TECHNICAL MANUAL

DIRECT SUPPORT

AND GENERAL SUPPORT

MAINTENANCE MANUAL

PART 3

MAINTENANCE

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

This copy is a reprint which includes current pages from Changes 1 and 2.

HEADQUARTERS, DEPARTMENT OF THE ARMY

OCTOBER 1980

WARNING

BE CAREFUL: CARBON MONOXIDE IS A GAS THAT CAN KILL YOU

Carbon monoxide always comes when something gets hot or burns - such as heaters, engines. etc. To keep carbon monoxide from making anyone sick or drowsy, there must be plenty of fresh air in the place where the heating or burning takes place. This gas has no color and no smell, but it is deadly poisonous. It can damage your brain. or kill you. if you do not have enough fresh air coming in to push the carbon monoxide out.

Follow these rules to keep from getting poisoned:

1. Do not operate engine or heater inside a building unless there is plenty of fresh air coming in.
2. Do not idle an engine unless you are sure there is plenty of fresh air in personnel compartments.
3. Do not drive a vehicle which has inspection plates. cover plates, or engine compartment doors taken off. except for very short maintenance times when necessary.
4. When operating vehicle. always be on the lookout for personnel who seem to be getting sick or drowsy. If you notice this happening, immediately get fresh air into personnel compartments. If this does not help, remove sick or drowsy personnel from vehicle and do following:

   a. Put him into fresh air

   b. Keep him covered warm.

   c. Keep him still. Do not let him exercise. (Exercise will make him worse.)

   d. Give him artificial respiration if necessary.

   e. Get medical help

CHANGE

NO. 2

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

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

PART 3
MAINTENANCE

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

TM 9-2350-222-34-2-3, 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	Insert Pages
A and B	None
i and ii	i and ii
13-1 and 13-2	13-1 and 13-2
13-31 and 13-32	13-31 and 13-32
13-89/(13-90)	13-89/(13-90 blank)
13-111 and 13-112	13-111 and 13-112
13-147 thru 13-149/(13-150 blank)	13-147 thru 13-149/(13-150 blank)
13-157 and 13-158	13-157 and 13-158
13-165 and 13-166	13-165/(13-166 blank)
13-167 thru 13-170	13-167 thru (13-169 blank)/13-170
13-171 and 13-172	13-171 and 13-172
13-187 and 13-188	13-187 and 13-188
13-189 thru 13-202	None
13-205 and 13-206	13-205 and 13-206
13-275 and 13-276	13-275 and 13-276
13-407 thru 13-412	13-407 and 13-412
13-413 thru 13-416	13-413 thru 13-416
13-419 thru 13-426	13-419 thru 13-426
13-431 and 13-432	13-431 and 13-432
Index 1 and Index 2	Index 1 and Index 2

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

By Order of the Secretary of the Army:

CARL E. VUONO
General United States Army
Chief of Staff

Official:

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

DISTRIBUTION:

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

CHANGE

No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC 22 *November* 1983

Direct Support and General Support Maintenance
COMBAT ENGINEER VEHICLE, FULL-TRACKED, M728
NSN 2350-00-795-1797
(TURRET)

TM 9-2350-222-34-2-3, 10 October 1980, is changed as follows:

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

Remove Pages	*Insert Pages*
A and B	NONE
i and ii	i and ii
13-1 through 13-8	13-1 through 13-8
NONE	13-8.1 and 13-8.2
13-9 and 13-10	13-9 and 13-10
13-15 and 13-16	13-15 and 13-16
13-19 and 13-20	13-19 and 13-20
NONE	13-20.1 and 10-20.2
13-21 through 13-30	13-21 through 13-30
13-63 through 13-71/(13-72 blank)	13-63 through 13-71/(13-72 blank)
13-171 and 13-172	13-171 and 13-172
13-177 through 13-181/(13-182 blank)	13-177 through 13-181/(13-182 blank)
NONE	13-182.1 through 13-182.8
13-313 through 13-320	13-313 through 13-320
14-53 and 14-54	14-53 and 14-54
14-59 and 14-60	14-59 and 14-60

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

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

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

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

WARNING

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.

WARNING

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.

WARNING

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.

WARNING

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.

WARNING

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.

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES .

LIST OF EFFECTIVE PAGES

NOTE: The portions of the text affected by the changes are indicated in the outer margins of the page. Changes to illustrations are indicated by miniature pointing shaded areas. to wiring diagrams are indicated by **shaded areas.**

Dates of issue for original and changed pages are:

Original . . . 0 . . . 10 October 1980

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 537 CONSISTING OF THE FOLLOWING:

No.	*Change No.
Cover	0
a - c	0
A - B	0
i - ii	0
13-1 - 13-13	0
13-14 Blank	0
13-15 - 13-53	0
13-54 Blank	0
13-55 - 13-57	0
13-58 Blank	0
13-59 - 13-61	0
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13-399 - 13-405	0
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13-407 - 13-427	0
13-428 Blank	0
13-429 - 13-451	0
13-452 Blank	0

*Zero in this column indicates an original page.

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LIST OF EFFECTIVE PAGES

Page No.	*Change No.
14-1 - 14-9	0
14-10 Blank	0
14-11 - 14-15	0
14-16 Blank	0
14-17 - 14-33	0
14-34 Blank	0
14-35 - 14-66	0
Index 1 - Index 3	0
Index 4 Blank	0
FO-1 - FO-5	0
Metric Conversion Chart	0
Cover	0

*Zero in this column indicates an original page.

Technical Manual
No. 9-2350-222-34-2-3

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

Technical Manual

Direct Support and General Support Maintenance Manual

Part 3 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 9-2350-222-34-2-4, and TM 9-2350-222-34-2-5 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 Slipring Assembly, Turret and Miscellaneous Components for the M728 CEV, including all changes.

TABLE OF CONTENTS

CHAPTER 13

POWER PACK

Section 1. SCOPE

13-1. LIST OF EQUIPMENT ITEMS CONTAINED IN THIS CHAPTER

Section	Equipment Item	Paragraph
2	Power Pack	13-2
3	Manual Elevation Accumulator	13-7
4	Hydraulic Riser	13-11
5	Shuttle Valve	13-18
6	Relief Valve (Early Model)	13-25
7	Drain Tube	13-31
8	Check Valve	13-34
9	Oil Filter	13-40
10	Oil Reservoir	13-47
11	Hydraulic Pump and Motor Mount	13-52
12	(Deleted)	
13	Manual Elevation Pump	13-58
14	Gunner's Control	13-77

Section 2. POWER PACK

13-2. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks			
	Removal	Installation	Disassembly	Assembly
Power Pack	13-3	13-4	13-5	13-6

13-3. POWER PACK REMOVAL PROCEDURE

TOOLS: 3/16 in. socket head screw key (Allen wrench)
6 in. extension (1/2 in. drive)
3/4 in. socket (1/2 in. drive)
1/2 in. drive ratchet
Adjustable hook spanner wrench
9/16 in. open end wrench
11/16 in. open end wench
13/16 in. open end wrench (late model)
5/8 in. open end wrench (early model)
3/4 in. open end wrench (early model)
7/8 in. open end wrench
1 in. open end wrench
1-1/8 in. open end wrench
Hoist
Slip joint pliers with plastic jaws (connector pliers)

SUPPLIES: Wood block (4 in. x 4 in. x 18 in.) (two) To support power pack after removal
Wood block (2 in. x 2 in. x 6 in.) (two) To place under electric motor
Wood block (2 in. x 6 in. x 12 in.) (two) To support power pack in and out Of vehicle
Caps and plugs
Lint-free cloths and rags (item 21, App. A)
Masking tape (item 36, App. A)
Pencil
Rope (3/4 in. diameter x 20 feet long)

PERSONNEL: Three

REFERENCES: JPG for procedure to:
Tag hydraulic-tubes
Disconnect electrical connectors
TM 9-2350-222-20-2-3 for procedures to:
Drain turret hydrauIic system
Remove gunner's control box and bracket
Remove gunner’s seat
Remove gunner’s footrest

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver’s Master Control Panel	FO-3	11
Main Accumulator	FO-1	16
Gunner’s Control Handles	FO-1	25
Power Pack	FO-l	15
Gunner’s Control	FO-l	4

13-3. POWER PACK REMOVAL PROCEDURE (CONT)

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Turret hydraulic system drained (TM 20-2-3)
Gunner's control box (switch box) and bracket removed (TM-20-2-3)
Gunner's seat removed (TM-20-2-3)
Gunner's footrest removed (TM-20-2-3)

GENERAL INSTRUCTIONS:

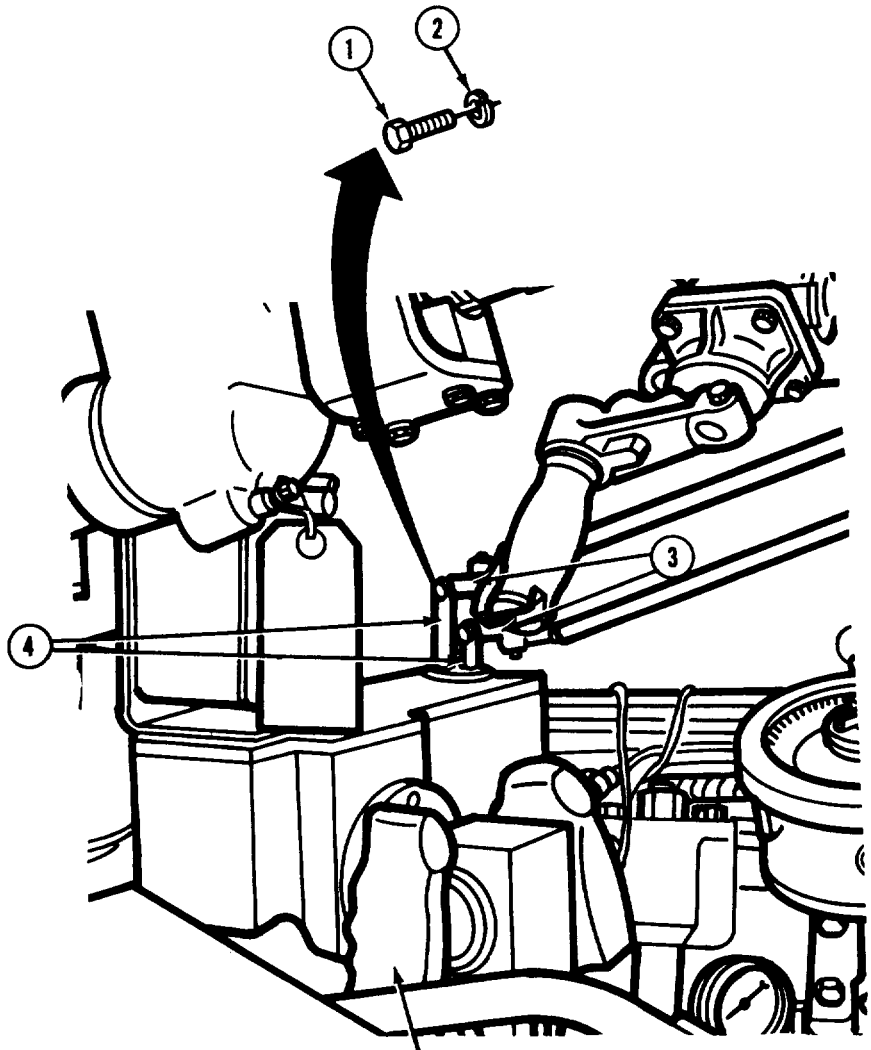
CAUTION

Hydraulic parts must be protected from dirt after removal. Dirt can damage hydraulic parts. Lint-free cloths, caps, and plugs should be used to keep hydraulic parts clean.

13-3. POWER PACK REMOVAL PROCEDURE (CONT)

FRAME 1

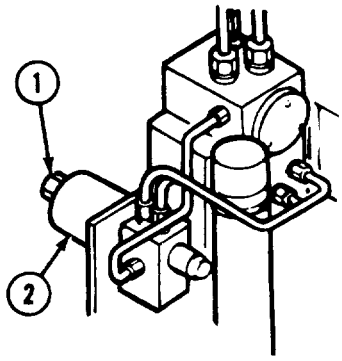
STEP	PROCEDURE
1.	Using Allen wrench remove two screws (1) and two lockwashers (2) that attach control levers (3) to commander's control shafts (4).
2.	Remove two control levers (3) from control shafts (4).
	GO TO FRAME 2



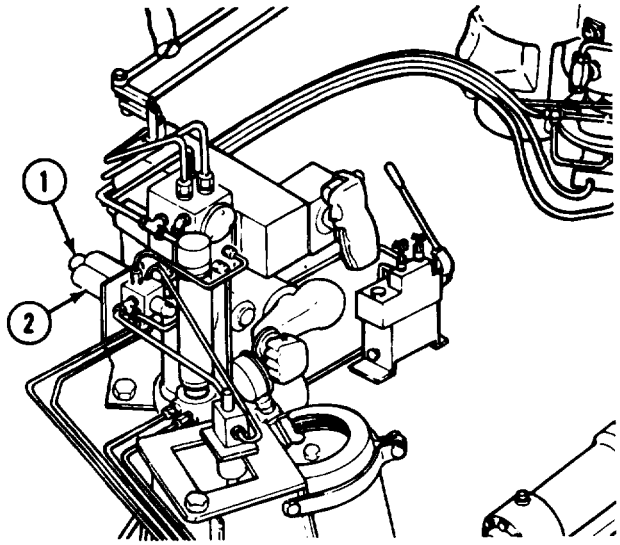
13-3. POWER PACK REMOVAL PROCEDURE (CONT)

FRAME 2

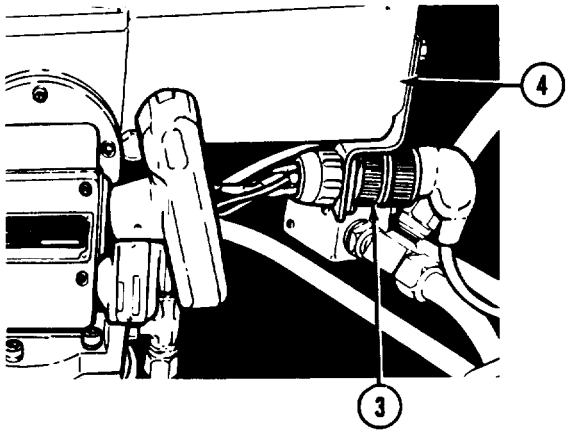
STEP	PROCEDURE
1.	Disconnect electrical connector (1) from deck clearance valve solenoid (2) (JPG).
2.	Using pliers, disconnect electrical connector (3) from bottom of gunner's control (4) (JPG).
3.	Using spanner wrench, disconnect electrical connectors (5) from power pack motor (6) (JPG).
	GO TO FRAME 3 (EARLY MODEL)
	GO TO FRAME 4.1 (LATE MODEL)

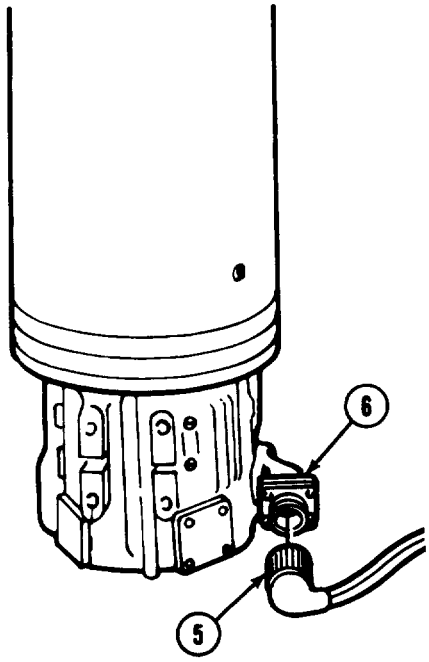


EARLY MODEL



LATE MODEL

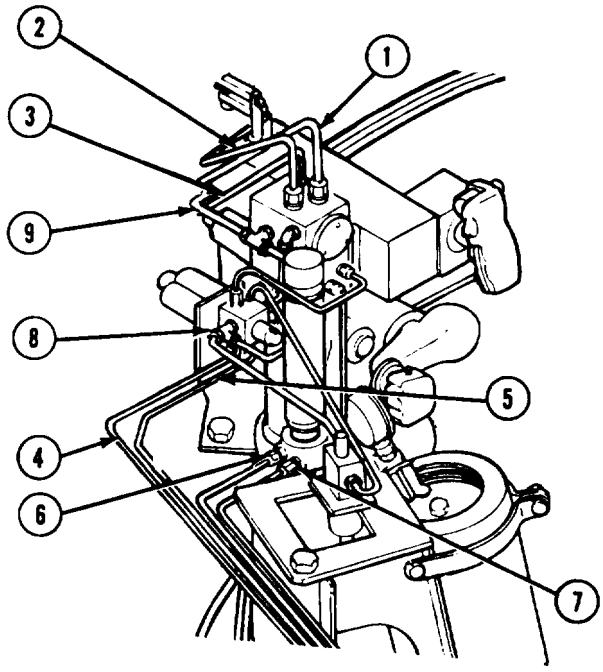




13-3. POWER PACK REMOVAL PROCEDURE (CONT)

FRAME 3

STEP	PROCEDURE
1.	**Using 3/4 inch and 1 inch open end wrenches, disconnect two tubes (1 and 2) from power pack. Tag tubes (JPG).**
2.	**Using 5/8 inch and 11/16 inch open end wrenches, disconnect seven tubes (3 thru 9) from power pack. Tag tubes (JPG).**
	GO TO FRAME 4

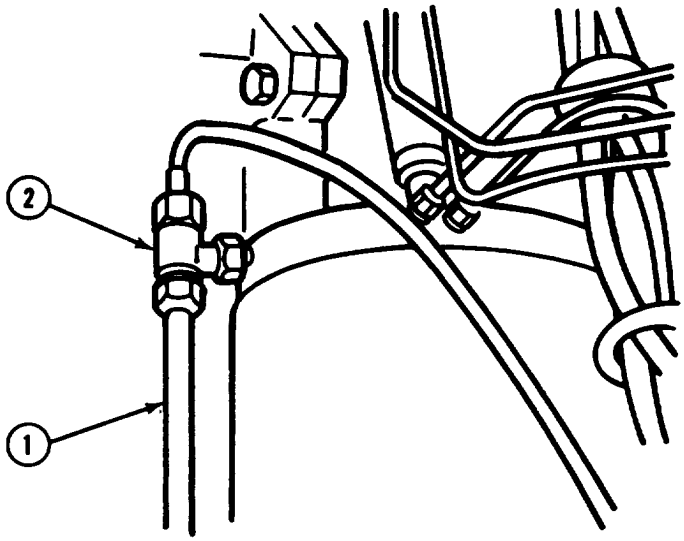


EARLY MODEL

13-3. **POWER PACK REMOVAL PROCEDURE (CONT)**

FRAME 4

STEP	PROCEDURE
1.	**Using 1-1/8 inch open end wrench, disconnect tube (1) from relief valve (2). Tag tube (JPG).** **GO TO FRAME 6**

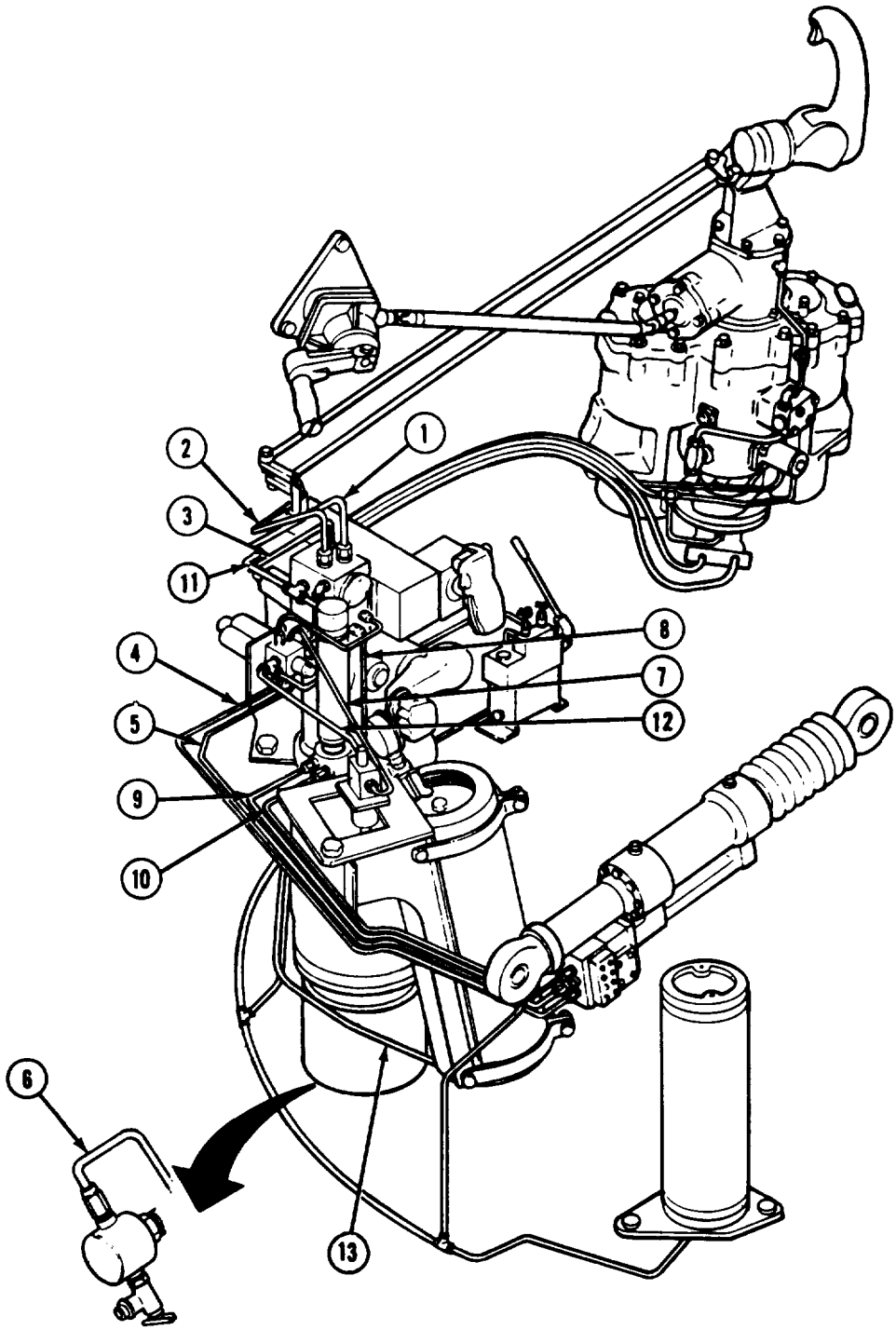


EARLY MODEL

13-3. POWER PACK REMOVAL PROCEDURE (CONT)

FRAME 4.1

STEP	PROCEDURE
1.	Remove any tube holders, if necessary, that hold tube assemblies to equipment (TM- 20-2-3-1, Maintenance Procedure Index).
2.	Using 7/8 inch wrench on tube assembly nuts and 1-1/8 inch wrench on nipples, disconnect tubes (1 and 2). Tag lines (JPG).
3.	Using 9/16 inch wrench on tube assembly nuts and 11/16 inch wrench on nipples, disconnect tubes (3 thru 7). Tag lines (JPG).
4.	Using 9/16 inch wrench on tube assembly nuts and 13/16 inch wrench on reducers, disconnect tubes (8 thru 10). Tag lines (JPG).
5.	Using 9/16 inch wrench on tube assembly nuts, disconnect tubes (11 and 12) from tees. Tag lines (JPG).
6.	Using 1 inch wrench on tube assembly nuts, disconnect tube (13) from elbow. Tag line (JPG).
	GO TO FRAME 5

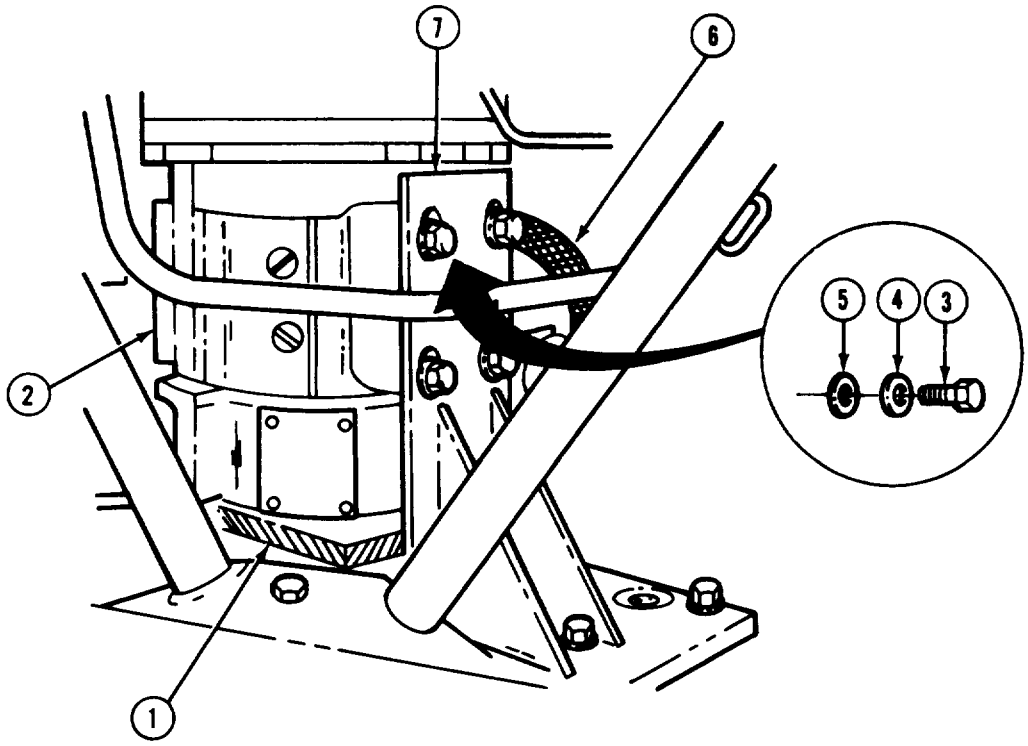


LATE MODEL

13-3. POWER PACK REMOVAL PROCEDURE (CONT)

FRAME 5

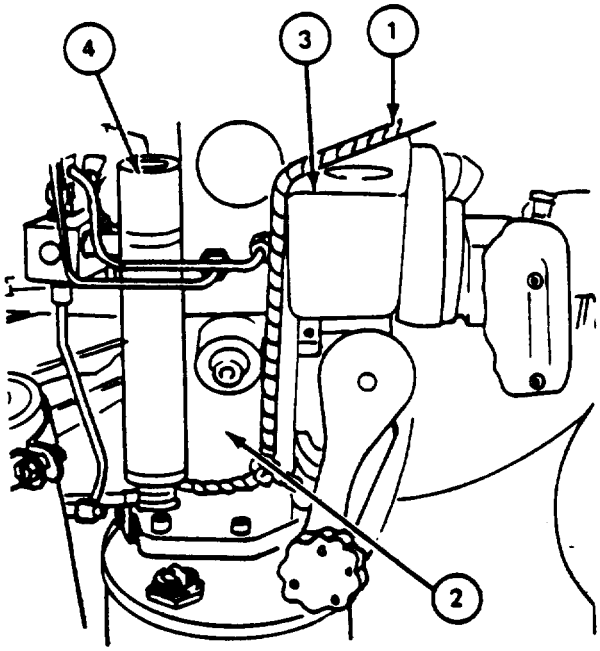
STEP	PROCEDURE
1.	Put two (2 inch x 2 inch x 6 inch) blocks of wood (1) under motor (2) to support power pack. Do not put wood under bearing hump at center of motor.
2.	Using socket wrench, remove four screws (3), four lockwashers (4), four flat washers (5), and ground strap (6) that attach motor (2) to bracket (7).
	GO TO FRAME 6

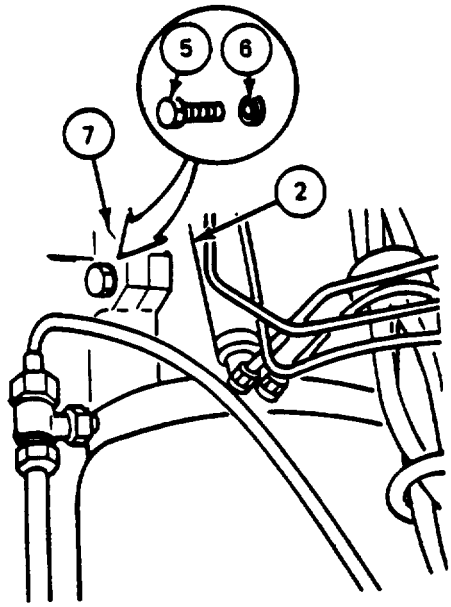


13-3. POWER PACK REMOVAL PROCEDURE (CONT)

FRAME 6

Step	Procedure
1.	Tie rope (1) around riser (2) under gunner's control (3). Run rope between accumulator (4) and riser (2), up and over top of gunner's control (3).
	CAUTION
	Hold power pack to keep it from falling.
2.	Using socket wrench and extension, remove two screws (5) and two lockwashers (6) that attach riser (2) to bracket (7).
	GO TO FRAME 7

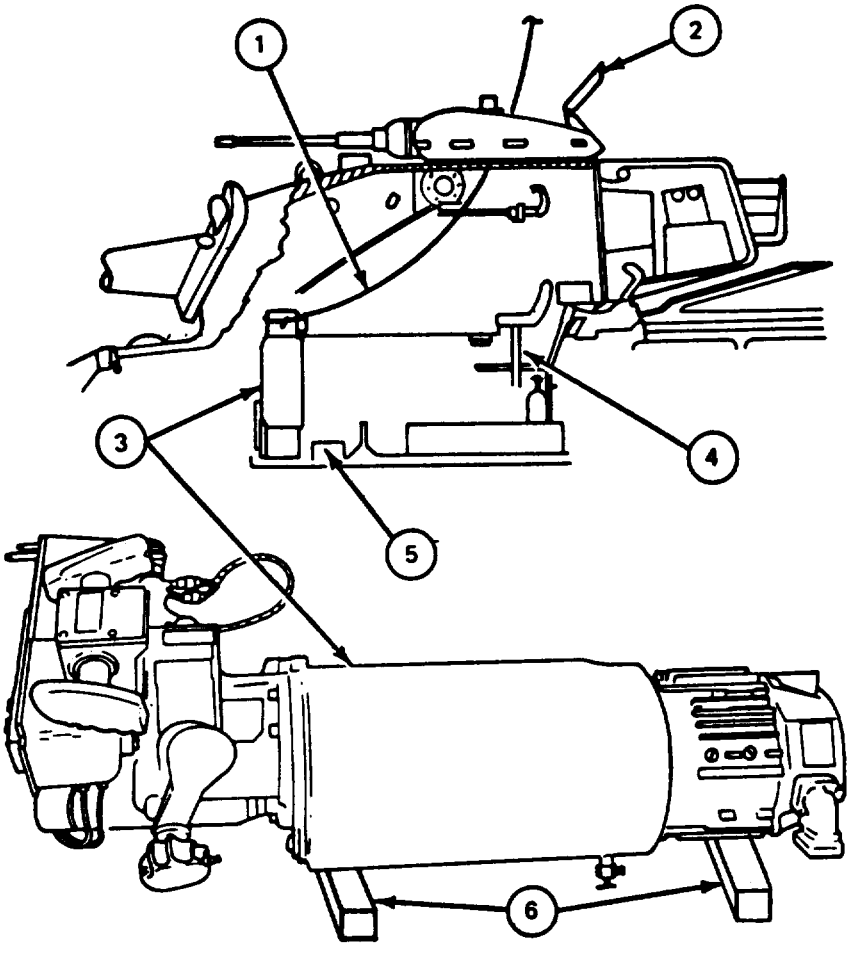




13-3. POWER PACK REMOVAL PROCEDURE (CONT)

FRAME 7

Step	Procedure
	WARNING Power pack weighs approximately 280 pounds. Handle it with care so no one is hurt.
1.	Put hoist hook (1) down through cupola hatch (2).
2.	Tie rope around power pack (3) and attach to hoist hook (1).
	CAUTION Be careful while moving power pack across floor of turret. Do not rest weight of power pack on relay control box because you may damage it.
3.	Soldier A and Soldier B with help from hoist, move power pack (3) close to commander's seat (4), without resting weight of power pack on relay control box (5).
4.	Using hoist, lift power pack (3) from vehicle. Soldier A, Soldier B, and Soldier C guide power pack through cupola hatch (2) as it is lifted.
	CAUTION When power pack (3) is laid on wood blocks, take care not to damage tubes or ports, or to rest weight against gunner's handles.
5.	Outside of vehicle, lower power pack (3) to clean surface and lay on wood blocks (6).
6.	Untie rope from power pack (3).
7.	Using rag, clean up spilled hydraulic fluid.
	END OF TASK


1
2
3
4
5
6

13-4. POWER PACK INSTALLATION PROCEDURE

TOOLS: 1/2 in. drive ratchet
6 in. extension (1/2 in. drive)
Hoist
3/4 in. socket (1/2 in. drive)
7/8 in. open end wrench
9/16 in. open end wrench
11/16 in. open end wrench
13/16 in. open end wrench (late model)
5/8 in. open end wrench (early model)
3/4 in. open end wrench (early model)
1 in. open end wrench
1-1/8 in. open end wrench
Adjustable hook spanner wrench
3/16 in. socket head screw key (Allen wrench)
Slip joint pliers with plastic jaws (connector pliers)
3/8 in. socket head socket wrench attachment (3/8 in. drive)
Torque wrench (3/8 in. drive) (0-150 lbs-in.) (0-16.8 N-m)

SUPPLIES: Wood blocks (2 in. x 2 in. x 6 in.) (two)
Lint-free clothe (item 21, App. A)
Wood blocks (12 in. x 12 in. x 12 in.) (two)
Rope (3/4 in. diameter x 20 feet long)

PERSONNEL: Four

REFERENCES: TM 9-2350-222-10 for procedures to:
Traverse turret
Check main accumulator nitrogen charge
JPG for procedure to install electrical connectors
TM 9-2350-222-20-2-3 for procedures to:
Install gunner's control box mounting bracket
Install gunner's control box
Install gunner's seat
Check manual accumulator nitrogen charge
Fill hydraulic reservoir with fluid
Bleed hydraulic system
Install gunner's footrest plate

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-3	11
Power Pack	FO-1	15
Main Accumulator	FO-1	16

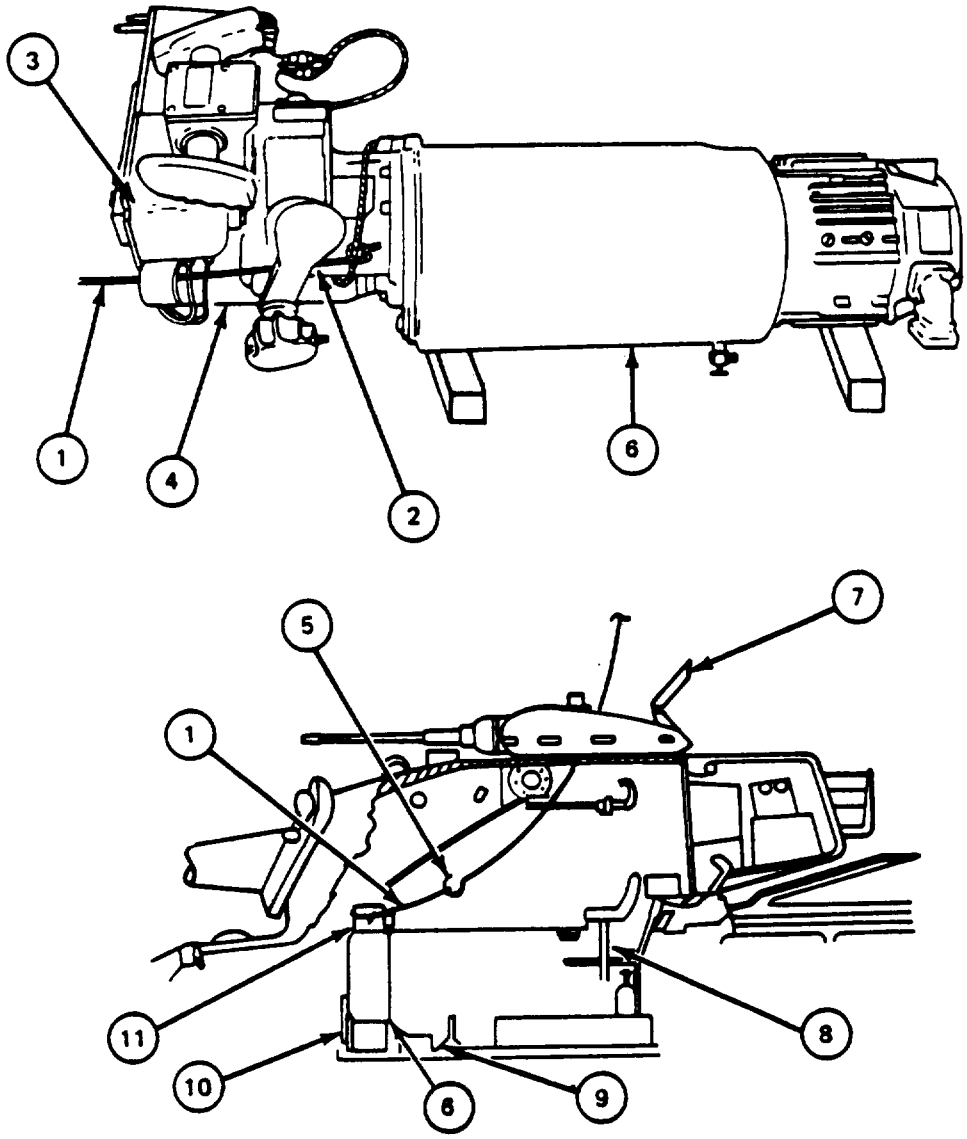
EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF

PRELIMINARY PROCEDURES: Assemble power pack (para 13-6)
Install gunner's control handle (para 13-88)
Install manual elevation pump (para 13-61)

13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 1

STEP	PROCEDURE
	WARNING Power pack (6) weighs approximately 280 pounds. Handle it with care so no one is hurt.
1.	Tie rope (1) around ricer (2) under gunner's control (3). Run rope between accumulator (4) and ricer (2).
2.	Tie rope (1) to hook (5) of hoist.
3.	Using hoist, lift power pack (6) and put over cupola hatch (7) opening.
4.	Soldier A, soldier B, soldier C, and soldier D: Guide power pack (6) as it is lowered inside vehicle to turret floor near commander's seat (8). **CAUTION** Be careful while moving power pack (6) across floor of turret Do not rest weight of power pack (6] on relay control box (9),
5.	Soldier A and soldier B. With help of hoist, move power pack (6) over to mounting bracket (10) without resting weight of power pack on relay control box (9). Line up mounting bolt holes with brackets (10) and (11). **GO TO FRAME 2**


3
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7
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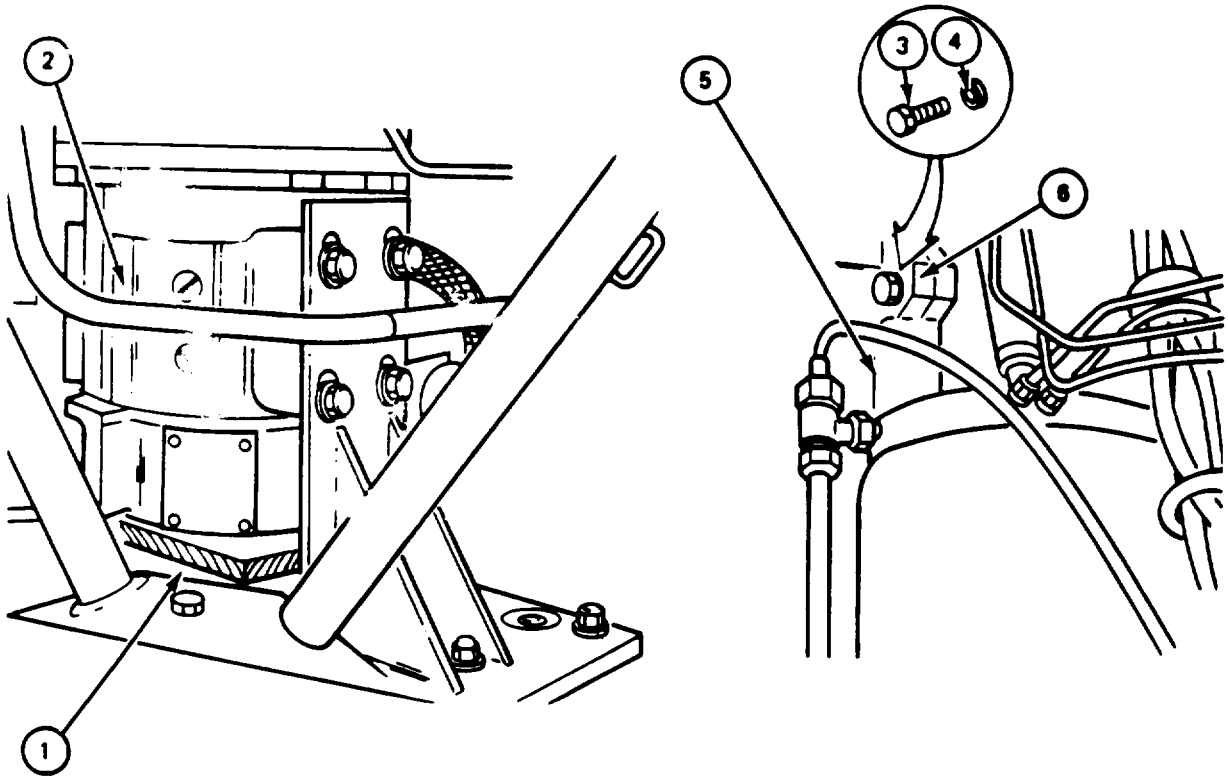
13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 2

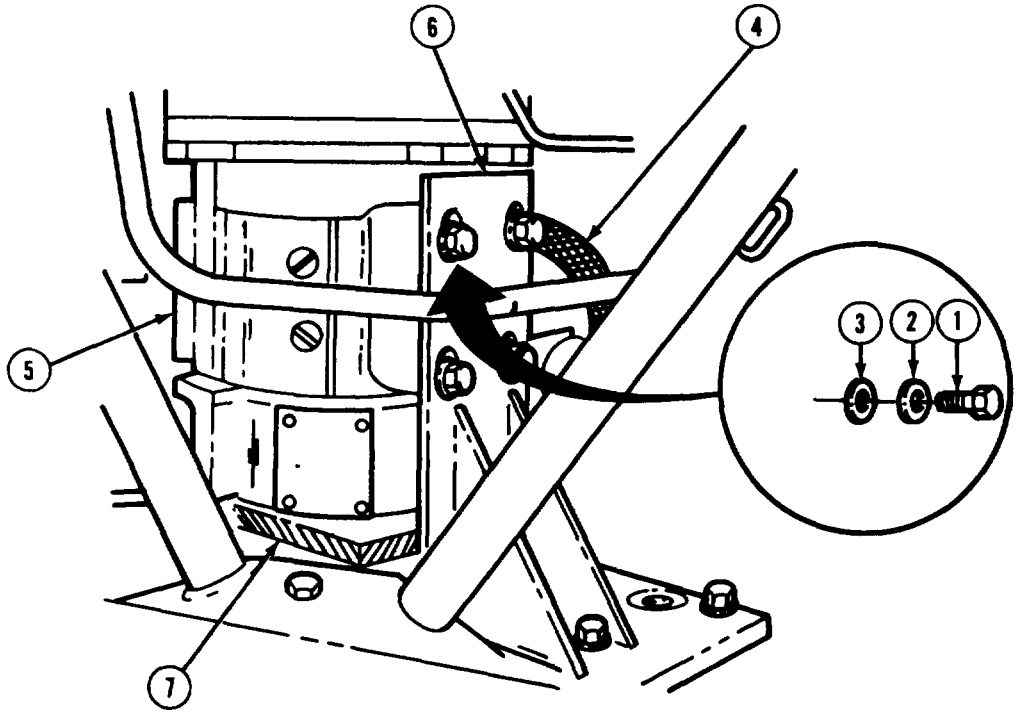
Step	Procedure
	CAUTION Do not put blocks under bearing hump at center of motor. Bearing can be damaged.
1.	Put blocks of wood (1) under motor (2) to support power pack.
2.	Using 3/4" socket wrench and extension, put in two screws (3) and two lockwashers (4) that attach riser (5) to bracket (6).
	GO TO FRAME 3



13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 3

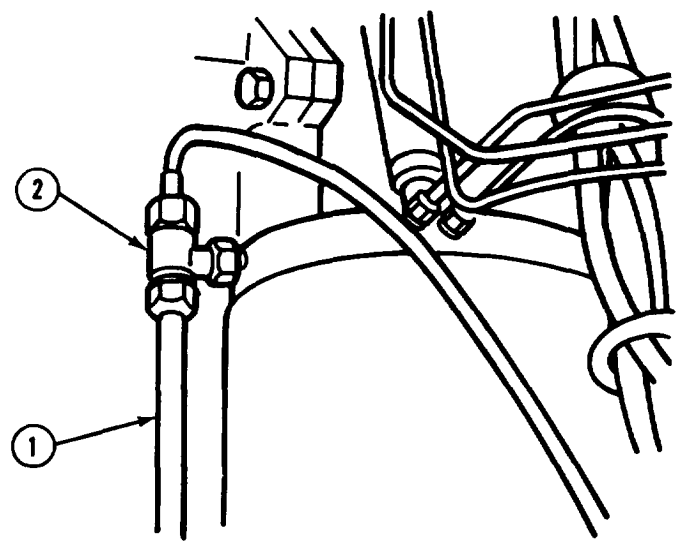
STEP	PROCEDURE
1.	Using 3/4 inch socket wrench, put in four screws (1), four lockwashers (2), four flat washers (3), and ground strap (4), that attach motor (5) to bracket (6).
2.	Remove blocks of wood (7).
3.	Remove rope from power pack.
	GO TO FRAME 4 (EARLY MODEL)
	GO TO FRAME 5.1 (LATE MODEL)



13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 4

STEP	PROCEDURE
1.	**Using 1-1/8 inch open end wrench, connect tube (1) to relief valve (2).** **GO TO FRAME 5**

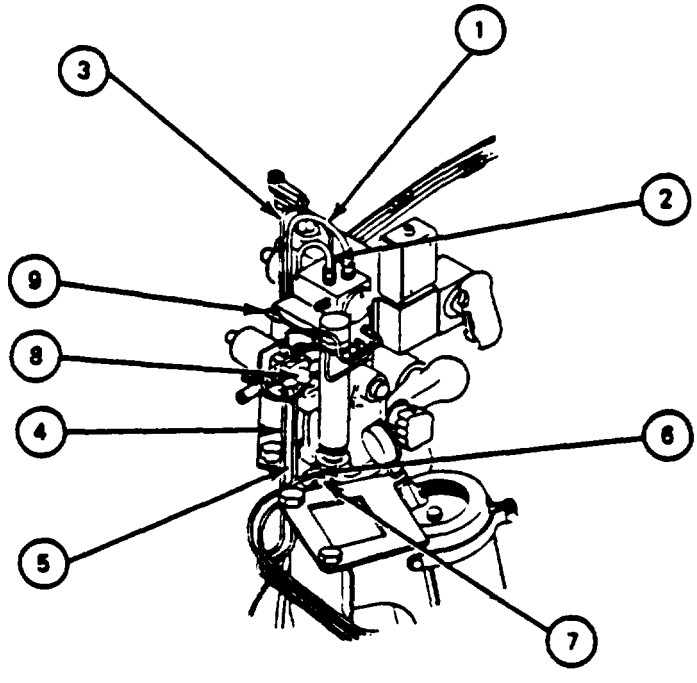


EARLY MODEL

13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 5

STEP	PROCEDURE
1.	Using 3/4 inch combination wrench, connect two tubes (1) and (2) to power pack.
2.	Using 5/8 inch open end wrench, connect seven tubes (3) thru (9) to power pack.
	GO TO FRAME 6

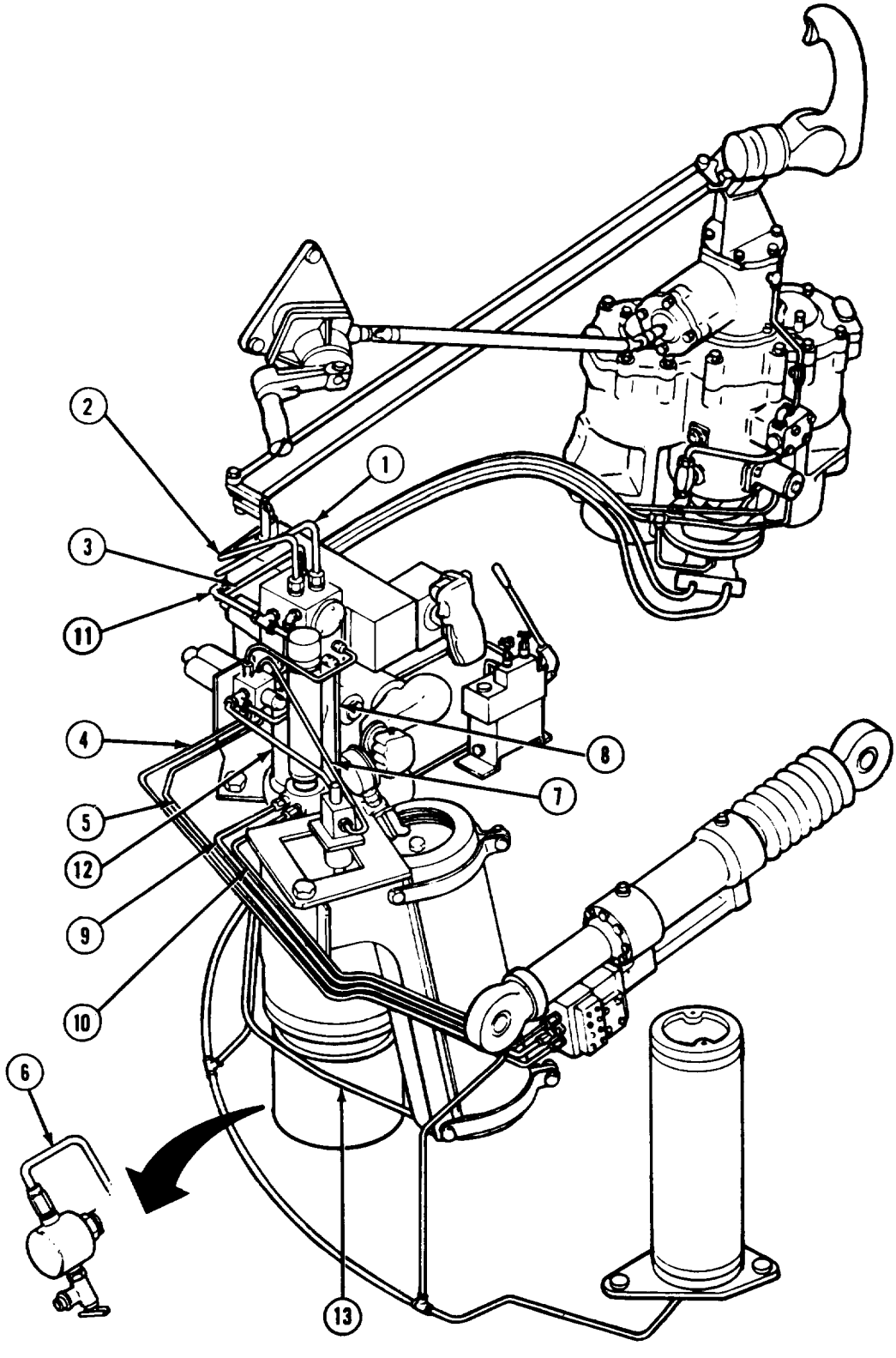


EARLY MODEL

13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 5.1

STEP	PROCEDURE
1.	Using 7/8 inch wrench on tube assembly nuts and 1-1/8 inch wrench on nipples, connect tubes (1 and 2).
2.	Using 9/16 inch wrench on tube assembly nuts and 11/16 inch wrench on nipples, connect tubes (3 thru 7).
3.	Using 9/16 inch wrench on tube assembly nuts and 13/16 inch wrench on reducers. connect tubes (8 thru 10).
4.	Using 9/16 inch wrench on tube assembly nuts connect tubes (11 and 12) to tees.
5.	Using 1 inch wrench on tube assembly nut, connect tube (13) to elbow.
6.	Install any tube holders, if any were removed from tube assemblies (TM-20-2-3-1, Maintenance Procedure Index). Remove tags from tubes. GO TO **FRAME 6**

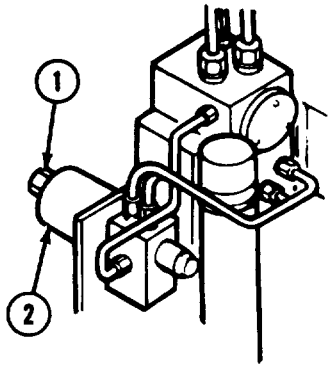


LATE MODEL

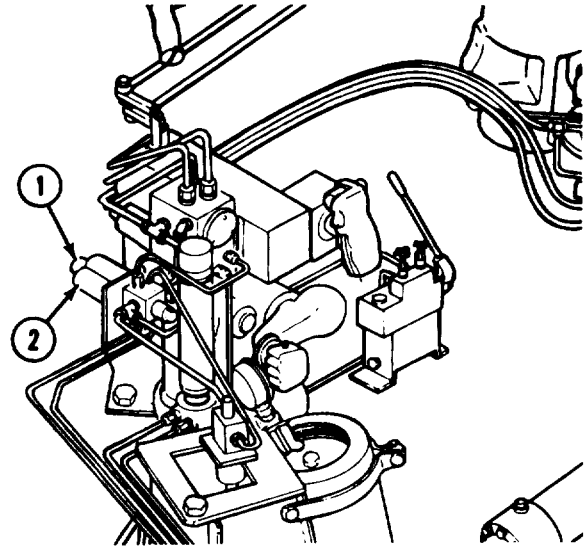
13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 6

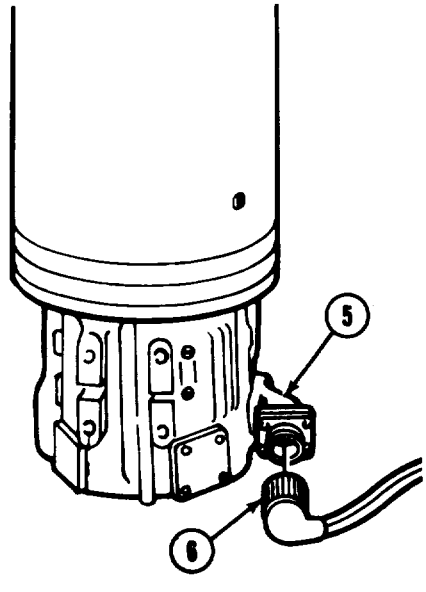
STEP	PROCEDURE
1.	Using fingers, connect electrical connector (1) on deck clearance valve solenoid (2) (JPG).
2.	Using pliers, connect electrical connector (3) under gunner's control housing (4) (JPG).
3.	Using spanner wrench, connect electrical connector (5) on power pack motor (6) (JPG).
	GO TO FRAME 7

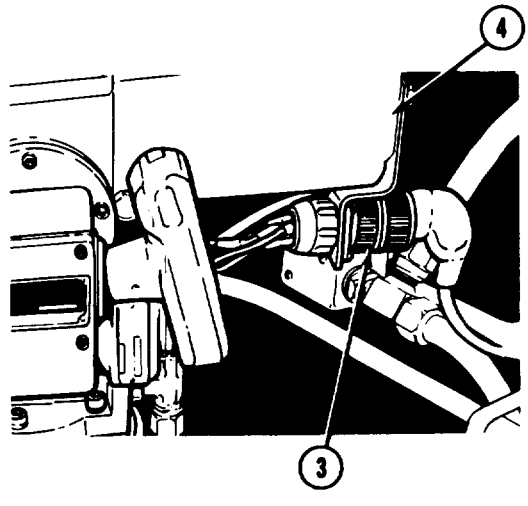


EARLY MODEL



LATE MODEL

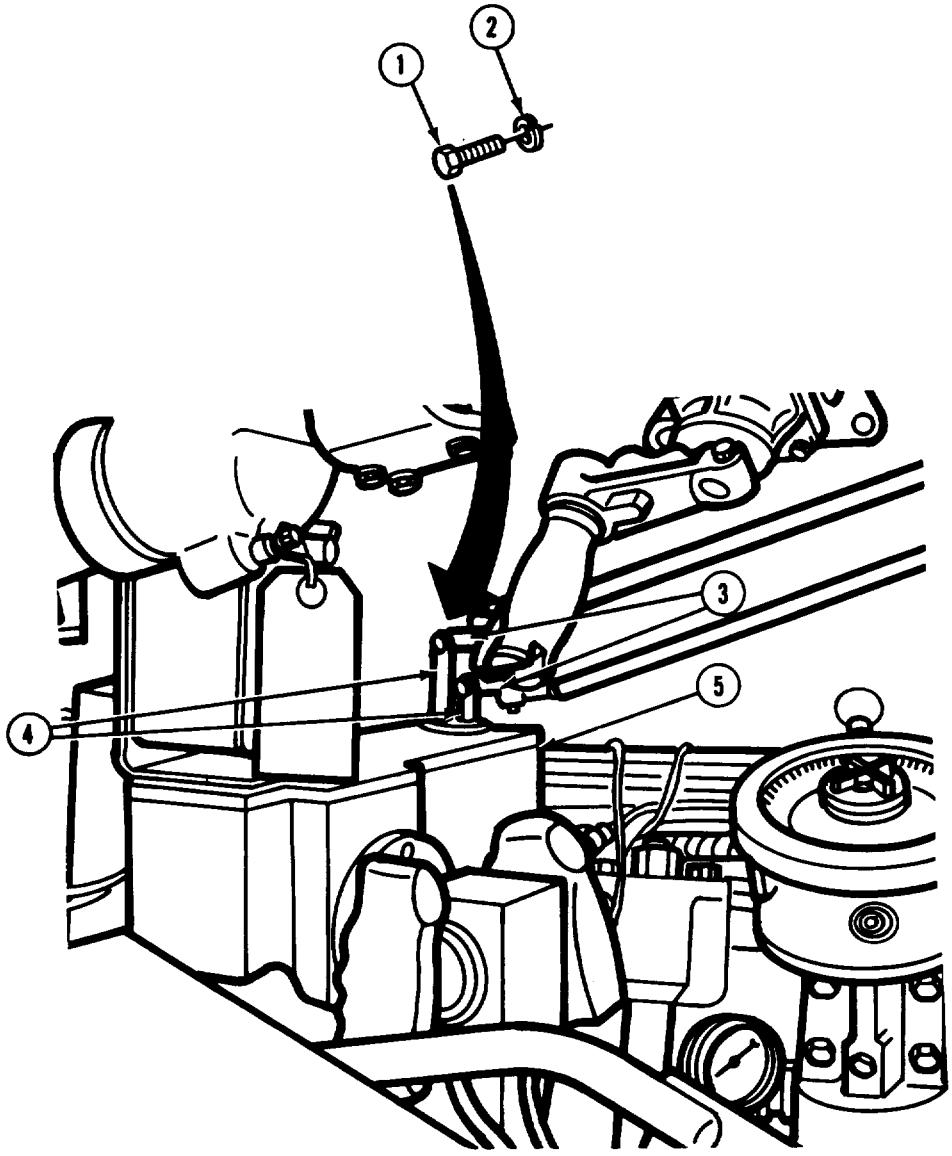




13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 7

STEP	PROCEDURE
1.	Using **Allen Wrench, install two screws (1) and two lockwashers (2) that attach two control levers (3) to control shafts (4) on gunner's control (5).**
2.	**Using 3/8 inch socket wrench attachment and torque wrench, tighten screws (1) to 80-110 lbs-in. (8.9 - 12.3 N-m).**
	NOTE Follow-on Maintenance Action Required: Install gunner's footrest plate (TM-20-2-3). Install gunner's control box mounting bracket (TM-20-2-3). Install gunner's control box (TM-20-2-3). Install gunner's seat (TM-20-2-3). Check manual accumulator nitrogen charge (TM-20-2-3). Check main accumulator nitrogen charge (TM-10). Fill hydraulic reservoir (TM-20-2-3). Bleed hydraulic system (TM-20-2-3). Traverse turret in power mode to make sure It operates properly (TM-10). END OF TASK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13-5. POWER PACK DISASSEMBLY PROCEDURE

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedures to:
Remove oil strainer
Remove manual elevation accumulator
Remove gunner's control
Remove relief valve (late model)

EQUIPMENT CONDITION: Gunner's control removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Remove power pack (para 13-3)
Remove manual elevation pump (para 13-60)

13-5. POWER PACK DISASSEMBLY PROCEDURE (CONT)

FRAME 1

STEP	PROCEDURE
1.	**Remove relief valve, early model (para 13-27), late model (TM-20-2-3).**
2.	**Remove manual elevation accumulator (TM-20-2-3).**
3.	**Remove shuttle valve (para 13-21).**
4.	**Remove oil strainer (TM-20-2-3).**
5.	**Remove hydraulic riser (para 13-14).**
6.	**Remove check valve (para 13-36).**
7.	**Remove drain tube (para 13-32).**
8.	**Remove oil filter (para 13-43).**
9.	**Remove electric drive motor (para 13-56).**
10.	**Remove oil reservoir (para 13-48).**
11.	**Remove hydraulic pump (para 13-53).**
12.	**Disassemble relief valve (para 13-29) (early model).**
13.	**Disassemble manual elevation accumulator (para 13-9).**
14.	**Disassemble shuttle valve (para 13-23).**
15.	**Disassemble hydraulic riser (para 13-16).**
16.	**Disassemble check valve (para 13-38).**
17.	**Disassemble oil filter (para 13-45).**
18.	**Disassemble oil reservoir (para 13-50).**
	END OF TASK

13-6. POWER PACK ASSEMBLY PROCEDURE

PERSONNEL: One

REFERENCES: TM 9-2350-222-202-3 for procedures to:
Install manual elevation accumulator
Install oil strainer
Install gunner's control
Install relief valve (late model)

FRAME 1

STEP	PROCEDURE
1.	**Assemble oil reservoir (para 13-51).**
2.	**Assemble oil filter (para 13-46).**
3.	**Assemble check valve (para 13-39).**
4.	**Assemble hydraulic riser (para 13-17).**
5.	**Assemble shuttle valve (para 13-24).**
6.	**Assemble manual elevation accumulator (para 13-10).**
7.	**Assemble relief valve (para 13-30) (early model).**
8.	**Install hydraulic pump (para 13-54).**
9.	**Install oil reservoir (para 13-49).**
10.	**Install electric drive motor (para 13-57).**
	GO TO FRAME 2

13-6. POWER PACK ASSEMBLY PROCEDURE (CONT)

FRAME 2

STEP	PROCEDURE
1.	Install oil filter (para 13-44).
2.	Install drain tube (para 13-33).
3.	Install check valve (para 13-37).
4.	Install hydraulic riser (para 13-15).
5.	Install oil strainer (TM-20-2-3)
6.	Install shuttle valve (para 13-22).
7.	Install manual elevation accumulator (TM-20-2-3).
8.	Install relief valve, early model (para 13-28), late model (TM-20-2-3)
	NOTE **Follow-on Maintenance Action Required:** **Install manual elevation pump (para 13-61).** **Install gunner's control (TM-20-2-3).**
	END OF TASK

Section 3. MANUAL ELEVATION ACCUMULATOR

13-7. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks Test	Disassembly	Assembly
Manual Elevation Accumulator	13-8	13-9	13-10

13-8. MANUAL ELEVATION ACCUMULATOR TEST PROCEDURE

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

TOOLS: 10 in. adjustable wrench
3/8 in. combination wrench
Drive pin punch (0.050 in. diameter)
3/4 in. combination wrench

SUPPLIES: Pan (two)
Wood dowel (3/16 in. diameter, 6 in. long)
Hydraulic fluid (item 10, App. A)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

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

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

PRELIMINARY PROCEDURES: Assemble manual elevation accumulator (para. 13-10)

GENERAL INSTRUCTIONS:

WARNING

Hydraulic fluid under pressure can hurt or kill you. This test is done with high pressure hydraulic fluid. Follow procedure carefully.

