

TECHNICAL MANUAL

DIRECT SUPPORT

AND GENERAL SUPPORT

MAINTENANCE MANUAL

PART 5

MAINTENANCE

TURRET

FOR

COMBAT ENGINEER VEHICLE,

M728

(2350-00-795-1797)

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HEADQUARTERS, DEPARTMENT OF THE ARMY

This manual is a reprint including
changes 1-4

OCTOBER 1980

CHANGE

No. 4

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**Technical Manual
Direct Support and General Support
Maintenance Manual**

**Part 5
Maintenance**

**TURRET
FOR
COMBAT ENGINEER VEHICLE,
M728
(2350-00-795-1797)**

TM 9-2350-222-34-2-5, 10 October 1980, is changed as follows:

1. Remove old pages and insert new pages as indicated below
2. New or changed material is indicated by a vertical bar in the margin of the page.

Remove Pages

i and ii
None

Insert Pages

i and ii
32-1 and 32-2

3. File this change sheet in front of the publication for reference purposes.

By Order of the Secretary of the Army:

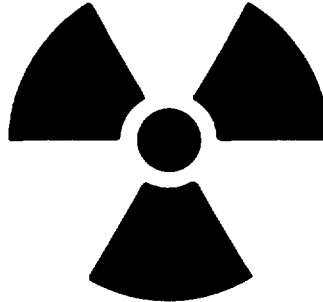
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Direct and General Support Maintenance, Requirements for TM 9-2350-222-34-2-5.

**WARNING
RADIATION HAZARD**



Azimuth dial pointers in indicator may be tipped with radioactive material. This becomes dangerous when dial window is broken or removed. When this happens, make repairs as soon as possible.

If dial window is broken or removed, all maintenance must be done at depot level only, except replacement of lamps or replacement of whole indicator unit.

Protecting, handling, storing, and getting rid of radioactive material must be done in accordance with TB MED-232 and TB 750-237.



When placing the turret (elev/trav) power switch in the ON position, ensure that the gunner's power control handles are not displaced. If handles are displaced, rapid movements of the turret traverse in azimuth may result in fatal injury.



When turret is in the power mode the gun will elevate and depress without depressing the magnetic brake switch on the gunner's control handles.



Assure crew are in safe positions and driver has lowered his seat and has head down before operating in power or manual traversing or elevating modes.



Do not release magnetic brake switch or override in magnetic brake actuator while traversing until gunner's or commander's power control is returned to neutral position. This will reduce unnecessary wear and/or damage to magnetic brake.

WARNING

Be careful when working around pressurized parts. Hydraulic fluid under pressure can hurt you.

WARNING

Before charging main accumulator, hydraulic system pressure must be lowered to 0 psi. Hydraulic fluid under pressure can hurt you.

WARNING

Before draining hydraulic system, pressure must be lowered to 0 psi. Hydraulic fluid under pressure can hurt you.

WARNING

Before removing hydraulic tubes, hydraulic system pressure must be lowered to 0 psi. Hydraulic fluid under pressure can hurt you.

WARNING

Before traversing turret, make sure gun will not hit anything if turret is traversed. If necessary, move vehicle.

WARNING

Nitrogen under pressure can hurt you. Keep fingers and hands clear of valve while letting out nitrogen. Let nitrogen out slowly.

Technical Manual
 No. 9-2350-222 -34-2-5

HEADQUARTERS,
 DEPARTMENT OF THE ARMY
 Washington, D. C., 10 October 1980

**Technical Manual
 Direct Support and General Support
 Maintenance Manual**

**Part 5
 Maintenance**

**TURRET
 FOR
 COMBAT ENGINEER VEHICLE,
 M728
 (2350-00-795-1797)**

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 directly to:

Commander
 U. S. Army Armament, Munitions and Chemical Command
 ATTN: AMSMC-MAS
 Rock Island, IL 61299-6000

A reply will be furnished to you.

*This manual in conjunction with TM 9-2350-222-34-2-1, TM 9-2350-222-34-2-2, TM 9-2350-222-34-2-3, and TM 9-2350-222-34-2-4 supersedes so much of the DS/GS portion of TM 9-2300-378-35/2, January 1968, as pertains to the M728 CEV, so much of the DS/GS Portion of TM 9-2350-222-35/2, October 1965, as pertains to the M728 CEV, and so much of the DS/GS portion of TM 9-2300-378-35/1, January 1968, as pertains to the Slipping Assembly, Turret and Miscellaneous Components for the M728 CEV, including all changes.

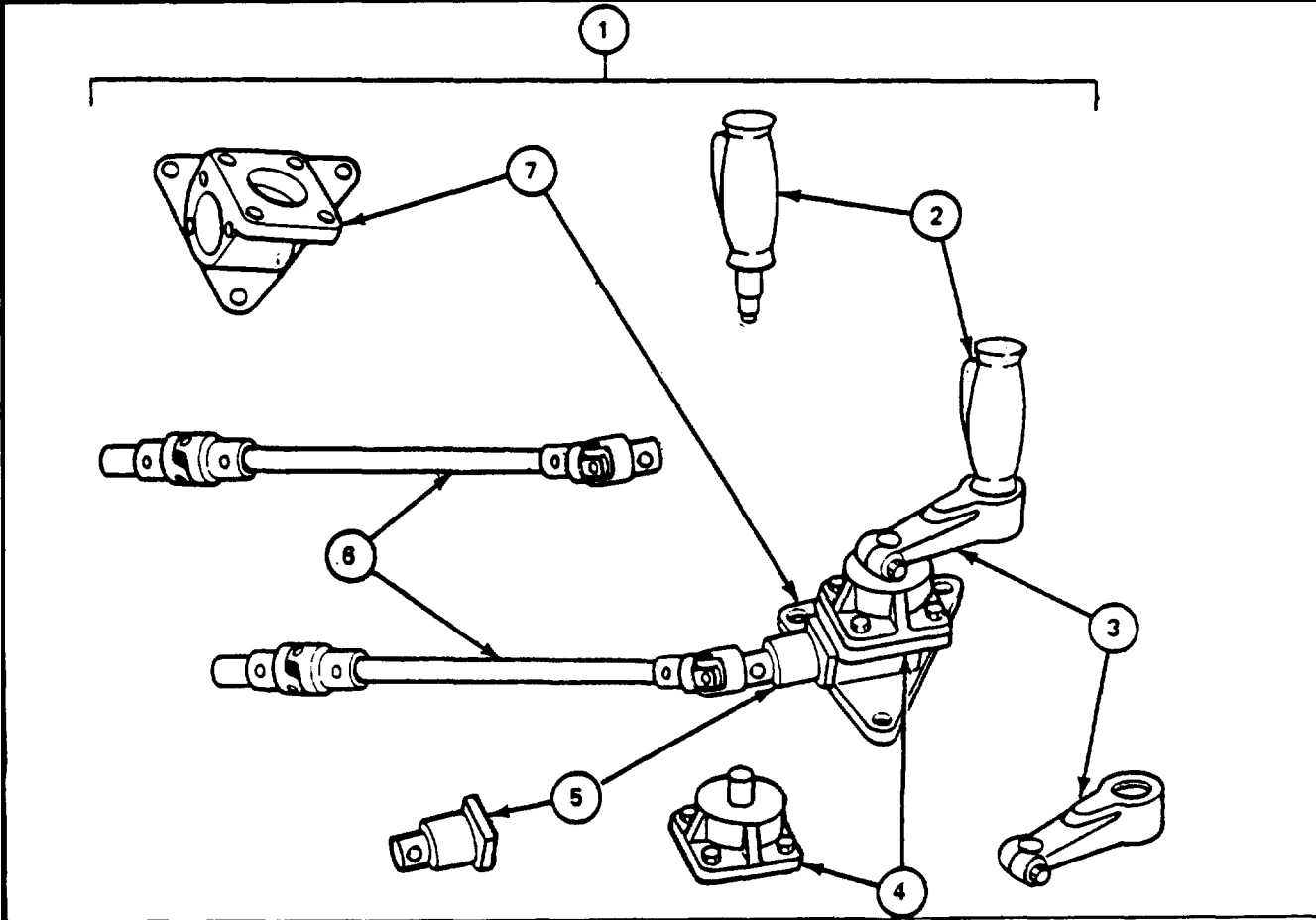
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CHAPTER 19
HAND TRAVERSING DRIVE

19-1. MAINTENANCE PROCEDURES INDEX

Equipment Item	Test	Tasks				
		Removal	Installation	Disassembly	Assembly	Repair
1. Hand Traversing Drive	19-2			19-3	19-4 . . .	
2. Crank Handle	. . .	19-5	19-6	19-7	19-8 . . .	
3. Crank Arm	. . .	19-9	19-10	19-11	19-12	19-13
4. Drive Gear	. . .	19-14	19-15	. . .	. . .	19-16
5. Output Gear	. . .	19-17	19-18	. . .	. . .	19-19
6. Driveshaft	. . .	19-20	19-21	19-22	19-23 . . .	
7. Housing	. . .	19-17	19-18	. . . . .	. . . . .



19-2. HAND TRAVERSING DRIVE TEST PROCEDURE

TOOLS: Vise

PERSONNEL: One

REFERENCES TM 9-2350-222-20-2-3 for procedure to remove hand traversing drive

EQUIPMENT CONDITION: Hand traversing drive removed (TM-20-2-3)

GENERAL INSTRUCTIONS:

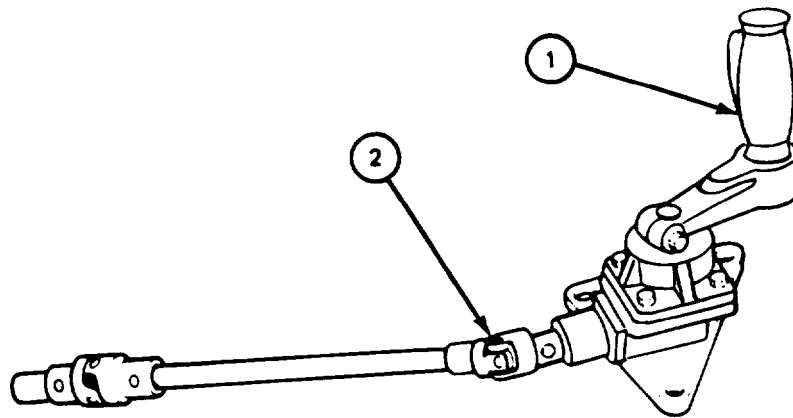
NOTE

If normal indication is not obtained, replace bad part listed in Probable Fault column. Refer to section index (para 19-1) for replacement of bad part.

19-2. HAND TRAVERSING DRIVE TEST PROCEDURE (CONT)

FRAME 1

Step	Procedure	Normal Indication	Probable Fault
1.	Place hand traversing drive (1) housing in vise and allow driveshaft (2) to hang downward.		
2.	Unlock and turn handle (1) clockwise two turns.	Handle (1) turns freely without binding.	Bad output gear or bad drive gear.
3.	Unlock and turn handle (1) counterclockwise two turns.	Handle (1) turns freely without binding.	Bad output gear or bad drive gear.
<p>NOTE</p> <p>If normal indication was obtained in steps 1 and 2, hand traversing drive (1) is good.</p> <p>END OF TASK</p>			



19-3. HAND TRAVERSING DRIVE DISASSEMBLY PROCEDURE

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to remove hand traversing drive

EQUIPMENT CONDITION: Hand traversing drive removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test hand traversing drive (para 21-2)

FRAME 1		
Step	Procedure	
1.	Remove crank handle (para 19-5).	
2.	Remove crank arm (para 19-9).	
3.	Remove drive gear (para 19-14).	
4.	Remove output gear and housing (para 19-17).	
5.	Disassemble crank handle (para 19-7).	
6.	Disassemble crank arm (para 19-11).	
7.	Disassemble driveshaft (para 19-22).	
END OF TASK		

19-4. HAND TRAVERSING DRIVE ASSEMBLY PROCEDURE

PERSONNEL: One

FRAME 1	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 4. 5. 6. 7. 	<p>Assemble driveshaft (para 19-23).</p> <p>Assemble crank arm (para 19-12).</p> <p>Assemble crank handle (para 19-8).</p> <p>Install output gear and housing (para 19.18).</p> <p>Install crank arm (para 19-10).</p> <p>Install crank handle (para 19-6).</p> <p>Install drive gear (para 19-15).</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Test hand traversing drive (para 19-2).</p> <p>END OF TASK</p>

19-5. CRANK HANDLE REMOVAL PROCEDURE

TOOLS: External retaining ring pliers
 20 ounce ball peen hammer
 1/4" brass drift pin punch
 Scraper
 Stiff bristled brush
 Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
 Crocus cloth (item 7, App. A)

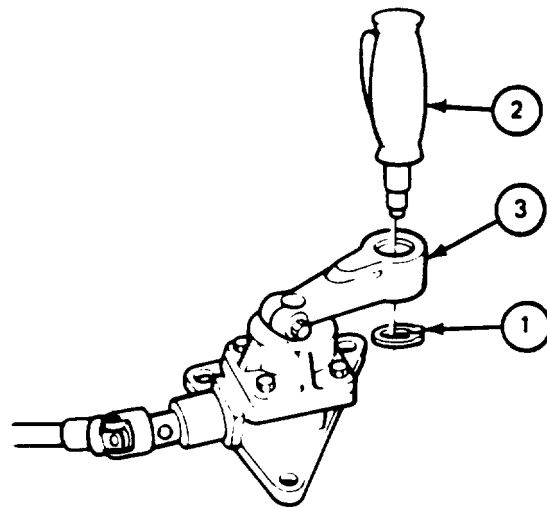
PERSONNEL: One

REFERENCES: TM 5-2350-222-20-2-3 for procedure to remove hand traversing drive
 JPG for procedures to:
 Use retaining ring pliers
 Clean parts
 Inspect and repair parts

EQUIPMENT CONDITION: Hand traversing drive removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test hand traversing drive (para 19-2)

FRAME 1	
Step	Procedure
1.	Using pliers, remove retaining ring (1) that attaches crank handle (2) to crank arm (3) (JPG).
2.	Using hammer and punch, tap crank handle (2) from crank arm (3). Remove crank handle.
NOTE	
Follow-on Maintenance Action Required:	
Clean all parts (JPG). Inspect and repair all parts (JPG).	
END OF TASK	



19-6. CRANK HANDLE INSTALLATION PROCEDURE

TOOLS: External retaining ring pliers
3/32" socket head screw key (Allen wrench)

PERSONNEL: One

REFERENCES: JPG for procedure to use retaining ring pliers

PRELIMINARY PROCEDURES: Assemble crank handle (para 19-8)

FRAME 1	
Step	Procedure
1. 2. 3.	Put crank handle (1) in crank arm (2). Using pliers, attach crank handle (1) to crank arm (2) with retaining ring (3) (JPG). Using Allen wrench, adjust setscrew (4) so that shaft (5) rests against locking lever (6) when locked to housing (7). END OF TASK

19-7. CRANK HANDLE DISASSEMBLY PROCEDURE

TOOLS: 20 ounce ball peen hammer
 5/32" drive pin punch
 3/32" socket head screw key (Allen wrench)
 Vise
 Scraper
 Stiff bristled brush
 Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
 Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
 Clean parts
 Inspect and repair parts

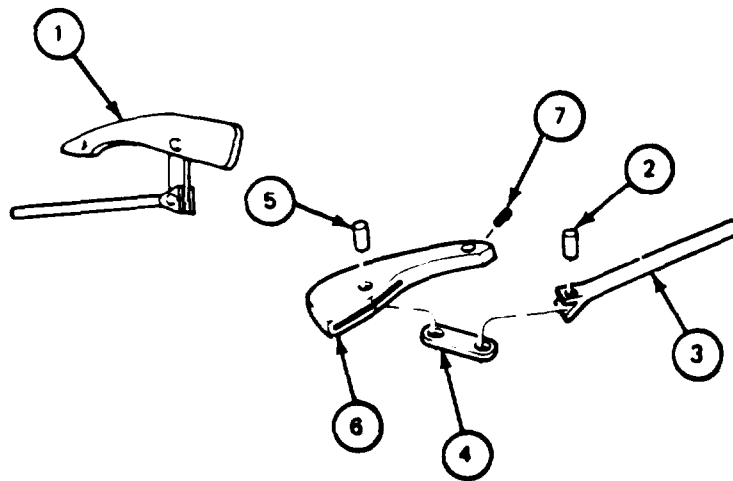
PRELIMINARY PROCEDURES: Test hand traversing drive (para 19-2)
 Remove crank handle (para 19-5)

FRAME 1	
Step	Procedure
	NOTE
	Pin (1) may be located on either end of crank handle (3).
1.	Using hammer and punch, remove pin (1) that attaches lever (2) in crank handle (3).
2.	Remove lever (2) from crank handle (3).
	GO TO FRAME 2

19-7. CRANK HANDLE DISASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
<ol style="list-style-type: none"> 1. Put lever (1) in vise. 2. Using hammer and punch, remove pin (2) that attaches shaft (3) to link (4). 3. Remove shaft (3). 4. Using hammer and punch, remove pin (5) that attaches link (4) to lever (6). 5. Remove link (4). 6. Using Allen wrench, remove setscrew (7) from lever (6). 	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Clean all parts (JPG). Inspect and repair all parts (JPG).</p> <p>END OF TASK</p>



19-8. CRANK HANDLE ASSEMBLY PROCEDURE

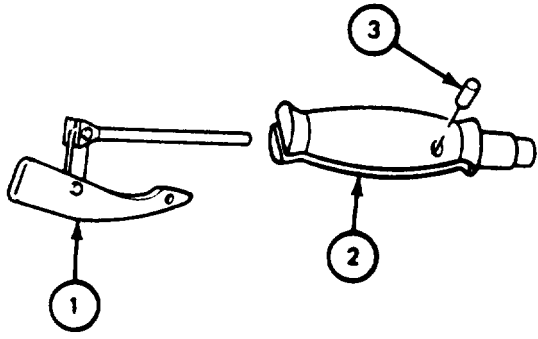
TOOLS: 20 ounce ball peen hammer
 3/32" socket head screw key (Allen wrench)

SUPPLIES: Grease (item 14, App. A)

PERSONNEL: One

FRAME 1	
Step	Procedure
1.	Put link (1) in handle lever (2).
2.	Using hammer, put in pin (3) that attaches link (1) to handle lever (2).
3.	Put shaft (4) on link (1).
4.	Using hammer, put in pin (5) that attaches shaft (4) to link (1).
5.	Put a light coat of grease on shaft (4).
6.	Using Allen wrench, put setscrew (6) in handle lever (2).
	GO TO FRAME 2

19-8. CRANK HANDLE ASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
1.	<p>Put lever (1) in crank handle (2). Line up hole in lever with hole in crank handle,</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Pin (3) may be located on either end of crank handle (2).</p>
2.	<p>Using hammer and punch, put in pin (3) that attaches lever (1) in crank handle (2).</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required: Install crank handle (para 19-6).</p> <p>END OF TASK</p> <div style="text-align: center; margin-top: 20px;">  </div>

19-9. CRANK ARM REMOVAL PROCEDURE

TOOLS: 1/2" combination wrench
 Plastic face hammer
 Scraper
 Stiff bristled brush
 Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
 Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
 Clean parts
 Inspect and repair parts

PRELIMINARY PROCEDURES: Test hand raversing drive (para 19-2)
 Remove crank handle (para 19-5)

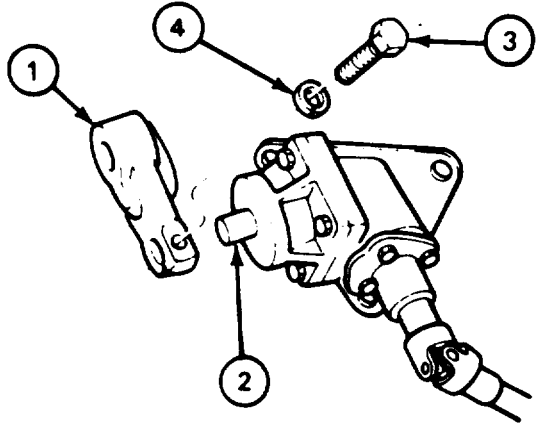
FRAME 1	
Step	Procedure
1.	Using wrench, remove screw (1) and lockwasher (2) that attach crank arm (3) to drive gearshaft (4).
2.	Using hammer, tap crank arm (3) from drive gearshaft (4). Remove crank arm.
	NOTE
	Follow-on Maintenance Action Required:
	Clean all parts (JPG).
	Inspect and repair all parts (JPG).
	Repair bad bearing in crank arm (para 19-13) after disassembly (para 19-11).
	END OF TASK

19-10. CRANK ARM INSTALLATION PROCEDURE

TOOLS: 1/2" combination wrench

PERSONNEL: One

PRELIMINARY PROCEDURES: Assemble crank arm (para 19-12)

FRAME 1	
Step	Procedure
<ol style="list-style-type: none"> 1. Put crank arm (1) on drive gearshaft (2). 2. Put screw (3) with lockwasher (4) through flat side of crank arm (1). 3. Using wrench, attach crank arm (1) to drive gearshaft (2) with screw (3) and lockwasher (4). 	<p>NOTE</p> <p>Follow-on Maintenance Action Required: Install crank handle (para 19-6).</p> <p>END OF TASK</p>
 <p>The diagram illustrates the assembly process. It shows a crank arm (1) being attached to a drive gearshaft (2). A screw (3) and a lockwasher (4) are used to secure the crank arm to the gearshaft. The crank arm is shown in a position where it is being slid onto the gearshaft, and the screw and lockwasher are shown being inserted through the flat side of the crank arm to secure it.</p>	

19-11. CRANK ARM DISASSEMBLY PROCEDURE

TOOLS: 20 ounce ball peen hammer
5/32" drive pin punch
Scraper
Stiff bristled brush
Fine stone

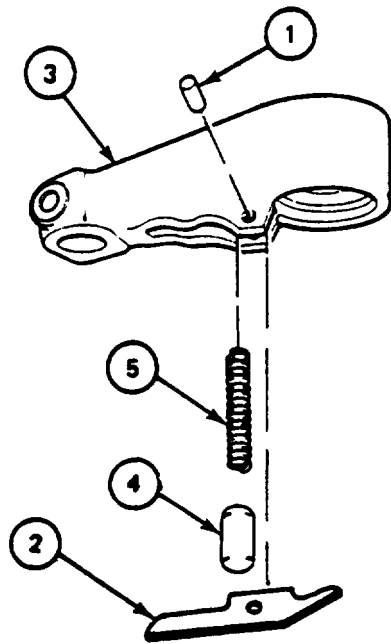
SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Test hand traversing drive (para 19-2)
Remove crank handle (para 19-5)
Remove crank arm (para 19-9)

FRAME 1		
Step	Procedure	
	<div data-bbox="662 1108 881 1188" style="text-align: center; border: 1px solid black; padding: 5px;">WARNING</div> <p data-bbox="418 1234 1130 1325" style="text-align: center;">Spring (5) can fly out. Place crank arm (3) so that when spring is let go, spring does not hit you but falls on work bench.</p> <ol data-bbox="152 1346 1382 1461" style="list-style-type: none">1. Using hammer and punch, remove pin (1) that attaches locking lever (2) to crank arm (3).2. Remove locking lever (2), plunger (4), and spring (5). <p data-bbox="215 1476 431 1507">END OF TASK</p>	

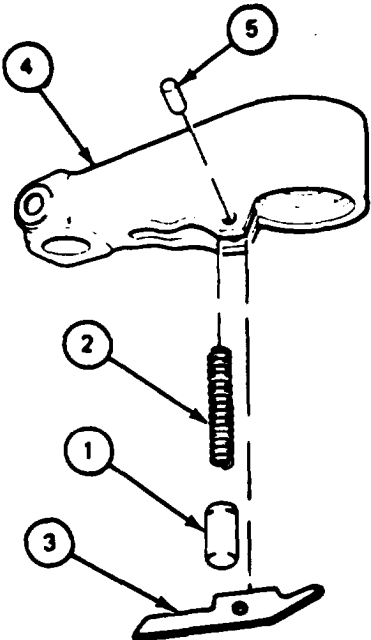


19-12. CRANK ARM ASSEMBLY PROCEDURE

TOOLS: 20 ounce ball peen hammer
 5/32" drive pin punch

SUPPLIES: Grease (item 14, App. A)

PERSONNEL: One

FRAME 1	
Step	Procedure
1.	Put a light coat of grease on plunger (1).
	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">WARNING</div> <p style="text-align: center; margin-top: 10px;">When compressing spring (2), take care spring does not release and hurt you.</p>
2.	Put spring (2), plunger (1), and locking lever (3) in crank arm (4). Line up hole in lever (3) and hole in crank arm (4).
3.	Using hammer and punch, put in pin (5) that attaches lever (3) to crank arm (4).
	<p>NOTE</p> Follow-on Maintenance Action Required: Install crank arm (para 19-10).
	END OF TASK
	

19-13. CRANK ARM REPAIR PROCEDURE

SUPPLIES: Needle bearing (B138XOH)
Ball bearing (7122 14)
Retaining ring (MS- 16625-1165)
Grease (item 14. App. A)

PERSONNEL: One

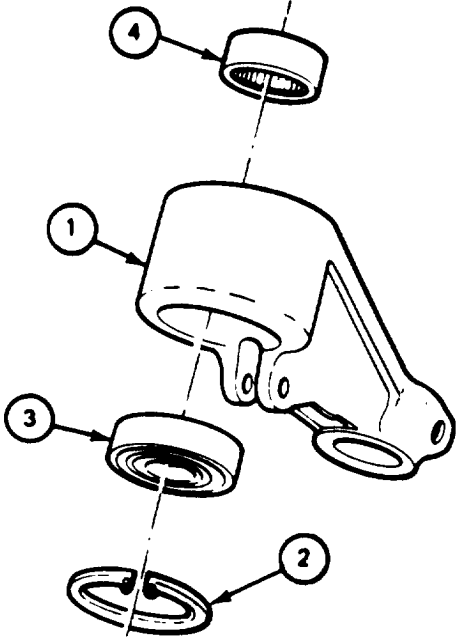
REFERENCES: JPG for procedure to grease bearings

GENERAL INSTRUCTIONS:

NOTE

Procedure is used to replace needle bearing and ball bearing in crank arm.

19-13. CRANK ARM REPAIR PROCEDURE (CONT)

FRAME 1	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 	<p>Grease new bearings (JPG).</p> <p style="text-align: center;">SUPPORT SHOP WORK</p> <p>Take crank arm (1) and repair parts to shop where bearing press and measuring equipment are available.</p> <ol style="list-style-type: none"> a. Remove retaining ring (2), bad ball bearing (3), or bad needle bearing (4). b. Install new needle bearing (4), or new ball bearing (3), and new retaining ring (2). Install needle bearing flush to 0.03" below machined surface of crank arm (1). <p>After support shop work, return crank arm (1) to turret shop.</p> <p>END OF TASK</p>
 <p>The diagram shows an exploded view of a crank arm assembly. A central vertical dashed line indicates the axis of rotation. Callout 1 points to the main crank arm body. Callout 2 points to a retaining ring at the bottom. Callout 3 points to a ball bearing in the middle. Callout 4 points to a needle bearing at the top. The components are arranged vertically along the axis, showing their relative positions in the assembly.</p>	

19-14. DRIVE GEAR REMOVAL PROCEDURE

TOOLS: 7/16" combination wrench
 Plastic face hammer
 Scraper
 Stiff bristled brush
 Fine stone

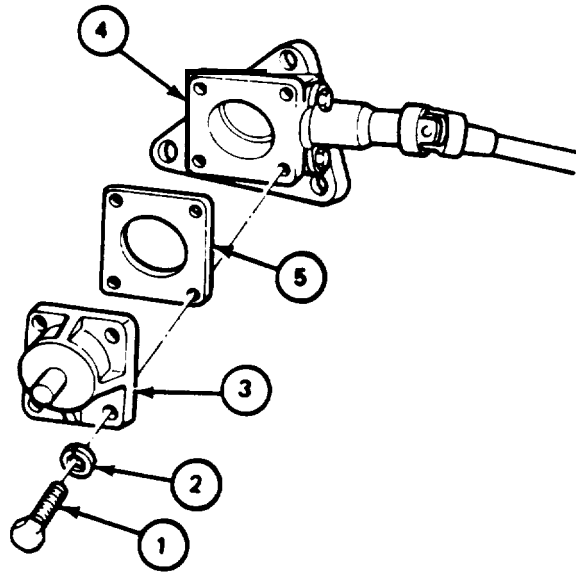
SUPPLIES: Dry cleaning solvent (item 33, App. A)
 Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: JPG .-or procedures to:
 Clean parts
 Inspect and repair parts

PRELIMINARY PROCEDURES: Test hand traversing drive (para 19-2)
 Remove crank handle (para 19-5)
 Remove crank arm (para 19-9)

FRAME 1	
Step	Procedure
1.	Using wrench, remove four screws (1) and four lockwashers (2) that attach drive gear (3) to housing (4).
2.	Using hammer, tap drive gear (3) from housing (4). Remove drive gear (3) and shims (5).
NOTE	
Follow-on Maintenance Action Required:	
Clean all parts (JPG).	
Inspect and repair all parts (JPG).	
Repair bad bearing in drive gear housing (para 19-16).	
END OF TASK	



19-15. DRIVE GEAR INSTALLATION PROCEDURE

TOOLS: 7/16" combination wrench

SUPPLIES: Shim (7365052)
Grease (item 14, App. A)

PERSONNEL: One

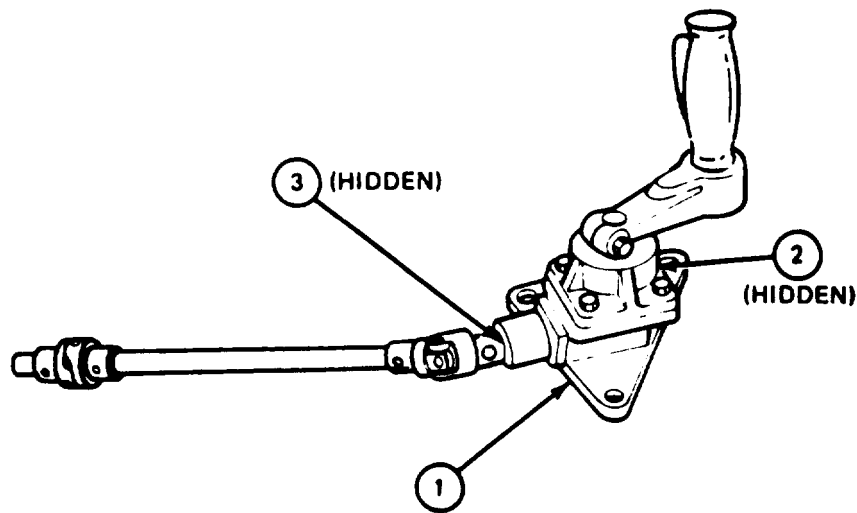
PRELIMINARY PROCEDURES: Install output gear (para 19-18)
Assemble crank arm" (para 19-12)
Install crank arm (para 19-10)
Assemble crank handle (para 19-8)
Install crank handle (para 19-6)

FRAME 1	
Step	Procedure
1.	Put a light coat of grease on teeth of drive gear (1).
2.	Put shim (2) over drive gear (1).
NOTE	
Position drive gear (1) with notch to left.	
3.	Using wrench, attach drive gear (1) to housing (3) with four screws (4) and four lockwashers (5).
GO TO FRAME 2	

19-15. DRIVE GEAR INSTALLATION PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	<p style="text-align: center;">SUPPORT SHOP WORK</p> <p>Take hand traversing drive (1) to support shop where dial indicator is available.</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Proper backlash between drive gear (2) and output gear (3) is 0.000 to 0.003 inch.</p> <p>2. Measure for proper backlash.</p> <p>3. If backlash is bad, add to or subtract from shim at drive gear (2) and output gear (3) as needed. Repeat step 2.</p> <p>4. After support shop work, return hand traversing drive (1) to turret shop.</p> <p>END OF TASK</p>



19-16. DRIVE GEAR REPAIR PROCEDURE

SUPPLIES: Needle bearing (MS17131-23)
Ball bearing (712215)
Grease (item 14. App. A)

PERSONNEL: One

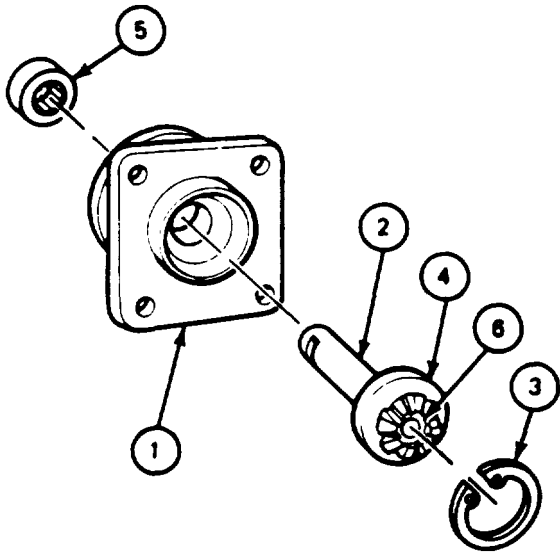
REFERENCES: JPG for procedure to grease bearings

GENERAL INSTRUCTIONS:

NOTE

Procedure is used to replace needle bearing and ball bearing in drive gear housing.

19-16. DRIVE GEAR REPAIR PROCEDURE (CONT)

FRAME 1	
Step	Procedure
1.	Grease new bearings (JPG).
	SUPPORT SHOP WORK
2.	Take housing (1) with drive gearshaft (2), and repair parts to support shop where bearing puller, press, and measuring equipment are available. <ul style="list-style-type: none"> a. Remove retaining ring (3) and drive gearshaft (2). b. Remove bad ball bearing (4) or bad needle bearing (5). c. Install new ball bearing (4) or new needle bearing (5). Install needle bearing flush to 0.03" below machined surface of housing (1). d. Install drive gearshaft (2) and retaining ring (3).
3.	After support shop work, return housing (1) with drive gearshaft (2) to turret shop. END OF TASK
 <p>The diagram shows an exploded view of a drive gear assembly. Part 1 is a square housing with four mounting holes. Part 2 is a drive gearshaft with a gear. Part 3 is a retaining ring. Part 4 is a ball bearing. Part 5 is a needle bearing. Part 6 is a component that fits between the housing and the gearshaft. Arrows indicate the assembly sequence and relative positions of the parts.</p>	

19-17. OUTPUT GEAR OR HOUSING REMOVAL PROCEDURE

TOOLS: 7/16" combination wrench
 Plastic face hammer
 Scraper
 Stiff bristled brush
 Fine stone

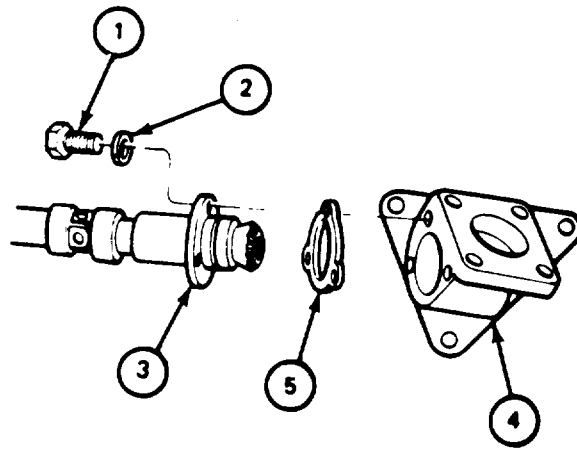
SUPPLIES: Dry cleaning solvent (item 33, App. A)
 Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
 Clean parts
 Inspect and repair parts

PRELIMINARY PROCEDURES: Test hand traversing drive (para 19-2)
 Remove crank handle (para 19-5)
 Remove crank arm (para 19-9)
 Remove drive gear (para 19-14)

FRAME 1	
Step	Procedure
1.	Using wrench, remove three screws (1) and three lockwashers (2) that attach output gear (3) to housing (4).
2.	Using hammer, tap output gear (3) from housing (4). Remove output gear (3) and shims (5).
NOTE	
Follow-on Maintenance Action Required:	
Clean all parts (JPG).	
Inspect and repair all parts (JPG).	
Repair bad bearing in output gear (para 19-19) after disassembly (para 19-22).	
END OF TASK	



19-18. OUTPUT GEAR OR HOUSING INSTALLATION PROCEDURE

TOOLS: 7/16" combination wrench

SUPPLIES: Shim (7365051)
Grease (hem 14, App. A)

PERSONNEL: One

PRELIMINARY PROCEDURES: Install driveshaft (para 19-21)

FRAME 1	
Step	Procedure
	<p>NOTE</p> <p>Proper backlash between output gear (2) and drive gear is needed for proper operation. Backlash is checked during drive gear installation (para 19-15).</p>
<ol style="list-style-type: none"> 1. Put shim (1) over output gear (2). 2. Put a light coat of grease on teeth of output gear (2). 3. Put output gear (2) in housing (3). 4. Using wrench, put in three screws (4), and three Lockwashers (5) that attach output gear (2) in housing (3). 	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required: install drive gear (para 19-15).</p> <p>END OF TASK</p>

19-19. OUTPUT GEAR REPAIR PROCEDURE

SUPPLIES: Ball bearing (7973659)
Needle bearing (MS17131-44)
Grease (item 14, App. A)

PERSONNEL: One

REFERENCES JPG for procedures to grease bearings

GENERAL INSTRUCTIONS:

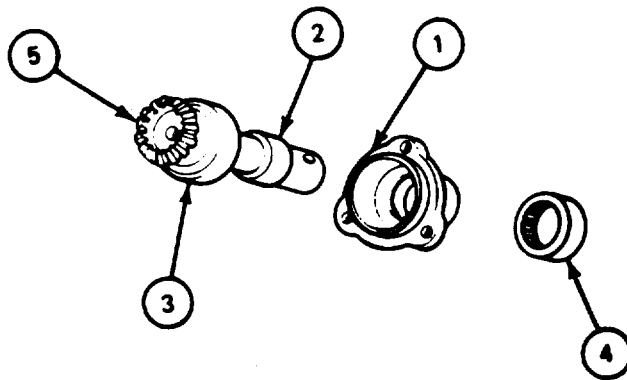
NOTE

Procedure is used to replace ball bearing in output gear housing and needle bearing in output gears housing extension.

19-19. OUTPUT GEAR REPAIR PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Grease new bearings (JPG).
SUPPORT SHOP WORK	
2.	Take housing extension (1) with output gearshaft (2), and repair parts to support shop where bearing puller, press, and measuring equipment are available. <ul style="list-style-type: none"> a. Remove bad ball bearing (3) or bad needle bearing (4). b. Grease new bearing (3) or (4), and gear teeth (5). c. Install new needle bearing (4) or new ball bearing (3). Install needle bearing flush to 0.03" below machined surface of housing extension (1).
3.	After support shop work, return housing extension (1) with output gearshaft (2) to turret shop.
END OF TASK	



19-20. DRIVESHAFT REMOVAL PROCEDURE

TOOLS: 20 ounce ball peen hammer
 Plastic face hammer
 5/32" drive pin punch
 Cold chisel (1/4" w cut, 4" lg)
 Flat file
 Vise
 Scraper
 Stiff bristled brush

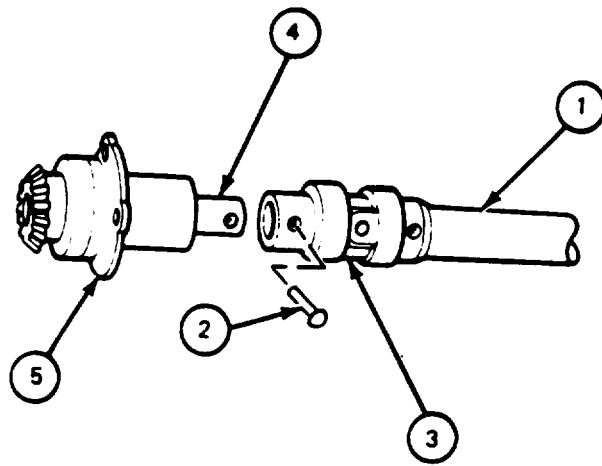
SUPPLIES: Dry cleaning solvent (item 33, App. A)
 Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
 Remove rivets
 Clean parts
 Inspect and repair parts

PRELIMINARY PROCEDURES: Test hand traversing drive (para 19-2)
 Remove crank handle (para 19-5)
 Remove crank arm (para 19-9)
 Remove drive gear (para 19-14)
 Remove output gear (para 19-17)

FRAME 1	
Step	Procedure
1.	Put driveshaft (1) in vise.
2.	Using ball peen hammer, chisel, file, and punch, remove rivet (2) that attaches universal joint (3) to output gearshaft (4) (JPG).
3.	Remove universal joint (3) from output gearshaft (4).
4.	Using plastic face hammer, tap output gearshaft (4) from housing extension (5).
5.	Remove driveshaft (1) from vise.
NOTE	
Follow-on Maintenance Action Required:	
Clean all parts (JPG).	
Inspect and repair all parts (JPG).	
END OF TASK	



19-21. DRIVESHAFT INSTALLATION PROCEDURE

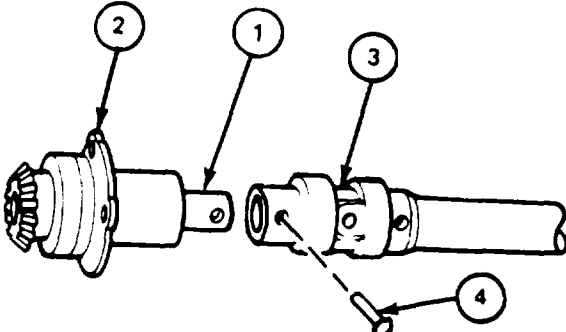
TOOLS: 20 ounce ball peen hammer
 7/32" drive pin punch
 Droll motor
 0.223 to 0.224" reamer

SUPPLIES: Rivet (102661)

PERSONNEL: One

REFERENCE: JPG for procedure to install rivets

PRELIMINARY PROCEDURES: Driveshaft assembled (para 19-23)

FRAME 1	
Step	Procedure
<ol style="list-style-type: none"> 1. Put output gearshaft (1) in housing extension (2). 2. Using drill motor and reamer, ream existing hole in output gearshaft (1) and hole in universal joint (3). Remove all sharp edges and burrs from holes. 3. Line up hole in output gearshaft (1) with hole on universal joint (3). 4. Using hammer and punch. attach universal joint (3) to output gearshaft with rivet (4) (JPG). 	<p>NOTE</p> <p>Follow-on Maintenance Action Required: Install output gear (para 19-17).</p> <p>END OF TASK</p>
	

19-22. DRIVESHAFT DISASSEMBLY PROCEDURE

TOOLS: 20 ounce ball peen hammer
Cold chisel (1/4" w cut, 4" lg)
5/32" drive pin punch
Flat file
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

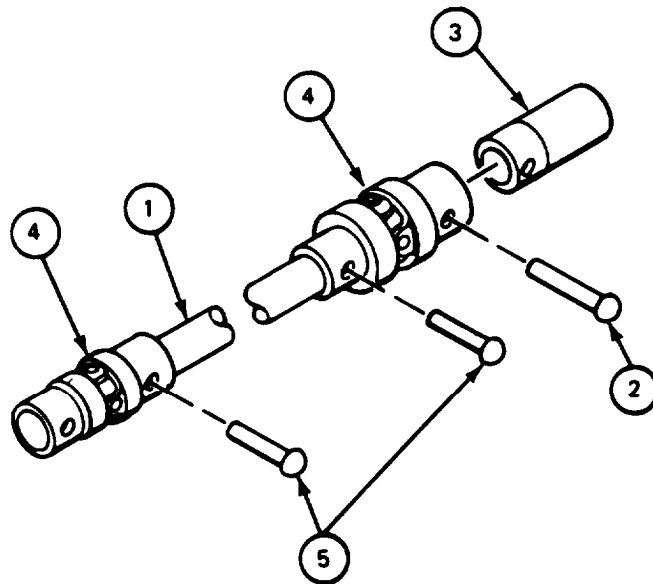
REFERENCES: JPG for procedures to:
Remove rivets
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Test hand traversing drive (para 19-2)
Remove crank handle (para 19-5)
Remove crank arm (para 19-9)
Remove drive gear (para 19-14)
Remove output gear (para 19-17)
Remove driveshaft (para 19-20)

19-22. DRIVESHAFT DISASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
<ol style="list-style-type: none"> 1. Put drive tube (1) in vise. 2. Using hammer, chisel, file, and punch, remove rivet (2) that attaches adapter (3) to universal joint (4) (JPG). 3. Remove adapter (3). 4. Using hammer, chisel, file, and punch, remove two rivets (5) that attach two universal joints (4) to drive tube (1) (JPG). 5. Remove universal joints (4) from drive tube (1). 6. Remove drive tube (1) from vise. 	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Clean all parts (JPG). Inspect and repair all parts (JPG).</p> <p>END OF TASK</p>



19-23. DRIVESHAFT ASSEMBLY PROCEDURE

TOOLS: 20 ounce ball peen hammer
7/32" drive pin punch
Drill motor
0.223" to 0.224" reamer

SUPPLIES: Rivets (102661) (three)

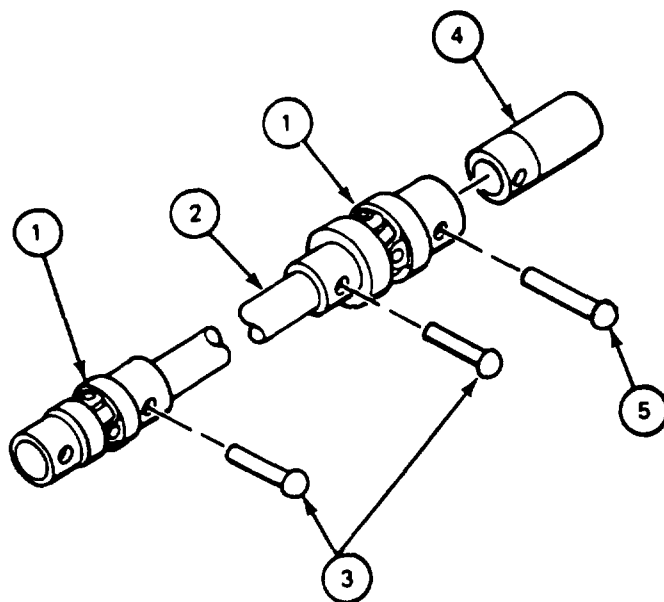
PERSONNEL: One

REFERENCES: JPG for procedure to install rivets

19-23. DRIVESHAFT ASSEMBLY PROCEDURE (CONT)

FRAME 1

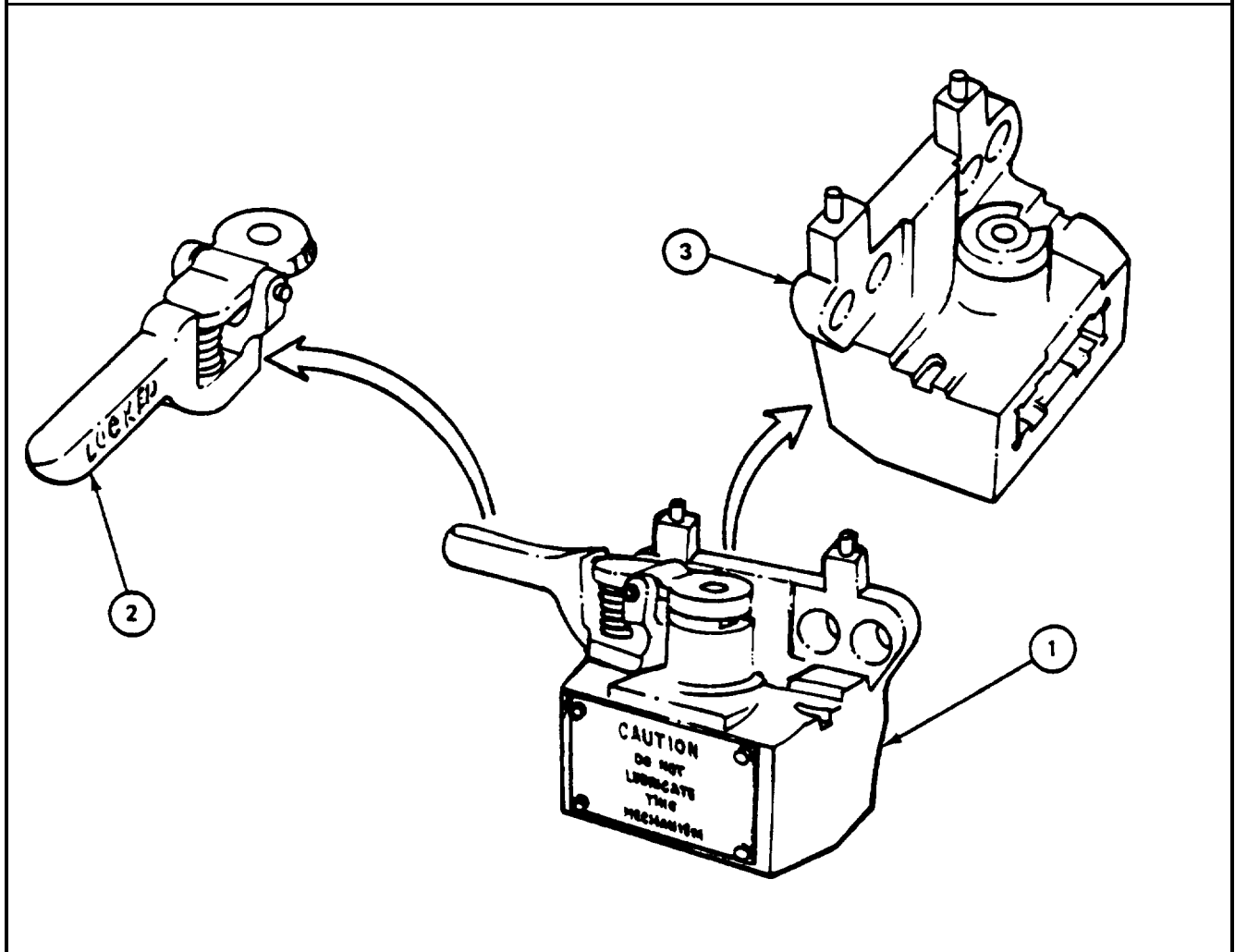
Step	Procedure
1.	Put universal joints (1) on drive tube (2). Line up holes in universal joints with holes in drive tube.
2.	Using drill motor and reamer, ream existing holes in two universal joints (1) and drive tube (2). Remove all sharp edges and burrs from holes.
3.	Using hammer and punch, attach universal joints (1) to drive tube (2) with two rivets (3) (JPG).
4.	Put adapter (4) in universal joint (1). Line up hole in adapter with hole in universal joint.
5.	Using drill motor and reamer, ream existing hole in adapter (4). Remove all sharp edges and burrs from holes.
6.	Using hammer and punch, attach adapter (4) to universal joint (3) with rivet (5) (JPG).
<p>NOTE</p> <p>Follow-on Maintenance Action Required:</p> <p>Install driveshaft (para 19-23).</p> <p>END OF TASK</p>	



CHAPTER 20 TURRET TRAVERSE LOCK

20-1. MAINTENANCE PROCEDURES INDEX

Equipment Item	Inspection	Test	Removal	Tasks Installation	Disassembly	Assembly	Repair
1. Turret Traverse Lock	20-2	20-3	. . .	. . .	20-4	20-5	20-6
2. Handle	. . .	. . .	20-7	20-8	20-7	20-8	. . .
3. Housing	. . .	. . .	. . .	. . .	20-9	20-10	. . .



20-2. TURRET TRAVERSE LOCK INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Remove and disassemble handle (para 20-7)
Disassemble housing (para 20-9)

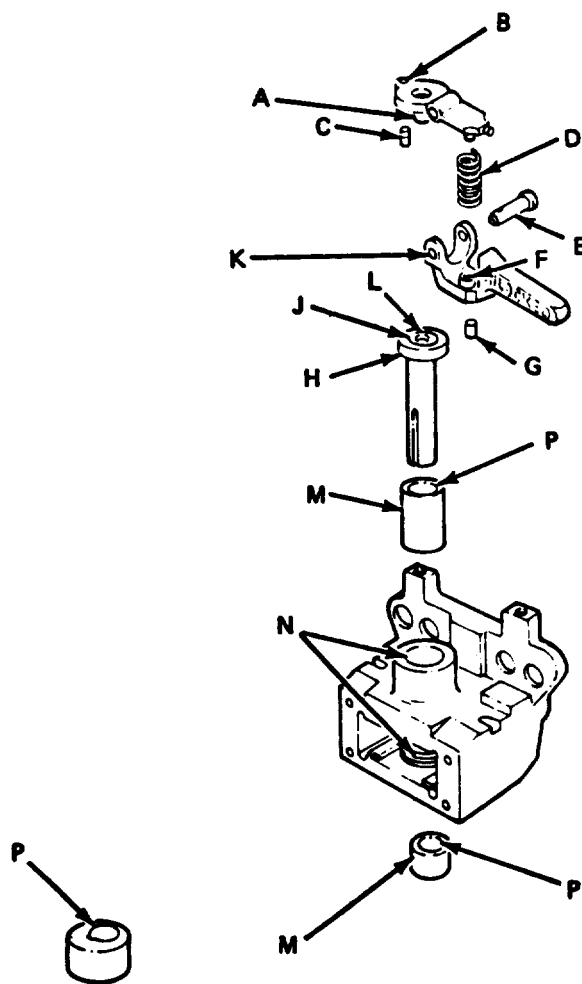
GENERAL INSTRUCTIONS:

NOTE

If part is bad, order repair part or next higher assembly, as required. Refer to section index (para 20-1) for replacement of parts.

20-2. TURRET TRAVERSE LOCK INSPECTION PROCEDURE (CONT)

FRAME 1																																														
Step	Procedure																																													
	SUPPORT SHOP WORK																																													
1.	Take turret traverse lock parts to shop where inspection equipment is available.																																													
2.	Make dimensional check.																																													
	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Reference Letter</th> <th style="text-align: left;">Point of Measurement</th> <th style="text-align: left;">Measurement</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>OD of lever shaft</td> <td>0.628 to 0.629</td> </tr> <tr> <td>B</td> <td>ID of pin hole in turret lock lever</td> <td>0.2488 to 0.2498</td> </tr> <tr> <td>c</td> <td>Diameter of pin</td> <td>0.2509 to 0.2511</td> </tr> <tr> <td>D</td> <td>Free length of spring</td> <td>2.10 to 2.12</td> </tr> <tr> <td>E</td> <td>OD of pin</td> <td>0.365 to 0.370</td> </tr> <tr> <td>F</td> <td>ID of pin bore in handle</td> <td>0.371 to 0.372</td> </tr> <tr> <td>G</td> <td>OD of pin</td> <td>0.373 to 0.374</td> </tr> <tr> <td>H</td> <td>ID of bore in camshaft</td> <td>0.8127 to 0.8137</td> </tr> <tr> <td>J</td> <td>OD of sleeve bearing</td> <td>0.815 to 0.816</td> </tr> <tr> <td>K</td> <td>ID of bore</td> <td>0.371 to 0.372</td> </tr> <tr> <td>L</td> <td>ID of bearing</td> <td>0.630 to 0.631</td> </tr> <tr> <td>M</td> <td>OD of bearing</td> <td>1.377 to 1.378</td> </tr> <tr> <td>N</td> <td>ID of bore turret lock housing</td> <td>1.375 to 1.376</td> </tr> <tr> <td>P</td> <td>ID of bushing</td> <td>1.125 to 1.126</td> </tr> </tbody> </table>	Reference Letter	Point of Measurement	Measurement	A	OD of lever shaft	0.628 to 0.629	B	ID of pin hole in turret lock lever	0.2488 to 0.2498	c	Diameter of pin	0.2509 to 0.2511	D	Free length of spring	2.10 to 2.12	E	OD of pin	0.365 to 0.370	F	ID of pin bore in handle	0.371 to 0.372	G	OD of pin	0.373 to 0.374	H	ID of bore in camshaft	0.8127 to 0.8137	J	OD of sleeve bearing	0.815 to 0.816	K	ID of bore	0.371 to 0.372	L	ID of bearing	0.630 to 0.631	M	OD of bearing	1.377 to 1.378	N	ID of bore turret lock housing	1.375 to 1.376	P	ID of bushing	1.125 to 1.126
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	Tag parts that are out of tolerance.																																													
3.	After support shop work, return turret traverse lock parts to turret shop.																																													
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	<p>If measurements of pins (C), (G) are out of tolerance, replace pins (para 20-6).</p> <p>If measurements of bearings (M), (P) are out of tolerance, replace bearings (para 20-6).</p>																																													
	END OF TASK																																													



20-3. TURRET TRAVERSE LOCK TEST PROCEDURE

TOOLS: Depth micrometer

SUPPLIES: Steel rod, approximately .480 diameter, 8" long (two)
20 lb weight

PERSONNEL: One

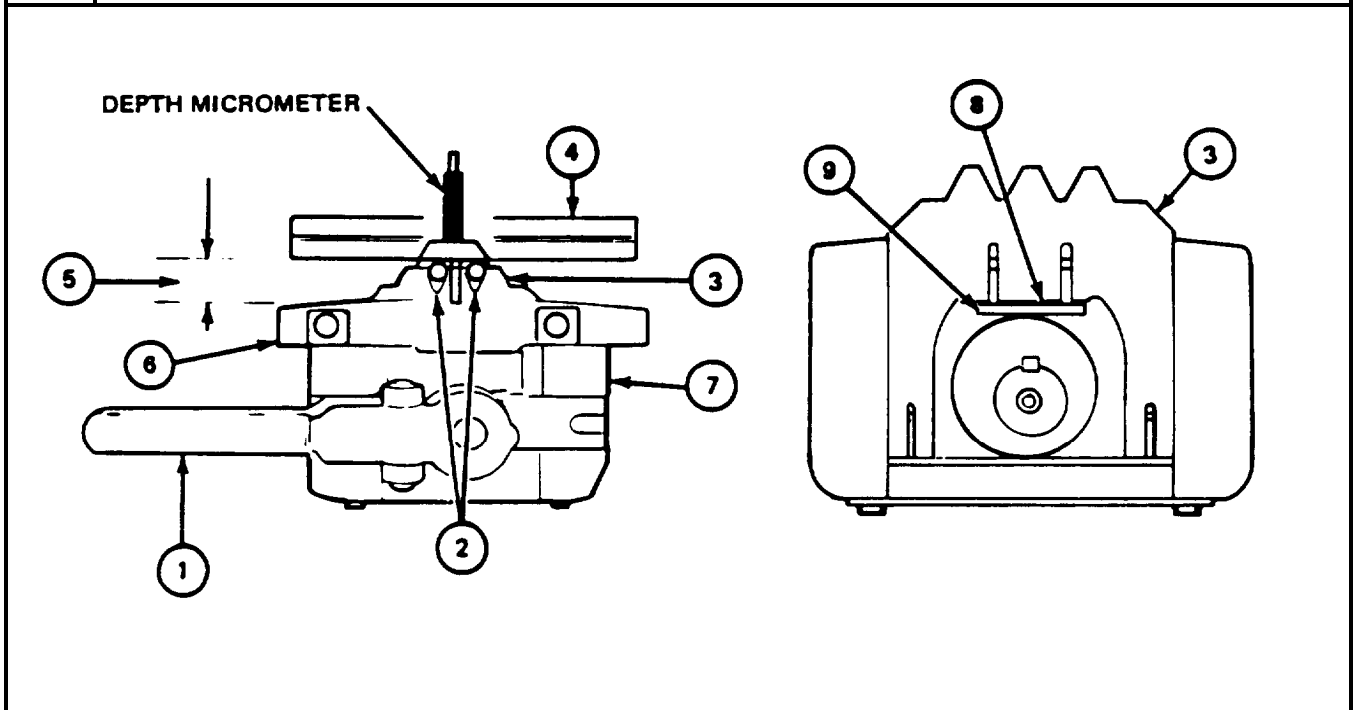
REFERENCES: TM 9-2350 -222-20-2-3 for procedure to remove turret traverse lock
JPG for procedure to use micrometer

EQUIPMENT CONDITION: Turret traverse lock removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Assemble turret traverse lock (para 20-5)

20-3. TURRET TRAVERSE LOCK TEST PROCEDURE (CONT)

FRAME 1	
Step	Procedure
<ol style="list-style-type: none"> 1. Lift handle (1) and put in LOCKED position. 2. Put two rods (2) between bolt (3) teeth. 3. Center weight (4) on rods (2). 	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Distance (5) from top of rods (2) to top of lock flange (6) must be between .799" and .803" for proper bolt (3) movement.</p>
<ol style="list-style-type: none"> 4. Using depth micrometer, measure distance (5) (JPG). 	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">If distance (5) measurement was not right, turret traverse lock (7) housing must be disassembled (para 20-9) to add or remove .002" laminations from shim (8) between bolt (3) and wear plate (9), then assembled (para 20-10).</p> <p style="text-align: left;">END OF TASK</p>



20-4. TURRET TRAVERSE LOCK ASSEMBLY PROCEDURE

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to remove turret traverse lock

EQUIPMENT CONDITION: Turret traverse lock removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test turret traverse lock (para 20-3)

FRAME 1	
Step	Procedure
1.	Remove and disassemble handle (para 20-7).
2.	Disassemble housing (para 20-9).
	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Inspect turret traverse lock (para 20-2)</p> <p>END OF TASK</p>

20-5. TURRET TRAVERSE LOCK ASSEMBLY PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Inspect turret traverse lock (para 20-2)

FRAME 1	
Step	Procedure
1.	Assemble housing and related parts (para 20-10).
2.	Assemble and install handle and related parts (para 20-8).
	<p>NOTE</p> <p>Follow-on Maintenance Action Required:</p> <p>Test turret traverse lock (para 20-3).</p> <p>END OF TASK</p>

20-6. TURRET TRAVERSE LOCK REPAIR PROCEDURE

SUPPLIES: Bearings
 Pins

PERSONNEL: One

PRELIMINARY PROCEDURES: Inspect turret traverse lock (para 20-2)

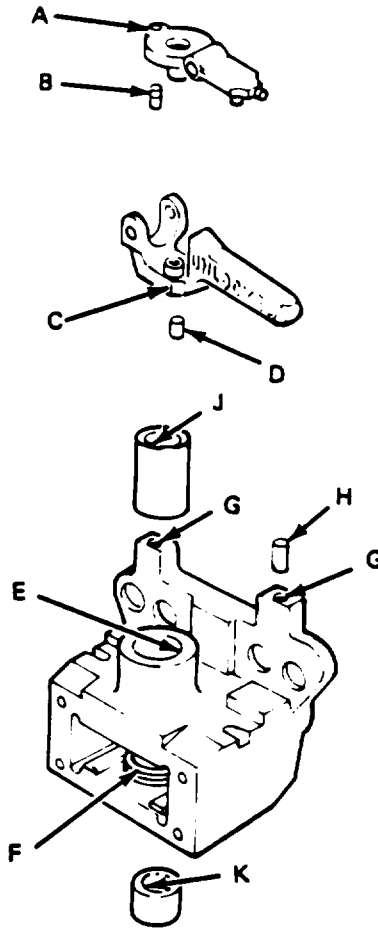
GENERAL INSTRUCTIONS:

NOTE

Procedure is used to replace bad pins and bearings in housing. If part is bad, order repair part or next higher assembly, as required.

