

**TEKTRONIX®**

***C-5B  
CAMERA***

***With Options***

INSTRUCTION MANUAL

Tektronix, Inc.  
P.O. Box 500  
Beaverton, Oregon 97077

Serial Number \_\_\_\_\_



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**This Tektronix instrument is warranted against defective materials and workmanship for one year. Any questions with respect to the warranty should be taken up with your Tektronix Field Engineer or representative.**

**All requests for repairs and replacement parts should be directed to the Tektronix Field Office or representative in your area. This will assure you the fastest possible service. Please include the instrument type number or part number and serial number with all requests for parts or service.**

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# TABLE OF CONTENTS

	Page		Page
LIST OF ILLUSTRATIONS	ii	<b>SECTION 3</b>	<b>THEORY OF OPERATION</b>
LIST OF TABLES	iii		SHUTTER CONTROL CIRCUIT 3-1
			GRATICULE FLASH UNIT CIRCUIT 3-1
<b>SECTION 1</b>	<b>GENERAL INFORMATION</b>		Converter 3-1
	DESCRIPTION 1-1		Charging, Intensity Control and Ready Indicator 3-2
	REPACKAGING FOR SHIPMENT 1-2		Trigger 3-2
	STANDARD ACCESSORIES 1-2	<b>SECTION 4</b>	<b>MAINTENANCE</b>
	SPECIFICATIONS 1-3		PREVENTATIVE MAINTENANCE 4-1
<b>SECTION 2</b>	<b>OPERATING INSTRUCTIONS</b>		CLEANING 4-1
	FUNCTION OF EXTERNAL CONTROLS AND INDICATORS 2-1		Exterior 4-1
	Camera 2-1		Interior 4-1
	Graticule Flash Unit 2-2		Lens 4-1
	OPERATING THE CAMERA SYSTEM 2-2		Pack Film Camera Back Rollers 4-1
	POWER REQUIREMENTS 2-2		STORING THE CAMERA 4-1
	FILM PACK CAMERA BACK 2-2		CORRECTIVE MAINTENANCE 4-2
	Loading the Film Pack 2-2		TEKTRONIX FIELD SERVICE 4-2
	Advancing and Developing the Film 2-5		OBTAINING REPLACEMENT PARTS 4-2
	Coating the Print 2-5		Standard Parts 4-2
	FILM SELECTION 2-6		Special Parts 4-2
	FILM STORAGE 2-6		Ordering Parts 4-2
	CHANGING THE OBJECT-TO-IMAGE RATIO 2-6		COMPONENT REMOVAL AND REPLACEMENT 4-2
	USING THE GRATICULE FLASH UNIT 2-6		Camera Sections 4-2
	OSCILLOSCOPE LIGHT FILTER AND GRATICULE FLASH ILLUMINATION 2-6		Lens Shutter Assembly 4-2
	MOUNTING THE CAMERA 2-8		Adapter Hood and Options 4-2
	Mounting the Standard and Option 1 Camera 2-8		Optical Lens 4-2
	Mounting the C-5B Camera, Option 2 2-8		Graticule Flash Unit and Circuit Board 4-6
	Mounting the C-5B Camera, Option 3 2-8		Battery Holder and Batteries 4-6
	CAMERA OPERATION 2-8		Electronic Shutter Circuit Board 4-6
	PHOTOGRAPHIC TECHNIQUES 2-9		Shutter Assembly 4-6
	FUNCTION OF THE SHUTTER SPEED, APERTURE AND GRATICULE FLASH UNIT 2-9		ADJUSTMENT OF GRATICULE FLASH UNIT CHARGING VOLTAGE 4-7
	Aperture 2-9		INTERNAL ADJUSTMENT OF THE 1/10 SEC SHUTTER SPEED 4-8
	Shutter Speed 2-9		TROUBLESHOOTING 4-8
	Graticule Flash Unit 2-9		TROUBLESHOOTING CHARTS 4-8
	PHOTOGRAPHING A CONTINUOUS TONE (GRAY SCALE) DISPLAY 2-9		VOLTAGES AND WAVEFORMS 4-8
			TROUBLESHOOTING EQUIPMENT 4-8
		<b>SECTION 5</b>	<b>INSTRUMENT OPTIONS</b>
		<b>SECTION 6</b>	<b>REPLACEABLE ELECTRICAL PARTS</b>
		<b>SECTION 7</b>	<b>DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS</b>
		<b>SECTION 8</b>	<b>REPLACEABLE MECHANICAL PARTS</b>
		<b>CHANGE INFORMATION</b>	

## WARNING

*The following servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing other than that contained in operating instructions unless you are qualified to do so.*

# LIST OF ILLUSTRATIONS

FIGURE NO.		Page	FIGURE NO.		Page
Frontispiece	The C-5B Camera.	iv	4-3	Removing the Graticule flash unit and circuit board.	4-5
1-1	Dimensional drawing of C-5B.	1-4	4-4	Removing the battery holder and batteries.	4-6
2-1	External camera controls.	2-1	4-5	Removal of electronic shutter circuit board.	4-7
2-2	Graticule flash unit controls and indicators.	2-2	4-6	Adjustment of electronic shutter.	4-9
2-3	Removing the battery holder and batteries.	2-3	<b>The illustrations in Section 7 are located near their associated diagrams on the foldout pages.</b>		
2-4	Loading the pack film.	2-4			
2-5	Developing the pack film.	2-5			
2-6	Changing the magnification factor.	2-7			
4-1	Removal of camera sections and lens-shutter assembly.	4-3	7-1	Shutter control circuit board.	
4-2	Removal of optical lens.	4-4	7-2	Troubleshooting chart for C-5B shutter control.	
			7-3	Graticule Flash Circuit Board.	
			7-4	Troubleshooting chart for the C-5B Graticule Flash unit.	

# LIST OF TABLES

TABLE NO.		Page
1-1	Relationship of Instrument to C-5B for Mounting the Camera	1-1
1-2	Relationship of Instrument Type of Magnification Factor	1-2
1-3	Specifications	1-3
2-1	Popular Polaroid Film Types for the C-5B Camera	2-6
5-1	Relationship of Instrument to C-5B for Mounting the Camera	5-1
5-2	Option Information Locator	5-2

C-5B Camera



2461-12

The C-5B Camera.

# GENERAL INFORMATION

## DESCRIPTION

The C-5B is a light-weight, fixed-focus, general purpose camera. It features an electronic shutter, battery operated Graticule Flash Unit and the capability for mounting on most models of Tektronix oscilloscopes and monitors (see Table 1-1). An interchangeable lens housing and spacer section provide for an object-to-image ratio (magnification factor) of 1:0.67 or 1:0.85 (Table 1-2 shows the relationship of instrument types to magnification factor). With these ratios, photographs on instruments with either an 8 X 10 or 9.8 X 12.2 centimeter display cover the entire usable area of the film surface.

**TABLE 1-1**  
**Relationship of Instrument to C-5B for Mounting the Camera**

Camera	Instrument	Adapter Hood Tektronix Part	Flash Unit Included
C-5B	577, 600-Series without illuminated graticule, 1420-Series, 5100-Series	016-0357-00	Yes
C-5B Option 1	528, 600-Series without graticule, or with illuminated graticule, 5400-Series, 7000-Series, T922R, Telequipment D83	016-0357-00	No
C-5B Option 2	432, 434, 455, 464, 465, 466, 475, 475A	016-0359-00	No
C-5B Option 3	T900 Series except T922R	016-0358-00	Yes

The C-5B camera back is a Polaroid<sup>1</sup> Type CB101, which is permanently secured to the rear camera frame. The camera's major sections are high-impact resistant, injection molded plastic. The fastening devices, light-sealing interfaces, and the lens-shutter housing are molded in place.

The Graticule Flash Unit is mounted on top of the camera adapter hood. This unit contains a crt viewing door, which can be opened to observe the instrument display without removing the camera. There is also a crt viewing door to provide display viewing for cameras not having a flash unit (Options 1 and 2).

<sup>1</sup> Polaroid is a registered trademark of the Polaroid Corporation.

### REPACKAGING FOR SHIPMENT

If the camera system is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing: owner (with address) and the name of an individual at your firm that can be contacted, complete instrument serial number and a description of the service required.

Save and reuse the package in which your instrument was shipped. If the original packaging is unfit for use or not available, repackage the instrument as follows:

Surround the instrument with polyethylene sheeting to protect the finish of the instrument. Obtain a carton of corrugated cardboard of the correct carton strength

and having inside dimensions of no less than six inches more than the instrument dimensions. Cushion the instrument by tightly packing three inches of dunnage or urethane foam between carton and instrument, on all sides. Seal carton with shipping tape or industrial stapler.

The carton test strength for your instrument is 200 pounds.

### STANDARD ACCESSORIES

1 Instruction Manual

TABLE 1-2

Relationship of Instrument Type to Magnification Factor

Tektronix Instrument Type	Magnification Factor
400-Series with 8 X 10 centimeter graticule <sup>1</sup>	0.85
577	0.67
577 (Option 10) 601 602	0.85
603 604	0.67
605 606 607	0.85
608 5100-Series 5403/D40 5444	0.67
5403/D41 7313	0.85
7403 7603 (except Option 4)	0.67
7603 (Option 4) 7613 7623 7633 7704A (except Option 4) R7704A (except Option 4) 7834 7844/R7844 7903 (except Option 4) 7904 (except Option 4)	0.85
T900-Series	0.85

<sup>1</sup> Also includes 464/466.

# SPECIFICATIONS

The specifications in Table 1-3 apply over an ambient temperature of 0° to +50°C (+32° to +122°F) unless otherwise specified. When needed, the minimum time to allow for temperature stabilization of the camera is five minutes.

TABLE 1-3  
Specifications

Characteristics	Performance Requirements
<b>OPTICAL</b>	
Maximum Relative Aperture	Fixed f/16.
Focal Length	58 mm, nominal.
Object-to-Image Ratio (Magnification Factor)	1:0.67 or 1:0.85 ±5%.
Geometric Distortion	1% or less.
Resolving Power	At least 6 lines/mm at center. At least 3 lines/mm at corner.
<b>ELECTRICAL</b>	
Shutter	
Shutter Speed Range	Continuously variable 0.1 through 5 seconds.
Minimum Time Interval	1/10 second ±20%.
Graticule Flash Unit	
Flash Recycle Time	2 seconds nominally.
Flash Energy Input	Adjustable from 0.04 joules to 0.2 joules.
<b>POWER REQUIREMENTS</b>	
Type	Alkaline.
Number of Cells	4.
Nominal Cell Voltage	1.5 volts.
Battery Size	AA.
<b>ENVIRONMENTAL</b>	
Temperature	
Operating	0° to +50°C (+32° to +122°F) at 75% humidity.
Nonoperating	-40° to +55°C (-40° to +131°F) (with film removed).

TABLE 1-3 (cont)

Characteristics	Performance Requirements
Altitude	
Operating	To 4,500 meters (15,000 ft.).
Nonoperating	To 15,000 meters (50,000 ft.).
Vibration	15 minutes along each of the three axes at a total displacement of 0.025 inch p-p with frequency varied from 10 to 55 to 10 Hz in one-minute sweeps. Hold for three minutes at each resonant point, or if none, at 55 Hz.
Shock	3 shocks at 50 g's, one-half sine, two milliseconds duration in each direction along each major axis. Total of 18 shocks.
Transportation	Qualifies under National Safe Transit Committee Test Procedure 1A.
<b>PHYSICAL</b>	
Length, Width, & Height	See Dimensional Drawing (Figure 1-1).
Weight	About 1.135 kg (2.5 lbs.).

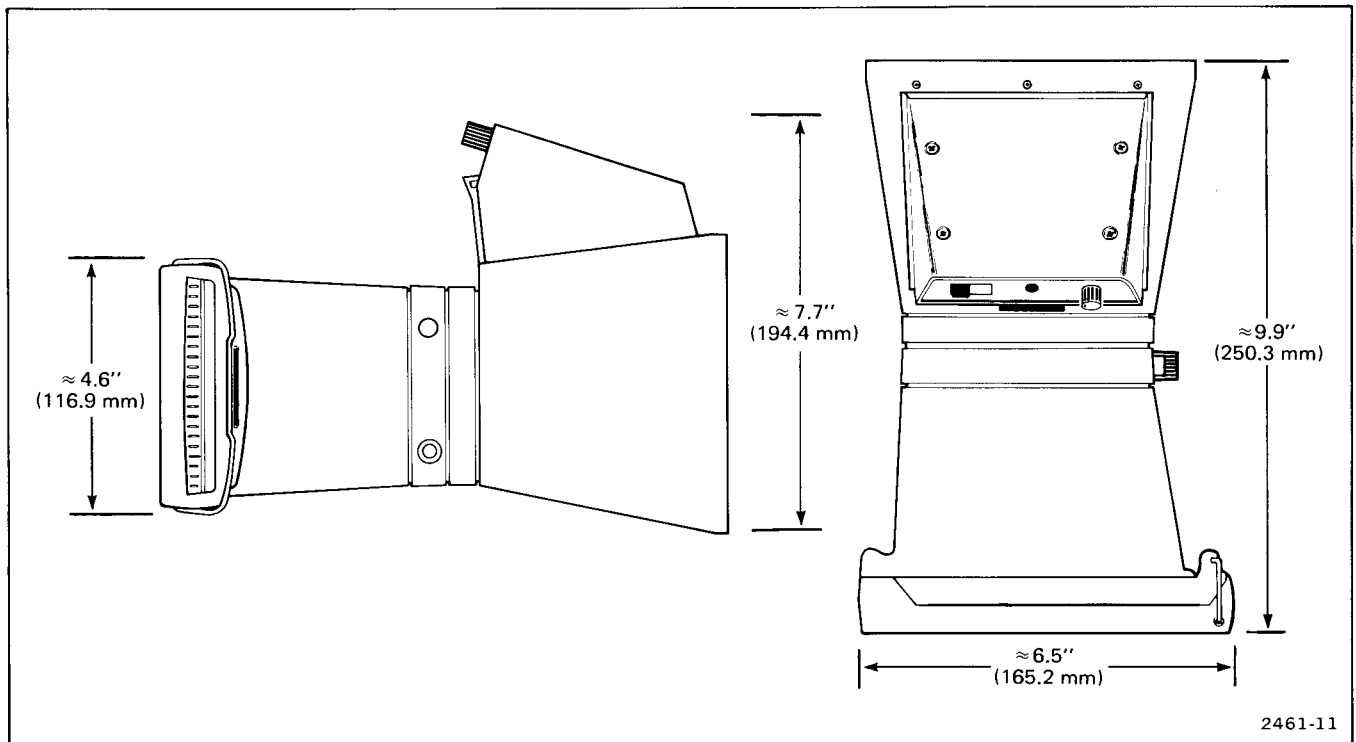


Figure 1-1. Dimensional drawing of C-5B.

# OPERATING INSTRUCTIONS

## FUNCTION OF EXTERNAL CONTROLS AND INDICATORS

### Camera (Figure 2-1)

- ① **Shutter.** Actuates the camera shutter and Graticule Flash Unit when pushed.
- ② **Shutter Speed.** Controls the time period that the shutter is open to admit light for exposing the film. Continuously variable from 0.1 through 5 seconds.
- ③ **Adapter Hood.** Mounts the camera on the instrument to be photographed.

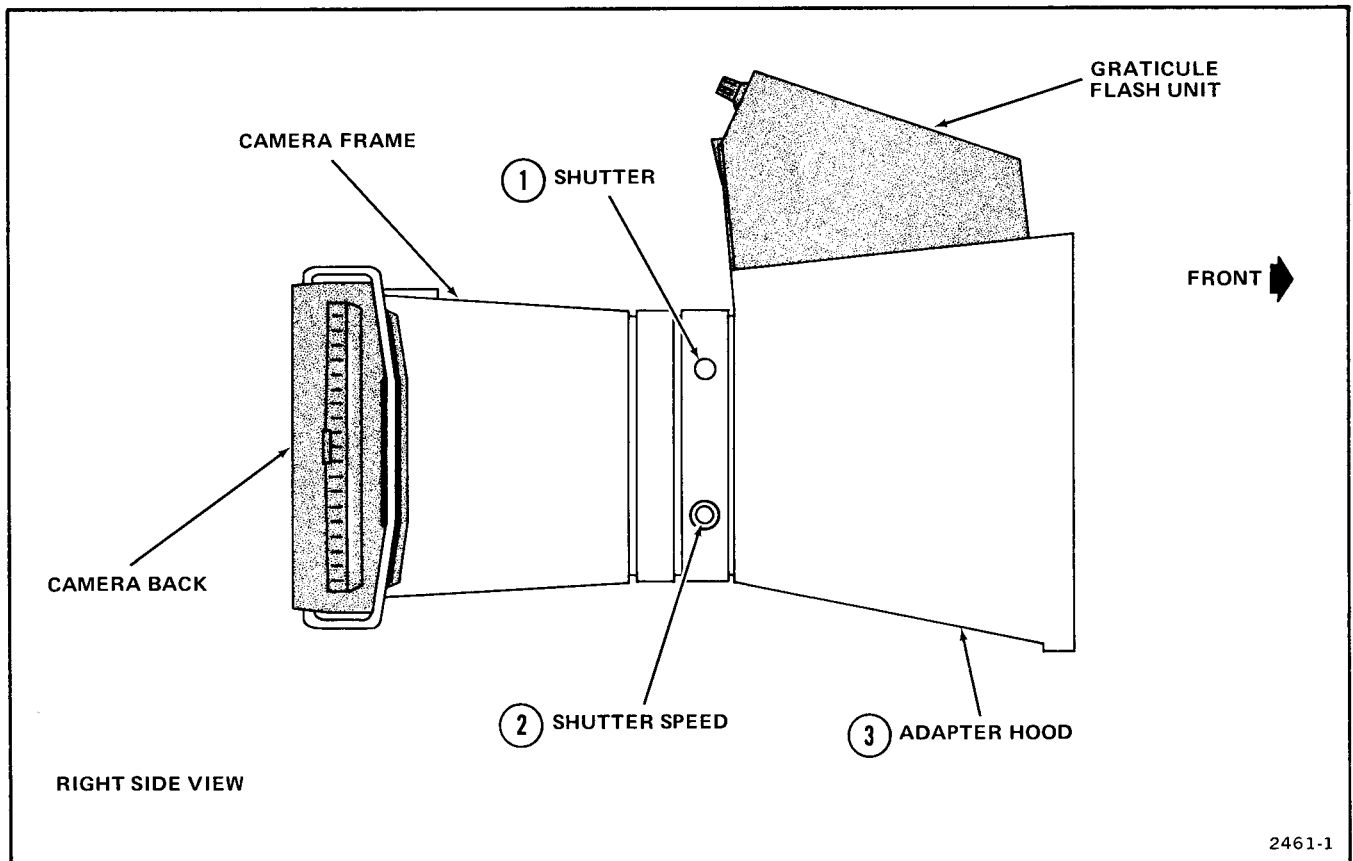


Figure 2-1. External camera controls.

### Graticule Flash Unit (Figure 2-2)

- ① **FLASH.** Turns the flash unit on and off.
- ② **Crt Viewing Door.** Opens to view the display to be photographed.
- ③ **Ready Indicator (LED).** When the LED is blinking, the unit is ready for operation. When the LED is on steady, the unit is recycling. If the LED does not blink within 6 to 7 seconds after the unit is turned on, the batteries may be weak or the unit faulty.
- ④ **FLASH INTENSITY.** Varies the intensity of the flash tube light.

