

TM 9-1240-375-34

TECHNICAL MANUAL

Direct Support and General Support Maintenance Manual  
for

QUADRANT, FIRE CONTROL: M17  
(1290-01-037-3883);

QUADRANT, FIRE CONTROL: M18  
(1290-01-037-7289);

MOUNT, TELESCOPE AND QUADRANT: M171  
(1240-01-039-7273);

MOUNT, TELESCOPE AND QUADRANT: M172  
(1240-01-037-7290);

TELESCOPE, PANORAMIC: M137  
(1240-01-038-0531); AND

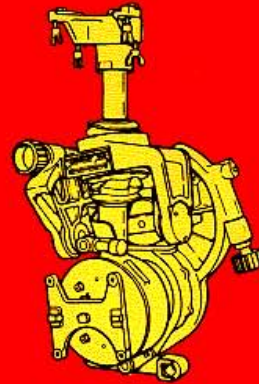
TELESCOPE, ELBOW: M138  
(1240-01-038-0530)



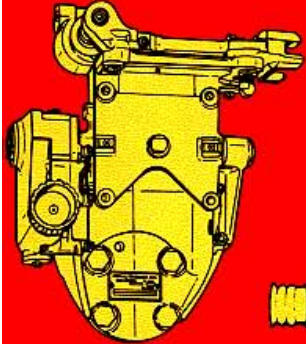
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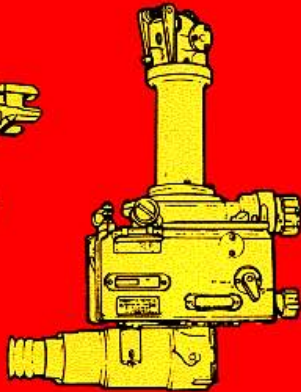
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M172



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HEADQUARTERS, DEPARTMENT OF THE ARMY  
SEPTEMBER 1980

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## WARNING

All personnel that operate and/or maintain fire control equipment must be aware of the following special precautions.

### RADIOACTIVE MATERIALS



### RADIATION HAZARD

#### Rules and Regulations

Copies of the following rules and regulations are maintained at HQ, ARRCOM Rock Island, IL 61299. Copies may be requested, or information pertinent to these rules and regulations obtained, by contacting the ARRCOM Radiological Protection Officer (RPO), AUTOVON 793-6982, Commercial (309)794-5843.

10CFR Part 19—Notices, Instructions, and Reports to Workers; Inspections.

10CFR Part 20—Standards for Protection Against Radiation.

NRC license, license conditions, and license application.

#### Safety Precautions

The radioactive material used in these instruments is tritium gas ( $H_3$ ) sealed in pyrex tubes. It poses no significant hazard to the re-

pairman when intact. These sources illuminate the instrumentation for night operations. Tampering with or removal of the sources in the field is prohibited by Federal law. In the event there is no illumination, notify the local Radiological Protection Officer. Do not attempt to repair or replace the instrument in the field! If skin contact is made with any area contaminated with tritium, immediately wash with nonabrasive soap and water.

#### Identification

Radioactive self-luminous sources are identified by means of radioactive warning labels (as above). These labels should not be defaced or removed, and should be replaced immediately when necessary. Refer to the local RPO or the ARRCOM RPO for instructions on handling, storage, or disposal.

#### Storage and Shipping

All radioactively illuminated instruments or modules which are defective will be evacuated to a depot maintenance activity. These items must be placed in a plastic bag (TM 9-1025-211-10) and packaged in the shipping container from which the replacement was taken before evacuation to a higher echelon is made. Spare equipment must be stored in the shipping container, as received, until installed on the weapon. Storage of these items is recommended to be in an outdoor shed-type storage or unoccupied building.

#### First Aid

For further information on first aid, see FM 21-11.



Change

NO. 2

HEADQUARTERS,  
DEPARTMENT OF THE ARMY  
Washington, DC, 17 September 1987

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AND  
TELESCOPE, ELBOW: M138  
(1240-01-038-0530)

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2. All data on warning page to be deleted and replaced with new data.

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B-1 and B-2  
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Index 3 and Index 4

3. File these change sheets, and all others, in front of the publication for reference purposes.

By Order of the Secretary of the Army:

CARL E. VUONO  
*General, United States Army*  
*Chief of Staff*

Official:

R. L. DILWORTH  
*Brigadier General, United States Army*  
*The Adjutant General*  
DISTRIBUTION:

To be distributed in accordance with DA Form 12-40, Direct Support and General Support Maintenance requirements for Howitzer, Medium, Towed, 155-MM, M198.



**WARNING**

All personnel that operate and/or maintain fire control equipment must be aware of the following special precautions.

**RADIOACTIVE MATERIALS  
RADIATION HAZARD****TRITIUM H3****Rules and Regulations**

-Copies of the following rules and regulations are maintained at HQ, AMCCOM Rock Island, IL 61299-6000. Copies may be requested, or information obtained by contacting the AMCCOM Radiological Protection Officer (RPO), AUTOVON 793-2964, Commercial (309) 782-2964.

10CFR Part 19-Notices, Instructions, and Reports to Workers: Inspections.

10CFR Part 20-Standards for Protection Against Radiation. NRC license, license conditions, and license application.

**Safety Precautions**

The radioactive material used in these instruments is tritium gas (H3) sealed in pyrex tubes. It poses no significant hazard to the repairman when intact. These sources illuminate the instrumentation for night operations. Tampering with or removal of the sources in the field is prohibited by Federal law. In the event there is no illumination, notify the local Radiological Protection Officer. Do not attempt to repair or replace the instrument in the field. If skin contact is made with any area contaminated with tritium, immediately wash with nonabrasive soap and water.

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By Order of the Secretary of the Army:

Official:

E. C. MEYER  
*General, United States Army*  
*Chief of Staff*

ROBERT M. JOYCE  
*Major General, United States Army*  
*The Adjutant General*

DISTRIBUTION ;

To be distributed in accordance with DA Form 12-41 Direct and General Support requirements for Mount, Quadrant; Mount, Telescope; Quadrant, Fire Control; Telescope, Elbow; Telescope, Panoramic.



TECHNICAL MANUAL )

No. 9-1240-375-34)

TM 9-1240-375-34  
HEADQUARTERS,  
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Washington, DC, 26 September 1980

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AND  
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(1240-01-038-0530)

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistakes 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, US Army Armament, Munitions and Chemical Command, IATTN: AMSMC-MAS, Rock Island, IL 61299-6000. A reply will be furnished directly to you.

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### HOW TO USE THIS MANUAL

#### GENERAL

References in the manual are to pages and other technical manuals.

#### INDEXES

This manual is organized to help the user quickly find the information needed. There are several useful indexes.

- a. **Front Cover Index.** Is a tabbed index of chapters and appendixes. Keyed to tabbed pages in the manual.
- b. **Table of Contents.** Lists in order all chapters, sections, and appendixes. Gives page references.
- c. **Nomenclature Cross-Reference List and List of Abbreviations.**

(1) **Nomenclature Cross-Reference List.** Gives an alphabetical list of common item names used in the manual. Official nomenclature is given for each item (p 1-2).

(2) **List of Abbreviations.** Is an alphabetical list of uncommon abbreviations used in the manual (p 1-3).

d. **Chapter Indexes.** At the beginning of each chapter. List paragraphs in alphabetical order. Reference pages.

e. **Chapter Overviews.** Summarize material covered in the chapter. Are located after chapter index at the beginning of each chapter.

f. **Symptom Index.** Located just before the troubleshooting table in each maintenance chapter. Lists in alphabetical order parts with possible malfunctions. References pages of the troubleshooting tables.

**g. Alphabetical Index.** Located at the end of the manual. An extensive subject index for everything in the manual. Gives page references.

## MAINTENANCE PROCEDURES

There are six maintenance chapters, one each for: M17 fire control quadrant, M18 fire control quadrant, M171 telescope and quadrant mount, M172 telescope and quadrant mount, M137 panoramic telescope, and M138 elbow telescope. Section IV and V of each chapter begins with a summary procedure, followed by detailed procedures for the maintenance tasks.

**a. Summary Procedure.** Made up of two parts-initial setup and list of tasks. Used only when doing maintenance on an entire piece of fire control equipment. (For maintenance of an individual part, use the detailed procedures immediately following each summary procedure.)

**(1) Initial Setup.** Is a list of everything needed to perform maintenance on fire control equipment:

**Test Equipment**-Lists required test equipment.

**Special Tools**--Lists tools required to perform the maintenance procedure.

**Materials/Parts**-Lists expendable materials. Each material or part is followed by a part number or appendix reference. If more than one part is needed, the quantity needed precedes the part number or reference.

**References**--Lists other publications containing necessary information.

**Troubleshooting References**-Lists malfunctions which can be corrected by following the maintenance procedure.

**Equipment Conditions**--Lists conditions to be met before starting the procedure. The reference on the left of the condition is a page reference to instructions for setting up the condition. At the end of each condition is a reference to the task numbers on the list of tasks to which the condition applies.

**Special Environmental Conditions**-Lists environmental conditions (such as lighting, temperature) needed before starting the task.

**(2) List of Tasks.** Summarizes in outline form the major tasks involved in your procedure. Gives page references to troubleshooting table and detailed procedures.

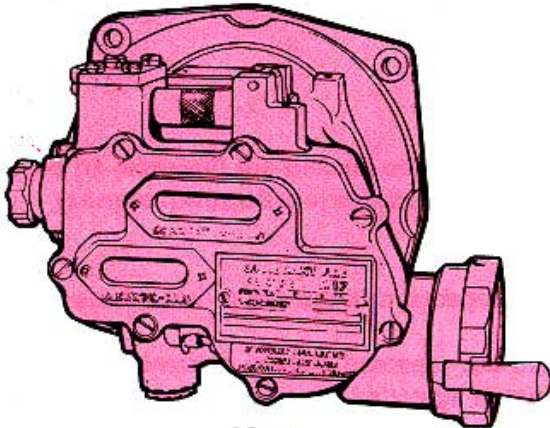
**b. Detailed Procedures.** Immediately follow each summary procedure. Also contain an initial setup plus step-by-step procedures.

**(1) Initial Setup.** Gives a list of everything needed in order to do maintenance on one part of a fire control equipment (for example, the adapter assembly for the M172 mount on p 510). See explanation of initial setup above.

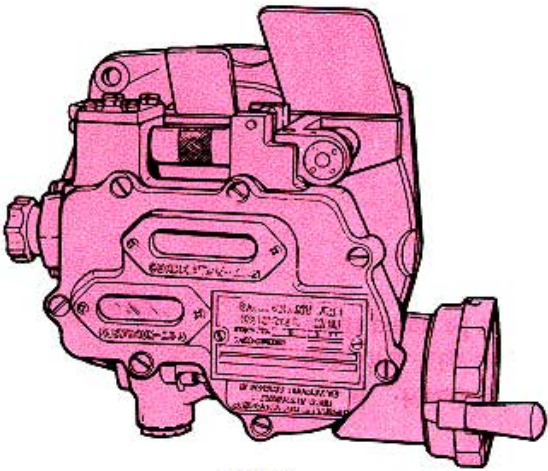
**(2) Step-By-Step Procedures.** Are illustrated procedures for maintenance authorized in the MAC (TM 9-1025211-20&P) and the RPSTL (TM 9-1240-375-34P).

**c. Troubleshooting.** Also included in section III of each chapter are procedures for direct support and general support troubleshooting.

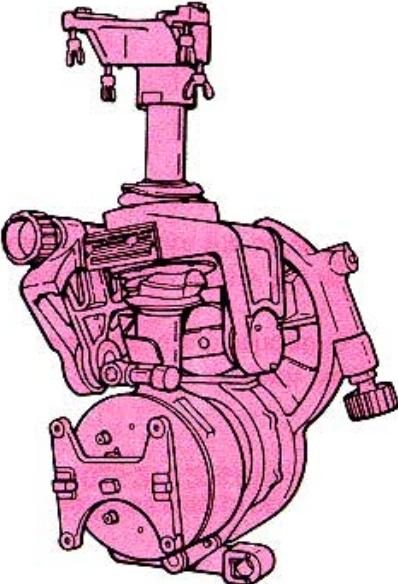
**d. Final Inspection Procedures.** Immediately follow the maintenance sections. List inspections and tests required to ensure the serviceability of each piece of fire control equipment.



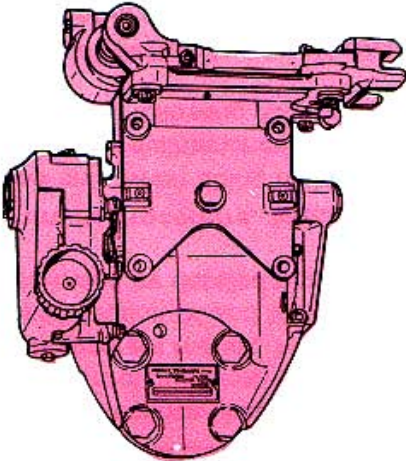
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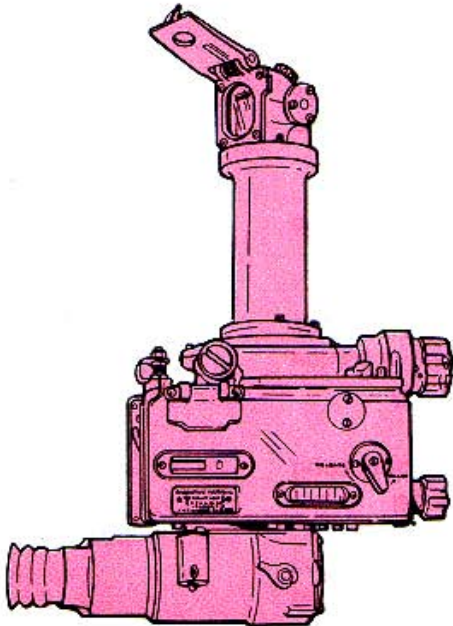
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INTRODUCTION**

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**CHAPTER OVERVIEW**

Section I references applicable maintenance forms, records, and reports; gives the procedure for reporting equipment improvement recommendations; and provides a cross-reference list of nomenclature and list of abbreviations. General descriptions, tabulated data, and locations for the M198 howitzer fire control equipment are provided in section II.

**Section I. GENERAL INFORMATION**

**1-1. SCOPE**

- a. Type of manual: Direct and general support maintenance.
- b. Model numbers and equipment names:
  - (1) M17 fire control quadrant.
  - (2) M18 fire control quadrant.
  - (3) M171 telescope and quadrant mount.
  - (4) M172 telescope and quadrant mount.

- (5) M137 panoramic telescope.
- (6) M138 elbow telescope.

c. Purpose of equipment:

- (1) M17 Quadrant. Measures cannon elevation during one-person operation.
- (2) M18 Quadrant. Measures cannon elevation during two-person operation.

**1-1. SCOPE (cont)**

c. Purpose of equipment: (cont)

(3) M171 Mount. Provides a mount for the M17 quadrant and M137 telescope.

(4) M172 Mount. Provides a mount for the M18 quadrant and M138 telescope.

(5) M137 Telescope. Provides a means of measuring horizontal direction in the indirect fire operation.

(6) M138 Telescope. Provides direction in the direct fire operation.

**1-2. MAINTENANCE FORMS, RECORDS. AND REPORTS**

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.

**1-3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)**

EIR's will be prepared using SF 368 (Quality Deficiency Report). Instructions for preparing EIR's are provided in DA PAM 738-750, The Army Maintenance Management System. EIR's should be mailed directly to Commander, US Army Armament, Munitions and Chemical Command, ATTN: AMSMC-QAD, Rock Island, IL 61299-6000. A reply will be furnished directly to you.

**1-4. NOMENCLATURE CROSS-REFERENCE LIST AND LIST OF ABBREVIATIONS**

**a. Nomenclature Cross-Reference List.**

<b>Common Name</b>	<b>Official Nomenclature</b>
Adapter .....	Quadrant testing fire control maintenance final inspection fixture
Azimuth counter .....	Rotating counter
Azimuth counter cover .....	Counter cover
Azimuth counter eccentric .....	Eccentric
Azimuth knob .....	Knob
Azimuth knob assembly .....	Knob assembly
Bracket .....	Rotating eye bracket
Collimator telescope .....	M1A1 infinity aiming reference collimator
Correction counter .....	Rotating counter
Correction knob .....	Knob
Correction knob assembly .....	Knob assembly
Cross level knob .....	Knob
Cross level vial .....	Level vial
Deflection counter .....	Rotating counter
Deflection counter eccentric .....	Eccentric
Elevation counter .....	Rotating counter
Elevation knob .....	Shouldered knob
Elevation knob assembly .....	Knob assembly
Elevation level vial .....	Level vial
Eyeshield .....	Optical eyeshield
Eyeshield .....	Optical instrument eyeshield
Felt .....	Mechanical preformed felt
Felt holder .....	Felt mechanical holder
Grease .....	Aircraft grease (aircraft instrument)

Common Name	Official Nomenclature
Grease .....	Aircraft grease (corrosion-resistant)
Housing .....	Worm gear housing
Housing .....	Worm housing body
Latch .....	Lock-release latch
Lever .....	Lock-release lever
Lever .....	Plunger-release lever
Locking ring .	Ring
Lock wire.....	Nonelectrical wire
M137 telescope .....	M137 panoramic telescope
M138 telescope .....	M138 elbow telescope
M17 quadrant .....	M17 fire control quadrant
M171 mount .....	M171 telescope and quadrant mount
M172 mount .....	M172 telescope and quadrant mount
M18 quadrant .....	M18 fire control quadrant
Packing .....	Preformed packing
Plunger .....	Detent plunger
Radioactive material caution plate .....	Instruction plate

Common Name	Official Nomenclature
-------------	-----------------------

Shop set .....	Instrument and fire control shop equipment
Support assembly .....	Quadrant support assembly
Telescope head spacer .....	Optical element spacer
Tool box .....	Instrument and fire control system repair shop equipment
Tool kit.....	Field artillery mechanics tool kit
Tool set .....	Fire control maintenance and repair shop specialized equipment tool set

**b. List of Abbreviations.**

Abbreviation	Definition
app. ....	Appendix
ft-lb.....	Foot-pound
in.-lb .....	Inch-pound
in.-oz .....	Inch-ounce
N-m .....	Newton/meter

**Section II. EQUIPMENT DESCRIPTION AND DATA**

**NOTE**

All fire control quadrants and telescopes contain radioactive sources, used to illuminate areas that in other instruments were illuminated by an external battery source. The sources are completely sealed tubes, and do not present any external radiation hazard. The tubes used in these instruments are of various sizes, shapes, and lengths. Each is shock mounted in clear potting compound and assembled in the interior of the equipment to protect it from damage.

**1-5. EQUIPMENT PURPOSE, CAPABILITIES, AND FEATURES**

a. M17 and M18 Fire Control Quadrants. The dual fire control quadrants are identical with the following exceptions: The M17 quadrant contains a left-hand worm shaft assembly and gear, and the M18 quadrant contains a right-hand worm shaft assembly and gear. Also, the M18 quadrant features a cross level vial, which is not present on the M17 quadrant. Both quadrants have the capability of measuring elevation to 1433 mils. The dual equipment permits either the assistant gunner or the gunner to lay the cannon in elevation. The counters and level vials are self-illuminated.

## 1-5. EQUIPMENT PURPOSE, CAPABILITIES, AND FEATURES(cont)

**b. M171 Telescope and Quadrant Mount.** The M171 mount supports the M137 telescope and the M17 quadrant. The M171 mount is installed on the left trunnion of the M198 howitzer. It provides an adjustable base for leveling the M137 telescope and the M17 quadrant. The adjustable base compensates for azimuth and elevation errors introduced by cant when the weapon is elevated. Self-illuminated level vials are provided for cross and elevation-leveling.

**c. M172 Telescope and Quadrant Mount.** The M172 mount supports and provides an adjustable base for leveling and boresighting the M138 telescope and the M18 quadrant. The M172 mount is installed on the right trunnion of the M198 howitzer.

**d. M137 Panoramic Telescope.** The M137 telescope is a 4power, 10-degree field of view instrument with digital counters. All counters and the reticle are self-illuminated by radioactive isotopes. The M137 telescope is the basic instrument used in laying the M198 howitzer in azimuth. It is mounted to the upper part of the M171 mount. This instrument is hermetically sealed and can be flushed with dry nitrogen.

**a. M138 Elbow Telescope.** The M138 telescope is an 8-power, 8 degree field of view instrument. A self-illuminated elevation reticle is provided for direct fire. The M138 telescope also has a mil scale reticle that is inscribed in meters for range and is self-illuminated. The optical system is composed of the following:

- A two-component objective lens system
- An amici prism
- A flat reticle
- A reticle lens
- A field lens
- A center lens
- An eye lens

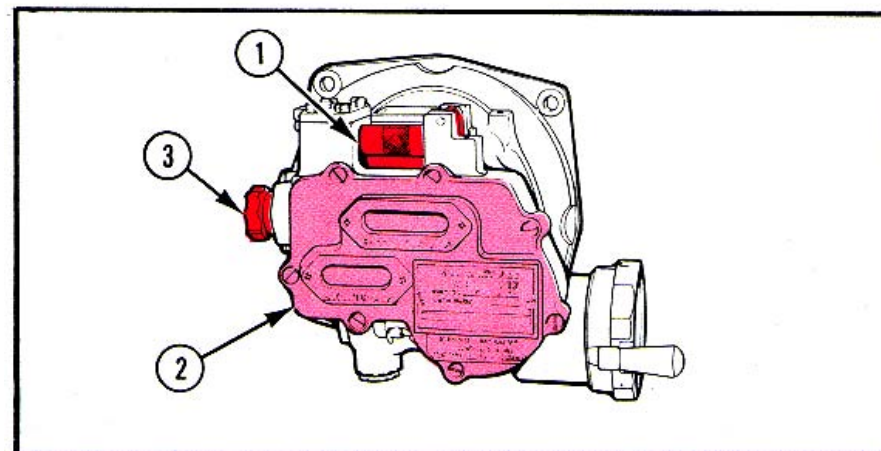
## 1-6. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

### a. M17 Fire Control Quadrant.

(1) Fire Control Level Assembly (1). The fire control level assembly consists of an elevation level vial in a vial holder. The fire control level assembly is used in checking the M199 cannon in elevation.

(2) Cover Assembly (2). The cover assembly includes the counter windows, the radioactive sources that illuminate the dials, the identification plate, and the instruction plate.

(3) Correction Knob Assembly (3). The correction knob assembly is located on the left side of the M17 quadrant. It is used to set elevation correction increments on the correction counter.





**(4) Counter Assembly (4).** The counter assembly consists of the elevation counter and the correction counter. The counters are mounted in the housing assembly.

**(5) Base Assembly (5).** The base assembly provides the mounting surface for the M17 quadrant. It also contains a bearing necessary for accurate rotation when setting elevation.

**(6) Worm Shaft Assembly (6).** The worm shaft assembly is located internally and is controlled by the elevation knob. The worm shaft assembly is used to level the M17 quadrant in elevation by moving the elevation and correction counters.

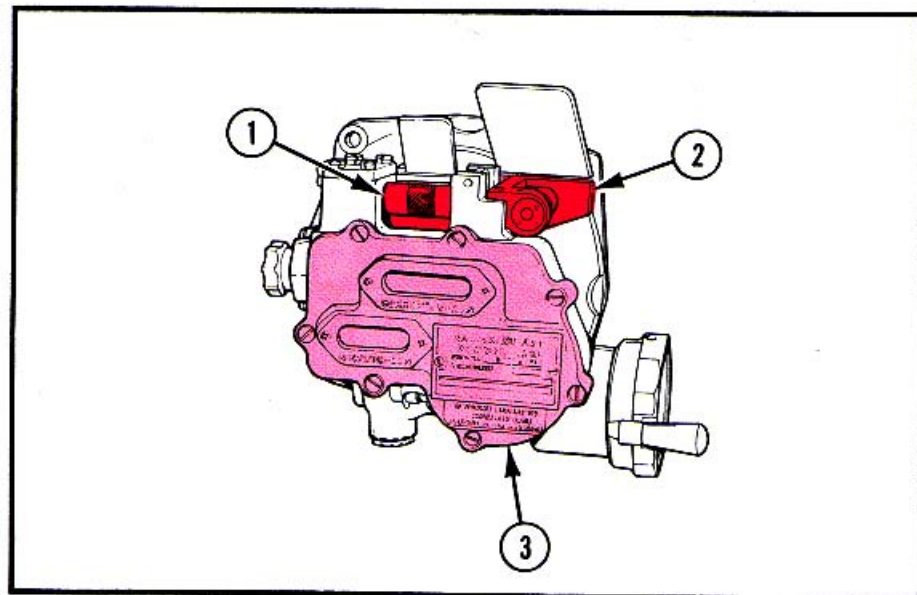
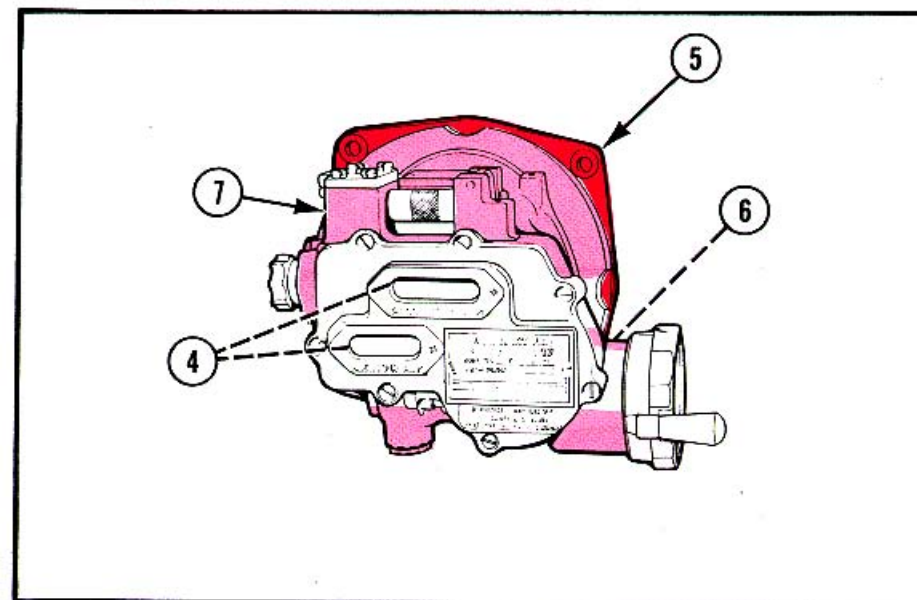
**(7) Housing Assembly (7).** The housing assembly for the M17 quadrant contains an elevation knob assembly, correction knob assembly, counter assembly, fire control level assembly, and a worm shaft assembly.

#### b. M18 Fire Control Quadrant.

**(1) Fire Control Level Assembly (1).** The fire control level assembly consists of an elevation level vial in a vial holder. The fire control level assembly is used in checking the M199 cannon in elevation.

**(2) Level Assembly (2).** The level assembly is located on the upper right side of the M18 quadrant. The level assembly consists of a cross level vial in a vial holder, and is used in checking the M198 howitzer for cross level.

**(3) Cover Assembly (3).** The cover assembly includes the counter windows, the radioactive sources that illuminate the dials, the identification plate, and the instruction plate.



## 1-6. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (cont)

## b. M18 Fire Control Quadrant. (cont)

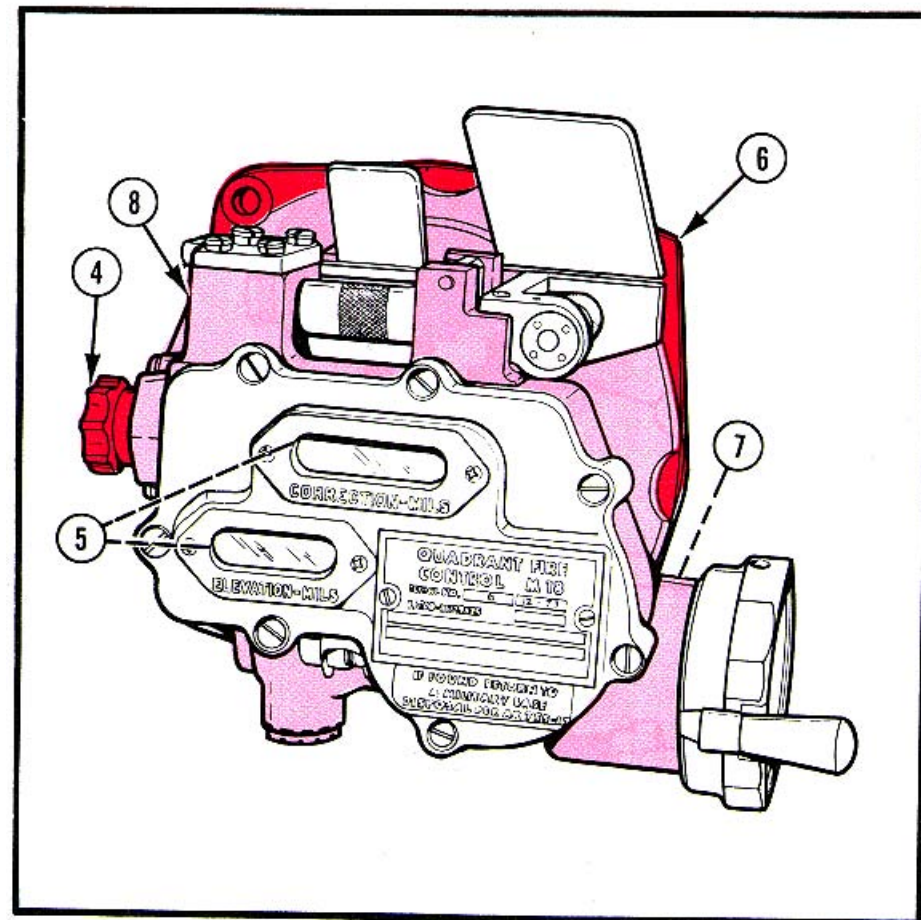
**(4) Correction Knob Assembly (4).** The correction knob assembly is located on the left side of the M18 quadrant. It is used to set elevation correction increments on the correction counter.

**(5) Counter Assembly (5).** The counter assembly consists of the elevation counter and the correction counter. The counters are mounted in the housing assembly.

**(6) Base Assembly (6).** The base assembly provides the mounting surface for the M18 quadrant. It also contains a bearing necessary for accurate rotation when setting elevation.

**(7) Worm Shaft Assembly (7).** The worm shaft assembly is located internally and is controlled by the elevation knob. The worm shaft assembly is used to level the M18 quadrant in elevation by moving the elevation and correction counters.

**(8) Housing Assembly (8).** The housing assembly for the M18 quadrant contains an elevation knob assembly, correction knob assembly, counter assembly, level assembly, fire control level assembly, and a worm shaft assembly.



### c. M171 Telescope and Quadrant Mount.

**(1) Optical Instrument Support (1).** The optical instrument support, located at the top of the M171 mount, seats the M137 telescope.

**(2) Optical Instrument Rocker Assembly (2).** The optical instrument rocker assembly houses the cross-leveling mechanism. In conjunction with the elevation-leveling mechanism located on the housing assembly, the optical instrument rocker assembly establishes the vertical axis reference for azimuth compensation.

**(3) Worm Shaft Assembly (Cross Level) (3).** The worm shaft assembly is located in the optical instrument rocker assembly. The worm shaft assembly is actuated by a cross level knob. The cant of the M171 mount is controlled by this assembly.

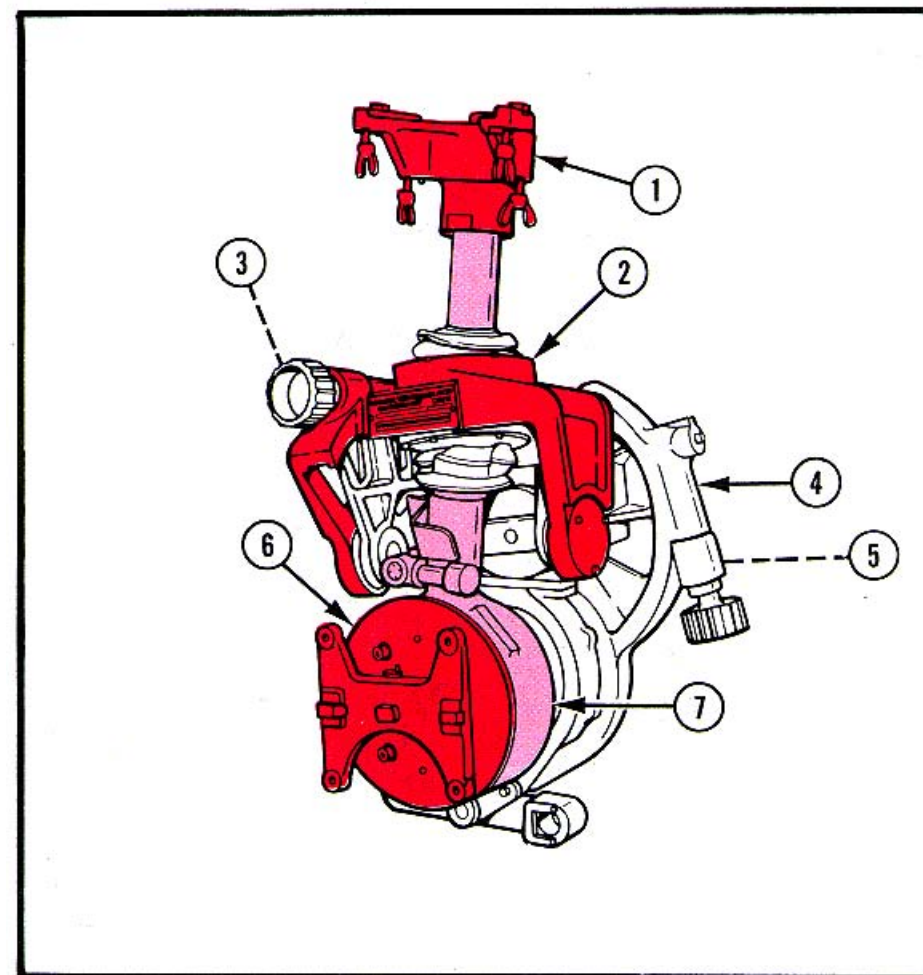
**(4) Housing Assembly (4).** The housing assembly houses the elevation-leveling mechanism and supports the plunger assembly. The plunger assembly secures the M171 mount in an upright position on the weapon. A spring-loaded guide is provided to prevent damage to the M171 mount if the elevation limit of the instrument is exceeded.

**(5) Worm Shaft Assembly (Elevation) (5).** The worm shaft assembly is located in the housing assembly. It is actuated by the elevation knob.

**(6) Arm and Adapter Assembly (6).** The arm and adapter assembly is located on the face of the arm assembly, and supports the M17 quadrant. The mounting adapter provides the keyed interface for assembling the M171 mount to the prequalified mounting adapter on the weapon trunnion. This adapter also houses the bar. It serves as a reference about which the M171 mount is adjusted to compensate in azimuth and elevation for the effects of trunnion cant.

**(7) Bearing Housing Assembly (7).** The bearing housing assembly houses the bearings which permit the smooth, compensating

motion when the weapon is elevated. The stem holds the optical instrument support, which seats the M137 telescope. It also provides the bearing in which the M171 mount is cross and elevation leveled. Located at the base of the stem are the cross level vial and elevation level vial.



## 1-6. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (cont)

**d. M172 Telescope and Quadrant Mount.**

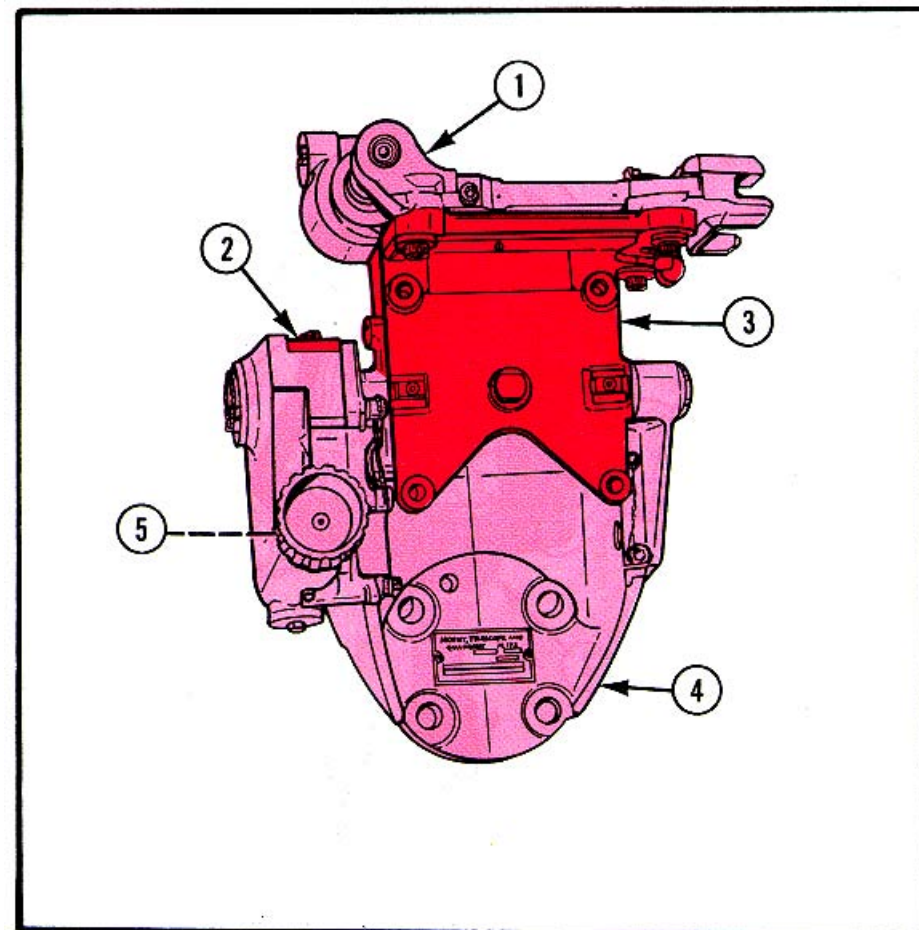
(1) Telescope Mounting Bracket (1). The telescope mounting bracket, attached to the top portion of the adapter assembly, supports the M138 telescope. Seats are included to support a M1A2 gunner's quadrant when fine elevation settings are required.

(2) Access Cover (2). The access cover is located on top of the housing on the support assembly. The purpose of the access cover is to protect and aid in alignment of the worm wheel gear sector.

(3) Adapter Assembly (3). The adapter assembly supports the M18 quadrant. This assembly pivots about an axis, parallel to the weapon bore, to facilitate cross leveling.

(4) Quadrant Support Assembly (4). The support assembly provides the keyed interface for assembling the M172 mount to the weapon mounting adapter. It also includes the cross-leveling mechanism for the M172 mount.

(5) Worm Shaft Assembly (5). The worm shaft assembly is located in the housing on the support assembly and is operated using the cross level knob. The worm shaft assembly is used to actuate the adapter assembly.





e. M137 Panoramic Telescope.

(1) Head Assembly (1). The head assembly is capable of 360degree (6400-mil) revolution. The amount of azimuth travel is indicated by a counter box assembly. The head assembly is adjustable in elevation (+ 300 mils) by means of an elevation knob. An entrance window protects the prism and the rest of the M137 telescope against moisture, dirt, and other foreign particles. A window cover, when in the closed position, forms a parallax shield to reduce parallax when viewing a close target.

(2) Telescope Head Spacer (2). The telescope head spacer couples the head assembly to the body assembly at a sufficient height so the line of sight has minimum obstructions.

(3) Body Assembly (3). The body assembly includes the main M137 telescope tube and housing and the radioactive sources that illuminate the reticles. This assembly also includes the azimuth knob assembly and associated gearing that rotates the head assembly and drives the counter box assembly. One rotation of the azimuth knob assembly rotates the head assembly 100 mils.

(4) Knob Assembly (4). The knob assembly is located on the body assembly. It is used to activate the worm shaft assembly which rotates the head assembly.

(5) Elbow Assembly (5). The elbow assembly is located on the bottom of the M137 telescope. The elbow assembly contains the optical cell assembly and adapter assembly.

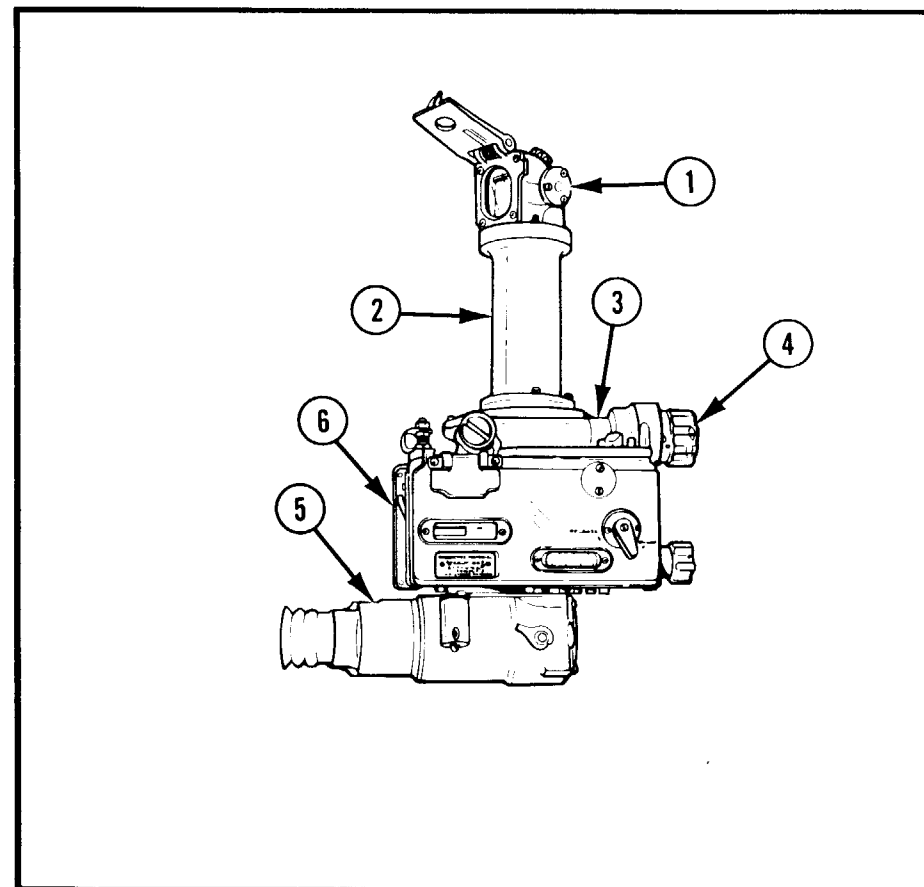
(6) Counter Box Assembly (6). The counter box assembly contains the 6400-mil azimuth counter, the 6400-mil deflection counter, and the 95mil correction counter. It also contains the associated gearing for driving and setting the counters.

(a) The azimuth counter indicates the azimuth angle of the M137 telescope head assembly with respect to the weapon bore.

(b) The deflection counter indicates the azimuth angle in mils.

It enables an operator to quickly lay the weapon on a desired deflection setting with respect to the aiming posts or collimator.

(c) The correction counter indicates relatively constant deflection correction.



**1-6. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (cont)**

**f. M138 Elbow Telescope.**

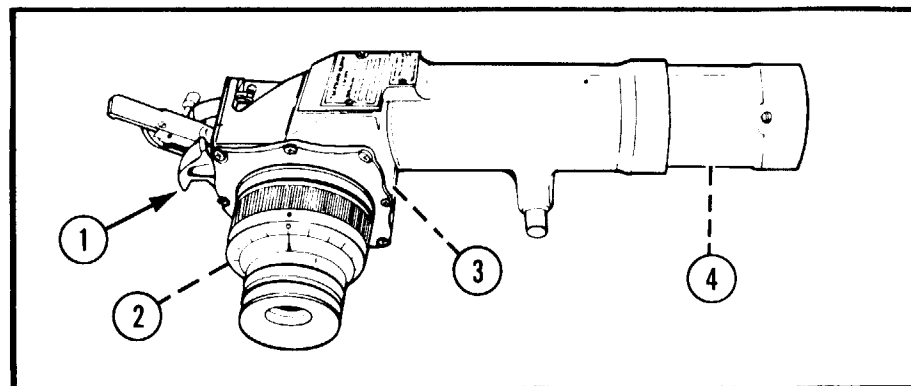
(1) Optical Instrument Latch Set (1). The optical instrument latch set is attached to the eyepiece end of the M138 telescope. The optical instrument latch set is used for mounting the M138 telescope to the M172 mount.

(2) Eyepiece Cell Assembly (2). The eyepiece cell assembly is inside the optical element holder, which is attached to the M138 telescope.

The eyepiece cell assembly consists of a series of lenses and spacers.

(3) Reticle Cell Assembly (3). The reticle cell assembly is inside the rear of the optical element holder. The reticle cell assembly consists of an optical element cell, reticle, and a nuclear lamp for illumination.

(4) Objective Cell Assembly (4). The objective cell assembly is located inside the optical instrument housing. The objective cell assembly consists of an optical element cell and an optical instrument lens. An optical instrument eyeshield is attached to the optical element holder.



**1-7. EQUIPMENT DATA I**

	<b>US CUSTOMARY</b>	<b>METRIC</b>
M17 Fire Control Quadrant		
Correction .....	95 mils	
Depression .....	- 280 mils	
Elevation .....	+ 1433 mils	
Least increment reading (counters) .....	1 mil	
Radioactive material:		
Max surface radiation .....	0 millirad per hour	
Tritium H3 .....	1.86 curies	
Weight .....	7.5 lb	3.40 kg

M18 Fire Control Quadrant		
Correction .....	95 mils	
Depression .....	- 280 mils	
Elevation .....	+ 1433 mils	
Least increment reading (counters) .....	1 mil	
Radioactive material:		
Max surface radiation .....	0 millirad per hour	
Tritium H3 .....	1.95 curies	
Weight .....	7.5 lb	3.40 kg
M171 Telescope and Quadrant Mount		
Cross level adjustment:		
Left .....	178 mils	
Right.....	178 mils	
Depression .....	- 270 mils	
Elevation .....	+ 1333 mils	
Pitch level adjustment:		
Aft .....	178 mils	
Fore.....	178 mils	
Radioactive material:		
Max surface radiation .....	0 millirad per hour	
Tritium H3 .....	.015 curies	
Weight:		
Adapter assembly .....	3.25 lb	1.47 kg
Mount .....	75 lb	34.02 kg
Optical instrument support .....	2 lb	0.91 kg
M172 Telescope and Quadrant Mount		
Boresighting:		
Azimuth .....	18 mils	
Elevation .....	15 mils	
Cross level adjustment .....	34 degrees	
Weight:		
Adapter assembly .....	4.75 lb	2.15 kg
Mount .....	27.5 lb	12.47 kg

1-7. EQUIPMENT DATA (cont)

	US CUSTOMARY	METRIC
M137 Panoramic Telescope		
Field of view.....	10 degrees	
Movement:		
Azimuth counter .....	6400 mils'	
Azimuth (deflection).....	6400 mils	
Correction (AZ) .....	95 mils	
Elevation .....	300 mils	
Least increment reading (AZ) .....	1.0 mils	
Optical characteristics:		
Clear eye distance .....	0.88 in.	2.24 cm
Effective focal length:		
Eyeshield .....	1.00 in.	2.54 cm
Objective .....	4.00 in.	10.16 cm
Exit pupil diameter .....		7mm
Field of view .....	10 degrees	
Power.....	4X	
Radioactive material:		
Max surface radiation .....	0 millirad per hour	
Tritium H3 .....	5.1 curies	
Weight .....	19 lb	8.62 kg
M138 Elbow Telescope		
Elevation.....	60 mils	
Field of view .....	8 degrees	
Optical characteristics:		
Diopter adjustment .....	4 diopters	
Effective focal length:		
Clear eye distance .....	6-3/5 in.	16.76 cm
Eyeshield .....	1-1/2 in.	3.81 cm
Objective .....	10 in.	25.40 cm

\*Increasing counterclockwise.

Exit pupil diameter .....	7 mm	
Field of view .....	8 degrees	
Power.....	8X	
Radioactive material:		
Max surface radiation .....	0 millirad per hour	
■ Tritium H3 .....	4.4 curies	
Weight .....	8 lb	3.63 kg

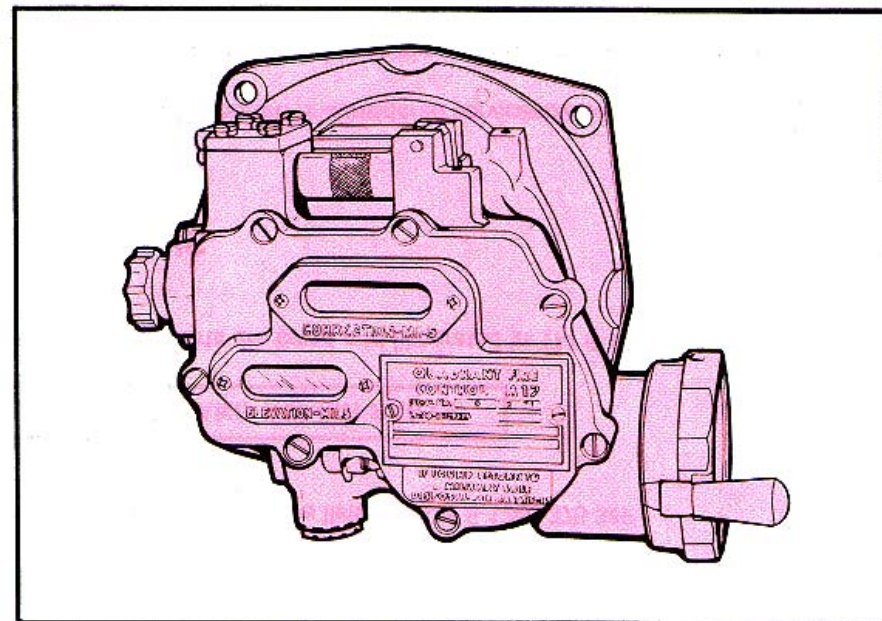
**CHAPTER 2  
M17 FIRE CONTROL QUADRANT-MAINTENANCE  
INSTRUCTIONS**

**CHAPTER INDEX**

	<b>Page</b>
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Counter Assembly-General Support Maintenance Instructions.....	2-46
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**CHAPTER OVERVIEW**

This chapter contains maintenance procedures for the M17 quadrant. Information on repair parts and special tools is included. Detailed procedures for troubleshooting and maintenance of the various M17 quadrant parts are also included.





**Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT****2-1. COMMON TOOLS AND EQUIPMENT**

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

**2-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT**

Special tools, TMDE, and support equipment required and authorized for

repair of the M17 quadrant are listed in TM 9-1240-375-34P.

**2-3. SPARES AND REPAIR PARTS**

Spares and repair parts are listed and illustrated in TM 91240-375-34P.

**Section II. INSPECTIONS****2-4. GENERAL**

a. Inspection is performed primarily to determine the following:

- (1) Completeness.
- (2) The nature of unserviceability.
- (3) The work, repair parts, and supplies required to return the materiel to serviceability.
- (4) That work in process is being performed properly.
- (5) That completed work complies fully with serviceability standards.

b. The M17 quadrant is considered serviceable when:

- (1) It is complete and properly performs the intended function.
- (2) All modification work orders (MWO's) have been applied.
- (3) All defects disclosed by the inspection have been corrected.

c. DA Form 2408-5 and DA Form 2409 list applicable MWO's.

**2-5. CATEGORIES OF INSPECTION**

Categories of inspection define responsibilities.

a. An initial inspection is performed immediately on receipt of the M17 quadrant for maintenance. This inspection will determine the amount and type of work to be performed or whether the M17 quadrant should be sent to depot maintenance.

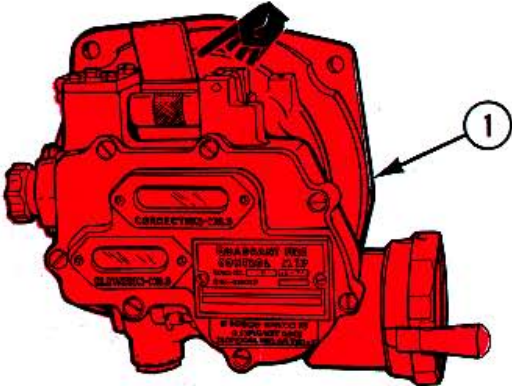
b. A final inspection of the M17 quadrant is performed after repairs

have been completed to ensure the item meets serviceability standards.

c. Table 2-1 lists initial inspection procedures for the M17 quadrant. Final inspection procedures are located on page 2-60.

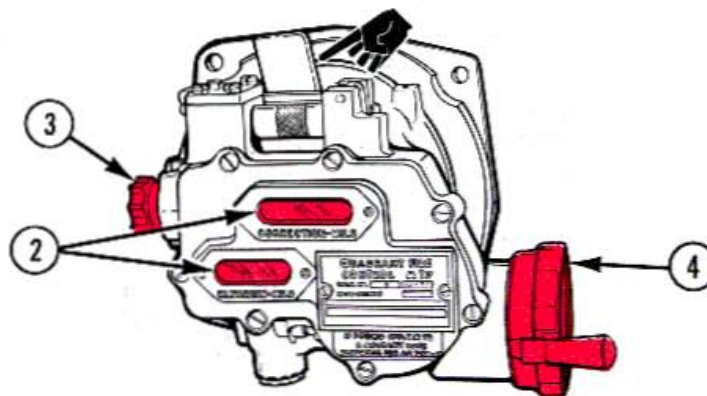
d. Preembarkation inspection procedures are located on page 2-76.

**Table 2-1. INITIAL INSPECTION-M17 QUADRANT**

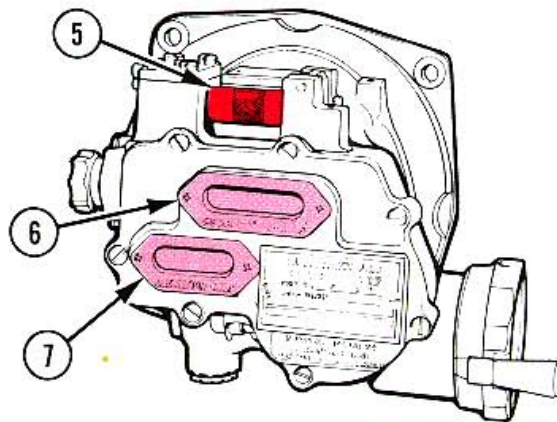
		
Item No.	Item To Be Inspected	Procedures
1	M17 QUADRANT (1)	<div style="background-color: black; width: 15px; height: 15px; display: inline-block; vertical-align: middle;"></div> Check for dents, scuff marks, bare spots, missing parts, and missing lock wire. Inspect M17 quadrant for cleanliness. Check for missing or illegible instruction plates or identification plates.


2-5. CATEGORIES OF INSPECTION (cont)

Table 2-1. INITIAL INSPECTION-M17 QUADRANT (cont)



Item No.	Item To Be Inspected	Procedures
2	COUNTER WINDOWS (2)	Check for moisture. Look for broken, cracked, or chipped glass.
3	CORRECTION KNOB (3)	Operate correction knob. Check that operation is smooth without binding or rough motion.
4	ELEVATION KNOB (4)	Operate elevation knob. Check that operation is smooth without binding or rough motion.



Item No.	Item To Be Inspected	Procedures
5	ELEVATION LEVEL VIAL (5)	<p style="text-align: center;"><b>WARNING</b></p> <p> When inspecting radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.</p> <p>Check radioactive light sources. Check that light is present and even throughout the elevation level vial. Check that elevation level vial graduations are present and legible.</p>
6	CORRECTION COUNTER (6)	<p>Check radioactive light sources. Check that light is present and even throughout the correction counter. Check that correction counter numbers are clear and legible.</p>
7	ELEVATION COUNTER (7)	<p>Check radioactive light sources. Check that light is present and even throughout the elevation counter. Check that elevation counter numbers are clear and legible.</p>

Section III. TROUBLESHOOTING

2-6. GENERAL

a. The symptom index can be used as a quick guide to troubleshooting. Common malfunctions are listed in alphabetical order with a page number reference to the troubleshooting table where a test or inspection and corrective action are provided.

b. The direct support troubleshooting table (p 26) lists the common malfunctions which may be found during maintenance of the M17 quadrant. Perform the tests/inspections and corrective actions in the order listed.

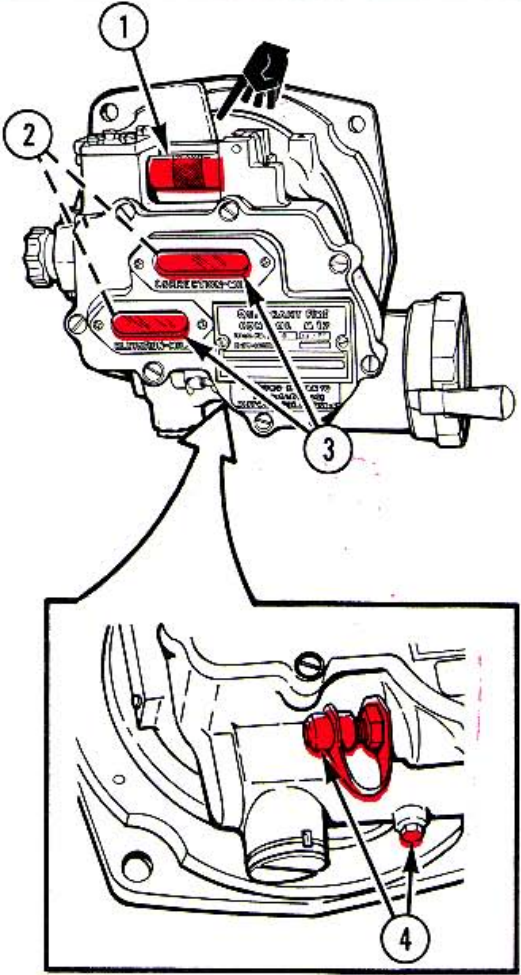
c. The general support troubleshooting table (p 2-8) lists the common malfunctions which may be found during maintenance of the M17 quadrant. Perform the tests/inspections and corrective actions in the order listed.

d. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective action, notify depot maintenance.

DIRECT SUPPORT SYMPTOM INDEX

	Troubleshooting Procedure (Page)
<b>COVER ASSEMBLY</b>	
Counter windows are fogged or have condensation.....	2-7
<b>FIRE CONTROL LEVEL ASSEMBLY</b>	
Elevation level vial and counter dials have uneven or no illumination .....	2-7
Elevation level vial has no bubble, but still illuminated.....	2-7

Table 2-2. DIRECT SUPPORT TROUBLESHOOTING-M17 QUADRANT

<p><b>MALFUNCTION</b> <b>TEST OR INSPECTION</b> <b>CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p><b>WARNING</b> When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.</p>	
<p><b>FIRE CONTROL LEVEL ASSEMBLY</b></p>	
<p>1. <b>ELEVATION LEVEL VIAL (1) AND COUNTER DIALS (2) HAVE UNEVEN OR NO ILLUMINATION.</b></p>	
<p>Observe visually in darkened area. a. Place M17 quadrant in plastic bag (TM 9-1025-211-10). b. Send to general support maintenance.</p>	
<p>2. <b>ELEVATION LEVEL VIAL (1) HAS NO BUBBLE, BUT STILL ILLUMINATED.</b></p>	
<p>Observe visually. a. The elevation level vial may be replaced if it is cracked but still illuminated. b. Return broken elevation level vial to general support maintenance.</p>	
<p><b>COVER ASSEMBLY</b></p>	
<p>3. <b>COUNTER WINDOWS (3) ARE FOGGED OR HAVE CONDENSATION.</b></p>	
<p><b>NOTE</b></p>	
<p>Charge nitrogen pressure to 7 psi (0.49 kg/cm<sup>2</sup>). Remove hose. Put soap suds on valve opening to check for leakage.</p>	
<p>Check for loose or defective valves (4). a. Tighten, or replace valves (p 2-16). b. Purge and charge M17 quadrant with dry nitrogen (TM 9-1025-211-20&amp;P).</p>	



2-6. GENERAL (cont)

GENERAL SUPPORT SYMPTOM INDEX

Troubleshooting Procedure (Page)

CORRECTION KNOB ASSEMBLY

Correction knob binds ..... 2-10

COUNTER ASSEMBLY

Correction counter fails to allow + 95 to + 99 mils max or -95 to -99 mils max ..... 2-11

Counter numbers are not in horizontal alinement ..... 2-11

Elevation counter fails to allow 1433 or 9720 mils ..... 2-12

COVER ASSEMBLY

Counter windows are fogged or have condensation ..... 2-10

FIRE CONTROL LEVEL ASSEMBLY

Elevation level bubble is not level ..... 2-9

Elevation level bubble is not synchronized with M198 howitzer tube ..... 2-9

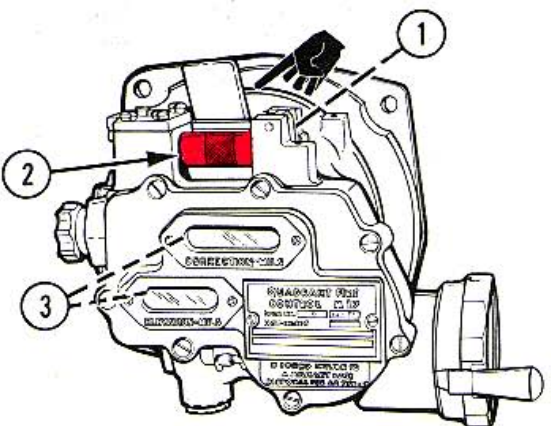
Elevation level vial and counter dials have uneven or no illumination ..... 2-9

Elevation level vial has no bubble, but still illuminated ..... 2-9

WORM SHAFT ASSEMBLY

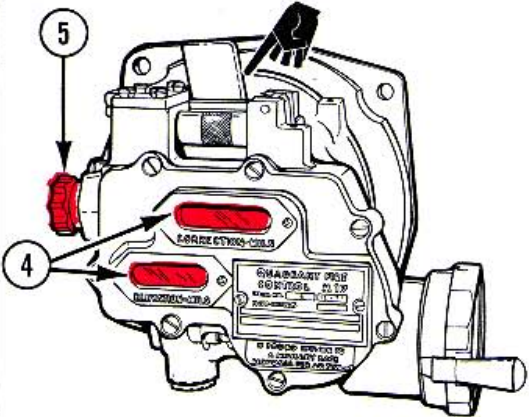
Elevation knob exceeds 0.7-mil backlash ..... 2-12

Table 2-3. GENERAL SUPPORT TROUBLESHOOTING-M17 QUADRANT

<p><b>MALFUNCTION</b> <b>TEST OR INSPECTION</b> <b>CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p><b>WARNING</b> When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.</p>	
<p><b>FIRE CONTROL LEVEL ASSEMBLY</b></p>	
<p>1. <b>ELEVATION LEVEL BUBBLE IS NOT SYNCHRONIZED WITH M198 HOWITZER TUBE.</b></p> <p>Observe visually. Synchronize elevation level bubble and M198 howitzer tube (p 2-73).</p> <p>2. <b>ELEVATION LEVEL BUBBLE IS NOT LEVEL.</b></p> <ul style="list-style-type: none"> <li>■ Adjust eccentric (1). ■ Refer to page 2-18.</li> </ul> <p>3. <b>ELEVATION LEVEL VIAL (2) AND COUNTER DIALS (3) HAVE UNEVEN OR NO ILLUMINATION.</b></p> <p>Observe visually in darkened area.</p> <ol style="list-style-type: none"> <li>a. Place M17 quadrant in plastic bag (TM 9-1025-211-10).</li> <li>b. Send to depot maintenance.</li> </ol> <p>4. <b>ELEVATION LEVEL VIAL (2) HAS NO BUBBLE, BUT STILL ILLUMINATED.</b></p> <p>Observe visually.</p> <ol style="list-style-type: none"> <li>a. The elevation level vial may be replaced if it is cracked, but still illuminated.</li> <li>b. Return broken elevation level vial to depot maintenance.</li> </ol>	 <p>The diagram shows a side view of the fire control level assembly. Callout 1 points to an eccentric adjustment screw on the top. Callout 2 points to the elevation level vial, which contains a red bubble. Callout 3 points to the counter dials on the front panel. The assembly is labeled 'CONCRETE-CT-5' and 'M17 QUADRANT'.</p>

2-6. GENERAL (cont)

Table 2-3. GENERAL SUPPORT TROUBLESHOOTING-M17 QUADRANT (cont)

<p><b>MALFUNCTION</b>  <b>TEST OR INSPECTION</b>  <b>CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p style="text-align: center;"><b>COVER ASSEMBLY</b></p> <p><b>5. COUNTER WINDOWS (4) ARE FOGGED OR HAVE CONDENSATION.</b></p> <p>Check for damaged glass or defective or missing parts.</p> <ol style="list-style-type: none"> <li>a. Replace glass if required (p 2-39).</li> <li>b. Replace defective or missing parts as required and authorized (p 2-39).</li> <li>c. Purge and charge M17 quadrant with dry nitrogen (TM 9-1025-211-20&amp;P).</li> </ol> <p style="text-align: center;"><b>CORRECTION KNOB ASSEMBLY</b></p> <p><b>6. CORRECTION KNOB (5) BINDS.</b></p> <p>Step 1. Check for defective correction knob assembly.          Replace correction knob assembly (p 242).</p> <p>Step 2. Check for defective correction counter.          Replace correction counter assembly (p 2-47).</p>	 <p>The diagram shows a perspective view of the M17 quadrant cover assembly. Two red rectangular counter windows are visible, with callout '4' pointing to them. A red correction knob assembly is located on the left side, with callout '5' pointing to it. The assembly includes various mechanical components, a label with technical specifications, and a large adjustment knob on the right side.</p>

### COUNTER ASSEMBLY

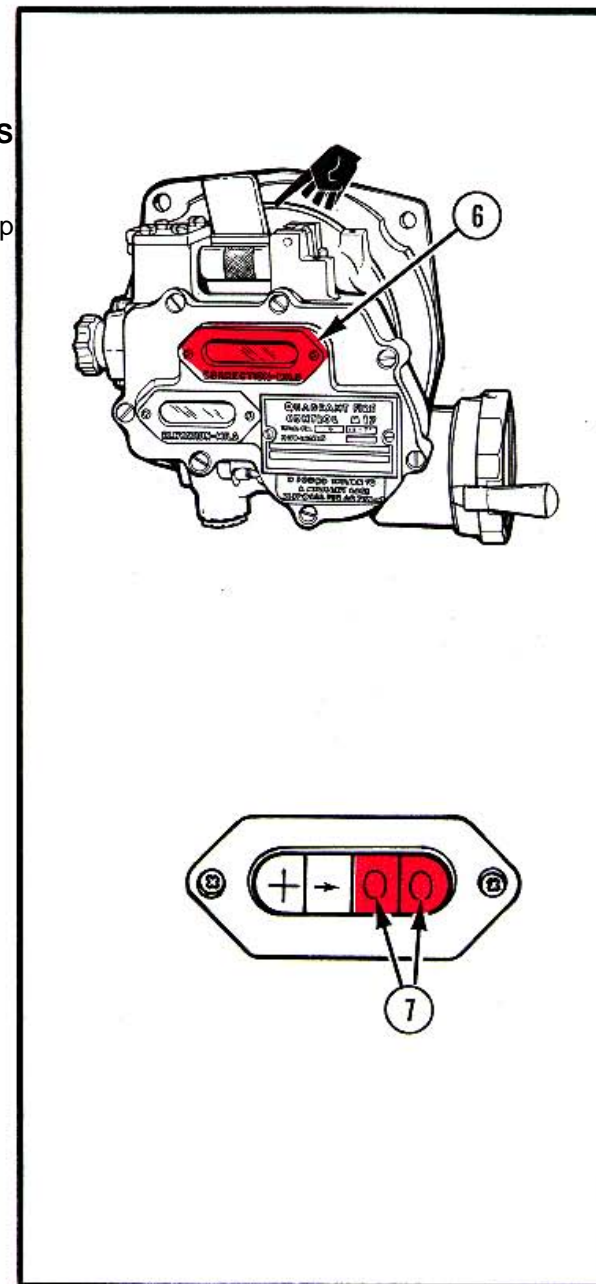
#### 7. CORRECTION COUNTER (6) FAILS TO ALLOW +95 to +99 MILS MAX OR -95 TO -99 MILS MAX.

Step 1. Check for incorrect assembly of key washers after removing correction knob assembly (p 2.42).

Reinstall key washers correctly (p 2.43).

Step 2. Check for worn or damaged correction knob assembly.

Replace worn or damaged parts as required and authorized (p 2.43).



#### 8. COUNTER NUMBERS (7) ARE NOT IN HORIZONTAL ALINEMENT.

Step 1. Observe visually for defective counters.

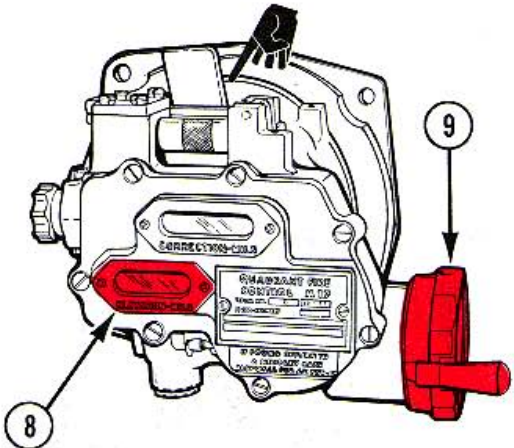
Replace counter assembly (p 2-47).

Step 2. Check for incorrectly assembled counter assembly.

Reassemble counter assembly correctly (p 2-49).

2-6. GENERAL (cont)

Table 2-3. GENERAL SUPPORT TROUBLESHOOTING-M17 QUADRANT (cont)

<p><b>MALFUNCTION</b> <b>TEST OR INSPECTION</b> <b>CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p style="text-align: center;"><b>COUNTER ASSEMBLY (cont)</b></p> <p><b>9. ELEVATION COUNTER (8) FAILS TO ALLOW 1433 OR 9720 MILS.</b></p> <p>Step 1. Check for incorrectly installed counter. Reinstall counter correctly (p 2-50).</p> <p>Step 2. Check for incorrectly assembled counter. Reassemble counter correctly (p 2-49).</p> <p>Step 3. Check for defective counter assembly. Replace counter assembly (p 2-47).</p> <p style="text-align: center;"><b>WORM SHAFT ASSEMBLY</b></p> <p><b>10. ELEVATION KNOB (9) EXCEEDS 0.7-MIL BACKLASH.</b></p> <p>Step 1. Check for incorrectly adjusted retainers. Adjust retainers (p 2-59).</p> <p>Step 2. Check for worn or damaged parts. Remove worm shaft assembly (p 2-55), and replace parts as required and authorized.</p>	 <p>The diagram shows a technical drawing of the M17 quadrant counter and worm shaft assembly. A red counter assembly is labeled with a circled '8' and an arrow pointing to it. A red elevation knob is labeled with a circled '9' and an arrow pointing to it. The counter assembly has a label that reads 'CORRECTION-COLS'. The worm shaft assembly has a label that reads 'WORM SHAFT ASSEMBLY' and 'CORRECTION-COLS'. There is also a label that reads 'IF PARTS ARE LOST OR DAMAGED, ORDER PARTS FROM THE FOLLOWING SOURCE:'. The diagram is a black and white line drawing with red highlights for parts 8 and 9.</p>



Section IV. DIRECT SUPPORT MAINTENANCE PROCEDURES FOR THE M17 QUADRANT

2-7. M17 QUADRANT-MAINTENANCE INSTRUCTIONS

**INITIAL SETUP**

Special Tools  
 Tool box (SC 4931-95-CL-AO9)


2-7 Elevation level vial has no bubble, but still illuminated.  
 2-7 Counter windows are fogged or have condensation.

Materials/Parts  
 Cleaning compound (MIL-C-18718)  
 Lock wire (MS20995 C32)  
 Sealing compound (MIL-S-11031)

Equipment Condition  
 M17 quadrant mounted on M198 howitzer with M199 cannon at zero elevation (TM 9-1025-211-10) (task no. 2).

References  
 TM 9-1025-211-10  
 TM 9-1025-211-20&P  
 TM 9-1240-375-34P

Troubleshooting References  
 2-7 Elevation level vial and counter dials have uneven or no illumination.

	<p><b>WARNING</b></p> <p>When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.</p>
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2-7. M17 QUADRANT-MAINTENANCE INSTRUCTIONS (cont)

List of Tasks			
Task No.	Task	Task Ref (Page)	Troubleshooting Ref No. (Page)
1	Maintain M17 quadrant:  a. Disassemble. b. Clean. c. Repair. d. Reassemble.	2-15 2-16 2-17 2-17	2-7
2	Maintain fire control level assembly:  a. Repair. b. Adjust.	2-19 2-19	2-7

2-8. M17 QUADRANT-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Disassembly
- b. Cleaning
- c. Repair
- d. Reassembly

**INITIAL SETUP**

Special Tools

Tool box (SC 4931-95-CL-A09)

Materials/Parts

Cleaning compound (MIL-C-18718)

Sealing compound (MIL-S-11031)

References

TM 9-1025211-10

TM 9-1025-211-20&P

TM 9-1240-37534P

Troubleshooting References

2-9 ■ Elevation level bubble is not level.

2-7 ■ Counter windows are fogged or have condensation.

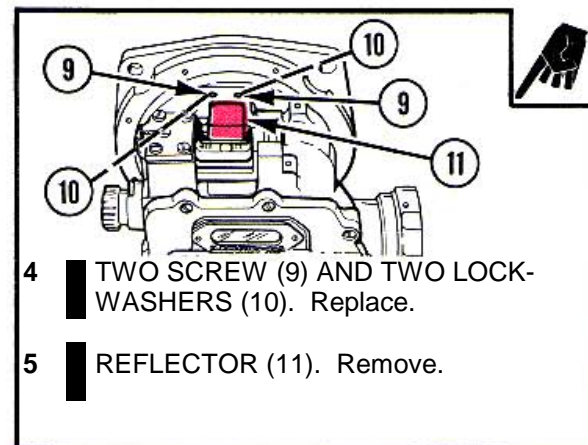
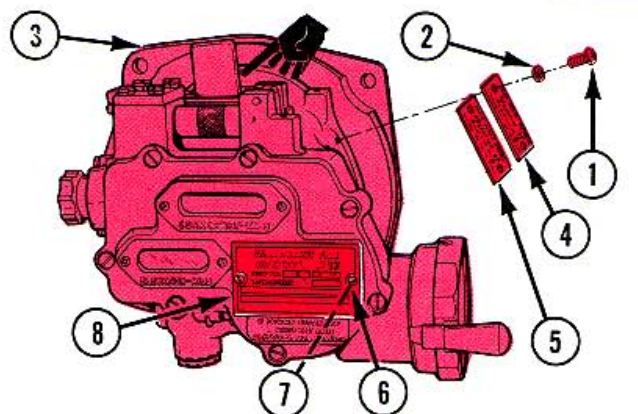


**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

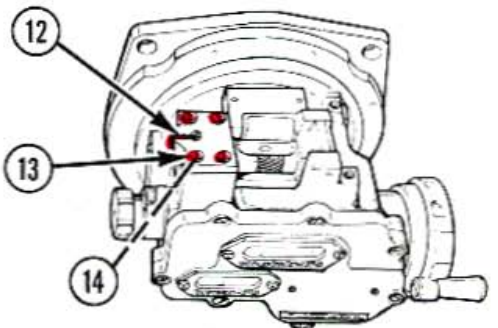
**DISASSEMBLY**

- 1 FOUR SCREWS (1) AND FOUR LOCK-WASHERS (2). Remove from side of M17 quadrant (3).
- 2 ■ INSTRUCTION PLATES (4 and 5). Remove only if defective.
- 3 TWO SCREWS (6), TWO LOCK-WASHERS (7), AND IDENTIFICATION PLATE (8). Remove from front of M17 quadrant.



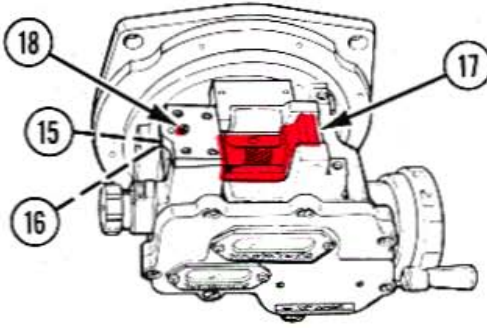
2-8. M17 QUADRANT-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY (cont)



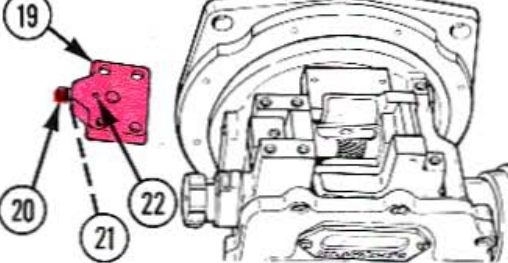
6 LOCK WIRE (12). Remove.

7 FOUR SCREWS (13) AND FOUR LOCKWASHERS (14). Remove.



8 SETSCREW (15) AND PAD (16). Loosen, but do not remove from fire control level assembly (17).

9 SCREW (18). Remove.

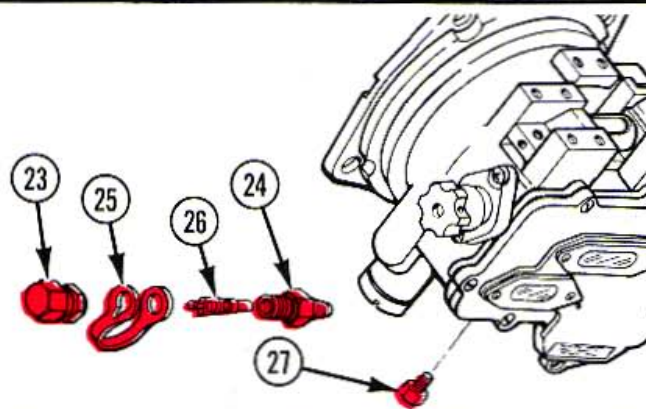


10 PLATE (19). Remove.

11 SETSCREW (20) AND PAD (21). Loosen from plate (19).

12 SETSCREW (22). Loosen.

CLEANING



13 CAP (23). Unscrew from valve stem (24) and remove from strap (25).

14 VALVE STEM (24). Remove.

15 VALVE CORE (26). Remove from valve stem (24).

16 STRAP (25). Remove from valve stem (24).

17 SAFETY RELIEF VALVE (27). Remove.

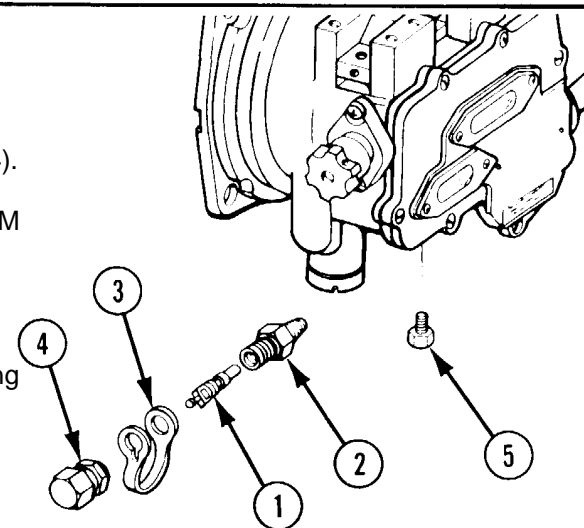
Clean all parts with cleaning compound (TM 9-1025-211-10).

REPAIR

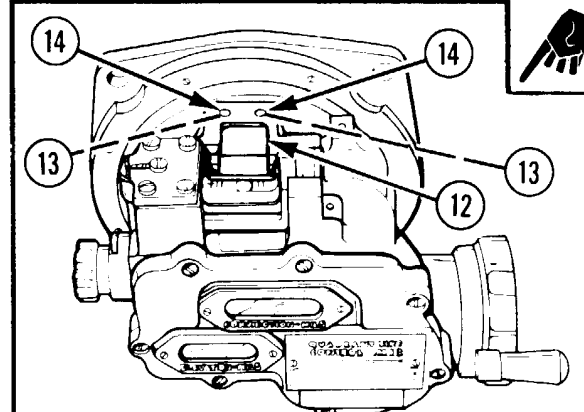
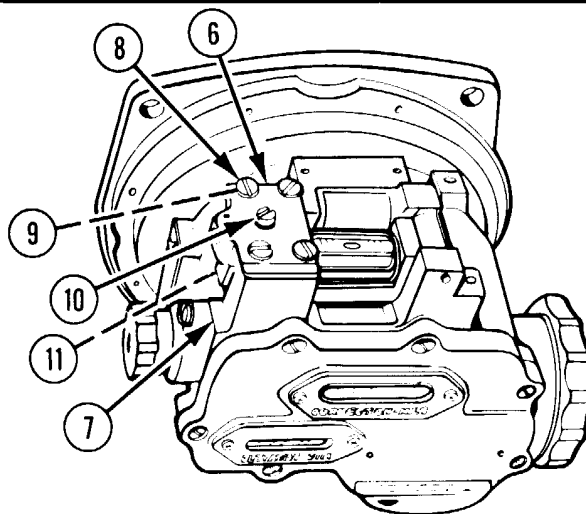
Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

REASSEMBLY

- 1 VALVE CORE (1). Install in valve stem (2).
- 2 STRAP (3). Place on valve stem (2) and cap (4).
- 3 VALVE STEM (2). Apply sealing compound (TM 9-1025-211-20&P) and install.
- 4 CAP (4). Install on valve stem (2).
- 5 SAFETY RELIEF VALVE (5). Apply sealing compound (TM 9-1025-211-20&P) and install.

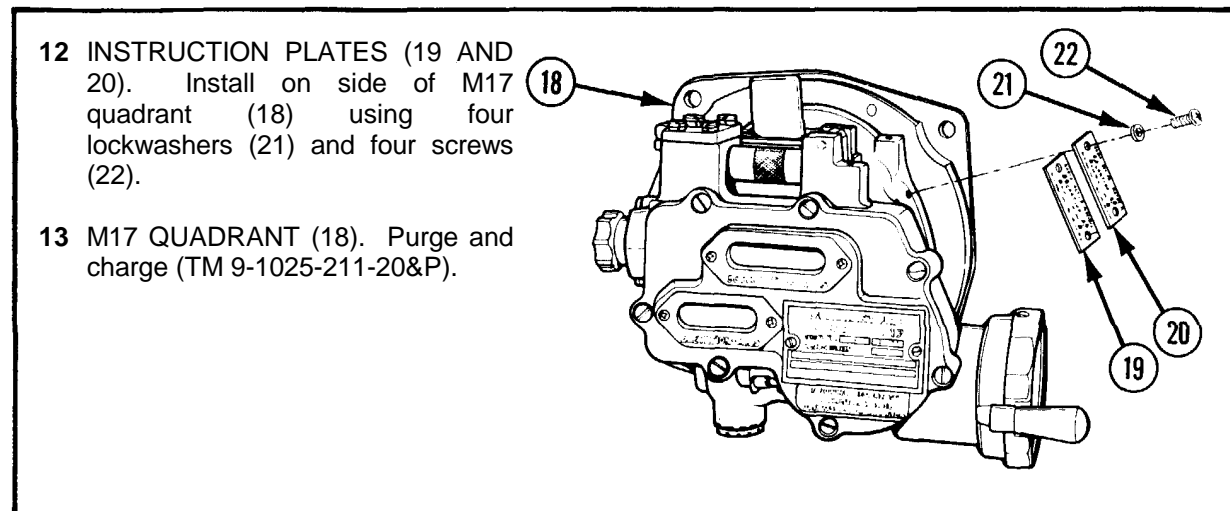
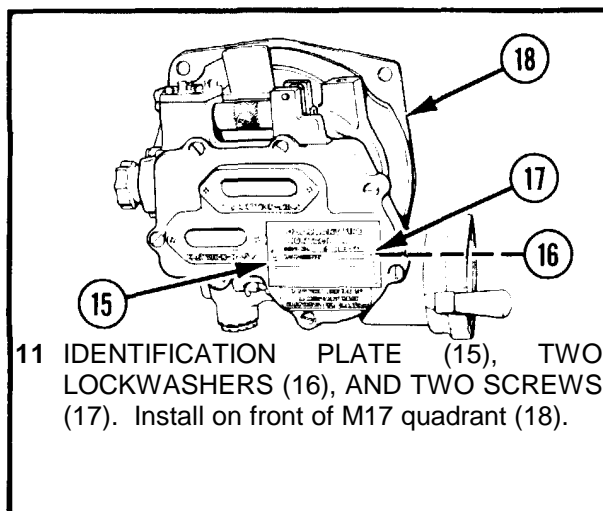


- 6 PLATE (6). Place on top of bracket (7).
- 7 FOUR SCREWS (8) AND FOUR LOCKWASHERS (9). Install and tighten.
- 8 SCREW (10). Start, but do not tighten. (Screw will be tightened and locked with setscrew (11) during adjustment (p 2-19).)



- 9 REFLECTOR (12). Install.
- 10 TWO LOCKWASHERS (13) AND TWO SCREWS (14). Install and tighten.

**2-8. M17 QUADRANT-MAINTENANCE INSTRUCTIONS (cont)  
REASSEMBLY (cont)**



**2-9. FIRE CONTROL LEVEL ASSEMBLY-MAINTENANCE INSTRUCTIONS**

<b>THIS TASK COVERS:</b>	
<ul style="list-style-type: none"> <li>a. Repair</li> <li>b. Adjustment</li> </ul>	
<b>INITIAL SETUP</b>	
<p>Special Tools</p> <ul style="list-style-type: none"> <li>Tool box (SC 4931-95-CL-A09)</li> </ul>	<p>Materials/Parts</p> <ul style="list-style-type: none"> <li>■ Lock wire (MS20995-C32)</li> <li>Sealing compound (MIL-S-11031)</li> </ul>



References

- TM 9-1025-211-10
- TM 9-1025-211-20&P
- TM 9-1240-375-34P


Equipment Condition

M17 quadrant mounted on M198 howitzer with M199 cannon at zero elevation (TM 9-1025-211-10).

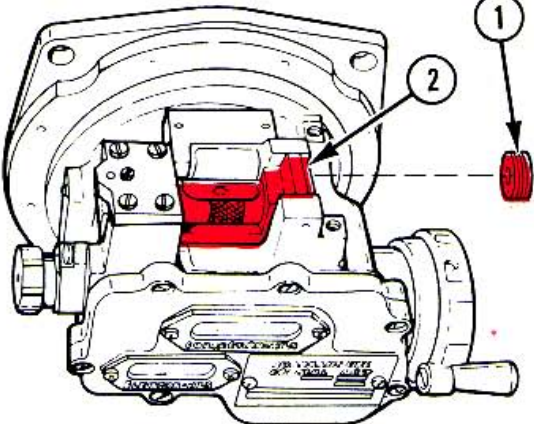
Troubleshooting References

- 2-7 Elevation level vial and counter dials have uneven or no illumination.
- 2-7 Elevation level vial has no bubble, but still illuminated.

**WARNING**

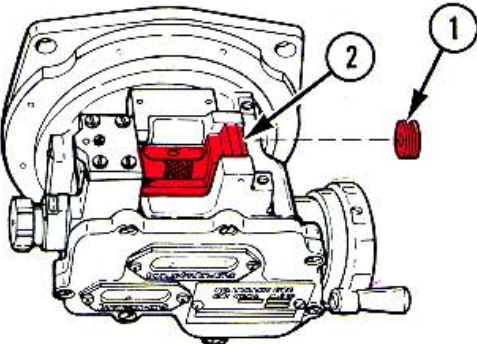
 When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**REPAIR**



1 RING (1). Remove sealing compound and ring (1) from fire control level assembly (2).

**ADJUSTMENT**

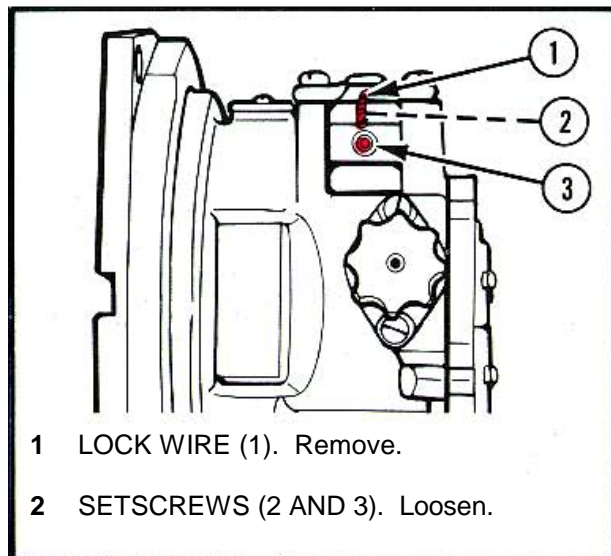


**NOTE**  
Repair is by replacement of ring (1) (TM 9-1240-375-34P) as required.

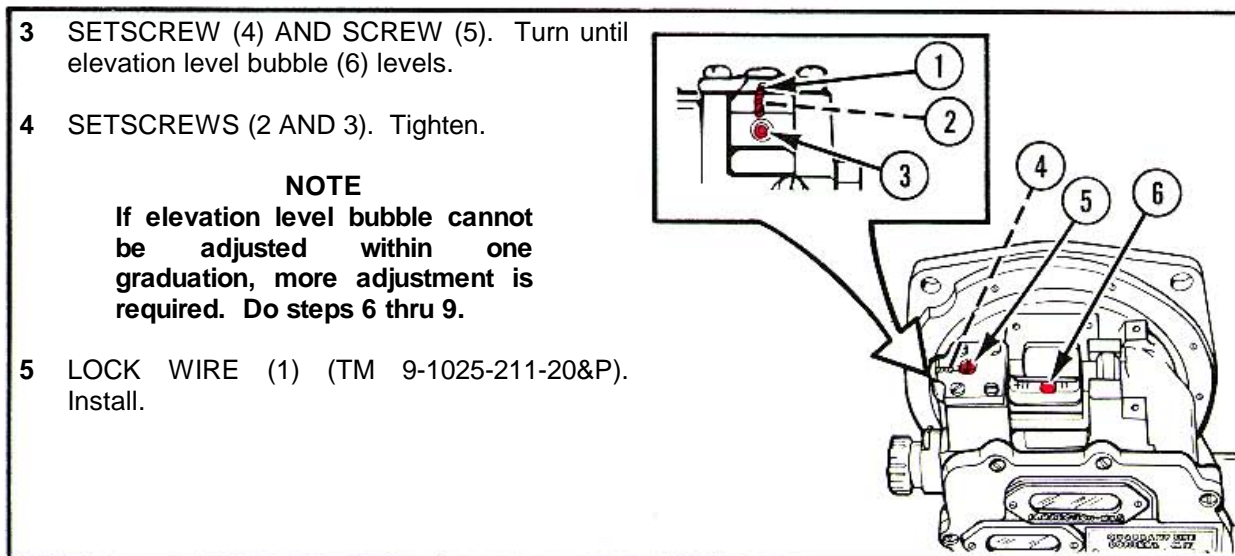
2 RING (1). Install in fire control level assembly (2).

**NOTE**  
Correction and elevation counters must be set at zero.

**2-9. FIRE CONTROL LEVEL ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)  
ADJUSTMENT (cont)**



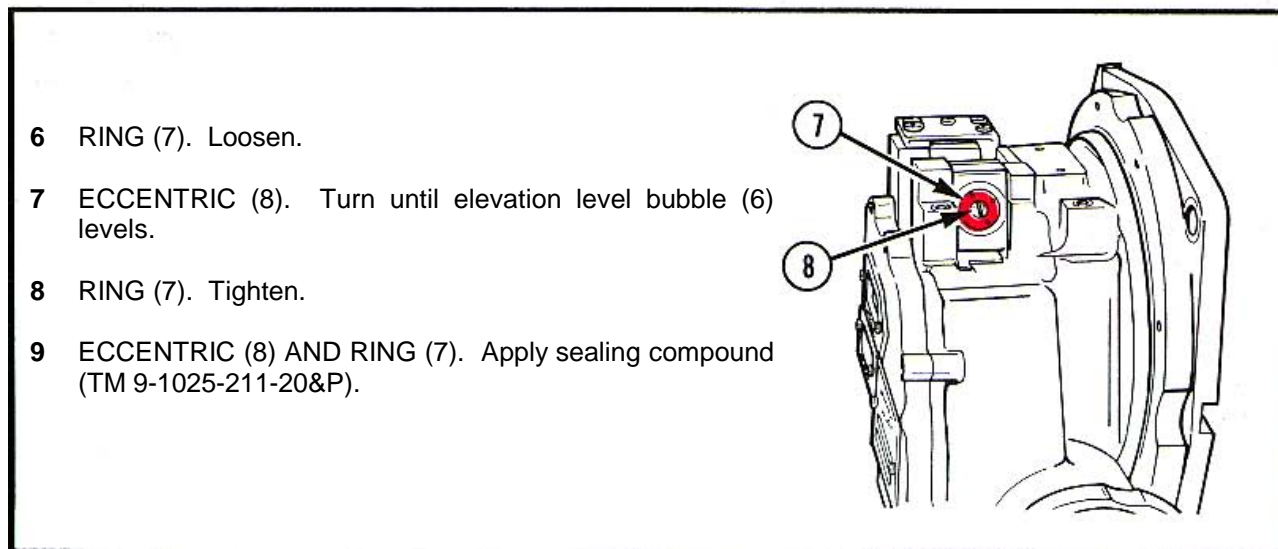
- 1 LOCK WIRE (1). Remove.
- 2 SETSCREWS (2 AND 3). Loosen.



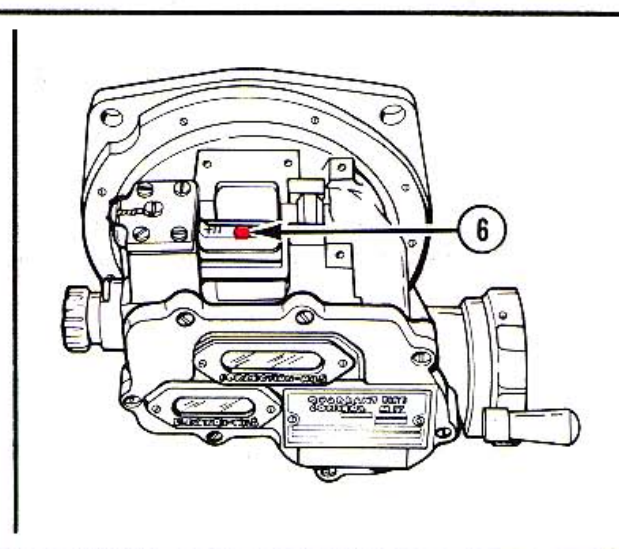
- 3 SETSCREW (4) AND SCREW (5). Turn until elevation level bubble (6) levels.
- 4 SETSCREWS (2 AND 3). Tighten.

**NOTE**  
If elevation level bubble cannot be adjusted within one graduation, more adjustment is required. Do steps 6 thru 9.

- 5 LOCK WIRE (1) (TM 9-1025-211-20&P). Install.



- 6 RING (7). Loosen.
- 7 ECCENTRIC (8). Turn until elevation level bubble (6) levels.
- 8 RING (7). Tighten.
- 9 ECCENTRIC (8) AND RING (7). Apply sealing compound (TM 9-1025-211-20&P).



Section V. GENERAL SUPPORT MAINTENANCE PROCEDURES FOR THE M17 QUADRANT

2-10. M17 QUADRANT-MAINTENANCE INSTRUCTIONS

<b>INITIAL SETUP</b>	
<p>Test Equipment</p> <ul style="list-style-type: none"> <li>Cross-leveling fixture (6523553)</li> </ul> <p>Special Tools</p> <ul style="list-style-type: none"> <li>Adapter (12008990)</li> <li>Adapter set (SC 4931-95-CL-A11)</li> <li>Precision level (7686087)</li> <li>Shop set (SC 4931-95-CL-A07)</li> <li>Tool box (SC 4931-95-CL-A09)</li> </ul> <p>Materials 'Parts</p> <ul style="list-style-type: none"> <li>Cleaning compound (MIL-C-18718)</li> <li>Grease (item 2, app B)</li> <li>Grease (item 3, app B)</li> <li>Lock wire (MS20995 C32)</li> <li>Sealing compound (MIL-S-11031)</li> <li>Preformed packing (MS9021-017)</li> <li>Preformed packing (MS9021-046)</li> </ul> <p>References</p> <ul style="list-style-type: none"> <li>TM 9-1025-211-10</li> <li>TM 9-1025-21 1-20&amp;P</li> <li>TM 9-1240-375-34P</li> </ul>	<p>Troubleshooting References</p> <ul style="list-style-type: none"> <li>2-9 Elevation level bubble is not synchronized with M198 howitzer tube.</li> <li>2-9 Elevation level bubble is not level.</li> <li>2-9 Elevation level vial and counter dials have uneven or no illumination.</li> <li>2-9 Elevation level vial has no bubble, but still illuminated.</li> <li>2-10 Counter windows are fogged or have condensation.</li> <li>2-10 Correction knob binds.</li> <li>2-11 Correction counter fails to allow + 95 to-99 mils max or -95 to-99 mils max.</li> <li>2-11 Counter numbers are not in horizontal alinement.</li> <li>2-12 Elevation counter fails to allow 1433 or 9720 mils.</li> <li>2-12 Elevation knob exceeds 0.7-mil backlash.</li> </ul> <p>Equipment Conditions</p> <ul style="list-style-type: none"> <li>2-24 Cover assembly removed (tasks no. 4 thru 6).</li> <li>2-26 Correction knob assembly removed (tasks no. 5 and 6).</li> <li>2-26 Counter assembly removed (task no. 6).</li> </ul>



**WARNING**  
 When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

2-10. M17 QUADRANT-MAINTENANCE INSTRUCTIONS (cont)

List of Tasks			
Task No.	Task	Task Ref (Page)	Troubleshooting Ref No. (Page)
1	Maintain M17 quadrant:  a. Disassemble. b. Clean and inspect. c. Repair. d. Reassemble.	  2-24 2-28 2-28 2-28	
2	Maintain fire control level assembly:  a. Remove. b. Disassemble. c. Repair. d. Reassemble. e. Install.	  2-33 2-34 2-34 2-34 2-35	2-9
3	Maintain cover assembly:  a. Remove. b. Disassemble. c. Repair. d. Reassemble. e. Install.	  2-10  2-38 2-39 2-39 2-39 2-40	
4	Maintain correction knob assembly:  a. Remove. b. Disassemble. c. Clean.	  2-42 2-42 2-43	2-10

	d. Repair.	2-43	
	e. Reassemble.	2-43	
	f. Install.	2-44	
5	Maintain counter assembly:		2-11, 2-12
	a. Remove.	2-47	
	b. Disassemble.	2-47	
	c. Clean.	2-49	
	d. Repair.	2-49	
	e. Reassemble.	2-49	
	f. Install.	2-52	
6	Maintain worm shaft assembly:		2-12
	a. Remove.	2-55	
	b. Clean.	2-56	
	c. Inspect.	2-56	
	d. Install.	2-57	
	e. Adjust.	2-59	

2-11. M17 QUADRANT-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Disassembly
- b. Cleaning and inspection
- c. Repair
- d. Reassembly

**INITIAL SETUP**

Special Tools

- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)

Materials/Parts

- Cleaning compound (MIL-C-18718)
- Grease (item 2, app B)
- Grease (item 3, app B)
- Preformed packing (MS9021-017)
- Preformed packing (MS9021-046)

References

- TM 9-1025-211-10
- TM 9-1240-375-34P

Troubleshooting Reference

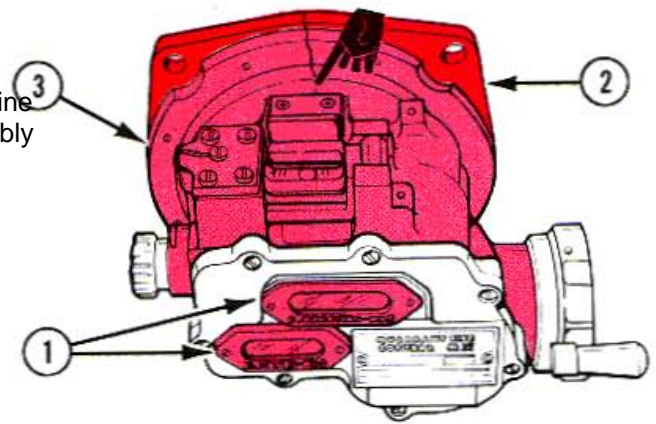
- 2-9 Elevation level bubble is not synchronized with M198 howitzer tube.

**WARNING**

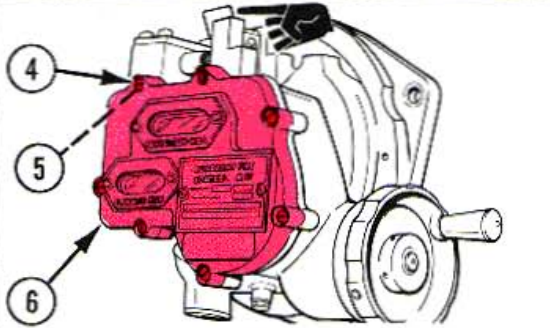
When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**DISASSEMBLY**

1 COUNTERS (1). Set at zero. Scribe a line on base assembly (2) and housing assembly (3) to facilitate correct counter installation.

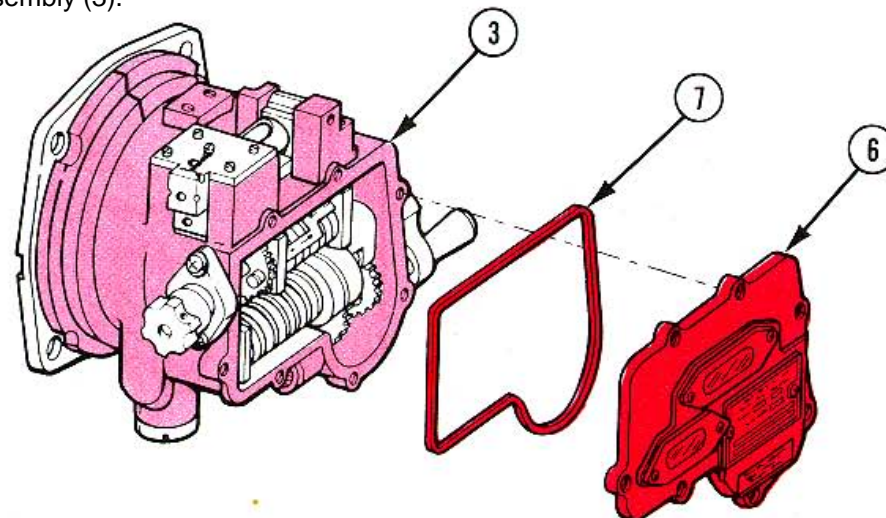


2 SEVEN SCREWS (4) AND SEVEN LOCKWASHERS (5). Remove from cover assembly (6).





3 COVER ASSEMBLY (6) WITH PACKING (7). Remove from housing assembly (3).

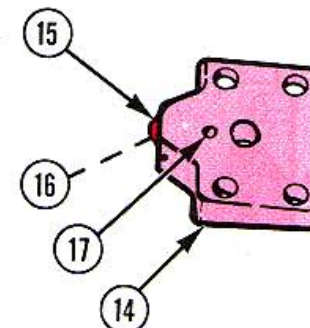
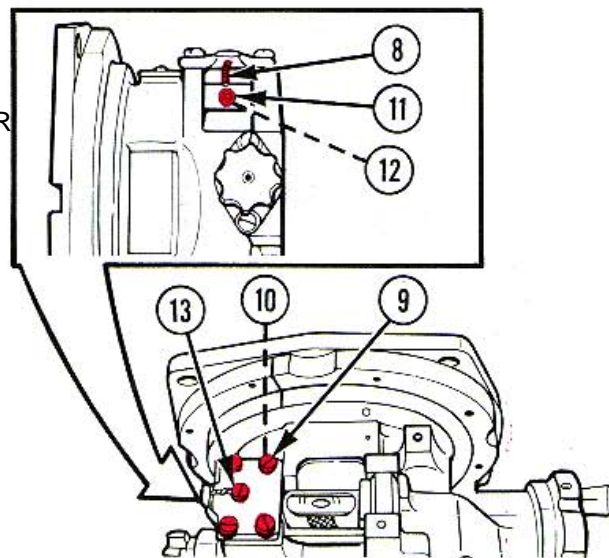


4 LOCK WIRE (8). Remove.

5 FOUR SCREWS (9) AND FOUR LOCKWASHERS (10). Remove.

6 SETSCREW (11) AND PAD (12). Loosen.

7 SCREW (13). Remove.



8 PLATE (14). Remove.

9 SETSCREW (15) AND PAD (16). Loosen.

10 SETSCREW (17). Loosen.

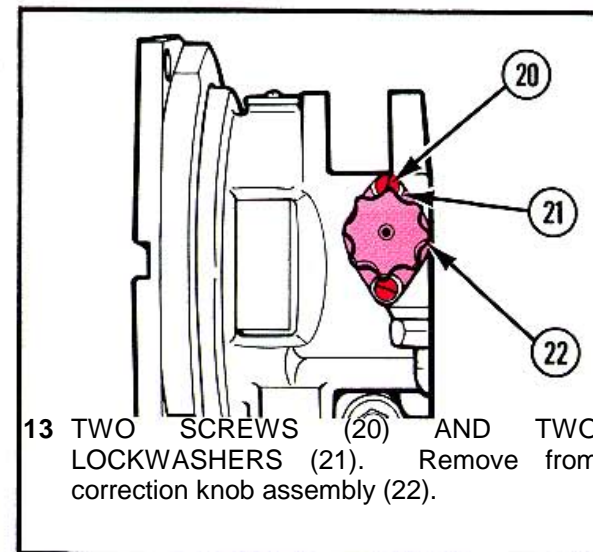
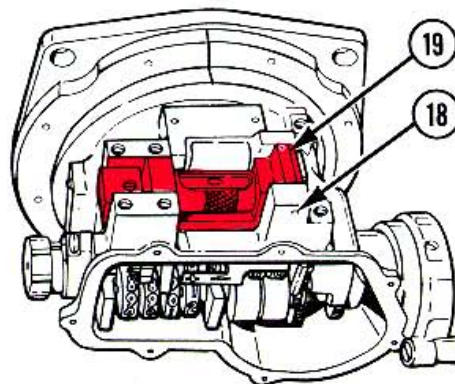
2-11. M17 QUADRANT-MAINTENANCE INSTRUCTIONS (cont)  
DISASSEMBLY (cont)

11 PIN (18). Drive out.

**NOTE**

Replacement of fire control level assembly parts can be done without removing fire control level assembly from M17 quadrant.

12 FIRE CONTROL LEVEL ASSEMBLY (19). Lift off and remove sealing compound.



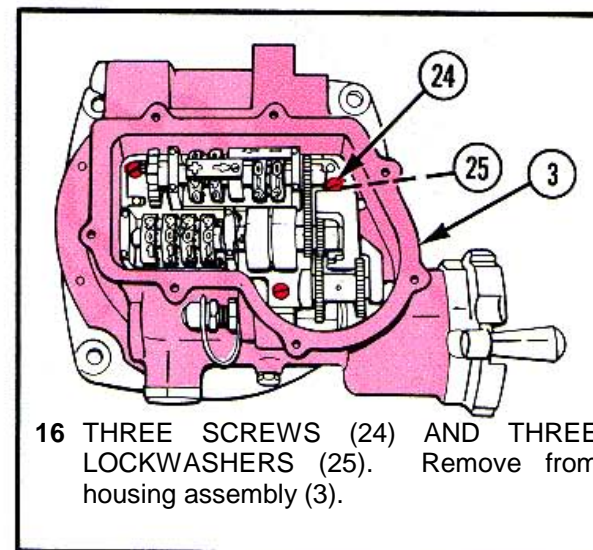
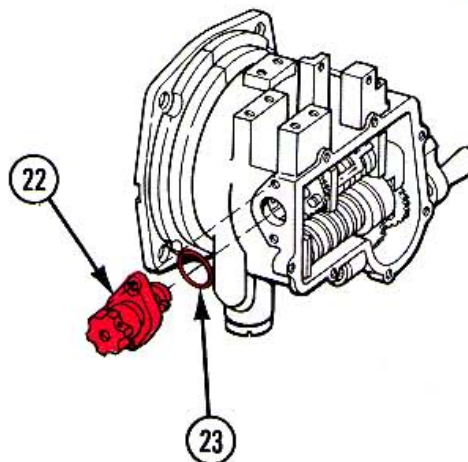
13 TWO SCREWS (20) AND TWO LOCKWASHERS (21). Remove from correction knob assembly (22).

**CAUTION**

Correction knob assembly must be removed carefully, or internal M17 quadrant parts could be damaged.

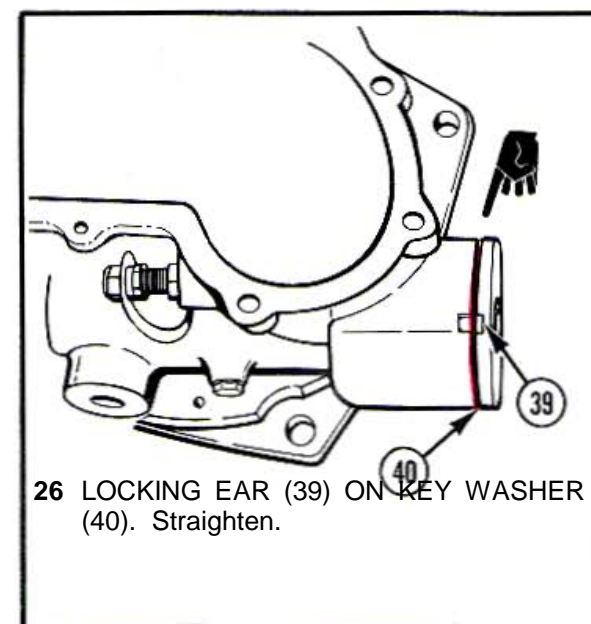
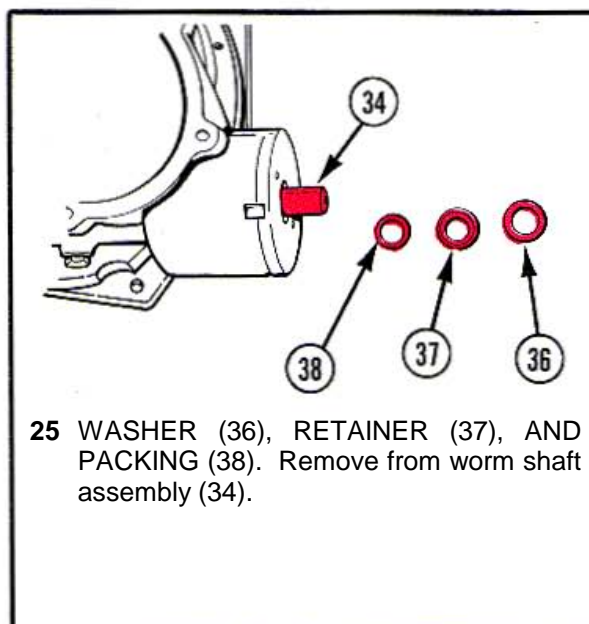
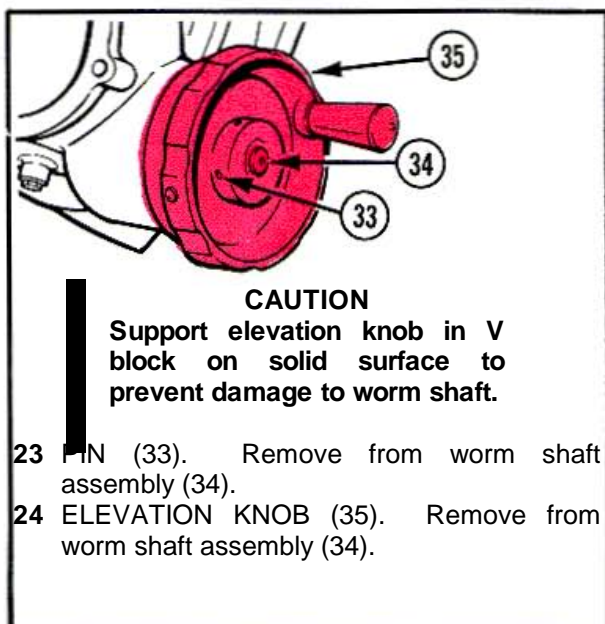
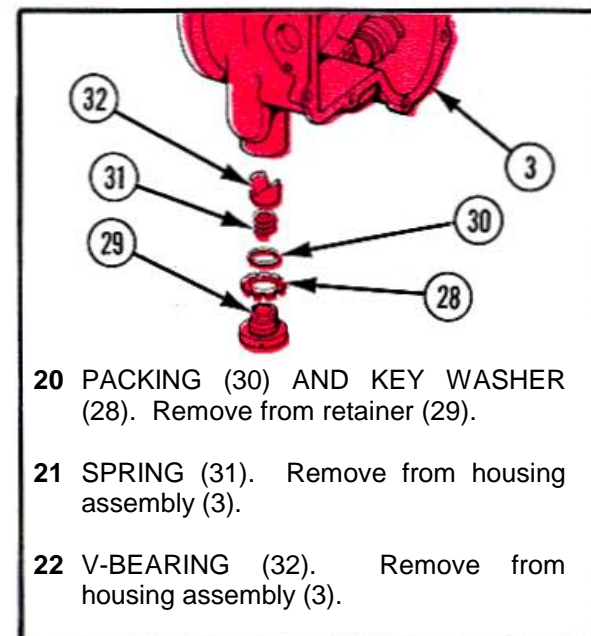
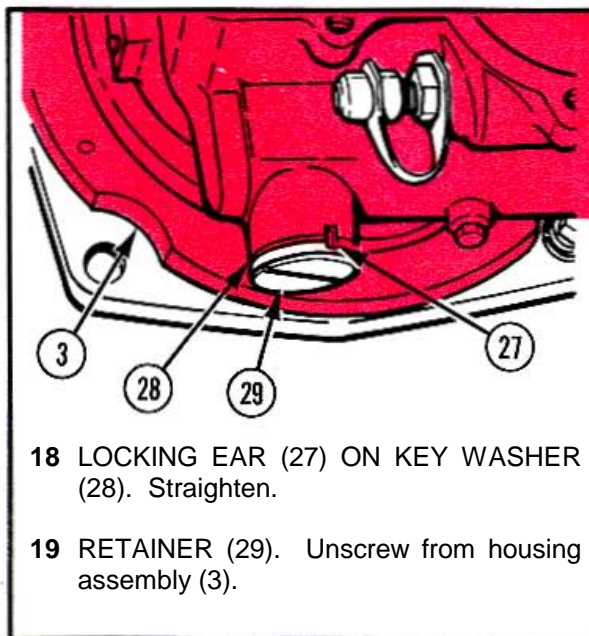
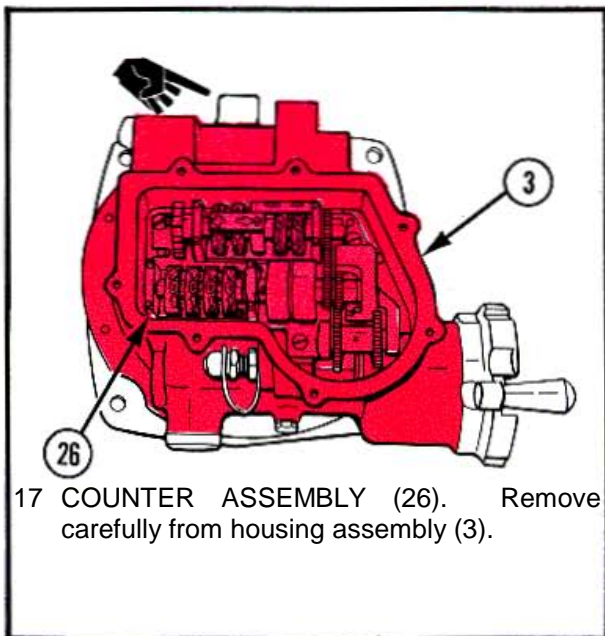
14 CORRECTION KNOB ASSEMBLY (22). Remove.

15 PACKING (23). Remove.

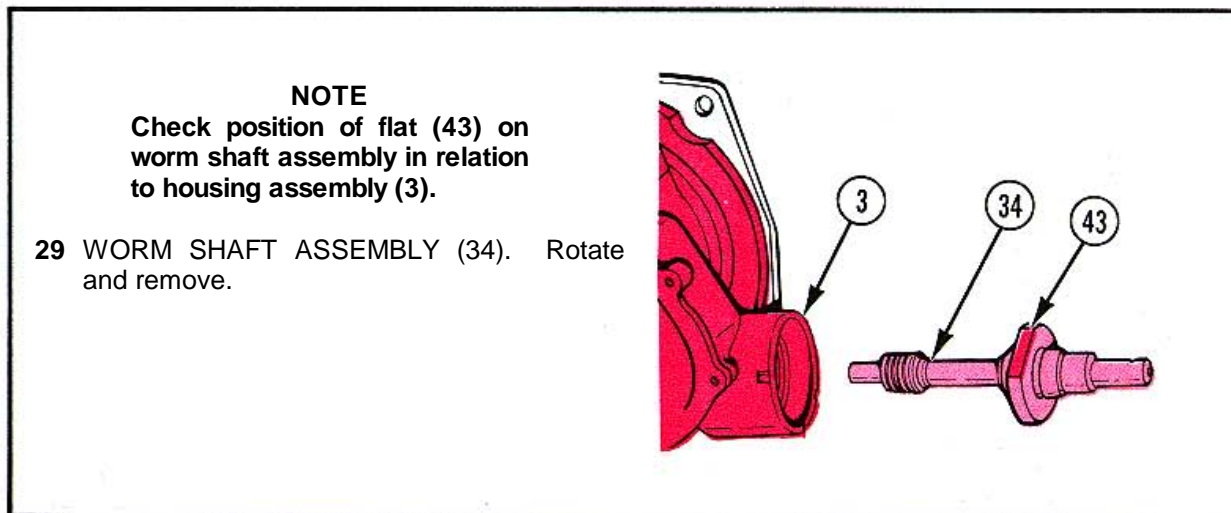
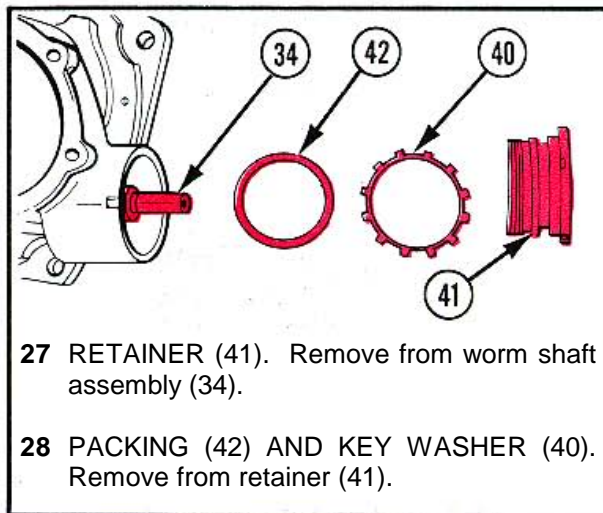


16 THREE SCREWS (24) AND THREE LOCKWASHERS (25). Remove from housing assembly (3).





**2-11. M17 QUADRANT-MAINTENANCE INSTRUCTIONS (cont)  
DISASSEMBLY (cont)**



**CLEANING AND INSPECTING**

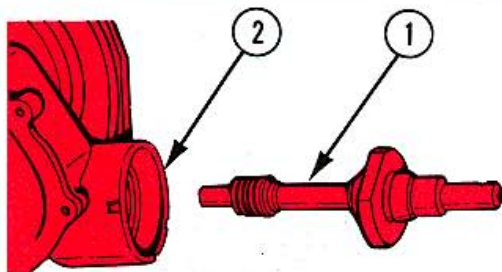
- 1** ALL PARTS. Clean with cleaning compound (TM 9-1025-211-10).
- 2** GEARS. Inspect for missing teeth or stripped gears.
- 3** BEARING SURFACES. Inspect for nicks or burrs.

**REPAIR**

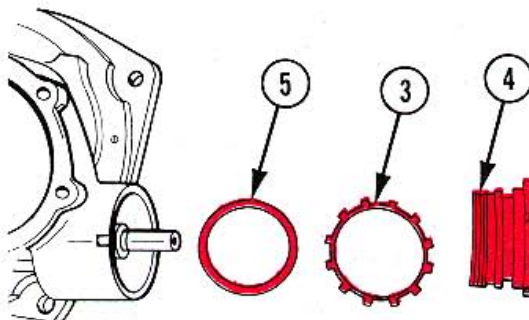
Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

**REASSEMBLY**

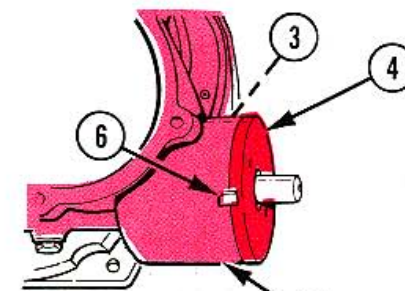
**NOTE**  
Ensure flat on worm shaft assembly is in proper position for counter assembly clearance.



- 1** WORM SHAFT ASSEMBLY (1).
- a. Apply light coat of grease (item 2, app B).
  - b. Insert in housing assembly (2) by turning.

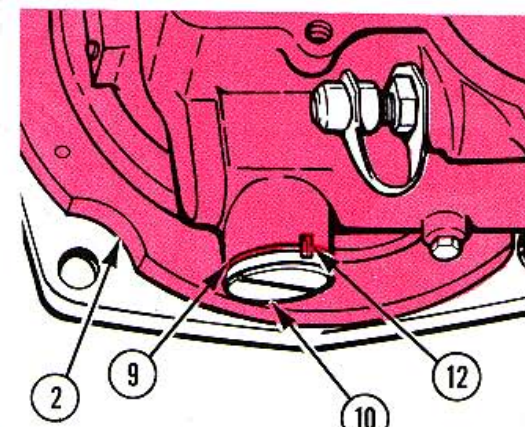
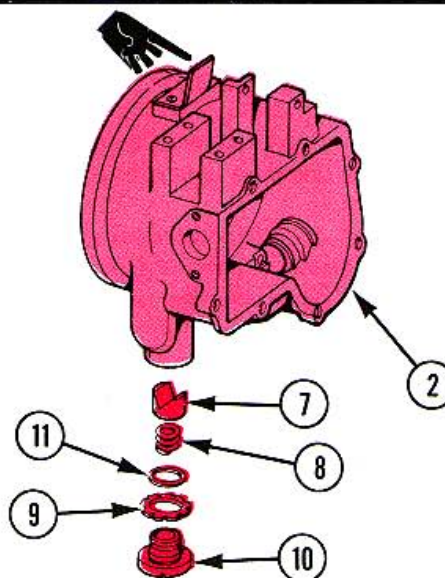


- 2** KEY WASHER (3). Install on retainer (4).
- 3** PACKING (5). Apply light coat of grease (item 3, app B), and install on retainer (4).



- 4** RETAINER (4). Screw in housing assembly (2) until tight.
- 5** LOCKING EAR (6). Bend to secure key washer (3) to housing assembly (2).

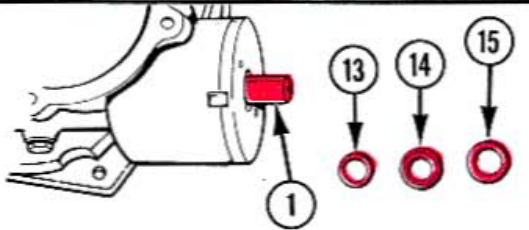
- 6** V-BEARING (7). Apply a light coat of grease (item 2, app B), and install in housing assembly (2).
- 7** SPRING (8). Install in housing assembly (2).
- 8** KEY WASHER (9). Place on retainer (10).
- 9** PACKING (11). Apply light coat of grease (item 3, app B), and install on retainer (10).
- 10** RETAINER (10). Screw in housing assembly (2) until tight.



- 11** LOCKING EAR (12) ON KEY WASHER (9). Bend to secure retainer (10) to housing assembly (2).



2-11. M17 QUADRANT-MAINTENANCE INSTRUCTIONS (cont)  
REASSEMBLY (cont)



12 PACKING (13), RETAINER (14), AND WASHER (15).

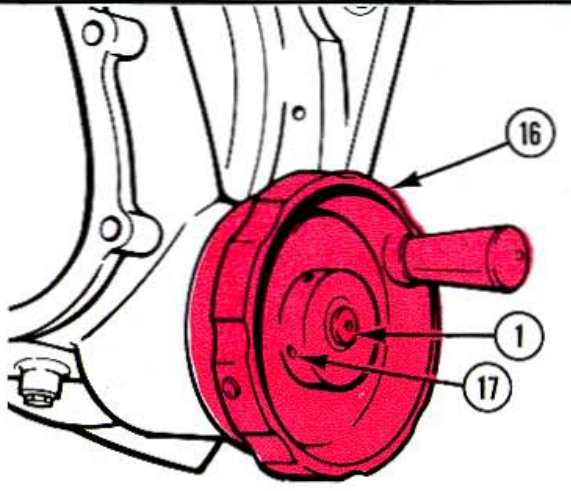
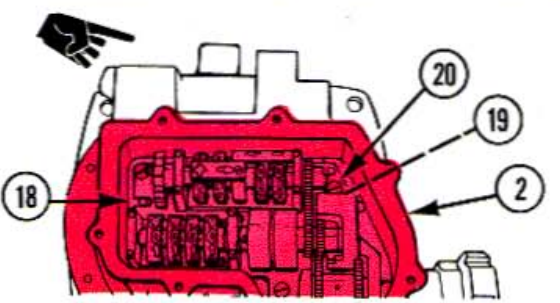
- Apply a light coat of grease (item 3, app B) to packing (13).
- Install all items over worm shaft assembly (1).

13 ELEVATION KNOB (16). Install on worm shaft assembly.

**CAUTION**  
Support elevation knob in V block on solid surface to prevent damage to worm shaft.

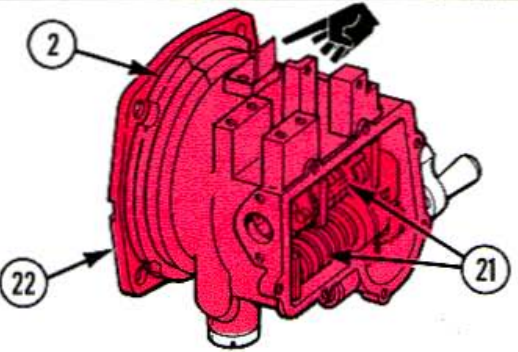
14 PIN (17). Install in elevation knob (16) and worm shaft assembly (1).

**NOTE**  
Ensure counters are set to zero and scribe lines on M17 quadrant housing assembly are aligned.

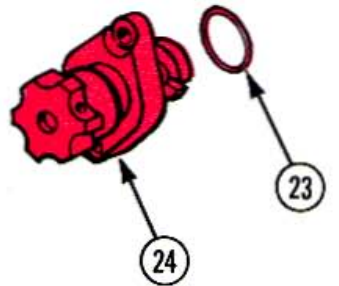



15 COUNTER ASSEMBLY (18). Position in housing assembly (2).

16 THREE LOCKWASHERS (19) AND THREE SCREWS (20). Install in housing assembly (2).



17 COUNTERS (21). Check to ensure counters are zeroed with scribe lines on base assembly (22) and housing assembly (2) aligned.



18 PACKING (23). Place new packing on correction knob assembly (24). Apply grease (item 3, app B).

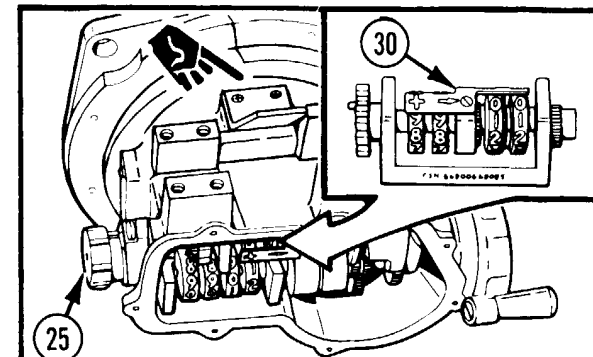
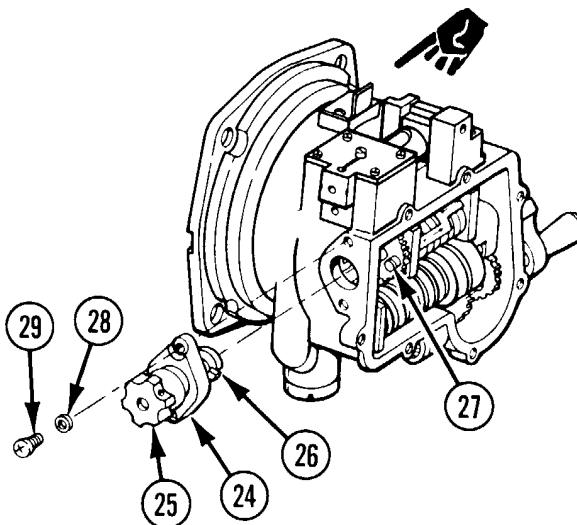


**19 CORRECTION KNOB (25).**

- a. Ensure rotation is smooth through 19-1/4 revolutions.
- b. Turn clockwise until it stops, and then turn counterclockwise 9-1/2 turns.

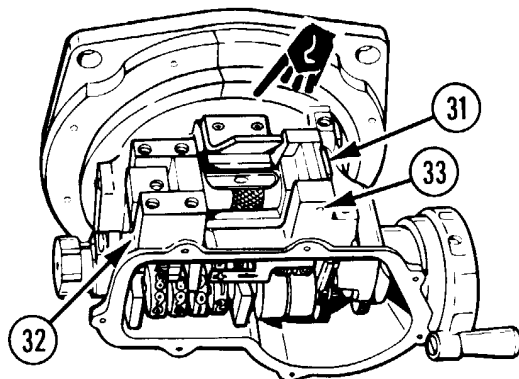
**20 CORRECTION KNOB ASSEMBLY (24).**  
Install and align slot (26) with pin (27).

**21 TWO LOCKWASHERS (28) AND TWO SCREWS (29).** Install.



**22 CORRECTION KNOB (25).** Turn and ensure correction counter (30) indicates readings from + 95 to + 99 mils and - 95 to -99 mils.

**23 CORRECTION COUNTER (30).** Return to 00.



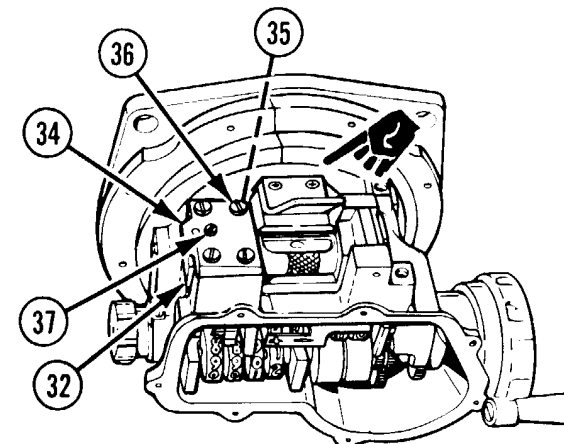
**24 FIRE CONTROL LEVEL ASSEMBLY (31).**  
Place in bracket (32).

**25 PIN (33).** Install.

**26 PLATE (34).** Place on top of bracket (32).

**27 FOUR LOCKWASHERS (35) AND FOUR SCREWS (36).** Install and tighten.

**28 SCREW (37).** Start, but do not tighten. (Tighten screw while performing adjustment (p 2-19).)

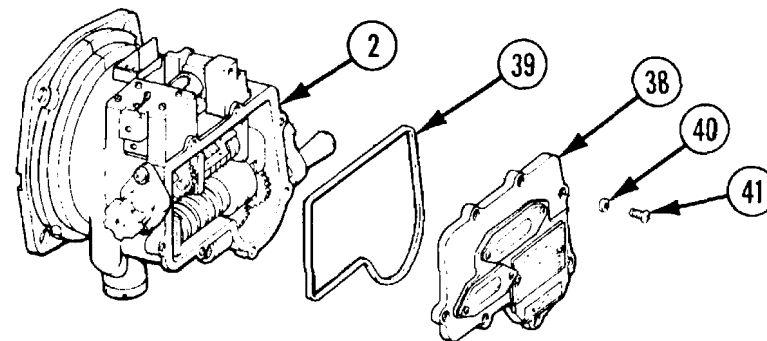


2-11. M17 QUADRANT-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY (cont)

**29 COVER ASSEMBLY (38) WITH PACKING (39).** Apply light coat of grease (item 3, app B) on new packing (39) and place cover assembly (38) with new packing (39) on housing assembly (2).

**30 SEVEN LOCKWASHERS (40) AND SEVEN SCREWS (41).** Install in cover assembly (38).



2-12. FIRE CONTROL LEVEL ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Remova
- b. Disassembly
- c. Repair
- d. Reassembly
- e. installation

**INITIAL SETUP**

- Test Equipment
- Cross-leveling fixture (6523553)
- Special Tools
- Adapter (12008990)
- Precision level (7686087)
- Tool box (SC 4931-95-CL-A09)
- Materials/Parts
- Lock wire (MS20995-C32)
- Sealing compound (MIL-S-1 1031)
- References
- TM 9-1025-211-20&P
- TM 9-1240-375-34P

Troubleshooting References

- 2-9 Elevation level bubble is not synchronized with M198 howitzer tube.
- 2-9 Elevation level bubble is not level.
- 2-9 Elevation level vial and counter dials have uneven or no illumination.
- 2-9 Elevation level vial has no bubble, but still illuminated.

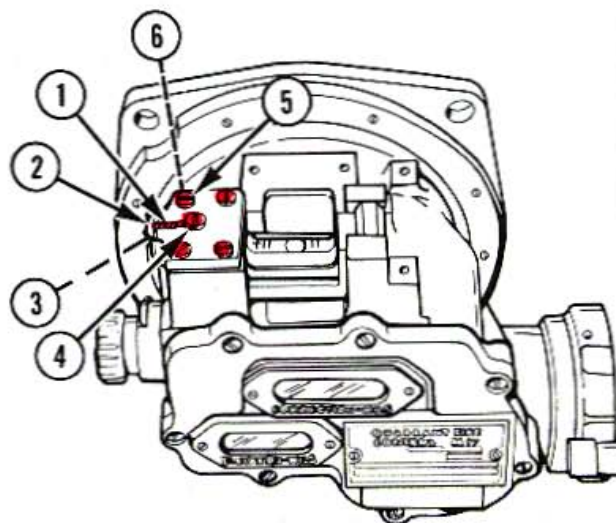
**WARNING**



When maintaining radioactively illuminated fire Control equipment, follow radiation hazard procedures on inside front cover

REMOVAL

- 1 LOCK WIRE (1). Remove.
- 2 SETSCREW (2) AND PAD (3). Loosen.
- 3 SCREW (4). Remove.
- 4 FOUR SCREWS (5) AND FOUR LOCK-WASHERS (6). Remove.

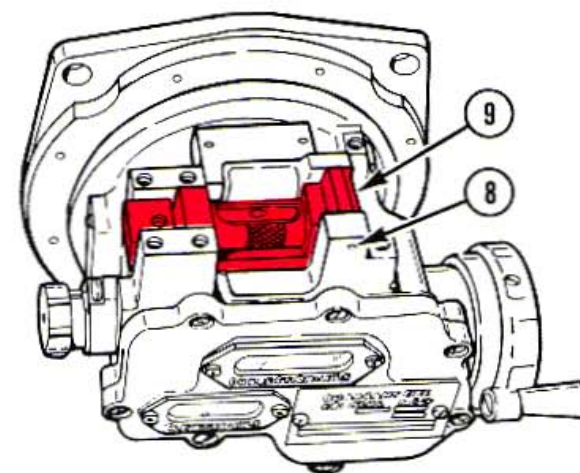


- 5 PLATE (7). Remove.

NOTE

Removal of fire control level assembly parts can be done without removing fire control level assembly from M17 quadrant .

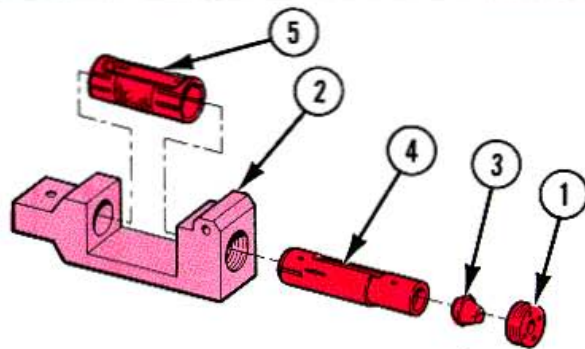
- 6 PIN (8). Drive out.
- 7 FIRE CONTROL LEVEL ASSEMBLY (9). Lift off and remove sealing compound.



2-12. FIRE CONTROL LEVEL ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY

- 1 RING (1). Remove from holder (2).
- 2 ECCENTRIC (3). Remove.
- 3 ELEVATION LEVEL VIAL (4). Slide through holder (2).
- 4 COVER (5). Lift off holder (2).

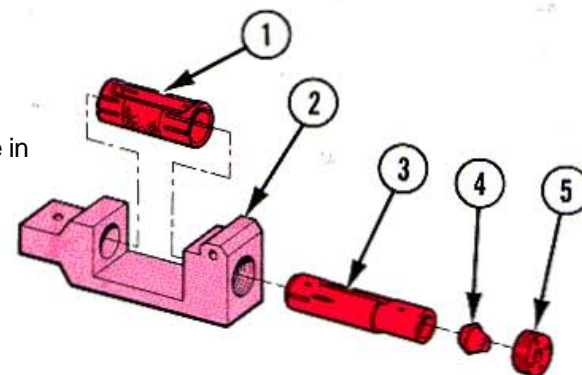


**NOTE**  
 Replace fire control level assembly if any threads are stripped or holder is damaged.

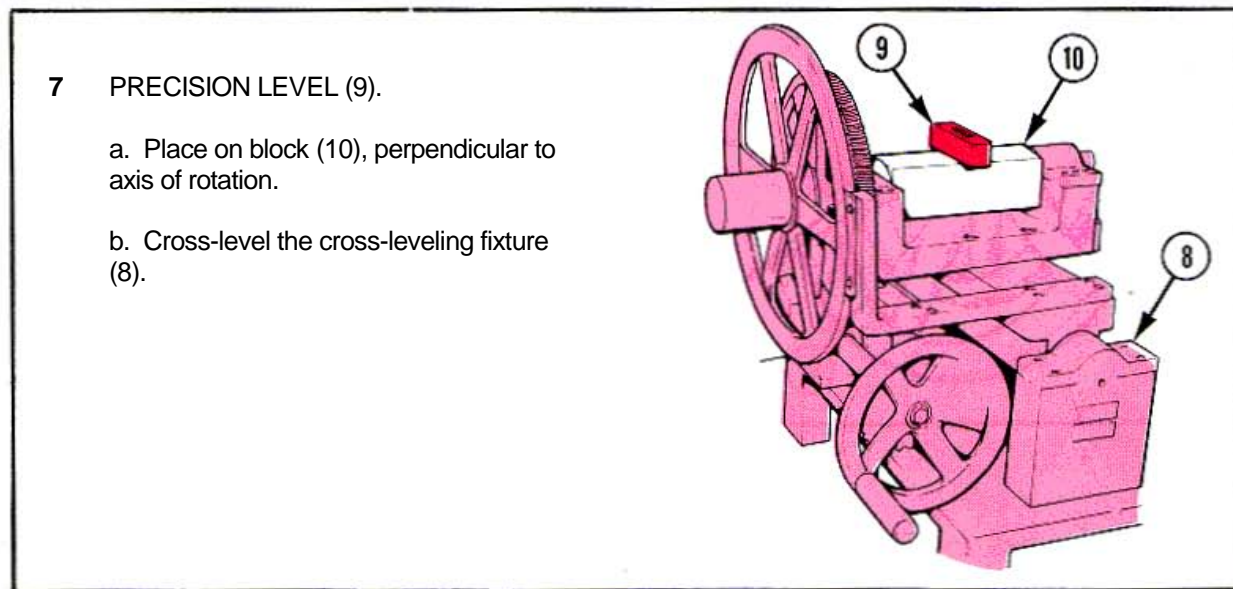
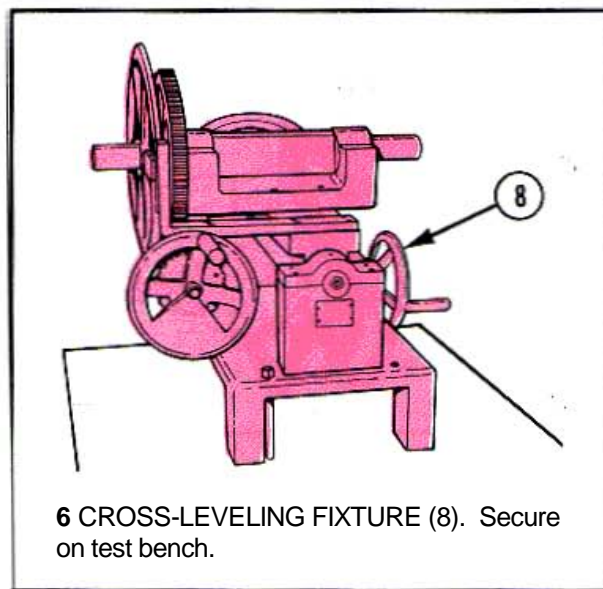
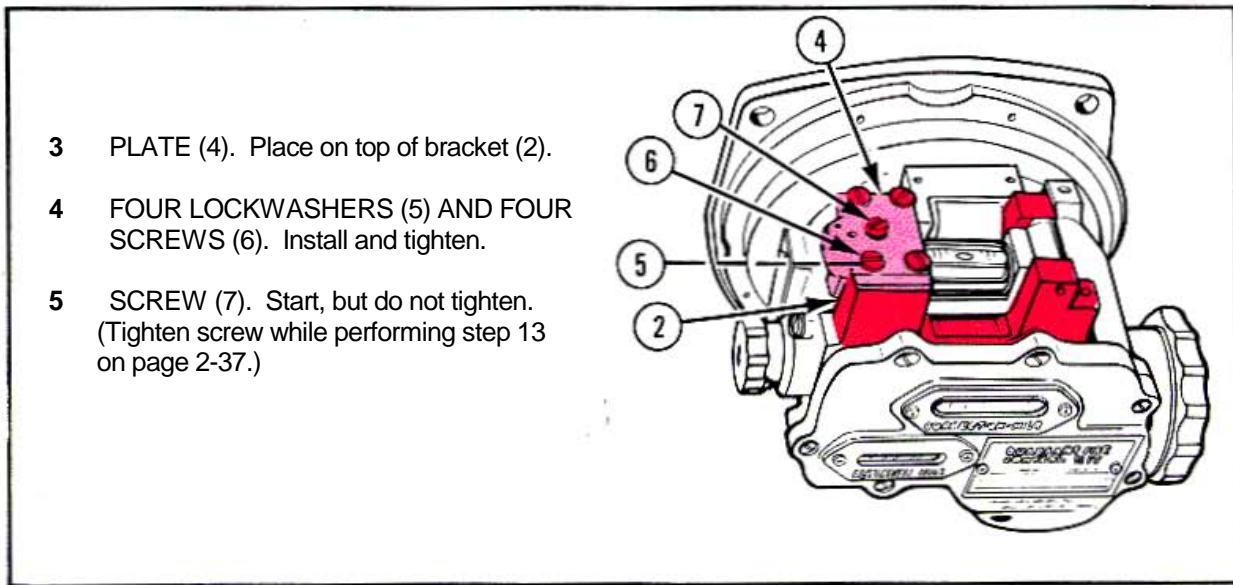
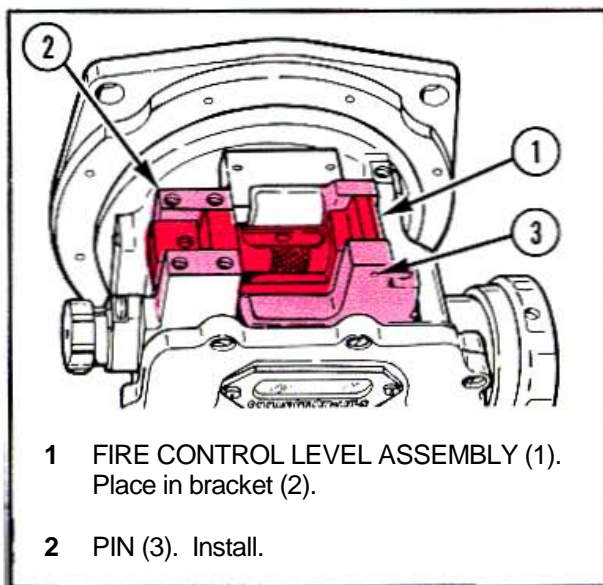
Repair is by replacement of authorized parts (TM 91240-375-34P) as required.

**NOTE**  
 The elevation level vial may be replaced if it is cracked but still illuminated. Return broken elevation level vial to depot maintenance. If the elevation level vial is not illuminated, the M17 quadrant must be returned to depot maintenance.

- 1 COVER (1). Place in holder (2).
- 2 ELEVATION LEVEL VIAL (3). Slide in holder (2).
- 3 ECCENTRIC (4). Install.
- 4 RING (5). Install.