FRAME 1

Step	Procedure																														
	SUPPORT SHOP WORK																														
1.	Take turret traverse lock and new pins or bearings to shop where press, machine reaming, and inspection equipment are available. <ul style="list-style-type: none"> a. Remove bad pins or bearings. b. Make dimensional check. <table border="0" style="width: 100%; margin-left: 40px;"> <thead> <tr> <th style="text-align: left;">Reference Letter</th> <th style="text-align: left;">Point of Measurement</th> <th style="text-align: left;">Measurement</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>ID of pin hole in lever</td> <td>0.2488 to 0.2498</td> </tr> <tr> <td>B</td> <td>Diameter of pin</td> <td>0.2509 to 0.2511</td> </tr> <tr> <td>C</td> <td>ID of pin hole in handle</td> <td>0.371 to 0.372</td> </tr> <tr> <td>D</td> <td>OD of pin</td> <td>0.373 to 0.374</td> </tr> <tr> <td>E,F</td> <td>ID of housing bore for bearing</td> <td>1.375 to 1.376</td> </tr> <tr> <td>G</td> <td>ID of pin holes in housing</td> <td>0.4920 to 0.4950</td> </tr> <tr> <td>H</td> <td>OD of pins</td> <td>0.4922 to 0.4952</td> </tr> </tbody> </table> <ul style="list-style-type: none"> c. Install new bearings. d. Finish bearings and make dimensional check, <table border="0" style="width: 100%; margin-left: 40px;"> <thead> <tr> <th style="text-align: left;">Reference Letter</th> <th style="text-align: left;">Point of Measurement</th> <th style="text-align: left;">Measurement</th> </tr> </thead> <tbody> <tr> <td>J,K</td> <td>ID of bearing</td> <td>1.125 to 1.126</td> </tr> </tbody> </table>	Reference Letter	Point of Measurement	Measurement	A	ID of pin hole in lever	0.2488 to 0.2498	B	Diameter of pin	0.2509 to 0.2511	C	ID of pin hole in handle	0.371 to 0.372	D	OD of pin	0.373 to 0.374	E,F	ID of housing bore for bearing	1.375 to 1.376	G	ID of pin holes in housing	0.4920 to 0.4950	H	OD of pins	0.4922 to 0.4952	Reference Letter	Point of Measurement	Measurement	J,K	ID of bearing	1.125 to 1.126
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Reference Letter	Point of Measurement	Measurement																													
J,K	ID of bearing	1.125 to 1.126																													
2.	After support shop work, return turret traverse lock to turret shop. END OF TASK																														



20-7. HANDLE REMOVAL AND DISASSEMBLY PROCEDURE

TOOLS: Long nose pliers
7/16" socket (3/8" drive)
3/8" drive ratchet
8 ounce ball peen hammer
Scraper
Stiff bristled brush
1/4" drift pin punch
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

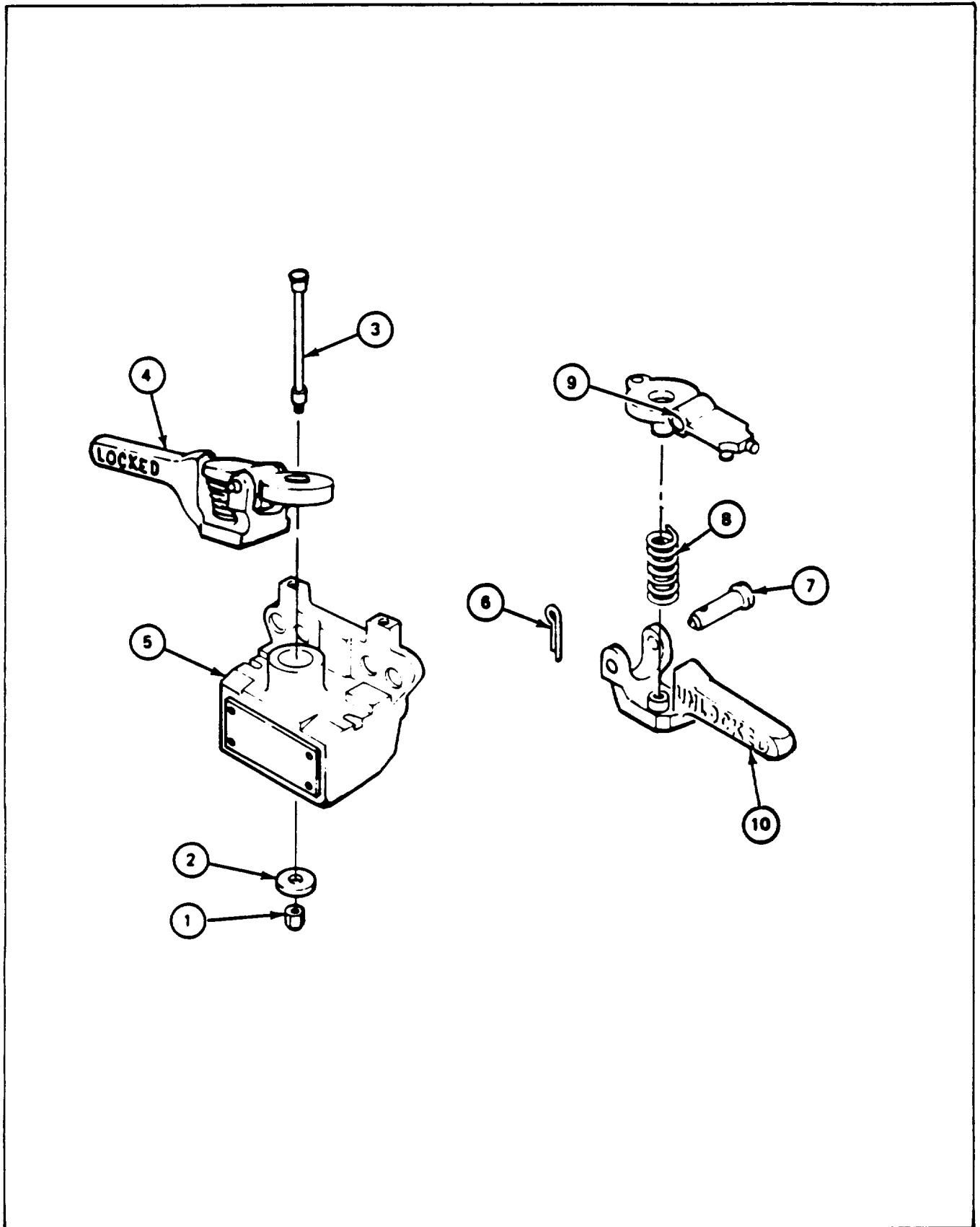
REFERENCES: TM 9-2350-222 -20-2-3 for procedure to remove turret traverse lock
JPG for procedures to
Remove cotter pins
Clean parts
Inspect and repair parts

EQUIPMENT CONDITION: Turret traverse lock removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test turret traverse lock (para 20-3)

20-7. HANDLE REMOVAL AND DISASSEMBLY PROCEDURE (CONT)

FRAME 1	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 4. 5. 	<p>Using 'rocket wrench, remove nut (1) and flat washer (2) from shaft (3).</p> <p>Remove assembled handle (4) with shaft (3) from housing (5).</p> <p>Using hammer and punch, tap end of shaft (3) loose from assembled handle (4).</p> <p>Remove shaft (3) from assembled handle (4).</p> <p>Using pliers, remove cotter pin (6) from pin (7) (JPG).</p> <div style="text-align: center; border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>WARNING</p> </div> <p>Sudden release of spring (8) pressure could hurt you. Press down on lever (9) to compress spring slightly when removing pin (7).</p> <ol style="list-style-type: none"> 6. 7.
	<p>NOTE</p> <p>Follow-on Maintenance Action Required:</p> <p>Clean all parts (JPG).</p> <p>Inspect and repair all parts (JPG).</p> <p>Do detail inspection of parts (para 20-2).</p>
	<p>END OF TASK</p>



20-8. HANDLE ASSEMBLY AND INSTALLATION PROCEDURE

TOOLS: Long nose pliers
 7/16" socket (3/8" drive)
 3/8" drive ratchet

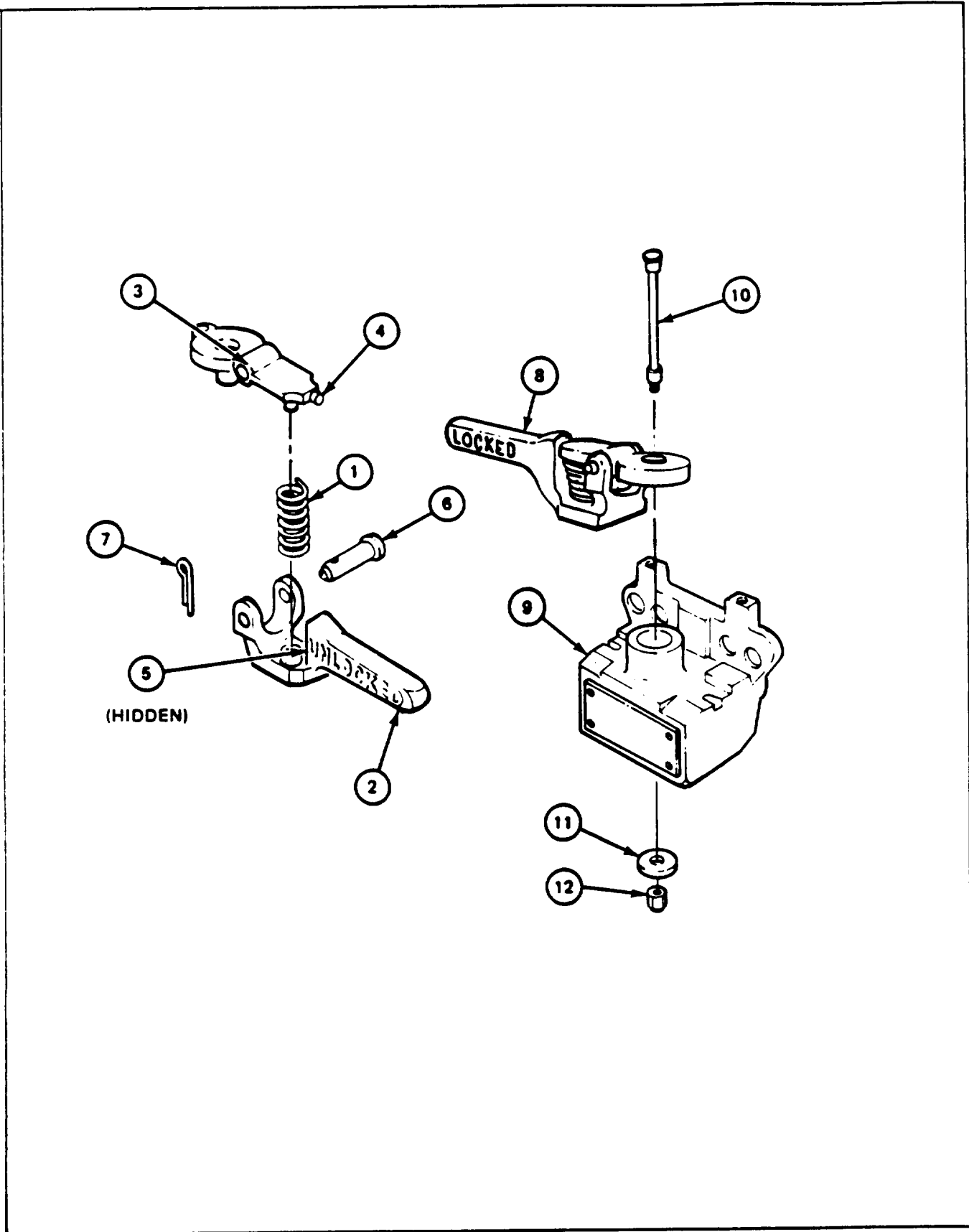
SUPPLIES: Cotter pin

PERSONNEL: One

REFERENCES: JPG for procedure to install cotter pins

PRELIMINARY PROCEDURES: Inspect handle (para 20-2)
 Assemble housing (para 20-10)

FRAME 1	
Step	Procedure
1.	Put spring (1) on handle (2).
2.	Put lever (3) on top of spring (1) engaging lever pin (4) in groove (5) of handle (2).
3.	Press down lever (3) to hold spring (1) slightly compressed and align holes for pin (6).
4.	Using hands, attach lever (3) to handle (2) with pin (6).
5.	Using pliers, install cotter pin (7) in pin (6) (JPG).
6.	Put assembled handle (8) on housing (9).
	NOTE
	It may be necessary to turn handle (8) slightly to put in shaft (10).
7.	Align shaft (10) with hole in lever (3) and put in shaft.
8.	Using socket wrench, attach shaft (10) to housing (9) with flat washer (11) and nut (12).
	NOTE
	Follow-on Maintenance Action Required: Test turret traverse lock (para 20-3).
	END OF TASK



20-9. HOUSING DISASSEMBLY PROCEDURE

TOOLS: 1/4" flat tip screwdriver
8 ounce ball peen hammer
1/4" drift pin punch
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

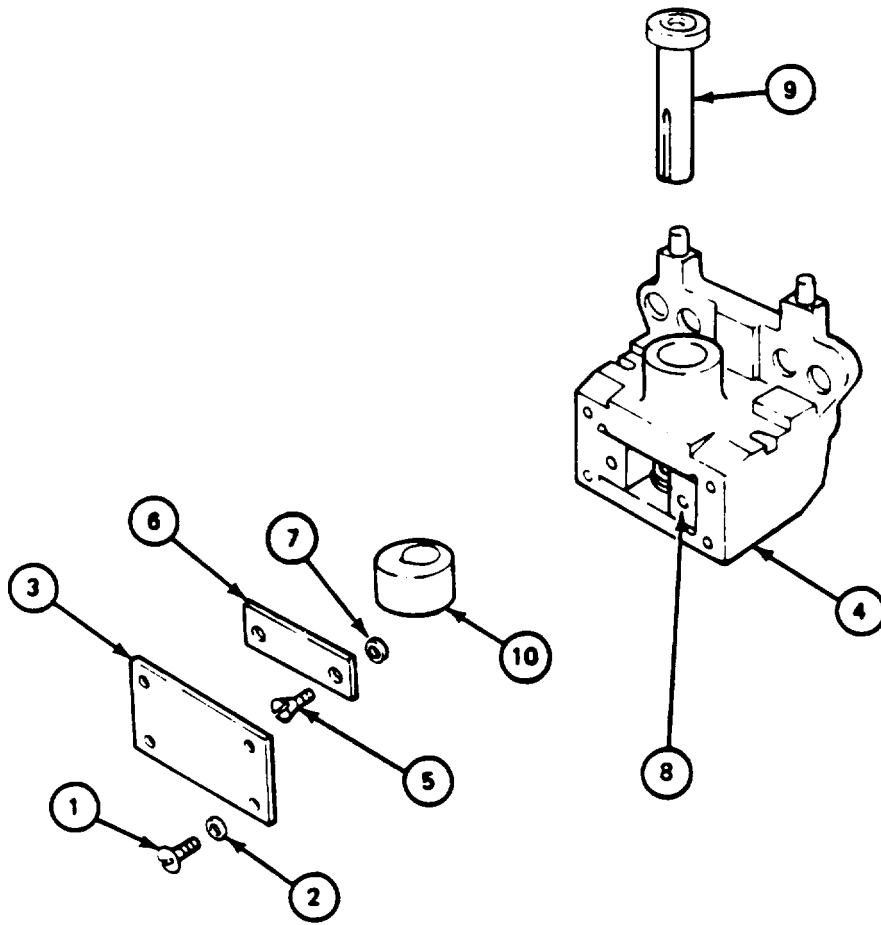
PERSONNEL: One

REFERENCES: JPG for procedures to:
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove handle (para 19-7)

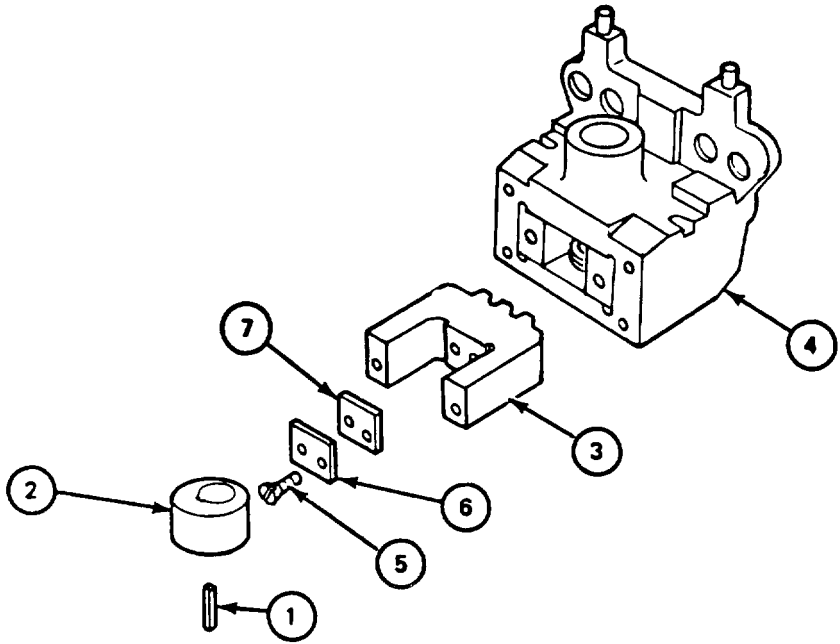
20-9. HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 1	
Step	Procedure
1.	Using screwdriver, remove four screws (1) and four lockwashers (2) that attach cover (3) to housing (4).
2.	Remove cover (3).
3.	Using screwdriver, remove two screws (5), wear plate (6), and two shim washers (7) from bolt (8).
4.	Remove camshaft (9) and cam (10) from housing (4).
	GO TO FRAME 2



20-9. HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 4. 	<p>Using hammer and punch, remove key (1) from cam (2).</p> <p>Remove bolt (3) from housing (4).</p> <p>Using screwdriver, remove two screws (5) that attach plate (6) and shims (7) to bolt (3).</p> <p>Remove plate (6) and shims (7).</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of parts (para 20-2).</p> <p>END OF TASK</p>



20-10. HOUSING ASSEMBLY PROCEDURE

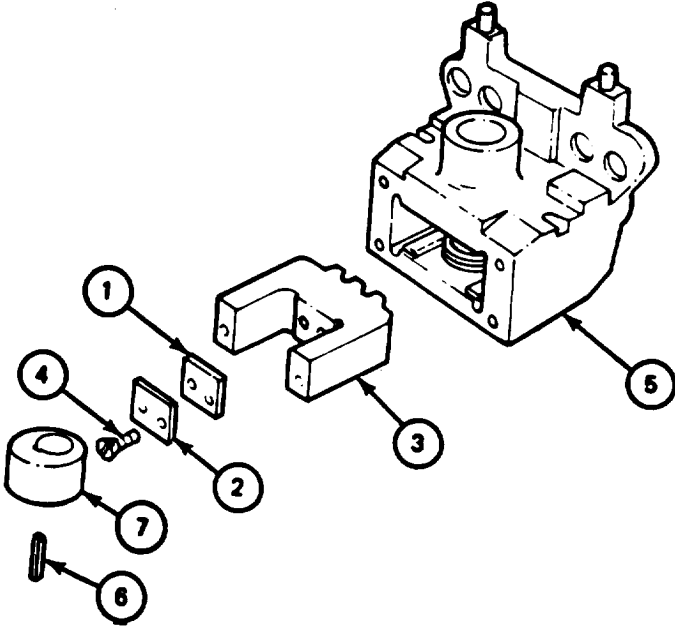
TOOLS: 1/4" flat tip screwdriver
Feeler gauge
8 ounce ball peen hammer
1/4" drift pin punch

SUPPLIES: Flat washer shim (8762422)
shim (7953799)

PERSONNEL: One

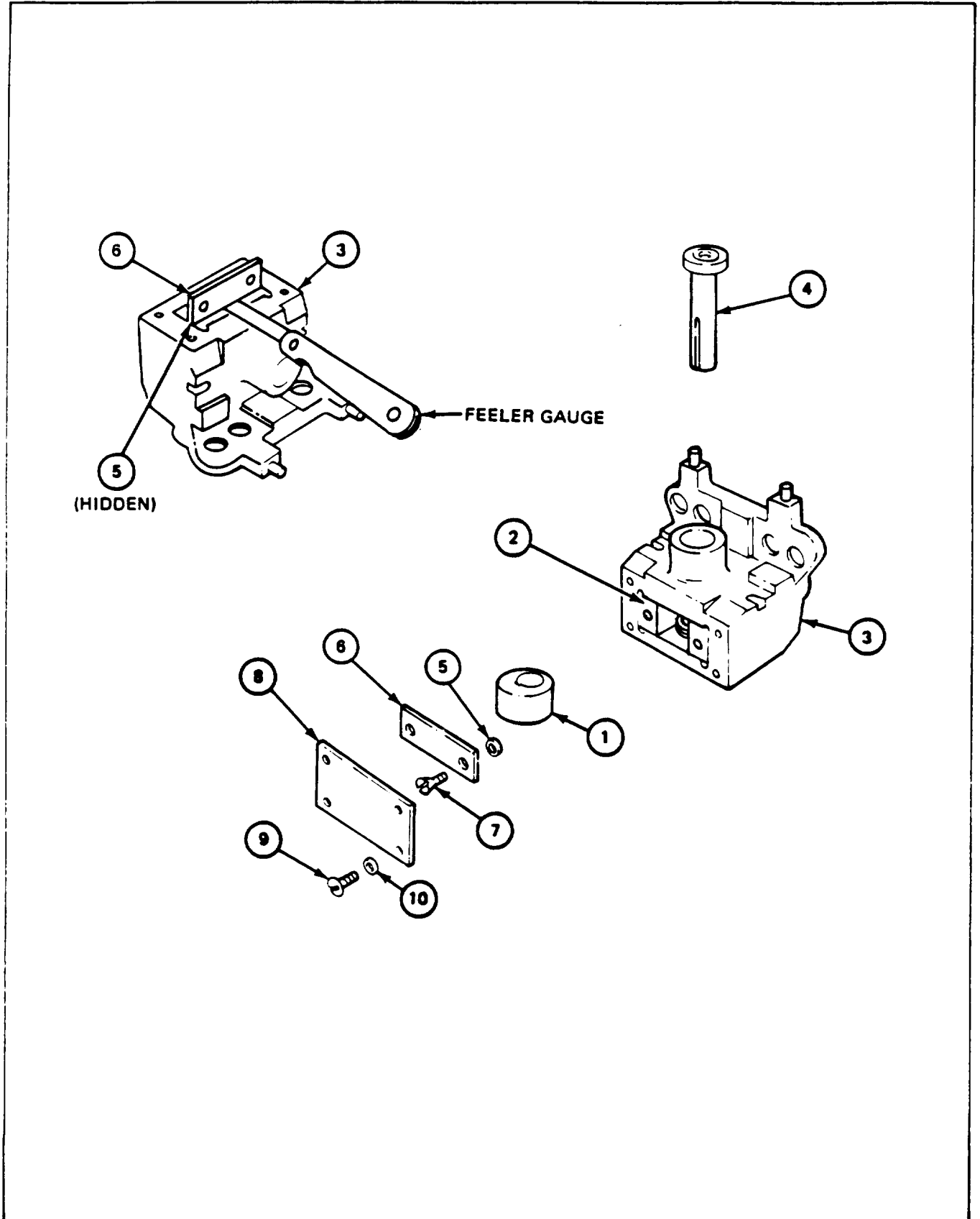
REFERENCES: JPG for procedure to use feeler gauge

PRELIMINARY PROCEDURES: Inspect housing turret lock parts (para 20-2)

FRAME 1	
Step	
	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Position wear plate (2) with countersunk holes up.</p> <ol style="list-style-type: none">1. Using screwdriver, attach shim (1) and wear plate (2) to bolt (3) with two screws (4).2. Put bolt (3) in housing (5).3. Using hammer and punch, lightly tap key (6) in cam (7) keyway. <p>GO TO FRAME 2</p>
	

20-10. HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
1.	Put cam (1) in bolt (2) inside housing (3).
2.	Align keyway in camshaft (4) with key in cam (1).
3.	Put camshaft (4) in housing (3).
4.	Put two shim washers (5) on bolt (2).
5.	Using wear plate (6) as straight edge, put wear plate on shim washers (5).
	NOTE
	Clearance between wear plate (6) and cam (1) should be between .002" and .006" with high side of cam up.
6.	Using feeler gauge, measure clearance between cam (1) and wear plate (6) (JPG).
	NOTE
	Shim washers (5) have .002 laminations that can be separated for proper clearance.
7.	Using screwdriver, attach Proper shim washer (5) and wear plate (6), with countersunk holes up, to bolt (2) with two screws (7).
8.	Using screwdriver, attach cover (8) to housing (3) with four screws (9) and four lockwashers (10).
	NOTE
	Follow-on Maintenance .Action Required: Install handle (para 20-8). Test turret traverse lock (para 20-3).
	END OF TASK

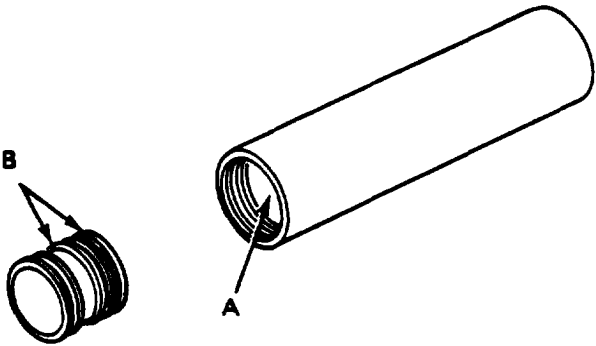


CHAPTER 21
EQUILIBRATOR ACCUMULATOR

21-1. MAINTENANCE PROCEDURES INDEX

Equipment Item	Inspection	Test	Tasks Disassembly	Assembly
Equilibrator Accumulator	21-2	21-3	21-4	21-5

21-2. EQUILIBRATOR ACCUMULATOR INSPECTION PROCEDURE (CONT)

FRAME 1										
Step	Procedure									
<p>1.</p> <p>2.</p> <p>3.</p>	<p style="text-align: center;">SUPPORT SHOP WORK</p> <p>Take equilibrator accumulator cylinder and piston to support shop where measuring equipment is available.</p> <p>Make dimensional check</p> <table border="0" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Reference Letter</th> <th style="text-align: center;">Point of Measurement</th> <th style="text-align: center;">Measurement (in inches)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">A</td> <td style="text-align: center;">ID of cylinder</td> <td style="text-align: center;">3.875 to 3.877</td> </tr> <tr> <td style="text-align: center;">B</td> <td style="text-align: center;">OD of piston</td> <td style="text-align: center;">3.870 to 3.872</td> </tr> </tbody> </table> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Tag parts that are out of tolerance.</p> <p>After support shop work, return equilibrator accumulator cylinder and piston to turret shop.</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Assemble equilibrator accumulator (para 21-5)</p> <p>END OF TASK</p>	Reference Letter	Point of Measurement	Measurement (in inches)	A	ID of cylinder	3.875 to 3.877	B	OD of piston	3.870 to 3.872
Reference Letter	Point of Measurement	Measurement (in inches)								
A	ID of cylinder	3.875 to 3.877								
B	OD of piston	3.870 to 3.872								
	 <p>The diagram illustrates the measurement points for the equilibrator accumulator. On the left, a piston is shown with an arrow labeled 'B' pointing to its outer diameter. On the right, a cylinder is shown with an arrow labeled 'A' pointing to its inner diameter.</p>									

21-3. EQUILIBRATOR ACCUMULATOR TEST PROCEDURE

TEST EQUIPMENT M3 oil pump (NSN 4933-00-449-7166) (7550134)
Hydraulic test kit (NSN 1015-01-151-6441) (9337932)
Watch with sweep second hand

TOOLS: 3/8 in. combination wrench
 1/16 in. drive pin punch
 3/4 in. combination wrench

SUPPLIES: Hydraulic fluid (item 10, App A)
 Funnel
 Container (2 ft. long x 1 ft. wide x 1 ft. deep, minimum)
 Pan
 Lint-free cloths (item 21, App A)
 Protective shield (metal plate, 1/2 in. thick x 4 ft. square or
 wooden board 2 in. thick x 4 ft. square)
 Pencil and paper

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedures to:
 Charge main accumulator
 Remove main accumulator

EQUIPMENT CONDITION: Equilibrator accumulator removed (TM -20-2-3)

PRELIMINARY PROCEDURES: Assemble equilibrator accumulator (para 21-5)

GENERAL INSTRUCTIONS:

CAUTION

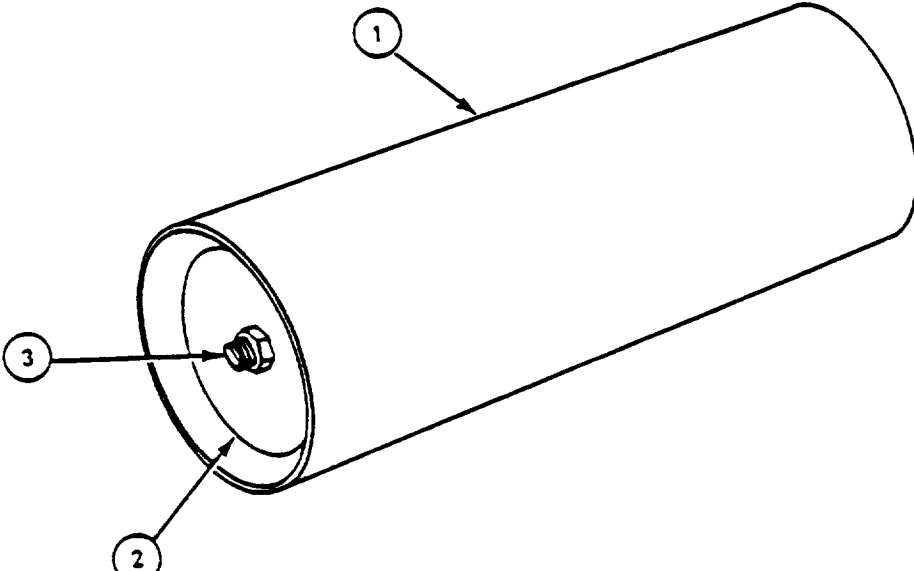
Keep dirt from getting in tubing or parts. Dirt can damage equipment.

NOTE

Suitable fittings, preformed packings, and tools should be used to connect test equipment to parts being tested.

If test does not give normal indication, equilibrator accumulator is bad. Disassemble bad equilibrator accumulator (para 21-4) and replace bad parts.

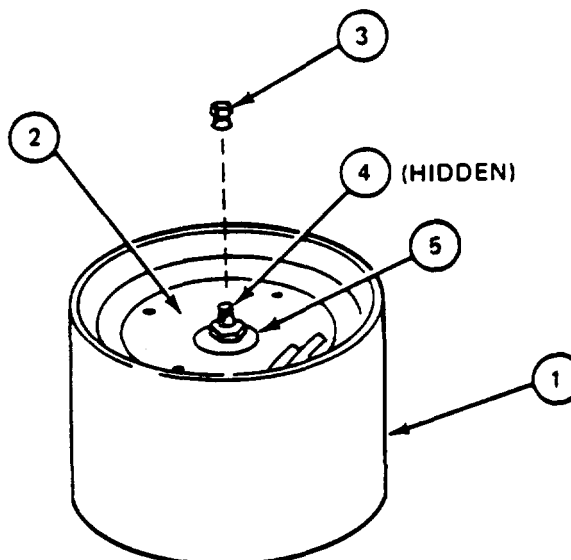
21-3. EQUILBRATOR ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 1		
Step	Procedure	
1. 2. 3. 4.	Turn accumulator (1) on end with fluid-end cap (2) up. Remove protective plug from port (3). Using funnel, pour hydraulic fluid in port (3) until fluid chamber of accumulator (1) is full. Install test pressure plug in port (3). GO TO FRAME 2	
 A technical drawing of a cylindrical accumulator. Callout 1 points to the main body of the cylinder. Callout 2 points to a circular cap on the left end of the cylinder. Callout 3 points to a hexagonal port located in the center of the cap.		

21-3. EQUILIBRATOR ACCUMULATOR TEST PROCEDURE (CONT)

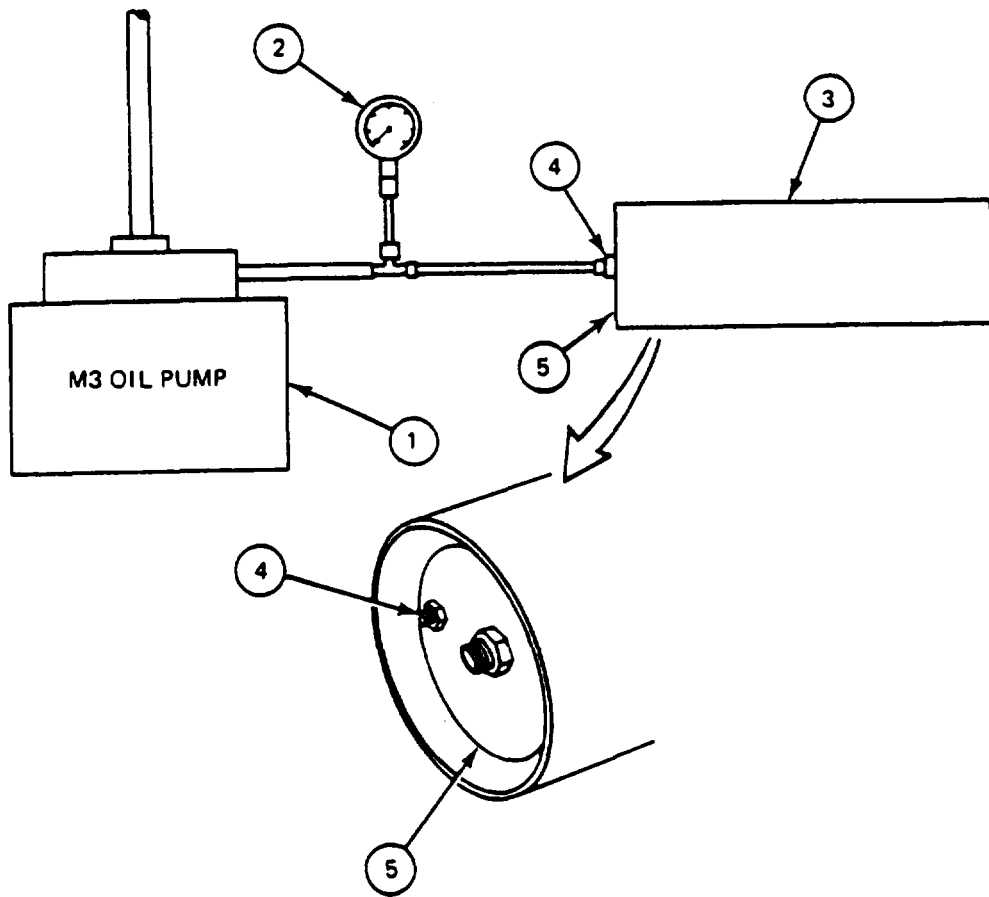
FRAME 2

Step	Procedure
<ol style="list-style-type: none"> 1. 2. 	<p>Turn accumulator (1) on end with gas-end cap (2) up.</p> <p>Using 3/8" wrench, remove valve cap (3).</p> <div style="text-align: center; border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>WARNING</p> </div> <p>Nitrogen under pressure can hurt you. Keep fingers and hands clear of valve while letting out nitrogen. Let nitrogen out slowly.</p> <ol style="list-style-type: none"> 3. 4. 5. <p>Using punch, push in valve core (4) until no more nitrogen comes out of gas valve (5).</p> <p>Using 3/4" wrench, remove gas valve (5).</p> <p>Using funnel, pour hydraulic fluid in port for gas valve (5) until nitrogen chamber of accumulator (1) is full.</p> <p>GO TO FRAME 3</p>



21-3. EQUILBRATOR ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 3	
Step	Procedure
1.	Connect M3 oil pump (1) and pressure gauge (2) to accumulator (3) at port (4) of gas-end cap (5). GO TO FRAME 4



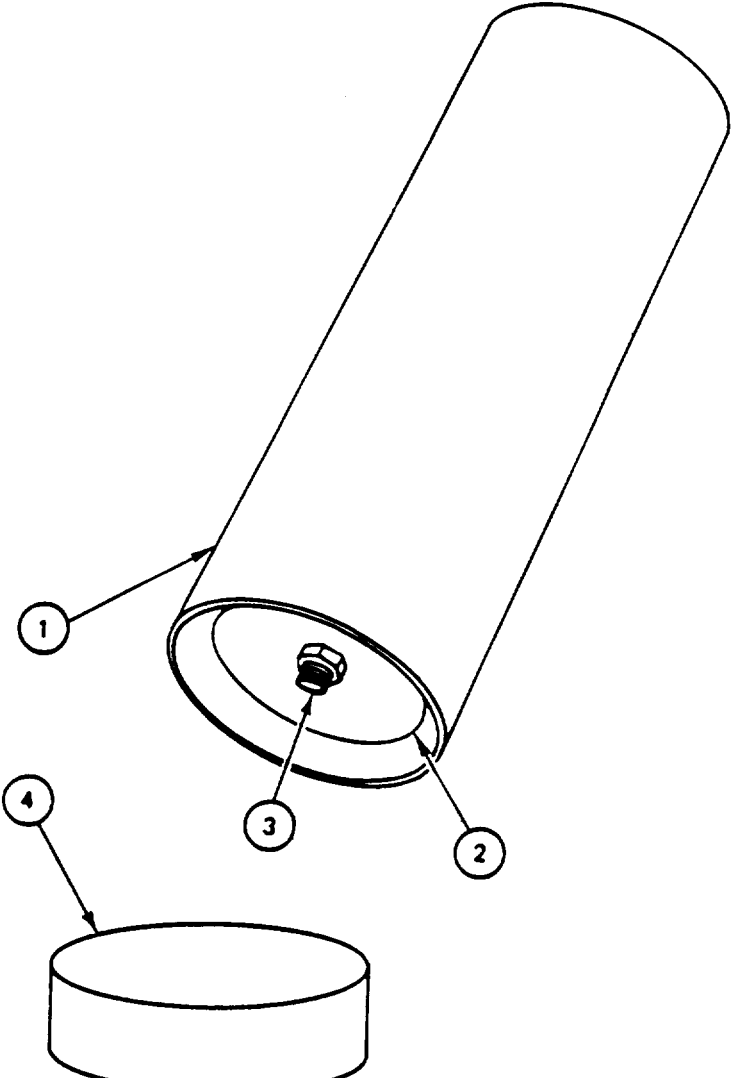
21-3. EQUILIBRATOR ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 4	Step	Procedure	Normal Indication	Probable Fault																				
<div data-bbox="743 489 966 563" style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 10px;">WARNING</div> <p data-bbox="495 617 1222 734">Hydraulic fluid under pressure can hurt or kill you. Steps 2 thru 4 must be done at 3000 psi. Do not pressurize accumulator until protective shield is put between accumulator and you.</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%; vertical-align: top;">1.</td> <td style="width: 45%;">Put protective shield in front accumulator (1).</td> <td style="width: 35%; text-align: center;">. . .</td> <td style="width: 15%; text-align: center;">. . .</td> </tr> <tr> <td style="vertical-align: top;">2.</td> <td>Operate M3 oil pump (2) until pressure gauge (3) reads between 2900 and 2100 psi (JPG).</td> <td style="text-align: center;">. . .</td> <td style="text-align: center;">. . .</td> </tr> <tr> <td style="vertical-align: top;">3.</td> <td>Using pencil and paper, write down reading on pressure gauge (3).</td> <td style="text-align: center;">. . .</td> <td style="text-align: center;">. . .</td> </tr> <tr> <td style="vertical-align: top;">4.</td> <td>Using watch, check accumulator pressure for five minutes.</td> <td style="vertical-align: top;">Pressure gauge (3)-reading is the same as written down in step 3.</td> <td style="vertical-align: top;">Bad preformed packings or bad rings.</td> </tr> <tr> <td style="vertical-align: top;">5.</td> <td>Using M3 oil pump, lower pressure gauge (3) reads 0 psi (JPG).</td> <td style="text-align: center;">. . .</td> <td style="text-align: center;">. . .</td> </tr> </table> <p data-bbox="379 1340 636 1372">GO TO FRAME 5</p>					1.	Put protective shield in front accumulator (1).	2.	Operate M3 oil pump (2) until pressure gauge (3) reads between 2900 and 2100 psi (JPG).	3.	Using pencil and paper, write down reading on pressure gauge (3).	4.	Using watch, check accumulator pressure for five minutes.	Pressure gauge (3)-reading is the same as written down in step 3.	Bad preformed packings or bad rings.	5.	Using M3 oil pump, lower pressure gauge (3) reads 0 psi (JPG).
1.	Put protective shield in front accumulator (1).																					
2.	Operate M3 oil pump (2) until pressure gauge (3) reads between 2900 and 2100 psi (JPG).																					
3.	Using pencil and paper, write down reading on pressure gauge (3).																					
4.	Using watch, check accumulator pressure for five minutes.	Pressure gauge (3)-reading is the same as written down in step 3.	Bad preformed packings or bad rings.																					
5.	Using M3 oil pump, lower pressure gauge (3) reads 0 psi (JPG).																					
<p>The diagram shows an M3 OIL PUMP (2) on the left, connected via a horizontal line to a pressure gauge (3). This line continues to the right, passing through a vertical dashed line labeled PROTECTIVE SHIELD, and then connects to an accumulator (1). Arrows point from the circled numbers 1, 2, and 3 to their respective components.</p>																								

21-3. EQUILBRATOR ACCUMULATOR TEST PROCEDURE (CONT)

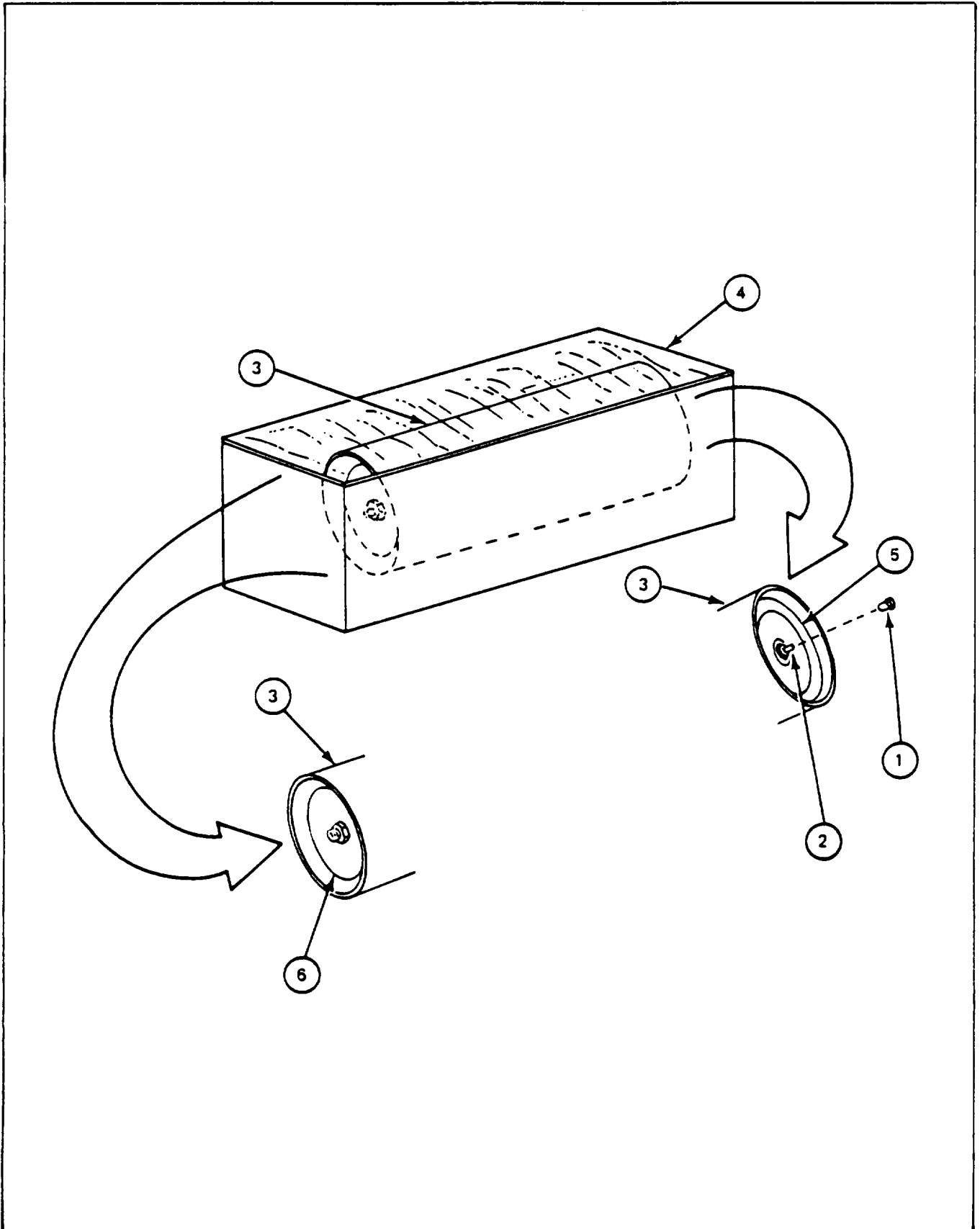
FRAME 5	
Step	Procedure
	<div style="text-align: center; border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <p>WARNING</p> </div> <p>Hydraulic fluid under pressure can hurt or kill you. Do not disconnect M3 oil pump from accumulator until pressure gauge reads 0 psi.</p> <ol style="list-style-type: none"> 1. Turn accumulator (1) on end with gas-end port (2) up. Disconnect M3 oil pump (3) and pressure gauge (4) from accumulator (1). 2. Turn accumulator (1) on end with gas-end port (2) down. Let fluid drain from nitrogen chamber into pan (5). 3. Allow accumulator (1) to stand on end for fifteen minutes and drain completely. 4. Turn accumulator (1) on end with gas-end port (2) up. 5. Using 3/4" wrench, put gas valve (6) in gas-end port (2). 6. Using 3/8" wrench, put valve cap (7) on gas valve (6). <p>GO TO FRAME 6</p>
	<p>The diagram illustrates the test procedure for the accumulator. It shows an M3 oil pump (3) connected to an accumulator (1) via a pressure gauge (4). The accumulator (1) is shown in two orientations: upright and tilted to drain fluid into a pan (5). A gas valve (6) and valve cap (7) are shown being installed into the gas-end port (2) of the accumulator (1).</p>

21-3. EQUILBRATOR ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 6	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 	<p>Turn accumulator (1) on end with fluid-end cap (2) up.</p> <p>Remove test pressure plug from port (3).</p> <p>Turn accumulator (1) on end with fluid-end cap (2) down. Let fluid drain fully from port (3) into pan (4).</p> <p>GO TO FRAME 7</p>
 <p>The diagram shows a cylindrical accumulator (1) tilted at an angle. At the bottom of the cylinder is a fluid-end cap (2) and a port (3) with a plug. Below the accumulator is a shallow cylindrical pan (4). Arrows point from the numbered labels to their respective parts in the diagram.</p>	

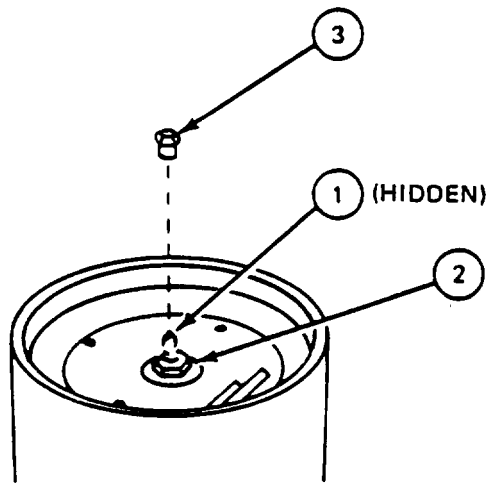
21-3. EQUILBRATOR ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 7			
Step	Procedure	Normal Indication	Probable Fault
1.	Using 3/8" wrench, remove valve cap (1) from gas valve (2).	. . .	. . .
2.	Charge accumulator (3) to between 165 and 185 psi (TM-20).	. . .	. . .
3.	Put accumulator (3) in container (4).	. . .	. . .
4.	Pour hydraulic fluid into container (4) until fluid completely covers accumulator (3).	. . .	. . .
NOTE			
Bubbles coming out of accumulator indicate leakage.			
5.	Using watch, check accumulator (3) for leaks for ten minutes:		
	a. At gas valve (2)	No bubbles coming from gas valve (2)	Bad preformed packing or bad valve core
	b. At gas-end cap (5) and fluid-end cap (6)	No bubbles coming from gas-end cap (5) or fluid-end cap (6)	Bad preformed packing or bad rings
6.	Remove accumulator (3) from container (4). Using lint-free cloths, wipe fluid from accumulator. GO TO FRAME 8	. . .	. . .



21-3. EQUILIBRATOR ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 8	
Step	Procedure
	<div style="text-align: center; border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <p>WARNING</p> </div> <p style="text-align: center;">Nitrogen under pressure can hurt you. Keep fingers and hands clear of valve while letting out nitrogen. Let nitrogen out slowly.</p> <ol style="list-style-type: none"> 1. Using punch, push in valve core (1) until no more nitrogen comes out of gas valve (2). 2. Using wrench, install valve cap (3) on gas valve (2). <div style="text-align: center; margin-top: 20px;"> <p>NOTE</p> <p>If normal indication is obtained in frames 4, 7, and 8, equilibrator accumulator is good.</p> </div> <p>END OF TASK</p>



21-4. EQUILIBRATOR ACCUMULATOR DISASSEMBLY PROCEDURE

TOOLS: Vise with brass caps
 Valve core wrench
 3/8" combination wrench
 20 ounce ball peen hammer
 3/4" socket (1/2" drive)
 1 /2" drive ratchet
 13/16" socket (1/2" drive)
 Spanner wrench (5 120-264-3777)
 Slipjoint pliers
 Stiff bristled brush
 O-ring extractor kit
 Scraper
 Fine stone

SUPPLIES: Hex head screw 1/2" -20 x 4" long
 Hex head screw 9/ 16" - 18 X 4" long
 Cleaning rags (Item 21, App A)
 Dry cleaning solvent (Item 33, APP. A)
 Crocus cloth (item 7, App A)
 Wood block (2" x 4" x 24" long)

PERSONNEL: One

REFERENCES: TM 9-2350 -222-20-2-3 for procedure to remove equilibrator accumulator
 JPG for procedures to:
 Use spanner wrench
 Remove packings, rings, and ring guides
 Clean parts
 Inspect and repair parts

EQUIPMENT CONDITION: Equilibrator accumulator removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test equilibrator accumulator (para 21-3)

GENERAL INSTRUCTIONS:

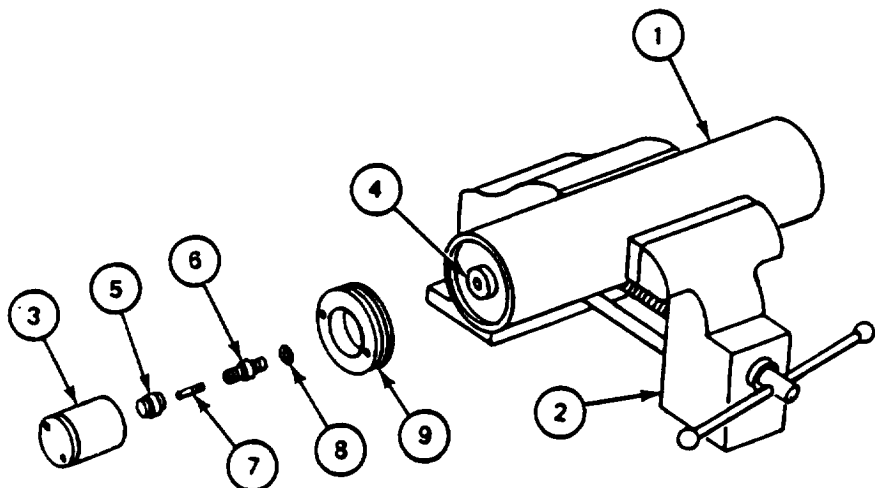
CAUTION

Keep dirt from getting in tubing or parts. Dirt can damage equipment.

NOTE

Use rags to clean up spilled hydraulic fluid.

21-4. EQUILIBRATOR ACCUMULATOR DISASSEMBLY PROCEDURE (CONT)

FRAME 1	Procedure
	<p style="text-align: center;">CAUTION</p> <p style="text-align: center;">Equilibrator accumulator cylinder (1) must not be scratched or grooved when put in vise (2).</p> <ol style="list-style-type: none"> 1. Put equilibrator accumulator cylinder (1) in vise (2) on workbench. 2. Using hands, unscrew cap (3) until it comes off end head (4). 3. Using 3/8" wrench, remove valve cap (5) from valve body (6), 4. Using valve core wrench, push in valve core (7) stem until all nitrogen pressure is released from accumulator cylinder (1). <p style="text-align: center;">WARNING</p> <p style="text-align: center;">Nitrogen pressure in cylinder (1) must be completely discharged before doing step (5) to prevent injury.</p> <ol style="list-style-type: none"> 5. Using valve core wrench, remove valve core (7). 6. Using 3/4" socket, remove valve body (6) and preformed packing (8) from end head (4) (JPG). Throw away preformed packing (8). 7. Using spanner wrench, remove end ring (9) from accumulator cylinder (1) (JPG). <p>GO TO FRAME 2</p>
	

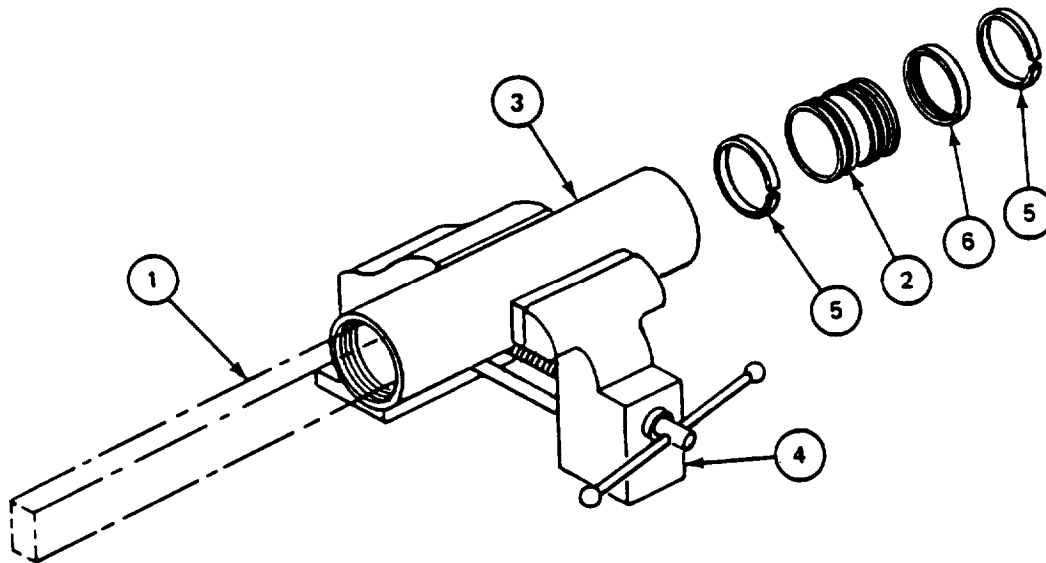
21-4. EQUILIBRATOR ACCUMULATOR DISASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
<ol style="list-style-type: none"> 1. Using hands, put 7/16" - 14 hex head screw (1) in end head (2). 2. Using pliers, pull screw (1) and end head (2) out of accumulator cylinder (3). Remove screw (1) from end head (2). 3. Using O-ring extractor tool, remove retainer (4) and packing (5) from groove in end head (2) (JPG). 4. Using 13/16" socket wrench, remove fitting (6) with preformed packing (7) from end head (8). 5. Using spanner wrench, remove end ring (9) from accumulator cylinder (3) (JPG). 6. Using hammer and wood block, tap on piston until end head (8) is removed from accumulator cylinder (3). 7. Using O-ring extractor tool, remove retainer (10) and packing (11) from groove in end head (8) (JPG). 8. Throw two preformed packings (5) and (11) away, GO TO FRAME 3 	

21-4. EQUILIBRATOR ACCUMULATOR DISASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
	<p style="text-align: center;">CAUTION</p> <p style="text-align: center;">When pushin piston (2) out of cylinder (3) usin softwood block(1),do not drop piston (2). Piston (2) will be damaged.</p> <ol style="list-style-type: none"> 1. Using softwood block (1), push piston (2) out of accumulator cylinder (3). 2. Remove accumulator cylinder (3) from vise (4). 3. Remove two rings (5) from two grooves in piston (2) (JPG). Throw away two rings (5). 4. Remove seal ring (6) from groove in piston (2) (JPG). Throw away seal ring (6). <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of parts (para 2 1-2).</p> <p>END OF TASK</p>



21-5. EQUILIBRATOR ACCUMULATOR ASSEMBLY PROCEDURE

TOOLS: Vise with brass caps
 Valve core wrench
 3/8" combination wrench
 3/4" socket (1/2" drive)
 1/2" drive ratchet
 Spanner wrench (5 120-264-3777)
 O-ring extractor kit
 13/16" socket (1/2" drive)

SUPPLIES: Parts kit (591 1031)
 Hydraulic fluid (item 10, App A)
 Rags (item 21, App A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
 Use spanner wrench
 Install packing, rings, and ring guides

PRELIMINARY PROCEDURES: Inspect equilibrator accumulator (para 2 1-2)

GENERAL INSTRUCTIONS:

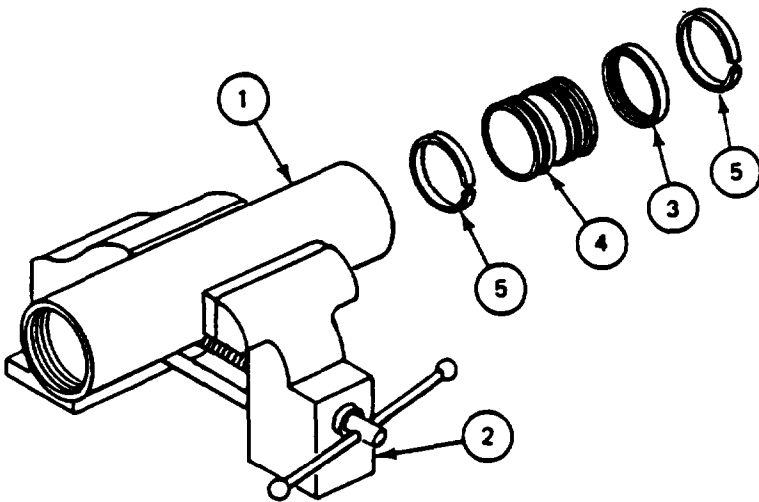
CAUTION

Keep dirt from getting in tubing or parts. Dirt can damage equipment.

NOTE

Use rags to clean up spilled hydraulic fluid.

21-5. EQUILIBRATOR ACCUMULATOR ASSEMBLY PROCEDURE (CONT)

IFRAME 1		
Step	Procedure	
	<p style="text-align: center;">CAUTION</p> <p style="text-align: center;">Equilibrator accumulator cylinder (1) must not be scratched or grooved when put in vise (2).</p> <ol style="list-style-type: none"> 1. Put equilibrator accumulator cylinder (1) in vise (2) on workbench. 2. Lightly coat seal ring (3), piston (4), and two rings (5) with hydraulic fluid (JPG). 3. Put new seal ring (3) (7748763) in center groove in piston (4) (JPG). 4. Put two new rings (5) (1095 1683) in two outer grooves in piston (5) (JPG). 5. Using hands, push piston (4), two rings (5) and seal ring (3) in accumulator cylinder (1) (JPG). <p>GO TO FRAME 2</p>	
		

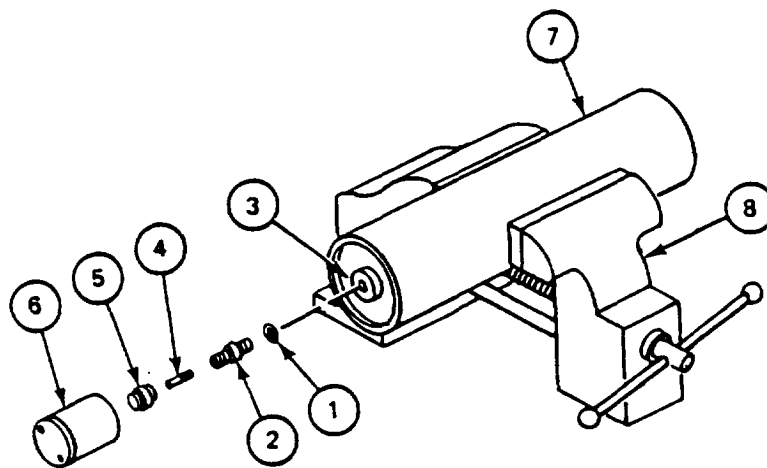
21-5. EQUILIBRATOR ACCUMULATOR ASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 	<p>Lightly coat two retainers (1) and two preformed packings (2) with hydraulic fluid (JPG).</p> <p>Put retainer (1) (MS28782-24) and preformed packing (2) (MS28775-341) in groove in end head (3) (JPG).</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">It may be necessary to tap end head (3) into cylinder (4).</p> <ol style="list-style-type: none"> 3. 4. 5. 6. 7. <p>GO TO FRAME 3</p>

21-5. EQUILIBRATOR ACCUMULATOR ASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 4. 5. 6. 7. 	<p>Lightly coat preformed packing (1) (MS28778-5) with hydraulic fluid (JPG).</p> <p>Put preformed packing (1) on valve body (2).</p> <p>Using 3/4" socket wrench, attach valve body (2) and preformed packing (1) to end head (3) (JPG).</p> <p>Using valve core wrench, put valve core (4) in valve body (2) until it is tight.</p> <p>Using 3/8" wrench, put valve cap (5) on valve body (2).</p> <p>Using hands, screw cap (6) on end head (3) until it is tight.</p> <p>Remove equilibrator accumulator assembly (7) from vise (8).</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required: Test equilibrator accumulator (para 21-3).</p> <p>END OF TASK</p>



CHAPTER 22
EQUILIBRATOR CHARGING MANIFOLD

22-1. MAINTENANCE PROCEDURE INDEX

Equipment Item	Inspection	Test	Tasks	
			Disassembly	Assembly
Equilibrator Charging Manifold	22-2	22-3	22-4	22-5

22-2. EQUILIBRATOR CHARGING MANIFOLD INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble equilibrators charging manifold (para 22-4)

GENERAL INSTRUCTIONS:

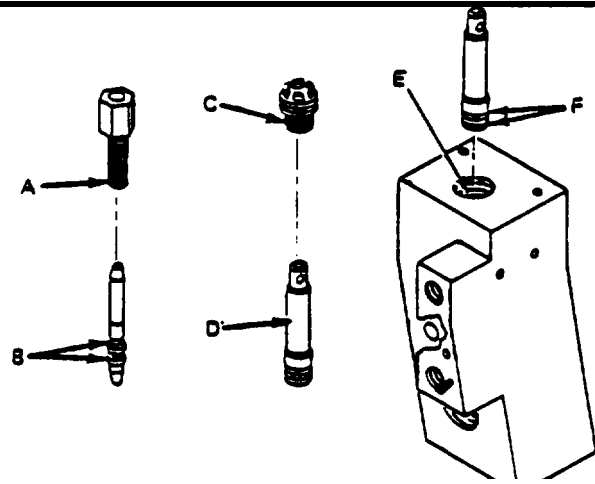
NOTE

If part is bad, order repair part or next higher assembly as required.

22-2. EQUILIBRATOR CHARGING MANIFOLD INSPECTION PROCEDURE (CONT)

FRAME 1

Step	Procedure																					
1.	SUPPORT SHOP WORK																					
1.	Take equilibrator charging manifold parts, to be checked, to support shop where measuring equipment is available.																					
2.	Make dimensional check.																					
	<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; width: 15%;">Reference Letter</th> <th style="text-align: center; width: 40%;">Point of Measurement</th> <th style="text-align: center; width: 45%;">Measurement (in inches)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">A</td> <td>ID of housing bore for poppet</td> <td style="text-align: center;">0.499 to 0.501</td> </tr> <tr> <td style="text-align: center;">B</td> <td>OD of poppet</td> <td style="text-align: center;">0.494 to 0.496</td> </tr> <tr> <td style="text-align: center;">C</td> <td>ID of plug</td> <td style="text-align: center;">0.626 to 0.627</td> </tr> <tr> <td style="text-align: center;">D</td> <td>OD of piston</td> <td style="text-align: center;">0.623 to 0.624</td> </tr> <tr> <td style="text-align: center;">E</td> <td>ID of manifold bore</td> <td style="text-align: center;">0.936 to 0.937</td> </tr> <tr> <td style="text-align: center;">F</td> <td>OD of piston</td> <td style="text-align: center;">0.933 to 0.934</td> </tr> </tbody> </table>	Reference Letter	Point of Measurement	Measurement (in inches)	A	ID of housing bore for poppet	0.499 to 0.501	B	OD of poppet	0.494 to 0.496	C	ID of plug	0.626 to 0.627	D	OD of piston	0.623 to 0.624	E	ID of manifold bore	0.936 to 0.937	F	OD of piston	0.933 to 0.934
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F	OD of piston	0.933 to 0.934																				
	<p>NOTE</p> <p>Tag parts that are out of tolerance.</p>																					
3.	<p>After support shop work return equilibrator charging manifold parts to turret shop.</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required</p> <p style="text-align: center;">Assemble equilibrator charging manifold (para 22-5).</p> <p>END OF TASK</p>																					



22-3. EQUILIBRATOR CHARGING MANIFOLD TEST PROCEDURE

■ **TEST EQUIPMENT:** Hydraulic test kit (NSN 1015-01-151-6441) (9337932)
Watch with sweep-second hand
Spring scale (50 pound capacity)
Graduated container (10 cubic-inch capacity)

SUPPLIES: Rags (item 21, App A)
Hydraulic fluid (item 10, App A)
Pencil and paper

PERSONNEL: One

REFERENCES: TM 9-2350-222-10 for procedure to fill equilibrator reservoir
TM 9-2350-222-20-2-3 for procedure to remove equilibrator charging manifold

EQUIPMENT CONDITION: Equilibrator charging manifold removed (TM -20-2-3)

PRELIMINARY PROCEDURES: Assemble equilibrator charging manifold (para 22-5)

GENERAL INSTRUCTIONS:

CAUTION

Keep dirt from getting in tubing or parts. Dirt can damage equipment.

NOTE

Rags should be used to clean up spilled hydraulic oil.

Suitable tools and supplies should be used to connect test equipment to equilibrator charging manifold.

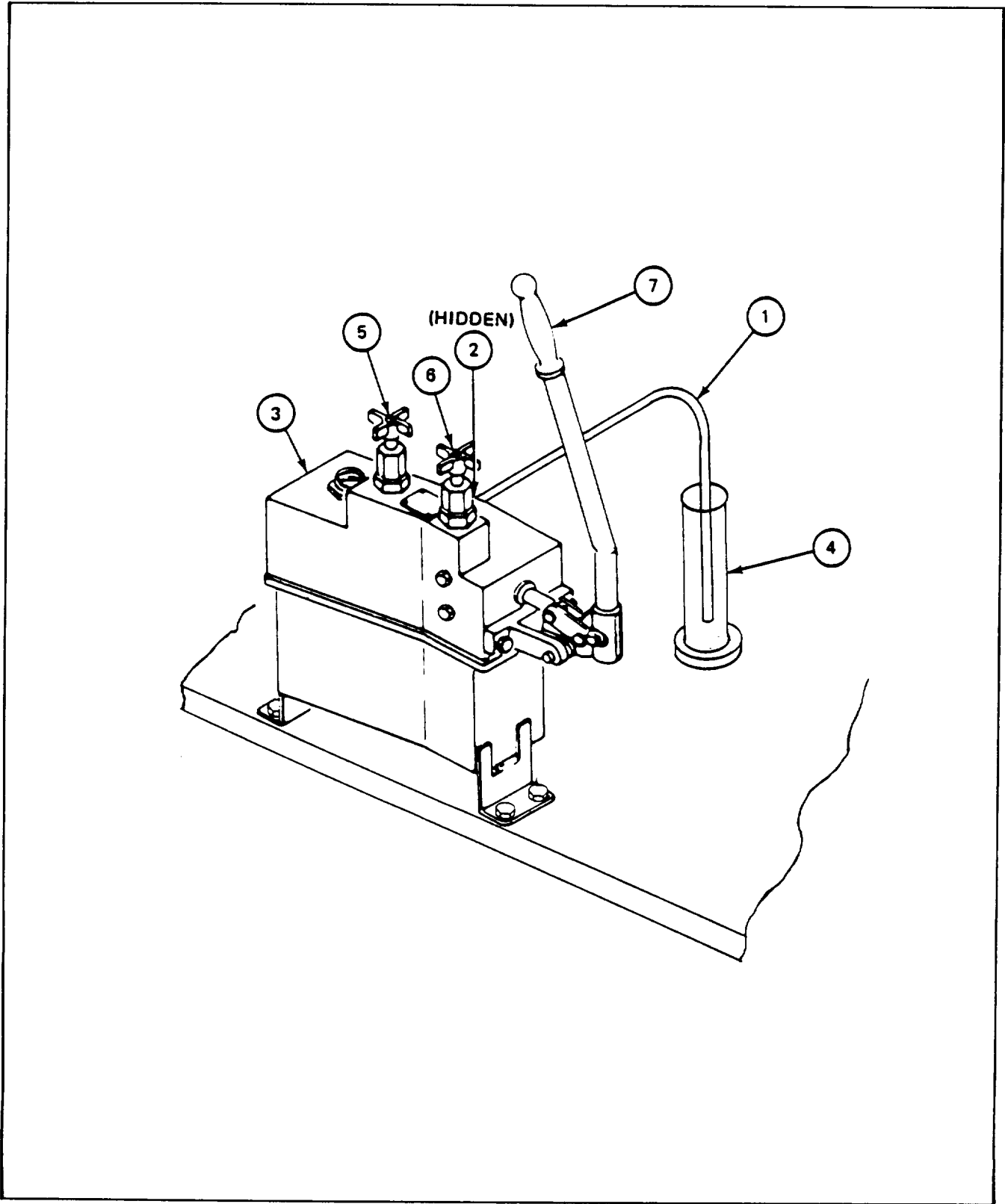
If test does not give normal indication, equilibrator charging manifold or equilibrator reservoir are bad. Disassemble bad equilibrator charging manifold (para 22-4) and replace bad parts.

22-3. EQUILIBRATOR CHARGING MANIFOLD TEST PROCEDURE (CONT)

FRAME 1			
Step	Procedure	Normal Indication	Probable Fault
1.	Using suitable tools and supplies, attach charging manifold (1) to work bench.	. . .	. . .
2.	Fill charging manifold reservoir (2) with hydraulic fluid until fluid level is between one inch and two inches above FULL mark on equilibrator gauge (3) (TM-10).	. . .	. . .
3.	Check for fluid leaks at seal (4) between charging manifold (1) and reservoir (2).	No fluid leaks	Bad equilibrator reservoir
<p>NOTE</p> <p>If step 3 does not give normal indication, tighten screws holding seal (4) (TM-20). Repeat step 3. If step 3 still does not give normal indication, equilibrator reservoir is bad.</p> <p>GO TO FRAME 2</p>			

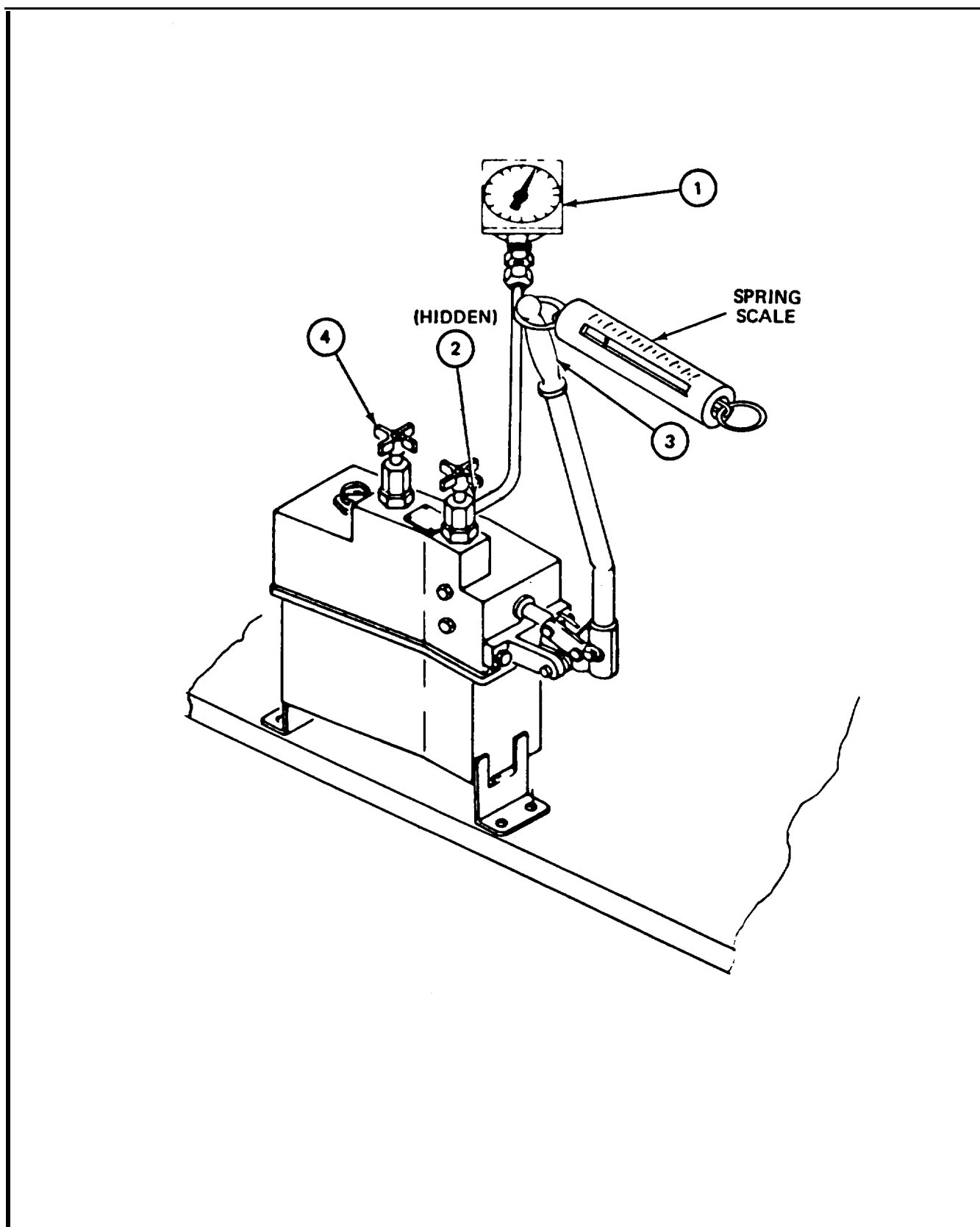
22-3. EQUILIBRATOR CHARGING MANIFOLD TEST PROCEDURE (CONT)

FRAME 2			
Step	Procedure	Normal Indication	Probable Fault
1.	Using suitable tools and supplies, attach one end of plastic tube (1) to Port E (2) on charging manifold (3). Put other end of plastic tube (1) in graduated container (4).	. . .	. . .
2.	Close drain valve (5)	. . .	. . .
3.	Open charging valve (6).	. . .	. . .
4.	Operate handle (7) until plastic tube (1) is full of hydraulic fluid.	No air bubbles in plastic tube	. . .
5.	Using pencil and paper, write down how much fluid is in graduated container (4).	. . .	. . .
6.	Using watch or timer, operate handle (7) ten times in ten seconds.	. . .	. . .
7.	Using pencil and paper, write down how much fluid is in graduated container (4).	. . .	. . .
8.	Using pencil and paper, subtract number written down in step 5 from number written down in step 7.	More than 6.2 cubic inches	Bad equilibrator charging manifold
9.	Remove plastic tube (1) from Port E (2) and graduated container (4).	. . .	. . .
GO TO FRAME 3			



22-3. EQUILIBRATOR CHARGING MANIFOLD TEST PROCEDURE (CONT)

FRAME 3			
Step	Procedure	Normal Indication	Probable Fault
1.	Using suitable tools and supplies, connect pressure gauge (1) to Port E (2).	. . .	. . .
2.	Operate handle (3) until pressure gauge (1) reads between 1500 and 1550 psi. Push handle (3) forward as far as it will go.	. . .	. . .
3.	Using spring scale, measure force needed to move handle (3) backward as far as it will go.	Less than 48 pounds	Bad equilibrator charging manifold
4.	Using spring scale, measure force needed to move handle (3) forward as far as it will go.	Less than 48 pounds	Bad equilibrator charging manifold
5.	Remove test equipment.	. . .	. . .
6.	Open drain valve (4).	. . .	. . .
NOTE			
If test gives normal indication, equilibrator charging manifold and equilibrator reservoir are good.			
END OF TASK			



22-4. EQUILIBRATOR CHARGING MANIFOLD DISASSEMBLY PROCEDURE

TOOLS: 1-5/8" open end wrench
1-3/8" open end wrench
No. 2 cross tip screwdriver (Phillips)
13/16" combination wrench
9/16" combination wrench
11/16" combination wrench
3/8" flat tip screwdriver
7/16" combination wrench
Spanner wrench
1/4" socket head screw key (Allen wrench)
Soft face hammer
15/16" combination wrench
8" adjustable wrench
Knife
Stiff bristled brush
Scraper
O-ring extractor kit
Fine stone
Long nose pliers
Vise with brass caps
1/4" flat tip screwdriver
Slip joint pliers

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App A)

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedures to:
Remove equilibrator charging manifold
Remove equilibrator reservoir
Remove equilibrator filter
JPG for procedures to:
Remove preformed packings and retainers
Remove clips and cotter pins
Clean parts
Inspect and repair parts

EQUIPMENT CONDITION: Equilibrator charging manifold removed (TM-20-2-3)
Equilibrator reservoir removed (TM-20-2-3)
Equilibrator filter removed (TM-20-2-3)

GENERAL INSTRUCTIONS:

CAUTION

Keep dirt from getting in tubing or parts. Dirt can damage equipment.

NOTE

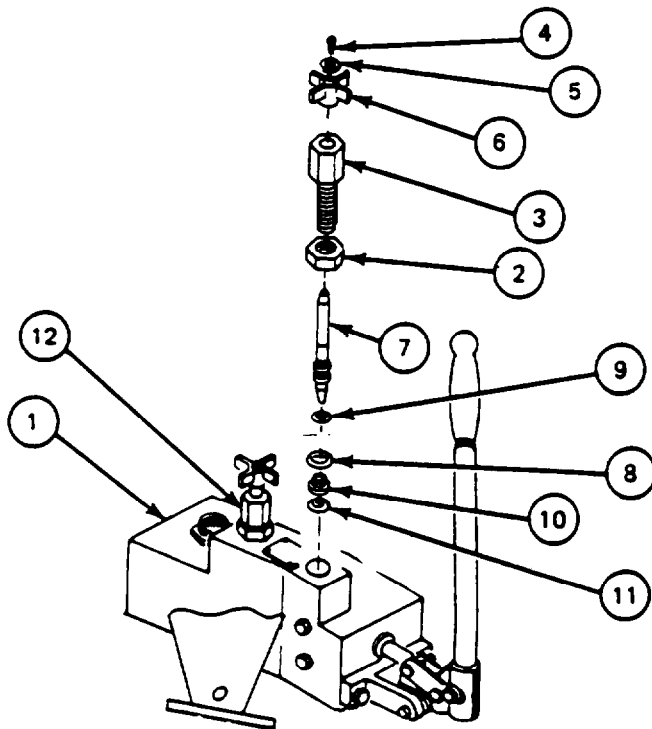
Use cleaning rags to clean up spilled hydraulic fluid.

