1	Subminiature; rated 2/10 amp at 125 v. Bussman Type GMW.	C-7779127-P2

Symbol	Description	GE Drawing
	INDUCTOR	
L1	Inductance 220 uh ± 10%, d-c resistance 3.8 ohms max. Aladdin Part #22-223.	B-7493472-P1
	PLUG	
P1	Miniature, rectangular; 8 male contacts. Winchester Code #MRE-8PT-K.	C-7777759-P43
	TRANSISTORS	
Q1	GE Type 2N1711.	A-7164451-P164
Q2	Motorola Type 2N3134.	A-7164451-P150
Q3	GE Type 2N1711.	A-7164451-P164
Q4 and Q5	RCA Type 2N3584.	A-7164451-P177
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R1	36,000 ohms.	C-3R152-P363J
R2	Potentiometer, composition; 25,000 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P5
R3	30,000 ohms.	C-3R152-P303J
R4	10,000 ohms.	C-3R152-P103J
R5	1000 ohms.	C-3R152-P102J
R6	4700 ohms.	C-3R152-P472J
R7	1000 ohms.	C-3R152-P102J
R8	3300 ohms.	C-3R152-P332J
R9	1200 ohms.	C-3R152-P122J
R10	220 ohms.	C-3R152-P221J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, ¼ w, unless otherwise specified.)	
R11	0.10 megohm, ½ w.	C-3R77-P104J
R12	Carbon film; 1000 megohm ± 5%, 2 w. IRC Type MVX-2.	A-7162499-P3
R13 and R14	3.3 ohms.	C-3R152AA-P3R3J
R15	100 ohms.	C-3R152-P101J
	TRANSFORMERS	
T1	Transformer assembly.	PL-7497166-G1
T2	High voltage transformer.	B-7497167-P1
	FUSE HOLDER	
XF1	Subminiature. Bussman Type HWA with Type AF knob.	B-7496215-P1
	TRANSISTOR SOCKETS	
XQ1 thru XQ3	Transistor socket assemblies.	PL-7380029-G2

IRIS CONTROL SERVO AMPLIFIER BOARD PL-7782027G2

	CAPACITORS	
C1	Electrolytic, solid tantalum type; 22 mfd ± 20%, 35 v d-c w. Texas Instrument Type SCM226GP035C4, Sprague Type 150D226X0035R2.	B-7493471-P8
C4	Silver mica, epoxy dipped; 4700 pf ± 5%, 500 v d-c w. Electromotive Type DM15.	B-7496932-P24

Symbol	Description	GE Drawing
	RECTIFIER	
CR1	Zener diode; 3.3 v nom. JEDEC Type 1N4728, Motorola Type 1M3.3ZS.	A-7172767-P1
	TRANSISTORS	
Q1 thru Q6	GE Type 2N2107.	A-7164451-P21
Q7	Delco Type 2N553.	A-7164451-P80
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R1	6800 ohms, $\frac{1}{2}$ w.	C-3R77-F682J
R2	Potentiometer, composition; 25,000 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P5
R3 and R4	3000 ohms.	C-3R152-P302J
R5	Potentiometer, composition; 25,000 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P5
R6	2000 ohms.	C-3R152-P202J
R7	Potentiometer, composition; 1000 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P2
R8	10,000 ohms.	C-3R152-P103J
R9	2000 ohms.	C-3R152-P202J
R10	10,000 ohms.	C-3R152-P103J
R11	6800 ohms, $\frac{1}{2}$ w.	C-3R77-P682J
R12	910 ohms.	C-3R152-P911J
R13	7500 ohms.	C-3R152-P752J
R14	5100 ohms.	C-3R152-P512J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R16	10,000 ohms.	C-3R152-P103J
R17	3900 ohms, 1 w.	C-3R78-P392J
R18	2000 ohms, 2 w.	C-3R79-P202J
R19	1000 ohms.	C-3R152-P102J
R20	10,000 ohms.	C-3R152-P103J
	TRANSISTOR SOCKETS	
XQ1 thru XQ6	Transistor socket assemblies.	PL-7380029-G2

IRIS CONTROL SERVO POWER SUPPLY BOARD PL-7672613

	CAPACITORS (Electrolytic, solid tantalum type, ± 10%, 35 v d-c w, unless otherwise specified.)	
C1 and C2	Electrolytic, tantalum; 50 mfd +50% -15%, 60 v d-c w. GE Type 62F405.	C-7779083-P61
C3	22 mfd. Texas Instrument Type SCM226GP035C2, Sprague Type 150D226X9035R2.	B-7493471-P108
C4	Electrolytic, polarized, tubular; 500 mfd +250% -10%, 50 v d-c w. Sprague Type #TVA-1315.	C-7775849-P16
C5	Electrolytic, tantalum; 50 mfd +50% -15%, 60 v d-c w. GE Type 62F405.	C-7779083-P61
C6	22 mfd. Texas Instrument Type SCM226GP035C2, Sprague Type 150D226X9035R2.	B-7493471-P108

Symbol	Description	GE Drawing
	RECTIFIERS	
CR1 thru CR4	Silicon rectifiers; PIV 200 max. EIA Type 1N3193.	B-7493633-P1
CR5	Zener diode; 6.8 volts ± 10%, 250 milliwatt units. Transitron Type 1N763.	A-7166198-P3
	FUSE	
F1	Subminiature, $\frac{1}{2}$ amp at 125 v. Bussman Type GMW.	C-7779127-P6
	CONNECTOR	
J1	Miniature, rectangular; 20 male contacts. Winchester Code #MRE-20PT-G.	C-7777759-P49
	TRANSISTORS	
Q1	Texas Instrument Type 2N1038.	A-7164451-P53
Q2	GE Type 2N527.	A-7164451-P82
Q3	GE Type 2N338.	A-7164451-P63
Q4	GE Type 2N2197.	A-7164451-P24
	RESISTORS (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R1 and R2	1000 ohms.	C-3R152-P102J
R3	2200 ohms.	C-3R152-P222J
R4	1500 ohms.	C-3R152-P152J
R5	Potentiometer, composition; 500 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P1
R6	680 ohms.	C-3R152-P681J

Symbol	Description	GE Drawing
	RESISTORS (CONTINUED) (Composition, ± 5%, $\frac{1}{4}$ w, unless otherwise specified.)	
R7	1800 ohms.	C-3R152-P182J
R8 and R9	1500 ohms.	C-3R152-P152J
R10	Potentiometer, composition; 500 ohms ± 20%, 0.4 w, linear taper. Allen Bradley Type O.	B-7493391-P1
R11	1800 ohms.	C-3R152-P182J
	TRANSFORMER	
T1	Rectifier, single phase. Pri: 125/117/110 v, 50/60 cycles; sec: 31 v d-c ± 5%, 225 ma d-c.	B-7496133-P1
	FUSE HOLDER	
XF1	Subminiature. Bussman Type HWA with Type AF knob.	B-7496215-P1
	TRANSISTOR SOCKETS	
XQ2 and XQ3	Transistor socket assemblies.	PL-7380029-G2

INTERCOM AMPLIFIER BOARD PL-7781675

	CAPACITORS	
C1	Mylar, dielectric; 0.47 mfd ± 5%, 50 v d-c w.	B-7496934-P210
C2	Ceramic, Hi-K disk; 0.05 mfd +80% -20%, 50 v d-c w. Sprague Cat. #44C29.	A-7161189-P1
C3 and C4	Mylar, dielectric; 0.22 mfd ± 5%, 50 v d-c w.	B-7496934-P208

Symbol	Description	GE Drawing
	CAPACITORS (CONTINUED)	
C5	Ceramic, Hi-K disk; 0.05 mfd +80% -20%, 50 v d-c w. Sprague Cat. #44C29.	A-7161189-P1
C6	Mylar, dielectric; 0.22 mfd ± 5%, 50 v d-c w.	B-7496934-P208
C7	Electrolytic, tubular; 100 mfd +75% -10%, 25 v d-c w. Sprague Cat. #30D188A1.	B-7489483-P18
	TRANSISTORS	
Q1 and Q2	GE Type 2N3414.	A-7164451-P161
	RESISTORS (Composition, ± 5%, $\frac{1}{2}$ w, unless otherwise specified.)	
R1	1500 ohms.	C-3R77-P152J
R2	30 ohms.	C-3R77-P300J
R3	0.10 megohm.	C-3R77-P104J
R4	1200 ohms.	C-3R77-P122J
R5	Potentiometer, composition; 2500 ohms ± 30%, $\frac{1}{4}$ w, linear taper.	B-7499585-P1
R6 thru R9	470 ohms.	C-3R77-P471J
R10	75 ohms.	C-3R77-P750J
R11	0.10 megohm.	C-3R77-P104J
R12	1200 ohms.	C-3R77-P122J
R13	100 ohms.	C-3R77-P101J
R14 and R15	10,000 ohms.	C-3R77-P103J

Symbol	Description	GE Drawing
	TRANSFORMER	
T1	Audio. Pri imp: 600 ohms CT: sec #1 imp: 300 ohms; sec #2 imp: 300 ohms. Central Type G2-434.	B-7499554-P1

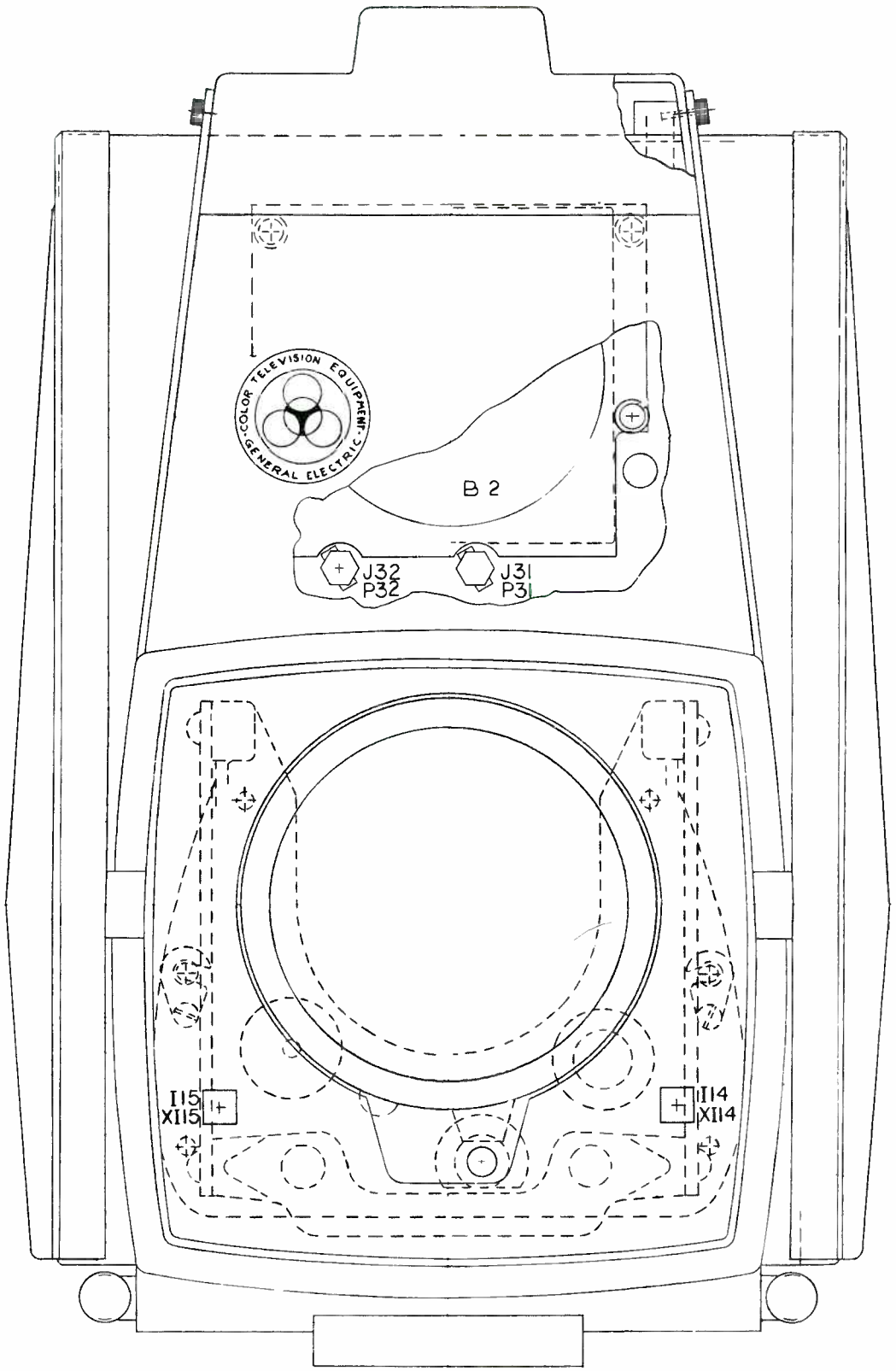
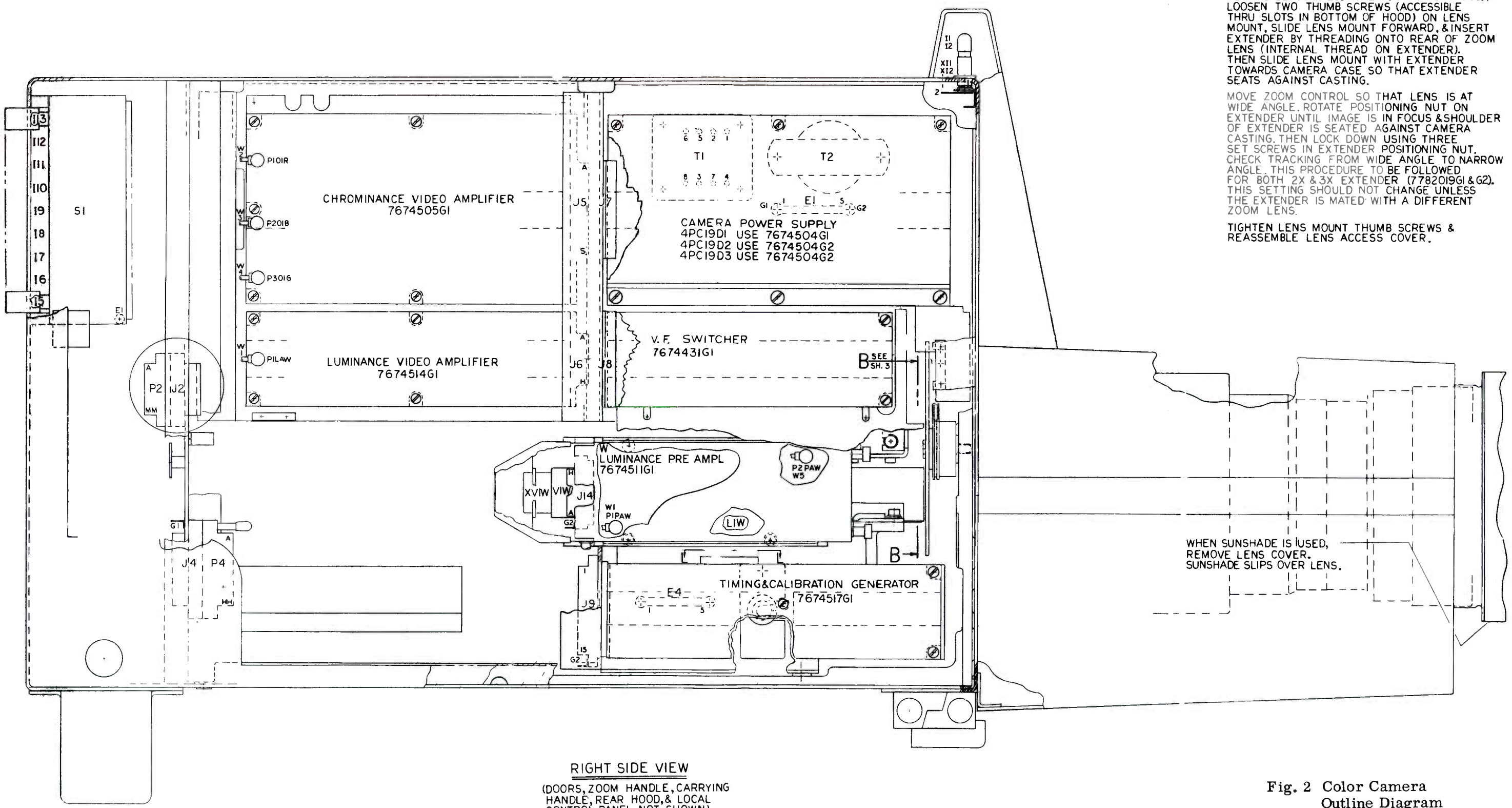


Fig. 1 Color Camera Outline Diagram (E-7355449, Sheet 1, Rev. A)



RIGHT SIDE VIEW

(DOORS, ZOOM HANDLE, CARRYING HANDLE, REAR HOOD, & LOCAL CONTROL PANEL NOT SHOWN)

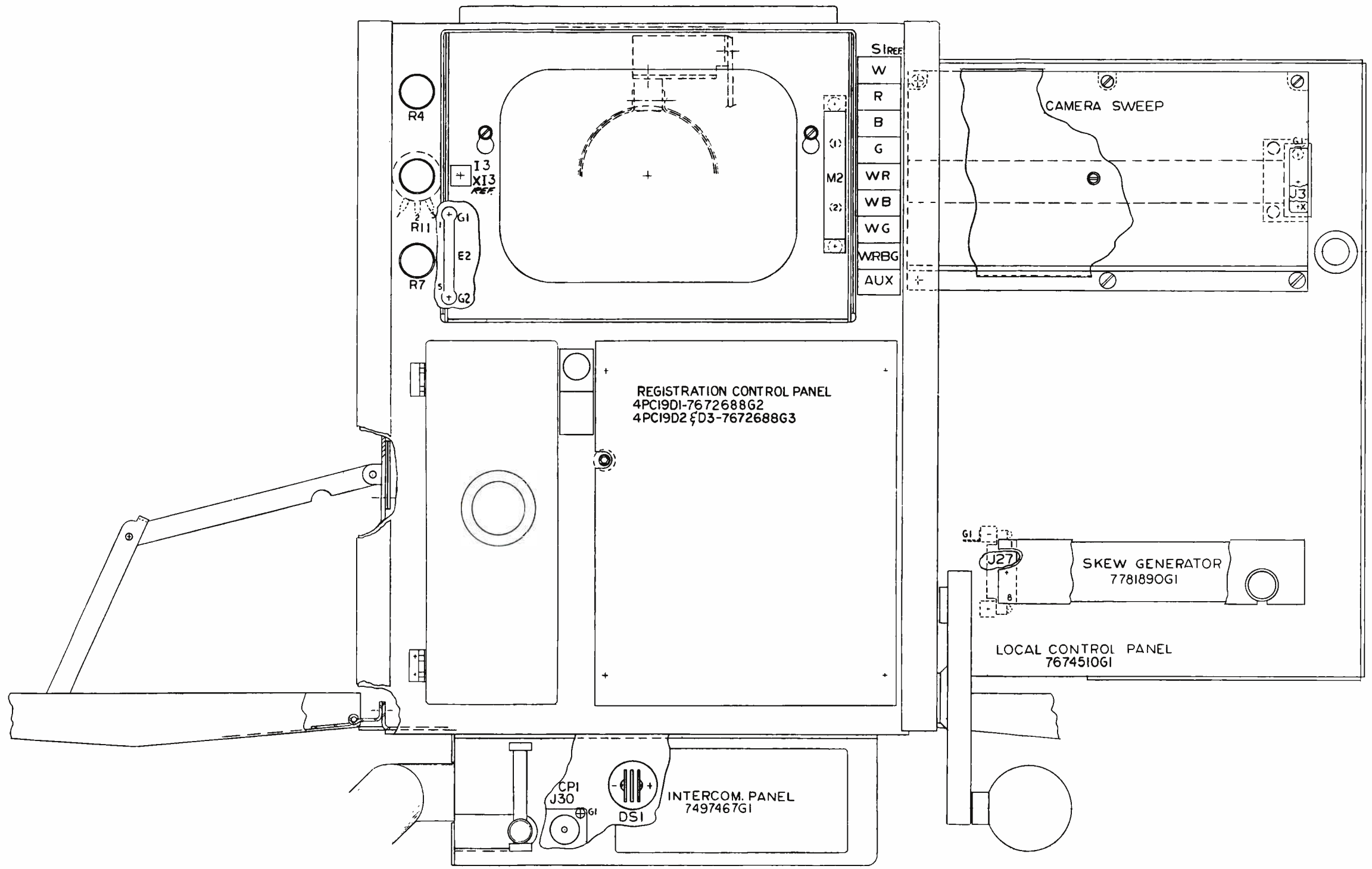
THE INSTALLATION AND/OR SETTING OF LENS EXTENDERS (TO BE DONE ONLY AFTER TRACKING OF ZOOM LENS WITHOUT EXTENDER HAS BEEN COMPLETED) WILL BE ACCOMPLISHED AS FOLLOWS:

REMOVE LENS ACCESS COVER (IN TOP OF HOOD), LOOSEN TWO THUMB SCREWS (ACCESSIBLE THRU SLOTS IN BOTTOM OF HOOD) ON LENS MOUNT, SLIDE LENS MOUNT FORWARD, & INSERT EXTENDER BY THREADING ONTO REAR OF ZOOM LENS (INTERNAL THREAD ON EXTENDER). THEN SLIDE LENS MOUNT WITH EXTENDER TOWARDS CAMERA CASE SO THAT EXTENDER SEATS AGAINST CASTING.

MOVE ZOOM CONTROL SO THAT LENS IS AT WIDE ANGLE. ROTATE POSITIONING NUT ON EXTENDER UNTIL IMAGE IS IN FOCUS & SHOULDER OF EXTENDER IS SEATED AGAINST CAMERA CASTING, THEN LOCK DOWN USING THREE SET SCREWS IN EXTENDER POSITIONING NUT. CHECK TRACKING FROM WIDE ANGLE TO NARROW ANGLE. THIS PROCEDURE TO BE FOLLOWED FOR BOTH 2X & 3X EXTENDER (7782019G1 & G2). THIS SETTING SHOULD NOT CHANGE UNLESS THE EXTENDER IS MATED WITH A DIFFERENT ZOOM LENS.

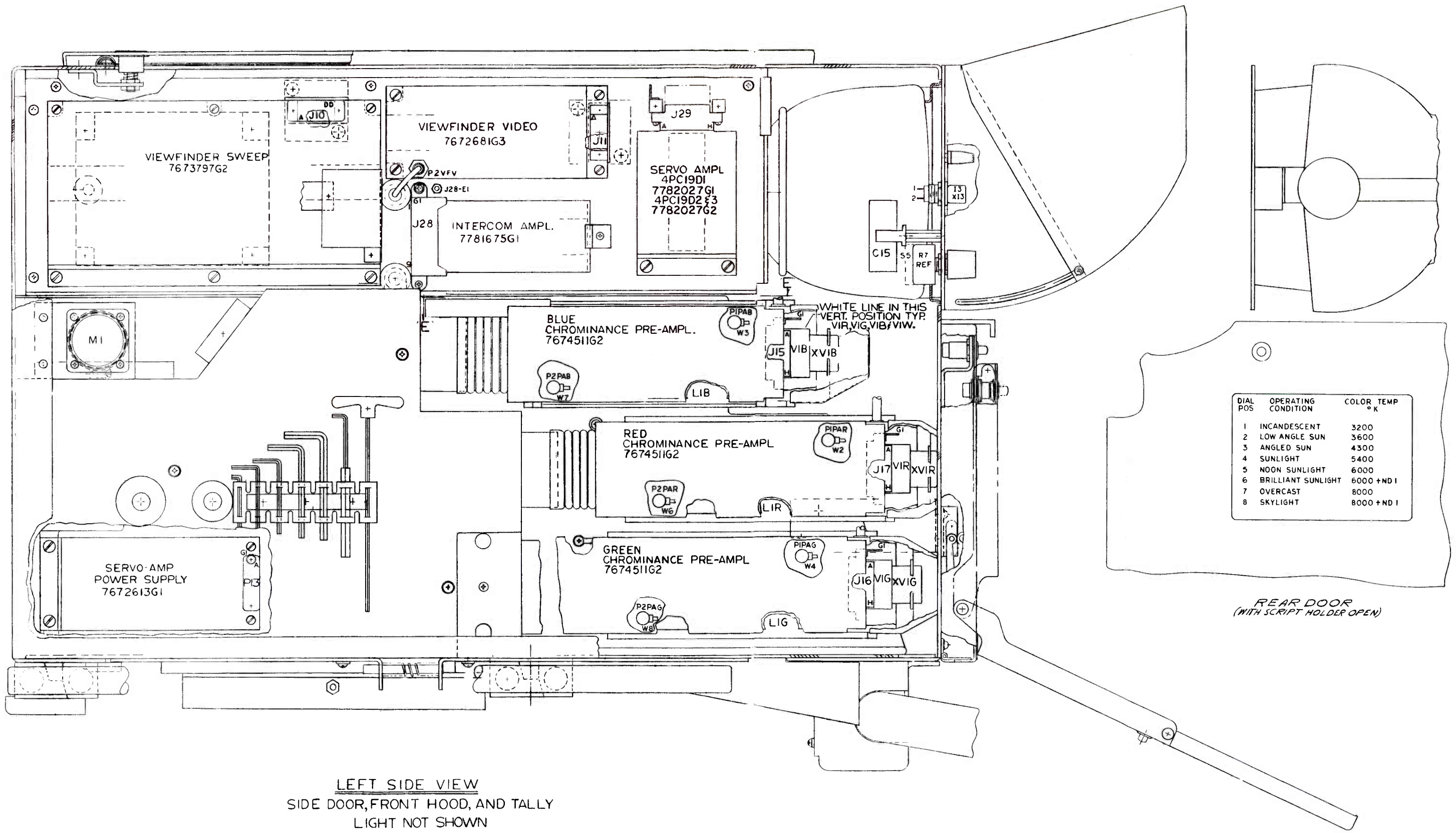
TIGHTEN LENS MOUNT THUMB SCREWS & REASSEMBLE LENS ACCESS COVER.

Fig. 2 Color Camera Outline Diagram (E-7355449, Sheet 2, Rev. B)



REAR VIEW
REAR DOOR NOT SHOWN

Fig. 3 Color Camera Outline Diagram (E-7355449, Sheet 3, Rev. D)



LEFT SIDE VIEW
SIDE DOOR, FRONT HOOD, AND TALLY
LIGHT NOT SHOWN

Fig. 4 Color Camera Outline Diagram (E-7355449, Sheet 4, Rev. F)

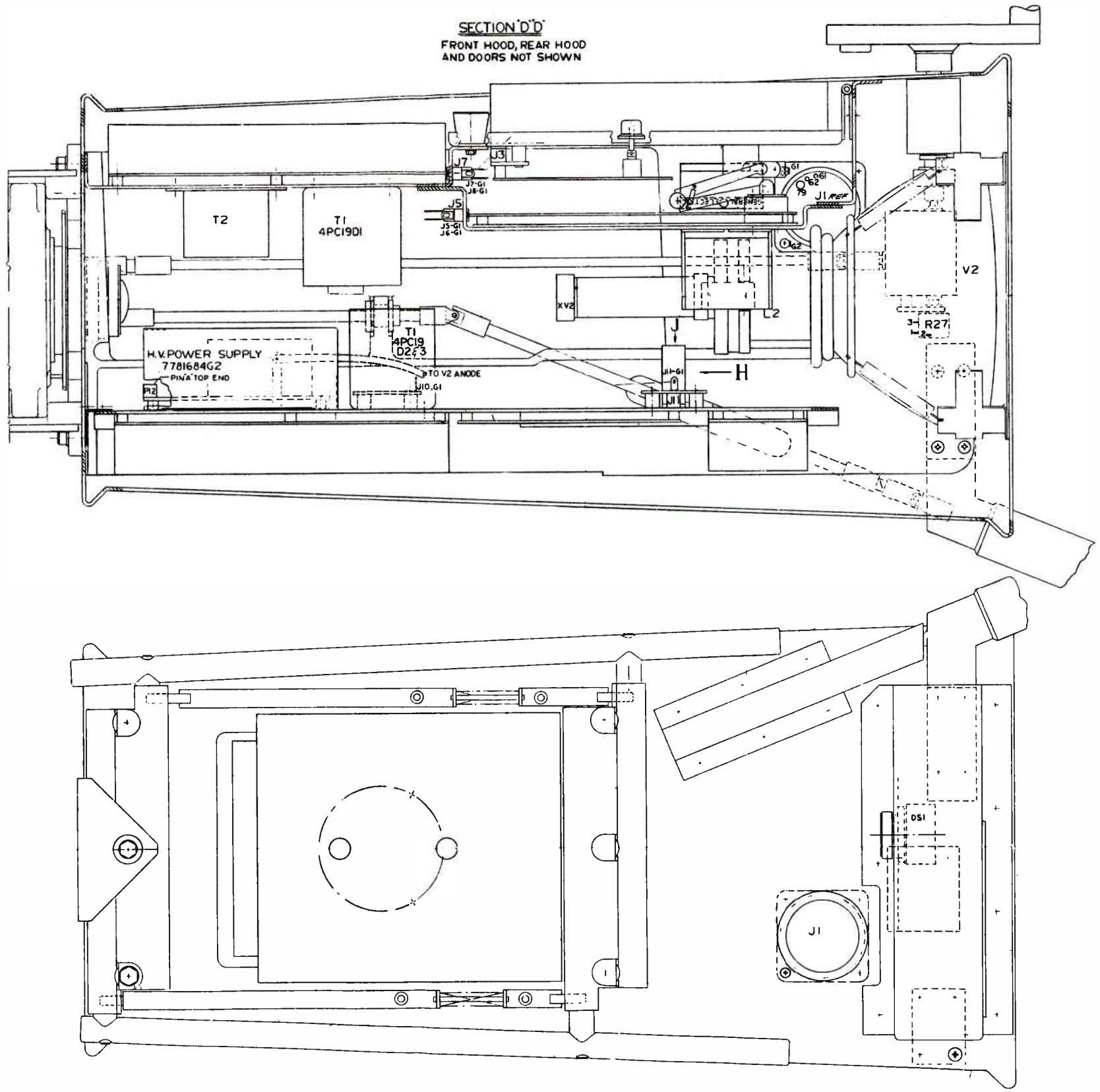


Fig. 5 Color Camera Outline Diagram (E-7355449, Sheet 5, Rev. C)

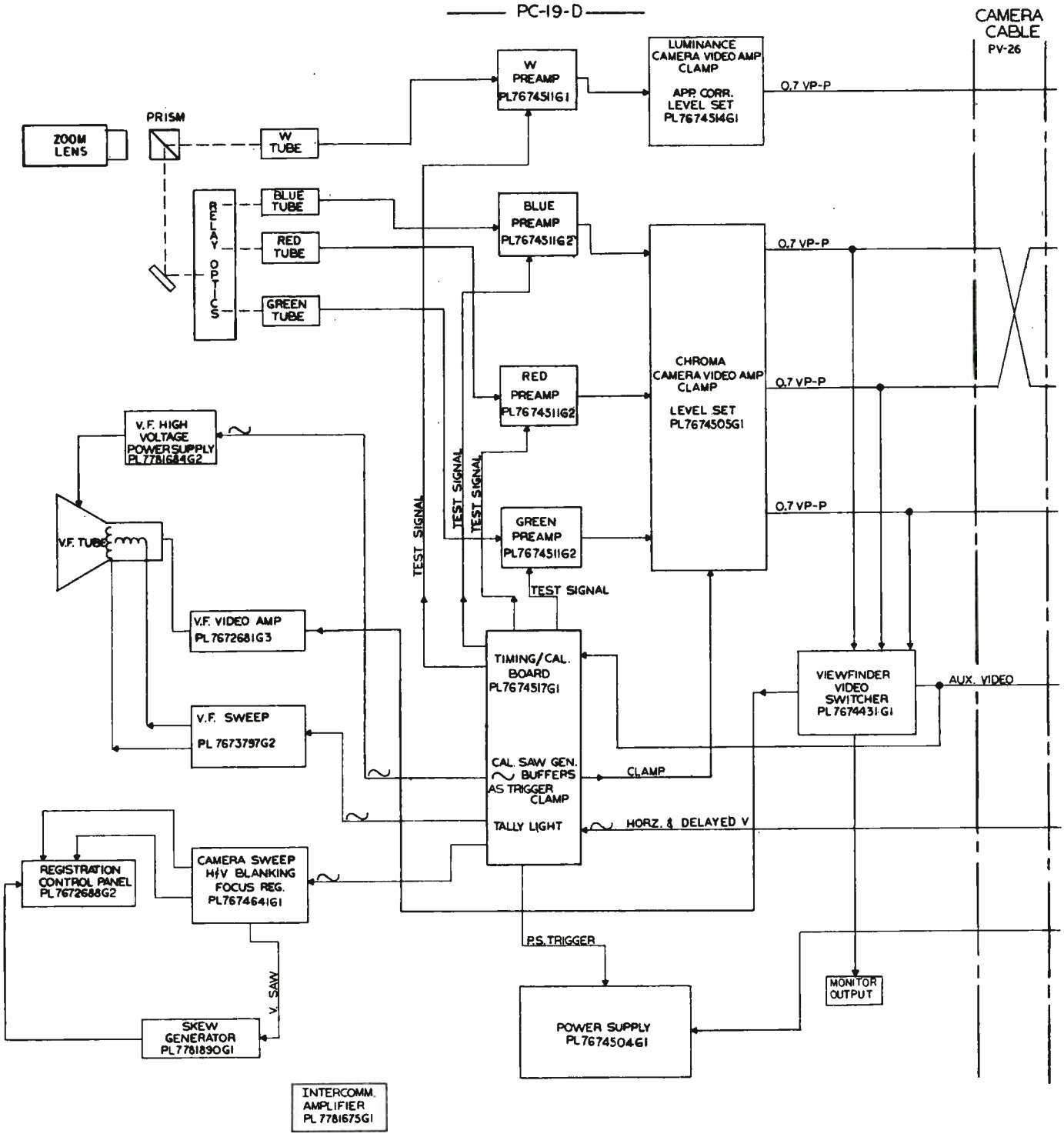


Fig. 6 Camera Block Diagram (Part of E-7355511)

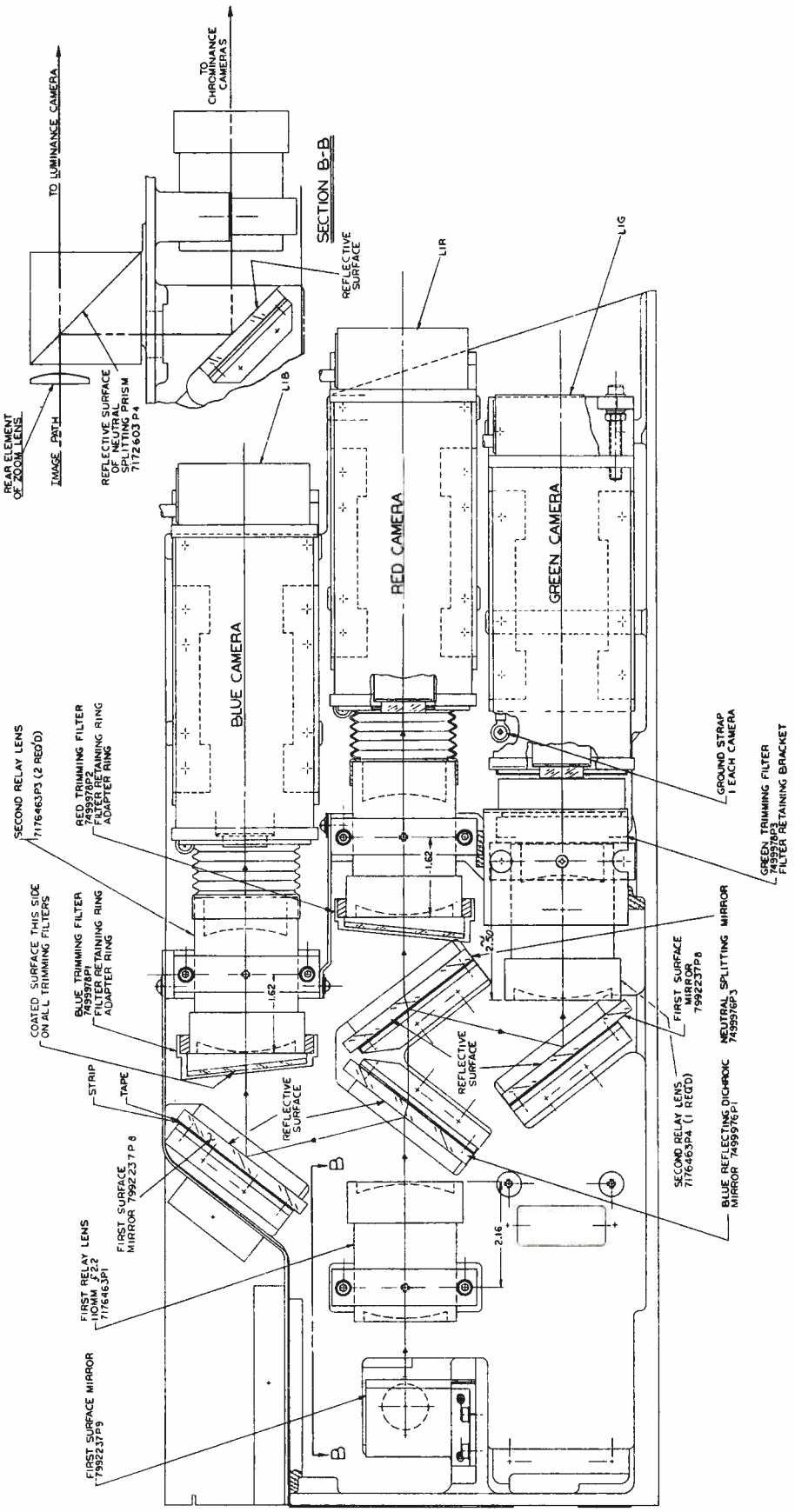


Fig. 7 Reduced Image Optical Assembly Diagram (D-7674522, Sheet 3, Rev. A)

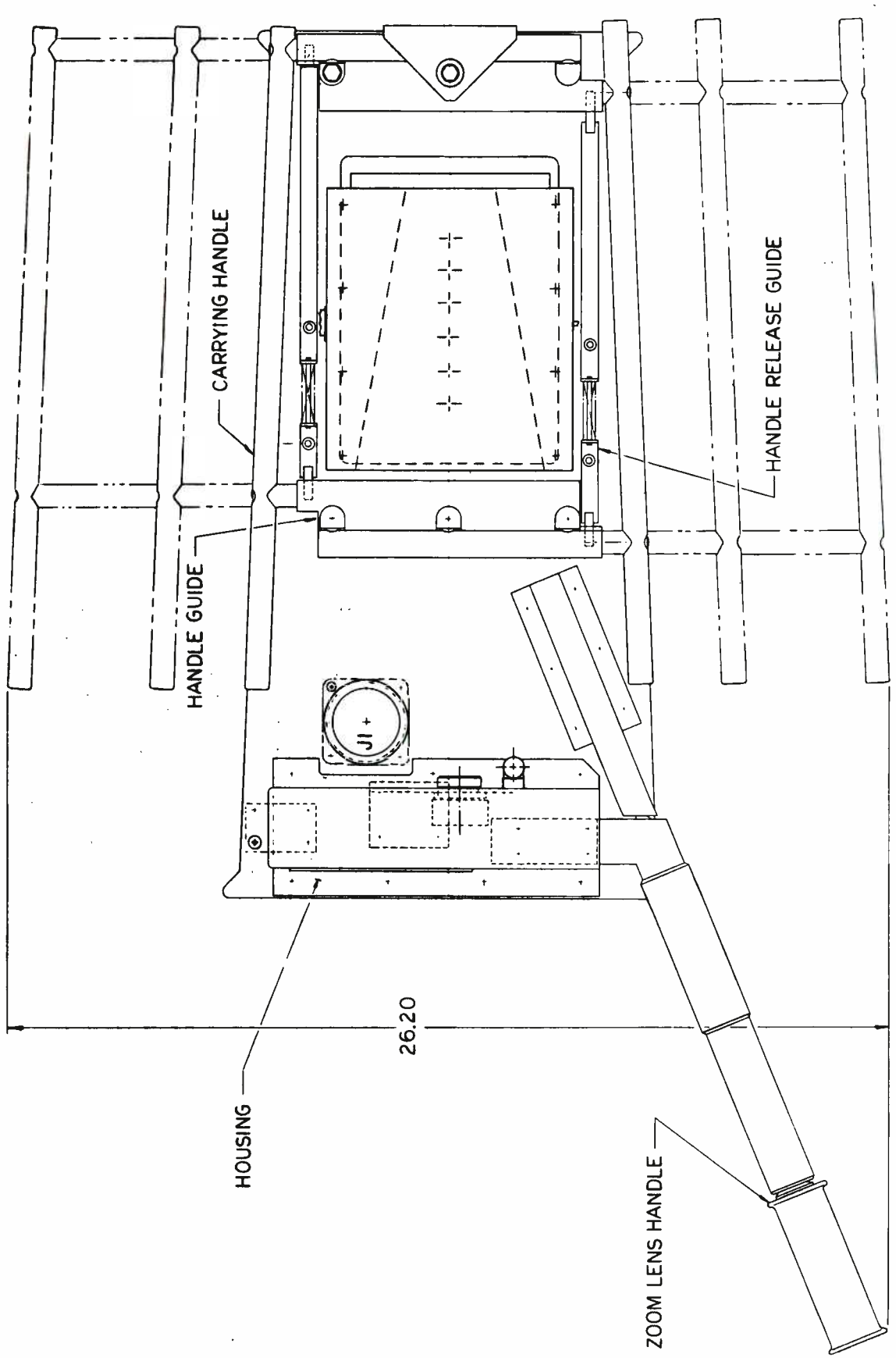


Fig. 8 Color Camera Outline Diagram (D-7674513, Sheet 3, Rev. A)

