

**TECHNICAL MANUAL**

**OPERATOR'S, ORGANIZATIONAL, DIRECT  
SUPPORT AND GENERAL SUPPORT  
MAINTENANCE MANUAL**

**TOPOGRAPHIC SUPPORT SYSTEM  
CAMERA, COPYING, LITHOGRAPHIC  
NSN: 3610-01-174-4066  
MODEL NO. P-E38**

---

**HEADQUARTERS, DEPARTMENT OF THE ARMY**

**14 APRIL 1986**

**WARNING**

Serious burns may occur if pulsed xenon lamp flash tubes are removed when hot. Allow flash tubes to cool before removal.

Avoid looking at lighted pulsed xenon lamps. Serious damage to eyes will occur.

HIGH VOLTAGE is used in this equipment. DEATH ON CONTACT or severe injury may result if personnel fail to observe safety precautions.

Do not be misled by the term LOW VOLTAGE. Low voltage can cause serious injury or death.

Test procedures requiring the operator or maintenance personnel to investigate equipment or restore casualties with interlocks disconnected or covers removed may result in DEATH ON CONTACT if personnel fail to observe safety precautions.

Voltages in switches and circuit breaker panels may result in DEATH ON CONTACT if personnel fail to observe safety precautions.

Failure to ground the section or equipment may result in DEATH ON CONTACT if personnel fail to observe safety procedures.

For Artificial Respiration refer to FM 21-11.

Dry Cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Wear solvent-impermeable gloves and eye/face protective equipment when using solvent. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).

Attempting to move overweight or top-heavy equipment that is unsecured may result in severe personnel injury. Always have sufficient personnel and equipment to accomplish the task.

a/(b blank)

Operator's, Organizational, Direct Support and  
General Support Maintenance Manual

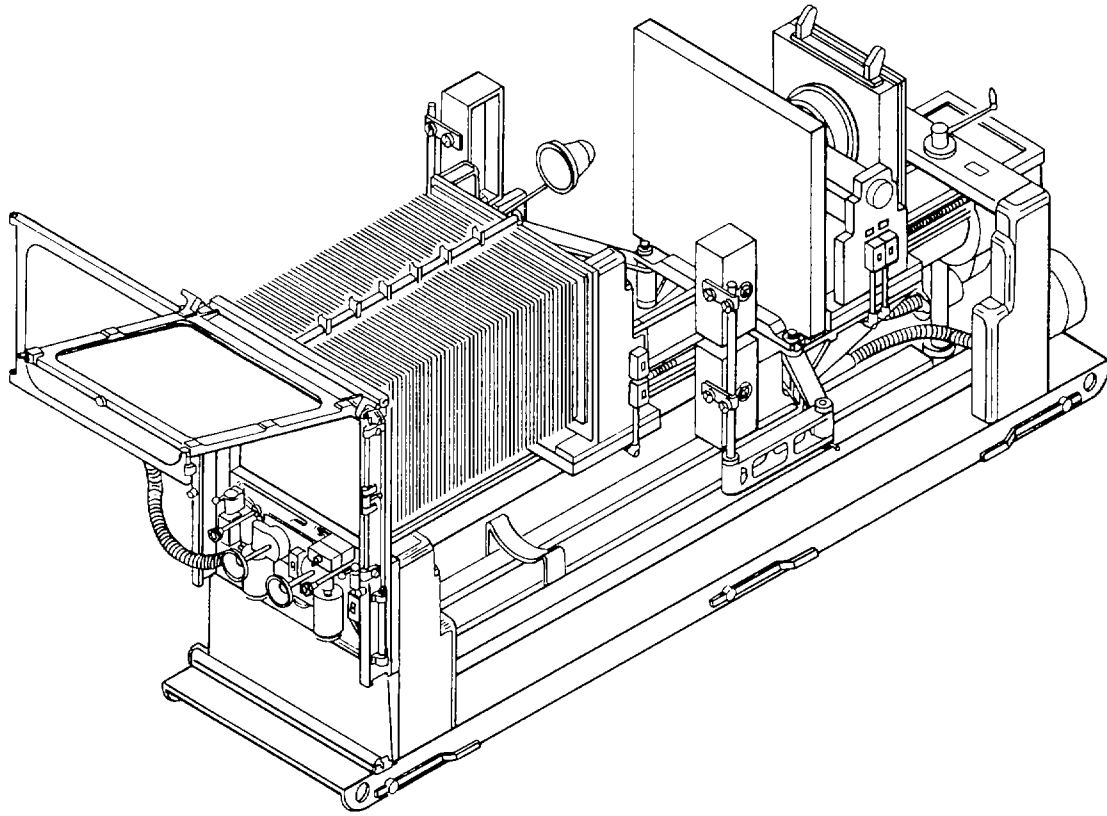
TOPOGRAPHIC SUPPORT SYSTEM  
CAMERA, COPYING, LITHOGRAPHIC  
NSN: 3610-01-174-4066, MODEL NO. P-E38

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Troop Support Command, ATTN: AMSTR-MCTS, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. A reply will be furnished directly to you.

CHAPTER 1	INTRODUCTION .....	1-1
Section I	General Information .....	1-1
Section II	Equipment Description .....	1-3
Section III	Technical Principles of Operation.....	1-8
CHAPTER 2	OPERATING INSTRUCTIONS .....	2-1
Section I	Description and Use of Operator's Controls and Indicators .....	2-1
Section II	Operator Preventive Maintenance Checks and Services .....	2-12
Section III	Operation Under Usual Conditions .....	2-30
Section IV	Operation Under Unusual Conditions .....	2-68
CHAPTER 3	OPERATOR MAINTENANCE INSTRUCTIONS .....	3-1
Section I	Lubrication Instructions .....	3-1
Section II	Troubleshooting Procedures .....	3-4
Section III	Maintenance Procedures .....	3-6
CHAPTER 4	ORGANIZATIONAL MAINTENANCE INSTRUCTIONS .....	4-1
Section I	Repair Parts, Special Tools; Test, Measurement, and Diagnostic Equipment (TMDE); and Support Equipment .....	4-1
Section II	Service Upon Receipt .....	4-1
Section III	Organizational Preventive Maintenance Checks and Services.....	4-7
Section IV	Troubleshooting .....	4-22
Section V	Maintenance Procedures .....	4-27
Section VI	Preparation for Storage or Shipment.....	4-106

CHAPTER 5	DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS....	5-1
Section I	Repair Parts, Special Tools; Test, Measurement, and Diagnostic Equipment (TMDE); and Support Equipment . . . . .	5-1
Section II	Troubleshooting . . . . .	5-1
Section III	Maintenance Procedures . . . . .	5-17
APPENDIX A	REFERENCES . . . . .	A-1
APPENDIX B	MAINTENANCE ALLOCATION CHART . . . . .	B-1
APPENDIX C	COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST . . . . .	C-1
APPENDIX D	ADDITIONAL AUTHORIZATION LIST . . . . .	D-1
APPENDIX E	EXPENDABLE SUPPLIES AND MATERIALS LIST . . . . .	E-1
APPENDIX F	ILLUSTRATED LIST OF MANUFACTURED ITEMS . . . . .	F-1
INDEX	. . . . .	INDEX-1



**CHAPTER 1 INTRODUCTION**

**Section I GENERAL INFORMATION**

**1-1 SCOPE.**

1-1.1 Type of Manual. Operator's, Organizational, Direct Support and General Support Maintenance.

1-1.2 Model Number and Equipment Name. Model number P-E38, Lithographic Copying Camera.

1-1.3 Purpose of Equipment. Reproduce any original. Copy may be enlarged or reduced.

**1-2 MAINTENANCE FORMS AND RECORDS.** Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, The Army Maintenance Management System (TAMMS).

**1-3 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS.** If your copying camera needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at U.S. Army Troop Support Command, ATTN: AMSTR-QX, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. We'll send you a reply.

**1-4 REFERENCE INFORMATION.** This listing includes an explanation of terms (glossary) used in this manual.

GLOSSARY

Adhere	To stick or support.
Continuous-Tone	An image which has not been screened and contains unbroken, gradient tones from black to white, in either positive or negative form.
Diaphragm	An adjustable aperture which controls the amount of light passing through a lens.
Emulsion	A suspension of either light-sensitive silver salts, diazos, or photopolymers, in a colloidal medium, usually gelatin, used for coating photographic films, plates, or papers.

Exposure	The total quantity of light received per unit area which may be expressed as the product of the light intensity and exposure time.
Filter	A material that selectively withholds some types of material or energy while permitting others to pass. Colored film or glass that transmits a single color or a range of colors while absorbing others.
Flash Exposure	A supplementary exposure given during halftone photography to strengthen the dots in shadow areas.
Halftone	Any photomechanical printing surface or the impression therefrom, in which detail and tone values are represented by a series of evenly spaced dots of varying size and shape, varying in direct proportion to the intensity of the tones they represent.
Line Copy	Any copy suitable for reproduction without using a screen; copy composed of lines or dots as distinguished from continuous-tone copy.
Magenta Contact Screen	A contact film screen composed of magenta-dyed dots of variable density used for making halftone negatives in the camera.
Masking	Blocking out areas of sensitized film or plate from exposure to actinic light.
Opaque Material	Any material that will prevent the passage of light of particular wavelengths. Thus, a substance may be opaque to some colors and not to others. It may be visually transparent, yet actinically opaque.
Optical Axis	A straight line which passes through the centers of curvature of the lens surfaces.

## Vignetting

Photography. A gradual reduction in density of parts of a photographic image, owing to the stopping of some of the rays entering the lens, as when a lens mounting interferes with the extreme oblique rays. An antivignetting filter is one that gradually decreases in density from the center toward the edges; it is used with many wide-angled lenses to produce a photograph of uniform density by cutting down the overexposure of the center of the photograph. This principle is employed in the magenta halftone screen, where light reflected from the image passes through vignetted dots, thus forming dots of varying sizes according to its intensity.

Lithography. A photographic process which portrays a solid color in a screen which shades off gradually into the unprinted portions of the paper. Open water on a map is often shown by this method.

**Section II EQUIPMENT DESCRIPTION****1-5 EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.**

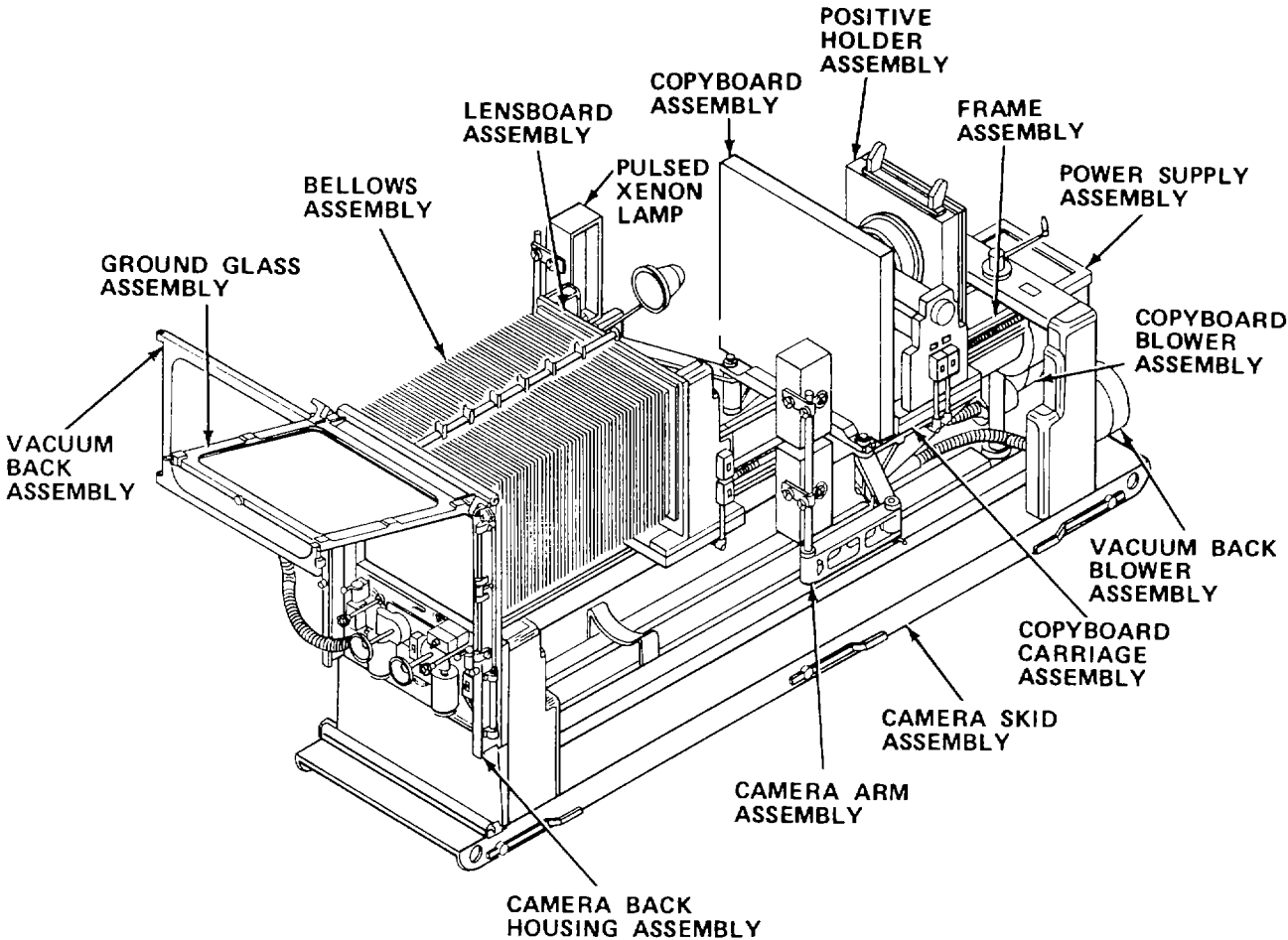
1-5.1 Purpose of Lithographic Copying Camera. Reproduces any original such as photographs, drawings, charts, maps, or written documents. Original may be line or continuous-tone. Copy may be enlarged or reduced.

1-5.2 Capabilities and Features.

- a. Designed for installation and operation in fixed or mobile site.
- b. Reduces or enlarges original copy.
- c. Reproduces copy from negative or positive transparencies.
- d. Reproduces aerial roll film.
- e. Utilizes high intensity pulsed xenon lamps.



1-6 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.



**POWER SUPPLY ASSEMBLY.** Supplies operating voltages and currents to four pulsed xenon lamps.

**VACUUM BACK BLOWER ASSEMBLY.** Provides suction to vacuum back assembly.

**COPYBOARD BLOWER ASSEMBLY.** Provides suction to copyboard assembly or positive holder assembly.

**CAMERA SKID ASSEMBLY.** Supports frame assembly in transport or operation mode.

**FRAME ASSEMBLY.** Bed of camera. Supports copyboard carriage assembly and lensboard carriage assembly. Mounted to camera skid assembly.

**CAMERA BACK HOUSING ASSEMBLY.** Part of darkroom end of camera. Camera back housing assembly supports vacuum back assembly and ground glass assembly.

**VACUUM BACK ASSEMBLY.** Holds film flat during exposure by suction created by drawing air through vacuum plate on vacuum back assembly.

**GROUND GLASS ASSEMBLY.** Contains a photogrid of permanently etched lines spaced at intervals of 0.1 in. (2.54 mm) and covering a 24 in. X 30 in. area. A clear 1 in. (25.4 mm) diameter circle in the center of the photogrid conforms to optical axis of camera. Photogrid can be adjusted horizontally.

**BELLOWS ASSEMBLY.** A lighttight rubberized fabric, expandable component connecting camera back housing assembly to lensboard assembly.

**LENSBOARD ASSEMBLY.** Supported by lensboard carriage base plate and side frames. Lensboard assembly houses shutter assembly, flash lamp, and lens assembly. Shutter and lens assemblies can be adjusted horizontally and vertically by two knobs located on darkroom end of camera. Lensboard assembly can be moved horizontally within a limited area.

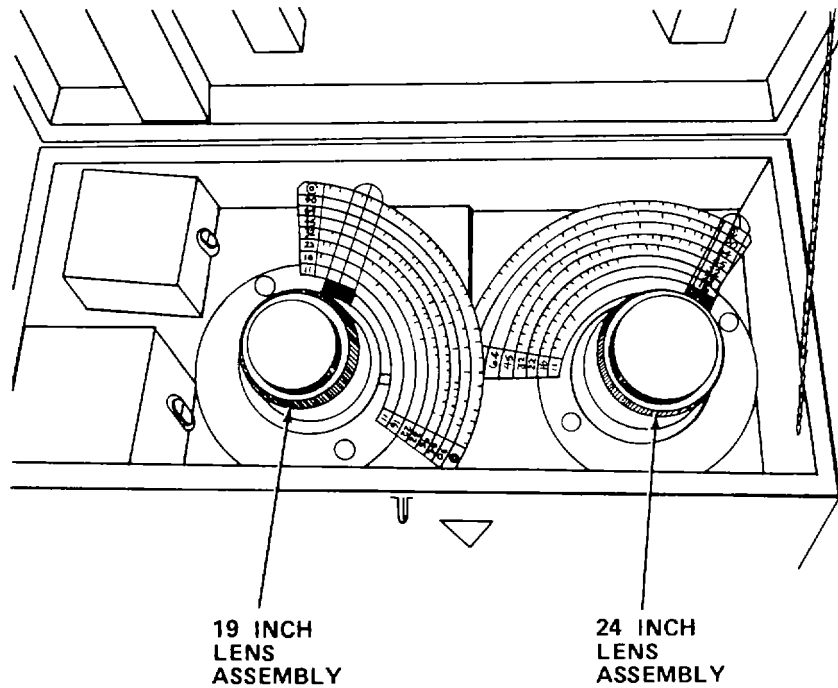
**PULSED XENON LAMPS.** Mounted on camera arm assembly in pairs. Provide uniform high intensity light to copyboard assembly.

**CAMERA ARM ASSEMBLY.** Mounted on both sides of copyboard carriage assembly. Supports pulsed xenon lamps. Each arm is adjustable to permit extending pulsed xenon lamps to working distance and angle to uniformly illuminate copyboard assembly. A cross brace is used to counterbalance the weight of each camera arm assembly.

**COPYBOARD ASSEMBLY.** Holds copy material flat and parallel to planes of lensboard and vacuum back assemblies. Copy is held flat by suction created by drawing air through holes in copyboard assembly.

**COPYBOARD CARRIAGE ASSEMBLY.** Supports the copyboard and positive holder assemblies. Copyboard carriage assembly permits positive holder and copyboard assemblies to rotate 180 degrees. Copyboard carriage can be moved horizontally within a limited area.

**POSITIVE HOLDER ASSEMBLY.** Consists of a light box assembly, inner, and outer diffusers. Top and bottom of positive holder assembly has aerial film brackets which can be used to handle roll film.



CAMERA LENS. There are two lenses used with the camera: The 24 in. (610 mm) lens assembly is equipped with a mounting plate and lenscaps. The diaphragm opening control limits the amount of light reflected to vacuum back assembly. It is the primary lens for the camera. The 19 in. and 24 in. (480 mm and 610 mm) lenses are stored in the lens box assembly when not in use.

The 19 in. (480 mm) lens assembly is equipped with an attached mounting plate and lenscaps. Diaphragm opening control is mounted on lens barrel. The 19 in. (480 mm) lens assembly is the secondary lens for the camera. The lens reflects light rays of desired image to vacuum back assembly.

**1-7 EQUIPMENT DATA.**

Power Requirements	208 V, ac 60 Hz, 3 phase, 4 wire
Dimensions	
Length	13 ft (3.96 m)
Width	4 ft (1.22 m)
Height	6 ft (1.83 m)
Net Weight	3300 lbs (1496.7 kg)

Maximum Operating Height	6 ft (1.83 m)
Lens	
Primary	24 in. (610 mm) f/9 to f/128
Secondary	19 in. (480 mm) f/9 to f/128
Maximum Size of Copyboard	36 in. X 48 in. (91.4 cm X 122 cm)
Maximum Transparency Copy Size	21 in. X 27 in. (53.3 cm X 68.6 cm)
Maximum Film/Screen Size on Vacuum Back	24 in. X 30 in. (61.0 cm X 76.2 cm)
Maximum Halftone Film Size on Vacuum Back	21 in. x 27 in. (53.3 cm x 68.6 cm)
Minimum Size on Vacuum Back	4 in. X 5 in. (10.2 cm X 12.7 cm)
19 in. (480 mm) Lens Reproduction Range	33 to 300%
24 in. (610 mm) Lens Reproduction Range	50 to 200%

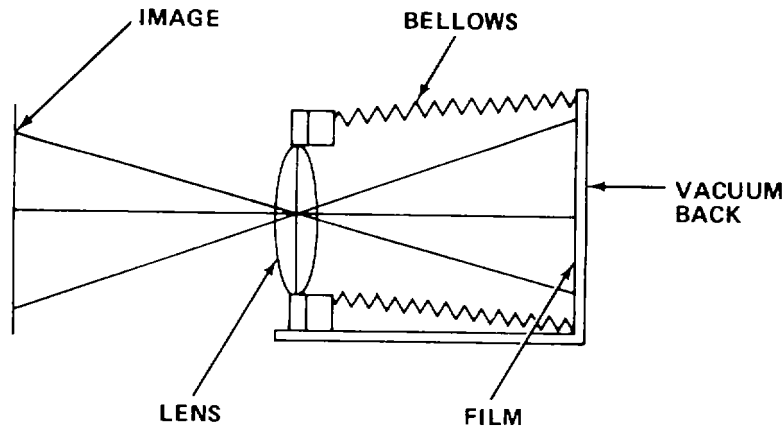
Accessory Equipment

<u>Equipment</u>	<u>Quantity</u>
Dial, Indicating, Trammel Assembly	1
Xenon Lamps	4
Hand Oiler, 1/2 pt (0.236 L.) capacity	1
Reproduction Chart, 19 in.(480 mm) Lens	3 copies
Reproduction Chart, 24 in.(610 mm) Lens	3 copies
Target	1

### Section III TECHNICAL PRINCIPLES OF OPERATION

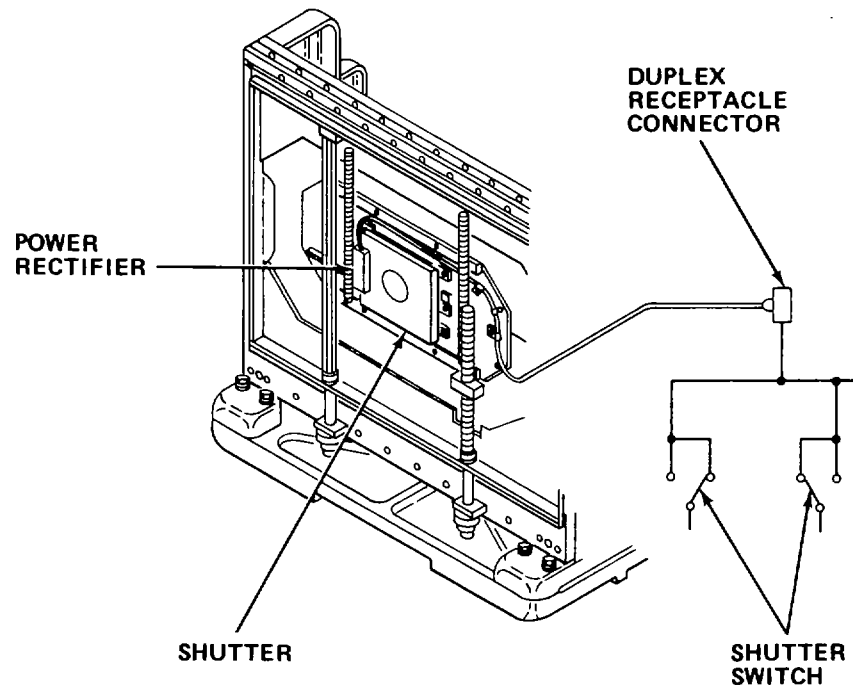
**1-8 LITHOGRAPHIC COPYING CAMERA.** The lithographic copying camera is designed to produce enlarged or reduced negatives of the copy. This is accomplished manually and electrically by changing the distance between the lensboard carriage assembly and copyboard carriage assembly. Utilizing reproduction charts provided with the camera, exact lensboard carriage and copyboard carriage distances may be set. Pulsed xenon lamps illuminate the copy on the copyboard assembly. The copy reflects light rays through the lens, exposing the film on the vacuum back assembly. The copy reflects light rays through the lens, exposing the film on the vacuum back assembly.

#### 1-8.1 Lens and Lensboard Assemblies.

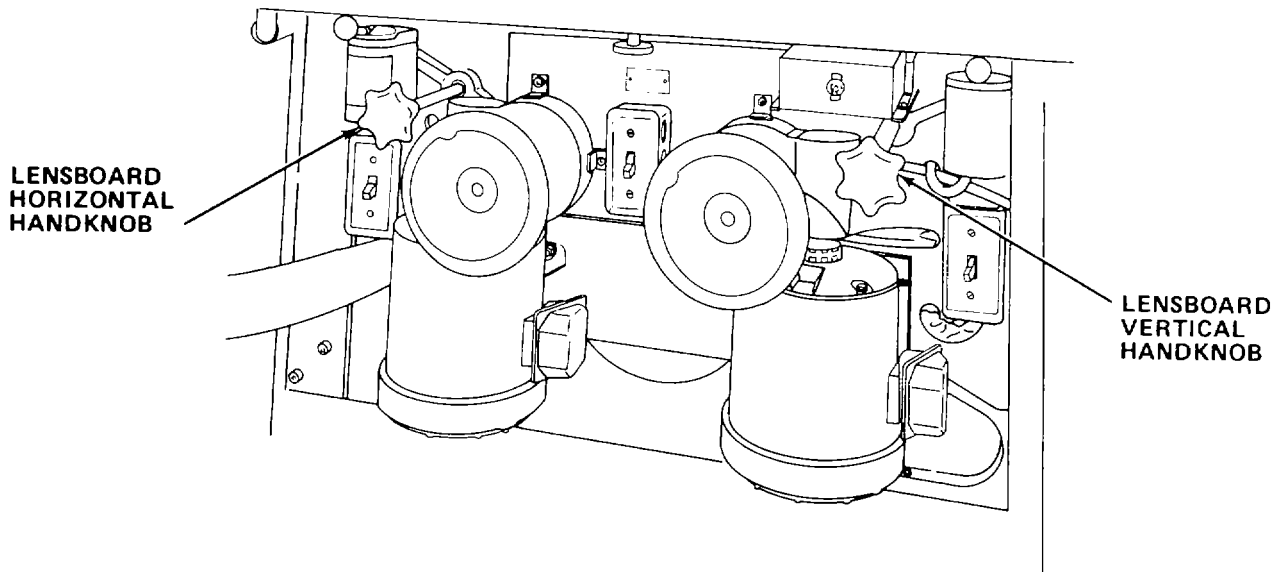


When light rays are reflected off the copy, the rays are received by the lens and projected to the film on the vacuum back as an image. The f/stop system on the lens is designed to allow the operator to control the amount of light reaching the film. The f/stops on both lenses can vary from f/9 to f/128. The bellows provides a lighttight chamber connecting the lensboard to the vacuum back.

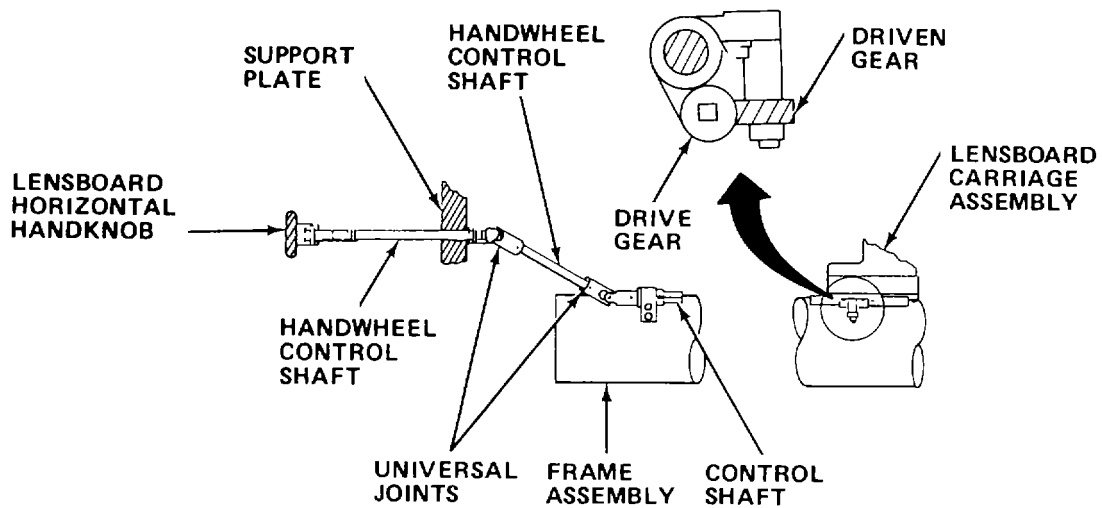
1-8.2 Shutter Assembly.



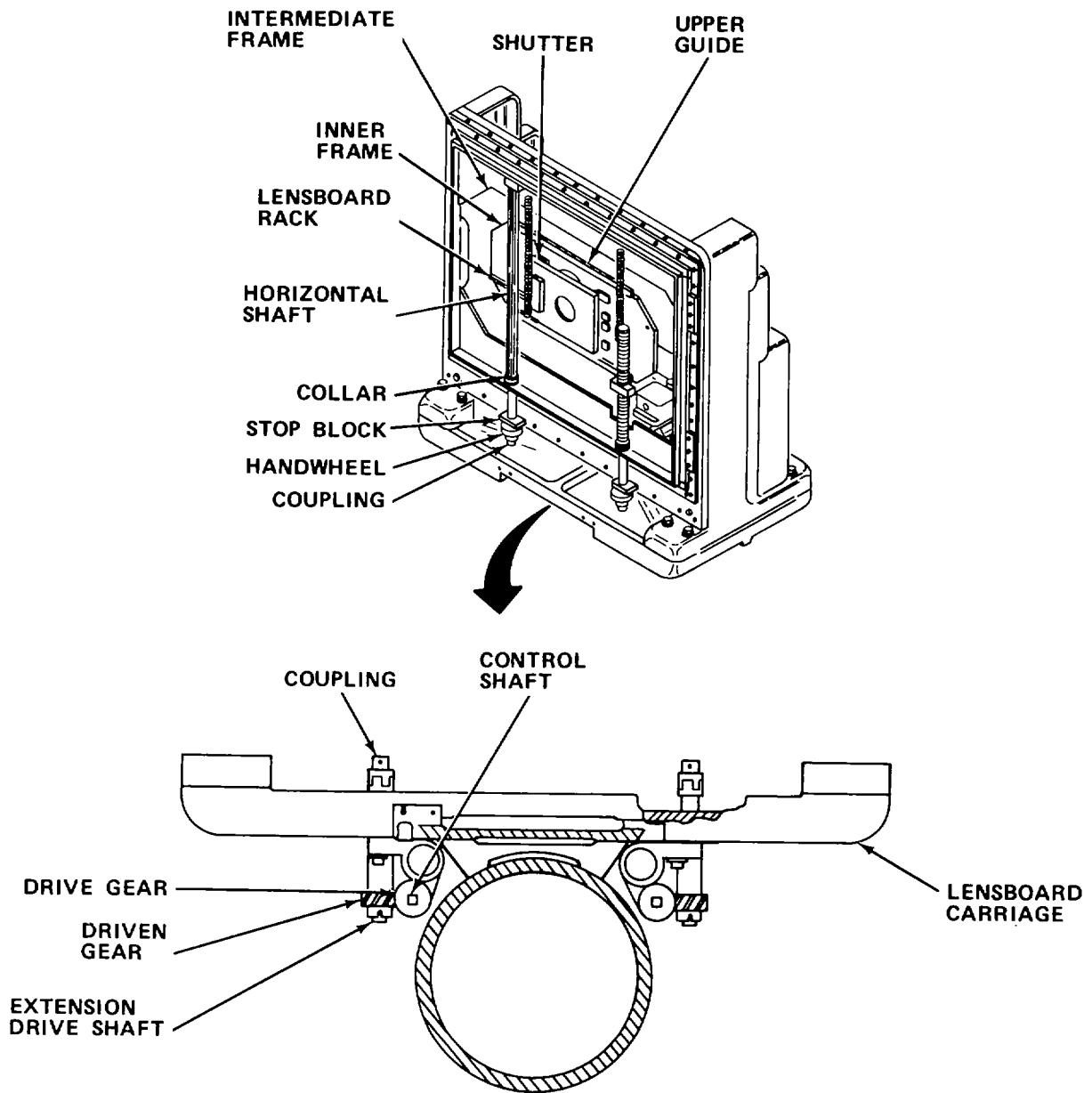
Shutter operation is controlled either by the light integrating exposure control instrument or the darkroom SHUTTER switch or lensboard SHUTTER switch. The switches are three-way toggles. This permits either switch to operate the shutter. When either switch is in the OPEN position, power is applied to the normally closed shutter via a duplex receptacle connector and a power rectifier solenoid unit. The power rectifier converts ac power into 95 125 V dc to operate the solenoid. This opens the shutter, permitting light rays from the material being copied to pass through the lens to the film on the vacuum back assembly.



Due to mission requirements, it may be necessary to move the lens vertically or horizontally for centering, positioning, or measuring the vertical or horizontal dimension of the image. The movement is accomplished through the use of the lensboard horizontal and vertical handknobs.

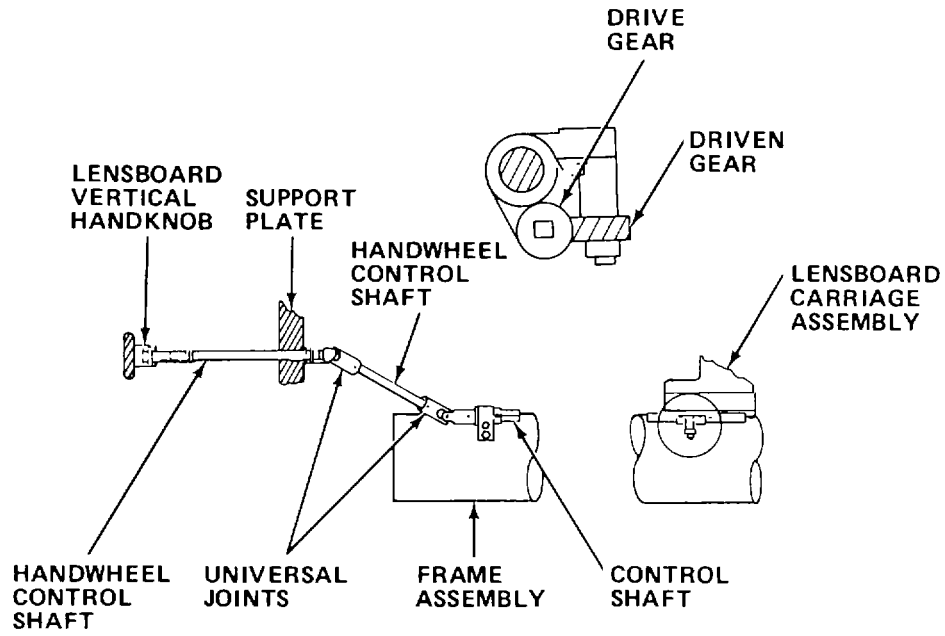


When the lensboard horizontal handknob is turned, this twisting motion is transmitted through the handwheel control shafts, universal joints, control shaft, and drive gear. The lensboard carriage driven gear is meshed with the drive gear and transmits the twisting motion to the lensboard.

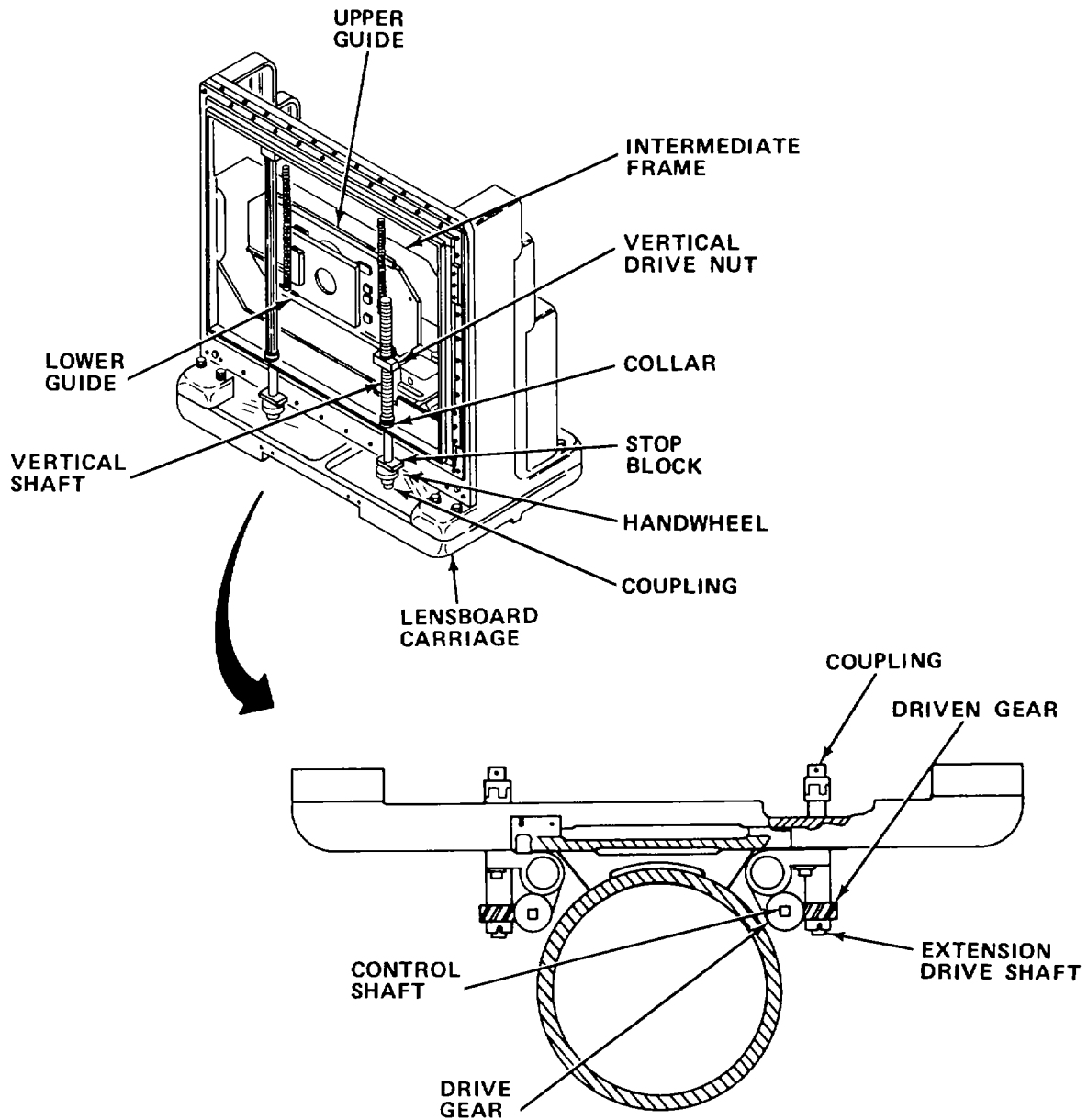


The driven gear's twisting motion is transmitted through the extension drive shaft, coupling, handwheel, and horizontal drive shaft. The horizontal drive shaft is fixed to the lensboard by the upper bearing block and stop block. The horizontal shaft is geared to the lensboard rack. The lensboard rack is connected to the inner frame. The inner frame is held in place by the upper and lower guides which are attached to the intermediate frame. The inner frame houses the lens and shutter. As the inner frame moves left or right, so do the shutter and lens. Two extension springs are attached to the lower guide and lensboard to keep the lower guide from warping or sagging, which could bind the movement of the inner frame.

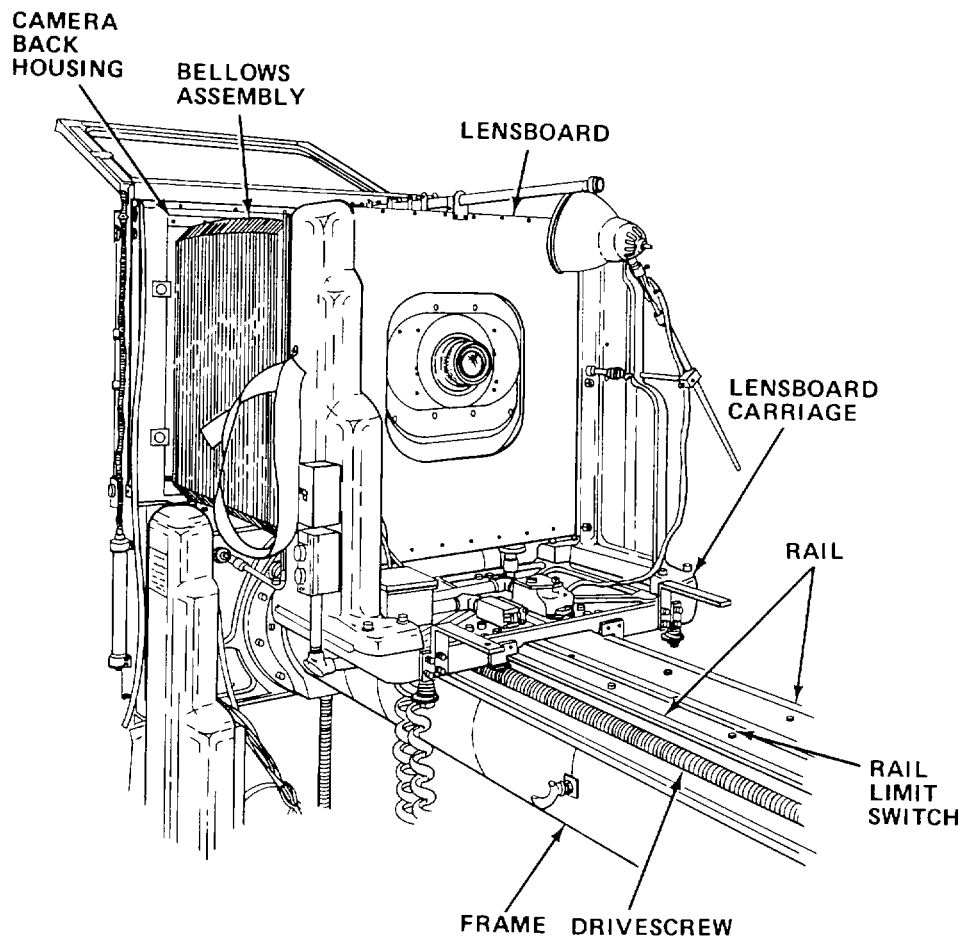




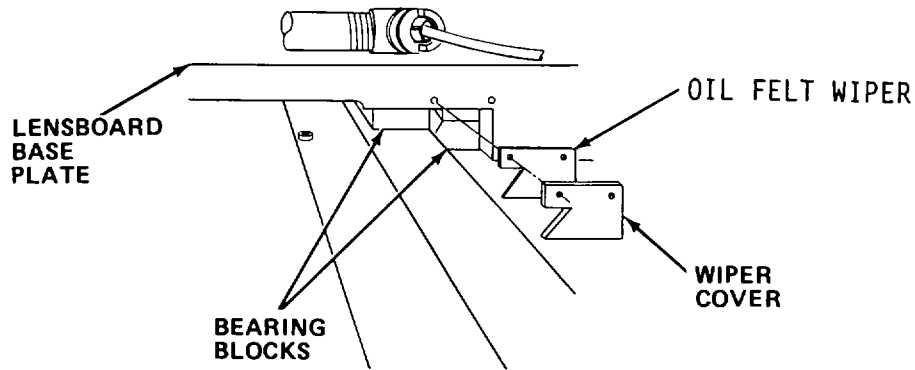
When the lensboard handknob is turned, the twisting motion is transmitted through the handwheel control shafts, universal joints, control shaft, and the drive gear. The lensboard carriage driven gear is meshed with the drive gear and transmits the twisting motion to the lensboard.



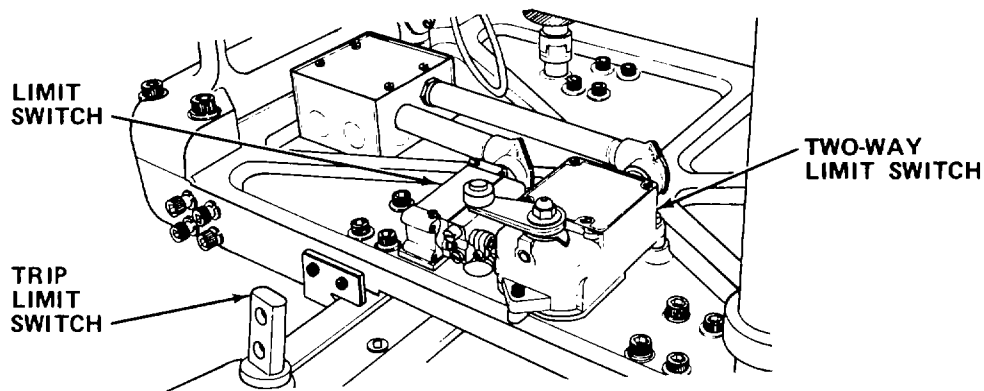
The driven gear's twisting motion is transmitted through the extension drive shaft, coupling, handwheel, and vertical drive shaft. The vertical drive shaft is held in place by the vertical drive nut and stop block. The vertical drive nut is connected to the intermediate frame. As the vertical drive shaft is threaded in or out of the vertical drive nut, this imparts vertical movement to the intermediate frame. The inner frame is held in place by upper and lower guides which are attached to the intermediate frame. As the intermediate frame moves vertically, so does the inner frame, lens, and shutter.

1-8.3 Lensboard Carriage Assembly Drive Mechanism.

The lensboard carriage assembly is supported by the frame assembly. The lensboard carriage assembly rides on the frame rails. The drivescrew moves the lensboard carriage assembly and is controlled by a handwheel at the darkroom end of the camera. The bellows assembly is attached to the lensboard and camera back housing assembly; the bellows assembly will either extend or retract, depending on the direction the lensboard carriage assembly moves. The movement of the lensboard carriage assembly changes the image distance and contributes to the overall reproduction ratio.

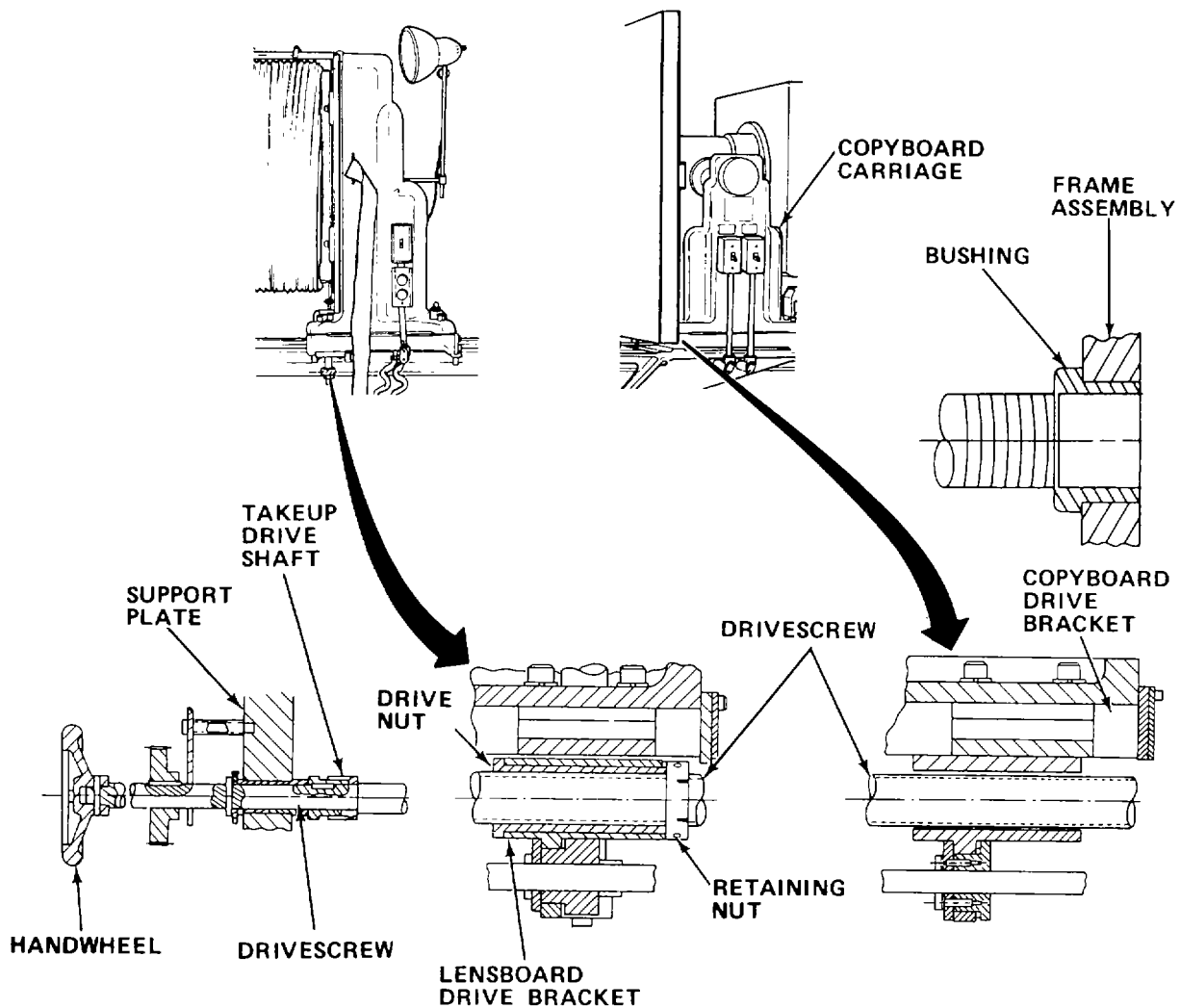


The lensboard base carriage assembly rides on bearing blocks. The bearing blocks are mounted in pairs at each end of the lensboard base plate. The bearing blocks are mounted with provisions to take up wear and to be sure that the carriage slides smoothly on the rails. Four oil felt wipers are installed on the carriage to lubricate the rails in both directions of travel.

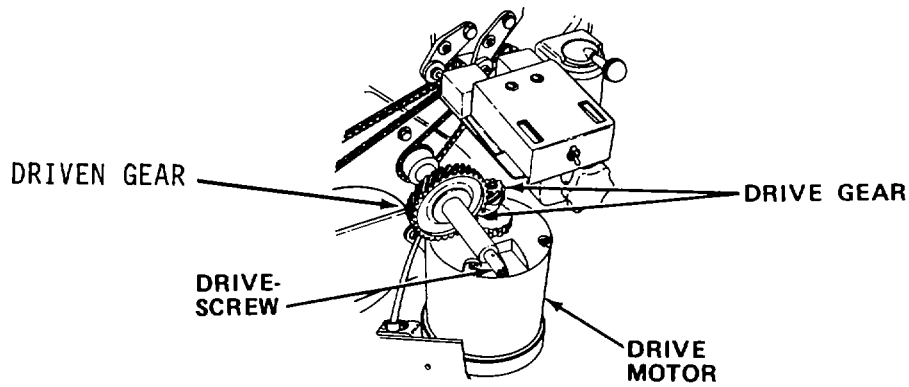


The lensboard carriage has two switches; namely, a two way limit switch and a limit switch. The limit switch roller rides on the frame rail. As long as contact is maintained between the limit switch roller and frame rail, the lensboard can be moved electrically. When the limit switch roller no longer maintains contact with the frame rail, the lensboard carriage can only be moved mechanically. This normally occurs when the bellows is being retracted.

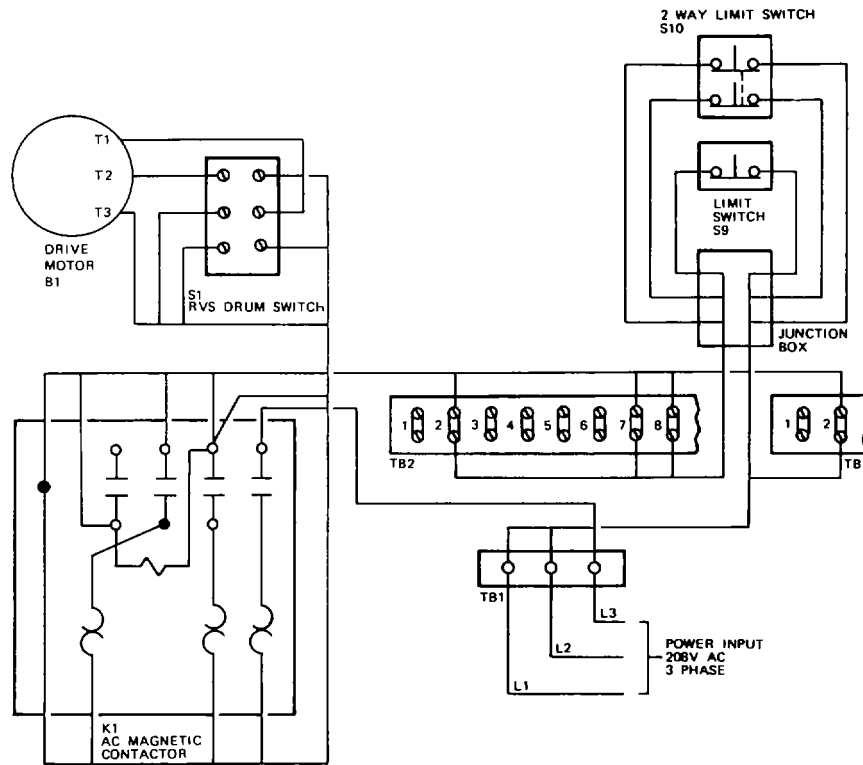
The two-way limit switch serves to prevent the lensboard carriage from hitting the copyboard carriage and causing optical misalignment. The cross brace has a limit switch trip mounted to it. As the distance between the lensboard and copyboard decreases, the limit switch trip makes contact with the two-way limit switch. The arm on the two-way limit switch moves toward the lensboard. When the two-way limit switch opens, the drive motor stops. The lensboard can still be moved mechanically.



The mechanical movement of the lensboard is obtained by turning the handwheel. The handwheel is pinned to the handwheel extension. The handwheel extension is pinned to the drivescrew. The drivescrew passes through the support plate, lensboard drive bracket, and the copyboard drive bracket, and is held in place by a bushing in the frame assembly. As the drivescrew turns, it is threaded in or out of the drive bracket and retaining nuts. Since the drive nut is fixed to the lensboard drive bracket, the lensboard carriage is moved in or out. The copyboard carriage does not move because there is no drive nut in the copyboard drive bracket.

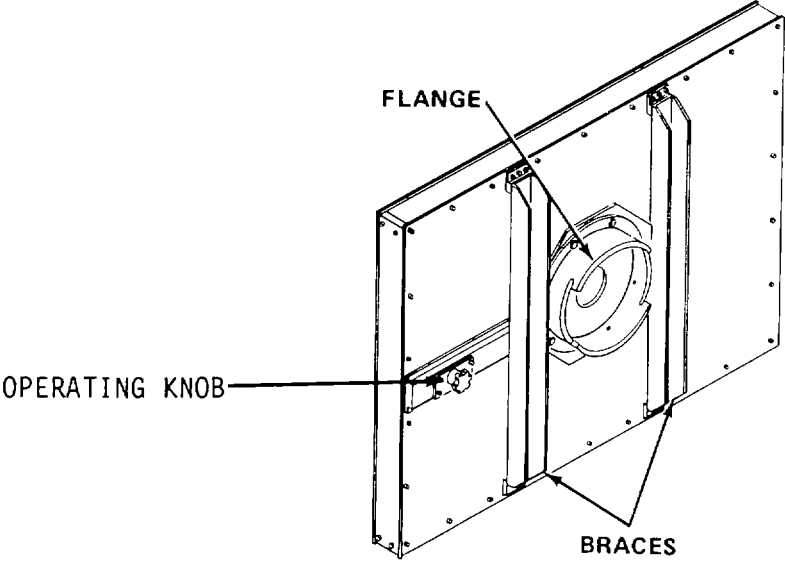


The lensboard can be moved electrically by using a drive motor. The drive gear is connected to the drive motor shaft. The drive gear meshes with a driven gear on the drivescrew.

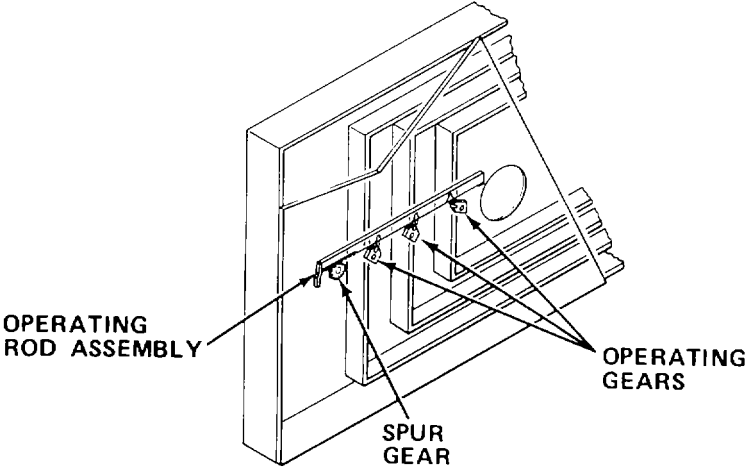


When primary power is applied to power input connector, it is fed to S9, S10, TB2, ac magnetic contactor, and reversing drum switch. When the drum switch is set to FWD or REV, the drive motor energizes. The drive motor will continue to run until the drum switch is released to the OFF position or one of the limit switches opens.

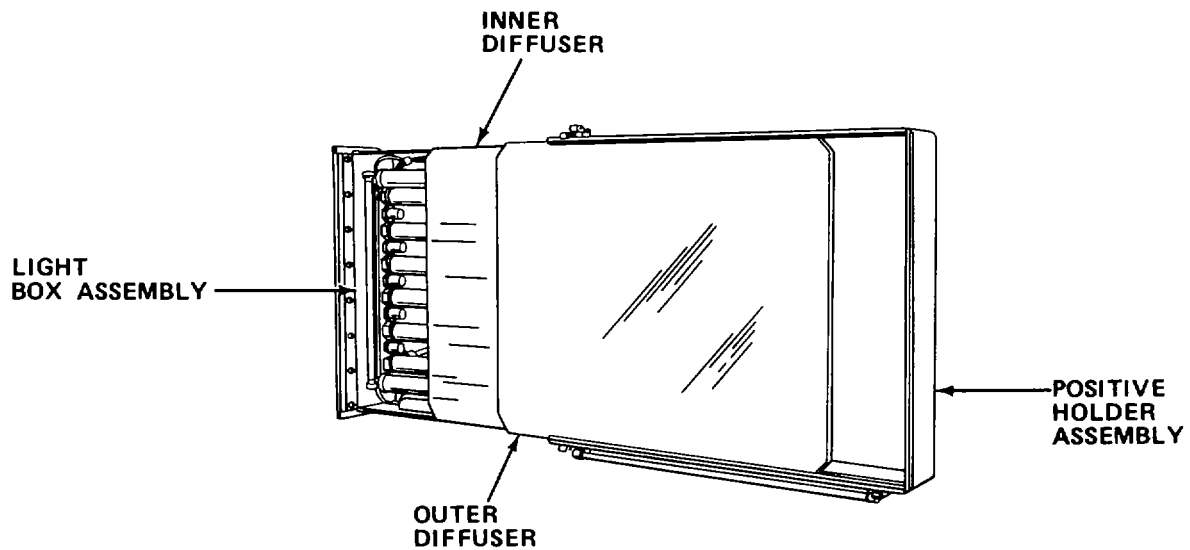
1-8.4 Copyboard Assembly.



The camera copyboard is made of aluminum alloy to reduce weight and aid its mobility. Two braces are mounted to the rear of the copyboard to increase strength. A flange connects the copyboard to the copyboard carriage. The front plate is perforated with tiny holes. A blower provides suction to hold the copy or film in place.

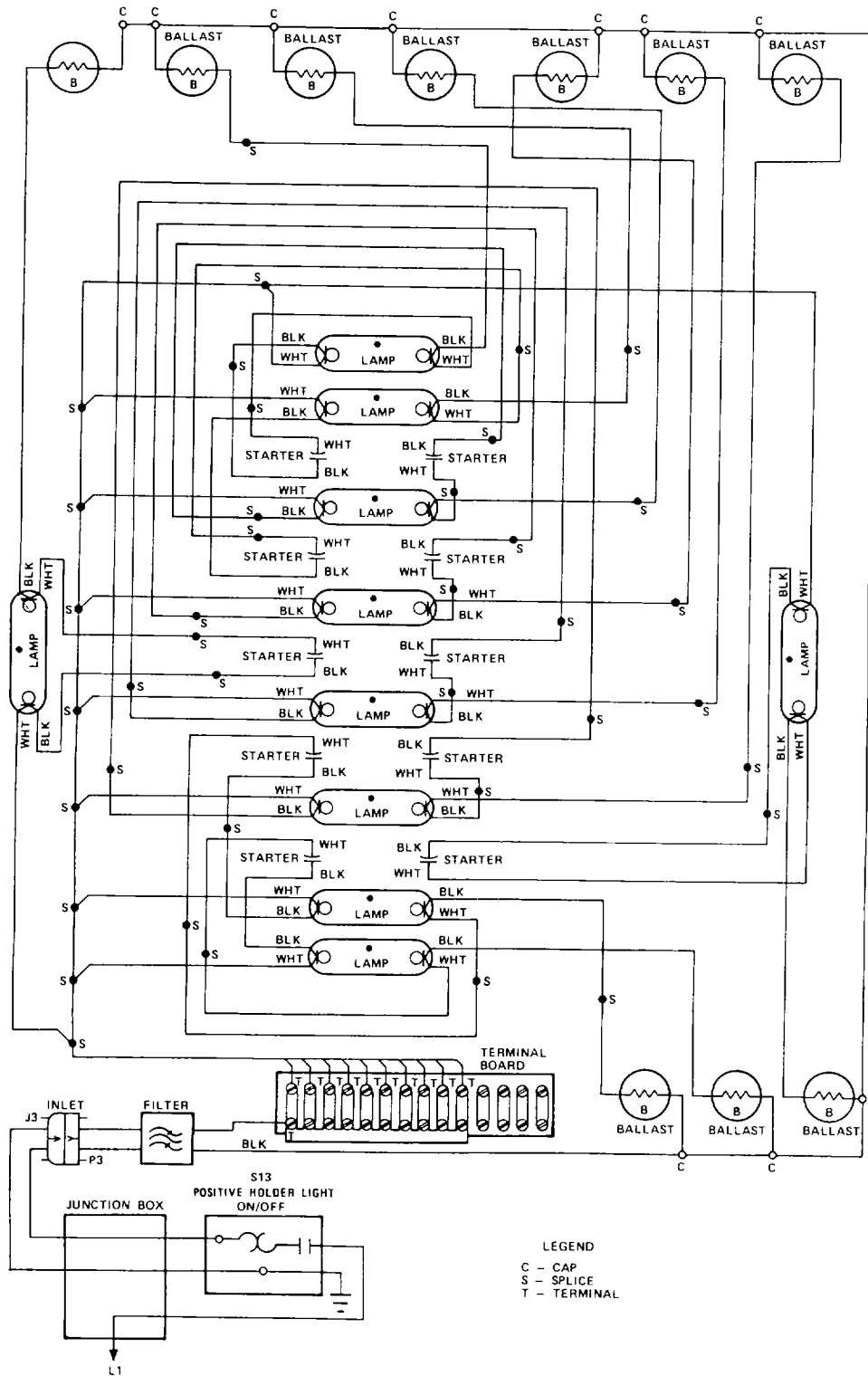


The area of suction is controlled by the operating knob. The knob operates a spur gear and operating rod and gear assembly which opens and closes operating gates. When the gates are closed, the copyboard is divided into four sealed compartments. The innermost compartment receives suction at all times. When the operating knob is rotated, it opens the next compartment. As each operating gate is opened, the previously opened operating gate remains open, increasing the suction area.

1-8.5 Positive Holder Assembly.

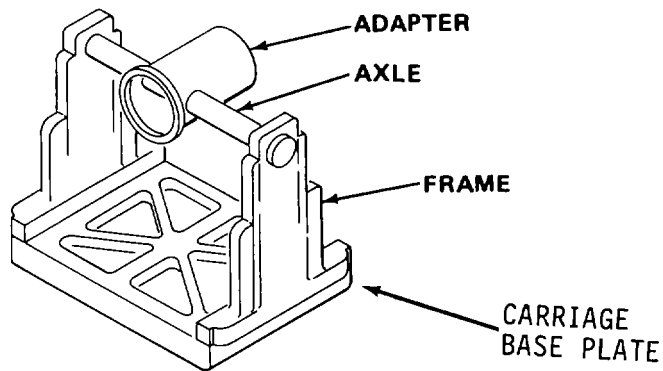
The positive holder assembly consists of a light box assembly and inner and outer diffusers. The positive holder is bolted to the axle and adapter of the copyboard carriage assembly to ensure that its front surface is an equal distance from the axis of rotation and parallel to the copyboard. The light box assembly is mounted inside the positive holder assembly and contains fluorescent lamps to supply necessary lighting for copying transparencies. Aerial film brackets are mounted on the top and bottom of the positive holder. They are used to roll aerial film over the outer diffuser.



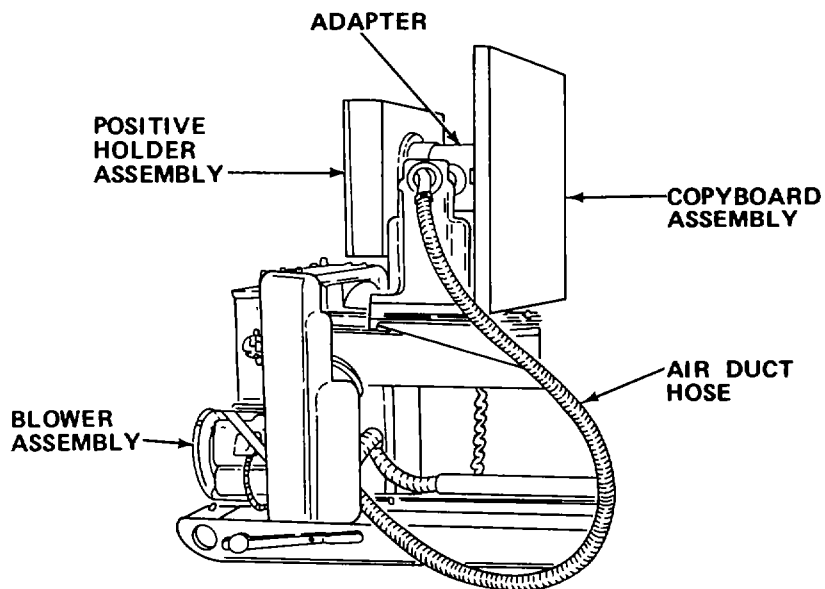


When the POSITIVE HOLDER LIGHT switch (S13) is set ON, 110 V ac is applied to the light box through P3 and J3, lighting the fluorescent lamps.

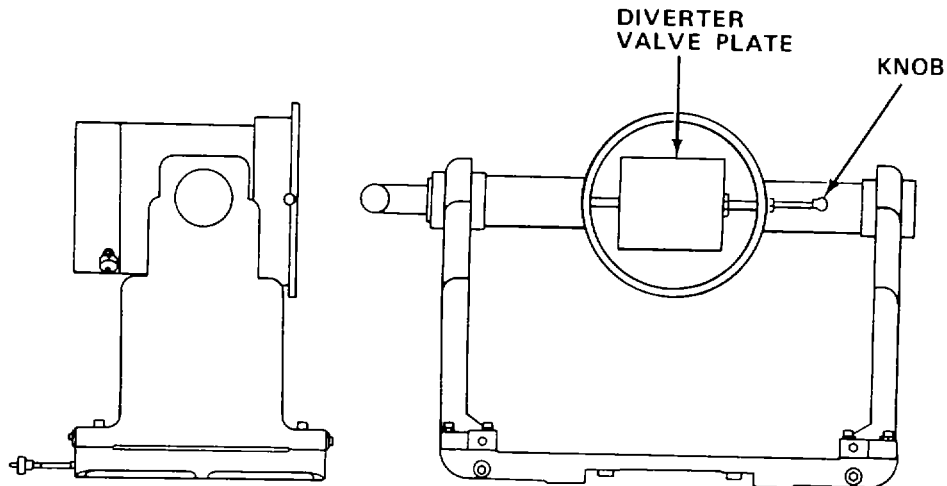
1-8.6 Copyboard Carriage Assembly.



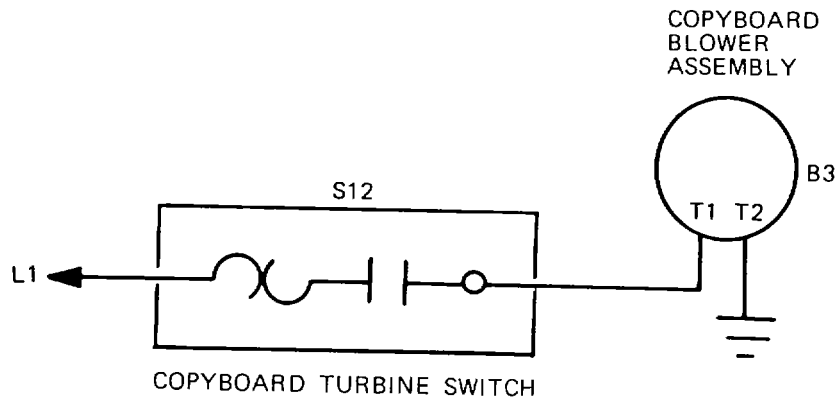
The copyboard carriage assembly consists primarily of the axle and adapter, copyboard frames, and carriage base plate. The copyboard and positive holder assemblies are secured to the axle and adapter. This permits rotations of 180 degrees for the copyboard and positive holder assemblies. The axle and adapter are supported by side frames and are able to rotate freely between them. The frames are bolted to the carriage base plate.



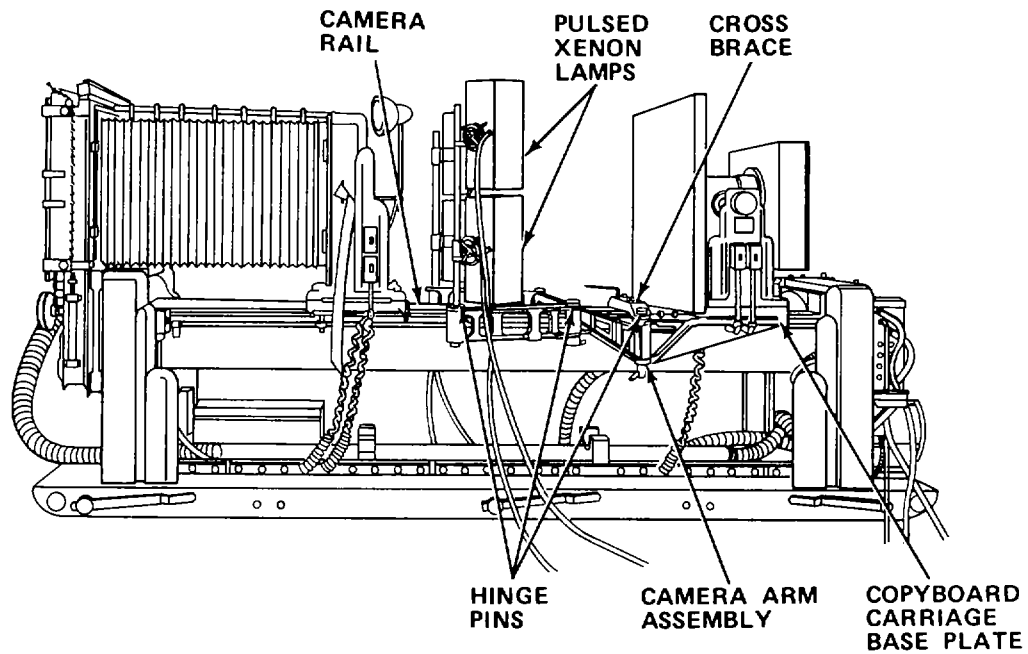
Suction for the copyboard assembly or positive holder assembly is supplied by a blower assembly, via the adapter, swivel flanged elbow, and air duct hose.



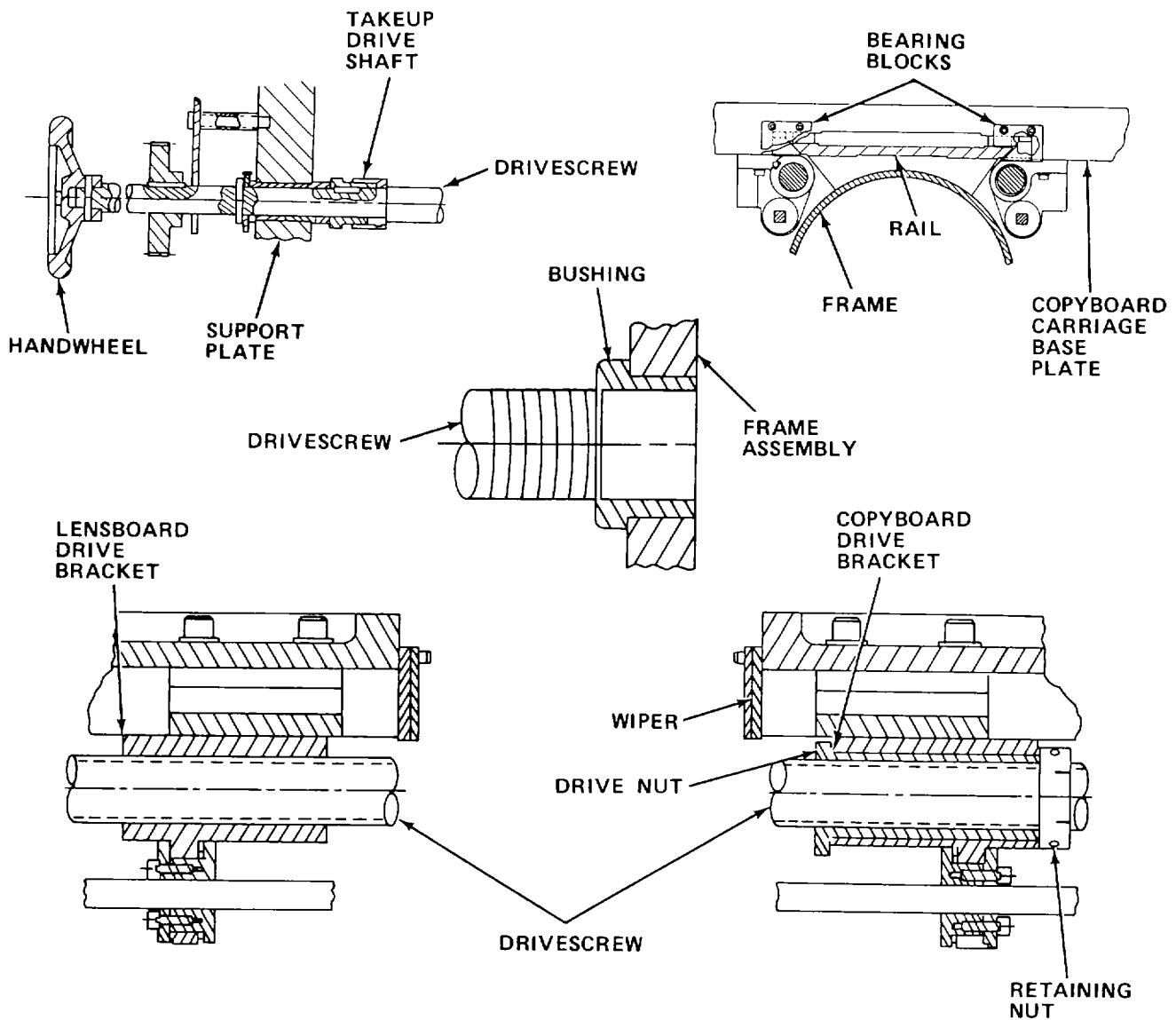
A diverter valve located in the adapter diverts suction to the positive holder assembly or copyboard assembly. Pushing the knob in provides suction to the copyboard assembly.



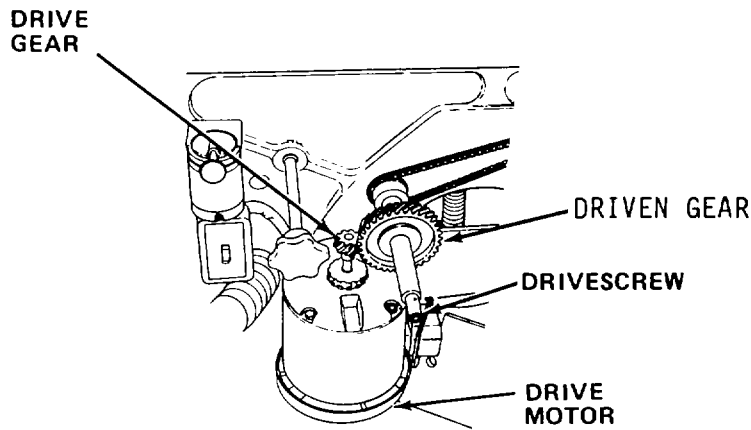
The copyboard blower is energized by 110 V ac being applied when copyboard turbine switch S12 is set to START. The blower has an automatic thermal overload protector. This removes power from the blower when the temperature exceeds 248 + 9°F (120 + 5°C). The thermal overload protector resets automatically when the temperature drops below 248°F (120 °C).



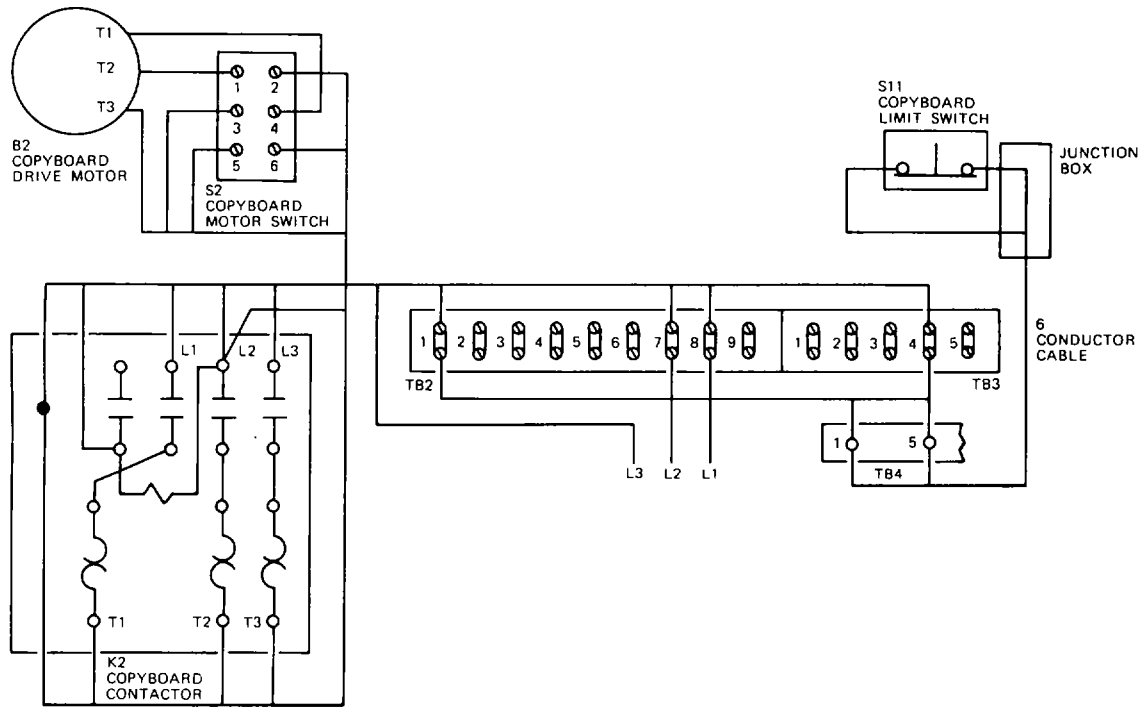
The camera arm assemblies are used to support the pulsed xenon lamps. The arm assemblies consist mainly of hinged arm brackets that allow the pulsed xenon lamps to be moved to the transport or operating positions. The arm brackets are also attached to the copyboard carriage base plate. A cross brace with internal rollers rides on the camera rail and offsets the weight of the camera arm assemblies and pulsed xenon lamps.



The mechanical movement of the copyboard carriage is accomplished by turning the handwheel. The handwheel is pinned to the handwheel extension. The handwheel extension is pinned to the drivescrew. The drivescrew passes through the support plate, lensboard drive bracket, copyboard drive bracket, and is held in place by a bushing in the frame. As the drivescrew turns, it is threaded in the copyboard drive bracket's drive and retaining nuts. This causes the copyboard's distance to increase or decrease from the vacuum back, but does not move the lensboard. The cross brace and camera arm assemblies are bolted to the copyboard carriage base plate; the cross brace and camera arm assemblies move with the copyboard carriage as one unit. The copyboard carriage rides on bearing blocks. The bearing blocks are mounted in pairs at each end of the base plate. The bearing blocks are mounted with provisions to take up wear and to be sure the carriage slides smoothly on the rails. Four oil felt wipers are installed on the carriage to lubricate the rails in both directions of travel.

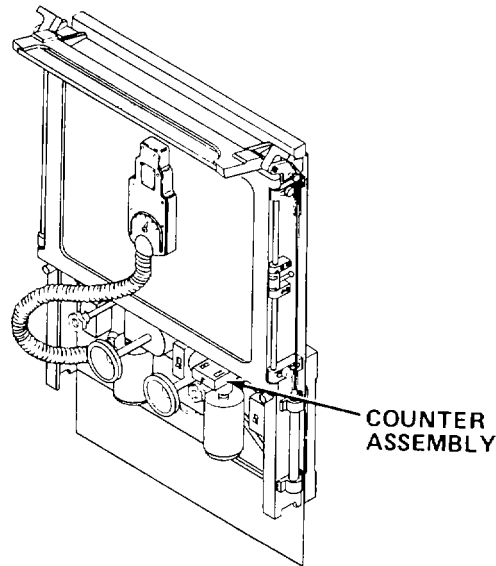


The copyboard carriage assembly can be moved electrically by using a drive motor. The drive gear is connected to the drive motor's shaft. The drive gear meshes with a driven gear on the drivescrew.

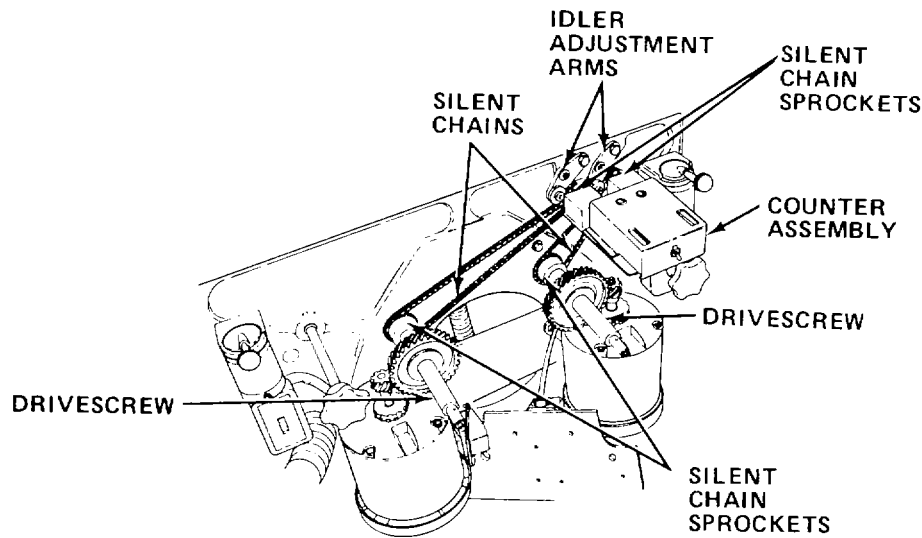


Primary power is applied to TB2, TB3, TB4, S11, K2, and the reversing drum switch (S2). When S2 is set to FWD or REV, the drive motor is energized. If limit switch (S11) roller no longer makes contact with the frame rail, S11 opens and the drive motor deenergizes. This normally occurs when the copyboard is moving rearward. To reset S11, the copyboard must be moved toward the lensboard mechanically. The movement of the copyboard changes the object distance to the lens. Changing object distance and image distance changes the reproduction ratio.

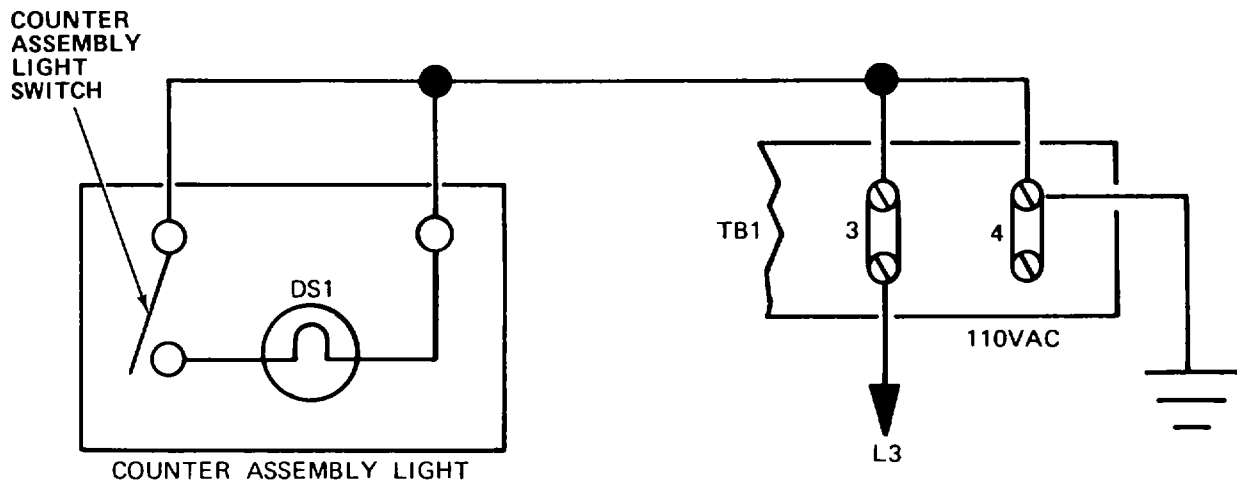
1-8.7 Counter Assembly.



The counter assembly provides copyboard and lensboard distance readings. The readings are in inches and hundredths of an inch. The counters provide readings to accurately position the lensboard and copyboard for the required reproduction ratios.

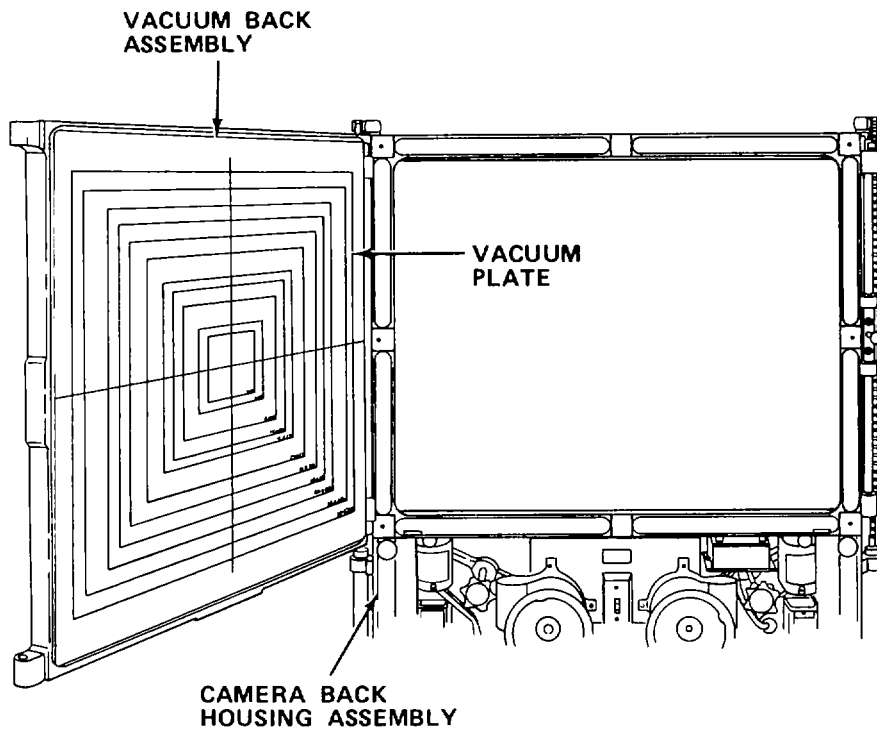


The copyboard and lensboard counters receive their inputs from the drivescrews via silent chain sprockets, silent chains, and sprockets connected to their respective counter. As each drivescrew is turned, the counter displays the distance. The silent chains use idler adjustment arms to maintain chain tension. This compensates for stretching of the chains.



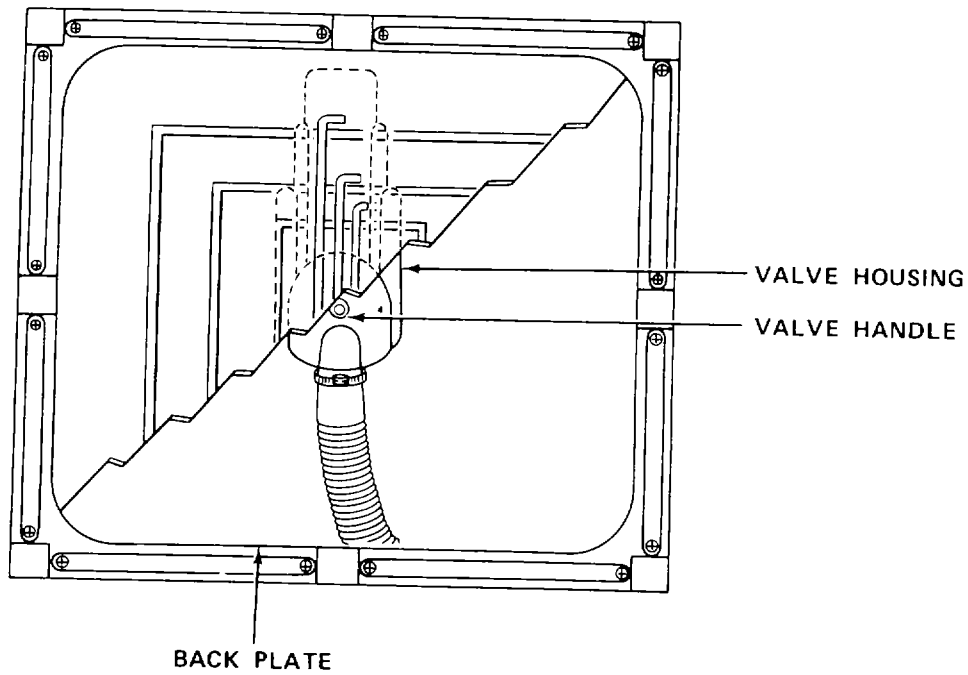
The counter assembly uses a neon lamp to provide illumination in the dark. When ON/OFF switch (S6) is set ON, power is provided to the neon lamp DS1.

1-8.8 Vacuum Back Assembly.

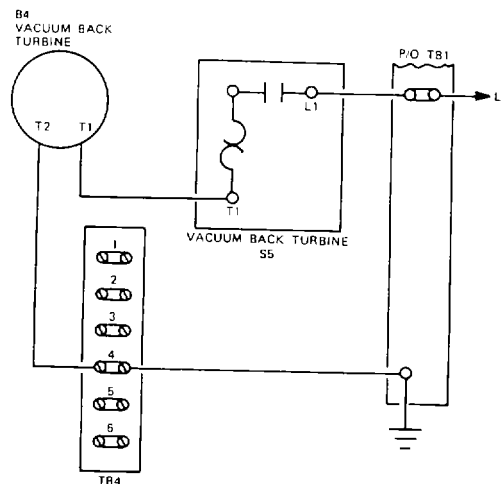


The vacuum back assembly is hinged to the camera back housing assembly. It consists of a door with a vacuum plate on the inside and a back plate on the outside. The back plate has a valve housing with a valve handle. An air duct hose is connected to the valve housing and blower. The blower provides suction to hold the film against the vacuum plate. When the vacuum back assembly is closed, it is locked by the vacuum back locking assembly.

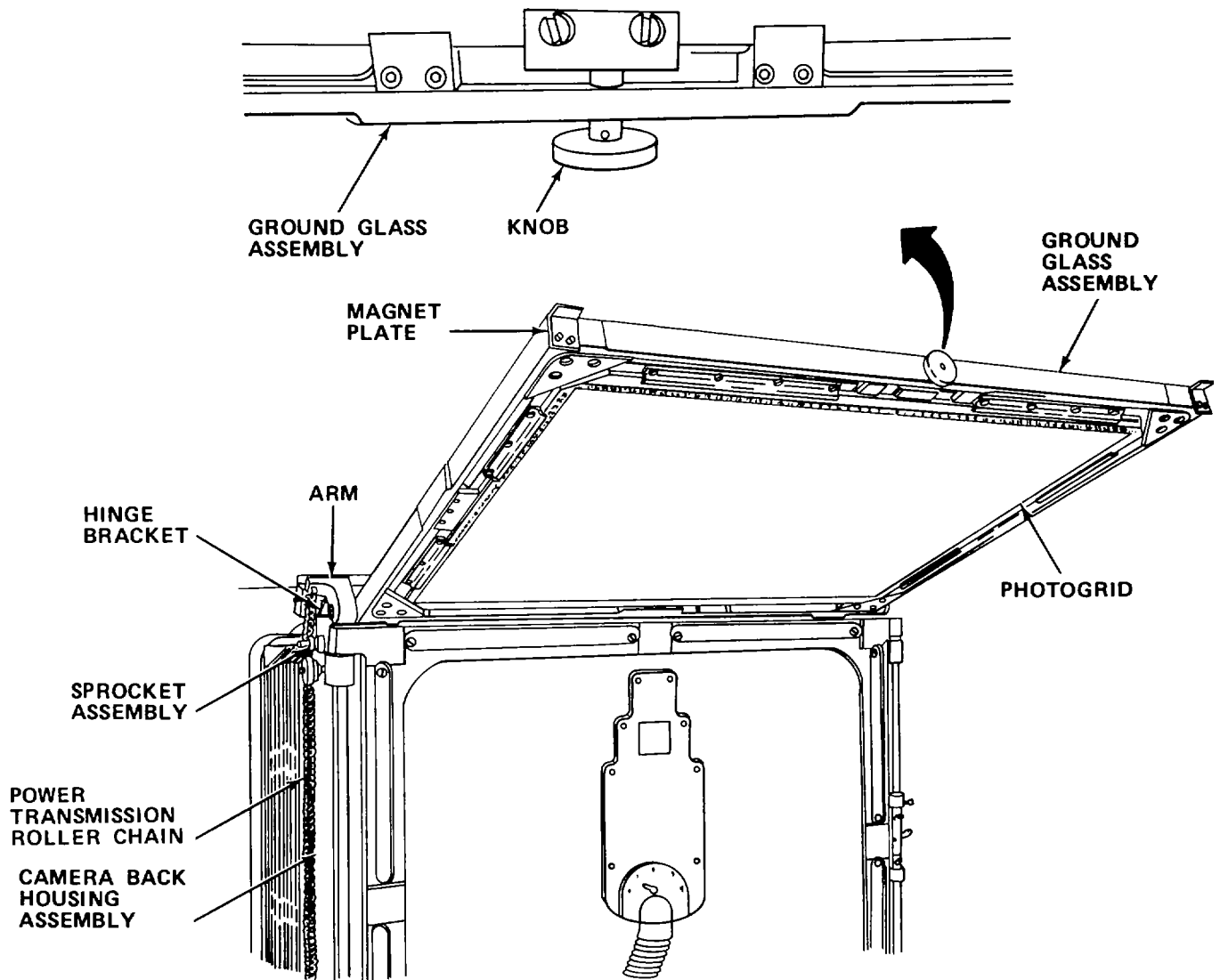




Suction is routed to the vacuum plate by the position of the valve handle. If the valve handle is set to 24 X 30, the valve rotor rotates, allowing suction over the complete vacuum plate. If the valve handle is set to 20 X 24, the valve rotor blocks the inlet for the 24 X 30 size. When the valve handle is set to the CLOSED position, the valve rotor blocks all suction openings.

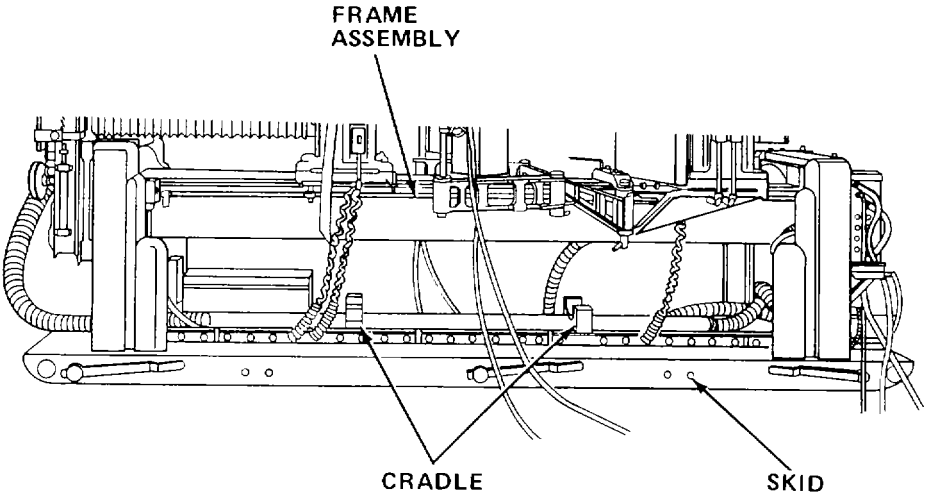


Suction is supplied to the vacuum back assembly through an air duct hose connected to the vacuum back blower. When the vacuum back blower switch S5 is closed, the blower is energized. The blower's automatic thermal overload protection is set to open at 248 + 9°F (120 + 5°C). This deenergizes the blower and automatically resets if the temperature drops below 248°F (120°C).

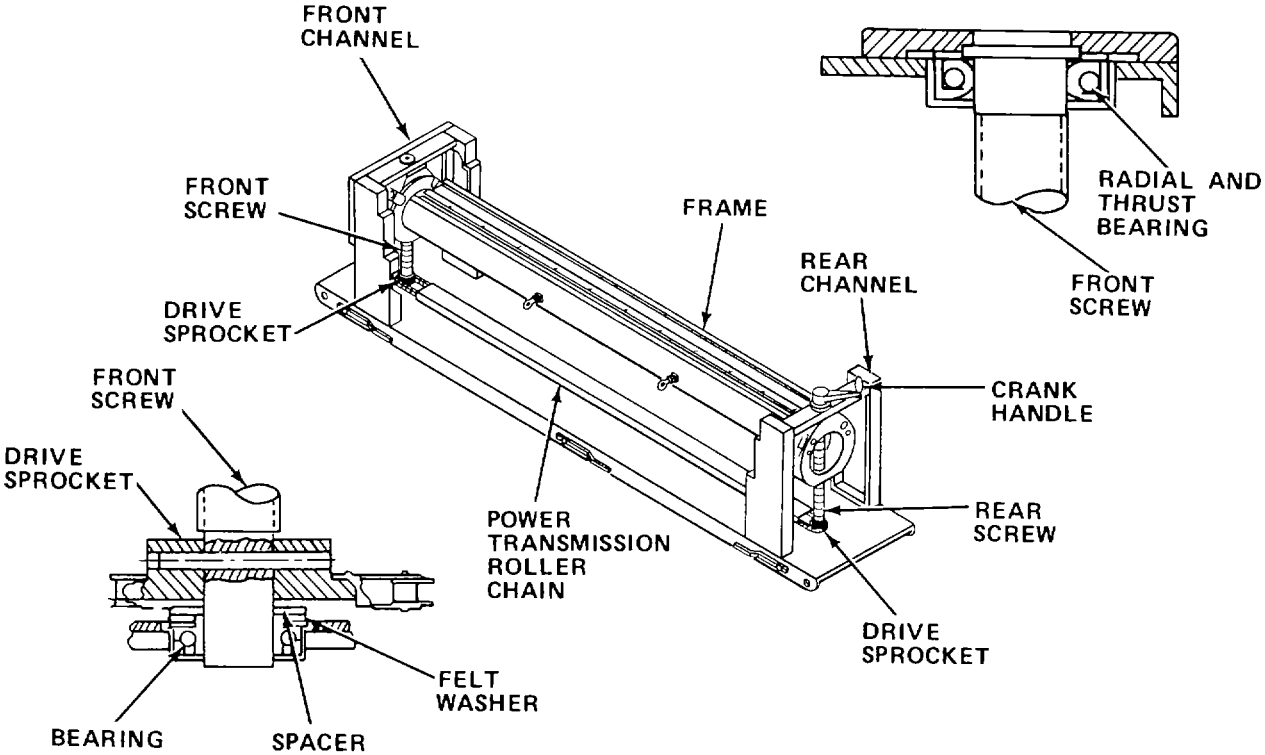
1-8.9 Ground Glass Assembly.

The ground glass assembly is connected by two hinge brackets to the camera back housing assembly. It is raised and lowered by two sprocket assemblies and power transmission roller chains connected to two arms and shafts. When the ground glass assembly is lowered, it is held in place by two magnetic plates attached to the ground glass assembly and two magnetic latches attached to the camera back housing assembly. The ground glass assembly contains a photogrid. The photogrid is 24 X 30 in (61.0 cm X 76.2 cm) and has lines etched every 0.1 in. (2.54 mm). At 0.5 in. (12.7 mm) intervals, the lines are numbered 1-30 in length and 1-24 in width. A 1 in. (25.4 mm) diameter circle is in the center of the photogrid. The ground glass assembly is used to check the optical accuracy of the camera, focus the camera visually, and check the focus of the camera when using reproduction charts. A knob on the ground glass assembly allows the photogrid to be moved horizontally to check alignment.

1-8.10 Camera Height Control.

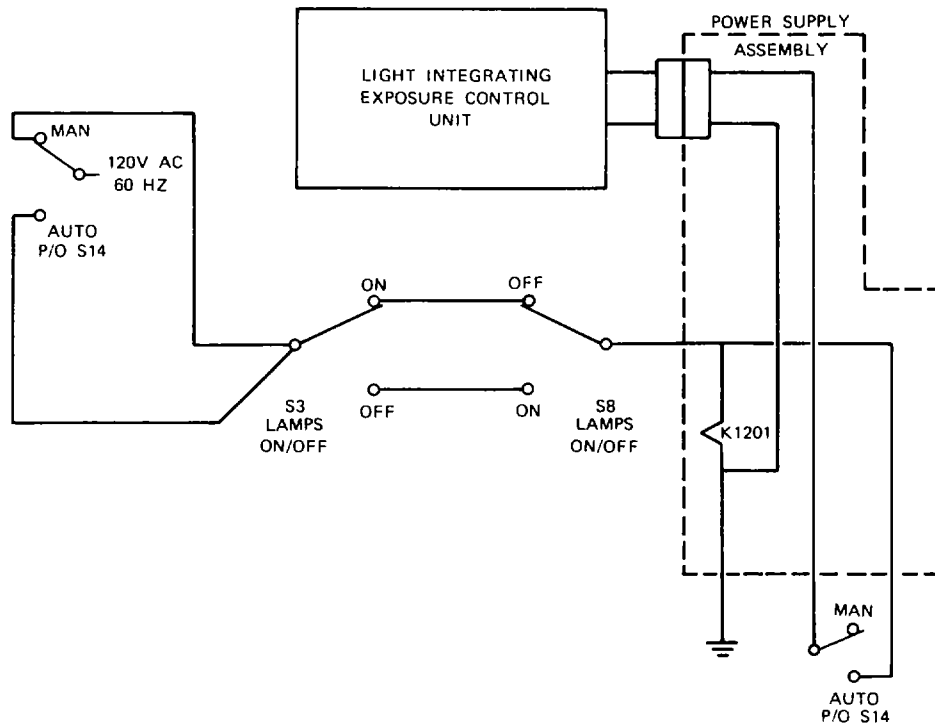


The camera must be raised to the operating position and lowered to the transport position. This is accomplished by controlling the height of the frame with respect to the skid.

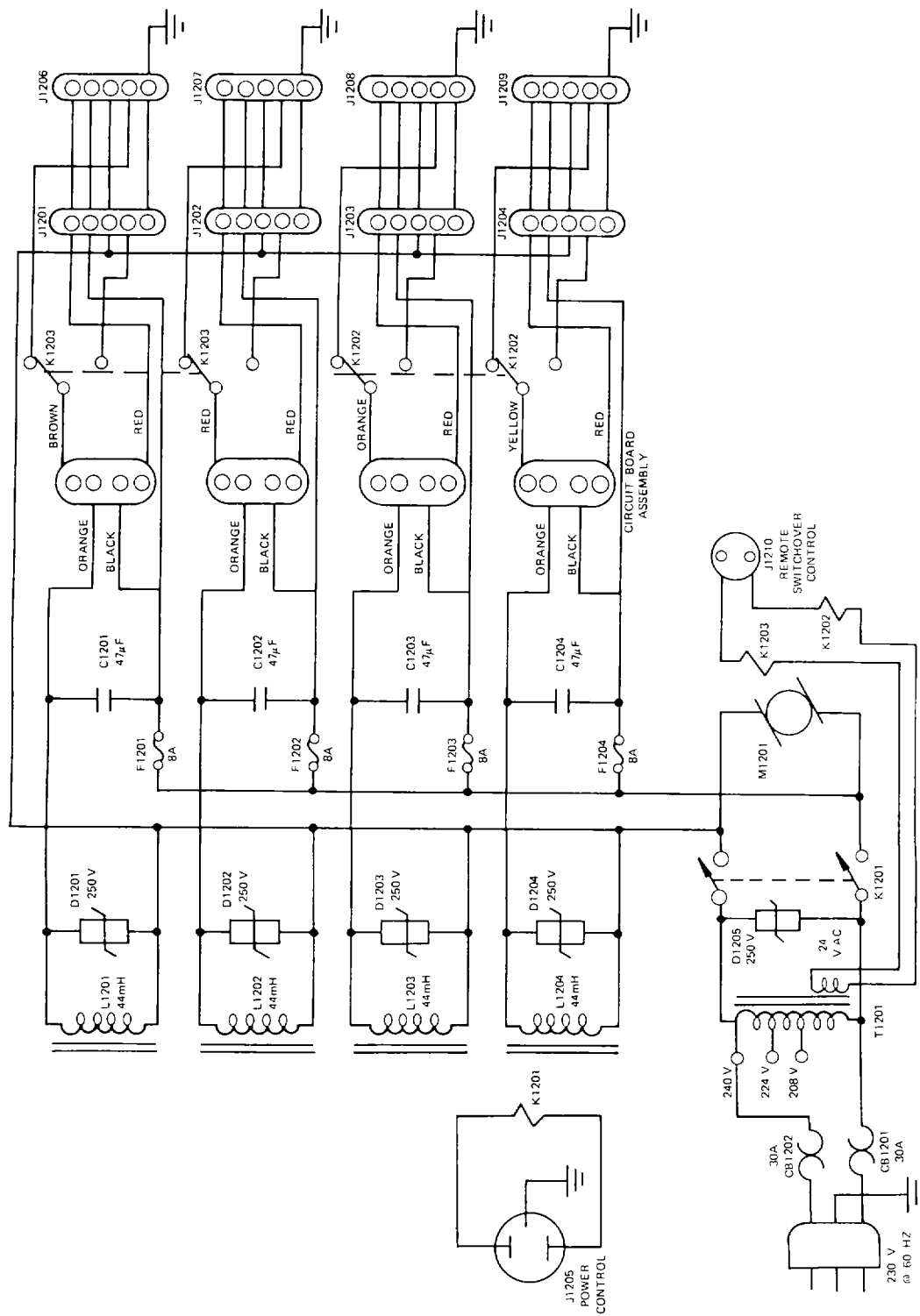


Camera height is controlled by turning the front and rear screws. Each screw passes through a radial and thrust bearing, frame, drive sprocket, felt washer, spacer, bearing, and skid. The drive sprockets are connected by a power transmission roller chain. When the crank handle is turning, the rear screw is threaded in or out of the frame. This movement rotates the front and rear drive sprockets, keeping both ends of the frame at the same height. This prevents uneven height and twisting of the frame, maintaining optical alignment of the camera.