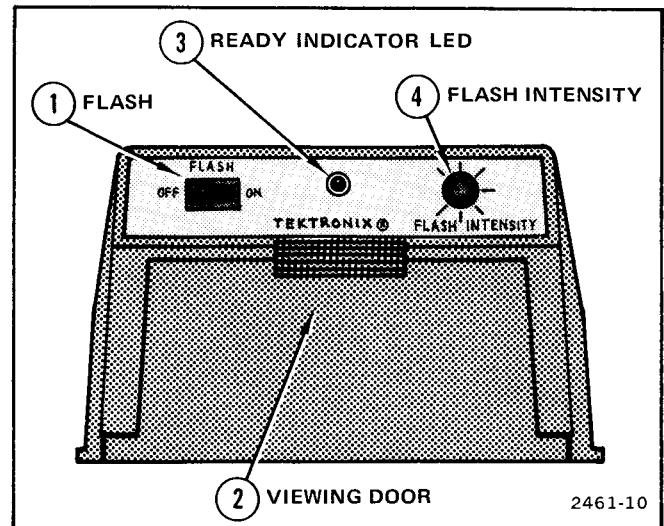


Figure 2-2. Graticule flash unit controls and indicators.

## OPERATING THE CAMERA SYSTEM

### POWER REQUIREMENTS

#### NOTE

*Tektronix does not provide batteries for the C-5B Camera. Alkaline type, size AA power cell batteries or equivalent should be used.*

The C-5B requires four 1.5 volt (total output voltage of 6 volts), batteries to operate the Shutter and Graticule Flash Unit. These batteries are inserted into a battery holder located inside the camera frame. Figure 2-3 describes how to remove the batteries and battery holder from the camera. Insufficient battery charge indicated by inoperative or continual activating shutter.

#### CAUTION

*Observe positive-negative polarities when inserting the batteries into the battery holder. This information is imprinted in the battery slots of the holder.*

### FILM PACK CAMERA BACK

The C-5B Camera is equipped with a Polaroid Type CB101 camera back. The following procedures described the proper method to load the film pack, advance and develop film, and protect the film prints.

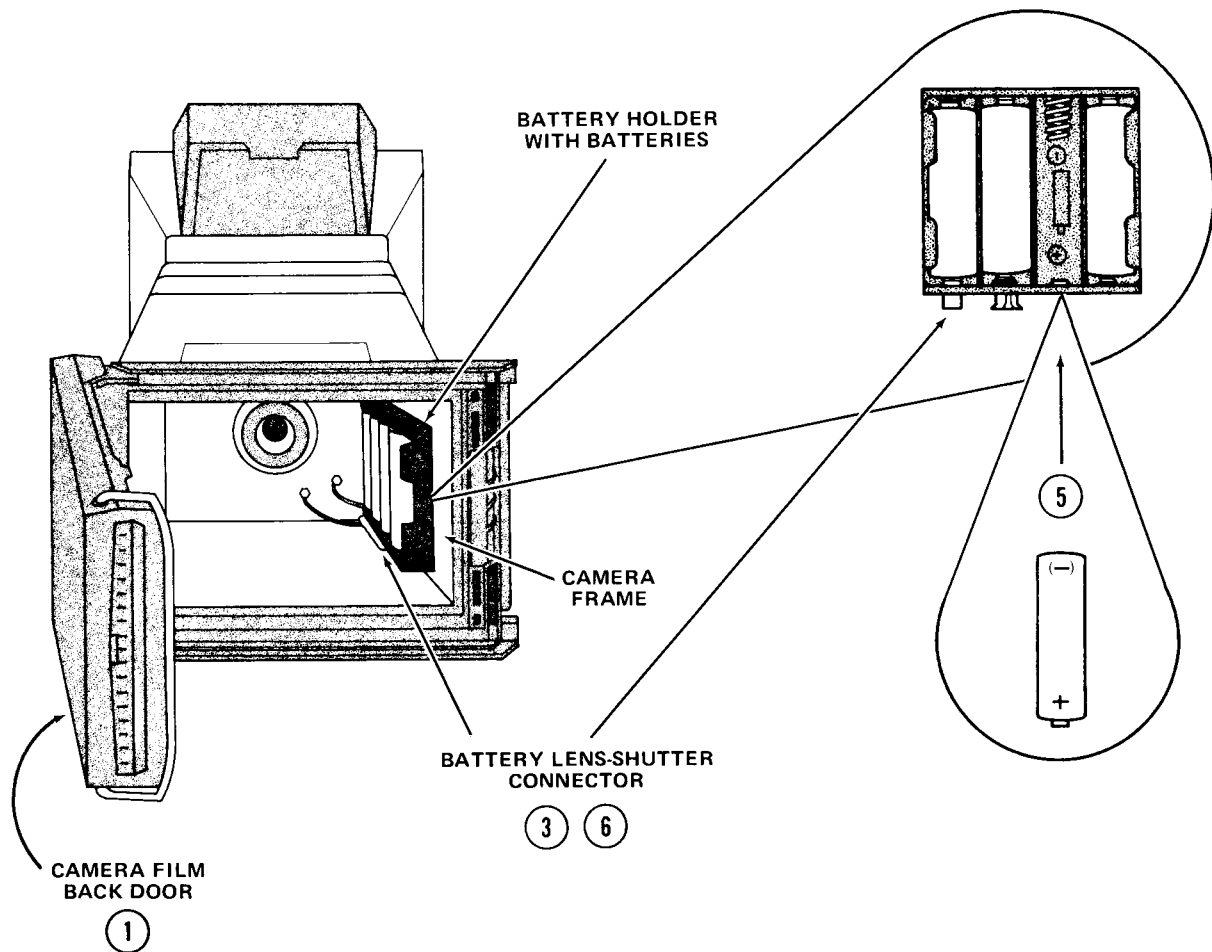
#### Loading the Film Pack

Refer to Figure 2-4 for film pack loading instructions.

#### NOTE

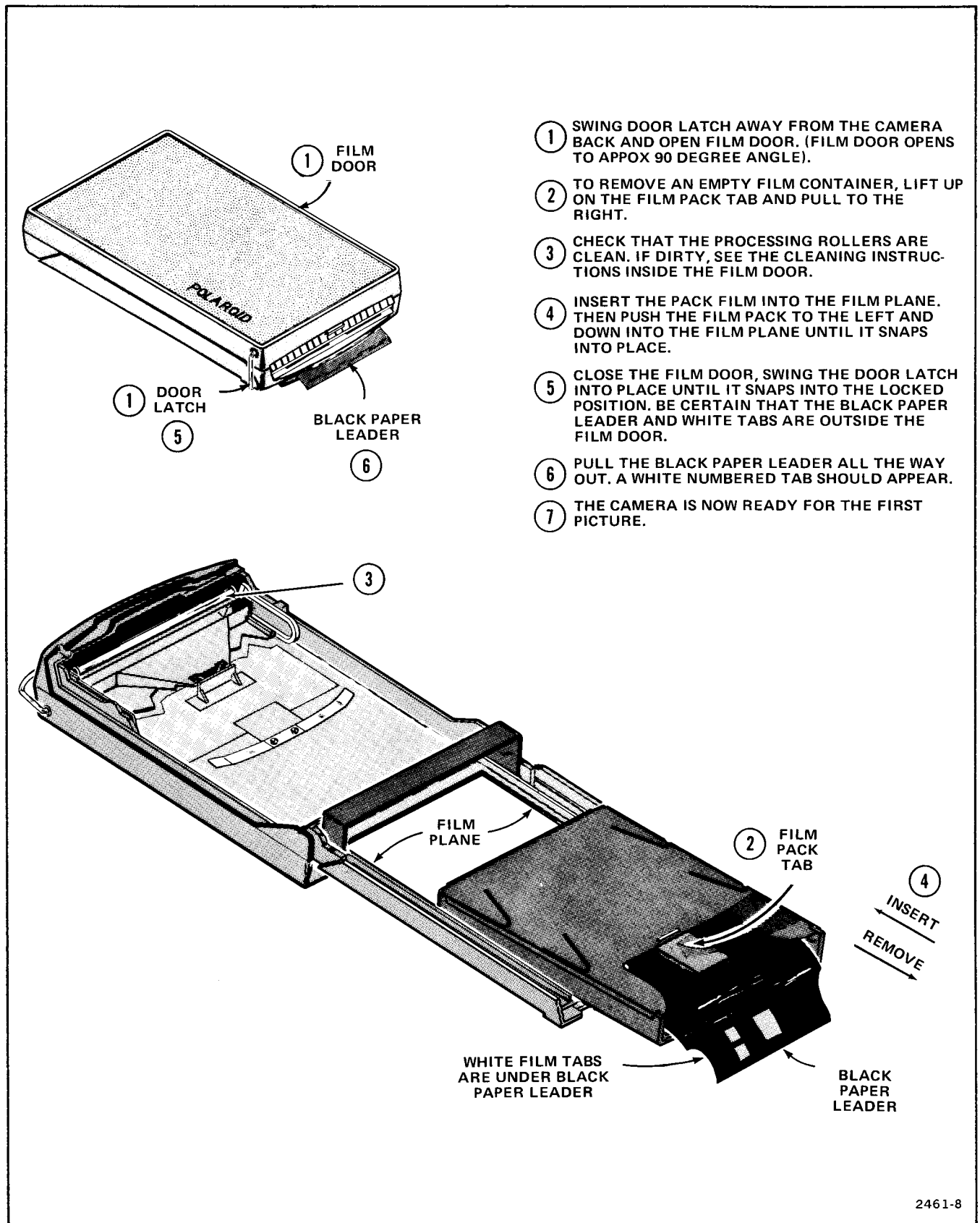
*Only a white tab should be showing when a picture is taken. If a yellow tab is showing, pull it out and develop the film to determine if the picture is acceptable.*

- ① OPEN THE CAMERA FILM BACK DOOR.
- ② THE BATTERY HOLDER IS SECURED TO THE CAMERA FRAME BY REMOVABLE PRESSURE SENSITIVE FASTENERS. TO REMOVE THE BATTERY HOLDER, PULL THE HOLDER FROM THE FRAME, WHICH SEPARATES THE FASTENERS.
- ③ UNPLUG THE BATTERY LENS-SHUTTER CONNECTOR FROM THE BATTERY HOLDER. BE CAREFUL NOT TO PULL THE CONNECTING WIRES OUT OF THE LENS-SHUTTER CIRCUIT BOARD.
- ④ TO REMOVE A BATTERY FROM THE BATTERY HOLDER, PRY THE POSITIVE TERMINAL END OF THE BATTERY UPWARD AWAY FROM THE HOLDER. THE BATTERY SHOULD SNAP OUT OF THE HOLDER.
- ⑤ TO REPLACE A BATTERY, PLACE THE FLAT END (NEGATIVE TERMINAL) AGAINST THE SPRING IN THE BATTERY HOLDER. PUSH THE BATTERY TOWARDS THE SPRING AND DOWNWARD INTO THE BATTERY HOLDER. THE BATTERY SHOULD SNAP FIRMLY INTO THE SLOT.
- ⑥ TO REPLACE THE BATTERY HOLDER, SECURELY SNAP THE BATTERY LENS-SHUTTER CONNECTOR ONTO THE HOLDER TERMINAL. POSITION THE HOLDER AGAINST THE CAMERA FRAME WITH THE BATTERY TERMINAL FACING DOWNWARD. PUSH THE FASTENERS TOGETHER UNTIL THE HOLDER ADHERES TO THE CAMERA FRAME.



2461-3

Figure 2-3. Removing the battery holder and batteries.



- ① SWING DOOR LATCH AWAY FROM THE CAMERA BACK AND OPEN FILM DOOR. (FILM DOOR OPENS TO APPROX 90 DEGREE ANGLE).
- ② TO REMOVE AN EMPTY FILM CONTAINER, LIFT UP ON THE FILM PACK TAB AND PULL TO THE RIGHT.
- ③ CHECK THAT THE PROCESSING ROLLERS ARE CLEAN. IF DIRTY, SEE THE CLEANING INSTRUCTIONS INSIDE THE FILM DOOR.
- ④ INSERT THE PACK FILM INTO THE FILM PLANE. THEN PUSH THE FILM PACK TO THE LEFT AND DOWN INTO THE FILM PLANE UNTIL IT SNAPS INTO PLACE.
- ⑤ CLOSE THE FILM DOOR, SWING THE DOOR LATCH INTO PLACE UNTIL IT SNAPS INTO THE LOCKED POSITION. BE CERTAIN THAT THE BLACK PAPER LEADER AND WHITE TABS ARE OUTSIDE THE FILM DOOR.
- ⑥ PULL THE BLACK PAPER LEADER ALL THE WAY OUT. A WHITE NUMBERED TAB SHOULD APPEAR.
- ⑦ THE CAMERA IS NOW READY FOR THE FIRST PICTURE.

Figure 2-4. Loading the pack film.

## Advancing and Developing the Film

**CAUTION**

Many developing solutions contain a caustic substance which may cause chemical burns. If you accidentally get the solution on your skin, wipe it off immediately and wash the area thoroughly as soon as possible. Be extremely careful to keep the solution away from the eyes and mouth.

Procedures for developing the film are identified in Figure 2-5. If a yellow tab doesn't appear when the white tab is pulled, open the film back and carefully remove the yellow tab that failed to pop out. Discard the yellow tab. Remember, a camera back that contains film should be opened in a dark condition.

## NOTE

Development time for the Type 107 film is approximately 15 to 20 seconds at a ambient temperature of 70° F or above. A slightly longer development time generally provides greater print contrast. Shorter development time will decrease print contrast, but may improve display details not otherwise visible.

## Coating the Print

Prints should be coated as soon as possible after separating them from the negative. Use six to eight overlapping strokes to apply the print coater along the entire length of the print, including edges, borders, and corners. These procedures do not apply for coaterless film types, which are chemically coated during the print development.

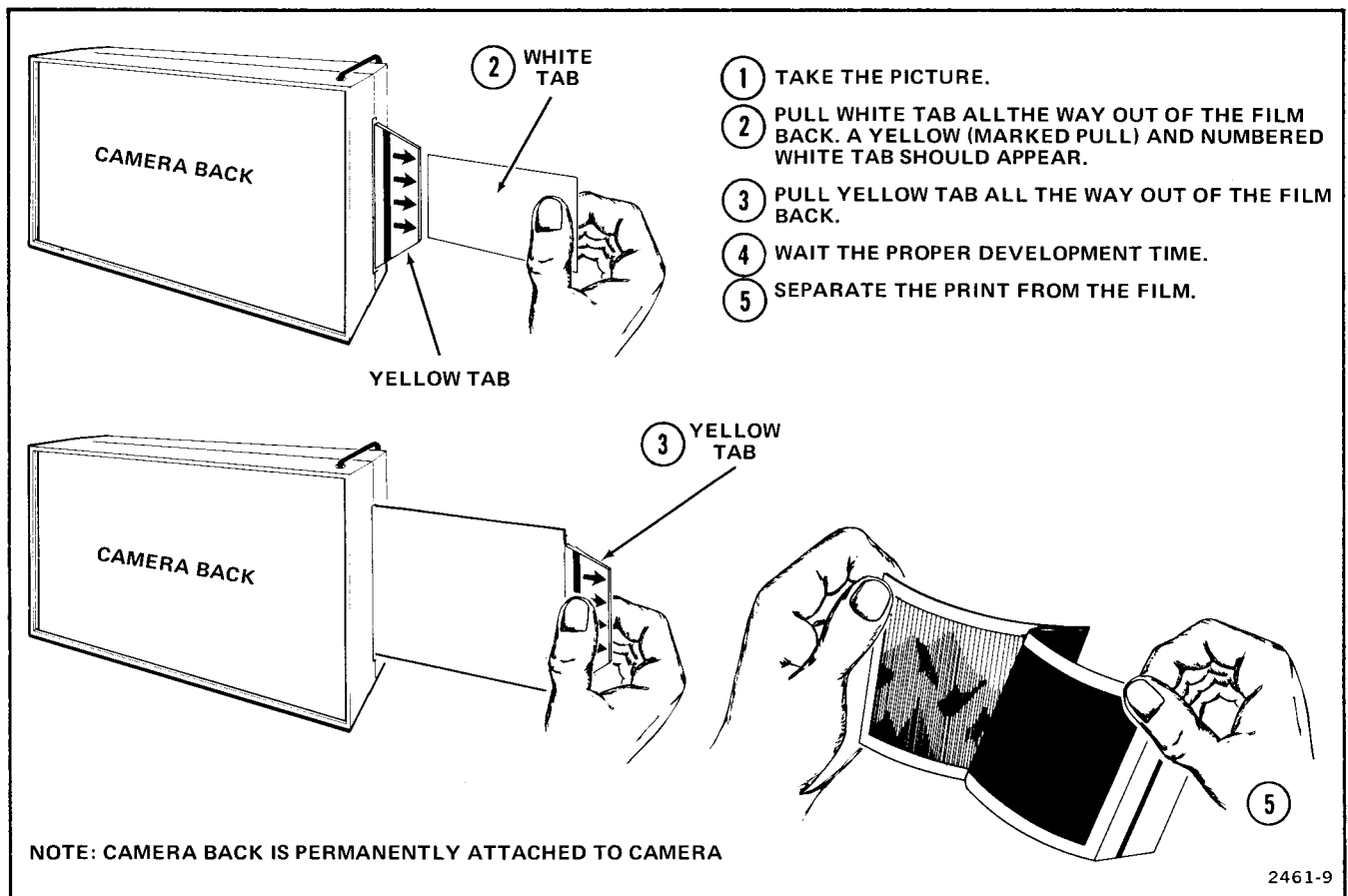


Figure 2-5. Developing the pack film.

## FILM SELECTION

The following table of popular Polaroid film types gives ASA and approximate emulsion sizes.

**TABLE 2-1**  
Popular Polaroid Film Types for the C-5B Camera

Film Type	ASA	Approximate Emulsion Size
Polaroid Type 665	75	7.3 x 9.5 cm
Polaroid Type 107	3000	7.3 x 9.5 cm
Polaroid Type 667 (coaterless)	3000	7.3 x 9.5 cm

## FILM STORAGE

Refer to the manufacturers instruction sheet provided with the film for information on film storage.

## CHANGING THE OBJECT-TO-IMAGE RATIO (MAGNIFICATION FACTOR)



*When the four screws are removed in the magnification factor change procedures, the lens-shutter assembly is completely loose. Careless handling could cause this assembly to fall free and be damaged.*

The magnification factor is determined by the position of a movable spacer in relation to the lens-shutter assembly. When the spacer is between the camera back and lens-shutter assembly, the magnification factor is 1:0.85. When the spacer is positioned in front of the lens-shutter assembly, the magnification factor is 1:0.67. Figure 2-6 describes procedures for changing the magnification factor.

## USING THE GRATICULE FLASH UNIT

The following procedures assume that the instrument has an optimum display presentation, pack film is loaded in the camera back, and the camera is ready for taking photographs.

1. Set the FLASH INTENSITY to midrange. Additional adjustment may be required to determine the best setting for graticule reproduction.

2. Turn the Graticule Flash Unit on and wait for the Ready Indicator LED to begin blinking.

### NOTE

*If the LED does not begin blinking within 6 to 7 seconds, the batteries may be weak and should be replaced. If replacement does not provide normal operation, the unit may be faulty and require repair.*

3. When the Ready Indicator LED begins blinking, close the viewing door and push the Shutter button.
4. Advance and develop the film.
5. Turn the Graticule Flash Unit off, when finished taking pictures.