NOTE

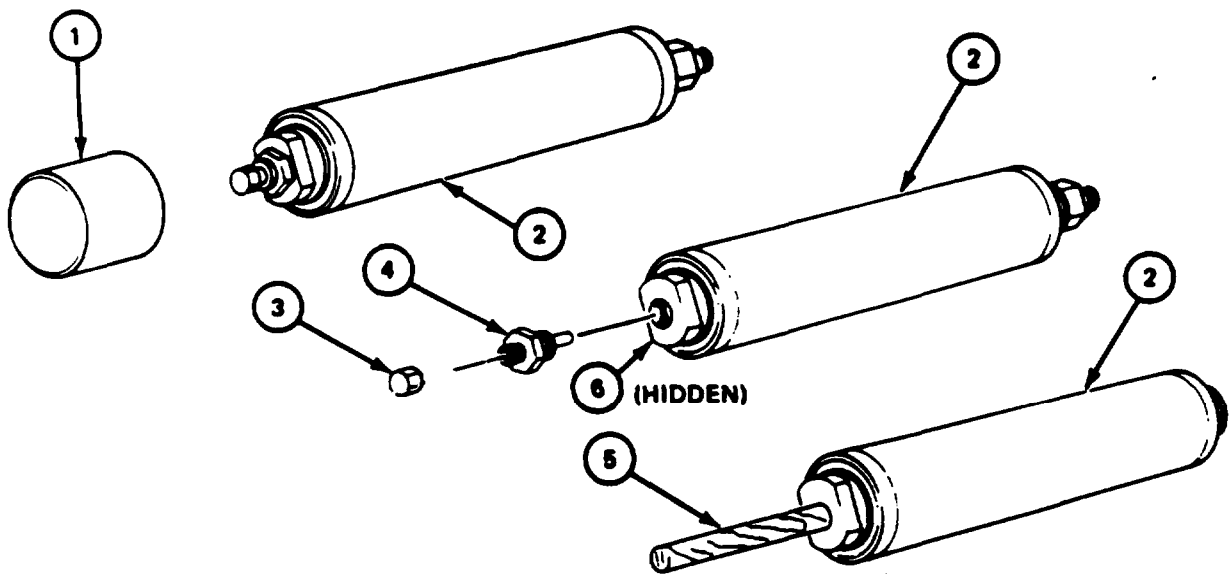
Suitable fittings, preformed packings, and tools should be used to connect test equipment to parts being tested.

If normal indication is not obtained, accumulator is bad. Disassemble bad accumulator (para. 13-9).

13-8. MANUAL ELEVATION ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 1

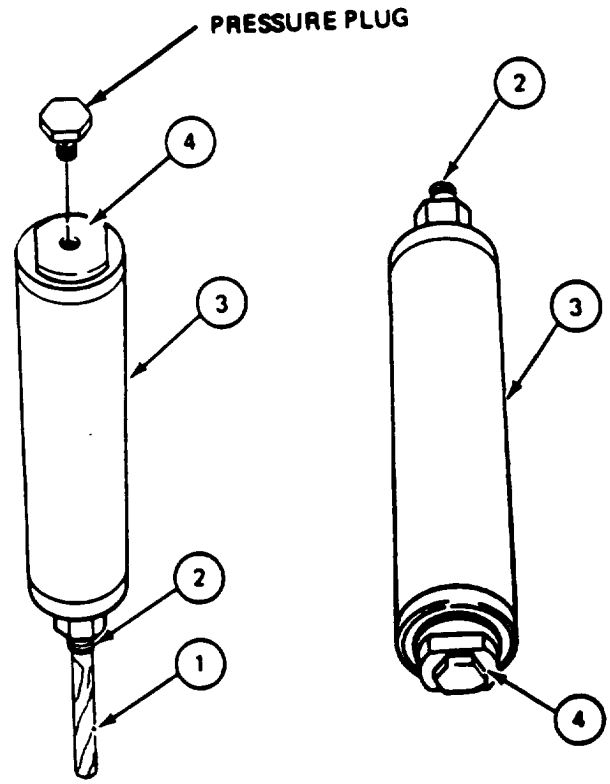
Step	Procedure
1.	Remove end cap (1) from accumulator (2).
2.	Using 3/8" combination wrench, remove valve cap (3) from charging valve (4).
	WARNING Make sure accumulator gas chamber is not pressurized before removing charging valve (4). Removal of valve under pressure can hurt or kill you.
3.	Using punch, press center pin of charging valve (4) until valve is open. If accumulator gas chamber is pressurized, gas can be heard escaping from valve. Bleed gas from valve slowly until it stops. Remove punch.
4.	Using adjustable wrench, and 3/4" combination wrench, remove charging valve (4) from accumulator (2).
5.	Using wood dowel (5), push accumulator piston (6) to about two inches from either end of accumulator. Remove wood dowel.
	GO TO FRAME 2



13-8. MANUAL ELEVATION ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 2

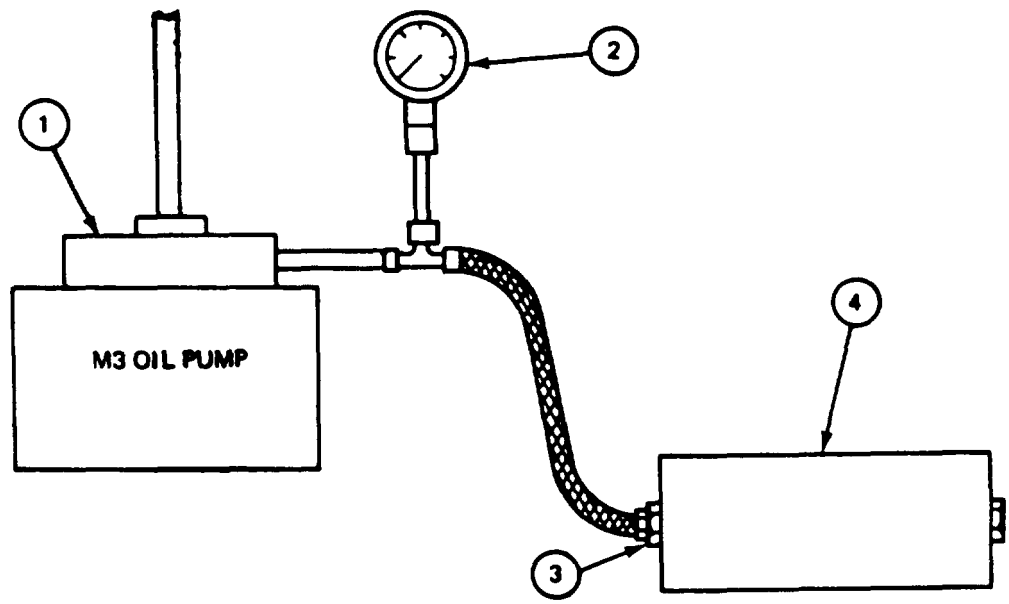
Step	Procedure
1.	Put wood dowel (1) in port (2) of accumulator (3) until it touches accumulator piston.
2.	Turn accumulator (3) until charging valve port (4) is on top.
3.	Holding wood dowel (1) against piston, fill gas chamber of accumulator (3) with hydraulic fluid through port (4).
4.	When chamber is full, plug port (4).
5.	Remove wood dowel (1).
6.	Tighten pressure plug.
7.	Turn accumulator (3) until oil port (2) is on top.
8.	Fill oil chamber with hydraulic fluid through port (2).
	GO TO FRAME 3



13-8. MANUAL ELEVATION ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 3

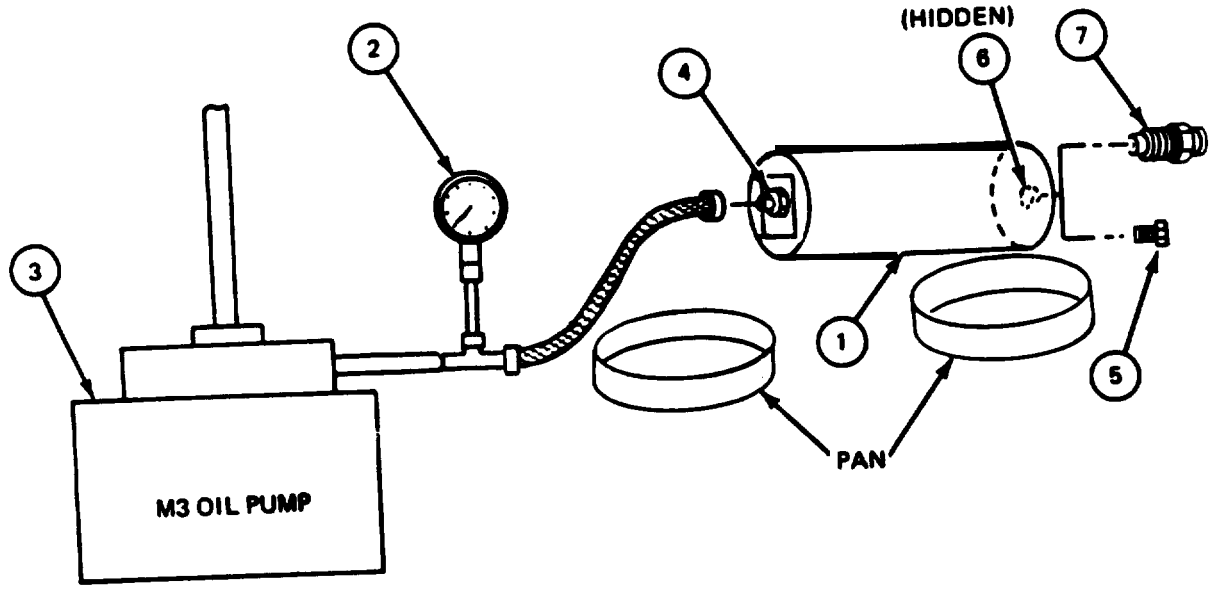
Step	Procedure
1.	Assemble M3 oil pump (1).
2.	Connect M3 oil pump (1) and pressure gauge (2) to oil port (3) of accumulator (4).
3.	Using lint-free cloths, wipe all hydraulic fluid from outside of accumulator (4).
4.	Operate pump until pressure gauge (2) reads between 800 and 850 psi (JPG).
	NOTE No hydraulic fluid should leak out of accumulator.
5.	Using watch, check accumulator (4) for leaks for five minutes.
	GO TO FRAME 4



13-8. MANUAL ELEVATION ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 4

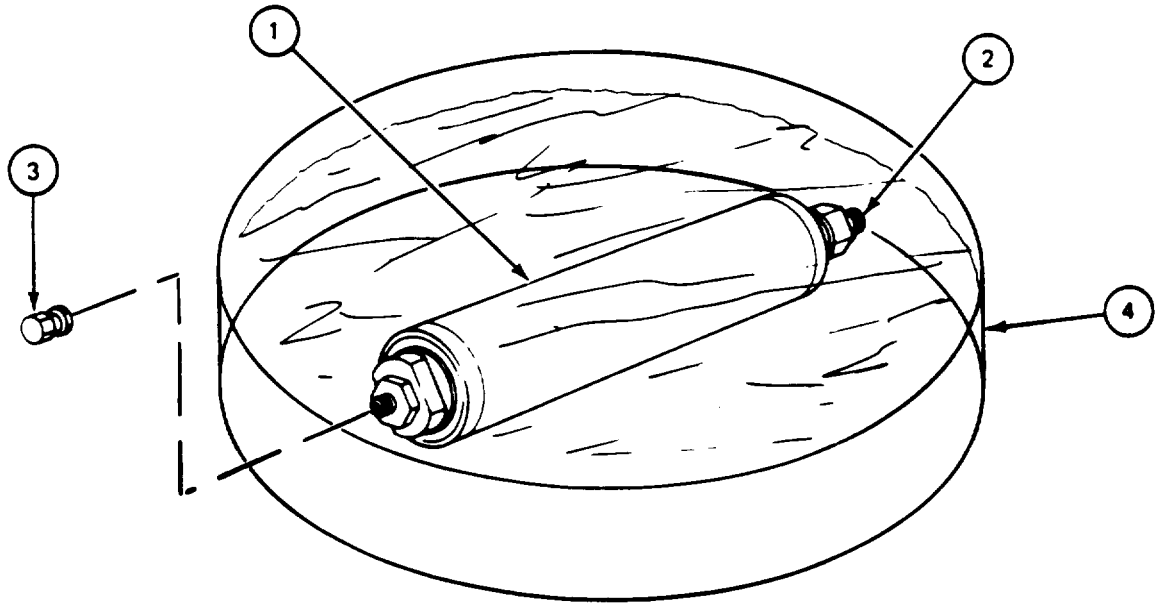
Step	Procedure
1.	Slowly lower hydraulic pressure in accumulator (1) until pressure gauge (2) reads 0 psi (JPG).
	NOTE Use pan to catch hydraulic fluid.
2.	Disconnect M3 oil pump (3) from accumulator oil port (4). Let hydraulic fluid drain into pan.
3.	Using adjustable wrench, remove pressure plug (5) from charging valve port (6).
4.	Pour hydraulic fluid out of accumulator gas chamber through charging valve port (6). Let hydraulic fluid drip from port for at least 10 minutes.
5.	Using adjustable wrench, and 3/4" combination wrench, install charging valve (7) in charging valve port (6).
	GO TO FRAME 5



13-8. MANUAL ELEVATION ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 5

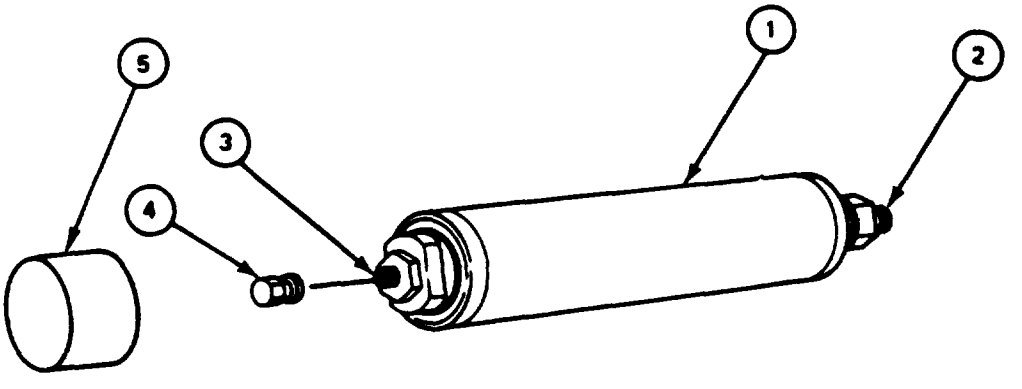
Step	Procedure
1.	Charge accumulator (1) to about 100 psi with nitrogen gas (TM-20-2-3).
2.	With oil port (2) open and gas charging valve cap (3) removed, put accumulator (1) in pan (4).
3.	Cover accumulator (1) with hydraulic fluid.
	NOTE No bubbles should come out of accumulator during test. Bubbles mean accumulator is leaking.
4.	Using watch, check accumulator for bubbles (leaks) for 10 minutes.
	GO TO FRAME 6



13-8. MANUAL ELEVATION ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 6

Step	Procedure
1.	Take accumulator (1) out of pan.
2.	Pour hydraulic fluid out of oil port (2) into pan.
3.	Using punch, press down on middle of charging valve (3) until all nitrogen gas is out of accumulator (1).
4.	Let accumulator drip dry for at least 10 minutes.
5.	Using 3/8” combination wrench, install charging valve cap (4).
6.	Install end cap (5).
7.	Disassemble M3 oil pump.
	NOTE If normal indication was obtained in Frames 1 through 5, accumulator is good.
	END OF TASK



13-9. MANUAL ELEVATION ACCUMULATOR DISASSEMBLY PROCEDURE

TOOLS: 3/8” combination wrench
3/4” combination wrench
l-1/8” combination wrench
Drive pin punch (0.050” diameter)
Valve core tool
1/8” flat tip screwdriver
Wood dowel 1/2” diameter, 10” long
O-ring extractor kit
Vise with brass caps
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Lint-free cloths (item 21, App. A)
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 manual elevation accumulator
JPG for procedures to:
Remove preformed packings
Remove retaining rings
Clean parts
Inspect and repair parts

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

PRELIMINARY PROCEDURES: Test manual elevation accumulator (para 13-8)

GENERAL INSTRUCTIONS:

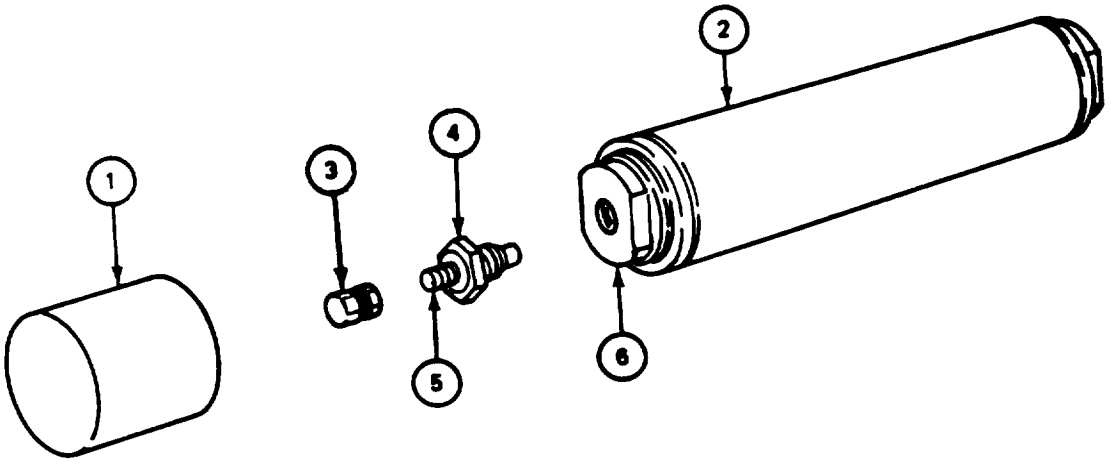
CAUTION

Hydraulic parts must be protected from dirt during disassembly. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

13-9. MANUAL ELEVATION ACCUMULATOR DISASSEMBLY PROCEDURE (CONT)

FRAME 1

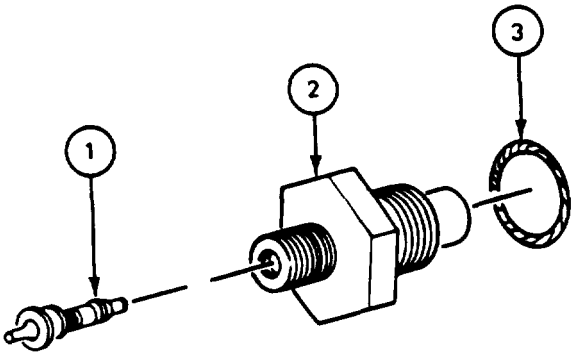
Step	Procedure
1.	Using hands, remove cap (1) from cylinder (2).
2.	Using 3/8” wrench, remove valve cap (3) from valve body (4).
3.	Using punch, press valve core (5) in valve body (4) to release any nitrogen pressure.
4.	Using l-l/8” wrench on fitting (6) and 3/4” wrench on valve body (4), remove valve body from fitting.
	GO TO FRAME 2



13-9. MANUAL ELEVATION ACCUMULATOR DISASSEMBLY PROCEDURE (CONT)

FRAME 2

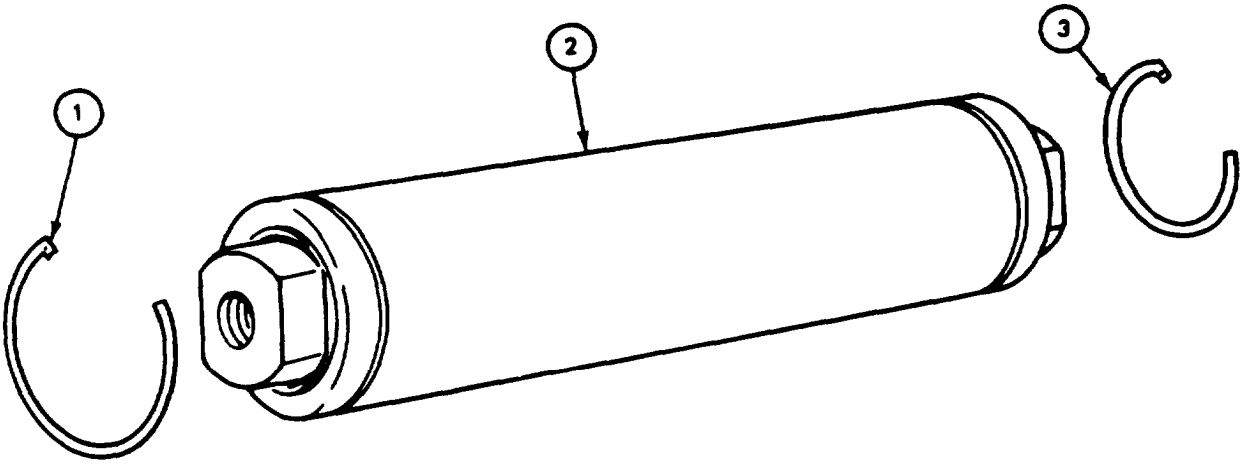
Step	Procedure
1.	Using valve core tool, remove valve core (1) from valve body (2).
2.	Using O-ring extractor tool, remove preformed packing (3) from valve body (2) (JPG). Throw preformed packing away.
	GO TO FRAME 3



13-9 MANUAL ELEVATION ACCUMULATOR DISASSEMBLY PROCEDURE (CONT)

FRAME 3

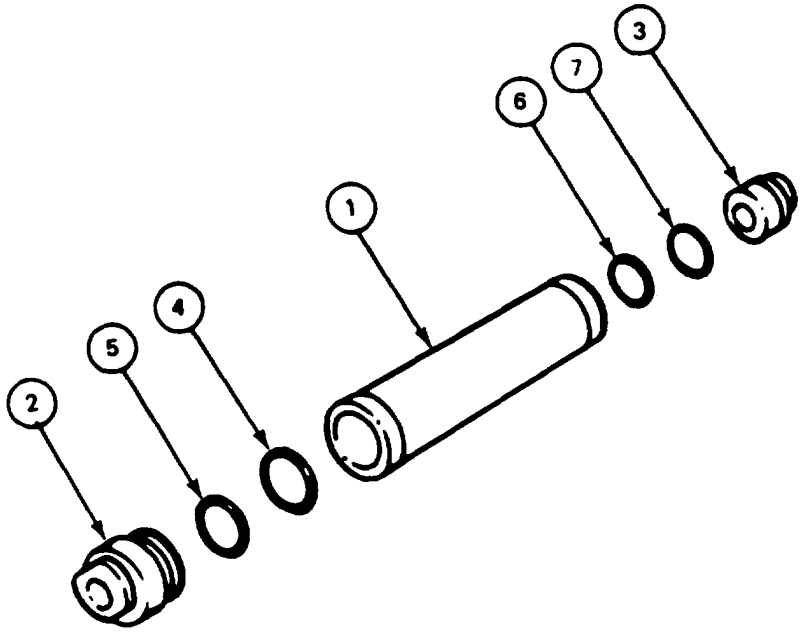
Step	Procedure
1.	Using punch and screwdriver, remove retaining ring (1) from cylinder (2) (JPG).
2.	Using punch and screwdriver, remove retaining ring (3) from cylinder (2) (JPG).
	GO TO FRAME 4



13-9. MANUAL ELEVATION ACCUMULATOR DISASSEMBLY PROCEDURE (CONT)

FRAME 4

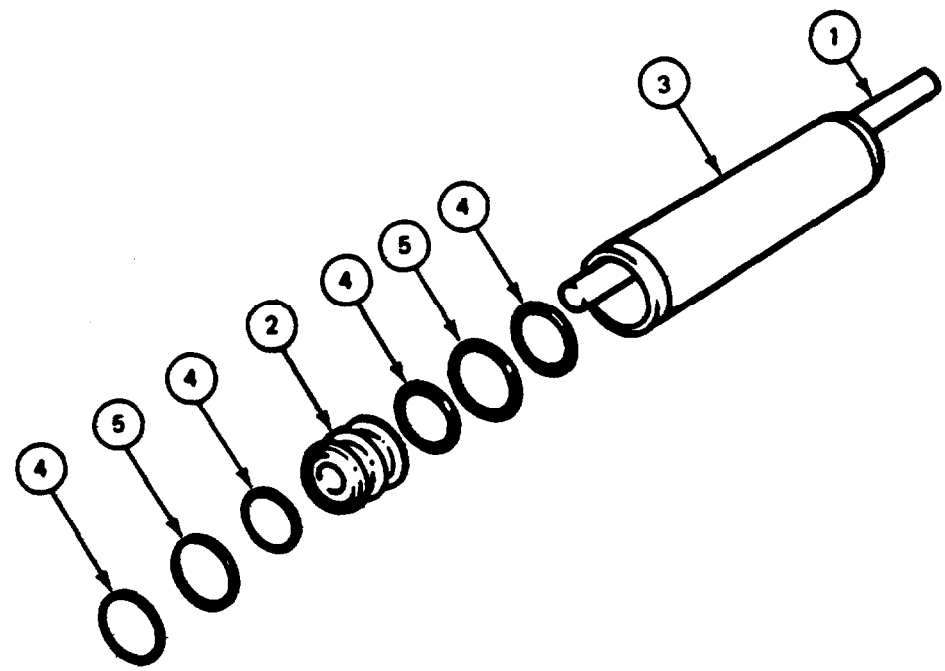
Step	Procedure
1.	Put cylinder (1) in vise.
2.	Using 1-1/8" wrench on fitting (2). remove fitting from cylinder (1).
3.	Using 1-1/8” wrench on fitting (3), remove fitting from cylinder (1).
4.	Using O-ring extractor tool, remove preformed packing (4) and backup ring (5) from fitting (2) (JPG). Throw backup ring and preformed packing away.
5.	Using O-ring extractor tool, remove preformed packing (6) and backup ring (7) from fitting (3) (JPG). Throw backup ring and preformed packing away.
	GO TO FRAME 5



13-9. MANUAL ELEVATION ACCUMULATOR DISASSEMBLY PROCEDURE (CONT)

FRAME 5

Step	Procedure
1.	Using wood dowel (1), push piston (2) from cylinder (3).
2.	Using O-ring extractor tool, remove two backup rings (4) and one preformed packing (5) from each end of piston (2) (JPG). Throw backup rings and preformed packings away.
3.	Remove cylinder (3) from vise.
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK



13-10. MANUAL ELEVATION ACCUMULATOR ASSEMBLY PROCEDURE

TOOLS: 3/8” combination wrench
3/4” combination wrench
1-1/8” combination wrench
Valve core tool
O-ring extractor kit
Vise with brass caps

SUPPLIES: Accumulator assembly parts kit (5703505)
Hydraulic fluid (item 10, App. A)

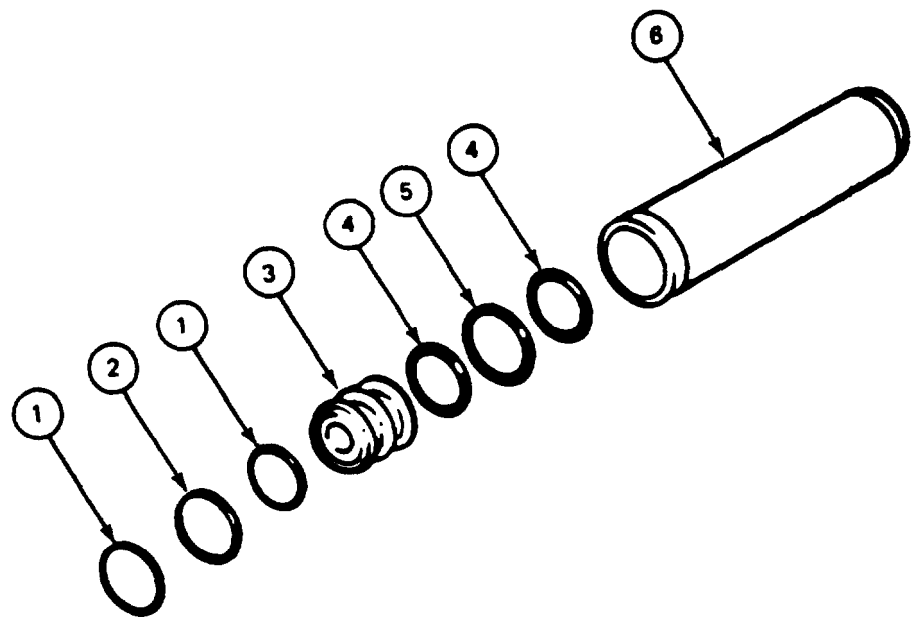
PERSONNEL: One

REFERENCES: JPG for procedures to
Install preformed packing
Install retaining ring

13-10. MANUAL ELEVATION ACCUMULATOR ASSEMBLY PROCEDURE (CONT)

FRAME 1

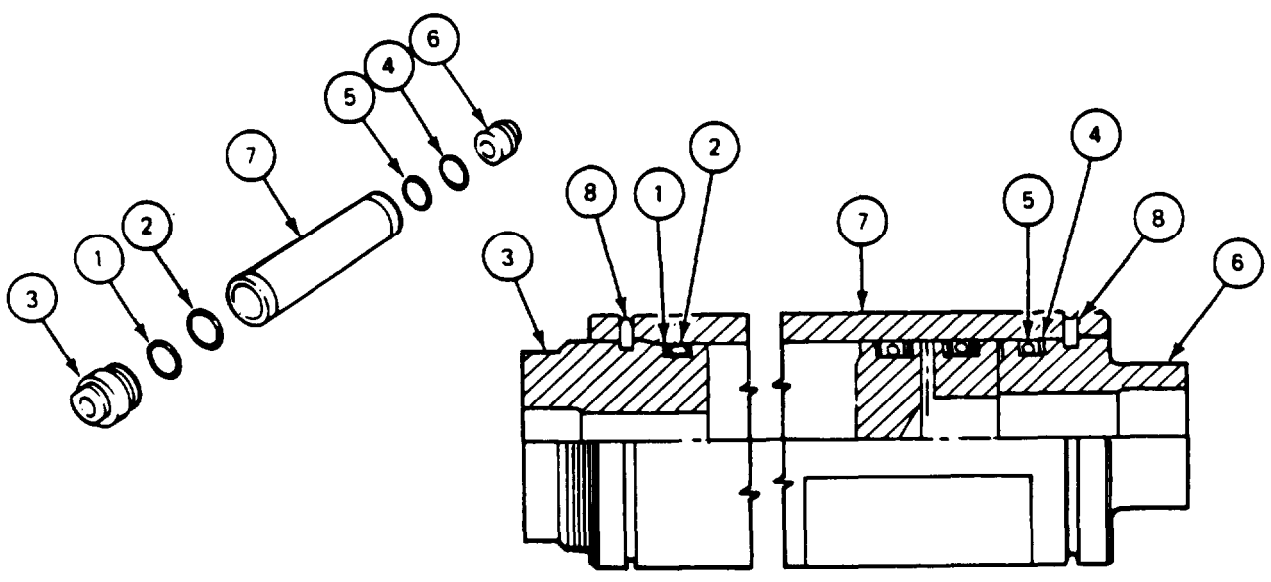
Step	Procedure
1.	Using O-ring extractor tool, put two new backup rings (1) and new preformed packing (2) on end of piston (3) (JPG).
2.	Using O-ring extractor tool, put two new backup rings (4) and new preformed packing (5) on other end of piston (3) (JPG).
3.	Check to make sure two backup rings (1), two backup rings (4), preformed packing (2), and preformed packing (5) are all the way in grooves on piston (3).
4.	Coat piston (3) and inside of cylinder (6) with hydraulic fluid.
5.	Carefully put piston (3) in cylinder (6).
	GO TO FRAME 2



13-10. MANUAL ELEVATION ACCUMULATOR ASSEMBLY PROCEDURE (CONT)

FRAME 2

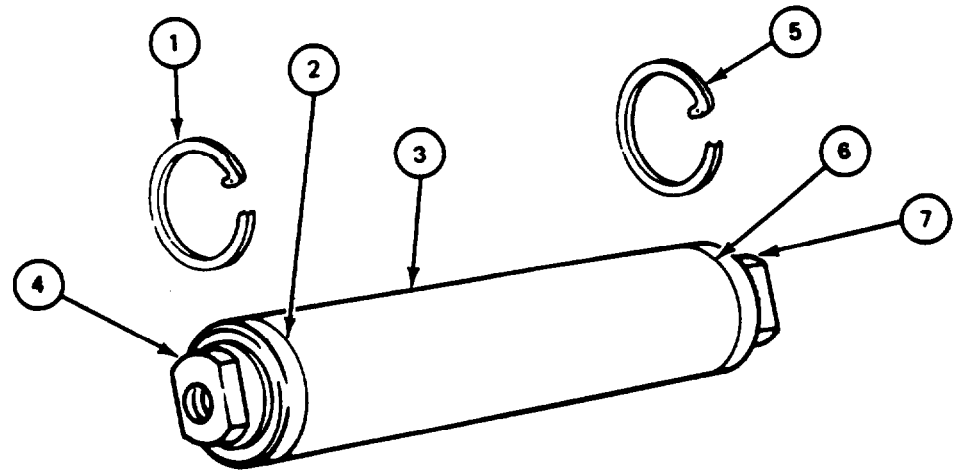
Step	Procedure
1.	Using O-ring extractor tool, put new backup ring (1) and new preformed packing (2) on fitting (3) (JPG).
2.	Using O-ring extractor tool, put new backup ring (4) and new preformed packing (5) on fitting (6) (JPG).
3.	Check to make sure backup ring (1) and preformed packing (2) are all the way in grooves on fitting (3). Check to make sure backup ring (4) and preformed packing (5) are all the way in grooves on fitting (6).
4.	Coat fitting (3), fitting (6), and inside of cylinder (7) with hydraulic fluid.
5.	Put cylinder (7) in vise.
	NOTE Fitting (3) has smaller threaded hole thru middle. Be sure to put fitting (3) into end of cylinder (7) facing flat end of piston.
6.	Carefully push fitting (3) and fitting (6) into cylinder (7).
7.	Using 1-1/8” wrench, attach fitting (3) to cylinder (7). Line up retaining ring groove in fitting (3) with retaining ring hole (8) in cylinder (7).
8.	Using 1-1/8” wrench, attach fitting (6) to cylinder (7). Line up retaining ring groove in fitting (6) with retaining ring hole (8) in cylinder (7).
	GO TO FRAME 3



13-10. MANUAL ELEVATION ACCUMULATOR ASSEMBLY PROCEDURE (CONT)

FRAME 3

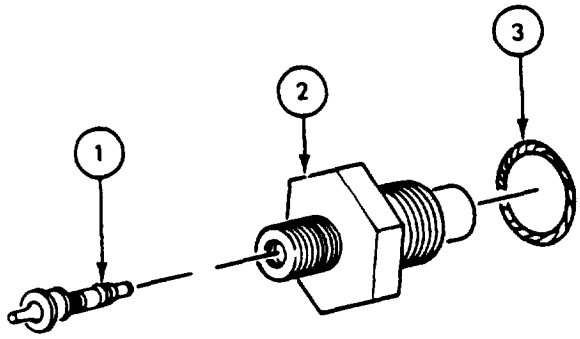
Step	Procedure
1.	Put bent end of retaining ring (1) in hole in groove (2).
2.	Slide free end of retaining ring (1) around cylinder (3) and into groove (2).
3.	Check to be sure bent end of retaining ring (1) is all the way in groove (2). If not, screw fitting (4) in or out as needed to make retaining ring (1) fit in groove (2).
4.	Put bent end of retaining ring (5) in hole in groove (6).
5.	Slide free end of retaining ring (5) around cylinder (3) and into groove (6).
6.	Check to be sure bent end of retaining ring (1) is all the way in groove (6). If not, screw fitting (7) in or out as needed to make retaining ring (5) fit in groove (6).
7.	Remove cylinder (3) from vise.
	GO TO FRAME 4



13-10. MANUAL ELEVATION ACCUMULATOR ASSEMBLY PROCEDURE (CONT)

FRAME 4

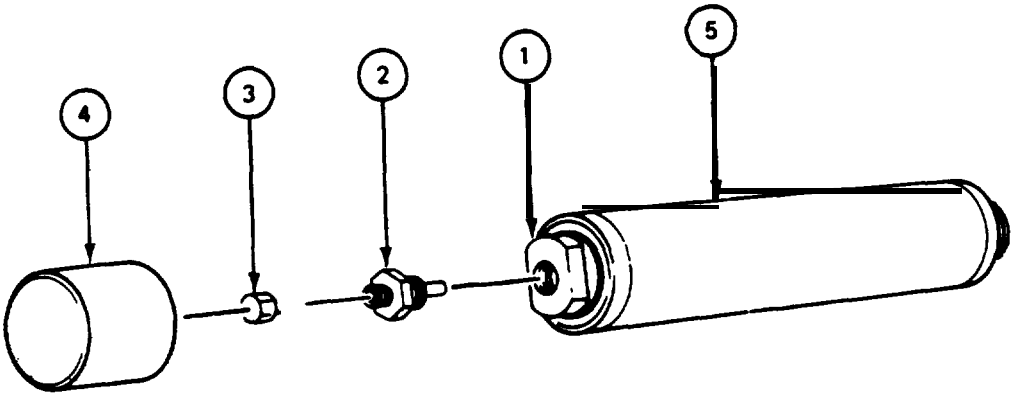
Step	Procedure
1.	Using valve core tool, put valve core (1) in valve body (2).
2.	Coat new preformed packing (3) with hydraulic fluid.
3.	Using O-ring extractor tool, put preformed packing (3) on valve body (2) (JPG).
	GO TO FRAME 5



13-10. MANUAL ELEVATION ACCUMULATOR ASSEMBLY PROCEDURE (CONT)

FRAME 5

Step	*Procedure*
1.	Using 1-1 /8” wrench to hold fitting (1) and 3/4” wrench to turn valve body (2). put valve body (2) in fitting (1).
2.	Using 3/8” wrench, put valve cap (3) on valve body (2).
3.	Put cap (4) on cylinder (5).
	NOTE Follow-on Maintenance Action Required: Test manual elevation accumulator assembly (para 13-8).
	END OF TASK



Section 4. HYDRAULIC RISER

13-11. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks: Inspection	Test	Adjustment	Removal	Installation	Disassembly	Assembly
Hydraulic Riser	13-12	13-13	13-13	13-14	13-15	13-16	13-17

13-12. HYDRAULIC RISER INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble hydraulic riser (para 13-16)

GENERAL INSTRUCTIONS:

NOTE

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

13-12. HYDRAULIC RISER INSPECTION PROCEDURE (CONT)

FRAME 1

Step	Procedure
	SUPPORT SHOP WORK
1.	Take parts to shop where inspection and spring testing equipment is available.
2.	Check dimensions and spring loads as follows:

NOTE

Spool (D) and sleeve (E) are matched set. Keep them together at all times.

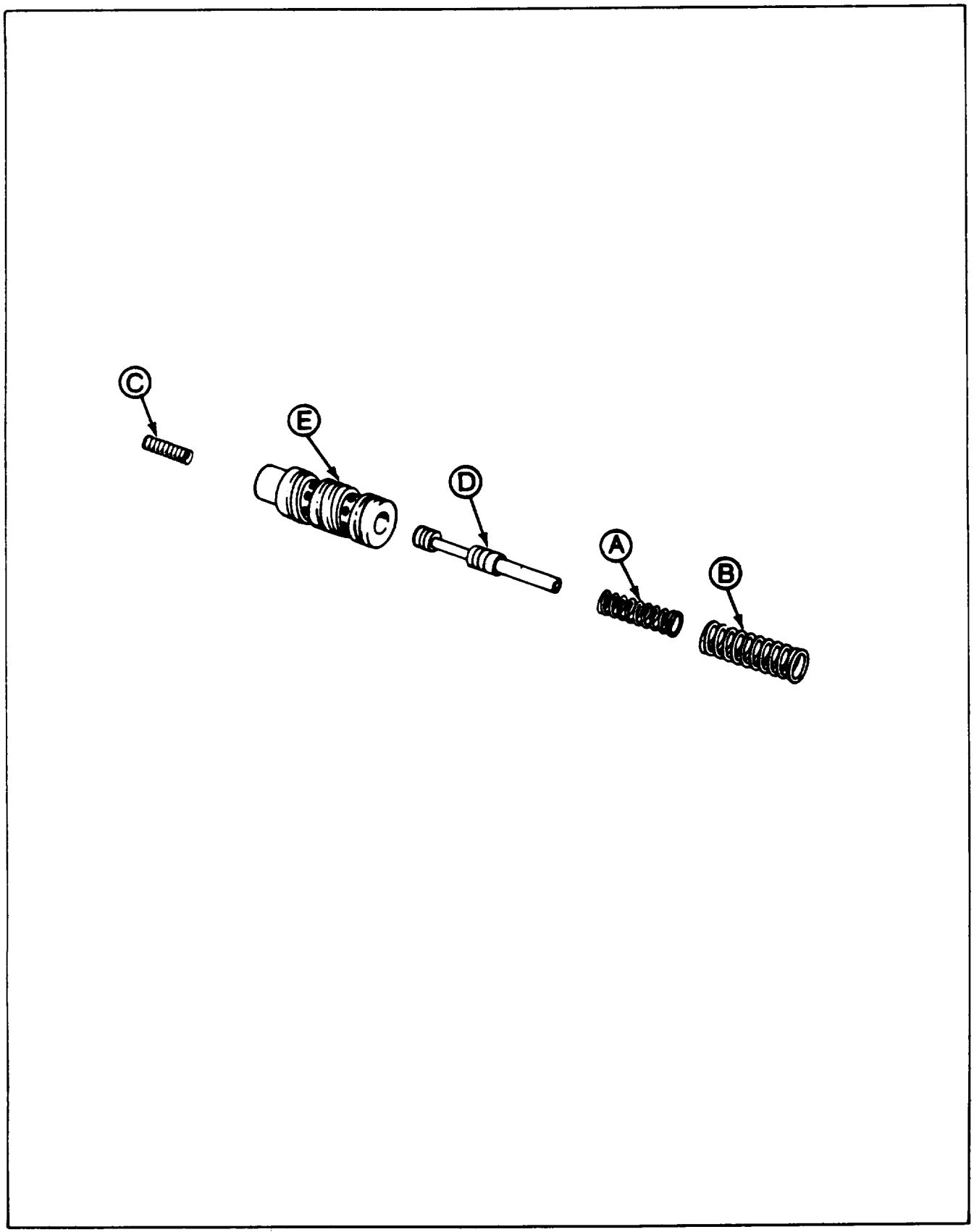
Reference P	Point of Measurement	Size and Load
A	Spring: Free length	2.8550 to 2.8950”
	Load required to compress to 1.710”	81 to 99 pounds
	Load required to compress to 1.920”	66.5 to 80.5 pounds
B	Spring: Free length	2.0040 to 2.9740”
	Load required to compress to 1.82"	120.5 to 136.5 pounds
	Load required to compress to 1.66”	137 to 155 pounds
C	Spring: Free length	1.3860 to 1.4260”
	Load required to compress to 0.880”	25 to 31 pounds
	Load required to compress to 0.980”	15 to 19 pounds
D	Outside diameter of spool	0.5615 to 0.5620”
E	Inside diameter of spool sleeve	0.5623 to 0.5628”

NOTE

Tag parts that are out of tolerance.

3. After support shop work, return parts to turret shop.

END OF TASK


C
E
D
A
B

13-13. HYDRAULIC RISER TEST AND ADJUSTMENT PROCEDURE

TOOLS: 9/16" combination wrench
5/8" combination wrench

SUPPLIES: Rags (item 21, App. A)
Protective cap
Paper
Pencil

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to lower hydraulic system pressure

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-3	11
Turret Traverse Lock	FO-3	7
Gunner's Control Box	FO-1	2
Power Pack	FO-1	15

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Turret traverse lock set to LOCKED
Gunner's control box ELEV/TRAV power switch set to OFF

PRELIMINARY PROCEDURES: Install hydraulic riser (para 13-15)

GENERAL INSTRUCTIONS:

CAUTION

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

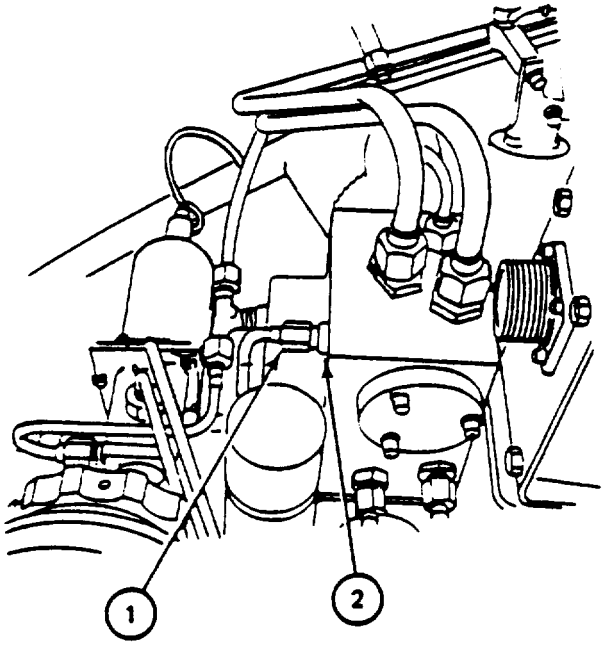
NOTE

Use rags for oil spillage.

13-13. HYDRAULIC RISER TEST AND ADJUSTMENT PROCEDURE (CONT)

FRAME 1

Step	Procedure
	WARNING Hydraulic pressure must be lowered to 0 psi before removal of any hydraulic tubes or parts. Hydraulic fluid under pressure can hurt you.
1.	Lower hydraulic system pressure to 0 psi (TM-20-2-3).
2.	Using 5/8” combination wrench, disconnect tube (1) from fitting (2).
3.	Put protective cap in tube (1).
4.	Put test pressure gauge on fitting (2).
	GO TO FRAME 2


1
2

13-13. HYDRAULIC RISER TEST AND ADJUSTMENT PROCEDURE (CONT)

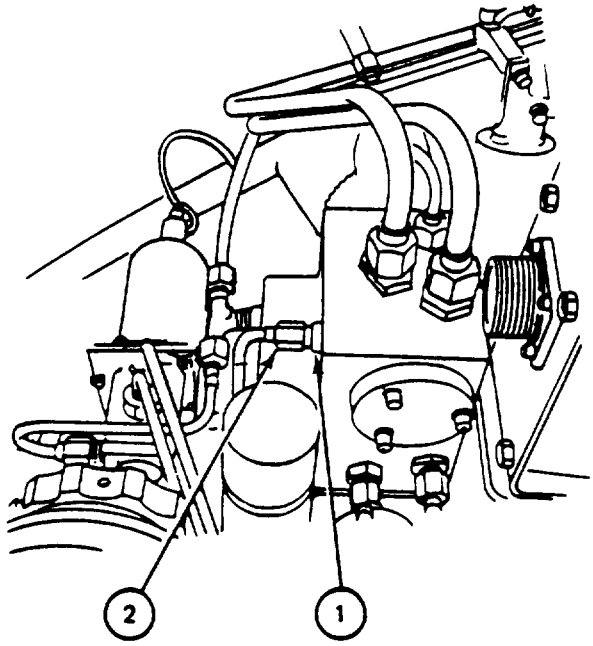
FRAME 2

Step	Procedure	Normal Indication
1.	Set driver's master control panel MASTER BATTERY switch to ON.	MASTER BATTERY lamp lights
2.	Set gunner's control panel ELEV/ TRAV POWER switch to ON.	ELEV/TRAV POWER lamp lights. Test pressure gauge should show pressure increase and then indicate between 925 and 975 psi.
3.	Using paper and pencil, write down test pressure gauge reading.	. . .
4.	Set gunner's control box ELEV/ TRAV POWER switch to OFF.	ELEV/TRAV power lamp goes out.
5.	Set driver's master control panel MASTER BATTERY switch to OFF.	MASTER BATTERY lamp goes out.
6.	Lower hydraulic system pressure to 0 psi (TM-20-2-3).	. . .
	NOTE If test pressure gauge has normal indication, GO TO FRAME 3. If test pressure gauge indicates less than 925 psi, shims must be added to hydraulic riser. If test pressure gauge indicates more than 975 psi, shims must be removed from hydraulic riser.	
7.	Remove shims from hydraulic riser (para 13-16, FRAME 1).	
8.	Install proper shims in hydraulic riser (para 13-17, FRAMES 4 and 5).	
9.	Repeat steps 1 through 6.	
	GO TO FRAME 3	

13-13. HYDRAULIC RISER TEST AND ADJUSTMENT PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Remove test pressure gauge from fitting (1).
2.	Remove protective cap from tube (2).
3.	Using 5/8" combination wrench, connect tube (2) to fitting (1).
	END OF TASK


2
1

13-14. HYDRAULIC RISER REMOVAL PROCEDURE

TOOLS: 5/16" socket head screw key (Allen wrench)
5/8" open end wrench
11/16" open end wrench
13/16" open end wrench
15/16" open end wrench
3/4" socket (1/2" drive)
6" extension (1/2" drive)
1/2" drive ratchet
O-ring extractor kit

SUPPLIES: Lint-free cloths (item 21, App. A)
Caps
Plugs

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedures to:
Remove gunner's control
Remove manual elevation accumulator
JPG for procedures to:
Tag hydraulic tubes
Remove preformed packings

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-3	11
Power Pack	FO-1	15

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Manual elevation accumulator removed (TM-20-2-3)
Gunner's control removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Remove shuttle valve (para 13-21) (See General Instruction Note)
Remove manual elevation pump (para 13-60)

GENERAL INSTRUCTIONS:

CAUTION

Hydraulic parts must be protected from dirt after removal. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

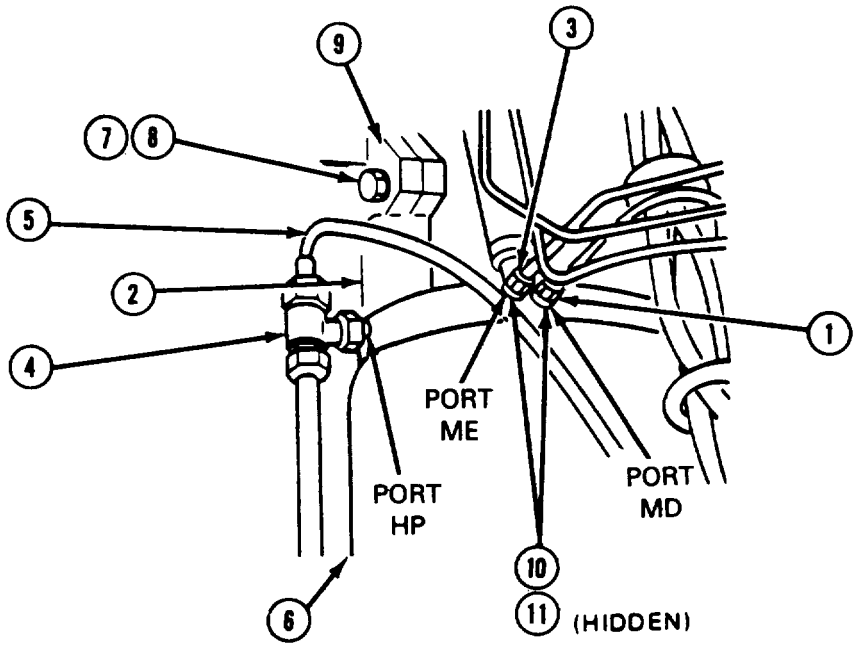
NOTE

If removing hydraulic riser only to service hydraulic filter, shuttle valve does not need to be removed.

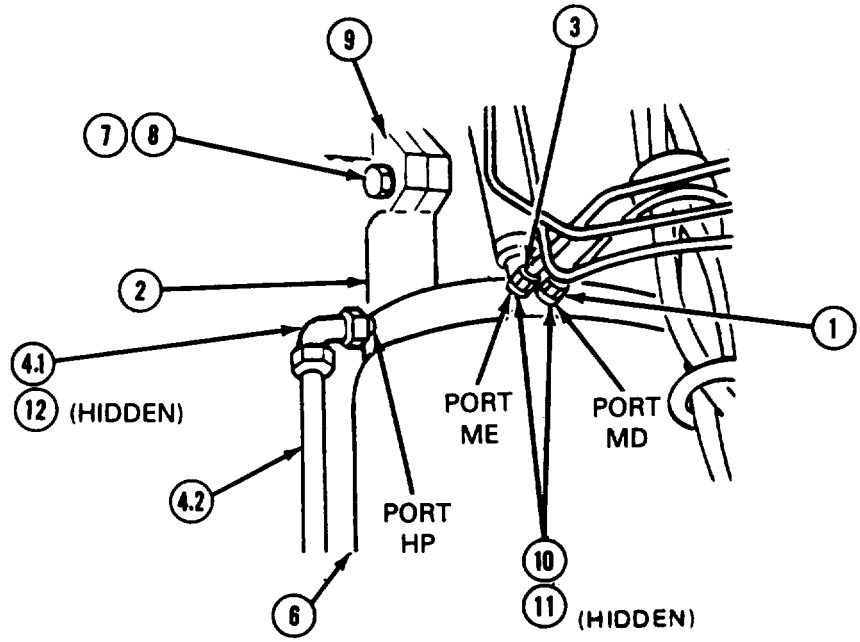
13-14. HYDRAULIC RISER REMOVAL PROCEDURE (CONT)

FRAME 1

STEP	PROCEDURE
1.	Using 5/8” and 13/16” open end wrenches, disconnect tube (1) from riser (2) port MD. Tag tubes (JPG)
2.	Using 5/8” and 13/16” open end wrenches, disconnect tube (3) from riser (2) port ME. Tag tubes (JPG).
3.	Remove relief valve (4) (para 13-27) (Early Model).
3.1.	Using adjustable wrench to hold elbow (4.1), use 15/16” open end wrench to remove tube (4.2) from elbow (Late Model).
4.	Using 5/8” and 11/16” open end wrenches, remove tube (5) from bottom of reservoir (6). Tag tubes (JPG) (Early Model).
5.	Using 3/4” socket with extension, remove two screws (7) and two lockwashers (8) attaching riser (2) to bracket (9).
	NOTE Do steps 6 through 9 if riser is bad.
6.	Using 13/16” open end wrench, remove two nipples (10) from riser (2) ports MD and ME.
7.	Using O-ring extractor tool, remove two preformed packings (11) from two nipples (10) (JPG). Throw preformed packing away.
8.	Using adjustable wrench, remove elbow (4.1) from riser (2) port HP (Late Model).
9.	Using O-ring extractor tool, remove preformed packing (12) from elbow (4.1) (JPG). Throw preformed packing away (Late Model).
	GO TO FRAME 2



EARLY MODEL

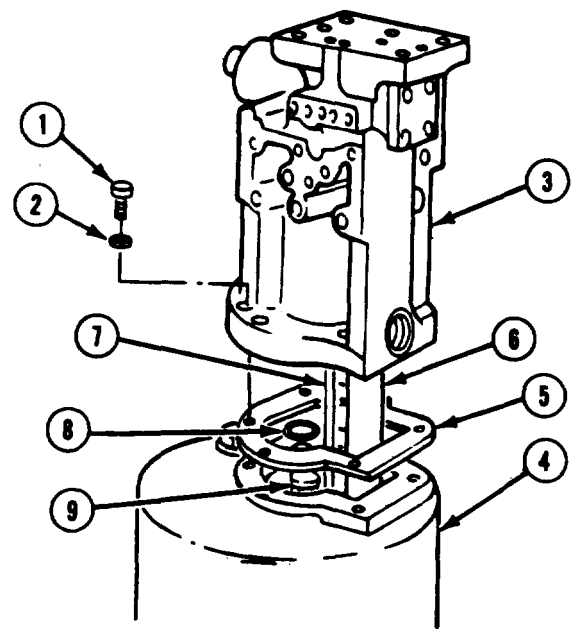


LATE MODEL

13-14. HYDRAULIC RISER REMOVAL PROCEDURE (CONT)

FRAME 2

STEP	PROCEDURE
1.	Using Allen wrench, remove six screws (1) and six lockwashers (2) attaching riser (3) to reservoir (4).
2.	Remove riser (3) from reservoir (4).
3.	Remove gasket (5) from reservoir (4). Throw away gasket.
	NOTE **Do steps 4 and 5 if riser (3) is bad.**
4.	Remove drain tube (6) (para 13-32).
5.	Remove check valve (7) (para 13-36),
6.	Using O-ring extractor tool, remove packing (8) from oil filter (9) (JPG). Throw away packing.
	END OF TASK



13-15. HYDRAULIC RISER INSTALLATION PROCEDURE

TOOLS: 3/4" socket (1/2" drive)
1/2" drive ratchet
6" extension (1/2" drive)
13/16" open end wrench
5/8" open end wrench
11/16" open end wrench
15/16" open end wrench
5/16" socket head screw key (Allen wrench)
5/16" hex head socket (3/8" drive)
3/8" drive torque wrench (0-600 inch-pounds)
O-ring extractor kit

SUPPLIES: Control power pack parts kit (5703523)
Hydraulic fluid (item 10, App. A)
Preformed packing (MS 28778-6) (two)
Preformed packing (MS 28778-10) (two)
Non-metallic washer (MS 28777-10)

PERSONNEL: One

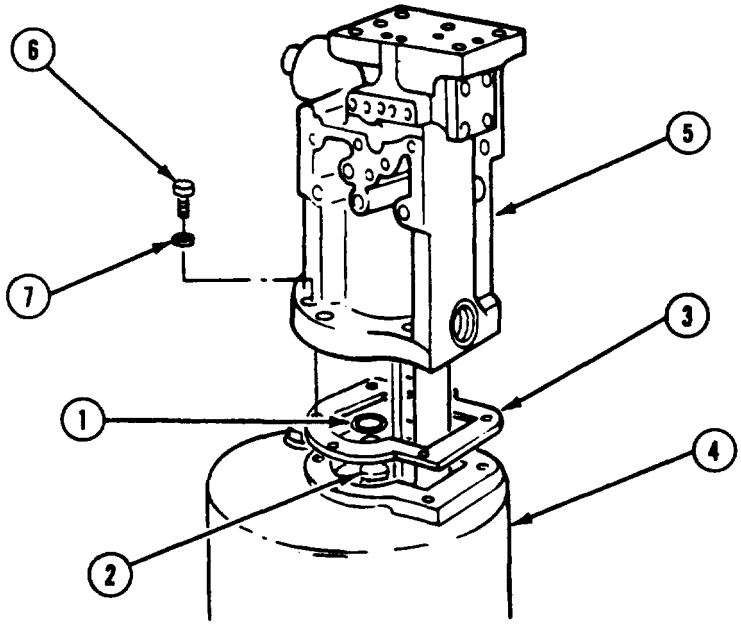
REFERENCES: TM 9-2350-222-10 for procedure to traverse turret
TM 9-2350-222-20-2-3 for procedures to:
Install manual elevation accumulator
Install gunner's control
Pressurize manual elevation accumulator
Bleed hydraulic system
JPG for procedures to:
Use torque wrench
Install preformed packing

PRELIMINARY PROCEDURES: Install oil filter (para 13-44)
Install drain tube on hydraulic riser (para 13-33)
Install check valve on hydraulic riser (para 13-37)

13-15. HYDRAULIC RISER INSTALLATION PROCEDURE (CONT)

FRAME 1

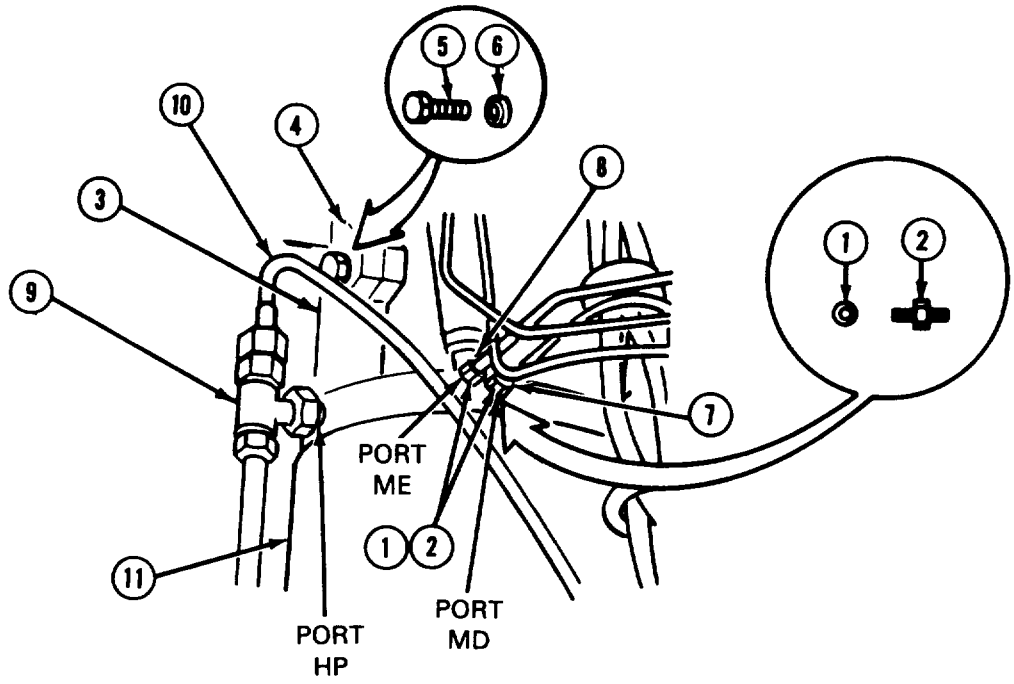
STEP	PROCEDURE
1.	Coat preformed packing (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put new preformed packing (1) on oil filter (2).
3.	Put new gasket (3) on reservoir (4). Lineup screw holes in gasket with screw holes on top of reservoir.
4.	Put riser (5) on reservoir (4). Lineup screw holes. Make sure packing (1) goes through port on bottom of riser (5).
5.	Push riser (5) down on reservoir (4) as far as it will go.
6.	Using Allen wrench, attach riser (5) to reservoir (4) with six screws (6) and six lockwashers (7).
7.	Using 5/16” hex head socket and torque wrench, tighten screws (6) to between 192 and 216 inch-pounds (JPG).
	END OF TASK



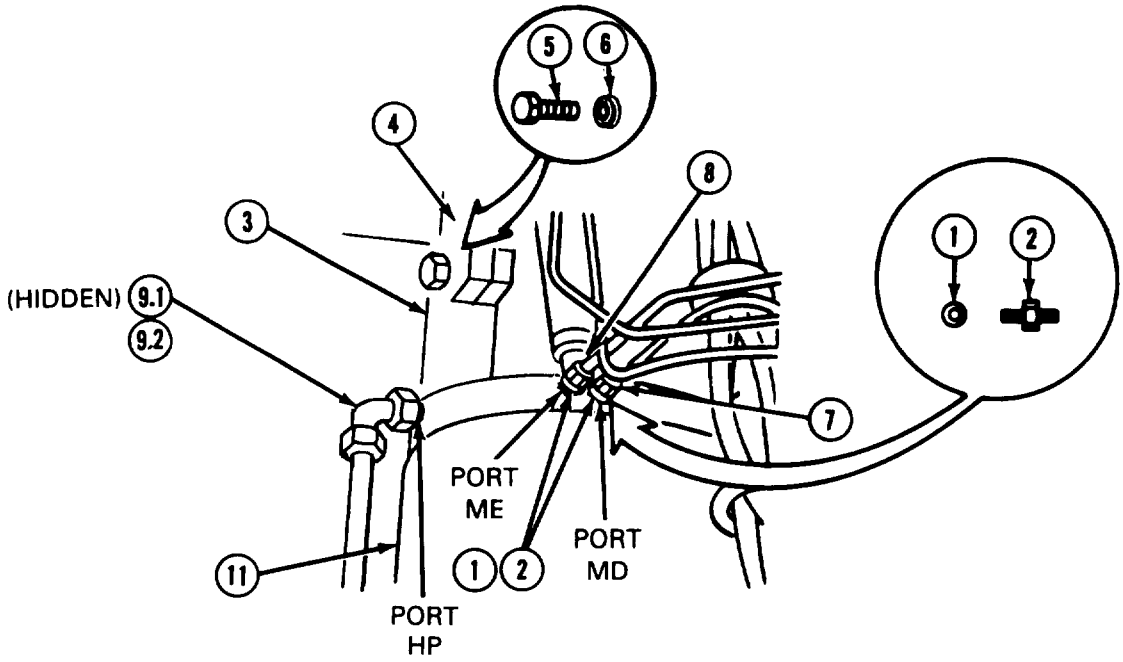
13-15. HYDRAULIC RISER INSTALLATION PROCEDURE (CONT)