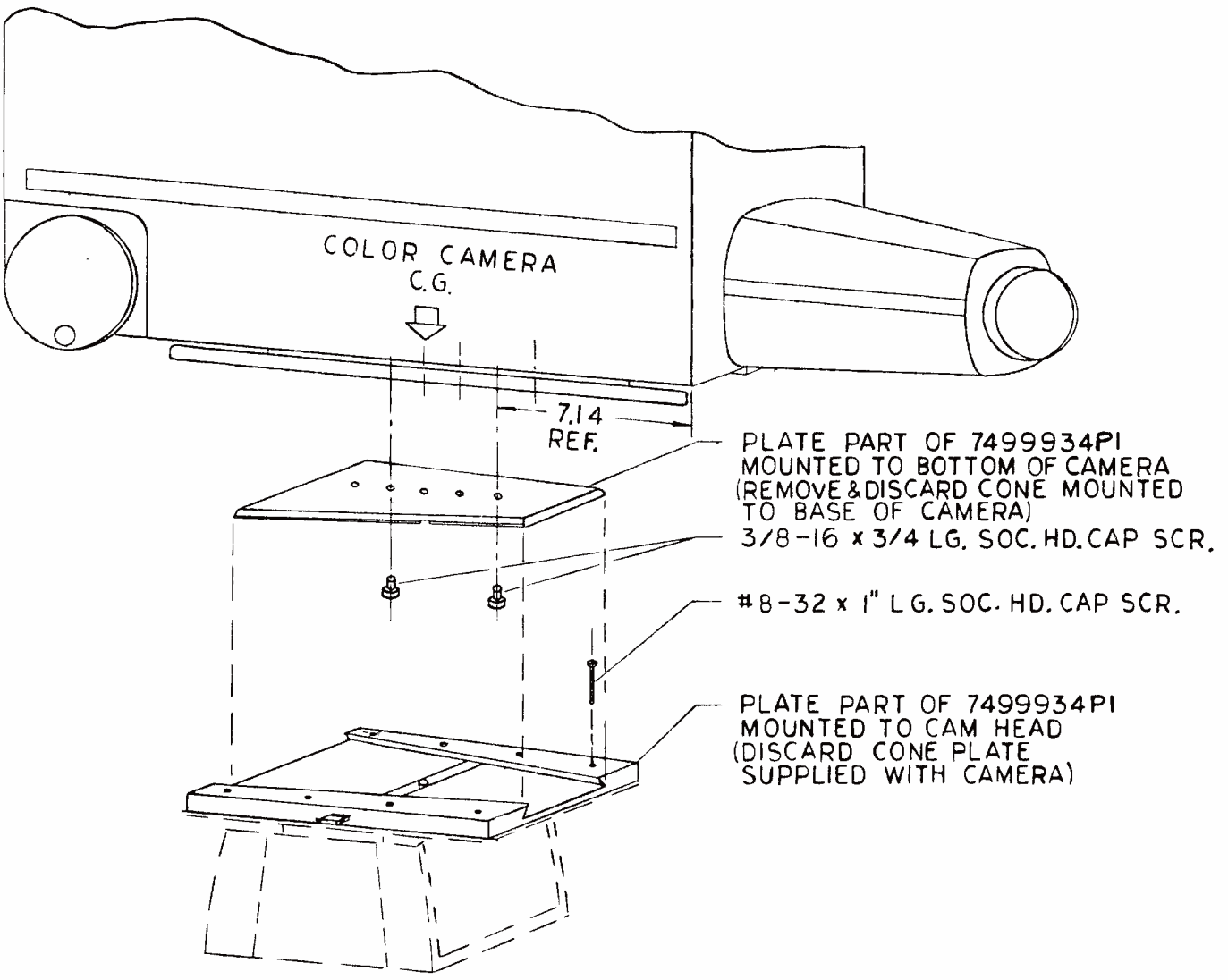


Fig. 9 Color Camera Houston-Fearless Mounting Diagram (B-7499942, Rev. A)

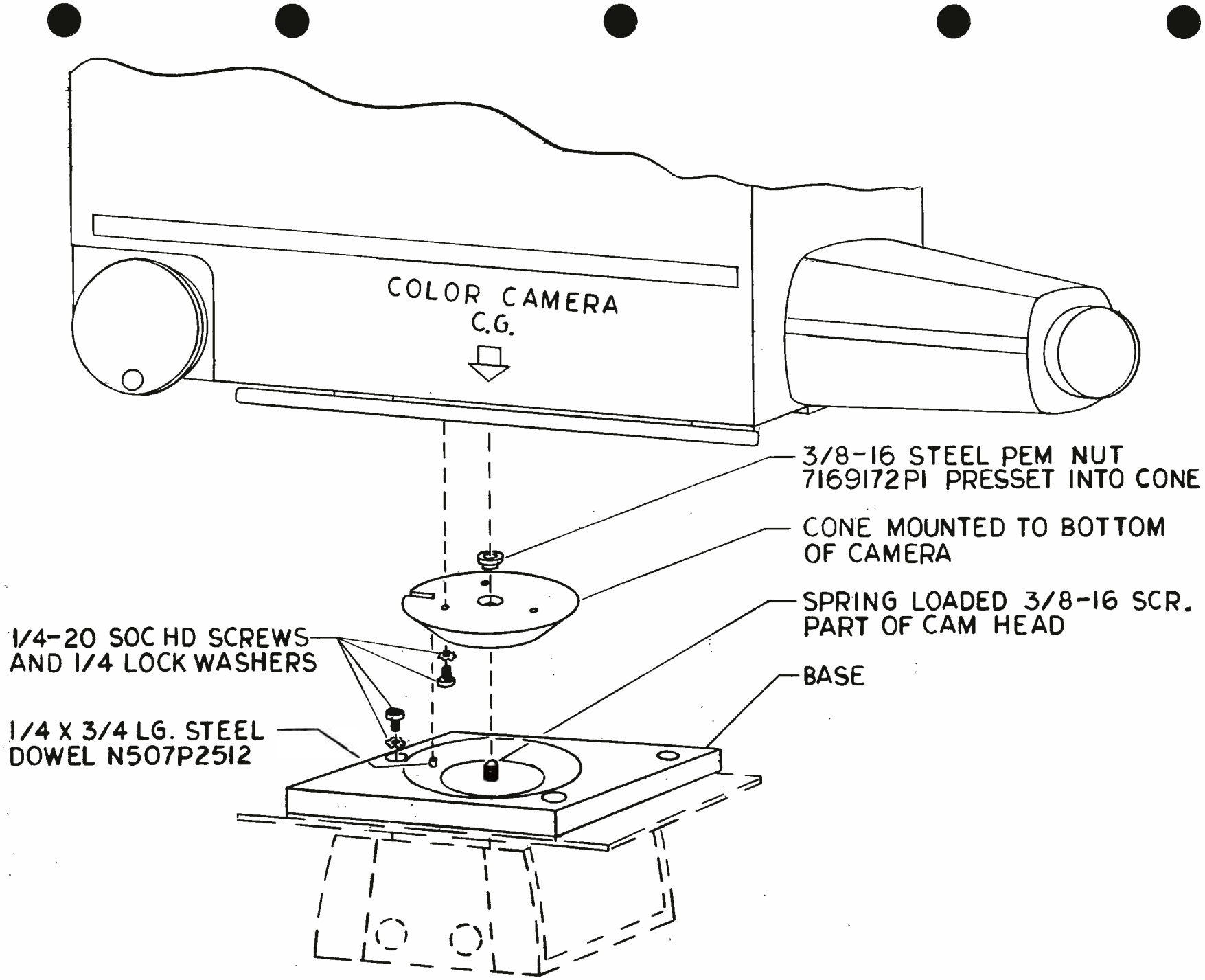


Fig. 10 Color Camera Cone Mounting Diagram (D-7674271, Sheet 3, Rev. A)

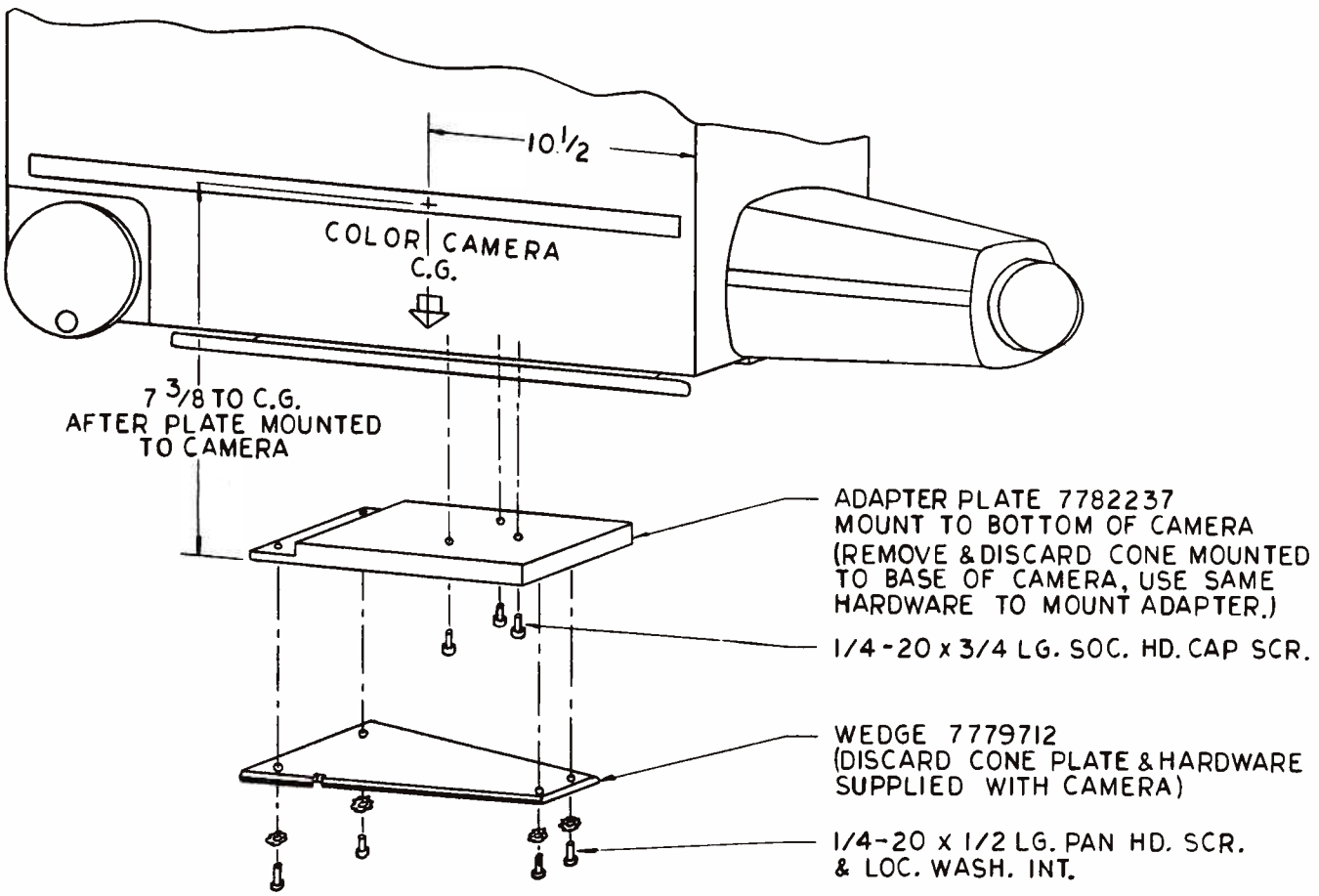


Fig. 11 Color Camera Vinton Wedge Mounting Diagram (B-7499949)

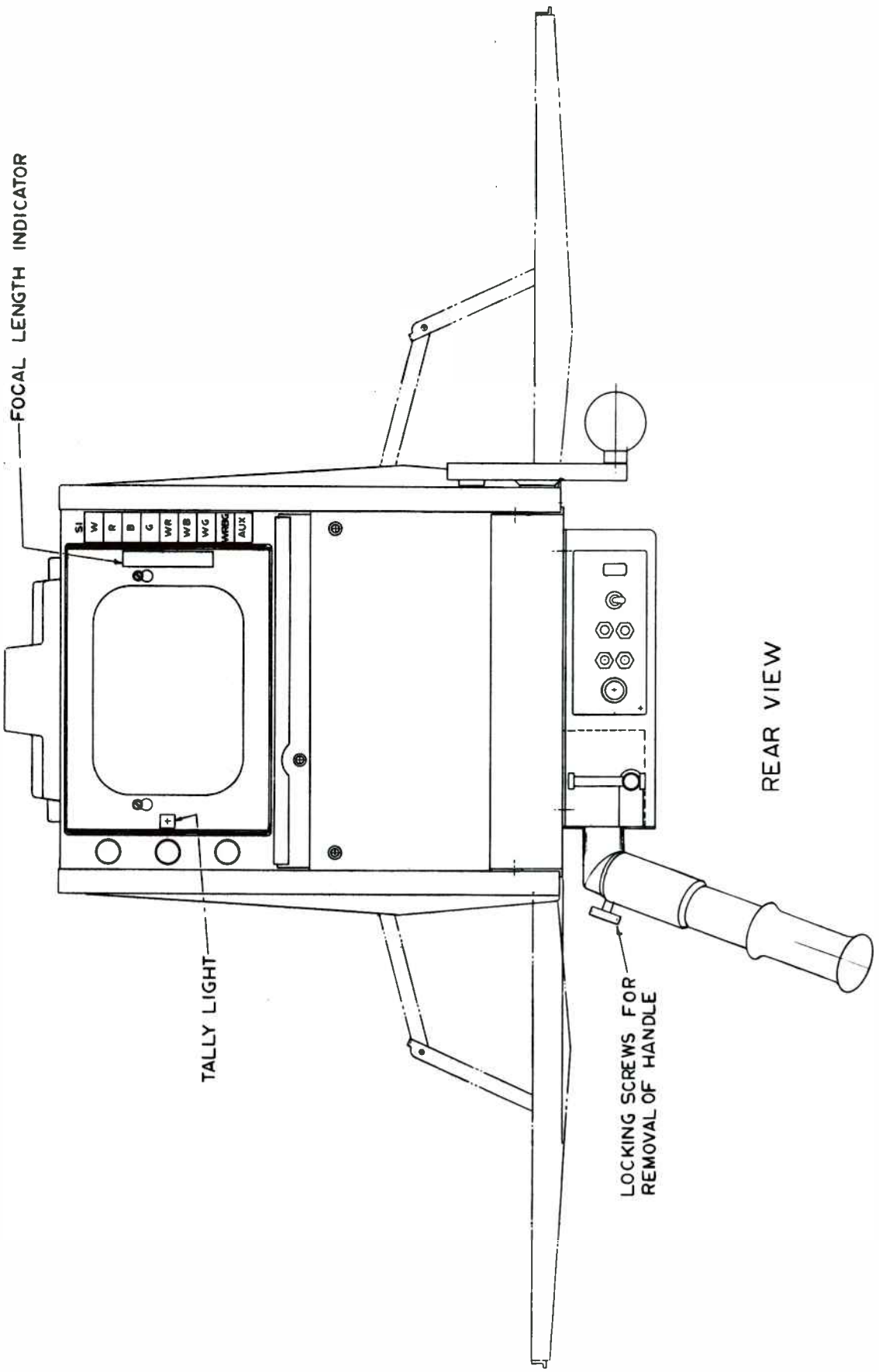


Fig. 12 Color Camera Outline Diagram (D-7674513, Sheet 2)

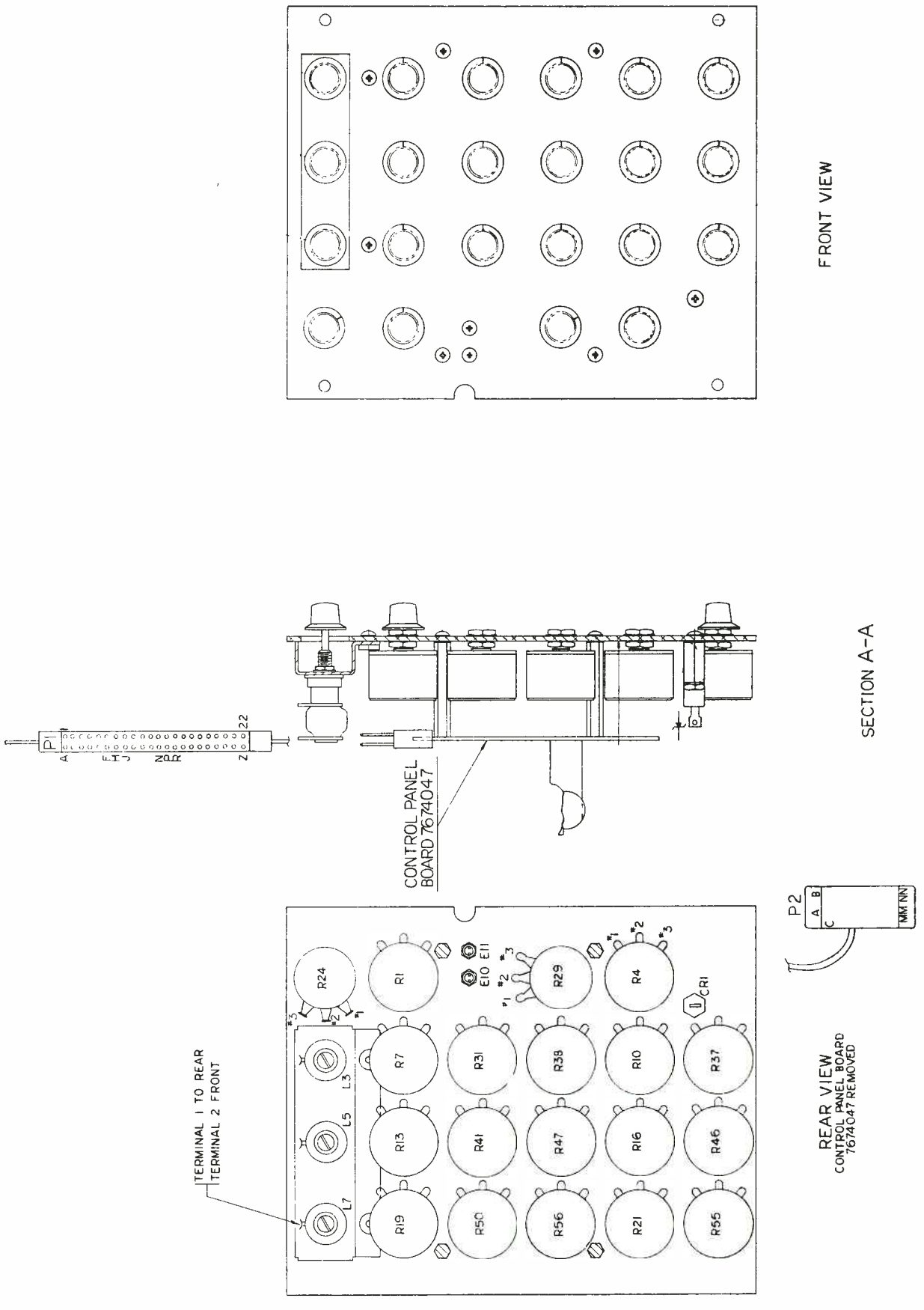


Fig. 13 Registration Control Panel Component Diagram (D-7672688, Rev. G)

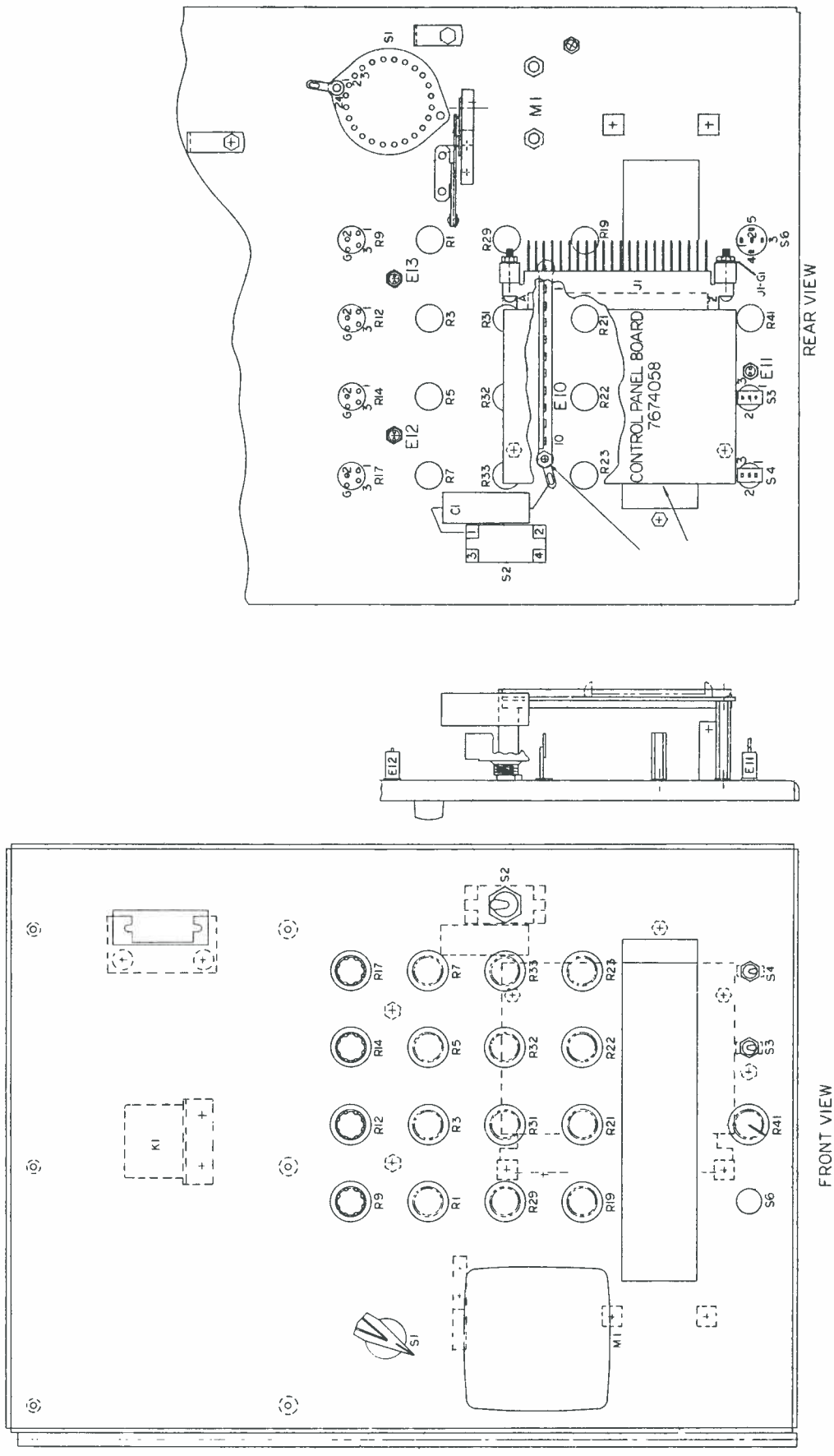
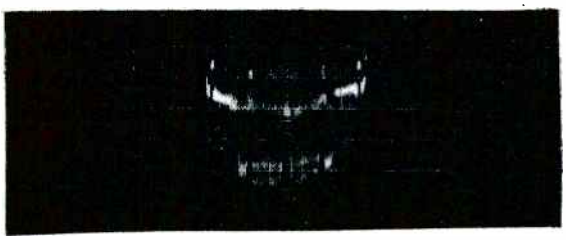
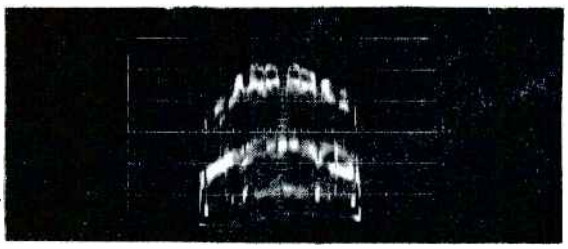


Fig. 14 Local Camera Control Panel Component Diagram (D-7674510, Rev. A)

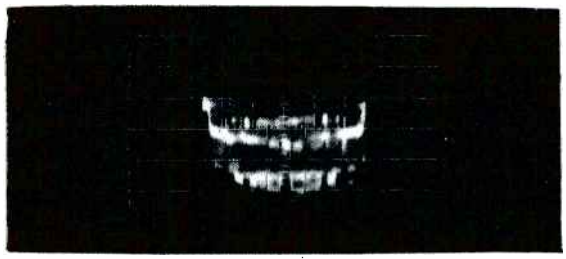


(a) Q8, Base, 0.35 volt P-P, H Rate

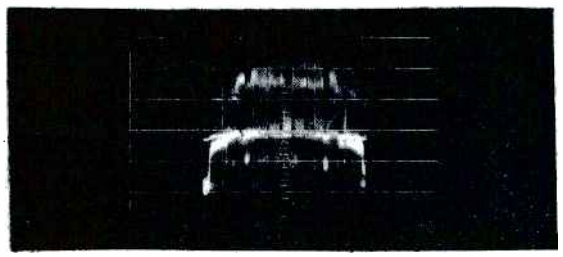


(b) J1, Output, 0.25 volt P-P, H Rate

LUMINANCE GROUP 1



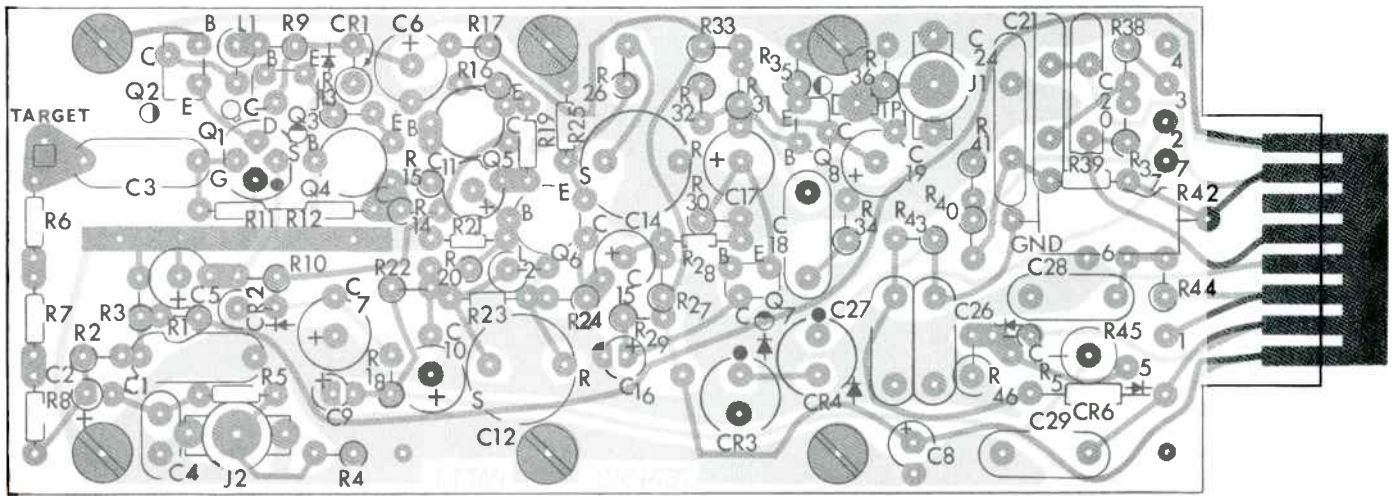
(e) Q8, Base, 0.25 volt P-P, H Rate



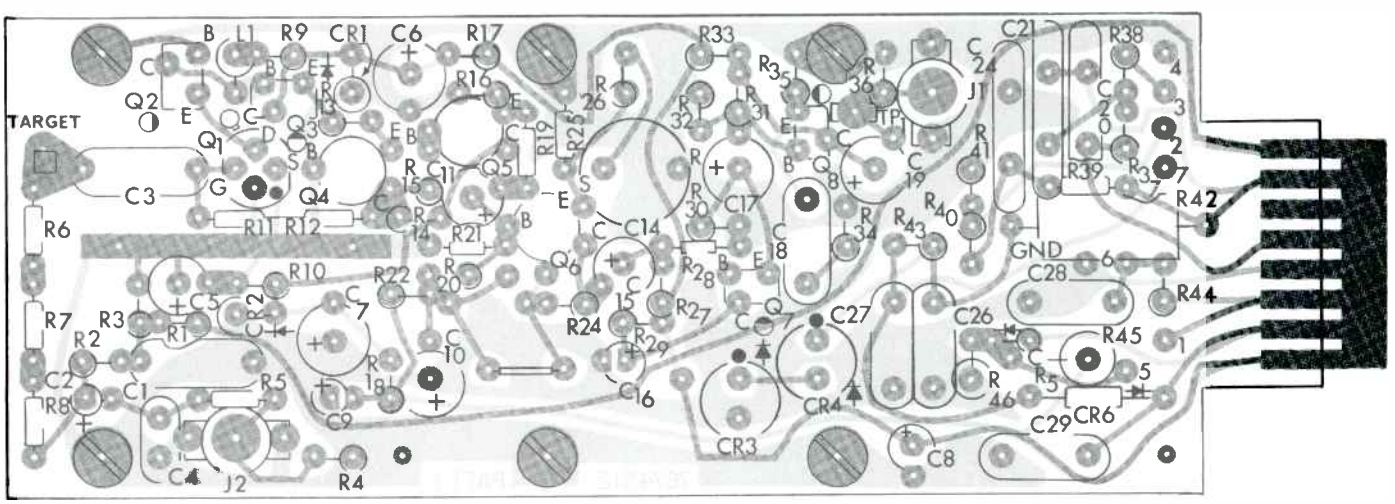
(f) J1, Output, 0.25 volt P-P, H Rate

BLUE GROUP 2

Fig. 15 Preamplifier Board Waveforms: Q8, J1

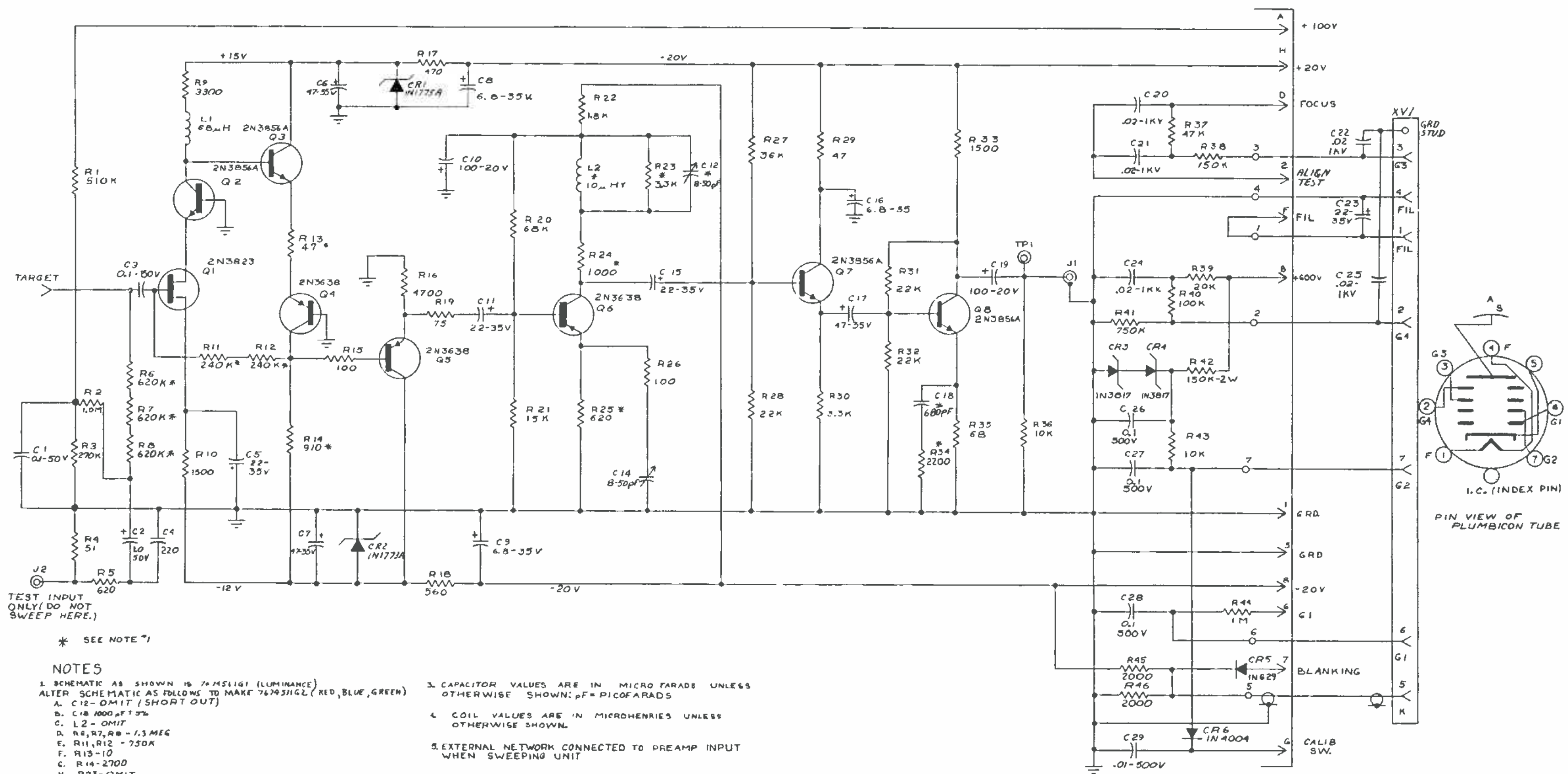


(MARKING FOR PT 3 GROUP 1)



(MARKING FOR PT 4 GROUP 2)

Fig. 16 Preamplifier Board Printed Circuit Diagram (D-7674512, Patt. E, Rev. D)



* SEE NOTE \#1

NOTES

1. SCHEMATIC AS SHOWN IS 7674511G1 (LUMINANCE). ALTER SCHEMATIC AS FOLLOWS TO MAKE 7674511G2 (RED, BLUE, GREEN)
   A. C12 - OMIT (SHORT OUT)
   B. C18 1000 pF ± 5%
   C. L2 - OMIT
   D. R6, R7, R8 - 1.3 MEG
   E. R11, R12 - 750K
   F. R13 - 10
   G. R14 - 2700
   H. R23 - OMIT
   J. R24 - 2000
   K. R34 - 910
   L. R25 - 430
2. RESISTOR VALUES ARE IN OHMS; 1/4 WATT UNLESS OTHERWISE SHOWN: K = 100 OHMS MEG = 1,000,000 OHMS
3. CAPACITOR VALUES ARE IN MICRO FARADS UNLESS OTHERWISE SHOWN: pF = PICOFARADS
4. COIL VALUES ARE IN MICROHENRIES UNLESS OTHERWISE SHOWN.
5. EXTERNAL NETWORK CONNECTED TO PREAMP INPUT WHEN SWEEPING UNIT

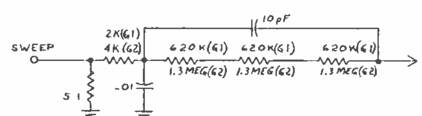
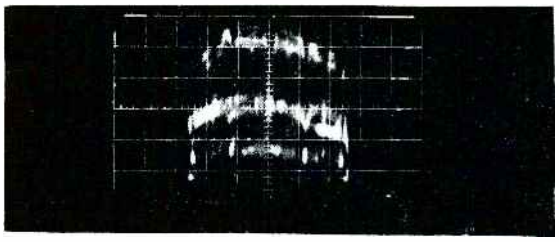
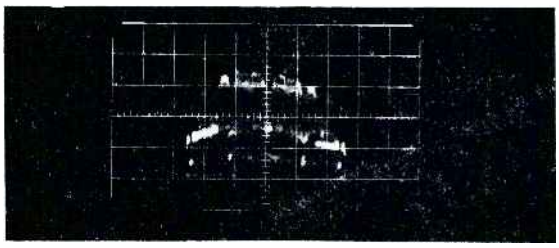


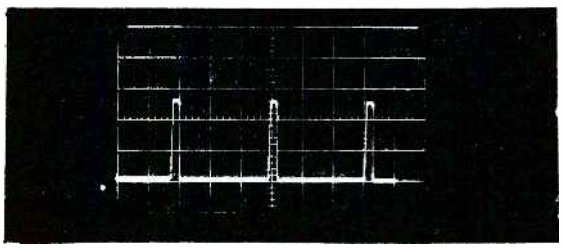
Fig. 17 Preamplifier Board Schematic Diagram (D-7674523, Rev. A)



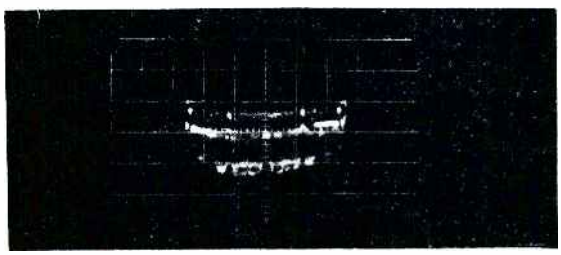
(a) J1, Input, 0.3 volt P-P, H Rate



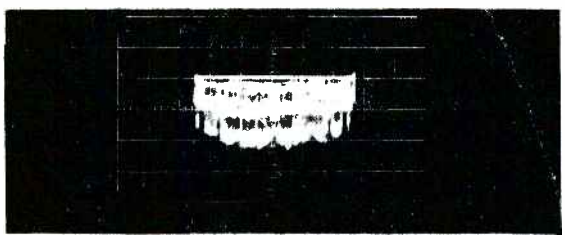
(b) Q1, 0.17 volt P-P, H Rate (Depends on Setting of Gain Control)



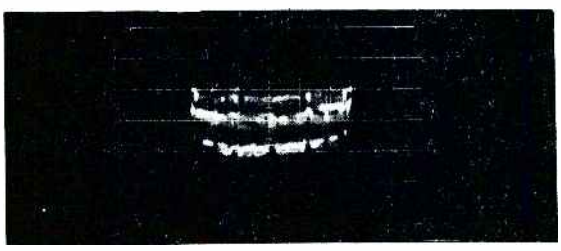
(c) Q3, Base, Clamp Pulse, 5.0 volts P-P, H Rate



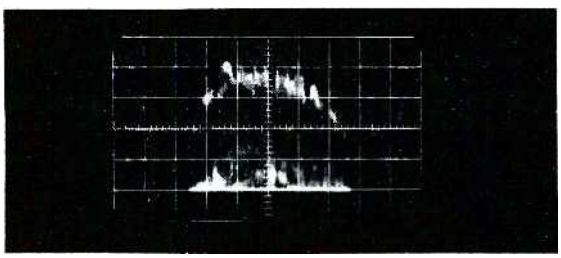
(d) Q2, Base, 1.5 volts P-P, H Rate



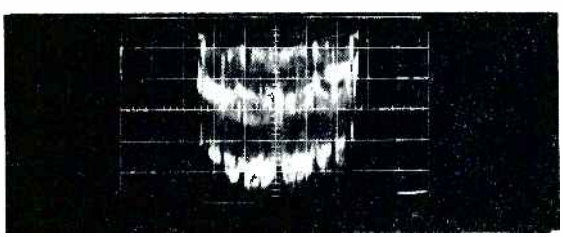
(e) Q4, Base, 1.2 volts P-P, H Rate



(f) Q5, Emitter, 1.2 volts P-P, H Rate

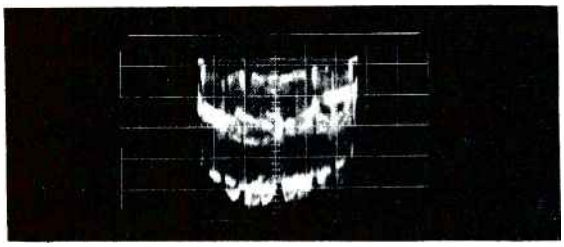


(g) Q7, Base, 2.0 volts P-P, H Rate (Typical Value Depends on Setting of Aperture Correction Control)