### NOTE

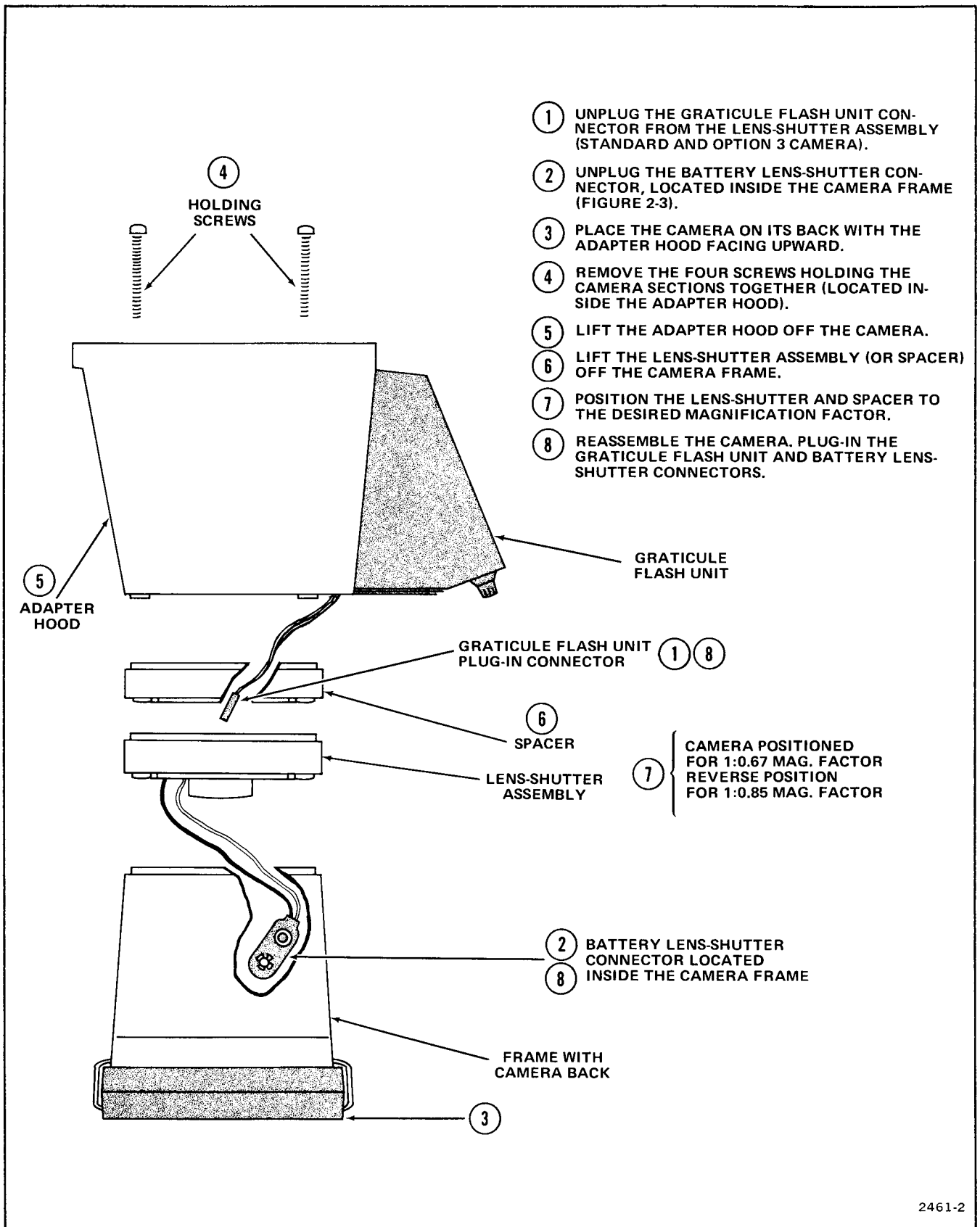
*Failure to turn the Graticule Flash Unit off when not in use will shorten battery life due to circuit leakage current.*

## OSCILLOSCOPE LIGHT FILTER AND GRATICULE FLASH ILLUMINATION

Some oscilloscopes contain a factory installed colored (usually blue or green) plastic light filter in front of the crt to improve general purpose viewing contrast in high ambient light conditions. (In some applications this device also functions as in implosion safety shield).

Effectiveness of graticule flash illumination is severely degraded when used with these colored crt light filters. If a clear light filter is available, the colored filter should be removed and the clear filter installed in its place. The clear filter may also provide improved photograph reproduction and contrast with reduced crt intensity settings. Under no circumstance should the oscilloscope be operated without a filter when no other implosion shield is provided.

If your oscilloscope was not provided with a clear light filter accessory, contact your local Tektronix Field Office for ordering information.



2461-2

Figure 2-6. Changing the magnification factor.

## MOUNTING THE CAMERA

### Mounting the Standard and Option 1 Camera

**CAUTION**

*To prevent the camera from falling free and being damaged, DO NOT let go of the camera until it is securely attached to the instrument.*

To mount the camera, set the inside front lip of the camera adapter hood down into the groove on the top of the instrument bezel. Then, let the bottom of the adapter swing down until it rests tightly against the bezel.

To remove the camera, swing the bottom part of the camera adapter hood out and away from the instrument bezel. Then, lift the camera up and away from the groove on the top of the bezel.

### Mounting the C-5B Camera, Option 2

Use the mounting procedures for the Standard and Option 1 camera.

### Mounting the C-5B Camera, Option 3

To mount the camera, set the top lip of the camera adapter hood up into the groove on the underside of the top part of the oscilloscope bezel. Then, let the adapter swing down into the bezel. When the bottom part of the adapter touches the instrument, let the adapter drop vertically down into the small notch in the top side of the bottom part of the bezel.

To remove the camera, lift the mounting adapter up until the bottom lip is clear of the oscilloscope bezel. Swing the bottom of the adapter out and away from the bezel. Then pull the camera down and away from the groove on the underside of the top part of the bezel.

## CAMERA OPERATION

The following procedures assume the user understands the operating instructions described in this section. The procedures are presented in a normal picture-taking sequence, and may be used for basic familiarization or training of new operators.

1. Confirm camera object-to-image ratio (magnification factor) for the instrument being photographed (Table 1-2). Figure 2-6 identifies procedures for changing the magnification factor.
2. Load the camera with film (Figure 2-4).
3. Obtain instrument graticule and display to be photographed.
4. Mount the camera on the instrument (refer to Mounting the Camera, in this section).
5. Select the Shutter Speed and FLASH INTENSITY (see Shutter Speed, Aperture, and Graticule Flash Unit, in this section).
6. Press and release the Shutter button.
7. Advance and develop the film (Figure 2-5).
8. Coat the print, if required.

# PHOTOGRAPHIC TECHNIQUES

## FUNCTION OF THE SHUTTER SPEED, APERTURE AND GRATICULE FLASH UNIT

A basic understanding of camera controls is important if the user is to realize consistent, acceptable print reproduction. Experimentation will confirm control settings for any photograph.

### Aperture

Camera aperture determines the amount of light exposure to the film. The C-5B has a fixed  $f/16$  aperture opening, which provides a wide depth of field.

### Shutter Speed

The C-5B Shutter Speed is variable from 0.1 through 5 seconds. Selection of the shutter speed determines the length of time that the shutter is opened to expose the film to light. A setting of 0.5 through 1 second will usually provide an acceptable photograph. If the print appears underexposed, set the Shutter Speed to a higher setting.

### Graticule Flash Unit

When the Shutter button is pushed, the Graticule Flash Unit provides illumination to reproduce the instrument graticule. A FLASH INTENSITY setting of midrange generally produces satisfactory graticule reproduction. If the graticule develops underexposed, increase the FLASH INTENSITY to a higher setting. If the print appears overexposed, decrease the level of intensity.

## PHOTOGRAPHING A CONTINUOUS TONE (GRAY SCALE) DISPLAY

Photographing a continuous tone (gray scale) display requires a technique different from that used for trace recording. In trace recording, it is necessary to record two levels of intensity—white for trace and graticule black or gray for the background. In gray scale photography, it is important to record a whole range of tones that may be only slightly different from one another.

A problem when photographing a continuous tone display is that the print develops with a loss of detail in the dark and light areas. This occurs because the brightness range of the display is much greater than the film can accurately reproduce. The range of an instrument display is approximately 100 to 150:1; Polaroid 107 film has a recordable range of 15:1; while the human eye has a dynamic range accommodating (within one scene) brightness ranges approaching 1000:1.

Instrument displays are normally adjusted to provide visual satisfaction (high contrast), which is far beyond the recordable range of the film. There is acceptable tonal rendition when the brightness range of the display compares to that of the film. To achieve these results, adjust instrument contrast so that the display appears "washed out". This adjustment compresses the display within the recordable range of the film. Generally, this process requires some experimentation for satisfactory results.

# THEORY OF OPERATION

This section of the manual contains a description of the circuitry used in the electronic Shutter and Graticule Flash Unit. Each circuit is described using the schematic diagrams located on foldout pages at the rear of the manual.

## SHUTTER CONTROL CIRCUIT

The C5B electronic shutter control circuitry is contained on one printed circuit board. This circuitry provides multiple shutter speeds. Pressing the Shutter push button actuates the shutter.

Integrated circuit U114 is a dual, resettable monostable multivibrator. When triggered, each section can produce an accurate output pulse over a wide range of widths. The duration and accuracy of these pulse widths is determined by external timing components C115, R115, R116 and R118 for U114A, and C126, R126 for U114B. These components are selected such that the output pulse from U114B is always shorter than the fastest shutter timing speed (0.1 second). Resistor R116 is used to calibrate shutter timing at 1/10 second, while R118 externally adjusts the shutter timing between 1/10 and 5 seconds.

Before activating the shutter, the quiescent operating state of the devices are:

U114-6 and U114-10	LOW
U133A	LOW
U133B	HIGH
U133C	LOW
Q140 and Q145	OFF

When S100 is closed (Shutter button pushed), U114A and U114B are triggered causing their respective high output pulses. The short duration high from U114B couples through U133B as a low and U133C as a high, momentarily turning on Q140, which momentarily turns on Q145. When Q145 turns on, current through L155 latches the shutter open. When this short duration pulse ends, all devices except U114A and U133A return to their quiescent state. The output of U114A remains high until the end of the shutter timing cycle, which holds U133A low. VR145 protects Q145 from the negative voltage transient caused by the collapsing field of L155.

When the shutter timing cycle ends, U114A goes low. This causes U133A to go high, U133B low and U133C high which again turns on Q140 and Q145 and activates L155, closing the shutter. When U133B is low, a signal is coupled through CR128 to pin 11 of U114B triggering a short duration pulse, latching the shutter closed. All devices should now return to their quiescent state.

A low frequency oscillator circuit composed of U133, R135, R134, CR134, C131, and R147 closes the shutter if it should open by means other than the control circuitry. If either pin 1 or 2 of U133A should go high, the circuit would be disabled. It also ensures that the shutter is closed whenever new batteries are installed.

R122, R124, and C124 form a reset circuit. With batteries removed, R124 discharges C124. With batteries installed and power on, C124 holds pins 4 and 13 of U114 low until charged through R122.

## GRATICULE FLASH UNIT CIRCUIT

The Graticule Flash Unit circuitry is contained on one printed circuit board and has these main circuit functions—Converter, Charging, Intensity and Ready Indicator, and Trigger.

### Converter

Transistor Q40 and transformer T45 form a blocking oscillator that operates as a flyback type of DC-to-DC converter. From a six volt battery supply, the converter produces a charging voltage of up to 500 volts.

## Theory of Operation—C-5B Camera

When power is applied to the flash unit, Q40 is biased on by R42 and CR40. Current flow through Q40 and pins 1 and 6 of T45 create a magnetic field, which induces a positive feedback voltage through pin 2 to Q40. Current through Q40 continues to increase until the core of T45 saturates. At that point, the feedback voltage ceases. Current through Q40 starts to decrease and the magnetic field of T45 begins to collapse. As the field collapses, a negative-feedback voltage at pin 2 of T45 turns off Q40. When Q40 turns off, a high flyback voltage is induced in all windings of T45. High voltage at pin 7 is rectified by CR45 for the charging circuit, and by CR24 for the Intensity Control circuit. To protect Q40, high voltage at pin 2 is shunted to ground through CR40.

The blocking-oscillator cycle of the converter is repeated until stopped by the Intensity Control circuit. Once stopped, the cycle starts again only when a charge voltage is needed (after a flash, or when required by the Intensity Control circuit).

With power applied, C65 charges to the supply voltage through R65, R67 and R48. This charge is used later in triggering the flash. Charging current through R48 causes a negative gate voltage on Q48, which has no effect.

### Charging, Intensity Control and Ready Indicator

The high voltage rectified by CR45 charges C46 and C52. The charge level on C52 (between 200 and 450 volts) determines the flash intensity of V50. This level is determined by the length of time the converter operates, which is controlled by the Intensity Control circuit. As the high voltage, rectified by CR24 charges C24, a negative voltage is developed. This voltage is limited to  $-6.2$  volts by VR23, and is used as a reference voltage for the Intensity control. The voltage across VR23 is summed (through R25, R26 and R27) with a positive voltage from C52 (through R12 and R13) at pin 3 of U10A. R25 sets the maximum voltage level that may be applied to C52. R27 controls the voltage at C52 to between 200 and 450 volts. Pin 1 of U10A remains low while voltage is developing across C52. When voltage on pin 3 of U10A exceeds the voltage on pin 2, set by CR30 at about  $+0.6$  volts, pin 1 goes high. This causes Q42 to be biased on which grounds the base of Q40, turning it off. With Q40 off, C52 slightly discharges causing pin 1 of U10A to again go low, turning Q40 on. This cycle continually repeats, maintaining a constant selected voltage on C52, until the unit is triggered.

The Ready indicator LED CR29 blinks at the same frequency as the charging cycle. Reverse voltage protection of CR29 is provided by CR28. R28 determines the current level through CR29.

A circuit composed of U10B, Q15, R17, VR16 and VR17 causes the voltage on C52 to be raised or lowered whenever the Flash Intensity control is changed. Pin 6 of U10B is referenced at about  $+0.3$  volts to pin 2 of U10A. Pin 5 of U10B is common to pin 3 of U10A, which causes pin 7 of U10B to be low. If the Intensity control is adjusted to a lower level, pin 1 of U10A goes high. This biases Q42 on, turning Q40 off. Pin 7 of U10B goes high turning Q15 on. This causes the voltage level on C52 (through VR16, VR17 and R17) to decrease until the voltage on pin 5 is lower than pin 6 of U10B. Pin 7 of U10B then goes low, turning Q15 off. U10A takes control repeating the charging cycle at the new voltage setting.

### Trigger

Assume that C46 and C52 are charged to the charging voltage, C65 is charged to the supply voltage (battery), and the LED is blinking to indicate that the Flash Unit is ready to operate.

When the Shutter is actuated, a short circuit is applied across the X SYNC and GND terminals which turns Q64 on through CR62 and R62. This causes C65 to discharge through R48 and R65, which applies a positive gate to Q48. This gate turns on Q48, which discharges C46 through the primary of T50, a high-turns-ratio transformer. The output of T50 is a 4 to 6 kilovolt pulse, which triggers V50. This causes C52 to discharge through V50 creating a flash.

Capacitors C46 and C52 discharge during the flash time, which readies the unit for recharging. As soon as the momentary short circuit across the X SYNC and GND terminals is removed and the flash terminated, C65, C46 and C52 begins to recharge.

As a safety factor, whenever the unit is turned off, S60 connects R60 across C52 to discharge any potential that may be on C52.

# MAINTENANCE

## PREVENTATIVE MAINTENANCE

The C-5B Camera is designed to provide long, trouble-free service if given the same care as other precision optical devices. Care should be taken in handling the various mechanisms to ensure that they are not damaged.

### CLEANING

#### Exterior

Clean the plastic surfaces with a cloth or swab dampened with warm water, and if necessary a mild soap solution.

#### Interior

Interior surfaces may be cleaned by dusting with a dry, lint-free cloth or brush.

#### Lens

Lense surfaces may be dusted with a soft, camel-hair brush. Fingerprints and smudges should be lightly wiped off with a high-quality lense tissue. Be careful not to scratch the lense surfaces. Also keep them free of oil and grease.

#### Pack Film Camera Back Rollers

The pack film back has two stainless steel rollers inside at one end. These rollers are used when processing exposed film and may in time collect film developing solution. They should be checked each time a film pack is inserted, and cleaned as necessary.

Instructions for removing the rollers are located inside the camera back door. If these instructions are missing or worn, the rollers can be removed by lifting the rear of the roller assembly up and out of the camera back. To replace the assembly, set the rollers down into the camera back. Then gently push the rear of the roller assembly down into the camera back until the small plastic retaining latch on the roller assembly catches and holds the rollers in place.

Wipe the rollers clean with a slightly dampened sponge or lint free cloth. Do not scrape the rollers with any metal or other device that may scar them.

### STORING THE CAMERA

To prevent chemical or corrosion damage when storing the camera for long periods of time, clean the processing rollers, remove any film, and remove the batteries. Also, to keep dust from accumulating in or on the camera, it should be covered or stored in a relatively dust free area.

## CORRECTIVE MAINTENANCE

### TEKTRONIX FIELD SERVICE

Tektronix, Inc. maintains repair and recalibration facilities at its local Field Service Centers and the Factory Service Center. For further information or assistance contact your local Tektronix Field Office, or representative.

### OBTAINING REPLACEMENT PARTS

#### Standard Parts

All electrical and mechanical part replacements can be obtained through your local Tektronix Field Office or representative. However, many of the standard electronic components can be obtained locally in less time than is required to order them from Tektronix, Inc. Before purchasing or ordering replacement parts, check the parts list for value, tolerance, rating, and description.

#### Special Parts

In addition to the standard electronic components, some special components are used. These components are manufactured or selected by Tektronix, Inc. to meet specific performance requirements, or are manufactured for Tektronix, Inc. in accordance with our specifications. These special components are indicated in the parts list by the Tektronix, Inc. manufacturer code (80009) listed in the Mfr. Code column. Most of the mechanical parts used in this instrument, except miscellaneous hardware, have been manufactured by Tektronix, Inc. Order all special parts directly from your local Tektronix Field Office or representative.

#### Ordering Parts

When ordering replacement parts from Tektronix, Inc., we require the following information to ensure that you receive the proper parts.

1. Instrument type (included mod or option numbers).
2. Instrument serial number.
3. The complete description line from the parts list (Circuit No., Tektronix Part No., Serial/Model No., etc.).

### COMPONENT REMOVAL AND REPLACEMENT

Mechanical disassembly requires a small cross-point screwdriver with about a six-inch shank and No. 1 point.

#### Camera Sections

To remove and replace the camera sections, refer to Figure 4-1.



*When the camera sections are removed, the lens-shutter assembly is completely loose. Careless handling could cause the assembly to fall free and be damaged.*

#### Lens Shutter Assembly

To remove and replace the lens-shutter assembly, refer to Figure 4-1.

#### Adapter Hood and Options

To disassemble the adapter hood, remove the four holding screws as shown in Figure 4-1. Procedures for changing adapter hood options are identical to those for standard installation.