FRAME 2

STEP	PROCEDURE
	NOTE **Do steps 1 through 3.3 if riser (3) was replaced.**
1.	Coat two preformed packings (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put two preformed packings (1) on two nipples (2) (JPG).
3.	Using 13/16" open end wrench, put two nipples (2) in riser (3) ports MD and ME.
3.1.	Coat preformed packing (9.1) with hydraulic fluid (Late model).
3.2.	Using O-ring extractor tool, put preformed packing (9.1) on elbow (9.2) (Late model).
3.3.	Using adjustable wrench, install elbow (9.2) in riser (3) port HP (Late model).
4.	Using 3/4" socket wrench with extension, attach riser (3) to bracket (4) with two screws (5) and two lockwashers (6).
5.	Using 5/8" open end wrench, connect tube (7) to riser (3) port MD.
6.	Using 5/8" open end wrench, connect tube (8) to riser (3) port ME.
7.	Install relief valve (9) (para 13-28) (Early model).
8.	Using 5/8" and 11/16" open end wrench, connect tube (10) to bottom of reservoir (11) (Early model).
9.	Using adjustable wrench to hold elbow (9.2), use 15/16" open end wrench and connect tube (12) to elbow (9.2) (Late model).
	NOTE Follow-on Maintenance Action Required: Install manual elevation accumulator (TM-20-2-3). Install shuttle valve (para 13-22). Install manual elevation pump (pare 13-61). Install gunner's control (TM-20-2-3). Pressurize manual elevation accumulator (TM-20-2-3). Bleed hydraulic system (TM-20-2-3). Test hydraulic riser (para 13-13). Traverse turret in power mode to make sure it operates properly (TM-10). END OF TASK



EARLY MODEL



LATE MODEL

13-16. HYDRAULIC RISER DISASSEMBLY PROCEDURE

TOOLS: Internal retaining ring pliers
3/16” socket head screw key (Allen wrench)
1" combination wrench
O-ring extractor kit
Vise
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: 2” jacking screw (MS 16997-66) (two)
Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

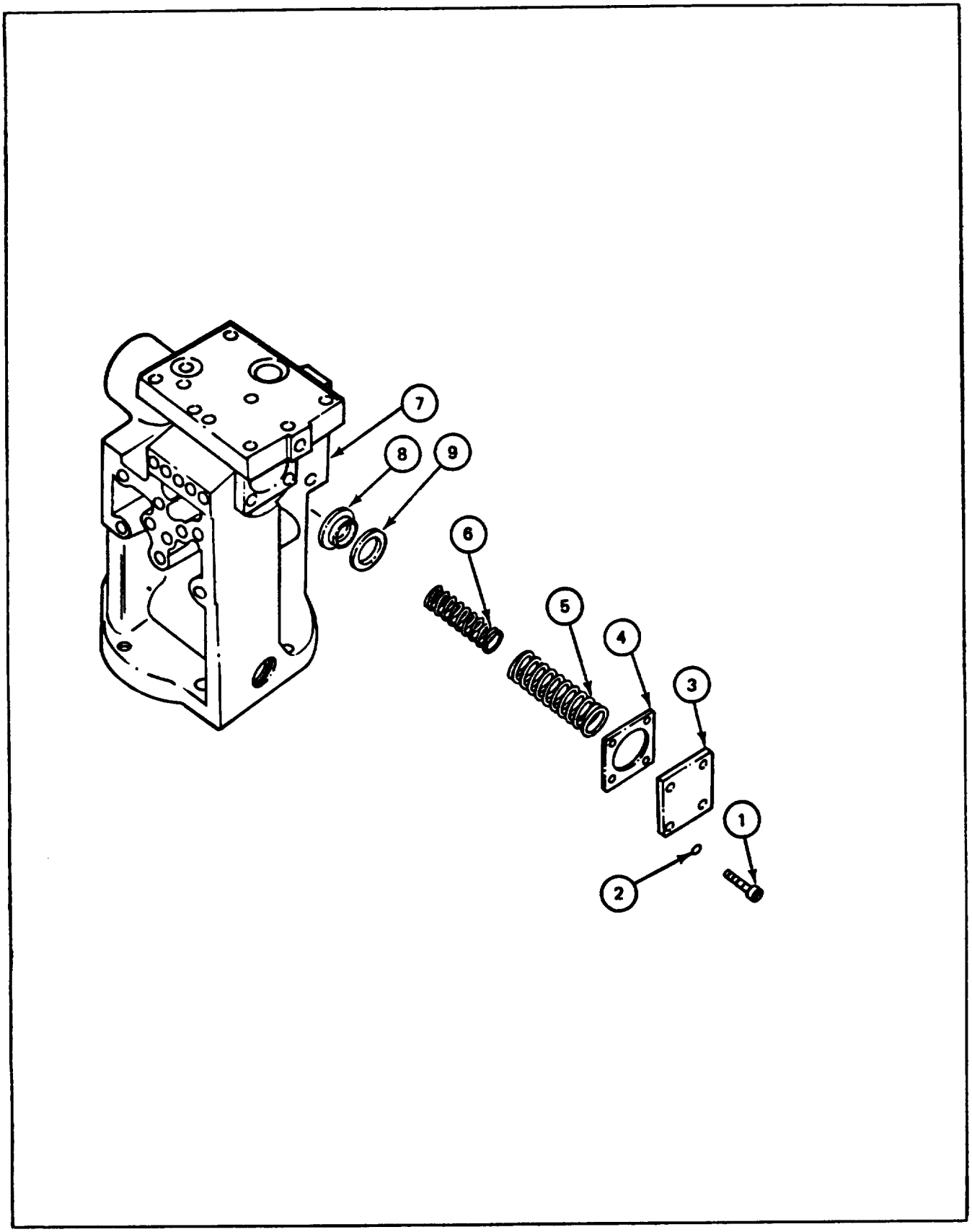
REFERENCES: JPG for procedures to:
Remove retaining rings
Remove preformed packings
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove hydraulic riser (para 13-114)
Remove shuttle valve (para 13-21)
Remove manual elevation pump (para 13-60)

13-16. HYDRAULIC RISER DISASSEMBLY PROCEDURE (CONT)

FRAME 1

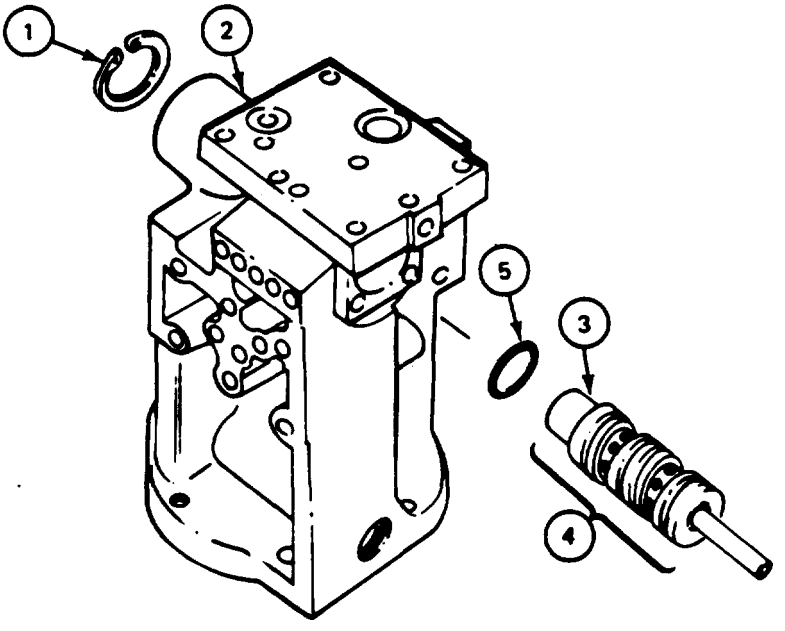
Step	Procedure
	WARNING Cover (3) is under spring pressure. Use jacking screws to remove cover and springs safely.
1.	Using Allen wrench, remove two screws (1) and two lockwashers (2) from upper left and lower right corners of cover (3).
2.	Put two short jacking screws in two empty screw holes. Turn jacking screws in as far as they will go.
3.	Using Allen wrench, remove other two cover screws (1) and two lockwashers (2). Turn screws evenly as cover (3) moves outward.
4.	Using Allen wrench, remove two long jacking screws and cover (3).
5.	Remove cover gasket (4).
6.	Remove springs (5) and (6) from riser body (7).
	NOTE Keep shims for assembly (para 13-17).
7.	Remove seat (8) and shims (9) from riser body (7). GO TO FRAME 2


7
8
9
6
5
4
3
1
2

13-16. HYDRAULIC RISER DISASSEMBLY PROCEDURE (CONT)

FRAME 2

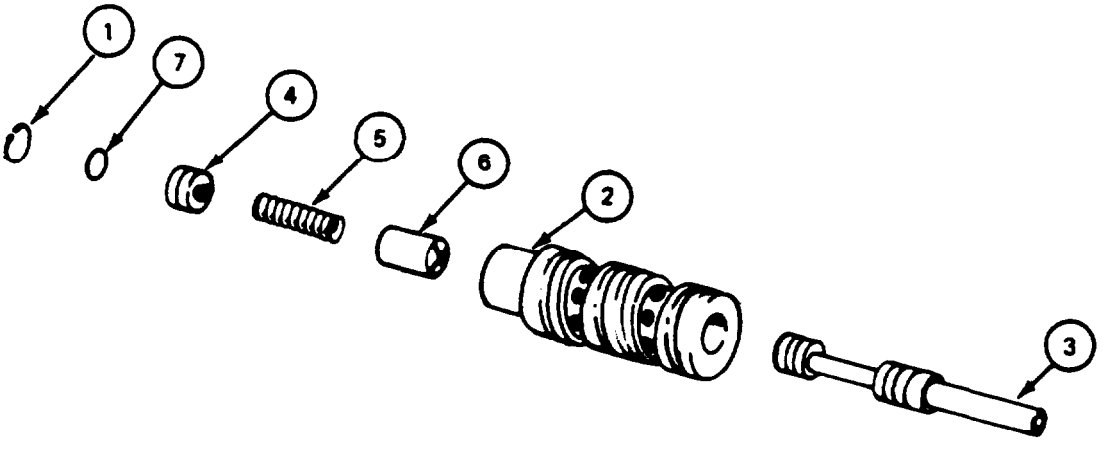
Step	Procedure
1.	Using pliers, remove large retaining ring (1) from riser body (2) (JPG).
2.	Push on end of sleeve (3) that sticks out. Remove sleeve (3) and spool assembly (4) from riser body (2).
3.	Using O-ring extractor tool, remove four preformed packings (5) from sleeve and spool assembly (4) (JPG). Throw preformed packing away.
	GO TO FRAME 3



13-16. HYDRUALIC RISER DISASSEMBLY PROCEDURE (CONT)

FRAME 3

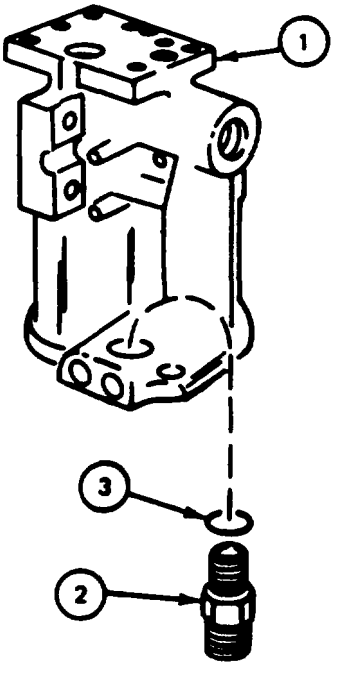
Step	Procedure
1.	Using pliers, remove small retaining ring (1) from small end of sleeve (2) (JPG).
2.	Push on small end of spool (3). Take retainer (4), small spring (5), and snubber (6) from small end of sleeve (2).
3.	Remove spool (3) from sleeve (2).
	NOTE Spool (3) and sleeve (2) are a matched set. Keep them near each other at all times.
4.	Using O-ring extractor tool, remove preformed packing (7) from retainer (4) (JPG). Throw preformed packing away.
	GO TO FRAME 4



13-16. HYDRAULIC RISER DISASSEMBLY PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Put riser housing (1) in vise.
2.	Using combination wrench, remove adapter (2) from riser housing (1).
3.	Using O-ring extractor tool, remove preformed packing (3) from adapter (2) (JPG). Throw preformed packing away.
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of parts (para 13-12).
	END OF TASK



13-17. HYDRAULIC RISER ASSEMBLY PROCEDURE

TOOLS: 1" combination wrench
3/16" socket head screw key (Allen wrench)
3/16" hex head socket (3/8” drive)
3/8” drive torque wrench (0-150 inch-pounds)
Internal retaining ring pliers
O-ring extractor tool

SUPPLIES: 2” jacking screw (two) (MS 16997-66)
Preformed packing (MS 28775-110)
preformed packing (four) (MS 28775-214)
Hydraulic fluid (item 10, App. A)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Install preformed packings
Install retaining rings
Use torque wrench

PRELIMINARY PROCEDURES: Inspect hydraulic riser (para 13-12)

GENERAL INSTRUCTIONS:

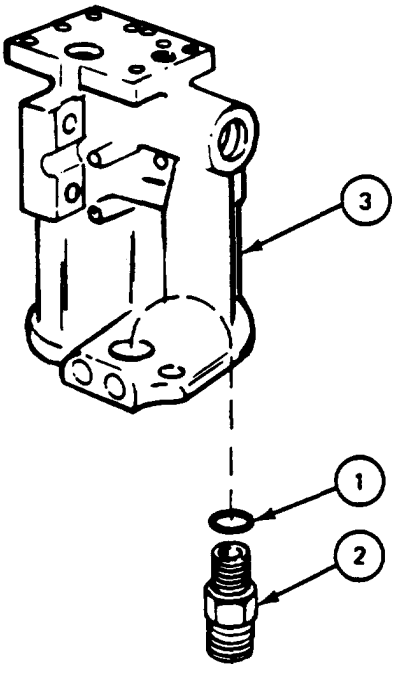
CAUTION

Hydraulic parts must be protected from dirt during assembly. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

13-17. HYDRAULIC RISER ASSEMBLY PROCEDURE (CONT)

FRAME 1

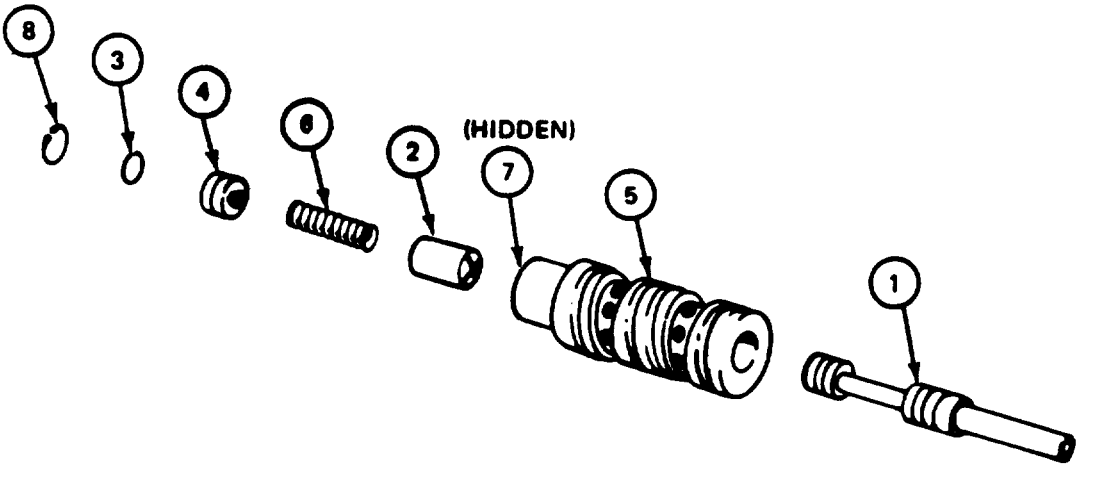
Step	Procedure
1.	Coat preformed packing (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packing (1) on adapter (2) (JPG).
3.	Using combination wrench, put adapter (2) in riser housing (3).
	GO TO FRAME 2



13-17. HYDRAULIC RISER ASSEMBLY PROCEDURE (CONT)

FRAME 2

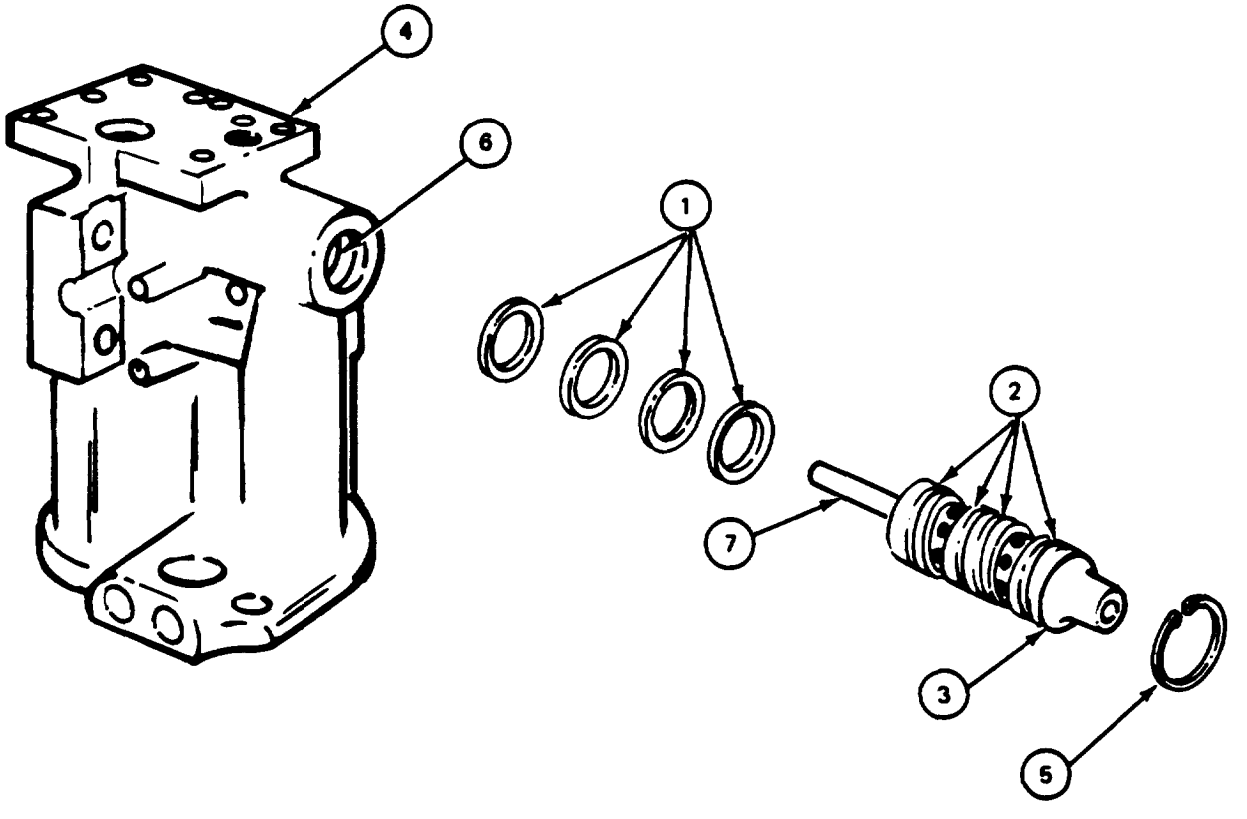
Step	Procedure
	NOTE Spool (1) and sleeve (5) must be a matched set. Make sure both parts are from the same matched set. Parts that are not matched will not work.
1.	Coat spool (1), snubber (2), and preformed packing (3) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packing (3) on retainer (4) (JPG).
3.	Put spool (1) in sleeve (5).
	NOTE Snubber (2) goes into sleeve (5) closed end first.
4.	Put snubber (2) in sleeve (5).
5.	Put spring (6) in snubber (2).
6.	Put retainer (4) in end of spring (6). Push retainer (4) and preformed packing (3) into sleeve (5) past groove (7).
7.	Using pliers, put retaining ring (8) in groove (7) (JPG).
8.	Push on small end of spool (1). Check to be sure retainer (4) is against retaining ring (8) and spool (1) springs in and out smoothly.
	GO TO FRAME 3



13-17. HYDRAULIC RISER ASSEMBLY PROCEDURE (CONT)

FRAME 3

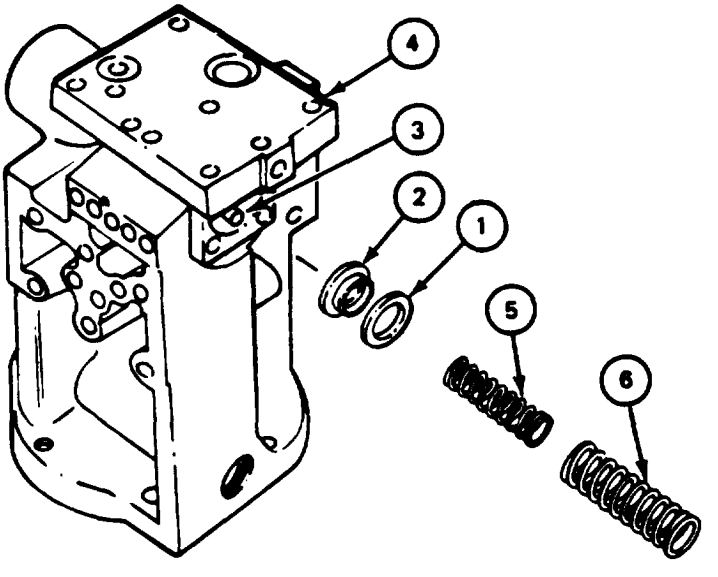
Step	Procedure
1.	Coat four new preformed packings (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put four preformed packings (1) in four grooves (2) in sleeve (3) (JPG).
3.	Put sleeve (3) in riser housing (4). Push sleeve all the way inside riser housing.
4.	Using pliers. put retaining ring (5) in groove (6) (JPG).
5.	Push on spool (7) until shoulder of sleeve (3) is against retaining ring (5). Check to be sure sleeve (3) sticks out of riser housing (4).
	GO TO FRAME 4



13-17. HYDRAULIC RISER ASSEMBLY PROCEDURE (CONT)

FRAME 4

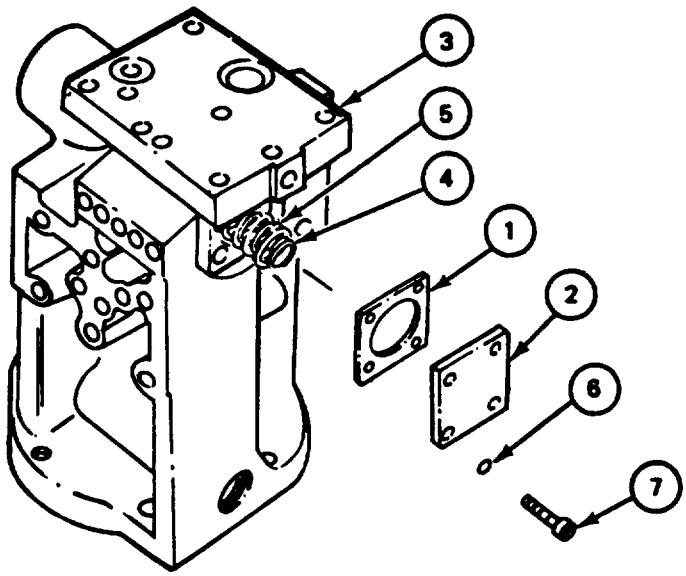
Step	Procedure
	NOTE Number of shims (1) needed for operation depends on riser test (para 13- 13). For assembly before test, same number of shims removed during disassembly (para 13-16) should be used.
1.	Put shims (1) on seat (2).
2.	Put seat (2) over end of spool (3) in riser housing (4). Check to be sure shims (1) stay on seat (2).
3.	Put spring (5) and spring (6) over end of spool (3). Check to be sure spring (6) is against shims (1).
	GO TO FRAME 5



13-17. HYDRAULIC RISER ASSEMBLY PROCEDURE (CONT)

FRAME 5

Step	Procedure
	WARNING Cover (2) is installed under strong spring pressure. Jacking screws are used to squeeze springs safely. Follow procedure carefully. Spring pressure is strong enough that cover could fly off and hurt you.
1.	Put new gasket (1) on cover (2). Line up screw holes.
2.	Put one jacking screw through upper left hole in cover (2).
3.	Put one long jacking screw through lower right hole in cover (2).
4.	Line up mounting holes in cover (2) with mounting holes in riser housing (3). Start two jacking screws into riser housing (3).
5.	Using Allen wrench, turn jacking screws evenly to squeeze spring (4) and spring (5). Turn jacking screws in as far as they will go. Do not tighten.
6.	Using Allen wrench, put two lockwashers (6) and two screws (7) in lower left and upper right holes in cover (2).
7.	Using Allen wrench, remove two jacking screws from upper left and lower right holes in cover (2).
8.	Using Allen wrench, put two lockwashers (6) and two screws (7) in cover (2).
9.	Using hex head socket and torque wrench, tighten four screws (7) to between 60 and 85 inch-pounds (JPG).
	NOTE Follow-on Maintenance Action Required: Install hydraulic riser (para 13-15)
	END OF TASK


3
5
4
1
2
6
7

Section 5. SHUTTLE VALVE

13-18. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks					
	Inspection	Test	Removal	Installation	Disassembly	Assembly
Shuttle Valve	13-19	13-20	13-21	13-22	13-23	13-24

13-19. SHUTTLE VALVE INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble shuttle valve (para 13-23)

GENERAL INSTRUCTIONS:

NOTE

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

13-19. SHUTTLE VALVE INSPECTION PROCEDURE (CONT)

FRAME 1

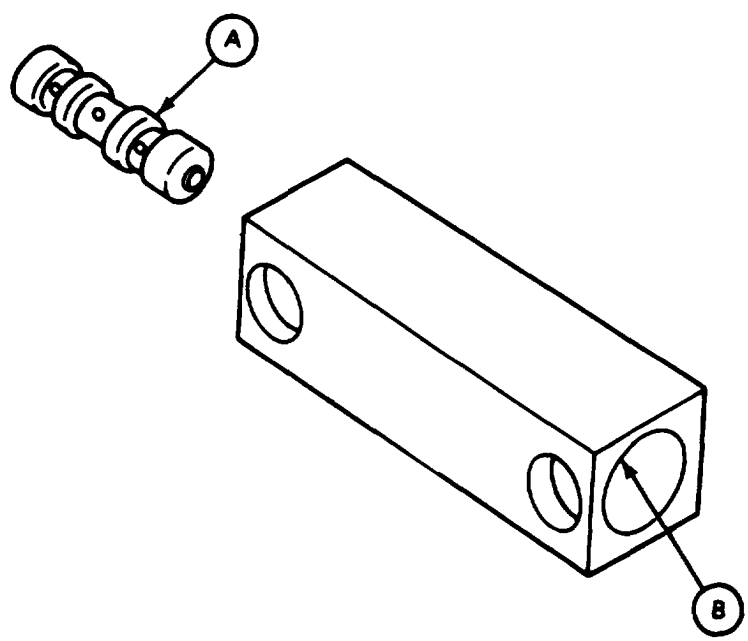
Step	Procedure
	SUPPORT SHOP WORK
1.	Take shuttle valve to shop where inspection equipment is available.
2.	Make dimensional check.

Reference	Point of Measurement	Measurement
A	OD of spool assembly	0.3120 to 0.3130
B	ID of valve body	0.3135 to 0.3140

NOTE

Tag parts that are out of tolerance.

3.	After support shop work, return shuttle valve to turret shop.
	END OF TASK



13-20. SHUTTLE VALVE TEST PROCEDURE

TEST EQUIPMENT: Hydraulic test kit (NSN 1015-01-151-6441) (9337932)
M3 oil pump (NSN 4933-00-449-7166) (7550134)
Measuring cup (8 ounce)
Watch with sweep second hand
Shuttle valve test manifold (fabricated tool, item 8, App. B)

TOOLS: 5/32 in. socket head screw key (Allen wrench)

SUPPLIES: Rags (item 21, App.A)
Container
Hydraulic fluid (item 10, App. A)

PERSONNEL: One

PRELIMINARY PROCEDURES: Remove shuttle valve (para. 13-21)
Assemble shuttle valve (para. 13-24)

GENERAL INSTRUCTIONS:

WARNING

Hydraulic fluid under pressure can hurt or kill you. This test requires up to 950 psi hydraulic pressure. Follow procedure carefully.

NOTE

Container and rags should be used to clean up spilled oil.

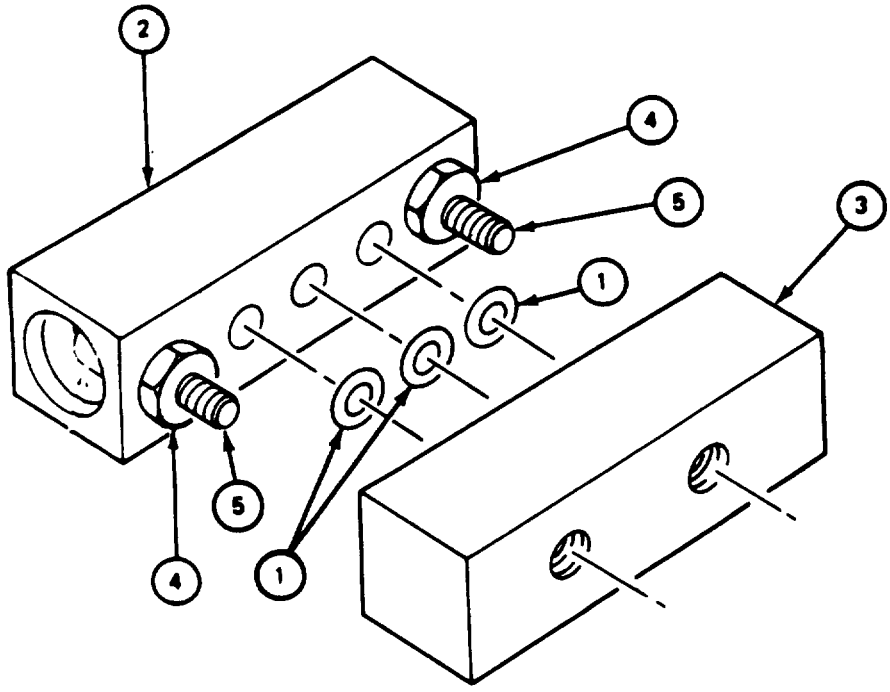
Suitable fittings, preformed packings, and tools should be used to connect test equipment to parts being tested.

If normal indication is not obtained, shuttle valve is bad. Disassemble bad shuttle valve (para. 13-23).

13-20. SHUTTLE VALVE TEST PROCEDURE (CONT)

FRAME 1

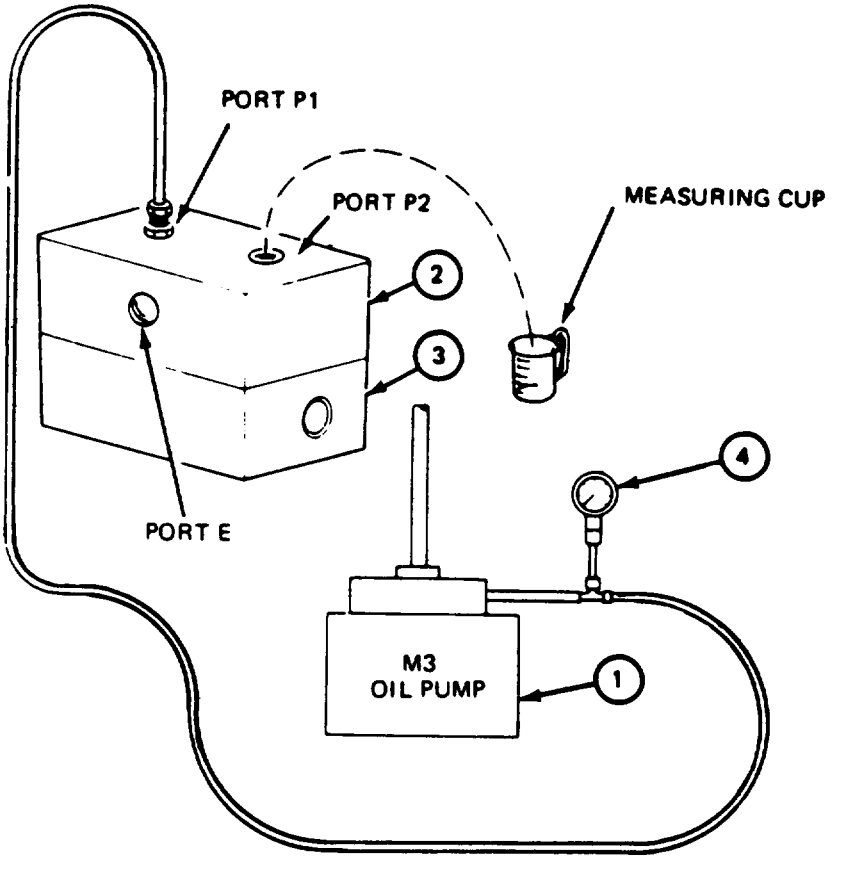
Step	Procedure
1.	Lightly coat three packings (1), and mating surfaces of shuttle valve (2) and test manifold (3) with hydraulic fluid.
2.	Put three packings (1) in test manifold (3) (JPG).
	NOTE Keep nuts (4) for installation at end of test.
3.	Using fingers, remove two nuts (4) from two screws (5).
4.	Carefully place shuttle valve (2) against test manifold (3). Put screws (5) into test manifold.
5.	Using Allen wrench, tighten screws (5) until shuttle valve (2) and test manifold (3) are held tightly together.
	GO TO FRAME 2



13-20. SHUTTLE VALVE TEST PROCEDURE (CONT)

FRAME 2

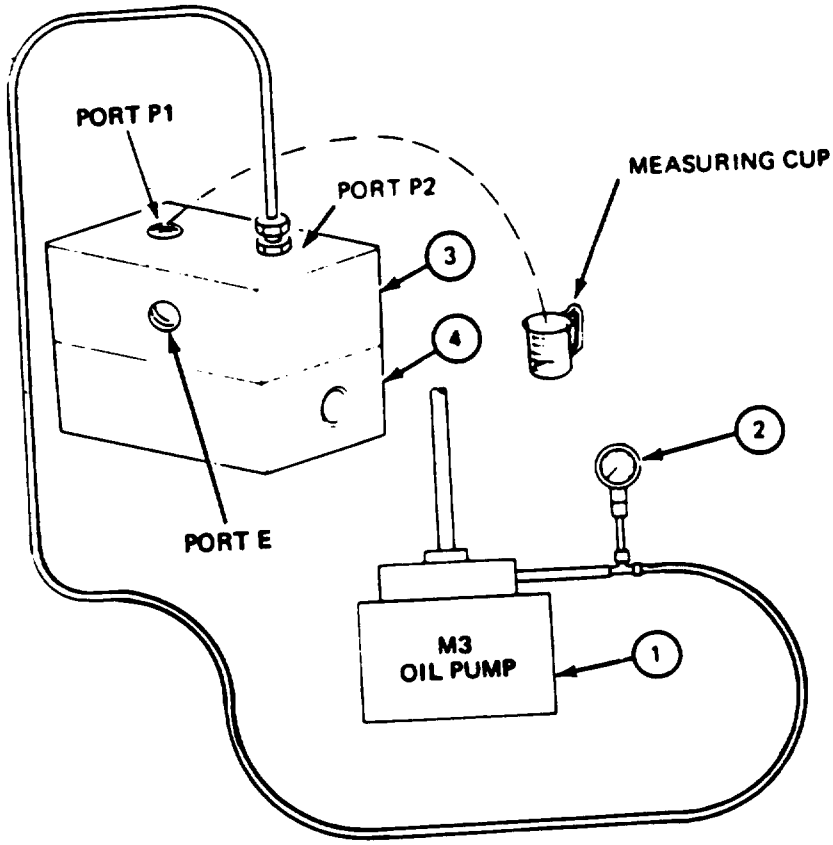
Step	Procedure
1.	Assemble M3 oil pump (1).
2.	Turn test manifold (2) with ports P1 and P2 up. Plug port E.
3.	Pour hydraulic fluid into ports P1 and P2 of test manifold (2) until shuttle valve (3) is filled.
4.	Connect M3 oil pump (1) and pressure gauge (4) to port P1 of test manifold (2).
5.	Using M3 oil pump (1), pressurize shuttle valve (3) until pressure gauge (4) reads between 900 and 950 psi (JPG).
	NOTE Except for port P2, oil should not leak out of shuttle valve (2).
6.	Check shuttle valve (3) for leaks.
7.	Turn test manifold (2) and shuttle valve (3) as needed to catch oil from port (2) in measuring cup.
	NOTE Not more than 5 drops of oil should leak from port P2 in 1 minute.
8.	Using watch, check port P2 for oil leaks for 1 minute.
9.	Using M3 oil pump (1), reduce pressure until pressure gauge (4) reads 0 psi (JPG).
10.	Disconnect M3 oil pump (1) from port P1 of test manifold (2).
	GO TO FRAME 3


PORT P1
PORT P2
MEASURING CUP
2
3
4
PORT E
M3
OIL PUMP
1

13-20. SHUTTLE VALVE TEST PROCEDURE (CONT)

FRAME 3

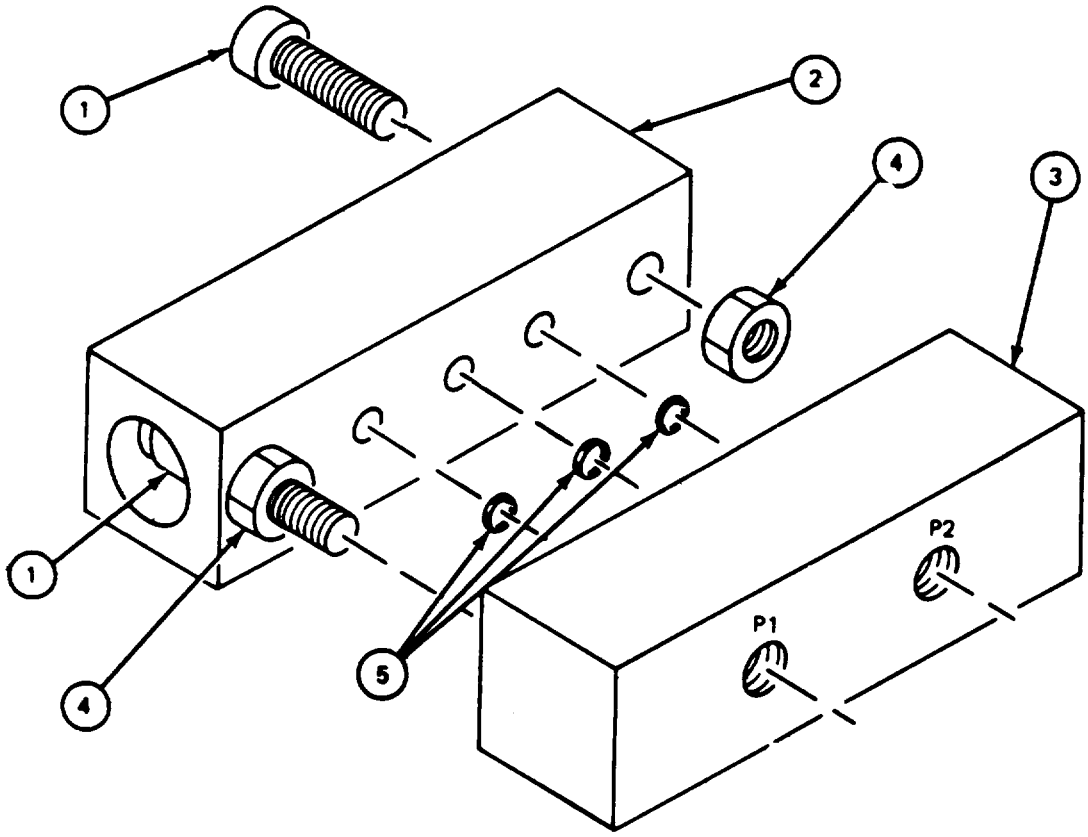
Step	Procedure
1.	Connect M3 oil pump (1) and pressure gauge (2) to port P2 of test manifold (3).
2.	Using M3 oil pump (1), pressurize shuttle valve (4) until pressure gauge (2) reads between 900 and 950 psi (JPG).
	NOTE Except for port P1, oil should not leak out of shuttle valve (4).
3.	Check shuttle valve (4) for leaks.
4.	Turn test manifold (3) and shuttle valve (4) as needed to catch oil from port P1 in measuring cup.
	NOTE Not more than 5 drops of oil should leak from port P1 in 1 minute.
5.	Using watch, check port P1 for oil leaks for 1 minute.
6.	Using M3 oil pump, reduce pressure until pressure gauge (2) reads 0 psi (JPG).
7.	Disconnect M3 oil pump (1) from test manifold (3).
8.	Unplug port E.
	GO TO FRAME 4


PORT P1
PORT P2
MEASURING CUP
3
4
2
PORT E
M3
OIL PUMP
1

13-20. SHUTTLE VALVE TEST PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Disassemble M3 oil pump.
	NOTE
	Do not remove two screws (1) from shuttle valve.
2.	Using Allen wrench, loosen two screws (1).
3.	Pull shuttle valve (2) away from test manifold (3).
	NOTE
	Use nuts (4) removed in frame 1.
4.	Put two nuts (4) on two screws (1) hand tight.
5.	Remove three packings (5) from test manifold (3). Throw packings away (JPG).
	NOTE
	If normal indication was obtained in frames 1 through 4, shuttle valve is good.
	END OF TASK


1
2
4
3
1
4
5
P2
P1

13-21. SHUTTLE VALVE REMOVAL PROCEDURE

TOOLS: 5/32” hex head socket (3/8” drive)
O-ring extractor kit
3/8” drive ratchet
11” extension (3/8” drive)

SUPPLIES: Nut (MS 35649-202) (two)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedure to remove preformed packing

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver’s Master Control Panel	FO-3	11

EQUIPMENT CONDITION: Driver’s master control panel MASTER BATTERY switch set to OFF

GENERAL INSTRUCTIONS:

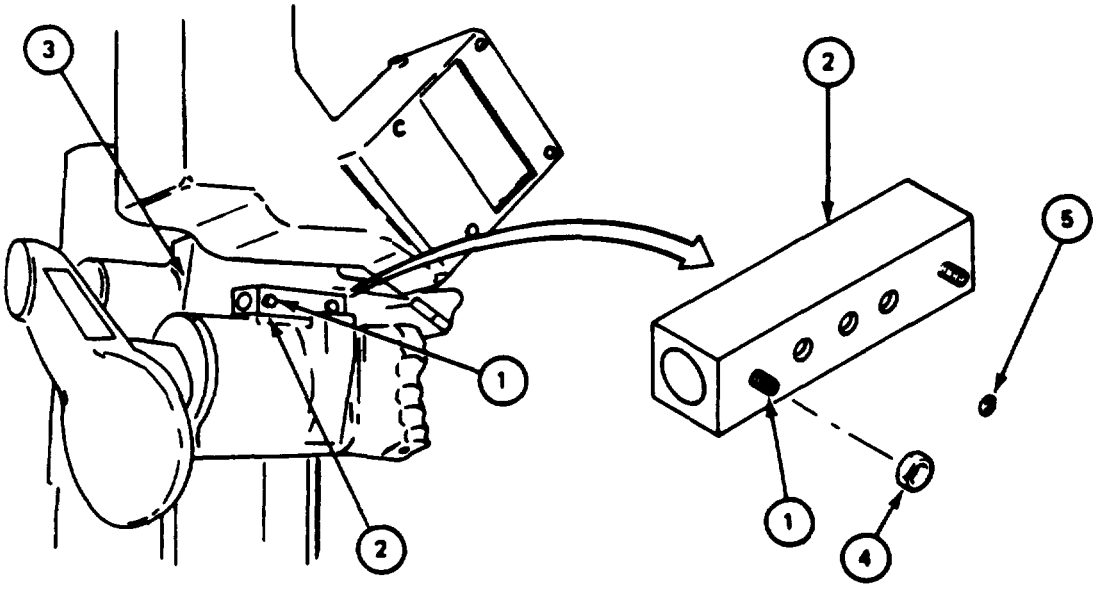
CAUTION

Hydraulic parts must be protected from dirt after removal. Dirt can damage hydraulic parts. Lint-free cloths should be used to keep hydraulic parts clean.

13-21. SHUTTLE VALVE REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
	NOTE Do not remove screws (1) from shuttle valve (2). Screws hold shuttle valve plugs in place. Loosen screws just enough to get shuttle valve (2) free of riser (3).
1.	Using socket wrench, loosen, but do not remove, two screws (1).
2.	Remove shuttle valve (2) with two screws (1) from riser (3).
3.	Put two nuts (4) on two screws (1) to hold screws in place.
4.	Using O-ring extractor tool, remove three preformed packings (5) from shuttle valve ports in riser (3) (JPG). Throw packing away.
	END OF TASK



13-22. SHUTTLE VALVE INSTALLATION PROCEDURE

TOOLS: O-ring extractor kit
5/32” hex head socket (3/8” drive)
3/8” drive ratchet
11” extension (3/8” drive)

SUPPLIES: Hydraulic fluid (item 10, App. A)
Preformed packing (three) (MS 28775-8)

PERSONNEL: One

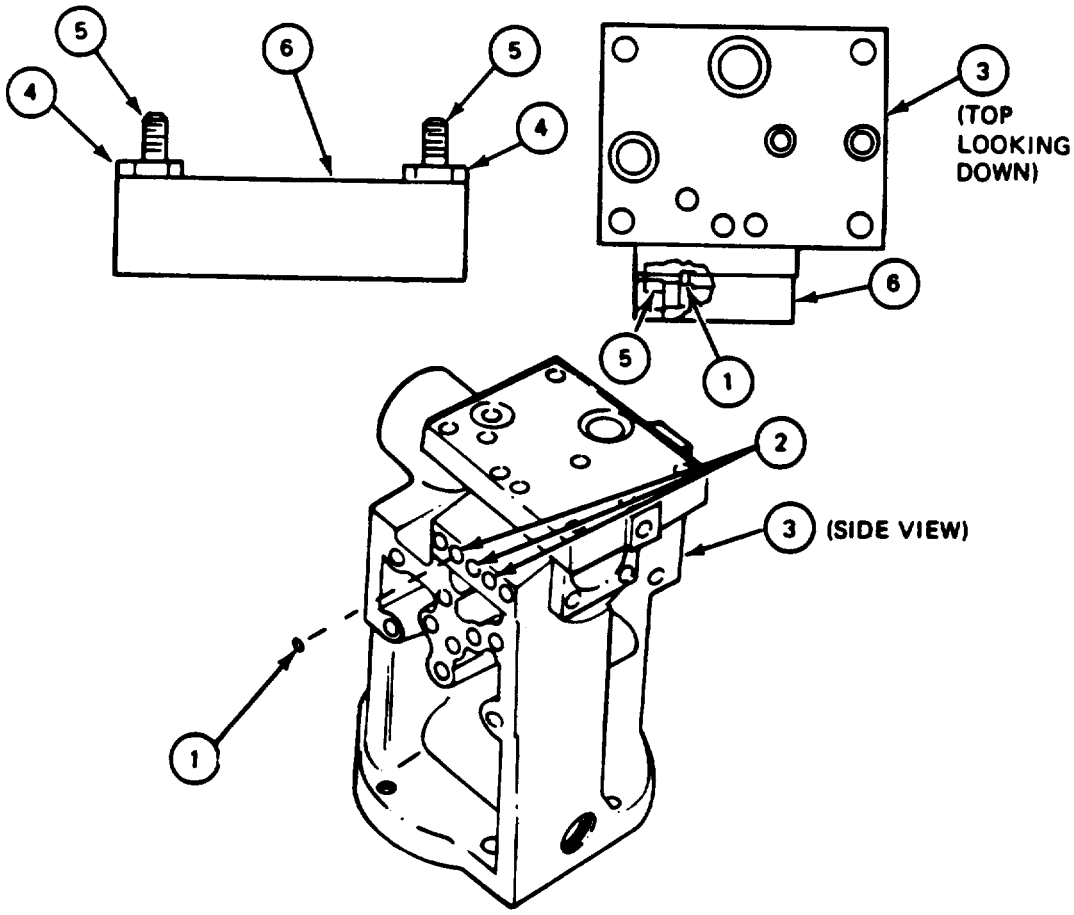
REFERENCES: JPG for procedure to install preformed packing
TM 9-2350-222-10 for procedure to elevate main gun

PRELIMINARY PROCEDURES: Test shuttle valve (para 13-20)

13-22. SHUTTLE VALVE INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Coat three new preformed packings (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packings (1) in three ports (2) on hydraulic riser (3) (JPG).
3.	Remove nuts (4) from screws (5).
4.	Put shuttle valve (6) on hydraulic riser (3). Make sure that preformed packings (1) are still in three ports (2).
5.	Put screws (5) through shuttle valve (6) into hydraulic riser (3).
6.	Using Allen wrench, tighten screws (5).
	NOTE Follow-on Maintenance Action Required: Elevate main gun in manual mode to make sure shuttle valve operates properly (TM-10).
	END OF TASK


5
6
5
4
4
3
(TOP
LOOKING
DOWN)
6
5
1
2
3
(SIDE VIEW)
1

13-23. SHUTTLE VALVE DISASSEMBLY PROCEDURE

TOOLS: O-ring extractor kit
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Wood dowel (1/4" diameter. 6" long)
Screw (No. 4-40 NC thread, 3/4" long)
Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

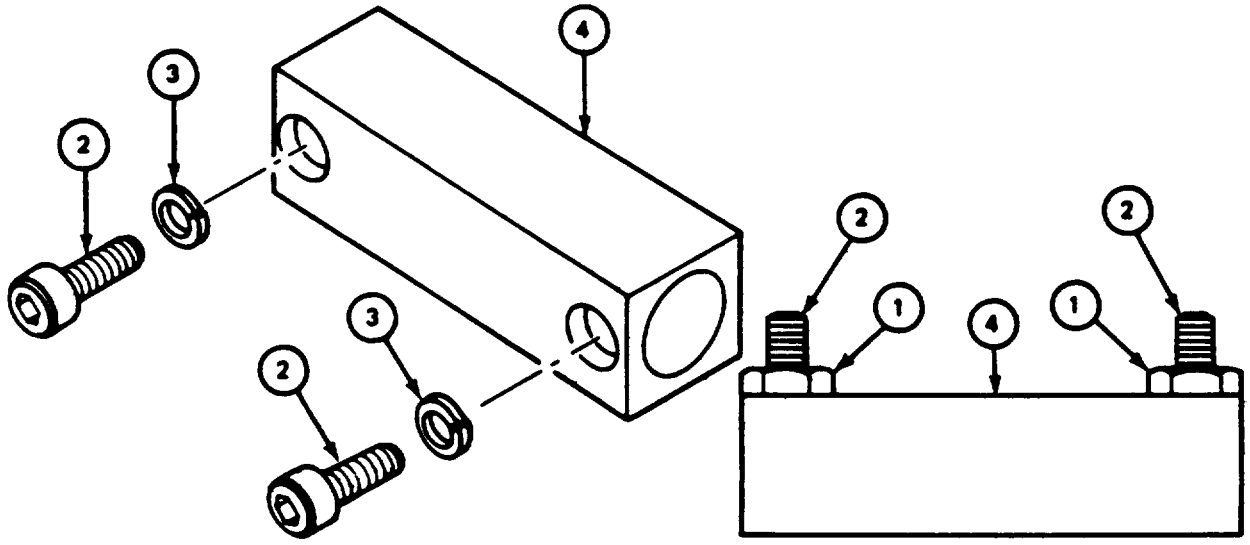
REFERENCES: JPG for procedures to:
Remove preformed packing
Clean parts
Inspect and repair pans

PRELIMINARY PROCEDURES: Remove shuttle valve (para 13-21)
Test shuttle valve (para 13-20)

13-23. SHUTTLE VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 1

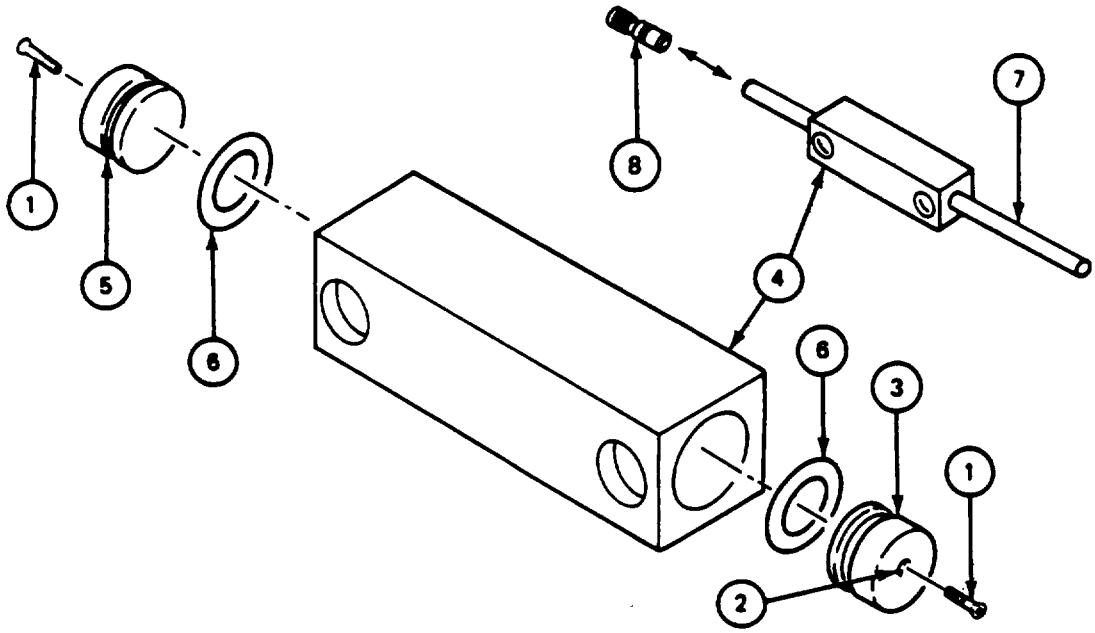
Step	Procedure
1.	Using fingers, remove two nuts (1) from screws (2).
2.	Remove two screws (2) and two lockwashers (3) from shuttle valve (4).
	GO TO FRAME 2



13-23. SHUTTLE VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE Screw (1) must have 4-40 NC thread.
1.	Put screw (1) in threaded hole (2) of plug (3).
2.	Pull screw (1) with plug (3) from valve body (4).
3.	Remove screw (1) from plug (3).
4.	Put screw (1) in threaded hole of plug (5).
5.	Pull screw (1) with plug (5) from valve body (4).
6.	Remove screw (1) from plug (5).
7.	Using O-ring extractor tool, remove preformed packings (6) from plugs (3) and (5) (JPG). Throw preformed packings away.
8.	Using wood dowel (7), push spool (8) from valve body (4).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of parts (para 13-19).
	END OF TASK


1
5
6
8
7
4
6
3
1
2

13-24. SHUTTLE VALVE ASSEMBLY PROCEDURE

SUPPLIES: Wood dowel (1/4” diameter, 6” long)
Screw (No. 4-40 NC thread, 3/4” long)
Preformed packing (two) (MS 28775-011)
Hydraulic fluid (item 10, App. A)
Nut (two) (No. 10-24 NC thread)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedure to install preformed packing

PRELIMINARY PROCEDURES: Inspect shuttle valve (para 13- 19)

GENERAL INSTRUCTIONS:

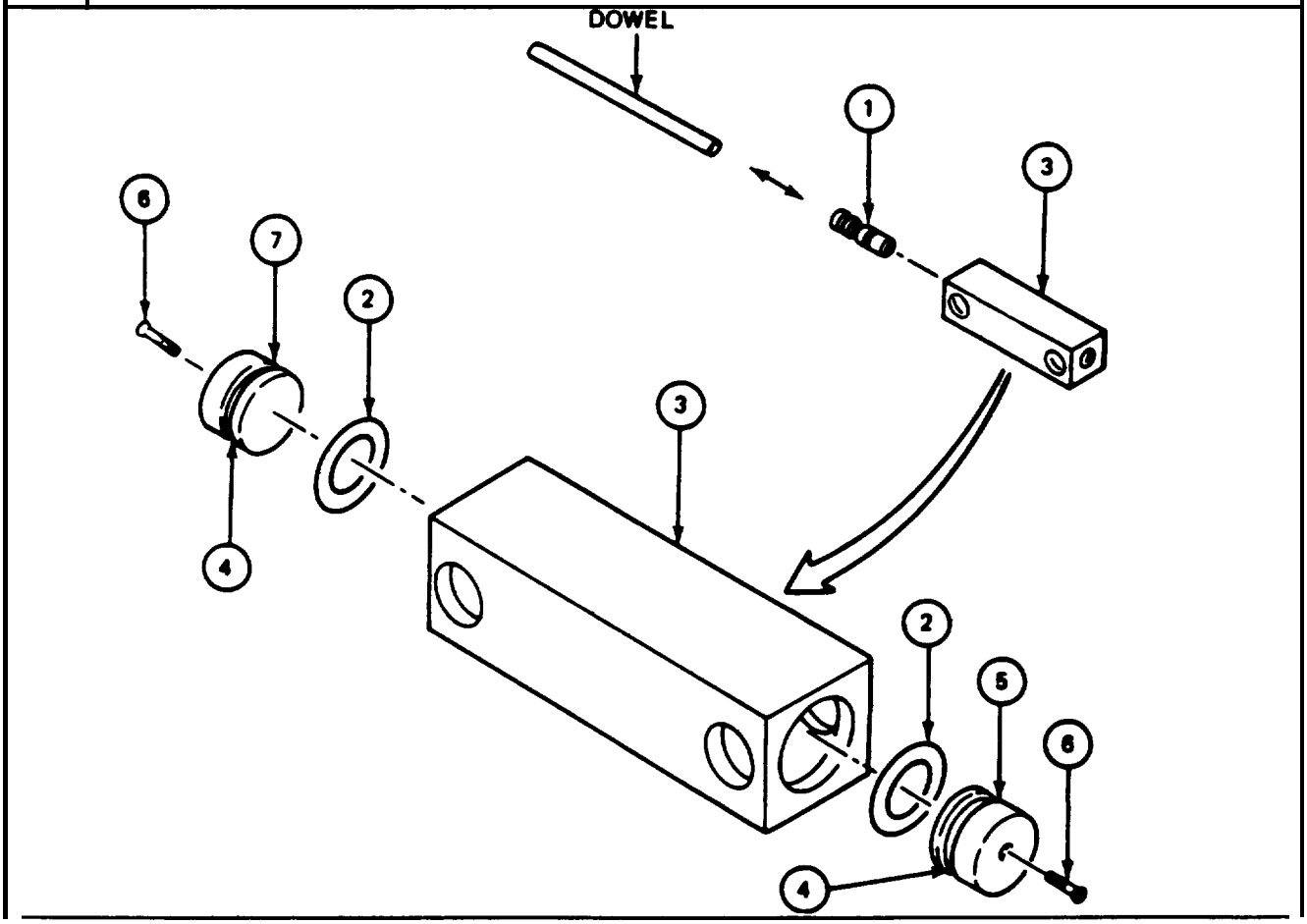
CAUTION

Hydraulic parts must be protected from dirt during assembly. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

3-24. SHUTTLE VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 1

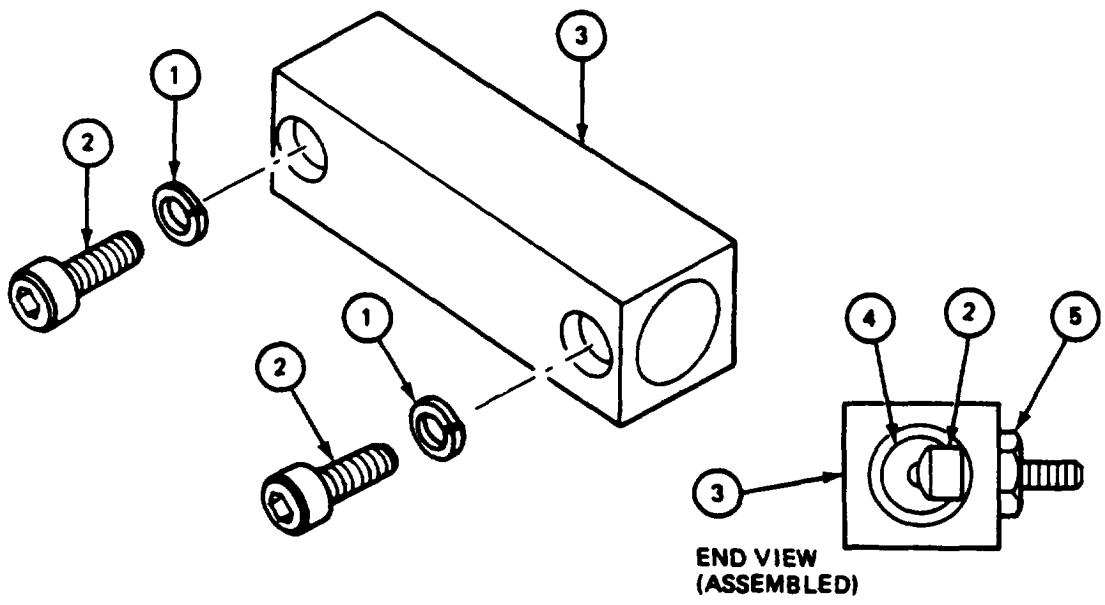
Step	Procedure
1.	Coat spool (1) and two new preformed packings (2) with hydraulic fluid.
2.	Put spool (1) in shuttle valve body (3).
3.	Using dowel, push spool (1) to middle of shuttle valve body (3). Take dowel out of shuttle valve body.
4.	Using O-ring extractor tool, put one preformed packing (2) in groove (4) of plug (5) (JPG).
5.	Put screw (6) in hole in plug (5).
6.	Using screw (6) as a handle, put plug (5) in shuttle valve body (3) as far as it will go.
7.	Take screw (6) out of plug (5).
8.	Repeat steps 4 thru 8 to put plug (7) in shuttle valve body (3).
	GO TO FRAME 2



13-24. SHUTTLE VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Put two lockwashers (1) on two screws (2).
	NOTE Two screws (2) are used to hold two plugs (4) in shuttle valve body (3). If screws do not go all the way in, push plugs (4) farther into shuttle valve body (3).
2.	Put two screws (2) and two lockwashers (1) in shuttle valve body (3).
	NOTE Two nuts (5) are used to keep two screws (2) from falling out of shuttle valve body (3).
3.	Put two nuts (5) on two screws (2). Do not tighten nuts.
	NOTE Follow-on Maintenance Action Required: Test shuttle valve (para 13-20).
	END OF TASK



Section 6. RELIEF VALVE

13-25. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks				
	Test	Removal	Installation	Disassembly	Assembly
Relief Valve	13-26	13-27	13-28	13-29	13-30

13-26. RELIEF VALVE TEST PROCEDURE

TEST EQUIPMENT Hydraulic test kit (NSN 1015-01-151-6441) (9337932)
Watch with sweep second hand

SUPPLIES: Pan
Pressure cap

PERSONNEL: One

PRELIMINARY PROCEDURES: Assemble relief valve (para. 13-30)
Remove relief valve (para. 13-27)

GENERAL INSTRUCTIONS:

WARNING

Oil under pressure can hurt or kill you. Follow procedures carefully. This test requires up to 2400 psi pressure.