22-4. EQUILIBRATOR CHARGING MANIFOLD DISASSEMBLY PROCEDURE (CONT)

FRAME 1	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 4. 	<p>Using hands, remove gage (1) from strainer (2).</p> <p>Using 1-5/8" wrench, remove strainer (2) from manifold (3).</p> <p>Using adjustable wrench, remove tube (4).</p> <p>Using 11/16" wrench, remove reducer (5).</p> <p>GO TO FRAME 2</p>

22-4. EQUILIBRATOR CHARGING MANIFOLD DISASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
1.	Put manifold (1) in vise.
2.	Using 1-3/8" wrench, loosen nut (2).
3.	Using 1-1/8" open end wrench, unscrew valve housing (3) from manifold (1).
4.	Using 1/4" flat tip screwdriver, remove screw (4) and flat washer (5) holding handle (6) to poppet (7). Remove handle (6) from poppet (7).
5.	Using O-ring extractor, remove preformed packing (8) and nut (2) from valve housing (3) (JPG).
6.	Using hands, unscrew poppet (7) clockwise and remove from housing (2).
7.	Remove preformed packing (9) from poppet (7) (JPG).
8.	Using long nose pliers, remove seat (10) and preformed packing (11) from manifold (1).
9.	Using O-ring extractor, remove packing (11) from seat (10) (JPG).
10.	Repeat steps 2 thru 9 for drain valve (12).
11.	Remove manifold (1) from vise.
GO TO FRAME 3	



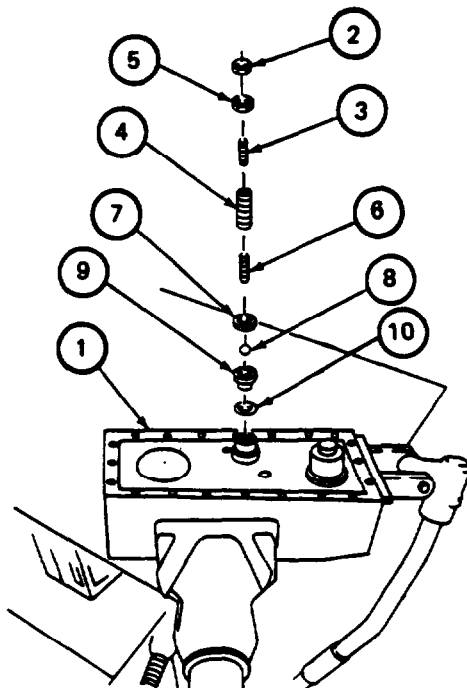
22-4. EQUILIBRATOR CHARGING MANIFOLD DISASSEMBLY PROCEDURE (CONT)

FRAME 3	
Step	Procedure
<ol style="list-style-type: none"> 1. Place manifold (1) on work bench. 2. Using 13/16" wrench, remove plug (2) and preformed packing (3) from manifold (1). 3. Using O-ring extractor, remove preformed packing (3) from plug (2) (JPG). 4. Using O-ring extractor, remove seat (4), spring (5) and ball (6) from manifold (1) (JPG). 5. Using 9/16" wrench, remove three plugs (7) and three preformed packings (8) from manifold (1) (JPG). 6. Using O-ring extractor, remove three preformed packings (8) from three plugs (7) (JPG). Using O-ring extractor, remove two seats (9), spring (10), and ball (11) from manifold (1) (JPG). 	<p>GO TO FRAME 4</p>

22-4. EQUILIBRATOR CHARGING MANIFOLD DISASSEMBLY PROCEDURE (CONT)

FRAME 4

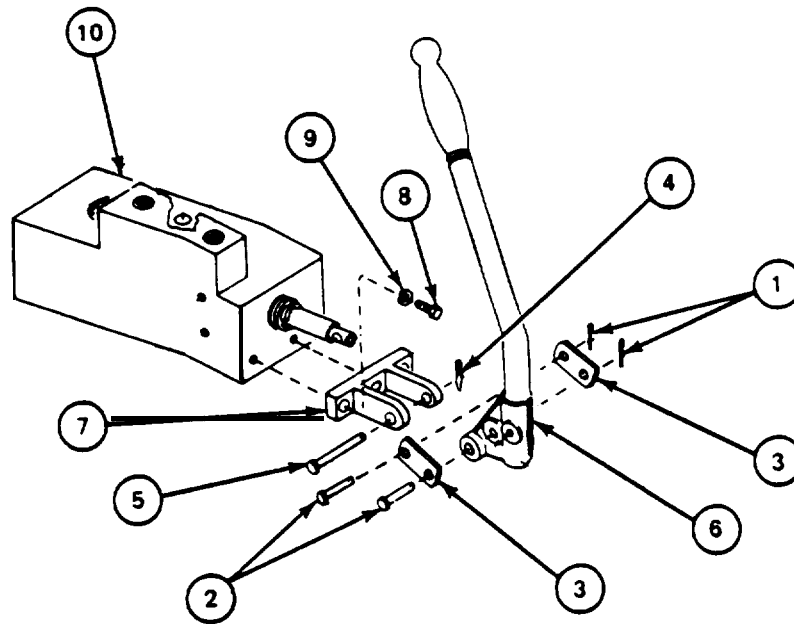
Step	Procedure
<ol style="list-style-type: none"> 1. Put manifold (1) in vise. 2. Using 11/16" wrench and 3/8" screwdriver, remove nut (2) and screw (3) from screw (4). 3. using 15/16" wrench and 5/8" screwdriver, remove nut (5). 4. using O-ring extractor, remove spring (6). 5. using 3/8" screwdriver, remove screw (4). 	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">If retainer (7) came out with screw (4) go to Step 7.</p>
<ol style="list-style-type: none"> 6. using O-ring extractor, remove retainer (7). 7. Using O-ring extractor, remove ball (8). 8. Using Oring extractor, remove seat (9) and preformed packing (10) (JPG). 9. Remove manifold (1) from vise. 	<p style="text-align: center;">GO TO FRAME 5</p>



22-4. EQUILIBRATOR CHARGING MANIFOLD DISASSEMBLY PROCEDURE (CONT)

FRAME 5

Step	Procedure
1.	Using slip joint pliers, remove two clips (1), two pins (2) and two links (3) (JPG).
2.	Using slip joint pliers, remove clip (4) and pin (5) holding adapter assembly (6) to bracket (7) (JPG).
3.	Remove adapter assembly (6) from bracket (7).
4.	Using 7/16" wrench, remove three screws (8), and three lockwashers (9) holding bracket (7) to manifold (10).
5.	Remove bracket (7) from manifold (10). GO TO FRAME 6



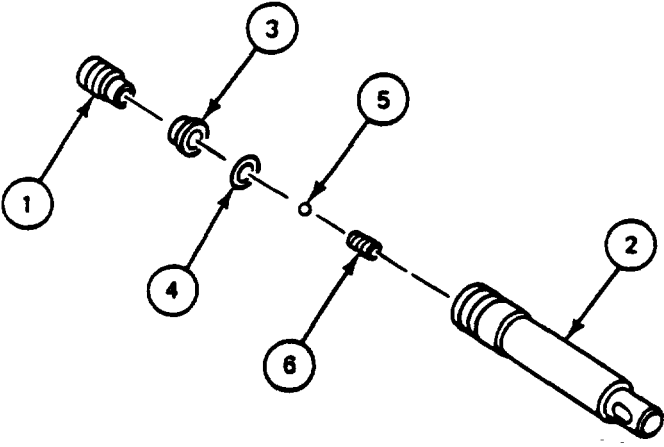
22-4. EQUILIBRATOR CHARGING MANIFOLD DISASSEMBLY PROCEDURE (CONT)

FRAME 6	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 	<p>Using two 7/16" wrenches, remove screw (1) and locknut (2) holding handle (3) to adapter (4).</p> <p>Using hammer, tap adapter (4) from handle (3).</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Do step 3 if grip (5) is to be replaced.</p>
<ol style="list-style-type: none"> 3. 	<p>Using knife, remove grip (5) from handle (3).</p> <p>GO TO FRAME 7</p>

22-4. EQUILIBRATOR CHARGING MANIFOLD DISASSEMBLY PROCEDURE (CONT)

FRAME 7	
Step	Procedure
<ol style="list-style-type: none"> 1. Put manifold (1) in vise. 2. Using spanner wrench, remove plug (2) from manifold (1). 3. Slide plug (2) and piston (3) from manifold (1). 4. Remove manifold (1) from vise. 5. Slide plug (2) off piston (3). 6. Using O-ring extractor, remove retainer (4) and preformed packing (5) from outside of plug (2) (JPG). 7. Using O-ring extractor, remove retainer (6) and preformed packing (7) from residue of plug (2) (JPG). 8. Using O-ring extractor, remove two retainers (8) and preformed packing (9) from outside of piston (3) (JPG). <p>GO TO FRAME 8</p>	

22-4. EQUILIBRATOR CHARGING MANIFOLD DISASSEMBLY PROCEDURE (CONT)

FRAME 8	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 	<p>Using Allen wrench, remove seat (1) from piston (2).</p> <p>Using O-ring extractor, remove retainer (3), ball (4) and spring (5) from inside piston (2) (JPG).</p> <p>Using O-ring extractor, remove packing (6) from inside piston (2) (JPG).</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of parts (para 22-2).</p> <p>END OF TASK</p>
	

22-5. EQUILIBRATOR CHARGING MANIFOLD ASSEMBLY PROCEDURE

TOOLS: 1-5/8" open end wrench
 1-3/8" open end wrench
 No. 2 crosstip screwdriver (Phillips)
 13/16" combination wrench
 9/16" combination wrench
 11/16" combination wrench
 3/8" flat tip screwdriver
 7/16" combination wrench (two)
 Spanner wrench
 1/4" socket head screw key (Allen wrench)
 1/4" flat tip screwdriver
 15/16" combination wrench
 M3 oil pump
 Gage (MS28063-2)
 8" adjustable wrench
 O-ring extractor kit

PERSONNEL: One

SUPPLIES: Rags (item 21, App A)
 Hydraulic fluid (item 10, App A)
 Locknut (MS51922-5)
 Preformed packing (MS28775-012) (two)
 Preformed packing (MS28778-12) (two)
 Preformed packing (MS28775-113) (two)
 Preformed packing (MS28778-2) (three)
 Preformed packing (MS28778-6)
 Preformed packing (MS28775-009)
 Preformed packing (MS28775-213)
 Preformed packing (MS28775-114)
 Preformed packing (MS28775-116)
 Preformed packing (MS28775-111)
 Teflon tape (item 34, App A)
 Grip (7383864)
 Adhesive (item 4, App A)

REFERENCES: JPG for procedures to:
 Install preformed packings and retainers
 Install clips and cotter pins
 Apply adhesive
 Use M3 oil pump
 TM 9-2350-222-20-2-3 for Procedures to:
 Install equilibrator filter
 Install equilibrator reservoir
 Install equilibrator charging manifold

PRELIMINARY PROCEDURES: Inspect equilibrator charging manifold (para 22-2)

GENERAL INSTRUCTIONS:**CAUTION**

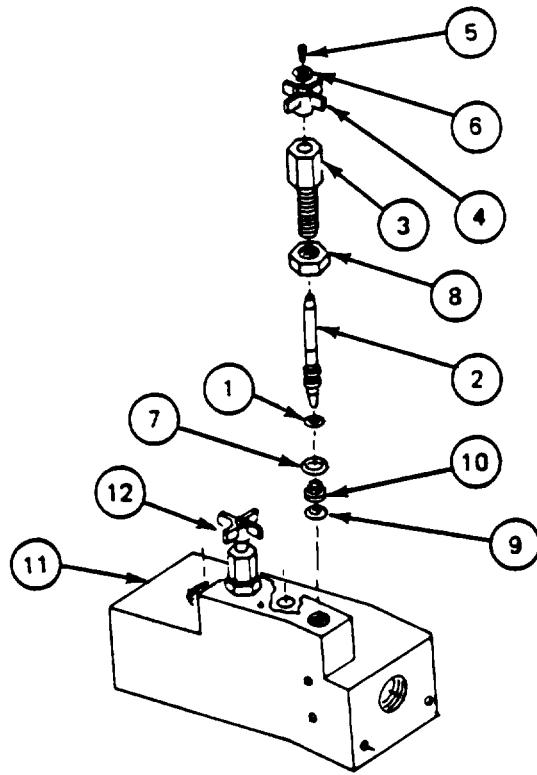
Keep dirt from getting in tubing or parts. Dirt can damage equipment.

NOTE

Use rags to clean up spilled hydraulic fluid.

22-5. EQUILIBRATOR CHARGING MANIFOLD ASSEMBLY PROCEDURE (CONT)

FRAME 1	
Step	Procedure
1.	Put manifold (1) in vise.
2.	Lightly coat preformed packing (2) (MS28775-012) with hydraulic fluid (JPG).
3.	Put preformed packing (2) on poppet (3) (JPG).
4.	Slide poppet (3) in housing (4).
5.	Using 1/4" flat tip screwdriver, attach handle (5) to poppet (3) with screw (6) and flat washer (7).
6.	Screw nut (8) past groove in threads of housing (4).
7.	Lightly coat preformed packing (9) with hydraulic fluid (JPG).
8.	Install preformed packing (9) in groove in threads of housing (4).
9.	Lightly coat preformed packing (10) (MS28775-113) with hydraulic fluid (JPG).
10.	Install preformed packing (10) in groove of seat (11).
11.	Using long nose pliers, install seat (11) in manifold (1) with preformed packing (10) facing down.
12.	Turn handle (5) in housing (4) counterclockwise as far as it will go.
13.	Using 1-1/8" wrench, install housing (4) in manifold (1).
14.	Using 1-3/8" wrench, tighten nut (8).
15.	Using hands, turn handle (5) clockwise as far as it will go. Hand tighten handle (5) to close valve.
16.	Repeat steps 2 through 15 for drain valve (12).
17.	Remove manifold (1) from vise.
	GO TO FRAME 2



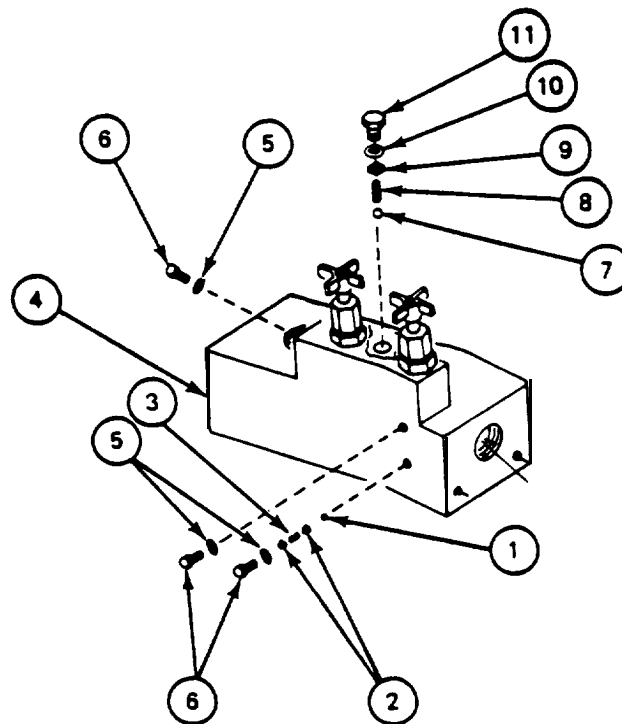
22-5. EQUILIBRATOR CHARGING MANIFOLD ASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
<ol style="list-style-type: none"> 1. Put manifold (1) in vise. 2. Lightly coat new preformed packing (2) (MS28775-009) with hydraulic fluid (JPG). 3. Put preformed packing (2) and seat (3) in manifold (1) (JPG). 4. Using 3/8" screwdriver, put screw (4) in manifold (1). 5. Using 15/16" wrench, put nut (5) on screw (4). 	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Make sure ball (6) is centered in hole of seat (3).</p> <ol style="list-style-type: none"> 6. Put ball (6) in screw (4). 7. Install retainer (7) in screw (4) flat side down. 8. Put spring (8) in screw (4). 9. Using 3/8" screwdriver, put screw (9) in screw (4). 10. Put nut (10) on screw (9). Do not tighten nut (10). 11. Remove manifold (1) from vise. <p style="text-align: center;">GO TO FRAME 3</p>

22-5. EQUILIBRATOR CHARGING MANIFOLD ASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 4. 	<p>Put ball (1), one seat (2), spring (3) and one seat (2) in manifold (4) (JPG).</p> <p>Lightly coat three preformed packings (5) (MS28778-2) with hydraulic fluid (JPG).</p> <p>Install three preformed packings (5) on three plugs (6) (JPG).</p> <p>Using 9/16" wrench, put three plugs (6) and three packings (5) in manifold (4) (JPG).</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Install seat (9) with flat side up.</p> <ol style="list-style-type: none"> 5. 6. 7. 8. <p>Put ball (7), spring (8), and seat (9) in manifold (4) (JPG).</p> <p>Lightly coat preformed packing (10) (MS28778-6) with hydraulic fluid (JPG).</p> <p>Install preformed packing (10) on plug (11) (JPG).</p> <p>Using 13/16" wrench, put plug (11) with preformed packing (10) in manifold (4) (JPG).</p> <p>GO TO FRAME 4</p>

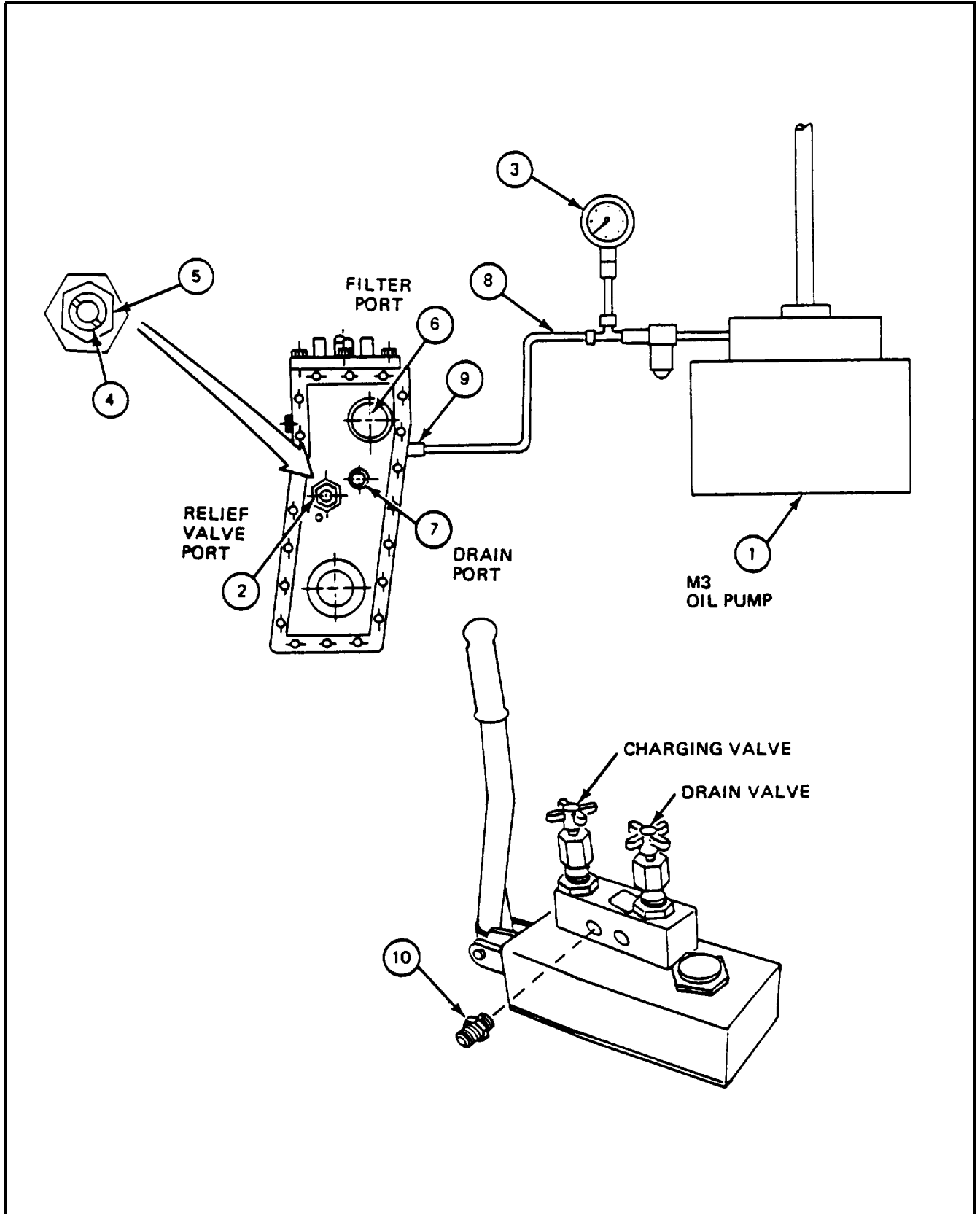


22-5. EQUILIBRATOR CHARGING MANIFOLD ASSEMBLY PROCEDURE (CONT)

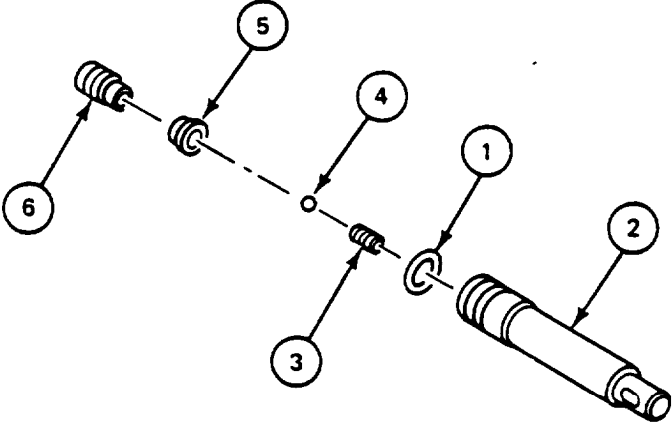
FRAME 4	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 	<p>Replace gage (1) on M3 oil pump with gage (MS 28063-2) (JPG).</p> <p>Using 11/16" wrench, install adapter (2) on Port E.</p> <p>Connect hose (3) to adapter (2) port E (JPG).</p> <p>GO TO FRAME 5</p>
<p>The diagram illustrates the assembly of the M3 Oil Pump. On the left, a component with a vertical shaft is shown. A dashed line points to a port labeled '2 PORT E'. A hose, labeled '3', connects this port to a gage labeled '1 GAGE' mounted on top of the 'M3 OIL PUMP' unit. The pump unit is a rectangular box with a vertical shaft extending from its top.</p>	

22-5. EQUILIBRATOR CHARGING MANIFOLD ASSEMBLY PROCEDURE (CONT)

FRAME 5	
Step	Procedure
	NOTE
	<p>Make sure charging valve and drain valve are both closed before operating M3 oil pump.</p>
1.	Operate M3 oil pump (1) until hydraulic fluid starts to flow from relief valve port (2) (JPG).
2.	<p>Read pressure on pressure gage (3). Release pressure at M3 oil pump (1) (JPG).</p> <p>If pressure reading is between 2500 and 2600 psi, go to step 3.</p> <p>If pressure reading is below 2500 psi, using 3/8" screwdriver tighten screw (4) and repeat steps 1 and 2.</p> <p>If pressure reading is above 2600 psi, using 3/8" screwdriver loosen screw (4) and repeat steps 1 and 2.</p>
3.	Using 11/16" wrench, tighten nut (5).
4.	Operate M3 oil pump (1) until pressure on gage (3) reads between 1500 and 1600 psi (JPG).
5.	Check hydraulic fluid leakage at relief valve port (2), filter port (6), and drain port (7). If leakage is moist to the touch or shows pink discoloration of surfaces, the valves are leaking and must be replaced.
6.	Release pressure at M3 oil pump (1) (JPG).
7.	Disconnect hose (8) from adapter (9).
8.	Using 11/16" wrench, remove adapter (9).
9.	Replace gage (3) on M3 oil pump with gage (M S28063-1).
10.	Using 11/16" wrench, install reducer (10).
	GO TO FRAME 6



22-5. EQUILIBRATOR CHARGING MANIFOLD ASSEMBLY PROCEDURE (CONT)

FRAME 6	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 4. 	<p>Lightly coat new preformed packing (1) (MS28775-111) with hydraulic fluid (JPG).</p> <p>Using O-ring extractor, install preformed packing (1) in piston (2) (JPG).</p> <p>Put spring (3), ball (4), and retainer (5) in piston (2) (JPG).</p> <p>Using Allen wrench, put seat (6) in piston (2).</p> <p>GO TO FRAME 7</p>
 <p>The diagram shows an exploded view of a piston assembly. A piston (2) is shown on the right. To its left are various components: a preformed packing ring (1), a spring (3), a ball (4), a retainer (5), and a seat (6). Arrows point from each numbered callout to its corresponding part in the assembly.</p>	

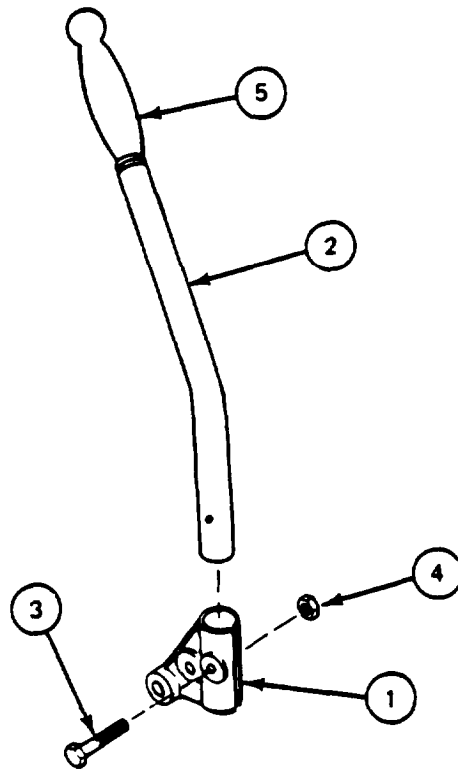
22-5. EQUILIBRATOR CHARGING MANIFOLD ASSEMBLY PROCEDURE (CONT)

FRAME 7	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 4. 5. 6. 7. 8. 9. 	<p>Lightly coat new preformed packing (1) (MS28775-116) with hydraulic fluid (JPG).</p> <p>Put preformed packing (1) and two retainers (2) on piston (3) (JPG).</p> <p>Lightly coat new preformed packing (4) (MS28775-114) with hydraulic fluid (JPG).</p> <p>Using O-ring extractor, install retainer (5) and preformed packing (4) inside plug (6) (JPG).</p> <p>Lightly coat new preformed packing (7) (MS28775-213) with hydraulic fluid (JPG).</p> <p>Put retainer (8) and preformed packing (7) (MS28775-213) on plug (6) (JPG).</p> <p>Slide plug assembly (6) on piston assembly (3).</p> <p>Put piston assembly (3) and plug assembly (6) in manifold (9).</p> <p>Using spanner wrench, tighten plug (6) in manifold (9).</p> <p>GO TO FRAME 8</p>

22-5. EQUILIBRATOR CHARGING MANIFOLD ASSEMBLY PROCEDURE (CONT)

FRAME 8

Step	Procedure
1.	Using hammer, tap adapter (1) on handle (2).
2.	Line up holes in handle (2) with adapter (1).
3.	Using two 7/16" wrenches, attach handle (2) to adapter (1) with screw (3) and new locknut (4).
<p>NOTE</p> <p>Do step 4 if grip (5) was removed.</p>	
4.	Apply adhesive to handle (2) and put on grip (5) (JPG). GO TO FRAME 9



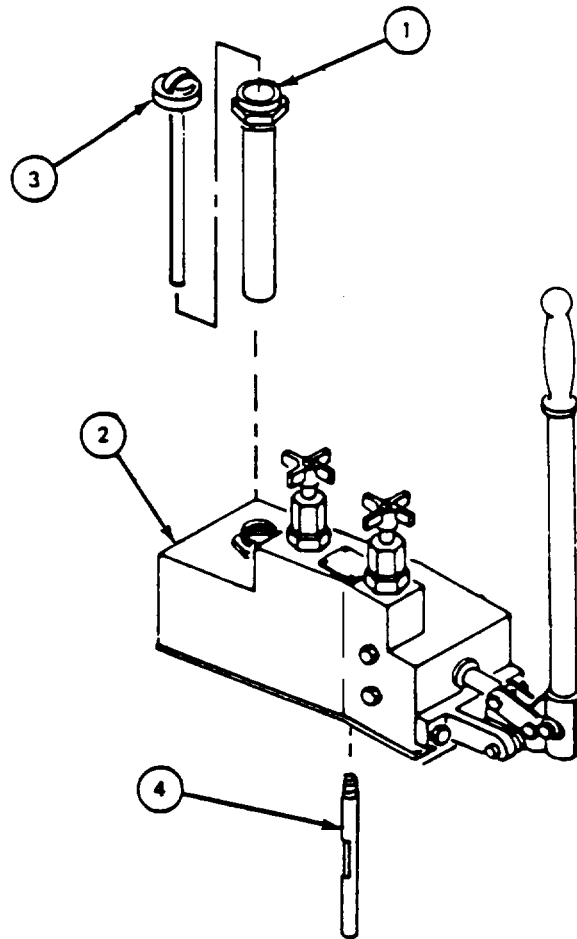
22-5. EQUILIBRATOR CHARGING MANIFOLD ASSEMBLY PROCEDURE (CONT)

FRAME 9	
Step	Procedure
<ol style="list-style-type: none"> 1. Using 7/16" wrench, attach bracket (1) to manifold (2) with three screws (3) and three lockwashers (4). 2. Line up hole in adapter assembly (5) with two holes in bracket (1). 3. Attach adapter assembly (5) to bracket (1) with pin (6) and clip (7) (JPG). 4. Attach two links (8) to adapter assembly (5) with pin (9) and clip (10) (JPG). 5. Attach other end of two links (8) to piston (11) with pin (12) and clip (13) (JPG). <p>GO TO FRAME 10</p>	

22-5. EQUILIBRATOR CHARGING MANIFOLD ASSEMBLY PROCEDURE (CONT)

FRAME 10

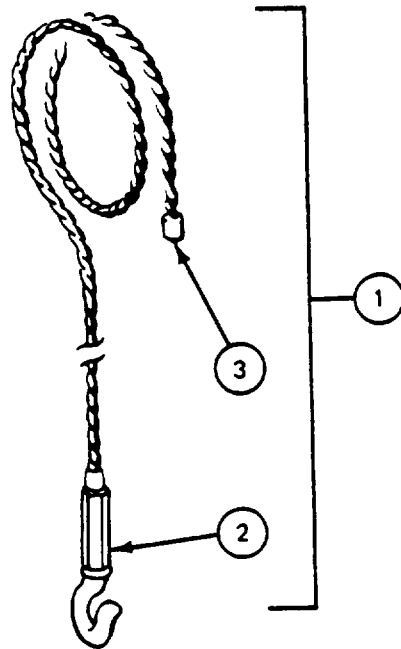
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 	<p>Using 1-5/8" wrench, attach strainer (1) to manifold (2).</p> <p>Using hands, put gage (3) in strainer (1).</p> <p>Using adjustable wrench and teflon tape, install tube (4) (MIL-T-27730).</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Install equilibrator filter (TM-20-2-3). Install equilibrator reservoir (TM-20-2-3). Test equilibrator charging manifold (para 22-3).</p> <p>END OF TASK</p>



CHAPTER 23
WIRE ROPE AND FERRULE

23-1. MAINTENANCE PROCEDURES INDEX

Equipment Item	Removal	Tasks		
		Installation	Disassembly	Assembly
1. Wire Rope and Ferrule			23-2	23-3
2. Swivel Hook	23-4	23-5	...	...
3. Ferrule	23-6	23-7	...	...



23-2. WIRE ROPE AND FERRULE DISASSEMBLY PROCEDURE

PERSONNEL: One

FRAME 1	
Step	Procedure
1.	Remove swivel hook (para 23-4).
2.	Remove ferrule (para 23-6).
	END OF TASK

23-3. WIRE ROPE AND FERRULE ASSEMBLY PROCEDURE

PERSONNEL: One

FRAME 1	
Step	Procedure
1.	Install ferrule (para 23-7).
2.	Install swivel hook (para 23-5).
	END OF TASK

23-4. SWIVEL HOOK REMOVAL PROCEDURE

TOOLS: 12" adjustable wrench (two)
Vise with brass caps

SUPPLIES: Leather gloves

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to remove wire rope and ferrule

EQUIPMENT CONDITION: Wire rope and ferrule removed (Tm-20-2-3)

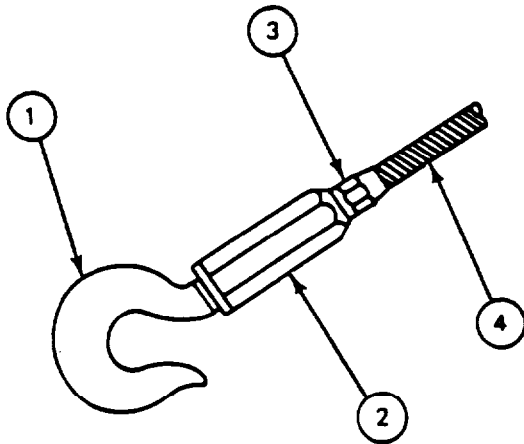
GENERAL INSTRUCTIONS:

WARNING

Leather gloves should be worn when handling wire rope.
Wire rope can cut and scrape your hands.

FRAME 1

Step	Procedure
1.	Put swivel hook (1) in vise.
2.	Using one wrench to hold collar (2) and one wrench to turn nut (3), loosen nut (3). Slide nut (3) up wire rope (4) about three inches.
3.	Using wrench, loosen collar (2) and remove wire rope (4) from swivel hook (1).
4.	Slide nut (3) and collar (2) off wire rope (4).
END OF TASK	



23-5. SWIVEL HOOK INSTALLATION PROCEDURE

TOOLS: 12" adjustable wrench
Vise with brass caps

SUPPLIES: Leather gloves

PERSONNEL One

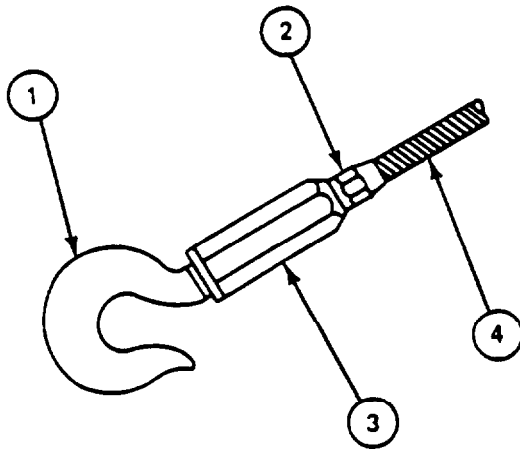
GENERAL INSTRUCTIONS:

WARNING

Leather gloves should be worn when handling wire rope.
Wire rope can cut and scrape your hands.

FRAME 1

Step	Procedure
1.	Put swivel hook (1) in vise.
2.	Slide nut (2) and collar (3) on wire rope (4).
3.	Using wrench, attach collar (3) to swivel hook (1).
4.	Using wrench, secure wire rope (4) to swivel hook (1) with nut (2).
END OF TASK	



23-6. FERRULE REMOVAL PROCEDURE

TOOLS: Hack saw
 Slip joint pliers
 Vise with brass caps

SUPPLIES: Leather gloves

PERSONNEL: One

REFERENCES: TM 9-2350-222 -20-2-3 for procedure to remove wire rope and ferrule

EQUIPMENT CONDITION: Wire rope and ferrule removed (TM-20-2-3)

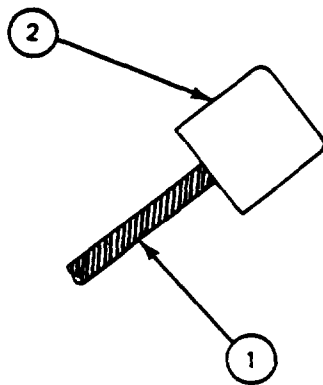
GENERAL INSTRUCTIONS:

WARNING

Leather gloves should be worn when handling wire rope.
 Wire rope can cut and scrape your hands.

FRAME

Step	Procedure
1.	Put wire rope (1) in vise.
2.	Using pliers, unscrew and remove ferrule (2) from wire rope (1).
<p>NOTE</p> <p>Do step 3 only if ferrule (2) will not unscrew from wire rope (1).</p>	
3.	Using hack saw, cut ferrule (2) off wire rope.
<p>END OF TASK</p>	



23-7. FERRULE INSTALLATION PROCEDURE

TOOLS: Slip joint pliers
Vise with brass caps

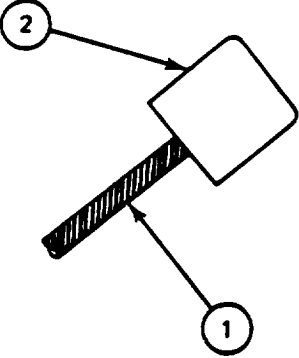
SUPPLIES: Leather gloves

PERSONNEL: One

GENERAL INSTRUCTIONS:

WARNING

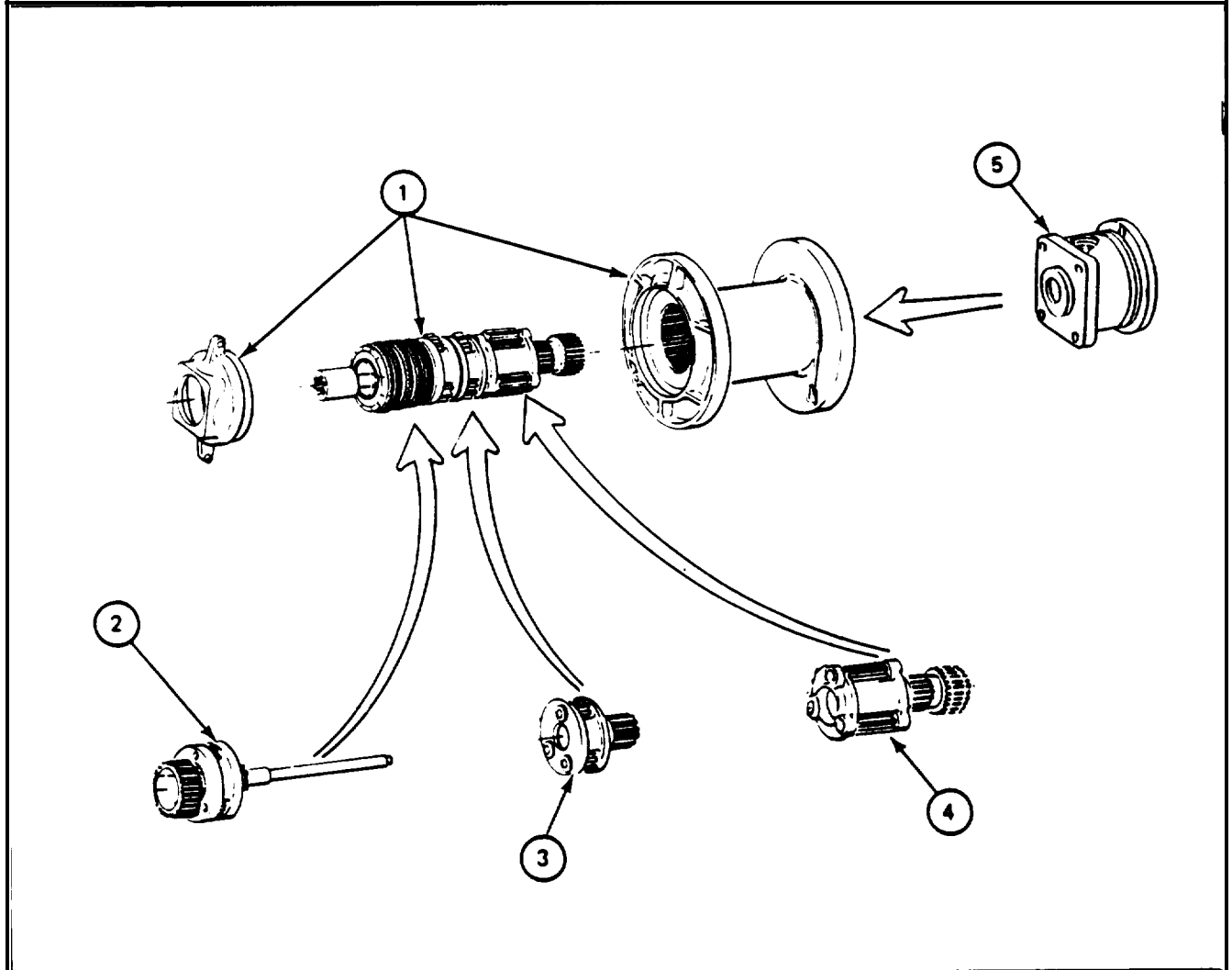
Leather gloves should be worn when handling wire rope.
Wire rope can cut and scrape your hands.

FRAME 1	
Step	Procedure
1.	Put wire rope (1) in vise.
2.	Using pliers, screw ferrule (2) on wire rope (1).
END OF TASK	
 <p>The diagram illustrates the first step of the procedure. A wire rope, labeled with a circled '1', is held in a vise. The ferrule, labeled with a circled '2', is being positioned over the end of the wire rope. The wire rope is shown with diagonal hatching to indicate its texture. The ferrule is a rectangular block with a hole through its center, designed to fit over the wire rope and be secured with a nut and washer.</p>	

CHAPTER 24 WINCH

24-1. MAINTENANCE PROCEDURES INDEX

Equipment Item	Test	Tasks				
		Inspection	Removal	Installation	Disassembly	Assembly
1. Winch	. . .	24-2	24-3	24-4	24-5	24-6
2. Carrier (Stage 1)	. . .	24-7	24-5	24-6	24-8	24-9
3. Carrier (Stage 2)	. . .	24-10	24-5	24-6	24-11	24-12
4. Carrier (Stage 3)	. . .	24-13	24-5	24-6	24-14	24-15
5. Control Cylinder	14-16	24-17	24-18	24-19	24-20	24-21



24-2. WINCH INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble winch (para 24-5)

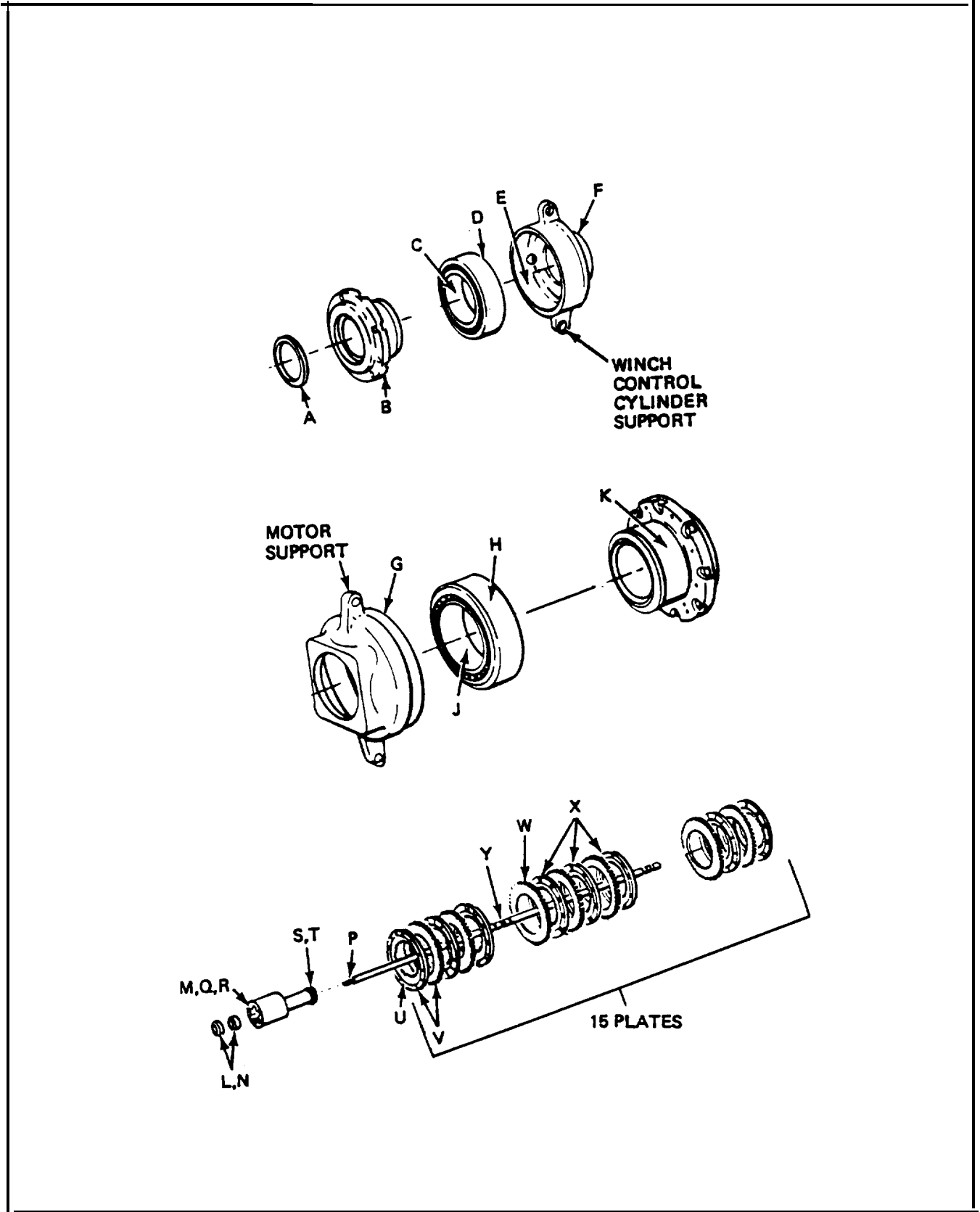
GENERAL INSTRUCTIONS:

NOTE

If part is bad, order repair part or next higher assembly as required.

24-2. WINCH INSPECTION PROCEDURE (CONT)

FRAME 1																																																																									
Step	Procedure																																																																								
	SUPPORT SHOP WORK																																																																								
1.	Take winch parts to shop where inspection equipment is available.																																																																								
2.	Make dimensional check.																																																																								
	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Reference Letter</th> <th style="text-align: center;">Point of Measurement</th> <th style="text-align: center;">Measurement (in inches)</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Thickness of thrust washer</td> <td>0.180 Minimum</td> </tr> <tr> <td>B</td> <td>OD of housing spindle</td> <td>5.1140 Minimum</td> </tr> <tr> <td>C</td> <td>ID of bearing</td> <td>5.1171 to 5.1181</td> </tr> <tr> <td>D</td> <td>OD of bearing</td> <td>7.8728 to 7.8740</td> </tr> <tr> <td>E</td> <td>ID of support bore</td> <td>7.8750 to 7.8770</td> </tr> <tr> <td>F</td> <td>Major diameter of support internal spline</td> <td>3.8750 to 3.8800</td> </tr> <tr> <td>G</td> <td>ID of support bore for bearing</td> <td>7.8750 to 7.8770</td> </tr> <tr> <td>H</td> <td>OD of bearing</td> <td>7.8728 to 7.8740</td> </tr> <tr> <td>J</td> <td>ID of bearing</td> <td>5.1171 to 5.1181</td> </tr> <tr> <td>K</td> <td>OD of housing spindle</td> <td>5.1140 Minimum</td> </tr> <tr> <td>L</td> <td>OD of bearing</td> <td>0.8746 to 0.8750</td> </tr> <tr> <td>M</td> <td>ID of spool bearing bore</td> <td>0.8764 Maximum</td> </tr> <tr> <td>N</td> <td>ID of bearing</td> <td>0.3747 to 0.3750</td> </tr> <tr> <td>P</td> <td>OD of shifting rod minor diameter</td> <td>0.3720 Minimum</td> </tr> <tr> <td>Q</td> <td>Spool internal spline minor diameter</td> <td>2.250 to 2.260</td> </tr> <tr> <td>R</td> <td>Spool external spline minor diameter</td> <td>1.895 to 1.900</td> </tr> <tr> <td>S</td> <td>Spool internal spline major diameter</td> <td>1.365 to 1.370</td> </tr> <tr> <td>T</td> <td>Spool external spline minor diameter</td> <td>1.145 to 1.150</td> </tr> <tr> <td>U</td> <td>Brake plate internal spline measured between O. 1800 pins</td> <td>3.8075 Maximum</td> </tr> <tr> <td>V</td> <td>Brake plate thickness (plates must be flat to within 0.010)</td> <td>0.107 Minimum</td> </tr> <tr> <td>W</td> <td>External spline measured over 0.3200 pins</td> <td>7.308 Minimum</td> </tr> <tr> <td>X</td> <td>Thickness of plates. Plates must be flat to within 0.010.</td> <td>0.055 to 0.065</td> </tr> <tr> <td>Y</td> <td>OD of shift rod major diameter</td> <td>0.496 to 0.498</td> </tr> </tbody> </table>	Reference Letter	Point of Measurement	Measurement (in inches)	A	Thickness of thrust washer	0.180 Minimum	B	OD of housing spindle	5.1140 Minimum	C	ID of bearing	5.1171 to 5.1181	D	OD of bearing	7.8728 to 7.8740	E	ID of support bore	7.8750 to 7.8770	F	Major diameter of support internal spline	3.8750 to 3.8800	G	ID of support bore for bearing	7.8750 to 7.8770	H	OD of bearing	7.8728 to 7.8740	J	ID of bearing	5.1171 to 5.1181	K	OD of housing spindle	5.1140 Minimum	L	OD of bearing	0.8746 to 0.8750	M	ID of spool bearing bore	0.8764 Maximum	N	ID of bearing	0.3747 to 0.3750	P	OD of shifting rod minor diameter	0.3720 Minimum	Q	Spool internal spline minor diameter	2.250 to 2.260	R	Spool external spline minor diameter	1.895 to 1.900	S	Spool internal spline major diameter	1.365 to 1.370	T	Spool external spline minor diameter	1.145 to 1.150	U	Brake plate internal spline measured between O. 1800 pins	3.8075 Maximum	V	Brake plate thickness (plates must be flat to within 0.010)	0.107 Minimum	W	External spline measured over 0.3200 pins	7.308 Minimum	X	Thickness of plates. Plates must be flat to within 0.010.	0.055 to 0.065	Y	OD of shift rod major diameter	0.496 to 0.498
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	NOTE																																																																								
	Tag parts that are out of tolerance.																																																																								
3.	After support shop work, return winch parts to turret shop.																																																																								
	NOTE																																																																								
	Follow-on Maintenance Action Required: Assemble winch (para 24-6 .																																																																								
	END OF TASK																																																																								



24-3. WINCH REMOVAL PROCEDURE

TOOLS: Hoist
Hoist sling
1-1/2" socket (3/4" drive)
3/4" drive ratchet
3-1/4" extension (3/4" drive)

SUPPLIES: Cleaning rags (item 21, App A)

PERSONNEL: Two

REFERENCES: TM 9-2350-222-20-2-3 for procedures to:
Remove tube assembly (10951625)
Remove tube assembly (10940790)
Remove tube assembly(10940791))

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Hydraulic Winch	FO-5	1

EQUIPMENT CONDITION: Two tube assemblies (10951625) removed (TM-20-2-3)
Tube assembly (10940790) removed (TM-20-2-3)
Tube assembly (10940791) removed (TM-20-2-3)

GENERAL INSTRUCTIONS:

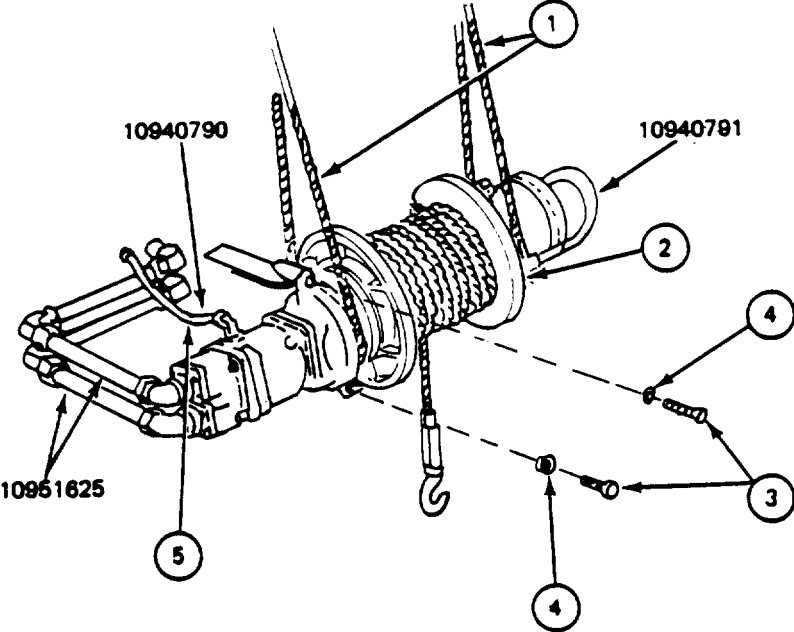
CAUTION

Keep dirt from getting in tubing or parts. Dirt can damage equipment.

NOTE

Use rags to clean up spilled hydraulic fluid.

24-3. WINCH REMOVAL PROCEDURE (CONT)

FRAME 1	Procedure
Step	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Soldier A operate hoist. Soldier B guide winch (2)</p> <ol style="list-style-type: none"> 1. Using hoist and hoist sling (1), support winch (2). 2. Operate hoist until all slack in hoist sling (1) is removed. 3. Using socket wrench, remove four screws (3) and four lockwashers (4) holding winch (2) to four mounting brackets (5). 4. Remove winch (2) from vehicle. <p>END OF TASK</p>
	

24-4. WINCH INSTALLATION PROCEDURE

TOOLS: Hoist

Hoist sling

1-1/2" socket (3/4" drive)

3/4" drive ratchet

3-1/4" extension (3/4" drive)

SUPPLIES: Cleaning rags (item 21, App. A)

PERSONNEL: Two

REFERENCES: TM 9-2350-222-20-2-3 for procedures to:

Install tube assembly (10951625)

Install tube assembly (10940790)

Install tube assembly (10940791)

PRELIMINARY PROCEDURES: Assemble winch (para 24-6)

GENERAL INSTRUCTIONS:

CAUTION

Keep dirt from getting in tubing or parts. Dirt can damage equipment.

NOTE

Use rags to clean up spilled hydraulic fluid.

24-4. WINCH INSTALLATION PROCEDURE (CONT)

FRAME 1	
Step	Procedure
	<p>NOTE</p> <p>Soldier A: Operate hoist. Soldier B: guide and position winch (2).</p> <ol style="list-style-type: none"> 1. Using hoist and hoist sling (1), move winch (2) into position on four mounting brackets (3). 2. Using socket wrench, attach winch (2) to four mounting brackets (3) with four screws (4) and four lockwashers (5). 3. Remove hoist and hoist sling (1). <p style="text-align: center;">NOTE</p> <p>Follow-on Maintenance Action Required:</p> <p>Install tube assembly (10940791) (TM-20-2-3). Install tube assembly (10940790) (TM-20-2-3). Install two tube assemblies (10951625) (TM -20-2-3). Service winch and boom controls (TM-20-2-3). Perform load test requirement per TB 43-0142 following winch, carrier, or control cylinder repair.</p> <p>END OF TASK</p>

24-5. WINCH DISASSEMBLY AND CARRIERS (STAGE 1 THRU 3) REMOVAL PROCEDURE

TOOLS: No. 3 cross tip screwdriver
External retaining ring pliers
3/8" socket head screw key (Allen wrench)
3/16" socket head screw key (Allen wrench)
7/16" combination wrench
Slip joint pliers
9/16" combination wrench
Internal retaining ring pliers
Stiff bristled brush
O-ring extractor kit
1/4" drive pin punch
8 ounce ball peen hammer
1/8" flat tip screwdriver
7/8" combination wrench
8" adjustable wrench
Pry bar
Fine stone
Scraper

SUPPLIES: Lint-free cloths (item 21, App A)
Dry-cleaning solvent (item 33, App A)
Crocus cloth (item 7, App A).

PERSONNEL: One

REFERENCES: LO 9-2350-222-12 for procedure to drain winch lubricant
TM 9-2350-222-20-2-3 for procedure to remove winch motor

EQUIPMENT CONDITION: Winch motor removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Remove winch (para 24-3)
Remove control cylinder (para 24-18)

GENERAL INSTRUCTIONS:

CAUTION

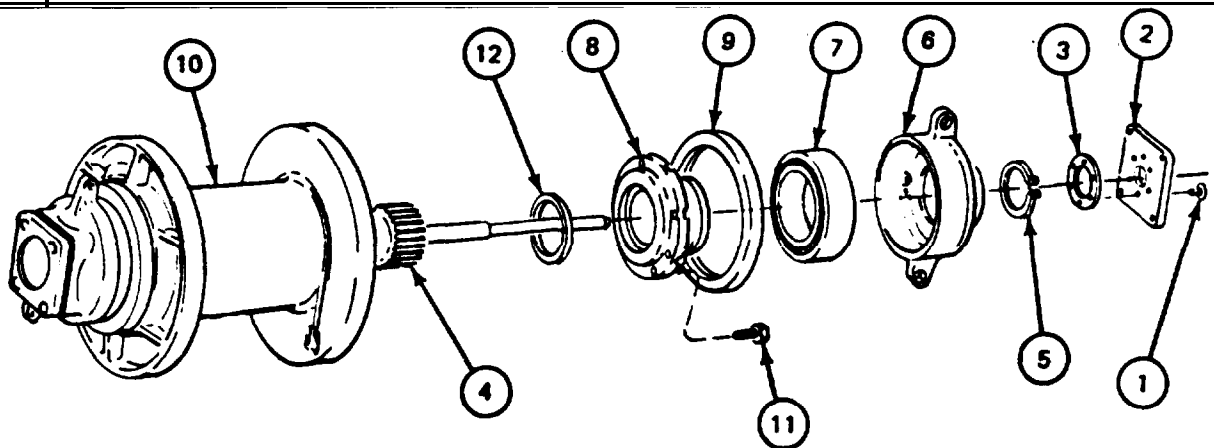
Keep dirt from getting in tubing or parts. Dirt can damage equipment

NOTE

Use rags to clean up spilled hydraulic fluid.

24-5. WINCH DISASSEMBLY AND CARRIERS (STAGE 1 THRU 3) REMOVAL PROCEDURE (CONT)

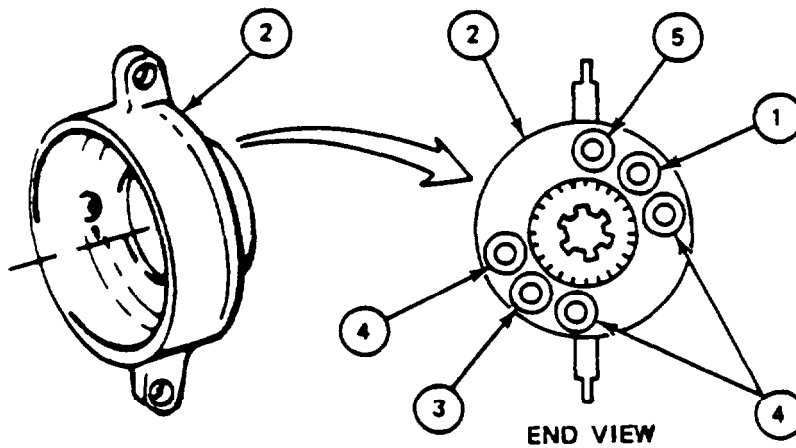
Step	Procedure
1.	Drain winch lubricant (LO- 12).
2.	Using No. 3 cross tip screwdriver, remove six screws (1) holding adapter plate (2) and gasket (3) to gear shaft (4).
3.	Remove adapter plate (2) and gasket (3) from gear shaft (4). Throw gasket (3) away.
4.	Using 1/8" screwdriver to raise retaining ring (5) and 1/4" screwdriver to pry retaining ring (5) off, remove retaining ring (5) from gear shaft (4) (JPG).
NOTE	
Pry bar may be used to start support (6) off gear shaft (4).	
5.	Slide support (6) off gear shaft (4).
NOTE	
Bearing (7) may come off with support (6).	
6.	Slide bearing (7) off housing (8).
7.	Using pry bar, remove seal (9) from drum (10).
8.	Using 3/8" Allen wrench, remove eight screws (11) that attach housing (8) to drum (10).
9.	Remove housing (8) and thrust washer (12) from drum (10). GO TO FRAME 2



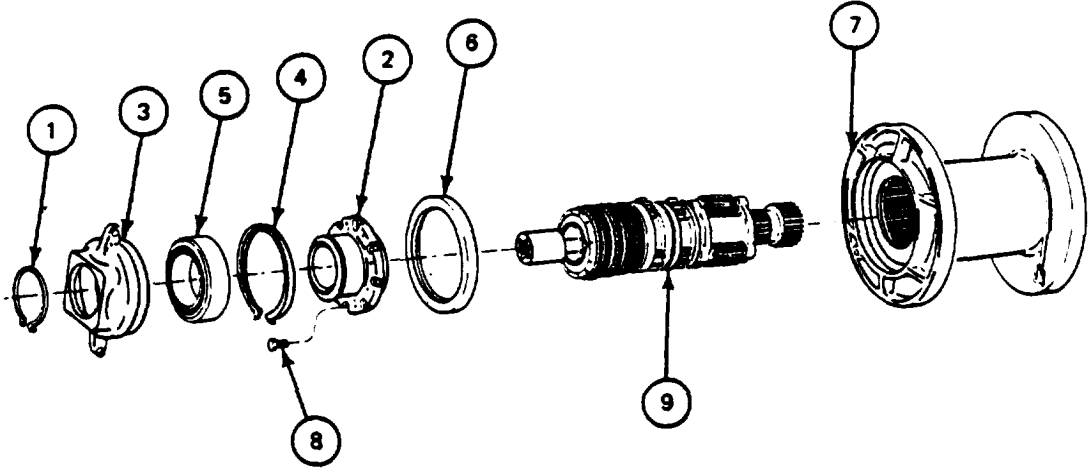
24-5. WINCH DISASSEMBLY AND CARRIERS (STAGE 1 THRU 3) REMOVAL PROCEDURE (CONT)

FRAME 2

Step	Procedure
	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Do steps 1 thru 3 if support (2) is damaged. If not, go to frame 3.</p> <ol style="list-style-type: none"> 1. Using 7/16" combination wrench, remove pressure fitting (1) from support (2). 2. Using 3/16" Allen wrench, remove plug (3) from support (2). 3. Using 9/16" wrench, remove three plugs (4) from support (2). 4. Using 7/8" wrench, remove plug (5) from support (2). <p>GO TO FRAME 3</p>

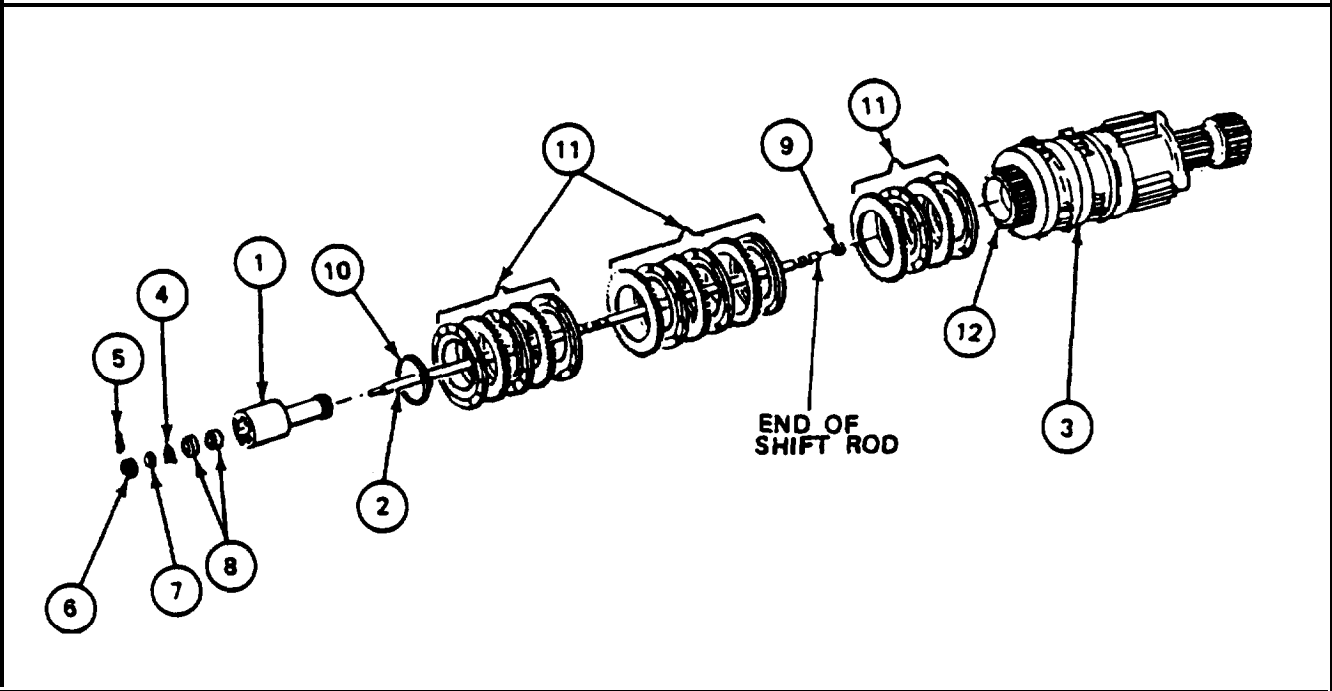


24-5. WINCH DISASSEMBLY AND CARRIERS (STAGE 1 THRU 3) REMOVAL PROCEDURE (CONT)

FRAME 3	
Step	Procedure
	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Retaining ring (1) will remain in support (3).</p> <ol style="list-style-type: none"> 1. Using external retaining ring pliers, remove retaining ring (1) from housing (2) (JPG). 2. Slide support (3) off housing (2). 3. Using external retaining ring pliers, remove retaining ring (4) from support (3) (JPG). 4. Remove bearing (5) from support (3). 5. Remove retaining ring (1) from support (3). <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Do not remove seal (6) unless seal is damaged.</p> <ol style="list-style-type: none"> 6. Using hammer and punch, remove seal (6) from drum (7) (JPG). 7. Using 3/8" Allen wrench, remove eight screws (8) holding housing (2) to drum (7). 8. Remove housing (2) from drum (7). 9. Using hands, slide gear and earner (9) out of drum (7). <p>GO TO FRAME 4</p>
	

24-5. WINCH DISASSEMBLY AND CARRIERS (STAGE 1 THRU 3) REMOVAL PROCEDURE (CONT)

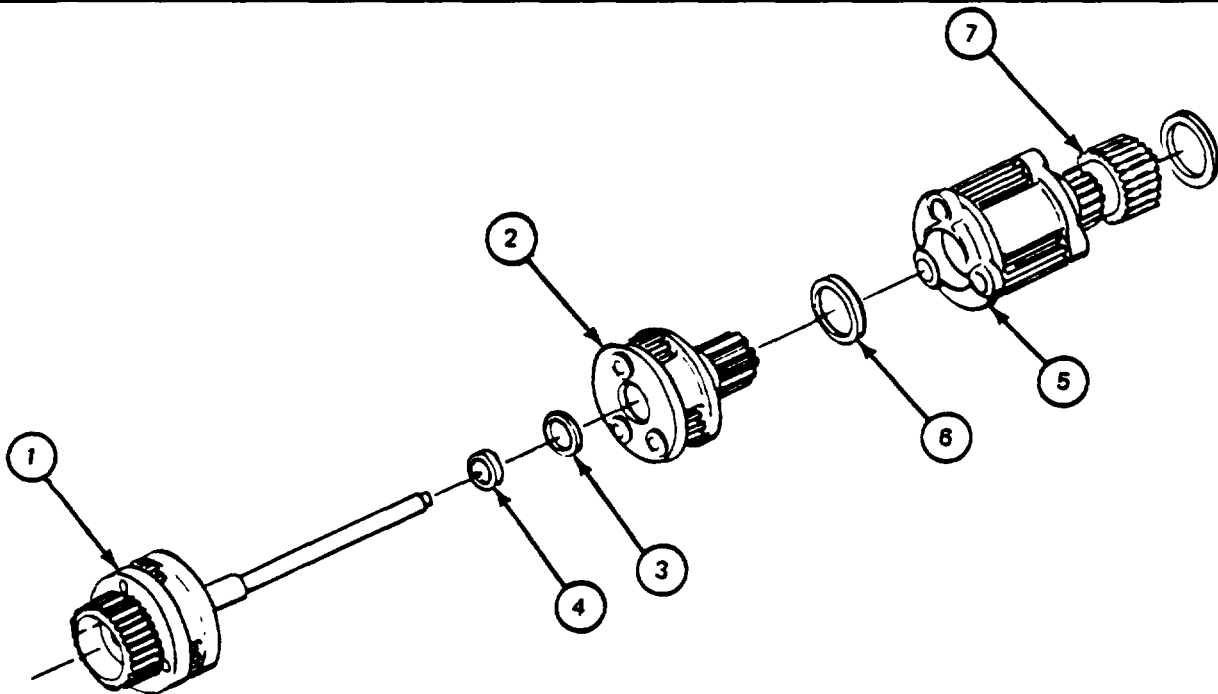
FRAME 4	
Step	Procedure
<ol style="list-style-type: none"> 1. Slide spool (1) and shift rod (2) out of gear and earner assemblies (3). 2. Using internal retaining ring pliers, remove retaining ring (4) (JPG). 3. Tap shift rod (2) on solid surface and remove from spool (1). 4. Using slip joint pliers, remove cotter pin (5) (JPG). 5. Using adjustable wrench to hold end of shift rod (2) and 9/16" wrench to remove nut (6), remove nut (6) and washer (7). 6. Remove two bearings (8) from shift rod (2). 7. Using O-ring extractor, remove preformed packing (9) from shift rod, (2) (JPG). 8. Using 1/8" screwdriver, remove retaining ring (10). 	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">If braking plates (11) are to be reused, keep them together as they came off brake ring (12).</p> <ol style="list-style-type: none"> 9. Using hands, pull 15 braking plates (11) off carrier brake' ring (12). <p>GO TO FRAME 5</p>



24-5. WINCH DISASSEMBLY AND CARRIERS (STAGE 1 THRU 3) REMOVAL PROCEDURE (CONT)

FRAME 5

Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 4. 5. 	<p>Using hands, remove carrier (stage 1) (1) from carrier (stage 2) (2).</p> <p>Using hands, remove thrust washer (3) and retainer (4) from carrier (stage 1) (1).</p> <p>Using hands, remove carrier (stage 2) (2) from carrier (stage 3) (5).</p> <p>Using hands, remove thrust washer (6) from carrier (stage 2) (2).</p> <p>Using O-ring extractor tool, remove preformed packing (7) from carrier (stage 3) (5) (JPG)</p>
<p>NOTE</p> <p>Follow-on Maintenance Action Required:</p> <p>Clean all parts (JPG).</p> <p>Disassemble carrier (stage 1) (para 24-8).</p> <p>Disassemble carrier (stage 2) (para 24- 11).</p> <p>Disassemble carrier (stage 3) (para 24- 14).</p> <p>Inspect and repair all parts (JPG).</p> <p>Do detail inspection of parts (para 24-2).</p> <p>END OF TASK</p>	



24-6. WINCH ASSEMBLY AND CARRIER (STAGE 1 THRU 3) INSTALLATION PROCEDURE

TOOLS: O-ring extractor kit
No. 3 cross tip screwdriver
External retaining ring pliers
Internal retaining ring pliers
3/8" socket head screw key (Allen wrench)
3/16" socket head screw key (Allen wrench)
7/16" combination wrench
9/16" combination wrench
Slip joint pliers
8 ounce ball peen hammer
1/2" drift pin punch
1/4" flat tip screwdriver
7/8" combination wrench

SUPPLIES: Winch brake repair kit (5702993)
Carrier repair kit (5702990)
Cleaning rags (item 21, App A)
Lubricant (item 17, App A)
Preformed packing (MS28775-0 12)
Gasket (10908418)
Preformed packing (MS28775-341)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Install preformed packings
Install cotter pins
Install retaining rings
TM 9-2350-22-20-2-3 for procedures to:
Install winch motor
Service winch and boom controls
LO 9-2350-222-12 for procedure to fill winch with lubricant

PRELIMINARY PROCEDURES: Inspect winch (para 24-2).
Assemble carrier (stage 1) (para 24-9).
Assemble carrier (stage 2) (para 24-12).
Assemble carrier (stage 3) (para 24-15).

GENERAL INSTRUCTIONS:

CAUTION

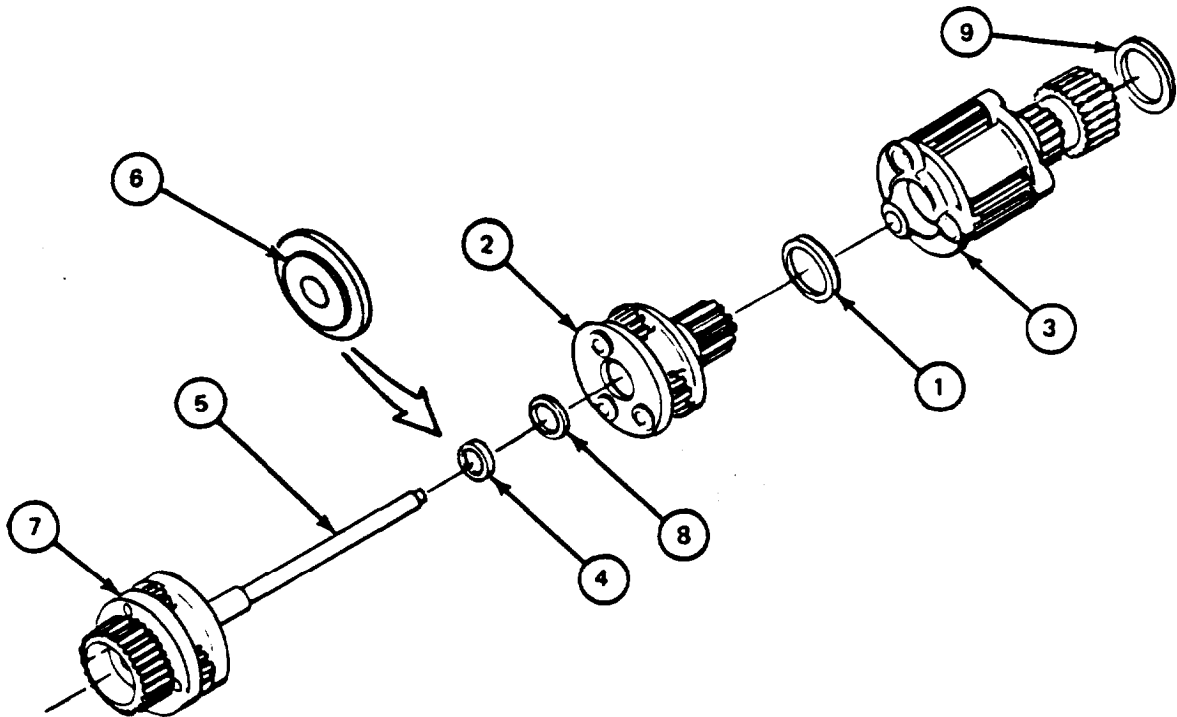
Keep dirt from getting in parts. Dirt can damage equipment.

NOTE

Use rags to clean up spilled hydraulic fluid.