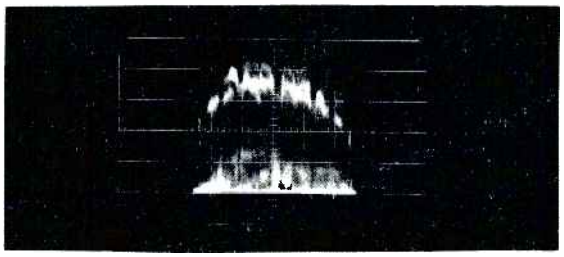


(h) Q8, Base, 1.0 volt P-P, H Rate

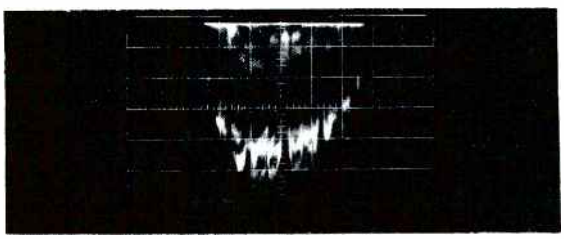
Fig. 18 Luminance Video Amplifier Board Waveforms: J1, Q1, Q2, Q3, Q4, Q5, Q7, Q8



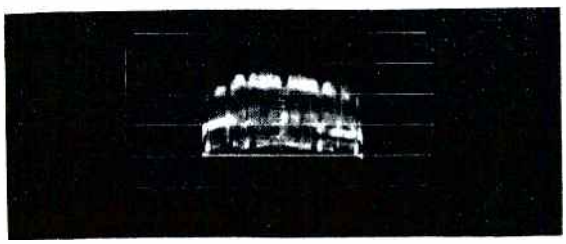
(a) Q9, Base, 0.6 volt P-P, H Rate



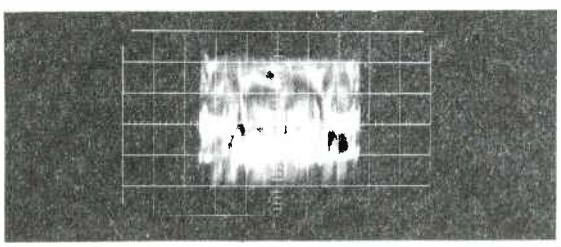
(b) Q10, Base, 2.0 volts P-P, H Rate (Typical Value Depends on Setting of Aperture Correction Control)



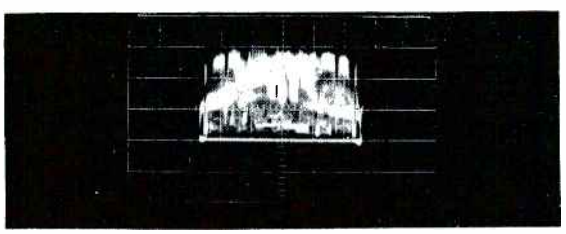
(c) Q11, Base, 3.0 volts P-P, H Rate (Typical Value Depends on Setting of Aperature Balance Control)



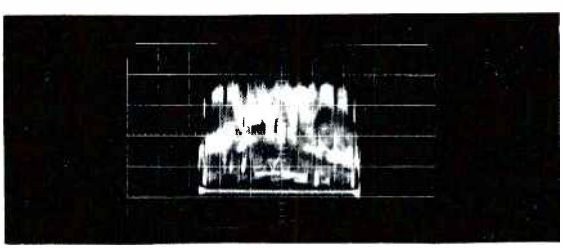
(d) Q12, Base, 2.0 volts P-P, H Rate



(e) Q13, Base, 0.15 volt P-P, H Rate



(f) Q13, Collector, 1.5 volts P-P, H Rate



(g) Pin C, Output #2, 0.7 volt P-P H Rate

Fig. 19 Luminance Videc Amplifier Board Waveforms: Q9, Q10, Q11, Q12, Q13, Pin C

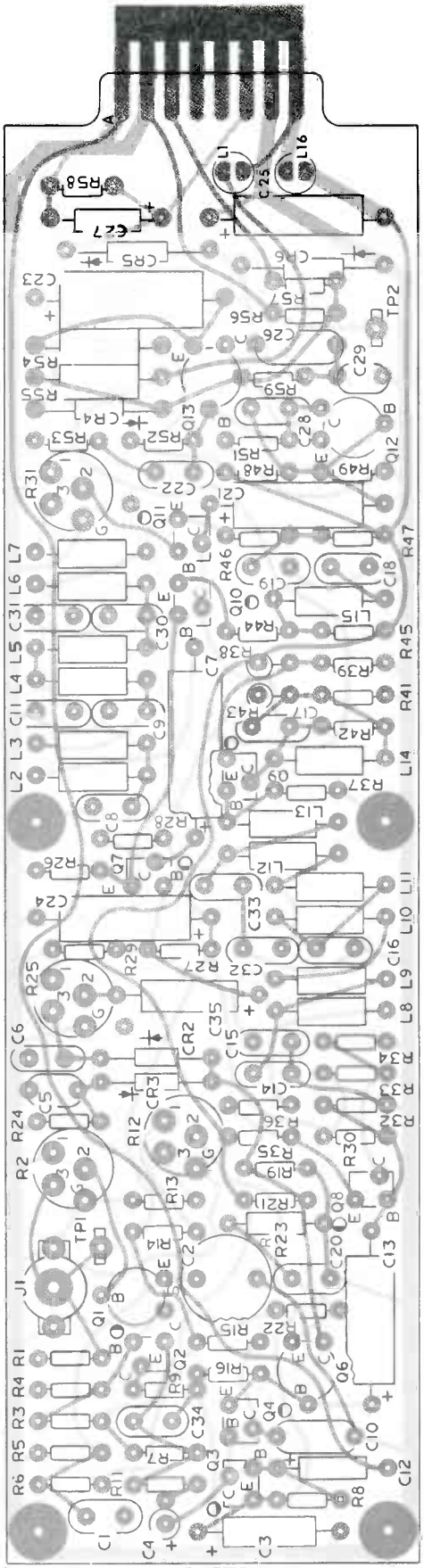
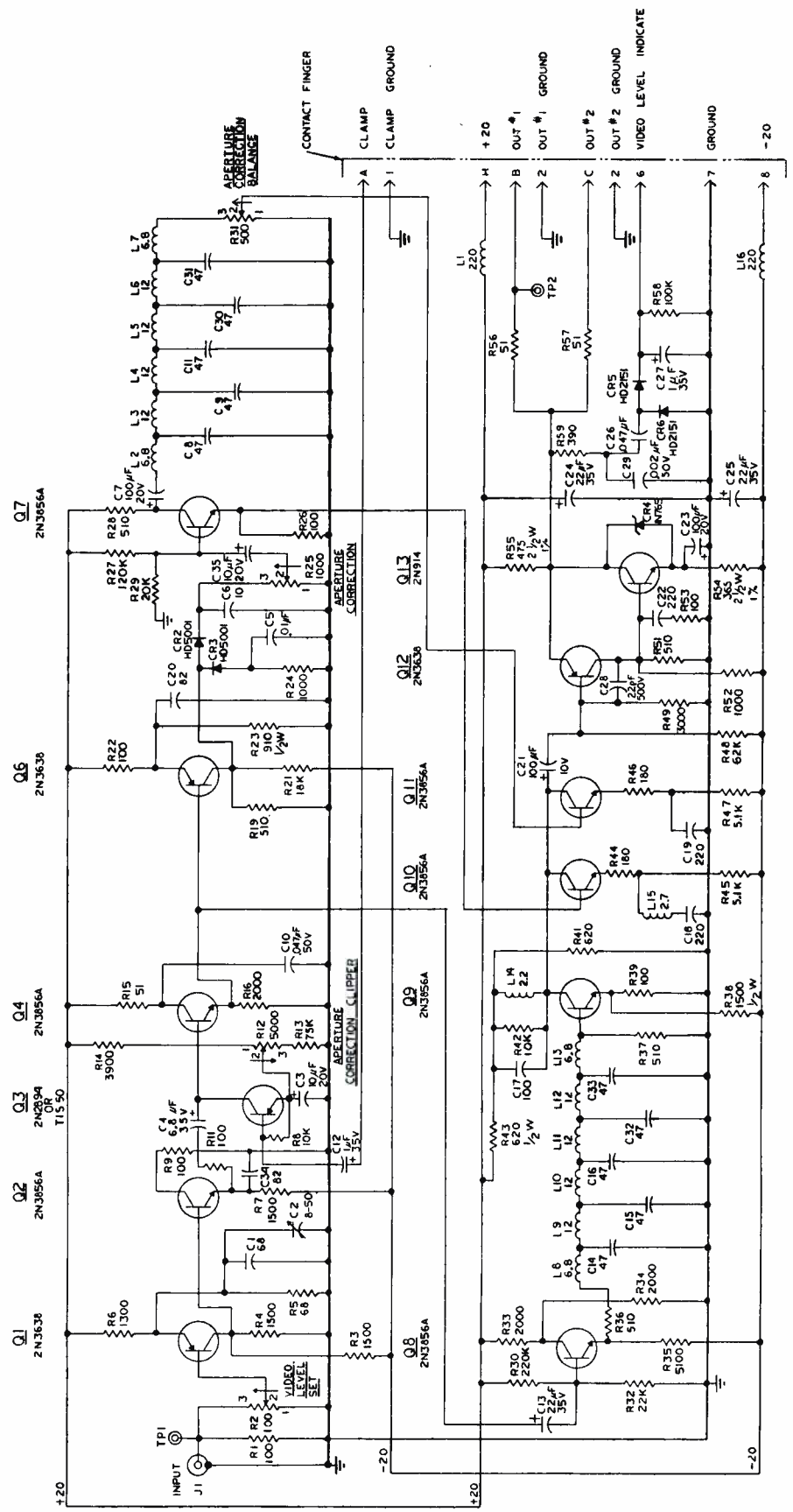
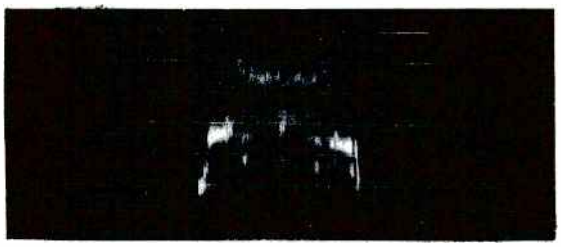


Fig. 20 Luminance Video Amplifier Board Printed Circuit Diagram (D-7674515, Patt D, Rev. D)

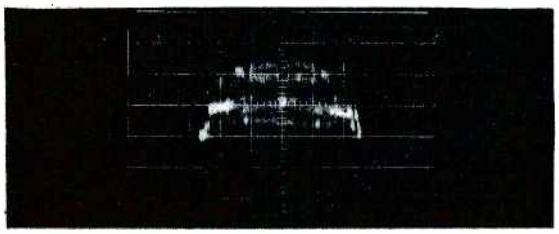


NOTES:
1. RESISTOR VALUES ARE IN OHMS AND ¼ WATT UNLESS OTHERWISE SHOWN. K = 1000 OHMS
2. CAPACITOR VALUES ARE IN PICOFARADS UNLESS OTHERWISE SHOWN. μF = MICROFARADS
3. COIL VALUES ARE IN MICROHENRIES UNLESS OTHERWISE SHOWN.

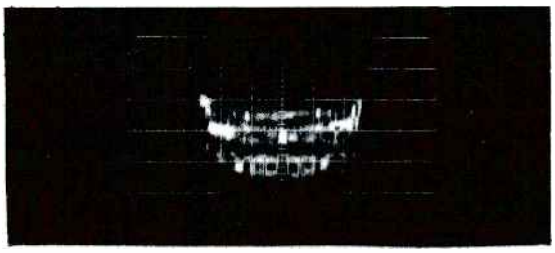
Fig. 21 Luminance Video Amplifier Board Schematic Diagram (D-7674516, Rev. C)



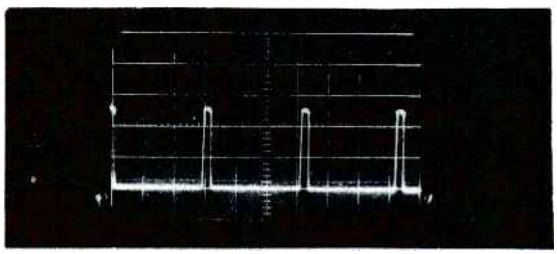
(a) J201, Blue Video Input 0.50 volt P-P H Rate



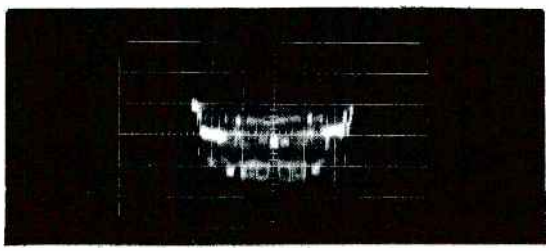
(b) Q201, Base, 0.15 volt P-P, H Rate (Depends on Setting of Gain Control)



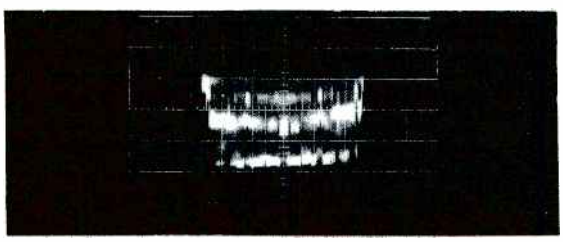
(c) Q202, Base, 1.5 volts P-P, H Rate



(d) Q203, Base, Clamp Pulse, 5.0 volts P-P, H Rate

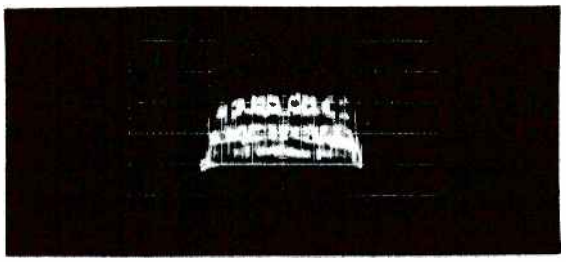


(e) Q204, Base, 1.5 volts P-P, H Rate

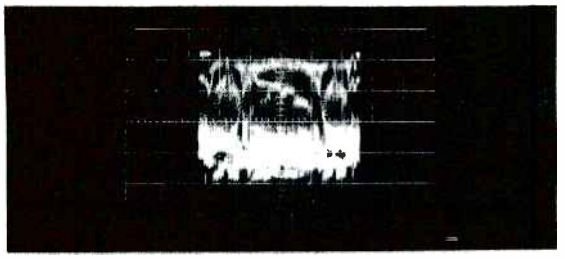


(f) Q206, Base, 1.5 volts P-P, H Rate

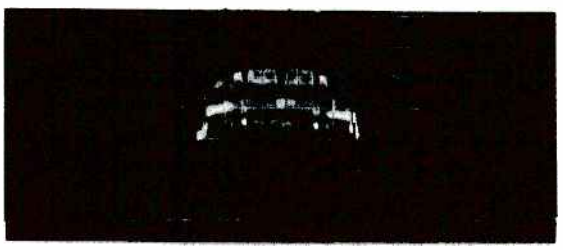
Fig. 22 Chrominance Video Amplifier Board Blue Waveforms: J201, Q201, Q202, Q203, Q204, Q206



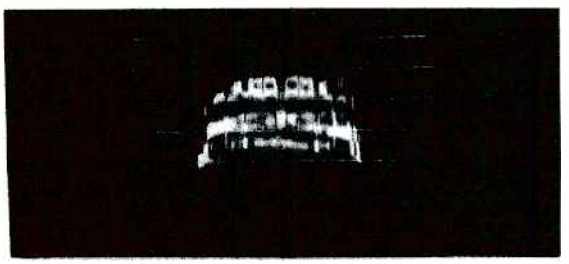
(a) Q207, Base, 1.3 volts P-P, H Rate



(b) Q208, Base, 0.25 volt P-P, H Rate



(c) Junction of R233 and R234, (Q208, Collector), 1.5 volts P-P, H Rate



(d) Pin J, Blue Video Output #2, 0.70 volt P-P, H Rate

Fig. 23 Chrominance Video Amplifier Board Blue Waveforms: Q207, Q208

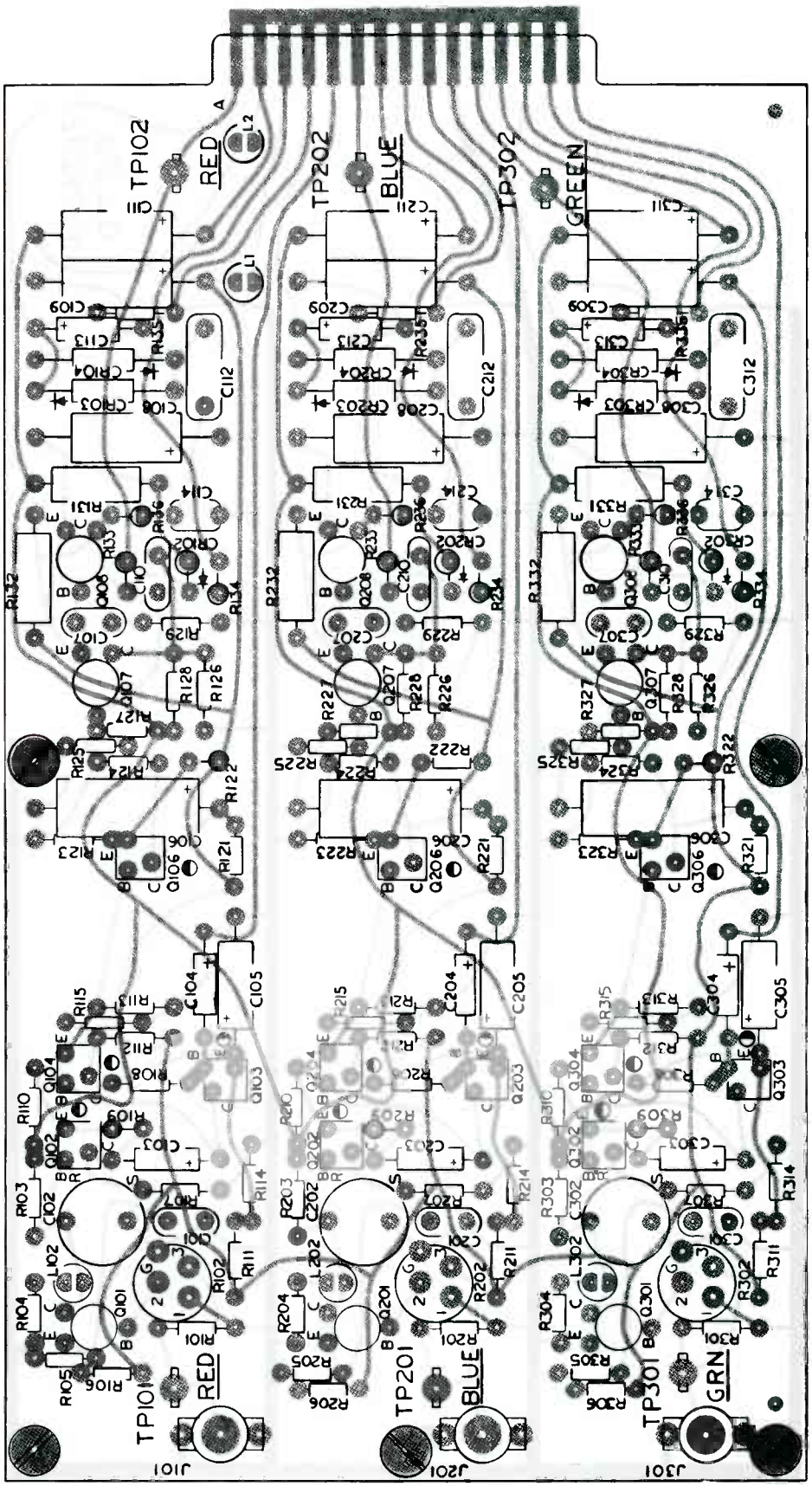
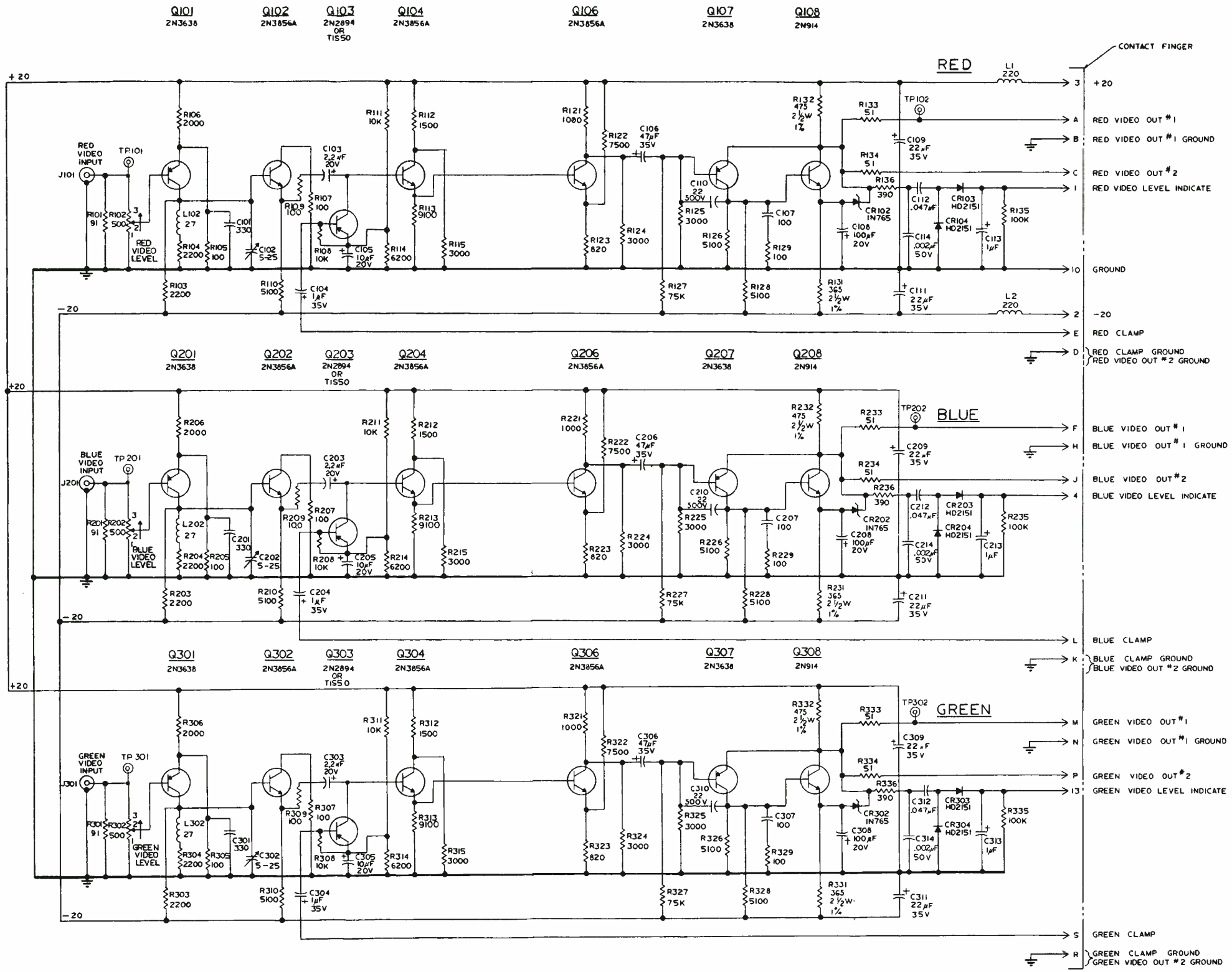
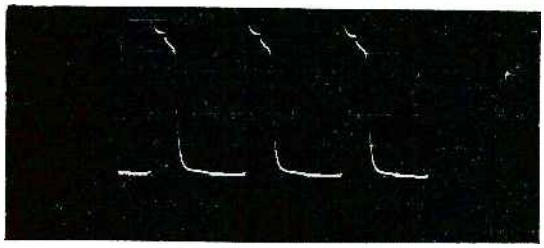


Fig. 24 Chrominance Video Amplifier Board Printed Circuit Diagram (D-7674506, Patt D, Rev. E)

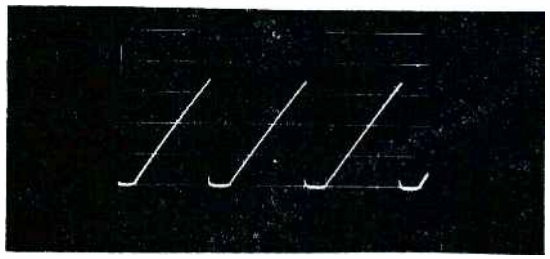


NOTES:
1. RESISTOR VALUES ARE IN OHMS AND ¼ WATT UNLESS OTHERWISE SHOWN. K=1000 OHMS
2. CAPACITOR VALUES ARE IN PICOFARADS UNLESS OTHERWISE SHOWN. μF = MICROFARADS
3. COIL VALUES ARE IN MICROHENRIES UNLESS OTHERWISE SHOWN.

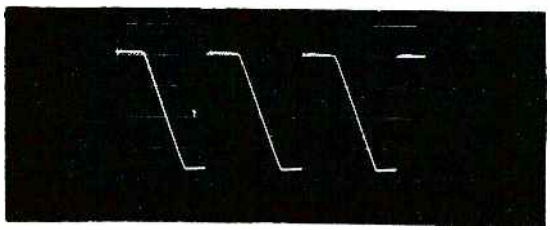
Fig. 25 Chrominance Video Amplifier Board Schematic Diagram (E-7355445, Rev. D)



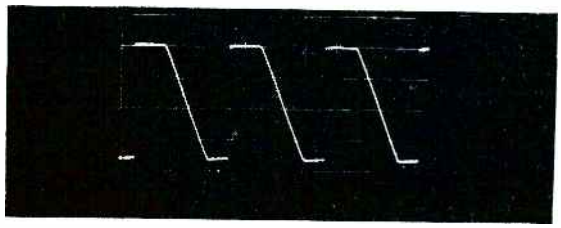
(a) Q1, Base, 1.0 volt P-P, H Rate



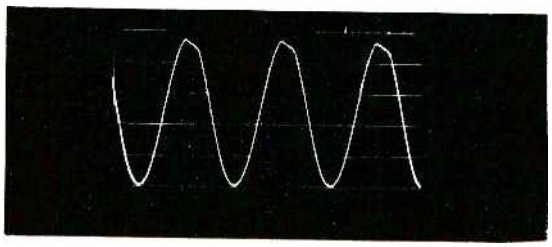
(b) Q2, Base, 3.5 volts P-P, H Rate



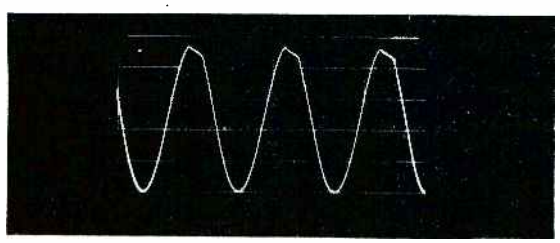
(c) Q3, Base, 0.75 volt P-P, H Rate



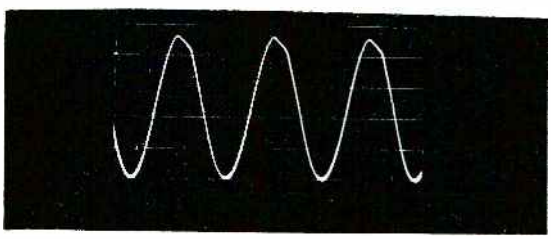
(d) TP1, 0.75 volt P-P, H Rate



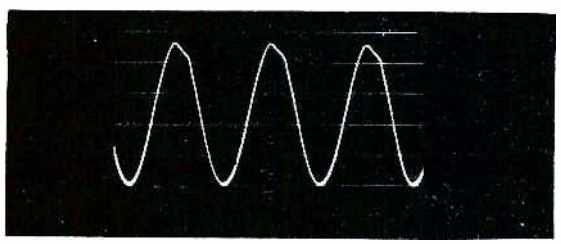
(e) Q4, Base, 24 volts P-P, H Rate



(f) Q4, Emitter, 24 volts P-P, H Rate

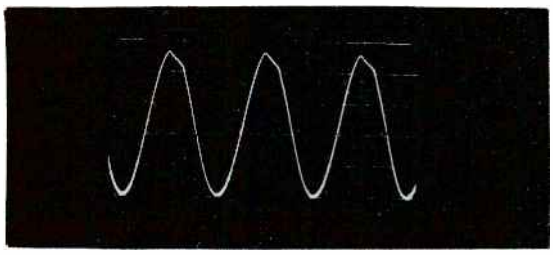


(g) Q5, Base, 24 volts P-P, H Rate

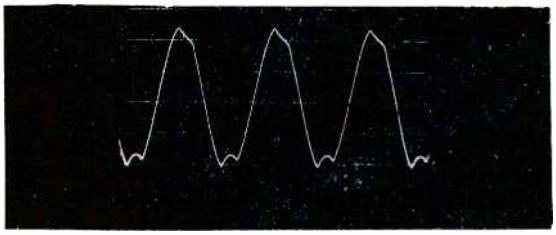


(h) Q5, Emitter, 24 volts P-P, H Rate

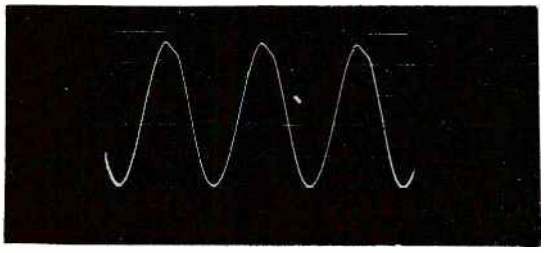
Fig. 26 Timing and Calibration Generator Board Waveforms: Q1, Q2, Q3



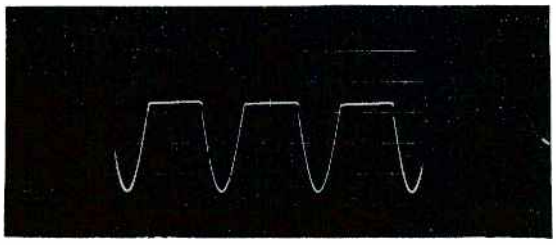
(a) Q6, Base, 24 volts P-P, H Rate



(b) Q6, Emitter, 24 volts P-P, H Rate

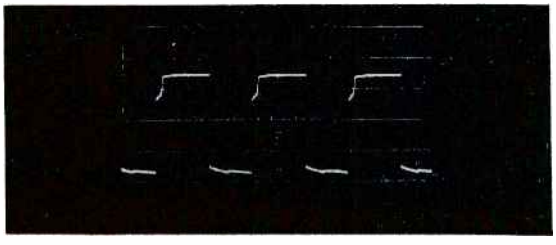


(c) Q7, Base, 24 volts P-P, H Rate

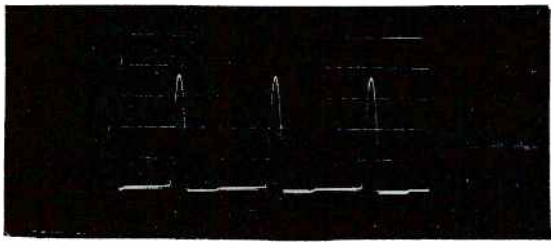


(d) Q8, Base, 6.0 volts P-P, H Rate

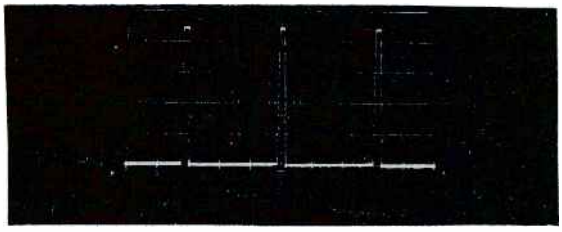
(e) Q9, Base, 20 volts P-P, H Rate



(f) Q10, 3.0 volts P-P, H Rate

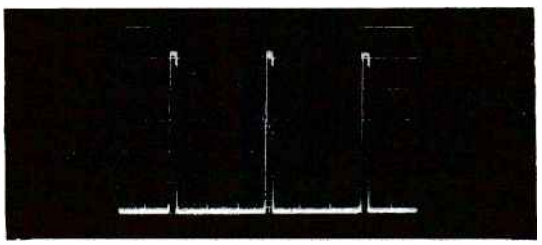


(g) Q10, Collector, 38 volts P-P, H Rate

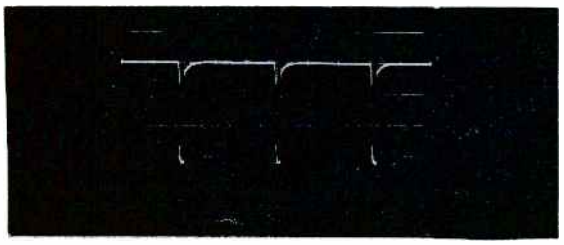


(h) Q11, Base, 9.0 volts P-P, H Rate

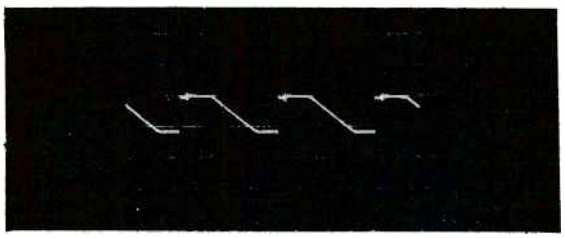
Fig. 27 Timing and Calibration Generator Board Waveforms: Q6, Q7, Q8, Q9, Q10, Q11



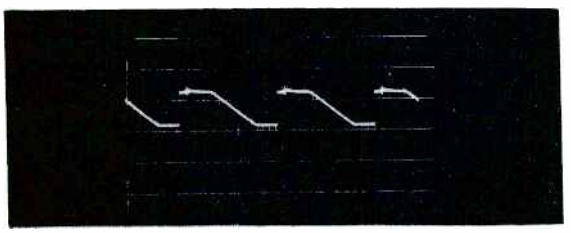
(a) Q11, Emitter, Pin 1 Clamp, 5.0 volts P-P, H Rate



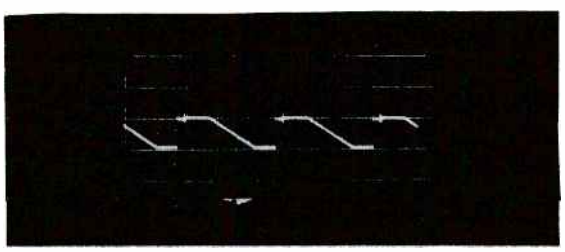
(b) Q11, Collector, Power Supply Trigger, 15 volts P-P, H Rate



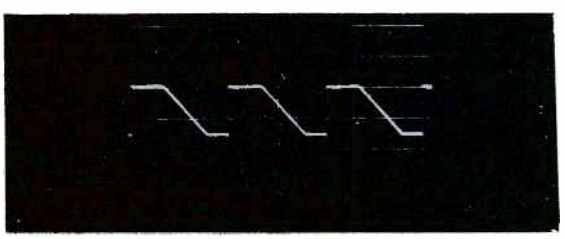
(c) Pin 13, Green Test, 0.06 volt P-P, H Rate



(d) Pin P, Blue Test, 0.05 volt P-P, H Rate



(e) Pin R, Red Test, 0.06 volt P-P H Rate



(f) Pin 14, White Test, 0.07 volt P-P, H Rate

Fig. 28 Timing and Calibration Generator Board Waveforms: Q11, Pin 13, Pin P, Pin R, Pin 14

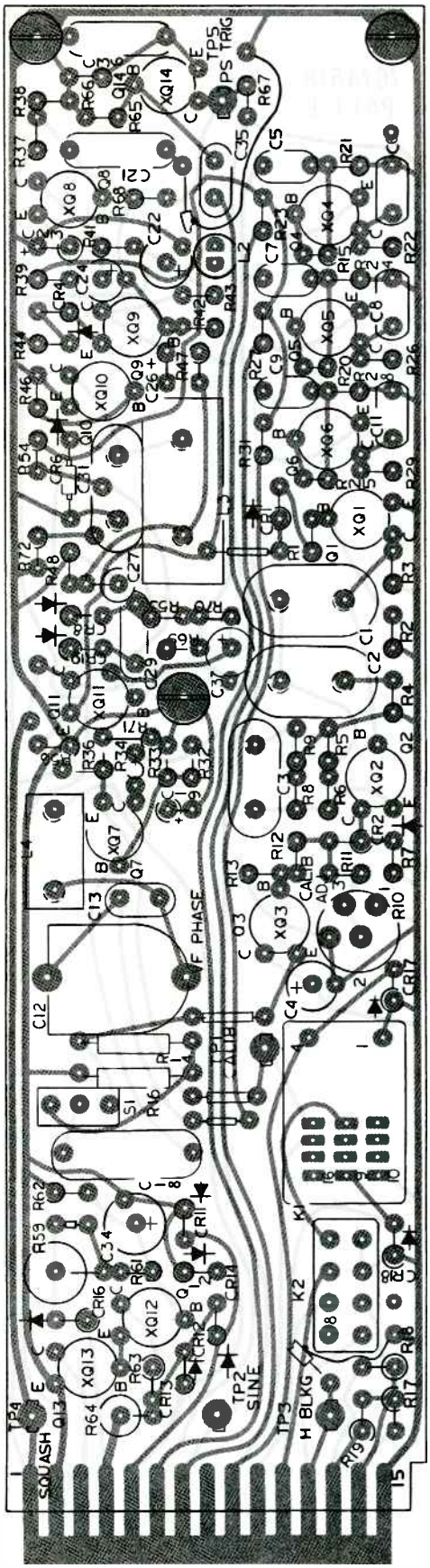


Fig. 29 Timing and Calibration Generator Board Printed Circuit Diagram (D-7674518, Patt E, Rev. B)

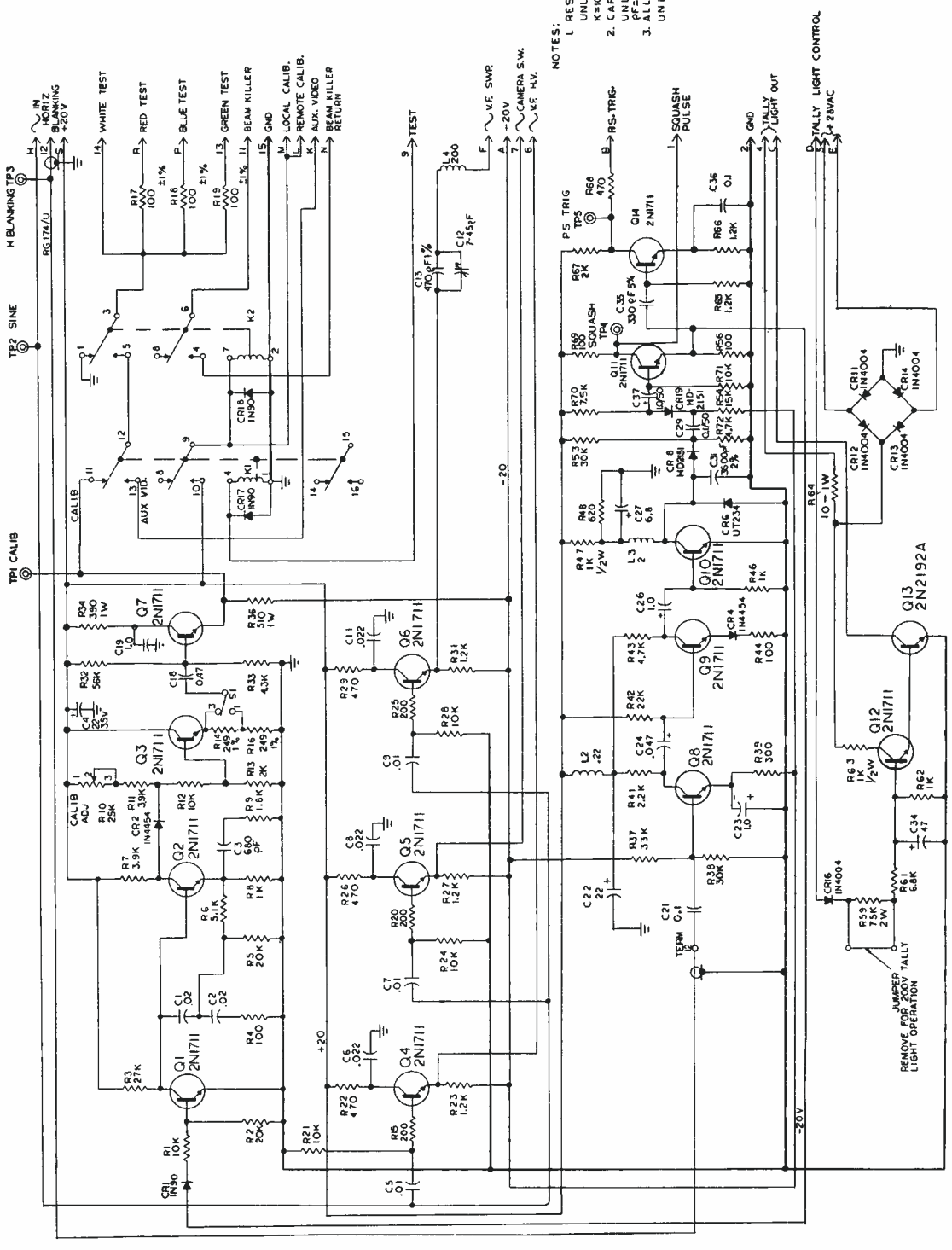
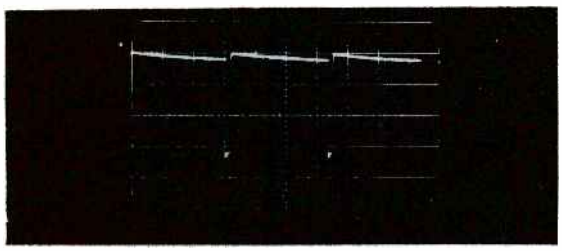
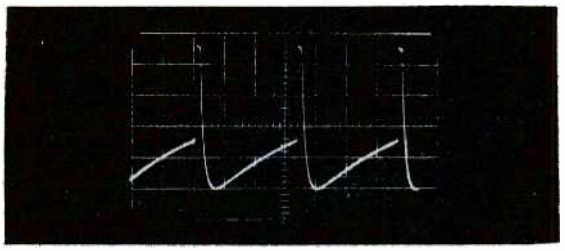