1-8.11 Pulsed Xenon Lamps and Power Supply Assembly.



When the AUTO/MAN switch is placed in MAN, 110 V ac is applied to the LAMPS ON and OFF three-way toggle switch S3. Placing either LAMPS ON and OFF switches S3 or S8 ON energizes the power supply assembly relay K1201. If the AUTO/MAN switch is set to AUTO, the power supply assembly relay K1201 is energized by the light integrating exposure control unit.



The power supply assembly consists of four independent and identical power supplies. Each power supply output is fed to a 1.5 kW pulsed xenon lamp. After K1201 is energized, 230 V ac is fed to four identical filter networks consisting of L1201 thru L1204 and C1201 thru C1204. Overvoltage protection is provided by 250 V zener diodes D1201 thru D1205. Overcurrent protection consists of 8 amp fuses F1201 thru F1204 and two 30 amp circuit breakers CB1201 and CB1202. Fan M1201 provides cooling.

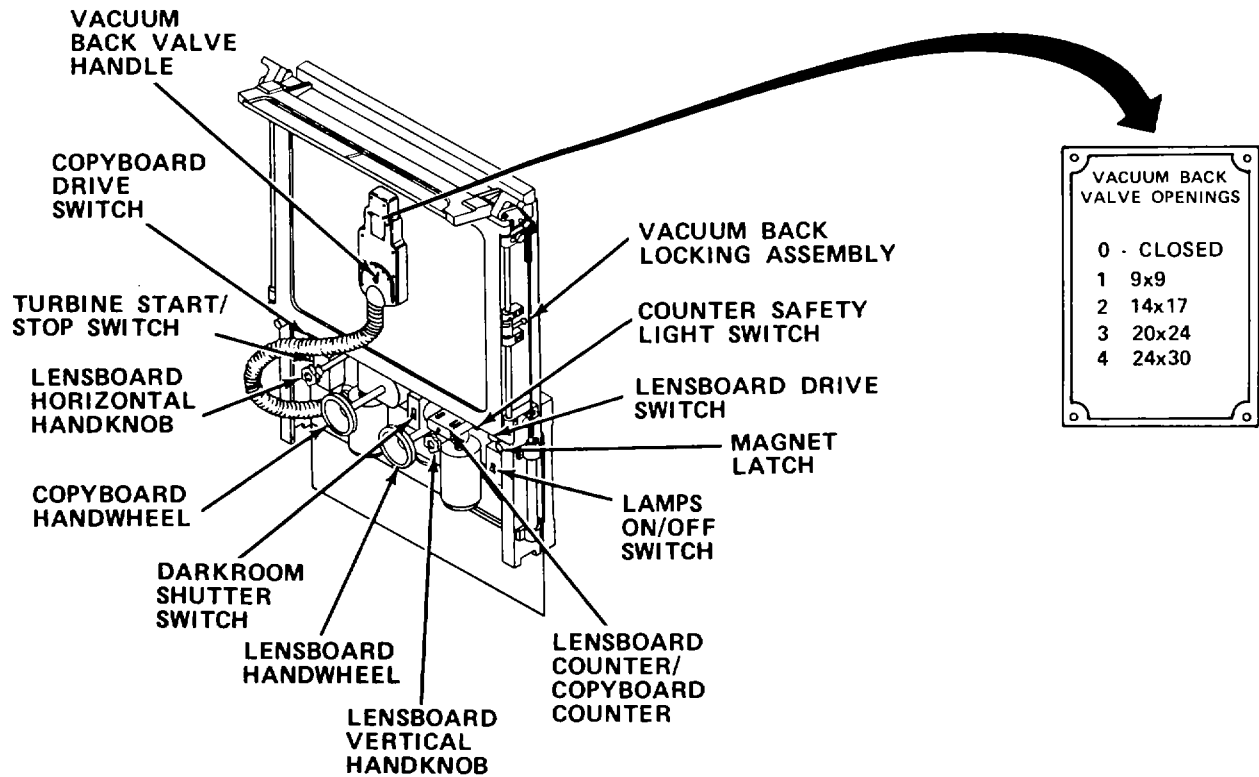
The ac input is applied to circuit board assembly J1 and J4. Q3 and Q2 provide trigger pulses for Q1 and Q4. Q1's output is limited to 130 V by D4. R1 is factory adjusted to ensure Q1 and Q4 outputs remain constant. Q1's output is fed to pulsed xenon lamp pulse transformer T1201 via C1201, R1201, safety interlock S1201, J1204, relay K1202 and J3. Q4's output is fed to pulsed xenon lamp flash tube via J1204 and J2. The lamp housing is cooled by a fan motor. Over temperature protection is provided by F1202, which will open if temperature exceeds 1450F (630C). F1201 provides overcurrent protection.

Refer to Power Supply Assembly FO-1.

**1-33/(1-34 blank)**

CHAPTER 2 OPERATING INSTRUCTIONS

Section I DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS



2-1 CONTROL OR INDICATOR.

Vacuum Back Locking Assembly

Magnet Latches

Counter Safety Light Switch

Lensboard Vertical Handknob

FUNCTION

Locks vacuum back in place.

Hold ground glass assembly to camera back housing assembly during operation.

ON-OFF switch. Provides light for reading lens and copy counters in darkroom conditions.

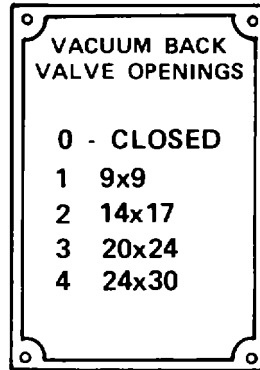
Controls the vertical movement of the lens on the lensboard. This moves the photographic image on the ground glass as required for centering, positioning, or measuring the vertical dimension of the image.

LENSBOARD DRIVE Switch	Labeled FWD, REV, and OFF. Operates lensboard assembly through drive motor. The switch has a spring loaded lever that returns to OFF when released.
LAMPS ON and OFF Switch	Controls pulsed xenon lamps from darkroom end of camera.
Lensboard Handwheel	Provides fine or final adjustment of lensboard assembly by moving lensboard assembly in or out from ground glass assembly after an approximation has been made with LENSBOARD DRIVE switch.
Darkroom Shutter Switch	Three-way toggle switch labeled SHUTTER, OPEN, and CLOSED. Controls shutter operation from darkroom end of camera.
Copyboard Handwheel	Provides fine or final adjustment of copyboard by moving copyboard in or out from ground glass assembly after an approximation has been made with COPYBOARD DRIVE switch.
Lensboard Horizontal Handknob	Controls the horizontal movement of the lens assembly on the lensboard assembly. This movement shifts the photographic image on the ground glass horizontally, as required for centering, measurement, or positioning of the horizontal dimension of the image.
TURBINE START and STOP switch	Controls the operation of the blower which provides vacuum to the vacuum back assembly.



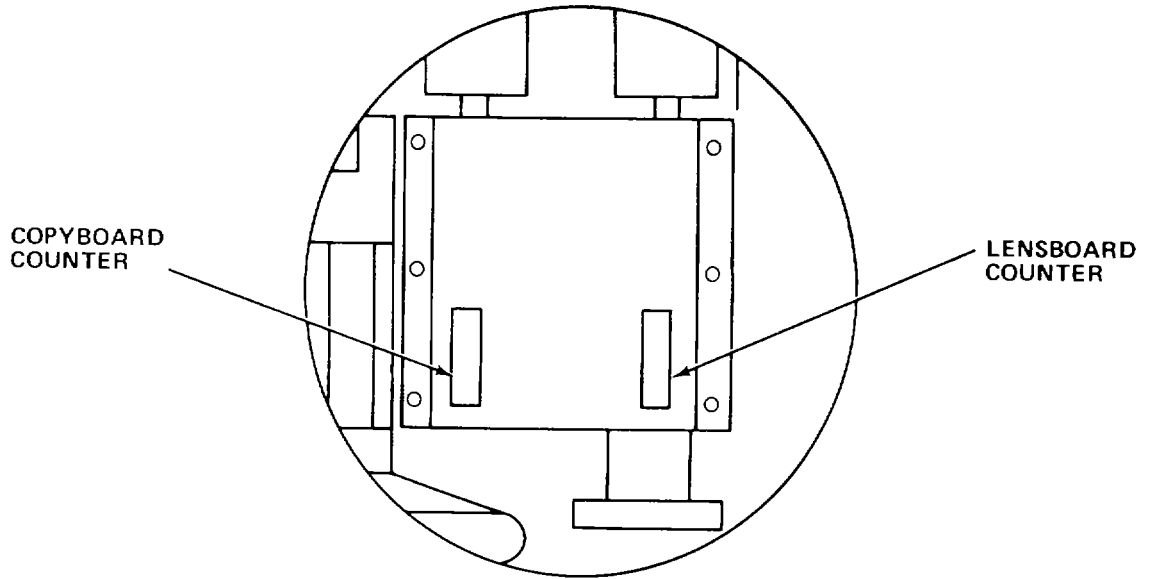
COPYBOARD DRIVE Switch

Operates the copyboard through a drive motor. The switch is labeled FWD, REV, and OFF and has a spring loaded lever that returns to OFF when released.



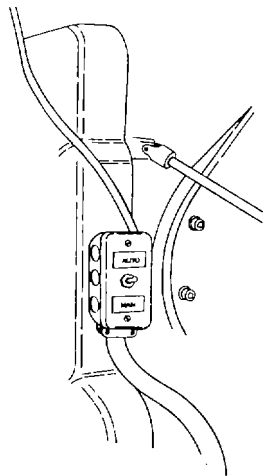
Vacuum Back Valve Handle

Regulates the air intake through the vacuum back assembly controlling the area on the suction plate for various film and screen sizes. A plate lists the various vacuum sizes.



Lensboard Counter/Copyboard Counter

Provides lensboard/copyboard distance reading from plane of ground glass. This accurately positions lensboard assembly and copyboard assembly to provide the required reproduction ratio and focus.

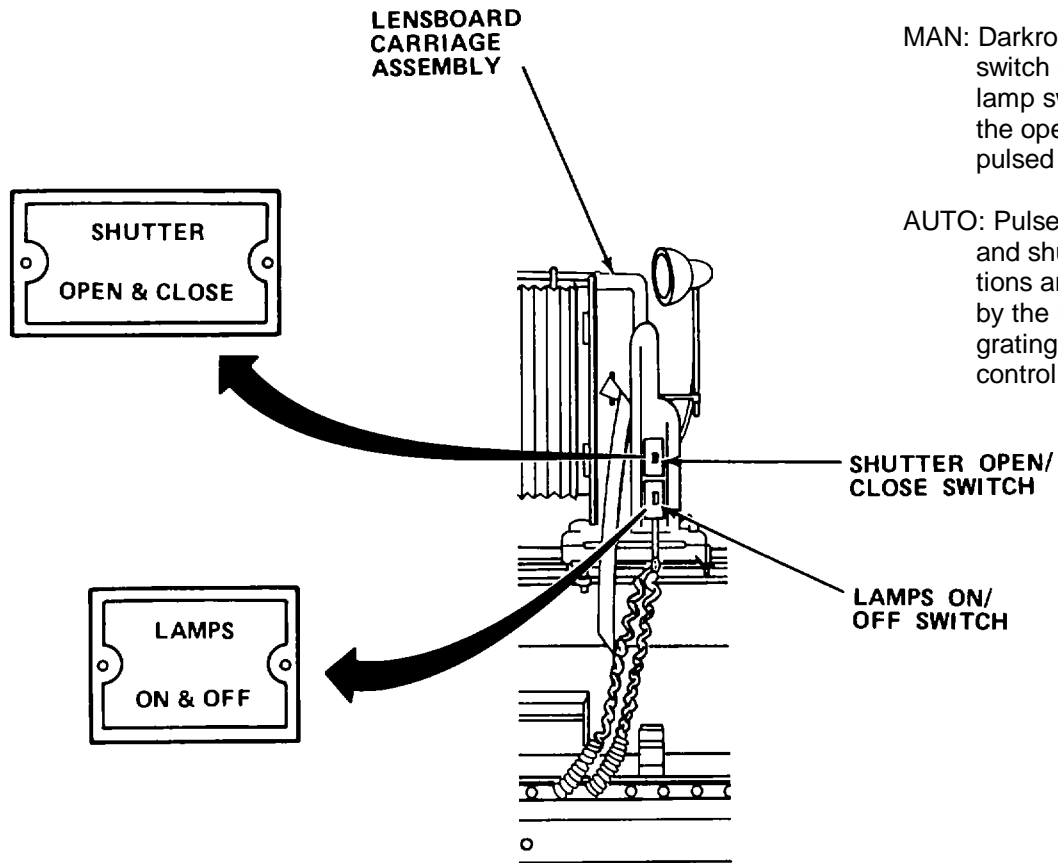


AUTO/MAN Toggle Switch

There are two modes of operation:

MAN: Darkroom lamp switch or lensboard lamp switch controls the operation of pulsed xenon lamps.

AUTO: Pulsed xenon lamps and shutter operations are controlled by the light integrating exposure control unit.

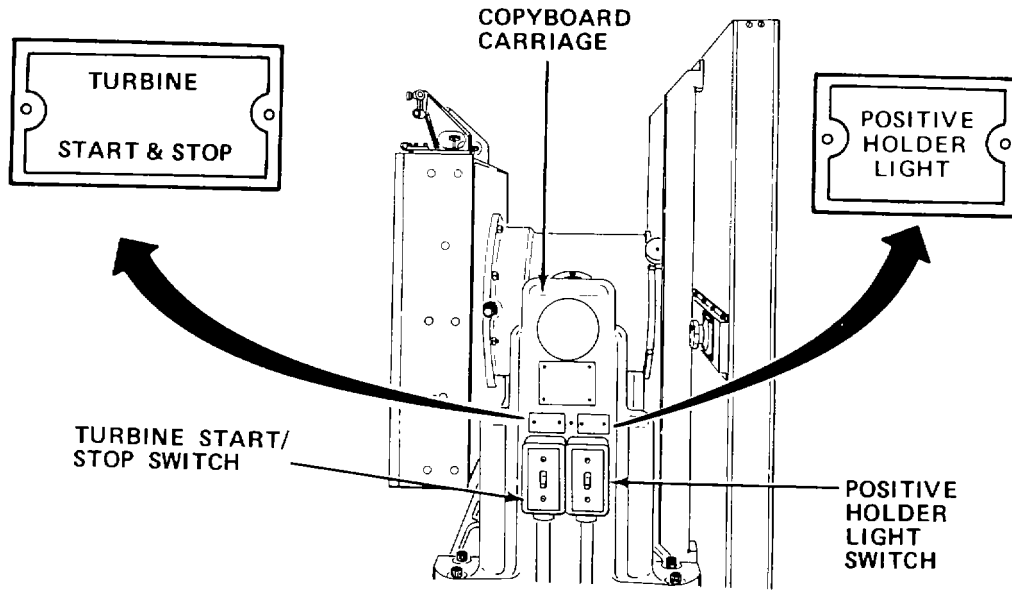


SHUTTER OPEN and CLOSE Switch

Three-way toggle switch mounted on lensboard carriage. Controls shutter operation from lensboard carriage assembly.

LAMPS ON and OFF Switch

A three-way toggle switch that permits control of the pulsed xenon lamps from the lensboard carriage assembly.

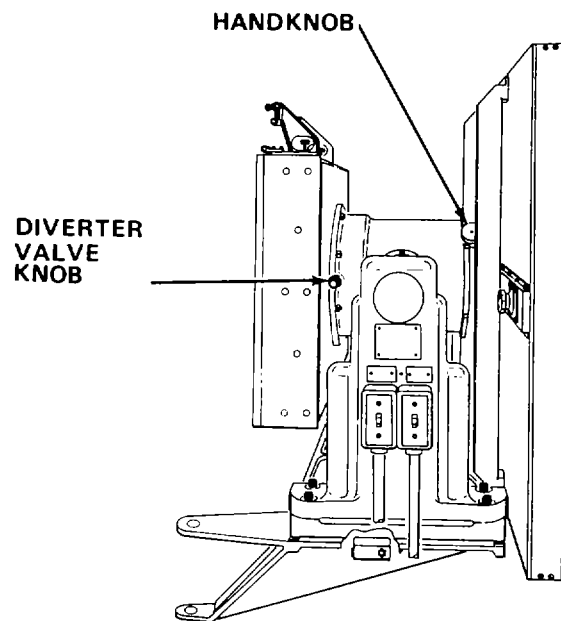


POSITIVE HOLDER LIGHT Switch

Labeled ON-OFF. Mounted on copyboard carriage assembly. Controls power to fluorescent lamps illuminating positive holder assembly.

TURBINE START and STOP Switch

Controls operation of the blower. Provides vacuum to the copyboard assembly or positive holder assembly.

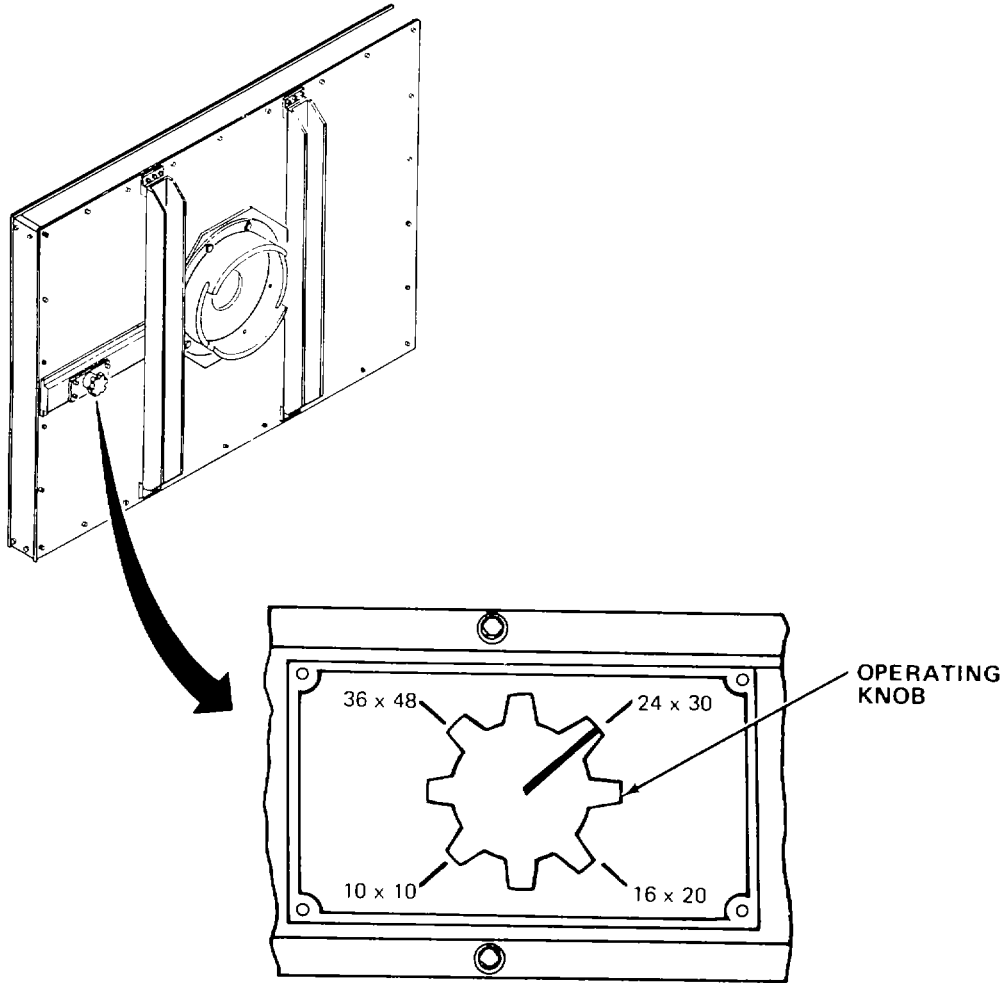


Diverter Valve Knob

Located on copyboard carriage assembly. Diverts suction to copyboard assembly when knob is pushed in. When pulled out, diverts suction to the positive holder assembly.

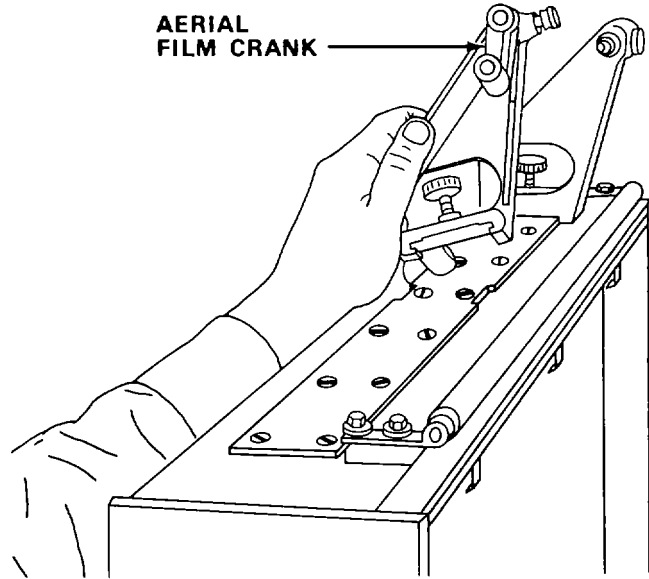
Handknob

Secures copyboard assembly to axle and adapter.



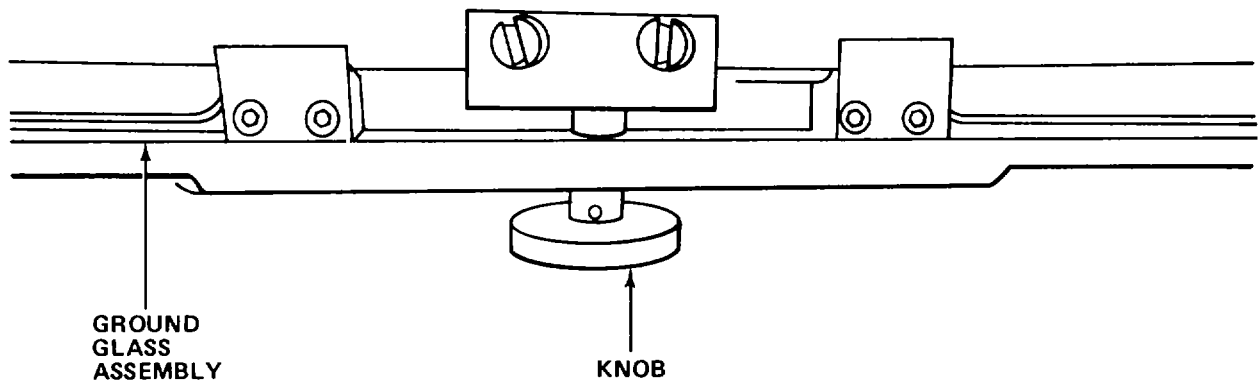
Operating Knob

Located at the rear of the copyboard assembly. Controls suction area through the operating rod assembly that is required for copy size.



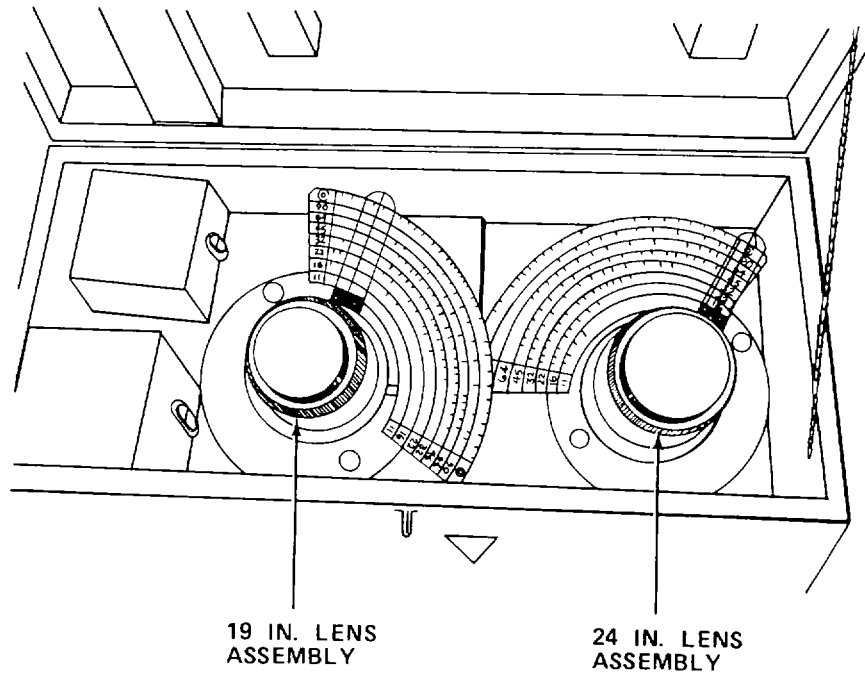
Aerial Film Crank

A handcrank used to wind aerial film from spool-to-spool. Centers aerial film on positive holder assembly.



Ground Glass Assembly Knob

Moves the oscillating frame and photogrid horizontally for image alinement to the grid.



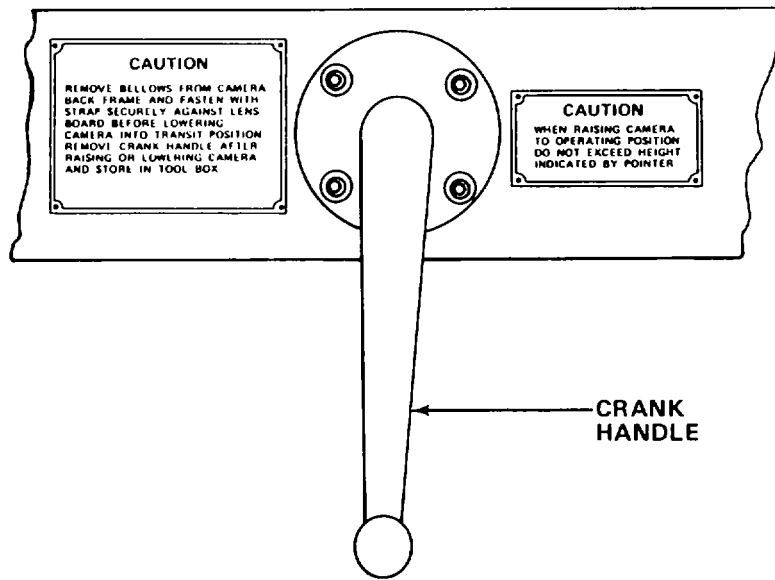
24 inch Lens Assembly

Primary lens for the camera. Focuses light from copy and projects it as an image on the ground glass or film on the vacuum back assembly. F/stop range from f/9 to f/128.

19 inch Lens Assembly

Secondary lens for the camera. Focuses light from copy and projects it as an image on the ground glass assembly or film on the vacuum back assembly. F/stop range from f/9 to f/128.





Crank Handle

Used to elevate camera for operation or lower camera to transport mode on the camera skid assembly.

## Section II OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

### 2-2 INTRODUCTION.

2-2.1 General. The Lithographic Copying Camera must be regularly inspected to find and correct defects.

2-2.1.1 Before You Operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your before (B) PMCS.

2-2.1.2 While You Operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your during (D) PMCS.

2-2.1.3 After You Operate. Be sure to perform your after (A) PMCS.

2-2.1.4 If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

### 2-2.2 PMCS Procedures.

- a. Your Preventive Maintenance Checks and Services table lists the inspections and care of your equipment required to keep it in good operating condition.
- b. The interval column of your PMCS table tells you when to do a certain check or service.
- c. The procedure column of your PMCS table tells you how to do the required checks and services. Carefully follow these instructions. If you do not have the tools, or if the procedure tells you to, have organizational maintenance do the work.
- d. Perform weekly as well as before operation if:
  - (1) You are the assigned operator and have not operated the item since the last weekly.
  - (2) You are operating the item for the first time.
- e. If your equipment does not perform as required, refer to Chapter 3 under Troubleshooting for possible problems. Report any malfunctions or failures on the proper DA Form 2404, or refer to DA Pam 738-750.

f. Tools and materials required for PMCS.

<u>Item</u>	<u>Quantity</u>
Lens Brush	1 ea
Optical Lens Cleaning Compound (Item 4, Appendix E)	ar
Lens Paper (Item 16, Appendix E)	ar
Cheesecloth (Item 5, Appendix E)	ar
Target	1 ea
Camel Hair Brush	1 ea
Detergent (Item 6, Appendix E)	ar
Utility Pail	1 ea
Oil OG-P	ar

**NOTE**

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

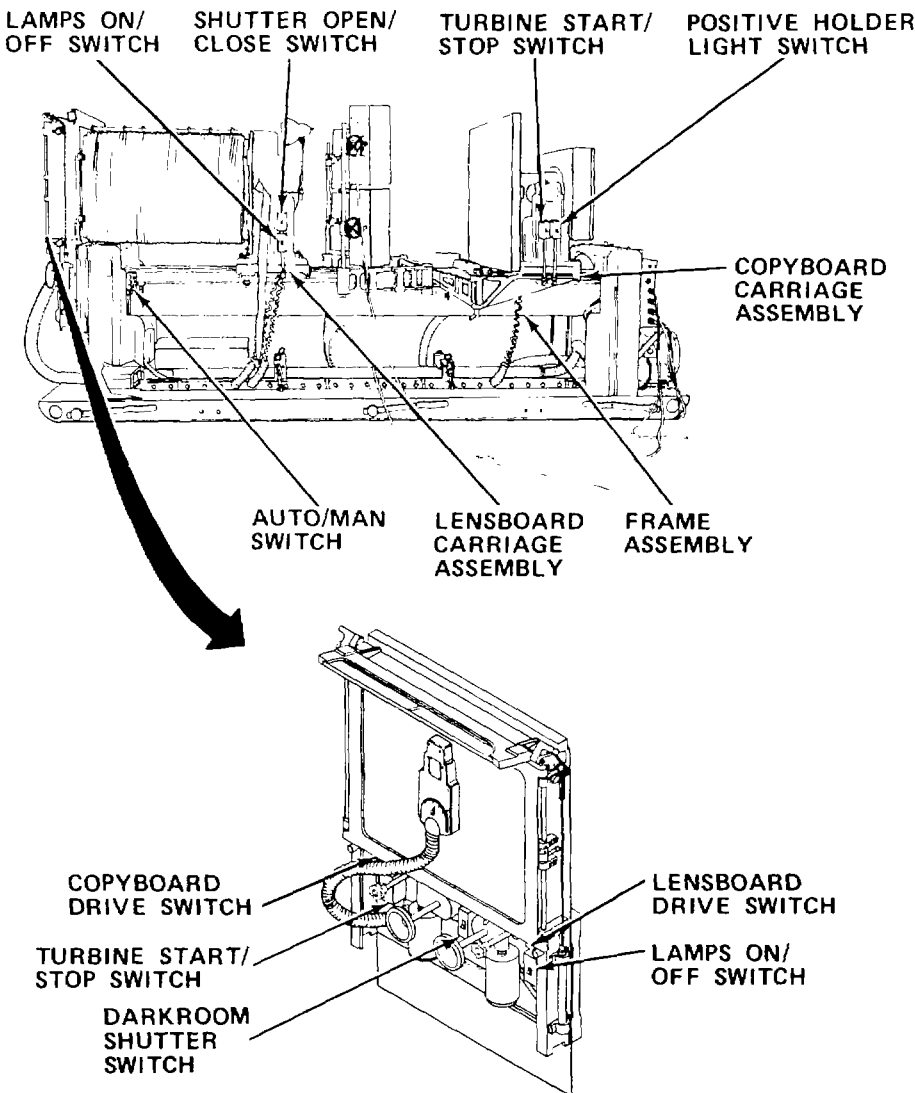
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
		 <p>The diagram shows a control panel with several labeled components:</p> <ul style="list-style-type: none"> <li>LAMPS ON/OFF SWITCH</li> <li>SHUTTER OPEN/CLOSE SWITCH</li> <li>TURBINE START/STOP SWITCH</li> <li>POSITIVE HOLDER LIGHT SWITCH</li> <li>COPYBOARD CARRIAGE ASSEMBLY</li> <li>AUTO/MAN SWITCH</li> <li>LENSBOARD CARRIAGE ASSEMBLY</li> <li>FRAME ASSEMBLY</li> <li>COPYBOARD DRIVE SWITCH</li> <li>TURBINE START/STOP SWITCH</li> <li>DARKROOM SHUTTER SWITCH</li> <li>LENSBOARD DRIVE SWITCH</li> <li>LAMPS ON/OFF SWITCH</li> </ul>	

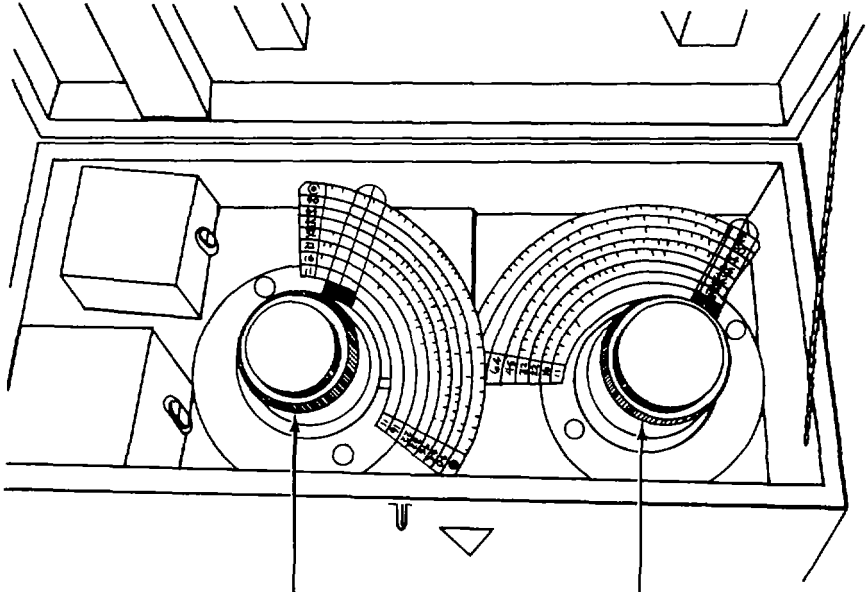
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
1	B	<p>CAMERA</p> <p>Frame Assembly</p> <p>Check for objects on camera rail that could stop movement of copy-board carriage assembly or lens-board carriage assembly.</p> 	
2	B	<p>Lens Assemblies</p> <p>Check for dust or fingerprints. Clean if dirty.</p>	

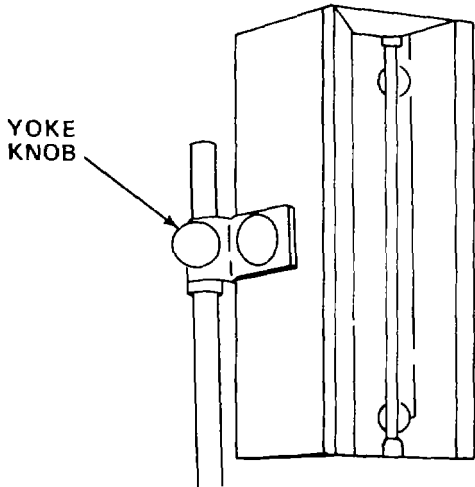
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
3	D	<p>CAMERA - Cont</p>  <p><b>WARNING</b> Avoid looking at lighted pulsed xenon lamps. Serious damage to eyes may occur.</p> <p>Pulsed Xenon Lamps</p> <p>Check for proper operation.</p> <p>Check glass cover for cracks, chips, or breaks and dirty glass. Clean if dirty.</p>	<p>Pulsed xenon lamps defective.</p> <p>Pulsed xenon lamp glass cover cracked or broken.</p>

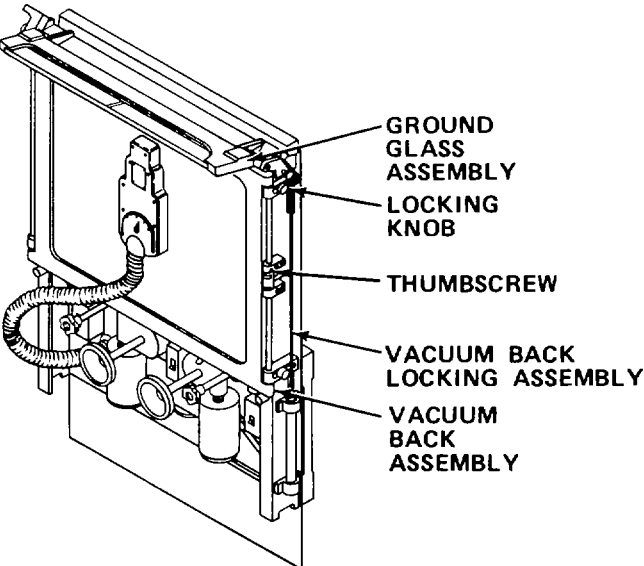
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
CAMERA - Cont			
			
4	D	Vacuum Back Assembly  Check for proper closing and locking.	Vacuum back assembly does not lock properly.
5	D	Ground Glass Assembly  Check for proper movement and latching. Be sure photogrid is free of cracks, scratches, or breaks.	Ground glass assembly defective.

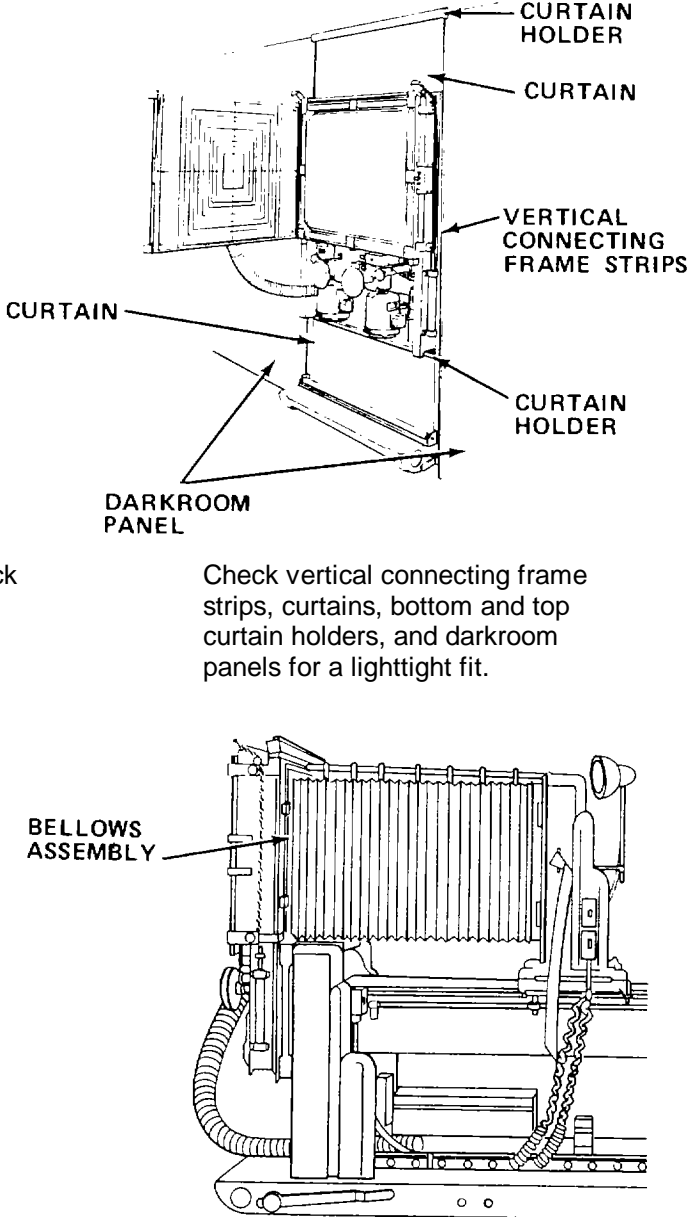
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
6	D	<p>CAMERA - Cont</p>  <p>Camera Back Housing Assembly</p> <p>Check vertical connecting frame strips, curtains, bottom and top curtain holders, and darkroom panels for a lighttight fit.</p>	<p>Camera back housing assembly attaching hardware defective.</p>



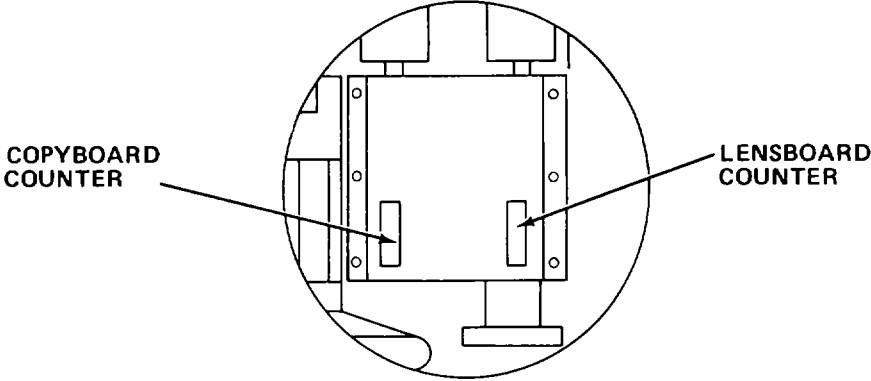
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
7	D	CAMERA - Cont  Bellows Assembly  Check for light leaks.	Light leaks in bellows assembly.
8	D	Vacuum Back Assembly  Check for vacuum.	No vacuum to vacuum back assembly.
9	D	Copyboard Assembly  Check for vacuum.	No vacuum to copyboard assembly.
10	D	Lensboard/ Copyboard Carriage Assemblies  Check for erratic movement.  	Lensboard/ copyboard carriage assembly moves erratically.
11	D	Counter Assembly  Check for proper operation.	Counter(s) defective.

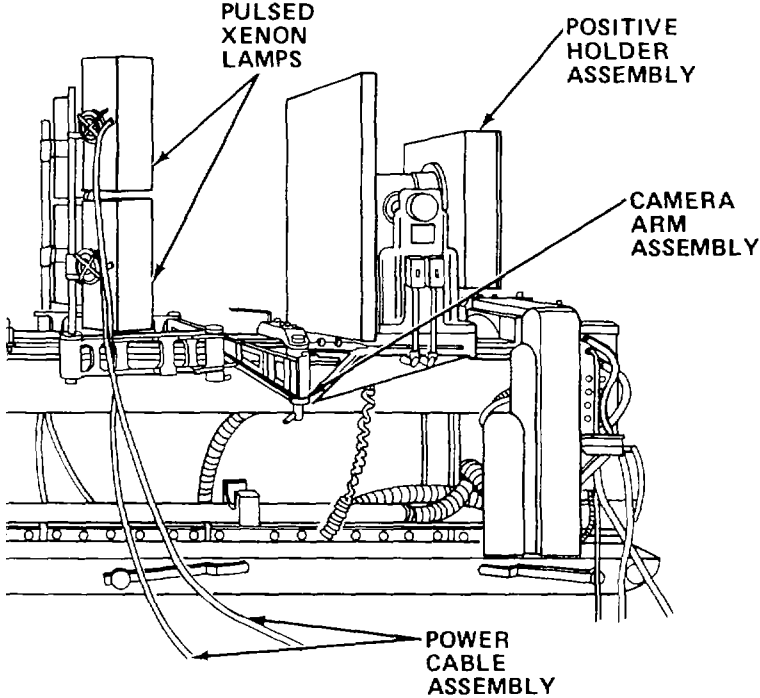
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
CAMERA - Cont			
			
12	D	Camera Arm Assemblies  Check for freedom of movement.	Camera arm assembly binds.
13	D	Lensboard Assembly  Check for erratic vertical/horizontal movement.	Lensboard vertical/horizontal movement erratic.
14	M	Positive Holder Assembly  Check for proper operation.	Positive holder assembly defective.

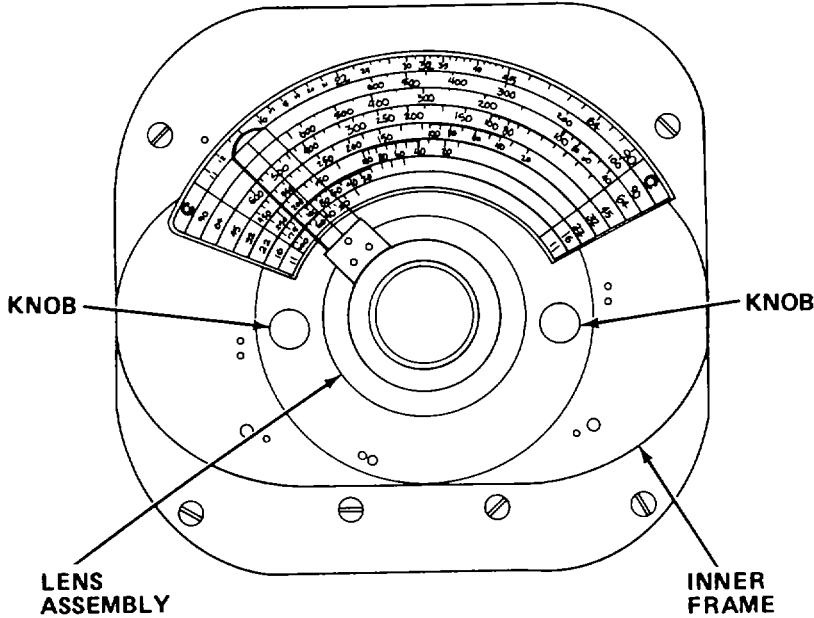
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
15	M	<p>CAMERA - Cont</p> <p style="text-align: center;"><b><u>WARNING</u></b></p> <p style="text-align: center;"><b>Avoid looking at lighted pulsed xenon lamps. Serious damage to eyes may occur.</b></p> <p>Pulsed Xenon Lamp/Power Cable Assembly</p> <p>Check for damage.</p>	Pulsed xenon lamp/power cable defective.
16	M	<p>Camera Skid Assembly</p> <p>Check air duct hoses for cracks and leaks.</p>  <p>The diagram shows a top-down view of a camera lens assembly. It features a central lens element surrounded by an inner frame. Two knobs are positioned on either side of the lens assembly. The entire assembly is housed within a larger frame. The diagram is annotated with labels: 'KNOB' pointing to the left and right knobs, 'LENS ASSEMBLY' pointing to the central lens area, and 'INNER FRAME' pointing to the inner circular frame surrounding the lens.</p>	Air duct hose(s) damaged.

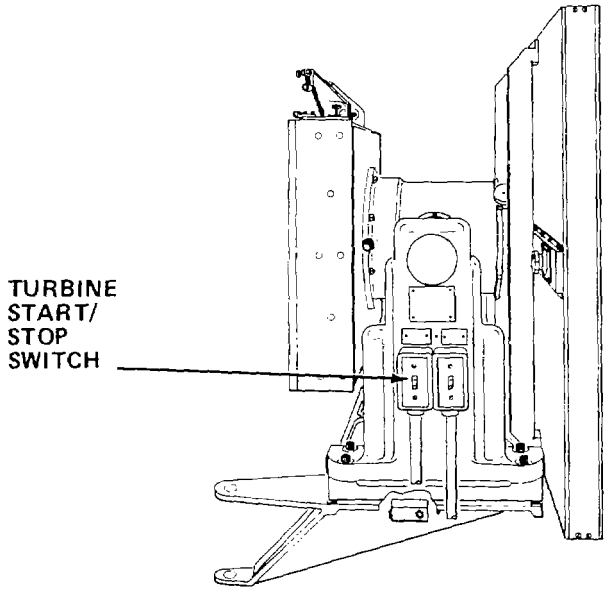
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
17	Q	<p>CAMERA - Cont</p> <p style="text-align: center;"><b>NOTE</b> <b>Optical accuracy should be checked after each movement, as well as quarterly.</b></p> <p>Optical Accuracy of Camera</p> <ol style="list-style-type: none"> <li>1. Install 24 in. lens assembly. Remove and store lens cap.</li> </ol> <div style="text-align: center;">  <p>The diagram shows a side view of a control panel for a turbine. A callout line points from the text 'TURBINE START/STOP SWITCH' to a specific switch on the panel. The panel has various buttons, a display, and a large handle.</p> </div> <ol style="list-style-type: none"> <li>2. Set copyboard TURBINE START and STOP switch to START.</li> </ol>	<p>Blower assembly inoperative.</p>

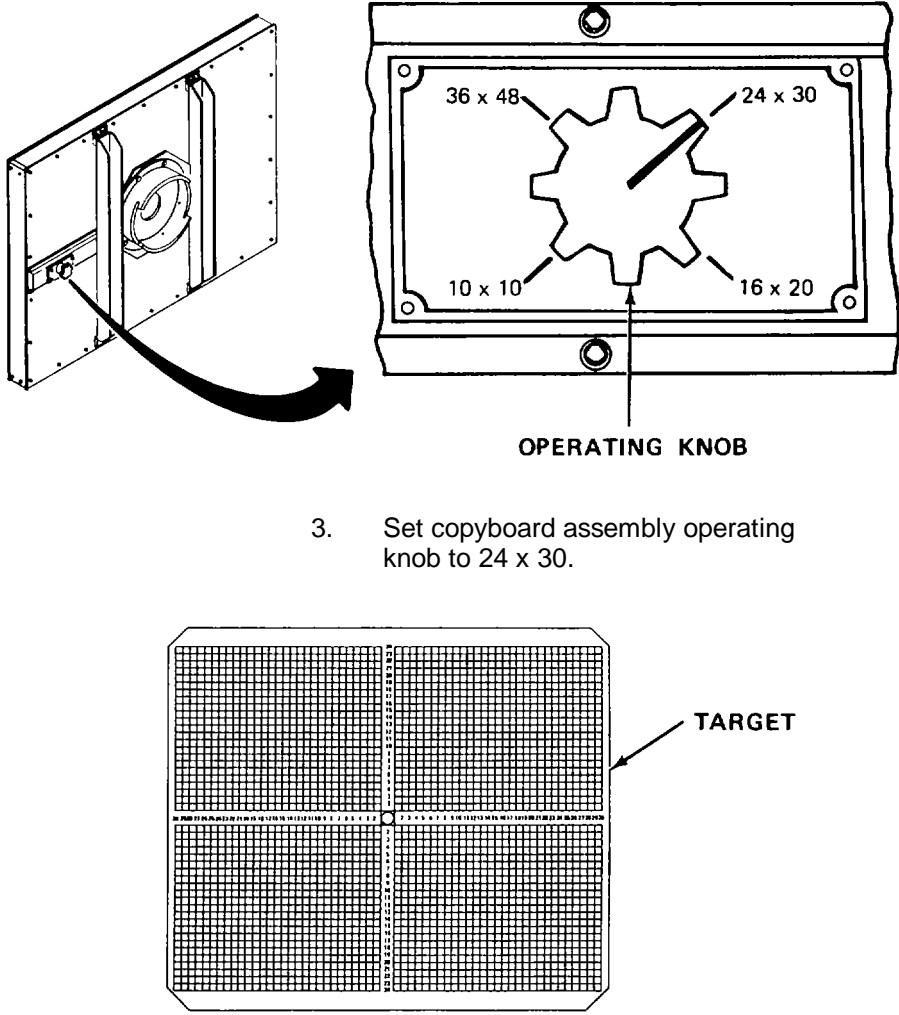
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
17	Q	<p>CAMERA - Cont Optical Accuracy of Camera - Cont</p>  <p>The diagram shows a camera assembly on the left and a copyboard on the right. The copyboard features a gear-shaped operating knob with four dimensions labeled: 36 x 48 (top-left), 24 x 30 (top-right), 10 x 10 (bottom-left), and 16 x 20 (bottom-right). An arrow points to the knob with the label 'OPERATING KNOB'. Below the copyboard is a grid target with the label 'TARGET' and an arrow pointing to it.</p> <p>3. Set copyboard assembly operating knob to 24 x 30.</p> <p>4. Turn target upside down and center on copyboard assembly.</p>	<p>Operating knob inoperative.</p> <p>Target missing or damaged.</p>

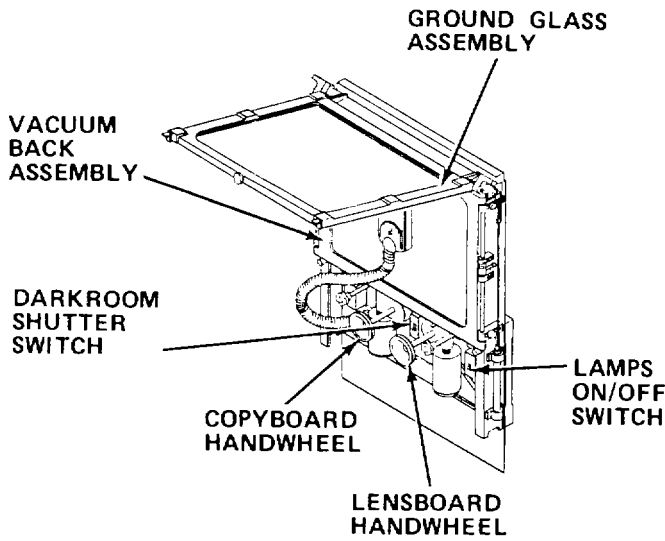
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
17	Q	<p>CAMERA - Cont</p> <p>Optical Accuracy of Camera - Cont</p>  <p style="text-align: center;"><b>NOTE</b></p> <p style="text-align: center;"><b>Always rotate handwheel to left when making final adjustment. This will decrease error.</b></p> <ol style="list-style-type: none"> <li>5. Refer to 24 in. lens reproduction chart and set lens counter to 1:1 ratio.</li> <li>6. Refer to 24 in. lens reproduction chart and set copy counter to 1:1 ratio plus 0.06 in. (1.5 mm).</li> </ol>	<p>Reproduction chart missing.</p>



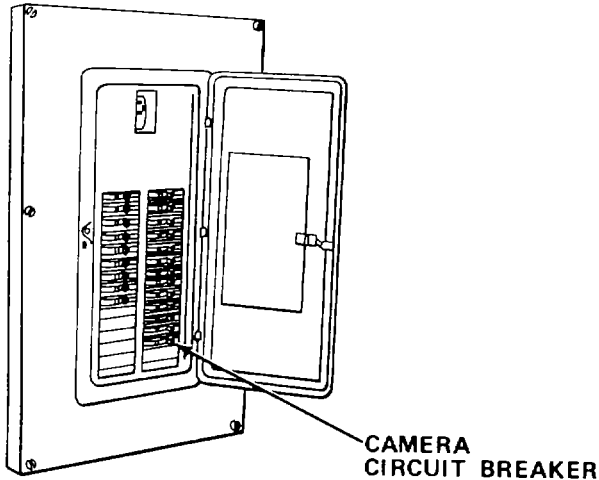
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
17	Q	<p>CAMERA - Cont</p> <p>Optical Accuracy of Camera Cont</p> <ol style="list-style-type: none"> <li>13. Target image should be square and in focus upon inspection.</li> <li>14. Set LAMPS ON and OFF switch OFF.</li> <li>15. Set darkroom SHUTTER switch to CLOSE.</li> <li>16. Raise ground glass assembly.</li> <li>17. Close and lock vacuum back assembly.</li> <li>18. Set interior light switch ON. In darkroom, set red safe-lights OFF.</li> <li>19. Remove target.</li> <li>20. Set copyboard TURBINE START and STOP switch to STOP.</li> </ol> 	<p>Target image out of focus.</p>



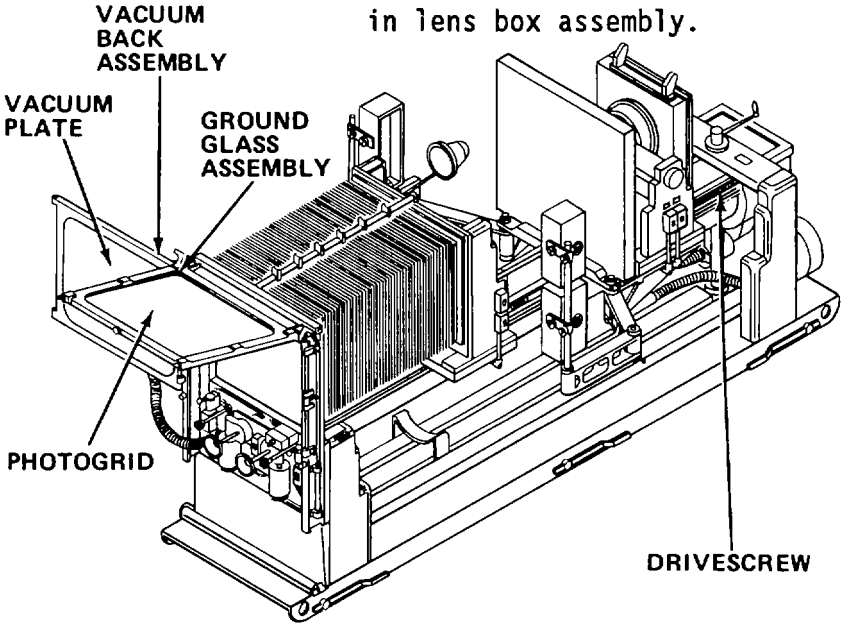
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
18	A	<p style="text-align: center;"><b>WARNING</b></p> <p style="text-align: center;"><b>Death or serious injury may occur from electrical shock unless power cable is unplugged before servicing camera.</b></p> <p>Service Camera</p> <ol style="list-style-type: none"> <li>1. Set camera circuit breaker on power panel OFF.</li> <li>2. Remove lens assembly and store in lens box assembly.</li> </ol> <div style="text-align: center;">  <p style="text-align: center;">in lens box assembly.</p> </div> <ol style="list-style-type: none"> <li>3. Use clean oil-dampened cheesecloth to wipe dirt and grease from frame assembly and drive-screws.</li> </ol>	

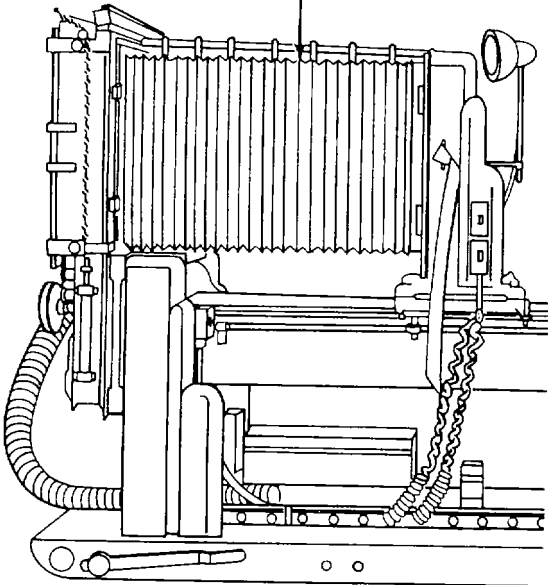
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
18	A  W  W	<p>CAMERA - Cont</p> <p>Service Camera - Cont</p> <ol style="list-style-type: none"> <li>4. Clean both sides of photogrid with optical lens cleaning compound and lens paper.</li> <li>5. Clean vacuum back assembly vacuum plate with mild soap and water.</li> </ol> <p style="text-align: center;">BELLOWS ASSEMBLY</p> 	

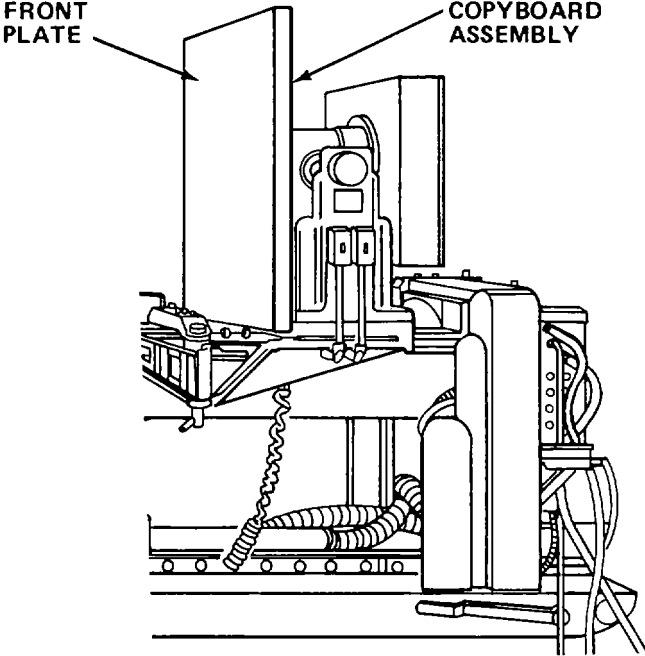
**Table 2-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE	For Readiness Reporting Equipment Is Not Ready/ Available If:
18	W	<p>CAMERA - Cont</p> <p>Service Camera - Cont</p> <p>6. Clean bellows with camel hair brush.</p>  <p>7. Clean copyboard assembly front plate with mild soap and water.</p>	

## Section III OPERATION UNDER USUAL CONDITIONS

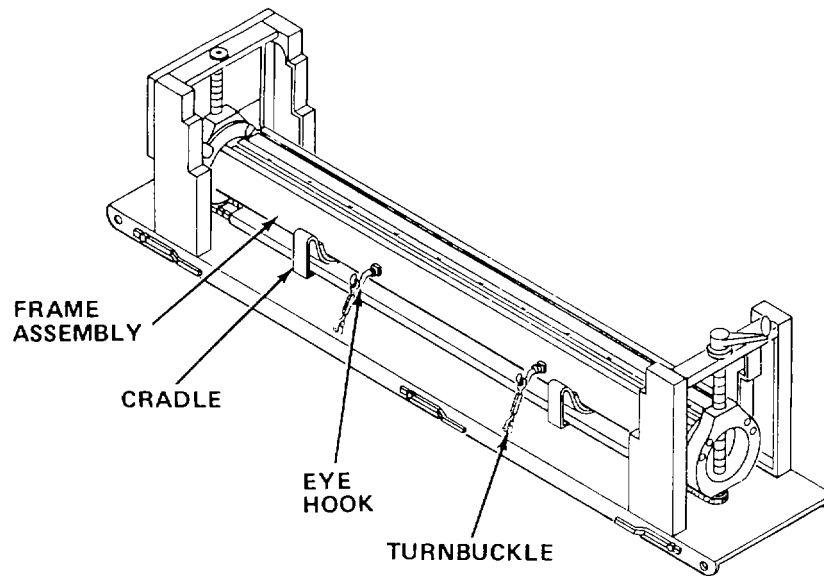
## 2-3 ASSEMBLY AND PREPARATION FOR USE.

## NOTE

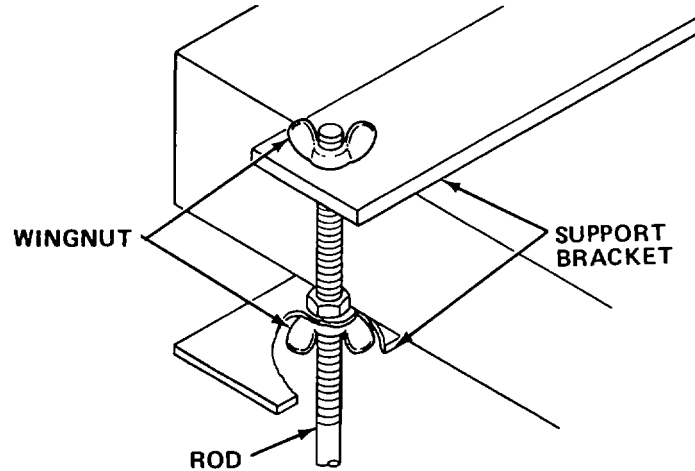
- Perform this procedure if Camera Section has been moved.
- Two persons are required to perform this task.

2-3.1 Raising the Frame Assembly.

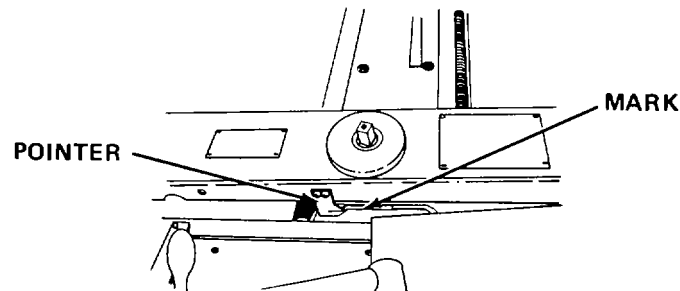
- a. Remove crank handle from the tool box.



- b. Loosen turnbuckles and set them clear of frame assembly.



- c. Remove upper wingnuts and copyboard assembly support brackets.
- d. Remove the support brackets and rods. Store under supply cabinet.
- e. Loosen handknobs and rotate copyboard assembly 90 degrees horizontally; then pivot copyboard assembly into position with phototube at the top of the copyboard assembly.
- f. Tighten handknobs on copyboard assembly.
- g. Install crank handle on rear screw.



**CAUTION**

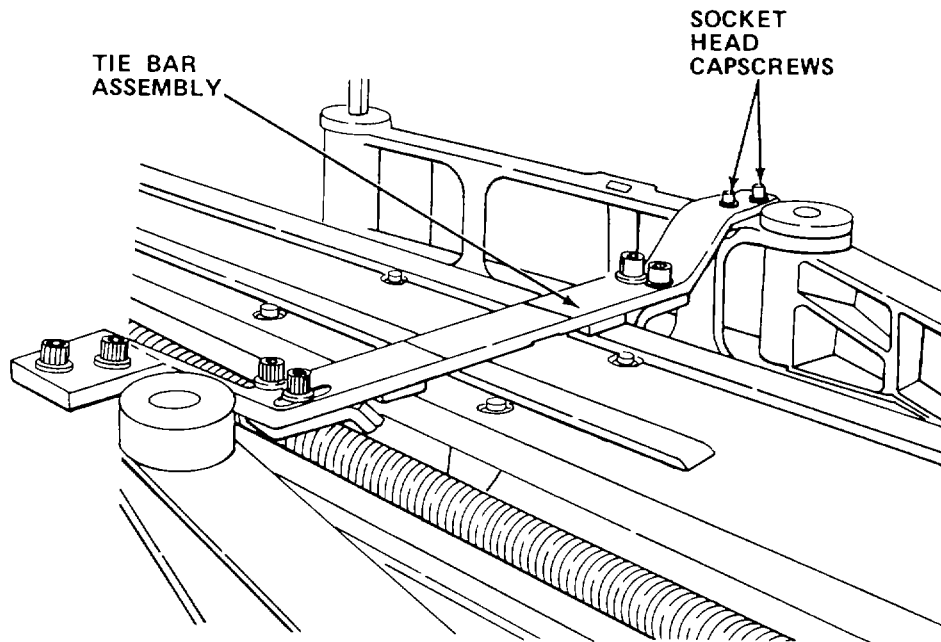
When raising camera to operating height, do not exceed height indicated by pointer. Damage to camera may occur.

**NOTE**

Operating height is reached when pointer is aligned with mark on frame assembly.

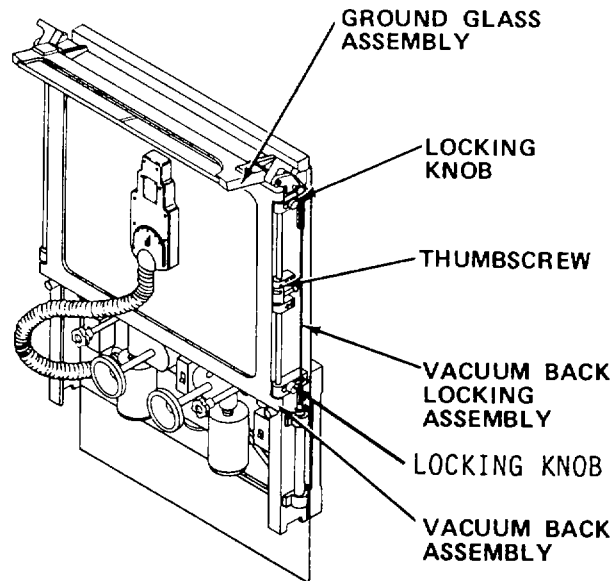
- h. Raise frame assembly to operating height.

- i. Remove and store crank handle.



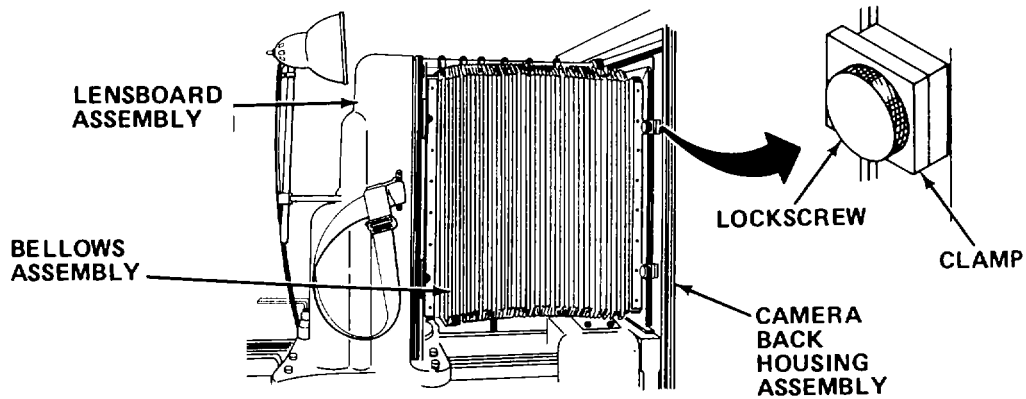
- j. Remove tie bar assembly.

2-3.2 Setting Up the Camera.

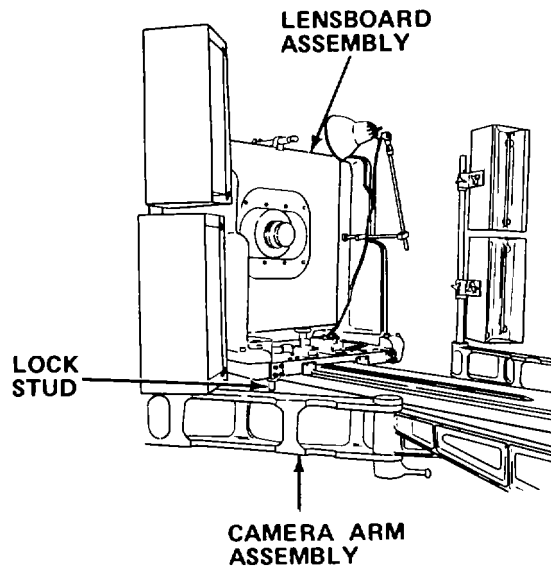


- a. Loosen thumbscrew, unlock and open vacuum back assembly.

- b. Raise ground glass assembly.
- c. Close vacuum back assembly.
- d. Loosen locking knobs.
- e. Push vacuum back assembly toward rear of camera.
- f. Tighten locking knobs.



- g. Loosen bellows clamps and lockscrews.
- h. Unstrap bellows assembly from lensboard assembly.
- i. Slide bellows assembly toward camera back housing assembly.
- j. Turn bellows clamps 90 degrees and carefully clamp bellows assembly to camera back housing assembly.
- k. Tighten lockscrews.

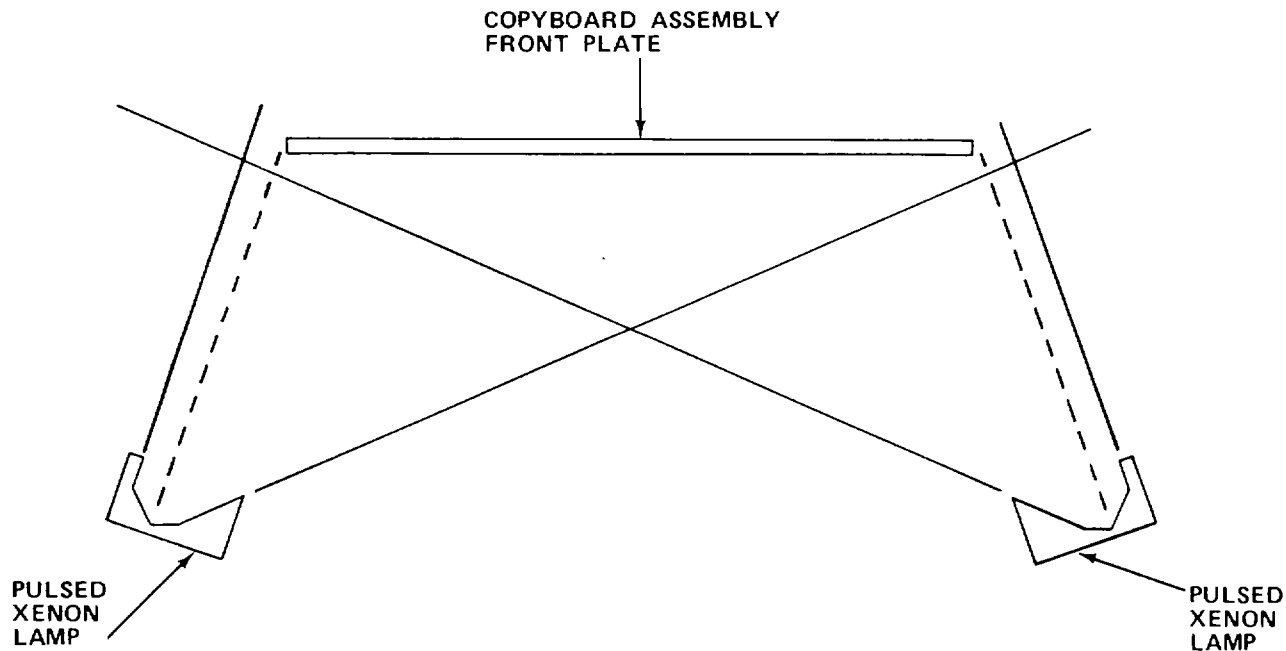


- 1. Loosen camera arm assembly hex nuts.

- m. Manually move lensboard assembly back until lock studs and hex nuts clear slots in camera arm assemblies.
- n. Tighten hex nuts.

**NOTE**

**When installing pulsed xenon lamps, it is important that you do so properly. To insure even light distribution, follow diagram for installation.**

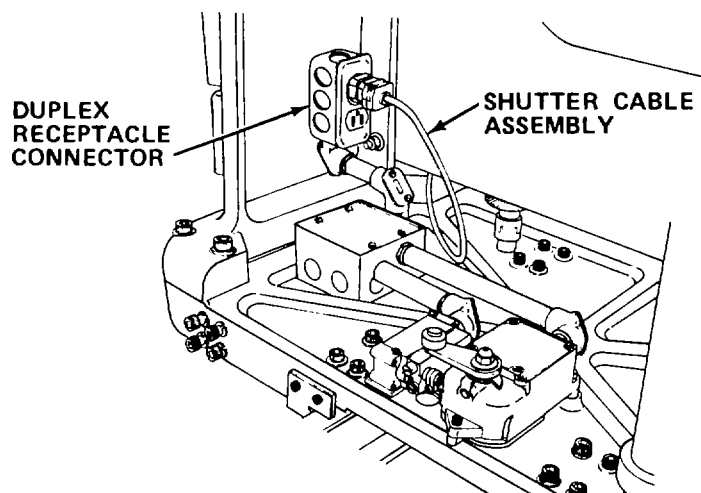


- o. One at a time, remove pulsed xenon lamps from lamp storage rack assembly. Mount two lamps on each camera arm assembly, securing with locking yoke knobs.
- p. Post reproduction charts in the darkroom.

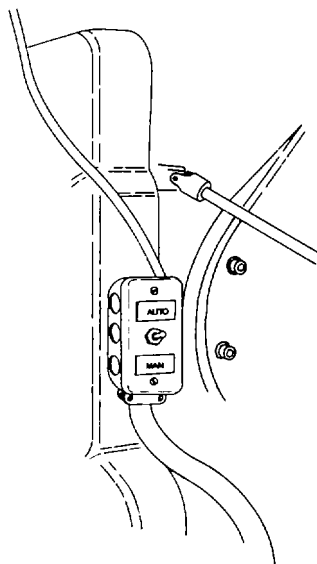
**NOTE**

**If the camera is to be operated using the light integrating exposure control instrument, refer to TM 5-3610-257-14, Operator's, Organizational, Direct Support and General Support Maintenance Manual, Topographic Support System Camera Section.**





- q. Plug shutter cable assembly into duplex receptacle connector.



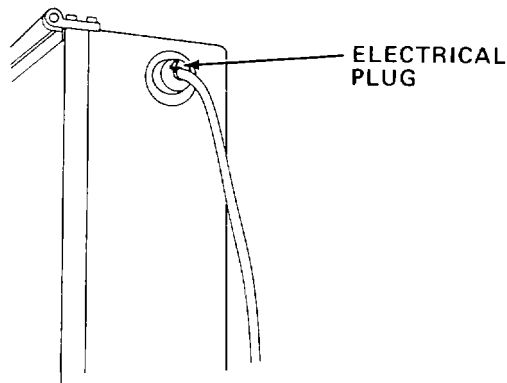
- r. Set AUTO/MAN switch to MAN.

**2-4 INITIAL ADJUSTMENTS, DAILY CHECKS AND SELF-TESTS.**

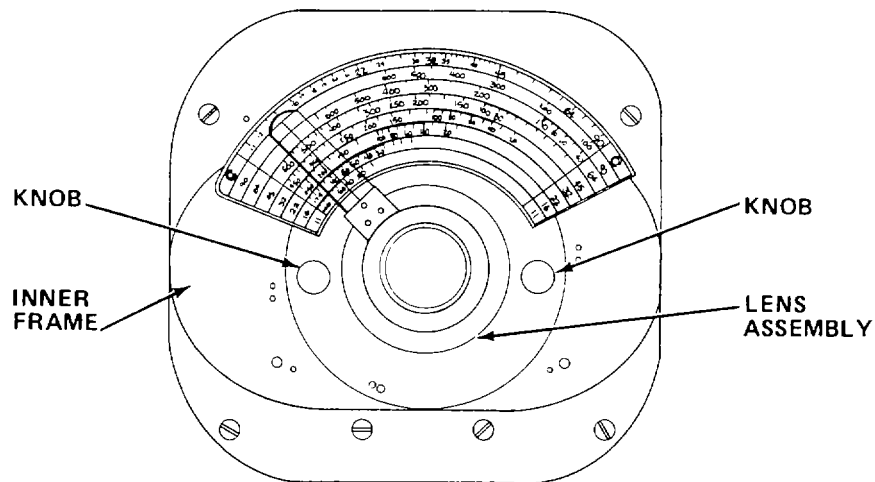
- a. Perform Before Use PMCS.
- b. Rotate axle and adapter to position copyboard assembly or positive holder assembly so that it faces lensboard assembly.

**NOTE**

**If aerial film or flat film is not going to be reproduced, skip step c.**



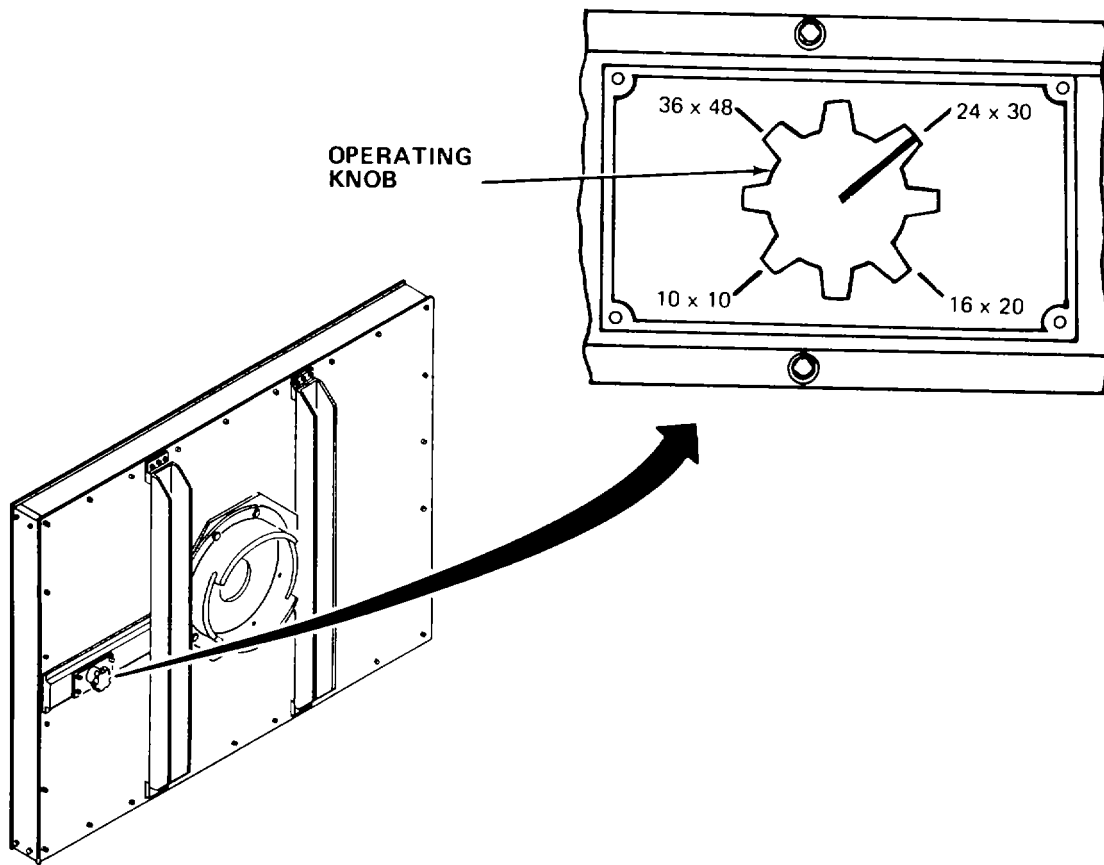
- c. Insert plug in light box assembly.



- d. Insert lugs behind mounting plate in slots of lensboard assembly inner frame.
- e. Hold knobs on mounting plate and rotate 15 degrees right to lock lens assembly into inner frame of lensboard assembly.
- f. Set white light switch OFF. Set safelight switch ON.

**2-5 OPERATING PROCEDURES.**

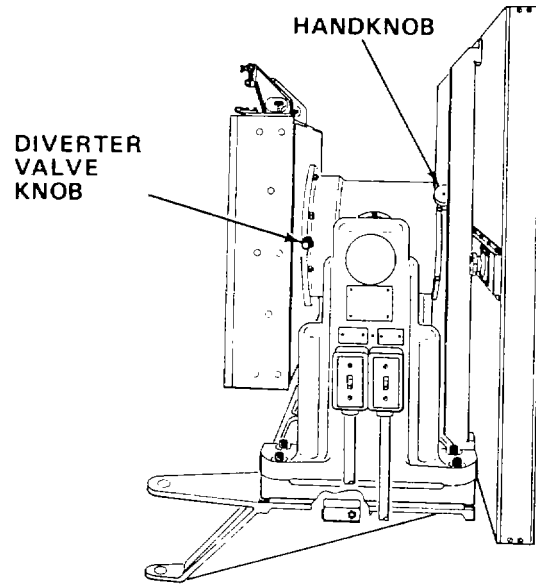
2-5.1 Producing Line or Continuous-Tone Negatives.



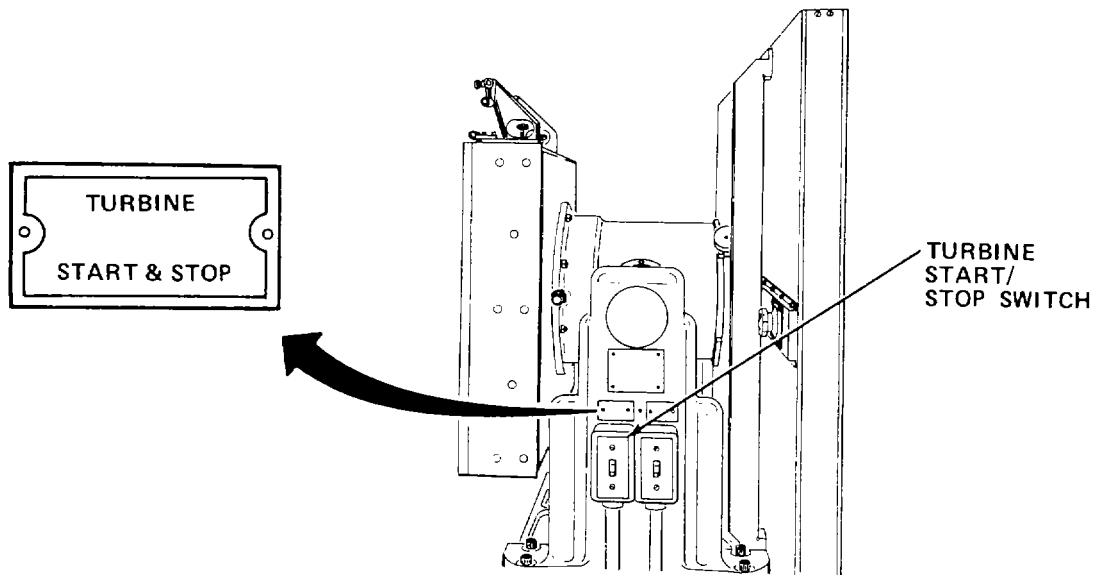
**NOTE**

- Darkroom must be in safelight condition.
- If copy is smaller than 10 x 10, surround copy with black paper to prevent vacuum leakage. This will provide adequate suction.

- a. Set knob for smallest area that will include entire copy.



- b. Push in diverter valve knob.



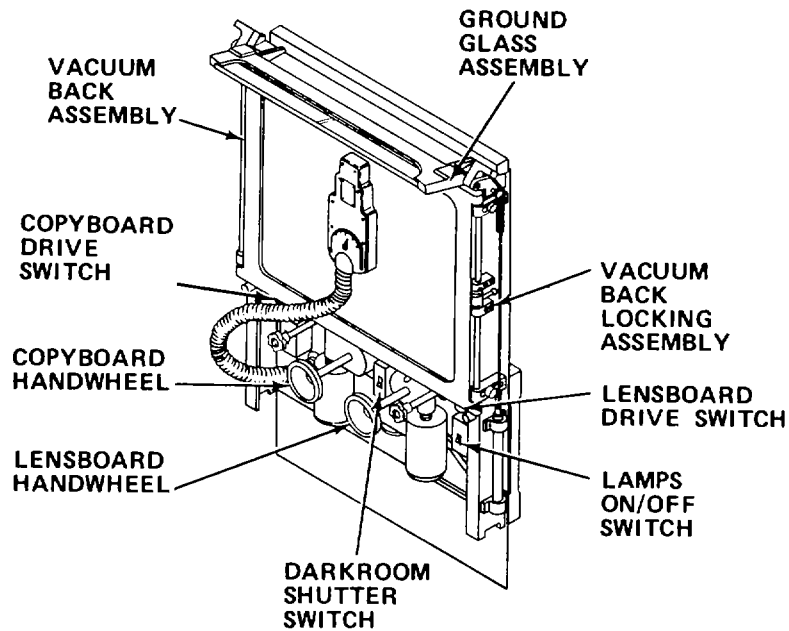
- c. Set copyboard TURBINE START and STOP switch to START.
- d. Place copy in center of copyboard assembly.
- e. Carefully press out wrinkles in copy.
- f. Set desired f/stop to setting required for reproduction ratio.

- g. Remove lenscap from lens assembly.
- h. Place lenscap in lens assembly box.
- i. Insert color filter if required.

**NOTE**

If the lens assembly being used does not have a reproduction chart prepared, or counters are inoperative, notify your supervisor.

- j. Refer to reproduction charts for counter settings.



- k. Use COPYBOARD DRIVE to position copyboard carriage assembly to some number above desired copyboard setting.

**NOTE**

Always make final setting by turning to left. This reduces error.

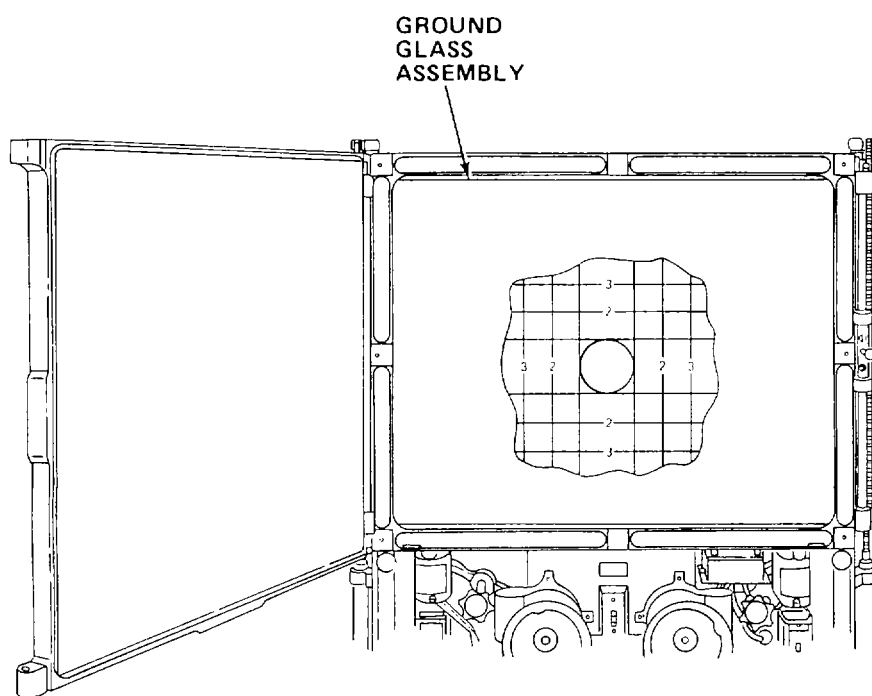
- 1. Rotate copyboard handwheel to left until desired setting on copyboard counter is obtained.

- m. Use LENSBOARD DRIVE to position lensboard carriage assembly to some number above desired lensboard setting.

**NOTE**

Always make final setting by turning to left. This reduces error.

- n. Rotate lensboard handwheel to left until desired setting on lensboard counter is obtained.
- o. Unlock and swing vacuum back assembly out of way.
- p. Lower and latch ground glass assembly.
- q. Set darkroom SHUTTER switch to OPEN.



- r. Set LAMPS ON and OFF switch ON.
- s. Examine image on ground glass assembly to be sure it is center.
  - (1) If image is tilted, carefully realine copy on copyboard assembly.
  - (2) If image is off center, use lensboard horizontal or vertical handknob to center it.

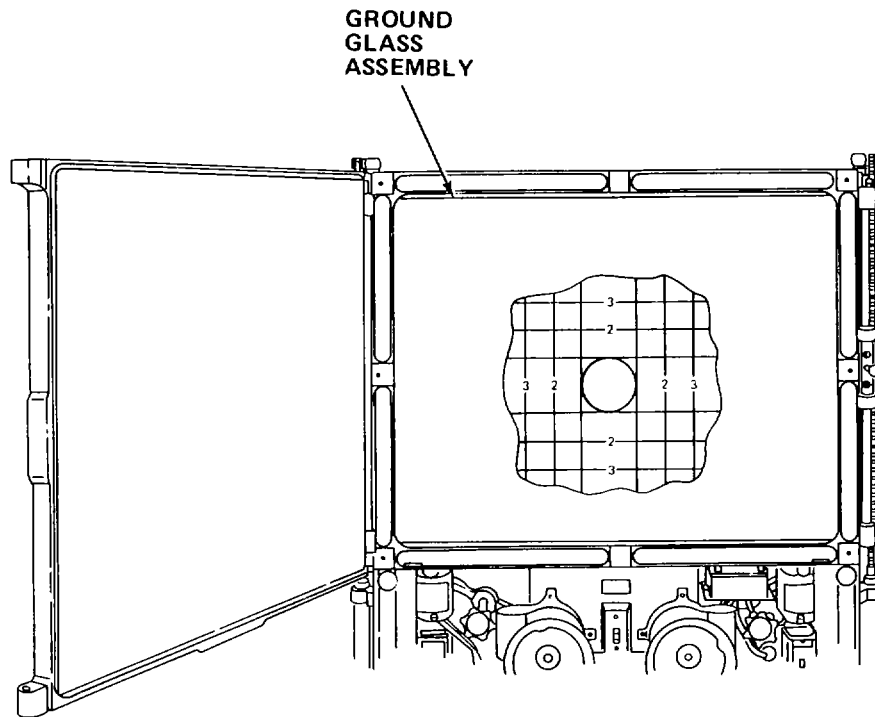
(3) Set LAMPS ON and OFF switch OFF.

(4) Set darkroom SHUTTER switch to CLOSE.

**NOTE**

Visual focusing may be required where relief maps or three dimensional copy is to be photographed. For thick copy, the total copy thickness in hundredths of an inch should be added to the copyboard counter setting to be sure of sharp focus. Steps (2) through (4) above apply to visual focusing.

- t. Set darkroom SHUTTER switch to OPEN.
- u. Set LAMPS ON and OFF switch ON. Swing vacuum back assembly out of way. Latch ground glass assembly.



- v. Examine image on ground glass assembly for sharpness with monocular magnifier.

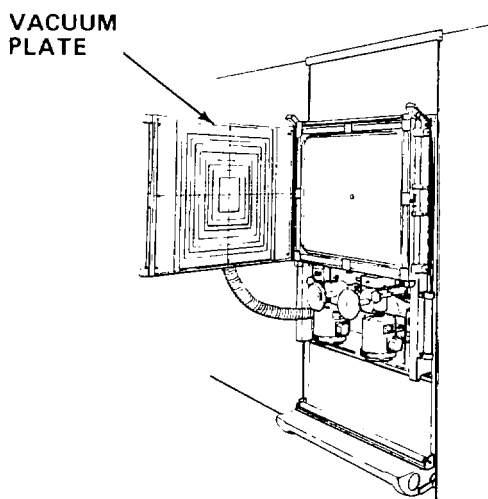
(1) Use lensboard handwheel to move lensboard carriage assembly until a sharp image is obtained.

**NOTE**

If a sharp image cannot be obtained, increase copyboard distance and repeat step v (1).

- (2) Check image size by scale or against grid markings on ground glass assembly.
- (3) If distance is smaller, move lensboard carriage assembly a short distance from ground glass assembly.
- (4) Adjust copyboard carriage distance until sharp image is obtained.
- (5) Check image size again.
- (6) Repeat steps (1) through (5) until exact size and focus is obtained.
- (7) During final focusing, be sure image is square and centered on photogrid.
- (8) Check for sharp image across ground glass assembly with monocular magnifier.
- (9) Set darkroom SHUTTER switch to CLOSE.
- (10) Set LAMPS ON and OFF switch OFF.

- w. Raise ground glass assembly.
- x. Set vacuum back valve handle to size of film.
- y. Set vacuum back TURBINE START and STOP switch to START.



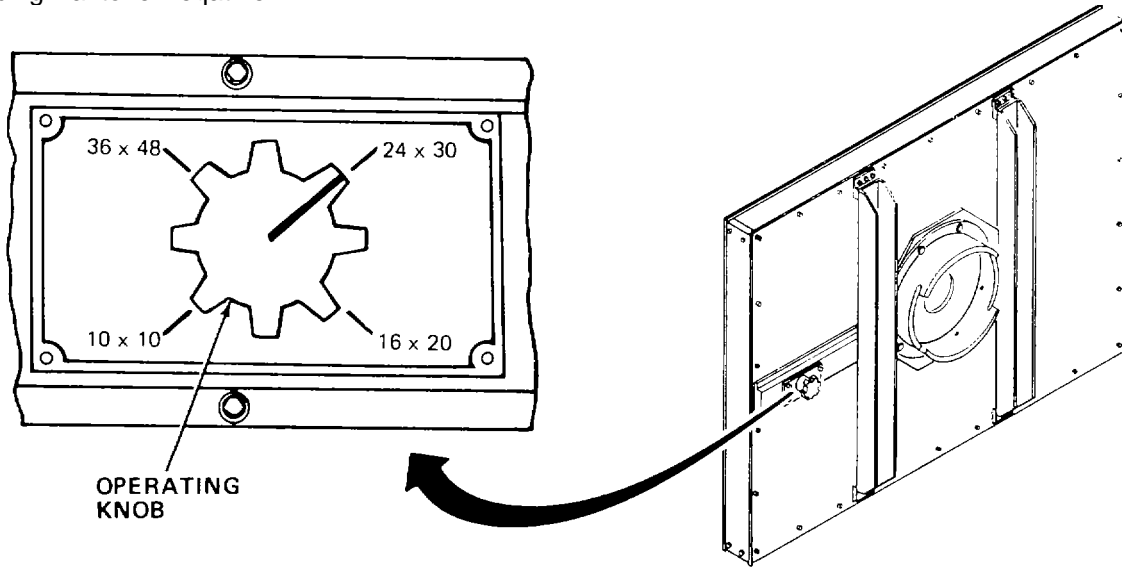


**NOTE**

Be sure the film's lighter-colored/dull emulsion side is facing lens of camera. If the film must be moved, raise film, relocate, and lower until it contacts vacuum plate.

- z. Hold film by its edges.
  - (1) Aline one edge with rectangle line on vacuum plate.
  - (2) Roll film so that it gradually adheres across its length or width to avoid forming wrinkles.
- aa. Close and lock vacuum back assembly.
- ab. Set LAMPS ON and OFF switch ON.
- ac. Set dark room SHUTTER switch ON.
- ad. Time exposer.
- ae. When exposer is completed, set darkroom SHUTTER switch OFF.
- af. Set LAMPS ON and OFF switch OFF.
- ag. Unlock and open vacuum back assembly.
- ah. Set vacuum back TURBINE START and STOP switch to STOP.
- ai. Remove exposed film from vacuum plate.
- aj. Close and lock vacuum back assembly.
- ak. Set copyboard TURBINE STOP and START switch to STOP.
- al. Remove copy from copyboard assembly.
- am. Remove lens assembly, install lenscaps and store lens assembly in lens assembly box.

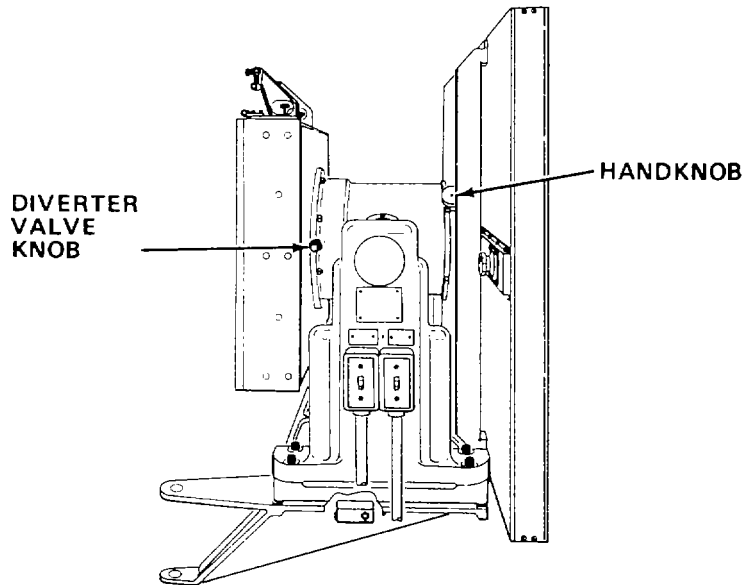
2-5.2 Producing Half-tone Negative.



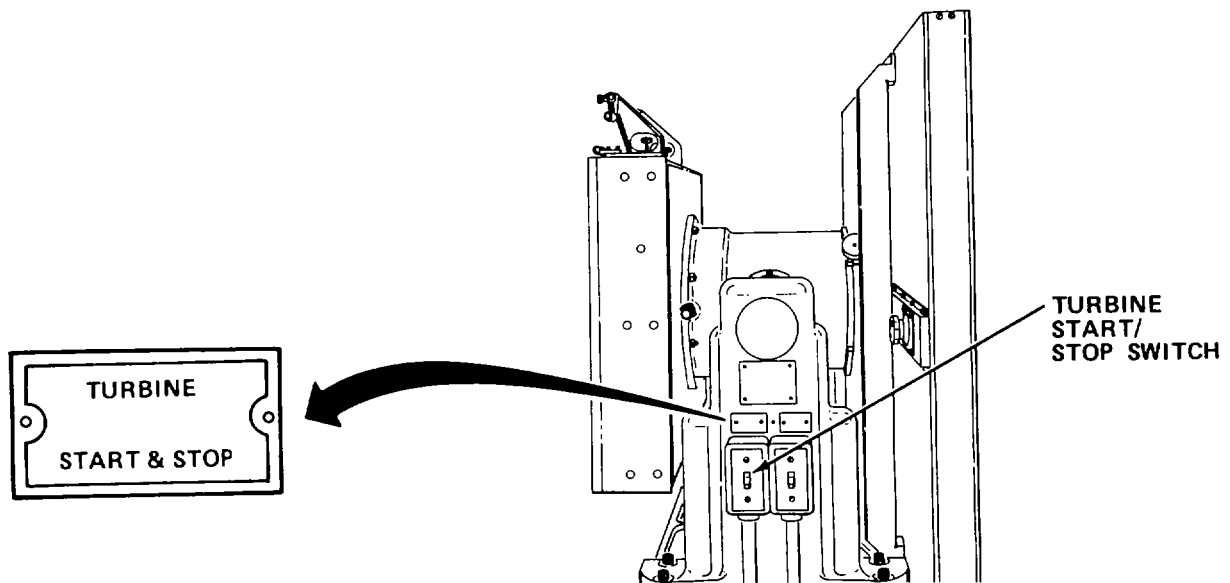
**NOTE**

Darkroom must be in safelight condition. If copy is smaller than 10 x 10, surround copy with black paper to prevent vacuum leakage. This will provide adequate suction.

- a. Set knob for smallest area that will include entire copy.



- b. Push diverter valve knob in.

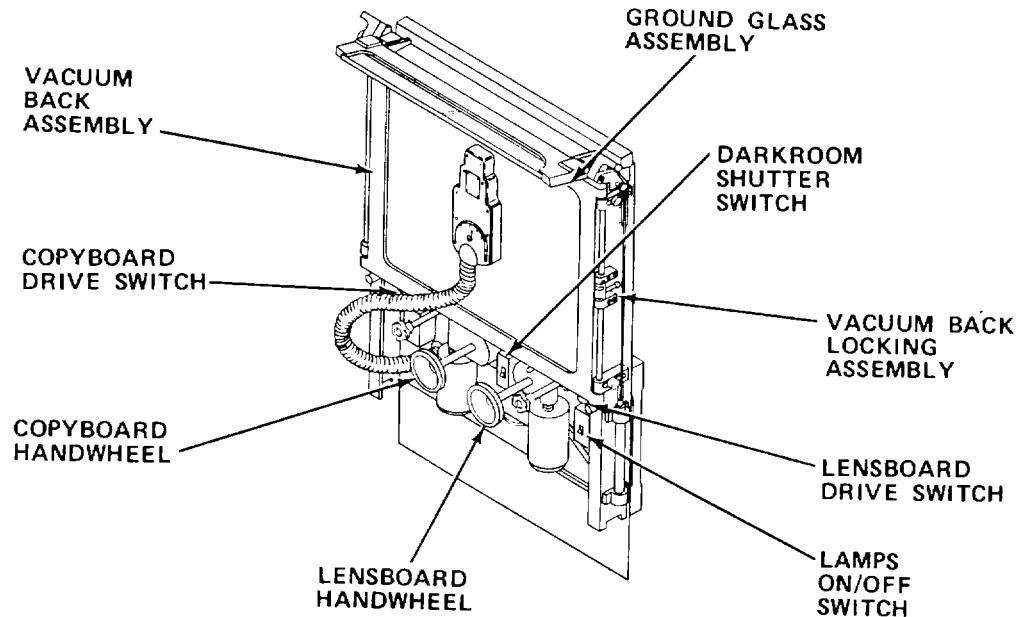


- c. Set copyboard TURBINE START and STOP switch to START.
- d. Place copy in center of copyboard assembly. Carefully press out wrinkles in copy.
- e. Set f/stop to setting required for desired reproduction ratio.
  - (1) Remove lenscaps from lens assembly.

(2) Place lenscaps in lens assembly box.

**NOTE**

If the lens assembly being used does not have a reproduction chart prepared, or counters are inoperative, notify your supervisor.



- f. Refer to reproduction chart for counter settings.
- g. Use COPYBOARD DRIVE to position copyboard carriage assembly to some number above desired copyboard setting.

**NOTE**

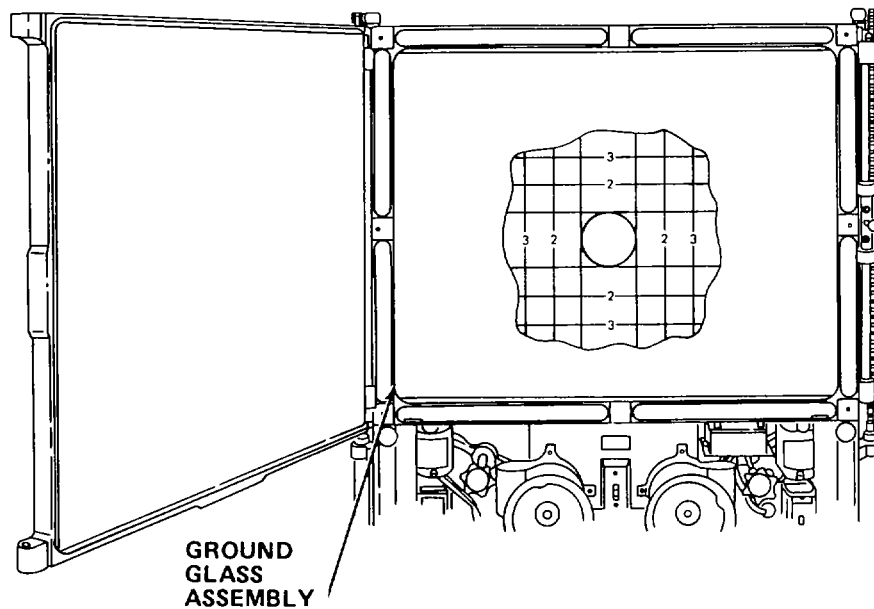
Always make final setting by turning to left. This reduces error.

- h. Rotate copyboard handwheel to left until desired setting on copyboard counter is obtained.
- i. Use LENSBOARD DRIVE to position lensboard carriage assembly to some number above desired lensboard setting.

**NOTE**

Always make final adjustment by turning to left. This reduces error.

- j. Rotate lensboard handwheel to left until desired setting is obtained on lens counter.
- k. Unlock and swing vacuum back assembly out of way.
- l. Lower and latch ground glass assembly.
- m. Set darkroom SHUTTER switch to OPEN.
- n. Set LAMPS ON and OFF switch ON.



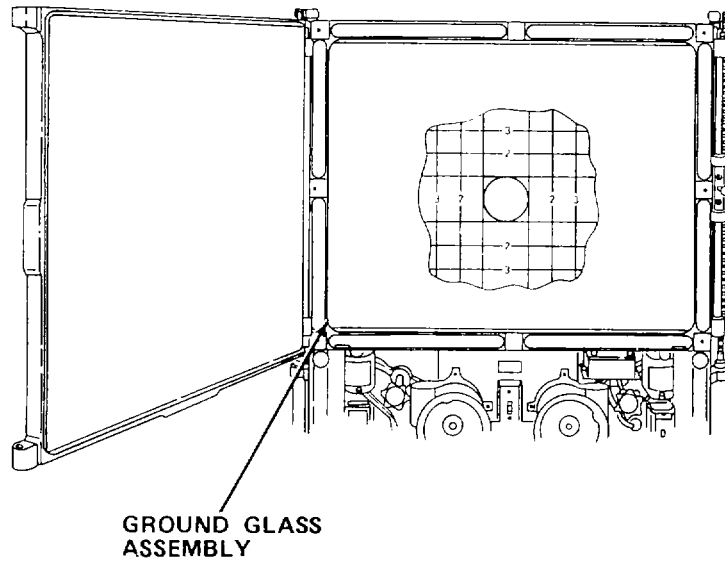
- o. Examine image on ground glass assembly to be sure it is centered.
  - (1) If image is tilted, carefully realine copy on copyboard assembly.
  - (2) If image is off center, use lensboard horizontal or vertical handknob to center it.
  - (3) Set darkroom SHUTTER switch to CLOSE.

- (4) Set LAMPS ON and OFF switch to OFF.

**NOTE**

For thick copy, the total copy thickness in hundredths of an inch should be added to the copyboard counter setting to be sure of sharp focus. Steps p through t apply to visual focusing

- p. Set darkroom SHUTTER switch to OPEN.  
 q. Set LAMPS ON and OFF switch ON.