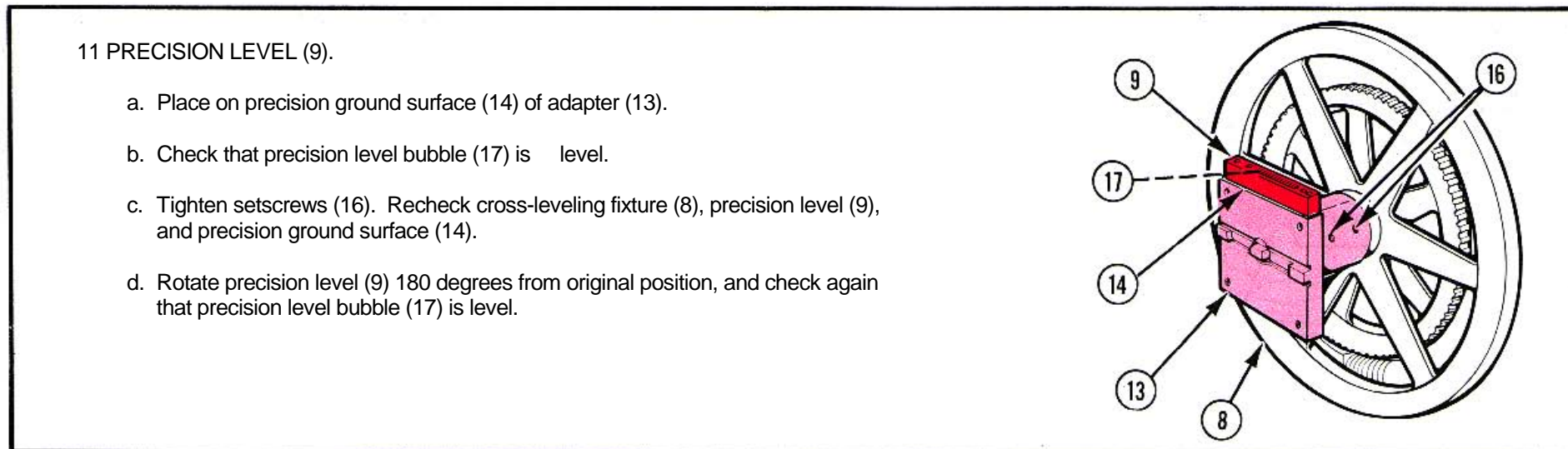
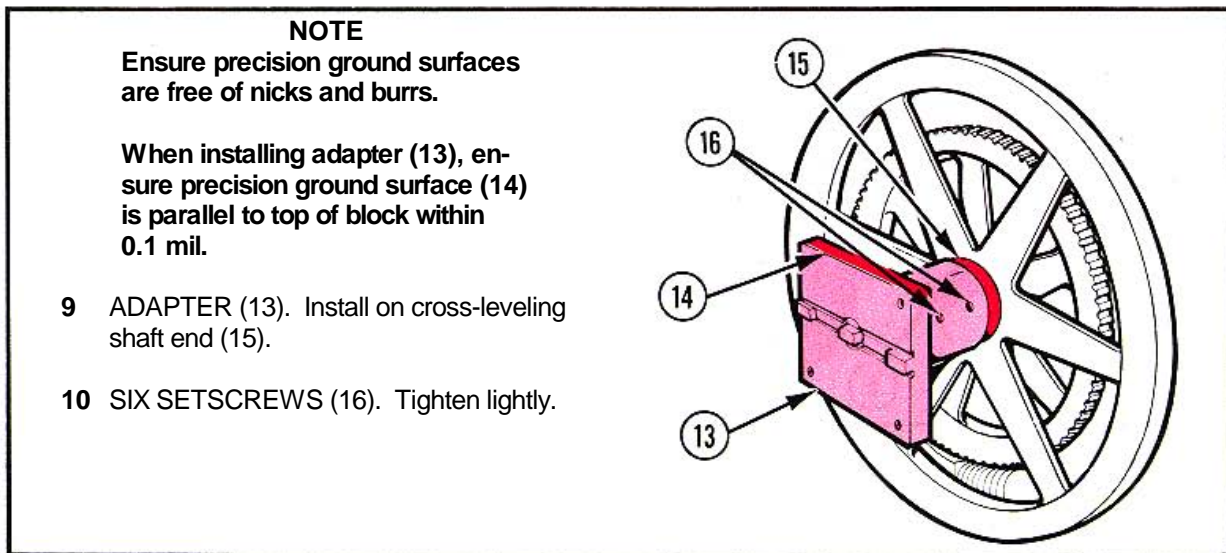
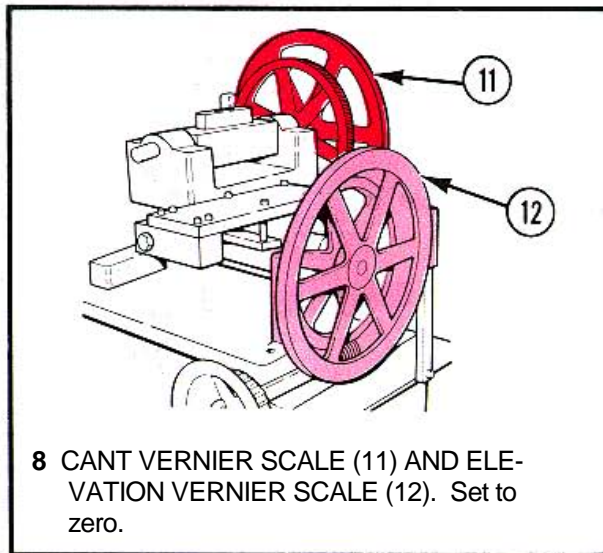
INSTALLATION





2-12. FIRE CONTROL LEVEL ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

INSTALLATION

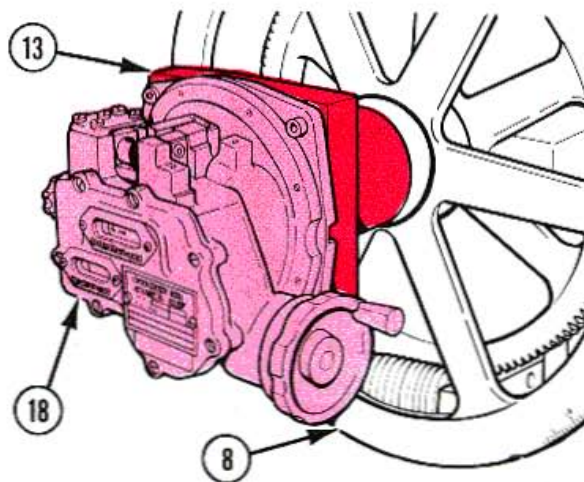




**NOTE**  
Check to make sure that cross-leveling fixture is still level in elevation and cant.

- 12 M17 QUADRANT (18). Install on adapter (13) of cross-leveling fixture (8).

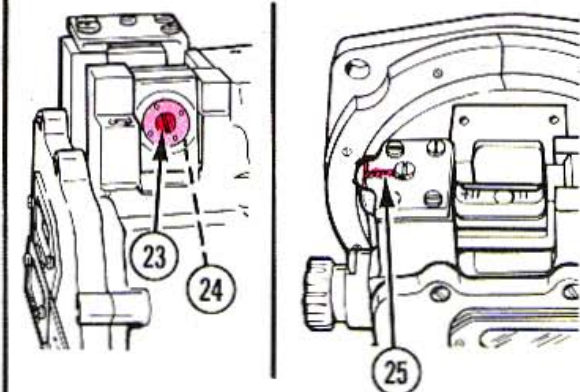
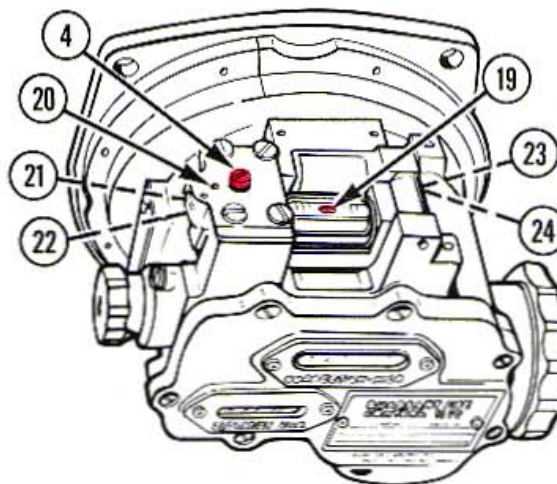
**NOTE**  
Correction and elevation counters must be set at zero when adjusting elevation level vial.



**NOTE**  
A combination of adjustment procedures in step 13 is necessary to center elevation level bubble.

13 ELEVATION LEVEL BUBBLE (19).

- a. Check that elevation level bubble is level. If not level, adjust screws (4 and 20).
- b. Tighten setscrews (21 and 22).
- c. Recheck elevation level bubble (19); if not level, adjust eccentric (23) and ring (24).



- 14 ECCENTRIC (23) AND RING (24). Apply sealing compound (TM 9-1025-211-20&P).

- 15 LOCK WIRE (25) (TM 9 -1025-211-20&P). Install.

2-13. COVER ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Removal
- b. Disassembly
- c. Repair
- d. Reassembly
- e. Installation

**INITIAL SETUP**

Special Tools  
 Tool box (SC 4931-95CL-A09)  
 Materials/Parts  
 Grease (item 3, app B)  
 Sealing compound (MIL-S-11031)  
 Preformed packing (MS9021-046)

Troubleshooting Reference  
 2-10 Counter windows are fogged or have condensation.

References  
 TM 9-1025-211-20&P  
 TM 9-1240-375-34P

**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

1 SEVEN SCREWS (1) AND SEVEN LOCK-WASHERS (2). Remove from cover assembly (3).

The diagram shows a side view of a mechanical housing assembly. A red cover assembly is being removed from the housing. Seven screws (labeled 1) and seven lock-washers (labeled 2) are shown being removed from the cover assembly (labeled 3).

2 COVER ASSEMBLY (3) WITH PACKING (4). Remove from housing assembly (5).

The diagram shows the housing assembly (labeled 5) with the cover assembly (labeled 3) and packing (labeled 4) being removed. The cover assembly is shown as a red component with a red packing ring (labeled 4) attached to its inner edge.

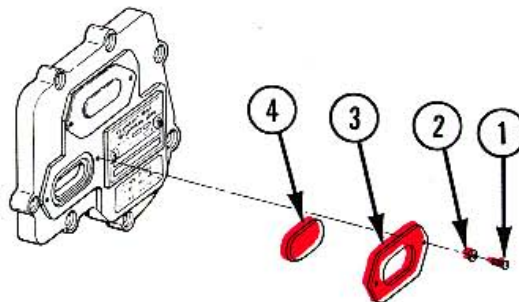
DISASSEMBLY

**CAUTION**

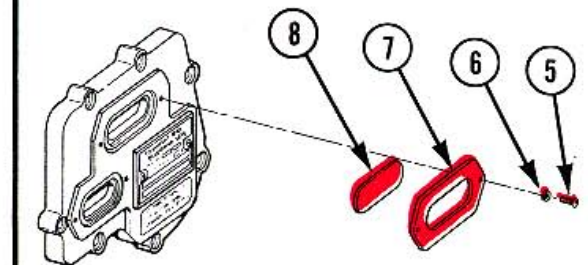
When removing windows, special care should be exercised to ensure the tritium vials are not damaged.

**NOTE**

Replace cover assembly if cracked, broken, or damaged in any way that would allow foreign matter to enter interior of the M17 quadrant.



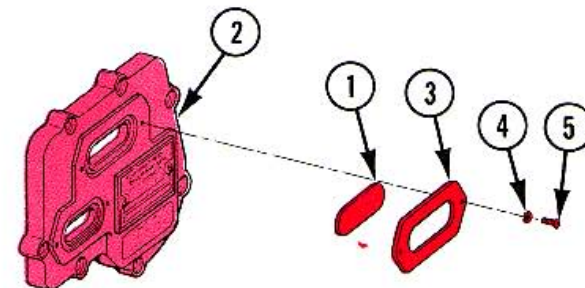
- 1 TWO SCREWS (1) AND TWO LOCKWASHERS (2). Remove from plate (3).
- 2 PLATE (3). Loosen and remove.
- 3 WINDOW (4). Remove.



- 4 TWO SCREWS (5) AND TWO LOCKWASHERS (6). Remove from plate (7).
- 5 PLATE (7). Remove.
- 6 WINDOW (8). Remove.

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

- 1 WINDOW (1). Install in cover assembly (2).
- 2 COVER ASSEMBLY (2). Apply light coat of sealing compound (TM 9-1025-211-20&P) in channel around window (1).
- 3 PLATE (3). Install.
- 4 TWO LOCKWASHERS (4) AND TWO SCREWS (5). Install.





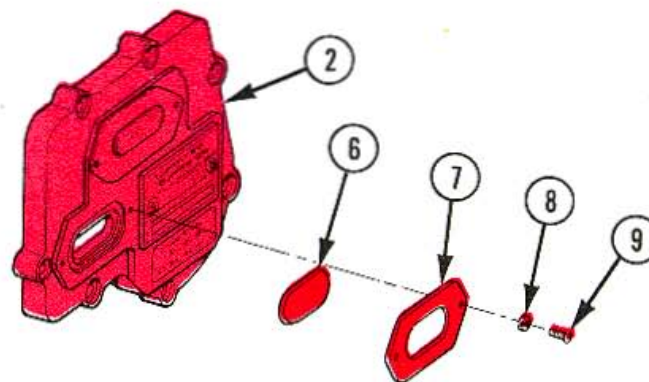
2-13. COVER ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

5 WINDOW (6). Install in cover assembly (2).

6 COVER ASSEMBLY (2). Apply light coat of sealing compound (TM 9-1025-211-20&P) in channel around window (6).

7 PLATE (7). Install.

8 TWO LOCKWASHERS (8) AND TWO SCREWS (9). Install.



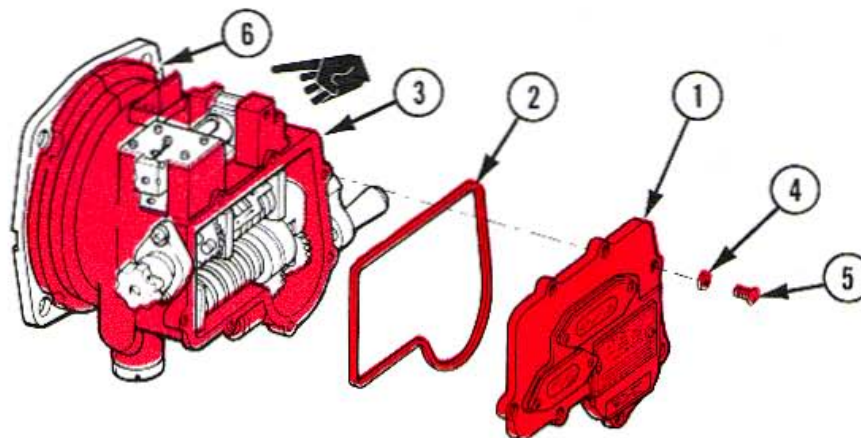
INSTALLATION

1 COVER ASSEMBLY (1) WITH PACKING (2).

- a. Apply light coat of grease (item 3, app B) on new packing (2).
- b. Place cover assembly (1) with new packing (2) on housing assembly (3).

2 SEVEN LOCKWASHERS (4) AND SEVEN SCREWS (5). Install in cover assembly (1).

3 M17 QUADRANT (6). Purge and charge (TM 9-1025-211-20&P).



2-14. CORRECTION KNOB ASSEMBLY--MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Removal
- b. Disassembly
- c. Cleaning
- d. Repair
- e. Reassembly
- f. Installation

**INITIAL SETUP**

Special Tools

- Adapter set (SC 4931-95-CL-A11)
- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)

Materials/Parts

- Cleaning compound (MIL-C-18718)
- Grease (item 2, app B)
- Grease (item 3, app B)
- Preformed packing (MS9021-017)
- Preformed packing (MS9021-046)

References

- TM 9-1025-211-10
- TM 9-1240-375-34P

Troubleshooting Reference

- 2-10 Correction knob binds.

Equipment Condition

- 2-24 Cover assembly removed.

**WARNING**



When maintaining radioactively illuminated fire Control equipment, follow radiation hazard procedures on inside front cover

2-14. CORRECTION KNOB ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

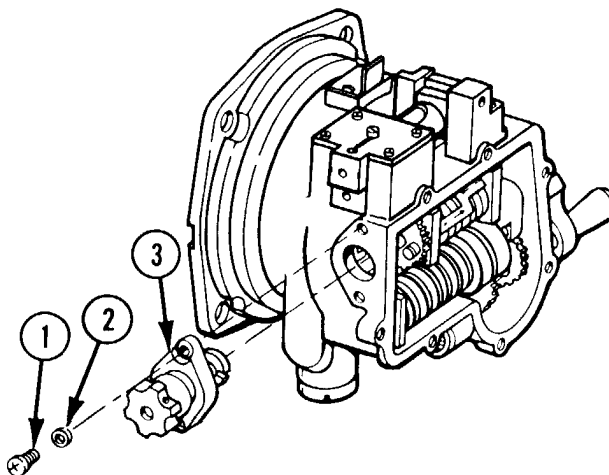
REMOVAL

- 1 TWO SCREWS (1) AND TWO LOCK-WASHERS (2). Remove from correction knob assembly (3).

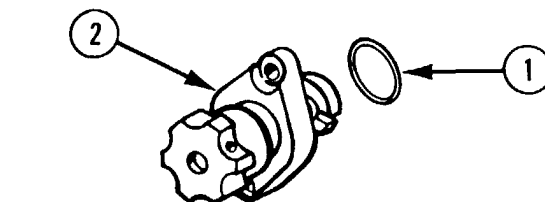
**CAUTION**

Correction knob assembly must be removed carefully, or internal M17 quadrant parts could be damaged.

- 2 CORRECTION KNOB ASSEMBLY (3). Remove.



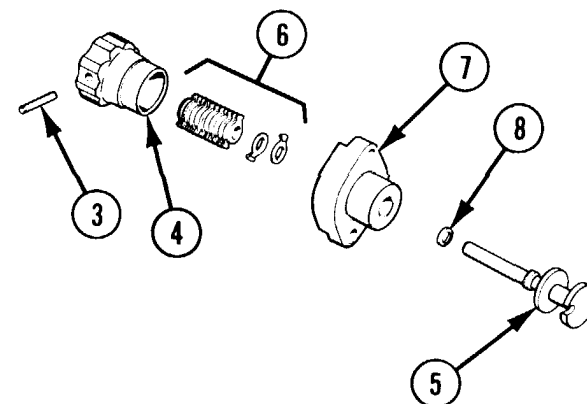
DISASSEMBLY



- 1 PACKING (1). Remove from correction knob assembly (2).

**CAUTION**  
Deleted.

- 2 PIN (3). Remove from correction knob (4).
- 3 CORRECTION KNOB (4). Pull off shaft (5), being careful not to lose key washers (6).
- 4 TWENTY-FOUR KEY WASHERS (6). Remove from shaft (5).
- 5 SHAFT (5).
  - a. Remove from housing (7).
  - b. Inspect shaft (5) for damage.
- 6 PACKING (8). Remove from shaft (5).





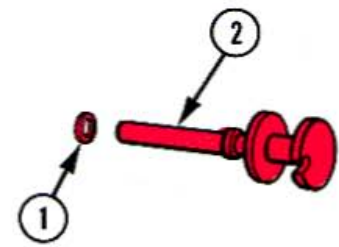
CLEANING

REPAIR

**NOTE**  
 Replace correction knob assembly if binding or damaged and will not turn the correction counter freely.

Clean all parts with cleaning compound (TM 9-1025-211-10).

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.



1 PACKING (1).

- Apply light coat of grease (item 3, app B).
- Install on shaft (2).

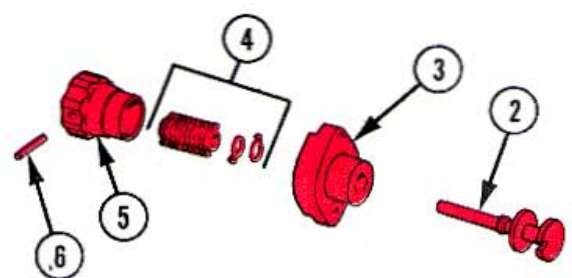
2 SHAFT (2). Reinstall in housing (3).

**NOTE**  
 Tabs on key washers (4) must face toward correction knob (5).

3 TWENTY-FOUR KEY WASHERS (4). Apply light coat of grease (item 2, app B) and place on shaft (2).

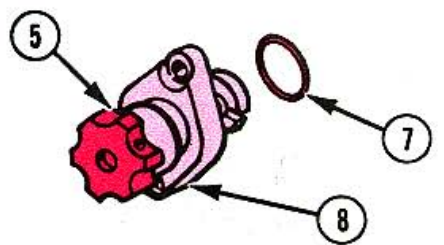
**CAUTION**  
 Support correction knob in V block on solid surface to prevent damage to shaft.

4 CORRECTION KNOB (5). Place on shaft (2), and secure with pin (6).



2-14. CORRECTION KNOB ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

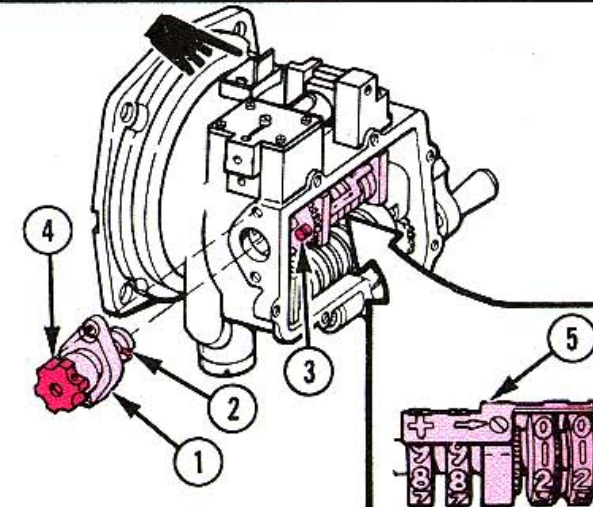
REASSEMBLY (cont)



**5 PACKING (7).** Place new packing on correction knob assembly (8). Apply grease (item 3, app B).

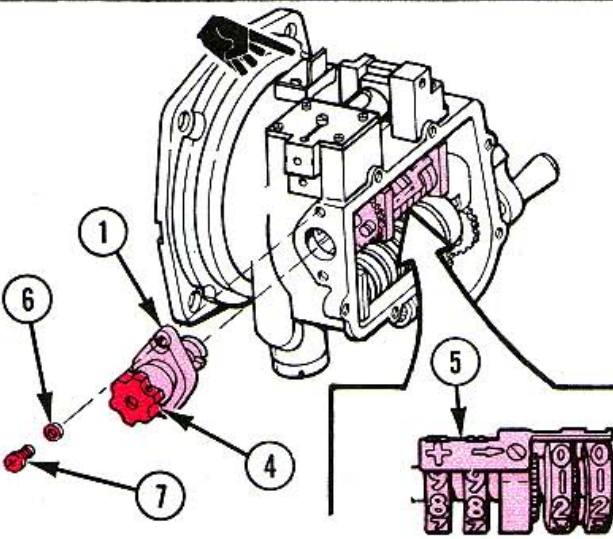
**6 CORRECTION KNOB (5).** Ensure rotation is smooth through 19-1/4 revolutions.

INSTALLATION



**1 CORRECTION KNOB ASSEMBLY (1).**

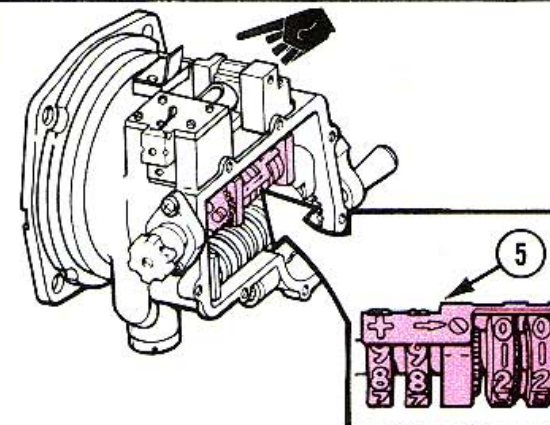
- Install and align slot (2) with pin (3).
- Hold and rotate correction knob (4) until correction counter (5) reads 00.
- Remove correction knob assembly (1).



**2 CORRECTION KNOB (4).**

- Turn clockwise until it stops, and then turn counterclockwise 9-1/2 turns.
- Install correction knob assembly (1).
- Turn and ensure correction counter (5) indicates readings from + 95 to + 99 mils and - 95 to -99 mils.

**3 TWO LOCKWASHERS (6) AND TWO SCREWS (7).** Install.

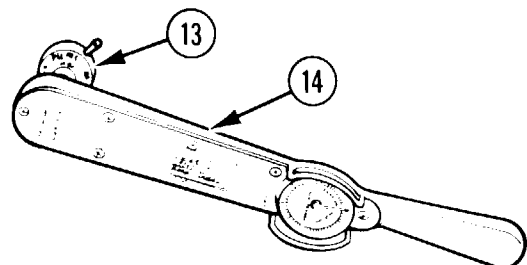
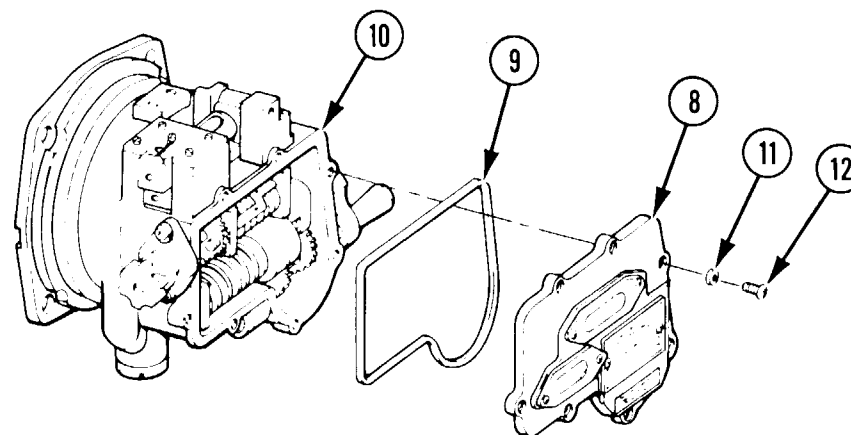


**4 CORRECTION COUNTER (5).** Return to 00.

**5 COVER ASSEMBLY (8) WITH PACKING (9).**

- a. Apply light coat of grease (item 3, app B) to new packing (9).
- b. Place cover assembly (8) with new packing (9) on housing assembly (10).

**6 SEVEN LOCKWASHERS (11) AND SEVEN SCREWS (12). Install in cover assembly (8).**



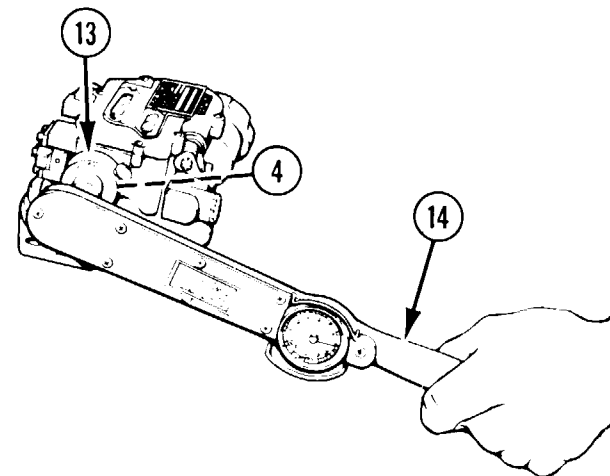
**7 TORQUE ADAPTER (13). Install on torque wrench (14).**

**NOTE**

Running torque should be no greater than 4 in.-lb (0.45 N-m) or less than 1 in.-lb (0.11 N-m).

**8 TORQUE WRENCH (14) WITH TORQUE ADAPTER (13).**

- a. Install on correction knob (4).
- b. Measure torque. If torque cannot be met, remove correction knob (4) and check for possible bent shaft.



2-15. COUNTER ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- |                |                 |
|----------------|-----------------|
| a. Removal     | d. Repair       |
| b. Disassembly | e. Reassembly   |
| c. Cleaning    | f. Installation |

**INITIAL SETUP**

Special Tools

- Adapter set (SC 4931-95-CL-A11)
- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)

Materials/ Parts

- Cleaning compound (MIL-C-18718)
- Grease (item 2, app B)
- Sealing compound (MIL-S-1 1031)

References

- TM 9-1025-211-10
- TM 9-1025-21 1-20&P
- TM 9-1240-375-34P

Troubleshooting References

- 2-11 Correction counter fails to allow + 95 to + 99 mils max or - 95 to - 99 mils max.

- 2-11 Counter numbers are not in horizontal alinement.
- 2-12 Elevation counter fails to allow 1433 or 9720 mils.

Equipment Conditions

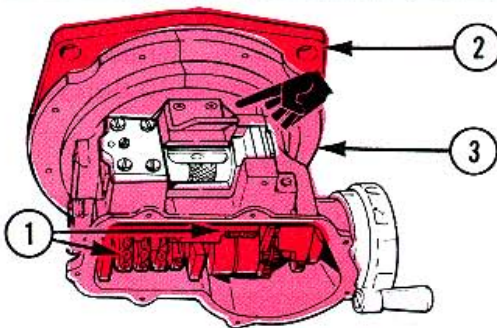
- 2-24 Cover assembly removed.
- 2-26 Correction knob assembly removed.

**WARNING**

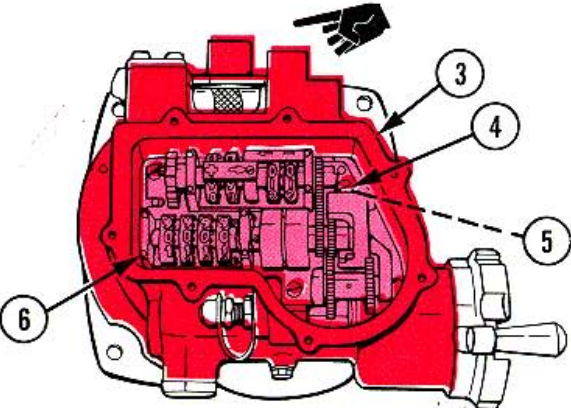


**When maintaining radioactively illuminated fire Control equipment, follow radiation hazard procedures on inside front cover**

**REMOVAL**



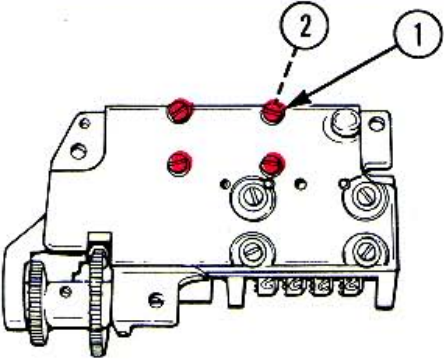
1 COUNTERS (1). Set at zero. Scribe a line on base assembly (2) and housing assembly (3) to facilitate correct counter assembly installation.



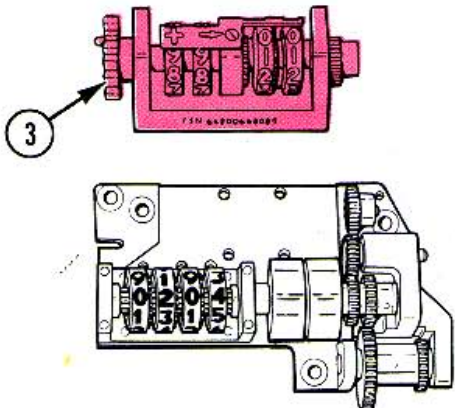
2 THREE SCREWS (4) AND THREE LOCK-WASHERS (5). Remove from housing assembly (3).

3 COUNTER ASSEMBLY (6). Remove carefully from housing assembly (3).

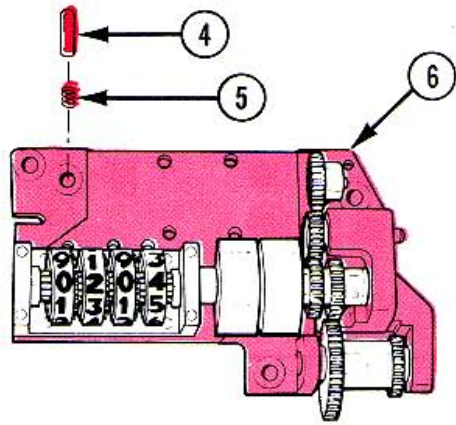
**DISASSEMBLY**



1 FOUR SCREWS (1) AND FOUR LOCK-WASHERS (2). Remove.



2 CORRECTION COUNTER (3). Remove.

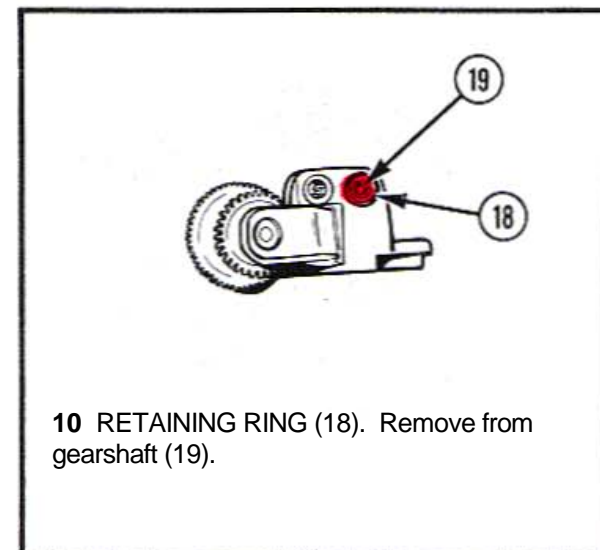
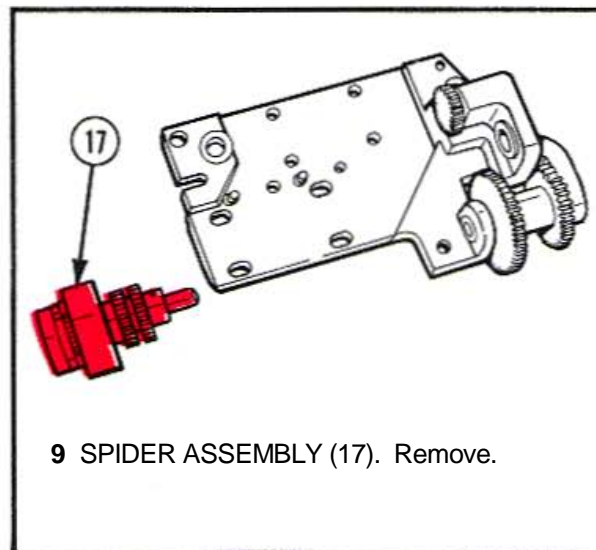
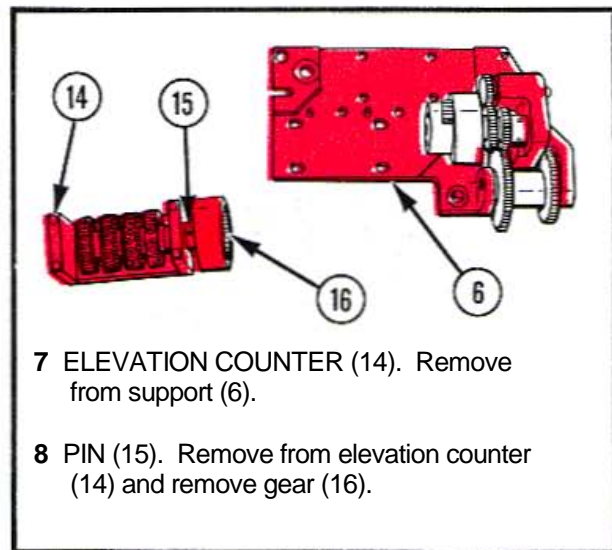
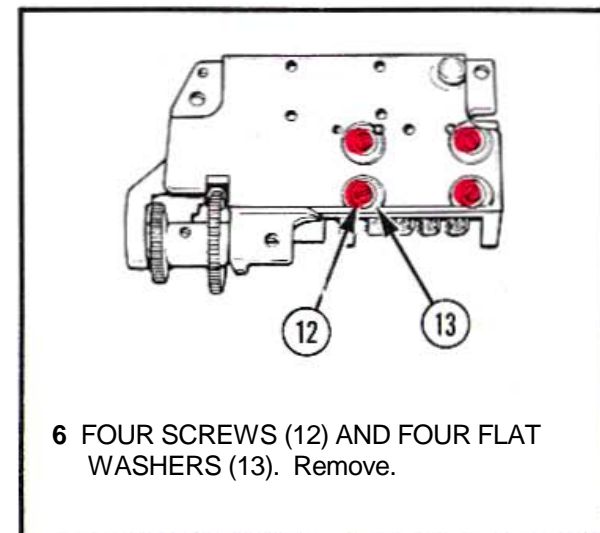
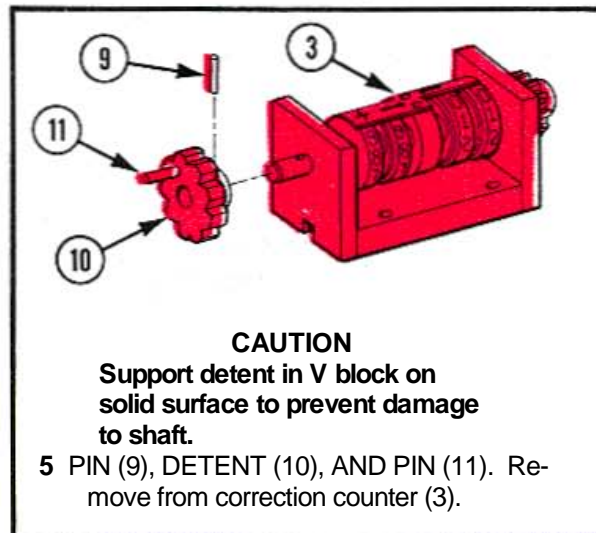
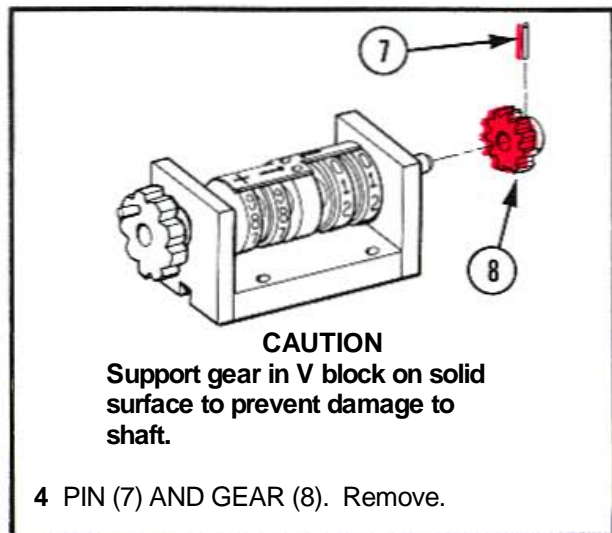


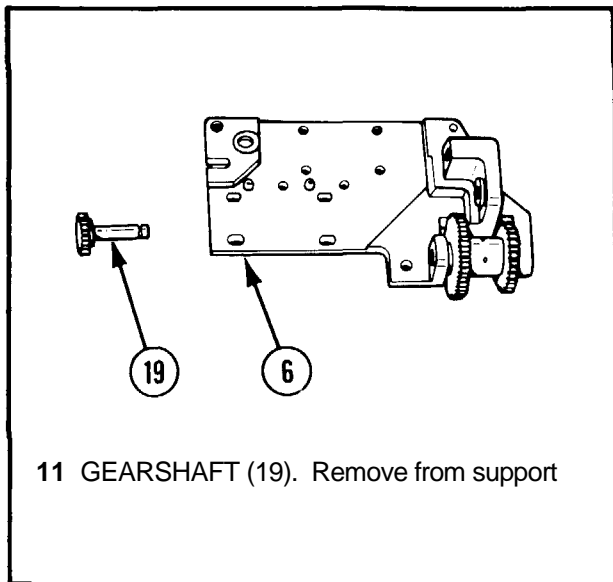
3 PLUNGER (4) AND SPRING (5). Remove from support (6).



2-15. COUNTER ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY





(6).

**NOTE**  
 Replace counter assembly if damaged so that the counters cannot be adjusted. This condition will affect accuracy of the sighting procedures.

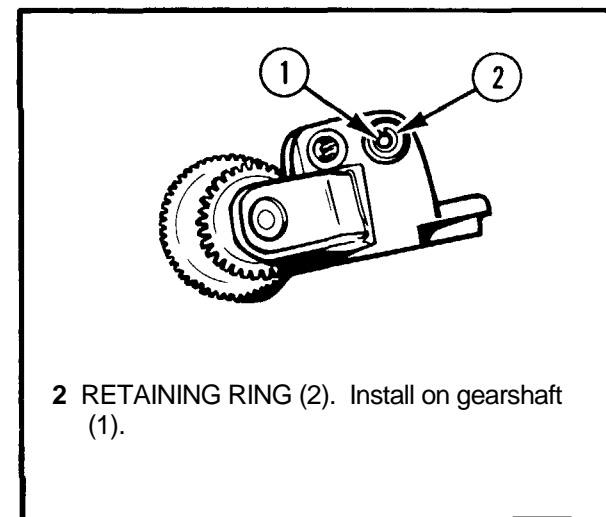
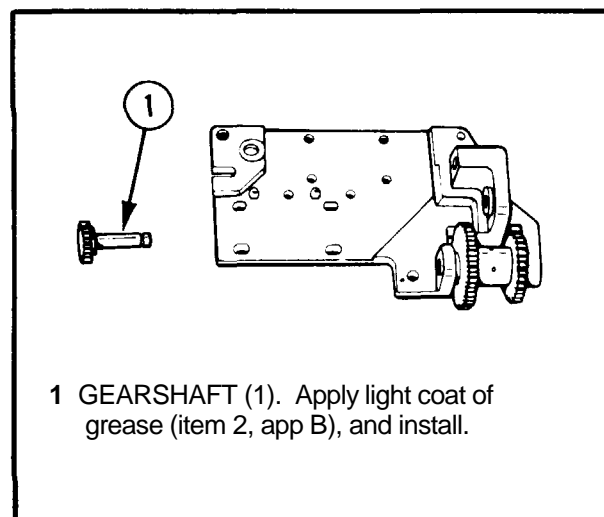
**CAUTION**  
 Do not clean counter assembly with cleaning compound.

Clean other parts with cleaning compound (TM 9-1025-211-10).

**REPAIR**

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

**REASSEMBLY**



2-15. COUNTER ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY (cont)

3 SPIDER ASSEMBLY (3). Apply light coat of grease (item 2, app B) and place in support (4).

4 GEAR (5). Place on elevation counter (6) and install pin (7).

5 ELEVATION COUNTER (6). Place on support (4) and slide onto spider assembly (3).

6 FOUR FLAT WASHERS (8) AND FOUR SCREWS (9). Apply a thin coat of sealing compound (TM 9 1025-211 20&P), and install.

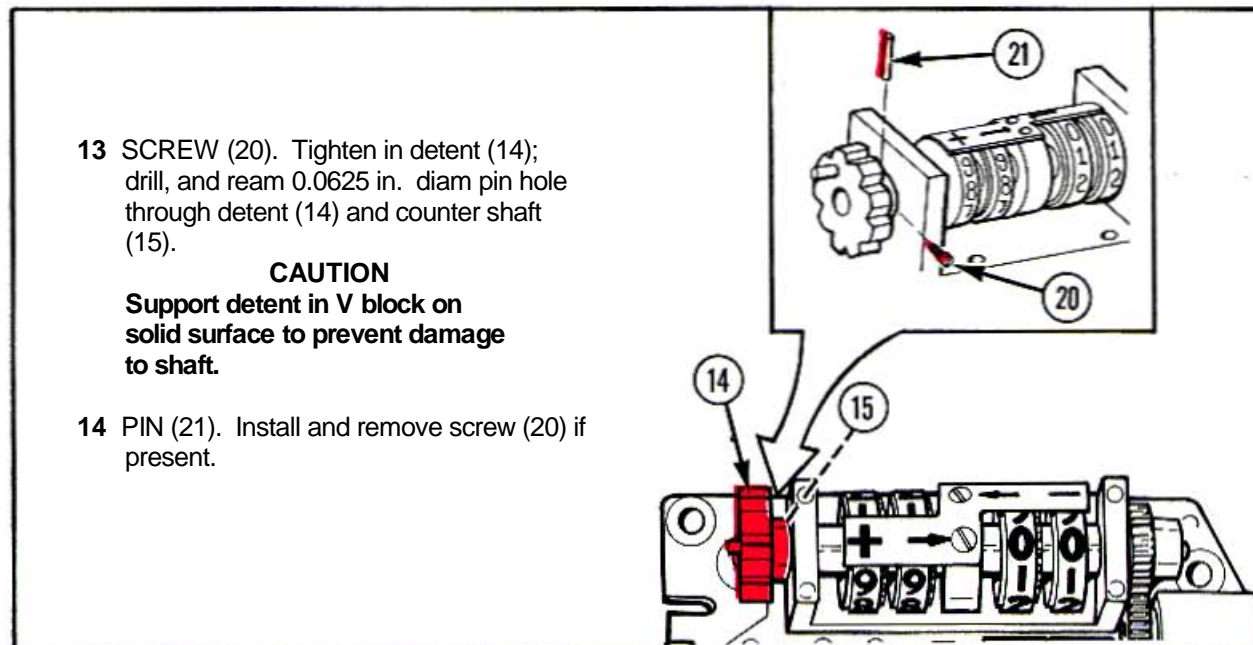
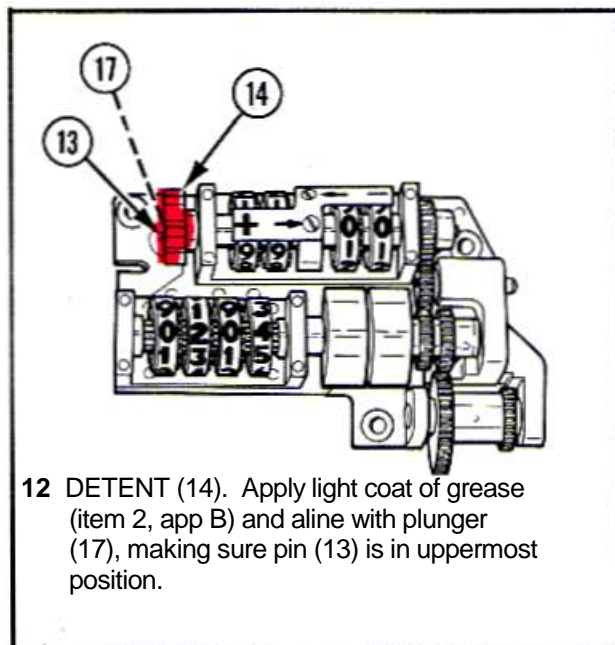
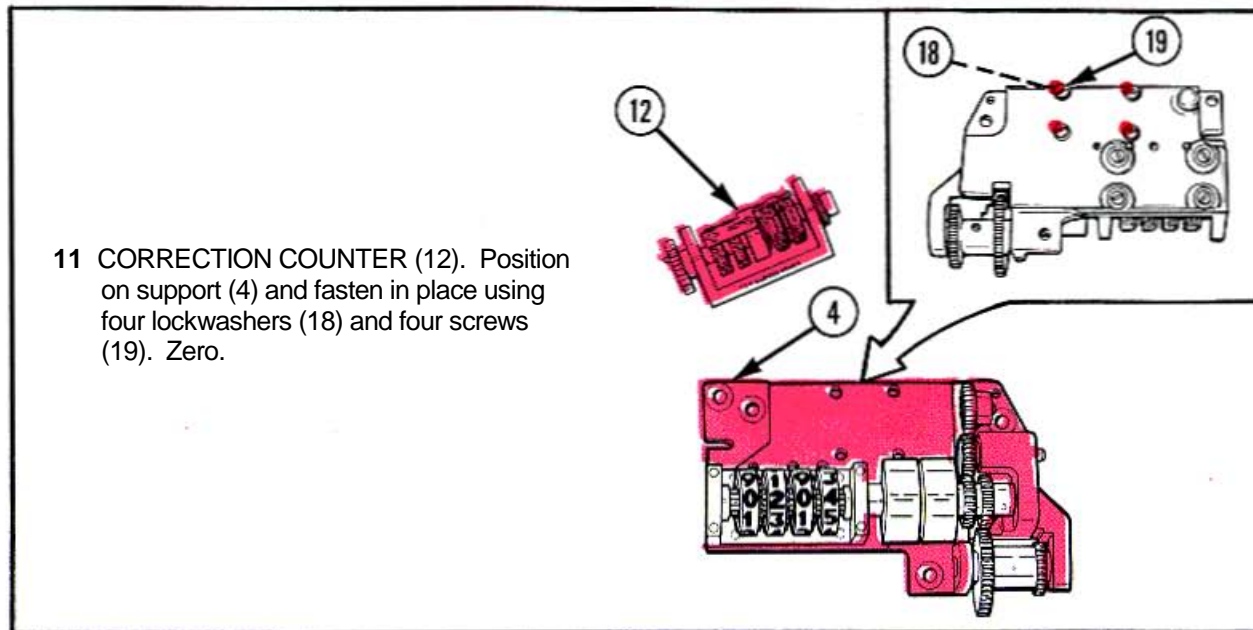
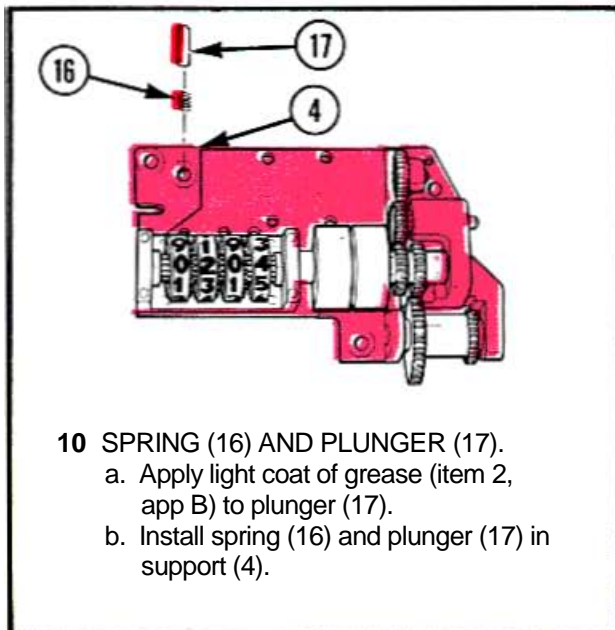
**CAUTION**  
Support gear in V block on solid surface to prevent damage to shaft.

7 GEAR (10) AND PIN (11). Install on correction counter (12).

**NOTE**  
If correction counter or detent replacement is required, timing must be maintained. Perform steps 8 thru 15.  
If replacement is not required, perform steps 8 thru 12 and proceed to step 14.

8 PIN (13). Install in detent (14).

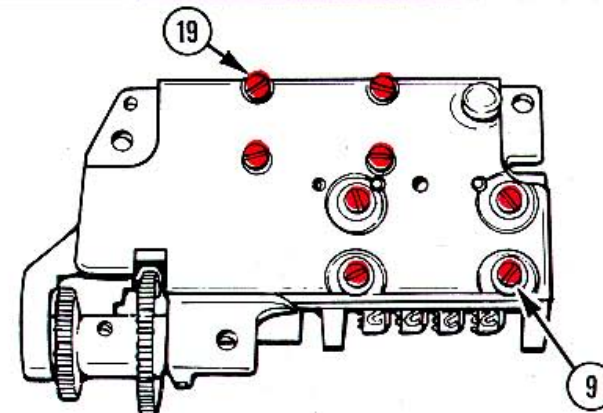
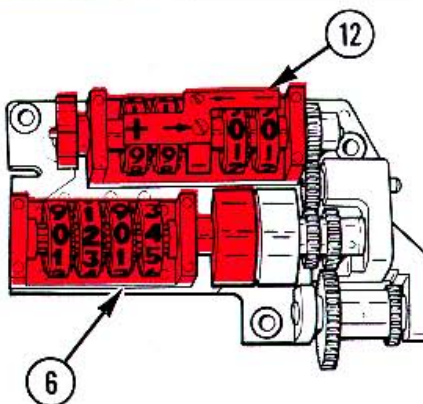
9 DETENT (14). Slide onto counter shaft (15).



2-15. COUNTER ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY (cont)

15 ELEVATION COUNTER (6) AND CORRECTION COUNTER (12). Ensure rotation is smooth. If movement is not smooth, loosen four screws (9) and four screws (19), and reposition counters.

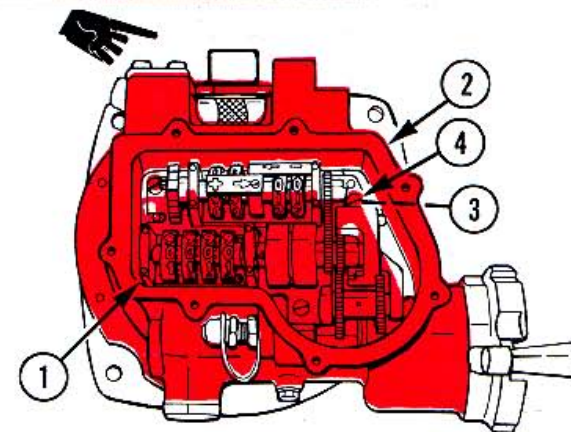


INSTALLATION

NOTE

Check that correction and elevation counters are set at zero before installation of counter assembly. Ensure scribe lines are aligned on M17 quadrant housing assembly.

- 1 COUNTER ASSEMBLY (1). Place in housing assembly (2).
- 2 THREE LOCKWASHERS (3) AND THREE SCREWS (4). Install.

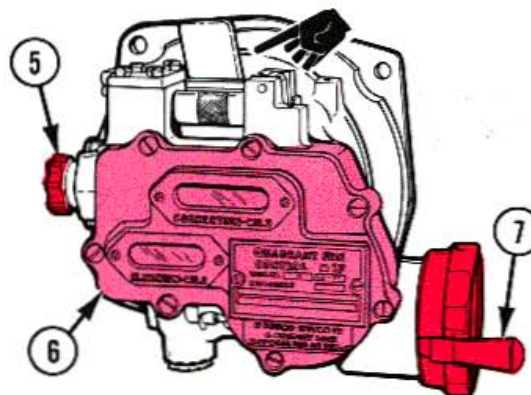




3 CORRECTION KNOB ASSEMBLY (5) AND COVER ASSEMBLY (6). Install (p 2-30).

4 ELEVATION KNOB (7).

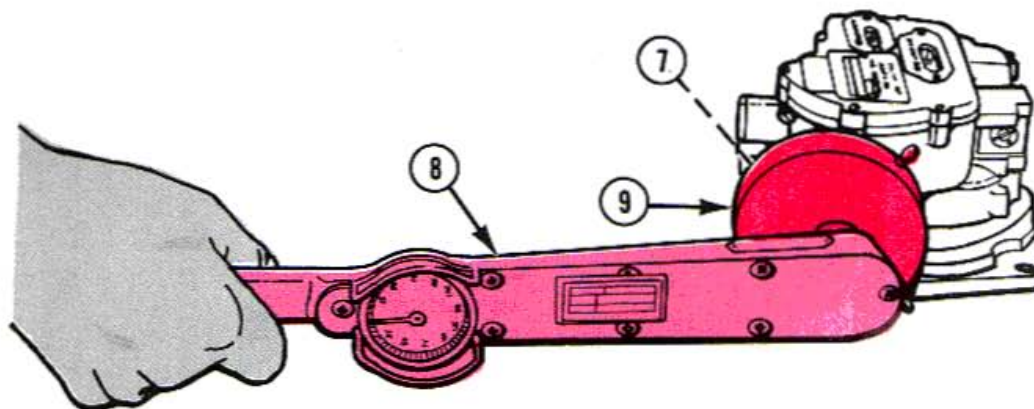
- a. Turn in one direction to 1433 mils.
- b. Turn in opposite direction to 9720 mils.



**NOTE**  
Starting torque should be no greater than 10 in.-lb (1.13 N-m) or less than 3 in.-lb (0.34 N-m).

5 TORQUE WRENCH (8) WITH TORQUE ADAPTER (9).

- a. Apply to elevation knob (7).
- b. Measure torque. If torque cannot be met, remove retainer, steps 18 thru 22 on page 2-27, and perform steps 6 thru 11 on page 2-29.



## 2-16. WORM SHAFT ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Removal
- b. Cleaning
- c. Inspection
- d. Installation
- e. Adjustment

**INITIAL SETUP**

## Special Tools

Adapter set (SC 4931-95CL-A11)  
Shop set (SC 4931-95CL-A07)  
Tool box (SC 4931-95CL-A09)

## Materials/Parts

Cleaning compound (MIL-C-18718)  
Grease (item 2, app B)  
Grease (item 3, app B)

## Reference

TM 9-1025211-10

## Troubleshooting Reference

2-12 1 Elevation knob exceeds 0.7-mil backlash.

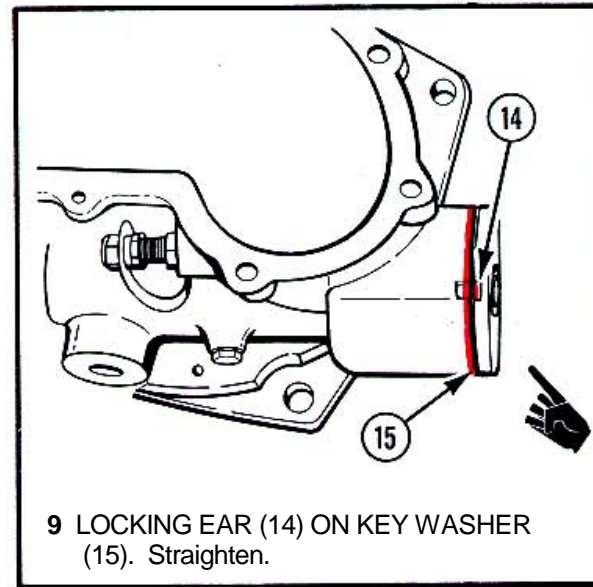
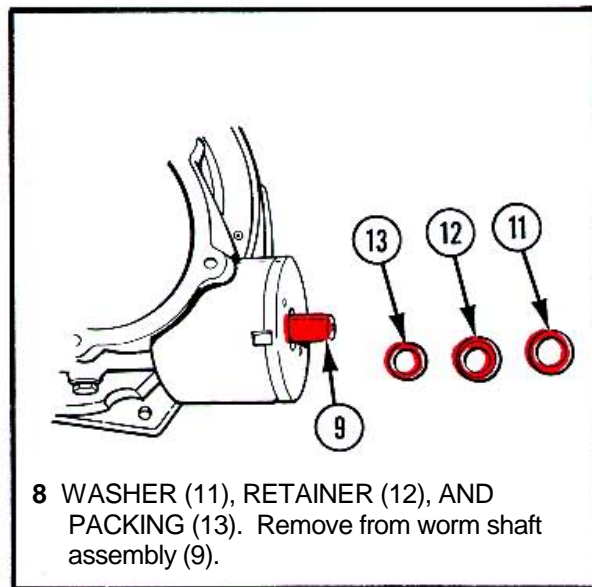
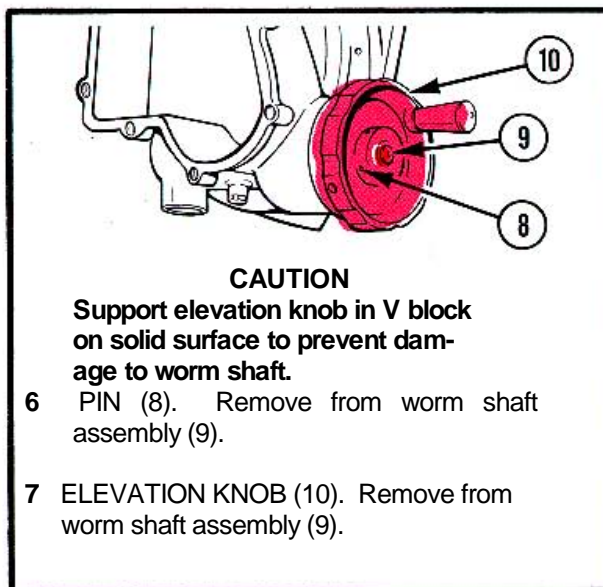
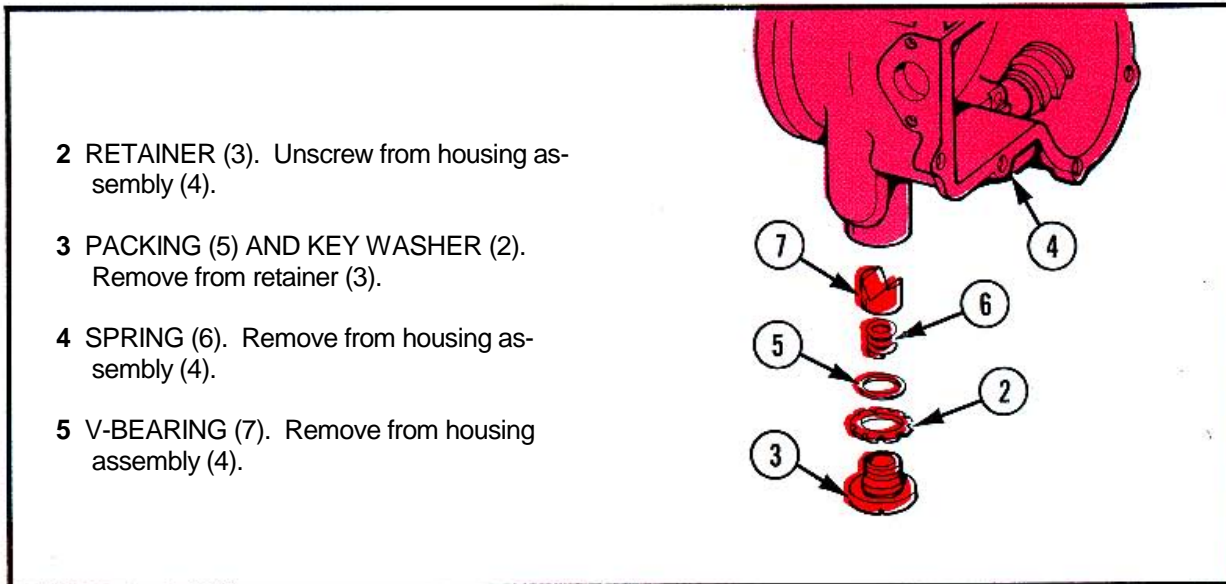
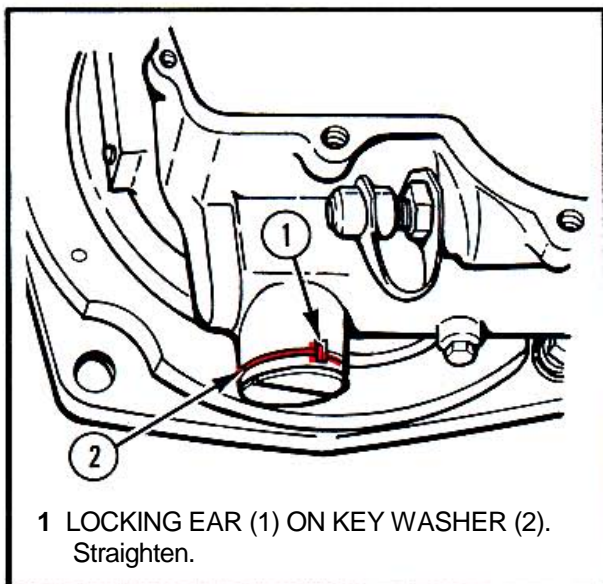
## Equipment Conditions

- 2-24 Cover assembly removed.
- 2-24 Correction knob assembly removed.
- 2-26 Counter assembly removed.

**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

REMOVAL



2-16. WORM SHAFT ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REMOVAL (cont)

10 RETAINER (16). Remove from worm shaft assembly (9).

11 PACKING (17) AND KEY WASHER (15). Remove from retainer (16).

**NOTE**  
Check position of flat (18) on worm shaft assembly (9) in relation to housing assembly (4).

12 WORM SHAFT ASSEMBLY (9). Rotate and remove.

CLEANING

Clean all parts with cleaning compound (TM 9-1025-211-10).

INSPECTION

- 1 GEARS. Inspect for missing teeth or stripped gears.
- 2 BEARING SURFACES. Inspect for nicks or burrs.

**NOTE**  
Replace worm shaft assembly if bent or damaged in a way that would affect the accuracy of the elevation adjustments.

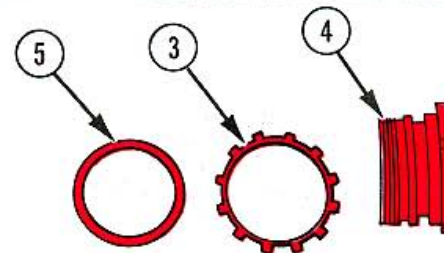
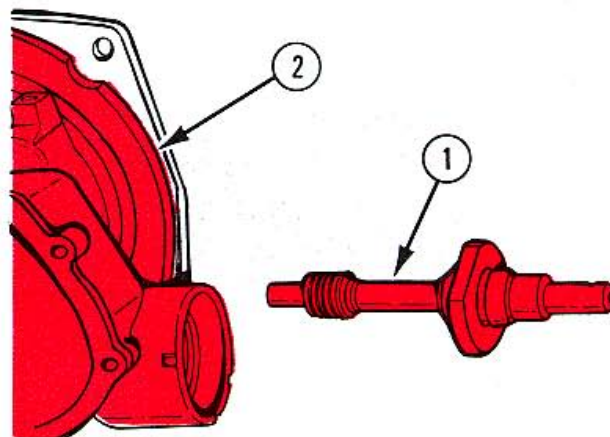


**INSTALLATION**

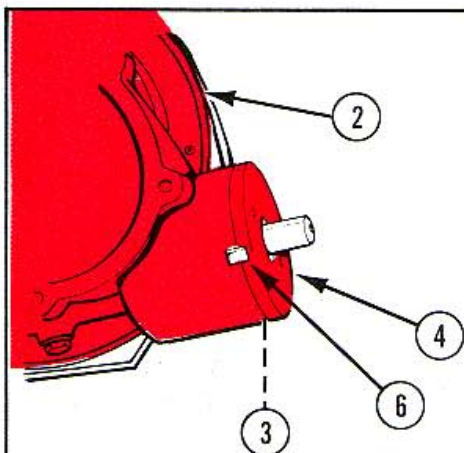
**NOTE**

Ensure flat on worm shaft assembly is in proper position for counter assembly clearance.

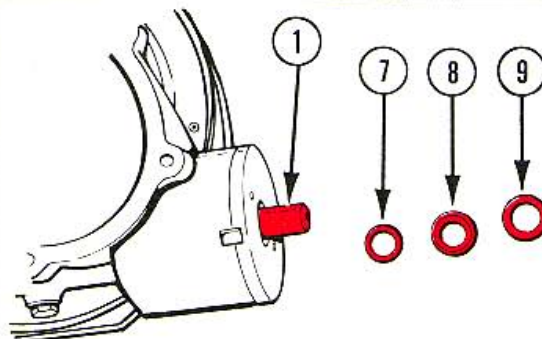
- 1 WORM SHAFT ASSEMBLY (1).
  - a. Apply light coat of grease (item 2, app B).
  - b. Insert in housing assembly (2) by turning.



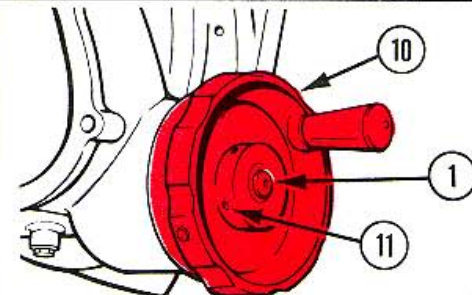
- 2 KEY WASHER (3). Install on retainer (4).
- 3 PACKING (5). Apply light coat of grease (item 3, app B), and install on retainer (4).



- 4 RETAINER (4). Screw in housing assembly (2) until tight.
- 5 LOCKING EAR (6). Bend to secure key washer (3) to housing assembly (2).



- 6 PACKING (7), RETAINER (8), AND WASHER (9).
  - a. Apply a light coat of grease (item 3, app B) to packing (7).
  - b. Install all items over worm shaft assembly (1).



- 7 ELEVATION KNOB (10). Install on worm shaft assembly (1).

**CAUTION**

Support elevation knob in V block on solid surface to prevent damage to worm shaft.

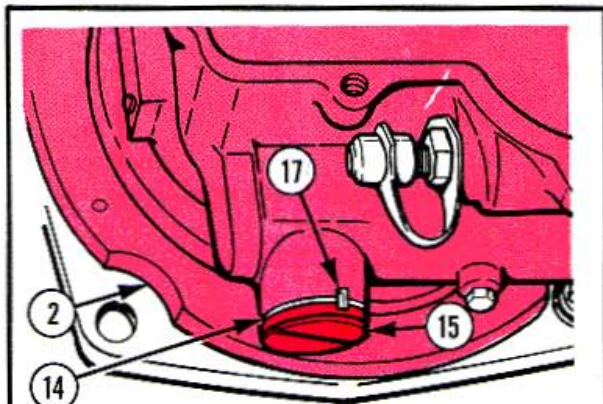
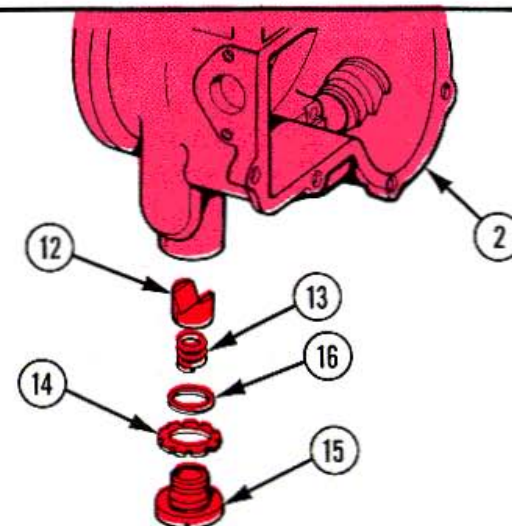
- 8 PIN (11). Install in elevation knob (10) and worm shaft assembly (1).



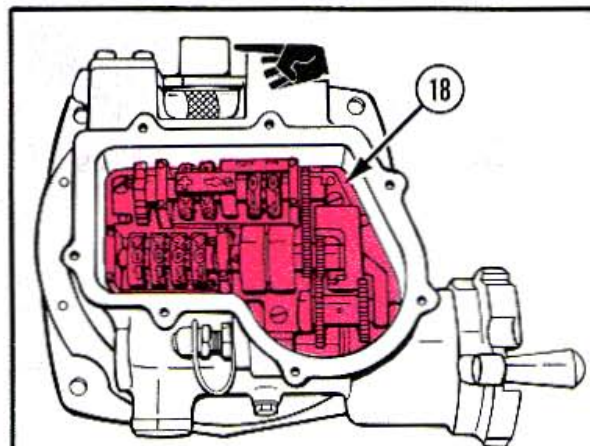
**2-16. WORM SHAFT ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)**

**INSTALLATION (cont)**

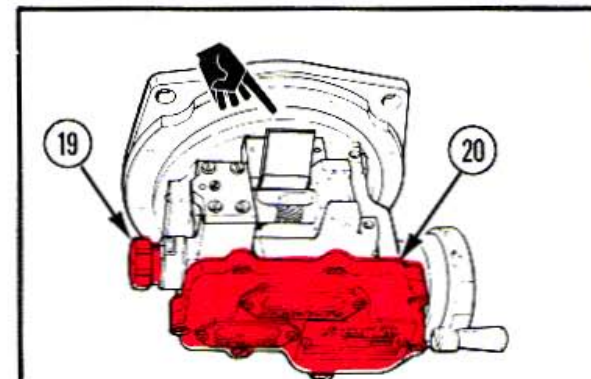
- 9** V-BEARING (12). Apply a light coat of grease (item 2, app B), and install in housing assembly (2).
- 10** SPRING (13). Install in housing assembly (2).
- 11** KEY WASHER (14). Place on retainer (15).
- 12** PACKING (16). Apply light coat of grease (item 3, app B), and install on retainer (15).
- 13** RETAINER (15). Screw in housing assembly (2) until tight.



**14** LOCKING EAR (17) ON KEY WASHER (14). Bend to secure retainer (15) to housing assembly (2).



**15** COUNTER ASSEMBLY (18). Install (p 2-30).

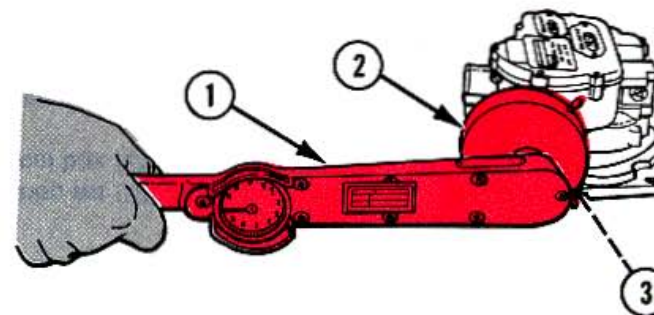


**16** CORRECTION KNOB ASSEMBLY (19) AND COVER ASSEMBLY (20). Install (p 2-30).

ADJUSTMENT

TORQUE WRENCH (1) WITH TORQUE ADAPTER (2). Measure torque, and look for the following readings:

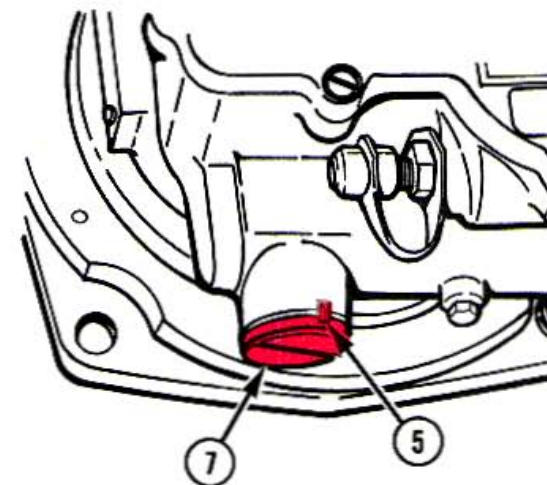
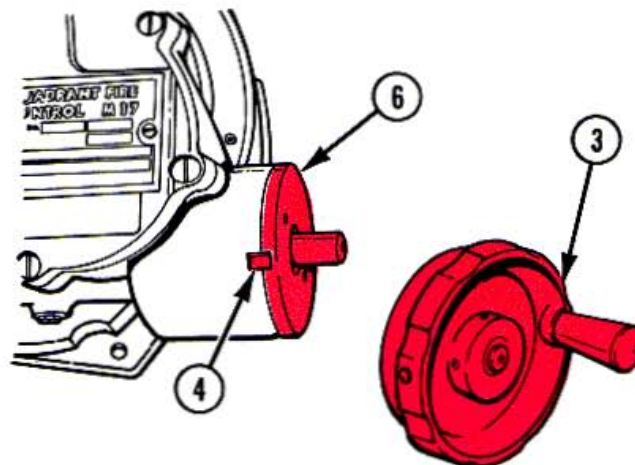
- 1 Torque reading required to start elevation knob (3) should be no greater than 10 in.4b (1.13 N-m) or less than 3 in.-lb (0.34 N-m).



- 2 If torque readings are not as specified, remove elevation knob (3) and straighten locking ears (4 and 5).

- 3 Tighten retainers (6 and 7) to increase torque, or loosen retainers to decrease torque.

- 4 Check for backlash (p 2-65).



Section VI. GENERAL SUPPORT FINAL INSPECTION PROCEDURES FOR THE M17 QUADRANT

2-17. GENERAL

a. This section describes and illustrates the final inspection of the M17 quadrant. A final inspection will be performed prior to returning a M17 quadrant to the using unit or to the supply system.

b. If the M17 quadrant being inspected fails to meet the required standards, ensure all maintenance authorized at the applicable level has been performed correctly. Then send the M17 quadrant to the next level of maintenance.

2-18. M17 QUADRANT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS

<b>THIS TASK COVERS:</b>	
<ul style="list-style-type: none"> <li>a. Setting up and adjusting the cross-leveling fixture and adapter</li> <li>b. Visual inspection</li> <li>c. Mounting M17 quadrant on cross-leveling fixture</li> <li>d. Backlash inspection</li> <li>e. Elevation counter and correction counter excursion range inspection</li> <li>f. Elevation accuracy inspection (200-mil increments)</li> </ul>	<ul style="list-style-type: none"> <li>g. Checking the effect of the correction counter setting on the elevation counter and level bubble</li> <li>h. Torque inspection</li> <li>i. Illumination inspection</li> <li>j. Purging</li> <li>k. M17 quadrant and M199 cannon tube synchronization procedure</li> </ul>
<b>INITIAL SETUP</b>	
<p>Test Equipment</p> <p>Cross-leveling fixture (6523553)</p> <p>Special Tools</p> <p>Adapter (12008990)</p> <p>Adapter set (SC 4931-95-CL-A11 )</p> <p>M1A2 gunner's quadrant (11732246)</p> <p>Precision level (7686087)</p>	<p>Shop set (SC 4931-95-CL-A07)</p> <p>Tool box (SC 4931-95-CL-A09)</p> <p>References</p> <p>TM 9-1025211-10</p> <p>TM 9-1025211-20&amp;P</p> <p>TM 9-1290-200-14&amp;P</p>

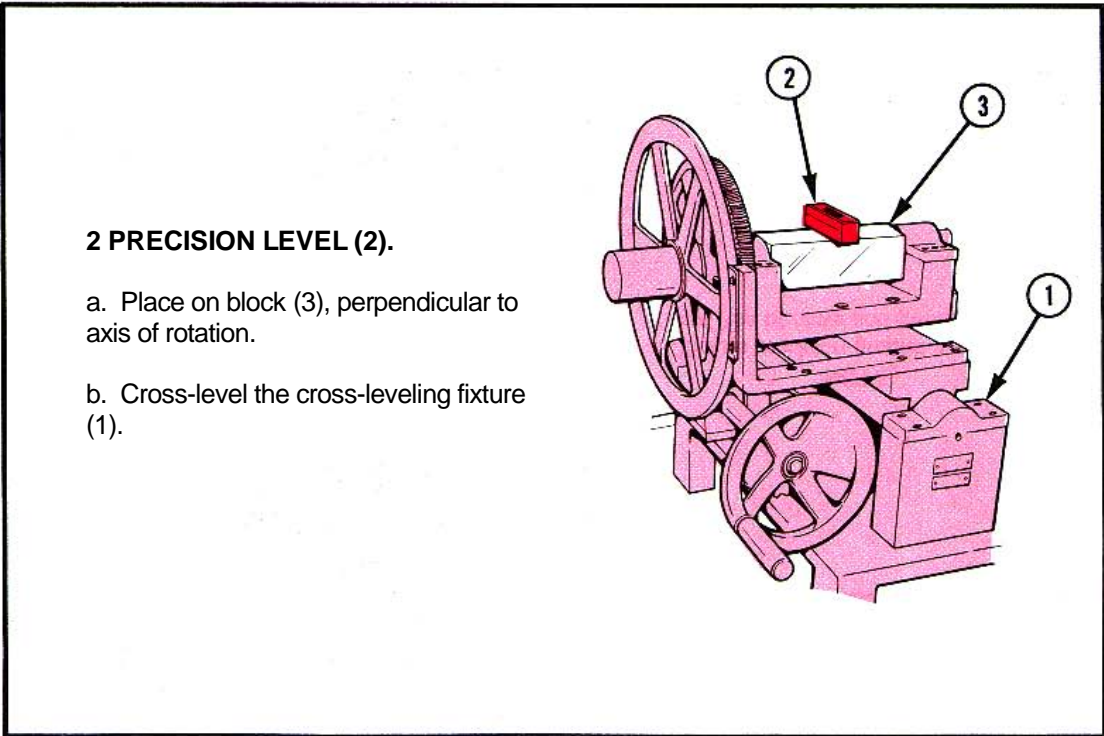
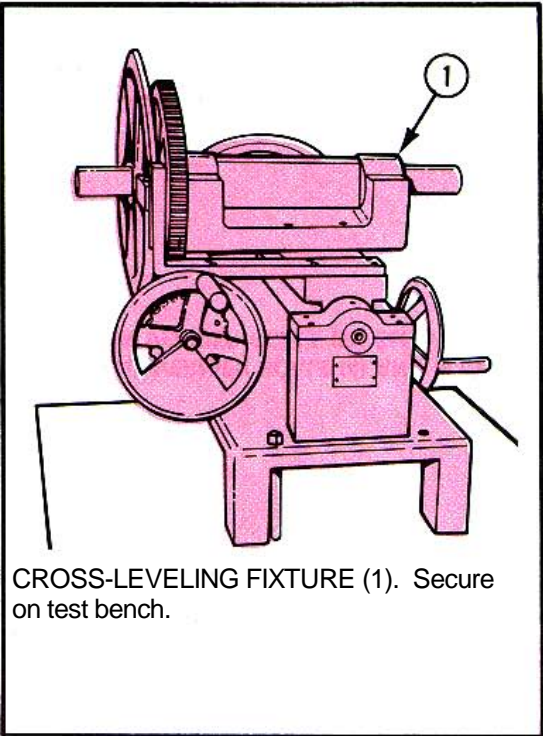
Equipment Condition  
 M17 quadrant mounted on M198 howitzer (TM 9-1025-211-10)  
 (task k).

Special Environmental Condition  
 Ambient temperature: +60°F (+16° C) to +90°F (+ 32° C)

**WARNING**


 When inspecting radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**SETTING UP AND ADJUSTING THE CROSS-LEVELING FIXTURE AND ADAPTER**

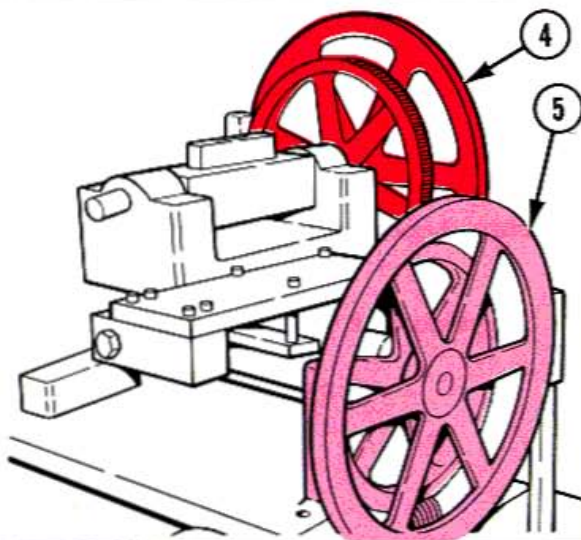




2-18. M17 QUADRANT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

SETTING UP AND ADJUSTING THE CROSS-LEVELING FIXTURE AND ADAPTER (cont)

3 CANT VERNIER SCALE (4) AND ELEVATION VERNIER SCALE (5). Set to zero.

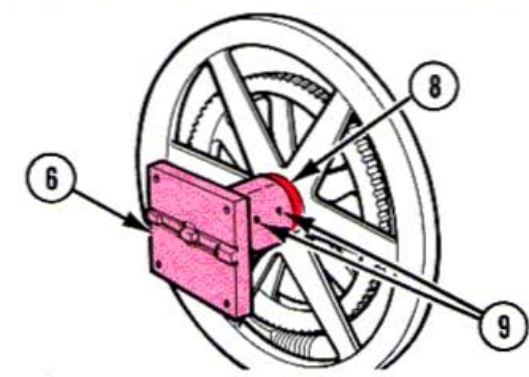
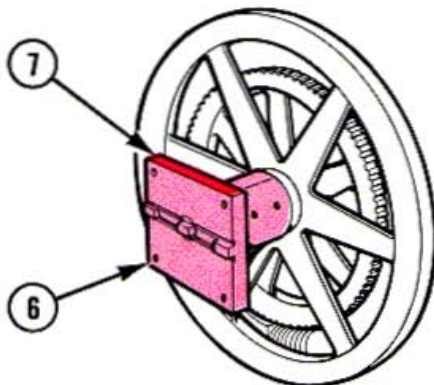


**NOTE**

Ensure precision ground surfaces are free of nicks and burrs.

**NOTE**

When installing adapter (6), ensure precision ground surface (7) is parallel to top of block within 0.1 mil.



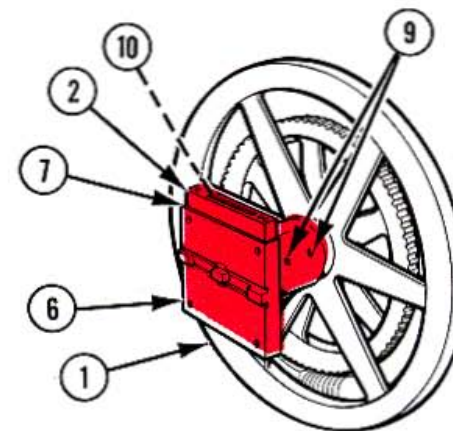
4 ADAPTER (6). Install on cross-leveling shaft end (8).

5 SIX SETSCREWS (9). Tighten lightly.



**6 PRECISION LEVEL (2).**

- a. Place on precision ground surface (7) of adapter (6).
- b. Check that precision level bubble (10) is level.
- c. Tighten setscrews (9). Recheck cross-leveling fixture (1), precision level (2), and precision ground surface (7).
- d. Rotate precision level (2) 180 degrees from original position, and check again that precision level bubble (10) is level.



**NOTE**

Adjust precision level bubble, if not centered.

**NOTE**

Check to make sure that cross-leveling fixture is still level in elevation and cant.

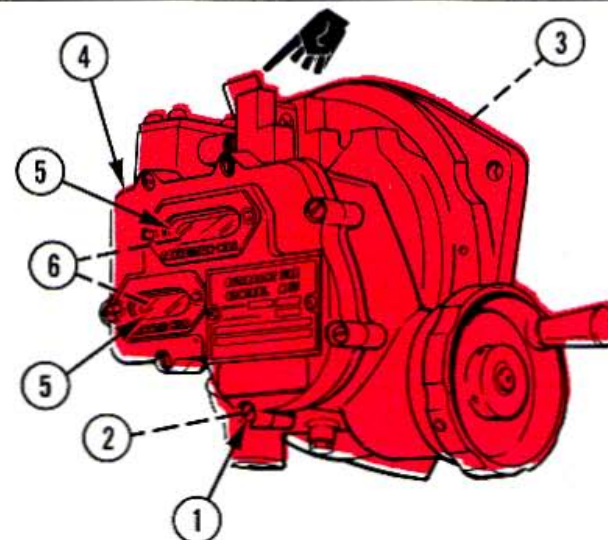
**1 ALL SCREWS (1) AND LOCKWASHERS (2).** Must be present and tight.

**2 MOUNTING SURFACE (3).** Must be clean and free of nicks and burrs.

**3 M17 QUADRANT (4).** Must be free of dirt, rust, and foreign matter. All parts must be present.

**4 COUNTER WINDOWS (5).** Must be free of condensation.

**5 COUNTER NUMBERS (6).** Must be in horizontal alignment.

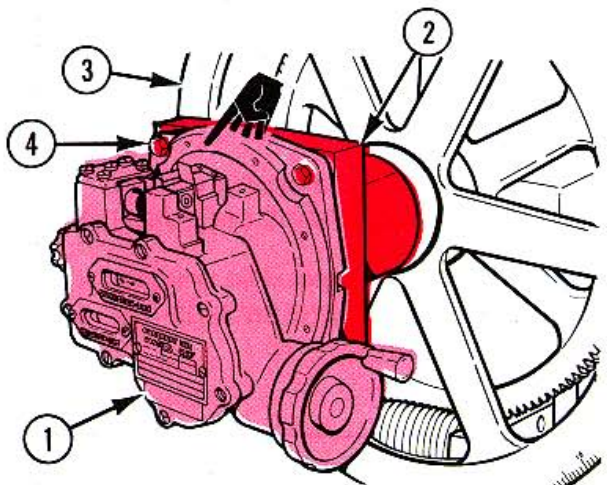


2-18. M17 QUADRANT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

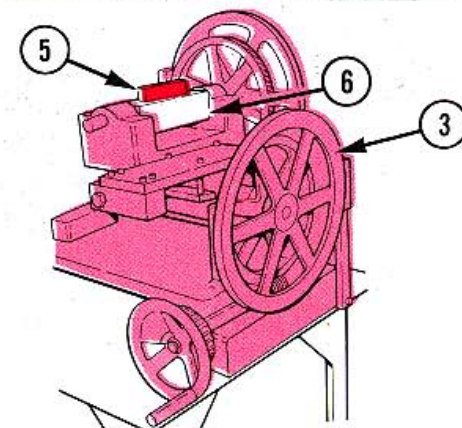
**MOUNTING M17 QUADRANT ON CROSS-LEVELING FIXTURE I**

**1 M17 QUADRANT (1).** Position on adapter (2) of cross-leveling fixture (3).

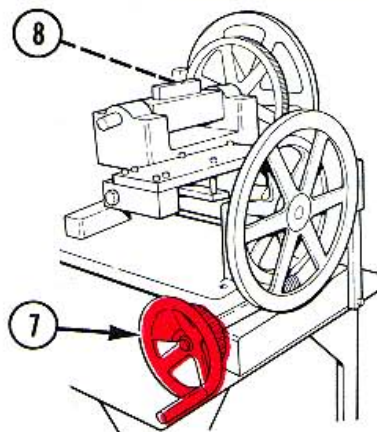
**2 FOUR MOUNTING SCREWS (4).** Install and tighten.



**3 PRECISION LEVEL (5).** Place parallel to block (6) of cross-leveling fixture (3).

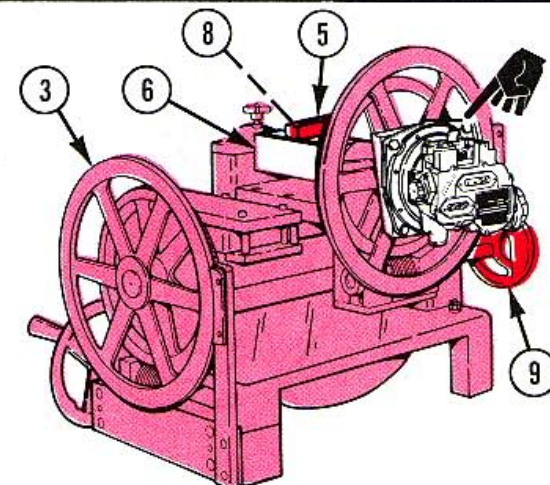


**6 ELEVATION HANDWHEEL (9).** Turn until precision level bubble (8) centers.



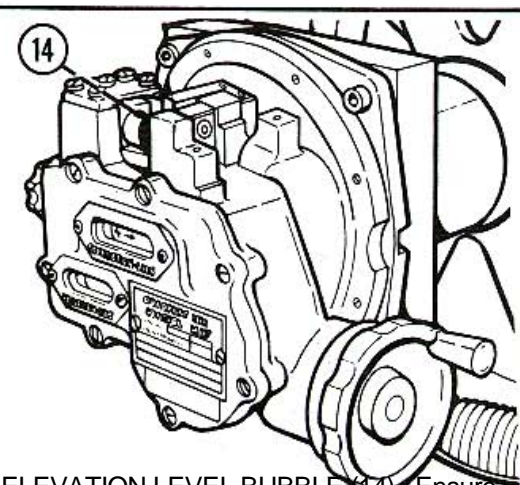
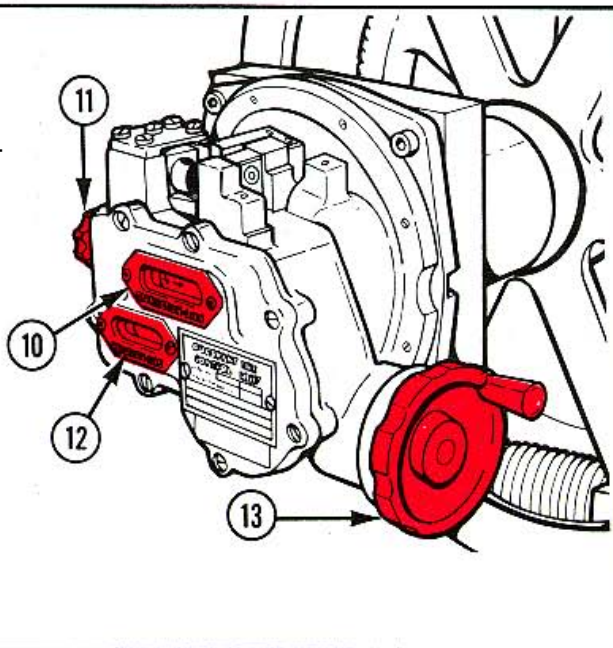
**4 CANT HANDWHEEL (7).** Rotate until precision level bubble (8) centers.

**5 PRECISION LEVEL (5).** Place 90 degrees to block (6) of cross-leveling fixture (3).



7 CORRECTION COUNTER (10). Using correction knob (11), set at zero mils.

8 ELEVATION COUNTER (12). Using elevation knob (13), set at zero mils.

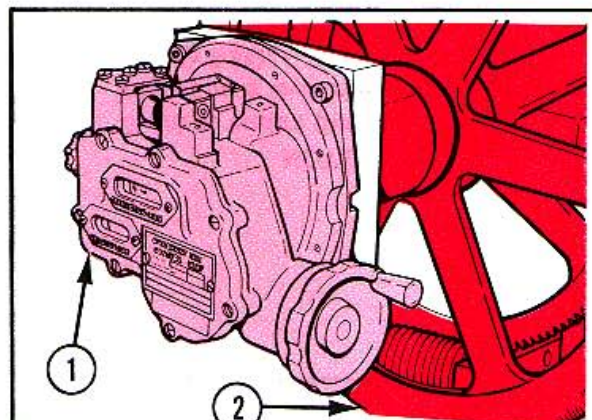


9 ELEVATION LEVEL BUBBLE (14). Ensure that bubble is centered. If not centered, adjust (p 2-19).

**BACKLASH INSPECTION**

**NOTE**

Inspect adapter mounting surfaces and M17 quadrant mounting surfaces to ensure they are clean and free of nicks and burrs.



1 M17 QUADRANT (1). Mount on cross-leveling fixture (2) (p 2-64).

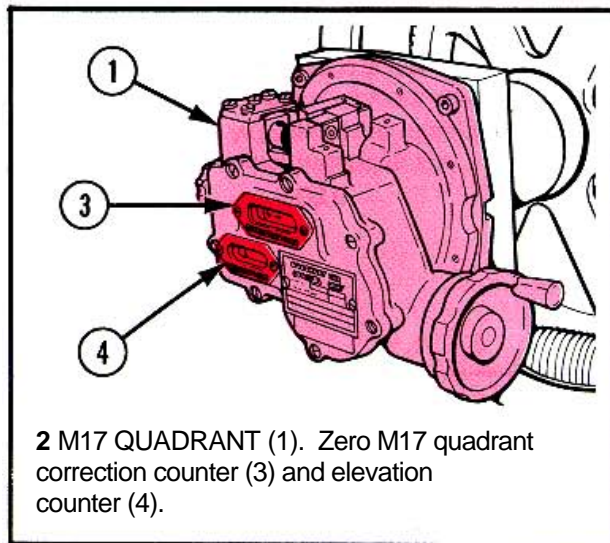
**NOTE**

Turn elevation knob clockwise. Do not overtravel zero.

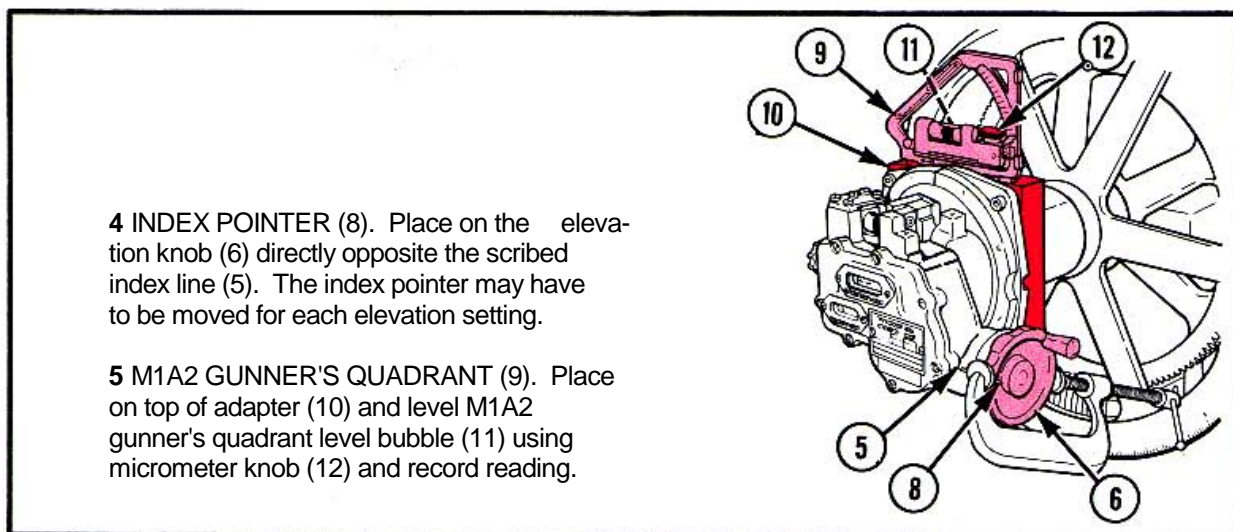
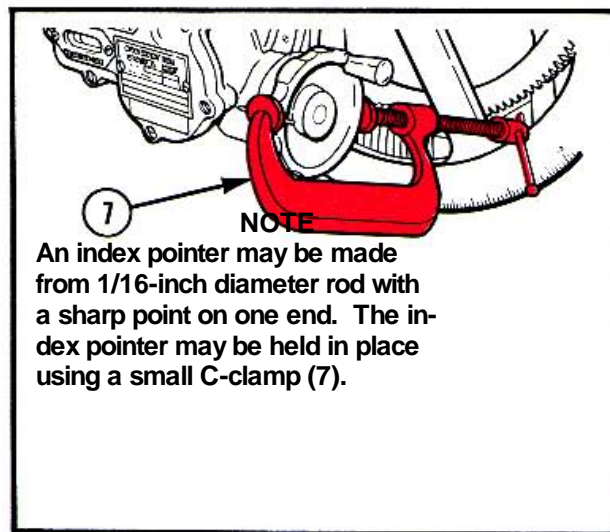
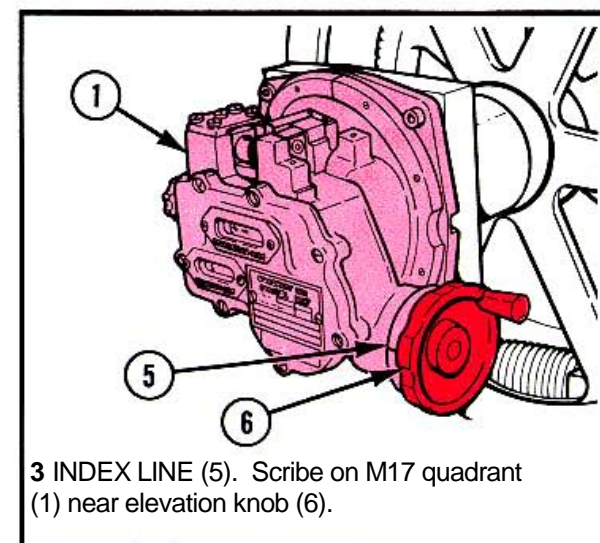


2-18. M17 QUADRANT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

BACKLASH INSPECTION (cont)



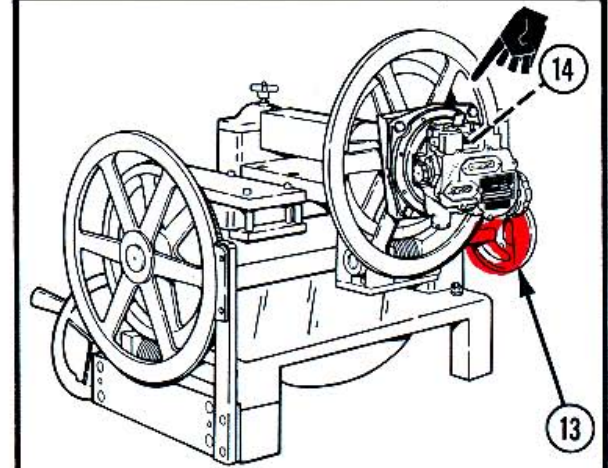
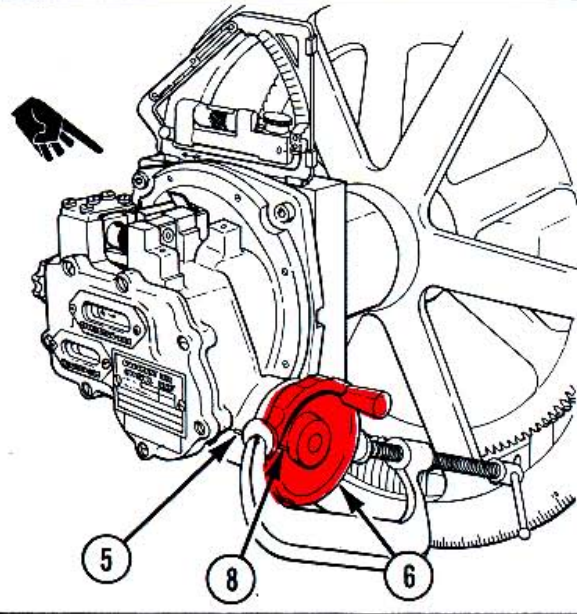
**NOTE**  
Check to ensure that cross-leveling fixture is level in elevation and cant (p 2-61).



**NOTE**

Do not go past scribed line when turning counterclockwise. Ensure scribed index line and index pointer are in perfect alignment.

6 ELEVATION KNOB (6). Rotate at least 1/2-turn clockwise. Then turn counterclockwise until index pointer (8) aligns with scribed index line (5).

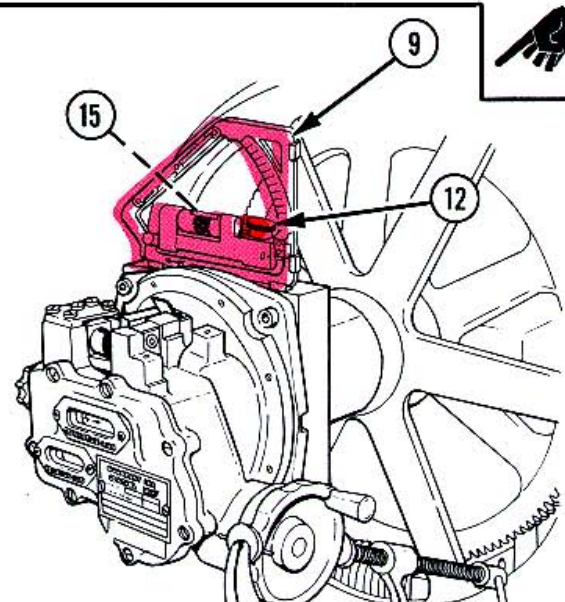


7 ELEVATION HANDWHEEL (13). Rotate until M17 quadrant elevation level bubble (14) is centered.

8 M1A2 GUNNER'S QUADRANT (9). Using micrometer knob (12) on M1A2 gunner's quadrant, center M1A2 gunner's quadrant level bubble (15) and record reading.

**NOTE**

The difference between the readings recorded in steps 5 and 8 will give the amount of backlash.



**NOTE**

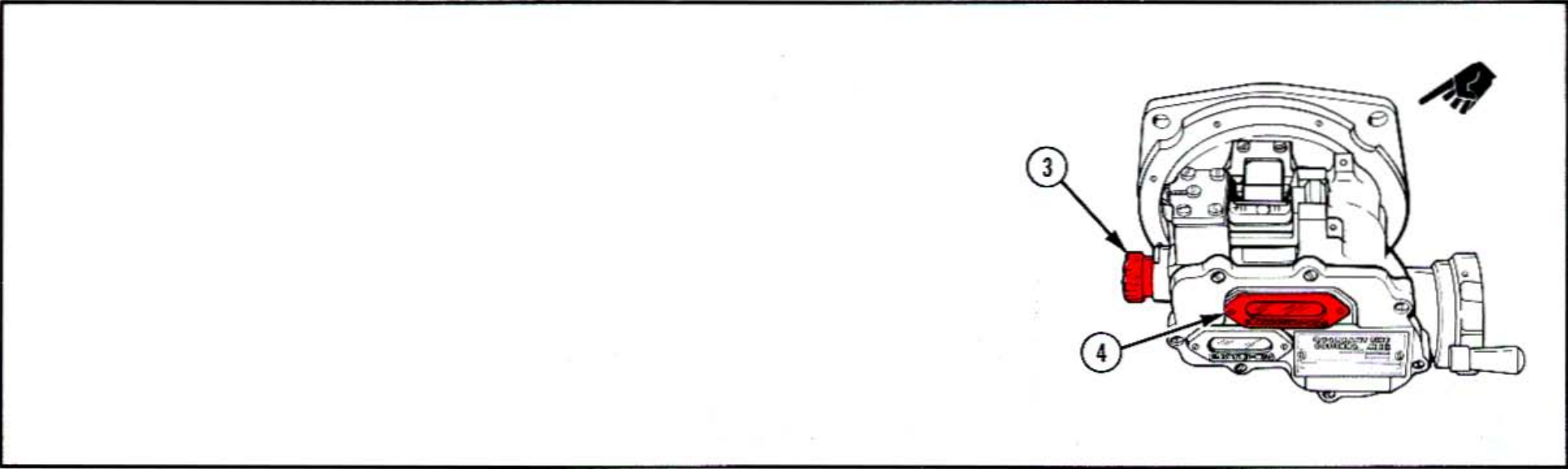
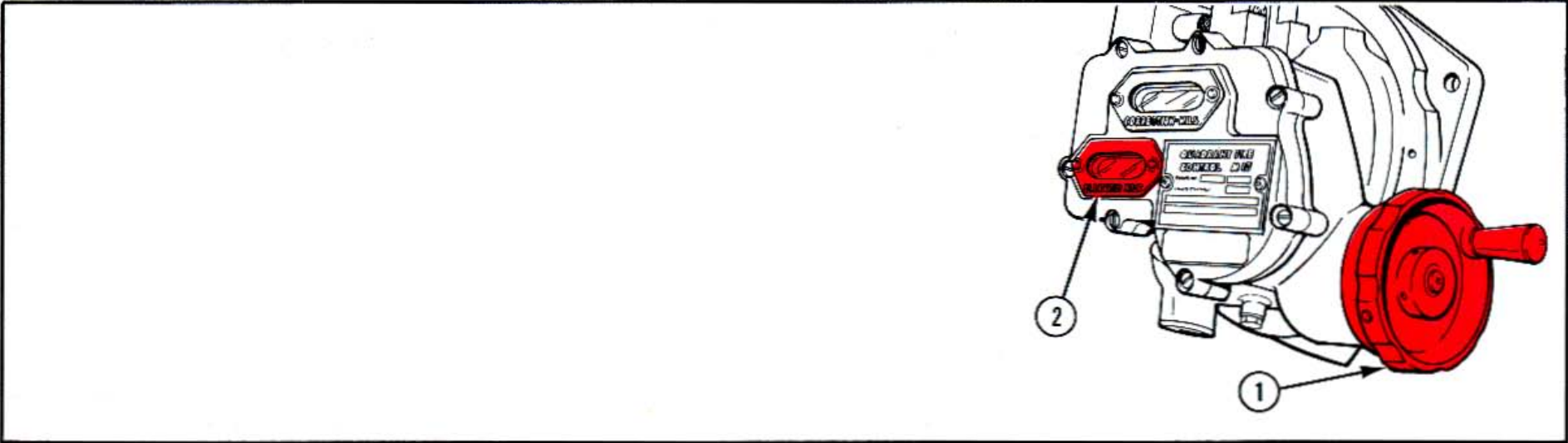
Backlash shall not exceed 0.7 mil at any elevation or depression setting.

Repeat steps 4 thru 8 at elevation settings of 150-mil depression, 200-mil elevation, 800-mil elevation, and 1400-mil elevation. Use M1A2 gunner's quadrant set on 'cross-leveling fixture adapter to initially set above elevations.



2-18. M17 QUADRANT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

ELEVATION COUNTER AND CORRECTION COUNTER EXCURSION RANGE INSPECTION



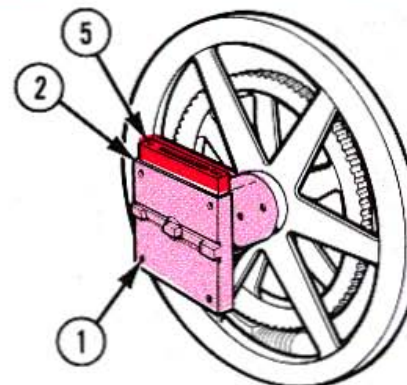
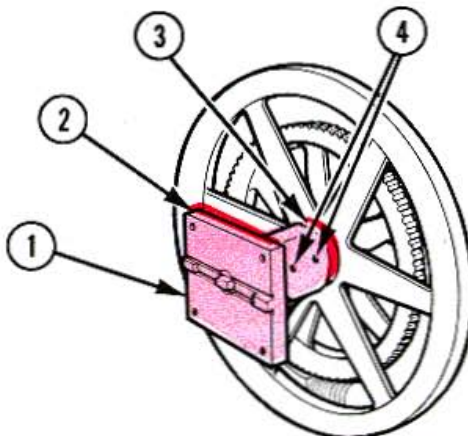
**ELEVATION ACCURACY INSPECTION (200-MIL INCREMENTS)**

**NOTE**

When installing adapter (1), ensure precision ground surface (2) is parallel to top of block within 0.1 mil.

1 ADAPTER (1). Install on cross-leveling shaft end (3).

2 SIX SETSCREWS (4). Tighten lightly.



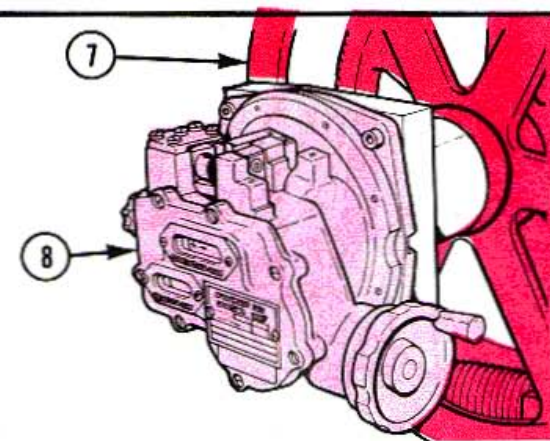
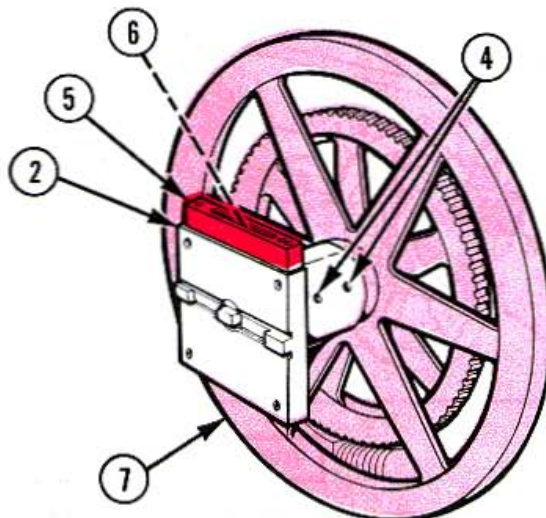
3 PRECISION LEVEL (5).

a. Place on precision ground surface (2) of adapter (1).

b. Check that precision level bubble (6) is level.

c. Tighten setscrews (4). Recheck cross-leveling fixture (7), precision level (5), and precision ground surface (2).

d. Rotate precision level (5) 180 degrees from original position, and check again that precision level bubble (6) is level.



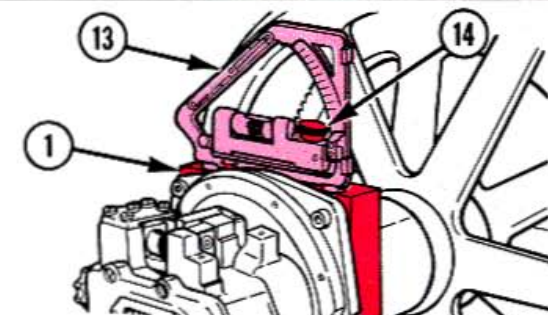
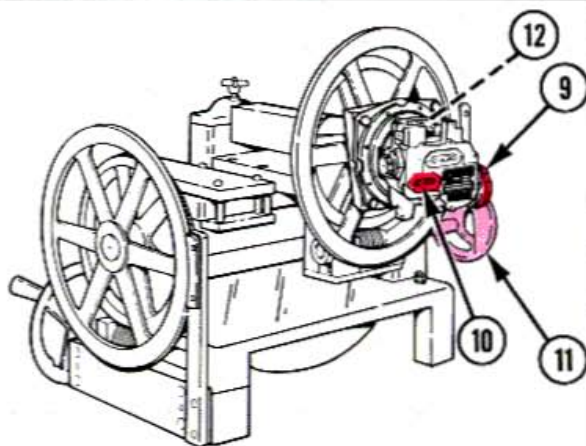
4 M17 QUADRANT (8). Mount on cross-leveling fixture (7) (p 2-64).

2-18. M17 QUADRANT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

ELEVATION ACCURACY INSPECTION (2W-MIL INCREMENTS) (cont)

5 ELEVATION KNOB (9). Turn until elevation counter (10) reads 200 mils.

6 ELEVATION HANDWHEEL (11). Turn until elevation level bubble (12) centers.



7 M1A2 GUNNER'S QUADRANT (13). Set to 200 mils. Place on top of adapter (1) and zero using micrometer knob (14).

CHECKING THE EFFECT OF THE CORRECTION COUNTER SETTING ON THE ELEVATION COUNTER AND LEVEL BUBBLE

**NOTE**

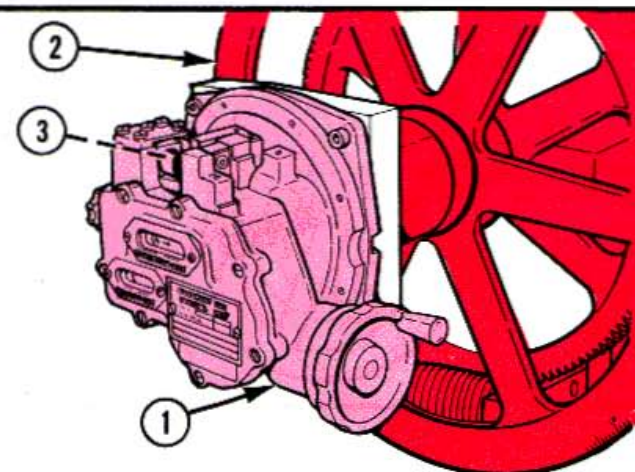
Micrometer dial will indicate any error. Error should not exceed 0.5 mil (1.0-mil total spread).

8 ADDITIONAL INCREMENTS. Repeat steps 1 thru 7 with gunner's quadrant set at elevations of 400, 600, 800, 1000, 1200, and 1400 mils. Error should not exceed 0.5 mil.

1 M17 QUADRANT (1). Mount on cross-leveling fixture (2) (p 2-64).

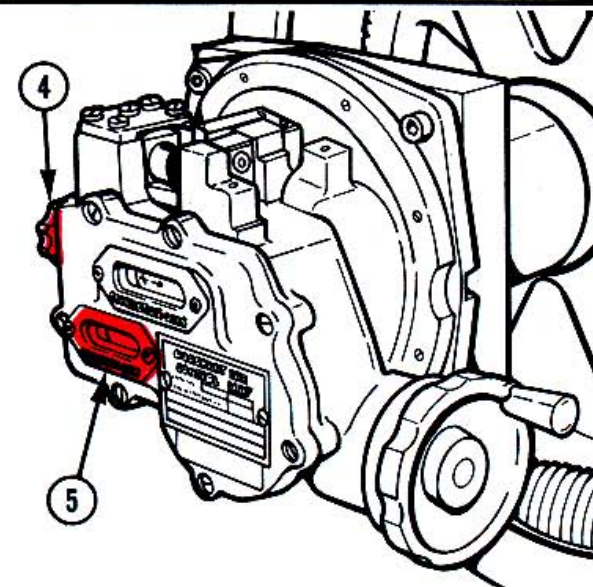
**NOTE**

Observe elevation level bubble (3) during steps 2 thru 5. It must remain centered within one vial graduation.



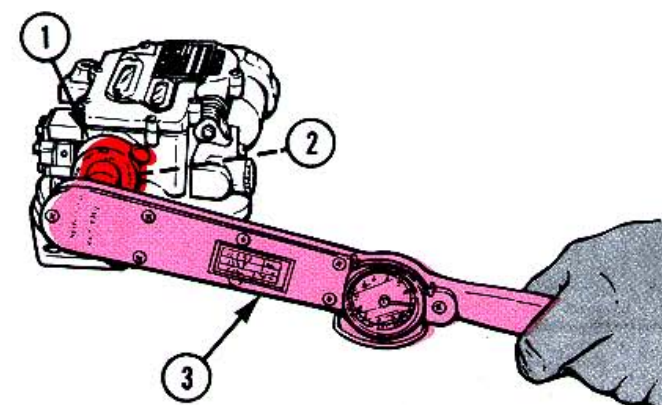


- 2 CORRECTION KNOB (4). Turn clockwise to -50 mils.
- 3 ELEVATION COUNTER (5). Check that elevation counter reads 50 mils  $\pm$  0.5 mil.
- 4 CORRECTION KNOB (4). Turn counterclockwise to 50 mils.
- 5 ELEVATION COUNTER (5). Check that elevation counter reads 9950 mils  $\pm$  0.5 mil.



### TORQUE INSPECTION

- 1 TORQUE ADAPTER (1). Place over correction knob (2).
- 2 TORQUE WRENCH (3). Place on torque adapter (1).
- 3 CORRECTION KNOB (2).
- a. Measure torque.
  - b. Torque required for continuous tuning should be between 1 in.-lb (0.11 N-m) and 4 in.-lb (0.45 N-m). If torque cannot be met, remove correction knob (2) and check for possible bent shaft.

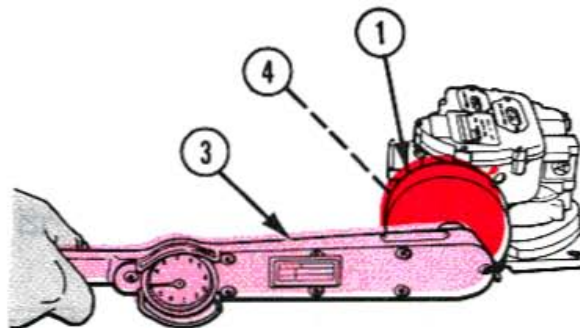


2-18. M17 QUADRANT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

TORQUE INSPECTION (cont)

4 TORQUE ADAPTER (1) AND TORQUE WRENCH (3).

- a. Place over elevation knob (4).
- b. Measure torque.
- c. Torque required for continuous turning should be between 3 in.-lb (0.34 N-m) and 10 in.-lb (1.13 N-m). If torque cannot be met, repeat step 5b on page 2-53.



ILLUMINATION INSPECTION



**WARNING**

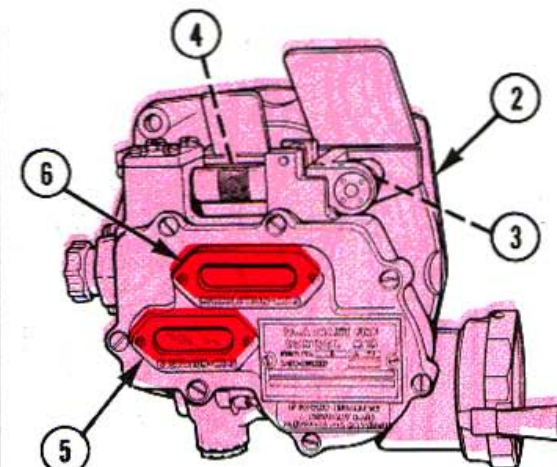
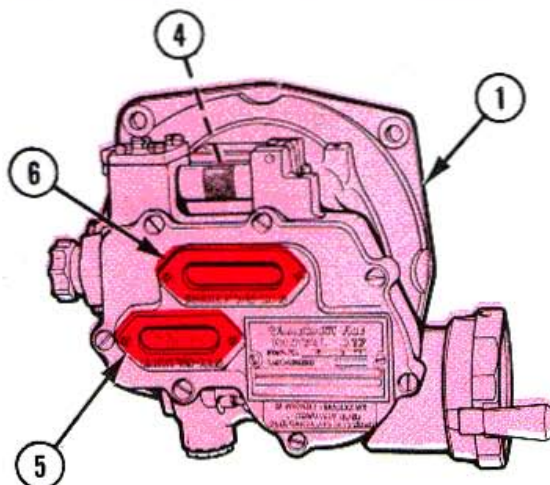
When inspecting radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

1 M17 QUADRANT (1) OR M18 QUADRANT (2). Take into dark area, and wait 15 minutes.

**NOTE**

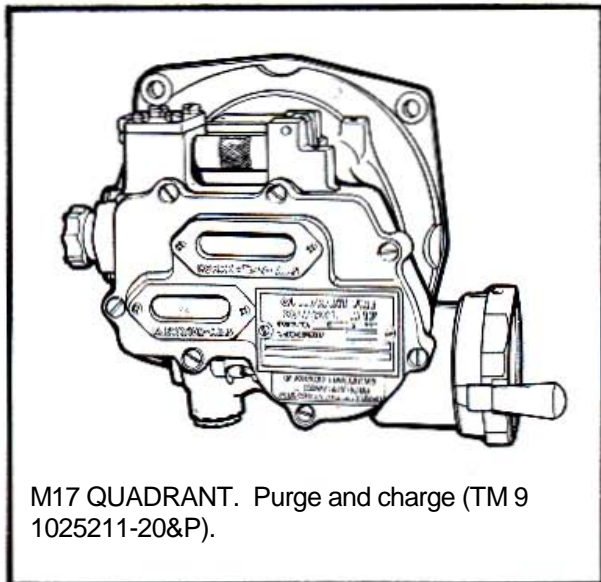
Cross level bubble (3) applies to M18 quadrant only.

2 ELEVATION LEVEL BUBBLE (4), ELEVATION COUNTER (5), CORRECTION COUNTER (6), AND CROSS LEVEL BUBBLE (3). Check that all are clearly visible with even illumination.





PURGING M17 QUADRANT AND M199 CANNON TUBE SYNCHRONIZATION PROCEDURE



**NOTE**

M18 quadrant is required for proper M199 cannon tube synchronization.

Perform the following whenever a cannon assembly or tube is removed.

Before beginning synchronization procedure, M199 cannon tube must be depressed to zero mils and trunnions leveled (TM 91025211-10).

Whenever the M17 or M18 quadrants are replaced, the following synchronization procedure should be performed.

**NOTE**

Before using cannon leveling pad (1), check for cleanness.

The M1A2 gunner's quadrant should be set on the higher cannon leveling pad when leveling the M199 cannon tube.

1 M1A2 GUNNER'S QUADRANT (2).

- a. Test M1A2 gunner's quadrant before using.
- b. Place on cannon leveling pad (1) with LINE OF FIRE arrow (3) pointed toward the muzzle.

2 M1A2 GUNNER'S QUADRANT LEVEL BUBBLE (4). Depress or elevate the M199 cannon tube with the elevating handwheel until the M1A2 gunner's quadrant level bubble (4) centers.

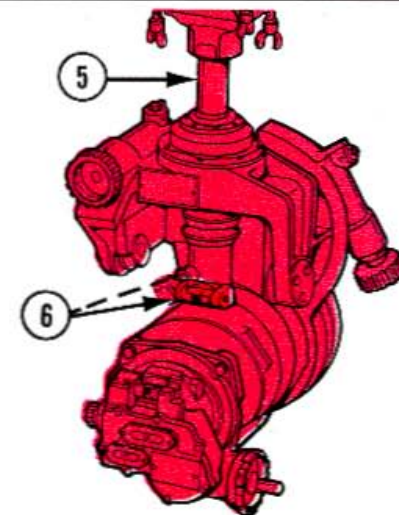
2-18. M17 QUADRANT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

M17 QUADRANT AND M199 CANNON TUBE SYNCHRONIZATION PROCEDURE (cont)

**NOTE**

Elevation counter of M17 and M18 quadrants shall reflect tube elevation and shall not exceed 1.0-mil deviation, excluding backlash.

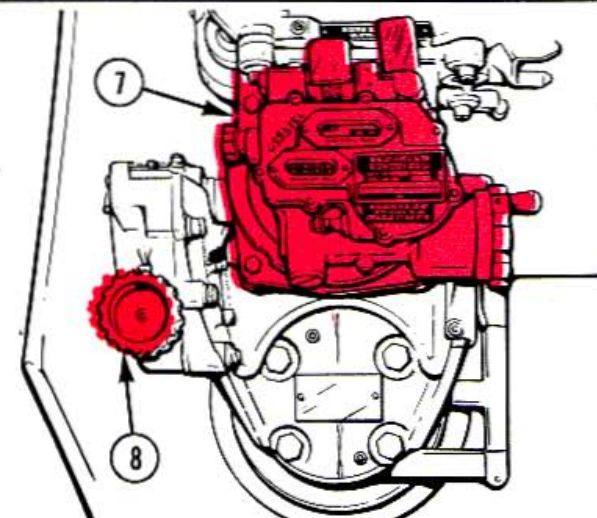
3 M171 MOUNT (5). Level elevation and cross level vials (6).



**NOTE**

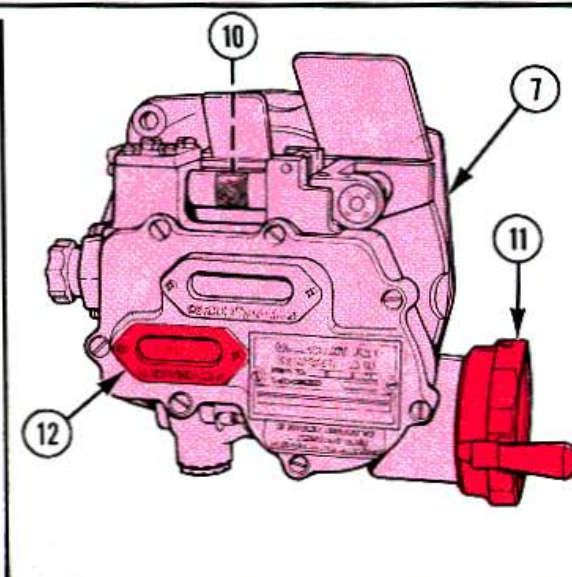
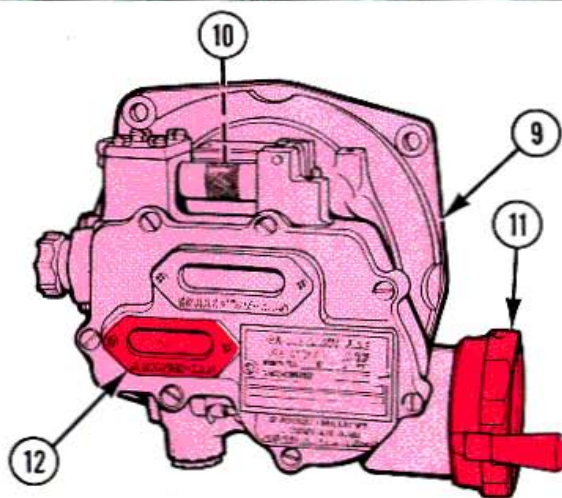
In the following steps, eliminate backlash by always making the last movement in the counter mechanisms a low-number-to-high-number movement.

4 M18 QUADRANT (7). Cross-level using M172 mount cross level knob (8).



**5 M17 QUADRANT (9) AND M18 QUADRANT (7).**

- a. Center elevation level bubbles (10) using elevation knobs (11).
- b. Elevation counter (12) in both quadrants should be zero. If not zero, turn elevation knobs (11) to set counters at zero and adjust elevation level bubbles (10) as necessary (p 2-19).

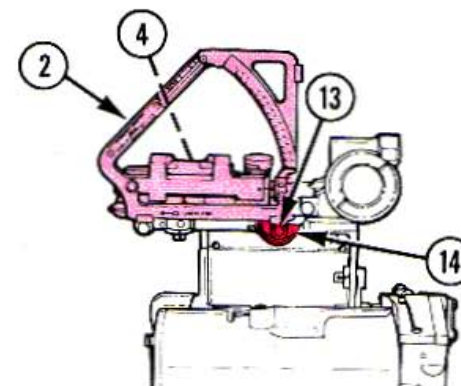


**6 M1A2 GUNNER'S QUADRANT (2).**

- a. Place on seats on M172 mount. M1A2 gunner's quadrant level bubble (4) should center.
- b. If not centered, adjust eccentric stud assembly (13).

**7 ECCENTRIC STUD ASSEMBLY (13).**

- a. Loosen to disengage from spline plate (14).
- b. Turn and engage spline plate (14). Tighten eccentric stud assembly (13).
- c. Repeat step 6b. If M1A2 gunner's quadrant level bubble does not center, repeat steps 7a and b until centered.



**Section VII. PREEMBARKATION INSPECTION PROCEDURES****2-19. GENERAL**

- a. Fire control instruments must be inspected for outward appearance, mechanical condition, and proper operation.
- b. Instruments must approach new equipment standards of operation and appearance. The workmanship and quality must reflect the highest standard obtainable. s

**2-20. SPECIFIC INSTRUCTIONS**

Fire control instruments must conform to the following specifications for overseas shipment.

- a. Condition of optical element. Lenses, prisms, reticles, and windows must be free from scratches, pits, and chips that will affect optical performance of the instrument.
- b. Functioning of mechanical parts. Mechanical parts must operate smoothly without binding or rough motion. Parts must be free from grit and must be properly lubricated.
- c. Illumination of radioactive parts. The level vials, reticles, and counter dials must illuminate properly.
- d. General appearance and condition of the instruments.
  - (1) All parts of the instruments must be present and free from defects.
  - (2) Paint must cover all specified surfaces. Repaint if painted surfaces show signs of damage.
  - (3) All optics must be free from any internal dirt and moisture. Excessive dirt or moisture indicates a breakdown in sealing and is cause for rejection of the instrument.
  - (4) All scales must be easily read. All numbers and divisions must be clearly defined.
  - (5) Any fire control instrument failing to meet the requirements of the final inspection is unsatisfactory for overseas shipment.
  - (6) All warning labels must be present and legible.



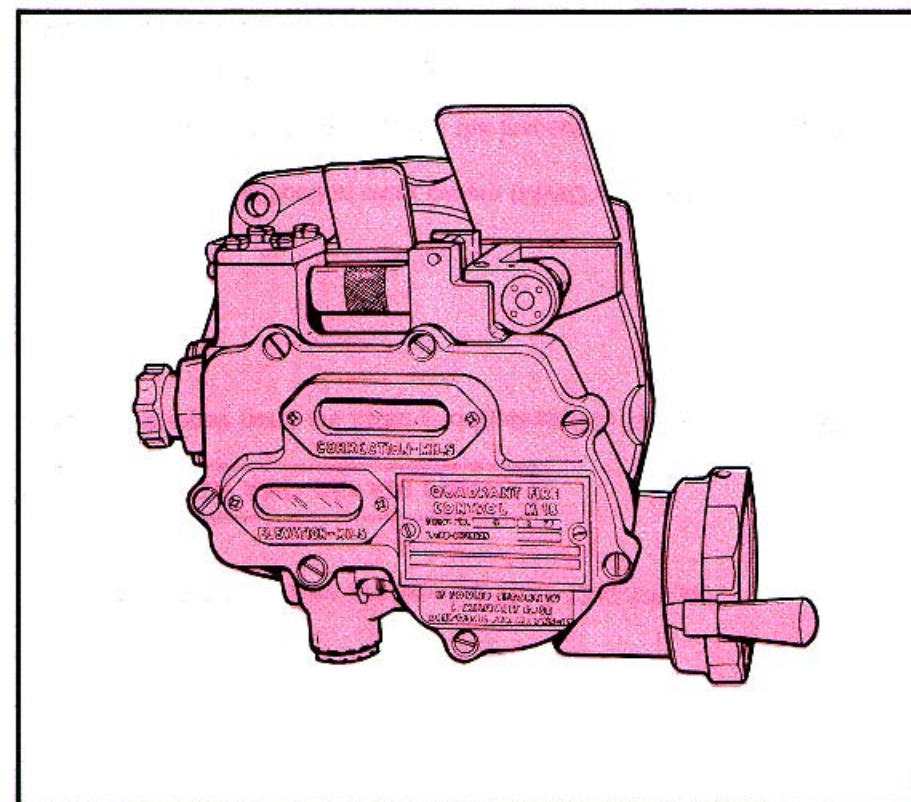
**CHAPTER 3  
M18 FIRE CONTROL QUADRANT-MAINTENANCE  
INSTRUCTIONS**

**CHAPTER INDEX**

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**CHAPTER OVERVIEW**

This chapter contains maintenance procedures for the M18 quadrant. Information on repair parts and special tools is included. Detailed procedures for troubleshooting and maintenance of the various M18 quadrant parts are also included.





## Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

### 3-1. COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

### 3-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Special tools, TMDE, and support equipment required and authorized for repair of the M18 quadrant are listed in TM 91240-7534P.

### 3-3. SPARES AND REPAIR PARTS

Spares and repair parts are listed and illustrated in TM 9-124147534P.

## Section II. INSPECTIONS

### 3-4. GENERAL

a. Inspection is performed primarily to determine the following:

- (1) Completeness.
- (2) The nature of unserviceability.
- (3) The work, repair parts, and supplies required to return the materiel to serviceability.
- (4) That work in process is being performed properly.
- (5) That completed work complies fully with serviceability standards.

b. The M18 quadrant is considered serviceable when:

- (1) It is complete and properly performs the intended function.
- (2) All modification work orders (MWO's) have been applied.
- (3) All defects disclosed by the inspection have been corrected.

c. DA Form 2408-5 and DA Form 2409 list applicable MWO's.

### 3-6. CATEGORIES OF INSPECTION

Categories of inspection define responsibilities.

a. An initial inspection is performed immediately on receipt of the M18 quadrant for maintenance. This inspection will determine the amount and type of work to be performed or whether the M18 quadrant should be sent to depot maintenance.

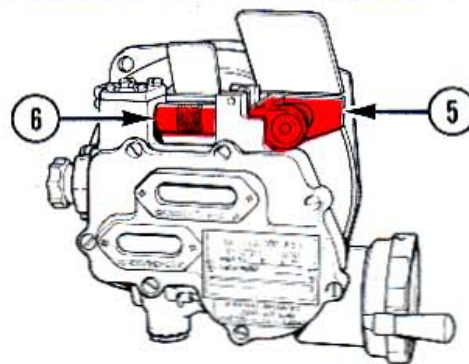
- b. A final inspection of the M18 quadrant is performed after repairs have been completed to ensure the item meets serviceability standards.
- c. Table 3-1 lists initial inspection procedures for the M18 quadrant. Final inspection procedures are located on page 3-32.
- d. Preembarkation inspection procedures are located on page 2-76.


**Table 3-1. INITIAL INSPECTION-M18 QUADRANT**

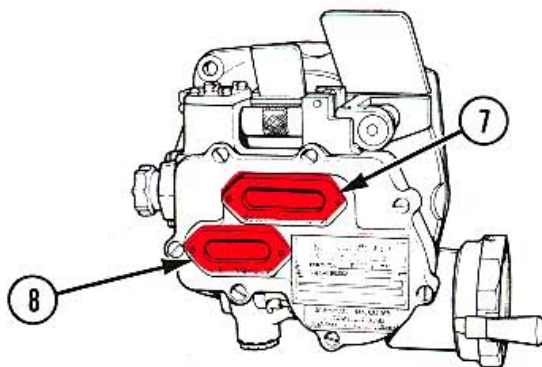
Item No.	Item To Be Inspected	Procedures
1	M18 QUADRANT (1)	<ul style="list-style-type: none"> <li>Check for dents, scuff marks, bare spots, missing parts, and missing lock wire. Inspect M18 quadrant for cleanliness.</li> <li>Check for missing or illegible instruction plates or identification plates.</li> </ul>
2	COUNTER WINDOWS (2)	<ul style="list-style-type: none"> <li>Check for moisture. Look for broken, cracked, or chipped glass.</li> </ul>
3	CORRECTION KNOB (3)	<ul style="list-style-type: none"> <li>Operate correction knob. Check that operation is smooth without binding or rough motion.</li> </ul>
4	ELEVATION KNOB (4)	<ul style="list-style-type: none"> <li>Operate elevation knob. Check that operation is smooth without binding or rough motion.</li> </ul>

3-5. CATEGORIES OF INSPECTION (cont)

Table 3-1. INITIAL INSPECTION-M18 QUADRANT (cont)



Item No.	Item To Be Inspected	Procedures
5	CROSS LEVEL VIAL (5)	<p style="text-align: center;"><b>WARNING</b></p> <p style="text-align: center;"> When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.</p> <p>Check radioactive light sources. Check that light is present and even throughout the cross level vial. Check that cross level vial graduations are present and legible.</p>
6	ELEVATION LEVEL VIAL (6)	<p>Check radioactive light sources. Check that light is present and even throughout the elevation level vial. Check that elevation level vial graduations are present and legible.</p>



<b>Item No.</b>	<b>Item To Be Inspected</b>	<b>Procedures</b>
7	CORRECTION COUNTER (7)	Check radioactive light sources. Check that light is present and even throughout the correction counter. Check that correction counter numbers are clear and legible.
8	ELEVATION COUNTER (8)	Check radioactive light sources. Check that light is present and even throughout the elevation counter. Check that elevation counter numbers are clear and legible.

Section III. TROUBLESHOOTING

3-6. GENERAL


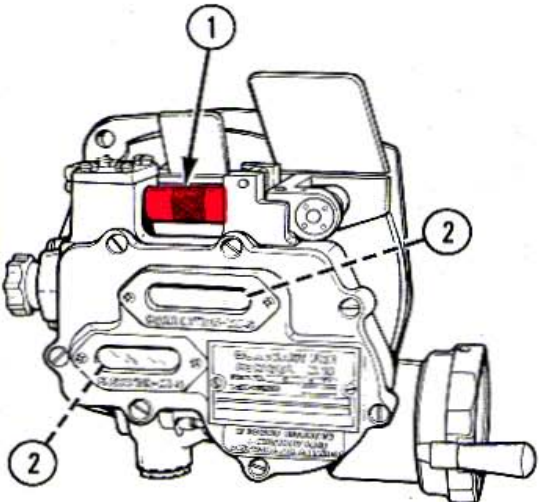
- a. The symptom index can be used as a quick guide to troubleshooting. Common malfunctions are listed in alphabetical order with a page number reference to the troubleshooting table where a test or inspection and corrective action are provided.
- b. The direct support troubleshooting table (p 3-6) lists the common malfunctions which may be found during maintenance of the M18 quadrant. Perform the tests/inspections and corrective actions in the order listed.
- c. The general support troubleshooting table (p 3-9) lists the common malfunctions which may be found during maintenance of the M18 quadrant. Perform the tests/inspections and corrective actions in the order listed.
- d. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective action, notify depot maintenance.

DIRECT SUPPORT SYMPTOM INDEX

	<b>Troubleshooting Procedure (Page)</b>
<b>COVER ASSEMBLY</b>	
Counter windows are fogged or have condensation .....	3-8
<b>FIRE CONTROL LEVEL ASSEMBLY</b>	
Elevation level bubble is not synchronized with M198 howitzer tube .....	3-7
Elevation level vial and counter dials have uneven or no illumination .....	3-7
Elevation level vial has no bubble, but still illuminated .....	3-7

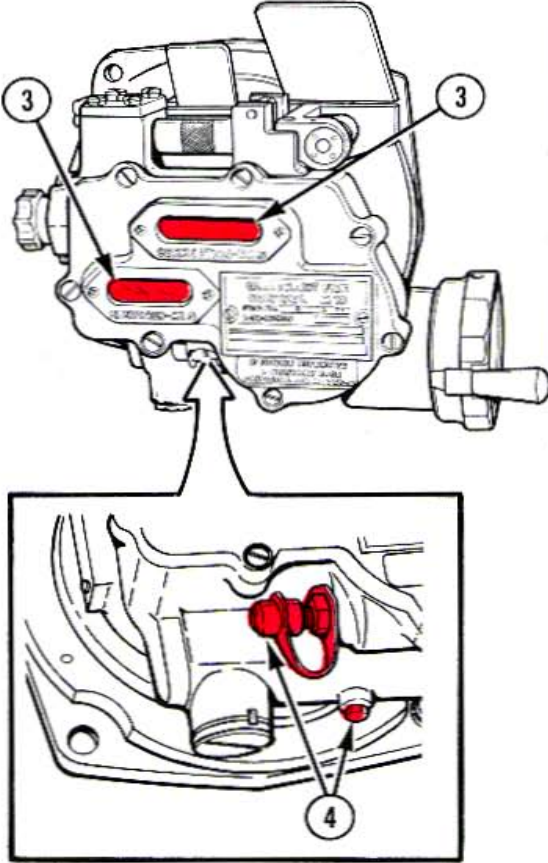


Table 3-2. DIRECT SUPPORT TROUBLESHOOTING-M18 QUADRANT

<p><b>MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p style="text-align: center;"><b>WARNING</b></p> <p> When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.</p>	
<p style="text-align: center;"><b>FIRE CONTROL LEVEL ASSEMBLY</b></p>	
<p><b>1 ELEVATION LEVEL BUBBLE IS NOT SYNCHRONIZED WITH M198 HOWITZER TUBE.</b></p> <p>Observe visually.</p> <p style="text-align: center;">Synchronize elevation level bubble and M198 howitzer tube (p 2-73).</p>	
<p><b>2 ELEVATION LEVEL VIAL (1) AND COUNTER DIALS (2) HAVE UNEVEN OR NO ILLUMINATION.</b></p> <p>Observe visually in darkened area.</p> <ol style="list-style-type: none"> <li>a. Place M18 quadrant in plastic bag (TM 9-1025211-10).</li> <li>b. Send to general support maintenance.</li> </ol>	
<p><b>3. ELEVATION LEVEL VIAL (1) HAS NO BUBBLE, BUT STILL ILLUMINATED.</b></p> <p>Observe visually.</p> <ol style="list-style-type: none"> <li>a. The elevation level vial may be replaced if it is cracked, but still illuminated.</li> <li>b. Return broken elevation level vial to general support maintenance.</li> </ol>	

3-6. GENERAL (cont)

Table 3-2. DIRECT SUPPORT TROUBLESHOOTING-M18 QUADRANT (cont)


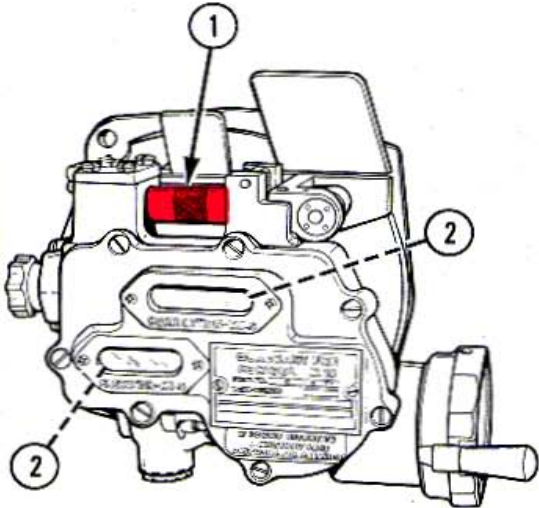
<p><b>MALFUNCTION</b> <b>TEST OR INSPECTION</b> <b>CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p style="text-align: center;"><b>COVER ASSEMBLY</b></p> <p><b>4. COUNTER WINDOWS (3) ARE FOGGED OR HAVE CONDENSATION.</b></p> <p style="text-align: center;"><b>NOTE</b></p> <p>Charge nitrogen pressure to 7 psi (0.49 kg/cm<sup>2</sup>). Remove hose. Put soap suds on valve opening to check for leakage.</p> <p>Check for loose, or defective valves (4).</p> <ol style="list-style-type: none"> <li>a. Tighten, or replace valves (p 2-16).</li> <li>b. Purge and charge M18 quadrant with dry nitrogen (TM 9-1025211-20&amp;P).</li> </ol>	

GENERAL SUPPORT SYMPTOM INDEX

	Troubleshooting Procedure (Page)
<b>CORRECTION KNOB ASSEMBLY</b>	
Correction knob binds .....	3-12
<b>COUNTER ASSEMBLY</b>	
Correction counter fails to allow + 95 to + 99 mils max or -95 to -99 mils max .....	3-12
Counter numbers are not in horizontal alinement .....	3-13
Elevation counter fails to allow 1433 or 9720 mils .....	3-13
<b>COVER ASSEMBLY</b>	
Counter windows are fogged or have condensation .....	3-11
<b>FIRE CONTROL LEVEL ASSEMBLY</b>	
■ Elevation level bubble is not level .....	3-10
Elevation level bubble is not synchronized with M198 howitzer tube .....	3-10
Elevation level vial and counter dials have uneven or no illumination .....	3-10
Elevation level vial has no bubble, but still illuminated .....	3-11
<b>LEVEL ASSEMBLY</b>	
Cross level vial and counter dials have uneven or no illumination .....	3-11
Cross level vial has no bubble, but still illuminated .....	3-11
<b>WORM SHAFT ASSEMBLY</b>	
■ Elevation knob exceeds 0.7-mil backlash .....	3-13

3-10 GENERAL (cont)

Table 3-3. GENERAL SUPPORT TROUBLESHOOTING-M18 QUADRANT

<p><b>MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p><b>WARNING</b>   When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.</p>	
<p style="text-align: center;"><b>FIRE CONTROL LEVEL ASSEMBLY</b></p> <p>1. ELEVATION LEVEL BUBBLE IS NOT SYNCHRONIZED WITH M198 HOWITZER TUBE.</p> <p style="padding-left: 20px;">Observe visually.</p> <p style="padding-left: 40px;">Synchronize elevation level bubble and M198 howitzer tube (p 2-73).</p> <p>2. ELEVATION LEVEL BUBBLE IS NOT LEVEL.</p> <p style="padding-left: 20px;">■ Adjust eccentric (1).</p> <p style="padding-left: 40px;">■ Remove cross level vial (2) (p 3-24) and refer to page 2-18.</p> <p>3. ELEVATION LEVEL VIAL (3) AND COUNTER DIALS (4) HAVE UNEVEN OR NO ILLUMINATION.</p> <p style="padding-left: 20px;">Observe visually in darkened area.</p> <p style="padding-left: 40px;">a. Place M18 quadrant in plastic bag (TM 9-1025211-10).</p> <p style="padding-left: 40px;">b. Send to depot maintenance.</p>	

**4. ELEVATION LEVEL VIAL (3) HAS NO BUBBLE, BUT STILL ILLUMINATED.**

Observe visually.