NOTE

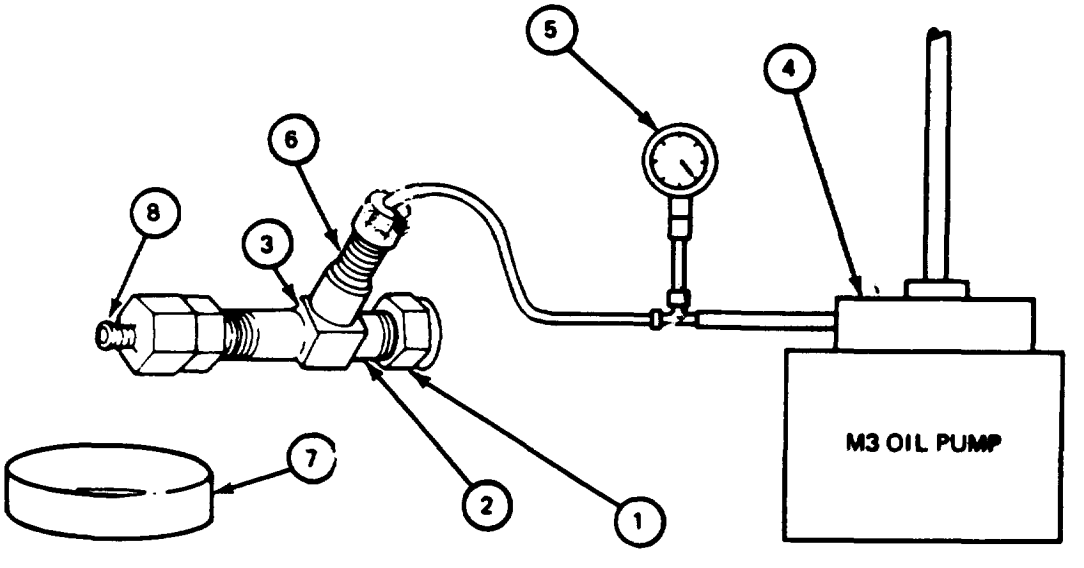
Suitable fittings, preformed packings, and tools should be used to connect test equipment to parts being tested.

If test does not give normal indication, relief valve is bad. Disassemble bad relief valve (para. 13-29).

13-26. RELIEF VALVE TEST PROCEDURE (CONT)

FRAME 1

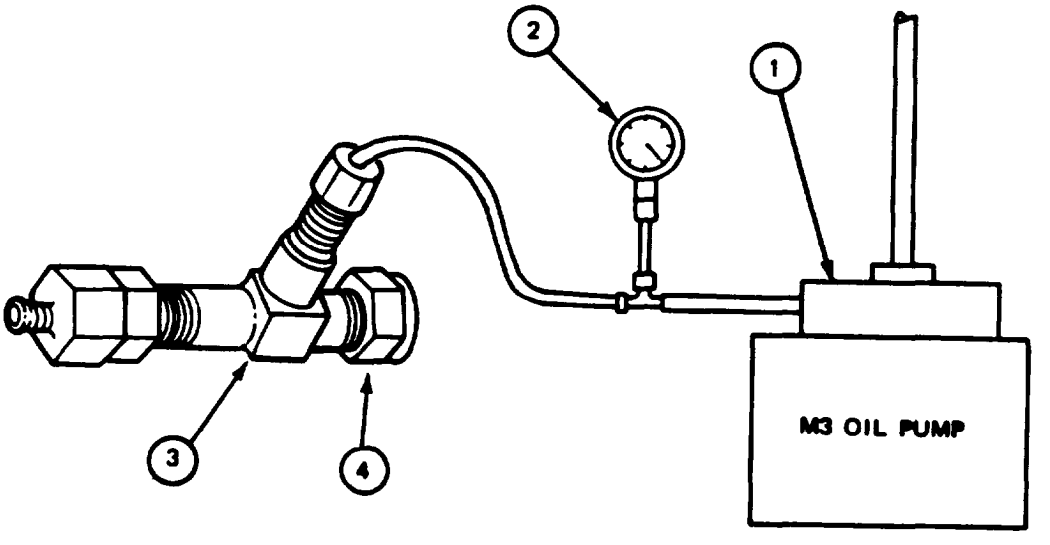
Step	Procedure
1.	Install pressure cap (1) on inlet port (2) of relief valve (3).
2.	Connect M3 oil pump (4) and pressure gauge (5) to relief valve (3) at port (6).
3.	Put pan (7) under reducing nut (8).
	NOTE Relief valve is open when a steady stream of oil comes out of reducing nut. Normal indication is relief valve open between 2000 and 2400 psi.
4.	Operate M3 oil pump until relief valve is open or until pressure gauge (5) reads more than 2400 psi (JPG).
	NOTE If normal indication was obtained, go to FRAME 3.
	GO TO FRAME 2



13-26. RELIEF VALVE TEST PROCEDURE (CONT)

FRAME 2

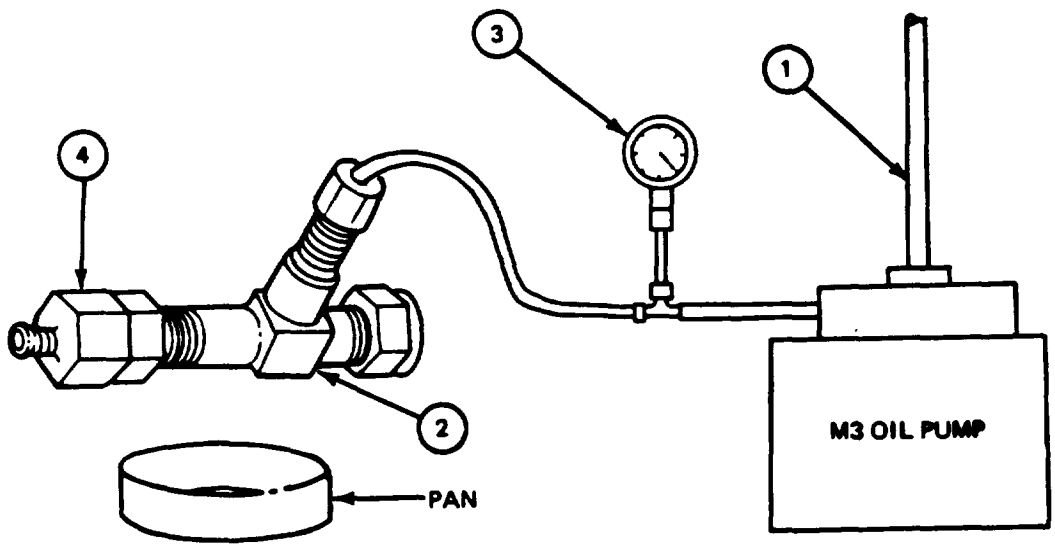
Step	Procedure
1.	Operate M3 oil pump (1) to lower pressure to 0 psi (JPG).
2.	Disconnect M3 oil pump (1) and pressure gauge (2) from relief valve (3).
3.	Remove pressure cap (4) from relief valve (3).
4.	Disassemble relief valve (3) (para 13-29).
	NOTE If pressure gauge read less than 2000 psi when relief valve was open, add one extra washer. If pressure gauge read more than 2400 psi, remove washer.
5.	Assemble relief valve (3) (para 13-30).
6.	Repeat FRAME 1.
	GO TO FRAME 3



13-26. RELIEF VALVE TEST PROCEDURE (CONT)

FRAME 3

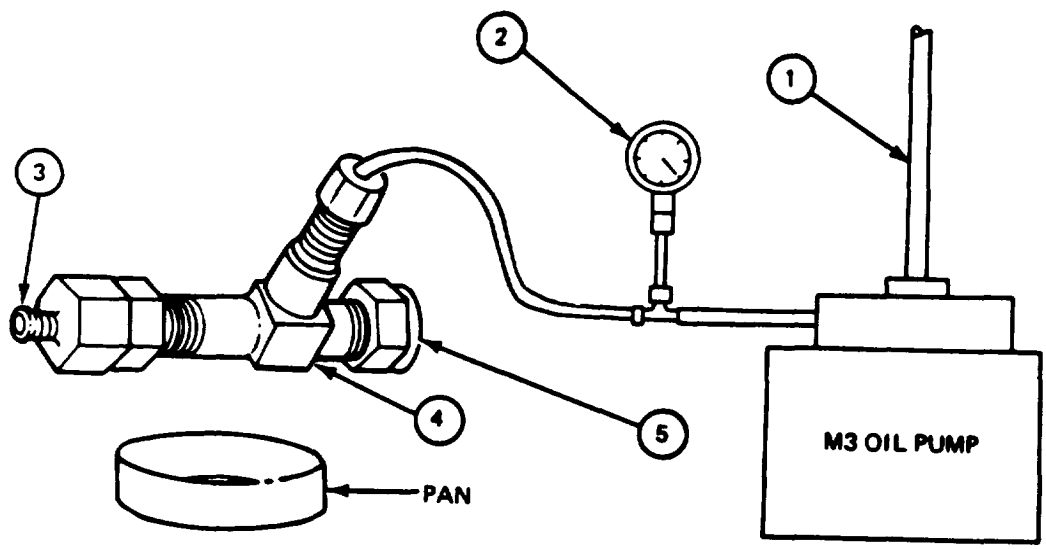
Step	Procedure
	NOTE Relief valve is closed when steady stream of oil stops and only drops of oil come out of reducing nut (4). Normal indication is relief valve closed between 1600 and 1920 psi.
1.	Operate M3 oil pump (1) to lower pressure until relief valve (2) is closed or until pressure gauge (3) reads less than 1600 psi (JPG).
	NOTE If normal indication was obtained, go to FRAME 4.
2.	Operate M3 oil pump (1) to lower pressure to 0 psi (JPG).
3.	Disconnect M3 oil pump (1) and pressure gauge (3) from relief valve (2).
4.	Remove pressure cap (4) from relief valve (2).
5,	Disassemble relief valve (2) (para 13-29).
6.	Assemble relief valve (2) with new spring (para 13-30).
7.	Repeat FRAME 1
	GO TO FRAME 4



13-26. RELIEF VALVE TEST PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Operate M3 oil pump (1) to reduce pressure to less than 1500 psi (JPG).
2.	Operate M3 oil pump (1) until pressure gauge (2) reads between 1500 and 1520 psi (JPG).
3.	Using watch, wait one minute.
	NOTE Normal indication is not more than four drops of oil leaking from reducing nut (3) in two minutes.
4.	Using watch, check how much oil leaks from reducing nut (3) in two minutes.
5.	Operate M3 oil pump (1) to reduce pressure to 0 psi (JPG).
6.	Disconnect M3 oil pump (1) and pressure gauge (2) from relief valve (4).
7.	Remove pressure cap (5) from relief valve (4).
	NOTE If test procedure gives normal indication in Frames 1 through 4, relief valve is good.
	END OF TASK



13-27. RELIEF VALVE REMOVAL PROCEDURE

TOOLS: 5/8" open end wrench
1-1/2" open end wrench
1-1/8" open end wrench
O-ring extractor kit

SUPPLIES: Lint-free cloths (item 21, App. A)
Caps
Plugs

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to lower hydraulic system pressure
JPG for procedure to remove preformed packings

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-3	11
Gunner's Control Box	FO-1	2
Turret Traverse Lock	FO-3	7

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV POWER switch set to OFF
Turret traverse lock set to LOCKED

GENERAL INSTRUCTIONS:

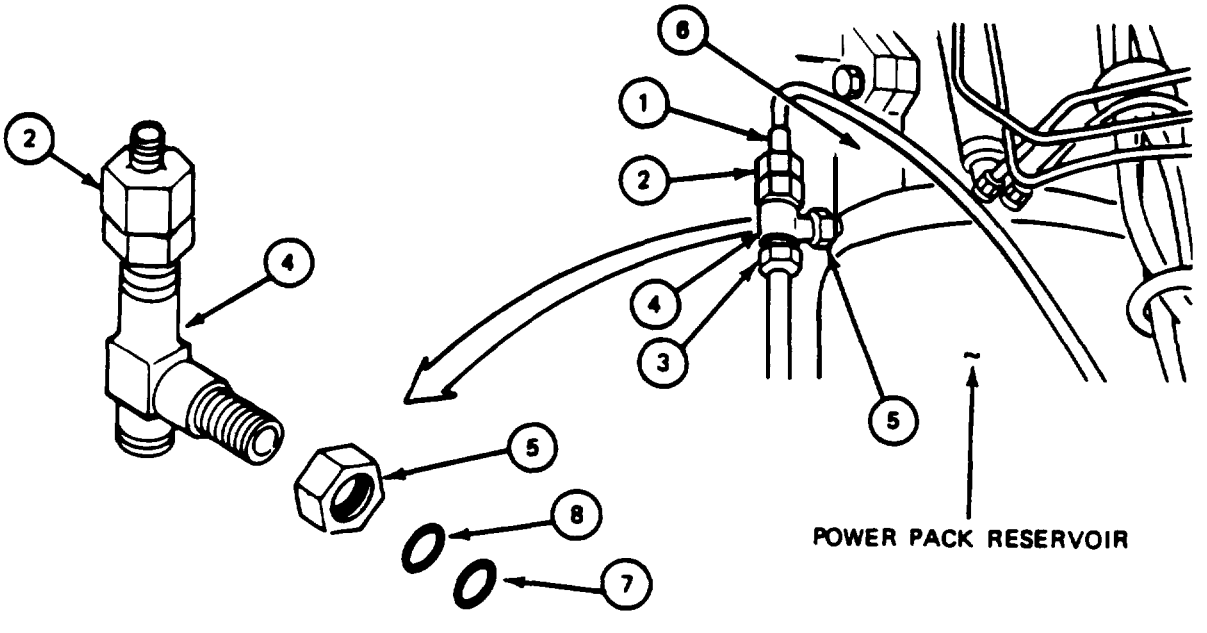
CAUTION

Hydraulic parts must be protected from dirt when removed from vehicle. Dirt can damage hydraulic parts. Lint-free cloths, caps, and plugs should be used to keep hydraulic parts clean.

13-27. RELIEF VALVE REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
	WARNING Before removing hydraulic tubes or parts, system pressure must be lowered to 0 psi. Hydraulic fluid under pressure can hurt you.
1.	Lower hydraulic system pressure to 0 psi (TM-20-2-3).
2.	Using 1-1/2” and 5/8” wrenches, remove nut on end of tube (1) from reducer (2).
3.	Using 1-1/8” wrench, remove nut (3) from relief valve (4).
4.	Using 1-1/8” wrench, loosen nut (5).
5.	Using 1-1/8” wrench, remove relief valve (4) from hydraulic riser (6).
6.	Using O-ring extractor tool, remove preformed packing (7) and non-metallic washer (8). Throw preformed packing and non-metallic washer away.
7.	Remove nut (5) from relief valve (4).
	END OF TASK



13-28. RELIEF VALVE INSTALLATION PROCEDURE

TOOLS: 12” adjustable wrench
5/8" open end wrench
1-1/8” open end wrench
O-ring extractor kit

SUPPLIES: Preformed packing (MS 28778-10)
Non-metallic washer (MS 28777-10)
Hydraulic fluid (item 10, App. A)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: TM 9-2350-222-10 for procedure to traverse turret
TM 9-2350-222-20-2-3 for procedure to bleed hydraulic system
JPG for procedure to install preformed packing

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver’s Master Control Panel	FO-3	11
Gunner’s Control Box	FO-1	2
Turret Traverse Lock	FO-3	7

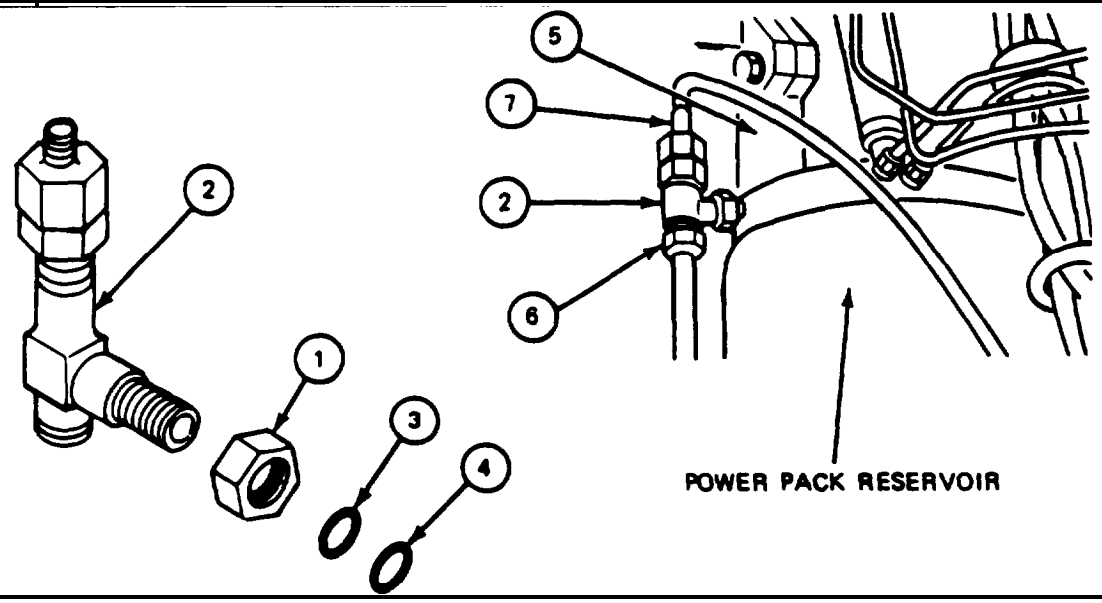
EQUIPMENT CONDITION: Driver’s master control panel MASTER BATTERY switch set to OFF
Gunner’s control box ELEV/TRAV POWER switch set to OFF
Turret traverse lock set to LOCKED

PRELIMINARY PROCEDURES: Test relief valve (para 13-26)

13-28. RELIEF VALVE INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Put nut (1) on relief valve (2) past groove in threads.
2.	Put non-metallic washer (3) on relief valve (2) and in groove.
3.	Coat preformed packing (4) with hydraulic fluid.
4.	Using O-ring extractor tool, put preformed packing (4) on relief valve (2) and against non-metallic washer (3) (JPG).
5.	Using 1-1/8” wrench, put relief valve (2) on hydraulic riser (5).
6.	Using adjustable wrench to hoId relief valve (2) and 1-1/8” wrench on nut (1), tighten nut (1).
7.	Using adjustable wrench to hold relief valve (2) and 1-1/8” wrench on nut (6), attach nut to relief valve.
8.	Using adjustable wrench to hold relief valve (2) and 5/8” wrench on nut of tube (7), attach nut to relief valve (2).
	NOTE Follow-on Maintenance Action Required: Bleed hydraulic system (TM-20-2-3). Traverse turret in power mode to make sure relief valve operates properly (TM-10).
	END OF TASK



13-29. RELIEF VALVE DISASSEMBLY PROCEDURE

TOOLS: Portable drill press
1/4" drill rod (5" long)
1-1/2" combination wrench
Internal retaining ring pliers
O-ring extractor kit
Scraper
Stiff bristled brush
Fine stone

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

PERSONNEL: One

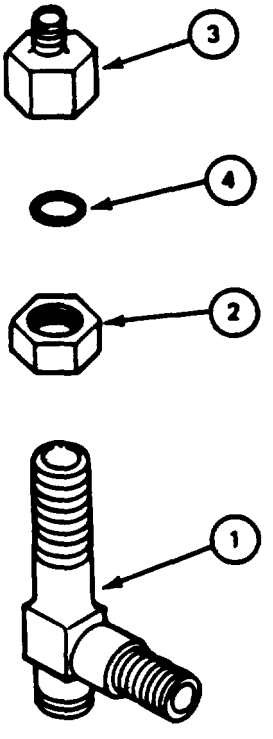
REFERENCES: JPG for procedures to:
Use drill press
Remove preformed packings
Remove retaining rings
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove relief valve (para 13-27)
Test relief valve (para 13-26)

13-29. RELIEF VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 1

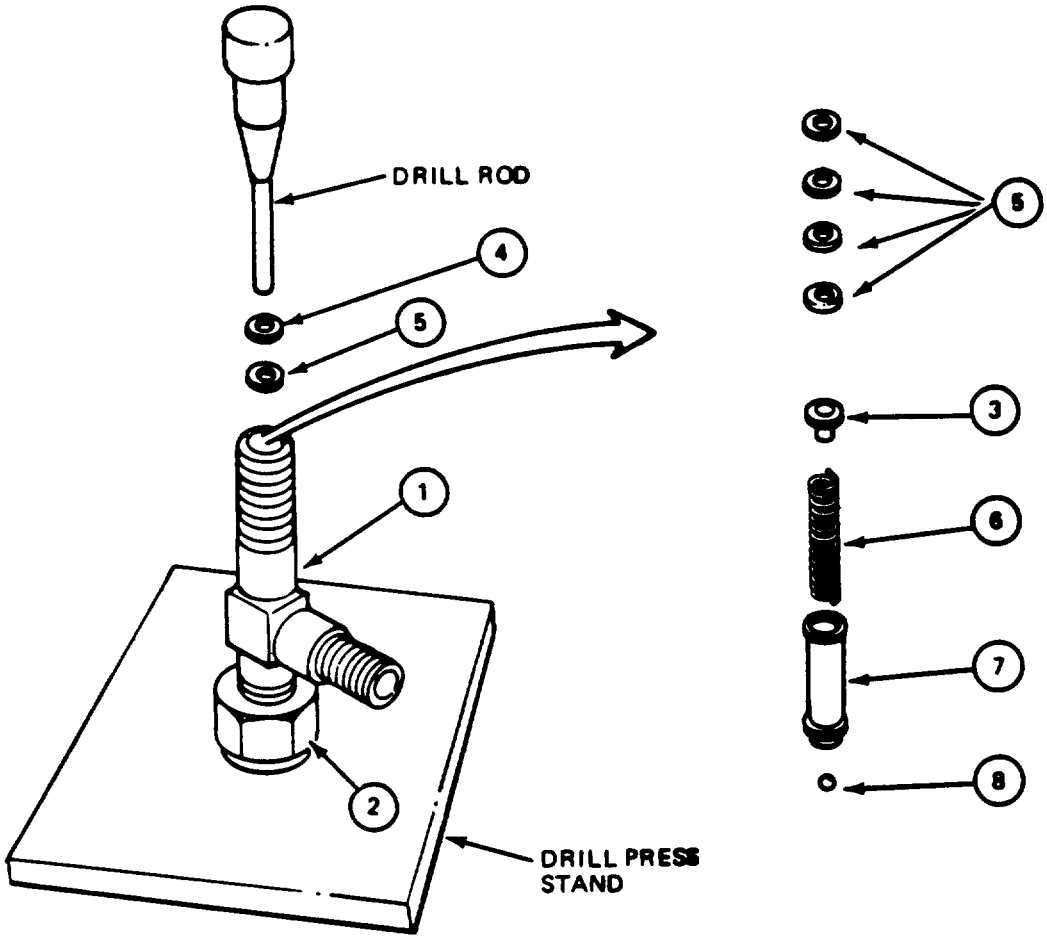
Step	Procedure
1.	Put relief valve body (1) in vise.
2.	Using wrench, loosen locknut (2).
3.	Using wrench, remove reducing nut (3).
4.	Using O-ring extractor tool, remove preformed packing (4) from reducing nut (3) (JPG). Throw preformed packing away.
5.	Using wrench, remove locknut (2).
	CAUTION Locknut (2) must be put on short end of valve body (1) to protect threads.
6.	Using fingers, put locknut (2) on short end of relief valve body (1).
	GO TO FRAME 2



13-29. RELIEF VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Put valve body (1) (with locknut (2) on short end) on drill press stand.
2.	Using drill rod in drill press, push down on seat (3) to take pressure off retaining ring (4) (JPG).
3.	Using pliers, remove retaining ring (4) from groove in valve body (1) (JPG).
4.	Slowly raise drill rod and remove retaining ring (4) and washers (5) from valve body (1).
	CAUTION Do not lose ball (8) in bottom of valve body (1).
5.	Turn valve body (1) upside down slowly, and remove seat (3), spring (6), bushing (7), and ball (8).
6.	Using fingers, remove locknut (2) from short end of valve body (1).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK


DRILL ROD
4
5
1
2
DRILL PRESS STAND
5
3
6
7
8

13-30. RELIEF VALVE ASSEMBLY PROCEDURE

TOOLS: Portable drill press
1/4" drill rod (5" long)
1-1/2" combination wrench
Internal retaining ring pliers
O-ring extractor kit
Vise with brass caps

SUPPLIES: Preformed packing (MS 28775-118)
Hydraulic fluid (item 10, App. A)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Use drill press
Install preformed packing
Install retaining ring

GENERAL INSTRUCTIONS:

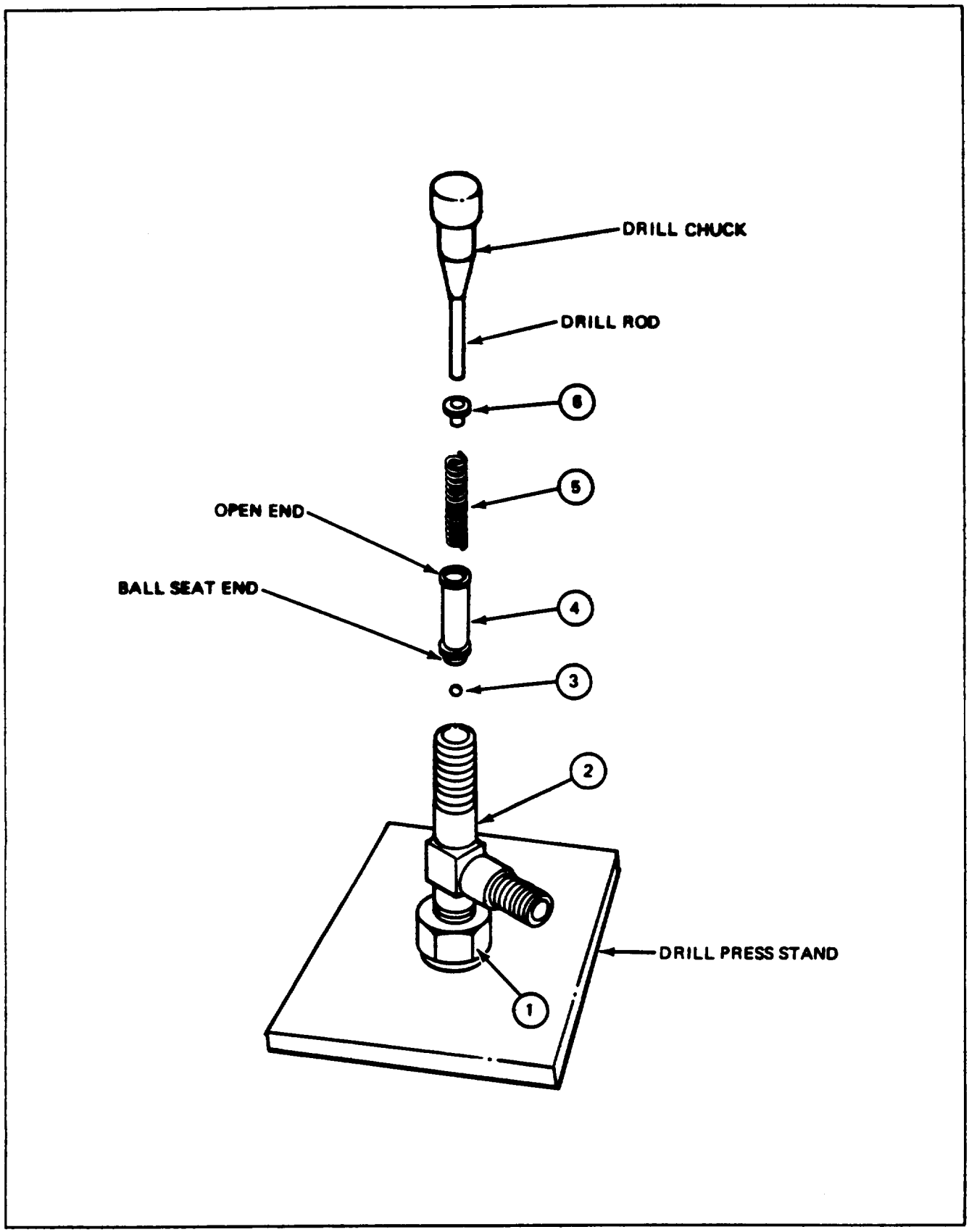
CAUTION

Hydraulic parts must be protected from dirt during assembly. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

13-30. RELIEF VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 1

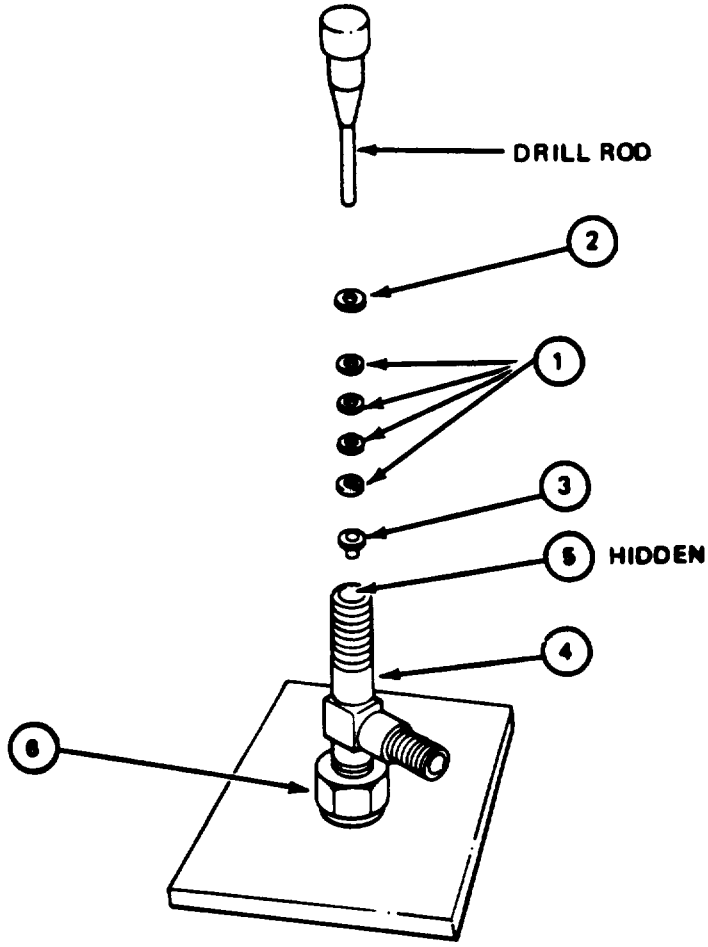
Step	Procedure
	NOTE Lock nut (1) is put on end of valve body (2) to protect valve body threads.
1.	Using fingers, screw locknut (1) on short end of valve body (2).
2.	Set valve body (2) on stand of drill press. Make sure that locknut (1) is down and that center of valve body is lined up with center of drill.
3.	Put ball (3) in valve body (2). Make sure that ball rolls to center of valve body.
4.	Put bushing (4) in valve body (2) with ball seat end of bushing down, open end up.
5.	Put spring (5) in bushing (4).
6.	Put small end of seat (6) in spring (5).
7.	Put drill rod, flat end down, in drill chuck (JPG).
	GO TO FRAME 2


DRILL CHUCK
DRILL ROD
6
5
OPEN END
BALL SEAT END
4
3
2
DRILL PRESS STAND
1

13-30. RELIEF VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 2

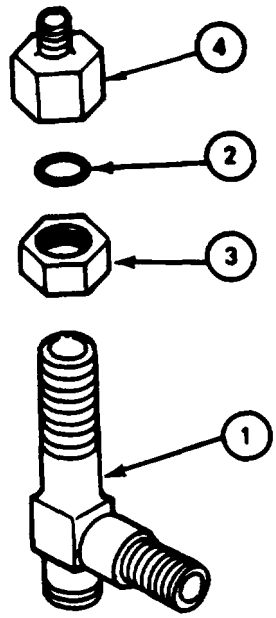
Step	Procedure
	NOTE The number of washers (1) required depends on results of test (para 13-26). For first assembly before test, install four washers.
1.	Stack four washers (1) and retaining ring (2) on seat (3).
2.	Using drill press and drill rod, push seat (3) down inside valve body (4). Make sure washers are pushed past retaining ring groove (5). Hold washers down until step 3 is completed (JPG).
3.	Using pliers, put retaining ring (2) in groove (5) (JPG).
4.	Raise drill rod from valve body (4).
5.	Using fingers, remove locknut (6) from valve body (4).
	GO TO FRAME 3


DRILL ROD
2
1
3
5
HIDDEN
4
6

13-30. RELIEF VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Put valve body (1) in vise.
2.	Coat preformed packing (2) with hydraulic fluid.
3.	Using fingers, put nut (3) on valve body (1).
4.	Using O-ring extractor tool, put preformed packing (2) in reducing nut (4) (JPG).
5.	Using wrench, put reducing nut (4) on valve body (l).
6.	Using wrench, tighten locknut (3) against reducing nut (4).
7.	Remove valve body (1) from vise.
	NOTE Follow-on Maintenance Action Required: Test relief valve (para 13-26).
	END OF TASK



Section 7. DRAIN TUBE

13-31. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks	
	Removal	Installation
Drain Tube	13-32	13-33

13-32. DRAIN TUBE REMOVAL PROCEDURE

TOOLS: Pipe wrench, fabric-strap type
Scraper
Stiff bristled brush
Fine stone

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

PERSONNEL: One

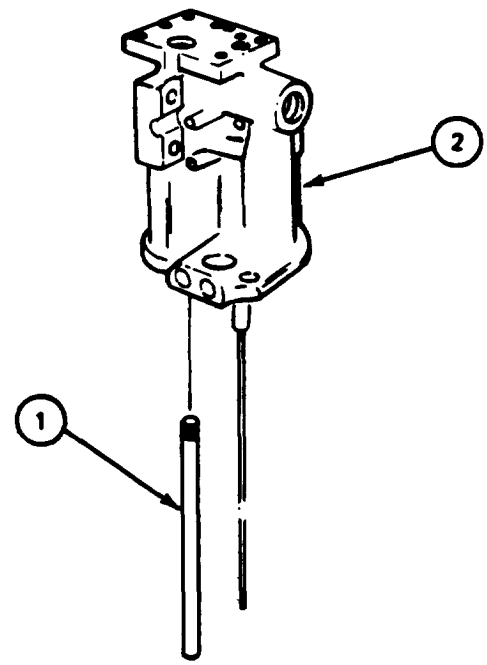
REFERENCES: JPG for procedures to:
Use strap type pipe wrench
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-60)
Remove hydraulic riser (para 13-14)

13-32. DRAIN TUBE REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using wrench, unscrew drain tube (1) from hydraulic riser (2) (JPG).
	NOTE
	Follow-on Maintenance Action Required:
	Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK



13-33. DRAIN TUBE INSTALLATION PROCEDURE

TOOLS: Pipe wrench, fabric-strap type

SUPPLIES: Hydraulic fluid (item 10, App. A)

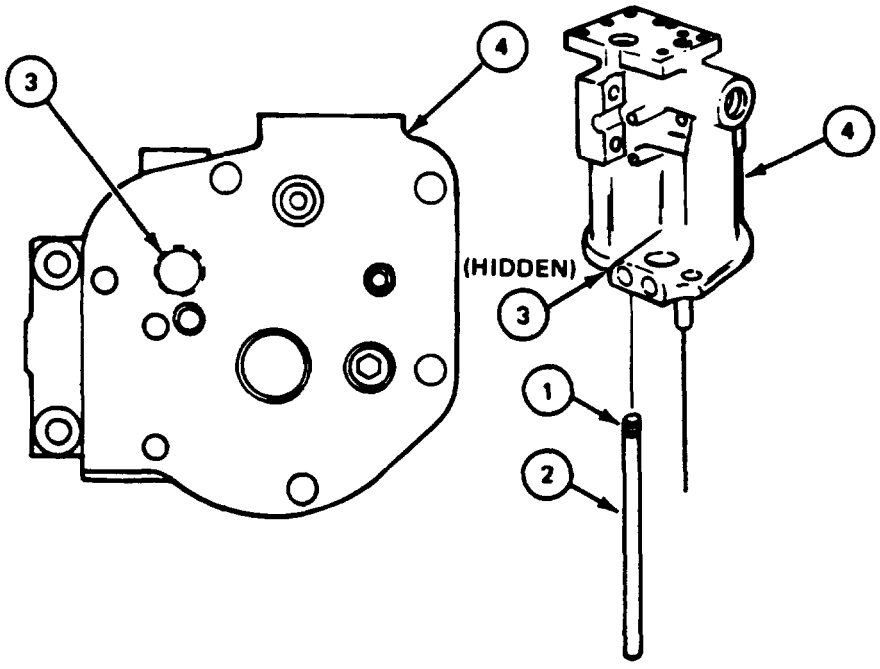
PERSONNEL: One

REFERENCES: JPG for procedure to use strap type pipe wrench

13-33. DRAIN TUBE INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Coat threaded end (1) of drain tube (2) with hydraulic fluid.
	CAUTION
	Make sure threaded end (1) of drain tube (2) screws easily into port (3) of hydraulic riser (4). If drain tube is hard-to screw in, it may be cross-threaded.
2.	Using hands, screw drain tube (2) into port (3) of hydraulic riser (4) as far as it will go.
3.	Using wrench, tighten drain tube (2) (JPG).
	NOTE
	Follow-on Maintenance Action Required:
	Install hydraulic riser (para 13-15).
	END OF TASK



Section 8. CHECK VALVE

3-34. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks: Test	Removal	Installation	Disassembly	Assembly
Check Valve	13-35	13-36	13-37	13-38	13-39

13-35. CHECK VALVE TEST PROCEDURE

TEST EQUIPMENT: M3 oil pump
Pressure gauge (0-3000 psi)
Suitable fittings, preformed packings and tools

SUPPLIES: Pan

PERSONNEL: One

REFERENCES: JPG for procedures to operate M3 oil pump

PRELIMINARY PROCEDURES: Remove check valve (para 13-36)
Assemble check valve (para 13-39)

GENERAL INSTRUCTIONS:

WARNING

Oil under pressure can hurt or kill you. Follow procedures carefully. This test procedure requires up to 2050 psi.

NOTE

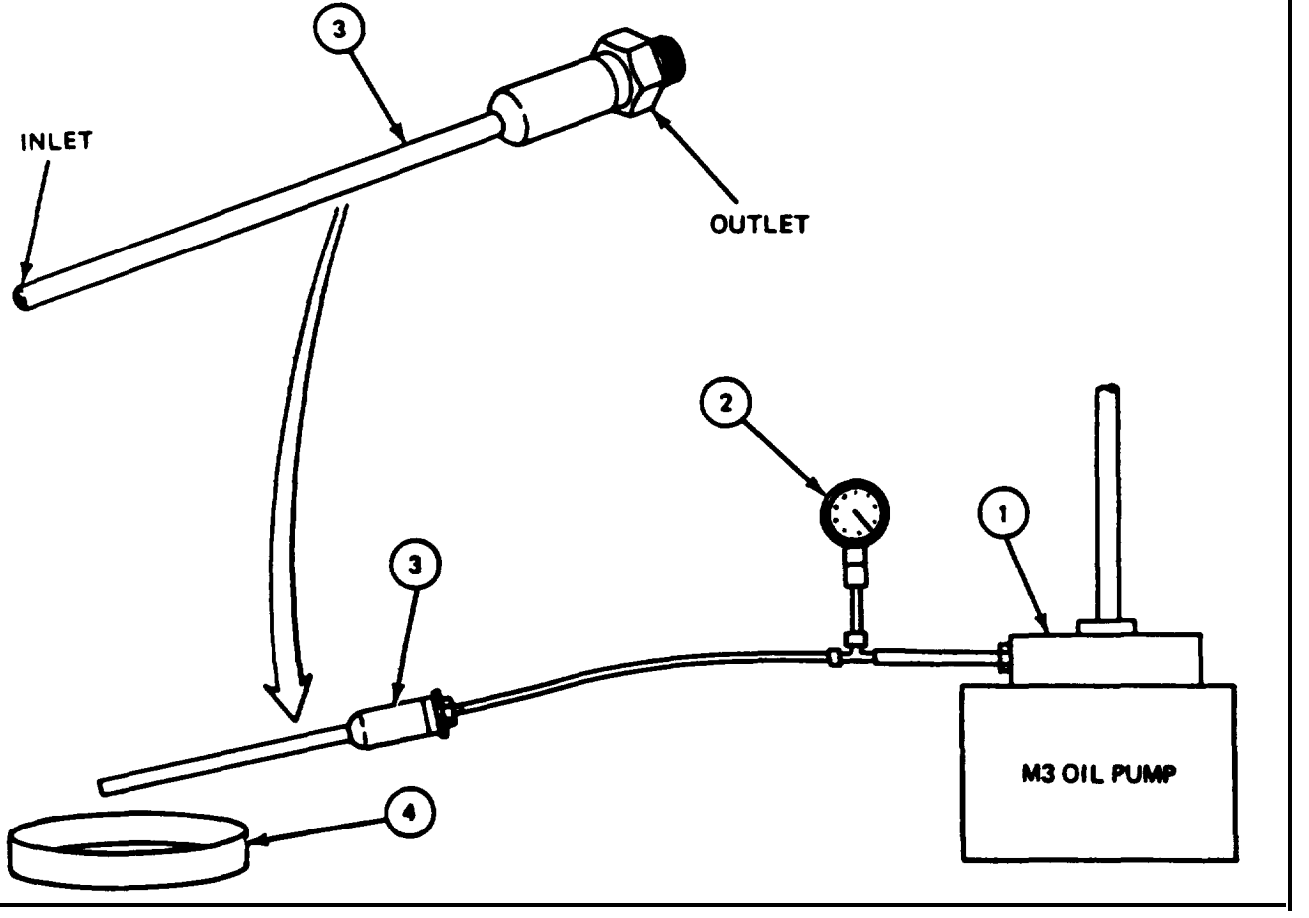
Suitable fittings, preformed packings, and tools should be used to connect test equipment to parts being tested.

If normal indication is not obtained, check valve is bad. Disassemble bad check valve (para 13-38).

13-35. CHECK VALVE TEST PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Connect M3 oil pump (1) and pressure gauge (2) to outlet end of check valve (3).
2.	Put inlet end of check valve (3) in pan (4).
3.	Operate M3 oil pump (1) until pressure gauge (2) reads between 2000 and 2050 psi (JPG).
4.	Check inlet end of check valve (3). Normal indication is no leaking.
5.	Operate M3 oil pump (1) to lower pressure to 0 psi (JPG).
6.	Disconnect M3 oil pump (1) and pressure gauge (2) from check valve (3).
	NOTE If normal indication is obtained, check valve is good.
	END OF TASK



13-36. CHECK VALVE REMOVAL PROCEDURE

TOOLS: 13/16” combination wrench
O-ring extractor kit

PERSONNEL: One

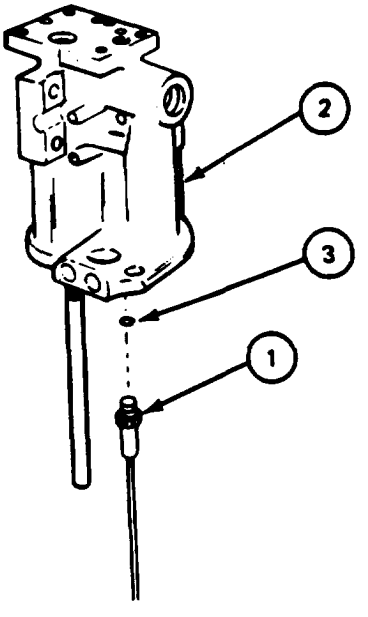
REFERENCES: JPG for procedure to remove preformed packings

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-60)
Remove hydraulic riser (para 13-14)

13-36. CHECK VALVE REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using wrench, remove check valve (1) from hydraulic riser (2).
2.	Using O-ring extractor tool, remove preformed packing (3) from check valve (1) (JPG). Throw away preformed packing.
	NOTE Follow-on Maintenance Action Required: Test check valve (para 13-35).
	END OF TASK



13-37. CHECK VALVE INSTALLATION PROCEDURE

TOOLS: 13/16” combination wrench
O-ring extractor kit

SUPPLIES: Preformed packing
Hydraulic fluid (item 10, App. A)

PERSONNEL: One

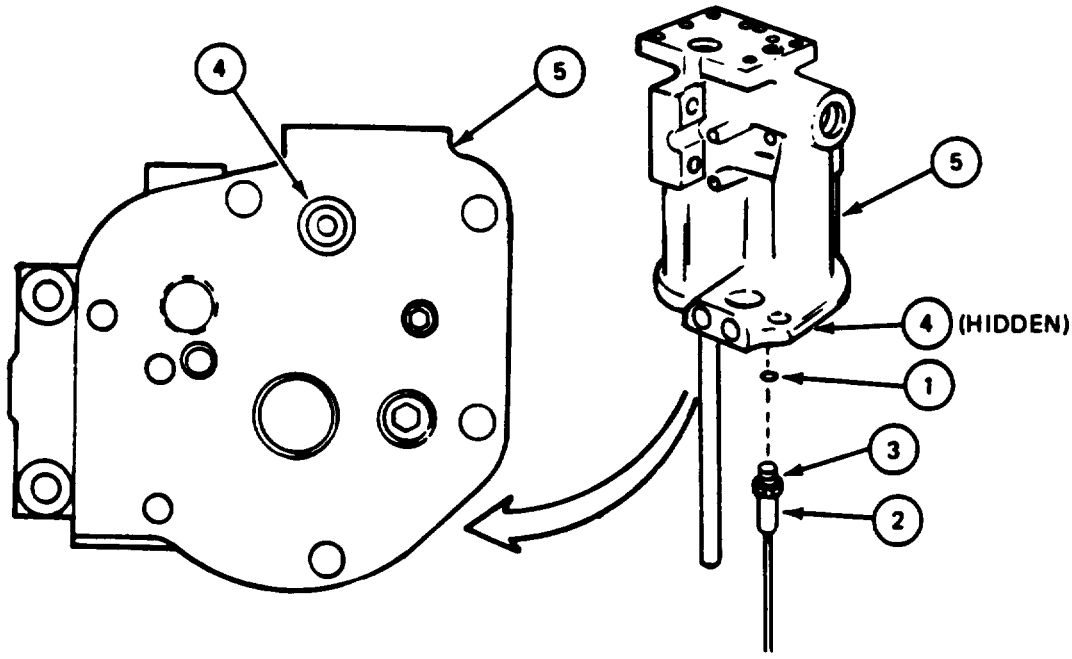
REFERENCES: JPG for procedure to install preformed packing

PRELIMINARY PROCEDURES: Test check valve (para 13-35)
Install drain tube (para 13-33)

13-37. CHECK VALVE INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Coat packing (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packing (1) on check valve (2) (JPG). Make sure preformed packing is in groove (3).
3.	Put check valve (2) in port (4) of hydraulic riser (5).
4.	Using wrench, tighten check valve (2) to hydraulic riser (5).
	NOTE Follow-on Maintenance Action Required: Install hydraulic riser (para 13-15).
	END OF TASK



13-38. CHECK VALVE DISASSEMBLY PROCEDURE

TOOLS: Vise with brass caps
13/16" combination wrench
O-ring extractor kit
Scraper
Stiff bristled brush
Fine stone

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

PERSONNEL: One

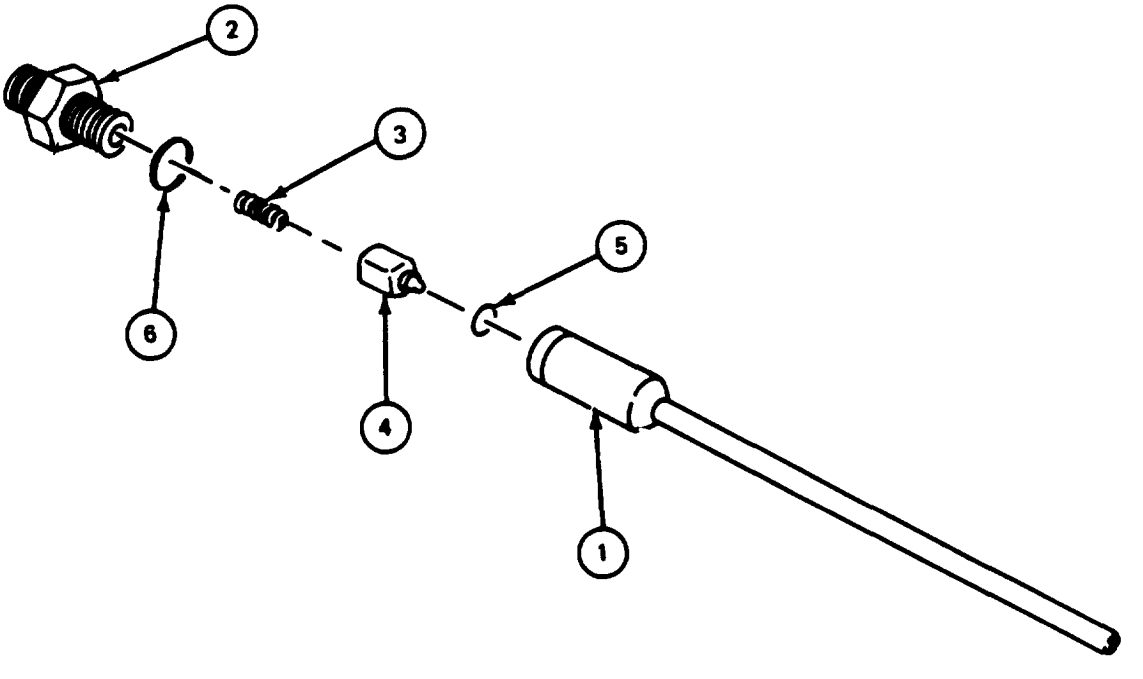
REFERENCES: JPG for procedures to:
Remove preformed packings
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-60)
Remove hydraulic riser (para 13-14)
Remove check valve (para 13-36)
Test check valve (para 13-35)

13-38. CHECK VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Put valve body (1) in vise.
2.	Using wrench, remove adapter (2) from valve body (1).
3.	Remove spring (3) and plunger (4) from valve body (1).
4.	Using O-ring extractor tool, remove preformed packing (5) from plunger (4) (JPG). Throw away preformed packing.
5.	Using O-ring extractor tool, remove preformed packing (6) from adapter (2) (JPG). Throw away preformed packing.
6.	Remove valve body (1) from vise.
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK



13-39. CHECK VALVE ASSEMBLY PROCEDURE

TOOLS: Strap style pipe wrench
13/16" combination wrench
O-ring extractor kit

SUPPLIES: Preformed packing (596921)
Preformed packing (596926)
Hydraulic fluid (item 10, App. A)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Install preformed packing
Use strap-type pipe wrench

GENERAL INSTRUCTIONS:

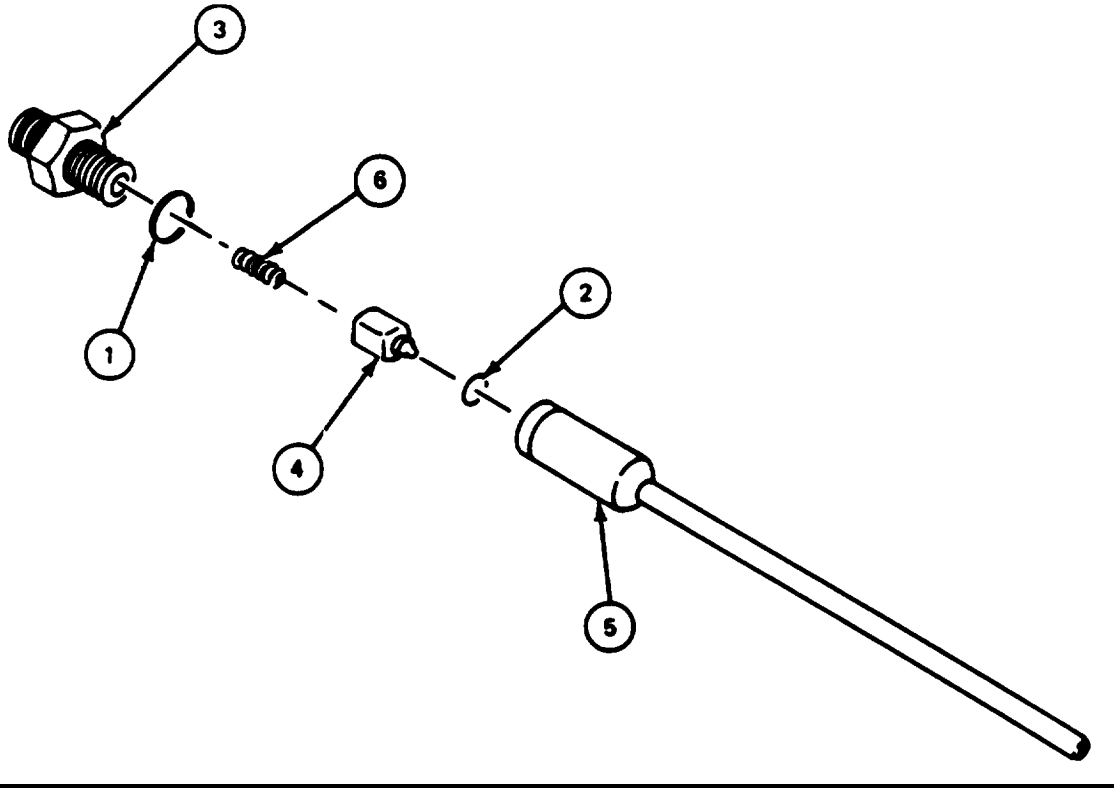
CAUTION

Hydraulic arts must be protected from dirt during assembly. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

13-39. CHECK VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Coat two packings (1) and (2) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packing (1) on adapter (3) (JPG).
3.	Using O-ring extractor tool, put preformed packing (2) on plunger (4) (JPG).
4.	Put plunger (4). with preformed packing (2) end first, in valve body (5).
5.	Put spring (6) into valve body (5).
6.	Screw adapter (3) into valve body (5).
7.	Using pipe wrench to hold valve body (5), and combination wrench to turn adapter (3), tighten adapter (3) to valve body (5) (JPG).
	NOTE Follow-on Maintenance Action Required: Test check valve (para 13-35).
	END OF TASK



Section 9. OIL FILTER

13-40. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks					
	Service	Test	Removal	Installation	Disassembly	Assembly
Oil Filter	13-41	13-42	13-43	13-44	13-45	13-46

13-41. OIL FILTER SERVICE PROCEDURE

TOOLS: Retaining ring pliers

SUPPLIES: Preformed packing (MS28775-226)
Filter element (12257235)
Lint-free cloth (item 21,. App. A)

PERSONNEL: One

PRELIMINARY PROCEDURES: Remove hydraulic riser (para. 13-14)
Remove oil filter (para. 13-43)

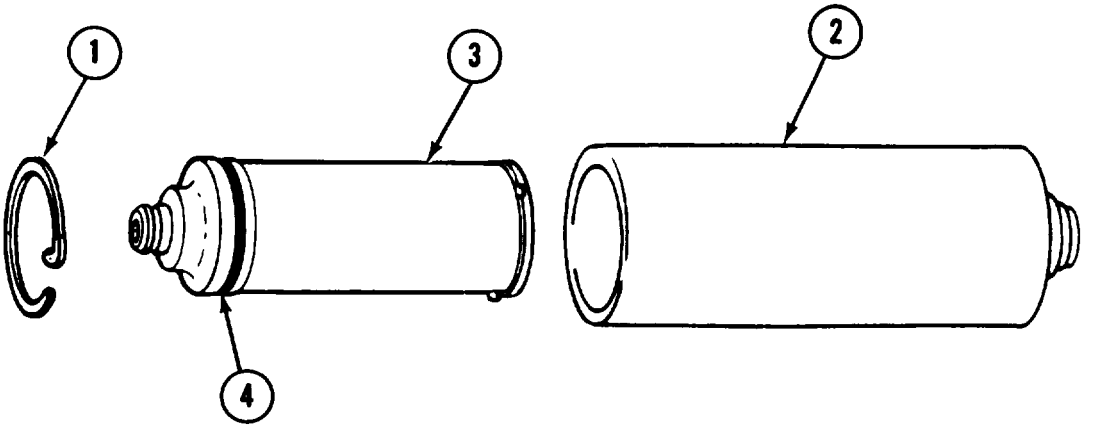
GENERAL INSTRUCTIONS:

CAUTION

Hydraulic parts must be protected from dirt during servicing. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

FRAME 1

Step	Procedure
	NOTE **Power pack oil filter is serviced by replacing filter element.**
1.	Using pliers, remove retaining ring (1).
2.	Pull filter element (3) from filter body (2). Throw away filter element (3) with preformed packing (4).
3.	Install new preformed packing (4) on new filter element (3).
4.	Install filter element (3) into filter body (2).
5.	Using pliers, install retaining ring (1) in groove of filter body (2).
	NOTE **Follow-on Maintenance Action Required:** **Install oil filter (para. 13-44).**
	END OF TASK



13-42. OIL FILTER TEST PROCEDURE

TEST EQUIPMENT: Hydraulic test kit (NSN 1015-01-151-6441) (9337932)
M3 oil pump (NSN 4933-00-449-7166) (7550134)
Watch with sweep second hand
Oil filter test fixture (fabricated tool, item 12, App. B)

TOOLS: 9/16 in. open end wrench (two)

SUPPLIES: Preformed packing (MS28775-115)
Preformed packing (MS28775-210)
Hydraulic fluid (item 10, App. A)
Pan
Masking tape (item 36, App. A)
Marking pen

PERSONNEL: One

PRELIMINARY PROCEDURES: Remove oil filter (para. 13-43)
Assemble oil filter (para. 13-46)

GENERAL INSTRUCTIONS:

WARNING

Hydraulic fluid under pressure can hurt or kill you. Follow procedure carefully. This test requires pressures up to 1300 psi.

NOTE

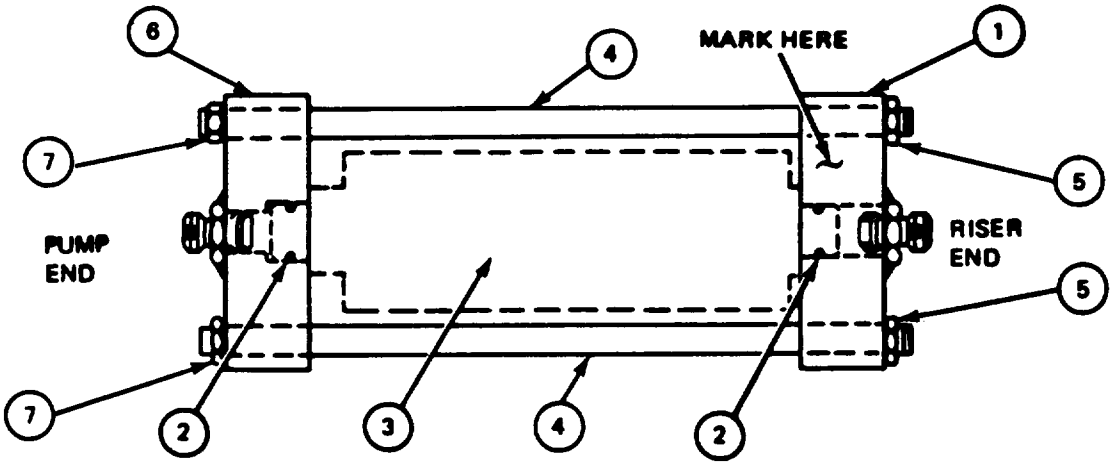
Suitable fittings, packings, and tools should be used to connect test equipment to parts being tested.