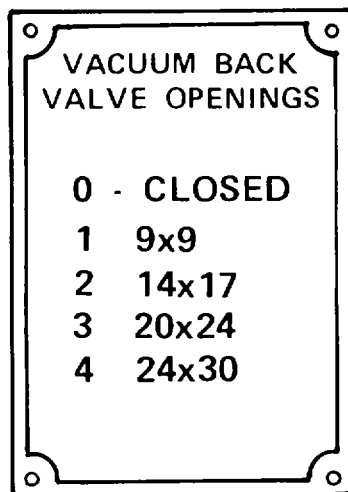


- r. Examine image on ground glass assembly for sharpness with monocular magnifier.  
 (1) Use lensboard handwheel to move lensboard carriage assembly until a sharp image is obtained.

**NOTE**

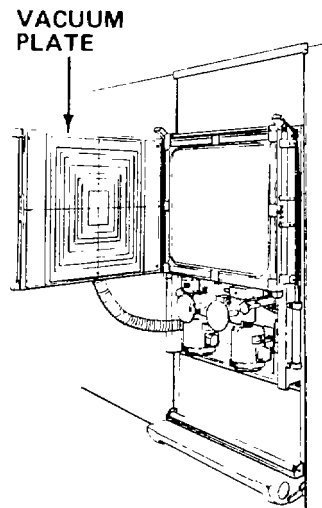
If a sharp image cannot be obtained, increase copyboard distance and repeat step r (1).

- (2) Check image size by scale or against grid markings on ground glass assembly.
  - (3) If distance is smaller, move lensboard carriage assembly a short distance from ground glass assembly.
  - (4) Adjust copyboard carriage assembly distance until sharp image is obtained.
  - (5) Check image size again.
  - (6) Repeat steps (1) through (5) until exact size and focus is obtained.
  - (7) During final focusing, be sure image is square and centered with photogrid.
  - (8) Check for sharp image across ground glass assembly with monocular magnifier.
  - (9) Set darkroom SHUTTER switch to CLOSE.
  - (10) Set LAMPS ON and OFF switch to OFF.
- s. Raise ground glass assembly.



- t. Set vacuum back valve handle to 24 x 30.

- u. Set vacuum back TURBINE START and STOP switch to START.



**NOTE**

Be sure that film's lighter-colored/dull emulsion side faces lens assembly. If film must be moved, raise film, relocate, and lower film until it contacts vacuum plate.

- v. Hold film by its edges.
  - (1) Aline one edge with rectangle line on vacuum plate.
  - (2) Roll film so that it gradually adheres across its length or width to avoid forming wrinkles.

**CAUTION**

Handle magenta contact screen by its corners. Damage to screen may occur.

**NOTE**

As supplied, the magenta contact screen is 30 in. by 30 in. The screen will have to be trimmed to 25 in. by 30 in. prior to use. When magenta contact screen is mounted over the film, the screen's emulsion/dull side must face the film (emulsion-to-emulsion).

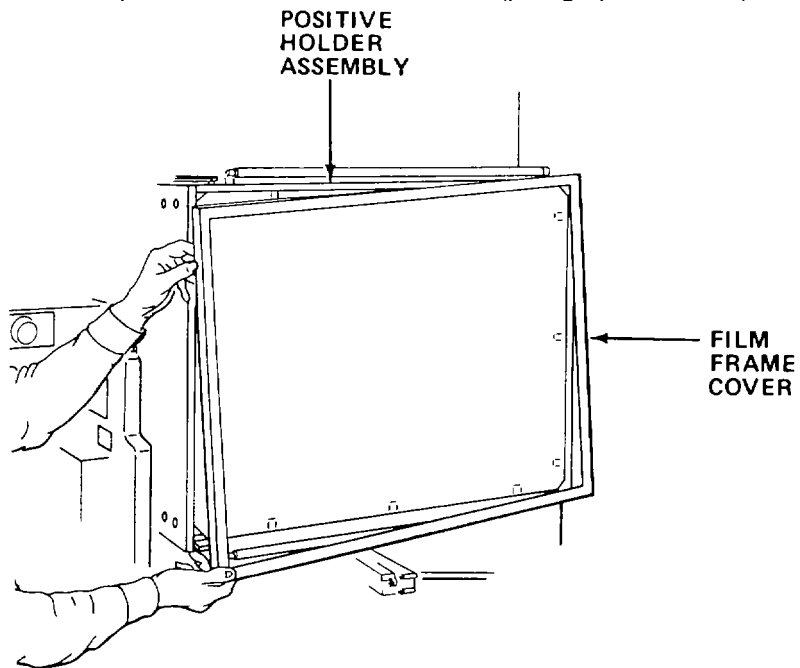
- w. Remove magenta contact screen from its container.
- x. Smooth any ripples or creases out of screen with a dry photo chamois. This ensures good contact with the film.



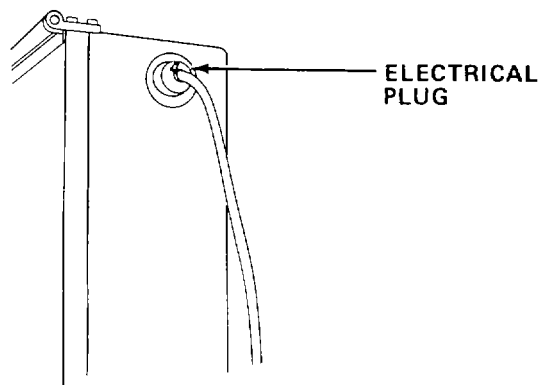
- y. Close and lock vacuum back assembly.
- z. Make MAIN exposure.
- aa. Make FLASH exposure.
- ab. When exposure times are completed, unlock and open vacuum back assembly.
  - (1) Remove magenta contact screen from vacuum plate and return to its container.
  - (2) Remove exposed film from vacuum plate.
- ac. Set vacuum back TURBINE START and STOP switch to STOP.
- ad. Close and lock vacuum back assembly.
- ae. Set copyboard TURBINE START and STOP switch to STOP; then remove copy from copyboard assembly.
- af. Remove lens assembly, install lenscaps and install lens assembly in lens assembly box.

2-5.3 Reproducing from Negative or Positive Transparencies (Flat Film).

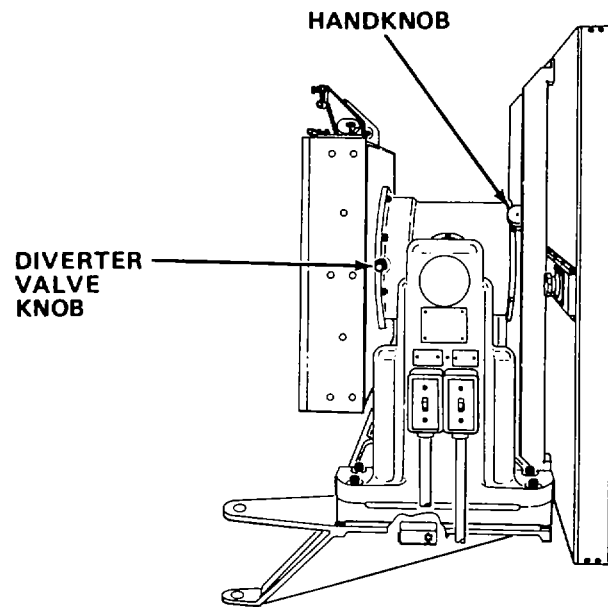
- a. Prepare the camera for operation under usual conditions (paragraphs 2-3, 2-4).



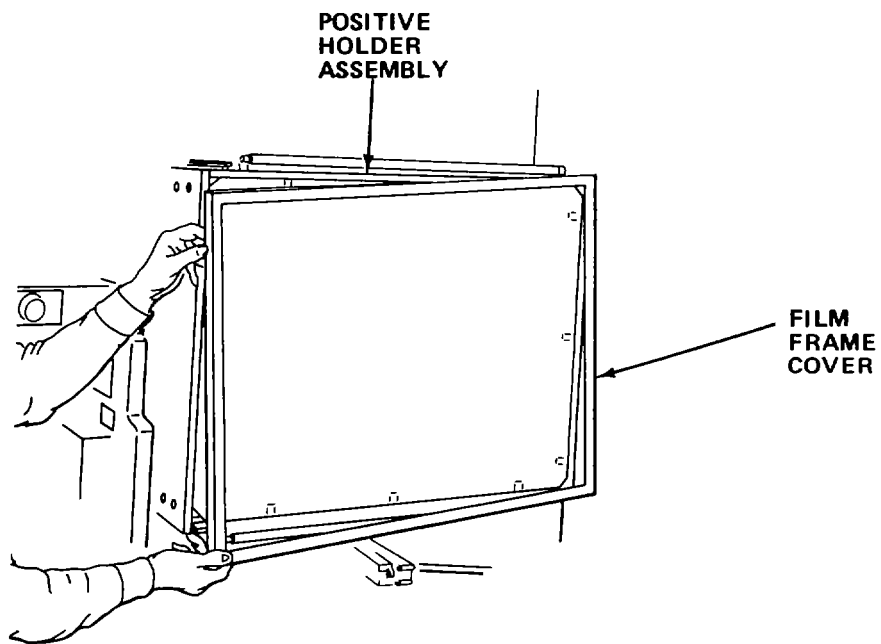
- b. Cut a piece of clear acetate that will cover the entire outer diffuser of the positive holder assembly.  
 c. Rotate the positive holder assembly toward the lensboard assembly.



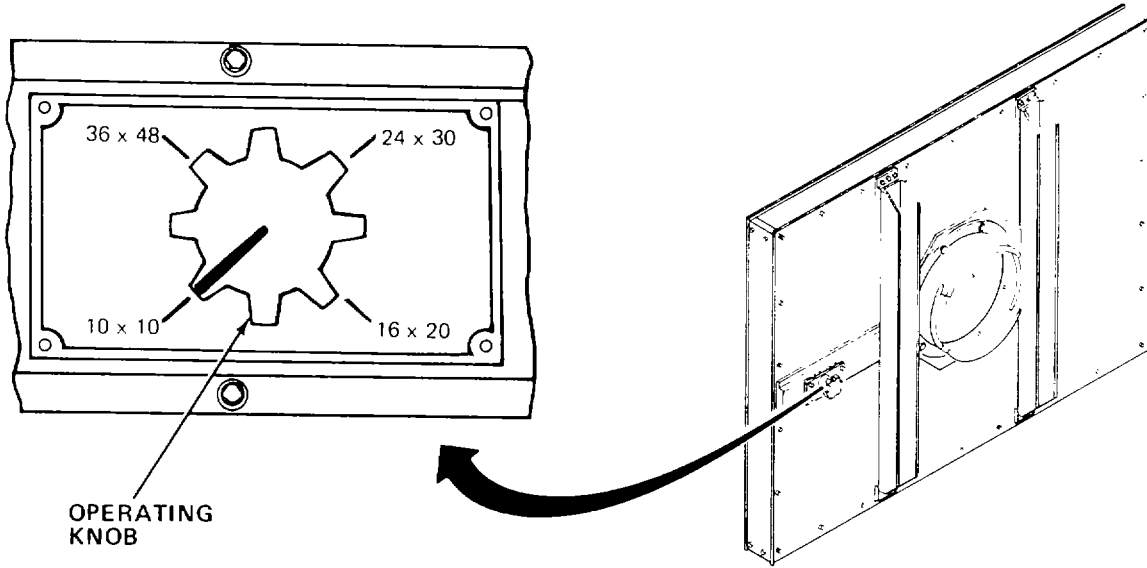
- d. Insert plug into socket of light box of the positive holder assembly.



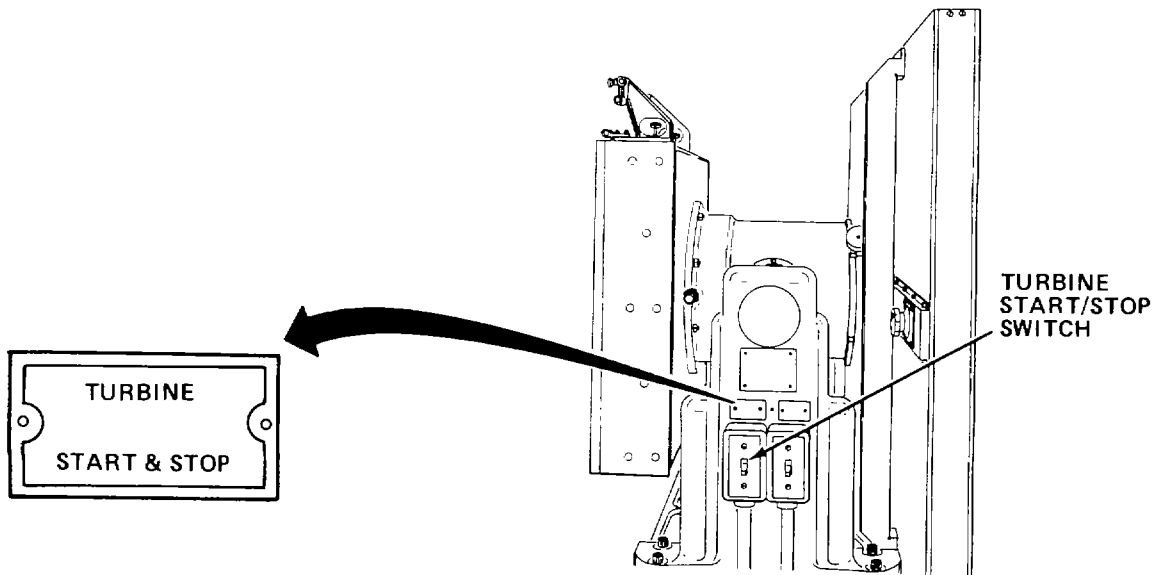
- e. Pull out the diverter valve knob to permit vacuum suction on the positive holder assembly.



- f. Remove the film frame cover from the positive holder assembly.



- g. Set the operating knob for 10 x 10.



- h. Set copyboard TURBINE START and STOP switch to START.

- i. Place the film in the approximate center of the positive holder assembly.

**NOTE**

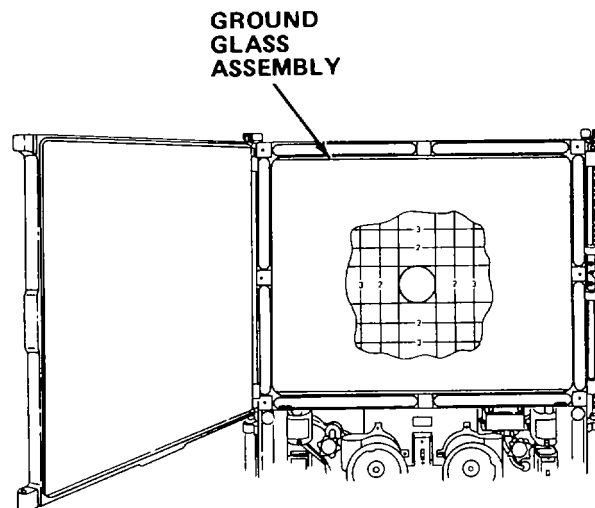
If the film is smaller than the outer diffuser of the positive holder assembly, preventing suction from holding it securely, secure the film to the outer diffuser with a small piece of tape on the top center of the film.

- j. Cover all remaining diffuser areas with black masking paper.

**NOTE**

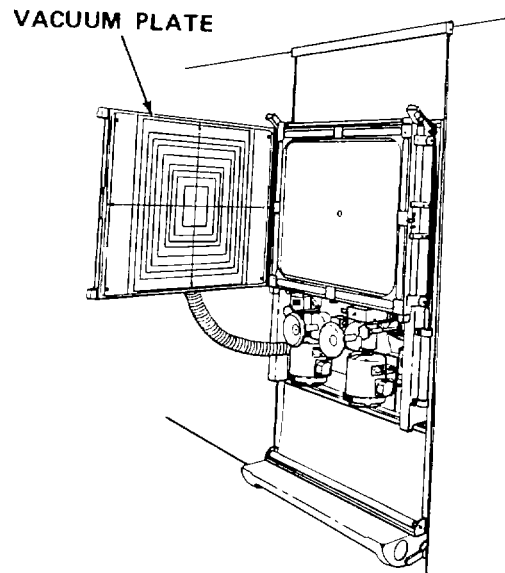
Do not cover vacuum suction openings on the corners of the outer diffuser.

- k. Cover the positive holder assembly outer diffuser with acetate.
- l. Smooth out any buckles or wrinkles.
- m. Install film frame cover.
- n. Set POSITIVE HOLDER LIGHT switch ON.
- o. Set lensboard and copyboard counters to required settings.
- p. Determine lens requirement.
- q. Mount the lens assembly in the lensboard assembly.
- r. Determine and set f/stop.
- s. Unlock and open vacuum back assembly.



- t. Lower and latch ground glass assembly.

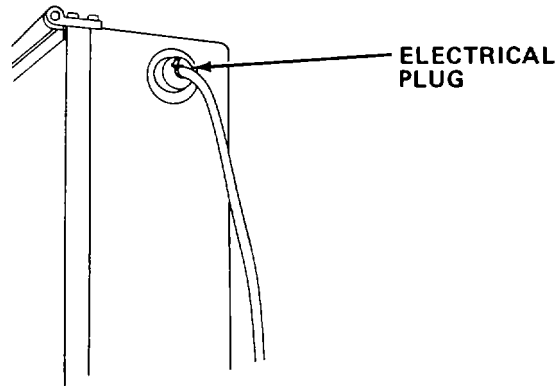
- u. Set darkroom SHUTTER switch to OPEN.
- v. Center image on ground glass.
- w. Set darkroom SHUTTER switch to CLOSE.
- x. Raise ground glass assembly.
- y. Determine new exposure time.
- z. Prepare darkroom for operation.



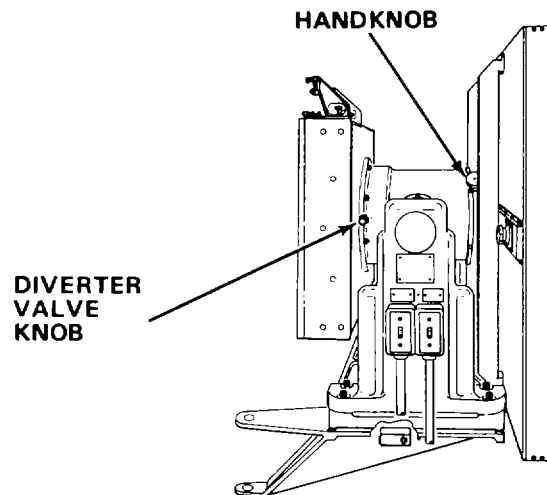
- aa. Mount film/paper on vacuum back.
- ab. Expose film/paper.

2-5.4 Reproducing from Negative or Positive Transparencies (Aerial Film).

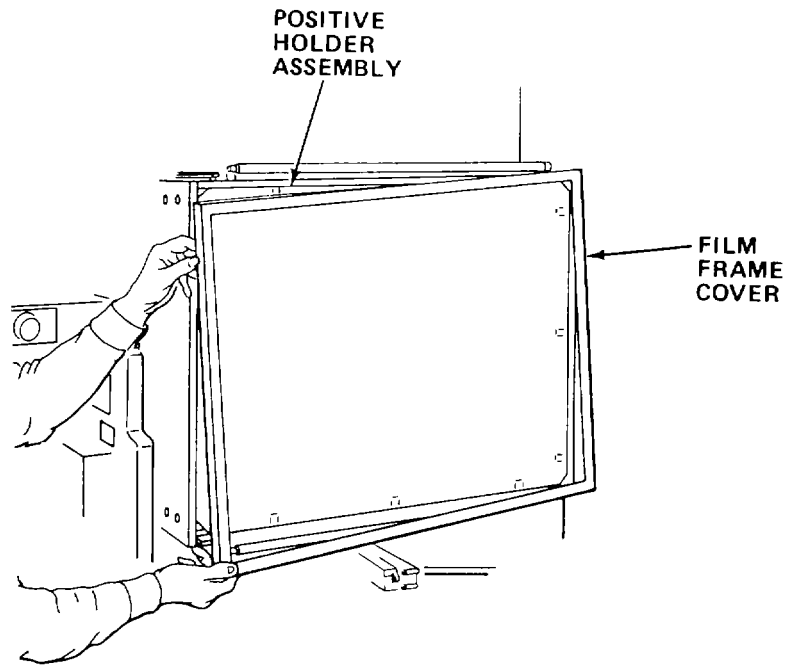
- a. Prepare the camera for operation under usual conditions (paragraphs 2-3, 2-4).
- b. Cut a piece of clear acetate that will cover the entire outer diffuser of the positive holder assembly.
- c. Rotate the positive holder assembly toward the lensboard assembly.



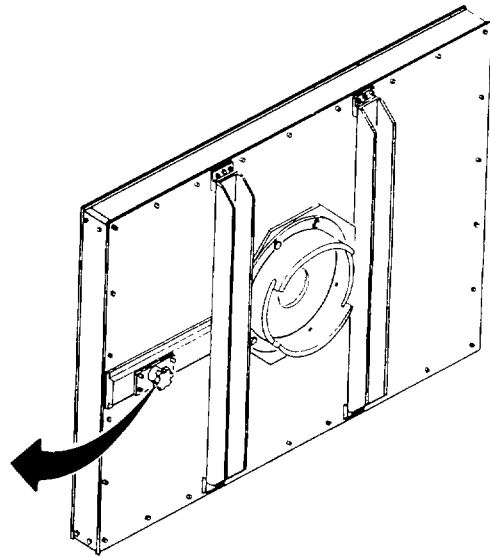
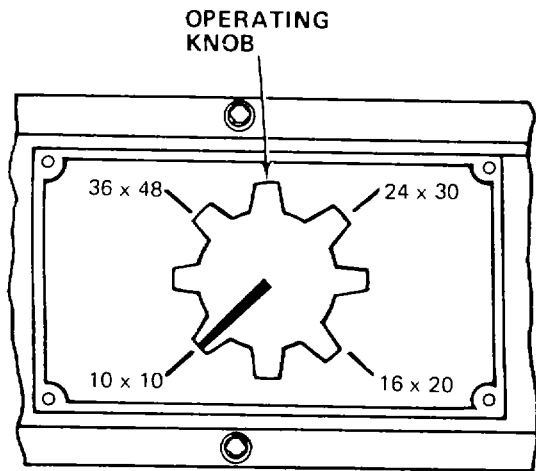
- d. Insert plug into light box of the positive holder assembly.



- e. Pull out the diverter valve knob to permit vacuum suction on the positive holder assembly.

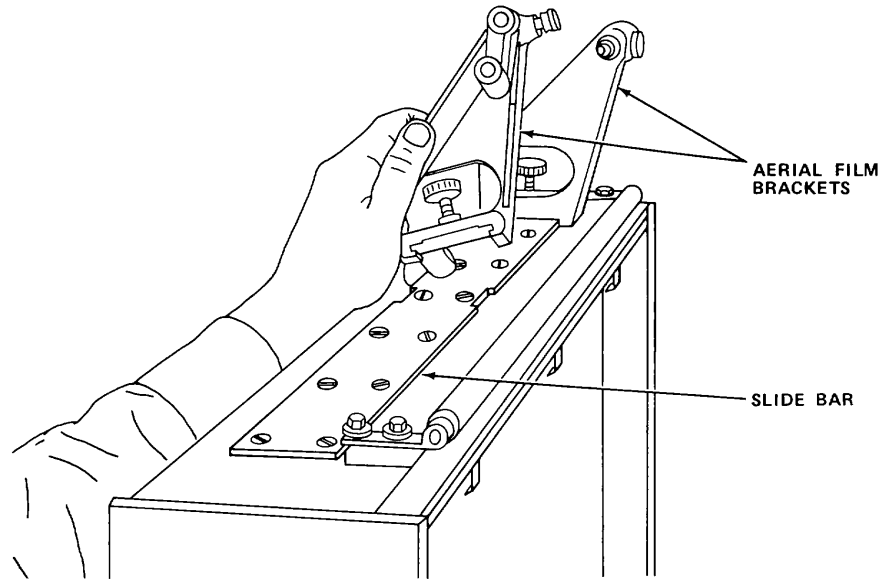


- f. Remove the film frame cover from the positive holder assembly.



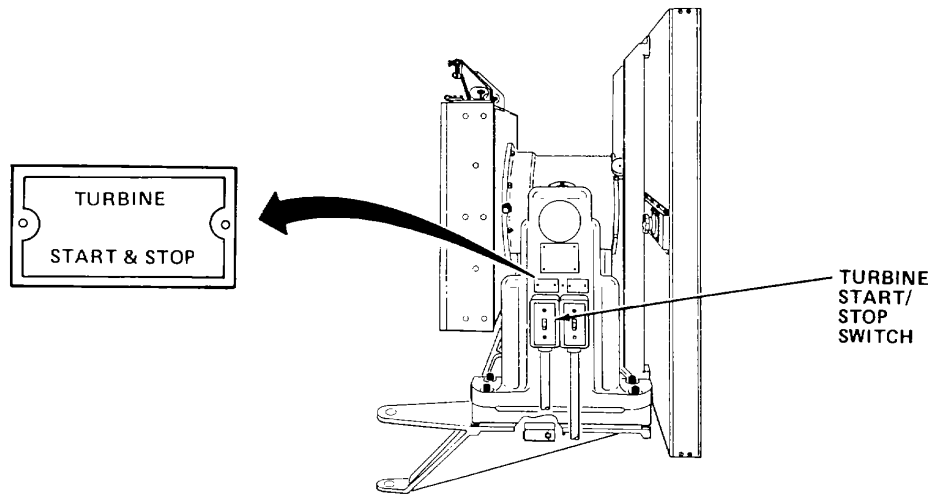
- g. Set the knob to 10 x 10.





- h. Place aerial film brackets in the top and bottom slide bar slots.
- i. Adjust aerial film brackets to length of film spools.
- j. Insert film spools on aerial film brackets.
- k. Adjust aerial film brackets for proper film spool fit.
- l. Tighten aerial film bracket(s) thumbscrew(s).
- m. Pull film from spool over roller, across diffuser, over the other roller, and into takeup spool slot.
- n. Wind film until the frame to be reproduced is approximately centered on the positive holder assembly.

- o. Tighten lockscrews.



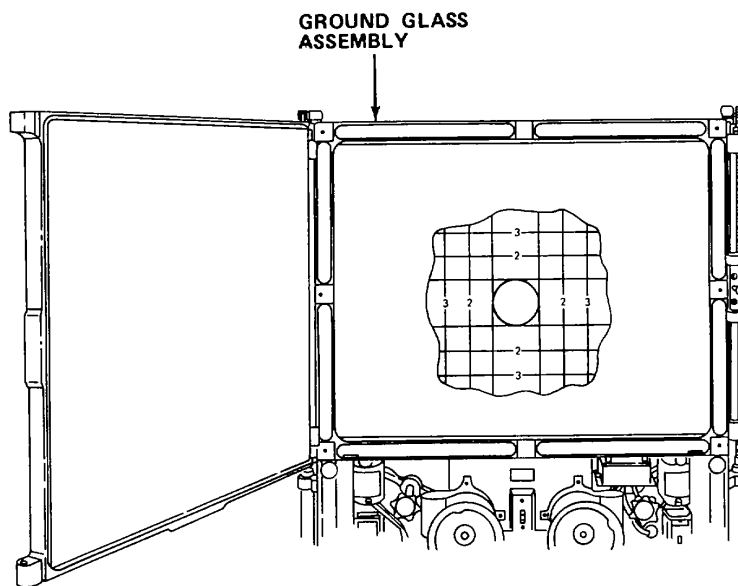
- p. Set copyboard TURBINE START and STOP switch ON.
- q. Cover all remaining diffuser areas with black masking paper.

**NOTE**

**Do not cover vacuum openings on the corners of the outer diffuser.**

- r. Cover the positive holder assembly outer diffuser with acetate.
- s. Smooth out any buckles or wrinkles.
- t. Install film frame cover.
- u. Set POSITIVE HOLDER LIGHT switch ON.
- v. Set lensboard and copyboard counters to required settings.
- w. Determine lens requirement.
- x. Mount lens assembly in the lensboard assembly.
- y. Determine and set f/stop.

- z. Unlock and open vacuum back assembly.



- aa. Lower and latch ground glass assembly.
- ab. Set darkroom SHUTTER switch to OPEN.
- ac. Center image on ground glass assembly.
- ad. Set darkroom SHUTTER switch to CLOSE.
- ae. Raise ground glass assembly.
- af. Determine new exposure time.
- ag. Prepare darkroom for operation.
- ah. Mount film/paper on vacuum plate.
- ai. Expose film/paper.

**2-6 OPERATION OF AUXILIARY EQUIPMENT.**

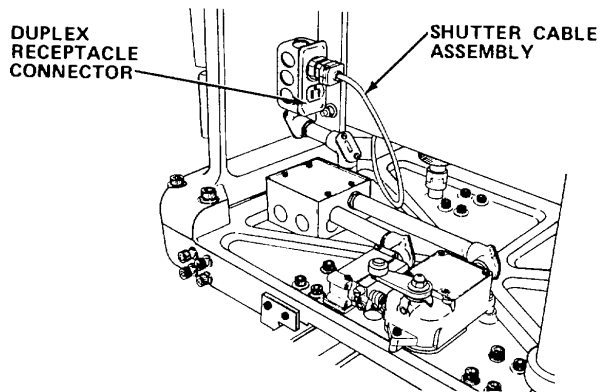
Refer to TM 5-3610-257-14, Operator's, Organizational, Direct Support and General Support Maintenance Manual, Topographic Support System Camera Section for operating procedures for the digital reflection densitometer and the Light Integrating Exposure Control Instrument.

**2-7 PREPARATION FOR MOVEMENT.**

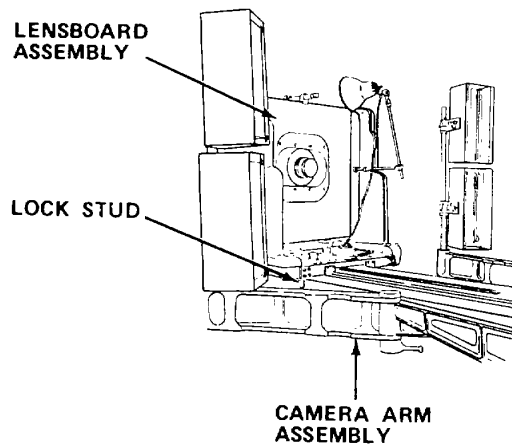
- a. Perform After Use PMCS.

**CAUTION**

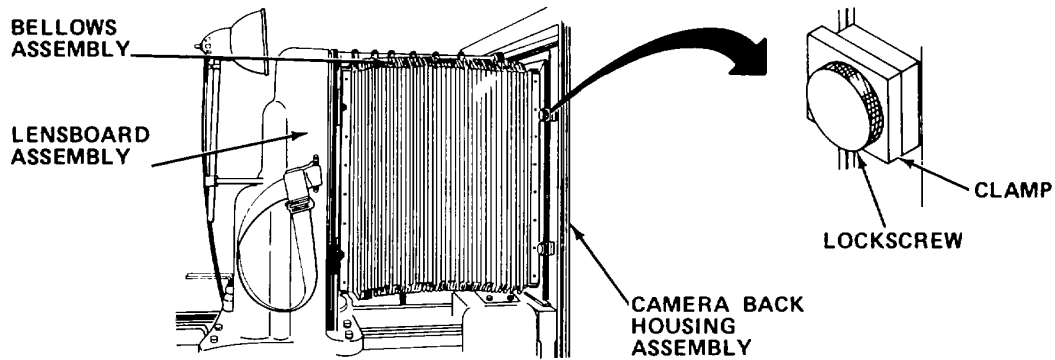
Remove bellows assembly from camera back housing assembly. Fasten securely with strap against lensboard assembly before lowering camera into transit position. Failure to do so will result in damage to bellows assembly.



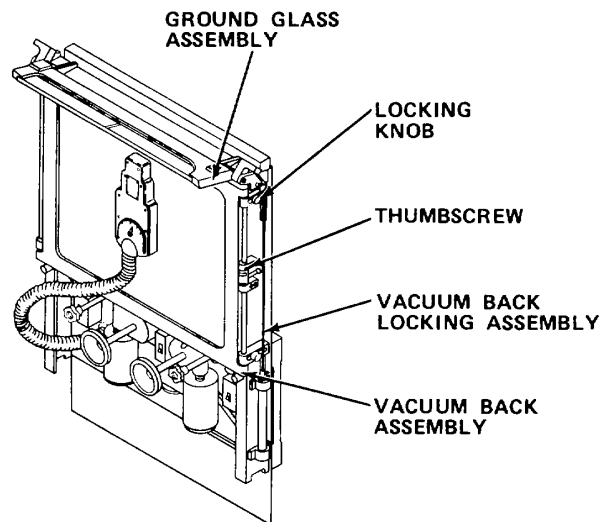
- b. Unplug shutter cable assembly.
- c. Carefully store reproduction charts in chest assembly.
- d. Remove pulsed xenon lamps from camera, and secure in lamp storage rack assembly. 2-62



- e. Secure camera arm assemblies to lensboard carriage assembly lock studs and secure with hex nuts.

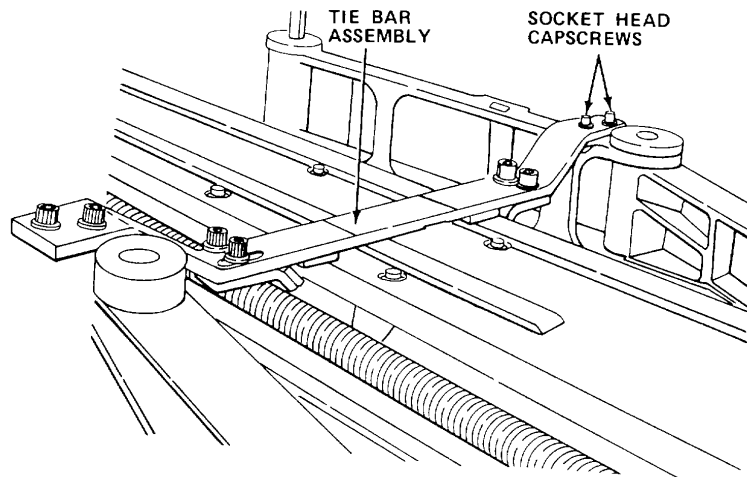


- f. Loosen bellows clamps, and carefully remove bellows assembly from camera back housing assembly.
- g. Slide bellows assembly toward lensboard assembly.
- h. Secure bellows assembly to lensboard assembly with strap. Be sure the bellows assembly is strapped tightly.
- i. Tighten the bellows clamps on the camera back housing assembly.

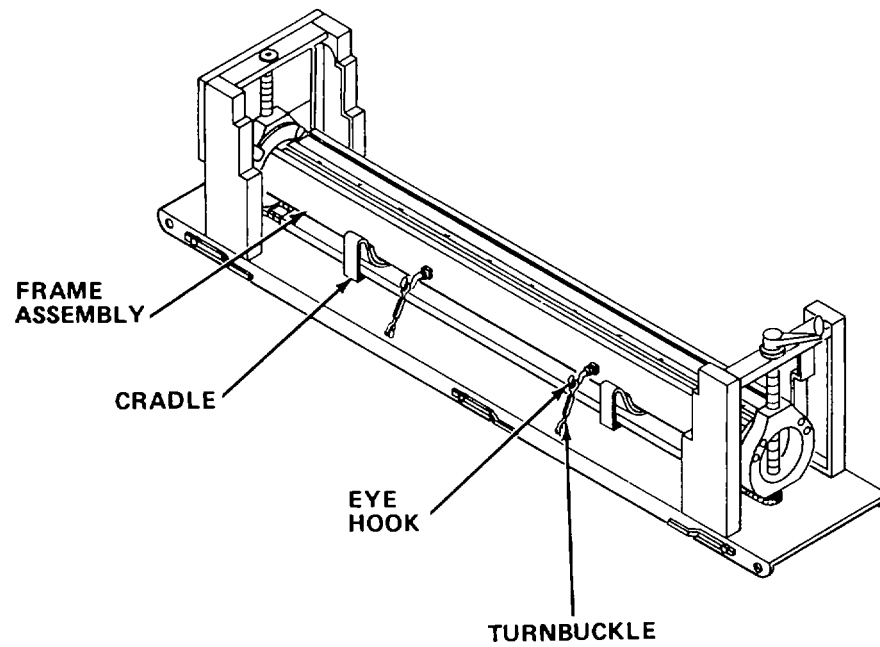


- j. Loosen locking knobs on vacuum back locking assembly and hinge slide plate.

- k. Pull vacuum back locking assembly and hinge slide plate out.
- l. Tighten locking knobs on vacuum back locking assembly and hinge slide plate.
- m. Unlock and open vacuum back assembly.
- n. Lower ground glass assembly.
- o. Close and lock vacuum back assembly, and tighten thumbscrew on vacuum back locking assembly.

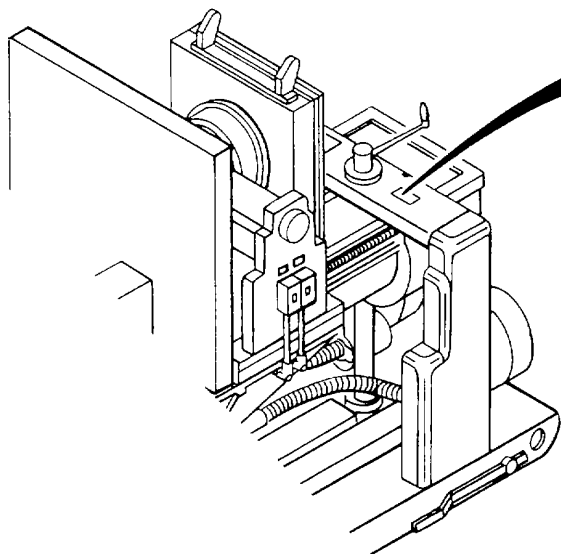


- p. Install tie bar assembly on camera arm assemblies.
- q. Retrieve the copyboard assembly support brackets and rods.
- r. Loosen copyboard handknobs and pivot copyboard assembly to a horizontal position. Then rotate the copyboard assembly 90 degrees horizontally.
- s. Install copyboard assembly support brackets and rods. Tighten securely with wingnuts. Be sure copyboard assembly remains horizontal.



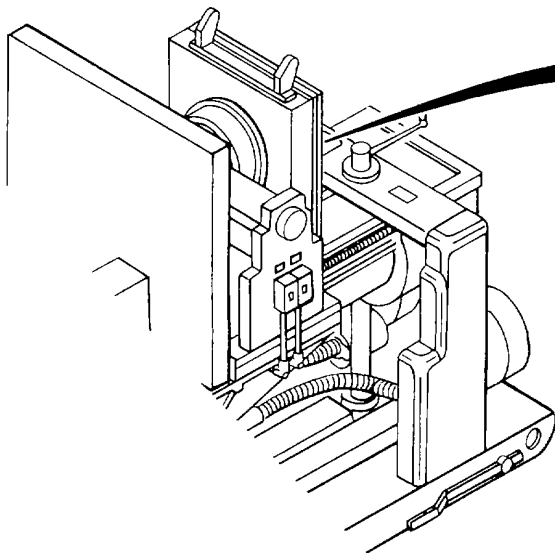
- t. Install crank handle on rear drivescrew.
- u. Lower camera to transit height.
- v. Attach turnbuckles to frame assembly; then tighten securely.
- w. Secure crank handle in tool box.

2-8 OPERATING INSTRUCTIONS ON DECALS AND INSTRUCTION PLATES.



**CAUTION**

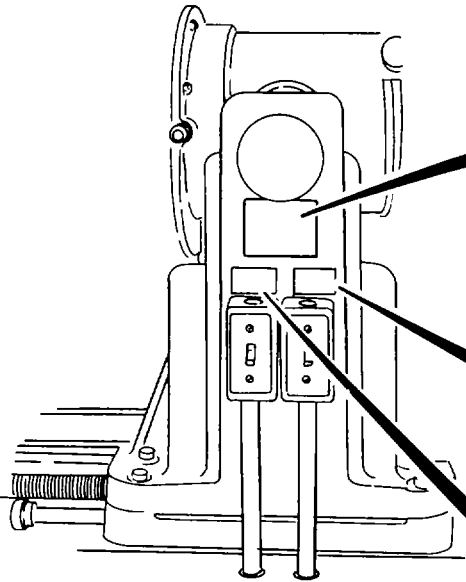
REMOVE BELLOWS FROM CAMERA BACK FRAME AND FASTEN WITH STRAP SECURELY AGAINST LENS BOARD BEFORE LOWERING CAMERA INTO TRANSIT POSITION. REMOVE CRANK HANDLE AFTER RAISING OR LOWERING CAMERA AND STORE IN TOOL BOX.



**CAUTION**

WHEN RAISING CAMERA TO OPERATING POSITION DO NOT EXCEED HEIGHT INDICATED BY POINTER.



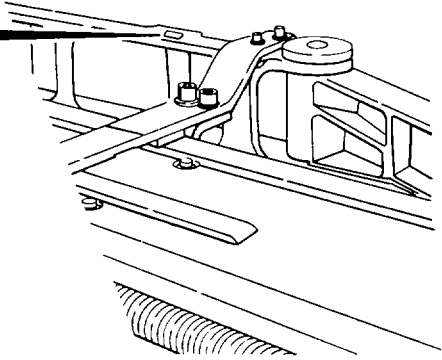


**CAUTION**  
REMOVE PLUG FROM  
TRANSPARENCY HOLDER  
LIGHT BOX BEFORE  
ROTATING COPY-  
BOARD ASSEMBLY

POSITIVE  
HOLDER  
LIGHT

TURBINE  
START & STOP

**CAUTION**  
SECURE RED  
SHIPPING BRACKET  
BEFORE TRANSIT



**Section IV OPERATION UNDER UNUSUAL CONDITIONS****2-9 OPERATION IN UNUSUAL WEATHER.**

a. If the camera has been subjected to subzero temperatures, allow the camera to warm to room temperature before beginning operations. Subzero temperatures will thicken most lubricants and make most materials brittle. As the lens assemblies warm to room temperature, condensation forms on the lens. This condensation will evaporate as lens gets warmer.

b. High humidity causes rapid deterioration and fungus growth. Make frequent inspections and keep equipment dry.

c. If the camera must be operated near saltwater areas, clean the equipment daily to prevent corrosion. Keep electrical connections dry.

d. Operations in a desert present problems with sand entering the camera. Use an artist's brush to remove grit before operating camera.

**CHAPTER 3 OPERATOR MAINTENANCE INSTRUCTIONS****Section I LUBRICATION INSTRUCTIONS****3-1 CAMERA LUBRICATION.****WARNING**

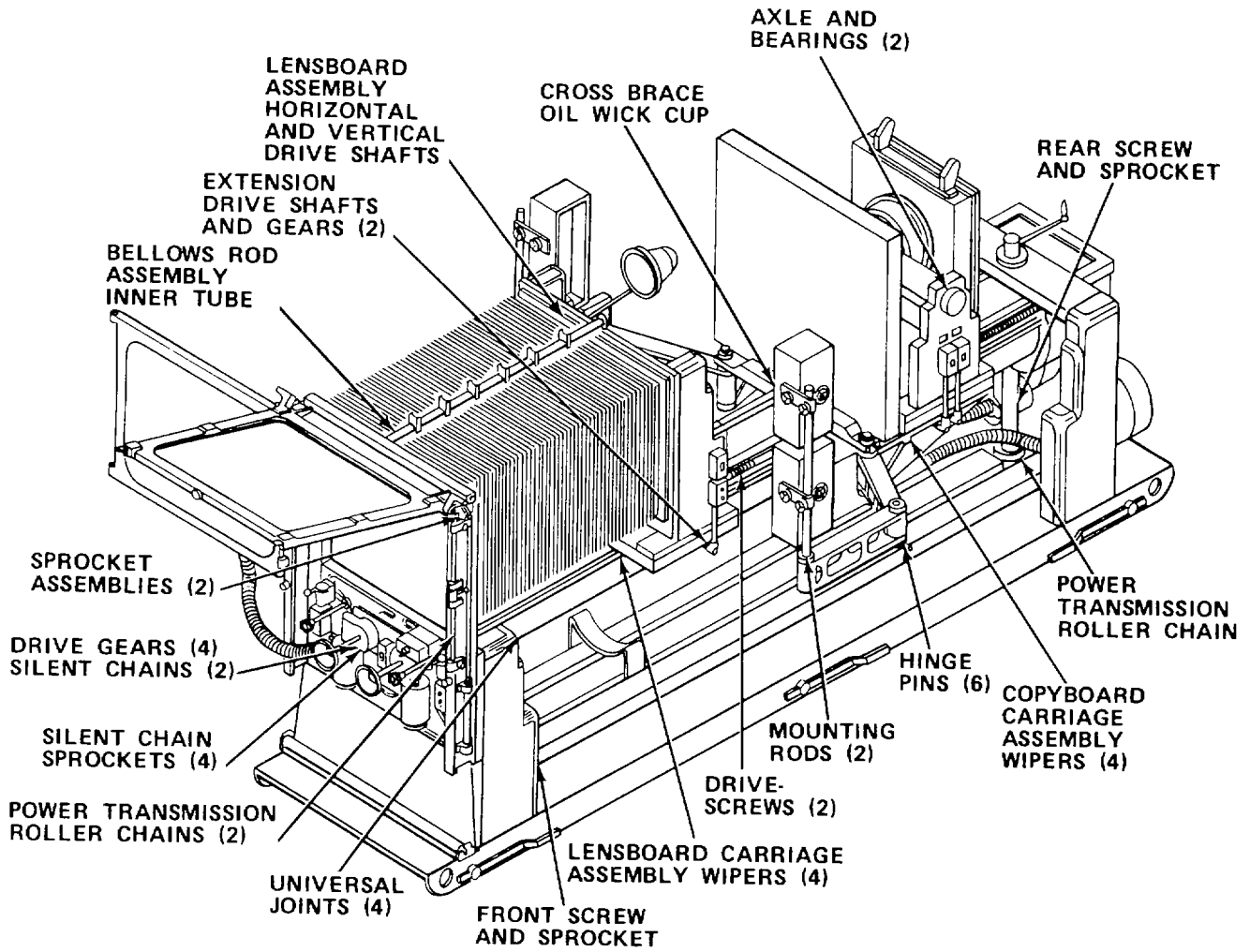
- Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Wear solvent-impermeable gloves and eye/face protective equipment when using solvent. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138 °F (38°C to 59°C).
- Death or serious injury may occur from electrical shock unless camera circuit breaker is turned off before servicing.

**CAUTION**

Optical equipment requires special care in lubrication. When a specified lubricant is called for, substitutions are not authorized. Minimum amounts of lubricant are to be used and all excess lubricant is to be immediately removed. Spray lubricants must not be used in the vicinity of optical equipment unless optics are completely protected. No lubricant is to be applied unless a thorough cleaning is conducted first to remove dirt, dust, or abrasive material.

**NOTE**

These lubrication instructions are mandatory.



ITEM	LUBRICANT	INTERVAL
Bellows Rod Assembly Inner Tube Assembly	PL-S	M Note 4, 5
Camera Arm Assembly Hinge Pins	PL-S	M Note 4
Camera Height Control Rear Drive Screw Front Drivescrew and Drive Sprockets	PL-S	Q Note 1, 3, 4
Copyboard Carriage Assembly Axle and Bearing Sleeves	PL-S	S Note 4
Counter Assembly Silent Chains and Sprockets	WD-40	Q Note 1, 2,
Cross Brace Rollers	PL-S	Q Note 4
Drive Gears and Drive Motor Gears	GAA	S Note 1, 4, 5
Frame Assembly	WD-40	D Note 4, 5
Ground Glass Assembly Power Transmission Chain	WD-40	M Note 2, 4 3
Lensboard and Copyboard Carriage Assembly Drivescrews and Universal Joints	GAA	Q Note 1, 3, 4, 5
Lensboard Assembly Extension Shafts, Driven and Drive Gears	GAA	Q Note 1, 4
Lensboard and Copyboard Carriage Assembly Wipers	PL-S	Q Note 4
Lensboard Assembly Horizontal Drive Shaft	PL-S	Q Note 1, 3, 4, 5
Lensboard Assembly Vertical Drive Shaft	PL-S	Q Note 1, 3, 4, 5
Mounting Rod Assemblies	PL-S	D Note 4, 5
Camera Rails	PL-S	D Note 5

**KEY**

**Lubricants specified on chart are for temperature above -65°F.**

LUBRICANTS	EXPECTED TEMPERATURE	INTERVAL
Automotive and Artillery Grease GAA	-65°F TO 225°F	D-Daily M-Monthly Q-Quarterly S-Semiannually
General Purpose Lubricating Oil PL-S		
Lubricating Oil WD-40		

**NOTES:**

1. Use cleaning solvent to clean or wash all parts. Dry parts thoroughly before applying lubricant. Apply a light grade of oil to all polished metal surfaces to prevent rusting.
2. When spraying chains, make sure lubricant enters the inner crevices of the chains.
3. Lubricate entire drivescrews with oil-saturated cheesecloth.
4. Operate immediately after lubrication to distribute lubricant evenly to friction surfaces.
5. Lubricate with oil-saturated cheesecloth.

**Section II TROUBLESHOOTING PROCEDURES**

**3-2 INTRODUCTION.**

a. The table lists the common malfunctions which you may find during operation or maintenance of the copying camera, or its components. You should perform the test/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all test or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

Table 3-1. TROUBLESHOOTING

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. VACUUM PLATE FAILS TO HOLD FILM PROPERLY.	Step 1. Check for improper selection of vacuum back control valve opening.	<ul style="list-style-type: none"> <li>a. Measure film size and move vacuum back control valve to a position best suited to hold film.</li> <li>b. If film is still not adhering to vacuum plate properly, proceed to step 2.</li> </ul>
	Step 2. Check for damaged air duct hose and loose hose clamps.	Refer to organizational maintenance.
2. COPYBOARD FAILS TO PROPERLY HOLD COPY.	Step 1. Copyboard suction not properly directed.	<ul style="list-style-type: none"> <li>a. Measure copy size and move knob to correct position.</li> <li>b. If copy is not being held properly, proceed to step 2.</li> </ul>
	Step 2. Check for damaged air duct hose or loose hose clamps.	Refer to organizational maintenance.
3. IMAGE OUT OF FOCUS ON GROUND GLASS ASSEMBLY.	Step 1. Camera not optically aligned.	Refer to organizational maintenance.
	Step 2. Verify ground glass assembly magnet plates rest solidly against magnet latches.	Refer to organizational maintenance.

Table 3-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4.	PULSED XENON LAMP DOES NOT LIGHT.	
	Step 1. Check to see if power cord is plugged into power supply assembly.	
	a. Plug in power cord.	
	b. If pulsed xenon lamp does not light, proceed to step 2.	
	Step 2. Pulsed xenon lamp flash tube defective.	
		Replace pulsed xenon lamp flash tube (subparagraph 3-3.1).

**Section III MAINTENANCE PROCEDURES**

**3-3 MAINTENANCE PROCEDURES.**

a. This section contains instructions covering operator maintenance functions for the copying camera. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

**INDEX**

PROCEDURES	PARAGRAPH
Replace Pulsed Xenon Lamp Flash Tube .....	3-3.1



3-3.1 Replace Pulsed Xenon Lamp Flash Tube.

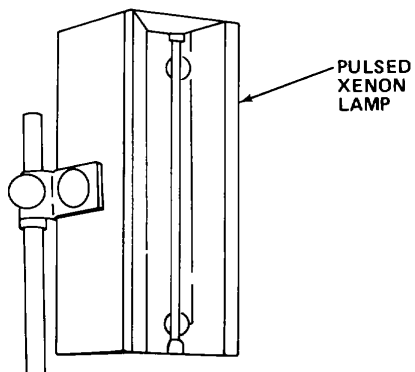
MOS: 83E, Photo and Layout Specialist

TOOLS: Flat tip Screwdriver

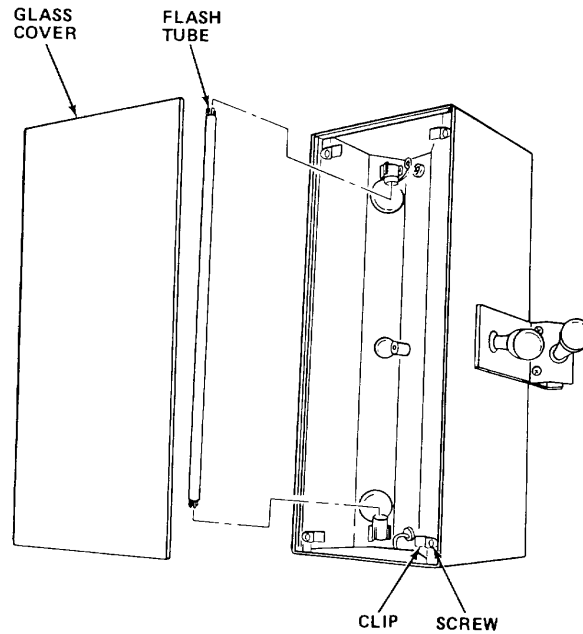
SUPPLIES: Flash Tube  
 Cheesecloth (Item 5, Appendix E)  
 Isopropyl Alcohol (Item 3, Appendix E)  
 Disposable Gloves (Item 14, Appendix E)  
 Glass Cleaner (Item 13, Appendix E)

**WARNING**

- **Death or serious injury may occur from electrical shock unless pulsed xenon lamp is disconnected from power supply assembly.**
- **Serious burns may occur if pulsed xenon lamp flash tubes are removed when hot. Allow flash tubes to cool before removal.**
- **Avoid looking at lighted pulsed xenon lamps. Serious damage to eyes may occur.**
  - a. Disconnect pulsed xenon lamp cable from power supply assembly.



- b. Rotate pulsed xenon lamp.



- c. Remove glass cover.
- d. Remove defective flash tube.

**NOTE**

**Wear disposable gloves.**

- e. Clean replacement flash tube with cheesecloth and alcohol.
- f. Install replacement flash tube.
- g. Clean glass cover with cheesecloth and glass cleaner.
- h. Install glass cover.
- i. Rotate pulsed xenon lamp to original position.
- j. Reconnect pulsed xenon lamp cable to power supply assembly.

## CHAPTER 4 ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

### Section I REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

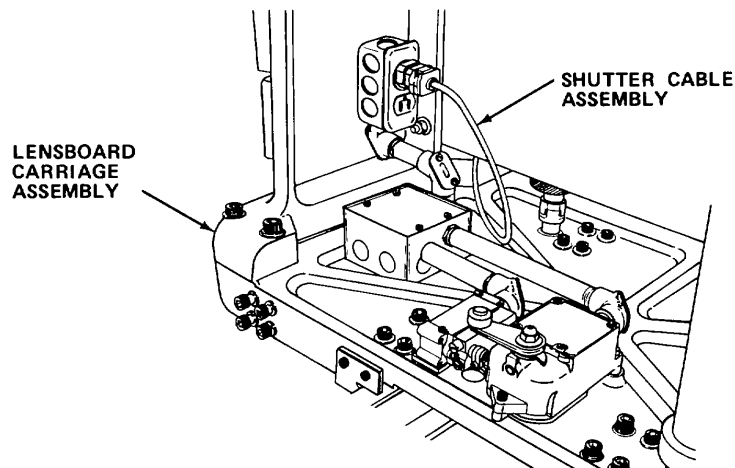
**4-1 COMMON TOOLS AND EQUIPMENT.** For authorized common tools and equipment, refer to the Table of Organization and Equipment (TOE) applicable to your unit.

**4-2 SPECIAL TOOLS; TMDE, AND SUPPORT EQUIPMENT.** Special Tools; TMDE, and Support Equipment is listed in the applicable repair parts and special tools list and in Appendix B of this manual.

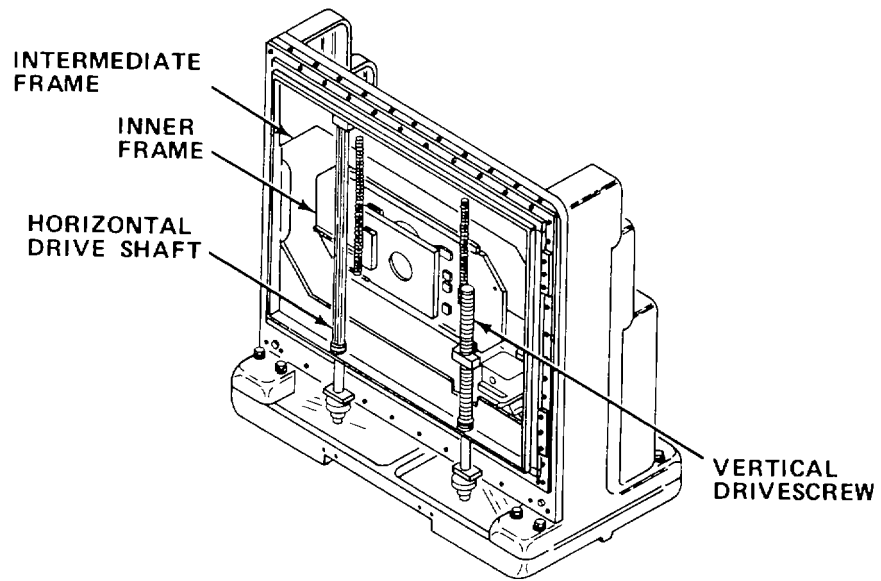
**4-3 REPAIR PARTS.** Repair parts are listed in the Repair Parts and Special Tools List, TM 5-3610-258-24P covering organizational maintenance for this equipment.

### Section II SERVICE UPON RECEIPT

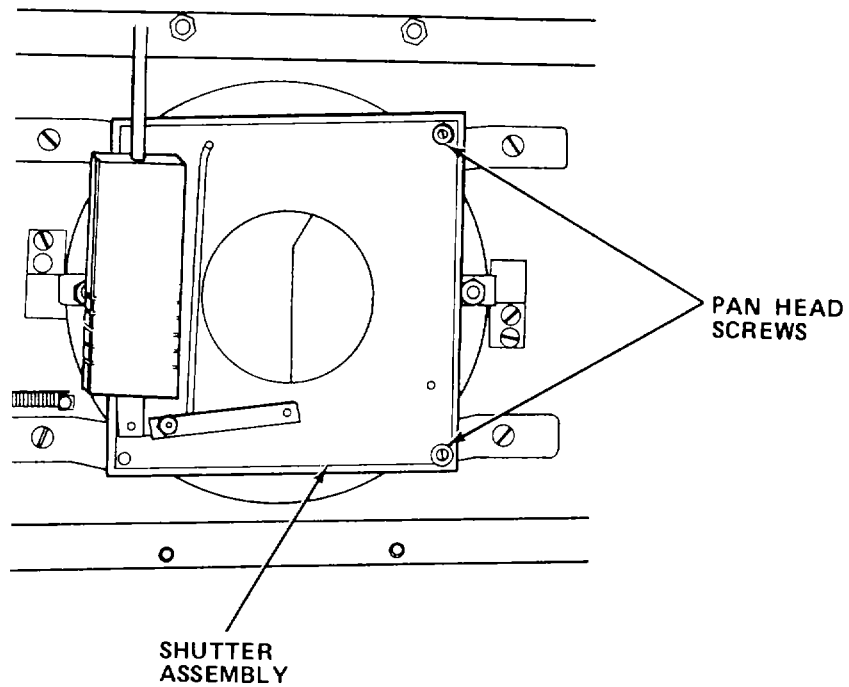
#### 4-4 PRELIMINARY SERVICING AND ADJUSTMENT OF CAMERA.



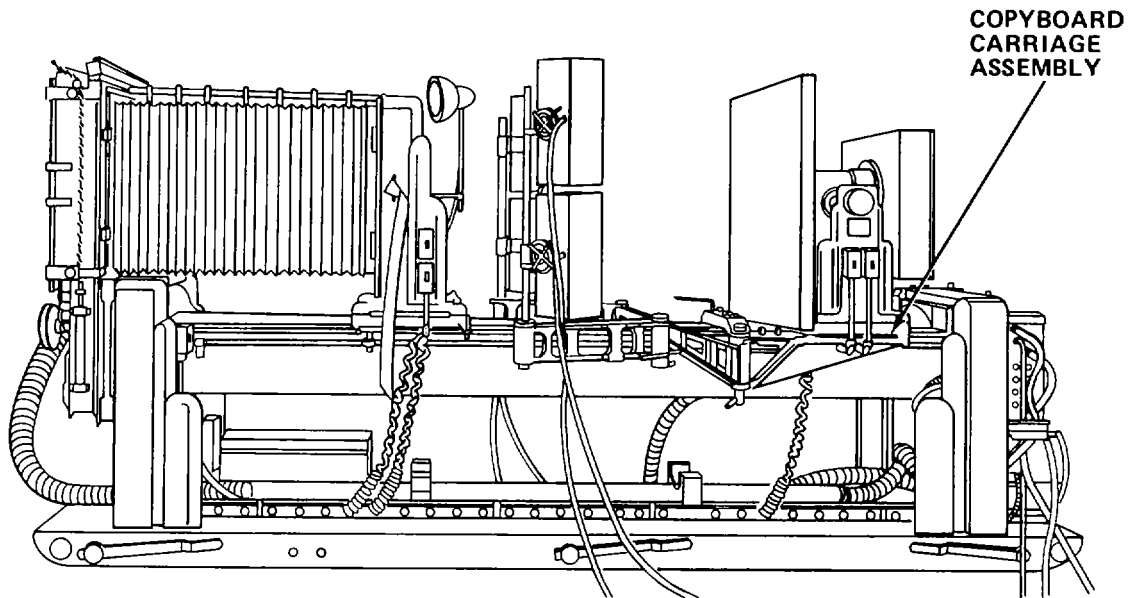
- a. Check lensboard carriage assembly for loose hardware.
- b. Check lensboard carriage assembly for side-to-side movement. It should not move.



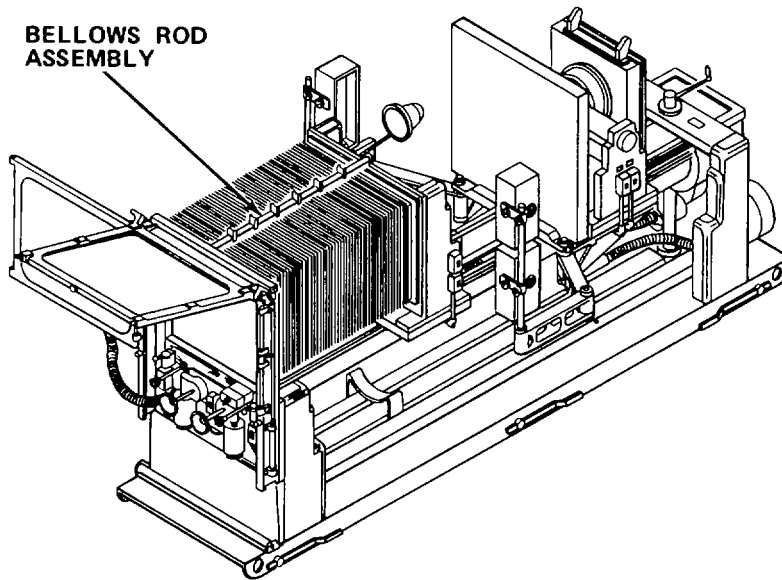
- c. Inspect intermediate and inner frame of lensboard assembly for damage.
- d. Inspect lensboard assembly horizontal shaft and vertical drivescrew for damage.



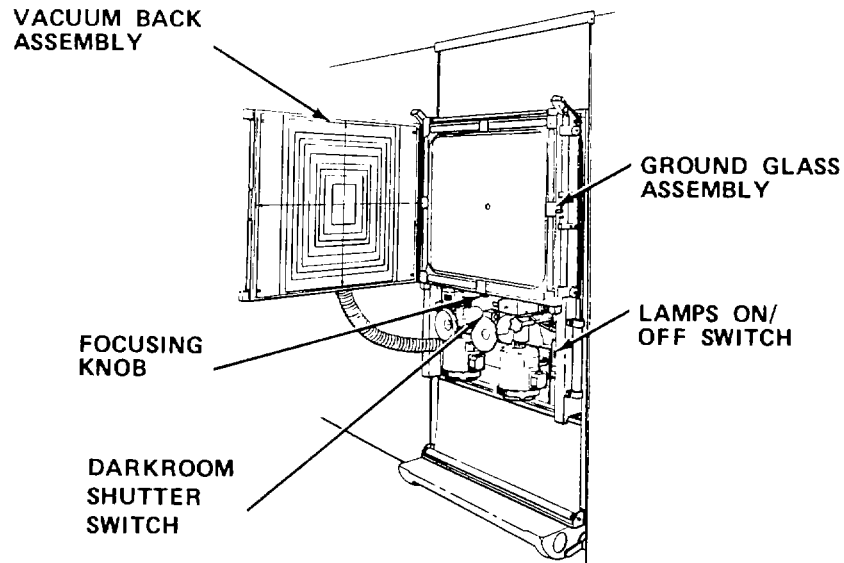
- e. Inspect shutter assembly for loose hardware and damage.



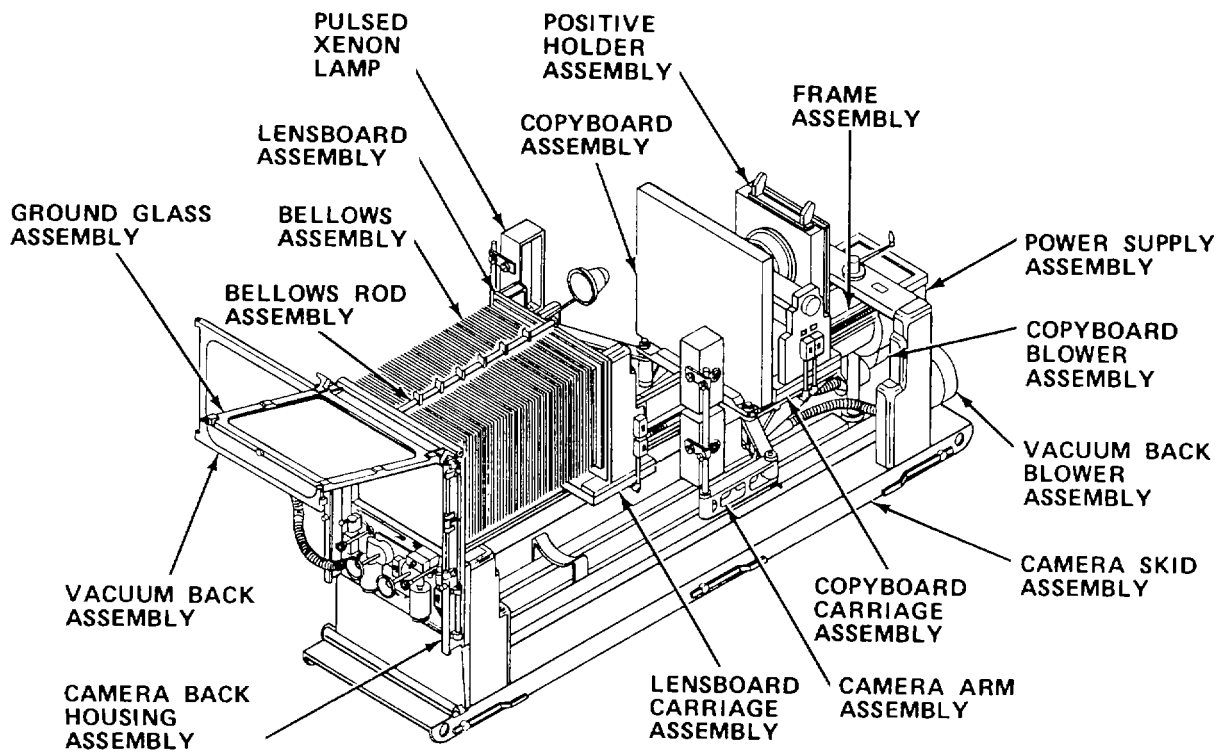
- f. Inspect copyboard carriage assembly for damage, or loose or missing hardware.
- g. Check copyboard carriage assembly for side-to-side movement. It should not move.



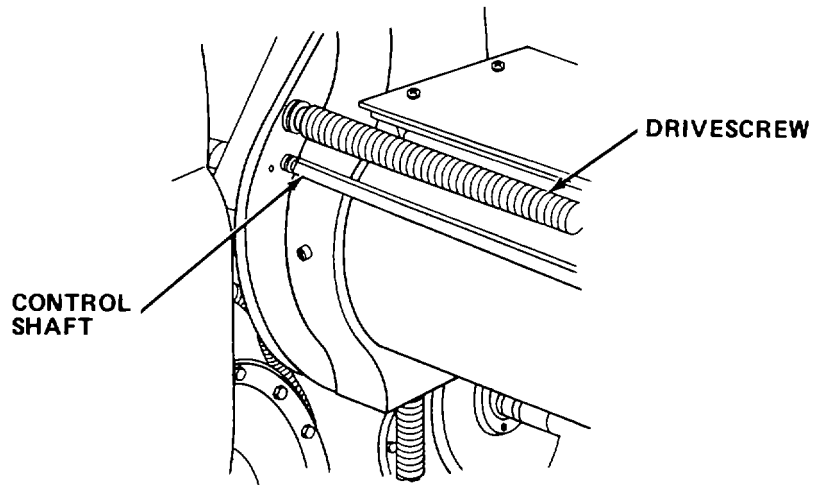
- h. Inspect bellows rod assembly for damage or missing hardware.



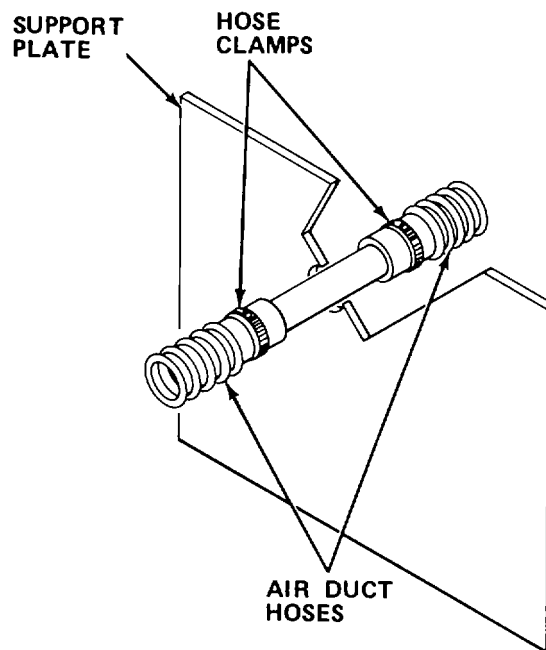
- i. Inspect camera back housing assembly for damage and loose or missing hardware.



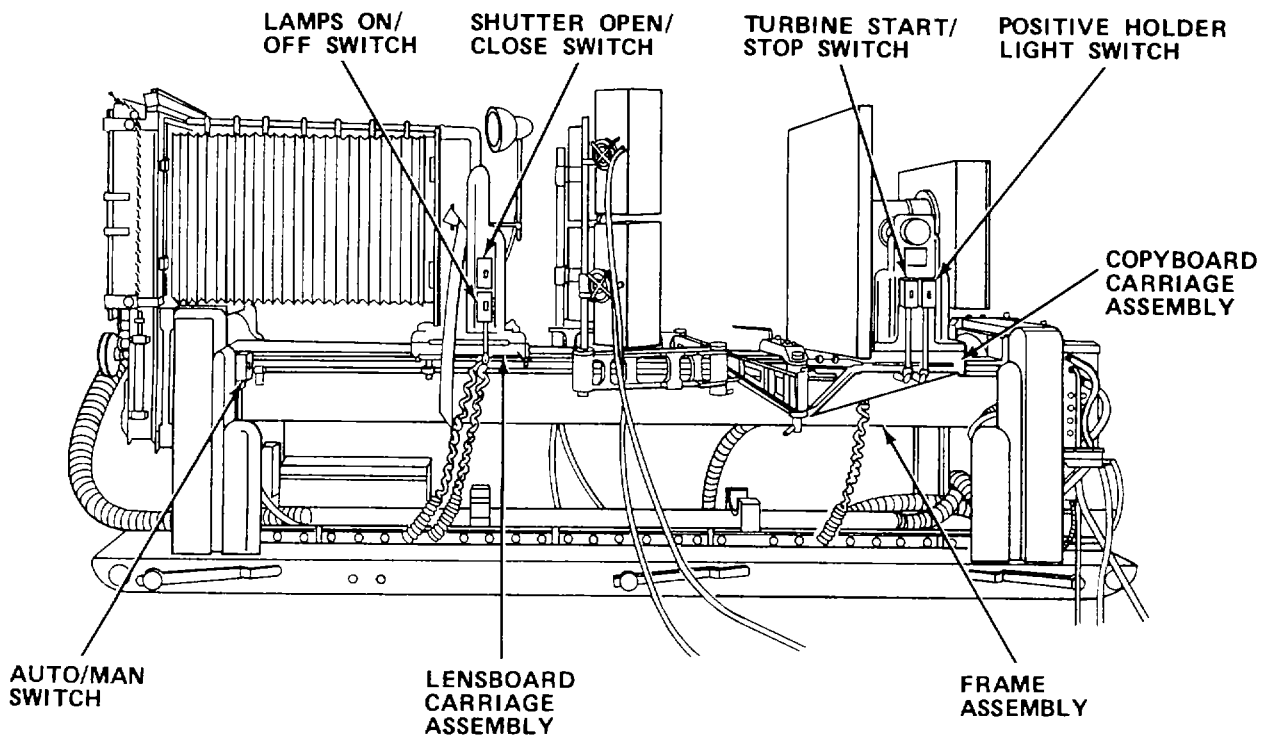
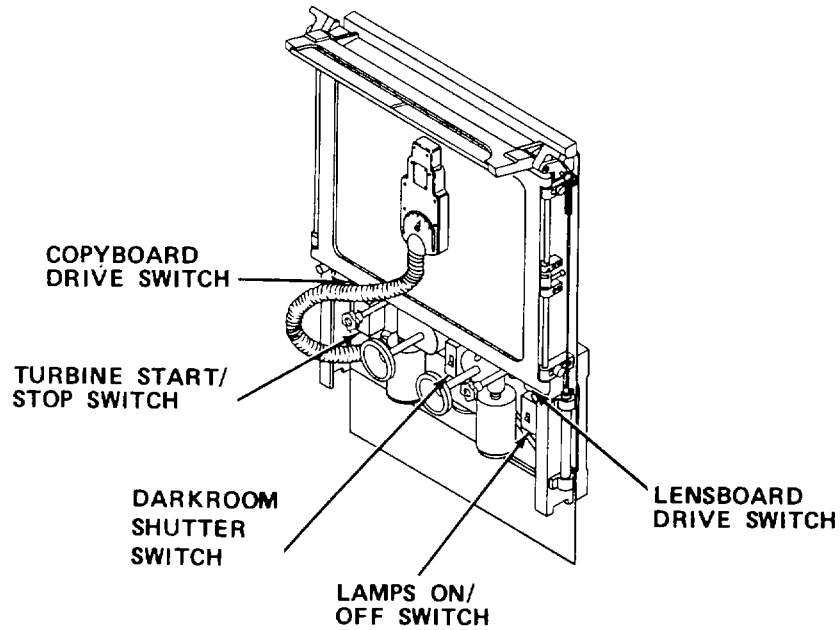
- j. Inspect camera arm assemblies for damage.
- k. Inspect frame assembly and camera skid assembly for damage and loose or missing hardware.



- l. Inspect camera drivescrews and control shafts for damage.
- m. Inspect handwheels for damage.
- n. Inspect drive motors and counter assembly for damage.



- o. Inspect air duct hoses for damage.



- p. Inspect all switches for physical damage.
- q. Prepare camera for initial use (paragraph 2-3).
- r. Record all deficiencies on DA Form 2404, Equipment Maintenance and Inspection Worksheet.



**Section III ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES**

**4-5 INTRODUCTION.**

4-5.1 General. The copying camera must be inspected regularly to find and correct defects.

4-5.1.1 Annual. Always keep in mind the CAUTIONS and WARNINGS. Perform your annual (A)PMCS.

4-5.1.2 Semiannual. Always keep in mind the CAUTIONS and WARNINGS. Perform your semiannual (S)PMCS.

4-5.1.3 If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper form. See DA Pam 738-750 (TAMMS).

4-5.2 PMCS Procedures.

4-5.2.1 Item Number Column. Item numbers are assigned in chronological ascending sequence regardless of interval designation. These numbers are used for your "TM Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording the results of PMCS.

4-5.2.2 Interval Column. This column determines the time period designated to perform your PMCS.

4-5.2.3 Item to be Inspected and Procedures Column. This column lists functional groups and their respective assemblies and subassemblies as shown in the Maintenance Allocation Chart (Appendix B). The appropriate check or service procedure follows the specific item to be inspected.

4-5.2.4 List of Tools and Materials Required for PMCS.

<u>Item</u>	<u>Quantity</u>
Light Machine Repair Tool Kit	1 kt
Cheesecloth (Item 5, Appendix E)	ar
Optical Lens Cleaning Compound (Item 4, Appendix E)	ar

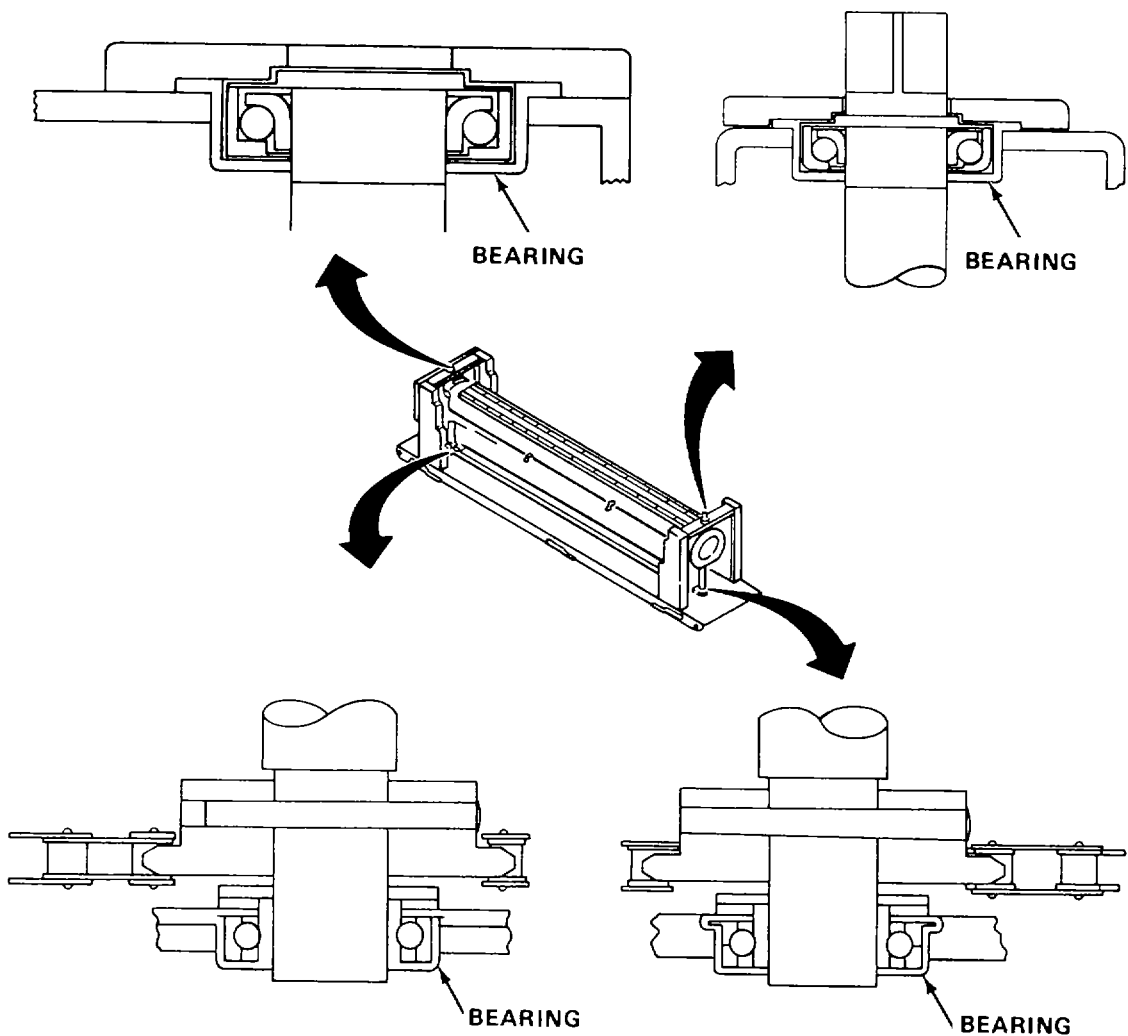
**Table 4-1. PREVENTIVE MAINTENACE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE
1	S	<p><b>Camera Height Control Bearings.</b></p> <p style="text-align: center;"><b>NOTE</b></p> <p style="text-align: center;"><b>Two personnel are required for this task.</b></p> <p>1. Move bellows assembly to transport position (paragraph 2-7f).</p> 

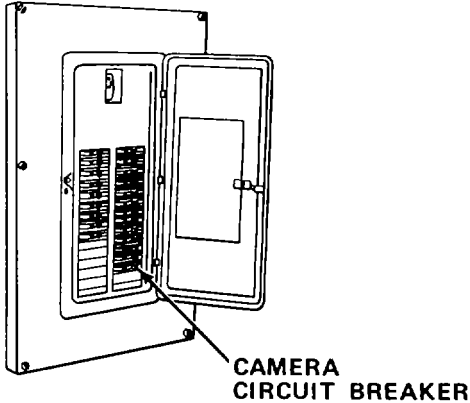
**Table 4-1. PREVENTIVE MAINTENACE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE
2	S	<p><b>Camera Height Control Bearings-Cont</b></p> <ol style="list-style-type: none"> <li>2. Place copyboard and lensboard assemblies in transport position (paragraph 2-7).</li> <li>3. Install crank handle.</li> <li>4. Slowly lower and raise frame assembly while listening for grinding noises from bearings.</li> <li>5. If grinding sounds are heard, notify higher authority.</li> <li>6. Remove crank handle and store.</li> <li>7. Move bellows assembly to operating position.</li> </ol> <p><b>Camera Drive Mechanism</b></p> <p style="text-align: center;"><b>WARNING</b></p> <p style="text-align: center;"><b>Death or serious injury may occur from electrical shock unless camera circuit breaker is off before servicing.</b></p> <p style="text-align: center;"><b>NOTE</b></p> <p style="text-align: center;"><b>Two personnel are required for this task.</b></p> <div style="text-align: center;">  </div> <ol style="list-style-type: none"> <li>1. Set camera circuit breaker on power panel OFF.</li> </ol>

**Table 4-1. PREVENTIVE MAINTENACE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

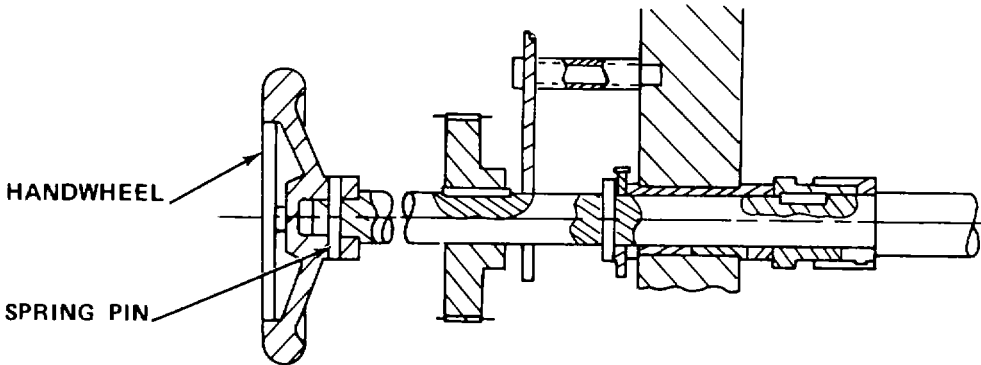
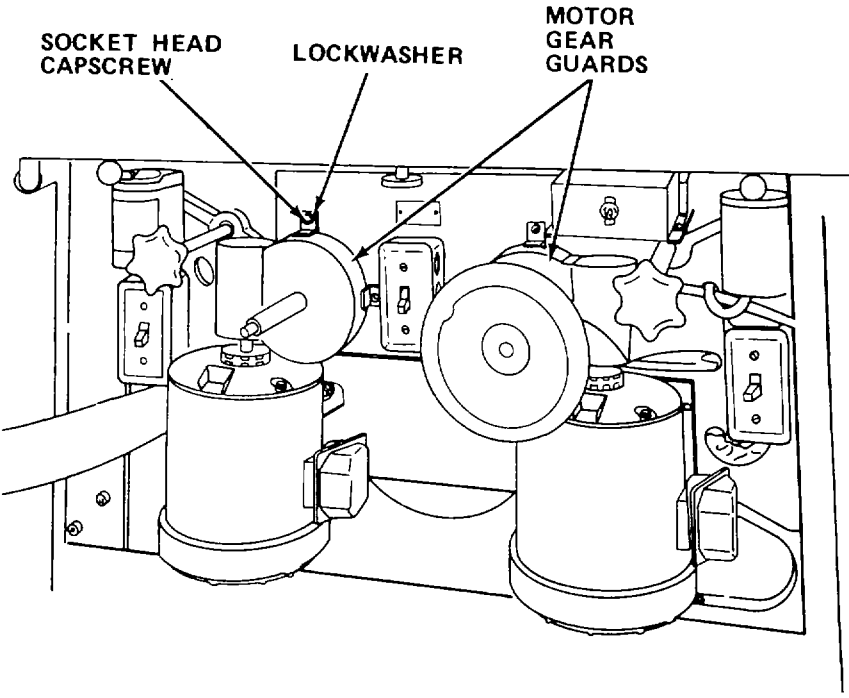
ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE
		<p><b>Camera Drive Mechanism - Cont</b></p>  <p>HANDWHEEL</p> <p>SPRING PIN</p> <p>2. Remove handwheels.</p>  <p>SOCKET HEAD CAPSCREW</p> <p>LOCKWASHER</p> <p>MOTOR GEAR GUARDS</p> <p>3. Remove motor gear guards.</p>

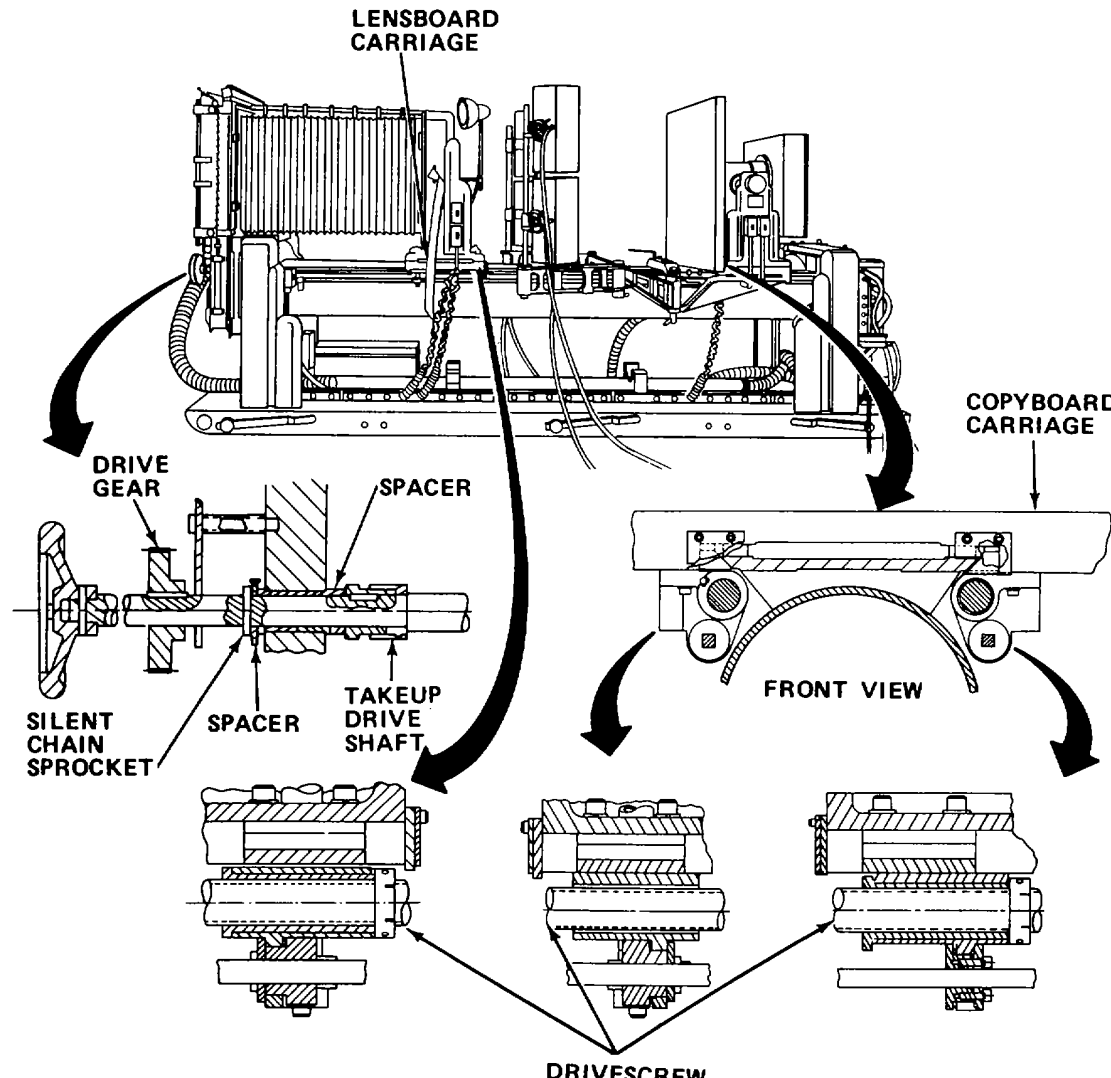
Table 4-1. PREVENTIVE MAINTENACE CHECKS AND SERVICES - Cont

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE
		<p><b>Camera Drive Mechanism - Cont</b></p>  <p>4. Check gears, drive shaft spacers, takeup drive shafts, drivescrews, silent chain, and idler adjustment arms for cracks, chipping, and burred edges.</p> <p>5. Install motor gear guard(s).</p> <p>6. Install handwheels.</p>

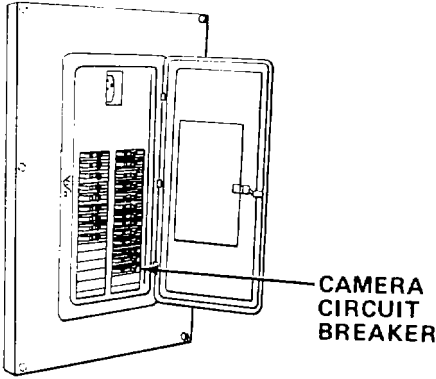
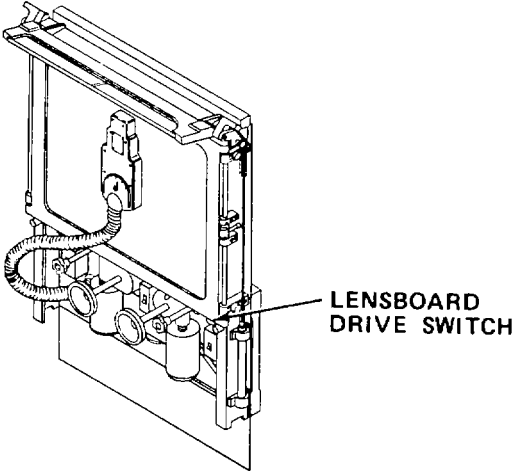
**Table 4-1. PREVENTIVE MAINTENACE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE
		<p><b>Camera Drive Mechanism - Cont</b></p>  <p>7. Set camera circuit breaker on power panel ON.</p>  <p>8. Hold LENSBOARD DRIVE switch to FWD position.</p>

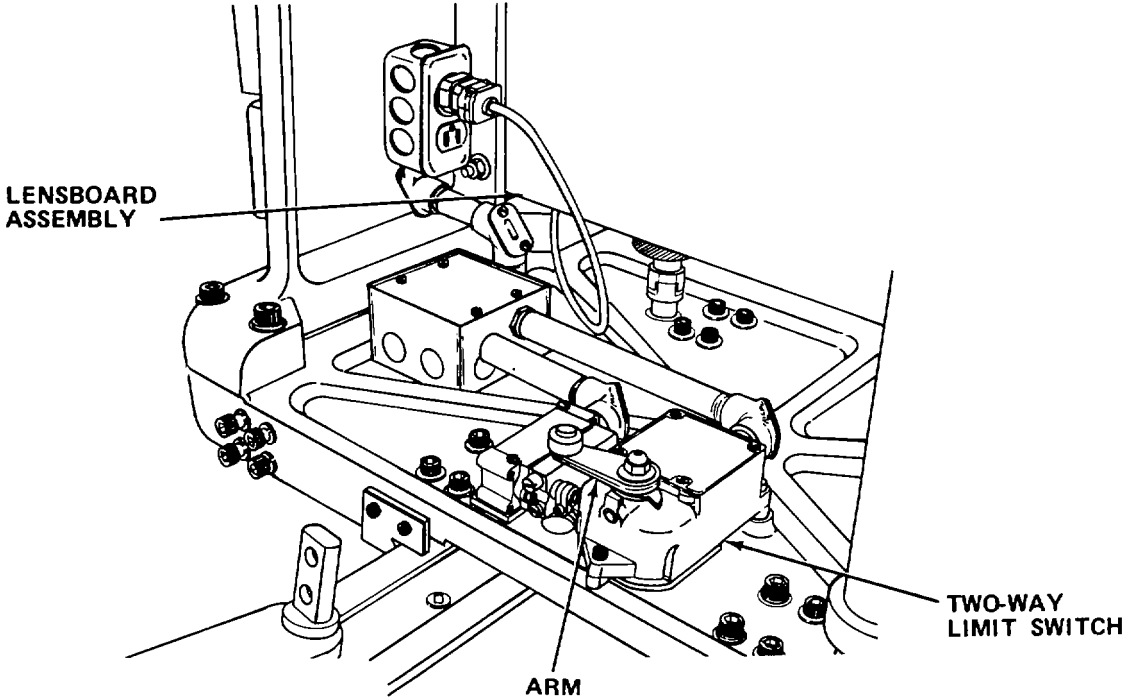
**Table 4-1. PREVENTIVE MAINTENACE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE
		<p><b>Camera Drive Mechanism - Cont</b></p>  <p>9. Swing two-way limit switch arm toward lensboard assembly. Lensboard carriage assembly should stop.</p> <p>10. Release two-way limit switch arm. Lensboard carriage assembly should move.</p>

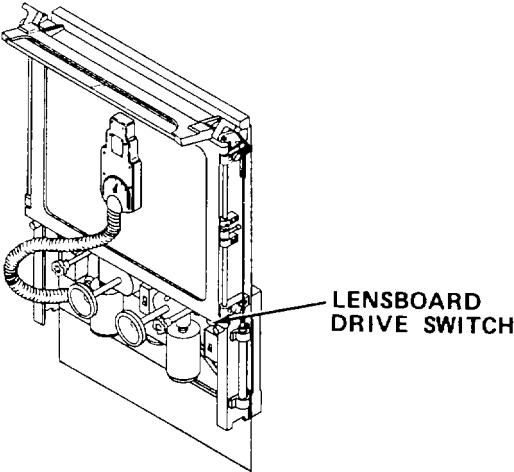
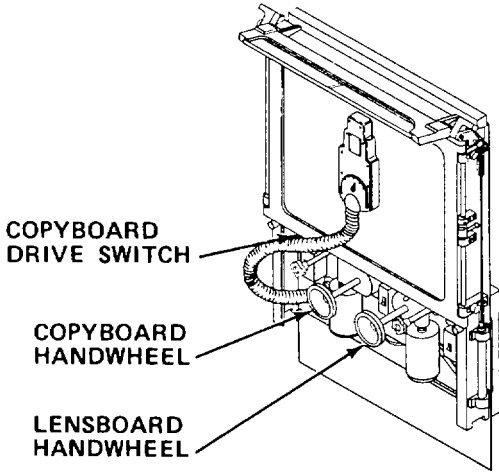
**Table 4-1. PREVENTIVE MAINTENACE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE
		<p><b>Camera Drive Mechanism - Cont</b></p>  <p>11. Release LENSBOARD DRIVE switch to OFF position; then hold LENSBOARD DRIVE switch in REV position. Lensboard carriage assembly should move backward until limit switch opens; then stop.</p> <p>12. Release LENSBOARD DRIVE switch to OFF.</p> 



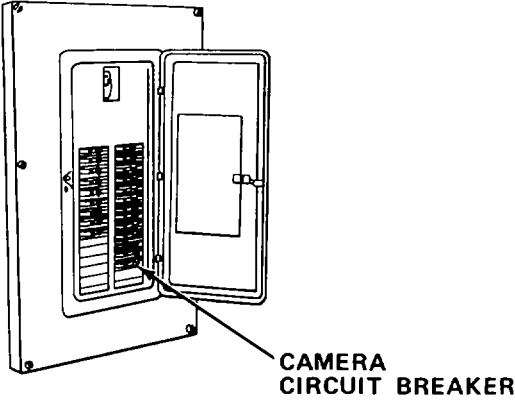
**Table 4-1. PREVENTIVE MAINTENACE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE
3	S	<p><b>Camera Drive Mechanism - Cont</b></p> <ol style="list-style-type: none"> <li>13. Hold COPYBOARD DRIVE switch in REV position. Copyboard carriage assembly should move backward until limit switch opens; then stop.</li> <li>14. Release COPYBOARD DRIVE switch to OFF position.</li> <li>15. Use lensboard and copyboard handwheels to move lensboard and copyboard forward about 6 in. (15.2 cm) to reset limit switches.</li> </ol> <p><b>Counter Assembly</b></p> <p style="text-align: center;"><b>WARNING</b></p> <p><b>Death or serious injury may occur from electrical shock unless camera circuit breaker is off before servicing.</b></p> <div style="text-align: center;">  <p><b>CAMERA CIRCUIT BREAKER</b></p> </div> <ol style="list-style-type: none"> <li>1. Set camera circuit breaker on power panel OFF.</li> </ol>

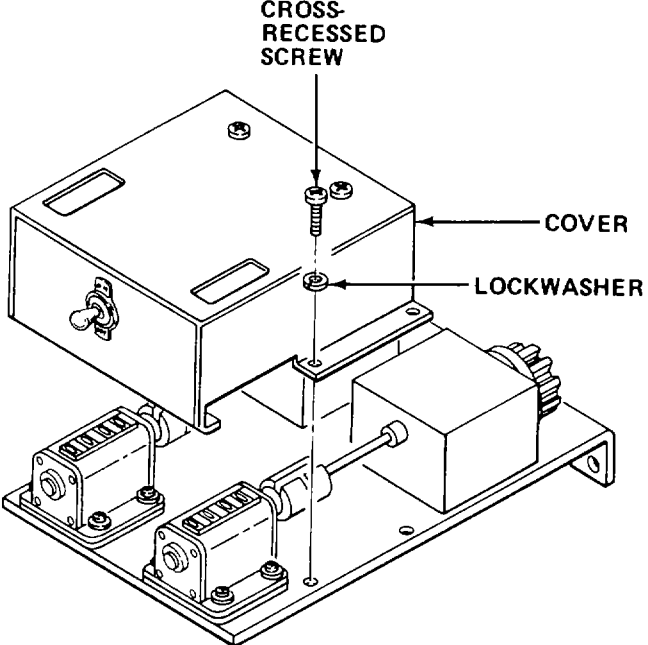
**Table 4-1. PREVENTIVE MAINTENACE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE
		<p><b>Counter Assembly - Cont</b></p>  <p><b>NOTE</b></p> <p><b>Do not break wires while lifting cover.</b></p> <p>2. Remove cover.</p>

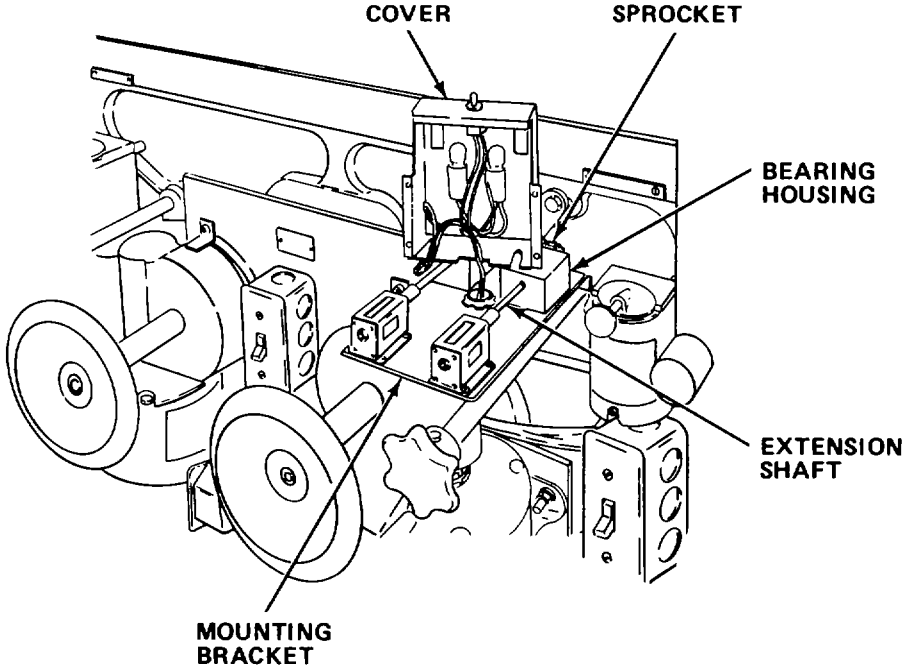
**Table 4-1. PREVENTIVE MAINTENACE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE
		<p><b>Counter Assembly - Cont</b></p>  <p>3. Check mounting bracket for cracks or corrosion.</p> <p>4. Check sprockets for worn or chipped teeth.</p> <p>5. Check bearing housing for wear in any area.</p> <p>6. Check extension shafts for splitting or cracks.</p> <p>7. Check gears and sprockets for proper alignment and mesh.</p> <p>8. Install cover.</p>

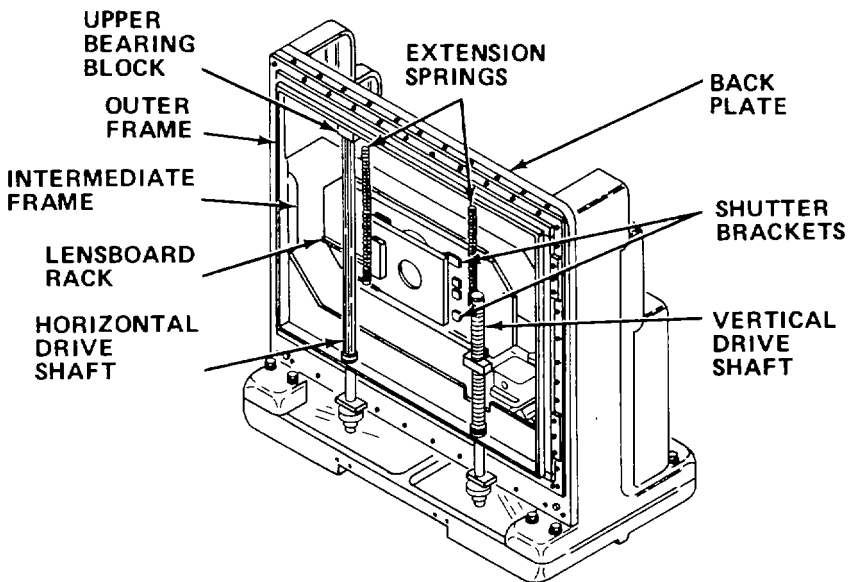
**Table 4-1. PREVENTIVE MAINTENACE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE
4	S	<p><b>Lensboard Assembly</b></p>  <ol style="list-style-type: none"> <li>1. Move bellows assembly to transport position (paragraph 2-7).</li> <li>2. Check back plate, intermediate frame, outer frame, and shutter brackets for wear and cracks.</li> <li>3. Check lensboard rack, vertical drivescrew and horizontal drive shaft for worn threads or chipped teeth.</li> <li>4. Check extension springs for tension.</li> <li>5. Check upper bearing block for loose screws.</li> <li>6. Report any discrepancies to higher authority for further action.</li> <li>7. Move bellows assembly to operational position.</li> </ol>

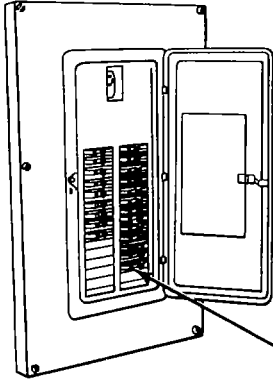
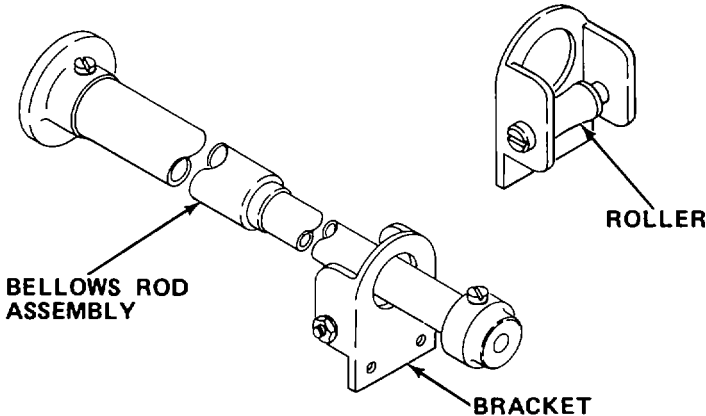
**Table 4-1. PREVENTIVE MAINTENACE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE
5	S	<p><b>Bellows Rod Assembly</b></p>  <p><b>CAMERA CIRCUIT BREAKER</b></p> <ol style="list-style-type: none"> <li>Set power panel camera circuit breaker ON.</li> </ol>  <p><b>BELLOWS ROD ASSEMBLY</b></p> <p><b>ROLLER</b></p> <p><b>BRACKET</b></p> <ol style="list-style-type: none"> <li>Check for cracks, splitting, scoring, uneven wear and flat spots.</li> </ol>

**Table 4-1. PREVENTIVE MAINTENACE CHECKS AND SERVICES - Cont**

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

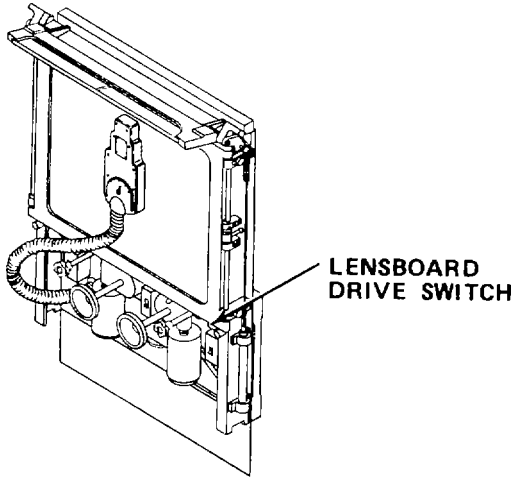
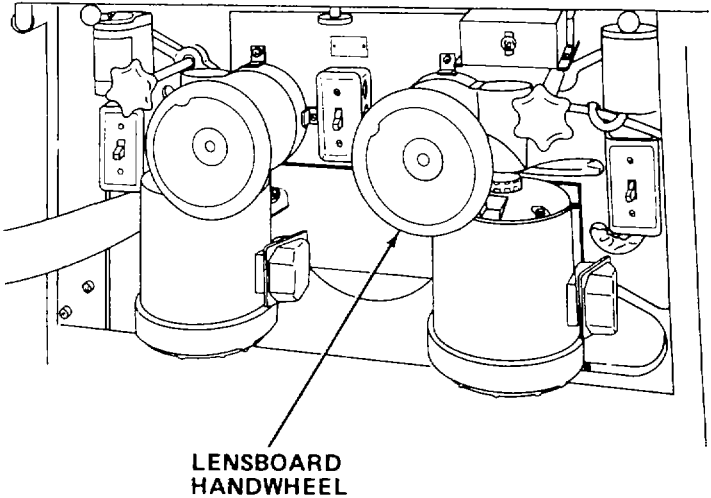
ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE
		<p><b>Bellows Rod Assembly - Cont</b></p>  <p>3. Hold LENSBOARD DRIVE switch in FWD position until bellows assembly is fully extended.</p> 

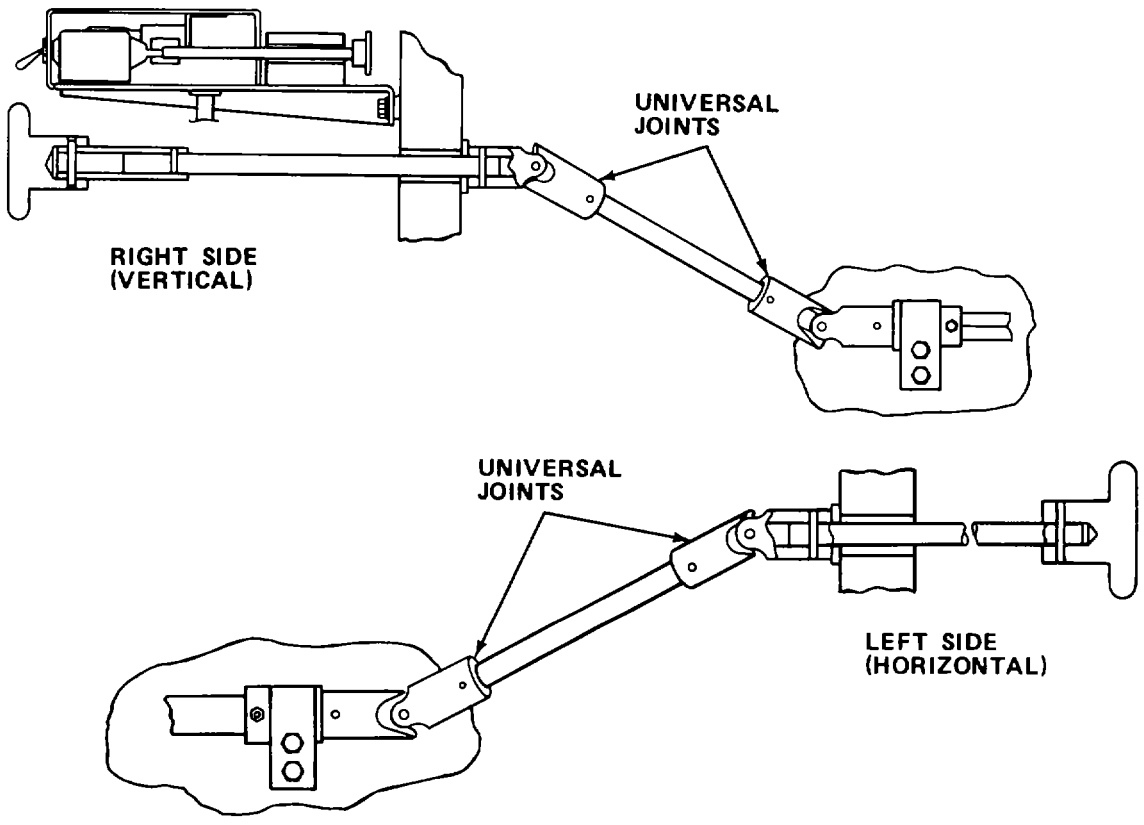
Table 4-1. PREVENTIVE MAINTENACE CHECKS AND SERVICES - Cont

B - Before  
D - During  
A - After

W - Weekly  
M - Monthly  
Q - Quarterly

AN - Annually  
S - Semiannually  
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED  PROCEDURE
6	AN	<p><b>Bellows Rod Assembly - Cont</b></p> <ol style="list-style-type: none"> <li>4. Check for cracks, splitting or scoring, uneven wear, and flat spots.</li> <li>5. Retract bellows assembly.</li> <li>6. Set power panel camera circuit breaker OFF.</li> </ol>  <p><b>Lensboard Vertical/ Horizontal Drive Universal Joints</b></p> <p>Check for signs of cracks or galling. Report discrepancies to higher authority.</p>

**Section IV. TROUBLESHOOTING**

**4-6 INTRODUCTION.**

a. Organizational troubleshooting procedures cover the most common malfunctions that may be repaired at the organizational level. Repair or adjustment requiring specialized equipment is not authorized unless such equipment is available. Troubleshooting procedures used by the operator should be conducted in addition to the organizational troubleshooting procedures.

b. This manual cannot list all the possible malfunctions or every possible test/ inspection and corrective action. If a malfunction is not listed or is not corrected by a listed corrective action, notify your supervisor.