- a. The elevation level vial may be replaced if it is cracked, but still illuminated.
- b. Return broken elevation level vial to depot maintenance.

**LEVEL ASSEMBLY**

**5. CROSS LEVEL VIAL (2) AND COUNTER DIALS (4) HAVE UNEVEN OR NO ILLUMINATION.**

Observe visually in darkened area.

- a. Place M18 quadrant in plastic bag (TM 9-1025-211-10).
- b. Send to depot maintenance.

**6. CROSS LEVEL VIAL (2) HAS NO BUBBLE, BUT STILL ILLUMINATED.**

Observe visually.

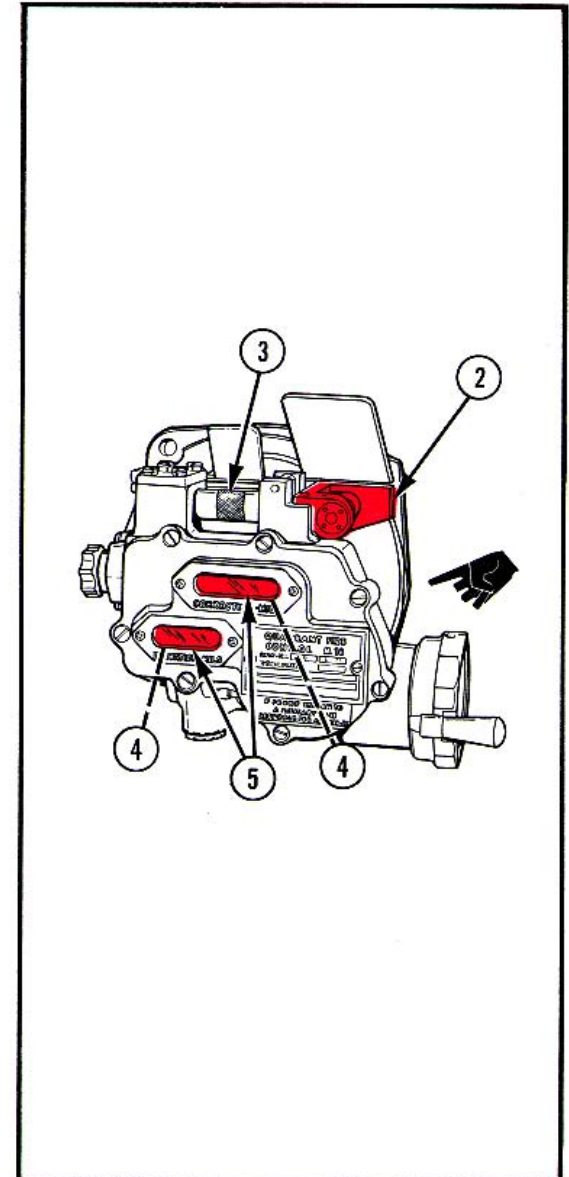
- a. The cross level vial may be replaced if it is cracked, but still illuminated.
- b. Return broken cross level vial to depot maintenance.

**COVER ASSEMBLY**

**7. COUNTER WINDOWS (5) ARE FOGGED OR HAVE CONDENSATION.**

Check for damaged glass or defective or missing parts.

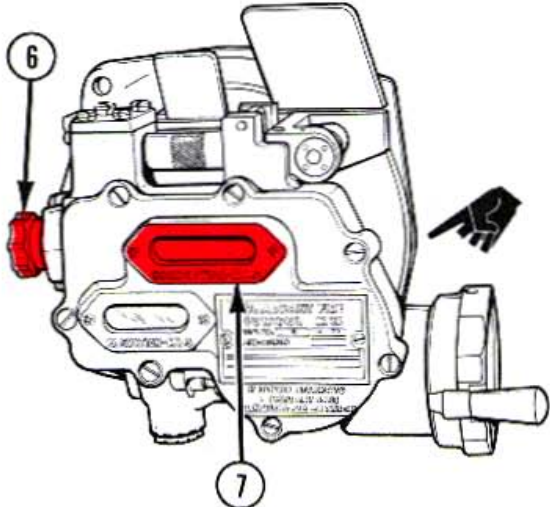
- a. Replace glass if required (p 2-39).
- b. Replace defective or missing parts as required and authorized (p 2-39).
- c. Purge and charge M18 quadrant with dry nitrogen (TM 9-1025-211-20&P).





3-6. GENERAL (cont)

Table 3-3. GENERAL SUPPORT TROUBLESHOOTING-M18 QUADRANT (cont)

<p><b>MALFUNCTION</b> <b>TEST OR INSPECTION</b> <b>CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p style="text-align: center;"><b>CORRECTION KNOB ASSEMBLY</b></p> <p><b>8. CORRECTION KNOB (6) BINDS.</b></p> <p>Step 1. Check for defective correction knob assembly. Replace correction knob assembly (p 2-42).</p> <p>Step 2. Check for defective correction counter. Replace correction counter assembly (p 2-47).</p> <p style="text-align: center;"><b>COUNTER ASSEMBLY</b></p> <p><b>9. CORRECTION COUNTER (7) FAILS TO ALLOW +95 TO +99 MILS MAX OR -95 TO -99 MILS MAX.</b></p> <p>Step 1. Check for incorrect assembly of key washers after removing correction knob assembly (p 2-42). Reinstall key washers correctly (p 2-43).</p> <p>Step 2. Check for worn or damaged correction knob assembly. Replace worn or damaged parts as required and authorized.</p>	 <p>The diagram shows a technical drawing of the M18 quadrant. A red correction knob is labeled with a circled '6' and an arrow pointing to it. A red counter assembly is labeled with a circled '7' and an arrow pointing to it. A hand icon is shown pointing towards the counter assembly. The drawing includes various mechanical details and a label with technical specifications.</p>

**10. COUNTER NUMBERS (8) ARE NOT IN HORIZONTAL ALINEMENT.**

Step 1. Observe visually for defective counters.

Replace counter assembly (p 2-47).

Step 2. Check for incorrectly assembled counter assembly.

Reassemble counter assembly correctly (p 2-49).

**11. ELEVATION COUNTER (9) FAILS TO ALLOW 1433 OR 9720 MILS.**

Step 1. Check for incorrectly installed counter.

Reinstall counter correctly (p 2-50).

Step 2. Check for incorrectly assembled counter.

Reassemble counter correctly (p 2-49).

Step 3. Check for defective counter assembly.

Replace counter assembly (p 2-47).

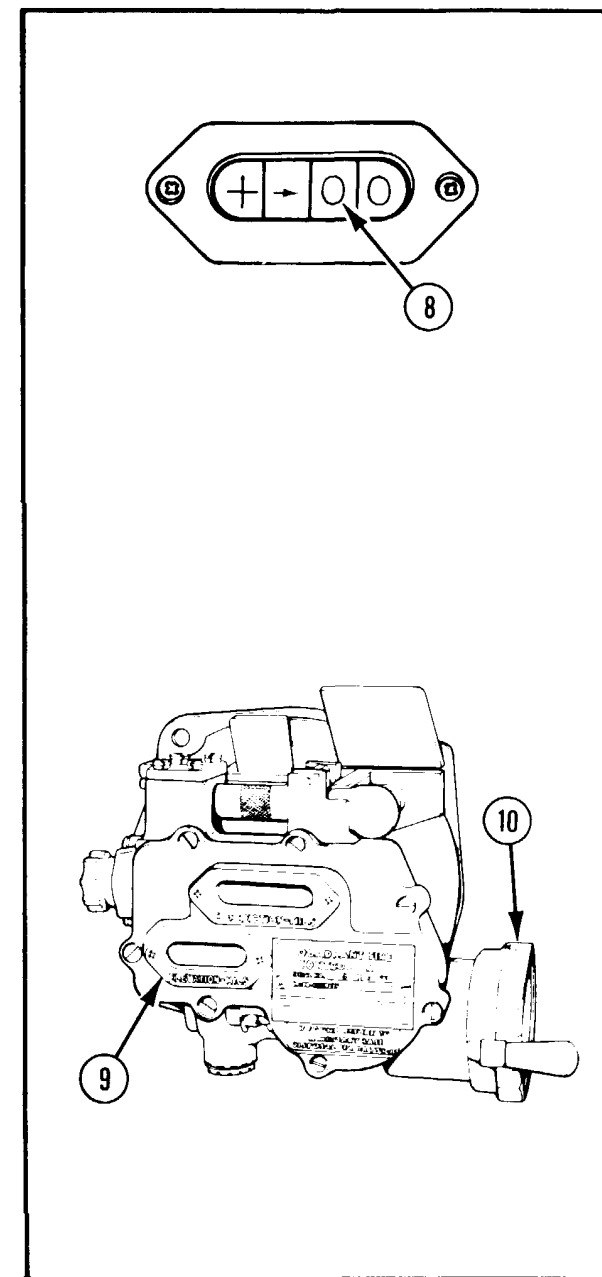
**WORM SHAFT ASSEMBLY****12. ELEVATION KNOB (10) EXCEEDS 0.7-MIL BACKLASH.**

Step 1. Check for incorrectly adjusted retainers.

Adjust retainers (p 2-59).

Step 2. Check for worn or damaged parts.

Remove worm shaft assembly (p 2-55), and replace parts as required and authorized.



## Section IV. DIRECT SUPPORT MAINTENANCE PROCEDURES FOR THE M18 QUADRANT

### 3 7. M18 QUADRANT-MAINTENANCE INSTRUCTIONS

#### INITIAL SETUP

##### Special Tools

Tool box (SC 4931-95-CL-A09)

##### Materials/Parts

- Cleaning compound (MIL-C-18718)
- Lock wire (MS20995-C32)
- Sealing compound (MIL-S-11031)

##### References

TM 9-1025-211-10  
TM 9-1025211-20&P  
TM 9-1240-37534P

##### Troubleshooting References

- 3-7 Elevation level vial and counter dials have uneven or no illumination.
- 3-7 Elevation level vial has no bubble, but still illuminated.
- 3-8 Counter windows are fogged or have condensation.

##### Equipment Condition

M18 quadrant mounted on M198 howitzer with M199 cannon at zero elevation (TM 9-1025211-10) (task no. 2).



**WARNING**  
When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

List of Tasks

Task Task No.	Task	Ref (Page)	Troubleshooting Ref No. (Page)
1	Maintain M18 quadrant:  a. Disassemble. b. Clean. c. Repair. d. Reassemble.	2-15 2-16 2-17 2-17	3-8
2	Maintain fire control level assembly:  a. Repair. b. Adjust.	2-19 2-19	3-7

**3-8. M18 QUADRANT-MAINTENANCE INSTRUCTIONS****THIS TASK COVERS :**

- a. Disassembly (p 2-15)
- b. Cleaning (p 2-16)
- c. Repair (p 2-17)
- d. Reassembly (p 2-17)

**INITIAL SETUP**

## Special Tools

Tool box (SC 4931-95-CL-A09)

## Materials/ Parts

Cleaning compound (MIL-C-18718)

Sealing compound (MIL-S-11031)

## References

TM 9-1025-211-10

TM 9-1025-211-20&P

TM 9-1240-375-34P

## Troubleshooting Reference

3-8 Counter windows are fogged or have condensation.

**WARNING**

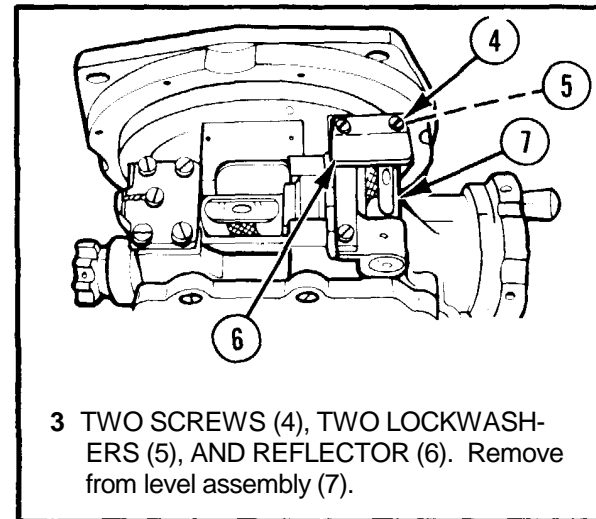
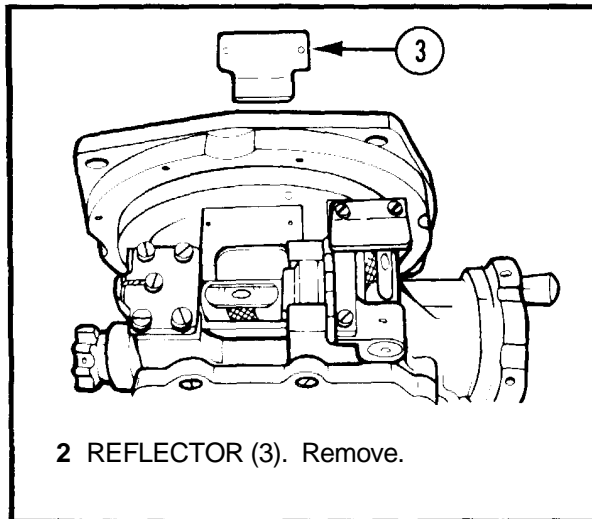
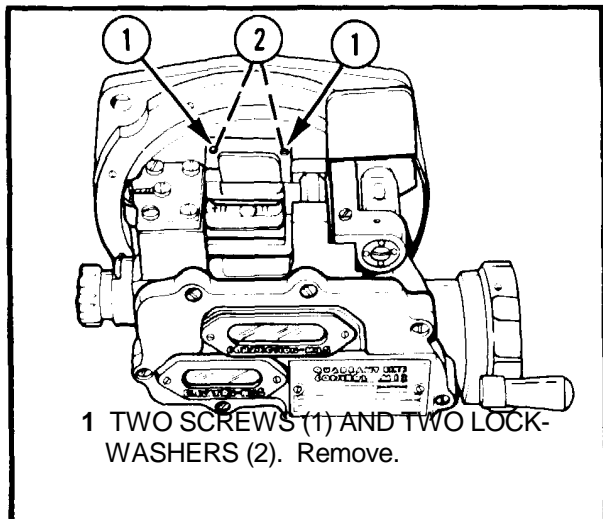
When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**NOTE**

Direct support maintenance for the M18 quadrant are identical to the M17 quadrant (p 2-15) with the exception of the following procedures.



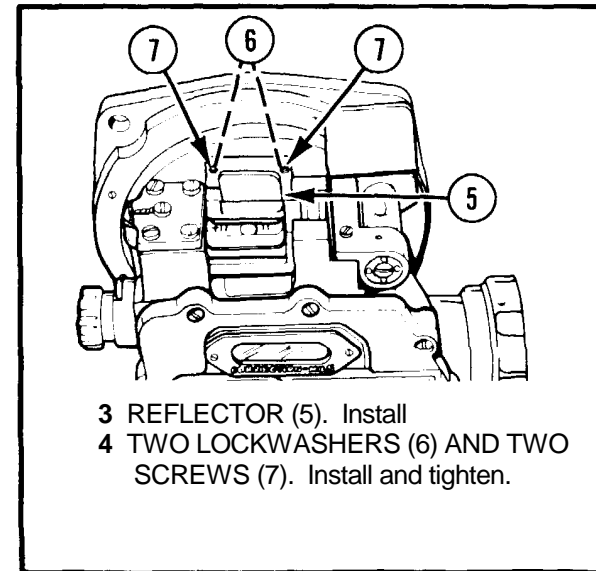
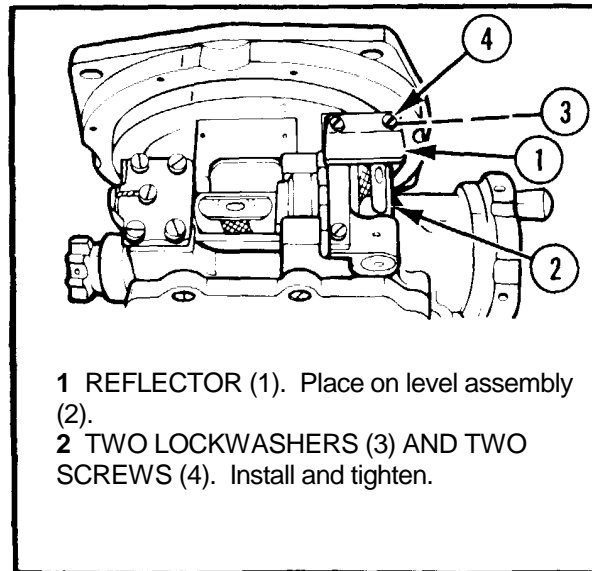
**DISASSEMBLY**



**REPAIR**

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

**REASSEMBLY**



## 3-9. FIRE CONTROL LEVEL ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS :**

- a. Repair (p 2-19)
- b. Adjustment (p 2-19)

**INITIAL SETUP**

## Special Tools

Tool box (SC 4931-95-CL-A09)

## Materials/Parts

- Lock wire (MS20995-C32)
- Sealing compound (MIL-S-1 1031)

## References

TM 9-1025-211-10  
 TM 9-1025-211-20&P  
 TM 9-1240-375-34P

## Troubleshooting References

- 3-7 Elevation level vial and counter dials have uneven or no illumination.
- 3-7 Elevation level vial has no bubble, but still illuminated.

## Equipment Condition

M18 quadrant mounted on M198 howitzer with M199 cannon at zero elevation (TM 9-1025-211-10).

**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**NOTE**

Direct support maintenance instructions for the M18 quadrant fire control level assembly are identical to the M17 quadrant fire control level assembly (p 2-18).

Section V. GENERAL SUPPORT MAINTENANCE PROCEDURES  
FOR THE M18 QUADRANT

3-10. M18 QUADRANT-MAINTENANCE INSTRUCTIONS

**INITIAL SETUP**

Test Equipment

Cross-leveling fixture (6523553)

Special Tools

Adapter (12008990)

Adapter set (SC 4931-95-CL-A11)

Precision level (7686087)

Shop set (SC 4931-95-CL-A07)

Tool box (SC 4931-95-CL-A09)

Materials Parts

Cleaning compound (MIL-C 18718)

Grease (item 2, app B)

Grease (item 3, app B)

Lock wire (MS20995 C32)

Sealing compound (MILS-1 1031)

Preformed packing (MS9021-017)

Preformed packing (MS9021-046)

References

TM 9-1025-211-10

TM 9-1025-211-20&P

TM 9-1240-375-34P

Troubleshooting References

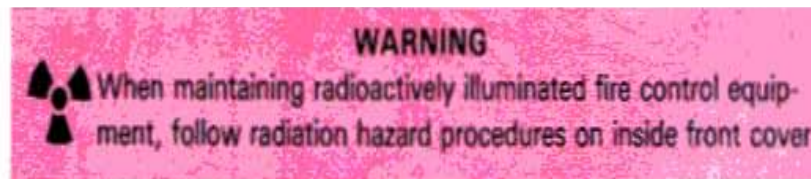
3-10 Elevation level bubble is not synchronized with M198 howitzer tube.

3-10 Elevation level vial and counter dials have uneven or no illumination.

- 3-10 Elevation level bubble is not level.
- 3-11 Elevation level vial has no bubble, but still illuminated.
- 3-11 Cross level vial and counter dials have uneven or no illumination.
- 3-11 Cross level vial has no bubble, but still illuminated.
- 3-11 Counter windows are fogged or have condensation.
- 3-12 Correction knob binds.
- 3-12 Correction counter fails to allow + 95 to + 99 mils max or - 95 to - 99 mils max.
- 3-13 Counter numbers are not in horizontal alignment.
- 3-13 Elevation counter fails to allow 1433 or 9720 mils.
- 3-13 Elevation knob exceeds 0.7-mil backlash.

Equipment Conditions

- 2-24 Cover assembly removed (tasks no. 5 thru 7).
- 2-26 Correction knob assembly removed (tasks no. 6 and 7).
- 2-26 Counter assembly removed (task no. 7).
- 2-61 Cross-leveling fixture set up and adjusted (task no. 3).



3-10. M18 QUADRANT-MAINTENANCE INSTRUCTIONS (cont)

List of Tasks

Task No.	Task	Task Ref (Page)	Troubleshooting Ref No. (Page)
1	Maintain M18 quadrant:		
2	a. Disassemble. b. Clean and inspect. c. Repair. d. Reassemble.  Maintain fire control level assembly:  a. Remove. b. Disassemble. c. Repair. d. Reassemble. e. Install.	2-24 2-28 2-28 2-28   2-33 2-34 2-34 2-34 2-35	3-10
3	Maintain level assembly:  a. Remove. b. Disassemble. c. Repair. d. Reassemble. e. Install. f. Adjust.	3-26 3-26 3-27 3-27 3-27 3-28	3-11

4	<p>Maintain cover assembly:</p> <ul style="list-style-type: none"> <li>a. Remove.</li> <li>b. Disassemble.</li> <li>c. Repair.</li> <li>d. Reassemble.</li> <li>e. Install.</li> </ul>	<p>2-38 2-39 2-39 2-39 2-40</p>	3-11
5	<p>Maintain correction knob assembly:</p> <ul style="list-style-type: none"> <li>a. Remove.</li> <li>b. Disassemble.</li> <li>c. Clean.</li> <li>d. Repair.</li> <li>e. Reassemble.</li> <li>f. Install.</li> </ul>	<p>2-42 242 243 2-43 2-43 2-44</p>	3-12
6	<p>Maintain counter assembly:</p> <ul style="list-style-type: none"> <li>a. Remove.</li> <li>b. Disassemble.</li> <li>c. Clean.</li> <li>d. Repair.</li> <li>e. Reassemble.</li> <li>f. Install.</li> </ul>	<p>2-47 2-47 2-49 2-49 2-49 2-52</p>	3-12, 3-13
7	<p>Maintain worm shaft assembly:</p> <ul style="list-style-type: none"> <li>a. Remove.</li> <li>b. Clean.</li> <li>c. Inspect.</li> <li>d. Install.</li> <li>e. Adjust.</li> </ul>	<p>2-55 2-56 2-56 2-57 2-59</p>	3-13



All data on pages 3-22 and 3-23 deleted, including paragraph 3-11.

3-22

3-12. FIRE CONTROL LEVEL ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS :**

- a. Removal (p 2-33)
- b. Disassembly (p 2-34)
- c. Repair (p 2-34)
- d. Reassembly (p 2-34)
- e. Installation (p 2-35)

**INITIAL SETUP**

Test Equipment  
 Cross-leveling fixture (6523553)

Special Tools  
 Adapter (12008990)  
 Precision level (7686087)  
 Tool box (SC 4931-95-CL-A09)


Materials/Parts  
 ■ Lock wire (MS20995-C32)  
 Sealing compound (MIL-S-11031)

References  
 TM 9-1025-211-20&P  
 TM 9-1240-375-34P

Troubleshooting References

- 3-10 Elevation level bubble is not synchronized with M198 howitzer tube.
- 3-10 Elevation level bubble is not level.
- 3-10 Elevation level vial and counter dials have uneven or no illumination.
- 3-10 Elevation level vial has no bubble, but still illuminated.

**WARNING**



When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**NOTE**

General support maintenance instructions for the M18 quadrant fire control level assembly are identical to the M17 quadrant fire control level assembly (p 2-32) with the following exception: If eccentric adjustment is required, the level assembly must be removed.

Replace fire control level assembly if elevation level vial is cracked or broken, and if the threads of any parts are stripped.

3-13. LEVEL ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>a. Removal</li> <li>b. Disassembly</li> <li>c. Repair</li> </ul> | <ul style="list-style-type: none"> <li>d. Reassembly</li> <li>e. Installation</li> <li>f. Adjustment</li> </ul> |
|---|---|

**INITIAL SETUP**

Test Equipment  
 Cross-leveling fixture (6523553)

Special Tools  
 Adapter (12008990)  
 Adapter set (SC 4931-95-CL-A11)  
 Shop set (SC 4931-95-CL-A07)  
 Tool box (SC 4931-95-CL-A09)

Materials/Parts  
 Sealing compound (MIL-S-11031)

References  
 TM 9-1025-211-20&P  
 TM 9-1240-375-34P


Troubleshooting References

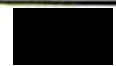
- 3-11 Cross level vial and counter dials have uneven or no illumination.
- 3-11 Cross level vial has no bubble, but still illuminated.

Equipment Condition

- 2-61 Cross-leveling fixture set up and adjusted.

**WARNING**


 When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

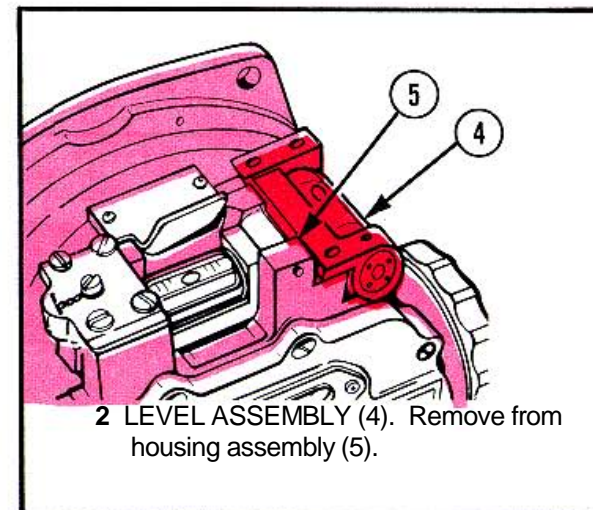
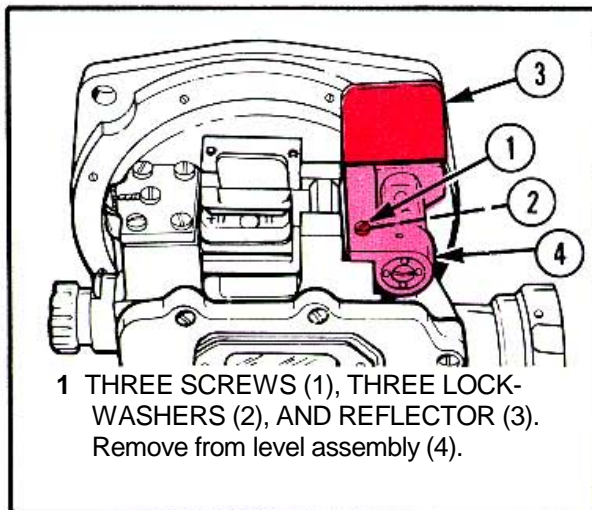


3-13. LEVEL ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REMOVAL

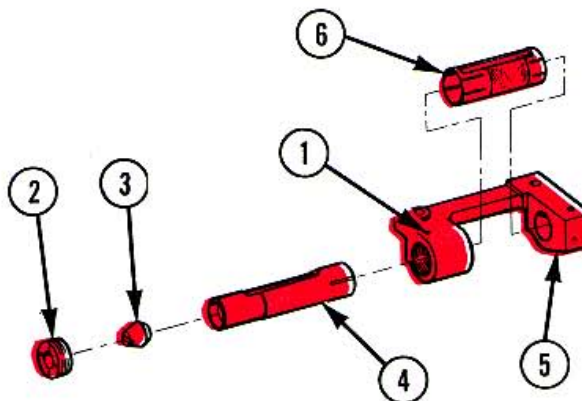
**NOTE**

Replacement of level assembly parts can be done without removing level assembly from M18 quadrant.



DISASSEMBLY

- 1 SETSCREW (1). Remove sealing compound and loosen setscrew (1).
- 2 RING (2). Remove sealing compound from level assembly and remove ring (2).
- 3 ECCENTRIC (3). Remove.
- 4 CROSS LEVEL VIAL (4). Slide out of bracket (5).
- 5 COVER (6). Lift out.

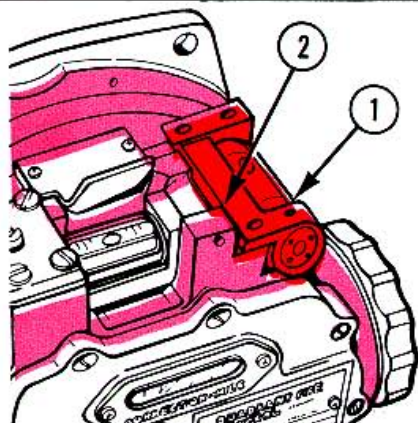


**NOTE**

Replace level assembly if bracket is damaged.

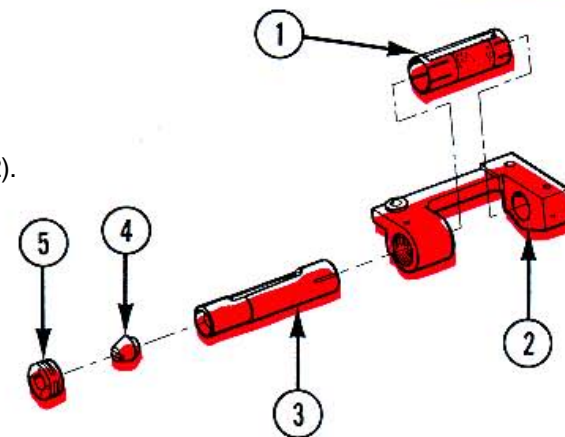
Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

## INSTALLATION

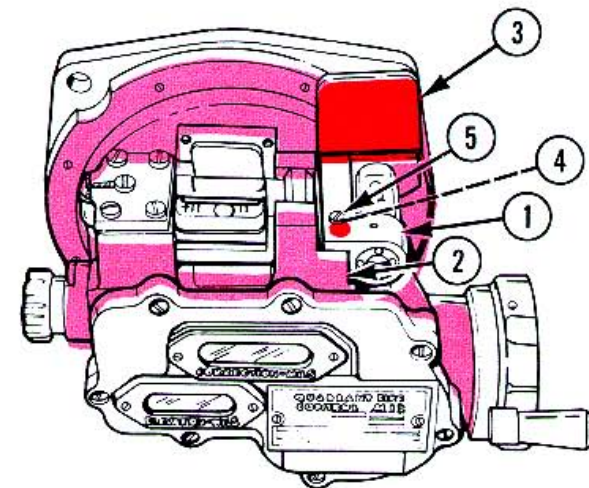


- 1 LEVEL ASSEMBLY (1). Place on housing assembly (2).

- 1 COVER (1). Place in bracket (2).
- 2 CROSS LEVEL VIAL (3). Slide in bracket (2).
- 3 ECCENTRIC (4). Install.
- 4 RING (5). Install.



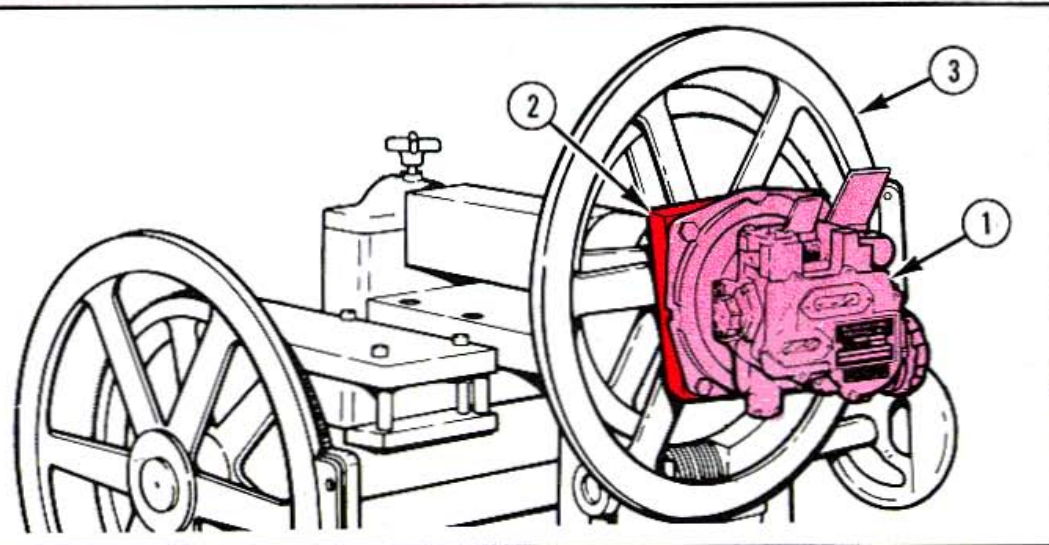
- 2 REFLECTOR (3). Place on level assembly (1).
- 3 THREE LOCKWASHERS (4) AND THREE SCREWS (5). Install in housing assembly (2), and tighten



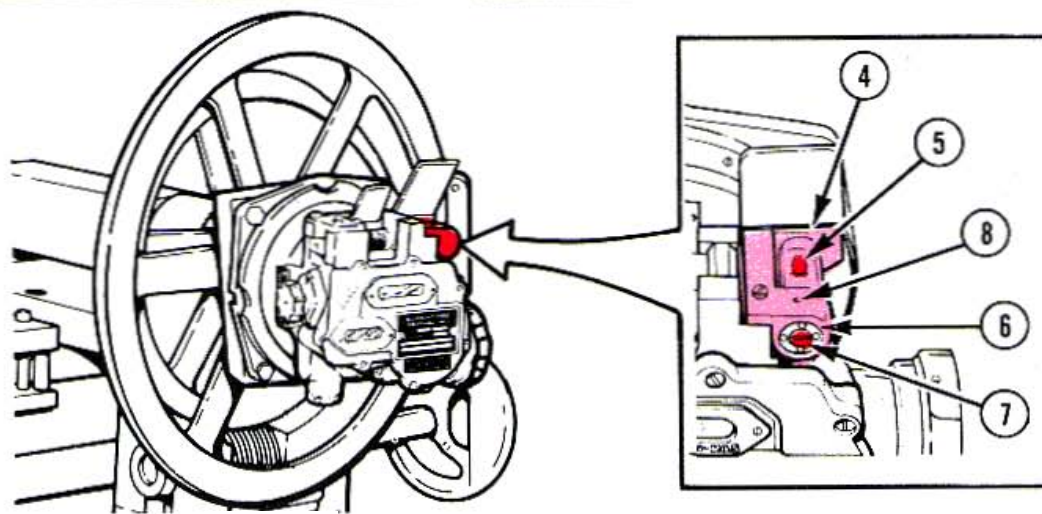


3-13. LEVEL ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

- 1 M18 QUADRANT (1). Install on adapter (2).
- 2 CROSS-LEVELING FIXTURE (3). Recheck level.



- 3 LEVEL ASSEMBLY (4). Center cross level bubble (5) using ring (6) and eccentric (7).
- 4 SETSCREW (8), RING (6), AND ECCENTRIC (7). Tighten and apply sealing compound (TM 9-1025-211-20&P).



3-14. COVER ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS :**

- a. Removal (p 2-38)
- b. Disassembly (p 2-39)
- c. Repair (p 2-39)
- d. Reassembly (p 2-39)
- e. Installation (p 2-40)

**INITIAL SETUP**

Special Tools

Tool box (SC 4931-95-CL-A09)

Materials/Parts

Grease (item 3, app B)  
 Sealing compound (MIL-S-11031)  
 Prefomed packing (MS9021-046)


References

TM 9-1025-211-20&P  
 TM 9-1240-375-34P

Troubleshooting Reference

3-11 Counter windows are fogged or have condensation.

**WARNING**



When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**NOTE**

General support maintenance instructions for the M18 quadrant cover assembly are identical to the M17 quadrant cover assembly (p 2-38).

Replace cover assembly if bent, cracked, or otherwise damaged.



**3-15 CORRECTION KNOB ASSEMBLY-MAINTENANCE INSTRUCTIONS**

**THIS TASK COVERS :**

- a. Removal (p 2-42)
- b. Disassembly (p 2-42)
- c. Cleaning (p 2-43)
- d. Repair (p 2-43)
- e. Reassembly (p 2-43)
- f. Installation (p 2-44)

**INITIAL SETUP**

Special Tools

- Adapter set (SC 4931-95-CL-A11)
- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)

Materials/Parts

- Cleaning compound (MIL-C-18718)
- Grease (item 2, app B)
- Grease (item 3, app B)
- Preformed packing (MS9021-017)
- Preformed packing (MS9021-046)

References

- TM 9-1025-211-10
- TM 9-1240-375-34P


Troubleshooting Reference

- 3-12 Correction knob binds.

Equipment Condition

- 2-24 Cover assembly removed

**WARNING**

 When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**NOTE**

General support maintenance instructions for the M18 quadrant correction knob assembly are identical to the M17 quadrant correction knob assembly (p 241).

Replace correction knob assembly if correction knob does not turn or binds.

3-16. COUNTER ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS :**

- a. Removal (p 2-47)
- b. Disassembly (p 2-47)
- c. Cleaning (p 2-49)
- d. Repair (p 2-49)
- e. Reassembly (p 2-49)
- f. Installation (p 2-52)

**INITIAL SETUP**

Special Tools

- Adapter set (SC 4931-95-CL-A11)
- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)

Materials/ Parts

- Cleaning compound (MIL-C-18718)
- Grease (item 2, app B)
- Sealing compound (MIL-S-11031)

References

- TM 9-1025-211-10
- TM 9 1025-211-20&P
- TM 9-1240-375-34P


Troubleshooting References

- 3-12 Correction counter fails to allow +95 to +99 mils max or - 95 to - 99 mils max.
- 3-13 Counter numbers are not in horizontal alinement.
- 3-13 Elevation counter fails to allow 1433 or 9720 mils.

Equipment Conditions

- 2-24 Cover assembly removed.
- 2-26 Correction knob assembly removed.

**WARNING**

 When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**NOTE**

General support maintenance instructions for the M18 quadrant counter assembly are identical to the M17 quadrant counter assembly (p 2-46).

Replace counter assembly when it is damaged to the extent that it can no longer perform its intended function.



**3-17. WORM SHAFT ASSEMBLY-MAINTENANCE INSTRUCTIONS**

**THIS TASK COVERS :**

- a. Removal (p 2-55)
- b. Cleaning (p 2-561)
- c. Inspection (p 2-56)
- d. Installation (p 2-57)
- e. Adjustment (p 2-59)

**INITIAL SETUP**

Special Tools  
 Adapter set (SC 4931-95-CL-A11)  
 Shop set (SC 4931-95-CL-A07)  
 Tool box (SC 4931-95-CL A09)

Materials/Parts  
 Cleaning compound (MIL-C-18718i)  
 Grease (item 2, app B)  
 Grease (item 3, app B)


Reference  
 TM 9-1025-211-10

Troubleshooting Reference  
 3-13 Elevation knob exceeds 0.7-mil backlash.

Equipment Conditions  
 2-24 Cover assembly removed.

2-26 Correction counter assembly removed.  
 2-26 Counter assembly removed

**WARNING**

 When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**NOTE**

General support maintenance instructions for the M18 quadrant worm shaft assembly are identical to the M17 quadrant worm shaft assembly (p 2-54).

Replace worm shaft assembly if bent or if any other damage is evident.

**Section VI. GENERAL SUPPORT FINAL INSPECTION PROCEDURES FOR THE M18 QUADRANT**

**3-18. GENERAL**

Final inspection procedures for the M18 quadrant are identical to the final inspection procedures for the M17 quadrant (p 2-60) with the following exception:

The cross level bubble shall remain centered within the thickness of

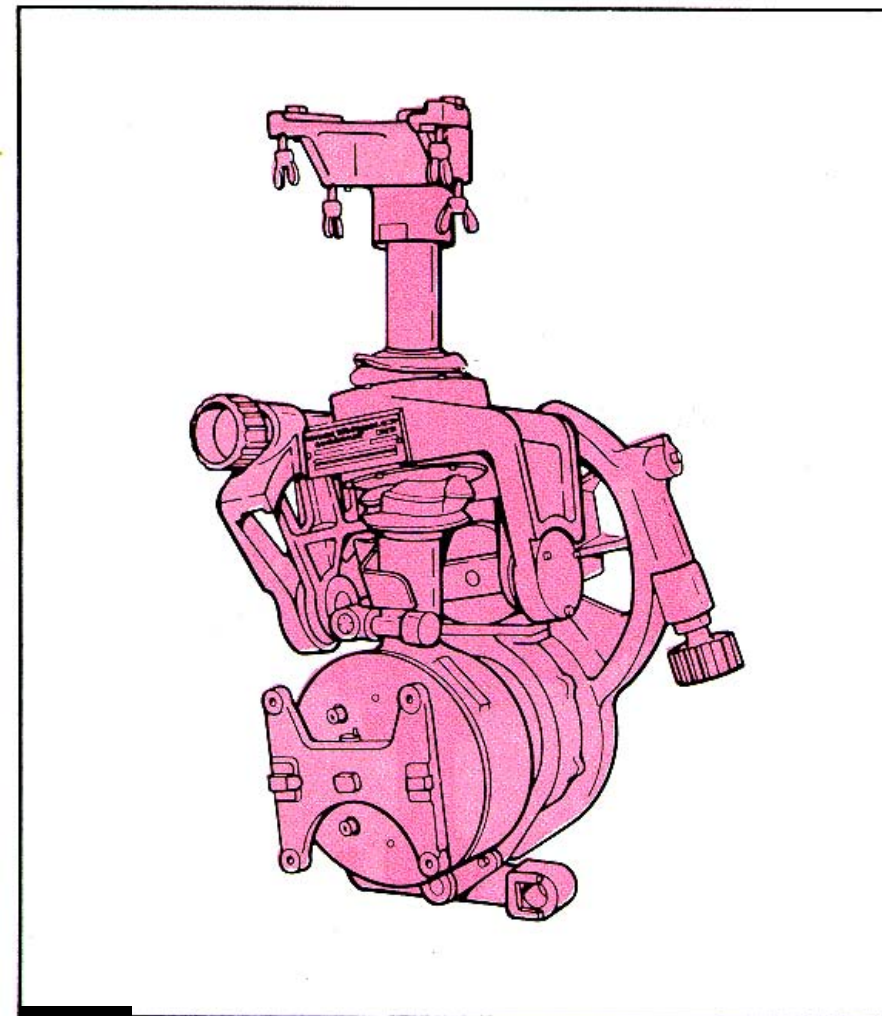
a graduation line when the M18 quadrant is elevated from 280 mils depression to 1433 mils elevation, and the elevation level bubble is centered. This check is performed in conjunction with Elevation Accuracy Inspection (200-Mil Increments) (p 2-69).



**CHAPTER 4  
M171 TELESCOPE AND QUADRANT  
MOUNT-MAINTENANCE INSTRUCTIONS**

**CHAPTER INDEX**

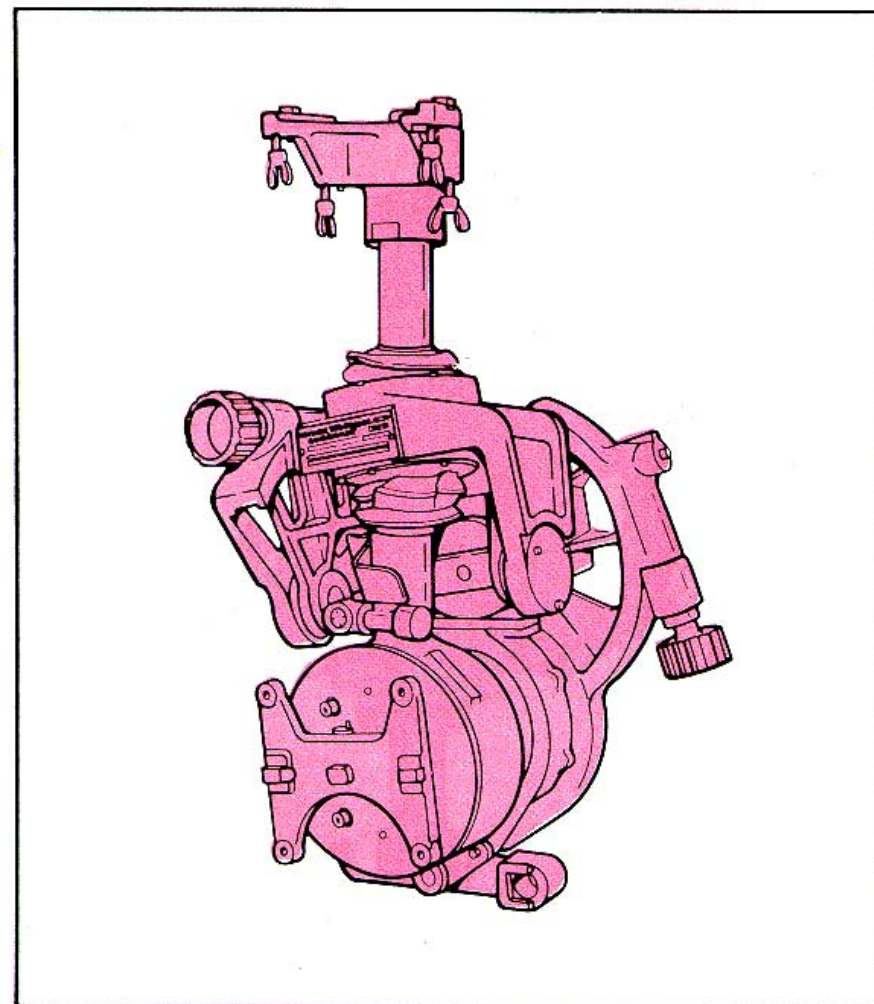
	<b>Page</b>
Arm and Adapter Assembly-General Support Maintenance Instructions .....	4-61
Bearing Housing Assembly-Direct Support Maintenance Instructions .....	4-21
Categories of Inspection .....	4-4
Common Tools and Equipment .....	4-3
General (Final Inspection) .....	4-65
General (Inspections) .....	4-3
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Mounting Adapter--General Support Maintenance Instructions .....	4-63
M171 Mount-Direct Support Maintenance Instructions .....	4-15
M171 Mount-General Support Final Inspection Instructions .....	4-65
M171 Mount-General Support Maintenance Instructions .....	4-26
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Optical Instrument Rocker Assembly-Direct Support Maintenance Instructions .....	4-19



**CHAPTER INDEX (cont)**

**Page**

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Optical Instrument Support- Direct Support Maintenance Instructions .....	4-18
Optical Instrument Support-General Support Maintenance Instructions .....	4-37
Plunger Assembly-General Support Maintenance Instructions .....	4-58
Spares and Repair Parts .....	4-3
Special Tools, TMDE, and Support Equipment .....	4-3
Worm Shaft Assembly (Cross Level)-General Support Maintenance Instructions .....	4-43
Worm Shaft Assembly (Elevation)-General Support Maintenance Instructions .....	4-60



**Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE,  
AND SUPPORT EQUIPMENT**

**4-1. COMMON TOOLS AND EQUIPMENT**

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

**4-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT**

Special tools, TMDE, and support equipment required and authorized for repair of the M171 mount are listed in TM 9-1240-375-34P.

**4-3. SPARES AND REPAIR PARTS**

Spares and repair parts are listed and illustrated in TM 9-1240-375-34P.

**Section II. INSPECTIONS**

**4-4. GENERAL**

**a.** Inspection is performed primarily to determine the following:

- (1) Completeness.
- (2) The nature of unserviceability.
- (3) The work, repair parts, and supplies required to return the M171 mount to serviceability.
- (4) That work in process is being performed properly.

(5) That completed work complies fully with serviceability standards.

**b.** The M171 mount is considered serviceable when:

- (1) It is complete and properly performs the intended function.
- (2) All modification work orders (MWO's) have been applied.
- (3) All defects disclosed by the inspection have been corrected.

**c.** DA Form 2408-5 and DA Form 2409 list applicable MWO's.



**4-5. CATEGORIES OF INSPECTION**

Categories of inspection define responsibilities.

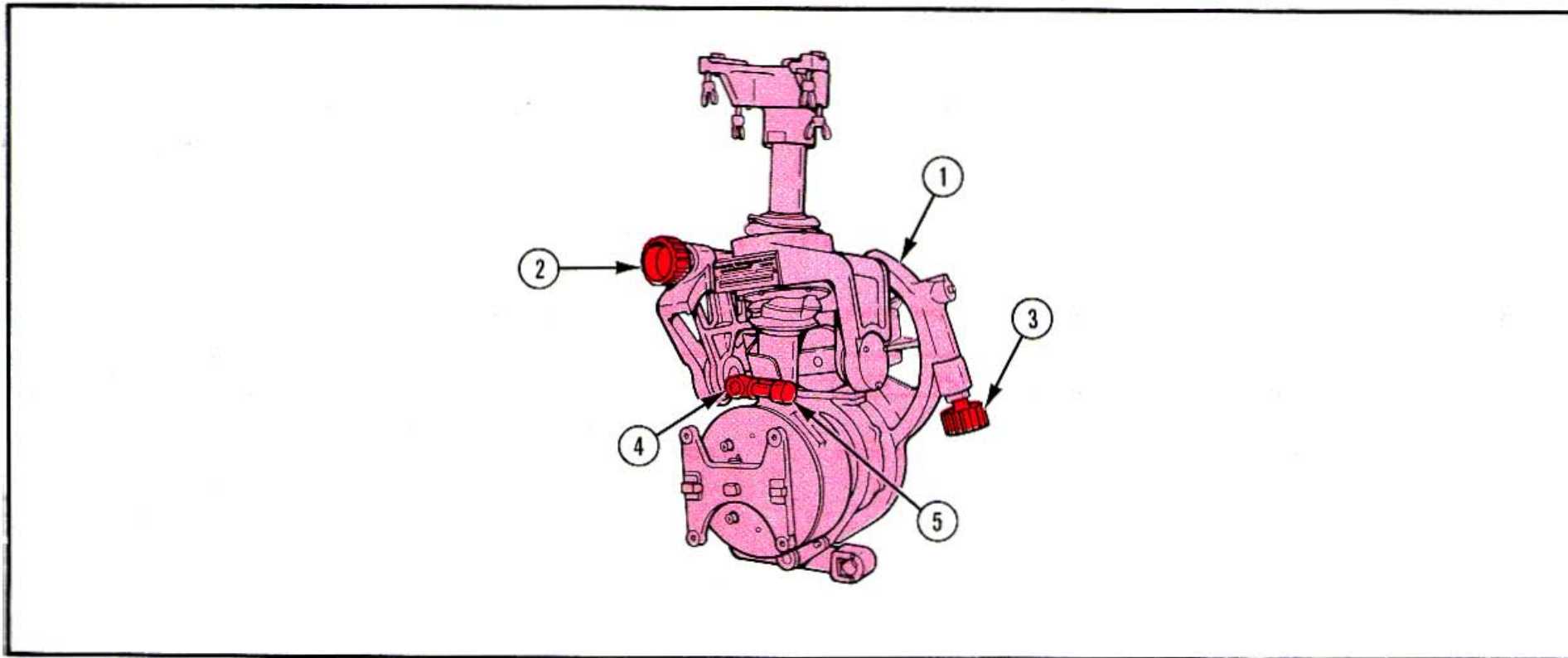
a. An initial inspection is performed immediately on receipt of the M171 mount for maintenance. This inspection will determine the amount and type of work to be performed or whether the materiel should be sent to depot maintenance.


b. A final inspection of the M171 mount is performed after repairs have been completed to ensure the item meets serviceability standards.

c. Table 4-1 lists initial inspection procedures for the M171 mount. Final inspection procedures are located on page 4-65.

d. Preembarkation inspection procedures are located on page 2-76.

**Table 4-1. INITIAL INSPECTION-M171 MOUNT**



Item No.	Item To Be Inspected	Procedures
1	M171 MOUNT (1)	Look for signs of mistreatment, such as bare spots, dents, scuff marks, or damaged parts. Inspect M171 mount for cleanness.
2	CROSS LEVEL KNOB (2)	Operate cross level knob. Check that operation is smooth without binding or rough motion.
3	ELEVATION KNOB (3)	Operate elevation knob. Check that operation is smooth without binding or rough motion.
<p><b>WARNING</b></p> <p> When inspecting radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.</p>		
4	CROSS LEVEL VIAL (4)	Cross level bubble must move freely. Glass must not be broken or cracked. Radioactive light must be present and even throughout the cross level vial.
5	ELEVATION LEVEL VIAL (5)	Elevation level bubble must move freely. Glass must not be broken or cracked. Radioactive light must be present and even throughout the elevation level vial.





Section III. TROUBLESHOOTING

4-6. GENERAL

a. The symptom index can be used as a quick guide to troubleshooting. Common malfunctions are listed in alphabetical order with a page number reference to the troubleshooting table where a test or inspection and corrective action are provided.

b. The direct support troubleshooting table (p 4-6) lists the common malfunctions which may be found during maintenance of the M171 mount. Perform the tests/inspections and corrective actions in the order listed.

c. The general support troubleshooting table (p 4-8) lists the common malfunctions which may be found during maintenance of the M171 mount. Perform the tests/inspections and corrective actions in the order listed.

d. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective action, notify depot maintenance.

DIRECT SUPPORT SYMPTOM INDEX

	Troubleshooting Procedure (Page)
<b>BEARING HOUSING ASSEMBLY</b>	
Mirror does not clearly reflect image of cross level vial and elevation level vial .....	4-8
<b>OPTICAL INSTRUMENT SUPPORT</b>	
Optical instrument support does not seat M137 telescope correctly .....	4-7
Thumbscrews do not secure M 137 telescope correctly .....	4-7

Table 4-2. DIRECT SUPPORT TROUBLESHOOTING-M171 MOUNT


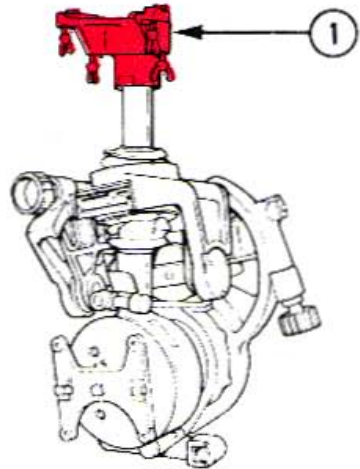
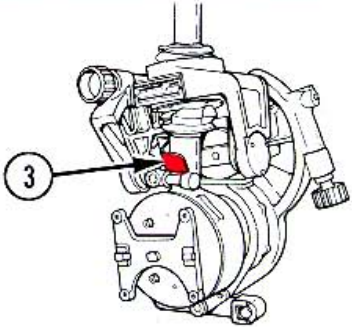
<p><b>MALFUNCTION</b>  <b>TEST OR INSPECTION</b>  <b>CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p style="text-align: center;"><b>WARNING</b></p> <p> When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.</p> <p style="text-align: center;"><b>OPTICAL INSTRUMENT SUPPORT</b></p> <p><b>1. OPTICAL INSTRUMENT SUPPORT (1) DOES NOT SEAT M137 TELESCOPE CORRECTLY.</b>            Check mounting surfaces for dirt or burrs.</p> <ul style="list-style-type: none"> <li>a. Clean mounting surface with cleaning compound (TM 9-1025-211-10).</li> <li>b. Remove burrs on mounting surface with abrasive cloth dipped in cleaning compound (TM 9-1025-211-10).</li> </ul> <p><b>2. THUMBSCREWS (2) DO NOT SECURE M137 TELESCOPE CORRECTLY.</b>            Check for bent or damaged thumbscrews or damaged thumbscrew threads.            Replace thumbscrews (p 4-18).</p>	



Table 4-2. DIRECT SUPPORT TROUBLESHOOTING-M171 MOUNT (cont)

<p><b>MALFUNCTION</b>  <b>TEST OR INSPECTION</b>  <b>CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p align="center"><b>BEARING HOUSING ASSEMBLY</b></p> <p><b>3. MIRROR (3) DOES NOT CLEARLY REFLECT IMAGE OF CROSS LEVEL VIAL AND ELEVATION LEVEL VIAL.</b>                      Check mirror for dirt, damage, or scars.                      a. Clean with cleaning compound (TM 9-1025-211-10).                      b. Replace mirror (p 4-21).</p>	

**GENERAL SUPPORT SYMPTOM INDEX**

**Troubleshooting  
 Procedure  
 (Page)**

**BEARING HOUSING ASSEMBLY**

Cross level bubble or elevation level bubble does not center within one graduation ..... 4-12

Cross level vial or elevation level vial has no illumination ..... 4-12

■ M17 quadrant does not mount correctly ..... 4-13

■ Plunger assembly binds ..... 4-13

**HOUSING ASSEMBLY**

Elevation control is erratic and rough during movement ..... 4-11

Elevation knob:

Exceeds 1.5-mil backlash ..... 4-11

Requires torque in excess of 12 in.-lb (1.35 N-m) to rotate ..... 4-11

**OPTICAL INSTRUMENT ROCKER ASSEMBLY**

Cross level control is erratic and rough during movement ..... 4-10

Cross level knob:


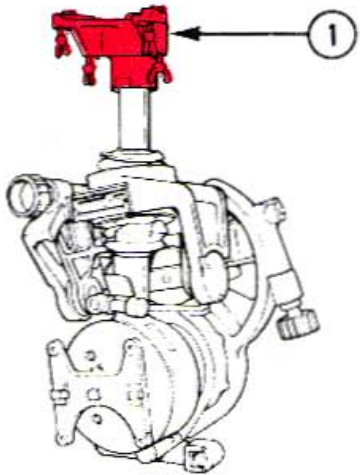
Exceeds 1.5-mil backlash ..... 4-10

Requires torque in excess of 12 in.-lb (1.35 N-m) to rotate ..... 4-10

**OPTICAL INSTRUMENT SUPPORT**

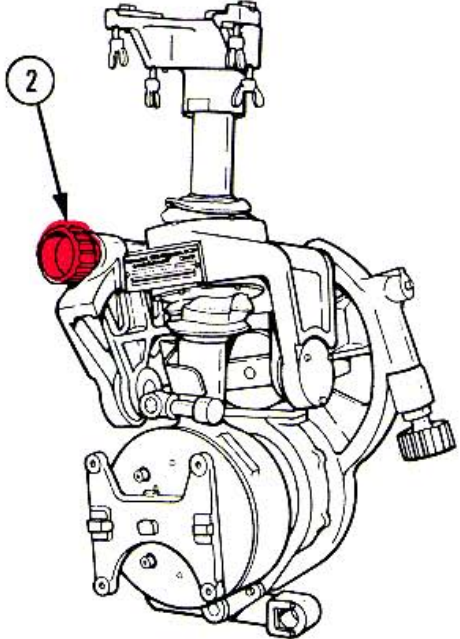
Optical instrument support does not seat M137 telescope correctly ..... 4-9

**Table 4-3. GENERAL SUPPORT TROUBLESHOOTING-M171 MOUNT**

<p><b>MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p style="text-align: center;"><b>WARNING</b></p> <p> When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.</p> <p style="text-align: center;"><b>OPTICAL INSTRUMENT SUPPORT</b></p> <p><b>1. OPTICAL INSTRUMENT SUPPORT (1) DOES NOT SEAT M137 TELESCOPE CORRECTLY.</b></p> <p>Check mounting surfaces for dirt or burrs.</p> <ol style="list-style-type: none"> <li>a. Clean mounting surface with cleaning compound (TM 9-1025-211-10).</li> <li>b. Remove burrs on mounting surface with abrasive cloth dipped in cleaning compound (TM 9-1025-211-10).</li> </ol>	

4-6. GENERAL (cont)

Table 4-3. GENERAL SUPPORT TROUBLESHOOTING-M171 MOUNT (cont)

<p><b>MALFUNCTION</b>  <b>TEST OR INSPECTION</b>  <b>CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p style="text-align: center;"><b>OPTICAL INSTRUMENT ROCKER ASSEMBLY</b></p> <p><b>2. CROSS LEVEL CONTROL IS ERRATIC AND ROUGH DURING MOVEMENT.</b>                      Step 1. Check for worn or defective worm shaft assembly.                      Replace worm shaft assembly (p 4-44).                      Step 2. Check for worn or defective gears in gear sector.                      Replace gear sector (p 4-49).</p> <p><b>3. CROSS LEVEL KNOB (2) EXCEEDS 1.5-MIL BACKLASH.</b>                      Step 1. Check for loose or worn V-bearing or plain bearing.                      Replace V-bearing or plain bearing (p 4-44).                      Step 2. Check for worn or defective worm shaft assembly.                      Replace worm shaft assembly (p 4-44).</p> <p><b>4. CROSS LEVEL KNOB (2) REQUIRES TORQUE IN EXCESS OF 12 IN.-LB (1.35 N-m) TO ROTATE.</b>                      Step 1. Check V-bearing tightness.                      Loosen plug, and adjust torque (p 4-47).</p>	



- Step 2. Check for defective worm shaft assembly, plain bearing, or V-bearing.  
Replace worm shaft assembly, plain bearing, or V-bearing (p 4-44).

### HOUSING ASSEMBLY

#### 5. ELEVATION CONTROL IS ERRATIC AND ROUGH DURING MOVEMENT.

- Step 1. Check for worn or defective worm shaft assembly.  
Replace worm shaft assembly (p 4-51).  
Step 2. Check for worn or defective gears in gear sector.  
Replace gear sector (p 4-49).

#### 6. ELEVATION KNOB (3) EXCEEDS 1.5-MIL BACKLASH.

- Step 1. Check for loose or worn V-bearing or plain bearing.  
Replace V-bearing or plain bearing.  
Step 2. Check for worn or defective worm shaft assembly.  
Replace worm shaft assembly (p 4-51).

#### 7. ELEVATION KNOB (3) REQUIRES TORQUE IN EXCESS OF 12 IN.-LB (1.35 N-m) TO ROTATE.

- Step 1. Check V-bearing tightness.  
Loosen plug, and adjust torque (p 4-57).

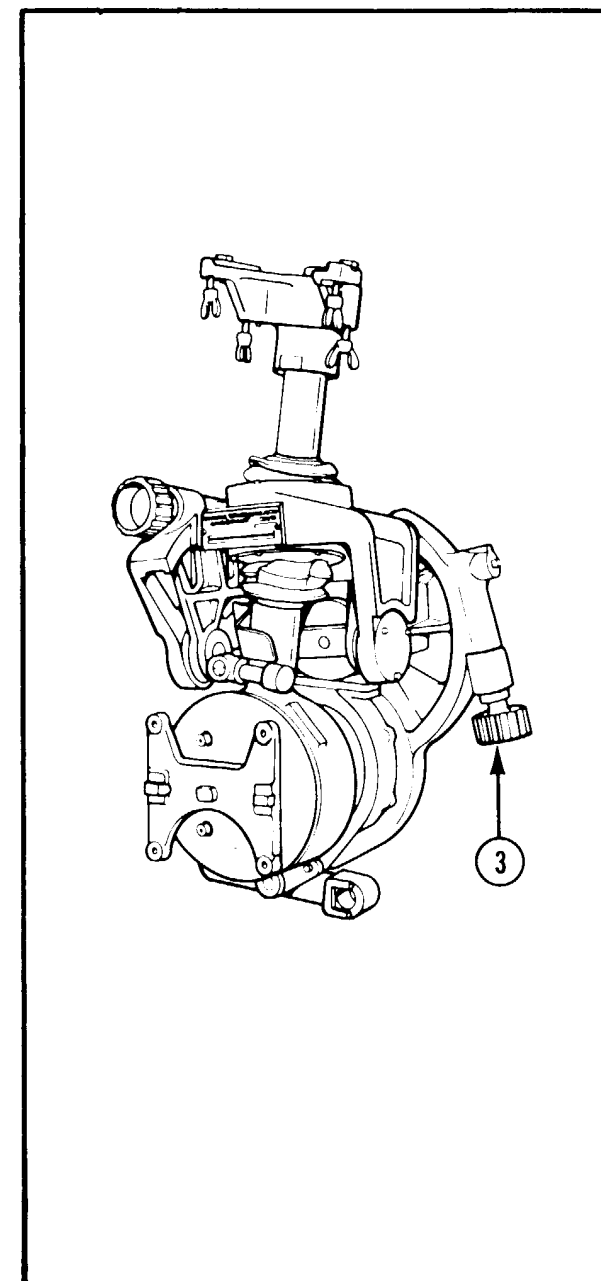
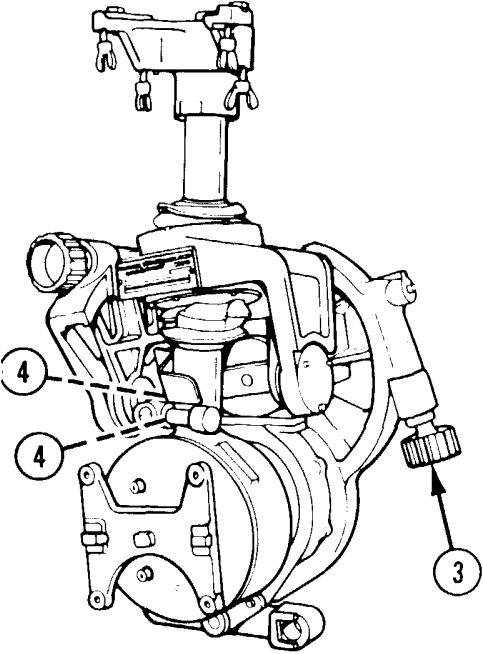


Table 4-3. GENERAL SUPPORT TROUBLESHOOTING-M171 MOUNT (cont)

<b>MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION</b>	<b>LOCATION</b>	
<b>HOUSING (cont)</b>		
<p><b>7. ELEVATION KNOB (3) REQUIRES TORQUE IN EXCESS OF 12 IN.-LB (1.35 N-m) TO ROTATE. (cont)</b></p> <p>Step 2. Check for defective worm shaft assembly, plain bearing, or V-bearing. Replace worm shaft assembly, plain bearing, or V-bearing (p 4-51).</p>		
<b>BEARING HOUSING ASSEMBLY</b>		
<p><b>8. CROSS LEVEL BUBBLE OR ELEVATION LEVEL BUBBLE (4) DOES NOT CENTER WITHIN ONE GRADUATION LINE.</b></p> <p>Check for incorrect adjustment (p 4-74). Adjust cross level bubble or elevation level bubble correctly (p 4-74).</p>		
<p><b>9. CROSS LEVEL VIAL OR ELEVATION LEVEL VIAL HAS NO ILLUMINATION.</b></p> <p>Step 1. Check cross level vial or elevation level vial for cracks. a. The cross level vial or elevation level vial may be replaced if it is cracked, but still illuminated. b. Return broken cross level vial or elevation level vial to depot maintenance.</p> <p>Step 2. Check cross level vial or elevation level vial for illumination. If not illuminated, the M171 mount is to be placed in plastic bag (TM 9-1025-211-10) and returned to depot maintenance.</p>		

**10. M17 QUADRANT DOES NOT MOUNT CORRECTLY.**

Step 1. Check for worn or defective keys (5).

If worn or defective, replace keys (5).

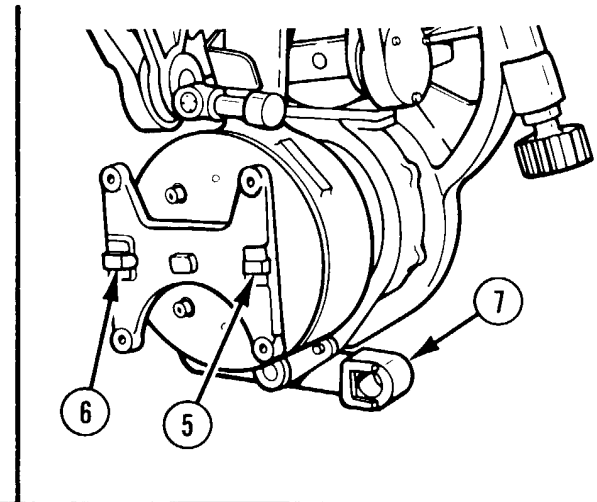
Step 2. Check for bent or damaged mounting adapter (6).

If bent or damaged, replace mounting adapter (6).

**11. PLUNGER ASSEMBLY (7) BINDS.**

Check for dirt or foreign material.

Clean with cleaning compound (TM 9-1025-211-10).



**Section IV. DIRECT SUPPORT MAINTENANCE PROCEDURES FOR THE M171 TELESCOPE AND QUADRANT MOUNT**

**4-7. M171 MOUNT-MAINTENANCE INSTRUCTIONS**

**INITIAL SETUP**

Special Tools

- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)
- Tool kit (SC 5180-95-CL-A43)

Materials/Parts

- Lock wire (item 5, app B)
- Sealing compound (MIL-S-11031)

References

- TM 9-1025-211-20&P
- TM 9-1025-211-34
- TM 9 1240 375-34P

Equipment Condition

- 4-15 M171 mount removed from M198 howitzer (tasks no. 2 thru 4).

Troubleshooting References

- 4-7 Optical instrument support does not seat M137 panoramic telescope correctly.
- 4-7 Thumbscrews do not secure M137 panoramic telescope correctly.
- 4-8 Mirror does not clearly reflect image of cross level vial a elevation level vial.

**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

4-7. M171 MOUNT-MAINTENANCE INSTRUCTIONS (cont)

List of Tasks

Task No.	Task	Task Ref (Page)	Troubleshooting Ref No. (Page)
1	Maintain M171 mount: <ul style="list-style-type: none"> <li>a. Remove M171 mount.</li> <li>b. Install M171 mount.</li> <li>c. Remove instruction plate.</li> <li>d. Repair.</li> <li>e. Install instruction plate.</li> </ul>	4-15 4-16 4-17 4-17 4-17	
2	Maintain optical instrument support: <ul style="list-style-type: none"> <li>a. Disassemble.</li> <li>b. Repair.</li> <li>c. Reassemble.</li> </ul>	4-18 4-18 4-19	4-7
3	Maintain optical instrument rocker assembly: <ul style="list-style-type: none"> <li>a. Disassemble.</li> <li>b. Repair.</li> <li>c. Reassemble.</li> </ul>	4-20 4-20 4-20	
4	Maintain bearing housing assembly: <ul style="list-style-type: none"> <li>a. Disassemble.</li> <li>b. Repair.</li> <li>c. Reassemble.</li> </ul>	4-21 4-22 4-22	4-8

4-8 M171 MOUNT-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Removal of M171 mount
- b. Installation of M171 mount
- c. Removal of instruction plate
- d. Repair
- e. Installation of instruction plate

**INITIAL SETUP**

Special Tools

- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)
- Tool kit (SC 5180-95-CL-A43)


Materials/Parts

- Lock wire (item 5, app B)

References

- TM 9-1025-211-34
- TM 9-1240-375-34P

**WARNING**



When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**REMOVAL OF M171 MOUNT**

- 1 LOCK WIRE (1). Remove.

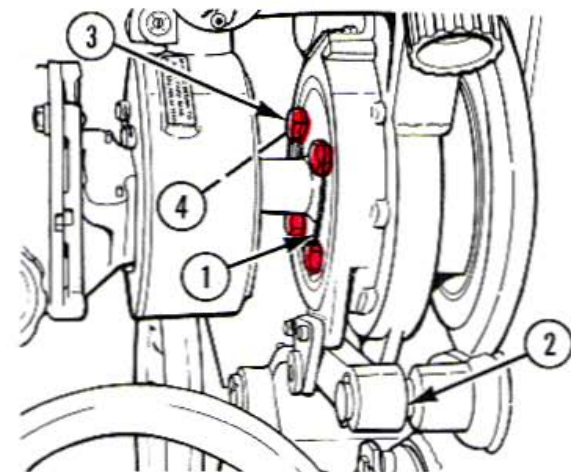
**CAUTION**

Support M171 mount while removing mounting screws.

**NOTE**

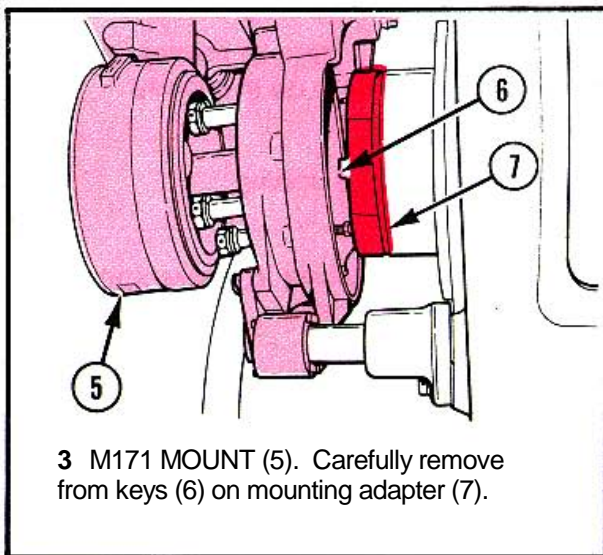
Removal of M171 mount may be accomplished with plunger assembly (2) removed (p 4-59).

- 2 FOUR MOUNTING SCREWS (3) AND FOUR LOCKWASHERS (4). Unscrew, and remove.





## 4-8. M171 MOUNT-MAINTENANCE INSTRUCTIONS (cont) I

**REMOVAL OF M171 MOUNT (cont)**

3 M171 MOUNT (5). Carefully remove from keys (6) on mounting adapter (7).

**INSTALLATION OF M171 MOUNT****CAUTION**

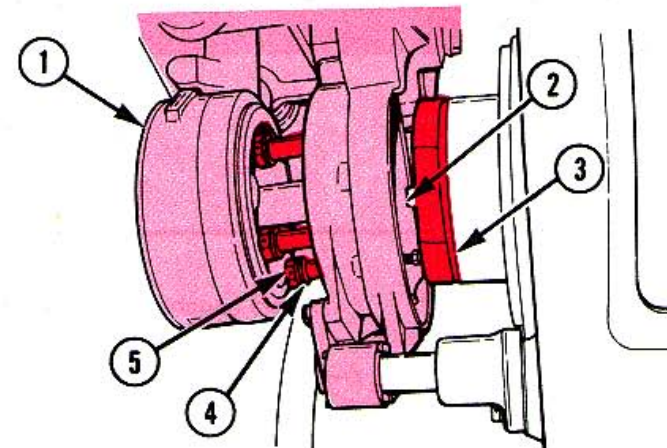
Support M171 mount until mounting screws are installed. Ensure that shims between mounting plate and trunnion are in place and not missing.

**NOTE**

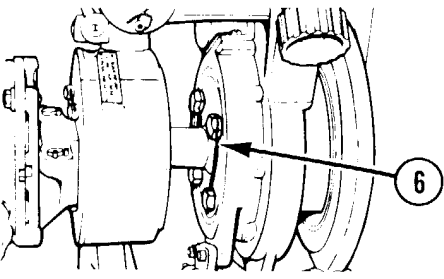
Installation of the M171 mount to M198 howitzer trunnion may be accomplished with plunger assembly removed from M171 mount. After installing the M171 mount, see plunger assembly installation procedures on page 459.

Before M171 mount is installed, mounting adapter keys and mount key-ways must be clean and free of nicks and burrs.

- 1 M171 MOUNT (1). Support and align on keys (2) of mounting adapter (3).
- 2 FOUR LOCKWASHERS (4) AND FOUR MOUNTING SCREWS (5).
  - a. Install.
  - b. Tighten diagonally and gradually by torquing 50 ft-lb (67.5 N-m) to 70 ft-lb (94.5 N-m).



**REMOVAL OF INSTRUCTION PLATE**



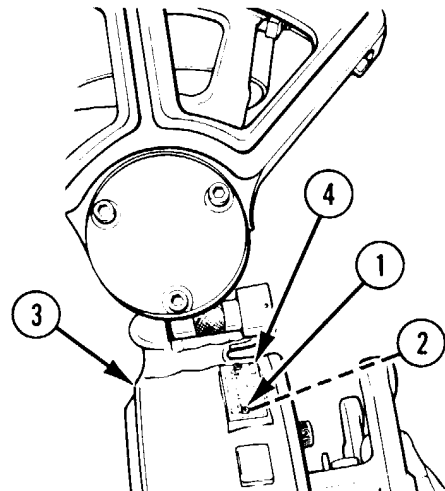
3 LOCK WIRE (6) (ITEM 5, APP B). Install.

**NOTE**  
Boresighting and synchronization procedures should be performed in

accordance with TM 9-1025-211-34.

- 1 TWO SCREWS (1) AND TWO LOCKWASHERS (2). Remove from bearing housing assembly (3).
- 2 INSTRUCTION PLATE (4). Lift off.

**NOTE**  
Replace M171 mount if it can no longer perform its intended function.

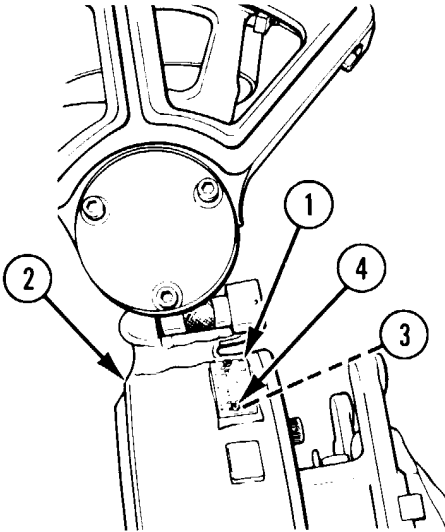


**REPAIR**

**INSTALLATION OF INSTRUCTION PLATE**

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

- 1 INSTRUCTION PLATE (1). Position on bearing housing assembly (2).
- 2 TWO LOCKWASHERS (3) AND TWO SCREWS (4). Install.



**4-9. OPTICAL INSTRUMENT SUPPORT-MAINTENANCE INSTRUCTIONS**

**THIS TASK COVERS:**

- a. Disassembly
- b. Repair
- c. Reassembly

**INITIAL SETUP**

Special Tools  
Tool box (SC 4931-95-CL-A09)

Materials/Parts  
Sealing compound (item 4, app B)

Reference  
TM 9-1240-375-34P

Troubleshooting References  
4-7 Optical instrument support does not seat M137 panoramic telescope correctly.

4-7 Thumbscrews do not secure M137 panoramic telescope correctly.

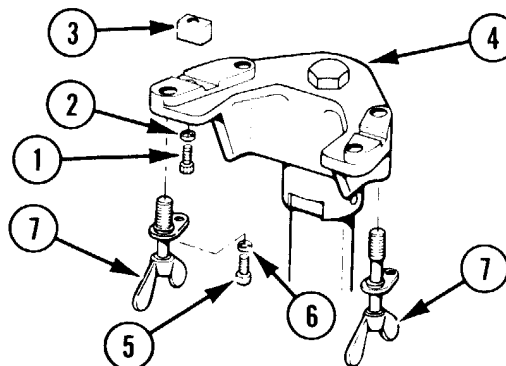
Equipment Condition  
4-15 M171 mount removed from M198 howitzer.

**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**DISASSEMBLY**

- 1 TWO SCREWS (1) AND TWO LOCK-WASHERS (2). Remove.
- 2 TWO KEYS (3). Pry out of groove in optical instrument support (4).
- 3 FOUR SCREWS (5) AND FOUR LOCK-WASHERS (6). Remove.
- 4 FOUR THUMBSCREWS (7). Remove.

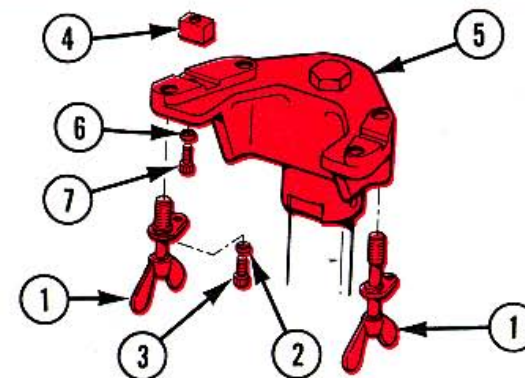


**REPAIR**

Repair is by replacement of authorized parts as required (TM 9-1240-375-34P).

**REASSEMBLY**

- 1 FOUR THUMBSCREWS (1). Install.
- 2 FOUR LOCKWASHERS (2) AND FOUR SCREWS (3). Apply light coat of sealing compound (item 4, app B), and install.
- 3 TWO KEYS (4). Install in grooves of optical instrument support (5).
- 4 TWO LOCKWASHERS (6) AND TWO SCREWS (7). Apply light coat of sealing compound (item 4, app B), and install.



**4-10. OPTICAL INSTRUMENT ROCKER ASSEMBLY-MAINTENANCE INSTRUCTIONS**

**THIS TASK COVERS:**

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>a. Disassembly</li> <li>b. Repair</li> </ol> | <ol style="list-style-type: none"> <li>c. Reassembly</li> </ol> |
|---|---|

**INITIAL SETUP**

Special Tools  
 Tool box (SC 4931-95-CL-A09)

Reference  
 TM 9-1240-375-34P

Equipment Condition  
 4-15 M171 mount removed from M198 howitzer.

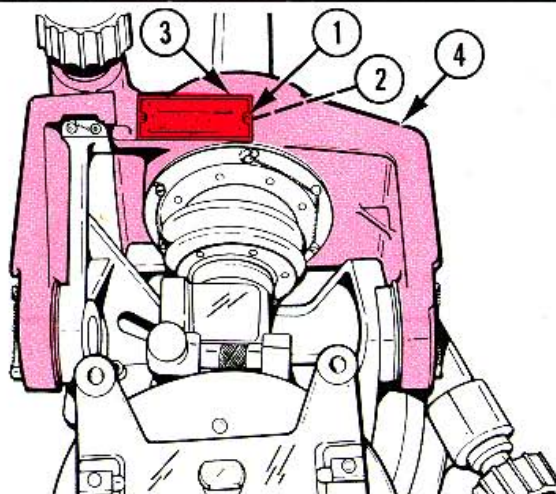
**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

4-10. OPTICAL INSTRUMENT ROCKER ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY

- 1 TWO SCREWS (1) AND TWO LOCK-WASHERS (2). Remove.
- 2 IDENTIFICATION PLATE (3). Remove from optical instrument rocker assembly (4).

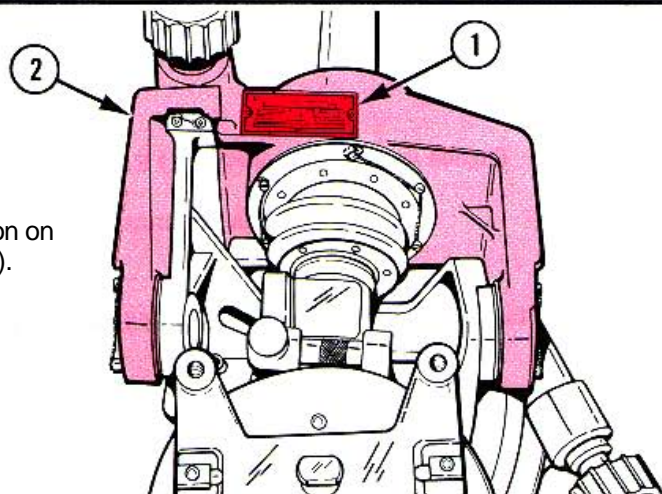


REPAIR

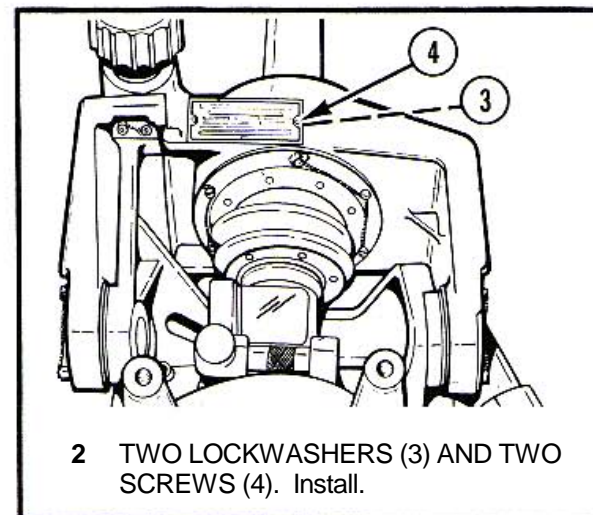
Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

REASSEMBLY

- 1 IDENTIFICATION PLATE (1). Position on optical instrument rocker assembly (2).



- 2 TWO LOCKWASHERS (3) AND TWO SCREWS (4). Install.





**4-11. BEARING HOUSING ASSEMBLY-MAINTENANCE INSTRUCTIONS**

THIS TASK COVERS:

- a. Disassembly
- b. Repair
- c. Reassembly

**INITIAL SETUP**

Special Tools

Tool box (SC 4931-95-CL-A09)

Materials/Parts

■ Sealing compound (MIL-S-11031)

Reference

■ TM 9-1025-211-20&P  
 ■ TM 9-1240-375-34P

Troubleshooting Reference

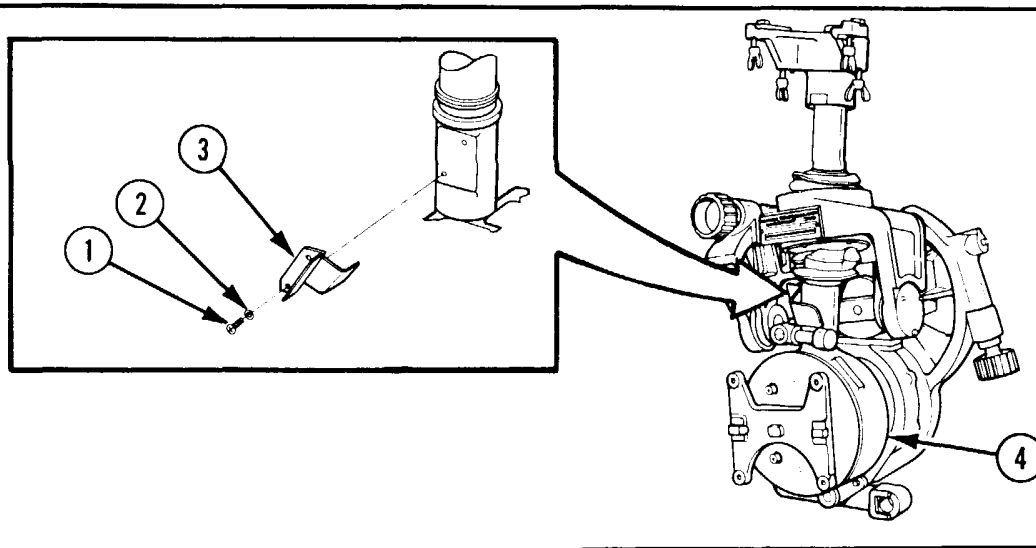
4-8 Mirror does not clearly reflect image of cross level vial and elevation level vial.

Equipment Condition

4-15 M171 mount removed from M198 howitzer.

**DISASSEMBLY**

- 1 TWO SCREWS (1) AND TWO LOCK-WASHERS (2). Remove.
- 2 MIRROR (3). Remove from bearing housing assembly (4).



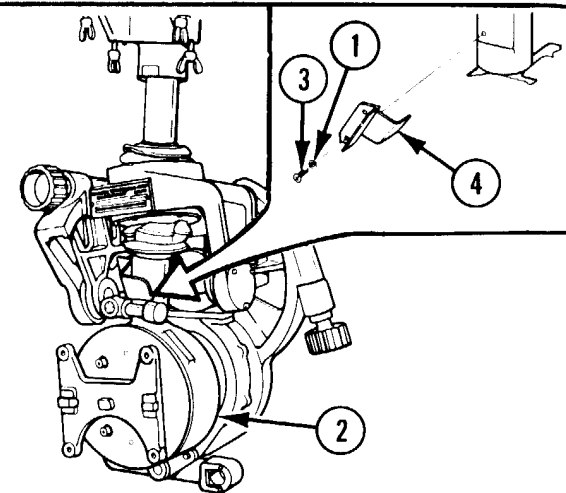
4-11. BEARING HOUSING ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

**REPAIR**

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

**REASSEMBLY**

- 1 **MIRROR (1). Position on bearing housing**
- 2 **TWO LOCKWASHERS (3) AND TWO SCREWS (4).**
  - a. Apply sealing compound (TM 1 9-1025-21 1-20&P) to screw threads.
  - b. Install, and tighten screws.



**Section V. GENERAL SUPPORT MAINTENANCE PROCEDURES FOR THE M171 TELESCOPE AND QUADRANT MOUNT**

4-12. M171 MOUNT-MAINTENANCE INSTRUCTIONS

**INITIAL SETUP**

Special Tools  
 Adapter set (SC 4931-95-CL-A11)  
 Shop set (SC 4931-95-CL-A07)  
 Tool box (SC 4931-95-CL-A09)  
 Torque adapter (11828725)

**Materials/Parts**

Cleaning compound (MIL-C-18718)

Felt (11727895) (4)  
 Grease (item 2, app B)  
 Grease (item 3, app B)  
 Lock wire (item 5, app B)  
 Lock wire (MS20995-C41)  
 Sealing compound (MIL-S-11031)

References

- TM 9-1025-211-10
- TM 9-1025-211-20&P
- TM 9-1240-375-34P

Troubleshooting References

- 4-9 Optical instrument support does not seat M137 panoramic telescope correctly.
- 4-10 Cross level control is erratic and rough during movement.
- 4-10 Cross level knob exceeds 1.5-mil backlash.
- 4-10 Cross level knob requires torque in excess of 12 in.-lb (1.35 N-m) to rotate.
- 4-11 Elevation control is erratic and rough during movement.
- 4-11 Elevation knob exceeds 1.5-mil backlash.
- 4-11 Elevation knob requires torque in excess of 12 in.-lb (1.35 N-m) to rotate.
- 4-12 Cross level bubble or elevation level bubble does not center within one graduation.
- 4-13 M17 quadrant does not mount correctly.
- 4-13 Plunger assembly binds.

Equipment Conditions

- 4-15 M171 mount removed from M198 howitzer (tasks no. 1 thru 10).
- 4-26 Optical instrument support removed (tasks no. 3 and 6).
- 4-27 Optical instrument rocker assembly removed (tasks no. 3 and 6).
- 4-28 Cross level knob and worm shaft assembly removed (task no. 4).
- 4-29 Retaining plates, cover, gasket, and pawl removed (task no. 6).

**WARNING**

 When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**List of Tasks**

<b>Task No.</b>	<b>Task</b>	<b>Task Ref (Page)</b>	<b>Troubleshooting Ref No. (Page)</b>
1	Maintain M171 mount: <ul style="list-style-type: none"> <li>a. Disassemble.</li> <li>b. Clean.</li> <li>c. Repair.</li> <li>d. Reassemble.</li> </ul>	4-26 4-31 4-32 4-32	4-12

4-12. M171 MOUNT-MAINTENANCE INSTRUCTIONS (cont)

List of Tasks (cont)

Task No.	Task	Task Ref (Page)	Troubleshooting Ref No. (Page)
2	Maintain optical instrument support: a. Remove. b. Repair. c. Install.	4-37 4-38 4-38	4-9
3	Maintain optical instrument rocker assembly: a. Disassemble. b. Clean. c. Repair. d. Reassemble.	4-39 4-40 4-40 4-40	4-10
4	Maintain optical instrument rocker: a. Disassemble. b. Repair. c. Reassemble.	4-42 4-42 4-42	4-10
5	Maintain worm shaft assembly (cross level): a. Remove. b. Clean. c. Install.	4-44 4-45 4-45	4-10

6	Maintain housing assembly:	4-49	4-11
	a. Disassemble.	4-53	
	b. Clean.	4-53	
	c. Repair.	4-53	
	d. Reassemble.	4-53	
7	Maintain plunger assembly:	4-59	
	a. Remove.	4-59	
	b. Install.		
8	Maintain worm shaft assembly (elevation):	4-51	
	a. Remove.	4-53	
	b. Clean.	4-56	
	c. Install.		
9	Maintain arm and adapter assembly:	4-62	
	a. Remove.	4-62	
	b. Repair.	4-62	
	c. Install.		
10	Maintain mounting adapter:	4-63	
	a. Remove.	4-64	
	b. Disassemble.	4-64	
	c. Repair.	4-64	
	d. Reassemble.	4-64	
	e. Install.		



4-13. M171 MOUNT-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Disassembly
- b. Cleaning
- c. Repair
- d. Reassembly

**INITIAL SETUP**

TM 9-1025-211-20&P  
TM 9-1240-375-34P

Special Tools

- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)

Troubleshooting References

- 4-10 Cross level control is erratic and rough during movement
- 4-11 Elevation control is erratic and rough during movement.
- 4-12 Cross level bubble or elevation level bubble does not center within one graduation.

Materials/Parts

- Cleaning compound (MIL-C-18718)
- Grease (item 2, app B)
- Grease (item 3, app B)
- Lock wire (item 5, app B)
- Lock wire (MS20995-C41)
- Sealing compound (MIL-S-11031)

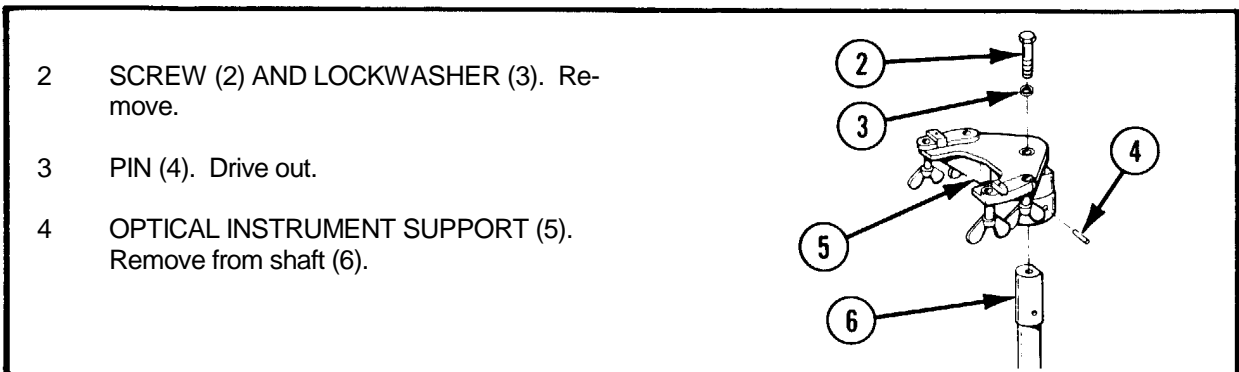
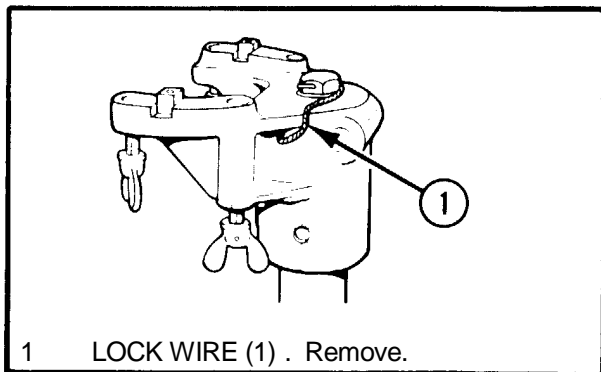
Equipment Condition

- 4-15 M171 mount removed from M198 howitzer.

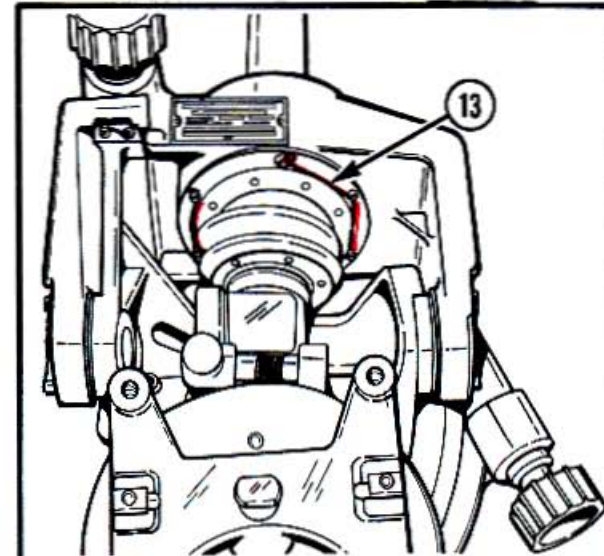
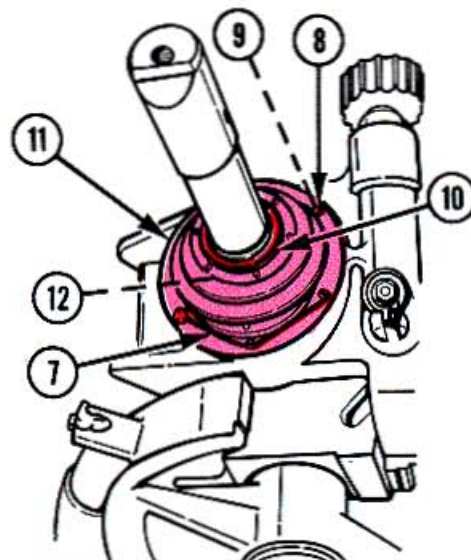
References

TM 9-1025-211-10

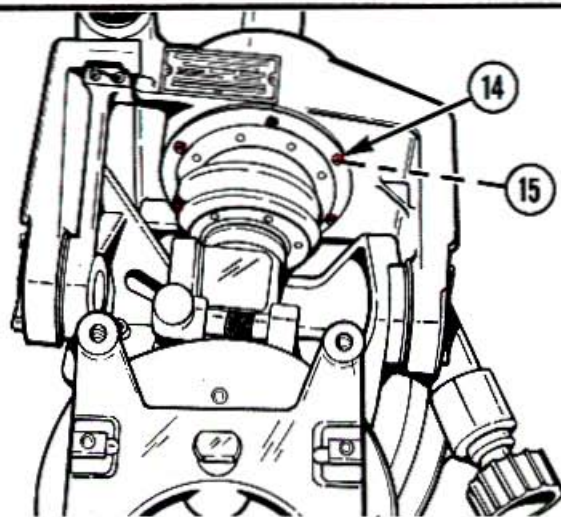
**DISASSEMBLY**



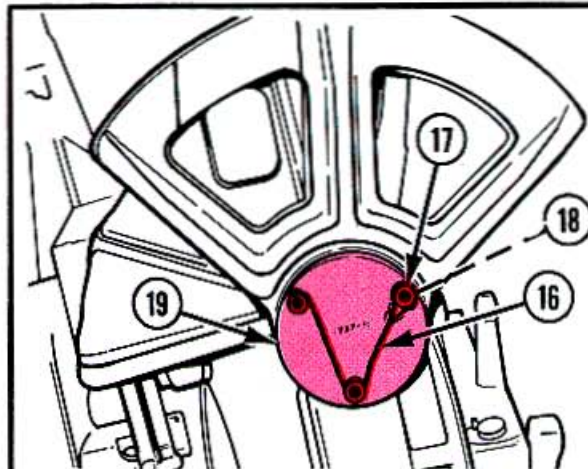
- 5 LOCK WIRE (7). Remove.
- 6 SIX SCREWS (8) AND SIX LOCKWASHERS (9). Remove.
- 7 RING (10), BELLOWS (11), AND RING (12). Remove.



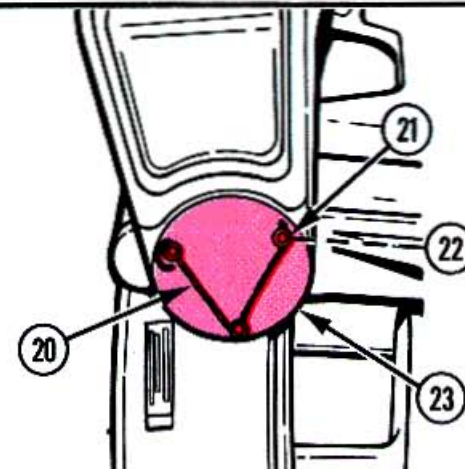
- 8 LOCK WIRE (13). Remove.



- 9 SIX SCREWS (14) AND SIX LOCKWASHERS (15). Remove.



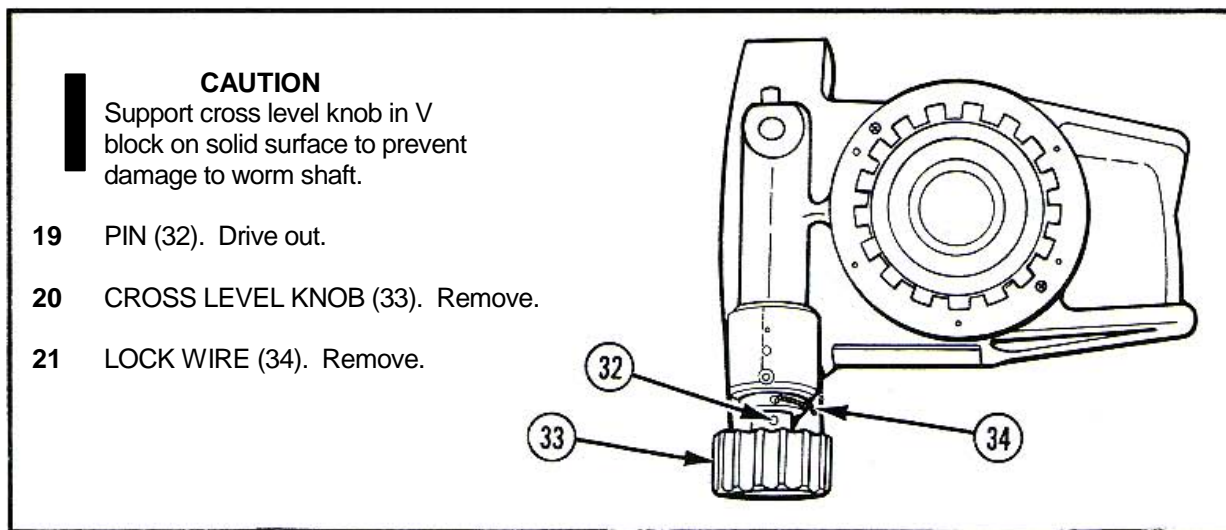
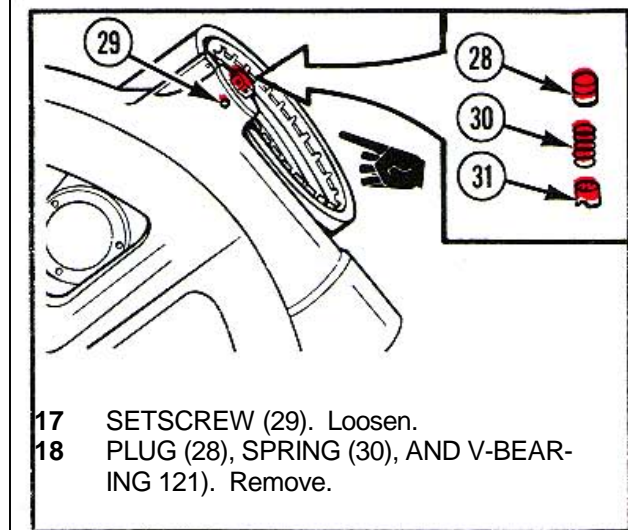
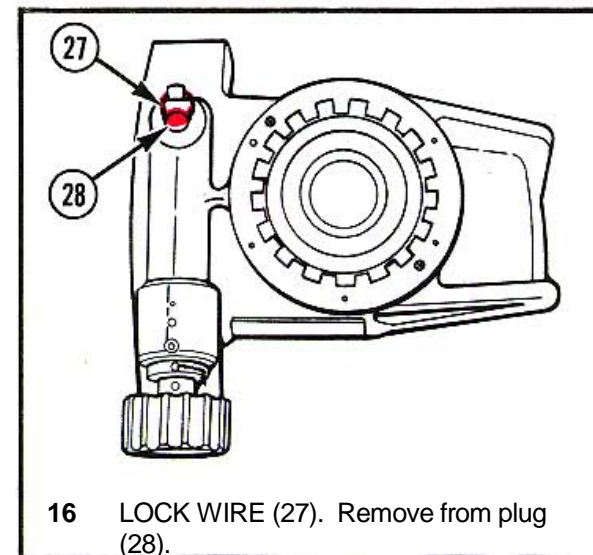
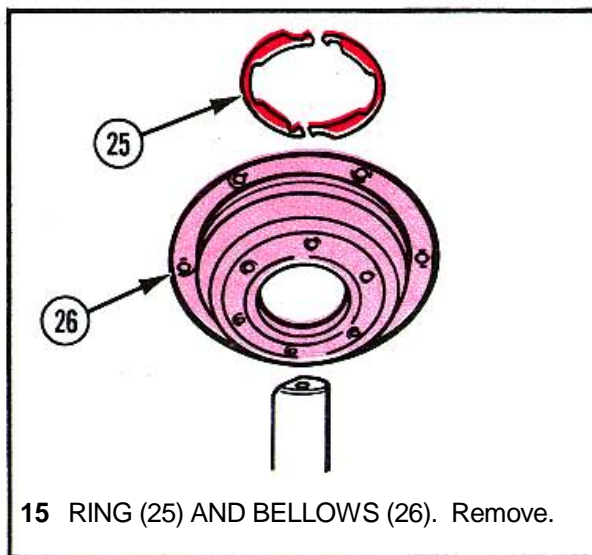
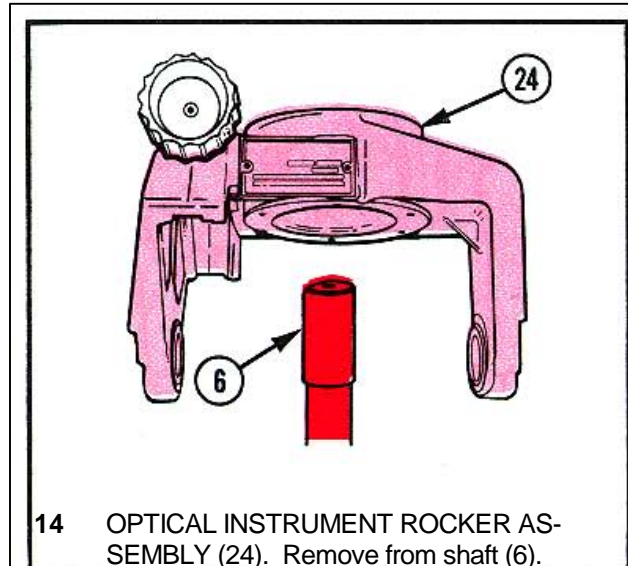
- 10 LOCK WIRE (16). Remove.
- 11 THREE SCREWS (17), THREE LOCKWASHERS (18), AND PIN (19). Remove.



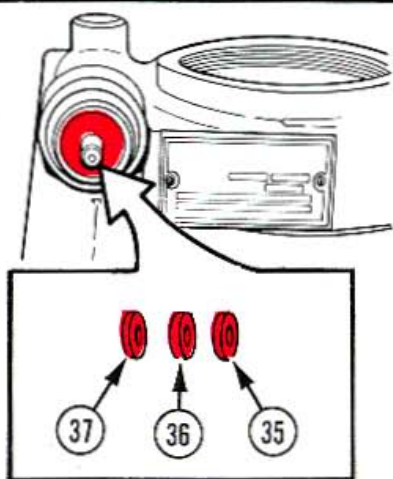
- 12 LOCK WIRE (20). Remove.
- 13 THREE SCREWS (21), THREE LOCKWASHERS (22), AND PIN (23). Remove.

143. M171 MOUNT-MAINTENANCE INSTRUCTIONS (cont) I

DISASSEMBLY (cont)

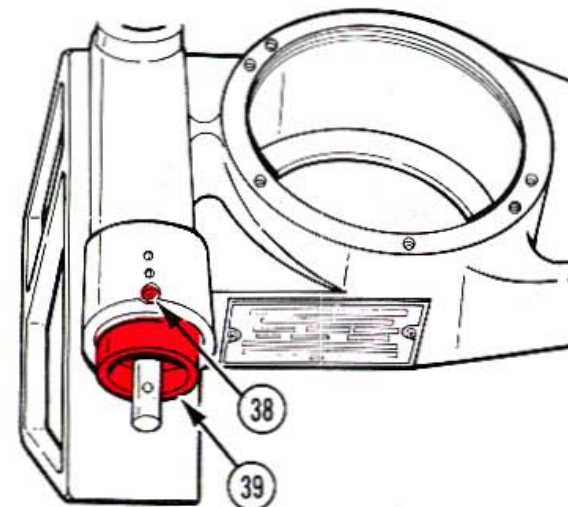




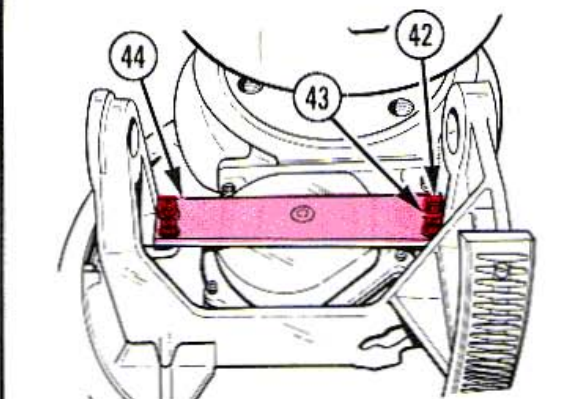
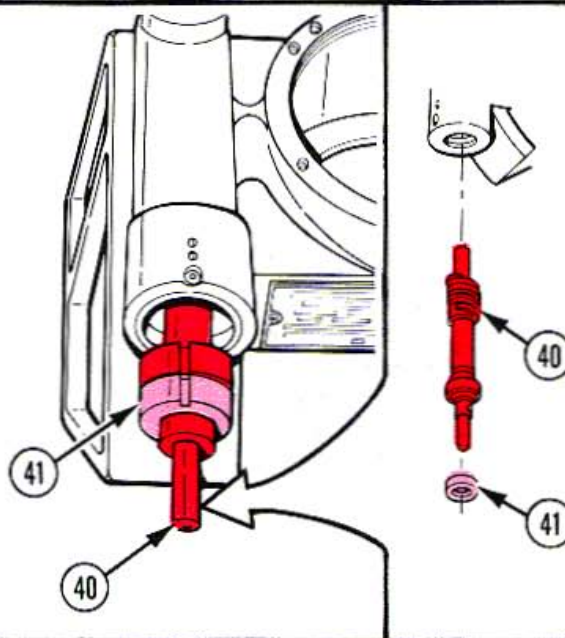


22 FLAT WASHER (35), FELT (36), AND FLAT WASHER (37). Remove.

23 SETSCREW (38). Loosen.  
 24 RING (39). Unscrew and remove.



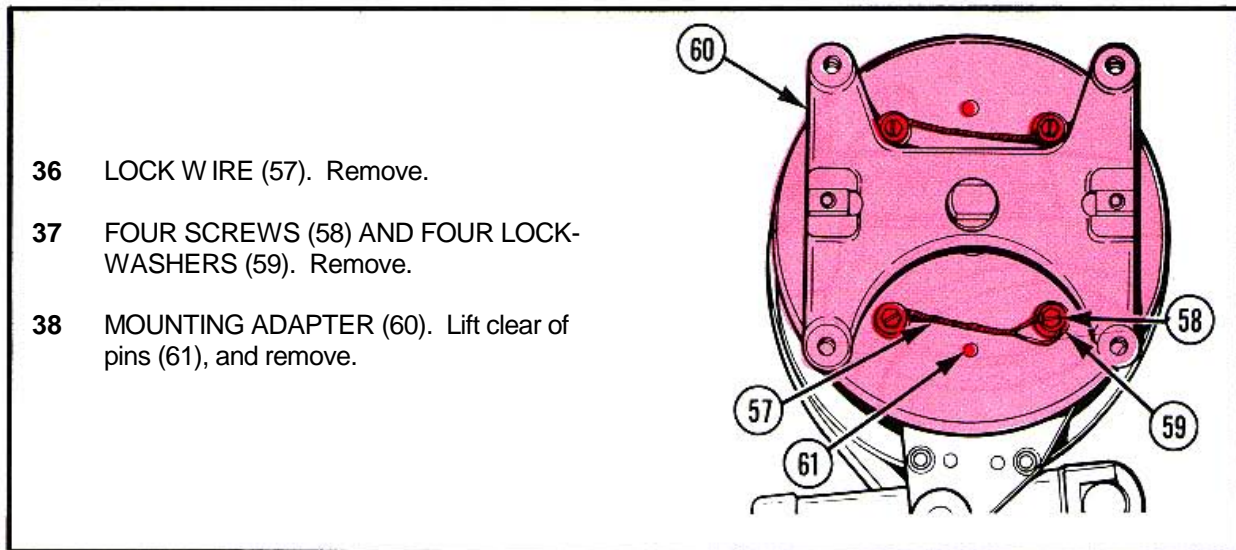
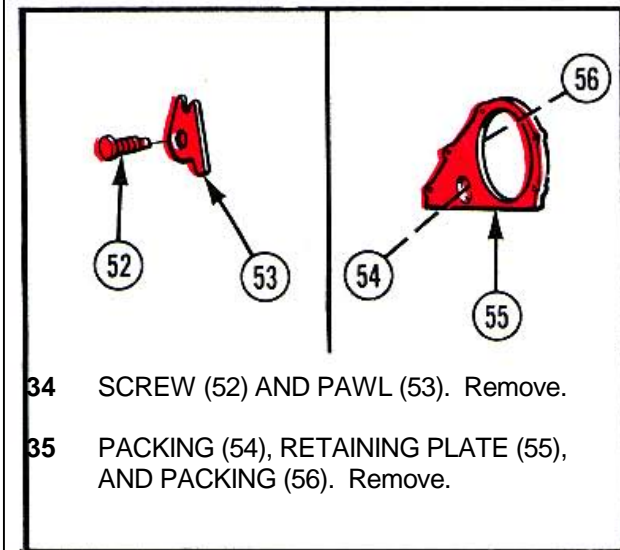
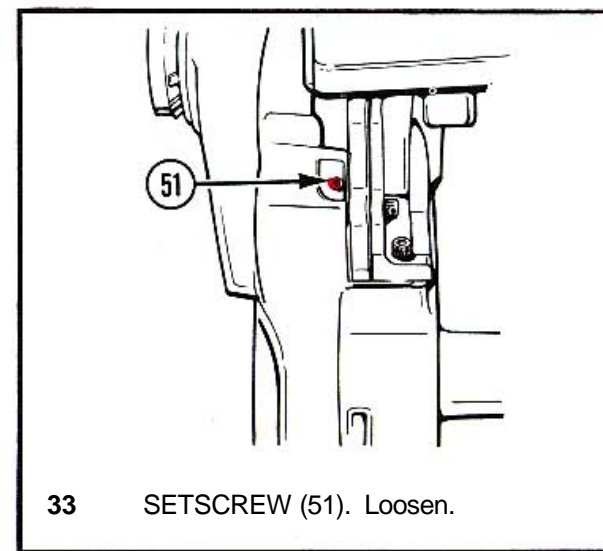
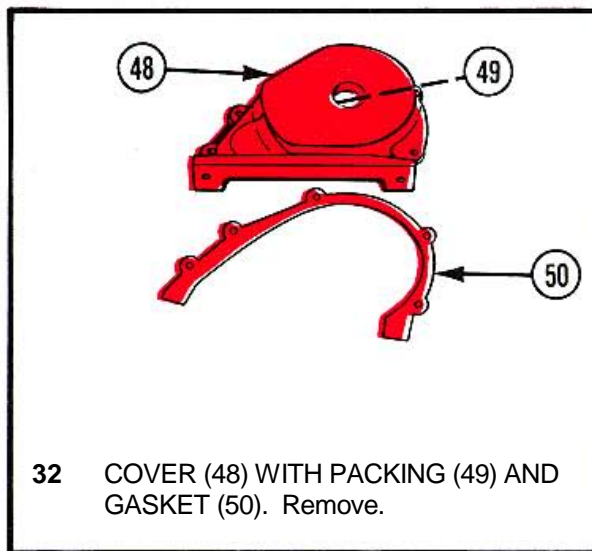
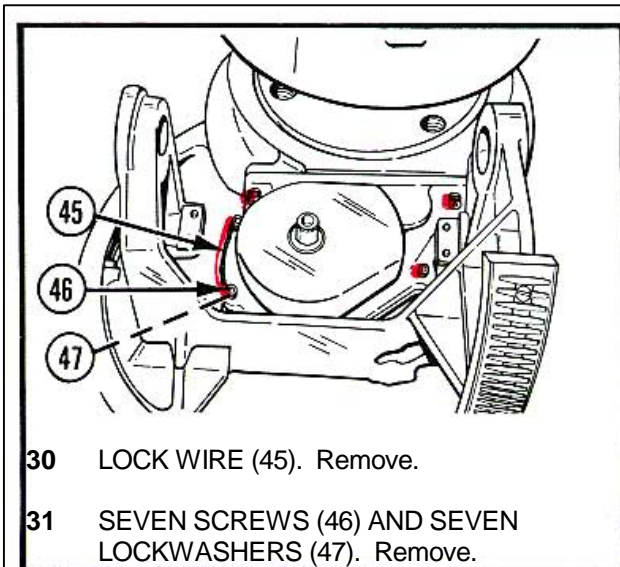
25 WORM SHAFT ASSEMBLY (40). Partially remove.  
 26 BEARING (41). Remove.  
 27 WORM SHAFT ASSEMBLY (40). Remove.



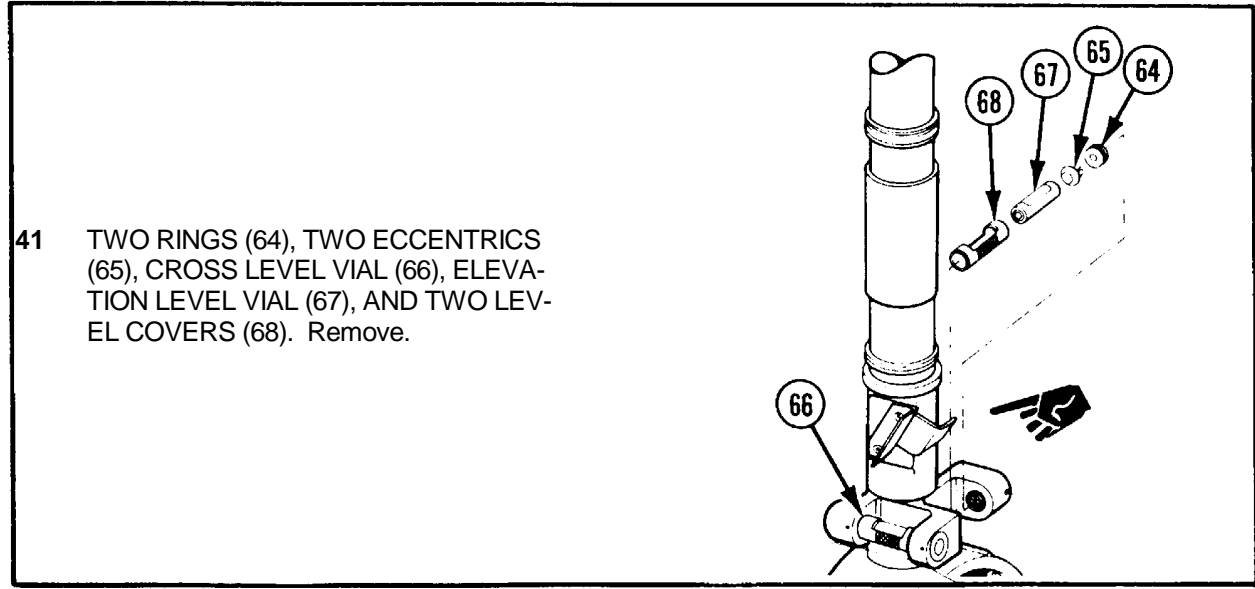
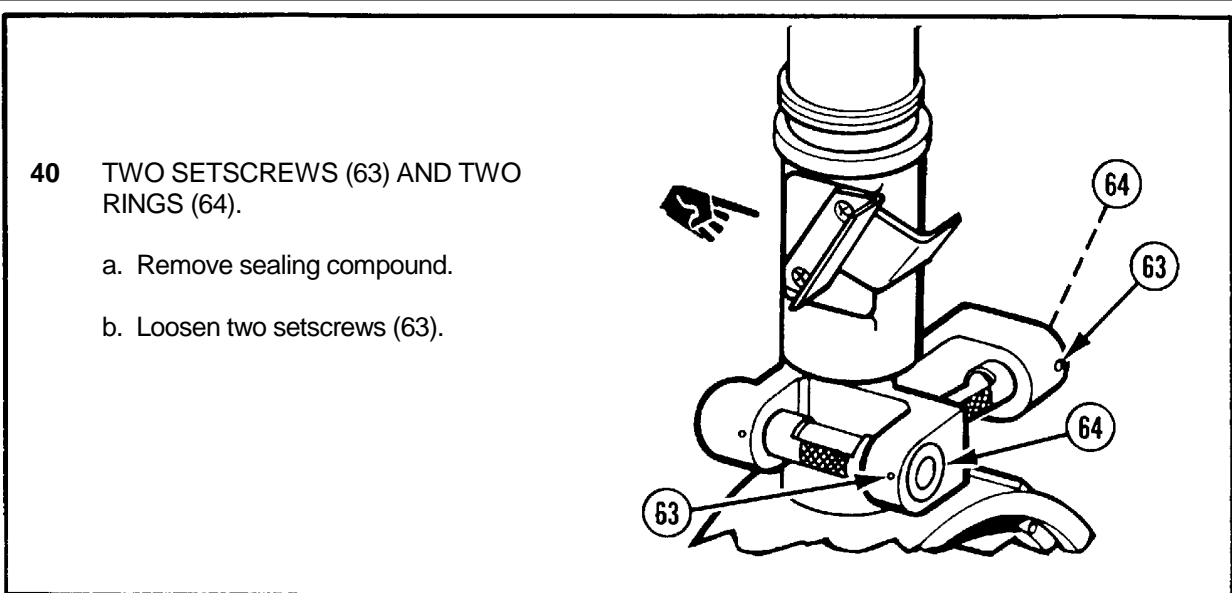
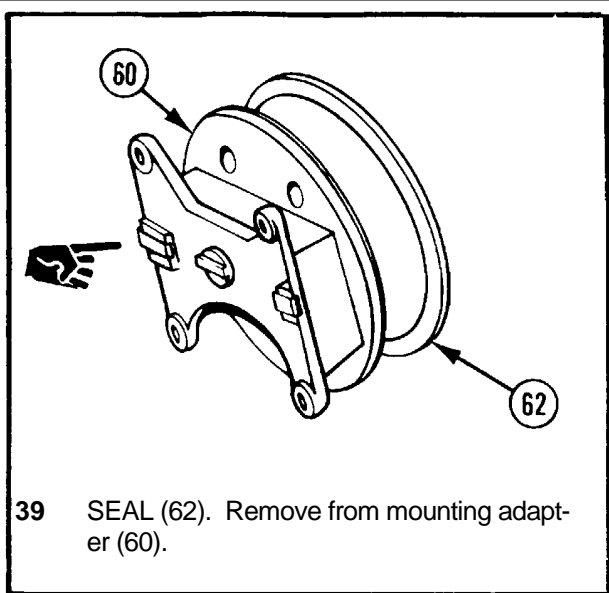
28 FOUR SCREWS (42) AND FOUR LOCK-WASHERS (43). Remove.  
 29 RETAINING PLATE (44). Remove.

4-13. M171 MOUNT-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY (cont)







**CLEANING**

Clean all parts with cleaning compound (TM 9-1025-211-10).

4-13. M171 MOUNT-MAINTENANCE INSTRUCTIONS (cont)

REPAIR

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

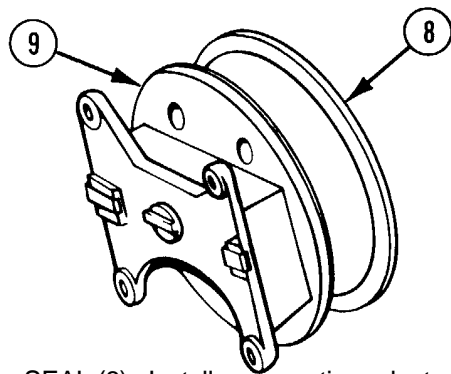
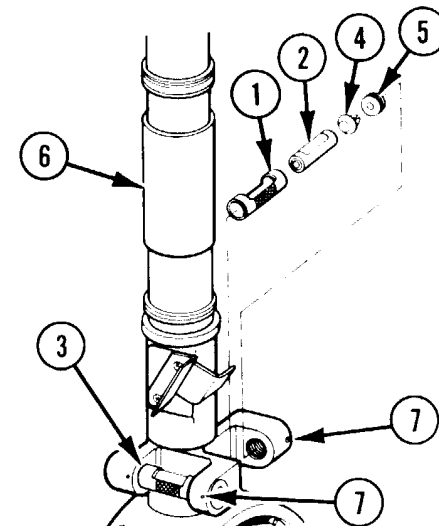
**NOTE**

On all machined surfaces apply light coat of grease (item 2, app B).

On all preformed packings apply light coat of grease (item 3, app B).

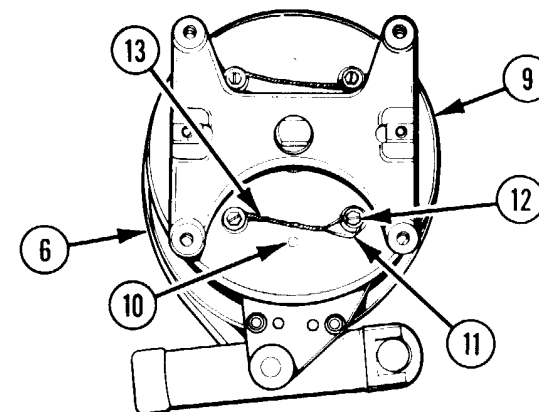
REASSEMBLY

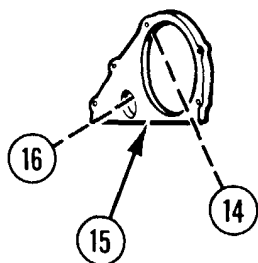
- 1 TWO LEVEL COVERS (1), ELEVATION LEVEL VIAL (2), CROSS LEVEL VIAL (3), TWO ECCENTRICS (4), AND TWO RINGS (5). Install in bearing housing assembly (6).
- 2 TWO SETSCREWS (7).
  - a. Apply sealing compound (TM 9-1025-21 1-20&P) to threads and tighten.
  - b. Cover setscrews with sealing compound (TM 9-1025-211-20&P).



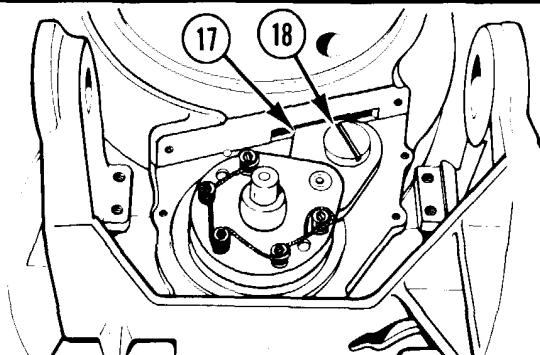
- 3 SEAL (8). Install on mounting adapter (9), and lubricate with grease (item 2, app B).

- 4 MOUNTING ADAPTER (9). Install on bearing housing assembly (6) over pins (10).
- 5 FOUR LOCKWASHERS (11) AND FOUR SCREWS (12). Install and tighten.
- 6 LOCK WIRE (13) (TM 9-1025-211-20&P). Install.

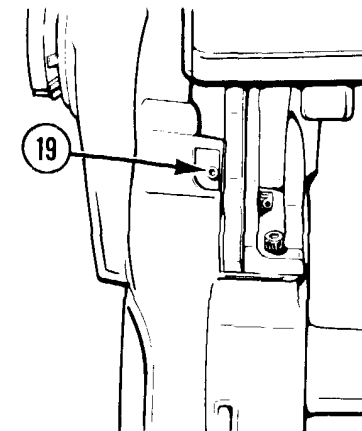




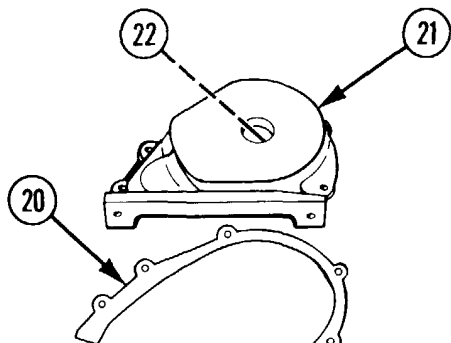
**7** PACKING (14), RETAINING PLATE (15), AND PACKING (16). Install.



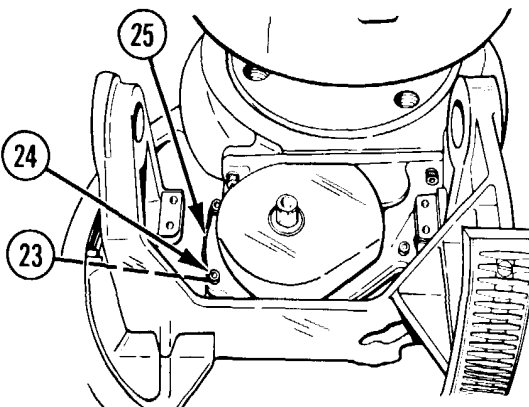
**8** PAWL (17) AND SCREW (18).  
 a. Apply sealing compound (TM 9 1025-21 1-20&P) to threads of screw (18).  
 b. Install pawl (17) and screw (18).



**9** SETSCREW (19). Apply sealing compound (TM 9-1025-211-20&P) and tighten.

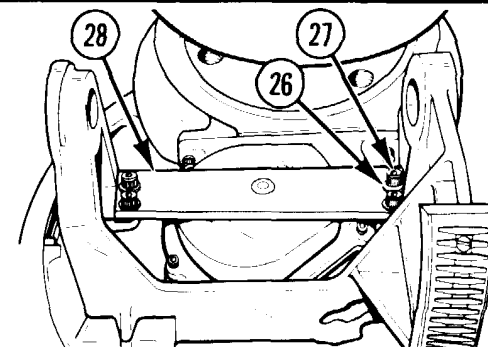


**10** GASKET (20) AND COVER (21) WITH PACKING (22). Install



**11** SEVEN LOCKWASHERS (23) AND SEVEN SCREWS (24). Install.

**12** LOCK WIRE (25) (ITEM 5, APP B). Install.

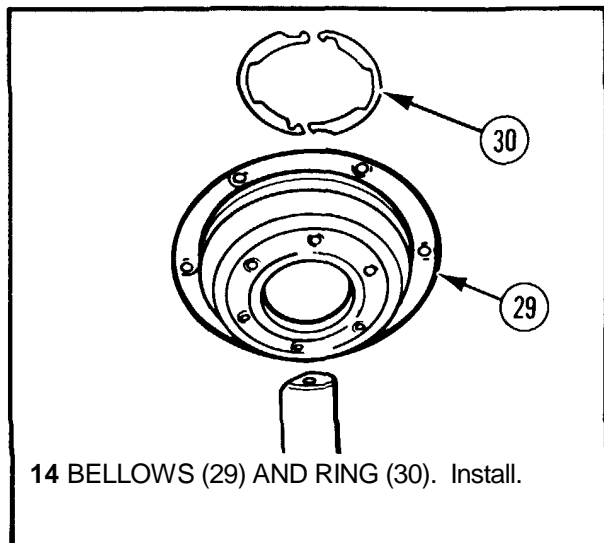


**13** FOUR LOCKWASHERS (26) AND FOUR SCREWS (27).

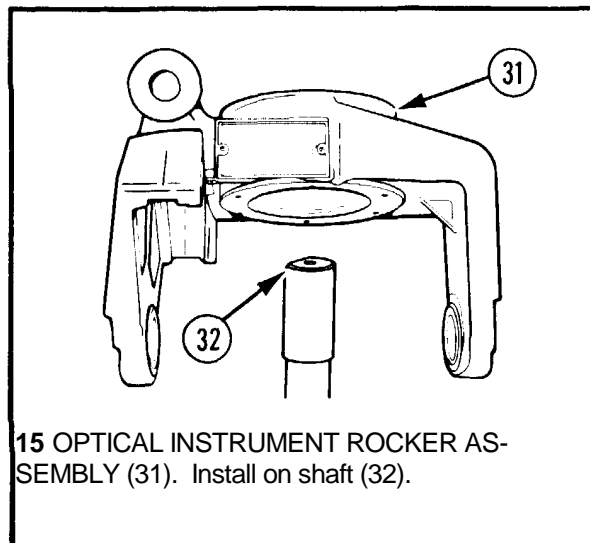
a. Apply sealing compound (TM 9-1025-211-20&P) to threads of four screws (27).  
 b. Install to secure retaining plate (28) to M171 mount.

4-13. M171 MOUNT-MAINTENANCE INSTRUCTIONS (cont)

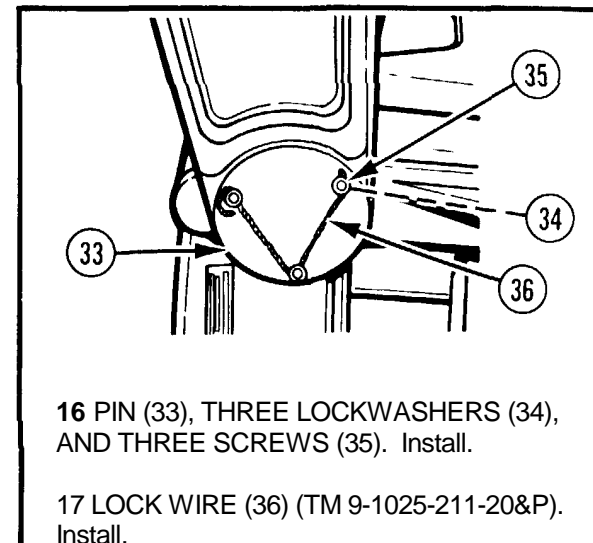
REASSEMBLY (cont)



14 BELLOWS (29) AND RING (30). Install.

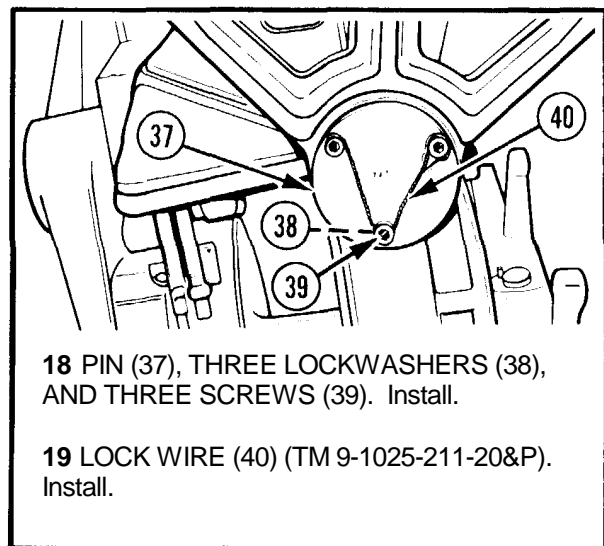


15 OPTICAL INSTRUMENT ROCKER ASSEMBLY (31). Install on shaft (32).



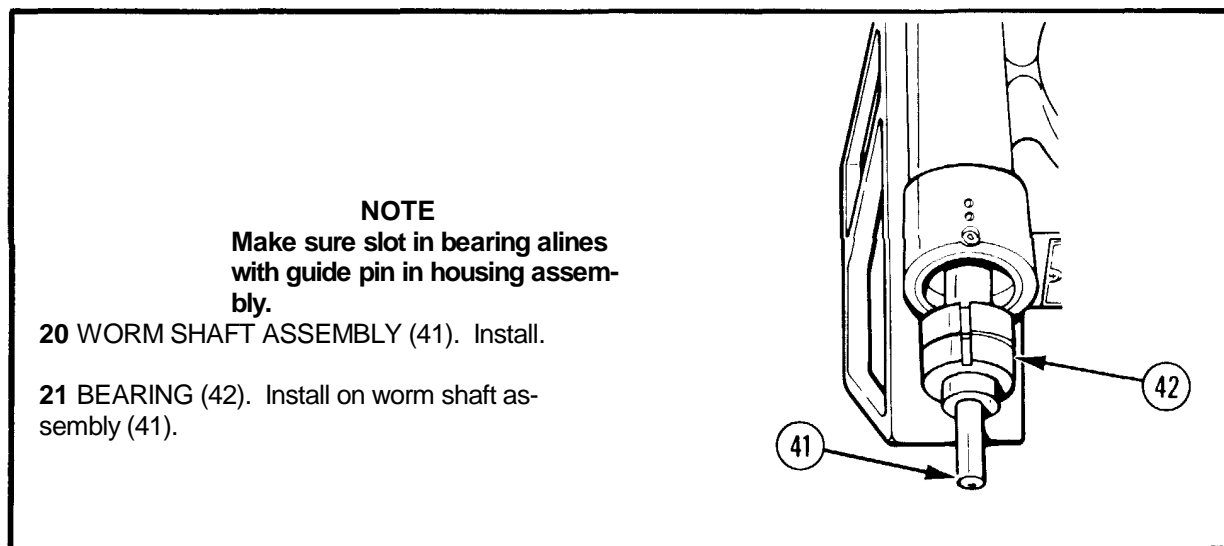
16 PIN (33), THREE LOCKWASHERS (34), AND THREE SCREWS (35). Install.

17 LOCK WIRE (36) (TM 9-1025-211-20&P). Install.



18 PIN (37), THREE LOCKWASHERS (38), AND THREE SCREWS (39). Install.

19 LOCK WIRE (40) (TM 9-1025-211-20&P). Install.



**NOTE**

Make sure slot in bearing aligns with guide pin in housing assembly.

20 WORM SHAFT ASSEMBLY (41). Install.

21 BEARING (42). Install on worm shaft assembly (41).

**22 RING (43).** Install in optical instrument rocker assembly (31) and tighten until worm shaft assembly (41) rotates with a drag.

**23 SETSCREW (44).** Apply sealing compound (TM 9-1025-211-20&P) and tighten.

**24 FLAT WASHER (45), FELT (46), AND FLAT WASHER (47).** Install.

**25 LOCK WIRE (48)** (TM 9-1025-211-20&P). Install.

**26 CROSS LEVEL KNOB (49).** Install.

**CAUTION**  
Support cross level knob in V block on solid surface to prevent damage to worm shaft.

**27 PIN (50).** Drive in.

**NOTE**  
After installation of V-bearing (52) and spring (53), screw plug (51) until V-bearing bottoms on worm shaft assembly (41), and then back off 1/4 turn.

**28 V-BEARING (52), SPRING (53), AND PLUG (51).** Install.

**29 SETSCREW (54).** Apply sealing compound (TM 9 1025 211 20&P) and tighten.

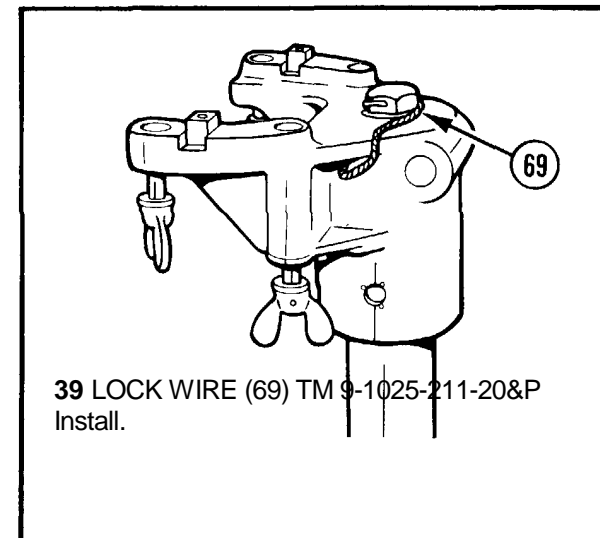
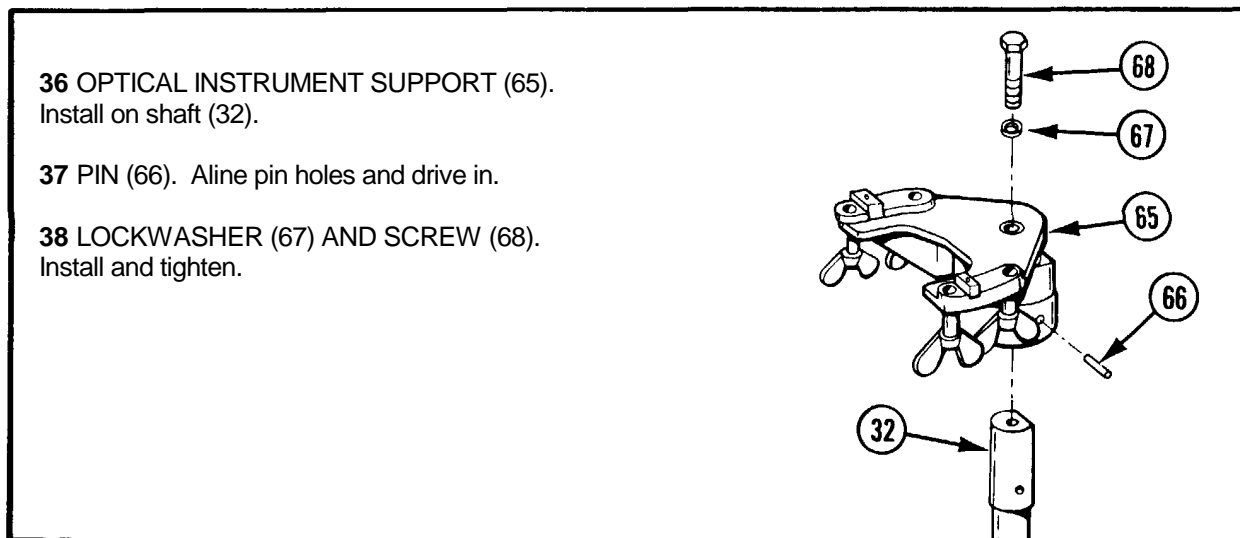
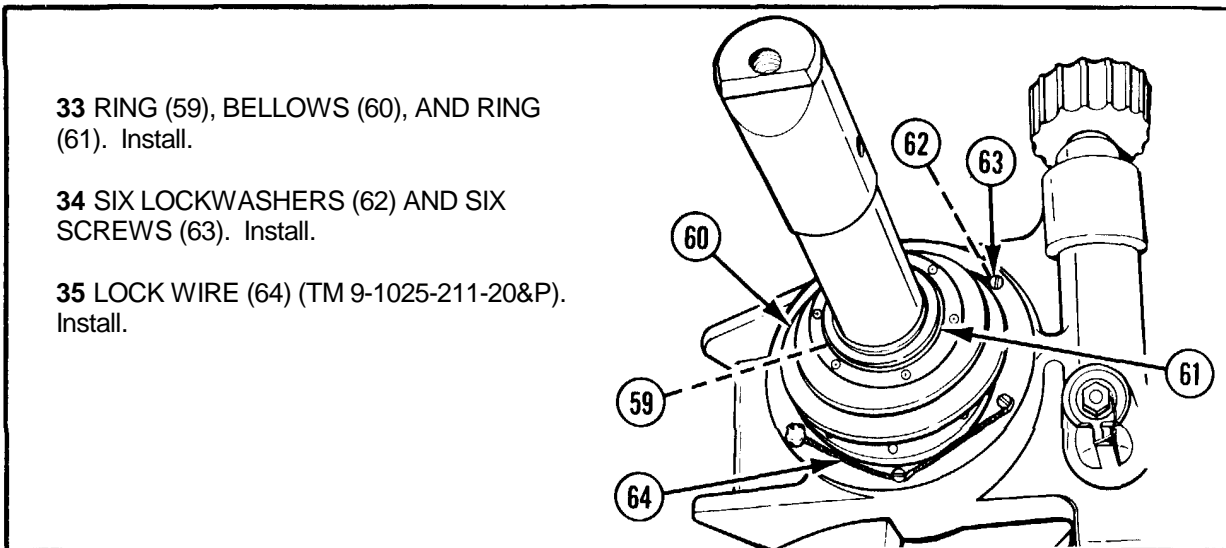
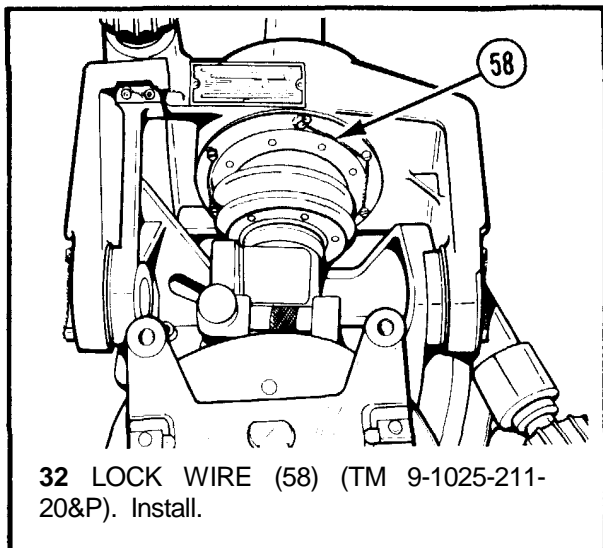
**30 LOCK WIRE (55)** (TM 9-1025-211-20&P). Install in plug (51).

**31 SIX LOCKWASHERS (56) AND SIX SCREWS (57).** Install.



4-13. M171 MOUNT-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY (cont)



4-14. OPTICAL INSTRUMENT SUPPORT-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Removal
- b. Repair
- c. Installation

**INITIAL SETUP**

**Special Tools**

Tool box (SC 4931-95-CL-A09)

**Materials/Parts**

Lock wire (MS20995-C41)

**References**

TM 9-1025-211-20&P

TM 9-1240-375-34P

**Troubleshooting Reference**

4-9 Optical instrument support does not seat M137 panoramic telescope correctly.

**Equipment Condition**

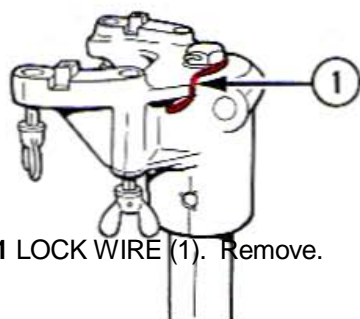
4-15 M171 mount removed from M198 howitzer.

**WARNING**



When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**REMOVAL**

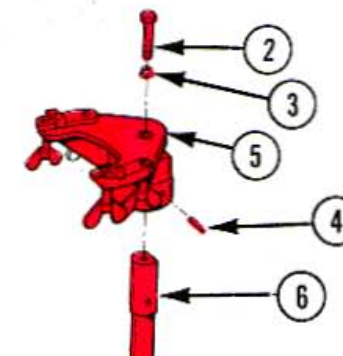


1 LOCK WIRE (1). Remove.

2 SCREW (2) AND LOCKWASHER (3). Remove.

3 PIN (4). Drive out.

4 OPTICAL INSTRUMENT SUPPORT (5). Remove from shaft (6).



4-14. OPTICAL INSTRUMENT SUPPORT-MAINTENANCE INSTRUCTIONS (cont)

REPAIR

Repair is by replacement of authorized parts as required (TM 9-1240-375-34P).