If normal indication is not obtained, oil filter is bad. Disassemble bad oil filter (para. 13-45)

13-42. OIL FILTER TEST PROCEDURE (CONT)

FRAME 1

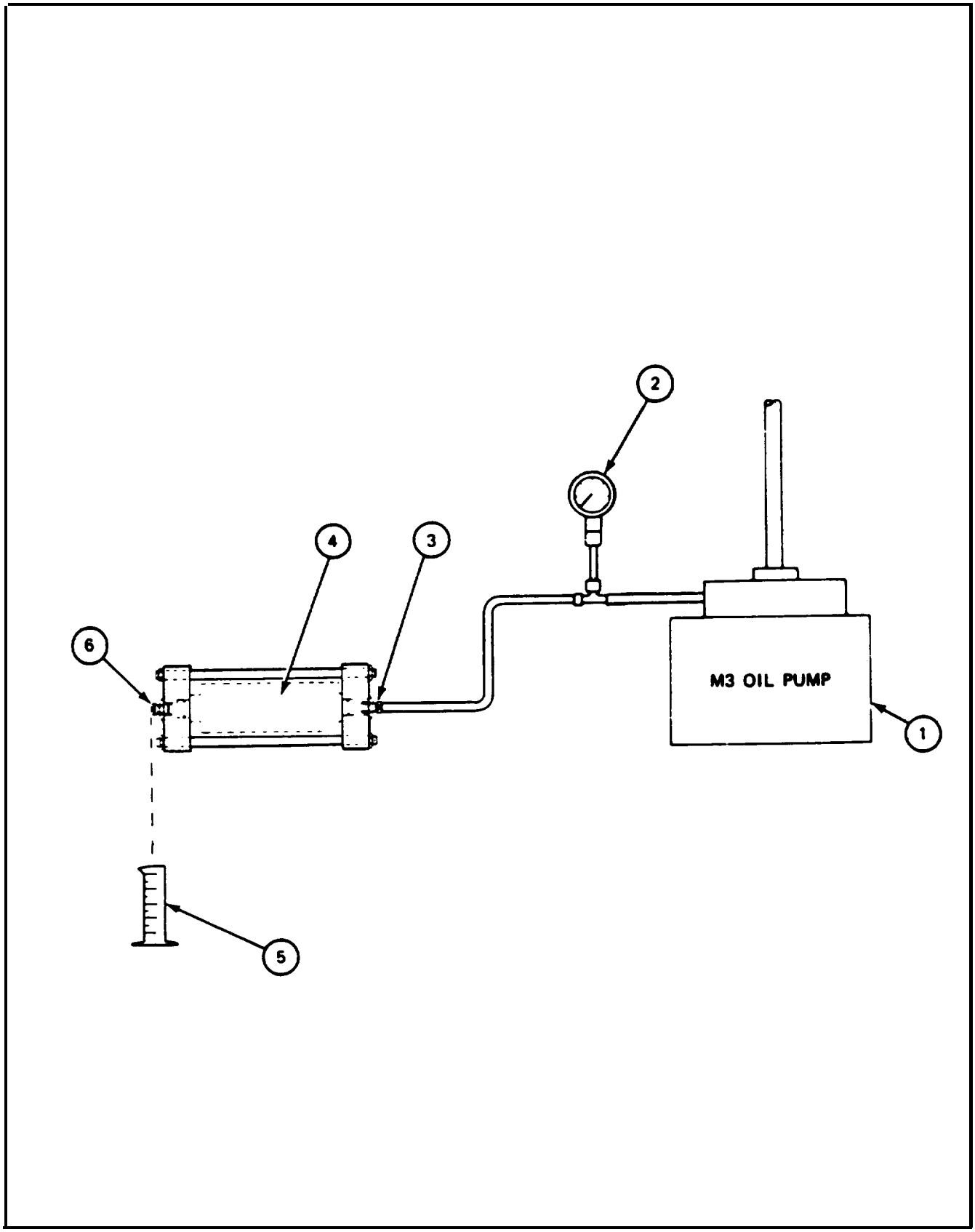
Step	Procedure
	NOTE Riser end adapter of oil filter test fixture has smaller center hole than pump end adapter.
1.	Using masking tape and marking pen, mark riser end adapter (1) (JPG).
2.	Coat two packings (2) and both ends of filter (3) with hydraulic fluid.
3.	Install two packings (2) on two ends of filter (3) (JPG).
4.	Put riser end of falter (3) in riser end adapter (1).
5.	Put two rods (4) through holes in riser end adapter (1).
6.	Put two nuts (5) on two rods (4) and tighten nuts four turns.
7.	Slide pump end adapter (6) over two rods (4) and onto pump end of filter (3).
8.	Put two nuts (7) on two rods (4).
9.	Using one wrench to hold nuts (5) and one wrench to turn nuts (7), tighten nuts (7) evenly until filter (3) is attached to fixture.
	GO TO FRAME 2



13-42. OIL FILTER TEST PROCEDURE (CONT)

FRAME 2

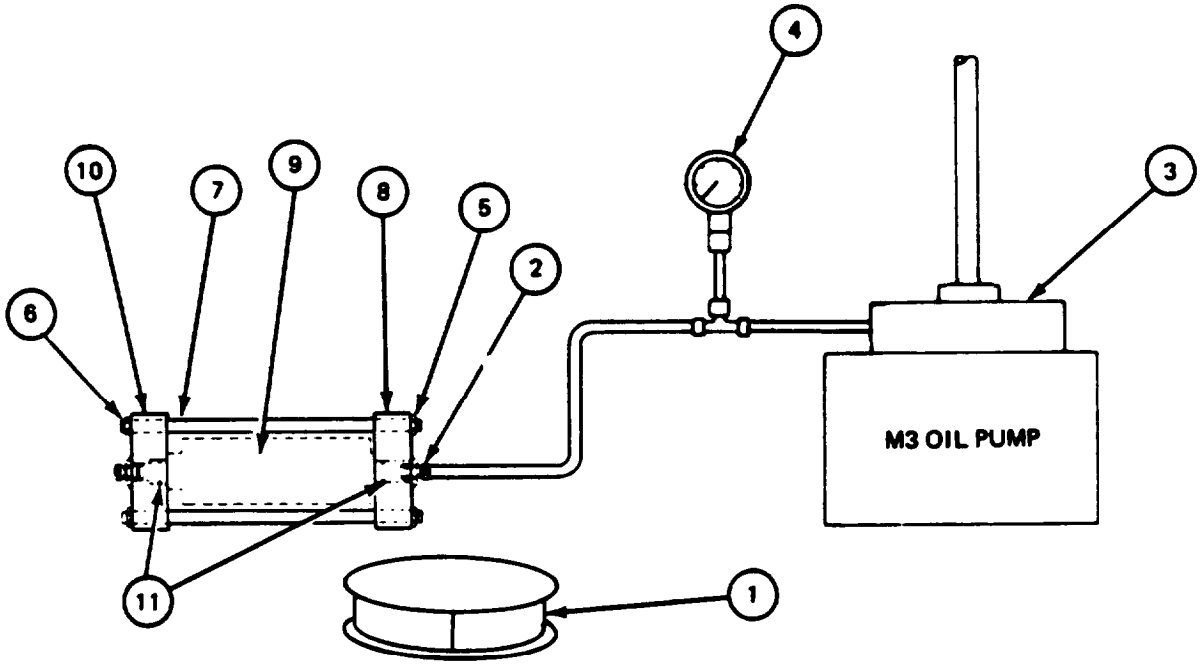
Step	Procedure
1.	Connect M3 oil pump (1) and pressure gauge (2) to riser end port (3).
2.	Slowly operate M3 oil pump (1) until pressure gauge (2) reads between 200 and 300 psi (JPG).
	NOTE Normal indication is no oil leaking from oil filter except from pump end port.
3.	Using watch, check oil filter (4) for leaks for two minutes.
4.	Put graduated cylinder (5) under pump end port (6).
	NOTE Normal indication is not more than 0.05 cc leakage in one minute.
5.	Using watch, check pump end port (6) for leakage for one minute.
6.	Using graduated cylinder (5), check how much fluid leaks from pump end port (6).
7.	Operate M3 oil pump (1) to lower pressure to 0 psi (JPG).
	GO TO FRAME 3


2
4
3
6
M3 OIL PUMP
1
5

13-42. OIL FILTER TEST PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Put pan (1) under riser end port (2).
2.	Disconnect M3 oil pump (3) and pressure gauge (4) from riser end port (2).
3.	Using one wrench to hold nuts (5) and one wrench to turn nuts (6), remove nuts from two rods (7).
4.	Pull riser end adapter (8) away from filter (9) and two rods (7).
5.	Pull filter (9) out of pump end adapter (10).
6.	Remove two nuts (6) from two rods (7).
7.	Remove two rods (7) from pump end adapter (10).
8.	Remove two packings (11) from ends of filter (9). Throw away packings (JPG).
	NOTE If normal indication was obtained in Frame 2, oil filter is good.
	END OF TASK



13-43. OIL FILTER REMOVAL PROCEDURE

TOOLS: O-ring extractor kit

SUPPLIES: Lint-free cloths (item 21, App. A)
Protective caps
Pan

PERSONNEL: One

REFERENCES: JPG for procedure to remove preformed packings
TM 9-2350-222-20-2-3 for procedure to drain hydraulic reservoir

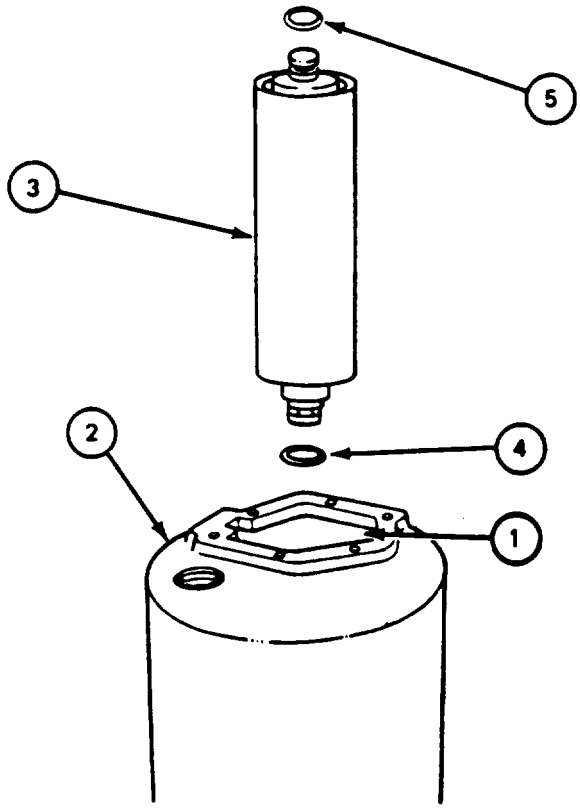
EQUIPMENT CONDITION: Hydraulic reservoir drained (TM-20-2-3)

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-60)
Remove hydraulic riser (para 13-14)

13-43. OIL FILTER REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Reach into top opening (1) of reservoir (2). Pull filter (3) out of reservoir (2).
2.	Using O-ring extractor tool, remove preformed packing (4) from bottom end of filter (3) (JPG). Throw away packing.
	NOTE Keep shims for installation (para 13-44).
3.	Remove shims (5) from filter (3).
4.	Using pan, drain hydraulic fluid from filter (3).
5.	Using cloth, wipe hydraulic fluid from filter (3).
6.	Using caps, plug inlet and outlet ends of filter (3).
	NOTE Follow-on Maintenance Action Required: Test oil filter (para 13-42).
	END OF TASK


5
3
2
4
1

13-44. OIL FILTER INSTALLATION PROCEDURE

TEST EQUIPMENT:
- Hydraulic test kit (NSN 1015-01-151-6441) (9337932)
- M3 oil pump (NSN 4933-00-449-7166) (7550134)
- Power pack filter assembly adjustment fixture (fabricated tool, item 3, App. B)
- Pressure gauge adapter
- Depth gauge

SUPPLIES:
- Pencil and paper
- Preformed packing (MS28775-115)
- Preformed packing (MS28775-210)
- Shim (7974359)
- Hydraulic fluid (item 10, App. A)
- Lint-free cloths (item 21, App. A)

PERSONNEL: One

PRELIMINARY PROCEDURES:
- Service oil filter (para. 13-41)
- Assemble oil filter (para. 13-46)

GENERAL INSTRUCTIONS:

WARNING

This procedure is done with pressure up to 100 psi. Hydraulic fluid pressure can hurt or kill you.

CAUTION

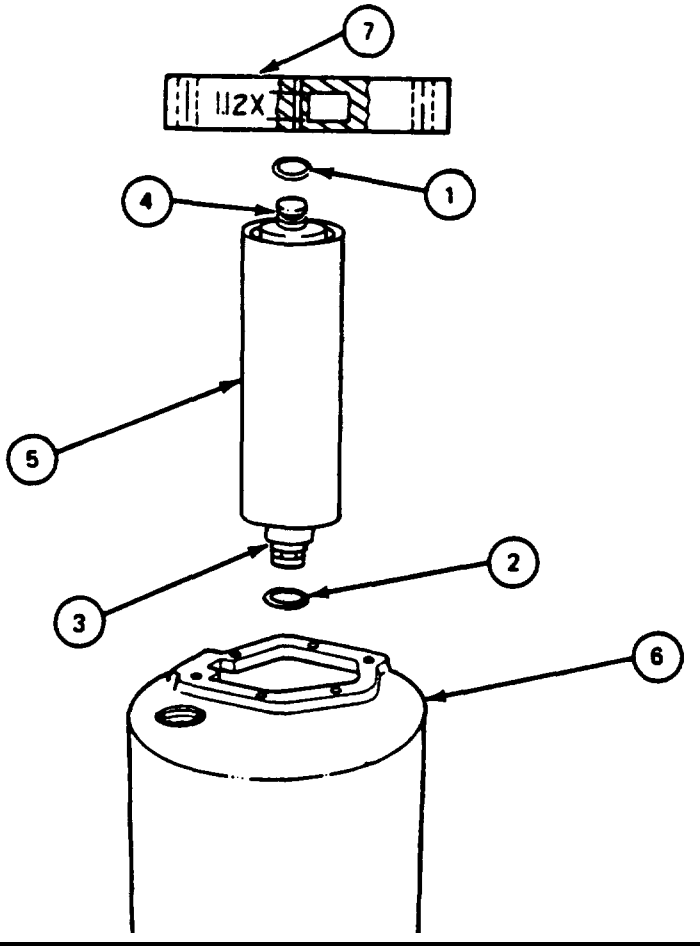
Hydraulic parts must be protected from dirt during installation. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

Suitable hydraulic fittings and tools should be used, as required, to connect adjustment fixture.

13-44. OIL FILTER INSTALLATION PROCEDURE (CONT)

FRAME 1

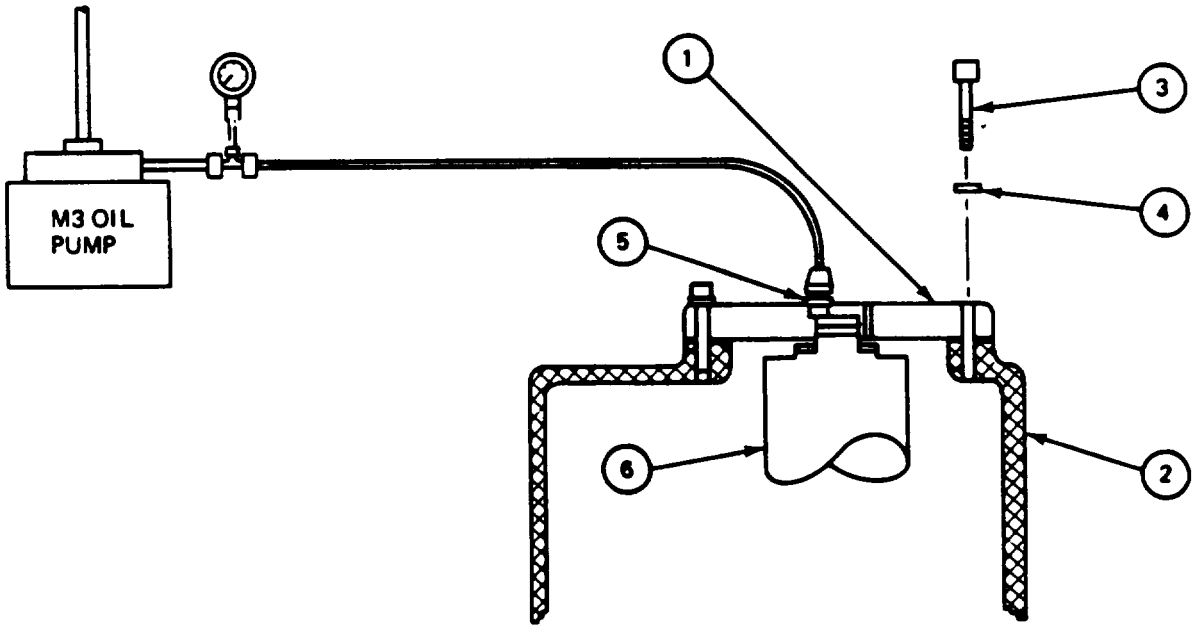
Step	Procedure
1.	Coat packings (1) and (2) with hydraulic fluid.
2.	Put packings (1) and (2) on pump (inlet) end (3) and riser (outlet) end (4) of oil filter (5) (JPG).
	NOTE Inlet end (3) of oil filter (5) is longer end.
3.	Put oil filter (5), inlet end (3) first, into oil reservoir (6) through reservoir top. opening.
4.	Put adjustment fixture (7) on outlet end (4) of filter (5).
5.	Line up two screw holes in test fixture (7) with riser mounting holes in reservoir (6).
	GO TO FRAME 2



13-44. OIL FILTER INSTALLATION PROCEDURE (CONT)

FRAME, 2

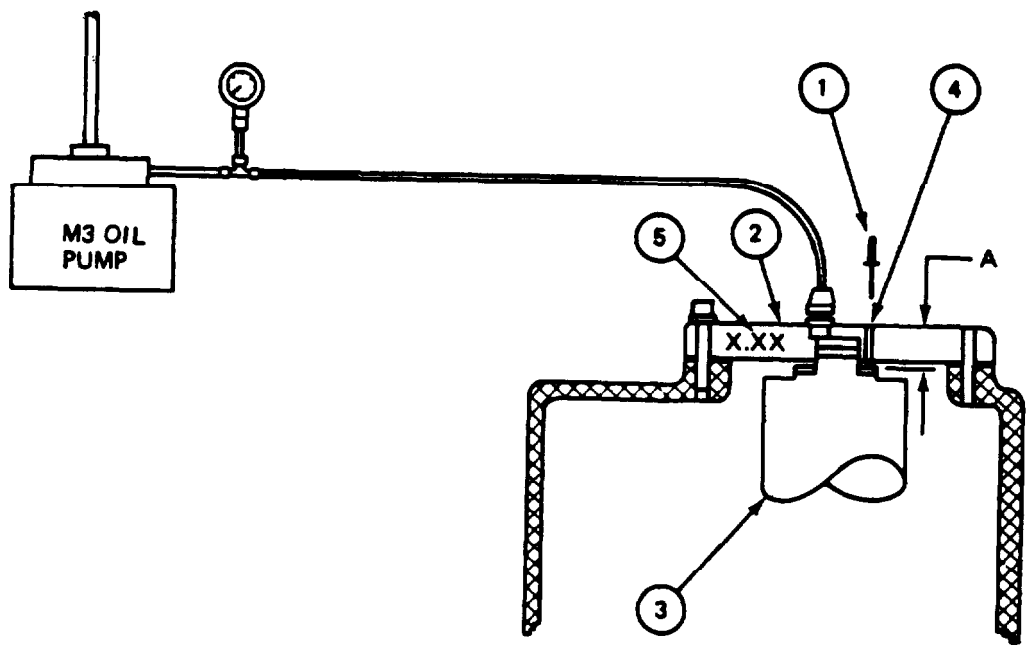
Step	Procedure
1.	Attach test fixture (1) to reservoir (2) with two screws (3) and two lockwashers (4).
2.	Assemble M3 oil pump.
3.	Put fitting (5) in text fixture (1).
4.	Connect hose from M3 oil pump to fitting (5),
5.	Using M3 oil pump, pressurize filter (6) to between 60 and 100 psi (JPG).
	GO TO FRAME 3



13-44. OIL FILTER INSTALLATION PROCEDURE (CONT)

FRAME 3

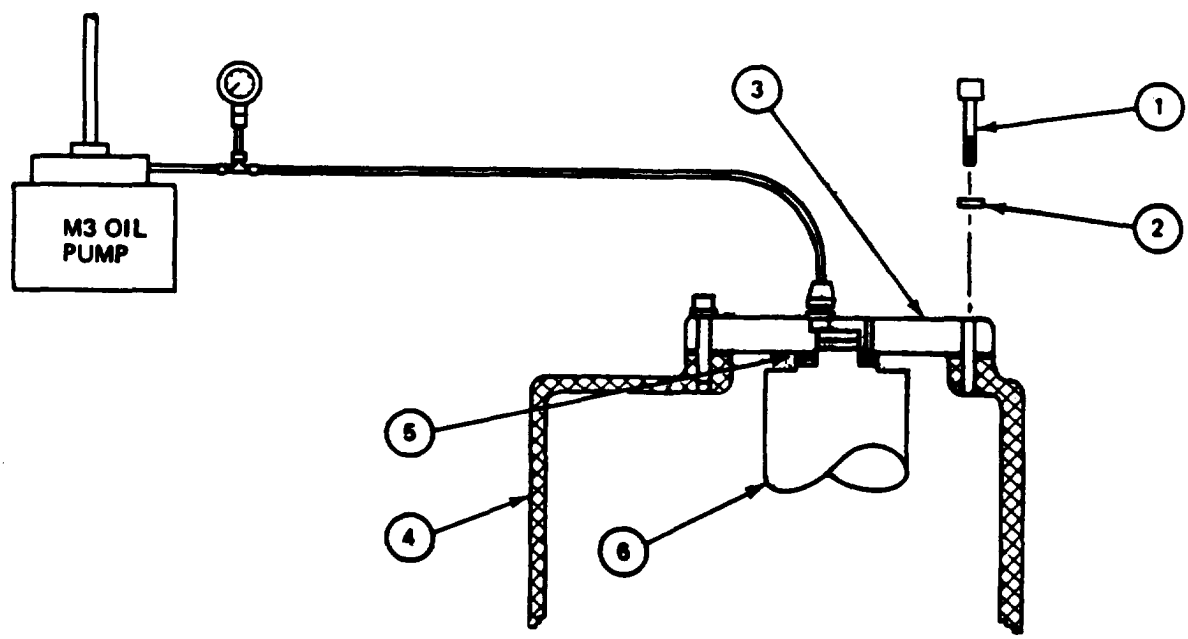
Step	Procedure
1.	Using depth gauge (1), measure distance A from top of test fixture (2) to top of filter (3) through fixture hole (4).
2.	Using pencil and paper, write down distance A.
	NOTE Actual thickness (5) of test fixture (2) is stamped on side of fixture.
3.	Using pencil and paper, subtract actual thickness (5) of test fixture (2) from distance A. Write down difference.
4.	Using M3 oil pump, reduce pressure to 0 psi (JPG).
	NOTE If difference written down in Step 3 is less than 0.010", go to Frame 4. If difference written down in Step 3 is 0.010" or more, go to Frame 5.
	GO TO FRAME 4



13-44. OIL FILTER INSTALLATION PROCEDURE (CONT)

FRAME 4

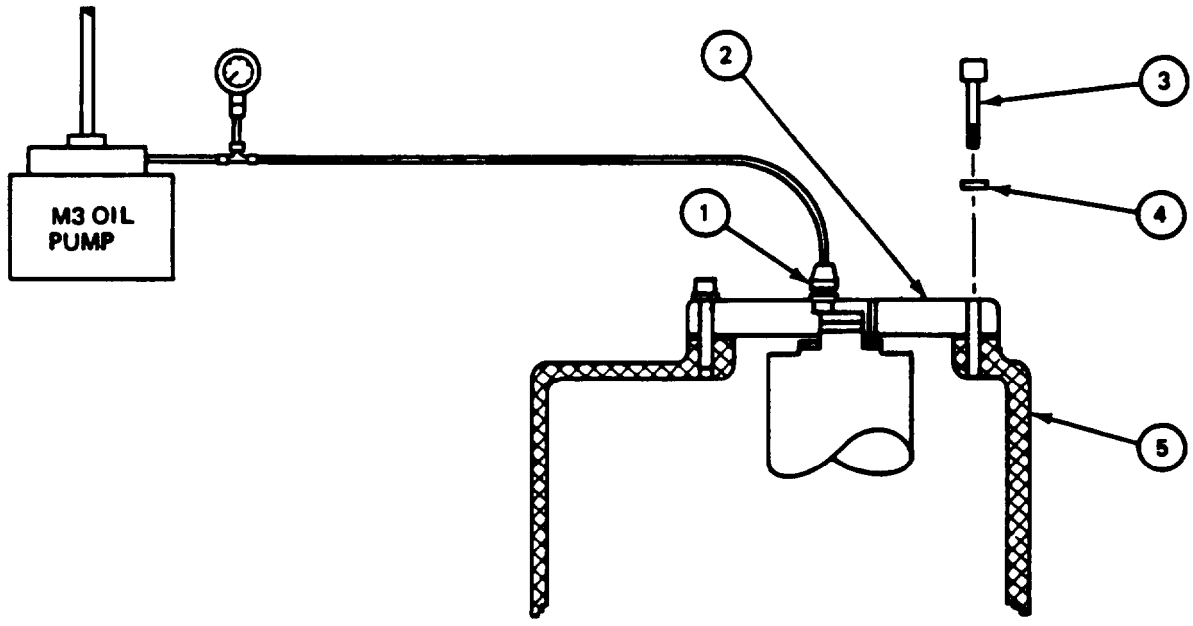
Step	Procedure
	NOTE Do the procedure in this frame only if the difference written down in Frame 3, Step 3 is less than 0.010". If the difference written down in Frame 3, Step 3 is 0.0 10" or more, go to Frame 5.
1.	Remove two screws (1), two lockwashers (2), and test fixture (3) from top of reservoir (4).
2.	Install shims (5) as required, on filter (6).
3.	Using Allen wrench, attach test fixture (3) to top of reservoir (4) with two screws (1) and two lockwashers (2).
4.	Using M3 oil pump, pressurize filter (6) to between 60 and 100 psi (JPG).
5.	Repeat Frame 3.
	GO TO FRAME 5



13-44. OIL FILTER INSTALLATION PROCEDURE (CONT)

FRAME 5

Step	Procedure
1.	Remove hose from M3 oil pump to fitting (1) on test fixture (2).
2.	Remove fitting (1) from test fixture (2).
3.	Remove two screws (3) and two lockwashers (4) that attach test fixture (2) to reservoir (5).
4.	Remove test fixture (2) from reservoir (5).
5.	Disassemble M3 oil pump.
	NOTE Follow-On Maintenance Action Required: Install hydraulic riser (para 13-15).
	END OF TASK



13-45. OIL FILTER DISASSEMBLY PROCEDURE

TOOLS: Internal retaining ring pliers
5/32" socket head screw key (Allen wrench)
Combination slip joint pliers with cutter
O-ring extractor kit
Scraper
Stiff bristled brush
Fine stone

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

PERSONNEL: One

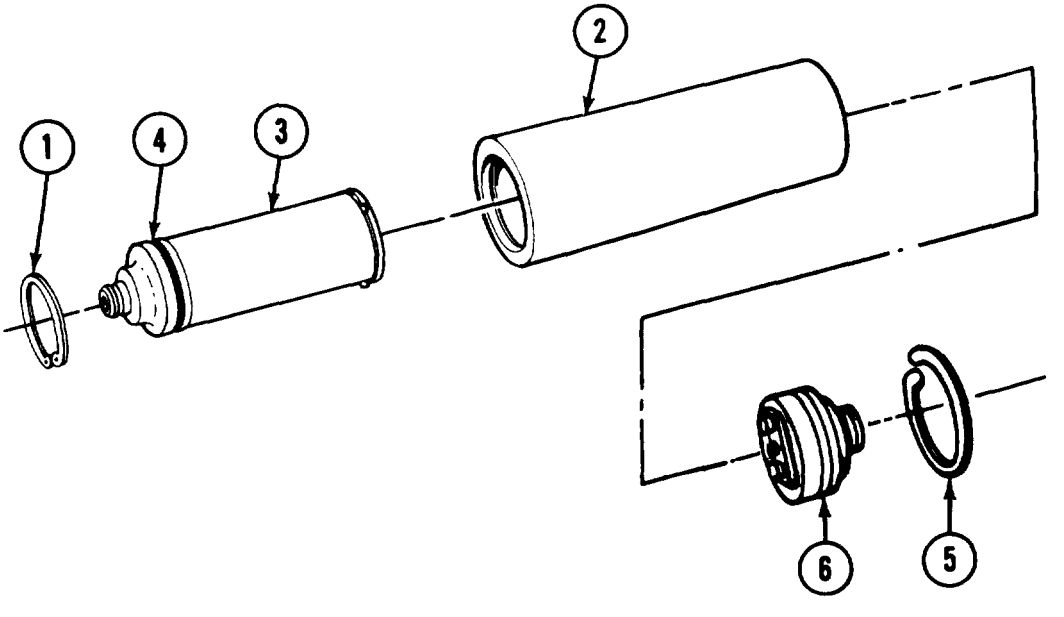
REFERENCES: JPG for procedures to:
Use retaining ring pliers
Remove preformed packing
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-60)
Remove hydraulic riser (para 13-14)
Remove oil filter (para 13-43)
Test oil filter (para 13-42)

13-45. OIL FILTER DISASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using retaining pliers, remove retaining ring (1) from oil filter body (2).
2.	Using slip joint pliers, pull filter element (3) from oil filter body (2). Throw away filter element (3) with preformed packing (4).
3.	Using retaining ring pliers, remove retaining ring (5) from oil filter body (2).
4.	Using slip joint pliers, pull head assembly (6) from oil filter body (2).
	GO TO FRAME 3

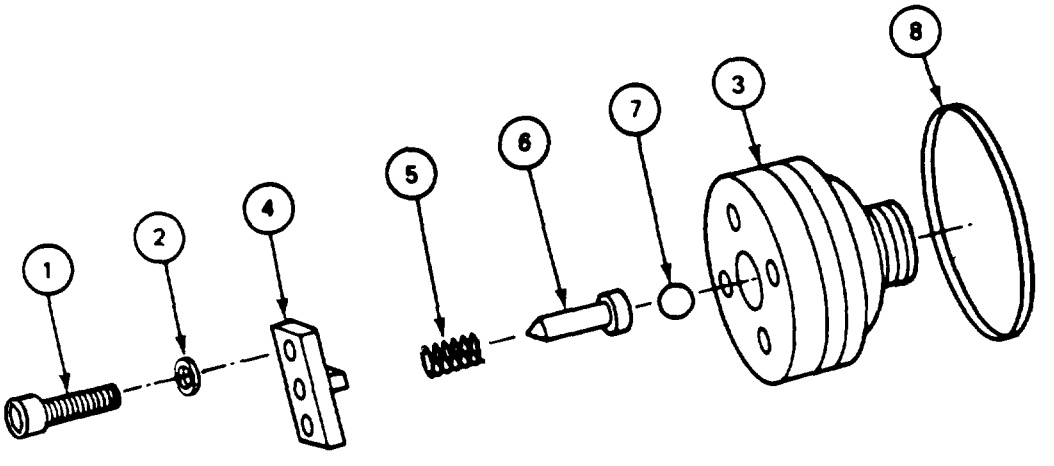


(All data on page 13-166 and frame 2 deleted)

13-45. OIL FILTER DISASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Using Allen wrench, slowly remove two screws (1) and two lockwashers (2) from head (3).
2.	Remove guide (4), spring ((5), guide (6), and ball (7) from head (3).
3.	Using o-ring extractor tool, remove preformed packing (8) from head (3). Throw preformed packing away.
	NOTE Follow-on Maintenance Action Required: Clean all parts Inspect and repair all parts
	END OF TASK



13-46. OIL FILTER ASSEMBLY PROCEDURE

TOOLS: Internal retaining ring pliers
5/32" socket head screw key (Allen wrench)
O-ring extractor kit

SUPPLIES: Filter element (12257235)
Preformed packing (MS28775-226)
Preformed packing (MS28775-328)
Lockwasher (8346053) 2 required
Hydraulic fluid (item 10. App. A)
Lint-free cloth (item 21, App. A)

PERSONNEL: One

GENERAL INSTRUCTIONS:

CAUTION

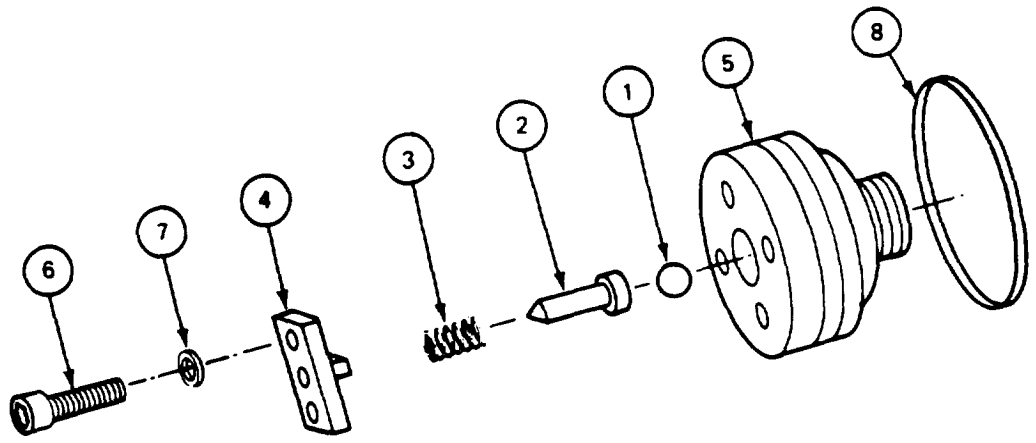
All hydraulic parts being assembled must be clean. Dirt can damage hydraulic parts. Use lint-free cloth to keep hydraulic parts clean.

(All data on page 13-169 and frame 1 deleted)

13-46. OIL FILTER ASSEMBLY PROCEDURE (CONT)

FRAME 2

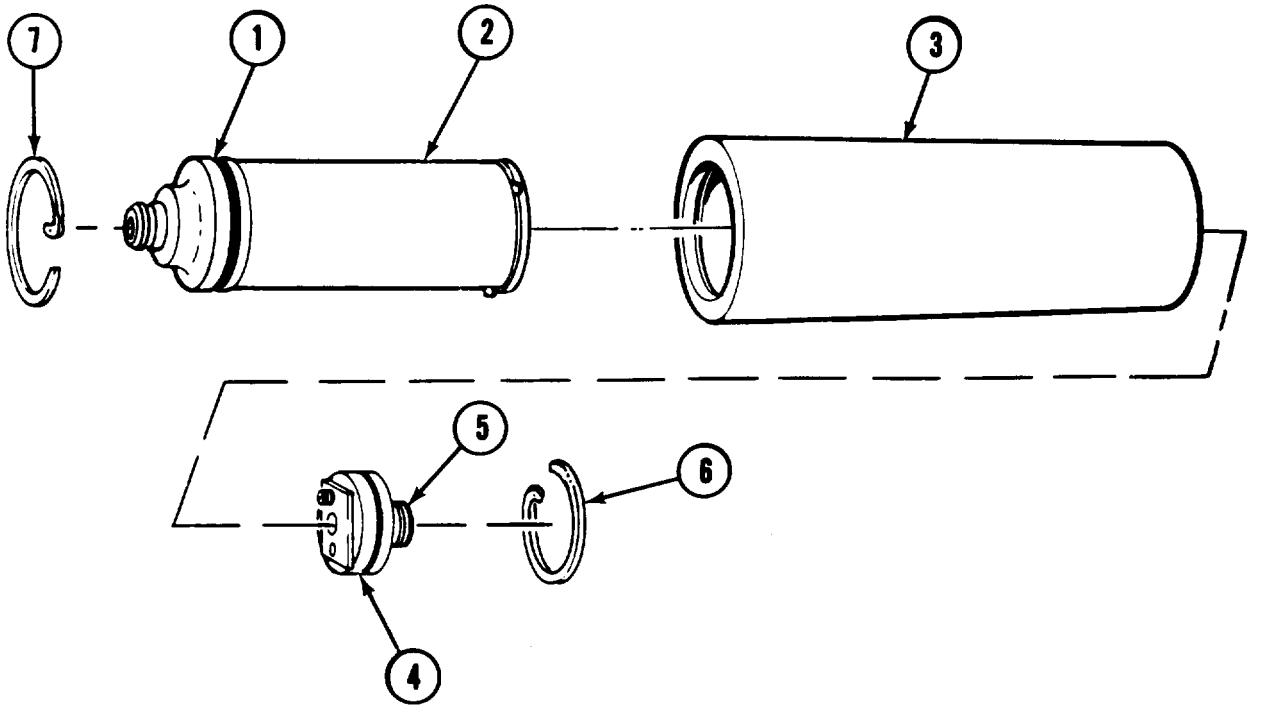
Step	Procedure
1.	Place ball (1), guide (2), spring (3), and guide (4) into center of head (5).
2.	Using Allen wrench, install two screws (6) and two lockwashers (7) to secure guide (4) to head (5).
3.	Lightly coat preformed packing (8) with hydraulic fluid.
4.	Install preformed packing (8) on head (5).
	GO TO FRAME 3



13-46. OIL FILTER ASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Lightly coat preformed packing (1) with hydraulic fluid and install on filter assembly (2).
2.	Lightly coat inside of filter body (3) and preformed packings (1) and (4) with hydraulic fluid.
3.	Slide head assembly (5) into filter body (3).
4.	Using pliers, install retaining ring (6) in filter body (3) groove.
5.	Slide filter element (2) into filter body (3).
6.	Using pliers, install retaining ring (7) in filter body (3) groove.
	NOTE Follow-on Maintenance Action Required: Test oil filter (para 13-42).
	END OF TASK



Section 10. OIL RESERVOIR

13-47. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks			
	Removal	Installation	Disassembly	Assembly
Oil Reservoir (Early Model)	13-48	13-49	13-50	13-51
Oil Reservoir (Late Model)	13-48	13-49	13-51.1	13-51.2

13-48. OIL RESERVOIR REMOVAL PROCEDURE

TOOLS: 5/16" socket head screw key (Allen wrench)
O-ring extractor kit

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 fluid strainer
JPG for procedures to:
Remove preformed packing
Clean parts
Inspect and repair parts

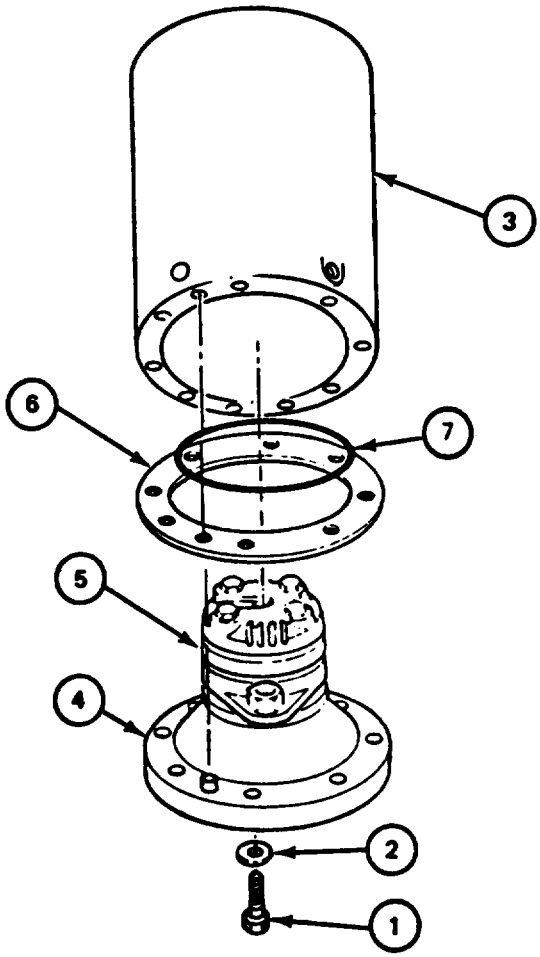
EQUIPMENT CONDITION: Fluid strainer removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Remove power pack (para 13-3)
Remove hydraulic riser (para 13-14)
Remove electric drive motor (para 13-56)
Remove oil filter (para 13-43)

13-48. OIL RESERVOIR REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using Allen wrench, remove four screws (1) and four lockwashers (2).
	CAUTION Be careful to lift oil reservoir (3) straight u off mount (4). If reservor is lifted at an angle, it could hit pump (5) and break it.
2.	Lift oil reservoir (3) straight up off mount (4).
	NOTE Do step 3 for mount (4) with gasket (6). Do step 4 for mount (4) with preformed packing (7).
3.	Remove gasket (6) from mount (4). Throw away gasket.
4.	Using O-ring extractor tool, remove preformed packing (7) from groove in mount (4) (JPG). Throw away preformed packing.
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK


3
6
7
5
4
2
1

13-49. OIL RESERVOIR INSTALLATION PROCEDURE

TOOLS: 5/16” socket head screw key (Allen wrench)
3/8” drive torque wrench (0-600 inch-pounds)
5/16” hex head socket (3/8” drive)

SUPPLIES: Gasket
Preformed packing (546899)

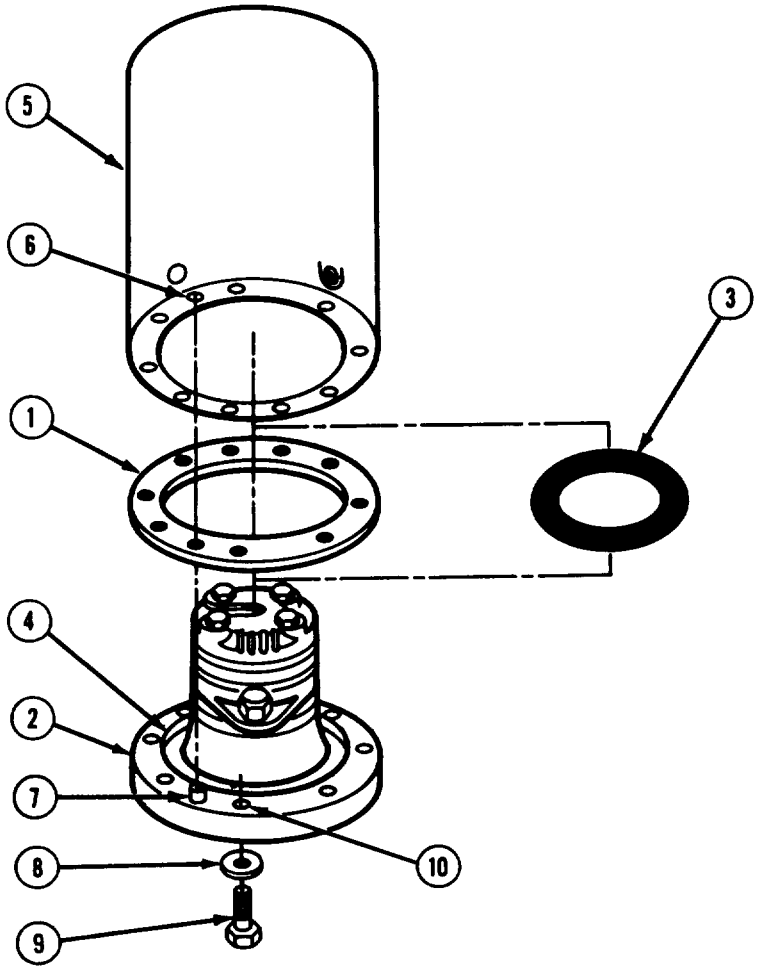
PERSONNEL: One

REFERENCES: JPG for procedure to use torque wrench
TM 9-2350-222-20-2-3 for procedure to install strainer

PRELIMINARY PROCEDURES: Assemble oil reservoir (para 13-51)

FRAME 1

Step	Procedure
	NOTE Do step 1 for mount (2) without groove (4). Do step 2 for mount (2) with groove (4).
1.	Put gasket (1) on flat surface of mount (2).
2.	Put preformed packing (3) in groove (4) of mount (2).
3.	Place oil reservoir (5) over mount (2).
4.	Line up small hole (6) with pin (7). Push oil reservoir (5) down on mount (2).
5.	Put four lockwashers (8) on four screws (9).
6.	Put four screws (9) in four large holes (10) in mount (2).
7.	Using Allen wrench, tighten four screws (9).
8.	Using torque wrench, tighten screws (9) to between 190 and 215 inch-pounds (JPG).
	NOTE Follow-on Maintenance Action Required: Install electric drive motor (para 13-57). Install oil filter (para 13-44). Install hydraulic riser (para 13-15). Install fluid strainer (TM-20-2-3). Install power pack (para 13-4).
	END OF TASK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6
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1
4
2
7
10
8
9

13-50. OIL RESERVOIR (EARLY MODEL) DISASSEMBLY PROCEDURE

TOOLS: 7/8 in. combination wrench
1 in. combination wrench
11/16 in. combination wrench
O-ring extractor kit
1-1/2 in. open end wrench
Scraper
Stiff bristled brush
Fine stone

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

PERSONNEL: One

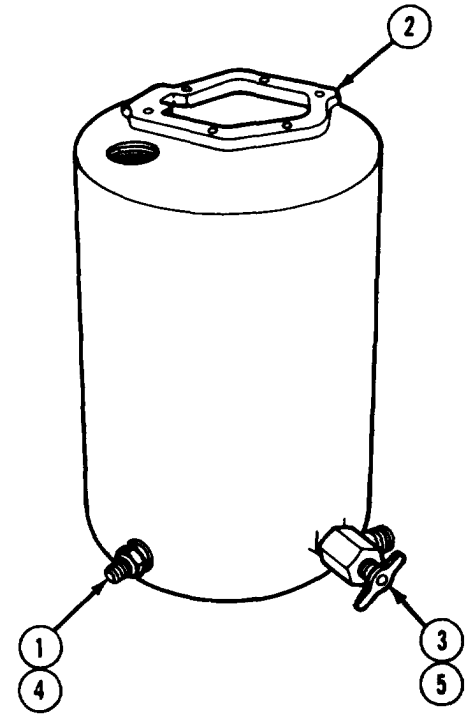
REFERENCES: JPG for procedures to:
Remove preformed packings
clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove power pack (para 13-8)
Remove hydraulic riser (para 13-14)
Remove electric drive motor (para 13-56)
Remove oil filter (para 13-43)
Remove oil reservoir (para 13-48)

13-50. OIL RESERVOIR (EARLY MODEL) DISASSEMBLY PROCEDURE (CONT)

FRAME 1

STEP	PROCEDURE
1.	Using 11/16 inch combination wrench, remove nipple (1) from oil reservoir (2).
2.	Using 11/16 inch combination wrench, remove drain cock (3) from oil reservoir (2).
3.	Using O-ring extractor tool, remove preformed packing (4) from nipple (1) (JPG). Throw preformed packing away.
4.	Using O-ring extractor tool, remove preformed packing (5) from drain cock (3). Throw preformed packing away.
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK



13-51. OIL RESERVOIR (EARLY MODEL) ASSEMBLY PROCEDURE

TOOLS: 7/8 in. combination wrench
1 in. combination wrench
1-1/2 in. open end wrench
11/16 in. combination wrench
O-ring extractor kit

SUPPLIES: Preformed packing (MS 28778-4
Preformed packing (MS 28778-10)
Preformed packing (MS 28778-6)
Lint-free cloths (item 21, App. A)
Hydraulic fluid (item 10, App. A)

PERSONNEL: One

REFERENCES: JPG for procedure to install preformed packing

GENERAL INSTRUCTIONS:

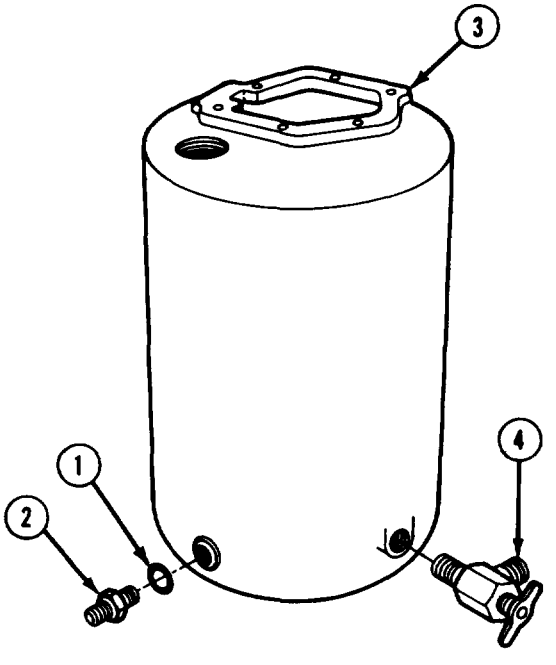
CAUTION

Hydraulic parts must be protected from dirt during assembly. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

13-51. OIL RESERVOIR (EARLY MODEL) ASSEMBLY PROCEDURE (CONT)

FRAME 1

STEP	PROCEDURE
1.	Coat preformed packing (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packing (1) on nipple (2) (JPG).
3.	Put nipple (2) in hole of oil reservoir (3).
4.	Using 11/16 inch combination wrench, tighten nipple (2).
5.	Put drain cock (4) in oil reservoir (3).
6.	Using 11/16 inch combination wrench, tighten drain cock (4).
	NOTE **Follow-on Maintenance Action Required** **Install oil reservoir (para 13-49).**
	END OF TASK



13-51.1 OIL RESERVOIR (LATE MODEL) DISASSEMBLY PROCEDURE

TOOLS: 11/16 in. combination box and open end wrench
1-1/8 in. open end wrench
O-ring extractor kit
Scraper
Stiff bristled brush
Fine stone
Pipe wrench

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

PERSONNEL: One

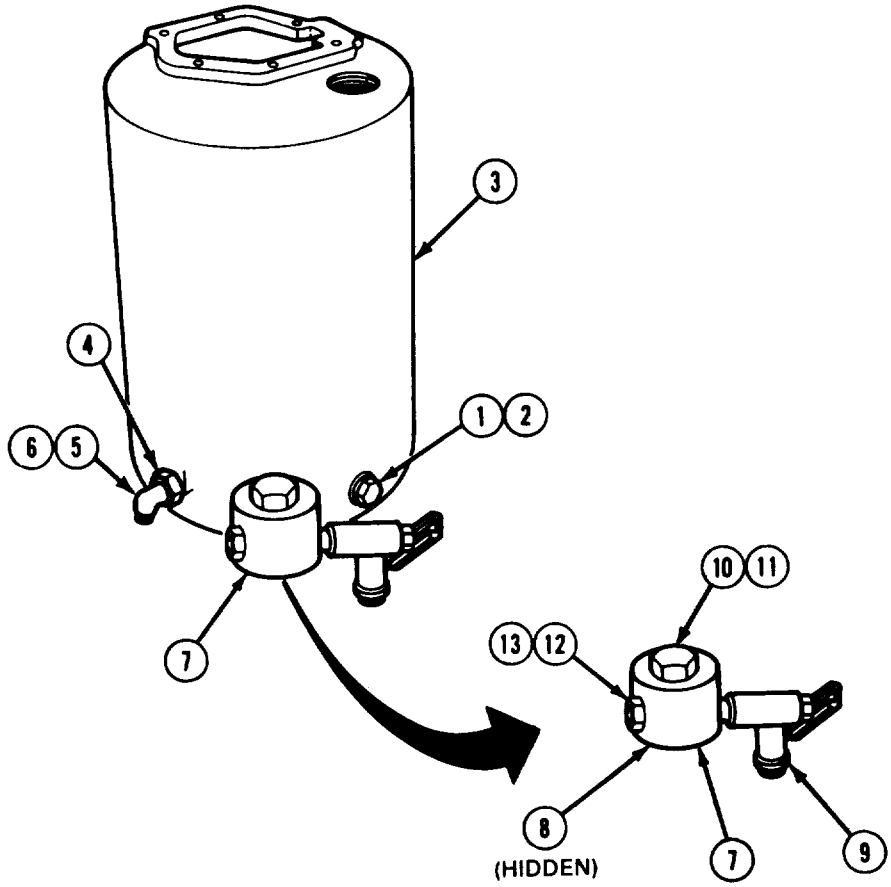
REFERENCES: JPG for procedures to:
Remove preformed packings
Clean parts
Inspect and repair parts
TM 9-2350-222-20-2-3 for procedure to remove liquid level sight gage

PRELIMINARY PROCEDURES: Remove power pack (para 13-3)
Remove hydraulic riser (para 13-14)
Remove electric drive motor (para 13-56)
Remove oil filter (para 13-43)
Remove oil reservoir (para 13-48)
Remove liquid level sight gage (TM 20-2-3)

3-51.1 OIL RESERVOIR (LATE MODEL) DISASSEMBLY PROCEDURE (CONT)

FRAME 1

STEP	PROCEDURE
1.	Using 11/16-inch combination wrench, remove plug (1) and preformed packing (2) from oil reservoir (3). Throw preformed packing away.
2.	Using pipe wrench, remove tee (4) from oil reservoir (3).
	NOTE Nipple (6) may remain on oil reservoir (3). If so, do step 3 and skip step 4. lf removed with tee (4), go to step 4.
3.	Using pipe wrench, remove nipple (5) from oil reservoir (3). Throw nipple away.
4.	Using pipe wrench, remove nipple (5) from tee (4). Throw nipple away.
5.	Using pipe wrench, remove drain cock (6) from tee (4).
6.	Using 1-1/8 inch open end wrench, remove plug (7) and preformed packing (8) from tee (4). Throw preformed packing away.
7.	Using 11/16 inch combination wrench, remove nipple (9) and preformed packing (10) from tee (4). Throw preformed packing away.
	NOTE Follow-on maintenance required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK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(HIDDEN)
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13-51.2. OIL RESERVOIR (LATE MODEL) ASSEMBLY PROCEDURE

TOOLS: 11/16 in. combination box and open end wrench
1-1/8 in. open end wrench
O-ring extractor kit
Pipe wrench

SUPPLIES: Preformed packing (MS 28778-4) (2 required)
Preformed packing (MS 28778-10)
Lint-free cloths (item 21, App. A)
Hydraulic fluid (item 10, App. A)

PERSONNEL: One

REFERENCES: JPG for procedure to install preformed packing
TM 9-2350-222-20-2-3 for procedure to install liquid level sight gage

GENERAL INSTRUCTIONS:

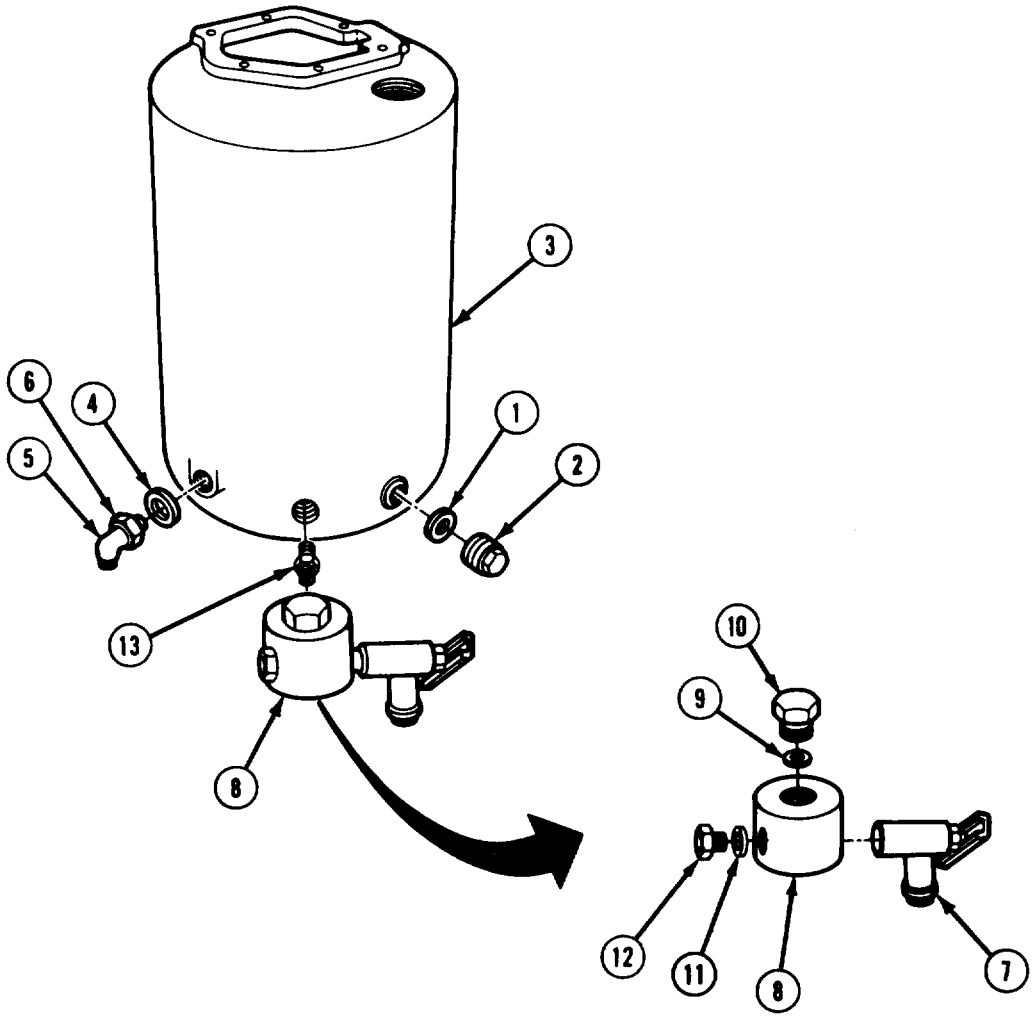
CAUTION

Hydraulic parts must be protected from dirt during assembly. **Dirt can damage hydraulic parts. Use lint-free** cloths to keep hydraulic parts clean.

3-51.2. OIL RESERVOIR (LATE MODEL) ASSEMBLY PROCEDURE (CONT)

FRAME 1

STEP	PROCEDURE
1.	Coat preformed packing (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packing (1) on plug (2) (JPG).
3.	Put plug (2) in hole of oil reservoir (3).
4.	Using 11/16 inch combination wrench, tighten plug (2).
5.	Using pipe wrench on drain cock (4), install drain cock into tee (5) and align as shown.
6.	Coat preformed packing (6) with hydraulic fluid.
7.	Using O-ring extractor tool, put preformed packing (6) on plug (7) (JPG).
8.	Put plug (7) in hole at top of tee (5).
9.	Using 1-1/8 inch open end wrench, tighten plug (7).
10.	Coat preformed packing (8) with hydraulic fluid.
11.	Using O-ring extractor tool, put preformed packing (8) on nipple (9) (JPG).
12.	Put nipple (9) in tee (5).
13.	Using 11/16 inch combination wrench, tighten nipple (9).
14.	Apply pipe tape to threads of nipple (10), keeping first two threads on each side free of tape.
15.	Using pipe wrench, install nipple (10) into oil reservoir (3), and tighten.
16.	Install tee (5) on nipple (10).
17.	Using pipe wrench, tighten tee (5) and align as shown.
	NOTE Follow-on maintenance required: Install liquid level sight gage (TM 20-2-3). Install oil reservoir (para 13-49).
	END OF TASK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Section 11. HYDRAULIC PUMP AND MOTOR MOUNT

13-52. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks	
	Removal	Installation
1. Hydraulic Pump	13-53	13-54
2. Motor Mount	13-53	13-54

13-53. HYDRAULIC PUMP AND MOTOR MOUNT REMOVAL PROCEDURE

TOOLS: 9/16" combination wrench
1/8" socket head screw key (Allen wrench)
8 ounce ball peen hammer
1/4" drive pin punch
O-ring extractor kit
Scraper
Stiff bristled brush
Fine stone

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

PERSONNEL: One

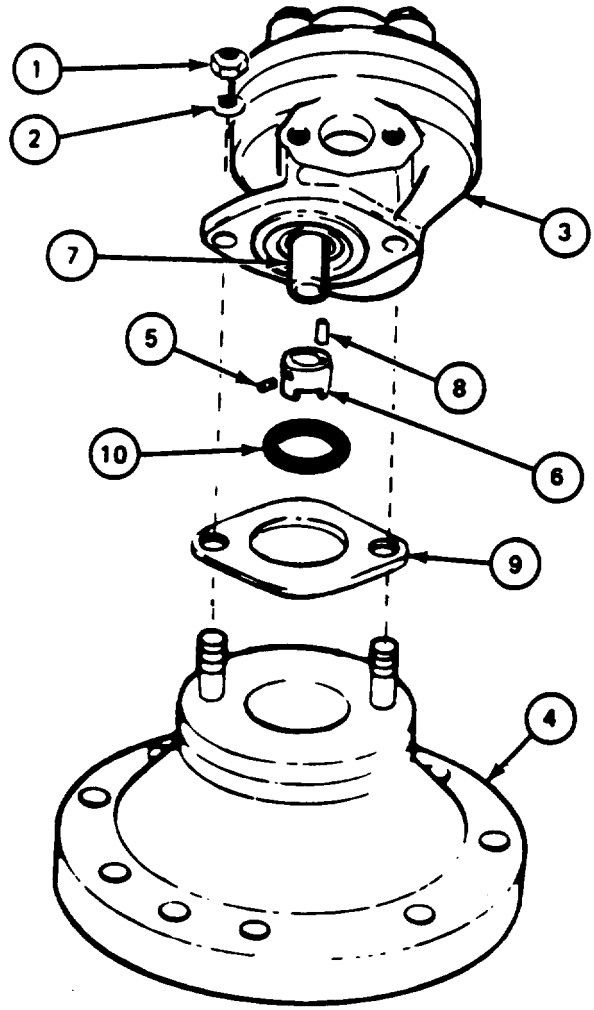
REFERENCES: JPG for procedures to:
Remove preformed packing
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove power pack (para 13-3)
Remove hydraulic riser (para 13-14)
Remove electric motor (para 13-56)
Remove oil reservoir (para 13-48)

13-53. HYDRAULIC PUMP AND MOTOR MOUNT REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using combination wrench, remove two nuts (1), two lockwashers (2), and pump (3) from pump mount (4).
2.	Using Allen wrench, remove setscrew (5) from coupling (6).
3.	Remove coupIing (6) from shaft (7) of pump (3).
4.	Using hammer and punch, remove key (8) from shaft (7).
	NOTE Do step 5 for pump mount (4) with gasket (9). Do step 6 for pump mount (4) with preformed packing (10).
5.	Remove gasket (9) from motor mount (4). Throw away gasket.
6.	Using O-ring extractor tool, remove preformed packing (10) from groove in pump mount (4). Throw away preformed packing.
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK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13-54. HYDRAULIC PUMP AND MOTOR MOUNT INSTALLATION PROCEDURE

TOOLS: 1/8” socket head screw key (Allen wrench)
Feeler gauge
9/16" combination wrench
8 ounce ball peen hammer
1/4” drive pin punch

SUPPLIES: Parts kit (5703523)
Preformed packing (MS 25775-228)

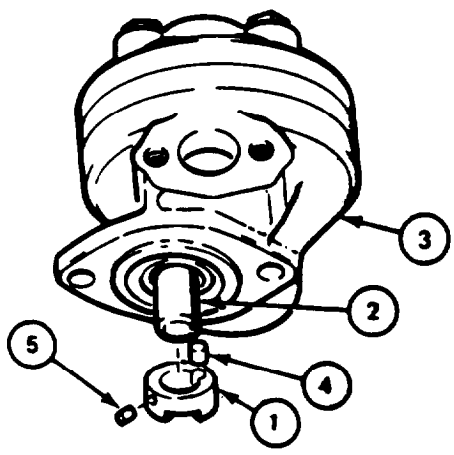
PERSONNEL: One

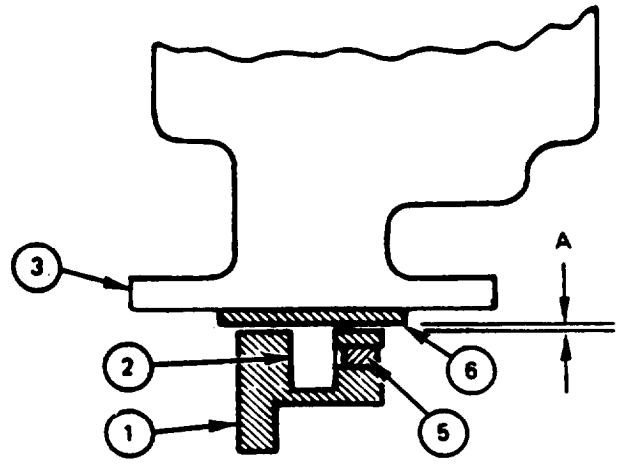
REFERENCES: JPG for procedures to:
Use torque wrench
Use feeler gauge

13-54. HYDRAULIC PUMP AND MOTOR MOUNT INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Put coupling (1) on shaft (2) of pump (3). Align key slots of coupling and shaft.
2.	Using hammer and punch, put key (4) in key slots of coupling (1) and shaft (2).
3.	Using Allen wrench, put setscrew (5) in coupling (1), Do not tighten setscrew.
4.	Using feeler gauge, slide coupling (1) up and down on shaft (2) until gap A between base (6) of pump (3) and end of coupling (1) is between 0.016” and 0.031”
5.	Using Allen wrench, tighten setscrew (5).
	GO TO FRAME 2

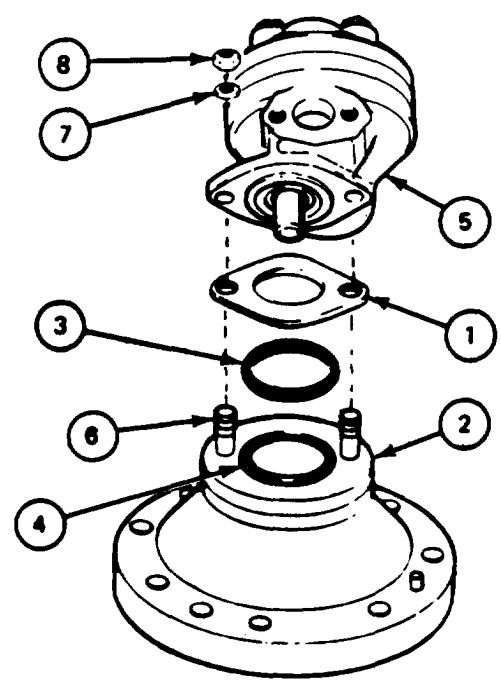




13-54. HYDRAULIC PUMP AND MOTOR MOUNT INSTALLATION PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE Do step 1 if pump mount (2) does not have groove (4). Do step 2 for pump mount (2) with groove (4).
1.	Put new gasket (1) on flat surface of pump mount (2).
2.	Put preformed packing (3) in groove (4) of pump mount (2).
3.	Put mounting flange of pump (5) over two studs (6) and on pump mount (2).
4.	Using combination wrench, attach pump (5) to two studs (6) on pump mount (2) with two lockwashers (7) and two nuts (8).
	NOTE Follow-on Maintenance Action Required: Install oil reservoir (para 13-49).
	END OF TASK



(All data on pages 13-189 thru 13-202 is deleted)

Section 12. ELECTRIC DRIVE MOTOR

13-55. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks: Removal	Tasks: Installation
Electric Drive Motor	13-56	13-57

13-56. ELECTRIC DRIVE MOTOR REMOVAL PROCEDURE

TOOLS: 9/16” combination wrench
Adjustable hook spanner wrench
5/32” socket head screw key (Allen wrench)
Hoist (200 pounds)
Metal scribe

SUPPLIES: 2"x2"x6" wood blocks (two)
3/4” rope sling (used with hoist to lift motor)

PERSONNEL: Three (Including hoist operator)

REFERENCES: TM 9-2350-222-10 for procedures to:
Traverse turret
Set turn lock to LOCKED and UNLOCKED
JPG for procedure to disconnect electrical connectors
TM 9-2350-222-20-2-3 for procedures to:
Remove gunner’s footrest plate
Remove turret power relay box
Remove motor mounting bracket

EQUIPMENT LOCATION INFORMATION:

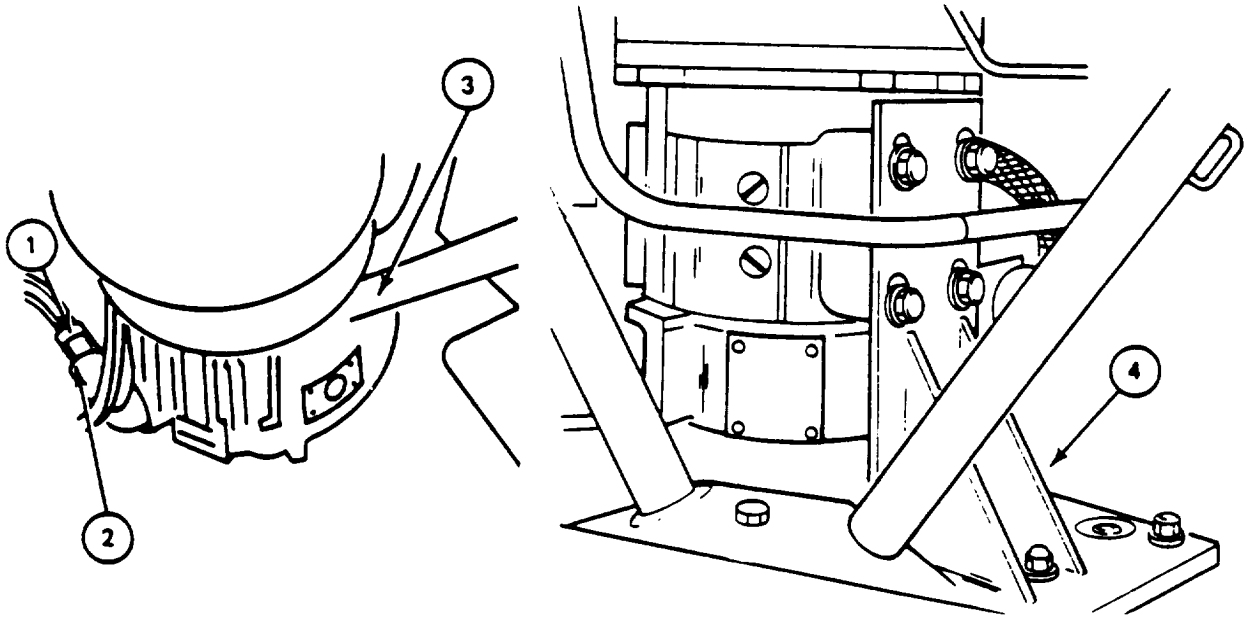
EQUIPMENT	FOLDOUT	CALLOUT
Driver’s Master Control Panel	FO-3	11
Turret Traverse Lock	FO-3	7
Power Pack	FO-1	15