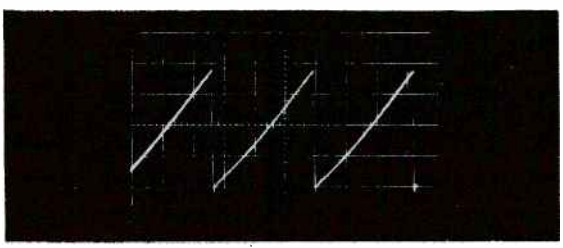
Fig. 30 Timing and Calibration Generator Board Schematic Diagram (D-7674519, Rev. B)



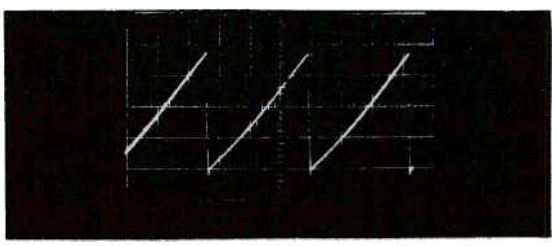
(a) Q1, Base, 4.0 volts P-P, V Rate



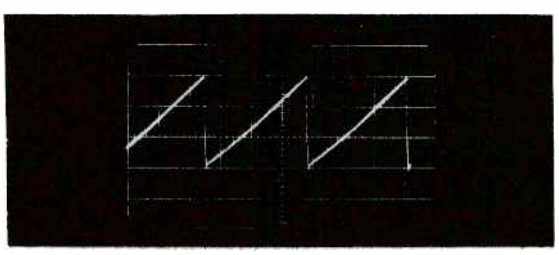
(b) Q2, Base, 8.0 volts P-P, V Rate



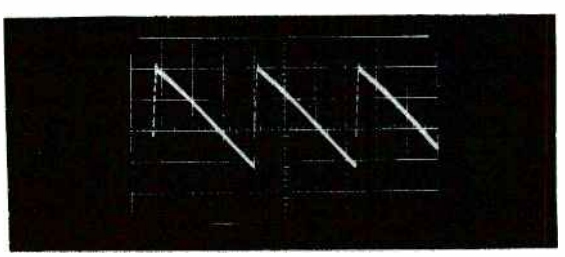
(c) Q3, Base, 8.0 volts P-P, V Rate



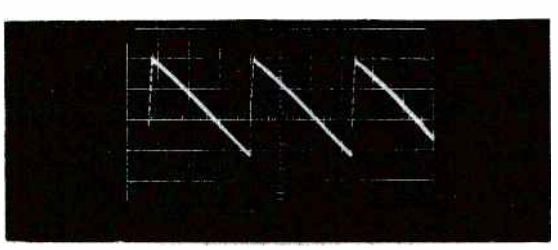
(d) Q3, Emitter, 8.0 volts P-P, V Rate



(e) Q4, Base, 3.0 volts P-P, V Rate (Depends on Setting of W HEIGHT Control)

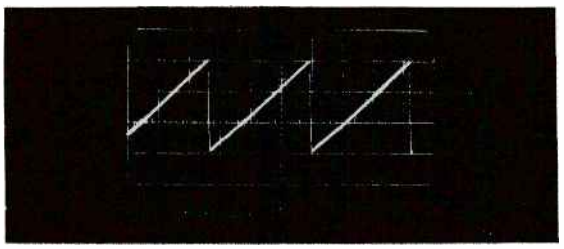


(f) Q5, Base, 1.5 volts P-P, V Rate

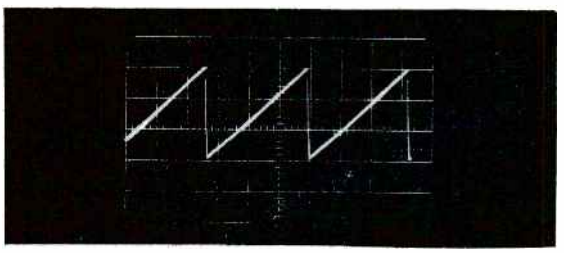


(g) Q6, Base, 1.5 volts P-P, V Rate

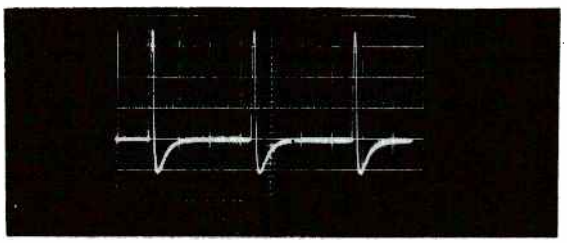
Fig. 31 Camera Sweep Board Waveforms: Q1, Q2, Q3, Q4, Q5, Q6



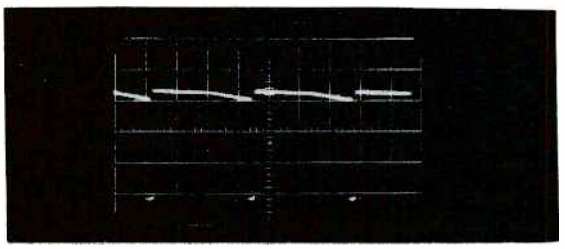
(a) Q7, Base, 6.0 volts P-P, V Rate



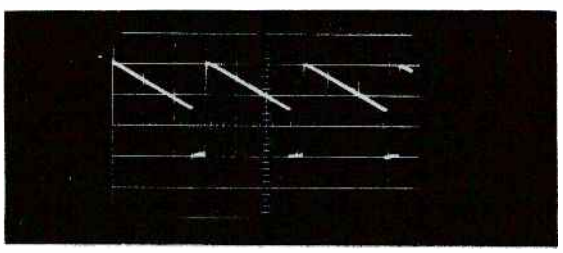
(b) Q7, Emitter, 6.0 volts P-P, V Rate



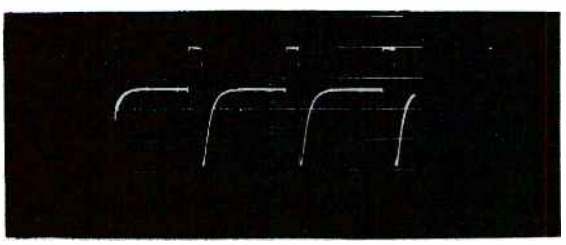
(c) Q8, Base, 8.5 volts P-P, V Rate



(d) Q9, Base, 7.0 volts P-P, V Rate

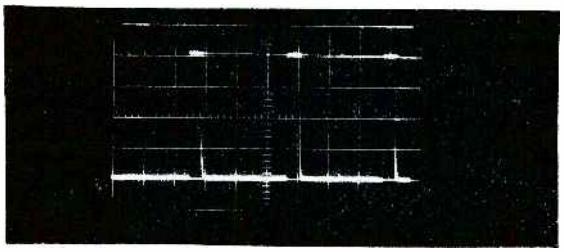


(e) Q12, Base, 3.0 volts P-P, H Rate

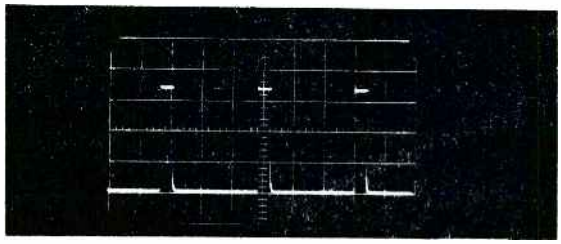


(f) Q13, Base, 2.0 volts P-P, H Rate

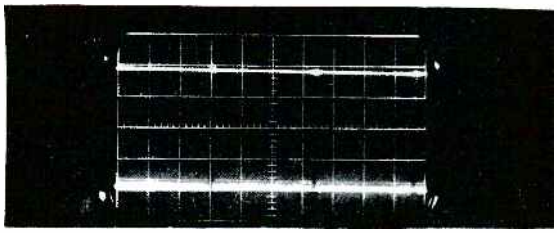
Fig. 32 Camera Sweep Board Waveforms: Q7, Q8, Q9, Q12, Q13



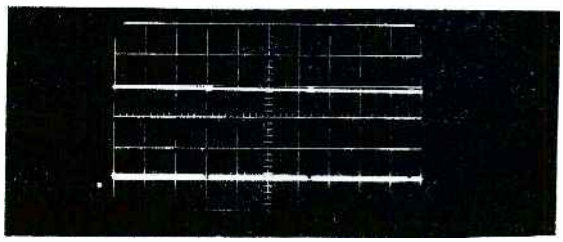
(a) Q10, Base, 40 volts P-P, H Rate



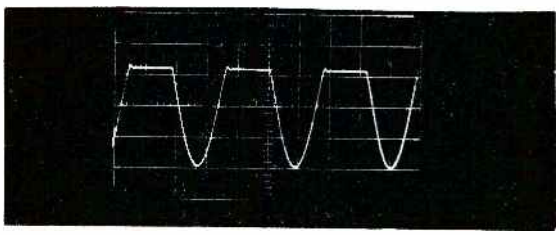
(b) Q10, Emitter, 35 volts P-P, H Rate



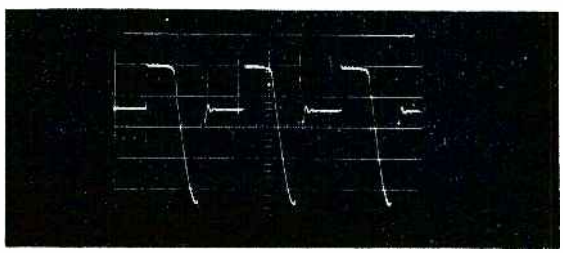
(c) Q10, Base, Composite Blanking, 40 volts P-P, V Rate



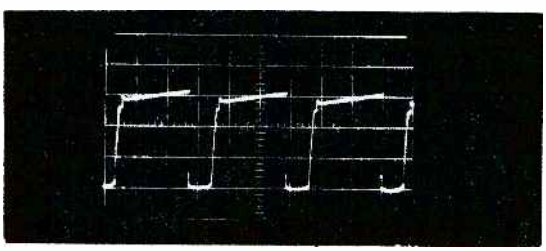
(d) Q10, Emitter, Composite Blanking, 30 volts P-P, V Rate



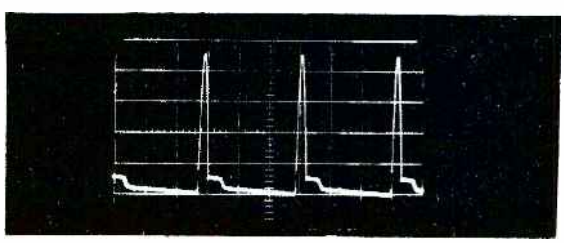
(e) Q14, Base, 5.5 volts P-P, H Rate



(f) Q15, Base, 4.0 volts P-P, H Rate

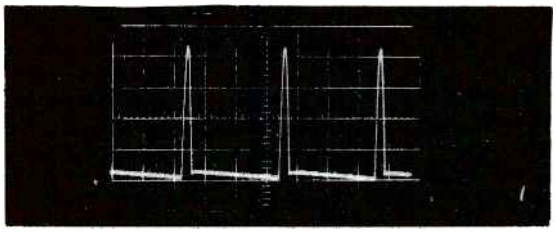


(g) Q15, Collector, H Sweep Drive, 15 volts P-P, H Rate

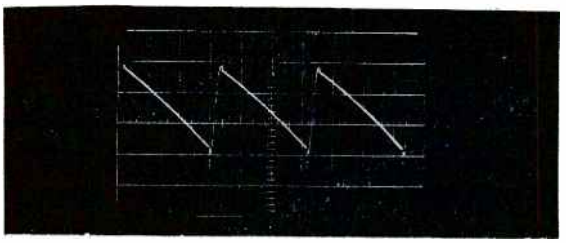


(h) Q16, Base, H Sweep, 45 volts P-P, H Rate

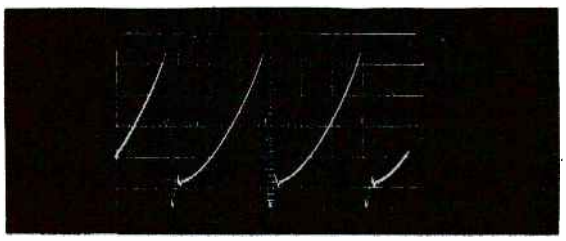
Fig. 33 Camera Sweep Board Waveforms: Q10, Q14, Q15, Q16



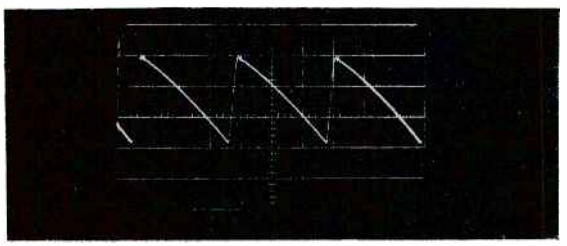
(a) Q16, Emitter, H Sweep, 43 volts P-P, H Rate



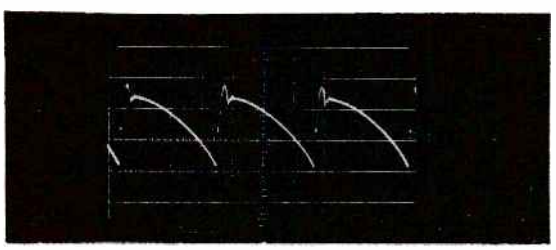
(b) Q16, Collector, 2.0 volts P-P, H Rate



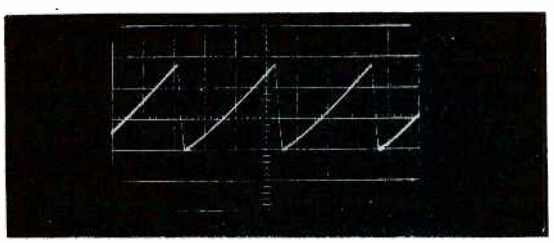
(c) Q17, Base, 0.80 volt P-P, H Rate (Depends on Setting of Master H Lin Control)



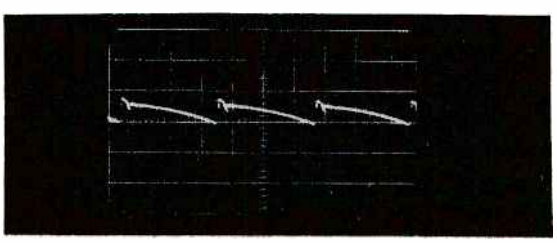
(d) Q17, Collector, 13 volts P-P, H Rate (Depends on Setting of Master H Lin Control)



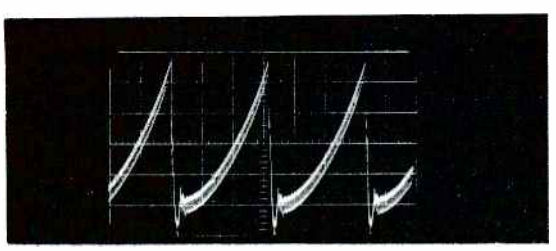
(e) Q18, Base, 0.80 volt P-P, H Rate (Depends on Setting of Master H Lin Control)



(f) Q18, Collector, 13 volts P-P, H Rate (Depends on Setting of Master H Lin Control)



(g) Q19, Base, 0.05 volt P-P, H Rate (Depends on Setting of Master H-Lin Control)



(h) Q19, Collector, 0.70 volt P-P H Rate (Depends on Setting of Master H Lin Control)

Fig. 34 Camera Sweep Board Waveforms: Q16, Q17, Q18, Q19

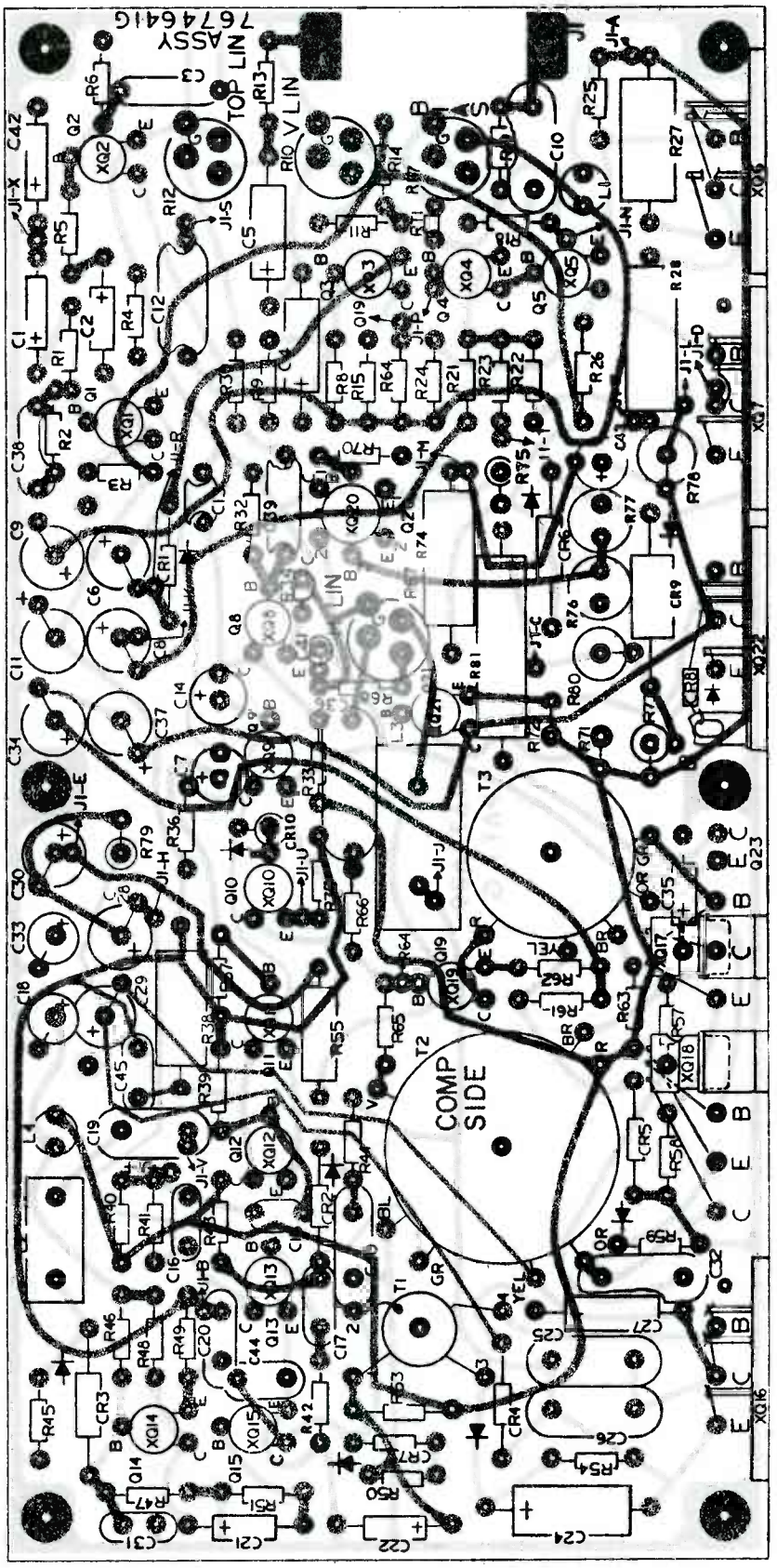
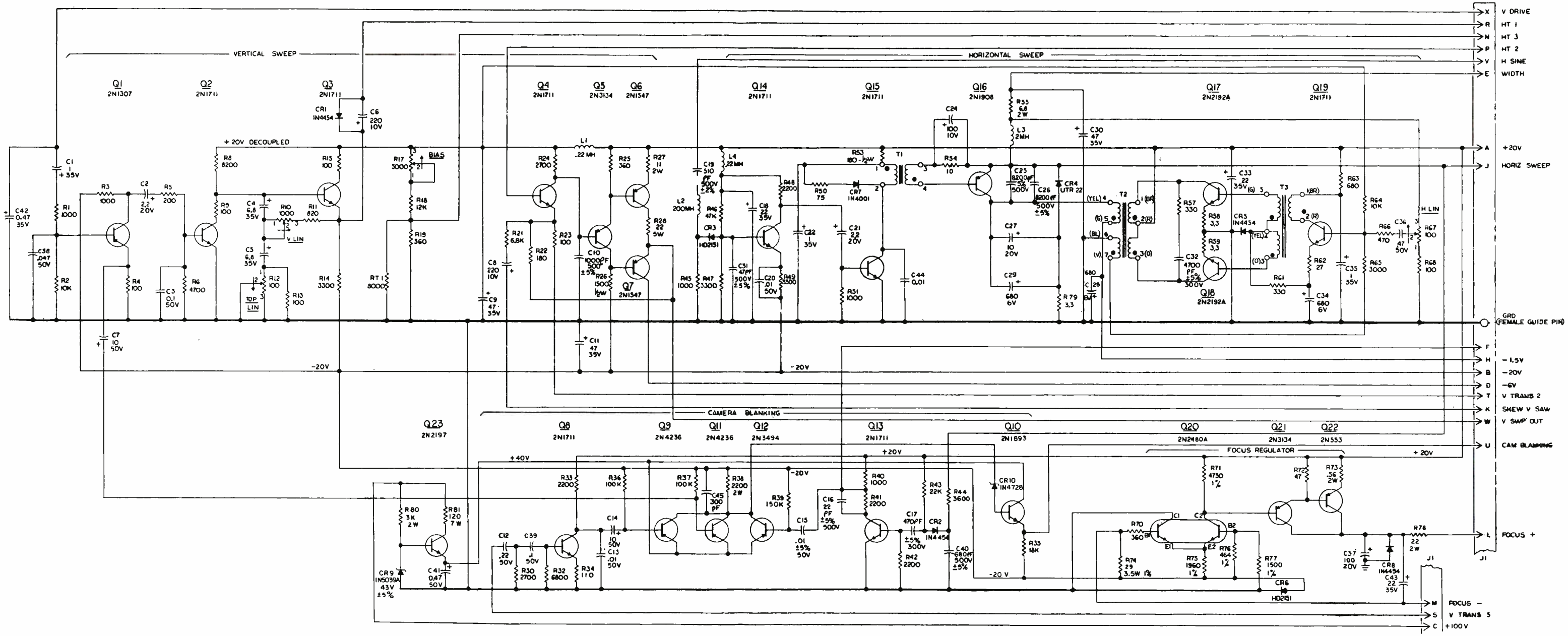


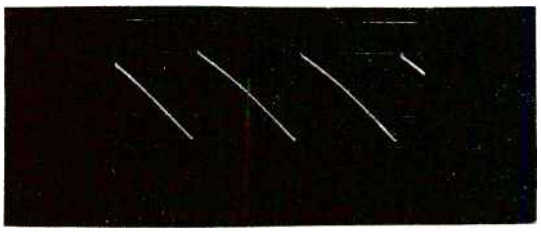
Fig. 35 Camera Sweep Board Printed Circuit Diagram (D-7674639, Patt G, Rev. E)



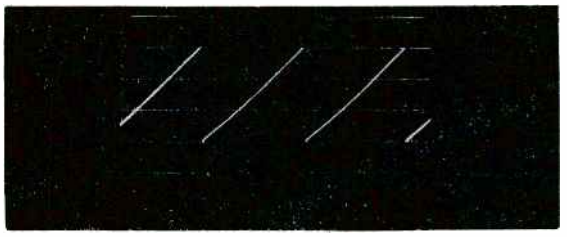
NOTES:

1. RESISTOR VALUES ARE IN OHMS & 1/4 WATT UNLESS OTHERWISE SHOWN TOL±5% K=1000 OHMS
2. CAPACITOR VALUES ARE IN MICROFARADS TOL±20% UNLESS OTHERWISE SHOWN pF=PICOFARADS
3. COIL VALUES ARE IN MICROHENRIES UNLESS OTHERWISE SHOWN MH=MILLIHENRIES HY=HENRIES

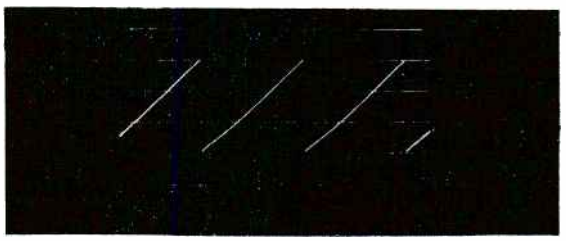
Fig. 36 Camera Sweep Board Schematic Diagram (DD-7674118, Rev. F)



(a) Q1, Collector, 1.5 volts P-P, H Rate



(b) Q1, Base, 1.5 volts P-P, H Rate



(c) Q1, Emitter, 1.5 volts P-P, H Rate

Fig. 37 Skew Generator Board Waveforms: Q1

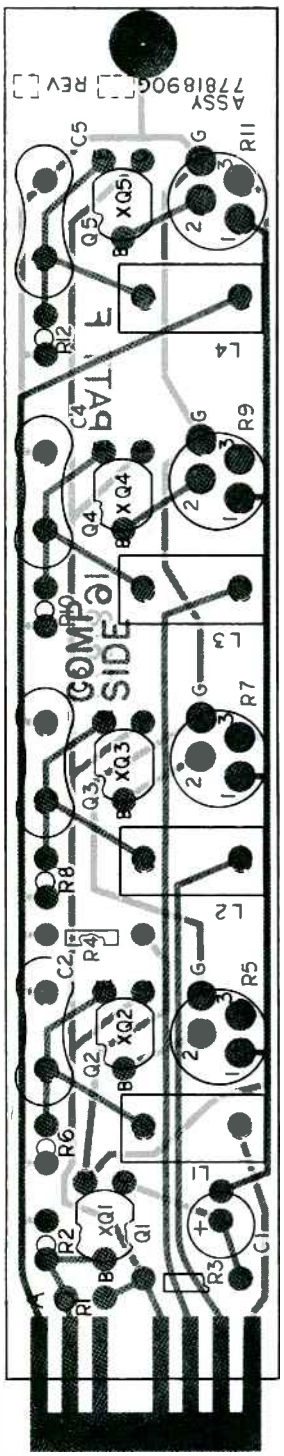
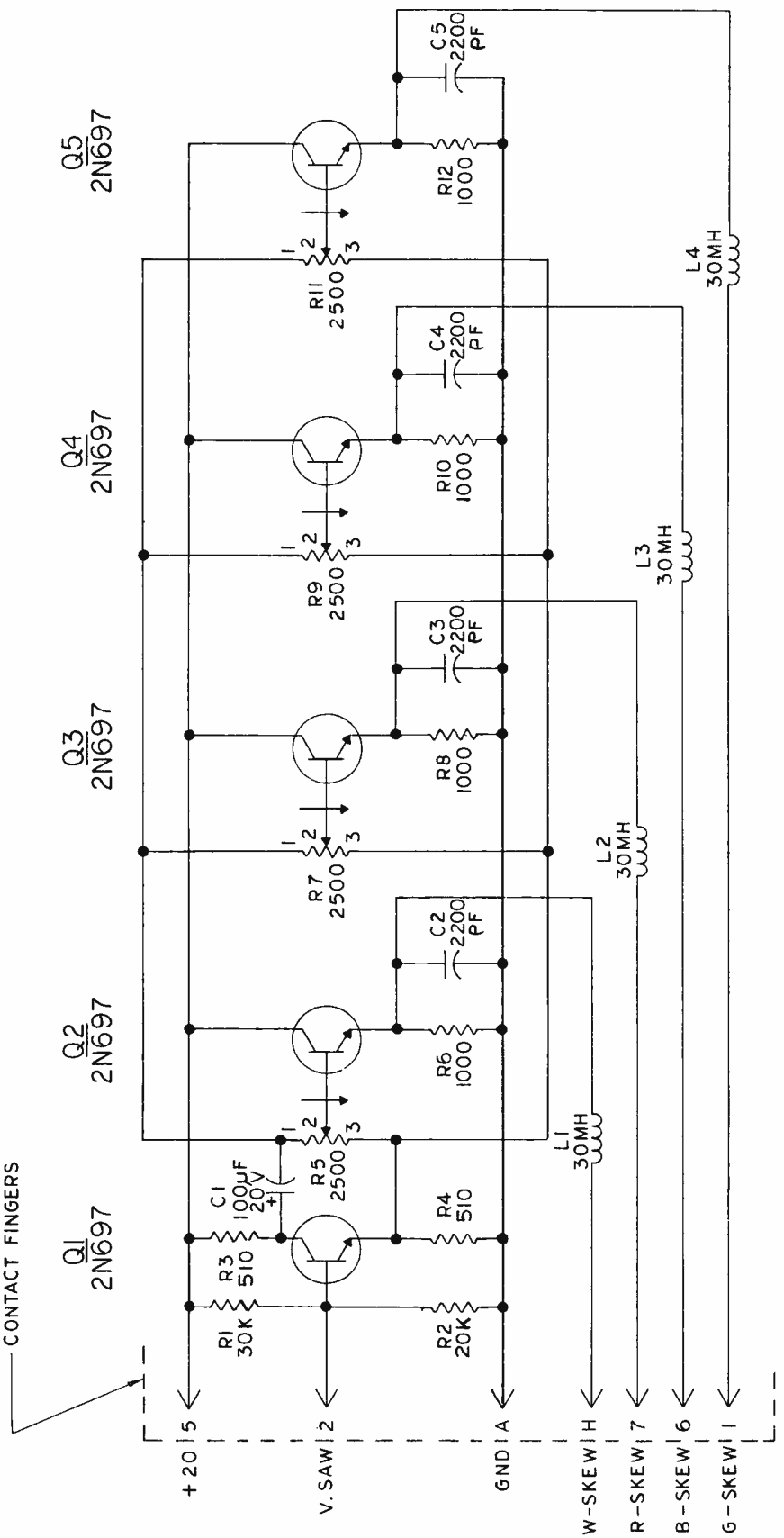
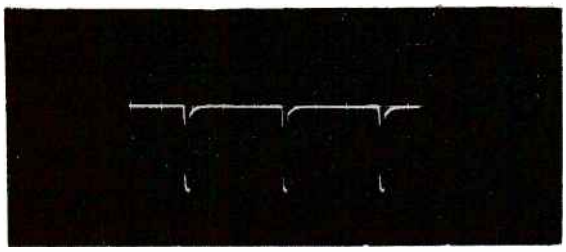


Fig. 38 Skew Generator Board Printed Circuit Diagram (C-7781891, Patt F, Rev. D)

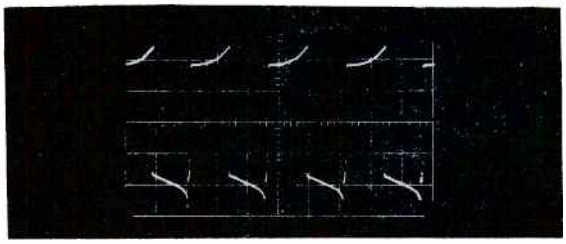


NOTES
1 RESISTOR VALUES ARE IN OHMS, TOL. ± 5% & 1/4 WATT, UNLESS OTHERWISE SHOWN K = 1,000
2 CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE SHOWN PF = PICOFARADS μF = MICROFARADS
3 INDUCTOR VALUES ARE IN MILLIHENRY UNLESS OTHERWISE SHOWN MH = MILLIHENRY

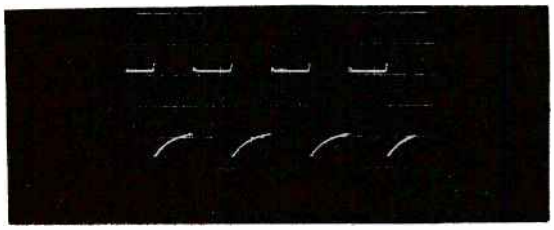
Fig. 39 Skew Generator Board Schematic Diagram (C-781890, Sheet 2, Rev. B)



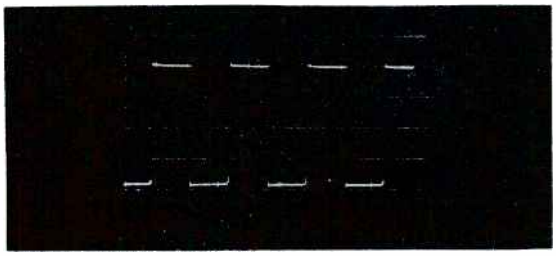
(a) Power Supply Input Trigger, 14 volts P-P, H Rate



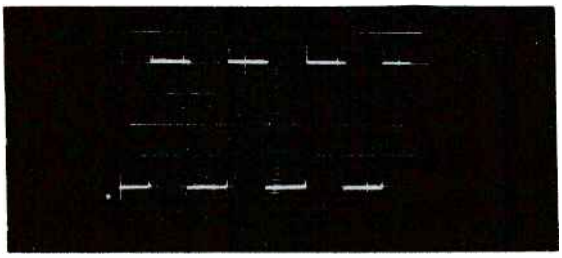
(b) Q11, Base, 10 volts P-P, H Rate



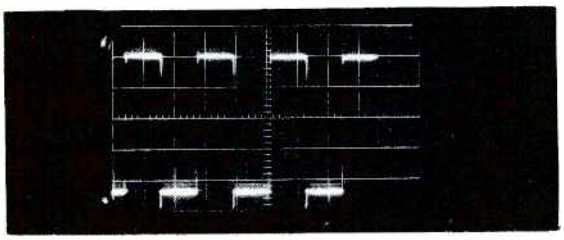
(c) Q1, Base, 3.0 volts P-P, H Rate



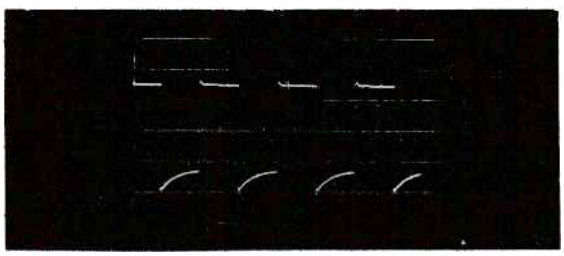
(d) Q2, Base, 2.0 volts P-P, H Rate



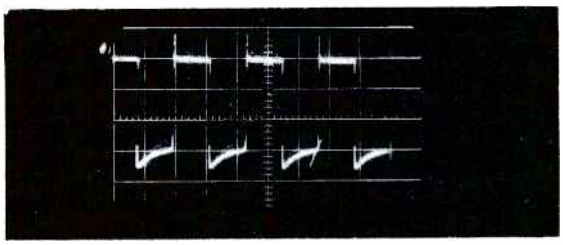
(e) Q1, Collector, 86 volts P-P, H Rate



(f) Q2, Collector, 86 volts P-P, H Rate

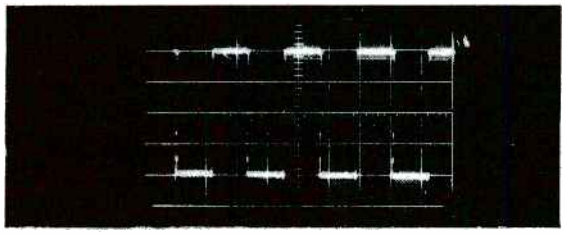


(g) Q3, Base, 3.5 volts P-P, H Rate

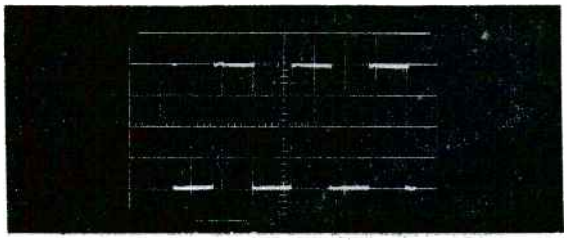


(h) Q4, Base, 3.5 volts P-P, H Rate

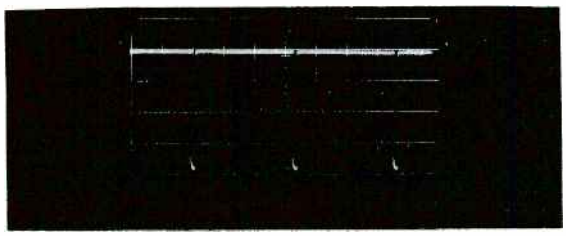
Fig. 40 Camera Power Supply Board Waveforms: Power Supply Input Trigger, Q11, Q1, Q2, Q3, Q4



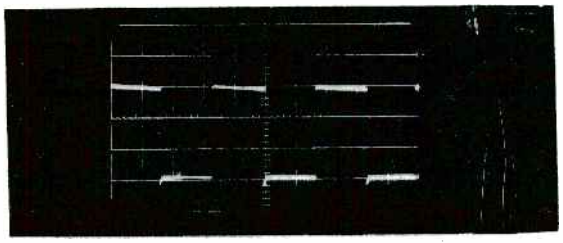
(a) Q4, Collector, 200 volts P-P, H Rate



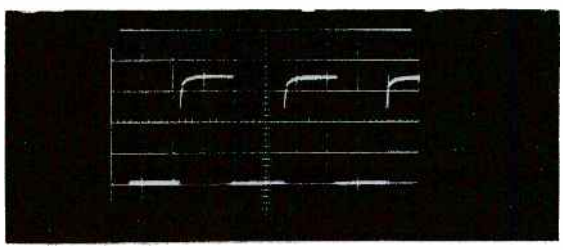
(b) Q3, Collector, 200 volts P-P, H Rate



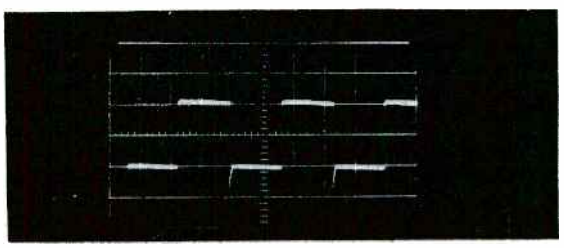
(c) Pin H, Vertical Drive, 5.0 volts P-P, V Rate