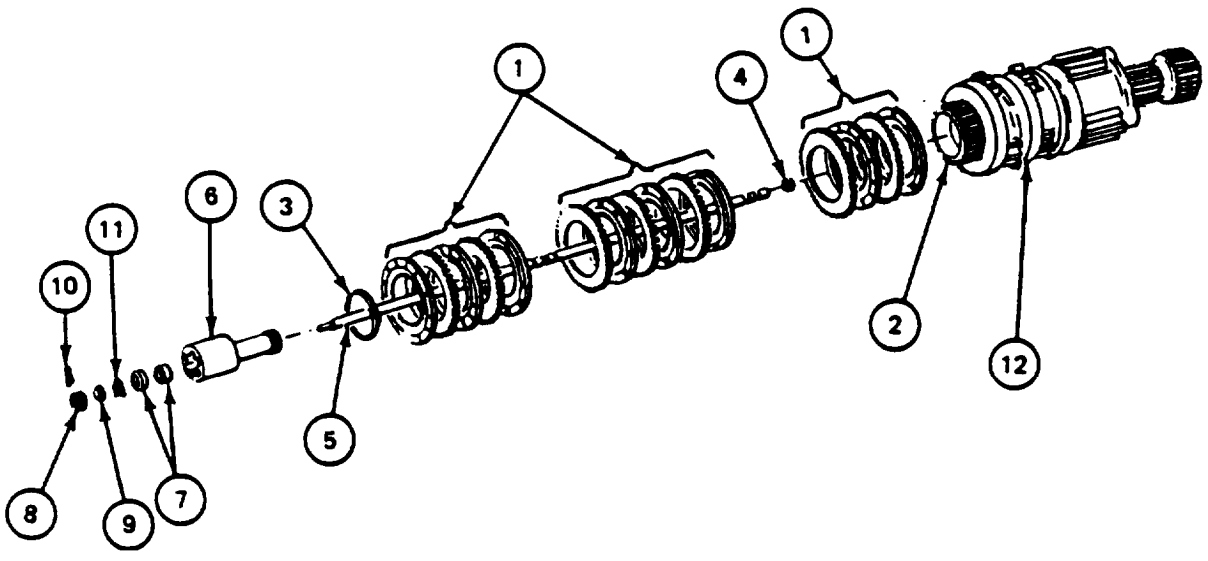
24-6. WINCH ASSEMBLY AND CARRIERS (STAGE 1 THRU 3) INSTALLATION PROCEDURE (CONT)

FRAME 1	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 4. 5. 6. 	<p>Put new thrust washer (1) (10908648) on shoulder of carrier (stage 2) (2).</p> <p>Push earner (stage 2) (2) and thrust washer (1) in carrier (stage 3) (3) as far as it will go.</p> <p>Slide retainer (4) on rod (5) with small outside diameter (6) toward carrier (stage 1) (7) gear.</p> <p>Slide new thrust washer (8) (10908642) on rod (5) until it is against retainer (4).</p> <p>Slide rod (5) and earner (stage 1) (7) in carrier (stage 2) (2) as far as it will go.</p> <p>Using O-ring extractor tool, put new preformed packing (9) on carrier (stage 3) (3) (JPG).</p> <p>GO TO FRAME 2</p>



24-6. WINCH ASSEMBLY AND CARRIERS (STAGE 1 THRU 3) INSTALLATION PROCEDURE (CONT)

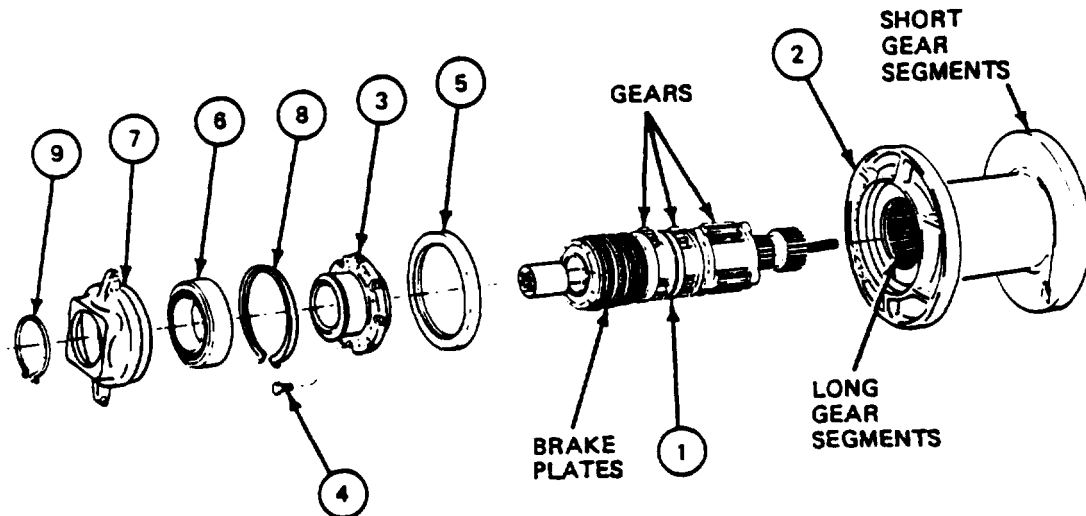
FRAME 2	
Step	Procedure
1.	Push 15 braking plates (1) on carrier brake ring (2).
2.	Install new retaining ring (3) (JPG).
3.	Lightly coat new preformed packing (4) (MS28775-012) with lubricant.
4.	Install preformed packing (4) on shift rod (5) (JPG).
5.	Slide shift rod (5) in spool (6), leaving about six inches of shift rod showing out of spool.
6.	Put two bearings (7) on shift rod (5).
7.	Using 9/16" wrench, install nut (8) and washer (9) on shift rod (5).
8.	Using slip joint pliers, install cotter pin (10) (JPG).
9.	Using punch, tap shift rod (5) in spool (6).
10.	Using internal retaining ring pliers and screwdriver, install retaining ring (11) (JPG).
11.	Slide shift rod (5) and spool (6) in gear and carrier (12) as far as they will go.
GO TO FRAME 3	



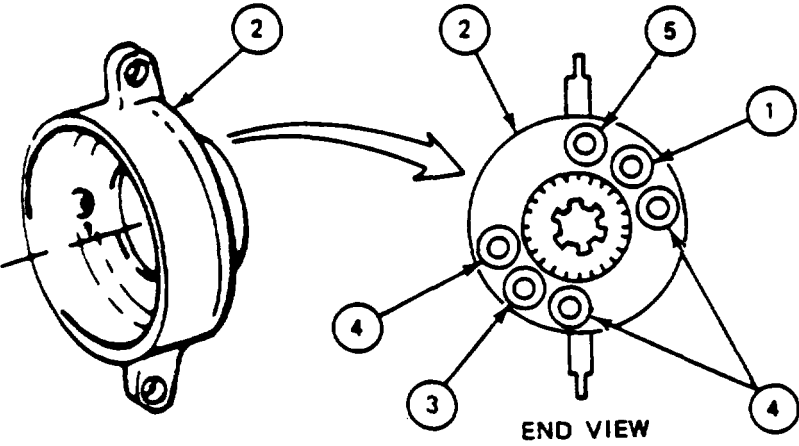
24-6. WINCH ASSEMBLY AND CARRIERS (STAGE 1 THRU 3) INSTALLATION PROCEDURE (CONT)

FRAME 3

Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 	<p>Slide gear and carriers (1) in drum (2).</p> <p>Using 1/4" flat tip screwdriver, line up brake plates with long gear segments.</p> <p>Using 3/8" Allen wrench, attach housing (3) to drum (2) with eight screws (4).</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">If seal (5) was removed, do step 4.</p> <ol style="list-style-type: none"> 4. 5. 6. 7. 8. <p>GO TO FRAME 4</p>



24-6. WINCH ASSEMBLY AND CARRIERS (STAGE 1 THRU 3) INSTALLATION
PROCEDURE (CONT)

FRAME 4	
Step	Procedure
	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Do steps 1 through 4 if support (2) has been replaced. If not, GO TO FRAME 5.</p> <ol style="list-style-type: none"> 1. Using 7/16" combination wrench, put pressure fitting (1) in support (2). 2. Using 3/16" Allen wrench, put plug (3) in support (2). 3. Using 9/16" wrench, put three plugs (4) in support (2). 4. Using 7/8" wrench, put plug (5) in support (2). <p>GO TO FRAME 5</p>
	

24-6. WINCH ASSEMBLY AND CARRIERS (STAGE 1 THRU 3) INSTALLATION PROCEDURE (CONT)

FRAME 5	
Step	Procedure
1.	Put thrust washer (1) in housing (2).
2.	Slide housing (2) on gear shaft (3) as far as it will go.
3.	Using 3/8 in. Allen wrench, attach housing (2) to drum (4) with eight screws (5).
<p>NOTE</p> <p>If seal (6) was removed, do step 3.</p>	
4.	Using hammer, put new seal (6) in drum (4).
5.	Slide bearing (7) on housing (2).
6.	Slide support (8) on bearing (7).
7.	Using 1/4 in. flat tip screwdriver, install retaining ring (9) on gear shaft (3).
8.	Lightly coat new gasket (10) with lubricant.
9.	Using No. 3 cross tip screwdriver, attach adapter plate (11) and gasket (10) to gear shaft (3) with six screws (12).
<p>NOTE</p> <p>Follow-on Maintenance Action Required:</p> <p>Install control cylinder (para 24-19). Install winch motor (TM -20-2-3). Fill winch with lubricant (LO-12). Perform load test requirement per TB 43-0142 following winch, carrier, or control cylinder repair.</p>	
END OF TASK	

24-7. CARRIER (STAGE 1) INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble carrier (stage 1) (para 24-8).

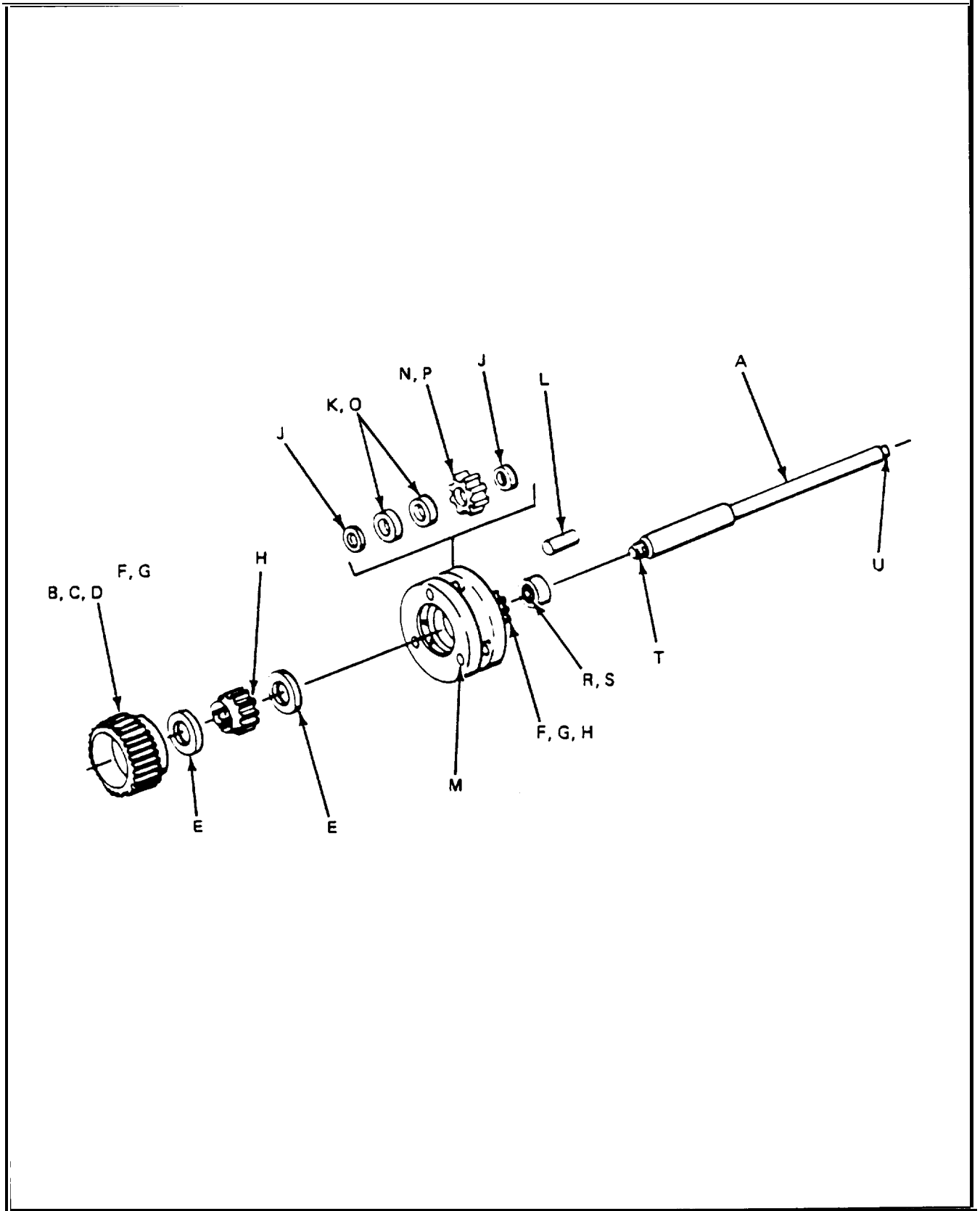
GENERAL INSTRUCTIONS:

NOTE

If pan is bad, order repair part or next higher assembly as required.

24-7. CARRIER (STAGE 1) INSPECTION PROCEDURE (CONT)

FRAME 1																																																																
Step	Procedure																																																															
SUPPORT SHOP WORK																																																																
1.	Take carrier parts to shop where inspection equipment is available.																																																															
2.	Make dimensional checks.																																																															
	<table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Reference Letter</th> <th style="text-align: center;">Point of Measurement</th> <th style="text-align: center;">Measurement (in inches)</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>OD of brake rod</td> <td>0.860 to 0.865</td> </tr> <tr> <td>B</td> <td>Brake ring external spline major diameter</td> <td>4.1180 to 4.1250</td> </tr> <tr> <td>c</td> <td>Brake ring external spline minor diameter</td> <td>3.8280 to 3.8460</td> </tr> <tr> <td>D</td> <td>Spline measure over 0.2400 diameter pins</td> <td>4.3360 Minimum</td> </tr> <tr> <td>E</td> <td>Thickness of thrust washer</td> <td>0.180 Minimum</td> </tr> <tr> <td>F</td> <td>Sun gear internal spline major diameter</td> <td>1.375 to 1.385</td> </tr> <tr> <td>G</td> <td>Sun gear internal spline minor diameter</td> <td>1.161 to 1.169</td> </tr> <tr> <td>H</td> <td>Sun gear measured over 2.24686 diameter pins</td> <td>2.5535</td> </tr> <tr> <td>J</td> <td>Thickness of washer</td> <td>0.830</td> </tr> <tr> <td>K</td> <td>ID of bearing</td> <td>0.7870 to 0.7874</td> </tr> <tr> <td>L</td> <td>OD of pin</td> <td>0.7869 to 0.7874</td> </tr> <tr> <td>M</td> <td>ID of pin hole in carrier</td> <td>0.7880 to 0.7890</td> </tr> <tr> <td>N</td> <td>Sun gear measured over 0.24686 diameter pins</td> <td>2.9515 Minimum</td> </tr> <tr> <td>O</td> <td>OD of bearing</td> <td>1.6530 to 1.6535</td> </tr> <tr> <td>P</td> <td>ID of gear bearing bore</td> <td>1.6535 to 1.6545</td> </tr> <tr> <td>Q</td> <td>ID of sun gear recess for bearing</td> <td>1.582 Minimum</td> </tr> <tr> <td>R</td> <td>OD of bearing</td> <td>1.5728 to 1.5748</td> </tr> <tr> <td>s</td> <td>ID of bearing</td> <td>0.7870 to 0.7878</td> </tr> <tr> <td>T</td> <td>OD of brake rod</td> <td>0.784 Minimum</td> </tr> <tr> <td>u</td> <td>ID of brake rod (measured at six inches minimum from end)</td> <td>0.500 to 0.503</td> </tr> </tbody> </table>	Reference Letter	Point of Measurement	Measurement (in inches)	A	OD of brake rod	0.860 to 0.865	B	Brake ring external spline major diameter	4.1180 to 4.1250	c	Brake ring external spline minor diameter	3.8280 to 3.8460	D	Spline measure over 0.2400 diameter pins	4.3360 Minimum	E	Thickness of thrust washer	0.180 Minimum	F	Sun gear internal spline major diameter	1.375 to 1.385	G	Sun gear internal spline minor diameter	1.161 to 1.169	H	Sun gear measured over 2.24686 diameter pins	2.5535	J	Thickness of washer	0.830	K	ID of bearing	0.7870 to 0.7874	L	OD of pin	0.7869 to 0.7874	M	ID of pin hole in carrier	0.7880 to 0.7890	N	Sun gear measured over 0.24686 diameter pins	2.9515 Minimum	O	OD of bearing	1.6530 to 1.6535	P	ID of gear bearing bore	1.6535 to 1.6545	Q	ID of sun gear recess for bearing	1.582 Minimum	R	OD of bearing	1.5728 to 1.5748	s	ID of bearing	0.7870 to 0.7878	T	OD of brake rod	0.784 Minimum	u	ID of brake rod (measured at six inches minimum from end)	0.500 to 0.503
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	Tag parts that are out of tolerance.																																																															
3.	After support shop work, return carrier parts to turret shop.																																																															
	END OF TASK																																																															



24-8. CARRIER (STAGE 1) DISASSEMBLY PROCEDURE

TOOLS: 1/8" flat tip screwdriver
Diagonal cutting pliers
3/4" combination wrench
7/16" open end wrench
3/8" flat tip screwdriver
1" socket (1/2" drive)
1/2" drive ratchet
1/8" socket head screw key (Allen wrench)
8 ounce ball peen hammer
1/2" diameter brass drift pin punch
Metal scribe
Stiff bristled brush
Scraper
Fine stone

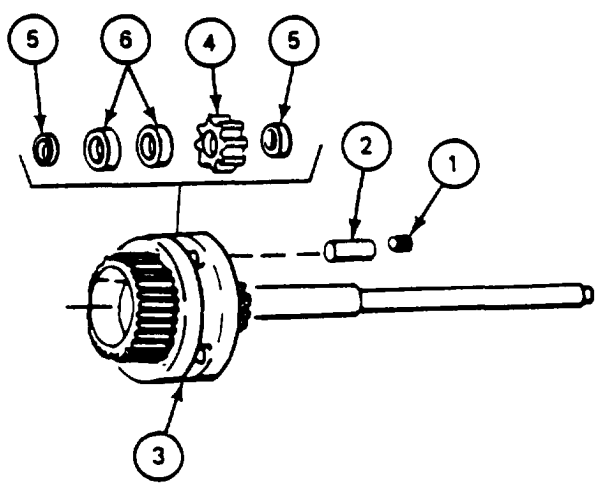
SUPPLIES: Dry-cleaning solvent (item 33, App A)
Crocus cloth (item 7, App A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Remove lockwire
Clean parts
Inspect and repair parts

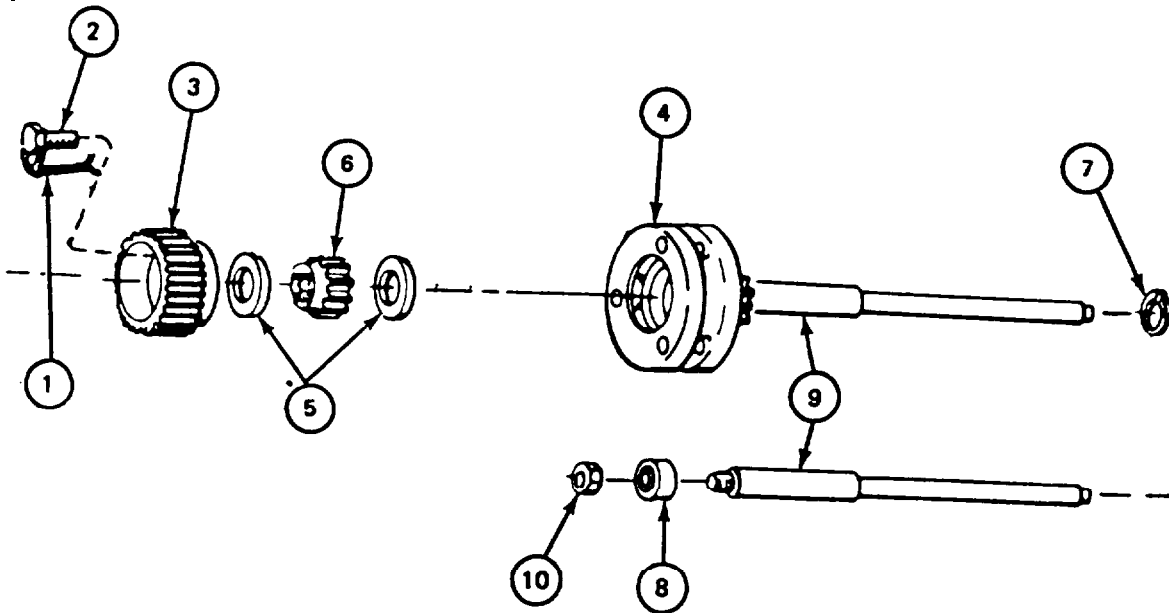
PRELIMINARY PROCEDURES: Remove earner (stage 1) (para 24-5)

24-8. CARRIER (STAGE 1) DISASSEMBLY PROCEDURE (CONT)

FRAME 1	
Step	Procedure
	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Setscrew (1) was staked in place and may require tapping on Allen wrench with hammer to break stake.</p> <ol style="list-style-type: none"> 1. Using Allen wrench, remove setscrew (1) from pin (2) and carrier housing (3). 2. Using metal scribe, scribe locating mark on pin (2) and carrier housing (3). 3. Using hammer and punch, remove pin (2) from carrier housing (3). 4. Remove gear (4) and two washers (5) from carrier housing (3). 5. Using hammer and punch, lightly tap two bearings (6) from gear (4). 6. Repeat steps 1 through 5 for two more gears (4). <p>GO TO FRAME 2</p>
	

24-8. CARRIER (STAGE 1) DISASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
1.	Using cutting pliers, remove lockwire (1) from eight screws (2) (JPG).
2.	Using 7/16" open end wrench, remove eight screws (2) that brake ring (3) to earner housing (4).
3.	Using 3/8" screwdriver, pry brake ring (3) from earner housing (4).
4.	Remove washer (5), gear (6) and second washer (5) from carrier housing (4).
5.	Using 1/8" screwdriver, remove retaining ring (7) that attaches bearing (8) to carrier housing (4).
6.	Remove rod (9) from carrier housing (4).
7.	Using 3/4" wrench on end of rod (9) and 1" socket wrench on nut (10), remove nut (10) from rod (9).
8.	Remove bearing (8) from carrier housing (4).
<p>NOTE</p> <p>Follow-on Maintenance Action Required:</p> <p>Clean all parts (JPG).</p> <p>Inspect and repair all parts (JPG) .</p> <p>Do detail inspection of carrier (stage 1) (para 24-7).</p>	
<p>END OF TASK</p>	



24-9. CARRIER (STAGE 1) ASSEMBLY PROCEDURE

TOOLS: Feeler gauge
Needle nose pliers
Diagonal cutting pliers
3/4" combination wrench
7/16" open end wrench
1" socket (1/2" drive)
1/8" flat tip screwdriver
3 ounce brass hammer
Center punch
1/8" socket head screw key (Allen wrench)
8 ounce ball peen hammer

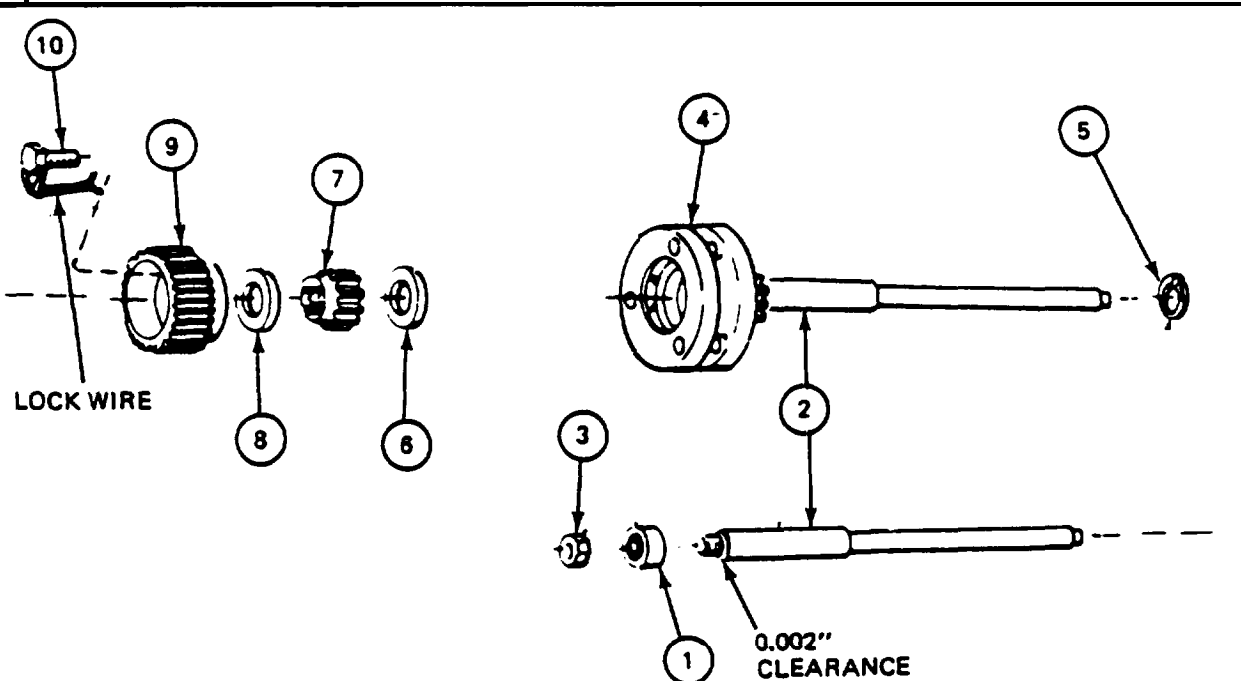
SUPPLIES: Lockwire

PERSONNEL: One

REFERENCES: JPG for procedures to:
Stake screws
Install lockwire
Peen threads
Use feeler gauge

PRELIMINARY PROCEDURES: Inspect carrier (stage 1) (para 24-7).

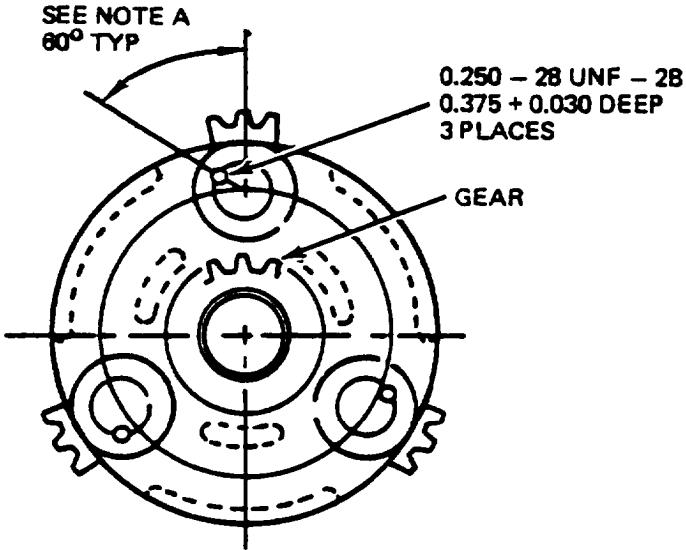
24-9. CARRIER (STAGE 1) ASSEMBLY PROCEDURE (CONT)

FRAME 1	
Step	Procedure
1.	Put bearing (1) on rod (2). <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Use feeler gauge to measure clearance of 0.200" between nut (3) and rod end (2).</p>
2.	Using 3/4" wrench on end of rod (2) and 1" socket wrench on nut (3), install nut (3) on rod (2) until clearance of 0.200" is reached (JPG).
3.	Put rod (2) in carrier housing (4).
4.	Using screwdriver, install rod (2) to carrier housing (4) with retaining ring (5).
NOTE	
Washer (6) and washer (8) are the same.	
5.	Install washer (6), gear (7), washer (8), and brake ring (9) on carrier housing (4).
6.	Using 7/16" wrench, attach brake ring (9) to carrier housing (4) with eight screws (10).
7.	Using needle nose and cutting pliers, install lockwire on eight screws (9) (JPG).
GO TO FRAME 2	
	

24-9. CARRIER (STAGE 1) ASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
<ol style="list-style-type: none"> 1. Put two bearings (1) in gear (2). 2. Put gear (2) with one washer (3) on each side of gear in carrier housing (4). 	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">If pin (5) marked during removal is used, put in same hole in carrier housing (4) with setscrew holes in line.</p> <ol style="list-style-type: none"> 3. Using brass hammer, put pin (5) in carrier housing (4). 4. Repeat steps 1 through 3 for two more gears (4). <p style="text-align: center;">NOTE</p> <p style="text-align: center;">If new pin (5) was installed, new setscrew hole must be drilled. Go to frame 3.</p> <ol style="list-style-type: none"> 5. Using Allen wrench, put setscrew (6) in pin (5) and-earner housing (4). 6. Using hammer and punch, stake setscrew (6) in place (JPG). <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required: Install earner (stage 1) (para 24-6).</p> <p>END OF TASK</p>
<p>The diagram illustrates the assembly of a carrier housing (4) onto a shaft. Above the housing, several components are shown: two bearings (1) are placed on either side of a gear (2). Washers (3) are placed on the outer sides of the gear. A pin (5) is shown being inserted into the carrier housing. A setscrew (6) is shown being inserted into the pin (5) to secure it in place.</p>	

24-9 CARRIER (STAGE 1) ASSEMBLY PROCEDURE (CONT)

FRAME 3	
Step	Procedure
<p>SUPPORT SHOP WORK</p> <p>1. Take carrier to shop where machine shop equipment is available.</p> <p> a. Drill and tap holes for setscrews on side with gear.</p> <p>2. After support shop work, return carrier to turret shop for installation of setscrew (frame 2, steps 5 and 6).</p> <p>END OF TASK</p>	
 <p>SEE NOTE A 60° TYP</p> <p>0.250 - 28 UNF - 28 0.375 + 0.030 DEEP 3 PLACES</p> <p>GEAR</p> <p>NOTE A - HOLE LOCATION IS NOT IMPORTANT. MOVE TO MISS EXISTING HOLE.</p>	

24-10. CARRIER (STAGE 2) INSPECTION PROCEDURE

PERSONNEL: One

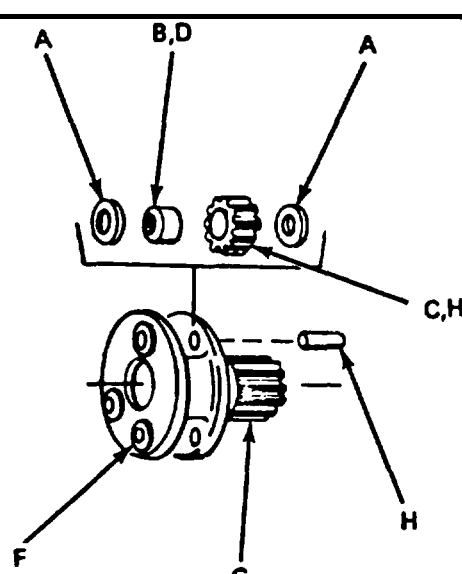
PRELIMINARY PROCEDURES: Disassemble carrier (stage 2) (para 24-11).

GENERAL INSTRUCTIONS:

NOTE

If part is bad, order repair part or next higher assembly as required.

24-10. CARRIER (STAGE 2) INSPECTION PROCEDURE (CONT)

FRAME 1																												
Step	Procedure																											
SUPPORT SHOP WORK																												
1.	Take carrier parts to shop where inspection equipment is available.																											
2.	Make dimensional checks.																											
	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 15%;">Reference Letter</th> <th style="text-align: left; width: 55%;">Point of Measurement</th> <th style="text-align: left; width: 30%;">Measurement (in inches)</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Thickness of washer</td> <td>0.093 Minimum</td> </tr> <tr> <td>B</td> <td>OD of bearing</td> <td>1.3745 to 1.3750</td> </tr> <tr> <td>C</td> <td>ID of gear for bearing</td> <td>1.3750 to 1.3760</td> </tr> <tr> <td>D</td> <td>ID of bearing bore</td> <td>0.8745 to 0.8750</td> </tr> <tr> <td>E</td> <td>OD of pin</td> <td>0.8745 to 0.8750</td> </tr> <tr> <td>F</td> <td>ID of pin hole in earner</td> <td>0.8755 to 0.8765</td> </tr> <tr> <td>G</td> <td>Sun gear measured over 0.24686 diameter pins</td> <td>2.5535 Minimum</td> </tr> <tr> <td>H</td> <td>Sun gear measured over 0.24686 diameter pins</td> <td>2.5915 Minimum</td> </tr> </tbody> </table>	Reference Letter	Point of Measurement	Measurement (in inches)	A	Thickness of washer	0.093 Minimum	B	OD of bearing	1.3745 to 1.3750	C	ID of gear for bearing	1.3750 to 1.3760	D	ID of bearing bore	0.8745 to 0.8750	E	OD of pin	0.8745 to 0.8750	F	ID of pin hole in earner	0.8755 to 0.8765	G	Sun gear measured over 0.24686 diameter pins	2.5535 Minimum	H	Sun gear measured over 0.24686 diameter pins	2.5915 Minimum
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	<p>NOTE</p> <p>Tag parts that are out of tolerance.</p>																											
3.	After support shop work, return earner parts to turret shop.																											
END OF TASK																												
																												

24-11. CARRIER (STAGE 2) DISASSEMBLY PROCEDURE

TOOLS: 1/8" socket head screw key (Allen wrench)
8 ounce ball peen hammer
1/2" diameter brass drift pin
Stiff bristled brush
Metal scribe
Scraper
Fine stone

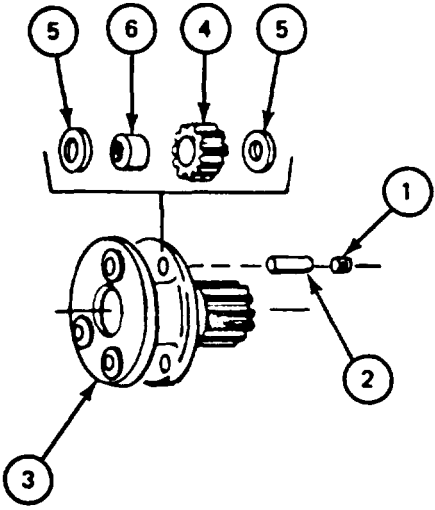
SUPPLIES: Dry-cleaning solvent (item 33, App A)
Crocus cloth (item 7, App A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Inspect and repair parts
Clean parts

PRELIMINARY PROCEDURES: Remove carrier (stage 2) (para 24-5)

24-11. CARRIER (STAGE 2) DISASSEMBLY PROCEDURE (CONT)

FRAME 1	
Step	Procedure
	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Setscrew (1) was staked in place and may require tapping on Allen wrench with hammer to break stake.</p> <ol style="list-style-type: none"> 1. Using Allen wrench, remove setscrew (1) from pin (2) and carrier housing (3). 2. Using metal scribe, scribe locating mark on pin (2) and carrier housing (3). 3. Using hammer and drift pin, remove pin (2) from carrier housing (3). 4. Remove gear (4) and two washers (5) from earner housing (3). 5. Using hammer and punch, lightly tap bearing (6) from gear (4). 6. Repeat steps 1 through 5 for two more gears (4). <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of carrier (stage 1) (para 24-10).</p> <p>END OF TASK</p>
	

24-12. CARRIER (STAGE 2) ASSEMBLY PROCEDURE

TOOLS: 1/8” socket head screw key (Allen wrench)
8 ounce ball peen hammer
Center punch
3 ounce brass hammer

PERSONNEL: One

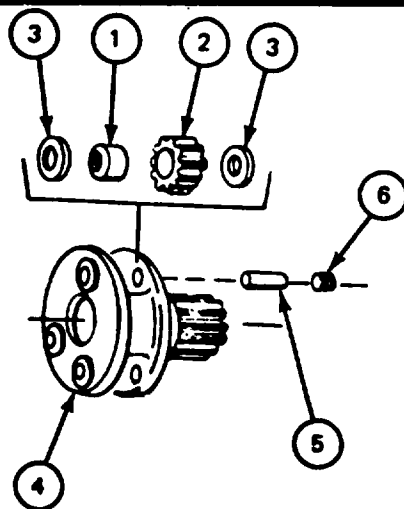
REFERENCES: JPG for procedure to stake screws

PRELIMINARY PROCEDURES: Inspect carrier (stage 2) (para 24-11).

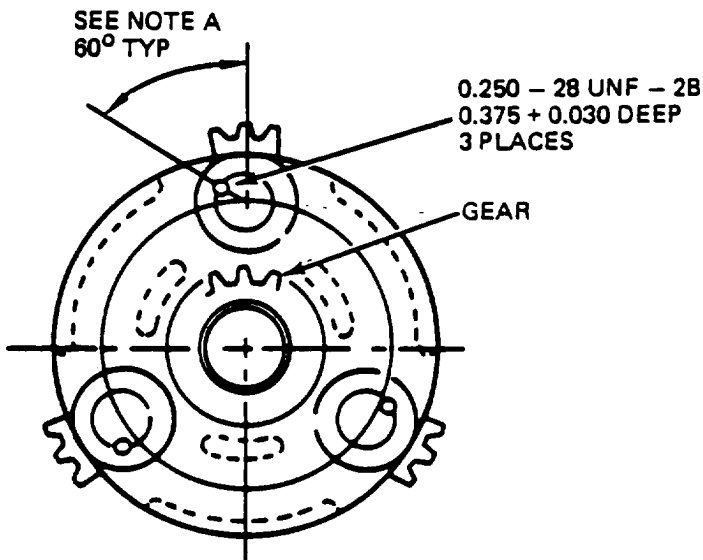
24-12. CARRIER (STAGE 2) ASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Put bearing (1) in gear (2).
2.	Put gear (2) with washer (3) on each side of gear in carrier housing (4).
NOTE	
If pin (5) marked during removal is used, put in same hole in carrier housing (4) with setscrew holes in line.	
3.	Using brass hammer, put pin (5) in carrier housing (4).
4.	Repeat steps 1 through 3 for two more gears (4).
NOTE	
If new pin (5) was installed, new setscrew hole must be drilled. Go to frame 2.	
5.	Using Allen wrench, put setscrew (6) in pin (5) and- carrier housing (4).
6.	Using ball peen hammer and punch, stake setscrew (6) in place (JPG).
NOTE	
Follow-on Maintenance Action Required:	
Install carrier (stage 2) (para 24-6).	
GO TO FRAME 2	



24-12. CARRIER (STAGE 2) ASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
	<p style="text-align: center;">SUPPORT SHOP WORK</p> <ol style="list-style-type: none"> 1. Take earner to shop where machine shop equipment is available. <ol style="list-style-type: none"> a. Drill and tap holes for setscrews on side with gear. 2. After support shop work, return carrier to turret shop for installation of setscrew (frame 1, steps 5 and 6). <p>END OF TASK</p>
<div style="text-align: center;">  <p>SEE NOTE A 60° TYP</p> <p>0.250 - 28 UNF - 2B 0.375 + 0.030 DEEP 3 PLACES</p> <p>GEAR</p> <p>NOTE A - HOLE LOCATION IS NOT IMPORTANT. MOVE TO MISS EXISTING HOLE.</p> </div>	

24-13. CARRIER (STAGE 3) INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble carrier (stage 3) (para 24-14)

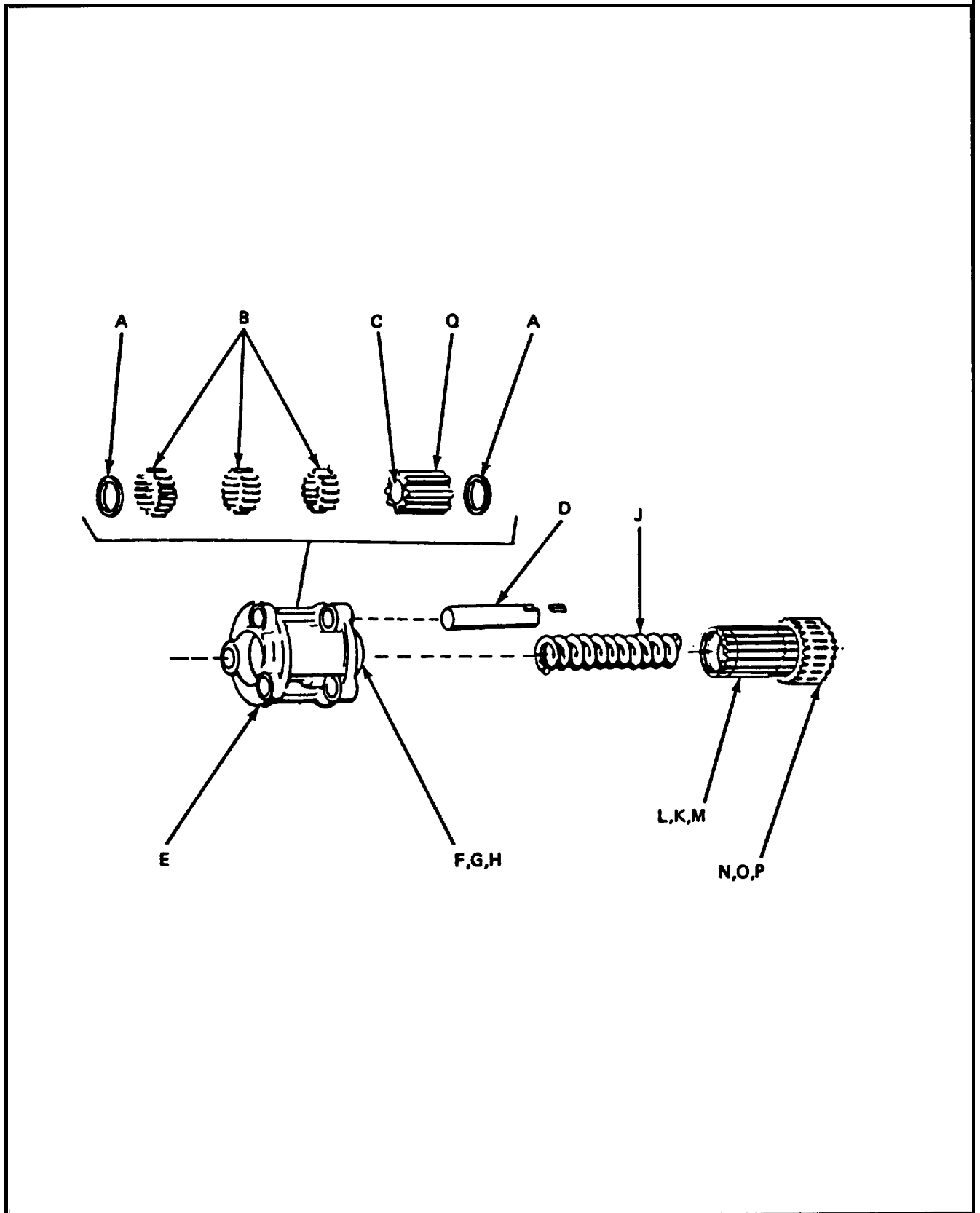
GENERAL INSTRUCTIONS:

NOTE

If part is bad, order repair part or next higher assembly as required.

24-13. CARRIER (STAGE 3) INSPECTION PROCEDURE (CONT)

FRAME 1																																																				
Step	Procedure																																																			
	SUPPORT SHOP WORK																																																			
1.	Take carrier parts to shop where inspection equipment is available.																																																			
2.	Make dimensional checks.																																																			
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	Tag parts that are out of tolerance.																																																			
3.	After support shop work, return carrier parts to turret shop.																																																			
	END OF TASK																																																			



24-14. CARRIER (STAGE 3) DISASSEMBLY PROCEDURE

TOOLS: Stiff bristled brush
1/8" flat tip screwdriver
1/8" socket head screw key (Allen wrench)
Metal scribe
1/2" diameter brass drift pin
8 ounce ball peen hammer
Fine stone
Internal retaining ring pliers
Slipjoint pliers
Scraper

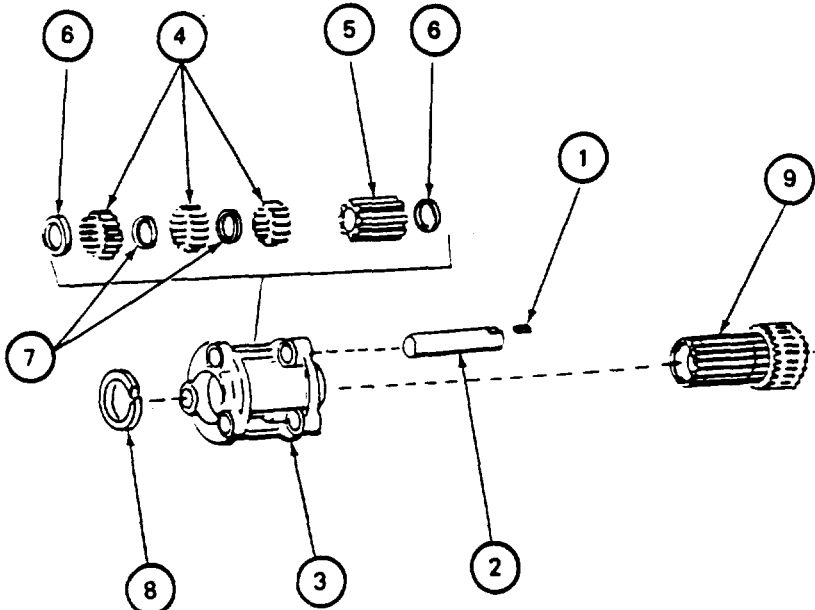
SUPPLIES: Dry-cleaning solvent (item 33, App A)
Crocus cloth (item 7, App A)

PERSONNEL: One

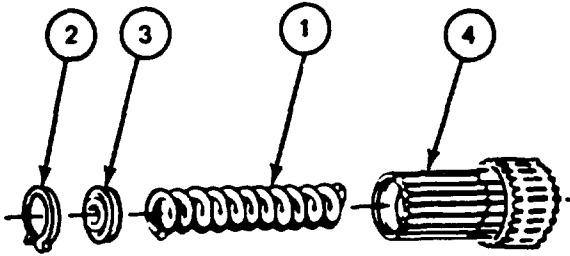
REFERENCES: JPG for procedures to
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove carrier (stage 3) (para 24-5)

24-14. CARRIER (STAGE 3) DISASSEMBLY PROCEDURE (CONT)

FRAME 1	
Step	Procedure
<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Setscrew (1) was staked in place and may require tapping on Allen wrench with hammer to break stake.</p> <ol style="list-style-type: none"> 1. Using Allen wrench, remove setscrew (1) from pin (2) and carrier housing (3). 2. Using metal scribe, scribe locating mark on pin (2) and carrier housing (3). <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Individual pin rollers (4) are loose and may fall out during pin (2) removal.</p> <ol style="list-style-type: none"> 3. Using hammer and punch, remove pin (2) from carrier housing (3). 4. Remove gear (5) and two washers (6). 5. Remove 1oz rollers (4) and two spacers (7) from inside of gear (5). 6. Repeat steps 1 through 5 for two more gears (5). 7. Using screwdriver and slip joint pliers inside carrier housing (3) remove ring (8) that attaches gear shaft (9) to carrier housing (3). <p>GO TO FRAME 2</p>	
 <p>The diagram shows an exploded view of the carrier assembly. At the top, there are two gear assemblies. Each gear assembly consists of a gear (5) with two washers (6) on either side. Below the gears are two pin rollers (4) and two spacers (7). In the center is the carrier housing (3). To the left of the housing is a ring (8) that attaches to the gear shaft (9). To the right of the housing is a pin (2) with a setscrew (1) attached to its end. Dashed lines indicate the assembly alignment.</p>	

24-14. CARRIER (STAGE 3) DISASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
	<p style="text-align: center;">SUPPORT SHOP WORK</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">If spring (1) must be removed from gear shaft, do steps 1 and 2.</p> <ol style="list-style-type: none"> 1. Take gear shaft to shop where hydraulic press is available. 2. Remove retaining ring (2), stop (3) and spring (1) from gear shaft (4). 3. After support shop work, return gear shaft (4) parts to turret shop. <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of carrier (stage 3) (para 24-13).</p> <p>END OF TASK</p>
	 <p>The diagram shows a gear shaft assembly. From left to right, it consists of a retaining ring (2), a stop (3), a coiled spring (1), and the gear shaft (4). Arrows point from the numbered circles to their respective parts.</p>

24-15. CARRIER (STAGE 3) ASSEMBLY PROCEDURE

TOOLS: 1/8" flat tip screwdriver
1/8" socket head screw key (Allen wrench)
8 ounce ball peen hammer
1/4" flat tip screwdriver
Center pin punch

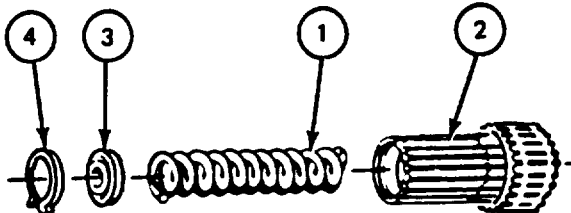
SUPPLIES: Grease (item 12, App A)

PERSONNEL: One

REFERENCES: JPG for procedure to stake screws

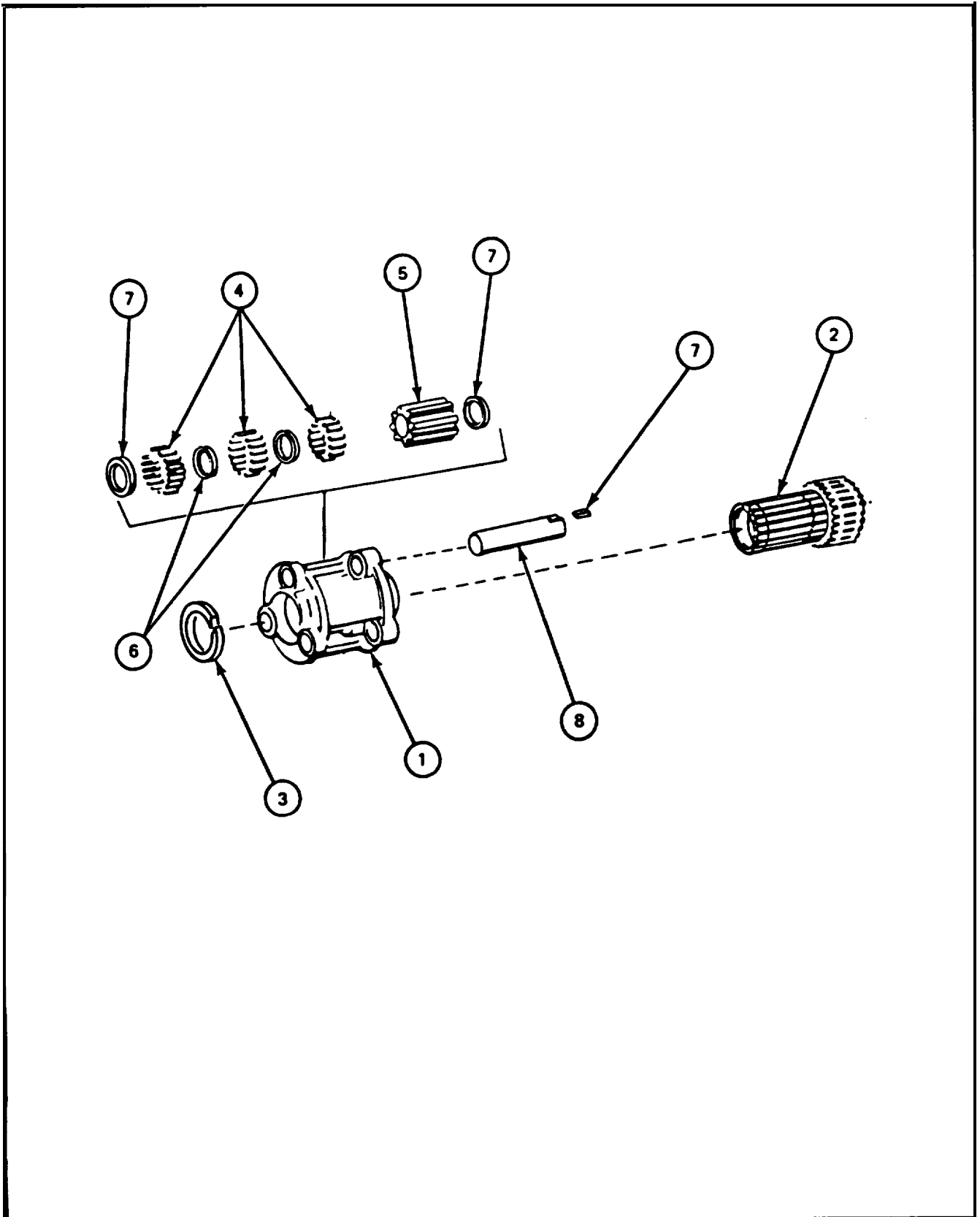
PRELIMINARY PROCEDURES: Inspect earner (stage 3) (para 24-13).

24-15. CARRIER (STAGE 3) ASSEMBLY PROCEDURE (CONT)

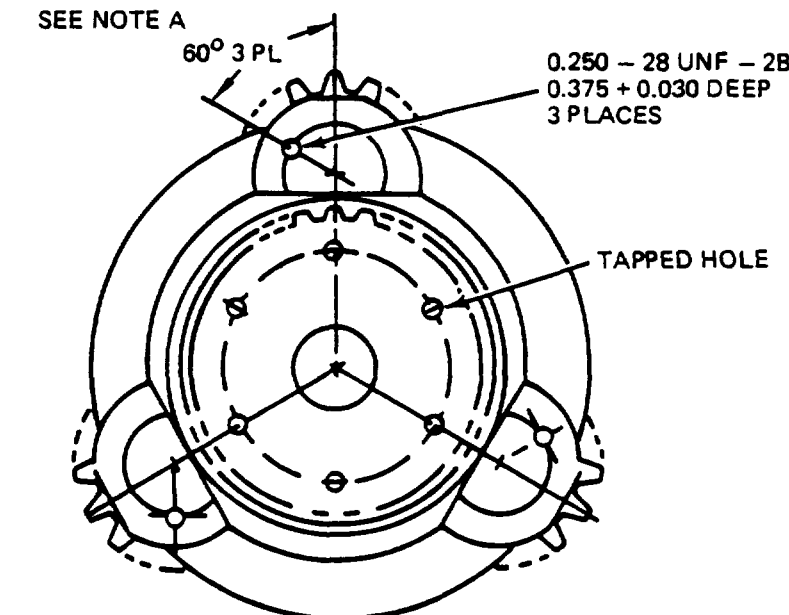
FRAME 1	
Step	Procedure
	<p style="text-align: center;">SUPPORT SHOP WORK</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">If spring (1) was removed, do steps 1 and 2.</p> <ol style="list-style-type: none"> 1. Take gear shaft (2), spring (1), stop (3) and retaining ring (4) to shop where hydraulic press is available. 2. Install spring (1), stop (3) and retaining ring (4) in gear shaft (2). 3. After support shop work, return gear shaft (2) to turret shop. <p>GO TO FRAME 2</p>
 <p>The diagram shows an exploded view of a gear shaft assembly. From left to right, the components are: a retaining ring (4), a stop (3), a spring (1), and a gear shaft (2). Arrows point from the numbered circles to their respective parts.</p>	

24-15. CARRIER (STAGE 3) ASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
1.	Using two screwdrivers inside carrier housing (1), attach gear shaft (2) to carrier housing (1) with ring (3).
2.	Lightly grease 34 rollers (4) and put rollers inside gear (5).
3.	Put spacer (6) inside gear (5).
4.	Repeat step 2 for 34 more rollers (4).
5.	Put second spacer (6) inside gear (5).
6.	Repeat step 2 for 34 more rollers (4).
7.	Put gear (5) with one washer (7) on each side of gear in carrier housing (1).
NOTE	
If pin (8) marked during removal is used put in same hole in carrier housing (1) with setscrew holes in line.	
7.	Using hammer, put pin (8) in carrier housing (1) and through gear (5) and two washers (7).
8.	Repeat steps 2 through 8 for two more gears (5).
NOTE	
If new pin (8) was installed, new setscrew hole must be drilled, GO TO FRAME 3	
9.	Using Allen wrench, put setscrew (9) in pin (8) and carrier housing (1).
10.	Using hammer and center pin punch, stake setscrews (9) (JPG).
GO TO FRAME 3	



24-15. CARRIER (STAGE 3) ASSEMBLY PROCEDURE (CONT)

FRAME 3	
Step	Procedure
<ol style="list-style-type: none"> 1. Take carrier to shop where machine shop equipment is available. 2. Drill and tap holes for setscrews on side with tapped holes. 3. After support shop work, return carrier to turret shop for installation of setscrew (frame 2, steps 10 and 11). 	<p style="text-align: center;">SUPPORT SHOP WORK</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required: Install earner (stage 3) (para 24-6).</p> <p>END OF TASK</p>
<div style="text-align: center;">  <p>SEE NOTE A 60° 3 PL</p> <p>0.250 - 28 UNF - 2B 0.375 + 0.030 DEEP 3 PLACES</p> <p>TAPPED HOLE</p> <p>NOTE A - HOLE LOCATION IS NOT IMPORTANT. MOVE TO MISS EXISTING HOLE.</p> </div>	

24-16. CONTROL CYLINDER TEST PROCEDURE

TEST EQUIPMENT: M3 oil pump
Watch or timer
Pressure gauge (0-6000 psi)

TOOLS: 12" adjustable wrench
9/16" socket (3/8" drive)
3/8" drive ratchet
3/8" flat tip screwdriver

SUPPLIES: Hydraulic fluid (item 10, App A)
Rags (item 21, App A)
Funnel
Pan

PERSONNEL: One

REFERENCES: JPG for procedure to operate M3 oil pump

PRELIMINARY PROCEDURES: Remove control cylinder (para 24-18)
Assemble control cylinder (para 24-21)

GENERAL INSTRUCTIONS:

CAUTION

Keep dirt from getting in parts or tubing. Dirt can damage equipment.

NOTE

If test does not give normal indication, control cylinder is bad. Disassemble bad control cylinder (para 24-20) and replace bad parts.

Rags should be used to clean up spilled oil.

Suitable tools and supplies should be used as needed to connect test equipment to control cylinder.

24-16. CONTROL CYLINDER TEST PROCEDURE (CONT)

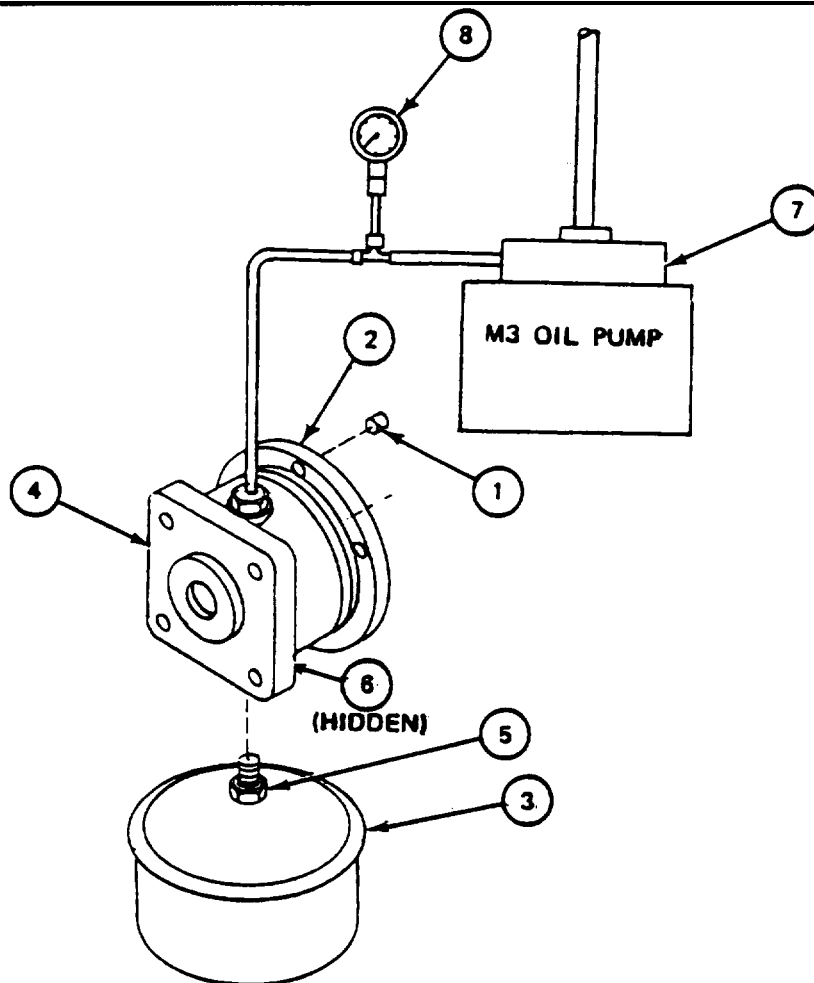
FRAME 1	
Step	Procedure
1.	Using adjustable wrench, remove plug (1) from cylinder (2).
2.	Using funnel, fill cylinder (2) with hydraulic fluid.
3.	Using suitable tools and supplies, connect M3 oil pump with pressure gauge (0-6000 psi) to cylinder (2).
	GO TO FRAME 2

The diagram illustrates the test setup for a control cylinder. On the left, a control cylinder (2) is shown with a plug (1) being removed from its top. An arrow points to the right, where the cylinder (2) is now connected to an M3 oil pump. A pressure gauge (0-6000 PSI) is connected to the pump's output line. The pump has a vertical vent pipe on top.

24-16. CONTROL CYLINDER TEST PROCEDURE (CONT)

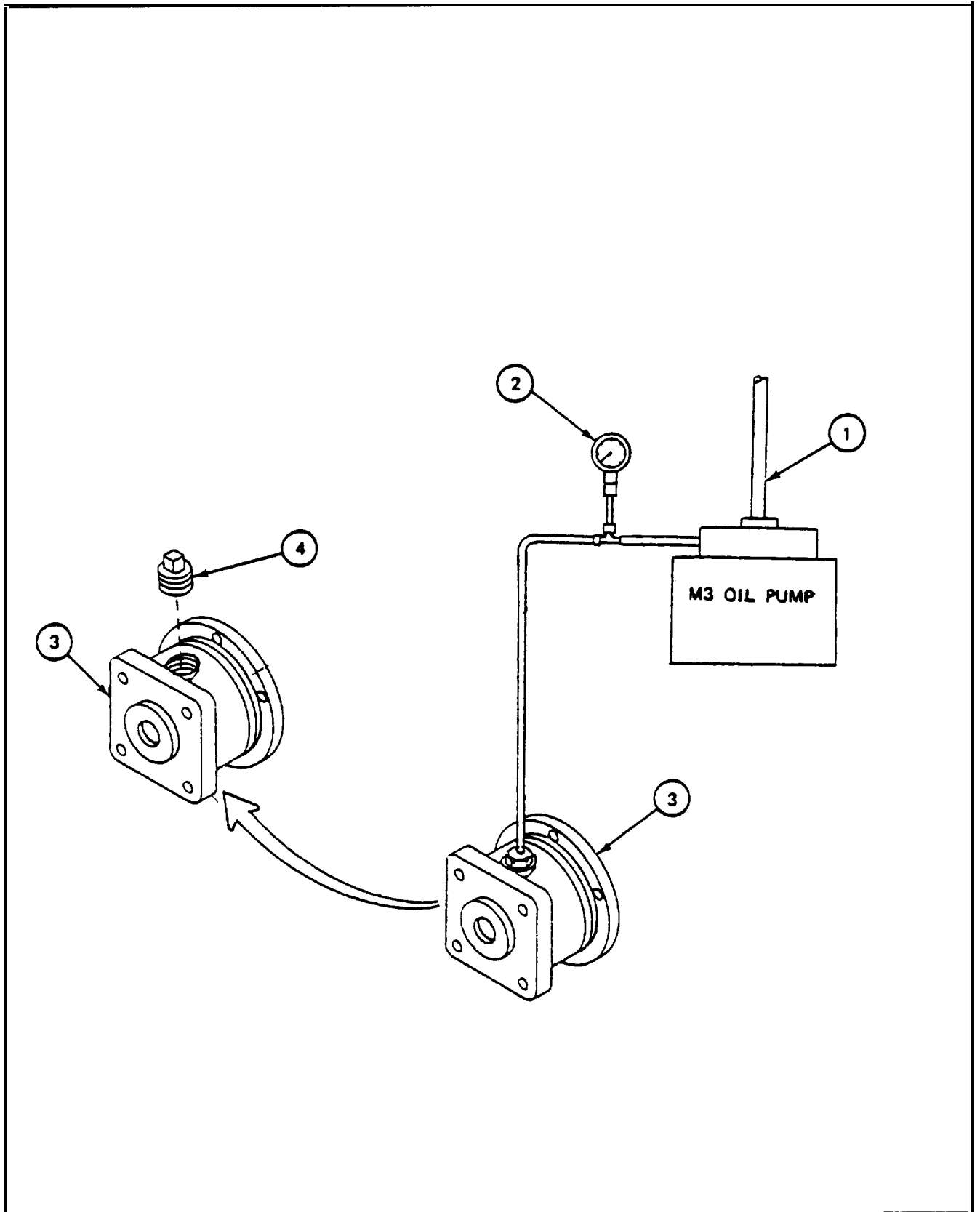
FRAME 2

Step	Procedure
1.	Using screwdriver, remove plug (1) from cylinder head (2).
2.	Put pan (3) under cylinder (4).
3.	Using socket wrench, remove plug (5) from drain port (6).
4.	Operate M3 oil pump (7) until fluid flows from drain port (6) (JPG).
5.	Using socket wrench, install plug (5) in drain port (6).
6.	Operate M3 oil pump (7) until pressure gauge (8) reads between 2700 and 3300 psi (JPG).
7.	Using screwdriver, install plug (1) in cylinder head (2).
GO TO FRAME 3	



24-16. CONTROL CYLINDER TEST PROCEDURE (CONT)

FRAME 3			
Step	Procedure	Normal Indication	Probable Fault
1.	Operate M3 oil pump (1) until pressure gauge (2) reads between 2700 and 3300 psi (JPG).	. . .	. . .
2.	Using watch or timer, keep control cylinder (3) under pressure for five' minutes.	Pressure gauge (2) reads between 2700 and 3300 psi. Fluid does not leak from control cylinder (3).	Bad control cylinder
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">WARNING</div> <p style="text-align: center;">Be sure hydraulic pressure is 0 psi before disconnecting hydraulic lines or parts. Hydraulic fluid under pressure can hurt you.</p>			
3.	Operate M3 oil pump until pressure gauge (2) reads 0 psi (JPG).	. . .	. . .
4.	Using suitable tools, disconnect M3 oil pump (1) and pressure gauge (2) from control cylinder (3).	. . .	. . .
5.	Using adjustable wrench, install plug (4) in control cylinder (3).	. . .	. . .
<p>NOTE</p> <p>If test give normal indication, control cylinder is good. If control cylinder is good, disassembly is not needed.</p> <p>END OF TASK</p>			



24-17. CONTROL CYLINDER INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble control cylinder (para 24-20)

GENERAL INSTRUCTIONS:

NOTE

If part is bad, repair part or order next higher assembly.

24-17. CONTROL CYLINDER INSPECTION PROCEDURE (CONT)

FLAME 1																									
Step	Procedure																								
SUPPORT SHOP WORK																									
1.	If necessary, take cylinder (1), piston (2), cylinder head (3) and collar (4) to shop where inspection equipment is available.																								
2.	Make the following dimensional checks.																								
	<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Reference Letter</th> <th style="text-align: center;">Point of Measurement</th> <th style="text-align: center;">Measurement (in inches)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">A</td> <td>ID of cylinder bore and cylinder head "bore for piston spindles</td> <td style="text-align: center;">1.500 to 1.502</td> </tr> <tr> <td style="text-align: center;">B</td> <td>OD of piston spindles</td> <td style="text-align: center;">1.496 to 1.498</td> </tr> <tr> <td style="text-align: center;">c</td> <td>ID of cylinder</td> <td style="text-align: center;">5.502 to 5.504</td> </tr> <tr> <td style="text-align: center;">D</td> <td>OD of piston</td> <td style="text-align: center;">5.496 to 5.498</td> </tr> <tr> <td style="text-align: center;">E</td> <td>ID of piston (minor internal dia.)</td> <td style="text-align: center;">0.875 to 0.877</td> </tr> <tr> <td style="text-align: center;">F</td> <td>ID of piston spindle bore for collar</td> <td style="text-align: center;">1.115 to 1.120</td> </tr> <tr> <td style="text-align: center;">G</td> <td>OD of collar</td> <td style="text-align: center;">1.105 to 1.110</td> </tr> </tbody> </table>	Reference Letter	Point of Measurement	Measurement (in inches)	A	ID of cylinder bore and cylinder head "bore for piston spindles	1.500 to 1.502	B	OD of piston spindles	1.496 to 1.498	c	ID of cylinder	5.502 to 5.504	D	OD of piston	5.496 to 5.498	E	ID of piston (minor internal dia.)	0.875 to 0.877	F	ID of piston spindle bore for collar	1.115 to 1.120	G	OD of collar	1.105 to 1.110
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G	OD of collar	1.105 to 1.110																							
NOTE																									
Tag all parts that are out of tolerance.																									
3.	After support shop work, return parts to turret shop.																								
END OF TASK																									

24-18. CONTROL CYLINDER REMOVAL PROCEDURE

TOOLS: 1-5/16" combination wrench
 9/16" socket (3/8" drive)
 3/8" drive ratchet
 11/16" combination wrench

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to:
 Remove winch clutch cover
 Remove winch shift lever

EQUIPMENT CONDITION: Winch clutch cover removed (TM-20-2-3)
 Boom-winch shift lever removed (TM-20-2-3)

FRAME 1	
Step	Procedure
<ol style="list-style-type: none"> 1. Using 11/16" wrench, remove elbow nut (1) from reducer (2). Pull elbow and tube (3) away from reducer (2). 2. Using 1-5/16" combination wrench, remove two nuts (4) from cylinder rod (5). 3. Using socket wrench, remove four screws (6) and four lockwashers (7) from cylinder (8) and drum (9). 4. Pull cylinder (8) away from drum (9). Remove cylinder (8) and gasket (10) from cylinder rod (5). Throw away gasket. 	<p>END OF TASK</p>

24-19. CONTROL CYLINDER INSTALLATION PROCEDURE

TEST EQUIPMENT: M3 oil pump

TOOLS: 12" adjustable wrench
7/16" combination wrench (two)
9/16" socket (3/8" drive)
3/8" drive ratchet
O-ring extractor kit
3/8" flat tip screwdriver
11/16" combination wrench
1-5/16" combination wrench

SUPPLIES: Gasket (10908418)
Funnel
Hydraulic fluid (item 10, App A)
Rags (item 21, App A)
Pan
Reducer (MS2 1916-8-4)
Preformed packing (MS27778-8)

PERSONNEL: One

REFERENCES: TM 9-2350-222 -20-2-3 for procedures to:
Install boom winch shift lever
Install winch clutch cover
JPC for procedures to:
Install preformed packing
Use M3 oil pump
Read hydraulic pressure gauge

PRELIMINARY PROCEDURES Assemble winch (para 24-6)
Assemble control cylinder (para 24-21)
Test control cylinder (para 24- 16)

GENERAL INSTRUCTIONS:

CAUTION

Keep dirt from getting in parts or tubing. Dirt can damage equipment.

NOTE

Cleaning rags should "be used to wipe up spilled hydraulic fluid.

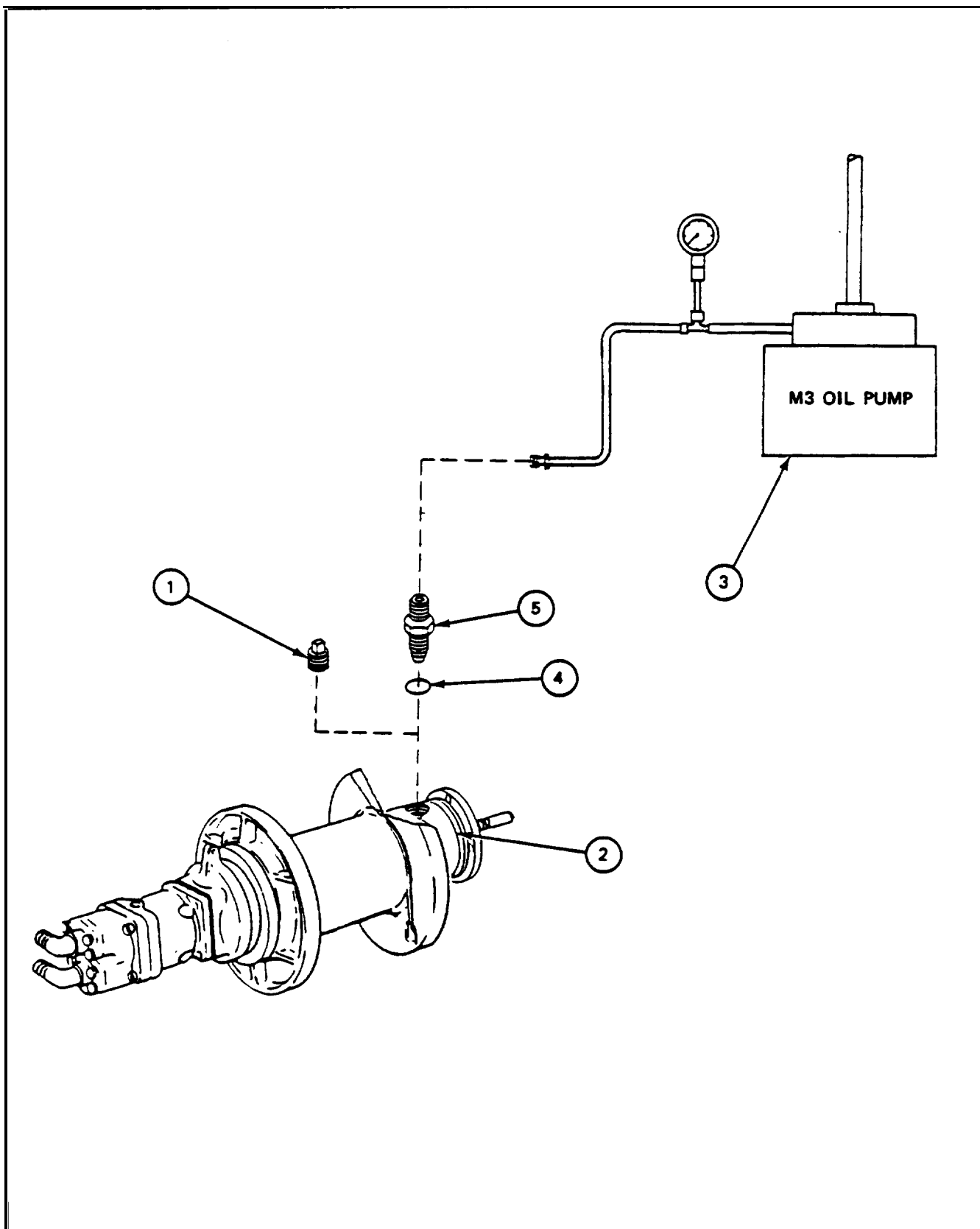
24-19. CONTROL CYLINDER INSTALLATION PROCEDURE (CONT)

FRAME 1		
Step	Procedure	
1.	Slide gasket (1) and cylinder (2) over cylinder rod (3). Line up mounting holes in gasket and cylinder with mounting holes in drum (4).	
2.	Using socket wrench, attach gasket (1) and cylinder (2) to drum (4) with four screws (5) and four lockwashers (6).	
3.	Using 11/16" combination wrench, install elbow nut (7) on reducer (8). GO TO FRAME 2	

The diagram shows an exploded view of the control cylinder assembly. On the left is a drum with a central rod. A gasket (1) and a cylinder (2) are shown being slid onto the rod (3). The drum has four mounting holes (4). Four screws (5) and four lockwashers (6) are shown being used to secure the gasket and cylinder to the drum. On the right, a reducer (8) is shown with an elbow nut (7) being installed. Dashed lines indicate the alignment of the mounting holes.