INSTALLATION

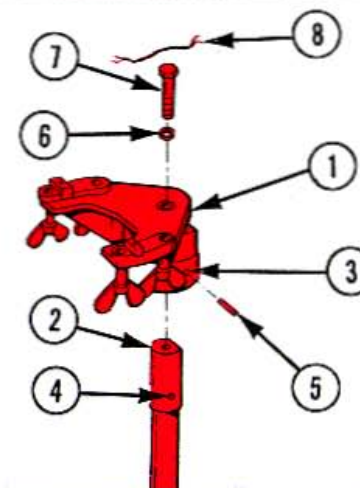
1 OPTICAL INSTRUMENT SUPPORT (1).

- a. Place on shaft (2).
- b. Aline hole (3) in optical instrument support with hole (4) in shaft.

2 PIN (5). Install.

3 LOCKWASHER (6) AND SCREW (7). Install and tighten.

4 LOCK WIRE (8) (TM 9-1025211-211-20&P). Install.



4-15. OPTICAL INSTRUMENT ROCKER ASSEMBLY-MAINTENANCE INSTRUCTIONS

THIS TASK COVERS:

- a. Disassembly
- b. Cleaning
- c. Repair
- d. Reassembly

INITIAL SETUP

Special Tools

- Adapter set (SC 4931-95-CL-A11)
- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)
- Torque adapter (11828725)

Materials/Parts

- Cleaning compound (MIL-C-18718)

- Grease (item 2, app B)
- Sealing compound (item 4, app B)

References

- TM 9-1025-211-10
- TM 9-1240-375-34P

**Troubleshooting References**

- 4-10 Cross level control is erratic and rough during movement.
- 4-10 Cross level knob exceeds 1.5-mil backlash.
- 4-10 Cross level knob requires torque in excess of 12 in.-lb (1.35 N-m) to rotate.

**Equipment Conditions**

- 4-15 M171 mount removed from M198 howitzer.

- 4-26 Optical instrument support removed.
- 4-27 Optical instrument rocker assembly removed.

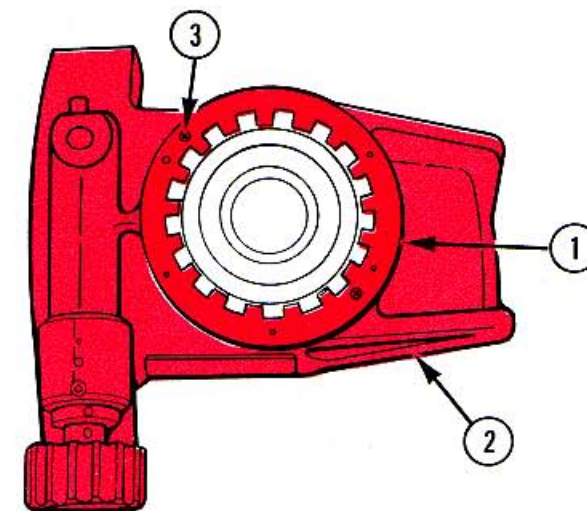
**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**DISASSEMBLY****NOTE**

Scribe a line across key washer (1) and optical instrument rocker assembly (2) for reference during installation.

- 1 TWO SCREWS (3) AND KEY WASHER (1). Remove from optical instrument rocker assembly (2).

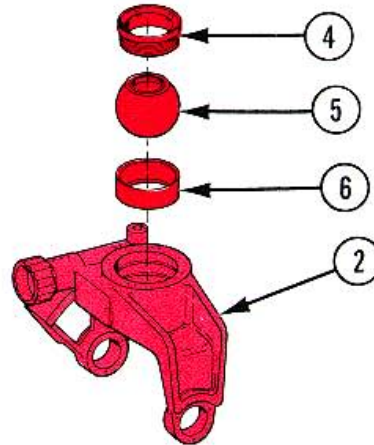


4-15. OPTICAL INSTRUMENT ROCKER ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY (cont)

2 BEARING SEAT (4), BEARING (5), AND BEARING SEAT (6). Remove from optical instrument rocker assembly (2).

**NOTE**  
Replace optical instrument rocker assembly if it has been damaged to the extent that it can no longer perform its intended function.



CLEANING

Clean all parts with cleaning compound (TM 9-1025-211-10).

REPAIR

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

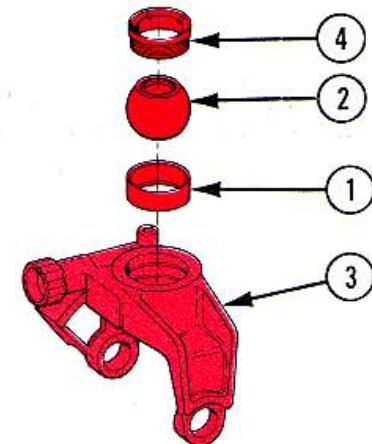
REASSEMBLY

1 BEARING SEAT (1) AND BEARING (2). Apply light coat of grease (item 2, app B), and install in optical instrument rocker assembly (3).

2 BEARING SEAT (4).

a. Apply light coat of grease (item 2, app B).

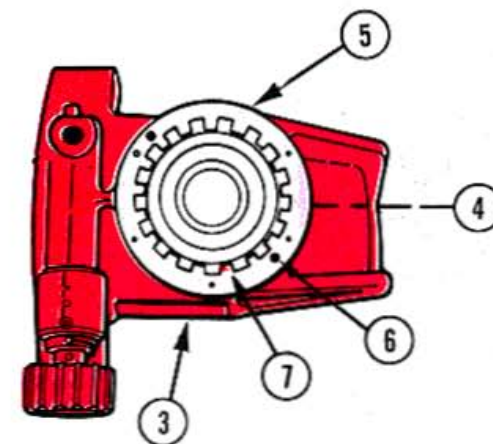
b. Install and tighten. Torque to 16 to 18 in.-lb (1.80 to 2.03 N-m) using torque adapter.





**3 KEY WASHER (5).**

- a. Position on optical instrument rocker assembly (3).
- b. Aline reference line on key washer (5) with reference line on optical instrument rocker assembly (3).
- c. Apply sealing compound (item 4, app B) to two screws (6) and install.
- d. Bend tang (7) to fit notch in bearing seat (4).

**4-16. OPTICAL INSTRUMENT ROCKER-MAINTENANCE INSTRUCTIONS****THIS TASK COVERS:**

- a. Disassembly
- b. Repair
- c. Reassembly

**INITIAL SETUP****Special Tools**

Shop set (SC 4931-95-CL-A07)  
Tool box (SC 4931-95-CL-A09)

**Reference**

TM 9-1240-375-34P

**Troubleshooting Reference**

4-10 Cross level control is erratic and rough during movement.

**Equipment Conditions**

- 4-15 M171 mount removed from M198 howitzer.
- 4-28 Cross level knob and worm shaft assembly removed.

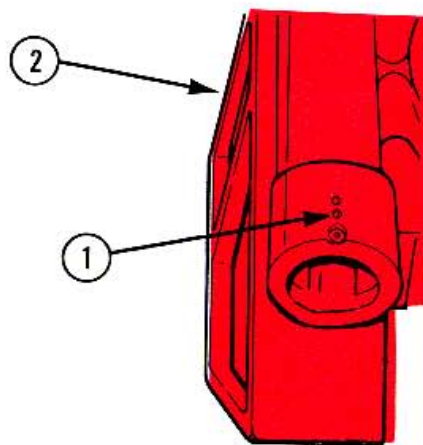
**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

4-16. OPTICAL INSTRUMENT ROCKER-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY

TWO PINS (1). Remove from optical instrument rocker (2).



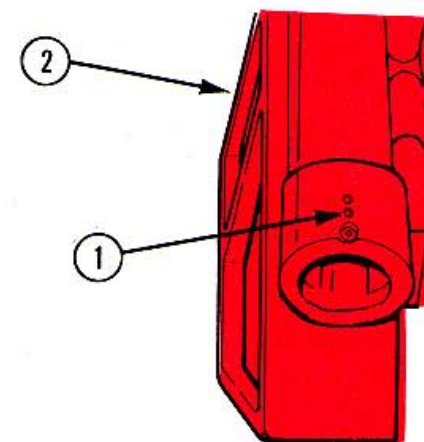
**NOTE**  
Replace optical instrument rocker if damaged, causing the cross level control to be erratic or rough during movement.

REPAIR

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

REASSEMBLY

TWO PINS (1). Install in optical instrument rocker (2).



4-17. WORM SHAFT ASSEMBLY (CROSS LEVEL)-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>a. Removal</li> <li>b. Cleaning</li> </ul> | <ul style="list-style-type: none"> <li>c. Installation</li> </ul> |
|---|---|

**INITIAL SETUP**

**Special Tools**

- Adapter set (SC 4931-95-CL-A11)
- Shop set (SC 4931-95-CL-A07)
- Tool box (S C 4931-95-CL-A09)

**Materials/Parts**

- Cleaning compound (MIL-C-18718)
- Grease (item 2, app B)
- Lock wire (MS20995-C41)
- Sealing compound (MIL-S-11031)

**References**

- TM 9-1025-211-10
- TM 9-1025-211-20&P

**Troubleshooting References**

- 4-10 Cross level control is erratic and rough during movement.
- 4-10 Cross level knob exceeds 1.5-mil backlash.
- 4-10 Cross level knob requires torque in excess of 12 in.-lb (1.35 N-m) to rotate.

**Equipment Condition**

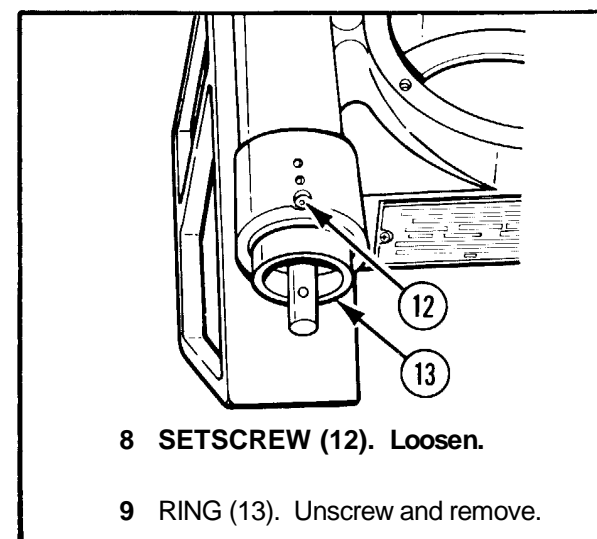
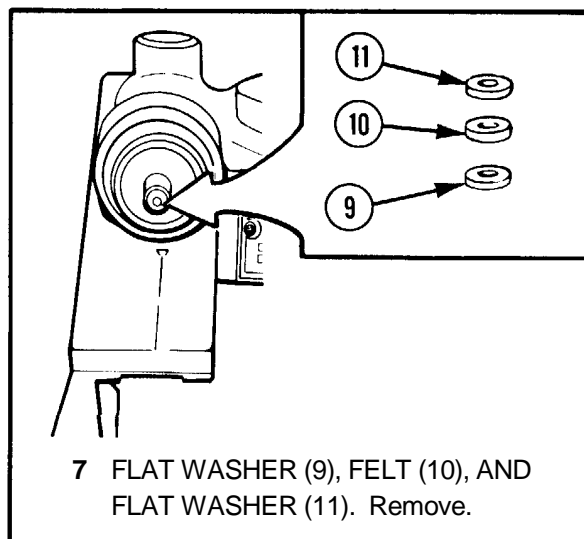
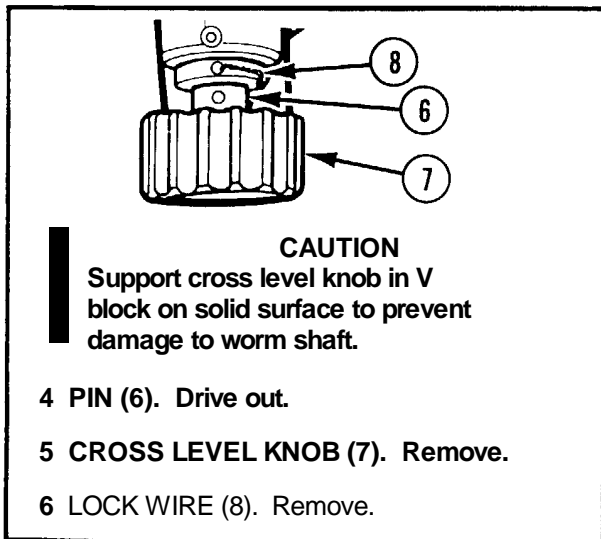
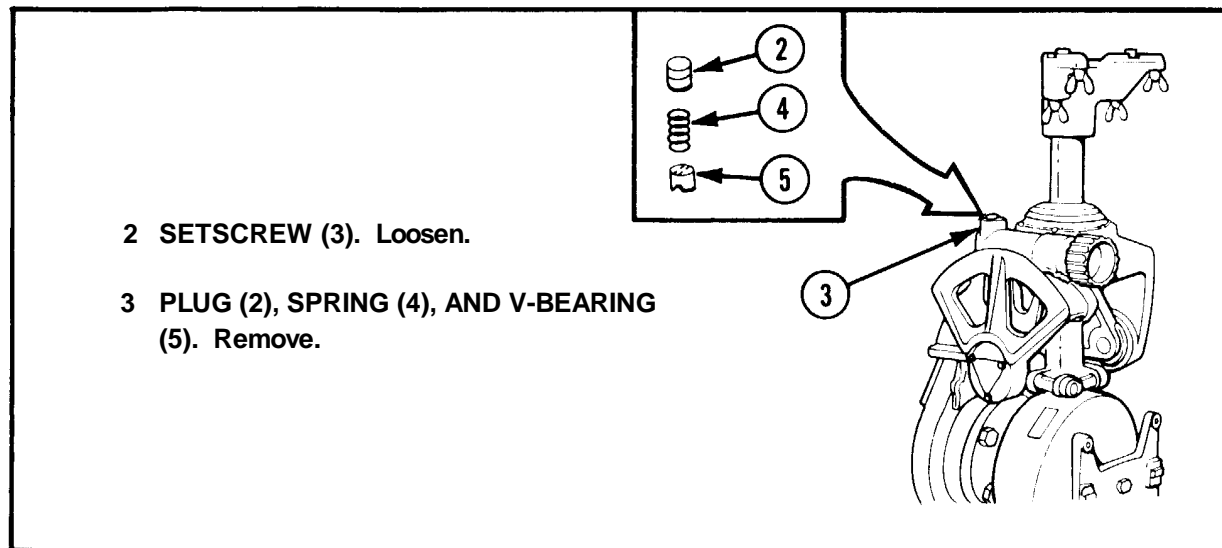
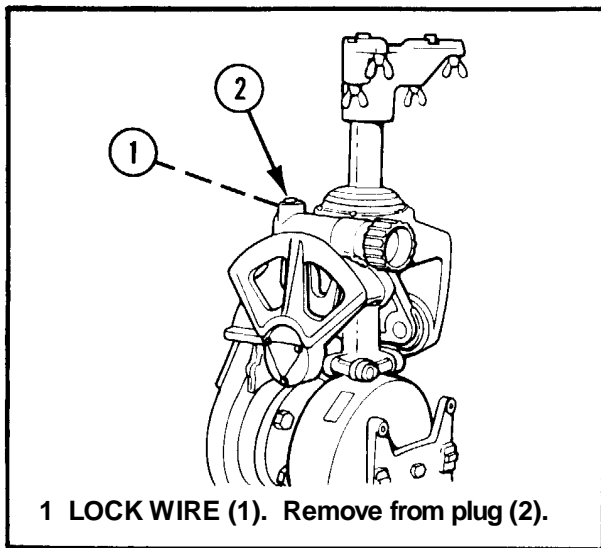
- 4-15 M171 mount removed from M198 howitzer.

**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

4-17. WORM SHAFT ASSEMBLY (CROSS LEVEL)-MAINTENANCE INSTRUCTIONS (cont)

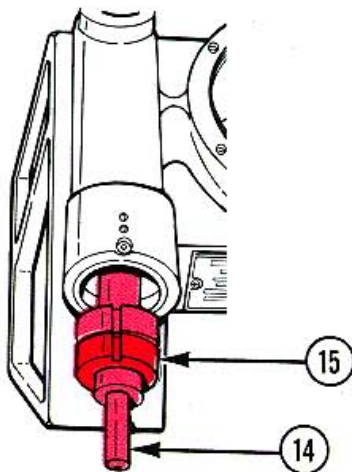
REMOVAL



10 WORM SHAFT ASSEMBLY (14). Partially remove.

11 BEARING (15). Remove.

12 WORM SHAFT ASSEMBLY (14). Remove.



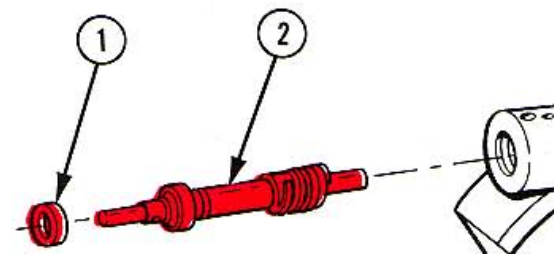
**NOTE**  
 Replace worm shaft assembly if cross level knob has excessive backlash or rough movement caused by damaged worm shaft assembly.

**CLEANING**

**INSTALLATION**

Clean all parts with cleaning compound (TM 9-1025-211-10).

1 BEARING (1). Apply light coat of grease (item 2, app B) and install on worm shaft assembly (2).



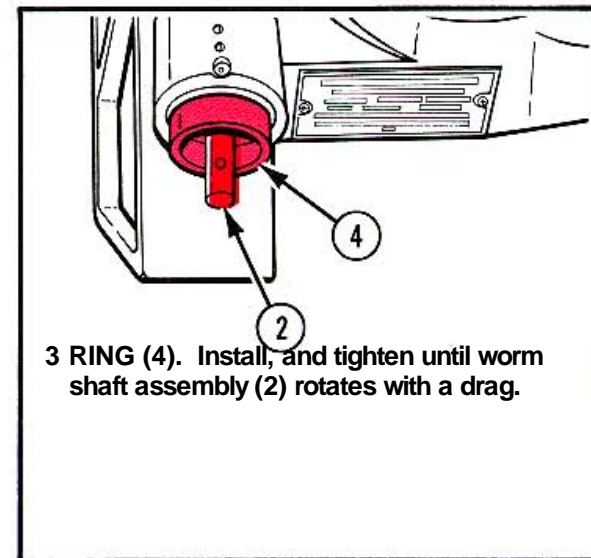
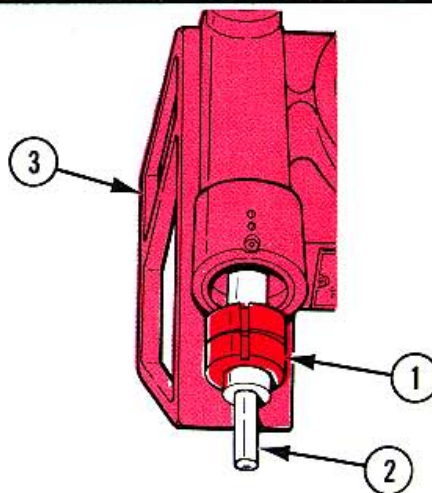


4-17. WORM SHAFT ASSEMBLY (CROSS LEVEL)-MAINTENANCE INSTRUCTIONS (cont)

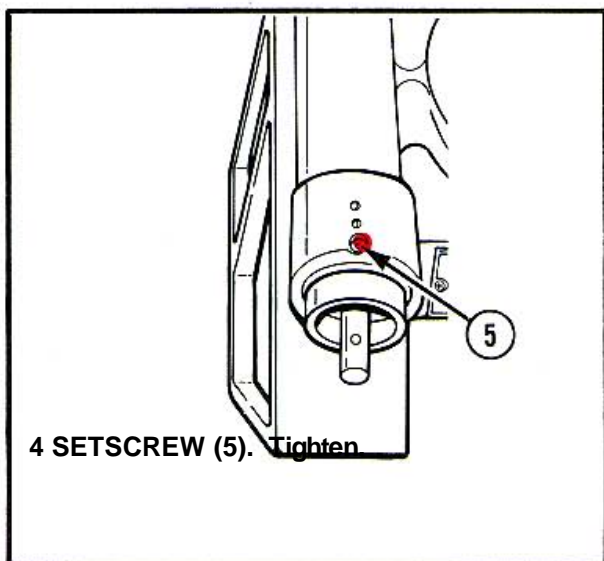
INSTALLATION (cont)

2 WORM SHAFT ASSEMBLY (2).

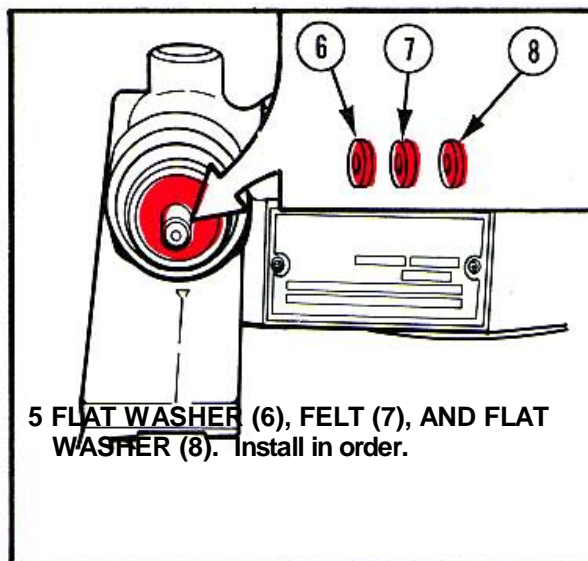
- a. Apply light coat of grease (item 2, app B) and install in optical instrument rocker assembly (3).
- b. Align slot in bearing (1) with guide pin in optical instrument rocker assembly (3).



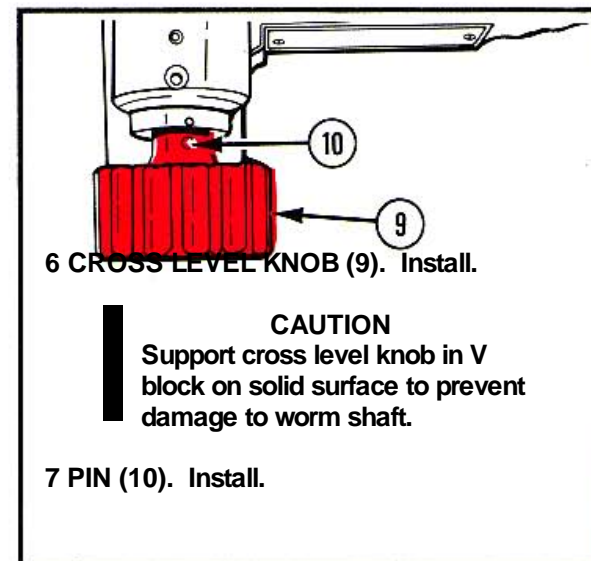
3 RING (4). Install, and tighten until worm shaft assembly (2) rotates with a drag.



4 SETSCREW (5). Tighten.



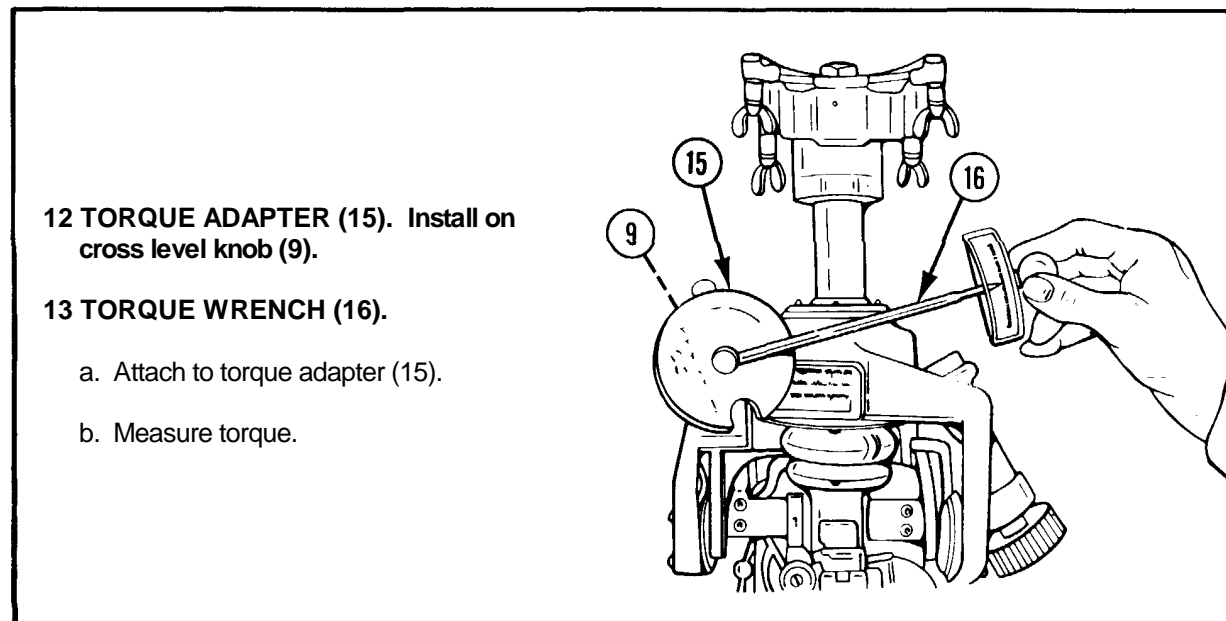
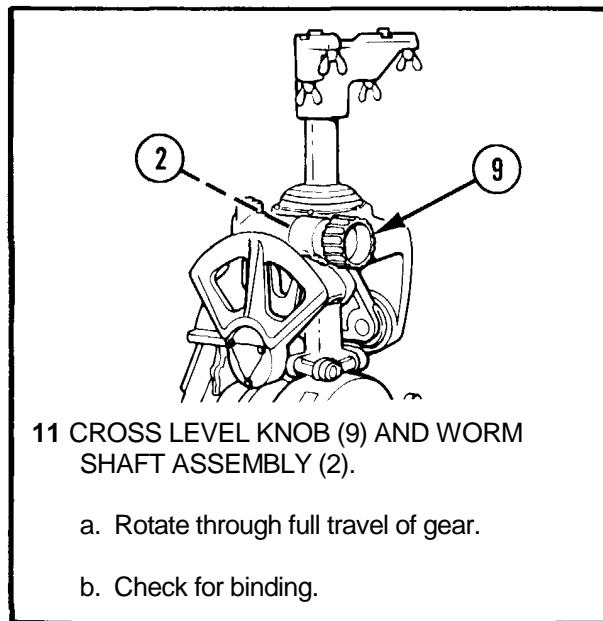
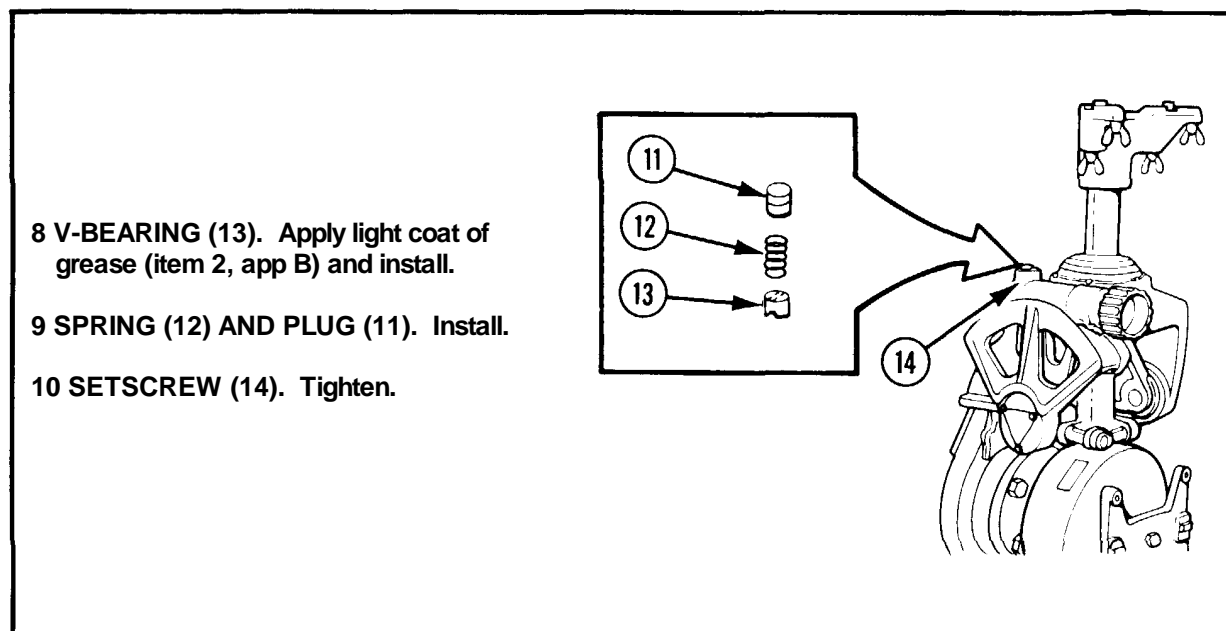
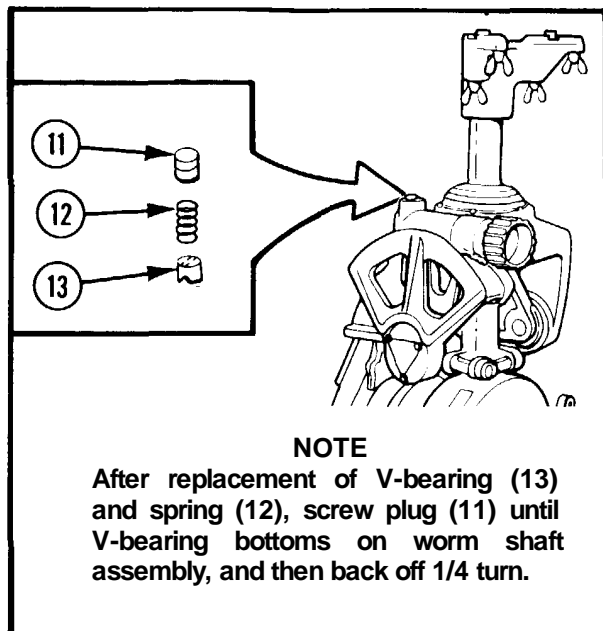
5 FLAT WASHER (6), FELT (7), AND FLAT WASHER (8). Install in order.



6 CROSS LEVEL KNOB (9). Install.

**CAUTION**  
Support cross level knob in V block on solid surface to prevent damage to worm shaft.

7 PIN (10). Install.



4-17. WORM SHAFT ASSEMBLY (CROSS LEVEL)-MAINTENANCE INSTRUCTIONS (cont)

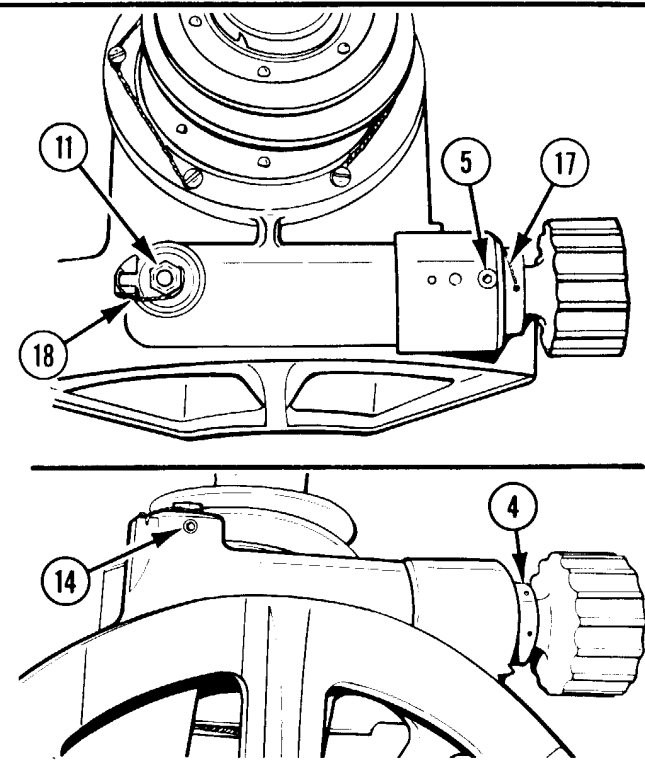
INSTALLATION (cont)

**NOTE**

If torque does not read between 4 in.-lb (0.45 N-m) and 12 in.-lb (1.35 N-m), loosen setscrews (14 and 5). Tighten or loosen ring (4) or plug (11).

14 SETSCREWS (14 AND 5). Apply sealing compound (TM 9-1025-211-20&P) and tighten.

15 LOCK WIRES (17 AND 18) (TM 9-1025-211-20&P). Install.



4-18. HOUSING ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Disassembly
- b. Cleaning

- c. Repair
- d. Reassembly

**INITIAL SETUP**

**Special Tools**

- Adapter set (SC 4931-95-CL-A11)
- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)

**Materials/Parts**

- Cleaning compound (MIL-C-18718)
- Felt (11727895) (4)
- Grease (item 2, app B)
- Grease (item 3, app B)
- Lock wire (item 5, app B)
- Lock wire (MS20995-C41)
- Sealing compound (MIL-S-11031)

**References**

- TM 9-1025-211-10
- TM 9-1025-211-20&P
- TM 9-1240-375-34P

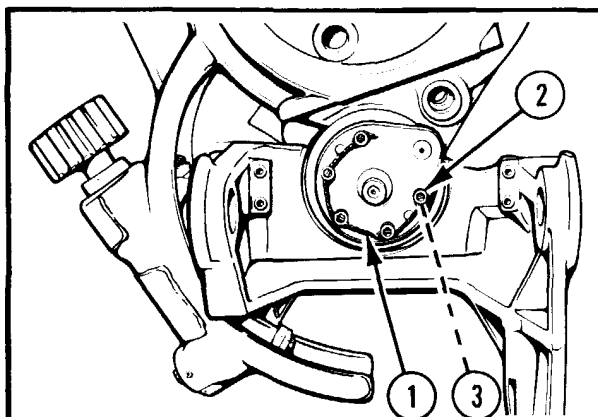
**Troubleshooting Reference**

- 4-11 Elevation control is erratic and rough during movement.

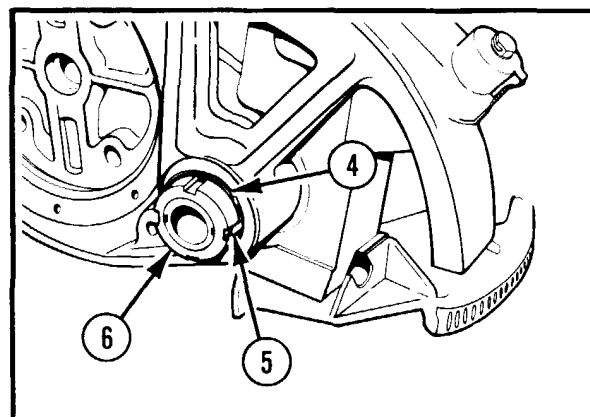
**Equipment Conditions**

- 4-15 M171 mount removed from M198 howitzer.
- 4-26 Optical instrument support removed.
- 4-27 Optical instrument rocker assembly removed.
- 4-29 Retaining plates, cover, gasket, and pawl removed.

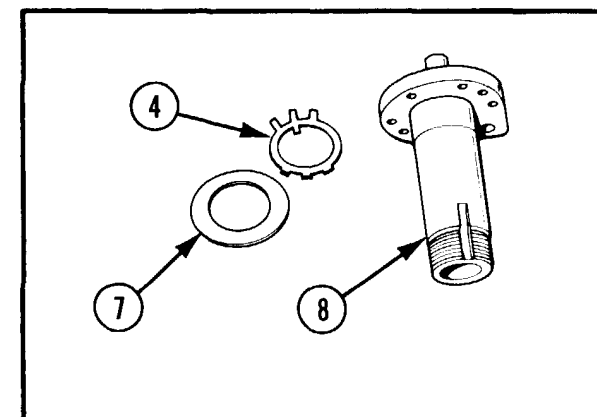
**DISASSEMBLY**



- 1 LOCK WIRE (1). Remove.
- 2 FIVE SCREWS (2) AND FIVE LOCK-WASHERS (3). Remove.



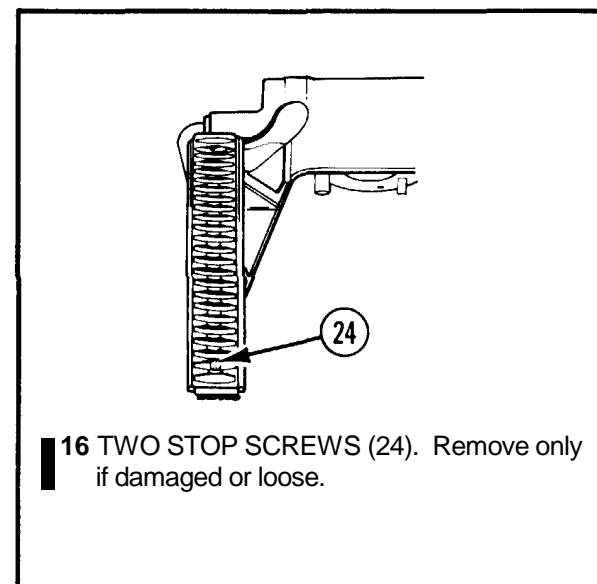
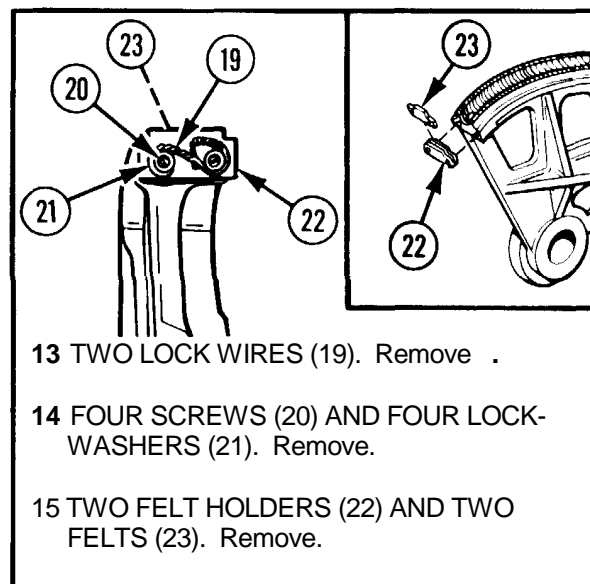
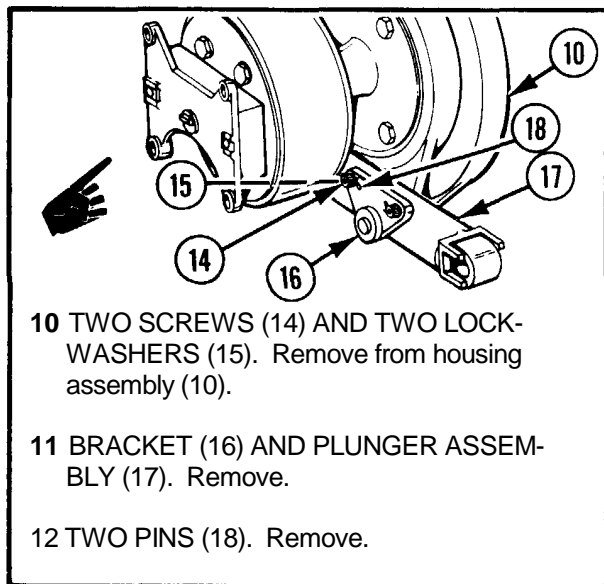
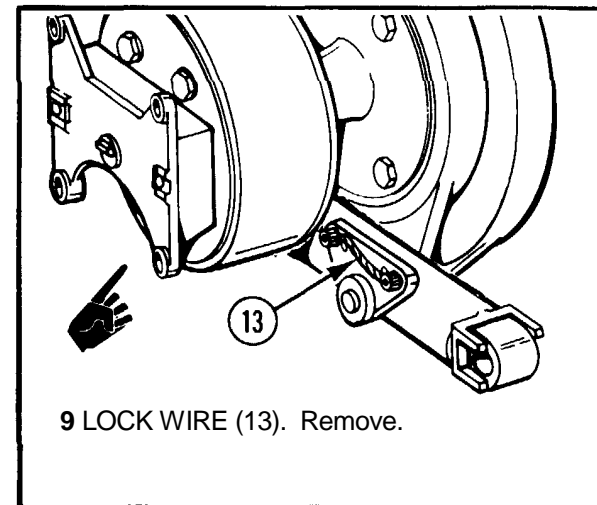
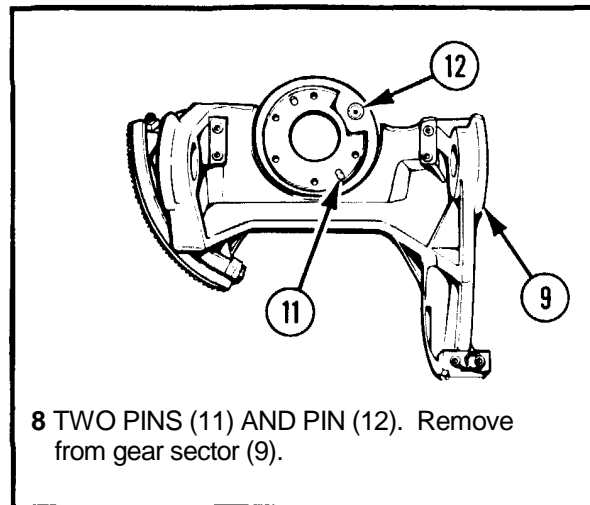
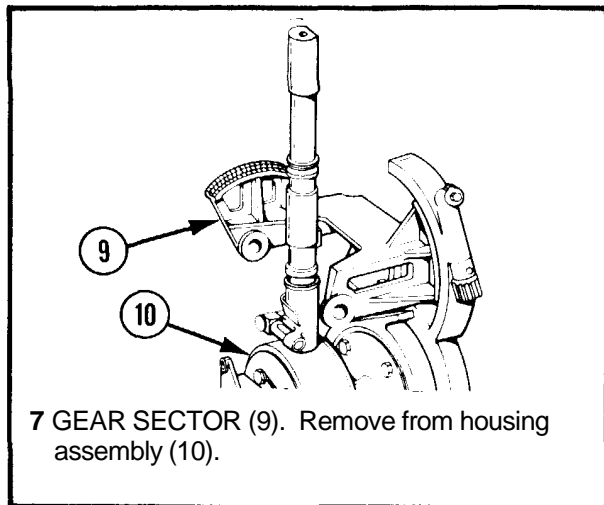
- 3 KEY WASHER (4). Bend tang (5) out of groove of nut (6).
- 4 NUT (6). Unscrew and remove.



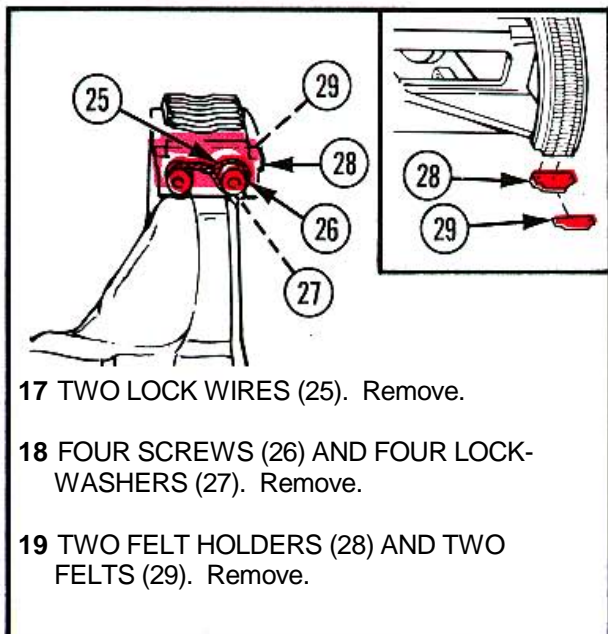
- 5 KEY WASHER (4) AND WASHER (7). Remove.
- 6 CAMSHAFT (8). Drive out, and remove.

4-18. HOUSING ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY (cont)



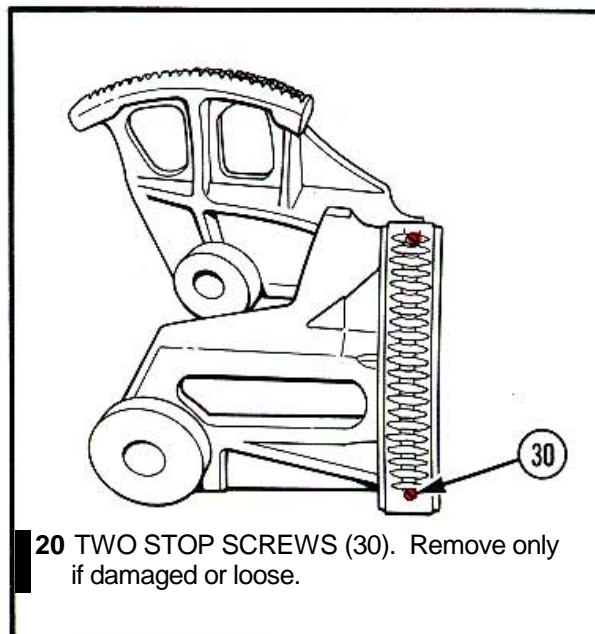




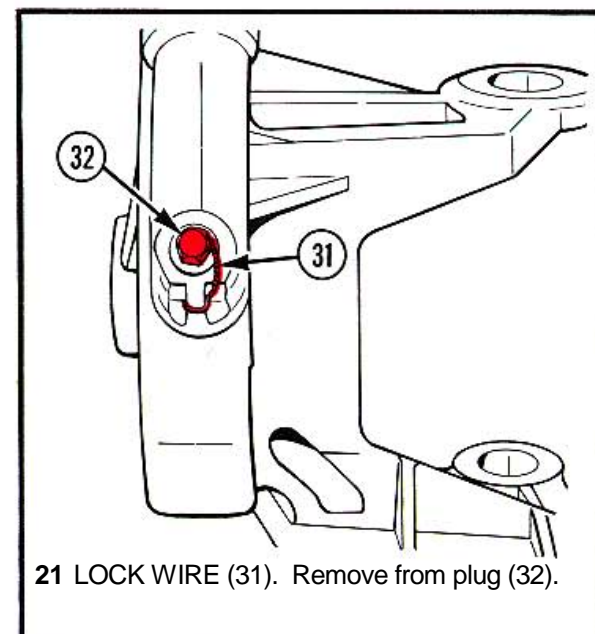
17 TWO LOCK WIRES (25). Remove.

18 FOUR SCREWS (26) AND FOUR LOCK-WASHERS (27). Remove.

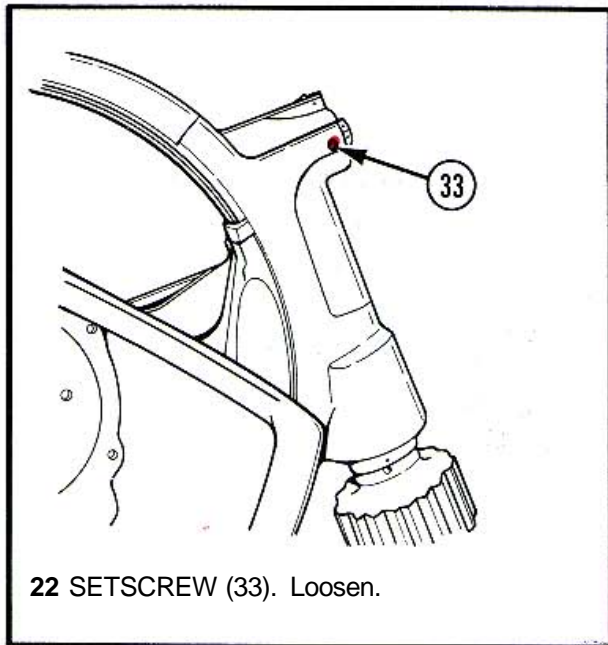
19 TWO FELT HOLDERS (28) AND TWO FELTS (29). Remove.



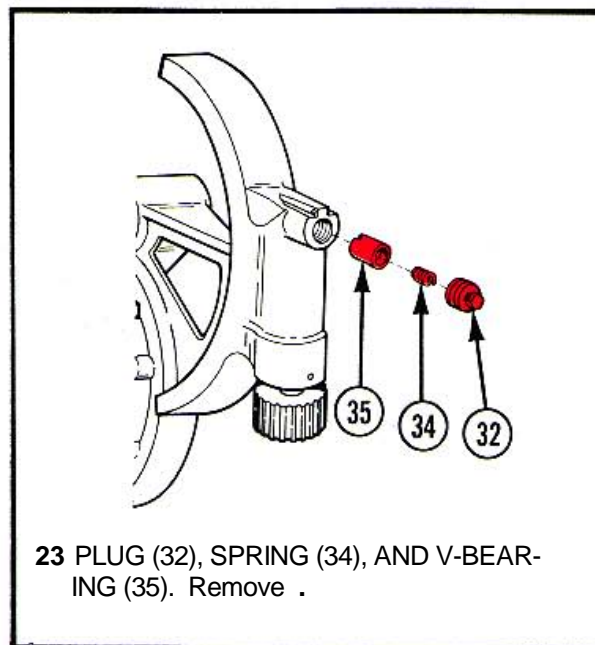
20 TWO STOP SCREWS (30). Remove only if damaged or loose.



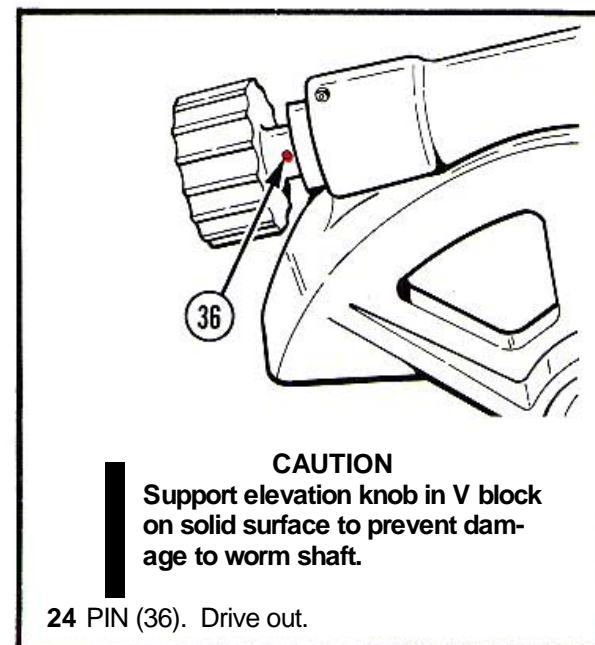
21 LOCK WIRE (31). Remove from plug (32).



22 SETSCREW (33). Loosen.



23 PLUG (32), SPRING (34), AND V-BEARING (35). Remove .

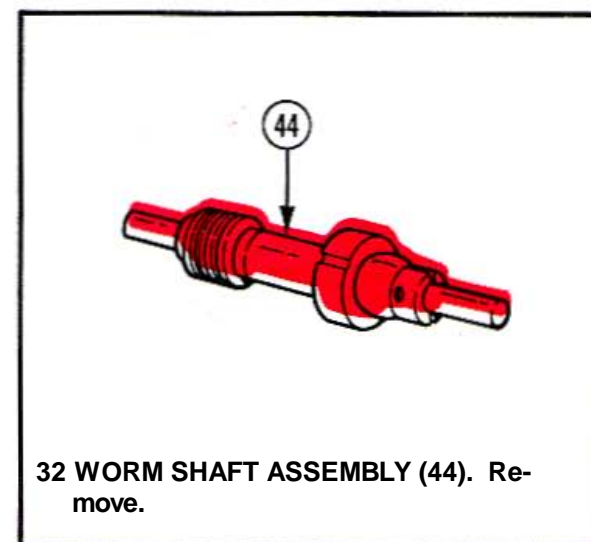
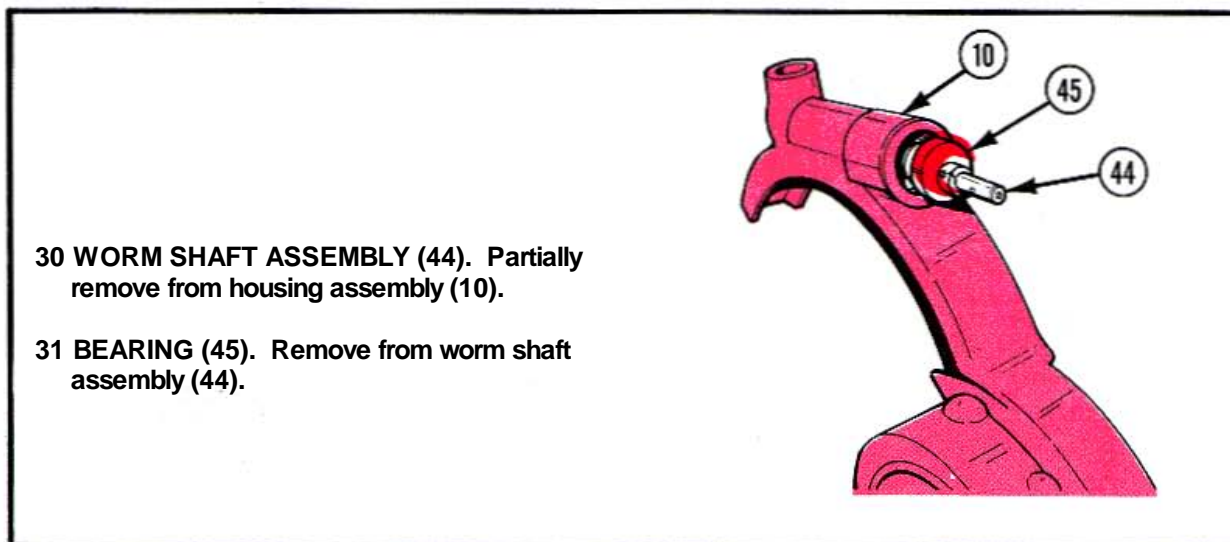
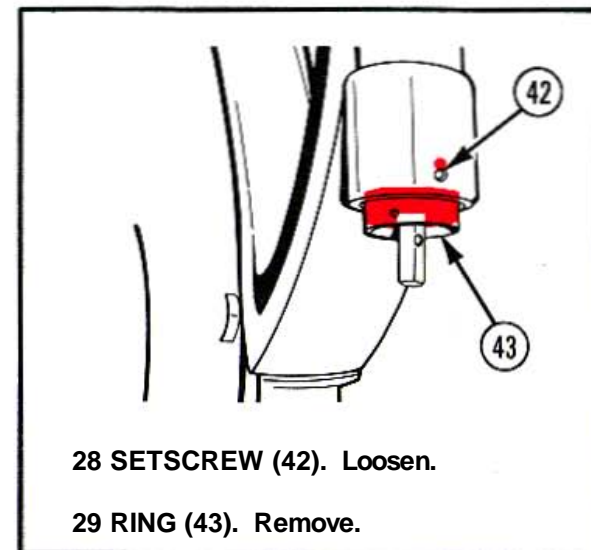
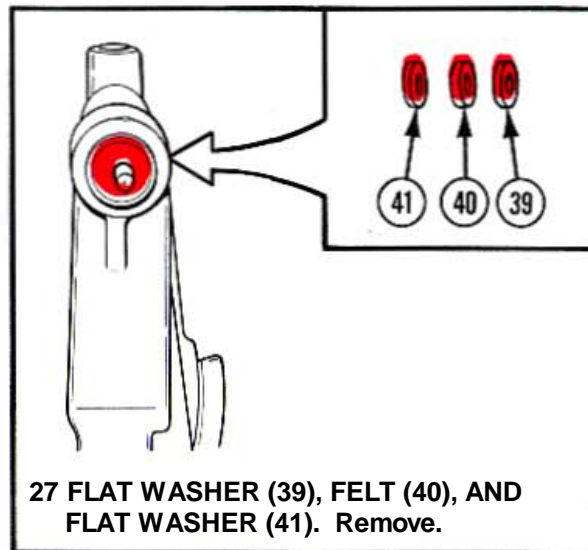
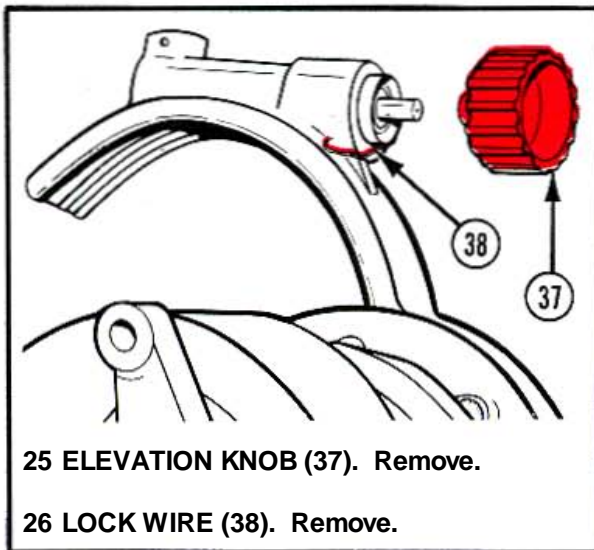


**CAUTION**  
Support elevation knob in V block on solid surface to prevent damage to worm shaft.

24 PIN (36). Drive out.

4-18. HOUSING ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY (cont)



**CLEANING**

Clean all parts with cleaning compound (TM 9-1025-211-10).

**REPAIR**

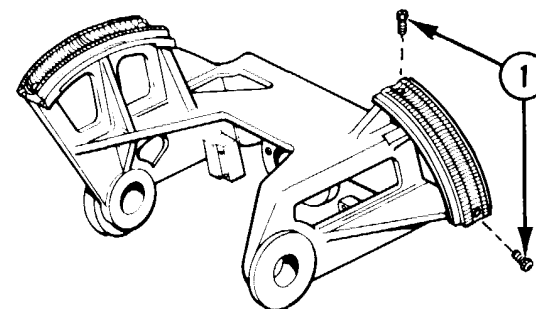
Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

**NOTE**

On all machined surfaces and felts apply light coat of grease (item 2, app B).

On all preformed packings apply light coat of grease (item 3, app B)

**REASSEMBLY**



**1 TWO STOP SCREWS (1).**

a. Apply sealing compound (TM 9 1025 211 20&P)

b. Install and tighten.

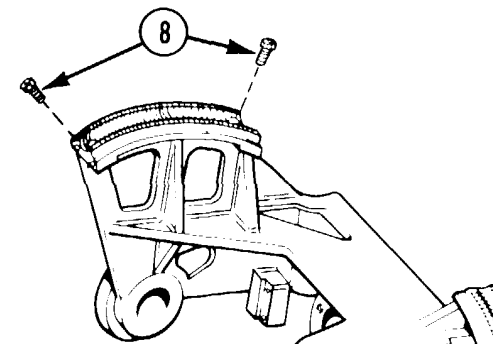
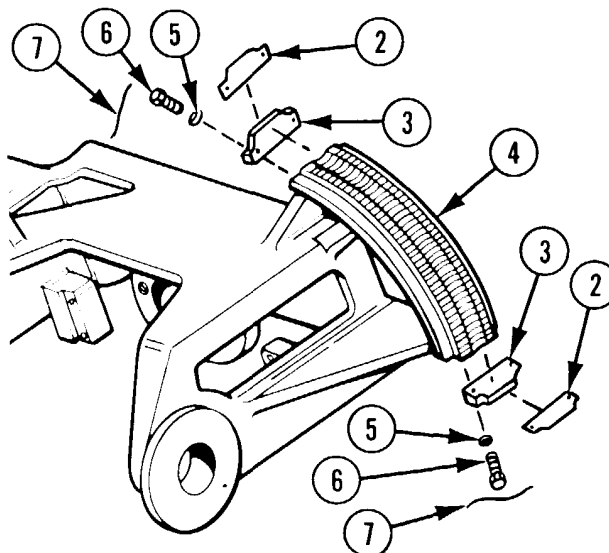
**NOTE**

Two felts (2) and two felt holders (3) must be installed in exact alinement with end of gear sector (elevation) (4).

**2 TWO NEW FELTS (2) AND TWO FELT HOLDERS (3).** Position on end of gear sector (elevation) (4).

**3 FOUR LOCKWASHERS (5) AND FOUR SCREWS (6).** Install and tighten.

**4 TWO LOCK WIRES (7) (ITEM 5, APP B).** Install.



**5 TWO STOP SCREWS (8).**

a. Apply sealing compound (TM 9-1025 211 20&P)

b. Install and tighten.

4-18. HOUSING ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY (cont)

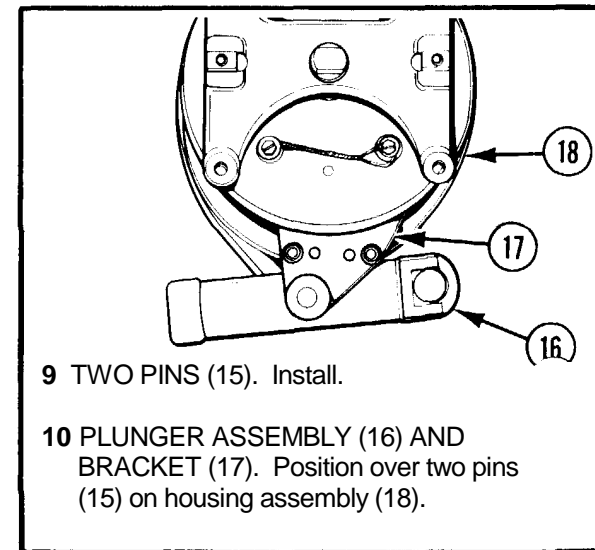
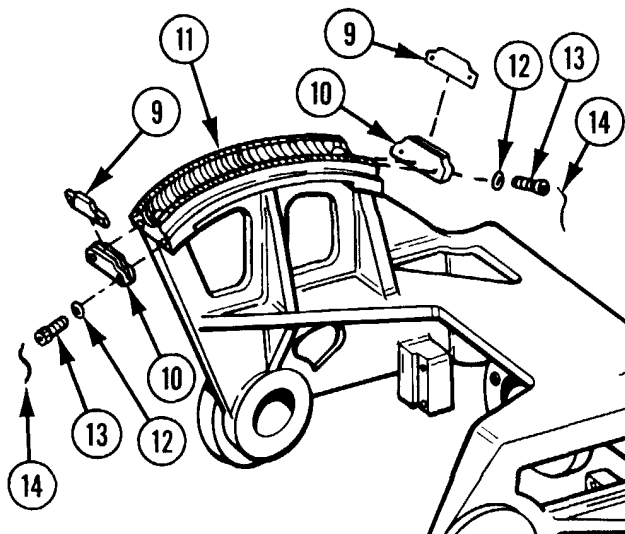
**NOTE**

Two felts (9) and two felt holders (10) must be installed in exact alignment with the end of gear sector (cant) (11).

6 TWO NEW FELTS (9) AND TWO FELT HOLDERS (10). Position on end of gear sector (cant) (11).

7 FOUR LOCKWASHERS (12) AND FOUR SCREWS (13). Install and tighten.

8 TWO LOCK WIRES (14) (ITEM 5, APP B). Instal l.

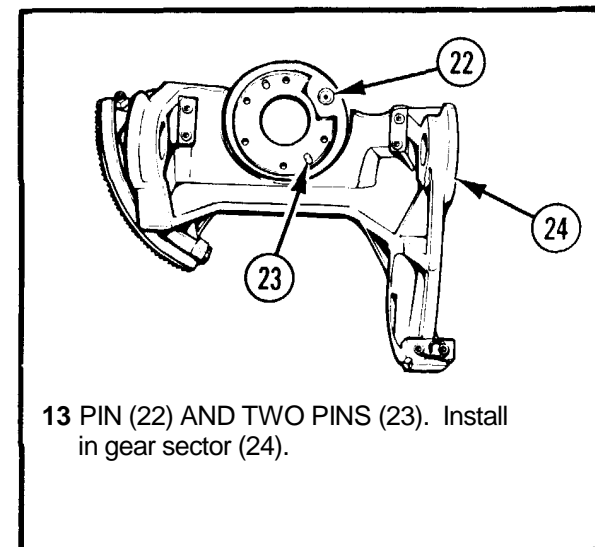
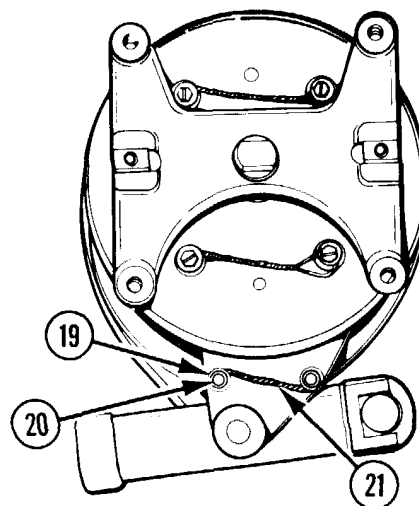


9 TWO PINS (15). Install.

10 PLUNGER ASSEMBLY (16) AND BRACKET (17). Position over two pins (15) on housing assembly (18).

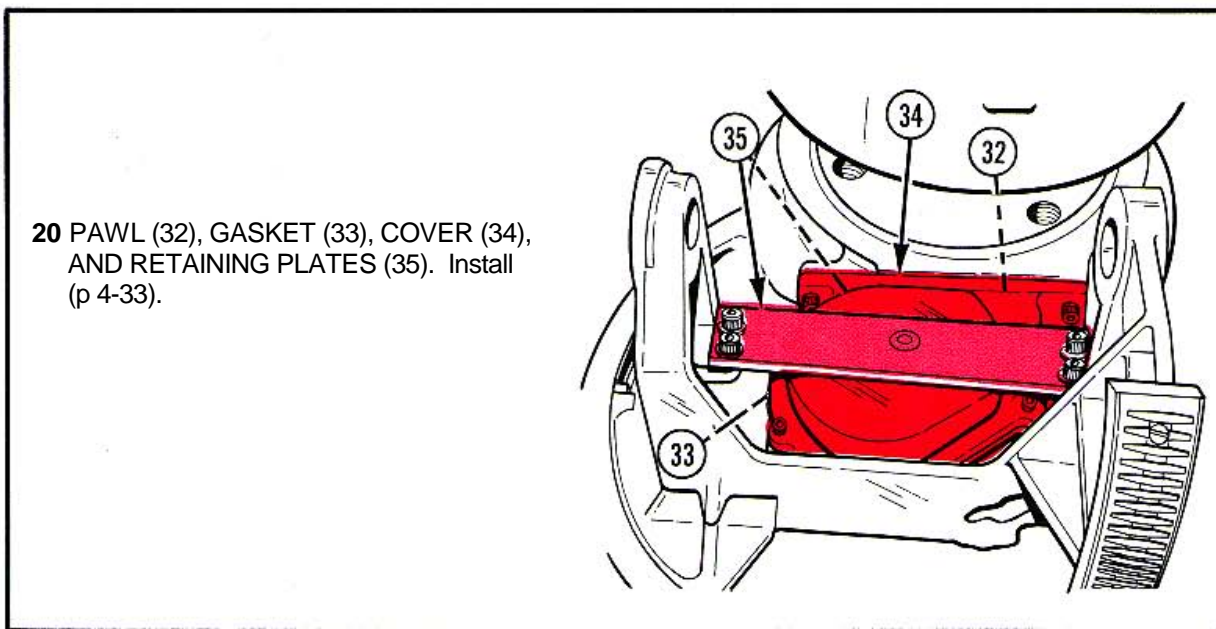
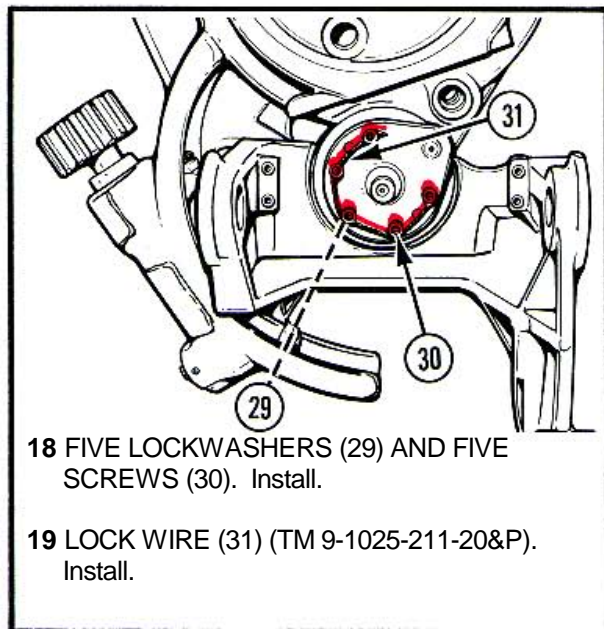
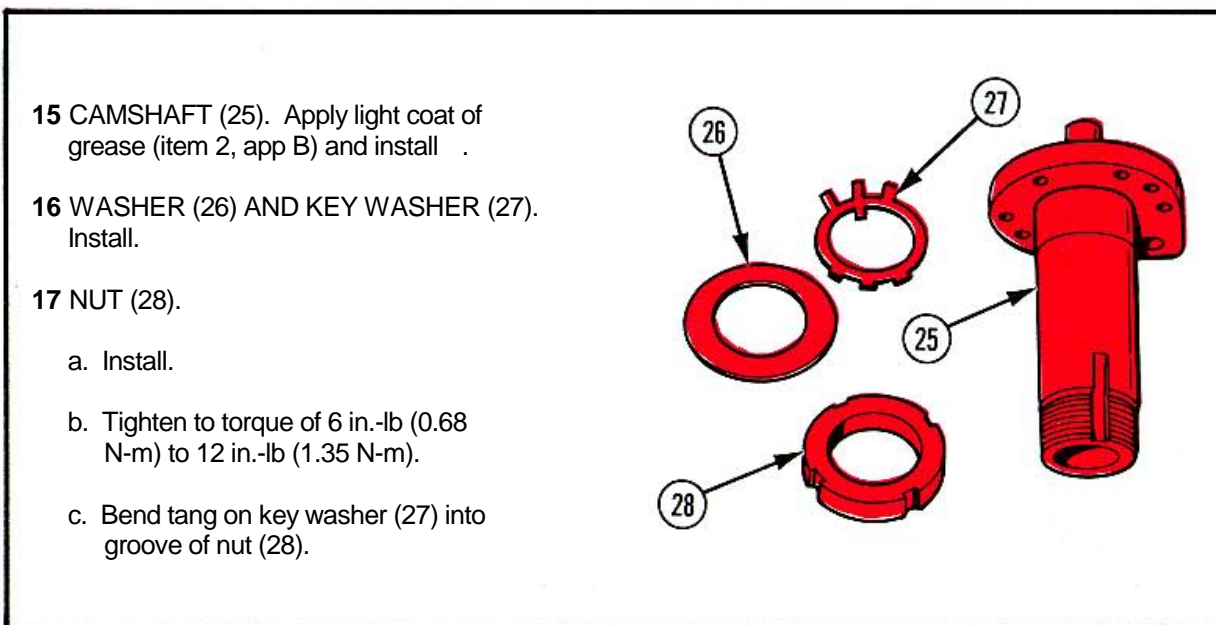
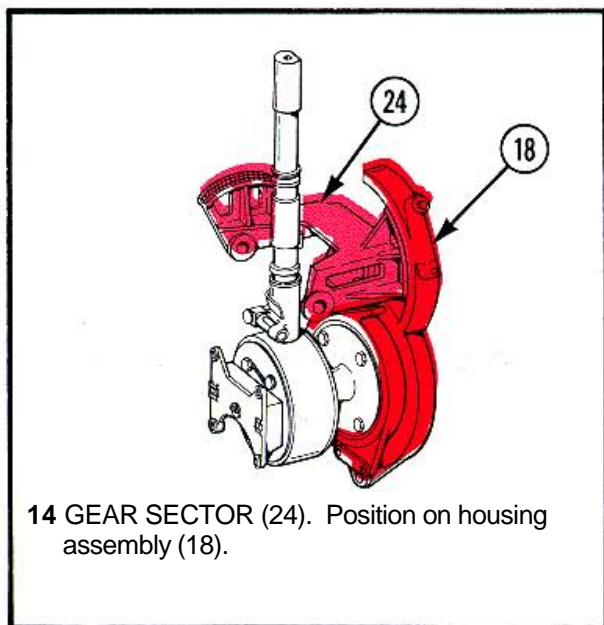
11 TWO LOCKWASHERS (19) AND TWO SCREWS (20). Install and tighten.

12 LOCK WIRE (21) (TM 9-1025-211-20&P). Install.



13 PIN (22) AND TWO PINS (23). Install in gear sector (24).







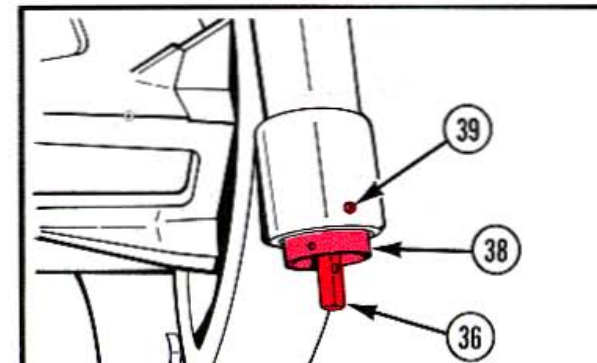
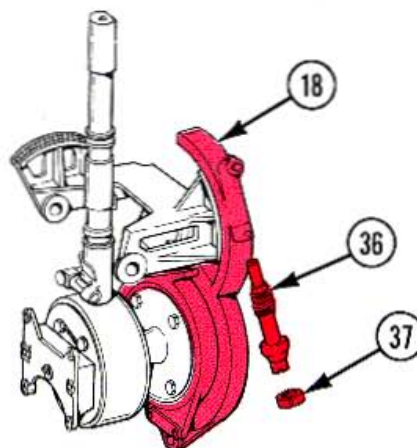
4-18. HOUSING ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY (cont)

21 WORM SHAFT ASSEMBLY (36). Place in housing assembly (18).

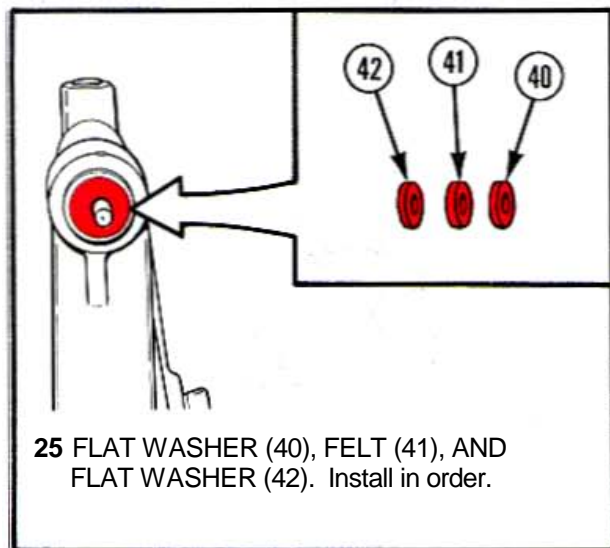
22 BEARING (37). Apply grease (item 2, app B) and install on worm shaft assembly (36).

**NOTE**  
Make sure slot in bearing aligns with guide pin in housing assembly.

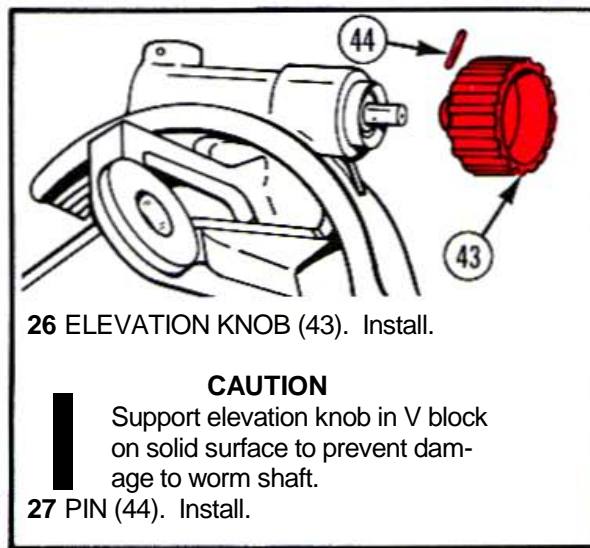


23 RING (38). Install and tighten until worm shaft assembly (36) rotates with a drag.

24 SETSCREW (39). Tighten.

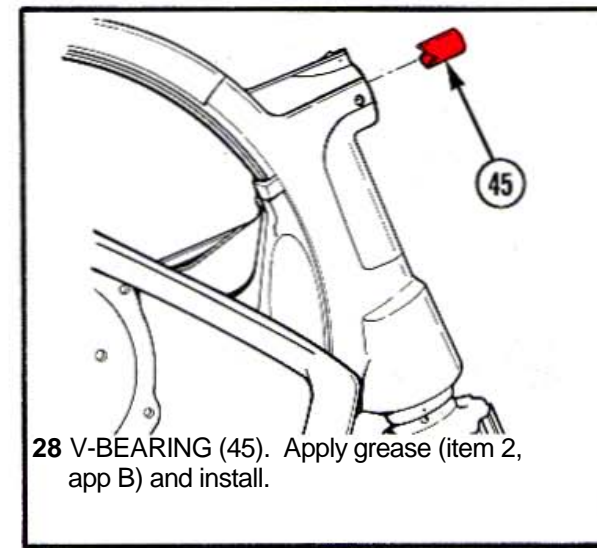


25 FLAT WASHER (40), FELT (41), AND FLAT WASHER (42). Install in order.



26 ELEVATION KNOB (43). Install.

**CAUTION**  
Support elevation knob in V block on solid surface to prevent damage to worm shaft.  
27 PIN (44). Install.

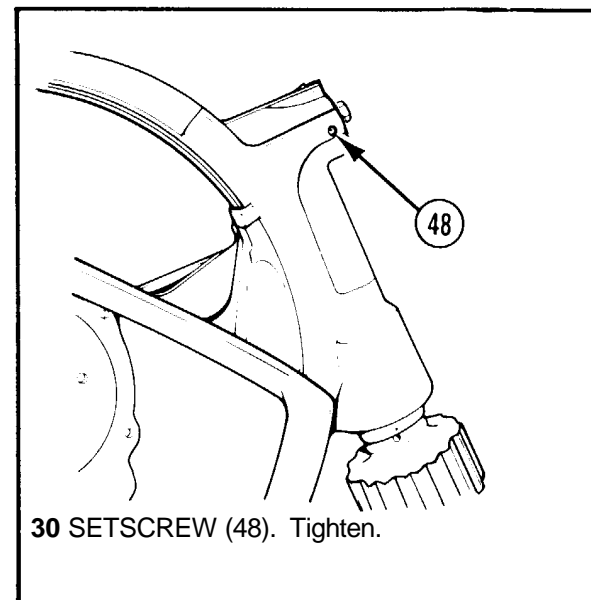
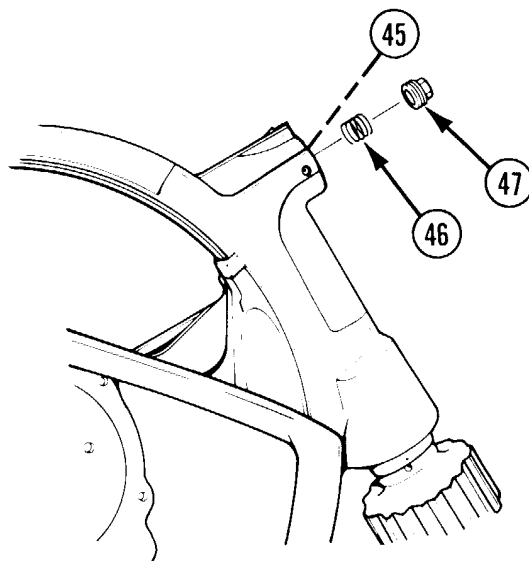


28 V-BEARING (45). Apply grease (item 2, app B) and install.

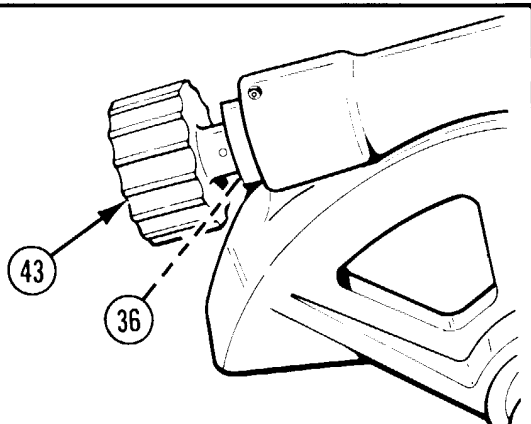
**29 SPRING (46) AND PLUG (47). Install.**

**NOTE**

After installing V-bearing (45) and spring (46), screw plug (47) until V-bearing bottoms on worm shaft assembly, and then back off 1/4 turn.



**30 SETSCREW (48). Tighten.**



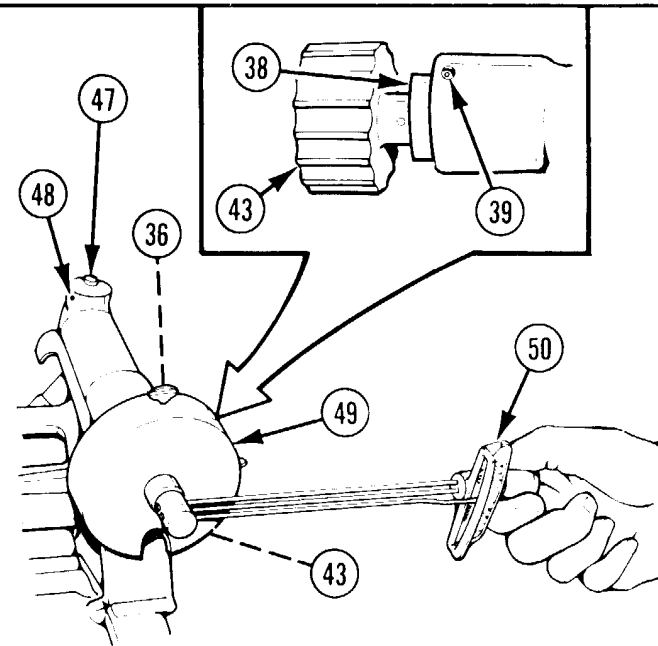
**31 ELEVATION KNOB (43) AND WORM SHAFT ASSEMBLY (36).**

- a. Rotate through full travel of gear.
- b. Check for binding.

**32 TORQUE ADAPTER (49). Install on elevation knob (43).**

**33 TORQUE WRENCH (50).**

- a. Attach to torque adapter (49), and measure torque required to turn worm shaft assembly (36).
- b. If torque does not read between 4 in.-lb (0.45 N-m) and 12 in.-lb (1.35 N-m), loosen setscrews (48 and 39). Tighten or loosen ring (38) or plug (47).

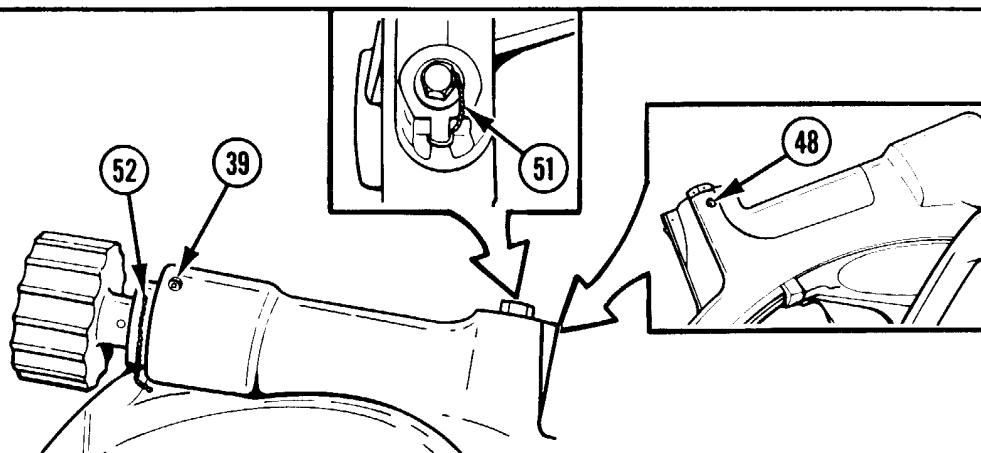


4-18. HOUSING ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY (cont)

34 SETSCREWS (48 AND 39). Apply sealing compound (TM 9-1025-211-20&P) and tighten.

35 LOCK WIRES (51 AND 52) (TM 9-1025-211-20&P). Install.



4-19. PLUNGER ASSEMBLY-MAINTENANCE INSTRUCTIONS

THIS TASK COVERS:

- a. Removal
- b. Installation

INITIAL SETUP

**Special Tools**  
Tool box (SC 4931-95-CL-A09)

**Materials/Parts**  
Grease (item 2, app B)  
Lock wire (MS20995-C41)

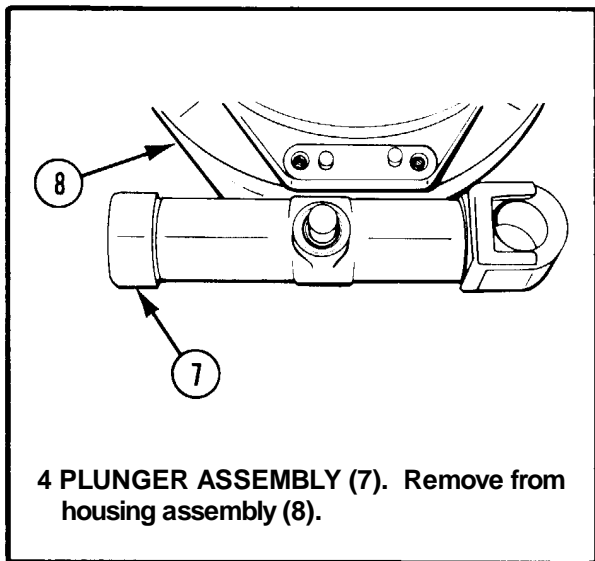
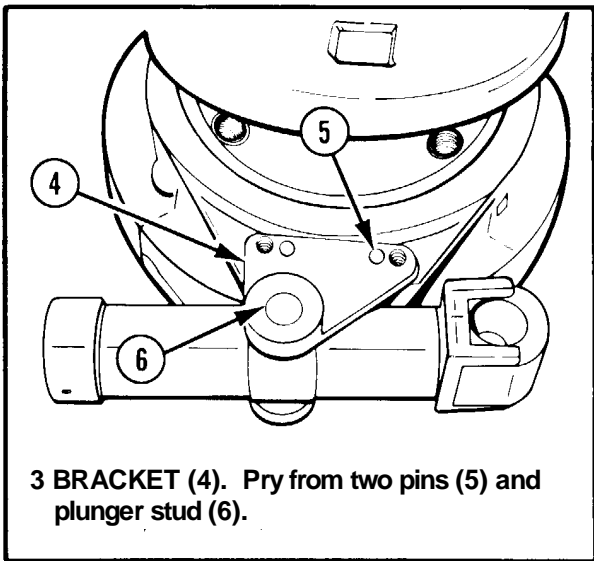
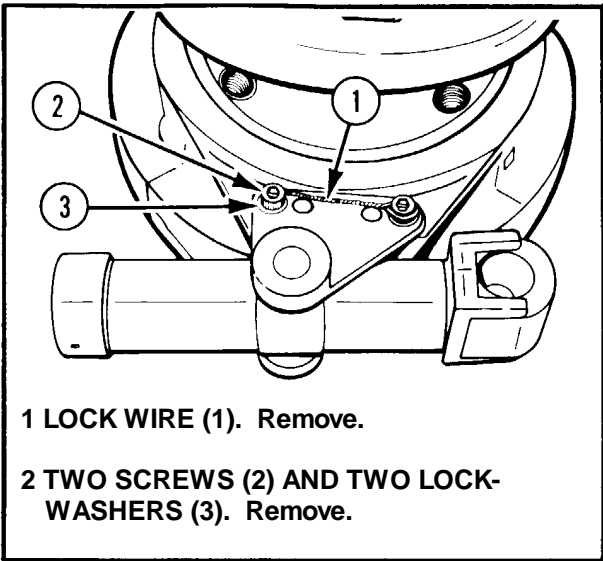
**Reference**  
TM 9-1025-211-20&P

**Troubleshooting Reference**  
4-13 Plunger assembly binds.

**Equipment Condition**  
4-15 M171 mount removed from M198 howitzer.

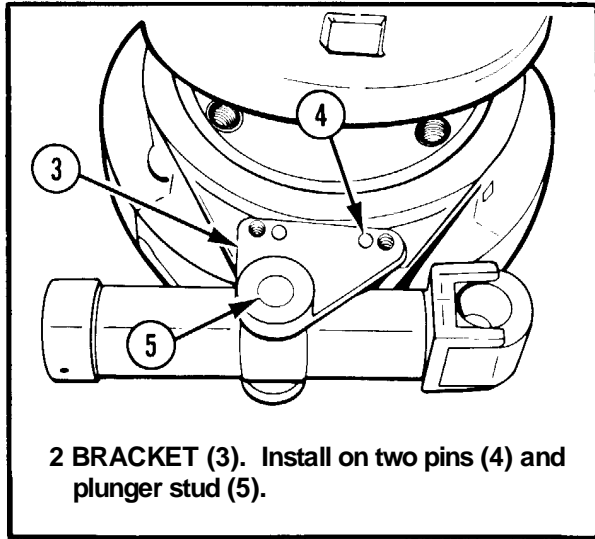
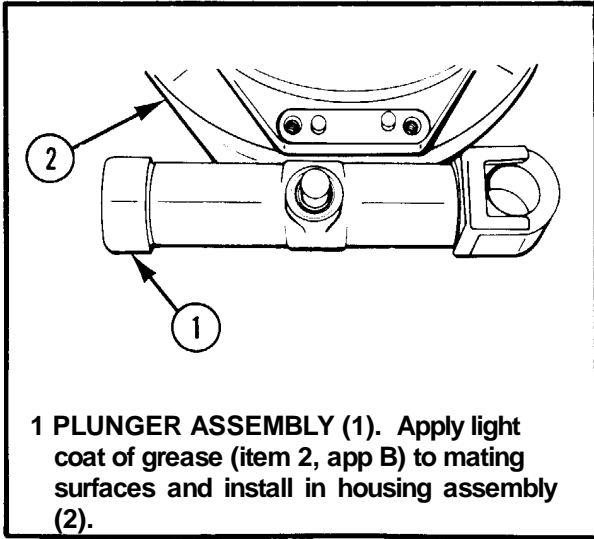
**WARNING**  
When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**REMOVAL**



**INSTALLATION**

**NOTE**  
Replace plunger assembly if damaged to the extent that improper tension is applied to the M171 mount.

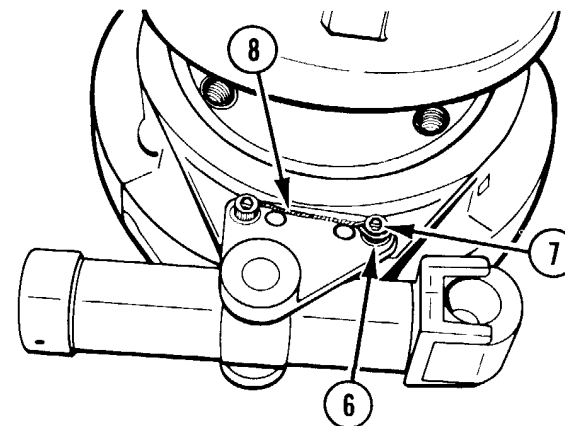


4-19. PLUNGER ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

INSTALLATION (cont)

3 TWO LOCKWASHERS (6) AND TWO SCREWS (7). Install.

4 LOCK WIRE (8) (TM 9-1025-211-20&P). Install.



4-20. WORM SHAFT ASSEMBLY (ELEVATION)-MAINTENANCE INSTRUCTIONS

THIS TASK COVERS:

- a. Removal
- b. Cleaning

- c. Installation

INITIAL SETUP

Special Tools

- Adapter set (SC 4931-95-CL-A11)
- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)

Materials/ Parts

- Cleaning compound (MIL-C-18718)
- Grease (item 2, app B)
- Lock wire (MS20995-C41)
- Sealing compound (MIL-S-11031)



**References**

- TM 9-1025-211-10
- TM 9-1025-211-20&P


**Troubleshooting References**

- 4-11 Elevation control is erratic and rough during movement.
- 4-11 Elevation knob exceeds 1 .5-mil backlash.
- 4-11 Elevation knob requires torque in excess of 12 in.-lb (1.35 N-m) to rotate.

**Equipment Condition**

- 4-15 M171 mount removed from M198 howitzer.

**WARNING**



When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**NOTE**

Replace worm shaft assembly if bent or unserviceable.

Maintenance instructions for the worm shaft assembly are on page 4-51.

**4-21. ARM AND ADAPTER ASSEMBLY MAINTENANCE INSTRUCTIONS**

**THIS TASK COVERS:**

- a. Removal
- b. Repair
- c. Installation

**INITIAL SETUP**

**Special Tools**

- Tool box (SC 4931-95-CL-A09)

**Materials/Parts**

- Lock wire (MS20995-C41)


**References**

- TM 9-1025-211-20&P
- TM 9-1240-375-34P

**Equipment Condition**

- 4-15 M171 mount removed from M198 howitzer.

**WARNING**

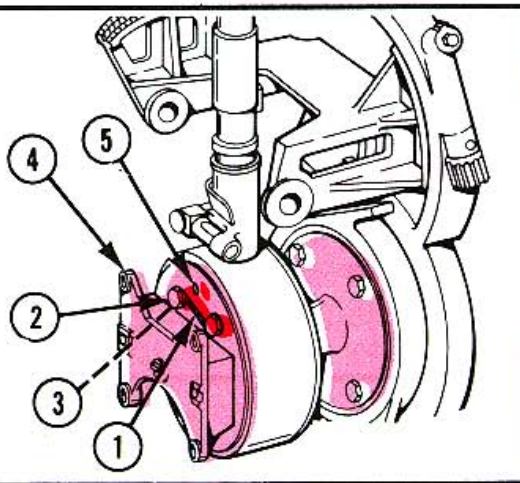


When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

4-21. ARM AND ADAPTER ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REMOVAL

- 1 LOCK WIRE (1). Remove.
- 2 FOUR SCREWS (2) AND FOUR LOCK-WASHERS (3). Remove.
- 3 ARM AND ADAPTER ASSEMBLY (4). Lift clear of two pins (5), and remove.
- 4 TWO PINS (5). Remove.

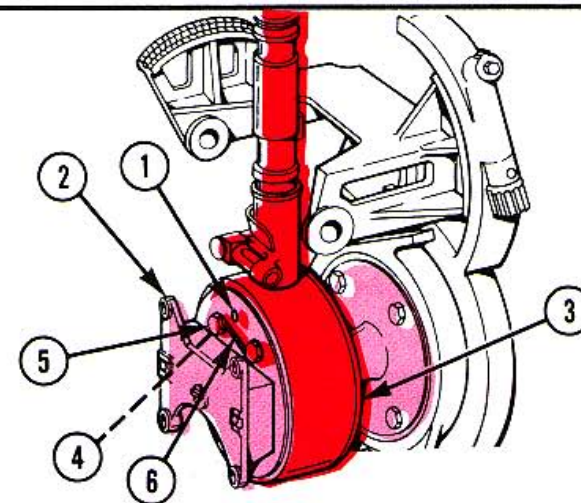


REPAIR

Repair is by replacement of authorized parts (TM 91240-375-34P) as required.

INSTALLATION

- 1 TWO PINS (1). Install.
- 2 ARM AND ADAPTER ASSEMBLY (2). Install on bearing housing assembly (3) over two pins (1).
- 3 FOUR LOCKWASHERS (4) AND FOUR SCREWS (5). Install and tighten.
- 4 LOCK WIRE (6) (TM 9-1025-211-20&P). Install.



4-22. MOUNTING ADAPTER-MAINTENANCE INSTRUCTIONS

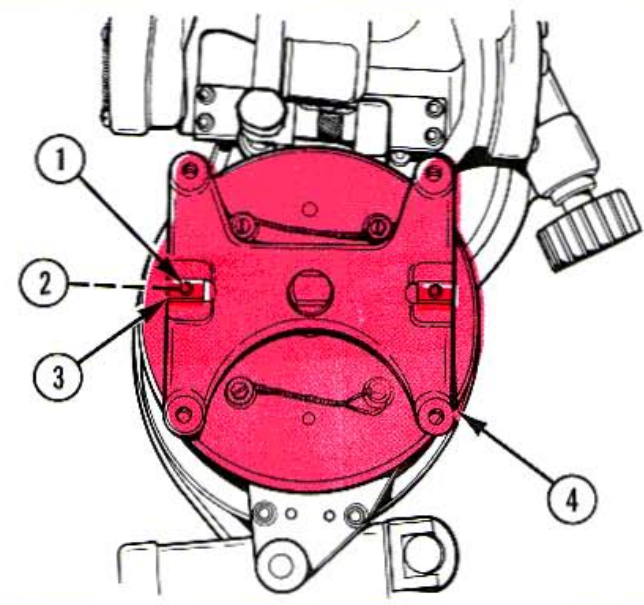
<b>THIS TASK COVERS:</b>	
<p>a. Removal                  b. Disassembly                  c. Repair</p>	<p>d. Reassembly                  e. Installation</p>
<b>INITIAL SETUP</b>	
<p><b>Special Tools</b>                  Tool box (SC 4931-95-CL-A09)</p> <p><b>Reference</b>                  TM 9-1240-375-34P</p>	<p>■ <b>Troubleshooting Reference</b>                  4-13 ■ M17 quadrant does not mount correctly.</p> <p><b>Equipment Condition</b>                  4-15 M171 mount removed from M198 howitzer.</p>

REMOVAL

If mounting adapter is damaged beyond replacement of piece parts, refer to removal procedures on page 4-62.

DISASSEMBLY

TWO SCREWS (1), TWO LOCKWASHERS (2), AND TWO KEYS (3). Remove from mounting adapter (4).



4-22. MOUNTING ADAPTER-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY (cont)

**NOTE**

Replace mounting adapter if bent or otherwise damaged causing M17 quadrant to mount incorrectly.

REPAIR

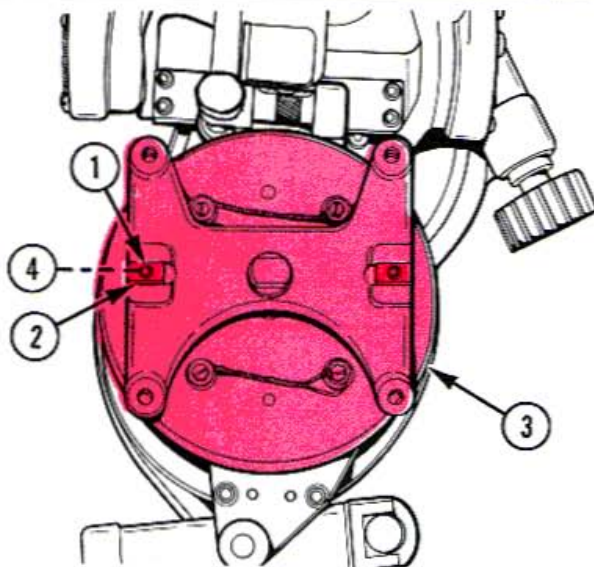
Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

REASSEMBLY

**NOTE**

Apply sealing compound (item 4, app B) to two screws (1) prior to installation.

**TWO KEYS (2).** Position on mounting adapter (3) and fasten using two lockwashers (4) and two screws (1).



INSTALLATION

For installation procedures see page 4-62.

**Section VI. GENERAL SUPPORT FINAL INSPECTION PROCEDURES  
FOR THE M171 TELESCOPE AND QUADRANT MOUNT**

**4-23. GENERAL**

a. This section describes and illustrates the final inspection of the M171 mount. A final inspection will be performed prior to returning the M171 mount to the using unit or to the supply system.

b. If the M171 mount being inspected fails to meet the required standards, ensure all maintenance authorized at the applicable level has been performed correctly. Then send the M171 mount to the next level of maintenance.

**4-24. M171 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS**

**THIS TASK COVERS:**

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>a. Setting up and adjusting the cross-leveling fixture</li> <li>b. Visual inspection</li> <li>c. Mounting the M171 mount on cross-leveling fixture</li> <li>d. Elevation travel and travel deviation inspection</li> <li>e. Cant travel inspection</li> <li>f. Cant backlash inspection</li> </ul> | <ul style="list-style-type: none"> <li>g. Pitch level backlash inspection</li> <li>h. Pitch level and plumb travel inspection</li> <li>i. Mount rigidity inspection</li> <li>j. Azimuth correction inspection</li> <li>k. Torque inspection</li> <li>l. Illumination inspection</li> </ul> |
|---|--|

**INITIAL SETUP**

**Test Equipment**

- Alinement tool (app C)
- Cross-leveling fixture (6523553)
- Inspection aid support assembly (10553898)
- Precision level (7686087)
- Push-pull gage (719-20)
- Test fixture adapter (10555619)

**Special Tools**

- Adapter plate (10555620)
- Adapter set (SC 4931-95-CL-A11)
- M1A2 gunner's quadrant (11732246)
- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)
- Tool set (SC 4931-95-CL-J51)

**Materials/Parts**

Sealing compound (MIL-S-11031)

**References**

- TM 9-1025-211-20&P
- TM 9-1290-200-14&P

**Special Environmental Condition**

Ambient temperature: + 60° F (+ 16° C) to + 90° F (+ 32° C)

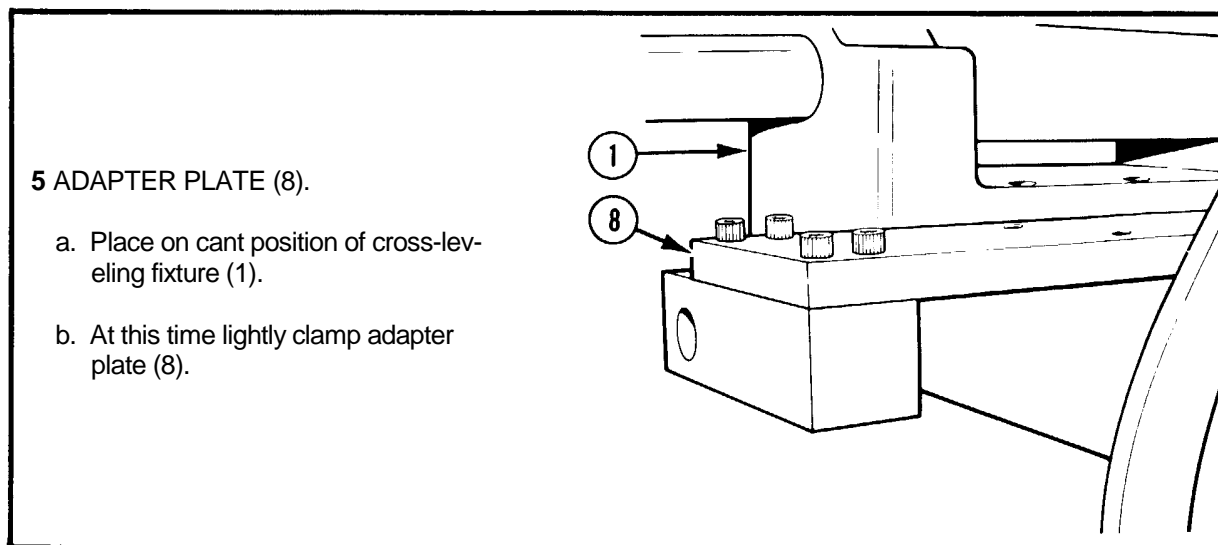
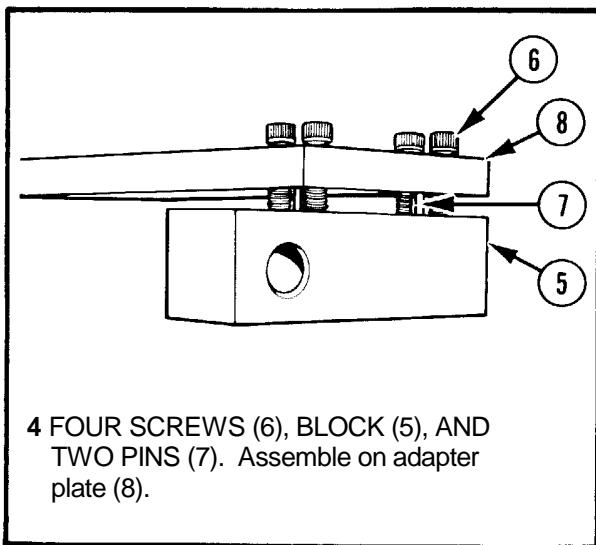
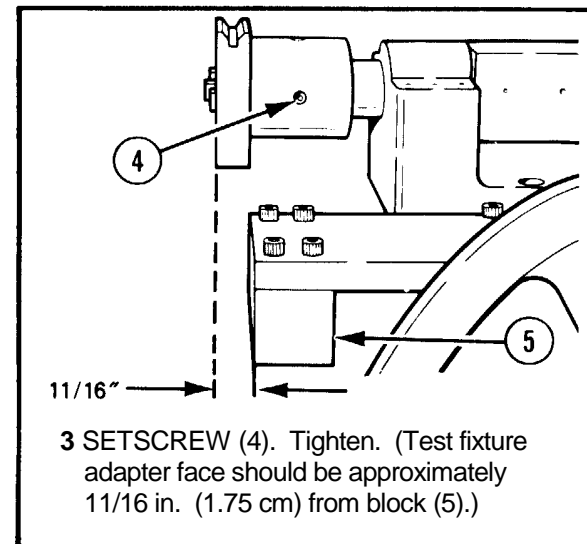
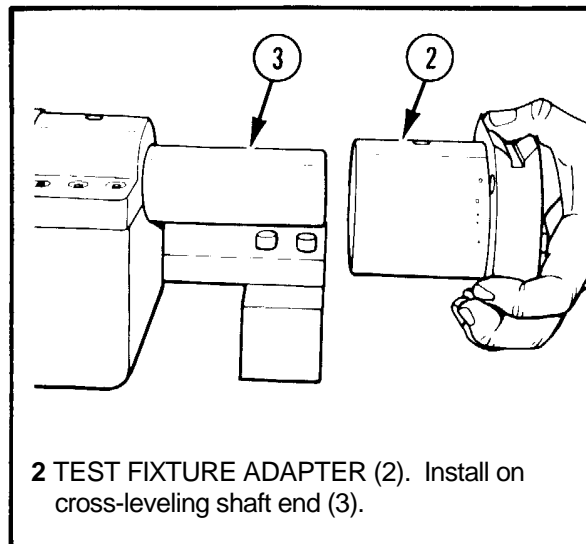
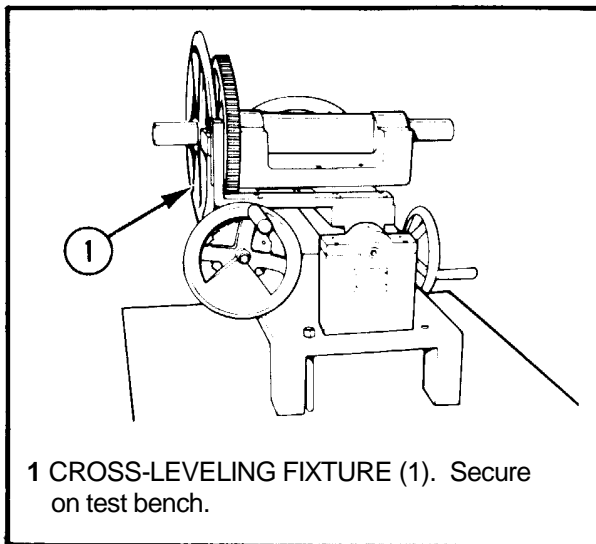
**WARNING**

When inspecting radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.



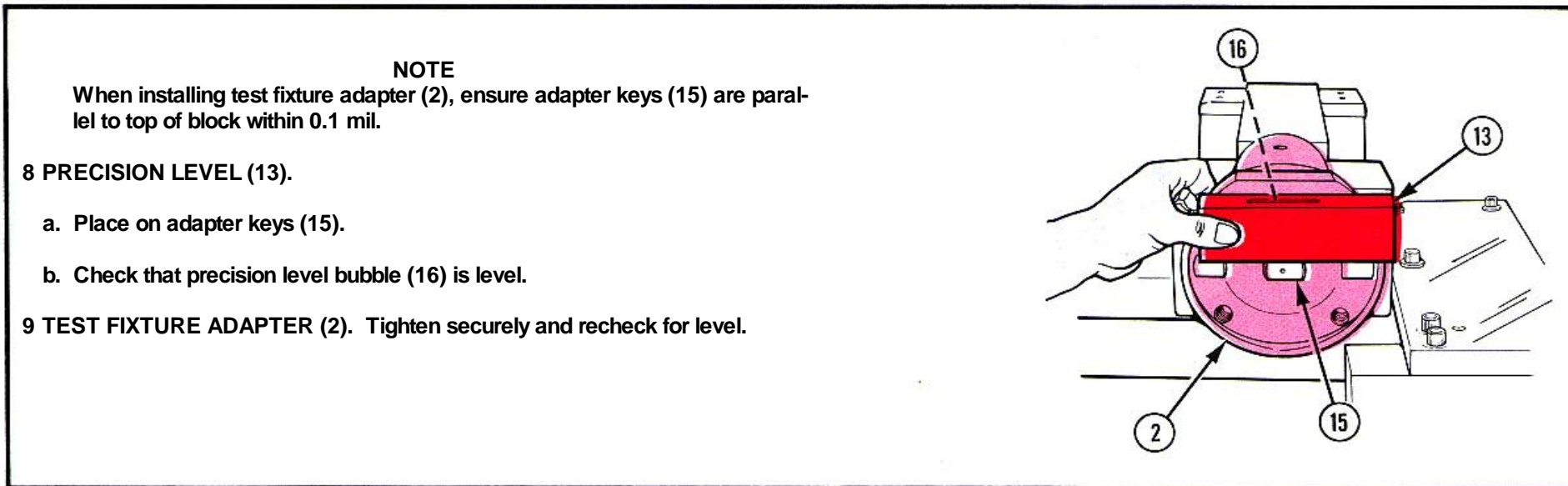
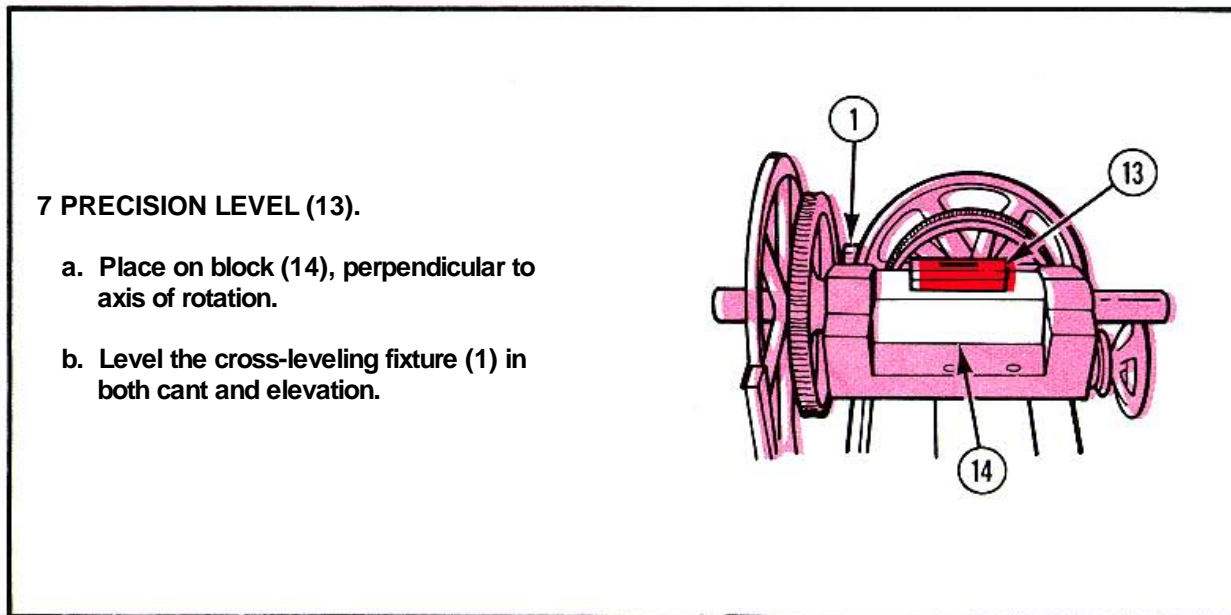
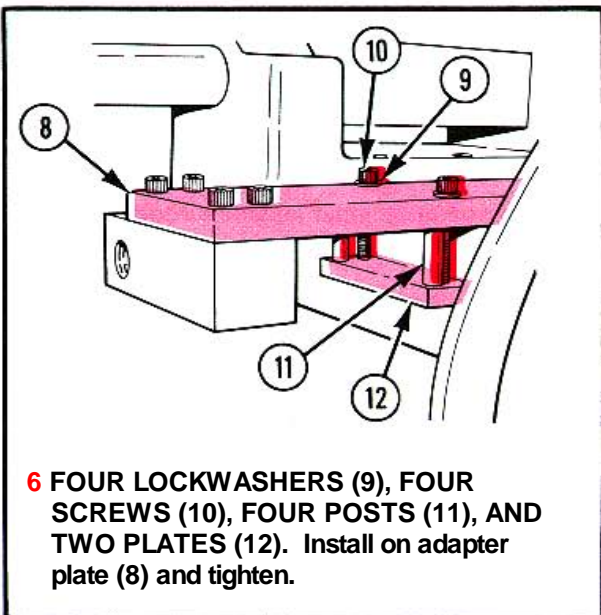
4-24. M171 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

SETTING UP AND ADJUSTING THE CROSS-LEVELING FIXTURE



4-24. M171 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

SETTING UP AND ADJUSTING THE CROSS-LEVELING FIXTURE (cont)



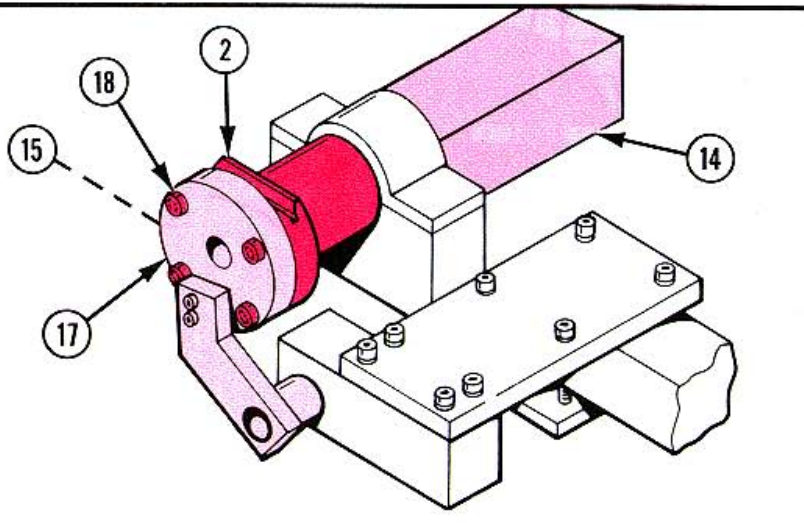
4-24. M171 MOUNT-- GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

SETTING UP AND ADJUSTING THE CROSS-LEVELING FIXTURE (cont)

**NOTE**

Ensure that adapter keys (15) and block (14) are parallel within 0.1 mil while performing steps 10 and 11.

**10 ALINEMENT TOOL (17).** Secure to test fixture adapter (2) with four screws (18).



**11 BLOCK ASSEMBLY (19).**

a. Aline with alinement tool (17) so that pin (20) will guide fit through both bores (21) without binding.

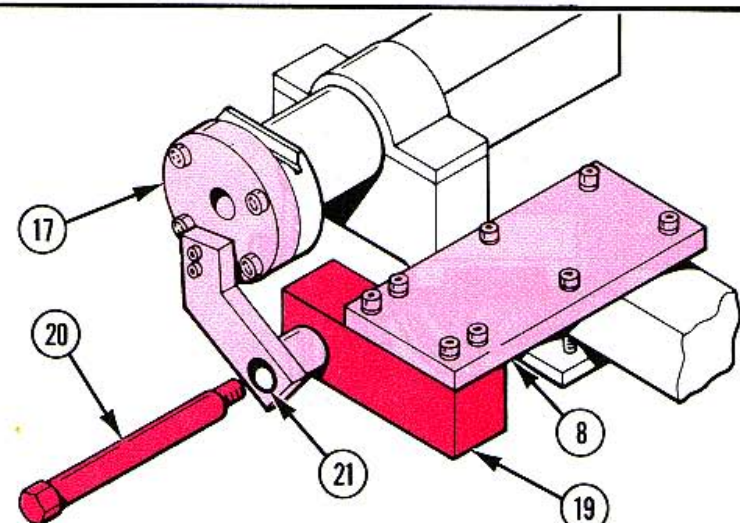
**NOTE**

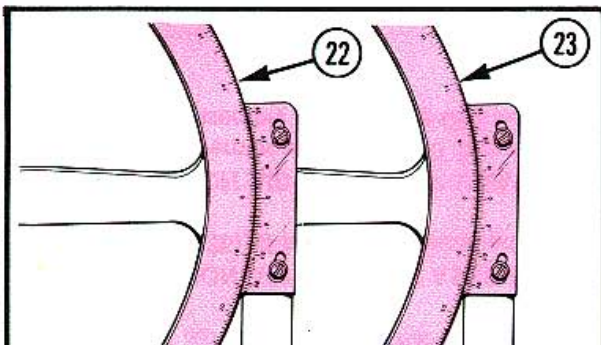
It may be necessary to shim adapter plate (8) for proper alinement of pin (20).

b. Secure adapter plate (8) in position.

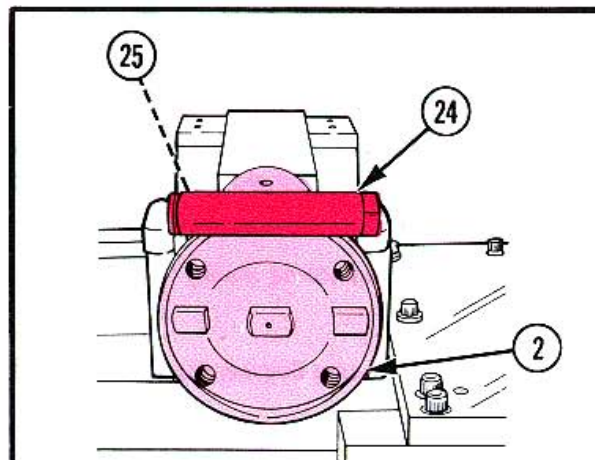
c. Recheck pin alinement.

d. Remove alinement tool (17).

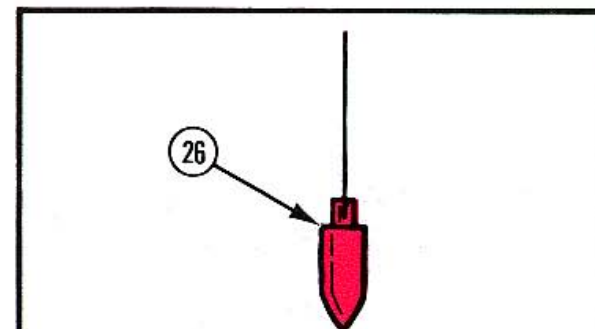




12 CANT VERNIER SCALE (22) AND ELEVATION VERNIER SCALE (23). Set to zero.



13 COLLIMATOR TELESCOPE (24). Place in V portion (25) of test fixture adapter (2).

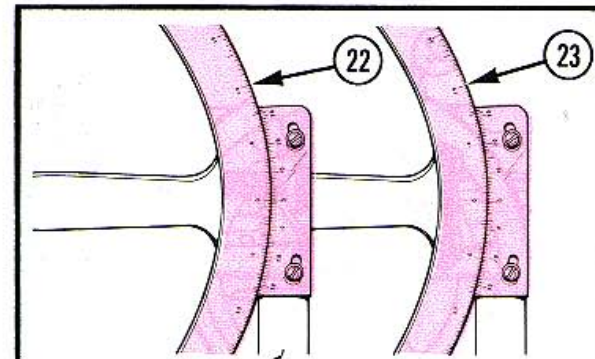
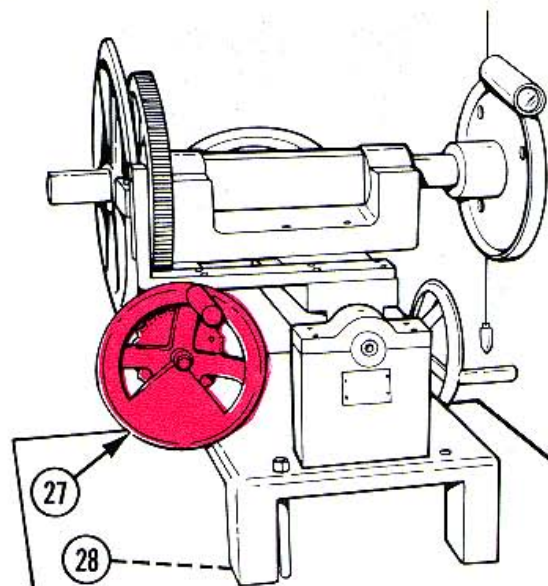


14 PLUMBLINE (26).

- a. Position approximately 10 feet (3.0 m) from collimator telescope.
- b. Check that plumbline is in view of the collimator telescope line of sight.

15 ELEVATION HANDWHEEL (27).

- a. Rotate and observe parallel between optical axis of collimator telescope and plumbline.
- b. If optical axis is not parallel with plumbline, adjust using shims (28).



16 CANT VERNIER SCALE (22). Reset to zero, if necessary.

17 ELEVATION VERNIER SCALE (23). Return to zero elevation, if necessary.



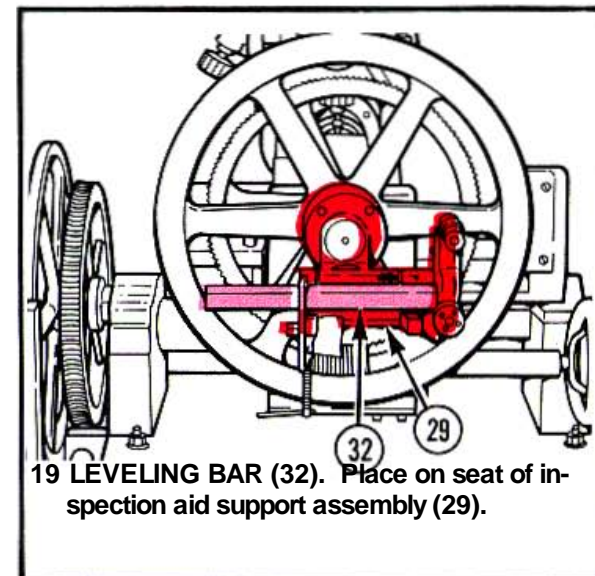
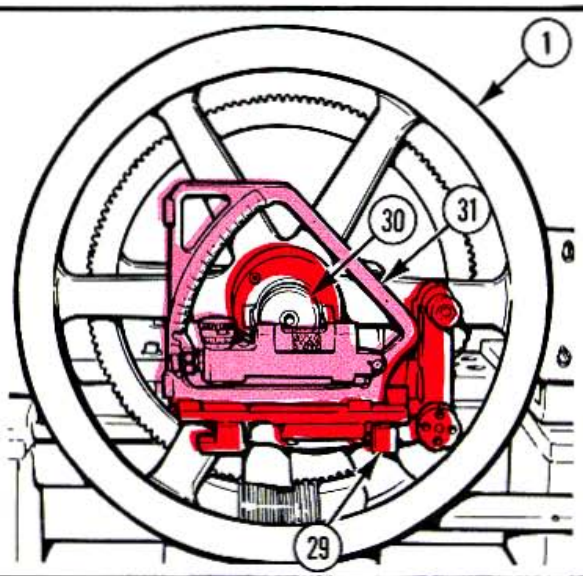
4-24. M171 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

SETTING UP AND ADJUSTING THE CROSS-LEVELING FIXTURE (cont)

**NOTE**

Check to make sure that cross-leveling fixture is still level in elevation and cant.

18 INSPECTION AID SUPPORT ASSEMBLY (29). Assemble to elevation shaft (30) on the elevation vernier scale side of the cross-leveling fixture (1). Set M1A2 gunner's quadrant (31) on inspection aid support assembly, set at zero, and level inspection aid support assembly (29) in elevation.



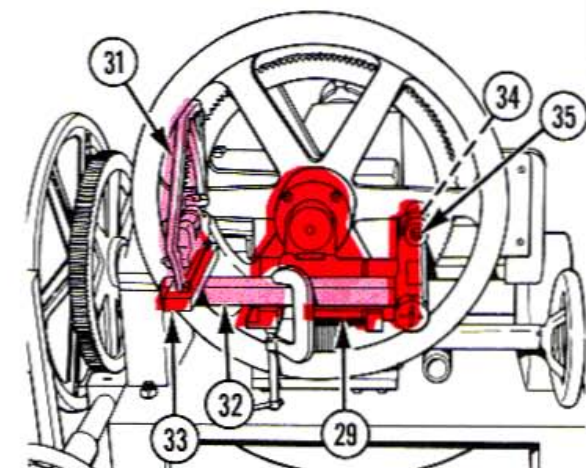
19 LEVELING BAR (32). Place on seat of inspection aid support assembly (29).

20 LEVELING BAR (33). Place across leveling bar (32).

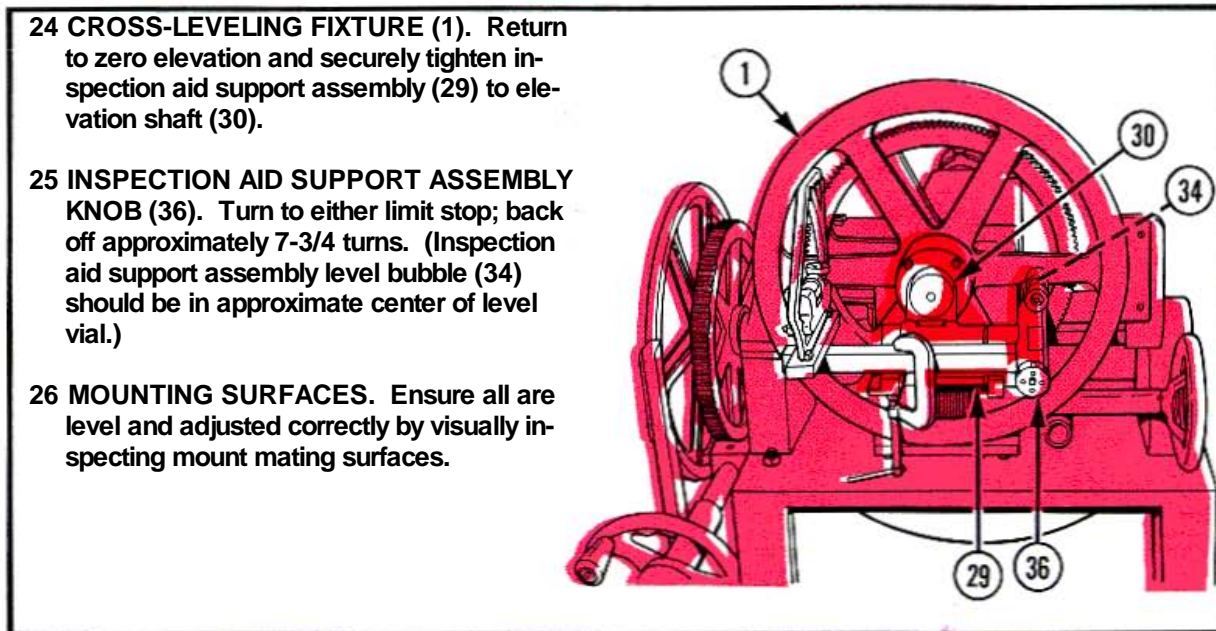
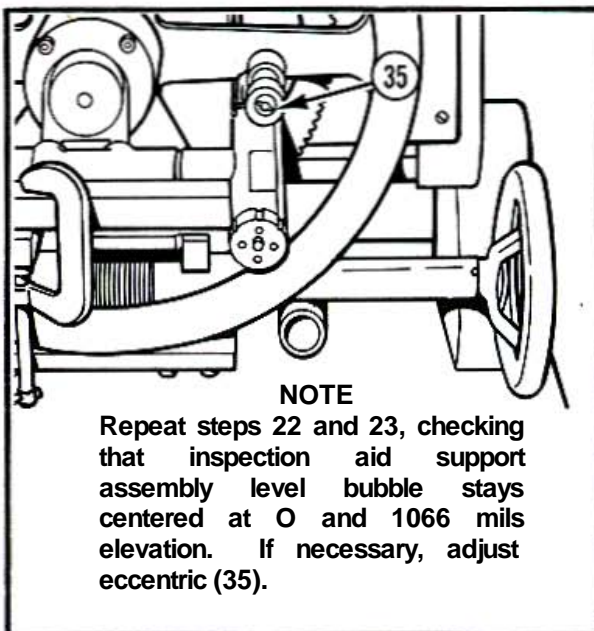
21 INSPECTION AID SUPPORT ASSEMBLY (29). Level in cant using leveling bars (32 and 33) and M1A2 gunner's quadrant (31).

22 INSPECTION AID SUPPORT ASSEMBLY LEVEL BUBBLE (34). Center by rotating eccentric (35), if not already centered.

23 INSPECTION AID SUPPORT ASSEMBLY (29). Rotate elevation handwheel until elevation vernier scale reads 60 degrees or 1066 mils. Check that inspection aid support assembly level bubble (34) stays centered.

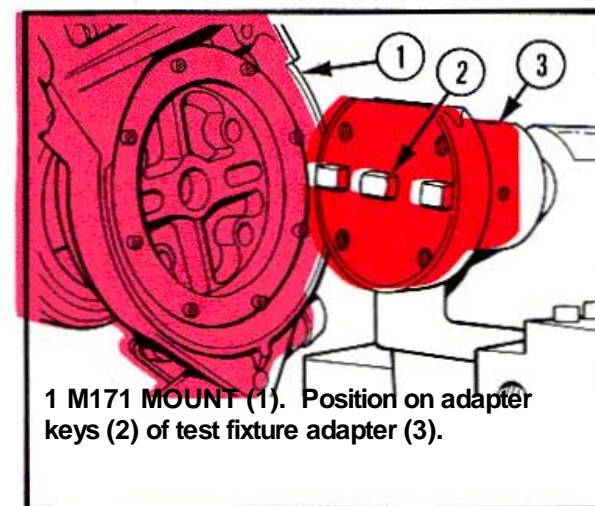
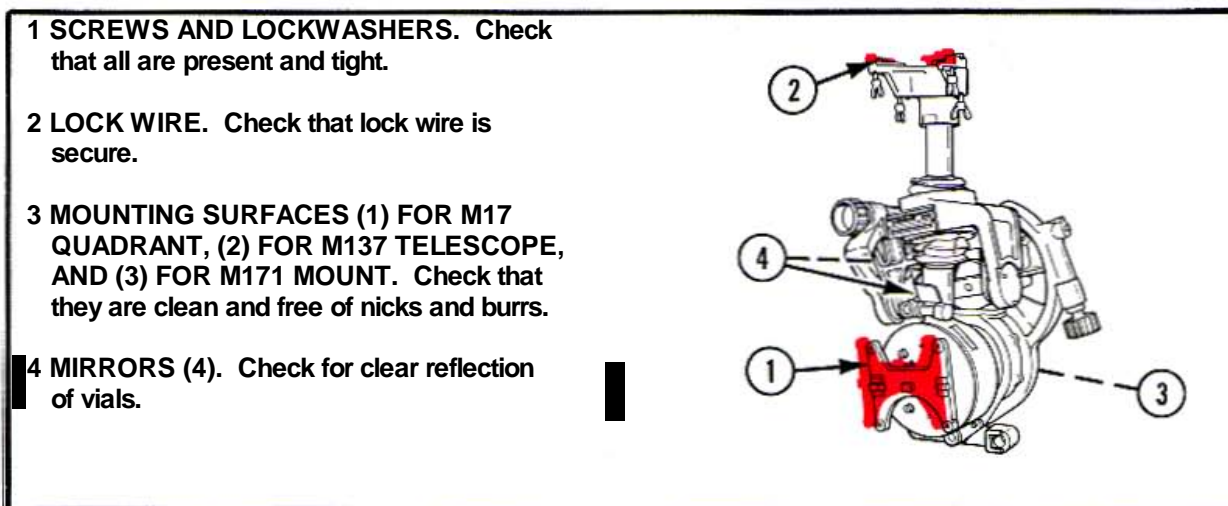






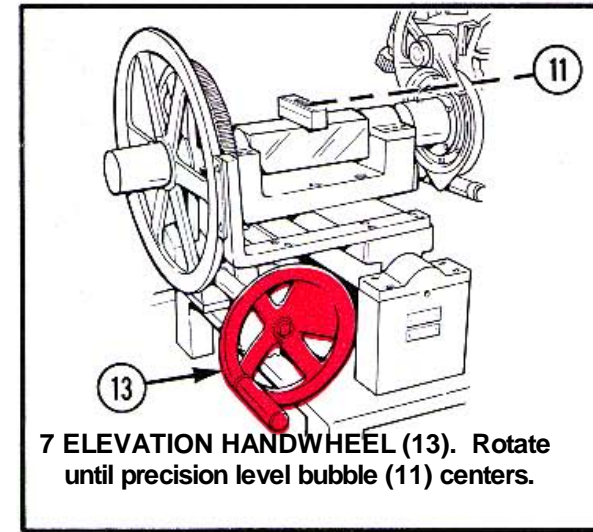
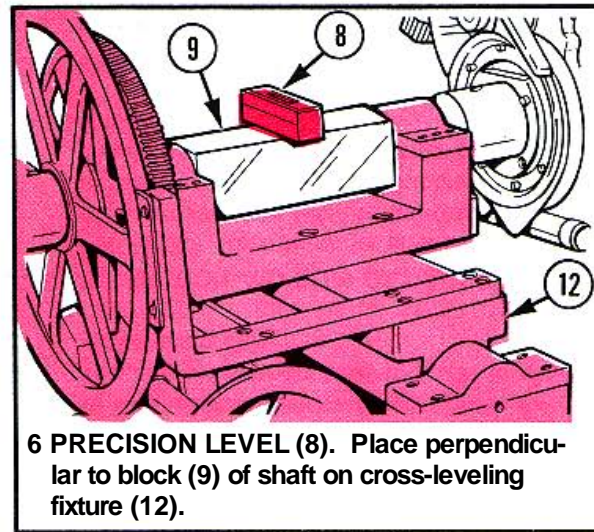
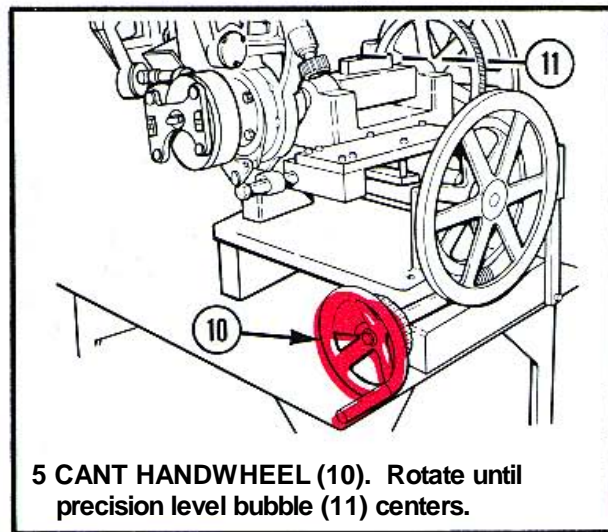
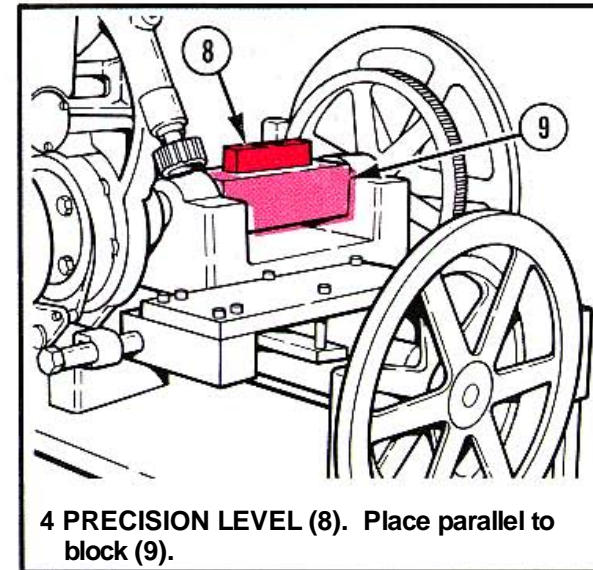
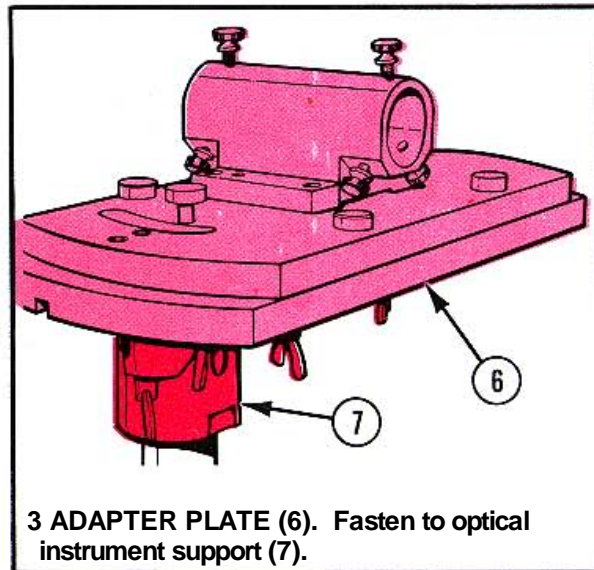
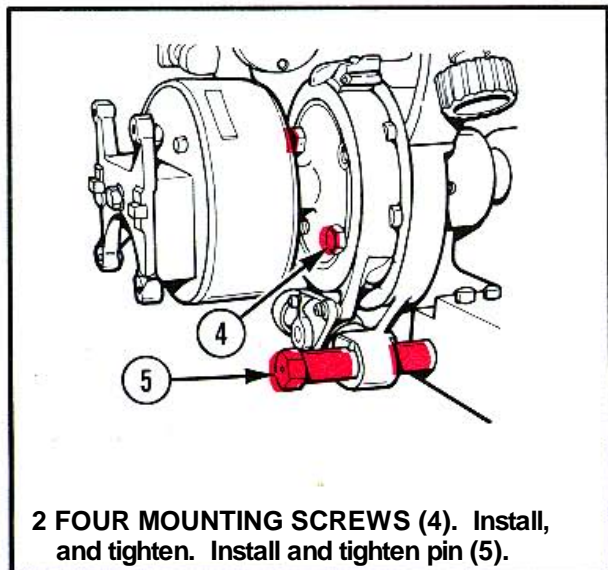
**VISUAL INSPECTION**

**MOUNTING THE M171 MOUNT ON CROSS-LEVELING FIXTURE**



4-24. M171 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

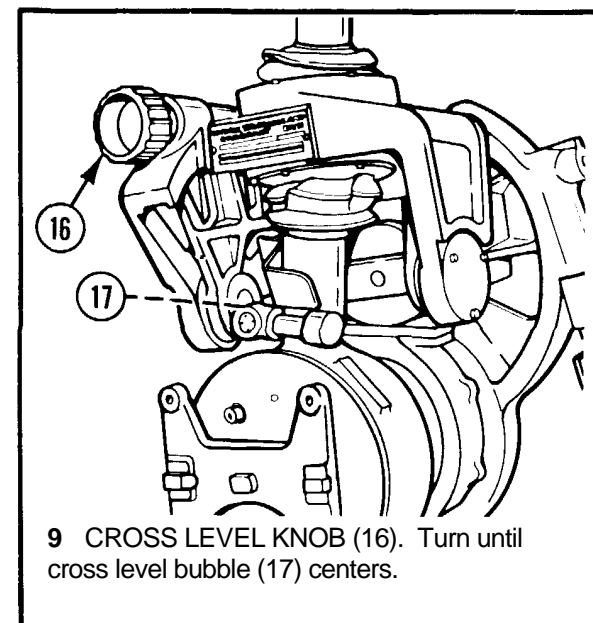
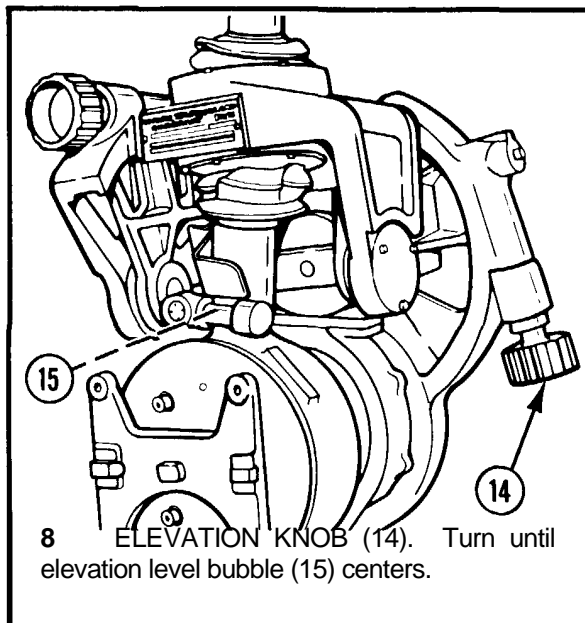
MOUNTING THE M171 MOUNT ON CROSS-LEVELING FIXTURE (cont)





**NOTE**

If new elevation or cross level vials were installed, do not perform steps 8 and 9. Instead, proceed to step 10.



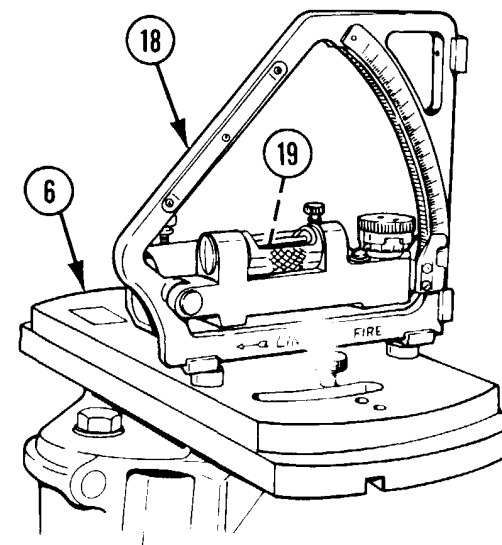
**10 M1A2 GUNNER'S QUADRANT (18).**

- a. Set at zero mils plus correction factor, if any, and place on adapter plate (6).