#### Optical Lens



*After removal of the lens holding rings (Steps 3 and 6, Figure 4-2), the lens are completely loose. Careless handling could cause the lens to fall free and be damaged.*

To remove and replace the optical lens, refer to Figure 4-2.

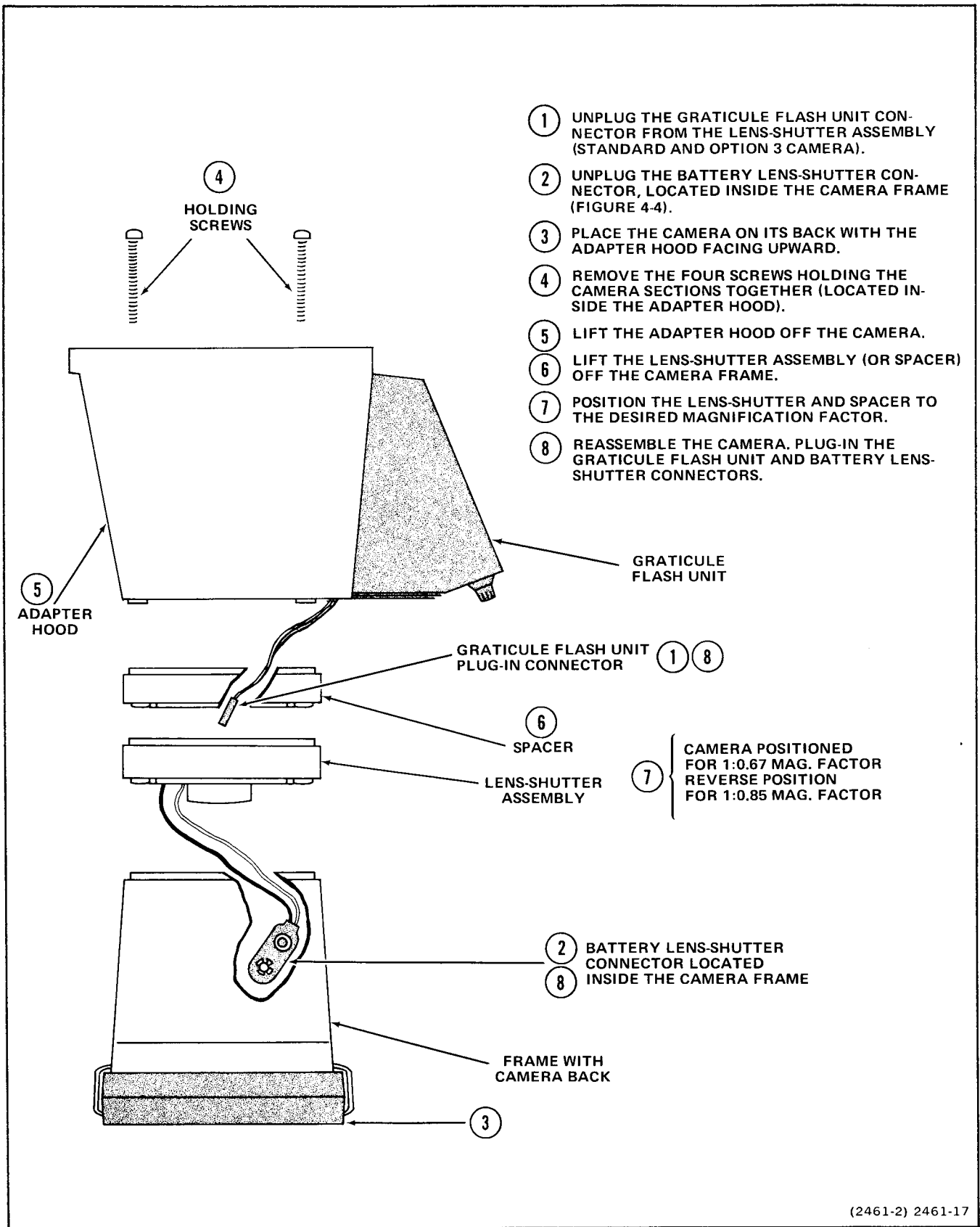
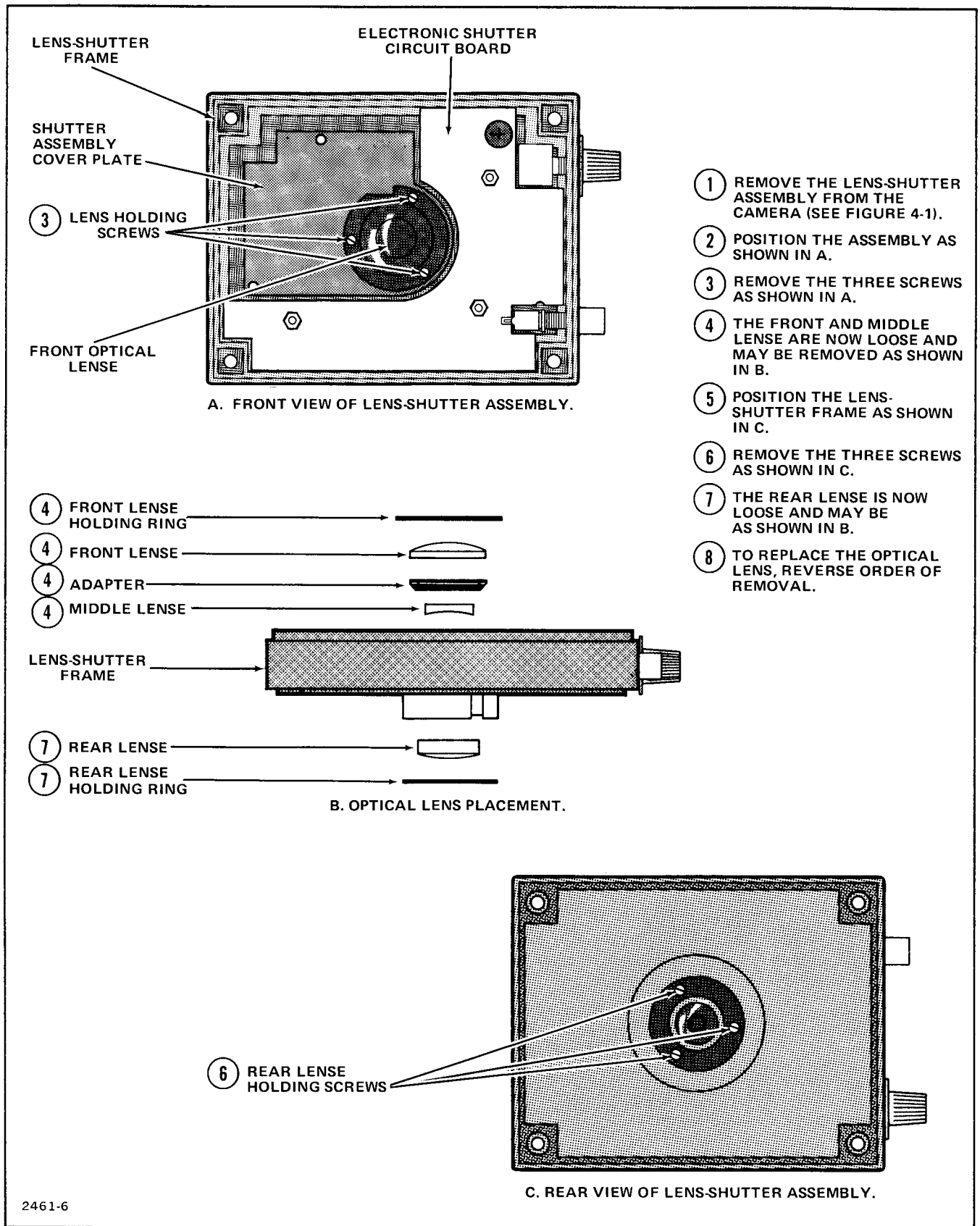


Figure 4-1. Removal of camera sections and lens-shutter assembly.



2461-6

Figure 4-2. Removal of optical lens.

- ① UNPLUG THE GRATICULE FLASH UNIT CONNECTOR FROM THE ELECTRONIC SHUTTER CIRCUIT BOARD.
- ② DISASSEMBLE THE CAMERA SECTIONS AS SHOWN IN FIGURE 4-1.
- ③ PLACE THE ADAPTER HOOD ON A FIRM SURFACE.
 

CAUTION

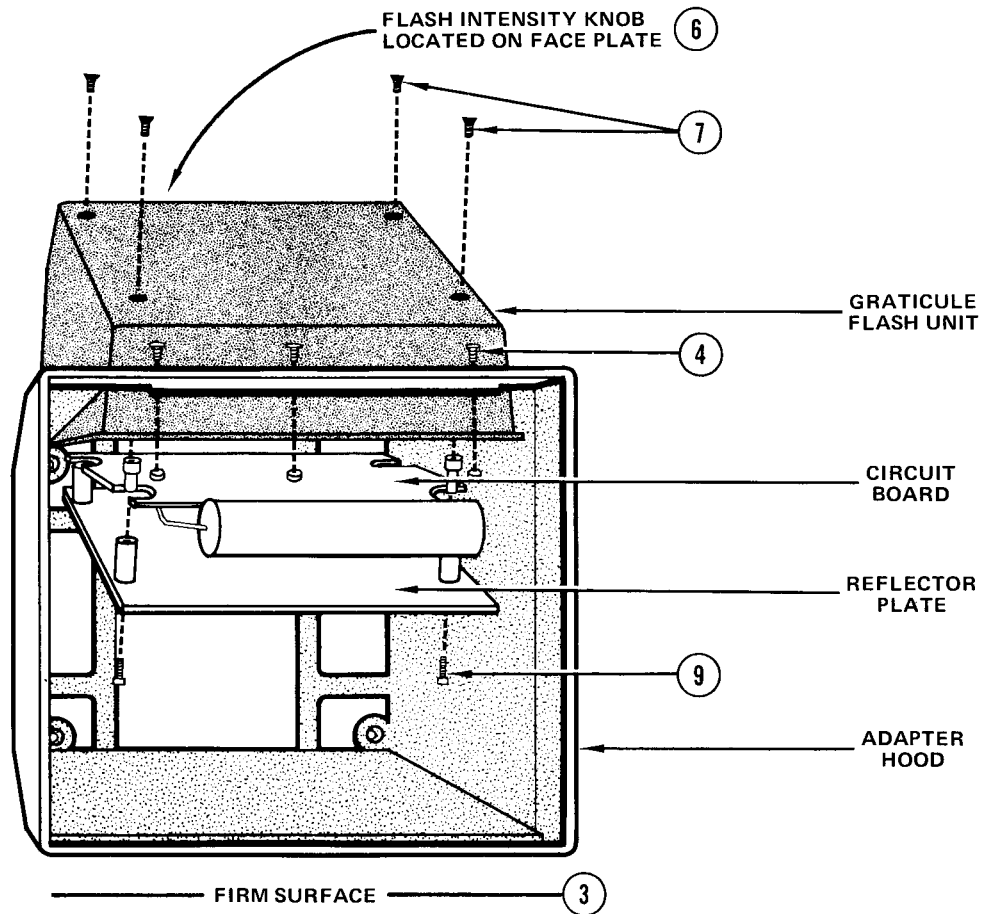
AFTER REMOVING THE THREE SCREWS IN THE NEXT STEP, THE GRATICULE FLASH UNIT CAN FALL FREE. THEREFORE, WHILE REMOVING THE SCREWS, SUPPORT THE UNIT WITH YOUR HAND.
- ④ REMOVE THE THREE SCREWS SECURING THE FLASH UNIT TO THE ADAPTER HOOD.
- ⑤ REMOVE THE GRATICULE FLASH UNIT BY LETTING THE FRONT PART (WHERE THE SCREWS ARE INSERTED) DROP DOWN.

- ⑥ WITH THE GRATICULE FLASH UNIT REMOVED FROM THE ADAPTER HOOD, PULL OFF THE FLASH INTENSITY KNOB.

CAUTION

AFTER REMOVING THE SCREWS IN THE NEXT STEP, THE CIRCUIT BOARD CAN FALL FREE. THEREFORE, SUPPORT THE BOARD WITH YOUR HAND WHEN REMOVING THE SCREWS.

- ⑦ REMOVE THE FOUR SCREWS ON TOP OF THE GRATICULE FLASH UNIT.
- ⑧ REMOVE THE CIRCUIT BOARD AND REFLECTOR PLATE BY LETTING THE END OPPOSITE THE FLASH INTENSITY KNOB DROP DOWN INTO YOUR HAND. THEN PULL THE CIRCUIT BOARD AND PLATE DOWN AND OUT OF THE FLASH HOUSING.
- ⑨ FOR ACCESS TO BOTH SIDES OF THE CIRCUIT BOARD, REMOVE THE FOUR SCREWS ON TOP OF THE REFLECTOR PLATE. FOR COMPLETE CIRCUIT BOARD REMOVAL, UNSOLDER THE FLASH TUBE LIGHT.



2461-4

Figure 4-3. Removing the Graticule flash unit and circuit board.

### Graticule Flash Unit and Circuit Board

To remove and replace the Graticule Flash Unit, circuit board, and reflector plate refer to Figure 4-3.

### Battery Holder and Batteries

To remove and replace the battery holder and batteries, refer to Figure 4-4.

### Electronic Shutter Circuit Board

To remove and replace the electronic circuit board, refer to Figure 4-5.

### Shutter Assembly

To disassemble the shutter assembly, remove the lens-shutter assembly from the camera (see Figure 4-1). Refer to the Exploded View drawing in the Replaceable Mechanical Parts section of the manual to remove or reassembly components of the shutter assembly.

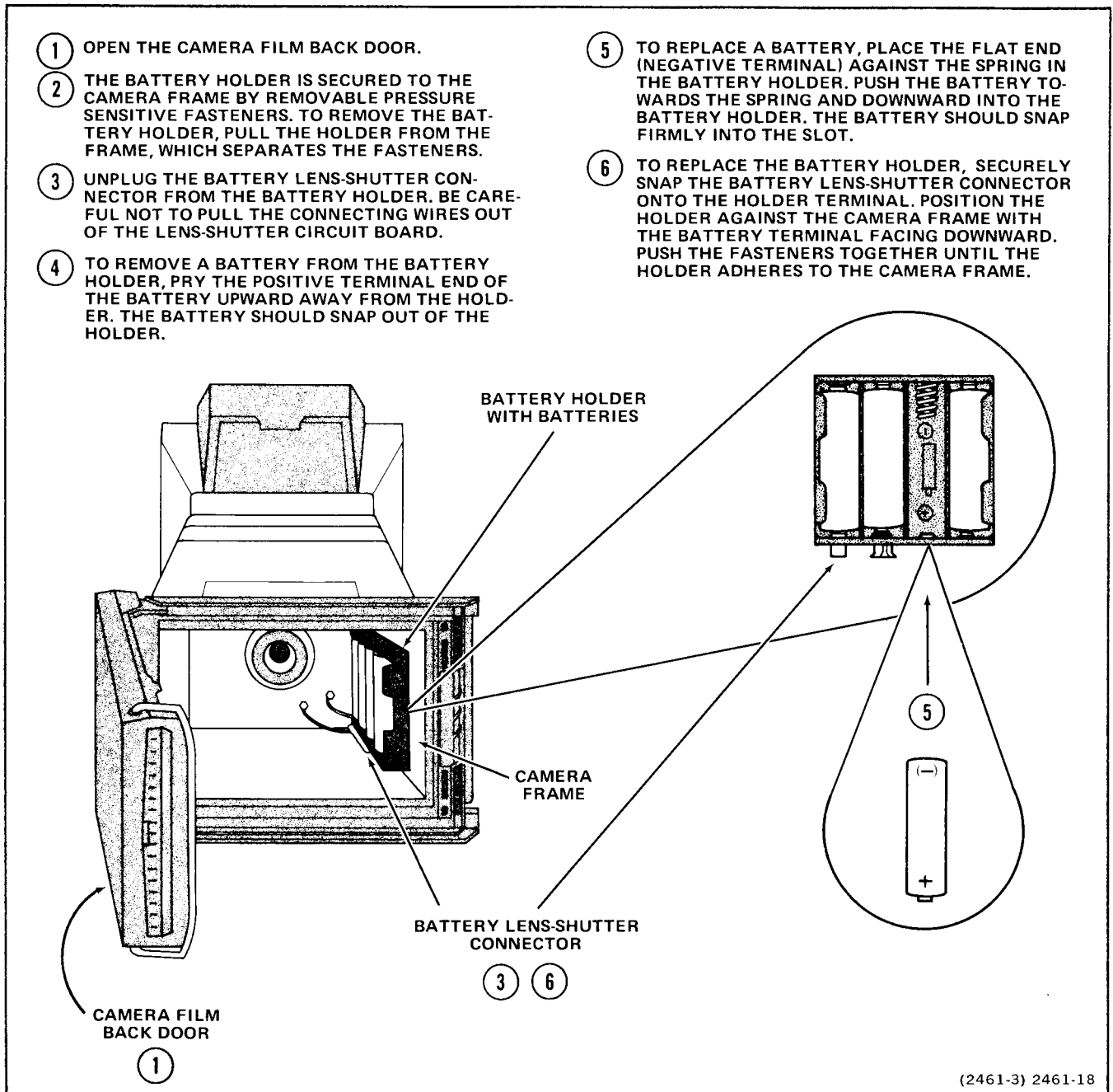


Figure 4-4. Removing the battery holder and batteries.

## ADJUSTMENT OF GRATICULE FLASH UNIT CHARGING VOLTAGE

The Graticule Flash Unit charging voltage is set at the factory and should not require readjustment unless the unit has been repaired. This adjustment requires a high resistance dc, 1000 Vdc voltage meter (e.g. Triplet 630-NA). To adjust the charging voltage, proceed as follows:

1. Remove the Graticule Flash Unit circuit board (refer to Figure 4-3).

### WARNING

*Potentially dangerous high voltages exist on the Flash circuit board when it is operating. DO NOT touch any components when making adjustments.*

2. Connect a high resistance dc voltage meter across C52 (observe meter polarity) and set the meter for at least a 500 Vdc reading.

3. Set R25, Voltage Set, fully counterclockwise and R27, FLASH INTENSITY, fully clockwise.
4. Connect the Graticule Flash Unit to the Lens-Shutter assembly (three-pin connector), and turn the unit on.
5. Adjust R25, Voltage Set, for a +450 Vdc reading on the voltmeter.
6. Depress the Shutter button causing the unit to flash.
7. Confirm that the voltage recharges to +450 Vdc.
8. Turn the unit off, unplug the connector, and reinstall the Graticule Flash Unit circuit board as shown in Figure 4-3.