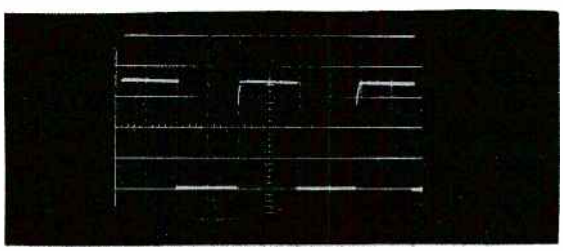
(d) Q18, Base, 0.6 volt P-P, V Rate



(e) Q18, Collector, 35 volts P-P, V Rate



(f) Q12, Base, 0.4 volt P-P, V Rate



(g) Q12, Collector, 35 volts P-P, V Rate

Fig. 41 Camera Power Supply Board Waveforms: Q4, Q3, Pin H, Q18, Q12

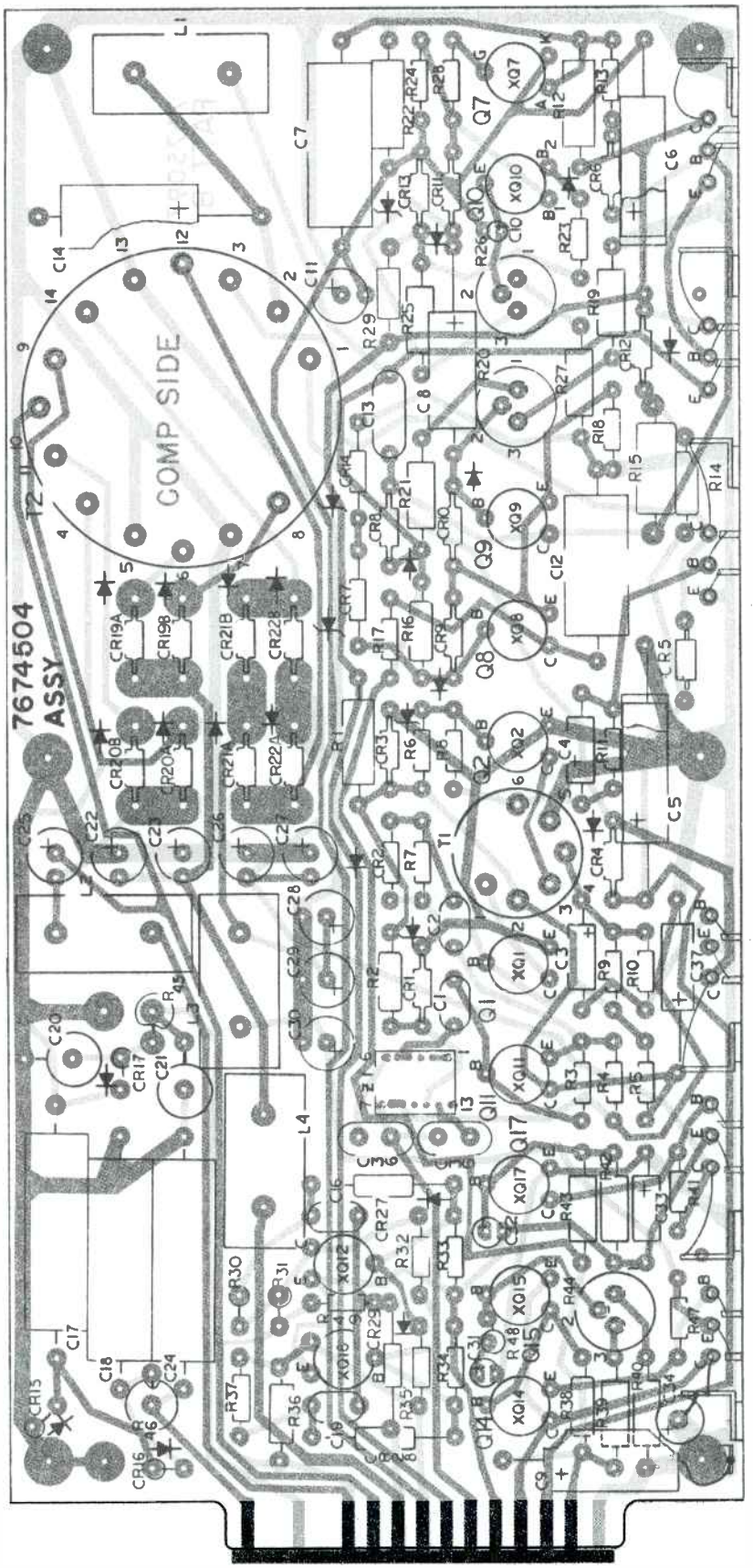
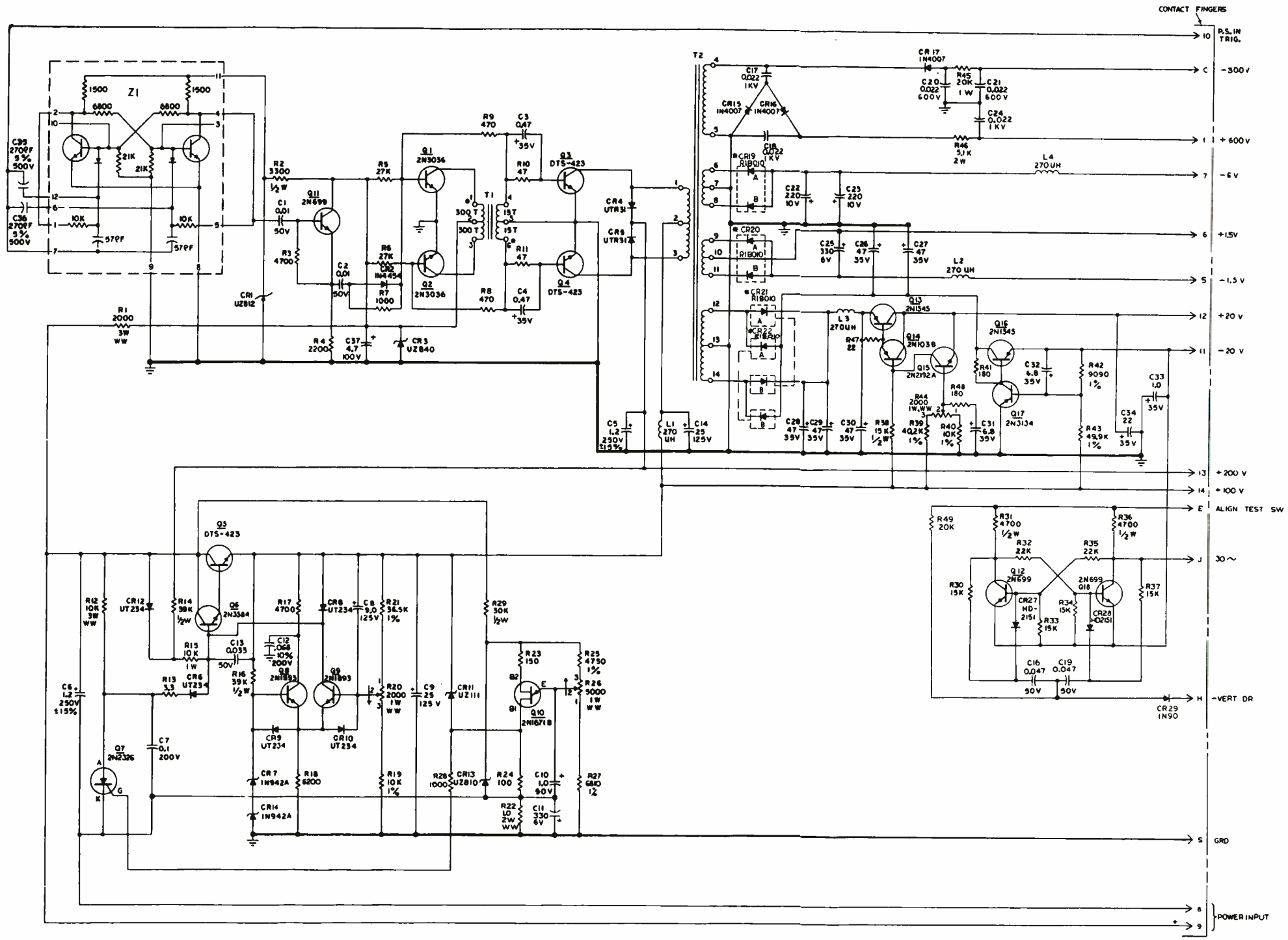


Fig. 42 Camera Power Supply Board Printed Circuit Diagram (D-7675097, Patt B, Rev. C)

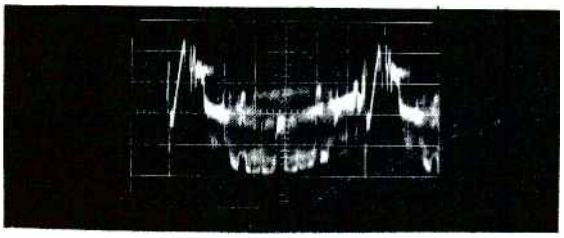


NOTES:

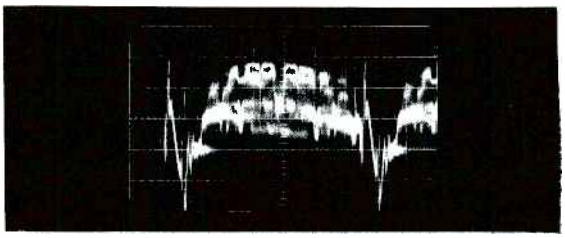
1. RESISTOR VALUES ARE IN OHMS ± ¼ WATT ±5% UNLESS OTHERWISE SHOWN K=1000 OHMS
2. CAPACITOR VALUES ARE IN MICROFARADS (TOL ± 20%) UNLESS OTHERWISE SHOWN PF= PICOFARADS
3. C15, C17, C18, C20, C21 & C24 (TOL $^{+80\%}_{-20\%}$)
4. C1, C2, C13, C16, C19, C35 & 36 (TOL. ± 5%)
5. * CR19 A & B THRU CR22 A & B INCL ARE MATCHED PAIRS. IF ONE RECTIFIER FAILS BOTH MUST BE REPLACED.

Fig. 43 Camera Power Supply Board Schematic Diagram (E-7355675)

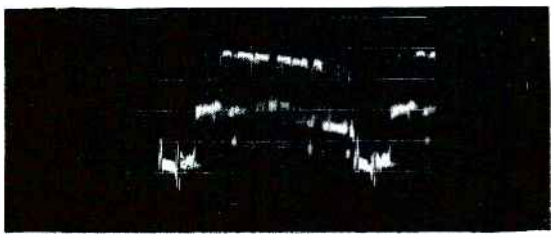
(a) Q1, Base, 0.70 volt P-P, H Rate



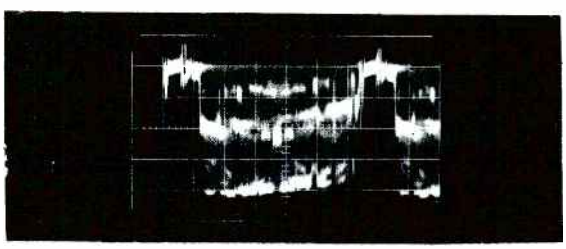
(b) Q1, Collector, 0.80 volt P-P, H Rate



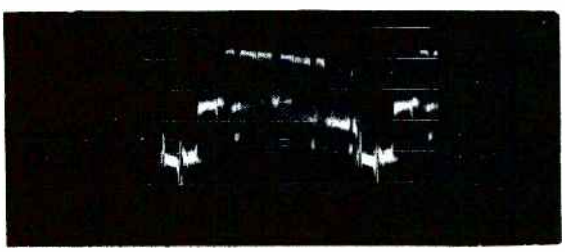
(c) Q1, Emitter, 0.70 volt P-P, H Rate



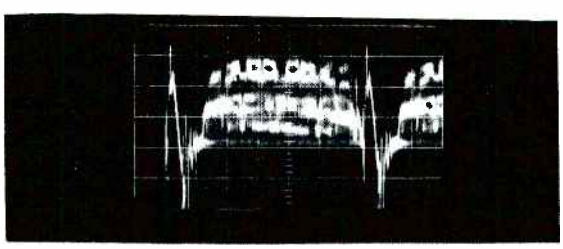
(d) Q2, Base, 0.70 volt P-P, H Rate



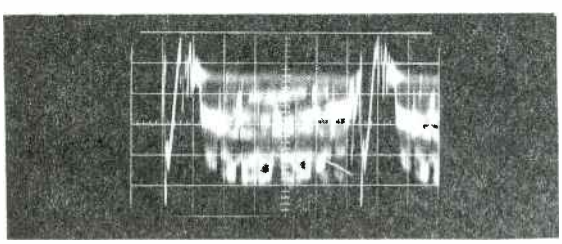
(e) Q2, Collector, 0.80 volt P-P, H Rate



(f) Q2, Emitter, 0.70 volt P-P, H Rate

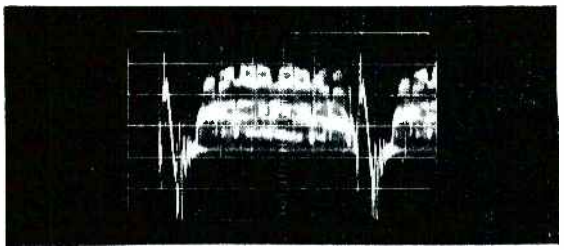


(g) Q3, Base, 0.70 volt P-P, H Rate

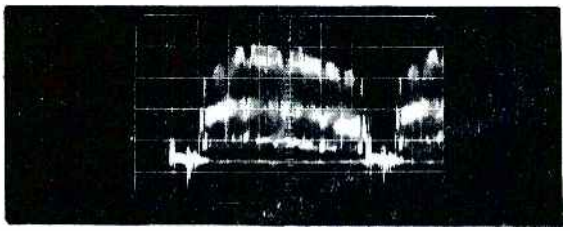


(h) Q3, Collector, 0.80 volt P-P, H Rate

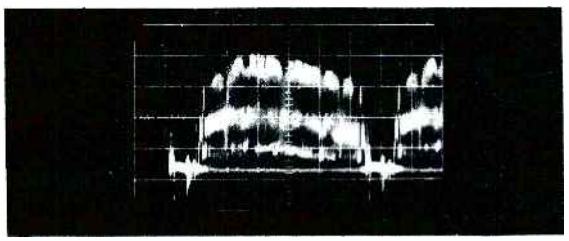
Fig. 44 Viewfinder Switcher Board Waveforms: Q1, Q2, Q3



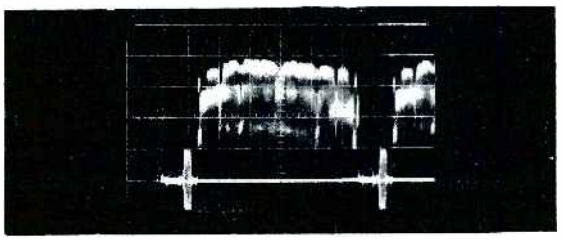
(a) Q3, Emitter, 0.70 volt P-P, H Rate



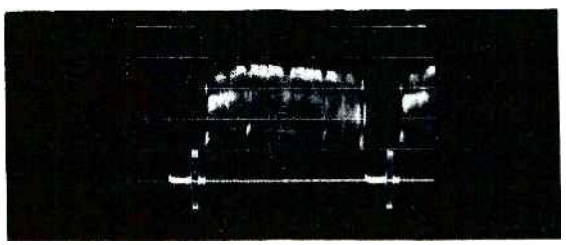
(b) Q4, Base, 0.70 volt P-P, H Rate



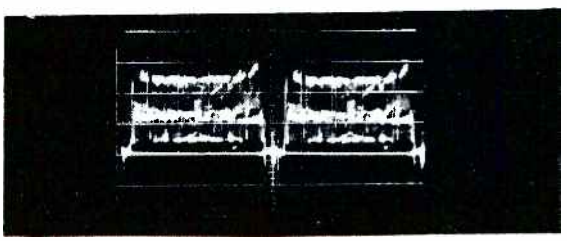
(c) Q4, Emitter, 0.70 volt P-P, H Rate



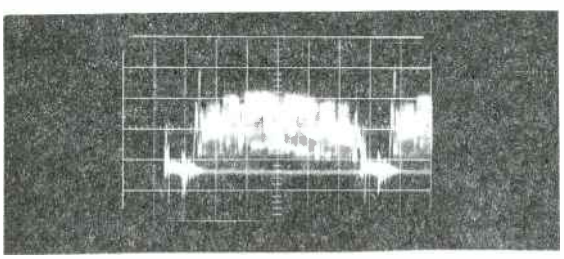
(d) Q5, Base, 0.70 volt P-P, H Rate



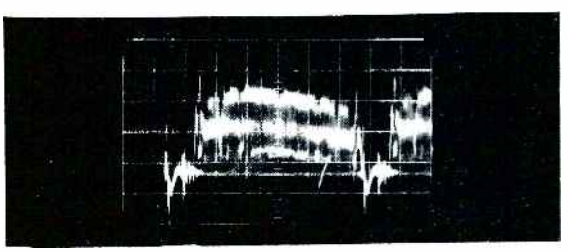
(e) Q5, Emitter, 0.70 volt P-P, H Rate



(f) Pin 9, Output of W, 0.5 volt P-P, H Rate



(g) Pin 9, Output of W-G, 0.40 volt P-P H Rate



(h) Pin 9, Output of W-B, 0.40 volt P-P, H Rate

Fig. 45 Viewfinder Switcher Board Waveforms: Q3, Q4, Q5, Pin 9

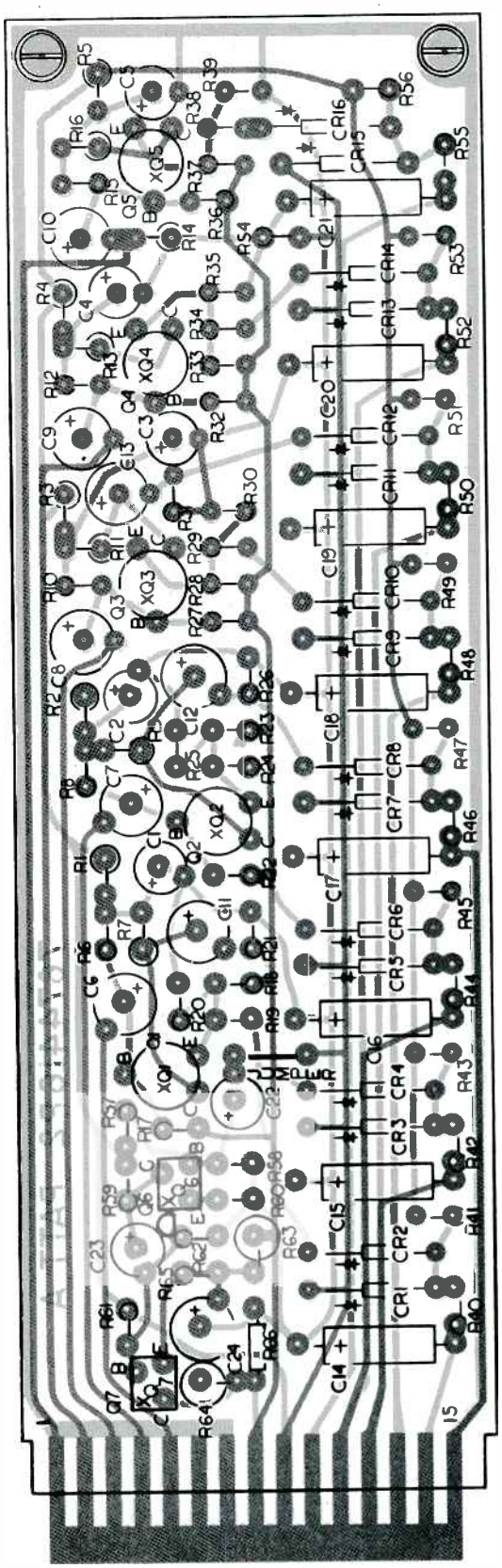


Fig. 46 Viewfinder Switcher Board Printed Circuit Diagram (D-7674416, Patt A)

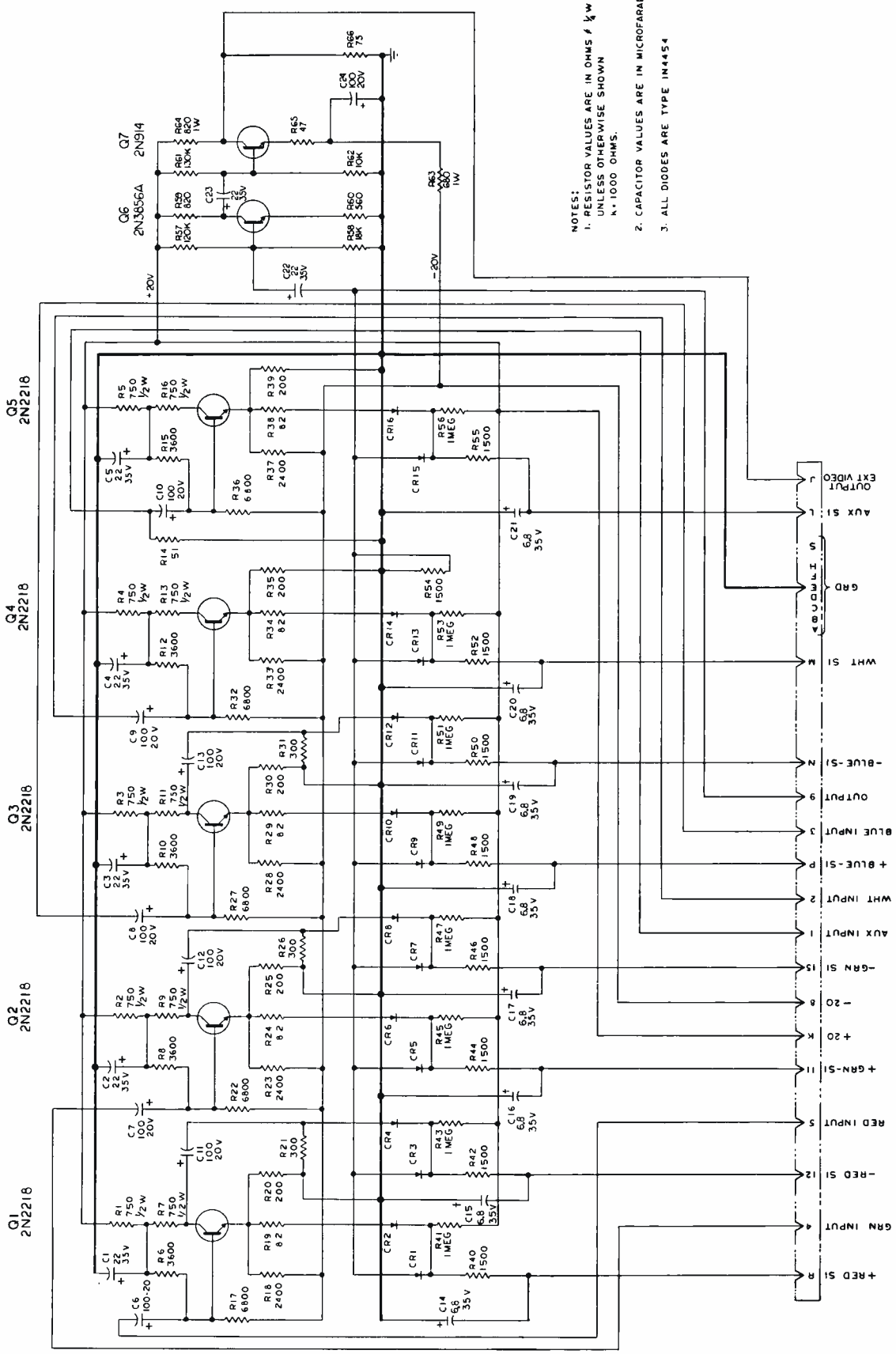


Fig. 47 Viewfinder Switcher Board Schematic Diagram (D-7674431, Sheet 2)

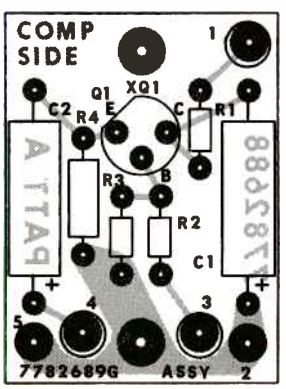
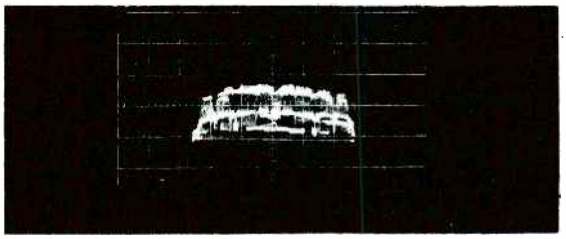
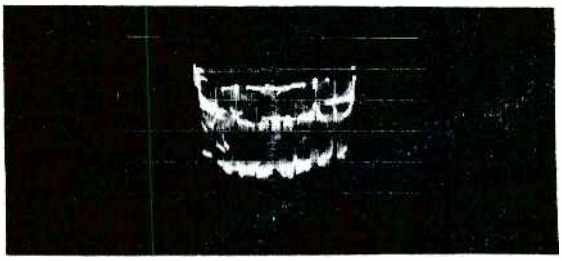


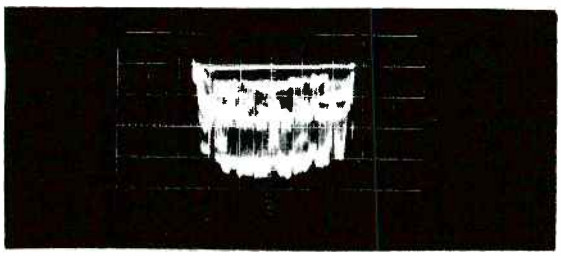
Fig. 48 Sync Adder Board Printed Circuit Diagram (C-7782688, Patt A, Rev. A)



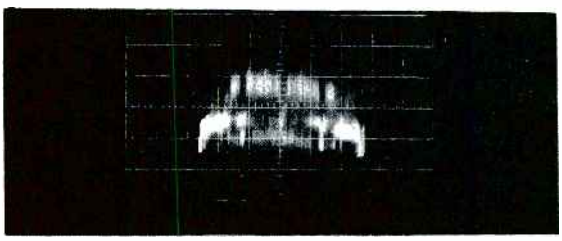
(a) Q1, Base, 0.20 volt P-P, H Rate (Typical Value Depends on Setting of Viewfinder Contrast Control)



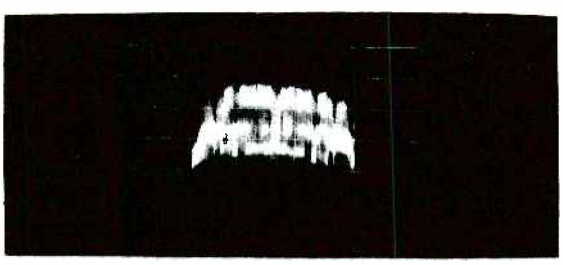
(b) Q2, Base, 0.80 volt P-P, H Rate (Typical Value Depends on Setting of Viewfinder Contrast Control)



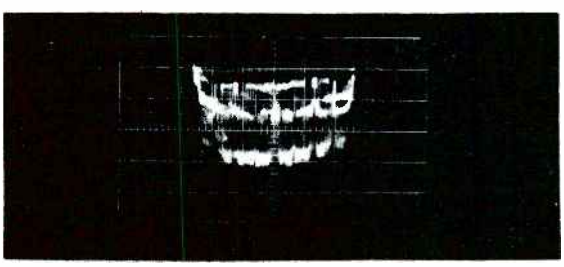
(c) Q3, Base, 0.80 volt P-P, H Rate (Typical Value Depends on Setting of Viewfinder Contrast Control)



(d) Q4, Base, 0.25 volt P-P, H Rate (Typical Value Depends on Setting of Viewfinder Contrast Control)



(e) Q5, Base, 0.25 volt P-P, H Rate (Typical Value Depends on Setting of Viewfinder Contrast Control)



(f) Q5, Collector, 15.0 volts P-P, H Rate (Typical Value Depends on Setting of Viewfinder Contrast Control)

Fig. 49 Viewfinder Video Amplifier Board Waveforms: Q1, Q2, Q3, Q4, Q5

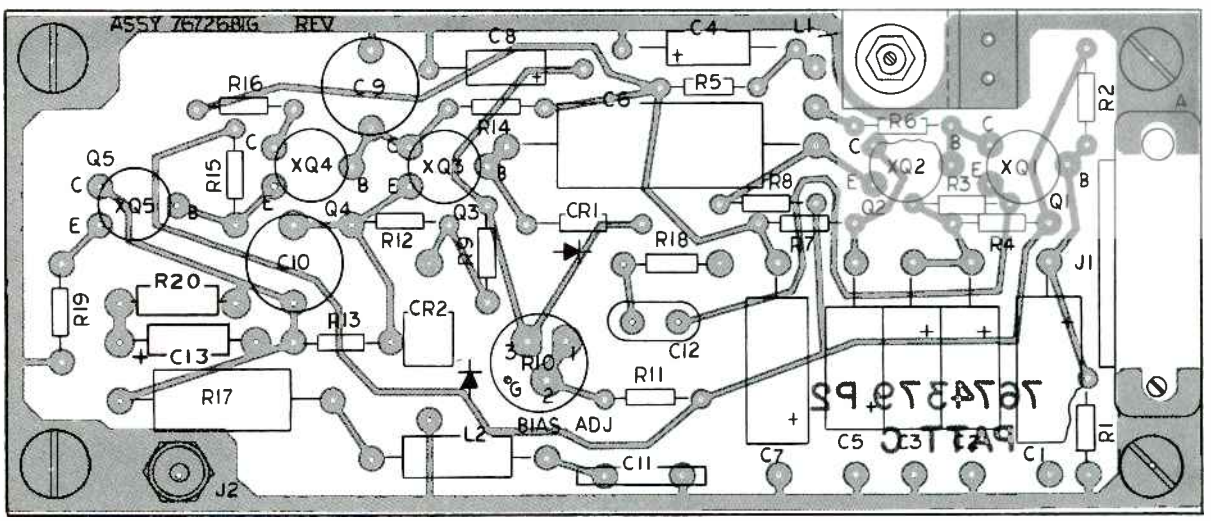


Fig. 50 Viewfinder Video Amplifier Board Printed Circuit Diagram (D-7674379, Patt C, Rev. C)

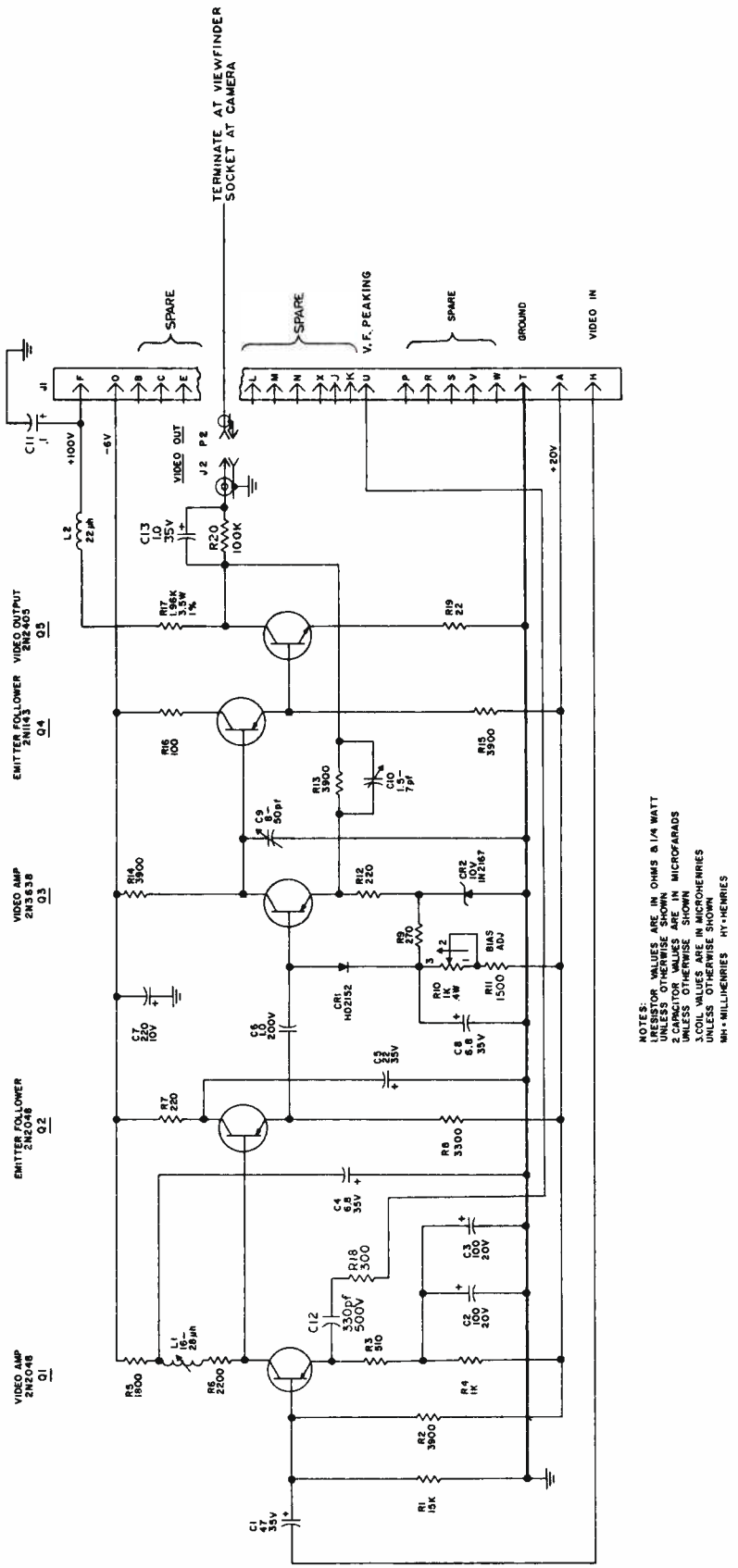
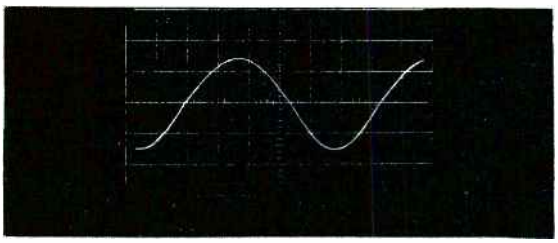
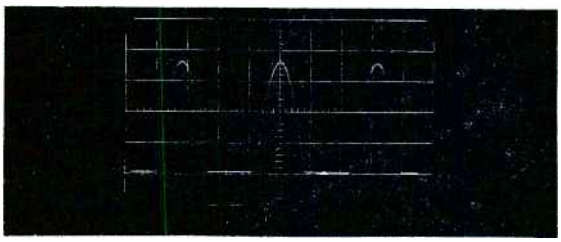


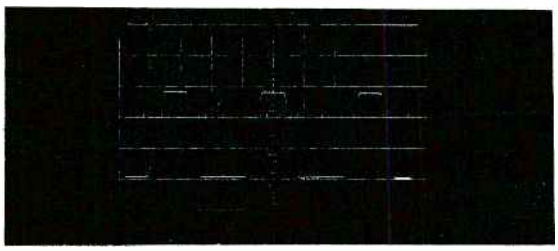
Fig. 51 Viewfinder Video Amplifier Board Schematic Diagram (D-7674381, Rev. D)



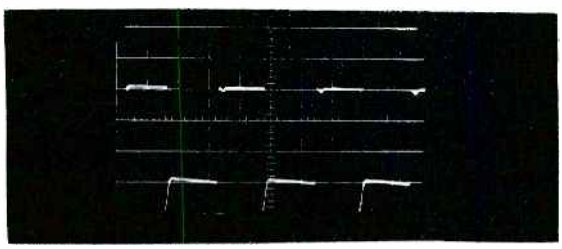
(a) H Sine Input at CR1, 1.5 volts P-P, H Rate



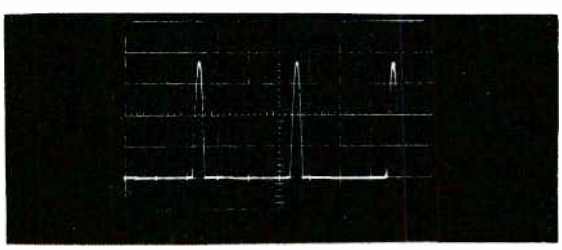
(b) Q1, Base, 7.0 volts P-P, H Rate



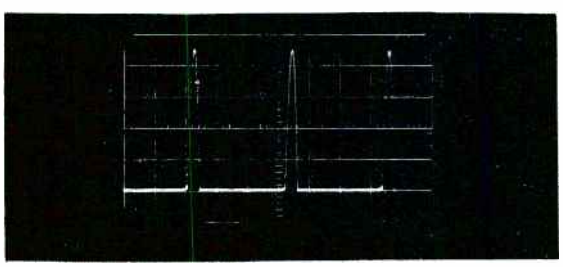
(c) Q2, Base, 5.6 volts P-P, H Rate



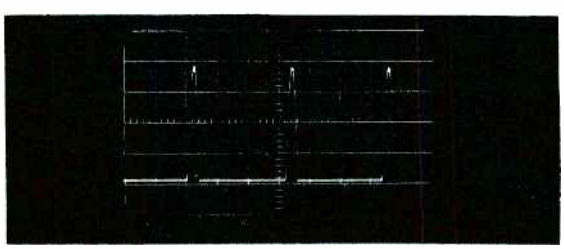
(d) Q2, Collector, 30 volts P-P, H Rate



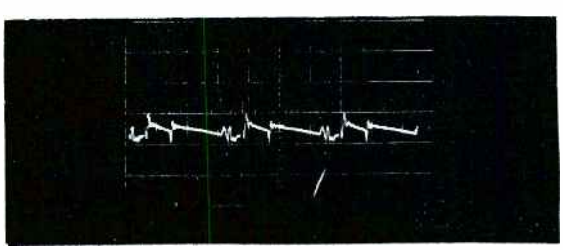
(e) Q3, Base, 200 volts P-P, H Rate



(f) Q4, Base, 100 volts P-P, H Rate

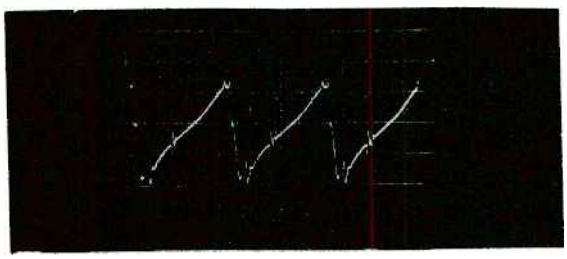


(g) Q3, Emitter, 200 volts P-P, H Rate

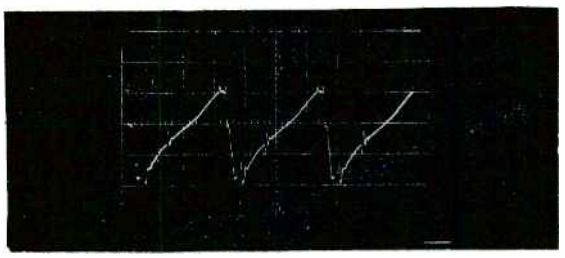


(h) Q5, Base, 0.1 volt P-P, H Rate

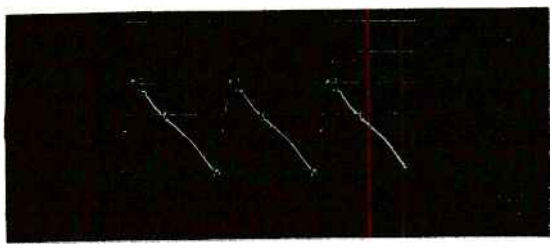
Fig. 52 Viewfinder Sweep Board Waveforms: H Sine Input, Q1, Q2, Q3, Q4, Q5



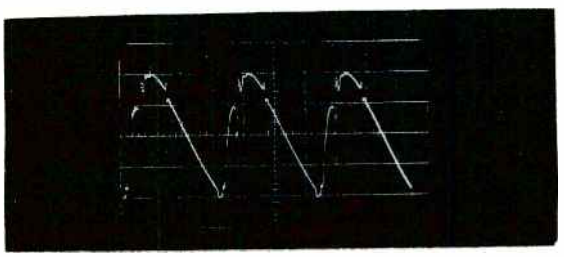
(a) Q5, Collector, 2.0 volts P-P, H Rate