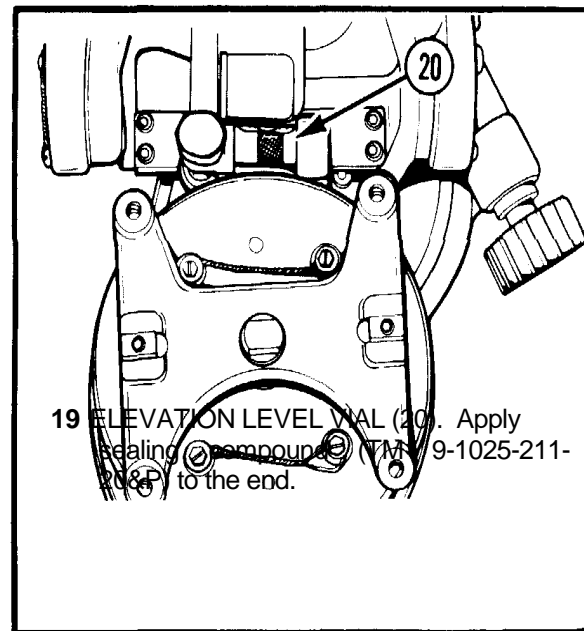
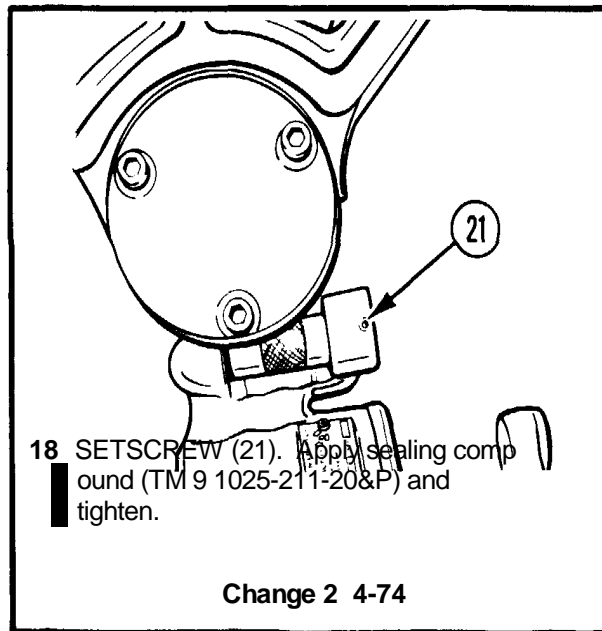
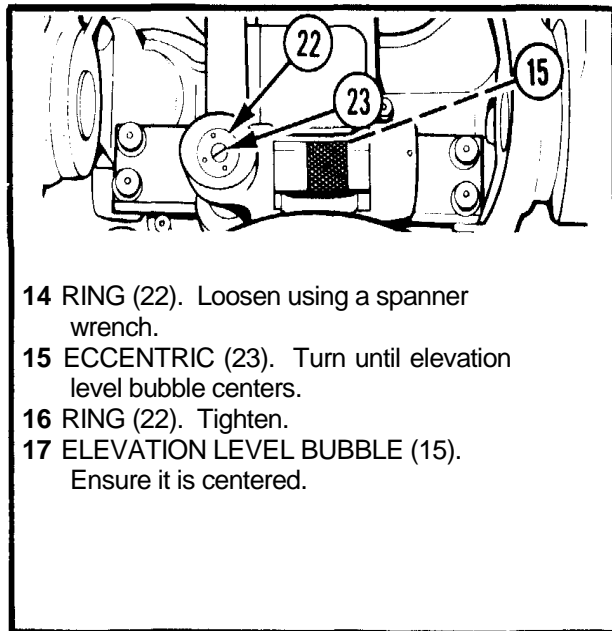
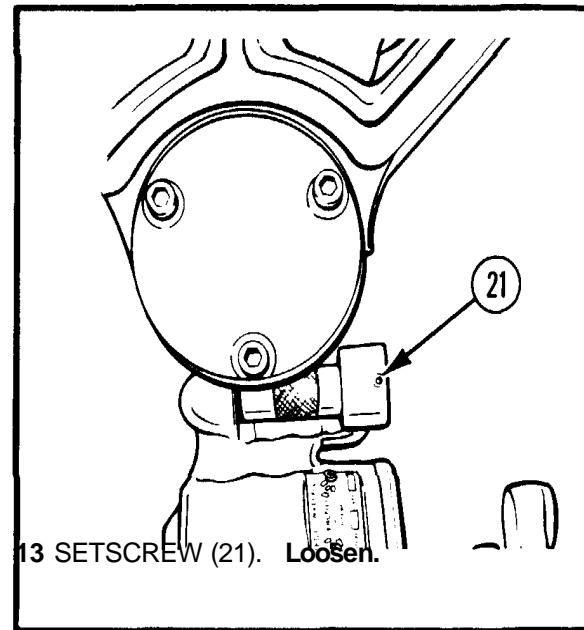
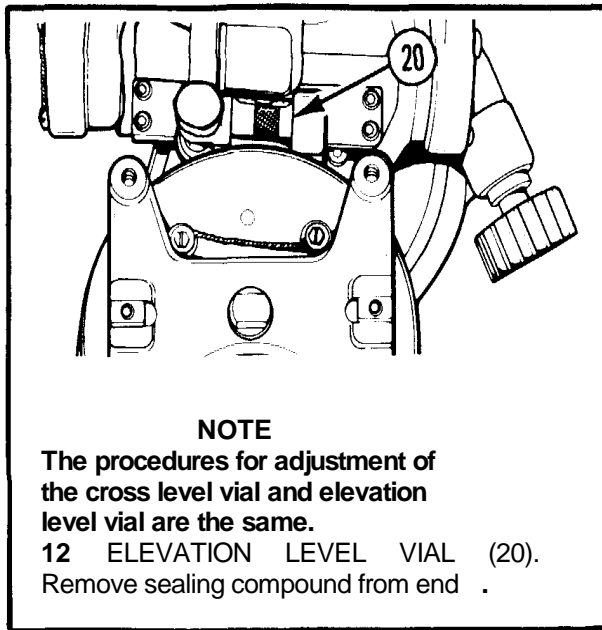
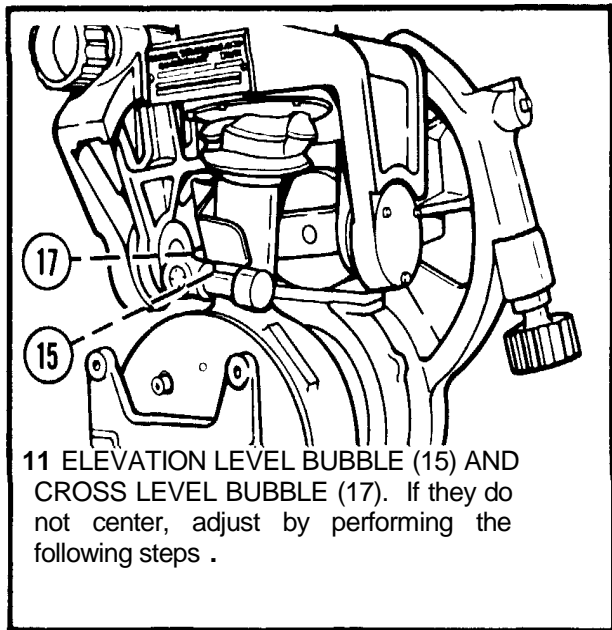
**NOTE**

**M1A2 gunner's quadrant line of fire arrow should be toward cant vernier scale for pitch level check and toward elevation vernier scale for cross level check.**

- b. M1A2 gunner's quadrant level bubble (19) should center in both cant and elevation. If not, center M1A2 gunner's quadrant level bubble using either the elevation knob or cross level knob as required.



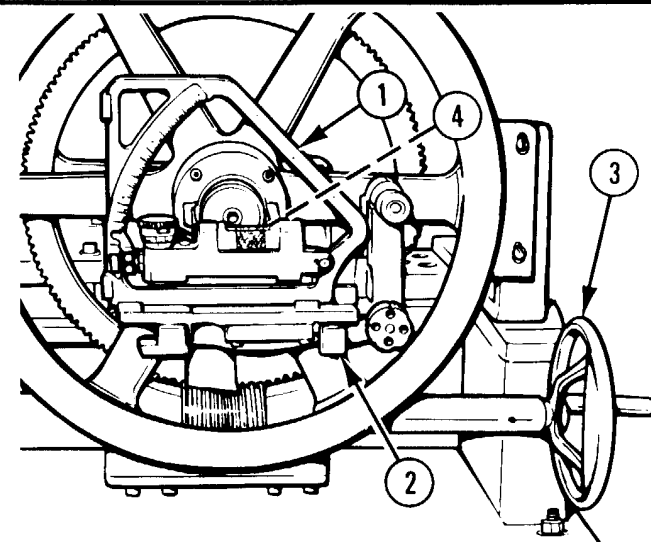
4-24. M171 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)  
 MOUNTING THE M171 MOUNT ON CROSS-LEVELING FIXTURE (cont)



## ELEVATION TRAVEL AND TRAVEL DEVIATION INSPECTION

## 1 M1A2 GUNNER'S QUADRANT (1).

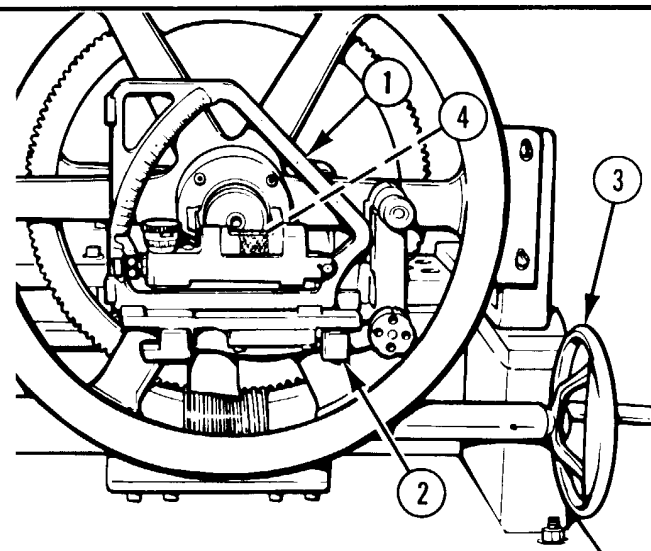
- a. Set to 1333 mils for elevation check, and place on inspection aid support assembly (2). Turn elevation handwheel (3) clockwise until M1A2 gunner's quadrant level bubble (4) centers.
- b. Set to 270 mils for depression and place on inspection aid support assembly (2). Turn elevation handwheel (3) counterclockwise until M1A2 gunner's quadrant level bubble (4) centers.



## NOTE

If M1A2 gunner's quadrant level bubble does not center in either step a or b, the M171 mount does not have sufficient travel. Return to depot maintenance.

- c. Set to zero and place on inspection aid support assembly (2). Turn elevation handwheel (3) clockwise until M1A2 gunner's quadrant level bubble (4) centers.





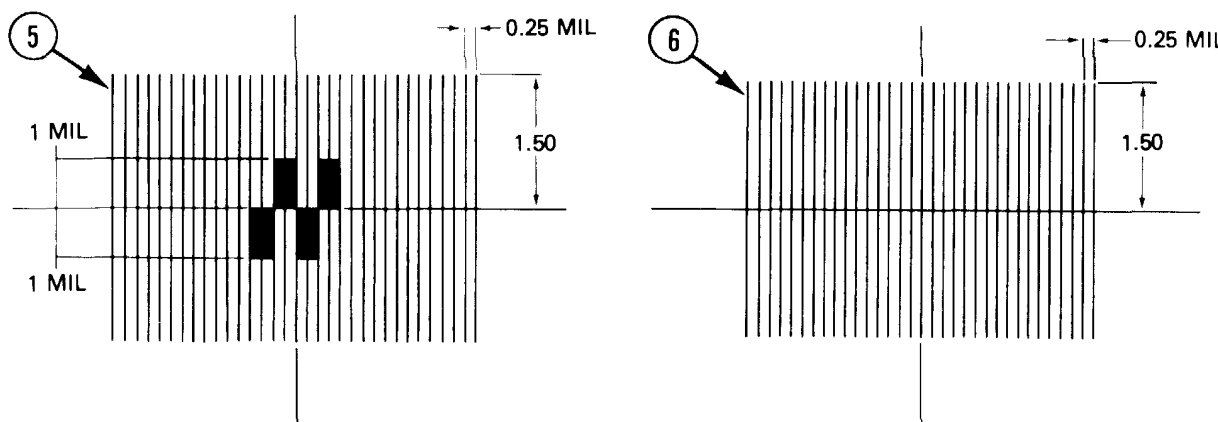
4-24. M171 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

ELEVATION TRAVEL AND TRAVEL DEVIATION INSPECTION (cont)

2 TARGETS (5 AND 6). Use any suitable material to locally fabricate targets.

**NOTE**

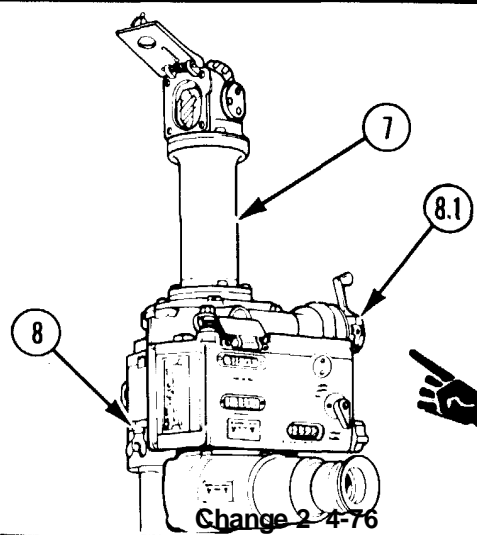
Target and plumbline should be positioned at a minimum of 40 feet (12.2 m) from cross-leveling fixture and alined to M137 telescope set at 4800 mils. The line of sight of the M137 telescope will be across the elevation vernier scale of cross-leveling fixture.



NOTE: Mil size =  $\frac{\text{Target distance (inches)}}{1000}$

3 M137 TELESCOPE (7).

- a. Secure to optical instrument support (8).
- b. Ensure cross-leveling fixture and M171 mount are cross leveled.
- c. Turn azimuth knob (8.1) clockwise to 4800 mils. Aline plumbline and target to the M137 telescope reticle.

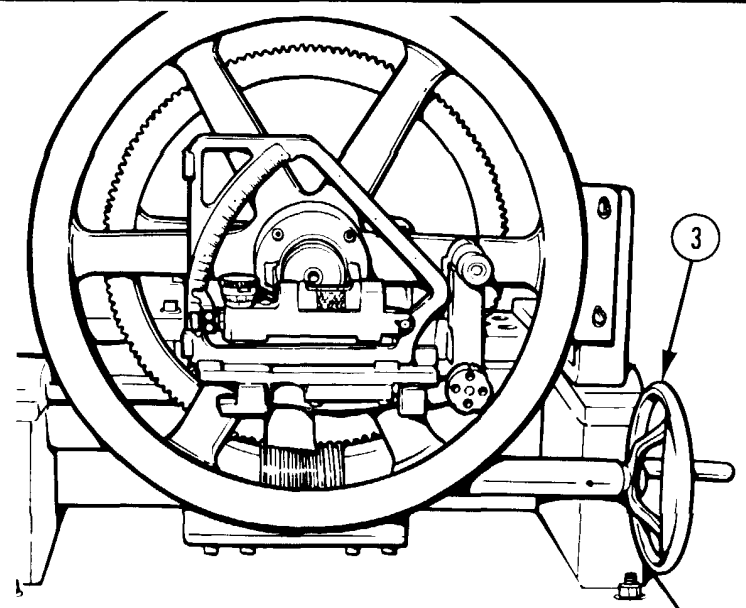


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**NOTE**

To ensure accuracy of travel deviation inspection, two repairmen may be required.

- 4 ELEVATION HANDWHEEL (3). Rotate from 270 mils depression thru 800 mils elevation (line of sight must not deviate more than 0.25 mil); rotate from 801 mils elevation thru 1333 mils elevation (line of sight must not deviate more than 0.50 mil).

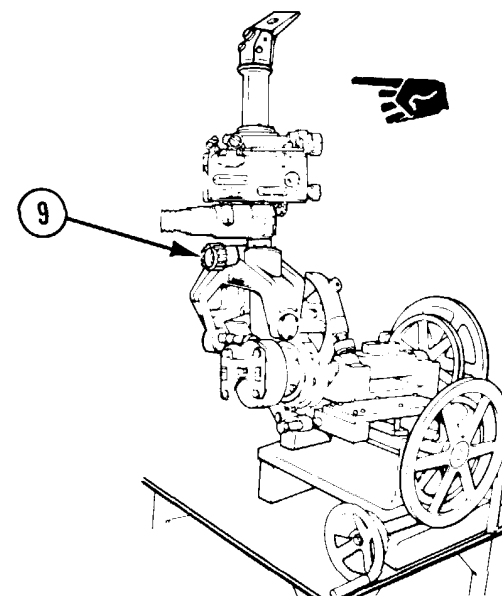


#### NOTE

Use M1A2 gunner's quadrant on adapter plate to ensure that optical instrument support is parallel and perpendicular to mounting surface of M171 mount within 0.5 mil.

If deviation exceeds 0.25 mil from -270 to 800 mils or 0.50 mil from 801 to 1333 mils, the M137 telescope reticle line must be brought in coincidence with center line of wall target. To accomplish this, perform the following steps.

- 5 CROSS LEVEL KNOB (9). Rotate clockwise and stop when coincidence is obtained.



4-24. M171 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

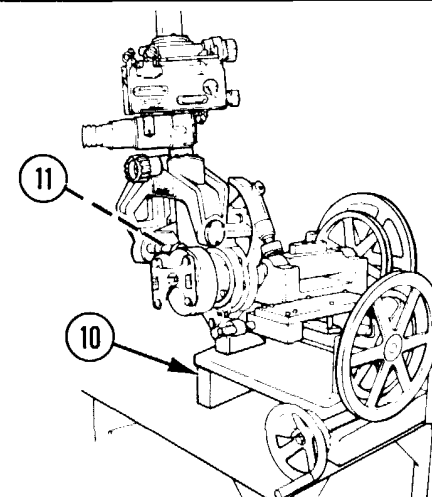
ELEVATION TRAVEL AND TRAVEL DEVIATION INSPECTION (cont)

6 CROSS-LEVELING FIXTURE (10). Return to zero elevation.

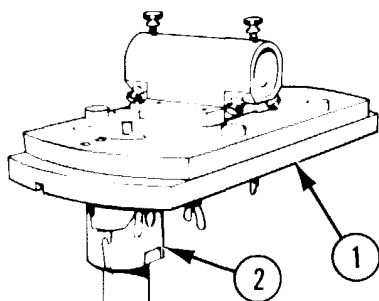
7 CROSS LEVEL BUBBLE (11). Recenter (steps 12 thru 19, p 4-74).

**NOTE**

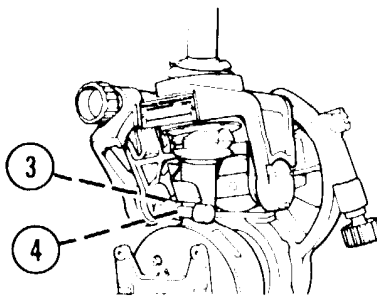
Sight on target and repeat step 4 above until deviation is less than 0.25 mil for -270 to 800 mils elevation and 0.50 mil for 801 thru 1333 mils elevation. If either deviation cannot be eliminated, the M171 mount is defective. Return to depot maintenance.



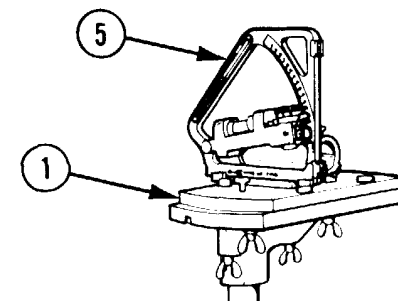
**CANT TRAVEL INSPECTION**



1 ADAPTER PLATE (1). Mount on optical instrument support (2).



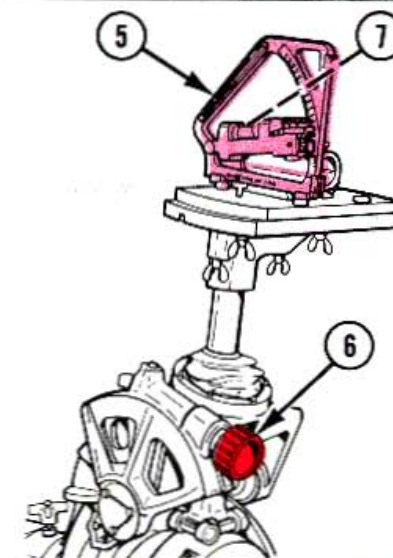
2 CROSS LEVEL BUBBLE (3) AND ELEVATION LEVEL BUBBLE (4). Center.



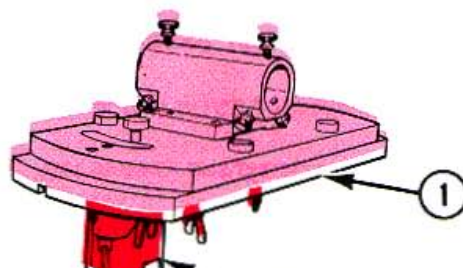
3 M1A2 GUNNER'S QUADRANT (5).

a. Set to 178 mils and place on adapter plate (1).

- b. Turn cross level knob (6) until M1A2 gunner's quadrant level bubble (7) centers.
- c. If M1A2 gunner's quadrant level bubble (7) does not center, M171 mount is defective.
- d. Reverse M1A2 gunner's quadrant (5).
- e. Turn cross level knob (6) until M1A2 gunner's quadrant level bubble (7) centers.
- f. If M1A2 gunner's quadrant level bubble (7) does not center, M171 mount is defective.



**CANT BACKLASH INSPECTION**

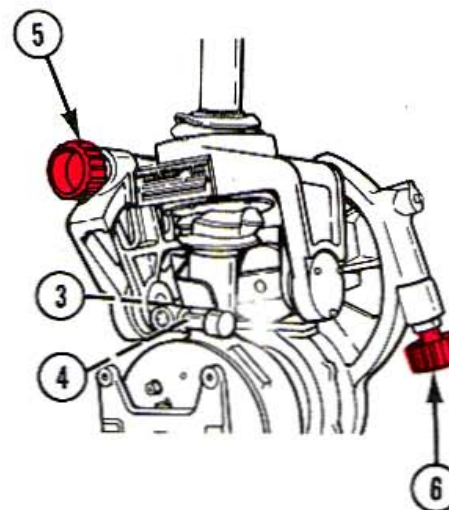


- 1 ADAPTER PLATE (1). Fasten to optical instrument support (2).

**NOTE**

When centering cross level vial and elevation level vial, final movement of cross level knob and elevation knob should be a clockwise motion.

- 2 CROSS LEVEL BUBBLE (3) AND ELEVATION LEVEL BUBBLE (4). Center using cross level knob (5) and elevation knob (6).

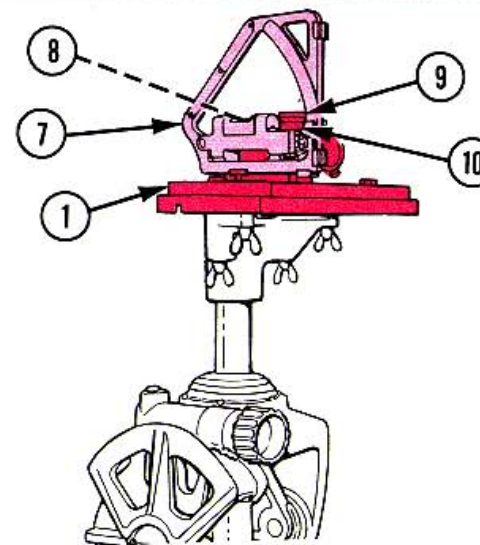


## 4-24. M171 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

## CANT BACKLASH INSPECTION (cont)

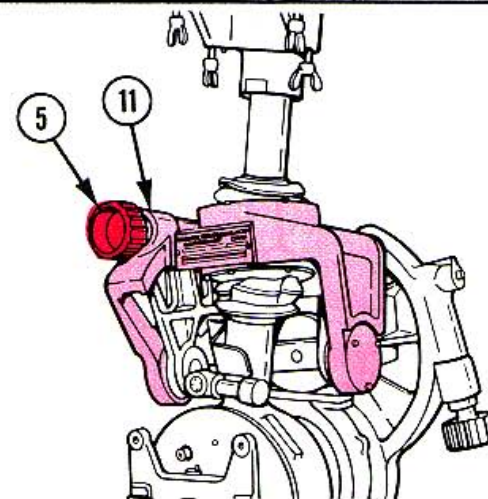
## 3 M1A2 GUNNER'S QUADRANT (7).

- a. Set to zero, and place on adapter plate (1).
- b. Check that M1A2 gunner's quadrant level bubble (8) is centered.
- c. If not centered, use micrometer knob (9) to center.
- d. Record reading of micrometer (10).

**NOTE**

While performing backlash check, a C-clamp and pointer may be used instead of a scribed line on cross level knob.

- 4 CROSS LEVEL KNOB (5) AND OPTICAL INSTRUMENT ROCKER ASSEMBLY (11). Scribe one line across both.



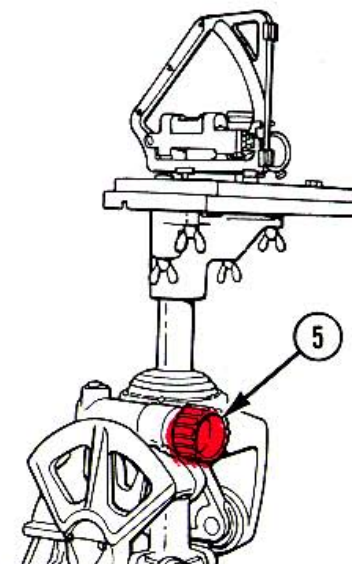


**NOTE**

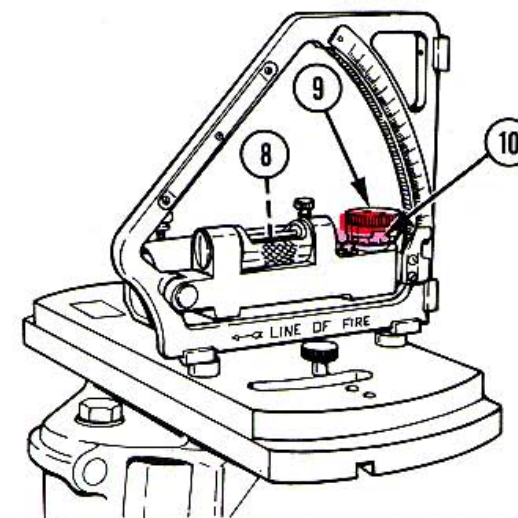
Do not go past the scribed line when turning counterclockwise. Ensure scribed lines are in perfect alignment.

**5 CROSS LEVEL KNOB (5).**

- a. Turn at least 1/2 turn clockwise.
- b. Turn counterclockwise until scribed lines are aligned.

**6 M1A2 GUNNER'S QUADRANT LEVEL BUBBLE (8).**

- a. With scribed lines aligned, recenter if necessary, using micrometer knob (9).
- b. Record reading of micrometer (10).
- c. Compare reading with reading recorded in step 3.
- d. If readings differ over 1.5 mils, backlash is excessive. Perform steps 3 and 4 (P 4-10). If backlash is still excessive, return to depot maintenance.



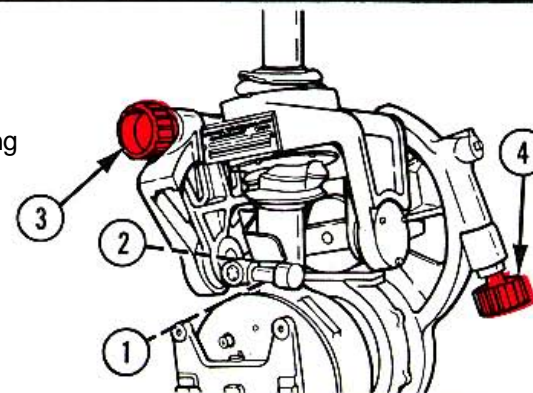
4-24. M171 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

PITCH LEVEL BACKLASH INSPECTION

**NOTE**

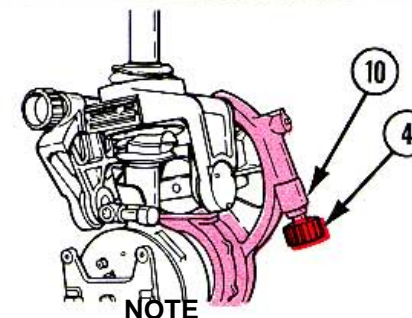
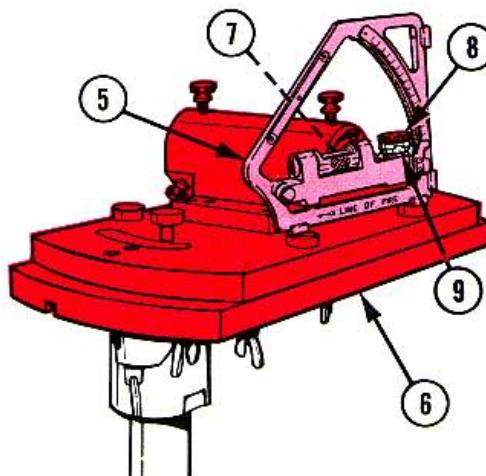
Final movement of cross level knob and elevation knob should be a clockwise motion when centering cross level vial and elevation level vial.

- 1 ELEVATION LEVEL BUBBLE (1) AND CROSS LEVEL BUBBLE (2). Center using cross level knob (3) and elevation knob (4).



2 M1A2 GUNNER'S QUADRANT (5).

- a. Set at zero, and place on adapter plate (6).
- b. M1A2 gunner's quadrant level bubble (7) should be centered. If not centered, use micrometer knob (8) to center.
- c. Record reading on micrometer (9).



**NOTE**

A C-clamp and pointer may be used instead of a scribed line on elevation knob while performing backlash check.

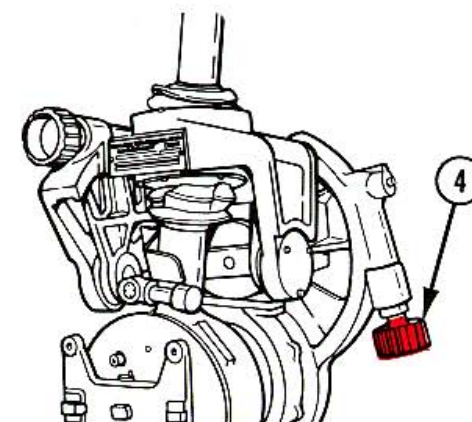
- 3 ELEVATION KNOB (4) AND HOUSING ASSEMBLY (10). Scribe one line across both.

**NOTE**

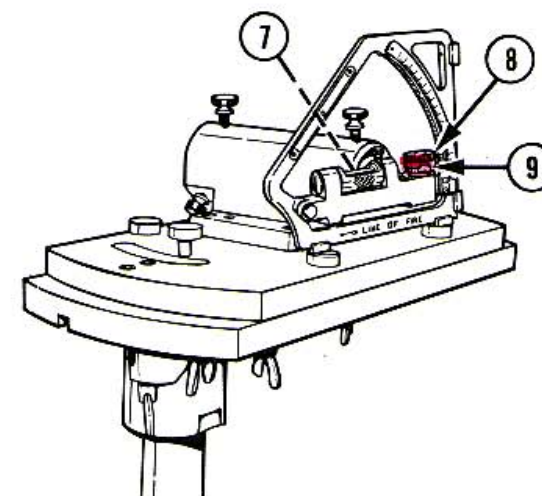
Do not go past scribed line when turning counterclockwise. Ensure scribed lines are in perfect alinement.

**4 ELEVATION KNOB (4).**

- a. Turn at least 1/2 turn clockwise.
- b. Turn counterclockwise until scribed lines are alined.

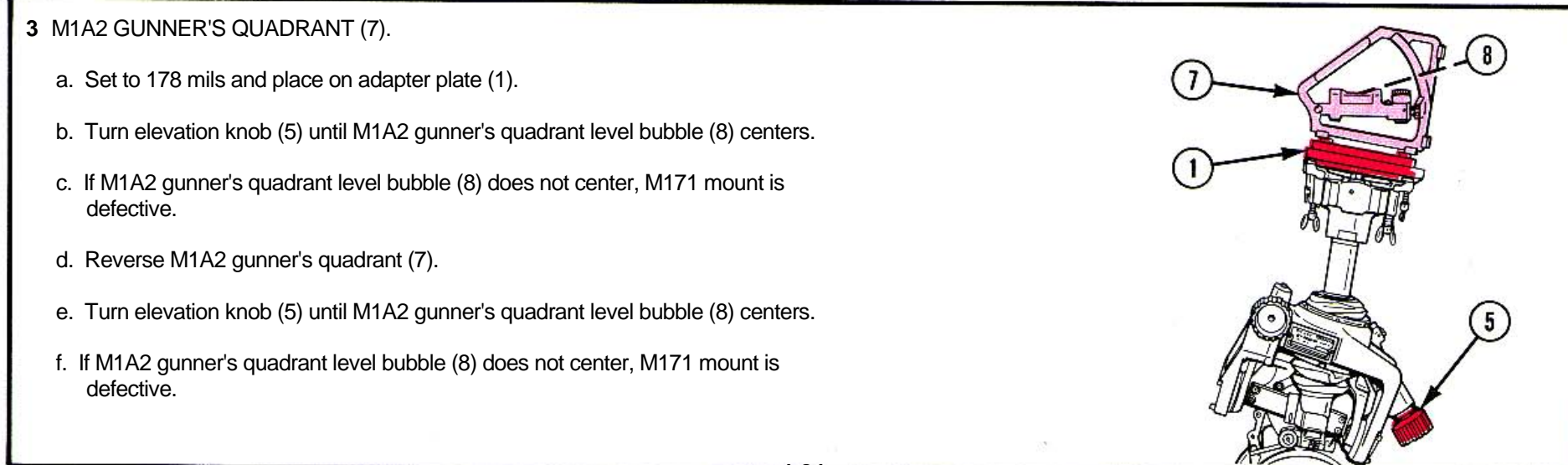
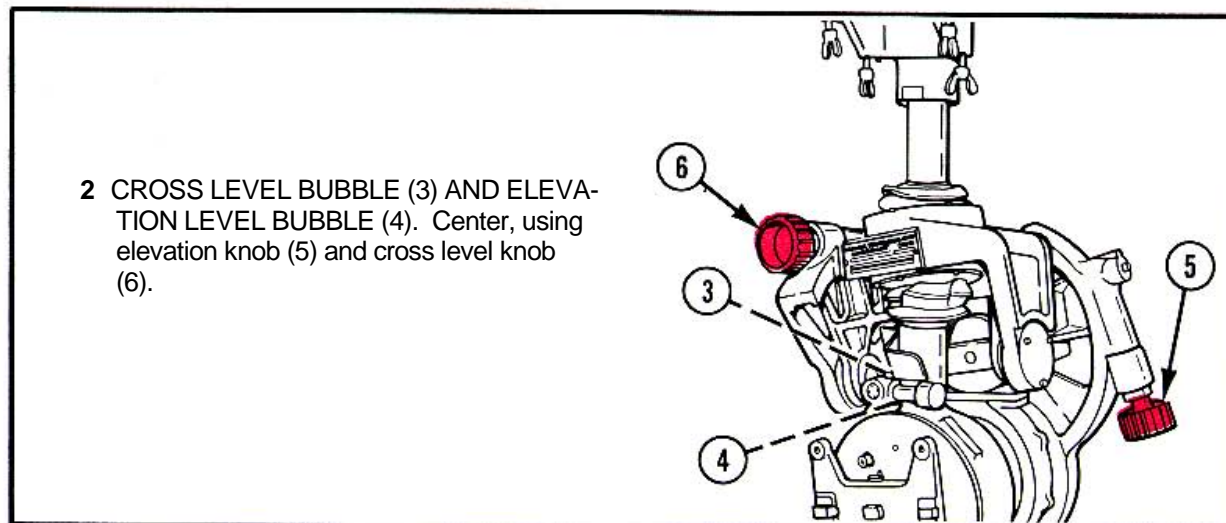
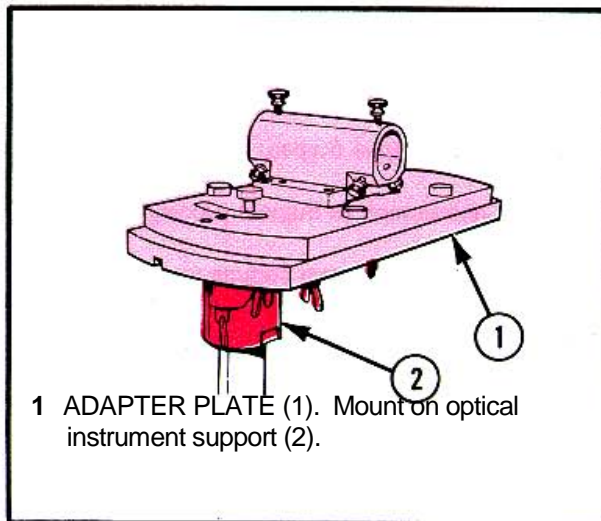
**5 M1A2 GUNNER'S QUADRANT LEVEL BUBBLE (7).**

- a. With scribed lines alined, recenter if necessary using micrometer knob (8).
- b. Record reading of micrometer (9).
- c. Compare reading with reading recorded in step 2.
- d. If readings differ over 1.5 mils, backlash is excessive. Perform step 6 (p 4-11). If backlash is still excessive, return to depot maintenance.

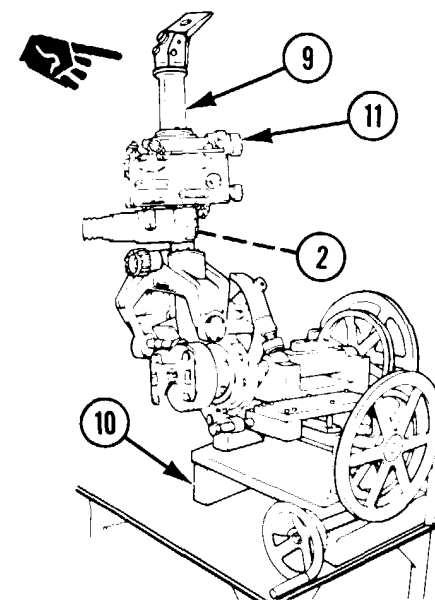


4-24. M171 MOUNT--GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

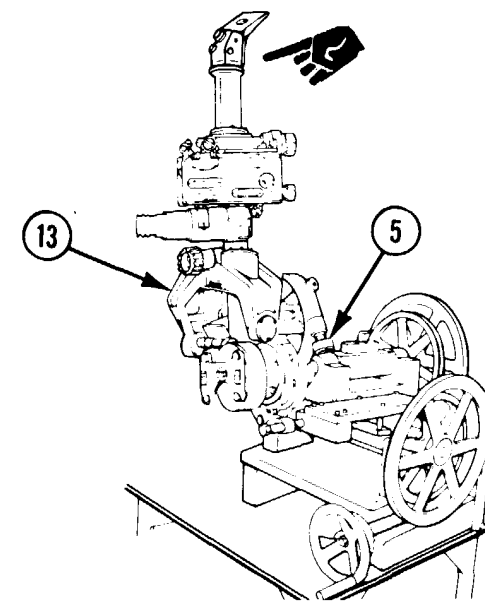
PITCH LEVEL AND PLUMB TRAVEL INSPECTION



- 4 M137 TELESCOPE (9). Secure to optical instrument support (2).
- 5 CROSS-LEVELING FIXTURE (10). Level and recenter the cross level bubble and elevation level bubble (p 4-74).
- 6 AZIMUTH KNOB (11). Rotate clockwise to 0000 mils. Aline plumblines to M137 telescope reticle.



- 7 M171 MOUNT (12).
- Turn elevation knob (5) clockwise until it stops.
  - Turn counterclockwise until it stops.
  - Line of sight must not deviate over 0.5 mil (total spread). If deviation is in excess of 0.5 mil, return to depot maintenance.



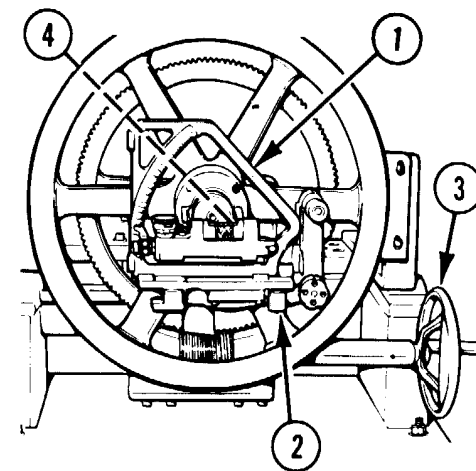


4-24. M171 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont) I

MOUNT RIGIDITY INSPECTION

1 M1A2 GUNNER'S QUADRANT (1).

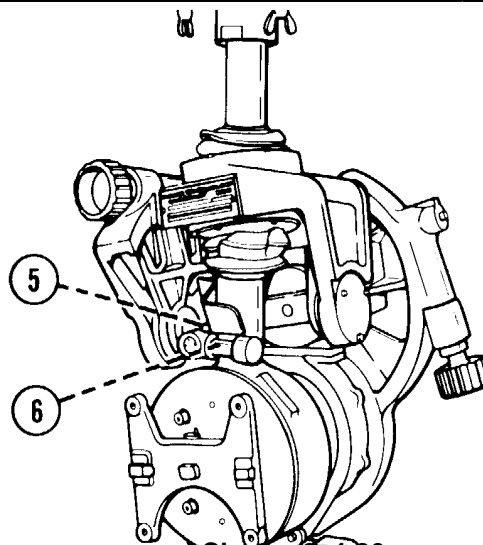
- a. Set to zero mil.
- b. Place on inspection aid support assembly (2) and turn elevation handwheel (3) until M1A2 gunner's quadrant level bubble (4) centers.



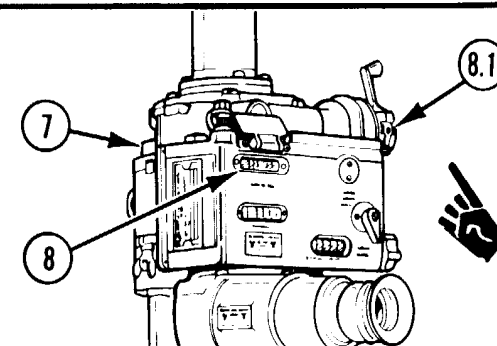
**NOTE**

Cross-leveling fixture should be releveled in elevation and cant before checking zero setting on elevation vernier scale.

2 CROSS LEVEL BUBBLE (5) AND ELEVATION LEVEL BUBBLE (6). Center.



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- 3 AZIMUTH KNOB (8.1). Rotate clockwise to 4800 mils on azimuth counter. Align target to reticle line.

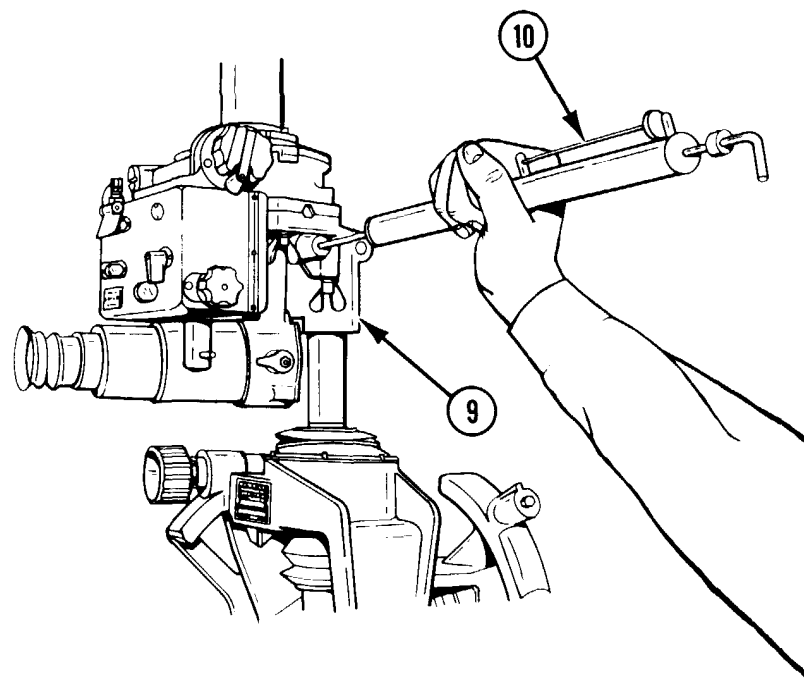
**4 OPTICAL INSTRUMENT SUPPORT (9).**

- a. While sighting on target, use push-pull gage (10); and apply 20-lb (9.07-kg) load on right side, 2.3 inches (5.84 cm) from center of optical instrument support (9).
- b. Release load and record amount of movement.
- c. Place push-pull gage (10) on left side of optical instrument support (9); and apply 20-lb (9.07-kg) load, 2.3 inches (5.84 cm) from center of optical instrument support (9).
- d. Release load and record amount of movement.
- e. Total of steps b and d must not exceed total movement listed in table 4-4.

**NOTE**

- If movement exceeds amount allowed in table 4-4, recheck M171 mount for proper assembly. If movement still exceeds amount
- allowed in table 4-4, return to depot maintenance.

- f. Repeat steps 1 thru 4 using elevations listed in table 4-4.



**Table 4-4. MOUNT RIGIDITY INSPECTION-ELEVATION, CANT, AND TOTAL MOVEMENT DATA**

Elevation (mils)	Elevation (degrees)	Cant angle (mils)	Total movement (mils)
0	0°	0	0.25
800	44° 54'	0	0.75
1100	51° 53'	0	1.75
1333	74° 59'	0	3.50

4-24. M171 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

**AZIMUTH CORRECTION INSPECTION**

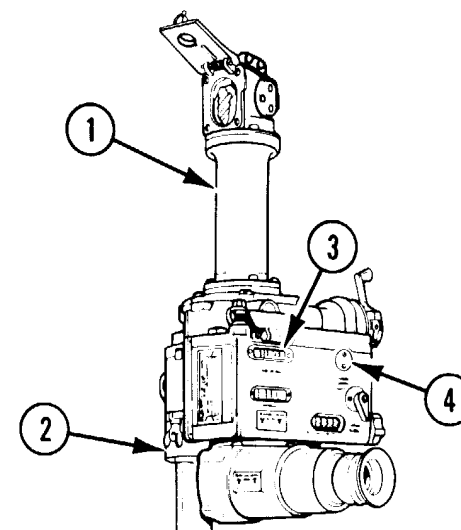
1 M137 TELESCOPE (1).

- a. Secure to optical instrument support (2).
- b. Level the cross-leveling fixture in elevation and cant.

**NOTE**

**Ensure cross level bubble and elevation level bubble on M171 mount are centered.**

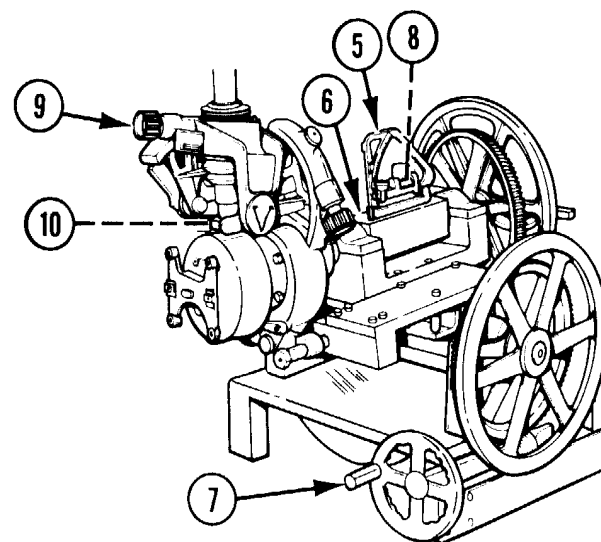
- c. Set azimuth counter (3) at 4800 mils.
- d. Release azimuth counter eccentric (4), aline M137 telescope reticle line on wall target, and engage azimuth counter eccentric (4).



2 M1A2 GUNNER'S QUADRANT (5). Set at 88.9 mils and place on block (6).

3 CANT HANDWHEEL (7). Turn until M1A2 gunner's quadrant level bubble (8) centers.

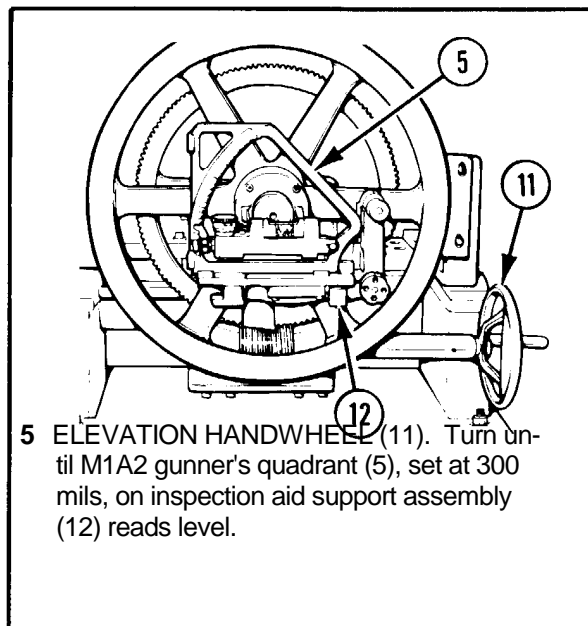
4 CROSS LEVEL KNOB (9). Turn to recenter cross level bubble (10).



**NOTE**

After cant is set into the cross-leveling fixture, recenter inspection aid support assembly level bubble when elevation settings are applied.

If test fixture is not equipped with inspection aid support assembly, set vernier scale at 16° 56' elevation .



5 ELEVATION HANDWHEEL (11). Turn until M1A2 gunner's quadrant (5), set at 300 mils, on inspection aid support assembly (12) reads level.

**NOTE**

After each elevation setting, re-center elevation level bubble.

When M137 telescope is alined on target, final movement of azimuth knob should be in a clockwise direction .

**6 M138 TELESCOPE (1).**

- a. Look through eyeshield (2) and aline M137 telescope reticle line on wall target.

**NOTE**

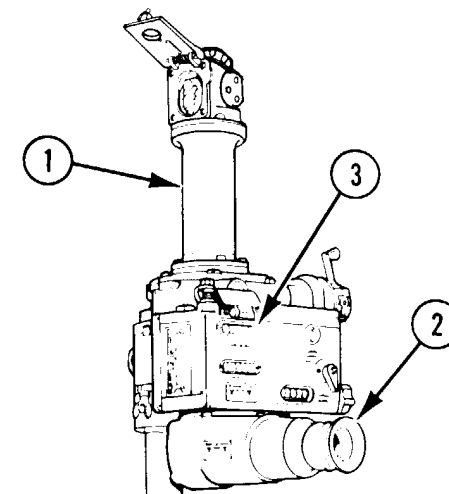
The variance in readings is dependent upon which way the 88.9 mils is applied to the fixture. The 27 mils ± .3 mil would be subtracted from the 4800-mil reading.

- b. Azimuth counter (3) should read 4837 mils ± 0.3 mil or 4773 mils ± 0.3 mil.
- c. Repeat steps 2 thru 6b using elevations, cant angles, azimuth

- corrections, and tolerances in table 4-5.
- d. Repeat steps 2 thru 6b, setting cant in opposite direction.

**NOTE**

If azimuth counter readings cannot be obtained, check to ensure proper maintenance procedures were followed when the M171 mount was reassembled. If azimuth correction readings are still unobtainable, there is a possibility of excessively worn or bent depot parts. Return the M171 mount to depot maintenance .



4 24. M171 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

AZIMUTH CORRECTION INSPECTION (cont)

■ Table 4-5. AZIMUTH CORRECTION DATA

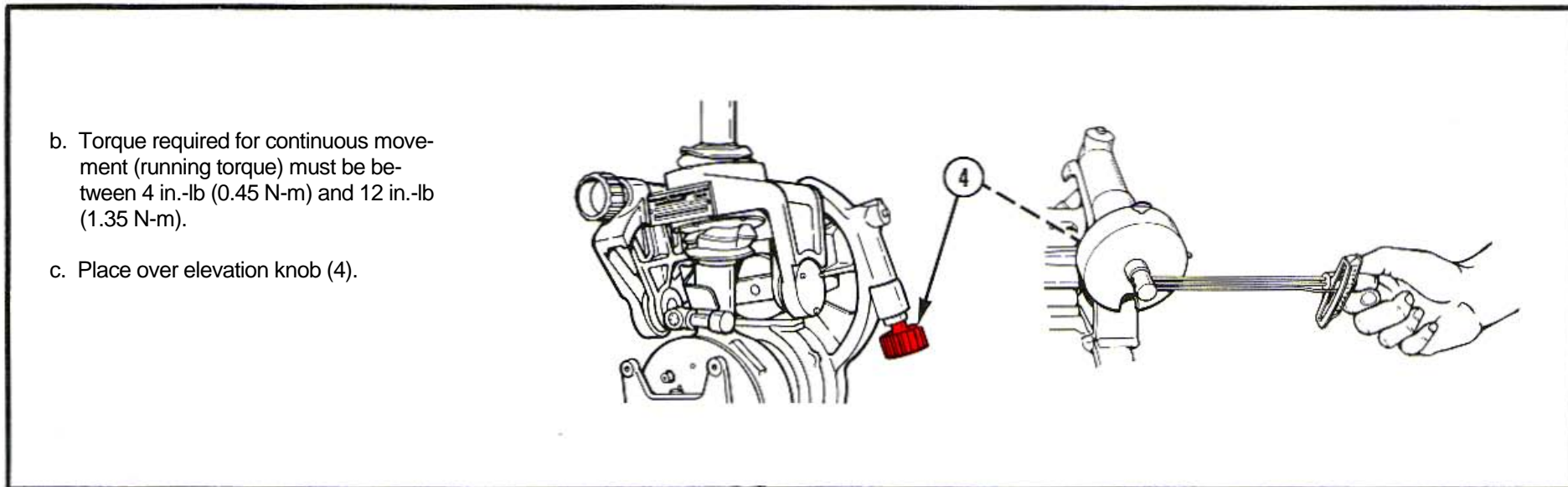
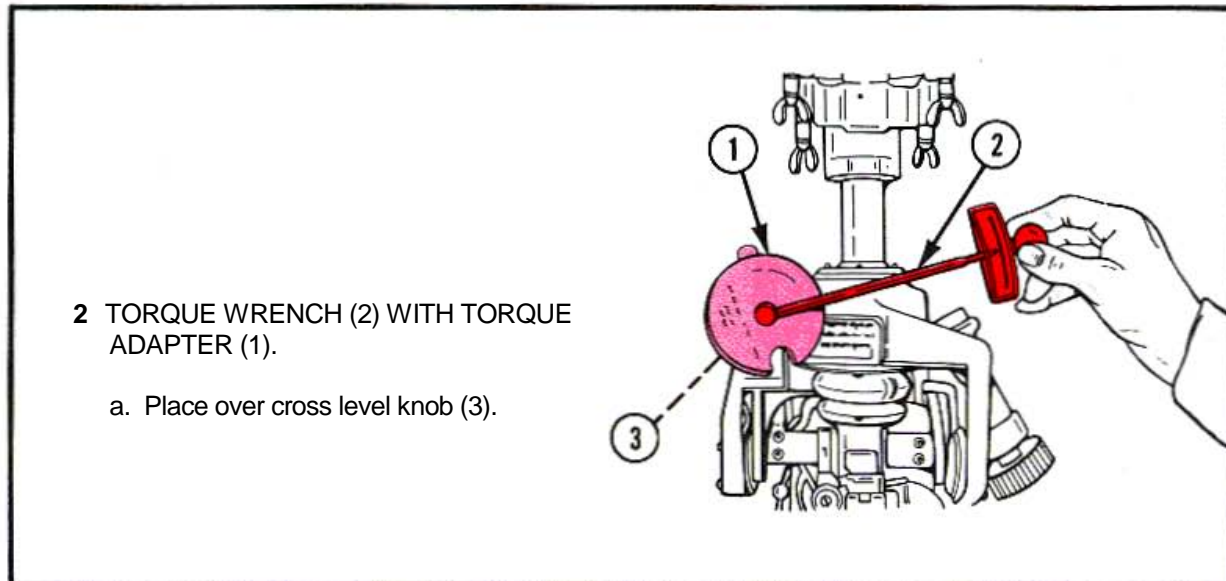
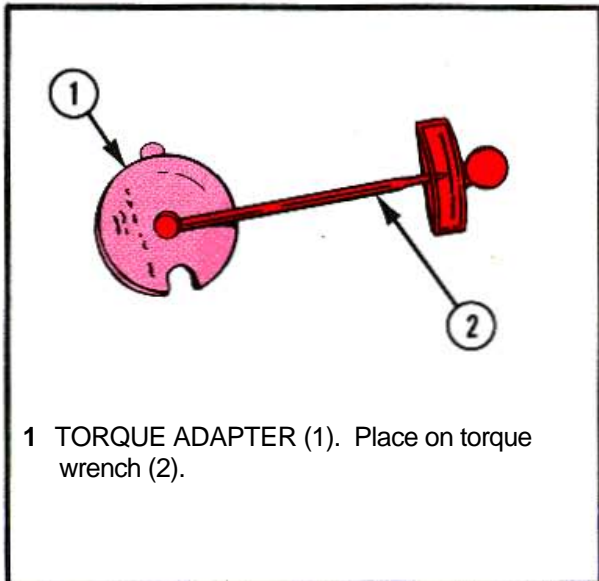
Reference elevation (mils)	Cant angle (mils)	Azimuth correction (mils)	Tolerance (mils)
300	88.9	27.0	0.3
600	88.9	59.6	0.7
900	88.9	108.8	1.5
1200	88.9	216.8	1.8
300	177.8	54.5	0.6
600	177.8	120.3	1.0
1100	177.8	342.4	2.0

**NOTE**

When M171 mount is canted 88.9 and 177.8 mils below zero, the azimuth corrections will be added to the 4800 mil azimuth counter reading. When M 171 mount is canted 88.9 and 177.8 mils above zero, the azimuth corrections will be subtracted from the 4800 mil azimuth counter reading.



**TORQUE INSPECTION**

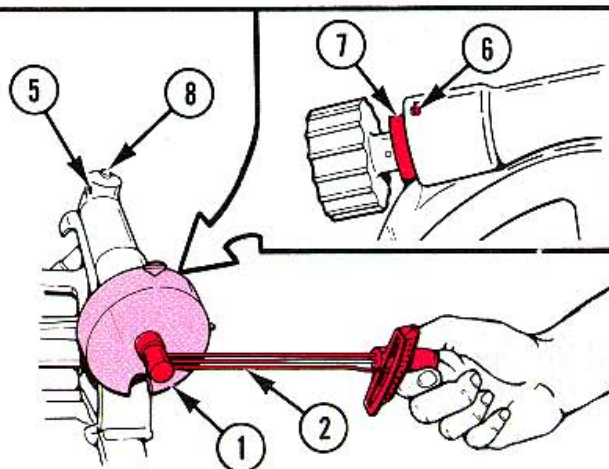


4-24. M171 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

TORQUE INSPECTION (cont)

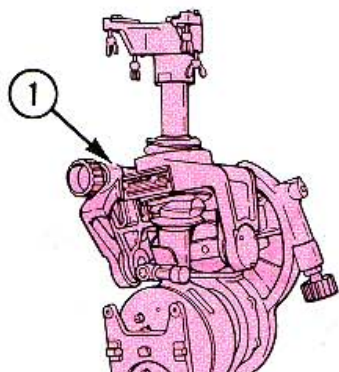
2 TORQUE WRENCH (2) WITH TORQUE ADAPTER (1). (cont)

- d. Torque required for continuous movement (running torque) must be between 4 in.-lb (0.45 N-m) and 12 in.-lb (1.35 N-m).
- e. If torque is not met for cross level knob or elevation knob, loosen set-screws (5 and 6). Tighten or loosen ring (7) or plug (8).



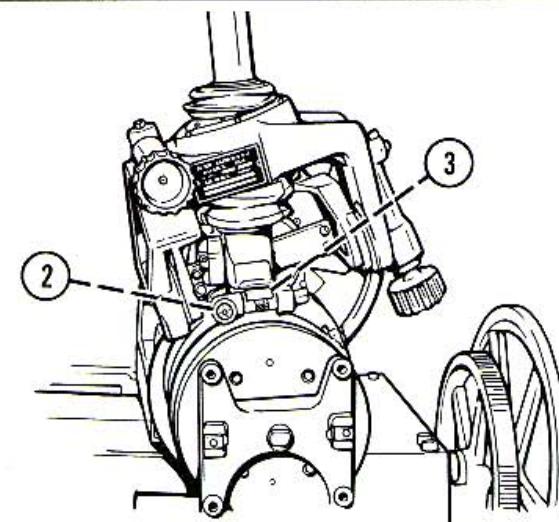
ILLUMINATION INSPECTION

**WARNING**  
When inspecting radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.



1 M171 MOUNT (1). Take inside of dark room and wait 15 minutes.

2 CROSS LEVEL BUBBLE (2) AND ELEVATION LEVEL BUBBLE (3). Check for even illumination and sufficient illumination to see bubbles and vial graduations.



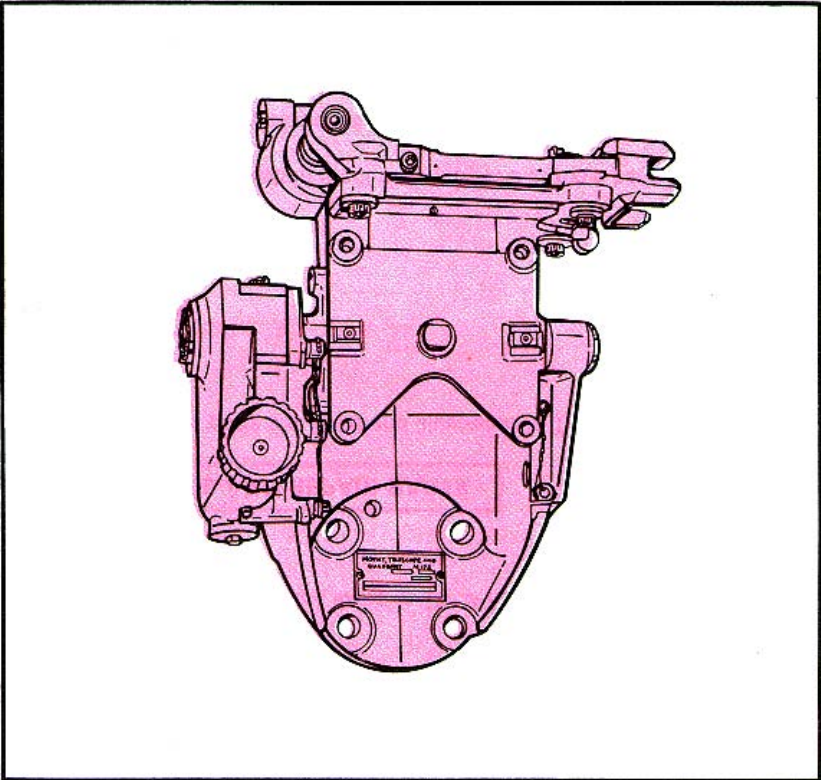
**CHAPTER 5  
M172 TELESCOPE AND QUADRANT  
MOUNT-MAINTENANCE INSTRUCTIONS**

**CHAPTER INDEX**

Page	
Access Cover-General Support Maintenance	
Instructions .....	5-27
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Instructions .....	5-10
Adapter Assembly-General Support Maintenance	
Instructions .....	5-29
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Common Tools and Equipment .....	5-2
General (Final Inspection) .....	5-38
General (Inspections) .....	5-2
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Instructions .....	5-37

**CHAPTER OVERVIEW**

This chapter contains maintenance procedures for the M172 mount. Information on repair parts and special tools is included. Detailed procedures for troubleshooting and maintenance of the M172 mount parts are also included.



**Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT**

**5-1. COMMON TOOLS AND EQUIPMENT**

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

repair of the M172 mount are listed in TM 9-1240-375-34P.

**5-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT**

Special tools, TMDE, and support equipment required and authorized for

**5-3. SPARES AND REPAIR PARTS**

Spares and repair parts are listed and illustrated in TM 9-1240-375-34P.

**Section II. INSPECTIONS**

**5 4. GENERAL**

a. Inspection is performed primarily to determine the following:

- (1) Completeness.
- (2) The nature of unserviceability.
- (3) The work, repair parts, and supplies required to return the M172 mount to serviceability.
- (4) That work in process is being performed properly.
- (5) That completed work complies fully with serviceability standards.

b. The M172 mount is considered serviceable when:

- (1) It is complete and properly performs the intended function.

(2) All modification work orders (MWO's) have been applied.

(3) All defects disclosed by the inspection have been corrected.

c. DA Form 2408-5 and DA Form 2409 list applicable MWO's.

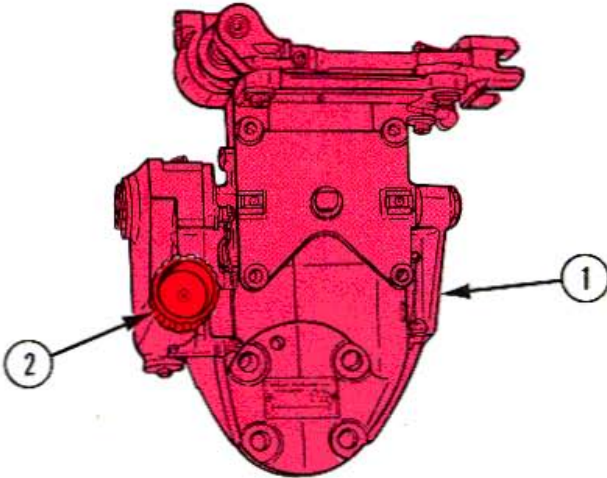
**5-5. CATEGORIES OF INSPECTION**

Categories of inspection define responsibilities.

a. An initial inspection is performed immediately on receipt of the M172 mount for maintenance. This inspection will determine the amount of work to be performed or whether the M172 mount should be forwarded to depot maintenance.

- b. A final inspection of the M172 mount is performed after repairs have been completed to ensure the item meets serviceability standards.
- c. Table 5-1 lists initial inspection procedures for the M172 mount. Final inspection procedures are located on page 5-38.
- d. Preembarkation inspection procedures are located on page 2-76

**Table 5-1. INITIAL INSPECTION-M172 MOUNT**

		
<b>Item No.</b>	<b>Item To Be Inspected</b>	<b>Procedures</b>
1	M172 MOUNT (1)	Check for bare spots, dents, scuff marks, and damaged parts. Inspect the M172 mount for cleanness.
2	CROSS LEVEL KNOB (2)	Operate cross level knob. Check that rotation is free and smooth without binding or rough motion



**Section III. TROUBLESHOOTING**

**5-6. GENERAL**

- a. The symptom index can be used as a quick guide to troubleshooting. Common malfunctions are listed in alphabetical order with a page number reference to the troubleshooting table where a test or inspection and corrective action are provided.
- b. The troubleshooting table 5-2 lists the common malfunctions which may be found during maintenance of the M172 mount which are the responsibility of general support. Perform the tests/inspections and corrective actions in the order listed.
  - c. Deleted.
- d. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective action notify depot maintenance.

**■ DIRECT SUPPORT SYMPTOM INDEX**

	<b>Troubleshooting Procedure (Page)</b>
<b>■ ADAPTER ASSEMBLY</b>	
■ Telescope mounting bracket difficult to level .....	5-4
<b>■ QUADRANT ADAPTER</b>	
■ M18 quadrant does not mount correctly .....	5-4.1

**Table 5-1.1. DIRECT SUPPORT TROUBLESHOOTING-M172 MOUNT**

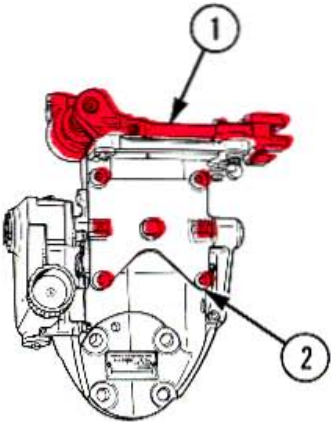
MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	LOCATION
<ul style="list-style-type: none"> <li>■ ADAPTER ASSEMBLY</li> </ul> <b>1. TELESCOPE MOUNTING BRACKET (1) DIFFICULT TO LEVEL.</b>	

- Check for defective eccentric stud assembly.
  - Replace eccentric stud assembly (p 5-11).

**QUADRANT ADAPTER**

■ **2. M18 QUADRANT DOES NOT MOUNT CORRECTLY.**

- Check mounting surface (2) for dirt or burrs.
  - a. Clean mounting surface with cleaning compound (TM 9-1025-211-10).
  - b. Remove burrs on mounting surface.



**GENERAL SUPPORT SYMPTOM INDEX**

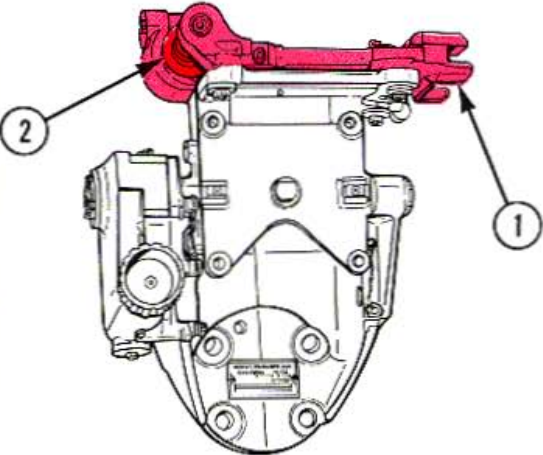
**Troubleshooting  
Procedure  
(Page)**

**TELESCOPE MOUNTING BRACKET**

Does not seat M138 telescope correctly .....	5-4.2
Shaft does not seat correctly in M138 telescope latch assembly .....	5-4.2

**Change 1 5-4.1**

Table 5-2. GENERAL SUPPORT TROUBLESHOOTING-M172 MOUNT

<p><b>MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p style="text-align: center;"><b>TELESCOPE MOUNTING BRACKET</b></p> <p><b>1. TELESCOPE MOUNTING BRACKET (1) DOES NOT SEAT M138 TELESCOPE CORRECTLY.</b></p> <p>Check for dirt or burrs on telescope mounting bracket.</p> <ul style="list-style-type: none"> <li>a. Clean with cleaning compound (TM 9-1025-211-10).</li> <li>b. Remove burrs with abrasive cloth dipped in cleaning compound (TM 9-1025-211-10).</li> </ul> <p><b>2. SHAFT (2) DOES NOT SEAT CORRECTLY IN M138 TELESCOPE LATCH ASSEMBLY.</b></p> <p>Check for damaged or worn shaft.</p> <p>Replace telescope mounting bracket (p 5-26).</p>	 <p>The diagram shows a mechanical assembly with a red telescope mounting bracket. Callout 1 points to the bracket's latching mechanism, and callout 2 points to a shaft within the assembly.</p>

**Section IV. DIRECT SUPPORT MAINTENANCE PROCEDURES  
FOR THE M172 TELESCOPE AND QUADRANT MOUNT**

**5-7. M172 MOUNT-MAINTENANCE INSTRUCTIONS**

<p><b>INITIAL SETUP</b></p> <p>Special Tools  M1A2 gunner's quadrant (11732246)  Tool box (SC 4931-95-CL-A09 )  Tool kit (SC 5180-95-CL-A43)</p> <p>Materials/Parts  Grease (item 2, app B)  Lock wire (item 5, app B)  ■ Sealing compound (MIL S 11031)</p> <p>References  TM 9-1025-211-10  ■ TM 9-1025-211-20&amp;P  TM 9-1025-211-34</p>	<p>TM 9-1240-375-34P  TM 9-1290-200-14&amp;P</p> <p>Troubleshooting Reference  5-4 Telescope mounting bracket difficult to level.</p> <p>Equipment Condition  5-7 M172 mount removed from M198 howitzer (task no. 2).</p>
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5-7. M172 MOUNT-MAINTENANCE INSTRUCTIONS (cont)

List of Tasks			
Task No.	Task	Task Ref (Page)	Troubleshooting Ref No. (Page)
1	Maintain M172 mount:  a. Remove. b. Install. c. Repair.	5-7 5-7 5-8	
2	Maintain adapter assembly:  a. Disassemble. b. Repair. c. Reassemble.	5-10 5-12 5-12	

5-8. M172 MOUNT-MAINTENANCE INSTRUCTIONS I

<b>THIS TASK COVERS:</b>	
a. Removal b. Installation	c. Repair
<b>INITIAL SETUP</b>	
Special Tools Tool box (SC 4931-95-CL-A09) Tool kit (SC 5180-95-CL-A43)	Materials/Parts Lock wire (item 5, app B)  References ■ TM 9-1025-211-10 TM 9-1240-375-34P



**REMOVE**

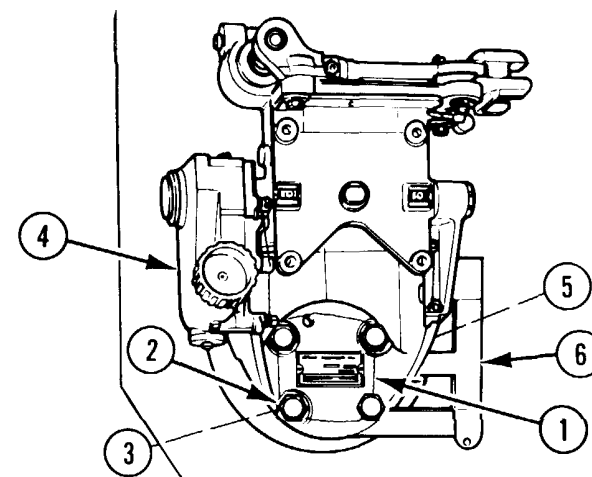
1 LOCK WIRE (1). Remove.

**CAUTION**

Support M172 mount while removing mounting screws.

2 FOUR MOUNTING SCREWS (2) AND FOUR LOCKWASHERS (3). Unscrew and remove.

3 M172 MOUNT (4). Carefully remove from keys (5) on mounting plate (6).



**INSTALLATION**

**INSTALLATION**

**CAUTION**

Ensure that shims between mounting adapter and trunnion are in place and not missing.

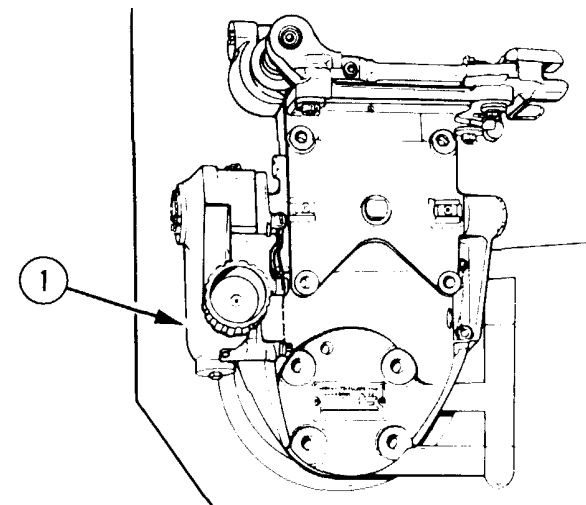
**NOTE**

Before M172 mount is installed, mounting plate keys and mount keyways must be clean and free of nicks and burrs.

1 M172 MOUNT (1). Position on top carriage assembly of M198 howitzer.

**CAUTION**

Support M172 mount until mounting screws are installed .



5-8. M172 MOUNT-MAINTENANCE INSTRUCTIONS (cont)

INSTALLATION (cont)

**INSTALLATION (cont)**

**NOTE**  
 Mounting screws should have a torque of 50 ft-lb (67.5 N-m) to 70 ft-lb (94.5 N-m).

2 FOUR LOCKWASHERS (2) AND FOUR MOUNTING SCREWS (3).

a. Install.

b. Tighten diagonally and gradually.

3 LOCK WIRE (4) (ITEM 5, APP B). Install.

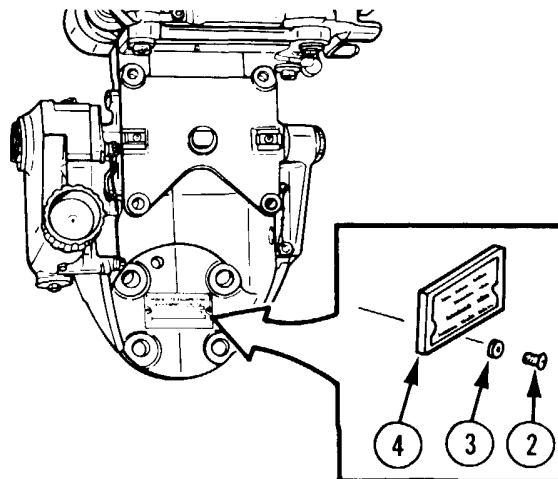
**NOTE**  
 Boresighting and synchronization procedures should be performed in accordance with TM 9-1025-21 1-34.

**REPAIR**

1 OIL CUP (1). Remove only if defective.

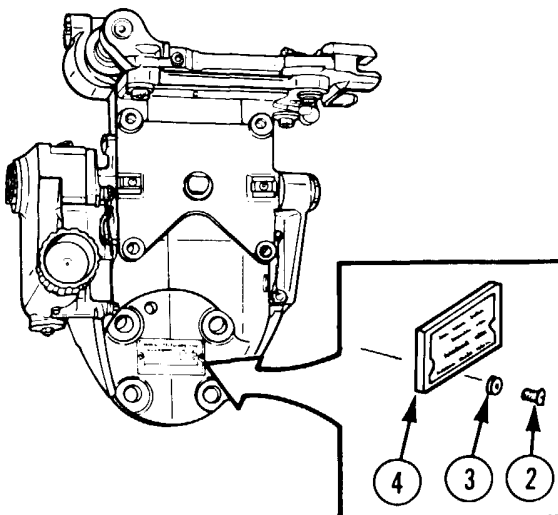
2 TWO SCREWS (2) AND TWO LOCK-  
WASHERS (3). Remove.

3 IDENTIFICATION PLATE (4). Remove  
only if defective.

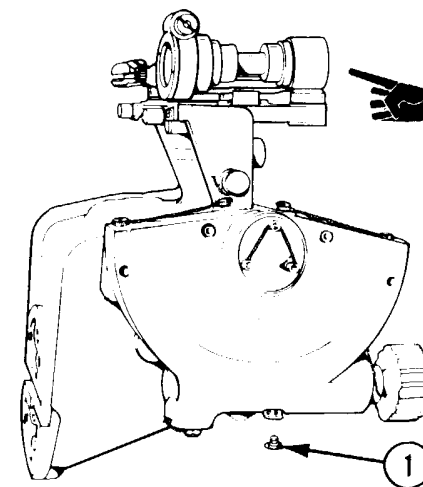


**NOTE**  
Repair is by replacement of au-  
thorized parts (TM 9-1240-375-  
34P) as required.

4 IDENTIFICATION PLATE (4). Install using  
two lockwashers (3) and two screws (2).



5 OIL CUP (1). Install.



5-9. ADAPTER ASSEMBLY-MAINTENANCE INSTRUCTIONS I

**THIS TASK COVERS:**

- a. Disassembly
- b. Repair

- c. Reassembly

**INITIAL SETUP**

**Special Tools**

- M1A2 gunner's quadrant (11732246)
- Tool box (SC 4931-95-CL-A09)

**Materials/Parts**

- Grease (item 2, app B)
- Lock wire (item 5, app B)
- Sealing compound (MIL-S-1 1031)

**References**

- TM 9 1025 211-10
- ITM 9 1025 211 20&P
- TM 9-1240-375 34P
- TM 9-1290-200-14&P

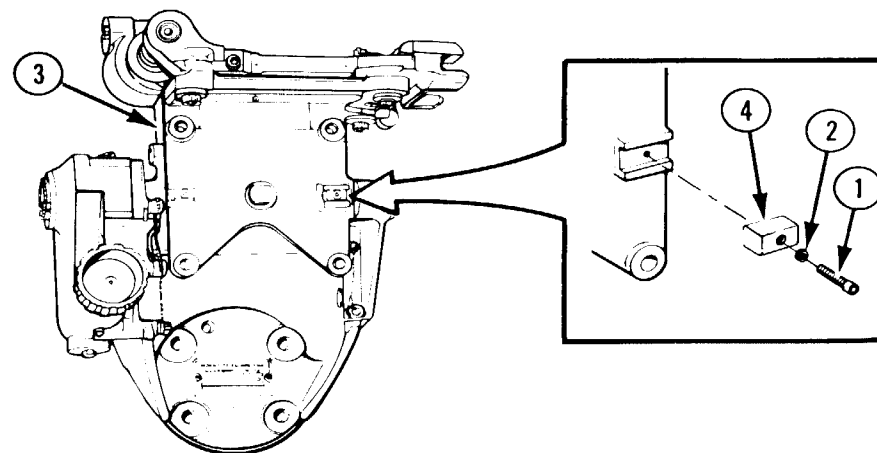
**Equipment Condition**

- 5-7 M172 mount removed from M198 howitzer.

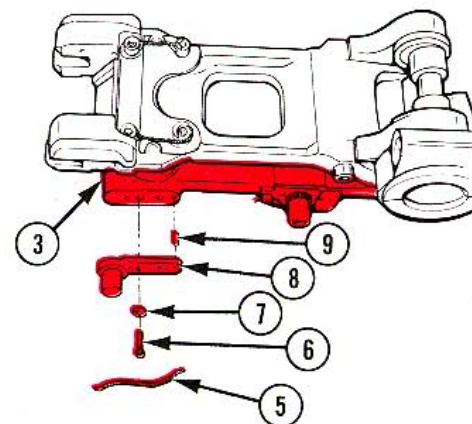
**DISASSEMBLY**

1 TWO SCREWS (1) AND TWO LOCKWASHERS (2). Remove from quadrant adapter (3).

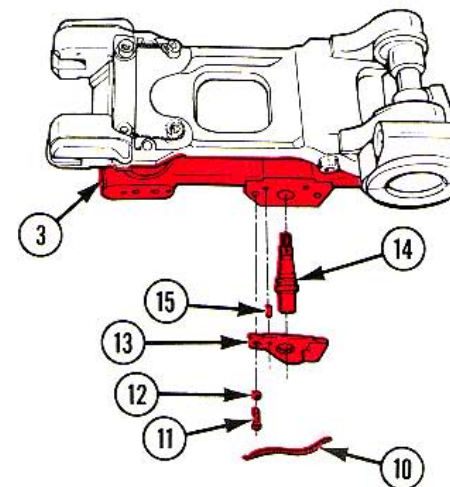
2 TWO KEYS (4). Remove.



- 3 LOCK WIRE (5). Remove.
- 4 TWO SCREWS (6) AND TWO LOCKWASHERS (7). Remove from quadrant adapter (3).
- 5 PLATE (8). Remove.
- 6 TWO PINS (9). Remove.



- 7 LOCK WIRE (10). Remove.
- 8 TWO SCREWS (11) AND TWO LOCKWASHERS (12). Remove from quadrant adapter (3).
- 9 SPLINE PLATE (13). Remove.
- 10 ECCENTRIC STUD ASSEMBLY (14). Remove.
- 11 TWO PINS (15). Remove.



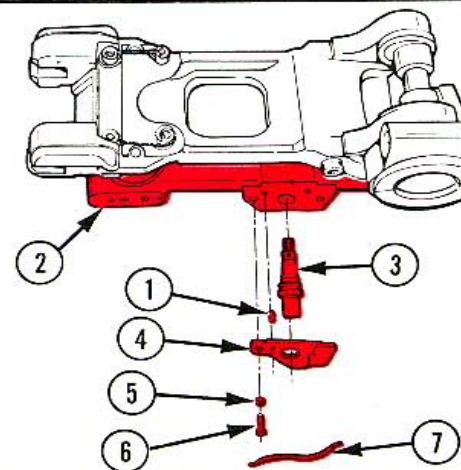
5-9. ADAPTER ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REPAIR

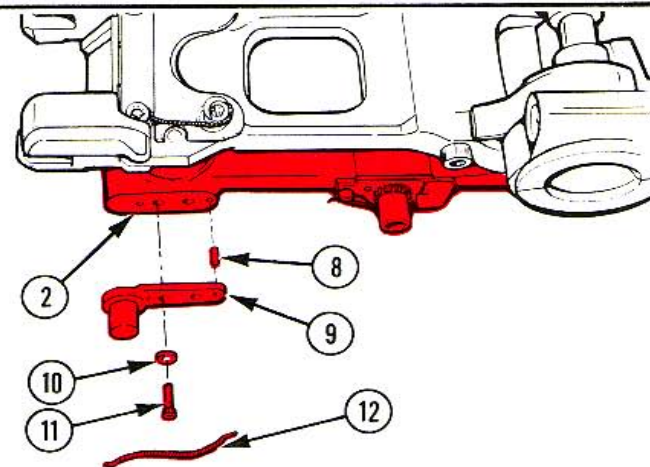
Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

REASSEMBLY

- 1 TWO PINS (1). Install in quadrant adapter (2).
- 2 ECCENTRIC STUD ASSEMBLY (3). Apply light coat of grease (item 2, app B) and install.
- 3 SPLINE PLATE (4), TWO LOCKWASHERS (5), AND TWO SCREWS (6). Install.
- 4 LOCK WIRE (7) (ITEM 5, APP B). Install.

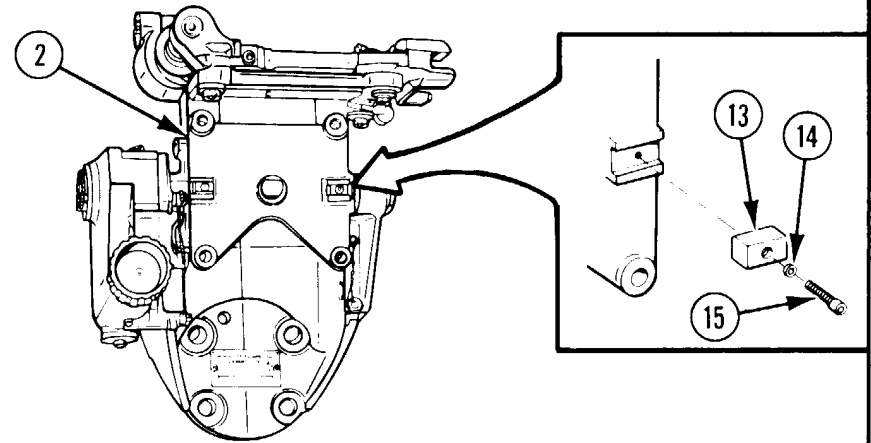


- 5 TWO PINS (8). Install in quadrant adapter (2).
- 6 PLATE (9), TWO LOCKWASHERS (10), AND TWO SCREWS (11). Install.
- 7 LOCK WIRE (12) (ITEM 5, APP B). Install.



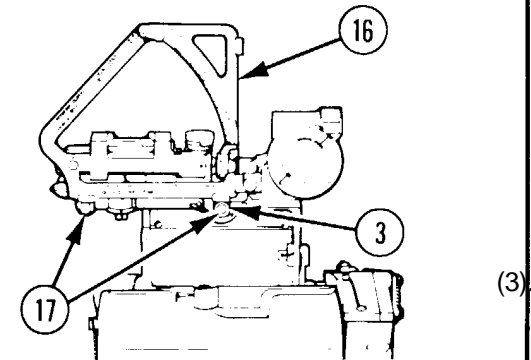


- 8 TWO KEYS (13). Place on quadrant adapter (2).
- 9 TWO LOCKWASHERS (14) AND TWO SCREWS (15).
  - a. Apply sealing compound (TM 9 1025-21 1-U20&P) to screws.
  - b. Install and tighten.



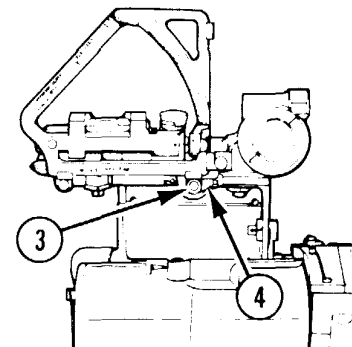
**NOTE**  
 To adjust eccentric stud assembly, the M172 mount and M18 quadrant must be installed on the M198 howitzer (TM 9-1025-211-10). Also, the M199 cannon tube must be set to zero elevation and the M18 quadrant level assembly leveled (TM 9-1025-211-10).

- 10 M1A2 GUNNER'S QUADRANT (16).
  - a. Place on seats (17) of M172 mount. M1A2 gunner's quadrant level bubble should center.
  - b. If not centered, adjust eccentric stud assembly



**5-9. ADAPTER ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)  
REASSEMBLY (cont)**

- 11 ECCENTRIC STUD ASSEMBLY (3).
- a. Loosen to disengage spline plate (4).
  - b. Turn eccentric stud assembly and engage spline plate (4); tighten eccentric stud assembly.
  - c. Repeat step 10a (p 5-13). If M1A2 gunner's quadrant level bubble is still not centered, repeat steps 11a and b above until centered.



**Section V. GENERAL SUPPORT MAINTENANCE PROCEDURES FOR THE  
M172 TELESCOPE AND QUADRANT MOUNT**

**5-10. M172 MOUNT-MAINTENANCE INSTRUCTIONS I**

**INITIAL SETUP**

**Special Tools**

Adapter set (SC 4931-95-CL-A11)  
Shop set (SC 4931-95-CL-A07)  
Tool box (SC 4931-95-CL-A09)  
Tool set (SC 4931-95-CL-J51)

Lock wire (item 5, app B)  
Sealing compound (MIL-S-11031)

**Materials/Parts**

Cleaning compound (MIL-C-18718)  
Grease (item 2, app B)

**References**

TM 9-1025-211-10  
TM 9-1025-211-20&P  
TM 9-1240-375-34P

**Troubleshooting References**

- 5-4 Telescope mounting bracket does not seat M138 telescope correctly.
- 5-5 Shaft does not seat correctly in M138 telescope latch assembly.

**Equipment Conditions**

- 5-7 M172 mount removed from M198 howitzer (tasks no. 1 thru 7).
- 5-18 Worm shaft assembly removed (task no. 4).

**List of Tasks**

Task No.	Task	Task Ref (Page)	Troubleshooting Ref No. (Page)
1	Maintain M172 mount: <ul style="list-style-type: none"> <li>a. Disassemble.</li> <li>b. Clean.</li> <li>c. Repair.</li> <li>d. Reassemble.</li> </ul>	517 5-20 5-20 5-20	
2	Maintain telescope mounting bracket: <ul style="list-style-type: none"> <li>a. Remove.</li> <li>b. Install.</li> </ul>	5-26 5-26	5-4, 5-5
3	Maintain access cover: <ul style="list-style-type: none"> <li>a. Remove.</li> <li>b. Repair.</li> <li>c. Install.</li> </ul>	5-27 5-28 5-28	

5-10. M172 MOUNT-MAINTENANCE INSTRUCTIONS (cont) I

List of Tasks			
Task No.	Task	Task Ref (Page)	Troubleshooting Ref No. (Page)
4	Maintain adapter assembly:  a. Remove. b. Disassemble. c. Clean. d. Repair. e. Reassemble. f. Install.	5-30 5-31 5-31 5-31 5-32 5-32	
5	Maintain quadrant adapter:  Repair.	5-35	
6	Maintain quadrant support assembly:  a. Disassemble. b. Repair. c. Reassemble.	5-36 5-36 5-36	
7	Maintain worm shaft assembly:  a. Remove. b. Install.	5-38 5-38	

## 11. M172 MOUNT-MAINTENANCE INSTRUCTIONS

### THIS TASK COVERS:

- a. Disassembly
- b. Cleaning
- c. Repair
- d. Reassembly

### INITIAL SETUP

#### Special Tools

- Adapter set (SC 4931-95-CL-A11)
- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)
- Tool set (SC 4931-95-CL-J51)

#### Materials/Parts

- Cleaning compound (MIL-C-18718)
- Grease (item 2, app B)
- Lock wire (item 5, app B)

Sealing compound (MIL-S-11031)

#### References

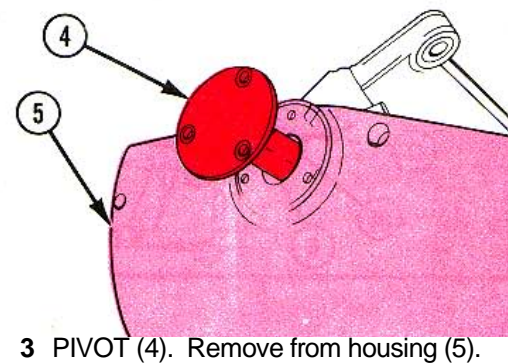
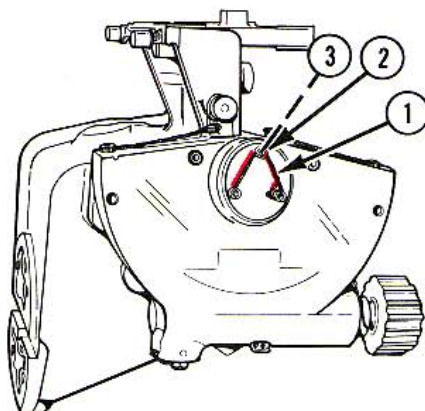
- TM 9-1025-211-10
- TM 9-1025-211-20&P
- TM 9-1240-375-34P

#### Equipment Condition

- 5-7 M172 mount removed from M198 howitzer.

### DISASSEMBLY

- 1 LOCK WIRE (1). Remove.
- 2 THREE SCREWS (2) AND THREE LOCK-WASHERS (3). Remove.



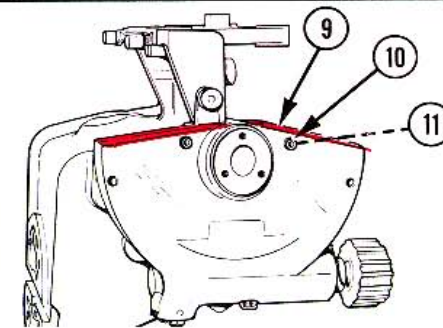
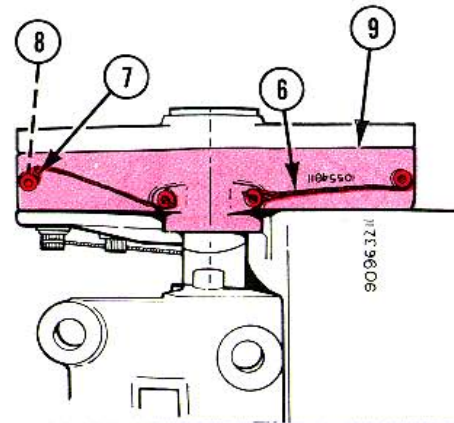
- 3 PIVOT (4). Remove from housing (5).

5-11. M172 MOUNT-MAINTENANCE INSTRUCTIONS (cont) I

DISASSEMBLY (cont)

4 TWO LOCK WIRES (6). Remove.

5 FOUR SCREWS (7) AND FOUR LOCK-WASHERS (8). Remove from access cover (9).



6 TWO SCREWS (10) AND TWO LOCK-WASHERS (11). Remove.

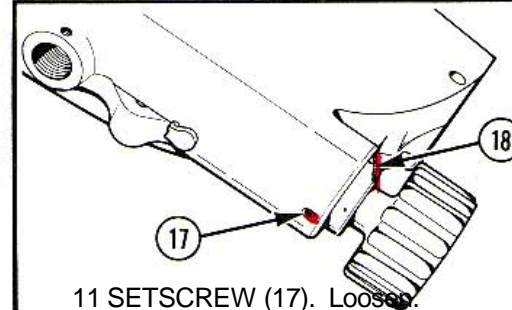
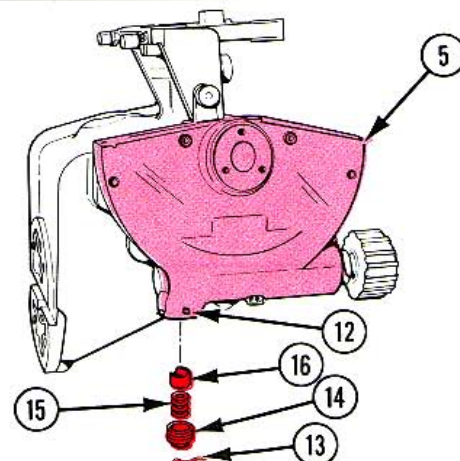
7 ACCESS COVER (9). Remove.

8 SETSCREW (12). Loosen.

9 LOCK WIRE (13). Remove.

**NOTE**  
Scribe a line across plug and housing, and V-bearing and housing for reference during reassembly.

10 PLUG (14), SPRING (15), AND V-BEARING (16). Remove from housing (5).



11 SETSCREW (17). Loosen.

12 LOCK WIRE (18). Remove.



**CAUTION**

Support cross level knob in V block on solid surface to prevent damage to worm shaft.

**NOTE**

Scribe a line across cross level knob and worm shaft assembly for reference during reassembly.

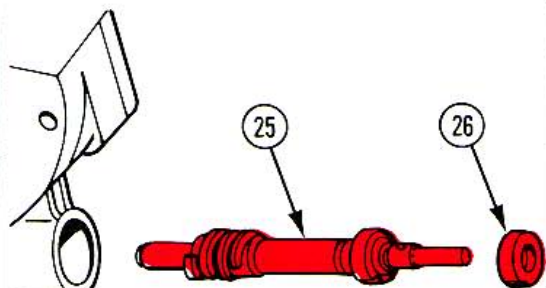
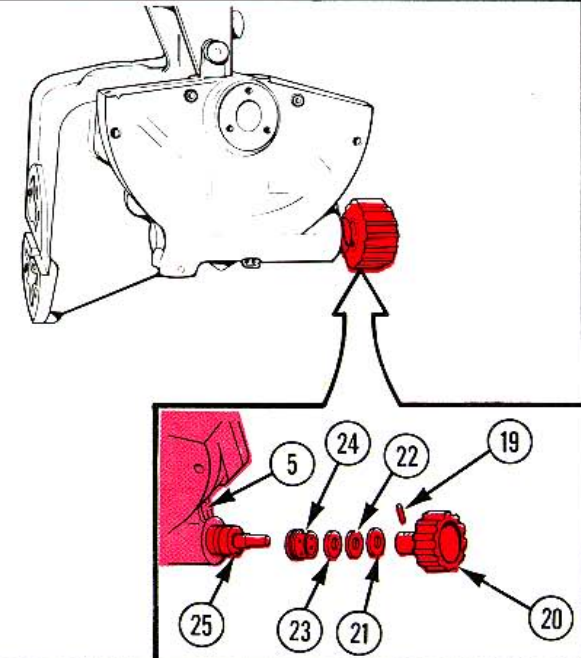
13 PIN (19). Drive out.

14 CROSS LEVEL KNOB (20). Remove.

15 FLAT WASHER (21), FELT (22), AND FLAT WASHER (23). Remove.

16 RING (24). Remove.

17 WORM SHAFT ASSEMBLY (25). Remove from housing (5).



18 BEARING (26). Remove from worm shaft assembly (25).

19 Deleted.

20 Deleted

21 Deleted.

5-11. M172 MOUNT-MAINTENANCE INSTRUCTIONS (cont)

**CLEANING**

Clean all parts with cleaning compound (TM 9-1025-211-10).

**NOTE**

Replace M172 mount when damaged to the extent that the M18 quadrant will not function properly.

**REPAIR**

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

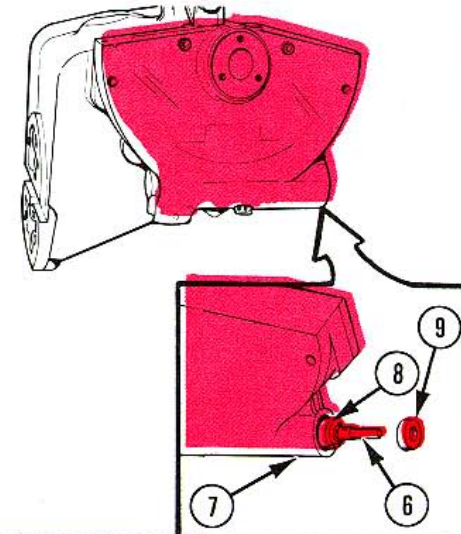
**REASSEMBLY**

- 1 Deleted.
- 2 Deleted.
- 3 Deleted.

**4 WORM SHAFT ASSEMBLY (6).**

- a. Apply light coat of grease (item 2, app B).
- b. Install in housing (7), making sure slot in bearing (8) is alined with guide pin in housing.

**5 BEARING (9).** Install, making sure slot is alined with guide pin in housing.



**6 RING (10).** Install and tighten.

**7 FLAT WASHER (11), FELT (12), AND FLAT WASHER (13).** Apply a light coat of grease (item 2, app B) and install.

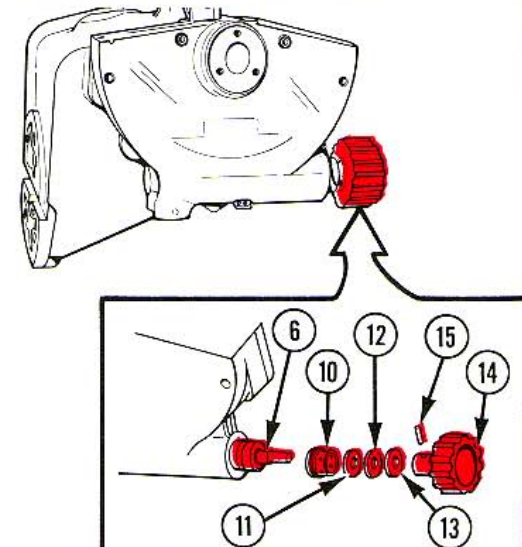
**8 CROSS LEVEL KNOB (14).**

- a. Aline reference marks.
- b. Install on worm shaft assembly (6).

**CAUTION**

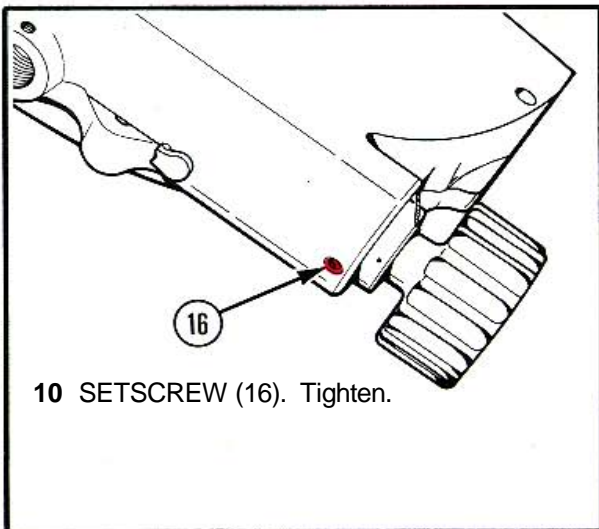
**Support cross level knob in V block on solid surface to prevent damage to worm shaft.**

**9 PIN (15).** Install.



511. M172 MOUNT-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY (cont)



11 V-BEARING (17).

- Apply a thin coat of grease (item 2, app B) to V portion of bearing.
- Aline reference marks, and install.

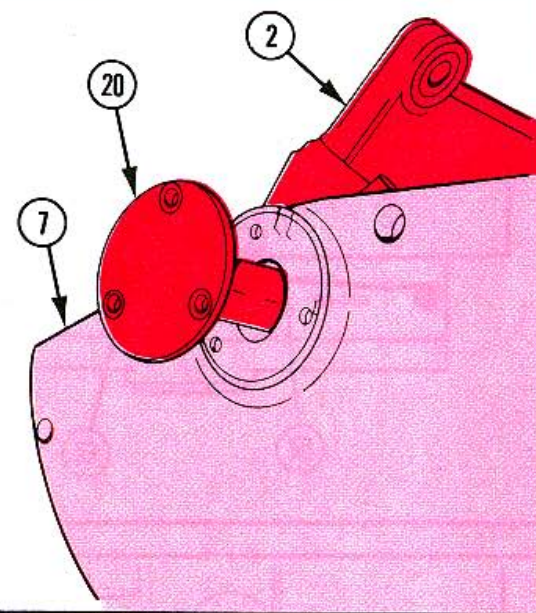
**NOTE**  
When installing plug, ensure reference marks are alined.

12 SPRING (18) AND PLUG (19). Install and tighten plug until reference marks are alined.

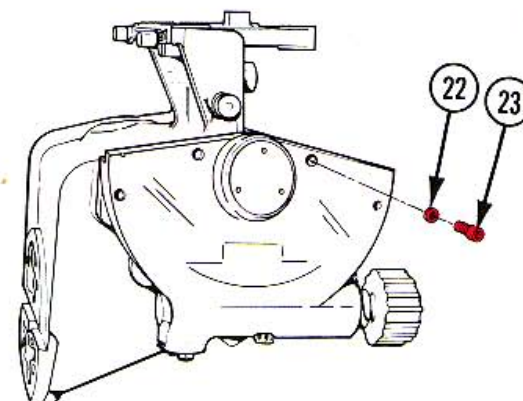
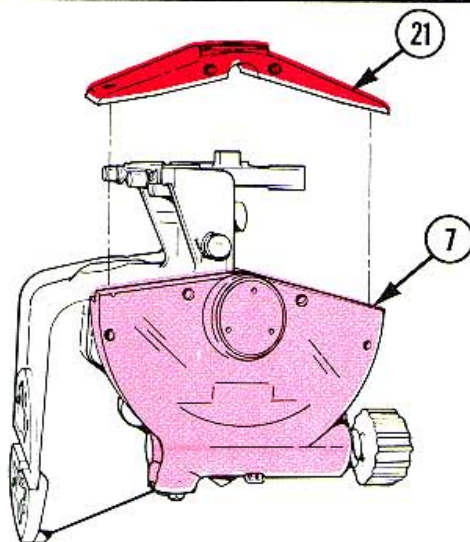
**NOTE**  
After installing V-bearing and spring, screw plug in until V-bearing bottoms on worm shaft assembly, and then back off plug (19) 1/4 turn.

**13 PIVOT (20).**

- a. Apply a light coat of grease (item 2, app B) to sleeve of pivot.
- b. Apply a light coat of sealing compound (TM 9-1025-211-20&P) to mating surface of pivot.
- c. Install through housing (7) and into shaft of adapter assembly (2).

**14 ACCESS COVER (21).**

- a. Apply sealing compound (TM 9-1025-211-20&P) to mating surfaces.
- b. Install on housing (7).



- 15 TWO LOCKWASHERS (22) AND TWO SCREWS (23).** Install and tighten.

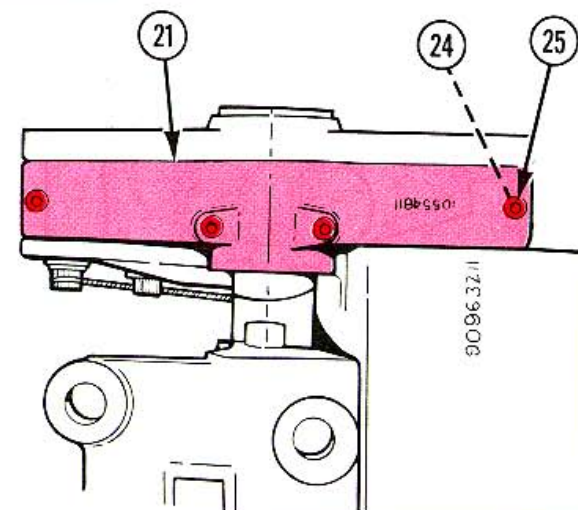


## 5-11. M172 MOUNT-MAINTENANCE INSTRUCTIONS (cont)

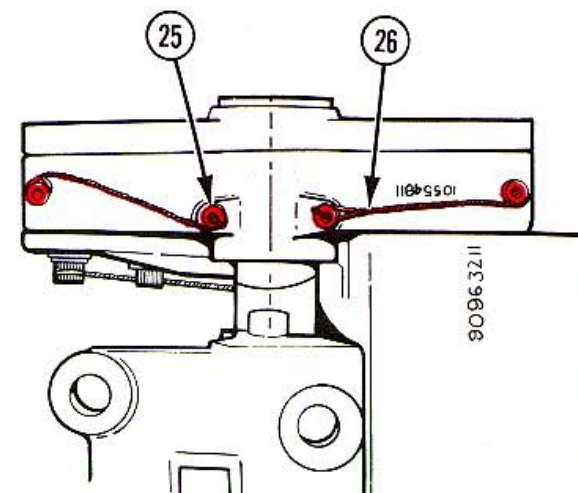
## REASSEMBLY (cont)

**16** FOUR LOCKWASHERS (24) AND FOUR SCREWS (25).

- a. Install, making sure the two longer screws are installed in center of access cover (21).
- b. Tighten.

**17** TWO LOCK WIRES (26) (ITEM 5, APP B).

- a. Install.
- b. Bend sharp ends into tops of screws (25).
- c. Cover with sealing compound (TM 9-1025-211-20&P).

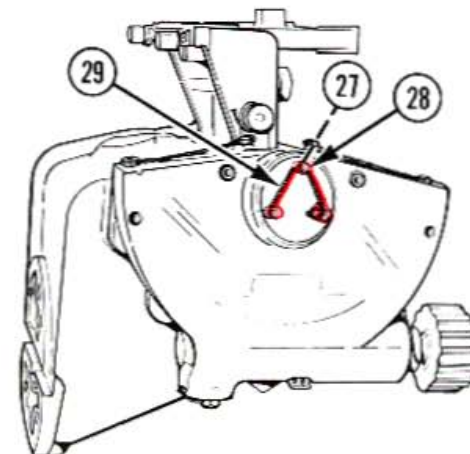




**18** THREE LOCKWASHERS (27) AND THREE SCREWS (28). Install and tighten.

**19** LOCK WIRE (29) (ITEM 5, APP B).

- a. Install.
- b. Bend sharp ends into tops of screws (28).
- c. Cover with sealing compound (TM 9-1025-211-20&P).



**5-12. TELESCOPE MOUNTING BRACKET-MAINTENANCE INSTRUCTIONS**

THIS TASK COVERS:

- a. Removal
- b. Installation

**INITIAL SETUP**

Special Tools

- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)

Materials/Parts

- Grease (item 2, app B)

Troubleshooting References

- 5-4 Telescope mounting bracket does not seat M138 telescope correctly.
- 5-5 Shaft does not seat correctly in M138 telescope latch assembly.

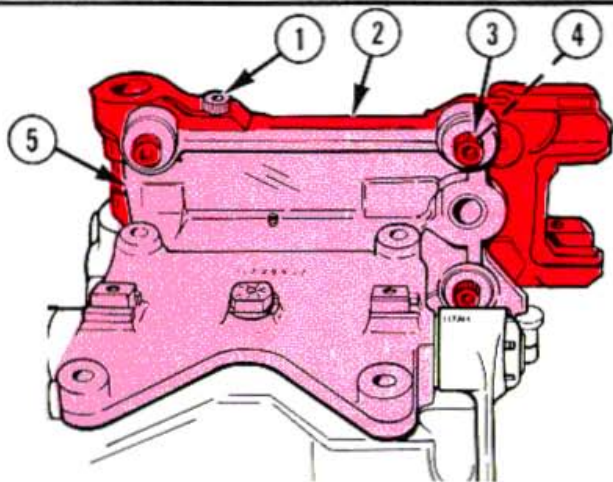
Equipment Condition

- 5-7 M172 mount removed from M198 howitzer.

## 5-12. TELESCOPE MOUNTING BRACKET-MAINTENANCE INSTRUCTIONS (cont)

## REMOVAL

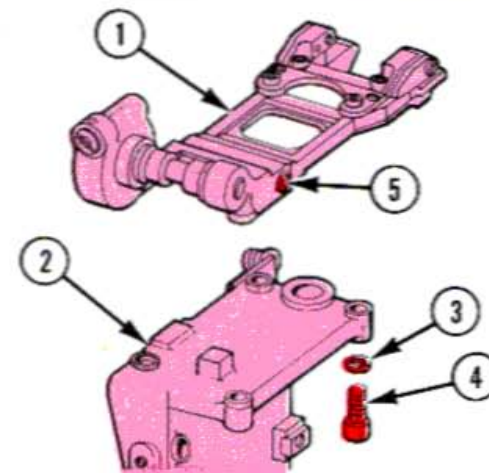
- 1 SCREW (1). Loosen to relieve tension on telescope mounting bracket (2).
- 2 FOUR SCREWS (3) AND FOUR FLAT WASHERS (4). Remove.
- 3 TELESCOPE MOUNTING BRACKET (2). Lift up, and remove from adapter assembly (5).



**NOTE**  
Replace telescope mounting bracket when it will not permit the M138 telescope to seat and operate correctly.

## INSTALLATION

- 1 TELESCOPE MOUNTING BRACKET (1).
  - a. Coat mating surfaces with a thin coating of grease (item 2, app B).
  - b. Install on adapter assembly (2).
- 2 FOUR FLAT WASHERS (3) AND FOUR SCREWS (4). Install and tighten.
- 3 SCREW (5). Tighten.



5-13. ACCESS COVER-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Removal
- b. Repair
- c. Installation

**INITIAL SETUP**

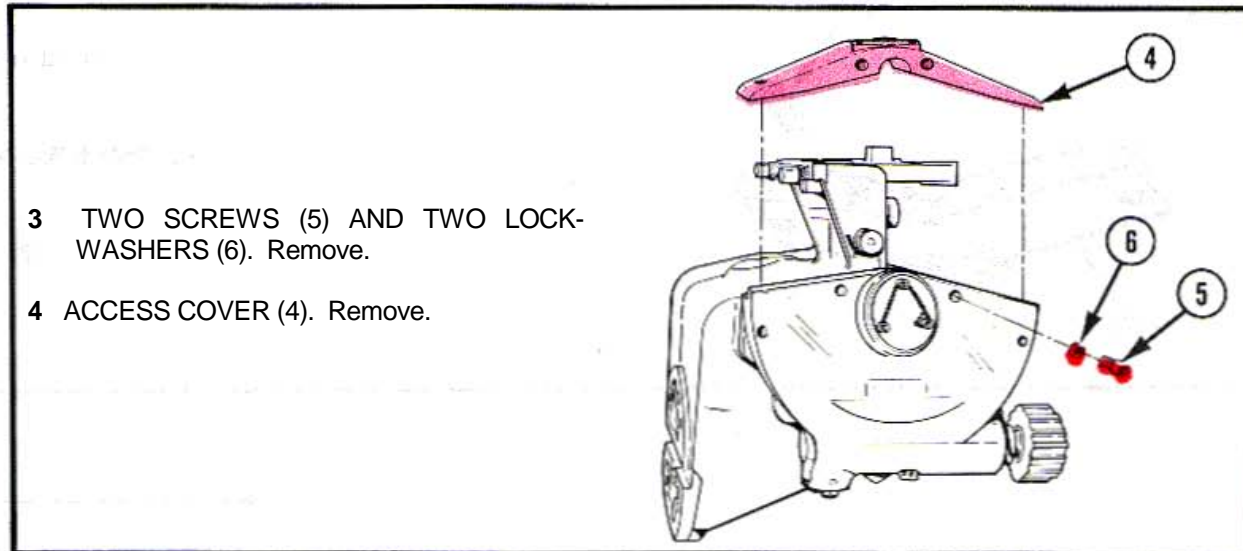
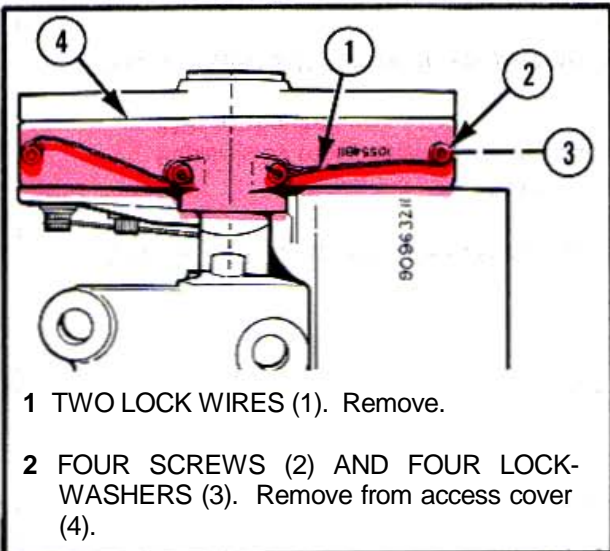
Special Tools  
 Tool box (SC 4931-95-CL-A09)

Materials/Parts  
 Lock wire (item 5, app B)  
 Sealing compound (MI L-S-11031)

References  
 TM 9-1025-211-20&P  
 TM 9-1240-375-34P

Equipment Condition  
 5-7 M172 mount removed from M198 howitzer.

**REMOVAL**



5-13. ACCESS COVER-MAINTENANCE INSTRUCTIONS (cont)

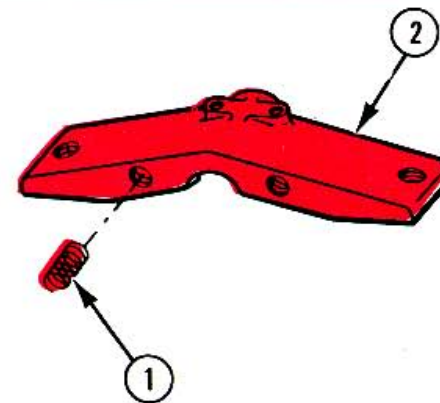
REPAIR

- 1 TWO INSERTS (1). Remove from access cover (2) only if damaged.

**NOTE**

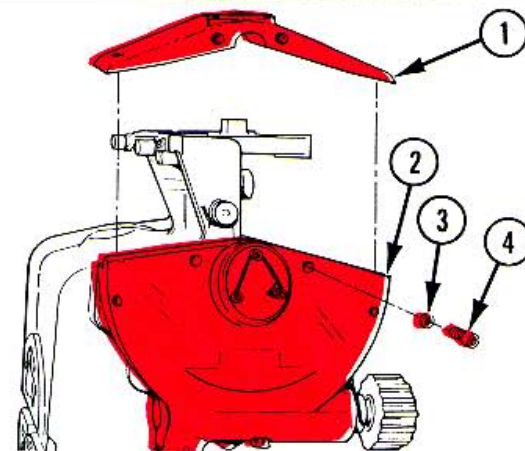
Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

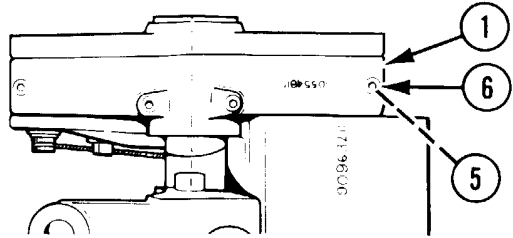
- 2 TWO INSERTS (1). Install in access cover (2) if removed.



INSTALLATION

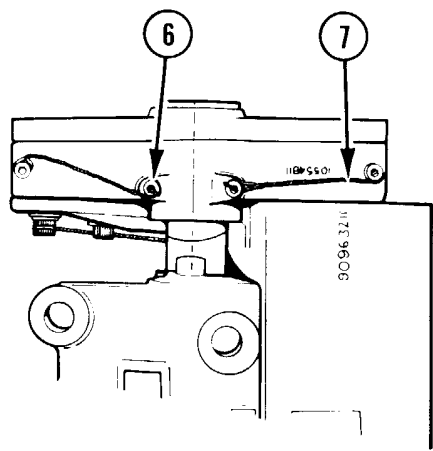
- 1 ACCESS COVER (1).
  - a. Apply sealing compound (TM 9-1025-211-20&P) to mating surfaces.
  - b. Install in housing (2).
- 2 TWO LOCKWASHERS (3) AND TWO SCREWS (4). Install and tighten.





**3 FOUR LOCKWASHERS (5) AND FOUR SCREWS (6).**

- Install, making sure the two longer screws are installed in center of access cover (1).
- Tighten.



**4 TWO LOCK WIRES (7) (ITEM 5, APP B).**

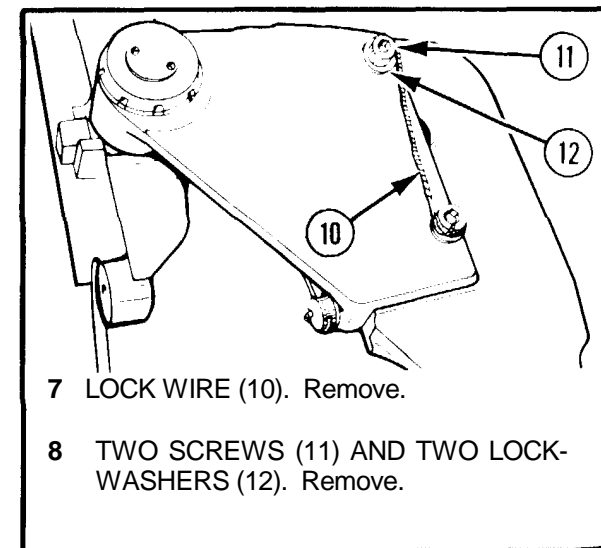
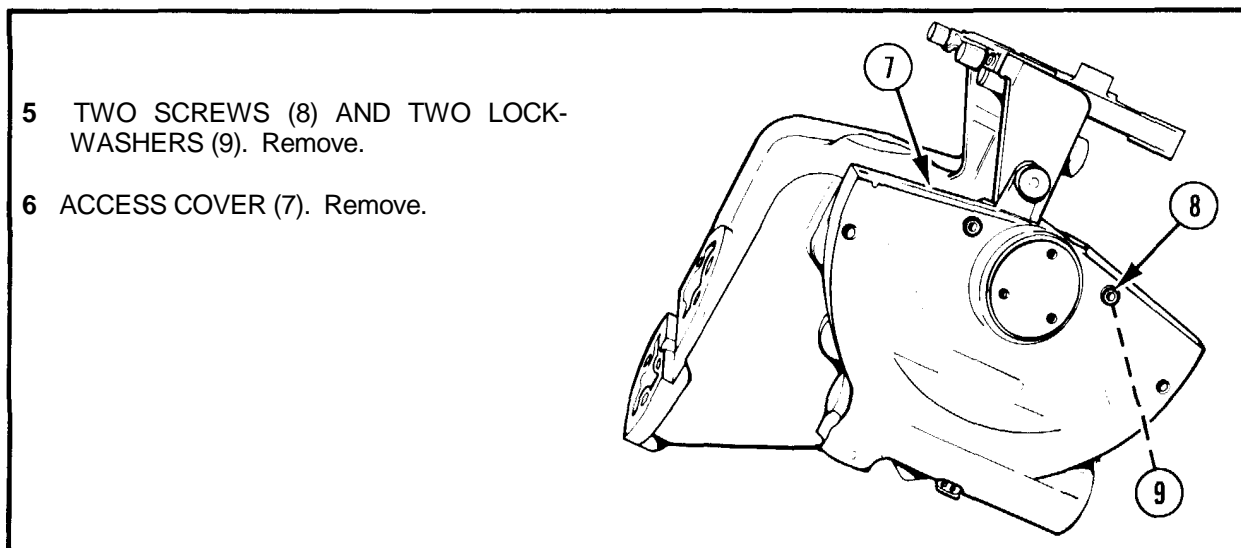
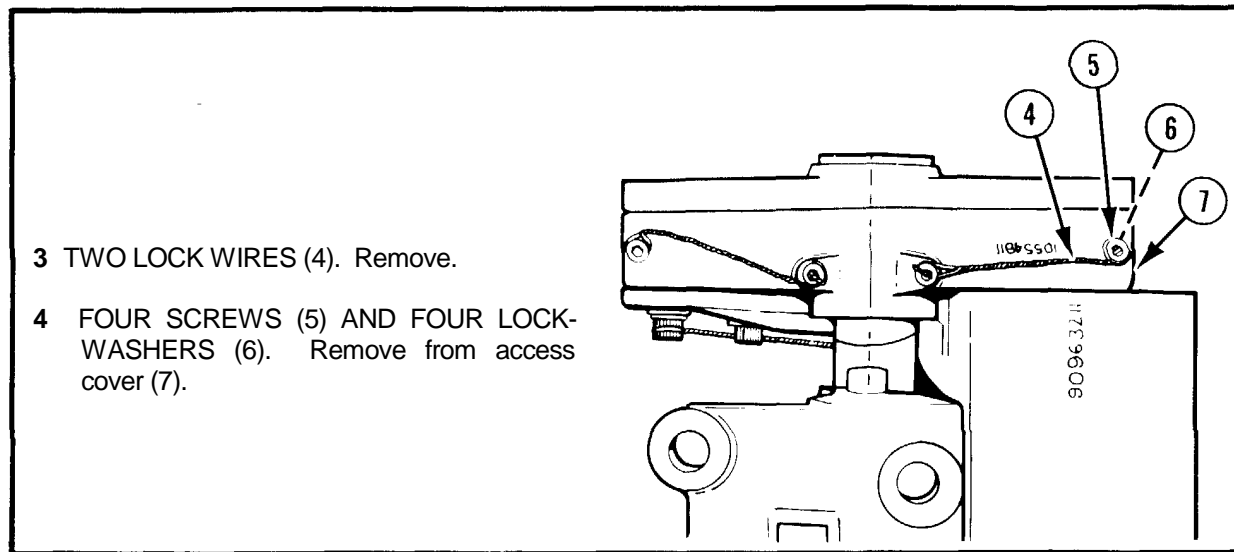
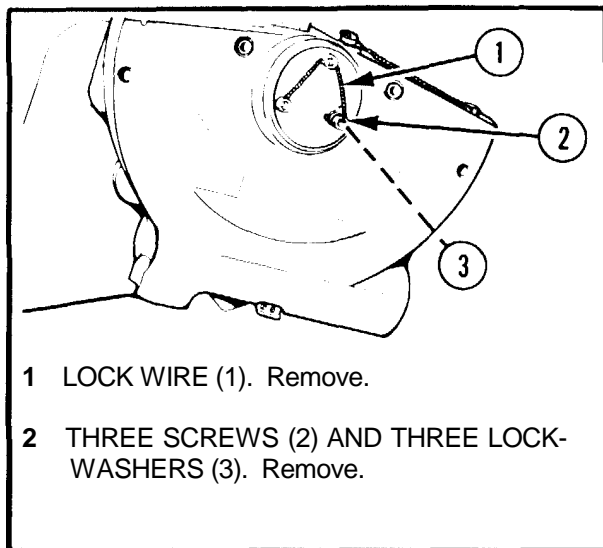
- Install.
- Bend sharp ends into tops of screws (6).
- Cover with sealing compound (TM 9-1025-211-20&P).

**5-14. ADAPTER ASSEMBLY-MAINTENANCE INSTRUCTIONS**

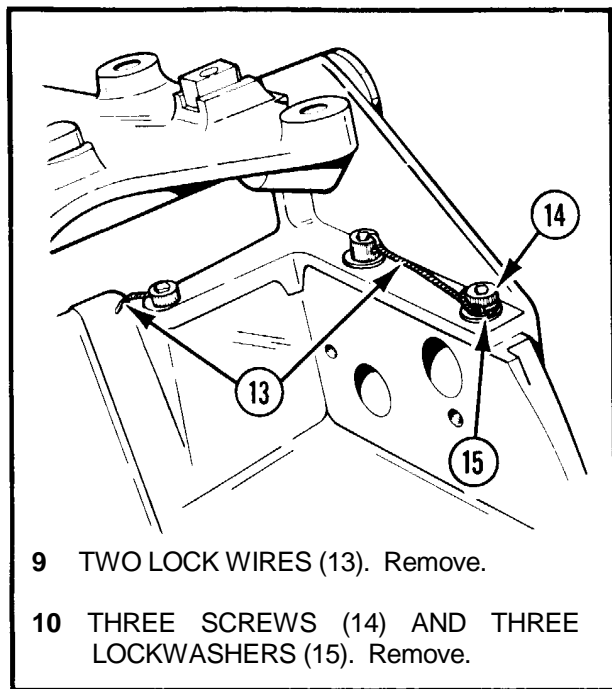
<b>THIS TASK COVERS:</b>	
<ol style="list-style-type: none"> <li>Removal</li> <li>Disassembly</li> <li>Cleaning</li> </ol>	<ol style="list-style-type: none"> <li>Repair</li> <li>Reassembly</li> <li>Installation</li> </ol>
<b>INITIAL SETUP</b>	
<b>Special Tools</b> Shop set (SC 4931-95-CL-A07) Tool box (SC 4931-95-CL-A09)	<b>References</b> TM 9-1025-211-10 TM 9-1025-211-20&P TM 9-1240-375-34P
<b>Materials/Parts</b> Cleaning compound (MIL-C-18718) Grease ( item 2, app B) Lock wire (item 5, app B) Sealing compound (MIL-S-11031)	<b>Equipment Conditions</b> 5-7 M172 mount removed from M198 howitzer. 5-18 Worm shaft assembly removed.

5-14. ADAPTER ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

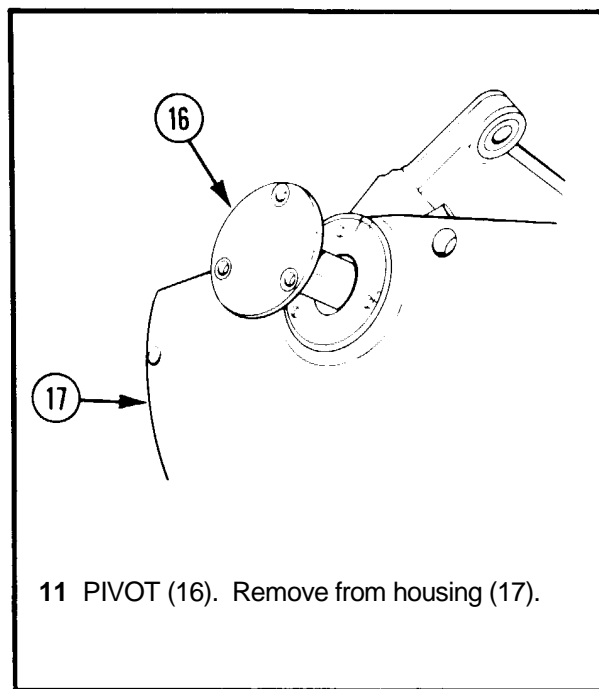
REMOVAL



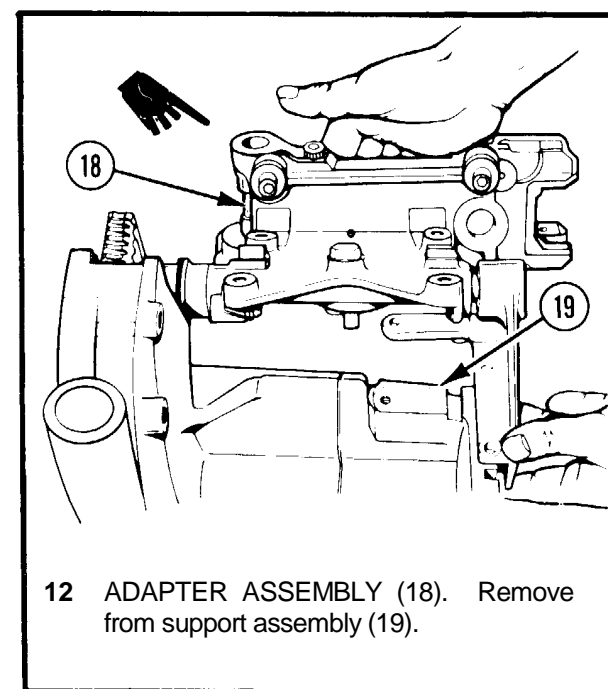




- 9 TWO LOCK WIRES (13). Remove.
- 10 THREE SCREWS (14) AND THREE LOCKWASHERS (15). Remove.



- 11 PIVOT (16). Remove from housing (17).

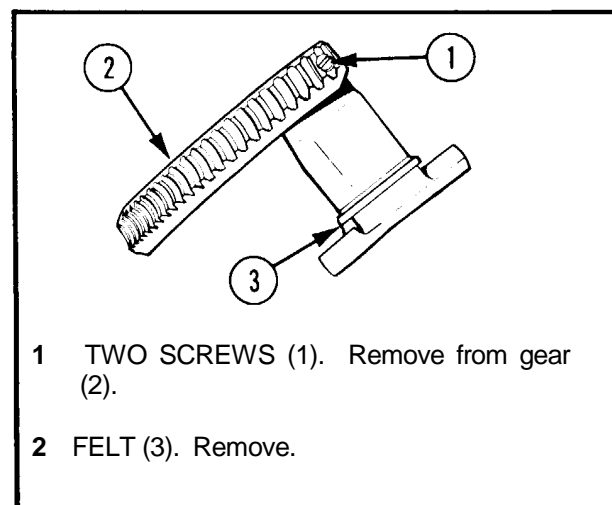


- 12 ADAPTER ASSEMBLY (18). Remove from support assembly (19).

**DISASSEMBLY**

**CLEANING**

**REPAIR**



- 1 TWO SCREWS (1). Remove from gear (2).
- 2 FELT (3). Remove.

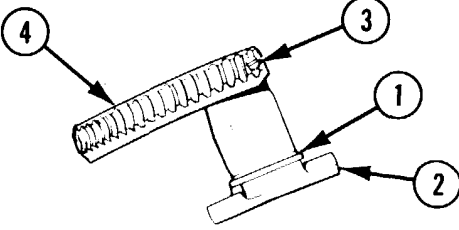
Clean all parts with cleaning compound (TM 9-1025-211-10).

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

5-14. ADAPTER ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY

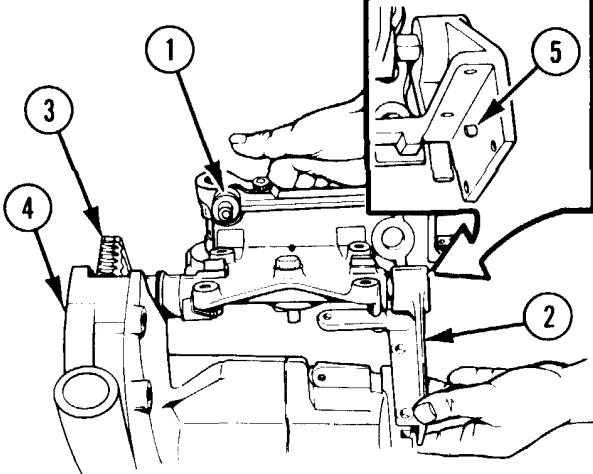
INSTALLATION



1 FELT (1). Saturate with grease (item 2, app B) and install on gear sector (2).

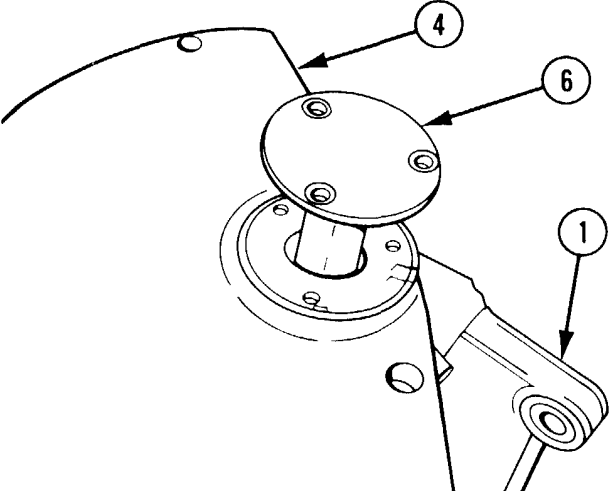
2 TWO SCREWS (3).

- Apply light coat of sealing compound (TM 9-1025-21 1-20&P).
- Install in gear (4), and tighten.



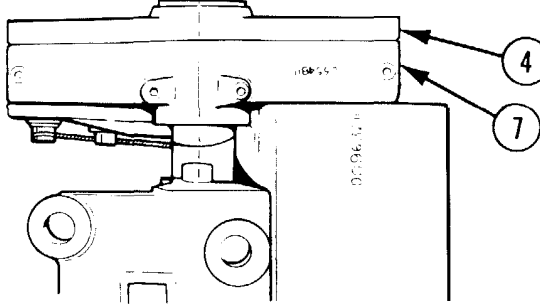
1 ADAPTER ASSEMBLY (1).

- Position on support assembly (2) with gear (3) positioned in housing (4).
- Align guide key (5) with slot in support assembly (2).



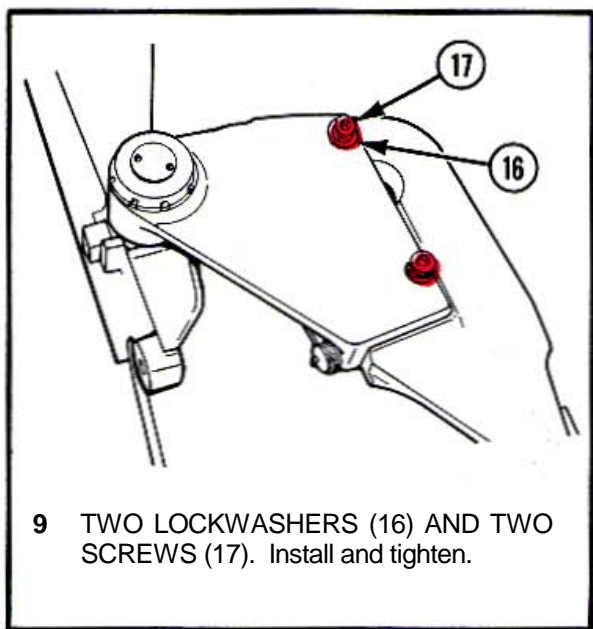
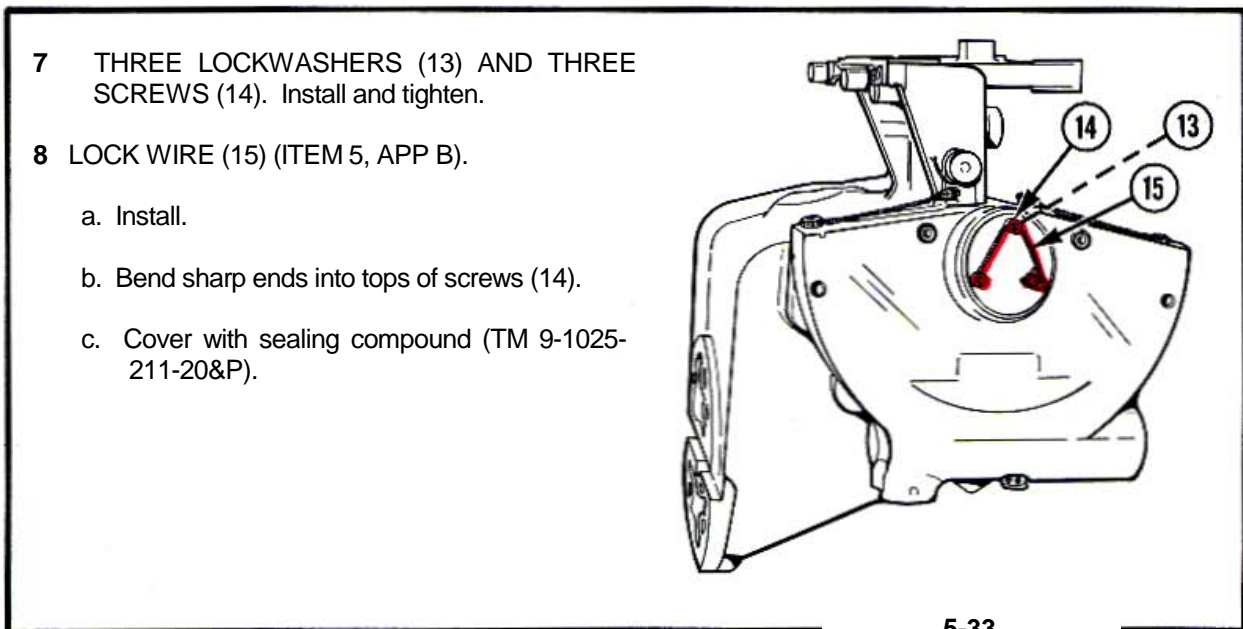
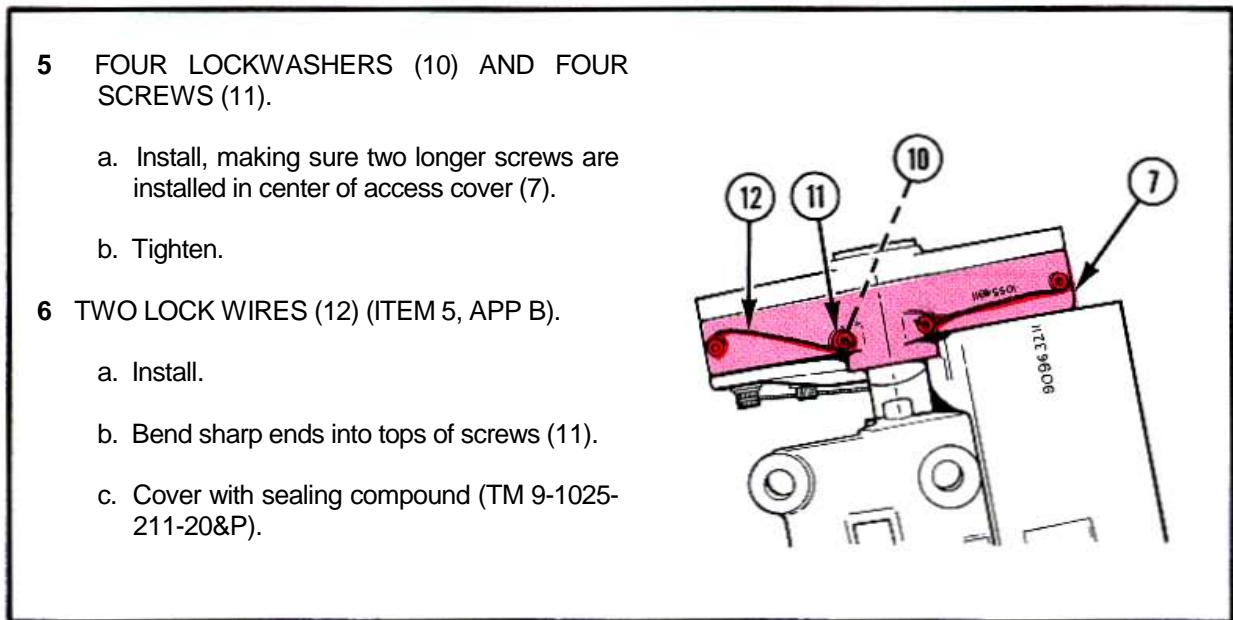
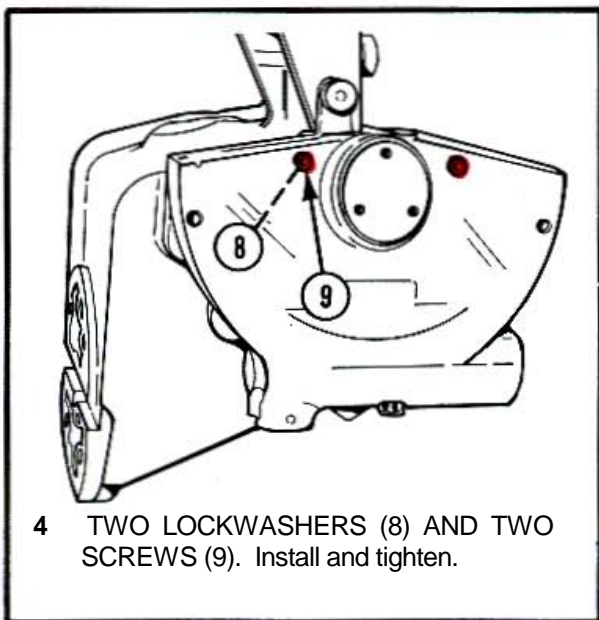
2 PIVOT (6).

- Apply a light coat of grease (item 2, app B) to the sleeve.
- Apply a light coat of sealing compound (TM 9-1025-211-20&P) to the mating surface.
- Install through housing (4) and into shaft of adapter assembly (1).



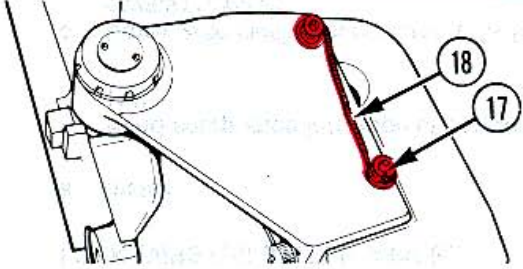
3 ACCESS COVER (7).

- Apply sealing compound (TM 9-1025-211-20&P) to mating surfaces.
- Install on housing (4).



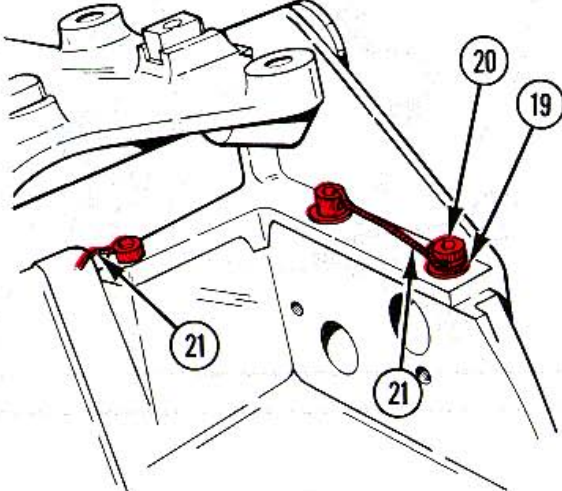
5-14. ADAPTER ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

INSTALLATION (cont )



**10** LOCK WIRE (18) (ITEM 5, APP B).

- Install.
- Bend sharp ends into tops of screws (17).
- Cover with sealing compound (TM 9-1025-211-20&P).



**11** THREE LOCKWASHERS (19) AND THREE SCREWS (20). Install and tighten.

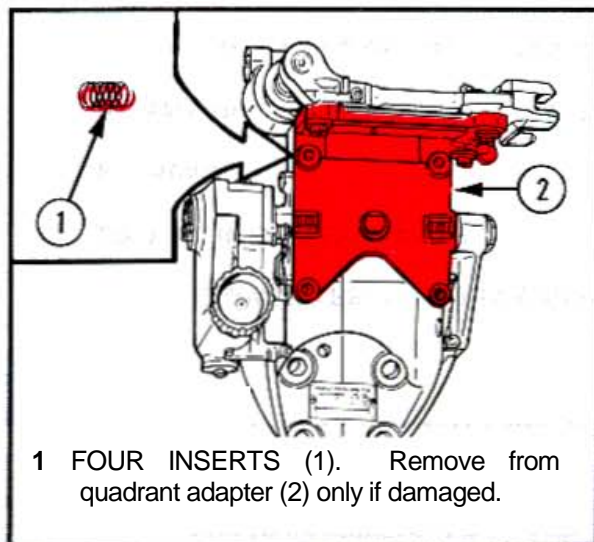
**12** TWO LOCK WIRES (21) (ITEM 5, APP B).

- Install.
- Bend sharp ends into tops of screws (20).
- Cover with sealing compound (TM 9-1025-211-20&P).