**Table 4-2. TROUBLESHOOTING**

---

<b>MALFUNCTION</b>	<b>TEST OR INSPECTION</b>	<b>CORRECTIVE ACTION</b>
--------------------	---------------------------	--------------------------

---

**1. VACUUM PLATE FAILS TO HOLD FILM PROPERLY.**

Step 1. Check for holes in air duct hose.

Replace air duct hose (subparagraph 4-7.29).

Step 2. Check vacuum conduit for cracks.

Replace vacuum conduit (subparagraph 4-7.27).

Step 3. Check for leaks at adapter gasket at blower assembly.

Replace adapter gasket (subparagraph 4-7.28).

**2. VACUUM BACK LOCKING ASSEMBLY DOES NOT LOCK PROPERLY.**

Step 1. Check for bent slide shafts.

Replace slide shafts (subparagraph 4-7.6).

Step 2. Check rollers for damage.

Replace rollers (subparagraph 4-7.5).



Table 4-2. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. IMAGE ON GROUND GLASS SLIGHTLY OUT OF FOCUS.	Step 1. Check for defective clip on ground glass oscillating frame.	Replace clip (subparagraph 4-7.4).
	Step 2. Ground glass assembly magnet latch fails to hold ground glass assembly.	Replace ground glass assembly magnet latch (subparagraph 4-7.20).
	Step 3. Check optical alinement of the camera.	Optically aline camera (subparagraph 4-7.36).
4. BELLOWS ROD ASSEMBLY MOVES ERRATICALLY.	Inspect bellows rod assembly components for gouges and bends.	Replace defective components (subparagraphs 4-7.8, 4-7.9, 4-7.10, 4-7.11, 4-7.12, 4-7.13, 4-7.14).
5. OVEREXPOSED FILMS.	Step 1. Check for light leak in bellows along fold.	Repair bellows (subparagraph 4-7.35).
	Step 2. Check for light leaks in bellows assembly along connector ribs and folds.	Replace bellows assembly (subparagraph 4-7.3).

Table 4-2. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. BLANK EXPOSURE.	Step 1. Check shutter switch(es) for 120 V ac in closed position. Replace switches (subparagraph 4-7.21).	Step 2. Check AUTO/MAN switch for 120 V ac in each switch position. Replace AUTO/MAN switch (subparagraph 4-7.24).
	Step 3. Check duplex receptacle connector for 120 V ac. Replace duplex receptacle connector (subparagraph 4-7.33).	Step 4. Check shutter cable assembly for 120 V ac at shutter assembly rectifier. Replace shutter cable assembly (subparagraph 4-7.16).
	Step 5. Check shutter assembly for bent blades and/or defective rectifier. Replace shutter assembly (subparagraph 4-7.15).	
7. LENS AND SHUTTER ASSEMBLIES MOVE ERRATICALLY IN HORIZONTAL DIRECTION.	Check lensboard rack for chipped teeth. Replace lensboard rack (subparagraph 4-7.18).	
8. LENS AND SHUTTER ASSEMBLIES MOVE ERRATICALLY IN VERTICAL DIRECTION.	Check extension spring(s) for sagging. Replace extension spring(s) (subparagraph 4-7.17).	
9. VIBRATION OR EXCESSIVE NOISE DURING OPERATION.	Camera rails are not being properly lubricated by the wiper. Replace wiper (subparagraph 4-7.30).	

Table 4-2. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
10. CAMERA OUT OF OPTICAL ALINEMENT.	Step 1. Worn bearing blocks. Optically aline camera (subparagraph 4-7.36).	Step 2. Bearing blocks defective. Replace bearing blocks (subparagraph 4-7.19).
11. POSITIONING COUNTERS ARE DIFFICULT TO READ.	Step 1. Counter assembly neon lamp(s) defective. Replace counter assembly neon lamp(s) (subparagraph 4-7.7).	Step 2. Counter assembly toggle switch defective. Replace counter assembly toggle switch (subparagraph 4-7.23).
	Step 3. Counter assembly lampholder defective. Replace counter assembly lampholder (subparagraph 4-7.34).	
12. COPYBOARD ASSEMBLY FAILS TO HOLD COPY PROPERLY.	Step 1. Check air duct hose for holes. Replace air duct hose (subparagraph 4-7.29).	Step 2. Check adapter gasket at blower assembly for leaks. Replace adapter gasket (subparagraph 4-7.28).

Table 4-2. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
13. LIGHT BOX ASSEMBLY HAS UNEVEN LIGHTING.	Step 1. Check for defective fluorescent lamp(s).	Replace light box assembly fluorescent lamp(s) (subparagraph 4-7.25).
	Step 2. Starter(s) defective.	Replace light box assembly fluorescent starter(s) (subparagraph 4-7.26).
14. FLUORESCENT LAMPS IN LIGHT BOX ASSEMBLY DO NOT ILLUMINATE.	Check POSITIVE HOLDER light switch for 120 V ac when switch is ON.	Replace switch (subparagraph 4-7.21).
15. FLAT SPOTS ON IDLER ADJUSTMENT ARM ROLLER.	Idler roller defective.	Replace idler roller (subparagraph 4-7.31).
16. CAMERA CANNOT BE RAISED OR LOWERED.	Camera height control power transmission roller chain defective.	Replace roller chain (subparagraph 4-7.32).

**Section V MAINTENANCE PROCEDURES**

**4-7 MAINTENANCE PROCEDURES.**

a. This section contains instructions covering organizational maintenance functions for the copying camera. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

**INDEX**

PROCEDURES	PARAGRAPH
Remove/Install Pulsed Xenon Lamp.....	4-7.1
Remove/Install Bellows Rod Assembly.....	4-7.2
Remove/Replace Bellows Assembly .....	4-7.3
Replace Ground Glass Assembly Clip.....	4-7.4
Replace Vacuum Locking Assembly Rollers.....	4-7.5
Replace Vacuum Back Locking Assembly Slide Shaft(s).....	4-7.6
Replace Counter Assembly Neon Lamp(s) .....	4-7.7
Replace Bellows Rod Assembly Inner Tube Support .....	4-7.8
Replace Bellows Rod Assembly Outer Tube Support .....	4-7.9
Replace Bellows Rod Assembly Bracket .....	4-7.10
Replace Bellows Rod Assembly Inner Tube Assembly .....	4-7.11
Replace Bellows Rod Assembly Outer Tube.....	4-7.12
Replace Bellows Rod Assembly Extension Spring.....	4-7.13
Replace Bellows Rod Assembly Bracket Roller .....	4-7.14
Replace Lensboard Assembly Shutter Assembly .....	4-7.15
Replace Lensboard Shutter Cable Assembly .....	4-7.16
Replace Lensboard Extension Spring(s).....	4-7.17
Replace Lensboard Rack .....	4-7.18
Replace Copyboard/Lensboard Carriage Assembly Bearing Blocks.....	4-7.19

PROCEDURES	PARAGRAPH
Replace Ground Glass Assembly Magnet Latch .....	4-7.20
Replace Switch(es) .....	4-7.21
Replace Camera Arm Assembly Arm Brackets.....	4-7.22
Replace Counter Assembly Toggle Switch .....	4-7.23
Replace AUTO/MAN Toggle Switch .....	4-7.24
Replace Light Box Fluorescent Lamp(s).....	4-7.25
Replace Light Box Fluorescent Starter(s) .....	4-7.26
Replace Vacuum Conduit.....	4-7.27
Replace Air Duct Hose Adapter Gasket.....	4-7.28
Replace Air Duct Hose .....	4-7.29
Replace Copyboard/Lensboard Carriage Assembly Wiper.....	4-7.30
Replace Copyboard/Lensboard Idler Adjustment Arm Roller .....	4-7.31
Replace Camera Height Control Power Transmission Roller Chain .....	4-7.32
Replace Lensboard Carriage Assembly Duplex Receptacle Connector.....	4-7.33
Replace Counter Assembly Lampholder.....	4-7.34
Repair Bellows .....	4-7.35
Optically Aline Camera .....	4-7.36
Adjust Copyboard/Lensboard Idler Adjustment Arm.....	4-7.37

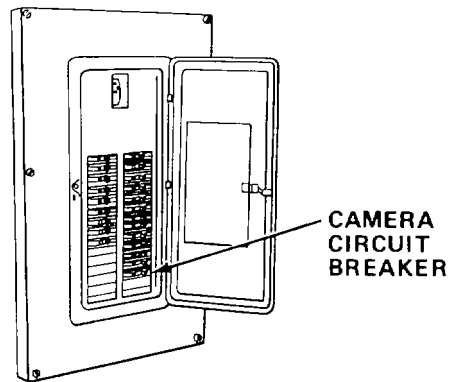
4-7.1 Remove/Install Pulsed Xenon Lamp.

MOS: 83FJ6, Reproduction Equipment Repairer

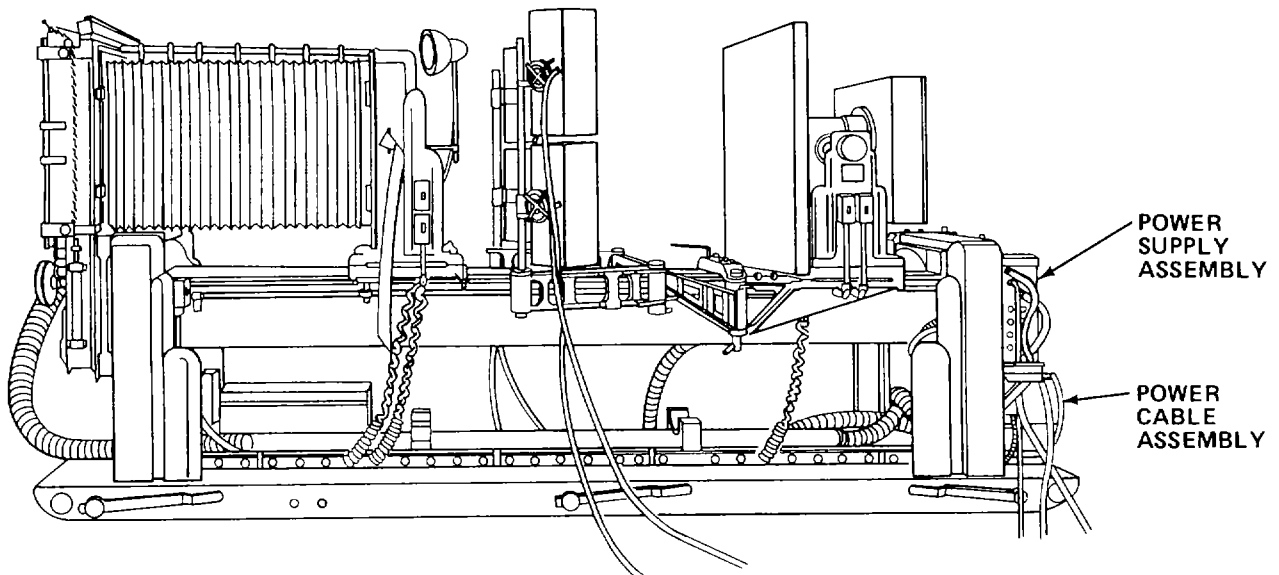
TOOLS: None

**WARNING**

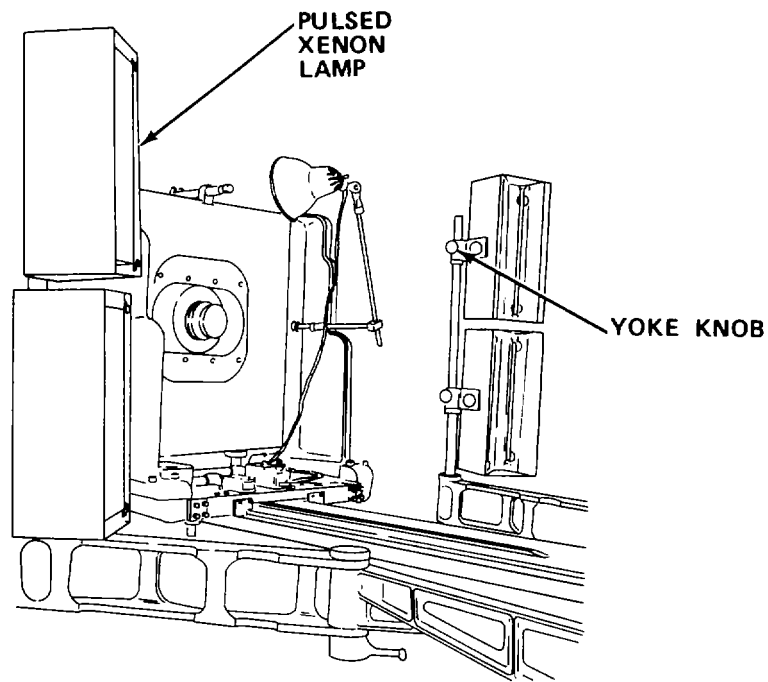
Death or serious injury may occur from electrical shock unless lamp power cable is unplugged before making repairs.



- a. Set camera circuit breaker on power panel OFF.



- b. Disconnect pulsed xenon lamp power cable assembly.



- c. Loosen yoke knob.
- d. Remove pulsed xenon lamp.
- e. Install pulsed xenon lamp.
- f. Tighten yoke knob.
- g. Reconnect pulsed xenon lamp power cable assembly.
- h. Set camera circuit breaker on power panel ON.



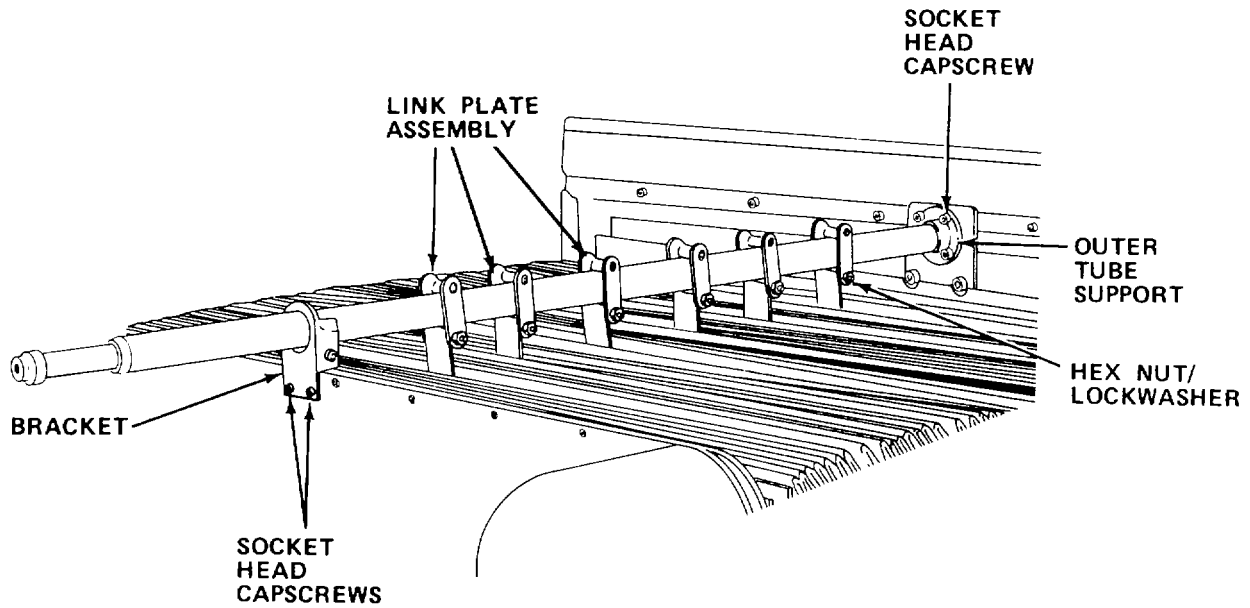
4-7.2 Remove/Install Bellows Rod Assembly.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Bellows Rod Assembly

**NOTE**  
This task requires two personnel.



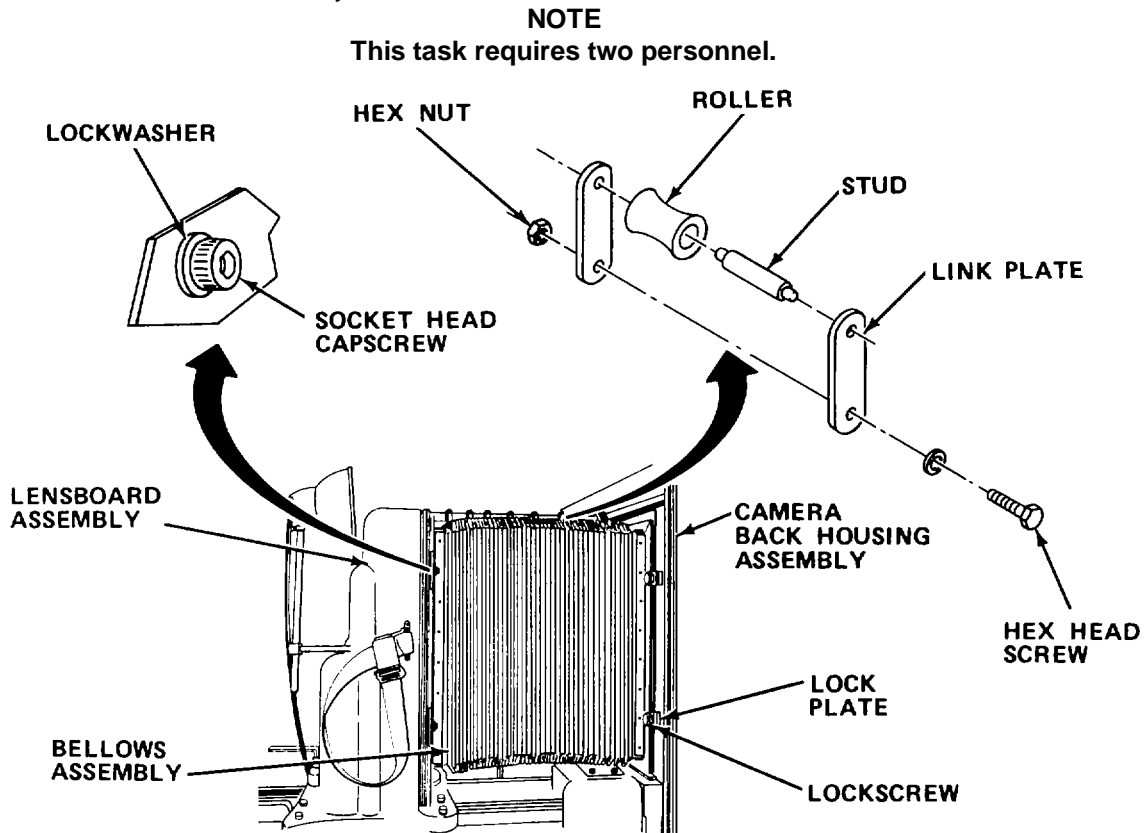
- a. Remove link plate assemblies.
- b. Remove outer tube support.
- c. Remove bracket.
- d. Remove bellows rod assembly.
- e. Install bellows rod assembly.
- f. Install bracket.
- g. Install outer tube support.
- h. Install link plate assemblies.

4-7.3 Remove/Replace Bellows Assembly.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Bellows Assembly



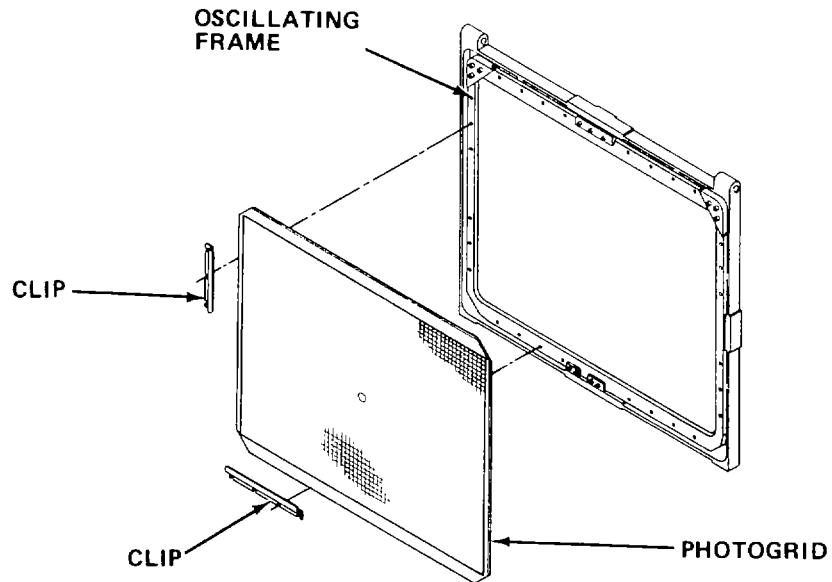
- a. Remove bellows assembly from camera back housing assembly.
- b. Remove bellows assembly from lensboard assembly.
- c. Remove link plate assemblies.
- d. Replace bellows assembly.
- e. Install link plate assemblies.
- f. Install bellows assembly to lensboard assembly.
- g. Install bellows assembly to camera back housing assembly.
- h. Check bellows assembly for light leaks.

4-7.4 Replace Ground Glass Assembly Clip.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Clip



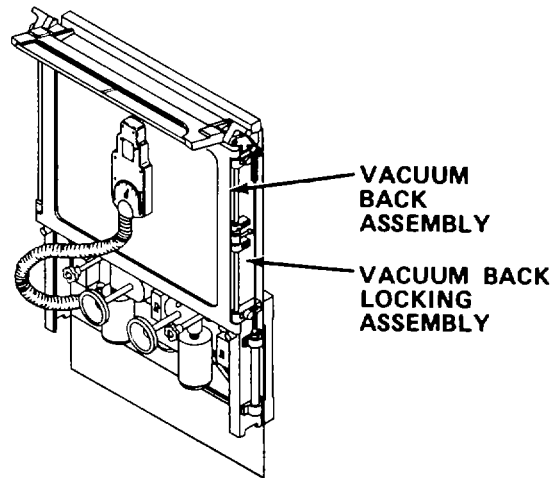
- a. Remove defective clip(s).
- b. Install replacement clip(s).

4-7.5 Replace Vacuum Back Locking Assembly Rollers.

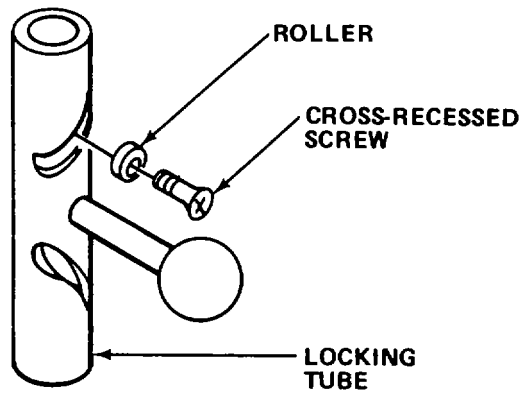
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Rollers (2)  
Locking Compound (Item 17, Appendix E)



- a. Open vacuum back assembly.



- b. Remove defective roller(s).
- c. Coat screw(s) threads with locking compound.

**NOTE**

Roller must be free to rotate without binding.

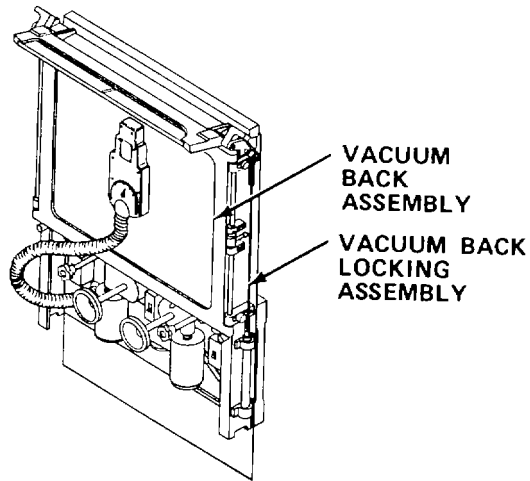
- d. Install replacement roller(s).

4-7.6 Replace Vacuum Back Locking Assembly Slide Shaft(s).

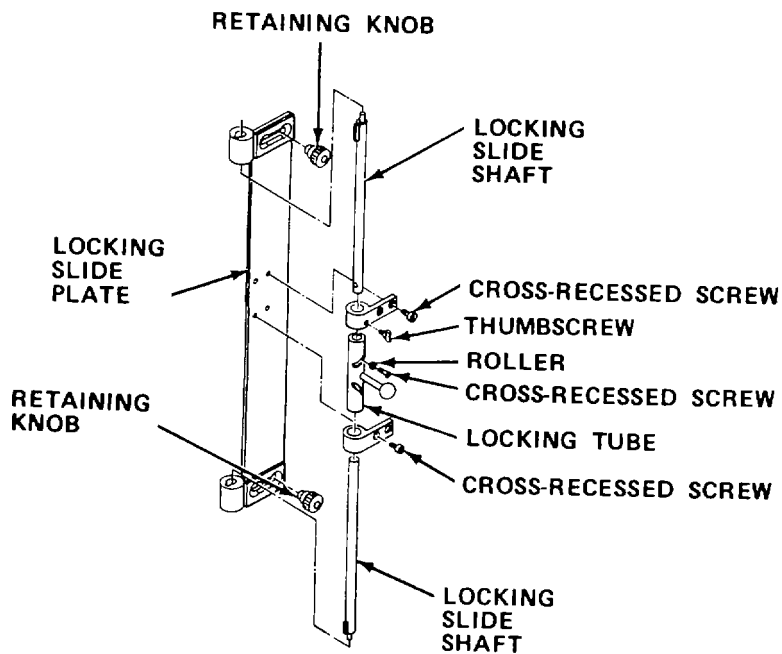
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Locking Slide Shaft(s)  
Locking Compound (Item 17, Appendix E)



- a. Open vacuum back assembly.



- b. Loosen knobs and slide locking slide plate out.
- c. Loosen thumbscrew.
- d. Remove roller(s).
- e. Pull defective locking slide shaft(s) out of locking tube.
- f. Insert new locking slide shaft(s) through locking bracket and into locking tube.
- g. Aline locking shaft hole with locking tube.
- h. Coat screw threads with locking compound.

**NOTE**

Roller must be free to rotate without binding.

- i. Install rollers.
- j. Slide locking slide plate in. Tighten knobs.

4-7.7 Replace Counter Assembly Neon Lamp(s).

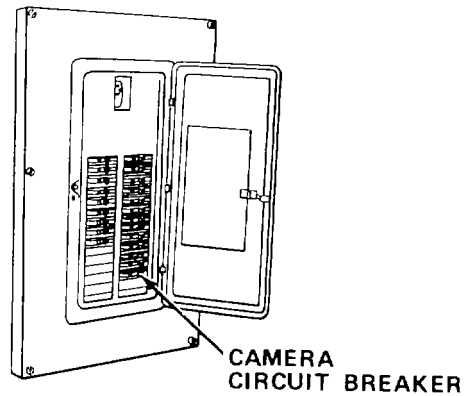
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

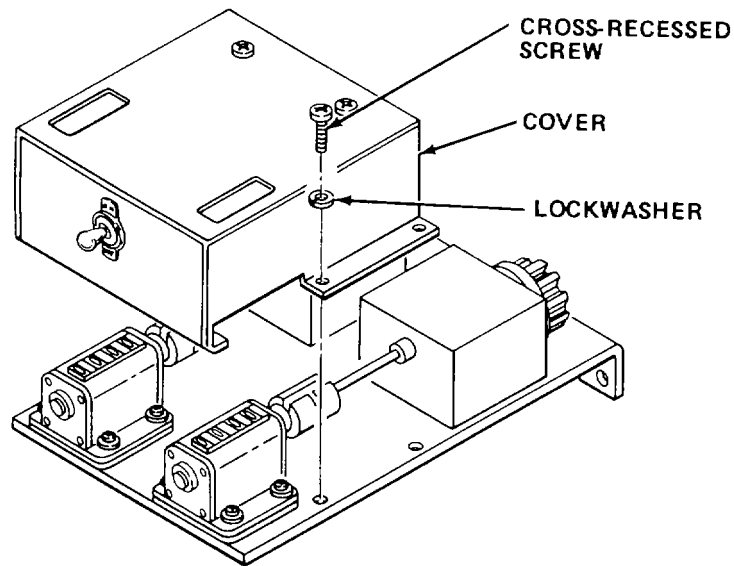
SUPPLIES: Neon Glow Lamp(s)

**WARNING**

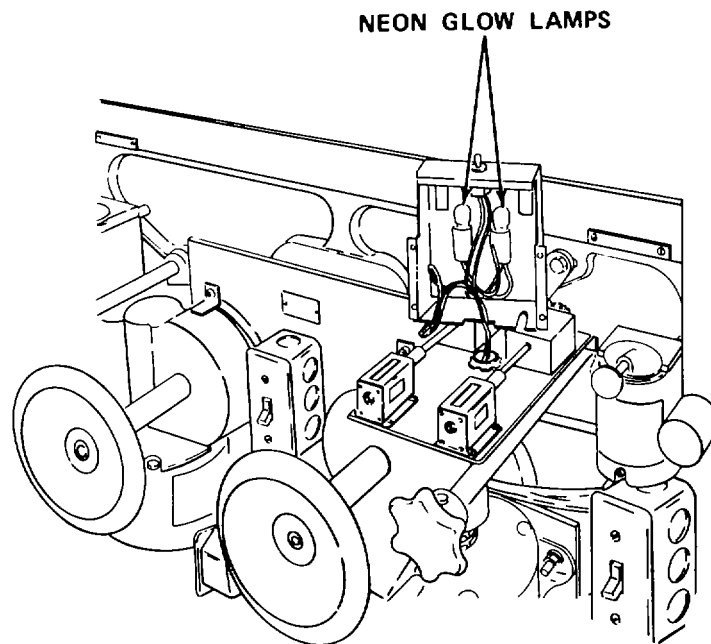
Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.



- a. Set camera circuit breaker on power panel OFF.



- b. Remove cover.



- c. Replace defective neon lamp(s).
- d. Install cover.
- e. Set camera circuit breaker on power panel ON.

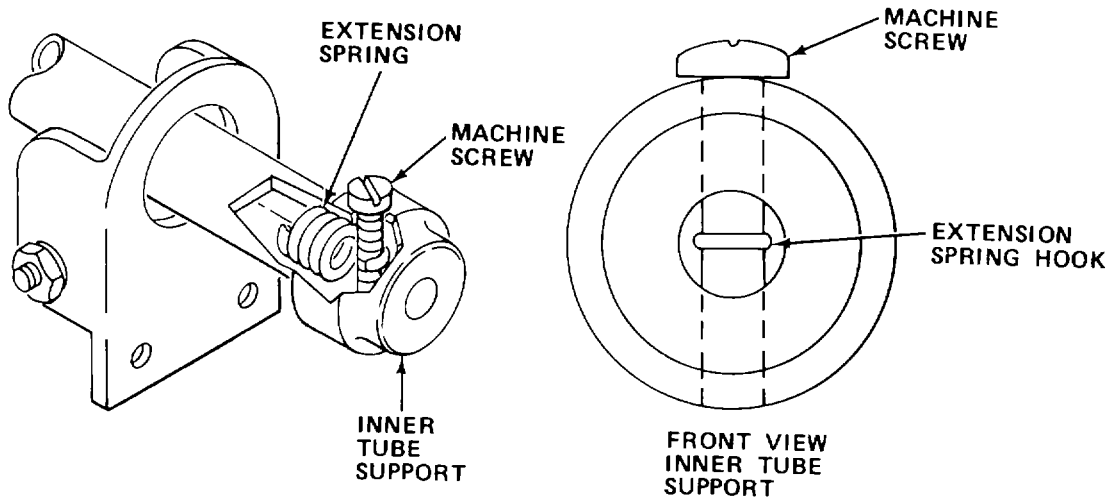


4-7.8 Replace Bellows Rod Assembly Inner Tube Support.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Inner Tube Support  
Stiff Wire



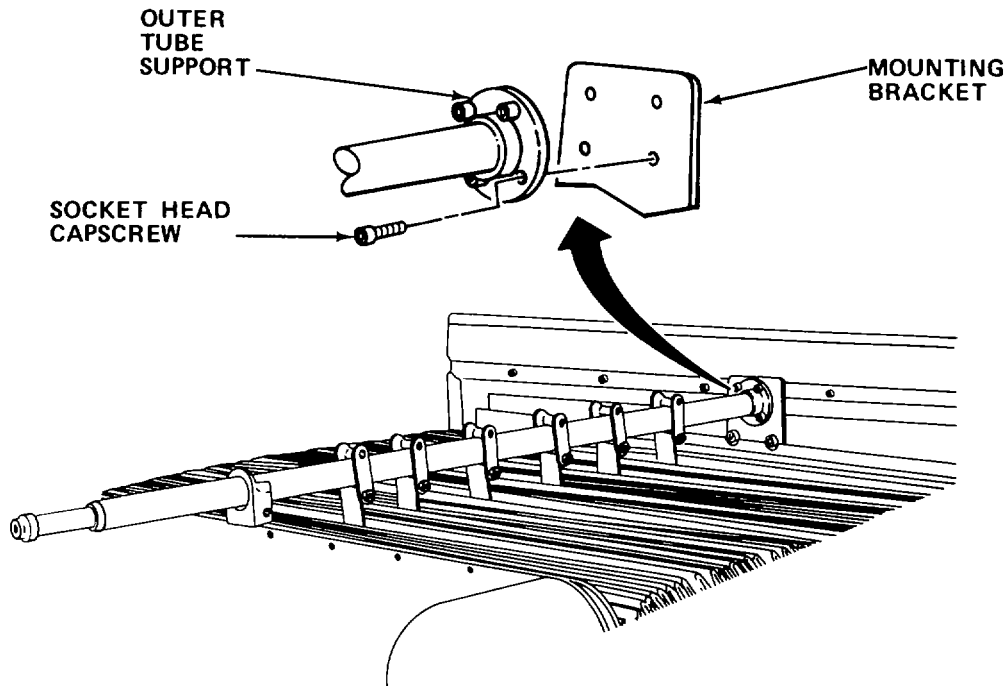
- a. Bend one end of wire into a hook.
- b. Hook wire onto extension spring through inner tube support opening.
- c. Hold tension on extension spring with wire.
- d. Remove screw and ease spring into inner tube assembly while removing defective inner tube support.
- e. Pull spring through inner tube assembly until looped end extends just outside inner tube assembly.
- f. Slide new inner tube support onto inner tube assembly.
- g. Rotate spring until loop is at right angle to hole located on inner tube support.
- h. Install screw through inner tube support, inner tube assembly, and spring loop.

4-7.9 Replace Bellows Rod Assembly Outer Tube Support.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Outer Tube Support  
Stiff Wire



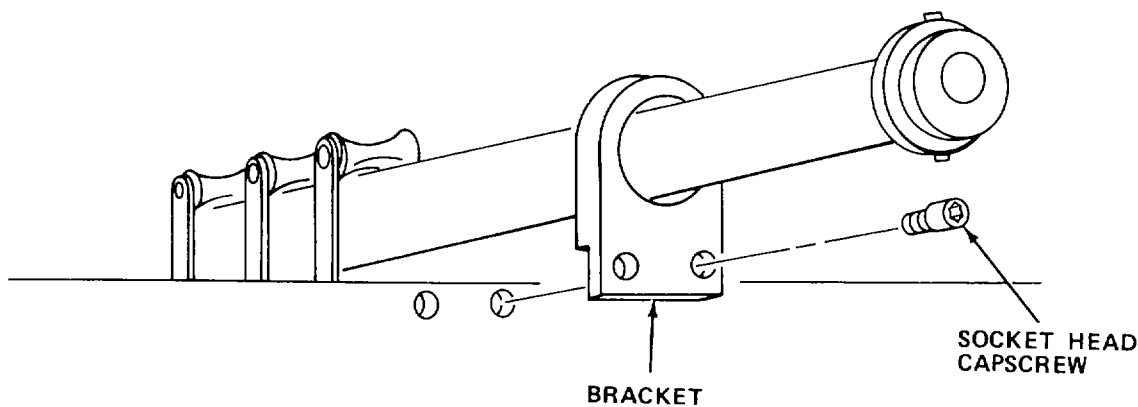
- a. Remove defective outer tube support from mounting bracket.
- b. Bend one end of wire into a hook.
- c. Hook wire onto extension spring through outer tube support opening.
- d. Hold tension on spring.
- e. Remove screw and ease spring into outer tube assembly while removing outer tube support.
- f. Pull spring through outer tube assembly until looped end extends just outside outer tube assembly.
- g. Slide new outer tube support onto outer tube assembly.
- h. Rotate spring until loop is at right angle to hole located on outer tube support.
- i. Install screw through outer tube support, outer tube, and spring loop.
- j. Install new outer tube support to mounting bracket.

4-7.10 Replace Bellows Rod Assembly Bracket.

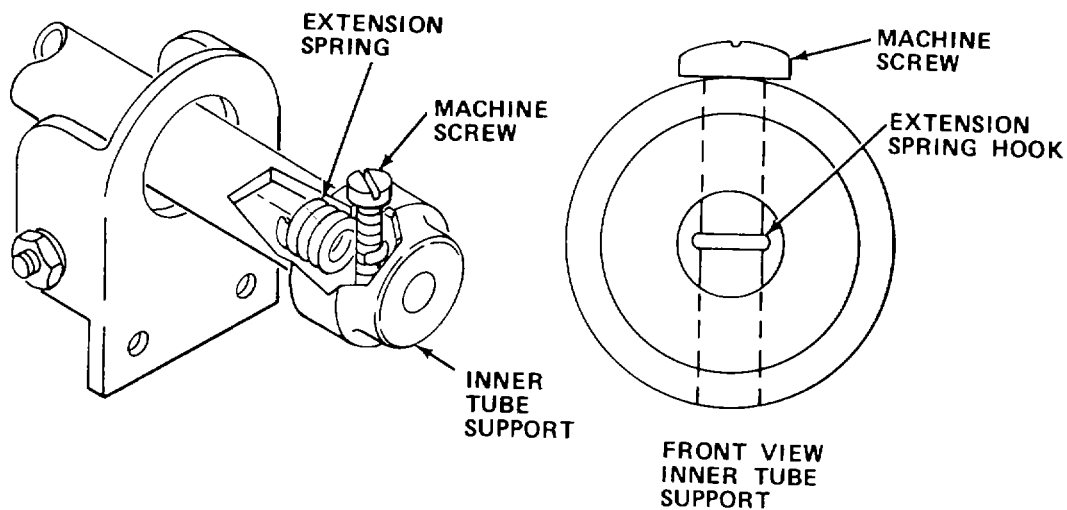
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

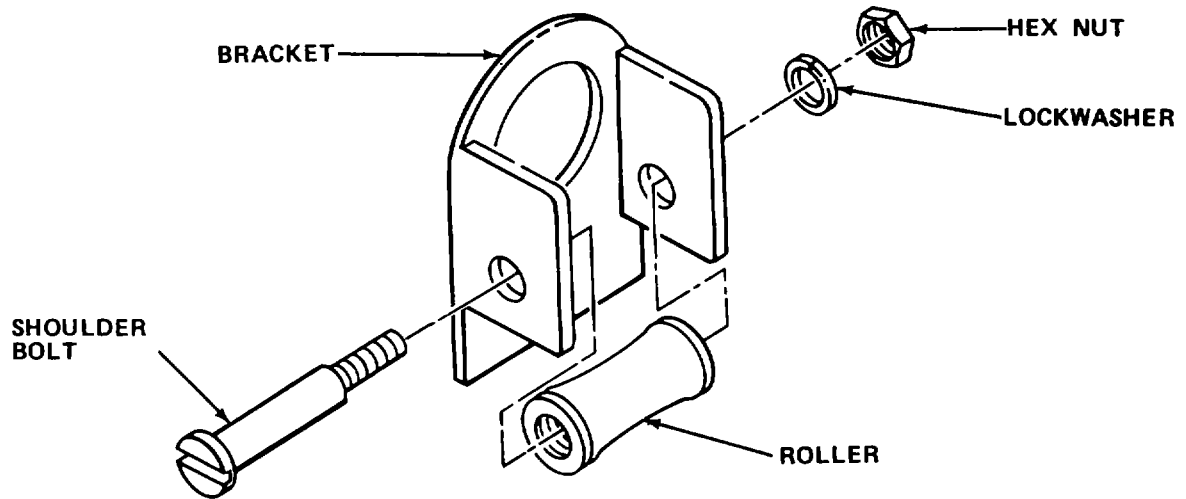
SUPPLIES: Bracket  
Stiff Wire



- a. Remove bracket screws from lensboard.



- b. Bend one end of wire into a hook.
- c. Hook wire onto extension spring through inner tube support opening.
- d. Hold tension on spring with wire.
- e. Ease spring into inner tube assembly while removing inner tube support.
- f. Slide defective bracket off inner tube assembly.



- g. Remove roller.
- h. Install roller on new bracket.
- i. Slide new bracket onto inner tube assembly.
- j. Push inner tube assembly into outer tube.
- k. Pull spring through inner tube assembly until looped end extends just outside inner tube assembly.
- l. Slide inner tube support onto inner tube assembly.
- m. Rotate spring until loop is at right angle to inner tube support hole.
- n. Install screw through inner tube support, inner tube assembly, and spring loop.
- o. Install new bracket.

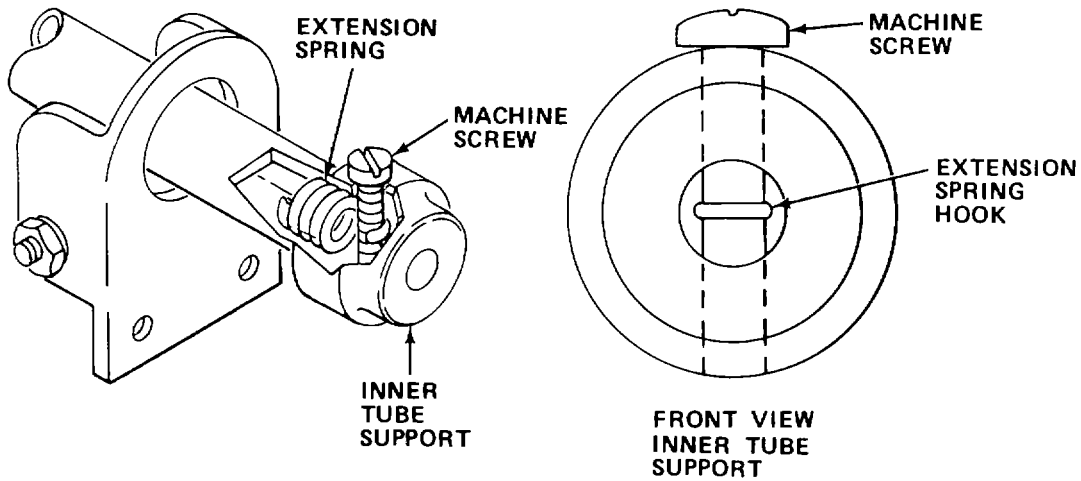
4-7.11 Replace Bellows Rod Assembly Inner Tube Assembly.

MOS: 83FJ6, Reproduction Equipment Repairer

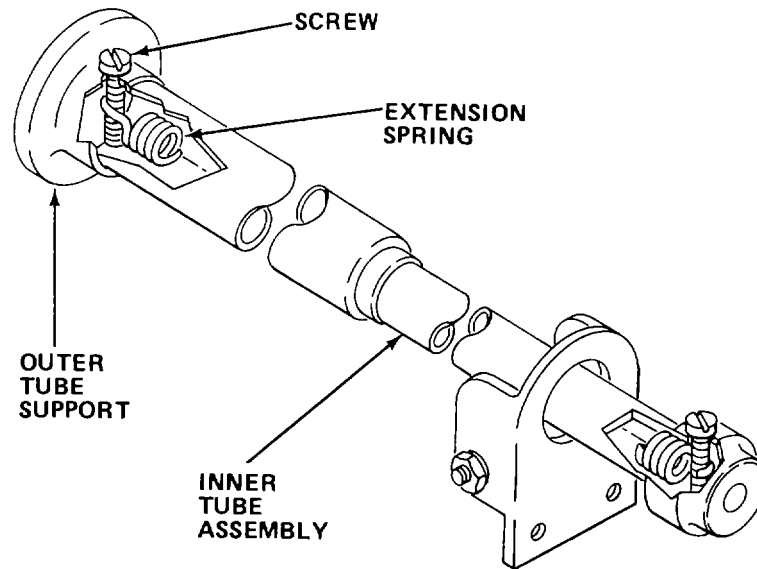
TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Inner Tube Assembly  
Stiff Wire

- a. Remove bellows rod assembly (subparagraph 4-7.2),



- b. Bend one end of wire into a hook.
- c. Hook wire onto extension spring through inner tube support opening.
- d. Hold tension on spring with wire.
- e. Remove screw and ease spring into inner tube assembly.



- f. Remove screw from outer tube support.
- g. Replace inner tube assembly.
- h. Rotate spring until loop is at right angle to hole located on outer tube support.
- i. Install screw through outer tube support, outer tube, and spring loop.
- j. Pull and rotate spring until loop is at right angle to hole located on inner tube support.
- k. Install screw through inner tube support, inner tube assembly, and spring loop.
- l. Install bellows rod assembly (subparagraph 4-7.2).

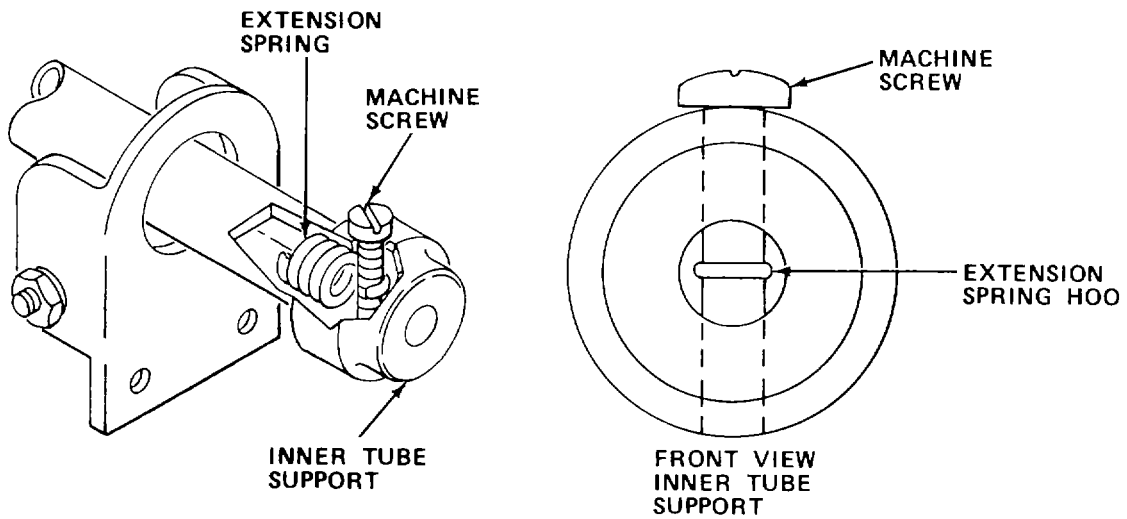
4-7.12 Replace Bellows Rod Assembly Outer Tube.

MOS: 83FJ6, Reproduction Equipment Repairer

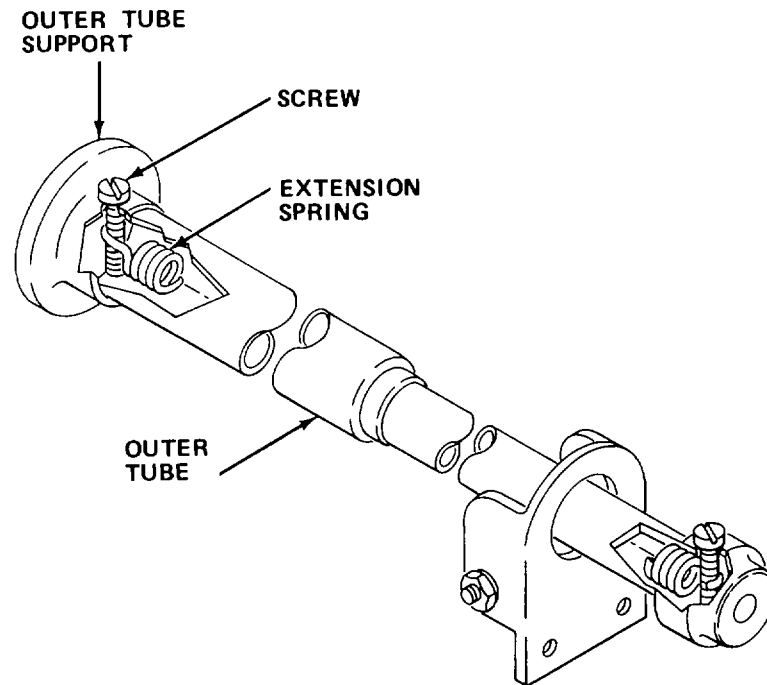
TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Outer Tube  
Stiff Wire

- a. Remove bellows rod assembly (subparagraph 4-7.2).



- b. Bend one end of wire into a hook.
- c. Hook wire onto extension spring through outer tube support opening.
- d. Hold tension on spring with wire.
- e. Remove screw and ease spring into inner tube.



- f. Remove screw from inner tube support.
- g. Replace defective outer tube.
- h. Pull and rotate spring until loop is at right angle to hole located on inner tube support.
- i. Install screw through inner tube support, inner tube, and spring loop.
- j. Pull and rotate spring until loop is at right angle to hole on outer tube support.
- k. Install screw through outer tube support, outer tube assembly, and spring loop.
- l. Install bellows rod assembly (subparagraph 4-7.2).



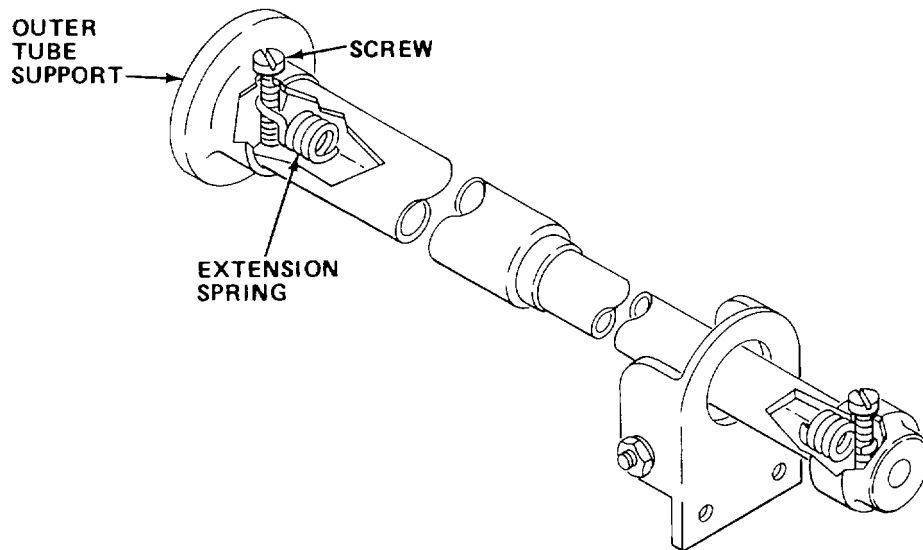
4-7.13 Replace Bellows Rod Assembly Extension Spring.

MOS: 83FJ6, Reproduction Equipment Repairer

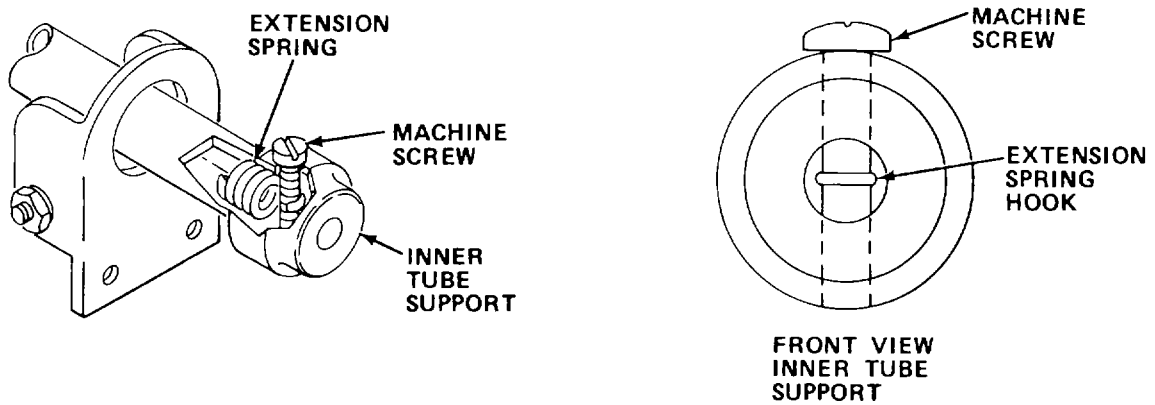
TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Extension Spring  
Stiff Wire

- a. Bend one end of wire into a hook.



- b. Hook wire onto extension spring through inner tube support opening.
- c. Hold tension on extension spring with wire.
- d. Remove screw and ease spring into inner tube assembly.



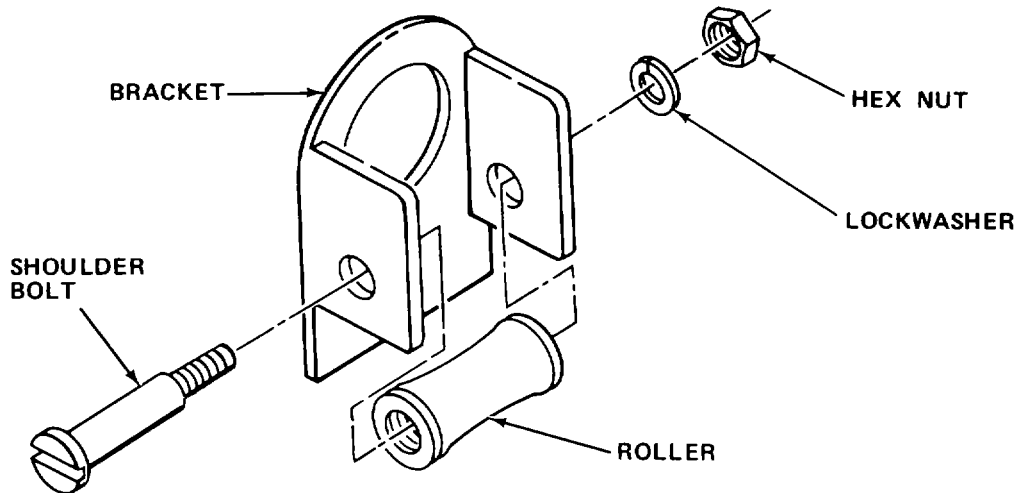
- e. Remove screw from outer tube support.
- f. Remove defective spring.
- g. Hook wire to new spring and insert free end into inner tube assembly.
- h. Rotate spring until loop is at a right angle to hole located on outer tube support.
- i. Install screw through outer tube support, outer tube, and spring loop.
- j. Pull and rotate spring until loop is at right angle to hole located on inner tube support.
- k. Install screw through inner tube support, inner tube assembly, and spring loop.

4-7.14 Replace Bellows Rod Assembly Bracket Roller.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Roller



Replace defective roller.

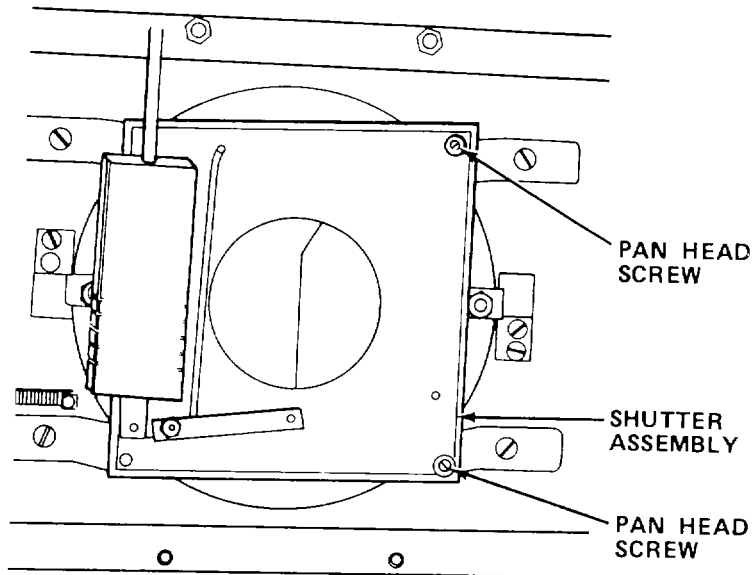
4-7.15 Replace Lensboard Assembly Shutter Assembly.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Shutter Assembly

- a. Move lensboard assembly toward camera back housing assembly.



- b. Open vacuum back assembly.
- c. Disconnect plug.
- d. Replace defective shutter.
- e. Reconnect plug.

## 4-7.16 Replace Lensboard Shutter Cable Assembly.

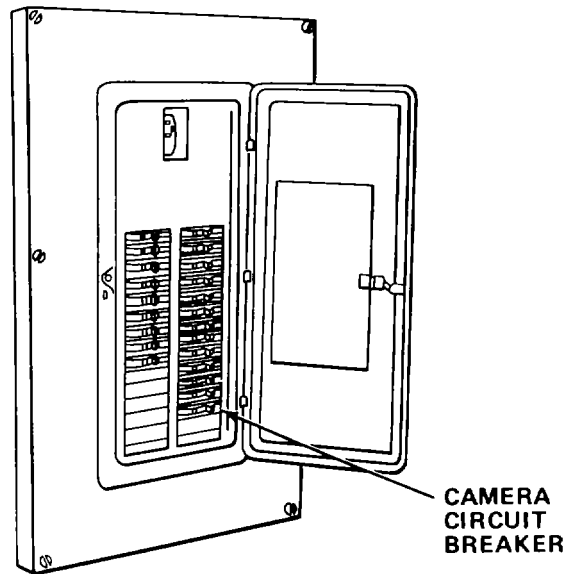
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

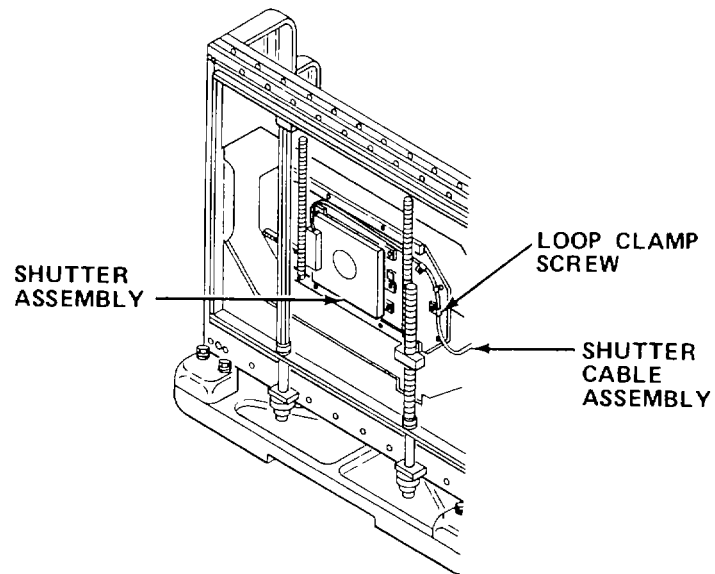
SUPPLIES: Shutter Cable Assembly

**WARNING**

Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.



- a. Set camera circuit breaker on power panel OFF.
- b. Move lensboard assembly toward camera back housing assembly.
- c. Unplug shutter cable assembly from power source.
- d. Open vacuum back assembly.



- e. Unplug shutter cable assembly.
- f. Remove loop clamps.
- g. Remove defective shutter cable assembly.
- h. Install new shutter cable assembly.
- i. Install loop clamps.
- j. Plug in shutter cable assembly.
- k. Set camera circuit breaker on power panel ON.

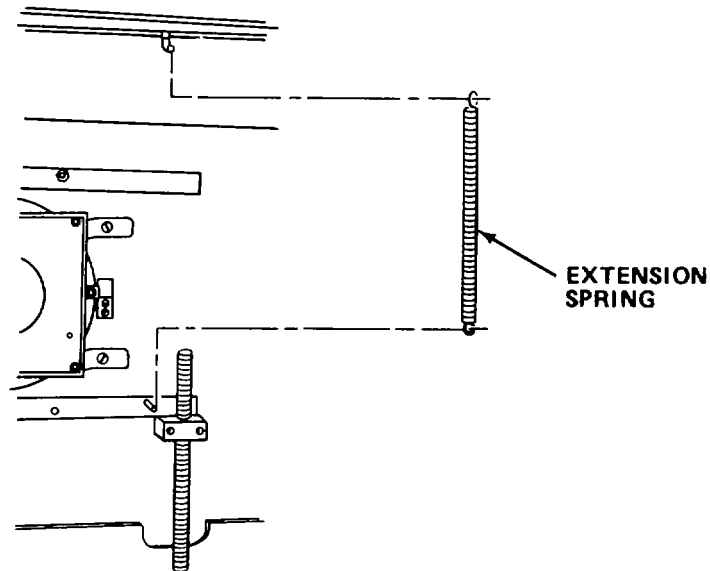
4-7.17 Replace Lensboard Extension Spring(s).

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Extension Spring(s)

- a. Move lensboard assembly toward camera back housing assembly.



- b. Open vacuum back.
- c. Replace defective extension spring(s).

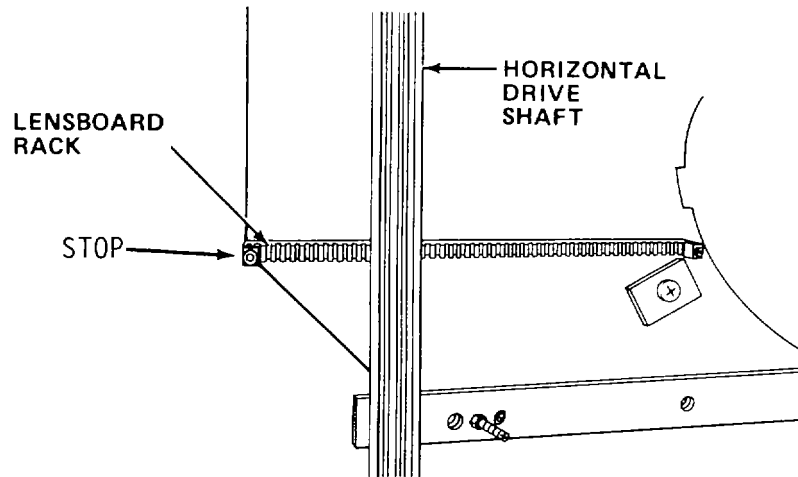
4-7.18 Replace Lensboard Rack.

MOS: 83FJ6, Reproduction Equipment Repairer

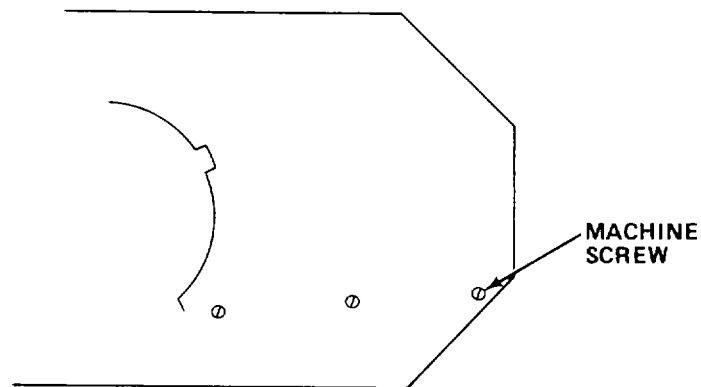
TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Lensboard Rack

- a. Move lensboard assembly toward camera back housing assembly.
- b. Open vacuum back assembly.



- c. Remove stop from left end of rack.
- d. Turn handwheel until rack clears horizontal drive shaft.



- e. Remove three screws from lensboard and remove defective rack.
- f. Install new rack.
- g. Turn handwheel and carefully mesh rack with horizontal drive shaft.
- h. Install stop.

4-7.19 Replace Copyboard/Lensboard Carriage Assembly Bearing Blocks.

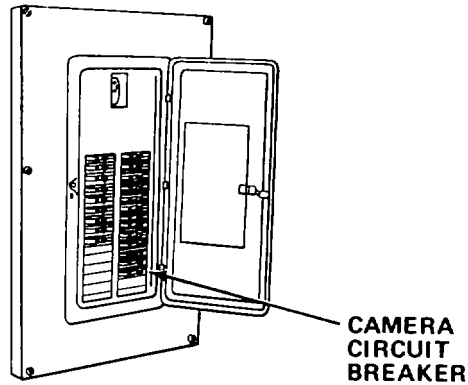
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Bearing Blocks

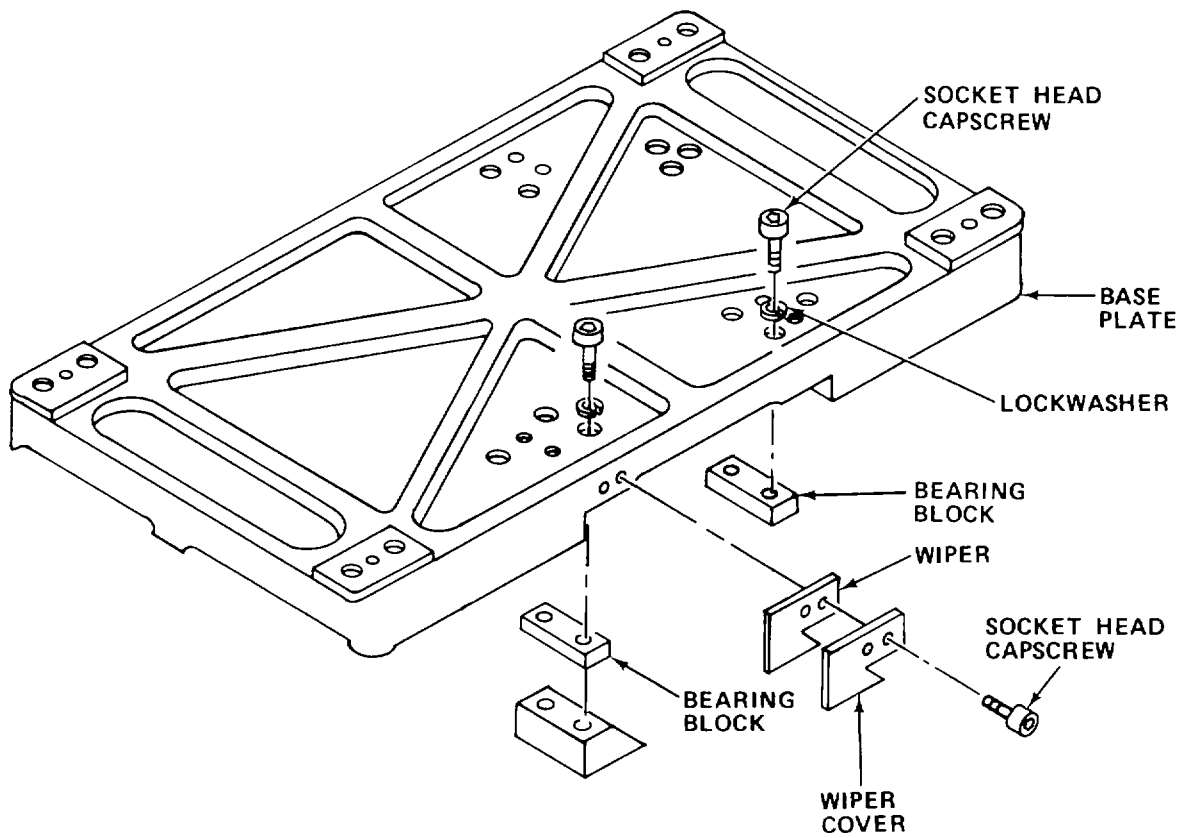
**WARNING**

**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**



- a. Set camera circuit breaker on power panel OFF.





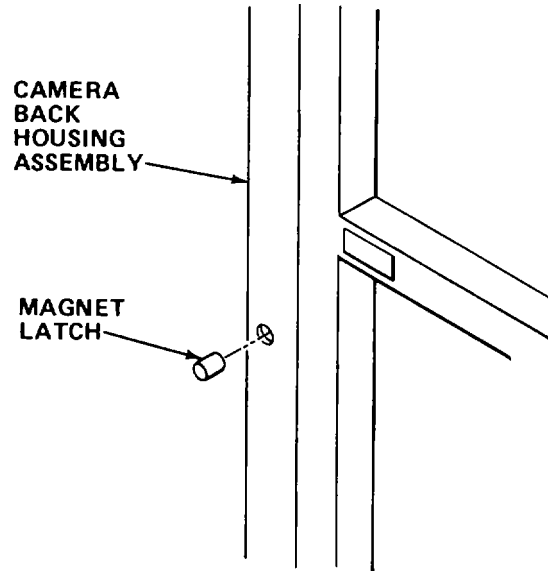
- b. Remove wiper cover and wiper.
- c. Replace defective bearing block(s).
- d. Install wiper and wiper cover.
- e. Set camera circuit breaker on power panel ON.
- f. Optically aline camera (subparagraph 4-7.36).

4-7.20 Replace Ground Glass Assembly Magnet Latch.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

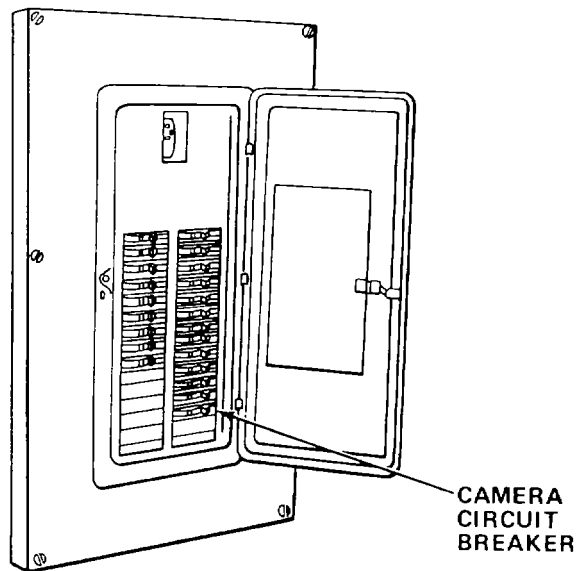
SUPPLIES: Magnet Latch



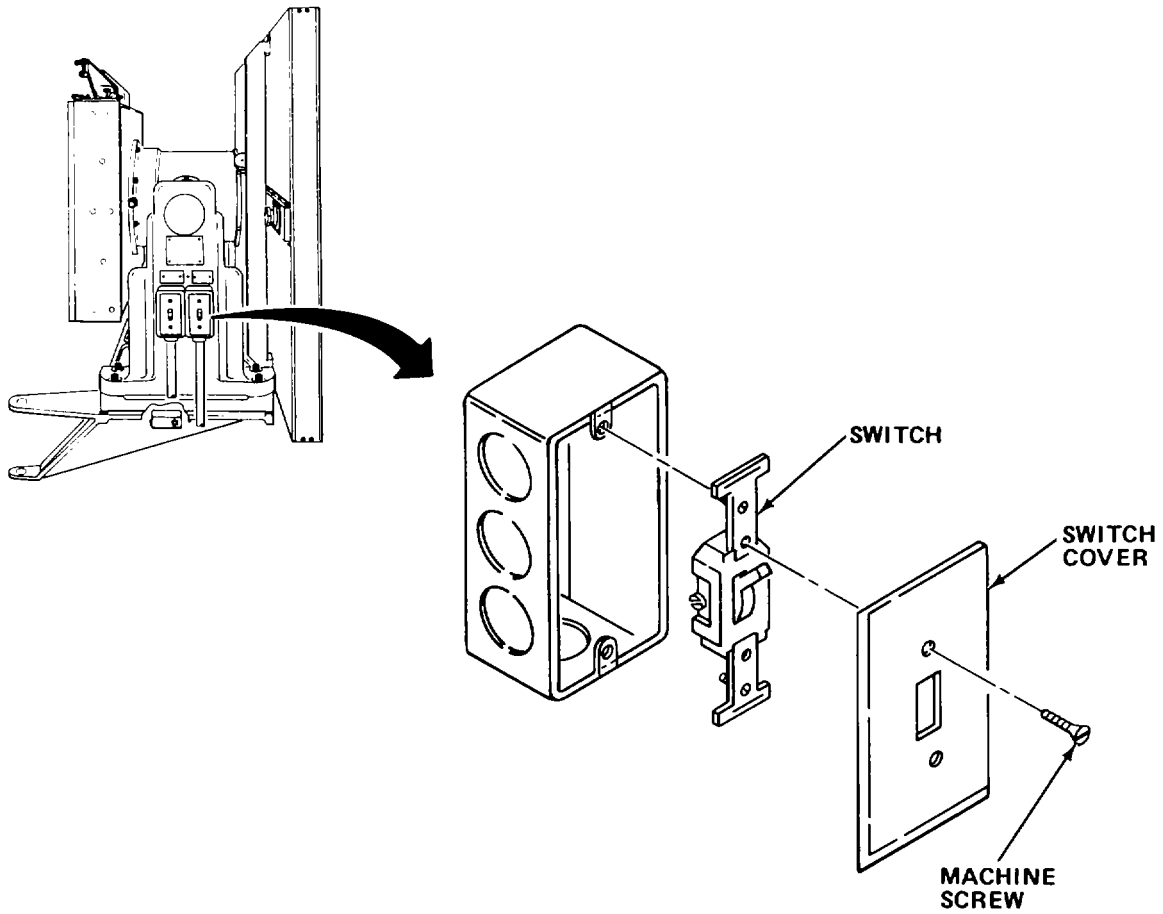
- a. Remove defective magnet latch.
- b. Install new magnet latch.

4-7.21 Replace Switch(es).

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
MultimeterSUPPLIES: Manual Starter Switch(es)  
3-Way Toggle Switch**WARNING****Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**

- a. Set camera circuit breaker on power panel OFF.



- b. Remove switch cover.
- c. Remove defective switch.
- d. Tag and disconnect leads.
- e. Reconnect leads to new switch.
- f. Install new switch.
- g. Install switch cover.
- h. Set camera circuit breaker on power panel ON.

4-7.22 Replace Camera Arm Assembly Arm Brackets.

MOS: 83FJ6, Reproduction Equipment Repairer

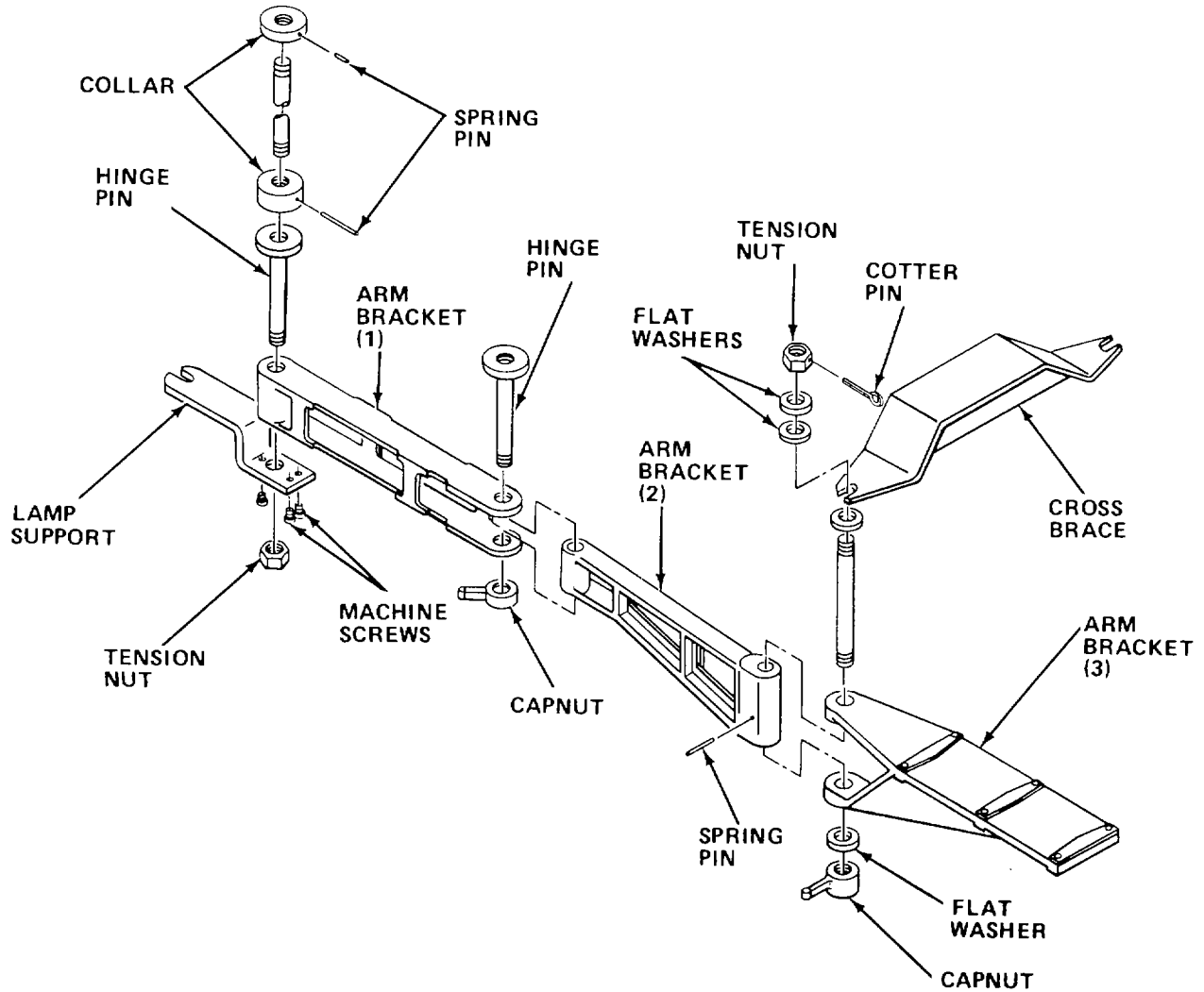
TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Arm Bracket

**NOTE**

**This task requires two personnel.**

- a. Remove pulsed xenon lamps (subparagraph 4-7.1).



- b. Remove mounting rod assembly.

**CAUTION**

**Support arm brackets before removing hinge pins. Damage to equipment may occur.**

- c. Remove lamp support.
- d. Remove arm bracket No. 1.
- e. Remove cross brace and arm bracket No. 2.
- f. Install new arm bracket No. 2 and cross brace.
- g. Install new arm bracket No. 1
- h. Install lamp support.
- i. Install mounting rod assembly.
- j. Install pulsed xenon lamps.

4-7.23 Replace Counter Assembly Toggle Switch.

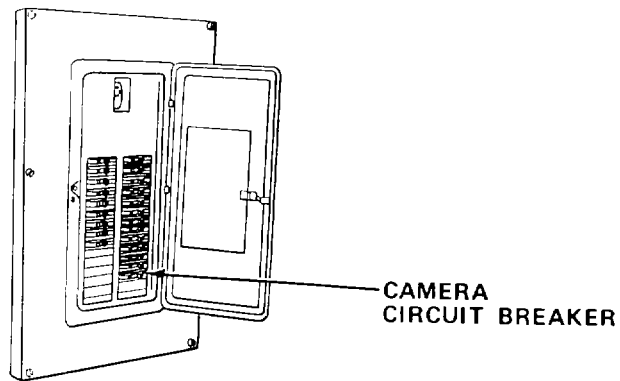
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
Multimeter

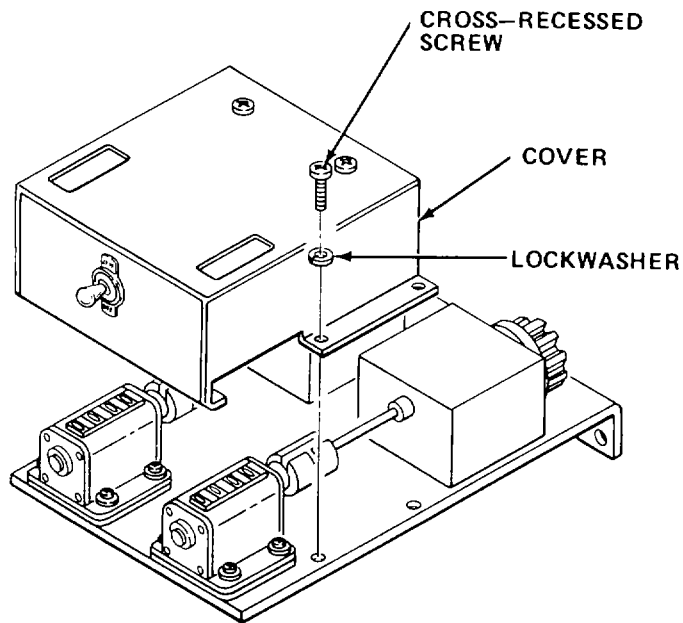
SUPPLIES: Toggle Switch SP

**WARNING**

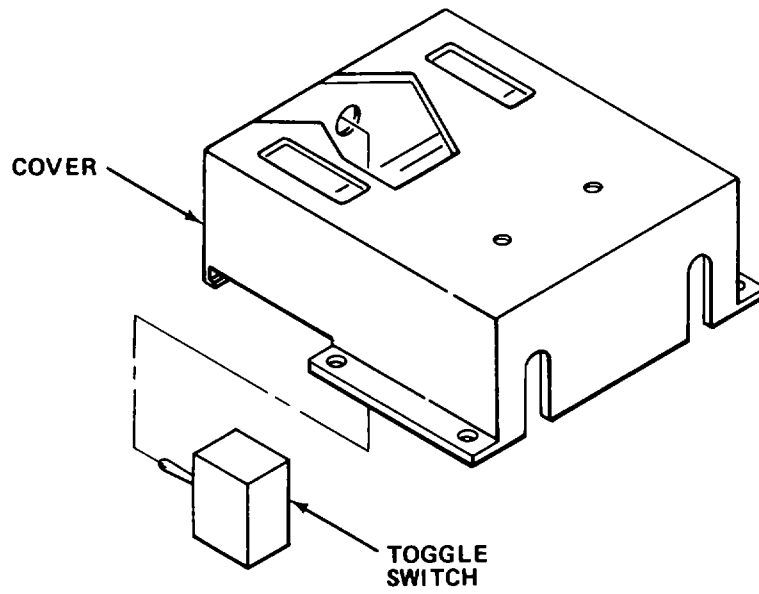
**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**



- a. Set camera circuit breaker on power panel OFF.



- b. Remove cover.



- c. Replace defective toggle switch.
- d. Install cover.
- e. Set camera circuit breaker on power panel ON.



4-7.24 Replace AUTO/MAN Toggle Switch.

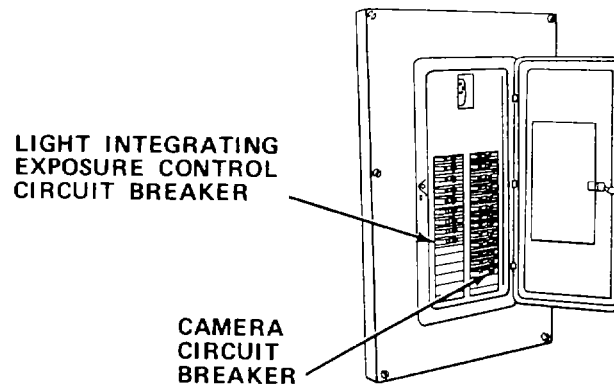
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
Multimeter

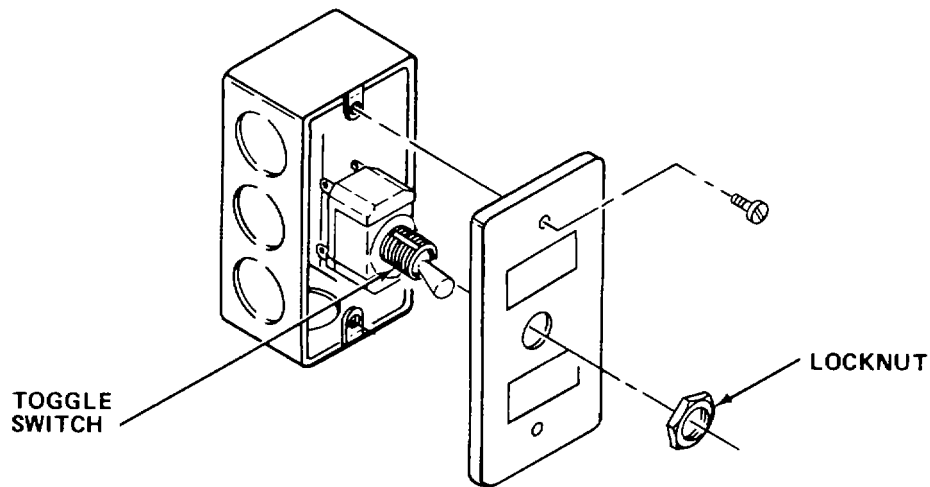
SUPPLIES: Toggle Switch

**NOTE**

**Death or serious injury may occur from electrical shock unless circuit breakers are off before making repairs.**



- a. Set camera and light integrating exposure control circuit breakers on power panel OFF.



- b. Remove switch cover.
- c. Remove locknut.
- d. Tag and disconnect leads.
- e. Replace defective switch.
- f. Reconnect leads.
- g. Install locknut.
- h. Install switch cover.
- i. Set camera and light integrating exposure control circuit breakers on power panel ON.

4-7.25 Replace Light Box Fluorescent Lamp(s).

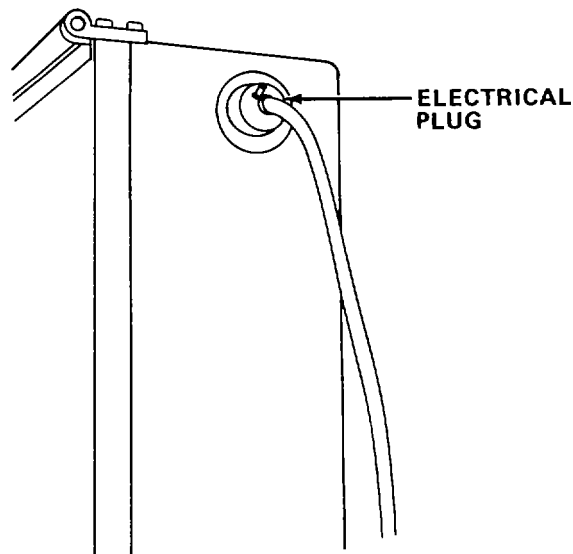
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

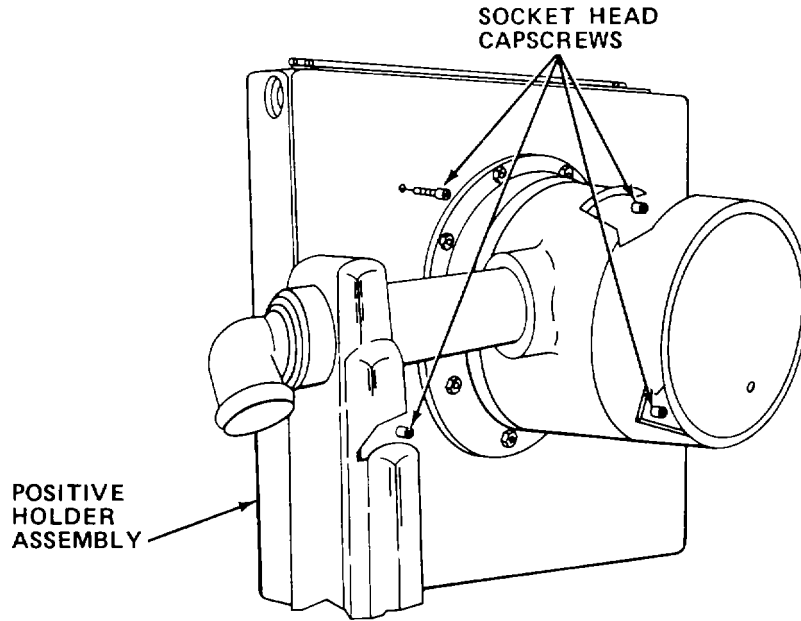
SUPPLIES: T-12 Fluorescent Lamp  
T-8 Fluorescent Lamp

**WARNING**

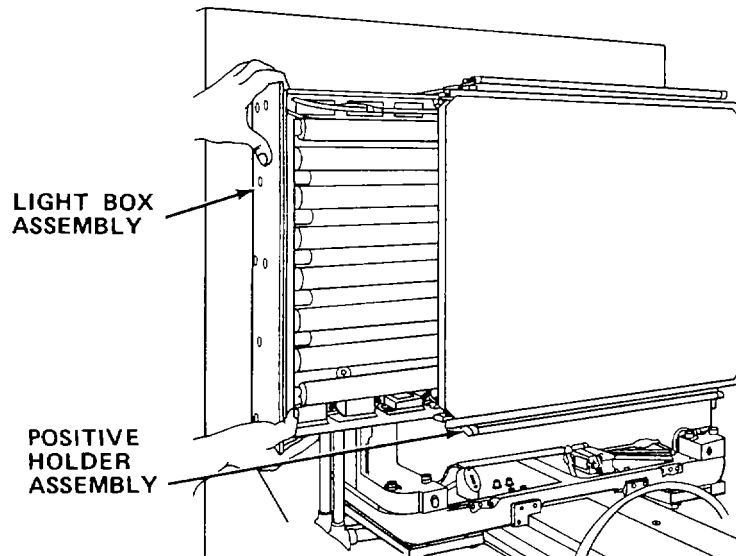
Death or serious injury may occur from electrical shock unless light box assembly power cord is disconnected before making repairs.



- a. Disconnect electrical plug.



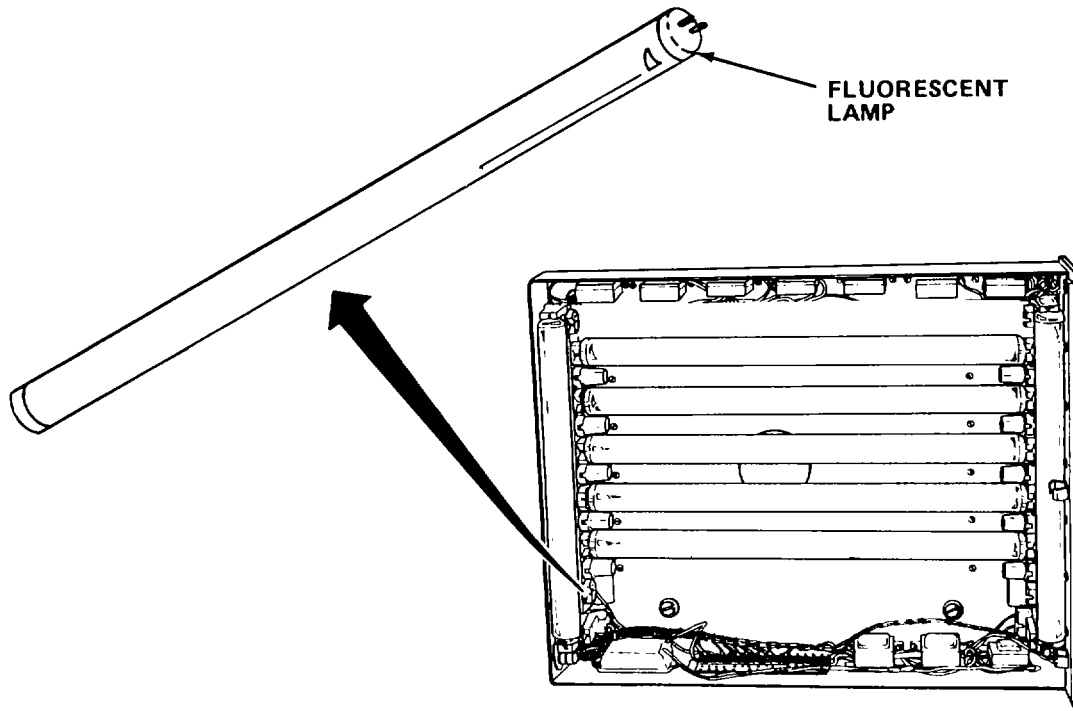
b. Remove four socket head cap screws.



**CAUTION**

**Be careful while removing light box assembly. Diffusers are fragile.**

- c. Remove light box assembly.



- d. Replace defective lamp.

**CAUTION**

**Be careful while installing light box assembly. Diffusers are fragile.**

- e. Install light box assembly.
- f. Reconnect electrical plug.

4-7.26 Replace Light Box Fluorescent Starter(s).

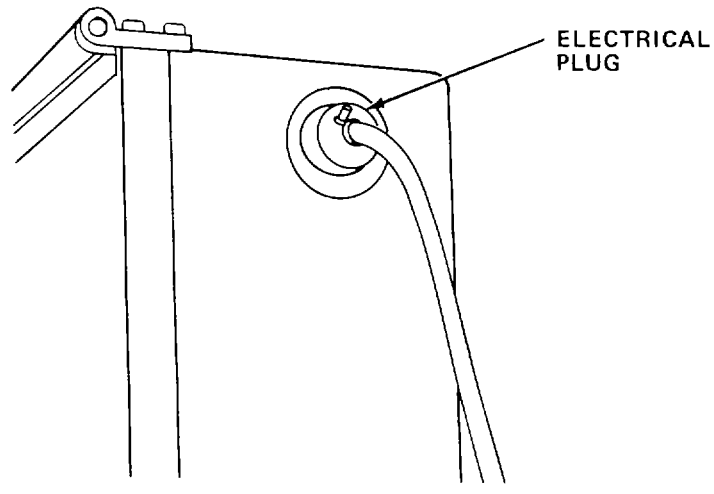
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

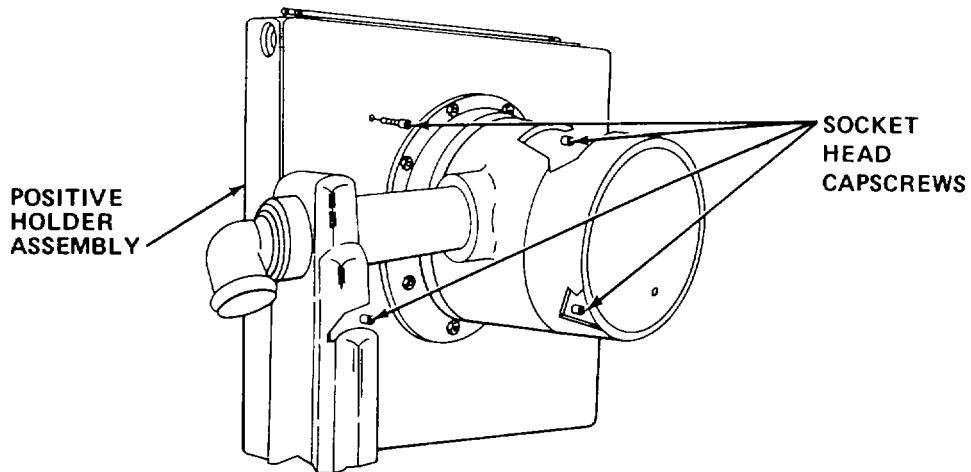
SUPPLIES: Fluorescent Starter(s)

**WARNING**

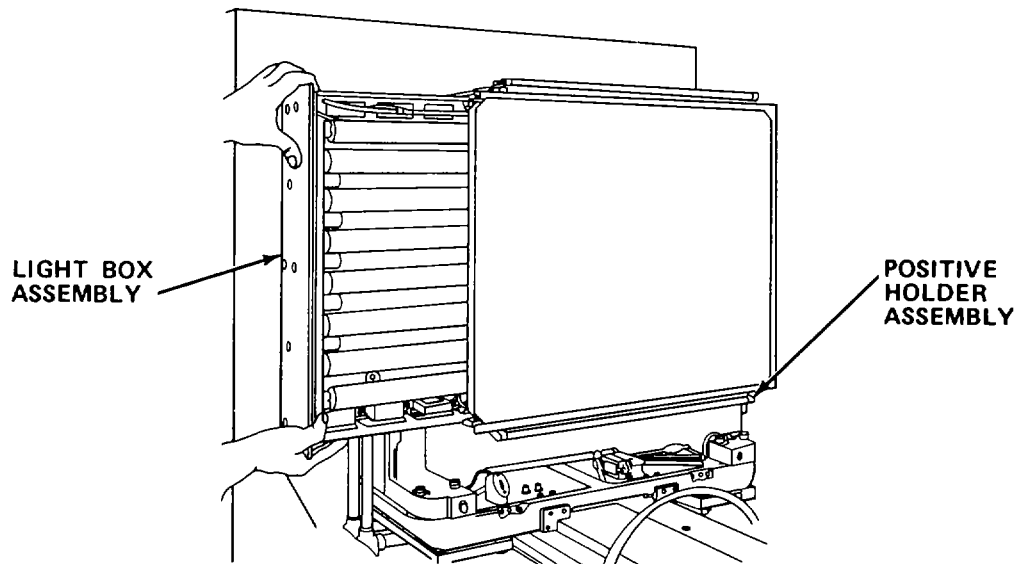
**Death or serious injury may occur from electrical shock unless light box assembly electrical plug is disconnected before making repairs.**



- a. Disconnect electrical plug.



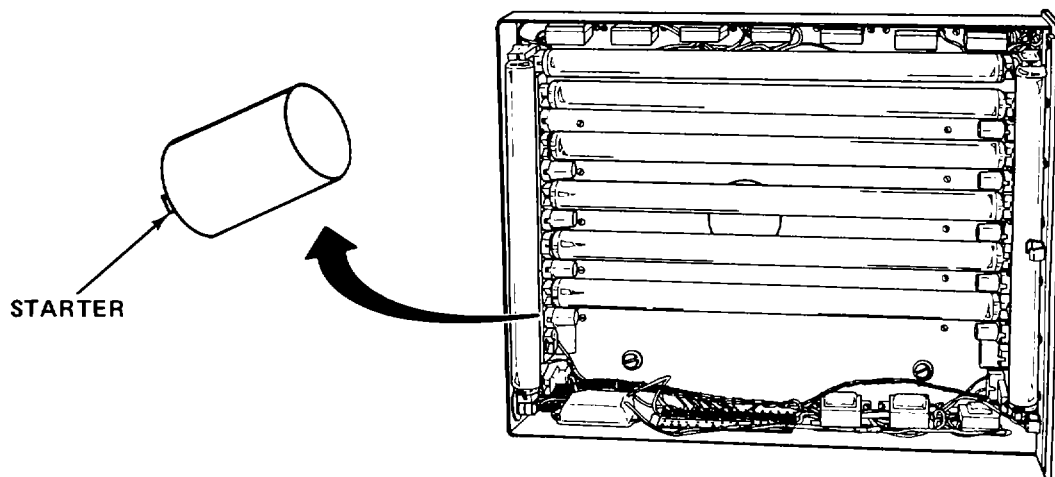
- b. Remove four socket head cap screws.



**CAUTION**

Be careful while removing light box assembly. Diffusers are fragile.

- c. Remove light box assembly.



- d. Replace defective starter.

**CAUTION**

**Be careful while installing light box assembly. Diffusers are fragile.**

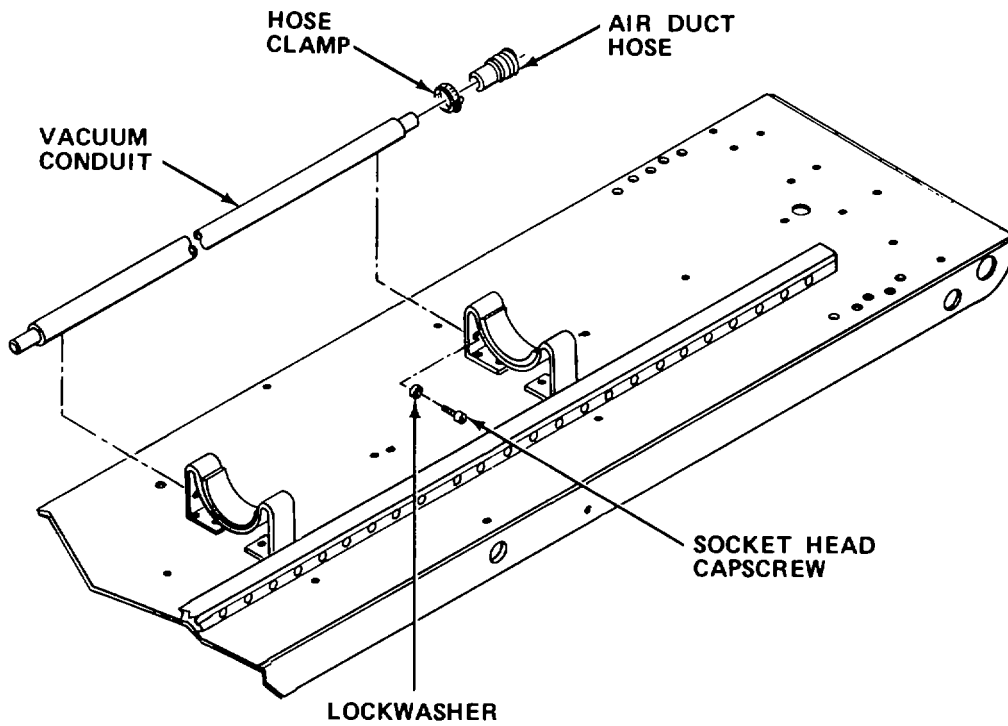
- e. Install light box assembly.
- f. Install socket head capscrews.
- g. Reconnect electrical plug.

4-7.27 Replace Vacuum Conduit.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Vacuum Conduit



- a. Loosen hose clamps.
- b. Remove air duct hoses from conduit.
- c. Remove bottom two screws from side of each cradle.
- d. Replace defective vacuum conduit.
- e. Replace screws in each cradle.
- f. Install air duct hoses.
- g. Tighten hose clamps.

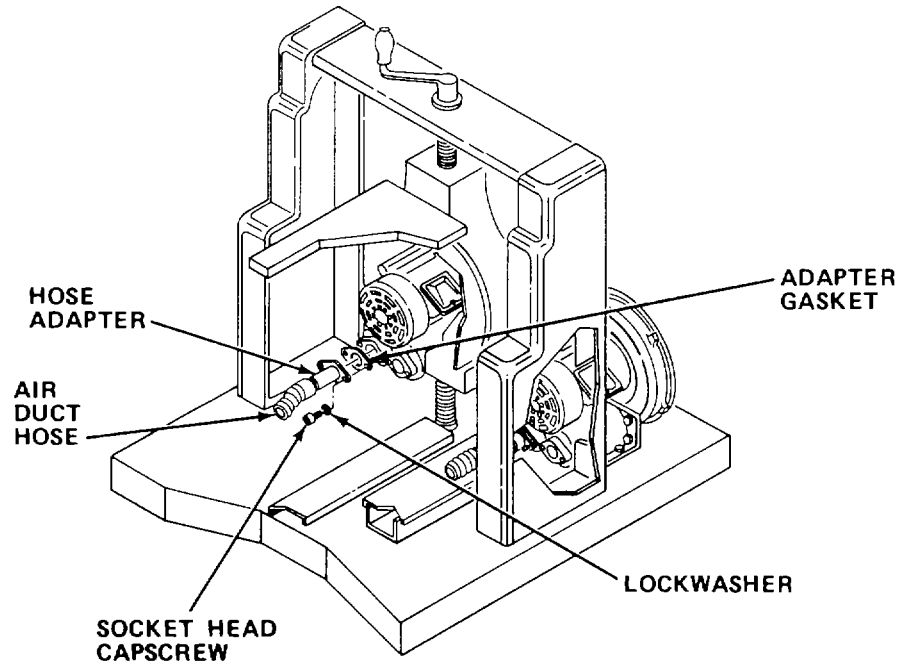


4-7.28 Replace Air Duct Hose Adapter Gasket.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Adapter Gasket



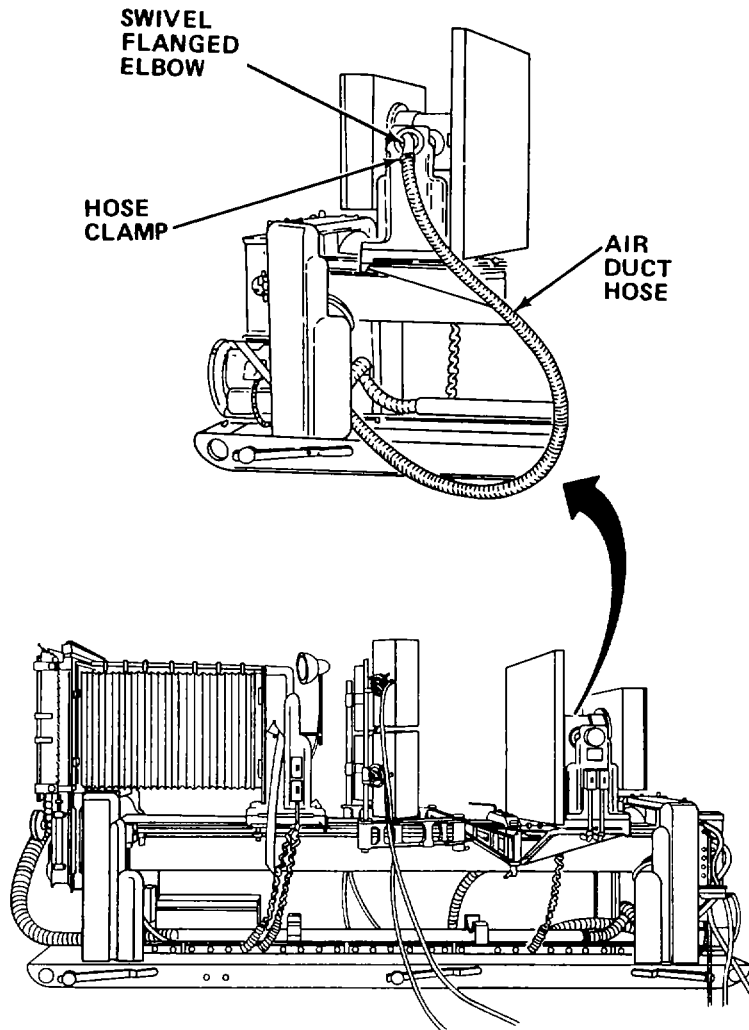
- a. Remove air duct hose.
- b. Remove hose adapter.
- c. Replace defective adapter gasket.
- d. Install hose adapter.
- e. Install air duct hose.