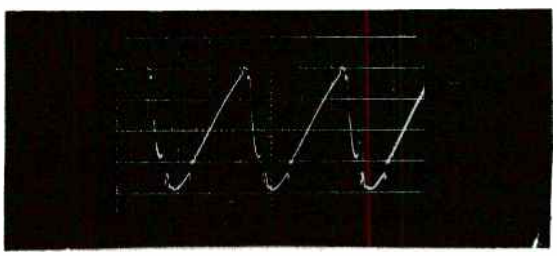
(b) Q6, Base, 1.5 volts P-P, H Rate



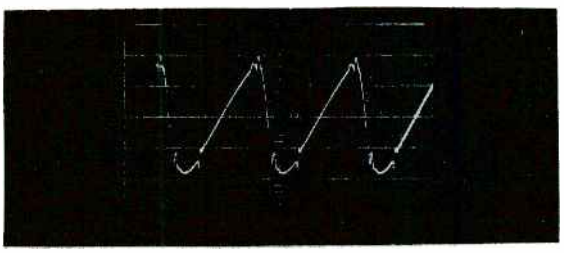
(c) Q7, Base, 1.5 volts P-P, H Rate



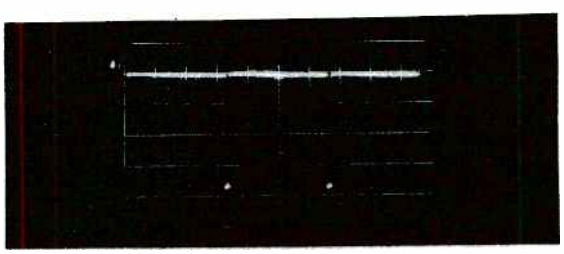
(d) Q6, Collector, 25 volts P-P, H Rate



(e) Q7, Collector, 25 volts P-P, H Rate

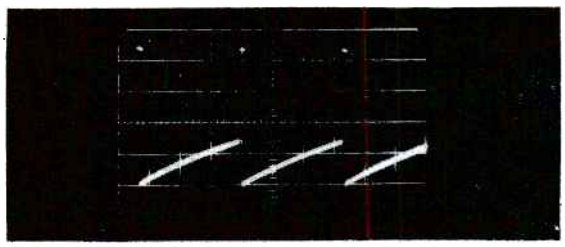


(f) H Sweep Return at R29, 2.0 volts P-P, H Rate

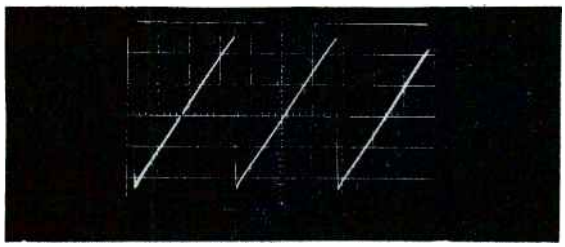


(g) Q12, Base, 6.0 volts P-P, V Rate

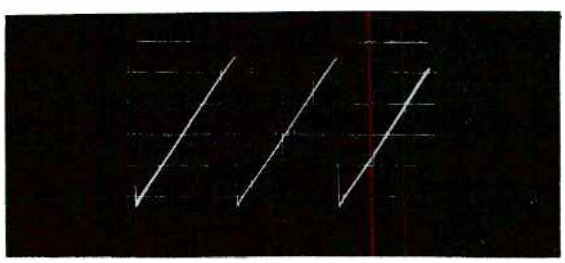
Fig. 53 Viewfinder Sweep Board Waveforms: Q5, Q6, Q7, H Sweep Return, Q12



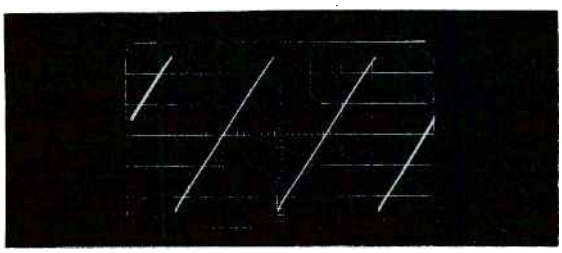
(a) Q13, Base, 9.0 volts P-P, V Rate



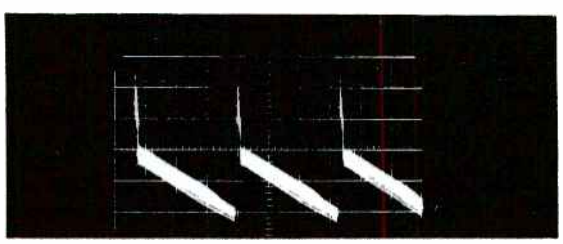
(b) Q14, Base, 5.0 volts P-P, V Rate



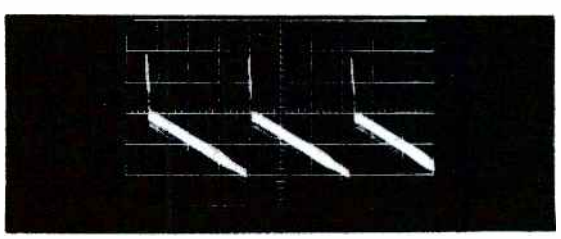
(c) Q14, Emitter, 5.0 volts P-P, V Rate



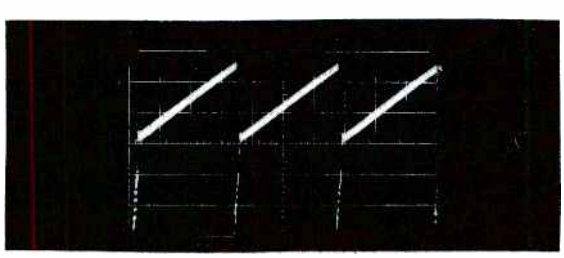
(d) Q15, Base, 2.5 volts P-P, V Rate



(e) Q16, Base, 2.0 volts P-P, V Rate

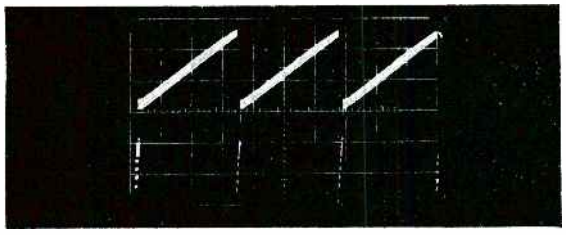


(f) Q17, Base, 1.8 volts P-P, V Rate

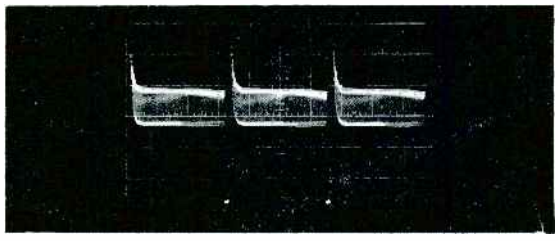


(g) Q18, Base, 28 volts P-P, V Rate

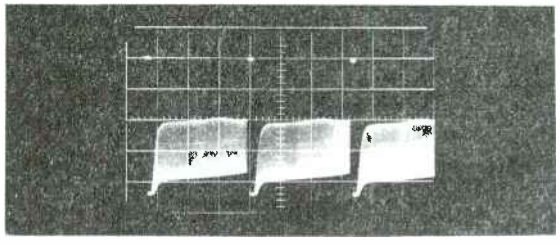
Fig. 54 Viewfinder Sweep Board Waveforms: Q13, Q14, Q15, Q16, Q17, Q18



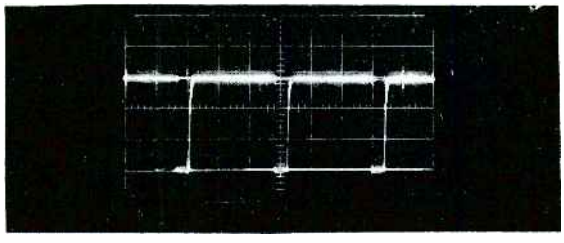
(a) Q18, Emitter, 38 volts P-P, V Rate



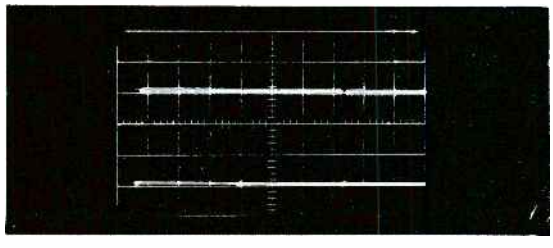
(b) Q19, Base, 7.0 volts P-P, V Rate



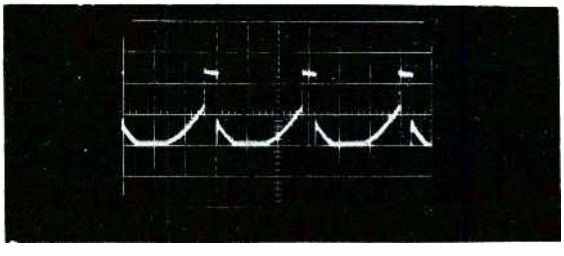
(c) Q20, Base, 11 volts P-P, V Rate



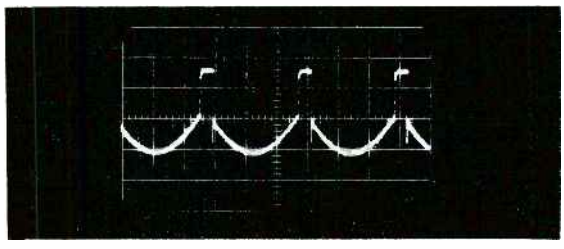
(d) Q20, Collector, 60 volts P-P, H Rate



(e) Q20, Collector, 60 volts P-P, V Rate



(f) Q21, Base, 12 volts P-P, H Rate



(g) Q22, Base, 14 volts P-P, H Rate

Fig. 55 Viewfinder Sweep Board Waveforms: Q18, Q19, Q20, Q21, Q22

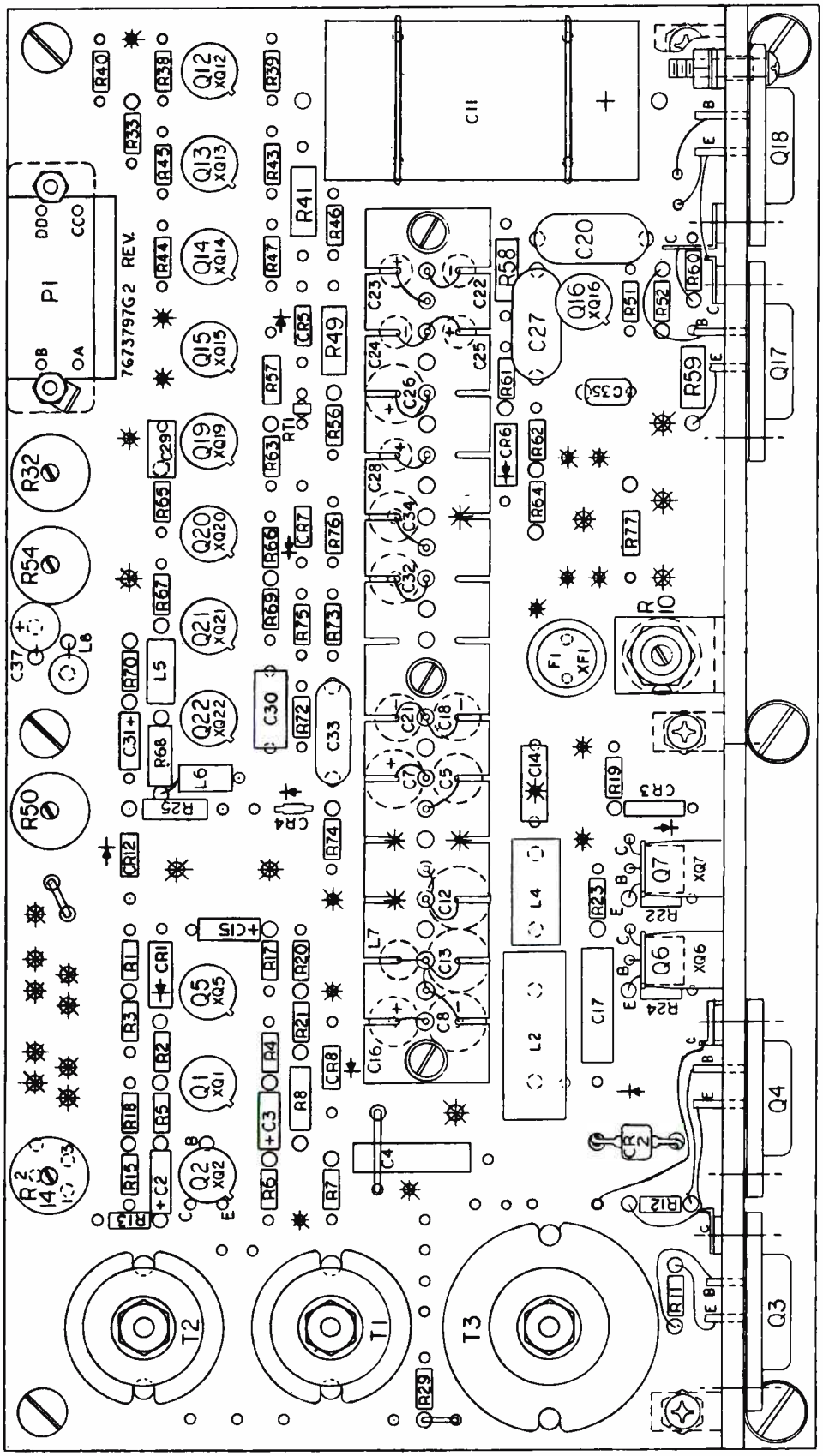
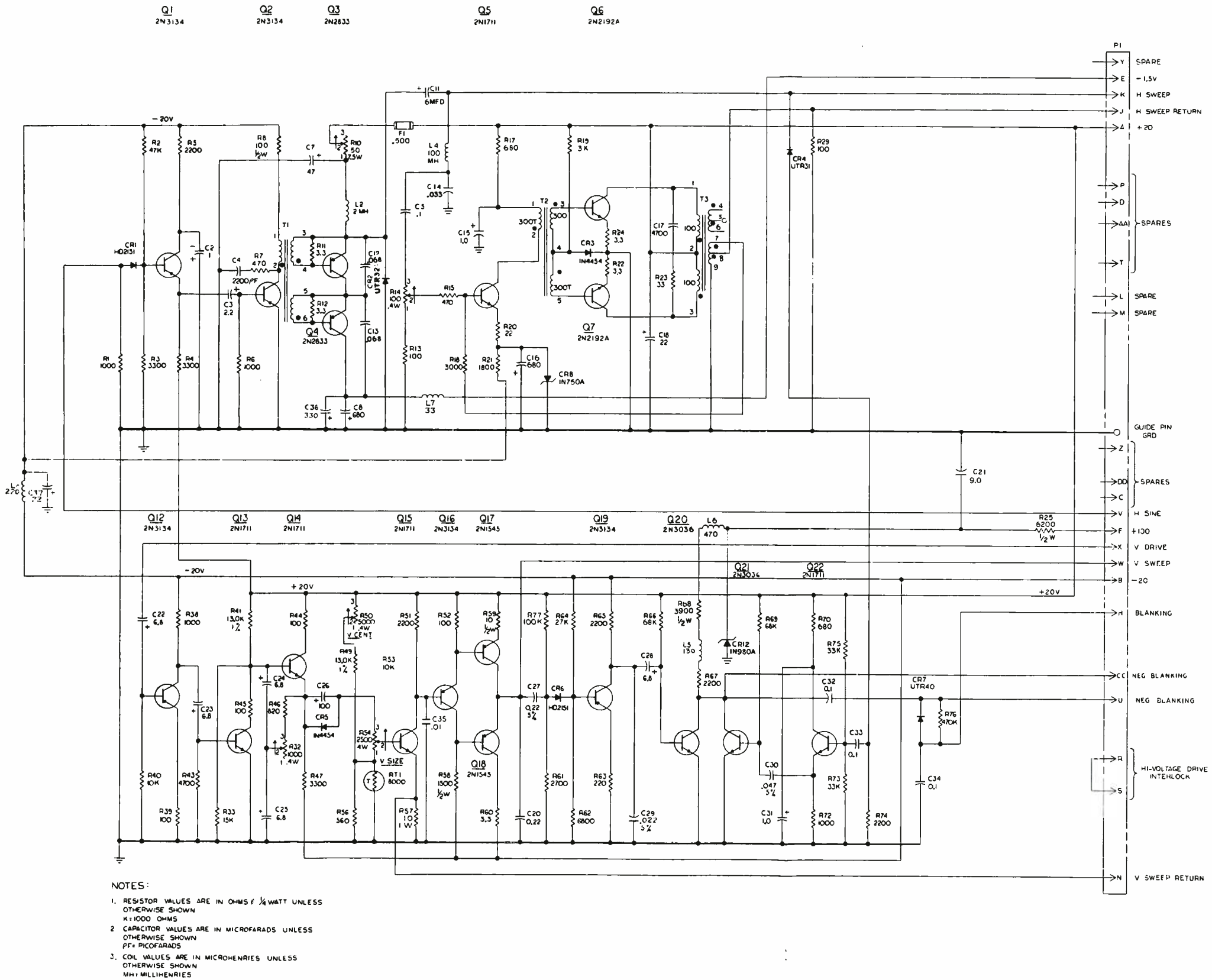


Fig. 56 Viewfinder Sweep Board Component Diagram (D-7673797, Sheet 2, Rev. P)



NOTES:

1. RESISTOR VALUES ARE IN OHMS & ¼ WATT UNLESS OTHERWISE SHOWN
   K = 1000 OHMS
2. CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE SHOWN
   PF = PICOFARADS
3. COIL VALUES ARE IN MICROHENRIES UNLESS OTHERWISE SHOWN
   MH = MILLIHENRIES

Fig. 57 Viewfinder Sweep Board Schematic Diagram (E-7355381, Rev. H)

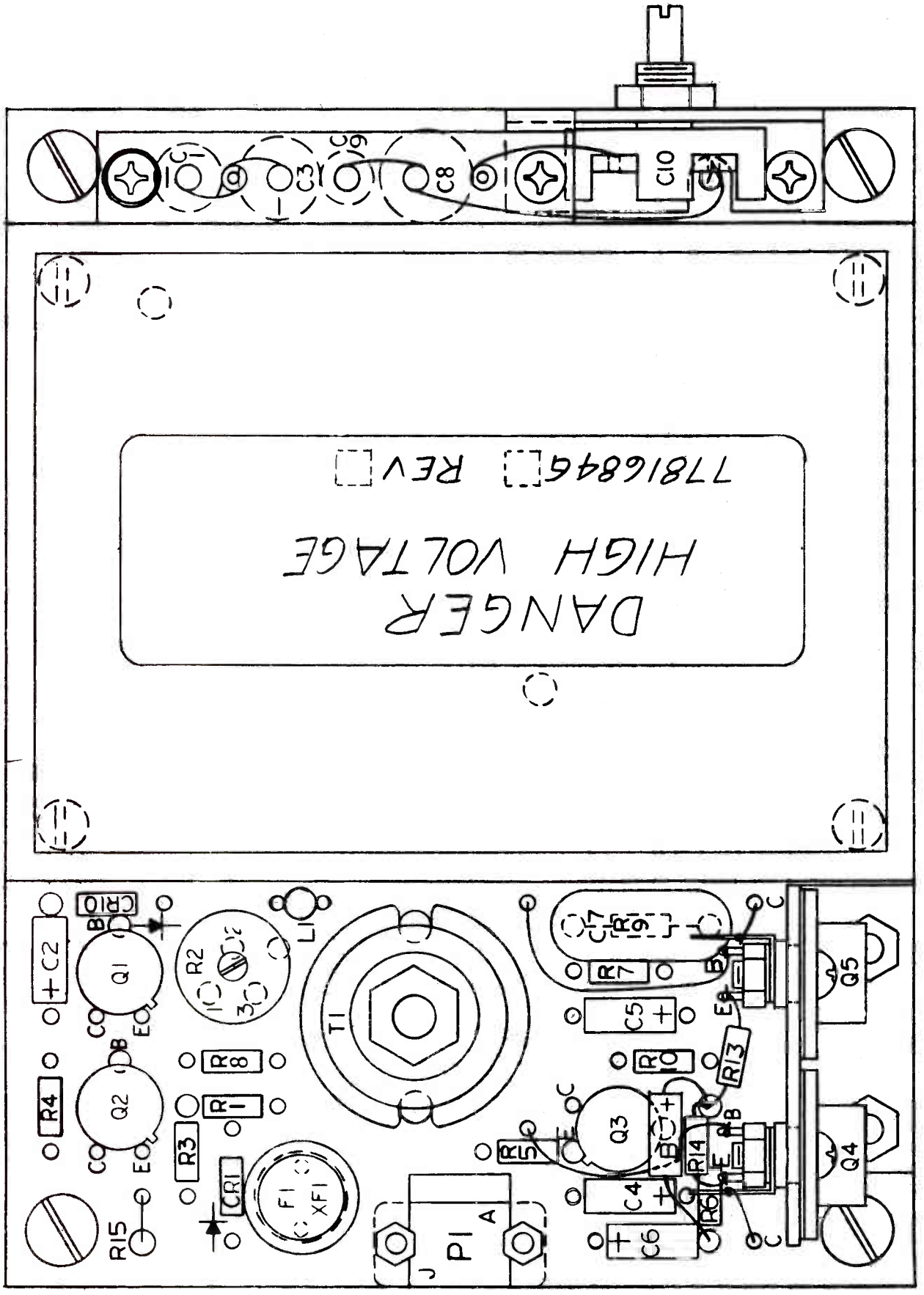
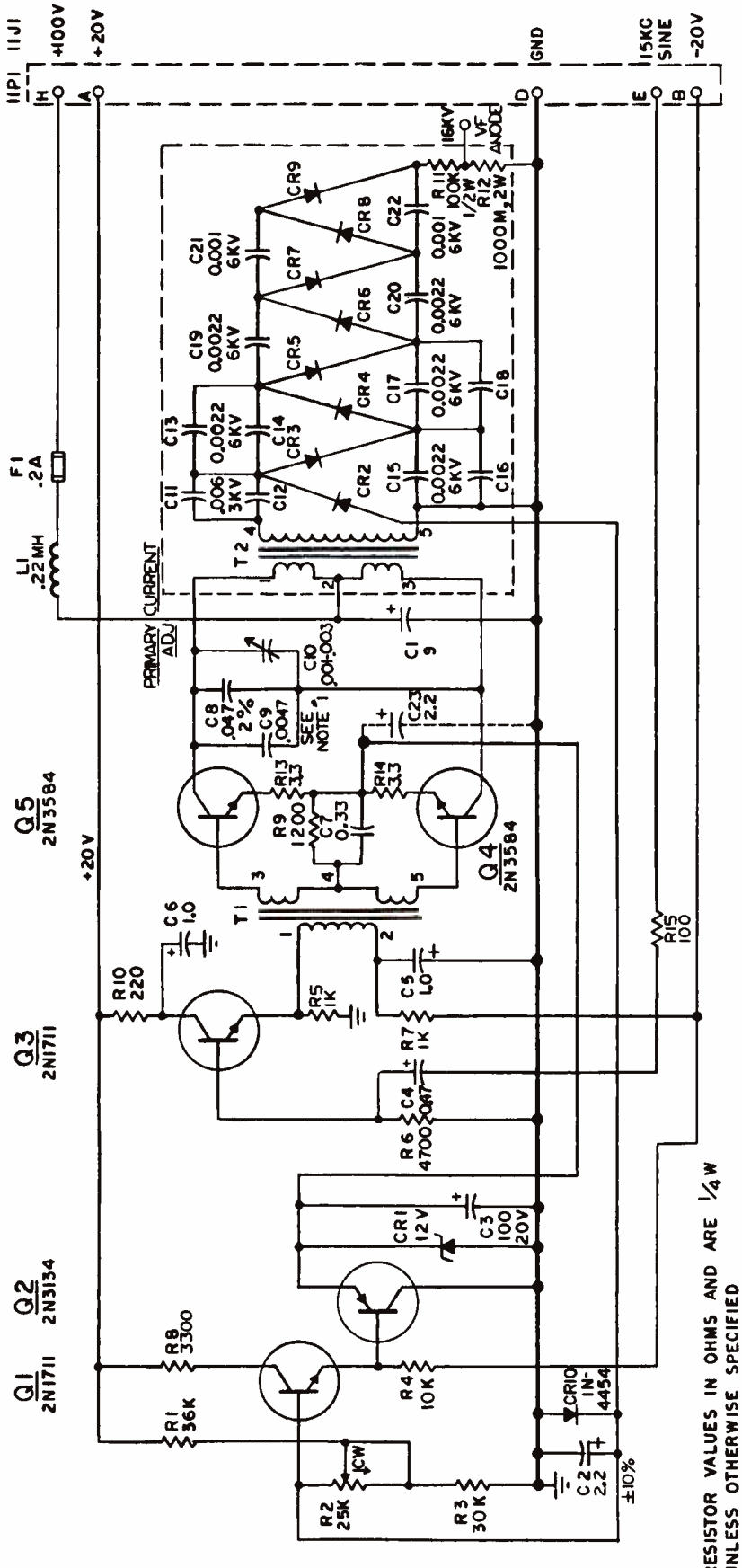


Fig. 58 Viewfinder High-Voltage Power Supply Board Component Diagram (C-7781684, Sheet 1, Rev. H)



RESISTOR VALUES IN OHMS AND ARE 1/4 W
UNLESS OTHERWISE SPECIFIED
K=1,000 M=1,000,000

CAPACITOR VALUES IN MICROFARADS
UNLESS OTHERWISE SPECIFIED
PF=PICOFARAD

Fig. 59 Viewfinder High-Voltage Power Supply Board Schematic Diagram (C-7781684, Sheet 4, Rev. F)

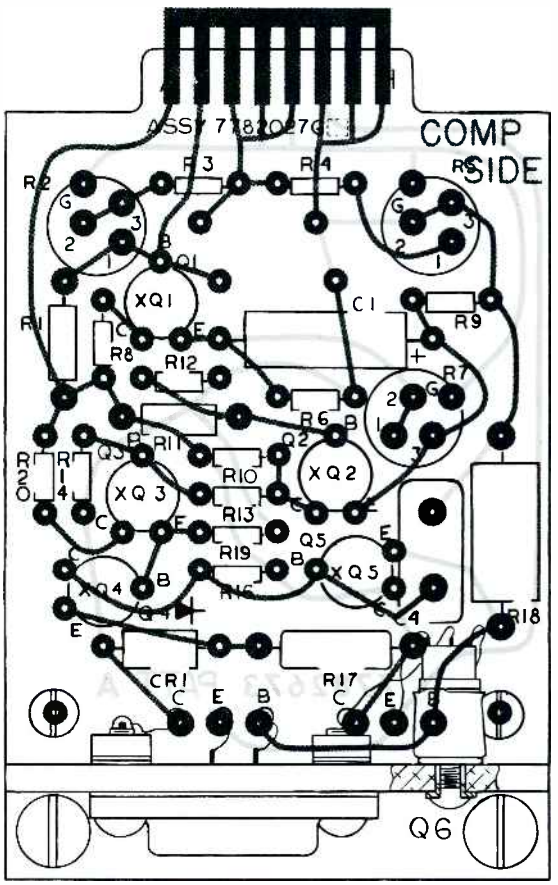
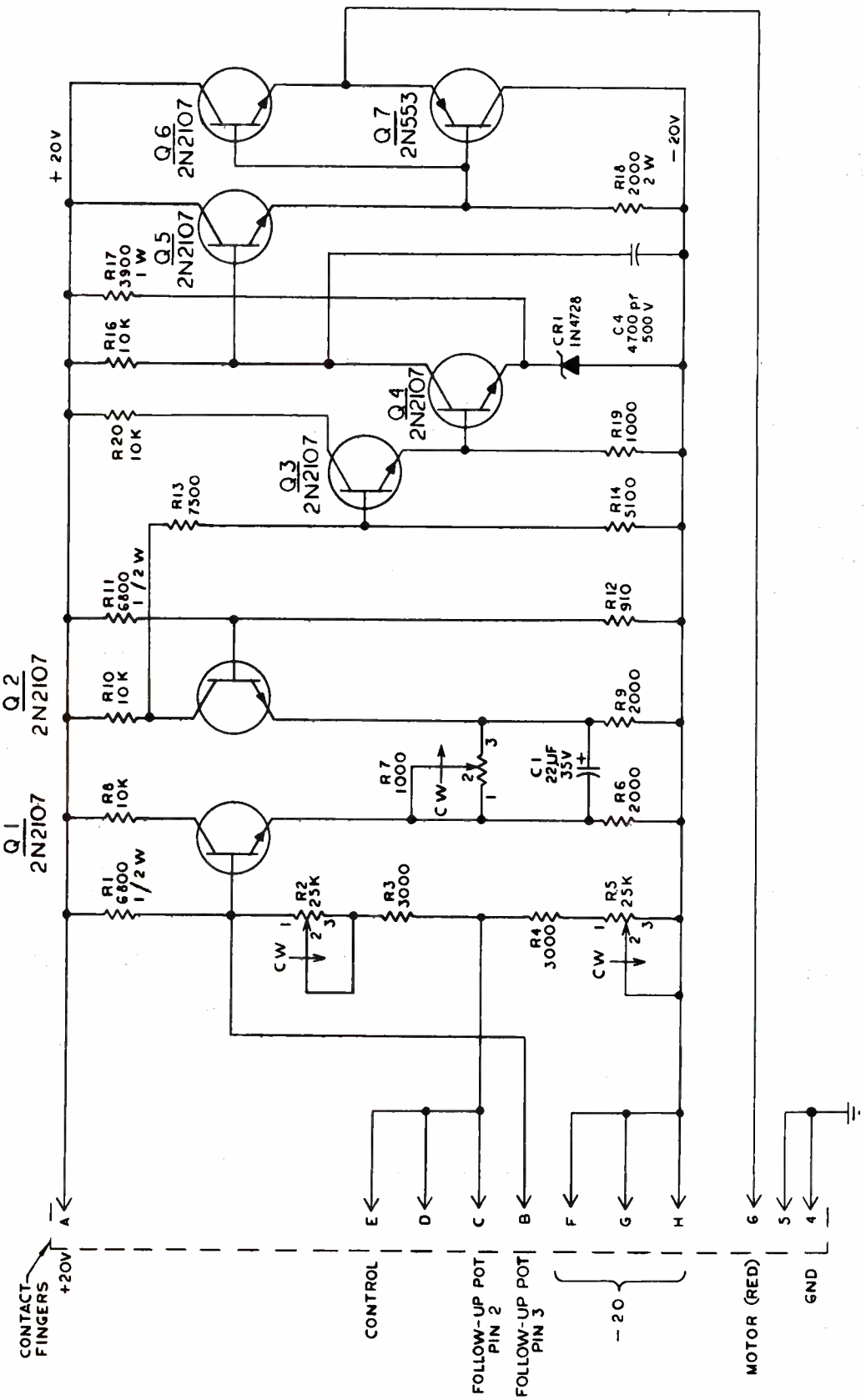
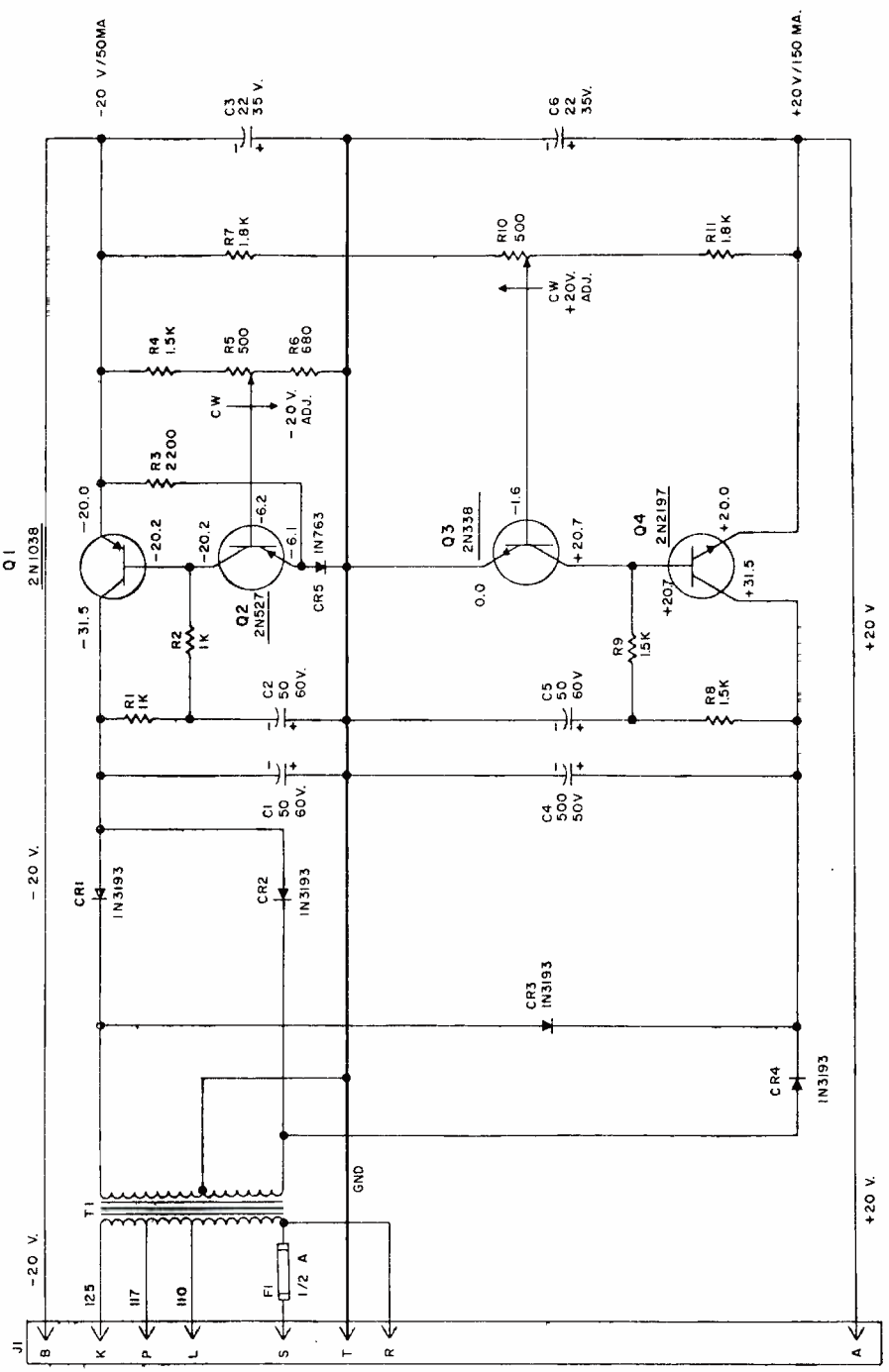


Fig. 60 Iris Servo Amplifier Board Printed Circuit Diagram (C-7782673, Patt A)



NOTES:
1. RESISTOR VALUES IN OHMS & 1/4 WATT UNLESS OTHERWISE SHOWN K= 1000 OHMS
2. CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE SHOWN

Fig. 61 Iris Servo Amplifier Board Schematic Diagram (C-7782672)



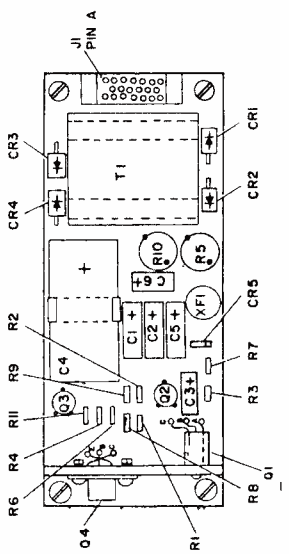


Fig. 62 Iris Servo Power Supply Board Component and Schematic Diagram (D-7672613, Sheet 2, Rev. D)

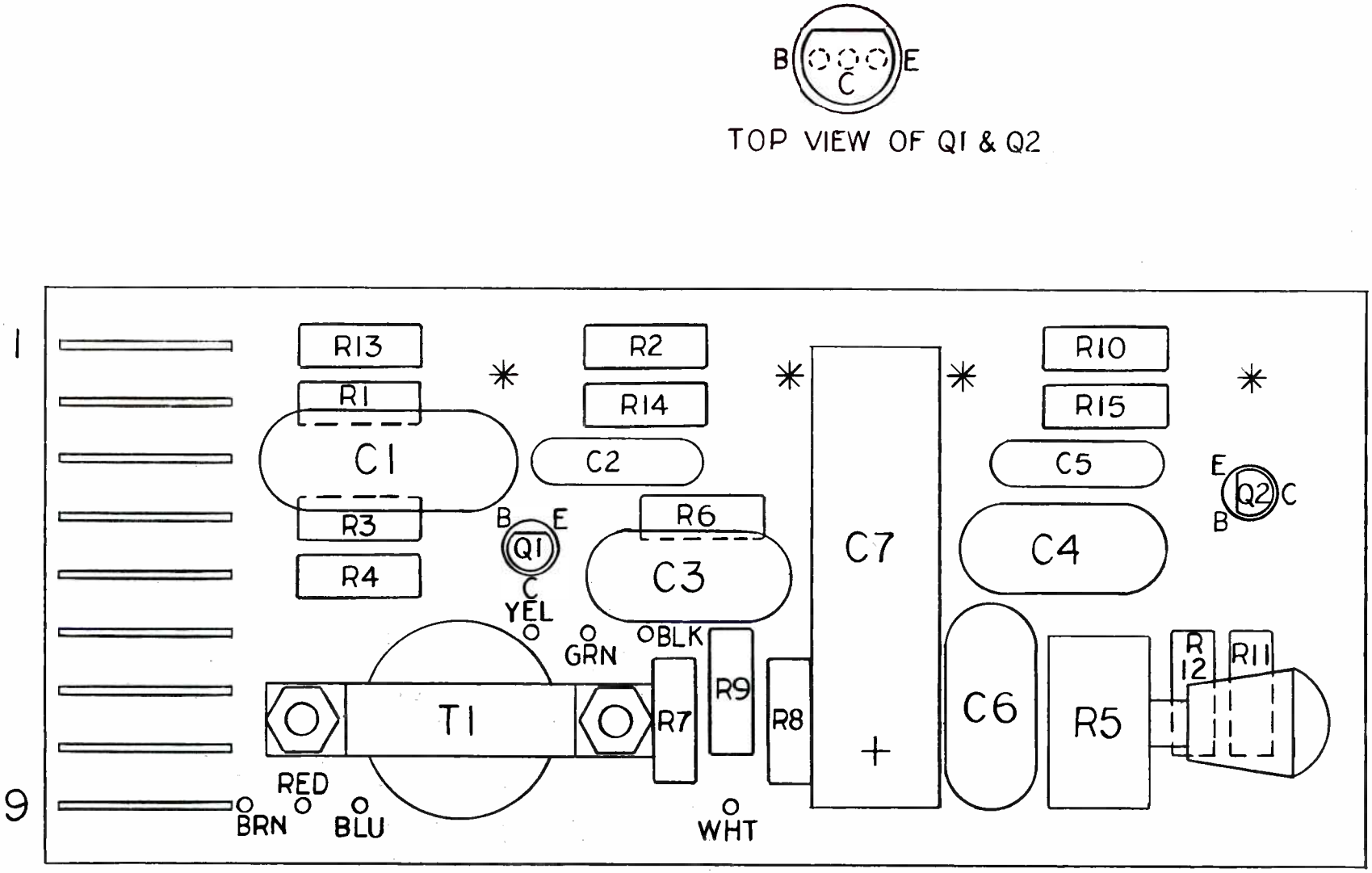


Fig. 63 Intercom Amplifier Board Component Diagram (C-7781675, Sheet 1)