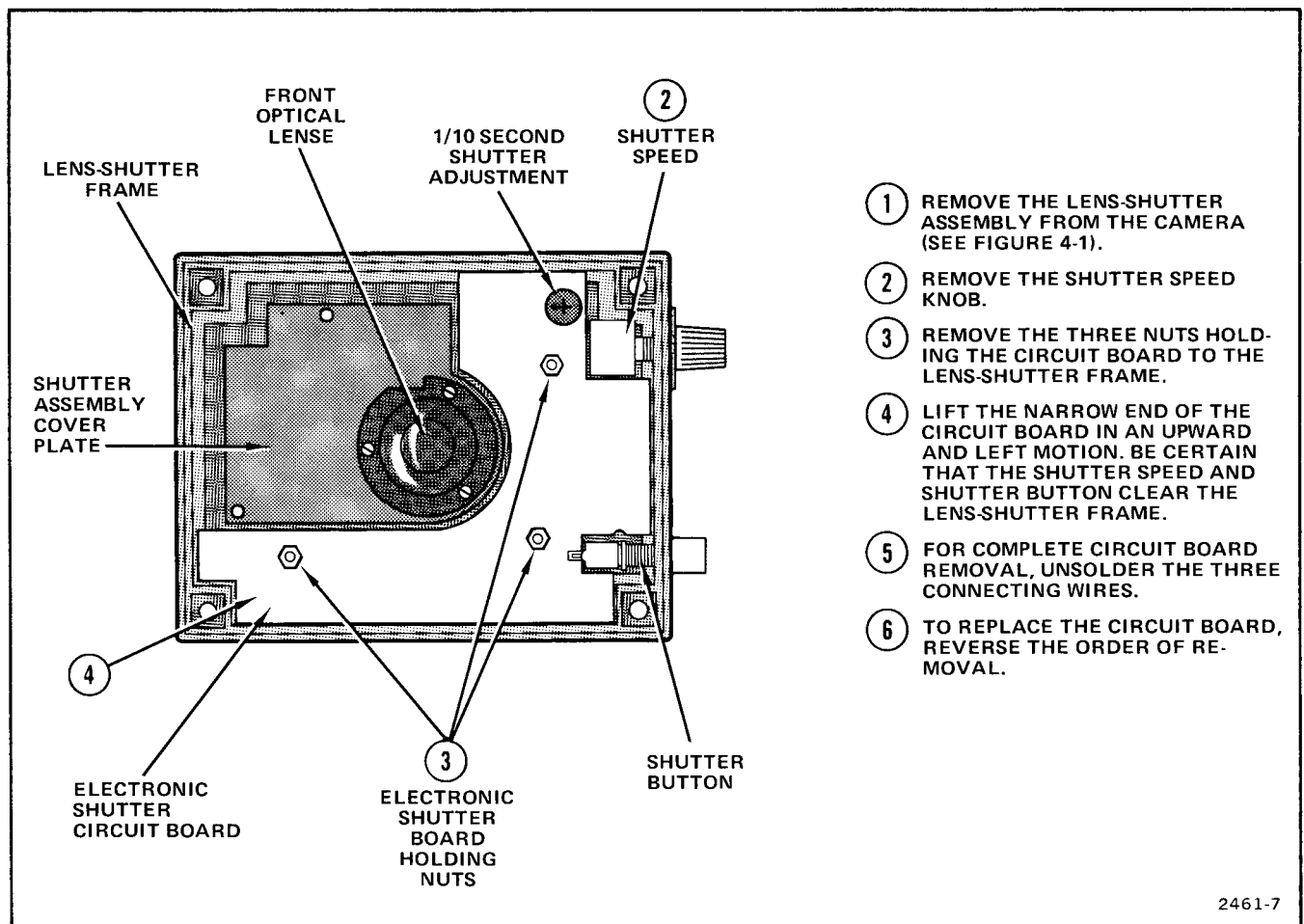


Figure 4-5. Removal of electronic shutter circuit board.

## INTERNAL ADJUSTMENT OF THE 1/10 SEC SHUTTER SPEED

### NOTE

*The 1/10 SEC adjustment is set at Tektronix and should not require additional adjustment. Situations in which readjustment may be required include circuit board repair, accidental movement of R116, change or alternation of the shutter assembly.*

Adjustment requires the following basic measuring and set-up devices:

1. General purpose oscilloscope with 1 V/div vertical deflection and 20 ms/div time base (Tektronix T900 Series).

2. Passive probe with 10X attenuation (Tektronix P6060), connecting cable and BNC connector.
3. Constant intensity light source.
4. Photometer probe (Tektronix J6501), or phototransistor (Fairchild FPT or equivalent) measuring device.

Figure 4-6 describes the basic set-up and adjustment procedures.

### WARNING

*Position the constant light source approximately six inches away from the optical lens. This will prevent damage to the plastic lens-shutter assembly resulting from excessive light source heat.*

# TROUBLESHOOTING

### WARNING

*Potentially dangerous high voltages exist on the Graticule Flash Unit circuit board when it is operating. DO NOT touch components while troubleshooting.*

## TROUBLESHOOTING CHARTS

Figures 7-2 and 7-4 (located on pullout pages at the rear of the manual) are guides for logical troubleshooting of a defective circuit or components.

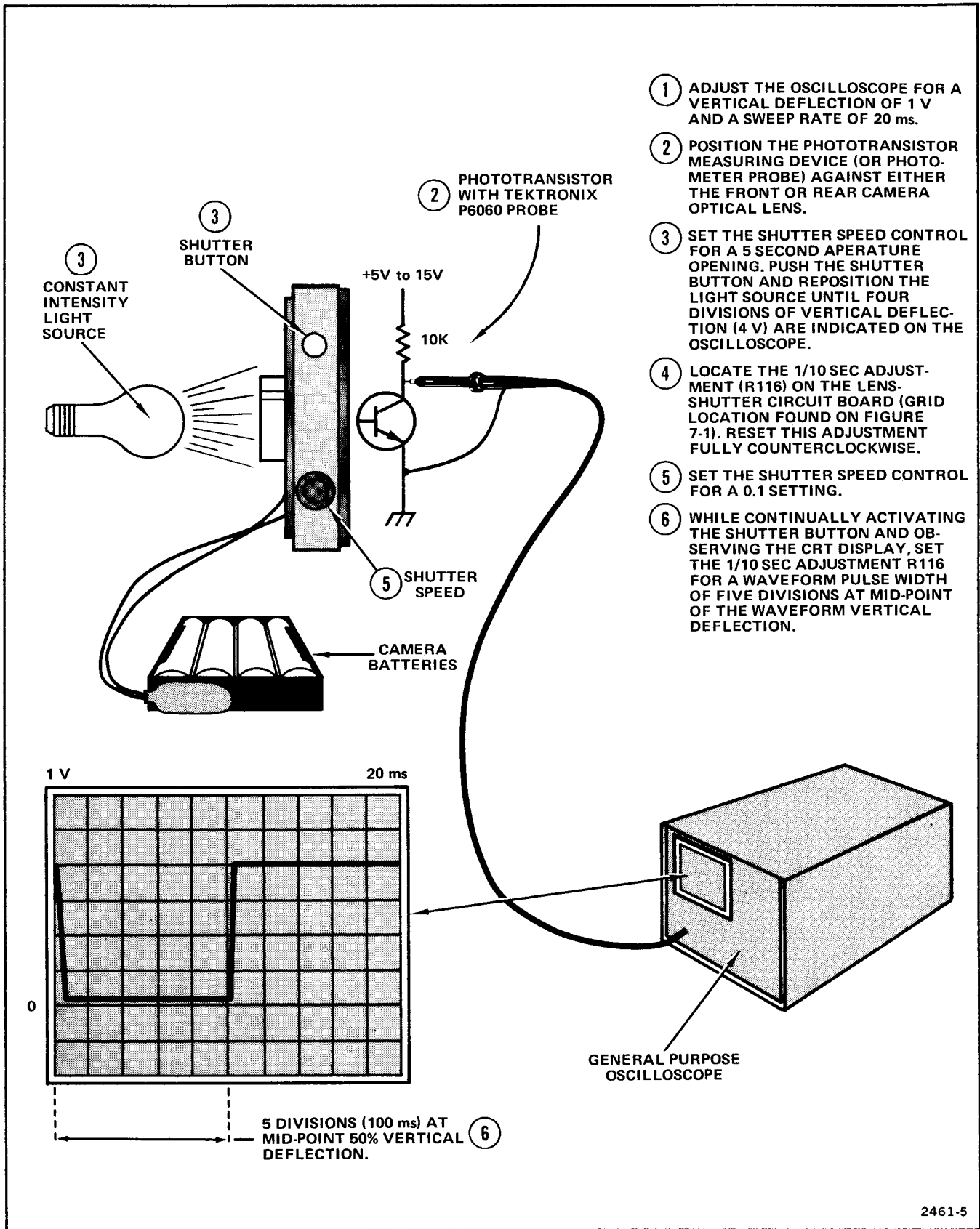
## VOLTAGES AND WAVEFORMS

Voltage and waveform measurements are shown with schematic diagrams 1 and 2 (located on pullout pages at the rear of the manual).

## TROUBLESHOOTING EQUIPMENT

The following equipment should be sufficient for troubleshooting:

1. Multimeter  
Description: 20,000 ohms per volts; dc range to at least 1000 volts; resistance measurements to at least ten meg-ohms.  
Example: Triplet Model 630-NA or Simpson Model 262.
2. General-purpose storage oscilloscope  
Example: Tektronix T912 or 214.



- 1 ADJUST THE OSCILLOSCOPE FOR A VERTICAL DEFLECTION OF 1 V AND A SWEEP RATE OF 20 ms.
- 2 POSITION THE PHOTOTRANSISTOR MEASURING DEVICE (OR PHOTOMETER PROBE) AGAINST EITHER THE FRONT OR REAR CAMERA OPTICAL LENS.
- 3 SET THE SHUTTER SPEED CONTROL FOR A 5 SECOND APERTURE OPENING. PUSH THE SHUTTER BUTTON AND REPOSITION THE LIGHT SOURCE UNTIL FOUR DIVISIONS OF VERTICAL DEFLECTION (4 V) ARE INDICATED ON THE OSCILLOSCOPE.
- 4 LOCATE THE 1/10 SEC ADJUSTMENT (R116) ON THE LENS-SHUTTER CIRCUIT BOARD (GRID LOCATION FOUND ON FIGURE 7-1). RESET THIS ADJUSTMENT FULLY COUNTERCLOCKWISE.
- 5 SET THE SHUTTER SPEED CONTROL FOR A 0.1 SETTING.
- 6 WHILE CONTINUALLY ACTIVATING THE SHUTTER BUTTON AND OBSERVING THE CRT DISPLAY, SET THE 1/10 SEC ADJUSTMENT R116 FOR A WAVEFORM PULSE WIDTH OF FIVE DIVISIONS AT MID-POINT OF THE WAVEFORM VERTICAL DEFLECTION.

Figure 4-6. Adjustment of electronic shutter.

# INSTRUMENT OPTIONS

The standard C-5B Camera with Graticule Flash Unit mounts to the instruments listed in Table 5-1. The available options and a brief description of each is given below. Refer to Table 5-2 for the location of option information contained in the manual.

## NOTE

*For latest information on available options, see your Tektronix Catalog or contact your Tektronix representative.*

## OPTION 1

The standard C-5B Camera without Graticule Flash Unit.

## OPTION 2

The C-5B Camera without a Graticule Flash Unit, which mounts to the instruments listed in Table 5-1.

## OPTION 3

The C-5B Camera with Graticule Flash Unit which mounts to the instruments listed in Table 5-1.

TABLE 5-1

Relationship of Instrument to C-5B for Mounting the Camera

Camera	Instrument	Adapter Hood Tektronix Part	Flash Unit Included
C-5B	577, 600-Series without illuminated graticule, 1420-Series, 5100-Series	016-0357-00	Yes
C-5B Option 1	528, 600-Series without graticule, or with illuminated graticule, 5400-Series, 7000-Series, T922R, Telequipment D83	016-0357-00	No
C-5B Option 2	432, 434, 455, 464, 465, 466, 475, 475A	016-0359-00	No
C-5B Option 3	T900 Series except T922R	016-0358-00	Yes

**TABLE 5-2**  
**Option Information Locator**

Instrument Option	Manual Section	Location of Information
Option 1  Standard C-5B Camera without Graticule Flash Unit	1 General Information	Description Table 1-1 contains information on the relationship of Tektronix instrument types to the Option 1 camera.
	2 Operating Instructions	Mounting the Standard and Option 1 Camera Instructions for mounting and removing the Standard and Option 1 camera.
	4 Maintenance	Adapter Hood and Options Instructions for removal of Adapter Hood and options.
	5 Instrument Options	Instrument Options Introduction and description of the Option 1 camera.
	8 Replaceable Mechanical Parts	Mechanical Parts List and Exploded View Drawing Parts list for the Option 1 camera with identifying cross-numbering on the Exploded View Drawing.
Option 2  The C-5 Camera without a Graticule Flash Unit which mounts with instruments listed in Table 5-1	1 General Information	Description Table 1-1 contains information on the relationship of of Tektronix instrument types to the Option 2 camera.
	2 Operating Instructions	Mounting the C-5B Camera Option 2 Instructions for mounting and removing the Option 2 camera.
	4 Maintenance	Adapter Hood and Options Instructions for removal of Adapter Hood and options.
	5 Instrument Options	Instrument Options Introduction and description of the Option 2 camera.
	8 Replaceable Mechanical Parts	Mechanical Parts List and Exploded View Drawing Parts list for the Option 2 camera with identifying cross-numbering on the Exploded View Drawing.

TABLE 5-2 (cont)

Instrument Option	Manual Section	Location of Information
Option 3  The C-5B Camera with Graticule Flash Unit which mounts to the instrument listed in Table 5-1	1 General Information	Description Table 1-1 contains information on the relationship of Tektronix instrument types to the Option 3 camera.
	2 Operating Instructions	Mounting the Option 3 Camera Instruction for mounting and removing the Option 3 camera.
	4 Maintenance	Adapter Hood and Options Instructions for removal of Adapter Hood and options.
	5 Instrument Options	Instrument Options Introduction and description of the Option 3 camera.
	8 Replaceable Mechanical Parts	Mechanical Parts List and Exploded View Drawing Parts list for the Option 3 camera with identifying cross-numbering on the Exploded View Drawing.

# REPLACEABLE ELECTRICAL PARTS

## PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

## SPECIAL NOTES AND SYMBOLS

- X000 Part first added at this serial number  
00X Part removed after this serial number

## ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

## ABBREVIATIONS

ACTR	ACTUATOR	PLSTC	PLASTIC
ASSY	ASSEMBLY	QTZ	QUARTZ
CAP	CAPACITOR	RECP	RECEPTACLE
CER	CERAMIC	RES	RESISTOR
CKT	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICOND	SEMICONDUCTOR
ELCTLT	ELECTROLYTIC	SENS	SENSITIVE
ELEC	ELECTRICAL	VAR	VARIABLE
INCAND	INCANDESCENT	WW	WIREWOUND
LED	LIGHT EMITTING DIODE	XFMR	TRANSFORMER
NONWIR	NON WIREWOUND	XTAL	CRYSTAL

Replaceable Electrical Parts—C-5B Camera

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
0000W	UNITED CHEMICON, INC.	731 JAMES STREET	SYRACUSE, NY 13203
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
03888	KDI PYROFILM CORPORATION	60 S JEFFERSON ROAD	WHIPPANY, NJ 07981
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD, PO BOX 20923	PHOENIX, AZ 85036
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
09353	C AND K COMPONENTS, INC.	103 MORSE STREET	WATERTOWN, MA 02172
14936	GENERAL INSTRUMENT CORP., SEMICONDUCTOR PRODUCTS GROUP	P.O. BOX 600, 600 W. JOHN ST.	HICKSVILLE, NY 11802
15818	TELEDYNE SEMICONDUCTOR	1300 TERRA BELLA AVE.	MOUNTAIN VIEW, CA 94043
16898	VOLTARC TUBES INC.	102 LINWOOD AVENUE	FAIRFIELD, CT 06430
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
28480	HEWLETT-PACKARD CO., CORPORATE HQ.	1501 PAGE MILL RD.	PALO ALTO, CA 94304
52592	ELECTRO-MECHANISMS, INC. DISPLAYS OPERATIONS	PO BOX A, 1163 W 4TH ST. 350 N HAYDEN ROAD	AZUSA, CA 91702 SCOTTSDALE, AZ 85257
53184	XCITON CORPORATION	5 HEMLOCK STREET	LATHAM, NY 12110
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
82389	SWITCHCRAFT, INC.	5555 N. ELSTON AVE.	CHICAGO, IL 60630
84411	TRW ELECTRONIC COMPONENTS, TRW CAPACITORS	112 W. FIRST ST.	OGALLALA, NE 69153
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601

Replaceable Electrical Parts—C-5B Camera

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-5601-00			CKT BOARD ASSY:SHUTTER CONTROL	80009	670-5601-00
A2	670-5619-00			CKT BOARD ASSY:GRATCULE FLASH	80009	670-5619-00
BT160 <sup>1</sup>	146-0025-00			BATTERY, DRY:1.5V, F CELL	80009	146-0025-00
C24	290-0769-00			CAP., FXD, ELCTLT:10UF, +50-10%, 100V	0000W	100TAL10
C27	283-0060-00			CAP., FXD, CER DI:100PF, 5%, 200V	72982	855-535U2J101J
C46	285-0572-00			CAP., FXD, PLASTIC:0.1UF, 20%, 200V	56289	410P10402
C48	283-0178-00			CAP., FXD, CER DI:0.1UF, +80-20%, 100V	72982	8131N145 E 104Z
C49	290-0297-00			CAP., FXD, ELCTLT:39UF, 10%, 10V	56289	150D396X9010B2
C52	285-1152-00			CAP., FXD, PLSTC:2UF, 10%, 500VDC	84411	TEK 184-20595
C65	290-0246-00			CAP., FXD, ELCTLT:3.3UF, 10%, 15V	56289	162D335X9015CD2
C112	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C113	283-0328-00			CAP., FXD, CER DI:0.03UF, +80-20%, 200V	72982	8131N225651303Z
C115	290-0830-00			CAP., FXD, ELCTLT:10UF, 5%, 20V	56289	150D106X5020B2
C124	290-0395-00			CAP., FXD, ELCTLT:4.7UF, 20%, 50V	56289	150D475X0050B2
C125	283-0032-00			CAP., FXD, CER DI:470PF, 5%, 500V	72982	831-500Z5D471J
C126	283-0249-00			CAP., FXD, CER DI:0.068UF, 10%, 50V	72982	8131N075 C 683K
C131	285-0905-00			CAP., FXD, PLSTC:0.33UF, 5%, 50V	56289	LP66A1A334J002
C133	283-0032-00			CAP., FXD, CER DI:470PF, 5%, 500V	72982	831-500Z5D471J
C137	283-0024-00			CAP., FXD, CER DI:0.1UF, +80-20%, 30V	72982	8131N075Z5U0104Z
C162	290-0755-00			CAP., FXD, ELCTLT:100UF, +50-10%, 10V	56289	502D223
C164	290-0755-00			CAP., FXD, ELCTLT:100UF, +50-10%, 10V	56289	502D223
CR10	152-0322-00			SEMICOND DEVICE:SILICON, 15V, HOT CARRIER	28480	5082-2672
CR24	152-0586-00			SEMICOND DEVICE:SILICON, 600V, 500MA	14936	RGP10J
CR28	152-0574-00			SEMICOND DEVICE:SILICON, 120V, 0.15A	80009	152-0574-00
CR29	150-1031-00			LAMP, LED:RED, 650NM, 40MA MAX	53184	XC209R
CR30	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR40	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR45	152-0586-00			SEMICOND DEVICE:SILICON, 600V, 500MA	14936	RGP10J
CR62	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR113	152-0322-00			SEMICOND DEVICE:SILICON, 15V, HOT CARRIER	28480	5082-2672
CR114	152-0322-00			SEMICOND DEVICE:SILICON, 15V, HOT CARRIER	28480	5082-2672
CR128	152-0322-00			SEMICOND DEVICE:SILICON, 15V, HOT CARRIER	28480	5082-2672
CR134	152-0322-00			SEMICOND DEVICE:SILICON, 15V, HOT CARRIER	28480	5082-2672
CR145	152-0066-00			SEMICOND DEVICE:SILICON, 400V, 750MA	80009	152-0066-00
CR162	152-0581-00			SEMICOND DEVICE:SILICON, 20V, 1A	04713	1N5817
L155	119-0995-00			SOLENOID, ELEC:1.5V, 3W, 2 AMP, 0.821 L X 0.36 W	52592	PO-37
Q15	151-0444-00			TRANSISTOR:SILICON, NPN	80009	151-0444-00
Q20	151-0126-00			TRANSISTOR:SILICON, NPN	15818	2N2484
Q40	151-0183-00			TRANSISTOR:SILICON, NPN	80009	151-0183-00
Q42	151-0190-00			TRANSISTOR:SILICON, NPN	80009	151-0190-00
Q48	151-0527-00			SCR:SILICON	04713	2N6241
Q64	151-0188-00			TRANSISTOR:SILICON, PNP	80009	151-0188-00
Q140	151-0302-00			TRANSISTOR:SILICON, NPN	04713	2N2222A
Q145	151-0625-00			TRANSISTOR:SILICON, PNP	03508	D45H11
R12	307-0465-00			RES., FXD, FILM:10M OHM, 10%, 0.5W	03888	FL1/2 10MEG+1*
R13	315-0395-00			RES., FXD, CMPSN:3.9M OHM, 5%, 0.25W	01121	CB3955
R15	315-0392-00			RES., FXD, CMPSN:3.9K OHM, 5%, 0.25W	01121	CB3925
R17	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R18	315-0107-00			RES., FXD, CMPSN:100M OHM, 5%, 0.25W	01121	CB1075
R22	315-0155-00			RES., FXD, CMPSN:1.5M OHM, 5%, 0.25W	01121	CB1555

<sup>1</sup>Four batteries per unit (not included with camera).