4-7.29 Replace Air Duct Hose.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Air Duct Hose



- a. Loosen hose clamps.
- b. Remove defective air duct hose.
- c. Remove hose clamps from defective air duct hose.
- d. Slide hose clamps on new air duct hose.
- e. Install new air duct hose.
- f. Tighten hose clamps.

4-7.30 Replace Copyboard/Lensboard Carriage Assembly Wiper.

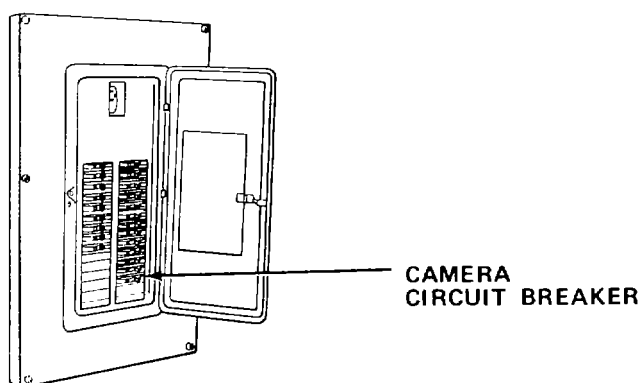
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

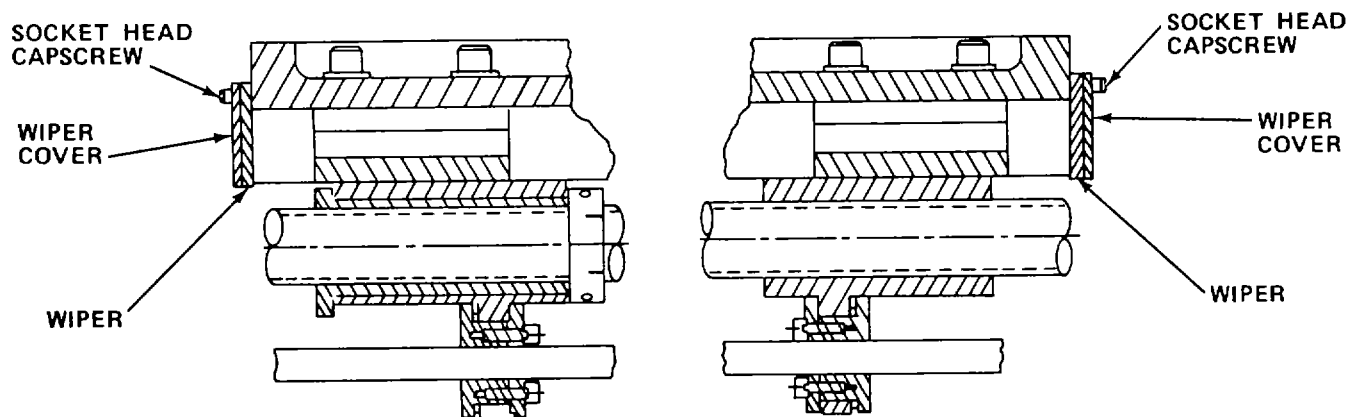
SUPPLIES: Wiper

**WARNING**

Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.



- a. Set camera circuit breaker on power panel OFF.



**CARRIAGE ASSEMBLY**

- b. Replace defective wiper.
- c. Lubricate wiper (paragraph 3-1).
- d. Set camera circuit breaker on power panel ON.

4-7.31 Replace Copyboard/Lensboard Idler Adjustment Arm Roller.

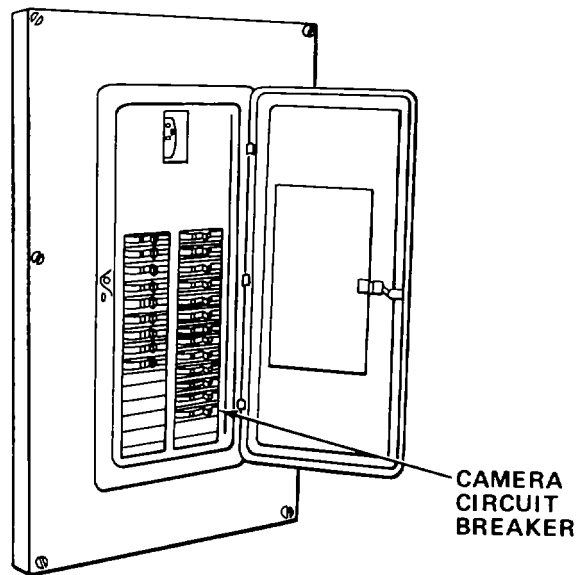
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

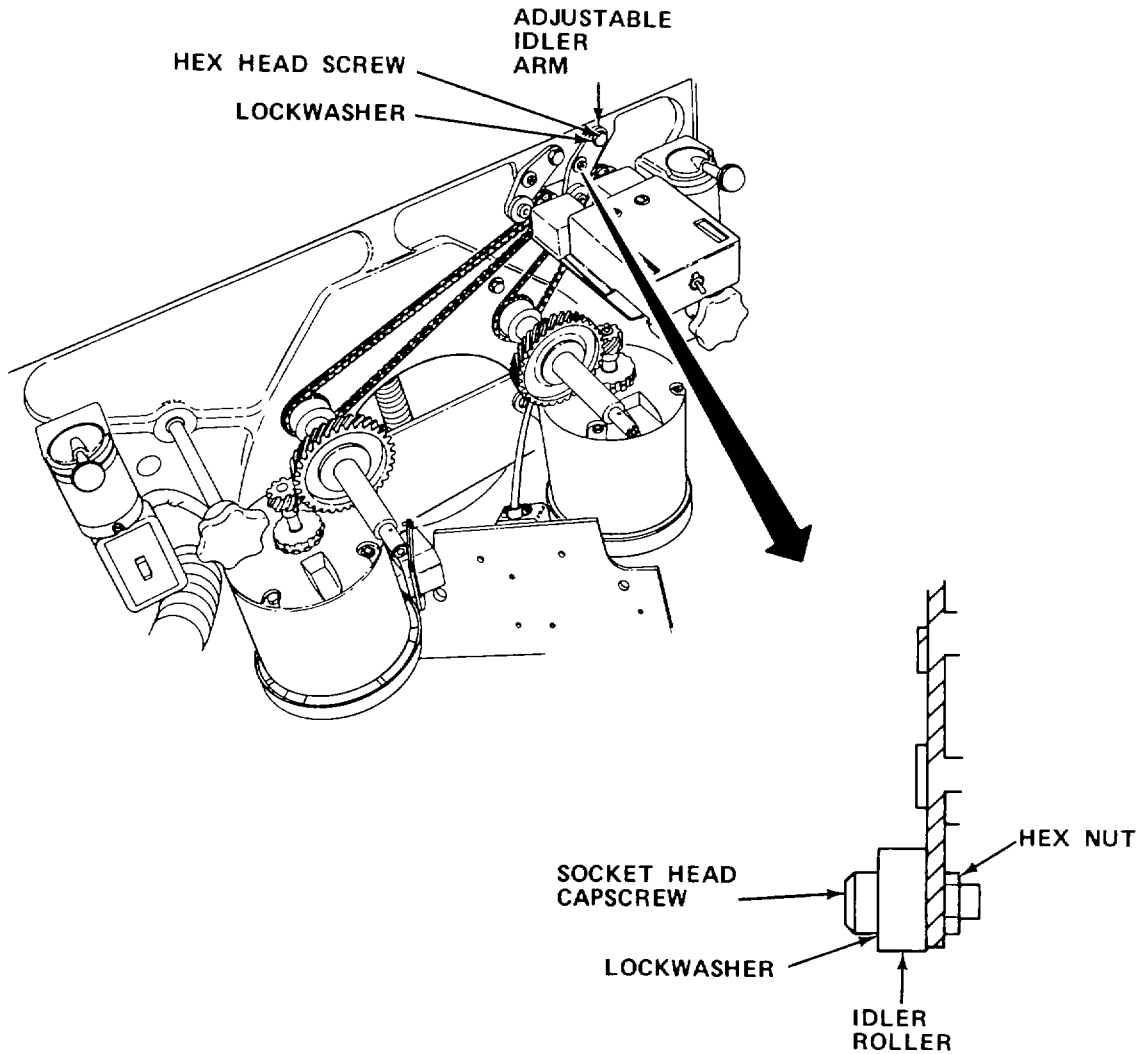
SUPPLIES: Idler Roller  
 Locking Compound (Item 17, Appendix E)

**WARNING**

**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**



- a. Set camera circuit breaker on power panel OFF.
- b. Open vacuum back assembly.



- c. Remove defective idler roller.
- d. Coat threads of idler roller screw with locking compound.
- e. Install new idler roller in adjustable idler arm.
- f. Perform idler arm adjustment (subparagraph 4-7.37).
- g. Close vacuum back assembly.
- h. Set camera circuit breaker on power panel ON.

4-7.32 Replace Camera Height Control Power Transmission Roller Chain.

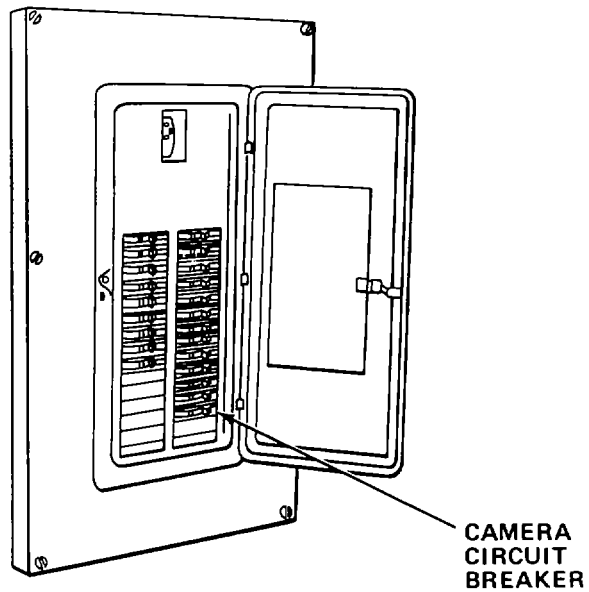
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

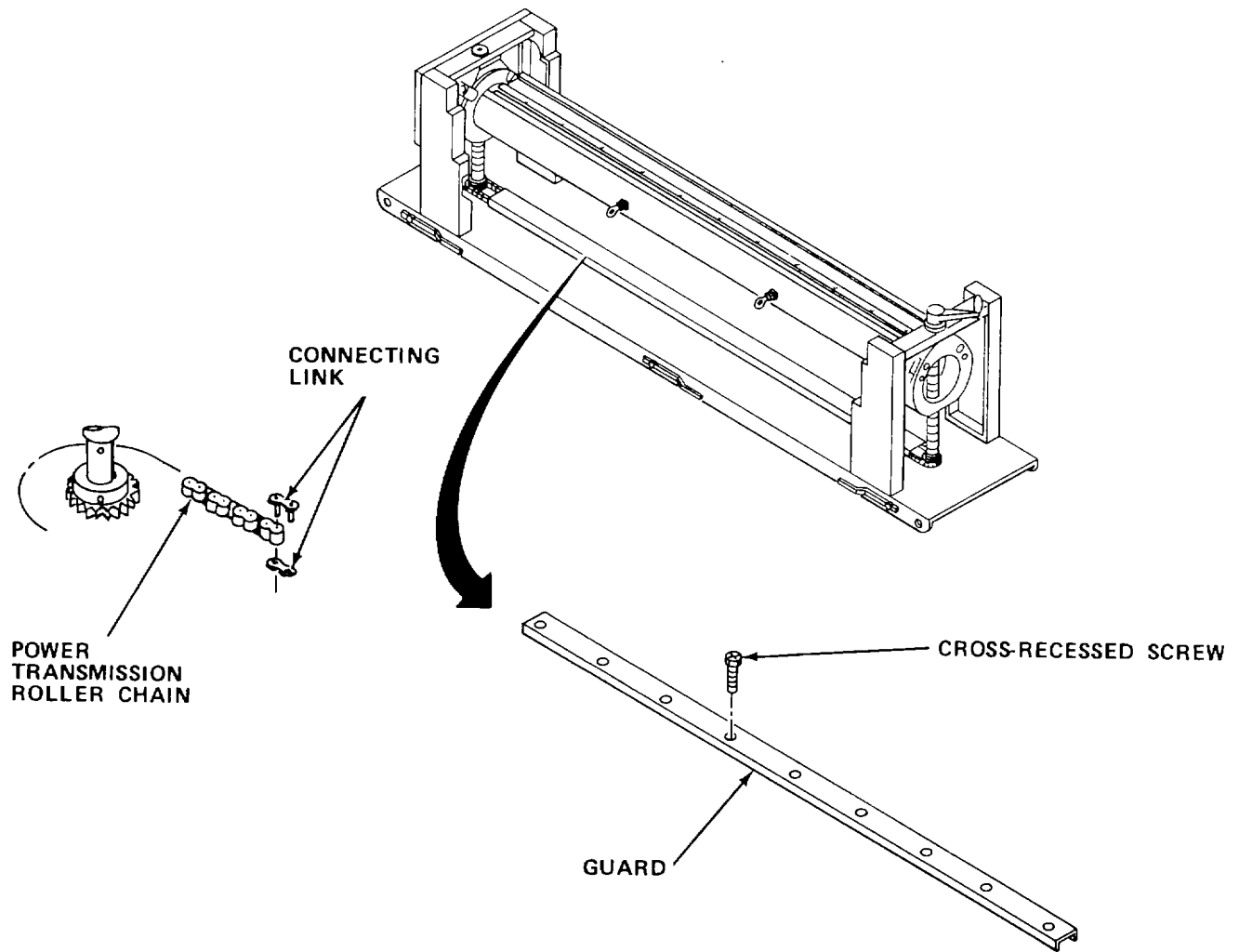
SUPPLIES: Power Transmission Roller Chain  
Power Transmission Roller Chain Link

**WARNING**

**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**



- a. Set camera circuit breaker on power panel OFF.



- b. Remove guard.
- c. Remove link from defective power transmission roller chain.
- d. Replace power transmission roller chain.
- e. Install power transmission roller chain link.
- f. Install guard.
- g. Set camera circuit breaker on power panel ON.

4-7.33 Replace Lensboard Carriage Assembly Duplex Receptacle Connector.

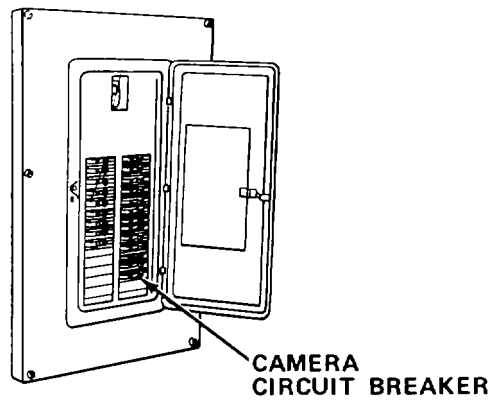
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
Multimeter

SUPPLIES: Duplex Receptacle Connector

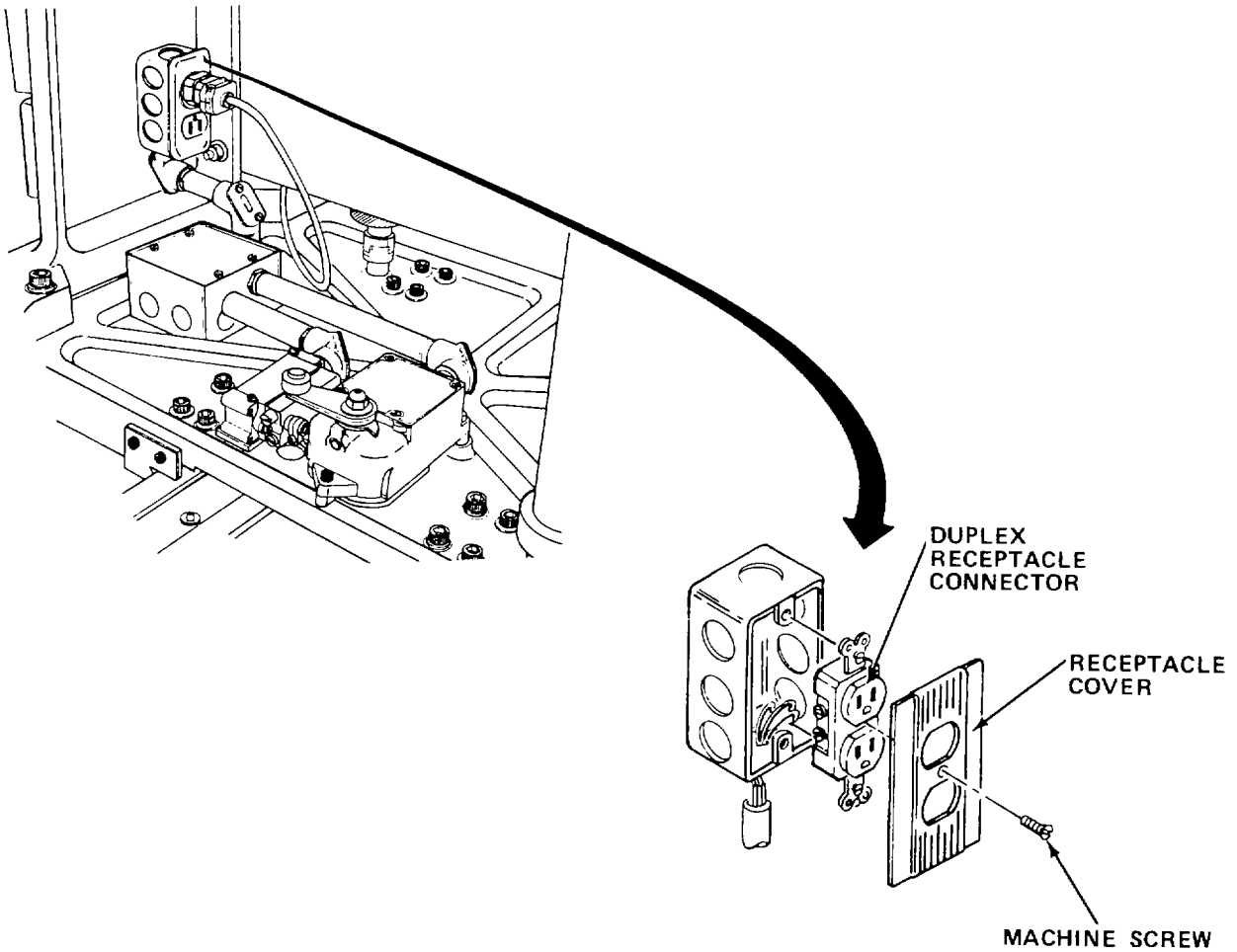
**WARNING**

**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**



- a. Set camera circuit breaker on power panel OFF.





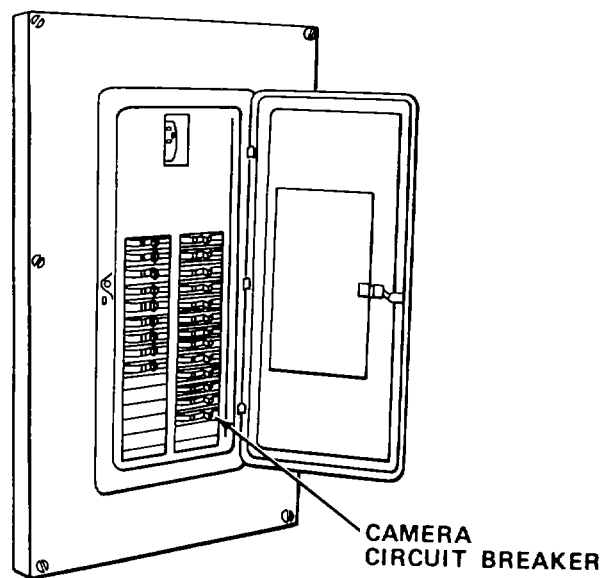
- b. Remove receptacle cover.
- c. Remove defective duplex receptacle connector.
- d. Tag and disconnect leads.
- e. Reconnect leads to new duplex receptacle connector.
- f. Install new duplex receptacle connector.
- g. Install receptacle cover.
- h. Set camera circuit breaker on power panel ON.

4-7.34 Replace Counter Assembly Lampholder.

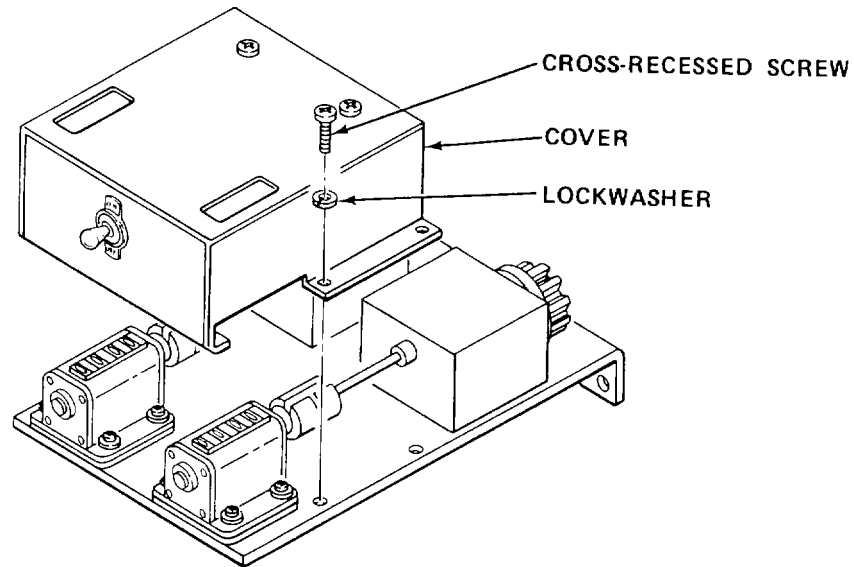
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
Multimeter

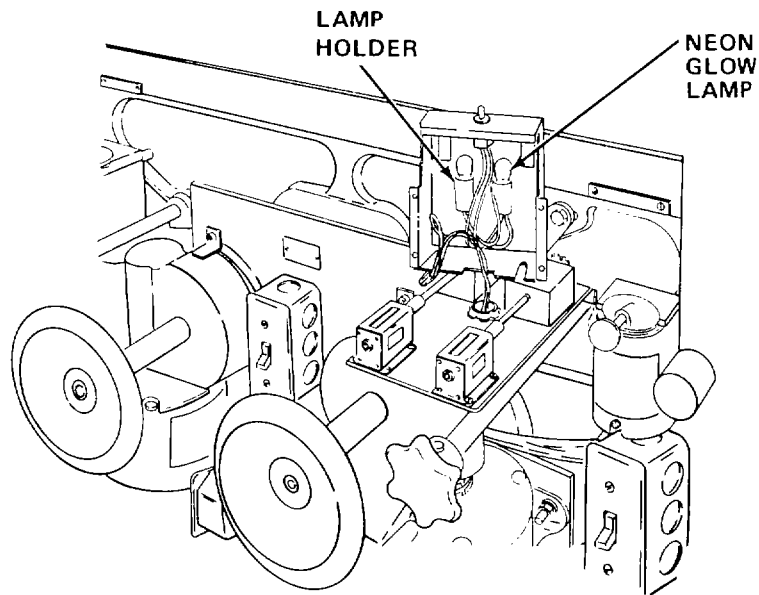
SUPPLIES: Lampholder

**WARNING****Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**

- a. Set camera circuit breaker on power panel OFF.



b. Remove cover.



c. Remove neon lamp.

d. Replace defective lampholder.

e. Install neon lamp.

f. Install cover.

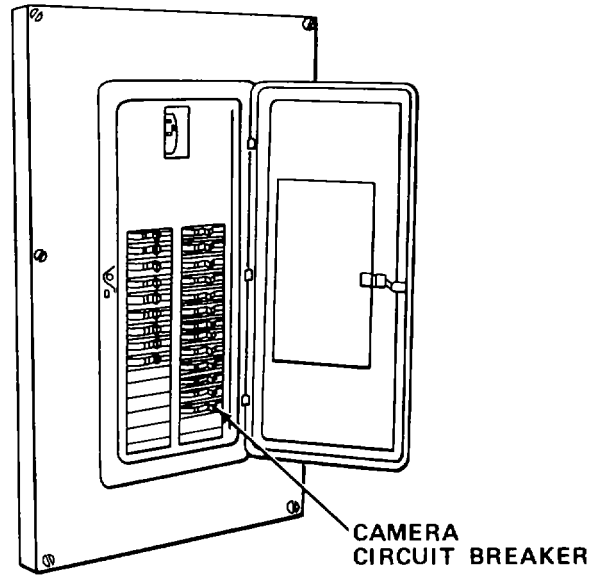
g. Set camera circuit breaker on power panel ON.

4-7.35 Repair Bellows.

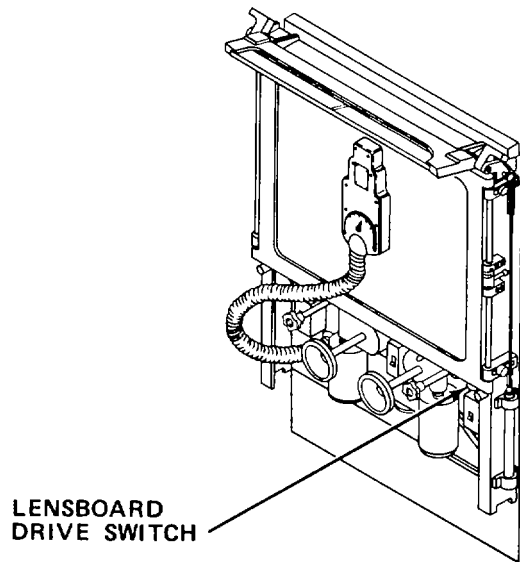
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

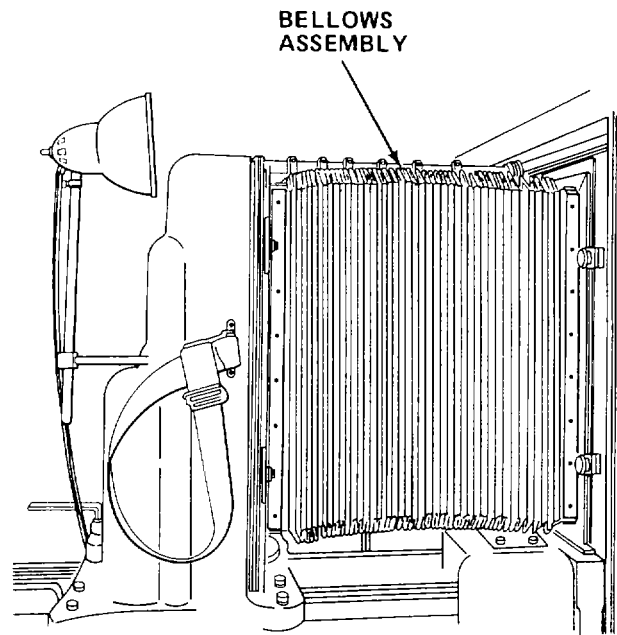
SUPPLIES: Black Silicone Adhesive-Sealant (Item 2, Appendix E)  
Closed-Cell Vinyl



- a. Set camera circuit breaker on power panel ON.



- b. Hold LENSBOARD DRIVE switch in FWD position to extend bellows assembly.



- c. Apply silicone adhesive-sealant to cracks or tears and cover with closed-cell vinyl. Let dry.
- d. Test bellows assembly for light leaks.

4-7.36 Optically Aline Camera.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
 Dial Indicator Trammel Assembly  
 Monocular Magnifier  
 Feeler Gage  
 MIC

SUPPLIES: Three Sheets Photographic Film 24 x 30 in.

Filler Bar (6)

Pencil

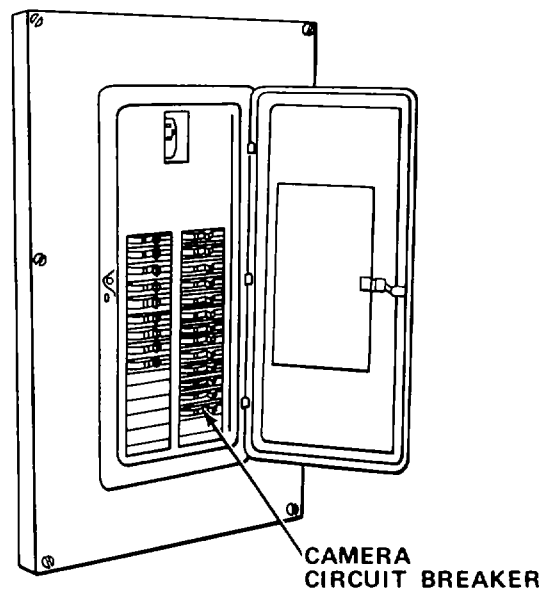
Pad Paper

Target

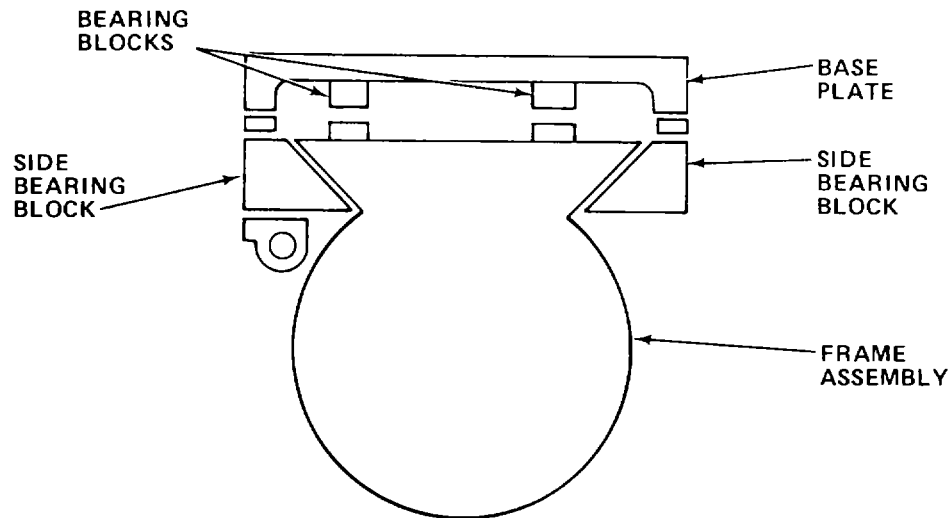
Black Silicone Adhesive-Sealant (Item 2, Appendix E)

**NOTE**

- **This task requires two personnel.**
- **Measure three sheets of film with a micrometer and record thickness.**

4-7.36.1 Safety Check.

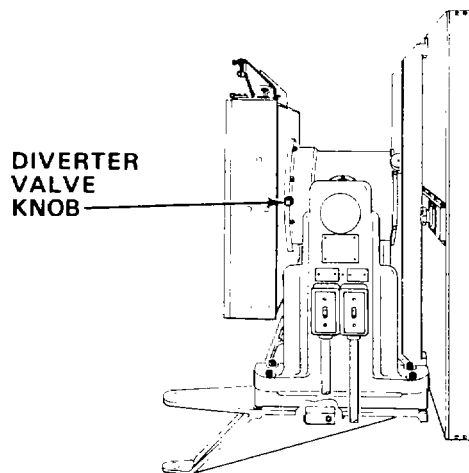
- Set camera circuit breaker on power panel OFF.
- Remove bellows assembly (subparagraph 4-7.3).
- Check rail assembly for foreign objects.



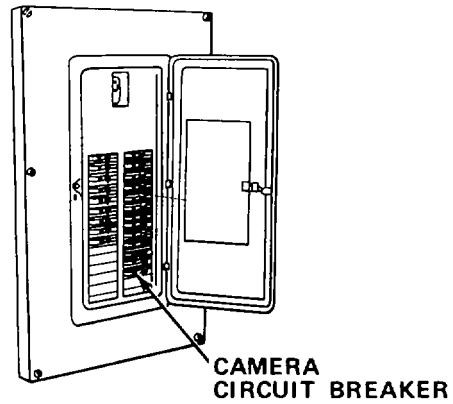
**NOTE**

**If horizontal movement is detected, add and subtract filler bar laminations from side bearing blocks diagonally from each other. If vertical movement is detected, add and subtract filler bar laminations from bearing blocks riding on the frame assembly.**

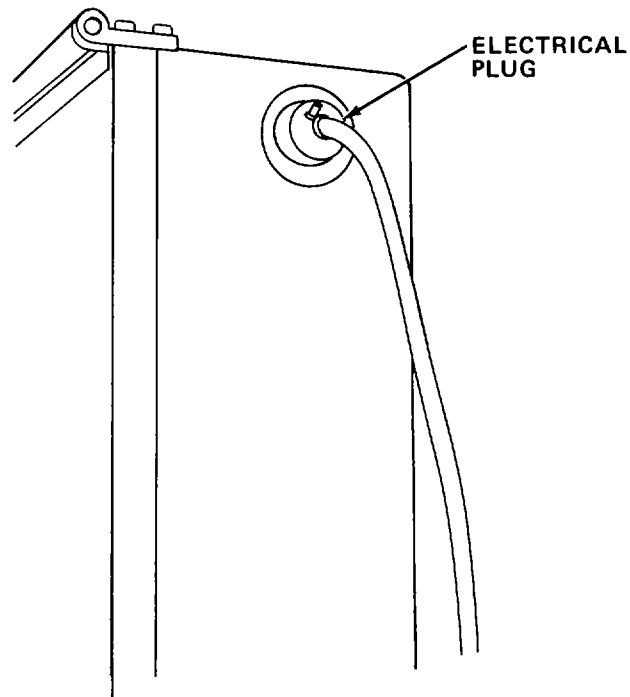
- d. Measure clearance between side bearing blocks bevelled edge and frame assembly with a feeler gage. Clearance must not exceed 0.002 in. (0.05 mm).
- e. Rock carriage base plates. They should not move.
- f. Check that all switches are in down position.



- g. Push diverter valve knob in.
- h. Check for loose cables.



- i. Set camera circuit breaker on power panel ON.
- j. Check operation of shutter assembly.
- k. Check operation of limit switches.
- l. Check operation of counters.

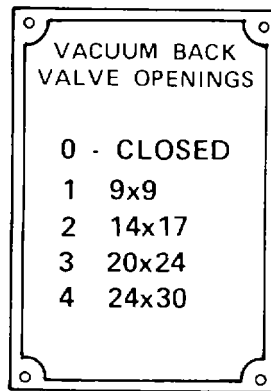


- m. Disconnect electrical plug.

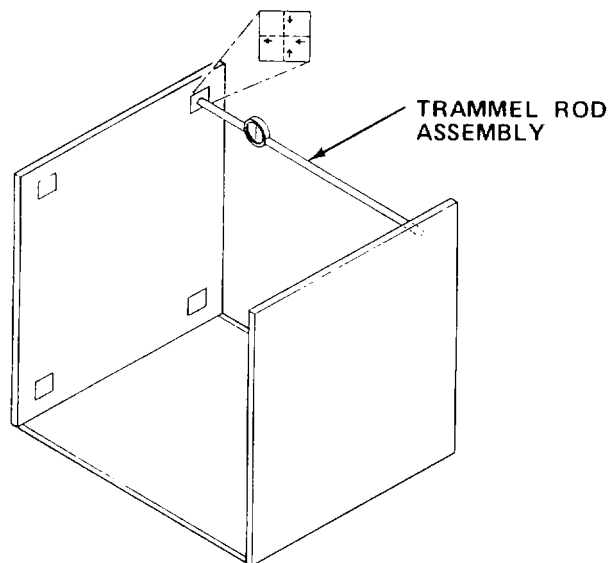


4-7.36.2 Trammel Vacuum Back Assembly.

- a. Unlock and open vacuum back assembly.
- b. Set vacuum back assembly TURBINE START and STOP switch to START.



- c. Set vacuum back valve handle to 24 x 30.
- d. Place photographic film on vacuum back assembly vacuum plate.
- e. Close and lock vacuum back assembly.



**NOTE**

- **To avoid making incorrect measurements, the trammel rod assembly must be kept parallel to the frame assembly.**
  
- **Record lens and copy counter readings.**
  
- f. Trammel lensboard assembly inner frame to vacuum back assembly. Record readings.
- g. Move lensboard assembly toward copyboard assembly approximately three in. (7.6 cm).

**NOTE**

**Turn handwheel to left when coming to final setting.**

- h. Position lensboard assembly to recorded lens counter reading.
- i. Perform step f.
- j. Move lensboard assembly toward vacuum back assembly approximately three in. (7.6 cm).

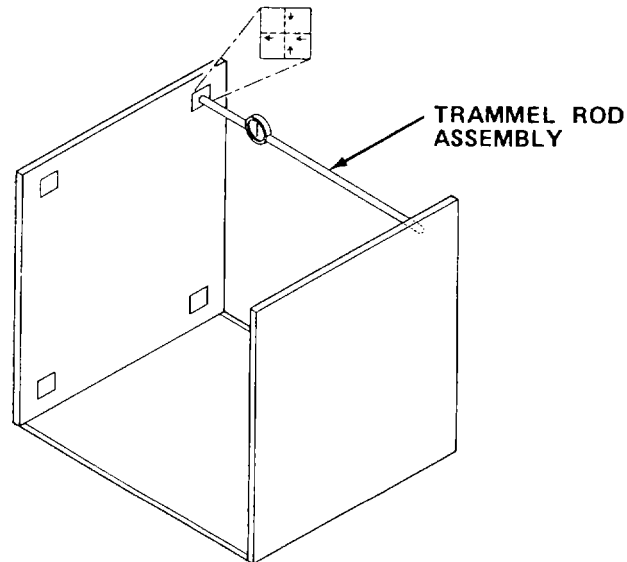
**NOTE**

**Turn handwheel to left when coming to final setting.**

- k. Position lensboard assembly to recorded lens counter reading.
- l. Perform step f.
- m. Unlock and open vacuum back assembly.
- n. Close and lock vacuum back assembly.
- o. Perform step f.
- p. Unlock and open vacuum back assembly.

4-7.36.3 Trammel Ground Glass Assembly.

- a. Lower and latch ground glass assembly.

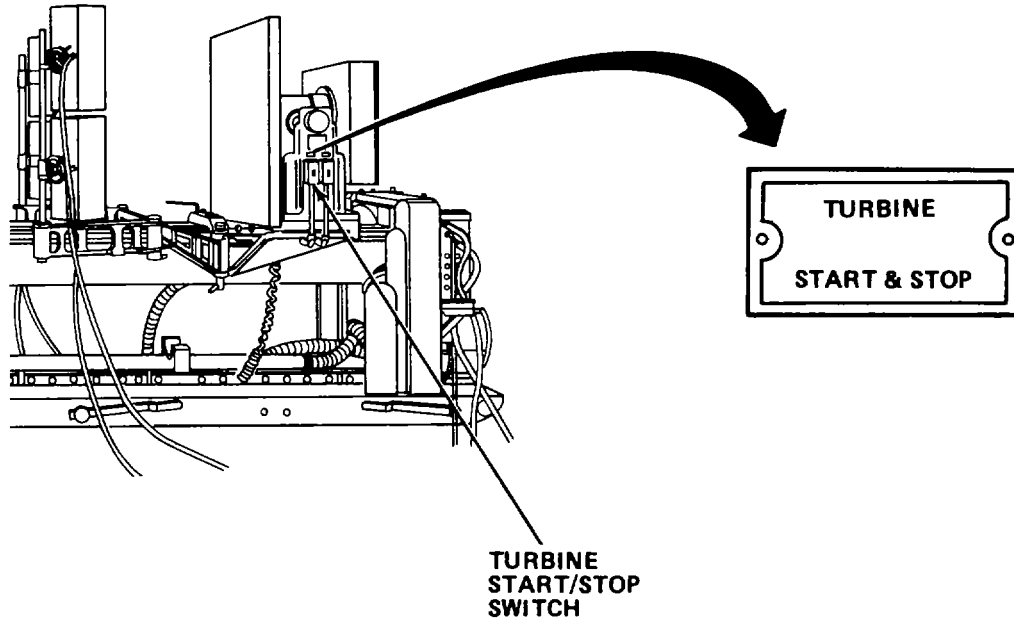


**NOTE**

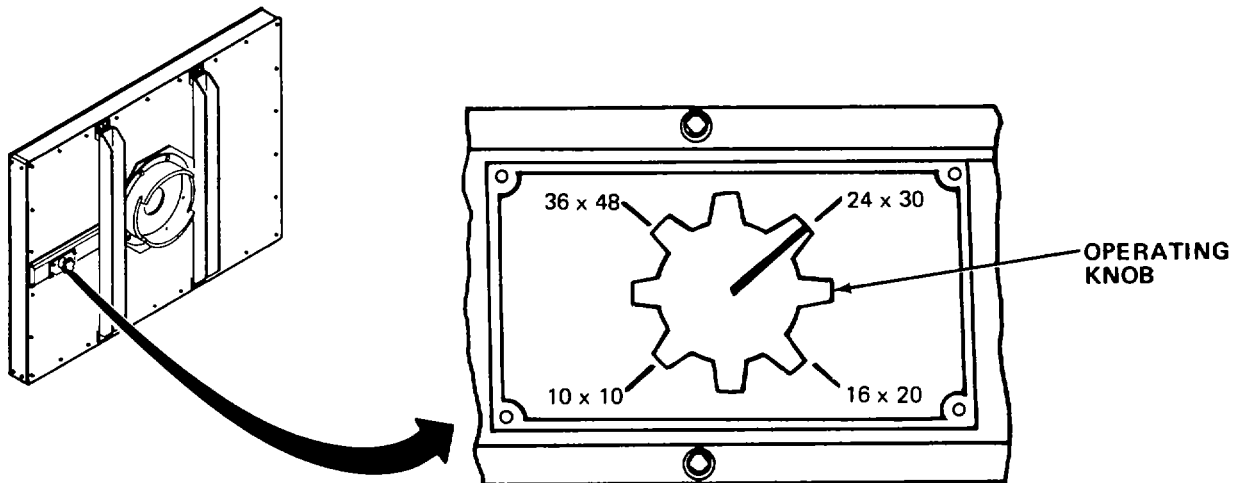
**To avoid making incorrect measurements, the trammel rod assembly must be kept parallel to the frame assembly.**

- b. Trammel ground glass assembly to lensboard assembly inner frame. Record readings.
- c. Perform steps 4-7.36.2g and 4-7.36.2h.
- d. Raise; then lower and latch ground glass assembly.
- e. Perform step b.
- f. Perform steps 4-7.36.2j and 4-7.36.2k.
- g. Perform step b.

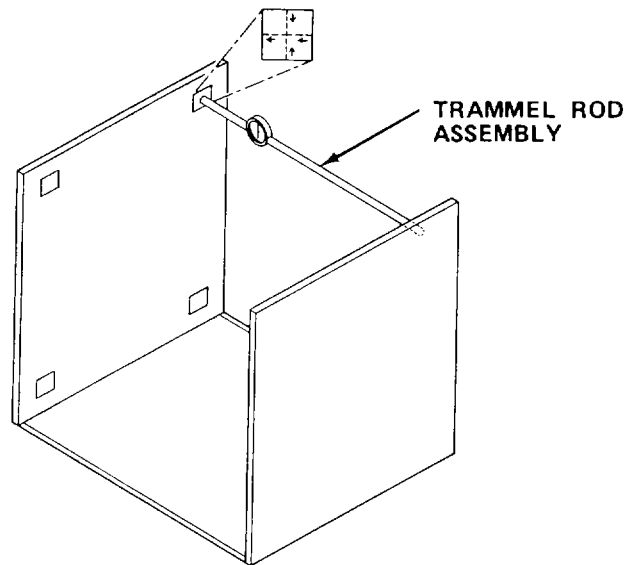
4-7.36.4 Trammel Copyboard Assembly and Positive Holder Assembly.



- a. Set copyboard TURBINE START and STOP switch to START.



- b. Set operating knob to 24 x 30.
- c. Place photographic film on copyboard assembly.



**NOTE**

- **To avoid making incorrect measurements, the trammel rod assembly must be kept parallel to the frame assembly.**

- **Record copy counter reading.**

- d. Trammel lensboard assembly inner frame to copyboard assembly. Record readings.
- e. Pivot copyboard assembly back and forth.
- f. Perform step d.
- g. Move copyboard assembly backward approximately three in. (7.6 cm).

**NOTE**

**Turn handwheel to left when coming to final setting.**

- h. Position copyboard assembly to recorded copy counter reading.
- i. Perform step d.
- j. Move copyboard assembly toward lensboard assembly approximately three in. (7.6 cm).

**NOTE**

**Turn handwheel to left when coming to final setting.**

- k. Position copyboard assembly to recorded copy counter reading.
- l. Perform step d.
- m. Pivot positive holder assembly until it is facing lensboard assembly.
- n. Trammel lensboard assembly inner frame to positive holder assembly. Record readings.
- o. Pivot positive holder assembly back and forth.
- p. Perform step n.
- q. Move positive holder assembly back approximately three in. (7.6 cm).

**NOTE**

**Turn handwheel to left when coming to final setting.**

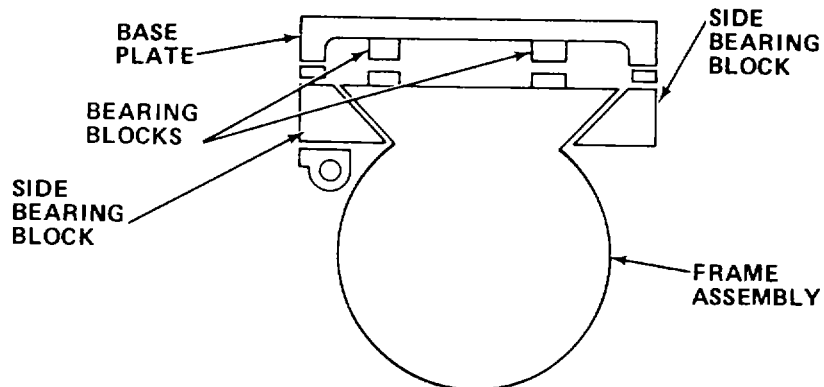
- r. Position positive holder assembly to recorded copy counter reading.
- s. Perform step n.
- t. Move positive holder assembly toward lensboard assembly approximately three in. (7.6 cm).

**NOTE**

**Turn handwheel to left when coming to final setting.**

- u. Position positive holder assembly to recorded copy counter reading.
- v. Perform step n.
- w. Evaluate readings. All planes must be parallel to within 0.0005 in. (0.0127 mm). If readings are within tolerance, proceed to subparagraph 4-7.36.11.

4-7.36.5 Lensboard Assembly Adjustments.

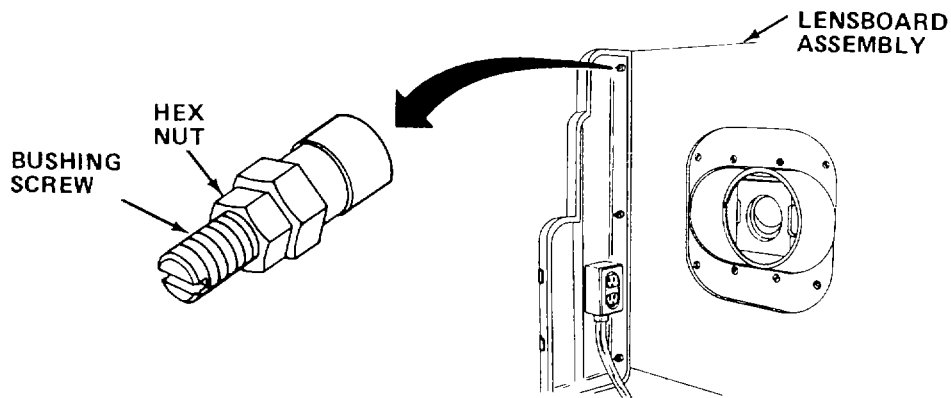


**NOTE**

**Adding or removing shim stock to bearing blocks beneath base plate affects vertical position. Adding or removing shim stock to side bearing blocks affects horizontal position.**

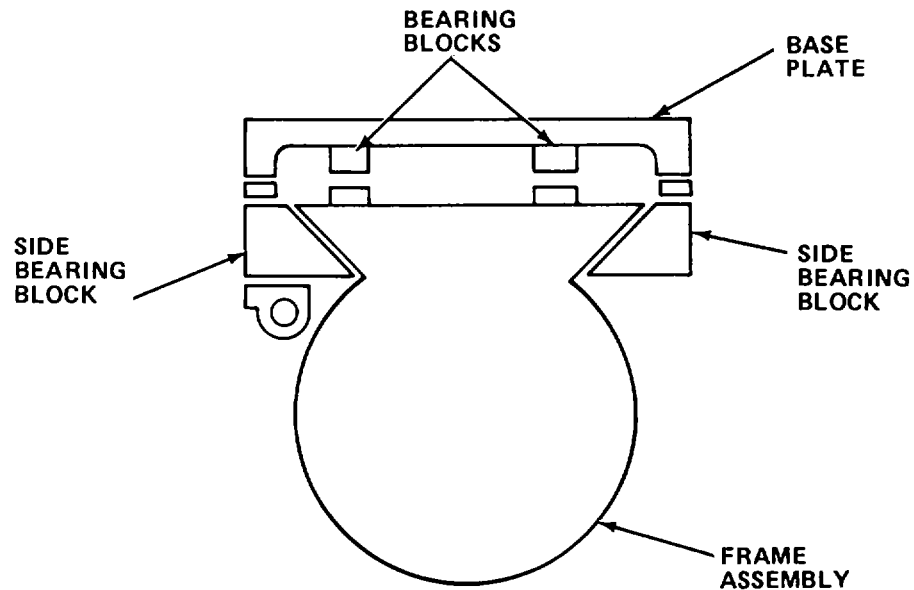
a. Shim side and/or base plate bearing blocks.

- (1) Check side bearing block clearance. Maximum clearance 0.002 in. (0.05 mm). If readings are within tolerance, proceed to subparagraph 4-7.37.11.
- (2) Move carriage assembly forward and backward at least two in. (5.08 cm) to seat side bearing blocks.



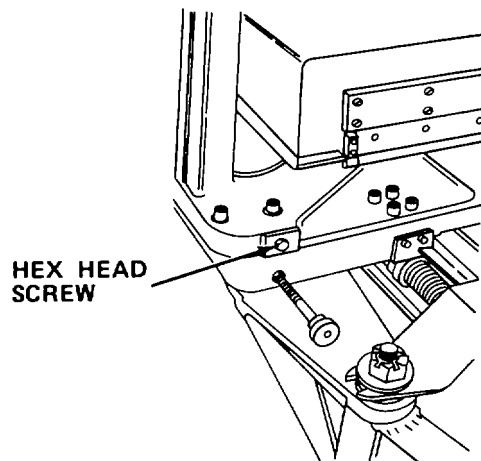
- b. Loosen hex nuts and bushing screw to adjust position of lensboard assembly.
- c. Tighten hex nuts.

4-7.36.6 Copyboard Assembly Adjustments.



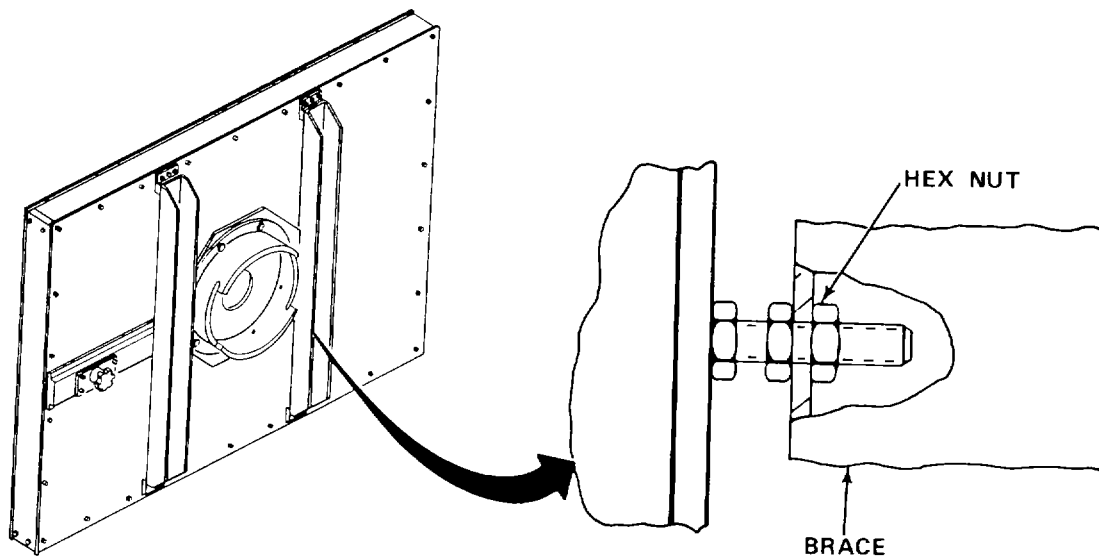
**Adding or removing shim stock to base plate bearing blocks affects vertical position. Adding or removing shim stock to side bearing blocks affects horizontal position.**

- a. Shim side bearing blocks and/or base plate bearing blocks.
  - (1) Check side bearing block clearance. Maximum clearance 2.000 in. (0.05 mm).
  - (2) Move carriage assembly forward and backward at least two in. (5.08 cm) to seat side bearing blocks.

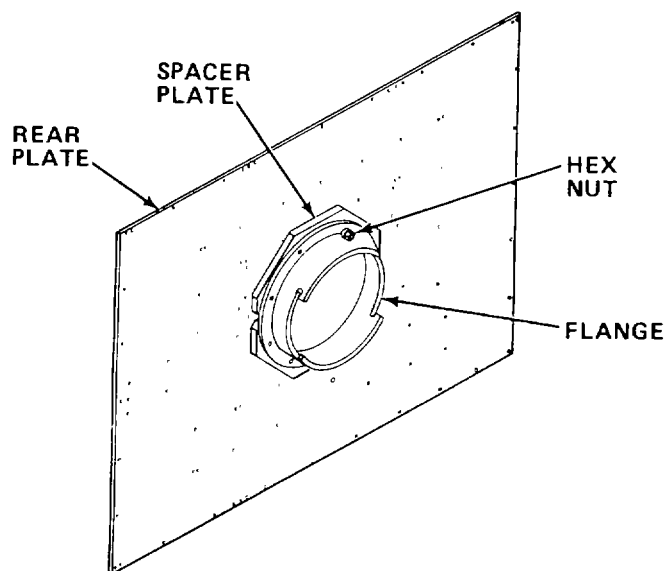


- b. Adjust hex head screws.



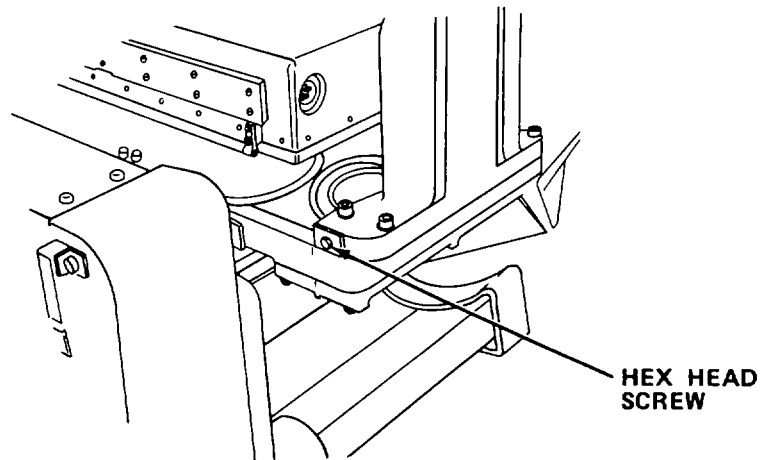


c. Adjust hex nuts on braces at rear of copyboard assembly.

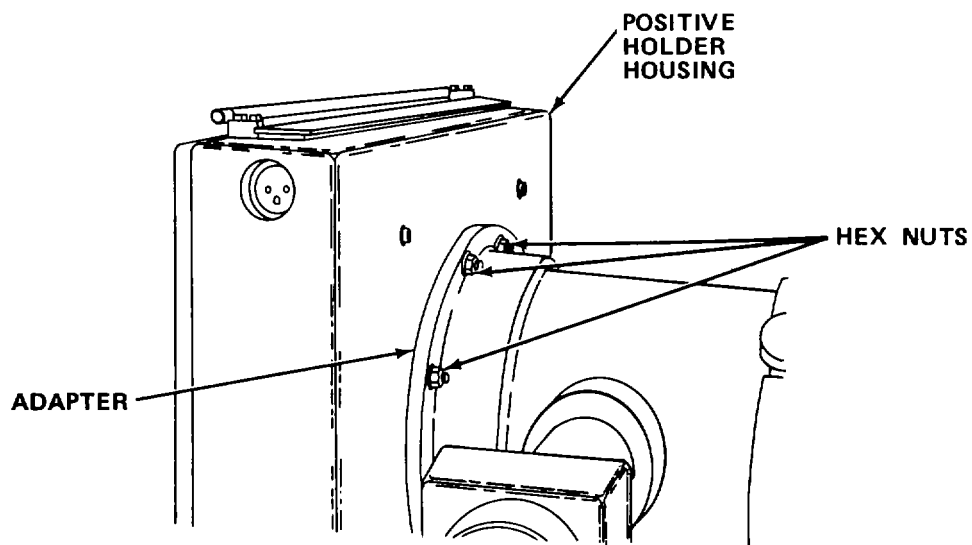


- d. Loosen hex nuts holding flange.
- e. Add shim stock between flange and spacer plate.
- f. Tighten hex nuts. Seal with adhesive to prevent leaks.

4-7.36.7 Positive Holder Assembly Adjustment.



a. Adjust hex head screws.



b. Loosen hex nuts.

c. Add shim stock between adapter and positive holder housing, if needed.

- (1) Tighten hex nuts.
- (2) Seal with adhesive to prevent leaks.

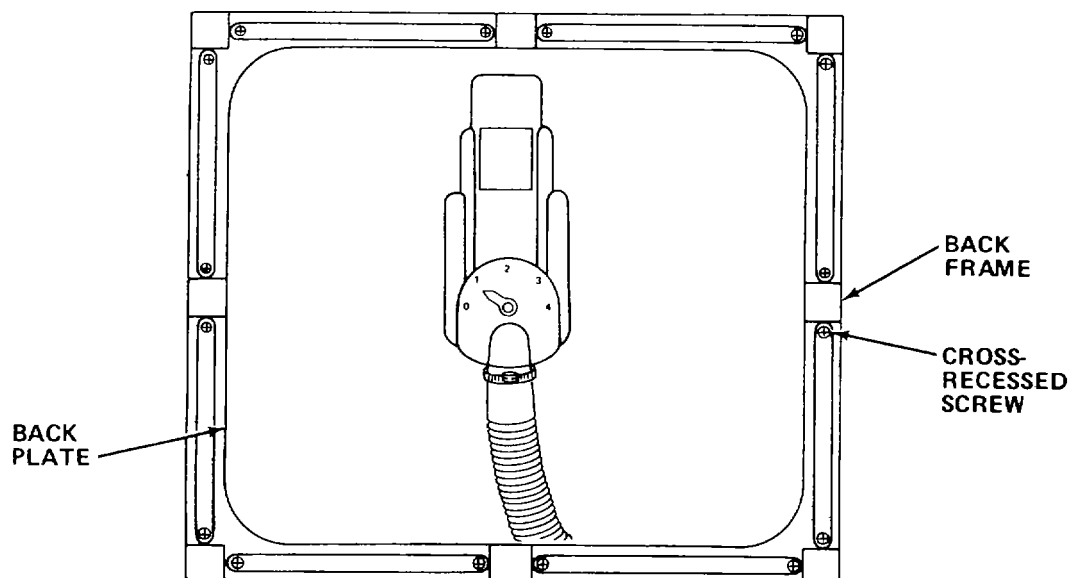
4-7.36.8 Retrammel.**NOTE**

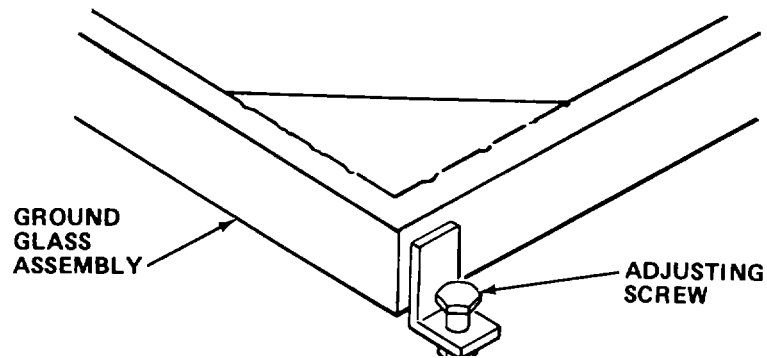
**Vacuum back assembly readings and ground glass assembly readings must be identical.**

- a. Trammel vacuum back assembly (subparagraph 4-7.36.2).
- b. Trammel ground glass assembly (subparagraph 4-7.36.3).
- c. Trammel copyboard assembly and positive holder assembly (subparagraph 4-7.36.4).
- d. If readings are within 0.0005 in. (0.0127 mm), proceed to subparagraph 4-7.36.11. If not, proceed to subparagraph 4-7.36.9.

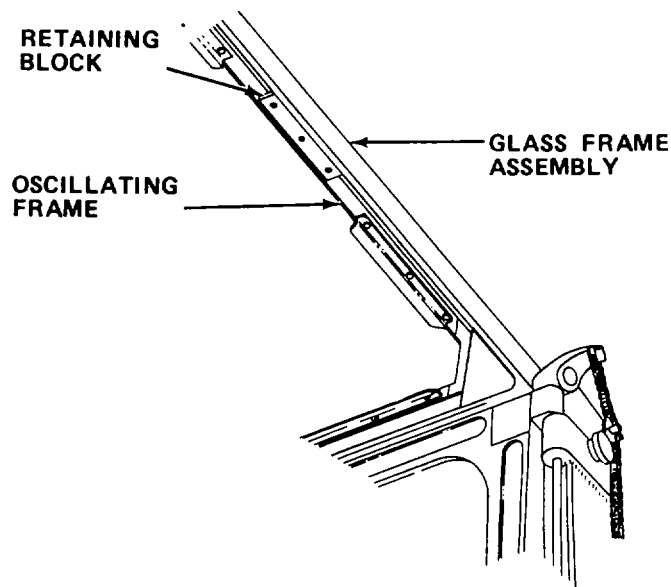
4-7.36.9 Adjust Vacuum Back Assembly and Ground Glass Assembly.

- a. Loosen cross-recessed screws and slide or remove shim stock between back frame and back plate. Tighten cross-recessed screws.





b. Adjust the length of adjusting screws.



c. Remove retaining blocks.

(1) Add or remove shim stock between oscillating frame and retaining blocks.

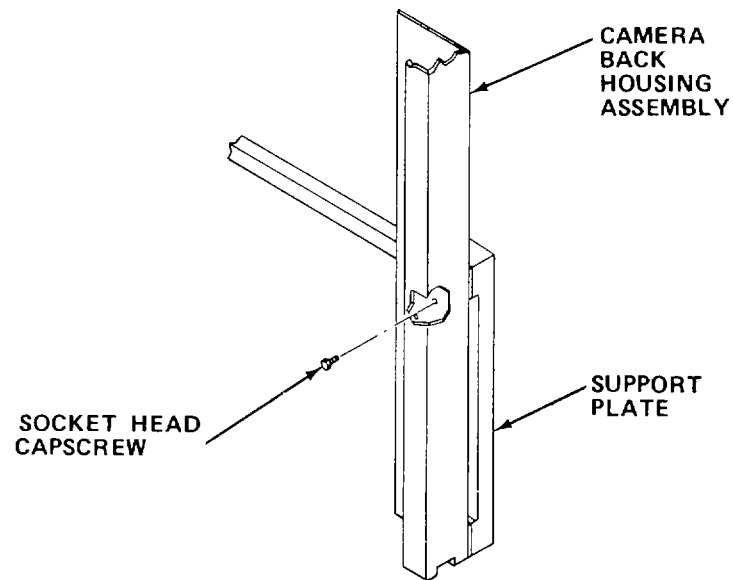
(2) Add or remove shim stock between glass frame assembly and retaining blocks.

d. Install retaining blocks.

e. Retrammel (subparagraph 4-7. 36. 8).

f. If readings are within 0. 0005 in. (0. 0127 mm), proceed to subparagraph 4-7. 36. 11. If not, proceed to subparagraph 4-7. 36. 10.

4-7.36.10 Adjust Camera Back Housing Assembly.



- a. Remove socket head capscrews.
- b. Add or remove shim stock between camera back housing assembly and support plate.
- c. Install socket head capscrews.
- d. Retrammel (subparagraph 4-7. 36. 8).

4-7.36.11 Calibrating Lens and Copy Counters.

- a. Unlock and open vacuum back assembly.
- b. Remove photographic film from vacuum back assembly vacuum plate and copyboard assembly.
- c. Set vacuum back assembly TURBINE START and STOP switch to STOP.
- d. Install bellows assembly (subparagraph 4-7. 3d).
- e. Install 24 in. lens assembly. Set f/stop to widest opening.
- f. Place target upside down on copyboard assembly.
- g. Set LAMPS ON and OFF switch ON. Open shutter.
- h. Move lensboard and copyboard assemblies to obtain 200% magnification.

**NOTE**

**Copyboard assembly movement affects focus. Lensboard assembly movement affects size.**

- i. Adjust lensboard and copyboard assemblies for sharp focus at proper size. Record lens and copy counter readings.
- j. Adjust lensboard assembly for a sharply focused image at 50%. Record lens counter reading.
- k. Subtract lower magnification from higher magnification.
  - (1) Subtract higher lens counter reading from lower lens counter reading.
  - (2) Effective focal length(EF) = difference counter reading difference magnification percent.
- l. Repeat steps h thru k three times.

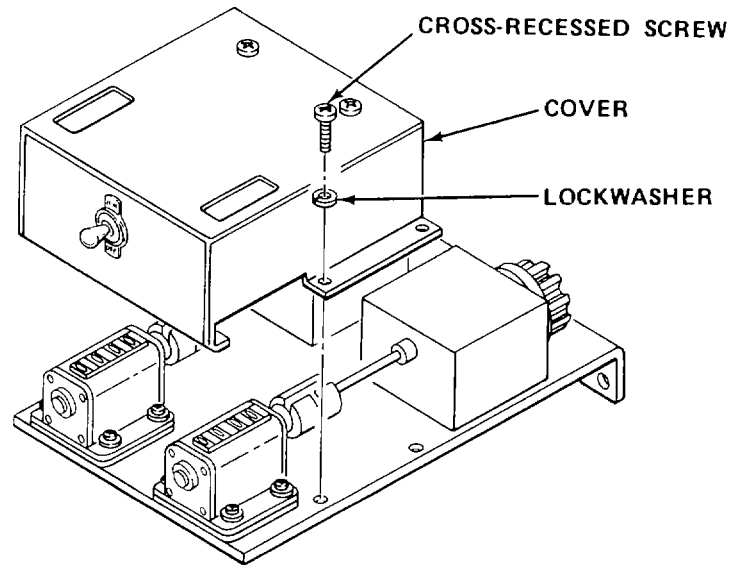
**NOTE**

• The following formulas will be used for the calibration of the lensboard and ,copyboard counters. Copyboard counter (CBC) =  $(1 + M)^2 (EF) M$

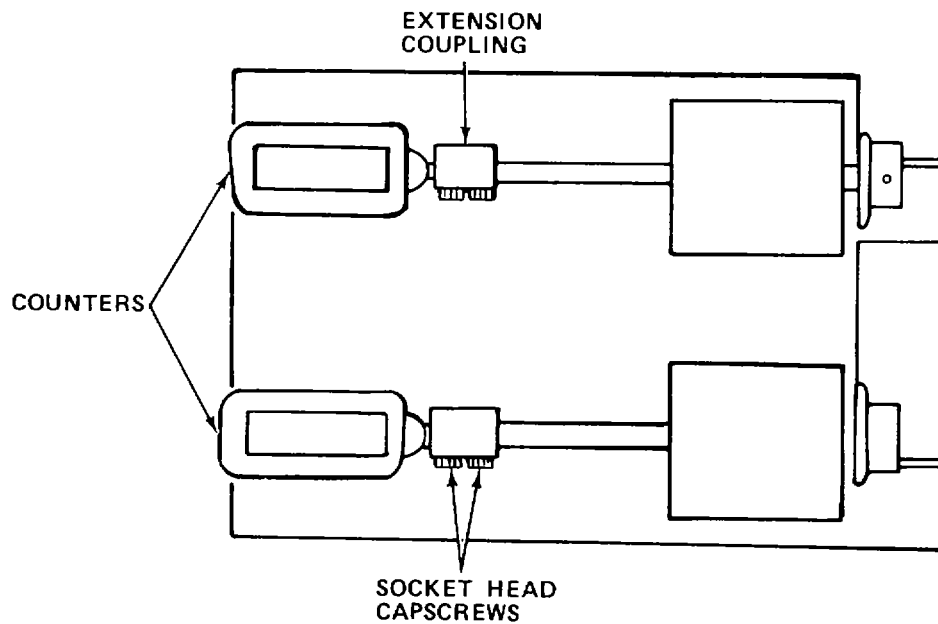
• Lensboard counter(LBC) =  $(1 + M)EF$ . M Magnification (percentage) scale of reproduction (in hundredths).

- m. Compute CBC and LBC for 50%, 100% and 200%.

- n. Position lensboard assembly and copyboard assembly to obtain 200% magnification.
- o. Use monocular magnifier to be sure image is in sharp focus and proper size on the ground glass assembly.



- p. Remove cover



- q. Loosen socket head cap screws on extension couplings nearest the counters.

- (1) Set the counters to computed CBC and LBC values at 200%.
  - (2) Tighten socket head capscrews.
- 
- r. Position lensboard assembly and copyboard assembly to the computed CBC and LBC counter readings for 50%.
  - s. Use monocular magnifier to be sure image is in sharp focus and proper size.
  - t. If the image is incorrect, perform steps h thru s.
  - u. Position lensboard assembly and copyboard assembly to the computed CBC and LBC counter readings for 100%.
  - v. Use monocular magnifier to be sure image is in sharp focus and proper size.
  - w. If image is incorrect, perform steps h thru v.
  - x. Position lensboard assembly and copyboard assembly to computed CBC and LBC counter readings for 200%.
  - y. Use monocular magnifier to be sure image is in sharp focus and proper size.
  - z. If image is incorrect, perform steps h thru y.
- 
- aa. If image is sharply focused and proper size, shoot a wet resolution shot at 100%.
  - ab. Position developed negative over target. Negative and target grid lines should coincide at all points.
  - ac. Construct lens chart in one percent increments for the magnification capabilities of the lens assembly.
  - ad. Remove 24 in. lens assembly and store in lens assembly box.
  - ae. Install 19 in. lens assembly.

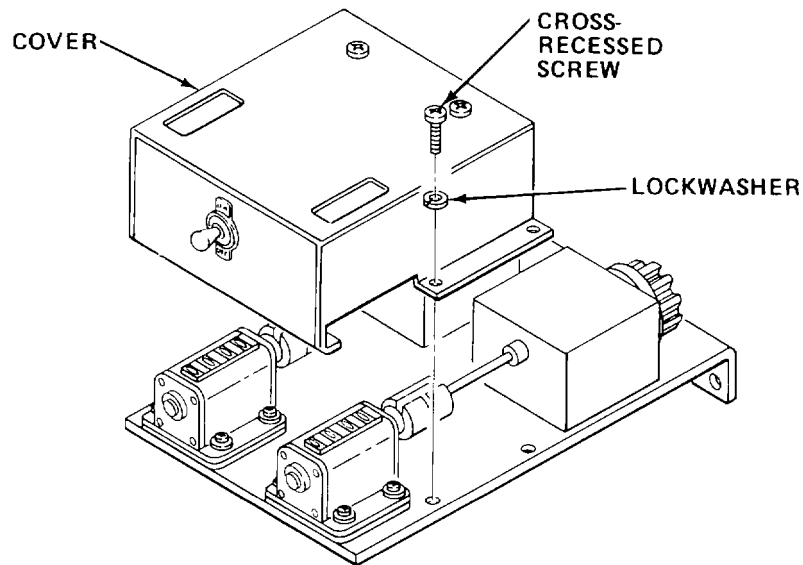
**NOTE**

**19 in. lens assembly reproduction range is 33 to 300%.**

- af. Perform steps h thru ac.



- ag. Set LAMPS ON and OFF switch OFF.
- ah. Remove target.
- ai. Set copyboard TURBINE START and STOP switch to STOP.



- aj. Install cover.
- ak. Set camera circuit breaker on power panel OFF.
- al. Remove 19 in. lens assembly and store in lens assembly box.

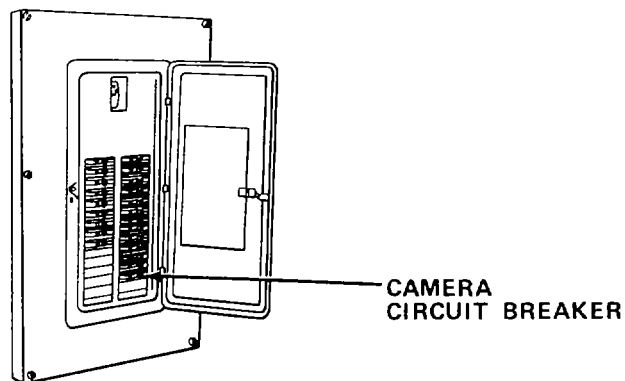
4-7.37 Adjust Copyboard/Lensboard Idler Adjustment Arm.

MOS: 83FJ6, Reproduction Equipment Repairer

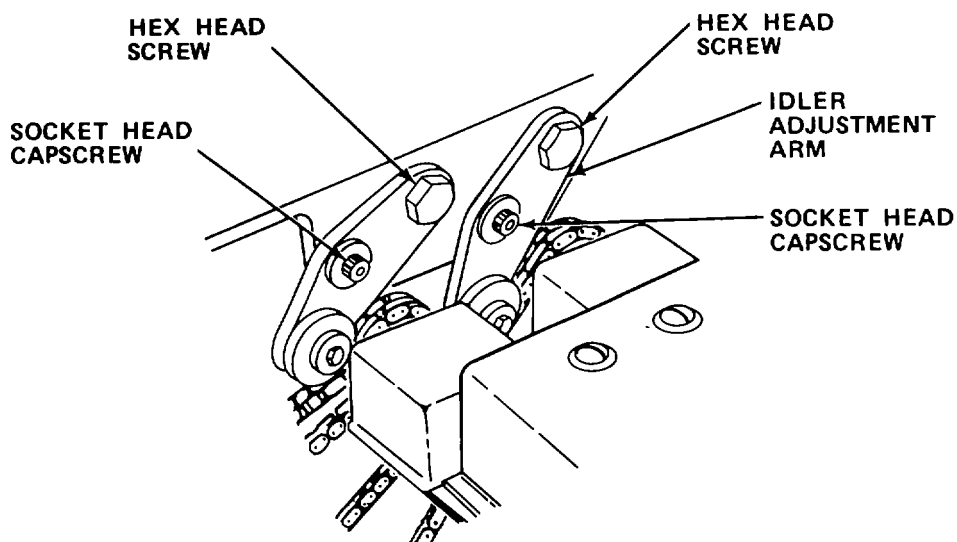
TOOLS: Light Machine Repair Tool Kit

**WARNING**

Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.



- a. Set camera circuit breaker on power panel OFF.



- b. Loosen idler adjustment arm socket head capscrew(s).
- c. Lower idler adjustment arm until idler roller makes firm contact with silent chain.
- d. Tighten idler adjustment arm socket head capscrew(s).
- e. Set camera circuit breaker on power panel ON.

**Section VI PREPARATION FOR STORAGE OR SHIPMENT**

**4-8 STORAGE OR SHIPMENT.**

In the event individual items of the lithographic copying camera must be removed from the section for repair or replacement, contact your battalion for packing and shipping instructions.

**CHAPTER 5 DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS**

**Section I REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT**

**5-1 COMMON TOOLS AND EQUIPMENT.** For authorized common tools and equipment, refer to the Table of Organization and Equipment (TOE) applicable to your unit.

**5-2 SPECIAL TOOLS; TMDE, AND SUPPORT EQUIPMENT.** Special Tools; TMDE, and Support Equipment is listed in the applicable repair parts and special tools list and in Appendix B of this manual.

**5-3 REPAIR PARTS.** Repair parts are listed in the Repair Parts and Special Tools List, TM 5-3610-258-24P covering direct support and general support maintenance for this equipment.

**Section II TROUBLESHOOTING**

**5-4 INTRODUCTION.** Direct support and general support troubleshooting procedures cover the most common malfunctions that may be repaired at the direct support and general support level. Repair or adjustment requiring specialized equipment is not authorized unless such equipment is available. Troubleshooting procedures used by lower level maintenance should be conducted in addition to the direct support and general support troubleshooting procedures.

**Table 5-1. TROUBLESHOOTING**

---

**MALFUNCTION**

**TEST OR INSPECTION**

**CORRECTIVE ACTION**

---

1. VACUUM BACK ASSEMBLY DOES NOT HOLD FILM PROPERLY.

Step 1. Check vacuum plate for cracks and splits.

Replace vacuum back assembly vacuum plate (subparagraph 5-5.31).

Table 5-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

1. VACUUM BACK ASSEMBLY DOES NOT HOLD FILM PROPERLY - Cont

Step 2. Check control valve housing for leaks.

Replace vacuum back assembly control valve (subparagraph 5-5.32).

Step 3. Check vacuum back assembly back plate for leaks.

Replace vacuum back assembly back plate (subparagraph 5-5.33).

**NOTE**

**Refer to lithographic copying camera wiring diagram.**

Step 4. Check for defective blower capacitors.

Replace capacitors in blower assembly (subparagraph 5-5.46).

Step 5. Check for defective blower assembly bearings or windings.

Replace blower assembly (subparagraph 5-5.47).

2. SUDDEN LOSS OF VACUUM ON VACUUM BACK ASSEMBLY.

**NOTE**

**Refer to lithographic copying camera wiring diagram.**

Check for defective blower assembly windings or bearings.

Replace blower assembly (subparagraph 5-5.47).

Table 5-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. GROUND GLASS ASSEMBLY MOVES ERRATICALLY.	Step 1. Check sprocket assembly for chipped or missing teeth.	Replace sprocket assembly (subparagraph 5-5.10).
	Step 2. Check hinge bracket assembly for cracks.	Replace hinge bracket assembly (subparagraph 5-5.12).
	Step 3. Check for defective ground glass assembly power transmission roller chain.	Replace ground glass assembly power transmission roller chain (subparagraph 5-5.11).
4. GROUND GLASS ASSEMBLY PHOTOGRID BADLY SCRATCHED.	Check for defective photogrid.	Replace ground glass assembly photogrid (subparagraph 5-5.30).
5. GLASS FRAME ASSEMBLY ON GROUND GLASS ASSEMBLY CRACKED.	Check for defective glass frame assembly.	Replace ground glass frame assembly (subparagraph 5-5.29).
6. OSCILLATING FRAME ON GROUND GLASS ASSEMBLY CRACKED.	Check for defective oscillating frame.	Repair ground glass oscillating frame assembly (subparagraph 5-5.60).

Table 5-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
7. OSCILLATING FRAME MOVES ERRATICALLY.	Check for defective rack spur gear, spur gear, or shaft.	Repair ground glass oscillating frame assembly (subparagraph 5-5.60).
8. LENSBOARD OR COPYBOARD COUNTERS MOVE ERRATICALLY.	Step 1. Check counter extension shaft for breaks.	Replace counter assembly extension shaft (subparagraph 5-5.35).
	Step 2. Check counter assembly bearing housing for scoring.	Replace counter assembly bearing housing (subparagraph 5-5.36).
	Step 3. Check counter assembly extension coupling for cracks.	Replace counter assembly extension coupling (subparagraph 5-5.37).
	Step 4. Check counter assembly sprocket for chipped or missing teeth.	Replace counter assembly sprocket (subparagraph 5-5.34).
	Step 5. Check copyboard or lensboard silent chain for slipping during operation.	Replace copyboard/lensboard silent chain (subparagraph 5-5.21).
	Step 6. Check copyboard or lensboard silent chain sprocket for chipped or broken teeth.	Replace copyboard/lensboard silent chain sprocket (subparagraph 5-5.15).

Table 5-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
9. COPYBOARD OR LENSBOARD COUNTER DOES NOT MOVE.	Step 1. Check for defective counter.	Replace counter(s) (subparagraph 5-5.38)
	Step 2. Check for defective copyboard or lensboard silent chain.	Replace copyboard/lensboard silent chain (subparagraph 5-5.21).
10. OVEREXPOSED PRINTS.	Step 1. Check bellows for large tears.	Replace bellows (subparagraph 5-5.39).
	Step 2. Check for broken connector rib in bellows.	Replace connector rib in bellows assembly (subparagraph 5-5.40).
11. LENS ASSEMBLY AND SHUTTER ASSEMBLY MOVE ERRATICALLY IN HORIZONTAL DIRECTION.	Step 1. Check lensboard assembly horizontal drive shaft for chipped or missing teeth.	Replace lensboard assembly horizontal drive shaft (subparagraph 5-5.49).
	Step 2. Check that lensboard assembly upper bearing block does not permit horizontal drive shaft excessive movement.	Replace lensboard assembly upper bearing block (subparagraph 5-5.50).
	Step 3. Check for defective lensboard horizontal universal joint.	Replace lensboard universal joint (subparagraph 5-5.14).
	Step 4. Check for defective lensboard coupling.	Replace lensboard horizontal coupling (subparagraph 5-5.24).



Table 5-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION	
11. LENS ASSEMBLY AND SHUTTER ASSEMBLY MOVE ERRATICALLY IN HORIZONTAL DIRECTION Cont	Step 5. Check for defective lensboard horizontal handwheel control shaft.	Replace lensboard horizontal handwheel control shaft (subparagraph 5-5.13).	
	Step 6. Check for defective lensboard horizontal control shaft.	Replace lensboard horizontal control shaft (subparagraph 5-5.25).	
	Step 7. Check for defective lensboard horizontal extension drive shaft.	Replace lensboard horizontal extension drive shaft (subparagraph 5-5.26).	
	Step 8. Check lensboard horizontal drive gear for chipped or broken teeth.	Replace lensboard horizontal drive gear (subparagraph 5-5.27).	
	Step 9. Check lensboard horizontal driven gear for chipped or broken teeth.	Replace lensboard horizontal driven gear (subparagraph 5-5.28).	
	Step 10. Check for defective control shaft bushing.	Replace control shaft bushing (subparagraph 5-5.48).	
	12. LENS ASSEMBLY AND SHUTTER ASSEMBLY MOVE ERRATICALLY IN A VERTICAL DIRECTION.	Step 1. Check for defective lensboard vertical universal joint.	Replace lensboard vertical universal joint (subparagraph 5-5.14).
		Step 2. Check for defective lensboard coupling.	Replace lensboard vertical coupling (subparagraph 5-5.24).
		Step 3. Check for defective lensboard vertical handwheel control shaft.	Replace lensboard vertical handwheel control shaft (subparagraph 5-5.13).

Table 5-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

## 12. LENS ASSEMBLY AND SHUTTER ASSEMBLY MOVE ERRATICALLY IN A VERTICAL DIRECTION Cont

Step 4. Check for defective lensboard vertical control shaft.

Replace lensboard vertical control shaft (subparagraph 5-5.25).

Step 5. Check for defective lensboard vertical extension drive shaft.

Replace lensboard vertical extension drive shaft (subparagraph 5-5.26).

Step 6. Check lensboard vertical drive gear for chipped or broken teeth.

Replace lensboard vertical drive gear (subparagraph 5-5.27).

Step 7. Check lensboard vertical driven gear for chipped or broken teeth.

Replace lensboard vertical driven gear (subparagraph 5-5.28).

Step 8. Check for defective control shaft bushing.

Replace control shaft bushing (subparagraph 5-5.48).

Step 9. Check lensboard assembly vertical drivescrew for stripped threads.

Replace lensboard assembly vertical drivescrew (subparagraph 5-5.51).

## 13. LENS ASSEMBLY AND SHUTTER ASSEMBLY MOVE ERRATICALLY IN VERTICAL AND HORIZONTAL DIRECTION.

Check for defective lensboard assembly upper guide.

Replace lensboard assembly upper guide (subparagraph 5-5.52).

## 14. SHUTTER ASSEMBLY DOES NOT OPERATE.

**NOTE**

**Refer to lithographic copying camera wiring diagram.**

Table 5-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

14. SHUTTER ASSEMBLY DOES NOT OPERATE Cont

Step 1. Check for shorts or opens in electrical system wiring.

Repair electrical system wiring (subparagraph 5-5.57).

Step 2. Refer to TM 5-3610-257-14 Troubleshooting Procedures for the Light Integrating Exposure Control Instrument.

15. LENSBOARD ASSEMBLY/COPYBOARD ASSEMBLY MOVE ONLY IN MANUAL.

**NOTE**

**Refer to lithographic copying camera wiring diagram.**

Step 1. Check lensboard or copyboard reversing drum switch for open contacts.

Replace copyboard/lensboard reversing drum switch (subparagraph 5-5.22).

Step 2. Check ac magnetic starter for open contacts or open coil.

Replace ac magnetic starter (subparagraph 5-5.9).

Step 3. Check copyboard or lensboard drive motor for open or shorted windings.

Replace copyboard/lensboard drive motor (subparagraph 5-5.16).

Table 5-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
16. GRINDING NOISE HEARD WHEN DRIVE MOTOR IS ENERGIZED.	Step 1. Check copyboard/lensboard drive motor for worn bearings.	Replace copyboard/lensboard drive motor (subparagraph 5-5.16).
	Step 2. Check copyboard/lensboard drive motor gear for chipped or worn teeth.	Replace copyboard/lensboard drive motor gear (subparagraph 5-5.17).
	Step 3. Check copyboard/lensboard drive gear for chipped or broken teeth.	Replace copyboard/lensboard drive gear (subparagraph 5-5.53).
17. LENSBOARD/COPYBOARD VIBRATES AND OCCASIONALLY MOVES ERRATICALLY.	Step 1. Check end play of drivescrew.	Adjust end play of drivescrew (subparagraph 5-5.62).
	Step 2. Check for defective copyboard/lensboard drive shaft spacer.	Replace copyboard/lensboard drive shaft spacer (subparagraph 5-5.20).
18. LENSBOARD CARRIAGE ASSEMBLY DOES NOT STOP AFTER STRIKING COPYBOARD LIMIT SWITCH TRIP WHEN USING ELECTRICAL DRIVE.		

**NOTE**

**Refer to lithographic copying camera wiring diagram.**

Step 1. Check adjustment of lensboard carriage assembly two-way limit switch.

Adjust lensboard carriage assembly two-way limit switch (subparagraph 5-5.63).

Table 5-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
18. LENSBOARD CARRIAGE ASSEMBLY DOES NOT STOP AFTER STRIKING COPYBOARD LIMIT SWITCH TRIP WHEN USING ELECTRICAL DRIVE Cont	Step 2. Check for defective lensboard carriage assembly two-way limit switch.	Replace lensboard carriage assembly two-way limit switch (subparagraph 5-5.19).
19. LENSBOARD CARRIAGE ASSEMBLY CONSTANTLY MOVES TOO FAR IN REVERSE WHEN USING ELECTRICAL DRIVE.	<b>NOTE</b>	<b>Refer to lithographic copying camera wiring diagram.</b>
	Step 1. Check adjustment of lensboard carriage assembly limit switch.	Adjust copyboard/lensboard carriage assembly limit switch (subparagraph 5-5.64).
	Step 2. Check for defective lensboard carriage assembly limit switch.	Replace copyboard/lensboard carriage assembly limit switch (subparagraph 5-5.18).
20. COPYBOARD ASSEMBLY FAILS TO HOLD COPY PROPERLY.	<b>NOTE</b>	<b>Refer to lithographic copying camera wiring diagram.</b>
	Step 1. Check blower assembly for open windings.	Replace blower assembly (subparagraph 5-5.47).

Table 5-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

## 20. COPYBOARD ASSEMBLY FAILS TO HOLD COPY PROPERLY Cont

Step 2. Check for defective blower assembly capacitors.

Replace capacitors in blower assembly (subparagraph 5-5.46).

Step 3. Check for defective copyboard assembly operating gear assembly.

Replace copyboard assembly operating gear (subparagraph 5-5.41).

Step 4. Check copyboard assembly spur gear for chipped or broken teeth.

Replace copyboard assembly spur gear (subparagraph 5-5.42).

Step 5. Check alinement of copyboard assembly operating gates.

Aline copyboard assembly operating gates (subparagraph 5-5.61).

Step 6. Check for defective copyboard operating rod assembly.

Replace copyboard operating rod assembly (subparagraph 5-5.43).

Step 7. Check for defective positive holder assembly diverter valve plate.

Replace positive holder assembly diverter valve plate (subparagraph 5-5.45).

## 21. POSITIVE HOLDER ASSEMBLY HAS UNEVEN LIGHTING.

**NOTE**

**Refer to light box assembly wiring diagram.**

Step 1. Check for defective light box assembly ballast.

Replace light box assembly ballast (subparagraph 5-5.54).

Table 5-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

21. POSITIVE HOLDER ASSEMBLY HAS UNEVEN LIGHTING Cont

Step 2. Check for defective lampholder in light box assembly.

Replace lampholder in light box assembly (subparagraph 5-5.44).

22. LIGHTS IN LIGHT BOX ASSEMBLY DO NOT ILLUMINATE.

**NOTE**

**Refer to light box assembly wiring diagram.**

Step 1. Check for defective light box assembly suppression filter.

Replace light box assembly suppression filter (subparagraph 5-5.55).

Step 2. Check for defective light box assembly wiring.

Repair defective wiring in light box assembly (subparagraph 5-5.58).

23. NO VACUUM TO COPYBOARD OR POSITIVE HOLDER ASSEMBLIES.

**NOTE**

**Refer to lithographic copying camera wiring diagram.**

Step 1. Check blower assembly for open windings.

Replace blower assembly (subparagraph 5-5.47).

Table 5-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

## 23. NO VACUUM TO COPYBOARD OR POSITIVE HOLDER ASSEMBLIES Cont

Step 2. Check for defective capacitor in blower assembly.

Replace blower assembly capacitors (subparagraph 5-5.46).

Step 3. Check for defective positive holder assembly diverter valve plate.

Replace positive holder assembly diverter valve plate (subparagraph 5-5.45).

Step 4. Check for defective wiring in blower circuit.

Repair electrical system wiring (subparagraph 5-5.57).

## 24. COPYBOARD CARRIAGE ASSEMBLY MOVES TOO FAR IN FORWARD DIRECTION USING DRIVE MOTOR.

**NOTE**

**Refer to lithographic copying camera wiring diagram.**

Step 1. Check adjustment of copyboard limit switch.

Adjust copyboard limit switch (subparagraph 5-5.64).

Step 2. Check for defective copyboard limit switch.

Replace copyboard limit switch (subparagraph 5-5.18).



Table 5-1. TROUBLESHOOTING - Cont

---

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

---

25. PULSED XENON LAMP OUT. FAN DOES NOT OPERATE.

**NOTE**

**Refer to pulsed xenon lamp power supply assembly schematic (FO-1).**

Step 1. Check for defective pulsed xenon lamp fuse.

Replace fuse.

Step 2. Check for defective pulsed xenon lamp power cable.

Replace power cable.

Step 3. Check for defective pulsed xenon lamp fan motor.

Replace fan motor.

Step 4. Check power supply assembly for tripped circuit breaker.

Reset power supply assembly circuit breaker.

Step 5. Check for defective power supply assembly fuse(s).

Replace power supply assembly fuse(s).

Step 6. Check power supply assembly for defective components.

Replace power supply assembly defective component(s).

Table 5-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

26. PULSED XENON LAMP OUT. FAN OPERATES NORMALLY.

**NOTE**

**Refer to pulsed xenon lamp power supply assembly schematic (FO-1).**

Step 1. Check for defective pulsed xenon lamp thermal fuse.

Replace thermal fuse.

Step 2. Check for defective pulsed xenon lamp safety interlock switch.

Replace interlock switch.

Step 3. Check for defective pulsed xenon lamp resistor R1201.

Replace pulsed xenon lamp resistor.

Step 4. Check for defective pulsed xenon lamp capacitor.

Replace lamp capacitor.

Step 5. Check for defective pulsed xenon lamp ceramic insulator.

Replace ceramic insulator.

Step 6. Check for defective pulsed xenon lamp pulse transformer.

Replace lamp pulse transformer.

Step 7. Check for defective power supply assembly.

Replace power supply assembly defective components.

27. ALL PULSED XENON LAMPS ARE OUT. FANS DO NOT OPERATE.

**NOTE**

**Refer to pulsed xenon lamp power supply assembly schematic (FO-1).**

Table 5-1. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

27. ALL PULSED XENON LAMPS ARE OUT. FANS DO NOT OPERATE Cont

Step 1. Check for defective power supply power cord assembly.

Replace power cord assembly.

Step 2. Check for defective power supply assembly.

Replace power supply defective components.

Step 3. Refer to TM 5-3610-257-14 Troubleshooting Procedures for the Light Integrating Exposure Control Instrument.

28. NO ELECTRICAL POWER IN CAMERA.

**NOTE**

**This procedure should be performed by a qualified electrician. Refer to lithographic copying camera wiring diagram.**

Step 1. Check for defective power cable assembly.

Repair/replace power cable assembly.

Step 2. Check for defective wiring in camera.

Repair electrical system wiring.

**Section III MAINTENANCE PROCEDURES**

**5-5 MAINTENANCE PROCEDURES.**

a. This section contains instructions covering direct support and general support maintenance functions for the lithographic copying camera. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

INDEX

PROCEDURES	PARAGRAPH
Remove/Install Ground Glass Assembly .....	5-5.1
Remove/Install Light Box Assembly .....	5-5.2
Remove/Install Positive Holder Assembly .....	5-5.3
Remove/Install Copyboard Assembly .....	5-5.4
Remove/Install Power Supply Assembly .....	5-5.5
Remove/Install Lensboard Assembly .....	5-5.6
Inspect Lensboard Assembly After Major Repairs.....	5-5.7
Replace Main Power Cable Assembly .....	5-5.8
Replace AC Magnetic Starter .....	5-5.9
Replace Sprocket Assembly .....	5-5.10
Replace Ground Glass Assembly Power Transmission Roller Chain .	5-5.11
Replace Left or Right Hinge Bracket Assembly .....	5-5.12
Replace Lensboard Horizontal/Vertical Handwheel Control Shafts .....	5-5.13
Replace Lensboard Horizontal/Vertical Universal Joints .....	5-5.14
Replace Copyboard/Lensboard Silent Chain Sprocket .....	5-5.15
Replace Copyboard/Lensboard Drive Motor .	5-5.16
Replace Copyboard/Lensboard Drive Motor Gear .....	5-5.17
Replace Copyboard/Lensboard Carriage Assembly Limit Switch .....	5-5.18
Replace Lensboard Carriage Assembly Two-Way Limit Switch .	5-5.19

## PROCEDURES

## PARAGRAPH

Replace Copyboard/Lensboard Drive Shaft Spacer.....	5-5.20
Replace Copyboard/Lensboard Silent Chain .....	5-5.21
Replace Copyboard or Lensboard Drive Reversing Drum Switch .....	5-5.22
Replace Cross Brace Needle Roller Bearing . .....	5-5.23
Replace Lensboard Vertical/Horizontal Coupling .....	5-5.24
Replace Lensboard Vertical/Horizontal Control Shaft . .....	5-5.25
Replace Lensboard Vertical/Horizontal Extension Drive Shaft .....	5-5.26
Replace Lensboard Vertical/Horizontal Drive Gear.....	5-5.27
Replace Lensboard Vertical/Horizontal Driven Gear .....	5-5.28
Replace Ground Glass Frame Assembly .....	5-5.29
Replace Photogrid in Ground Glass Assembly .....	5-5.30
Replace Vacuum Back Assembly Vacuum Plate .....	5-5.31
Replace Vacuum Back Assembly Control Valve.....	5-5.32
Replace Vacuum Back Assembly Back Plate .....	5-5.33
Replace Counter Assembly Sprocket . .....	5-5.34
Replace Counter Assembly Extension Shaft.....	5-5.35
Replace Counter Assembly Bearing Housing .....	5-5.36
Replace Counter Assembly Extension Coupling . .....	5-5.37
Replace Counter Assembly Counter.....	5-5.38
Replace Bellows .....	5-5.39
Replace Connector Rib in Bellows Assembly .....	5-5.40
Replace Copyboard Assembly Operating Gear .....	5-5.41
Replace Copyboard Assembly Spur Gear .....	5-5.42
Replace Copyboard Operating Rod Assembly.....	5-5.43
Replace Lampholder in Light Box Assembly.....	5-5.44
Replace Positive Holder Assembly Diverter Valve Plate . .....	5-5.45

PROCEDURES	PARAGRAPH
Replace Capacitors in Blower Assembly.....	5-5.46
Replace Blower Assembly.....	5-5.47
Replace Control Shaft Bushing.....	5-5.48
Replace Lensboard Assembly Horizontal Drive Shaft.....	5-5.49
Replace Lensboard Assembly Upper Bearing Block.....	5-5.50
Replace Lensboard Assembly Vertical Drivescrew.....	5-5.51
Replace Lensboard Assembly Upper Guide.....	5-5.52
Replace Copyboard/Lensboard Drive Gear.....	5-5.53
Replace Light Box Assembly Ballast.....	5-5.54
Replace Light Box Assembly Suppression Filter.....	5-5.55
Repair Power Supply Assembly.....	5-5.56
Repair Electrical System Wiring.....	5-5.57
Repair Defective Wiring in Light Box Assembly.....	5-5.58
Repair Pulsed Xenon Lamp.....	5-5.59
Repair Ground Glass Oscillating Frame Assembly.....	5-5.60
Aline Copyboard Assembly Operating Gates.....	5-5.61
Adjust End Play of Camera Drivescrew.....	5-5.62
Adjust Lensboard Carriage Assembly Two-Way Limit Switch.....	5-5.63
Adjust Copyboard/Lensboard Carriage Assembly Limit Switch.....	5-5.64

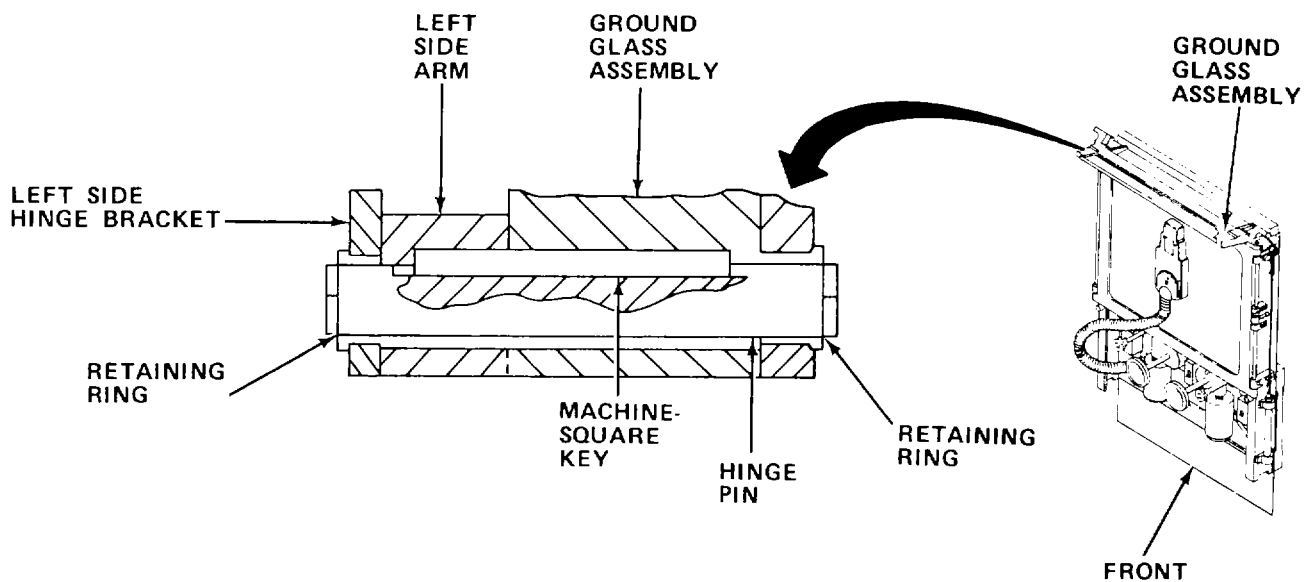
**5-5.1 Remove/Install Ground Glass Assembly.**

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

**NOTE**

**Two personnel are required for this task.**



**CAUTION**

**Support ground glass assembly while removing hinge pins. Damage to ground glass assembly may occur.**

- c. Remove hinge pins.
- d. Remove ground glass assembly.
- e. Install ground glass assembly.
- f. Install hinge pins.
- g. Install retaining rings.
- h. Close vacuum back.
- i. Optically aline camera (subparagraph 4-7.36).

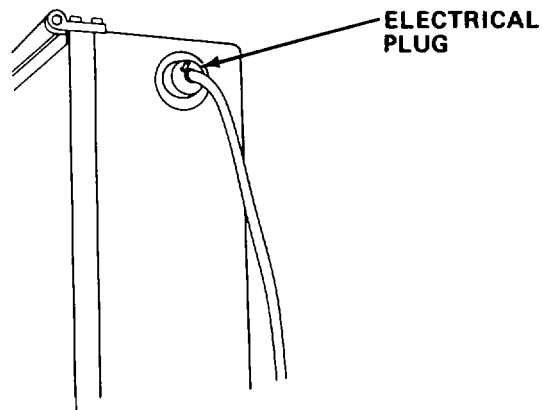
**5-5.2 Remove/Install Light Box Assembly.**

MOS: 83FJ6, Reproduction Equipment Repairer

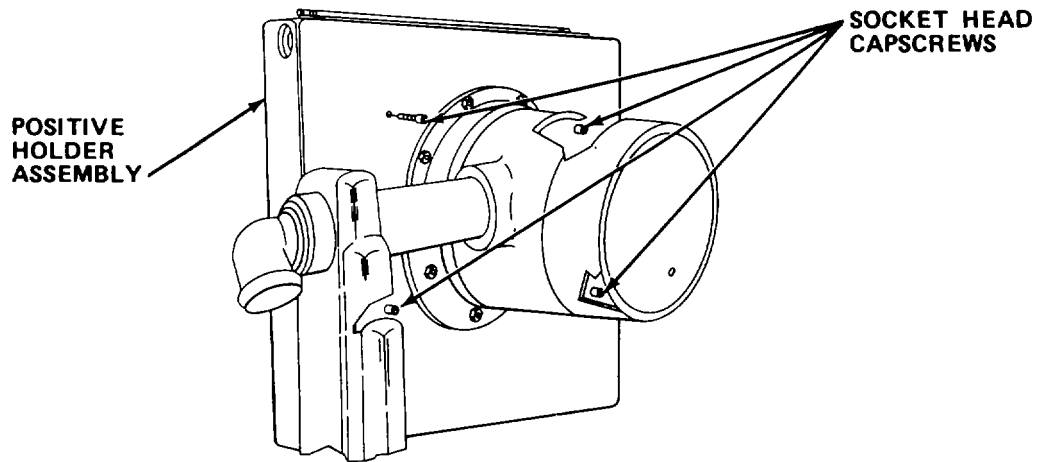
TOOLS: Light Machine Repair Tool Kit

**WARNING**

**Death or serious injury may occur from electrical shock unless electrical plug is disconnected before making repairs.**

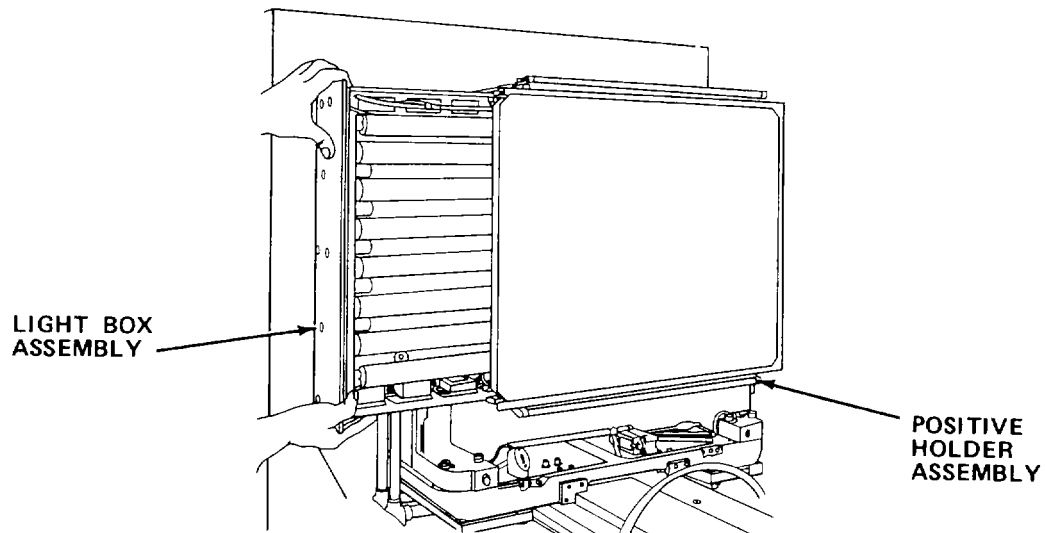


- a. Disconnect electrical plug.



- b. Remove four socket head cap screws at rear of positive holder assembly.





**CAUTION**

**Be careful removing and installing light box assembly. Diffusers are fragile.**

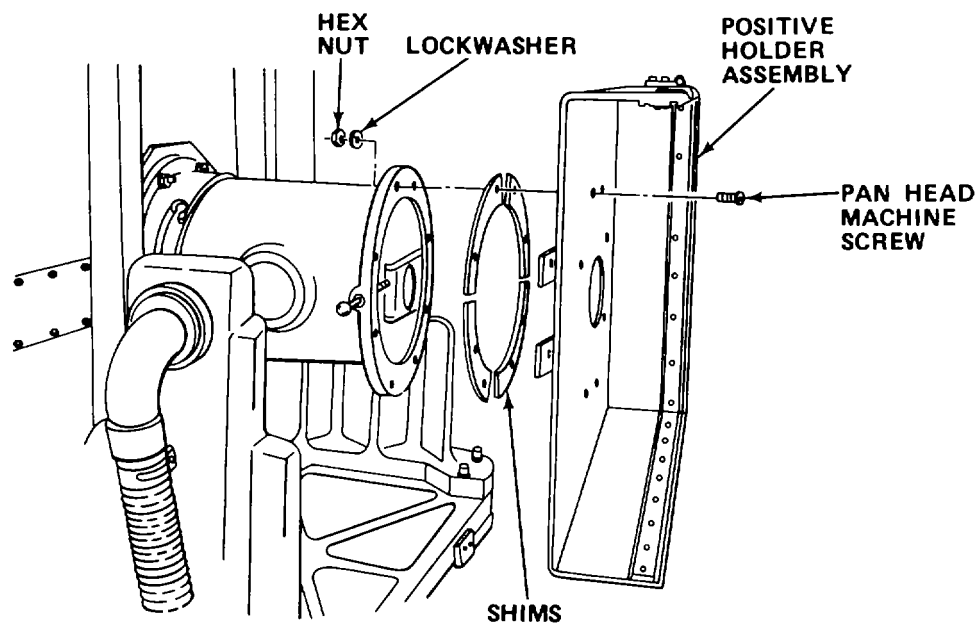
- c. Slide light box assembly out of positive holder assembly.
- d. Slide light box assembly into positive holder assembly.
- e. Install four socket head capscrews.
- f. Reconnect electrical plug.