EQUIPMENT CONDITION: Driver’s master control panel MASTER BATTERY switch set to OFF
Gunner’s footrest plate removed (TM-20-2-3)
Turret power relay box removed (TM-20-2-3)
Turret traverse lock set to UNLOCKED (TM-10)

13-56. ELECTRIC DRIVE MOTOR REMOVAL PROCEDURE (CONT)

FRAME 1

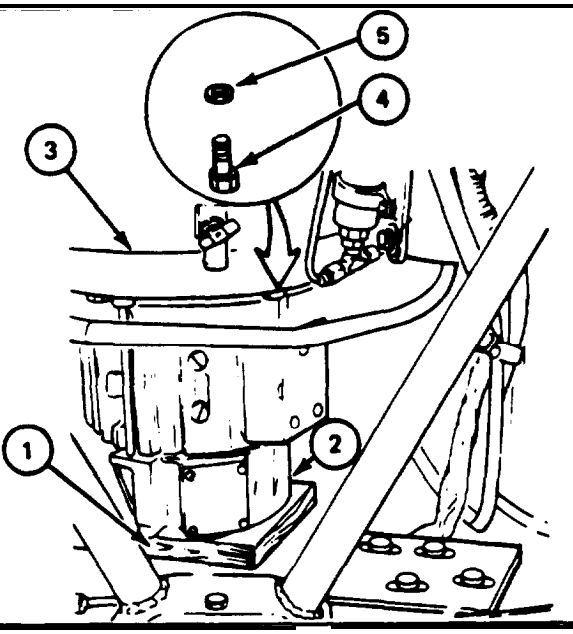
Step	Procedure
1.	Using spanner wrench, disconnect electrical connector (1) from elbow connector (2) on motor (3) (JPG).
2.	Manually traverse turret until motor mounting bracket (4) can be reached from driver's compartment (TM-10).
3.	Set turret traverse lock to LOCKED (TM-10).
4.	Remove motor mounting bracket (4) (TM-20-2-3).
	GO TO FRAME 2



13-56. ELECTRIC DRIVE MOTOR REMOVAL PROCEDURE (CONT)

FRAME 2

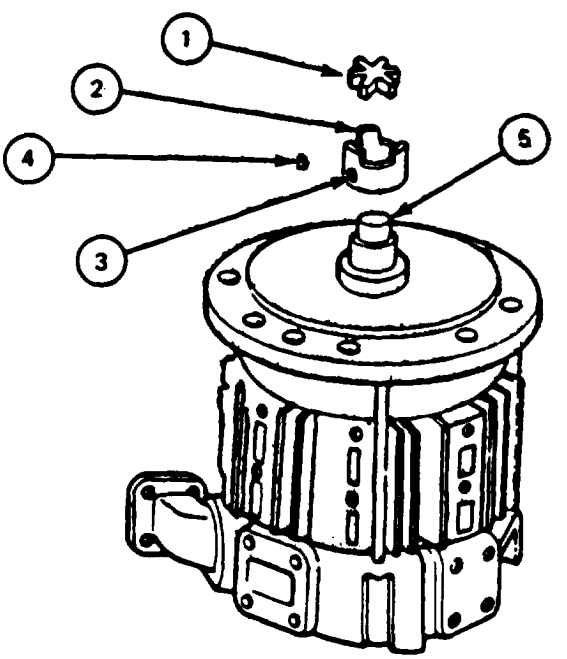
Step	Procedure
	WARNING Motor weights 77 pounds. Do not put fingers under motor. You could be hurt. Two soldiers are needed to remove and lift motor. **CAUTION** Do not put wood blocks (1) under bearing hump at center of motor. Bearing could be damaged.
1.	Place two wood blocks (1) under motor (2).
2.	Using scribe, put line across motor (2) and pump mount (3) to aid installation.
3.	Using 9/16" combination wrench, remove four screws (4) and four lockwashers (5) that attach motor (2) to pump mount (3).
4.	Carefully remove blocks (1) one at a time and lower motor (2).
5.	Slide motor (2) out from under pump mount (3).
	GO TO FRAME 3



13-56. ELECTRIC DRIVE MOTOR REMOVAL PROCEDURE (CONT)

FRAME 3

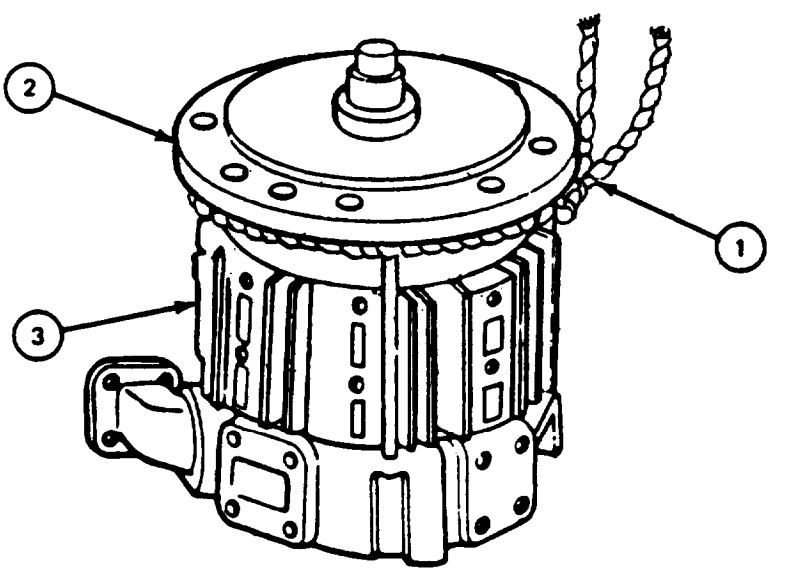
Step	Procedure
1.	Using fingers, remove spider insert (1) from motor coupling (2).
2.	Using Allen wrench, loosen setscrew (3) on side of motor coupling (2).
3.	Remove motor coupling (2) and woodruff key (4) from motor shaft (5).
	GO TO FRAME 4



13-56. ELECTRIC DRIVE MOTOR REMOVAL PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Tie rope sling (1) under and around motor drive head (2). Secure rope to hoist.
	WARNING Motor weighs 77 pounds. Be careful when lifting it. If motor drops or sways, it could hurt you.
2.	Soldier A and Soldier B: Place hoist over cupola hatch.
3.	Soldier C: Hold sides of motor (3).
4.	Soldier A and Soldier B: Using hoist, lift motor out of vehicle.
	END OF TASK



13-57. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE

TOOLS: Hoist (to lift 200 pounds)
3/8" drive ratchet
9/16" socket (3/8" drive)
Adjustable hook spanner wrench
5/32" socket head screw key Allen wrench)
6" steel rule (1/64" graduations)
12" straight edge (part of combination square)
3/8" drive torque wrench (0 to 600 inch-pounds)
8 ounce ball peen hammer

SUPPLIES: 3/4" rope sling (used with hoist to lift motor)
(2" x 2" x 6") wood blocks (three)
Paper
Pencil

PERSONNEL: Four (including hoist operator)

REFERENCES: TM 9-2350-222-10 for procedures to:
Traverse turret
Set turret traverse lock to LOCKED and UNLOCKED
JPG for procedures to:
Connect electrical connector
Use torque wrench
TM 9-2350-222-20-2-3 for procedures to:
Install motor mounting bracket
Install gunner's footrest plate
Install turret power relay box

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-3	11
Turret Traverse Lock	FO-3	7
Power Pack	FO-1	15

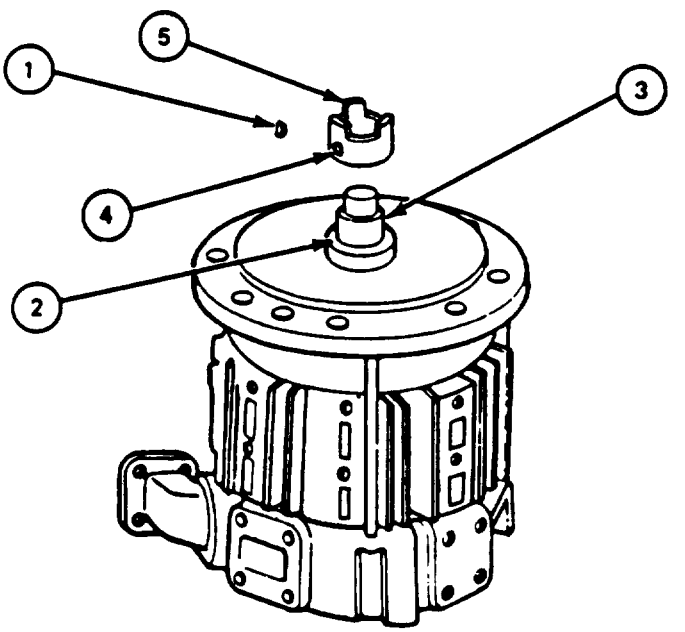
EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Turret traverse lock set to UNLOCKED (TM-10)

PRELIMINARY PROCEDURES Install hydraulic pump (para 13-54)

13-57. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE (CONT)

FRAME 1

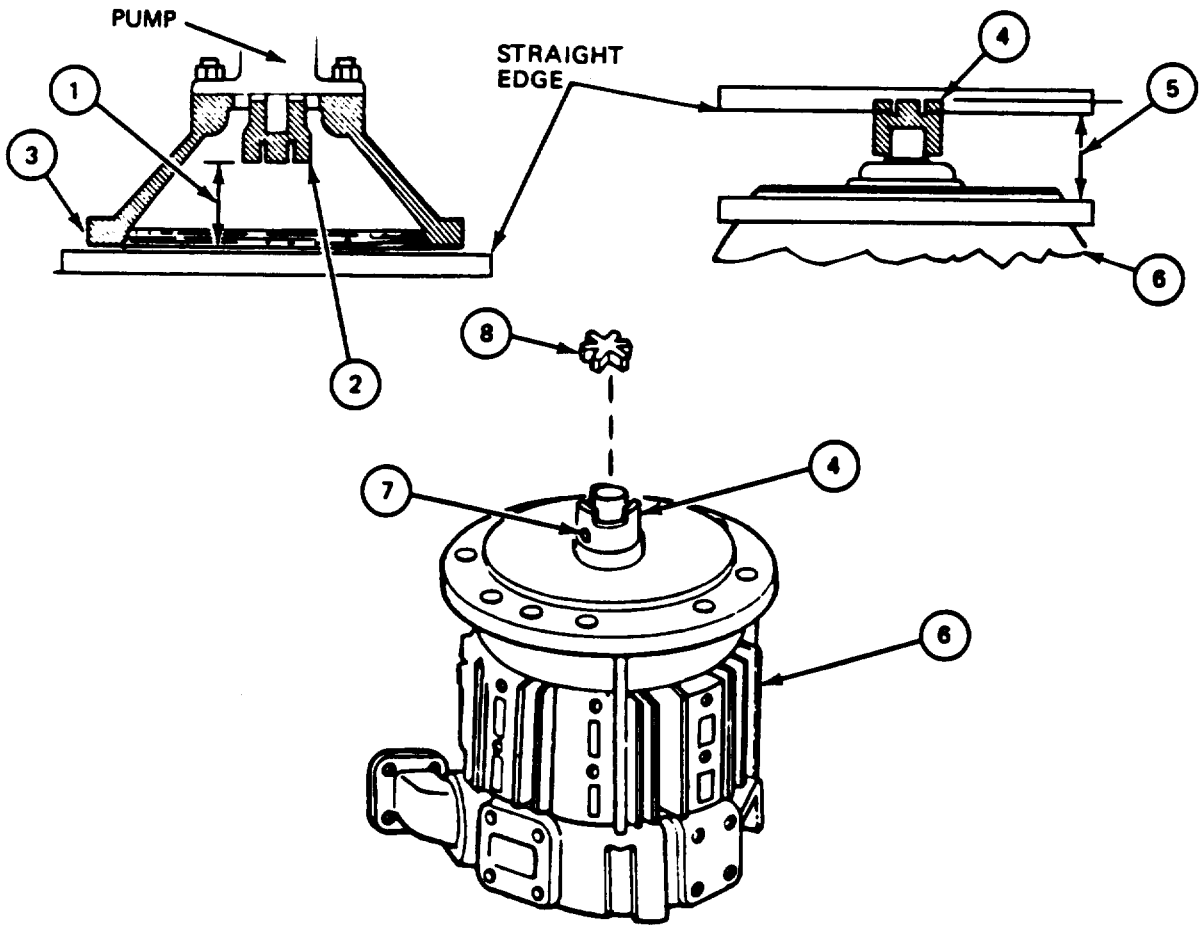
Step	Procedure
1.	Using hammer, tap woodruff key (1) in slot (2) on motor shaft (3).
2.	Using Allen wrench, loosen setscrew (4) in motor coupling (5).
3.	Put motor coupling (5) on motor shaft (3).
	GO TO FRAME 2



13-57. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Using straight edge and steel rule, measure distance (1) between bottom of pump coupling (2) and bottom of pump mount (3).
2.	Using pencil and paper, write down distance (1) measured in Step 1.
3.	Put straight edge in splines of motor coupling (4).
	NOTE Motor coupling (4) must be installed an exact distance (5) from electric drive motor (6) before motor is installed on pump mount (3).
4.	Using steel rule to measure, move motor coupling (4) until distance (5) is between 1/64" and 1/32" less than distance measured in step 1.
5.	Using Allen wrench, tighten setscrew (7).
6.	Put spider insert (8) in motor coupling (4).
	GO TO FRAME 3


PUMP
STRAIGHT EDGE
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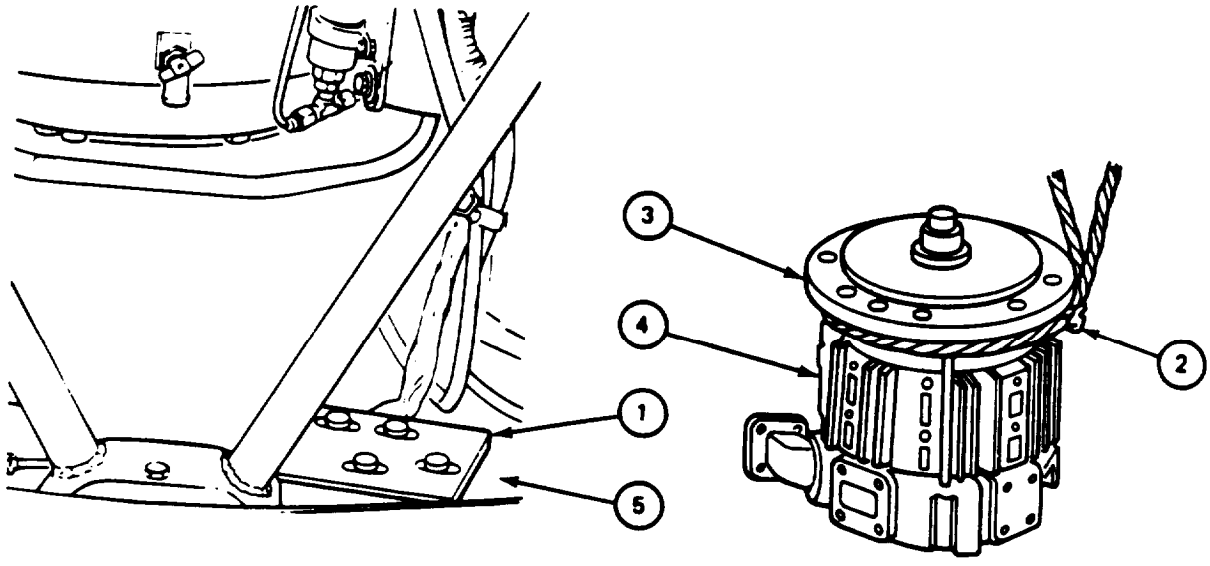
13-57. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE (CONT)

FRAME 3

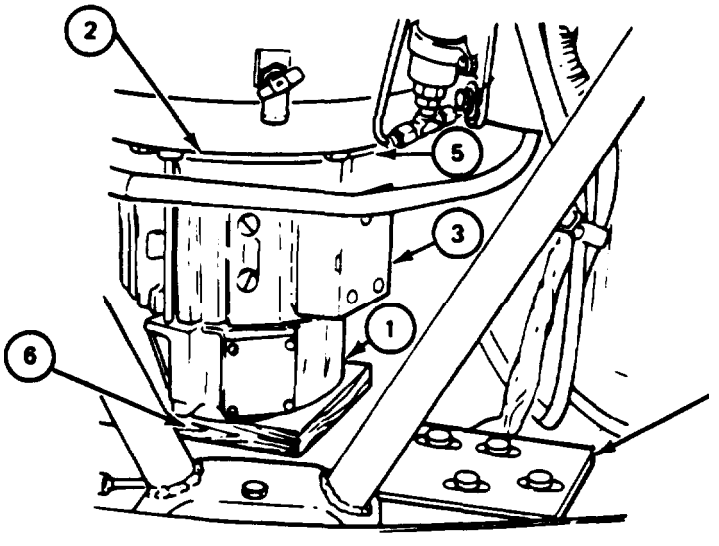
Step	Procedure
1.	Soldier A: Manually traverse turret until motor mounting plate (1) can be reached from driver's compartment (TM-10).
2.	Set turret traverse lock to LOCKED (TM-10).
3.	Soldier B: Tie rope sling (2) under and around motor drive head (3). Secure rope to hoist.
	WARNING Motor weighs 77 pounds. Be careful when lifting and lowering it. If motor drops or sways, it could hurt you.
4.	Soldier B and C: Slowly lower motor into vehicle.
5.	Soldier A: Hold motor on sides (4). Guide motor down to turret platform (5).
6.	Remove rope sling (2) from motor (4).
	GO TO FRAME 4



13-57. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE (CONT)

FRAME 4

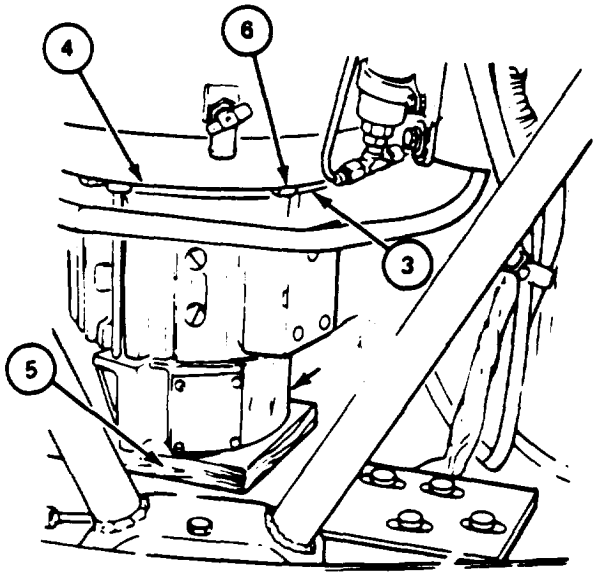
Step	Procedure
	WARNING Be careful to lift motor with knees bent, back straight. Lifting wrong can hurt you.
1.	Soldier A and Soldier B: Slide motor (1) under pump mount (2) with bracket mounting side (3) facing motor mounting plate (4).
	CAUTION Do not put wood blocks under bearing hump at center of motor.
2.	Grab motor under drive head (5). Lift motor up about 2” and align scribe marks made during removal.
3.	Soldier C: Slide two wood blocks (6) under motor for support.
4.	Soldier A and Soldier B: Lower motor (1) on wood blocks (6).
	GO TO FRAME 5

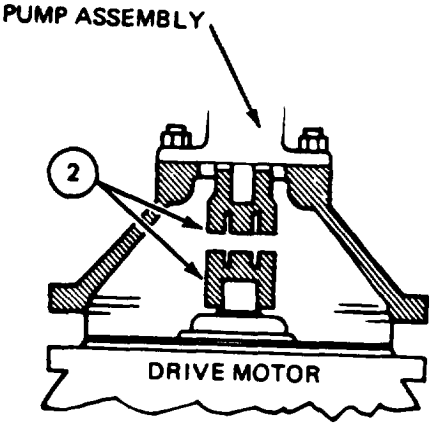


13-57. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE (CONT)

FRAME 5

Step	Procedure
	CAUTION Motor (1) must be lifted and turned carefully to keep from breaking motor parts.
1.	Soldier A and Soldier B: Lift motor (1) about 1/2".
2.	Soldier C: Turn motor (1) until shaft couplings (2) line up.
3.	Soldier A and Soldier B: Lift motor (1) until drive head (3) is flat against pump mount (4).
4.	Soldier C: Slide third wood block (5) under motor (1) to hold it against pump mount (4).
5.	Turn motor (1) until four mounting holes (6) are lined up.
	GO TO FRAME 6

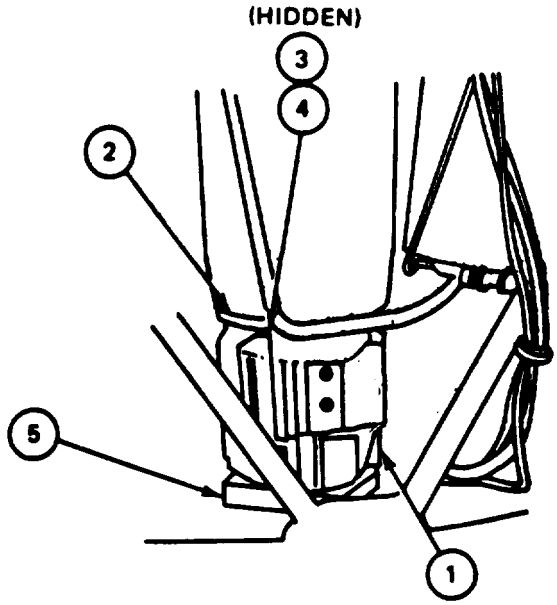




13-57. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE (CONT)

FRAME 6

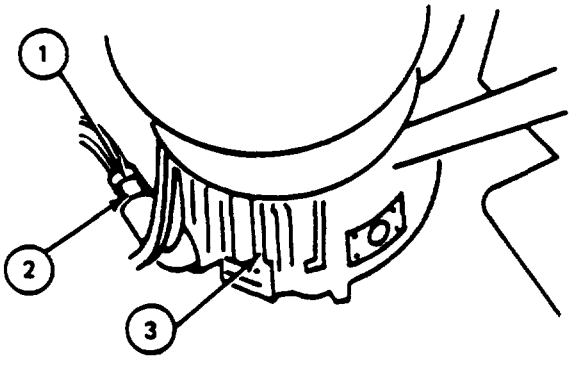
Step	Procedure
1.	Using socket wrench, attach motor (1) to pump mount (2) with four screws (3) and four lockwashers (4).
	NOTE Do step 2 only if power pack was removed from vehicle.
2.	Using torque wrench, tighten four screws (3) to between 205 and 225 inch-pounds (JPG).
3.	Install motor mounting bracket (TM-20).
4.	Remove wood blocks (5).
	GO TO FRAME 7



13-57. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE (CONT)

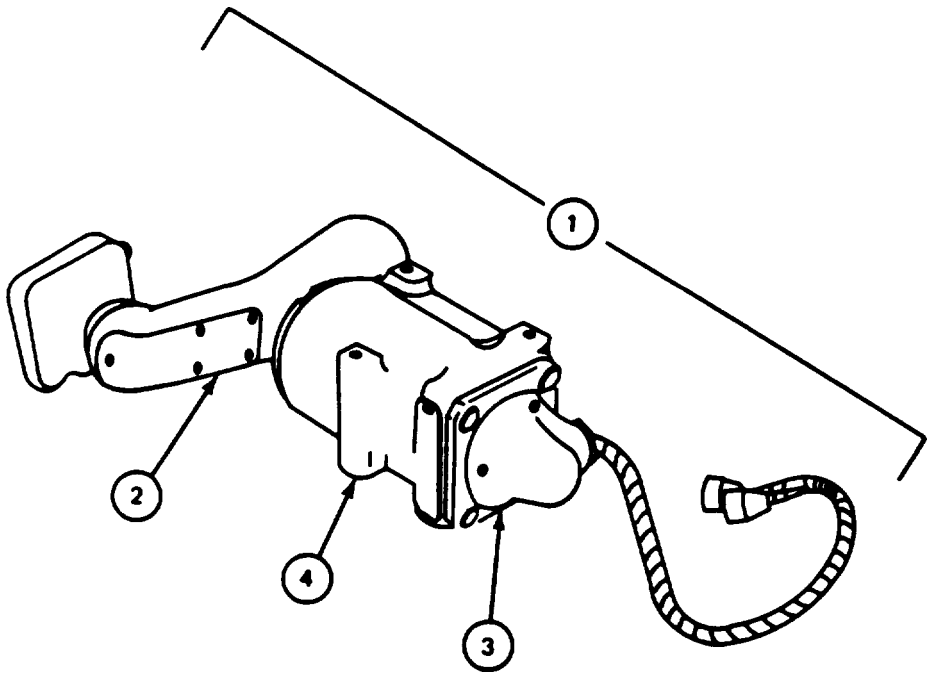
FRAME 7

Step	Procedure
1.	Using spanner wrench, connect electrical connector (1) to elbow connector (2) on motor (3) (JPG).
	NOTE
	Follow-on Maintenance Action Required:
	Install turret power relay box (TM-20-2-3). Install gunner's footrest plate (TM-20-2-3). Traverse turret in power mode to make sure motor works properly (TM-10).
	END OF TASK



Section 13. MANUAL ELEVATION PUMP

13-58. MAINTENANCE PROCEDURES INDEX



13-59. MANUAL ELEVATION PUMP TEST PROCEDURE

TEST EQUIPMENT:
- Multimeter
- M3 oil pump (NSN 4933-00-449-7166) (7550134)
- Hydraulic test kit (NSN 1015-01-151-6441) (9337932)
- Watch with second hand
- Test manifold (fabricated tool, item 16, App. B)
- Graduated cylinder, MS35943-4
- Spring scale (0 to 25 pounds)

TOOLS: 5/32 in. socket head screw key (Allen wrench)

SUPPLIES:
- Hydraulic fluid (item 10, App. A)
- Container, one quart

PERSONNEL: One

PRELIMINARY PROCEDURES: Remove manual elevation pump (para. 13-60)

GENERAL INSTRUCTIONS:

NOTE

If normal indication is not obtained, replace bad part listed in Probable Fault column. Refer to section index (para. 13-58 for replacement of bad part.

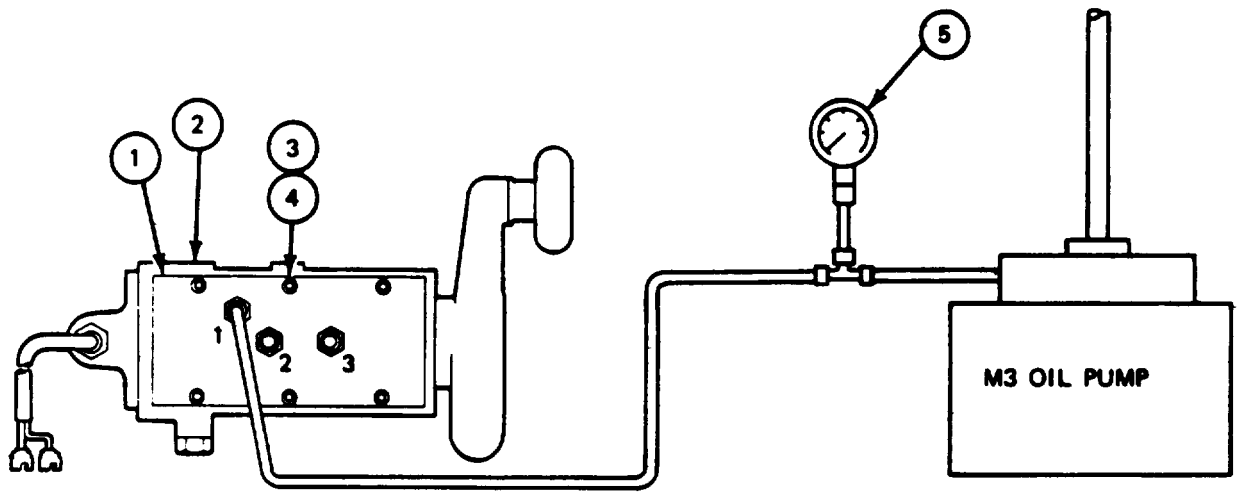
Suitable fittings, preformed packings, and tools should be used to connect test equipment to parts being tested.

13-59. MANUAL ELEVATION PUMP TEST PROCEDURE (CONT)

a. Leakage Test

FRAME 1

Step	Procedure	Normal Indication	Probable Fault
1.	Coat three preformed packings with hydraulic fluid.	. .	. . .
2.	Put three preformed packings in grooves on back of test manifold (1).	. .	. . .
3.	Using Allen wrench, attach test manifold (1) to manual elevation pump (2) with six screws (3) and six washers (4).	. .	. . .
4.	Install three fittings in three ports of test manifold (1).	. .	. . .
5.	Cap ports (2) and 3 of test manifold (1).	. .	. . .
6.	Assemble M3 oil pump.	. .	. . .
7.	Connect M3 oil pump and pressure gauge (5) to port 1 of test manifold (1).	. .	. . .
	NOTE Keep handle of manual elevation pump (2) from turning when pump is pressurized.		
8.	Using M3 oil pump, pressurize manual elevation pump (2) to 1000 psi.		. . .
9.	Using watch, check pressure for one minute.	Pump (2) does not leak.	Bad preformed packings inside pump (2).
10.	Using M3 oil pump, reduce pressure to 0 psi.	. . .	. . .
11.	Remove M3 oil pump hose from port 1 of test manifold (1) and cap port 1.	. . .	. . .
	GO TO FRAME 2		

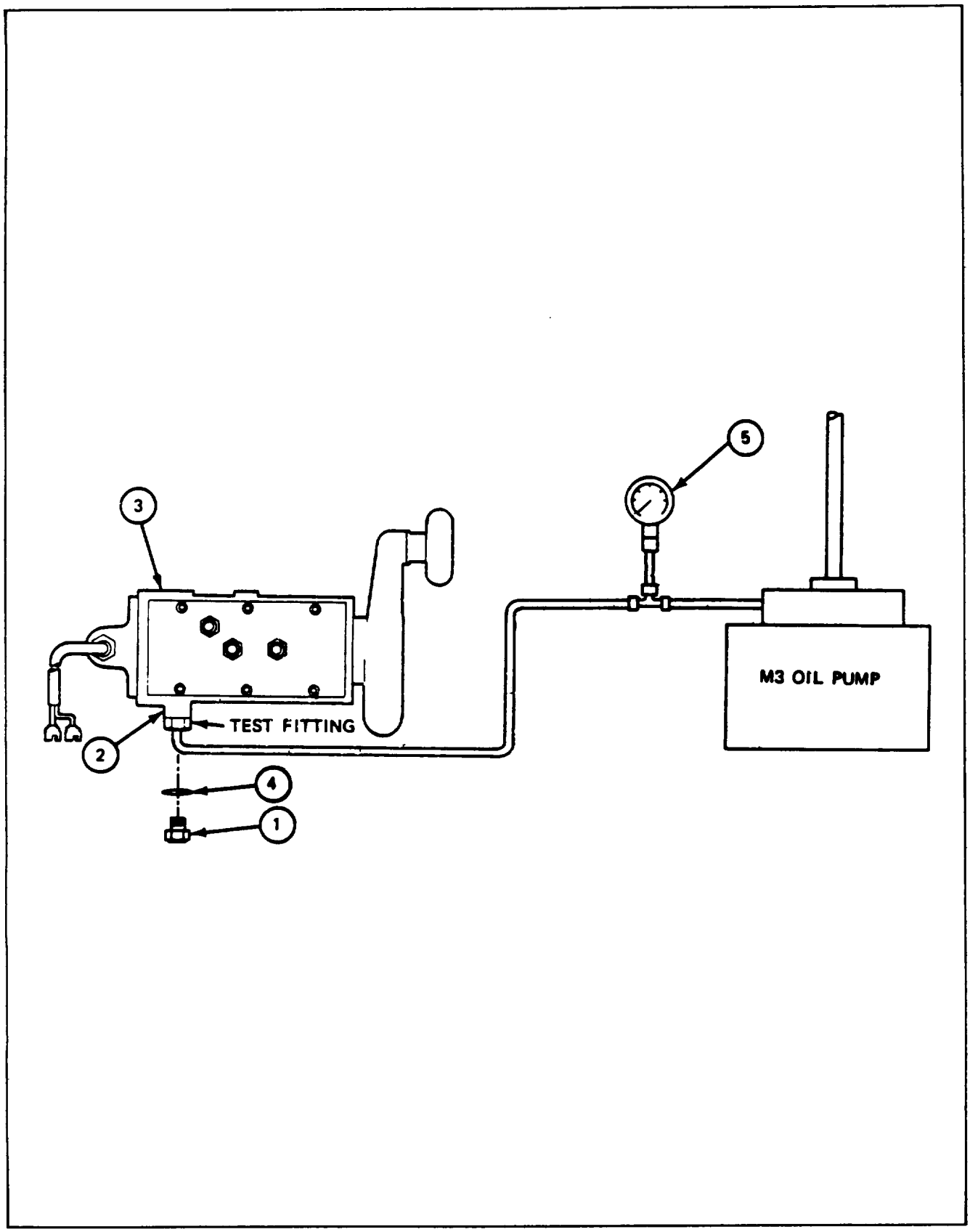

1
2
3
4
5
1
2
3
M3 OIL PUMP

13-59. MANUAL ELEVATION PUMP TEST PROCEDURE (CONT)

a. Leakage Test (Cont)

FRAME 2

Step	Procedure	Normal Indication	Probable Fault
1.	Remove plug (1) from port (2) of manual elevation pump (3).	. . .	. . .
2.	Remove preformed packing (4) from plug (1). Throw preformed packing away (JPG).	. . .	. . .
3.	Connect suitable test fitting with new preformed packing (4) in port (2).	. . .	. . .
4.	Connect M3 oil pump and pressure gauge (5) to port (2) of manual elevation pump (3).	. . .	. . .
5.	Using M3 oil pump, pressurize manual elevation pump (3) to about 78 psi (JPG).	. . .	. . .
6.	Using watch, check pressure for one minute.	Pump (3) does not leak.	Bad preformed packings inside pump (3).
7.	Using M3 oil pump, reduce pressure to 0 psi (JPG).	. . .	. . .
8.	Remove hose from port (2) of manual elevation pump (3).	. . .	. . .
9.	Coat new preformed packing (4) with hydraulic fluid.	. . .	. . .
10.	Remove test fitting from port (2).	. . .	. . .
11.	Put new preformed packing (4) on plug (1) (JPG).	. . .	. . .
12.	Put plug (1) with preformed packing (4) in port (2).	. . .	
13.	Disassemble M3 oil pump.	. . .	. . .
	GO TO FRAME 3		

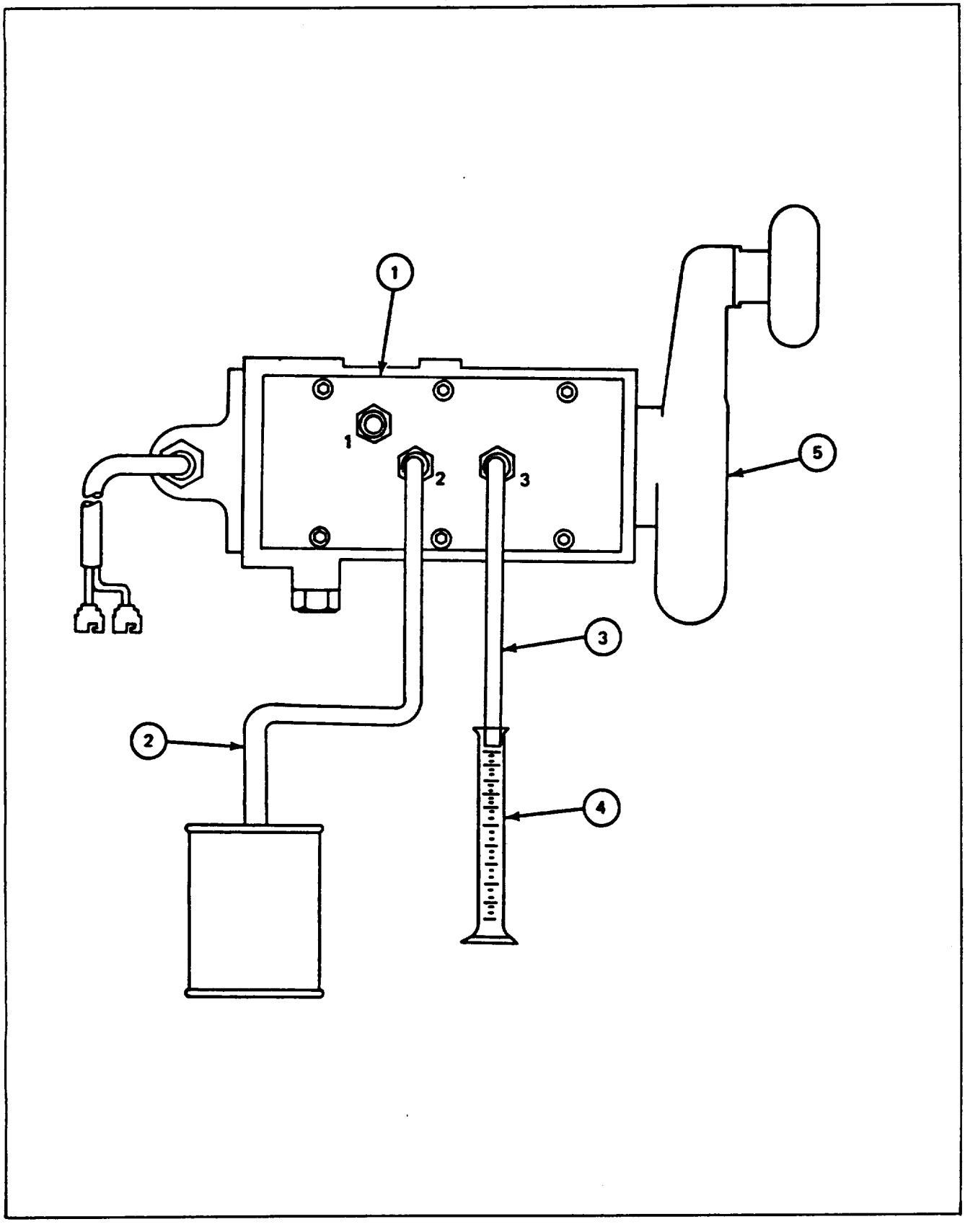

5
3
M3 OIL PUMP
TEST FITTING
2
4
1

13-59. MANUAL ELEVATION PUMP TEST PROCEDURE (CONT)

b. **Volume Test**

FRAME 3

Step	Procedure	Normal Indication	Probable Fault
1.	Uncap port 2 and port 3 of test manifold (1).	. . .	. . .
2.	Connect plastic tubing (2) to port 2 of test manifold (1).	. . .	. . .
3.	Put end of plastic tubing (2) in container of hydraulic fluid.	. . .	. . .
4.	Connect plastic tubing (3) to port 3 of test manifold (1).	. . .	. . .
5.	Put end of plastic tubing (3) in graduated cylinder (4).	. . .	. . .
6.	Turn handle (5) of manual elevation pump counterclockwise until hydraulic fluid comes out of tube (3) in steady stream into graduated cylinder (4).	. . .	. . .
7.	Using graduated cylinder (4), measure how much fluid is pumped out by one full turn of handle (5) counterclockwise.	From 9.0 ml to 13.0 ml.	Worn pistons or piston block.
	GO TO FRAME 4		

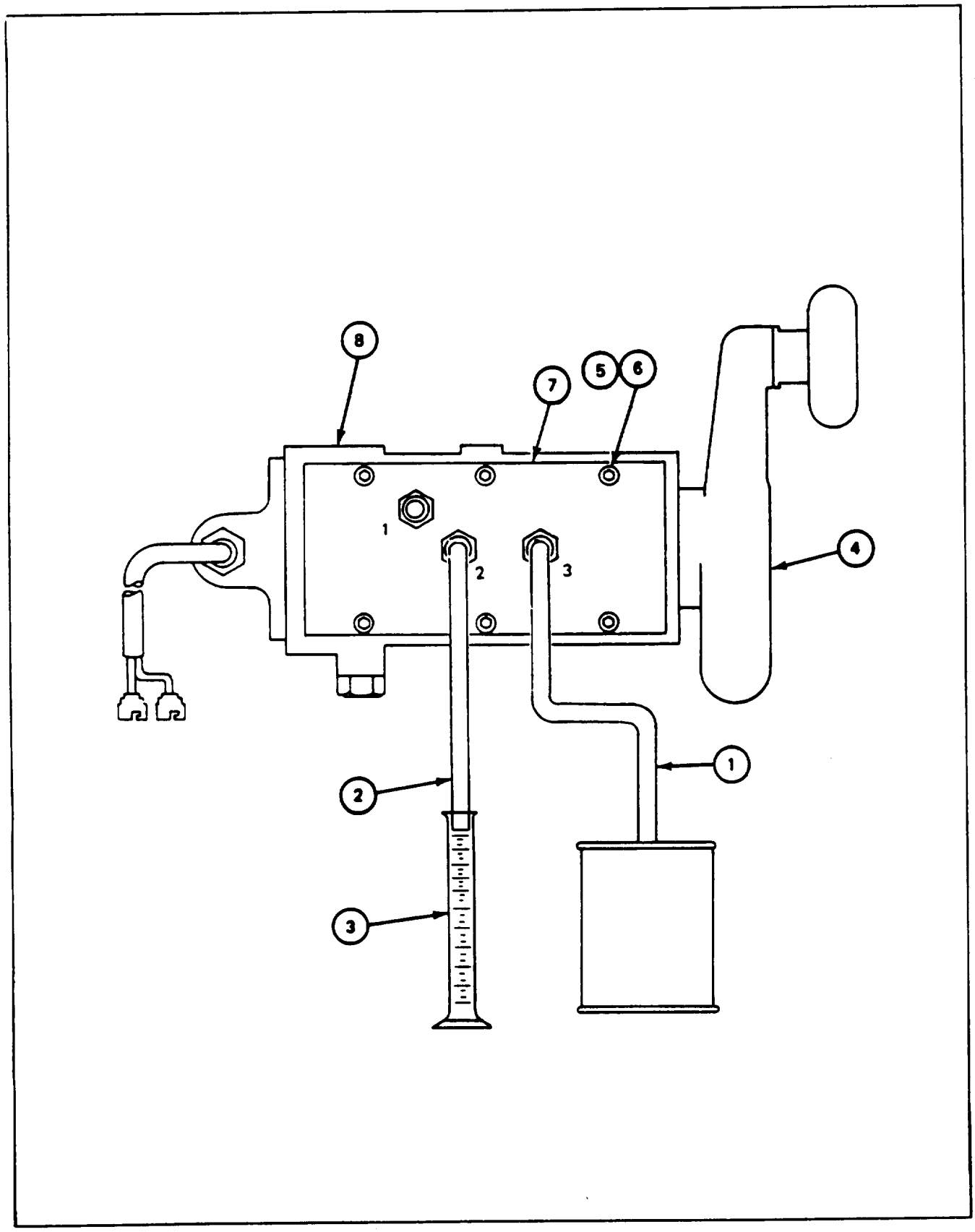

1
1
2
3
5
3
2
4

13-59 MANUAL ELEVATION PUMP TEST PROCEDURE (CONT)

b. Volume Test (Cont)

FRAME 4

Step	Procedure	Normal Indication	Probable Fault
1.	Put tubing (1) in container of hydraulic fluid.	. . .	. . .
2.	Put tubing (2) in graduated cylinder (3).	. . .	. . .
3.	Turn handle (4) clockwise until hydraulic fluid comes out of tubing (2) in steady stream into graduated cylinder (3).	. . .	. . .
4.	Using graduated cylinder (3), measure amount of fluid pumped out by one full turn of handle (4) clockwise.	From 9.0 ml to 13.0 ml.	Worn pistons or piston block.
5.	Remove tubing (1) and tubing (2) from ports 2 and 3.	. . .	. . .
6.	Using Allen wrench, remove six screws (5), and six washers (6), and test manifold (7) from manual elevation pump (8).	. . .	. . .
	GO TO FRAME 5		

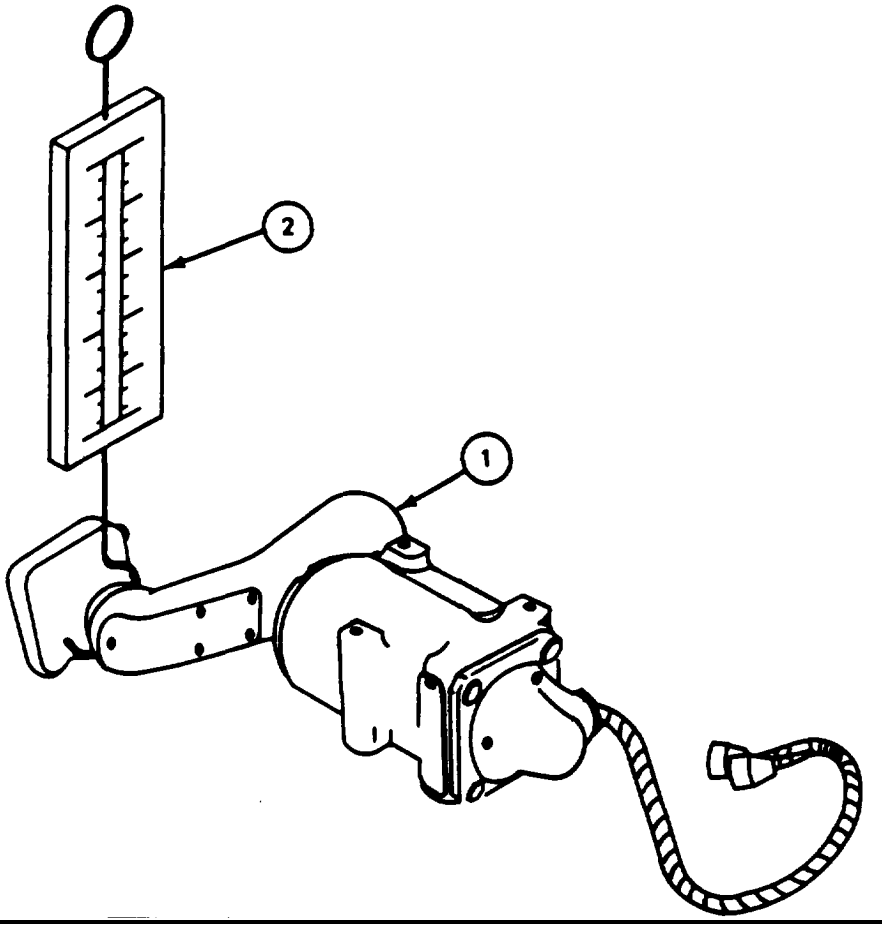

8
7
5
6
1
2
3
4
1
2
3

13-59. MANUAL ELEVATION PUMP TEST PROCEDURE (CONT)

c. Handle Torque Test

FRAME 5

Step	Procedure	Normal Indication	Probable Fault
1.	Using watch with second hand, turn manual elevation pump handle (1) clockwise at speed of one full turn per minute.	Handle (1) turns easily with smooth motion.	Bad piston in piston block or bad bearing.
2.	Using watch with second hand. turn manual elevation pump handle (1) counterclockwise at speed of one full turn per minute.	Handle (1) turns easily with smooth motion.	Bad piston in piston block or bad bearing.
3.	Using spring scale (2), pull on handle (1).	Handle (1) moves with force less than 10 pounds.	Bad piston in piston block or bad bearing.
	GO TO FRAME 6		



13-59. MANUAL ELEVATION PUMP TEST PROCEDURE (CONT)

d. Electrical Test

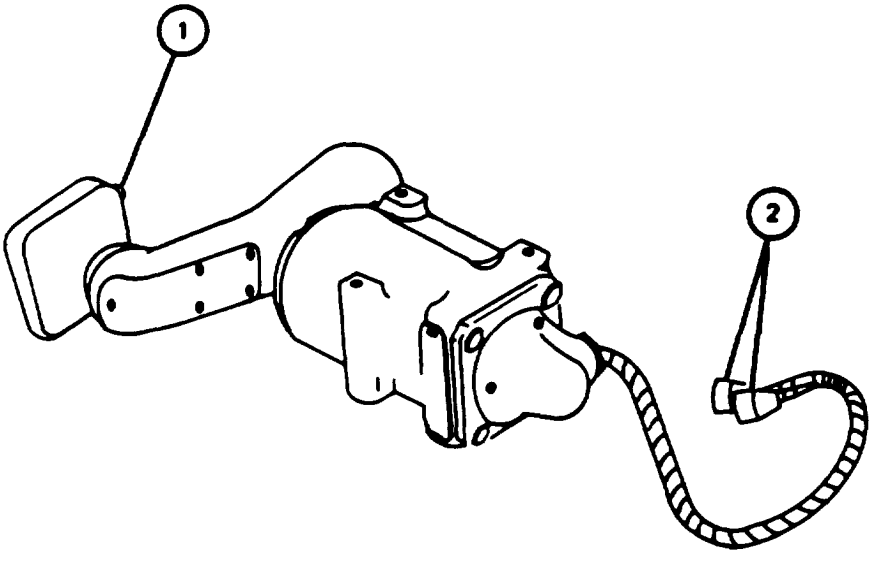
FRAME 6

Step	Procedure	Normal Indication	Probable Fault
1.	Make sure pushbutton (1) is not pushed in.	. . .	. . .
2.	Using multimeter, check continuity between switch leads (2).	Greater than 10. million ohms.	Bad trigger switch, bad wiring, or bad actuating linkage.
3.	Push in and hold pushbutton (1).	. . .	. . .
4.	Using multimeter, check continuity between two switch leads (2).	Less than 2 ohms.	Bad trigger switch. bad wiring, or bad actuating linkage.
5.	Remove multimeter from two leads (2).	. . .	. . .

NOTE

If normal indication was obtained in frames 1 through 6, manual elevation pump is good.

END OF TASK



13-60. MANUAL ELEVATION PUMP REMOVAL PROCEDURE

TOOLS: 5/32” socket head screw key (Allen wrench) 4” length

PERSONNEL: Two

REFERENCES: JPG for procedures to:
Remove hydraulic packings
Disconnect electrical connectors
Plug hydraulic ports
TM 9-2350-222-20-2-3 for procedure to remove manual elevation accumulator
TM 9-2350-222-10 for procedures to:
Manually traverse turret
Set turret traverse lock

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver’s Master Control Panel	FO-3	11
Gunner’s Control Box	FO-1	2
Power Pack	FO-1	15
Turret Traverse Lock	FO-3	7

EQUIPMENT CONDITION: Driver’s master control panel MASTER BATTERY switch set to OFF
Gunner’s control box ELEV/TRAV POWER switch set to OFF
Manual elevation accumulator removed (TM-20-2-3)

GENERAL INSTRUCTIONS:

CAUTION

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

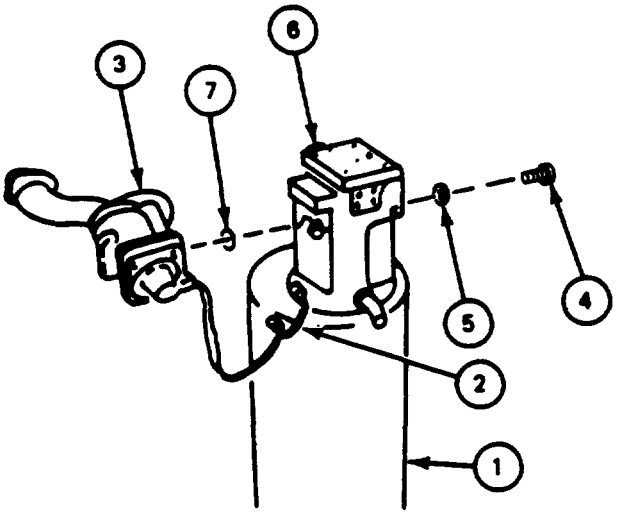
NOTE

Soldier A will be inside turret in gunner’s area.
Soldier B wiIl be inside driver’s compartment.

13-60. MANUAL ELEVATION PUMP REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
	NOTE Soldier A does all steps except step 5.
1.	Manually traverse turret until back side of power pack (1) can be reached from driver's compartment (TM-10).
2.	Set turret traverse lock to LOCKED (TM-10).
3.	Disconnect two electrical connectors (2) (JPG).
4.	Hold manual elevation pump (3) during step 5.
5.	Soldier B: Using Allen wrench, remove six screws (4) and six lockwashers (5) that attach manual elevation pump (3) to hydraulic riser (6).
6.	Remove manual elevation pump (3) and three packings (7) (JPG).
7.	Plug three ports in hydraulic riser (6) (JPG).
8.	Plug three ports in manual elevation pump (3) (JPG).
	END OF TASK



13-61. MANUAL ELEVATION PUMP INSTALLATION PROCEDURE

TOOLS: 5/32” socket head screw key (Allen wrench) 4” length

SUPPLIES: Preformed packing MS 28775-10 (three)
Hydraulic fluid (item 10, App. A)

PERSONNEL: Two

REFERENCES: JPG for procedures to:
Install hydraulic packings
Connect electrical connectors
TM 9-2350-222-10 for procedures to:
Set turret traverse lock
Manually traverse turret
Operate manual elevation pump
Check main gun firing circuit
TM 9-2350-222-20-2-3 for procedures to:
Bleed turret hydraulic system
Install manual elevation accumulator

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver’s Master Control Panel	FO-3	11
Gunner’s Control Box	FO-1	2
Turret Traverse Lock	FO-3	7
Power Pack	FO-1	15

EQUIPMENT CONDITION: Driver’s master control panel MASTER BATTERY switch set to OFF
Gunner’s control box ELEV/TRAV POWER switch set to OFF

GENERAL INSTRUCTIONS:

NOTE

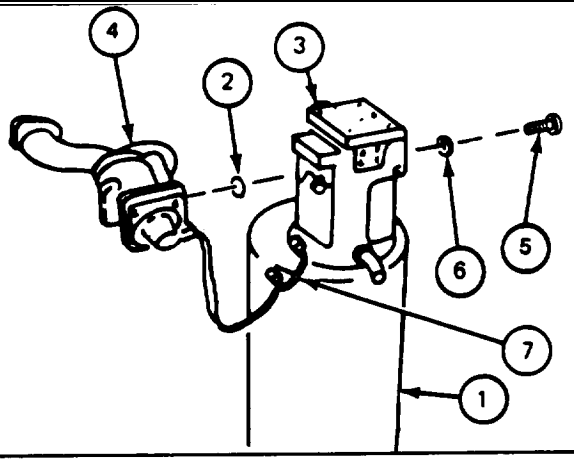
Soldier A will be inside turret in gunner’s area.

Soldier B will be in driver’s compartment.

13-61. MANUAL ELEVATION PUMP INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
	NOTE Soldier A does steps 1 through 6.
1.	Manually traverse turret until power pack (1) can be reached from driver's compartment (TM-10).
2.	Set turret traverse lock to LOCKED (TM-10).
3.	Coat three packings (2) with hydraulic fluid.
4.	Remove three plugs from ports of hydraulic riser (3).
5.	Put three packings (2) in three ports of hydraulic riser (3).
6.	Hold manual elevation pump (4) in place on hydraulic riser (3) during step 7.
7.	Soldier B: Using Allen wrench, attach manual elevation pump (4) to hydraulic riser (3) with six screws (5) and six lockwashers (6).
8.	Soldier A: Connect two electrical connectors (7) (JPG).
	NOTE Follow-on Maintenance Action Required: Install manual elevation accumulator (TM-20-2-3). Charge manual elevation accumulator (TM-20-2-3). Bleed turret hydraulic system (TM-20-2-3). Operate manual elevation pump and check main gun firing circuit to make sure they work properly (TM-10).
	END OF TASK



13-62. MANUAL ELEVATION PUMP DISASSEMBLY PROCEDURE

PERSONNEL: Two

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-60)
Test manual elevation pump (para 13-59)

FRAME 1

Step	Procedure
1.	Remove handle (para 13-65).
2.	Remove switch housing (para 13-69).
3.	Disassemble handle (para 13-67).
4.	Disassemble switch housing (para 13-71).
5.	Disassemble axial pistons pump (para 13-74).
	END OF TASK

13-63. MANUAL ELEVATION PUMP ASSEMBLY PROCEDURE

PERSONNEL: One

FRAME 1

Step	Procedure
1.	Assemble handle (para 13-68).
2.	Assemble switch housing (para 13-72).
3.	Assemble axial pistons pump (para 13-75).
4.	Install handle (para 13-66).
5.	Install switch housing (para 13-70).
	NOTE Follow-on Maintenance Action Required: Test manual elevation pump (para 13-59).
	END OF TASK

13-64. HANDLE INSPECTION PROCEDURE

PERSONNEL: One

REFERENCES: JPG for procedure to inspect and repair parts

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-60)
Test manual elevation pump (para 13-59)
Remove handle (para 13-65)
Disassemble handle (para 13-67)

GENERAL INSTRUCTIONS:

NOTE

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

13-64. HANDLE INSPECTION PROCEDURE (CONT)

FRAME 1

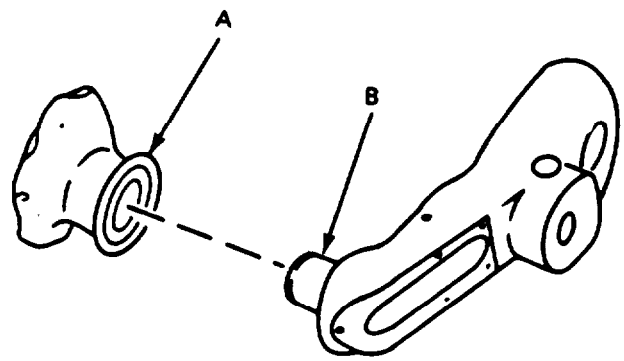
Step	Procedure
	SUPPORT SHOP WORK
1.	Take handle parts to shop where inspection equipment is available.
2.	Make dimensional check.

Reference Number	Point of Measurement	Measurement (Inches)
A	Inside diameter of support bushings	0.822 max
B	Outside diameter of arm handle shaft	0.809 min

NOTE

Tag parts that are out of tolerance.

3.	After support shop work, return handle parts to turret shop.
	END OF TASK



13-65. HANDLE REMOVAL PROCEDURE

TOOLS: 7/32” socket head screw key (Allen wrench)

PERSONNEL: One

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver’s Master Control Panel	FO-3	11
Gunner’s Control Box	FO-1	2
Turret Traverse Lock	FO-3	7
Manual Elevating Handle	FO-1	19

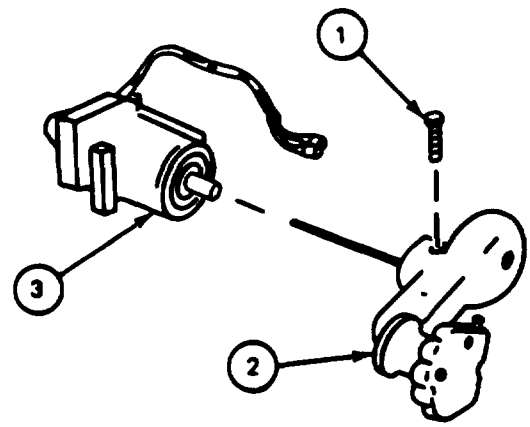
NOTE

Equipment condition applies only if manual elevation pump is installed in vehicle.

EQUIPMENT CONDITION: Driver’s master control panel MASTER BATTERY switch set to OFF
Gunner’s control box ELEV/TRAV POWER switch set to OFF
Turret traverse lock set to LOCKED

FRAME 1

Step	Procedure
1.	Using Allen wrench, remove screw (1) from handle (2).
2.	Remove handle (2) from axial pistons pump (3).
	END OF TASK



13-66. HANDLE INSTALLATION PROCEDURE

TOOLS: 7/32” socket head screw key (Allen wrench)

PERSONNEL: One

REFERENCES: TM 9-2350-222-10 for procedures to check main gun firing circuit

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver’s Master Control Panel	FO-3	11
Gunner’s Control Box	FO-1	2
Turret Traverse Lock	FO-3	7
Manual Elevating Handle	FO-1	19

NOTE

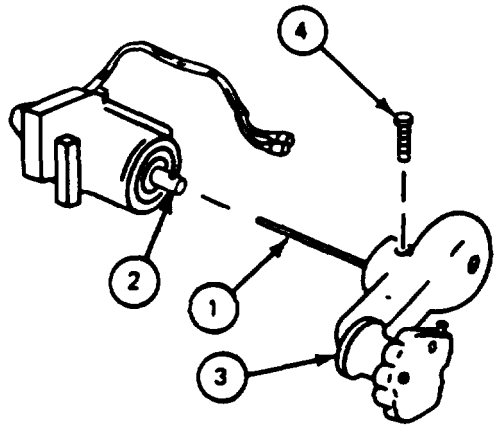
Equipment condition applies only if manual elevation pump is installed in vehicle.