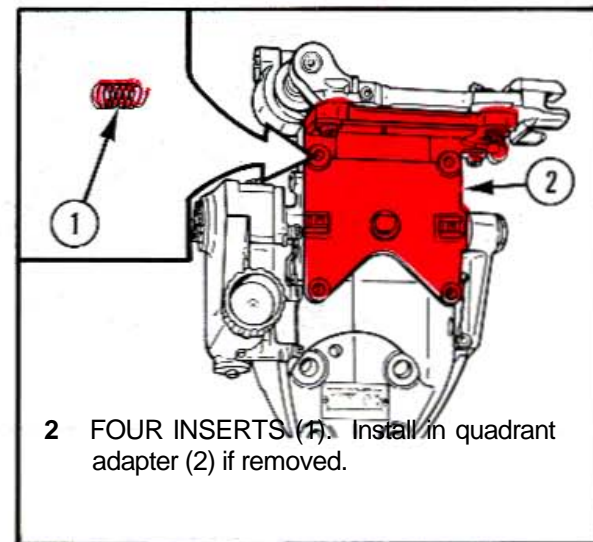
5-15. QUADRANT ADAPTER-MAINTENANCE INSTRUCTIONS

<b>THIS TASK COVERS:</b>	
Repair	
<b>INITIAL SETUP</b>	
Special Tools Shop set (SC 4931-95-CL-A07) Tool box (SC 4931-95-CL-A09)	Reference TM 9-1240-375-34P  Equipment Condition 5-7 M172 mount removed from M198 howitzer

REPAIR



**NOTE**  
 Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

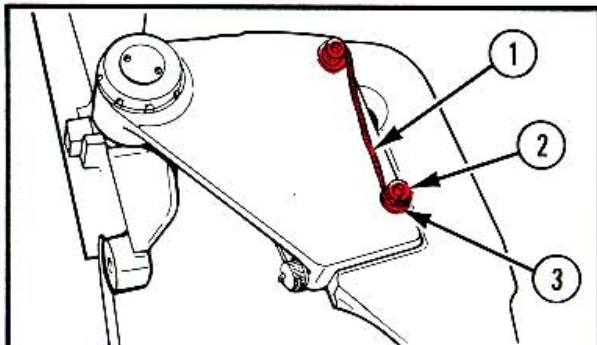


5-16. QUADRANT SUPPORT ASSEMBLY-MAINTENANCE INSTRUCTIONS

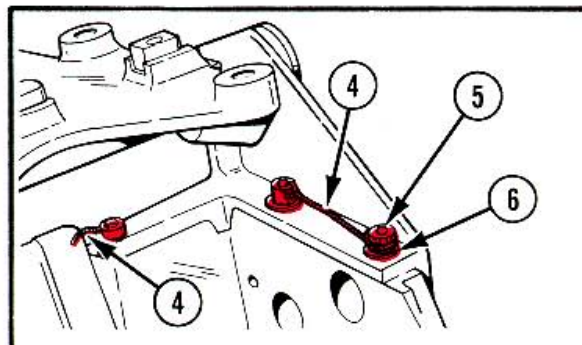
<p><b>THIS TASK COVERS:</b></p> <ul style="list-style-type: none"> <li>a. Disassembly</li> <li>b. Repair</li> <li>c. Reassembly</li> </ul>					
<p><b>INITIAL SETUP</b></p> <table border="0"> <tr> <td> <p>Special Tools                      Tool box (SC 4931-95-CL-A09)</p> </td> <td> <p>References                      TM 9-1025-211-20&amp;P                      TM 9-1240-375-34P</p> </td> </tr> <tr> <td> <p>Materials/Parts                      Lock wire (item 5, app B)                      Sealing compound (MIL-S-11031)</p> </td> <td> <p>Equipment Condition                      5-7 M172 mount removed from M198 howitzer.</p> </td> </tr> </table>		<p>Special Tools                      Tool box (SC 4931-95-CL-A09)</p>	<p>References                      TM 9-1025-211-20&amp;P                      TM 9-1240-375-34P</p>	<p>Materials/Parts                      Lock wire (item 5, app B)                      Sealing compound (MIL-S-11031)</p>	<p>Equipment Condition                      5-7 M172 mount removed from M198 howitzer.</p>
<p>Special Tools                      Tool box (SC 4931-95-CL-A09)</p>	<p>References                      TM 9-1025-211-20&amp;P                      TM 9-1240-375-34P</p>				
<p>Materials/Parts                      Lock wire (item 5, app B)                      Sealing compound (MIL-S-11031)</p>	<p>Equipment Condition                      5-7 M172 mount removed from M198 howitzer.</p>				

5-16. QUADRANT SUPPORT ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY



- 1 LOCK WIRE (1). Remove.
- 2 TWO SCREWS (2) AND TWO LOCK-WASHERS (3). Remove.



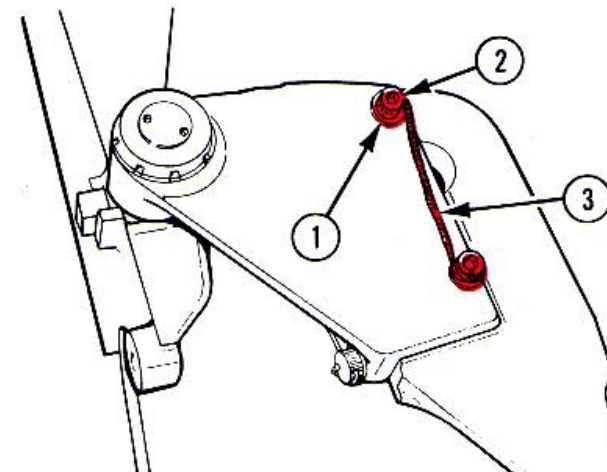
- 3 TWO LOCK WIRES (4). Remove.
- 4 THREE SCREWS (5) AND THREE LOCK-WASHERS (6). Remove.

REPAIR

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

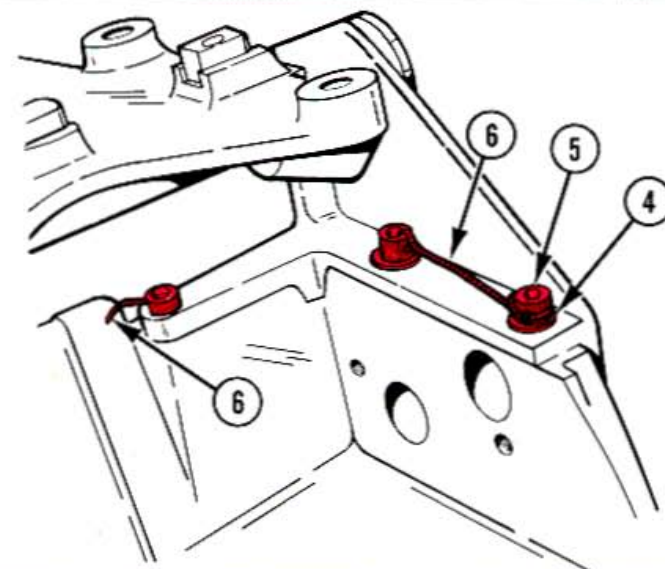
REASSEMBLY

- 1 TWO LOCKWASHERS (1) AND TWO SCREWS (2). Install and tighten.
- 2 LOCK WIRE (3) (ITEM 5, APP B).
  - a. Install.
  - b. Bend sharp ends into tops (if screws (2)).
  - c. Cover with sealing compound (TM 9-1025 211-20&P).





- 3 THREE LOCKWASHERS (4) AND THREE SCREWS (5). Install and tighten.
- 4 TWO LOCK WIRES (6) (ITEM 5, APP B).
  - a. Install.
  - b. Bend sharp ends into tops of screws (5).
  - c. Cover with sealing compound (TM 9-1025-211-20&P).



### 5-17. WORM SHAFT ASSEMBLY-MAINTENANCE INSTRUCTIONS

#### THIS TASK COVERS:

- a. Removal
- b. Installation

#### INITIAL SETUP

##### Special Tools

- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)

##### Materials/Parts

- Grease (item 2, app B)

##### Equipment Condition

- 5-7 M172 mount removed from M198 howitzer.

**5-17. WORM SHAFT ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)**

**REMOVAL**

Removal procedures are on page 5-18.

**NOTE**  
 Replace worm shaft assembly if bent or otherwise damaged. Damage may cause binding which will result in inaccuracies in sighting of M198 howitzer.

**INSTALLATION**

Installation procedures are on page 5-21.

**Section VI. GENERAL SUPPORT FINAL INSPECTION PROCEDURES  
 FOR THE M172 TELESCOPE AND QUADRANT MOUNT**

**5-18. GENERAL**

a. This section describes and illustrates the final inspection of the M172 mount. A final inspection will be performed prior to returning the M172 mount to the using unit or to the supply system.

b. If the M172 mount being inspected fails to meet the required standards, ensure all maintenance authorized at the applicable level has been performed correctly. Then send the M172 mount to the next level of maintenance.

**5-19. M172 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS**

**THIS TASK COVERS:**

<ul style="list-style-type: none"> <li>a. Setting up and adjusting the cross-leveling fixture</li> <li>b. Visual inspection</li> <li>c. Mounting the M172 mount on cross-leveling fixture</li> <li>d. Cross level mechanism backlash inspection</li> </ul>	<ul style="list-style-type: none"> <li>e. Cross level mechanism travel inspection</li> <li>f. Eccentric stud assembly adjustment</li> <li>g. Boresight adjustment inspection</li> <li>h. Torque inspection</li> </ul>
--	---

**INITIAL SETUP**

**Test Equipment**

- Cross-leveling fixture (6523553)
- Leveling adapter (10558253-11)
- M1A2 gunner's quadrant (11732246)
- Precision level (7686087)
- Test fixture adapter (10555619)

**Materials/ Parts**

- Lock wire (item 5, app B)
- Sealing compound (MIL-S-11031)

**References**

- TM 9-1025-211-20&P
- TM 9-1290-200-14&P

**Special Tools**

- Adapter set (SC 4931-95-CL-A11)
- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)
- Tool set (SC 4931-95-CL-J51)

**Special Environmental Condition**

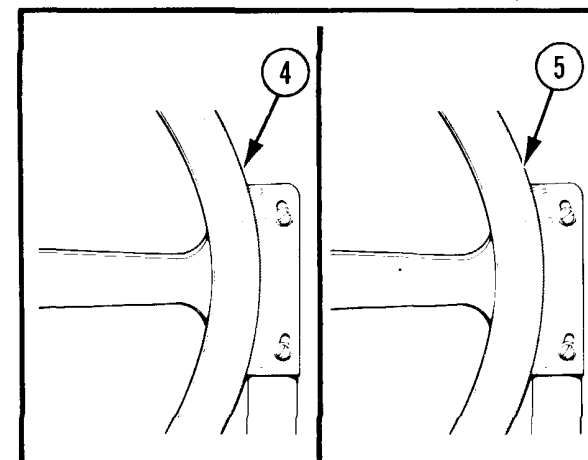
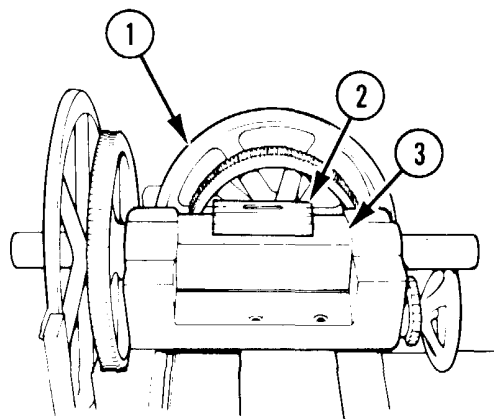
Ambient temperature: 60° F (16° C) to 90° F (32° C)

**SETTING UP AND ADJUSTING THE CROSS-LEVELING FIXTURE**

**1 CROSS-LEVELING FIXTURE (1).** Secure on solid stand bolted to floor.

**2 PRECISION LEVEL (2).**

- a. Place on block (3), perpendicular to axis of rotation.
- b. Level the cross-leveling fixture (1) in cant and elevation.

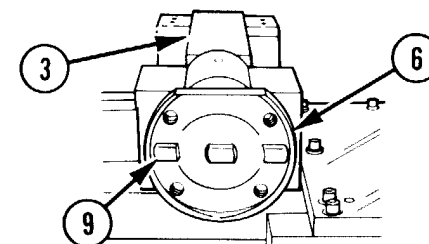
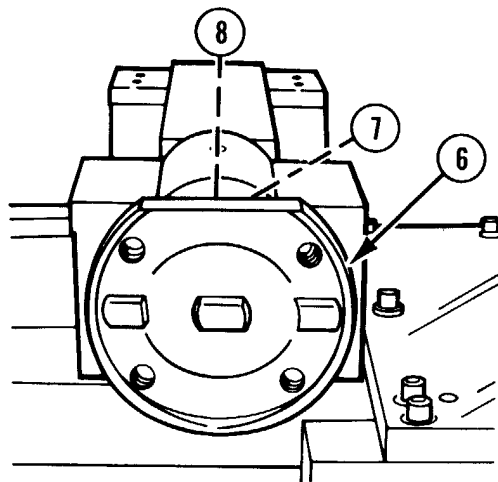


**3 CANT VERNIER SCALE (4) AND ELEVATION VERNIER SCALE (5).** Set to 0 for both elevation and cant.

**3-19 MILITARY MOUNT GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)**  
**SETTING UP AND ADJUSTING THE CROSS-LEVELING FIXTURE (cont)**

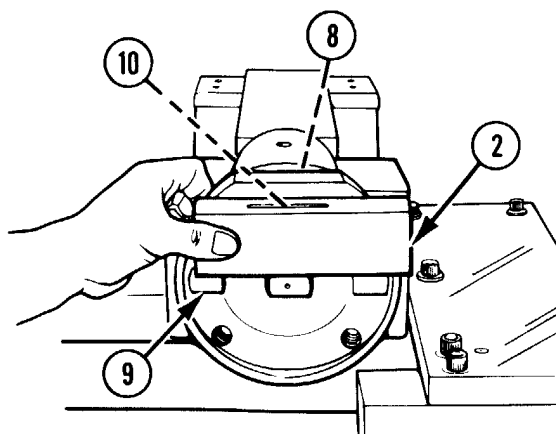
**SETTING UP AND ADJUSTING THE CROSS-LEVELING FIXTURE (cont)**

- 4 TEST FIXTURE ADAPTER (6). Install on cross-leveling shaft end (7).
- 5 SETSCREW (8). Tighten lightly.



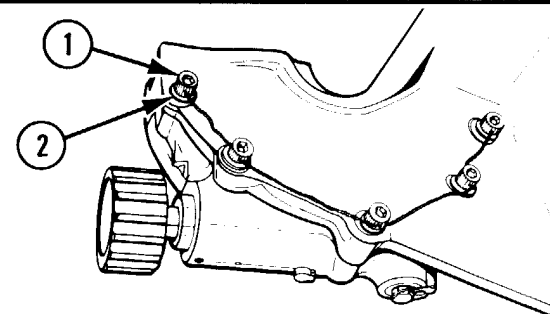
**NOTE**  
 When installing test fixture adapter (6), ensure adapter keys (9) are parallel to top of block (3) within 0.1 mil.

- 6 PRECISION LEVEL (2).
  - a. Place on adapter keys (9).
  - b. Check that precision level bubble (10) is centered.
  - c. Tighten setscrew (8); recheck cross level and adapter keys.
  - d. Rotate precision level (2) 180 degrees from original position, and check again that precision level bubble (10) is centered.

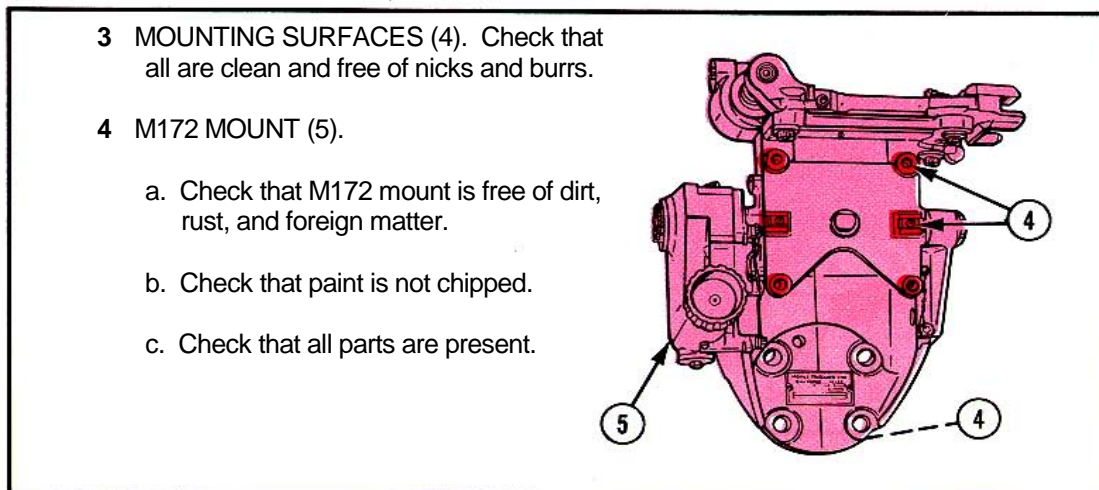
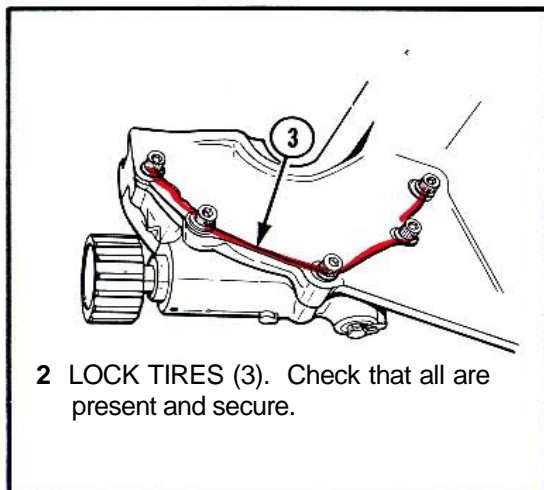


**VISUAL INSPECTION**

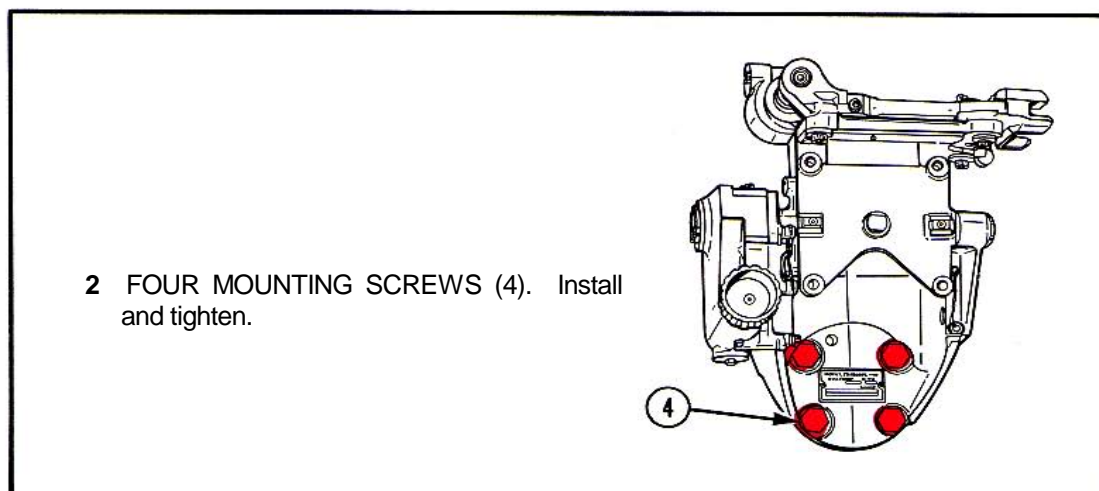
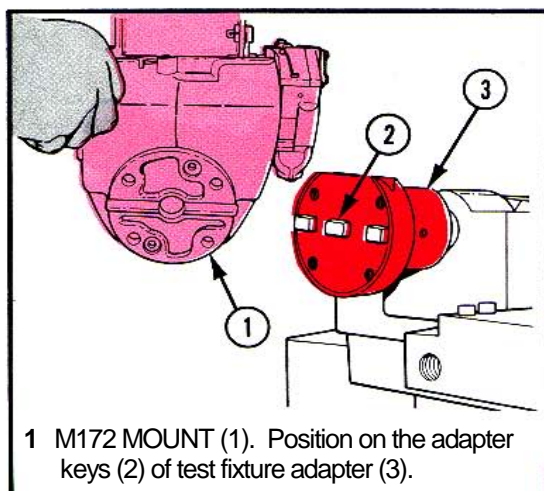
VISUAL INSPECTION I



1 ALL SCREWS (1) AND LOCKWASHERS (2). Check that all are present and tight.

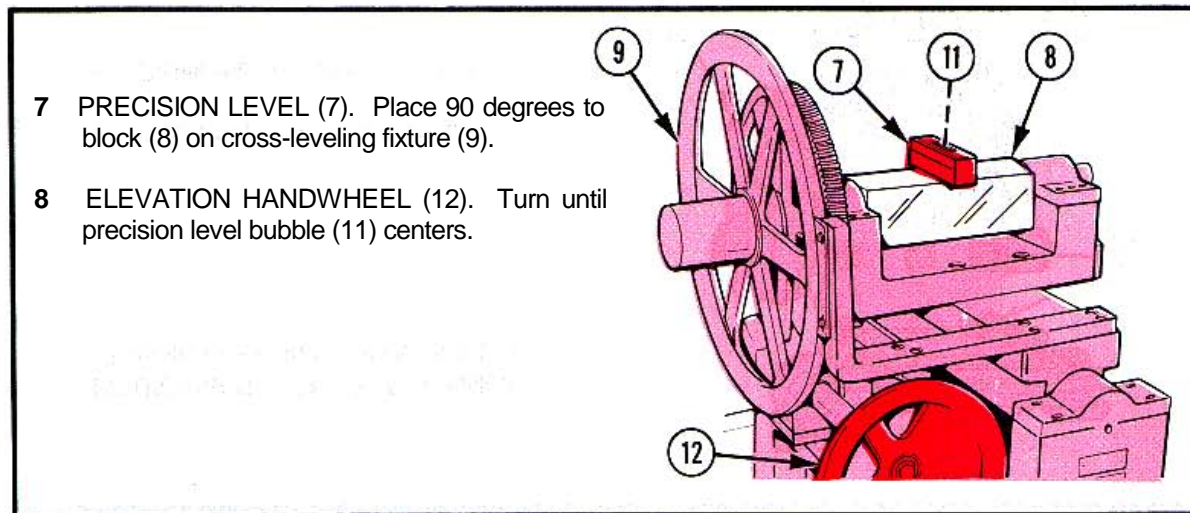
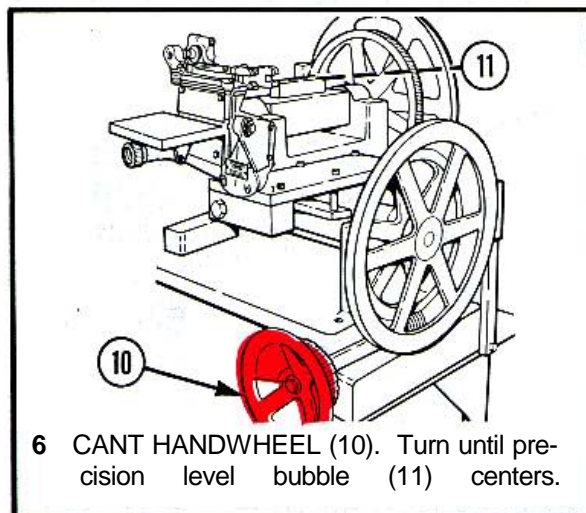
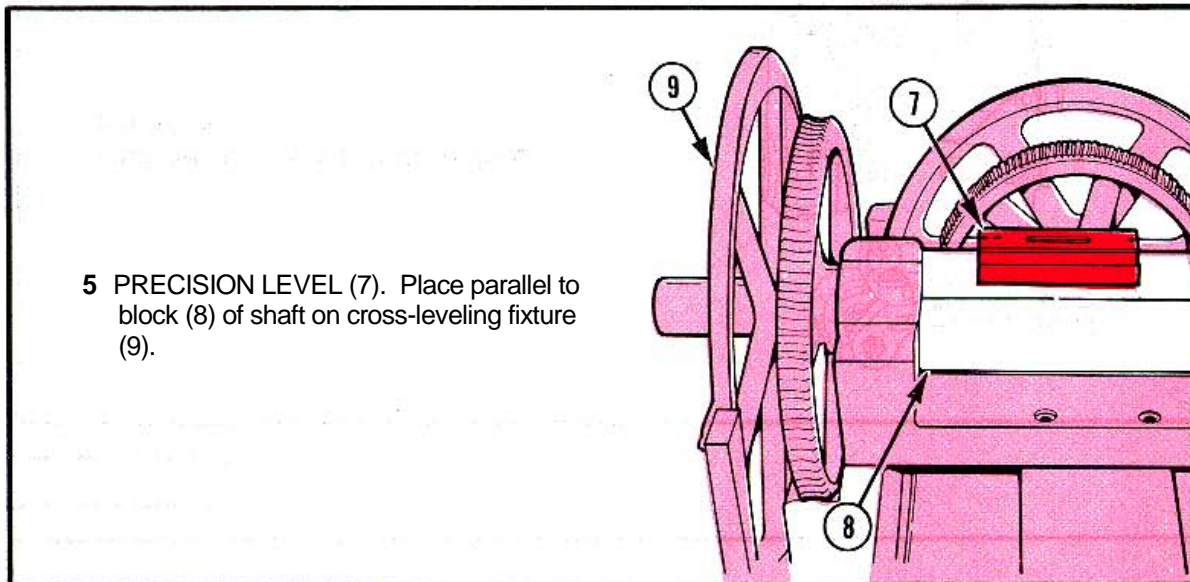
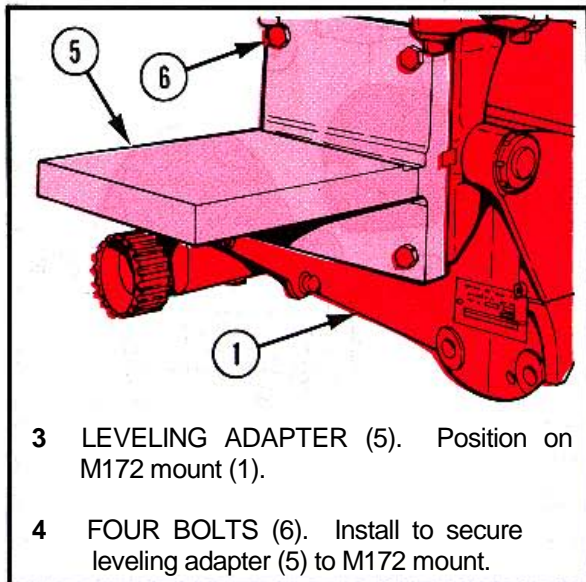


**MOUNTING THE M172 MOUNT ON CROSS-LEVELING FIXTURE**



5-19. M172 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

MOUNTING THE M172 MOUNT ON CROSS-LEVELING FIXTURE (cont)

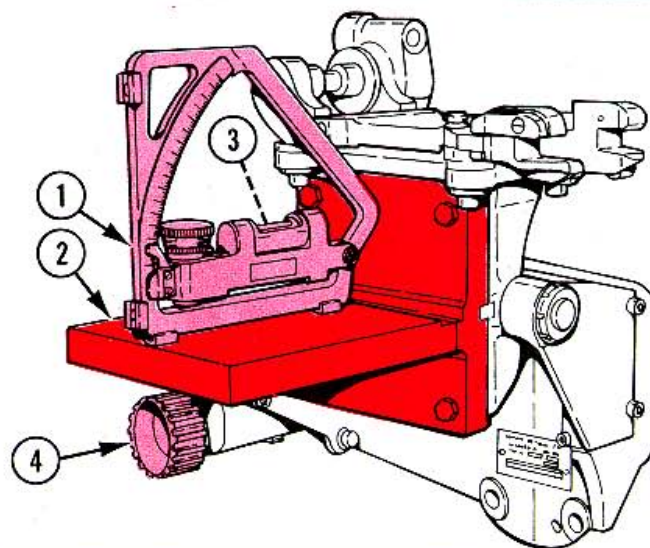




**CROSS LEVEL MECHANISM BACKLASH INSPECTION**

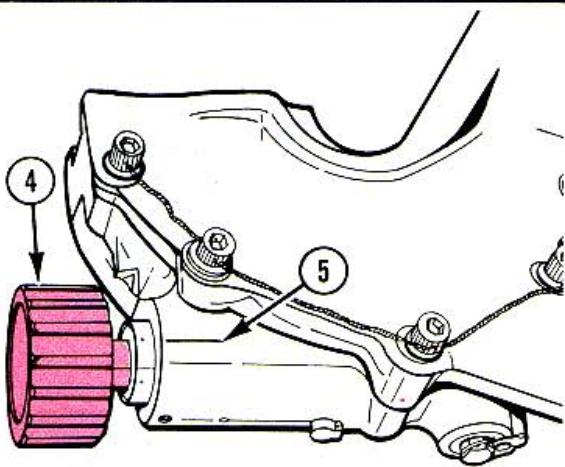
**1 M1A2 GUNNER'S QUADRANT (1).**

- a. Set at 0.
- b. Place on leveling adapter (2).
- c. Center M1A2 gunner's quadrant level bubble (3) using cross level knob (4).



**NOTE**

When bringing M172 mount level with M1A2 gunner's quadrant, rotate cross level knob in clockwise direction to center M1A2 gunner's quadrant level bubble. Do not overtravel when centering M1A2 gunner's quadrant level bubble.

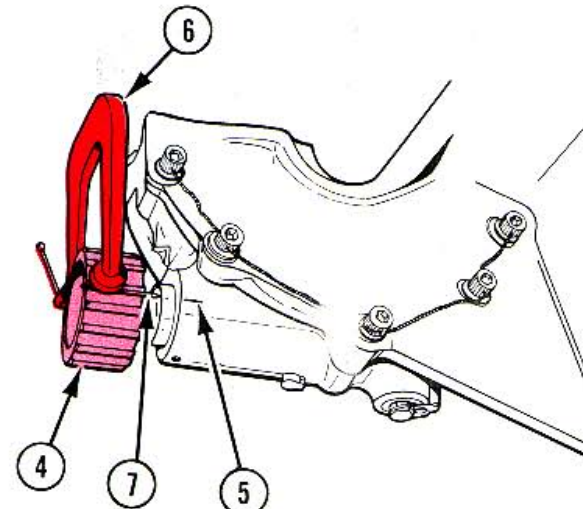


**2 INDEX LINE (5).** Scribe on M172 mount casting nearest to the cross level knob (4).

**NOTE**

An index pointer may be made from 1/16 inch diameter rod with sharp point on end. The index pointer may be held in place mechanically by a small C-clamp (6).

**3 INDEX POINTER (7).** Place on the cross level knob (4) directly opposite the scribed index line (5).



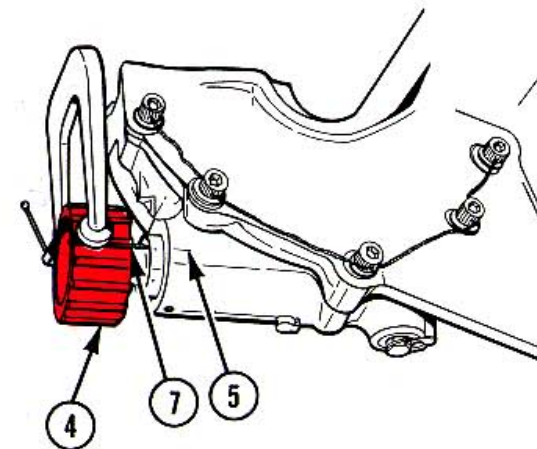
5-19. M172 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

CROSS LEVEL MECHANISM BACKLASH INSPECTION (cont)

**NOTE**

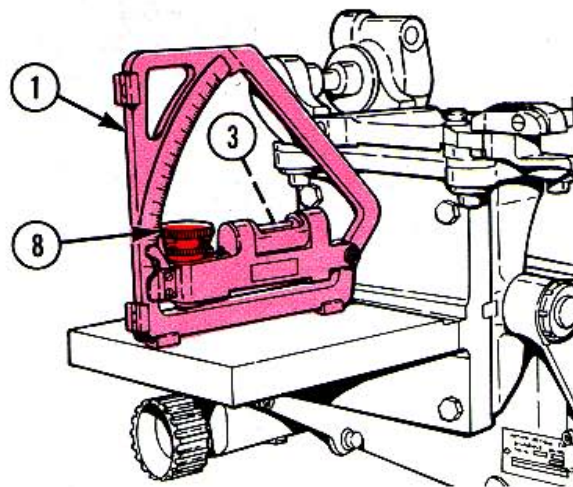
Do not go past scribed index line when turning counterclockwise. Ensure scribed index line and index pointer are in perfect alinement.

- 4 CROSS LEVEL KNOB (4). Rotate at least 1/2 turn clockwise. Turn counterclockwise until index pointer (7) aligns with scribed index line (5).



5 M1A2 GUNNER'S QUADRANT (1).

- a. Check that M1A2 gunner's quadrant level bubble (3) is centered when index pointer is aligned with scribed index line. If not centered, use micrometer knob (8) to center.
- b. Take reading from micrometer. If the reading has changed more than 1.5 mils, the backlash is excessive.



**NOTE**

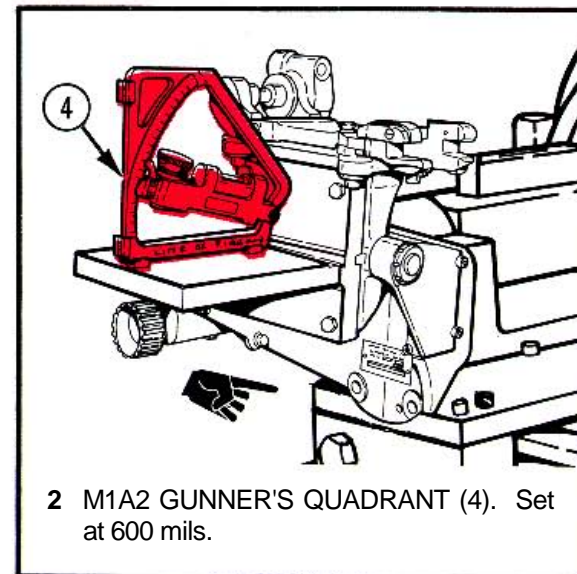
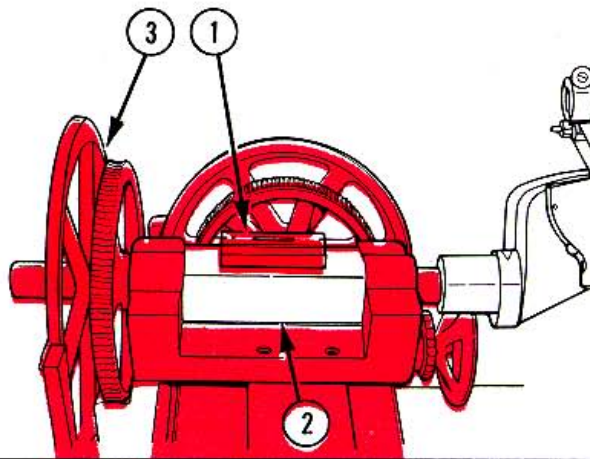
Repeat steps 1 thru 5 as necessary with readings of 150, 300, and 450 mils set on M1A2 gunner's quadrant.

This backlash procedure will be repeated at 0, 150, 300 and 450 mils in the opposite direction of cant, performed in steps 1 thru 5.

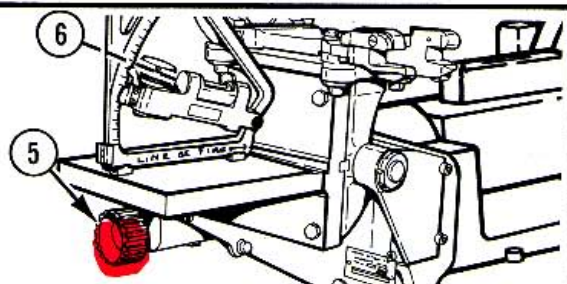
**CROSS LEVEL MECHANISM TRAVEL INSPECTION**

**1 PRECISION LEVEL (1).**

- a. Place on block (2), perpendicular to axis of rotation.
- b. Level cross-leveling fixture (3) in cant and elevation.



**2 M1A2 GUNNER'S QUADRANT (4).** Set at 600 mils.

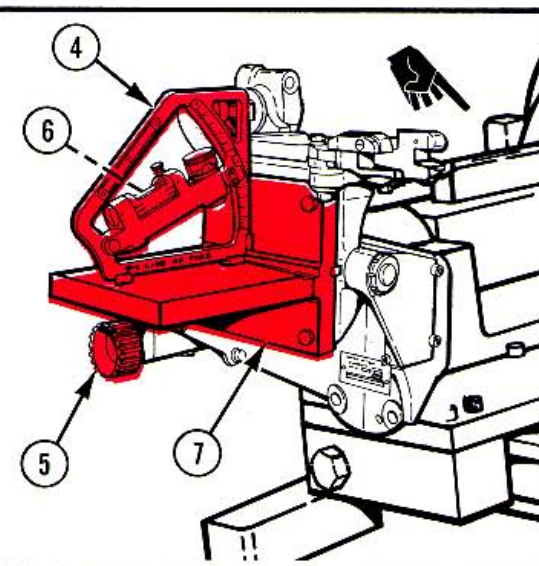


**3 CROSS LEVEL KNOB (5).**

- a. Turn until M1A2 gunner's quadrant level bubble (6) centers.
- b. If cross level knob (5) stops before M1A2 gunner's quadrant level bubble (6) centers, M172 mount is defective.

**4 M1A2 GUNNER'S QUADRANT (4).**

- a. Reverse.
- b. Turn cross level knob (5) until M1A2 gunner's quadrant level bubble (6) centers.
- c. If cross level knob stops before M1A2 gunner's quadrant level bubble is centered, M172 mount is defective.
- d. Set to zero and relevel leveling adapter (7).



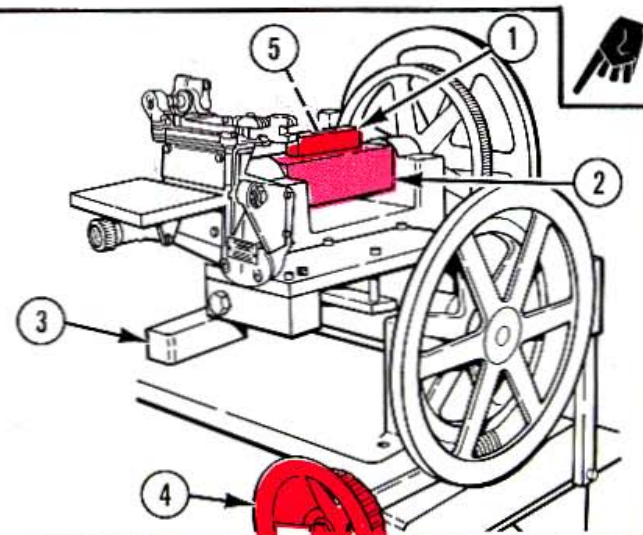


## 5-19. M172 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

## ECCENTRIC STUD ASSEMBLY ADJUSTMENT

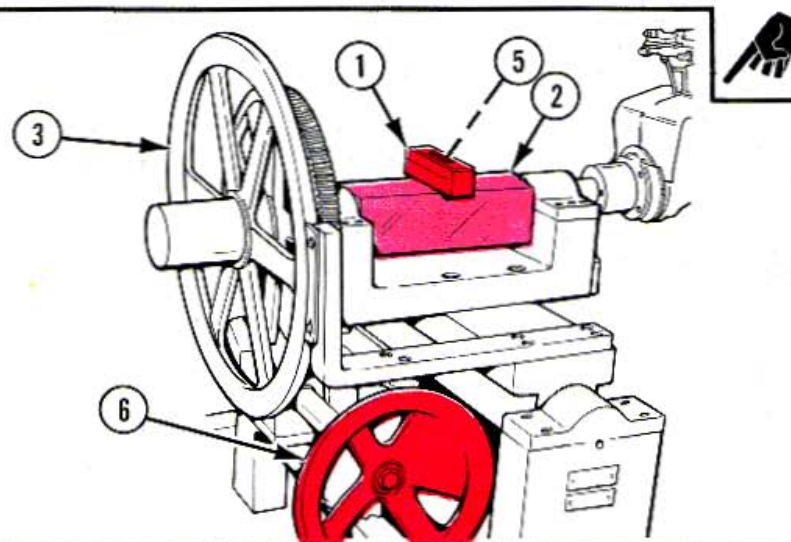
1 ■ PRECISION LEVEL (1). Place parallel to block (2) of shaft on cross-leveling fixture (3).

2 ■ CANT HANDWHEEL (4). Turn until precision level bubble (5) centers.



3 ■ PRECISION LEVEL (1). Place 90 degrees to block (2) on cross-leveling fixture (3).

4 ■ ELEVATION HANDWHEEL (6). Turn until precision level bubble (5) centers.

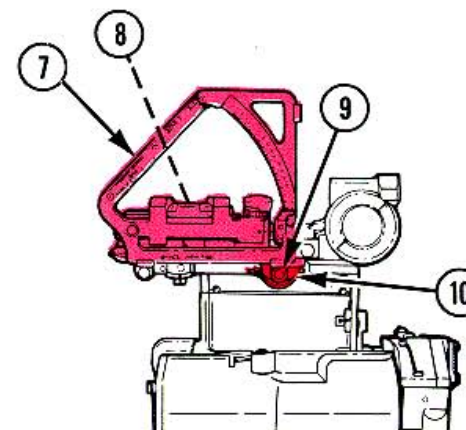


**5 M1A2 GUNNER'S QUADRANT (7).**

- a. Place on seats on M172 mount. M1A2 gunner's quadrant level bubble (8) should center.
- b. If not centered, adjust eccentric stud assembly (9).

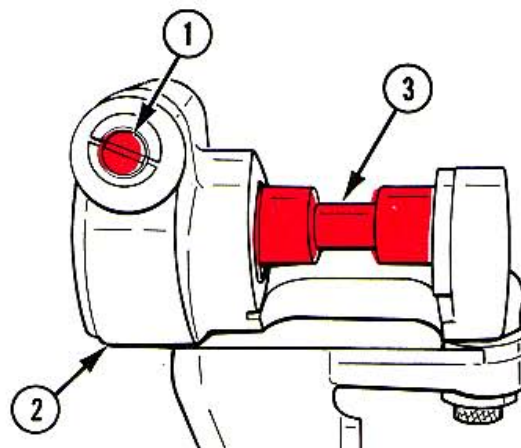
**6 ECCENTRIC STUD ASSEMBLY (9).**

- a. Loosen to disengage from spline plate (10).
- b. Turn and engage spline plate (10). Tighten eccentric stud assembly (9).
- c. Repeat step 5a. If M1A2 gunner's quadrant level bubble does not center, repeat steps 6a and b until centered.

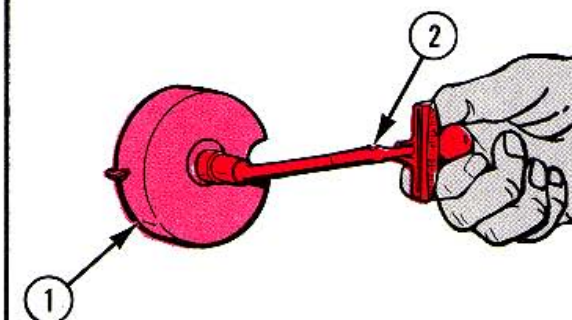


**BORESIGHT ADJUSTMENT INSPECTION**

BORESIGHT SCREW (1) ON BRACKET ASSEMBLY (2). Turn and observe shaft (3). When boresight screw (1) is turned, shaft should also turn.



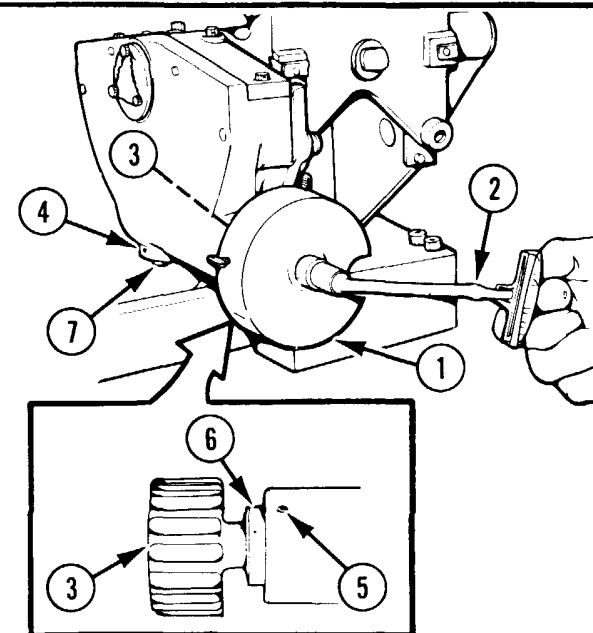
**TORQUE INSPECTION**



1 TORQUE ADAPTER (1). Place on torque wrench (2).

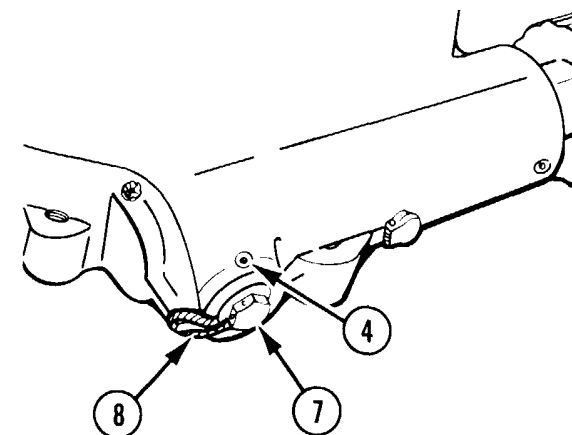
## 2 TORQUE ADAPTER (1) AND TORQUE WRENCH (2).

- a. Place over cross level knob (3).
- b. Measure torque.
- c. Torque required to start cross level knob (3) moving (starting torque) must not exceed 18 in.-lb (2.03 N-m).
- d. Torque required to keep cross level knob turning (running torque) must be between 4 in.-lb (0.45 N-m) and 12 in.-lb (1.35 N-m).
- e. If torque requirements cannot be met, loosen two setscrews (4 and 5). Tighten or loosen ring (6) or plug (7).



## 3 LOCK WIRE (8) (ITEM 5, APP B) AND SETSCREW (4).

- a. Install and tighten setscrew, making sure lock wire is attached so that tension is applied if plug (7) attempts to loosen.
- b. Apply sealing compound (TM 9-1025-21 1-20&P) and tighten setscrew (4).
- c. Apply sealing compound (TM 9-1025-211-20&P) to sharp ends of lock wire (8).



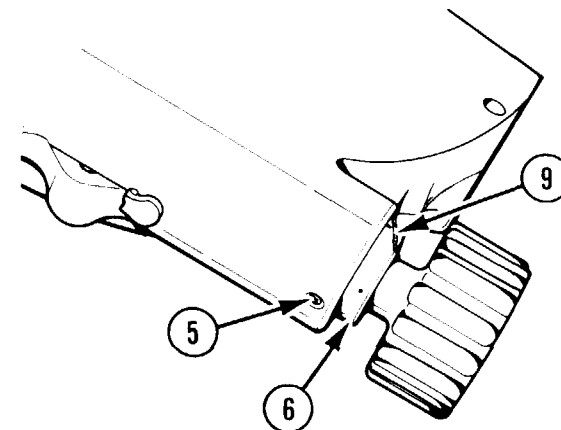


## 5-19. M172 MOUNT-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

## TORQUE INSPECTION (cont)

## 4 LOCK WIRE (9) (ITEM 5, APP B) AND SETSCREW (5).

- a. Install, making sure lock wire is attached so that tension is applied if ring (6) attempts to loosen.
- b. ■ Apply sealing compound (TM 9-1025 211-20&P) and tighten setscrew (5).
- c. Apply sealing compound (TM 9-1025-211-20&P) to sharp ends of lock wire (9).

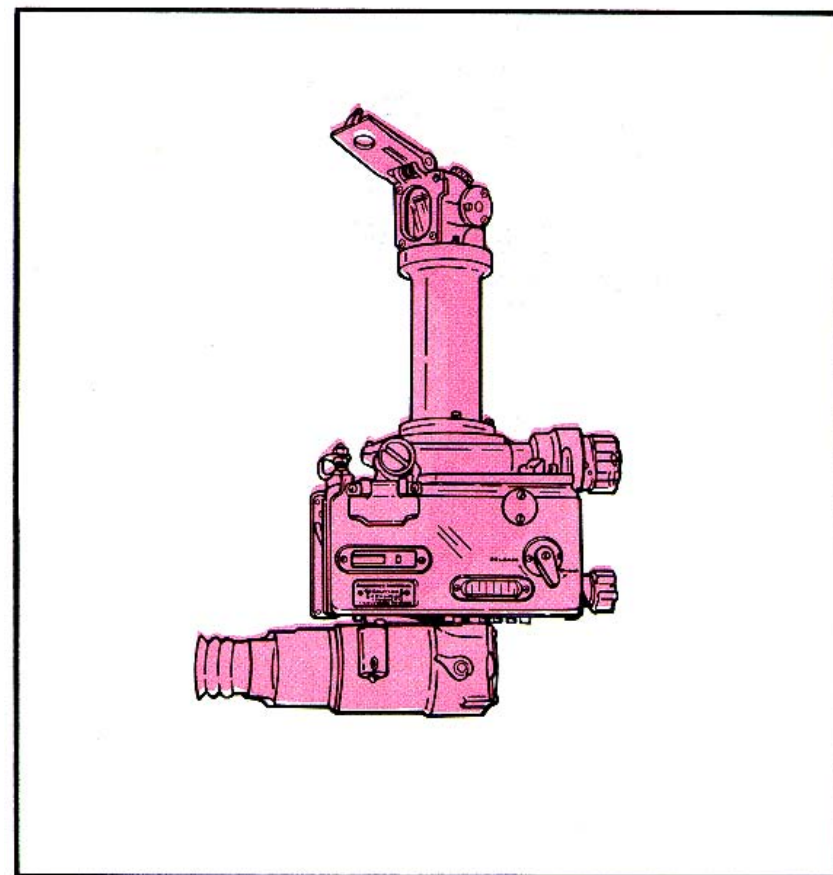


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**CHAPTER 6**  
**M137 PANORAMIC TELESCOPE--MAINTENANCE INSTRUCTIONS**

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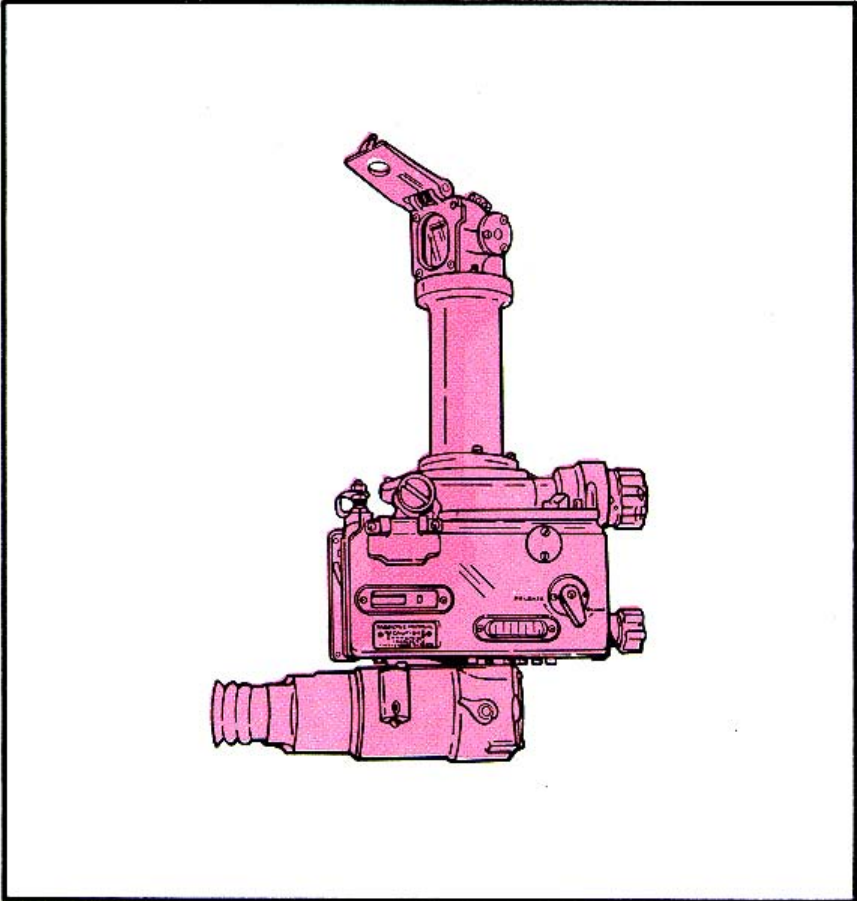
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Worm Shaft Assembly-General Support  
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CHAPTER OVERVIEW

This chapter contains maintenance procedures for the M137 telescope. Information on repair parts and special tools is included. Detailed procedures for troubleshooting and maintenance of the M137 telescope are also included.



**Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE,  
AND SUPPORT EQUIPMENT**

**6-1. COMMON TOOLS AND EQUIPMENT**

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

**6-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT**

Special tools, TMDE, and support equipment required and authorized for

repair of the M137 telescope are listed in TM 9-1240-375-34P.

**6-3. SPARES AND REPAIR PARTS**

Spares and repair parts are listed and illustrated in TM 9-1240-375-34P.

**Section II. INSPECTIONS**

**6-4. GENERAL**

a. Inspection is performed primarily to determine the following:

- (1) Completeness.
- (2) The nature of unserviceability.
- (3) The work, repair parts, and supplies required to return the M137 telescope to serviceability.
- (4) That work in process is being performed properly.
- (5) That completed work complies fully with serviceability standards.

b. The M137 telescope is considered serviceable when:

- (1) It is complete and properly performs the intended function.
- (2) All modification work orders (MWO's) have been applied.
- (3) All defects disclosed by the inspection have been corrected.

c. DA Form 2408-5 and DA Form 2409 list applicable MWO's.

**6-5. CATEGORIES OF INSPECTION**

Categories of inspection define responsibilities.

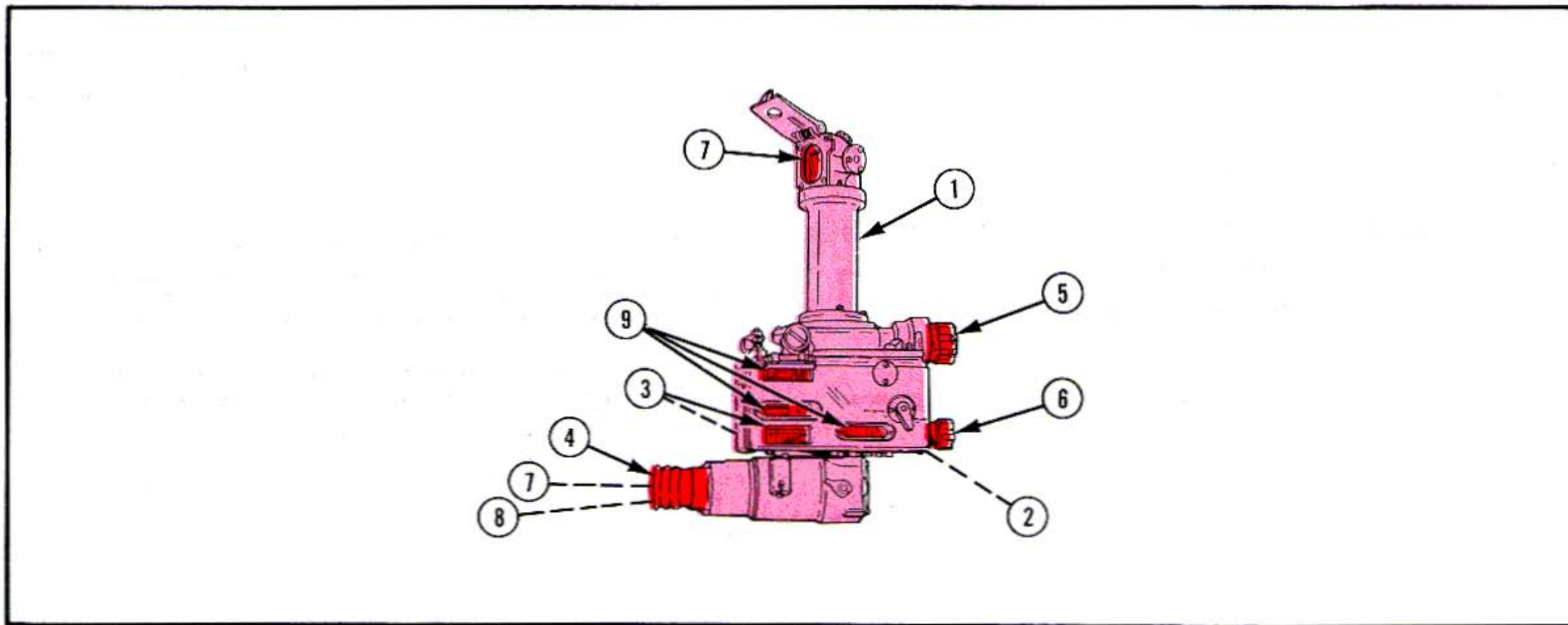
a. An initial inspection is performed immediately on receipt of the M137 telescope for maintenance. This inspection will determine the amount and type of work to be performed or whether the materiel should be sent to depot maintenance.


b. A final inspection of the M137 telescope is performed after repairs have been completed to ensure the item meets serviceability standards.

c. Table 6-1 lists initial inspection procedures for the M 137 telescope. Final inspection procedures are located on page 6-77.

d. Preembarkation inspection procedures are located on page 2-76.

**Table 6-1. INITIAL INSPECTION-M137 TELESCOPE**



Item No.	Item To Be Inspected	Procedures
1	M137 TELESCOPE (1)	Look for signs of mistreatment, such as bare spots, dents, scuff marks, or damaged parts. Inspect M137 telescope for cleanness.
2	MOUNTING SURFACE (2)	Mounting surface must be clean and free of nicks and burrs.
3	DECAL AND IDENTIFICATION PLATES (3)	Decal and identification plates must be present and readable.
4	EYESHIELD (4)	Eyeshield must not be torn or missing.
5	KNOB ASSEMBLY (AZIMUTH) (5)	Rotate the azimuth knob assembly. It must turn smoothly and rotate the head assembly and azimuth counter.
6	KNOB ASSEMBLY (CORRECTION) (6)	Rotate the correction knob assembly. It must turn smoothly and turn the correction counter.
7	LENSES (7)	<p>Check for dirt or condensation on lenses.</p> <p style="text-align: center;"><b>WARNING</b></p> <div style="display: flex; align-items: center;">  <p>When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.</p> </div>
8	RETICLE (8)	Check for dirt or condensation on reticle. Inspect reticle for illumination. Illumination must be present and even.
9	COUNTER BOX WINDOWS (9)	Inspect counter box windows for illumination. Illumination must be present and even.



Section III. TROUBLESHOOTING

6-6. GENERAL

a. The symptom index can be used as a quick guide to troubleshooting. Common malfunctions are listed in alphabetical order with a page number reference to the troubleshooting table where a test or inspection and corrective action are provided.

b. The direct support troubleshooting table (p 6-6) lists the common malfunctions which may be found during maintenance of the M137 telescope. Perform the tests/inspections and corrective actions in the order listed.

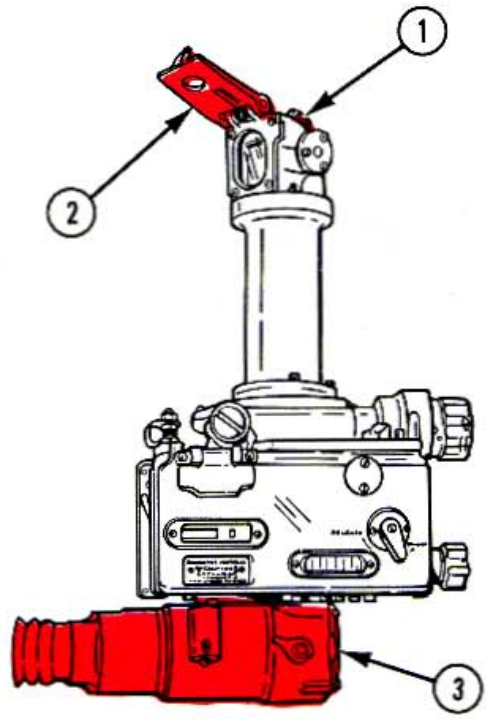
c. The general support troubles hooting table (p 6-9) lists the common malfunctions which may be found during maintenance of the M137 telescope. Perform the tests/inspections and corrective actions in the order listed.

d. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective action, notify depot maintenance.

DIRECT SUPPORT SYMPTOM INDEX

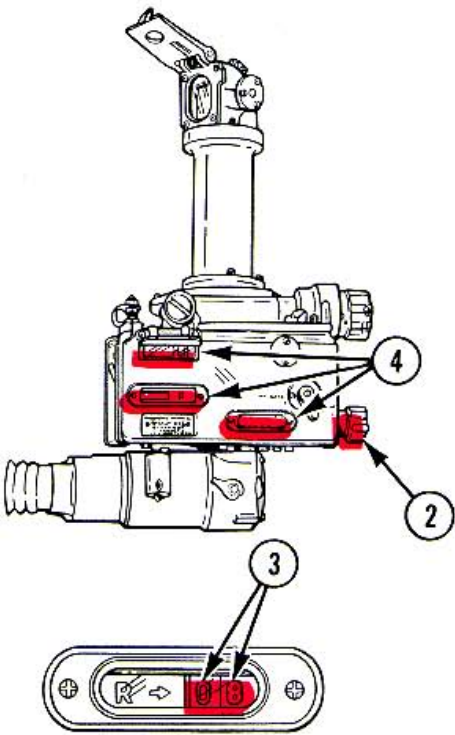
	<b>Troubleshooting Procedure (Page)</b>
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Table 6-2. DIRECT SUPPORT TROUBLESHOOTING-M137 TELESCOPE

<p><b>MALFUNCTION</b>  <b>TEST OR INSPECTION</b>  <b>CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p style="text-align: center;"><b>HEAD ASSEMBLY</b></p> <p>1. HEAD ASSEMBLY ELEVATION KNOB (1) BINDS.            Check for bent actuator.            Replace head assembly (p 6-36).</p> <p style="text-align: center;"><b>COVER ASSEMBLY (HEAD)</b></p> <p>2. COVER PLATE (2) DOES NOT LATCH CORRECTLY.            Check for incorrectly assembled cover assembly.            Reassemble cover assembly correctly (p 6-17).</p> <p style="text-align: center;"><b>ELBOW ASSEMBLY</b></p> <p>3. ELBOW ASSEMBLY (3) DOES NOT LATCH CORRECTLY.            Check for incorrectly assembled plunger.            Assemble plunger correctly (p 6-21).</p>	 <p>The diagram shows a technical drawing of the M137 telescope assembly. It consists of a main body with a telescopic section and a head assembly at the top. Three callout numbers are used to identify specific parts: '1' points to the elevation knob on the head assembly; '2' points to the cover plate on the head assembly; and '3' points to the elbow assembly at the bottom of the telescope.</p>

6-6. GENERAL (cont)

Table 6-2. DIRECT SUPPORT TROUBLESHOOTING-M137 TELESCOPE (cont)

<p><b>MALFUNCTION</b> <b>TEST OR INSPECTION</b> <b>CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p style="text-align: center;"><b>COUNTER BOX ASSEMBLY</b></p> <p><b>4. AZIMUTH COUNTER COVER (4) DOES NOT REMAIN OPEN OR CLOSED.</b>  Check for incorrectly assembled cover assembly.  Reassemble cover assembly correctly (p 6-26).</p> <p><b>5. COUNTER BOX WINDOWS (5) ARE FOGGED OR HAVE CONDENSATION.</b>  Step 1. Check for moisture in counter box.  Purge and charge with dry nitrogen (TM 9-1025-211-20&amp;P).  Step 2. Check for loose purging valve stem on counter box.  Tighten purging valve stem (p 6-25).</p> <p><b>6. COUNTER DIALS (6) HAVE UNEVEN OR NO ILLUMINATION.</b>  Observe visually in darkened area.  a. Place instrument in plastic bag (TM 9-1025-211-10).  b. Send to depot maintenance.</p>	

**GENERAL SUPPORT SYMPTOM INDEX**

**Troubleshooting  
Procedure  
(Page)**

**BODY ASSEMBLY**

Target is not clear or sharp because of parallax ..... 6-9

**COUNTER BOX ASSEMBLY**

Correction knob binds ..... 6-10

Counter numbers are not in horizontal alinement ..... 6-10

Counters have excessive backlash ..... 6-10

**KNOB ASSEMBLY (AZIMUTH)**

Azimuth knob does not function correctly ..... 6-9

**Table 6-3. GENERAL SUPPORT TROUBLESHOOTING-M137 TELESCOPE**

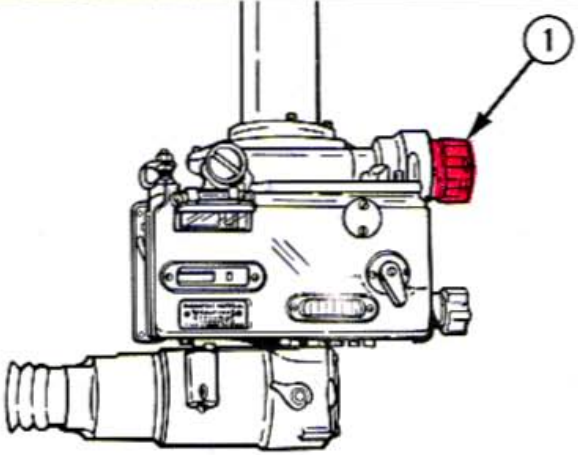
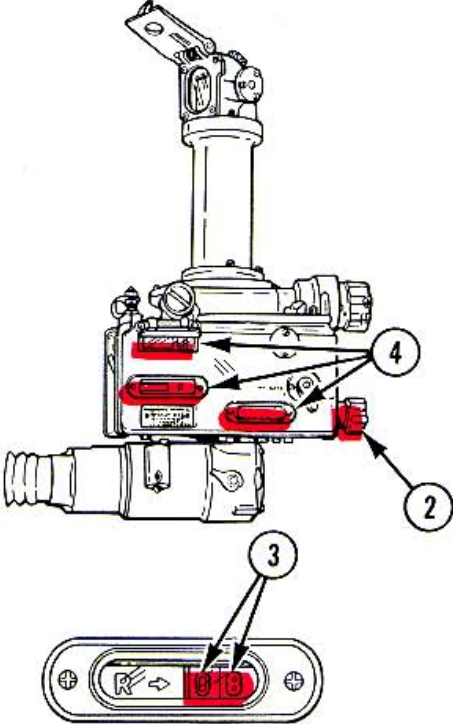
<p><b>MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p style="text-align: center;"><b>BODY ASSEMBLY</b></p> <p><b>1. TARGET IS NOT CLEAR OR SHARP BECAUSE OF PARALLAX.</b></p> <p>Observe visually.</p> <p>Place instrument in plastic bag (TM 9-1025-211-10) and send to depot maintenance.</p> <p style="text-align: center;"><b>KNOB ASSEMBLY (AZIMUTH)</b></p> <p><b>2. AZIMUTH KNOB (1) DOES NOT FUNCTION CORRECTLY.</b></p> <p>Check for incorrectly assembled azimuth knob assembly.</p> <p>Reassemble azimuth knob assembly correctly (p 6-54).</p>	 <p>The diagram shows a side view of the telescope's body assembly. A red azimuth knob is highlighted and labeled with a circled number '1'. The knob is mounted on the right side of the instrument's main housing. Below the main housing, the eyepiece assembly is visible.</p>

Table 6-3. GENERAL SUPPORT TROUBLESHOOTING-M137 TELESCOPE (cont)

<p><b>MALFUNCTION</b></p> <p><b>TEST OR INSPECTION</b></p> <p><b>CORRECTIVE ACTION</b></p>	<p><b>LOCATION</b></p>
<p style="text-align: center;"><b>COUNTER BOX ASSEMBLY</b></p> <p><b>3. CORRECTION KNOB (2) BINDS.</b></p> <p>Check for defective correction knob assembly.</p> <p>Replace correction knob assembly (p 6-72).</p> <p><b>4. COUNTER NUMBERS (3) ARE NOT IN HORIZONTAL ALINEMENT.</b></p> <p>Observe visually.</p> <p>Replace counters (p 6-61).</p> <p><b>5. COUNTERS (4) HAVE EXCESSIVE BACKLASH.</b></p> <p>Step 1. Check for loose counter mechanism mounting screws.</p> <p>Tighten mounting screws (p 6-64).</p> <p>Step 2. Check for worn or damaged counters.</p> <p>Replace counters (p 6-61).</p>	 <p>The diagram shows a side view of the counter box assembly. Callout 2 points to the correction knob on the right side. Callout 3 points to a counter window on the front face, which displays the number '010'. Callout 4 points to the counter mechanism on the right side of the front face.</p>

**Section IV. DIRECT SUPPORT MAINTENANCE PROCEDURES  
FOR THE M137 PANORAMIC TELESCOPE**

**6-7. M137 TELESCOPE-MAINTENANCE INSTRUCTIONS**

<b>INITIAL SETUP</b>	
<p>Special Tools</p> <ul style="list-style-type: none"> <li>Shop set (SC 4931-95-CL-A07)</li> <li>Tool box (SC 4931-95-CL-A09)</li> <li>Tool set (SC 4931-95-CL-J51)</li> </ul> <p>Materials/Parts</p> <ul style="list-style-type: none"> <li>Cleaning compound (MIL-C-18718)</li> <li>Grease (item 2, app B)</li> <li>Sealing compound (MIL-S-11031)</li> </ul> <p>References</p> <ul style="list-style-type: none"> <li>TM 9-1025-211-10</li> <li>TM 9-1025-211-20&amp;P</li> <li>TM 9-1240-375-34P</li> </ul>	<p>Troubleshooting References</p> <ul style="list-style-type: none"> <li>6-7 Head assembly elevation knob binds.</li> <li>6-7 Cover plate does not latch correctly.</li> <li>6-7 Elbow assembly does not latch correctly.</li> <li>6-8 Counter box windows are fogged or have condensation.</li> <li>6-8 Azimuth counter cover does not remain open or closed.</li> </ul> <p align="center"><b>WARNING</b></p> <p><b>When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.</b></p>

<b>List of Tasks</b>			
<b>Task No.</b>	<b>Task</b>	<b>Task Ref (Page)</b>	<b>Troubleshooting Ref No. (Page)</b>
1	Maintain M137 telescope: <ul style="list-style-type: none"> <li>a. Disassemble.</li> <li>b. Repair.</li> <li>c. Reassemble.</li> </ul>	6-14 6-14 6-14	




6-7. M137 TELESCOPE-MAINTENANCE INSTRUCTIONS (cont)

List of Tasks

Task No.	Task	Task Ref (Page)	Troubleshooting Ref No. (Page)
2	Maintain head assembly: a. Disassemble. b. Repair. c. Reassemble.	6-16 6-16 6-16	6-7
3	Maintain cover assembly (head): a. Disassemble. b. Repair. c. Reassemble.	6-17 6-18 6-18	6-7
4	Maintain body assembly: a. Disassemble. b. Repair. c. Reassemble.	6-19 6-19 6-19	
5	Maintain knob assembly (azimuth): a. Remove. b. Install.	6-20 6-20	
6	Maintain elbow assembly: a. Disassemble. b. Repair. c. Reassemble.	6-21 6-21 6-22	6-7

7	Maintain optical cell assembly:	6-23	6-8
	a. Disassemble.	6-23	
	b. Repair.	6-23	
	c. Reassemble.		
8	Maintain counter box assembly:	6-24	
	a. Disassemble.	6-24	
	b. Repair.	6-24	
	c. Reassemble.		
9	Maintain cover assembly (azimuth counter):	6-26	6-8
	a. Remove.	6-26	
	b. Disassemble.	6-26	
	c. Inspect.	6-26	
	d. Clean.	6-26	
	e. Repair.	6-27	
	f. Reassemble.	6-27	
	g. Install.	6-27	
	h. Purge.	6-27	

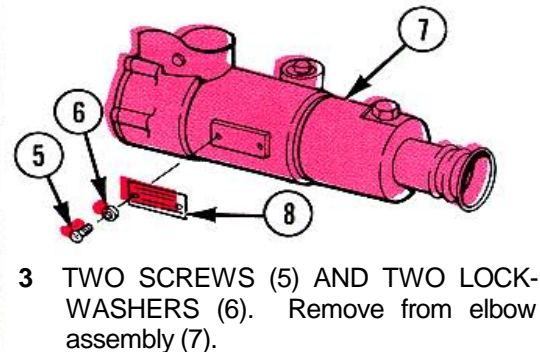
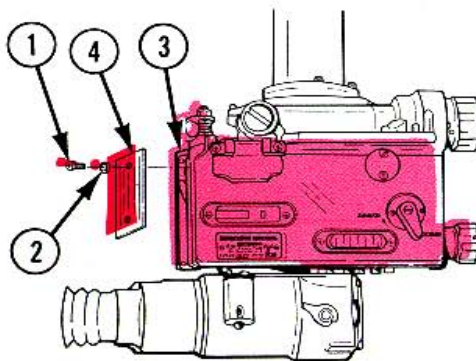
**6-8. M137 TELESCOPE-MAINTENANCE INSTRUCTIONS**

<b>THIS TASK COVERS:</b>	
<ul style="list-style-type: none"> <li>a. Disassembly</li> <li>b. Repair</li> <li>c. Reassembly</li> </ul>	
<b>INITIAL SETUP</b>	
<p>Special Tools Tool box (SC 4931-95-CL-A09)</p> <p>Reference TM 9-1240-375-34P</p>	<p><b>WARNING</b> When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.</p>

6-8. M137 TELESCOPE-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY

- 1 TWO SCREWS (1) AND TWO LOCK-WASHERS (2). Remove from counter box assembly (3).
- 2 IDENTIFICATION PLATE (4). Remove if defective.



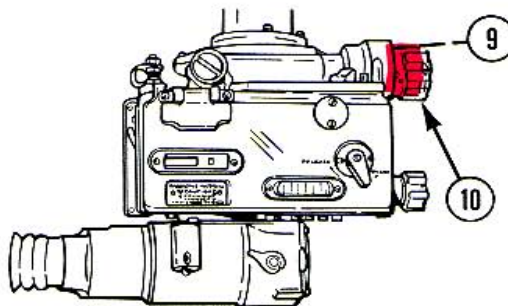
- 3 TWO SCREWS (5) AND TWO LOCK-WASHERS (6). Remove from elbow assembly (7).
- 4 INSTRUCTION PLATE (8). Remove only if defective.

REPAIR

**CAUTION**

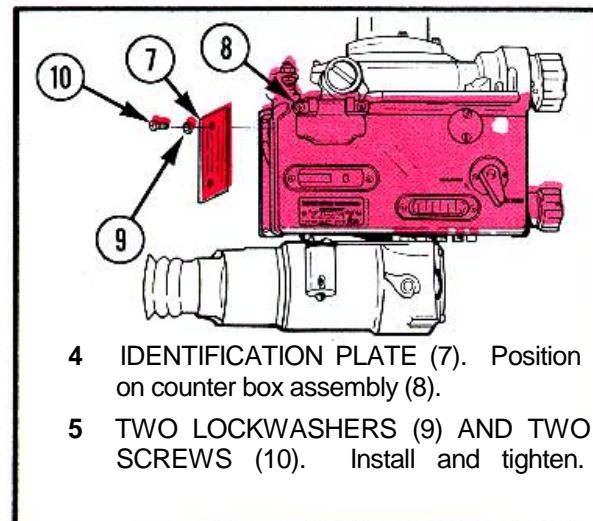
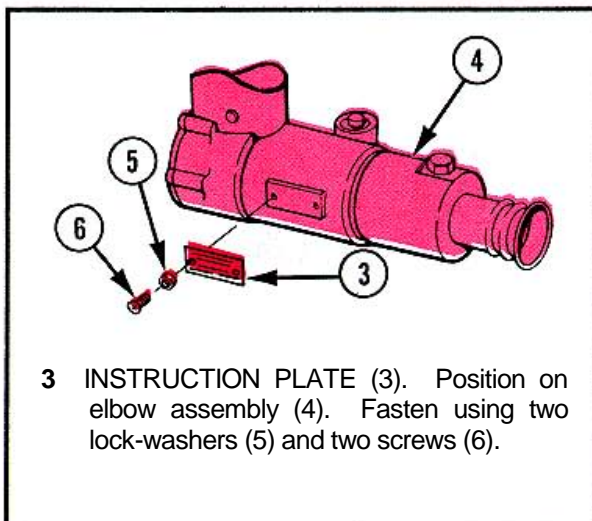
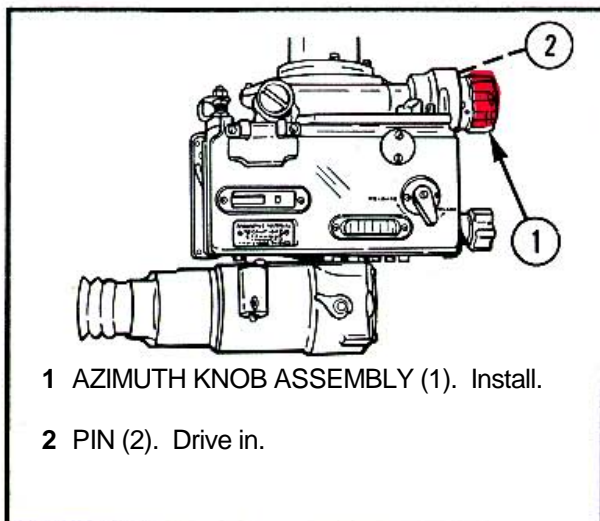
Support azimuth knob assembly in V block on solid surface to prevent damage to worm shaft.

- 5 PIN (9). Drive out.
- 6 AZIMUTH KNOB ASSEMBLY (10). Remove.



Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

REASSEMBLY



6-9. HEAD ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Disassembly
- b. Repair
- c. Reassembly

**INITIAL SETUP**

Special Tools  
Tool box (SC 4931-95-CL-A09)  
Materials/Parts  
Sealing compound (MIL-S-11031)  
References  
TM 9-1025-211-20&P  
-TM 9-1240-375-34P

Troubleshooting Reference  
6-7 Head assembly elevation knob binds.

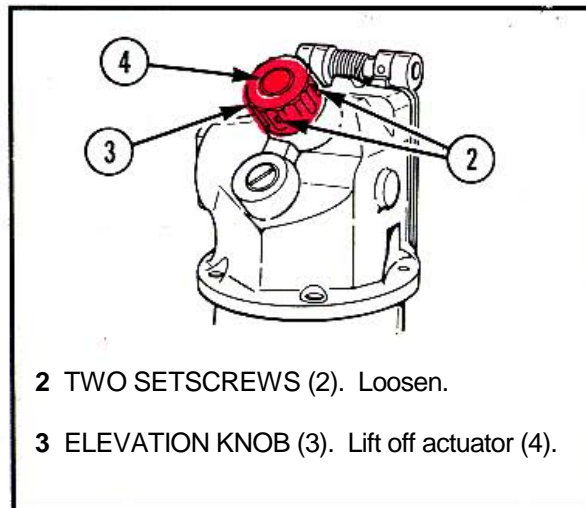
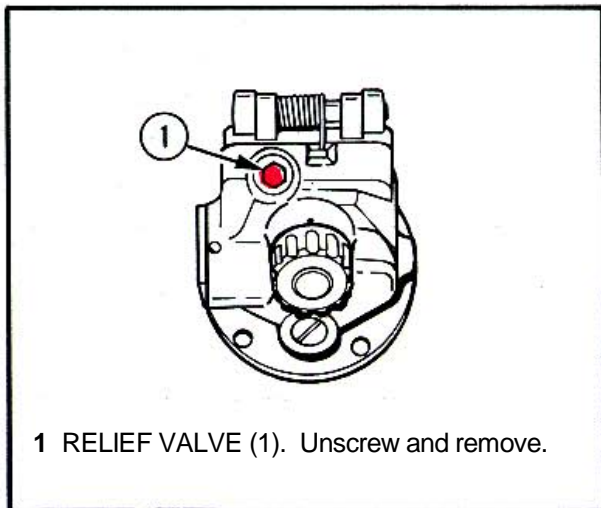
**WARNING**



When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

6-9. HEAD ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

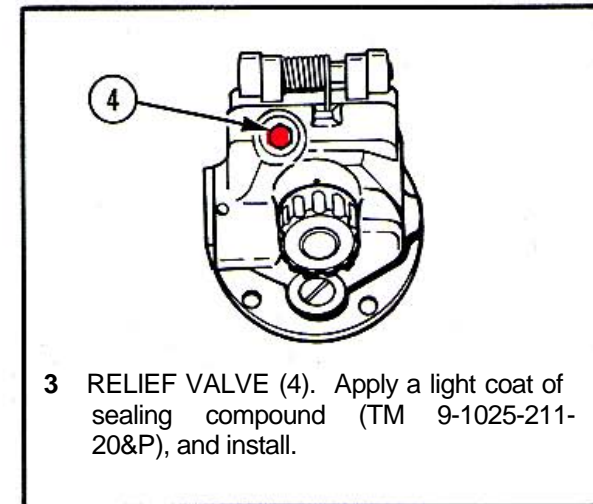
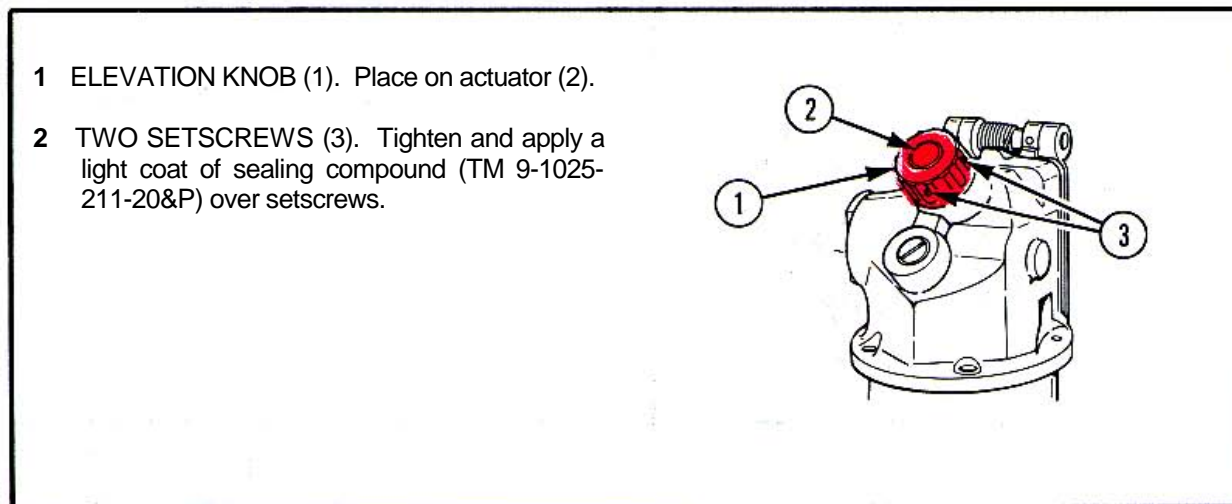
DISASSEMBLY



REPAIR

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

REASSEMBLY



6-10. COVER ASSEMBLY (HEAD)-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Disassembly
- b. Repair
- c. Reassembly

**INITIAL SETUP**

Special Tools

Tool box (SC 4931-95-CL-A09)

Troubleshooting Reference

6-7 Cover plate does not latch correctly.

Materials/Parts

Grease (item 2, app B)

■ Sealing compound (MIL-S-1 1031)

Reference

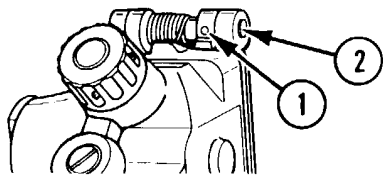
■ TM 9 1025-211-20&P

TM 9 1240-375-34P

**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

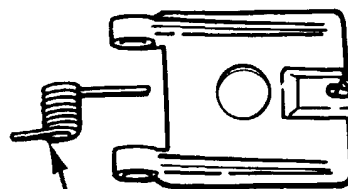
**DISASSEMBLY**



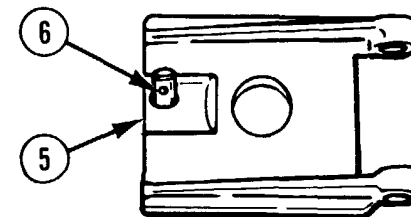
**CAUTION**

Support cover plate in V block on solid surface to prevent damage to shaft.

- 1 PIN (1). Remove.
- 2 PIN (2). Remove.



- 3 SPRING (3) AND COVER PLATE (4). Remove.

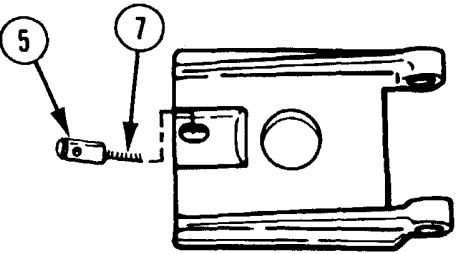


- 4 DETENT (5). Depress and hold.
- 5 POST (6). Unscrew.



6-10. COVER ASSEMBLY (HEAD)-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY (cont)



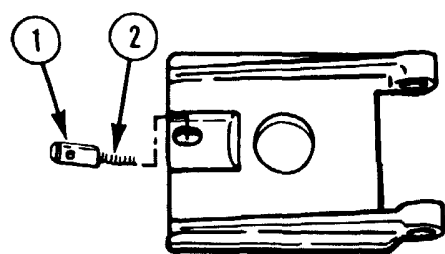
6 DETENT (5) AND SPRING (7).

- a. Release detent.
- b. Remove detent (5) and spring (7).

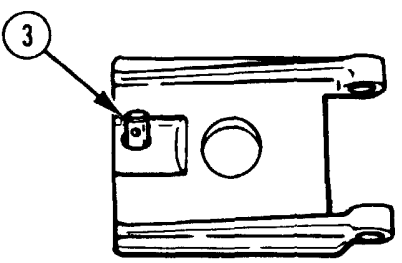
REPAIR

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

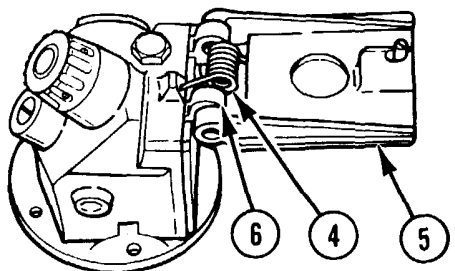
REASSEMBLY



1 DETENT (1) AND SPRING (2). Apply a light coat of grease (item 2, app B) and install.

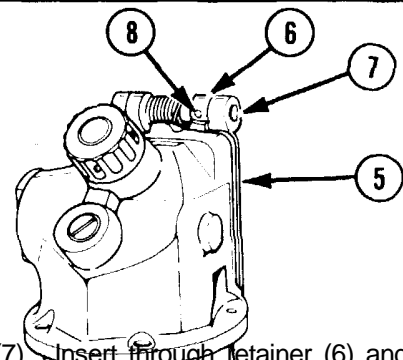


2 POST (3). Apply a light coat of sealing compound (TM 9-1025-211-20&P) to threads and install.



3 SPRING (4).

- a. Install long end in cover plate (5).
- b. Install short end in retainer (6).



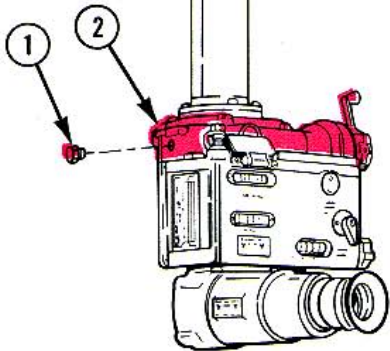
4 PIN (7). Insert through retainer (6) and cover plate (5).

5 PIN (8). Insert in retainer (6).

**6-11. BODY ASSEMBLY-MAINTENANCE INSTRUCTIONS**

<p><b>THIS TASK COVERS:</b></p> <ul style="list-style-type: none"> <li>a. Disassembly</li> <li>b. Repair</li> </ul>	<ul style="list-style-type: none"> <li>c. Reassembly</li> </ul>
<p><b>INITIAL SETUP</b></p> <p>Special Tools Tool box (SC 4931-95-CL-A09)</p> <p>Materials/Parts Sealing compound (MIL-S-11031)</p>	<p>References TM 9-1025-211-20&amp;P TM 9-1240-37534P</p> <div style="background-color: red; color: black; padding: 5px; text-align: center;"> <p><b>WARNING</b></p> <p>When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.</p> </div>

**DISASSEMBLY**

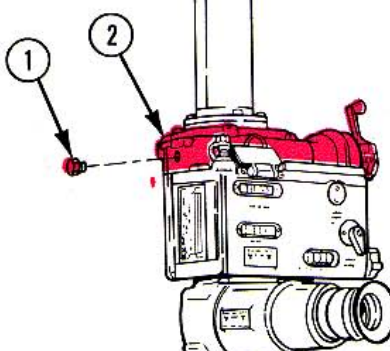


SAFETY RELIEF VALVE (1). Remove from body assembly (2).

**REPAIR**

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

**REASSEMBLY**



SAFETY RELIEF VALVE (1). Apply a light coat of sealing compound (TM 9-1025-211-20&P) on threads and install in body assembly (2).

6-12. KNOB ASSEMBLY (AZIMUTHI-MAINTENANCE INSTRUCTIONS I

**THIS TASK COVERS:**

- a. Removal
- b. Installation

**INITIAL SETUP**

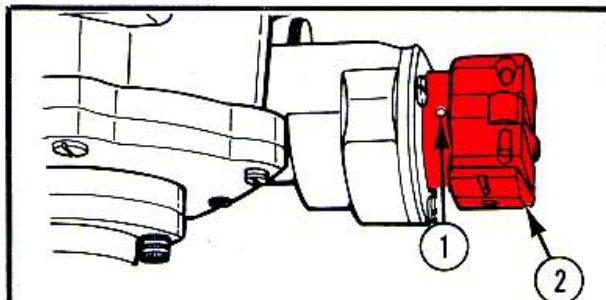
Special Tools  
 Tool box (SC 4931-95-CL-A09)



**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**REMOVAL**



**CAUTION**

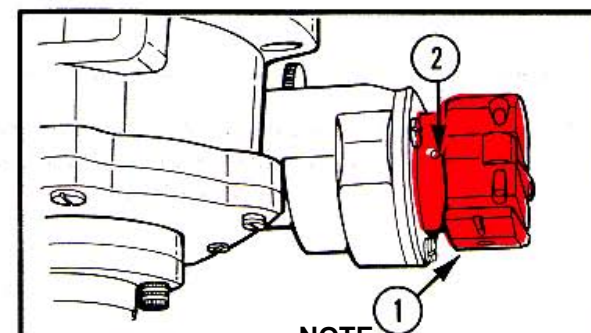
Support azimuth knob assembly in V block on solid surface to prevent damage to worm shaft.

- 1 PIN (1). Remove.
- 2 AZIMUTH KNOB ASSEMBLY (2). Remove.

**NOTE**

Replace azimuth knob assembly if bent, broken, or damaged in a way that interferes with normal operation of the M137 telescope.

**INSTALLATION**



**NOTE**

The word INDIRECT should be facing outward when azimuth knob assembly is installed.

- 1 AZIMUTH KNOB ASSEMBLY (1). Install.
- 2 PIN (2). Install.

6-13. ELBOW ASSEMBLY-MAINTENANCE INSTRUCTIONS I

**THIS TASK COVERS:**

- a. Disassembly
- b. Repair
- c. Reassembly

**INITIAL SETUP**

Special Tools  
 Tool box (SC 4931-95-CL-A09)

Materials/Parts  
 Grease (item 2, app B)  
 Sealing compound (MIL-S-11031)

References  
 TM 9-1025-211-20&P  
 TM 9-1240-375-34P

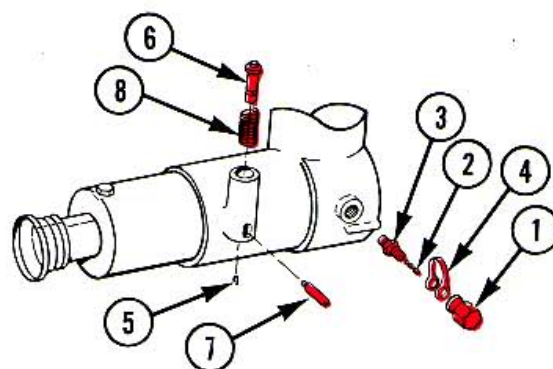
Troubleshooting Reference  
 6-7 Elbow assembly does not latch correctly.

**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**DISASSEMBLY**

- 1 CAP (1), VALVE CORE (2), PURGING VALVE STEM (3), AND STRAP (4). Remove.
- 2 SETSCREW (5). Loosen.
- 3 PLUNGER (6). Depress.
- 4 LEVER (7). Unscrew.
- 5 PLUNGER (6) AND SPRING (8). Remove.



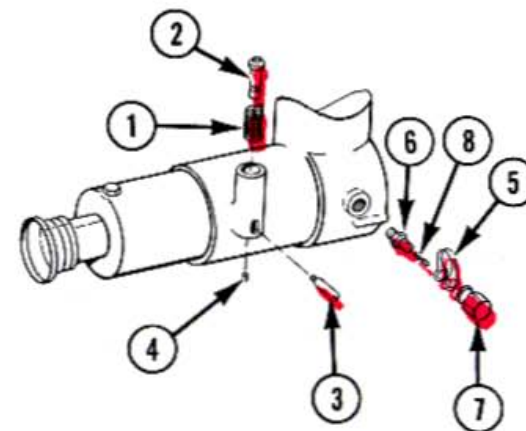
**REPAIR**

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

**6-13. ELBOW ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont) I**

**REASSEMBLY**

- 1 SPRING (1) AND PLUNGER (2). Apply a light coat of grease (item 2, app B) and install.
- 2 LEVER (3). Install.
- 3 SETSCREW (4). Tighten and apply light coat of sealing compound (TM 9-1025-211-20&P) over setscrew.
- 4 STRAP (5). Install over purging valve stem (6) and cap (7).
- 5 PURGING VALVE STEM (6). Apply light coat of sealing compound (TM 9-1025-211-20&P) on threads and install.
- 6 VALVE CORE (8). Install.
- 7 CAP (7). Install.



**6-14 OPTICAL CELL ASSEMBLY-MAINTENANCE INSTRUCTIONS**

**THIS TASK COVERS:**

- a. Disassembly
- b. Repair
- c. Reassembly

**INITIAL SETUP**

Special Tools  
Tool box (SC 4931-95-CL-A09)

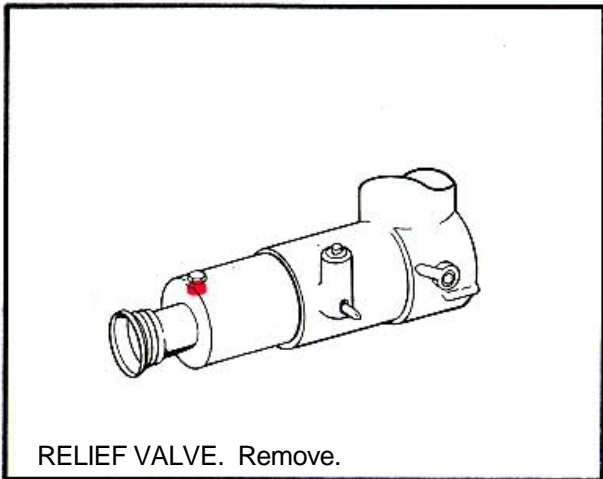
Materials/Parts  
Sealing compound (MIL-S-11031)

References  
TM 9-1025-211-20&P  
TM 9-1240-375-34P

**WARNING**  
When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.



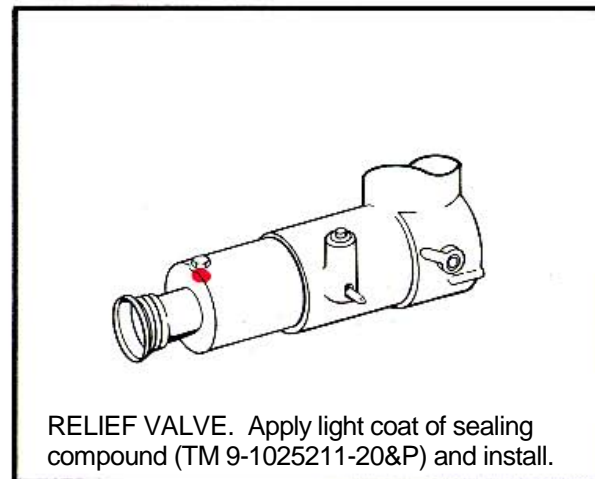
**DISASSEMBLY**



**REPAIR**

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

**REASSEMBLY**



**6-15. COUNTER BOX ASSEMBLY-MAINTENANCE INSTRUCTIONS.**

**THIS TASK COVERS:**

- a. Disassembly
- b. Repair
- c. Reassembly

**INITIAL SETUP**

Special Tools

- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-AO9)
- Tool set (SC 4931-95-CL-J51)

Materials/Parts

- Sealing compound (MIL-S-11031)
- Soap (P-S-624)

References


- TM 9-1025-211-20&P

- TM 9-1240-375-34P
- TM 9-1025-211-10

Troubleshooting Reference

- 6-8 Counter box windows are fogged or have condensation.

**WARNING**


 When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.



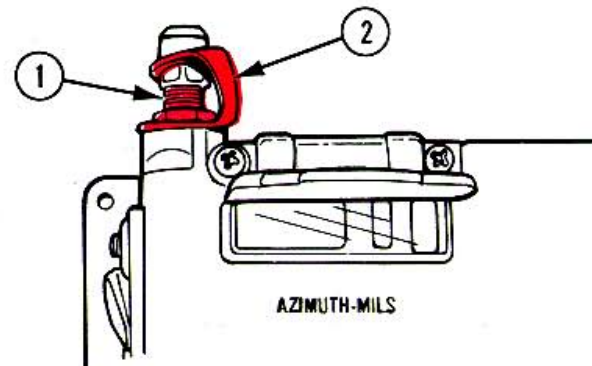
6-15. COUNTER BOX ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY

**NOTE**

Charge nitrogen pressure to 7 psi (0.49 kg/cm<sup>2</sup>). Remove hose. Put soap suds (TM 9-1025-211-10) on valve opening to check for leakage. If valve leaks, replace valve stem and/or valve core.

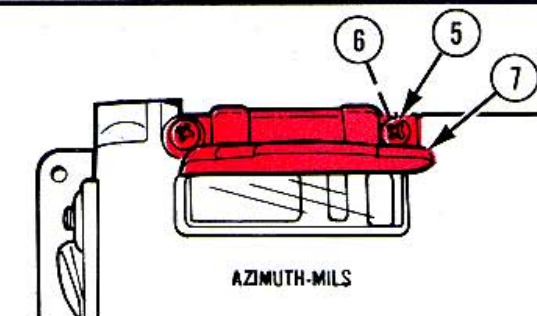
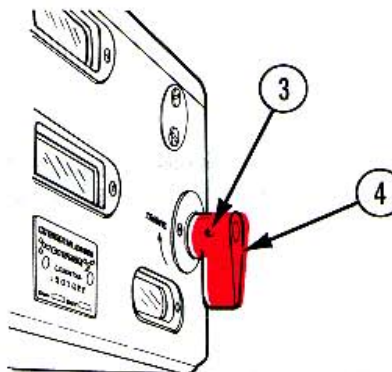
- 1 PURGING VALVE STEM (1). Remove.
- 2 STRAP (2). Remove from purging valve stem (1).



**CAUTION**

Support knob in V block on solid surface to prevent damage to shaft.

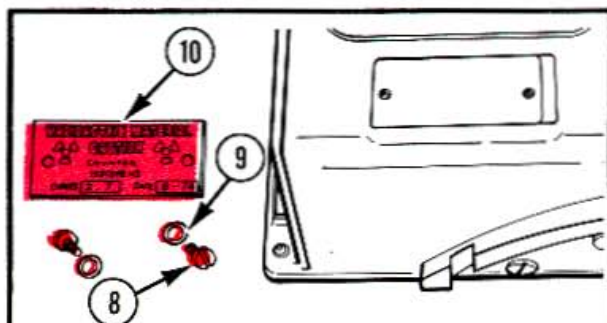
- 3 PIN (3). Remove from knob (4).
- 4 KNOB (4). Remove.



- 5 TWO SCREWS (5) AND TWO LOCK-WASHERS (6). Remove.
- 6 AZIMUTH COUNTER COVER ASSEMBLY (7). Remove.

REPAIR

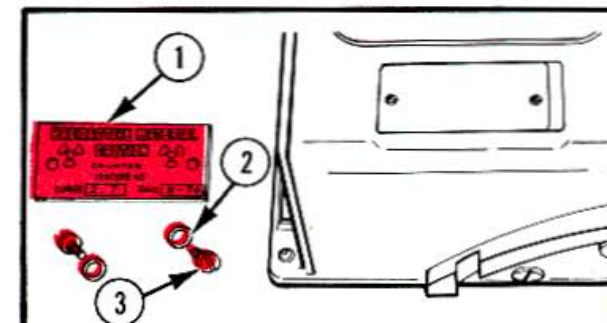
REASSEMBLY



7 TWO SCREWS (8) AND TWO LOCKWASHERS (9). Remove.

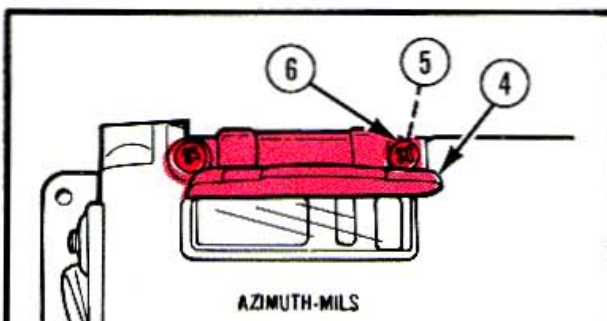
8 RADIOACTIVE MATERIAL CAUTION PLATE (10). Remove only if defective.

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.



1 RADIOACTIVE MATERIAL CAUTION PLATE (1). Install.

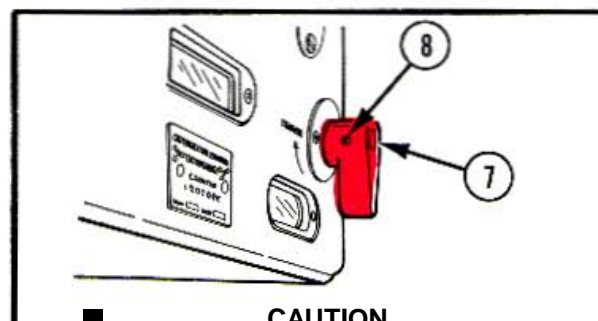
2 TWO LOCKWASHERS (2) AND TWO SCREWS (3). Install.



3 AZIMUTH COUNTER COVER ASSEMBLY (4). Place in position.

4 TWO LOCKWASHERS (5) AND TWO SCREWS (6). Install.

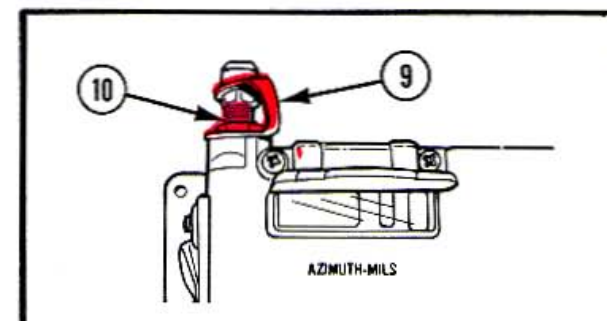
AZIMUTH-MILS



**CAUTION**  
Support knob in V block on solid surface to prevent damage to shaft.

5 KNOB (7). Install.

6 PIN (8). Install in knob.



7 STRAP (9). Install over purging valve stem (10).

8 PURGING VALVE STEM (10). Apply sealing compound (TM 9-1025-211-20&P) and install.

AZIMUTH-MILS

6-16. COVER ASSEMBLY (AZIMUTH COUNTER)-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- |                |                 |
|----------------|-----------------|
| a. Removal     | e. Repair       |
| b. Disassembly | f. Reassembly   |
| c. Inspection  | g. Installation |
| d. Cleaning    | h. Purging      |

**INITIAL SETUP**

Special Tools  
 Tool box (SC 4931-95-CL-A09)


Materials/Parts  
 Cleaning compound (MIL-C-18718)  
 Grease (item 2, app B)

References  
 TM 9-1025-211-10  
 TM 9-1025-211-20&P  
 TM 9-1240-375-34P

Troubleshooting Reference

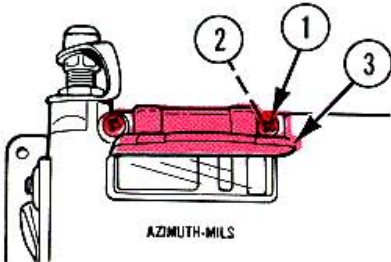
6-8 Azimuth counter cover does not remain open or closed.

**WARNING**

 When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

6-16. COVER ASSEMBLY (AZIMUTH COUNTER)-MAINTENANCE INSTRUCTIONS (cont)

REMOVAL



AZIMUTH-MILS

- 1 TWO SCREWS (1) AND TWO LOCK-WASHERS (2). Remove.
- 2 AZIMUTH COUNTER COVER ASSEMBLY (3). Remove.

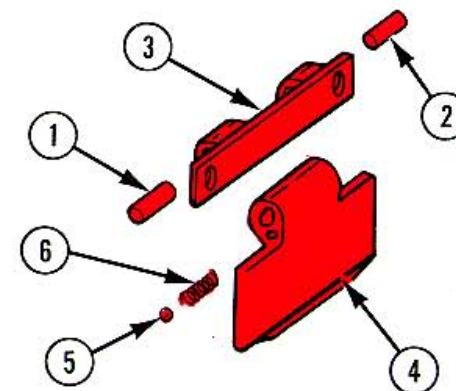
DISASSEMBLY

- 1 PIN (1). Remove.
- 2 PIN (2). Remove.

**NOTE**

Use pressure against ball and spring to prevent loss.

- 3 BRACKET (3) AND COVER (4). Separate.
- 4 BALL (5) AND SPRING (6). Remove.



INSPECTION

Inspect for bent cover, nicks and burrs, or damaged parts.

CLEANING

Clean all parts with cleaning compound (TM 9-1025-211-10).

**NOTE**

Replace azimuth counter cover assembly if bent or damaged in any way that will prevent it from closing securely.

**REPAIR**

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

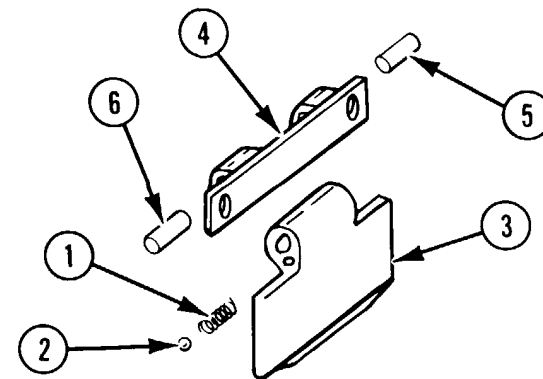
**REASSEMBLY**

**1** SPRING (1) AND BALL (2).

- a. Apply light coat of grease (item 2, app B).
- b. Place in cover (3) and hold in place with finger.

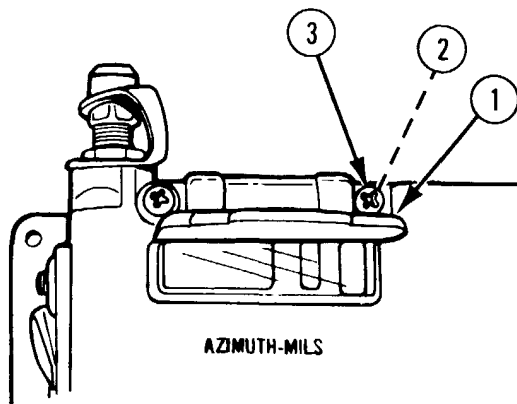
**2** BRACKET (4). Position on cover (3)

**3** PINS (5 AND 6). Install.

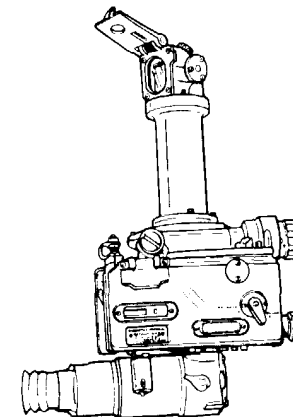


**INSTALLATION**

- 1** AZIMUTH COUNTER COVER ASSEMBLY (1). Place on M137 telescope.
- 2** TWO LOCKWASHERS (2) AND TWO SCREWS (3). Install.



**PURGING**



M137 TELESCOPE. Purge and charge (TM 9-1025-211-20&P).

**Section V. GENERAL SUPPORT MAINTENANCE PROCEDURES  
FOR THE M137 PANORAMIC TELESCOPE**

**6-17. M137 TELESCOPE-MAINTENANCE INSTRUCTIONS**

**INITIAL SETUP**

Special Tools

- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)
- Tool set (SC 4931-95-CL-J51)
- Snap ring pliers (app C)

Materials/Parts

- Cleaning compound (MIL-C-18718)
- Grease (item 2, app B)
- Grease (item 3, app B)
- Lens paper (NNN-P-40)
- Optical lens cleaning compound (MIL-L-43454A)
- Sealing compound (MIL-S-11031)
- Gasket (11741172)
- Preformed packing (MS9021-015)
- Preformed packing (MS9021-130)
- Preformed packing (MS9021-134)

References

- TM 9-1025-211-10
- TM 9-1025-211-20&P
- TM 9-1240-375-34P

Troubleshooting References

- 6-9 Target is not clear or sharp because of parallax.
- 6-9 Azimuth knob does not function correctly.
- 6-10 Correction knob binds.
- 6-10 Counter numbers are not in horizontal alignment.
- 6-10 Counters have excessive backlash.

Equipment Conditions

- 6-32 Counter box assembly removed (tasks no. 6, 10, and 11).
- 6-60 Cover on counter box assembly removed (task no. 10).
- 6-53 Knob assembly (azimuth) removed (task no. 6).
- 6-72 Knob assembly (correction) removed (task no. 11).

**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.



List of Tasks

Task No.	Task	Task Ref (Page)	Troubleshooting Ref No. (Page)
1	Maintain M137 telescope:  a. Disassemble. b. Repair. c. Reassemble.	6-32 6-33 6-34	
2	Maintain head assembly:  a. Remove. b. Disassemble. c. Clean. d. Repair. e. Reassemble. f. Install.	6-36 6-36 6-37 6-37 6-37 6-38	
3	Maintain cover assembly (head):  a. Remove. b. Install.	6-39 6-40	
4	Maintain telescope head spacer:  a. Remove. b. Disassemble. c. Repair. d. Reassemble. e. Install.	6-41 6-41 6-42 6-42 6-42	

6-17. M137 TELESCOPE--MAINTENANCE INSTRUCTIONS (cont)

List of Tasks (cont)

Task No.	Task	Task Ref (Page)	Troubleshooting Ref No. (Page)
5	Maintain body assembly:  a. Remove. b. Disassemble. c. Clean. d. Repair. e. Reassemble. f. Install.  Maintain worm shaft assembly :  a. Remove. b. Repair. c. Install.	6-43 6-44 6-45 6-46 6-46 6-48     6-49 6-50 650	6-9
7	Maintain knob assembly (azimuth):  a. Remove. b. Disassemble. c. Repair. d. Reassemble. e. Install.	6-53 6-53 6-54 6-54 6-55	6-9
8	Maintain elbow assembly:  a. Remove. b. Install.	6-56 6-56	

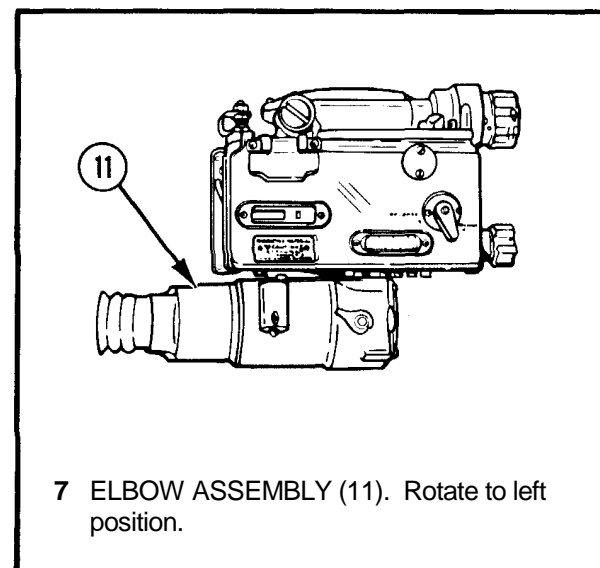
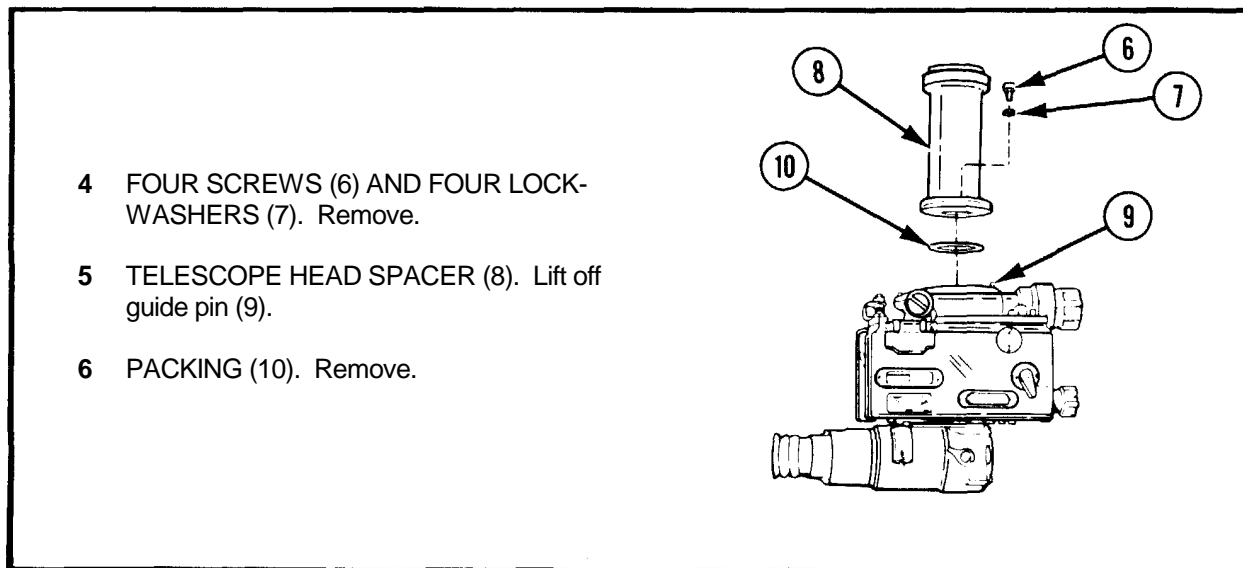
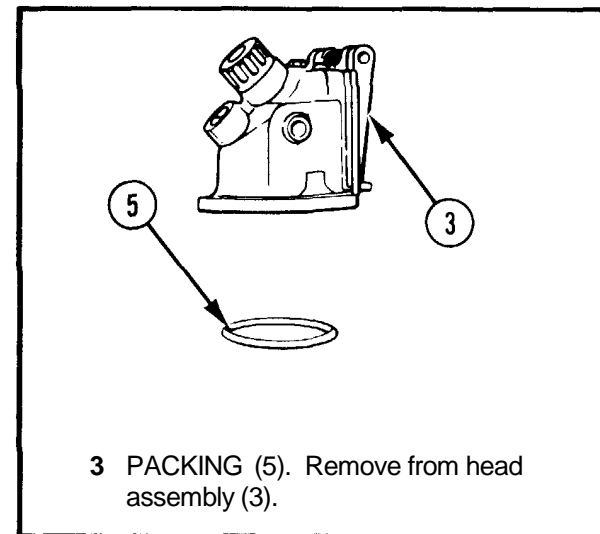
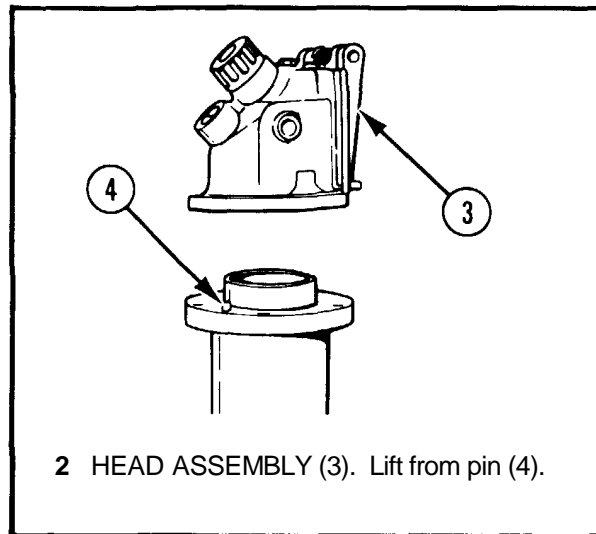
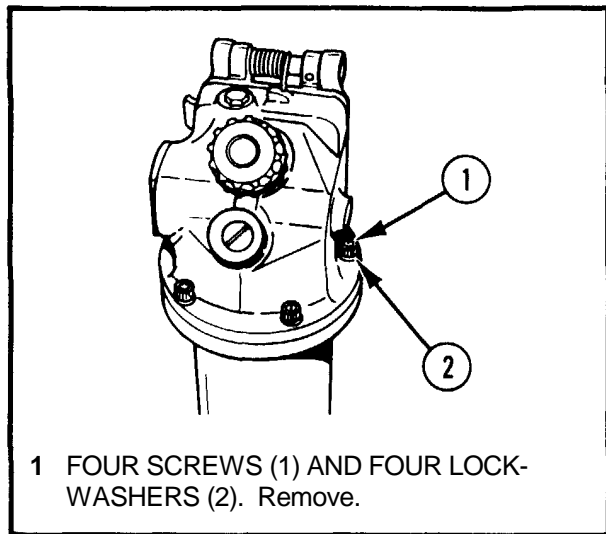
<p>9</p>	<p>Maintain counter box assembly:</p> <ul style="list-style-type: none"> <li>a. Remove.</li> <li>b. Disassemble.</li> <li>c. Repair.</li> <li>d. Reassemble.</li> <li>e. Install.</li> </ul>	<p>6-58 6-59 6-63 6-63 6-71</p>	<p>6-10</p>
<p>10</p>	<p>Maintain knob assembly (correction):</p> <ul style="list-style-type: none"> <li>a. Remove.</li> <li>b. Disassemble.</li> <li>c. Inspect.</li> <li>d. Repair.</li> <li>e. Reassemble.</li> <li>f. Install.</li> </ul>	<p>6-72 6-72 6-73 6-73 6-73 6-74</p>	<p>6-10</p>
<p>11</p>	<p>Maintain gear block assembly:</p> <ul style="list-style-type: none"> <li>a. Remove.</li> <li>b. Install.</li> </ul>	<p>6-75 6-76</p>	

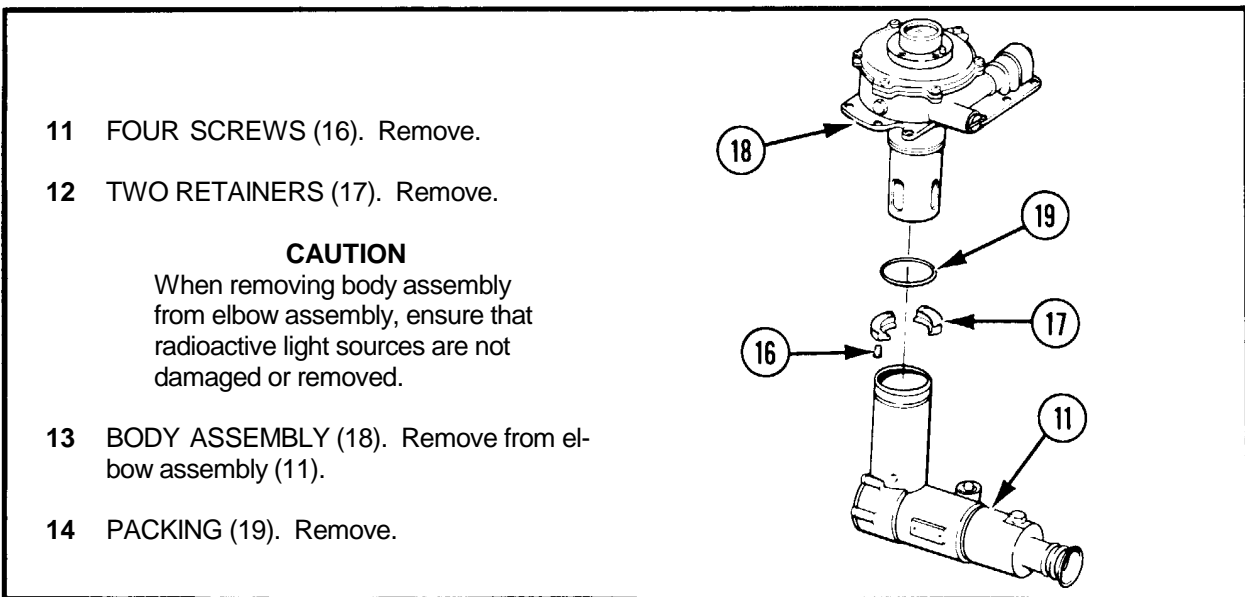
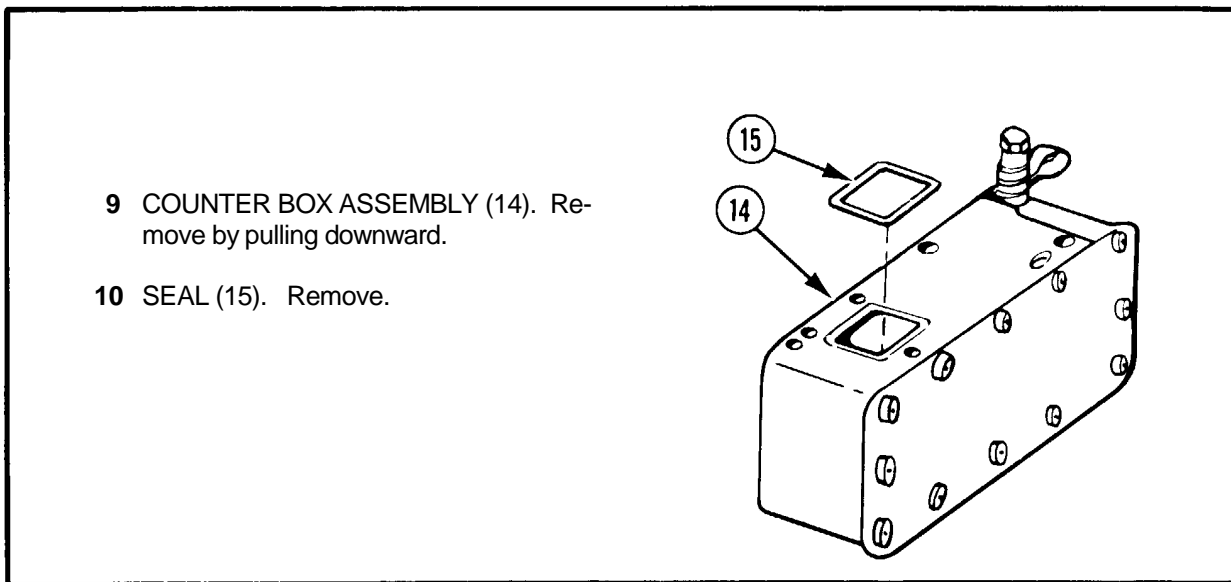
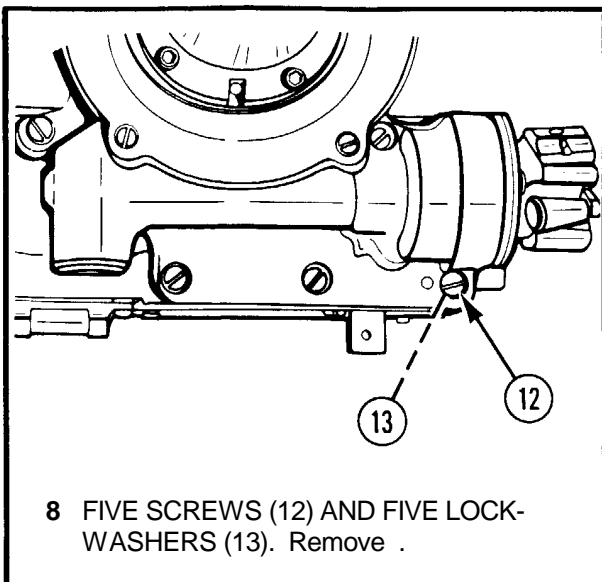
**6-18. M137 TELESCOPE-MAINTENANCE INSTRUCTIONS**

<p><b>THIS TASK COVERS:</b></p> <ul style="list-style-type: none"> <li style="width: 45%;">a. Disassembly</li> <li style="width: 45%;">c. Reassembly</li> </ul> <ul style="list-style-type: none"> <li>b. Repair</li> </ul>	
<p><b>INITIAL SETUP</b></p> <p>Special Tools Tool box (SC 4931-95-CL-A09)</p> <p>Materials/Parts</p> <ul style="list-style-type: none"> <li>Grease (item 3, app B)</li> <li>■ Sealing compound (MIL-S-1 1031)</li> <li>Preformed packing (MS9021-130)</li> <li>Preformed packing (MS9021 134)</li> </ul>	<p>Reference</p> <ul style="list-style-type: none"> <li>■ TM 9-1025-211-20&amp;P</li> <li>TM 9-1240-375-34P</li> </ul> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center;"><b>WARNING</b></p> <p><b>When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover</b></p> </div>

6-18. M137 TELESCOPE-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY





**REPAIR**

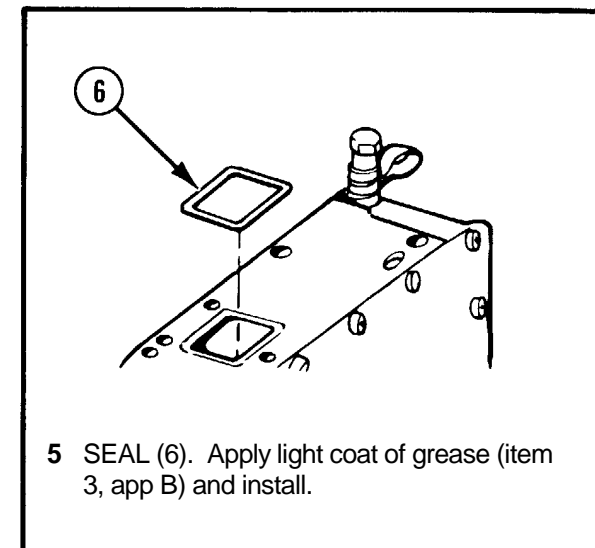
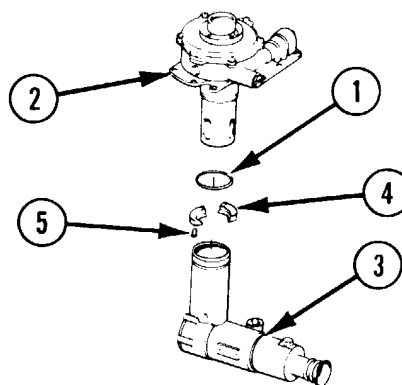
**REPAIR**

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

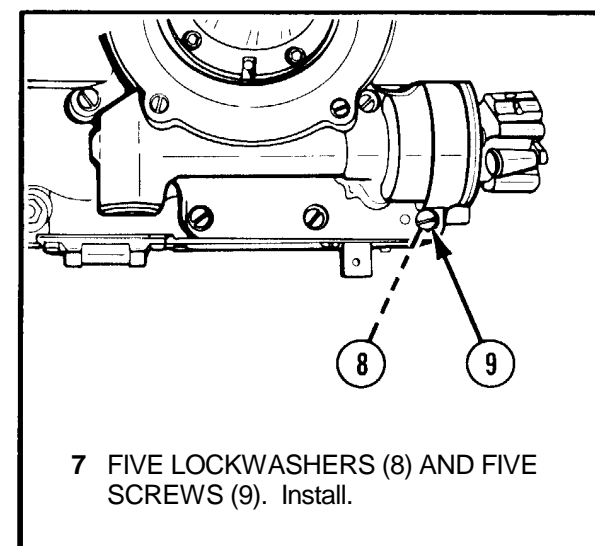
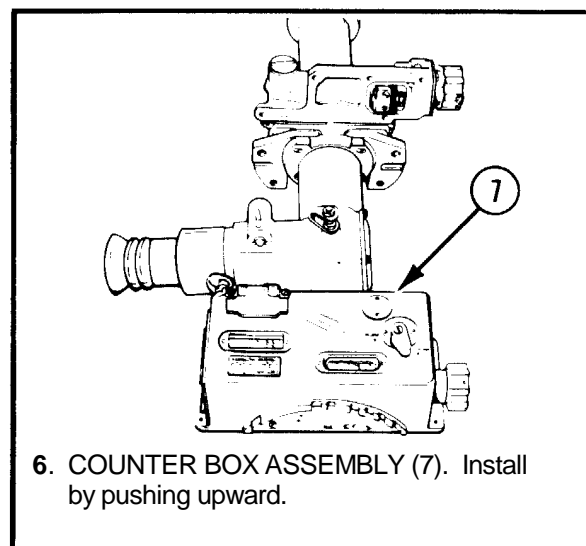
6-18. M137 TELESCOPE-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY

- 1 PACKING (1). Apply light coat of grease (item 3, app B) on new packing and install.
- 2 BODY ASSEMBLY (2). Install on elbow assembly (3).
- 3 TWO RETAINERS (4). Install.
- 4 FOUR SCREWS (5).
  - a. Apply light coat of sealing compound (TM 9-1025-211 20&P).
  - b. Install and tighten.

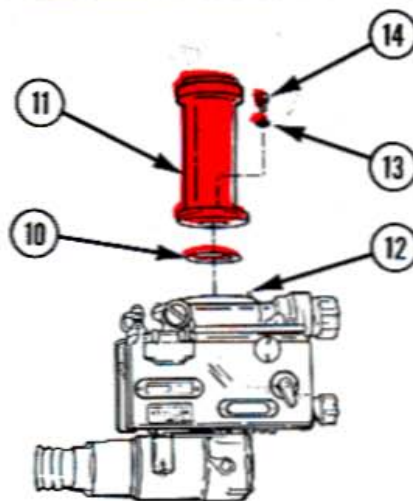


**CAUTION**  
Ensure gears are meshed correctly while installing counter box assembly.

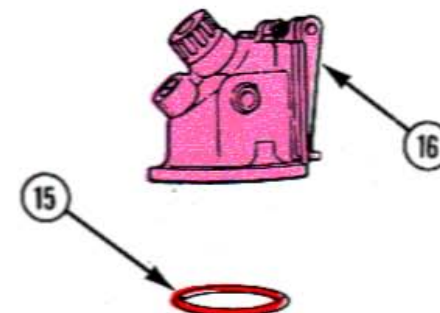




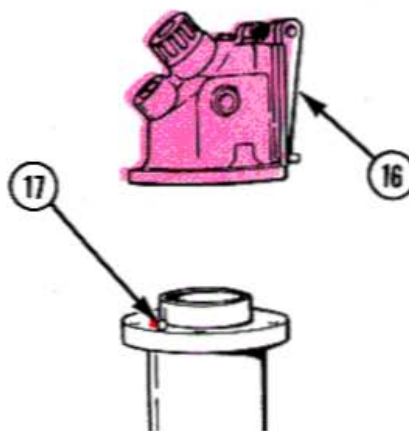
- 8 PACKING (10). Apply light coat of grease (item 3, app B) and install.
- 9 TELESCOPE HEAD SPACER (11). Install over guide pin (12).
- 10 FOUR LOCKWASHERS (13) AND FOUR SCREWS (14). Install.



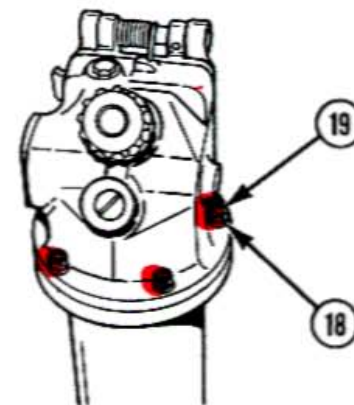
- 11 PACKING (15). Apply light coat of grease (item 3, app B) on new packing and install in head assembly (16).



- 12 HEAD ASSEMBLY (16). Place on pin (17).



- 13 FOUR LOCKWASHERS (18) AND FOUR SCREWS (19). Install.



6-19. HEAD ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Removal
- b. Disassembly
- c. Cleaning
- d. Repair
- e. Reassembly
- f. Installation


**INITIAL SETUP**

Special Tools  
 Tool box (SC 4931-95-CL-A09)

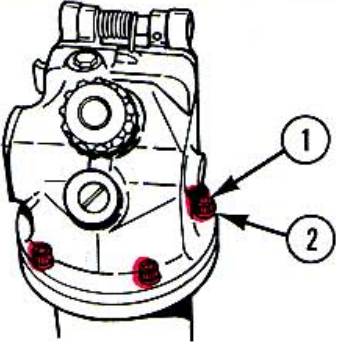
Materials/Parts  
 Grease (item 3, app B)  
 Lens paper (NNN-P-40)  
 Optical lens cleaning compound (MIL-L43454A)  
 Sealing compound (MIL-S-11031)  
 Preformed packing (MS9021-130)

References  
 TM 9-1025-211-10  
 TM 9-1025-211-20&P  
 TM 9-1240-375-34P

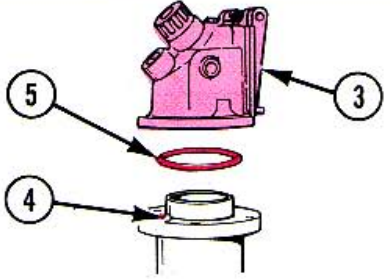
**WARNING**

 When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**REMOVAL**

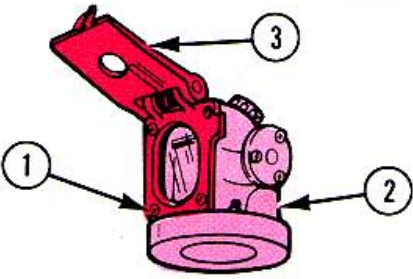


1 FOUR SCREWS (1) AND FOUR LOCK-WASHERS (2). Remove.



2 HEAD ASSEMBLY (3). Lift from pin (4).  
 3 PACKING (5). Remove from head assembly (3).

**DISASSEMBLY**



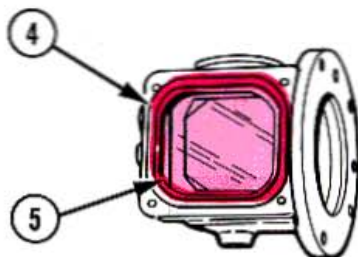
1 FOUR SCREWS (1). Remove from head assembly (2).  
 2 COVER ASSEMBLY (3). Remove.

3 SEAL (4). Remove.

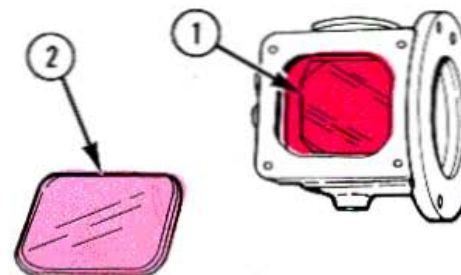
**CAUTION**

Glass can be damaged and scratched if handled carelessly and excessively.

4 WINDOW (5). Remove.



**CLEANING**



PRISM (1) AND WINDOW (2). Clean using optical lens cleaning compound and lens paper (TM 9-1025-211-10).

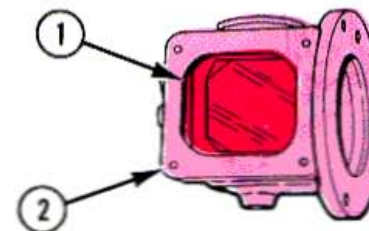
**REPAIR**

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

**REASSEMBLY**

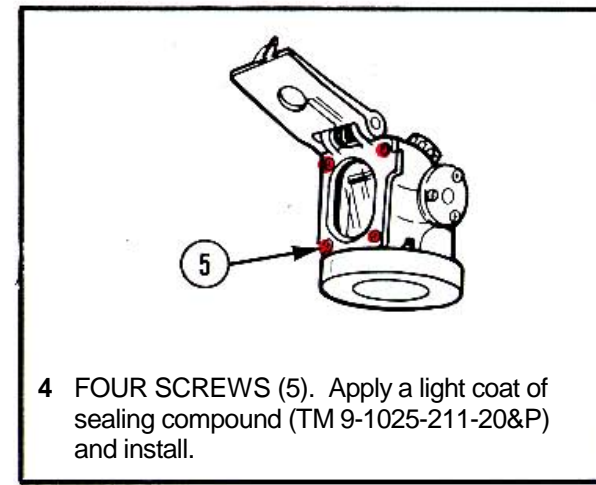
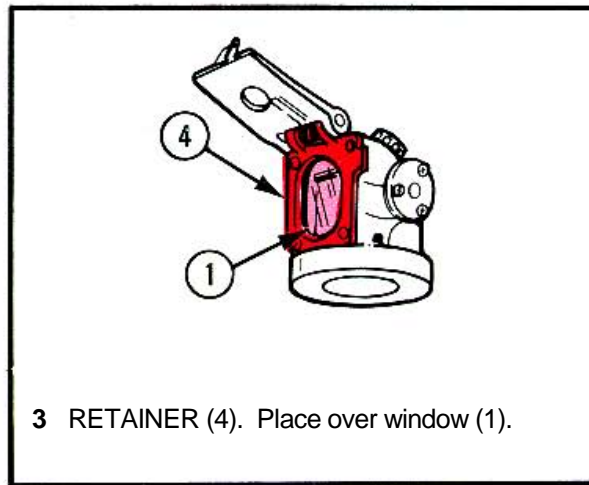
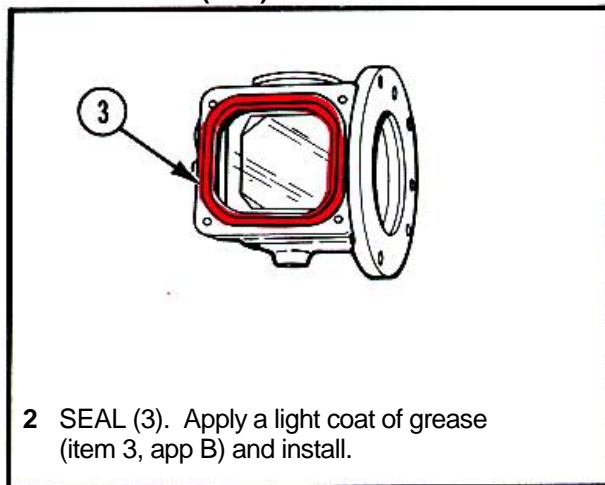
1 WINDOW (1).

- a. Apply 1/16-inch coat of sealing compound (TM 9-1025-211-20&P) around edge of window.
- b. Place on head assembly (2).

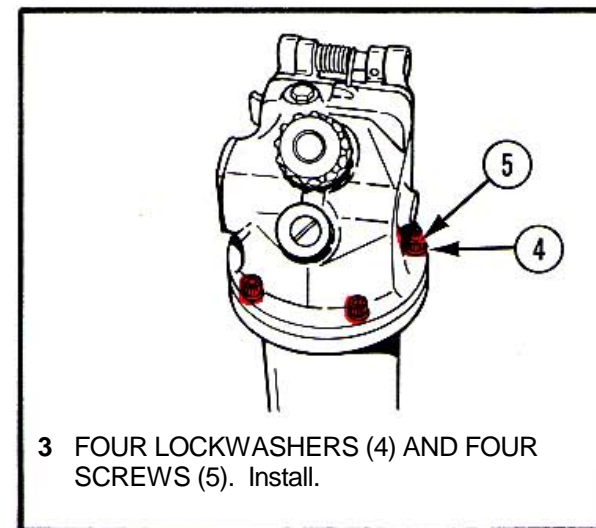
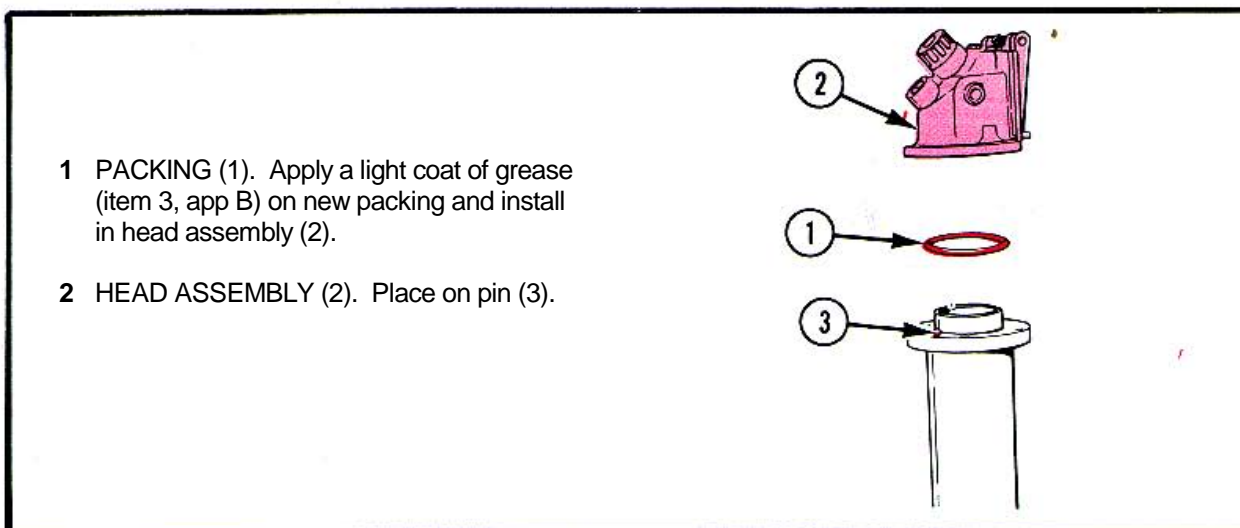


6-19. HEAD ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY (cont)



INSTALLATION



6-20. COVER ASSEMBLY (HEAD)-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Removal
- b. Installation

**INITIAL SETUP**

Special Tools  
 Tool box (SC 4931-95-CL-A09)

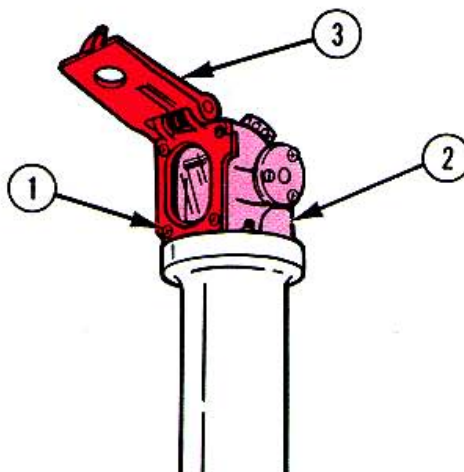
Materials/Parts  
 Sealing compound (MIL-S-11031)

Reference  
 TM 9-1025-211-20&P

**WARNING**  
 When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**REMOVAL**

- 1 FOUR SCREWS (1). Remove from head assembly (2).
- 2 COVER ASSEMBLY (3). Remove.



**NOTE**  
 Replace cover assembly if it will not close tight enough to protect the M137 telescope window from damage.

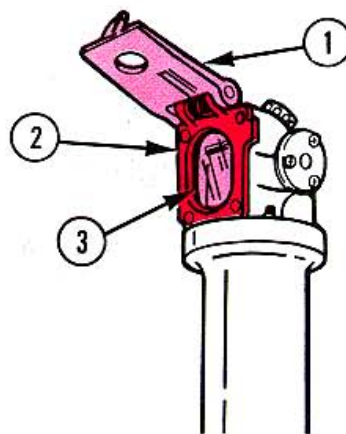


6-20. COVER ASSEMBLY (HEAD)-MAINTENANCE INSTRUCTIONS (cont) |

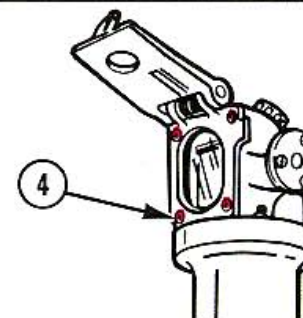
INSTALLATION

1 COVER ASSEMBLY (1).

- a. Apply a light coat of sealing compound (TM 9-1025-211-20&P) around edge of retainer (2).
- b. Place over window (3).



- 2 FOUR SCREWS (4). Apply a light coat of sealing compound (TM 9-1025-211-20&P) and install.