**5-5.3 Remove/Install Positive Holder Assembly.**

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

- a. Remove light box assembly (subparagraph 5-5.2).



**NOTE**

**Mark position of shims to aid in installing shims in their proper location.**

- b. Remove positive holder assembly.
- c. Install positive holder assembly.
- d. Install light box assembly (subparagraph 5-5.2d).
- e. Optically aline camera (subparagraph 4-7.36).

**5-5.4 Remove/Install Copyboard Assembly.**

MOS: 83FJ6, Reproduction Equipment Repairer

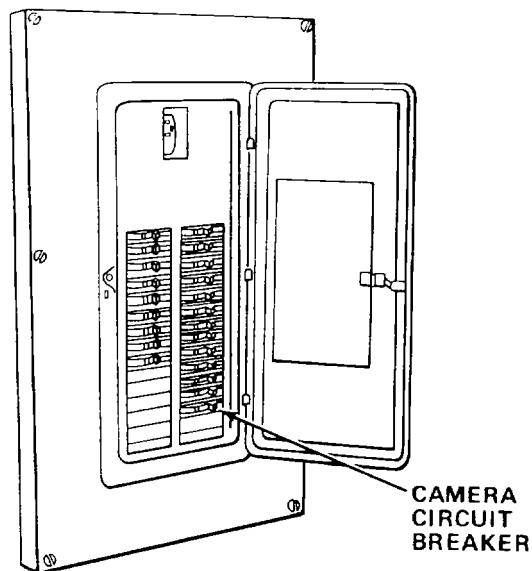
TOOLS: Light Machine Repair Tool Kit

**WARNING**

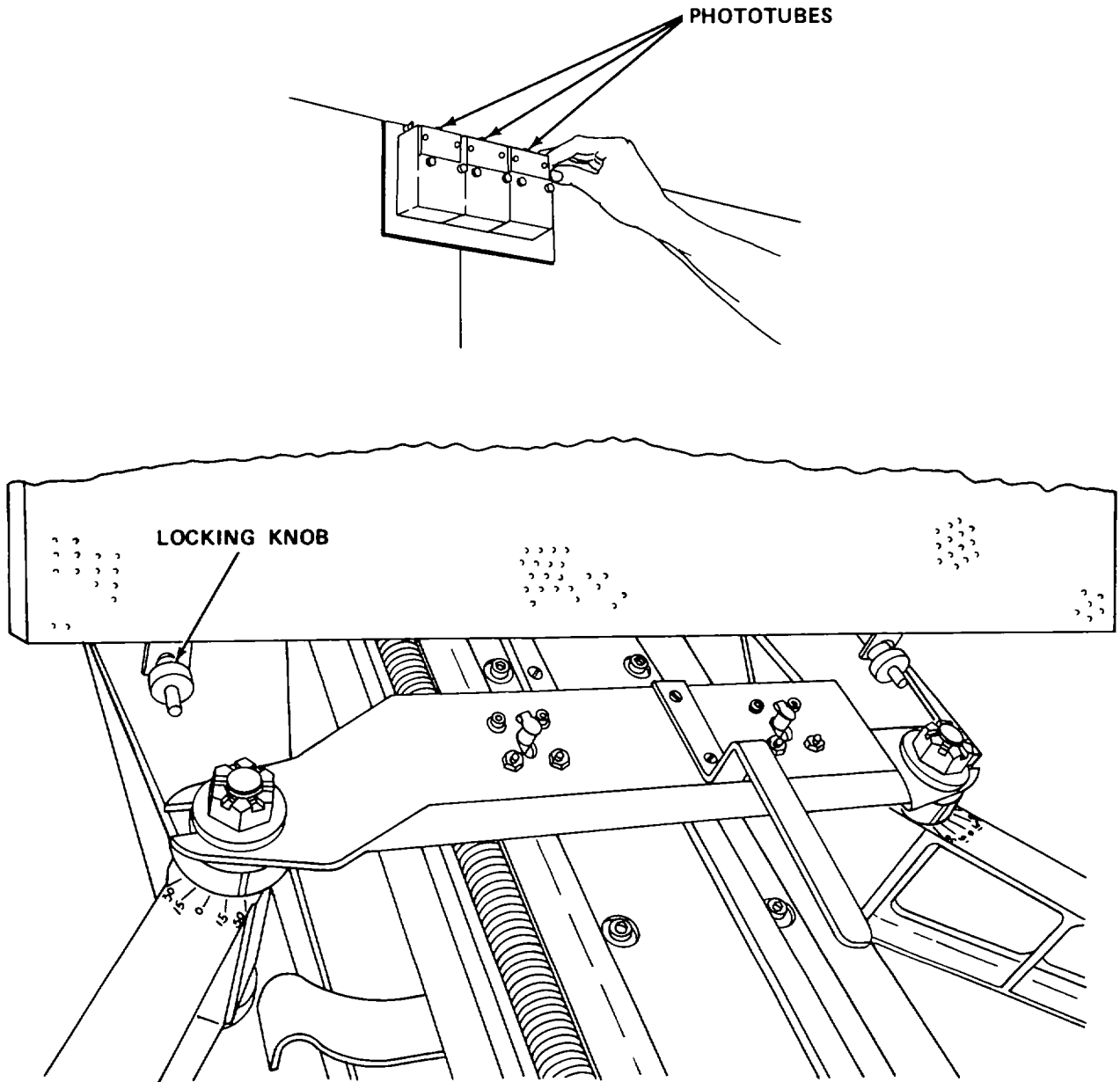
Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.

**NOTE**

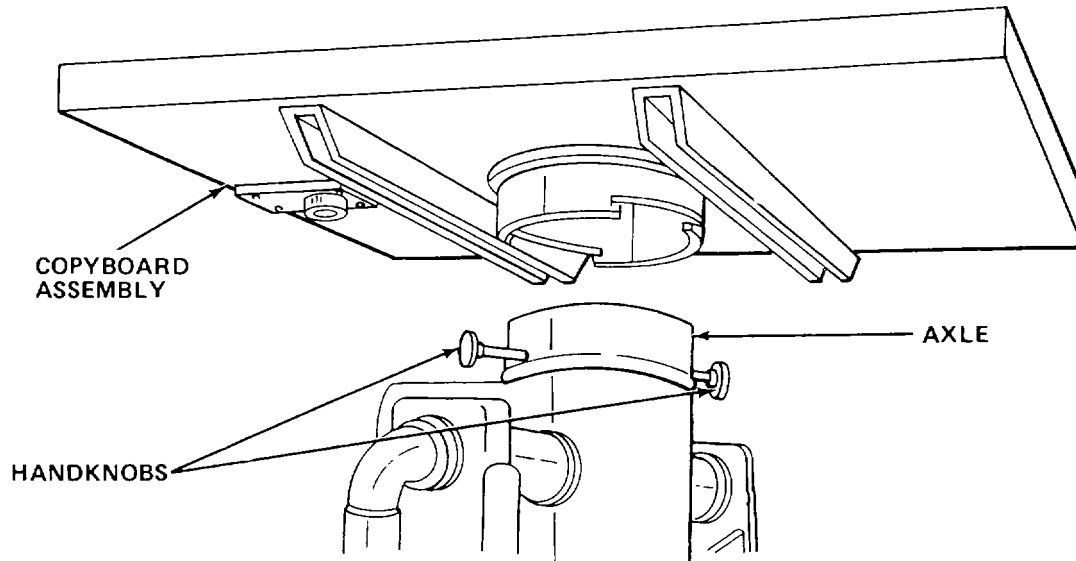
Three personnel are required to perform this task.



- a. Set camera circuit breaker on power panel OFF.
- b. Lower camera (paragraph 2-7).



- c. Remove phototubes and loosen copyboard locking knobs; then pivot copyboard until it is parallel to the floor.



- d. Loosen handknobs.
- e. Turn copyboard to left until handknobs clear.
- f. Lift off copyboard.
- g. Install copyboard on adapter.
- h. Turn copyboard to right.
- i. Tighten handknobs. Pivot copyboard to vertical position and tighten copyboard locking knobs.
- j. Install phototubes.
- k. Raise camera (subparagraph 2-3.1).
- l. Set camera circuit breaker on power panel ON.
- m. Optically aline camera (subparagraph 4-7.36).

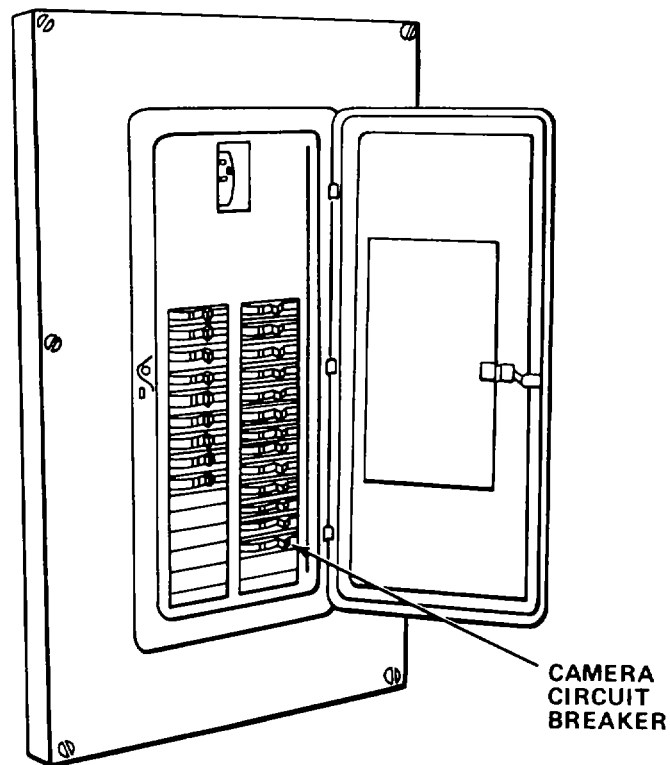
**5-5.5 Remove/Install Power Supply Assembly.**

MOS: 35E, Special Electronic Devices Repairer

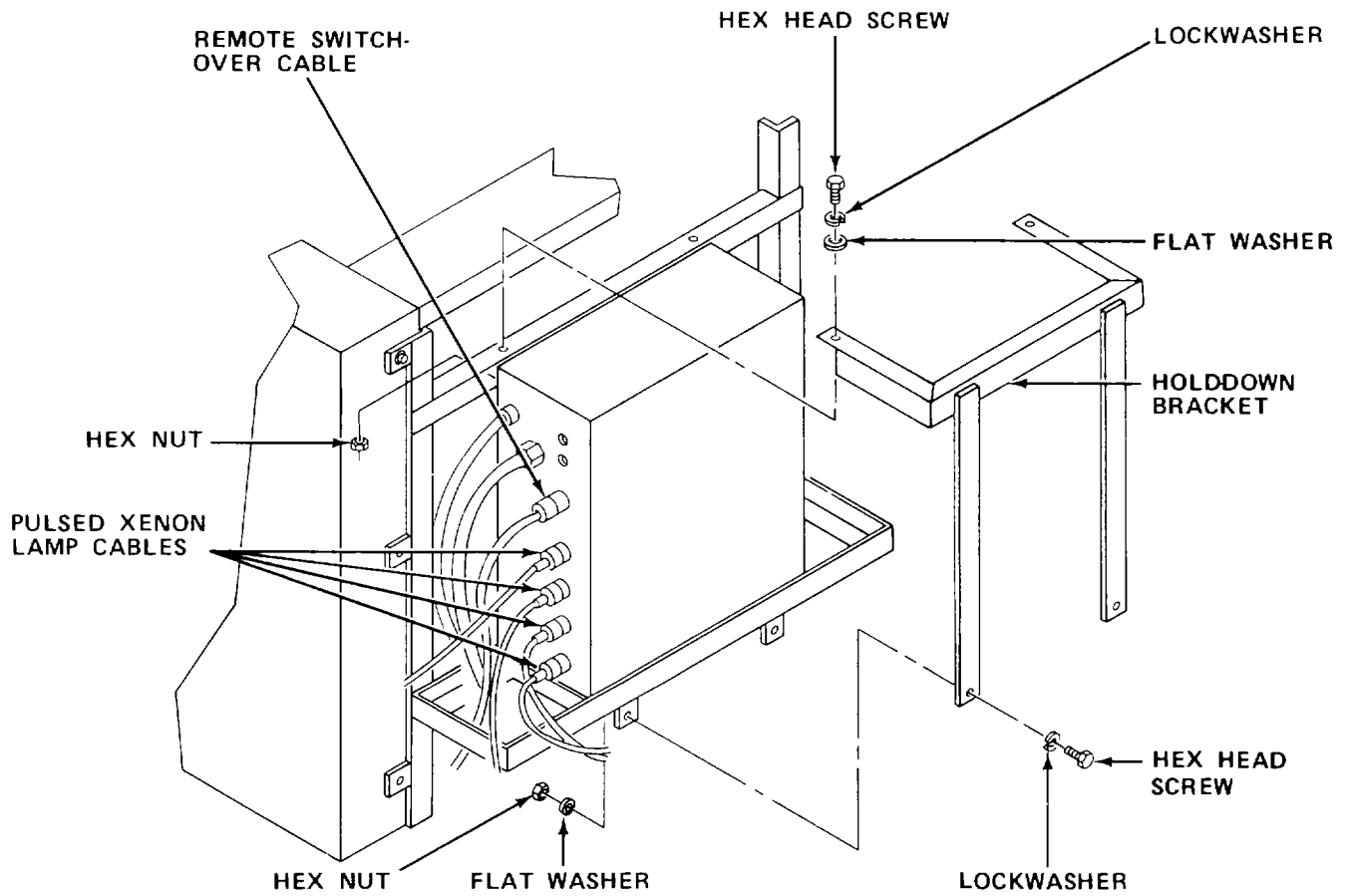
TOOLS: Electronic Equipment Tool Kit Multimeter

**WARNING**

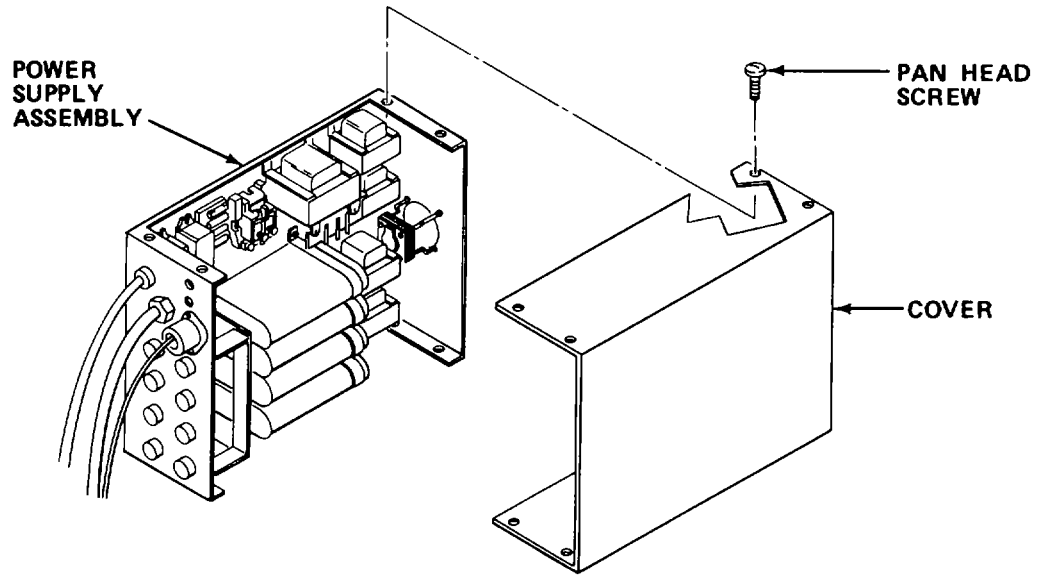
Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.



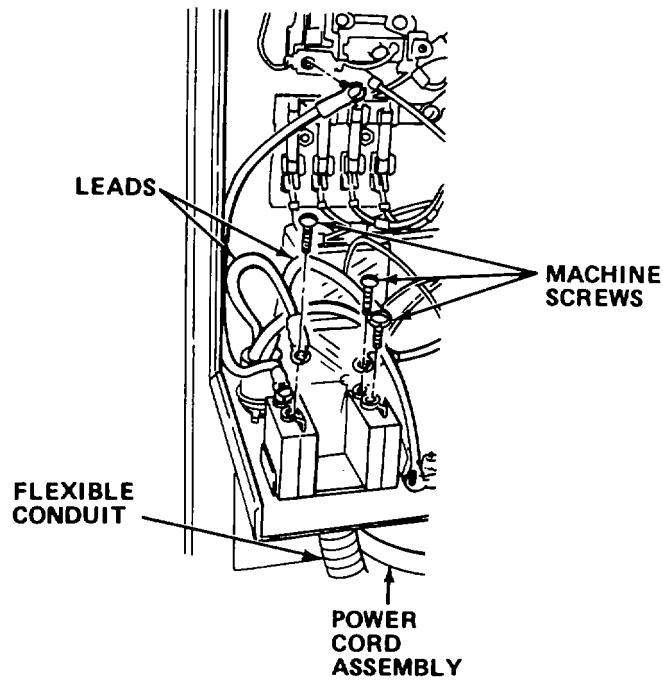
- a. Set camera circuit breaker on power panel OFF.



- b. Remove power supply holddown bracket.
- c. Disconnect pulsed xenon lamp cables and remote switch-over cable.

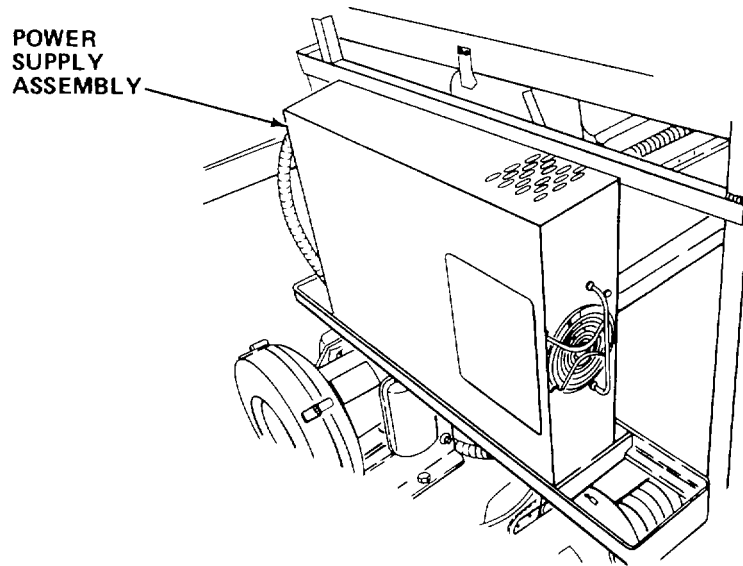


d. Remove cover.



e. Tag, disconnect, and remove power cord and flexible conduit.





**CAUTION**

**Power supply assembly weighs 75 lbs (34 kg). Do not drop power supply assembly. Damage to equipment may occur.**

- f. Remove power supply assembly.
- g. Install power supply assembly.
- h. Install power cord assembly and flexible conduit.
- i. Reconnect power cord assembly leads and flexible conduit leads.
- j. Install cover.
- k. Reconnect pulsed xenon lamp cables and remote switch-over cable.
- l. Install power supply holddown bracket.
- m. Set camera circuit breaker on power panel ON.

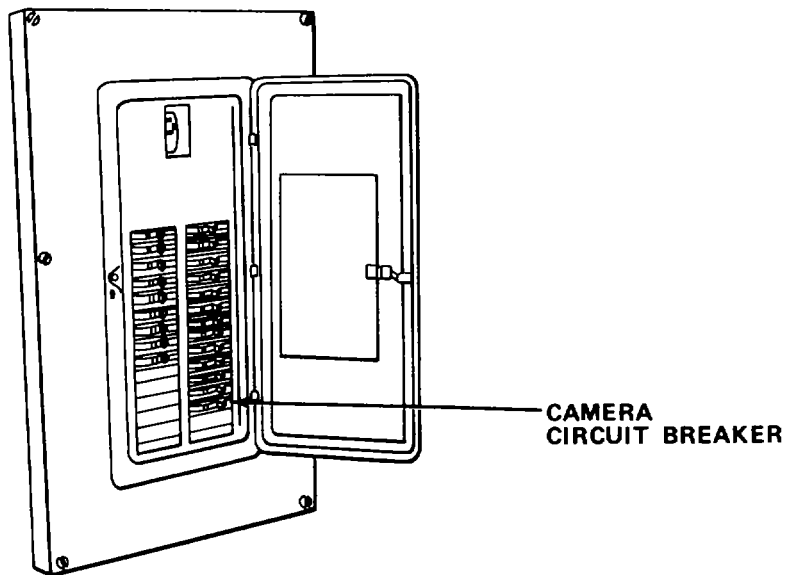
**5-5.6 Remove/Install Lensboard Assembly.**

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

**WARNING**

Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.

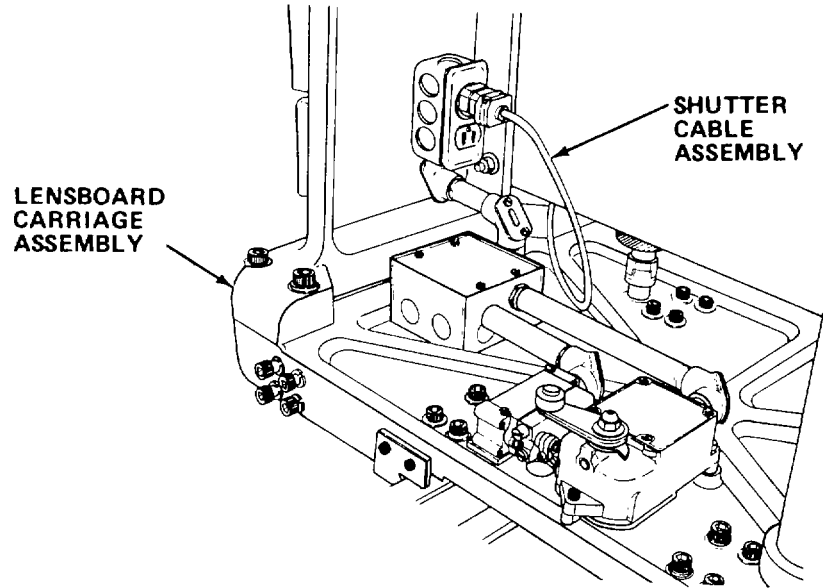


- a. Set camera circuit breaker on power panel OFF.

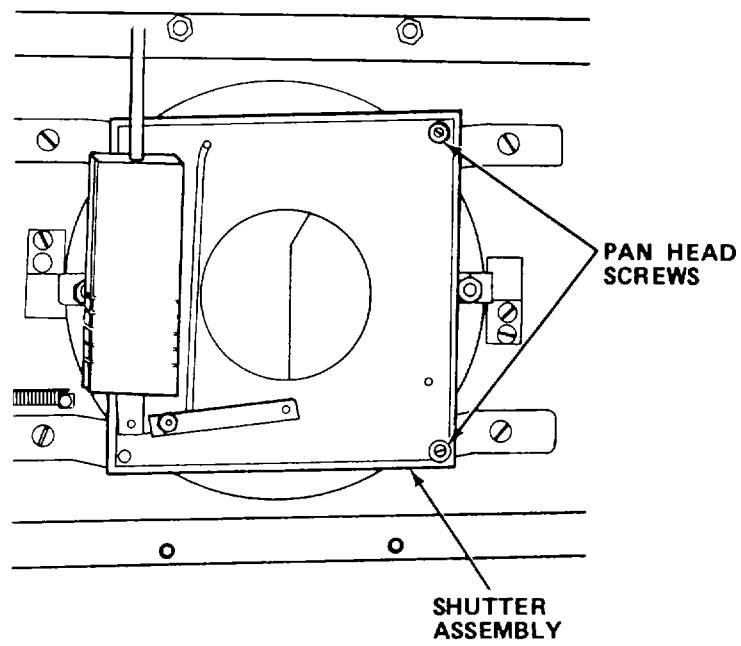
**NOTE**

**This task requires two personnel.**

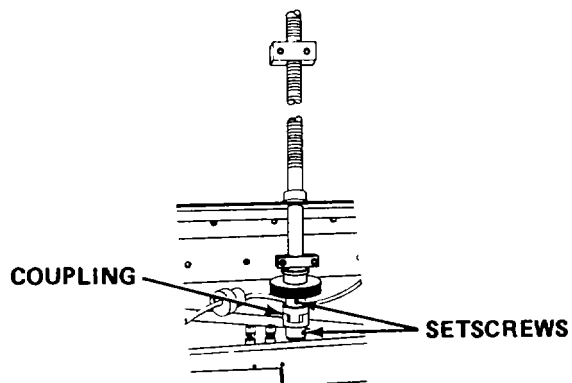
- b. Remove bellows assembly (subparagraph 4-7.3).
- c. Remove bellows rod assembly (subparagraph 4-7.2).



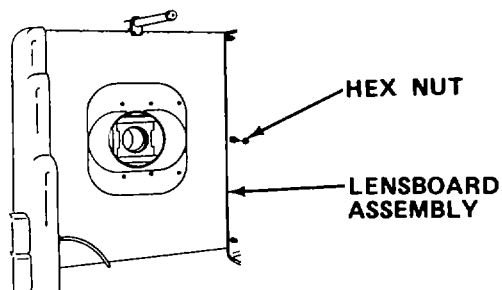
d. Disconnect shutter cable assembly.



e. Remove shutter assembly.



- f. Loosen setscrews on couplings.



- g. Remove hex nuts.

**WARNING**

**Lensboard assembly is heavy. Serious injury to personnel may occur.**

- h. Remove lensboard assembly.
- i. Install lensboard assembly. Secure with hex nuts.
- j. Insert extension drive shafts into couplings and tighten setscrews.
- k. Install shutter assembly.
- l. Reconnect shutter cable assembly.
- m. Install bellows rod assembly (subparagraph 4-7.2e).
- n. Install bellows assembly (subparagraph 4-7.3d).
- o. Set camera circuit breaker on power panel ON.
- p. Optically aline camera (subparagraph 4-7.36).

**5-5.7 Inspect Lensboard Assembly After Major Repairs.**

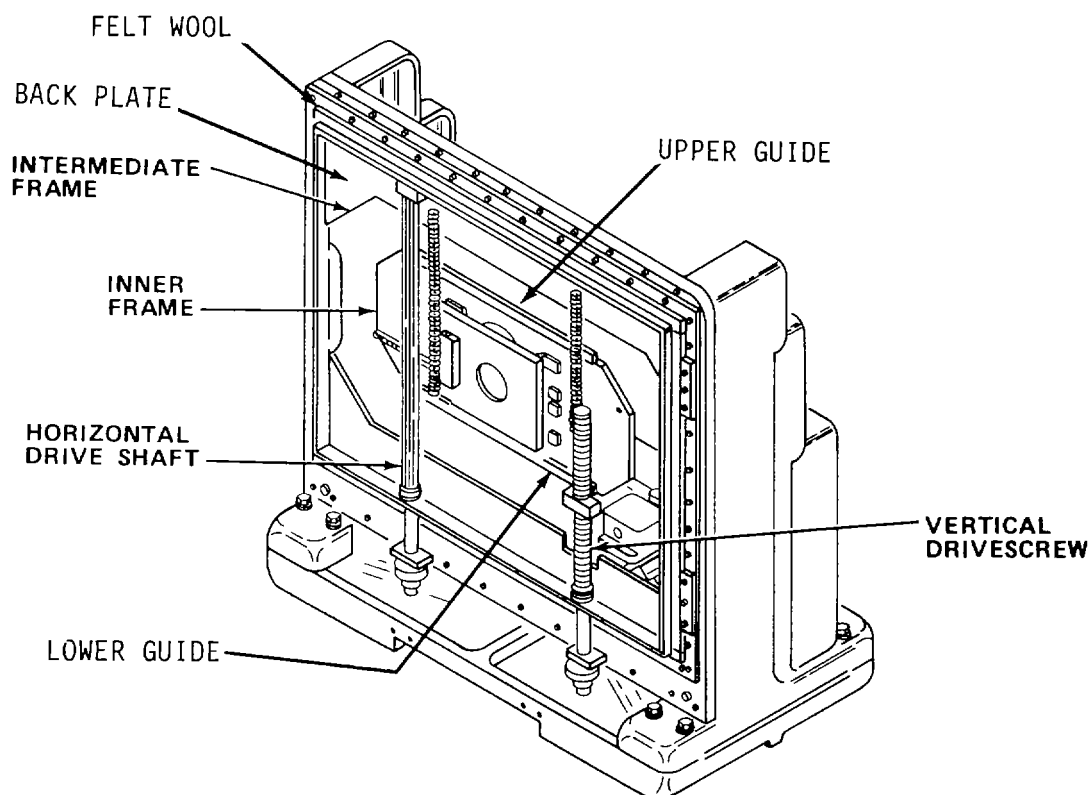
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit Feeler Gage

SUPPLIES: Black Lusterless Paint, (Item 7, Appendix E)  
 Rubber Base Adhesive, (Item 1, Appendix E)  
 Shim Stuck

**NOTE**

- This inspection is to be performed after repair of lensboard assembly.
  - Optical alinement of camera required (subparagraph 4-7.36).
- a. Inspect back plate to be sure felt wool is properly bonded to angle brackets. If required, reattach with adhesive.



- b. Measure gap between intermediate frame and back plate. It should be between 0.001 - 0.002 in. (0.0254 - 0.0508 mm).

- c. Add or subtract shim stock from side spacer until proper clearance is obtained.
- d. Measure gap between upper guide, lower guide, and intermediate frame.
- e. Add or remove shim stock from shim guides until inner frame moves freely. Maximum clearance 0.001 in. (0.0254 mm).
- f. Inspect vertical drivescrew and horizontal drive shaft for cracks, chips, or warping.
- g. Check mounting hardware to be sure it is tight.
- h. Repaint any area where paint is chipped.
- i. Install lensboard assembly (subparagraph 5-5.6i).
- j. Optically aline camera (subparagraph 4-7.36).

**5-5.8 Replace Main Power Cable Assembly.**

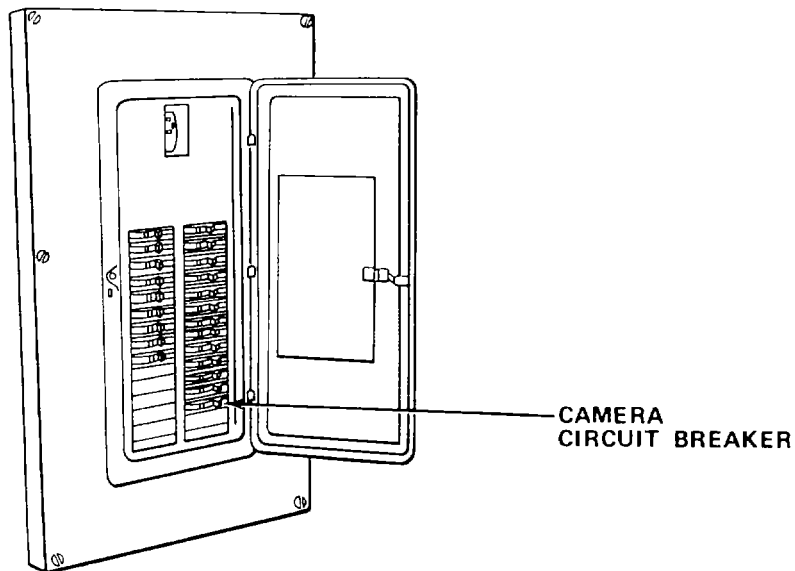
MOS: 35E, Special Electronic Devices Repairer

TOOLS: Electronic Equipment Tool Kit Multimeter

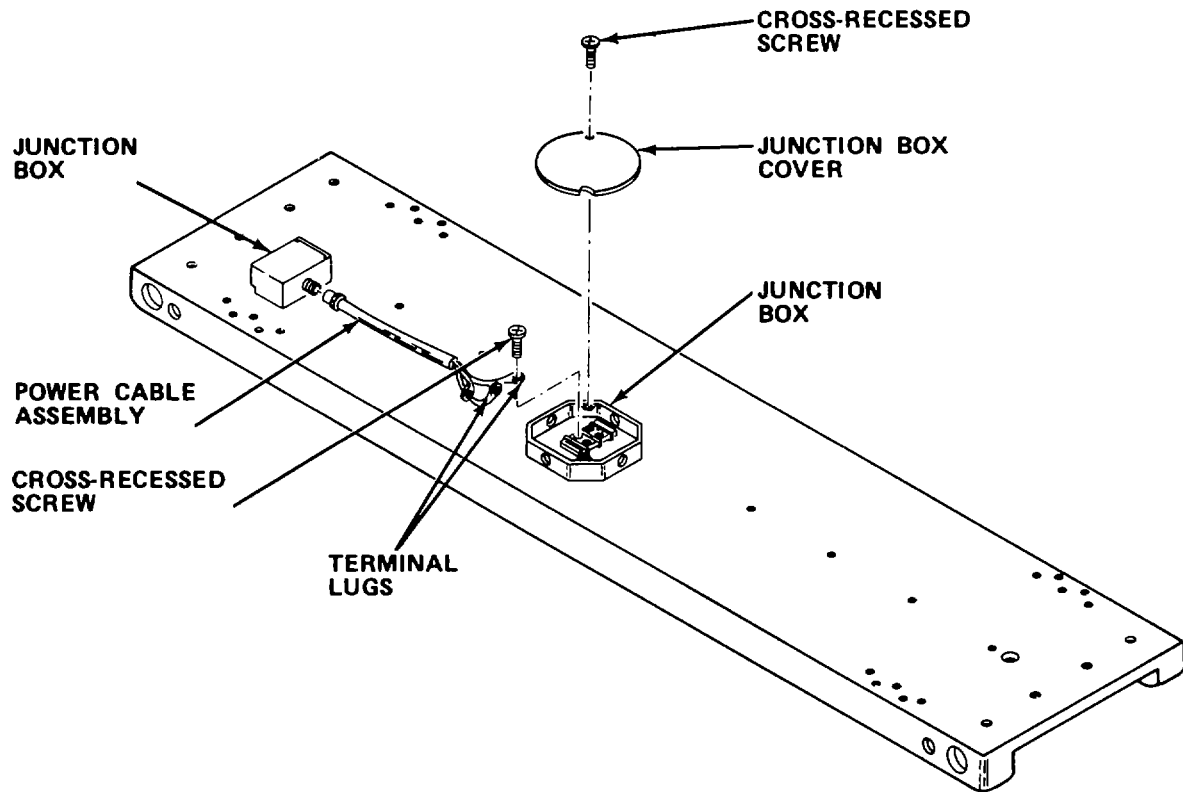
SUPPLIES: Power Cable Assembly  
Electrical Rubber Insulation Tape, (Item 24, Appendix E)  
Electrical Tape, (Item 22, Appendix E)

**WARNING**

Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.



- a. Set camera circuit breaker on power panel OFF.



- b. Disconnect defective main power cable assembly from junction box.
- c. Connect new main power cable assembly to junction box.
- d. Set camera circuit breaker on power panel ON.



**5-5.9 Replace AC Magnetic Starter.**

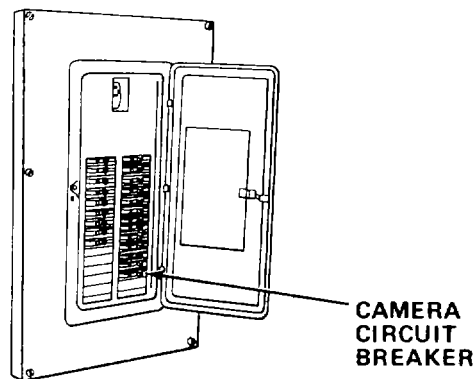
MOS: 35E, Special Electronic Devices Repairer

TOOLS: Electronic Equipment Tool Kit Multimeter

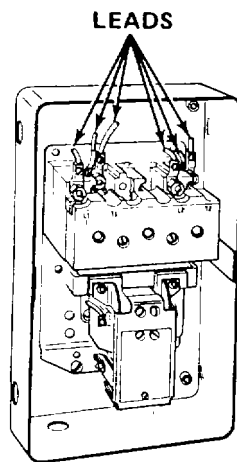
SUPPLIES: AC Magnetic Starter

**WARNING**

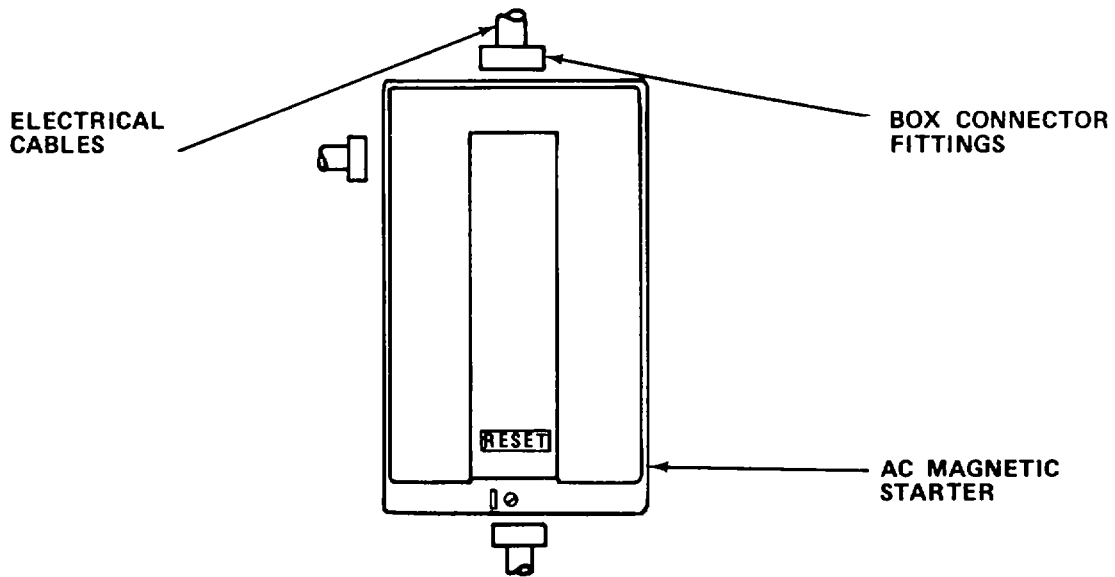
**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**



- a. Set camera circuit breaker on power panel OFF.



- b. Remove cover from ac magnetic starter.
- c. Tag and disconnect leads.



- d. Loosen box connector fittings.

**CAUTION**

**Do not break leads. Serious damage to equipment may occur.**

- e. Remove electrical cables from defective ac magnetic starter.
- f. Remove defective ac magnetic starter.
- g. Install new ac magnetic starter.
- h. Insert electrical cables in new ac magnetic starter.
- i. Tighten box connector fittings.
- j. Reconnect leads.
- k. Install cover.
- l. Set camera circuit breaker on power panel ON.

**5-5.10 Replace Sprocket Assembly.**

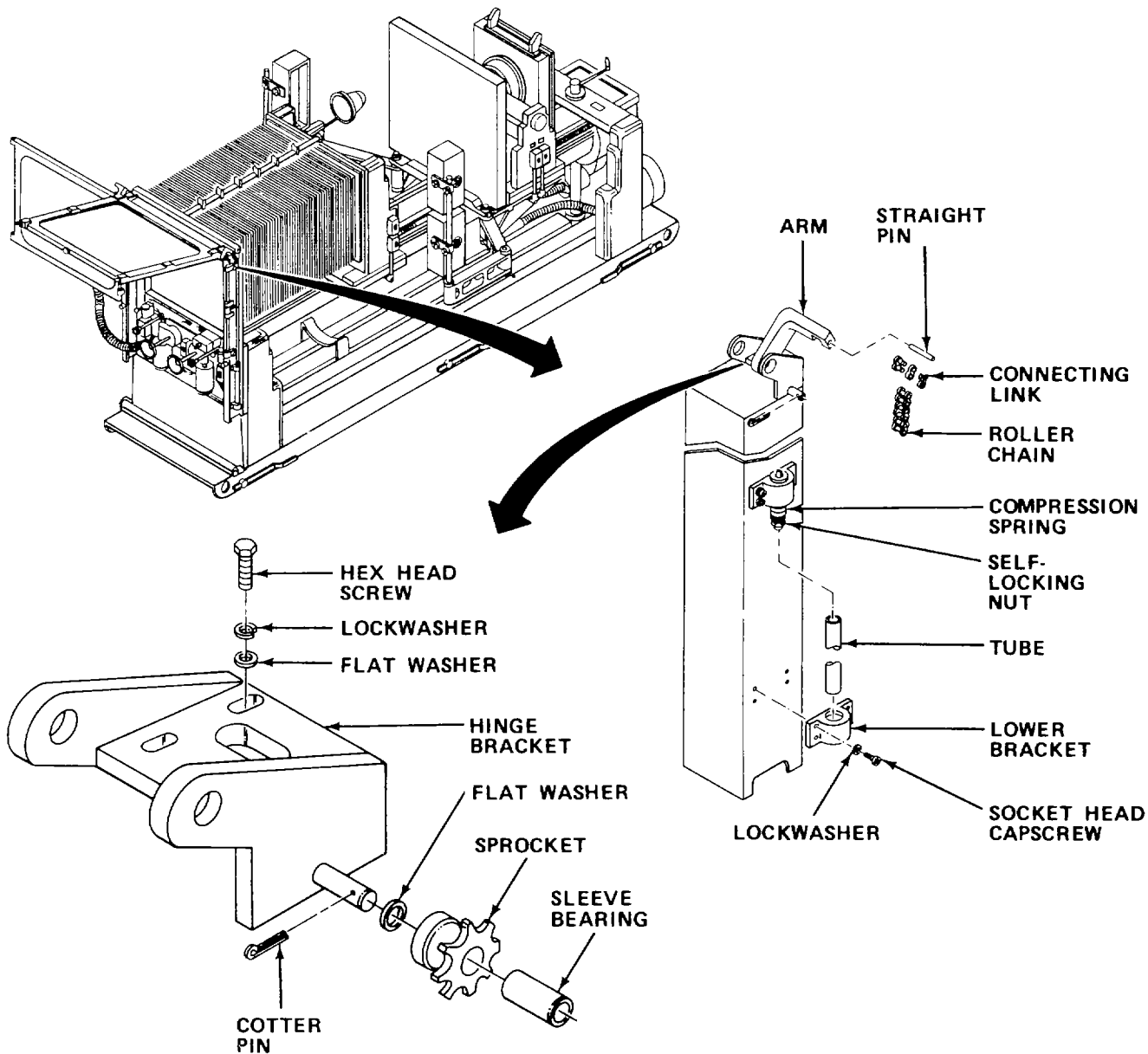
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit Industrial Goggles

SUPPLIES: Sprocket Assembly

**WARNING**

Power transmission roller chain is under tension. Release tension on compression spring to prevent death or serious injury.



**NOTE**

Lower ground glass assembly.

- a. Remove lower bracket and tube.
- b. Loosen self-locking nut on compression spring.
- c. Remove defective sprocket assembly.
- d. Install new sprocket assembly.
- e. Tighten self-locking nut on compression spring.
- f. Install tube and lower bracket.

5-5.11 Replace Ground Glass Assembly Power Transmission Roller Chain.

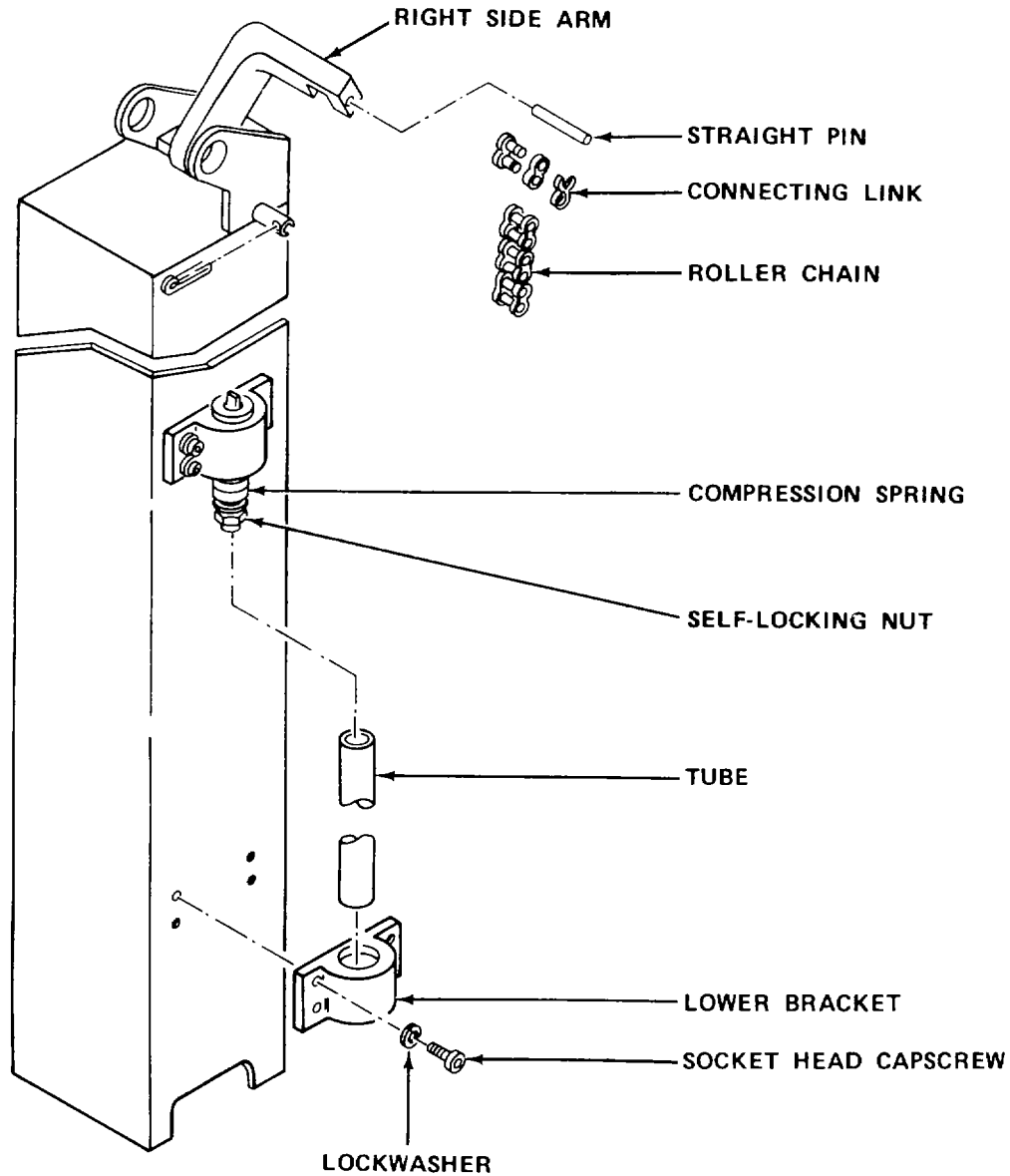
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Power Transmission Roller Chain

**WARNING**

**Power transmission roller chain is under tension. Release tension on compression spring to prevent death or serious injury.**



**NOTE**

Lower ground glass assembly.

- a. Remove lower bracket and tube.
- b. Loosen self-locking nut on compression spring.
- c. Remove defective power transmission roller chain.
- d. Install new power transmission roller chain.
- e. Tighten self-locking nut on compression spring.
- f. Install tube and lower bracket.

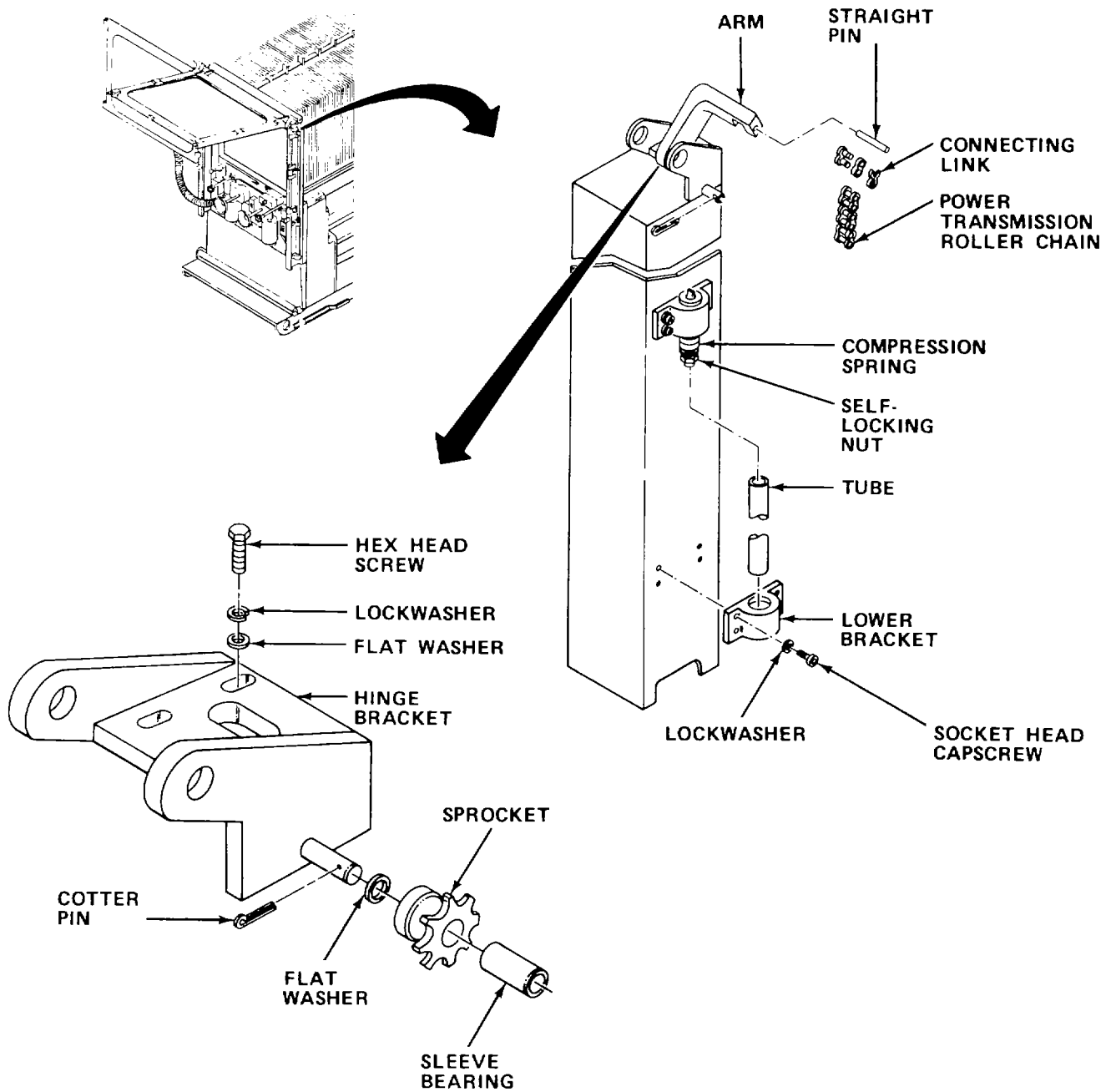
5-5.12 Replace Left or Right Hinge Bracket Assembly.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Left Side Hinge Bracket Assembly  
Right Side Hinge Bracket Assembly

- a. Remove ground glass assembly (subparagraph 5-5.1).



**WARNING**

**Power transmission roller chain is under tension. Release tension on compression spring to prevent death or serious injury.**

- b. Remove lower bracket and tube.
- c. Loosen self-locking nut on compression spring.
- d. Remove sprocket assembly.
- e. Remove defective hinge bracket assembly.
- f. Install sprocket assembly on new hinge bracket assembly.
- g. Install new hinge bracket assembly.
- h. Tighten self-locking nut on compression spring.
- i. Install tube and lower bracket.
- j. Install ground glass assembly (subparagraph 5-5.1e).

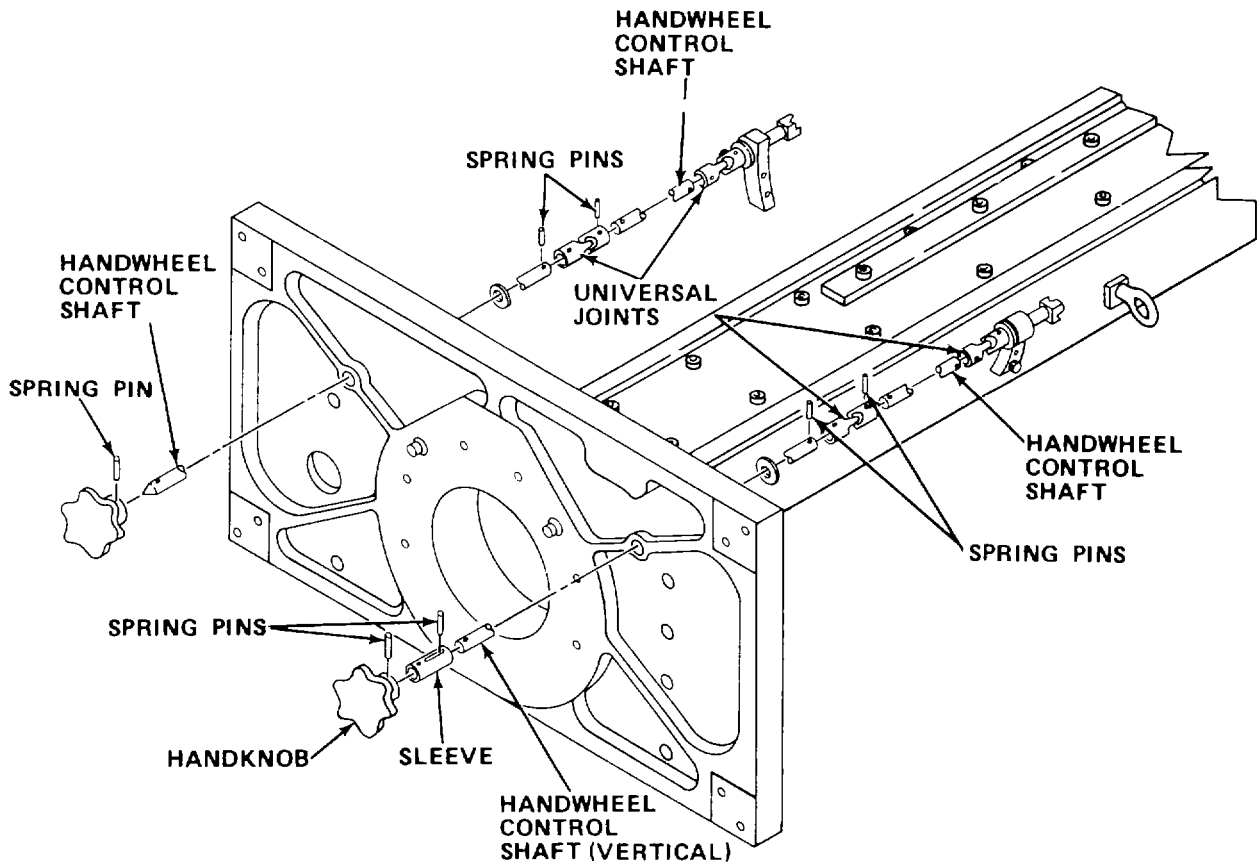


5-5.13 Replace Lensboard Horizontal/Vertical Handwheel Control Shafts.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Handwheel Control Shafts Spring Pin



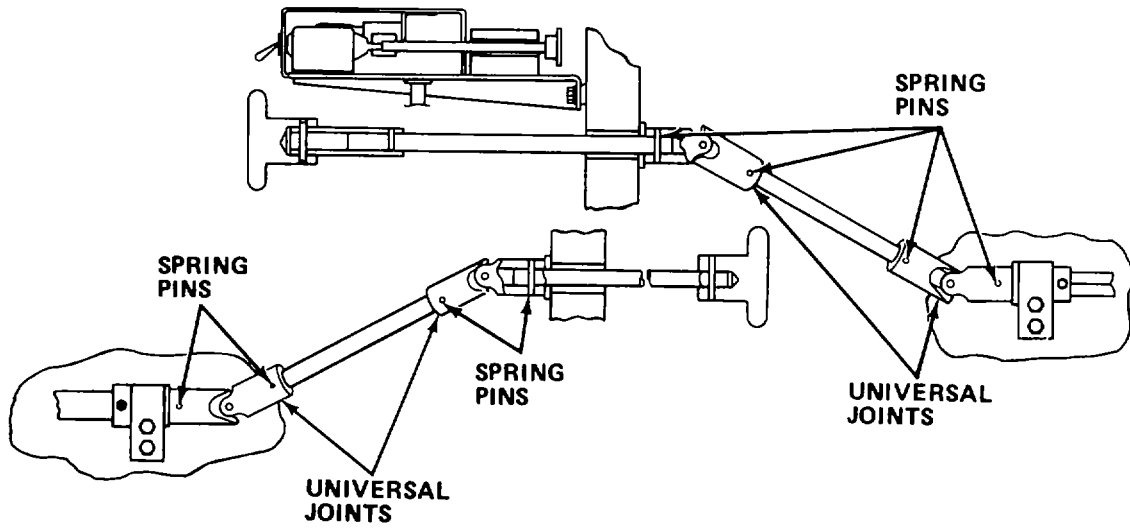
- a. Remove handknob.
- b. Remove sleeve (vertical shaft only).
- c. Remove three spring pins from universal joints.
- d. Remove universal joints from defective handwheel control shaft.
- e. Install new handwheel control shafts.
- f. Install universal joints.
- g. Install sleeve (vertical shaft only).
- h. Install handknob.

5-5.14 Replace Lensboard Horizontal/Vertical Universal Joints.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Universal Joint(s) Spring Pins



- a. Remove defective universal joint(s).
- b. Install new universal joint(s).

5-5.15 Replace Copyboard/Lensboard Silent Chain Sprocket.

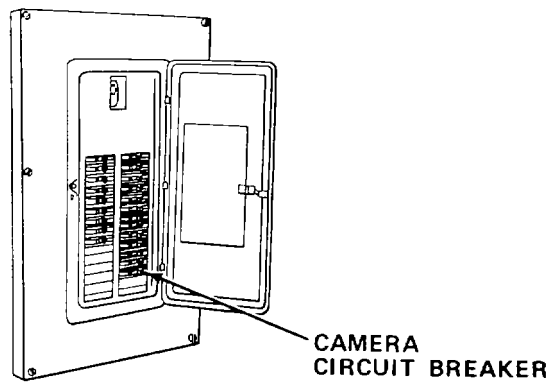
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
 Interchangeable Puller Set  
 Industrial Goggles  
 Multimeter

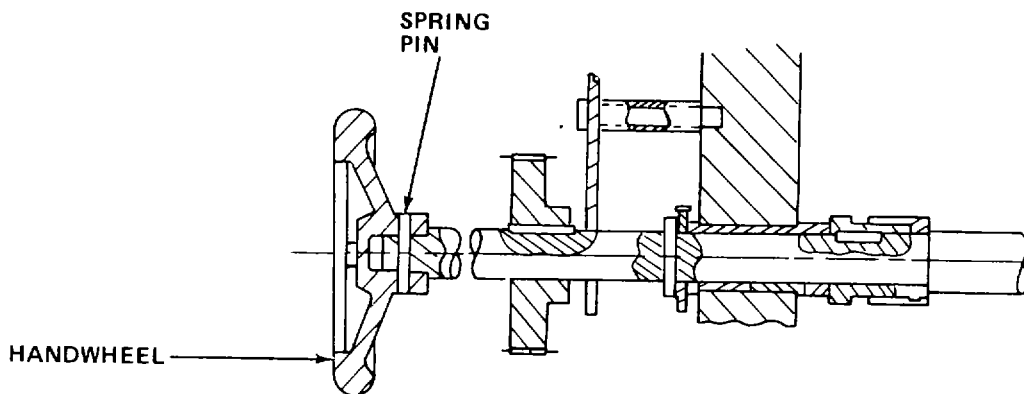
SUPPLIES: Silent Chain Sprocket Spring Pin

**WARNING**

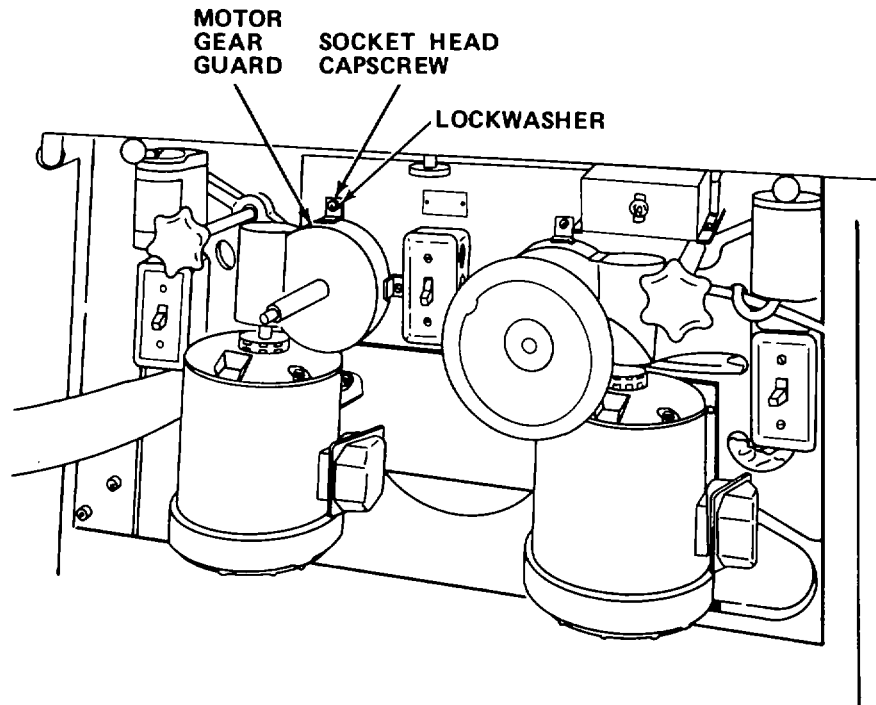
**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**



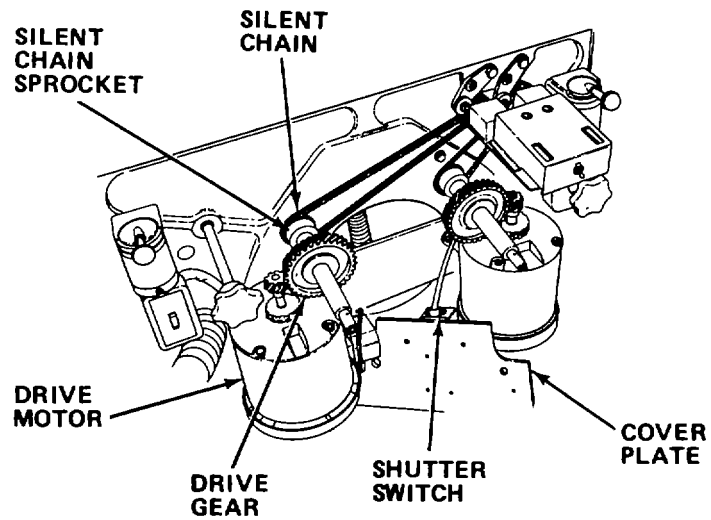
- a. Set camera circuit breaker on power panel OFF.



- b. Remove handwheels.



c. Remove motor gear guard.

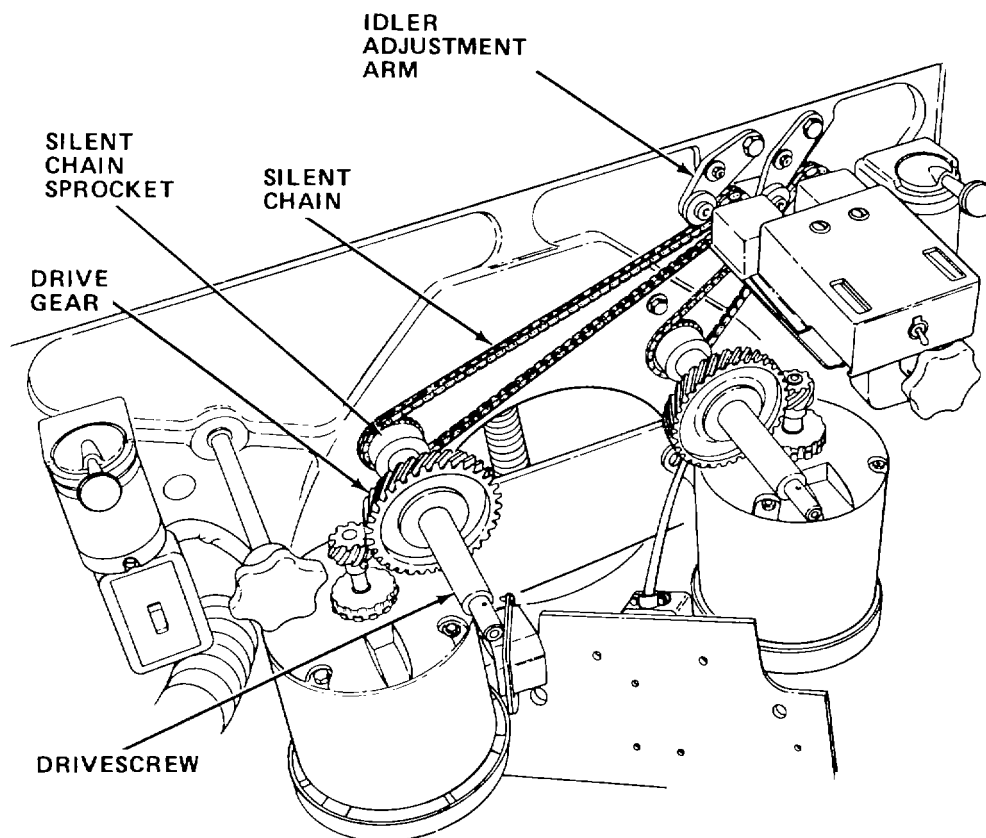


**WARNING**

**Do not break switch leads. Death or serious injury may occur.**

d. Remove shutter switch.

- e. Loosen and disengage drive motor from drive gear.
- f. Remove cover plate.



**CAUTION**

**Do not damage gear during removal.**

- g. Remove drive gear.
- h. Record counter reading.
- i. Release tension on silent chain.
- j. Remove defective silent chain sprocket.
- k. Install new silent chain sprocket.
- l. Set counter to recorded reading.
- m. Adjust idler adjustment arm (subparagraph 4-7.37).
- n. Install cover plate.
- o. Install shutter switch.

**CAUTION**

**Be sure gear teeth mesh correctly. Gears may chip if teeth are improperly meshed.**

- p. Install drive gear.
- q. Mesh drive motor gear with drive gear.
- r. Install motor gear guard.
- s. Install handwheel.
- t. Set camera circuit breaker on power panel ON.

5-5.16 Replace Copyboard/Lensboard Drive Motor.

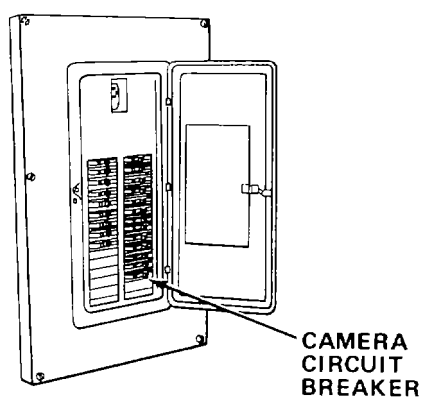
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
 Interchangeable Puller Set  
 Industrial Goggles  
 Multimeter

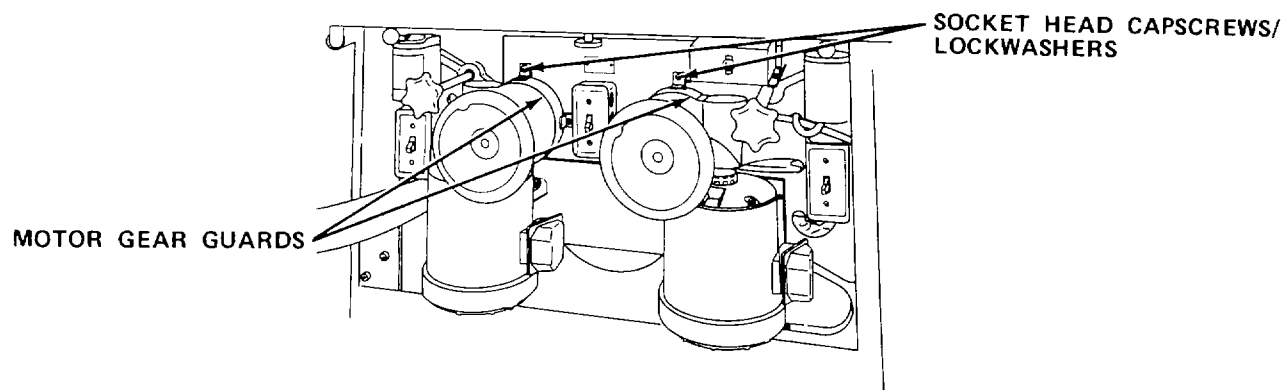
SUPPLIES: Drive Motor

**WARNING**

**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**



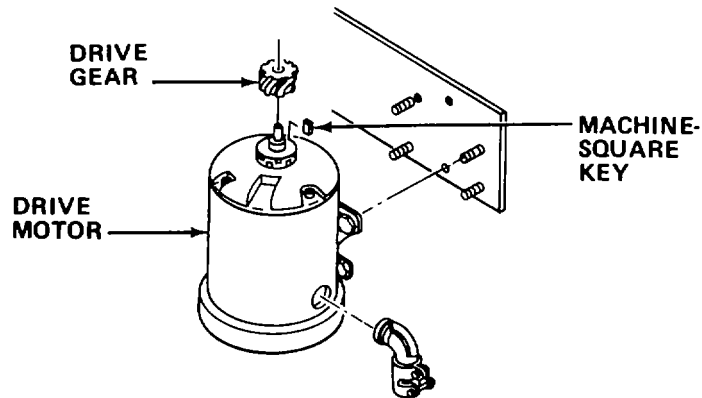
- a. Set camera circuit breaker on power panel OFF.



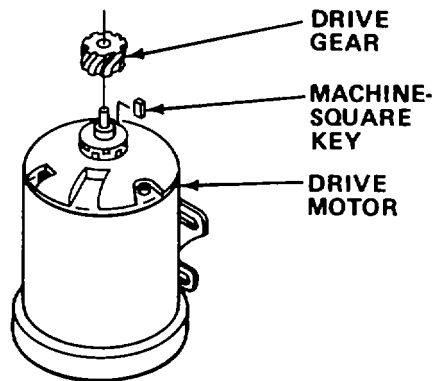
- b. Remove motor gear guard screws and slide motor gear guard toward handwheel.

**CAUTION**

**Do not damage drive gear during removal of drive motor.**



- c. Remove defective drive motor.



- d. Remove drive gear from defective drive motor shaft.
- e. Install drive gear on new drive motor shaft.

**CAUTION**

**Be sure gear teeth mesh properly. Damage to drive gears may occur.**

- f. Install new drive motor.
- g. Install motor gear guard.
- h. Set camera circuit breaker on power panel ON.



5-5.17 Replace Copyboard/Lensboard Drive Motor Gear.

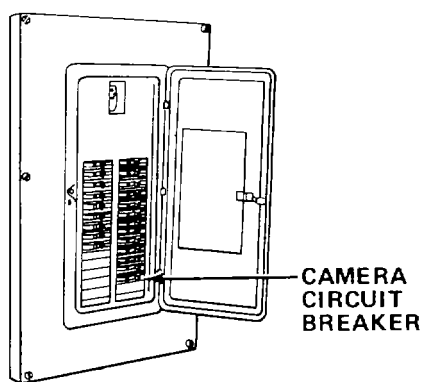
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
 Interchangeable Puller Set  
 Industrial Goggles  
 Multimeter

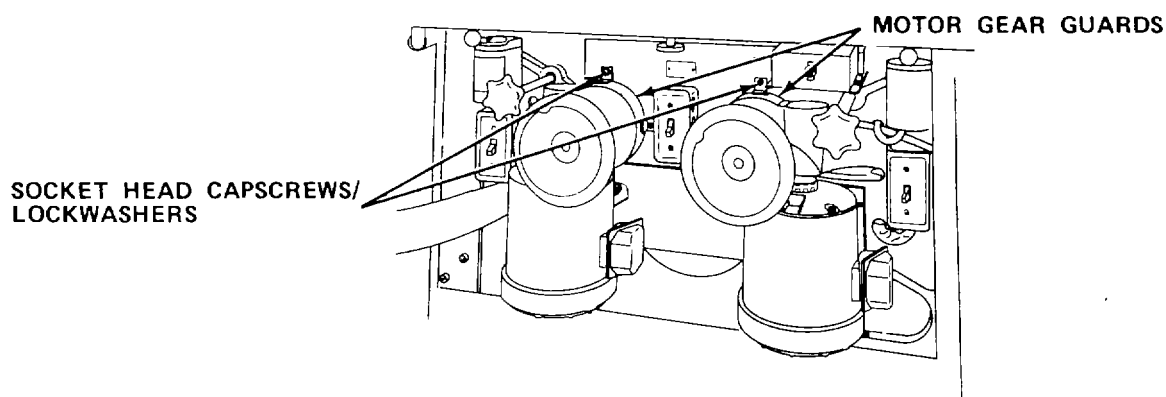
SUPPLIES: Drive Gear

**WARNING**

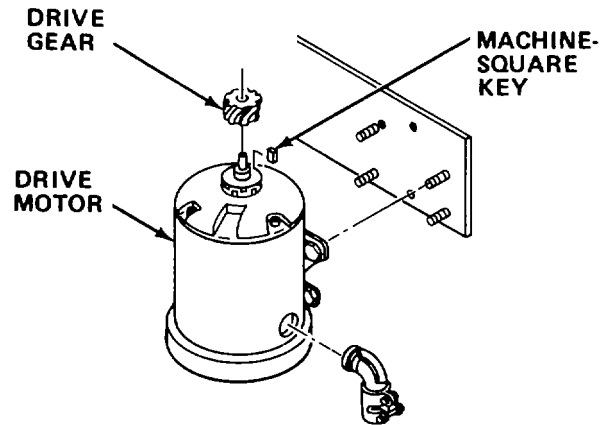
Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.



- a. Set camera circuit breaker on power panel OFF.



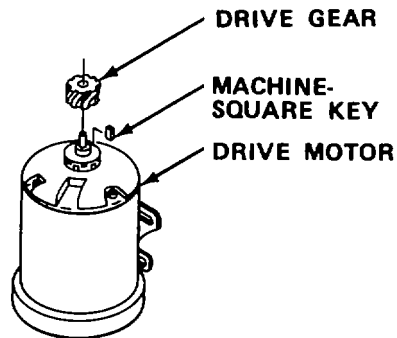
- b. Remove motor gear guard screws and slide motor gear guard toward handwheel.



**CAUTION**

**Do not damage drive gear during drive motor removal.**

- c. Remove drive motor.



- d. Remove defective drive gear from drive motor.
- e. Install new drive gear on drive motor shaft.

**CAUTION**

**Be sure gear teeth mesh properly. Damage to gears may occur.**

- f. Install drive motor.
- g. Install motor gear guard.
- h. Set camera circuit breaker on power panel ON.

5-5.18 Replace Copyboard/Lensboard Carriage Assembly Limit Switch.

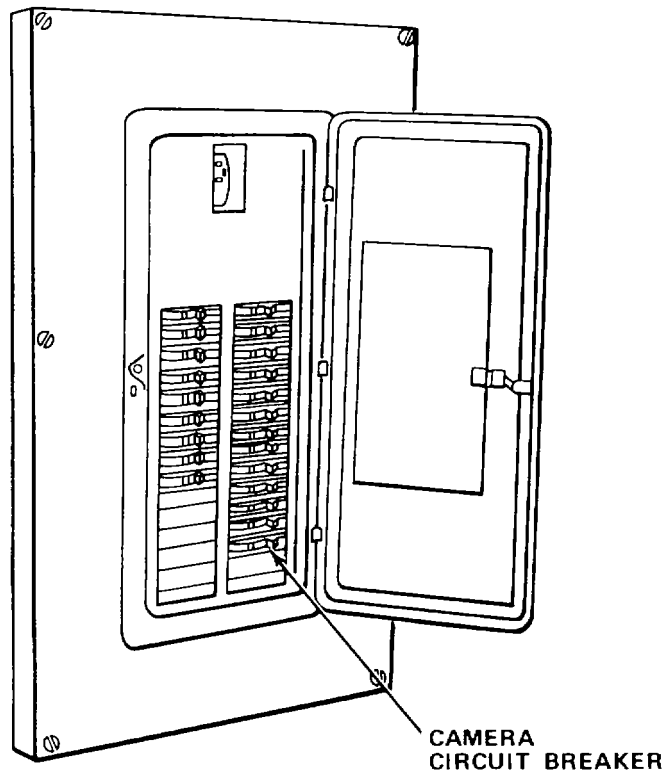
MOS: 35E, Special Electronic Devices Repairer

TOOLS: Electronic Equipment Tool Kit

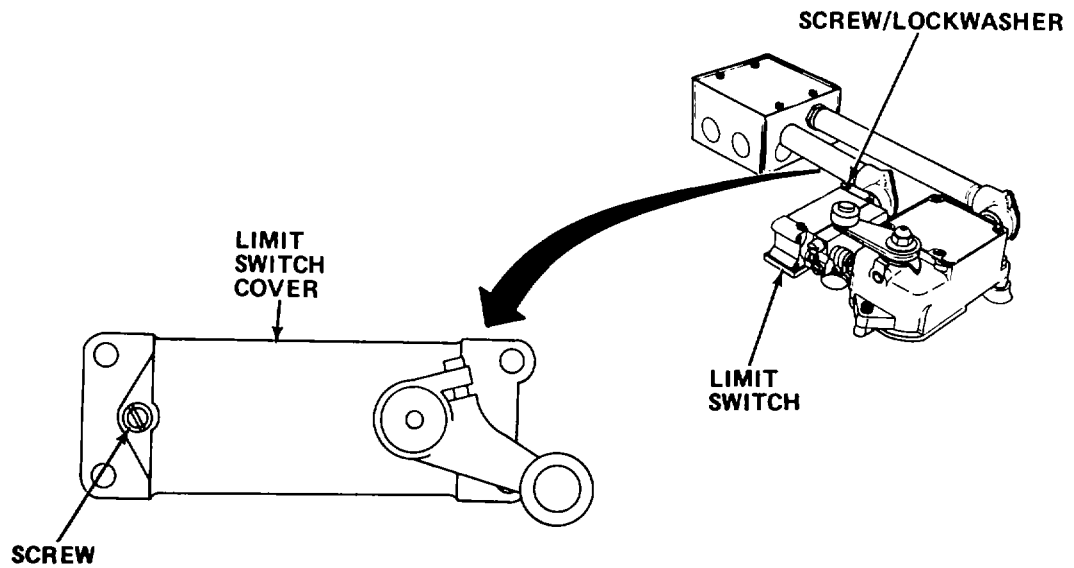
SUPPLIES: Limit Switch

**WARNING**

Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.



- a. Set camera circuit breaker on power panel OFF.



**NOTE**

**Replacement limit switch may or may not have arm.**

- b. Remove limit switch cover.
- c. Tag and disconnect leads.

**CAUTION**

**Be careful not to break leads while removing limit switch. Damage to limit switch may occur.**

- d. Remove defective limit switch.

**CAUTION**

**Be careful not to break leads while inserting them into limit switch. Damage to limit switch may occur.**

- e. Install new limit switch.
- f. Reconnect leads.
- g. Install limit switch cover.
- h. Set camera circuit breaker on power panel ON.
- i. Perform copyboard/lensboard carriage assembly limit switch adjustment (subparagraph 5-5.64).

5-5.19 Replace Lensboard Carriage Assembly Two-Way Limit Switch.

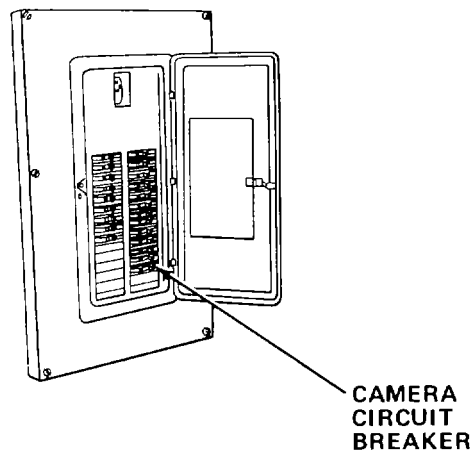
MOS: 35E, Special Electronic Devices Repairer

TOOLS: Electronic Equipment Tool Kit

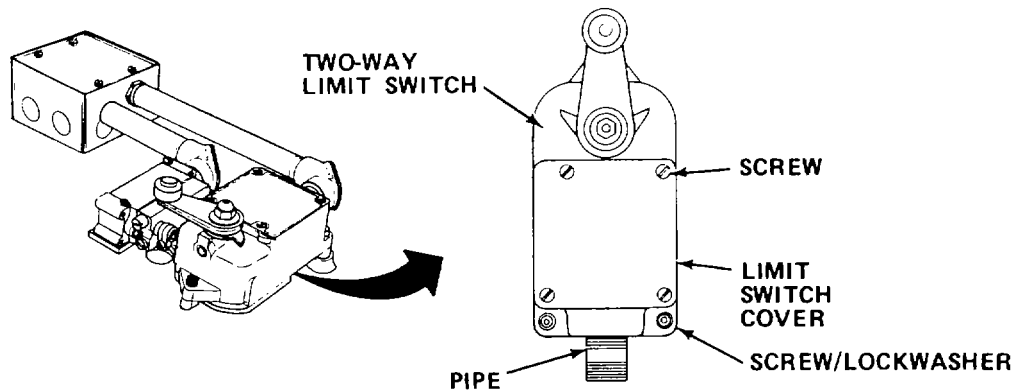
SUPPLIES: Two-Way Limit Switch

**WARNING**

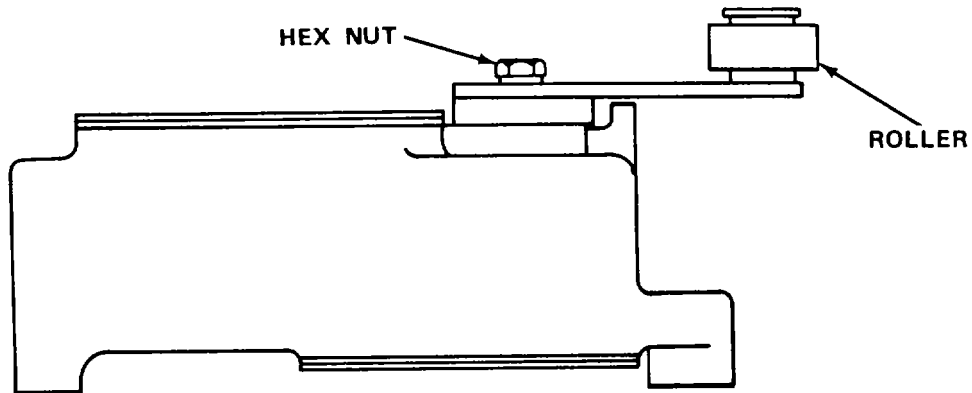
Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.



- a. Set camera circuit breaker on power panel OFF.



- b. Remove two-way limit switch cover.
- c. Tag and disconnect leads.
- d. Remove defective two-way limit switch.

**NOTE**

If the new two-way limit switch roller is not in position shown, remove roller and rotate 180 degrees.

- e. Install new two-way limit switch.
- f. Reconnect leads.
- g. Install switch cover.
- h. Set camera circuit breaker on power panel ON.
- i. Perform lensboard carriage assembly two-way limit switch adjustment (subparagraph 5-5.63).

5-5.20 Replace Copyboard/Lensboard Drive Shaft Spacer.

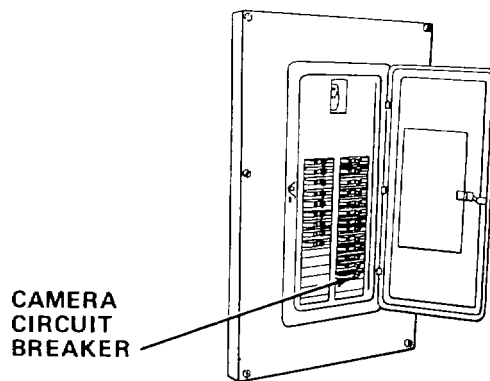
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
 Interchangeable Puller Set  
 Industrial Goggles  
 Multimeter

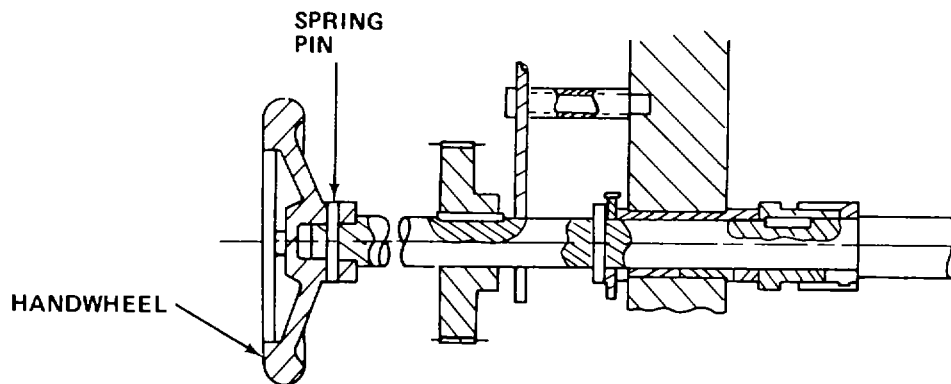
SUPPLIES: Spacer

**WARNING**

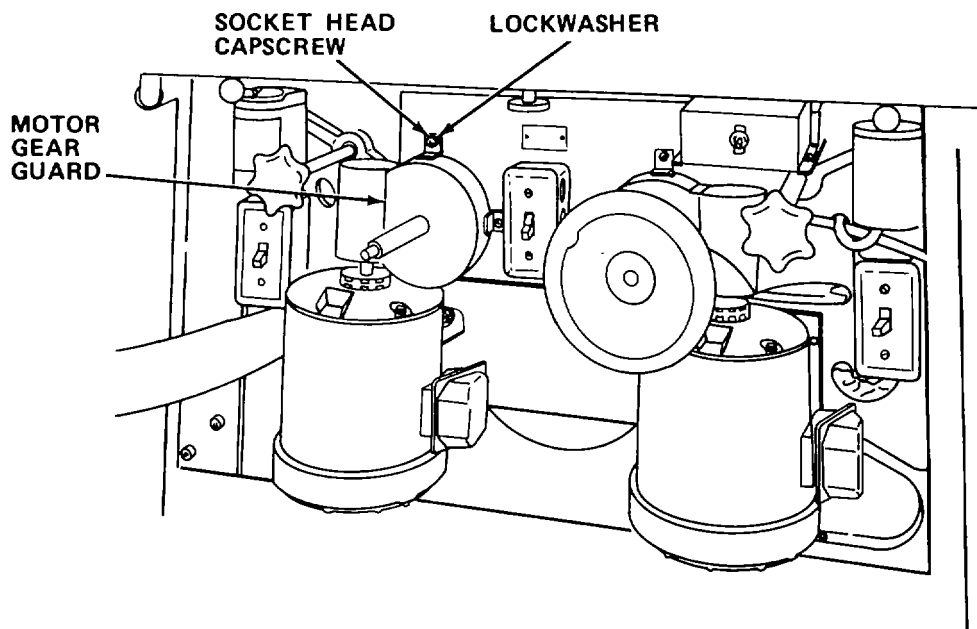
**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**



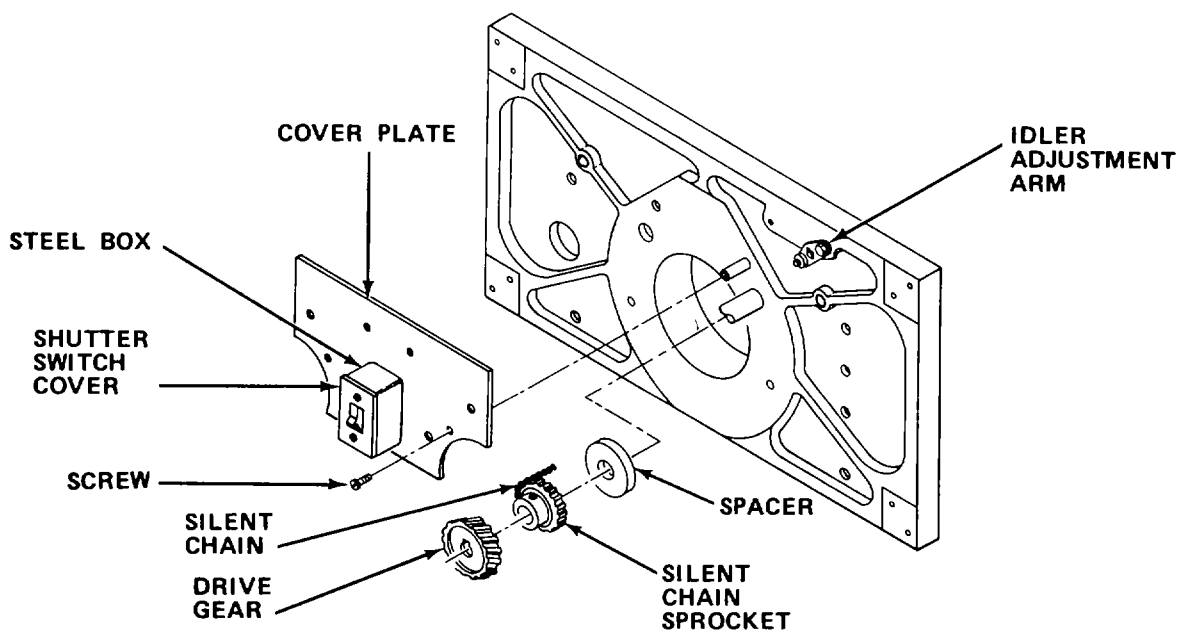
- a. Set camera circuit breaker on power panel OFF.



- b. Remove handwheels.



c. Remove motor gear guard.



d. Remove shutter switch.

e. Loosen and disengage drive motor from drive gear.

f. Remove drive gear.



- g. Remove cover plate.
- h. Release tension on silent chain.

**CAUTION**

**Do not damage gear during removal.**

- i. Remove silent chain sprocket.
- j. Replace defective spacer.
- k. Install silent chain sprocket.
- l. Adjust idler arm (subparagraph 4-7.37).
- m. Install cover plate.
- n. Install shutter switch.
- o. Install drive gear.

**CAUTION**

**Be sure drive gear teeth mesh correctly before installing drive motor. Damaged drive gears may occur.**

- p. Mesh drive motor gear with drive gear.
- q. Install motor gear guard.
- r. Install handwheel.
- s. Set camera circuit breaker on power panel ON.

5-5.21 Replace Copyboard/Lensboard Silent Chain.

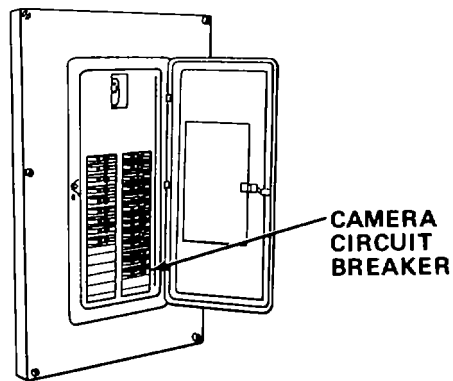
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
Interchangeable Puller Set  
Industrial Goggles  
Multimeter

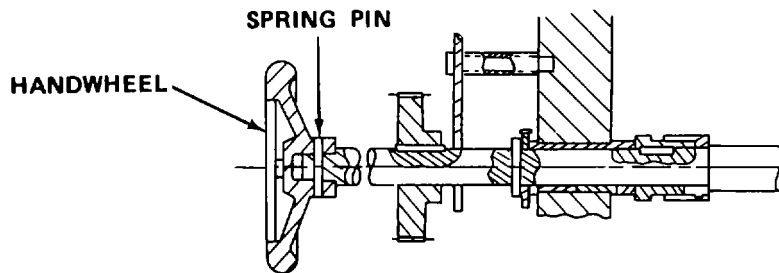
SUPPLIES: Silent Chain

**WARNING**

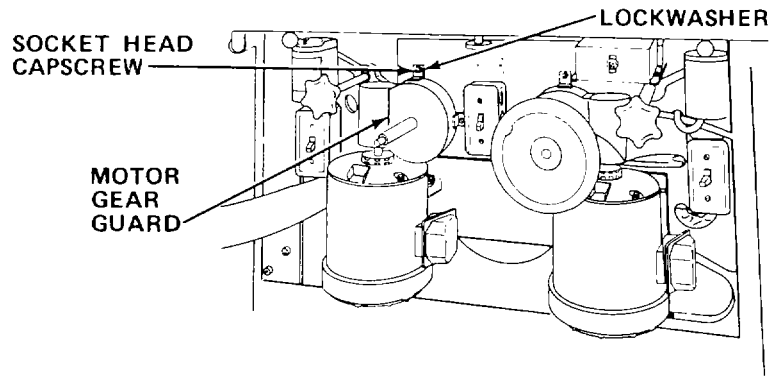
Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs



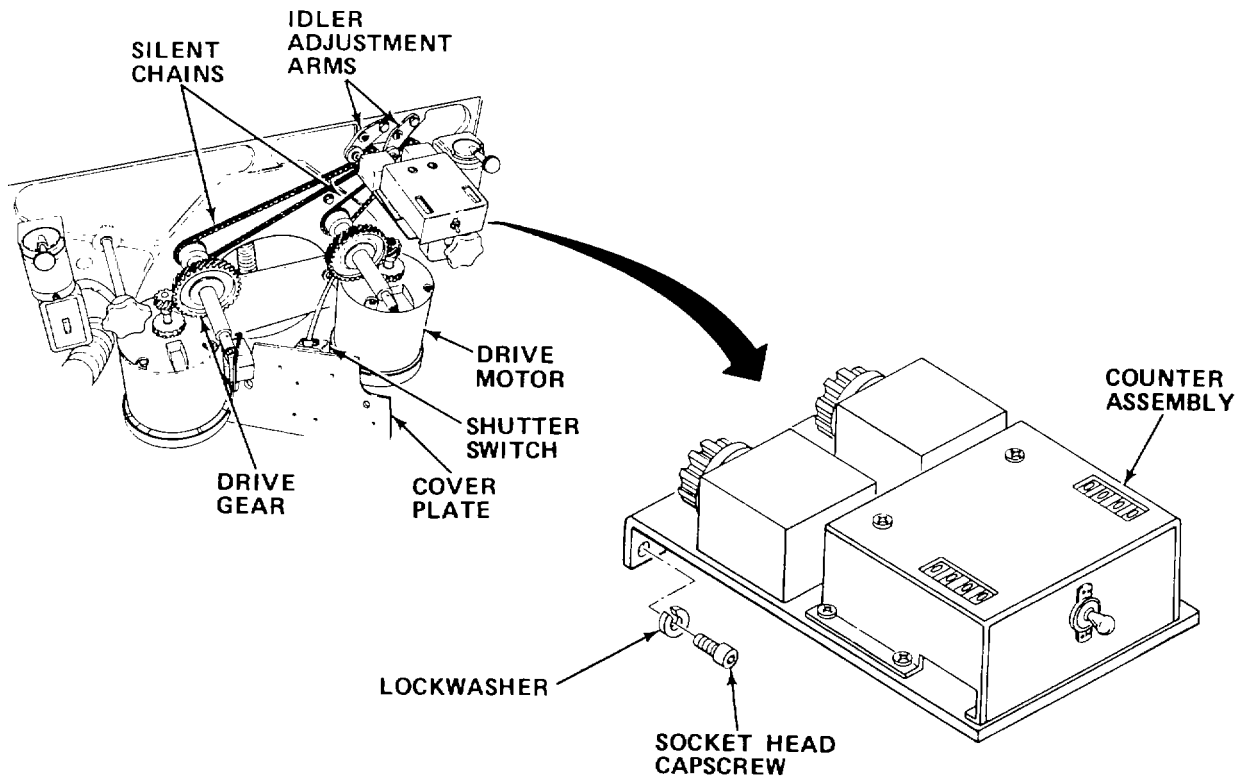
- a. Set camera circuit breaker on power panel OFF.



- b. Remove handwheel.



c. Remove motor gear guard.

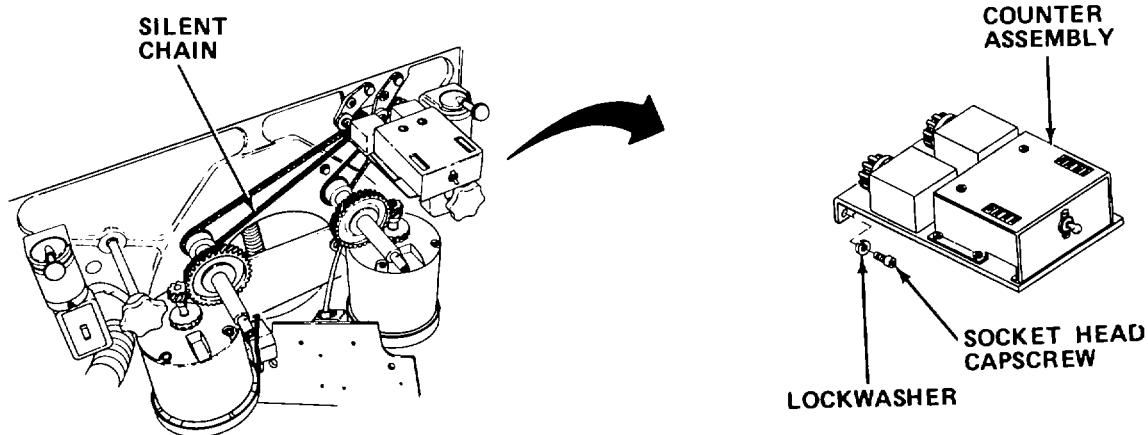


- d. Remove shutter switch.
- e. Loosen and disengage drive motor from drive gear.
- f. Remove cover plate.
- g. Loosen idler adjustment arms.

**NOTE**

**Record counter readings.**

- h. Remove counter assembly mounting screws only.



- i. Replace defective silent chain.  
 j. Install counter assembly and set counters to recorded readings.  
 k. Adjust idler adjustment arms (subparagraph 4-7.37).  
 l. Install cover plate.

**CAUTION**

**Be sure drive gear teeth mesh correctly before installing drive motor. Damage to drive gears may occur**

- m. Install drive motor.  
 n. Install motor gear guard.  
 o. Install shutter switch.  
 p. Install handwheel.  
 q. Set camera circuit breaker on power panel ON.  
 r. Optically aline camera (subparagraph 4-7.36).

5-5.22 Replace Copyboard or Lensboard Drive Reversing Drum Switch.

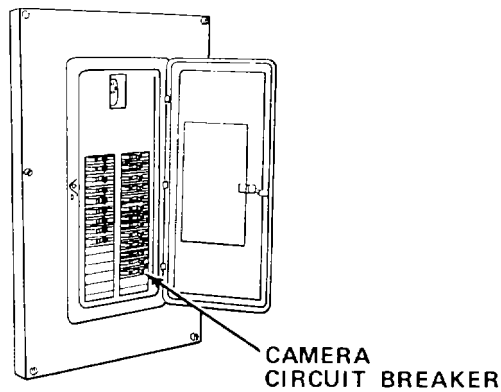
MOS: 35E, Special Electronic Devices Repairer

TOOLS: Electronic Equipment Tool Kit

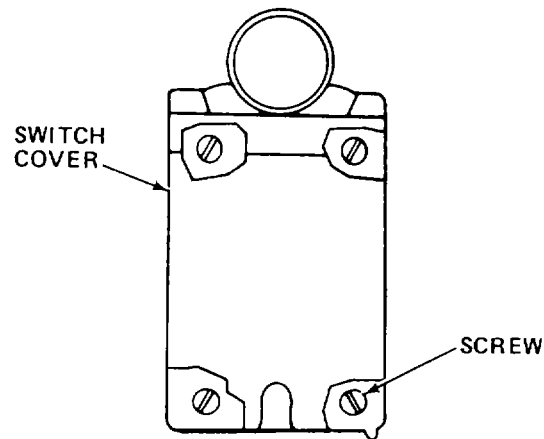
SUPPLIES: Reversing Drum Switch

**WARNING**

Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs



- a. Set camera circuit breaker on power panel OFF.

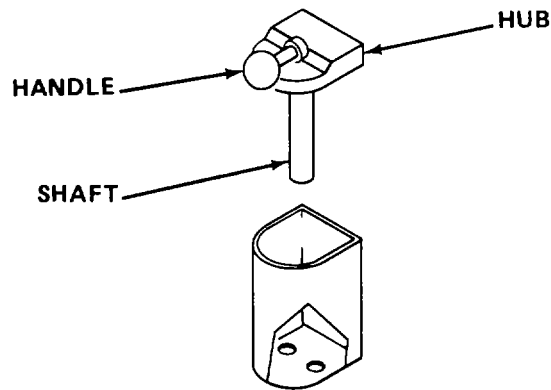


- b. Remove switch cover.
- c. Tag and disconnect leads.

**NOTE**

**While removing switch, carefully pull cables out bottom of switch.**

- d. Remove defective switch.



**NOTE**

**Set switch handle to ON position. If switch remains in ON position, perform steps e through j.**

- e. Remove handle.
- f. Remove hub.
- g. Rotate shaft 180 degrees.
- h. Install hub.
- i. Install handle.
- j. Set switch to ON. Switch should return to OFF.
- k. Install new switch.
- l. Reconnect leads.
- m. Install switch cover.
- n. Set camera circuit breaker on power panel ON.

5-5.23 Replace Cross Brace Needle Roller Bearing.

MOS: 83FJ6, Reproduction Equipment Repairer

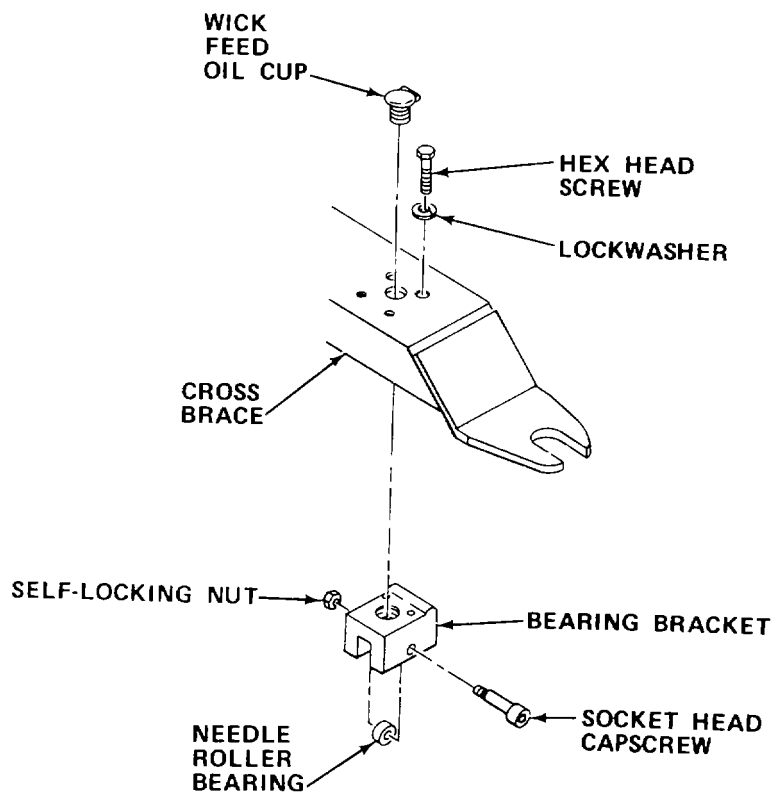
TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Needle Roller Bearing

**NOTE**

**This task requires two people.**

- a. Remove pulsed xenon lamps (subparagraph 4-7.1).
- b. Remove cross brace.



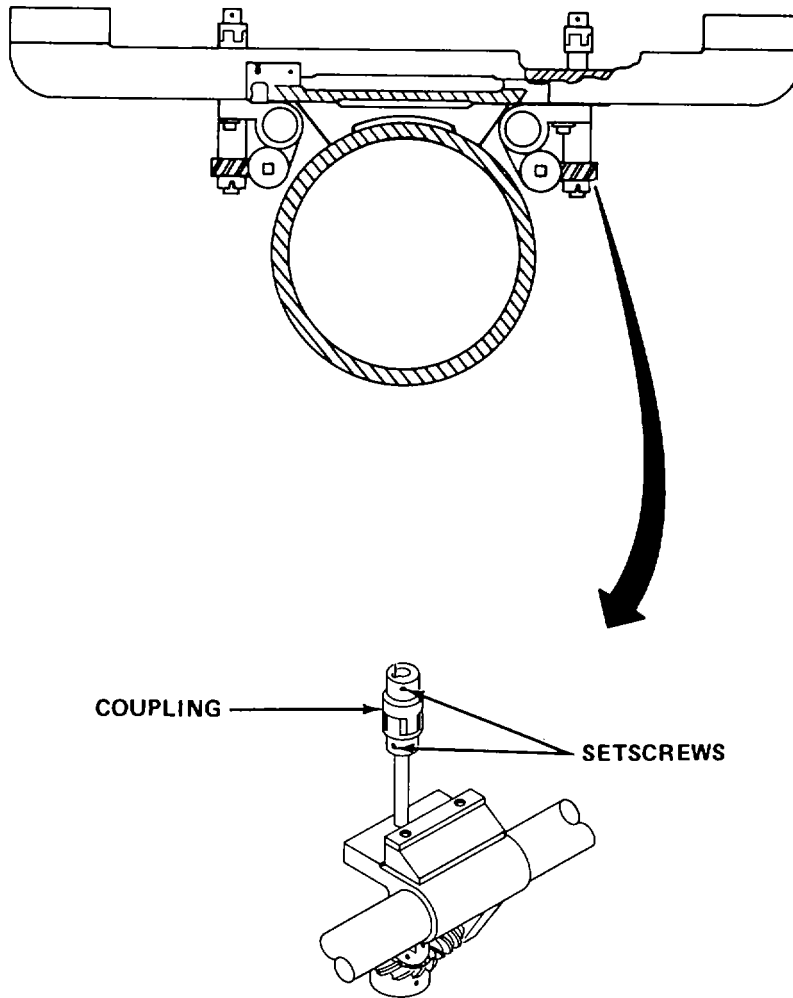
- c. Remove defective needle roller bearing.
- d. Install new needle roller bearing.
- e. Lubricate as required by camera lubrication instructions (paragraph 3-1).
- f. Install cross brace.
- g. Install pulsed xenon lamps (subparagraph 4-7.1e).

5-5.24 Replace Lensboard Vertical/Horizontal Coupling.

MOS: 83FJ6, Reproduction Equipment Repairer  
 TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Coupling  
 Machine-Square Key

- a. Remove lensboard assembly (subparagraph 5-5.6).



- b. Replace defective coupling.
- c. Install lensboard assembly (subparagraph 5-5.6i).



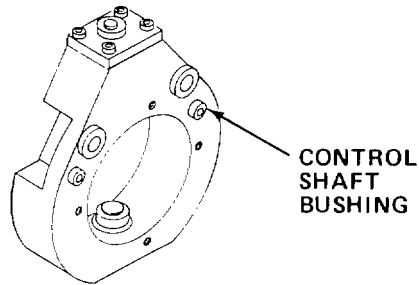
5-5.25 Replace Lensboard Vertical/Horizontal Control Shaft.