EQUIPMENT CONDITION: Driver’s master control panel MASTER BATTERY switch set to OFF
Turret traverse lock set to LOCKED

13-66. HANDLE INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Put actuating pin (1) in center of axial pistons pump shaft (2).
2.	Line up slot on shaft (2) with screw hole of handle (3).
3.	Using Allen wrench, attach handle (3) to shaft (2) with screw (4).
	NOTE Follow-on Maintenance Action Required: Test manual elevation pump (para 13-59) (if manual elevation pump is not installed in vehicle). Check main gun firing circuit (TM-10) (if manual elevation pump is installed in vehicle).
	END OF TASK



13-67. HANDLE DISASSEMBLY PROCEDURE

TOOLS: 5/32" drive pin punch
8 ounce ball peen hammer
1/4" flat tip screwdriver
External retaining ring pliers
7/64" socket head screw key (Allen wrench)
Scraper
Stiff bristled brush
Fine stone

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

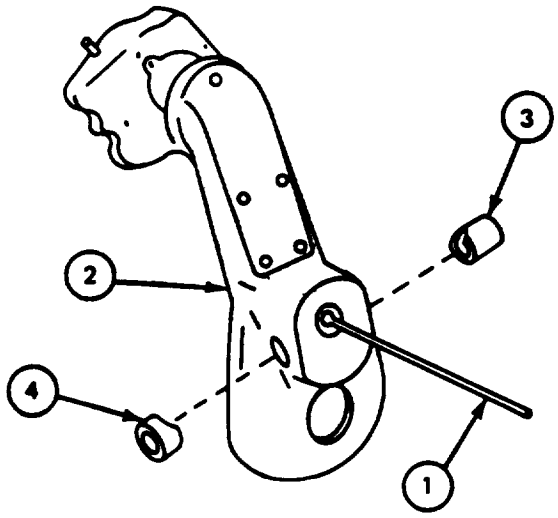
PERSONNEL: One

REFERENCES: JPG for procedures to:
Clean parts
Inspect and repair parts
Use retaining ring pliers

PRELIMINARY PROCEDURES: Remove handle (para 13-65)

FRAME 1

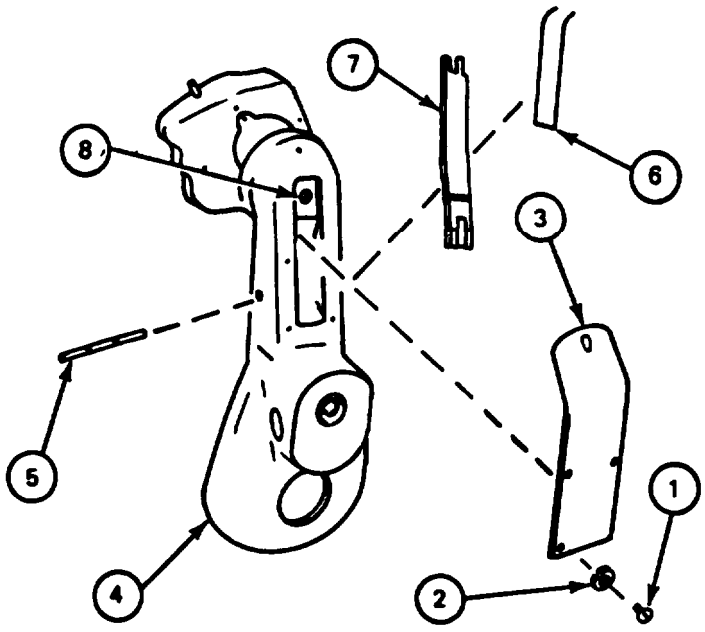
Step	Procedure
1.	Using hands, remove actuating pin (1) from handle (2).
2.	Using punch, push sleeve clamp (3) from handle (2).
3.	Using punch, push bushing clamp (4) from handle (3).
	GO TO FRAME 2



13-67. HANDLE DISASSEMBLY PROCEDURE (CONT)

FRAME 2

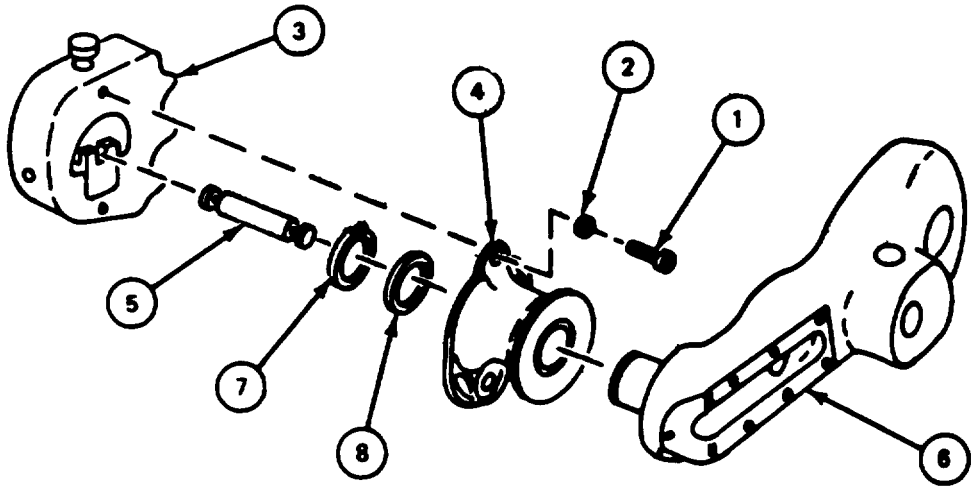
Step	Procedure
1.	Using screwdriver, remove five screws (1) and five lockwashers (2) that attach cover (3) to arm (4).
2.	Remove cover (3) from arm (4).
3.	Using hammer and pin punch, drive out pivot pin (5).
4.	Remove tension spring (6) from arm (4).
5.	Using screwdriver, remove upper end of operating arm (7) from rod (8).
6.	Remove operating arm (7) from arm (4),
	GO TO FRAME 3



13-67. HANDLE DISASSEMBLY PROCEDURE (CONT)

FRAME 3

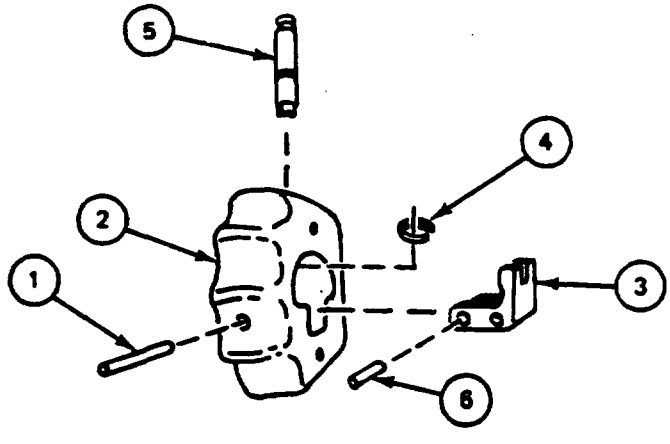
Step	Procedure
1.	Using Allen wrench, remove two screws (1) and two lockwashers (2) that attach handle (3) to support (4).
2.	Pull handle (3) and rod (5) from arm (6).
3.	Separate rod (5) from handle (3).
4.	Using pliers, remove retaining ring (7) from shaft of arm (6) (JPG).
5.	Remove washer (8) and support (4) from shaft of arm (6).
	GO TO FRAME 4



13-67. HANDLE DISASSEMBLY PROCEDURE (CONT)

FRAME 4

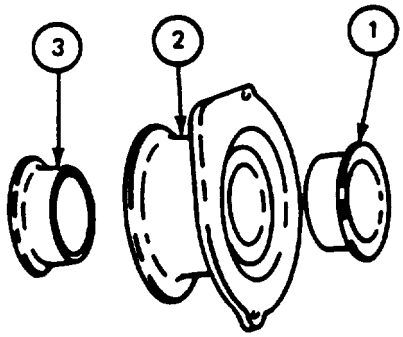
Step	Procedure
1.	Using hammer and pin punch, drive out pivot pin (1) from handle (2).
2.	Remove yoke (3) from handle (2).
3.	Using pliers, remove retaining ring (4) from end of pushbutton (5) (JPG).
4.	Remove pushbutton (5) from handle (2).
5.	Using hammer and punch, remove pin (6) from yoke (3).
	GO TO FRAME 5



13-67. HANDLE DISASSEMBLY PROCEDURE (CONT)

FRAME 5

Step	Procedure
1.	Using punch, push bushing (1) from support (2).
2.	Using punch, push bushing (3) from support (2).
	NOTE
	Follow-on Maintenance Action Required: Clean all Parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of handle (para 13-64).
	END OF TASK



13-68. HANDLE ASSEMBLY PROCEDURE

TOOLS: 5/32” drive pin punch
8 ounce ball peen hammer
1/4” flat tip screwdriver (two)
External retaining ring pliers
7/64” socket head screw key (Allen wrench)
Plastic faced hammer

SUPPLIES: Grease (item 13, App. A)

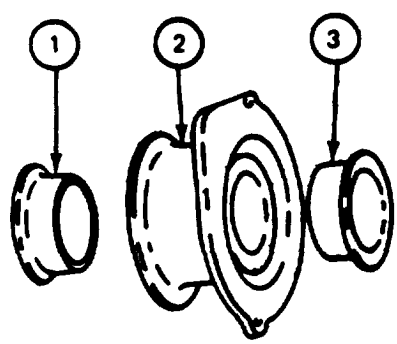
PERSONNEL: Two

REFERENCES: JPG for procedures to:
Use retaining ring pliers
Apply grease

PRELIMINARY PROCEDURES: Inspect handle parts (para 13-64)

FRAME 1

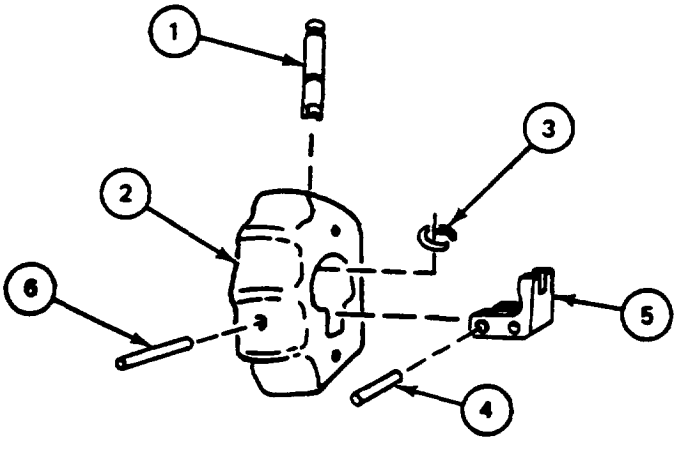
Step	Procedure
1.	Using fingers, push bushing (1) in support (2).
2.	Using fingers, push bushing (3) in support (2).
3.	Using plastic faced hammer, seat bushings (1) and (3) in support (2) by tapping lightly.
	GO TO FRAME 2



13-68. HANDLE ASSEMBLY PROCEDURE (CONT)

FRAME 2

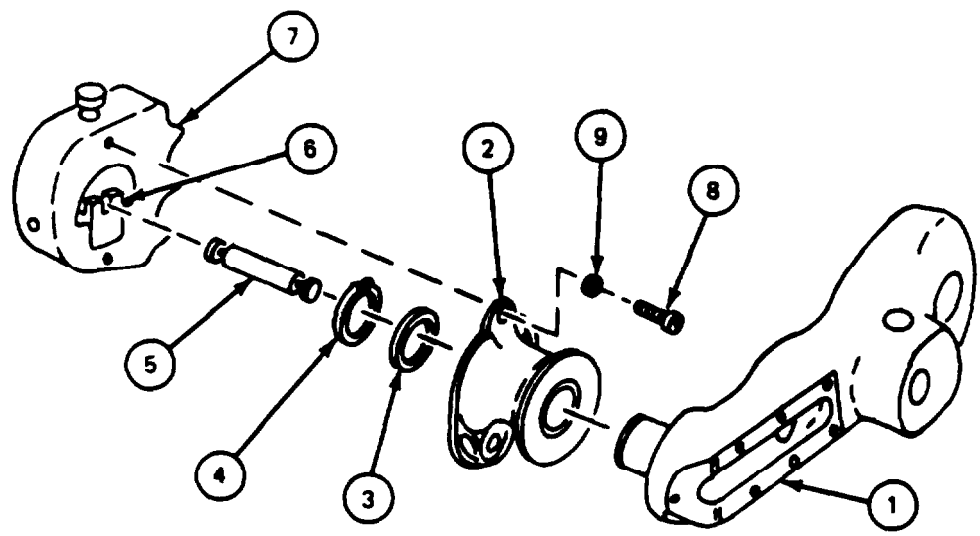
Step	Procedure
1.	Put pushbutton (1) through hole in handle (2).
2.	Using pliers, put retaining ring (3) on pushbutton (1).
3.	Using ball peen hammer, tap pin (4) in yoke (5).
4.	Put yoke (5) in handle (2). Check that pushbutton (1) is engaged with yoke.
5.	Using ball peen hammer and punch, put pivot pin (6) into handle (2) and yoke (5).
	GO TO FRAME 3



13-68. HANDLE ASSEMBLY PROCEDURE (CONT)

FRAME 3

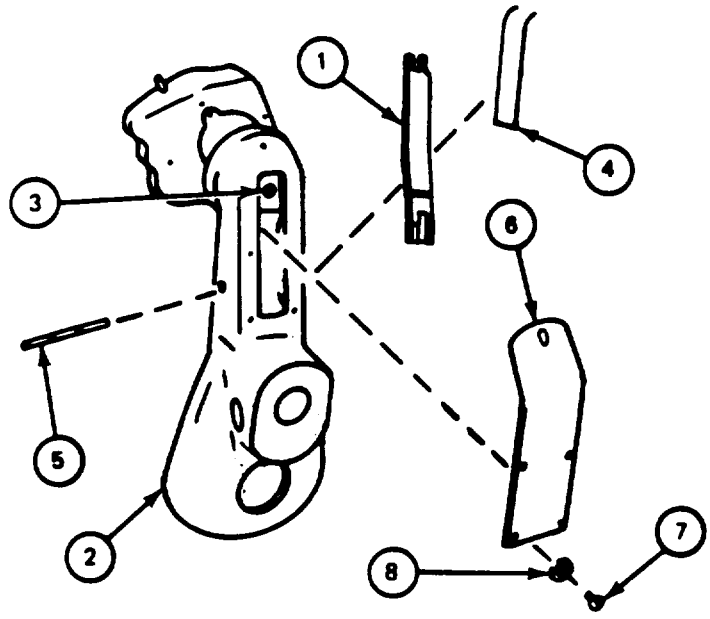
Step	Procedure
1.	Coat bearing surface of arm (1) with grease (JPG).
2.	Put support (2) and washer (3) on shaft of arm (1).
3.	Using pliers, put retaining ring (4) on shaft of arm (1) (JPG).
4.	Push rod (5) part way into shaft of arm (1).
5.	Engage end of rod (5) with yoke 6) in handle (7). Push handle up against support (2).
6.	Using Allen wrench, attach handle (7) to support (2) with two screws (8) and two lockwashers (9).
	GO TO FRAME 4



13-68. HANDLE ASSEMBLY PROCEDURE (CONT)

FRAME 4

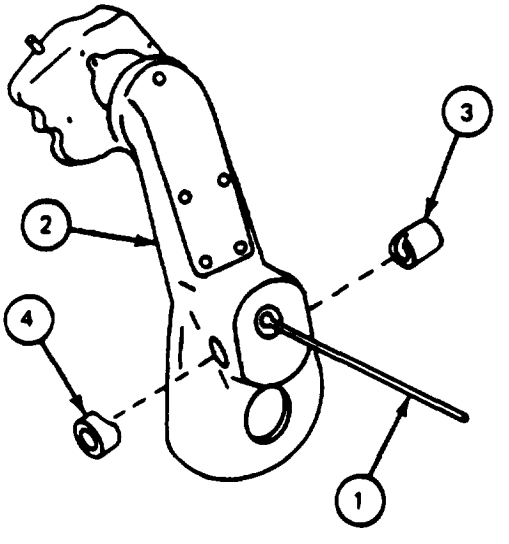
Step	Procedure
	NOTE Soldier A does all steps except step 4.
1.	Put operating arm (1) in slot on back of arm (2).
2.	Using hand, engage upper end of operating arm (1) with rod (3).
3.	Put tension spring (4) in slot on operating arm (1) with bent ends of tension spring pointing out.
4.	Soldier B: Using two screwdrivers, hold both legs of tension spring (4) down so pivot pin (5) will go over them during step 5.
5.	Using ball peen hammer and punch, drive pivot pin (5) into arm (2) and operating arm (1).
6.	Put cover (6) on back of arm (2).
7.	Using screwdriver, attach cover (6) to arm (2) with five screws (7) and five lockwashers (8).
	GO TO FRAME 5



13-68. HANDLE ASSEMBLY PROCEDURE (CONT)

FRAME 5

Step	Procedure
1.	Using hands, put headed end of actuating pin (1) in shaft hole of handle (2).
2.	Hook headed end of actuating pin (1) in slot on lower end of operating arm (inside shaft hole of handle).
3.	Using hand, push sleeve clamp (3) into handle (2) with cut out part toward actuating pin (1).
4.	Using hand, push bushing clamp (4) into handle (2) with cut out part toward actuating pin (1).
	NOTE Follow-on Maintenance Action Required: Install handle (para 13-66).
	END OF TASK



13-69. SWITCH HOUSING REMOVAL PROCEDURE

TOOLS: 1/4" flat tip screwdriver

PERSONNEL: One

REFERENCES: JPG for procedure to disconnect electrical connectors

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-3	11
Gunner's Control Box	FO-1	2
Turret Traverse Lock	FO-3	7
Manual Elevating Handle	FO-1	19

NOTE

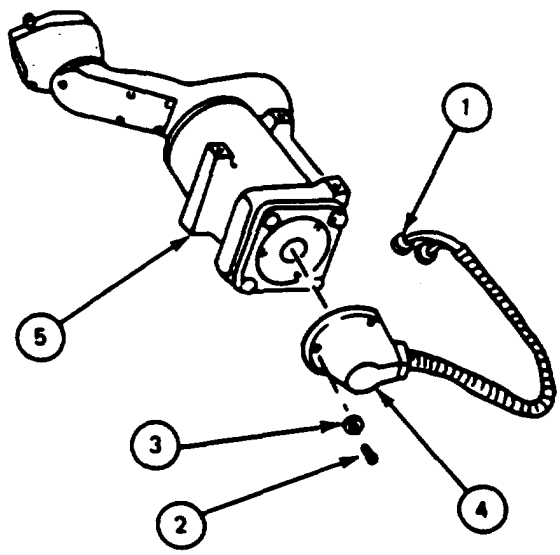
Equipment condition applies only if manual elevation pump is installed in vehicle.

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV POWER switch set to OFF
Turret traverse lock set to LOCKED

13-69. SWITCH HOUSING REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
	NOTE Go to step 2 if manual elevation pump has been removed.
1.	Disconnect two electrical connectors (1) (JPG).
2.	Using screwdriver, remove three screws (2) and three lockwashers (3) that attach switch housing (4) to axial pistons pump (5).
3.	Remove switch housing (4).
	END OF TASK



13-70. SWITCH HOUSING INSTALLATION PROCEDURE

TOOLS: 1/4” flat tip screwdriver

PERSONNEL: One

REFERENCES: JPG for procedure to connect electrical connectors
TM 9-2350-222-10 for procedures to check main gun firing circuit

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver’s Master Control Panel	FO-3	11
Gunner’s Control Box	FO-1	2
Turret Traverse Lock	FO-3	7
Manual Elevating Handle	FO-1	1

NOTE

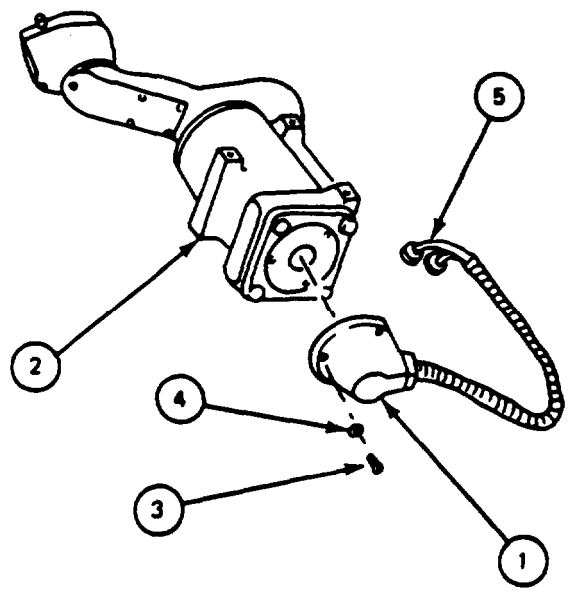
Equipment condition applies only if manual elevation pump is installed in vehicle.

EQUIPMENT CONDITION: Driver’s master control panel MASTER BATTERY switch set to OFF
Turret traverse lock set to LOCKED
Gunner’s control box ELEV/TRAV POWER switch set to OFF

13-70. SWITCH HOUSING INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Put switch housing (1) against pump (2).
2.	Using screwdriver, attach switch housing (1) to pump (2) with three screws (3) and three lockwashers (4).
	NOTE Do step 3 only if manual elevation pump is installed in vehicle.
3.	Connect two electrical connectors (5) (JPG).
	NOTE Follow-on Maintenance Action Required: Test manual elevation pump (para 13-59) (if manual elevation pump is not installed in vehicle). Check main gun firing circuit (TM-10) (if manual elevation pump is installed in vehicle).
	END OF TASK



13-71. SWITCH HOUSING DISASSEMBLY PROCEDURE

TOOLS: 7/8" open end wrench
No. 1 cross tip screwdriver (Phillips)
Soldering iron
Vise with brass caps
Scraper
Stiff bristled brush
Fine stone

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

PERSONNEL: One

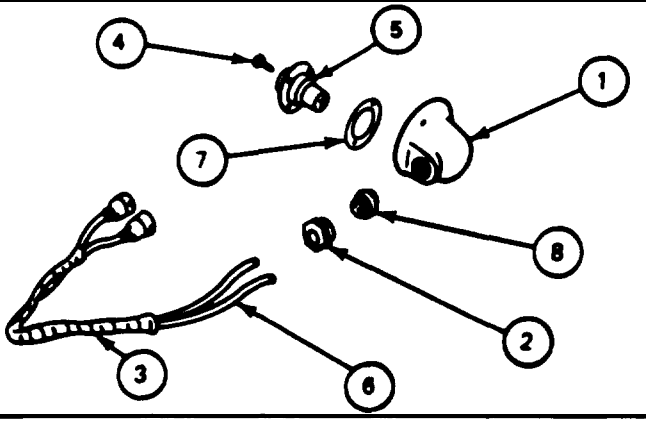
REFERENCES: JPG for procedures to:
Clean parts
Inspect and repair parts
Use soldering iron

PRELIMINARY PROCEDURES: Remove switch housing (para 13-69)

13-71. SWITCH HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
	CAUTION Do not overtighten vise or switch housing will be damaged.
1.	Put switch housing (1) in vise.
2.	Using wrench, remove nut (2) from switch housing (1) and pull nut back from switch housing on cable (3).
3.	Using screwdriver, remove four screws (4) that attach switch (5) to switch housing (1).
4.	Using fingers, pull switch (5) with cable (3) out of housing (1) until two cable leads (6) can be reached.
5.	Using soldering iron, unsolder two cable leads (6) from switch (5) (JPG). Remove switch.
6.	Remove gasket (7) from switch (5).
7.	Remove cable (3) and grommet (8) from housing (1).
8.	Remove nut (2) from cable (3).
9.	Remove switch housing (1) from vise.
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all pans (JPG).
	END OF TASK



13-72. SWITCH HOUSING ASSEMBLY PROCEDURE

TOOLS: 7/8” open end wrench
No. 1 cross tip screwdriver (Phillips)
Soldering iron

SUPPLIES: Solder (item 31, App. A)
Silicone compound (item 9, App. A)

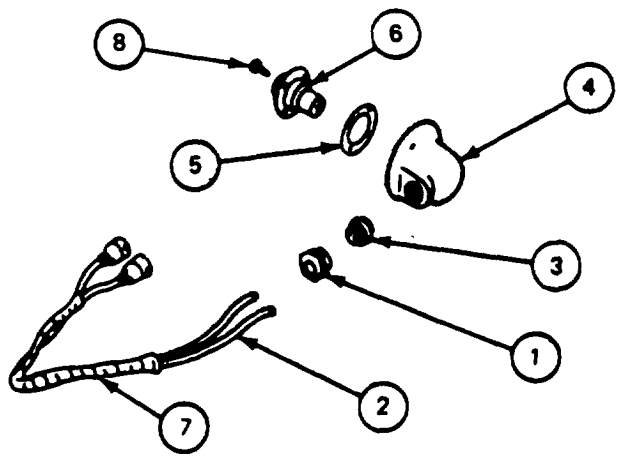
PERSONNEL: One

REFERENCES: JPG for procedures to:
Use soldering iron
Apply silicone

13-72. SWITCH HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Slide nut (1), with hex end first, on cable leads (2).
2.	Put light coat of silicone compound on cable leads (2) and outer edge of grommet (3).
3.	Slide grommet (3) on cable leads (2).
4.	Slide cable leads (2) through housing (4) far enough that soldering can be done.
5.	Install grommet (3) in housing (4).
6.	Start threads of nut (1) in housing (4). Do not tighten nut.
7.	Put gasket (5) over switch (6). Line up screw holes.
8.	Using soldering iron, solder two cable leads (2) to switch (6) (JPG).
9.	Gently pull cable (7) and push switch (6) until switch (6) is against housing (4).
10.	Using screwdriver, attach switch (6) to housing (4) with four screws (8).
11.	Using wrench, tighten nut (1).
	END OF TASK



13-73. AXIAL PISTONS PUMP INSPECTION PROCEDURE

PERSONNEL: One

REFERENCES: JPG for procedures to inspect and repair parts

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-60)
Test manual elevation pump (para 13-59)
Remove handle (para 13-65)
Remove switch housing (para 13-69)
Disassemble axial pistons pump (para 13-74)

GENERAL INSTRUCTIONS:

NOTE

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

13-73. AXIAL PISTONS PUMP INSPECTION PROCEDURE (CONT)

FRAME 1

Step	Procedure
	SUPPORT SHOP WORK
1.	Take axial piston pump parts to shop where inspection equipment is available.
2.	Make dimensional check.

Reference Letter	Point of Measurement	Measurement (Inches)
A	ID of bearing retainer	1.3790 max
B	OD of shaft spacer	1.3750 min
c	ID of shaft spacer	0.6290 max
D	OD of shaft spacer shoulder	0.6230 min
E	OD of bearing	1.3775 min
F	OD of bearing	1.5743 min
G	OD of bearing	0.8745 min
H	OD of handle shaft spacer shoulder	0.3100 min
J	ID of shaft slide	1.5753 max
K	OD of spacer	0.8700 min
L	ID of spacer	0.3160 max
M	ID of block center bore	0.8753 .max
N	Fit of piston in block piston bore (piston-and bore are matched sets)	0.0050 max

NOTE

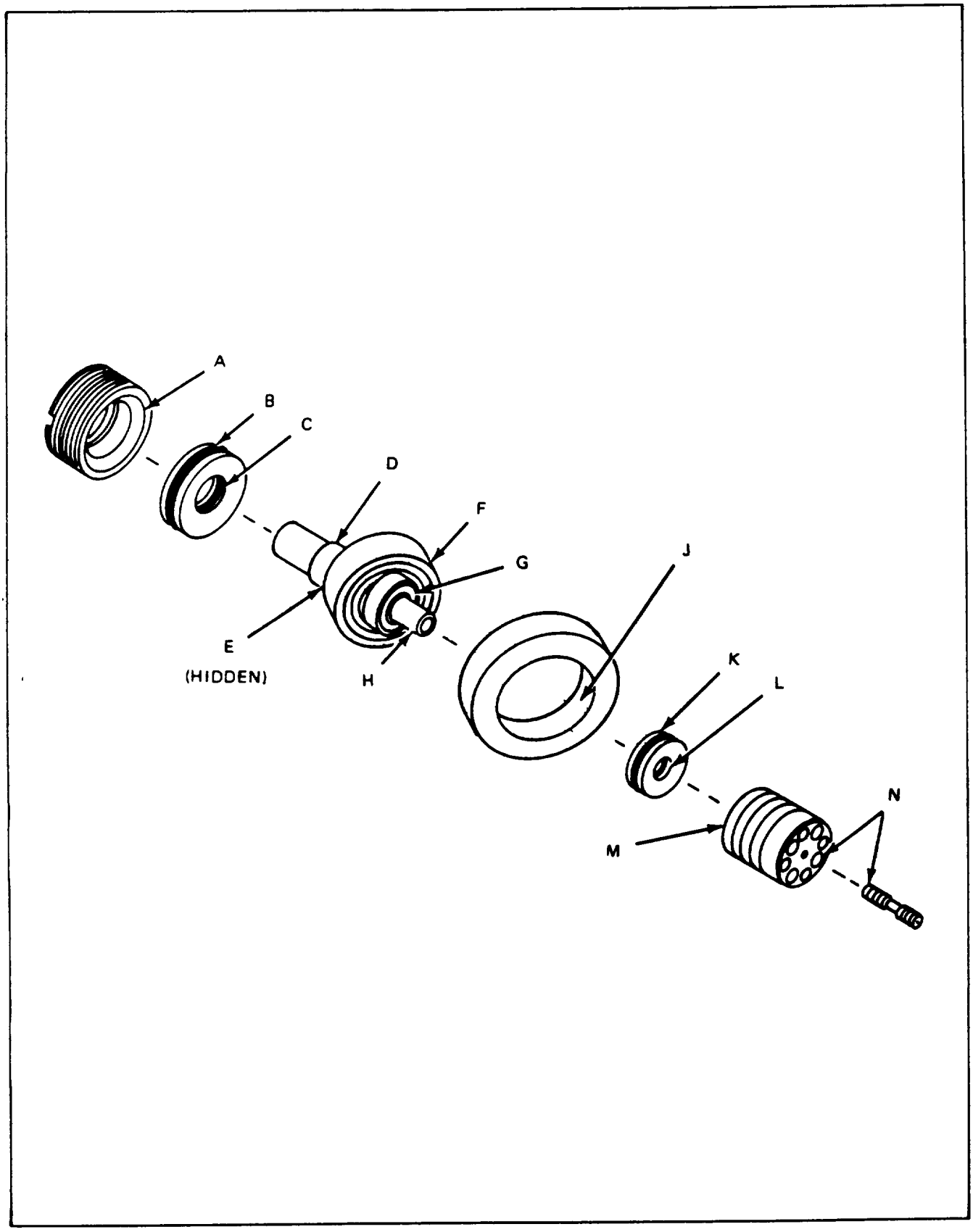
Tag parts that are out of tolerance

3. After support shop work, return parts to turret shop.

NOTE

If bearing measurements are out of tolerance, replace bearing (para 13-76).

END OF TASK


A
B
C
D
F
G
J
E
(HIDDEN)
H
K
L
N
M

13-74. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE

TOOLS: Adjustable hook, fixed pivot point spanner wrench
Open face spanner wrench (7010376)
7/16" open end wrench
11/16" open end wrench
8 ounce ball peen hammer
Plastic faced hammer
Vise with brass caps
Metal scribe
O-ring extractor kit
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Pencil with attached eraser
Wood dowel, 1" dia x 6" long
Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

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

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-60)
Test manual elevation pump (para 13-59)
Remove handle (para 13-65)
Remove switch housing (para 13-69)

GENERAL INSTRUCTIONS:

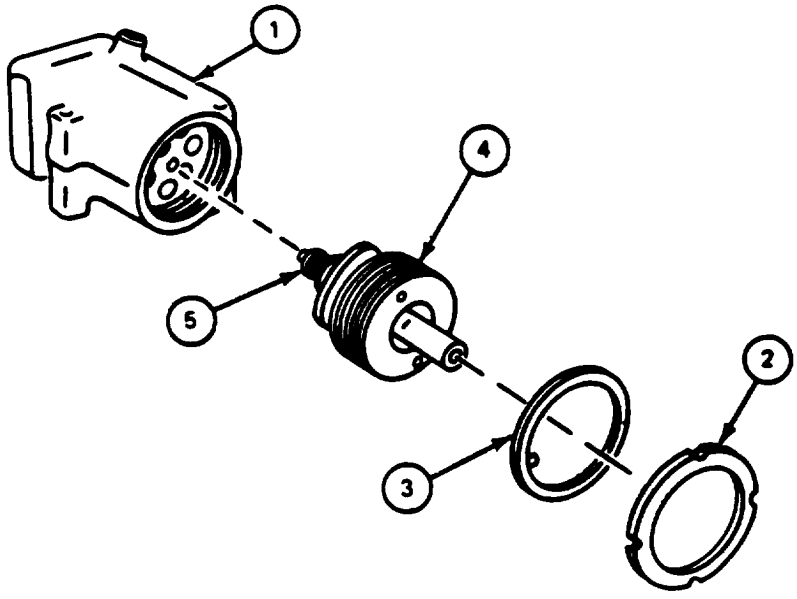
CAUTION

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

13-74. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 1

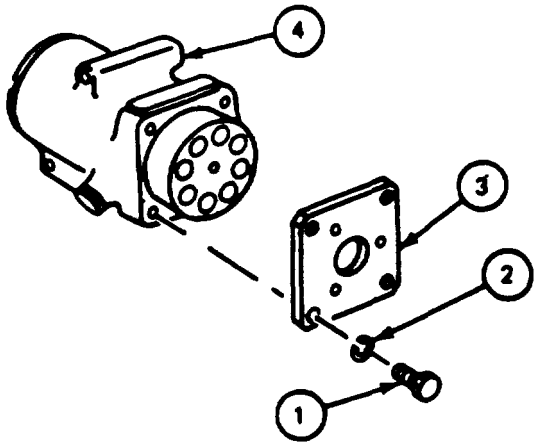
Step	Procedure
	CAUTION Do not overtighten vise or pump will be damaged.
1.	Put pump (1) in vise.
2.	Using adjustable hook spanner wrench, remove locknut (2) from pump housing (1).
3.	Remove washer (3) from pump housing (1).
	WARNING Be careful when removing retainer (4) from pump (1). Spring-loaded parts may fly out of pump and hit you.
4.	Using open face spanner wrench, remove retainer (4) with shaft (5) from pump (1). GO TO FRAME 2



13-74. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 2

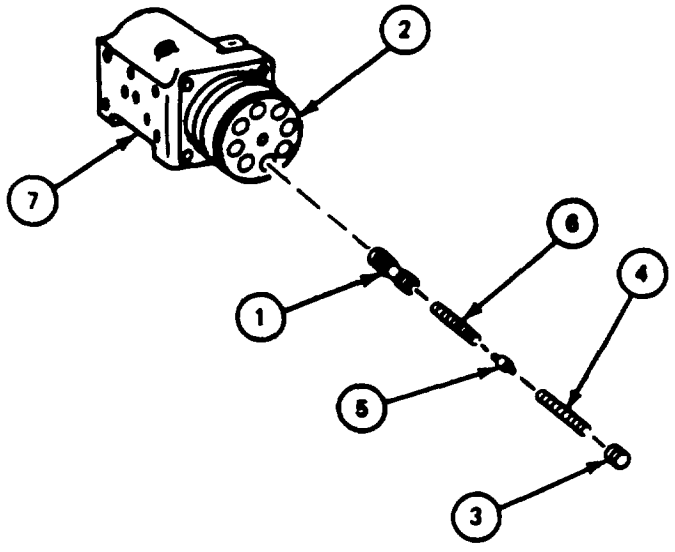
Step	Procedure
	WARNING Stuck pistons in block may cause spring-loaded parts to fly out and hit you.
1.	Using 7/16” wrench, remove four screws (1) and four lockwashers (2) that attach plate (3) to pump housing (4).
2.	Remove plate (3) from pump housing (4).
	GO TO FRAME 3



13-74. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 3

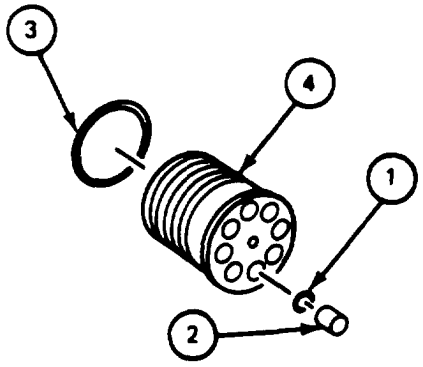
Step	Procedure
	NOTE Retainers (3) are held in by packings. Hold each retainer to keep spring-loaded parts from flying out while pushing on piston (1).
1.	Using eraser end of pencil, push on piston (1) at back of block (2).
2.	Remove retainer (3), spring (4), guide (5), spring (6) and piston (1).
	NOTE Pistons (1) are matched to holes in block (2) and must not get mixed up. Pistons and their holes in block should be numbered from one through eight. If they are not, do step 3 as each piston is removed.
3.	Using metal scribe, lightly scribe number on piston (1) (in narrow part of piston shank' and hole in block (2). Number clockwise around block, looking at piston end of block for seven other pistons.
4.	Repeat steps 1 and 2 for seven more pistons (1).
5.	Using ball peen hammer and wood dowel, lightly tap block (2) from pump housing (7).
	GO TO FRAME 4



13-74. AXIAL PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 4

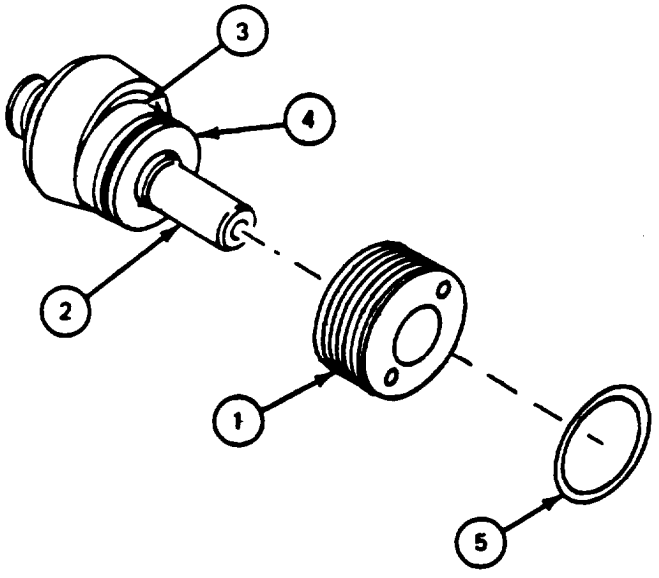
Step	Procedure
1.	Using O-ring extractor tool, remove eight packings (1) from eight retainers (2) (JPG).
2.	Using O-ring extractor tool, remove four packings (3) from block (4) (JPG).
	GO TO FRAME 5



13-74. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 5

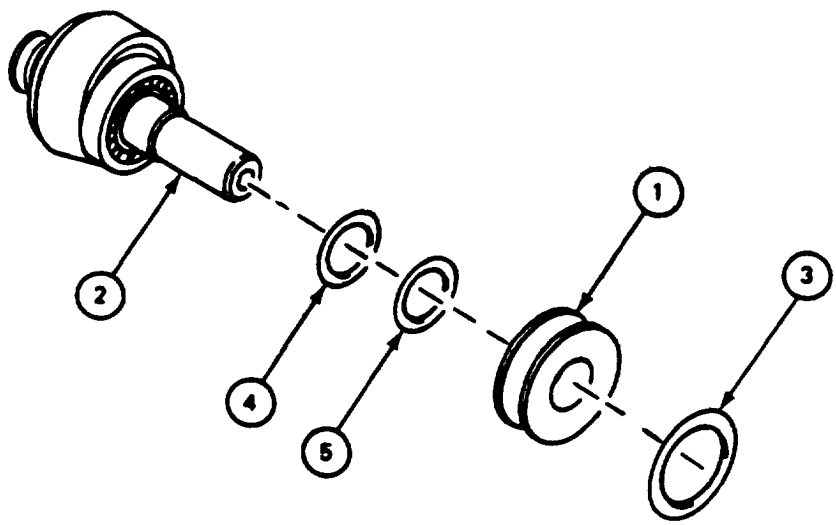
Step	Procedure
1.	Using plastic faced hammer and holding retainer (1) in hand, lightly tap shaft (2) to remove retainer (1) from bearing (3) and spacer (4).
2.	Using O-ring extractor tool, remove packing (5) from retainer (1) (JPG).
	GO TO FRAME 6



13-74. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 6

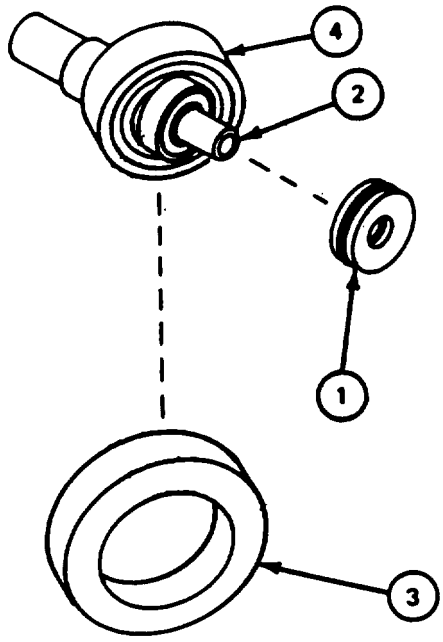
Step	Procedure
1.	Using fingers, remove spacer (1) from shaft (2).
2.	Using O-ring extractor tool, remove packing (3) from outside of spacer (1) (JPG).
3.	Using O-ring extractor tool, remove packing (4) from inside of spacer (1) (JPG).
4.	Using O-ring extractor tool, remove retainer (5) from inside of spacer (1) (JPG).
	GO TO FRAME 7



13-74. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 7

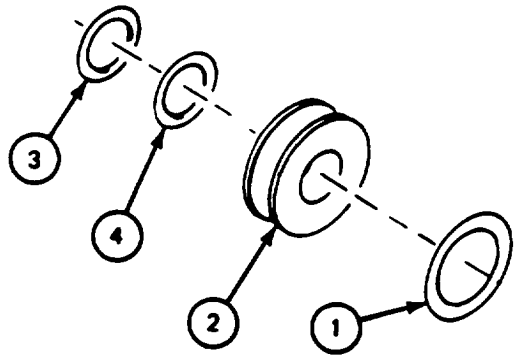
Step	Procedure
1.	Using fingers. remove spacer (1) from shaft (2).
2.	Using fingers, remove slide (3) from bearing (4).
	GO TO FRAME 8



13-74. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 8

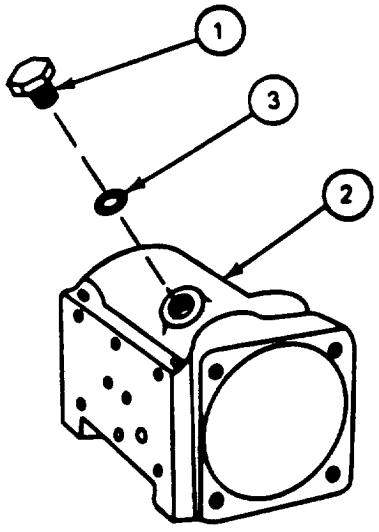
Step	Procedure
1.	Using O-ring extractor tool, remove packing (1) from outside of spacer (2) (JPG).
2.	Using O-ring extractor tool, remove packing (3) from inside of spacer (2) (JPG).
3.	Using O-ring extractor tool, remove retainer (4) from inside of spacer (2).
	GO TO FRAME 9



13-74. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 9

Step	Procedure
1.	Using 11/16” open end wrench, remove plug (1) from pump housing (2).
2.	Using O-ring extractor tool. remove packing (3) from plug (1) (JPG).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of axial pistons pump (para 13-73).
	END OF TASK



13-75. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE

TOOLS: Adjustable hook, fixed pivot point spanner wrench
Open face spanner wrench (7010376)
7/16” open end wrench
11/16“ open end wrench
1/8” flat tip screwdriver
Plastic faced hammer
Vise with brass caps
3/8” drive torque wrench (0 to 150 inch-pounds)
7/16" socket (3/8” drive)
6” machinist steel rule
O-ring extractor kit

SUPPLIES: Parts kit, 5704210
Hydraulic fluid (item 10, App. A)
Two jacking screws, MS 90727-7 or -8

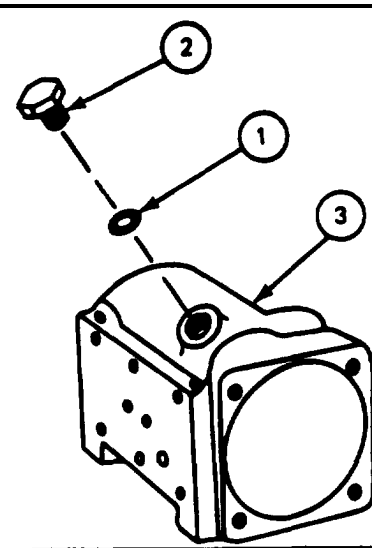
PERSONNEL: One

REFERENCES: JPG for procedures to:
Install preformed packings
Use torque wrench

PRELIMINARY PROCEDURES: Inspect axial pistons pump parts (para 13-73)

FRAME 1

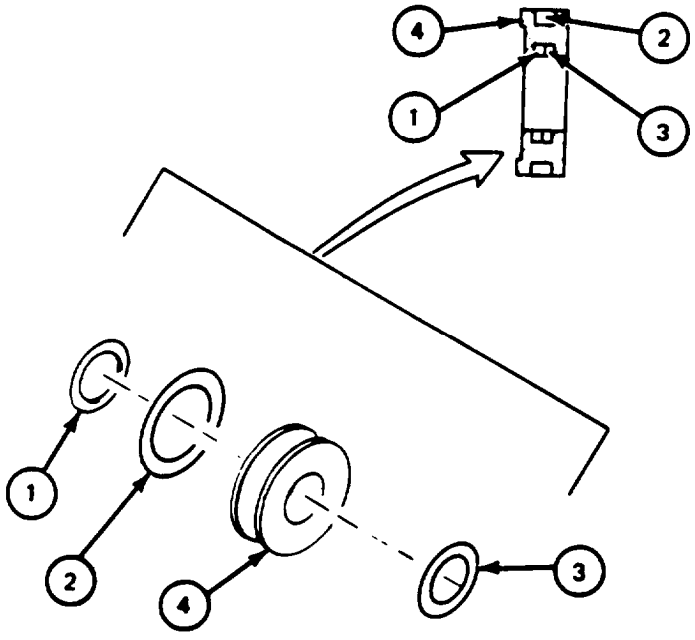
Step	Procedure
1.	Coat new packing (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put packing (1) on plug (2) (JPG).
3.	Using 11/16” wrench, put plug (2) in pump housing (3).
	GO TO FRAME 2



13-75. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 2

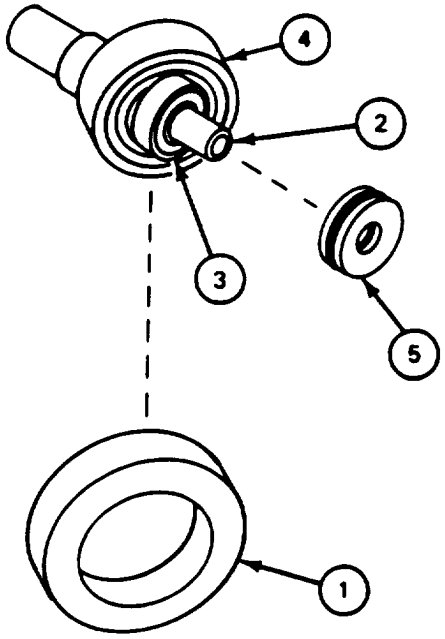
Step	Procedure
1.	Coat two new packings (1) and (2) and new retainer (3) with hydraulic fluid.
2.	Using O-ring extractor tool, put retainer (3) in spacer (4) (JPG).
	NOTE Retainer (3) is toward flat side of spacer (4).
3.	Using O-ring extractor tool, put packing (1) in spacer (4) (JPG).
4.	Using O-ring extractor tool, put packing (2) on spacer (4) (JPG).
	GO TO FRAME 3



13-75. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 3

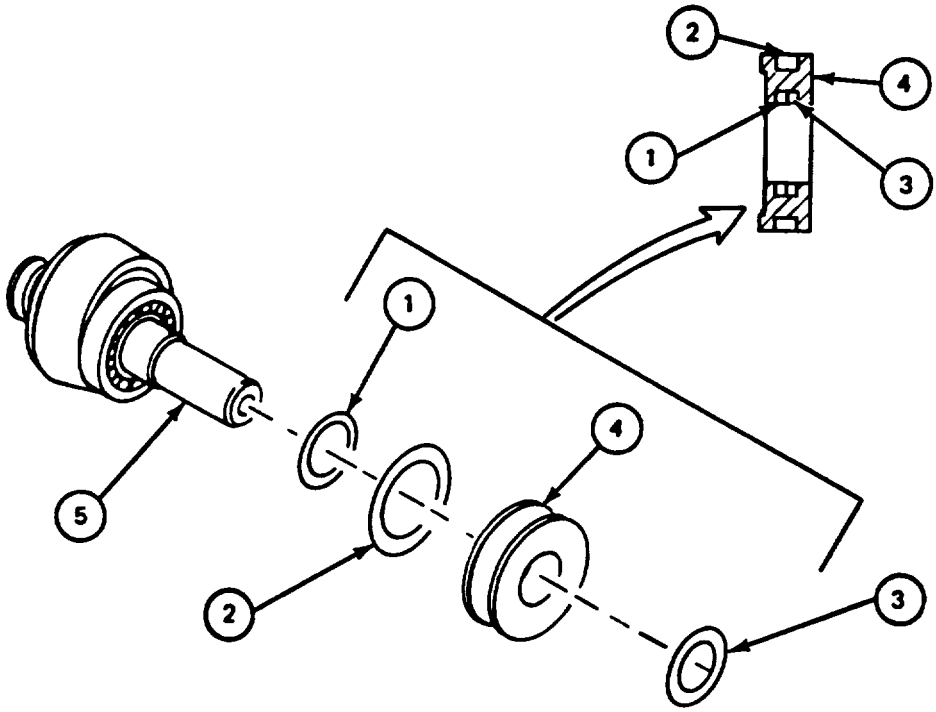
Step	Procedure
1.	Using hammer, tap slide (1) over small end of shaft (2) and small bearing (3) onto bearing (4).
2.	Coat shaft (2) with hydraulic fluid.
3.	Using twisting motion, put spacer (5), with flat side out, on shaft (2).
	GO TO FRAME 4



13-75. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 4

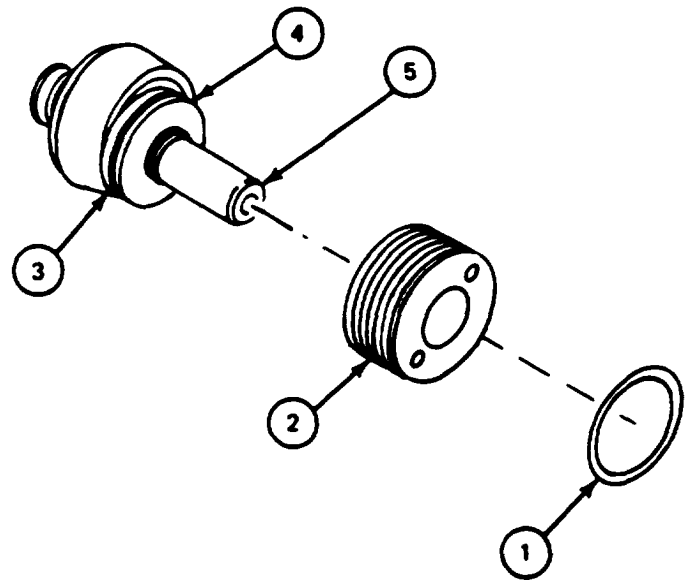
Step	Procedure
1.	Coat two new packings (1) and (2) and new retainer (3) with hydraulic fluid.
2.	Using O-ring extractor tool, put retainer (3) in spacer (4) (JPG).
	NOTE Retainer (3) is toward flat side of spacer (4).
3.	Using O-ring extractor tool, put packing (1) in spacer (4) (JPG).
4.	Using O-ring extractor tool, put packing (2) on spacer (4) (JPG).
5.	Coat shaft (5) with hydraulic fluid.
6.	Using twisting motion, put spacer (4) on shaft (5) with flat side out.
	GO TO FRAME 5



13-75. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 5

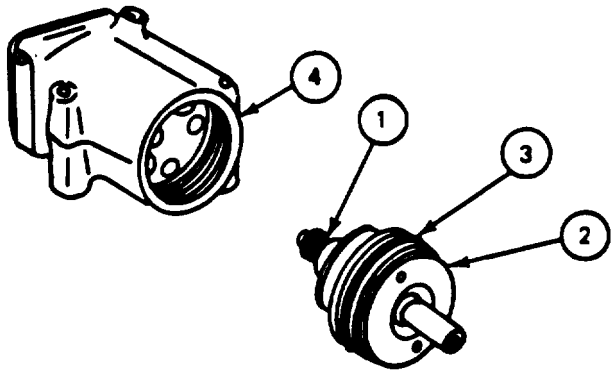
Step	Procedure
1.	Coat new packings (1) with hydraulic fluid.
2.	Put packing (1) on retainer (2) (JPG).
3.	Coat bearing (3), spacer (4), and inside of retainer (2) with hydraulic fluid.
4.	Using hammer, lightly tap retainer (2) over spacer (4) and bearing (3), onto shaft (5). GO TO FRAME 6



13-75. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 6

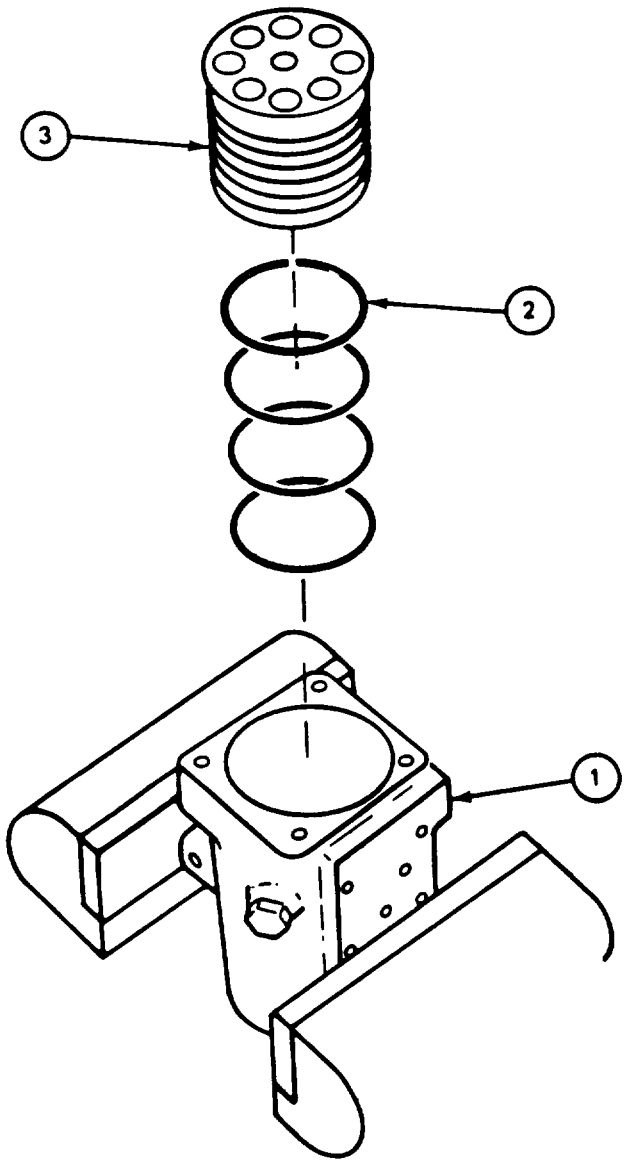
Step	Procedure
1.	Coat spacer (1), retainer (2) threads, and packing (3) with hydraulic fluid.
2.	Using open face spanner wrench, screw retainer (2) into pump housing (4) until packing (3) is just inside pump housing.
	GO TO FRAME 7



13-75. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 7

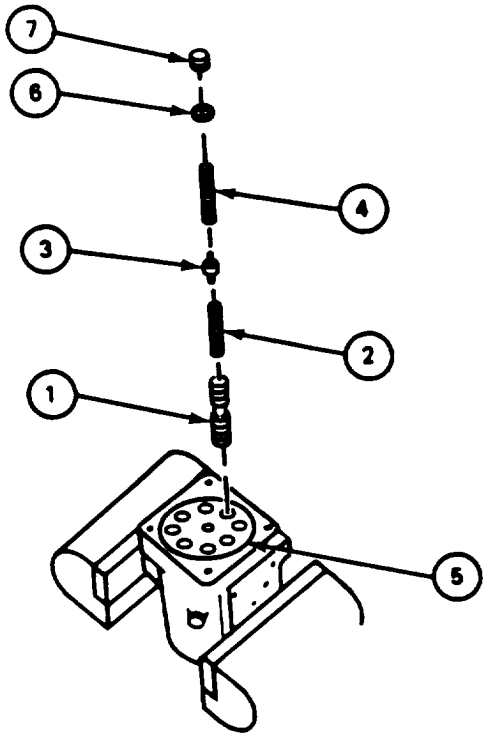
Step	Procedure
	CAUTION Do not overtighten vise, or pump will be damaged.
1.	Put pump (1) in vise with protected jaws.
2.	Coat four new packings (2) with hydraulic fluid.
3.	Put four packings (2) on block (3) (JPG).
4.	Coat lower inside area of block (3) with hydraulic fluid.
	CAUTION Take care not to damage packings (2).
5.	Using hammer, gently drive block (3) into pump housing (1) until top surface of block is even with face of pump housing.
	GO TO FRAME 8


3
2
1

13-75. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 8

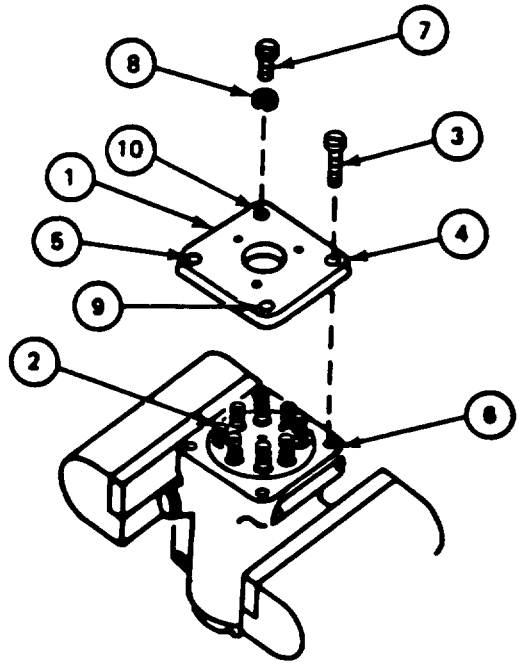
Step	Procedure
1.	Coat eight pistons (1). eight new springs (2), eight new guides (3), and eight new springs (4) with hydraulic fluid.
	NOTE
	Pistons (1) and holes in block (5) are matched sets. Pistons (in narrow part or piston shank) and holes are numbered. Each numbered piston must be put in the same numbered hole in block.
2.	Put eight pistons (1), eight springs (2), eight guides (3), and eight springs (4) in holes of block (5).
3.	Coat eight new packings (6) and eight retainers (7) with hydraulic fluid.
4.	Using O-ring extractor tool, put eight packings (6) on eight retainers (7) (JPG).
5.	Put eight retainers (7) on ends of eight springs (4).
	GO TO FRAME 9



13-75. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 9

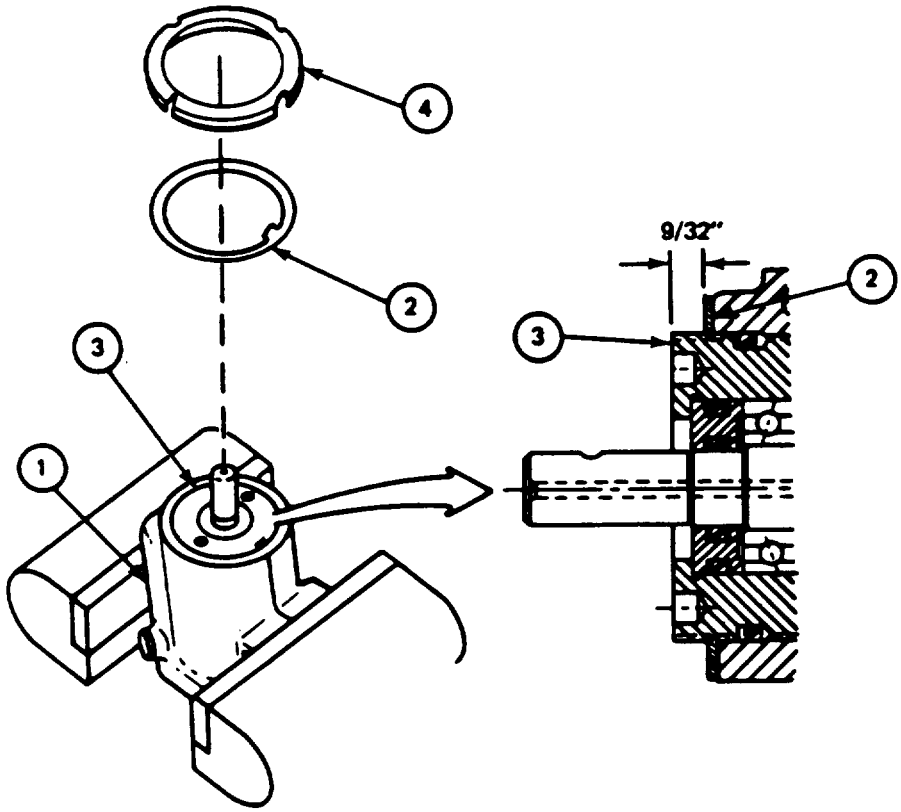
Step	Procedure
1.	Put plate (1) on eight retainers (2).
2.	Gently push down on plate (1) until two jacking screws (3) can be put through holes (4) and (5) of plate (i) into pump (6).
	CAUTION Take care that retainers are lined up with holes in block or they will be damaged.
3.	Using screwdriver, line up retainers (2) with holes in block. Take care not to scratch retainers, packings, or block.
	NOTE Take care not to bottom out jacking screws.
4.	Using 7/16" wrench, tighten jacking screws (3) enough so two screws (7) and two lockwashers (8) can be started through holes (9) and (10) of plate (1) into pump (6).
5.	Using 7/16" wrench, remove two jacking screws (3).
6.	Put two screws (7) and two lockwashers (8) through holes (4) and (5) of plate (1) into pump (6).
7.	Using 7/16" wrench, tighten four screws (7), one at a time, until tight, in the following order: holes (4), (5), (9), (10).
8.	Using torque wrench, torque four screws (7) to between 60 and 84 inch-pounds.
	GO TO FRAME 10


7
8
3
10
1
5
4
9
2
6

13-75. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 10

Step	Procedure
1.	Remove pump (1) from vise.
	CAUTION
	Do not overtighten vise, or pump will be damaged.
2.	Put pump (1) in vise with retainer end up.
3.	Put washer (2) over retainer (3), with tang of washer in slot of retainer.
	NOTE
	If distance obtained in step 4 is 9/32". omit step 5.
4.	Using steel rule, measure distance from washer (2) to end of retainer (3).
5.	Using open face spanner wrench, screw retainer (3) in or out until distance of 9/32" is obtained.
6.	Using adjustable hook spanner wrench, put on locknut (4).
	NOTE
	Follow-on Maintenance Action Required: Install handle (para 13-66). Install switch housing (para 13-707). Test manual elevation pump (para 13-59).
	END OF TASK


4
2
3
1
9/32"
2
3

13-76. AXIAL PISTONS PUMP REPAIR PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES:
Remove manual elevating pump (para 13-60)
Test manual elevation pump (para 13-59)
Remove handle (para 13-65)
Remove switch housing (para 13-69)
Disassemble axial pistons pump (para 13-74)
Inspect axial pistons pump (para 13-73)

GENERAL INSTRUCTIONS:

NOTE

This procedure is used to replace bad shaft bearings. If bearings are bad, order repair part or next higher assembly as required.

13-76. AXIAL PISTONS PUMP REPAIR PROCEDURE (CONT)

FRAME 1

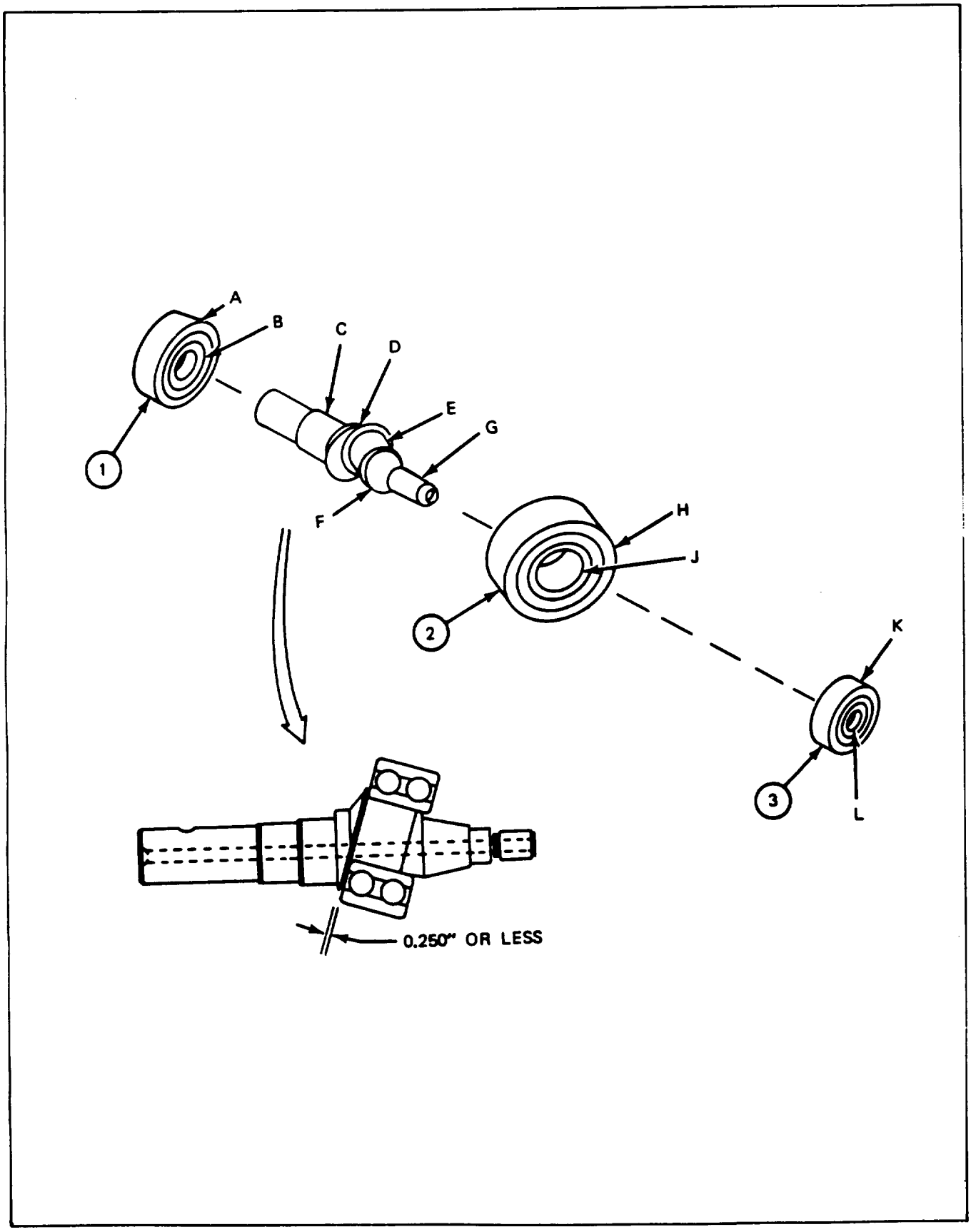
Step	Procedure
	SUPPORT SHOP WORK
1.	Take shaft and new bearings (1), (2), or (3) where bearing press and inspection equipment are available.
	a. Remove bad bearing(s) from shaft. b. Make dimensional check of parts:

Reference Letter	Point of Measurement	Measurement (Inches)
A	Outside diameter of bearing (1)	1.3775 min
B	Inside diameter of bearing (1)	0.6693 max
C	Outside diameter of shaft spacer shoulder	0.6230 min
D	Outside diameter of shaft bearing shoulder	0.6695 min
E	Outside diameter of shaft bearing shoulder	0.6692 min
F	Outside diameter of shaft bearing shoulder	0.3749 min
G	Outside diameter of shaft bearing shoulder	0.3100 min
H	Outside diameter of bearing (2)	1.5743 min
J	Inside diameter of bearing (2)	0.6693 max
K	Outside diameter of bearing (3)	0.8745 min
L	Inside diameter of beaing (3)	0.3750 max

NOTE

Tag parts that are out of tolerance.