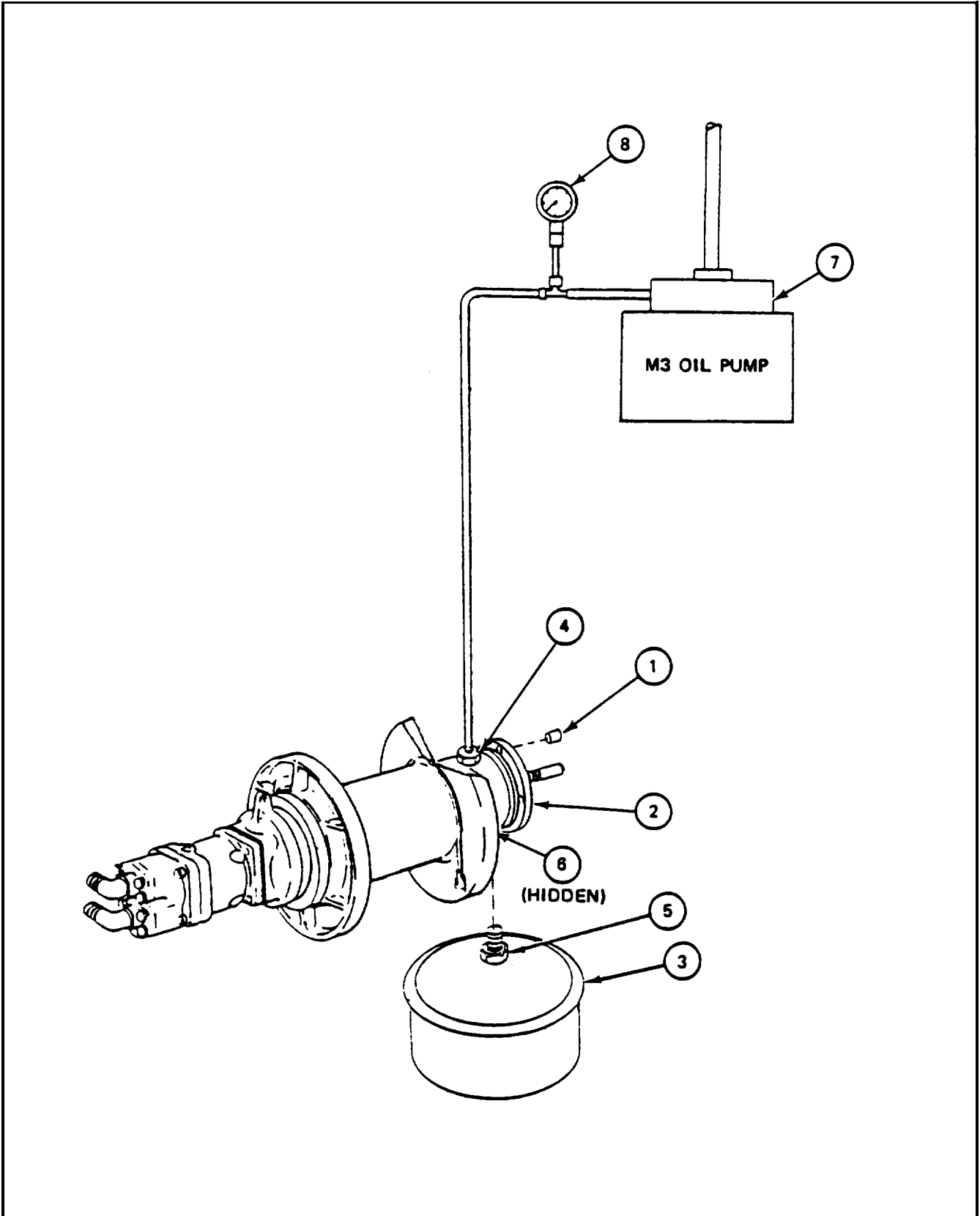
24-19. CONTROL CYLINDER INSTALLATION PROCEDURE (CONT)

FRAME 2	
Step	Procedure
1.	Using adjustable wrench, remove plug (1) from cylinder (2).
2.	Using funnel, fill cylinder (2) with hydraulic fluid.
3.	Assemble M3 oil pump (3) (JPG).
4.	Lightly coat packing (4) with hydraulic fluid.
5.	Using O-ring extractor, install packing (4) on reducer (5) (JPG).
6.	Using adjustable wrench, install reducer (5) and packing (4) in cylinder (2).
7.	Using adjustable wrench, connect outlet line of M3 oil pump (3) to reducer (5) (JPG).
	GO TO FRAME 3



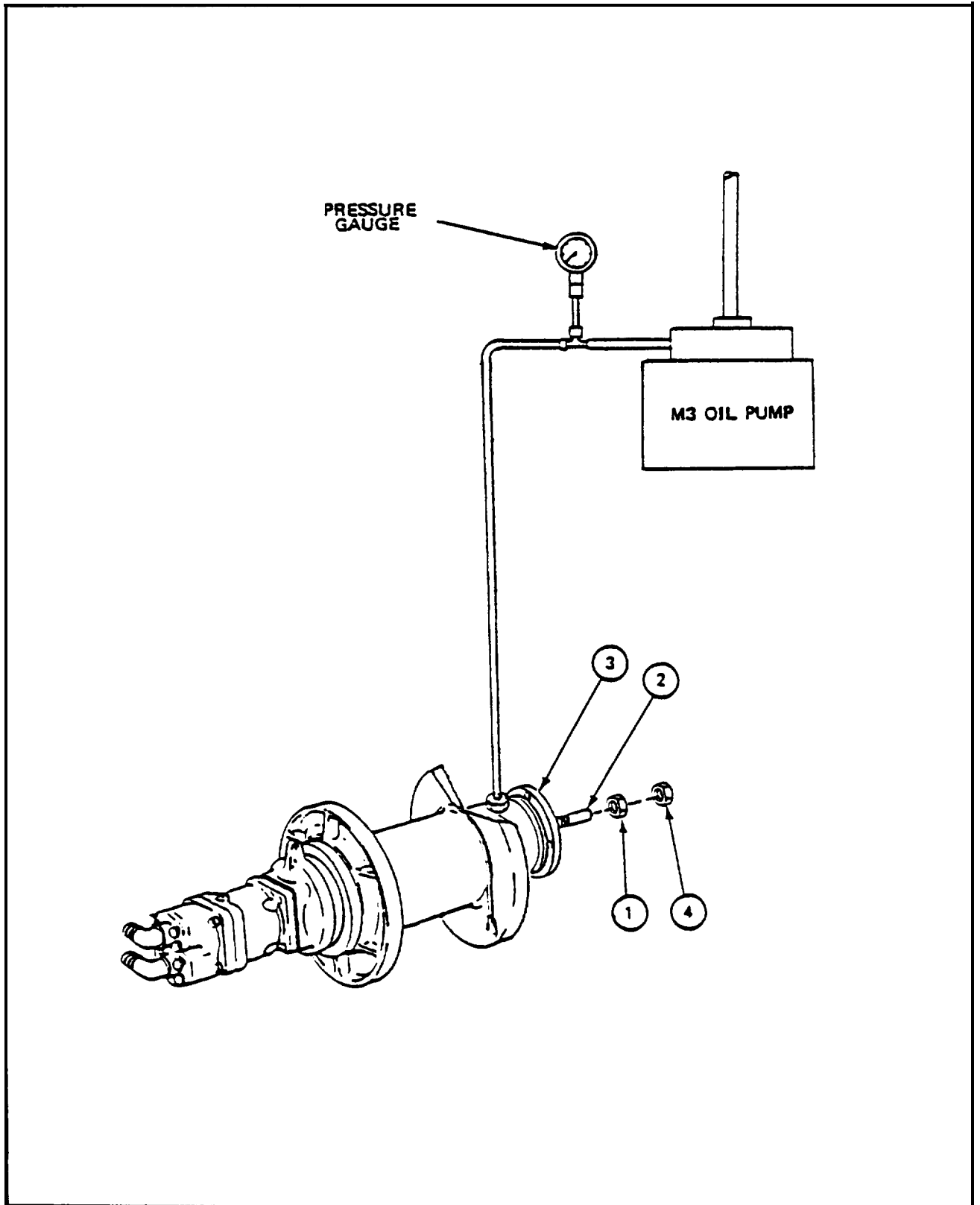
24-19. CONTROL CYLINDER INSTALLATION PROCEDURE (CONT)

FRAME 3	
Step	Procedure
1.	Using screwdriver, remove plug (1) from cylinder head (2).
2.	Put pan (3) under cylinder (4).
3.	Using socket wrench, remove plug (5) from drain port (6).
4.	Operate M3 oil pump (7) until hydraulic fluid flows out of drain port (6) (JPG).
5.	Using socket wrench, install plug (5) in drain port (6).
6.	Operate M3 oil pump (7) until pressure gauge (8) reads between 180 and 220 psi (JPG).
7.	Using screwdriver, install plug (1) in cylinder head (2).
	GO TO FRAME 4



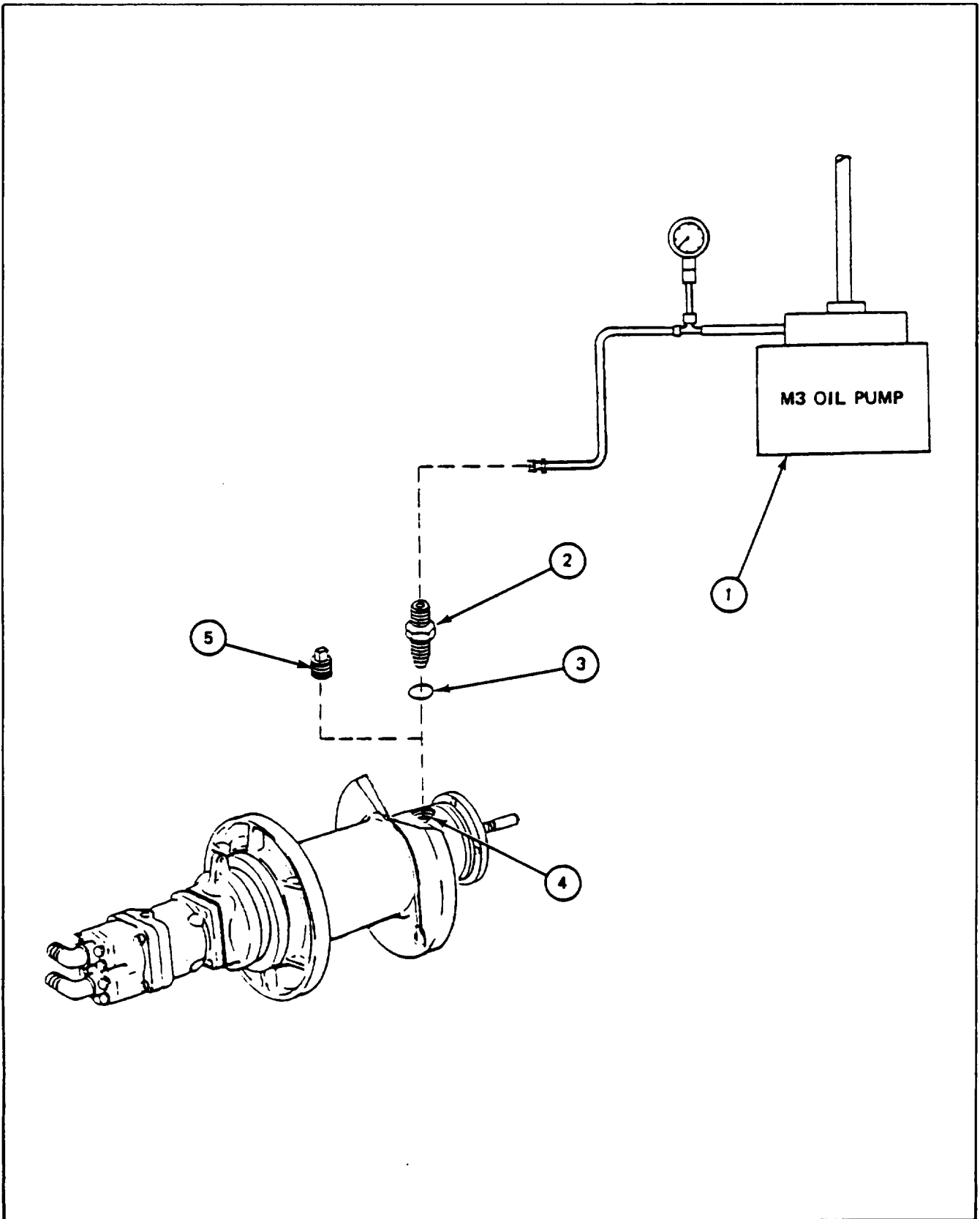
24-19. CONTROL CYLINDER INSTALLATION PROCEDURE (CONT)

FRAME 4	
Step	Procedure
	<p style="text-align: center;">NOTE</p> <p style="text-align: center;">Pressure gauge should read between 180 and 220 psi during the following steps.</p> <ol style="list-style-type: none">1. Using 1-5/16" combination wrench, install nut (1) on cylinder rod (2) until nut (1) just touches cylinder head (3).2. Using 5/16" combination wrench, tighten nut (1) one and a half turns.3. Using 1-5/16" combination wrench to hold nut (1) and adjustable wrench to turn nut (4), install nut (4) on cylinder rod (2). Tighten nut (4) until nut (1) is locked in place. <p>GO TO FRAME 5</p>



24-19. CONTROL CYLINDER INSTALLATION PROCEDURE (CONT)

FRAME 5	
Step	Procedure
	<div data-bbox="662 438 860 485" style="text-align: center; border: 1px solid black; padding: 2px;">WARNING</div> <p data-bbox="265 534 1257 597">Be sure hydraulic pressure is 0 psi before disconnecting hydraulic lines or parts. Hydraulic fluid under pressure can hurt you.</p> <ol data-bbox="125 623 1334 832" style="list-style-type: none"> 1. Operate M3 oil pump (1) to lower pressure to 0 psi. 2. Using adjustable wrench, disconnect outlet line of M3 oil pump (1) from reducer (2). 3. Using adjustable wrench, remove reducer (2) and packing (3) from cylinder (4). Throw away packing. 4. Using adjustable wrench, install plug (5) in cylinder (3). <div data-bbox="725 853 797 880" style="text-align: center;">NOTE</div> <p data-bbox="513 917 976 949" style="text-align: center;">Follow-on Maintenance Action Required:</p> <p data-bbox="353 966 1285 1087">Install boom winch shift lever (TM -20-2-3). Install winch clutch cover (TM -20-2-3). Perform load teat requirement per TB 43-0142 following winch, carrier, or control cylinder repair.</p> <p data-bbox="194 1115 393 1146">END OF TASK</p>



24-20. CONTROL CYLINDER DISASSEMBLY PROCEDURE

TOOLS: Vise with brass caps
1" combination wrench
Adjustable face spanner wrench
3/8" flat tip screwdriver
1/16" socket head screw key (Allen wrench)
O-ring extractor kit
9/16" socket (3/8" drive)
3/8" drive ratchet
1/4" flat tip screwdriver
20 ounce ball peen hammer
1/8" flat tip screwdriver
3/4" drift pin punch
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Cleaning rags (item 21, App A)
Crocus cloth (item 7, App A)
Dry-cleaning solvent (item 33, App A)

PERSONNEL: *Two*

REFERENCES: JPG for procedures to:
Inspect and repair parts
Clean parts
Use spanner wrench
Remove performed packing

PRELIMINARY PROCEDURES: Remove control cylinder (para 24-18)
Test control cylinder (para 24-16)

GENERAL INSTRUCTIONS:

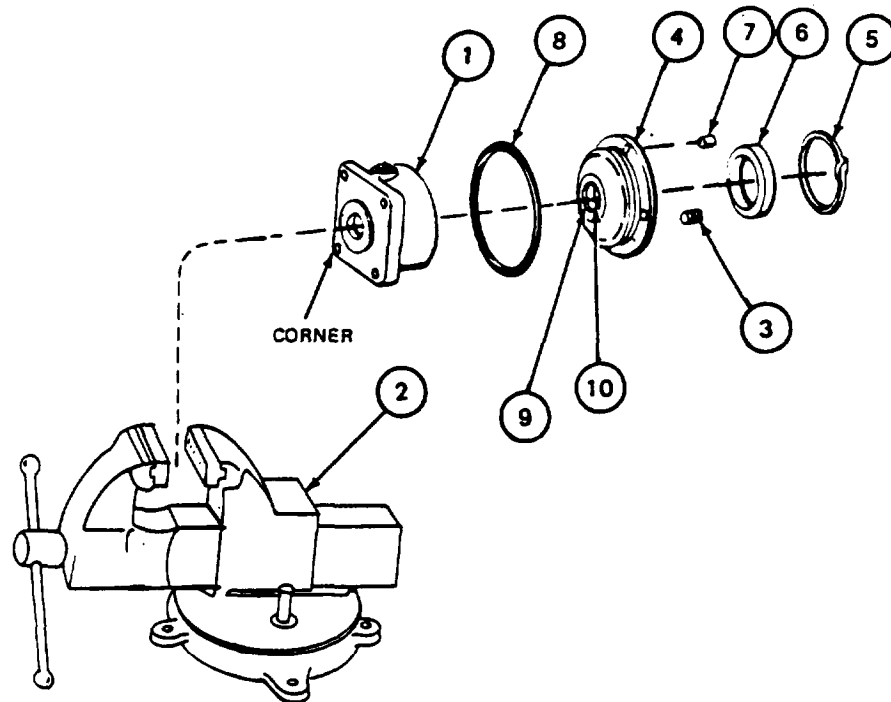
NOTE

Control cylinder must be tested before disassembly (para 24-16). If cylinder passes test, disassembly is not needed.

Rags should be used to wipe up any spilled hydraulic fluid.

24-20. CONTROL CYLINDER DISASSEMBLY PROCEDURE (CONT)

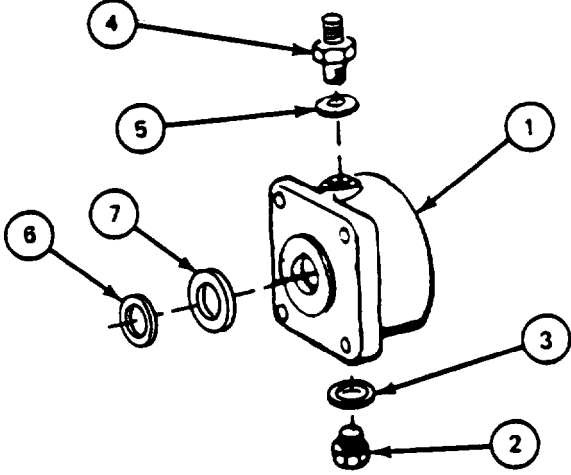
FRAME 1	
Step	Procedure
1.	Put cylinder (1) in vise (2).
2.	Using Allen wrench, remove setscrew (3) from cylinder head (4).
3.	Using 1/8" and 1/4" screwdrivers, remove retaining ring (5) and positioner ring (6) from cylinder head (4).
NOTE	
It may be necessary to tap spanner wrench with hammer.	
4.	Using spanner wrench, remove cylinder head (4) from cylinder (1) (JPG).
5.	Using 3/8" screwdriver, remove plug (7) from cylinder head (4).
6.	Using O-ring extractor, remove packing (8) from cylinder head (4) (JPG).
7.	Using O-ring extractor, remove packing (9) and ring (10) from inside cylinder head (4) (JPG).
GO TO FRAME 2	



24-20. CONTROL CYLINDER DISASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
<ol style="list-style-type: none"> 1. Soldier A: Hold piston (1) during Step 2. 2. Soldier B: Using drift pin and hammer, tap piston (1) out of cylinder (2). 3. Using O-ring extractor, remove packing (3) and ring (4) from outside of piston (1). 4. Put piston (1) on two wood blocks (5). <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Collar (6) is in piston shaft (7).</p> <ol style="list-style-type: none"> 5. Using drift pin and hammer, lightly tap collar (6) and remove collar from shaft (7). 6. Remove cylinder (2) from vise. <p>GO TO FRAME 3</p>	
<p>The diagram illustrates the disassembly process. On the left, a cylinder (2) is held in a vise. A piston (1) is shown being driven out of the cylinder. The piston (1) is supported by two wood blocks (5). A collar (6) is shown being removed from the piston shaft (7). An O-ring extractor (3) is used to remove packing (3) and a ring (4) from the piston.</p>	

24-20. CONTROL CYLINDER DISASSEMBLY PROCEDURE (CONT)

FRAME 3	
Step	Procedure
	<ol style="list-style-type: none"> 1. Using rags, wipe up any spilled oil and wipe oil from inside cylinder (1). 2. Using socket wrench, remove plug (2) from cylinder (1). 3. Using O-ring extractor, remove packing (3) from plug (2) (JPG). Throw away packing. 4. Using combination wrench, remove reducer (4) from cylinder (1). 5. Using O-ring extractor, remove packing (5) from reducer (4) (JPG). 6. Using O-ring extractor, remove packing (6) and ring (7) from inside cylinder (1) (JPG). <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of control cylinder (para 24- 17).</p> <p>END OF TASK</p> <div style="text-align: center;">  </div>

24-21. CONTROL CYLINDER ASSEMBLY PROCEDURE

TOOLS: 9/16" socket (3/8" drive)
3/8" drive ratchet
O-ring extractor kit
1/16" socket head screw key (Allen wrench)
3/8" flat tip screwdriver
Adjustable face spanner wrench
3/4" drift pin punch
Vise with brass caps
1" combination wrench
20 ounce ball peen hammer

SUPPLIES: Hydraulic fluid (item 10, App A)
Preformed packing (two) (MS28778-325)
Preformed packing (MS28778-212)
Preformed packing (MS28778-429)
Preformed packing (MS28778-0 10)
Ring (MS35803-429)
Ring (two) (MS35803-325)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Install preformed packing
Use spanner wrench

PRELIMINARY PROCEDURES: Inspect winch control cylinder (para 24-17)

24-21. CONTROL CYLINDER ASSEMBLY PROCEDURE (CONT)

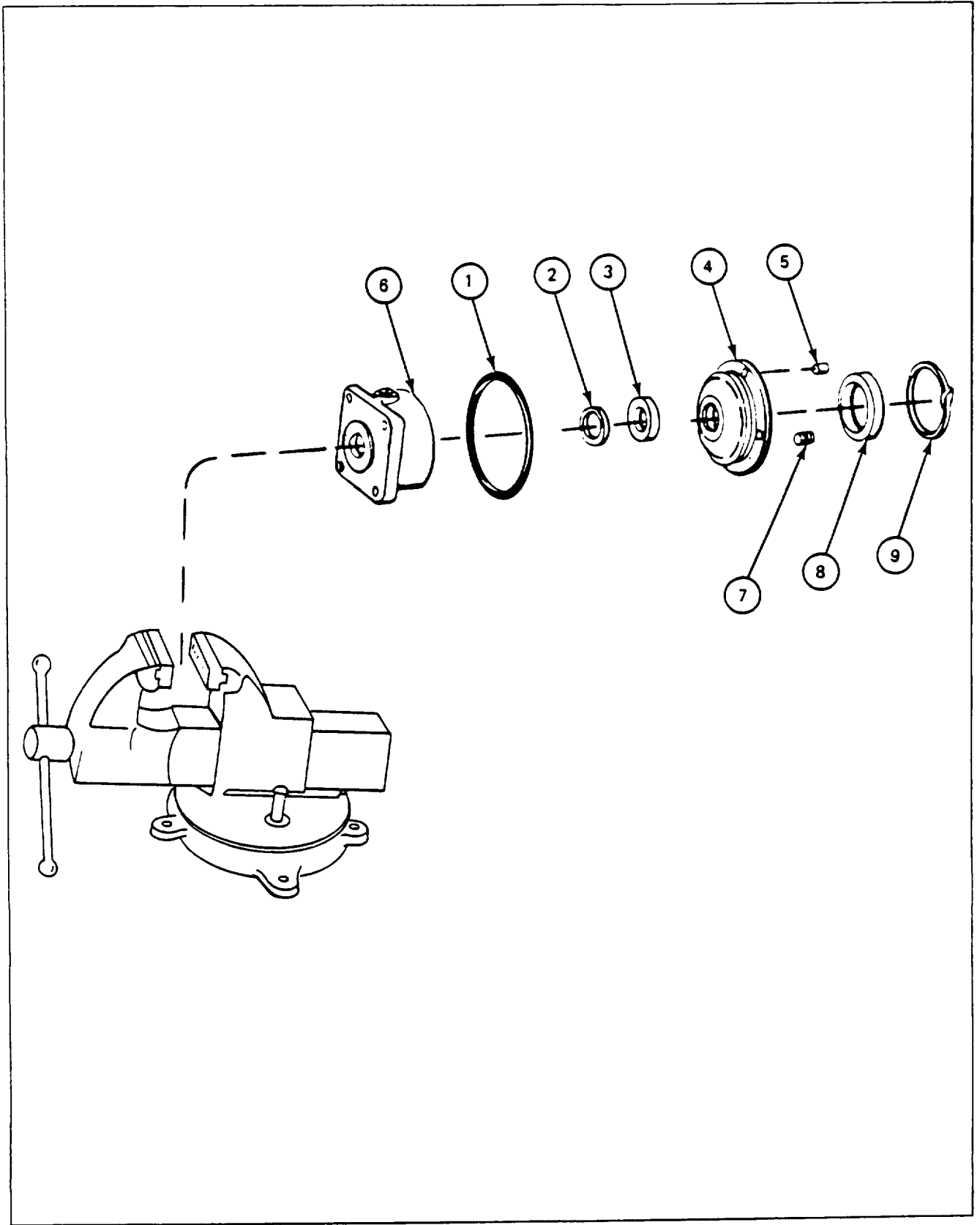
FRAME 1	
Step	Procedure
1.	Lightly coat preformed packing (1) with hydraulic fluid
2.	Install preformed packing (1) on reducer (2) (JPG).
3.	Using combination wrench, install reducer (2) in cylinder (3).
4.	Lightly coat preformed packing (4) with hydraulic fluid.
5.	Install preformed packing (4) on plug (5).
6.	Using socket wrench, install plug (5) in cylinder (3).
7.	Lightly coat ring (6) and preformed packing (7) with hydraulic fluid.
8.	Using O-ring extractor, put ring (6) and preformed packing (7) in cylinder (3) (JPG).
9.	Put cylinder (3) in vise. GO TO FRAME 2

24-21. CONTROL CYLINDER ASSEMBLY PROCEDURE (CONT)

FRAME 2	Procedure
<p>Step</p>	<p>1. Put piston (1) on two wood blocks (2) with longer shaft (3) facing up. NOTE Collar (4) should be put in shaft (3) with lip up.</p> <p>2. Using hammer and drift pin, tap collar (4) in piston shaft (3).</p> <p>3. Remove piston (1) from two wood blocks (2).</p> <p>4. Lightly coat ring (5) and preformed packing (6) with hydraulic fluid.</p> <p>5. Using O-ring extractor, install ring (5) and preformed packing (6) on piston (1) (JPG).</p> <p>6. Lightly coat ring (7) and preformed packing (8) with hydraulic fluid.</p> <p>7. Using O-ring extractor, install ring (7) and preformed packing (8) in cylinder (9) (JPG).</p> <p>8. Coat inside of cylinder (9) with hydraulic fluid.</p> <p>9. Using hammer and drift pin, tap piston (1) in cylinder (9).</p> <p>GO TO FRAME 3</p>
<p>The diagram illustrates the assembly components and their installation. At the top, an exploded view shows the cylinder (9), preformed packing (6), ring (5), preformed packing (8), ring (7), piston (1), and collar (4). Below, a vise is shown holding the cylinder (9). The piston (1) is shown resting on two wood blocks (2) with its shaft (3) facing up. The collar (4) is shown being inserted into the shaft (3).</p>	

24-21. CONTROL CYLINDER ASSEMBLY PROCEDURE (CONT)

FRAME 3	
Step	Procedure
1.	Lightly coat preformed packing (1), preformed packing (2) and ring (3) with hydraulic fluid.
2.	Using O-ring extractor, install preformed packing (1) on cylinder head (4) (JPG).
3.	Using O-ring extractor, install preformed packing (2) and ring (3) in cylinder head (4) (JPG).
4.	Using 3/8" screwdriver, put plug (5) in cylinder head (4).
5.	Using spanner wrench, install cylinder head (4) in cylinder (6) (JPG).
6.	Using Allen wrench, install screw (7) in cylinder head (4).
7.	Install positioner ring (8) in cylinder head (4).
8.	Install retaining ring (9) in cylinder head (4) (JPG).
9.	Remove cylinder (6) from vise.
<p>NOTE</p> <p>Follow-on Maintenance Action Required:</p> <p>Test control cylinder (para 24-16). Install control cylinder (para 24- 19).</p>	
<p>END OF TASK</p>	



CHAPTER 25
DIRECTIONAL CONTROL VALVE

25-1. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks	
	Disassembly	Assembly
Directional Control Valve	25-2	25-3

25-2. DIRECTIONAL CONTROL VALVE DISASSEMBLY PROCEDURE

TOOLS: 12" adjustable wrench
1-3/8" open end wrench
1-5/8" open end wrench
1/2" socket (3/8" drive)
3/8" drive ratchet
7/8" combination wrench
Long round nose pliers
O-ring extractor kit

SUPPLIES: Cleaning rags (item 21, App A)

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to remove directional control valve
JPG for procedures to:
Remove pin clips
Remove preformed packings

EQUIPMENT CONDITION: Directional control valve removed (TM-20-2-3)

GENERAL INSTRUCTIONS:

CAUTION

Keep dirt from getting in tubing or parts. Dirt can damage equipment.

NOTE

Use cleaning rags to clean up spilled hydraulic fluid.

25-2. DIRECTIONAL CONTROL VALVE DISASSEMBLY PROCEDURE (CONT)

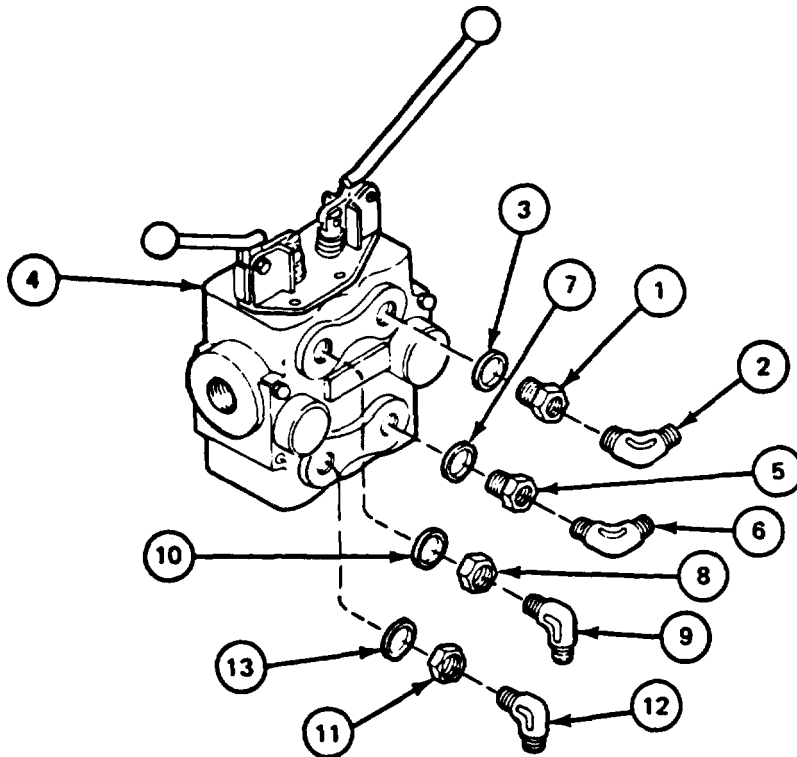
FRAME 1	
Step	Procedure
1.	Using 1-5/8" wrench, loosen nut (1).
2.	Using adjustable wrench, remove elbow (2), nut (1), and preformed packing (3) from directional control valve (4).
3.	Using O-ring extractor tool, remove preformed packing (3) (JPG). Throw preformed packing away.
4.	Remove nut (1) from elbow (2).
5.	Repeat steps 1 thru 4 for nut (5), tee (6) and preformed packing (7).
GO TO FRAME 2	

The diagram shows an exploded view of a directional control valve. Callout 1 points to a nut on the top right elbow. Callout 2 points to the elbow. Callout 3 points to a preformed packing ring between the elbow and the valve body. Callout 4 points to the valve body. Callout 5 points to a nut on the bottom left tee. Callout 6 points to the tee. Callout 7 points to a preformed packing ring between the tee and the valve body.

25-2. DIRECTIONAL CONTROL VALVE DISASSEMBLY PROCEDURE (CONT)

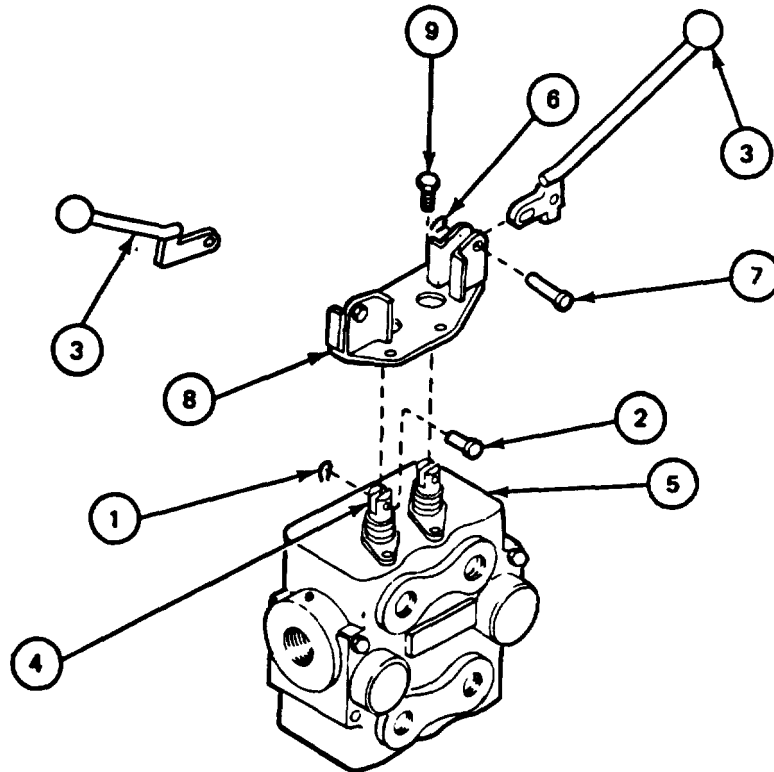
FRAME 2

Step	Procedure
1.	Using 1-3/8" open end wrench on reducer (1) and 7/8" combination wrench on elbow nut (2), remove elbow nut (2).
2.	Using 1-3/8" open end wrench, remove reducer (1) and preformed packing (3) from directional control valve (4).
3.	Using O-ring extractor tool, remove preformed packing (3) (JPG). Throw preformed packing away.
4.	Repeat steps 1 thru 3 for reducer (5), elbow nut (6) and preformed packing (7).
5.	Using 1-3/8" open end wrench, loosen nut (8).
6.	Using adjustable wrench, remove elbow (9), nut (8), and preformed packing (10) from directional control valve (4).
7.	Using O-ring extractor tool, remove preformed packing (10) (JPG). Throw preformed packing away.
8.	Remove nut (8) from elbow (9).
9.	Repeat steps 5 thru 8 for nut (11), elbow (12), and preformed packing (13).
GO TO FRAME 3	



25-2. DIRECTIONAL CONTROL VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 3	
Step	Procedure
1.	Using long nose pliers, remove two pin clips (1) (JPG).
2.	Remove two pins (2) holding two control handles (3) to two valve stems (4) on directional control valve (5).
3.	Using long nose pliers, remove two pin clips (6) (JPG).
4.	Remove two pins (7) holding two control handles (3) to bracket (8).
5.	Remove two control handles (3) from bracket (8).
6.	Using socket wrench, remove four screws (9) holding bracket (8) to directional control valve (5).
7.	Remove bracket (8) from directional control valve (5).
END OF TASK	



25-3. DIRECTIONAL CONTROL VALVE ASSEMBLY PROCEDURE

TOOLS: 12" adjustable wrench
1-3/8" open end wrench
1-5/8" open end wrench
1/2" socket (3/8" drive)
3/8" drive ratchet
3/8" torque wrench (0 to 50 foot-pounds)
Long round nose pliers
7/8" combination wrench

SUPPLIES: Cleaning rags (item 21, App A)
Preformed packing (MS28778- 16) (two)
Preformed packing (MS28778- 12) (four)
Hydraulic fluid (item 10, App A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Install pin clips
Use torque wrench

GENERAL INSTRUCTIONS:

CAUTION

Keep dirt from getting in tubing or parts. Dirt can damage equipment.

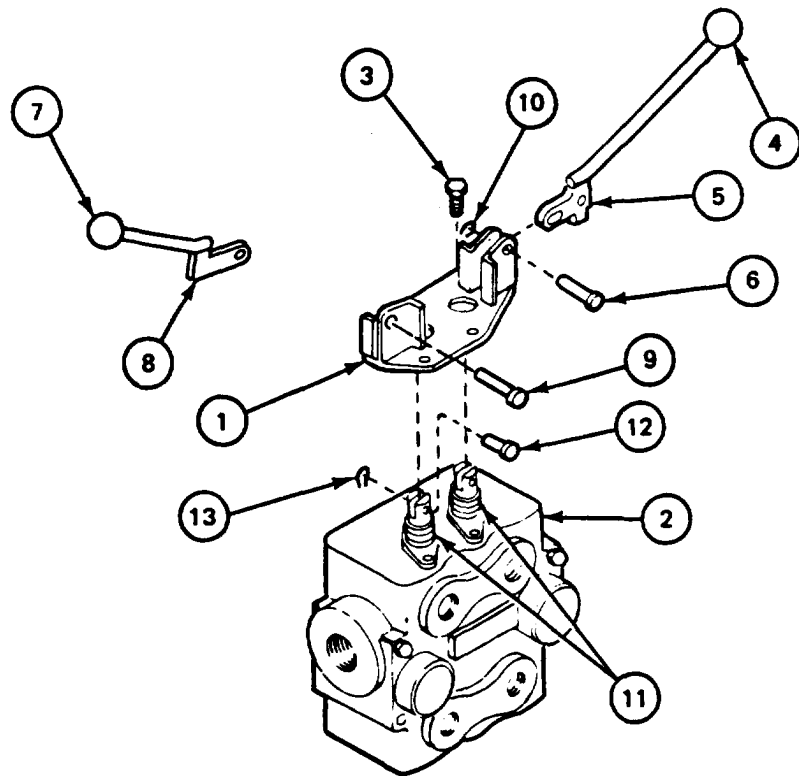
NOTE

Use rags to clean up spilled hydraulic fluid.

Final positioning of elbows and tee must be done at installation of hydraulic tubing.

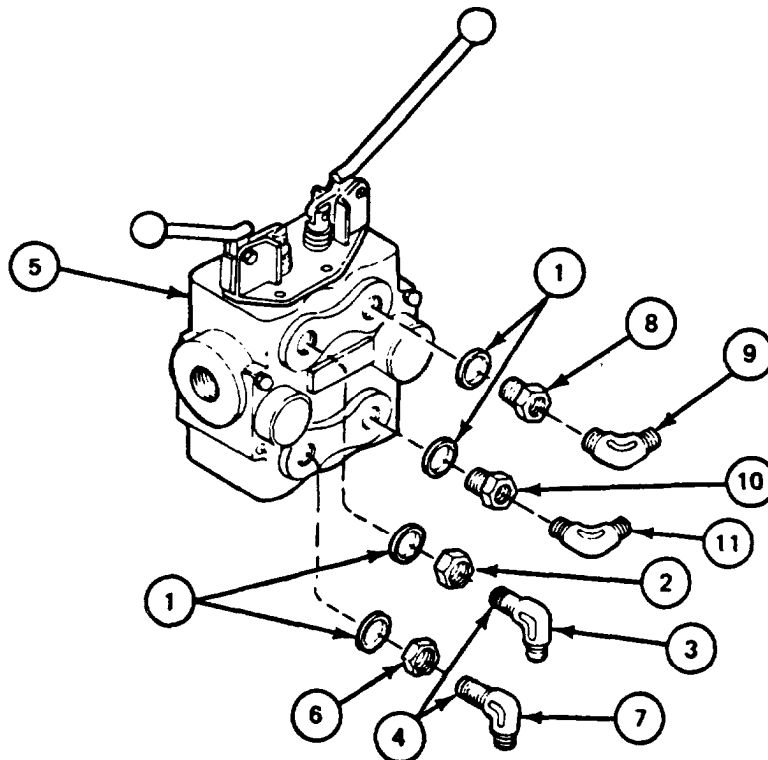
25-3. DIRECTIONAL CONTROL VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 1	
Step	Procedure
1.	Using socket wrench, attach bracket (1) to directional control valve (2) with four screws (3).
2.	Using torque wrench, torque four screws (3) to 18 foot-pounds (JPG).
3.	Attach handle (4) with stop (5) to right side of bracket (1) with short pin (6).
4.	Attach handle (7) with flat side (8) to left side of bracket (1) with short pin (9).
5.	Using pliers, install two pin clips (10) on two pins (6) and (9) (JPG).
6.	Attach two handles (4) and (7) to two valve stems (11) on directional control valve (2) with two long pins (12).
7.	Using pliers, install two pin clips (13) on two pins (12) (JPG).
GO TO FRAME 2	



25-3. DIRECTIONAL CONTROL VALVE ASSEMBLY PROCEDURE (CONT)

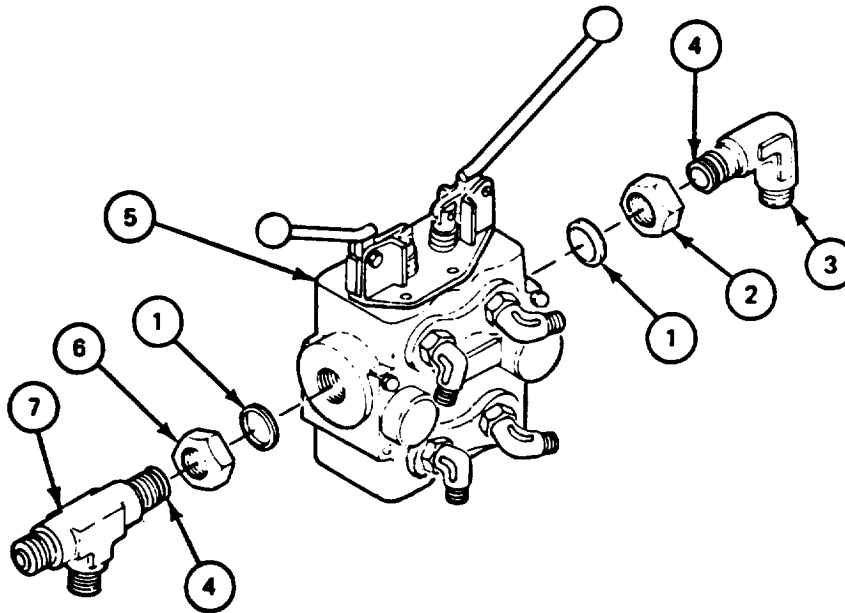
FRAME 2	
Step	Procedure
1.	Lightly coat four preformed packings (1) (MS28778-12) with hydraulic fluid.
2.	Screw nut (2) on elbow (3) until nut (2) is past groove (4).
3.	Put preformed packing (1) in groove (4) on elbow (3).
4.	Using adjustable wrench, put elbow (3), preformed packing (1), and nut (2) in directional control valve (5).
5.	Using 1-3/8" wrench, tighten nut (2).
6.	Repeat seps 2 thru 5 for nut (6), preformed packing (1) and elbow (7).
7.	Put preformed packing (1) on reducer (8).
8.	Using 1-3 /8" wrench, put reducer (8) and preformed packing (1) in directional control valve (5).
9.	Using 7/8" combination wrench, put elbow nut (9) on reducer (8).
10.	Repeat steps 7 thru 9 for reducer (10), preformed packing (1) and elbow (11).
GO TO FRAME 3	



25-3. DIRECTIONAL CONTROL VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Lightly coat two preformed packings (1) (MS28778- 16) with hydraulic fluid.
2.	Using hands, screw nut (2) on elbow (3) until nut (2) is past groove (4).
3.	Put preformed packings (1) in groove (4) of elbow (3).
4.	Using adjustable wrench, put elbow (3), nut (2), and preformed packing (1) in dire control valve (5).
5.	Using 1 5/8" wrench, tighten nut (2).
6.	Repeat steps 2 through 5 for nut (6), preformed packing (1), and tee (7). END OF TASK



CHAPTER 26
A-FRAME RIGHT TRUNNION

26-1. MAINTENANCE PROCEDURES INDEX

Equipment Item	Inspection	Tasks Removal	Installation
Right Trunnion Assembly	26-2	26-3	26-4

26-2. A-FRAME RIGHT TRUNNION INSPECTION

SUPPLIES: Trunnion bearings (two) (1095 1944)

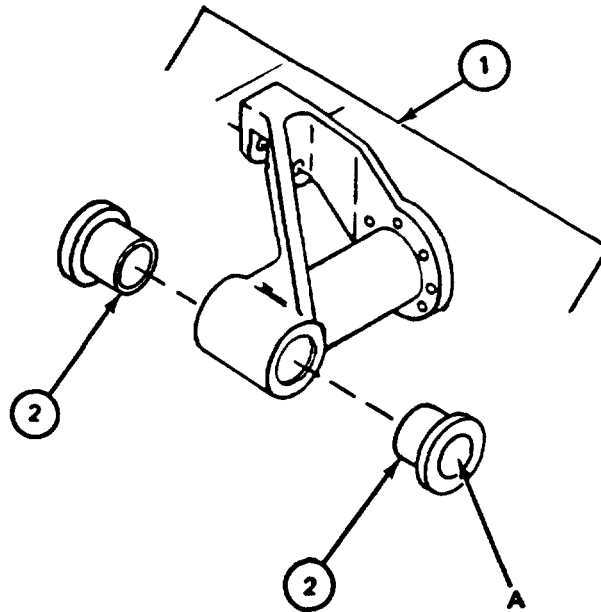
PERSONNEL: One

PRELIMINARY PROCEDURES: Remove A-frame right trunnion (para 26-3)

26-2. A-FRAME RIGHT TRUNNION INSPECTION PROCEDURE (CONT)

FRAME 1

Step	Procedure						
1. 2.	<p style="text-align: center;">SUPPORT SHOP WORK</p> <p>If necessary, take trunnion fitting to shop where inspection equipment is available.</p> <p>Make the following dimensional checks.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Reference Letter</th> <th>Point of Measurement</th> <th>Measurement (in inches)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">A</td> <td style="text-align: center;">ID of trunnion bearings (2)</td> <td style="text-align: center;">4.5000 to 4.5015</td> </tr> </tbody> </table> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">If trunnion bearings (2) are out of tolerance, press out old bearings and press in new bearings.</p>	Reference Letter	Point of Measurement	Measurement (in inches)	A	ID of trunnion bearings (2)	4.5000 to 4.5015
Reference Letter	Point of Measurement	Measurement (in inches)					
A	ID of trunnion bearings (2)	4.5000 to 4.5015					
3.	<p>After support shop work, return trunnion (1) to turret shop.</p> <p>END OF TASK</p>						



26-3. A-FRAME TRUNNION REMOVAL PROCEDURE

TOOLS: 15/16" socket (3/4" drive)
3/4" drive ratchet
7/16" combination wrench
Stiff bristled brush
Scraper
Fine stone

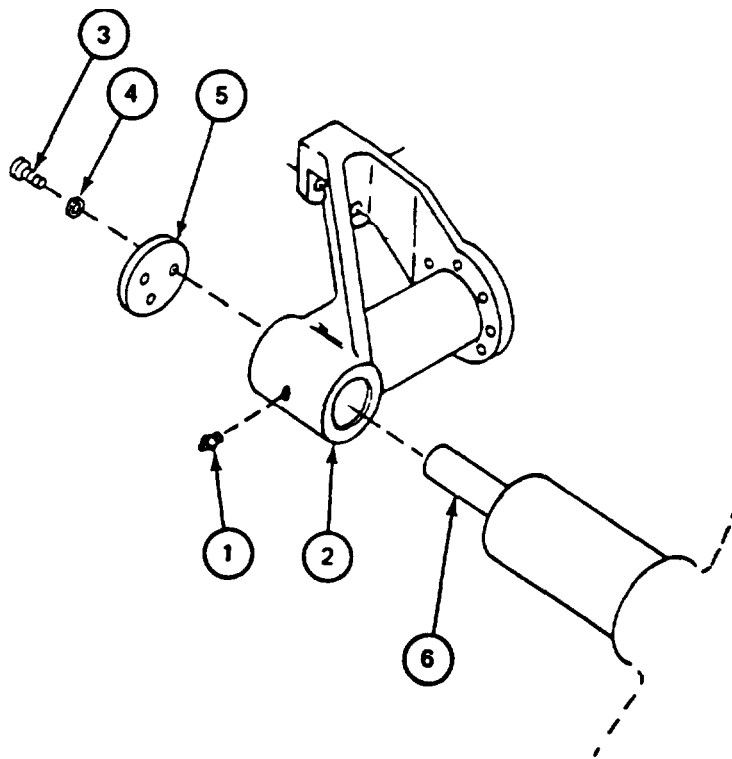
PERSONNEL: **Two**

REFERENCES: JPG for procedures to:
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove boom (para 29-2)

26-3. A-FRAME RIGHT TRUNNION REMOVAL PROCEDURE (CONT)

FRAME 1	
Step	Procedure
1.	Soldier A. Using combination wrench, remove lubrication fitting (1) from trunnion (2).
2.	Using socket wrench, remove three screws (3), three lockwashers (4) and plate (5) from trunnion shaft (6).
3.	Soldier A and Soldier B: Remove trunnion (2) from trunnion shaft (6).
<p>NOTE</p> <p>Follow-on Maintenance Action Required:</p> <p>Clean all parts (JPG).</p> <p>Inspect and repair all parts (JPG).</p> <p>Do detail inspection of parts (para 26-2).</p>	
END OF TASK	



26-4. A-FRAME RIGHT TRUNNION INSTALLATION PROCEDURE

TOOLS: 15/16" socket (3/4" drive)
3/4" drive ratchet
7/16" combination wrench

SUPPLIES: Grease (item 12, App A)

PERSONNEL: **Two**

REFERENCES: LO 9-2350-222-12 for procedure to lubricate right trunnion assembly

PRELIMINARY PROCEDURES: Inspect A-Frame right trunnion (para 26-2)

26-4. A-FRAME RIGHT TRUNNION INSTALLATION PROCEDURE (CONT)

FRAME 1	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 4. 	<p>Coat two trunnion (1) bearing surfaces and machined surfaces of trunnion shaft (2) with grease.</p> <p>Soldier A and Soldier B: Put trunnion (1) on trunnion shaft (2),</p> <p>Using socket wrench, attach trunnion plate (3) to trunnion shaft (2) with three screws (4) and three lockwashers (5).</p> <p>Using combination wrench, install lubrication fitting (6) in trunnion (1).</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Lubricate A-Frame right trunnion (LO-12). Install boom (para 29-3).</p> <p>END OF TASK</p>

CHAPTER 27
A-FRAME LEFT TRUNNION

27-1. MAINTENANCE PROCEDURES INDEX

Equipment Item	Inspection	Tasks Removal	Installation
A-Frame Left Trunnion	27-2	27-3	27-4

27-2. A-FRAME LEFT TRUNNION INSPECTION PROCEDURE

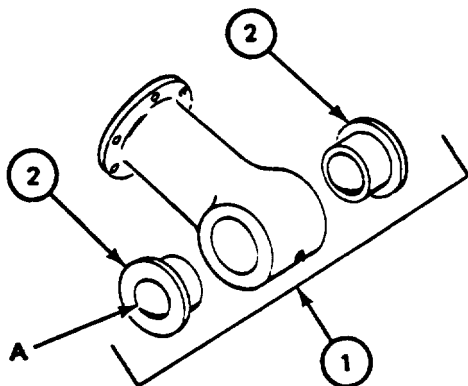
PERSONNEL: One

SUPPLIES: Trunnion bearings (two) (10951944)

PRELIMINARY PROCEDURES: Remove A-frame left trunnion (para 27-3)

FRAME 1

Step	Procedure						
1.	<p style="text-align: center;">SUPPORT SHOP WORK</p> <p>If necessary, take trunnion (1) to shop where inspection equipment is available.</p> <p>2. Make the following dimensional checks.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th data-bbox="326 889 451 944">Reference Letter</th> <th data-bbox="659 889 829 944">Point of Measurement</th> <th data-bbox="1049 889 1214 944">Measurement (in inches)</th> </tr> </thead> <tbody> <tr> <td data-bbox="380 966 399 991">A</td> <td data-bbox="561 966 927 991">ID of trunnion bearings (2)</td> <td data-bbox="1024 966 1235 991">4.5000 to 4.5015</td> </tr> </tbody> </table> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">If trunnion bearings (2) are out of tolerance, press out old bearings and press in new bearings.</p> <p>3. After support shop work, return trunnion (1) to turret shop.</p> <p>END OF TASK</p>	Reference Letter	Point of Measurement	Measurement (in inches)	A	ID of trunnion bearings (2)	4.5000 to 4.5015
Reference Letter	Point of Measurement	Measurement (in inches)					
A	ID of trunnion bearings (2)	4.5000 to 4.5015					



27-3. A-FRAME LEFT TRUNNION REMOVAL PROCEDURE

TOOLS: 15/ 16" socket (3/4" drive)
3/4" drive ratchet
7/16" combination wrench
Stiff bristled brush
Scraper
Fine stone

SUPPLIES: Dry-cleaning solvent (item 33, APP. A)
Crocus cloth (item 7, App A)

PERSONNEL: *Two*

REFERENCES: JPG for procedures to:
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove boom (para 29-2)

27-3. A-FRAME LEFT TRUNNION REMOVAL PROCEDURE (CONT)

FRAME 1	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 	<p>Soldier A: Using combination wrench, remove lubrication fitting (1) from trunnion (2).</p> <p>Using socket wrench, remove three screws (3), three lockwashers (4), plate (5), from trunnion shaft (6).</p> <p>Soldier A and Soldier B: Remove trunnion (2) from trunnion shaft (6).</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of parts (para 27-2).</p> <p>END OF TASK</p>

27-4. A-FRAME LEFT TRUNNION INSTALLATION PROCEDURE

TOOLS: 15/16" socket (3/4" drive)
3/4" drive ratchet
7/16" combination wrench

SUPPLIES: Grease (item 12, App A)

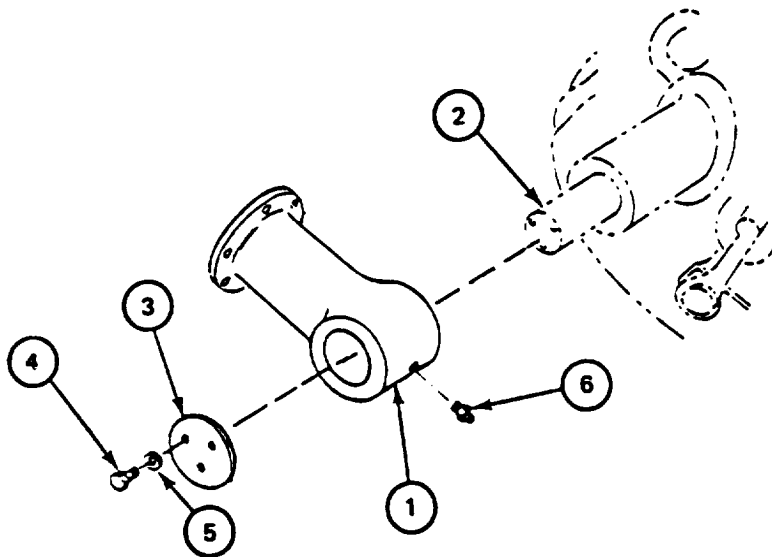
PERSONNEL: **Two**

REFERENCES: LO 9-2350-222-12 for procedure to lubricate A-Frame left trunnion

PRELIMINARY PROCEDURES: Inspect A-Frame trunnion (para 27-2)

27-4. A-FRAME LEFT TRUNNION INSTALLATION PROCEDURE (CONT)

FRAME 1	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 4. 	<p>Coat trunnion (1) bearing surfaces and machined surface of trunnion shaft (2) with grease.</p> <p>Soldier A and Soldier B: Put trunnion (1) on trunnion shaft (2).</p> <p>Using socket wrench, attach trunnion plate (3) to trunnion shaft (2) with three screws (4) and three lockwashers (5).</p> <p>Using combination wrench, install lubrication fitting (6) in trunnion (1).</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required: Lubricate A-Frame left trunnion (LO-12). Install boom (para 29-3).</p> <p>END OF TASK</p>



CHAPTER 28
BOOM LINEAR ACTUATING CYLINDER

28-1. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks					
	Inspection	Test	Removal	Installation	Disassembly	Assembly
Linear Actuating Boom Cylinder	28-2	28-3	28-4	28-5	28-6	28-7

28-2. BOOM LINEAR ACTUATING CYLINDER INSPECTION PROCEDURE

SUPPLIES: Bearing (8376373) (two)

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble linear actuating boom cylinder (para 28-6)

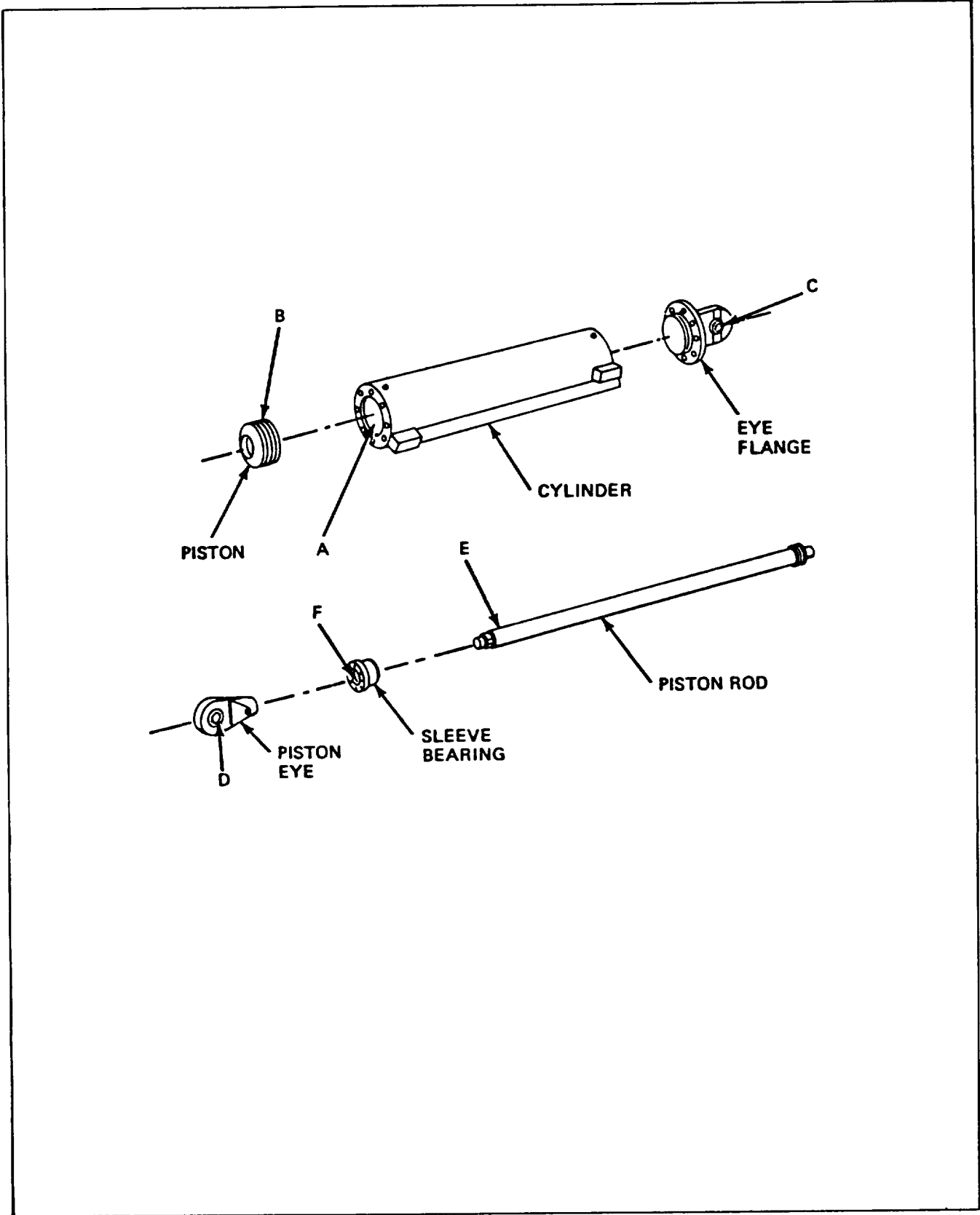
GENERAL INSTRUCTIONS:

NOTE

If part is bad, order repair part or next higher assembly as required.

28-2. BOOM LINEAR ACTUATING CYLINDER INSPECTION PROCEDURE (CONT)

FRAME 1																						
Step	Procedure																					
	SUPPORT SHOP WORK																					
1.	Take boom linear actuating cylinder parts, to be checked, to support shop where measuring equipment is available.																					
2.	Make dimensional checks.																					
	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Reference Letter</th> <th style="text-align: center;">Point of Measurement</th> <th style="text-align: center;">Measurement (in inches)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">A</td> <td>ID of cylinder bore</td> <td style="text-align: center;">4.500 to 4.501</td> </tr> <tr> <td style="text-align: center;">B</td> <td>OD of piston</td> <td style="text-align: center;">4.459 to 4.497</td> </tr> <tr> <td style="text-align: center;">c</td> <td>ID of bearing bore in eye (flange assembly)</td> <td style="text-align: center;">1.2493 to 1.2500</td> </tr> <tr> <td style="text-align: center;">D</td> <td>ID of bearing bore in eye (piston rod)</td> <td style="text-align: center;">1.2493 to 1.2500</td> </tr> <tr> <td style="text-align: center;">E</td> <td>OD of piston rod</td> <td style="text-align: center;">1.749 to 1.751</td> </tr> <tr> <td style="text-align: center;">F</td> <td>ID of sleeve bearing</td> <td style="text-align: center;">1.753 to 1.755</td> </tr> </tbody> </table>	Reference Letter	Point of Measurement	Measurement (in inches)	A	ID of cylinder bore	4.500 to 4.501	B	OD of piston	4.459 to 4.497	c	ID of bearing bore in eye (flange assembly)	1.2493 to 1.2500	D	ID of bearing bore in eye (piston rod)	1.2493 to 1.2500	E	OD of piston rod	1.749 to 1.751	F	ID of sleeve bearing	1.753 to 1.755
Reference Letter	Point of Measurement	Measurement (in inches)																				
A	ID of cylinder bore	4.500 to 4.501																				
B	OD of piston	4.459 to 4.497																				
c	ID of bearing bore in eye (flange assembly)	1.2493 to 1.2500																				
D	ID of bearing bore in eye (piston rod)	1.2493 to 1.2500																				
E	OD of piston rod	1.749 to 1.751																				
F	ID of sleeve bearing	1.753 to 1.755																				
	NOTE																					
	Tag parts that are out of tolerance																					
3.	If ID of bearing bore in eye flange C or piston eye D are out of tolerance, have support shop remove old bearing and press in new bearing.																					
4.	After support shop work, return boom linear actuating cylinder parts to turret shop.																					
	NOTE																					
	Follow-on Maintenance Action Required:																					
	Assemble boom linear actuating cylinder (para 28-5).																					
	END OF TASK																					



28-3. BOOM LINEAR ACTUATING CYLINDER TEST PROCEDURE

TEST EQUIPMENT: M3 oil pump
Four-way rotary selector valve
Pressure gauge (0-5000 psi)
Watch or timer with sweep second hand
Graduated container (10 cubic-inch capacity)

SUPPLIES: Rags (item 21, App A)
Hydraulic fluid (item 10, App A)
1 gallon can

PERSONNEL: One

REFERENCES: JPG for procedure to use M3 oil pump

PRELIMINARY PROCEDURES: Remove boom linear actuating cylinder (para 28-4)
Assemble boom linear actuating cylinder (para 28-7)

GENERAL INSTRUCTIONS:

CAUTION

Keep dirt from getting in tubing or parts. Dirt can damage equipment.

NOTE

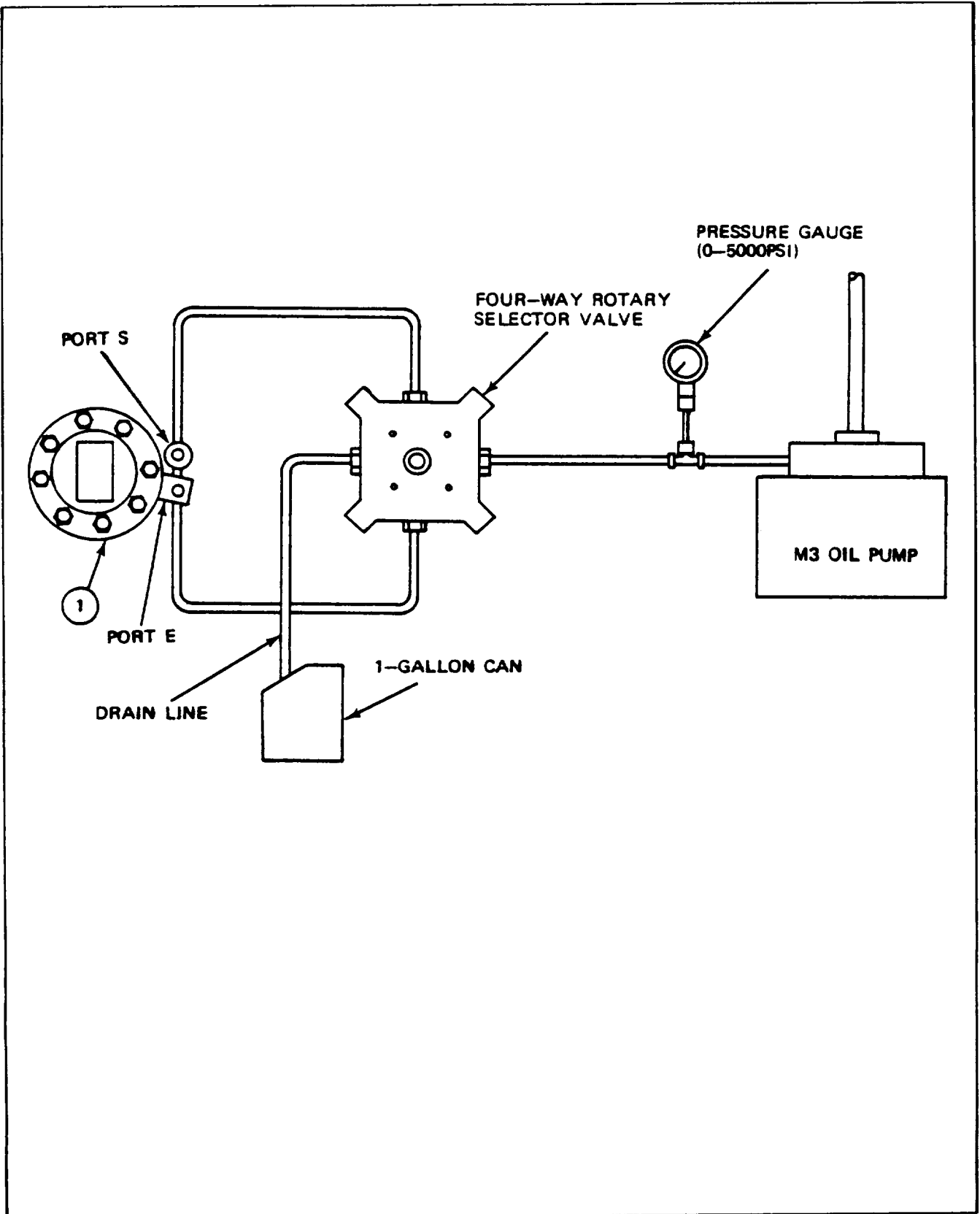
Rags should be used to clean up spilled hydraulic fluid.

Suitable tools and supplies should be used as needed to connect test equipment to boom linear actuating cylinder.

If test does not give normal indication, boom linear actuating cylinder is bad. Disassemble bad boom linear actuating cylinder (para 28-6) and replace bad parts.

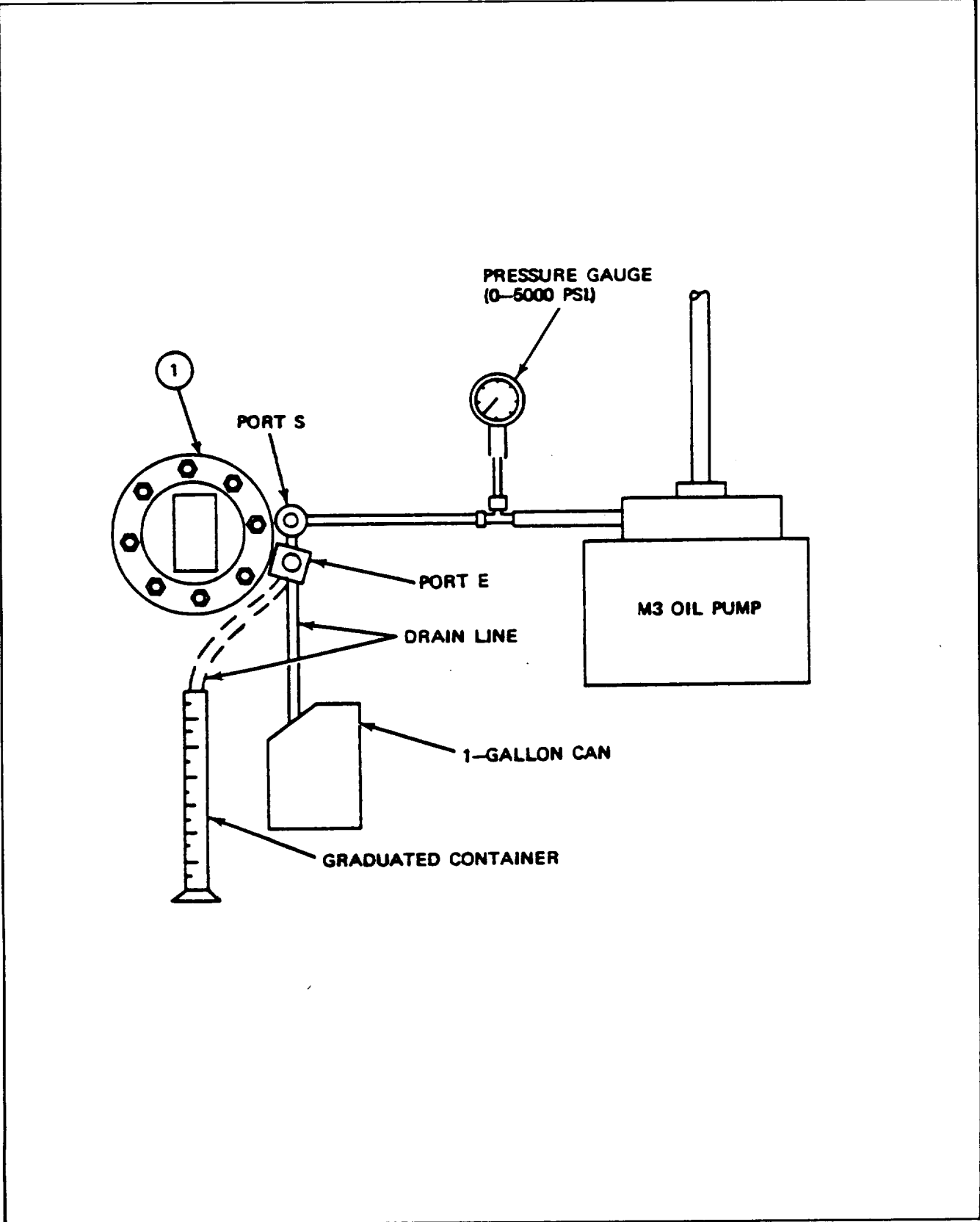
28-3. BOOM LINEAR ACTUATING CYLINDER TEST PROCEDURE (CONT)

FRAME 1			
Step	Procedure	Normal Indication	Probable Fault
1.	Using suitable tools and supplies, connect M3 oil pump, pressure gauge, and four-way rotary selector valve to boom linear actuating cylinder (1) at Port S and Port E.	. . .	. . .
2.	Set four-way rotary selector valve to apply pressure to boom linear actuating cylinder (1) at Port S.	. . .	. . .
3.	Operate M3 oil pump until piston and bellows on boom linear actuating cylinder (1) are fully extended. Release pressure at M3 oil pump (JPG).	. . .	. . .
4.	Set four-way rotary selector valve to apply pressure to boom linear actuating cylinder (1) at Port E.	. . .	. . .
5.	Operate M3 oil pump until piston and bellows on boom linear actuating cylinder (1) are fully retracted. Release pressure at M3 oil pump (JPG).	. . .	. . .
6.	Repeat steps 2 thru 5 three more times.	. . .	. . .
7.	Check boom linear actuating cylinder (1) for external leaks.	No leaks	Bad boom linear actuating cylinder
8.	Check piston rod seal for leaks.	Not more than one drop	Bad boom linear actuating cylinder
9.	Using suitable tools, disconnect M3 oil pump, pressure gauge, and four-way rotary selector valve from boom linear actuating cylinder (1). GO TO FRAME 2	. . .	. . .