6-21. TELESCOPE HEAD SPACER-MAINTENANCE INSTRUCTIONS

THIS TASK COVERS:

- a. Removal
- b. Disassembly
- c. Repair
- d. Reassembly
- e. Installation


INITIAL SETUP

Special Tools  
Tool box (SC 4931-95-CL-A09)

Materials/Parts  
Grease (item 3, app B)  
Prefomed packing (MS9021-130)

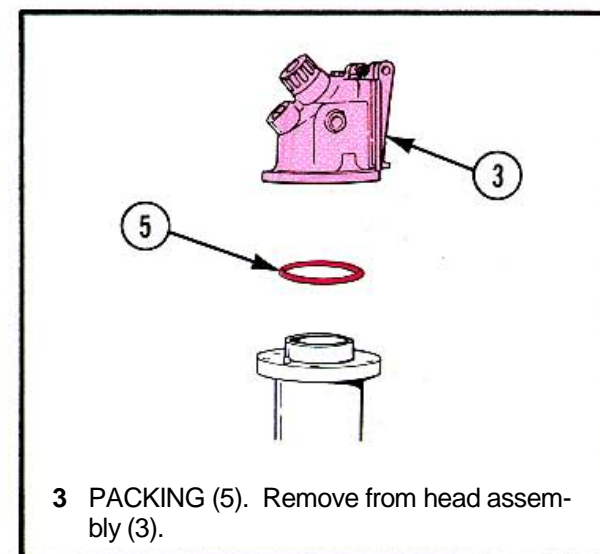
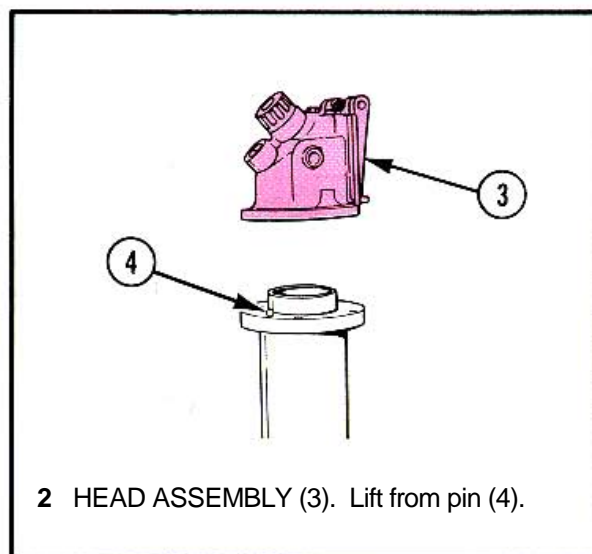
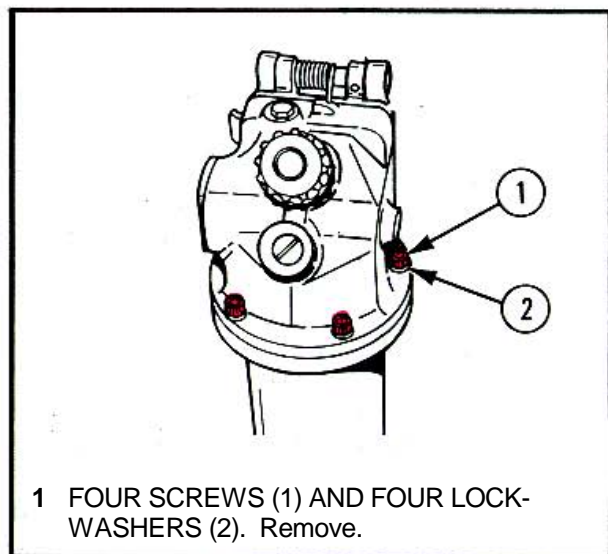
Reference  
TM 9-1240-375-34P

**WARNING**

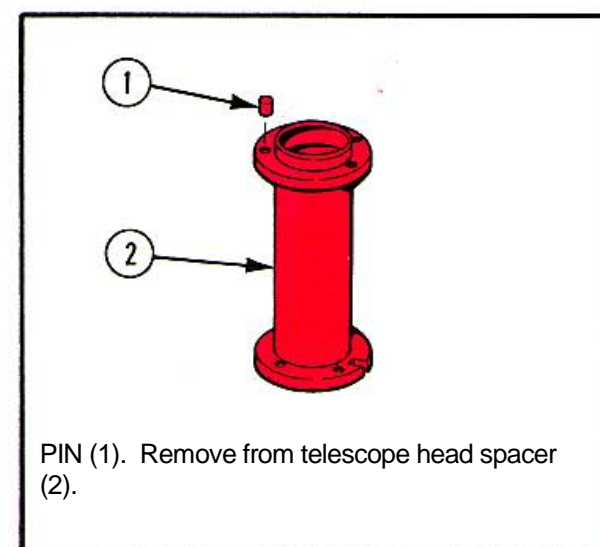
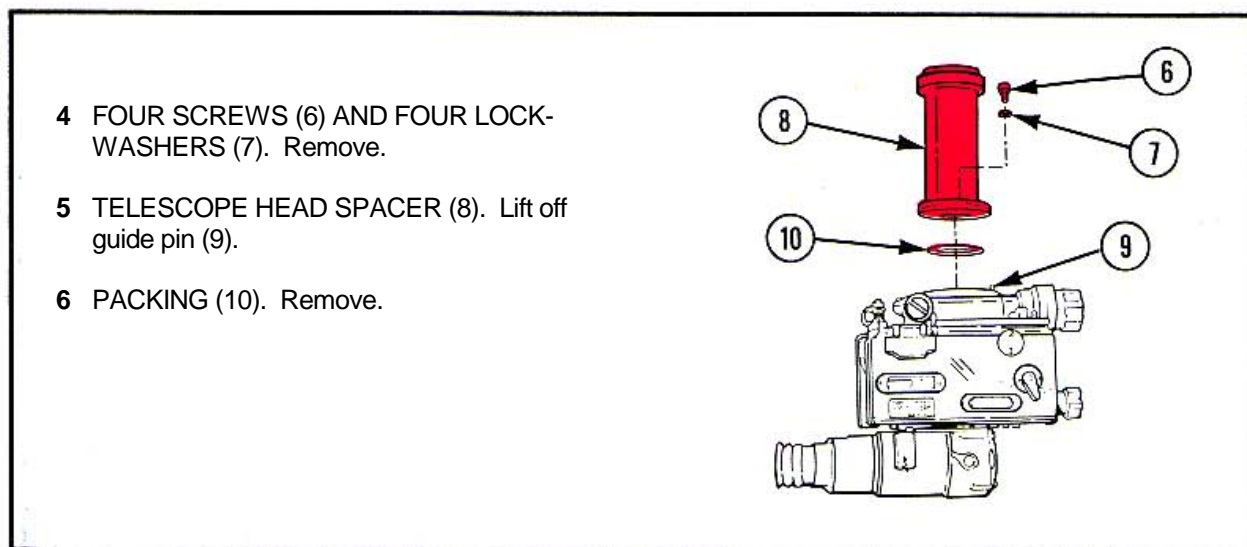
 When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.



**REMOVAL**



**DISASSEMBLY**



6-21. TELESCOPE HEAD SPACER-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY (cont)

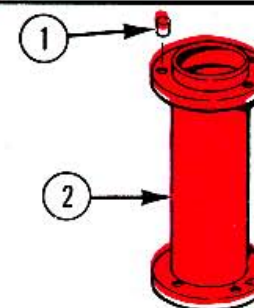
**NOTE**

Replace telescope head spacer if bent or damaged and will not keep the head assembly in alignment with elbow assembly.

REPAIR

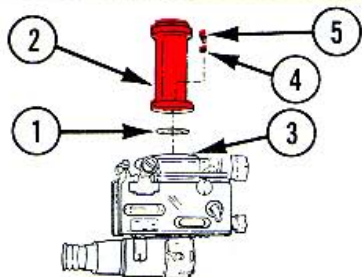
Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

REASSEMBLY

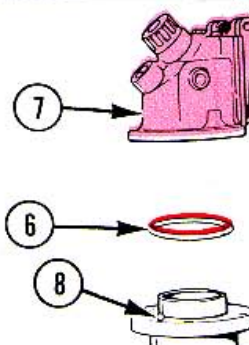


PIN (1). Install in telescope head spacer (2).

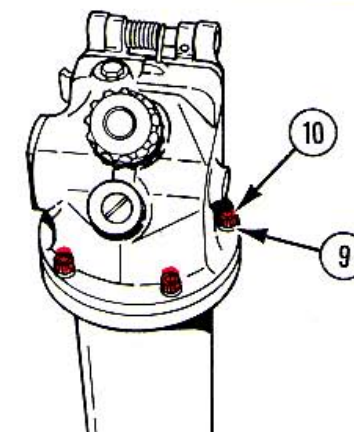
INSTALLATION



- 1 PACKING (1). Apply light coat of grease (item 3, a pp B) and install.
- 2 TELESCOPE HEAD SPACER (2). Install over guide pin (3).
- 3 FOUR LOCKWASHERS (4) AND FOUR SCREWS (5). Install.



- 4 PACKING (6). Apply light coat of grease (item 3, app B) on new packing and install in head assembly (7).
- 5 HEAD ASSEMBLY (7). Place on pin (8).



- 6 FOUR LOCKWASHERS (9) AND FOUR SCREWS (10). Install.

## 6-22. BODY ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- |                |                 |
|----------------|-----------------|
| a. Removal     | d. Repair       |
| b. Disassembly | e. Reassembly   |
| c. Cleaning    | f. Installation |

**INITIAL SETUP**

## Special Tools

Tool box (SC 4931-95-CL-A09)

## Materials/Parts

Cleaning compound (MIL-C-18718)

Grease (item 2, app B)

Grease (item 3, app B)

Lens paper (NNN-P-40)

Optical lens cleaning compound (MIL-L-43454A)

Sealing compound (MIL-S-11031)

## References

TM 9-1025-211-10

TM 9-1025-211-20&amp;P

TM 9-1240-375-34P

## Troubleshooting Reference

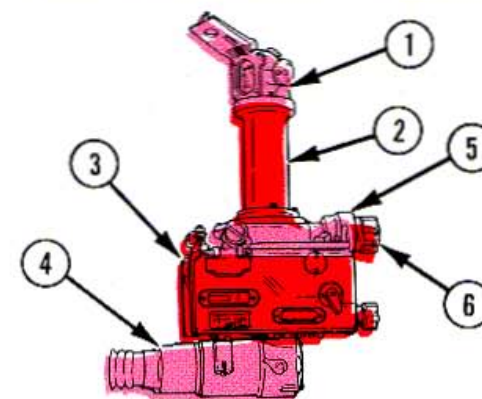
6-9 Target not clear or sharp because of parallax.

**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**REMOVAL**

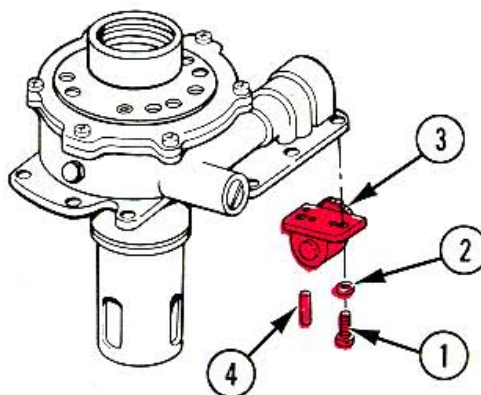
- 1 HEAD ASSEMBLY (1). Remove (p 6-32).
- 2 TELESCOPE HEAD SPACER (2). Remove (p 6-32).
- 3 COUNTER BOX ASSEMBLY (3). Remove (p 6-33).
- 4 ELBOW ASSEMBLY (4). Remove (p 6-33).
- 5 BODY ASSEMBLY (5). Remove (p 6-33).
- 6 KNOB ASSEMBLY (AZIMUTH) (6). Remove (p 6-53).



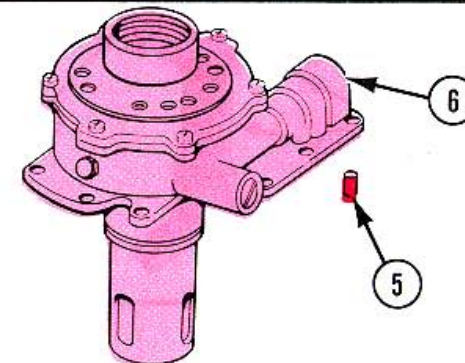
6-22. BODY ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY

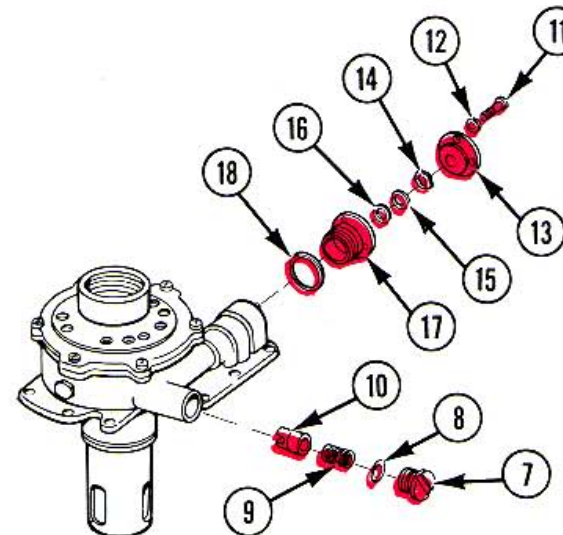
- 1 TWO SCREWS (1) AND TWO LOCK-WASHERS (2). Remove.
- 2 GEAR ASSEMBLY (3). Remove.
- 3 TWO PINS (4). Remove from gear assembly (3).

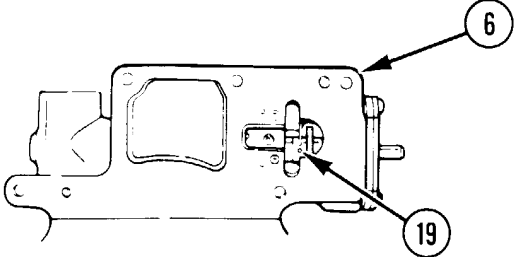


- 4 TWO GUIDE PINS (5). Remove from housing (6).



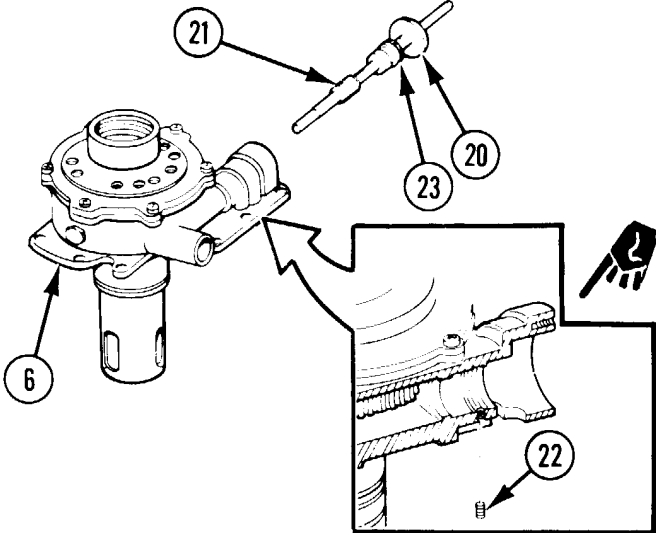
- 5 RETAINER (7). Remove.
- 6 PACKING (8). Remove from retainer (7).
- 7 SPRING (9). Remove.
- 8 PLUNGER (10). Remove.
- 9 THREE SCREWS (11) AND THREE LOCKWASHERS (12). Remove.
- 10 PLATE (13). Remove.
- 11 SPRING TENSION WASHER (14), RECESSED WASHER (15), AND PACKING (16). Remove.
- 12 CAP (17). Remove.
- 13 PACKING (18). Remove from cap (17).





**NOTE**  
To avoid bottoming in housing (6), drive pin (19) partially out. Turn worm shaft assembly 180 degrees to remove pin.

14 PIN (19). Remove.



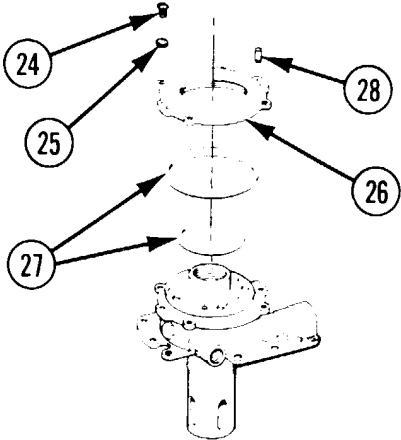
15 SPUR GEAR (20). Remove from worm shaft assembly (21).

16 SETSCREW (22). Remove sealing compound and loosen.

17 SEAT (23). Unscrew and remove from housing (6).

18 WORM SHAFT ASSEMBLY (21). Remove from housing (6).

**CLEANING**



19 SIX SCREWS (24) AND SIX LOCK-WASHERS (25). Remove.

20 RETAINER (26). Remove.

21 TWO PACKINGS (27). Remove.

22 TWO PINS (28). Remove.

Clean reticle and lenses with optical lens cleaning compound and lens paper (TM 9-1025-211-10).

Clean all other parts with cleaning compound (TM 9-1025-211-10).

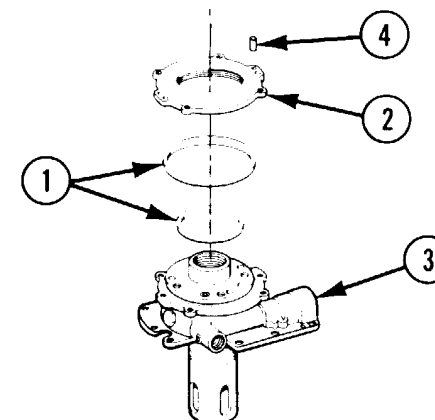
6-22. BODY ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REPAIR

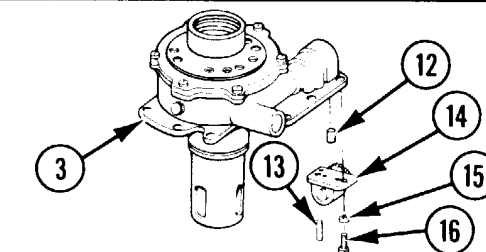
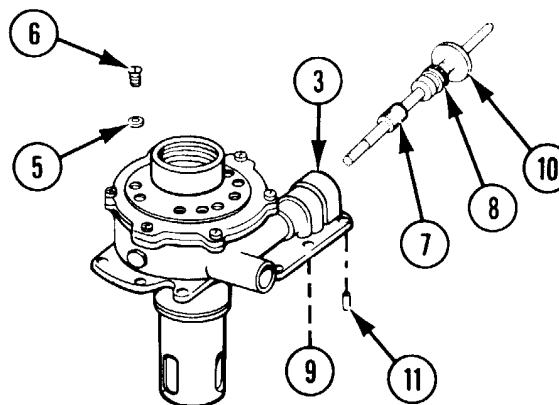
Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

REASSEMBLY

- 1 TWO PACKINGS (1). Apply light coat of grease (item 3, app B) and install in retainer (2).
- 2 RETAINER (2). Position on housing (3).
- 3 TWO PINS (4). Install.



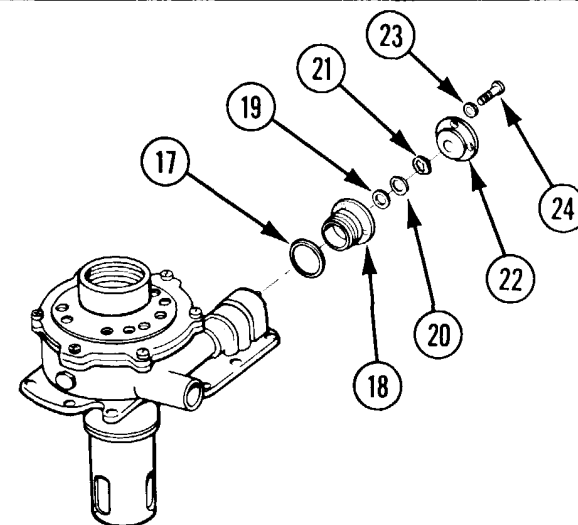
- 4 SIX LOCKWASHERS (5) AND SIX SCREWS (6). Install.
- 5 WORM SHAFT ASSEMBLY (7). Apply light coat of grease (item 2, app B) and install in housing (3).
- 6 SEAT (8). Screw in housing (3) and tighten.
- 7 SETSCREW (9). Tighten and fill with sealing compound (TM 9-1025-211-20&P).
- 8 SPUR GEAR (10). Install on worm shaft assembly (7) and install pin (11).



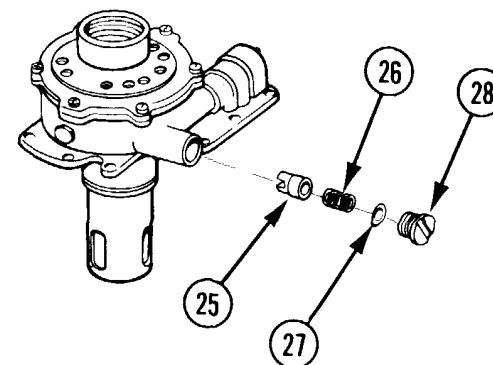
- 9 TWO PINS (12). Install in housing (3).
- 10 TWO PINS (13). Install in gear assembly (14).
- 11 GEAR ASSEMBLY (14). Install.
- 12 TWO LOCKWASHERS (15) AND TWO SCREWS (16). Install.



- 13 PACKING (17). Apply light coat of grease (item 3, app B) and install on cap (18).
- 14 CAP (18). Install.
- 15 PACKING (19). Apply light coat of grease (item 3, app B) and install.
- 16 RECESSED WASHER (20) AND SPRING TENSION WASHER (21). Install.
- 17 PLATE (22). Install.
- 18 THREE LOCKWASHERS (23) AND THREE SCREWS (24). Install and tighten.



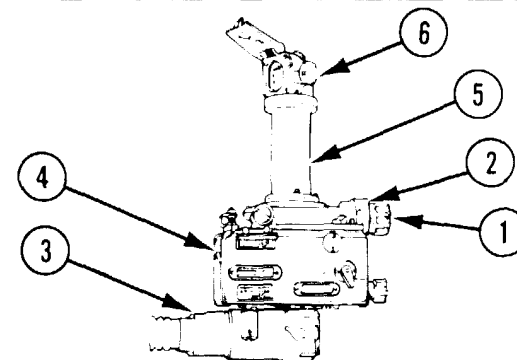
- 19 PLUNGER (25). Apply light coat of grease (item 2, app B) and install.
- 20 SPRING (26). Apply light coat of grease (item 2, app B) and install.
- 21 PACKING (27). Apply light coat of grease (item 3, app B) and install.
- 22 RETAINER (28). Apply light coat of sealing compound (TM 9-1025-211-20&P) on Threads only, and install.



6-22. BODY ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

**INSTALLATION**

- 1 KNOB ASSEMBLY (AZIMUTH) (1). Install (p 6-55).
- 2 BODY ASSEMBLY (2). Install (p 6-34).
- 3 ELBOW ASSEMBLY (3). Install (p 6-34).
- 4 COUNTER BOX ASSEMBLY (4). Install (p 6-34).
- 5 TELESCOPE HEAD SPACER (5). Install (p 6-35).
- 6 HEAD ASSEMBLY (6). Install (p 6-35).



6-23. WORM SHAFT ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Removal
- b. Repair
- c. Installation

**INITIAL SETUP**

Special Tools

- Tool box (SC 4931-95-CL-A09)
- Snap ring pliers (app C)

Materials/Parts

- Grease (item 2, app B)
- Grease (item 3, app B)
- Sealing compound (MIL-S-11031)

References

- TM 9-1025-211-20&P
- TM 9-1240-375-34P

Equipment Conditions

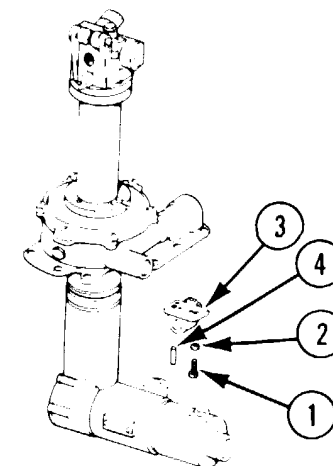
- 6-32 Counter box assembly removed.
- 6-53 Knob assembly (azimuth) removed.

**WARNING**

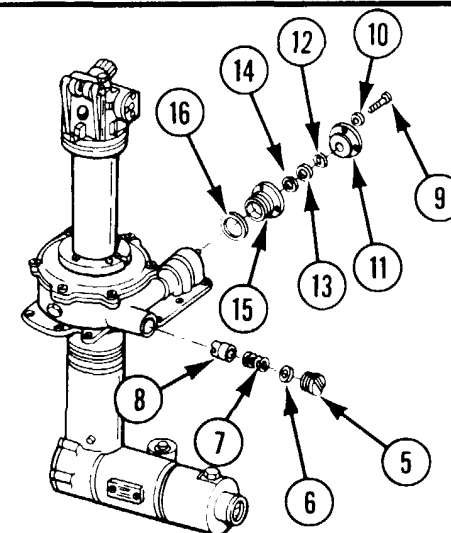
**When maintaining radioactively illuminated fire control equipment follow radiation hazard procedures on inside front cover .**

REMOVAL

- 1 TWO SCREWS (1) AND TWO LOCKWASHERS (2). Remove.
- 2 GEAR ASSEMBLY (3). Remove.
- 3 TWO PINS (4). Remove from gear assembly (3).

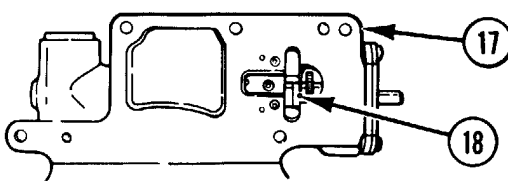


- 4 RETAINER (5). Remove.
- 5 PACKING (6). Remove from retainer (5).
- 6 SPRING (7). Remove.
- 7 PLUNGER (8). Remove.
- 8 THREE SCREWS (9) AND THREE LOCKWASHERS (10). Remove.
- 9 PLATE (11). Remove.
- 10 SPRING TENSION WASHER (12), RECESSED WASHER (13), AND PACKING (14). Remove.
- 11 CAP (15). Remove.
- 12 PACKING (16). Remove from cap (15).



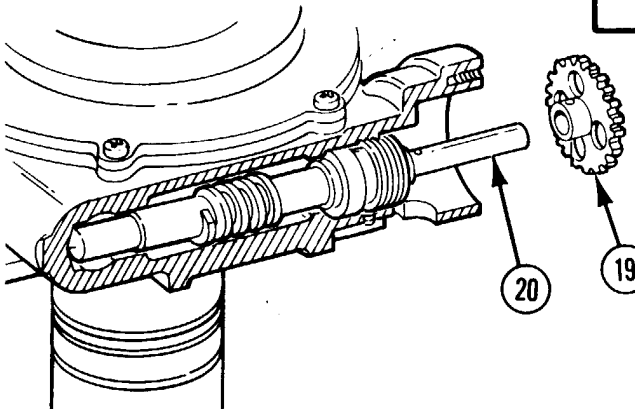
6-23. WORM SHAFT ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REMOVAL (cont)



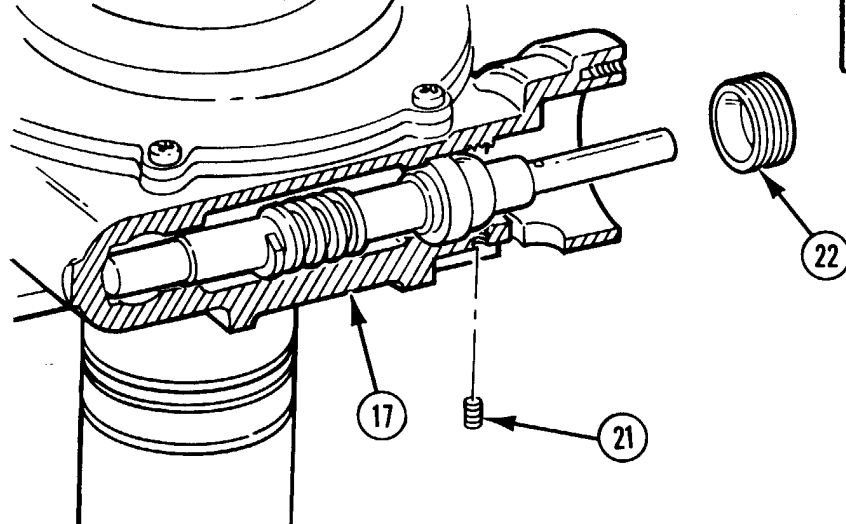
**NOTE**  
To avoid bottoming in housing (17), drive pin (18) partially out. Turn worm shaft assembly 180 degrees to remove pin.

13 PIN (18). Remove.



**NOTE**  
An alternate method of removing the worm shaft assembly using modified snap ring pliers (app C) is given in steps 18 thru 20.

14 SPUR GEAR (19). Remove from worm shaft assembly (20).



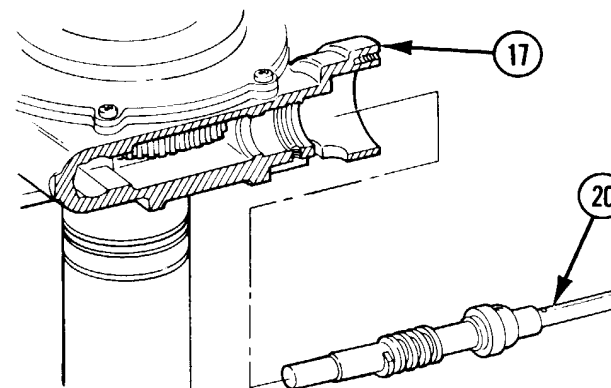
15 SETSCREW (21). Remove sealing compound and loosen.

16 SEAT (22). Unscrew and remove from housing (17).

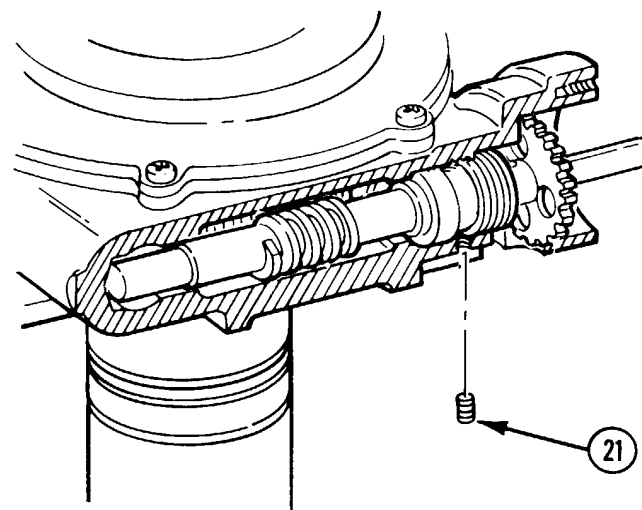
17 WORM SHAFT ASSEMBLY (20). Remove from housing (17).

**NOTE**

Replace worm shaft assembly if bent or otherwise damaged. The rotation of the head assembly will be affected if worm shaft assembly is damaged.



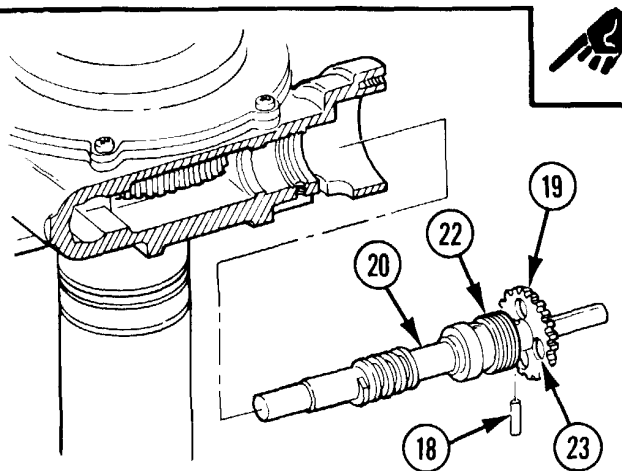
18 SETSCREW (21). Remove sealing compound and loosen.



6-23. WORM SHAFT ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REMOVAL (cont)

- 19 WORM SHAFT (20), SEAT (22), AND SPUR GEAR (19). Remove as an assembly by fitting tips of snap ring pliers through balance holes of spur gear (23) and into holes of ball seat.
- 20 PIN (18). Remove on V-block to prevent bending shaft.



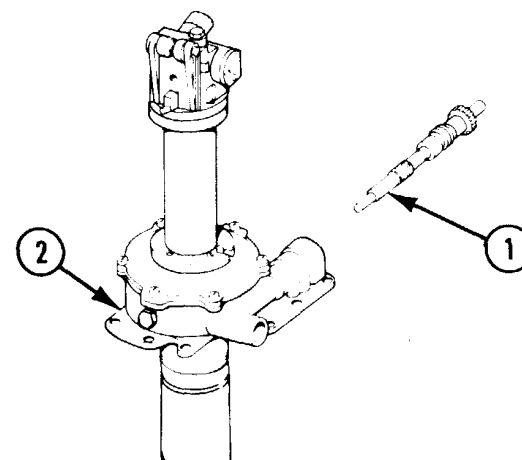
**NOTE**  
 Replace worm shaft assembly if bent or otherwise damaged. The rotation of the head assembly will be affected if worm shaft assembly is damaged.

**REPAIR**

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

**INSTALLATION**

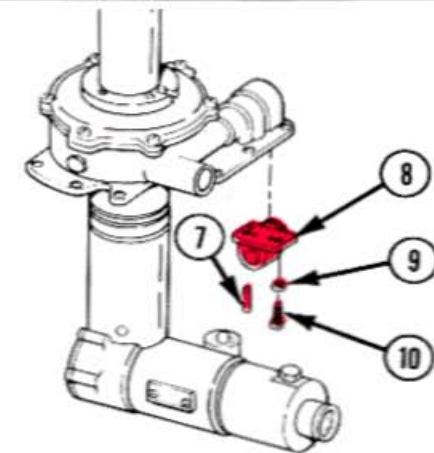
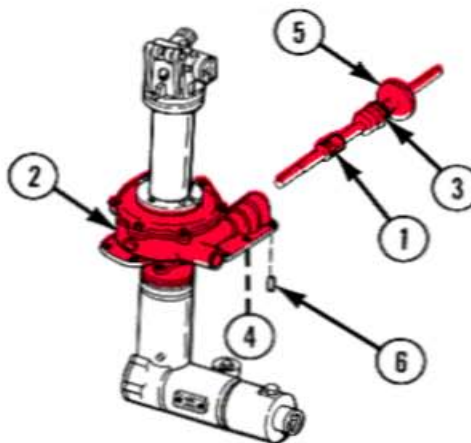
- 1 WORM SHAFT ASSEMBLY (1). Apply light coat of grease (item 2, app B) and install in housing (2).



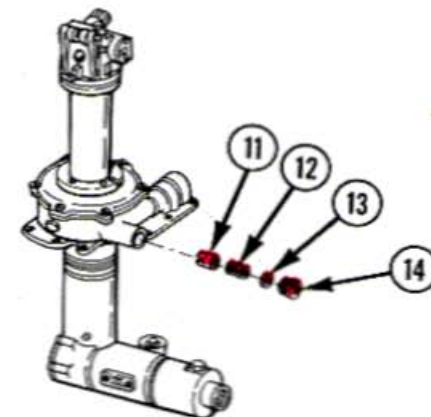
Change 2 6-50.2



- 2 SEAT (3). Screw in housing (2) and tighten .
- 3 SETSCREW (4). Tighten and fill with sealing compound (TM 9-1025211-20&P).
- 4 SPUR GEAR (5). Install on worm shaft assembly (1) and install pin (6).
- 5 TWO PINS (7). Install in gear (8).
- 6 GEAR ASSEMBLY (8). Install.
- 7 TWO LOCKWASHERS (9) AND TWO SCREWS (10). Install.



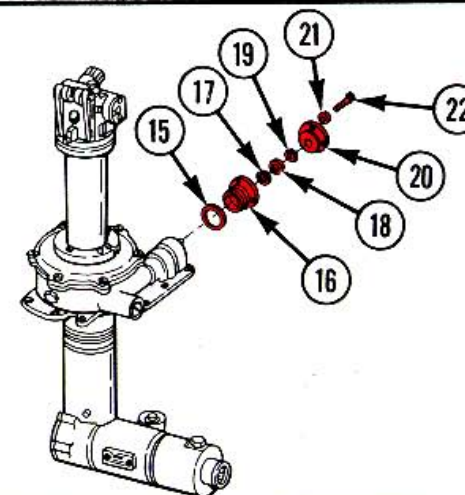
- 8 PLUNGER (11). Apply light coat of grease (item 2, app B) and install.
- 9 SPRING (12). Apply light coat of grease (item 2, app B) and install.
- 10 PACKING (13). Apply light coat of grease (item 3, app B) and install .
- 11 RETAINER (14). Apply light coat of sealing compound (TM 9-1025-211-20&P) on threads only, and install.



**6-23. WORM SHAFT ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)**

**INSTALLATION (cont)**

- 12 PACKING (15).
  - a. Apply light coat of grease (item 3, app B).
  - b. Install on cap (16).
- 13 CAP (16). Install.
- 14 PACKING (17). Apply light coat of grease (item 3, app B) and install.
- 15 RECESSED WASHER (18) AND SPRING TENSION WASHER (19). Install.
- 16 PLATE (20). Install.
- 17 THREE LOCKWASHERS (21) AND THREE SCREWS (22). Install and tighten.



**6-24. KNOB ASSEMBLY (AZIMUTH)-MAINTENANCE INSTRUCTIONS**

**THIS TASK COVERS:**

- a. Removal
- b. Disassembly
- c. Repair
- d. Reassembly
- e. Installation

**INITIAL SETUP**

Special Tools

Tool box (SC 4931-95-CL-A09)

Materials/Parts


Grease (item 2, app B)  
Sealing compound (MIL-S-11031)

References

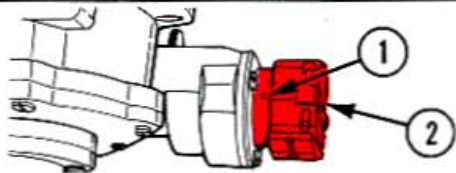
TM 9-1025-211-20&P  
TM 9-1240-375-34P

Troubleshooting Reference

6-9 Azimuth knob does not function correctly.

**WARNING**  
 When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

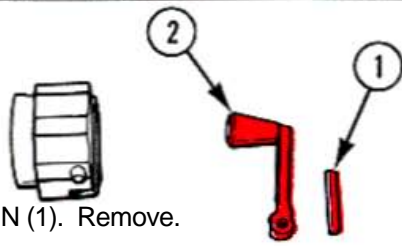
**REMOVAL**



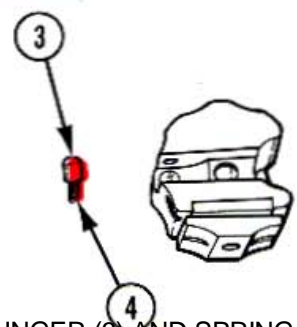
**CAUTION**  
 Support azimuth knob assembly in V block on solid surface to prevent damage to worm shaft.

1 PIN (1). Remove.  
 2 AZIMUTH KNOB ASSEMBLY (2) Remove.

**DISASSEMBLY**

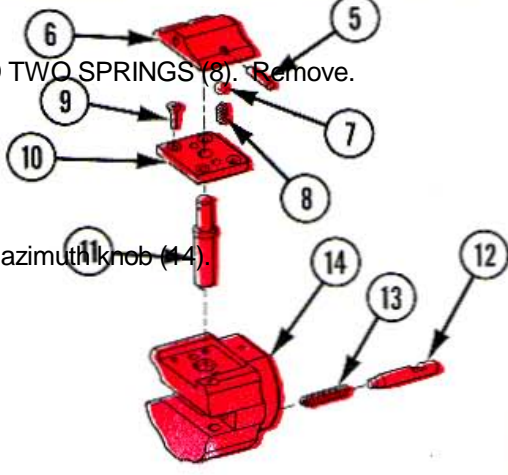


1 PIN (1). Remove.  
 2 CRANK (2). Remove.



3 PLUNGER (3) AND SPRING (4). Remove.

**CAUTION**  
 When removing knob, be careful not to lose ball bearings and spring .



4 PIN (5), KNOB (6), TWO BALL BEARINGS (7), AND TWO SPRINGS (8). Remove.  
 5 FOUR SCREWS (9) AND PLATE (10). Remove.  
 6 SHAFT (11). Remove.  
 7 PLUNGER (12) AND SPRING (13). Remove from azimuth knob (14).

6-24. KNOB ASSEMBLY (AZIMUTH)-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY (cont)

REPAIR

ASSEMBLY

**NOTE**  
 Replace azimuth knob assembly if bent, broken, or damaged in a way that interferes with normal operation of the M137 telescope.

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required .

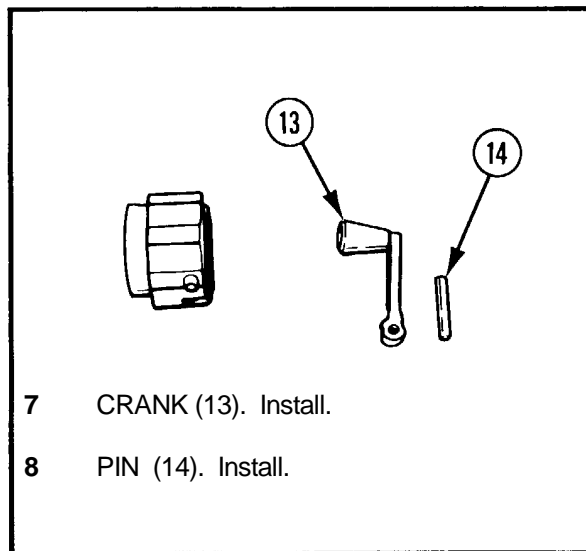
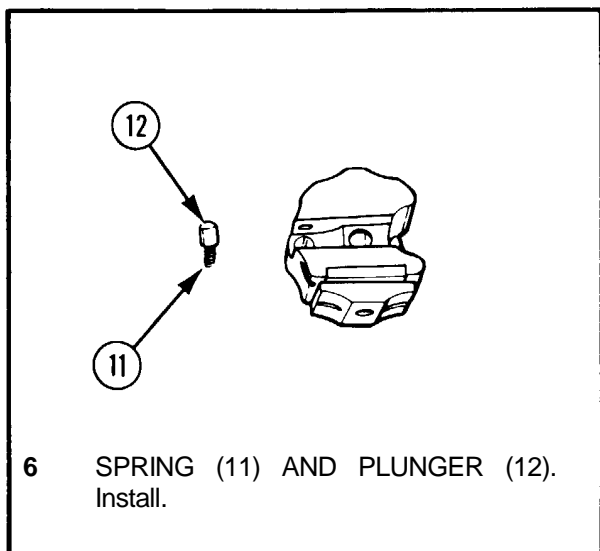
**NOTE**  
 Apply a light coat of grease (item 2, app B) on all springs, plungers, and shafts .

- 1 SPRING (1) AND PLUNGER (2). Insert in azimuth knob (3).
- 2 SHAFT (4). Install.
- 3 PLATE (5). Install.
- 4 FOUR SCREWS (6). Apply a light coat of sealing compound (TM 9-1025-211-20&P) and install.

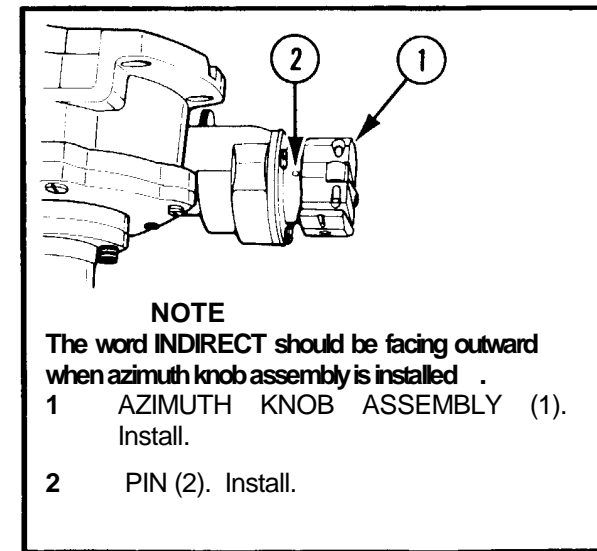
**NOTE**  
 Plunger (2) must be protruding when azimuth knob assembly reads DIRECT .

- 5 TWO SPRINGS (7), TWO BALL BEARINGS (8), KNOB (9), AND PIN (10). Insert.

The diagram shows an exploded view of the azimuth knob assembly. It includes a knob (9) at the top, a plate (5) in the middle, and a shaft (4) at the bottom. Various internal components like springs (1, 7), plungers (2), ball bearings (8), and a pin (10) are shown in their relative positions. Arrows point from the numbered callouts to the corresponding parts in the assembly.



**INSTALLATION**



**6-25. ELBOW ASSEMBLY-MAINTENANCE INSTRUCTIONS**

**THIS TASK COVERS :**

- a. Removal
- b. Installation

**INITIAL SETUP**

Special Tools  
Tool box (SC 4931-95-CL-A09)

Materials/Parts  
Grease (item 2, app B)  
Grease (item 3, app B)  
Sealing compound (MIL-S-1 1031)

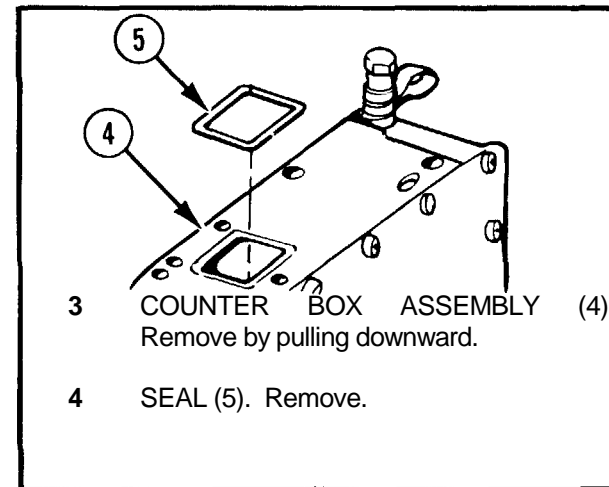
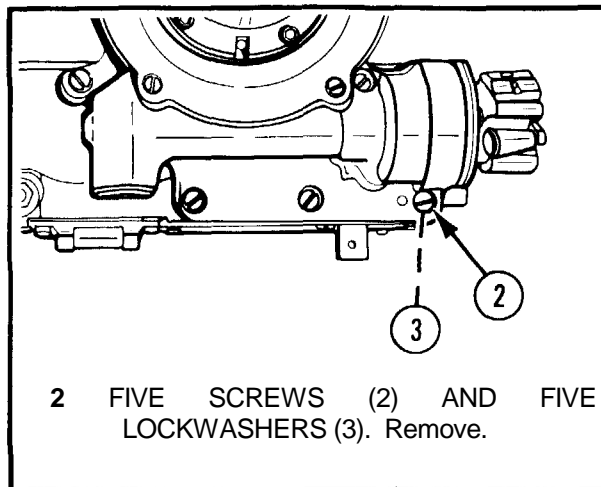
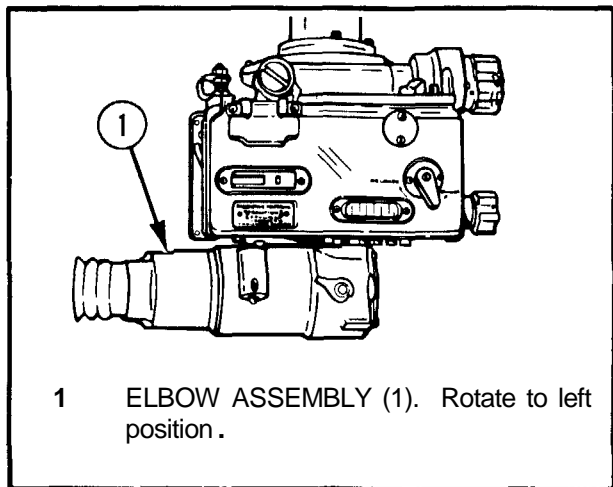
Reference  
TM 9-1025-211-20&P

**WARNING**

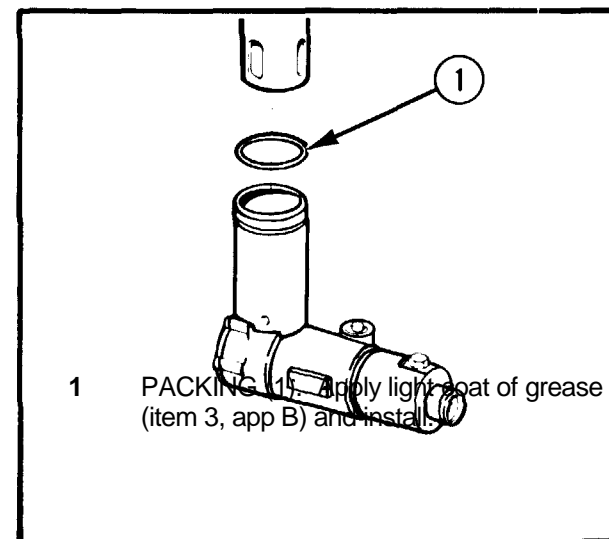
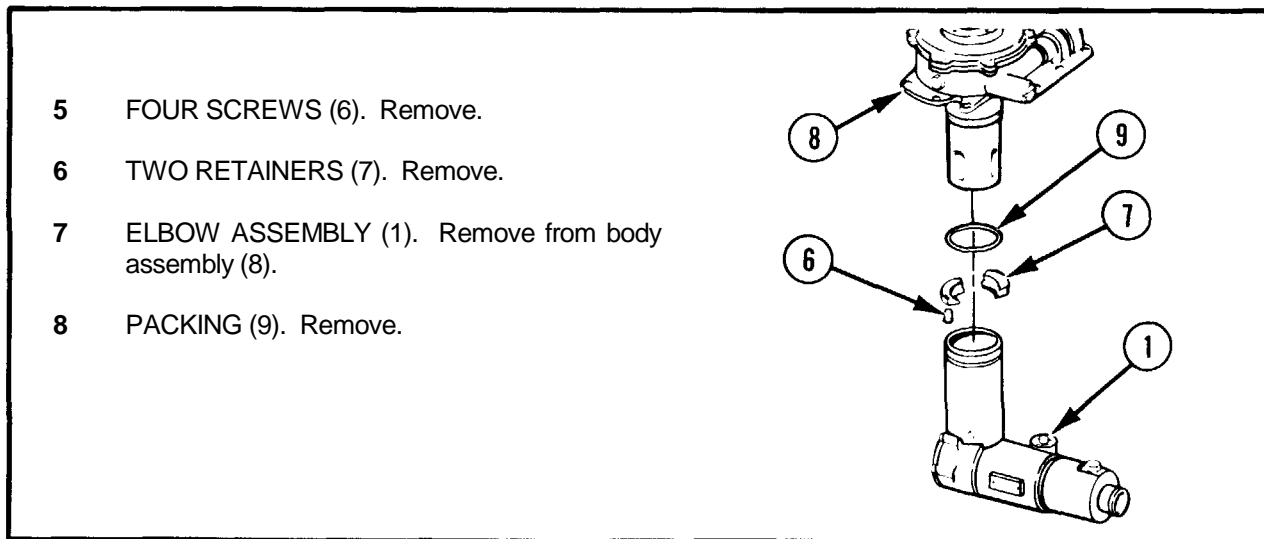
When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

6-25. ELBOW ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

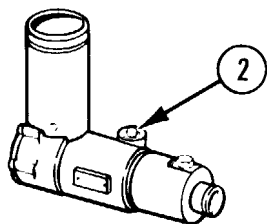
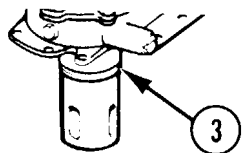
REMOVAL



**INSTALLATION**





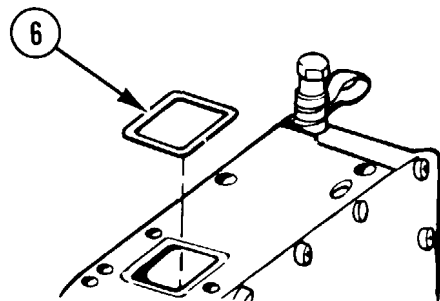
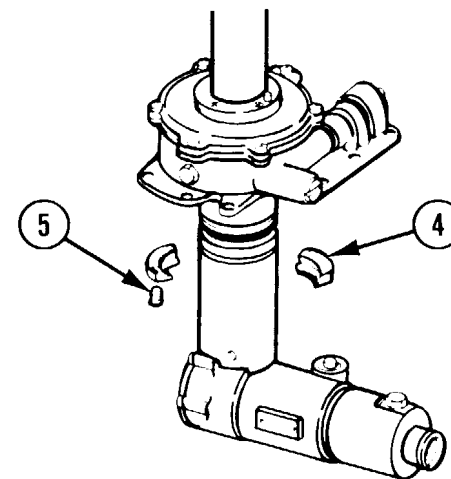


2 ELBOW ASSEMBLY (2). Apply light coat of grease (item 2, app B) on mating surfaces and install in left position on body assembly (3).

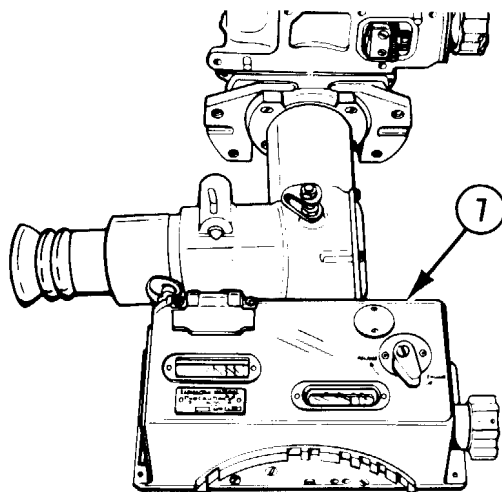
3 TWO RETAINERS (4). Install.

4 FOUR SCREWS (5).

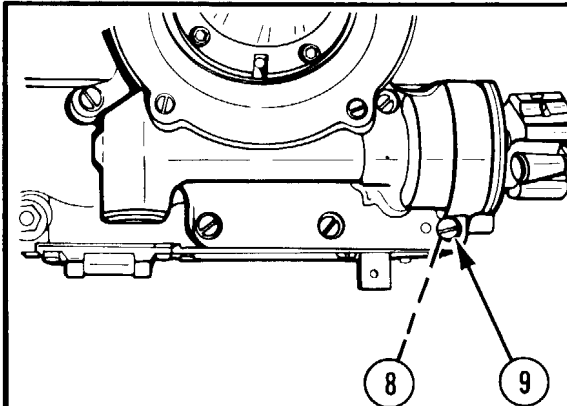
- a. Apply light coat of sealing compound (TM 9-1025-211-20&P).
- b. Install and tighten.



5 SEAL (6). Apply light coat of grease (item 3, app B) and install.



6 COUNTER BOX ASS EMBLY (7). Install by pushing upward.



7 FIVE LOCKWASHERS (8) AND FIVE SCREWS (9). Install.

6-26. COUNTER BOX ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Removal
- b. Disassembly
- c. Repair
- d. Reassembly
- e. Installation

**INITIAL SETUP**

Special Tools

- Shop set (SC 4931-95-CL-A07)
- Tool box (SC 4931-95-CL-A09)
- Tool set (SC 4931-95-CL-J51)

Materials/Parts

- Grease (item 3, app B)
- Lens paper (NNN-P-40)
- Optical lens cleaning compound (MIL-L-43454A)
- Sealing compound (MIL-S-11031)
- Gasket (11741172)
- Prefomed packing (MS9021-015)

References

- TM 9-1025-211-10
- TM 9-1025-211-20&P
- TM 9-1240-375-34P

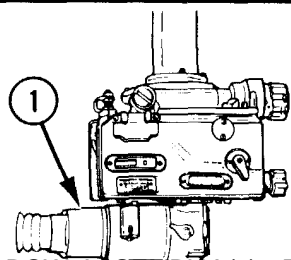
Troubleshooting References

- 6-10 Correction knob binds.
- 6-10 Counter numbers are not in horizontal alinement.
- 6-10 Counters have excessive backlash.

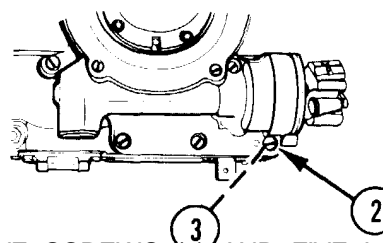
**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

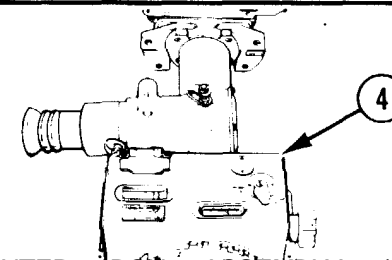
**REMOVAL**



1 ELBOW ASSEMBLY (1). Rotate to left position.

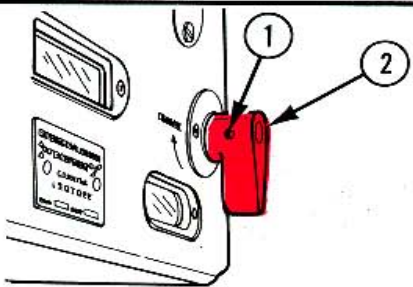


2 FIVE SCREWS (2) AND FIVE LOCK-WASHERS (3). Remove.



3 COUNTER BOX ASSEMBLY (4). Remove by pulling downward.

**DISASSEMBLY**

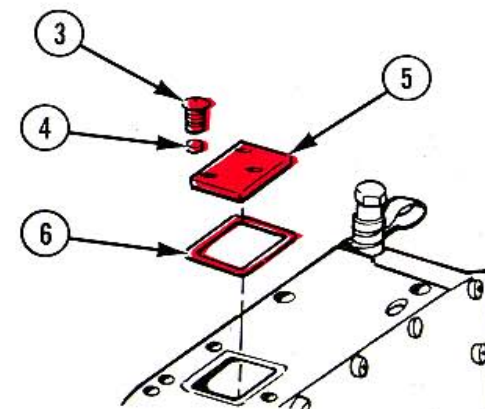


**CAUTION**  
Support knob in V block on solid surface to prevent damage to shaft.

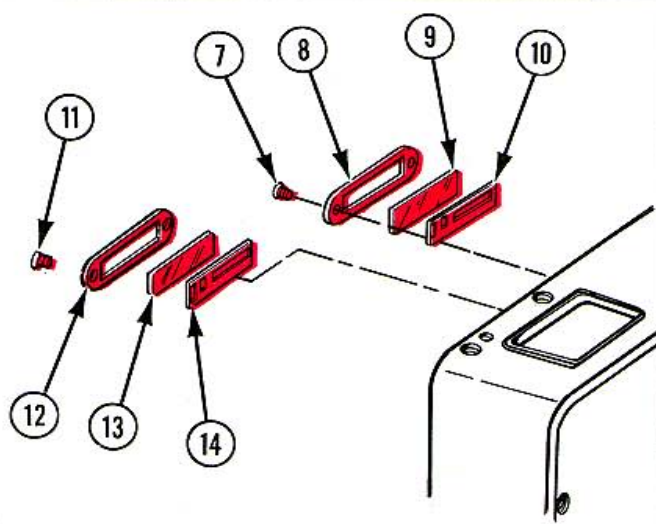
1 PIN (1). Remove from knob (2).  
2 KNOB (2). Remove.

**NOTE**  
Remove three screws (3), three lockwashers (4), and access cover (5). (Only present on new equipment. For shipping purposes only.) Reinstall on rejected counter box assembly.

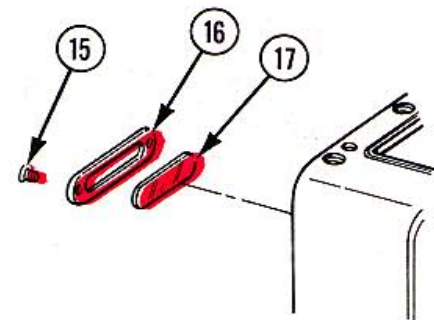
3 SEAL (6). Remove.



- 4 TWO SCREWS (7). Remove e.  
5 PLATE (8). Remove.  
6 WINDOW (9). Remove.  
7 MASK (10). Remove.  
8 TWO SCREWS (11). Remove.  
9 PLATE (12). Remove.  
10 WINDOW (13). Remove.  
11 MASK (14). Remove.

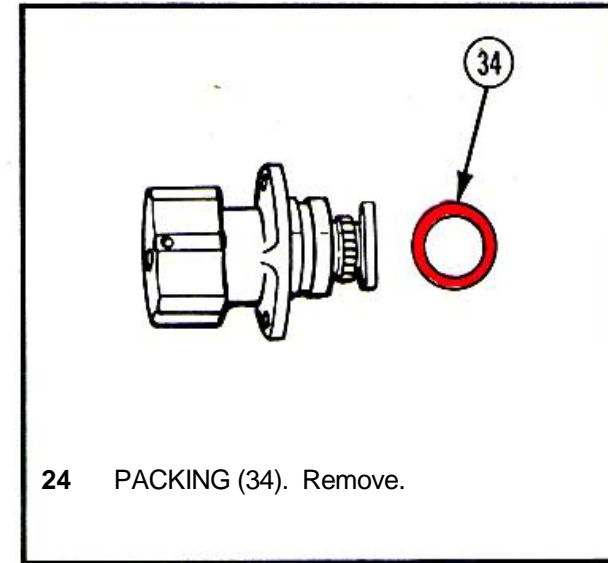
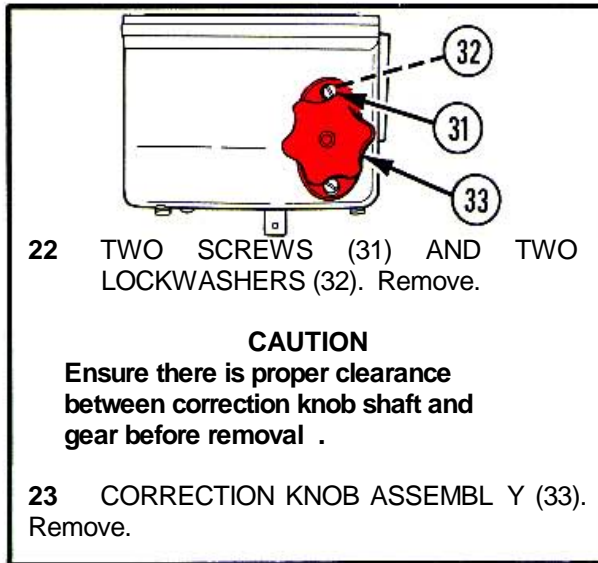
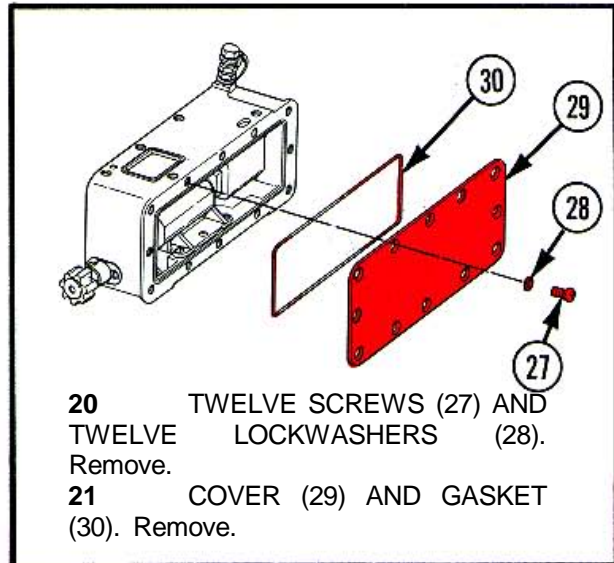
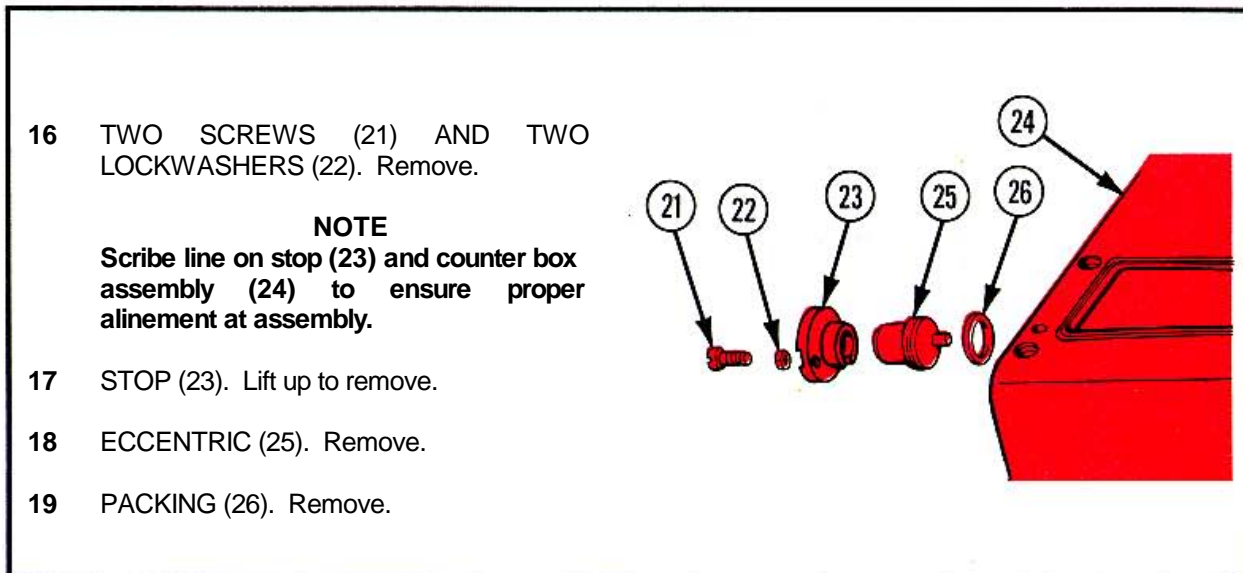
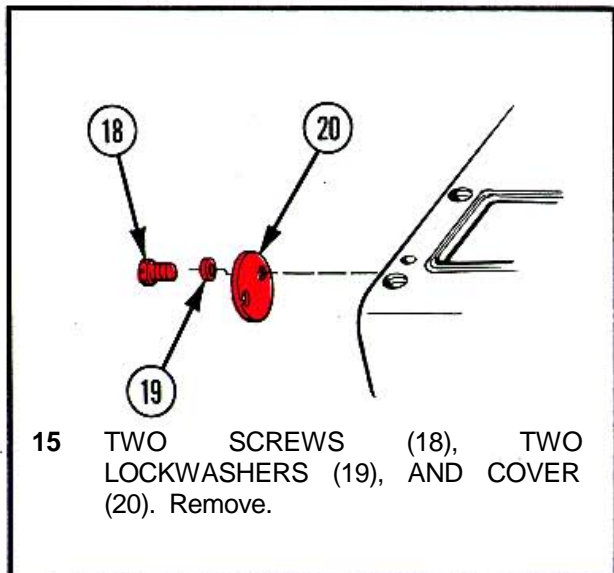


- 12 TWO SCREWS (15). Remove.  
13 PLATE (16). Remove.  
14 WINDOW (17). Remove.



6-26. COUNTER BOX ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

DISASSEMBLY (cont)

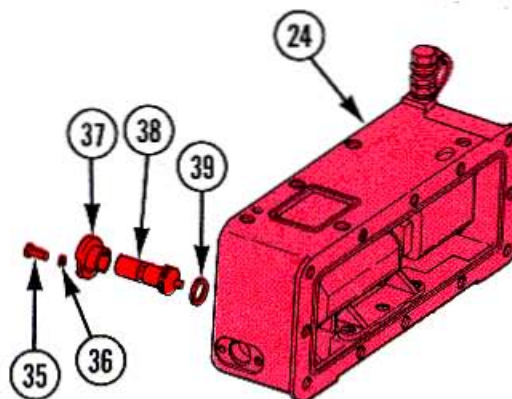


- 25 TWO SCREWS (35) AND TWO LOCKWASHERS (36). Remove.

**NOTE**

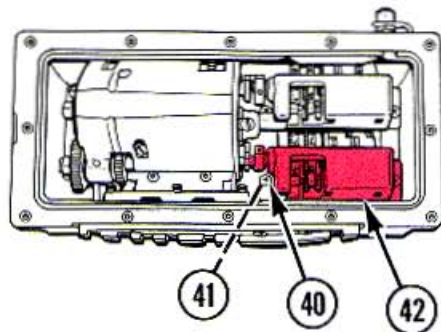
Scribe line on stop (37) and counter box assembly (24) to ensure proper alinement at assembly.

- 26 STOP (37). Lift up to remove.  
 27 ECCENTRIC (38). Remove.  
 28 PACKING (39). Remove.

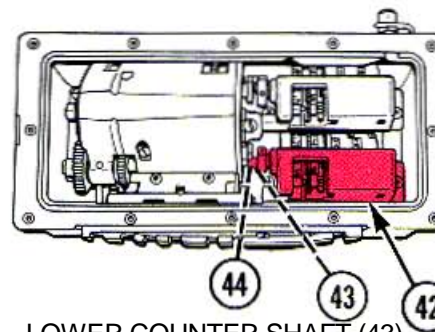


**NOTE**

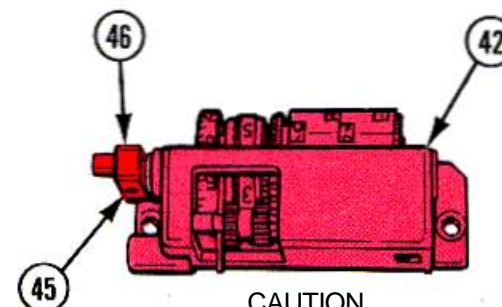
Deflection counter and azimuth counter are not interchangeable. Mark counters to identify for reassembly.



- 29 TWO SCREWS (40) AND TWO LOCKWASHERS (41). Remove from deflection counter (42).



- 30 LOWER COUNTER SHAFT (43). Rotate so that slot (44) is in up position.  
 31 DEFLECTION COUNTER (42). Remove.



**CAUTION**

Support coupling in V block on solid surface to prevent damage to shaft.

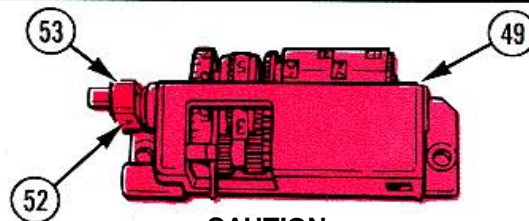
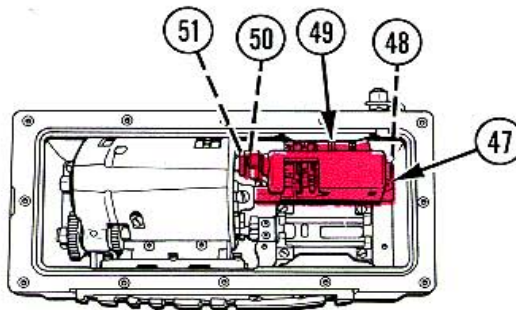
- 32 PIN (45). Remove.  
 33 COUPLING (46). Remove from deflection counter (42).



6-26. COUNTER BOX ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont) I

DISASSEMBLY (cont)

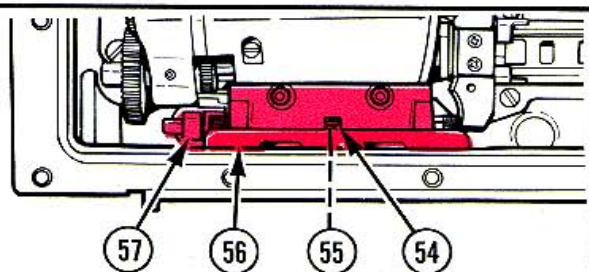
- 34 TWO SCREWS (47) AND TWO LOCKWASHERS (48). Remove from azimuth counter (49).
- 35 UPPER COUNTER SHAFT (50). Rotate so that slot (51) is in up position.
- 36 AZIMUTH COUNTER (49). Remove.



**CAUTION**

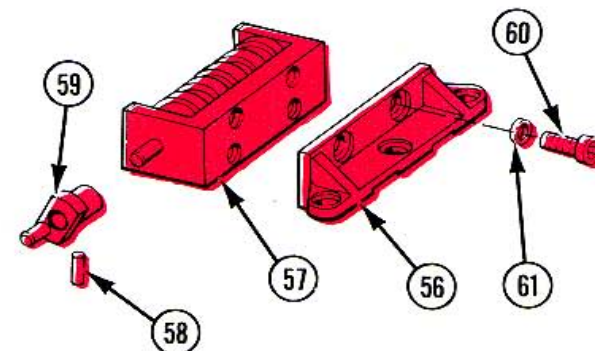
Support coupling in V block on solid surface to prevent damage to shaft.

- 37 PIN (52). Drive out.
- 38 COUPLING (53). Remove from azimuth counter (49).



- 39 THREE SCREWS (54) AND THREE LOCKWASHERS (55). Remove from mount (56).
- 40 CORRECTION COUNTER (57) WITH MOUNT (56). Remove.

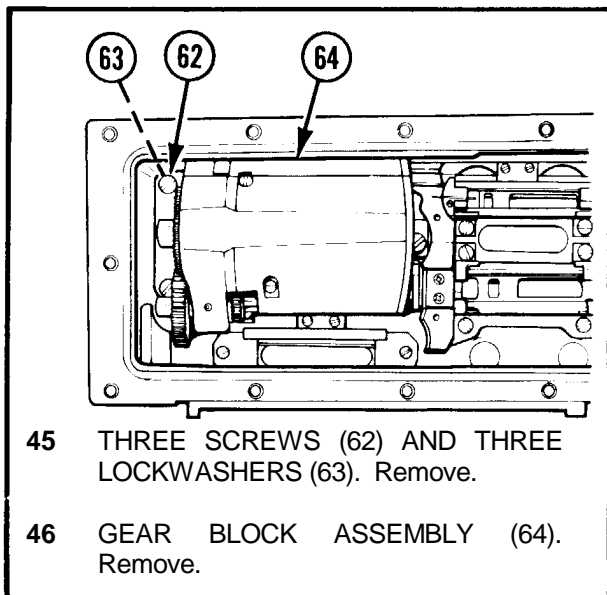
- 41 PIN (58). Drive out.
- 42 COUPLING (59). Remove from correction counter (57).
- 43 FOUR SCREWS (60) AND FOUR LOCKWASHERS (61). Remove.
- 44 MOUNT (56). Remove from correction counter (57).



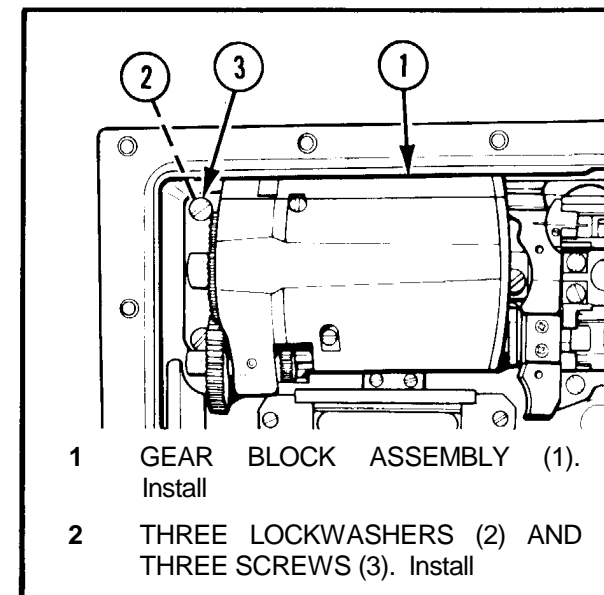


REPAIR

REASSEMBLY



Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.



- 3 MOUNT (4). Place on correction counter (5).
- 4 FOUR LOCKWASHERS (6) AND FOUR SCREWS (7). Install.

**NOTE**

If correction counter or coupling replacement is required, timing must be maintained. To accomplish this, proceed to step 9.

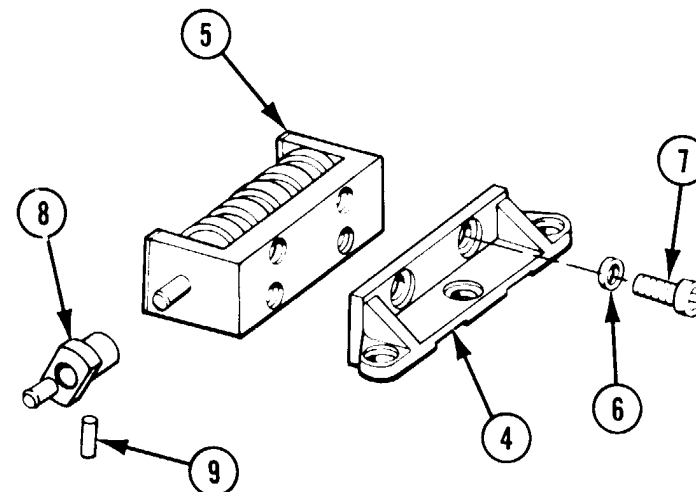
If replacement is not required, perform steps 5 thru 8 and proceed to step 16.

- 5 COUPLING (8). Position on correction counter (5).

**CAUTION**

Support coupling in V block on solid surface to prevent damage to shaft.

- 6 PIN (9). Install.

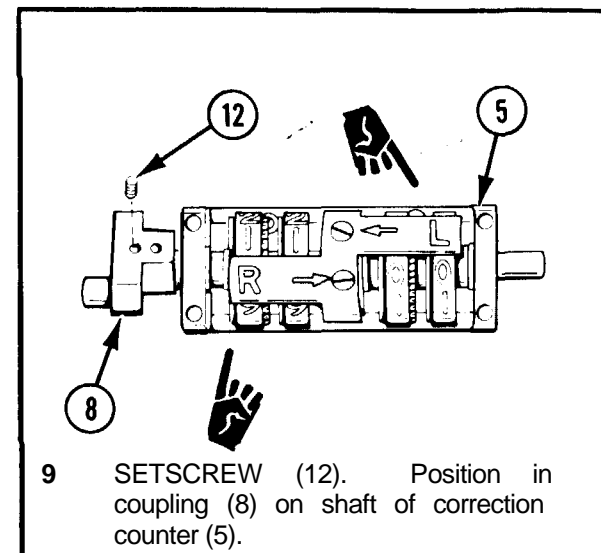
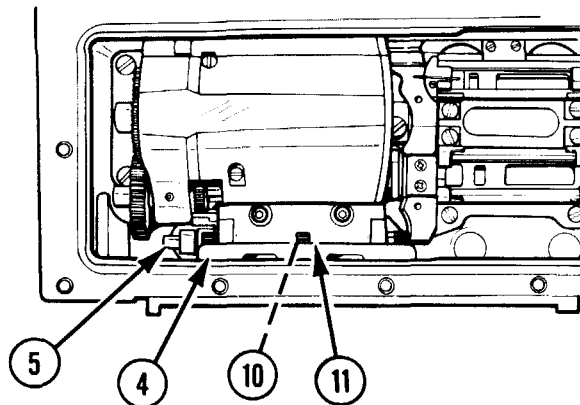


6-26. COUNTER BOX ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

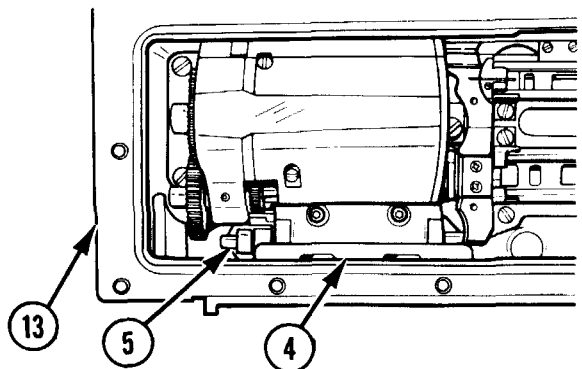
REASSEMBLY (cont)

7 CORRECTION COUNTER (5) WITH MOUNT (4). Set to 00 and install.

8 THREE LOCKWASHERS (10) AND THREE SCREWS (11). Install in mount (4).



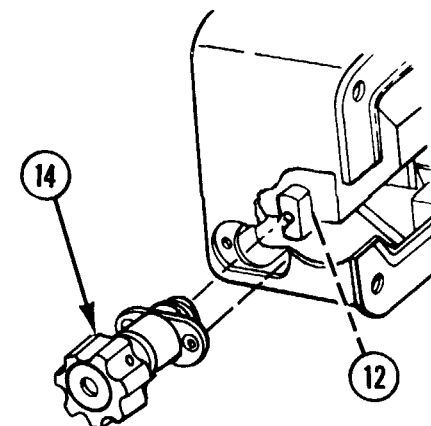
9 SETSCREW (12). Position in coupling (8) on shaft of correction counter (5).

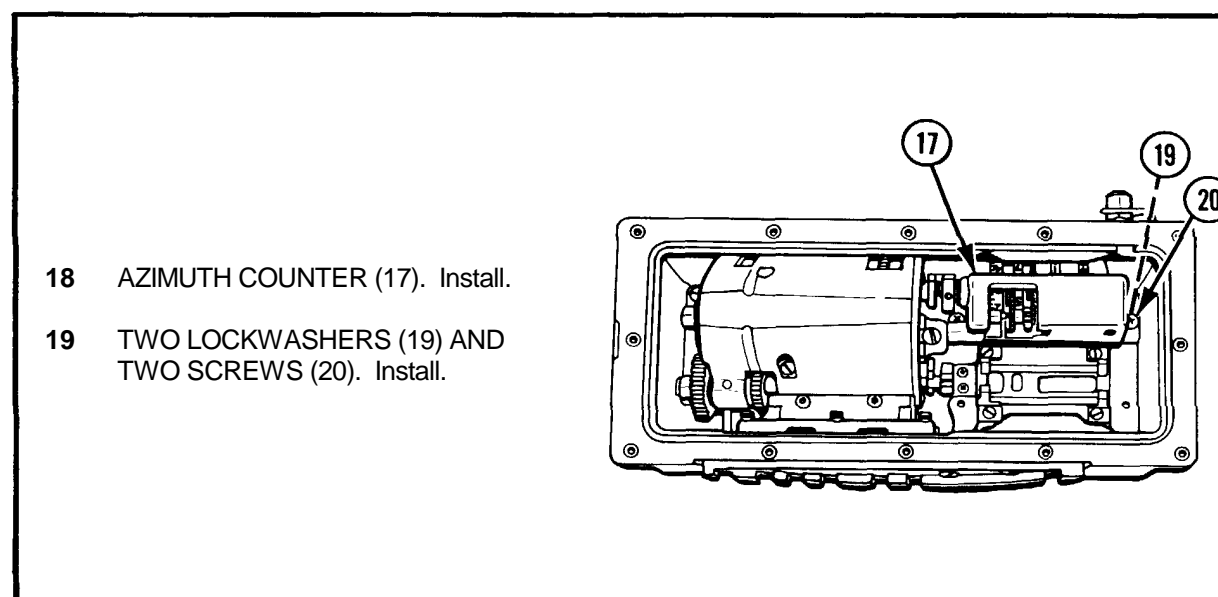
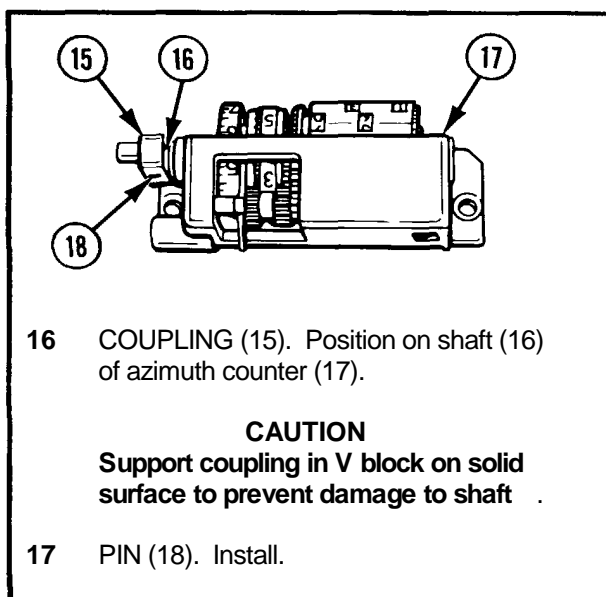
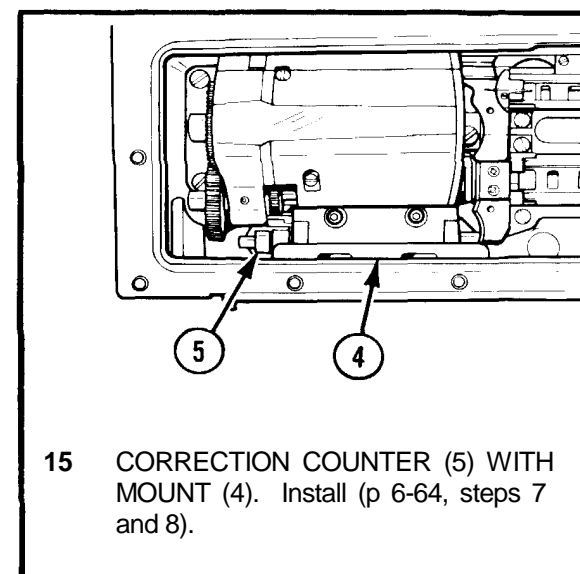
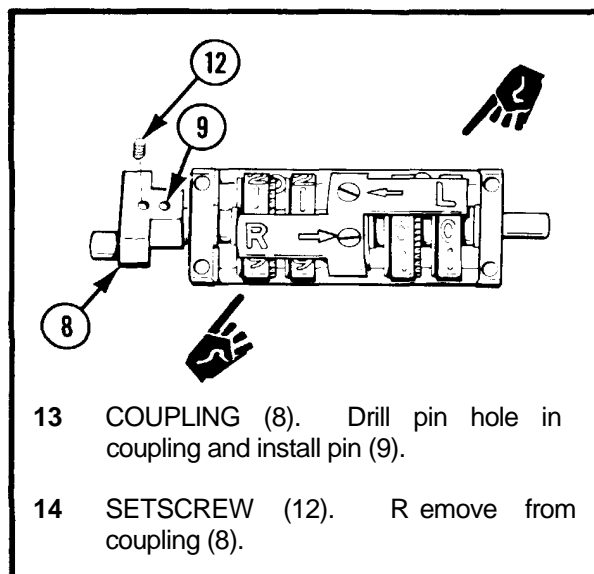
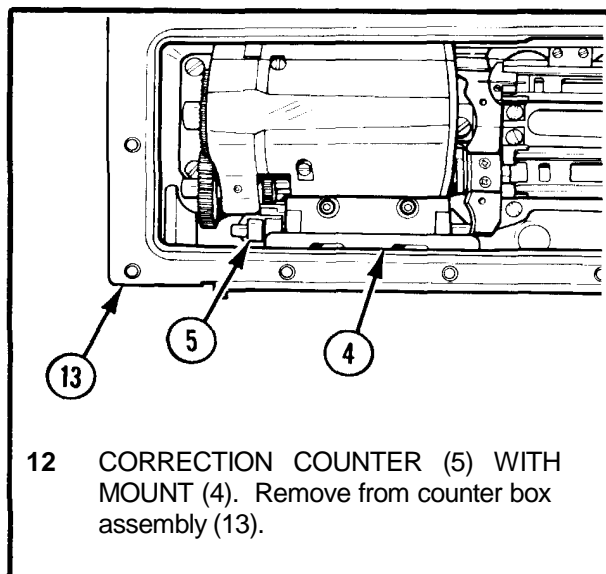


10 CORRECTION COUNTER (5) WITH MOUNT (4). Temporarily install in counter box assembly (13).

11 CORRECTION KNOB ASSEMBLY (14).

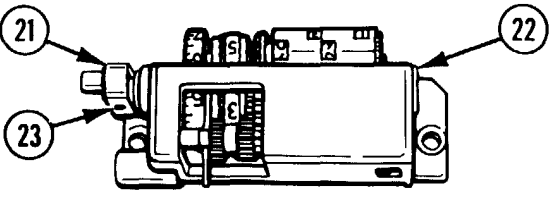
- a. Temporarily install. Set correction counter so that numbers are alined as seen through window.
- b. Set coupling so setscrew (12) is accessible and tighten.
- c. Turn correction knob to ensure correction counter numbers are in correct alinement. If not, loosen setscrew (12) and realine correction counter until number alinement is accomplished as seen through window.





6-26. COUNTER BOX ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY (cont)

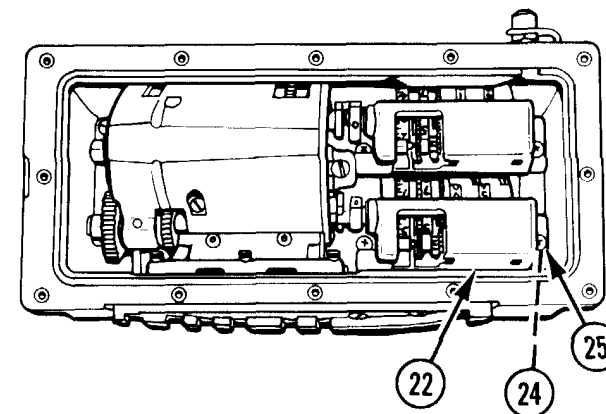


20 COUPLING (21). Position on shaft of deflection counter (22).

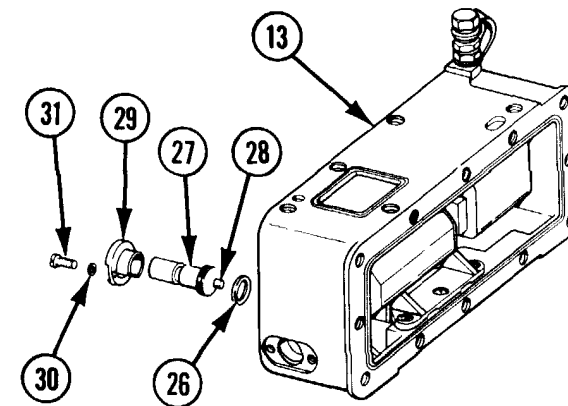
**CAUTION**  
Support coupling in V block on solid surface to prevent damage to shaft.

21 PIN (23). Install.

- 22 DEFLECTION COUNTER (22). Install.
- 23 TWO LOCKWASHERS (24) AND TWO SCREWS (25). Install.



- 24 PACKING (26).
- a. Apply light coat of grease (item 3, app B).
  - b. Install on eccentric (27).
- 25 ECCENTRIC (27). Install with lug (28) down.
- 26 STOP (29). Aline scribed line on stop with scribed line on counter box assembly (13).
- 27 STOP (29). Install on eccentric (27).
- 28 TWO LOCKWASHERS (30) AND TWO SCREWS (31). Install.



**29 PACKING (32).**

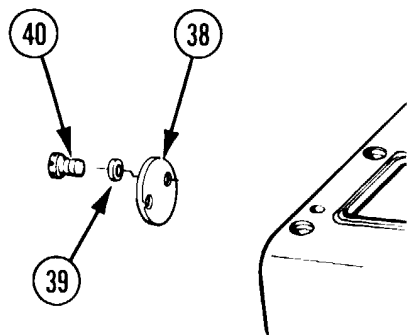
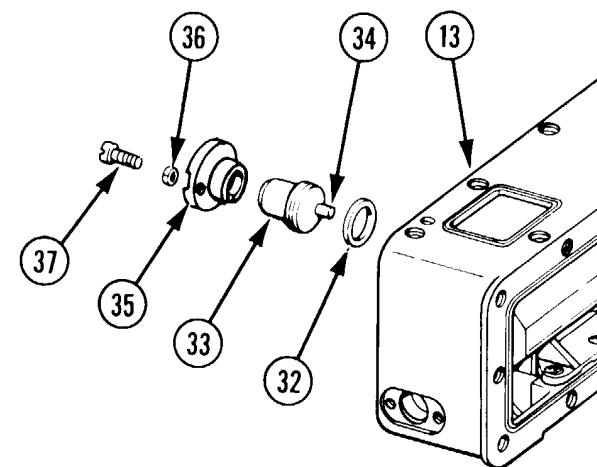
- a. Apply light coat of grease (item 3, app B).
- b. Install on eccentric (33).

**30 ECCENTRIC (33). Install with lug (34) down.**

**31 STOP (35).**

- a. Aline scribed line on stop with scribed line on counter box assembly (13).
- b. Install stop (35) on eccentric (33).

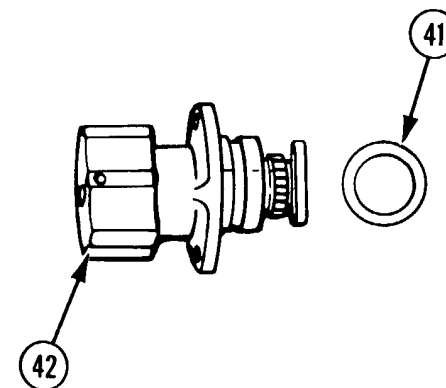
**32 TWO LOCKWASHERS (36) AND TWO SCREWS (37). Install.**



**33 COVER (38). Install using two lockwashers (39) and two screws (40).**

**34 PACKING (41). Apply light coat of grease (item 3, app B) on new packing and install.**

**35 CORRECTION KNOB (42). Turn clockwise to stop.**

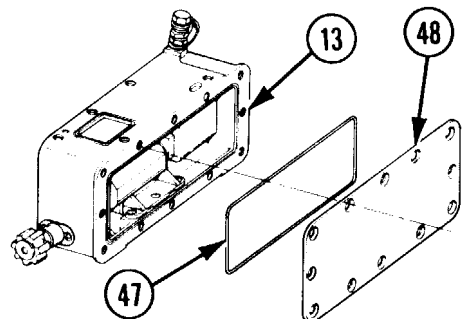
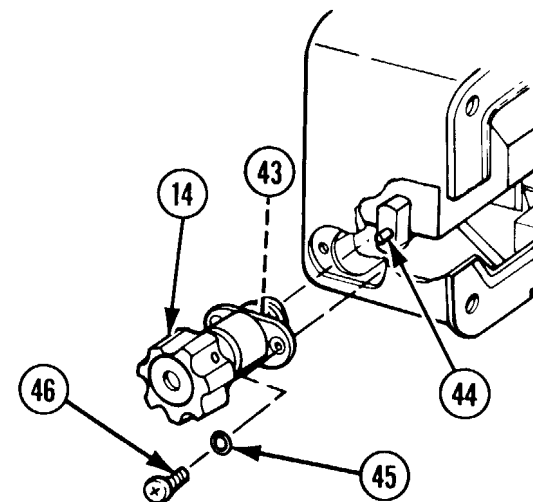


6-26. COUNTER BOX ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY (cont)

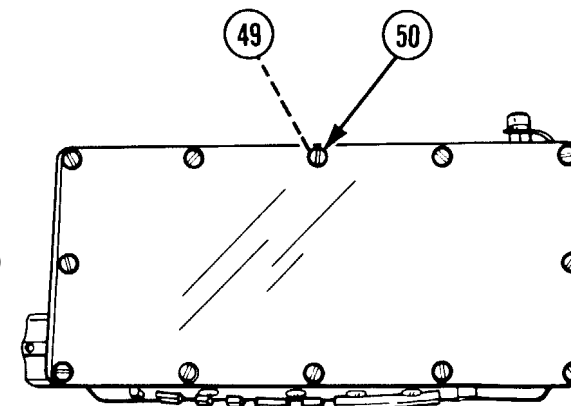
**NOTE**  
 correction counter should read on or  
 between R-95 and R-99.

- 36 CORRECTION KNOB ASSEMBLY (14). Install. Ensure slot (43) in shaft engages coupling pin (44).
- 37 TWO LOCKWASHERS (45) AND TWO SCREWS (46). Install.



- 38 GASKET (47) AND COVER (48). Place new gasket and cover on counter box assembly (13).

- 39 TWELVE LOCKWASHERS (49) AND TWELVE SCREWS (50). Install.



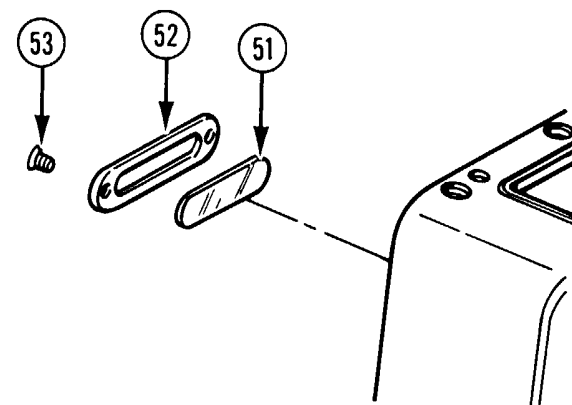


**NOTE**

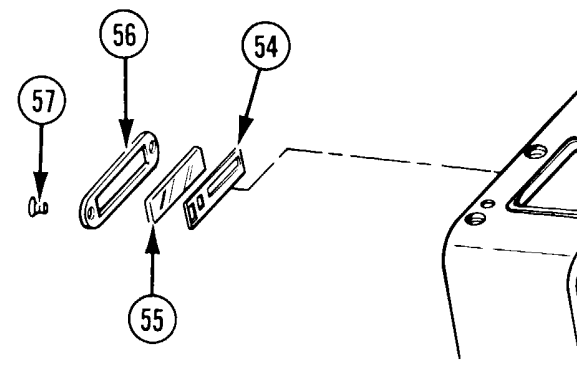
Check windows for nicks, scratches, or cracks.

Clean windows with optical lens cleaning compound and lens paper (TM 9-1025-211-10).

- 40 WINDOW (51).
  - a. Apply light coat of sealing compound (TM 9-1025-211-20&P) around edge.
  - b. Install.
- 41 PLATE (52). In stall.
- 42 TWO SCREWS (53). Apply a light coat of sealing compound (TM 9-1025-211-20&P) and install.



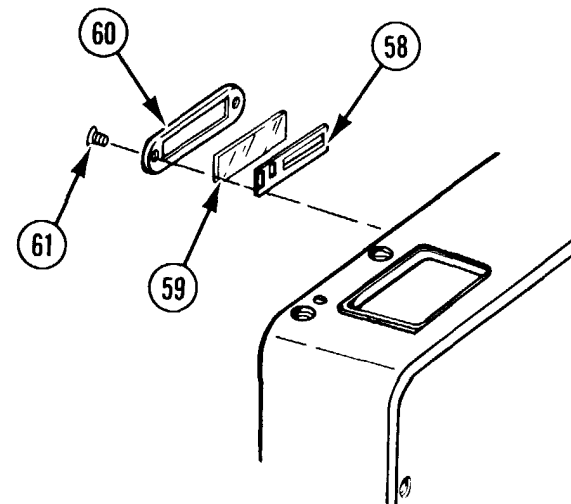
- 43 MASK (54). Install.
- 44 WINDOW (55).
  - a. Apply a light coat of sealing compound (TM 9-1025-211-20&P) around edge.
  - b. Install on mask (54).
- 45 PLATE (56). Install.
- 46 TWO SCREWS (57). Apply a light coat of sealing compound (TM 9-1025-211-20&P) and install.



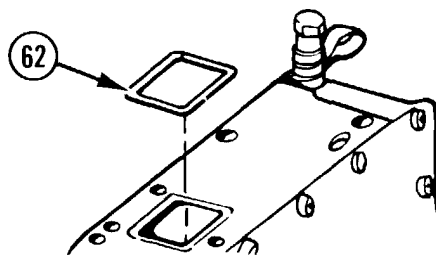
6-26. COUNTER BOX ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY (cont)

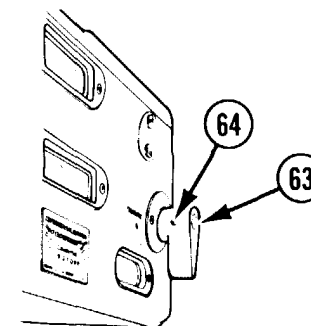
- 47 MASK (58). Install.
- 48 WINDOW (59).
  - a. Apply a light coat of sealing compound (TM 9-1025-211-20&P) around edge.
  - b. Install on mask (58).
- 49 PLATE (60). Install.
- 50 ■ TWO SCREWS (61). Apply a light coat of sealing compound (TM 59-1025 211 20&P) and install.



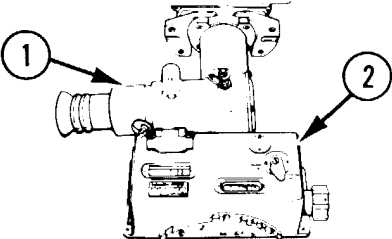
- 51 SEAL (62). Apply a light coat of grease (item 3, app B) and install.



- 52 KNOB (63). Install.
- 53 PIN (64). Install in knob.



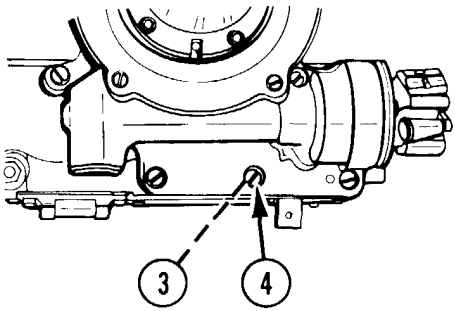
INSTALLATION



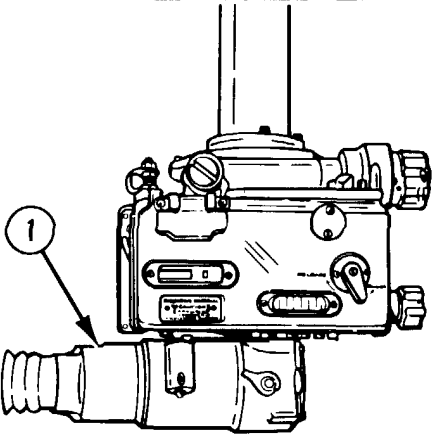
1 ELBOW ASSEMBLY (1). Rotate to left position.

**CAUTION**  
Ensure gears are meshed correctly while installing counter box assembly.

2 COUNTER BOX ASSEMBLY (2). Install by pushing upward.



3 FIVE LOCKWASHERS (3) AND FIVE SCREWS (4). Install.



4 ELBOW ASSEMBLY (1). Return to center position

6-27. KNOB ASSEMBLY (CORRECTION)-MAINTENANCE INSTRUCTIONS

THIS TASK COVERS:

- |                |                 |
|----------------|-----------------|
| a. Removal     | d. Repair       |
| b. Disassembly | e. Reassembly   |
| c. Inspection  | f. Installation |

INITIAL SETUP

Special Tools  
Tool box (SC 4931-95-CL-A09)

Materials/Parts  
Grease (item 2, app B)  
Grease (item 3, app B)  
Preformed packing (MS9021-015)

Reference  
TM 9-1240-375-34PTroubleshooting Reference  
6-10 Correction knob binds.

Equipment Conditions  
6-32 Counter box assembly removed.  
6-60 Cover on counter box assembly removed

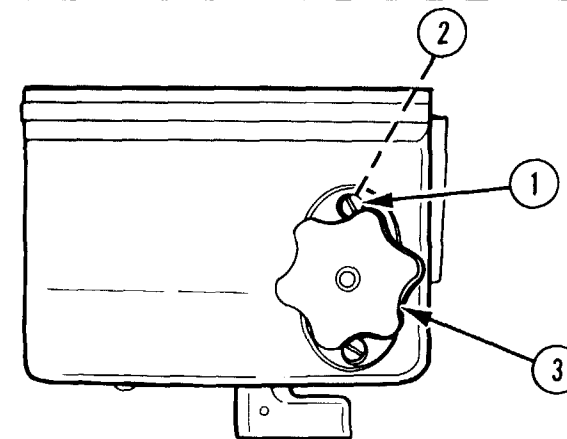
6-27. KNOB ASSEMBLY (CORRECTION)-MAINTENANCE INSTRUCTIONS (cont)

- 1 TWO SCREWS (1) AND TWO LOCKWASHERS (2). Remove.

**CAUTION**

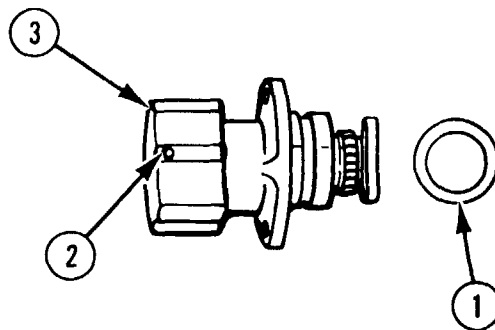
Ensure there is proper clearance between correction knob shaft and gear before removal.

- 2 CORRECTION KNOB ASSEMBLY (3). Remove.



**DISASSEMBLY**

- 1 PACKING (1). Remove .
- 2 PIN (2). Remove.
- 3 CORRECTION KNOB (3). Remove.



- 4 TWENTY-TWO KEY WASHERS (4). Remove from shaft (5).
- 5 SHAFT (5). Remove.
- 6 PACKING (6) AND BUSHING (7). Remove from shaft (5).

**INSPECTION**

Inspect all parts for nicks and burrs.

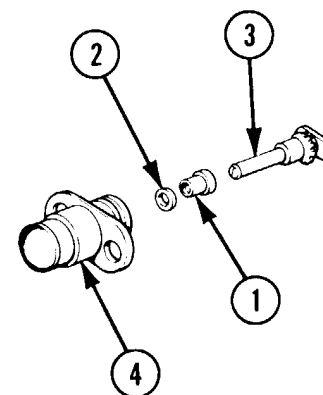
**REPAIR**

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

**NOTE**  
 Replace correction knob assembly if binding or inoperative making adjustment of the correction counter impossible .

**REASSEMBLY**

- 1 BUSHING (1) AND PACKING (2).
  - a. Apply light coat of grease (item 2, app B) to packing (2).
  - b. Install bushing (1) and packing (2) on shaft (3).
- 2 SHAFT (3). Install in housing (4).



6-27. KNOB ASSEMBLY (CORRECTION)-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY (cont)

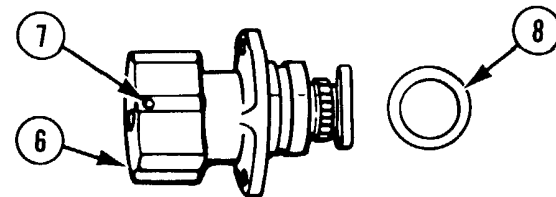
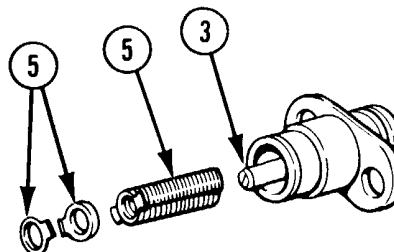
3 TWENTY-TWO KEY WASHERS (5).

a. Apply light coat of grease (item 3, app B).

**NOTE**

Tabs on key washers (5) must face toward correction knob.

b. Install on shaft (3) by alternating tabs.



4 CORRECTION KNOB (6). Install.

5 PIN (7). Install.

6 PACKING (8). Apply light coat of increase (item 2, app B) on new packing and install.

**INSTALLATION**

1 CORRECTION KNOB (1). Turn clockwise to stop.

**NOTE**

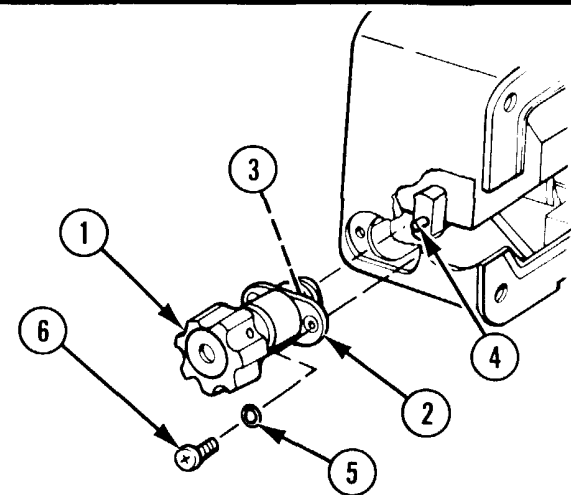
Correction counter should read on or between R-95 and R 99.

2 CORRECTION KNOB ASSEMBLY (2). Install. Ensure slot (3) in shaft engages coupling pin (4).

**NOTE**

Ensure knob assembly (2) has full travel in counterclockwise rotation. Correction counter should fall between L-95 and L-99 when limit stop is met.

3 TWO LOCKWASHERS (5) AND TWO SCREWS (6). Install.





6-28. GEAR BLOCK ASSEMBLY-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Removal
- b. Installation

**INITIAL SETUP**

Special Tools  
Tool box (SC 4931-95-CL-A09)

Materials/Parts  
Gasket (11741172)

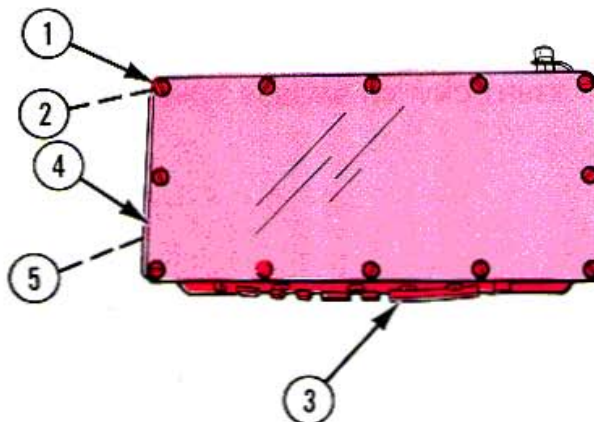
Equipment Conditions

- 6-32 Counter box assembly removed.
- 6-72 Knob assembly (correction) removed.

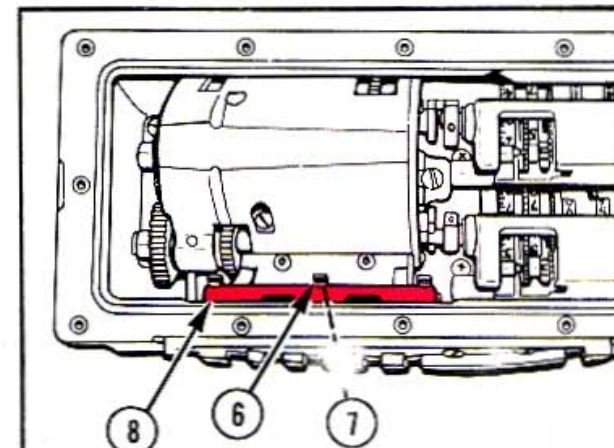
**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**REMOVAL**



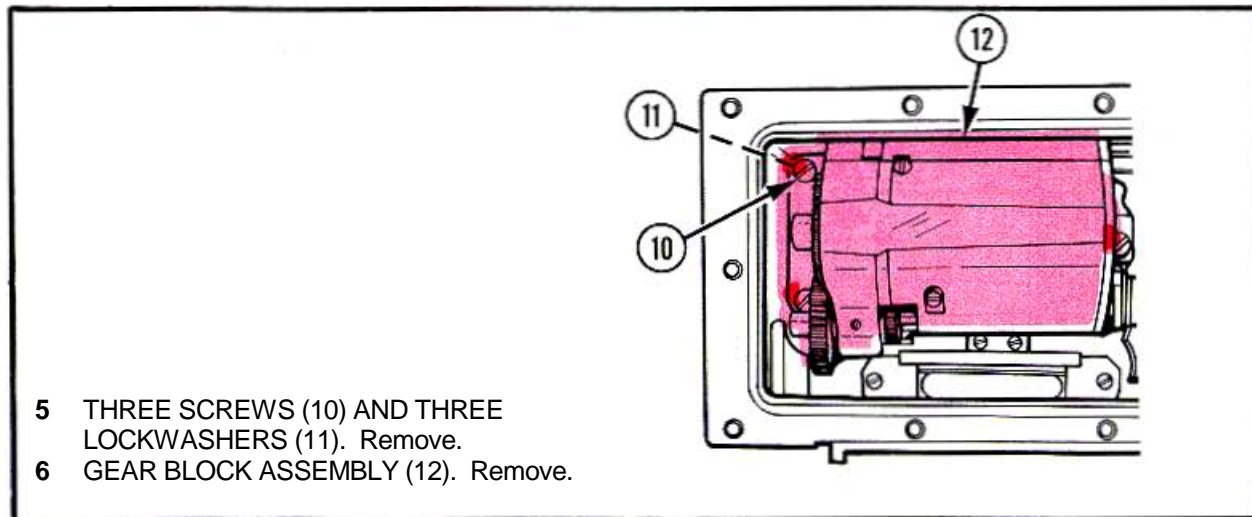
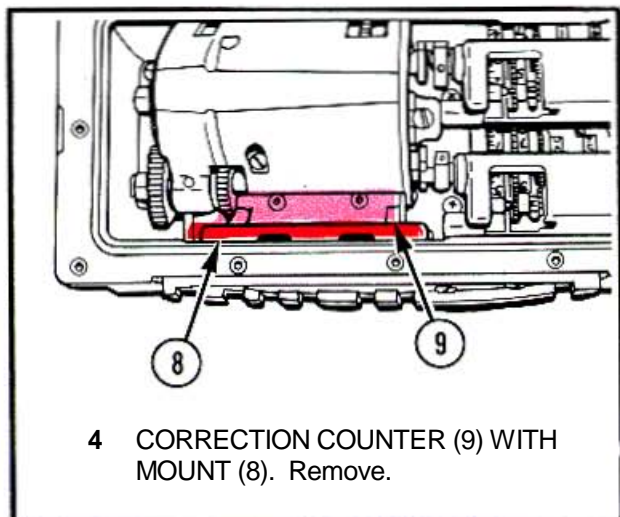
- 1 TWELVE SCREWS (1) AND TWELVE LOCKWASHERS (2). Remove from counter box assembly (3).
- 2 COVER (4) AND GASKET (5). Remove.



- 3 THREE SCREWS (6) AND THREE LOCKWASHERS (7). Remove from mount (8).

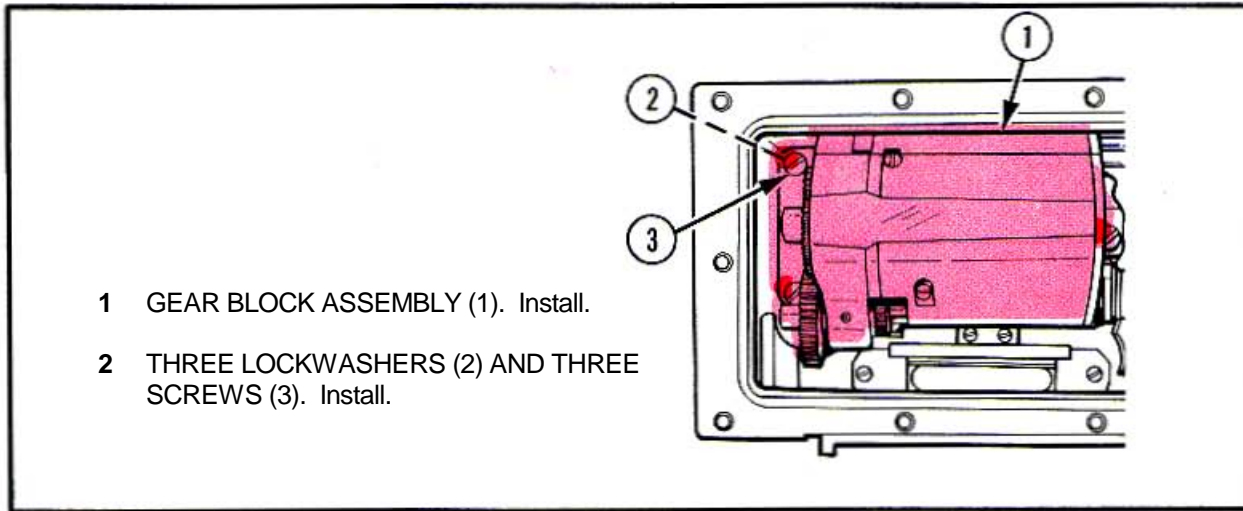
6-28. GEAR BLOCK ASSEMBLY-MAINTENANCE INSTRUCTIONS (cont)

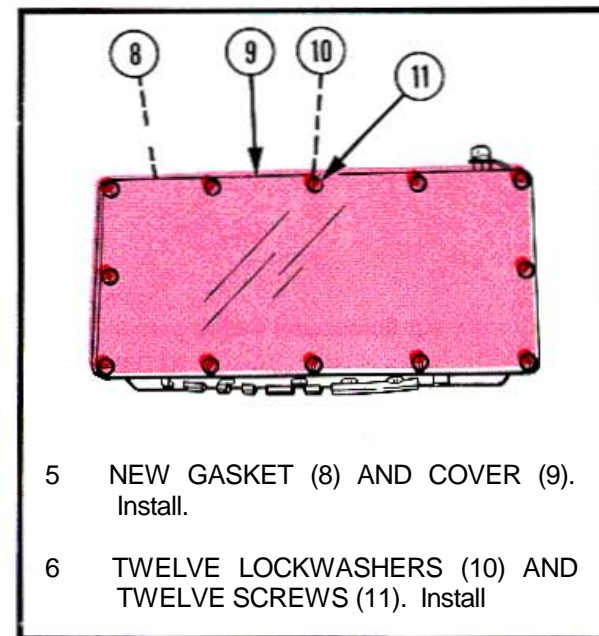
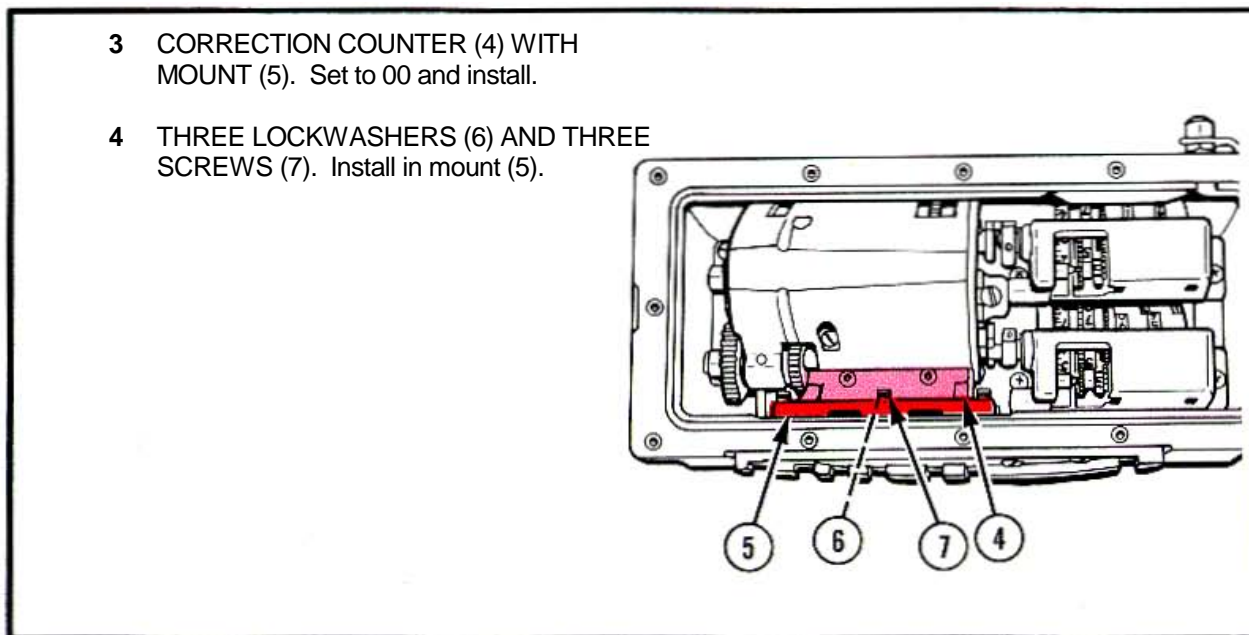
REMOVAL (cont)



**INSTALLATION**

**NOTE**  
Replace gear block assembly if threads are worn; teeth missing, nicked, or burred.





### Section VI. GENERAL SUPPORT FINAL INSPECTION PROCEDURES FOR THE M137 PANORAMIC TELESCOPE

#### 6-29. GENERAL

a. This section describes and illustrates the final inspection of the M137 telescope. A final inspection will be performed prior to returning the M137 telescope to the using unit or to the supply system.

b. If the M137 telescope being inspected fails to meet the required standards, ensure all maintenance authorized at the applicable level has been performed correctly. Then send the M137 telescope to the next level of maintenance.

**6 30. M137 TELESCOPE-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS****THIS TASK COVERS:**

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>a. Setting up and adjusting the azimuth test fixture</li> <li>b. Visual inspection</li> <li>c. Mounting M137 telescope to azimuth test fixture</li> <li>d. Boresight retention inspection</li> <li>e. Azimuth knob backlash inspection</li> <li>f. Head assembly excursion and plumbline travel inspection</li> <li>g. Azimuth mechanism 800-mil steps and level travel inspection</li> <li>h. Azimuth mechanism 15-mil steps inspection</li> <li>i. Azimuth mechanism lift inspection</li> </ul> | <ul style="list-style-type: none"> <li>j. Azimuth knob 5-mil click lead mechanism inspection</li> <li>k. Deflection counter setting inspection</li> <li>l. Correction counter setting and excursion range inspection</li> <li>m. Checking the effect of the correction counter setting on the deflection counter</li> <li>n. Torque inspection</li> <li>o. Illumination inspection</li> <li>p. Purging</li> </ul> |
|--|---|

**INITIAL SETUP**

## Test Equipment

Azimuth test fixture (7691596)  
 Collimating telescope holder (612110)  
 Precision level (7686087)

## Special Tools

Adapter set (SC 4931-95-CL-A11 )  
 Extension adapter (9327721)  
 Shop set (SC 4931-95-CL-A07)  
 Tool box (SC 4931-95-CL-A09)  
 Tool set (SC 4931-95-CL-J51)

## Reference

TM 9-1025-211-20&P

**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

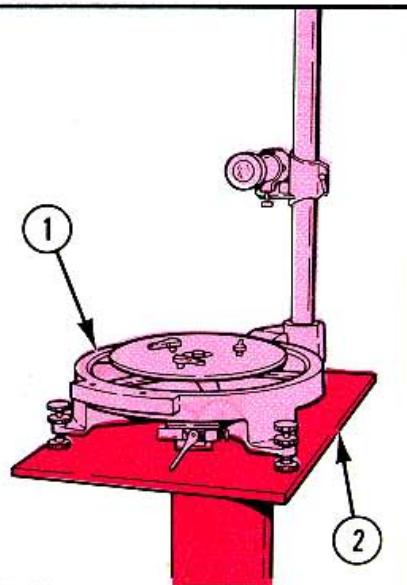
**NOTE**

Ensure all backlash is eliminated before performing the following inspection procedures.

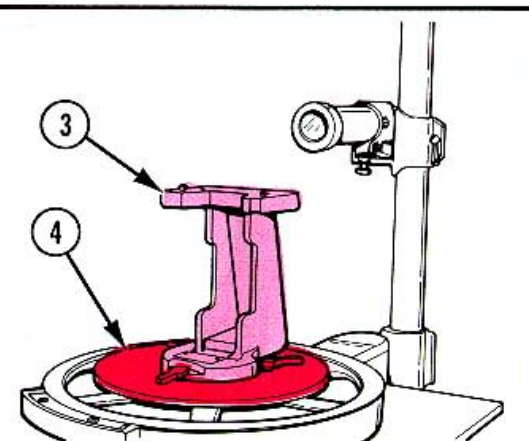


**SETTING UP AND ADJUSTING THE AZIMUTH TEST FIXTURE**

**1** AZIMUTH TEST FIXTURE (1). Secure on a test stand (2) at a height suitable for operation.

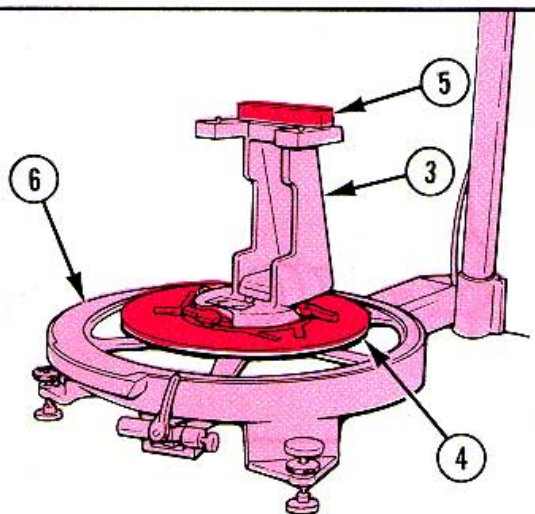


**2** ADAPTER FIXTURE (3). Position on the adapter support plate (4) and lightly clamp to hold in place.



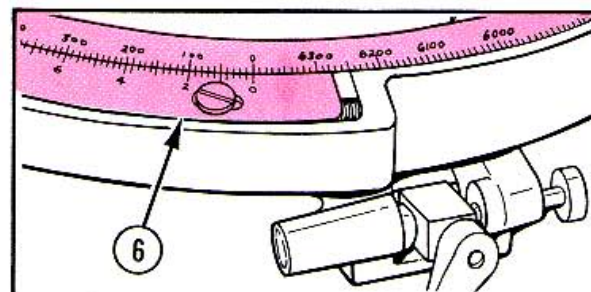
**3** PRECISION LEVEL (5).

- a. Place on adapter fixture (3) and turn adapter support plate (4).
- b. Adapter support plate must remain level through full rotation of azimuth test fixture scale (6).
- c. Place M137 telescope on adapter fixture (3) and adjust collimator height. Remove M137 telescope from adapter fixture after adjustment.



**4** AZIMUTH TEST FIXTURE SCALE (6).

- a. Set to 0 graduation.
- b. Aline with 0 graduation on vernier scale.
- c. Lock in this position

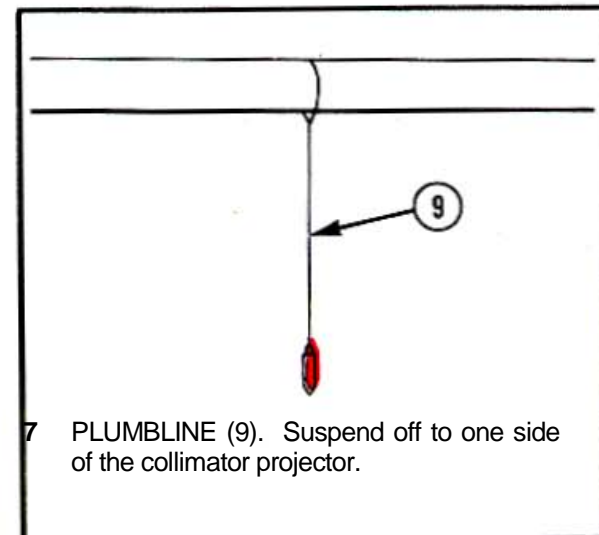
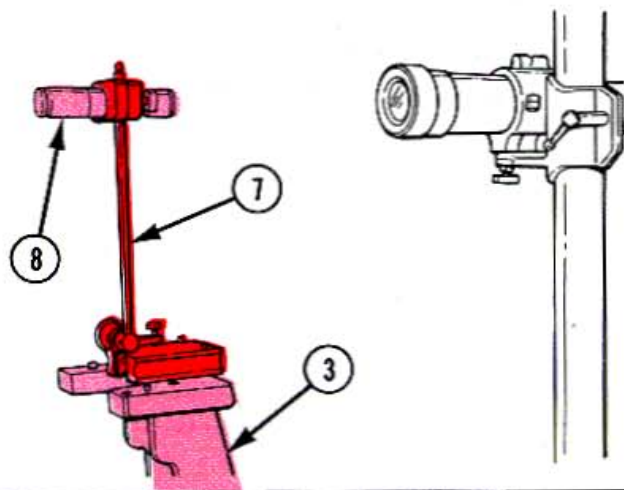


6-30. M137 TELESCOPE-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

SETTING UP AND ADJUSTING THE AZIMUTH TEST FIXTURE (cont)

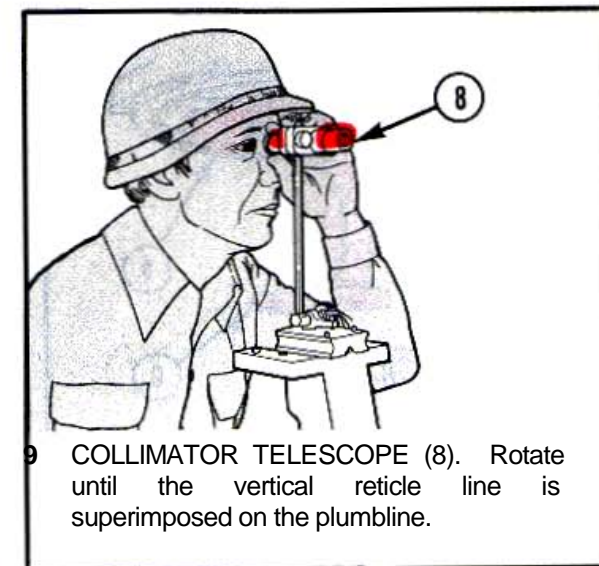
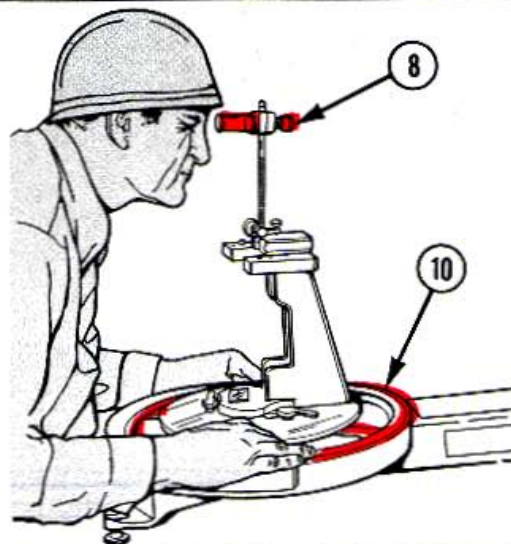
5 COLLIMATING TELESCOPE HOLDER (7). Position on adapter fixture (3).

6 COLLIMATOR TELESCOPE (8). Place on collimating telescope holder (7), and adjust for proper height.



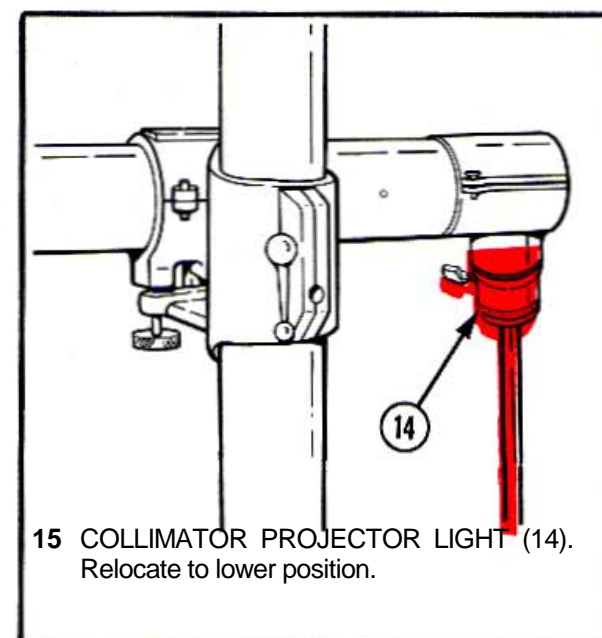
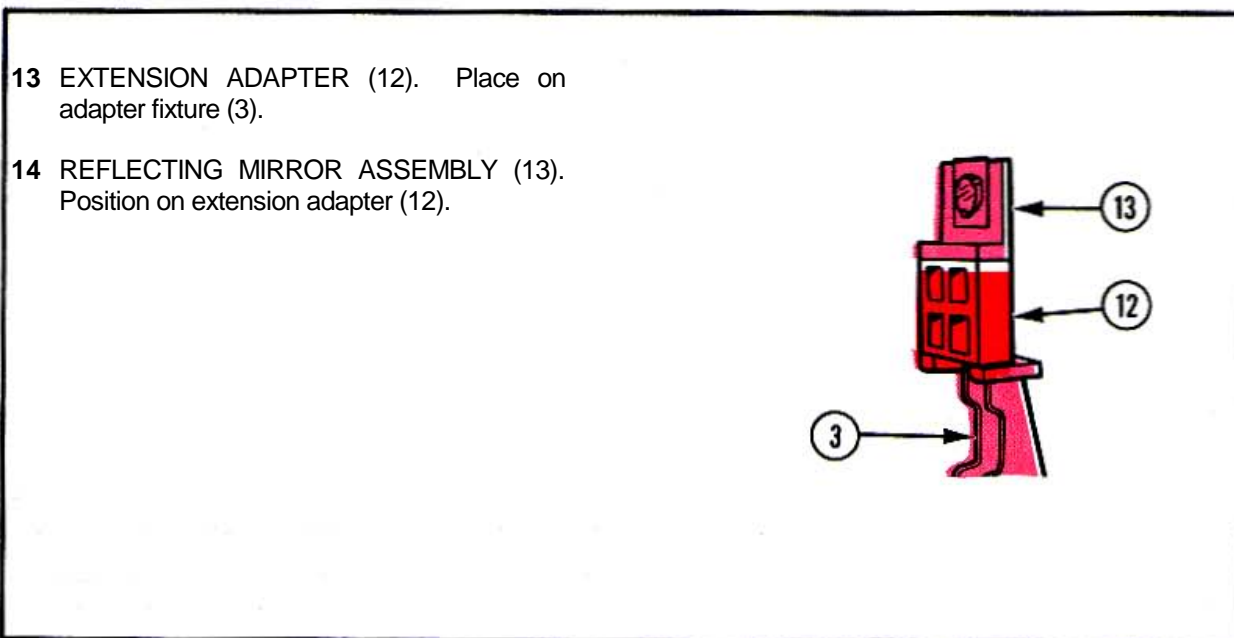
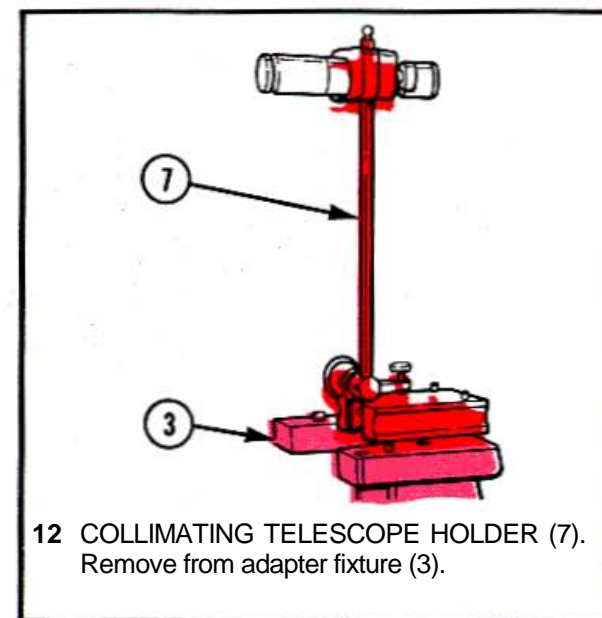
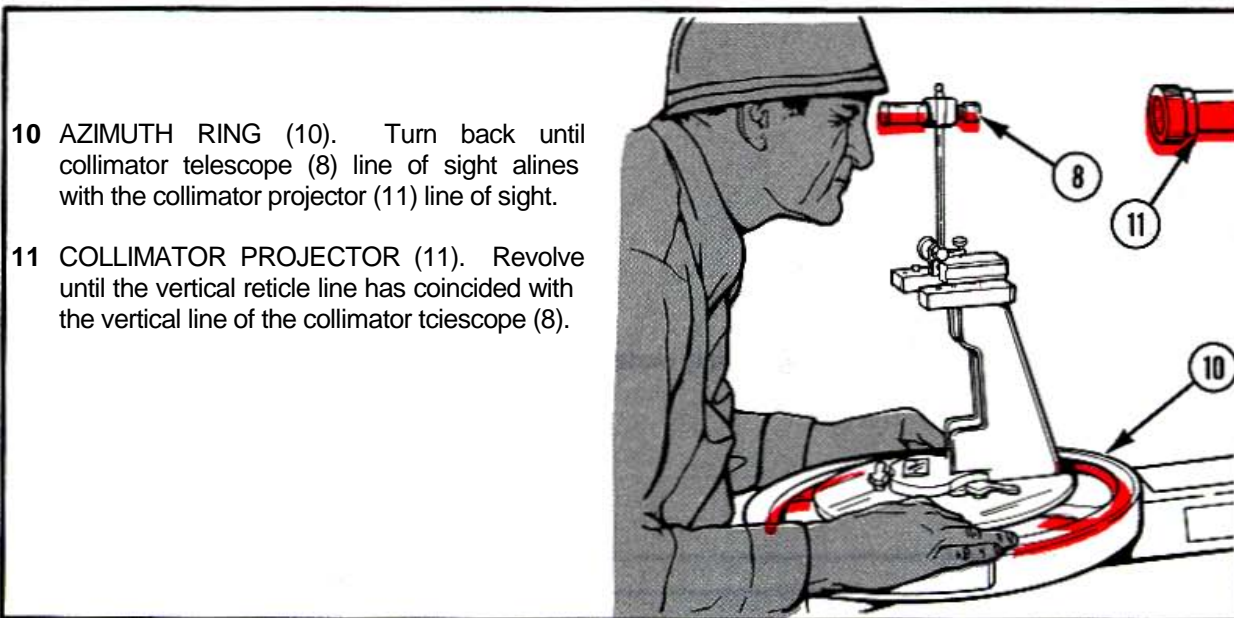
7 PLUMBLINE (9). Suspend off to one side of the collimator projector.

8 AZIMUTH RING (10). Turn until the reticle cross line intersection point of the collimator telescope (8) is centered on the plumbline.



9 COLLIMATOR TELESCOPE (8). Rotate until the vertical reticle line is superimposed on the plumbline.





## 6-30. M137 TELESCOPE-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

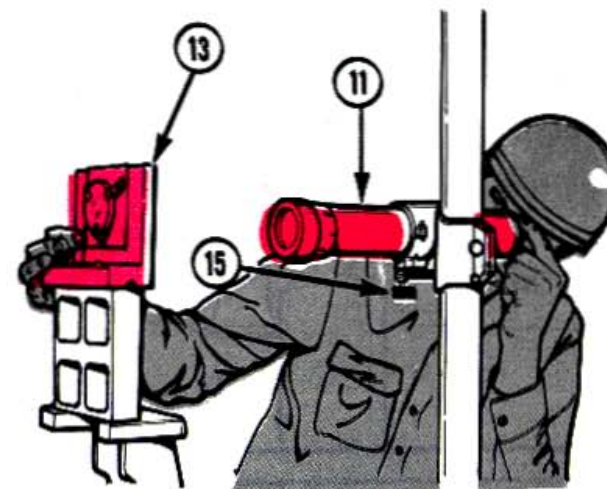
## SETTING UP AND ADJUSTING THE AZIMUTH TEST FIXTURE (cont)

**NOTE**

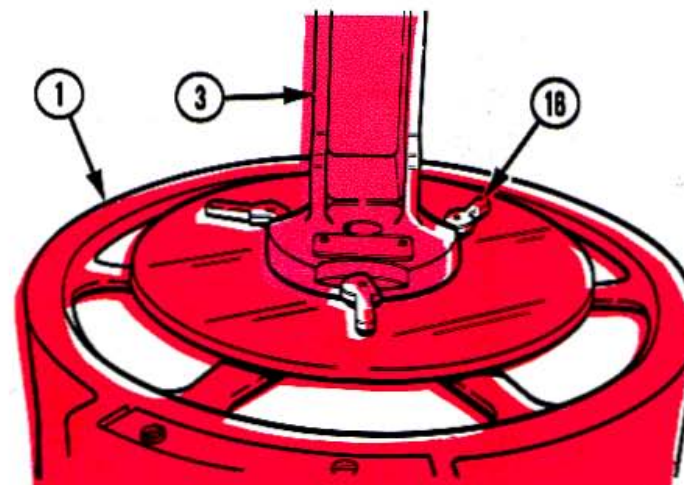
Ensure that locating keys and related keyways are kept in proper contact to ensure correct azimuth autocollimation.

**16** COLLIMATOR PROJECTOR (11).

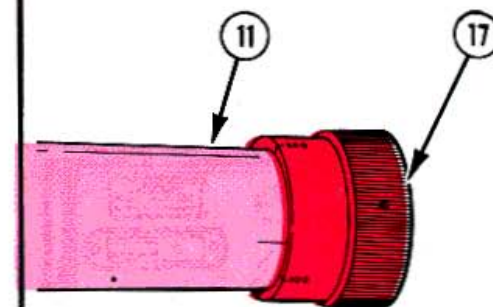
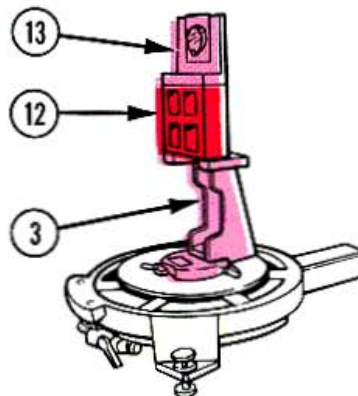
- a. Look through, and focus.
- b. Tilt in both elevation and depression, using holder screws (15), until the test reticle is reflected in the reflecting mirror assembly (13) and is superimposed upon itself.
- c. If reflected image is not superimposed in azimuth, slightly shift adapter fixture (3) to correct.

**17** AZIMUTH TEST FIXTURE (1).

- a. When autocollimation is finished, clamp adapter fixture (3) securely with three cam lock screws (16).
- b. Recheck autocollimation.
- c. Repeat the above steps if necessary.



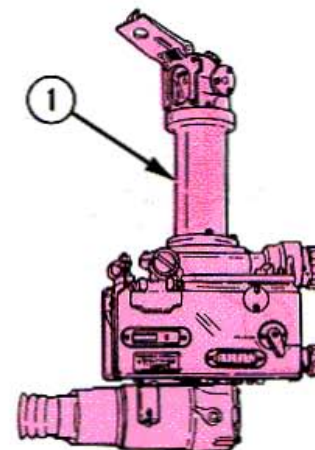
- 18 REFLECTING MIRROR ASSEMBLY (13). Remove from extension adapter (12).
- 19 EXTENSION ADAPTER (12). Remove from adapter fixture (3).



- 20 COLLIMATOR PROJECTOR (11). Set parallax distance to 130 meters  $\pm$  10 by rotating objective end (17).

**VISUAL INSPECTION**

- 1 SCREWS AND LOCKWASHERS. Check that all are present and secure.
- 2 MOUNTING SURFACE. Check that it is clean and free of nicks and burrs.
- 3 M137 TELESCOPE (1).
  - a. Check that it is free of rust, dirt, and foreign matter.
  - b. Check that all parts are present.
  - c. Check that paint is not chipped.



6-30. M137 TELESCOPE-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)

VISUAL INSPECTION (cont)

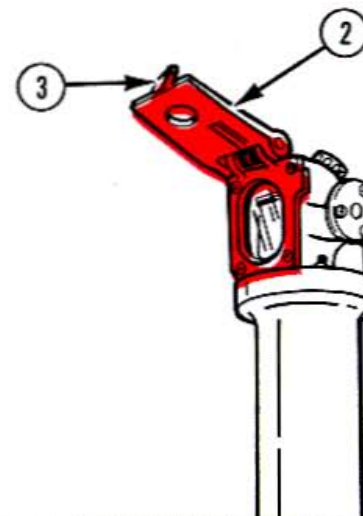
4 COVER ASSEMBLY (2).

**NOTE**  
Cover assembly should stay open.

- a. Depress detent (3) to open cover assembly (2).

**NOTE**  
Detent should keep cover assembly closed.

- b. Close cover assembly (2).



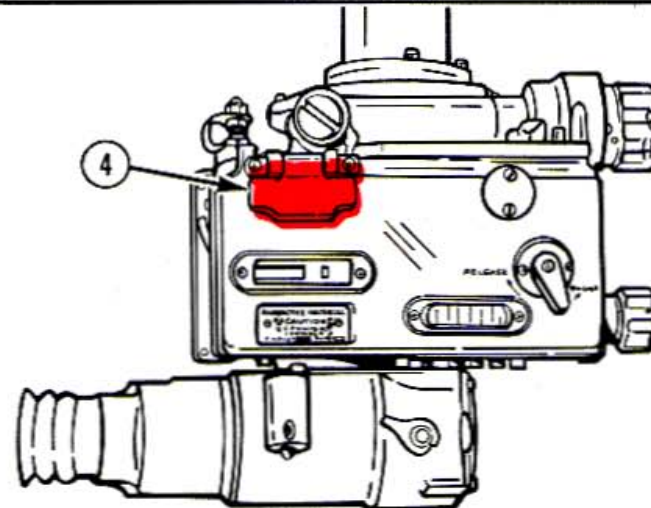
5 AZIMUTH COUNTER COVER (4).

**NOTE**  
Azimuth counter cover should remain open.

- a. Open.

**NOTE**  
Azimuth counter cover should remain closed.

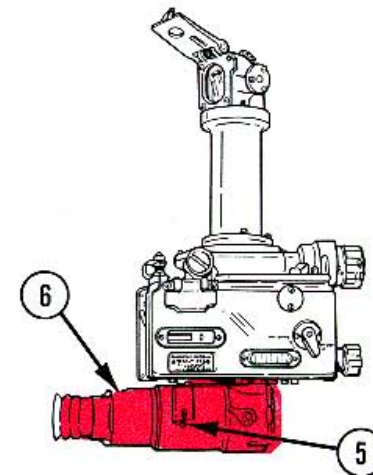
- b. Close.





**6** LEVER (5) AND ELBOW ASSEMBLY (6).

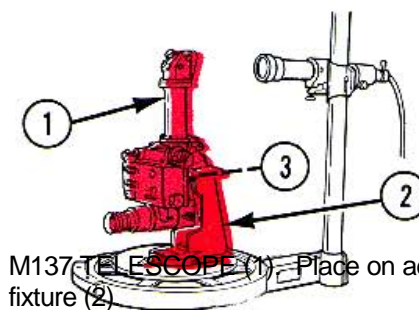
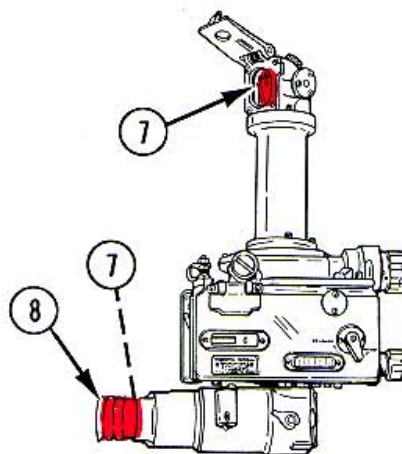
- a. Depress lever (5) and move elbow assembly (6) horizontally.
- b. Check that elbow assembly (6) moves freely without binding.
- c. Lever (5) should stop elbow assembly (6) at different positions during movement.



**MOUNTING TELESCOPE TO AZIMUTH TEST FIXTURE**

**7** LENSES (7).

- a. Look through eyeshield (8).
- b. Check that no dirt or moisture is present on lenses (7).



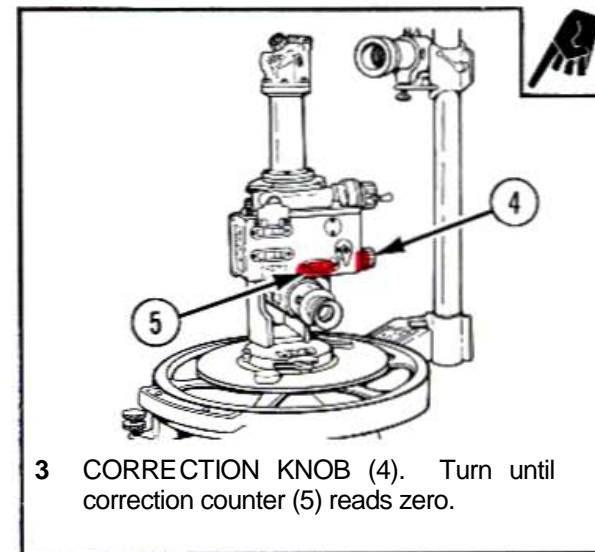
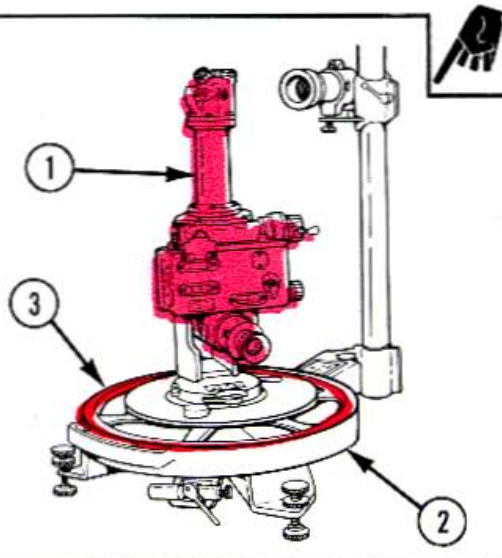
- 1 M137 TELESCOPE (1). Place on adapter fixture (2).
- 2 FOUR BOLTS (3). Install to secure M137 telescope to adapter fixture.