MOS: 83FJ6, Reproduction Equipment Repairer

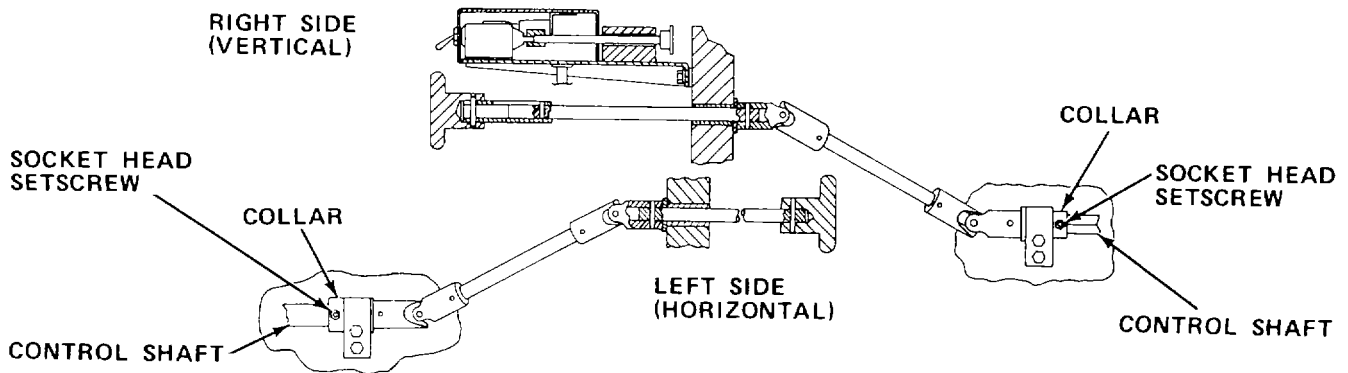
TOOLS: Light Machine Repair Tool Kit  
 Mechanical Puller Kit  
 Multimeter

SUPPLIES: Control Shaft  
 Bushing

- a. Remove power supply assembly (subparagraph 5-5.5).



- b. Remove control shaft bushing.



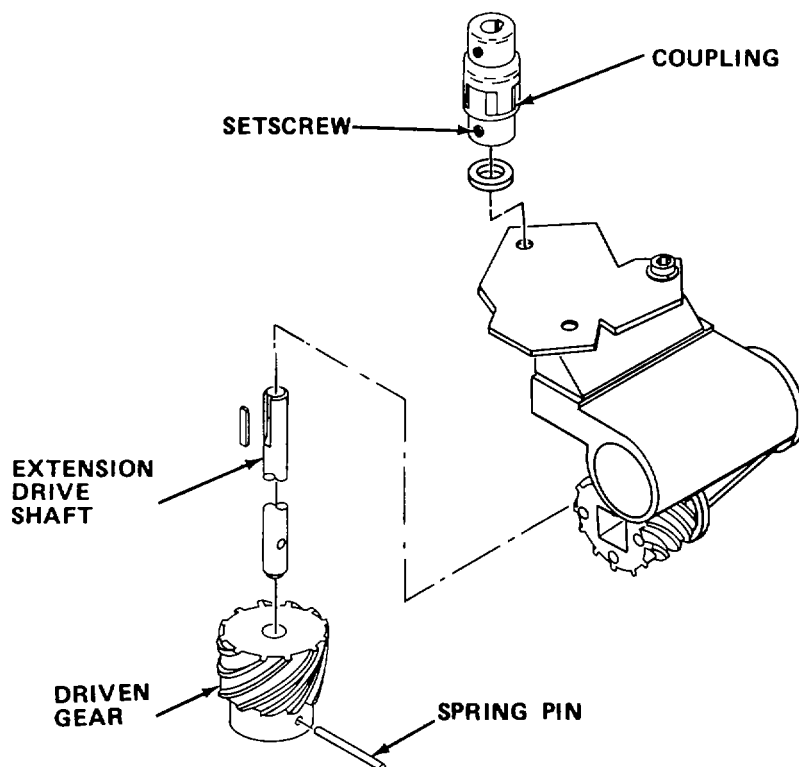
- c. Loosen socket head setscrew on collar
- d. Slide defective control shaft through frame assembly, copyboard, and lensboard drive brackets
- e. Install new control shaft through frame assembly, lensboard, and copyboard drive brackets
- f. Install control shaft bushing
- g. Install power supply assembly (subparagraph 5-5. 5g)

5-5.26 Replace Lensboard Vertical/Horizontal Extension Drive Shaft.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
Industrial Goggles

SUPPLIES: Extension Drive Shaft

**NOTE****Be careful not to damage drive gear or driven gear.**

- Remove defective extension drive shaft from coupling.
- Remove driven gear from defective extension drive shaft.
- Install driven gear on new extension drive shaft.
- Install new extension drive shaft on coupling.

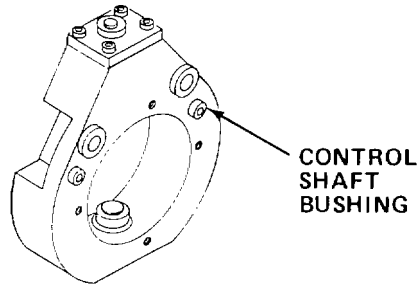
5-5.27 Replace Lensboard Vertical/Horizontal Drive Gear.

MOS: 83FJ6, Reproduction Equipment Repairer

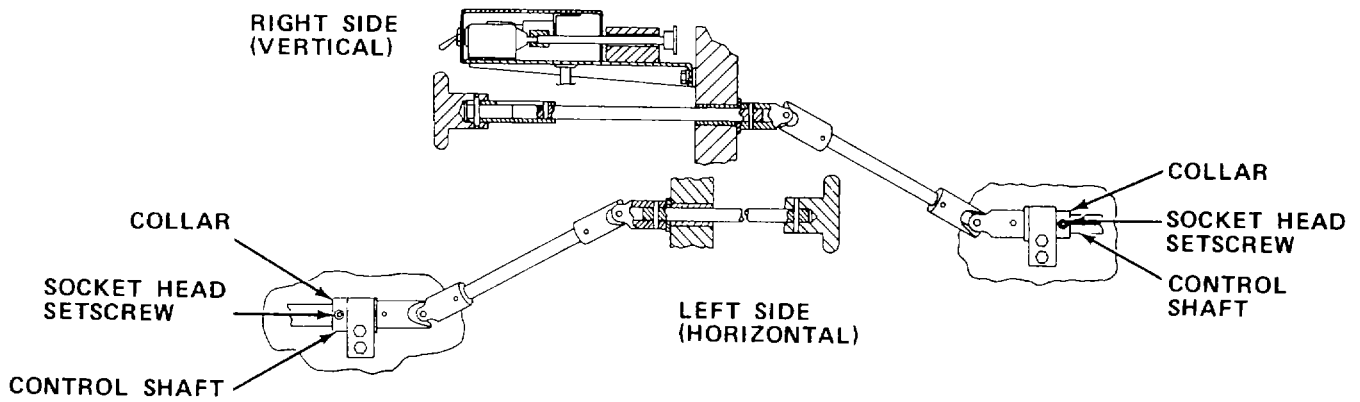
TOOLS: Light Machine Repair Tool Kit  
 Industrial Goggles  
 Multimeter

SUPPLIES: Drive Gear

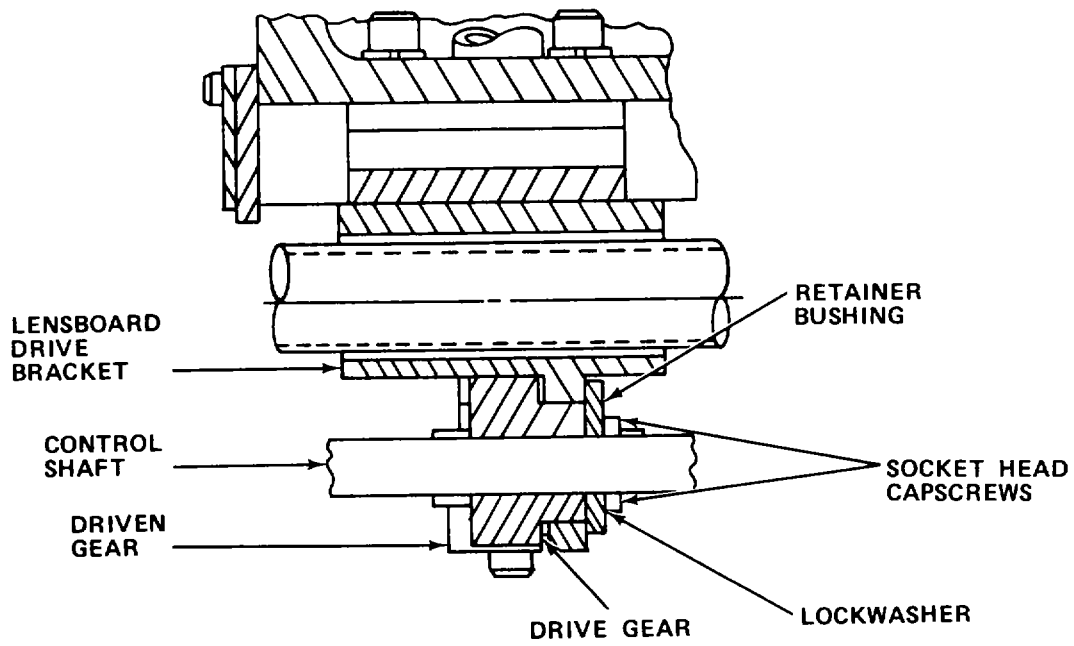
- a. Remove power supply assembly (subparagraph 5-5.5).



- b. Remove control shaft bushing.



- c. Loosen socket head setscrew on collar.



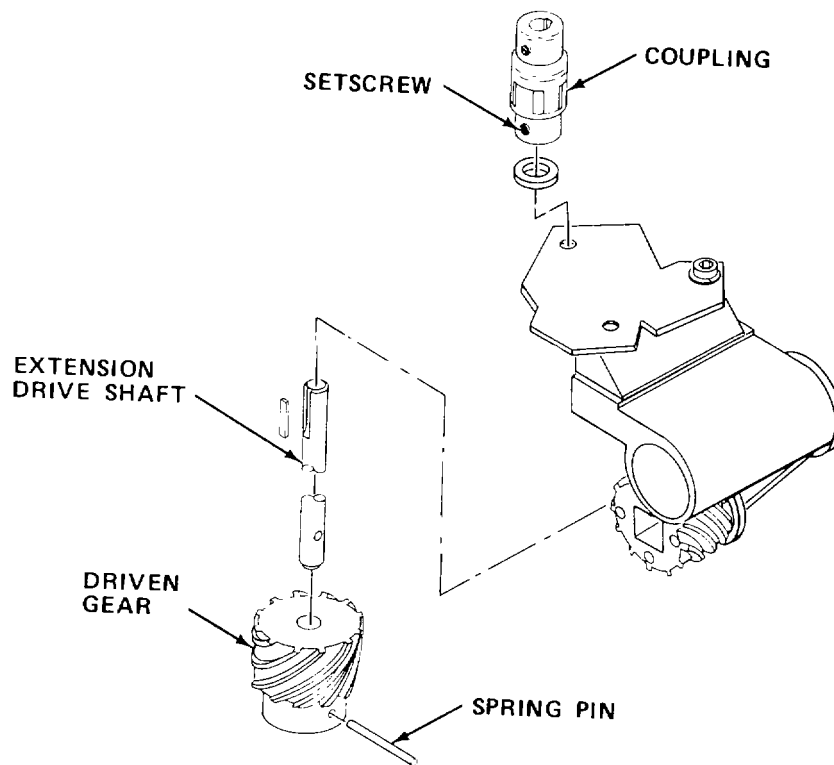
- d. Remove retainer bushing socket head cap screws.
- e. Slide defective drive gear off control shaft.
- f. Slide new drive gear on control shaft.
- g. Install retainer bushing socket head cap screws.
- h. Install control shaft bushing.
- i. Install power supply assembly (subparagraph 5-5.5g).

5-5.28 Replace Lensboard Vertical/Horizontal Driven Gear.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
Interchangeable Puller Set  
Industrial Goggles

SUPPLIES: Driven Gear

**NOTE****Be careful not to damage drive gear or driven gear.**

- a. Remove extension drive shaft from coupling.
- b. Remove defective driven gear from extension drive shaft.
- c. Install new driven gear on extension drive shaft.
- d. Install extension drive shaft in coupling.

5-5.29 Replace Ground Glass Frame Assembly.

MOS: 83FJ6, Reproduction Equipment Repairer

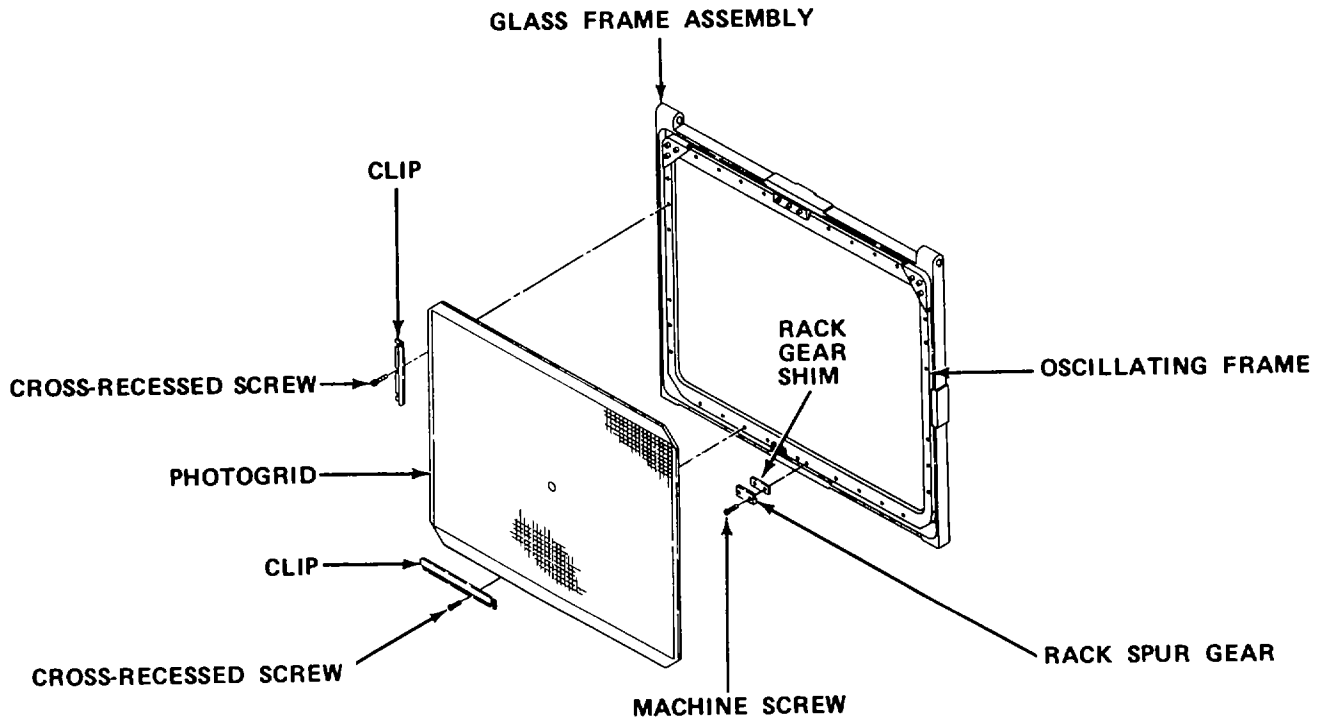
TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Ground Glass Frame Assembly

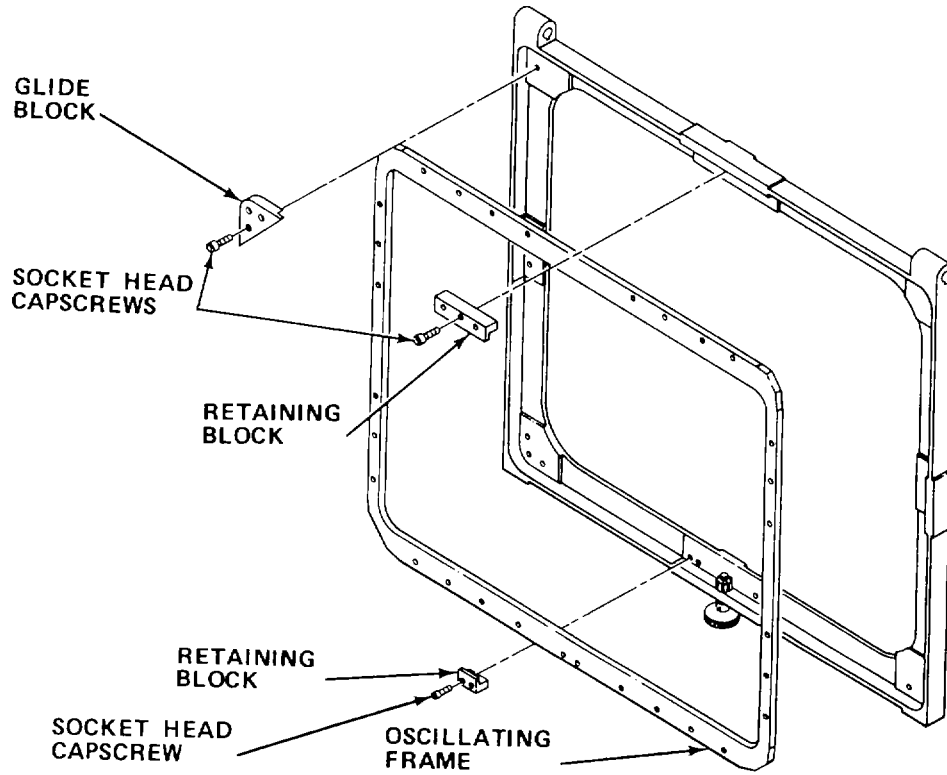
- a. Remove ground glass assembly (subparagraph 5-5.1).

**CAUTION**

**Mark and return shims to original position or optical misalignment may occur.**



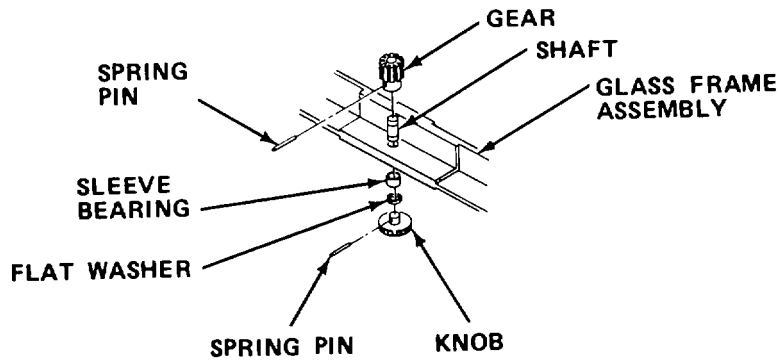
- b. Remove clips and photogrid from ground glass assembly.
- c. Remove rack spur gear and rack gear shim.



**NOTE**

**All glide blocks must be installed in their original positions.**

- d. Remove glide blocks.
- e. Remove retaining blocks.
- f. Remove oscillating frame.



- g. Remove knob, flat washer, sleeve bearing, and shaft.
- h. Remove defective glass frame assembly.
- i. Install shaft, sleeve bearing, flat washer, and knob into new glass frame assembly.
- j. Install gear.
- k. Center and install oscillating frame.
- l. Install retaining blocks.
- m. Install glide blocks in their original position.

**CAUTION**

**Check for proper meshing of gear and rack spur gear before installing rack spur shim and rack spur gear. Damage to gear or rack spur gear may occur**

- n. Install rack spur shim and rack spur gear.
- o. Install photogrid.
- p. Install ground glass assembly (subparagraph 5-5.1e).
- q. Optically aline camera (subparagraph 4-7.36).



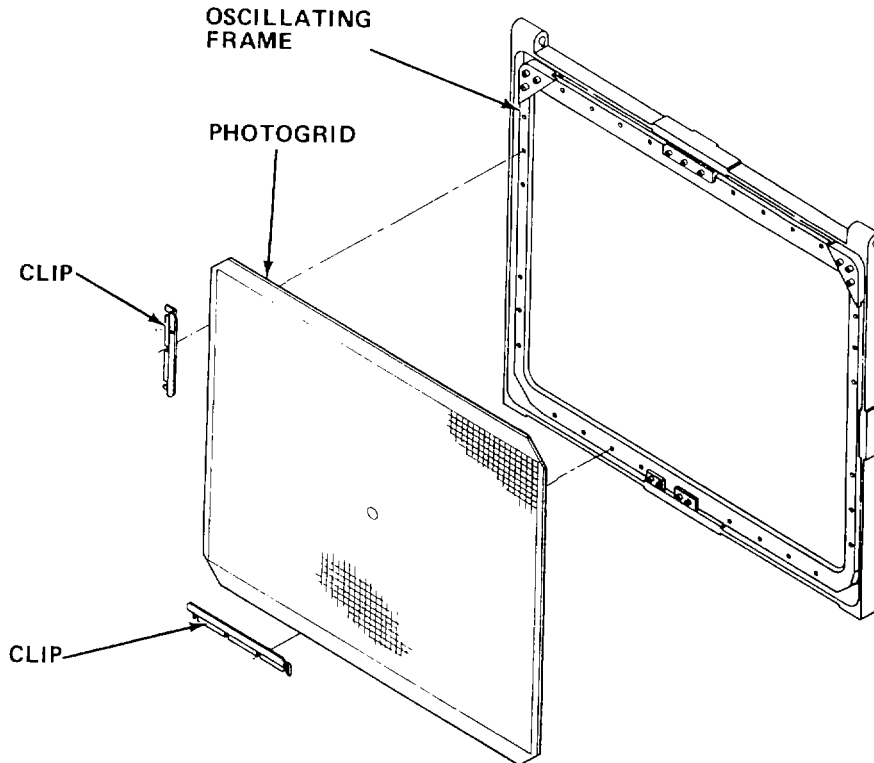
5-5.30 Replace Photogrid in Ground Glass Assembly.

MOS: 83FJ6, Reproduction Equipment Repairer  
 TOOLS: Light Machine Repair Tool Kit

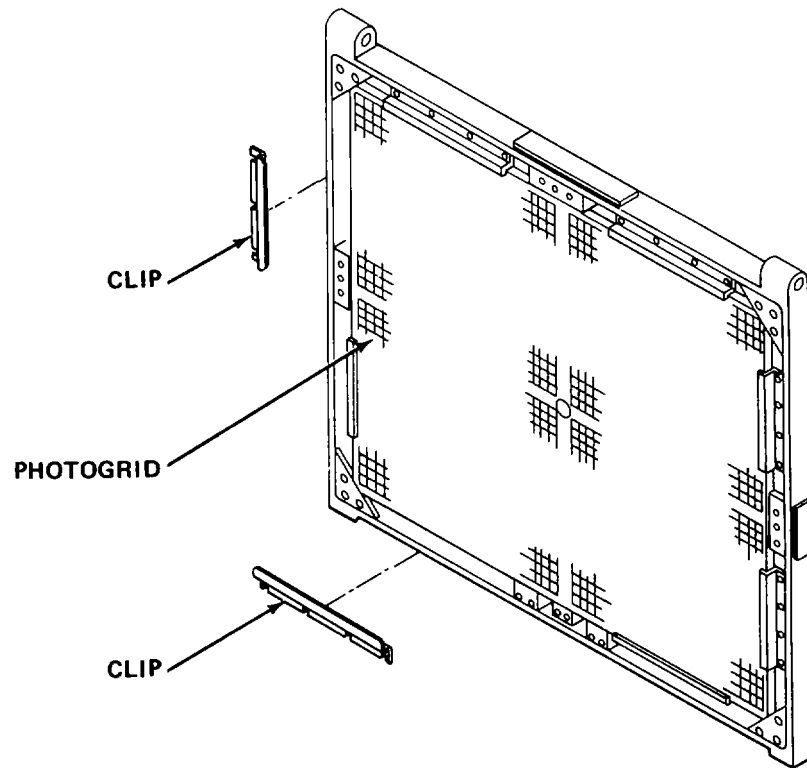
SUPPLIES: Photogrid  
 Waterproof Black Tape (Item 23, Appendix E)

**NOTE**

**This task requires two personnel.**



- a. Remove bottom clips.
- b. Support photogrid and remove screws on remaining clips.
- c. Remove defective photogrid from oscillating frame.

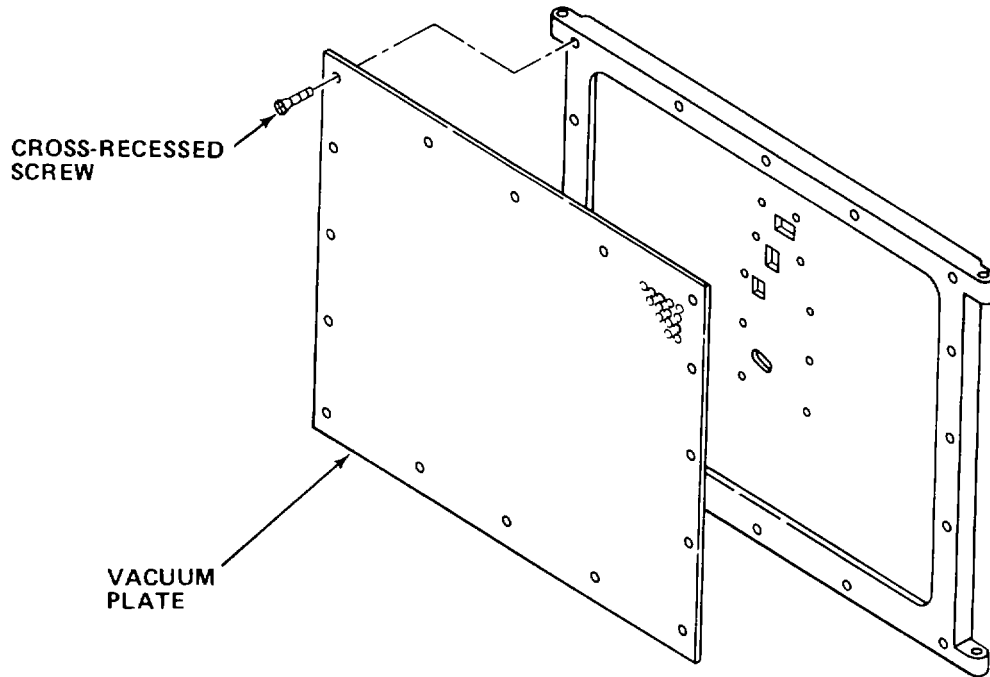


- d. Position new photogrid on oscillating frame.
- e. Install two side clips.
- f. Install bottom clips.
- g. Install remaining clips.
- h. Optically aline camera (subparagraph 4-7.36).

5-5.31 Replace Vacuum Back Assembly Vacuum Plate.

MOS: 83FJ6, Reproduction Equipment Repairer  
 TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Vacuum Plate



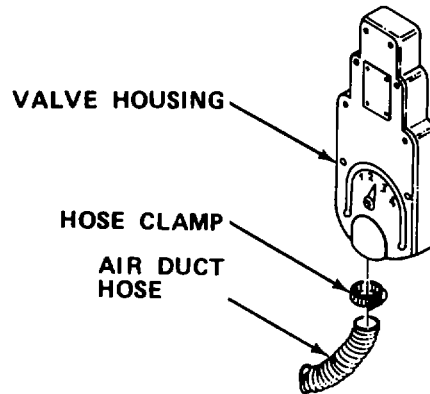
- a. Remove defective vacuum plate.
- b. Install new vacuum plate.
- c. Optically aline camera (subparagraph 4-7.36).

5-5.32 Replace Vacuum Back Assembly Control Valve.

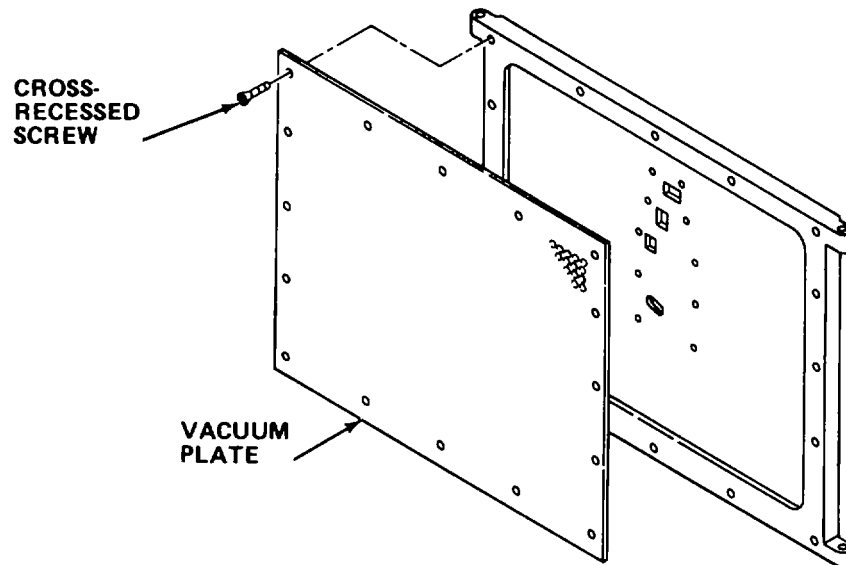
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

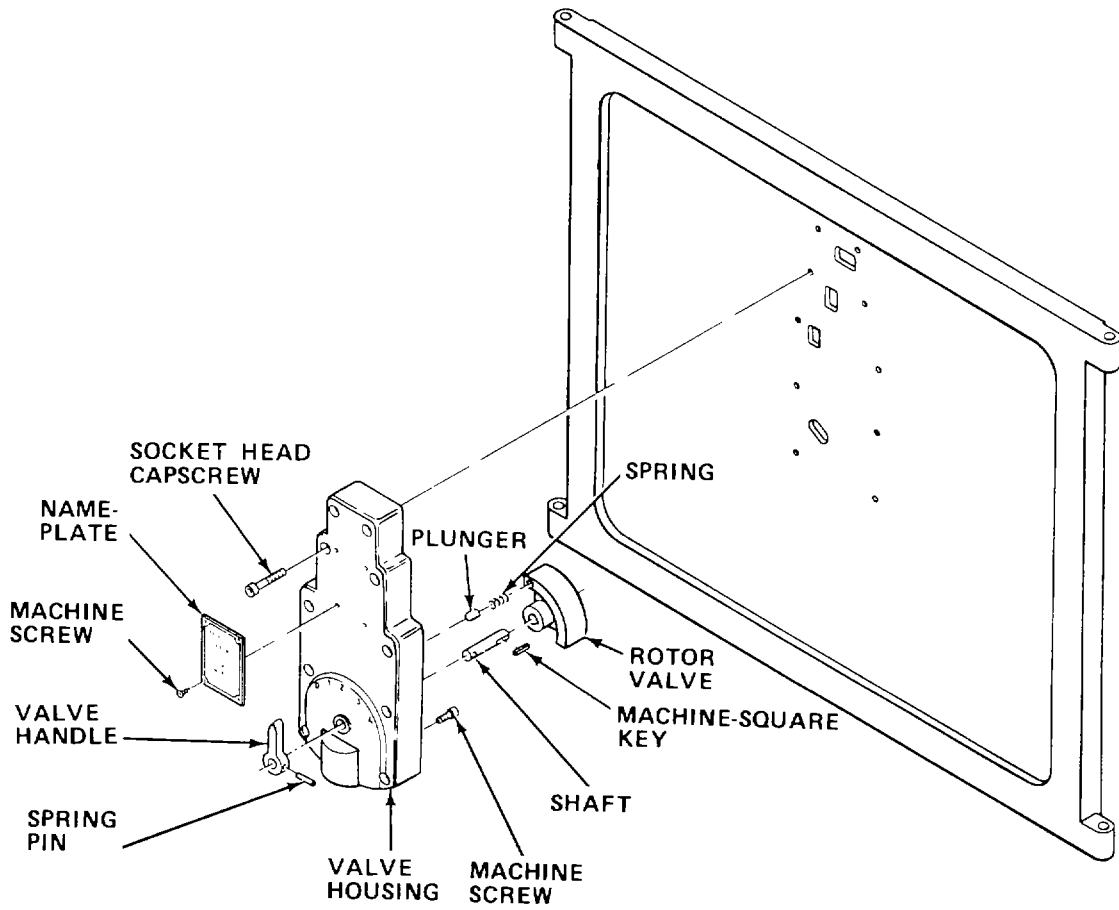
SUPPLIES: Valve Housing  
Rotor Valve  
Plunger Spring  
Shaft



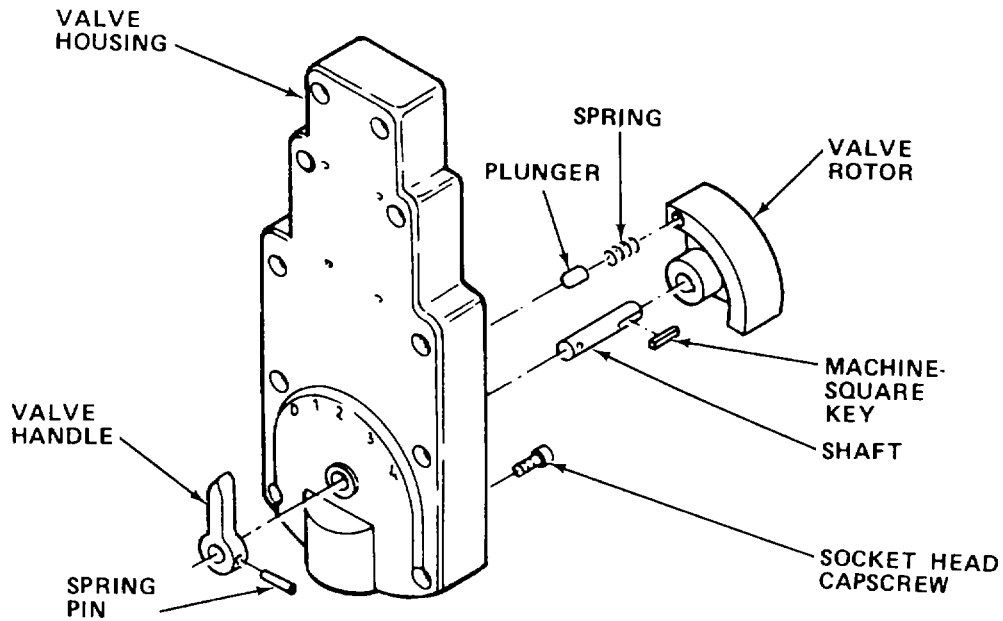
a. Disconnect air duct hose from vacuum back.



b. Remove vacuum plate.



c. Remove valve housing.



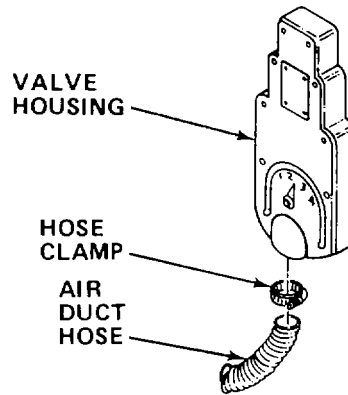
- d. Rotate valve handle. Valve rotor should rotate.
- e. Remove valve handle.
- f. Remove defective valve housing.
- g. Remove defective valve rotor.
- h. Remove defective plunger and spring.
- i. Remove defective shaft and key.
- j. Install new shaft and key in new valve rotor.
- k. Install new plunger and spring.
- l. Install valve handle.
- m. Install new valve housing.
- n. Install vacuum plate.
- o. Reconnect air duct hose to vacuum back.
- p. Optically align camera (subparagraph 4-7.36).

5-5.33 Replace Vacuum Back Assembly Back Plate.

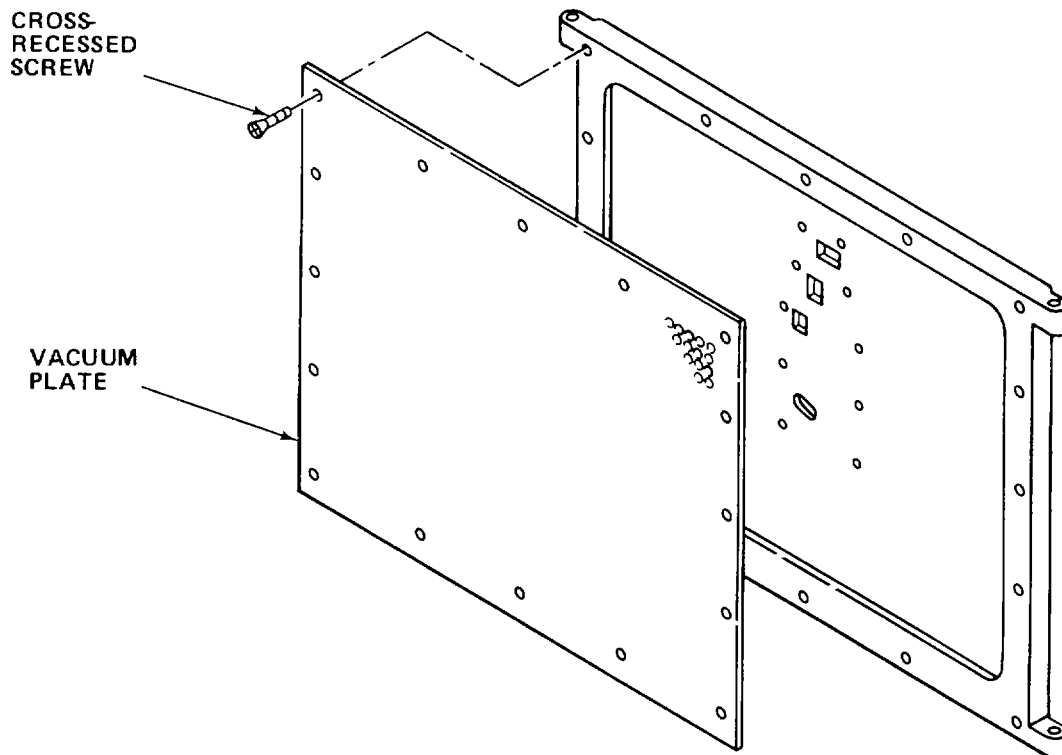
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

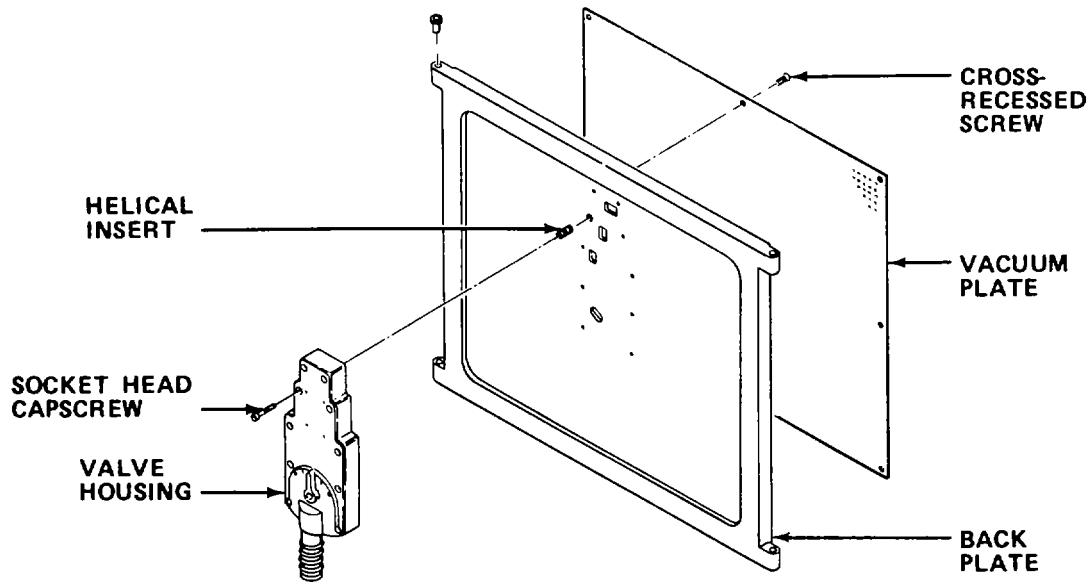
SUPPLIES: Back Plate



a. Disconnect air duct hose from vacuum back.



b. Remove vacuum plate.



c. Remove valve housing.

**NOTE**

**Mark position of locking knobs on slide plate hinge.**

- d. Remove slide plate hinge and vacuum back.
- e. Remove vacuum plate.
- f. Replace defective back plate.
- g. Install valve housing.
- h. Install vacuum back, vacuum plate, and slide plate hinge.
- i. Reconnect air duct hose to vacuum back.
- j. Optically align camera (subparagraph 4-7.36).



5-5.34 Replace Counter Assembly Sprocket.

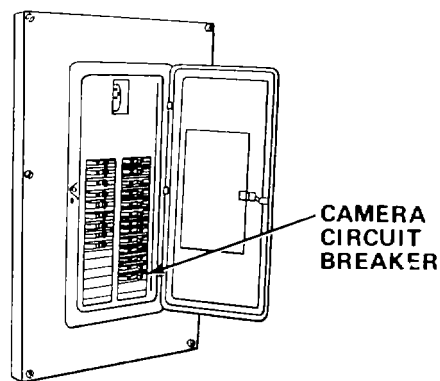
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
 Industrial Goggles  
 Interchangeable Puller Set

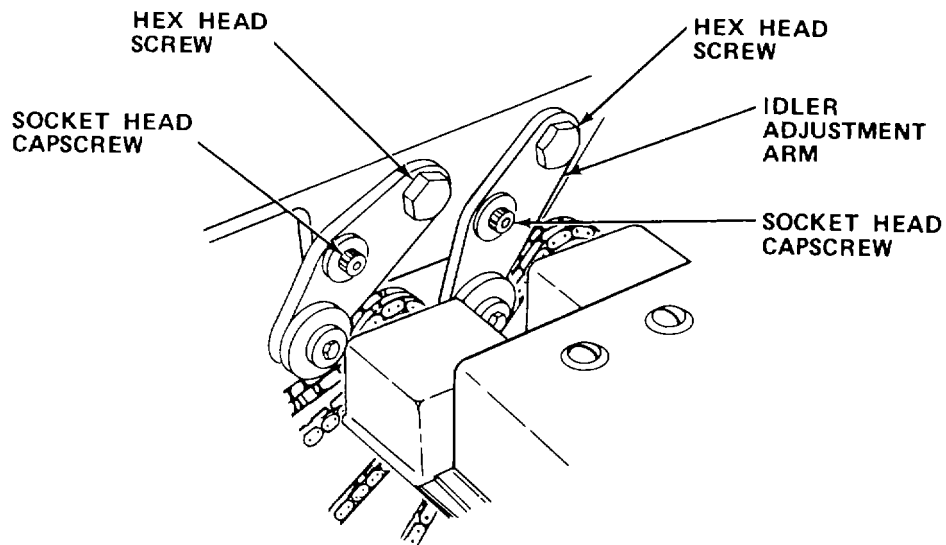
SUPPLIES: Sprocket

**WARNING**

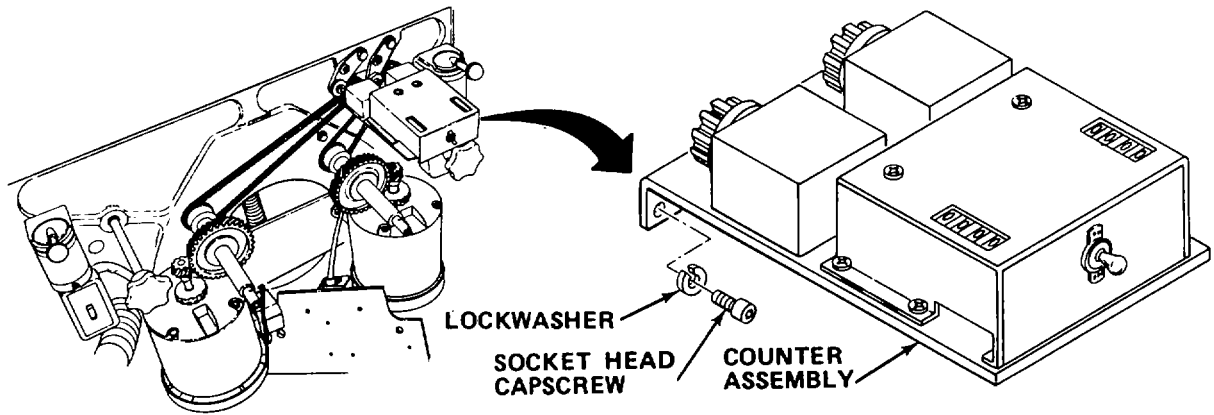
**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**



a. Set camera circuit breaker on power panel OFF.



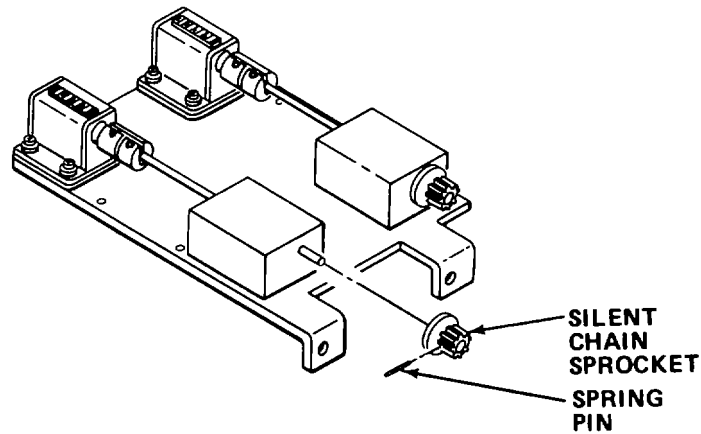
b. Loosen tension on idler adjustment arm.



**NOTE**

**Record counter readings.**

c. Remove counter assembly mounting screws.



**NOTE**

- Be sure sprockets are aligned properly.
- Be sure counter readings have not changed.

d. Replace defective sprocket.

e. Install counter assembly.

f. Perform idler arm adjustment (subparagraph 4-7.37).

g. Set camera circuit breaker on power panel ON.

h. Perform optical alinement of camera (subparagraph 4-7.36).

5-5.35 Replace Counter Assembly Extension Shaft.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
 Industrial Goggles  
 Multimeter

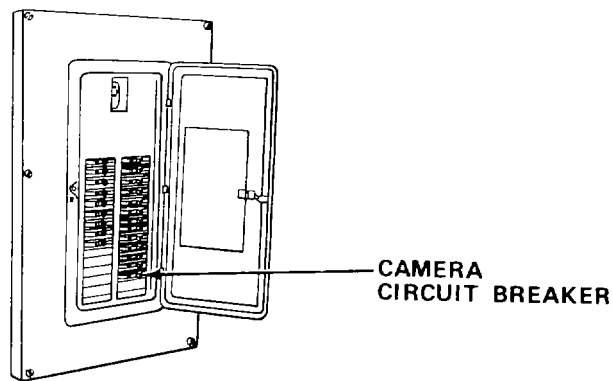
SUPPLIES: Extension Shaft

**WARNING**

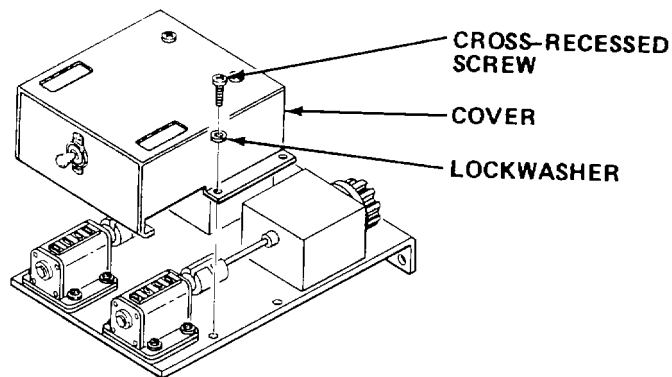
**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**

**NOTE**

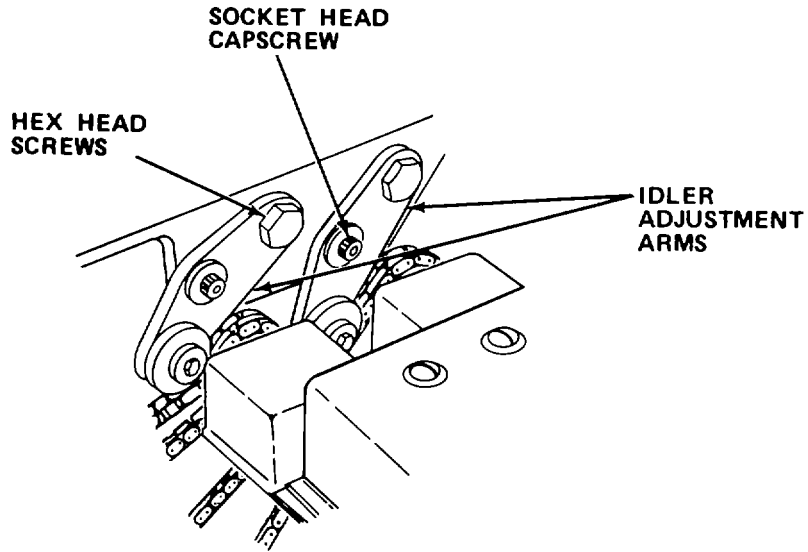
**Record counter readings before removing counter.**



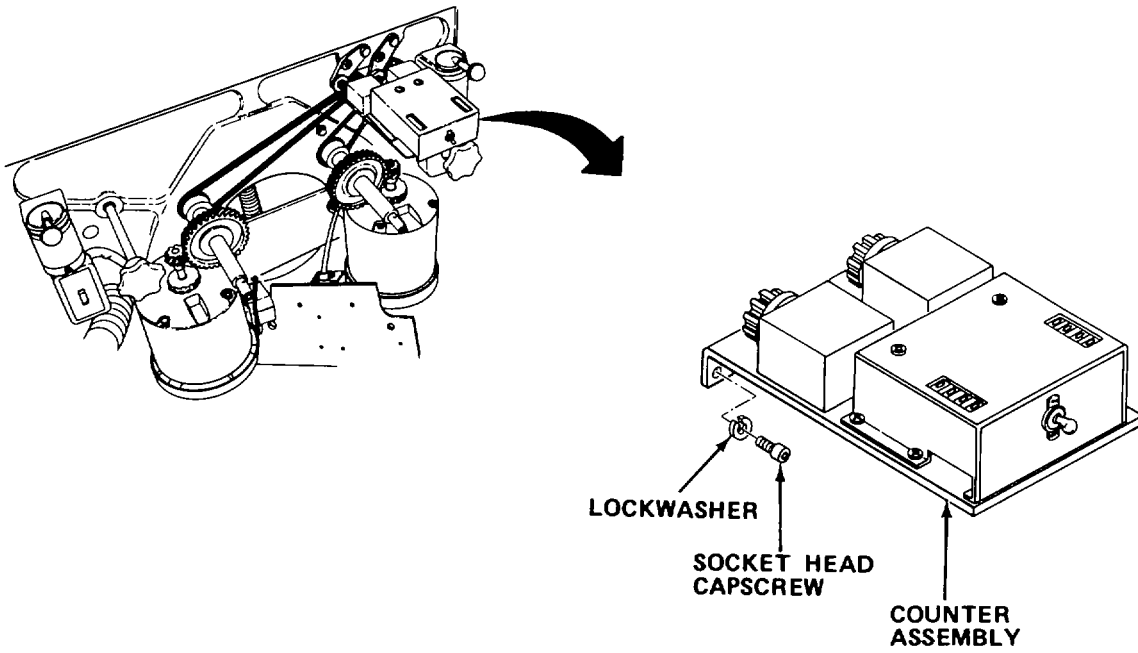
a. Set camera circuit breaker on power panel OFF.



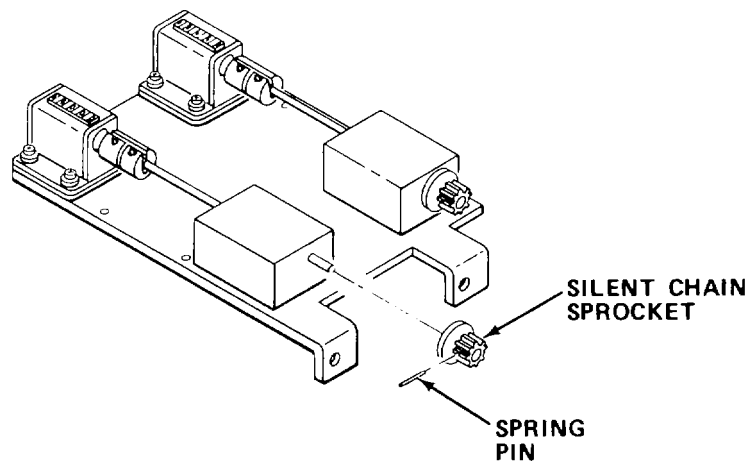
b. Remove cover, tag and disconnect leads.



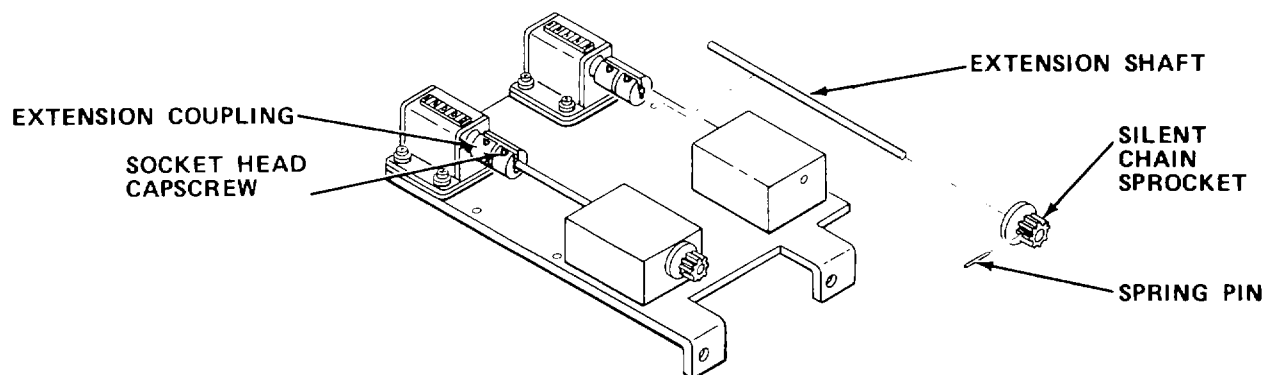
c. Loosen tension on idler adjustment arms.



d. Remove counter assembly.



e. Remove sprocket.



f. Loosen socket head capscrews on extension coupling.

g. Replace defective extension shaft.

h. Tighten socket head capscrews on extension coupling.

i. Install sprocket.

**NOTE**

**Set counters to recorded readings.**

j. Install counter assembly.

k. Perform idler arm adjustment (subparagraph 4-7.37).

l. Reconnect leads and install cover.

m. Set camera circuit breaker on power panel ON.

n. Optically align camera (subparagraph 4-7.36).

5-5.36 Replace Counter Assembly Bearing Housing.

MOS: 83FJ6, Reproduction Equipment Repairer

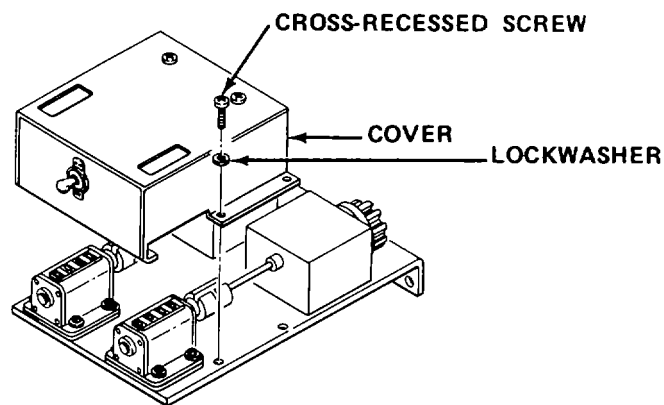
TOOLS: Light Machine Repair Tool Kit  
Industrial Goggles

SUPPLIES: Bearing Housing

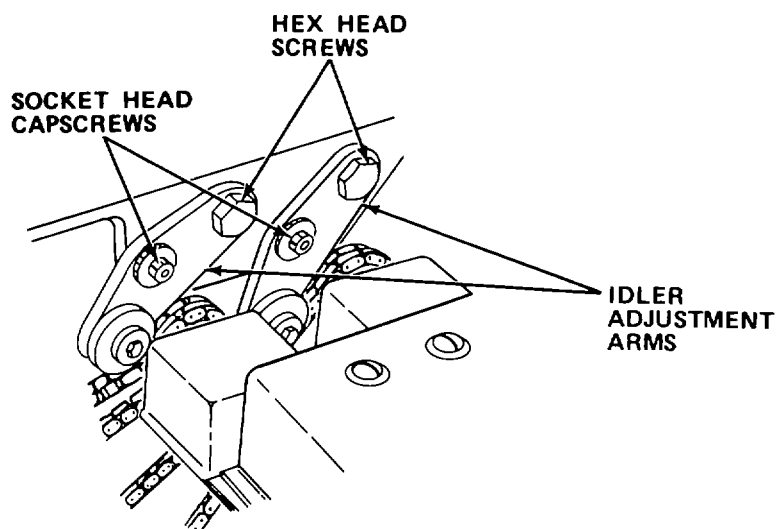
**WARNING**

**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**

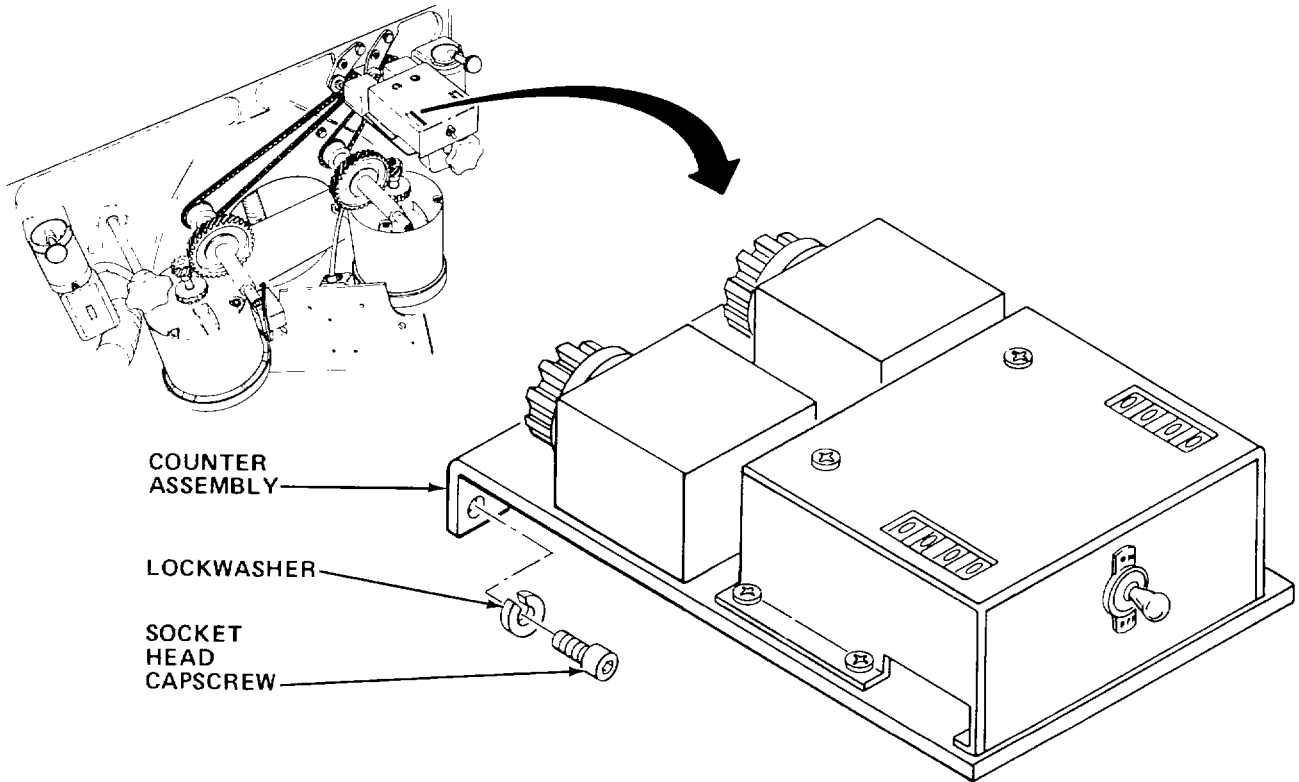
- a. Set camera circuit breaker on power panel OFF.



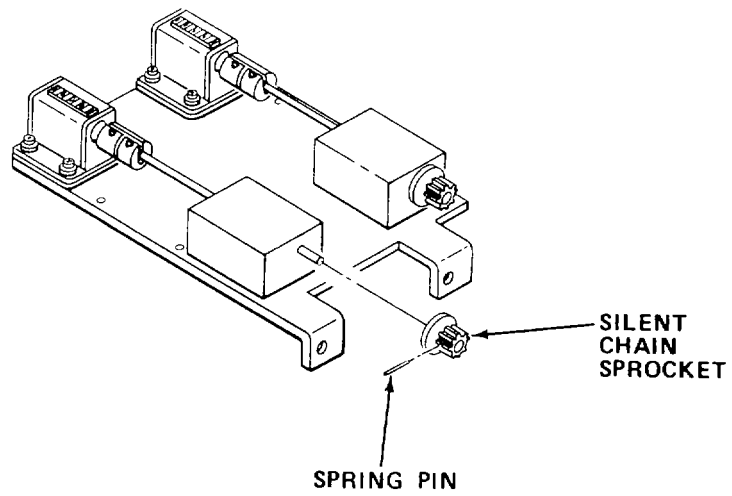
- b. Remove cover, tag and disconnect leads.



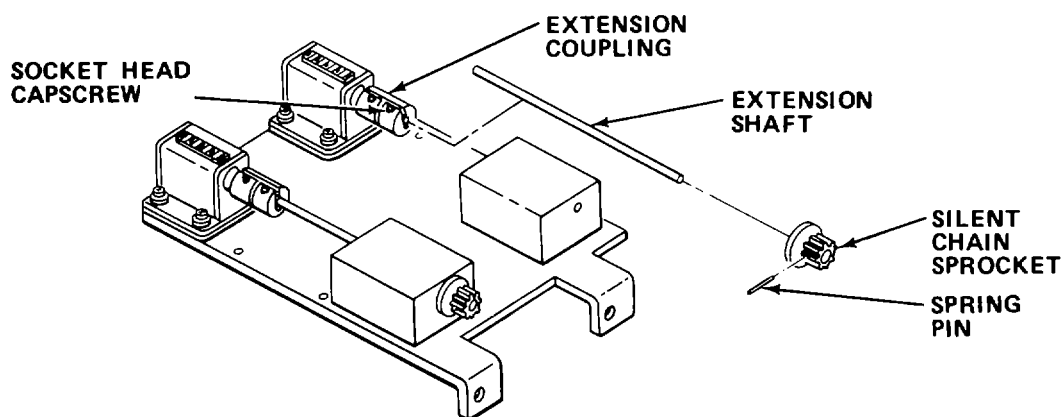
- c. Loosen tension on idler adjustment arms.



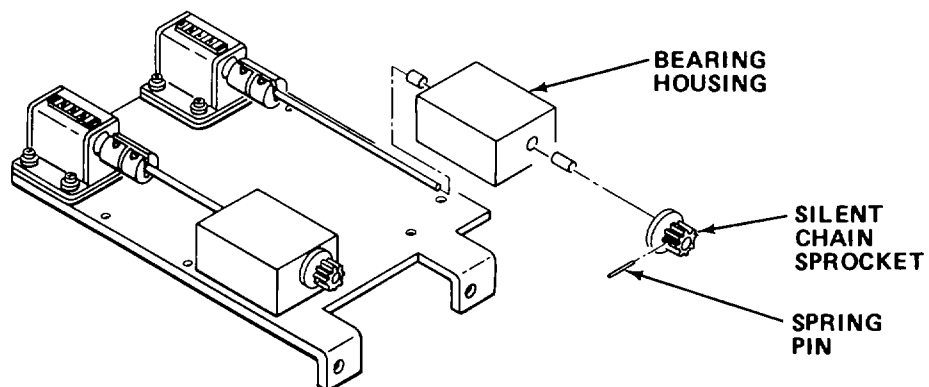
d. Remove counter assembly.



e. Remove sprocket.



- f. Loosen socket head capscrews on extension coupling.
- g. Remove extension shaft.



**NOTE**

**Be sure counter readings have not changed.**

- h. Replace defective bearing housing.
- i. Install extension shaft.
- j. Install sprocket.
- k. Install counter assembly.
- l. Perform idler arm adjustment (subparagraph 4-7.37).
- m. Reconnect leads and install cover.
- n. Set camera circuit breaker on power panel ON.
- o. Optically align camera (subparagraph 4-7.37).



5-5.37 Replace Counter Assembly Extension Coupling.

MOS: 83FJ6, Reproduction Equipment Repairer

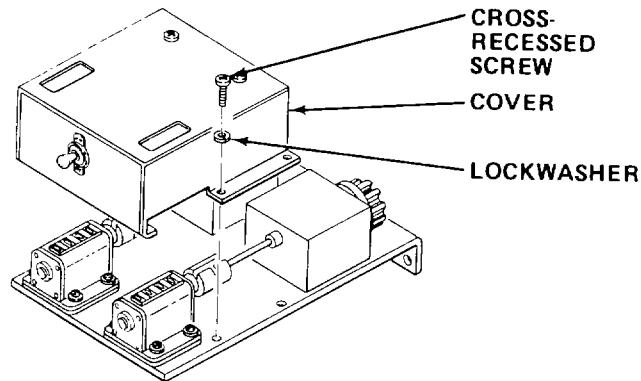
TOOLS: Light Machine Repair Tool Kit  
Multimeter

SUPPLIES: Extension Coupling

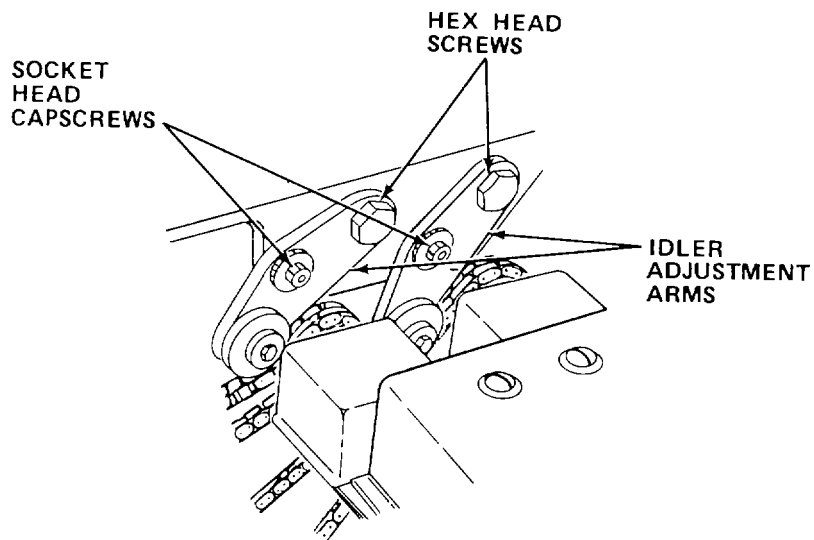
**WARNING**

**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**

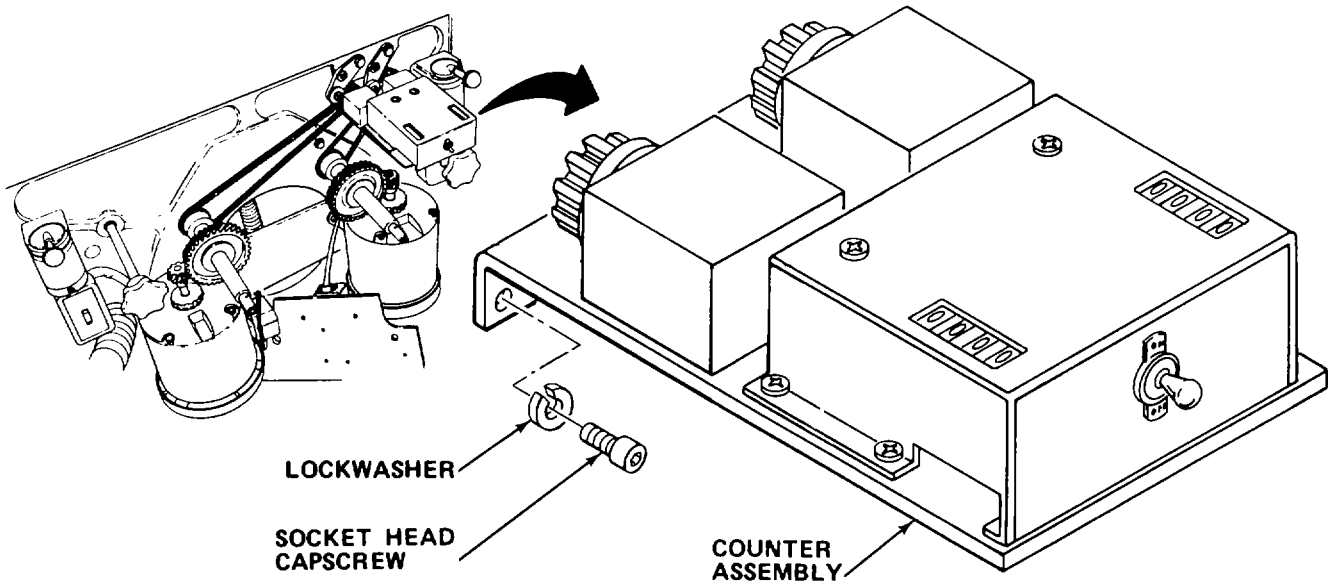
- a. Set camera circuit breaker on power panel OFF.



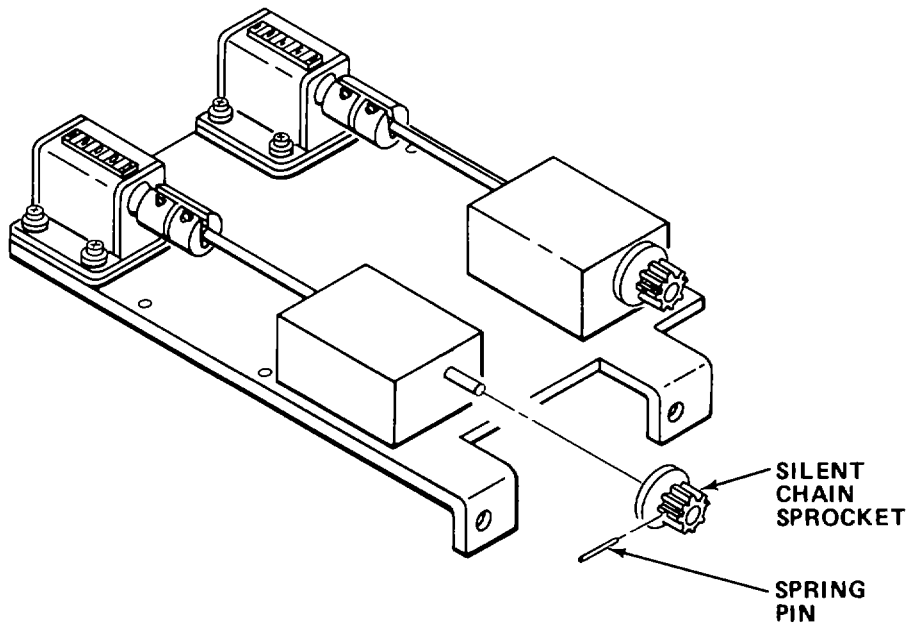
- b. Remove cover, tag and disconnect leads.



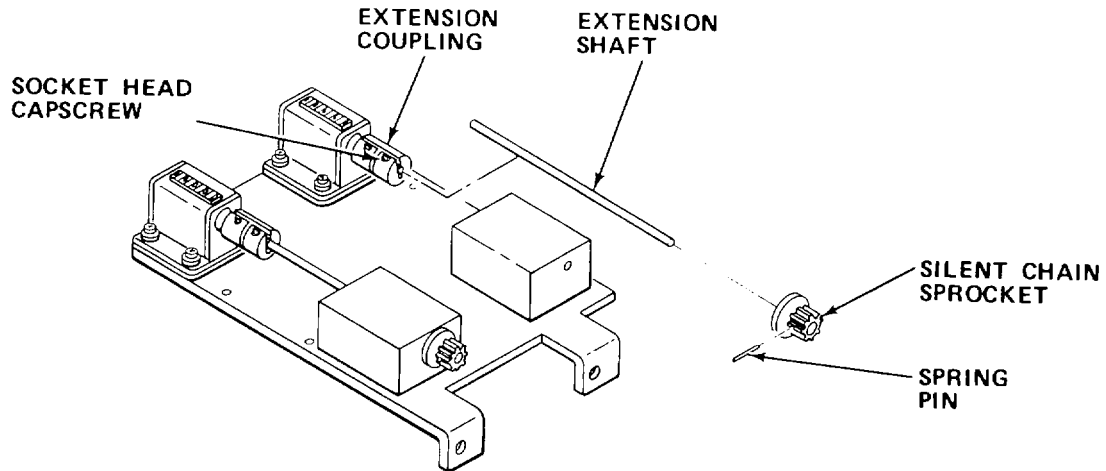
- c. Loosen tension on idler adjustment arms.



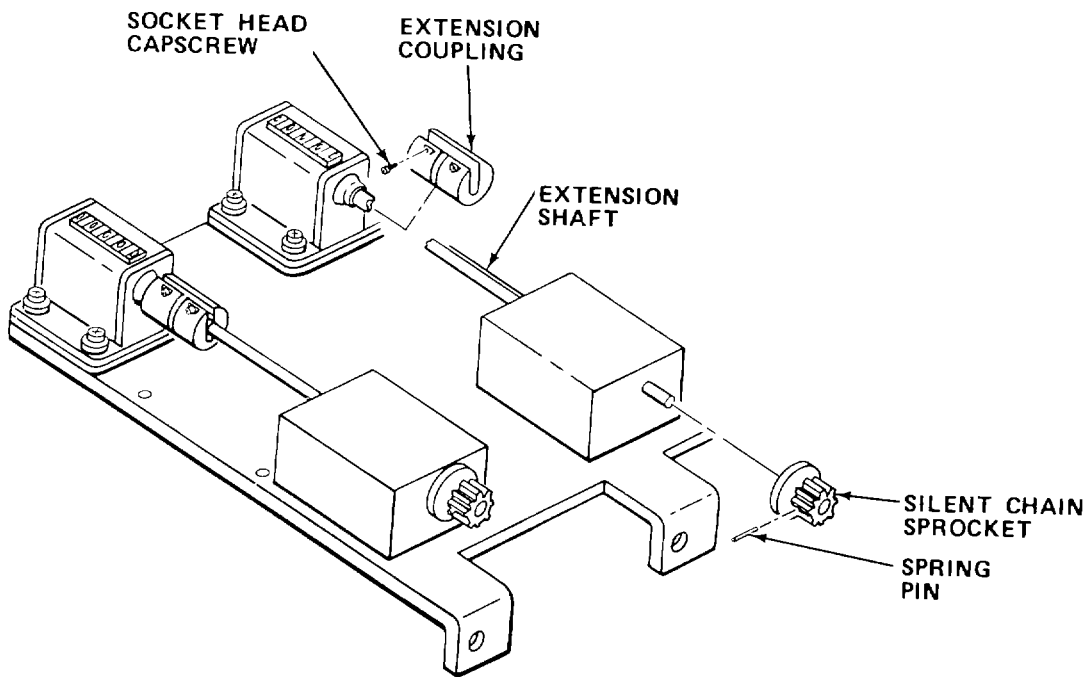
d. Remove counter assembly.



e. Remove sprocket.



- f. Loosen socket head capscrews on extension coupling.
- g. Remove extension shaft.



- h. Replace defective extension coupling.
- i. Install extension shaft.

**NOTE**

**Set counter to previously recorded reading.**

- j. Install sprocket.
- k. Install counter assembly.
- l. Perform idler arm adjustment (subparagraph 4-7.37).
- m. Reconnect leads and install cover.
- n. Set camera circuit breaker on power panel ON.
- o. Optically align camera (subparagraph 4-7.36).

5-5.38 Replace Counter Assembly Counter.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

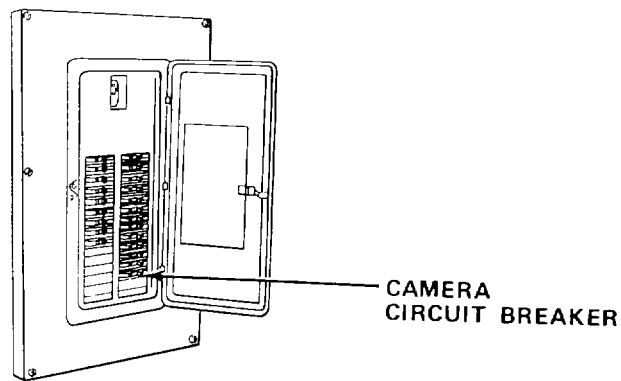
SUPPLIES: Counter

**WARNING**

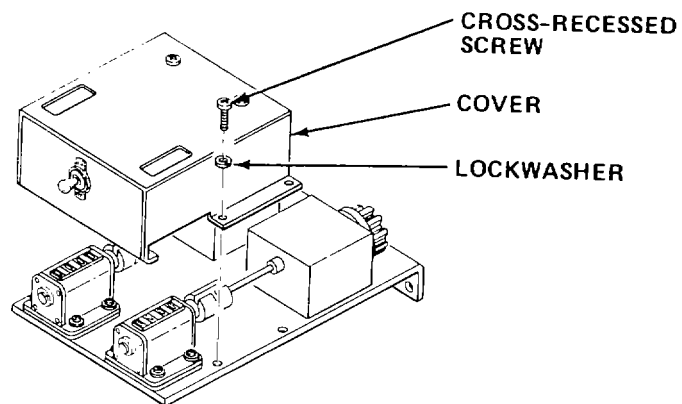
Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.

**NOTE**

Perform optical alinement of camera (subparagraph 4-7.36).



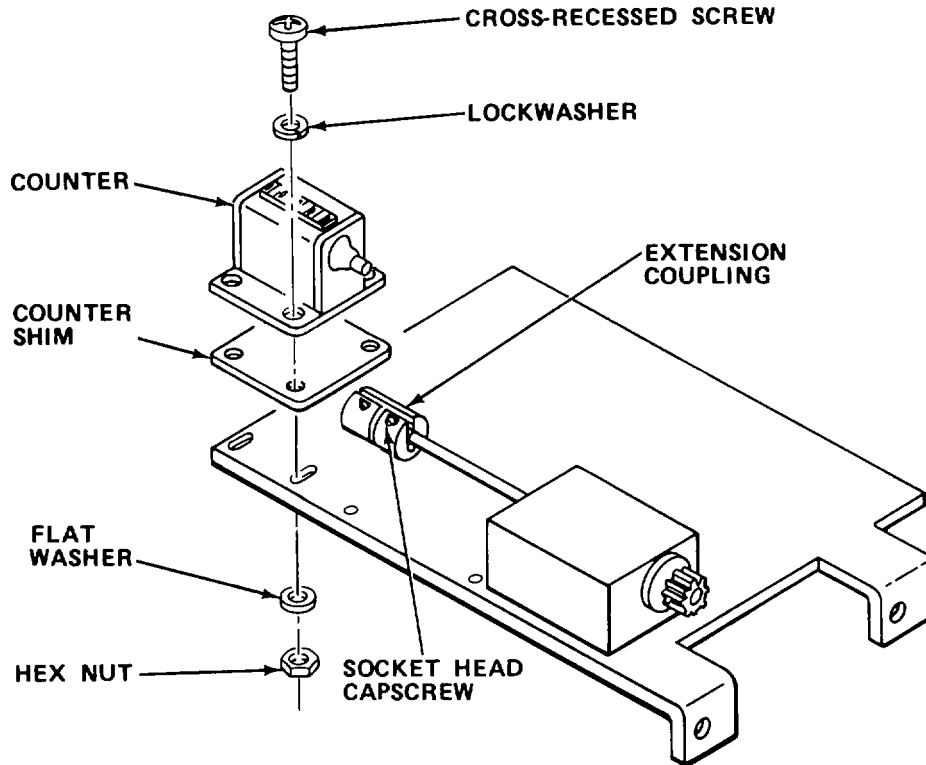
- a. Set camera circuit breaker on power panel OFF.



**NOTE**

**Record counter reading.**

b. Remove cover.



- c. Loosen socket head capscrew on extension coupling.
- d. Remove defective counter and counter shim.
- e. Set new counter to recorded reading.
- f. Install counter shim.
- g. Install new counter.
- h. Tighten socket head capscrew on extension coupling.
- i. Install cover.
- j. Set camera circuit breaker on power panel ON.

5-5.39 Replace Bellows.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
Riveter Kit

SUPPLIES: Bellows  
Silicone Adhesive-Sealant (Item 2, Appendix E)  
Flush Head Solid Rivets  
Strip  
Notched Strip

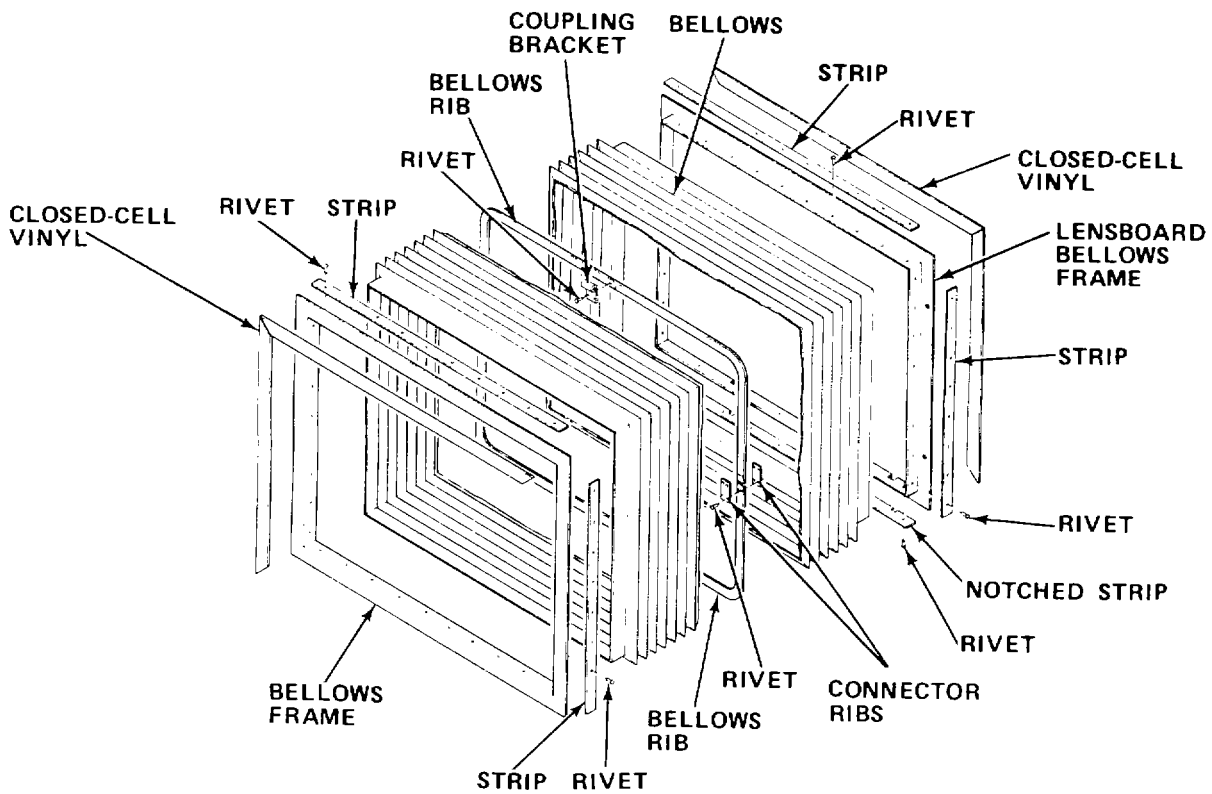
**NOTE**

- This task requires two personnel.
- Test bellows for light leaks after repairs (subparagraph 4-7.36).

a. Remove bellows assembly (subparagraph 4-7.3).

**NOTE**

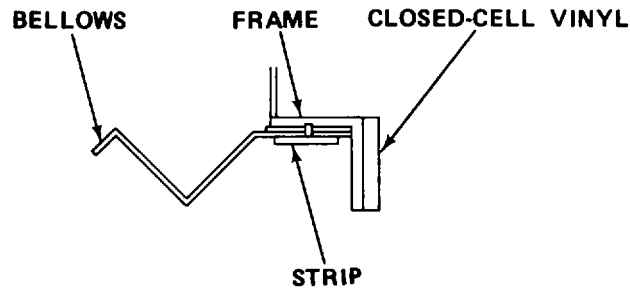
Replace bellows ribs and coupling brackets in new bellows to reflect the same configuration as in old bellows.



- b. Remove strips.
- c. Remove bellows frame from lensboard frame.
- d. Remove coupling brackets.
- e. Remove connector ribs.
- f. Remove bellows ribs.

**CAUTION**  
**Be careful not to tear bellows during reassembly.**

- g. Install bellows ribs in new bellows.
- h. Install connector ribs.
- i. Install coupling brackets.



- j. Use silicone adhesive-sealant to bond lensboard frame and bellows frame to bellows.
- k. Install strips.
- l. Use silicone adhesive-sealant to bond closed-cell vinyl to lensboard frame and bellows frame.
- m. Install bellows assembly (subparagraph 4-7.3d).



5-5.40 Replace Connector Rib In Bellows Assembly.

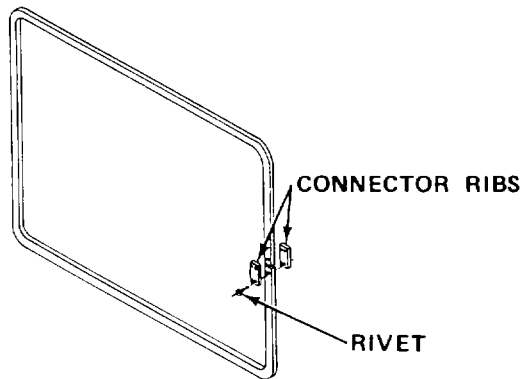
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
Riveter Kit

SUPPLIES: Solid Flat Head Rivets

Connector Rib

- a. Remove bellows assembly (subparagraph 4-7.3).



- b. Remove defective connector rib.
- c. Install new connector rib.
- d. Install bellows assembly (subparagraph 4-7.3d).
- e. Test bellows for light leaks.

5-5.41 Replace Copyboard Assembly Operating Gear.

MOS: 83FJ6, Reproduction Equipment Repairer

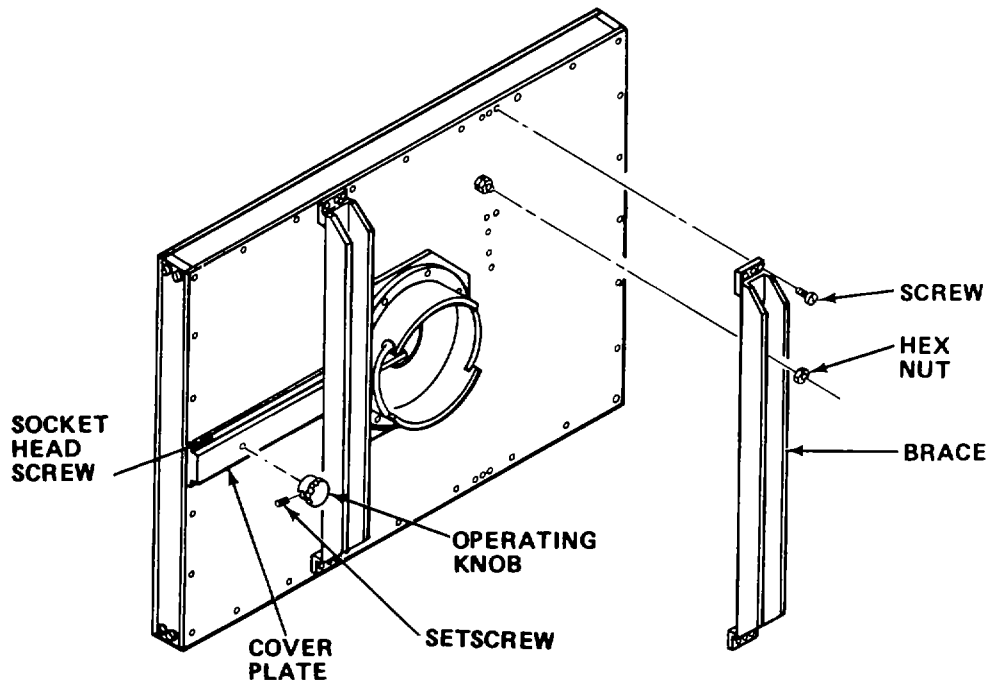
TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Operating Gear

**CAUTION**

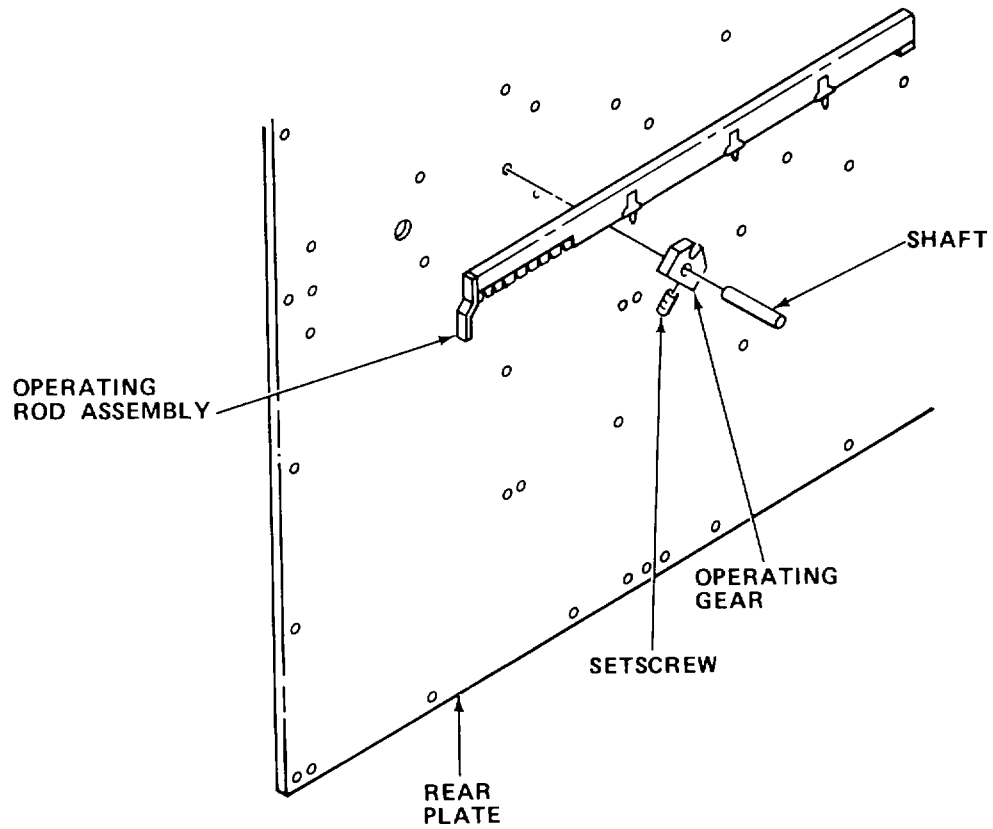
Place copyboard assembly on a protective covering to prevent damage to front plate of copyboard assembly.

- a. Remove copyboard assembly (subparagraph 5-5.4).

**NOTE**

Do not touch adjusting nuts when removing brace.

- b. Remove brace mounting screws.  
 c. Remove operating knob.  
 d. Remove cover plate.



- e. Remove defective operating gear.
- f. Install new operating gear.
- g. Install cover plate.
- h. Install operating knob.
- i. Install brace.
- j. Install copyboard assembly (subparagraph 5-5.4g).
- k. Optically aline camera (subparagraph 4-7.36).

5-5.42 Replace Copyboard Assembly Spur Gear.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Spur Gear

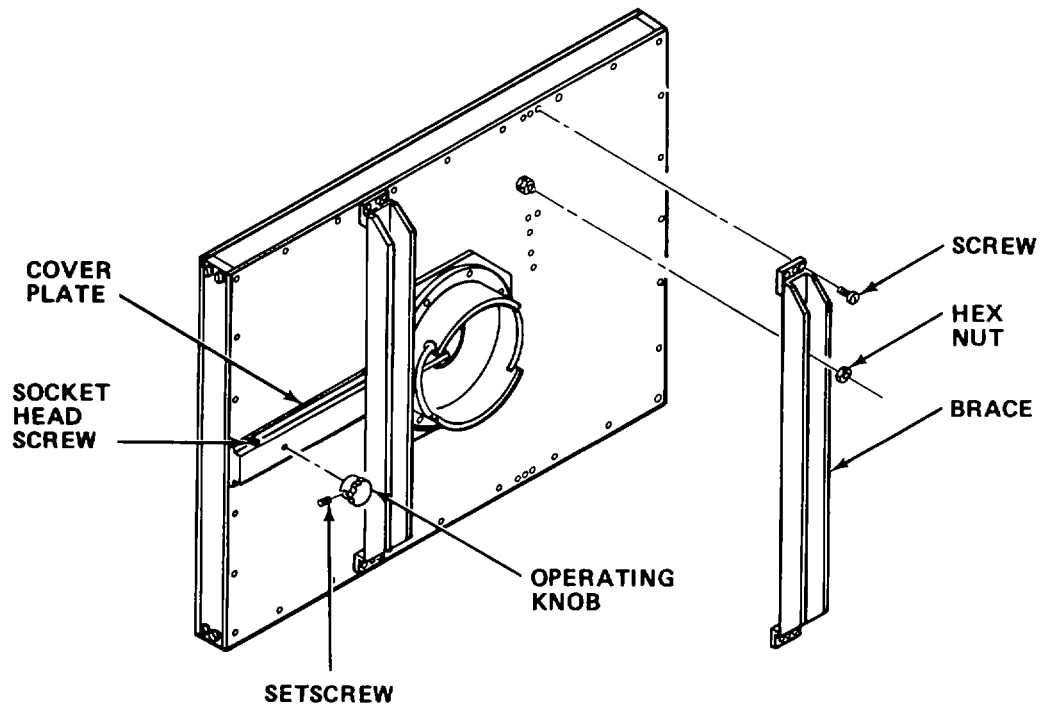
**CAUTION**

Place copyboard assembly on a protective covering to prevent damage to front plate of copyboard assembly.

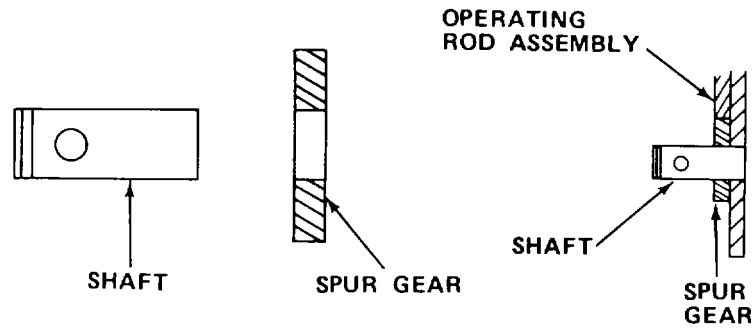
- a. Remove copyboard assembly (subparagraph 5-5.4).

**NOTE**

Do not touch adjusting nuts when removing brace.



- b. Remove brace mounting screws.
- c. Remove operating knob and cover plate.



- d. Remove shaft and defective spur gear.
- e. Remove defective spur gear.
- f. Install new spur gear on shaft.
- g. Install shaft and spur gear.
- h. Install cover plate.
- i. Install operating knob.
- j. Install brace.
- k. Install copyboard assembly (subparagraph 5-5.4g).
- l. Optically align camera (subparagraph 4-7.36).

5-5.43 Replace Copyboard Operating Rod Assembly.

MOS: 83FJ6, Reproduction Equipment Repairer

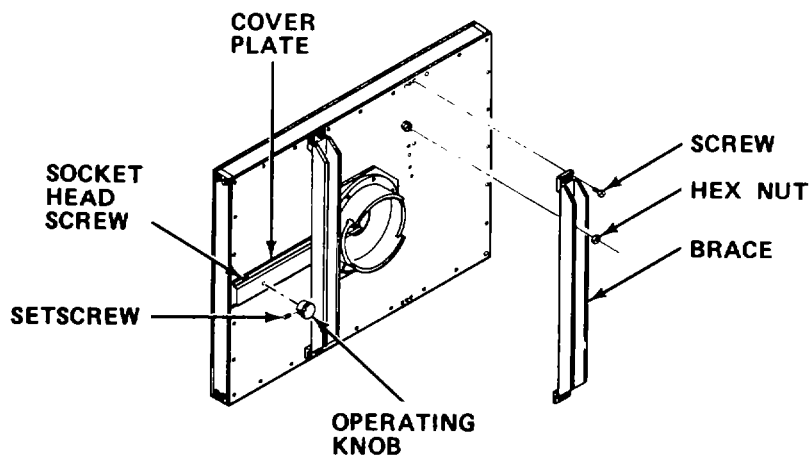
TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Operating Rod Assembly

**CAUTION**

**Place copyboard assembly on a protective covering to prevent damage to front plate of copyboard assembly.**

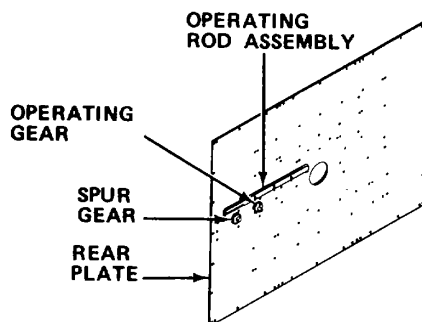
- a. Remove copyboard assembly (subparagraph 5-5.4).



**NOTE**

**Do not touch adjusting nuts when removing brace.**

- b. Remove brace mounting screws.
- c. Remove operating knob.
- d. Remove cover plate.



- e. Remove defective operating rod assembly.
- f. Install new operating rod assembly.
- g. Aline operating gates (subparagraph 5-5.61).
- h. Install cover plate.
- i. Install operating knob.
- j. Install brace.
- k. Install copyboard assembly (subparagraph 5-5.4g).
- l. Optically aline camera (subparagraph 4-7.36).

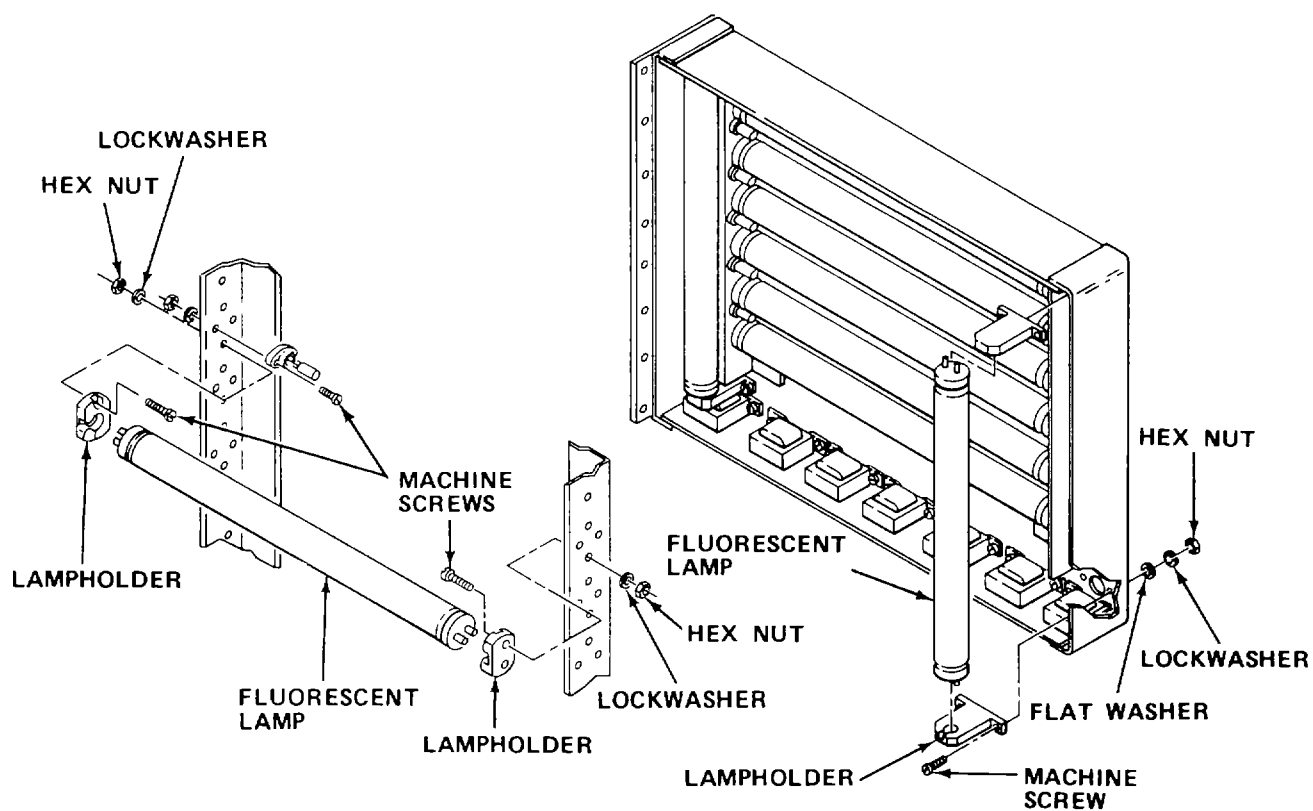
5-5.44 Replace Lampholder In Light Box Assembly.

MOS: 35E, Special Electronic Devices Repairer

TOOLS: Electronic Equipment Tool Kit

SUPPLIES: Starter Lampholder  
Lampholder  
Type VI Lampholder

a. Remove light box assembly (subparagraph 5-5.2).



- b. Remove defective lampholder.
- c. Tag and disconnect leads from defective lampholder.
- d. Reconnect leads to new lampholder.
- e. Install new lampholder.
- f. Install light box assembly (subparagraph 5-5.2d).

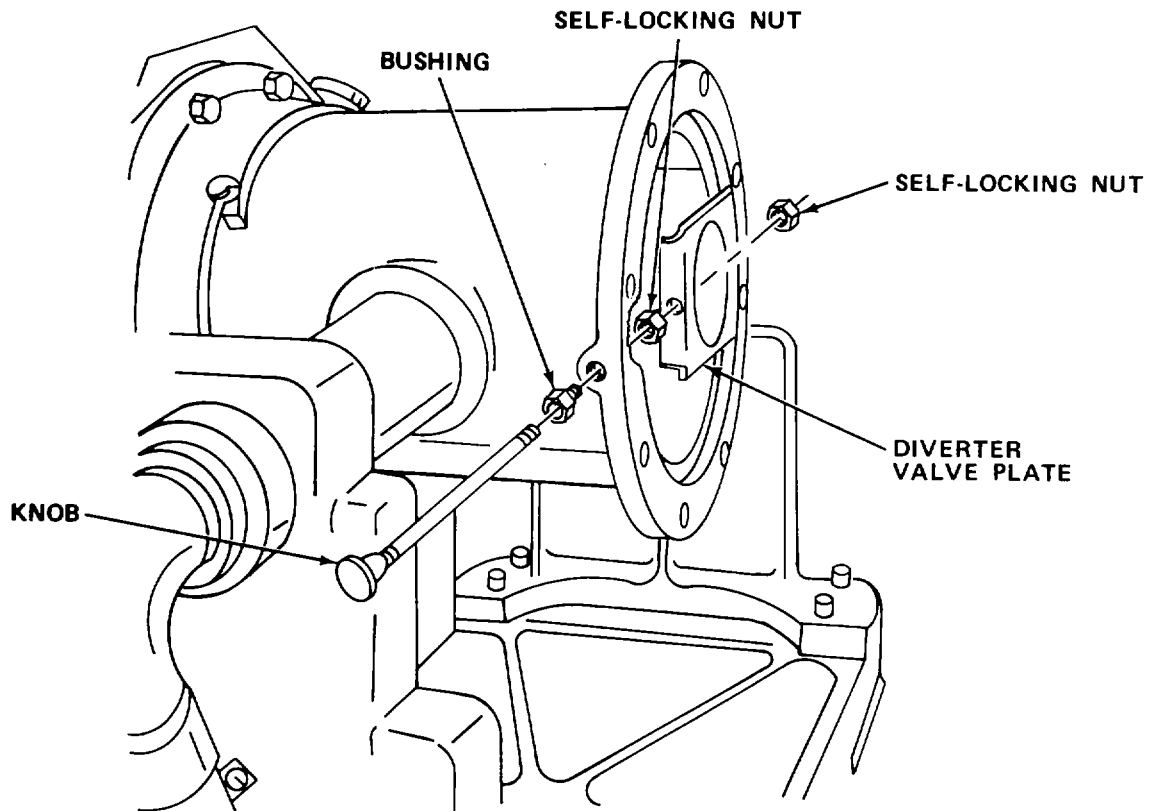
5-5.45 Replace Positive Holder Assembly Diverter Valve Plate.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Diverter Valve Plate

- a. Remove positive holder assembly (subparagraph 5-5.3).



- b. Pull diverter knob out.
- c. Replace defective diverter valve plate.
- d. Install positive holder assembly (subparagraph 5-5.3c).
- e. Optically aline camera (subparagraph 4-7.36).



5-5.46 Replace Capacitors In Blower Assembly.

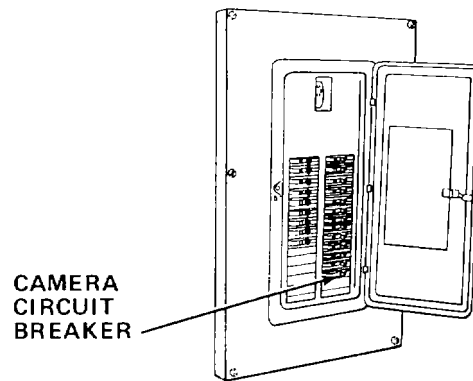
MOS: 35E, Special Electronic Devices Repairer

TOOLS: Electronic Equipment Tool Kit

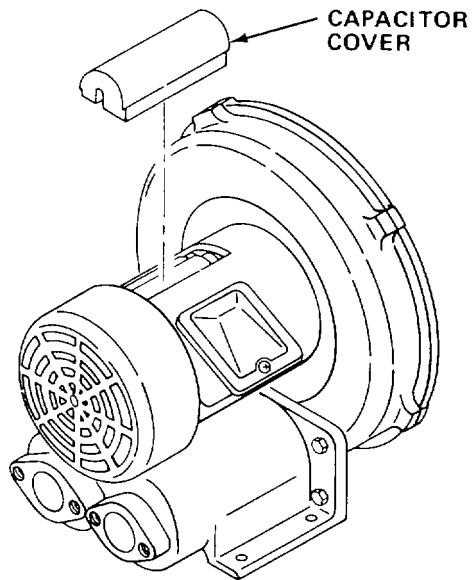
SUPPLIES: Capacitor(s)

**WARNING**

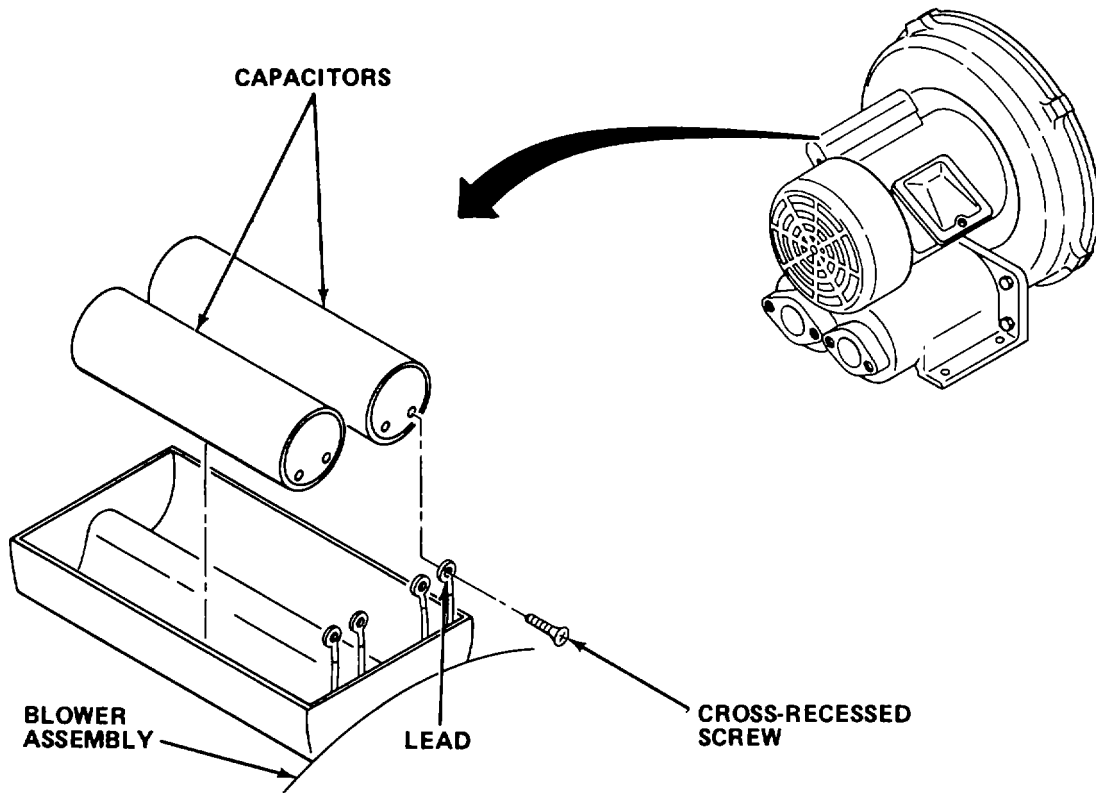
**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before repairing equipment.**



- a. Set camera circuit breaker on power panel OFF.