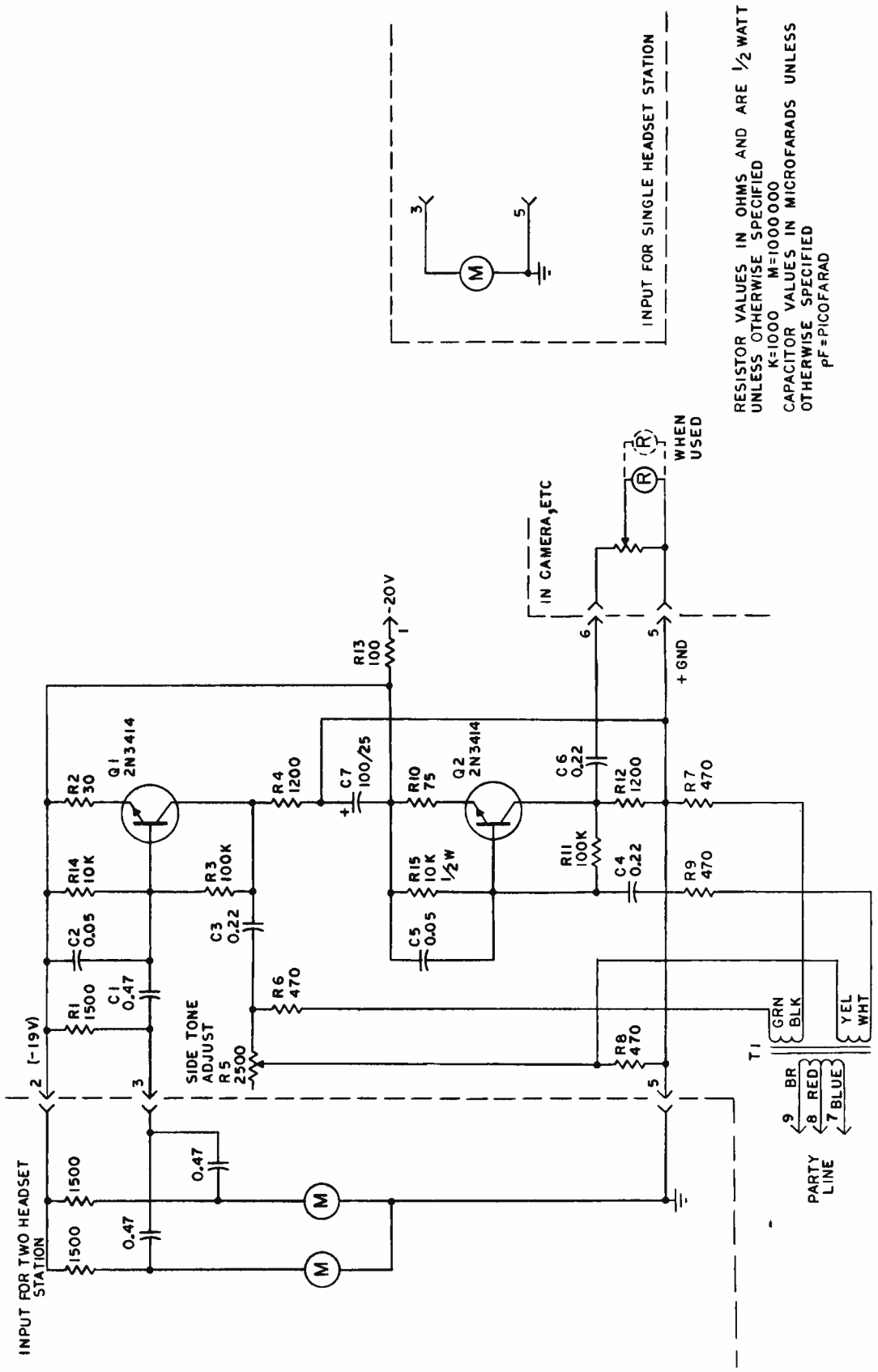
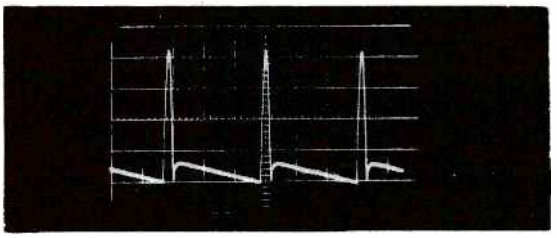
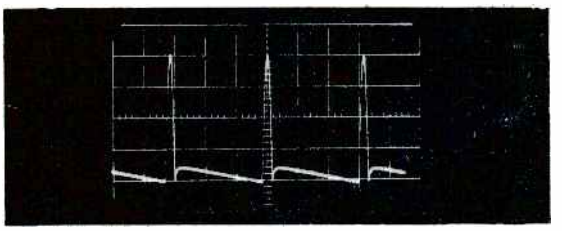


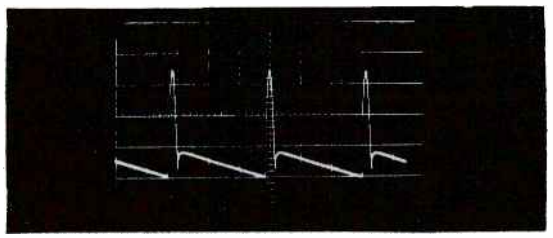
Fig. 64 Intercom Amplifier Board Schematic Diagram (C-7781675, Sheet 3, Rev. A)



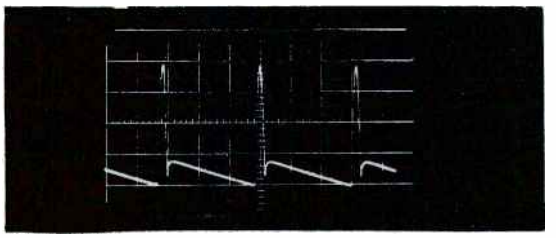
(a) P2-EE, W Horizontal Sweep Return, 8.0 volts P-P, H Rate (Depends on Setting of W WIDTH Control)



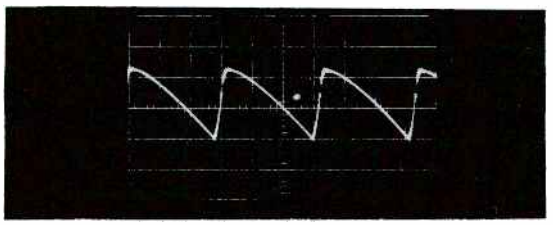
(b) P2-Z, R Horizontal Sweep Return, 8.0 volts P-P, H Rate (Depends on Setting of R WIDTH Control)



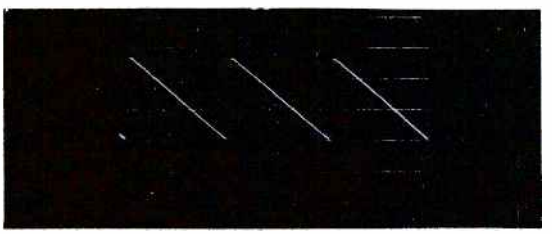
(c) P2-W, B Horizontal Sweep Return, 8.0 volts P-P, H Rate (Depends on Setting of B WIDTH Control)



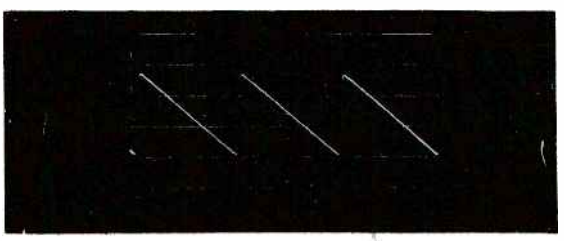
(d) P2-T, G Horizontal Sweep Return, 8.0 volts P-P, H Rate (Depends on Setting of G WIDTH Control)



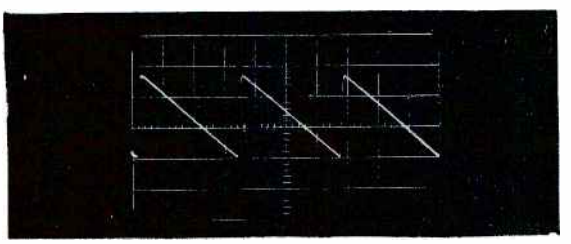
(e) P2-AA, W Vertical Sweep Return, 15.0 volts P-P, V Rate (Depends on Setting of W HEIGHT Control)



(f) P2-X, R Vertical Sweep Return, 15.0 volts P-P, V Rate, (Depends on Setting of W HEIGHT Control)



(g) P2-U, B Vertical Sweep Return, 15.0 volts P-P, V Rate (Depends on Setting of W HEIGHT Control)



(h) P2-R, G Vertical Sweep Return, 15.0 volts P-P, V Rate (Depends on Setting of W HEIGHT Control)

Fig. 65 Registration Control Panel Waveforms: P2-EE, P2-Z, P2-W, P2-T, P2-AA, P2-X, P2-U, P2-R

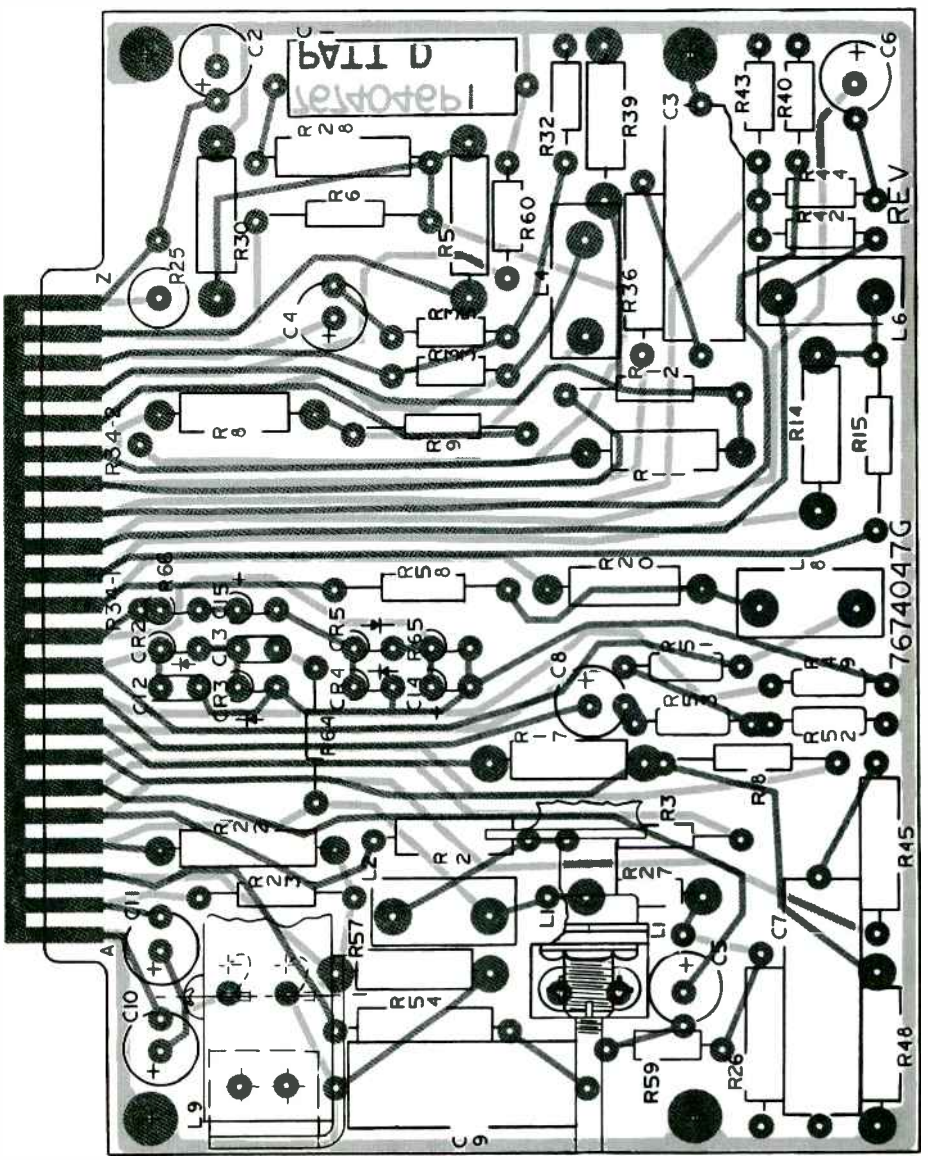


Fig. 66 Registration Control Panel Printed Circuit Diagram (D-7674046, Patt D, Rev. F)

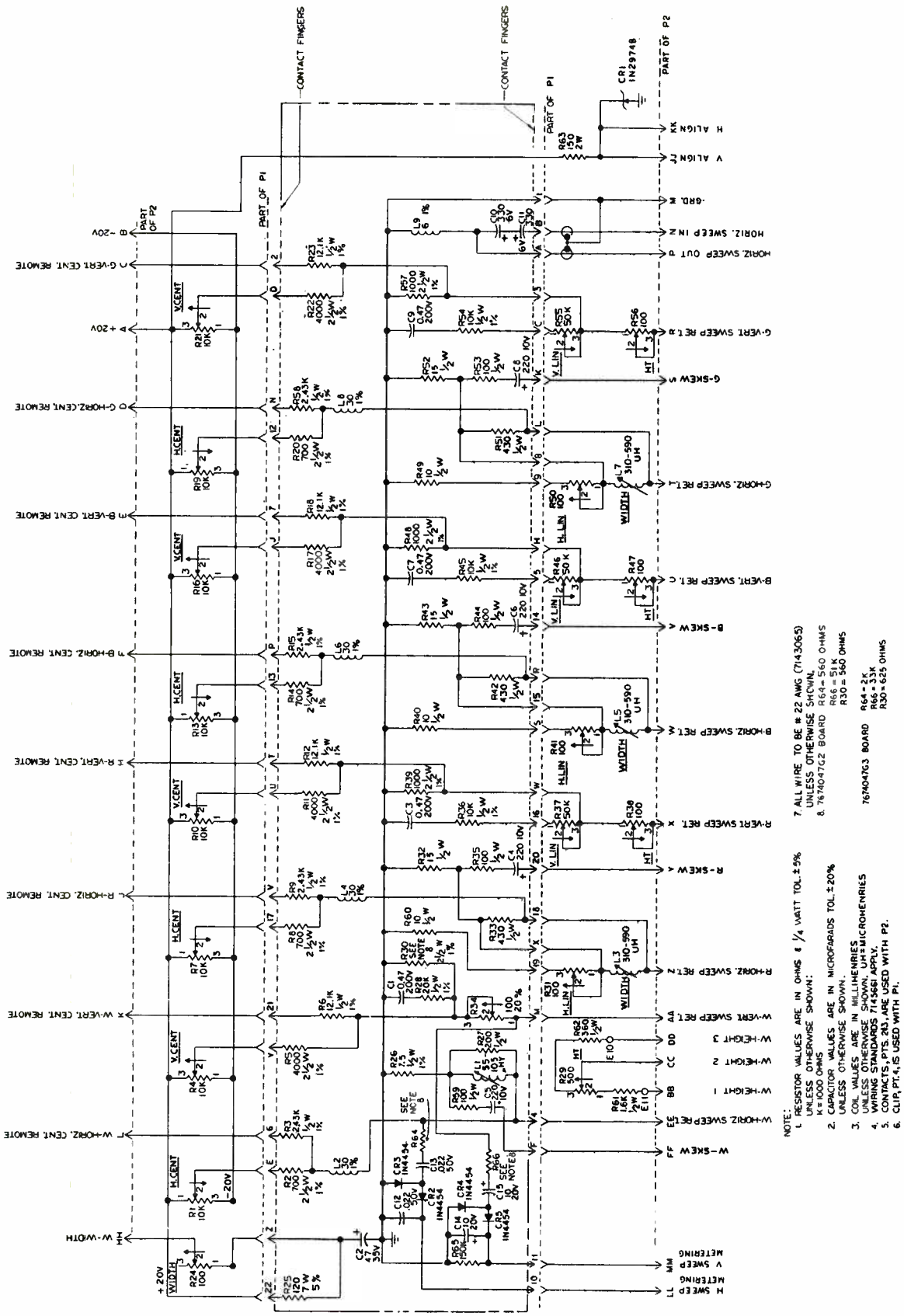


Fig. 67 Registration Control Panel Schematic Diagram (D-7674580, Rev. E)

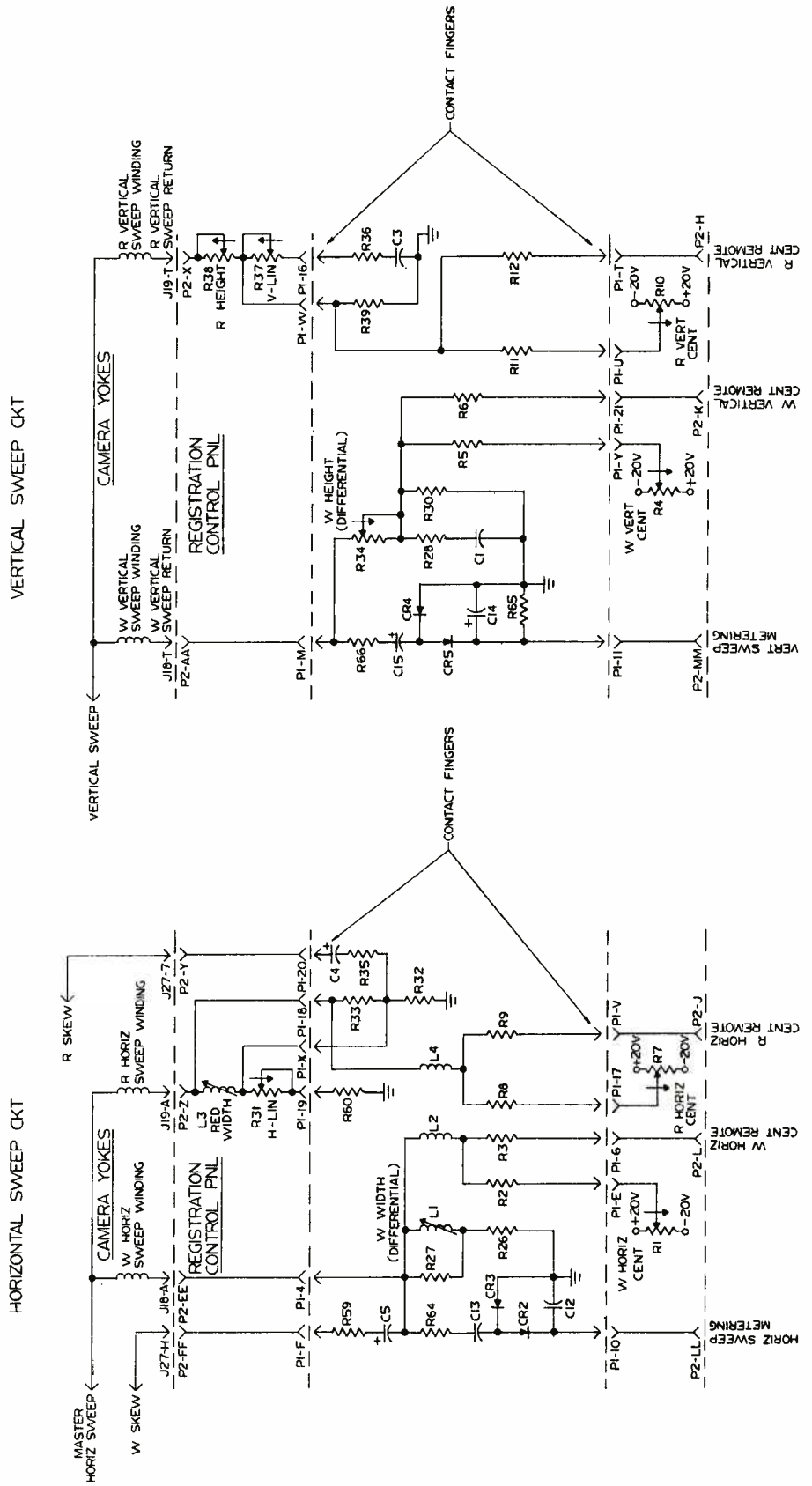


Fig. 68 Simplified Sweep Circuit Schematic Diagram (D-7674355)

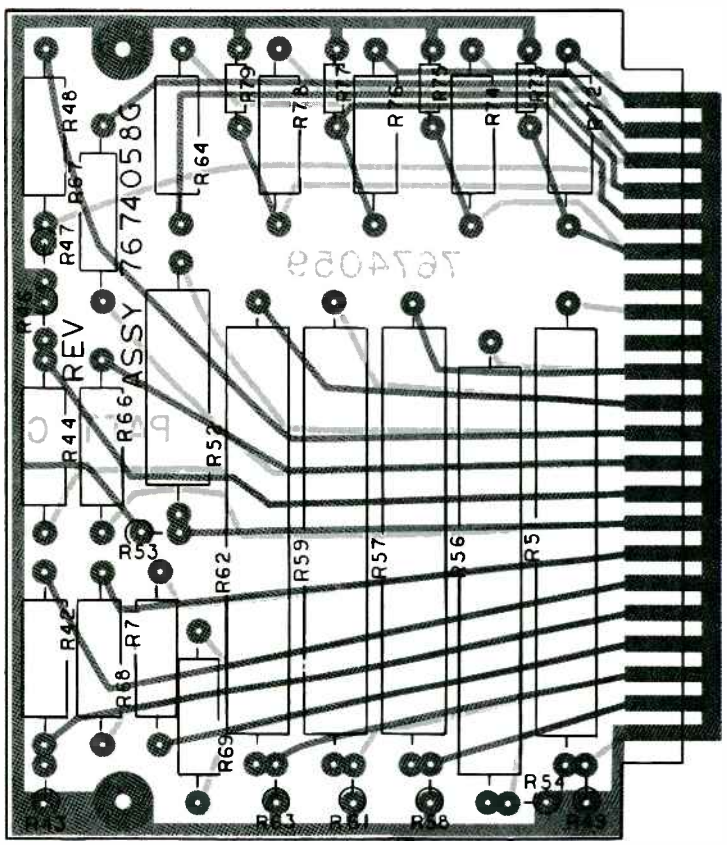


Fig. 69 Local Camera Control Panel Printed Circuit Diagram (D-7674059, Patt C, Rev. C)

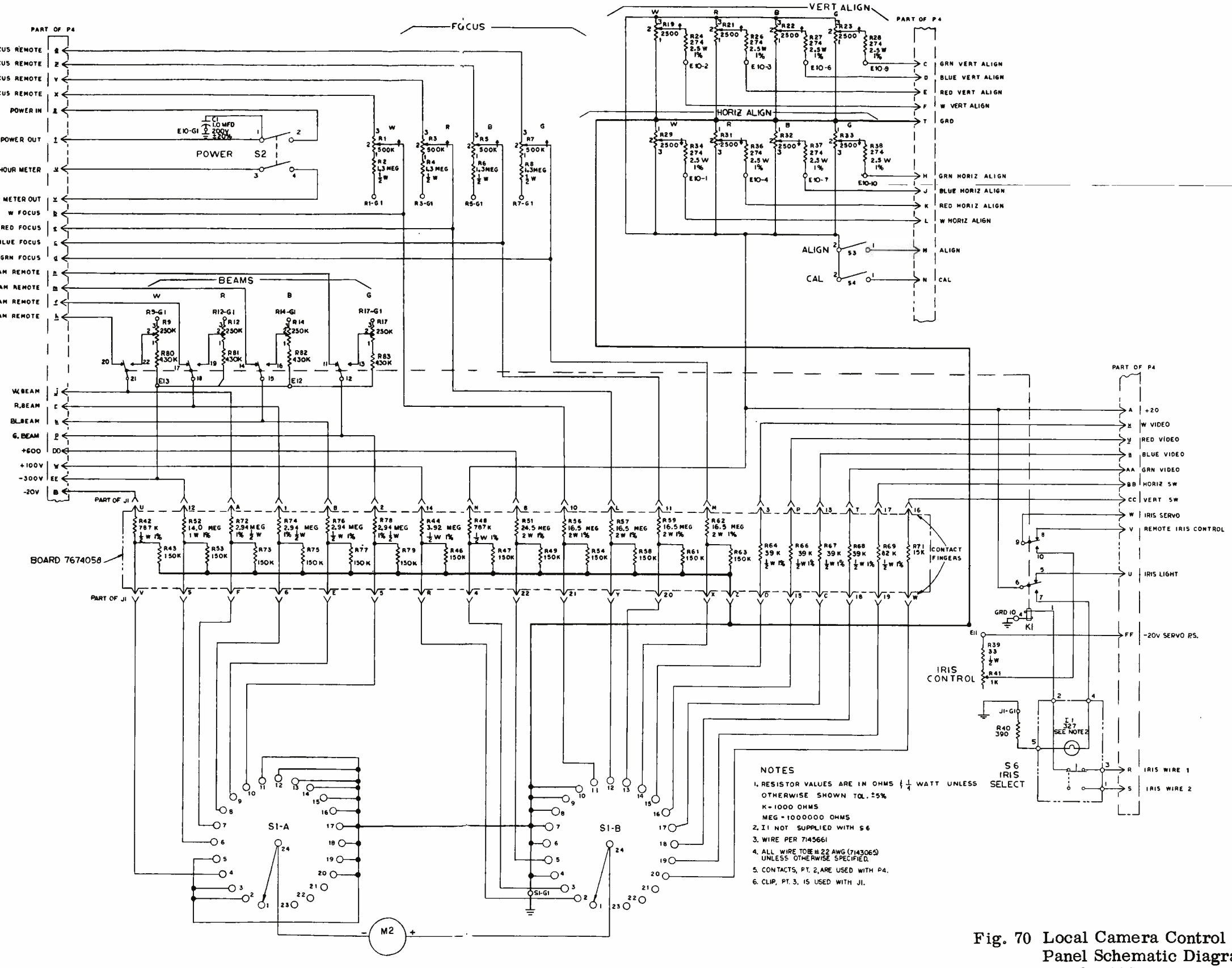
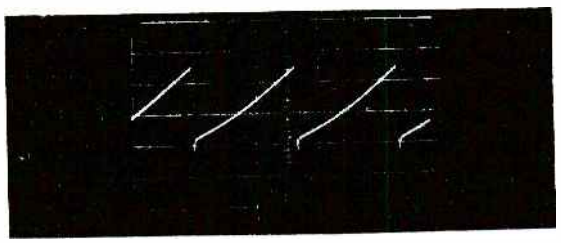
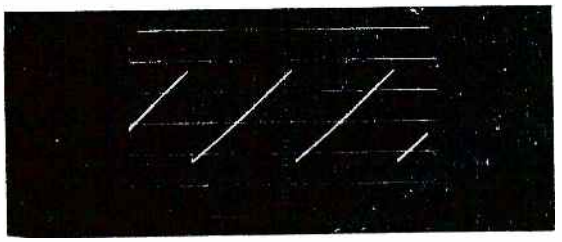


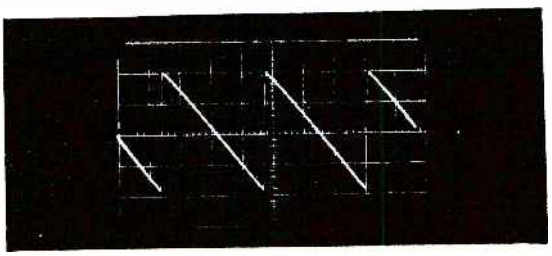
Fig. 70 Local Camera Control Panel Schematic Diagram (E-7355446, Rev. C)



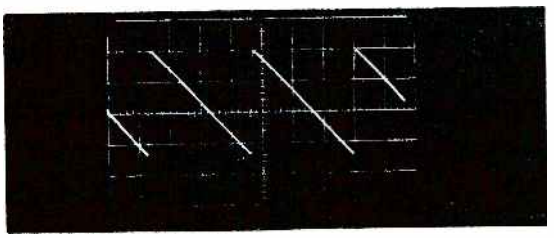
(a) T1-2, 1.8 volts P-P, V Rate



(b) T1-1, 5.0 volts P-P, V Rate



(c) T1-5, 20 volts P-P, V Rate



(d) T1-4, 18 volts P-P, V Rate

Fig. 71 Camera Vertical Transformer Waveforms: T1-2, T1-1, T1-5, T1-4

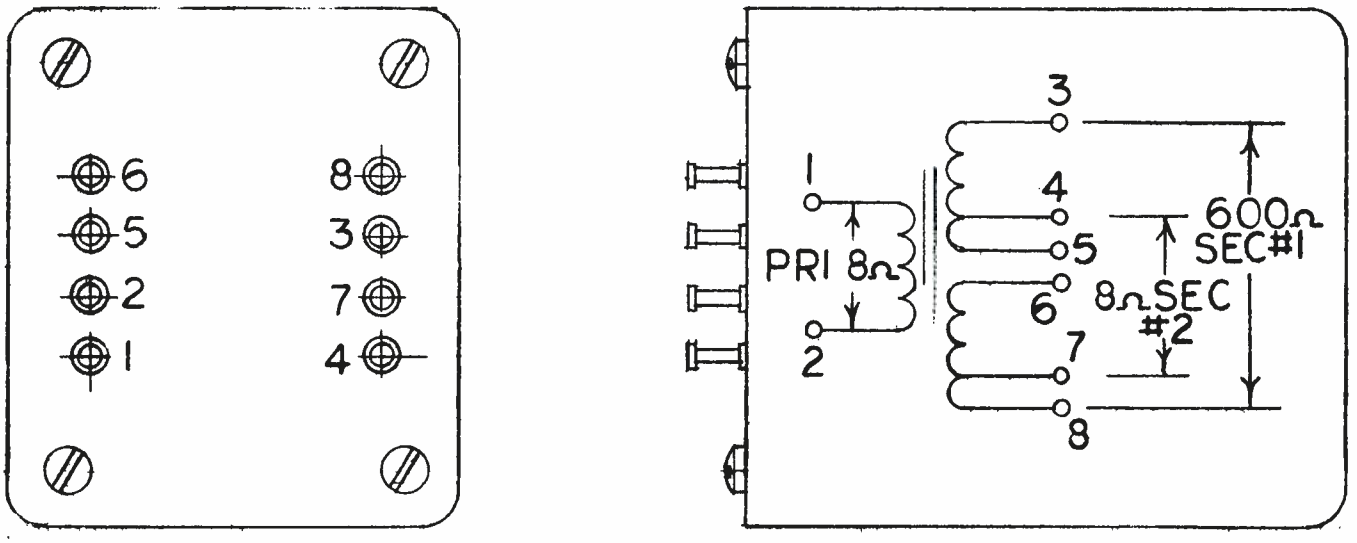


Fig. 72 Camera Vertical Transformer Schematic Diagram (B-7493632)

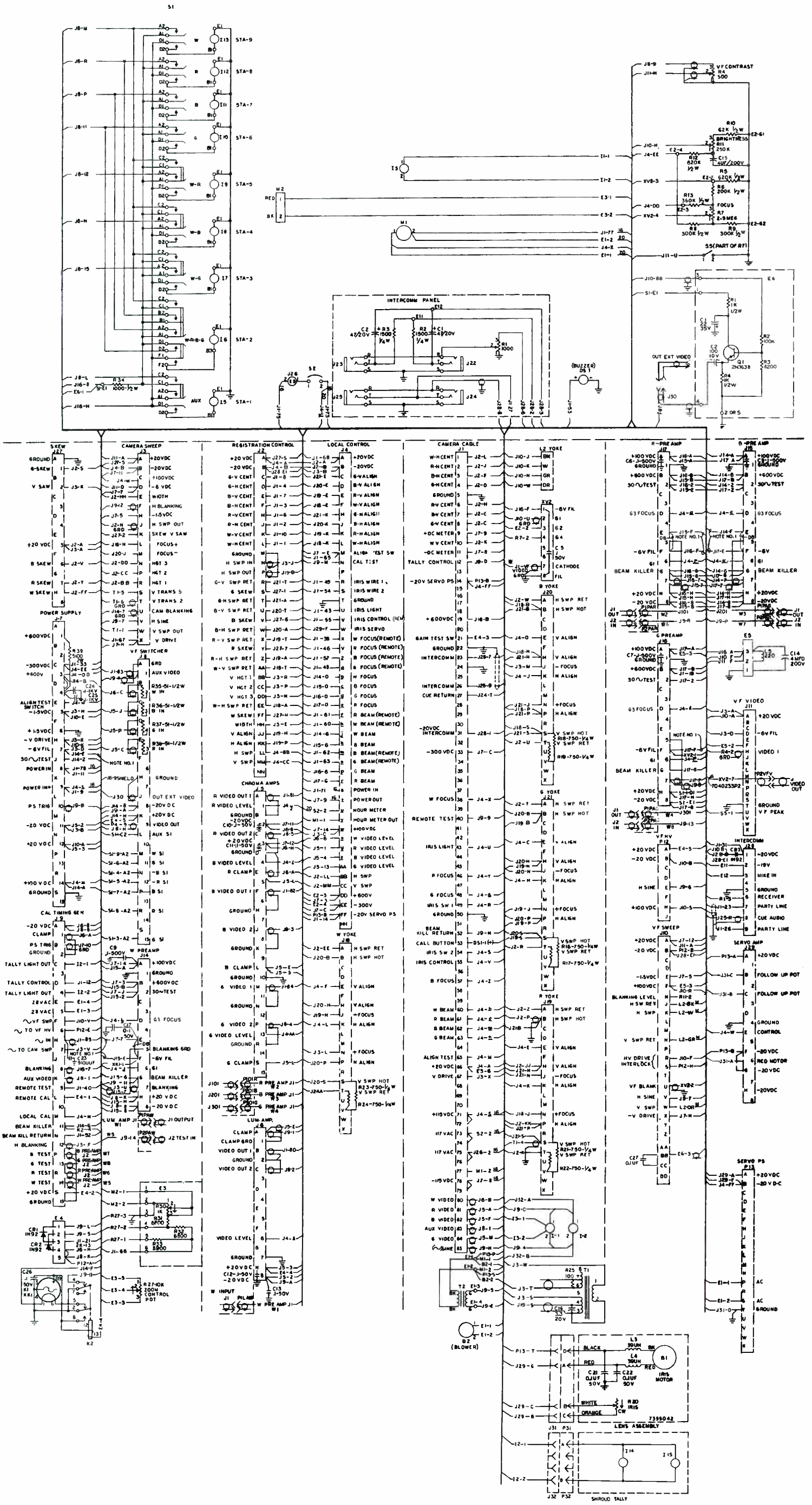


Fig. 73 Color Camera Wiring Diagram (EE-7355680, Rev. A)

INSTRUCTIONS

ANGENIEUX ZOOM LENS

TYPE 10X18J-1

EBI-6209B

VISUAL COMMUNICATION PRODUCTS DEPARTMENT
CONSUMER ELECTRONICS DIVISION

GENERAL ELECTRIC

ELECTRONICS PARK, SYRACUSE, N. Y.

8/68 (350)

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CONTENTS

DRAWINGS

INTRODUCTION

The General Electric Angenieux Zoom Lens is designed by the Television Zoomar Company for installation on the General Electric Types PC-19-A and PC-19-D Color Cameras. The Lens provides a focal length extending from 18 to 180mm at f2.2. This Zoom Lens allows a long back conjugate enabling the image to be split between the luminance and chrominance channels. The chrominance split is accomplished through a unity relay system. The lens system provides a faster Color Camera, color separation, and mechanical simplicity, in addition to the flexibility of a 10:1 zoom lens with custom engineered controls.

Zoom and focusing are achieved by manual control with the lens iris opening electrically controlled. Once registration of the Color Camera is set, it is not necessary to reset the Camera tubes with the Zoom Lens in its wide angle position even if the Camera is moved.

EQUIPMENT

The following equipment is supplied with the Zoom Lens.

Quantity	Name	Designation
1	Zoom Lens	PL-7355042G1
1	Sun Shade	B-7499765
1	3X Zoom Lens Extender	C-7782019G1
1	2X Zoom Lens Extender	C-7782019G2

ACCESSORY

The Close-up Adapter, PL-7172877P1, is an accessory which may be purchased under separate order. It reduces the minimum focusing distance of the standard zoom lens from three feet to 23 inches. The Adapter is attached to the front of the Zoom Lens by a felt grip fitting. When using the Adapter, telephoto-focusing can be achieved from 23 inches to 4.75 feet from the front element.

DESCRIPTION

The Angenieux Zoom Lens consists of four basic sections: (1) zoom lens and drive assembly, (2) zoom control and drive assembly (3) focus control and drive assembly, and (4) iris control, which, when integrated into the Color Camera, provide a compact and sophisticated optical system.

The wiring to the iris servo motor in the Type PC-19-A Color Camera is in conduit to a terminal board. See Fig. 1. The wiring to the iris servo motor in the Type PC-19-D Color Camera is a plug and cable assembly for quick disconnect. See Fig. 2.

Zoom Lens and Drive Assembly

The Zoom Lens is cradled in a cast housing which is mounted on two guide rods affixed to a horseshoe casting. The entire assembly is securely fastened to the General Electric Types PC-19-A and PC-19-D Color Cameras. The zoom and focus drive linkage, iris motor, wiring, and associated gears, are mounted within the zoom lens cradle.

The focal length of the Zoom Lens is monitored on a focal length meter mounted on the Color Camera viewfinder. This meter is calibrated in steps from 18mm to 18mm.

Zoom Control and Drive Assembly

The flywheel zoom control and the Zoom Lens are linked together by a zoom drive control rod, bevel gear block, zoom clutch, and zoom wheel block. The zoom drive rod is connected to the controlling mechanism and the zoom lens by two universal couplings. The zoom control potentiometer is located on the end of the bevel gear block. A large flywheel with ball handle is located in the right-hand side of the Camera for controlling zoom.

Focus Control and Drive Assembly

The panhandle, where all focusing is performed, and the Zoom Lens are linked together by a focus drive control rod and a panhandle housing and shaft. The focus drive rod is connected to the controlling mechanism and the Zoom Lens by three universal couplings and a focus rod bearing. The panhandle is located on the left-hand side of the Camera and focusing is performed by turning the panhandle grip control. This produces linear movement of the front section of the Zoom Lens. Lens movement is controlled by a rotating shaft and a focus bearing secured to the front section of the Lens.

The focus drag control knob, just above the panhandle grip, can be tightened to any degree to restrict freeness of focusing movement. A focus control protective clutch is installed in the focus control handle to prevent the Lens from being over-extended in either the forward or reverse position. If the drag control is securely tightened, the panhandle grip focus control can be rotated without producing Lens movement.

The position of the panhandle is adjustable from horizontal to 30 degrees below horizontal by loosening the handle bolt. The handle bolt must always be tightened after the desired position has been attained. The panhandle can be removed from the Camera during transportation or storage.

A stop plate is located on the end of the panhandle housing and shaft assembly to prevent the handle from exceeding its tilting limitations.

Iris Control

The Zoom Lens iris setting is controlled from the Type PC-19-A Color Camera local control panel by means of the EXP control.

Sun Shade

The sun shade prevents glare, halation, and extraneous light from striking the Zoom Lens.

Extenders

The extenders supplied with the Camera are designed to increase the focal length of the standard 10:1 Zoom Lens. The 2X extender increases the Zoom Lens focal length to 360mm at f4.4. The 3X extender increases the focal length to 54mm to 540mm at f6.6. The extenders are normally used for remote pickup.

Zoom Lens

The Lens focuses a corrected image 76.18mm behind the vertex of the last element and zooms from 18mm to 180mm at f2.2 for a Plumbicon* format. The Lens focuses from three feet to infinity.

*Registered Tradmark of N.V. Philips' Gloeilampenfabrieken of The Netherlands.

INSTALLATION

Panhandle

1. Loosen the three thumbscrews so that they do not protrude into the interior of the panhandle.
2. With the focus drag control in the up position, gently slide the panhandle onto the panhandle shaft. A male and female hexagon focus shaft assembly must mate with each other; therefore, DO NOT force the panhandle on to the associated shaft.
3. Tighten the three thumbscrews until the panhandle is firmly secured to the associated shaft.
4. Loosen the handle bolt and position the panhandle to suit the Color Camera operator, then retighten the bolt securely.

CAUTION

IF THE PANHANDLE IS REMOVED FROM THE CAMERA, COVER THE SHAFT WITH A PROTECTIVE MATERIAL TO AVOID DAMAGE.

Extenders

The extenders are shipped from the factory with their focus ring correctly set allowing for installation without having to make focus adjustments. If, however, focus tracking cannot be attained, the procedures under Focus Tracking, below, must be performed. Although the extender increases the focal length of the Zoom Lens, the focal length meter on the Camera viewfinder indicates only the focal length from 18mm to 180mm. To obtain the focal length with an extender in use, the meter reading must be multiplied by the extender focal power, either 2X or 3X.

1. Release the two cam locks securing the removeable panel from the overall Zoom Lens drive assembly shroud.
2. Remove the panel.
3. Using the thumb and forefinger, reach underneath the shroud and loosen the two thumbscrew lens locks.
4. Slide the Zoom Lens drive assembly forward so that the extender can be installed behind the Zoom Lens.
5. Screw the extender onto the end of the Zoom Lens.
6. Return the Zoom Lens drive assembly towards the Camera until the extender focus ring fits snugly against the front of the Camera.
7. Tighten the two Zoom Lens bed thumbscrews.
8. Run the Zoom Lens to its narrow-angle position and focus the Lens using the panhandle grip focus control. Check focus tracking through the entire range of the Zoom lens. If it is not attained, perform the steps under Focus Tracking, below.

Focus Tracking

1. Loosen the three Allen screws that secure the extender focus ring to the extender.
2. Rotate the zoom control until the Zoom Lens is in its wide-angle position.
3. Make certain that the extender is seated against the front of the Camera, then rotate the extender focus ring until the picture on the Camera viewfinder is in focus.
4. Rotate the zoom control until the Zoom Lens is in the narrow-angle position.
5. Rotate the panhandle grip focus control until the picture on the Camera viewfinder is in focus.
6. Return the Zoom Lens to the wide-angle position and recheck to insure that focus tracking has been maintained.
7. Return the Zoom Lens to the narrow-angle position and recheck to insure that focus tracking has been maintained.
8. If, after initially setting the focus ring, focus tracking cannot be achieved, steps 2 through 7 must be repeated until it is.

OPERATION

Zoom Control

Three and one-half turns of the flywheel zoom control in the clockwise direction causes the Zoom Lens to zoom from the wide-angle position (18mm) to the telephoto position (180mm). The Lens is protected by a zoom clutch which permits overriding at both ends of the flywheel zoom control. Therefore, there is no relationship between the position of the flywheel handle and the focal length of the zoom lens.

Focus Control

To focus the Lens at the three-foot minimum focusing distance, the panhandle grip focus must be rotated fully counter-clockwise. Full focus of the Zoom Lens is achieved by rotating the panhandle grip focus control three and one-half turns in the clockwise direction. The overriding clutch in the panhandle protects the Zoom Lens at both of its extreme positions.