28-3. BOOM LINEAR ACTUATING CYLINDER TEST PROCEDURE (CONT)

FRAME 2			
Step	Procedure	Normal Indication	Probable Fault
NOTE			
Piston rod and bellows on boom linear actuating cylinder (1) should be fully retracted.			
1.	Using suitable tools and supplies, connect M3 oil pump and pressure gauge to boom linear actuating cylinder (1) at Port S. Connect drain line to boom linear actuating cylinder (1) at Port E and put other end of drain line in 1-gallon container.	. . .	. . .
2.	Operate M3 oil pump until pressure gauge reads between 1900 and 2100 psi (JPG).	. . .	. . .
3.	Using watch or timer, wait four minutes.	. . .	. . .
4.	Move drain hose from 1-gallon container to graduated container.	. . .	. . .
5.	Using watch or timer, wait 60 seconds.		. . .
6.	Operate M3 oil pump to release pressure (JPG).	. . .	. . .
7.	Check fluid in graduated container.	Less than 5 cubic inches	Bad boom linear actuating cylinder
8.	Check piston rod seal for leaks.	No leaks	Bad boom linear actuating cylinder
9.	Check boom linear actuating cylinder for external leaks.	No leak	Bad boom linear actuating cylinder
10.	Using suitable tools, disconnect M3 oil pump, pressure gauge, and drain line from boom linear actuating cylinder (1).	. . .	. . .
END OF TASK			



28-4. BOOM LINEAR ACTUATING CYLINDER REMOVAL

TOOLS: 7/8" combination wrench
12" adjustable wrench
Slip joint pliers
Hoist with rope sling
12" pry bar

SUPPLIES: Support blocks 2" x 6" x 12" (four)
Wood wedges 2" x 2" x 4" (two)
Container for hydraulic oil
Rags
Dust plugs (two)
Dust caps (two)

PERSONNEL: Two

REFERENCES: JPG for procedure to remove cotter pins
TM 9-2350-222-10 for procedure to operate A-frame

EQUIPMENT LOCATION INFORMATION:

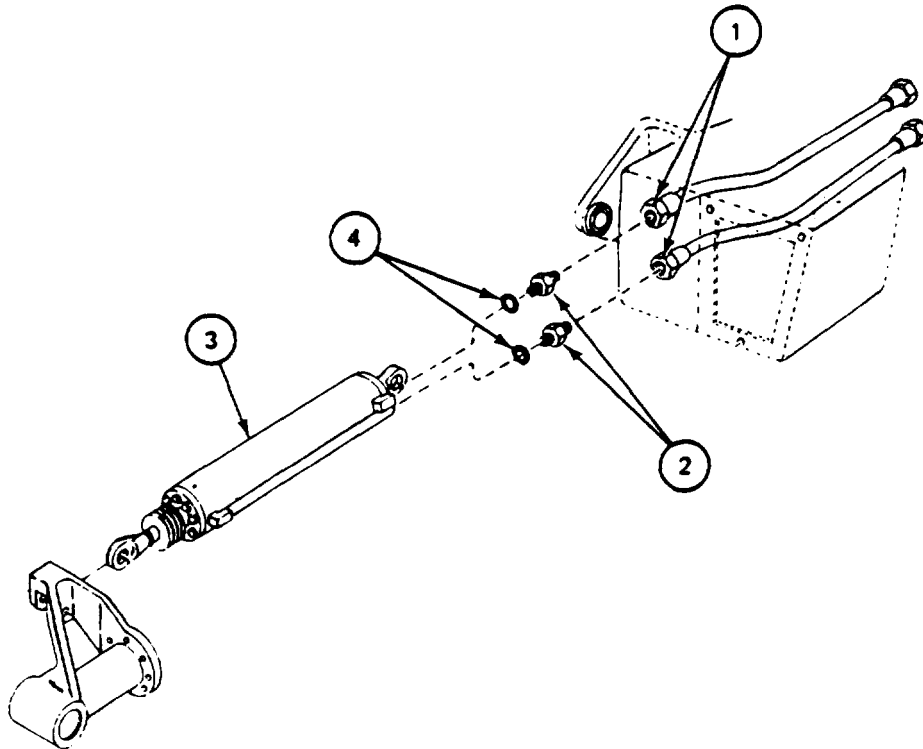
EQUIPMENT	FOLDOUT	CALLOUT
A-Frame Right Trunnion	FO-5	8
Hydraulic Pump Panel	FO-3	12

EQUIPMENT CONDITION: A-frame stowed with boom travel locks unlocked (TM-10)
HYDRAULIC PUMP switch on HYDRAULIC PUMP panel to OFF
set to OFF

28-4. BOOM LINEAR ACTUATING CYLINDER REMOVAL PROCEDURE (CONT)

FRAME 1

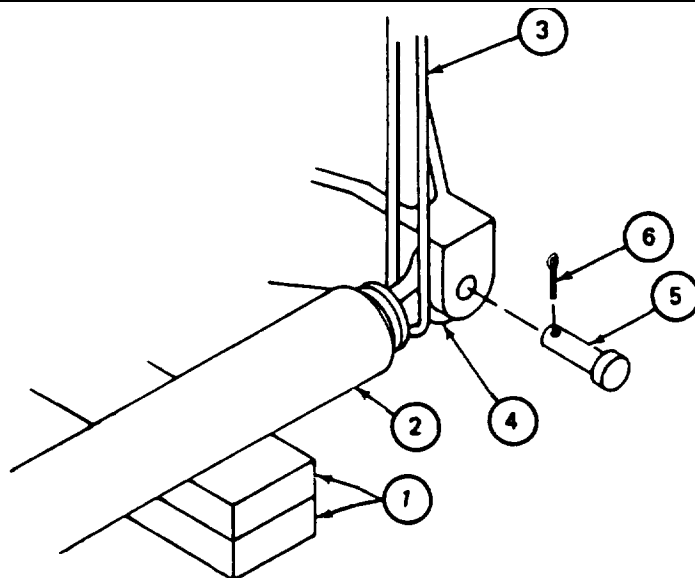
Step	Procedure
1.	Put container under hydraulic hose coupling nuts to catch oil.
2.	Using wrench, loosen and remove two hydraulic hose coupling nuts (1).
3.	Using adjustable wrench remove two unions (2) from cylinder (3).
4.	Remove two O-rings (4) from unions. Attach two unions (2) to two coupling nuts (1).
5.	Put dust caps on two unions (2).
6.	Put two dust plugs in holes in end of cylinder (3).
7.	Using rag, wipe up any hydraulic oil that was spilled. GO TO FRAME 2



28-4. BOOM LINEAR ACTUATING CYLINDER REMOVAL PROCEDURE (CONT)

FRAME 2

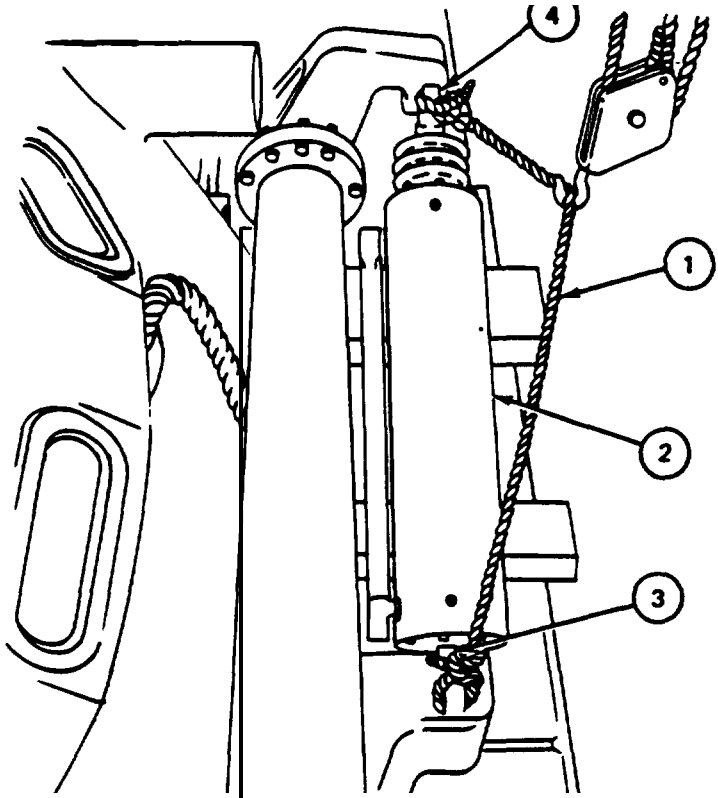
Step	Procedure
	<div style="text-align: center; border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <p>WARNING</p> </div> <p style="text-align: center;">Cylinder (2) weighs about 280 pounds. Use hoist with rope sling to remove cylinder (2) to prevent injury.</p> <div style="text-align: center; border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <p>CAUTION</p> </div> <p style="text-align: center;">Connect sling to eyes of cylinder (2) Do not attach sling to hydraulic connections.</p> <ol style="list-style-type: none"> 1. Soldier A: Put two support blocks (1) under piston end of cylinder (2). Soldier B: Attach sling (3) under eye of piston (4). 2. Soldier A: Using hoist, lift weight of cylinder (2) off pin (5). 3. Soldier B: Using pliers, remove cotter pin (6) from pin (5) (JPG). 4. Soldier B: Using pry bar, remove pin (5). 5. Soldier A: Using hoist lower cylinder end (2) to support blocks (1). 6. Soldier B: Remove Sling (3). <p>GO TO FRAME 3</p>



28-4. BOOM LINEAR ACTUATING CYLINDER REMOVAL PROCEDURE (CONT)

FRAME 3	
Step	Procedure
	<div data-bbox="789 449 1009 527" style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px auto; width: fit-content;"> <p>WARNING</p> </div> <p style="text-align: center; margin: 10px auto; width: 80%;">Use two wooden wedges (7) to prevent cylinder (2) from rolling off vehicle and causing injury,</p> <ol style="list-style-type: none"> 1. Soldier A: Put two support blocks (1) under cylinder (2). <li style="padding-left: 20px;">Soldier B: Attach sling (3) under eye (4) of cylinder (2). 2. Soldier A: Using hoist, lift weight of cylinder (2) off pin (5). 3. Soldier B: Using pliers, remove cotter pin (6) from pin (5). 4. Soldier B: Using prybar, remove pin (5). 5. Soldier A: Using hoist, lower cylinder (2) to support blocks (1). 6. Soldier A: Put two wooden wedges (7) under cylinder (2) to keep cylinder (2) from rolling off vehicle. <li style="padding-left: 20px;">Soldier B: Remove sling (3). <p>GO TO FRAME 4</p>

28-4. BOOM LINEAR ACTUATING CYLINDER REMOVAL PROCEDURE (CONT)

FRAME 4	Step	Procedure
		<div data-bbox="657 457 882 538" style="text-align: center; border: 1px solid black; padding: 5px;">WARNING</div> <p data-bbox="409 578 1129 644">Cylinder (2) weighs about 280 pounds. Use hoist with rope sling to remove cylinder (2) to prevent injury.</p> <div data-bbox="687 719 855 772" style="text-align: center; border: 1px solid black; padding: 5px;">CAUTION</div> <p data-bbox="409 787 1129 849">Connect sling to eyes of cylinder (2). Do not attach sling to hydraulic connections.</p> <p data-bbox="140 863 1096 991">1. Soldier A: Attach rope sling to connecting eye (3) and piston (4). Soldier B: Using hoist, remove cylinder (2) from vehicle. END OF TASK</p>
		

28-5. BOOM LINEAR ACTUATING CYLINDER INSTALLATION PROCEDURE

TOOLS: 7/8" combination wrench
 12" adjustable wrench
 Slip joint pliers
 Hoist with rope sling
 2 lb. ball peen hammer

SUPPLIES: Grease (item 12, App A)
 O-ring, MS28778-8 (two)
 Support blocks 2" x 6" x 12" (four)
 Wood wedges 2" x 2" x 4" (two)

PERSONNEL: **Two**

REFERENCES: JPG for procedure to install cotter pins
 TM 9-2350-222-10 for procedure to operate A-frame

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT
 Hydraulic Pump Panel

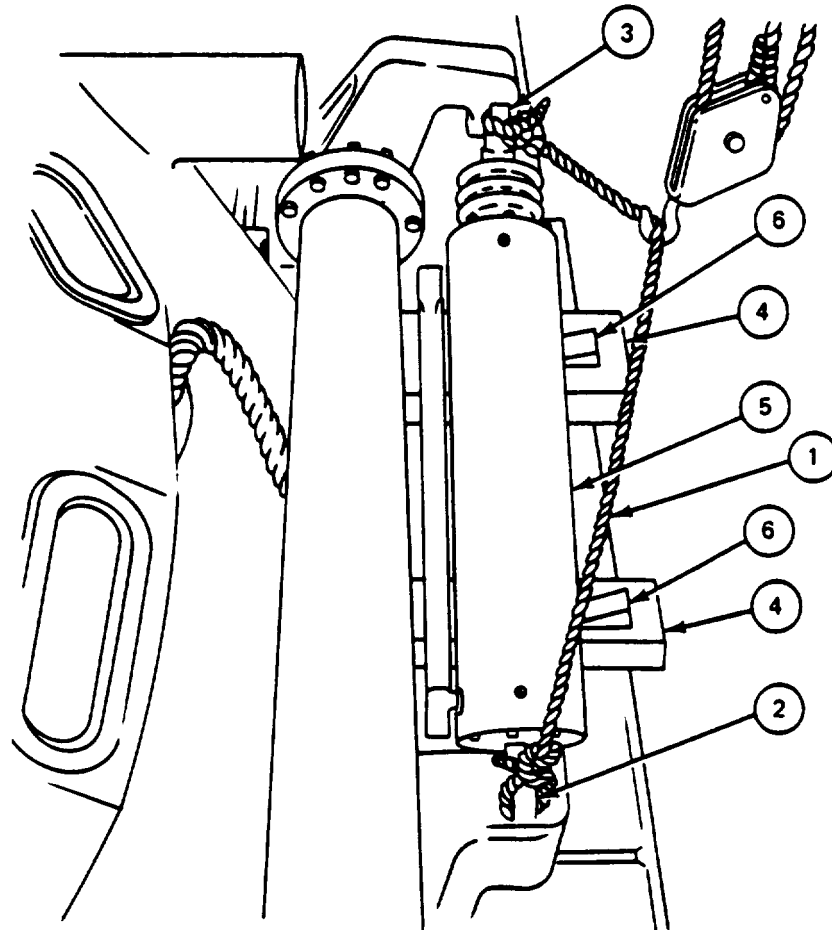
FOLDOUT
 FO-3

CALLOUT
 12

EQUIPMENT CONDITION: A-frame in stowed position with boom travel locks unlocked (TM-10)
 HYDRAULIC PUMP switch on HYDRAULIC PUMP panel set to
 OFF

28-5. BOOM LINEAR ACTUATING CYLINDER INSTALLATION PROCEDURE (CONT)

FRAME 1	
Step	Procedure
	<div data-bbox="634 517 855 597" style="text-align: center; border: 1px solid black; padding: 5px;">WARNING</div> <p data-bbox="391 640 1101 704">Cylinder (5) weighs about 280 pounds. Use hoist with rope sling (1) to remove cylinder (5) to prevent injury.</p> <div data-bbox="664 778 829 832" style="text-align: center; border: 1px solid black; padding: 5px;">CAUTION</div> <p data-bbox="391 849 1101 912">Connect sling (1) to eyes of cylidner (5). Do not attach sling to hydraulic connections.</p> <ol data-bbox="123 927 1143 1059" style="list-style-type: none"> 1. Soldier A: Attach rope sling (1) to cylinder eye (2) and piston eye (3). Soldier B: Put four support blocks (4) on vehicle. 2. Soldier B: Using hoist, lower cylinder (5) on support blocks (4). <div data-bbox="634 1134 855 1208" style="text-align: center; border: 1px solid black; padding: 5px;">WARNING</div> <p data-bbox="391 1257 1101 1321">Use two wooden wedges (6) to prevent cylinder (5) from rolling off vehicle and causing injury.</p> <ol data-bbox="123 1336 1321 1495" style="list-style-type: none"> 3. Soldier A: Put two wooden wedges (6) under cylinder (5) to keep cylinder (5) from rolling off vehicle, Soldier B: Remove sling (1). GO TO FRAME 2



28-5. BOOM LINEAR ACTUATING CYLINDER INSTALLATION PROCEDURE (CONT)

FRAME 2	
Step	Procedure
1.	Grease pin (1) cylinder eye (2) and two holes in turret attaching bracket (3).
2.	Put sling (4) under cylinder eye (2).
3.	Line up cylinder eye (2) with holes in turret bracket (3).
4.	Using hammer, install pin (1).
5.	Using pliers, install cotter pin (5) in pin (1) (JPG).
6.	Remove sling (4).
	GO TO FRAME 3

28-5. BOOM LINEAR ACTUATING CYLINDER PROCEDURE (CONT)

FRAME 3	
Step	Procedure
1.	Put grease on piston pin (1), eye (2), and two holes in A-frame attaching bracket (3).
2.	Put sling (4) under piston (2).
3.	Line up piston eye (2) with two holes in A-frame bracket (3).
4.	Using hammer, install pin (1).
5.	Using pliers, install cotter pin (5) in pin (1) (JPG).
6.	Remove sling (4).
7.	Remove four support blocks (6) and two wedges (7).
GO TO FRAME 4	

28-5. BOOM LINEAR ACTUATING CYLINDER INSTALLATION PROCEDURE (CONT)

FRAME 4	
Step	Procedure
1.	Remove two dust plugs from cylinder hydraulic openings (1).
2.	Remove two unions (2) from hydraulic lines (3).
3.	Remove dust caps from two unions (2).
4.	Install two new O-rings on two unions (2).
5.	Using adjustable wrench, install two unions (2) in cylinder hydraulic openings (1).
6.	Using wrench, install two hydraulic lines (3) to two unions (2).
7.	Purge hydraulic system of air (para 6-9).
8.	Using rags clean up any spilled hydraulic fluid.
	END OF TASK

28-6. BOOM LINEAR ACTUATING CYLINDER DISASSEMBLY PROCEDURE

TOOLS: O-ring extractor kit
5/16" combination wrench
1/8" socket head screw key (Allen wrench)
1/4" flat tip screwdriver
Spanner wrench (sleeve bearing)
7/8" combination wrench
3/16" socket head screw key (Allen wrench)
Scriber
Spanner wrench (piston)
Vise with brass caps
Pry bar
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Cleaning rags (item 21, App A)
Lint-free cloths (item 21, App A)
Crocus cloth (item 7, App A)
Dry cleaning solvent (item 33, App A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Remove preformed packing
Use spanner wrench
Inspect and repair parts
Clean parts
Use scriber

PRELIMINARY PROCEDURES: Remove boom linear actuating cylinder (para 28-5)

GENERAL INSTRUCTIONS:

CAUTION

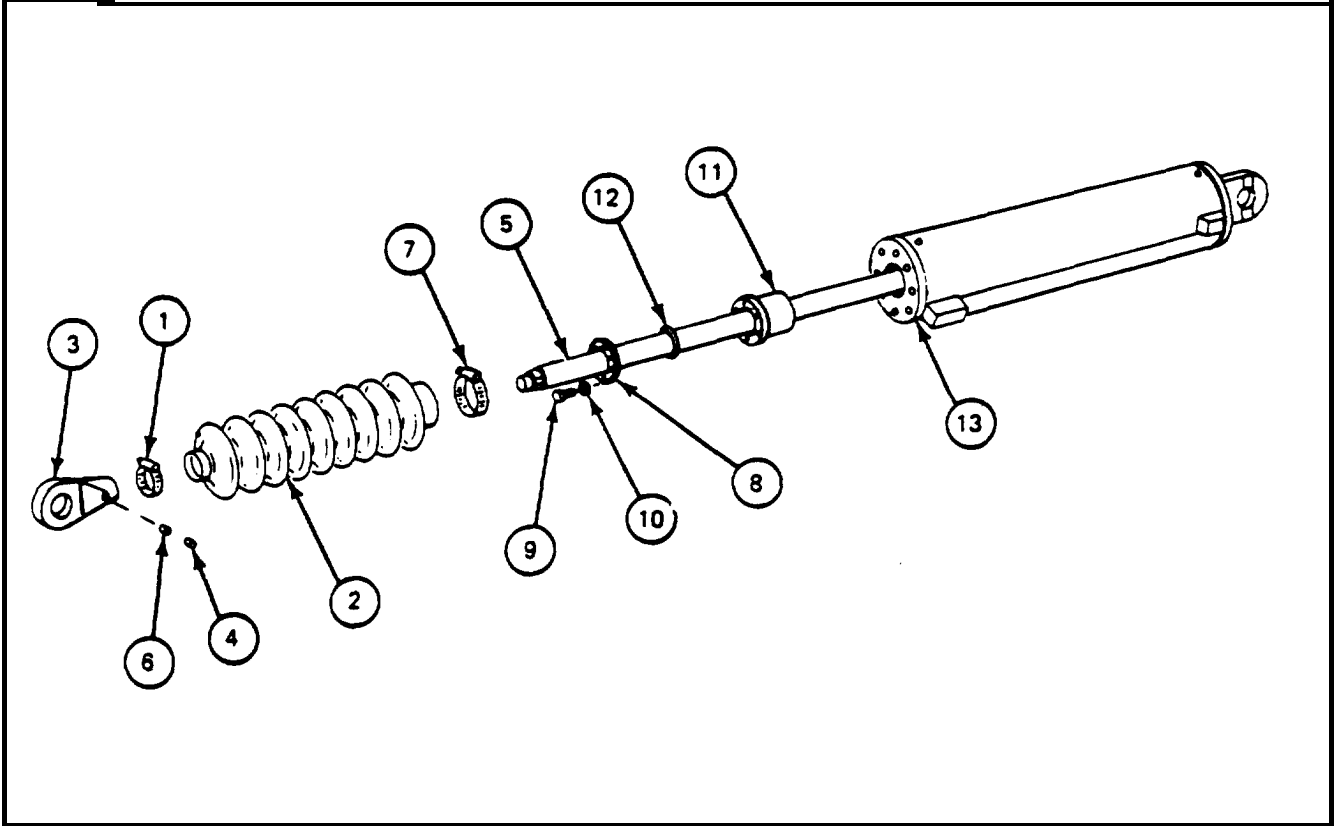
Keep dirt from getting in tubing or parts. Dirt can damage equipment.

NOTE

Use rags to clean up spilled hydraulic fluid.

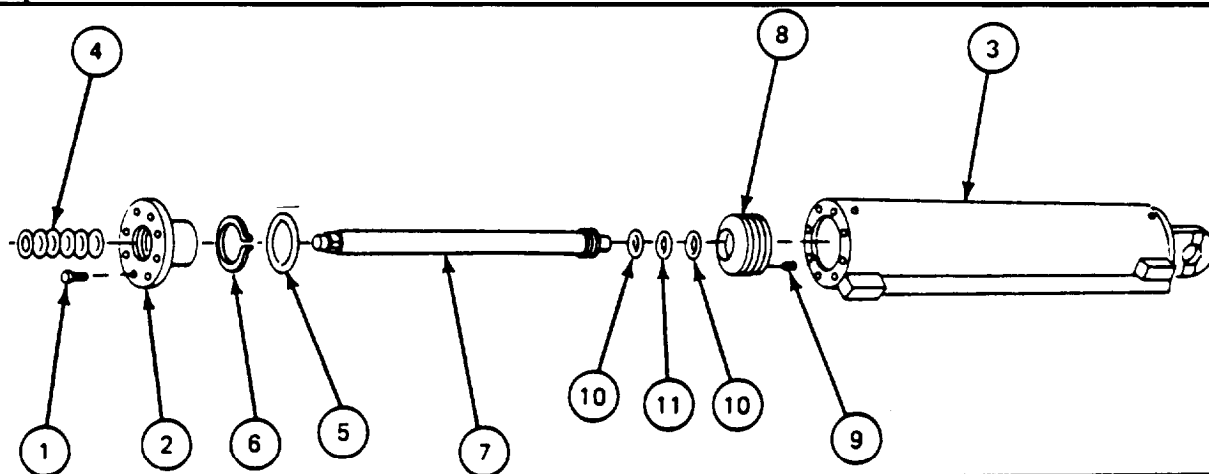
28-6. BOOM LINEAR ACTUATING CYLINDER DISASSEMBLY PROCEDURE (CONT)

FRAME 1	
Step	Procedure
1.	Using screwdriver, loosen clamp (1) holding bellows (2) to eye (3).
2.	Using hands, slide clamp (1) and bellows (2) off eye (3).
3.	Using 1/8" Allen wrench, loosen setscrew (4) from eye (3).
4.	Using hands, unscrew eye (3) from piston rod (5).
5.	Using 1/8" Allen wrench, tighten setscrew (4) until plug (6) falls out of eye (3).
6.	Using 1/8" Allen wrench, remove setscrew (4) from eye (3).
7.	Using screwdriver, loosen clamp (7) holding bellows (2) to scraper retainer (8).
8.	Using spanner wrench, unscrew piston (8) from piston rod (7).
9.	Remove piston rod (7) from vise.
10.	Using O-ring extractor, remove two retainers (1) and preformed packing (11) from piston rod (7) (JPG).
GO TO FRAME 3	

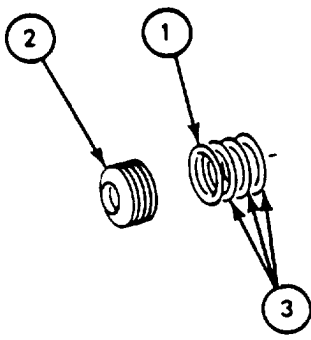


28-6. BOOM LINEAR ACTUATING CYLINDER DISASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
1.	Using 7/8" wrench, remove eight screws (1) holding cylinder end (2) to cylinder (3).
2.	Using prybar and ball peen hammer, remove cylinder end (2) from inside cylinder (3) (JPG).
3.	Using O-ring extractor, remove packing assembly (4) from inside cylinder end (2) (JPG). Throw away packing assembly (4).
4.	Using O-ring extractor remove preformed packing (5) and retainer (6) from cylinder end (2) (JPG) Throw away preformed packing (5).
5.	Slide piston rod (7) and piston (8) assembly from cylinder (3).
6.	Using 1/8" Allen wrench, remove set screw (9) from piston (8).
NOTE	
Piston rod (7) surface must not be scratched or damaged.	
7.	Put flat end of piston rod (7) in vise.
8.	Using spanner wrench, unscrew piston (8) from piston rod (7).
9.	Remove piston rod (7) from vise.
10.	Using O-ring extractor, remove two retainers (10) and preformed packing (11) from piston rod (7) (JPG).
GO TO FRAME 3	



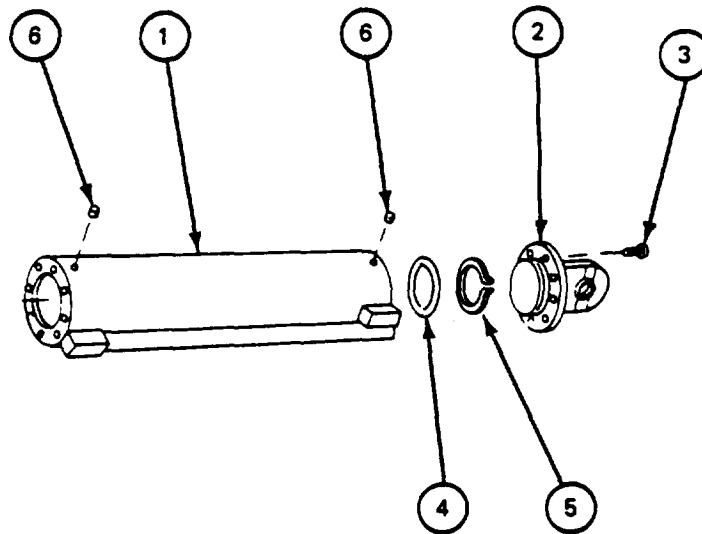
28-6. BOOM LINEAR ACTUATING CYLINDER DISASSEMBLY PROCEDURE (CONT)

FRAME 3	
Step	Procedure
	<p style="text-align: center;">CAUTION</p> <p>Piston (2) surface must not be scratched or damaged during removal of piston ring (1) and piston rings (3).</p> <p style="text-align: center;">NOTE</p> <p>Do this frame only if piston ring (1) or piston rings (3) are damaged or worn. If piston rings (1) and (3) are not damaged or worn, go to frame 4.</p> <ol style="list-style-type: none"> 1. Using screwdriver, lift end of piston ring (1) out of groove in piston (2). 2. Pull end of piston ring (1) until piston ring breaks. 3. Remove piston ring (1) from piston (2). 4. Repeat steps 1 through 3 for three piston rings (3). <p>GO TO FRAME 4</p>
	

28-6. BOOM LINEAR ACTUATING CYLINDER DISASSEMBLY PROCEDURE (CONT)

FRAME 4

Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 4. 5. 	<p>Using scribe, scribe a mark on cylinder (1) and flange (2).</p> <p>Using 7/8" wrench, remove eight screws (3) holding eye flange (2) to cylinder (1).</p> <p>Using hammer and pry bar, remove eye flange assembly (2).</p> <p>Using O-ring extractor, remove preformed packing (4) and retainer (5) from eye flange (2) (JPG). Throw away preformed packing (4).</p> <p>Using 3/16" Allen wrench, remove two plugs (6) from cylinder (1).</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Follow-on Maintenance Action Required:</p> <p style="text-align: center;">Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of parts (para 28-3).</p> <p>END OF TASK</p>



28-7. BOOM LINEAR ACTUATING CYLINDER ASSEMBLY PROCEDURE

TOOLS: 1/8" socket head screw key (Allen wrench)
3/16" socket head screw key (Allen wrench)
1/4" flat tip screwdriver
7/8" combination wrench
3/16" drive pin punch
8 ounce ball peen hammer
Spanner wrench (sleeve bearing)
Spanner wrench (piston)
Vise with brass caps
Piston ring spreader

SUPPLIES: Parts kit (5703551)
Packing assembly (vendor's item 10947096)
Piston rings (vendor's item 10947096) (four)
Cleaning rags (item 21, App A)
Hydraulic fluid (item 10, App A)
Sealing compound (item 25, App A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Use spanner wrench
Install preformed packings
Use piston ring spreader
Use sealing compound

PRELIMINARY PROCEDURES: Inspect boom linear actuating cylinder (para 28-2)

GENERAL INSTRUCTIONS:

CAUTION

Keep dirt from getting in tubing or parts. Dirt can damage equipment.

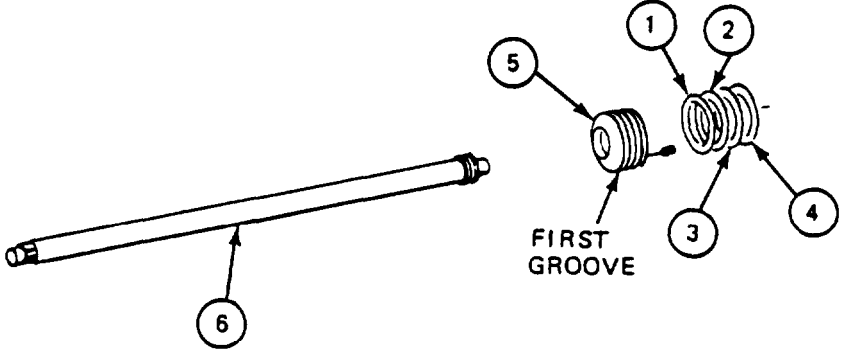
NOTE

Use rags to clean up spilled hydraulic fluid.

28-7. BOOM LINEAR ACTUATING CYLINDER ASSEMBLY PROCEDURE (CONT)

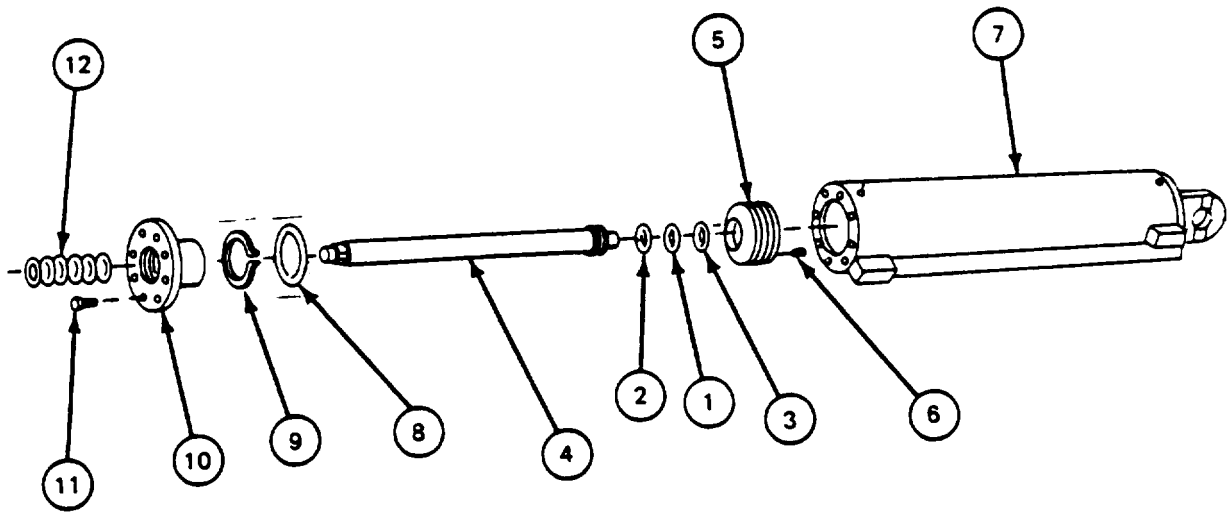
FRAME 1	
Step	Procedure
<ol style="list-style-type: none"> 1. 2. 3. 4. 5. 	<p>Lightly coat new preformed packing (1) (MS28775-346) with hydraulic fluid (JPG).</p> <p>Put retainer (2) and preformed packing (1) on eye flange (3) (JPG).</p> <p>Line up mark on eye flange (3) with mark on cylinder (4).</p> <p>Using 7/8" wrench, attach eye flange (3) to cylinder (4) with eight screws (5).</p> <p>Using 3/16" Allen wrench, put two plugs (6) in cylinder (4).</p> <p>GO TO FRAME 2</p>

28-7. BOOM LINERAR ACTUATING CYLINDER ASSEMBLY PROCEDURE (CONT)

FRAME 2	
Step	Procedure
	<p style="text-align: center;">CAUTION</p> <p>Piston (5) surface must not be scratched or damaged during installation of piston rings (1), (2), (3), and (4).</p> <p style="text-align: center;">NOTE</p> <p>Do this frame only if piston rings (1), (2), (3) and (4) have been removed. If piston rings (1), (2), (3) and (4) have not been removed, go to Frame 3.</p> <ol style="list-style-type: none"> 1. Lightly coat four piston rings (1), (2), (3) and (4) and piston (5) with hydraulic fluid (JPG). 2. Using piston ring spreader, put piston ring (1) in first groove in piston (5) with UP side of piston ring (1) toward piston rod (6) (JPG). 3. Hide piston ring (1) in first groove in piston (5) until opening in piston ring (1) is down. 4. Repeat step 2 for piston ring (2) and second groove in piston (5). 5. Hide piston ring (2) in second groove until opening in piston ring (2) is up. 6. Using piston ring spreader, put piston ring (3) in third groove in piston (5) with up side of piston ring (3) away from piston rod (6). 7. Slide piston ring (3) in third groove in piston (5) until opening in piston ring (3) is on left side of piston (5). 8. Repeat step 6 for piston ring (4) and fourth groove in piston (5). 9. Slide piston ring (4) in fourth groove in piston (5) until opening in piston ring (4) is on right side of piston (5) (JPG). <p>GO TO FRAME 3</p>
	 <p>The diagram illustrates the assembly process. On the left, a long piston rod is labeled with a circled '6'. To its right, a piston is labeled with a circled '5'. Four piston rings, labeled with circled numbers '1', '2', '3', and '4', are shown being installed onto the piston. Ring '1' is positioned in the 'FIRST GROOVE'. Arrows indicate the orientation and placement of each ring. The rings are shown in a staggered arrangement along the piston's length.</p>

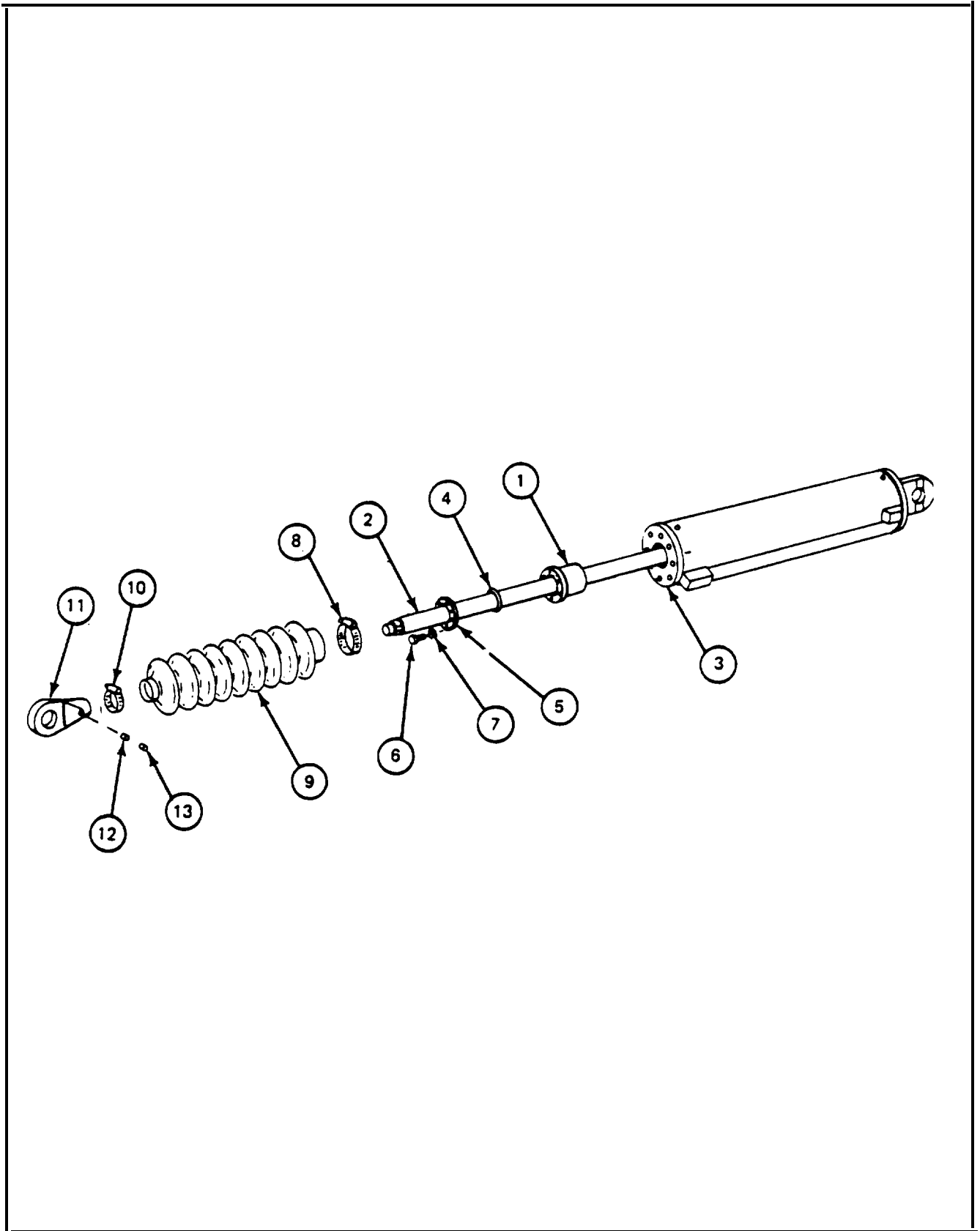
28-7. BOOM LINEAR ACTUATING CYLINDER ASSEMBLY PROCEDURE (CONT)

FRAME 3	
Step	Procedure
1.	Lightly coat new preformed packings (1) (MS28775-224) with hydraulic fluid (JPG).
2.	Put retainer (2), preformed packing (1), and retainer (3) on piston rod (4) (JPG).
3.	screw piston rod (4) in piston (5).
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">CAUTION</div> <p style="text-align: center;">Piston rod (4) surface must not be scratched or damaged.</p>	
4.	Put flat end of piston rod (4) in vise.
5.	Using spanner wrench, screw piston (5) on piston rod (4) until tight and setscrew holes are lined up.
6.	Remove piston rod (4) from vise.
7.	Apply sealing compound to setscrew (6) (JPG).
8.	Using 1/8" Allen wrench, put setscrew (6) in piston (5).
9.	Slide piston (5) into cylinder (7).
10.	Lightly coat new preformed packing (8) (MS28775-346) with hydraulic fluid (JPG).
11.	Put retainer (9) and preformed packing (8) on cylinder end (10) flange (JPG).
12.	Slide cylinder end (10) on piston rod (4).
13.	Using 7/8" wrench, attach cylinder end (10) to cylinder (7) with eight screws (11).
14.	Lightly coat new packing assembly (12) with hydraulic fluid (JPG).
15.	Slide packing assembly (12) on piston rod (4).
16.	Push packing assembly (12) into cylinder end (10) bore (JPG).
GO TO FRAME 4	



28-7. BOOM LINEAR ACTUATING CYLINDER ASSEMBLY PROCEDURE (CONT)

FRAME 4	
Step	Procedure
1.	Slide sleeve bearing (1) on piston rod (2).
2.	Using spanner wrench, screw sleeve bearing (1) into cylinder end (3).
3.	Lightly coat new scraper (4) (MS28776-019) with hydraulic fluid (JPG).
NOTE	
Scraper (4) is put on piston rod (2) with lip of scraper away from sleeve bearing (1).	
4.	Slide scraper (4) on piston rod (2) with lip toward scraper retainer (5).
5.	Using screwdriver, attach scraper retainer (5) and scraper (4) to sleeve bearing (1) with four screws (6) and four lockwashers (7).
6.	Slide clamp (8), bellows (9), and clamp (10) on piston rod (2). Do not fasten clamps.
7.	Screw eye (11) on piston rod (2) as far as it will go.
8.	Using hammer and punch, put plug (12) in hole in eye (11).
9.	Using 1/8" Allen wrench, install setscrew (13) in eye (11).
10.	Rotate bellows (9) until breather hole is in down position when cylinder is installed in vehicle.
11.	Using screwdriver, attach bellows (9) to eye (11) with clamp (10).
12.	Using screwdriver, attach bellows (9) to scraper retainer (5) with clamp (8).
NOTE	
Follow-on Maintenance Action Required: Test boom linear actuating cylinder (para 28-3).	
END OF TASK	



CHAPTER 29
BOOM

29-1. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks	
	Removal	Installation
Boom Assembly	29-2	29-3

29-2. BOOM REMOVAL PROCEDURE

TOOLS: Hoist (4000-pound capacity)
 1-1/8" combination wrench
 1-1/8" socket (3/4" drive)
 3/4" drive ratchet
 Turret lifting sling (11615369)

SUPPLIES: Wood block, 3" x 8" x 36" (four)
 Rope 1/4" x 30 feet long

PERSONNEL: Three

REFERENCES: TM 9-2350-222-10 for procedure to stow boom
 TM 9-2350-222 -20-2-3 for procedure to remove:
 Winch cable from sheave
 Staylines
 Boom linear actuating cylinder

EQUIPMENT CONDITION: Boom stowed, boom travel locks UNLOCKED (TM-10)
 Staylines removed (TM-20-2-3)
 Boom linear actuating cylinder removed (TM-20-2-3)
 Winch cable removed from sheave (TM-20-2-3)

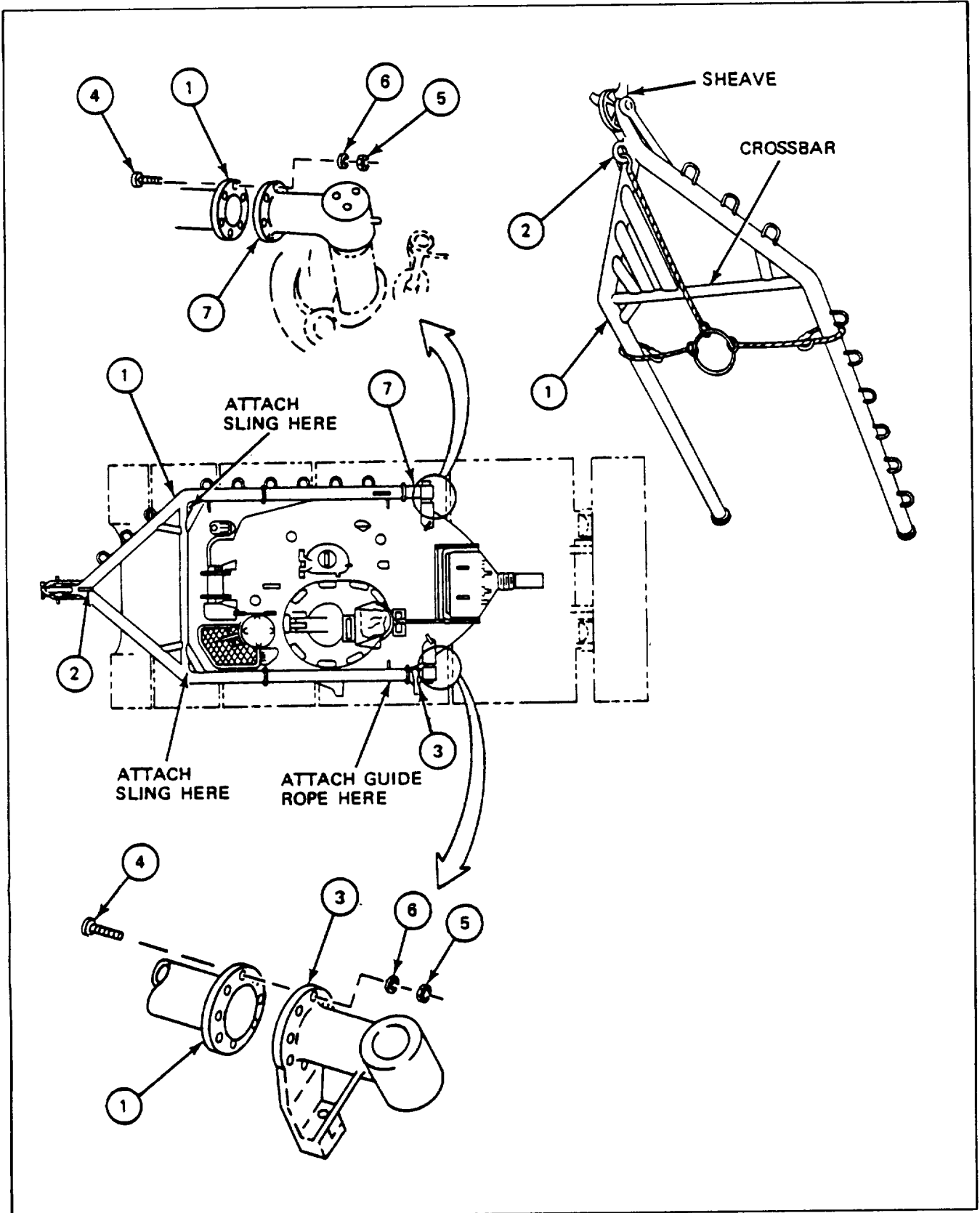
GENERAL INSTRUCTIONS:

WARNING

Stay clear when boom assembly is being lifted. Boom assembly is heavy enough to kill you if it falls.

29-2. BOOM REMOVAL PROCEDURE (CONT)

FRAME 1	Procedure
	<p style="text-align: center;">WARNING</p> <p style="text-align: center;">Boom (1) must be supported with hoist and sling at three points before removing screws (4) from trunnion (3) and trunnion (7). Sling must be attached to boom eye (2) near sheave and next to braces at rear of long cross brace. Without firm, three-point support, boom (1) could slip or fall and kill you.</p> <ol style="list-style-type: none"> 1. Soldier A and Soldier B: Hook center leg of turret lifting sling to boom eye (2) and fasten sling adjusting hook fifteen chain links from sling lifting ring. 2. Put other two legs of turret lifting sling around outside of boom (1), bring sling hooks under boom and attach to legs of sling. 3. Tie guide rope to boom (1) near right trunnion (3). <p style="text-align: center;">WARNING</p> <p style="text-align: center;">Stay clear of trunnion (3) and trunnion (7) while removing last screw (4). Trunnion (3) and trunnion (7) could rotate and hurt you.</p> <ol style="list-style-type: none"> 4. Soldier C: Using hoist, support boom (1). 5. Soldier A and Soldier B: Using combination wrench to hold screw (4) and socket wrench to turn nut (5), remove eight screws (4), eight nuts (5), and eight lockwashers (6) from boom (1) and right trunnion (3). 6. Using combination wrench to hold screw (4) and socket wrench to turn nut (5), remove eight screws (4), eight nuts (5), and eight lockwashers (6) from boom (1) and left trunnion (7). <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Soldier A should direct hoist operator. Soldier B should guide rope. Soldier C should operate hoist.</p> <ol style="list-style-type: none"> 7. Soldier C: Using hoist, lift boom (1) away from vehicle and lower boom (1) to four wood blocks. 8. Soldier A and Soldier B: Remove turret lifting sling and guide rope from boom (1). <p>END OF TASK</p>



29-3. BOOM INSTALLATION PROCEDURE

TOOLS: Hoist (4000-pound capacity)
1-1/8" combination wrench
1-1/8" socket (3/4" drive)
3/4" drive ratchet
Turret lifting sling (11615369)
Pry bar

PERSONNEL Three

REFERENCES: TM 9-2350-222-20-2-3 for procedures to
Install staylines
Install boom linear actuating cylinder
Install sheave
Install winch cable on sheave
TM 9-2350-222-10 for procedure to stow boom

EQUIPMENT CONDITION: Sheave installed (TM-20-2-3)

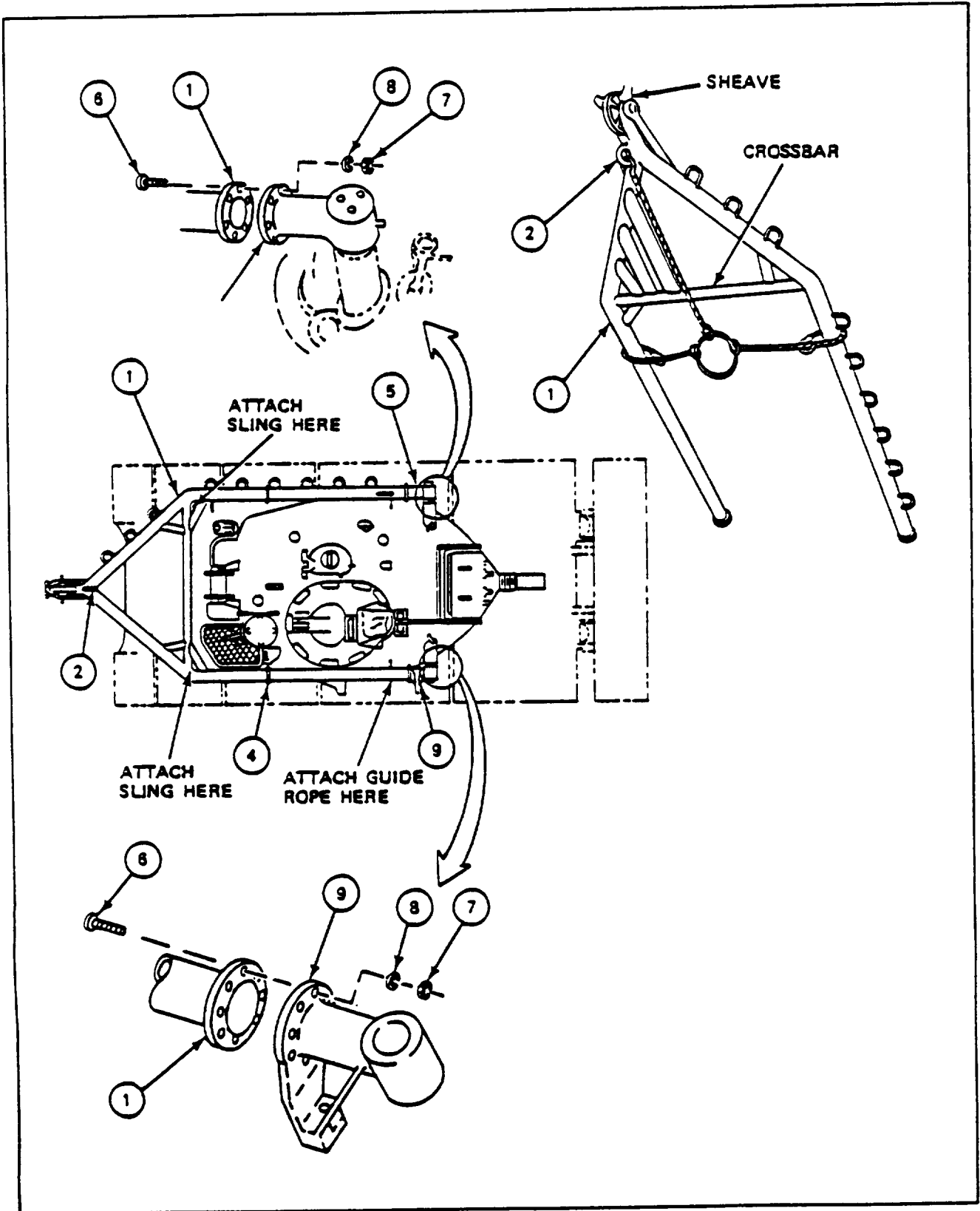
GENERAL INSTRUCTIONS:

WARNING

Stay clear when boom assembly is being lifted. If boom falls, it is heavy enough to kill you.

29-3. BOOM INSTALLATION PROCEDURE

FRAME 1	
Step	Procedure
	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">WARNING</div> <p>Boom (1) must be lifted with hoist and sling at three points. Hoist must be attached to boom eye (2) near sheave and next to braced at rear of long cross brace. Without firm, three-point support, boom (1) could slip and fall and kill you.</p>
1.	Soldier A and Soldier B: Hook center leg of turret lifting sling to boom eye (2) and fasten sling adjusting hook fifteen chain links from sling lifting ring.
2.	Put other two legs of sling around outside of boom (1), bring sling hooks under boom and attach to legs of sling.
3.	Tie guide rope to boom (1).
	<p>NOTE</p> <p>Soldier A should direct hoist operator. Soldier B should hold guide rope. Soldier C should operate hoist.</p>
4.	Soldier C: Using hoist, lift boom (1) into mounting position on vehicle. Let boom (1) rest in boom travel lock yokes (3) and (4).
	<p>NOTE</p> <p>Support boom (1) with hoist.</p>
5.	Soldier A and Soldier B: Using pry bar, line up holes in boom (1) with holes in left trunnion (5).
6.	Using combination wrench to hold screw (6) and socket wrench to turn nut (7), attach boom (1) to left trunnion (5) with eight screws (6), eight nuts (7), and eight lockwashers (8).
7.	Using pry bar, line up holes in boom (1) with holes in right trunnion (9).
8.	Using combination wrench to hold screw (6) and socket wrench to turn nut (7), attach boom (1) to right trunnion (9) with eight screws (6), eight nuts (7) and eight lockwashers (8).
9.	Disconnect sling and guide rope from boom (1).
	GO TO FRAME 2



29-3. BOOM INSTALLATION PROCEDURE (CONT)

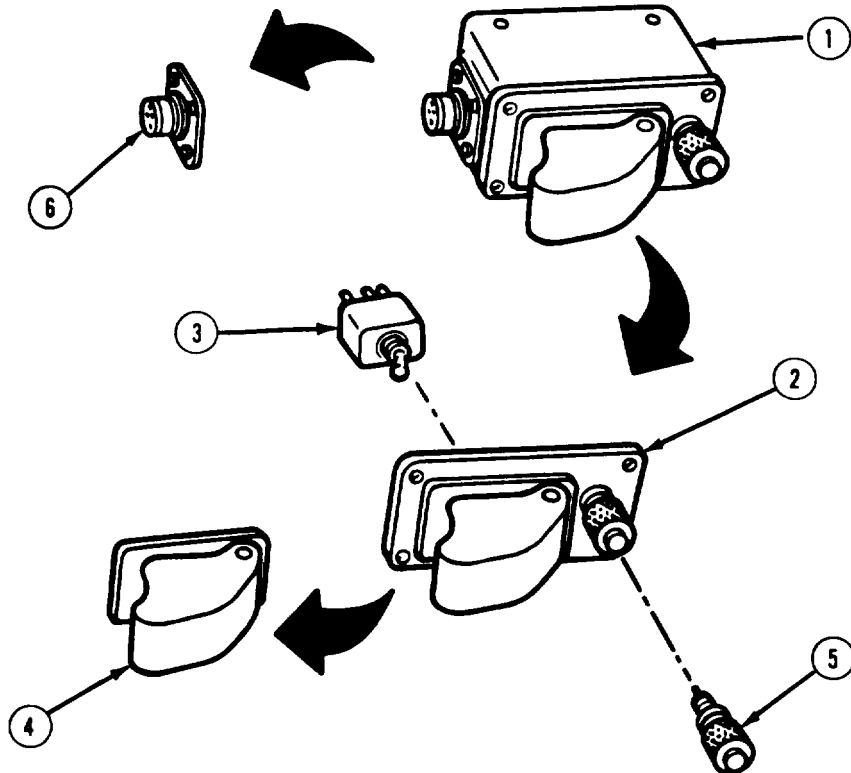
FRAME 2	
Step	Procedure
	<p style="text-align: center;">NOTE</p> <p>Follow-on Maintenance Action Required:</p> <p>Fasten travel locks (TM -10). Install winch cable on sheave (TM -20-2-3). Install staylines (TM -20-2-3). Install boom linear actuating cylinder (para 28-5). Perform load test requirement per TB 43-0142 following winch, carrier, or control cylinder repair.</p> <p>END OF TASK</p>

CHAPTER 30

GRENAD LAUNCHER POWER BOX

30-1. MAINTENANCE PROCEDURES INDEX

Equipment Item	Test	Removal	Tasks		
			Installation	Disassembly	Assembly
1. Grenade Launcher Power box.	30-2			30-3	30-4
2. Cover		30-5	30-6		
3. Switch		30-7	30-6		
4. Switch Guard		30-7	30-8		
5. Lamp Housing		30-9	30-10		
6. Electrical Connector		30-11	30-12		



30-2. GRENADE LAUNCHER POWER BOX TEST PROCEDURE

TEST EQUIPMENT: Multimeter
 24-28 vdc power source
 Power source leads (two)

PERSONNEL. One

REFERENCES: JPG for procedures to:
 Use multimeter
 Remove and install lamps
 Use power supply
 TM 9-2350-222-202-3 for procedure to remove power box

EQUIPMENT CONDITION: Discharger power box removed (TM-20-2-3)

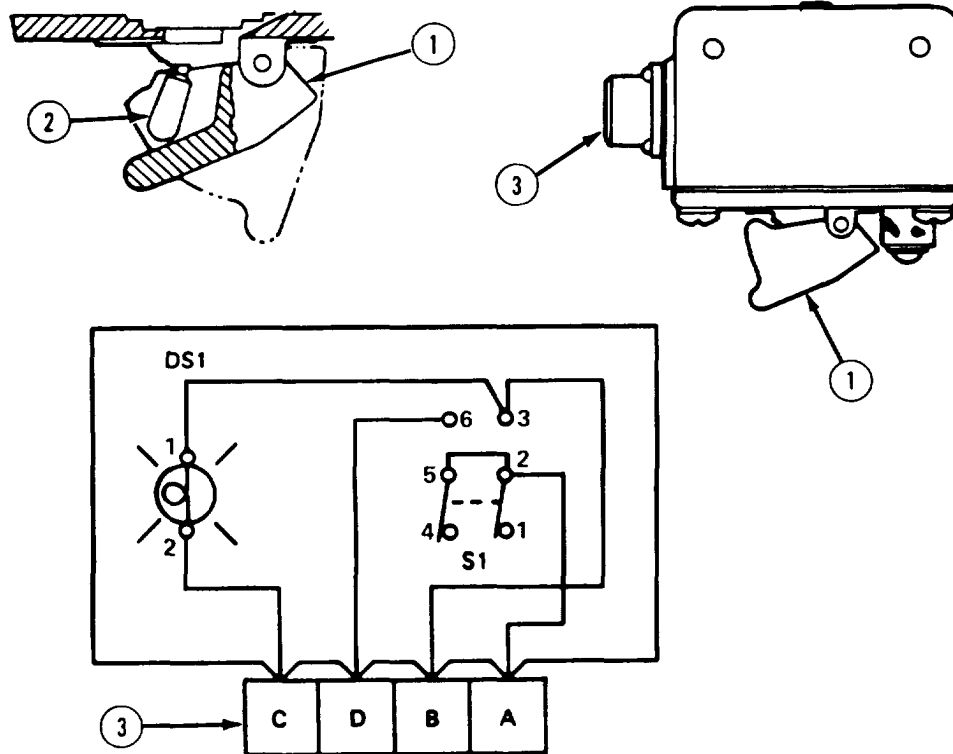
GENERAL INSTRUCTIONS:

NOTE

If normal indication is not obtained. remove cover (para 30-5) and do continuity checks on items listed in Probable Fault column (JPG). Refer to section index (para 30-1) for replacement of bad part.