Replaceable Electrical Parts—C-5B Camera

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R23	315-0474-00			RES., FXD, CMPSN:470K OHM, 5%, 0.25W	01121	CB4745
R25	311-1555-00			RES., VAR, NONWIR:100K OHM, 20%, 0.5W	73138	91A R100K
R26	321-0406-00			RES., FXD, FILM:165K OHM, 1%, 0.125W	91637	MFF1816G16502F
R27	311-0641-00			RES., VAR, NONWIR:200K OHM, 20%, 0.50W	01121	W7441A
R28	315-0201-00			RES., FXD, CMPSN:200 OHM, 5%, 0.25W	01121	CB2015
R30	315-0104-00			RES., FXD, CMPSN:100K OHM, 5%, 0.25W	01121	CB1045
R31	315-0205-00			RES., FXD, CMPSN:2M OHM, 5%, 0.25W	01121	CB2055
R34	315-0155-00			RES., FXD, CMPSN:1.5M OHM, 5%, 0.25W	01121	CB1555
R35	315-0392-00			RES., FXD, CMPSN:3.9K OHM, 5%, 0.25W	01121	CB3925
R42	315-0751-00			RES., FXD, CMPSN:750 OHM, 5%, 0.25W	01121	CB7515
R46	315-0475-00			RES., FXD, CMPSN:4.7M OHM, 5%, 0.25W	01121	CB4755
R48	315-0511-00			RES., FXD, CMPSN:510 OHM, 5%, 0.25W	01121	CB5115
R60	315-0105-00			RES., FXD, CMPSN:1M OHM, 5%, 0.25W	01121	CB1055
R62	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R64	315-0104-00			RES., FXD, CMPSN:100K OHM, 5%, 0.25W	01121	CB1045
R65	315-0471-00			RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R67	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R112	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R113	315-0473-00			RES., FXD, CMPSN:47K OHM, 5%, 0.25W	01121	CB4735
R115	321-0261-00			RES., FXD, FILM:5.11K OHM, 1%, 0.125W	91637	MFF1816G51100F
R116	311-1748-00			RES., VAR, NONWIR:TRMR, 15K OHM, 0.50W	73138	91A R15K
R118	311-1996-00			RES., VAR, NONWIR:CKT BD, 500K OHM, 10%, 0.5W	01121	WP4G040S504UZ
R120	315-0473-00			RES., FXD, CMPSN:47K OHM, 5%, 0.25W	01121	CB4735
R122	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R124	315-0105-00			RES., FXD, CMPSN:1M OHM, 5%, 0.25W	01121	CB1055
R125	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R126	315-0105-00			RES., FXD, CMPSN:1M OHM, 5%, 0.25W	01121	CB1055
R133	315-0123-00			RES., FXD, CMPSN:12K OHM, 5%, 0.25W	01121	CB1235
R134	315-0303-00			RES., FXD, CMPSN:30K OHM, 5%, 0.25W	01121	CB3035
R135	315-0274-00			RES., FXD, CMPSN:270K OHM, 5%, 0.25W	01121	CB2745
R136	315-0912-00			RES., FXD, CMPSN:9.1K OHM, 5%, 0.25W	01121	CB9125
R137	315-0104-00			RES., FXD, CMPSN:100K OHM, 5%, 0.25W	01121	CB1045
R142	315-0473-00			RES., FXD, CMPSN:47K OHM, 5%, 0.25W	01121	CB4735
R143	315-0360-00			RES., FXD, CMPSN:36 OHM, 5%, 0.25W	01121	CB3605
R147	315-0303-00			RES., FXD, CMPSN:30K OHM, 5%, 0.25W	01121	CB3035
S60	260-1811-00			SWITCH, SLIDE:DPDT, 0.5A, 125VAC DC	82389	C56206L2
S100	260-1285-00			SWITCH, PUSH:SPDT, 1A, 115AC, MOM	09353	P8121
T45	120-1037-00			XFMR, FLYBACK:POT CORE	80009	120-1037-00
T50	120-1032-00			XFMR, PWR, STU:PHOTO FLASH	16898	TR-01S
U10A, B	156-0853-00			MICROCIRCUIT, LI:OPERATIONAL AMPLIFIER, DUAL	27014	LM358N
U114A, B	156-1152-00			MICROCKT, DGTL:DUAL PRCN RETRIGGERABLE	04713	MC14538BCL
U133A-C	156-0575-00			MICROCIRCUIT, DI:3 INPUT NOR GATE	80009	156-0575-00
V50	150-0179-00			LAMP, PHOTOFLASH:LINEAR	16898	60305-001
VR16	152-0287-00			SEMICONV DEVICE:ZENER, 0.4W, 110V, 5%	04713	1N986B
VR17	152-0287-00			SEMICONV DEVICE:ZENER, 0.4W, 110V, 5%	04713	1N986B
VR22	152-0175-00			SEMICONV DEVICE:ZENER, 0.4W, 5.6V, 5%	80009	152-0175-00
VR23	153-0058-00			SEMICONV DEVICE:ZENER, SEL, 6.2V, 5%, 10MA	80009	153-0058-00
VR46	152-0289-00			SEMICONV DEVICE:ZENER, 0.4W, 180V, 5%	04713	1N991B

# DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

## Symbols and Reference Designators

Electrical components shown on the diagrams are in the following units unless noted otherwise:

- Capacitors = Values one or greater are in picofarads (pF).  
Values less than one are in microfarads ( $\mu$ F).
- Resistors = Ohms ( $\Omega$ ).

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The overline on a signal name indicates that the signal performs its intended function when it goes to the low state.

Abbreviations are based on ANSI Y1.1-1972.

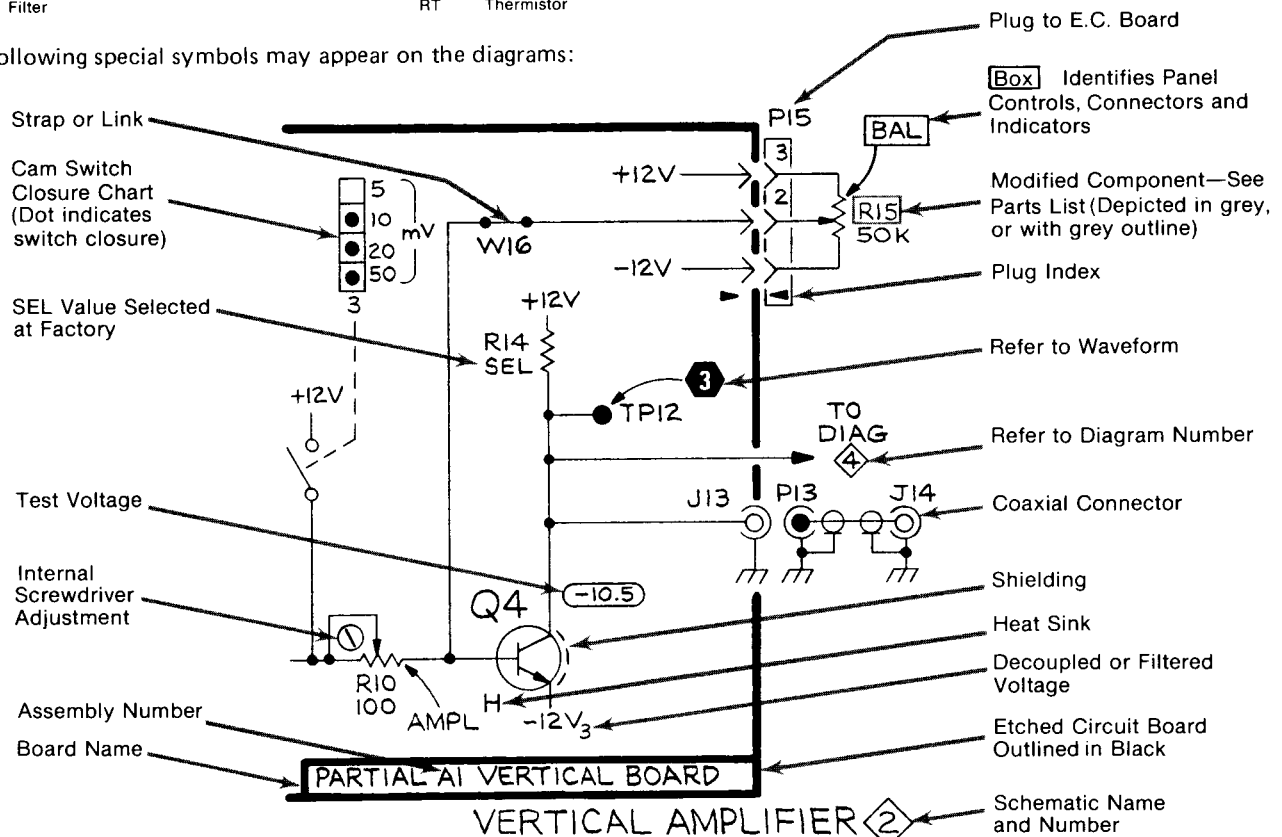
Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

- Y14.15, 1966 Drafting Practices.
- Y14.2, 1973 Line Conventions and Lettering.
- Y10.5, 1968 Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

A	Assembly, separable or repairable (circuit board, etc)	H	Heat dissipating device (heat sink, heat radiator, etc)	S	Switch or contactor
AT	Attenuator, fixed or variable	HR	Heater	T	Transformer
B	Motor	HY	Hybrid circuit	TC	Thermocouple
BT	Battery	J	Connector, stationary portion	TP	Test point
C	Capacitor, fixed or variable	K	Relay	U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
CB	Circuit breaker	L	Inductor, fixed or variable	V	Electron tube
CR	Diode, signal or rectifier	M	Meter	VR	Voltage regulator (zener diode, etc.)
DL	Delay line	P	Connector, movable portion	W	Wirestrap or cable
DS	Indicating device (lamp)	Q	Transistor or silicon-controlled rectifier	Y	Crystal
E	Spark Gap, Ferrite bead	R	Resistor, fixed or variable	Z	Phase shifter
F	Fuse	RT	Thermistor		
FL	Filter				

The following special symbols may appear on the diagrams:



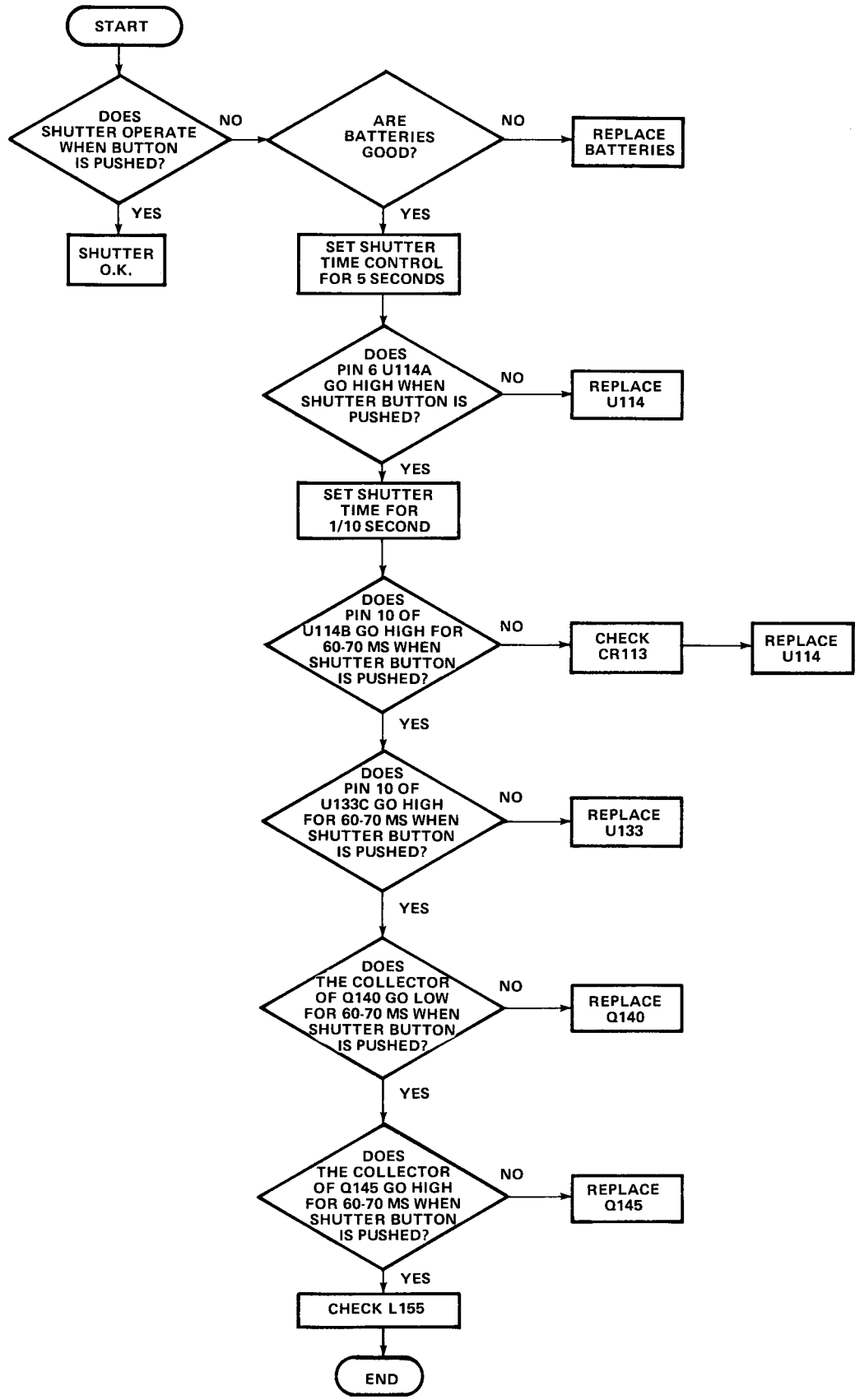


Figure 7-2. Troubleshooting chart for C-5B shutter control.

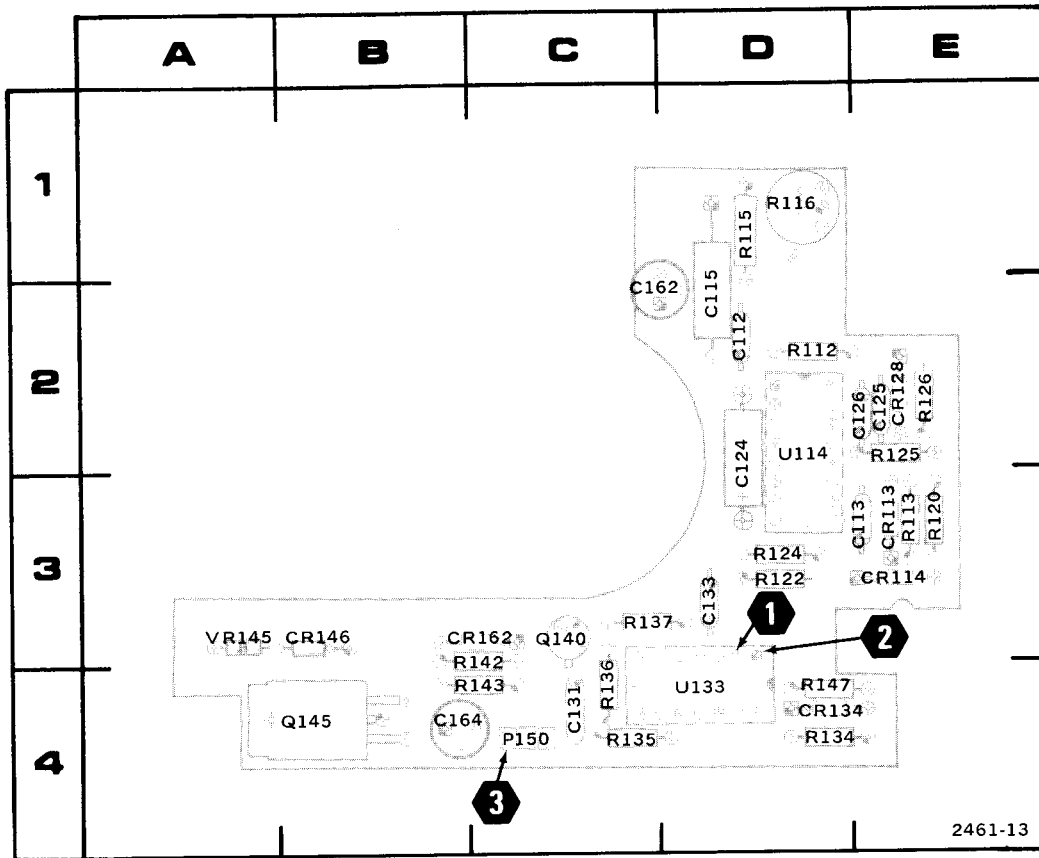


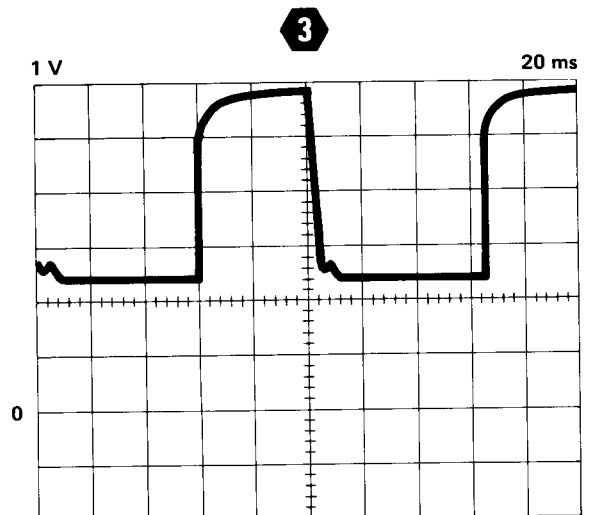
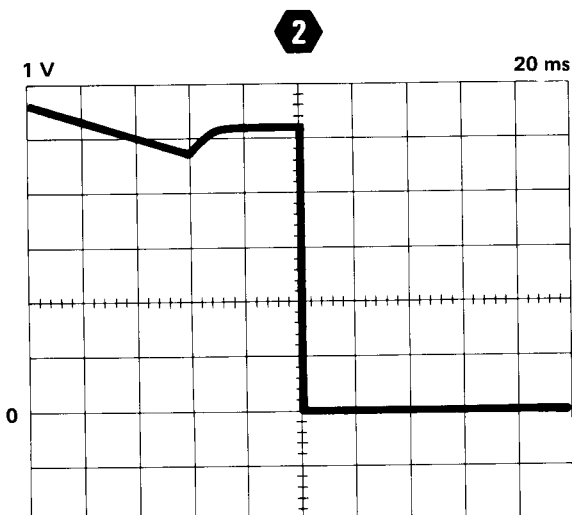
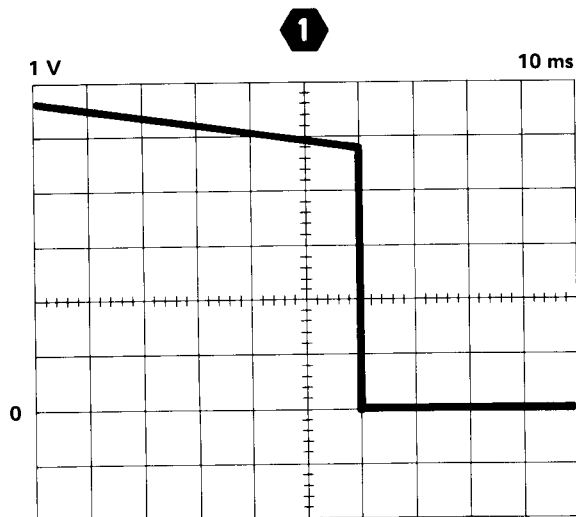
Figure 7-1. Shutter control circuit board.