- b. Remove capacitor cover.



**WARNING**

High voltages that are capable of causing death or serious injury may be stored in capacitor after power is removed. Be sure capacitor is discharged and reduced to zero volts.

- c. Tag and disconnect leads.
- d. Replace defective capacitor(s).
- e. Install capacitor cover.
- f. Set camera circuit breaker on power panel ON.

5-5.47 Replace Blower Assembly.

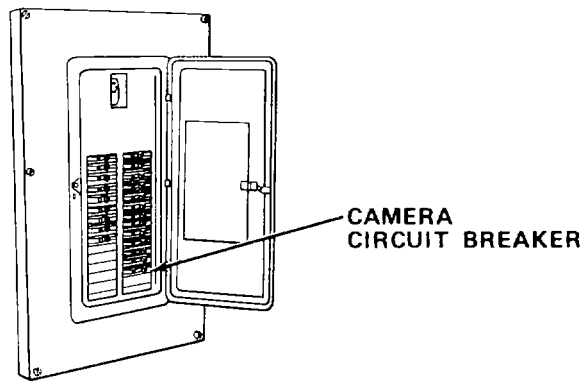
MOS: 35E, Special Electronic Devices Repairer

TOOLS: Electronic Equipment Tool Kit

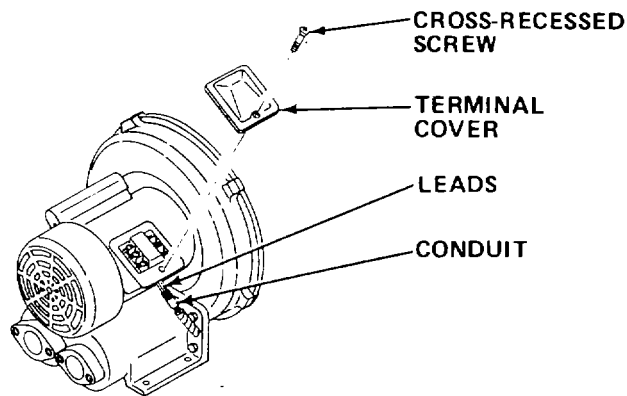
SUPPLIES: Blower Assembly

**WARNING**

**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**



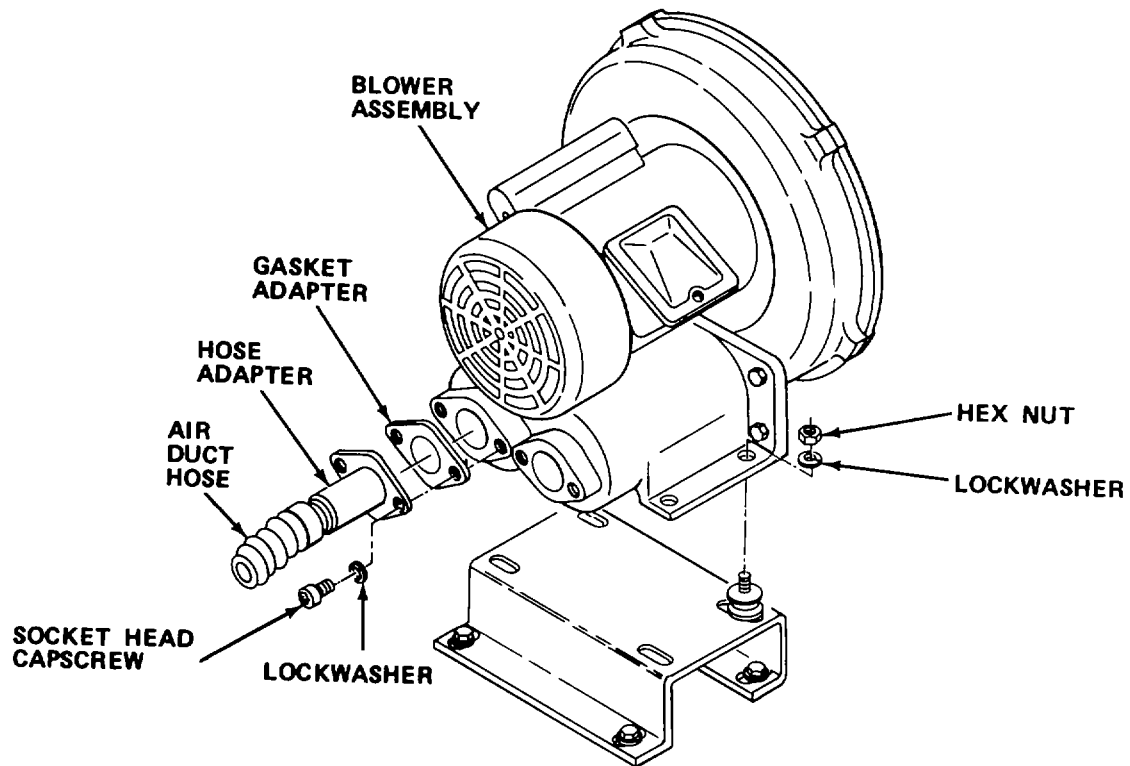
- a. Set camera circuit breaker on power panel OFF.



- b. Remove terminal cover.
- c. Tag and disconnect leads and remove conduit.

## NOTE

Be careful not to break leads.



- d. Remove air duct hose, hose adapter, and gasket adapter.
- e. Replace defective blower assembly.
- f. Install gasket adapter, hose adapter, and air duct hose.
- g. Reconnect conduit and leads.
- h. Install terminal cover.
- i. Set camera circuit breaker on power panel ON.

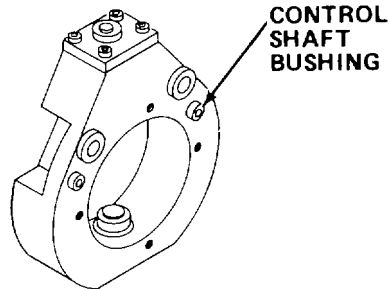
5-5.48 Replace Control Shaft Bushing.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit  
 Mechanical Puller Kit  
 Industrial Goggles

SUPPLIES: Bushings

- a. Remove power supply assembly (subparagraph 5-5.5).



- b. Replace defective bushing(s).
- c. Install power supply assembly (subparagraph 5-5.5g).

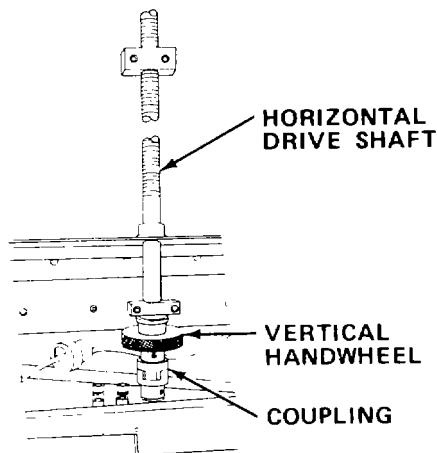
5-5.49 Replace Lensboard Assembly Horizontal Drive Shaft.

MOS: 83FJ6, Reproduction Equipment Repairer

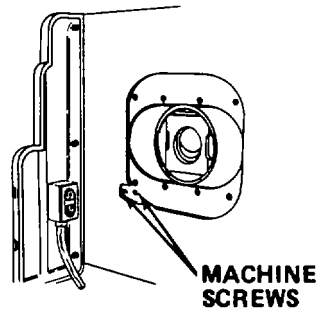
TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Horizontal Drive Shaft

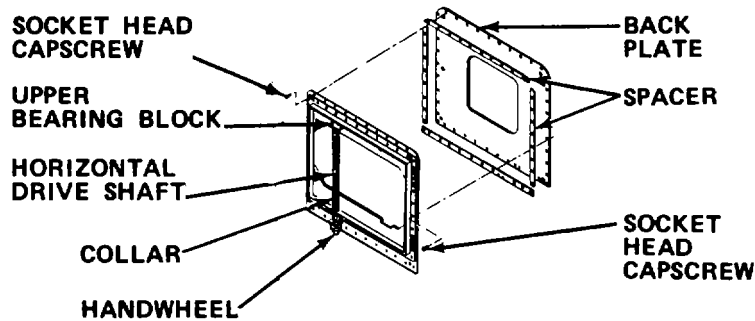
- a. Remove lensboard assembly (subparagraph 5-5.6).



- b. Remove coupling from horizontal drive shaft.
- c. Use vertical handwheel to raise inner frame to maximum height.



- d. Remove vertical drive nut screws.



**CAUTION**

**Tag all spacers or proper clearances will not be obtained upon reassembly of lensboard assembly.**

- e. Loosen setscrew on collar.
- f. Remove handwheel.
- g. Remove upper bearing block.
- h. Replace defective horizontal drive shaft.
- i. Install upper bearing block.
- j. Install handwheel.
- k. Tighten setscrew on collar.
- l. Install back plate.
- m. Install vertical drive nut screws.
- n. Inspect lensboard assembly after major repairs (subparagraph 5-5.7).
- o. Install coupling on horizontal drive shaft.
- p. Install lensboard assembly (subparagraph 5-5.6i).

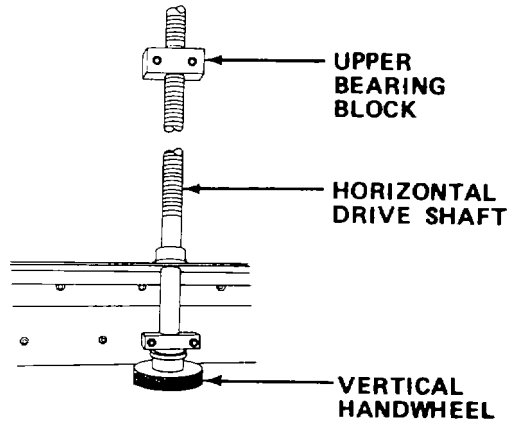
5-5.50 Replace Lensboard Assembly Upper Bearing Block.

MOS: 83FJ6, Reproduction Equipment Repairer

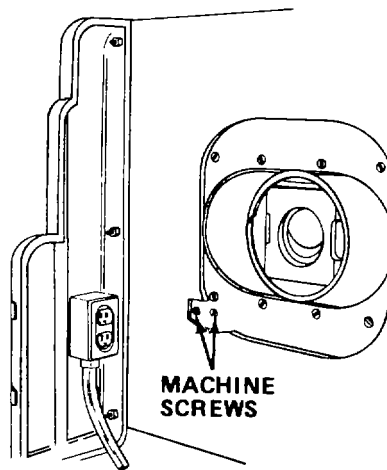
TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Upper Bearing Block

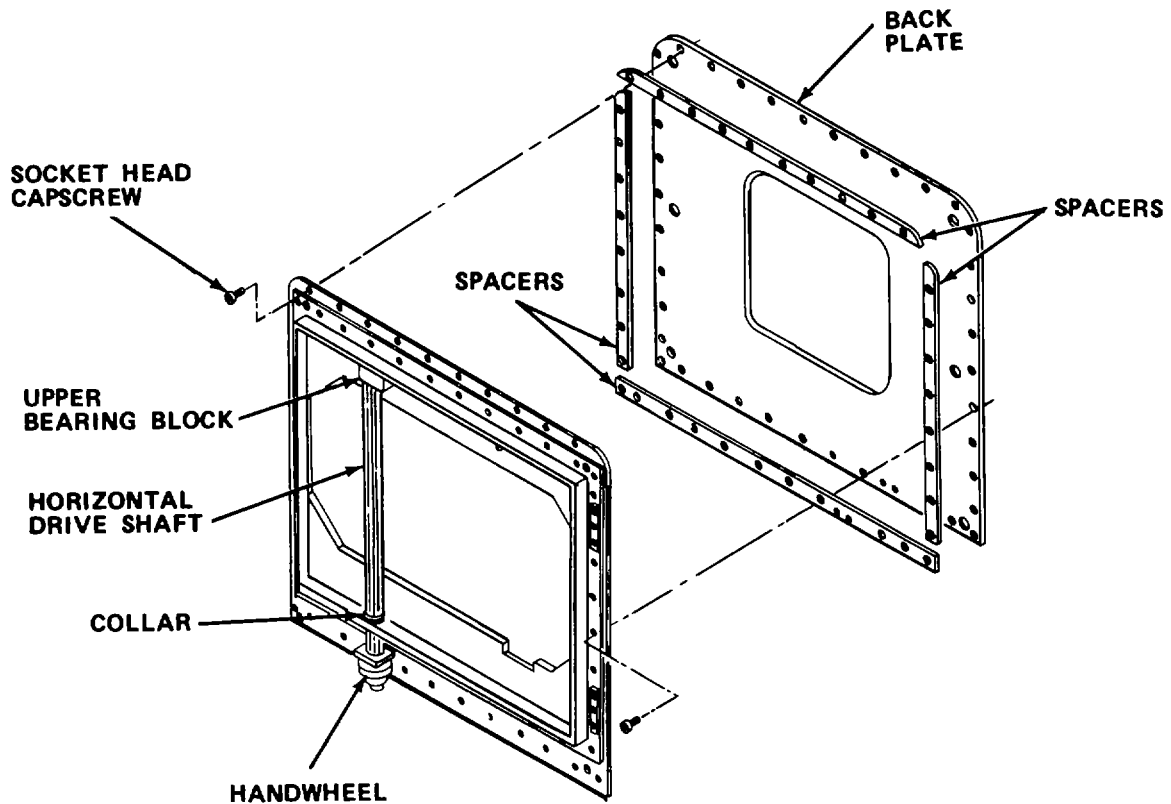
- a. Remove lensboard assembly (subparagraph 5-5.6).



- b. Remove coupling from horizontal drive shaft.
- c. Use vertical handwheel to raise inner frame to maximum height.



- d. Remove vertical drive nut screws.



**CAUTION**

**Tag all spacers or proper clearances will not be obtained upon reassembly of lensboard assembly.**

- e. Loosen setscrew on collar.
- f. Slide horizontal shaft until it clears upper bearing block.
- g. Replace defective upper bearing block.
- h. Slide horizontal drive shaft upward until it is seated in upper bearing block.
- i. Tighten setscrew on collar.
- j. Install back plate.
- k. Install vertical drive nut screws.
- l. Inspect lensboard assembly after major repairs (subparagraph 5-5.7).
- m. Install coupling on horizontal drive shaft.
- n. Install lensboard assembly (subparagraph 5-5.6i).



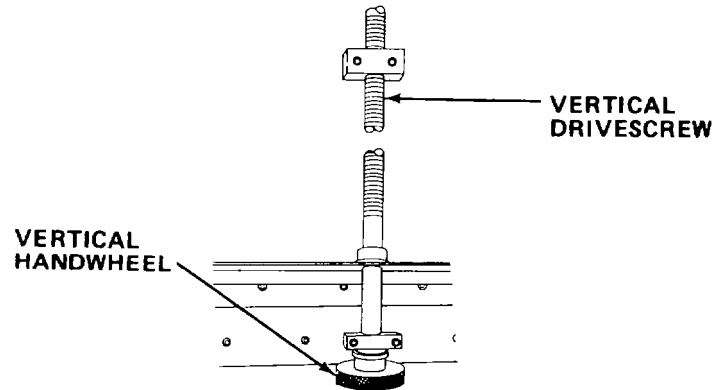
5-5.51 Replace Lensboard Assembly Vertical Drivescrew.

MOS: 83FJ6, Reproduction Equipment Repairer

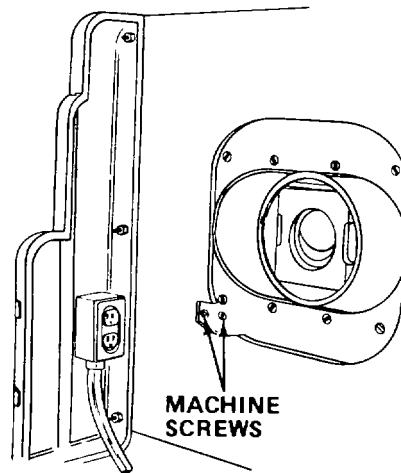
TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Vertical Drivescrew

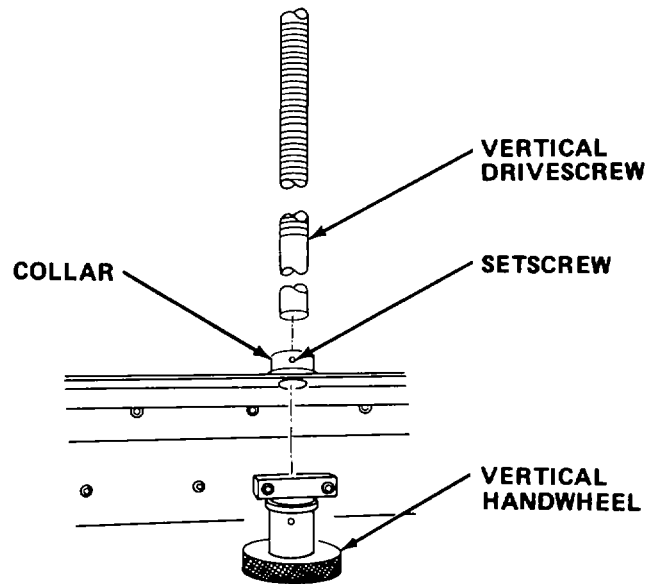
- a. Remove lensboard assembly (subparagraph 5-5.6).



- b. Remove coupling from vertical drivescrew.
- c. Use vertical handwheel to raise inner frame to maximum height.



- d. Remove vertical drive nut screws.



- e. Loosen setscrew on collar.
- f. Remove vertical handwheel.
- g. Replace defective vertical drivescrew.
- h. Install vertical handwheel.
- i. Tighten setscrew on collar.
- j. Install vertical drive nut screws.
- k. Install coupling on vertical drivescrew.
- l. Install lensboard assembly (subparagraph 5-5.6i).

5-5.52 Replace Lensboard Assembly Upper Guide.

MOS: 83FJ6, Reproduction Equipment Repairer

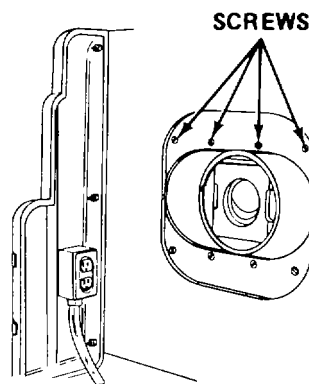
TOOLS: Light Machine Repair Tool Kit  
Feeler Gage

SUPPLIES: Upper Guide  
Guide Shim  
Shim Stock

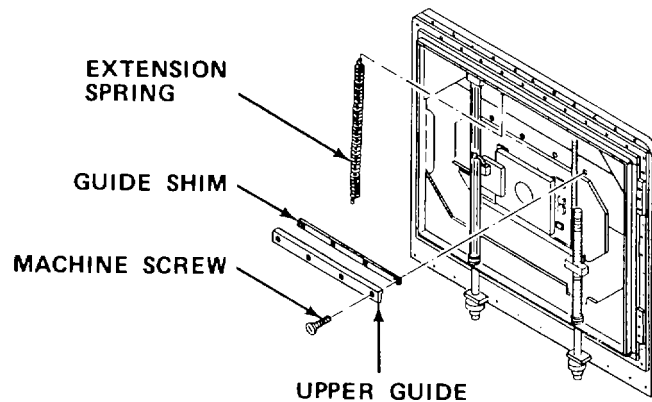
**NOTE**

**Shutter assembly must be centered in lensboard assembly.**

- a. Place bellows assembly to transport position (paragraph 2-7).



- b. Remove upper guide screws.

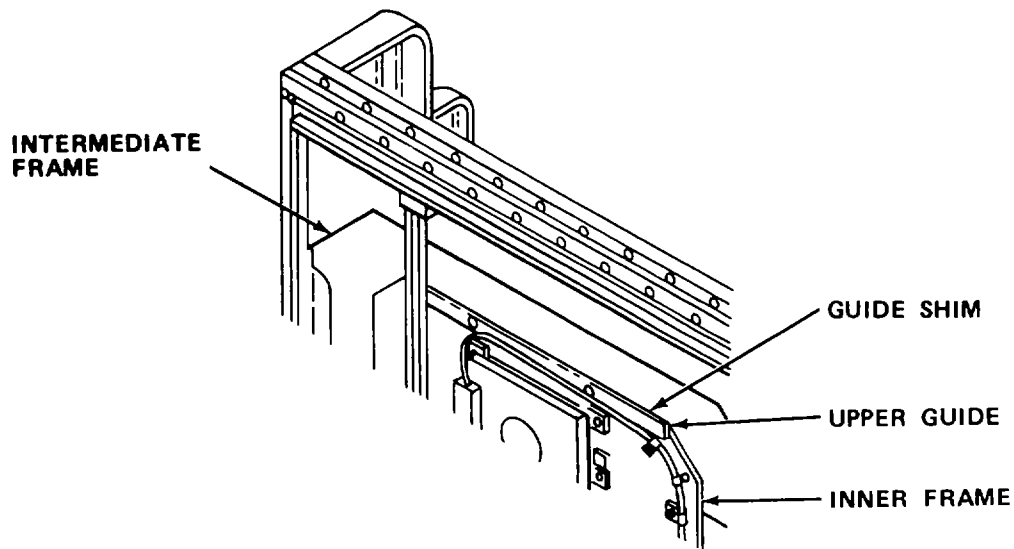


- c. Remove extension springs.

## NOTE

Guide shim is mounted behind upper guide. Do not lose straight pins.

- d. Remove defective upper guide.
- e. Install new upper guide.



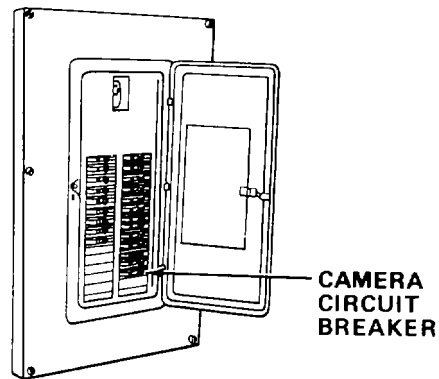
- f. Install upper guide screws.
- g. Remove or add shim stock from guide shim to allow inner frame to slide freely with a maximum of 0.001 in. (0.0254 mm) clearance between upper guide and intermediate frame.
- h. Install extension springs.

5-5.53 Replace Copyboard/Lensboard Drive Gear.

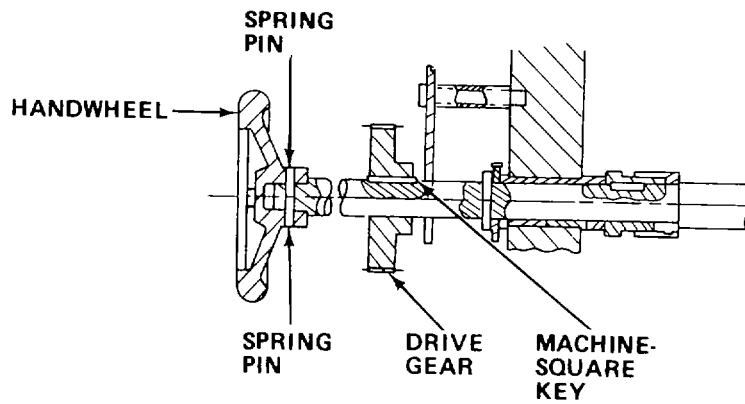
- MOS: 83FJ6, Reproduction Equipment Repairer  
 TOOLS: Light Machine Repair Tool Kit  
 Interchangeable Puller Set  
 Industrial Goggles  
 SUPPLIES: Drive Gear

**WARNING**

Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.



- a. Set camera circuit breaker on power panel OFF.



- b. Remove handwheel.
- c. Remove motor gear guard.
- d. Loosen and disengage drive motor from drive gear.
- e. Remove defective drive gear.

**CAUTION**

**Be sure drive gear teeth mesh correctly before installing drive motor. Damage to drive gears may occur.**

- f. Mesh drive motor gear with drive gear.
- g. Install motor gear guard.
- h. Install handwheel.
- i. Set camera circuit breaker on power panel ON.

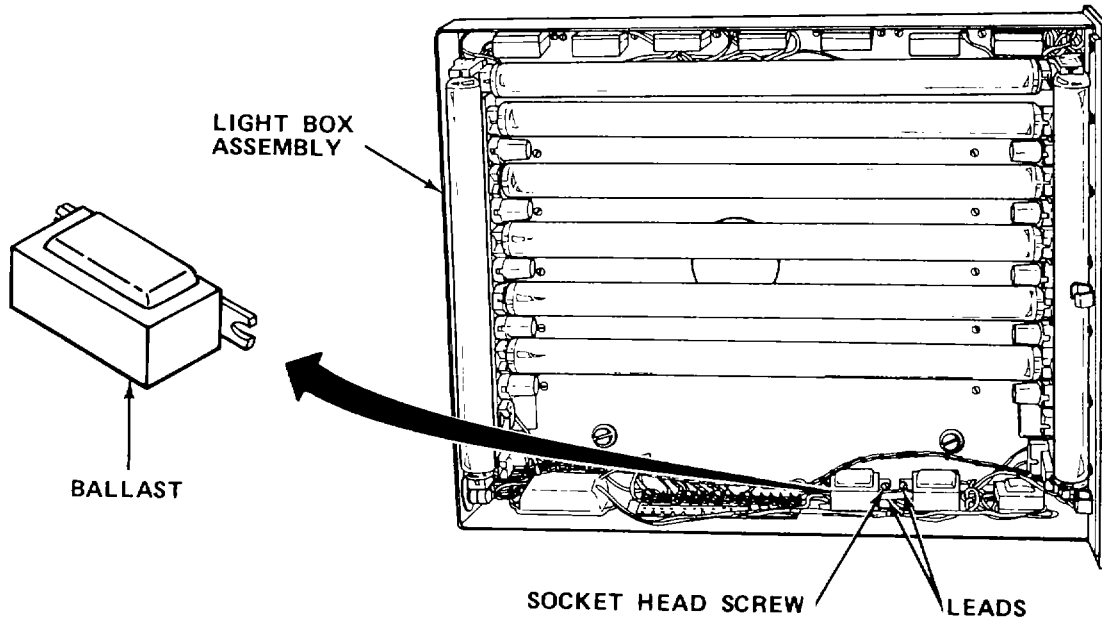
5-5.54 Replace Light Box Assembly Ballast.

MOS: 35E, Special Electronic Devices Repairer

TOOLS: Electronic Equipment Tool Kit

SUPPLIES: Ballast

- a. Remove light box assembly (subparagraph 5-5.2).



- b. Replace defective ballast.
- c. Install light box assembly (subparagraph 5-5.2d).

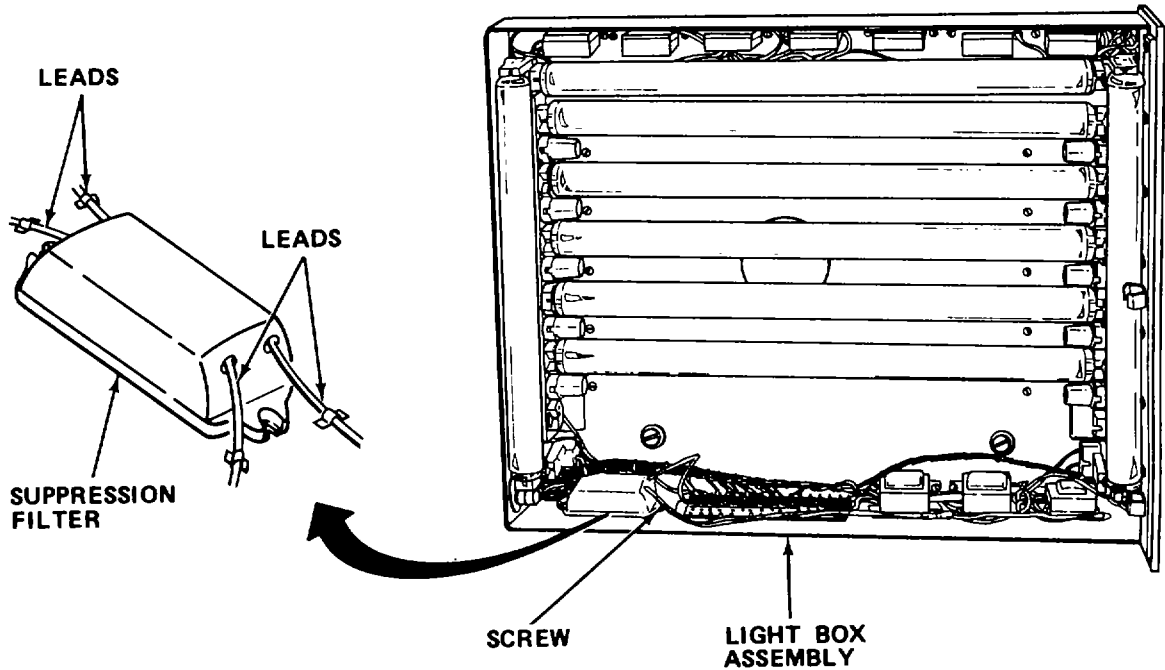
5-5.55 Replace Light Box Assembly Suppression Filter.

MOS: 35E, Special Electronic Devices Repairer

TOOLS: Electronic Equipment Tool Kit

SUPPLIES: Suppression Filter

- a. Remove light box assembly (subparagraph 5-5.2).



- b. Replace defective suppression filter.
- c. Install light box assembly (subparagraph 5-5.2d).

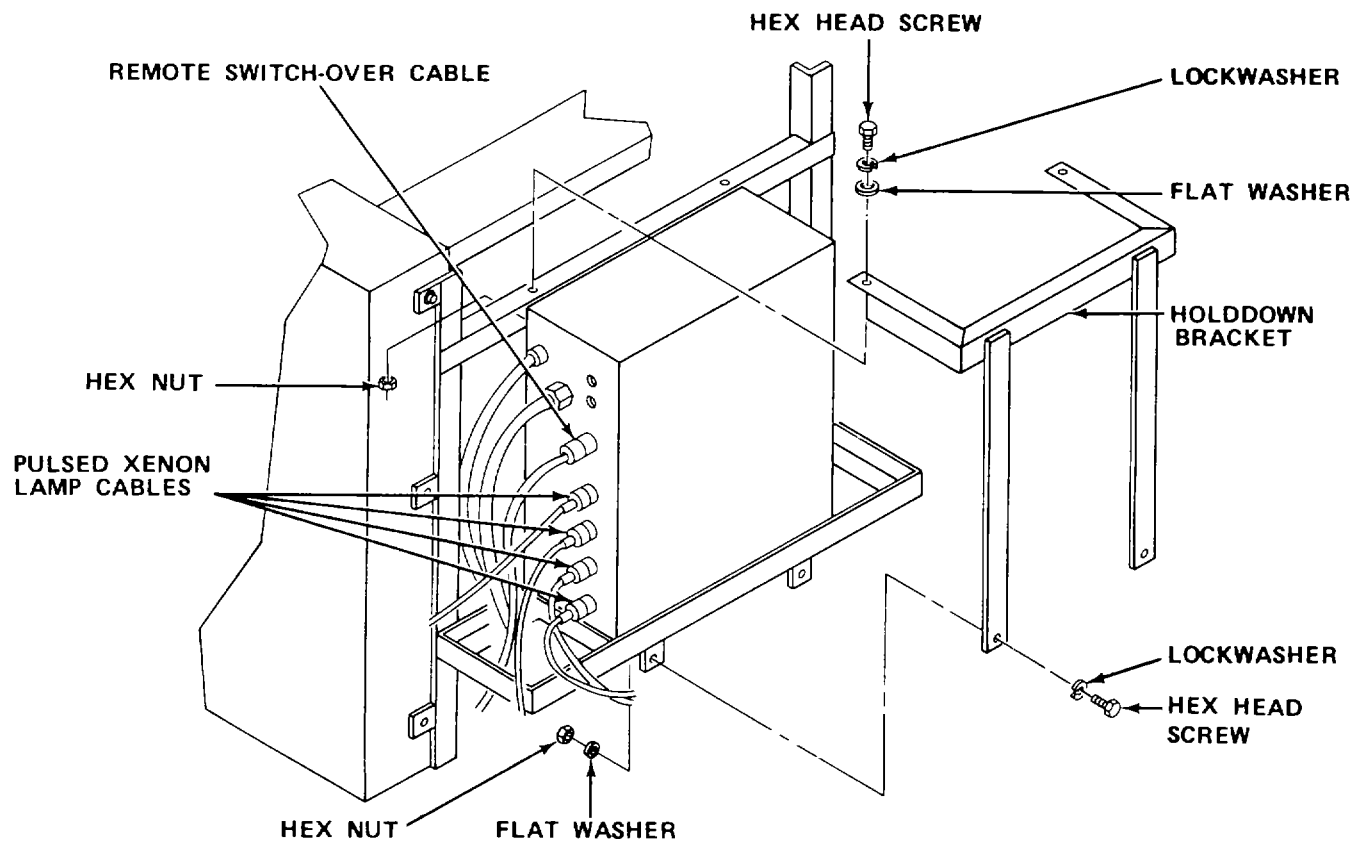


5-5.56 Repair Power Supply Assembly.

MOS: 35E, Special Electronic Devices Repairer  
 TOOLS: Electronic Equipment Tool Kit

SUPPLIES: Choke AC Magnetic Contactor  
 Auto Transformer Relay K1201  
 Capacitor Fan Motor  
 Fuse(s) Power Cord Assembly  
 Circuit Breaker Zener Diode(s) 250 v  
 Printed Circuit Card

- a. Remove power supply assembly (subparagraph 5-5.5).



- b. Replace defective component(s).
- c. Install power supply assembly (subparagraph 5-5.5g).

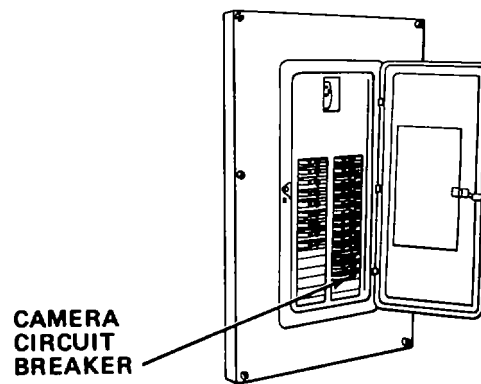
5-5.57 Repair Electrical System Wiring.

MOS: 35E, Special Electronic Devices Repairer  
TOOLS: Electronic Equipment Tool Kit

SUPPLIES: Electrical Insulated Sleeving  
Tiedown Strap  
Six-Conductor Cable  
Two-Conductor Cable  
Electrical Hookup Wire  
Crimp Terminal Lug

**WARNING**

**Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.**



- a. Set camera circuit breaker on power panel OFF.

**NOTE**

**Depending on extent of cable damage, it may be easier to run new cable instead of repairing defective cable section.**

- b. Determine extent of cable/wiring damage.
- c. Repair as necessary.
- d. Set camera circuit breaker on power panel ON.

5-5.58 Repair Defective Wiring In Light Box Assembly.

MOS: 35E, Special Electronic Devices Repairer

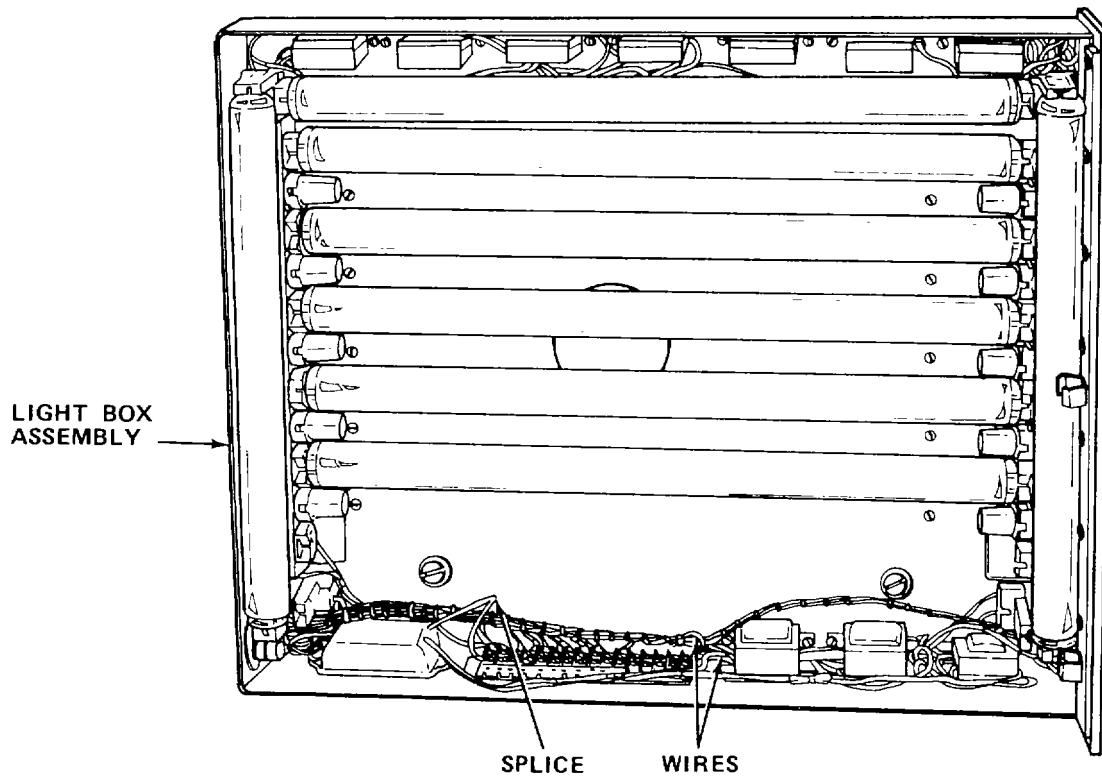
TOOLS: Electronic Equipment Tool Kit

SUPPLIES: 18 AWG Electrical Wire  
Crimp Electrical Splice

**WARNING**

Death or serious injury may occur from electrical shock unless power cord is unplugged before making repairs.

- a. Remove light box assembly (subparagraph 5-5.2).



- b. Locate defective wiring.
- c. Repair as needed.
- d. Install light box assembly (subparagraph 5-5.2d).

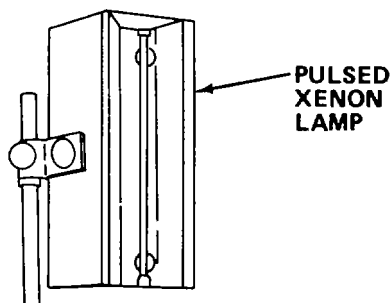
5-5.59 Repair Pulsed Xenon Lamp.

MOS: 35E, Special Electronic Devices Repairer

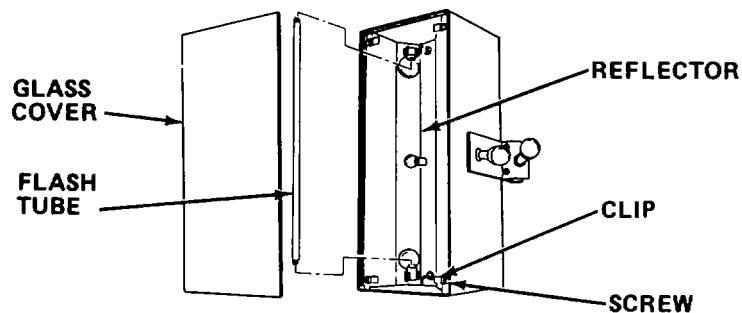
TOOLS: Electronic Equipment Tool Kit

SUPPLIES: Disposable Gloves (Item 14, Appendix E)  
 Resistor R1201  
 Cheesecloth (Item 5, Appendix E)  
 Power Cable Assembly  
 Isopropyl Alcohol (Item 3, Appendix E)  
 Pulse Transformer T1201  
 Glass Cleaner (Item 13, Appendix E)  
 Capacitor C1201  
 Ceramic Insulators  
 Lamp Fan Motor  
 Safety Interlock Switch  
 Lamp Thermal Fuses

- a. Remove pulsed xenon lamp (subparagraph 4-7.1).



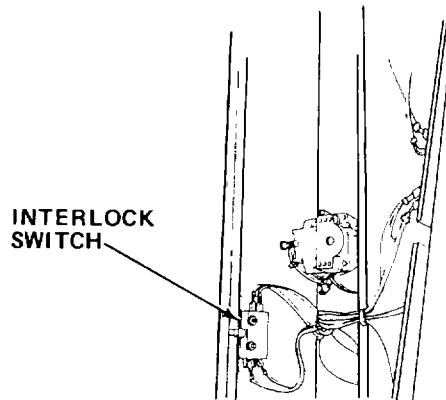
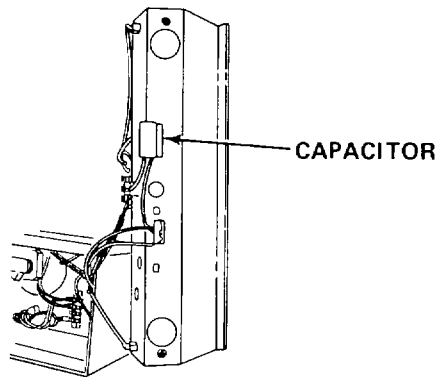
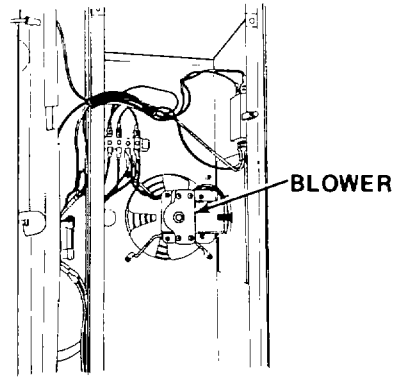
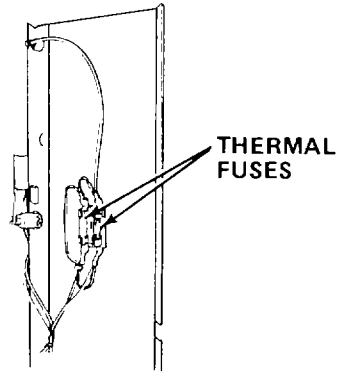
- b. Remove glass cover.



**CAUTION**

**Wear disposable gloves to avoid damage to flash tube.**

- c. Remove flash tube.
- d. Remove reflector.



- e. Replace defective components.

**NOTE**

**Clean reflector, flash tube, and ceramic insulator with cheesecloth and alcohol after installation.**

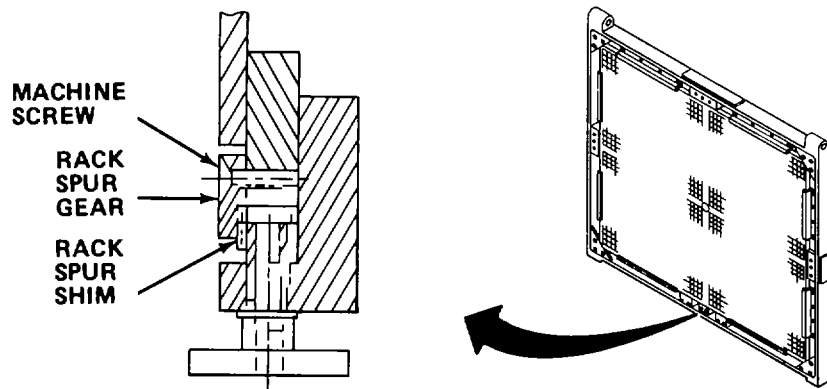
- f. Install reflector.
- g. Install flash tube.
- h. Install glass cover.
- i. Use cheesecloth moistened with glass cleaner to clean glass cover. Dry with dry cheesecloth.
- j. Install pulsed xenon lamp (subparagraph 4-7.1e).

5-5.60 Repair Ground Glass Oscillating Frame Assembly.

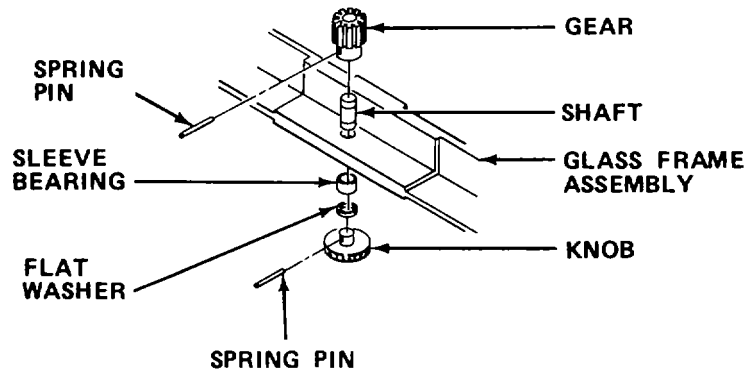
MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

SUPPLIES: Gear  
 Rack Spur Gear  
 Rack Spur Shim  
 Shaft  
 Spring Pin



a. Remove rack spur gear and rack spur shim.



b. Remove gear knob, flat washer, sleeve bearing, and shaft.

c. Replace defective component(s).

d. Install shaft, sleeve bearing, flat washer, knob, and gear.

e. Shim beneath rack spur gear to obtain proper mesh between gear and rack spur gear.

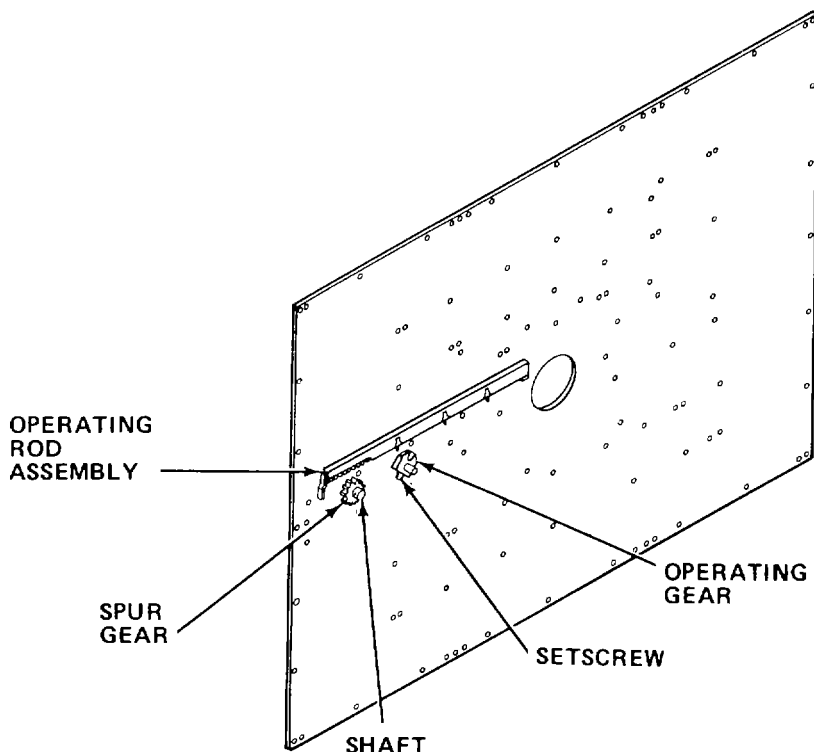
f. Install rack spur gear.

5-5.61 Aline Copyboard Assembly Operating Gates.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Light Machine Repair Tool Kit

- a. Remove copyboard assembly operating gear (subparagraph 5-5.41) or remove operating rod assembly (subparagraph 5-5.43).



- b. Set operating rod assembly to extreme right.
- c. Engage operating gears so that they mesh with first tooth on operating rod assembly. All operating gates are closed in this position.
- d. Tighten operating gear setscrews.
- e. Install spur gear onto shaft.
- f. Install cover plate.

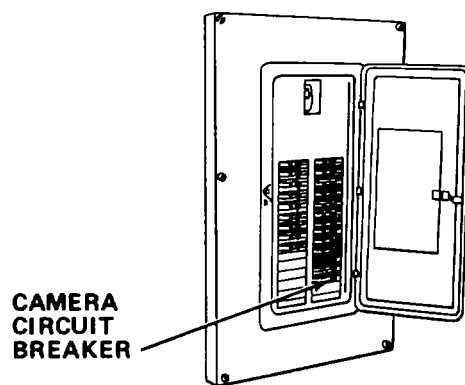
5-5.62 Adjust End Play of Camera Drivescrew.

MOS: 83FJ6, Reproduction Equipment Repairer

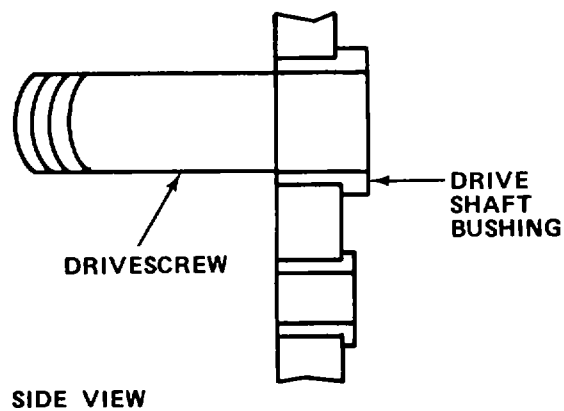
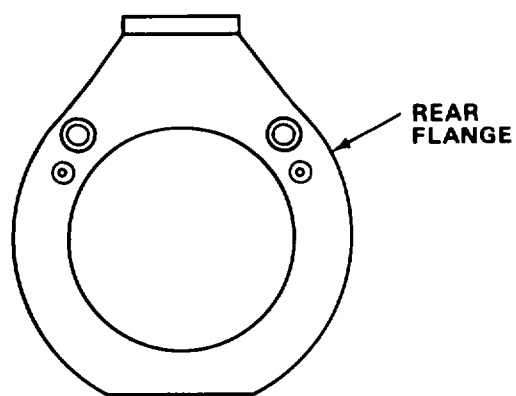
TOOLS: Light Machine Repair Tool Kit

**WARNING**

Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.

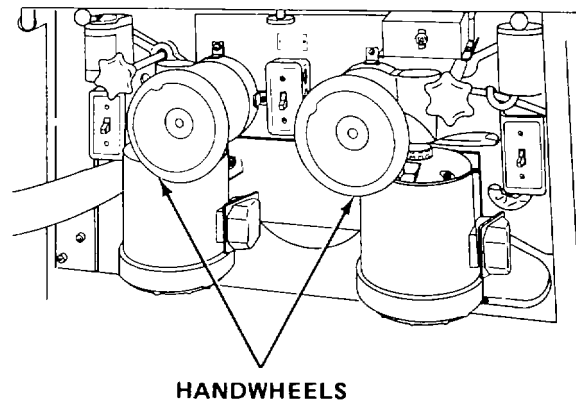


- a. Set camera circuit breaker on power panel OFF.

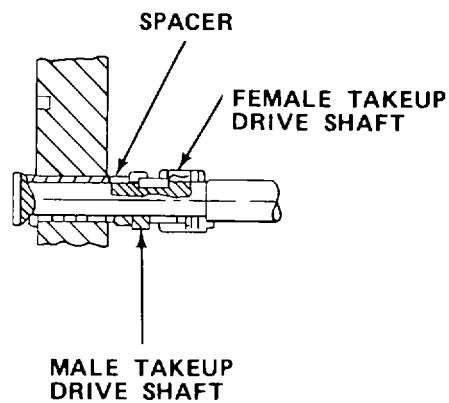


- b. Be sure drivescrew is resting flush in drive shaft bushing at rear flange.





- c. Turn handwheel to left to take up excessive play.



- d. Loosen socket head setscrews and turn female takeup drive shaft until male takeup drive shaft is snug against spacer.
- e. Tighten socket head setscrews in female takeup drive shaft.
- f. Test for snug running fit by turning handwheel in one direction and then opposite direction.
- g. If too tight, loosen socket head setscrews and slightly decrease gap between male takeup drive shaft and spacer.
- h. If too loose, loosen socket head setscrews and slightly increase gap between male takeup drive shaft and spacer.
- i. Set camera circuit breaker on power panel ON.

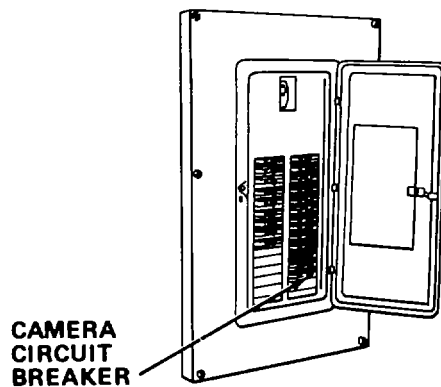
5-5.63 Adjust Lensboard Carriage Assembly Two-Way Limit Switch,

MOS: 35E, Special Electronic Devices Repairer

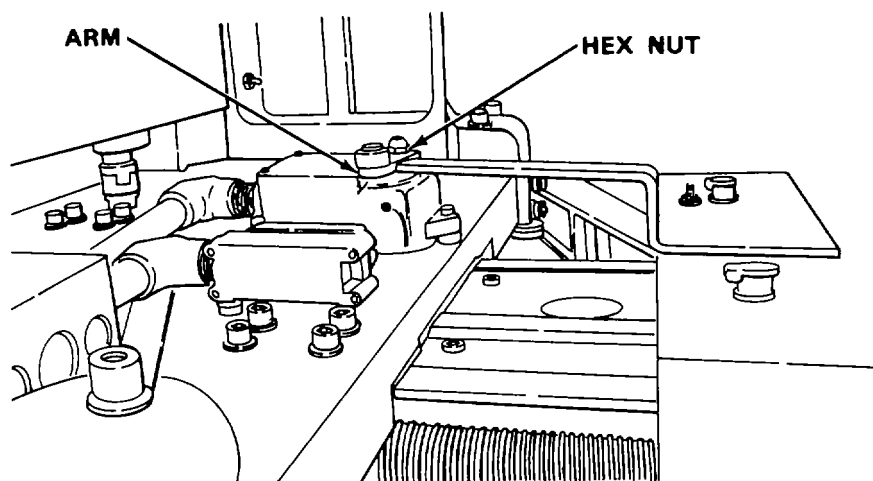
TOOLS: Electronic Equipment Tool Kit

**WARNING**

Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.



- a. Set camera circuit breaker on power panel OFF.



- b. Remove arm.  
 c. Position arm on two-way limit switch.  
 d. Move arm toward lensboard assembly until a click is heard.  
 e. Install and tighten hex nut.  
 f. Set camera circuit breaker on power panel ON.

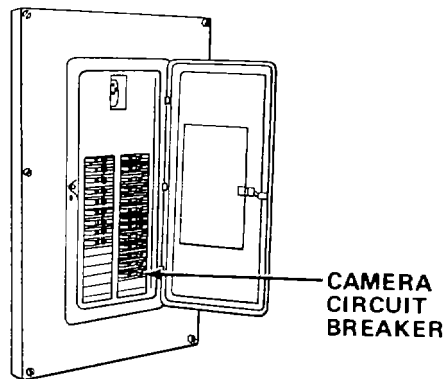
5-5.64 Adjust Copyboard/Lensboard Carriage Assembly Limit Switch.

MOS: 35E, Special Electronic Devices Repairer

TOOLS: Electronic Equipment Tool Kit

**WARNING**

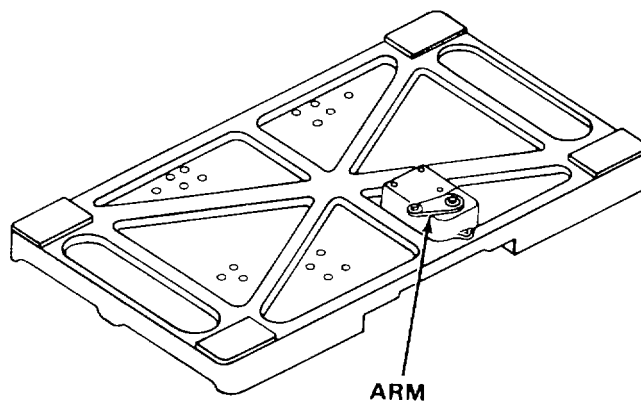
Death or serious injury may occur from electrical shock unless camera circuit breaker is off before making repairs.



**NOTE**

**This task requires two personnel.**

- a. Set camera circuit breaker on power panel OFF.
- b. Move carriage assembly manually until limit switch arm disengages from rail.



- c. Loosen arm socket head screw.
- d. Move carriage assembly forward.
- e. Tighten arm socket head screw.
- f. Move carriage assembly forward. A click should be heard.
- g. Move carriage assembly backward. A click should be heard.
- h. Set circuit breaker on power panel ON.
- i. Use LENSBOARD/COPYBOARD DRIVE switch to move carriage assembly backward to disengage limit switch.

**5-137/(5-138 blank)**

APPENDIX A

REFERENCES

**A-1. SCOPE.**

This appendix lists all forms, field manuals, technical manuals and miscellaneous publications in this manual.

**A-2. FORMS.**

Quality Deficiency Report ..... SF 368

The Army Maintenance Management System (TAMMS) ..... DA Pam 738-750

**A-3. FIELD MANUALS .**

First Aid for Soldiers..... FM 21-11

**A-4. TECHNICAL MANUALS .**

Operator's, Organizational, Direct Support and  
General Support Maintenance Manual for Chassis,  
Semi-Trailer, Container Transporter (ADCOR) ..... TM 5-2330-305-14

Organizational, Direct Support and General Support  
Maintenance Repair Parts and Special Tools List  
for Lithographic Copying Camera, Topographic  
Support System ..... TM 5-3610-258-24P

Procedures for Destruction of Equipment to Prevent  
Enemy Use ..... TM 750-244-3

Use and Care of Hand Tools and Measuring Tools..... TM 9-243

Offset Photolithography and Map Reproduction ..... TM 5-245

Elements of Signal Photography ..... TM 11-401

**A-5. MISCELLANEOUS PUBLICATIONS .**

Index of Technical Publications ..... DA Pamphlet 310-4

## APPENDIX B MAINTENANCE ALLOCATION CHART

### Section I INTRODUCTION

#### **B-1. GENERAL.**

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The application of maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designed maintenance categories.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

#### **B-2. MAINTENANCE FUNCTIONS .** Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service of other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the 3d position code of the SMR code.

i. Repair. The application of maintenance services<sup>1</sup>, including fault location/ troubleshooting<sup>2</sup>, removal/installation, and disassembly/assembly<sup>3</sup> procedures, and maintenance actions<sup>4</sup> to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/ components.

**B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II**

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies and modules with the next higher assembly. End item group number shall be "00".

b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in Column 2. (For detailed explanation of these functions, see paragraph B-2.)

<sup>1</sup>Services Inspect, test, service, adjust, aline, calibrate and/or replace.

<sup>2</sup>Fault locate/troubleshoot The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).

<sup>3</sup>Disassembly/assembly Encompasses the step-by-step taking apart (or breakdown) of a spare/functional group coded item to the level of its least componency identified as maintenance significant (i.e., assigned an SMR code) for the category of maintenance under consideration.

<sup>4</sup>Actions Welding, grinding, riveting, straightening, facing, remachining and/or resurfacing.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operation conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the Maintenance Allocation Chart. The symbol designations for the various maintenance categories are as follows:

- C . . . Operator or Crew
- O . . . Organizational Maintenance
- F . . . Direct Support Maintenance
- H . . . General Support Maintenance
- L . . . Specialized Repair Activity<sup>5</sup>
- D . . . Depot Maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE and support equipment required to perform the designated function.

f. Column 6, Remarks. This column shall, when applicable, contain a letter code, in alphabetical order, which shall be keyed to the remarks contained in Section IV.

<sup>5</sup>This maintenance category is not included in Section II, column 4 of the Maintenance Allocation Chart. To identify functions to this category of maintenance, enter a work time figure in the "H" column of Section II, column 4, and use an associated reference code in the Remarks column 6. Key the code to Section IV, Remarks, and explain the SRA complete repair application there. The explanatory remark(s) shall reference the specific Repair Parts and Special Tools List (RPSTL) TM which contains additional SRA criteria and the authorized spare/repair parts.



- b. Column 2, Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.
- c. Column 3, Nomenclature. Name or identification of the tool or test equipment.
- d. Column 4, National Stock Number. The National stock number of the tool or test equipment.
- e. Column 5, Tool Number. The manufacturer's part number.

**B-5. EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.**

- a. Column 1, Reference Code. The code recorded in Column (6), Section II.
- b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

Section II MAINTENANCE ALLOCATION CHART

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools and Equipment	(6) Remarks
			C	O	F	H	D		
01	LITHOGRAPHIC COPYING CAMERA	Inspect Test Service Aline	1.5 0.4 0.5	1.3				1,7,13, 15	A
	CAMERA DRIVE MECHANISM	Inspect		0.3					
	CAMERA HEIGHT CONTROL BEARINGS	Inspect		0.5					
	LENSBOARD HORIZONTAL/ VERTICAL DRIVE UNIVERSAL JOINTS	Inspect		0.2					
	CAMERA DRIVE- SCREW	Adjust			0.4			1	A
	COPYBOARD/ LENSBOARD LIMIT SWITCH	Adjust			0.2			2	A
	LENSBOARD CARRIAGE ASSEMBLY TWO-WAY LIMIT SWITCH	Adjust			0.2			2	A
	COPYBOARD/ LENSBOARD IDLER ADJUSTMENT ARM	Adjust		0.1				1	A
	PULSED XENON LAMP	Remove/ Install Repair		0.1		0.4		2,14	A
	FLASH TUBE	Replace	0.3					9	

Section II MAINTENANCE ALLOCATION CHART-Cont

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools and Equipment	(6) Remarks
			C	O	F	H	D		
01 - Cont	LITHOGRAPHIC COPYING CAMERA - Cont								
	CAMERA BACK HOUSING ASSEMBLY	Replace					1.8		
	CAMERA HEIGHT CONTROL DRIVE SPROCKET	Replace					7.6		
	CAMERA HEIGHT CONTROL RADIAL AND THRUST BEARING	Replace					7.6		
	CAMERA HEIGHT CONTROL BEARING	Replace					7.6		
	COPYBOARD/ LENSBOARD TAKEUP DRIVE SHAFT/SPACER	Replace					4.7		
	COPYBOARD/ LENSBOARD DRIVE SCREW	Replace					4.9		
	COPYBOARD/ LENSBOARD DRIVE SLEEVE BEARING	Replace					4.7		
	MAIN POWER CABLE ASSEMBLY	Replace			0.2			2,14	A
	AC MAGNETIC STARTER	Replace			0.5			2,14	A
	SPROCKET ASSEMBLY	Replace			0.4			1	A

Section II MAINTENANCE ALLOCATION CHART-Cont

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools and Equipment	(6) Remarks
			C	O	F	H	D		
01 - Cont	LITHOGRAPHIC COPYING CAMERA - Cont								
	GROUND GLASS ASSEMBLY POWER TRANSMISSION ROLLER CHAIN	Replace			0.3			1	A
	LEFT OR RIGHT HINGE BRACKET ASSEMBLY	Replace			0.5			1	A
	LENSBOARD HORIZONTAL/ VERTICAL HANDWHEEL CONTROL SHAFTS	Replace			0.3			1	A
	LENSBOARD HORIZONTAL/ VERTICAL UNIVERSAL JOINTS	Replace			0.1			1	A
	COPYBOARD/ LENSBOARD SILENT CHAIN SPROCKET	Replace			0.4			1,14,18	A
	COPYBOARD/ LENSBOARD DRIVE MOTOR	Replace			0.2			1,14,18	A
	COPYBOARD/ LENSBOARD DRIVE MOTOR GEAR	Replace			0.2			1,14,18	A

Section II MAINTENANCE ALLOCATION CHART-Cont

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools and Equipment	(6) Remarks
			C	O	F	H	D		
01 - Cont	LITHOGRAPHIC COPYING CAMERA - Cont								
	COPYBOARD/ LENSBOARD CARRIAGE ASSEMBLY LIMIT SWITCH	Replace			0.2			2,14	A
	LENSBOARD CARRIAGE ASSEMBLY TWO-WAY LIMIT SWITCH	Replace			0.2			2,14	A
	COPYBOARD/ LENSBOARD DRIVE SHAFT SPACER	Replace			0.6			1,14,18	A
	COPYBOARD/ LENSBOARD SILENT CHAIN	Replace			0.6			1,14,18	A
	COPYBOARD OR LENSBOARD DRIVE REVERSING DRUM SWITCH	Replace			0.3			2,14	A
	CROSS BRACE NEEDLE ROLLER BEARING	Replace			1.3			1	A
	COPYBOARD/ LENSBOARD DRIVE GEAR	Replace			0.6			1,14,18	A
	LENSBOARD HORIZONTAL/ VERTICAL COUPLING	Replace			0.9			1	A

Section II MAINTENANCE ALLOCATION CHART-Cont

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools and Equipment	(6) Remarks
			C	O	F	H	D		
01 - Cont	LITHOGRAPHIC COPYING CAMERA - Cont								
	LENSBOARD HORIZONTAL/ VERTICAL CONTROL SHAFT	Replace			1.6			1	A
	LENSBOARD VERTICAL/ HORIZONTAL EXTENSION DRIVE SHAFT	Replace			0.4			1	A
	LENSBOARD VERTICAL/ HORIZONTAL DRIVE GEAR	Replace			1.6			1	A
	LENSBOARD VERTICAL/ HORIZONTAL DRIVEN GEAR	Replace			0.2			1,18	A
	GROUND GLASS ASSEMBLY MAGNET LATCH	Replace		0.1				1	A
	AIR DUCT HOSE GASKET ADAPTER	Replace		0.1				1	A
	AIR DUCT HOSE	Replace		0.2				1	A
	COPYBOARD/ LENSBOARD CARRIAGE ASSEMBLY WIPER	Replace		0.1				1	A

Section II MAINTENANCE ALLOCATION CHART-Cont

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools and Equipment	(6) Remarks
			C	O	F	H	D		
01 - Cont	LITHOGRAPHIC COPYING CAMERA - Cont								
	LENSBOARD SHUTTER CABLE ASSEMBLY	Replace		0.1				1	A
	SWITCH	Replace		0.1				1,14	A
	COPYBOARD/ LENSBOARD IDLER ROLLER	Replace		0.2				1	A
	CAMERA HEIGHT CONTROL POWER TRANSMISSION ROLLER CHAIN	Replace		0.3				1	A
	COPYBOARD/ LENSBOARD CARRIAGE ASSEMBLY BEARING BLOCKS	Replace		0.2				1	A
	LENSBOARD CARRIAGE ASSEMBLY DUPLICATE RECEPTACLE CONNECTOR	Replace		0.2				1,14	A
	AUTO/MAN TOGGLE SWITCH	Replace		0.2				1,14	A
	ELECTRICAL SYSTEM WIRING	Repair		0.2				2,14	A

Section II MAINTENANCE ALLOCATION CHART-Cont

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools and Equipment	(6) Remarks
			C	O	F	H	D		
02 - Cont	GROUND GLASS ASSEMBLY	Remove/ Install		0.2				1	A
	GROUND GLASS FRAME ASSEMBLY	Replace		0.3				1	A
	PHOTOGRID	Replace		0.4				1	A
	CLIP	Replace		0.1				1	A
	OSCILLATING FRAME ASSEMBLY	Repair			0.3			1	A
03	VACUUM BACK LOCKING ASSEMBLY								
	ROLLER	Replace		0.1				1	A
	LOCKING SLIDE SHAFTS	Replace		0.2				1	A
04	VACUUM BACK ASSEMBLY								
	CONTROL VALVE	Replace			0.2			1	A
	VACUUM PLATE	Replace			0.7			1	A
	BACK PLATE	Replace			0.2			1	A
05	COUNTER ASSEMBLY	Inspect		0.3				1	A
	SPROCKET	Replace			0.4			1,18	A
	EXTENSION SHAFT	Replace			0.7			1,18	A



Section II MAINTENANCE ALLOCATION CHART-Cont

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools and Equipment	(6) Remarks
			C	O	F	H	D		
05 - Cont	COUNTER ASSEMBLY - Cont								
	BEARING HOUSING	Replace			0.8			1,18	A
	EXTENSION COUPLING	Replace			0.6			1,18	A
	COUNTER	Replace			0.5			1	A
	NEON LAMP	Replace			0.1			1	A
	LAMP HOLDER	Replace			0.2			1,14	A
	TOGGLE SWITCH	Replace			0.2			1,14	A
06	BELLOWS ASSEMBLY	Remove/ Replace		0.6				1	A
	CONNECTOR RIB	Replace		0.6				1,19	A
	BELLOWS	Replace Repair		0.1	2.7			1,19 1	A A
07	BELLOWS ROD ASSEMBLY	Inspect Remove/ Install		0.2 0.4				1	A
	INNER TUBE SUPPORT	Replace		0.1				1	A
	OUTER TUBE SUPPORT	Replace		0.2				1	A
	BRACKET	Replace		0.1				1	A
	INNER TUBE ASSEMBLY	Replace		0.1				1	A
	OUTER TUBE	Replace		0.1				1	A

Section II MAINTENANCE ALLOCATION CHART-Cont

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools and Equipment	(6) Remarks
			C	O	F	H	D		
07 - Cont	BELLOWS ROD ASSEMBLY - Cont EXTENSION SPRING	Replace		0.1				1	A
	BRACKET ROLLER	Replace		0.1				1	A
08	LENS ASSEMBLY (19 and 24 inch)	Service	0.1					3	
09	LENSBOARD ASSEMBLY	Inspect Remove/ Install		0.2	1.0 0.9			1 1	A A
	UPPER BEARING BLOCK	Replace			0.6			1	A
	HORIZONTAL DRIVE SHAFT	Replace			0.7			1	A
	VERTICAL DRIVE SHAFT	Replace			0.7			1	A
	UPPER GUIDE	Replace			0.9			1,15	A
	SHUTTER ASSEMBLY	Replace		0.7				1	A
	EXTENSION SPRING	Replace		0.6				1	A
	LENSBOARD RACK	Replace		0.8				1	A
10	LENSBOARD CARRIAGE ASSEMBLY	Remove/ Install					1.4		

Section II MAINTENANCE ALLOCATION CHART-Cont

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools and Equipment	(6) Remarks
			C	O	F	H	D		
11	CAMERA ARM ASSEMBLY	Remove/ Install					3.3		
	BRACKETS	Replace		0.4				1	A
12	COPYBOARD ASSEMBLY	Remove/ Install			0.1			1	A
	OPERATING GATES	Aline			0.4			1	A
	OPERATING ROD ASSEMBLY	Replace			1.0			1	A
13	OPERATING GEAR	Replace			1.2			1	A
	SPUR GEAR	Replace			1.0			1	A
	POSITIVE HOLDER ASSEMBLY	Remove/ Install			0.9			1	A
	DIVERTER VALVE PLATE	Replace			0.5			1	A
	LIGHT BOX ASSEMBLY	Remove/ Install			0.2			1	A
	LAMPHOLDER	Replace			0.2			2,14	A
	SUPPRESSION FILTER	Replace			0.2			2,14	A
	BALLAST	Replace			0.3			2,14	A
	FLUORESCENT LAMP	Replace		0.1				1	A
	STARTER	Replace		0.1				1	A
WIRING	Repair			0.3			2,14	A	

Section II MAINTENANCE ALLOCATION CHART-Cont

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools and Equipment	(6) Remarks
			C	O	F	H	D		
14	COPYBOARD CARRIAGE ASSEMBLY	Remove/ Install					3.5		
	AXLE	Replace					4.5		
	BEARING SLEEVES	Replace					3.8		
15	POWER SUPPLY ASSEMBLY	Remove/ Install			0.7			2,14	A
		Repair			1.0			2,14	A
16	BLOWER ASSEMBLY	Replace			0.4			2,14	A
	CAPACITOR	Replace			0.2			2,14	A
17	FRAME ASSEMBLY	Replace					4.6		
	DRIVE SHAFT BUSHING	Replace					4.6		
	CONTROL SHAFT BUSHING	Replace			2.0			1,17	A
	CAMERA DRIVE MECHANISM	Disassemble/ Assemble					4.6		
18	CAMERA SKID ASSEMBLY								
	VACUUM CONDUIT	Replace			0.6			1	A

## Section III TOOL AND TEST EQUIPMENT REQUIREMENTS

(1) Reference Code	(2) Maintenance Category	(3) Nomenclature	(4) National/ NATO Stock Number	(5) Tool Number
1	O,F	Light Machine Repair Tool Kit	5180-00-596-1540	W43827
2	F	Tool Kit, Electronic Equipment, TK101/G	5180-00-064-5178	W37483
3	C	Brush, Artist's	8020-00-619-8929	
4	C	Brush, Camel Hair	7920-00-205-0565	
5	C	Brush, Lens	7920-00-205-1427	
6	C	Lubricating Gun	4930-00-253-2478	
7	C	Magnifier, Monocular	6650-00-255-8268	
8	C	Oiler, Hand	4930-00-537-8977	
9	C	Screwdriver, Cross Tip, No. 2	5120-00-234-8913	
10	C	Screwdriver, Flat Tip	5120-00-227-7356	
11	C	Screwdriver, Flat Tip	5120-00-227-7362	
12	C	Screwdriver, Flat Tip	5120-00-288-7803	
13	0	Dial Indicator and Trammel Assembly	5210-01-044-0937	
14	O,F	Multimeter AN/URM-105	6625-00-999-6282	
15	F	Gage, Gap Setting (55719) FB310B		
16	F	Key Set, Socket Head Screw	5120-00-595-9244	
17	F	Puller Kit, Mechanical	5120-00-089-3660	
18	F	Puller Set, Interchangeable, Complete (55719) CJ1000FSB		
19	F	Riveter Kit, HP200A	5180-00-082-1408	
20	F	Wrench Set, Open End Fixed	5120-00-148-7918	

## Section IV REMARKS

---

REFERENCE CODE	REMARKS
----------------	---------

---

A	Maintenance task tools are authorized to HMC TOE 05336H600 and 05337H600, and carried in TSS Section 7, Maintenance Van.
---	--

**B17 /(B18 blank)**

**APPENDIX C****COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS**

---

**Section I INTRODUCTION****C-1. SCOPE.**

This appendix lists components of end item and basic issue items for the Lithographic Copying Camera to help you inventory items required for safe and efficient operation.

**C-2. GENERAL.**

The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. Section II: Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III: Basic Issue Items (BII). These are the minimum essential items required to place the Lithographic Copying Camera in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the Lithographic Copying Camera during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII based on TOE/MTOE authorization of the end item.

**C-3. EXPLANATION OF COLUMNS.**

The following provides an explanation of columns found in the tabular listings:

a. Column (1): Illustration Number (Illus Number). This column indicates the number of the illustration in which the item is shown.

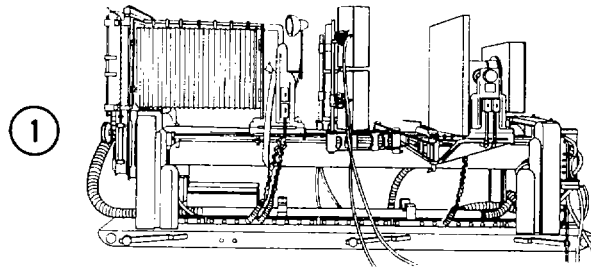
b. Column (2): National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

c. Column (3): Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. Column(4): Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two character alphabetical abbreviation (e.g., ea, in, pr).

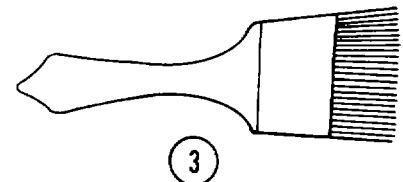
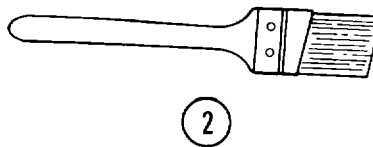
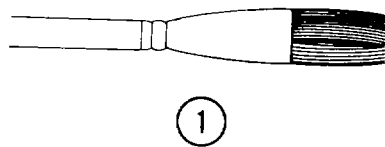
e. Column (5): Quantity Required (Qty Rqr.). Indicates the quantity of the item authorized to be used with/on the equipment.

**Section II COMPONENTS OF END ITEM**



(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
13610-01-1	74-4066	Camera, Copying, Lithographic (97403) 13226E5000	ea	1

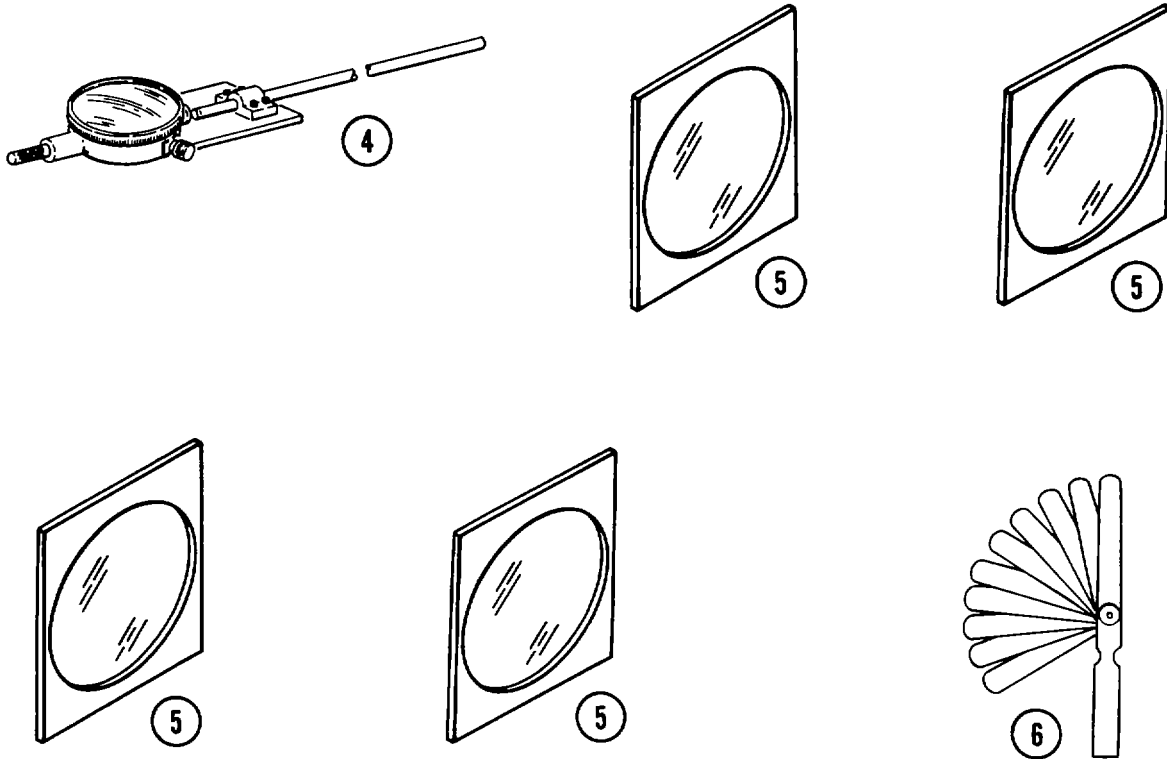
**Section III BASIC ISSUE ITEMS**



(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
1*	8020-00-619-8929 (06608) 13308-K	Brush, Artist's	ea	2
2	7920-00-205-0565	Brush, Camel Hair	ea	1
3*	7920-00-205-1427 (19139) 149 9714	Brush, Lens	ea	1

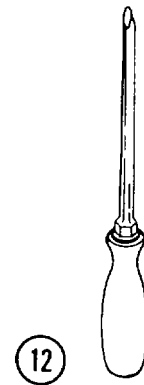
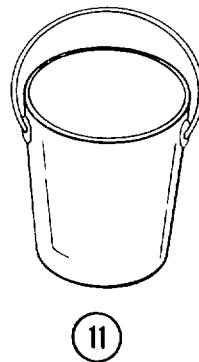
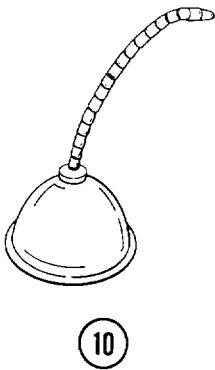
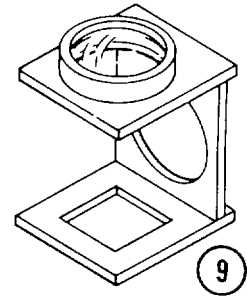
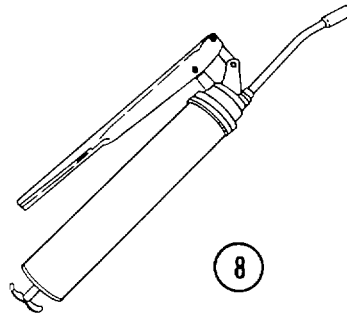
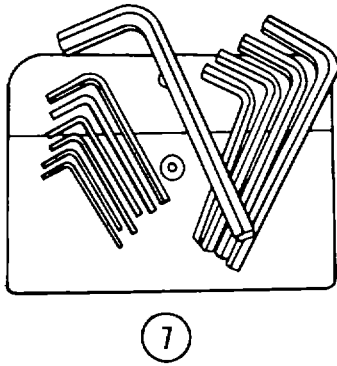


Section III BASIC ISSUE ITEMS - Cont



(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
4	5210-01-044-0937	Dial Indicator and Trammel Assembly (83113) 2010-114	ea	1
5*	6760-00-141-6764	Filter, Light, Photographic Lens: Blue (19139) 149 4368	ea	1
5*	6760-00-141-6765	Filter, Light, Photographic Lens: Green (19139) 149 4442	ea	1
5*	6760-00-286-8544	Filter, Light, Photographic Lens: Red (19139) 149 4178	ea	1
5*	6760-00-141-6751	Filter, Light, Photographic Lens: Yellow (19139) 149 4061	ea	1
6		Gage, Gap Setting (55719) FB310B	ea	1

Section III BASIC ISSUE ITEMS - Cont



(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
7	5120-00-595-9244	Key Set, Socket Head Screw (70276) 84606	ea	1
8	4930-00-253-2478	Lubricating Gun (77335) 30-116	ea	1
9*	6650-00-255-8268	Magnifier, Monocular (94480) 12-064-10	ea	2
10	4930-00-537-8977	Oiler, Hand (77335) 50-123	ea	1
11	7240-00-137-1608	Pail, Utility (19272) 4 gal.	ea	1
12	5120-00-234-8913	Screwdriver, Cross Tip, No. 2 (55719) SSDP42	ea	1

Section III BASIC ISSUE ITEMS - Cont



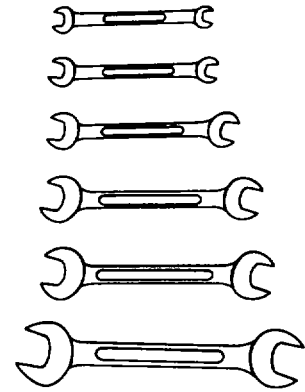
13



14



15



16

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
13	5120-00-227-7356	Screwdriver, Flat Tip (55719) SSDE 66	ea	1
14	5120-00-227-7362	Screwdriver, Flat Tip (78525) 66-172	ea	1
15	5120-00-288-7803	Screwdriver, Flat Tip, Cabinet (96508) S3161	ea	1
16	5120-00-148-7918	Wrench Set, Open End, Fixed (81348) GGG-W-636	se	1

C5/(C6 blank)

**APPENDIX D  
ADDITIONAL AUTHORIZATION LIST**

**Section I INTRODUCTION**

**D-1. SCOPE.**

This appendix lists additional items you are authorized for the support of the Lithographic Copying Camera.

**D-2. GENERAL.**

This list identifies items that do not have to accompany the Lithographic Copying Camera and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA or JTA.

**D-3. EXPLANATION OF LISTING.**

National stock numbers, descriptions and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i. e. , CTA, MTOE, TDA, or JTA) which authorizes the item(s) to you.

**Section II ADDITIONAL AUTHORIZATION LIST**

(1) National Stock Number	(2) Description FSCM and Part Number	(3) U/M	(4) Qty Rqr
	<u><b>TOE AUTHORIZED ITEMS</b></u> Not Applicable		

**D-1/(D-2 blank)**

**APPENDIX E**  
**EXPENDABLE SUPPLIES AND MATERIALS LIST**

---

**Section I INTRODUCTION**

**E-1. SCOPE.**

This appendix lists expendable supplies and materials you will need to operate and maintain the Lithographic Copying Camera. This listing is for information purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (except Medical, Class V, Repair Parts and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/ Durable Items.

**E-2. EXPLANATION OF COLUMNS**

a. Column (1) Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e. g. , "Use cleaning compound, Item 5, Appendix E. ").

b. Column (2) Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew

O - Organizational Maintenance

F - Direct Support Maintenance

H - General Support Maintenance

c. Column (3) National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4) Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. Column (5) Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by two-character alphabetical abbreviations (e. g. , ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

## Section II EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	F	8040-00-174-2610	Adhesive, Rubber	cn
2	O	Adhesive - Sealant	Silicone, Black Type I (81348) MIL-A-46106	
3	C	6810-00-983-8551	Alcohol, Isopropyl	cn
4	C	6850-00-227-1887	Cleaning Compound, Optical Lens	qt
5	C	8305-00-222-2423	Cloth, Cheesecloth	yd
6	C	7930-00-530-8067	Detergent, General Purpose	gl
7	F	8010-00-111-8005	Enamel, Metal, Black	gl
8	C	6750-00-279-3125	Film, Photographic (Orthochromatic Emulsion Sensitivity)	bx
9	C	6750-00-364-1620	Film, Photographic (Orthochromatic Emulsion Sensitivity)	bx
10	C	6750-00-586-9275	Film, Photographic (Orthochromatic Emulsion Sensitivity)	bx
11	C	6750-00-297-1675	Film, Photographic (Panchromatic Emulsion Sensitivity)	bx
12	C	6750-00-463-4292	Film, Photographic (Still Picture Film Type)	bx
13	C	7930-00-664-6910	Glass Cleaner	co
14	C	8415-00-248-3228	Gloves, Disposable (80011) 11-394-110B	bx
15	C	9150-00-190-0904	Grease, GAA	lb
16	C	6640-00-597-6745	Lens Tissue	bk
17	O	8030-00-434-4162	Locking Compound	oz
18	C	9150-01-054-8665	Lubricating Oil (09137) 40015	cn

## Section II EXPENDABLE SUPPLIES AND MATERIALS LIST - Cont

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
19		9150-00-273-2389	Oil, Lubricating, General Purpose, PL-S	cn
20	C	9330-00-282-8319	Plastic Sheet, Cellulose Acetate	pg
21	C	6850-00-274-5421	Solvent, P-D-680	cn
22	C		Tape, Electrical, Plastic (82053) 365045	ro
23	C	5970-00-644-3167	Tape, Insulation, Electrical	ro
24	C	5970-00-419-4290	Tape, Insulation, Electrical	ea

E3/(E4 blank)

## INDEX

Subject	Paragraph Figure, Table, Number
<b>A</b>	
AC Magnetic Starter, Replace .....	5-5.9
Adjust Camera Back Housing Assembly.....	4-7.37.10
Adjust Copyboard/Lensboard Carriage Assembly Limit Switch .....	5-5.64
Adjust End Play of Camera Drivescrew .....	5-5.62
Adjust Lensboard Carriage Assembly Two-Way Limit Switch .....	5-5.63
Adjust Vacuum Back Assembly and Ground Glass Assembly.....	4-7.37.9
Adjustment of Camera, Preliminary Servicing and .....	4-4
Adjustments, Copyboard Assembly .....	4-7.37.6
Adjustments, Lensboard Assembly.....	4-7.37.5
Adjustments, Positive Holder Assembly .....	4-7.37.7
Air Duct Hose Adapter Gasket, Replace.....	4-7.28
Air Duct Hose, Replace .....	4-7.29
Aline Camera, Optically .....	4-7.37
Aline Copyboard Assembly Operating Gates .....	5-5.61
Assembly and Preparation for Use .....	2-3
Auto/Man Toggle Switch, Replace.....	4-7.24
Auxiliary Equipment, Operation of.....	2-6
<b>B</b>	
Bellows Assembly, Remove/Replace .....	4-7.3
Bellows Assembly, Test for Light Leaks .....	4-7.36
Bellows, Repair .....	4-7.35
Bellows, Replace .....	5-5.39
Bellows Rod Assembly Extension Spring, Replace .....	4-7.13
Bellows Rod Assembly Inner Tube Assembly, Replace .....	4-7.11
Bellows Rod Assembly Inner Tube Support, Replace .....	4-7.8
Bellows Rod Assembly Outer Tube, Replace .....	4-7.12
Bellows Rod Assembly Outer Tube Support, Replace .....	4-7.9
Bellows Rod Assembly, Remove/Install.....	4-7.2
Bellows Rod Assembly Roller, Replace .....	4-7.14
Blower Assembly, Replace .....	5-5.47
Bracket, Replace .....	4-7.10
<b>C</b>	
Calibrating Lens and Copy Counters .....	4-7.37.11
Camera Arm Assembly Arm Brackets, Replace .....	4-7.22
Camera Back Housing Assembly, Adjust .....	4-7.37.10
Camera Height Control Power Transmission Roller Chain, Replace .....	4-7.32
Camera Lubrication .....	3-1
Camera (Technical Principles of Operation), Lithographic Copying .....	1-8
Capacitors in Blower Assembly, Replace .....	5-5.46
Common Tools and Equipment .....	4-1
	5-1
Components, Location and Description of Major.....	1-6



INDEX-Cont

Subject

Paragraph  
Figure, Table,  
Number

C - Cont

Connector Rib in Bellows Assembly, Replace .....	5-5.40
Control or Indicator .....	2-1
Control Shaft Bushing, Replace .....	5-5.48
Copyboard Assembly Adjustments .....	4-7.37.6
Copyboard Assembly Operating Gates, Aline .....	5-5.61
Copyboard Assembly Operating Gear, Replace .....	5-5.41
Copyboard Assembly, Remove/Install .....	5-5.4
Copyboard Assembly Spur Gear, Replace .....	5-5.42
Copyboard/Lensboard Carriage Assembly Bearing Blocks, Replace .....	4-7.19
Copyboard/Lensboard Carriage Assembly Limit Switch, Adjust .....	5-5.64
Copyboard/Lensboard Carriage Assembly Limit Switch, Replace .....	5-5.18
Copyboard/Lensboard Carriage Assembly Wiper, Replace .....	4-7.30
Copyboard/Lensboard Drive Gear, Replace .....	5-5.53
Copyboard/Lensboard Drive Motor Gear, Replace .....	5-5.17
Copyboard/Lensboard Drive Motor, Replace .....	5-5.16
Copyboard/Lensboard Idler Roller, Replace .....	4-7.31
Copyboard/Lensboard Silent Chain, Replace .....	5-5.21
Copyboard/Lensboard Silent Chain Sprocket, Replace .....	5-5.15
Copyboard Operating Rod Assembly, Replace .....	5-5.43
Copyboard or Lensboard Drive Reversing Drum Switch, Replace .....	5-5.22
Counter Assembly Bearing Housing, Replace .....	5-5.36
Counter Assembly Counter, Replace .....	5-5.38
Counter Assembly Extension Coupling, Replace .....	5-5.37
Counter Assembly Extension Shaft, Replace .....	5-5.35
Counter Assembly Lampholder, Replace .....	4-7.34
Counter Assembly Neon Lamp(s), Replace .....	4-7.7
Counter Assembly Sprocket, Replace .....	5-5.34
Counter Assembly Toggle Switch, Replace .....	4-7.23
Cross Brace Needle Roller Bearing, Replace .....	5-5.23

D

Data, Equipment .....	1-7
Decals and Instruction Plates, Operating Instructions on .....	2-8
Defective Wiring in Light Box Assembly, Repair .....	5-5.58

E

Electrical System Wiring, Repair .....	5-5.57
End Play of Camera Drivescrew, Adjust .....	5-5.62
Equipment Characteristics, Capabilities, and Features .....	1-5
Equipment, Common Tools and .....	4-1
	5-1
Equipment Data .....	1-7

INDEX-Cont

Subject	Paragraph Figure, Table, Number
<b>F</b>	
Features, Equipment Characteristics, Capabilities and .....	1-5
<b>G</b>	
Ground Glass Assembly Clip, Replace .....	4-7.4
Ground Glass Assembly Magnet Latch, Replace .....	4-7.20
Ground Glass Assembly Power Transmission Roller Chain, Replace .....	5-5.11
Ground Glass Assembly, Remove/Install .....	5-5.1
Ground Glass Frame Assembly, Replace .....	5-5.29
Ground Glass Oscillating Frame Assembly, Repair .....	5-5.60
<b>I</b>	
Initial Adjustments, Daily Checks and Self Tests .....	2-4
Inspect Lensboard Assembly After Major Repairs .....	5-5.7
Introduction (PMCS).....	2-2
	4-5
Introduction (Troubleshooting) .....	3-2
	4-6
	5-4
<b>L</b>	
Lampholder in Light Box Assembly, Replace.....	5-5.44
Left or Right Hinge Bracket Assembly, Replace .....	5-5.12
Lens and Copy Counters Calibrating .....	4-7.37.11
Lensboard Assembly Adjustments .....	4-7.37.5
Lensboard Assembly After Major Repairs, Inspect.....	5-5.7
Lensboard Assembly Horizontal Drive Shaft, Replace .....	5-5.49
Lensboard Assembly Lensboard Rack, Replace .....	4-7.18
Lensboard Assembly, Remove/Install .....	5-5.6
Lensboard Assembly Shutter Assembly, Replace .....	4-7.15
Lensboard Assembly Upper Bearing Block, Replace .....	5-5.50
Lensboard Assembly Upper Guide, Replace .....	5-5.52
Lensboard Assembly Vertical Drivescrew, Replace .....	5-5.51
Lensboard Carriage Assembly Duplex Receptacle Connector, Replace .....	4-7.33
Lensboard Carriage Assembly Two-Way Limit Switch, Adjust .....	5-5.63
Lensboard Carriage Assembly Two-Way Limit Switch, Replace .....	5-5.19
Lensboard Extension Spring(s), Replace .....	4-7.17
Lensboard Horizontal/Vertical Handwheel Control Shafts, Replace .....	5-5.13
Lensboard Horizontal/Vertical Universal Joints, Replace .....	5-5.14
Lensboard Shutter Cable Assembly, Replace.....	4-7.16
Lensboard Vertical/Horizontal Control Shaft, Replace .....	5-5.25
Lensboard Vertical/Horizontal Coupling Replace .....	5-5.24
Lensboard Vertical/Horizontal Drive Gear, Replace.....	5-5.27
Lensboard Vertical/Horizontal Driven Gear, Replace .....	5-5.28

INDEX-Cont

Subject	Paragraph Figure, Table, Number
<b>L</b>	
Lensboard Vertical/Horizontal Extension Drive Shaft, Replace .....	5-5.26
Light Box Assembly Ballast, Replace .....	5-5.54
Light Box Assembly, Remove/Install .....	5-5.2
Light Box Assembly Suppression Filter, Replace .....	5-5.55
Light Box Fluorescent Lamp(s), Replace .....	4-7.25
Light Box Fluorescent Starter(s), Replace .....	4-7.26
Light Leaks, Bellows Assembly, Test for .....	4-7.36
Lithographic Copying Camera (Technical Principles of Operation) .....	1-8
Location and Description of Major Components .....	1-6
Lubrication, Camera .....	3-1
<b>M</b>	
Main Power Cable Assembly, Replace .....	5-5.8
Maintenance Forms and Records .....	1-2
Maintenance Procedures .....	3-3
	4-7
	5-5
Movement, Preparation for .....	2-7
<b>O</b>	
Operating Instructions on Decals and Instruction Plates .....	2-8
Operating Procedures .....	2-5
Operation in Unusual Weather .....	2-9
Operation of Auxiliary Equipment .....	2-6
Optically Aline Camera .....	4-7.37
<b>P</b>	
Photogrid in Ground Glass Assembly, Replace .....	5-5.30
Positive Holder Assembly Adjustments .....	4-7.37.7
Positive Holder Assembly and Copyboard Assembly, Trammel .....	4-7.37.4
Positive Holder Assembly Diverter Valve Plate, Replace .....	5-5.45
Positive Holder Assembly, Remove/Install .....	5-5.3
Power Supply Assembly, Remove/Install .....	5-5.5
Power Supply Assembly, Repair .....	5-5.56
Preliminary Servicing and Adjustment of Camera .....	4-4
Preparation for Movement .....	2-7
Preventive Maintenance Checks and Services .....	T 2-1
	T 4-1
Procedures, Maintenance .....	3-3
Pulsed Xenon Lamp Flash Tube, Replace .....	3-3.1
Pulsed Xenon Lamp, Remove/Install .....	4-7.1
Pulsed Xenon Lamp, Repair .....	5-5.59

## INDEX-Cont

Subject	Paragraph Figure, Table, Number
<b>R</b>	
Reference Information .....	1-4
Remove/Install	
Bellows Rod Assembly .....	4-7.2
Copyboard Assembly .....	5-5.4
Ground Glass Assembly .....	5-5.1
Lensboard Assembly .....	5-5.6
Light Box Assembly .....	5-5.2
Positive Holder Assembly .....	5-5.3
Power Supply Assembly .....	5-5.5
Pulsed Xenon Lamp .....	4-7.1
Bellows Assembly .....	4-7.3
Repair	
Bellows .....	4-7.35
Defective Wiring in Light Box Assembly .....	5-5.58
Electrical System Wiring .....	5-5.57
Ground Glass Oscillating Frame Assembly .....	5-5.60
Parts .....	4-3
	5-3
Power Supply Assembly .....	5-5.56
Pulsed Xenon Lamp .....	5-5.59
Replace	
AC Magnetic Starter .....	5-5.9
Air Duct Hose .....	4-7.29
Air Duct Hose Adapter Gasket .....	4-7.28
Auto/Man Toggle Switch .....	4-7.24
Bellows .....	5-5.39
Bellows Rod Assembly Extension Spring .....	4-7.13
Bellows Rod Assembly Inner Tube Assembly .....	4-7.11
Bellows Rod Assembly Inner Tube Support .....	4-7.8
Bellows Rod Assembly Outer Tube .....	4-7.12
Bellows Rod Assembly Outer Tube Support .....	4-7.9
Bellows Rod Assembly Roller .....	4-7.14
Blower Assembly .....	5-5.47
Bracket .....	4-7.10
Camera Arm Assembly Arm Brackets .....	4-7.22
Camera Height Control Power Transmission Roller Chain .....	4-7.32
Capacitors in Blower Assembly .....	5-5.46
Connector Rib in Bellows Assembly .....	5-5.40
Control Shaft Bushing .....	5-5.48
Copyboard Assembly Operating Gear .....	5-5.41
Copyboard Assembly Spur Gear .....	5-5.42
Copyboard/Lensboard Carriage Assembly Bearing Blocks .....	4-7.19
Copyboard/Lensboard Carriage Assembly Limit Switch .....	5-5.18
Copyboard/Lensboard Carriage Assembly Wiper .....	4-7.30
Copyboard/Lensboard Drive Gear .....	5-5.53
Copyboard/Lensboard Drive Motor .....	5-5.16

## INDEX-Cont

## Subject

Paragraph  
Figure, Table,  
Number

## R - Cont

## Replace - Cont

Copyboard/Lensboard Drive Motor Gear.....	5-5.17
Copyboard/Lensboard Drive Shaft Spacer .....	5-5.20
Copyboard/Lensboard Idler Roller .....	4-7.31
Copyboard/Lensboard Silent Chain.....	5-5.21
Copyboard/Lensboard Silent Chain Sprocket .....	5-5.15
Copyboard Operating Rod Assembly .....	5-5.43
Copyboard or Lensboard Drive Reversing Drum Switch .....	5-5.22
Counter Assembly Bearing Housing.....	5-5.36
Counter Assembly Counter .....	5-5.38
Counter Assembly Extension Coupling.....	5-5.37
Counter Assembly Extension Shaft.....	5-5.35
Counter Assembly Lampholder.....	4-7.34
Counter Assembly Neon Lamp(s) .....	4-7.7
Counter Assembly Sprocket.....	5-5.34
Counter Assembly Toggle Switch.....	4-7.23
Cross Brace Needle Roller Bearing .....	5-5.23
Ground Glass Assembly Clip .....	4-7.4
Ground Glass Assembly Magnet Latch .....	4-7.20
Ground Glass Assembly Power Transmission Roller Chain .....	5-5.11
Ground Glass Frame Assembly .....	5-5.29
Lampholder in Light Box Assembly .....	5-5.44
Left or Right Hinge Bracket Assembly .....	5-5.12
Lensboard Assembly Horizontal Drive Shaft .....	5-5.49
Lensboard Assembly Lensboard Rack .....	4-7.18
Lensboard Assembly Shutter Assembly .....	4-7.15
Lensboard Assembly Upper Bearing Block.....	5-5.50
Lensboard Assembly Upper Guide .....	5-5.52
Lensboard Assembly Vertical Drive Shaft .....	5-5.51
Lensboard Carriage Assembly Duplex Receptacle Connector .....	4-7.33
Lensboard Carriage Assembly Two-Way Limit Switch .....	5-5.19
Lensboard Extension Spring(s) .....	4-7.17
Lensboard Shutter Cable Assembly .....	4-7.16
Lensboard Horizontal/Vertical Handwheel Control Shafts .....	5-5.13
Lensboard Horizontal/Vertical Universal Joints .....	5-5.14
Lensboard Vertical/Horizontal Control Shaft.....	5-5.25
Lensboard Vertical/Horizontal Coupling .....	5-5.24
Lensboard Vertical/Horizontal Drive Gear .....	5-5.27
Lensboard Vertical/Horizontal Driven Gear .....	5-5.28
Lensboard Vertical/Horizontal Extension Drive Shaft .....	5-5.26
Light Box Assembly Ballast.....	5-5.54
Light Box Assembly Suppression Filter .....	5-5.55
Light Box Fluorescent Lamp(s) .....	4-7.25
Light Box Fluorescent Starter(s) .....	4-7.26
Main Power Cable Assembly .....	5-5.8
Photogrid in Ground Glass Assembly.....	5-5.30

INDEX

Subject

Paragraph  
Figure, Table,  
Number

R - Cont

Replace - Cont

Positive Holder Assembly Diverter Valve Plate .....	5-5.45
Pulsed Xenon Lamp Flash Tube .....	3-3.1
Sprocket Assembly .....	5-5.10
Switch(es) .....	4-7.21
Vacuum Back Assembly Back Plate .....	5-5.33
Vacuum Conduit .....	4-7.27
Vacuum Back Assembly Control Valve .....	5-5.32
Vacuum Locking Assembly Rollers .....	4-7.5
Vacuum Locking Assembly Slide Shaft(s) .....	4-7.6
Vacuum Back Assembly Vacuum Plate .....	5-5.31
Reporting Equipment Improvement Recommendations .....	1-3
Retrammel .....	4-7.37.8

S

Safety Check .....	4-7.31.1
Self-Tests, Initial Adjustments, Daily Checks and .....	2-4
Services, Preventive Maintenance Checks and .....	T 2-1
	T 4-1
Scope .....	1-1
Special Tools; TMDE, and Support Equipment .....	4-2
	5-2
Sprocket Assembly, Replace .....	5-5.10
Storage or Shipment .....	4-8
Support Equipment, Special Tools; TMDE, and .....	4-2
	5-2
Switch(es), Replace .....	4-7.21

T

Test Bellows Assembly for Light Leaks.....	4-7.36
Trammel Copyboard Assembly and Positive Holder Assembly .....	4-7.37.4
Trammel Ground Glass Assembly .....	4-7.37.3
Trammel Vacuum Back Assembly .....	4-7.37.2
Troubleshooting .....	T 3-1
.....	T 4-2
.....	T 5-1

U

Unusual Weather, Operation in .....	2-9
Use, Assembly and Preparation for .....	2-3

INDEX

<b>Subject</b>	<b>Paragraph Figure, Table, Number</b>
<b>V</b>	
Vacuum Back Assembly and Ground Glass Assembly, Adjust .....	4-7.37.9
Vacuum Back Assembly Back Plate, Replace .....	5-5.33
Vacuum Back Assembly Control Valve, Replace.....	5-5.32
Vacuum Back Assembly Vacuum Plate, Replace . .....	5-5.31
Vacuum Conduit, Replace .....	4-7.27
Vacuum Locking Assembly Rollers, Replace .....	4-7.5
Vacuum Locking Assembly Slide Shaft(s), Replace .....	4-7.6

By Order of the Secretary of the Army:

Official:

**R. L. DILWORTH**  
*Brigadier General, United States Army*  
*The Adjutant General*

**JOHN A. WICKHAM, JR.**  
*General, United States Army*  
*Chief of Staff*

DISTRIBUTION:

To be distributed in accordance with special list.

★ U.S. GOVERNMENT PRINTING OFFICE: 1989 - 242-45/05086



RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



**SOMETHING WRONG WITH PUBLICATION**

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER

PUBLICATION DATE

PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.

PARA-GRAPH

FIGURE NO.

TABLE NO.

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

TEAR ALONG PERFORATED LINE

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE

# THE METRIC SYSTEM AND EQUIVALENTS

## Linear Measure

1 centimeter = 10 millimeters = .39 inch  
 1 decimeter = 10 centimeters = 3.94 inches  
 1 meter = 10 decimeters = 39.37 inches  
 1 dekameter = 10 meters = 32.8 feet  
 1 hectometer = 10 dekameters = 328.08 feet  
 1 kilometer = 10 hectometers = 3.2808.8 feet

## Square measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. in.  
 1 sq. decimeter = 100 sq. centimeters = 15.5 inches  
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 feet  
 1 sq. dekameter (are) = 100 sq. meters = 1.076.4 sq. ft.  
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres  
 1 sq. kilometer = 100 hectometers = .386 sq. miles

## Weights

1 centigram = 10 milligrams = .15 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigram = .035 ounce  
 1 dekagram = 10 grams = .35 ounce  
 1 hectogram = 10 dekagrams = 3.52 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.46 pounds  
 1 metric ton = 10 quintals = 1.1 short tons

## Liquid Measure

1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 centiliter = 10 milliliters = .34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 metric ton = 10 quintals = 1.1 short tons

## Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch  
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu in.  
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

## Approximate Conversion Factors

To change	To	Multiply by	To change	To	Multiply by
inches	centimeters	2.540	ounce inches	newton-meters	.0070062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
sq. inches	sq. centimeters	6.451	kilometers	miles	.621
sq. feet	sq. meters	.093	sq. centimeters	sq. inches	.155
sq. yards	sq. meters	.836	sq. meters	sq. yards	10.764
sq. miles	sq. kilometers	2.590	sq. kilometers	sq. miles	1.196
acres	sq. hectometers	.405	sq. hectometers	acres	2.471
cubic feet	cubic meters	.028	cubic meters	cubic feet	35.315
cubic yards	cubic meters	.765	milliliters	fluid ounces	.034
fluid ounces	milliliters	29.573	liters	pints	2.113
pints	liters	.472	liters	quarts	1.057
quarts	liters	.946	grams	ounces	.035
gallons	liters	3.785	kilograms	pounds	2.205
ounces	grams	28.349	metric tons	short tons	1.102
pounds	kilograms	.454	pound-feet	newton-meters	1.356
short tons	metric tons	.907			
pound inches	newton-meters	.11296			

## Temperature (Exact)

°F Fahrenheit temperature

5/9 ( after subtracting 32)

Celsius Temperature °C