6-30. M137 TELESCOPE-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)  
BORESIGHT RETENTION INSPECTION

**NOTE**

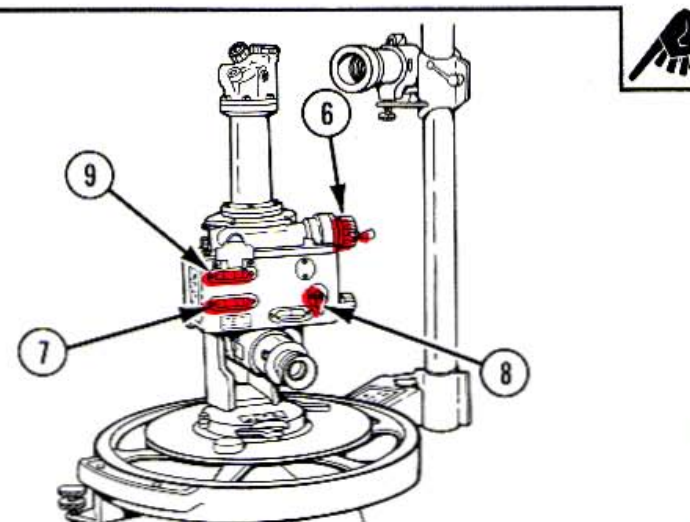
To help eliminate parallax between the M137 telescope and the collimator projector, wall targets, and plumbines; the cover plate on the head assembly should be closed.

- 1 M137 TELESCOPE (1). Mount on azimuth test fixture (2) (p 6-85).
- 2 AZIMUTH TEST FIXTURE SCALE (3). Set to 4800.



- 3 CORRECTION KNOB (4). Turn until correction counter (5) reads zero.

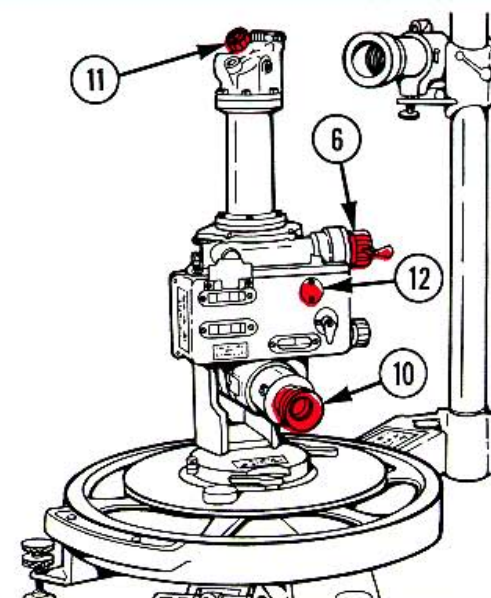
- 4 AZIMUTH KNOB (6). Turn until 3200 mils appears on deflection counter (7).
- 5 DEFLECTION COUNTER ECCENTRIC (8). Release.
- 6 AZIMUTH KNOB (6). Turn until 3200 mils appears on azimuth counter (9).
- 7 DEFLECTION COUNTER ECCENTRIC (8). Engage.





**8 EYESHIELD (10).**

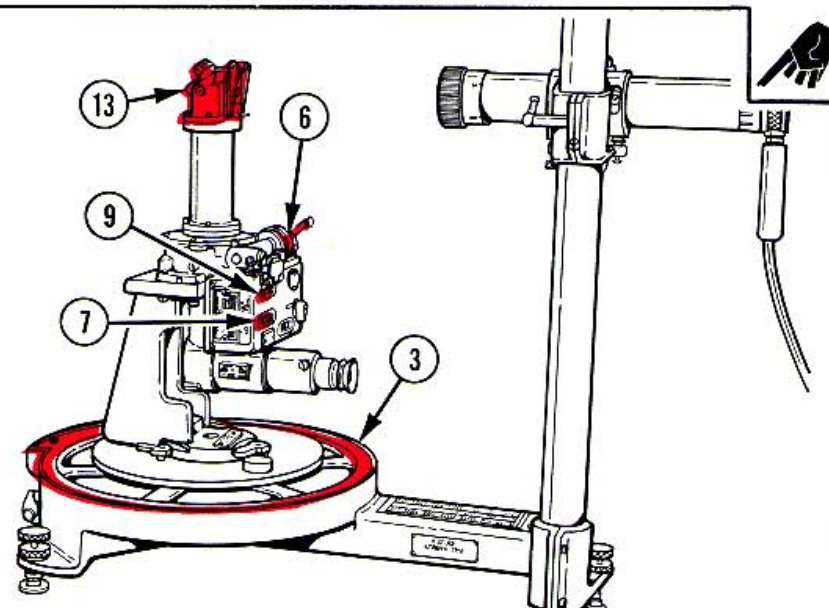
- a. Look through.
- b. Turn elevation knob (11) until horizontal reticle line is centered on collimator reticle target.
- c. Vertical reticle line should be centered on collimator reticle target.
- d. If not centered, turn azimuth counter to 3200 mils with backlash eliminated and release azimuth counter eccentric (12).
- e. Turn azimuth knob (6) until vertical reticle line is centered on collimator reticle target and engage azimuth counter eccentric (12).

**9 AZIMUTH KNOB (6).**

- a. Turn until head assembly (13) makes one complete revolution.
- b. Check that 3200 appears on azimuth counter (9).
- c. Vertical reticle line should be centered on collimator reticle target or within  $\pm 0.25$  mil.
- d. Deflection counter (7) should be within  $\pm 0.25$  mil of azimuth counter (9).

**10 AZIMUTH TEST FIXTURE SCALE (3).**

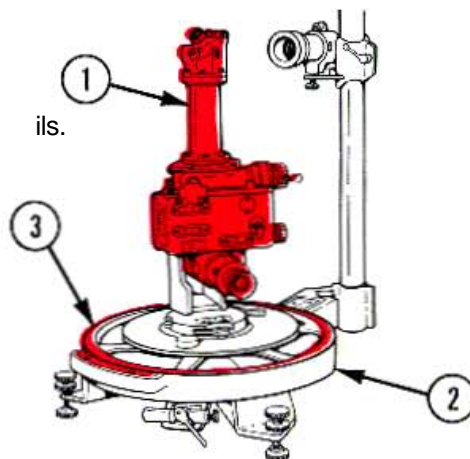
- a. Rotate to 1600.
- b. Repeat steps 4 thru 9 with 0000 on deflection counter (7) and azimuth counter (9).



**6-30. M137 TELESCOPE-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)  
AZIMUTH KNOB BACKLASH INSPECTION**

**1 M137 TELESCOPE (1).**

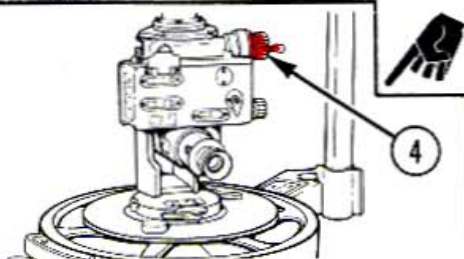
- a. Mount on azimuth test fixture (2) (p 6-85).
- b. Set azimuth test fixture scale (3) to read 4800 mils.



**NOTE**  
When checked at 3200 and 0000 mils, backlash in the azimuth mechanism shall not exceed 0.5 mil as read on the azimuth counter and 0.75 mil as read on the deflection counter.

**2 AZIMUTH KNOB (4).**

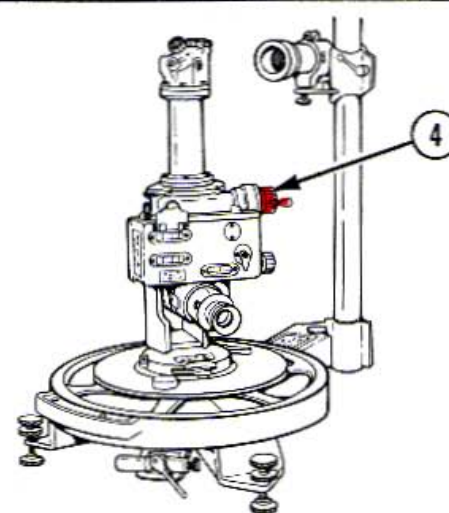
- a. Turn clockwise until vertical reticle line is centered with collimator reticle target.
- b. Record reading.

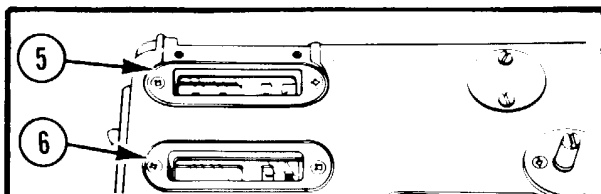


- c. Turn clockwise one complete turn.

**NOTE**  
When turning counterclockwise be careful not to go past the center of target.

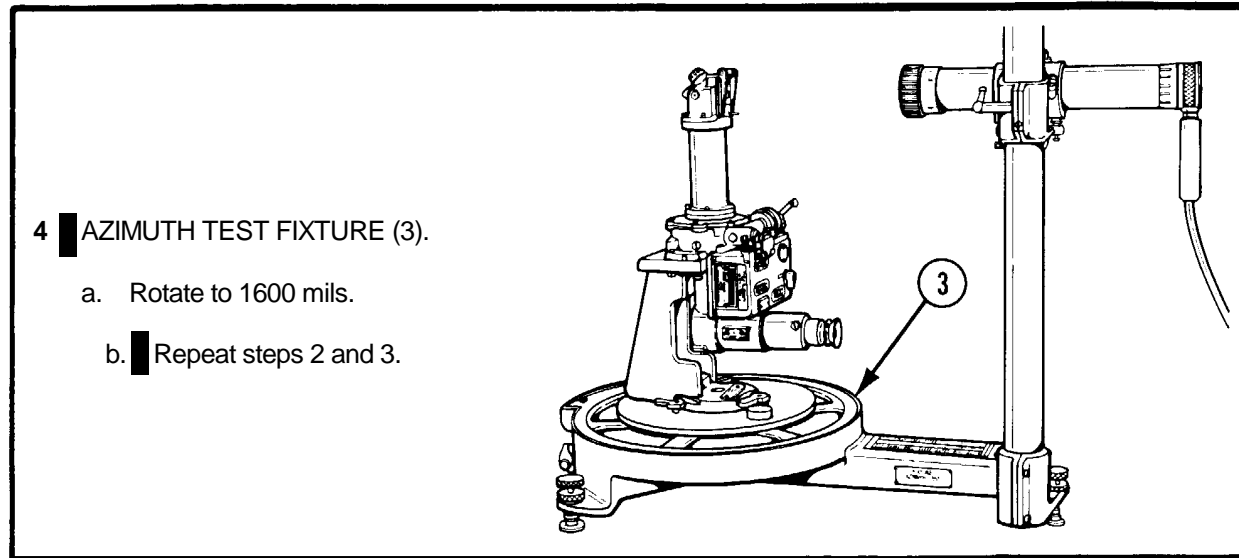
- d. Turn azimuth knob (4) counterclockwise until vertical reticle line is centered on collimator reticle target.





**3** AZIMUTH COUNTER (5) AND DEFLECTION COUNTER (6).

- Record reading.
- Compare with reading recorded in step 2.
- Difference must not exceed readings stated in the note following step 1 (p. 6-88).

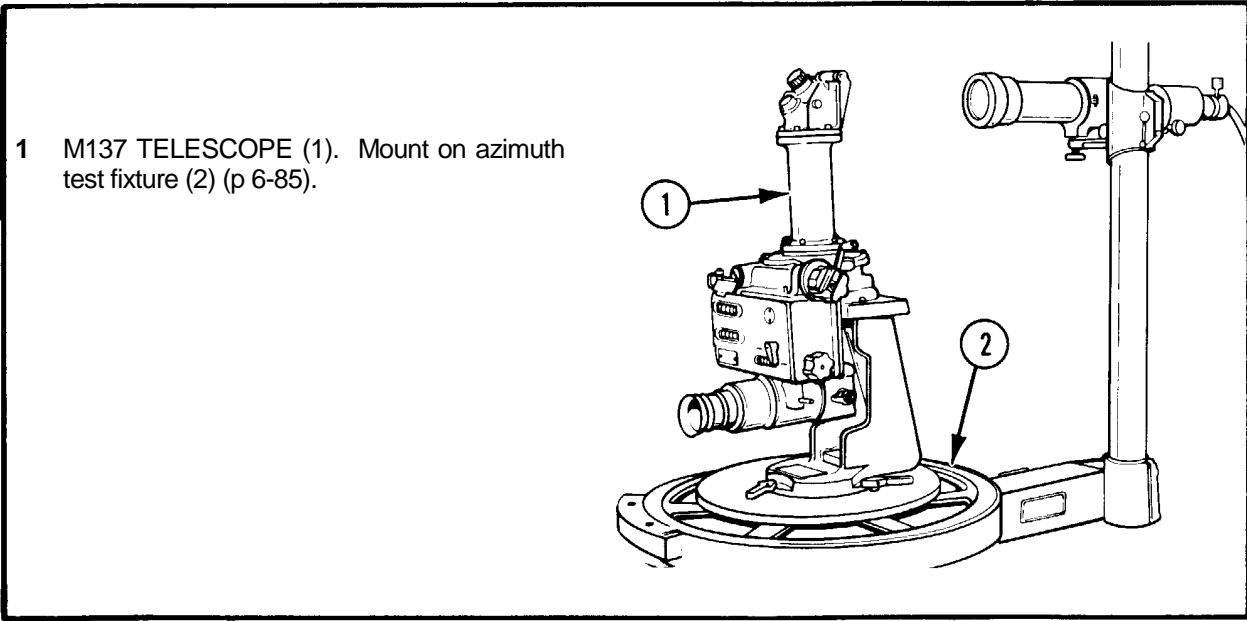
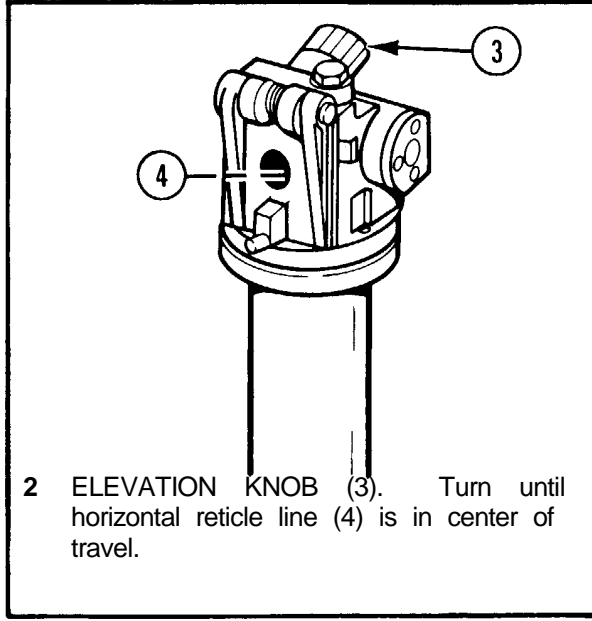


**4** AZIMUTH TEST FIXTURE (3).

- Rotate to 1600 mils.
- Repeat steps 2 and 3.

**HEAD ASSEMBLY EXCURSION AND PLUMBLINE TRAVEL INSPECTION**

**1** M137 TELESCOPE (1). Mount on azimuth test fixture (2) (p 6-85).

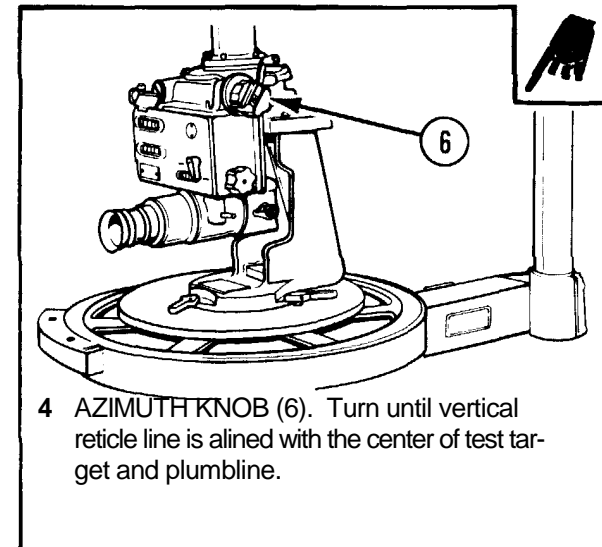
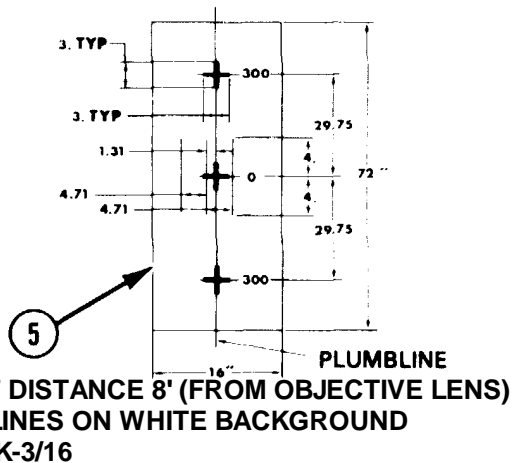



**2** ELEVATION KNOB (3). Turn until horizontal reticle line (4) is in center of travel.

**6-30. M137 TELESCOPE-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)  
HEAD ASSEMBLY EXCURSION AND PLUMBLINE INSPECTION (cont)**

**3 TEST TARGET (5).**

- a. Mount on wall 8 feet (2.44 m) from azimuth test fixture.
- b. Rotate azimuth test fixture and sight on test target.
- c. Check that M137 telescope horizontal reticle line is aligned with centered test target (5); if not, adjust target.

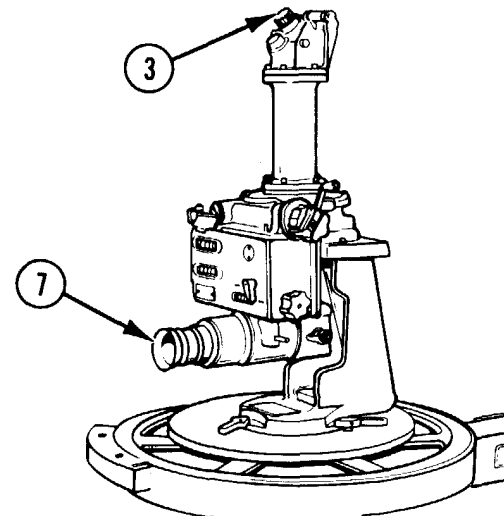


**5 ELEVATION KNOB (3).**

**NOTE**

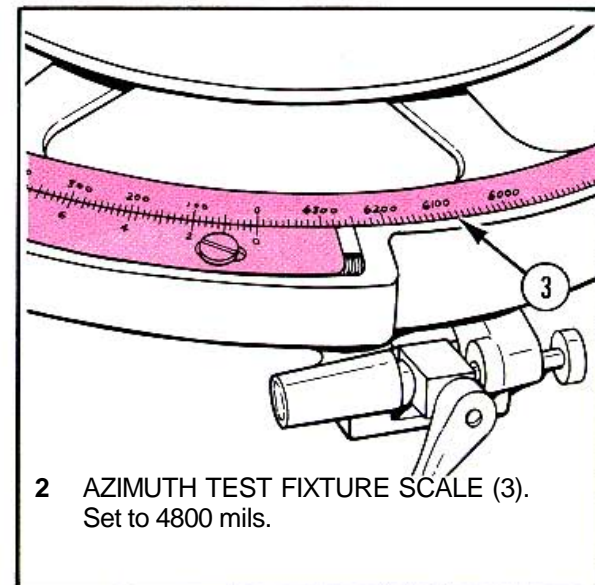
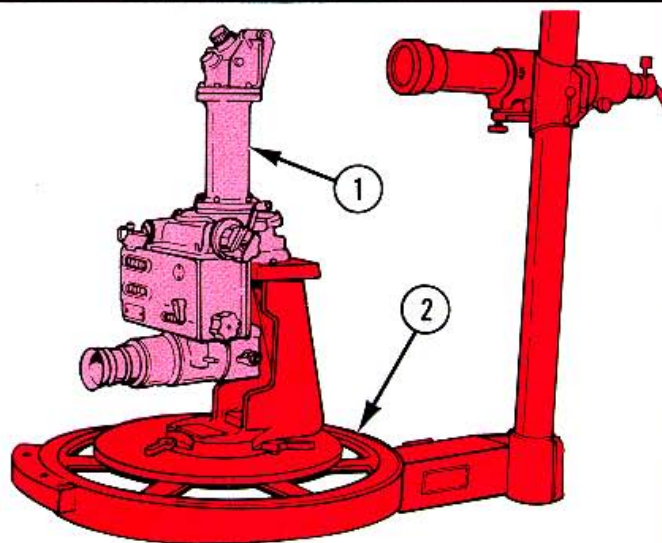
**Starting with line of sight in coincidence with a vertical target line, the line of sight shall track the plumbline within 0.5 mil.**

- a. While looking through eyeshield (7), turn clockwise as far as possible.
- b. Horizontal reticle line must reach 300 mils on test target.
- c. Turn elevation knob (3) counterclockwise as far as possible.
- d. Horizontal reticle line must reach 300 mils on test target.



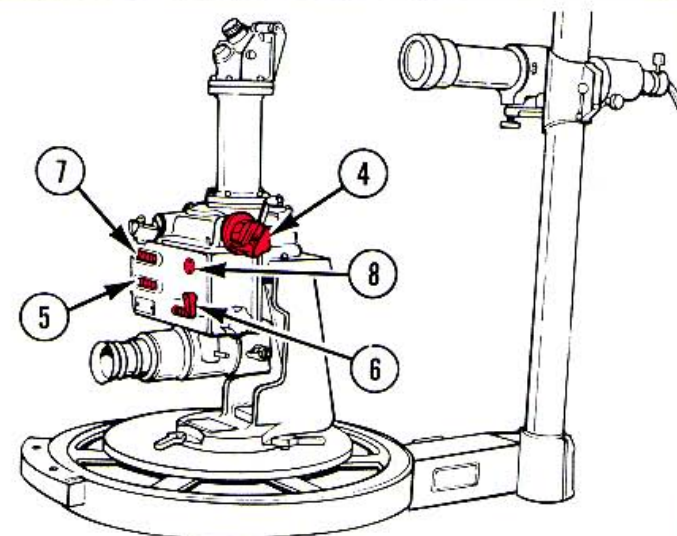
**AZIMUTH MECHANISM 800-MIL STEPS AND LEVEL TRAVEL INSPECTION**

- 1 M137 TELESCOPE (1). Mount on azimuth test fixture (2) (p 6-85).



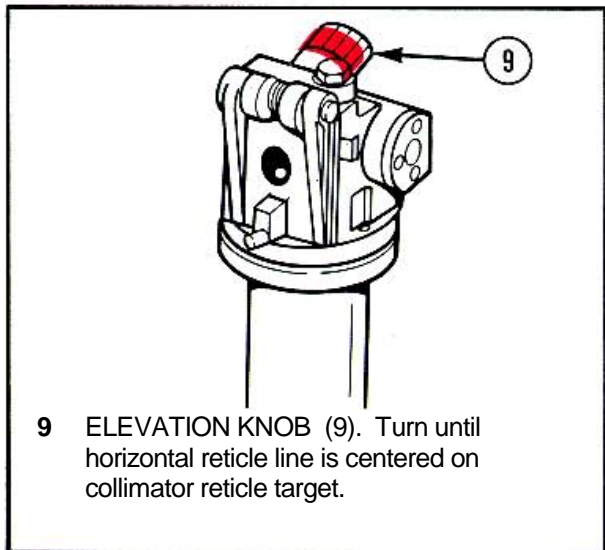
- 2 AZIMUTH TEST FIXTURE SCALE (3). Set to 4800 mils.

- 3 AZIMUTH KNOB (4). Turn until deflection counter (5) reads 3200.  
 4 DEFLECTION COUNTER ECCENTRIC (6). Disengage.  
 5 AZIMUTH KNOB (4). Turn until azimuth counter (7) reads 3200.  
 6 AZIMUTH COUNTER ECCENTRIC (8). Disengage.  
 7 AZIMUTH KNOB (4). Turn until vertical reticle line is centered on collimator reticle target.  
 8 DEFLECTION COUNTER ECCENTRIC (6) AND AZIMUTH COUNTER ECCENTRIC (8). Engage.

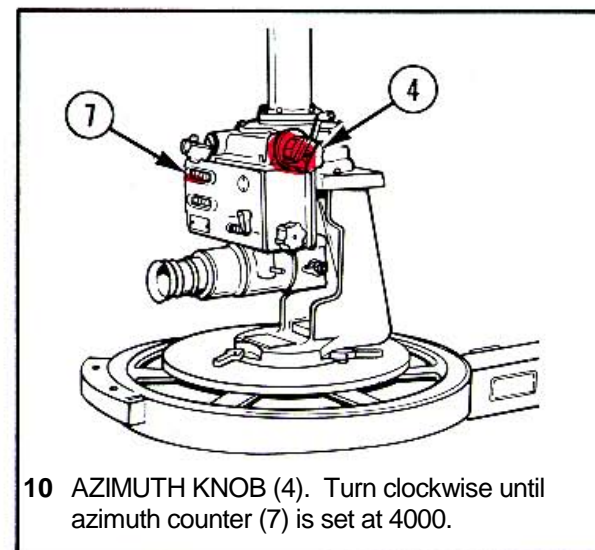




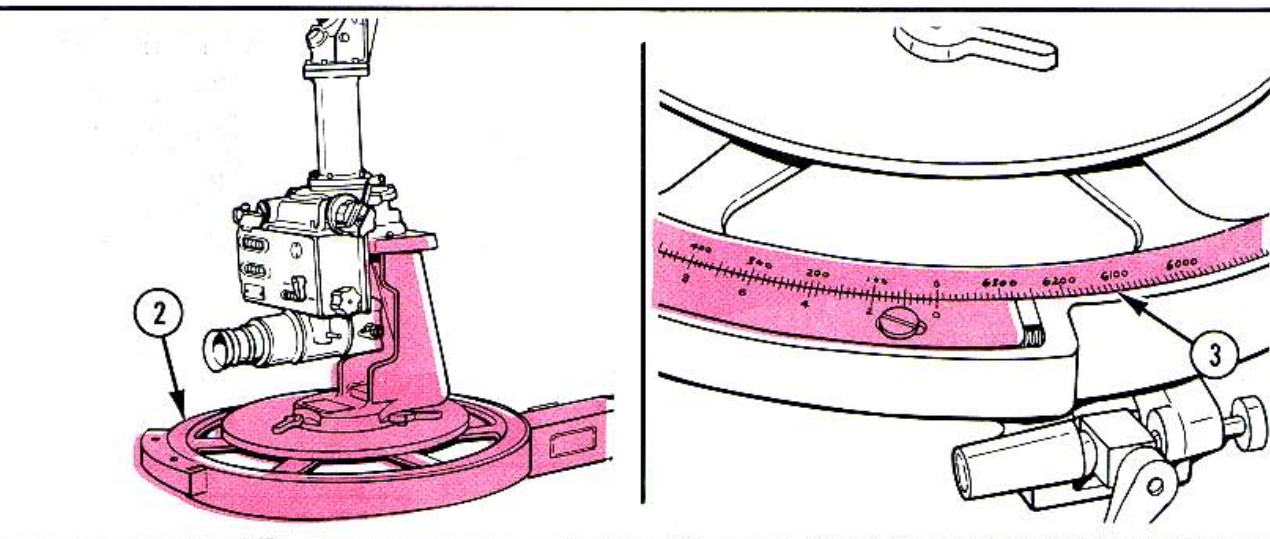
6-30. M137 TELESCOPE-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)  
 AZIMUTH MECHANISM 800-MIL STEPS AND LEVEL TRAVEL INSPECTION (cont)



**NOTE**  
 When doing the next step, be careful not to go past the specified counter setting.



11 AZIMUTH TEST FIXTURE (2). Rotate until azimuth test fixture scale (3) reads 5600.





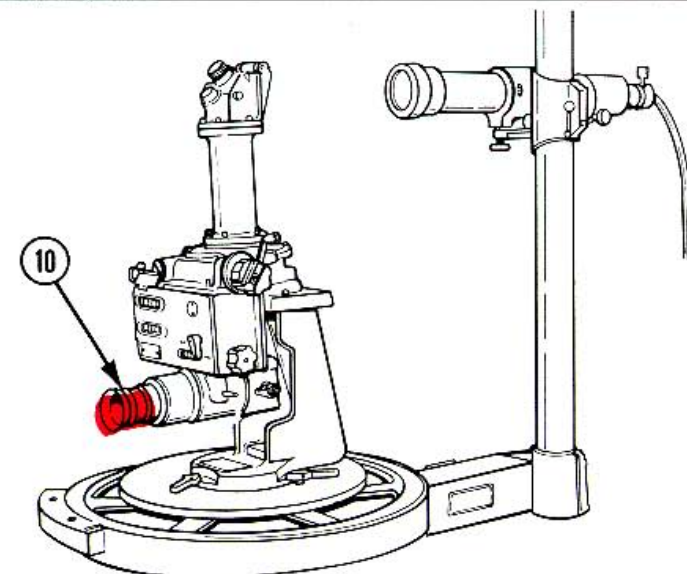
**12 EYESHIELD (10).**

- a. Look through.

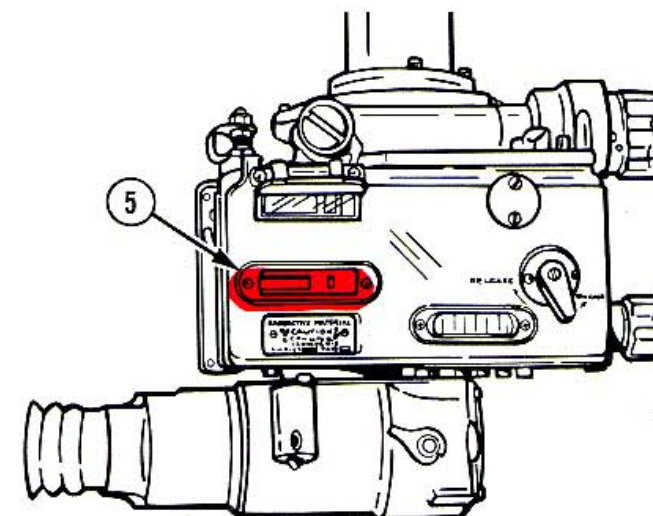
**NOTE**

The total spread through two full revolutions between the greatest positive error and greatest negative error shall not exceed 1 mil including backlash.

- b. Vertical reticle line must be centered on collimator reticle target within  $\pm 1$  mil.
- c. Horizontal reticle line must be centered on collimator reticle target within  $\pm 1$  mil (2-mil total spread).
- d. Record readings taken in steps b and c above for two full revolutions and compare readings. Ensure total spread does not exceed specified tolerances for level travel and azimuth error.

**13 DEFLECTION COUNTER (5).**

- a. Check that reading on deflection counter is 4000  $\pm$  0.25 mil.
- b. Repeat steps 10 thru 13 using the settings in table 6-4, until each reading obtained is verified two times.



**6-30. M137 TELESCOPE-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)  
 AZIMUTH MECHANISM 800-MIL STEPS AND LEVEL TRAVEL INSPECTION (cont)**

**Table 6-4. AZIMUTH MECHANISM INSPECTION-SETTINGS AND READINGS**

**NOTE**

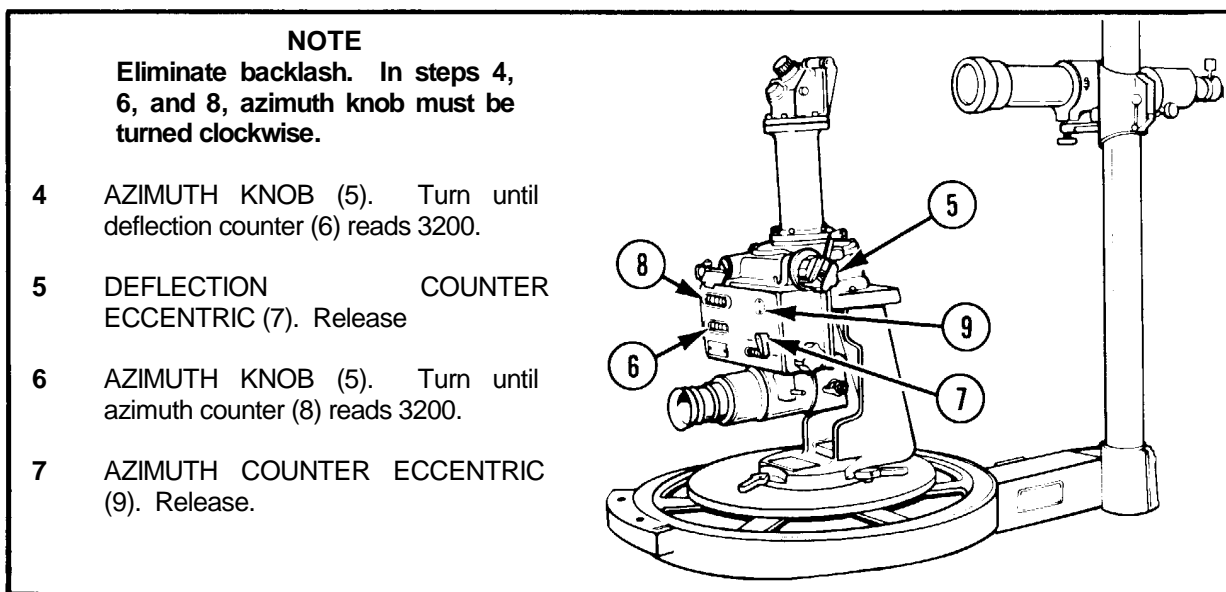
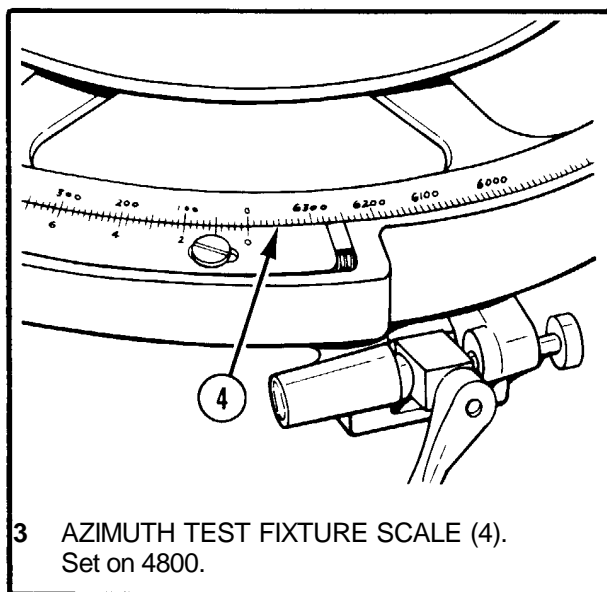
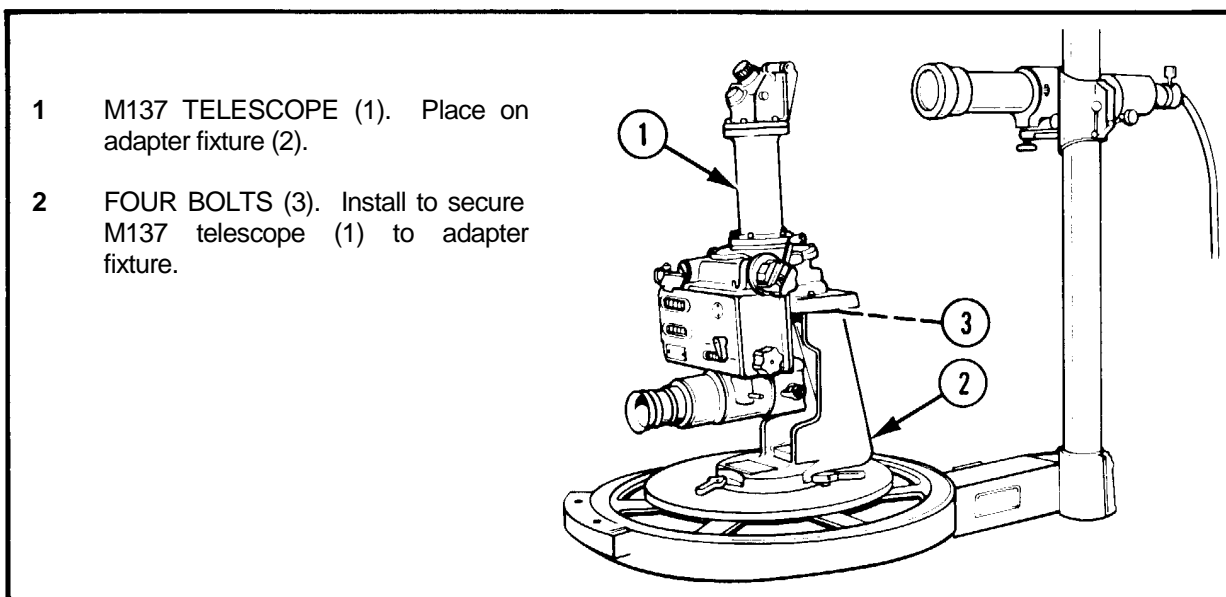
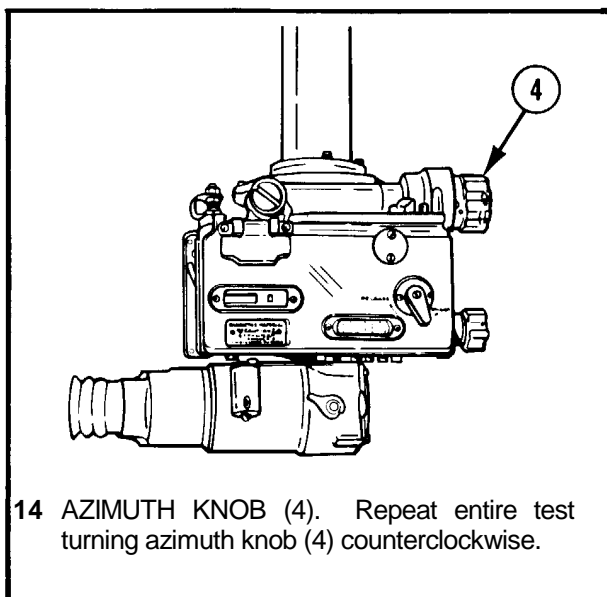
The following data are required to do steps 10, 11, and 13.

Columns one and two give the required settings, in 800-mil increments, to be used in steps 10 and 11.

Column three (step 13) gives the reading that should appear on the deflection counter after doing steps 10 and 11.

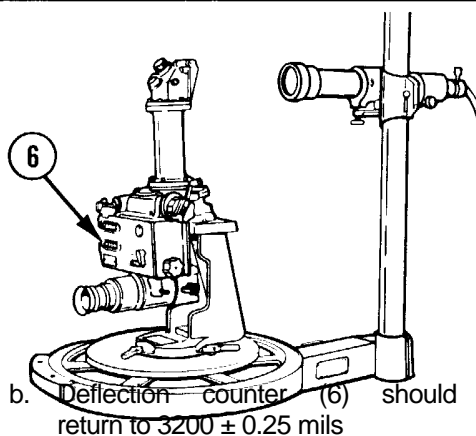
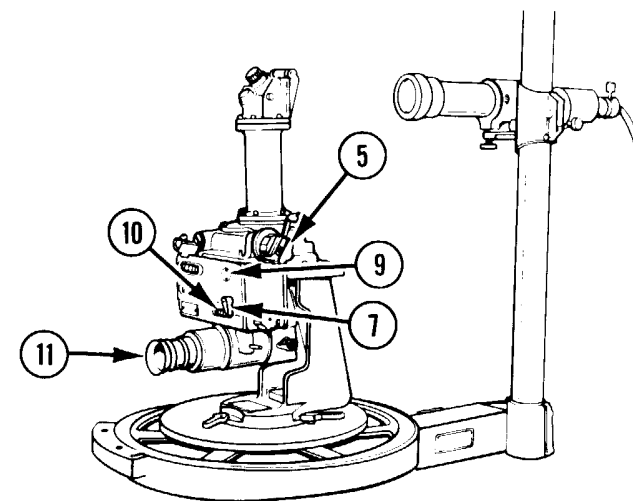
Azimuth knob setting (mils)	Azimuth test stand setting (mils)	Deflection counter reading (mils)
4000	5600	4000
4800	0	4800
5600	800	5600
0000	1600	0000
0800	2400	0800
1600	3200	1600
2400	4000	2400
3200	4800	3200

**AZIMUTH MECHANISM 15-MIL STEPS INSPECTION**



**6-30. M137 TELESCOPE-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)**  
**AZIMUTH MECHANISM 15-MIL STEPS INSPECTION (cont)**

- 8 AZIMUTH KNOB (5). Turn until vertical reticle line and horizontal reticle line are centered on collimator reticle target.
- 9 AZIMUTH COUNTER ECCENTRIC (9). Engage.
- 10 DEFLECTION COUNTER ECCENTRIC (7). Engage.
- 11 CORRECTION COUNTER (10). Set at L-15.
- 12 EYESHIELD (11).
  - a. Sighting through eyeshield (11) turn azimuth knob (5) clockwise to deflect line of sight 15 mils, as seen on reticle.



b. Deflection counter (6) should return to  $3200 \pm 0.25$  mils

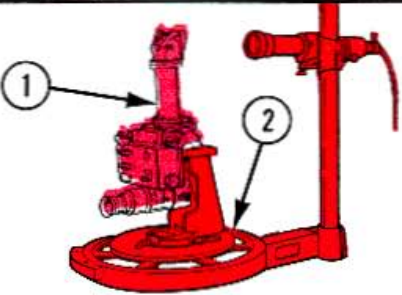
**NOTE**

Repeat step 3 with settings of 0, 1600, and 3200 mils, and azimuth counter settings of 4800, 0000, and 1600 mils respectively. Then repeat step 12.

Repeat steps 3 thru 12 in counterclockwise rotation with backlash eliminated and correction counter set at R-15.

Repeat step 3 with settings of 3200, 1600, and 0 mils, and azimuth counter settings of 1600, 0000, and 4800 mils respectively. Then repeat step 12.

**AZIMUTH MECHANISM LIFT INSPECTION**

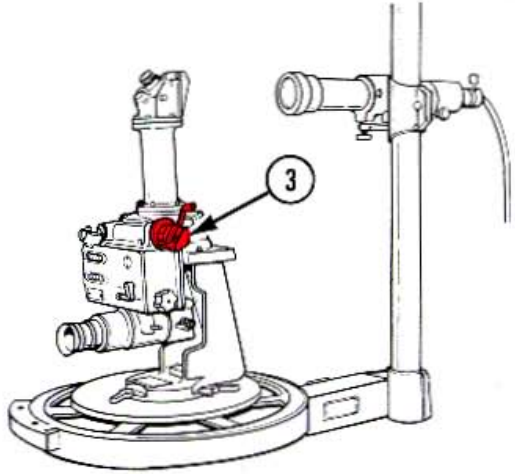


1 M137 TELESCOPE (1).

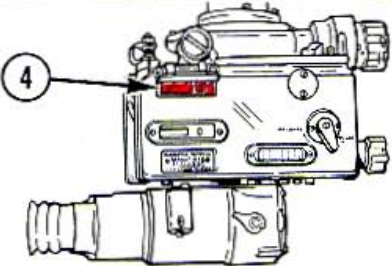
- Mount on azimuth test fixture (2) (p 6-85).
- Verify boresight using steps 1 thru 9 (p 6-86).

2 AZIMUTH KNOB (3).

- Deleted.
- Turn clockwise and then counterclockwise.
- Observe horizontal reticle line.



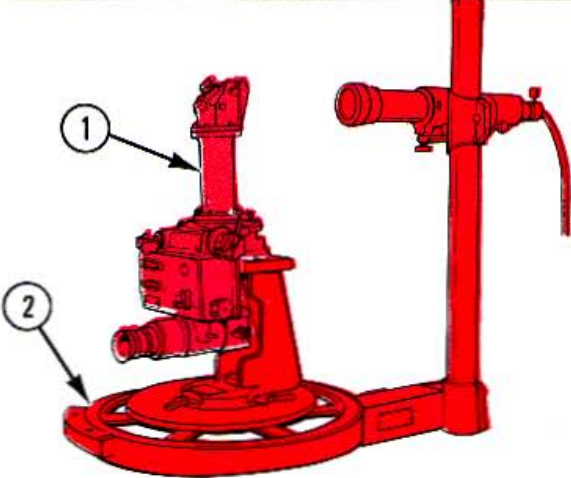
**AZIMUTH KNOB 5-MIL CLICK LEAD MECHANISM INSPECTION**



- Vertical displacement of the horizontal reticle line must not be more than 0.5 mil.
- Repeat steps b thru d above with settings of 4800, 0000, and 1600 mils on azimuth counter (4).

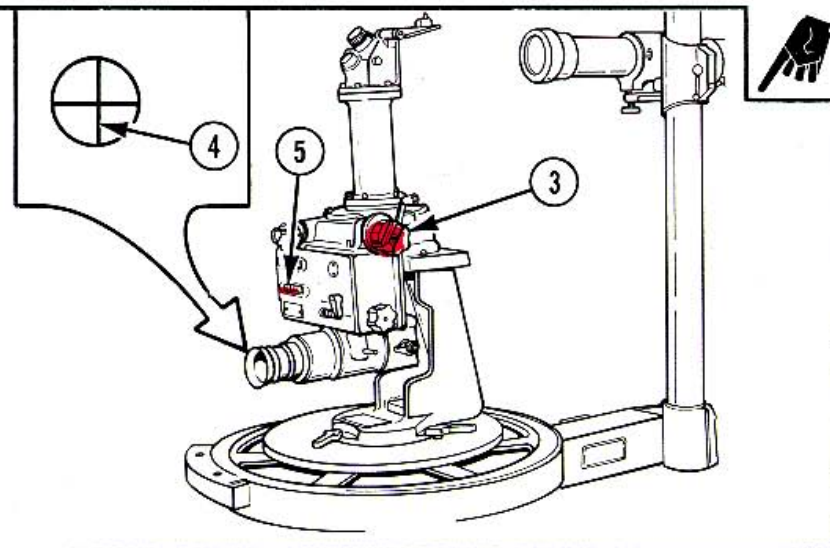
1 M137 TELESCOPE (1).

- Mount on azimuth test fixture (2) (p 6-85).
- Verify boresight (p 6-86).

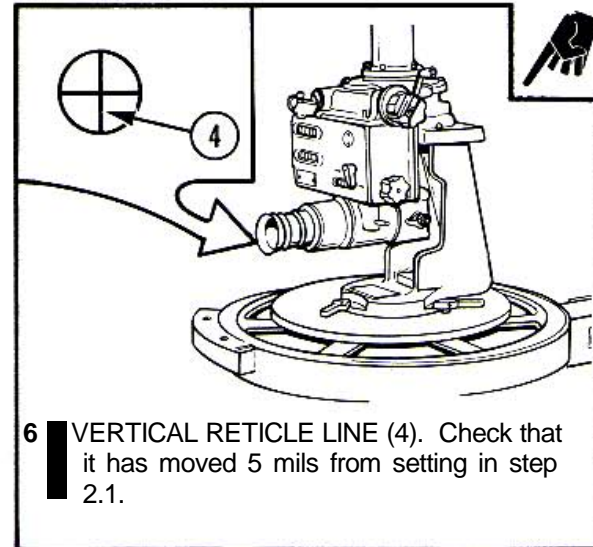
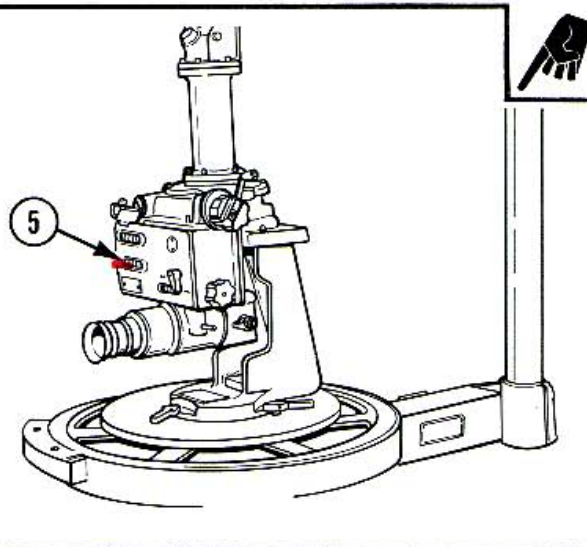


**6-30. M137 TELESCOPE-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)**  
**AZIMUTH KNOB 5-MIL CLICK LEAD MECHANISM INSPECTION (cont)**

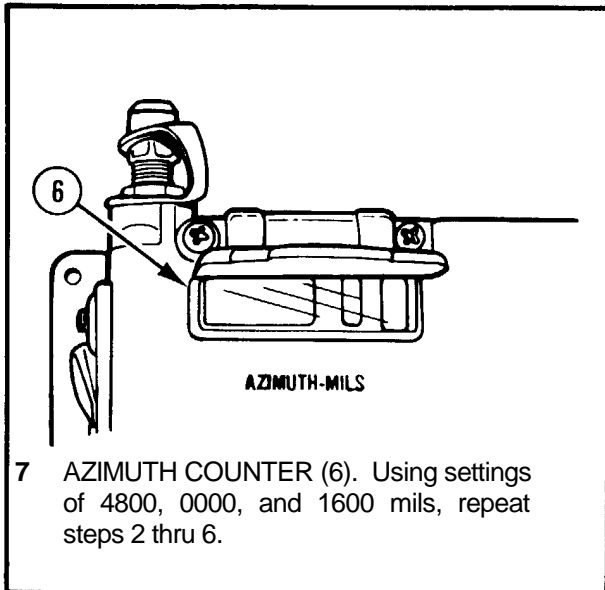
- 2** AZIMUTH KNOB (3).
- a. Set to DIRECT.
  - b. Turn clockwise slowly until detent engages. Be careful not to pass beyond detent engagement point.
- 2.1** VERTICAL RETICLE LINE (4). Note location of vertical reticle line relative to center of collimator reticle target.
- 3** DEFLECTION COUNTER (5). Record reading with detent engaged.
- 4** AZIMUTH KNOB (3). Slowly turn clockwise until detent engages again.



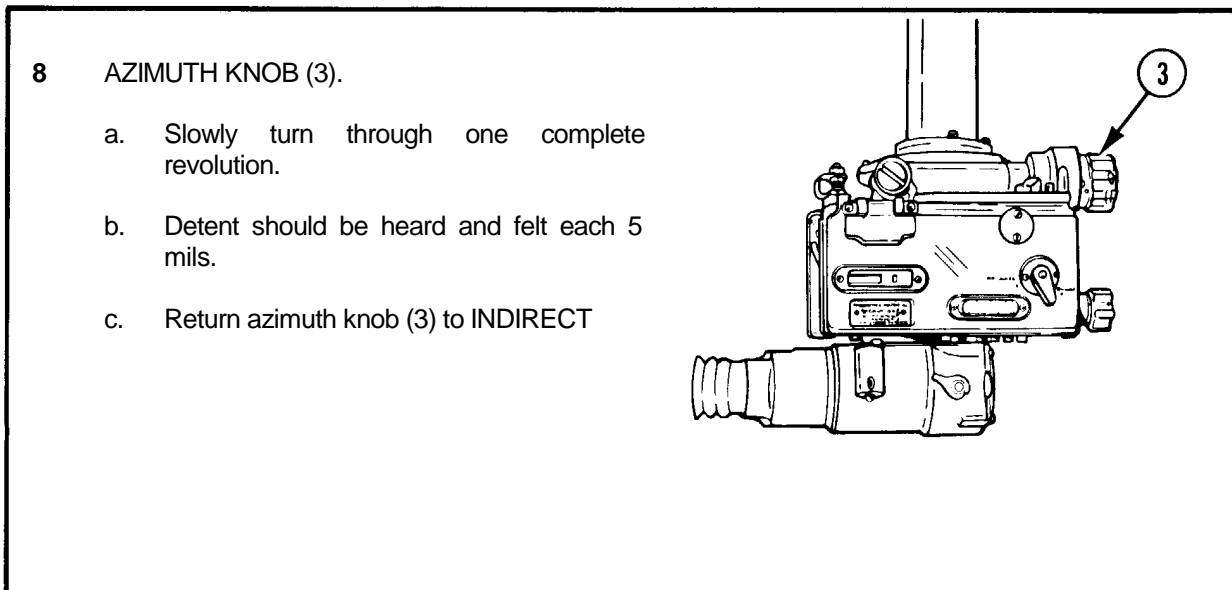
- 5** DEFLECTION COUNTER (5).
- a. Record reading.
  - b. Compare with reading recorded in step 3.
  - c. Readings must agree within  $\pm 0.5$  mil.







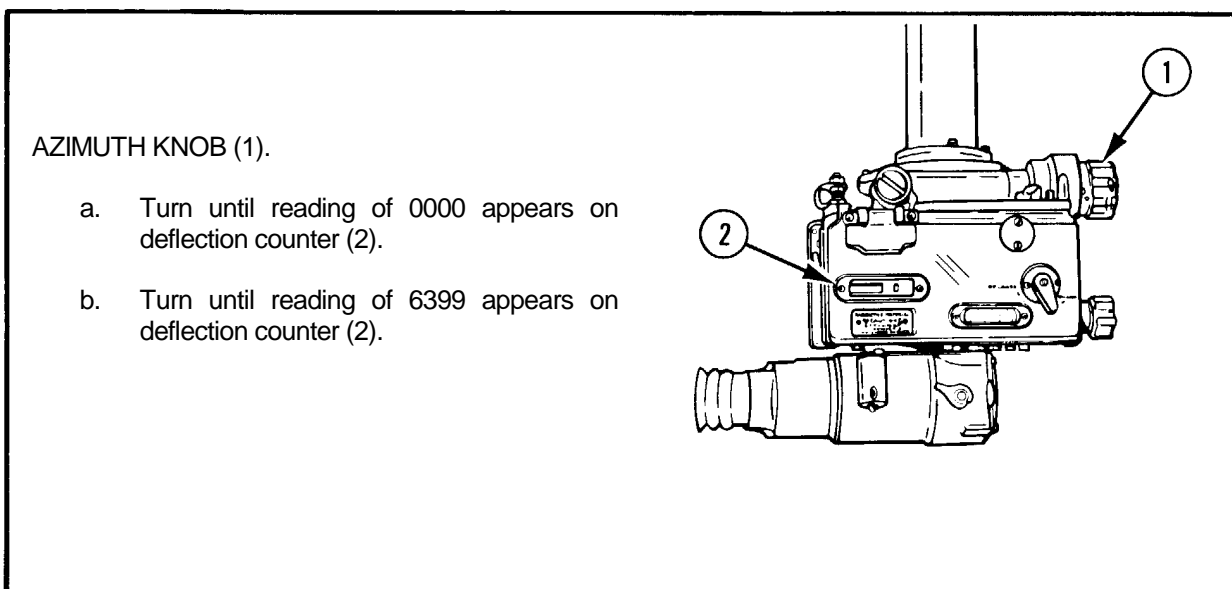
7 AZIMUTH COUNTER (6). Using settings of 4800, 0000, and 1600 mils, repeat steps 2 thru 6.



- 8 AZIMUTH KNOB (3).
- a. Slowly turn through one complete revolution.
  - b. Detent should be heard and felt each 5 mils.
  - c. Return azimuth knob (3) to INDIRECT

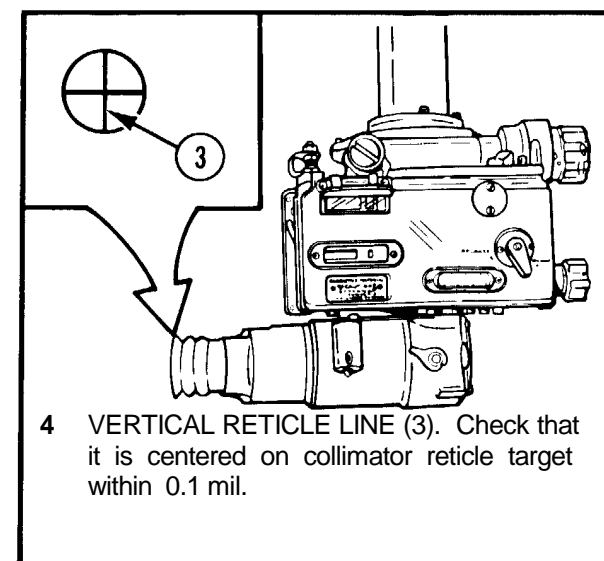
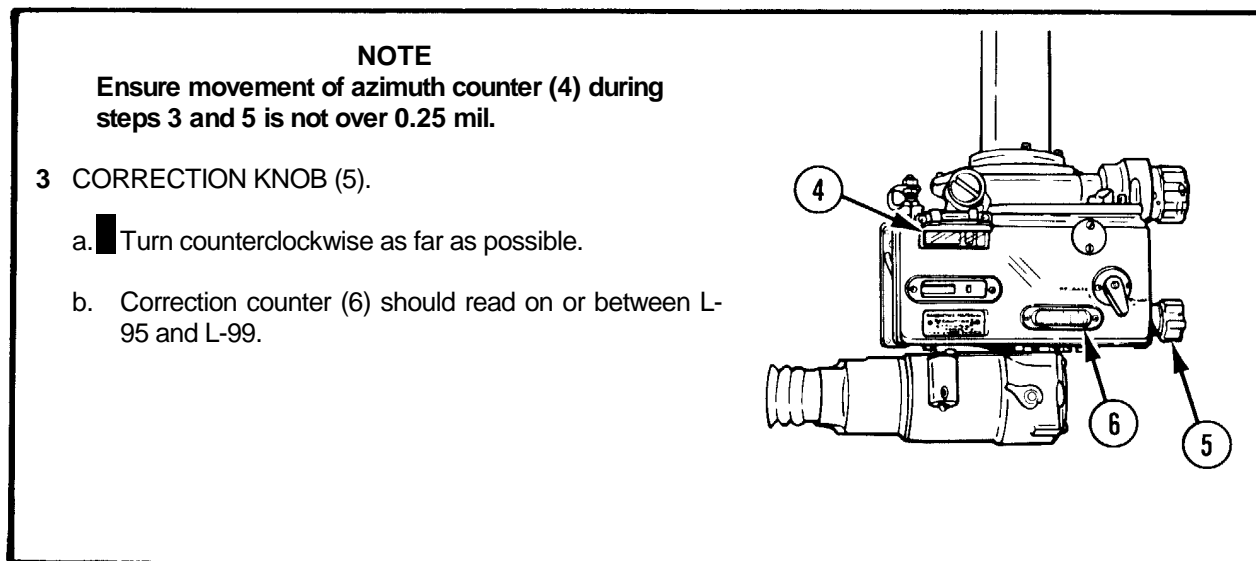
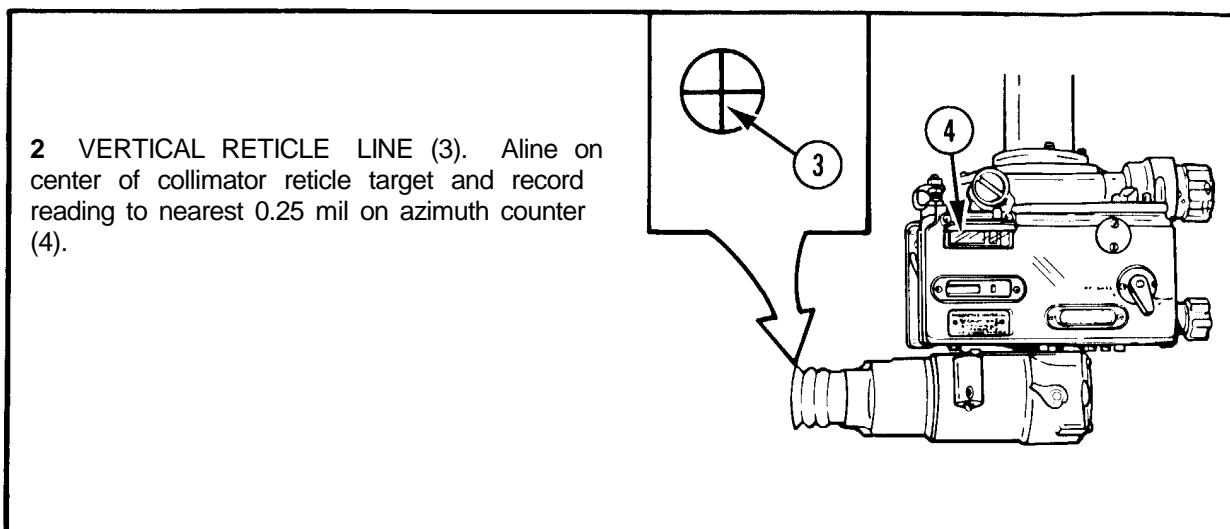
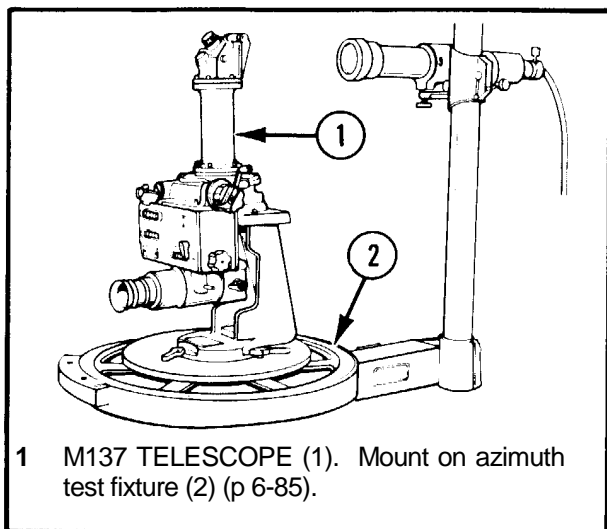
**DEFLECTION COUNTER SETTING INSPECTION**

**NOTE**  
 Watch all deflection counter numbers and azimuth counter numbers. Ensure each is legible and all settings between 0000 and 6399 can be made.



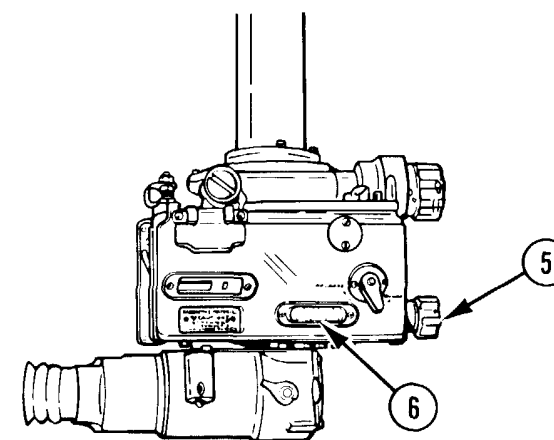
- AZIMUTH KNOB (1).
- a. Turn until reading of 0000 appears on deflection counter (2).
  - b. Turn until reading of 6399 appears on deflection counter (2).

**6-30. M137 TELESCOPE-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)  
CORRECTION COUNTER SETTING AND EXCURSION RANGE INSPECTION**

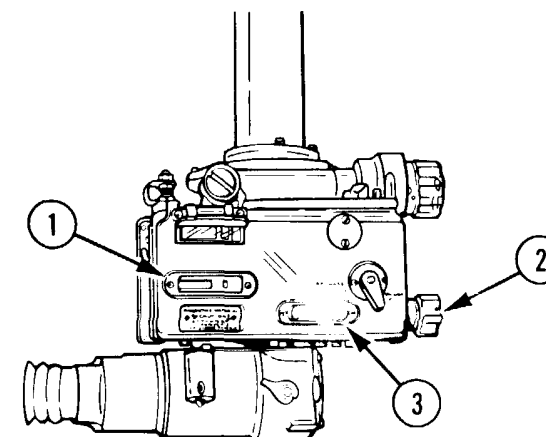


**5 CORRECTION KNOB (5).**

- a. Turn clockwise as far as possible.
- b. Correction counter (6) should read on or between R-95 and R-99.
- c. Repeat step 4.
- d. Turn correction knob (5) to set correction counter (6) at 00.

**CHECKING THE EFFECT OF THE CORRECTION COUNTER SETTING ON THE DEFLECTION COUNTER**

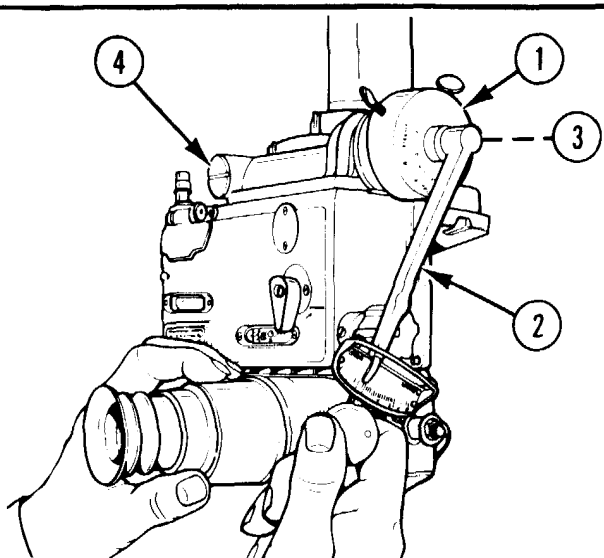
- 1 DEFLECTION COUNTER (1). Record reading closest to 0.25 mil.
- 2 CORRECTION KNOB (2). Turn until correction counter (3) reads R-95.
- 3 DEFLECTION COUNTER (1).
  - a. Record reading.
  - b. Compare reading recorded in step 1 with this reading.
  - c. Reading of deflection counter (1) should have increased 95 mils +0.5.
  - d. Repeat steps 2, 3a, and b using the L-95 setting.
  - e. Reading of deflection counter (1) should have decreased 95 mils +0.5.



**6-30. M137 TELESCOPE-GENERAL SUPPORT FINAL INSPECTION INSTRUCTIONS (cont)**  
**TORQUE INSPECTION**

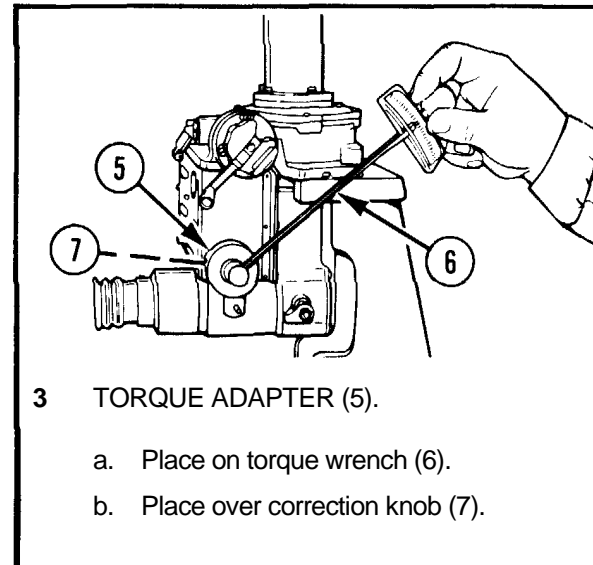
**1 TORQUE ADAPTER (1).**

- a. Place on torque wrench (2).
- b. Place over azimuth knob (3).



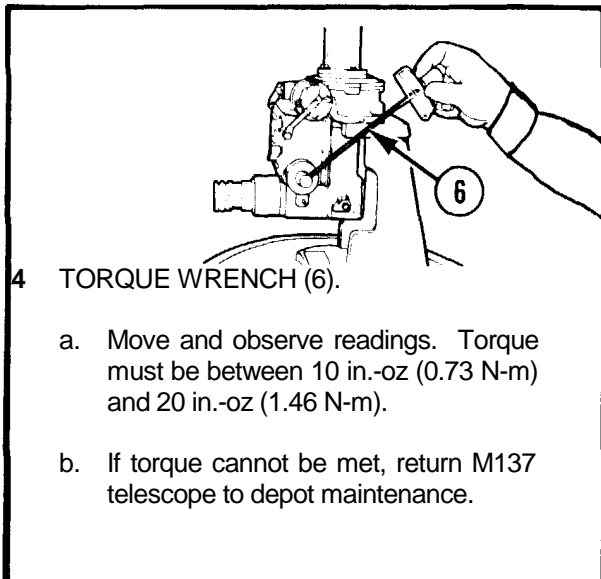
**2 TORQUE WRENCH (2).**

- a. Move and observe readings. Torque must be between 3 in.-lb (0.34 N-m) and 8 in.-lb (0.90 N-m).
- b. If torque cannot be met, tighten or loosen retainer (4).



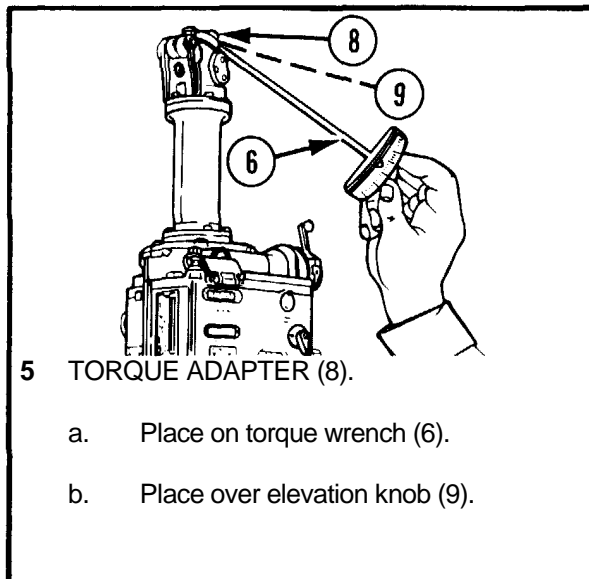
**3 TORQUE ADAPTER (5).**

- a. Place on torque wrench (6).
- b. Place over correction knob (7).



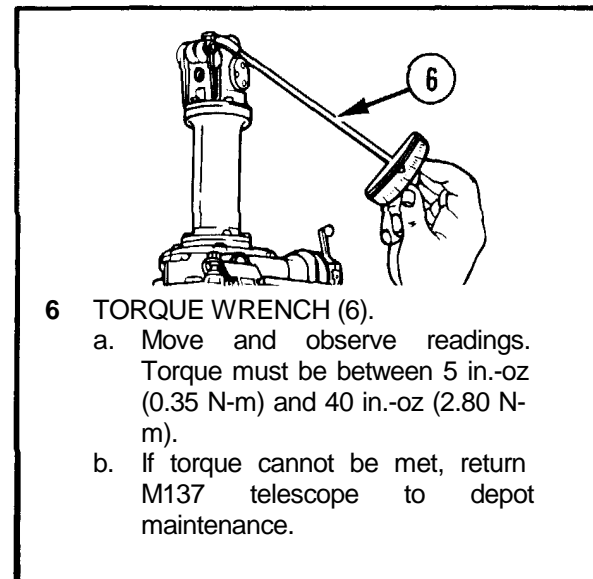
**4 TORQUE WRENCH (6).**

- a. Move and observe readings. Torque must be between 10 in.-oz (0.73 N-m) and 20 in.-oz (1.46 N-m).
- b. If torque cannot be met, return M137 telescope to depot maintenance.



**5 TORQUE ADAPTER (8).**

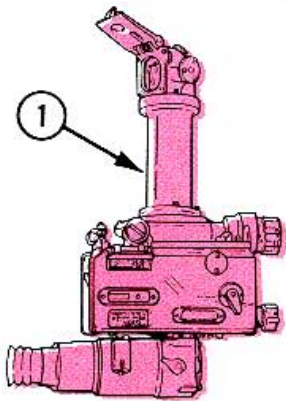
- a. Place on torque wrench (6).
- b. Place over elevation knob (9).



**6 TORQUE WRENCH (6).**

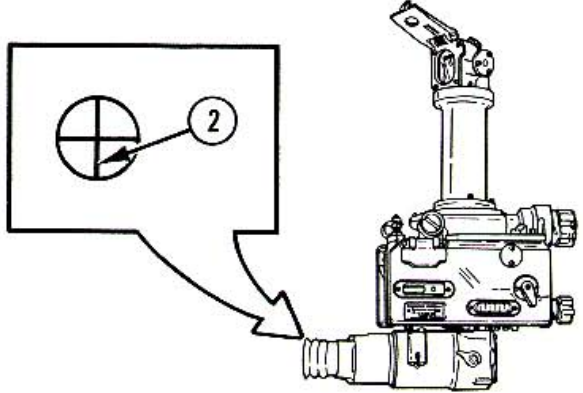
- a. Move and observe readings. Torque must be between 5 in.-oz (0.35 N-m) and 40 in.-oz (2.80 N-m).
- b. If torque cannot be met, return M137 telescope to depot maintenance.

ILLUMINATION INSPECTION

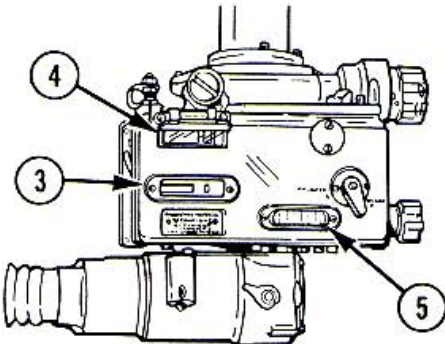


1 M137 TELESCOPE (1). Take into darkened area and wait 15 minutes.

2 VERTICAL RETICLE LINE (2). Ensure that it is clearly visible and illuminated.

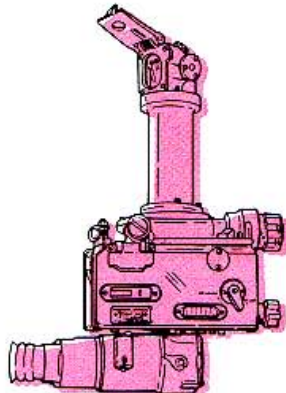


3 DEFLECTION COUNTER (3), AZIMUTH COUNTER (4), AND CORRECTION COUNTER (5). Ensure they are clearly visible with even illumination.



**WARNING**  
If not illuminated, follow radioactive safety precautions on inside front cover.

**PURGING**



M137 TELESCOPE. Purge and charge (TM 9- 1025-211-20&P).

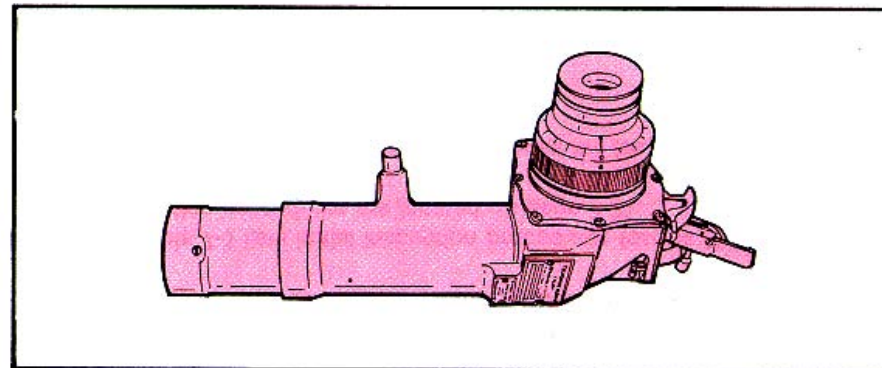
**CHAPTER 7  
M138 ELBOW TELESCOPE--MAINTENANCE INSTRUCTIONS**

**CHAPTER INDEX**

	<b>Page</b>
Categories of Inspection .....	7-2
Common Tools and Equipment .....	7-1
General (Final Inspection) .....	7-21
General (Inspections) .....	7-2
General (Troubleshooting) .....	7-4
M138 Telescope-Direct Support	
Maintenance Instructions .....	7-5
M 138 Telescope-Final Inspection	
Instructions .....	7-21
Optical Instrument Latch-Direct Support	
Maintenance Instructions .....	7-16
Optical Instrument Latch Set-Direct Support	
Maintenance Instructions .....	7-14
Spares and Repair Parts .....	7-1
Special Tools, TMDE, and Support Equipment .....	7-1

**CHAPTER OVERVIEW**

This chapter contains direct support maintenance procedures for the M138 telescope. General support maintenance is not authorized. Information on repair parts and special tools is included. Detailed procedures for troubleshooting and maintenance of the M138 telescope parts are also included.



**Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT**

**7-1. COMMON TOOLS AND EQUIPMENT**

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

**7-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT**

Special tools, TMDE, and support equipment required and authorized for

repair of this materiel are in TM 9-1240-375-34P.

**7-3. PARES AND REPAIR PARTS**

Spares and repair parts are listed and illustrated in TM 9-1240-375-34P.



**Section II. INSPECTIONS****7-4. GENERAL**

- a. Inspection is performed primarily to determine the following:
  - (1) Completeness.
  - (2) The nature of serviceability.
  - (3) The work, repair parts, and supplies required to return the M138 telescope to serviceability.
  - (4) That work in process is being performed properly.
  - (5) That completed work complies fully with serviceability standards.
- b. The M138 telescope is considered serviceable when:
  - (1) It is complete and properly performs the intended function.
  - (2) All modification work orders (MWO's) have been applied.
  - (3) All defects disclosed by the inspection have been corrected.

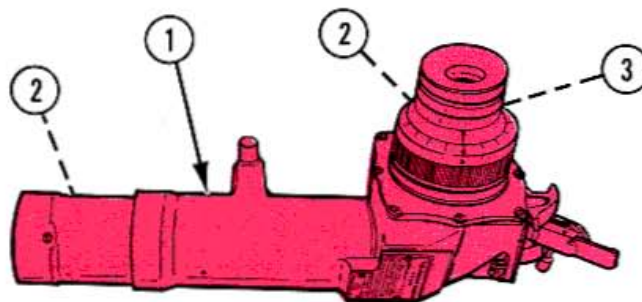
- c. DA Form 2408-5 and DA Form 2409 list applicable MWO's.


**7-5. CATEGORIES OF INSPECTION**

Categories of inspection define responsibilities.

- a. An initial inspection is performed immediately on receipt of the M138 telescope for maintenance. This inspection will determine the amount of work to be performed or whether the M138 telescope should be forwarded to depot maintenance.
- b. A final inspection of the M138 telescope is performed after repairs have been completed to ensure the item meets serviceability standards.
- c. Table 7-1 lists initial inspection procedures for the M138 telescope. Final inspection procedures are located on page 7-21.
- d. Preembarkation inspection procedures are located on page 2-76.

Table 7-1. INITIAL INSPECTION-M138 TELESCOPE



Item No.	Inspected	Procedures
1	M138 TELESCOPE (1)	Check for chipped paint, scuff marks, damaged or missing parts. Inspect M138 telescope for cleanliness and smooth operation.
2	LENSES (2)	Lenses must be free of scratches, pits, and moisture.
3	RADIOACTIVE LIGHT SOURCES (3)	<p style="text-align: center;"><b>WARNING</b></p> <p style="text-align: center;">                      When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.                 </p> <p>Radioactive light must be present and even throughout reticle cell assembly.</p>

Section III. TROUBLESHOOTING

7-6. GENERAL

a. The symptom index can be used as a quick guide to troubleshooting. Common malfunctions are listed in alphabetical order with a page number reference to the troubleshooting table where a test or inspection and corrective action are provided.

b. The troubleshooting table 7-2 lists the common malfunctions which may be found during maintenance of the M138 telescope which are the

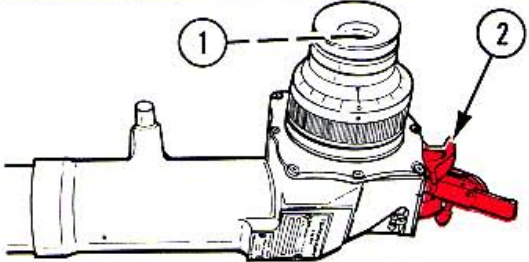
responsibility of direct support. Perform tests/inspections and corrective action in the order listed.

c. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective action, notify depot maintenance.

DIRECT SUPPORT SYMPTOM INDEX

	Troubleshooting Procedure (Page)
<b>► M138 TELESCOPE</b>	
► Reticle is fogged or has condensation .....	7-4
<b>OPTICAL INSTRUMENT LATCH SET</b>	
Does not operate correctly .....	7-5

Table 7-2. DIRECT SUPPORT TROUBLESHOOTING-M138 TELESCOPE

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	LOCATION
M138 TELESCOPE	
1. RETICLE (1) IS FOGGED OR HAS CONDENSATION  ► Check for moisture in telescope.  ► Purge and charge with dry nitrogen (TM 9-1025-211-20&P).	

**OPTICAL INSTRUMENT LATCH SET**

**2. OPTICAL INSTRUMENT LATCH SET (2) DOES NOT OPERATE CORRECTLY.**

Step 1. Check for incorrectly assembled optical instrument latch set.

Reassemble optical instrument latch set correctly (p 7-15).

Step 2. Check for worn, damaged, or missing parts.

Replace parts (p 7-15) as required and authorized.

**Section IV. DIRECT SUPPORT MAINTENANCE PROCEDURES  
FOR THE M138 ELBOW TELESCOPE**

**7-7. M138 TELESCOPE-MAINTENANCE INSTRUCTIONS**

**INITIAL SETUP**

Special Tools

Tool box (SC 4931-95-CL-A09)

Materials / Parts

Cleaning compound (MIL-C-18718)

Grease (item 2, app B)

Lens paper (NNN-P40)

Optical lens cleaning compound (MIL-L-43454A)

Sealing compound (MIL-S-11031)

Preformed packing (MS9021-155)

References

TM 9-1025-211-10

TM 9-1025-211-20&P

TM 9-1240-375-34P

Troubleshooting References

7-4 Reticle is fogged or has condensation.

7-5 Optical instrument latch set does not operate correctly.



**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

7-7. M138 TELESCOPE-MAINTENANCE INSTRUCTIONS (cont)

List of Tasks List of Tasks			
Task No. Task No.	Task Task	Task Page (Page)	Troubleshooting Page (Page)
1	Maintain M138 telescope:  Repair.	7-7	P 7-4
2	Maintain optical instrument latch set:  a. Remove. b. Disassemble. c. Repair. d. Reassemble. e. Install.	7-14 7-15 7-15 7-15 7-16	7-5
3	Maintain optical instrument latch:  a. Remove. b. Disassemble. c. Repair. d. Reassemble. e. Install.	7-17 7-17 7-18 7-19 7-20	7-5

7-8. M138 TELESCOPE-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

Repair

**INITIAL SETUP**

Special Tools

Tool box (SC 4931-95-CL-A09)

Materials/ Parts

Cleaning compound (MIL-C-18718)

Grease (item 2, app B)

Lens paper (NNN-P -40)

Optical lens cleaning compound (MIL-L-43454A)

Sealing compound (MIL-S-11031)

Preformed packing (MS9021-155)

Troubleshooting Reference

7-4 Reticle is fogged or has condensation.

References

TM 9-1025-211-10

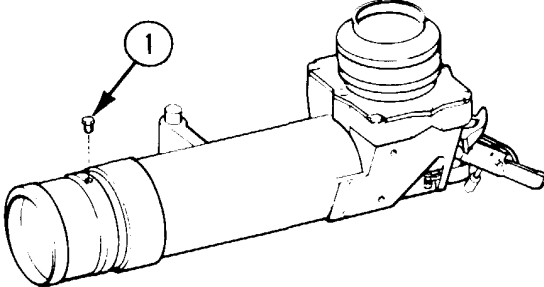
TM 9-1025-211-20&P

TM 9-1240-375-34P

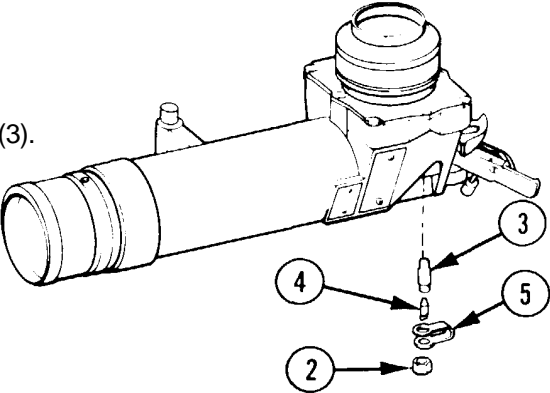
**WARNING**

When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

**REPAIR**



1 RELIEF VALVE (1). Unscrew and remove.



2 CAP (2). Unscrew from valve stem (3).

3 VALVE CORE (4). Remove from valve stem (3).

4 VALVE STEM (3). Remove.

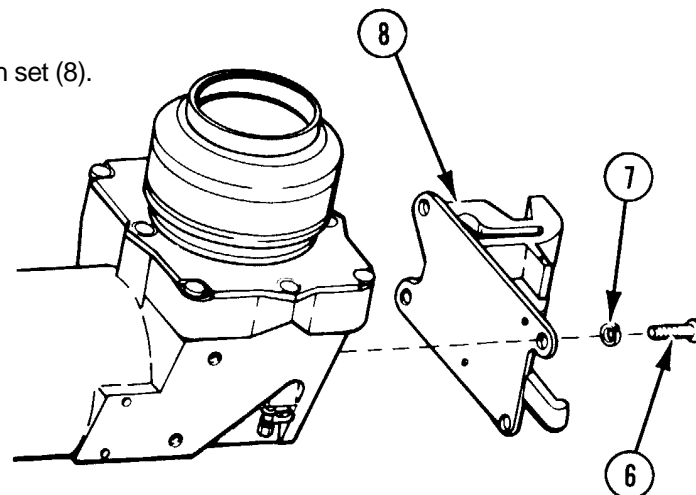
6 STRAP (5). Remove from valve stem (3).



7-8. M138 TELESCOPE-MAINTENANCE INSTRUCTIONS (cont) I

REPAIR (cont)

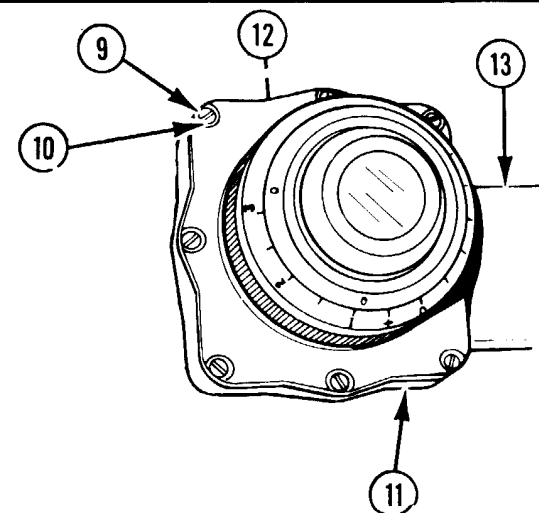
- 6 FOUR SCREWS (6) AND FOUR LOCKWASHERS (7). Remove from optical instrument latch set (8).
- 7 OPTICAL INSTRUMENT LATCH SET (8). Remove.

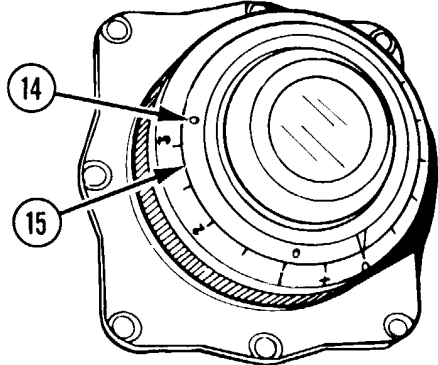


**WARNING**  
 If reticle cell assembly is not illuminated, do not perform any maintenance. Place M138 telescope in plastic bag (TM 9-1025-211-10) and send to depot maintenance

**NOTE**  
 Optical element holder may be disassembled while installed on M138 telescope.

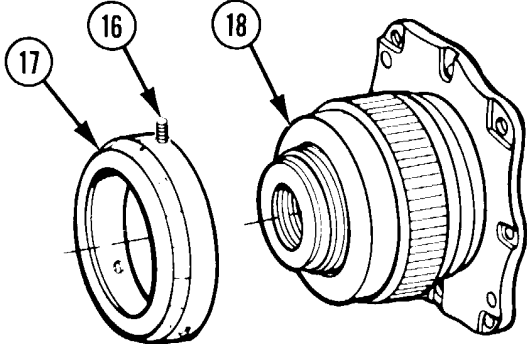
- 8 EIGHT SCREWS (9) AND EIGHT LOCKWASHERS (10). Remove.
- 9 OPTICAL ELEMENT HOLDER (11) AND PACKING (12). Lift off of optical instrument housing (13) being careful not to damage locating pins in optical instrument housing.





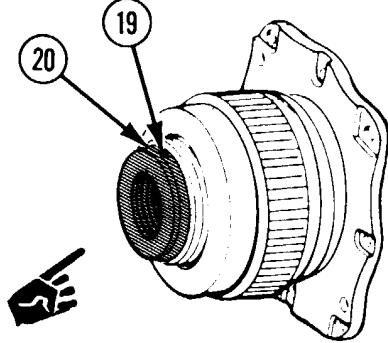
10 TWO SETSCREWS (14). Remove sealing compound and loosen.

11 POINTER (15). Lift off.



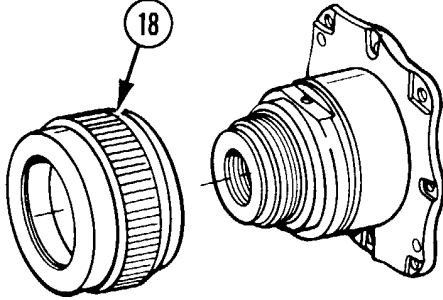
12 THREE SETSCREWS (16). Loosen.

13 DIPTER SCALE (17). Remove from knob (18).



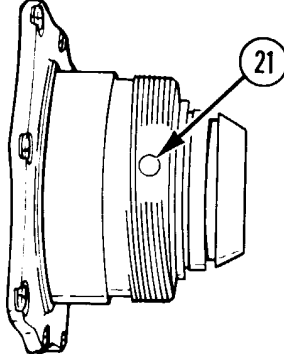
14 SETSCREW (19). Remove sealing compound and loosen.

15 NUT (20). Unscrew and remove.



16 KNOB (18). Remove from eyepiece cell assembly.

Change 2 7-9



17 STOP (21). Remove by lifting off.

7-8. M138 TELESCOPE-MAINTENANCE INSTRUCTIONS (cont) I

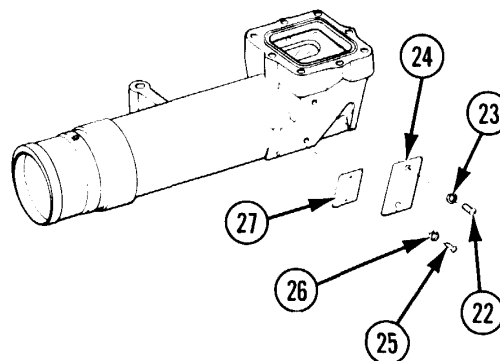
REPAIR (cont)

18 TWO SCREWS (22) AND TWO LOCK WASHERS (23). Remove.

19 IDENTIFICATION PLATE (24). Remove.

20 TWO SCREWS (25) AND TWO LOCK WASHERS (26). Remove.

21 INSTRUCTION PLATE (27). Remove.



22 ALL PARTS. Clean with cleaning compound (TM 9-1025-211-10).

23 RETICLE CELL ASSEMBLY AND EYEPIECE CELL ASSEMBLY. Clean with lens paper (TM 9-1025-211-10) and optical lens cleaning compound (TM 9-1025-211-10).

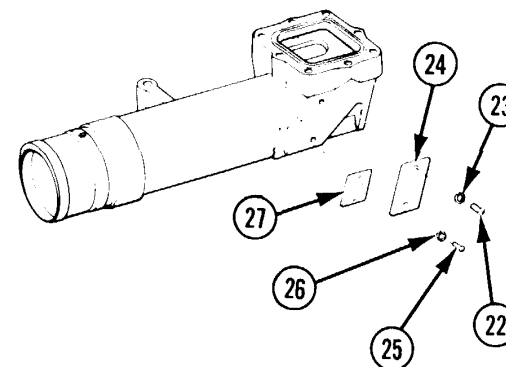
**NOTE**  
Repair is by replacement of authorized parts (TM 9-1240-37534P) as required.

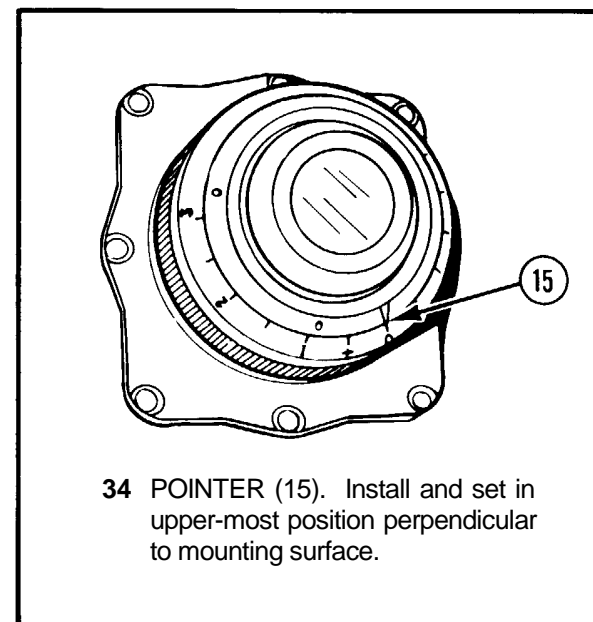
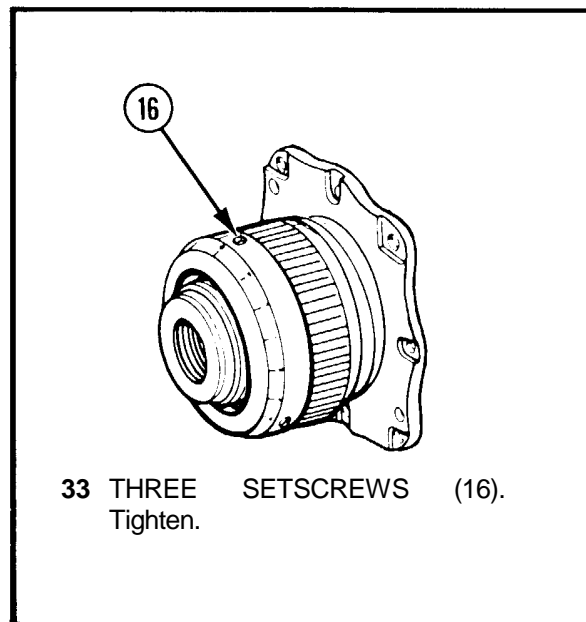
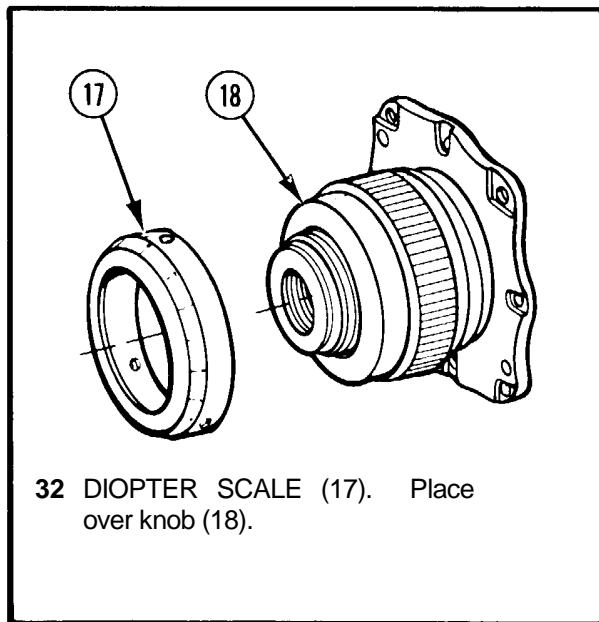
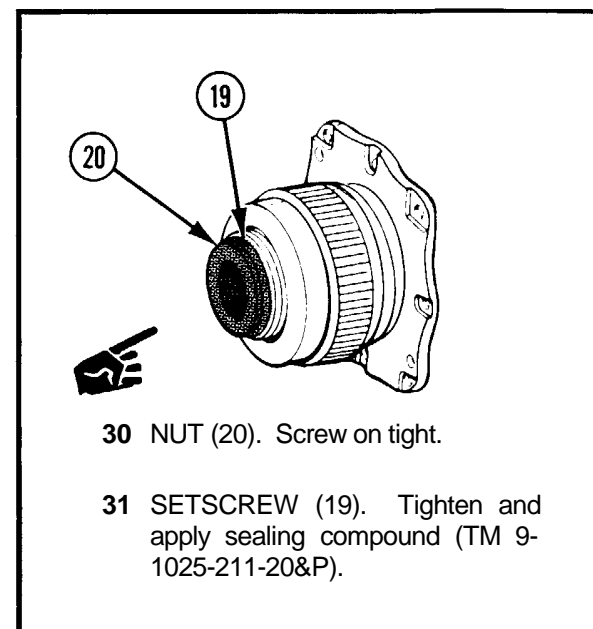
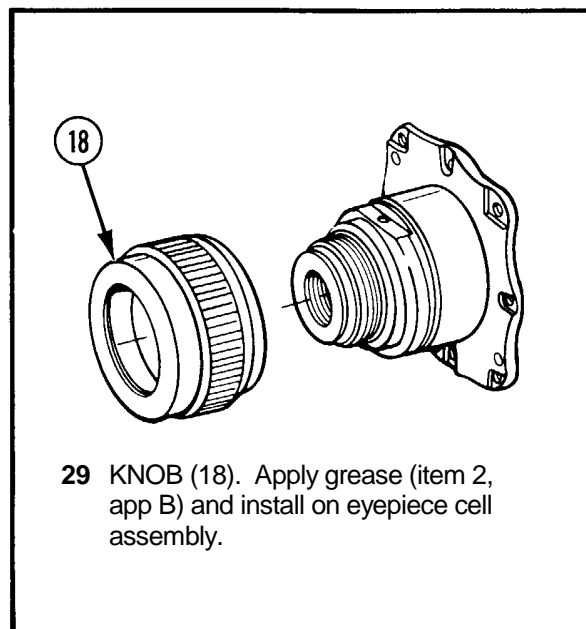
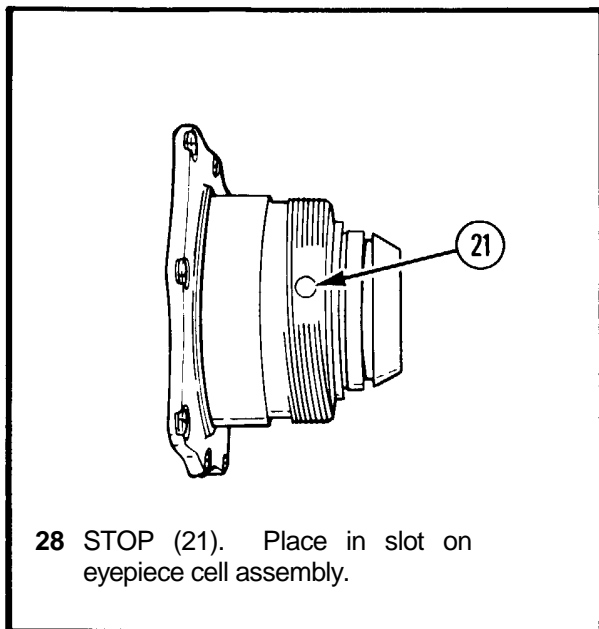
24 INSTRUCTION PLATE (27). Place on M138 telescope.

25 TWO LOCKWASHERS (26) AND TWO SCREWS (25). Install.

26 IDENTIFICATION PLATE (24). Place on M138 telescope.

27 TWO LOCKWASHERS (23) AND TWO SCREWS (22). Install.

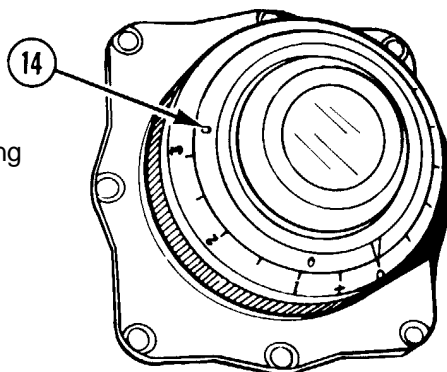




7-8 . M138 TELESCOPE-MAINTENANCE INSTRUCTIONS (cont) I

REPAIR (cont)

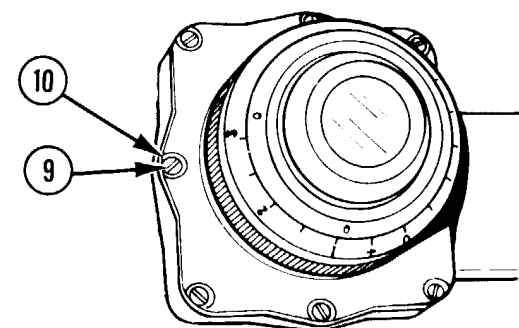
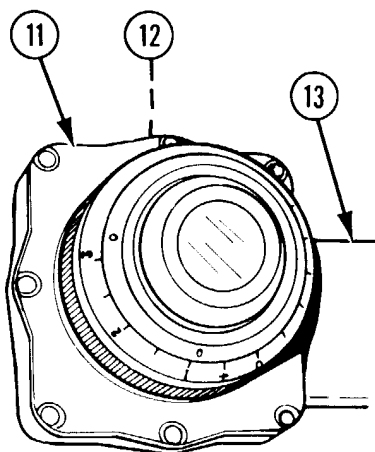
35 TWO SETSCREWS (14). Tighten and apply sealing compound (TM 9-1025-21120&P).



**NOTE**  
Before installing optical element holder, ensure that locating pins in optical instrument housing are not damaged.

36 PACKING (12). Install new packing in optical instrument housing (13).

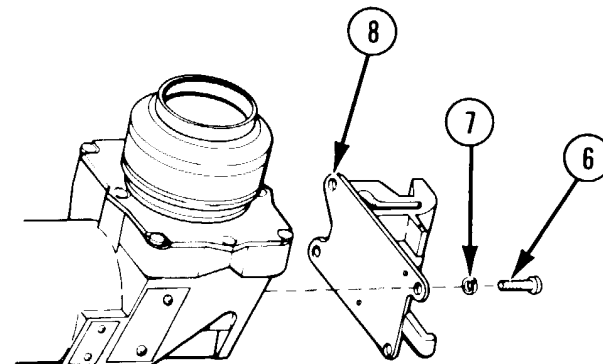
37 OPTICAL ELEMENT HOLDER (11). Place over locating pins in optical instrument housing (13).



38 EIGHT LOCKWASHERS (10) AND EIGHT SCREWS (9). Install, tighten, and perform final inspection (p 7-21).

**39 FOUR LOCKWASHERS (7) AND FOUR SCREWS (6).**

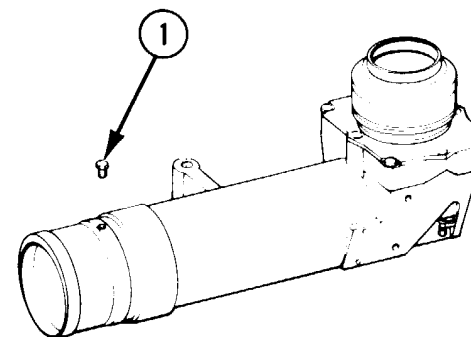
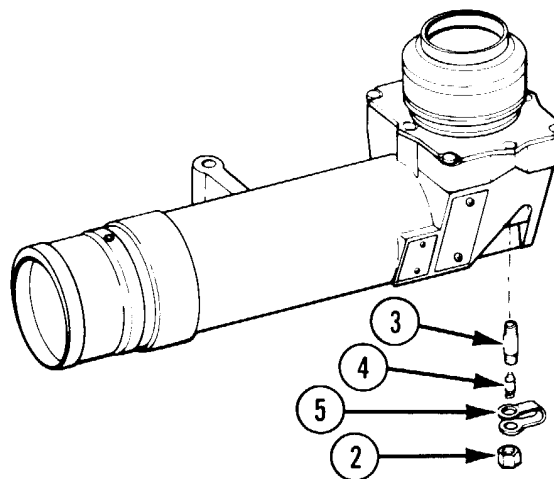
- a. **▮** Apply sealing compound (TM 9-1025 21 1-20&P) to screws.
- b. Install to secure optical instrument latch set (8) to M138 telescope.



**40 STRAP (5). Install on valve stem (3).**

**41 VALVE STEM (3). Apply sealing compound (TM 9-1025-211-20&P) and install.**

**42 VALVE CORE (4) AND CAP (2). Install.**



**43 RELIEF VALVE (1). Apply sealing compound (TM 9-1025-211-20&P) and install.**



**7-9. OPTICAL INSTRUMENT LATCH SET-MAINTENANCE INSTRUCTIONS**

**THIS TASK COVERS:**

- a. Removal
- b. Disassembly
- c. Repair
- d. Reassembly
- e. Installation

**INITIAL SETUP**

Special Tools  
 Tool box (SC 4931-95-CL-A09)

**Materials/Parts**

Grease (item 2, app B)  
 P Sealing compound (MIL-S-11031)

**Reference**

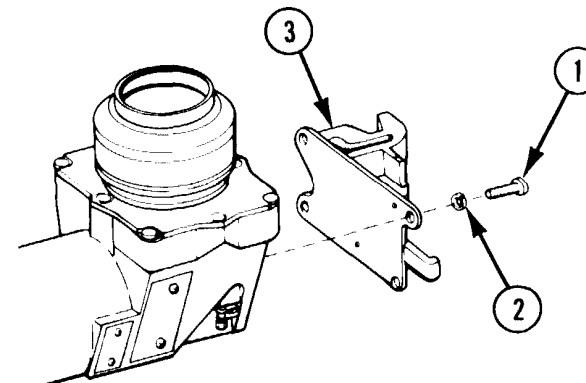
P TM 9-1025-211-20&P  
 TM 9-1240-375-34P

**Troubleshooting Reference**

7-4 Optical instrument latch set does not operate correctly.

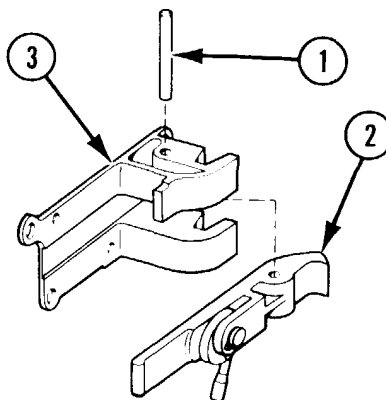
**REMOVAL**

- 1 FOUR SCREWS (1) AND FOUR LOCKWASHERS (2). Remove from optical instrument latch set (3).
- 2 OPTICAL INSTRUMENT LATCH SET (3). Remove.



**DISASSEMBLY**

- 1 PIN (1). Remove.
- 2 OPTICAL INSTRUMENT LATCH (2). Remove from latch holder (3).



**NOTE**  
 Replace optical instrument latch set if damaged to the extent that the M138 telescope does not lock securely in position.

**REPAIR**

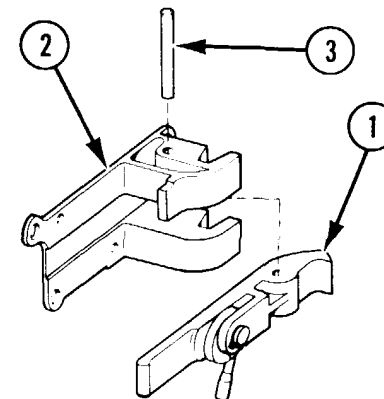
Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

**REASSEMBLY**

- 1 OPTICAL INSTRUMENT LATCH (1). Apply light coat of grease (item 2, app B) and position in latch holder (2).

**NOTE**  
 Ensure pin (3) is below surface of latch holder (2) on both sides.

- 2 PIN (3). Install.

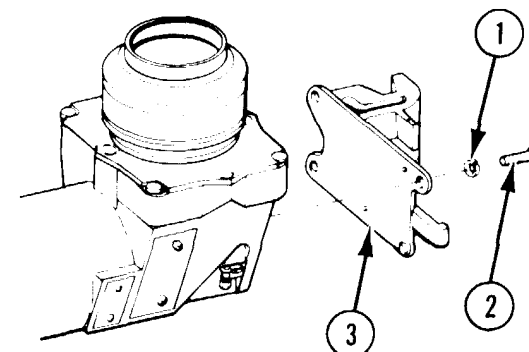


7-9. OPTICAL INSTRUMENT LATCH SET-MAINTENANCE INSTRUCTIONS (cont)

INSTALLATION I

**FOUR LOCKWASHERS (1) AND FOUR SCREWS (2).**

- a. ⚠ Apply sealing compound (TM 9 1025-21 1-20&P) to screws.
- b. Install to secure optical instrument latch set (3) to M138 telescope.



7-10. OPTICAL INSTRUMENT LATCH-MAINTENANCE INSTRUCTIONS

**THIS TASK COVERS:**

- a. Removal
- b. Disassembly
- c. Repair
- d. Reassembly
- e. Installation

**INITIAL SETUP**

Special Tools  
 Tool box (SC 4931-95-CL-A09)

**Materials/Parts**

Grease (item 2, app B)  
 ⚠ Sealing compound (MIL-S-1 1031)

**Reference**

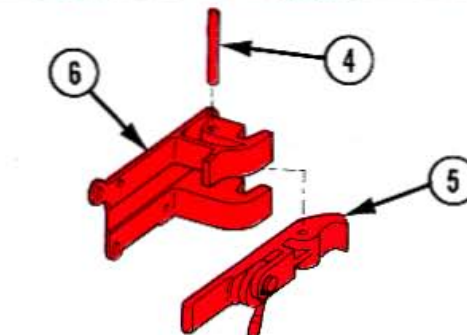
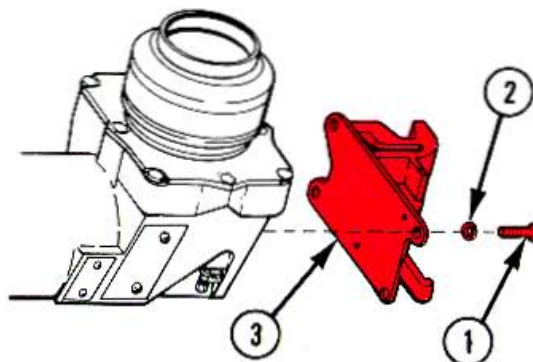
⚠ TM 9-1025-211-20&P  
 TM 9-1240-375-34P

**Troubleshooting Reference**

7-4 Optical instrument latch set does not operate correctly.

**REMOVAL**

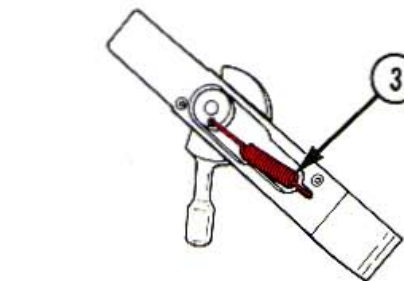
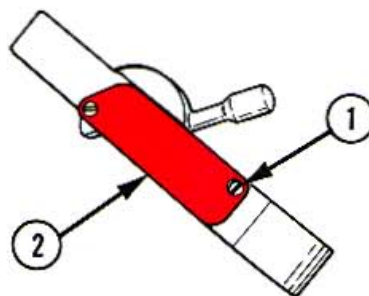
- 1 FOUR SCREWS (1) AND FOUR LOCK WASHERS (2). Remove from optical instrument latch set (3).
- 2 OPTICAL INSTRUMENT LATCH SET (3). Remove.



- 3 PIN (4). Remove.
- 4 OPTICAL INSTRUMENT LATCH (5). Remove from latch holder (6).

**DIASSEMBLY**

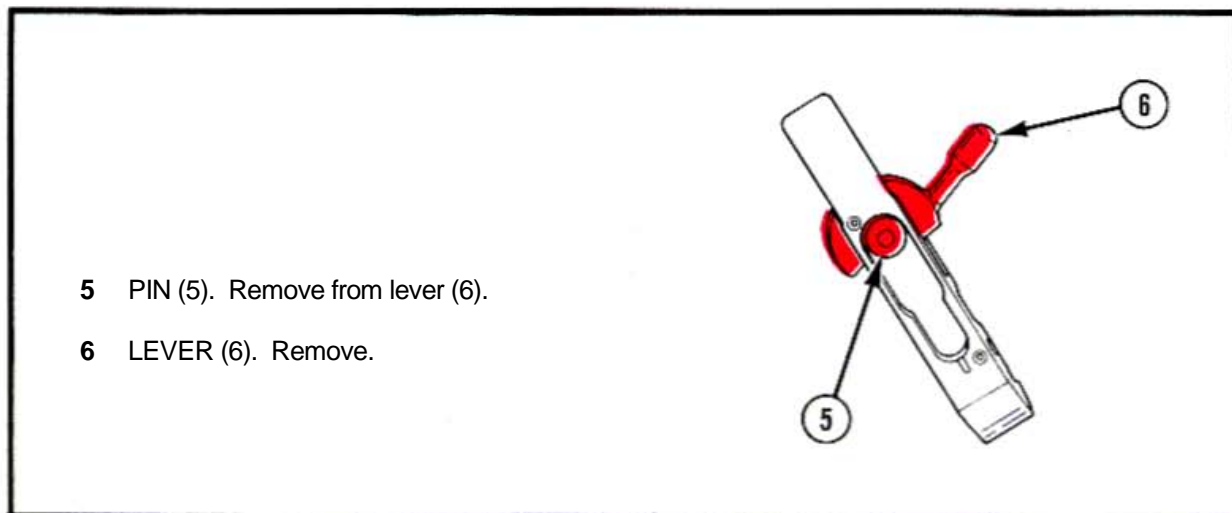
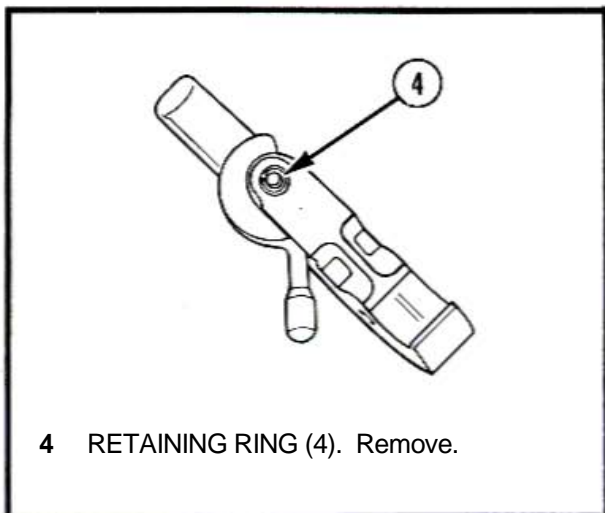
- 1 TWO SCREWS (1). Remove from cover (2).
- 2 COVER (2). Remove from optical instrument latch.



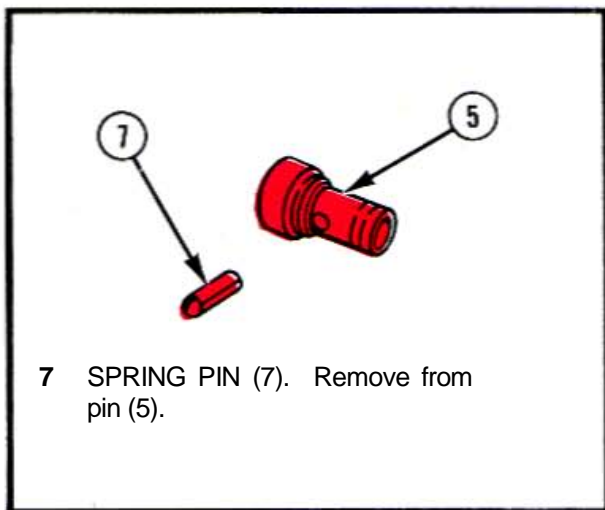
- 3 SPRING (3). Lift off.

7-10. OPTICAL INSTRUMENT LATCH-MAINTENANCE INSTRUCTIONS (cont) I

DISASSEMBLY (cont) I



REPAIR

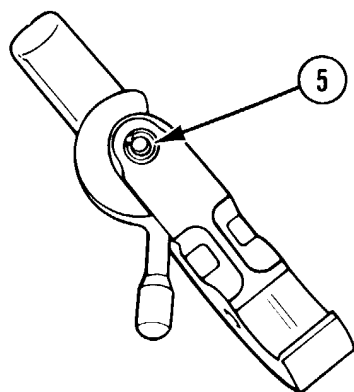
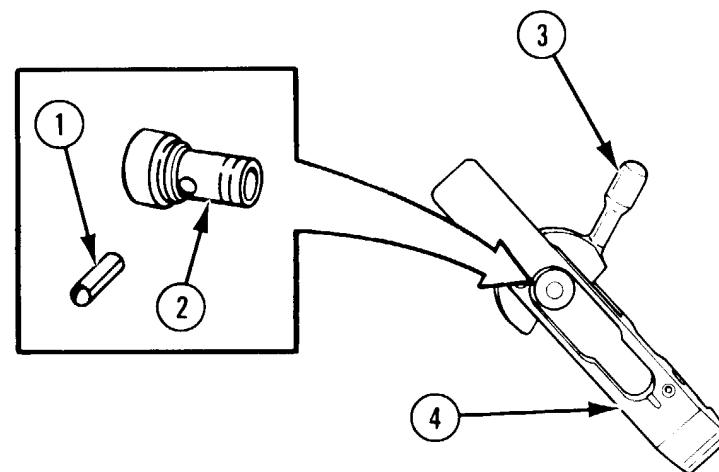


**NOTE**  
Replace optical instrument latch if damaged to the extent that it will not hold the M138 telescope in proper position.

Repair is by replacement of authorized parts (TM 9-1240-375-34P) as required.

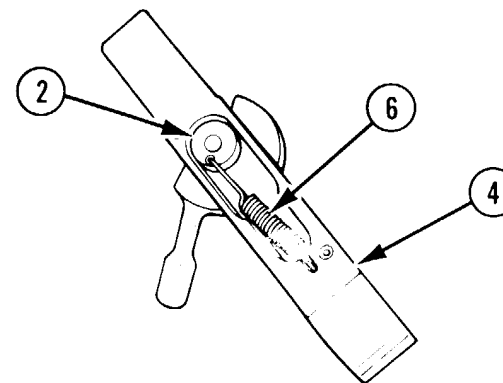
REASSEMBLY

- 1 SPRING PIN (1). Install in pin (2).
- 2 LEVER (3). Apply light coat of grease (item 2, app B) and place on optical instrument latch (4).
- 3 PIN (2). Install in lever (3).



- 4 RETAINING RING (5). Install.

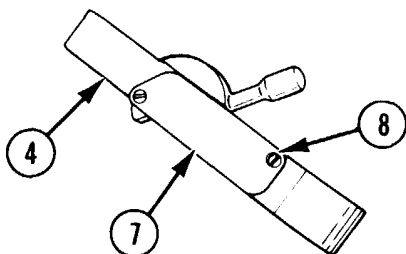
- 5 SPRING (6). Install two ends of spring (6) in holes of optical instrument latch (4) and pin (2).





7-10. OPTICAL INSTRUMENT LATCH-MAINTENANCE INSTRUCTIONS (cont)

REASSEMBLY (cont)



6 COVER (7). Place on optical instrument latch (4).

7 TWO SCREWS (8). Install to secure cover (7). INSTALLATION

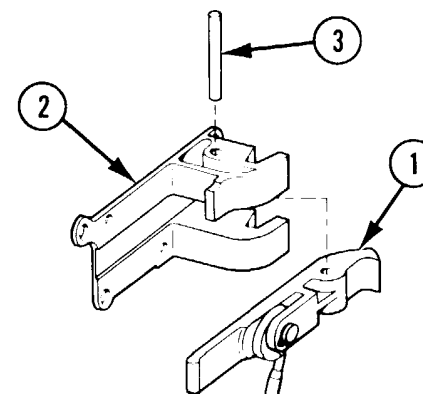
INSTALLATION

1 OPTICAL INSTRUMENT LATCH (1). Apply **light** coat of grease (item 2, app B) and position in latch holder (2).

**NOTE**

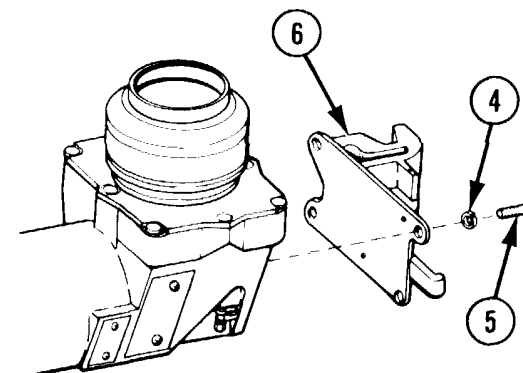
**Ensure pin (3) is below surface of latch holder (2) on both sides.**

2 PIN (3). Install.



3 FOUR LOCKWASHERS (4) AND FOUR SCREWS (5).

- a. Apply sealing compound (TM 9-1025-211-20&P) to screws.
- b. Install to secure optical instrument latch set (6) to M138 telescope.



**Section V. FINAL INSPECTION PROCEDURES  
FOR THE M138 ELBOW TELESCOPE**

**7-11. GENERAL I**

a. This section describes and illustrates the final inspection of the M138 telescope. A final inspection will be performed prior to returning the M138 telescope to the using unit or to the supply system.

b. If the telescope being inspected fails to meet the required standards, ensure all maintenance authorized at the applicable level has been performed correctly. Then send the M138 telescope to the next level of maintenance.

**7-12. M138 TELESCOPE--FINAL INSPECTION INSTRUCTIONS**

**THIS TASK COVERS:**

- a. Visual inspection
- b. Eyepiece focus inspection
- c. Torque inspection
- d. Illumination inspection
- e. Purging

**INITIAL SETUP**

**Special Tools**

- Tool box (SC 4931-95-CL-A09)
- Tool set (SC 4931-95-CL-J51)

**Materials/Parts**


- Cleaning compound (MIL-C-18718)
- Grease (item 3, app B)
- Sealing compound (MIL-S-11031)

**References**

- TM 9-1025-211-10
- TM 9-1025-211-20&P

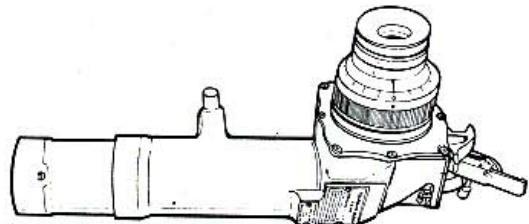
Special Environmental Condition  
Ambient temperature: +60° F (+ 160 C) to +900 F (+320 C).

**WARNING**

 When maintaining radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

7-12. M138 TELESCOPE-FINAL INSPECTION INSTRUCTIONS (cont) I

VISUAL INSPECTION



1 ALL SCREWS AND LOCKWASHERS. Check that screws and lockwashers are present and tight.

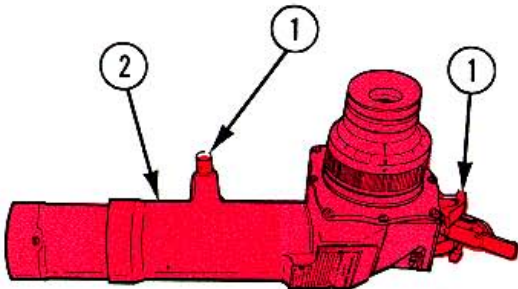
2 MOUNTING SURFACES (1). Check that mounting surfaces are clean and free of nicks and burrs.

3 M138 TELESCOPE (2).

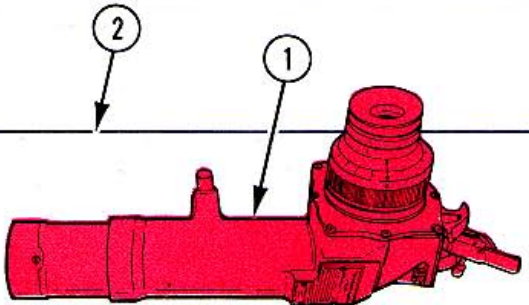
a. Check that M138 telescope is free of dirt, rust, and foreign matter.

b. Check that paint is not chipped.

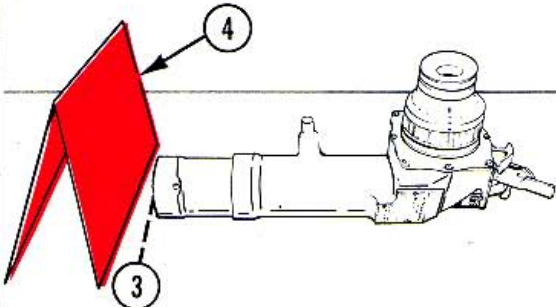
c. Check that all parts are present.



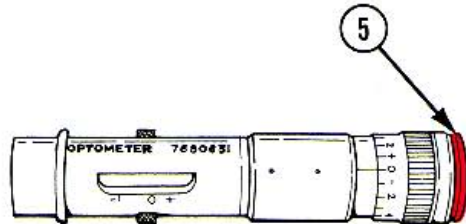
EYEPIECE FOCUS INSPECTION



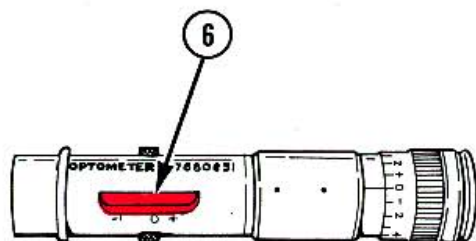
1 M138 TELESCOPE (1). Place on flat surface (2).



2 **P** M138 TELESCOPE LENS (3). Place close to any light-colored surface (4).

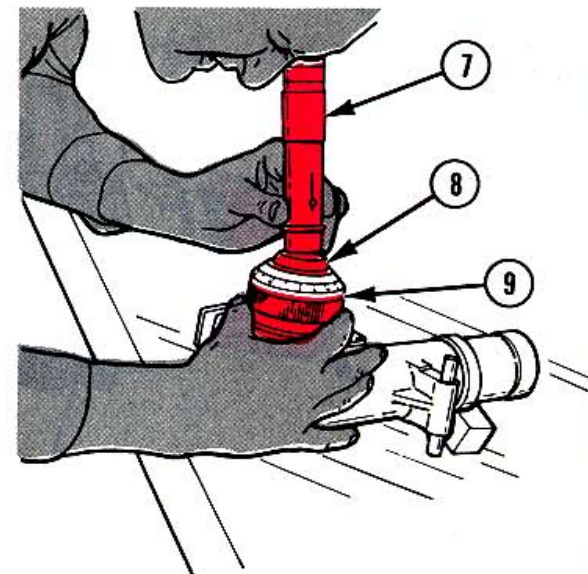


3 **P** DIOPMETER EYEPIECE (5). Adjust until the reticle is brought to its sharpest focus.



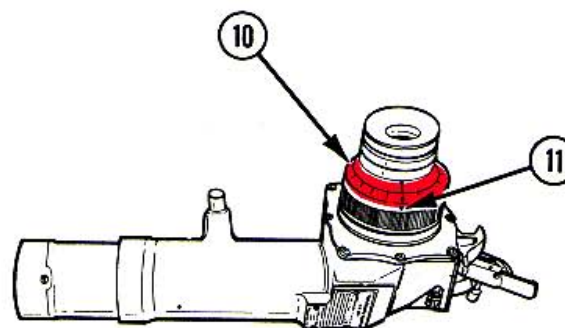
- 4 DIPTOMETER RANGE SCALE (6). Set to 0.

- 5 DIPTOMETER (7). Place over M138 telescope eyepiece (8).
- 6 KNOB (9). Turn until pattern of reticle is sharpest and darkest.



7 DIPTER SCALE (10).

- a. Check that diopter scale reads 0.
- b. If not, loosen three setscrews (11), and adjust diopter scale to read 0.
- c. Tighten setscrews (11) and apply sealing compound (TM 9-1025-211-20&P).



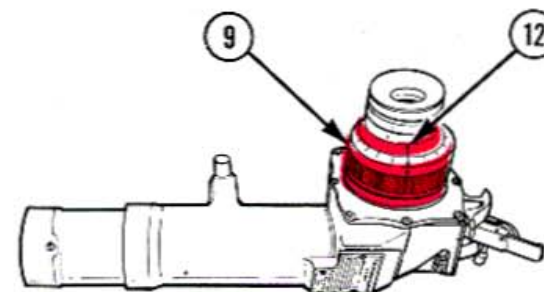
**NOTE**  
 Observe focus of the reticle image during step 8. The focus should change over a minimum range of + 3 diopters to -3 diopters.

## 7-12. M138 TELESCOPE-FINAL INSPECTION INSTRUCTIONS (cont)

## EYEPIECE FOCUS INSPECTION (cont)

## 8 KNOB (9).

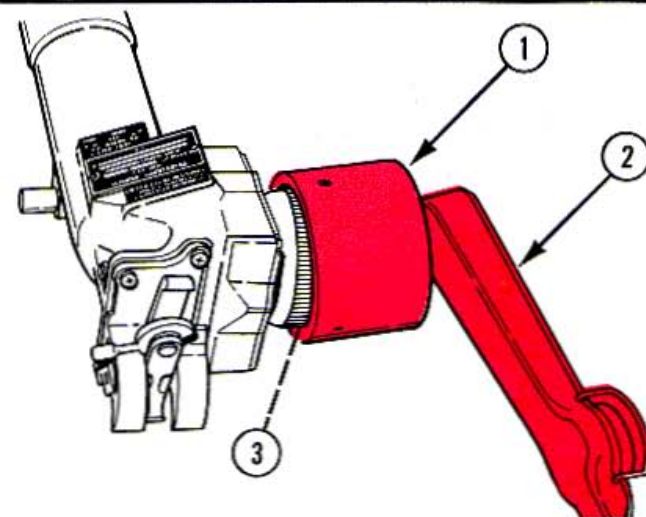
- a. Rotate clockwise as far as possible and note diopter scale setting.
- b. Diopter scale must read -3 diopters or greater.
- c. Rotate counterclockwise as far as possible and note diopter scale setting.
- d. Diopter scale must read +3 diopters or greater.
- e. **ⓘ** If readings of - 3 thru + 3 diopters cannot be achieved, repeat steps 3 thru 7. If proper excursion is still not obtained, return to depot maintenance.



## TORQUE INSPECTION

## TORQUE ADAPTER (1).

- a. Place on torque wrench (2).
- b. Place over knob (3).
- c. Measure torque.
- d. **ⓘ** Torque required to move diopter scale should be between 2 in.-lb (0.23 N-m) and 5 in.-lb (0.57 N-m).
- e. If above torque cannot be obtained, apply coat of grease (item 3, app B) to threads to increase torque or clean threads with cleaning compound (TM 9-1025-211-10) to decrease torque as necessary. If torque still cannot be obtained, return M138 telescope to depot maintenance.



**ILLUMINATION INSPECTION****M138 TELESCOPE.**

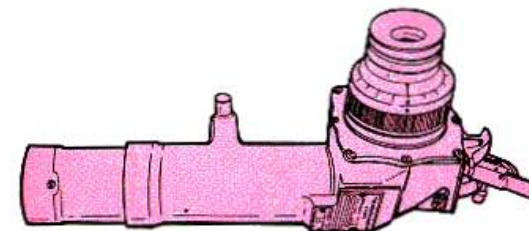
- a. Take into dark area and wait 15 minutes.
- b. Look through eyepiece and check that illumination is present and even.

**WARNING**

If not illuminated, follow radioactive safety precautions on inside front cover.

**PURGING**

M138 TELESCOPE. Purge and charge (TM 9-1025-21 1-20&P).





**APPENDIX A  
REFERENCES**

**A-1. TECHNICAL MANUALS (TM) |**

<p>TM 9-1025-211-10 ..... Operator's manual (crew) for howitzer, medium, towed: 155-mm, M198 (1025-01-026-6648)</p>	<p>rant: M172 (1240-01-037-7290); telescope, panoramic: M137 (1240-01-038-0531); and telescope, elbow: M138 (1240-01-038-0530)</p>
<p>TM 9-1025-211-20&amp;P ..... Organizational maintenance manual (including repair parts and special tools list) for howitzer, medium, towed, 155-mm: M198 (1025-01-026-6648)</p>	<p>TM 9-1290-200-14&amp;P ..... Operator's, organizational, direct support and general support maintenance port and general support maintenance manual for quadrant, fire control (gunner's) M1A w/e (1290-00-891-9999) and M1A2 (radioactive) w/e (1290-00-169-1937) (including organizational, direct support, general support and depot maintenance repair parts and special tools for quadrant, fire control (gunner's) M1A1 only)</p>
<p>TM 9-1025-211-34 ..... Direct support and general support maintenance manual for howitzer, medium, towed: 155-mm, M198 (1025-01-026-6648)</p>	
<p>TM 9-1240-375-34P ..... Direct support and general support repair parts and special tools list (including depot maintenance repair parts and special tools list) for quadrant, fire control: M17 (1290-01-037-3883); quadrant, fire control: M18 (1290-01-037-7289); mount, telescope and quadrant: M171 (1240-01-039-7273); mount, telescope and quad-</p>	<p>TM 9-254 ..... .. General maintenance procedures for fire control material</p>

**A-2. DEPARTMENT OF THE ARMY FORMS (DA Form)**

<p>DA 2028 .....</p>	<p>.... Recommended changes to publications and blank forms</p>
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**A-2. DEPARTMENT OF THE ARMY FORMS (DA Form)  
(cont)**

- DA 2028-2 ..... Recommended changes to equipment technical manuals
- DA 2408-5 ..... Equipment modifications record
- DA 2409 ..... Equipment maintenance log

**A-3. OTHER**

- CTA 8-100 ..... Army medical department expendable/durable items
- CTA 50-970 ..... Expendable items (except medical, class V repair parts, and heraldic items)

- DA PAM 738-750 ..... The Army maintenance management system
- FM 21-11 ..... First aid for soldiers
- SF 368 ..... Quality deficiency report
- TB 9-1000-247-34 ..... Standards for oversea shipment of domestic issue of small arms, aircraft armament, towed howitzers, mortars, recoilless rifles, rocket launchers and associated fire control equipment

APPENDIX B  
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

B-1. SCOPE I

This appendix lists expendable/durable supplies and materials you will need to operate and maintain the M198 fire control equipment. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

B-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., "Apply sealing compound, item 4, app B.").

b. **Column 2-Level** . This column identifies the lowest level of maintenance that requires the listed item.

F ..... Direct Support Maintenance  
H ..... General Support Maintenance

c. **Column 3-National Stock Number** . This item 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 the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

e. **Column 5-Unit of Measure (U/M)**. Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (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/DURABLE SUPPLIES AND MATERIALS LIST**

<b>(1)</b> Item Number	<b>(2)</b> Level	<b>(3)</b> Material Stock Number	<b>(4)</b> Description	<b>(5)</b> U/M
1	F	D 8040-01-1 82-8659	ADHESIVE, EPOXY: D MIL-A-47280-T 1	DQT
2	F	9150-00-119-9291	GREASE, AIRCRAFT: corrosion-resistant grease MIL-G-23827 (81349) 2-oz (56.6-gram) tube	TU
3	F	9150-00-985-7243	GREASE, AIRCRAFT: grease, aircraft instrument, corrosion and water-resistant MIL-G-4343 (81349) 1-oz (28.3-gram) tube	TU
4			D Deleted	
5	F	9505-00-293-4208	WIRE, NONELECTRICAL: annealed corrosion- resistant steel, 0.032-in. (0.085-cm) diam MS20995-C32 (96906) 1 lb (0.45 kg)	LB

**APPENDIX C**  
**ILLUSTRATED LIST OF MANUFACTURED ITEMS**

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**C-1. GENERAL**

This appendix includes complete instructions for making items authorized to be manufactured or fabricated at direct support level.

**C-2. PROCEDURE**

Fabricate items as required following sketches below.

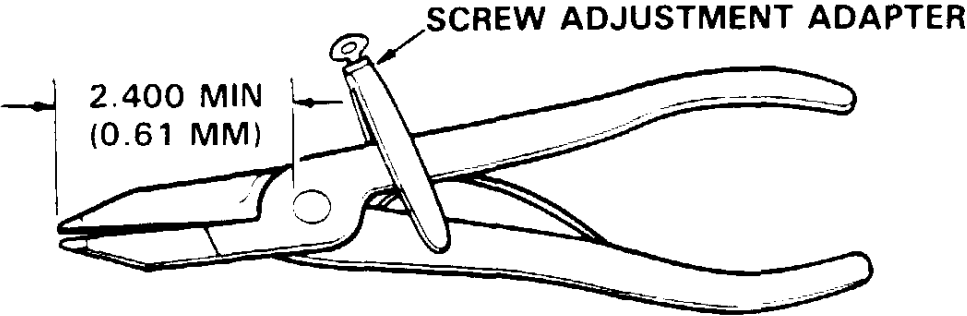
**Change 2 C-1**

C-2. PROCEDURE (cont)

MATERIAL BLOCK			
ITEM NO.	DESCRIPTION	SPECIFICATION	REMARKS
1	PLIERS, SNAP RING		Require Walders Truarc pliers no. 5. Remove screw adjustment adapter if present. Grind tips of pliers to a tapered diameter. All dimensions are shown in inches.

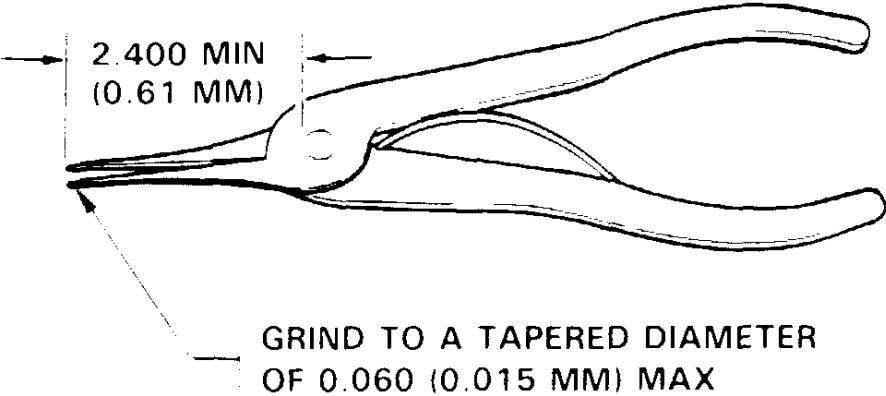
Change 2 C-2





BEFORE MODIFICATION

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AFTER MODIFICATION

Figure C- 1. Snap ring pliers.  
Change 2 C-3

C-2. PROCEDURE (cont)

MATERIAL BLOCK

ITEM NO.	DESCRIPTION	SPECIFICATION	REMARKS																																										
2	TOOL, ALIGNMENT		<p>Require 5-in. steel stock.            Fabricate from steel stock as required using pins and screws locally available.            All dimensions are shown in inches.</p> <p>CONVERSIONS</p> <table border="0"> <thead> <tr> <th>IN.</th> <th>MM</th> </tr> </thead> <tbody> <tr><td>0.0005</td><td>0.127</td></tr> <tr><td>0.001</td><td>0.025</td></tr> <tr><td>0.002</td><td>0.051</td></tr> <tr><td>0.005</td><td>0.127</td></tr> <tr><td>0.025</td><td>0.635</td></tr> <tr><td>0.031</td><td>0.787</td></tr> <tr><td>0.500</td><td>12.700</td></tr> <tr><td>0.625</td><td>15.875</td></tr> <tr><td>0.750</td><td>19.050</td></tr> <tr><td>0.875</td><td>22.225</td></tr> <tr><td>1.000</td><td>25.400</td></tr> <tr><td>1.141</td><td>28.981</td></tr> <tr><td>1.459</td><td>37.059</td></tr> <tr><td>1.500</td><td>38.100</td></tr> <tr><td>1.718</td><td>43.637</td></tr> <tr><td>2.600</td><td>66.040</td></tr> <tr><td>2.918</td><td>74.117</td></tr> <tr><td>3.125</td><td>79.375</td></tr> <tr><td>3.436</td><td>87.274</td></tr> <tr><td>4.875</td><td>123.825</td></tr> </tbody> </table>	IN.	MM	0.0005	0.127	0.001	0.025	0.002	0.051	0.005	0.127	0.025	0.635	0.031	0.787	0.500	12.700	0.625	15.875	0.750	19.050	0.875	22.225	1.000	25.400	1.141	28.981	1.459	37.059	1.500	38.100	1.718	43.637	2.600	66.040	2.918	74.117	3.125	79.375	3.436	87.274	4.875	123.825
IN.	MM																																												
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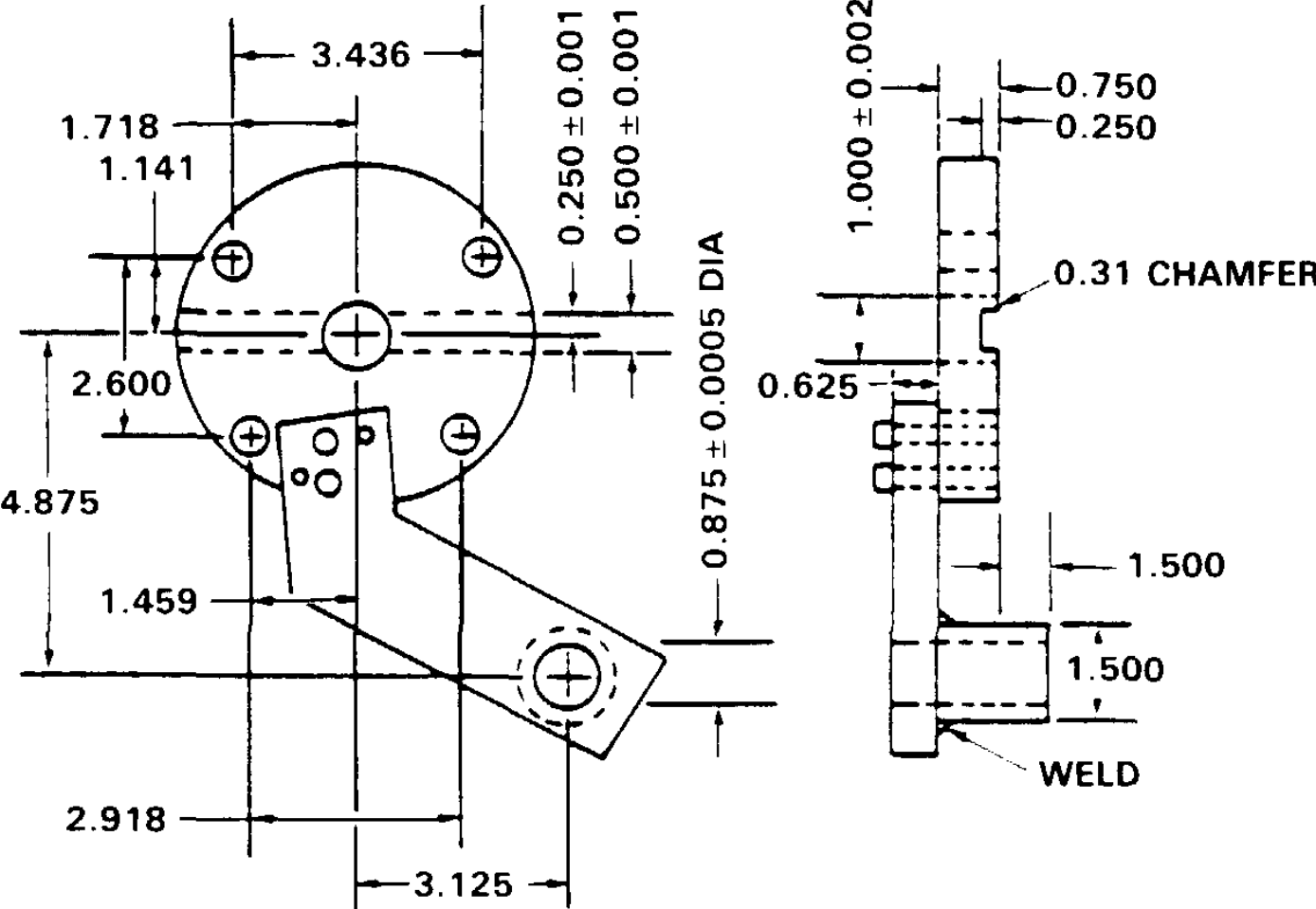


Figure C-2. Alignment tool.

Change 2 C-5/(C-6 blank)

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**C**

Categories of Inspection (See Specific Item.)

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\*DS-Direct Support  
GS-General Support

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\*DS-Direct Support  
GS-General Support



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\*DS-Direct Support  
GS-General Support

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\*DS-Direct Support  
GS-General Support

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\*DS-Direct Support  
GS-General Support

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		*DS-Direct Support
		GS-General Support

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METRIC CHART

UNITS OF MEASURE

When units of length, distance, temperature, weight, torque, or pressure are used in this manual, US customary and metric units are shown. Units of time and angle are the same for US customary and metric systems. No equal units are shown for seconds, minutes, hours, degrees of angle, and

mils. US customary units are shown first with the equal metric units shown in parentheses. The list below shows the differences between US customary and metric units with symbols.

US CUSTOMARY

METRIC

LENGTH AND DISTANCE

inch: 1 in .....	25.40 mm: millimeters or 2.54 cm: centimeters
foot: 1 ft .....	30.48 cm or 0.30 m: meter
yard: 1 yd .....	91.44 cm or 0.91 m

TEMPERATURE

degree Fahrenheit: 10 F .....	0.555° C: degree Celsius
-------------------------------	--------------------------

WEIGHT

pound: 1 lb .....	0.4536kg: kilogram
-------------------	--------------------

TORQUE

inch-ounce: 1 in.-oz .....	0.0071 N-m: Newton/meter
inch-pound: 1 in.4b .....	0.1130N-m: Newton/meter

PRESSURE

pounds/square inch: 1 psi .....	0.07 kg/cm2: kilograms/ centimeters squared
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**TM 9-1340-375-34 - FIRE CONTROL EQUIPMENT for HOWITZER,  
MEDIUM, TOWED: 155-MM, M198 (1979)**

**PIN: 046399-000**