The focus drag control can be set to suit the operator and existing conditions. Minimum friction setting of the drag control permits rotation of the panhandle grip focus control by sliding the palm of the hand over the control.

Program Focusing

To keep the Color Camera in focus, the cameraman should aim it at the subject, zoom the lens into the telephoto position, focus, and then zoom out and frame the subject in the viewfinder. As long as the Camera-to-subject distance does not change, the Camera remains correctly focused from the wide angle to the telephoto position of the zoom lens.

If the Camera-to-subject distance changes, the most critical adjustment is in the telephoto end of the zoom lens range. Correct Camera focus in the wide angle position of the zoom lens is dependent upon the correct lens-to-subject focus when the lens is zoomed into the most telephoto position.

MAINTENANCE

To obtain maximum life and satisfactory operation from the Angenieux Zoom Lens, establish a regular maintenance schedule. Pay careful attention to the Care and Cleaning of Optical Lenses section, below.

Keep the equipment as clean and dry as possible. An air blower or brush with long, soft bristles makes an excellent dust remover.

Before installing any replacement parts, check to determine the cause of failure. When replacing components, select the proper replacement part from Figs. 1 and 2 using the GE or Zoomar drawing number and name given.

Care and Cleaning of Optical Lenses

GENERAL

It is of extreme importance that the following suggestions and methods for cleaning the optical surfaces associated with the Zoomar Lens be followed. These cleaning procedures have been proven by lens manufacturers, and any deviation from them will result in scratching the optical surfaces.

WARNING

DO NOT UNDER ANY CIRCUMSTANCES USE ANY TYPE OF CLEANING POWDERS ON OPTICAL SURFACES.

CARE OF COATED LENS SURFACES

Any water or oil accidentally spilled on the optical surfaces must be immediately removed; otherwise, a distorted or imperfect image will be evident when the signal is transmitted. Cleaning devices should be

applied very lightly moving from the center surface of the lens towards the edge.

The recommended cleaning agents are the following:

1. A camel-hair brush.
2. Slightly moistened Kleenex balls or dust-free surgical swabs. The moistening agent should be breath moisture, denatured alcohol, ether, or acetone.

CLEANING THE GLASS SURFACES

1. Before applying any lens cleaning agent, first remove all dust particles by using a syringe. If this method fails, use a soft camel-hair brush; however, it is suggested that the brush be tapped on the edge of the Camera pedestal to remove the accumulated dust particles after each pass of the brush.

A soft, clean, dust-free cloth can also be used to remove dust particles. Rotate the finger when wiping. If you are cleaning the optical surfaces from right to left, rotate the finger clockwise, and if wiping left to right, rotate the finger counterclockwise.

Disassembly and Assembly

Refer to Figs. 1 and 2.

ZOOM LENS AND DRIVE ASSEMBLY

1. Remove the Camera Zoom Lens shroud to expose the Zoom Lens and drive assembly.
2. Open the left-hand door of the Camera and remove the light shield.
3. Remove the four iris motor wires from terminal board TB1, located directly below the servo amplifier power supply. They are connected as follows on the Type PC-19-A Camera:

Iris Motor Wires	Connect To TB1-
Red	1
White	2
Orange	3
Black	4

4. Disconnect the plug and cable assembly on the Type PC-19-D Camera.
5. Loosen the two thumbscrew locking nuts and move the Zoom Lens and drive assembly forward to its maximum position. The focus and zoom drive universal couplings are now exposed.
6. Rotate the flywheel zoom control until it is in its maximum clockwise position.
7. Rotate the focus control fully clockwise so that the zoom drive rod within the Camera is in its maximum position. If the assembly is being reinstalled on the Camera, it is necessary to reach into the interior of the Camera and rotate the zoom rod manually. The maximum forward position is indicated by a mechanical stop.
8. Remove the iris motor wires from within the Camera (Type PC-19-A only).
9. Loosen, but do not remove, the two socket set SC No. 8-32 Allen-head set screws (Fig. 1) on the focus and zoom drives. Disconnect the hexagons from the universal joints by pushing the universal joints back into the Camera.
10. While firmly grasping the zoom lens and drive assembly, remove the six Allen-head screws that secure the horseshoe collar to the Camera frame (Type PC-19-A only).
11. Loosen the two Allen-head socket screws and pivot C washers under the screw head. Pull off the lens (Type PC-19-D only).
12. Unscrew the iris wire guide tubing and tape the iris motor wires to the horseshoe casting (Type PC-19-A only).
13. Consult your local General Electric field representative for shipping instructions.
14. To reinstall this assembly on the Camera, repeat steps 1 through 12 in reverse order.

PANHANDLE HOUSING AND SHAFT

1. Open the left- and right-hand Camera doors.
2. Working from the left side of the Camera, remove the blue preamplifier cover located in the bottom portion of the Camera.
3. Remove the ground straps from the front and rear of the blue yoke assembly.

Access to the rear ground strap is achieved by opening the left-hand door on the rear of the Camera.

4. Remove the preamplifier board from the yoke mounts.

5. From the rear of the Camera, first remove the Plumbicon tube connector cover then remove the connector.

6. Remove the four screws that secure the yoke assembly to the Camera frame and rest the yoke assembly on the Camera door.

7. From the rear underside of the Camera, remove the seven Phillips screws that secure the intercom box to the Camera. Also remove the three screws that secure the panhandle housing and shaft assembly to the intercom box.

8. Remove the six Phillips screws that secure the focus drive rod cover to the Camera. The screws are located underneath the Camera.

9. Remove the panhandle.

10. While holding the panhandle housing and shaft assembly, remove the four Phillips flat-head screws from the rear inside of the Camera. These screws secure the assembly to the Camera.

ZOOM LENS

The Zoom Lens is a delicate instrument of sophisticated construction and must be treated with extreme care. When it is removed from the Camera, it must be placed on a foam rubber surface to prevent damage to its elements. DO NOT PLACE ON A HARD SURFACE.

CAUTION

IF IN THE OPINION OF THE CUSTOMER THE ZOOM LENS AND ITS DRIVE ASSEMBLY ARE NOT OPERATING CORRECTLY, THE CUSTOMER MUST CONTACT HIS LOCAL GENERAL ELECTRIC COMPANY VISUAL COMMUNICATION PRODUCTS DEPARTMENT DISTRICT SALES MANAGER, DISTRICT SERVICE ENGINEER, OR VCPD SERVICE ENGINEERING, MATTYDALE, NEW YORK.

IF THE ZOOM LENS AND DRIVE ASSEMBLY ARE TO BE REMOVED FROM THE CAMERA FOR REPAIRS, INDICATE TO THE GENERAL ELECTRIC REPRESENTATIVE WHETHER A RENTAL UNIT IS REQUIRED DURING THE REPAIR PERIOD. A RENTAL UNIT CONSISTS OF THE LENS ASSEMBLY COMPLETE WITH THE MECHANICAL DRIVES, BUT LESS THE FOCUS AND ZOOM CONTROLS. IF THE FOCUS AND ZOOM CONTROLS ARE NEEDED, INFORM YOUR LOCAL REPRESENTATIVE; OTHERWISE THESE ITEMS WILL NOT BE SHIPPED. YOUR REPRESENTATIVE WILL PROVIDE SHIPPING INSTRUCTIONS.

ANY SERVICING PERFORMED ON THE ZOOM LENS BY PERSONNEL OTHER THAN THOSE SPECIFIED BY THE GENERAL ELECTRIC COMPANY MAY VOID THE ZOOM LENS WARRANTY.

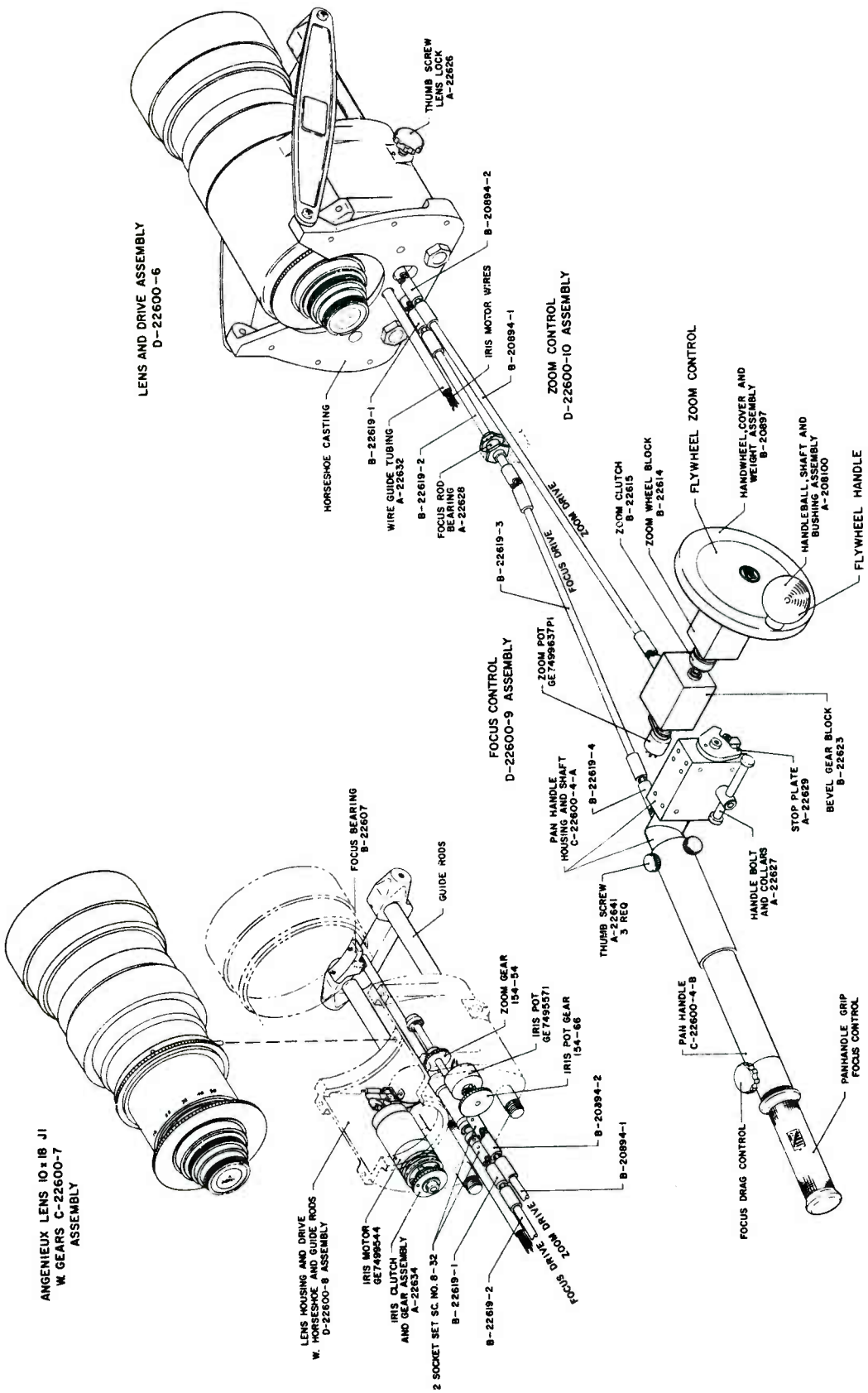

Fig. 1 Isometric Assembly Diagram (D-7674349)

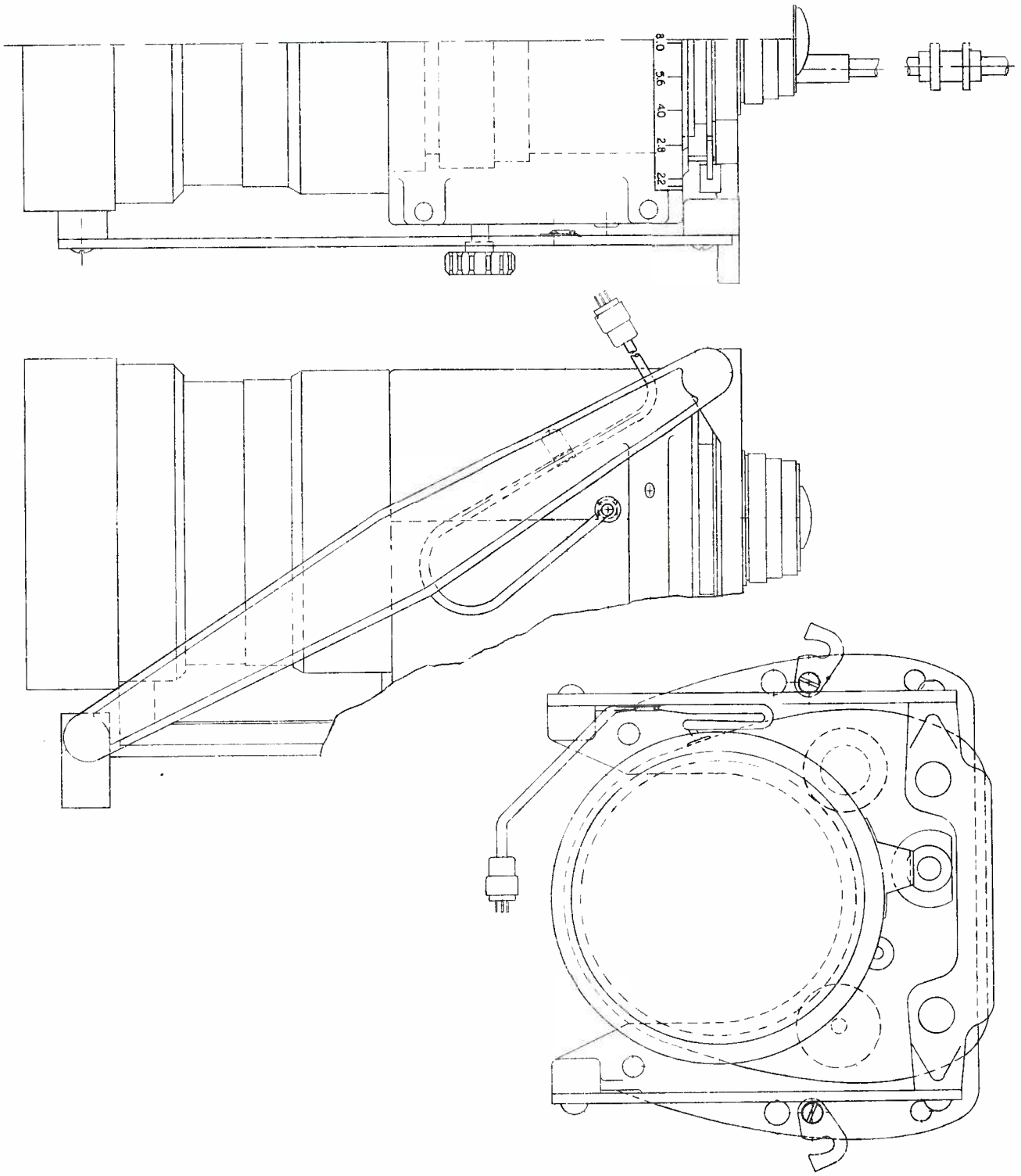

Fig. 2 Housing Assembly Diagram (D-7674584)

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XQ1020B
PLUMBICON*

The Amperex XQ1020 Plumbicon® is a sensitive high definition pick-up tube with a photoconductive target and low velocity stabilization. The XQ1020 employs a separate mesh construction.

The XQ1020 series of camera tubes are intended for highest quality broadcast cameras.

GENERAL CHARACTERISTICS

MECHANICAL

Focusing Method (1	magnetic
Deflection Method (1	magnetic
Dimensions	see outline drawing
Base	see outline drawing
Mounting Position	any
Weight	3.0 oz.
Accessories	
Socket	type 56021
Focusing and Deflection Coil Assembly	
for XQ1020	type AT1132
for XQ1020L, R, G, B	type AT1112 or AT1113

ELECTRICAL

Heating	indirectly by AC or DC; parallel supply
Heater Voltage	6.3 volts ± 5%
Heater Current	~300 ma
Capacitance	
Signal Electrode to All Other Electrodes	3 to 6 pf (5
Grid No. 1 Voltage for Cut-off at V_{g_2} = 300 V	-30 to -100 volts (7, 8
Blanking Voltage Peak to Peak	
on Grid No. 1	70 volts max.
on Cathode	25 volts min.
Grid No. 2 Current at Normally required beam currents	2 ma
Dark Current at E_{as} = 45 V	0.003 μA

OPTICAL

Dimensions of Quality Rectangle on Photoconductive Layer (aspect ratio 3:4)	0.5 in. x 0.67 in. (6
Orientation of Image on Photoconductive Layer	see note 2
Sensitivity at Color Temperature of Illumination = 2850° K	
type: XQ1020L	275 μA/lumen
XQ1020R	60 μA/lumen (3
XQ1020G	125 μA/lumen (3
XQ1020B	32 μA/lumen (3
Total Thickness of Faceplate Glass	0.28 ± 0.008 in.
Index of Refraction of Faceplate	1.5

* The XQ1020L is intended for black and white high quality cameras. The XQ1020R, G, B are intended for color cameras in the red, green and blue channels respectively.

Amperex®

OPTICAL (continued)

Gamma of Transfer Characteristic	0.95 ± 0.05 (4
Spectral Response: max. Response at	Approx. 5000 Å

MAXIMUM RATINGS

Signal Electrode Voltage	50 volts (8
Grid No. 4 Voltage	1000 volts (8
Grid No. 3 Voltage	750 volts (8
Potential Difference between Grid 4 and Grid 3	350 volts
Grid No. 2 Voltage	350 volts (8
Grid No. 2 Dissipation	1 volt
Grid No. 1 Voltage	
Positive	0 volt
Negative	125 volts
Cathode to Heater Voltage	
Positive Peak	50 volts
Negative Peak	50 volts (9 max
Heater Warm-up Time	1 minute min.
Ambient Temperature	50° C max.
(Storage and Operation)	-30° C min.
Faceplate Temperature	50° C max.
(Storage and Operation)	-30° C min.

TYPICAL OPERATING CONDITIONS AND PERFORMANCES

Cathode Voltage	0 volt
Grid No. 2 Voltage	300 volts
Signal Electrode Voltage	45 volts (11
Grid No. 3 and No. 4 Voltage	(See Note 13)
Beam Current	(See Note 12)
Focusing Coil Current	(See Note 13)
Line-resp. Frame Deflection Coil Current	(See Note 13)
Faceplate Illumination	(See Notes 10, 14 and 15)
Faceplate Temperature	20 to 45° C

Resolution: Modulation Depth, i. e. uncompensated horizontal amplitude response at 400 TV lines, in picture center. See note 16.

	XQ1020 XQ1020L	XQ1020R	XQ1020G	XQ1020B
Highlight Signal Current	0.3	0.15	0.3	0.15 μA
V_{g3} = 550 to 650V, $V_{g(4-3)}$ = 50 to 100V (See Note 17) Modulation Depth at 400 TV Lines	40	35	40	50%

Limiting Resolution	≥ 600 T. V. lines
Signal to Noise Ratio (18 at a Signal Current of 0.15 μA	approx. 200 : 1

LAG

Measured with 100% signal current of 0.1 μA and with a light source with a color temperature of 2850° K. Appropriate filter inserted in light path for tubes XQ1020R, G and B.

	XQ1020L, R, G	QX1020B
Residual signal after dark pulse of 60 msec.	max. 5%	max. 6%
Residual signal after dark pulse of 200 msec.	max. 2%	max. 5%

FOOTNOTES

1) For focusing/deflecting coil assembly, see "Accessories".
2) For proper orientation of the image on the photo-conductive layer the vertical scan should be essentially parallel to the plane passing through the tube axis and the mark on the tube base.
3) As measured under following conditions:
Tubes are exposed to 0.45 ft. C. illumination of black body color temperature of 2850° K. The appropriate filter is inserted in the light path (XQ1020R, G, B). The signal current obtained in nano-amperes denotes the color sensitivity expressed in terms of micro-amperes per lumen of white light before the filter.

Filters Used:				
XQ1020R	Schott	OG2	(Thickness	3mm)
XQ1020G	Schott	VG9	(Thickness	1mm)
XQ1020B	Schott	BG12	(Thickness	3mm)

4) Gamma is, to a certain extent, dependent on the wavelength of the illumination applied. The use of Gamma-stretching circuitry is recommended.
5) The capacitance of the target to all electrodes, which effectively is the output impedance, increases when the tube is inserted into the deflecting/focusing assembly.
6) Underscanning of the specified target area of 0.5 in. x 0.67 in. or failure of scanning, should be avoided since this may cause damage to the photoconductive target.
7) With no blanking voltage on Grid No. 1.
8) At cathode voltage = 0 volts
9) A minimum of 1 minute warm-up time for the heater is to be observed before drawing cathode current.
10) For short intervals, during storage and idle periods of the camera, the tube-face shall be covered with the plastic hood which is provided.
11) The signal electrode voltage shall be adjusted to 45 volts. To compete with excessive highlights in the scene to be televized, the signal electrode voltage may be reduced to a minimum of 25 volts. This will however result in some reduction in performance, especially in respect to sensitivity.
12) The beam current shall be adjusted for correct stabilization of a highlight signal current of twice the amount as indicated in the table below.
13)

	Focus Current mA	Line Current mA pp	Frame Current mA pp	
Black/White Coil Assembly AT1132 Grid No. 3 Voltage = 50-100 V Grid No. 4 - Grid No. 3 = 50-100 V	25	235	35	approx. values
Color Coil Assemblies AT1112 AT1113 Grid No. 3 Voltage = 600 V Grid No. 4 - Grid No. 3 = 50-100 V	100	235	35	

The optimum voltage difference between grid No. 4 and grid No. 3 is depending on the type of focusing/deflecting coil unit used.
For types AT1112, AT1113, AT1132 a voltage difference of 50 to 100 Volt is recommended.
14) Faceplate illumination level for the XQ1020 and XQ1020L typically needed to produce 0.3 μA signal current will be approx. 0.4 ft. C. The signal currents stated for the color tubes XQ1020R, G, B respectively will be obtained with an incident light-level (2850° K) on the filters of approx. 1.0 ft. C. The figures stated for modulation depth are based on the use of the filters described in note 3, for filter BG12 however a thickness of 1mm is chosen.
15) Illumination on the photo-conductive layer, Bph, in the case of a black/white camera is related to scene-illumination, Bsc, by the formula:

$$B_{ph} = B_{sc} \quad \frac{R.\,T.}{4F^2\,(m+1)^2}$$

in which R represents the scene-reflexivity (average or the object under consideration, whichever is relevant), T the lens transmission factor, F the lens aperture and m the linear magnification from scene to target.
A similar formula may be derived for the illumination level on the photoconductive layers of the respective R, G, and B tubes in which the effects of the various components of the complete optical system have been taken into account.

FOOTNOTES (continued)

16) The figures shown represent the typical horizontal amplitude responses of the tubes proper after correction for faults introduced by the optical system.
Horizontal amplitude response can be raised by the application of suitable correction circuits. Such compensation, however, does not affect vertical resolution, nor does it influence the limiting resolution.

17) Grid No. 3 voltage adjusted for optimum focuse. See also note 13.

18) The stated ratio represents the "visual equivalent signal-to-noise ratio," which is taken as the ratio of highlight video-signal current to R. M. S. noise-current, multiplied by a factor of 3. (Assuming an R. M. S. noise-current of the video pre-amplifier of 2. 10-9A, bandwidth 5 MHZ).

GENERAL RECOMMENDATIONS AND INSTRUCTIONS FOR USE

GENERAL

1. Signal-electrode connection is made with a spring-contact against the metallic coating at the face end of the tube, which is also part of the focusing coil.

2. Electrostatic shielding of the signal-electrode is required in order to avoid interference effects in the picture. Effective shielding is provided by grounding shields on the inside of the face-plate end of the focusing coil and, on the inside of the deflecting yoke.

3. The Plumbicon is provided with tungsten base pins. Avoid mechanical force and shocks to these pins and, insert the tube into its socket (type 56021) with care.

4. In some cases the properties of the photo-conductive layer used in the Plumbicon may become slightly deteriorated during long idle periods, such as encountered between the last factory test and actual delivery to the user.
Operate the tube directly after receipt under normal voltage settings, in overscanned position with evenly illuminated target and a signal current of 0.15 μA for several hours after which the initial properties will have been fully restored.

5. The light-transfer characteristic of the Plumbicon is characterized by a gamma near unity, it may be desirable for broadcast applications to incorporate a gamma correcting circuitry in the video-amplifier system with an adjustable gamma of 0.5 to 1.
Design this gamma correcting circuitry so that an extra compression can be introduced by manual control in the video signal range of 75 to 100% of normal peak white level.
This provision will prevent the video amplifier system from becoming over-loaded when the Plumbicon with its near unity gamma transfer-characteristic is exposed to scenes containing small peaked highlights as caused by reflections of shiny objects.

6. The Plumbicon does not generate its own noise to any noticeable extent, so the signal-to-noise ratio will primarily be determined by the entrance noise of the video amplifier system.
The high sensitivity of the Plumbicon provides pictures with excellent signal-to-noise ratio under normal studio lighting conditions provided its output is fed into a well-designed input stage of the video-amplifier system. In such a system an aperture correction may be incorporated to ensure an attractive gain in resolving power without visually impairing the signal-to-noise ratio.

Instructions for Use

1. Insert the tube in the deflection unit so the mark at the base of the tube is on top.

2. Clean the face-plate of the tube and press the socket gently onto the base-pins.

3. Cap lens and close iris.

4. Set:
   a) Grid No. 1 bias-control at max. negative bias (beam cut-off).
   b) Signal-electrode voltage to the value as indicated on the tube's test sheet.
   c) Scanning amplitudes to max. scan.

5. Switch on camera equipment and monitor.

6. Adjust monitor to produce a faint - non overscanned - raster.

7. Direct camera to the scene to be televised and uncap lens.

8. Turn grid No. 1 bias-control slowly until a picture is produced on the monitor. If the picture is too faint, increase lens aperture.

9. Adjust grid No. 3 and grid No. 4 voltage control (beam focus) and optical focus alternately for max. focus.

10. Align the beam of the plumbicon by either of the two following methods:

    a) Adjust the alignment fields in such a way that the center of the picture on the monitor does not move when grid No. 3 and No. 4 voltage (beam-focus) is varied.

    b) Reduce signal-electrode potential to a few tenths of a volt. Adjust alignment fields until most uniform picture is obtained as observed on monitor or waveform oscilloscope.

11. Adjust scanning amplitudes:

    a) By means of a mask of 0.5 x 0.67 in. which is in contact with and centered at the face-plate, decrease horizontal and vertical deflecting currents until the periphery of this mask is just outside the raster on the monitor. This procedure is facilitated by small adjustments of the centering controls.

    b) If no mask available, direct the camera to a test chart having correct aspect ratio of 3 : 4 and adjust the centering controls in such a way that the target ring is just visible in the corners of the picture. Adjust distance from camera to test chart and optical focus alternately until the picture of the test chart is positioned on the face-plate. Decrease both scanning amplitudes until the picture of the test chart completely fills the scanned raster on the monitor.

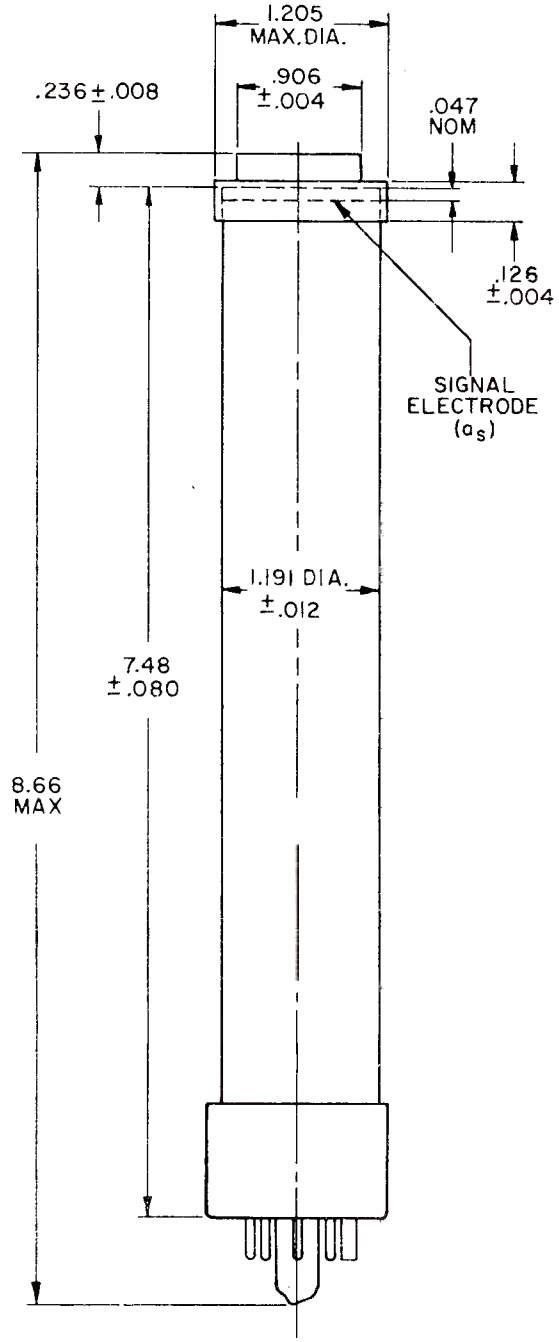
12. Adjust iris for a picture of sufficient contrast and adjust the beam-current to a value that all highlights will be stabilized.

13. Check alignment, beam focus and optical focus.

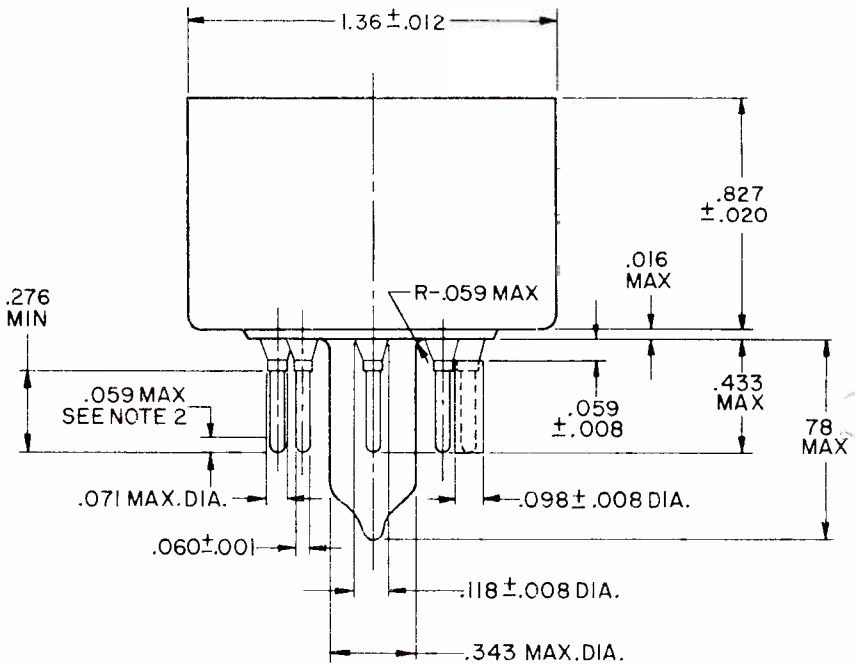
ALWAYS:
- use full size (0.5 x 0.67 in.) scanning of the target and avoid underscanning
- use sufficient beam current to stabilize the picture highlights
- make sure that the deflection circuits are operative before adjusting beam current
- avoid focusing camera directly to the sun
- keep lens capped when transporting camera

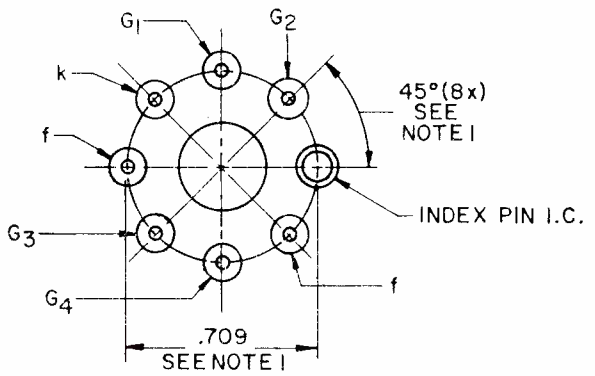
Transportation, Handling and Storage

During transportation handling or storage the longitudinal axis must either be in a horizontal position or be kept vertically with the faceplate of the tube up.
The ambient temperature should not exceed 30° C (86° F) during long term storage.

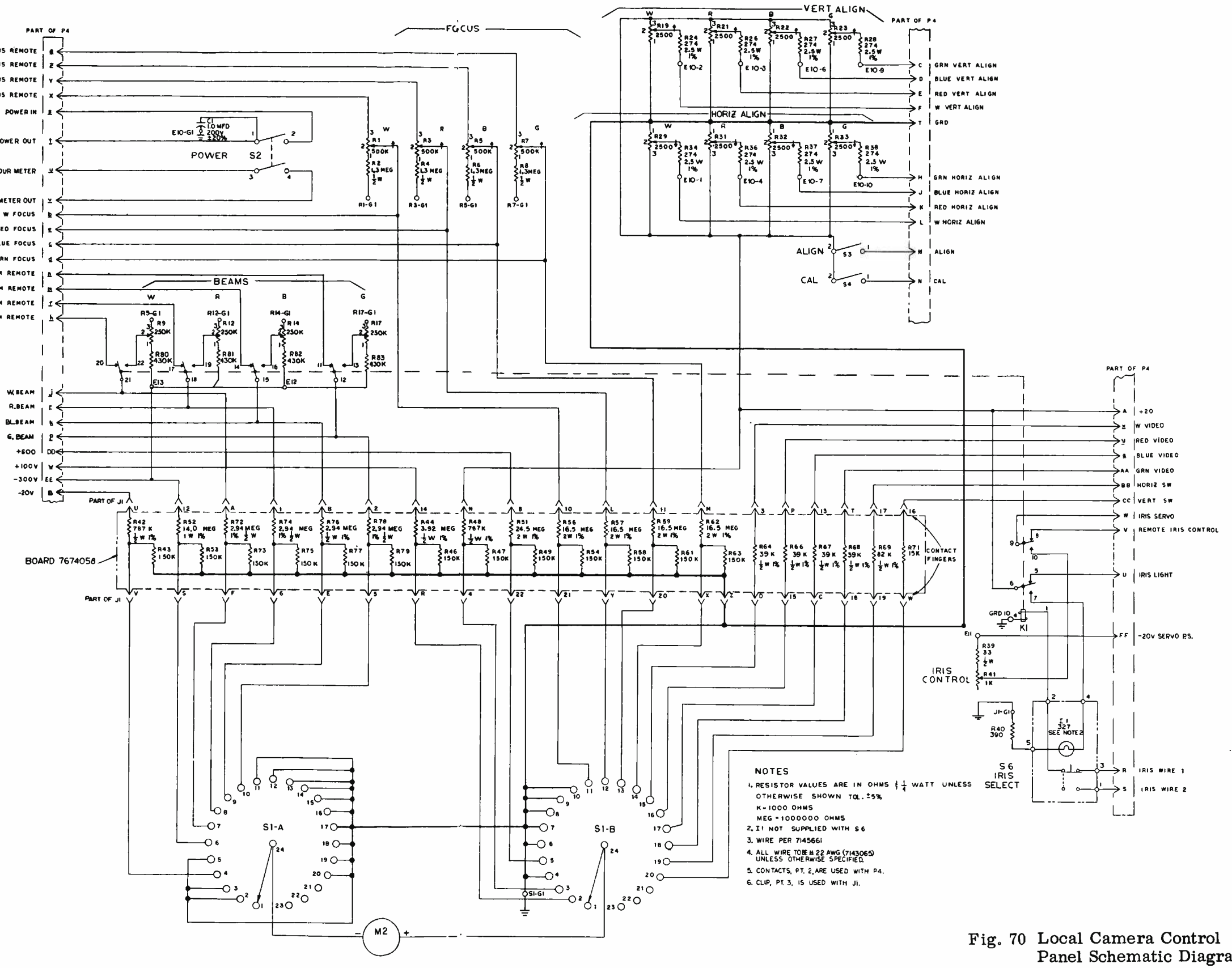


TOTAL GLASS THICKNESS
.283±.008
n = .059





BASING AND
PIN CONNECTIONS



NOTES

1. RESISTOR VALUES ARE IN OHMS ¼ WATT UNLESS OTHERWISE SHOWN TOL. ±5%
   K = 1000 OHMS
   MEG = 1000000 OHMS
2. F1 NOT SUPPLIED WITH S6
3. WIRE PER 7145661
4. ALL WIRE TO BE # 22 AWG (7143065) UNLESS OTHERWISE SPECIFIED.
5. CONTACTS, PT. 2, ARE USED WITH P4.
6. CLIP, PT. 3, IS USED WITH J1.

Fig. 70 Local Camera Control Panel Schematic Diagram (E-7355446, Rev. C)

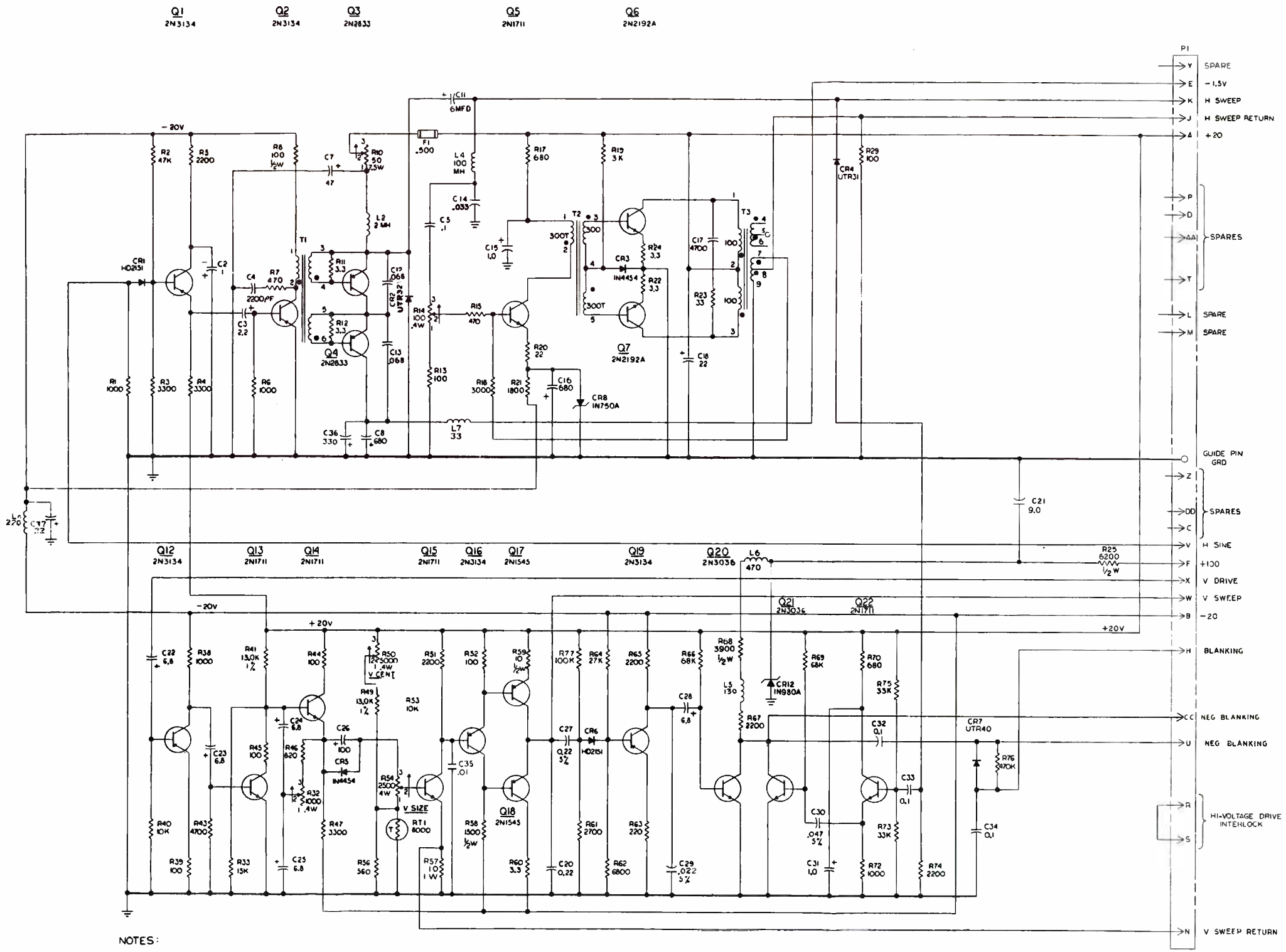


Fig. 57 Viewfinder Sweep Board Schematic Diagram (E-7355381, Rev. H)