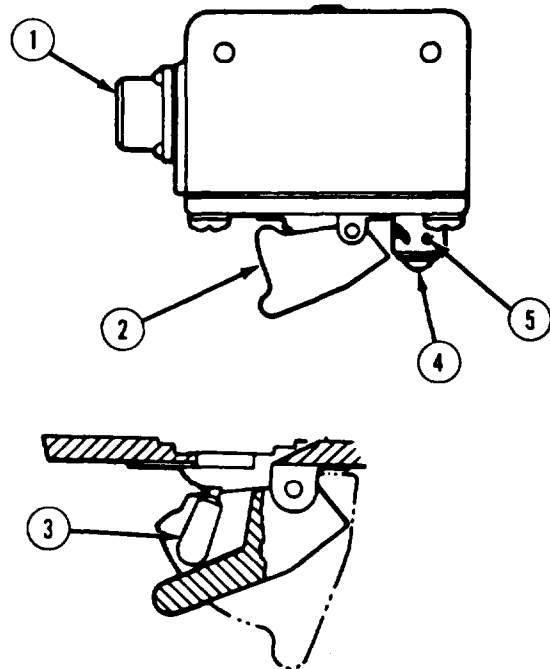
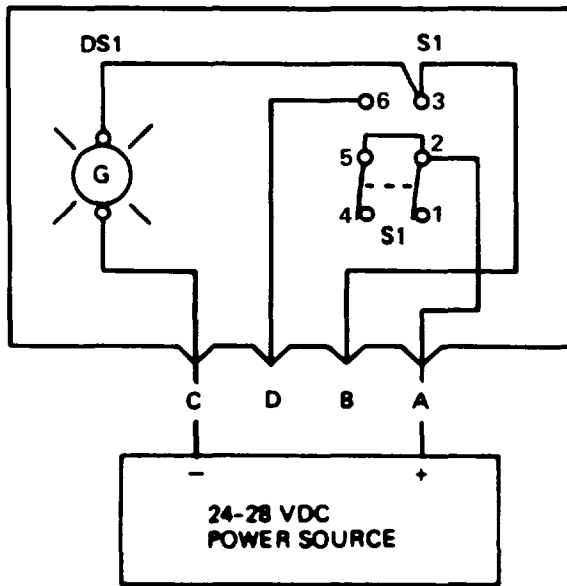
30-2. GRENADE LAUNCHER POWER BOX TEST PROCEDURE (CONT)

FRAME 1			
STEP	PROCEDURE	NORMAL INDICATION	PROBABLE FAULT
1.	Lift guard (1) and push switch (2) to ON position,	...	...
2.	Using multimeter, check for continuity between Less than 2 ohms connector (3) pins A and B (JPG).		Switch (2) Connector (3)
3.	Using multimeter, check for continuity between Less than 2 ohms connector (3) pins A and D (JPG).		Switch (2) Connector (3)
4.	Set switch (2) to OFF (close switch guard (1)).	...	...
5.	Using multimeter, check for continuity between Greater than 10 connector (3) pins A and B (JPG). million ohms		Switch (2)
GO TO FRAME 2			



30-2. GRENADE LAUNCHER POWER BOX TEST PROCEDURE (CONT)

FRAME 2			
STEP	PROCEDURE	NORMAL INDICATION	PROBABLE FAULT
1.	Connect positive lead of power source to connector (1) pin A (JPG).	...	...
2.	Connect negative lead of power source to connectol- (1) pin C (JPG).	...	...
3.	Turn power source ON.		
4.	Lift switch guard (2) and set switch (3) to ON.	Lamp (4) lights	Switch 3, Lamp housing (5), Connector (1).
5.	Set switch (3) to OFF position (close switch guard (2)).	Lamp (4) goes out	Switch (3)
6.	Turn power source OFF.		
7.	Disconnect power source leads.	...	...
<p>NOTE</p> <p>If normal indication was obtained in frames 1 and 2, part is good.</p> <p>END OF TASK</p>			



30-3. GRENADE LAUNCHER POWER BOX DISASSEMBLY PROCEDURE

PERSONNEL One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to remove grenade launcher power box

EQUIPMENT CONDITION: Grenade launcher power box removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test grenade launcher power box (para 30-2)

FRAME 1	
STEP	PROCEDURE
1.	Remove cover (para 30-5).
2.	Remove switch and switch guard (para 30-7).
3.	Remove lamp housing (para 30-9).
4.	Remove electrical connector (para 30-11).
	END OF TASK

30-4. GRENADE LAUNCHER POWER BOX ASSEMBLY PROCEDURE

PERSONNEL: One

FRAME 1

STEP	PROCEDURE
1.	Install electrical connector (para 30-12).
2.	Install lamp housing (para 30-10).
3.	Install switch and switch guard (para 30-8).
4.	Install cover (para 30-6).
NOTE	
Follow-on Maintenance Action Required:	
Test grenade launcher power box (para 30-2).	
END OF TASK	

30-5. COVER REMOVAL PROCEDURE

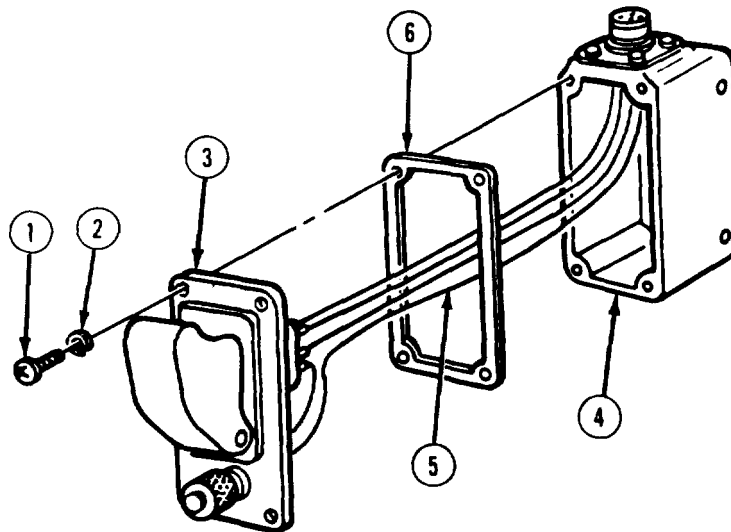
TOOLS: No. 3 cross-tip screwdriver (Phillips)

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to remove grenade launcher power box

EQUIPMENT CONDITION: Grenade launcher power box removed from vehicle (TM-20-2-3)

FRAME 1	
STEP	PROCEDURE
1.	Using screwdriver, remove four screws (1) and four lockwashers (2) that hold cover (3) to case (4).
2.	Lift cover (3) with wires (5) attached so you can get to parts inside case (4).
3.	Remove gasket (6) by sliding over cover (3).
	END OF TASK



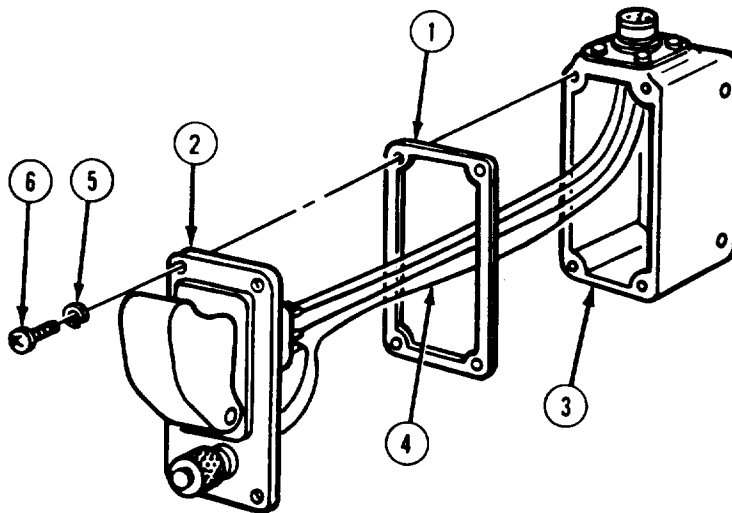
30-6. COVER INSTALLATION PROCEDURE

TOOL: No. 3 cross-tip screwdriver (Phillips)

PERSONNEL: One

PPRELIMINARY PROCEDURE: Install electrical connector (para 30-12)

FRAME 1	
STEP	PROCEDURE
1.	Slide gasket (1) over cover (2).
2.	Carefully place gasket (1) and cover (2) on case (3) while pushing wires (4) inside case (3).
3.	Using screwdriver, attach cover (2) to case (3) with four lockwashers (5) and four screws (6).
<p>NOTE</p> <p>Follow-on Maintenance Required:</p> <p>Test grenade launcher power box (para 30-2)</p>	
<p>END OF TASK</p>	



30-7. SWITCH AND SWITCH GUARD REMOVAL PROCEDURE

TOOLS: Soldering iron
Knife
9/16 in. combination wrench

SUPPLIES: Masking tape (item 36, App. A)
Pencil

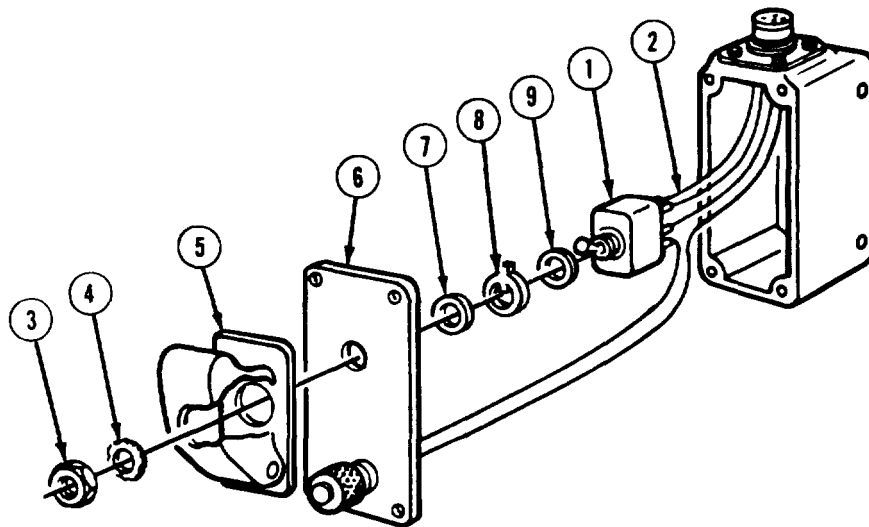
PERSONNEL One

REFERENCES: JPG for procedures to:
Use soldering iron
Tag wires

PRELIMINARY PROCEDURES: Test grenade power box (para 30-2)
Remove cover (para 30-5)

30-7. SWITCH AND SWITCH GUARD REMOVAL PROCEDURE (CONT)

FRAME 1	PROCEDURE
STEP	<ol style="list-style-type: none"> 1. Using knife, remove tubing insulation from four terminals of switch (1). 2. Using masking tape, tag each wire (2) connected to switch terminals (1) (JPG). 3. Using soldering iron, unsolder electrical wires (2) from switch terminals (1) (JPG). 4. Using wrench, remove nut (3), lockwasher (4), and switch guard (5) from switch (1). 5. Remove cover (6) from switch (1). 6. Remove gasket (7), key washer (8), and flat washer (9) from switch (1). <p>END OF TASK</p>



30-8. SWITCH AND SWITCH GUARD INSTALLATION PROCEDURE

TOOLS: Soldering iron
9/16 in. combination wrench
Heat gun (NSN 4940-00-561-1002)

SUPPLIES: Solder (item 31, App. A)
Tubing insulation (item 41, App. A)

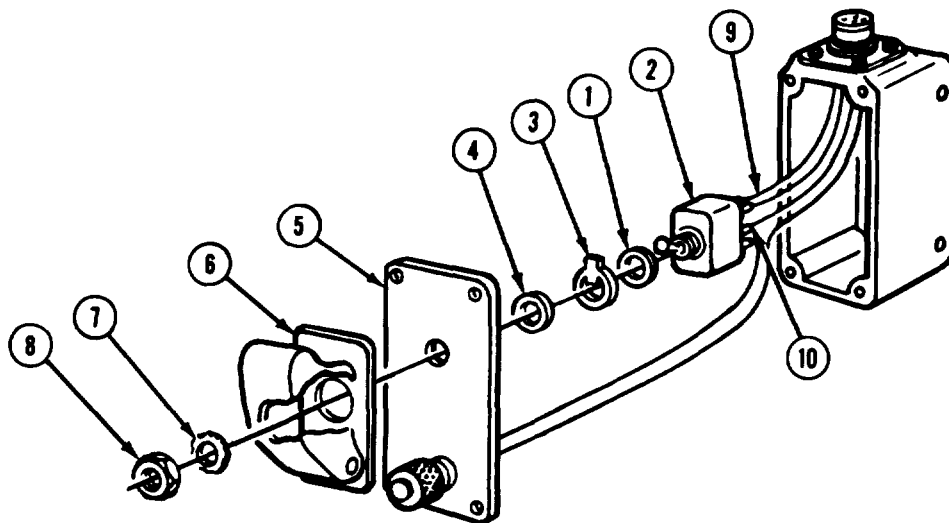
PERSONNEL: One

REFERENCES: JPG for procedures to:
Use soldering gun
Use heat gun

30-8. SWITCH AND SWITCH GUARD INSTALLATION PROCEDURE (CONT)

FRAME 1

STEP	PROCEDURE
1.	Put flat washer (1) on switch (2).
2.	Put key washer (3) on switch (2) with key tab facing out.
3.	Put gasket (4) on switch (2).
4.	Place switch (2) through hole in cover (5) with key tab aligned with keyway of cover.
5.	Put switch guard (6), and lockwasher (7) on switch (2).
6.	Using wrench, tighten nut (8) on switch (2).
7.	put 1/2 inch long piece of tubing insulation over each wire (9).
8.	Using solder iron, solder tagged wires (9) to switch terminals (10) (JPG).
9.	Put tubing insulation over switch (2) soldered connections.
10.	Using heat gun, shrink tubing insulation (JPG).
<p>NOTE</p> <p>Follow-on Maintenance Action Required:</p> <p>Install cover (para 30-6)</p> <p>Test grenade launcher power box (para 30-2).</p>	
<p>END OF TASK</p>	



30-9. LAMP HOUSING REMOVAL PROCEDURE

TOOLS: Soldering iron
9/16 in. combination wrench
Knife
O-ring extractor kit

SUPPLIES: Masking tape (item 36, App. A)
Pencil

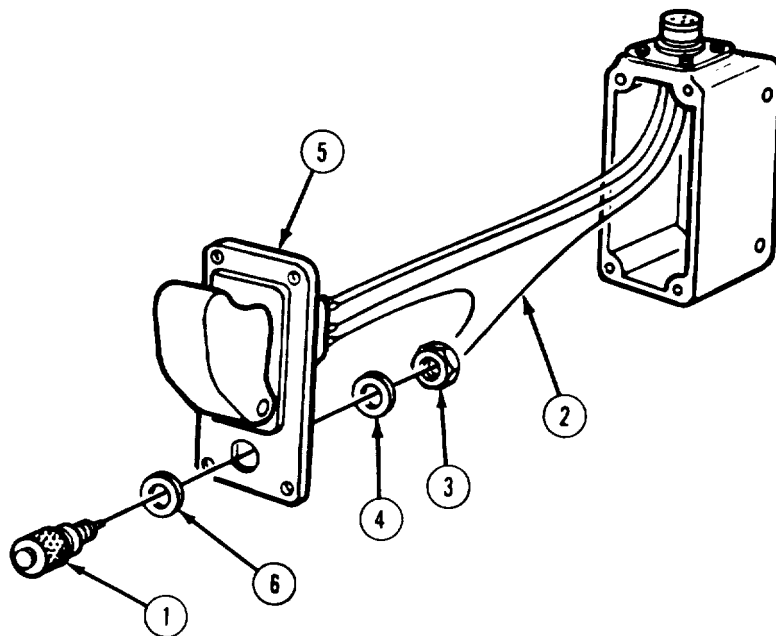
PERSONNEL: One

REFERENCES JPG for procedures to:
 Use soldering iron
 Tag wires
 Remove lamp
 Remove preformed packing

PRELIMINARY PROCEDURES: Test grenade launcher power box (30-2)
 Remove cover (para 30-5)

30-9. LAMP HOUSING REMOVAL PROCEDURE (CONT)

FRAME 1	
STEP	PROCEDURE
1.	Using knife, remove tubing insulation from two terminals on lamp housing (1).
2.	Using masking tape, tag wires (2) (JPG).
3.	Using soldering iron, unsolder two wires (2) from terminals on lamp housing (1).
4.	Using wrench, remove nut (3) and lockwasher (4) holding lamp housing (1) to cover (5).
5.	Remove lamp housing (1) from cover (5).
6.	Using O-ring extractor tool, remove preformed packing (6) from lamp housing (1) (JPG).
END OF TASK	



30-10. LAMP HOUSING INSTALLATION PROCEDURE

TOOLS: Soldering iron
9/16 in. combination wrench
Heat gun (NSN 4940-00-561-1002)
O-ring extractor kit

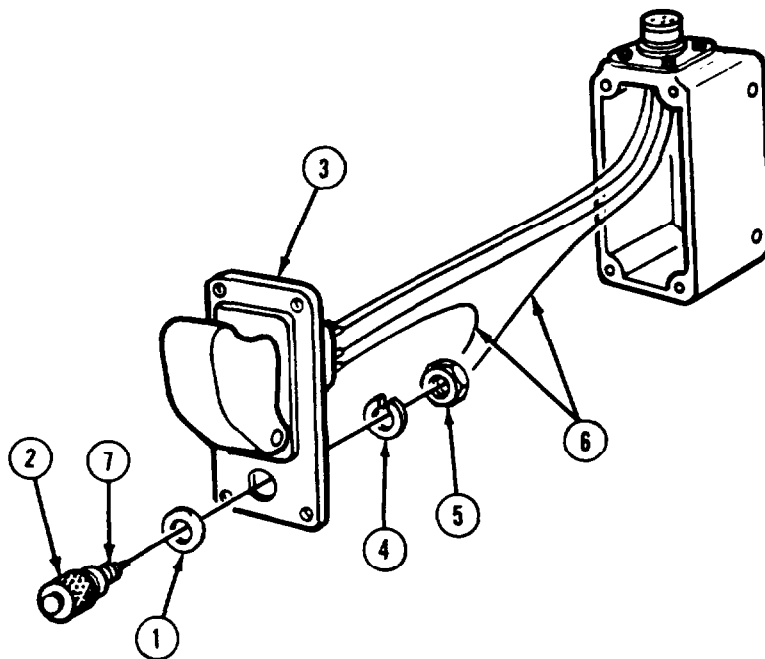
SUPPLIES: Solder (item 31, App. A)
Tubing insulation (item 41, App. A)
Packing Preformed (MS 25196-1) (1 Required)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Use soldering iron
Use heat gun
Install preformed packing

30-10. LAMP HOUSING INSTALLATION PROCEDURE (CONT)

FRAME 1	
STEP	PROCEDURE
1.	Using O-ring extractor tool, put preformed packing (1) on lamp housing (2) (JPG).
2.	Using wrench, attach lamp housing (2) to cover (3) with lockwasher (4) and nut (5).
3.	Put 1/2 inch long piece of tubing insulation over two wires (6).
4.	Using soldering iron, solder tagged wires (6) to lamp housing terminals (7) (JPG).
5.	Put tubing insulation over soldered lamp housing terminals (7).
6.	Using heat gun, shrink tubing insulation (JPG).
7.	Remove masking tape tags from wires (6).
<p>NOTE</p> <p>Follow-on Maintenance Action Required:</p> <p>install cover (para 30-6).</p> <p>Test grenade launcher power box (para 30-2).</p>	
<p>END OF TASK</p>	



30-11. ELECTRICAL CONNECTOR REMOVAL PROCEDURE

TOOLS: Soldering iron
No. 1 cross-tip screwdriver (Phillips)
Knife

SUPPLIES: Masking tape (item 36, App. A)
Pencil

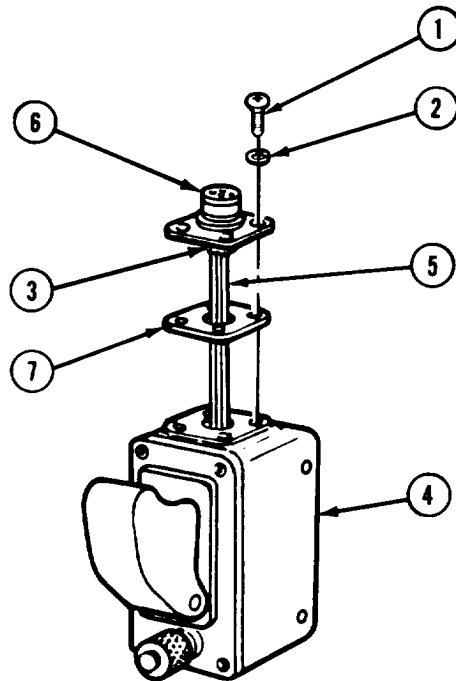
PERSONNEL: One

REFERENCES: JPG for procedures to:
Use soldering iron
Tag wires

PRELIMINARY PROCEDURE: Test grenade launcher power box (para 30-2)

30-11. ELECTRICAL CONNECTOR REMOVAL PROCEDURE (CONT)

FRAME 1	
STEP	PROCEDURE
1.	Using screwdriver, remove four screws (1) and four lockwashers (2) that hold electrical connector (3) to case (4).
2.	Pull connector (3) with wiring (5) attached from case (4) so you can get to the wiring.
3.	Using knife, remove tubing insulation from four connector pins (3).
4.	Using masking tape, tag four wires (5) (JPG).
5.	Using soldering iron, unsolder four wires (5) from electrical connector pins (3) (JPG).
6.	Remove electrical connector (6) and gasket (7) from case (4).
END OF TASK	



30-12. ELECTRICAL CONNECTOR INSTALLATION PROCEDURE

TOOLS: Soldering iron
No. 1 cross-tip screwdriver (Phillips)
Heat gun (NSN 4940-00-561-1002)

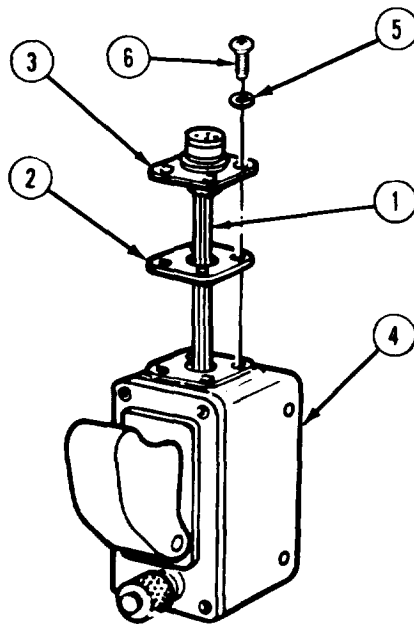
SUPPLIES: Solder (item 31, App. A)
Tubing insulation (item 41, App. A)
Lockwasher (MS 35338-40) (4 Required)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Use soldering iron
Use heat gun

30-12. ELECTRICAL CONNECTOR INSTALLATION PROCEDURE (CONT)

FRAME 1	
STEP	PROCEDURE
1.	Put four wires (1) through gasket (2).
2.	Put 1/2 inch long piece of tubing insulation over four wires (1).
3.	Using soldering iron, solder four wires (1) to proper pins on electrical connector (3) (JPG).
4.	Remove tags from four wires (1).
5.	Put tubing insulation over pins of electrical connector (3).
6.	Using heat gun, shrink tubing insulation (JPG).
7.	Put gasket (2) and electrical connector (3) on case (4) and align holes.
8.	Using screwdriver, attach electrical connector (3) to case (4) with four lockwashers (5) and four screws (6).
<p>NOTE</p> <p>Follow-on Maintenance Action Required:</p> <p>Test grenade launcher power box (para 30-2).</p>	
<p>END OF TASK</p>	



CHAPTER 31

SMOKE GRENADE DISCHARGER BRACKET

31-1. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks	
	Removal	Installation
Smoke Grenade Discharger Bracket	31-2	31-3

31-2. SMOKE GRENADE DISCHARGER BRACKET REMOVAL PROCEDURES

TOOLS: Acetylene cutting torch
 Portable grinder
 Fixture kit 12290819

PERSONNEL: Two

REFERENCES: JPG for using acetylene cutting torch and portable grinder
 TM 9-2350-222-10 for TM-10 procedures
 TM 9-2350-222-20-2 for TM-20 procedures

PRELIMINARY PROCEDURES:

Removal of: Discharger Harness TM 20-2-3-3
 Discharger TM 20-2-3-3
 Discharger Dummy Receptacle TM 20-2-3-3

Cover connector housing and optics with asbestos material.

Close all hatches (TM-10)

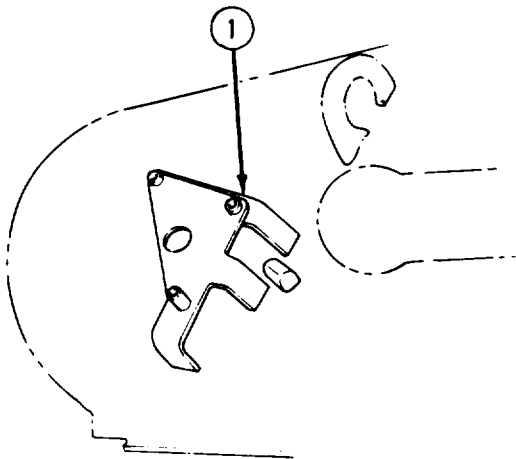
CAUTION

Prior to welding, cover optics to prevent damage from weld splatter and have a manned fire extinguisher standing by.

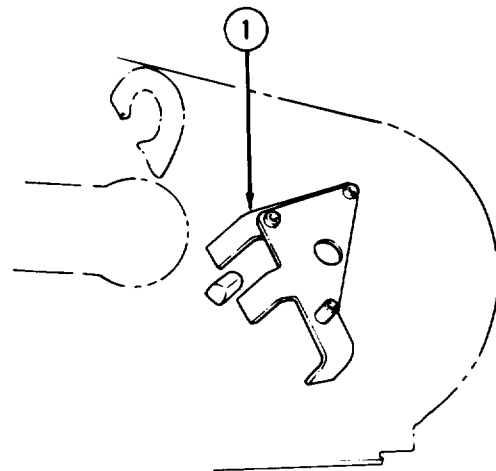
31-2. SMOKE GRENADE DISCHARGER BRACKET REMOVAL PROCEDURES (CONT)

FRAME 1

STEP	PROCEDURE
1.	Using acetylene cutting torch cut damaged discharger mounting bracket (1) from turret (JPG).
2.	Using portable grinder, grind turret surface 3 inches around area where former attaching welds were located, to conform to original contour of turret.
END OF TASK	



LEFT SIDE OF TURRET



RIGHT SIDE OF TURRET

31-3. SMOKE GRENADE DISCHARGER BRACKET INSTALLATION PROCEDURE

TOOLS: Arc welding machine
 3/4 in. combination wrench
 Machinist's square
 Rule -6 in.
 Flat-tip screwdriver

SUPPLIES: Pencil
 Paper
 Primer paint

PERSONNEL: Two

REFERENCES: TM 9-237 for welding theory and application
 TM 9-2350-222-202 for TM 20 procedures
 JPG for procedure to: Clean weld area
 Prime and paint

CAUTION

Prior to welding, cover optics to prevent damage from weld splatter and have a manned fire extinguisher standing by.

NOTE

Perform all welds to MIL-STD-1261 (MR). Refer to TM 9-237 for welding theory and application.

NOTE

Procedures for installing the left or right discharger mounting brackets are the same. Be sure to use appropriate fixtures.

Fixture kit 12290819
 consist of:

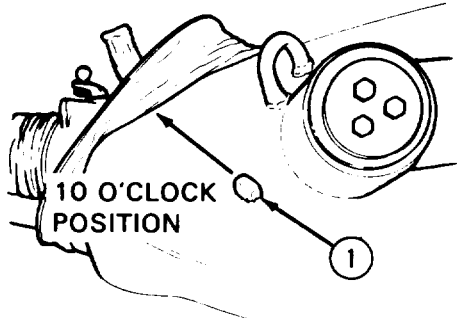
Left Discharger Bracket Locating Fixture Assembly consist of:	12290802
Left Discharger Bracket Locating Fixture	12290801
Left Reference Measurement Transfer Plate	12257657-1
Right Discharger Bracket Locating Fixture Assembly consist of:	12290813
Right Discharger Bracket Locating Fixture	12290811
Right Reference Measurement Transfer Plate	12257657-2
Stowage Box Pad Mounting Fixture	12257682

31-3. SMOKE GRENADE DISCHARGER BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 1	
STEP	PROCEDURE
<p>1. Obtain fixture kit 12290819.</p> <p>2. Using 3/4 inch wrench, remove and retain three screws, lockwashers, and flat washers (1), securing reference measurement transfer plate (2). Remove reference measurement transfer plate (2) from locating fixture (3).</p> <p>GO TO FRAME 2</p>	
<p>LEFT DISCHARGER BRACKET LOCATING FIXTURE ASSEMBLY 12290802</p> <p>RIGHT DISCHARGER BRACKET LOCATING FIXTURE ASSEMBLY 12290813</p> <p>LEFT DISCHARGER BRACKET REFERENCE MEASUREMENT TRANSFER PLATE 12257657-1</p> <p>RIGHT DISCHARGER BRACKET REFERENCE MEASUREMENT TRANSFER PLATE 12257657-2</p> <p>LEFT DISCHARGER BRACKET LOCATING FIXTURE 12290801</p> <p>RIGHT DISCHARGER BRACKET LOCATING FIXTURE 12290811</p> <p>STOWAGE BOX PAD MOUNTING FIXTURE 12257682</p> <p>FIXTURE KIT, 12290819</p>	

31-3. SMOKE GRENADE DISCHARGER BRACKET INSTALLATION PROCEDURE (CONT)

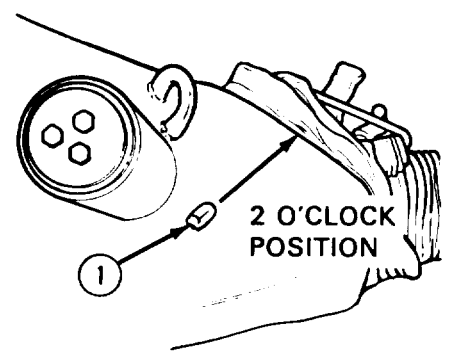
FRAME 2	
STEP	PROCEDURE
1.	Measure and record height of connector housing (1) on turret.
2.	Mark measurement (step 1) on locating fixture pin assembly (2).
3.	Back off pin assembly (2) to measured mark.
GO TO FRAME 3	



10 O'CLOCK POSITION

1

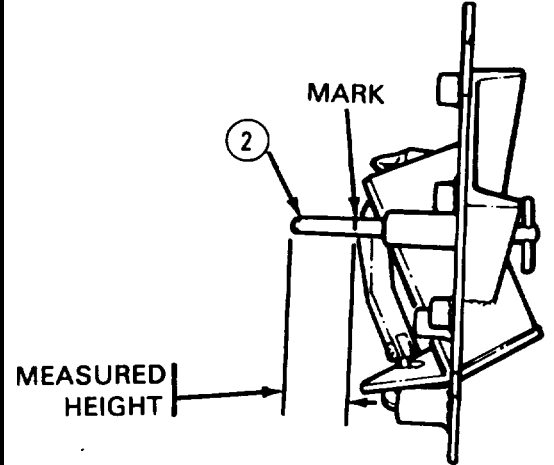
LEFT SIDE



2 O'CLOCK POSITION

1

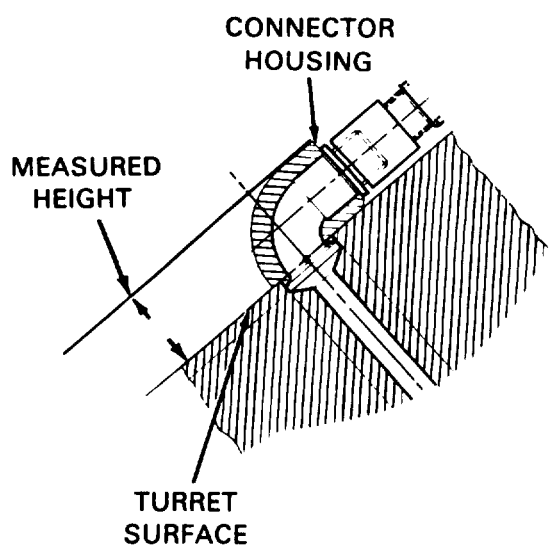
RIGHT SIDE



MARK

2

MEASURED HEIGHT



CONNECTOR HOUSING

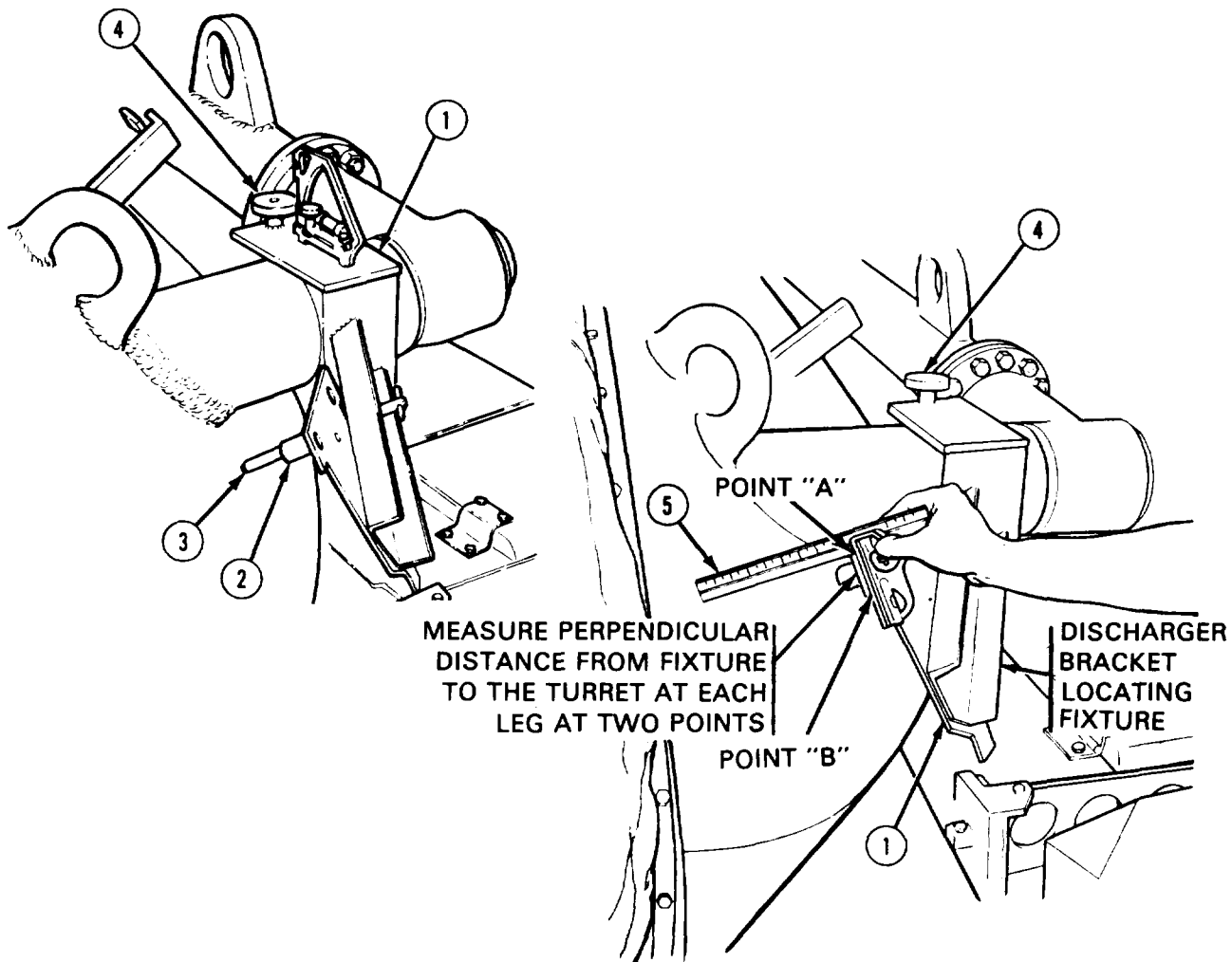
MEASURED HEIGHT

TURRET SURFACE

31-3. SMOKE GRENADE DISCHARGER BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 3

STEP	PROCEDURE
1.	Mount locating fixture (1) on boom support and slide it on boom support until pin assembly (2) touches top of connector housing (3). Tighten knob (4) to secure locating fixture.
2.	Using a machinist's square (5), measure and record distance from locating fixture (1) to turret surface at the four bracket leg locations. Measure distance at upper (point A) and lower (point B) edge of each leg location perpendicular to fixture.
<p>GO TO FRAME 4</p>	

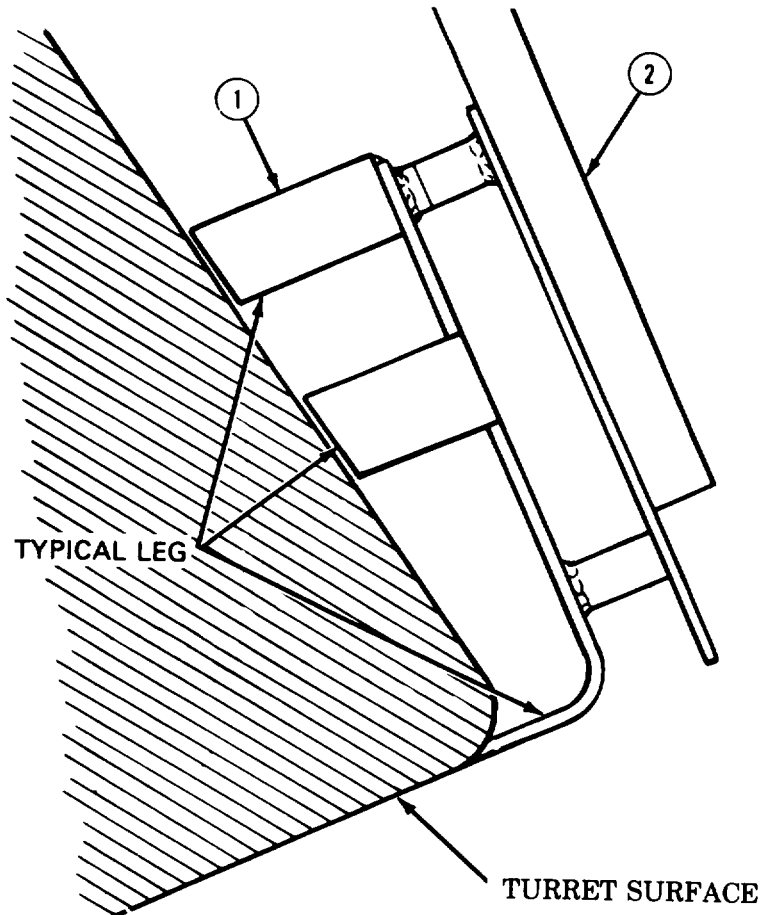


31-3. SMOKE GRENADE DISCHARGER BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 4	
STEP	PROCEDURE
1.	Using 3/4 inch wrench, attach discharger bracket (1) tire reference measurement transfer plate (2) with three screws, lockwashers, flat washers (3) (all hardware is part of fixture assembly).
2.	Mark measurements (recorded in step) to legs of discharger bracket (1) perpendicular to reference measurement transfer plate (2) as indicated.
3.	Unbolt discharger bracket (1) from reference measurement transfer plate (2) and cut bracket legs as marked.
GO TO FRAME 5	
<p>The diagram illustrates the assembly of the discharger bracket (1) to the reference measurement transfer plate (2). It shows the transfer plate with two sides, labeled 12257657-1 (LEFT) and 12257657-2 (RIGHT). The discharger bracket (1) is attached to the transfer plate using three screws, lockwashers, and flat washers (3). The diagram also shows the transfer plate being used to mark measurements on the legs of the discharger bracket. A note indicates that the scrap leg portion can be used to extend short legs if necessary.</p>	

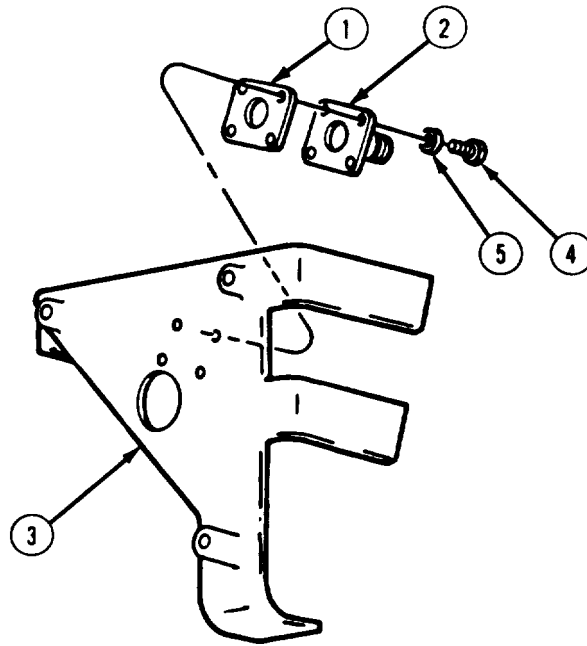
31-3. SMOKE GRENADE DISCHARGER BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 5	
STEP	PROCEDURE
	<p>Position bracket (1) between fixture (2) and turret wall and check the length of each leg.</p> <p style="text-align: center;">NOTE</p> <p>If fixture is forcing legs onto turret surface, these legs should be further trimmed until legs of bracket fit evenly against turret. Short legs should have spacers inserted to fill up space before welding (do not use spacers that are thicker than 1/4 inch). Undersize short legs (1/4 inch too short) should either be extended by butt welding with a scrap leg piece, or bracket should be replaced. If bracket legs are carefully measured and cut, no spacers will be needed.</p> <p>GO TO FRAME 6</p>



31-3. SMOKE GRENADE DISCHARGER BRACKET INSTALLATION PROCEDURE (CONT)

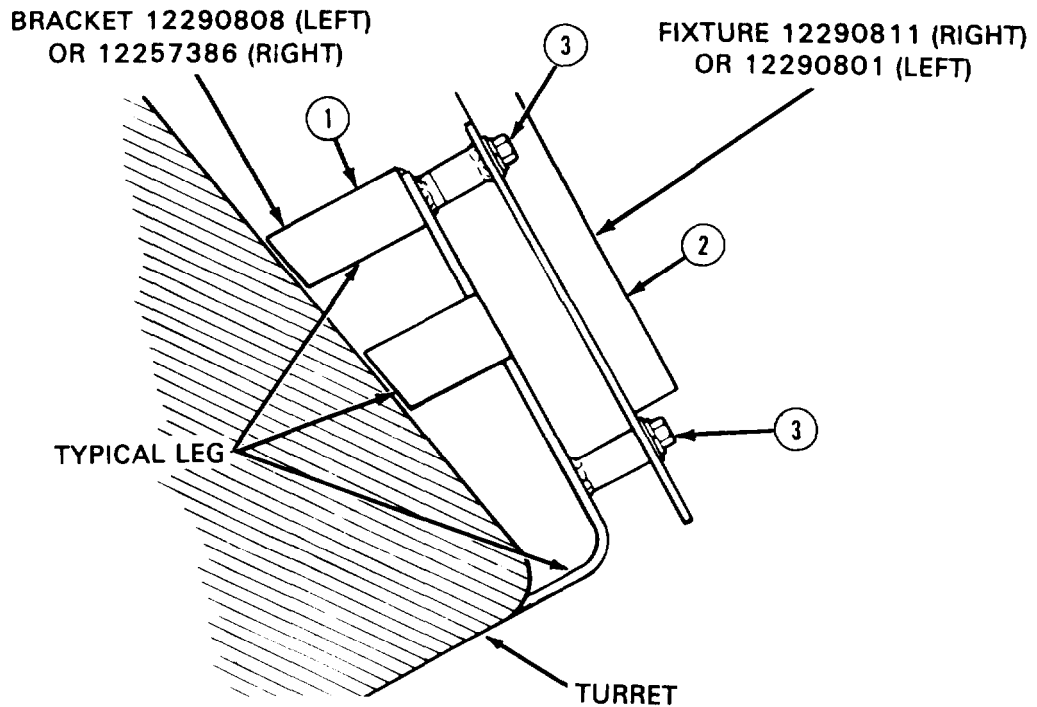
FRAME 6	
STEP	PROCEDURE
<ol style="list-style-type: none"> 1. Clean, prime, and paint underside of bracket (JPG). 2. Position gasket (1) and dummy receptacle (2) on underside of discharger bracket (3). 3. Using screwdriver, attach receptacle (2) to discharger bracket (3) with four screws (4) and four lockwashers (5). 	<p>NOTE</p> <p>Be sure receptacle key is positioned toward rear of turret.</p> <p>GO TO FRAME 7</p>



31-3. SMOKE GRENADE DISCHARGER BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 7

STEP	PROCEDURE
1.	Using 3/4-inch wrench, attach bracket (1) to locating fixture (2) using three screws, lockwashers, and flat washers (3).
2.	Tack weld discharger bracket (1) legs to turret surface (JPG).
3.	Using 3/4-inch wrench, remove screws and washers (3) securing discharger bracket (1) to locating fixture (2).
4.	Remove locating fixture (2) from boom support and return reference measurement transfer plate to stowage position on fixture,
5.	Complete welding discharger bracket (1) to turret (1/4-inch fillet weld on both sides of each leg).
6.	Clean, prime, and paint bracket and weld areas (JPG).
END OF TASK	



CHAPTER 32
LOCK ASSEMBLY

32-1. MAINTENANCE PROCEDURES INDEX

Equipment Item	Removal	Tasks	Installation
Lock Assembly (8716089)	32-2		32-3

32-2. LOCK ASSEMBLY REMOVAL PROCEDURES

TOOLS: Acetylene cutting torch
Portable grinder

PERSONNEL: Two

REFERENCES: TM 9-2350-222-10 for TM-10 procedures
TM 9-2350-222-34P-2 for equipment location
JPG for using acetylene cutting torch and portable grinder

PRELIMINARY PROCEDURES:

Remove tow cable from lock assembly.
Cover optics with asbestos material.
Close all hatches (TM-10).

CAUTION

Prior to welding, cover optics to prevent damage from weld splatter and have a manned fire extinguisher standing by.

FRAME 1

STEP	PROCEDURE
1.	Using acetylene cutting torch cut damaged lock assembly from turret (JPG).
2.	Using portable grinder, grind turret surface 3 inches around area where former attaching welds were located, to conform to original contour of turret.
END OF TASK	

32-3. LOCK ASSEMBLY INSTALLATION PROCEDURES

TOOLS: Arc Welding Machine

SUPPLIES: Primer Paint

PERSONNEL: Two

REFERENCES: TM 9-237 for welding theory and application
TM 9-2350-222-10 for TM-10 procedures
TM 9-2350-222-34P-2 for equipment location
JPG for procedure to: Clean weld area
Prime and paint

CAUTION

Prior to welding, cover optics to prevent damage from weld splatter and have a manned fire extinguisher standing by.

NOTE

Perform all welds to MIL-S7D-1941(MR), Method 1. Refer to TM 9-237 for welding theory and application.

FRAME 1

STEP

PROCEDURE

1. Position lock assembly in same location used previously.
2. Weld lock assembly to turret (0.25 inch minimum filled all around base), using austenitic electrode.
3. Refer to paragraphs 1-12 and 1-13 and clean, paint, and prime.

END OF TASK

APPENDIX A
EXPENDABLE SUPPLIES AND MATERIALS LIST

Section 1. INTRODUCTION

A-1. SCOPE

This appendix lists expendable supplies and materials you will need to maintain the M728 tank.

A-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 materials, e.g., Dry cleaning solvent (item 33, App. A).

b. Column 2- Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew

O - Organizational Maintenance

F - Direct Support Maintenance

H - General Support Maintenance

c. Column 3- National Stock Number. This is the National stock number assigned to the item - use it to request the listed 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 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 SUPPLIES AND MATERIALS LIST

(1) Item	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	O	8040-00-515-2250	Adhesive	QT
2	O	8040-00-152-0023	Adhesive, Class III, MMM-A-132, Type I	KT
3	O	8040-00-893-1882	Adhesive, Rubber, MMM-A-1617, Type II, 302	OZ
	O	8040-01-036-5432	Adhesive, Rubber, MMM-A-1617, Type II, 1 gal	GL
4	C	8040-00-664-4318	Adhesive, Type II, MIL-A-5092, 4 oz tube	TU
5	F	8040-00-181-7529	Adhesive, Sealant, MIL-R-46082	BT
6	C	8020-00-224-6024	Brush, Artist	EA
7	C	5350-00-221-0872	Cloth, Abrasive, Crocus, CA, 50 sheets	PKG
8	F	8030-00-163-5792	Coating, Viscous (11663357)	
9	O	6850-00-880-7616	Compound, Silicone, 8 oz tube, MIL-S-8660	TU
9.1	C	6850-00-285-8011	Dry Cleaning Solvent, P-D-680, Type II, 55-gal. drum	GL
10	O	9150-00-111-6256	Fluid, Hydraulic, FRH, MIL-H-46170	QT
11	O	6830-00-264-9086	Gas, Nitrogen, Dry, Type I, Class I, Grade 6, BB-N-411, 275 cf Cylinder	CY
	O	6830-00-656-1596	Gas, Nitrogen, Dry, Type I, Class I, Grade 6, BB-N-411, 200 cf Cylinder	CY
11.1	O	8415-00-641-4601	Gloves	PR
11.2	O	4240-00-816-3819	Goggles	PR
12	C	9150-00-190-0904	Grease, Automotive and Artillery, GAA, 1 lb can (MIL-G-10924)	CN
	C	9150-00-935-1017	Grease, Automotive and Artillery, GAA, 14 oz cartridge (MIL-G-10924)	EA
	C	9150-00-190-0905	Grease, Automotive and Artillery, GAA, 5 lb can (MIL-G-10924)	CN
13	F	9150-00-261-8297	Grease, Aeronautical (Preservative), MIL-G-3278	CN
	F	9150-00-261-8298	Grease, Aeronautical (Preservative), MIL-G-3278	CN
	F	9150-00-190-0898	Grease, Aeronautical (Preservative), MIL-G-3278	CN
14	F	9150-00-985-7244	Grease, Aircraft and Instrument (MIL-G-23827), 4 oz tube	TU
14.1	F	9150-00-168-2000	Lubricant, Solid (MIL-L46147)	CN
15	C	9150-00-231-2360	Oil, Lubricating, Medium, PL, GP, 1 qt can (MIL-L3150)	CN
	C	9150-00-231-2361	Oil, Lubricating, Medium, PL, GP, 1 qt can (MIL-L-3150)	CN
15.1	O	8010-00-936-8372	Primer Coating, TT-P-664, 1-pint pressurized can	PT

(1) Item	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
16		9150-00-231-6689	Oil, Lubricating, PL-S, GP, VV-L-800	QT
17			Not Used	
18	F	9150-00-802-4478	Oil (MIL-L-10295)	QT
19	F	9150-00-664-6518	Oil, Instrument (MIL-6085)	BT
20			Not Used	
21	C	7920-00-205-1711	Rag, Wiping, Cotton, 50 lb. Bale Cloth, Lint-free	BL
22			Not Used	
23	F		Sandpaper, Number 4/0	ST
24			Not Used	
25	O	8030-00-275-8114	Sealing Compound, MIL-S-11030, 1 pt can	CN
	O	8030-00-242-3194	Sealing Compound, MIL-S-11030, 1 qt can	CN
	O	8030-00-433-4145	Sealing Compound, MIL-S-11030, 50 ft roll	RO
		8030-00-965-2437	Sealing Compound, MIL-S-11030, 90 ft roll	RO
26	O	8030-00-275-8110	Sealing Compound, MIL-S-11031, Kit	EA
	O	8030-00-537-7925	Sealing Compound, MIL-S-11031, Kit	EA
	O	8030-00-656-1042	Sealing Compound, MIL-S-11031, Kit	EA
27	O	8030-01-013-9306	Sealing Compound, MIL-S-22473, 8 oz bottle	BT
28	O		Sealing Compound, MIL-S-46163, Type II, Grade 5.250 cc bottle	BT
29			Deleted	
30			Not used	
31	O	3439-00-003-8601	Solder, SN-60 (QQ-S-571), Solder, SN-50	CN
32	O	6850-00-826-2156	Solvent, Cleaning Compound (Tri- chloroethylene), MIL-C-81302. 1 pt can	CN
			Deleted	
	O	6850-00-935-1082	Solvent, Cleaning Compound (Tri- chloroethylene), MIL-C-81302, 55 gal drum	DR

(1) Item	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
33	C	6850-00-664-5685	Solvent, Dry Cleaning, SD, 1 qt can (P-D-680)	CN
	C	6850-00-281-1985	Solvent, Dry Cleaning, SD, 1 gal can (P-D-680)	CN
34			Not Used	
35	O	5970-00-184-2002	Tape, Electrical Insulation, Grade A, Spec HH-T-00111, 1/32 inch thick, 2.00 inches wide	RL
36	C	8135-00-551-1245	Tape, Adhesive, 6 yd roll, Olive, Opaque, W	RL
37	C	8110-00-242-2089	Thinner, Paint, TDN, 1 gal can	CN
38	C	3610-00-810-0571	Tissue, Lens, Box of 240 Each	BX
39	F	5970-00-082-3942	Tubing, Insulation (MIL-I-23053/5)	FT
40			Not Used	
41	F	5970-00-815-1295	Tubing, Insulation (MIL-I-23053/5)	FT
42	F	5470-00-357-7463	Tubing, Polyolefin (.375 id, MIL-R-46846), Type V	FT

APPENDIX B
FABRICATED TOOLS

Item	Title	Paragraph
1	Commander's Control Protractors	14-2
2	Main Accumulator End-Cup Removal Tool	16-4
3	Powerpack Filter Test and Adjustment	13-44
4	Cupola Adapters A and B	12-3
5	Turret Stand	2-6
6	Spring Wire Hook Tool	17-6
7	Deleted	
8	Shuttle Valve Test Manifold	13-20
9	Elevating Screwjack Holding Fixture	12-18
10	Gun Mount Wood Block	11-3
11	Replenisher Push Rod	11-32
12	Oil Filter Test Fixture	13-42
13	Gunner's Control Hydraulic Valve Manifold	13-111
14	Gunner's Control Hydraulic Valve Fixture	13-111
15	Gunner's Control Hydraulic Valve Adapter	13-111
16	Manual Elevation Pump Test Manifold	13-59
17	Gun Mount Wood Block	11-3
18	Cannon Tube Wood Block	11-16
19	Recoil Mechanism Wood Block	11-13
20	Recoil Piston Adapter Spanner Wrench	11-13
21	(Deleted)	
22	Recoil Mechanism Drill Extension and Split Bushing	11-15
23	Recoil Mechanism Upper Guide Plate	11-15

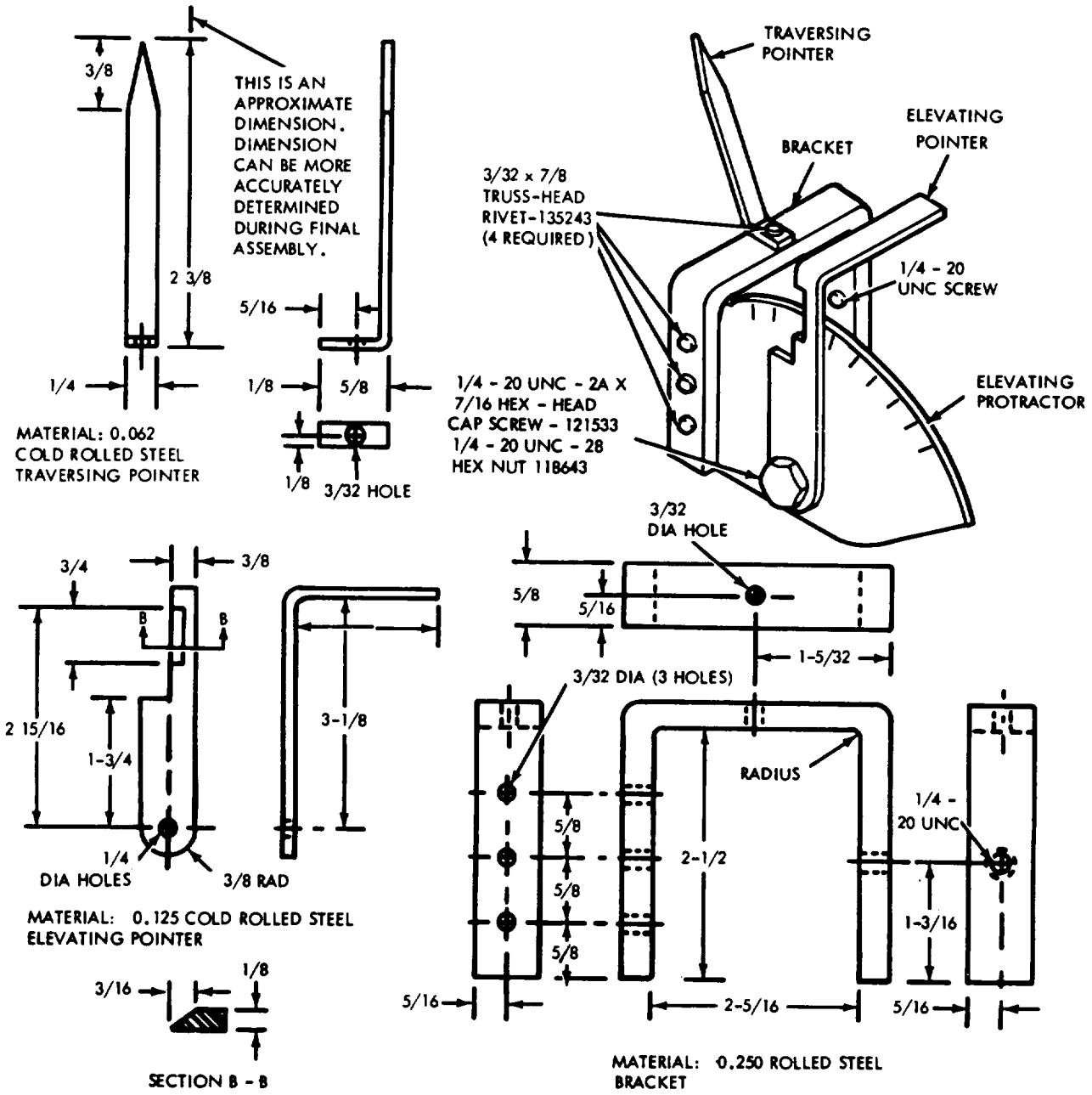
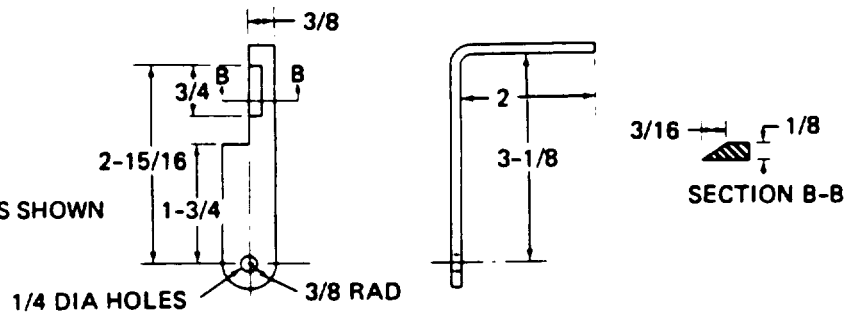
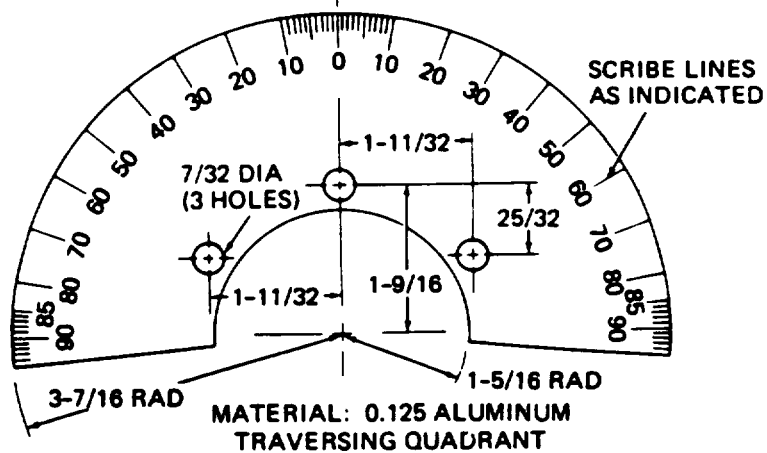
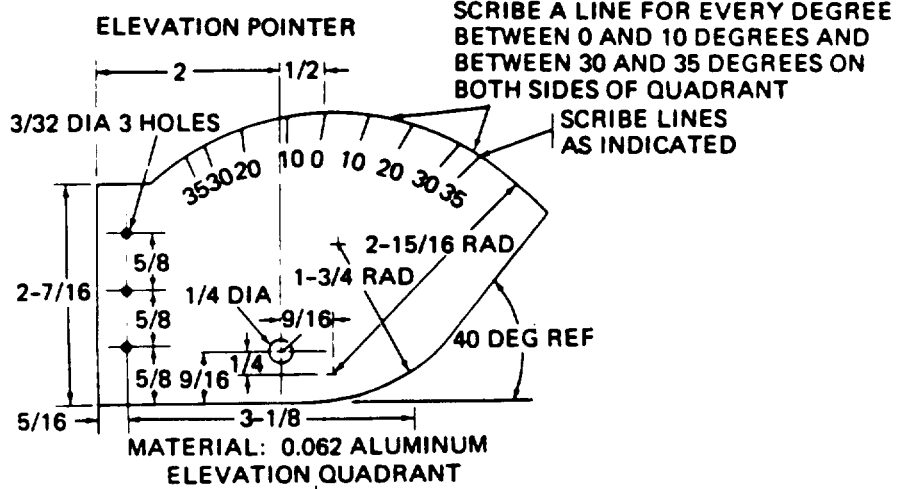


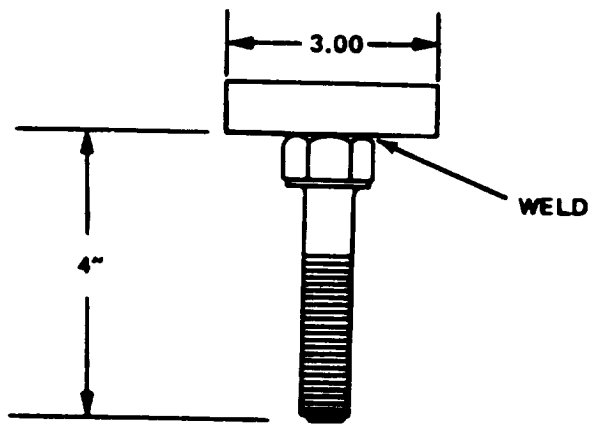
Figure 1. Commander's Control Protractors (Sheet 1 of 2)

NOTE: ALL DIMENSIONS SHOWN ARE IN INCHES



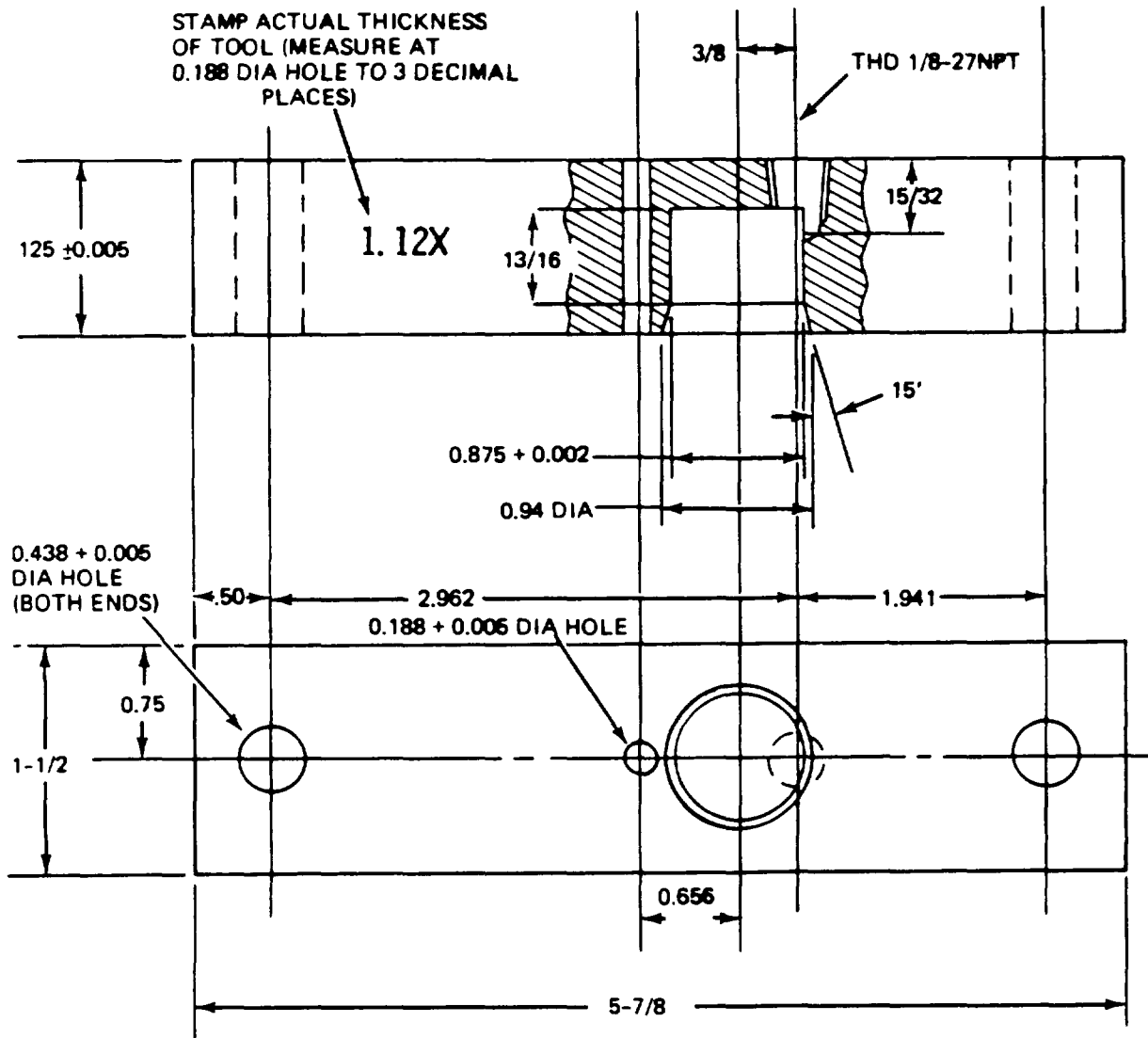
MATERIAL: 0.125 COLD ROLLED STEEL





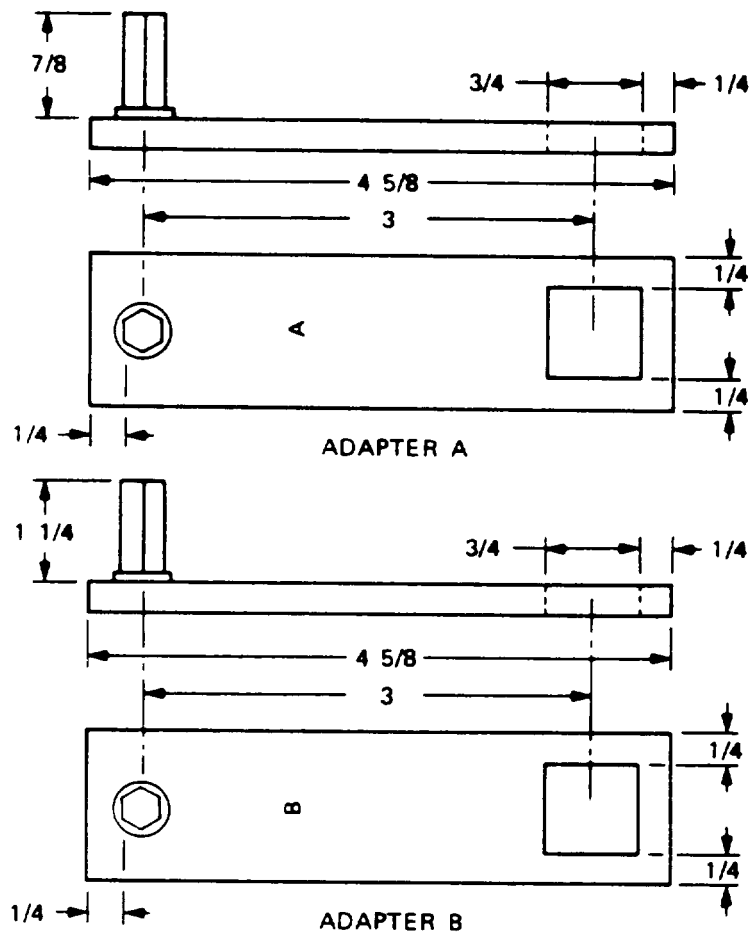
1. ALL DIMENSIONS ARE IN INCHES.
2. MATERIAL: 1020/1030 STEEL 3/8" DIA. BAR STOCK (OR EQUIVALENT); MS 90726-123 CAP SCREW.

2. MAIN ACCUMULATOR END-CAP REMOVAL TOOL



1. ALL DIMENSIONS ARE IN INCHES.
2. MATERIAL: 1020/1030 STEEL.
3. TOL: 3 PC DEC ±0.005, 2 PC DEC ±0.02 FRACTIONS ±1/32
4. SURFACE FINISH: 125 RMS
5. BREAK SHARP EDGES AND REMOVE BURRS.

3. POWER PACK FILTER TEST AND ADJUSTMENT TOOL



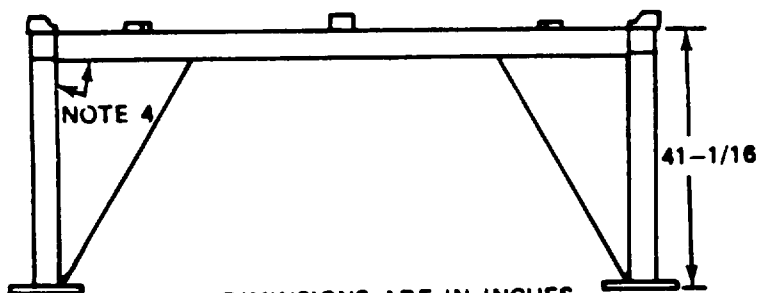
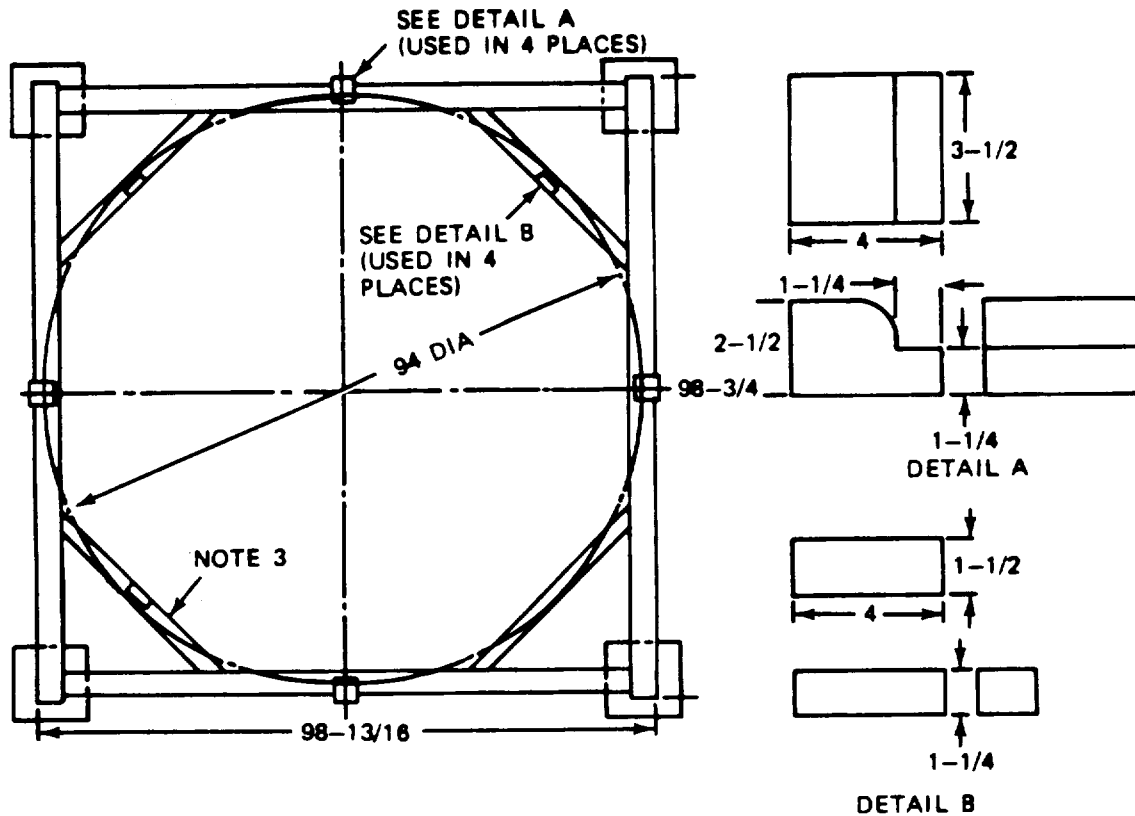
NOTES:

1. ALL DIMENSIONS IN INCHES.
2. DIMENSION BETWEEN CENTER-LINES OF 3/4 DRIVE SQUARE AND HEX MUST BE 3 INCHES.
3. METAL STAMP LETTERS ON EACH TOOL FOR IDENTIFICATION.
4. HEX STOCK WELDED TO STEEL STOCK.

MATERIAL REQUIRED:

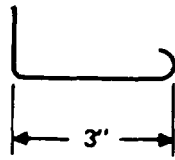
- 3/8 STEEL STOCK
- 9/16 HEX STOCK 7/8 LONG
- 9/16 HEX STOCK 1-1/4 LONG

4. CUPOLA ADAPTERS A AND B



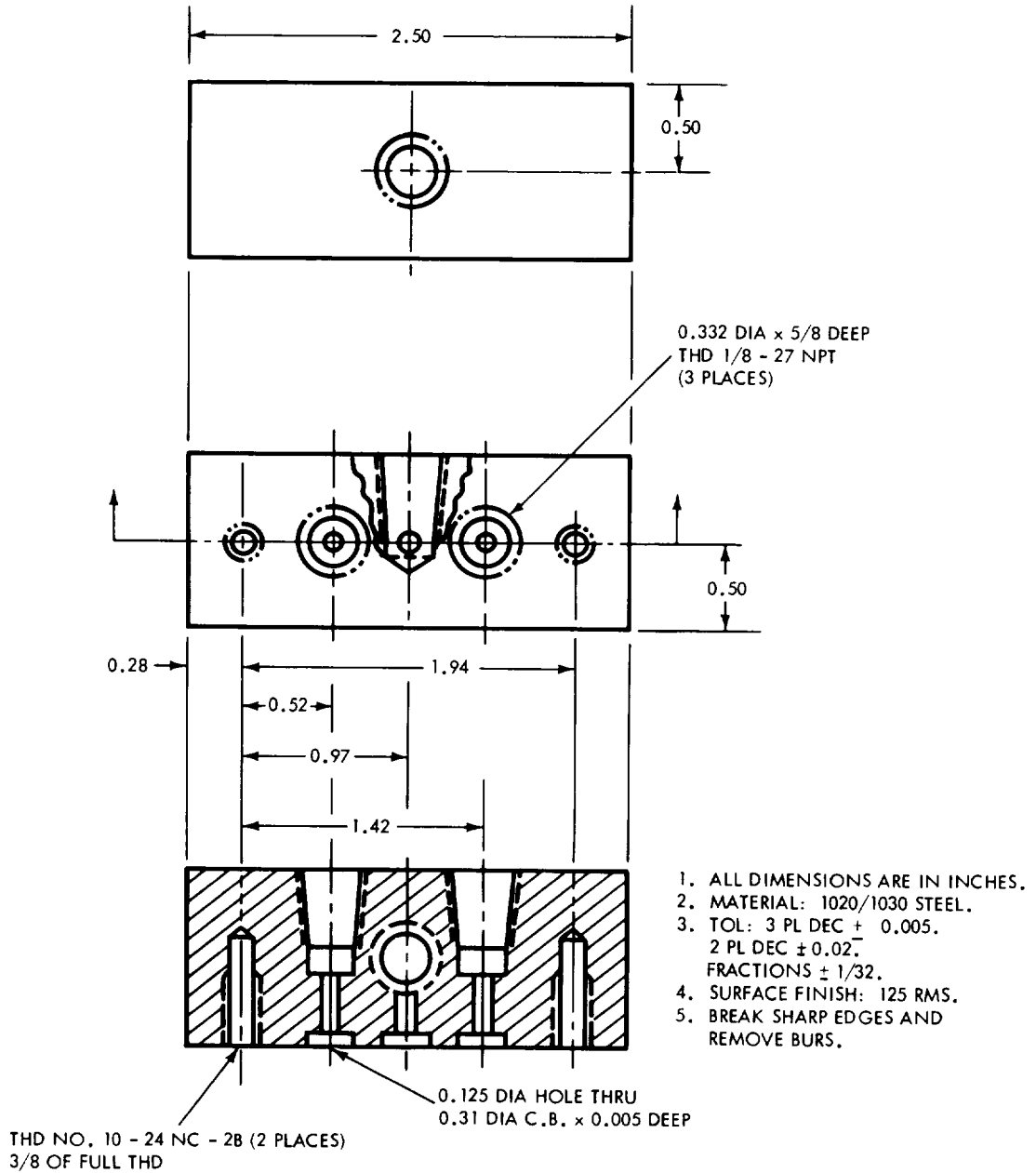
1. ALL DIMENSIONS ARE IN INCHES.
2. MATERIAL: 1015/1025 STEEL.
3. CHANNEL BRACES.
4. MAKE FROM CHANNELS WELDED IN BOX SECTION.
5. TOL: FRACTIONS +1/16.
6. BREAK SHARP EDGES.

5. TURRET STAND

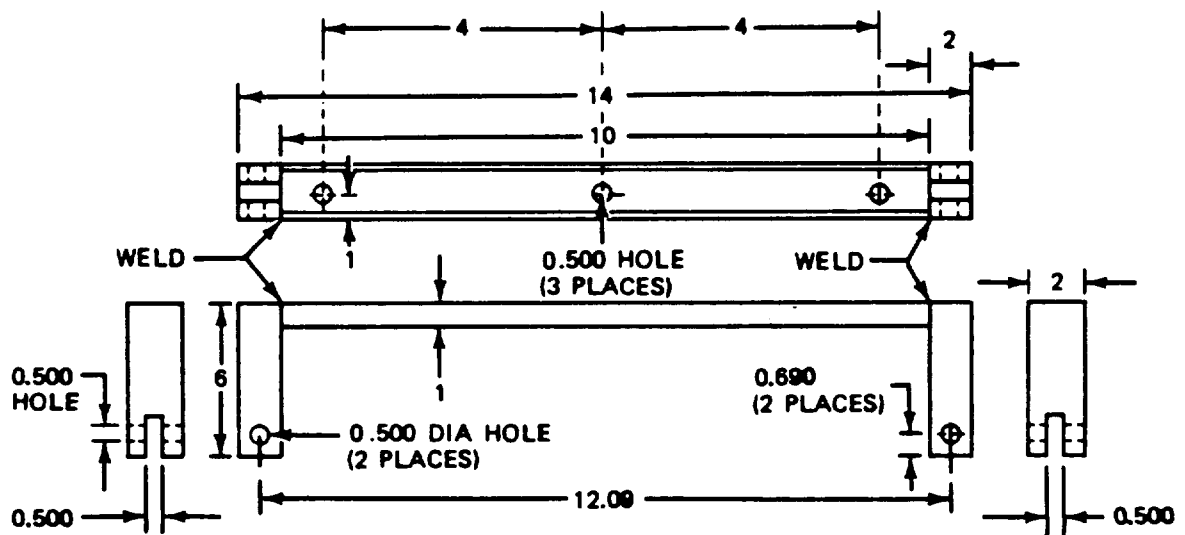


SPRING WIRE
HOOK TOOL

MATERIAL: LOCKWIRE



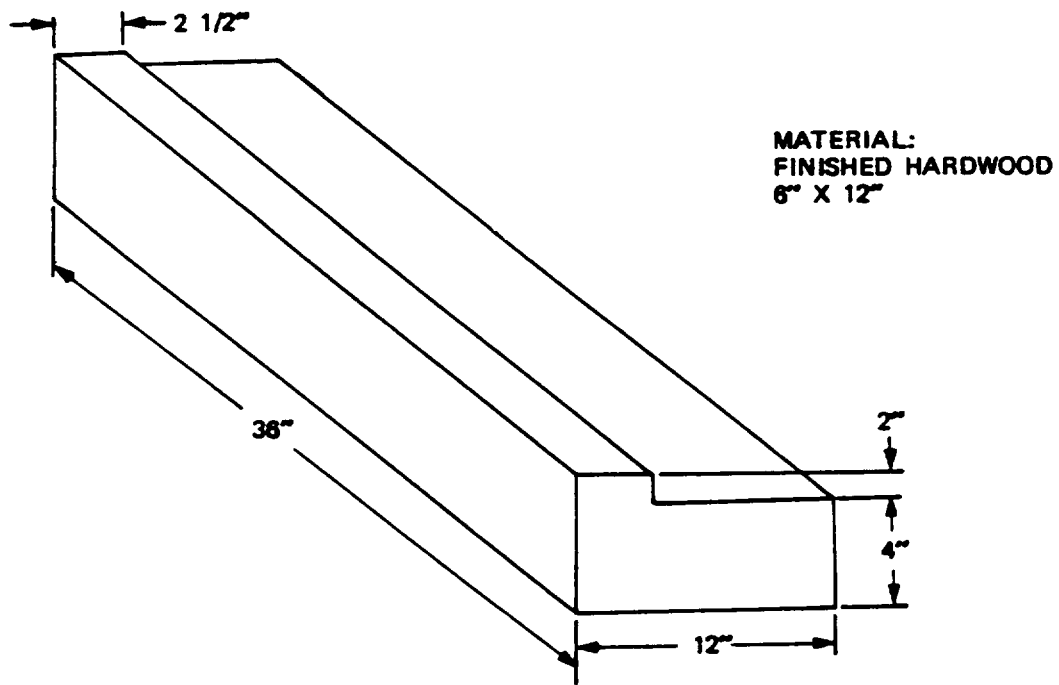
8. Shuttle Valve Test Manifold



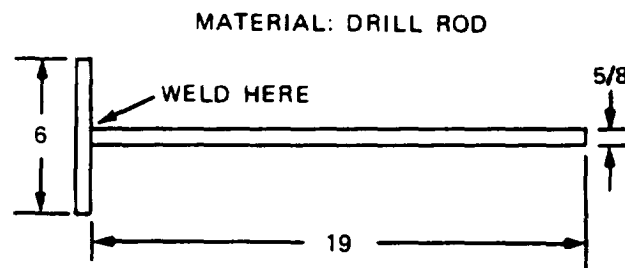
NOTES:

1. All dimensions are in inches.
2. Material: 1015/1025 Steel
 1 x 2 x 10 channel stock
 2 x 2 x 8 bar stock
3. Tolerance: 3 pl decimals ± 0.005
4. Break sharp edges and remove burrs.