CKT NO	GRID LOC	CKT NO	GRID LOC
C112	2D	R122	3D
C113	3E	R124	3D
C115	2D	R125	2E
C124	2D	R126	2E
C125	2E	R134	4D
C126	2E	R135	4C
C131	4C	R136	4C
C133	3D	R137	3C
C162	2D	R142	3C
C164	4B	R143	4C
		R147	4D
CR113	3E		
CR114	3E	U114	2D
CR128	2E	U133	4D
CR134	4D		
CR146	3B	VR145	3A
CR162	3C		
P150	4C	BT160 (BATTERIES) LOCATED INSIDE CAMERA	
		L155 LOCATED ON SHUTTER ASSEMBLY	
Q140	3C	S100 (SHUTTER BUTTON) AND R118 (SHUTTER SPEED CONTROL) LOCATED ON OUTSIDE CAMERA FRAME	
Q145	4B		
R112	2D		
R113	3E		
R115	1D		
R116	1D		
R120	3E		

# VOLTAGE AND WAVEFORM CONDITIONS

## Common Measurement Conditions

1. All measurements are between the observed test point and ground.
2. Test oscilloscope is dc coupled and internally triggered. Vertical deflection and sweep ranges are shown on the waveforms. The test oscilloscope should have a storage capability to provide optimum trace presentation.
3. Push the Shutter button to activate the circuit and test waveforms.
4. Set the Shutter Speed to 0.1 second for waveform display presentations 2 and 3.
5. Voltage measurements may vary as much as 20%.





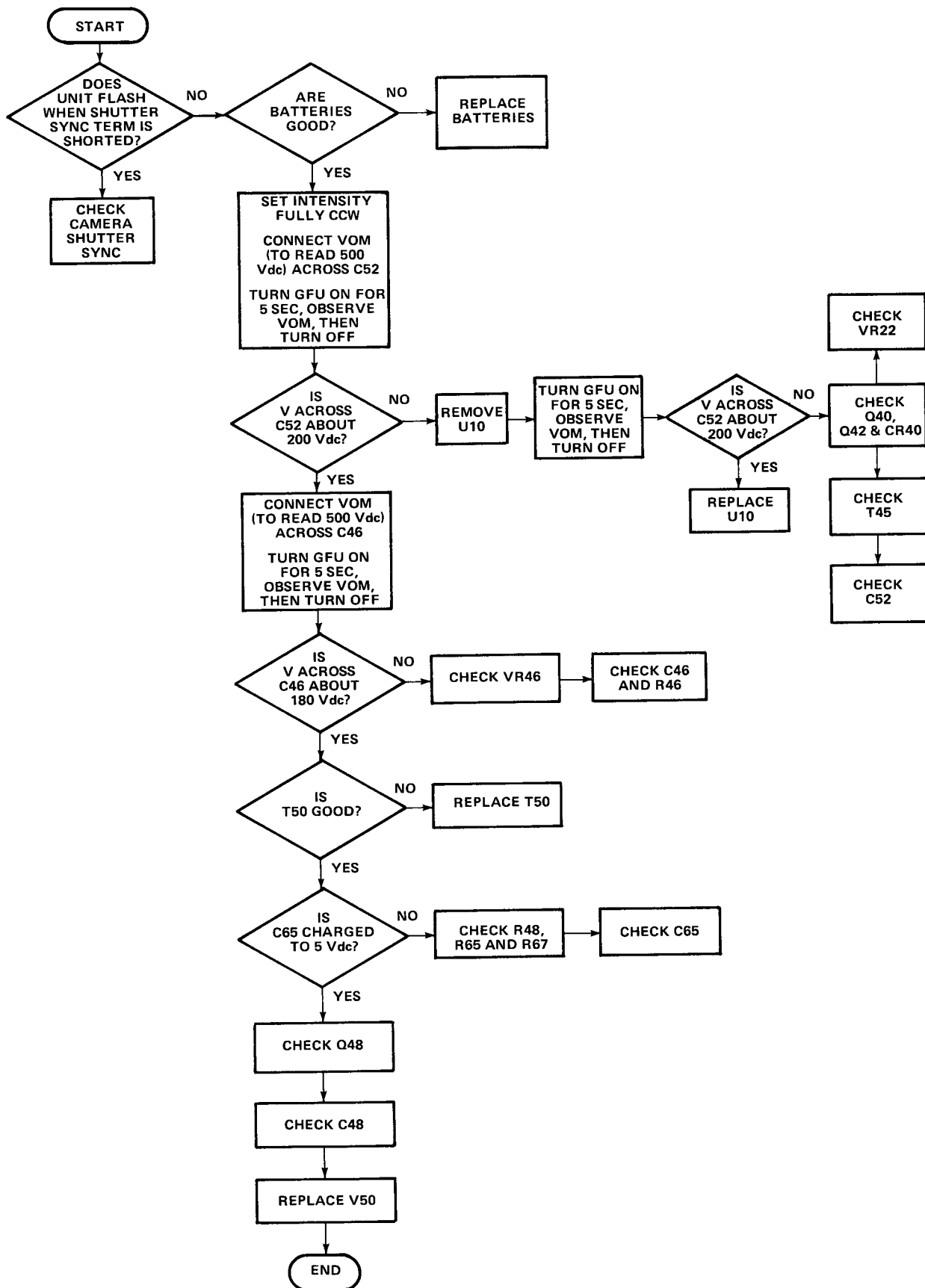


Figure 7-4. Troubleshooting chart for the C-5B Graticule Flash unit.

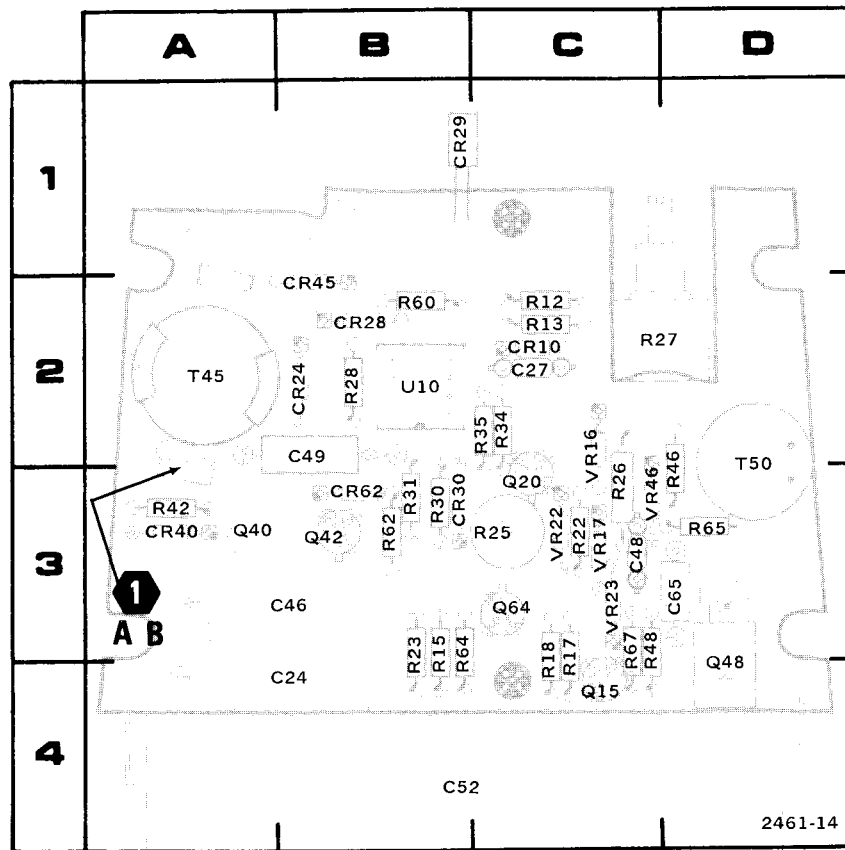


Figure 7-3. Graticule Flash Circuit Board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C24	4B	R17	3C	VR17	3C
C27	2C	R18	3C	VR22	3C
C46	3B	R22	3C	VR23	3C
C48	3C	R23	3B	VR46	3C
C49	2B	R25	3C		
C52	4B	R26	3C	V50 (FLASH TUBE) LOCATED OFF CIRCUIT BOARD	
C65	3D	R27	2C		
		R28	2B	R27 (INTENSITY CONTROL) LOCATED ON OUT-SIDE CAMERA FRAME	
CR10	2C	R30	3B		
CR24	2B	R31	3B		
CR28	2B	R34	2C		
CR29	1B	R35	2C		
CR30	3B	R42	3A		
CR40	3A	R46	3D		
CR45	2B	R48	3C		
CR62	3B	R60	2B		
		R62	3B		
Q15	4C	R64	3B		
Q20	3C	R65	3D		
Q40	3A	R67	3C		
Q42	3B				
Q48	4D	T45	2A		
Q64	3C	T50	3D		
R12	2C	U10	2B		
R13	2C				
R15	3B	VR16	2C		

# VOLTAGE AND WAVEFORM CONDITIONS

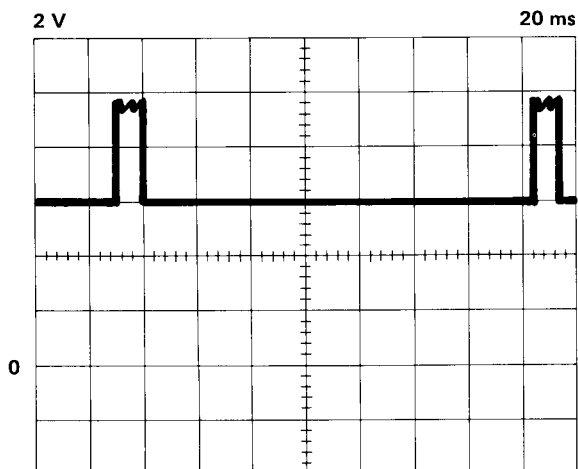
## WARNING

*Potentially dangerous high voltages exist on the Flash circuit board when it is operating. DO NOT touch connections or components when the unit is operating. Disconnect the batteries and discharge C52 and C46 before replacing circuit board parts.*

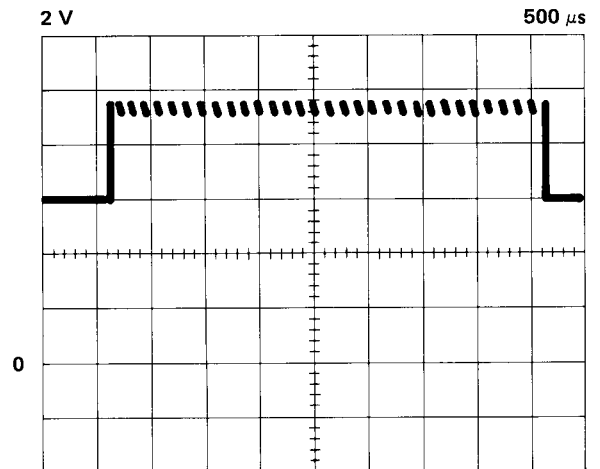
### Common Measurement Conditions

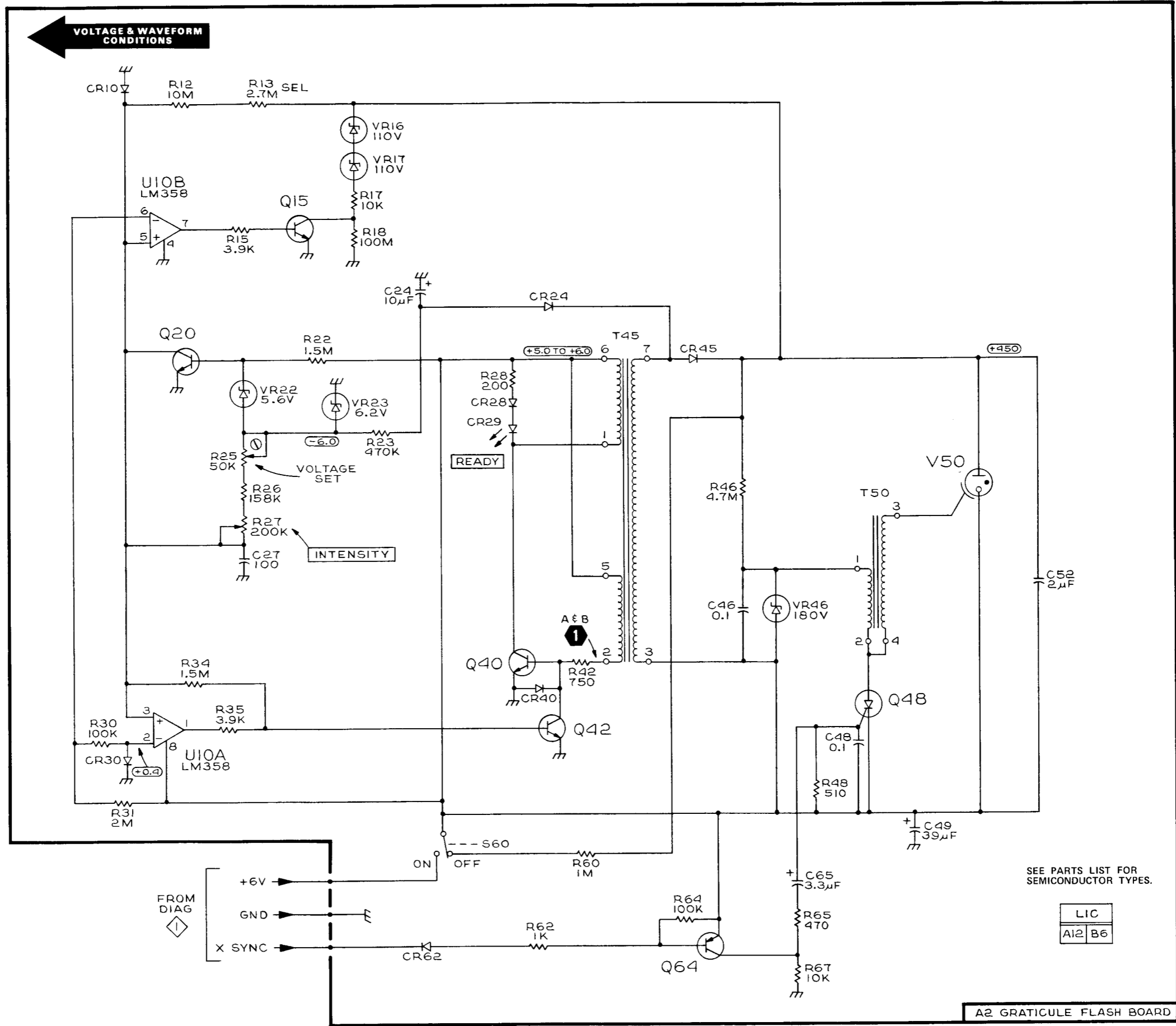
1. All measurements are between the test point and ground.
2. Accomplish the following set-up procedures before making voltage or waveform measurements:
  - (a) Connect a 2 M $\Omega$  resistor across C52.
  - (b) Set the FLASH INTENSITY control fully clockwise.
  - (c) Set R25 for a charge voltage of +450 Vdc.
3. Test oscilloscope is dc coupled and internally triggered. Vertical deflection and sweep ranges are shown on the waveforms.
4. Turn the Flash unit on and push the Shutter button to activate the circuit and test waveforms.
5. Voltage measurements may vary as much as 20%.

**1** A



**1** B





GRATICULE FLASH SCHEMATIC DIAGRAM

2

# REPLACEABLE MECHANICAL PARTS

## PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

## SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number  
00X Part removed after this serial number

## FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

## INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

```

1 2 3 4 5           Name & Description
Assembly and/or Component
Attaching parts for Assembly and/or Component
  ---*---
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
  ---*---
Parts of Detail Part
Attaching parts for Parts of Detail Part
  ---*---

```

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol ---\*--- indicates the end of attaching parts.

**Attaching parts must be purchased separately, unless otherwise specified.**

## ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

## ABBREVIATIONS

#	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
ACTR	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ADPTR	ACTUATOR	ELCTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICON	SEMICONDUCTOR
ALIGN	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
AL	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
ALUM	ALUMINUM	EQPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSEM	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ASSY	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
ATTEN	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVEING
AWG	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BD	BOARD	FLTR	FILTER	OBD	ORDER BY DESCRIPTION	SQ	SQUARE
BRKT	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BRS	BRASS	FSTNR	FASTENER	OVH	OVAL HEAD	STL	STEEL
BRZ	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
BSHG	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	T	TUBE
CAB	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CAP	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CER	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	THK	THICK
CHAS	CHASSIS	HEX HD	HEXAGONAL HEAD	PWR	POWER	TNSN	TENSION
CKT	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
COMP	COMPOSITION	HLCPS	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
CONN	CONNECTOR	HLEXT	HELICAL EXTENSION	RGD	RIGID	V	VOLTAGE
COV	COVER	HV	HIGH VOLTAGE	RLF	RELIEF	VAR	VARIABLE
CPLG	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W/	WITH
CRT	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
DEG	DEGREE	IDENT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
DWR	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR

Replaceable Mechanical Parts—C-5B Camera

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
07111	PNEUMO DYNAMICS CORPORATION	4800 PRUDENTIAL TOWER	BOSTON, MA 02199
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
09353	C AND K COMPONENTS, INC.	103 MORSE STREET	WATERTOWN, MA 02172
12360	ALBANY PRODUCTS CO., DIV. OF PNEUMO DYNAMICS CORPORATION	145 WOODWARD AVENUE	SOUTH NORWALK, CT 06586
13103	THERMALLOY COMPANY, INC.	2021 W VALLEY VIEW LANE P O BOX 34829	DALLAS, TEXAS 75234
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
22670	G.M. NAMEPLATE, INC.	2040 15TH AVENUE WEST	SEATTLE, WA 98119
29556	POLAROID CORPORATION	750 MAIN STREET	CAMBRIDGE, MA 02139
30181	ILEX OPTICAL COMPANY	690 PORTLAND AVENUE	ROCHESTER, NY 14621
70318	ALLMETAL SCREW PRODUCTS CO., INC.	821 STEWART AVE.	GARDEN CITY, NY 11530
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
76381	MINNESOTA MINING AND MFG. CO.	3M CENTER	ST. PAUL, MN 55101
77250	PHEOLL MANUFACTURING CO., DIVISION OF ALLIED PRODUCTS CORP.	5700 W. ROOSEVELT RD.	CHICAGO, IL 60650
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD P O BOX 500	ELGIN, IL 60120 BEAVERTON, OR 97077
80009	TEKTRONIX, INC.		
82647	TEXAS INSTRUMENTS, INC., CONTROL PRODUCTS DIV.	34 FOREST ST.	ATTLEBORO, MA 02703
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
86928	SEASTROM MFG. COMPANY, INC.	701 SONORA AVENUE	GLENDALE, CA 91201

Replaceable Mechanical Parts—C-5B Camera

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-	426-1294-02		1		FRAME,LT SHIELD:W/CAMERA BACK (ATTACHING PARTS)	80009	426-1294-02
-1	211-0553-00		4		SCREW,MACHINE:6-32 X 1.5 INCH,PNH STL	83385	OBD
	-----		-		. FRAME ASSY INCLUDES:		
-2	122-0989-00		1		. BACK,CAMERA:	29556	CB101
-3	334-2707-01		1		. PLATE,IDENT:	80009	334-2707-01
	252-0683-00		FT		. FSTNR TAPE,HOOK:1.0 W,NYLON,W/ADH BACK	76381	SJ 3503
-4	426-1294-00		1		. FRAME,LT SHIELD:	80009	426-1294-00
-5	361-0771-00		1		SPACER,MGF:LENS/SHUTTER	80009	361-0771-00
	380-0470-04		1		HOUSING,LENS:W/SHUTTER	80009	380-0470-04
-6	352-0511-00		1		. HOLDER,BATTERY:	80009	352-0511-00
	252-0684-00		FT		. FSTNR TAPE PILE:1.0 W,NYLON,W/ADH BACK	76381	SJ3504
-7	131-1160-00		1		. CLIP,ELECTRICAL:BATTERY	80009	131-1160-00
-8	366-1755-00		1		. PUSH BUTTON:WHITE,0.316 OD X 0.25 H	09353	80181
-9	366-1704-00		1		. KNOB:GRAY,0.127 ID,0.392 OD,0.4 H	80009	366-1704-00
-10	213-0153-00		1		. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-11	354-0579-00		1		. RING,KNOB SKIRT:CLEAR,TIME	80009	354-0579-00
-12	122-1009-00		1		. LENS SET,CAMERA: (ATTACHING PARTS)	30181	OBD
-13	343-0738-00		1		. RETAINER,LENS:REAR	80009	343-0738-00
-14	343-0739-00		1		. RETAINER,LENS:FRONT	80009	343-0739-00
-15	213-0805-00		4		. SCREW,TPG,TF:2-28 X 0.188,PLASTITE,PNH	83385	OBD
-16	211-0100-00		2		. SCREW,MACHINE:2-56 X 0.750 INCH,PNH,STL	83385	OBD
-17	210-0405-00		2		. NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	2X12157-402
	213-0119-00		2		. SCR,TPG,THD FOR:4-24 X 0.375 INCH,PNH STL	83385	OBD
	-----		-		. . . . .		
-18	361-0903-00		1		. SPACER,LENS:0.097 THK,BRASS	80009	361-0903-00
-19	200-2174-00		1		. COVER,SHUTTER: (ATTACHING PARTS)	80009	200-2174-00
-20	211-0003-00		2		. SCREW,MACHINE:2-56 X 0.875 INCH,PNH,STL	83385	OBD
-21	210-0405-00		2		. NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	2X12157-402
	-----		-		. . . . .		
-22	-----		1		. CKT BOARD ASSY:(SEE A1 EPL) (ATTACHING PARTS)		
-23	211-0081-00		1		. SCREW,MACHINE:2-56 X 0.562,PNH STL	83385	OBD
-24	210-0405-00		1		. NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	2X12157-402
-25	210-0001-00		1		. WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
-26	210-0259-00		1		. TERMINAL,LUG:0.099"ID INT TOOTH,SE (ATTACHING PARTS)	80009	210-0259-00
	-----		-		. . . . .		
-27	131-0608-00		3		. . . CONTACT,ELEC:0.365 L X 0.25 PH BRZ GOLD PL	22526	47357
-28	-----		1		. . . SWITCH,PUSH:(SEE S100 EPL)		
-29	-----		1		. . . RES.,VAR,NONWIR:(SEE R119 EPL)		
-30	136-0260-02		1		. . . SOCKET,PLUG-IN:16 CONTACT,LOW CLEARANCE	82647	C951601
-31	136-0269-02		1		. . . SOCKET,PLUG-IN:14 CONTACT,LOW CLEARANCE	01295	C951401
-32	211-0062-00		1		. SCREW,MACHINE:2-56 X 0.312 INCH,RDH STL	83385	OBD
-33	210-0405-00		1		. NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	2X12157-402
-34	210-0259-00		2		. TERMINAL,LUG:0.099"ID INT TOOTH,SE	80009	210-0259-00
-35	380-0470-03		1		. HOUSING,LENS:SHUTTER	80009	380-0470-03
	386-3912-01		1		PLATE,SHTR MTG:W/SHUTTER	80009	386-3912-01
-36	-----		1		. SOLENOID,ELEC:(SEE L155 EPL) (ATTACHING PARTS)		
-37	211-0193-00		2		. SCREW,MACHINE:1-72 X 0.125,PNH,STL	77250	OBD
-38	210-1008-00		2		. WASHER,FLAT:0.09 ID X 0.188" OD,BRS (ATTACHING PARTS)	12360	OBD
	-----		-		. . . . .		
-39	214-2715-00		1		. SPRING,SHUTTER:	80009	214-2715-00
-40	214-2717-00		1		. SPRING,SHUTTER:	80009	214-2717-00
-41	343-0740-00		1		. RETAINER,SPRING: (ATTACHING PARTS)	80009	343-0740-00
-42	211-0160-00		1		. SCREW,MACHINE:0-80 X 0.188,FILH,SST,SLOT (ATTACHING PARTS)	83385	OBD

Replaceable Mechanical Parts—C-5B Camera

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-43	214-2718-00		1	.					BLADE, SHUTTER: (ATTACHING PARTS)	80009	214-1718-00
-44	211-0123-00		1	.					SCREW, MACHINE: 1-72 X 0.188, PNH, STL, BK OXD	77250	OBD
-45	220-0818-00		1	.					NUT, SLEEVE: 1-72 X 0.25 DIA, BRASS	80009	220-0818-00
									- - - * - - -		
-46	214-2719-00		1	.					ARM, ACTUATOR: (ATTACHING PARTS)	80009	214-2719-00
-47	213-0121-00		1	.					SCREW, MACHINE: 0-80 X 0.094, PNH, SST, POZ	83385	OBD
-48	210-1293-00		1	.					WASHER, FLAT: 0.062 ID X 0.015 THK, STL	86928	5702-32-15
									- - - * - - -		
-49	129-0693-00		1	.					SPACER, POST: 0.235 L, 0-80 THRU THD, BRASS (ATTACHING PARTS)	80009	129-0693-00
-50	211-0160-00		1	.					SCREW, MACHINE: 0-80 X 0.188, FILH, SST, SLOT	83385	OBD
									- - - * - - -		
-51	214-2720-01		1	.					ACTUATOR, SHTR: W/PIN (ATTACHING PARTS)	80009	214-2720-01
-52	213-0121-00		1	.					SCREW, MACHINE: 0-80 X 0.094, PNH, SST, POZ	83385	OBD
-53	220-0819-00		1	.					NUT, SLEEVE: 0-80 X 0.188 DIA, BRASS	80009	220-0819-00
									- - - * - - -		
-54	131-0897-02		1	.					CONTACT, ELEC: W/POST CONTACT	80009	131-0897-02
	131-0898-00		1	.					TERMINAL, LUG: 0.048 ID, PLAIN CUBE	80009	131-0898-00
-55	352-0506-00		1	.					HLD, ELEC CONT: (ATTACHING PARTS)	80009	352-0506-00
-56	211-0160-00		1	.					SCREW, MACHINE: 0-80 X 0.188, FILH, SST, SLOT	83385	OBD
-57	210-0504-00		1	.					NUT, PLAIN, HEX.: 0-8 X 0.156 INCH, BRS	73743	3004-402
									- - - * - - -		
-58	343-0741-00		1	.					RETAINER, SPRING: (ATTACHING PARTS)	80009	343-0741-00
-59	211-0175-00		1	.					SCREW, MACHINE: 0-80 X 3.12, FLH, SST, SLOT	07111	OBD
-60	210-0504-00		1	.					NUT, PLAIN, HEX.: 0-8 X 0.156 INCH, BRS	73743	3004-402
-61	343-0762-00		1	.					RETAINER, SPRING: PLASTIC	80009	343-0762-00
-62	386-3912-00		1	.					PLATE, SHTR MTG: (ATTACHING PARTS)	80009	386-3912-00
	016-0642-00		1	.					FLASH UNIT: (ATTACHING PARTS)	80009	016-0642-00
-63	211-0117-00		3	.					SCREW, MACHINE: 4-40 X 0.312 INCH, PNH, SST	70318	OBD
-64	210-0406-00		3	.					NUT, PLAIN, HEX.: 4-40 X 0.188 INCH, BRS	73743	2X12161-402
									- - - * - - -		
-65	366-1035-00		1	.					FLASH UNIT INCLUDES: KNOB:	80009	366-1035-00
-66	334-2708-00		1	.					MARKER, IDENT:	22670	OBD
	334-2770-00		1	.					MARKER, IDENT: MARKED CAUTION	22670	OBD
-67	-----		-	.					CKT BOARD ASSY: (SEE A2 EPL) (ATTACHING PARTS)		
-68	211-0119-00		4	.					SCREW, MACHINE: 4-40 X 0.25" 100 DEG, FLH, STL	83385	OBD
-69	129-0599-00		4	.					SPACER, POST: 0.422 L, 4-40 THD, AL, 0.312 OD	80009	129-0599-00
									- - - * - - -		
-70	378-0846-01		1	.					CKT BOARD ASSY INCLUDES: REFLECTOR LIGHT: W/MARKING (ATTACHING PARTS)	80009	378-0846-01
-71	211-0014-00		4	.					SCREW, MACHINE: 4-40 X 0.50 INCH, PNH STL	83385	OBD
									- - - * - - -		
-72	-----		1	.					SWITCH, SLIDE: (SEE S60 EPL)		
-73	-----		1	.					LAMP: (SEE CR29 EPL)		
	352-0360-01		1	.					HOLDER, LED: 212/214	80009	352-0360-01
-74	131-0608-00		3	.					CONTACT, ELEC: 0.365 L X 0.25 PH BRZ GOLD PL	22526	47357
-75	-----		1	.					RES., VAR, NONWIR: (SEE R27 EPL)		
-76	-----		1	.					SCR: (SEE Q48 EPL)		
	386-1130-00		1	.					INSULATOR, DISC:	13103	7717-15N
-77	380-0469-00		1	.					HOUSING, FLASH:	80009	380-0469-00
	198-3952-00		1	.					WIRE SET, ELEC:	80009	198-3952-00
-78	175-0826-01		FT	.					CABLE, SP, ELEC: 3 RIBBON WIRE	08261	OBD
-79	131-0707-00		3	.					CONNECTOR, TERM.: 0.48" L, 22-26AWG WIRE	22526	75691-005

Replaceable Mechanical Parts—C-5B Camera

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-80	352-0161-00		1	.	.	CONN BODY, PL, EL:3 WIRE BLACK				80009	352-0161-00
-81	200-1932-00 <sup>1</sup>		1	.	DOOR, CRT VIEW:W/FLASH, PLASTIC					80009	200-1932-00
-82	016-0357-00 <sup>2</sup>		1	ADAPTER, HOOD:						80009	016-0357-00
-83	016-0359-00 <sup>3</sup>		1	ADAPTER, HOOD:						80009	016-0359-00
-84	016-0358-00 <sup>4</sup>		1	ADAPTER, HOOD:						80009	016-0358-00

- <sup>1</sup>Option 1 and 2 camera only.
- <sup>2</sup>Standard and Option 1 camera only.
- <sup>3</sup>Option 2 camera only.
- <sup>4</sup>Option 3 camera only.

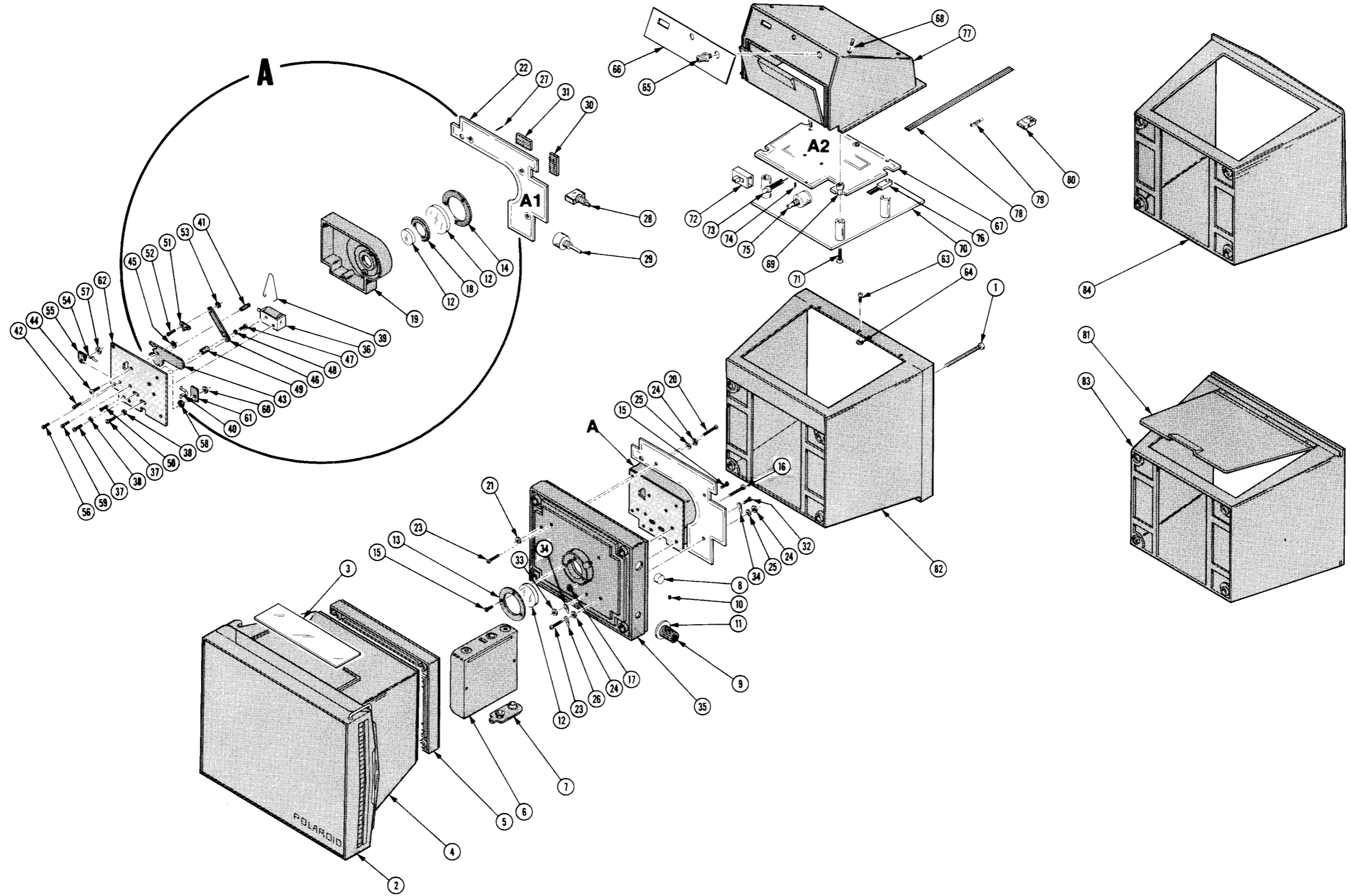


FIG. 1 EXPLODED



**TEKTRONIX®**  
committed to  
technical excellence

# MANUAL CHANGE INFORMATION

PRODUCT C-5B CAMERA  
070-2461-00

CHANGE REFERENCE CI/378  
DATE 3-15-78

CHANGE:	DESCRIPTION
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Pilot Changes #2, #3, & #5. TEXT CORRECTION

Page 1-3 SPECIFICATIONS

Change the Performance Requirement to read:

Flash Energy Input Adjustable from 0.07 joules to 0.2 joules.

### ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

**CHANGE TO:**

- |       |             |   |
|-------|-------------|---|
| C131  | 285-0905-00 | CAP., FXD, PLASTIC: 0.33UF, 5%, 50V       |
| CR162 | 152-0581-00 | SEMICONV DEVICE: SILICON, 20V, 1A, 1N5817 |
| R13   | 315-0395-00 | RES., FXD, CMPSN: 3.9M OHM, 5%, 0.25W     |
| R25   | 311-1555-00 | RES., VAR, NONWIR: 100K OHM, 20%, 0.50W   |
| R26   | 321-0406-00 | RES., FXD, FILM: 165K OHM, 1%, 0.125W     |
| R135  | 315-0274-00 | RES., FXD, CMPSN: 270K OHM, 5%, 0.25W     |
| R147  | 315-0303-00 | RES., FXD, CMPSN: 30K OHM, 5%, 0.25W      |

**REMOVE:**

- |       |             |  |
|-------|-------------|--|
| CR146 | 152-0141-02 | SEMICONV DEVICE: SILICON, 30V, 150MA, 1N4152         |
| VR145 | 152-0127-00 | SEMICONV DEVICE, DI: ZEN, SI, 7.5V, 5%, 0.4W, 1N958B |

**ADD:**

- |       |             |  |
|-------|-------------|--|
| C137  | 283-0024-00 | CAP., FXD, CER DI: 0.1UF, +80-20%, 30V     |
| CR145 | 152-0066-00 | SEMICONV DEVICE: SILICON, 400V, 1A, 1N3194 |
| R133  | 315-0123-00 | RES., FXD, CMPSN: 12K OHM, 5%, 0.25W       |

CHANGE:

DESCRIPTION

SCHMATIC CORRECTIONS

DIAGRAM **1** SHUTTER CONTROL - Partial