9. ELEVATING SCREW JACK HOLDING FIXTURE



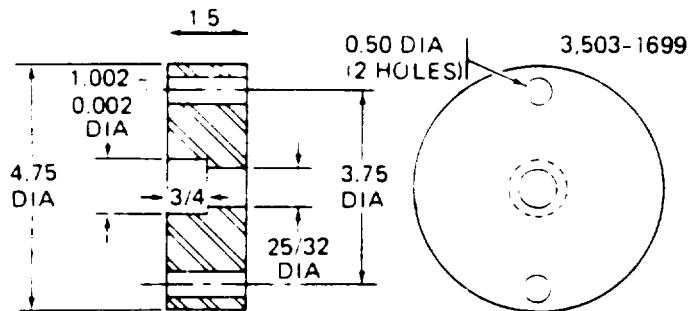
10. GUN MOUNT WOOD BLOCK



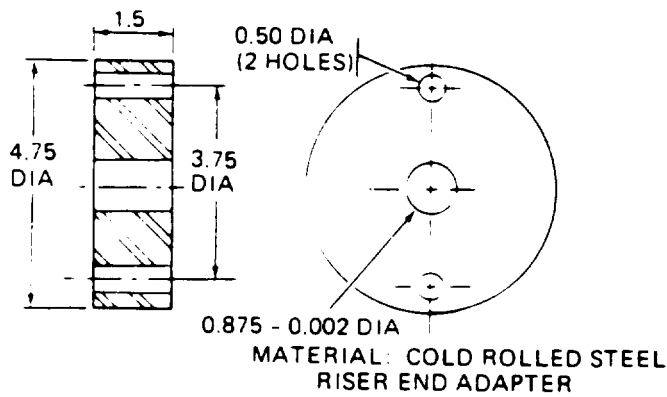
NOTE:
ALL DIMENSIONS ARE IN INCHES.

11. REPLENISHER PUSH ROD

NOTE ALL DIMENSIONS SHOWN ARE IN INCHES.

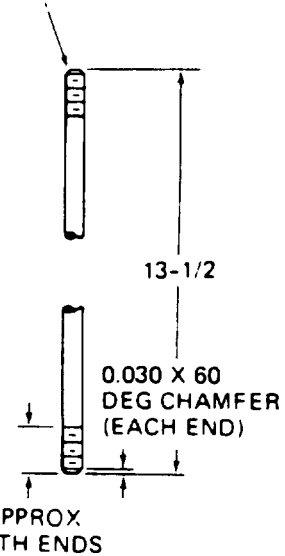


MATERIAL: COLD ROLLED STEEL
PUMP END ADAPTER

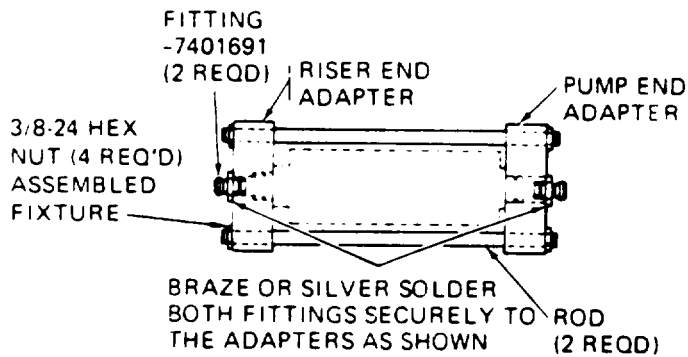


MATERIAL: COLD ROLLED STEEL
RISER END ADAPTER

3/8-24 THREAD
(EACH END)

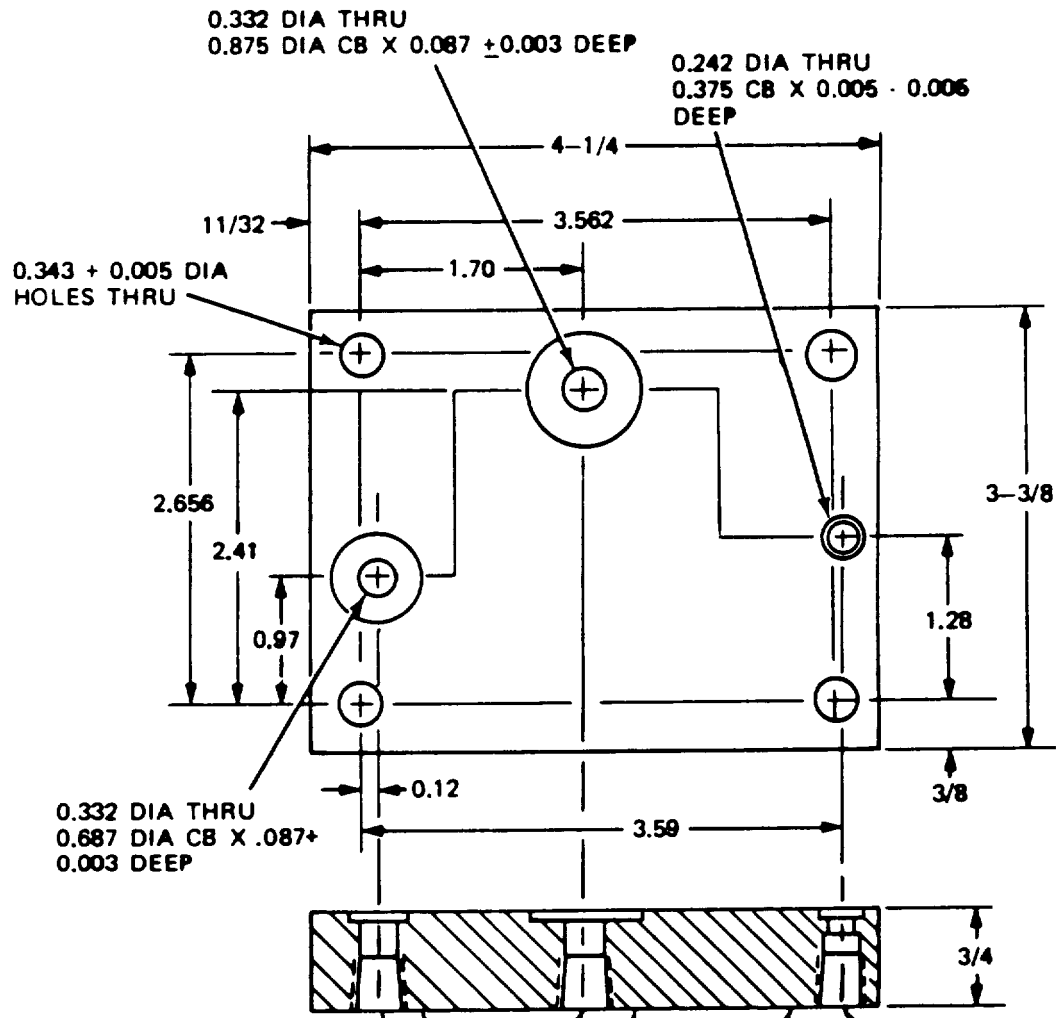


MATERIAL: 3/8 DIA STEEL ROD
(2 REQD)

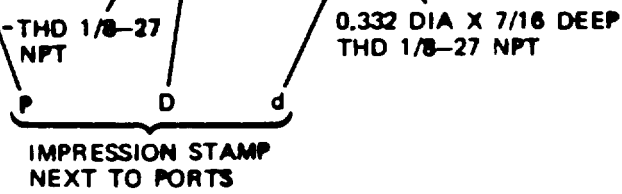


BRAZE OR SILVER SOLDER
BOTH FITTINGS SECURELY TO
THE ADAPTERS AS SHOWN (2 REQD)

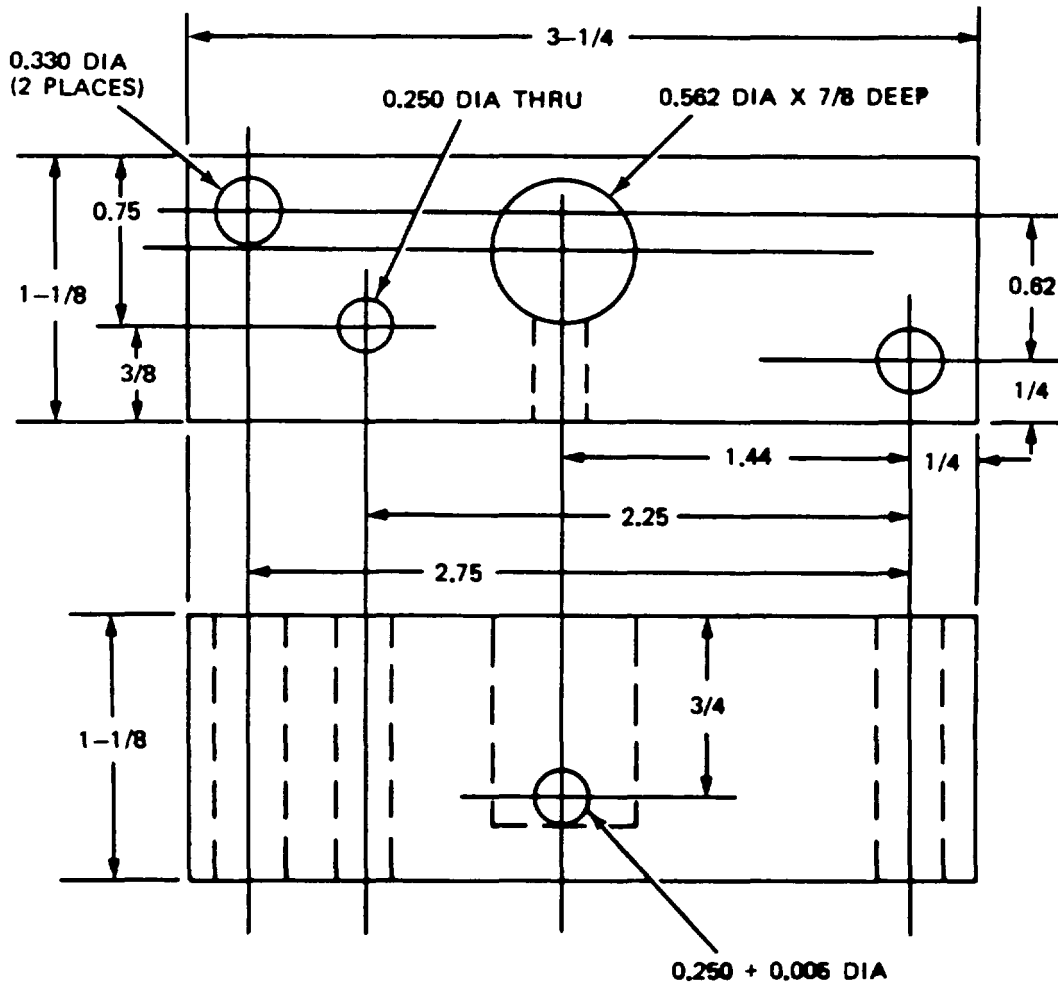
12. OIL FILTER TEST FIXTURE



1. ALL DIMENSIONS ARE IN INCHES.
2. MATERIAL: 2024 T4 ALUMINUM.
3. TOL: 3 PL DEC ±0.006, 2 PL DEC ±0.02, FRACTIONS ±1/32
4. SURFACE FINISH: 125 RMS.
5. BREAK SHARP EDGES AND REMOVE BURS.



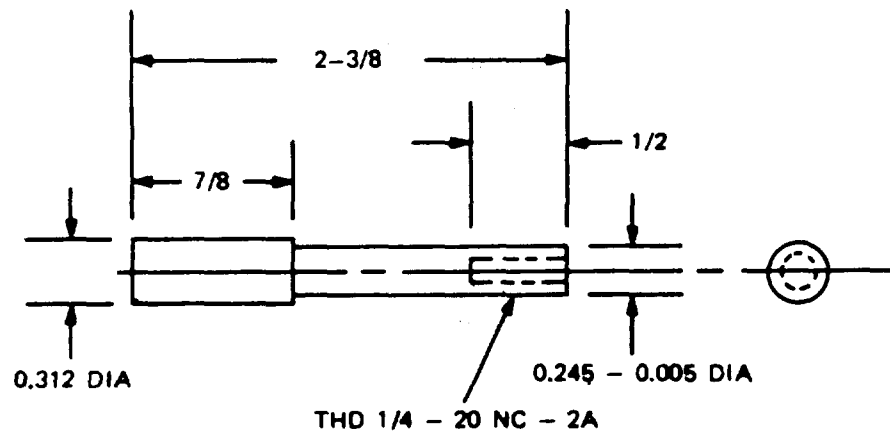
13. GUNNER'S CONTROL HYDRAULIC VALVE MANIFOLD



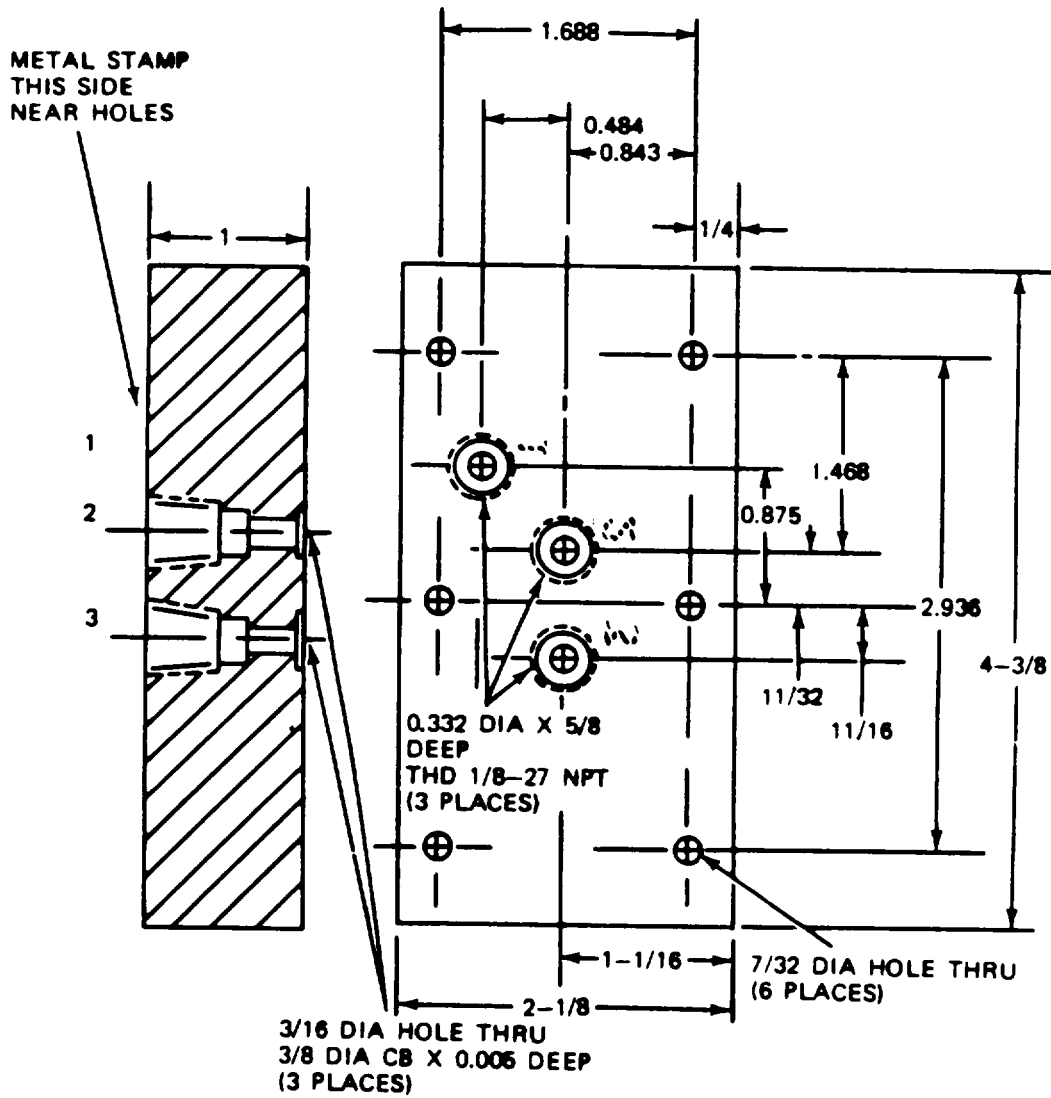
1. ALL DIMENSIONS ARE IN INCHES
2. MATERIAL: 2024 T4 ALUMINUM OR 1015/1030 STEEL
3. TOL: 3 PL DEC ± 0.010 , 2 PL DEC ± 0.02 , FRACTIONS $+1/32$
4. SURFACE FINISH: 250 RMS
5. BREAK SHARP EDGES AND REMOVE BURS

14. GUNNER'S CONTROL HYDRAULIC VALVE FIXTURE

1. ALL DIMENSIONS ARE IN INCHES
2. MATERIAL: 1015/1030 STEEL
3. TOL: 3 PL DEC ± 0.010 , FRACTIONS $\pm 1/32$
UNLESS OTHERWISE INDICATED
4. SURFACE FINISH: 125 RMS
5. BREAK SHARP EDGES AND REMOVE BURS

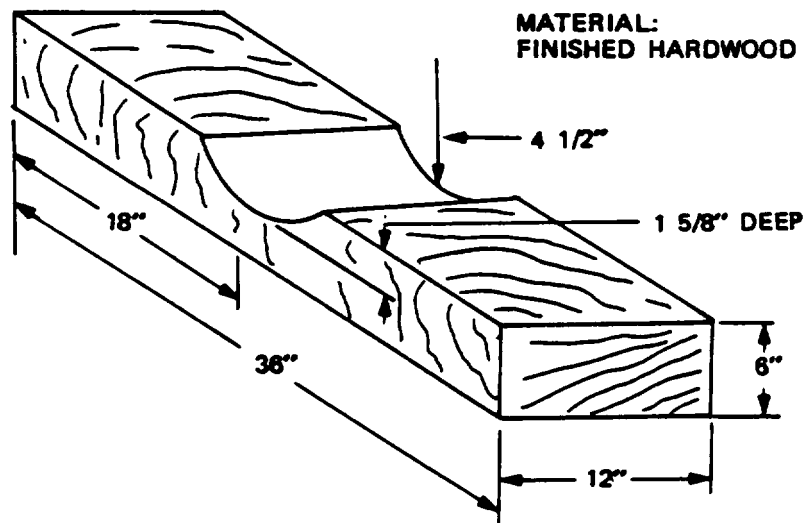


15. GUNNER'S CONTROL HYDRAULIC VALVE ADAPTER

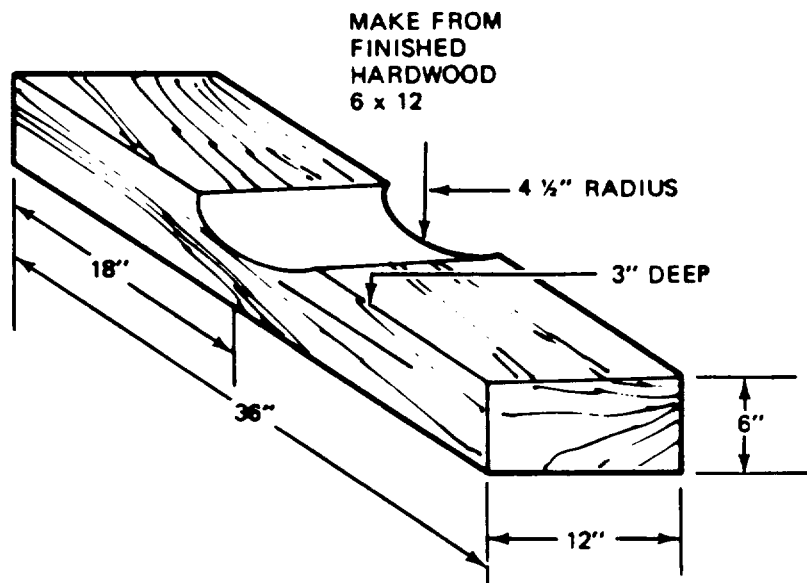


1. ALL DIMENSIONS ARE IN INCHES.
2. MATERIAL: 1020/1030 STEEL.
3. TOL: 3 PL DEC ± 0.005 , 2 PL DEC ± 0.02 , FRACTIONS $\pm 1/32$.
4. SURFACE INSIDE: 125 RMS.
5. BREAK SHARP EDGES AND REMOVE BURRS.

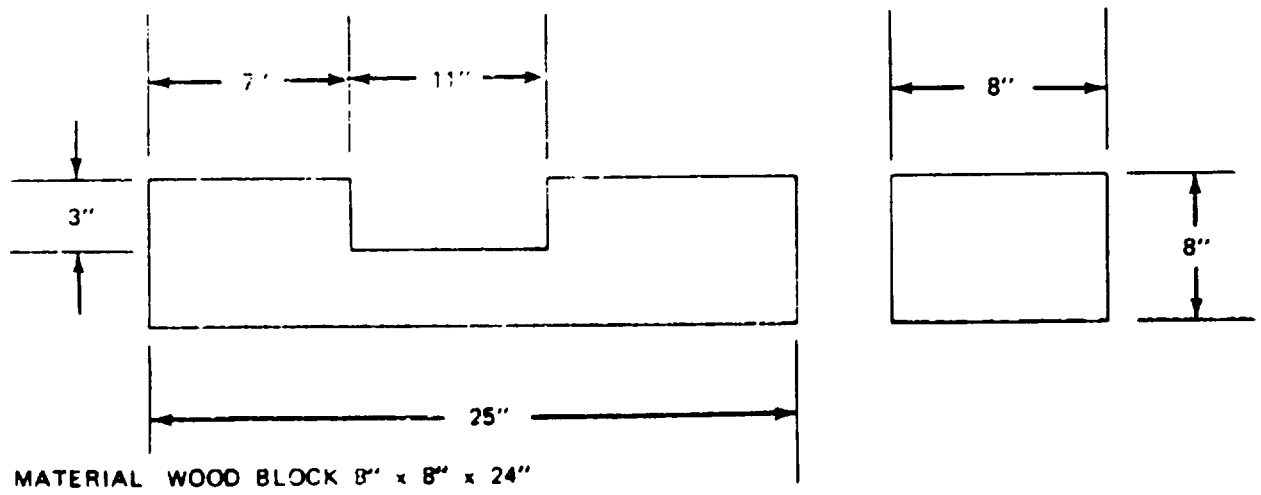
16. MANUAL ELEVATION PUMP TEST MANIFOLD



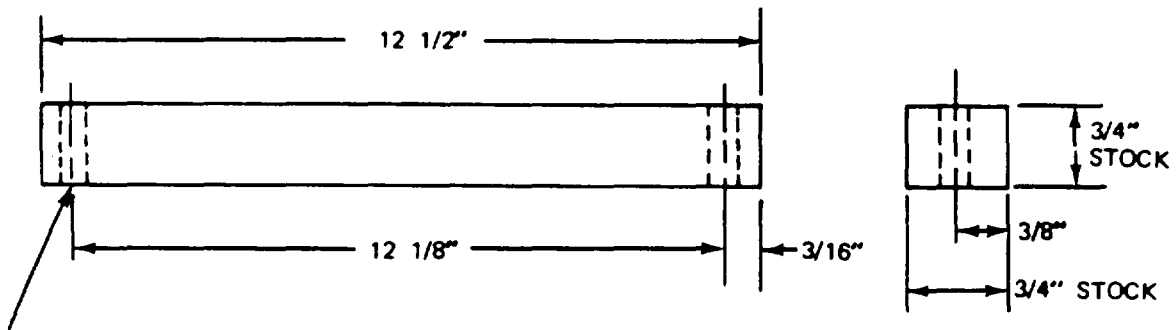
17. GUN MOUNT WOOD BLOCK



18. CANNON TUBE WOOD BLOCK



19. RECOIL MECHANISM WOOD BLOCK



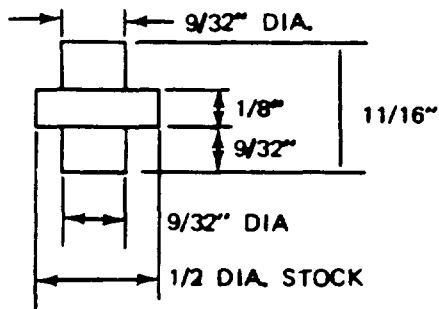
1/8" DIA. HOLE THRU REAM 11/32"
DEEP TO SUIT PIN ② FOR PRESS FIT

2 PLACES

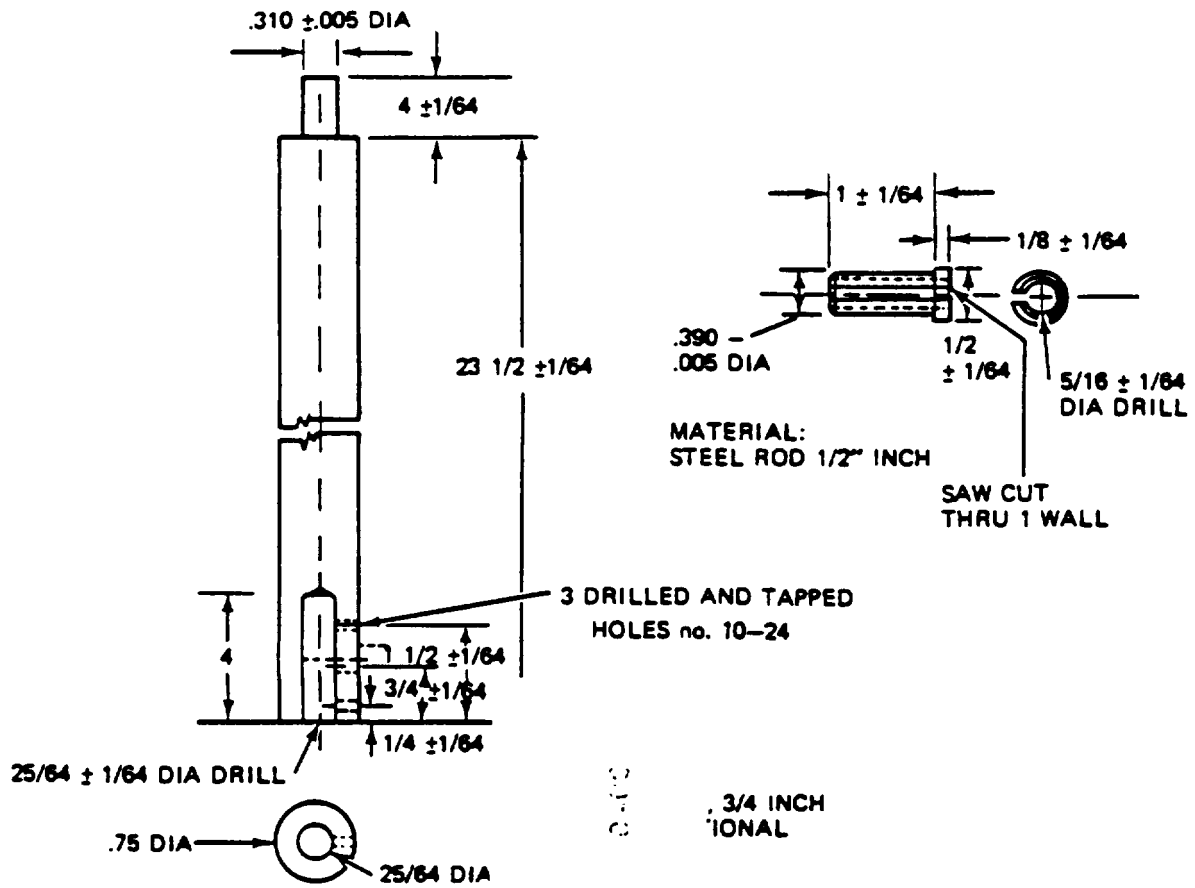
MATERIAL:

3/4" SQUARE STEEL BAR STOCK,
12 1/2" LONG

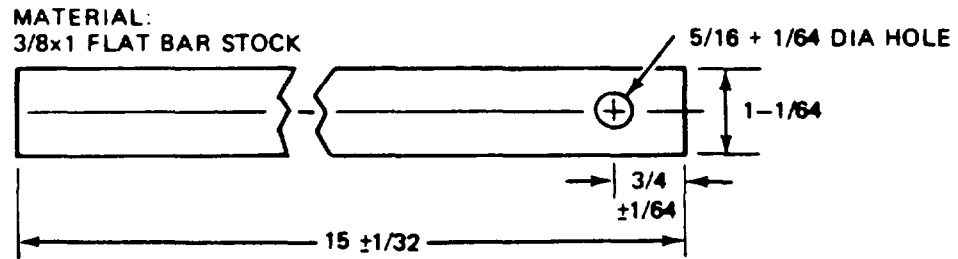
1/2" DIA. ROUND TOOL STEEL,
11/16" LONG (TWO REQUIRED)



20. RECOIL PISTON ADAPTER SPANNER WRENCH



22. RECOIL MECHANISM DRILL EXTENSION AND SPLIT BUSHING



NOTE: ALL MEASUREMENTS ARE IN INCHES

INDEX	PART	PARA
A-FRAME LEFT TRUNNION	5	27-1
A-FRAME RIGHT TRUNNION	5	26-1
ACCUMULATOR, EQUILIBRATOR	5	21-1
ACCUMULATOR, MAIN	4	16-1
ACCUMULATOR, MANUAL ELEVATION	3	13-7
AZIMUTH GEAR BOX, CUPOLA	3	12-11
BOOM	5	29-1
BOOM LINEAR ACTUATING CYLINDER	5	28-1
BLOWER, TURRET VENTILATING	1	7-1
BREECH RING	2	11-2
CAM ASSEMBLY, TURRET LOCK	5	Part of 20-9, 20-10
CANNON M 135 AND COMBINATION GUN MOUNT M 150	2	11-1
CHECK VALVE	3	13-34
CLAMP, GUNNER'S CONTROL	3	Part of 13-104, 13-105
CLUTCH	4	18-23
COMBINATION GUN MOUNT MI 50, CANNON M 135 AND	2	11-1
COMMANDER'S CONTROL HANDLE	3	14-1
CONTROL BOX, GUNNER'S	1	6-1
CONTROL, GUNNERS	3	13-77
CONTROL HANDLE, COMMANDER'S	3	14-1
CRANK ASSEMBLY, CUPOLA AZIMUTH GEAR BOX	2	Part of 12-14, 12-15
CUPOLA	2	12-1
CUPOLA AZIMUTH GEAR BOX	2	12-11
CUPOLA BEARINGS	2	12-5
CUPOLA ELECTRICAL SYSTEM	1	8-1
CUPOLA GUARDS	2	9-1
CYLINDER, BOOM LINEAR ACTUATING	5	28-1
DIRECTIONAL CONTROL VALVE	5	25-1
DRAIN TUBE	3	13-31
ELECTRIC DRIVE MOTOR	3	13-55
ELECTRICAL FIRING LEAD	2	11-6
ELECTRICAL SLIPRING, TURRET	1	3-1
ELECTRICAL SYSTEM, CUPOLA	1	8-1
ELEVATING MECHANISM	4	15-1
ELEVATING SCREW JACK	2	12-17
ELEVATION SHAFT	3	Part of 13-99, 13-100
EQUILIBRATOR ACCUMULATOR	5	21-1
EQUILIBRATOR CHARGING MANIFOLD	5	22-1
EYE ASSEMBLY, ELEVATION MECH (1 1591025)	4	Part of 15-6, 15-7
FERRULE, WIRE ROPE AND	5	23-1
FILTER, OIL	3	13-40
FIRING LEAD, ELECTRICAL	2	11-6
GEAR BOX, CUPOLA AZIMUTH	2	12-11
GEAR BOX, TRAVERSING	2	18-49
GUARD, GUNNERS	2	11-6

INDEX	PART	PARA
GUARDS, CUPOLA	2	9-1
GUIDE ASSEMBLY, ELEVATING MECH	4	15-6, 15-7
GUN MOUNT, M150 COMBINATION	2	11-1
GUN SHIELD	2	11-2
GUNNER'S CONTROL	3	13-77
GUNNER'S CONTROL BOX	1	6-1
GUNNER'S GUARD	2	11-2
HAND TRAVERSING DRIVE	5	19-1
HANGERS	2	10-1
HOUSING ASSEMBLY, HYDRAULIC MOTOR	4 Part of	18-46, 18-47
HYDRAULIC MOTOR	4	18-37
HYDRAULIC PUMP AND MOTOR MOUNT	3	13-52
HYDRAULIC RISER	3	13-11
LEVER ASSEMBLY, TURRET LOCK	5 Part of	20-7, 20-8
LOCK, TURRET TRAVERSE	5	20-1
MAIN ACCUMULATOR	4	16-1
MANIFOLD, EQUILIBRATOR CHARGING	5	22-1
MANUAL ELEVATION ACCUMULATOR	3	13-7
MANUAL ELEVATION PUMP	3	13-58
MOTOR, ELECTRIC DRIVE	3	13-55
MOTOR, HYDRAULIC	4	18-37
MOTOR MOUNT, HYDRAULIC PUMP AND	3	13-52
MOUNT, 165-MM COMBINATION GUN	2	11-1
NO-BAK	4	18-7
OIL FILTER	3	13-40
OIL RESERVOIR	3	13-47
PISTON AND SHAFT ASSEMBLY, HYDRAULIC MOTOR	4 Part of	18-46, 18-47
PLATFORM, TURRET	1	2-2
POWER AND SEARCHLIGHT RELAY BOX (10905722 OR 11654980), TURRET	1	5-1
POWER PACK	3 Part of	13-1, 13-2
PUMP, MANUAL ELEVATION	3	13-58
PUMP, HYDRAULIC, AND MOTOR MOUNT	3	13-52
RACE ASSEMBLY, INNER BEARING	4 Part of	17-6, 17-7
RACE RING, TURRET	4	17-1
RECOIL MECHANISM	2	11-2
RELAY BOX (10905722 OR 16654980), TURRET POWER AND SEARCHLIGHT	1	5-1
RELIEF VALVE	3	13-25
REPLENISHER	2	11-26
RESERVOIR, OIL	3	13-47
RISER, HYDRAULIC	3	13-11

INDEX	PART	PARA
SCREW JACK, ELEVATING	2	12-17
SHAFT ASSEMBLY, CUPOLA AZIMUTH GEARBOX	2	Part of 12-14, 12-15
SHUTTLE VALVE.....	3	13-18
SLEEVE ASSEMBLY, ELEVATING MECH	4	15-6, 15-7
SLIPRING, TURRET ELECTRICAL.....	1	3-1
SUPPORT, GUNNER'S CONTROL	2	Part of 13-104, 13-105
TERMINAL BOARD ASSEMBLY, CUPOLA	1	8-12
TRAVERSE LOCK, TURRET	5	20-1
TRAVERSE SHAFT	3	Part of 13-99, 13-100
TRAVERSING DRIVE, HAND	5	19-1
TRAVERSING GEAR BOX.....	4	18-49
TRAVERSING MECHANISM, TURRET.....	4	Part of 18-1, 18-2
TRUNNION, A-FRAME LEFT	5	27-1
TRUNNION, A-FRAME RIGHT	5	26-1
TURRET	1	2-1
TURRET ELECTRICAL SLIPRING.....	1	3-1
TURRET PLATFORM.....	1	2-2
TURRET POWER AND SEARCHLIGHT RELAY BOX (10905722 OR 11654980).....	1	5-1
TURRET RACE RING	4	17-1
TURRET STRUCTURE	1	2-6
TURRET TRAVERSE LOCK	5	20-1
TURRET TRAVERSING MECHANISM.....	4	Part of 18-1, 18-2
TURRET VENTILATING BLOWER	1	7-1
VALVE, DIRECTIONAL CONTROL	5	25-1
VENTILATING BLOWER, TURRET	1	7-1
WINCH.....	5	24-1
WIRE ROPE AND FERRULE	5	23-1
WIRING HARNESS	1	4-1
YOKE ASSEMBLY, HANDLE	3	Part of 13-67, 13-68

By Order of the Secretary of the Army:

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

Official :

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

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To be distributed in accordance with DA Form 12-37, Direct and General Support Maintenance requirements for Combat Engineer, Full-Track, M728 Vehicle.



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TITLE

Title of TM

BE EXACT... PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.
3		2	
109		51	
2-8			2-1
12	1-6a		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Item 10. Change illustration. Reason: Tube end shown assembled on wrong side of lever cam.

Item 3. The NSN and P/N are not listed on the AMDF nor the MCRL. Request correct NSN and P/N be furnished.

Preventive Maintenance: Checks and Services. Item 7 under "Items to be inspected" should be changed to read as follows: Firing linkage and firing mechanism pawl.

Since there are both 20- and 30- round magazines for this rifle, data on both should be listed.

SAMPLE

TEAR ALONG DOTTED LINE

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE:

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS



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10 OCT 1980

COMBAT ENGINEER VEHICLE, M728,
TURRET, PART 5, MA

BE EXACT... PIN-POINT WHERE IT IS

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.
----------	------------	------------	-----------

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PENALTY FOR PRIVATE USE, \$300

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US Army Armament Materiel Readiness Command
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Rock Island, IL 61299

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TM 9-2350-222-34-2-5

DATE

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TITLE

COMBAT ENGINEER VEHICLE, M728, TURRET, PART 5, MA

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PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

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TM 9-2350-222-34-2-5

10 OCT 1980

COMBAT ENGINEER VEHICLE, M728,
TURRET, PART 5, MA

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PLACEHOLDER

FIGURE #

Fo-1 - Fo-5

TABLE #

ILLUSTRATION #

DRAWING #

PAGE #

PLACEHOLDER

Figure 4-4. Placeholder Page

CHANGE

NO. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., 21 January 1988

DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL

PART 5
MAINTENANCE

TURRET
FOR
COMBAT ENGINEER VEHICLE,
M728
(2350-00-795-1797)

TM 9-2350-222-34-2-5, 10 October 1980, is changed as follows:

1. Remove old pages and insert new pages as indicated below.
2. New or changed information is indicated by a vertical bar in the margin of the page.

Remove Pages

A/(B blank)
i and ii
21-3 and 21-4
22-3 and 22-4
24-9 and 24-10
24-21 thru 24-24
24-69 and 24-70
29-5 thru 29-7/(29-8 blank)
A-1 and A-2
B-1 and B-2
B-23 and B-24

Insert Pages

None
i and ii
21-3 and 21-4
22-3 and 22-4
24-9 and 24-10
24-21 thru 24-24
24-69 and 24-70
29-5 thru 29-8
A-1 and A-2
B-1 and B-2
6-23/(6-24 blank)

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Chief of Staff

Official:

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Brigadier General United States Army
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CHANGE
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DIRECT SUPPORT
AND GENERAL SUPPORT
MAINTENANCE MANUAL
PART 5
MAINTENANCE

TURRET
FOR
COMBAT ENGINEER VEHICLE,
M728
(2350-00-795-1797)

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DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL PART 5
MAINTENANCE TURRET FOR COMBAT ENGINEER VEHICLE, M728
(2350-00-795-1797)

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i and ii NONE NONE A-1 thru A-4 B-1 and B-2 B-9 and B10 FO-2 FO-5	i and ii 30-1 thru 30-20 31-1 thru 31-10 A-1 thru A-4 B-1 and B-2 B-9 and B-10 FO-2 FO-5

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
 1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
 1 Kilogram = 1000 Grams = 2.2 Lb
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
 1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet
 1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter = 1000 Cu Millimeters = 0.06 Cu Inches
 1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

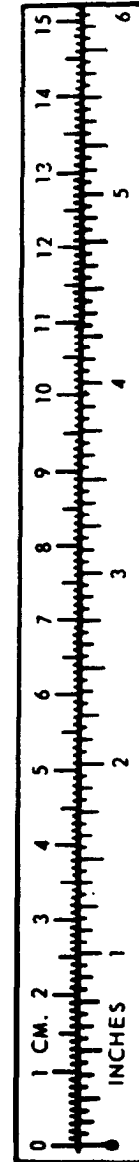
TEMPERATURE

$5/9 (^{\circ}\text{F} - 32) = ^{\circ}\text{C}$
 212^o Fahrenheit is equivalent to 100^o Celsius
 90^o Fahrenheit is equivalent to 32.2^o Celsius
 32^o Fahrenheit is equivalent to 0^o Celsius
 $9/5 \text{ C}^{\circ} + 32 = \text{F}^{\circ}$

APPROXIMATE CONVERSION FACTORS

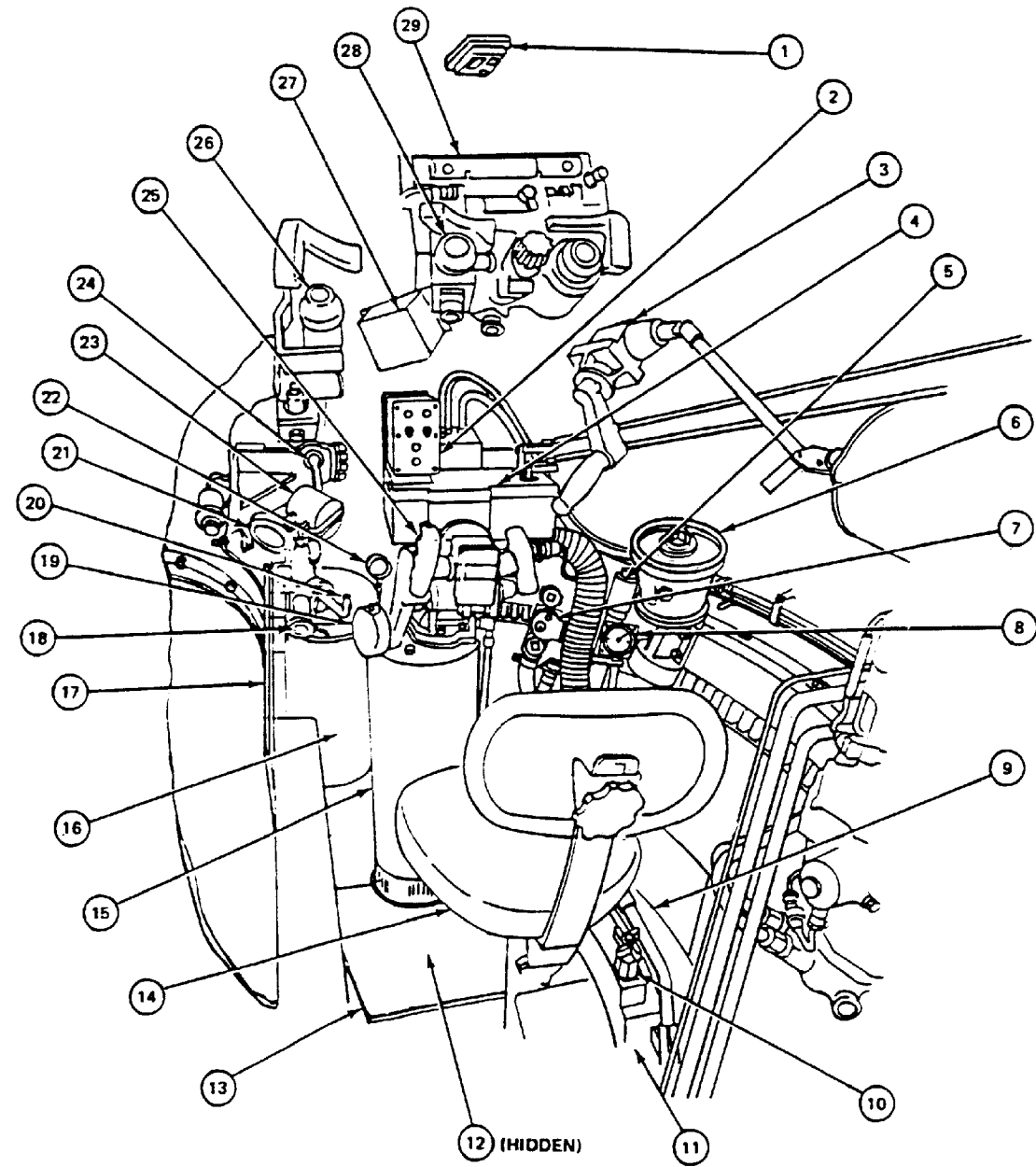
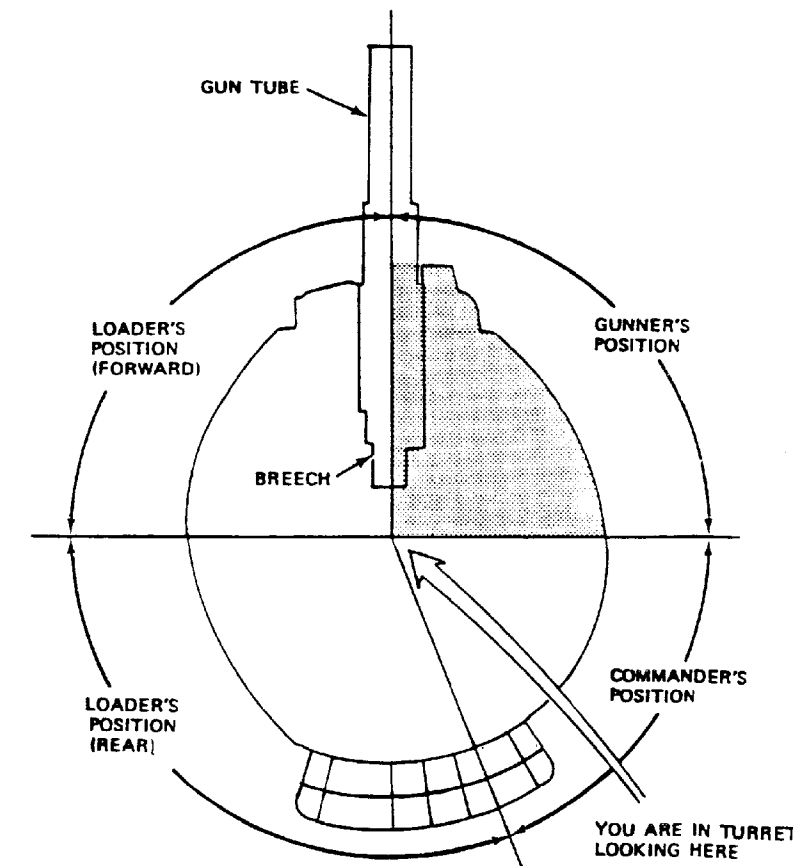
<u>TO CHANGE</u>	<u>TO</u>	<u>MULTIPLY BY</u>
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

<u>TO CHANGE</u>	<u>TO</u>	<u>MULTIPLY BY</u>
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



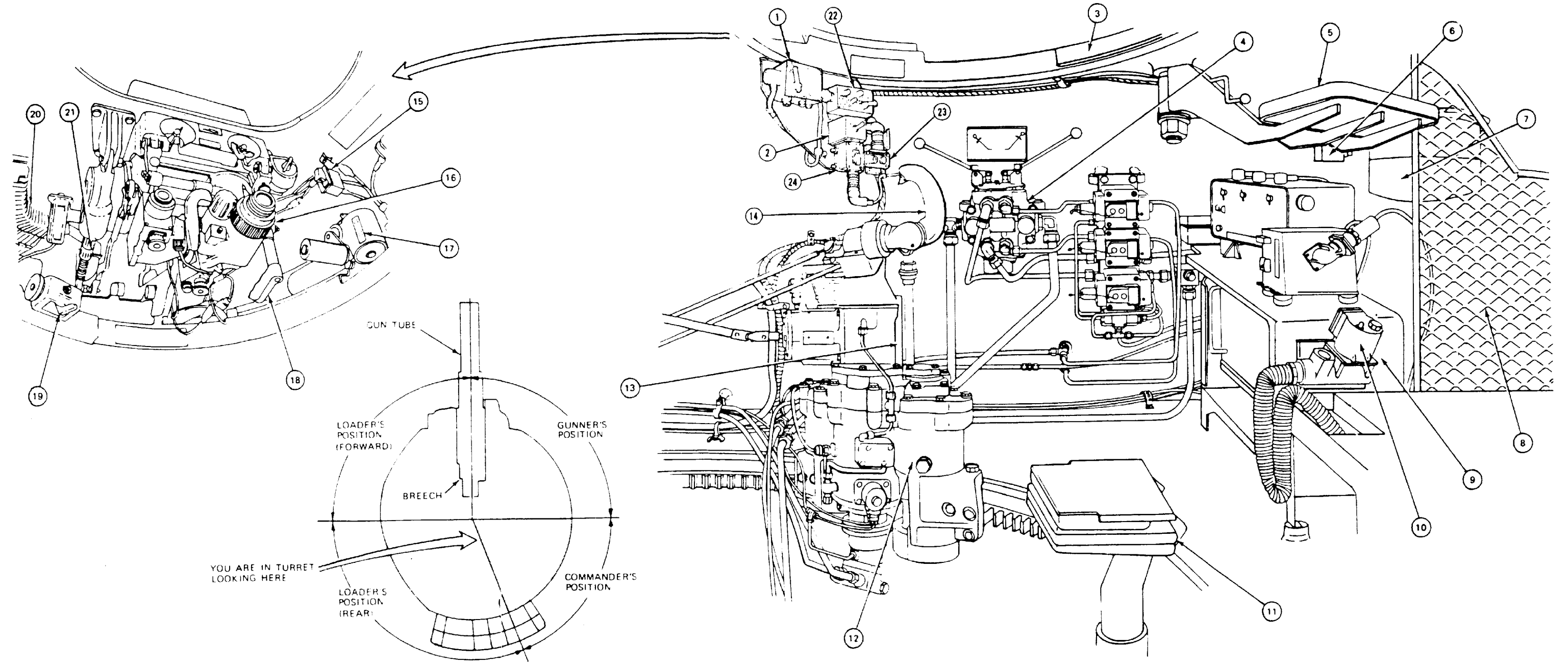
TA089991

- LEGEND:**
1. GUNNER'S DOMELIGHT
 2. GUNNER'S CONTROL BOX
 3. HAND TRAVERSING DRIVE
 4. GUNNER'S CONTROL
 5. RIGHT HANGER
 6. AZIMUTH INDICATOR
 7. GUNNER'S ELECTRIC AIR FILTER HEATER
 8. EQUILIBRATOR PRESSURE GAUGE
 9. GUNNER'S FOOTGUARD
 10. EQUILIBRATOR CHARGING MANIFOLD
 11. 7.62-MM AMMUNITION BOXES
 12. TURRET POWER AND SEARCHLIGHT RELAY BOX
 13. GUNNER'S FOOTREST PLATE
 14. GUNNER'S SEAT
 15. POWER PACK
 16. MAIN ACCUMULATOR
 17. GUNNER'S GUARD
 18. ELEVATION QUADRANT
 19. MANUAL ELEVATING HANDLE
 20. BLASTING MACHINE
 21. TELESCOPE LIGHT SOURCE CONTROL
 22. PRESSURE GAUGE
 23. FILTER BOX
 24. M114 TELESCOPE MOUNT
 25. GUNNER'S CONTROL HANDLES
 26. ARTICULATED TELESCOPE M105F
 27. TURRET GUN FIRING RELAY BOX
 28. GUNNER'S PERISCOPE M32
 29. GUNNER'S PERISCOPE MOUNT M118

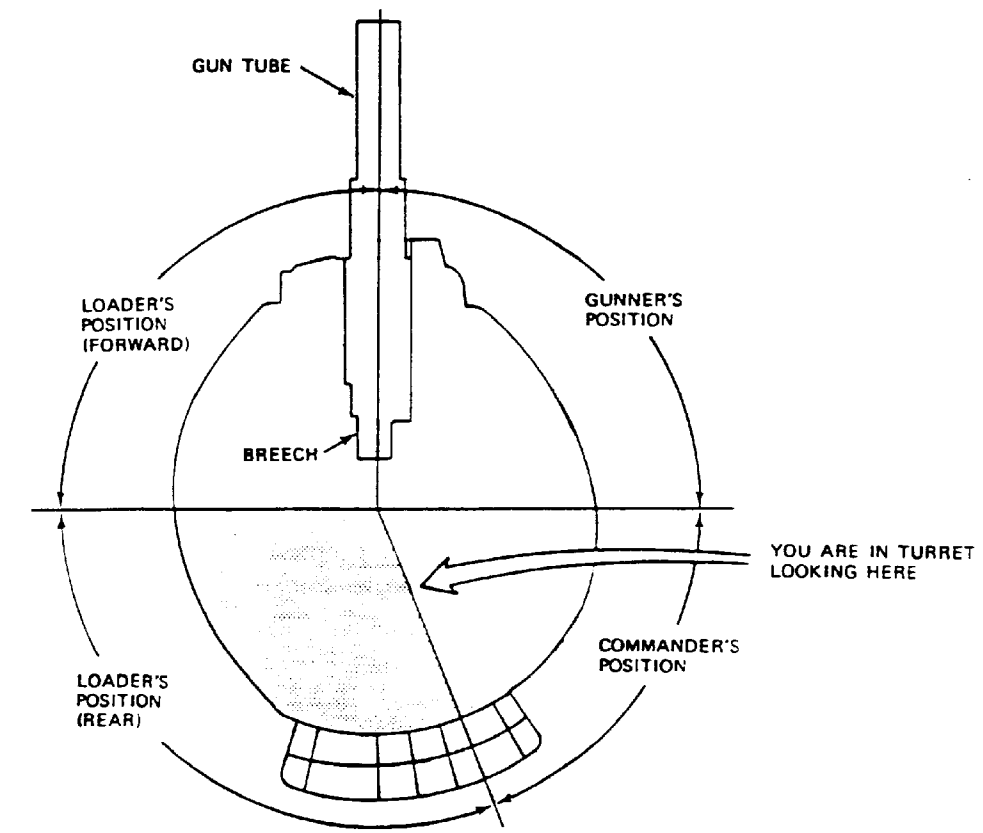


FO-1. EQUIPMENT LOCATION INFORMATION - GUNNER'S POSITION

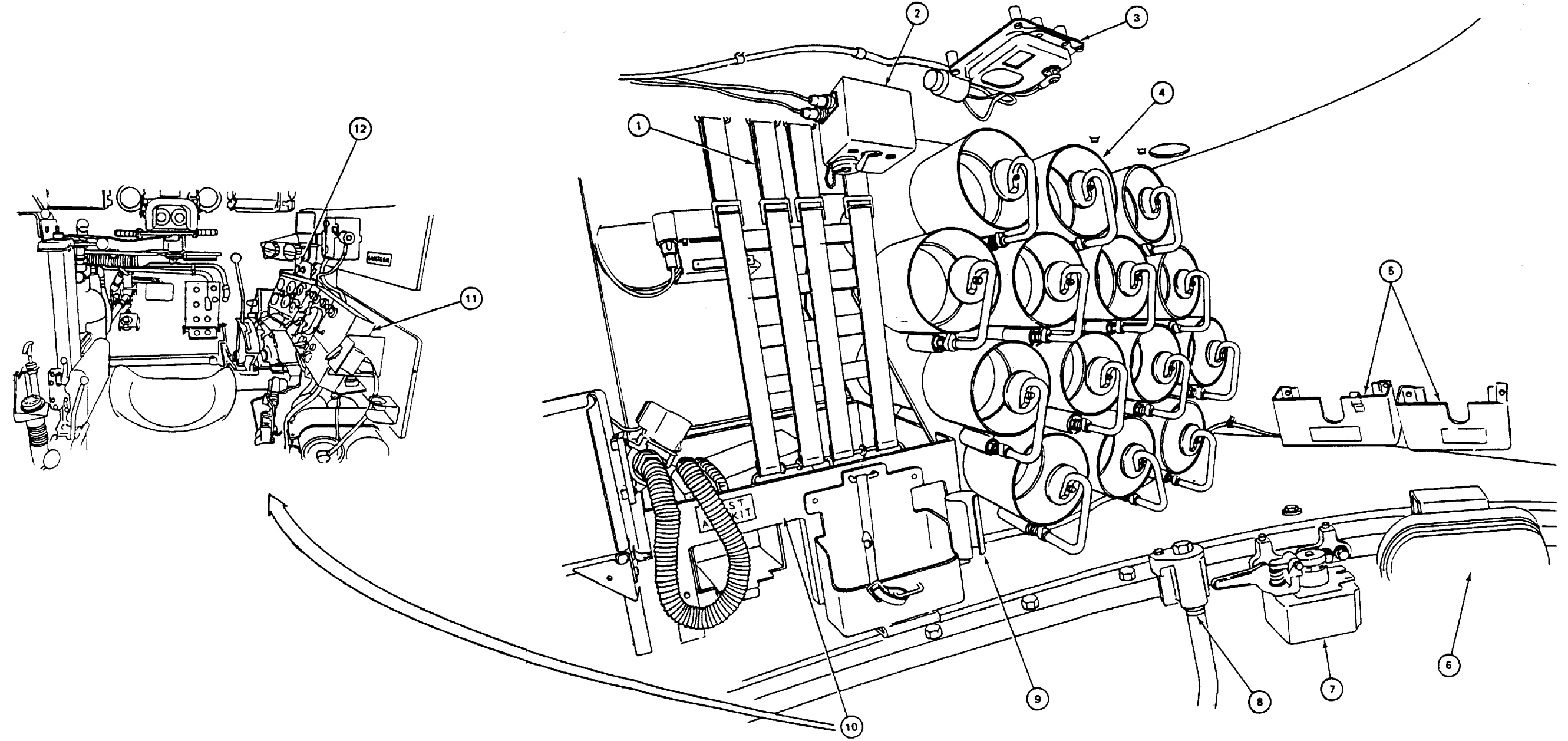
- LEGEND:
1. INTERPHONE AND CONTROL BOX
 2. CUPOLA ELECTRICAL POWER CONTROL PANEL
 3. BACKREST PAD
 4. WINCH BOOM CONTROL VALVES
 5. COMMANDER'S SWING SEAT
 6. INTERCONNECTING BOX
 7. TURRET VENTILATING BLOWER
 8. ODDMENT TRAY RIGHT SCREEN
 9. TURRET RADIO SUPPORTS
 10. COMMANDER'S ELECTRIC AIR FILTER HEATER
 11. COMMANDER'S SEAT
 12. TURRET TRAVERSING MECHANISM
 13. ANTI BACKLASH MECHANISM
 14. COMMANDER'S CONTROL HANDLE
 15. CUPOLA GUN SAFETY SWITCH AND GUARD
 16. COMMANDER'S PERISCOPE
 17. CUPOLA AZIMUTH GEAR BOX
 18. SHIELD OPERATING HANDLE
 19. CUPOLA AZIMUTH LOCK
 20. FLEXIBLE CHUTE ASSEMBLY
 21. ELEVATION SCREW JACK
 22. SEARCHLIGHT CONTROL BOX
 23. SMOKE GRENADE PUSHBUTTON UNIT
 24. SMOKE GRENADE POWER BOX



FO-2. EQUIPMENT LOCATION INFORMATION - COMMANDER'S POSITION
 Change 1 FO-2

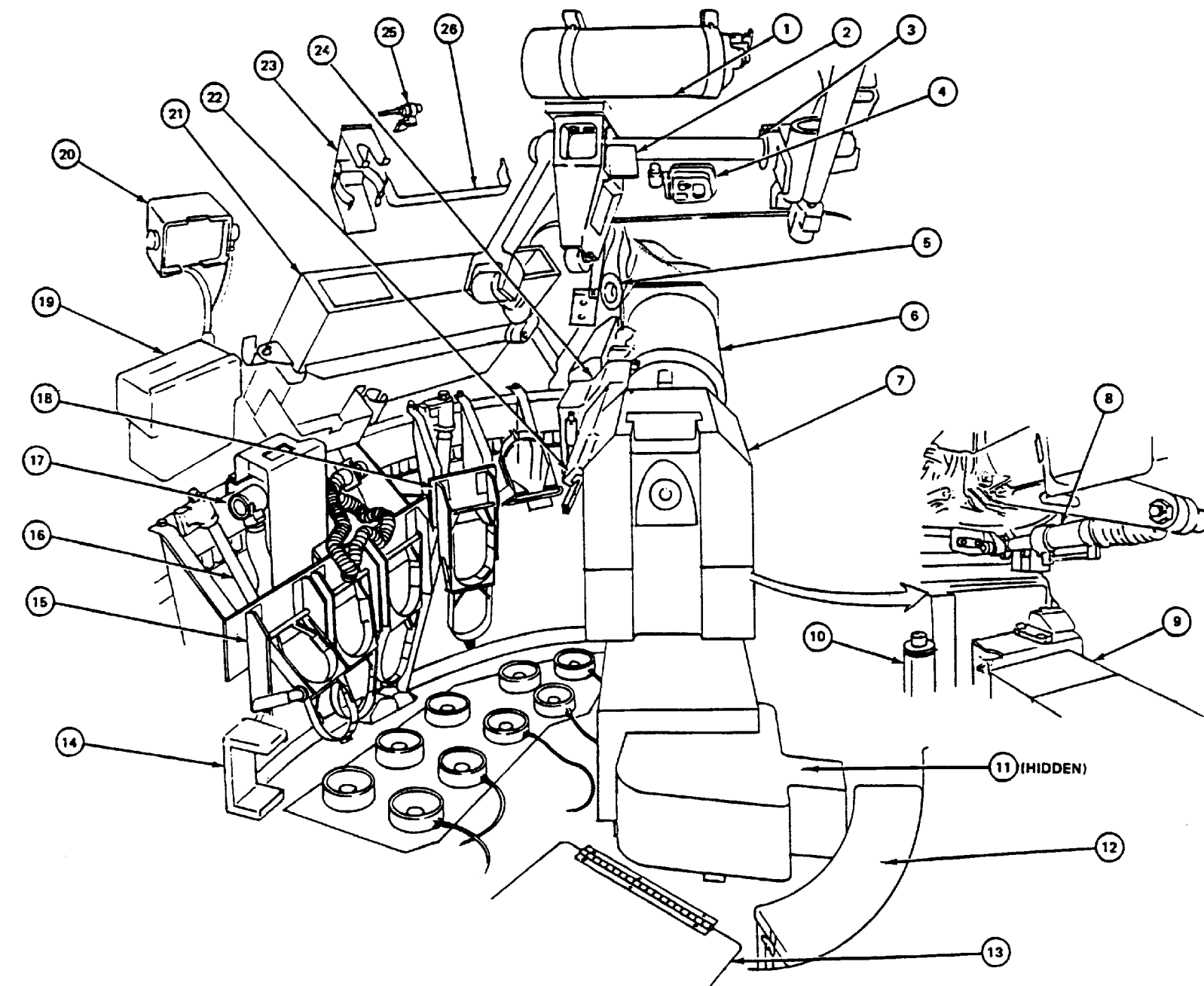
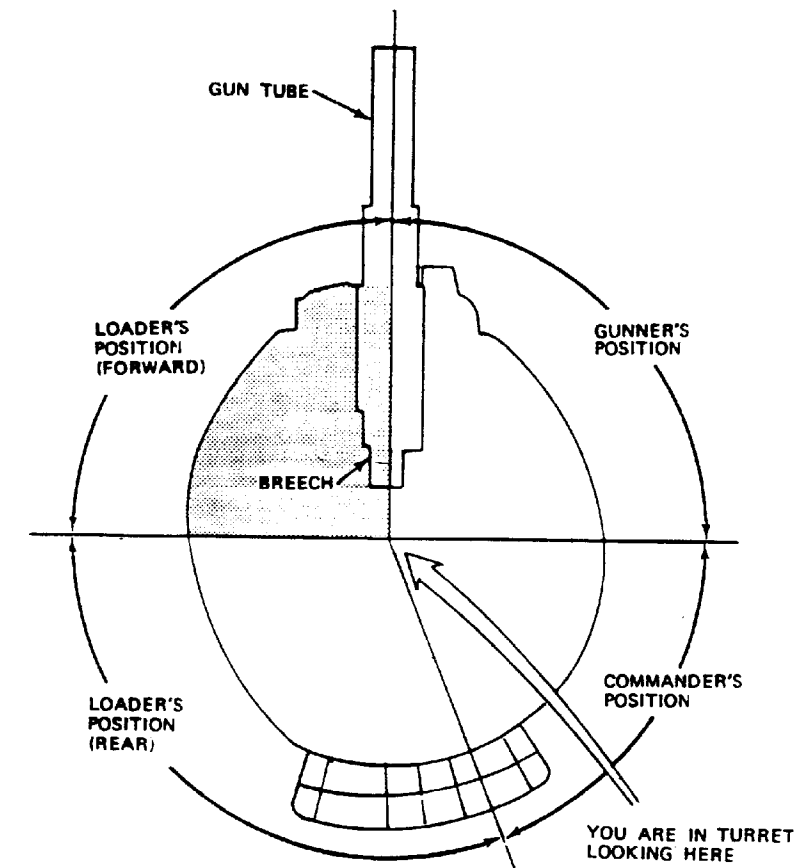


- LEGEND:**
- 1. RADIO GUARD SCREEN
 - 2. TURRET VENTILATING CONTROL BOX
 - 3. COMMANDER'S DOMELIGHT
 - 4. FOURTEEN ROUND AMMUNITION STOWAGE RACK
 - 5. HAND GRENADE STOWAGE BRACKETS
 - 6. LOADER'S SEAT
 - 7. TURRET TRAVERSE LOCK
 - 8. CENTER HANGER
 - 9. FLASHLIGHT TUBE
 - 10. ODDMENT TRAY
 - 11. DRIVER'S MASTER CONTROL PANEL
 - 12. HYDRAULIC PUMP PANEL



FO-3. EQUIPMENT LOCATION INFORMATION - LOADER'S POSITION REAR FO-3

- LEGEND:**
1. REPLENISHER
 2. GUN ELEVATION INTERFERENCE SWITCH
 3. BALLISTIC DRIVE
 4. LOADER'S DOMELIGHT
 5. MACHINE GUN MOUNT
 6. 165-MM GUN
 7. BREECH
 8. ELEVATING MECHANISM
 9. PERISCOPE STOWAGE BOX
 10. EQUILIBRATOR ACCUMULATOR
 11. ELECTRICAL SLIPRING
 12. CALIBER .50 AMMUNITION BOXES
 13. BATTERY ACCESS DOOR
 14. FIRE EXTINGUISHER MOUNTING BRACKET
 15. 165-MM SIX ROUND AMMUNITION RACK
 16. LEFT HANGER
 17. LOADER'S ELECTRIC AIR FILTER HEATER
 18. 165-MM THREE ROUND AMMUNITION RACK
 19. LOADER'S PERISCOPE BOX
 20. LOADER'S INTERPHONE CONTROL BOX
 21. .7.62 READY ROUND AMMO BOX AND COVER
 22. LOADER'S GUARD
 23. OILCAN MOUNTING BRACKET
 24. LOADER'S SAFETY SWITCH
 25. RADIATION DETECTOR
 26. CANTEEN MOUNTING BRACKET

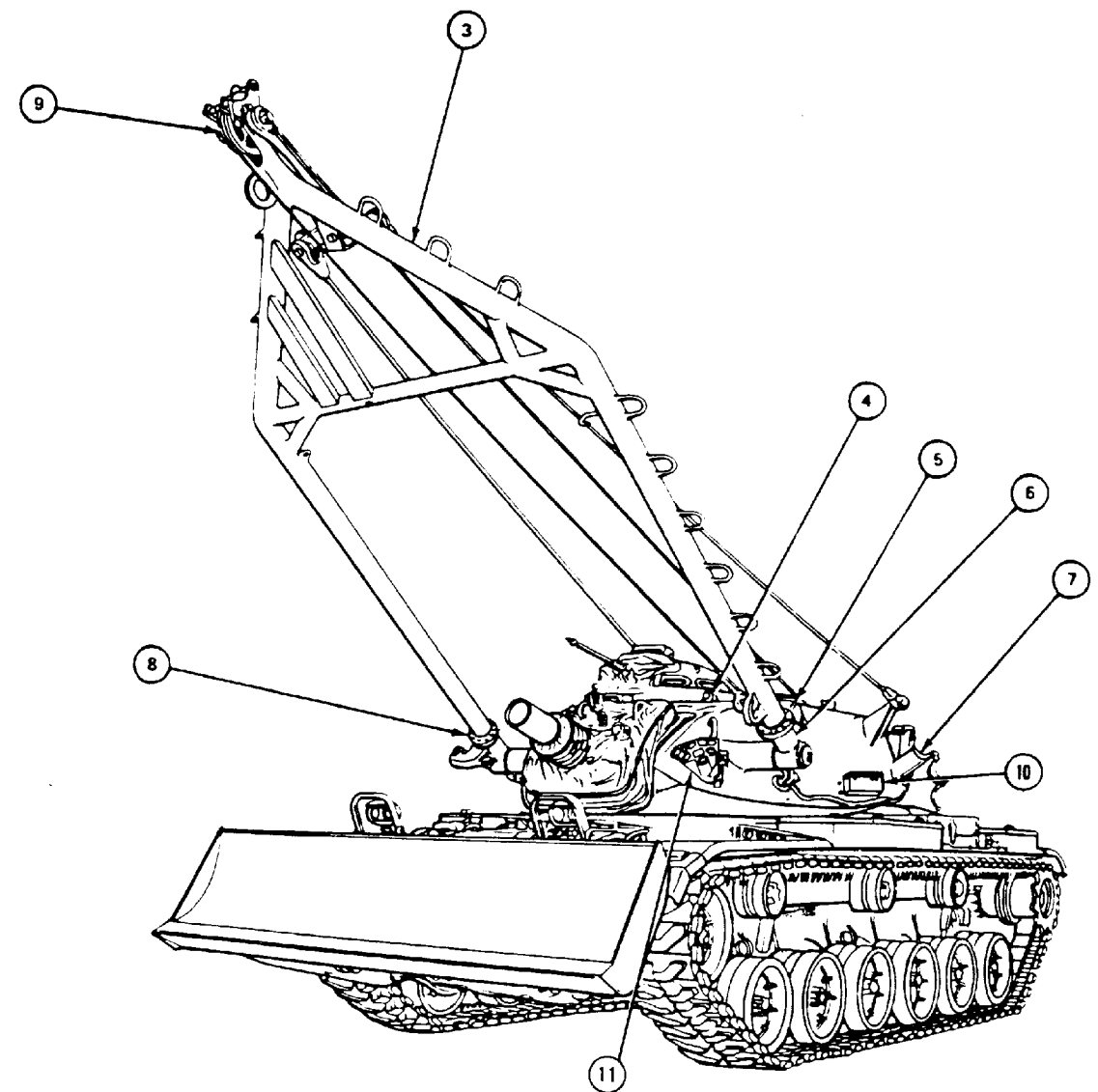
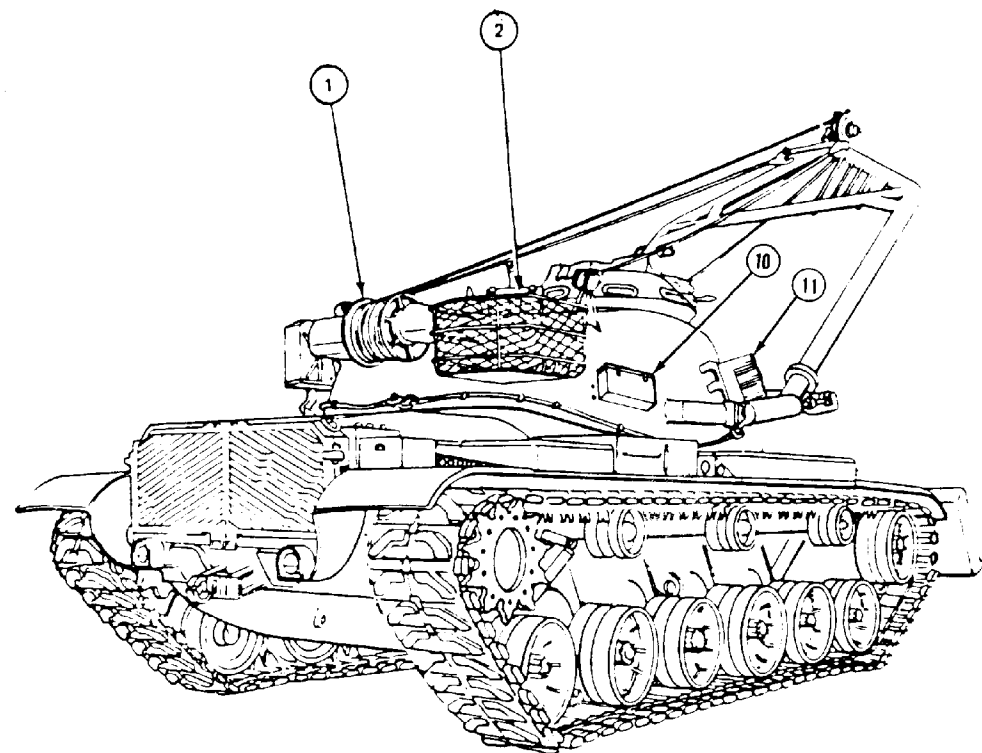


FO-4. EQUIPMENT LOCATION INFORMATION - LOADER'S POSITION FORWARD

LEGEND.

TM 9-2350-222-34-2-5

1. WINCH
2. SEARCHLIGHT STOWAGE BOX
3. A-FRAME
4. SEARCHLIGHT CONNECTOR
5. LOADER'S ESCAPE HATCH
6. A-FRAME LEFT TRUNNION
7. BOOM TRAVEL LOCK
8. A-FRAME RIGHT TRUNNION
9. A-FRAME PULLEY
10. SMOKE GRENADE STOWAGE BOX
11. SMOKE GRENADE DISCHARGER



FO-5. EQUIPMENT LOCATION INFORMATION - OUTSIDE TANK

Change 1 FO-5

TM 9-2350-222-34-2-5

**TURRET FOR COMBAT ENGINEER
VEHICLE, M728 (2350-00-795-1797),
PART 5, MAINTENANCE**

1980

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