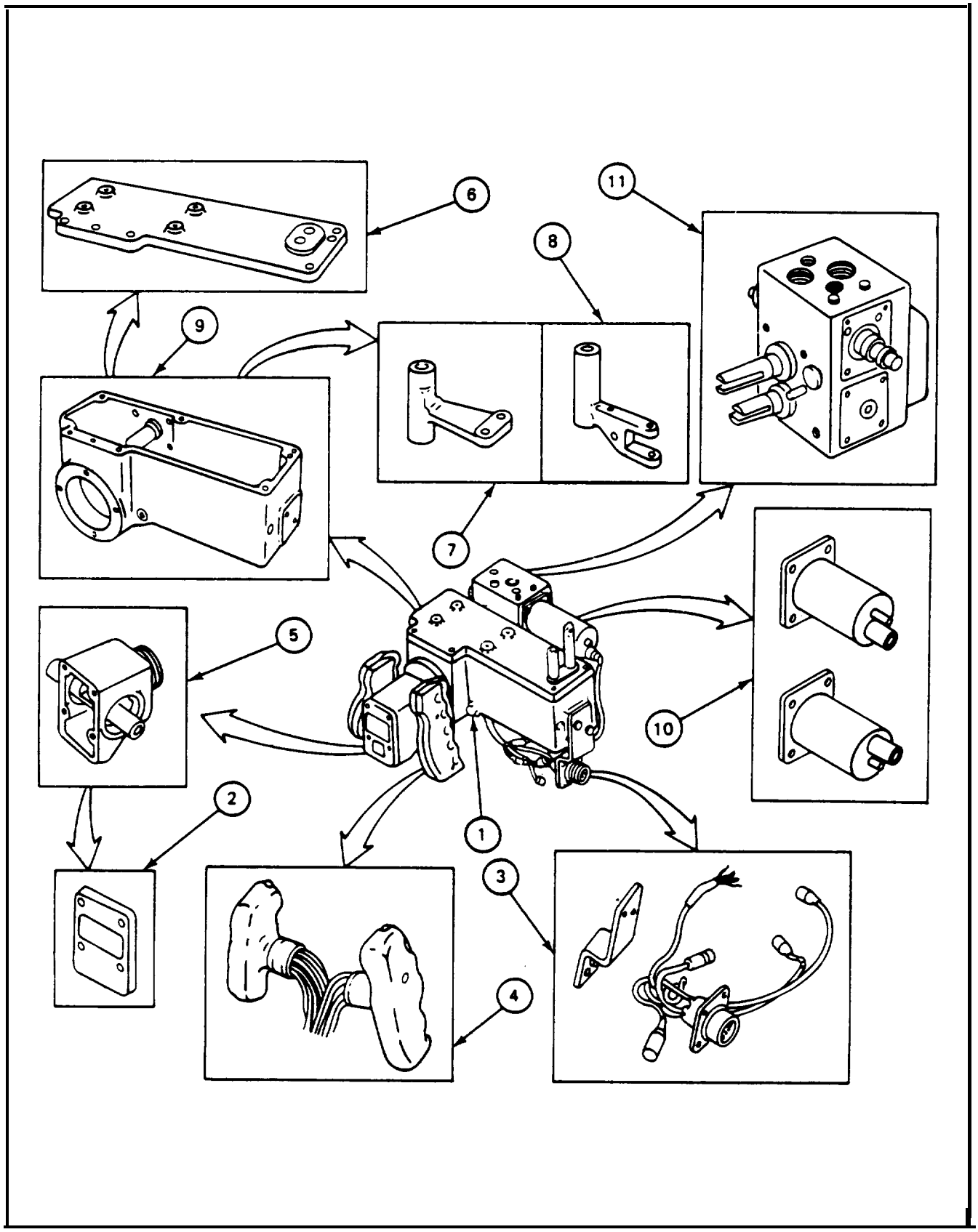
	c. Install new bearing(s). When installing bearing (2), press bearing on shaft until bearing is no more than 0.250" from shaft shoulder.
2.	After support shop work is complete, return repaired shaft to turret shop.
	END OF TASK


A
B
C
D
E
G
F
1
H
J
2
K
L
3
0.250" OR LESS

Section 14. GUNNER'S CONTROL

13-77. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks							
	Inspection	Test	Adjustment	Removal	Installation	Disassembly	Assembly	Repair
1. Gunner's Control		13-78	13-79			13-80	13-81	
2. Control Box Cover				13-82	13-83			
3. Harness and Bracket				13-84	13-85			
4. Handle	13-86			13-87	13-88	13-89	13-90	
5. Control Box	13-91			13-92	13-93	13-92	13-93	
6. Housing Cover	13-94			13-95	13-96			13-97
7. Traversing Arm	13-98			13-99	13-100	13-101	13-102	
8. Elevating Arm	13-98			13-99	13-100			13-103
9. Housing	13-94			13-104	13-105	13-99	13-100	13-106
10. Power Solenoid and Override Solenoid		13-107		13-108	13-109			
11. Hydraulic Valve		13-111		13-104	13-105	13-112	13-113	


1
2
3
4
5
6
7
8
9
10
11

13-78. GUNNER'S CONTROL TEST PROCEDURE

TEST EQUIPMENT: Multimeter
24-28 vdc power supply

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to remove gunner's control
JPG for procedures to:
Use multimeter
Disconnect and connect electrical connectors
Use power supply

EQUIPMENT CONDITION: Gunner's control removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Assemble gunner's control (para 13-81)

GENERAL INSTRUCTIONS:

NOTE

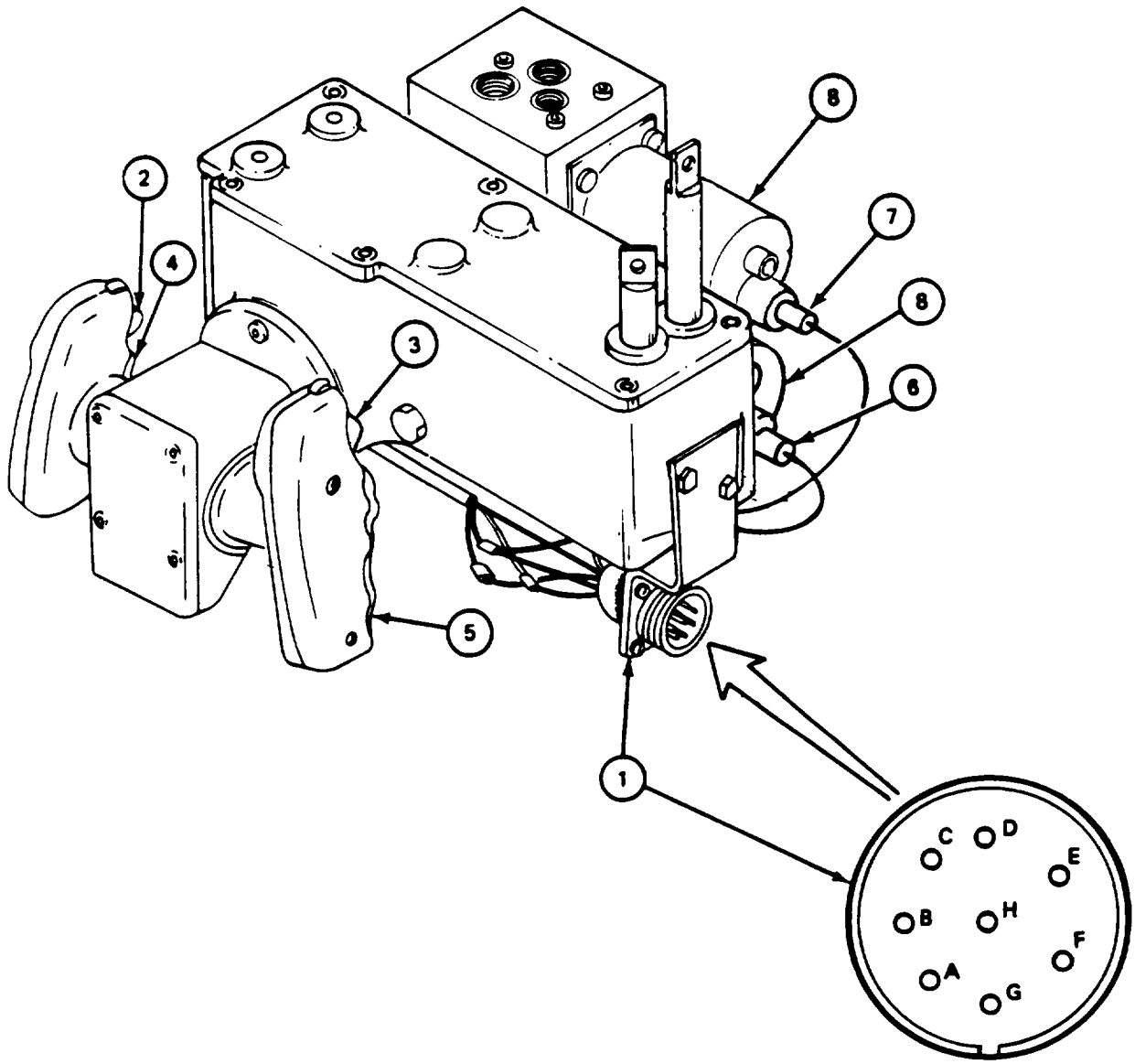
If normal indication is not obtained, remove probable fault items to find bad parts. Refer to section index (para 13-77) for replacement of bad parts.

13-78. GUNNER'S CONTROL TEST PROCEDURE (CONT)

a. Switches and Harness

FRAME 1

Step	Procedure	Normal Indication	Probable Fault
	NOTE Gun firing switches are normally open.		
1.	Using multimeter, check for continuity between pins A and B of electrical connector (1) (JPG).	Greater than 10 million ohms	Handle (trigger switches) or harness
2.	Repeat step 1 and press left trigger switch (2).	Less than 2 ohms	Handle (trigger switch)
3.	Repeat step 1 and press right trigger switch (3).	Less than 2 ohms	Handle (trigger switch)
	NOTE Brake switches are normally closed.		
4.	Using multimeter, check for continuity between pins C and D of electrical connector (1) (JPG).	Less than 2 ohms	Handle (brake switches) or harness
5.	Repeat step 4 and press left brake control switch (4).	Greater than 10 million ohms	Handle (brake switch)
6.	Repeat step 4 and press right brake control switch (5).	Greater than 10 million ohms	Handle (brake switch)
7.	Disconnect electrical connectors (6) and (7) from two solenoids (8) (JPG).	. . .	. . .
8.	Using multimeter, check for continuity between pin F and electrical connector 623 (6) (JPG).	Less than 2 ohms	Harness
9.	Using multimeter, check for continuity between pin C and electrical connector 625A (7) (JPG).	Less than 2 ohms	Harness
	GO TO FRAME 2		

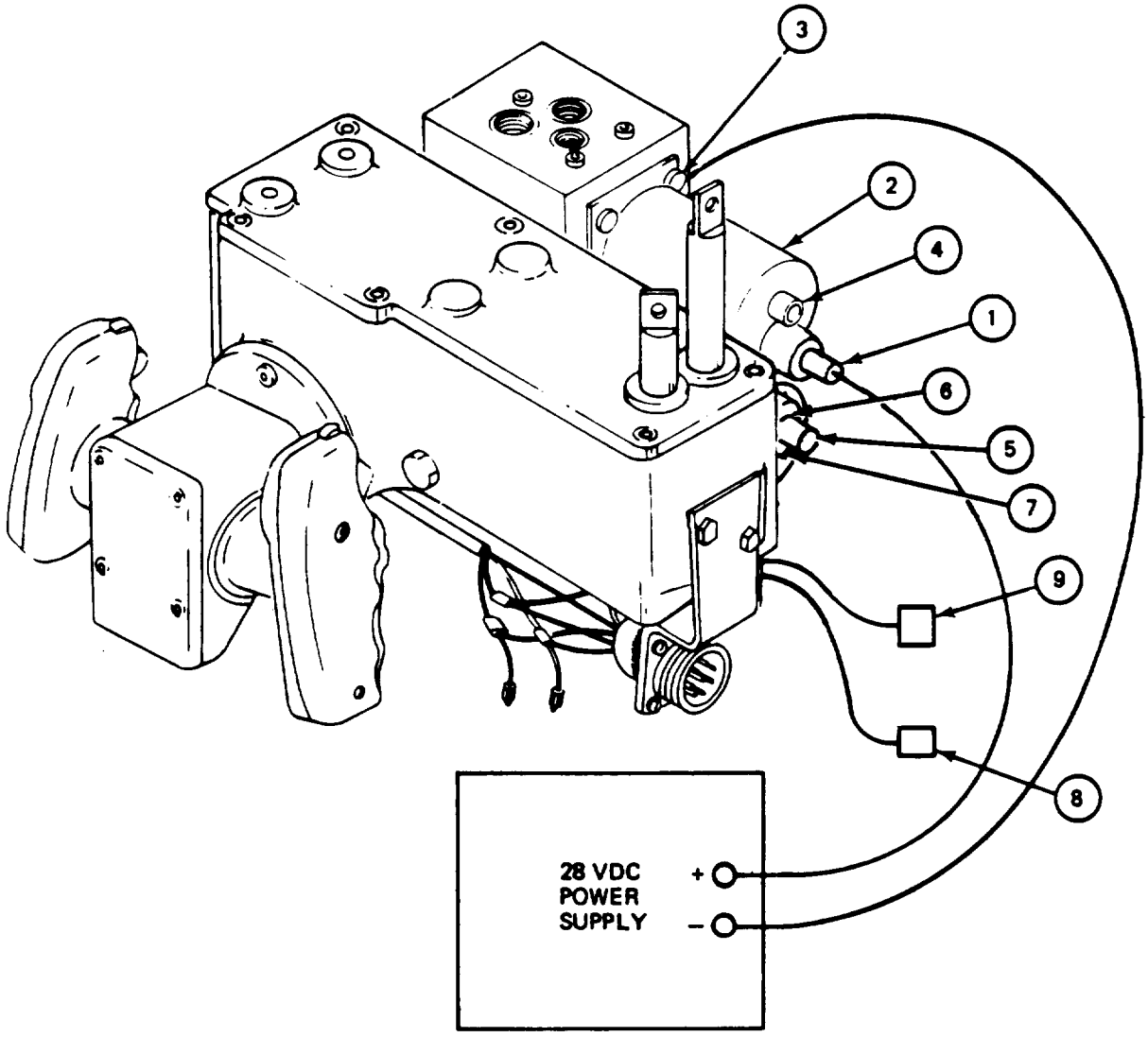

1
2
3
4
5
6
7
8
8
C
D
E
B
H
F
A
G

13-78. GUNNER'S CONTROL TEST PROCEDURE (CONT)

b. Power and Override Solenoids

FRAME 2

Step	Procedure	Normal Indication	Probable Fault
1.	Set up 24-28 vdc power supply (JPG).	. . .	. . .
2.	Connect positive lead from power supply to electrical connector (1) of power solenoid (2) (JPG).	. . .	. . .
3.	Connect negative lead from power supply to mounting screw (3) of power solenoid (2) (JPG).	. . .	. . .
4.	Turn on power supply (JPG) and push in power solenoid (2) plunger (4).	Power solenoid (2) plunger (4) can be pushed in with little effort and stays in.	Power solenoid
5.	Turn off power supply (JPG).	Power solenoid (2) plunger (4) moves outward,	Power solenoid
6.	Disconnect positive lead from power supply to electrical connector (1) of power solenoid (2) (JPG).	. . .	. . .
7.	Connect positive lead from power supply to electrical connector (5) of override solenoid (6) (JPG).	. . .	. . .
8.	Turn on power supply (JPG) and push in override solenoid (6) plunger (7).	Override solenoid (6) plunger (7) can be pushed in with little effort and stays in.	Override solenoid
9.	Turn off power supply (JPG).	Override solenoid (6) plunger (7) moves outward.	Override solenoid
10.	Disconnect positive and negative leads from screw (3) and override solenoid (6).	. . .	. . .
11.	Connect electrical connector 625A (8) to power solenoid electrical connector (1) and electrical connector 623 (9) to override solenoid electrical connector (5) (JPG).		
	GO TO FRAME 3		

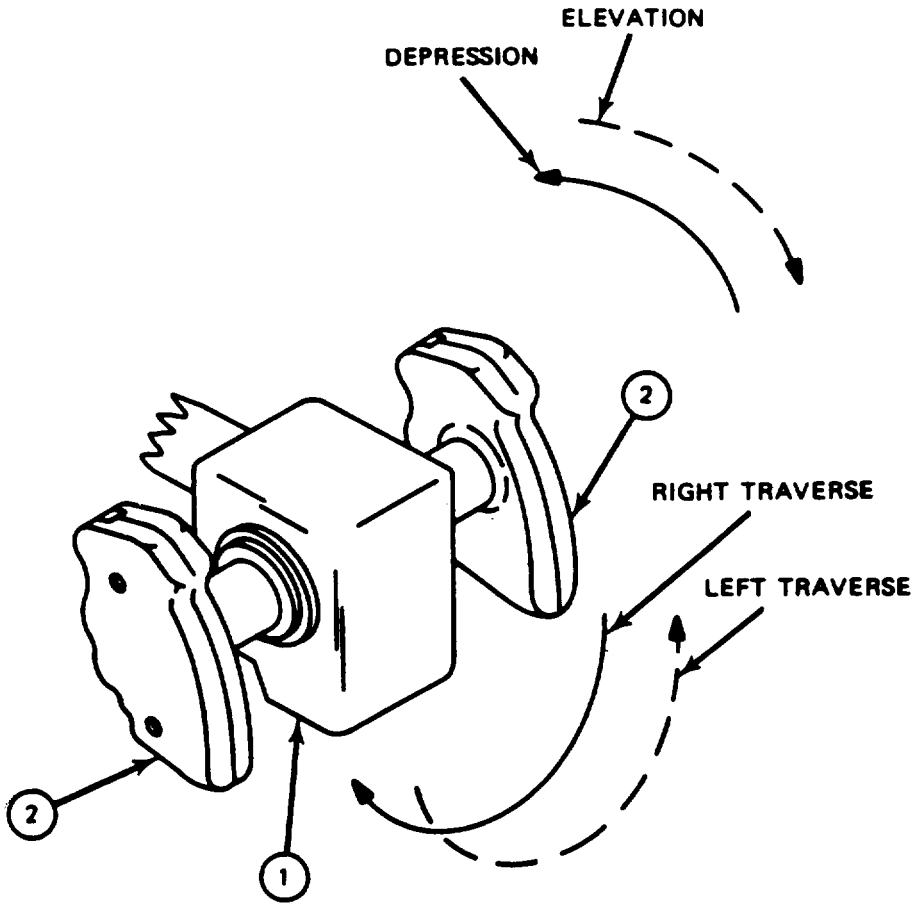

3
2
4
1
6
5
7
9
8
28 VDC
POWER
SUPPLY
+
–

13-78. GUNNER'S CONTROL TEST PROCEDURE (CONT)

c. Handle Movement

FRAME 1

Step	Procedure	Normal Indication	Probable Fault
	NOTE If normal indication is not obtained, adjust gunner's control (para 13-79), then repeat this frame. If normal indication is still not obtained, elevating arm or handles may be bending or hydraulic valve may be bad.		
1.	Place gunner's control (1) on surface so that handles (2) extend over edge to allow full movement.	. . .	
2.	Rotate handles (2) to full rearward position (elevation).	Handles move smoothly to about 30 degrees.	Gunner's control out of adjustment, elevating arm, handles, hydraulic valve
3.	Rotate handles (2) to full forward position (depression).	Handles move smoothly to about 30 degrees.	Gunner's control out of adjustment, elevating arm, handles, hydraulic valve
4.	If movement in steps 2 and 3 are not equal, adjust elevation or depression stopscrews (one that has least movement).	Equal movement	Gunner's control out out adjustment, elevating arm, handles, hydraulic valve
5.	With handles (2) released, they should be centered horizontally.	Handles horizontal	Gunner's control out of adjustment
6.	Rotate handles (2) to full right traverse and left traverse. Release handles.	Handles move smoothly and return to center position when released.	Gunner's control out of adjustment. hydraulic valve
	NOTE If normal indication was obtained in frames 1 through 3, gunner's control is good.		
	END OF TASK		


ELEVATION
DEPRESSION
2
RIGHT TRAVERSE
LEFT TRAVERSE
2
1

13-79. GUNNER'S CONTROL ADJUSTMENT PROCEDURE

TOOLS: 7/16" combination wrench (two)
Slip joint pliers
6" machinist steel rule (two)

SUPPLIES: Paper
Pencil

PERSONNEL: TWO

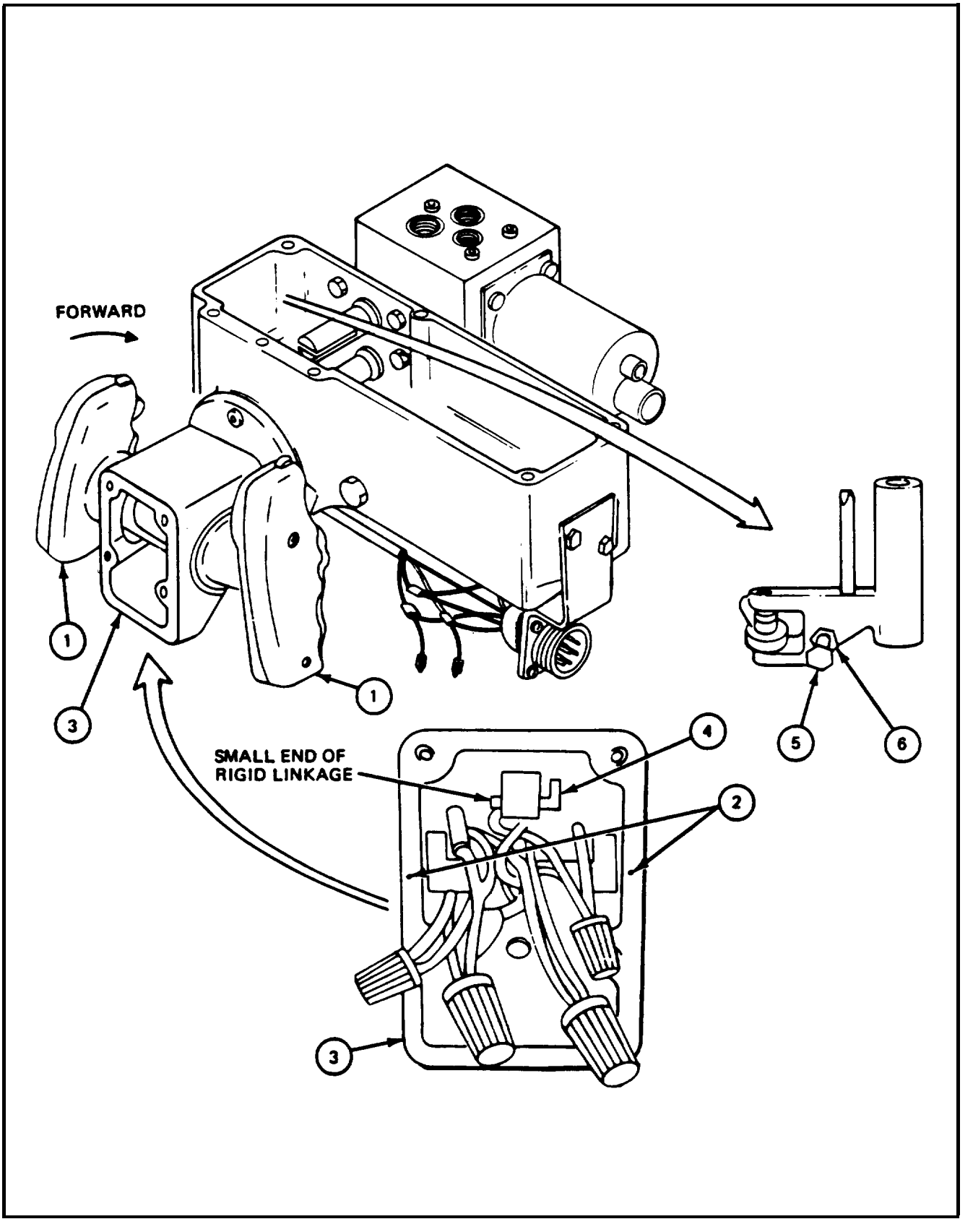
PRELIMINARY PROCEDURES: Assemble gunner's control (para 13-81)
Test gunner's control (para 13-78)
Remove housing cover (para 13-95)
Remove control box cover (para 13-82)

13-79. GUNNER'S CONTROL ADJUSTMENT PROCEDURE (CONT)

a. Depression

FRAME 1

Step	Procedure
	NOTE Elevation and depression travel should be approximately the same. If travel is not equal, adjustment of depression or elevation (frame 2) stopscrew must be made.
1.	Soldier A: Move gunner's control handles (1) forward to depression stop and hold handles there until measurements and adjustments are done.
2.	Soldier B: Place rule across cover mounting surfaces (2) of box (3).
3.	Place second rule against small part of rigid linkage (4) and measure distance from rigid linkage to cover mounting surface (2). Measurement should be between 1-11/32" and 1-13/32".
	NOTE Do steps 4 thru 6 only if adjustment is needed. If measurement is too short, depression stop screw (5) must be screwed in. If measurement is too long, depression stop screw (5) must be screwed out.
4.	Using wrench, loosen jam nut (6).
5.	Using wrench, adjust depression stop screw (5) until measurement in step 3 is obtained.
6.	Using two wrenches, hold depression stop screw (5) from turning while tightening jam nut (6).
	GO TO FRAME 2

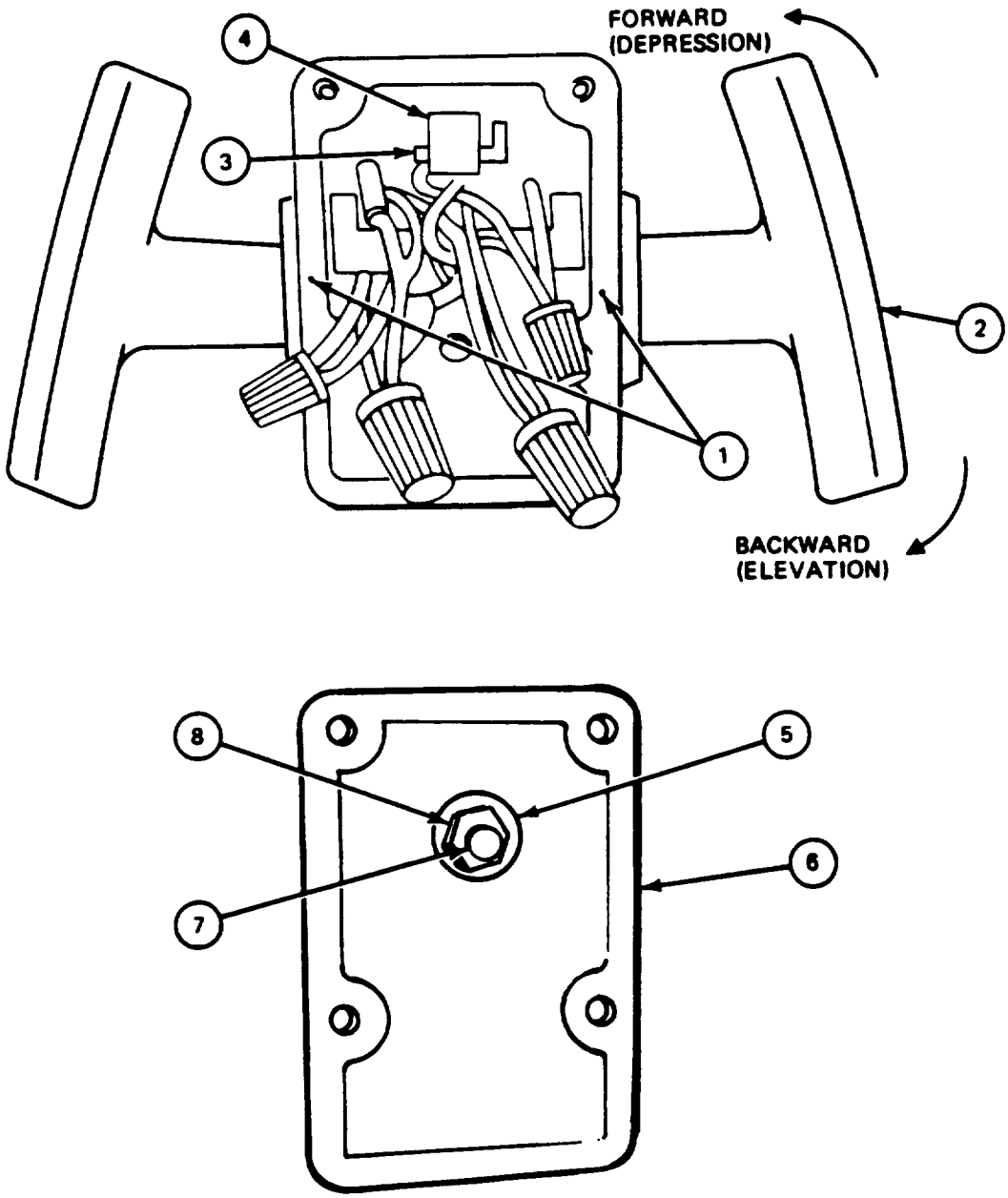

FORWARD
1
1
3
SMALL END OF
RIGID LINKAGE
4
2
3
5
6

13-79. GUNNER'S CONTROL ADJUSTMENT PROCEDURE (CONT)

b. Elevation

FRAME 2

Step	Procedure
1.	Soldier A: Place one ruler across mounting surfaces (1).
2.	Set end of second ruler at 21/32" from mounting surfaces (1) (first ruler).
3.	Soldier B: Move handles (2) backward (elevation) slowly until small end of rigid linkage (3) just touches second ruler.
4.	Soldier B: Hold handles (2) in place.
5.	Soldier A: Move second ruler and measure distance from rod end (4) to mounting Surfaces (1) (first ruler).
6.	Using paper and pencil, record reading.
7.	Measure distance from boss (5) on inside of control box cover (6) to end of stop screw (7). Measurement must be within 1/32" of measurement recorded in step 5.
	NOTE Do steps 8 through 10 only if adjustment is needed. If measurement is too long, stop screw (7) must be turned clockwise. If measurement is too short, stop screw must be turned counterclockwise.
8.	Using wrench, loosen jam nut (8).
9.	Using pliers, adjust stop screw (7) until measurement in step 5 is obtained.
10.	Using wrench and pliers, hold stop screw (7) from turning while tightening jam nut (8).
11.	Install control box cover (6) (para 13-83).
12.	Check elevation/depression movement of handles (2). Travel should be about equal.
	NOTE Follow-on Maintenance Action Required: Install housing cover (para 13-96).
	END OF TASK


FORWARD
(DEPRESSION)
BACKWARD
(ELEVATION)
1
2
3
4
5
6
7
8

13-80. GUNNER'S CONTROL DISASSEMBLY PROCEDURE

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to remove gunner's control assembly

EQUIPMENT CONDITION: Gunner's control removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test gunner's control (para 13-78)

FRAME 1

Step	Procedure
1.	Remove control box cover (para 13-82).
2.	Remove handles (para 13-87).
3.	Disassemble handles (para 13-89).
4.	Remove and disassemble control box (para 13-92).
5.	Remove housing cover (para 13-95).
6.	Remove traversing and elevating arms and disassemble housing (para 13-99).
7.	Disassemble traversing arm (para 13-101).
8.	Remove harness and bracket (para 13-84).
9.	Remove hydraulic valve (para 13-104).
10.	Disassemble hydraulic valve (para 13-112).
	END OF TASK

13-81. GUNNER'S CONTROL ASSEMBLY PROCEDURE

PERSONNEL: One

FRAME 1

Step	Procedure
1.	Assemble hydraulic valve (para 13-113).
2.	Install hydraulic valve (para 13-105).
3.	Install harness and bracket (para 13-85).
4.	Assemble traversing arm (para 13-102).
5.	Install traversing and elevating arms and assemble housing (para 13-100).
6.	Install housing cover (para 13-96).
7.	Assemble and install control box (para 13-93).
8.	Assemble handles (para 13-90).
9.	Install handles (para 13-88).
10.	Install control box cover (para 13-83).
	NOTE Follow-on Maintenance Action Required: Test gunner's control (para 13-78).
	END OF TASK

13-82. CONTROL BOX COVER REMOVAL PROCEDURE

TOOLS: 5/32” socket head screw key (Allen wrench)
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

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver’s Master Control Panel	FO-3	11
Gunner’s Control Box	FO-1	2
Turret Traverse Lock	FO-3	7

EQUIPMENT CONDITION: Driver’s master control panel MASTER BATTERY switch set to OFF
Gunner’s control box ELEV/TRAV switch set to OFF
Turret traverse lock set to LOCKED

GENERAL INSTRUCTIONS:

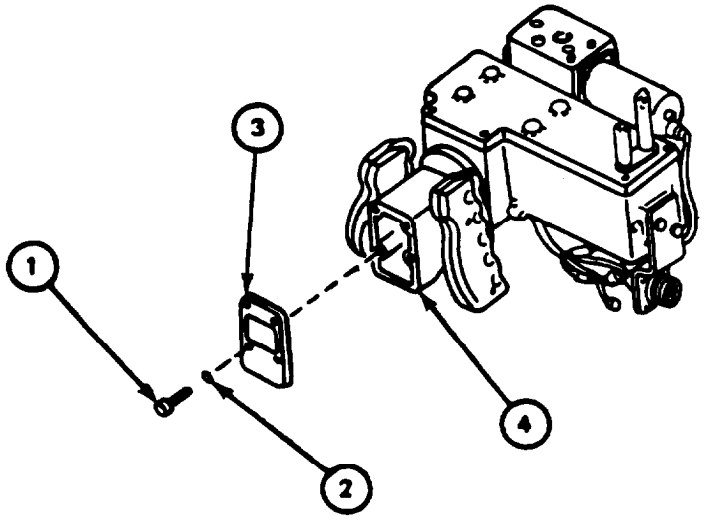
NOTE

Equipment conditions apply only if task is being done on vehicle.

13-82. CONTROL BOX COVER REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using Allen wrench, remove four screws (1) and four lockwashers (2) that attach control box cover (3) to control box (4).
2.	Remove cover (3) from control box (4).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK



13-83. CONTROL BOX COVER INSTALLATION PROCEDURE (CONT)

TOOLS: 5/32” socket head screw key (Allen wrench)

PERSONNEL: One

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver’s Master Control Panel	FO-3	11
Gunner’s Control Box	FO-1	2
Gunner’s Control	FO-1	4

EQUIPMENT CONDITION: Driver’s master control panel MASTER BATTERY switch set to OFF
Gunner’s control box ELEV/TRAV switch set to OFF

GENERAL INSTRUCTIONS:

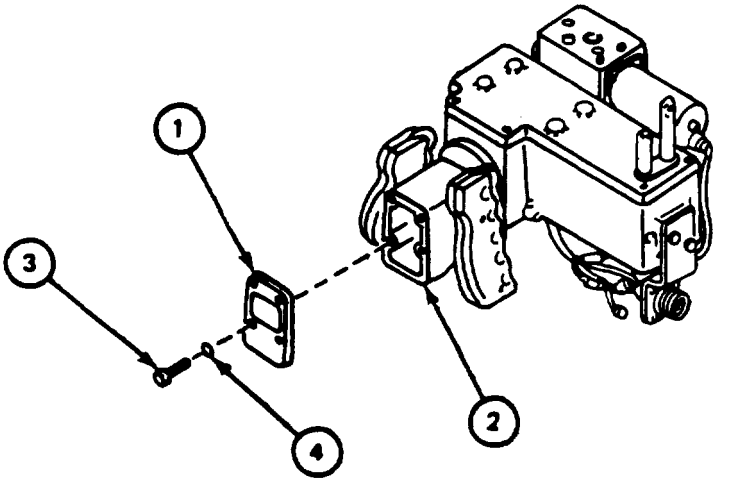
NOTE

Equipment conditions apply only if task is being done on vehicle.

13-83. CONTROL BOX COVER INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Place control box cover (1) on control box (2).
2.	Using Allen wrench, attach cover (1) to control box (2) with four screws (3) and four lockwashers (4).
	END OF TASK



13-84. HARNESS AND BRACKET REMOVAL PROCEDURE

TOOLS: 1/4” flat tip screwdriver
7/16” open end wrench
Diagonal cutting pliers
Slip joint pliers with plastic jaws (connector)

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

PERSONNEL: One

REFERENCES: JPG for procedures to:
Disconnect electrical connectors
Tag wires
Remove sealing compound
TM 9-2350-222-20-2-3 for procedure to lower hydraulic system pressure

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver’s Master Control panel	FO-3	11
Gunner’s Control Box	FO-1	2
Turret Traverse Lock	FO-3	7
Gunner’s Control	F0-1	4

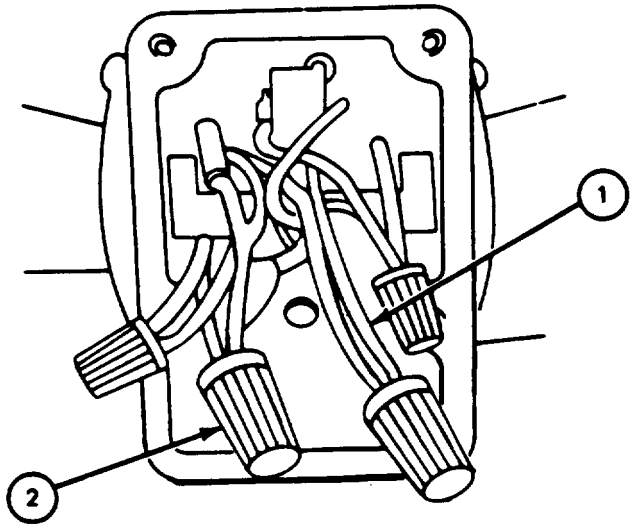
EQUIPMENT CONDITION: Driver’s master control panel panel MASTER BATTTERY switch set to OFF
Gunner’s control box ELEV/TRAV switch set to OFF
Turret traverse lock to LOCKED

PRELIMINARY PROCEDURES: Remove control box cover (para 13-82)

13-84. HARNESS AND BRACKET REMOVAL PROCEDURE (CONT)

FRAME 1

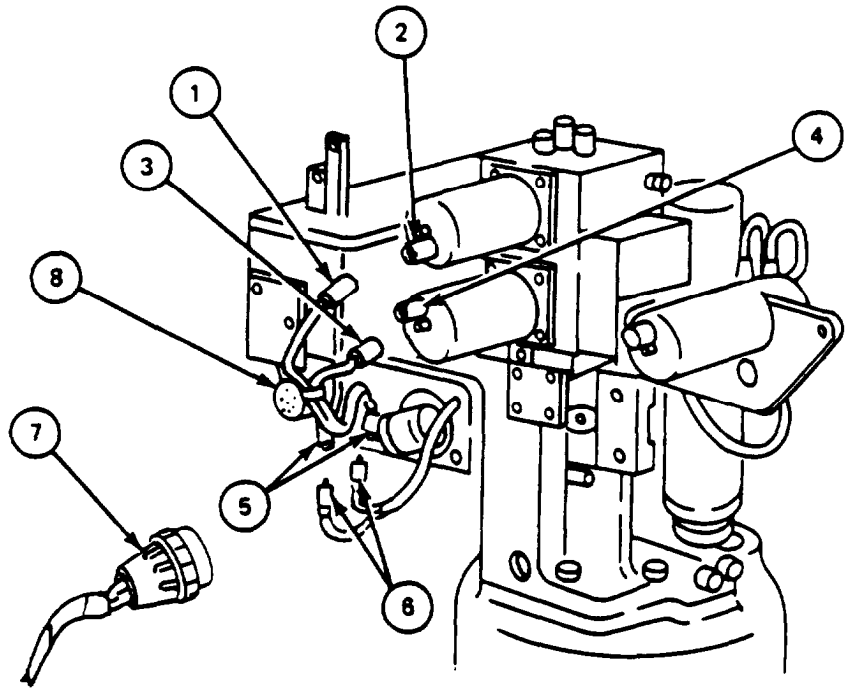
Step	Procedure
	WARNING Before doing work on gunner's control, hydraulic system pressure must be lowered to 0 psi, or you could get hurt by movement of turret or gun.
1.	Lower hydraulic system pressure to 0 psi (TM-20-2-3).
2.	Using masking tape and pencil, tag and mark all wires (1) to be removed from four connector nuts (2) (JPG).
3.	Using cutting pliers, cut wires (1) at four connector nuts (2).
	GO TO FRAME 2



13-84. HARNESS AND BRACKET REMOVAL PROCEDURE (CONT)

FRAME 2

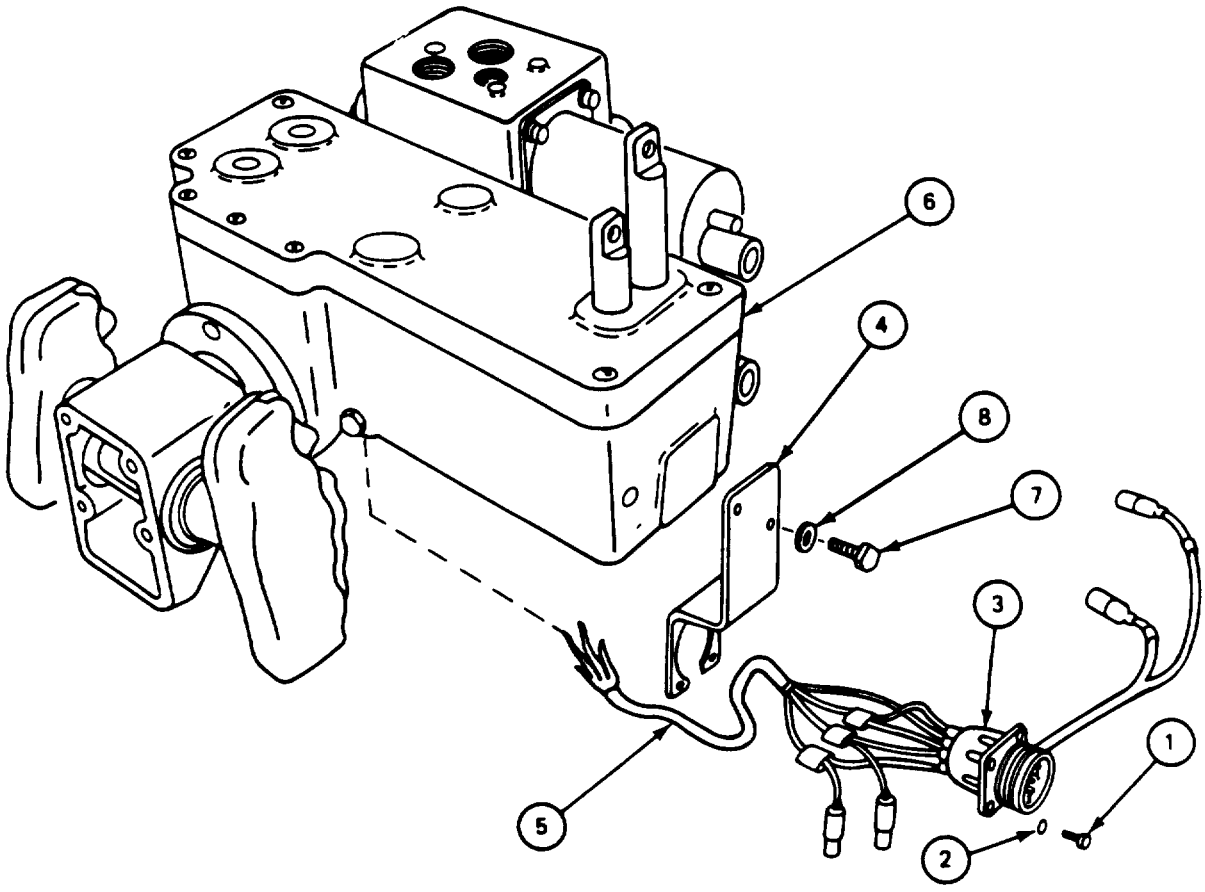
Step	Procedure
1.	Using hands, disconnect electrical connector (1) from power solenoid (2) (JPG).
2.	Using hands. disconnect electrical connector (3) from override solenoid (4) (JPG).
	NOTE Do steps 3 and 4 only if gunner's control assembly is mounted in vehicle.
3.	Using masking tape and pencil, tag wires connected to electrical connectors (5), manual elevation pump connectors (6), electrical connector (7) and wiring harness connector (8) (JPG)
4.	Using hands, disconnect two electrical connectors (5) from two manual elevation pump connectors (6) (JPG).
5.	Using connector pliers, remove electrical connector (7) from wiring harness connector (8) (JPG).
	GO TO FRAME 3



13-84. HARNESS AND BRACKET REMOVAL PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Using screwdriver, remove four screws (1) and four lockwashers (2) that attach electrical connector (3) to bracket (4).
2.	Using hands, pull wiring harness (5) out of gunner's control housing (6).
3.	Using wrench, remove two screws (7) and two lockwashers (8) that attach bracket (4) to gunner's control housing (6).
	END OF TASK



13-85. HARNESS AND BRACKET INSTALLATION PROCEDURE

TOOLS: Needle nose pliers
Slip joint pliers with plastic jaws (connector pliers)
1/8" flat tip screwdriver
No. 2 cross tip screwdriver (Phillips)
7/16" open end wrench

SUPPLIES: Nut (8735997) (large)
Screw (8735998) (for large nut)
Insert (8735996) (for large nut)
Nut (8735994) (small)
Screw (8735995) (for small nut)
Insert (8735993) (for small nut)
0.032" lockwire (18" long)
Masking tape (item 36, App. A)

PERSONNEL: One

REFERENCES: TM 9-2350-222-10 for procedure to check operation of gun firing circuits
JPG for procedures to:
Connect electrical connectors
Terminate wires

EQUIPMENT LOCATION INFORMATION:

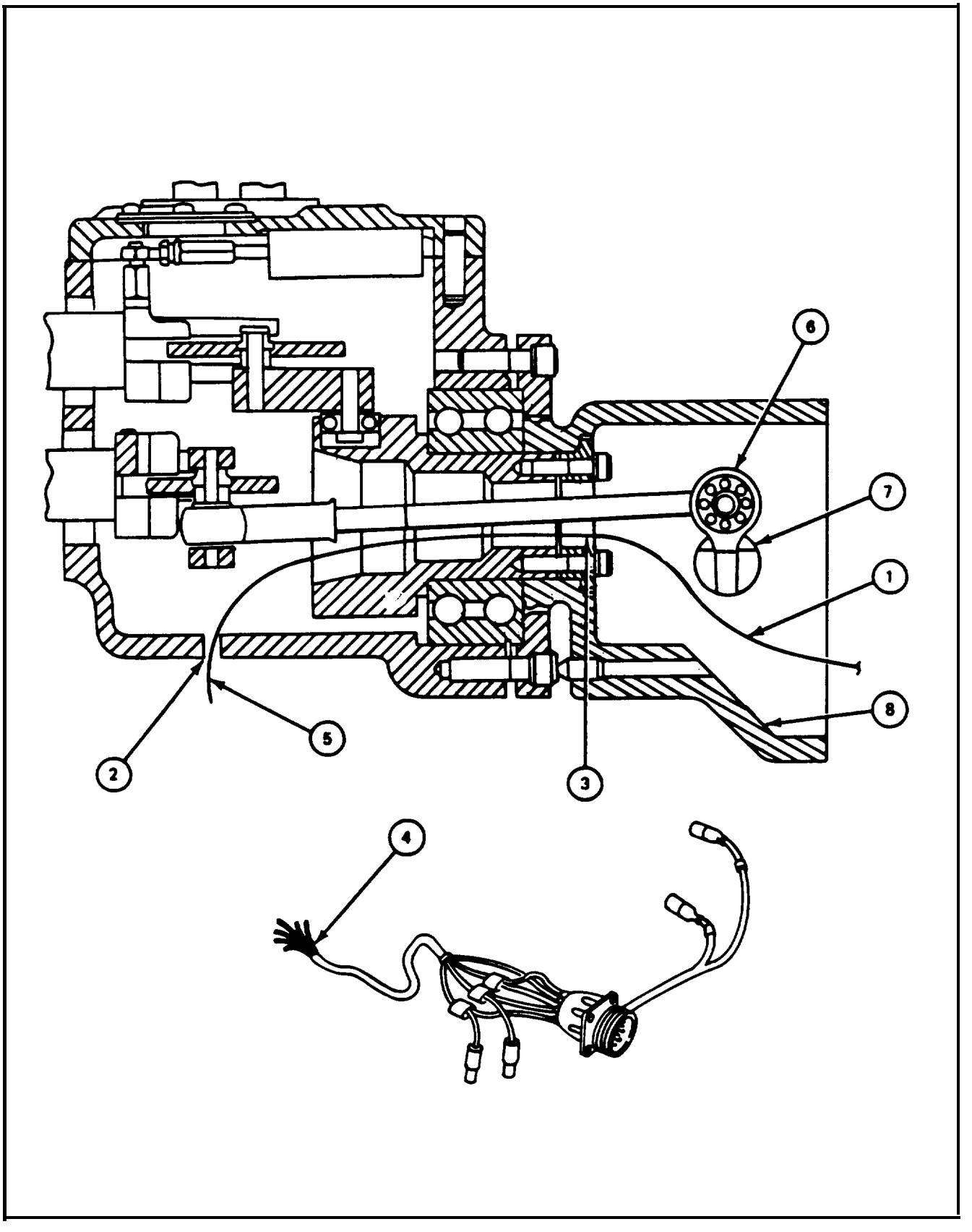
EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-3	11
Gunner's Control	FO-1	4

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Turret traverse lock set to LOCKED

13-85. HARNESS AND BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 1

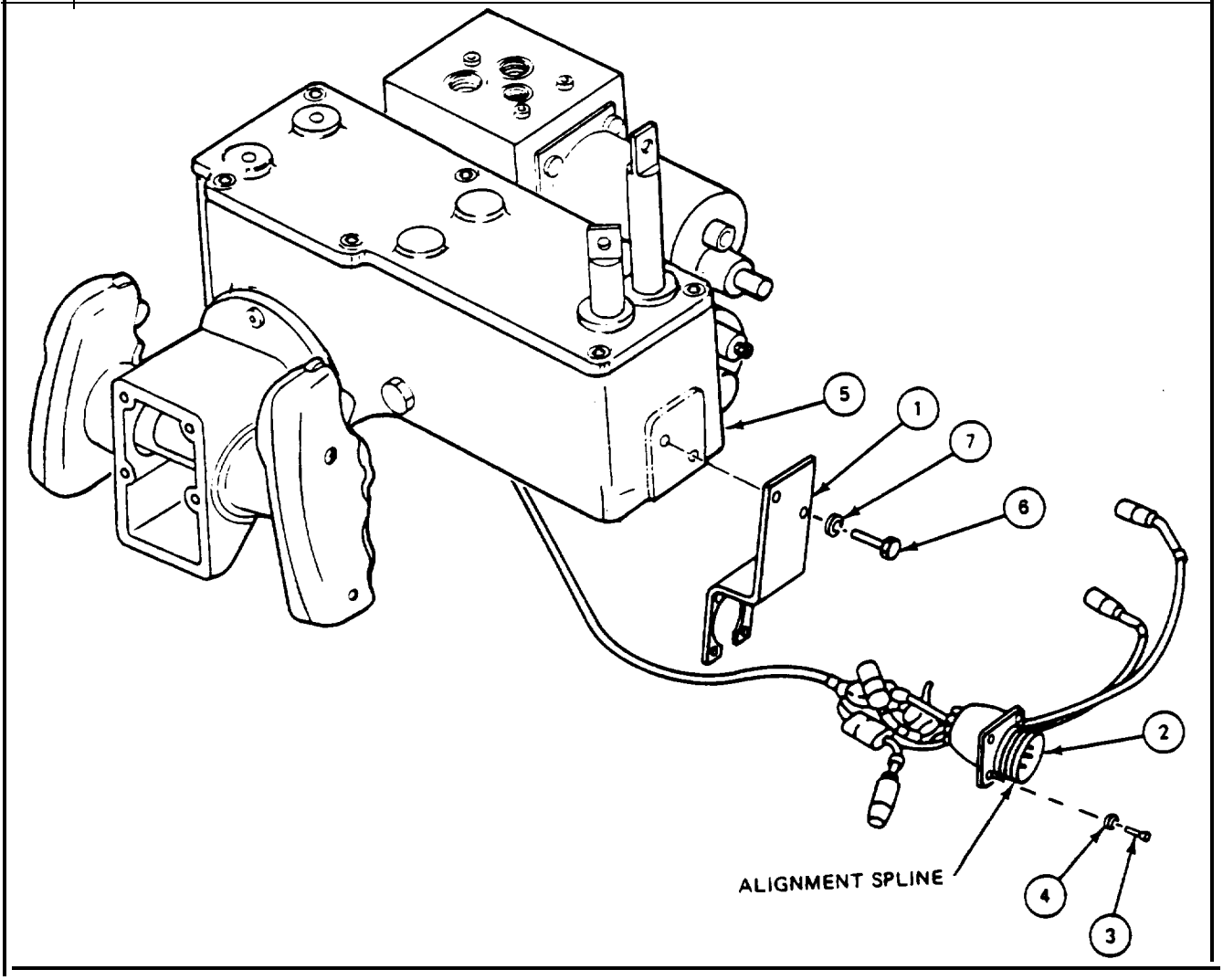
Step	Procedure
1.	Using needle nose pliers, thread lockwire (1) through hole in bottom of housing (2) and out through hole in cam (3).
2.	Using masking tape, tape ends of wiring harness (4) to end of lockwire (5).
	NOTE Wires should be clear of elevation eyebolt (6) and under shaft (7).
3.	Pull lockwire (1) and harness wire (4) through hole (2), cam hole (3), and out gunner's control box (8).
4.	Remove tape and lockwire (1) from wiring harness (4).
	GO TO FRAME 2


6
7
1
8
5
2
3
4

13-85. HARNESS AND BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 2

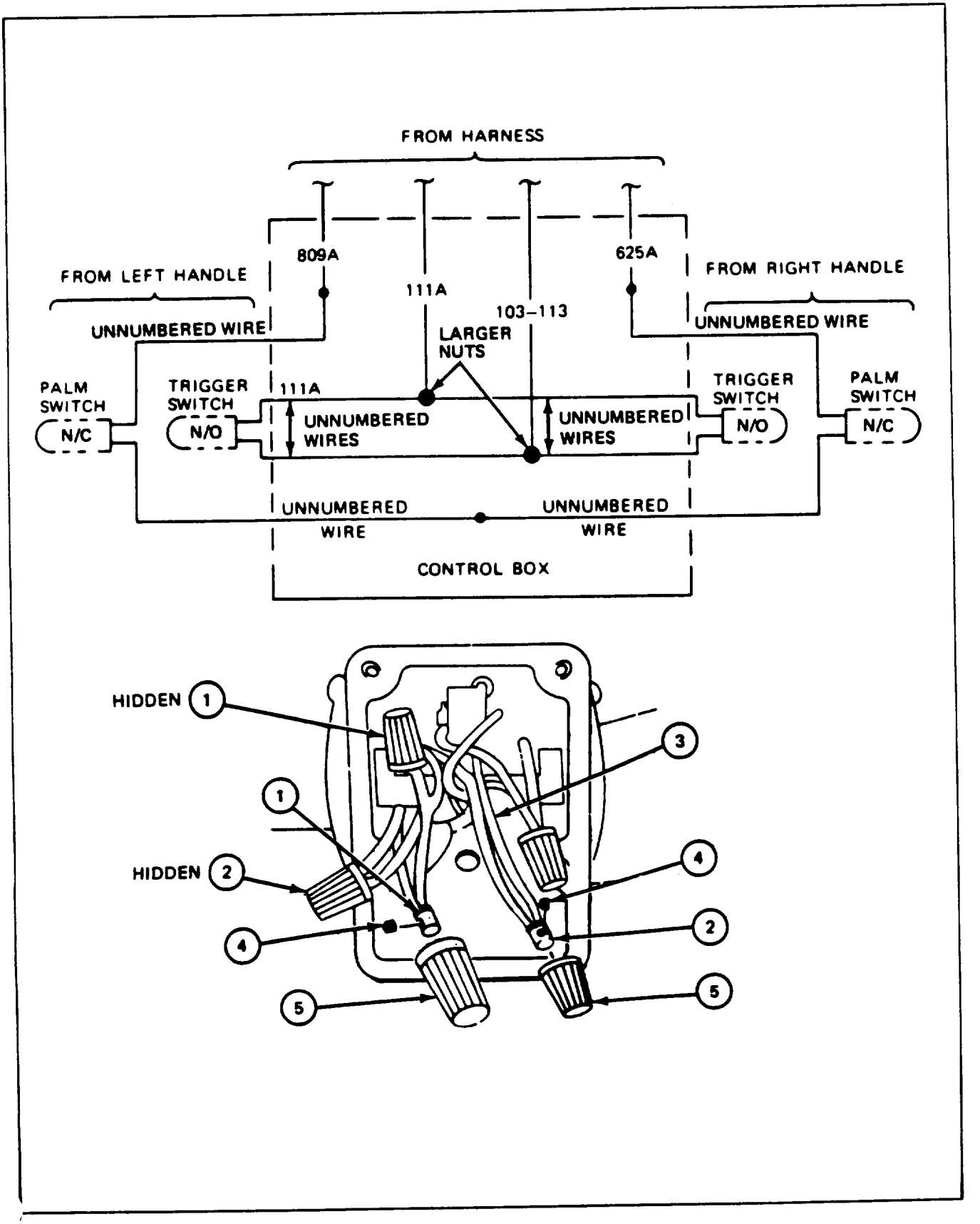
Step	Procedure
	NOTE Alignment spline of harness connector (2) must be to bottom of bracket (1).
1.	Using cross tip screwdriver, attach bracket (1) to harness connector (2) with four screws (3) and four lockwashers (4).
2.	Using open end wrench, attach harness connector bracket (1) to housing (5) with two screws (6) and two lockwashers (7).
	GO TO FRAME 3



13-85. HARNESS AND BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 3

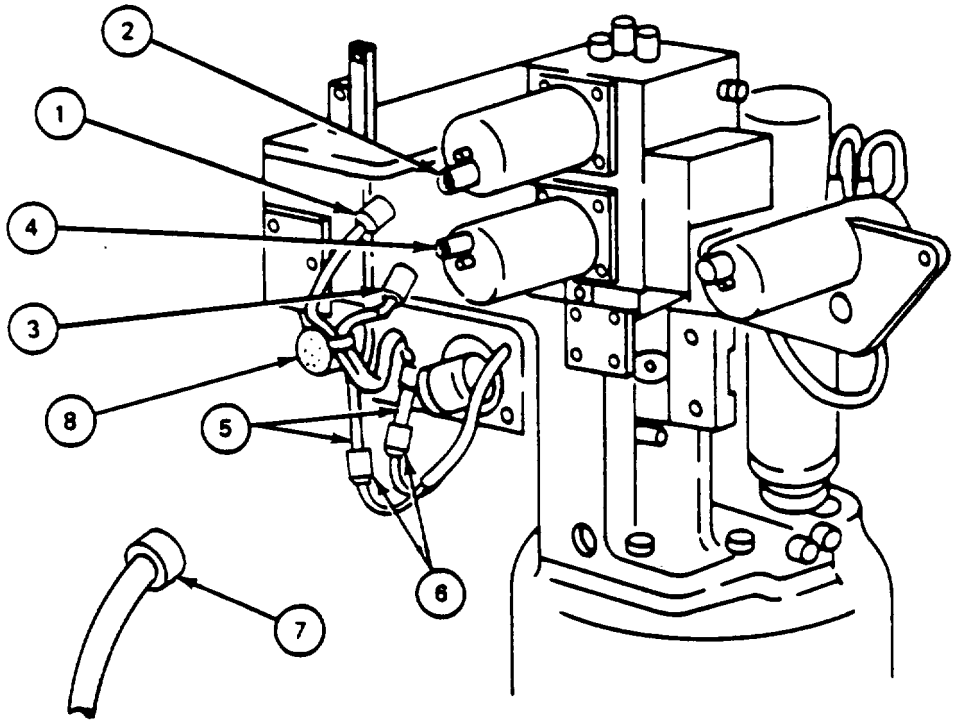
Step	Procedure
	NOTE Insulation stripping and replacement of nuts, inserts, and screws are required for wires that were cut off during removal of harness. Wires were tagged during removal. If tags were lost, use schematic (JPG). Two inserts (1) holding three wires, are larger than two inserts (2) holding two wires.
1.	Using flat tip screwdriver, attach wires (3) to four inserts with four screws (4).
2.	Using hands, screw four connector nuts (5) on four inserts.
	GO TO FRAME 4


FROM HARNESS
809A
111A
103–113
625A
FROM LEFT HANDLE
FROM RIGHT HANDLE
UNNUMBERED WIRE
LARGER NUTS
UNNUMBERED WIRE
PALM SWITCH
N/C
TRIGGER SWITCH
N/O
111A
UNNUMBERED WIRES
UNNUMBERED WIRES
TRIGGER SWITCH
N/O
PALM SWITCH
N/C
UNNUMBERED WIRE
UNNUMBERED WIRE
CONTROL BOX
HIDDEN 1
HIDDEN 2
1
2
3
4
4
5
5

13-85. HARNESS AND BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Using hands, connect electrical connector 625A (1) to power solenoid (2) (JPG).
2.	Using hands, connect electrical connector 623 (3) to override solenoid (4) (JPG).
	NOTE Do steps 3 and 4 only if gunner's control assembly is mounted in vehicle.
3.	Using hands, connect two electrical connectors (5) to manual elevation pump connectors (6) (JPG).
4.	Using pliers with plastic jaws, connect electrical connector (7) to wiring harness connector (8) (JPG).
	NOTE Follow-on Maintenance Action Required: Install control box cover (para 13-83). Check operation of gun firing circuits (TM-10).
	END OF TASK



13-86. HANDLE INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble handle (para 13-89)

GENERAL INSTRUCTIONS:

NOTE

This procedure is for inspection of either left or right, early or late model handles.

NOTE

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

13-86. HANDLE INSPECTION PROCEDURE (CONT)

FRAME 1

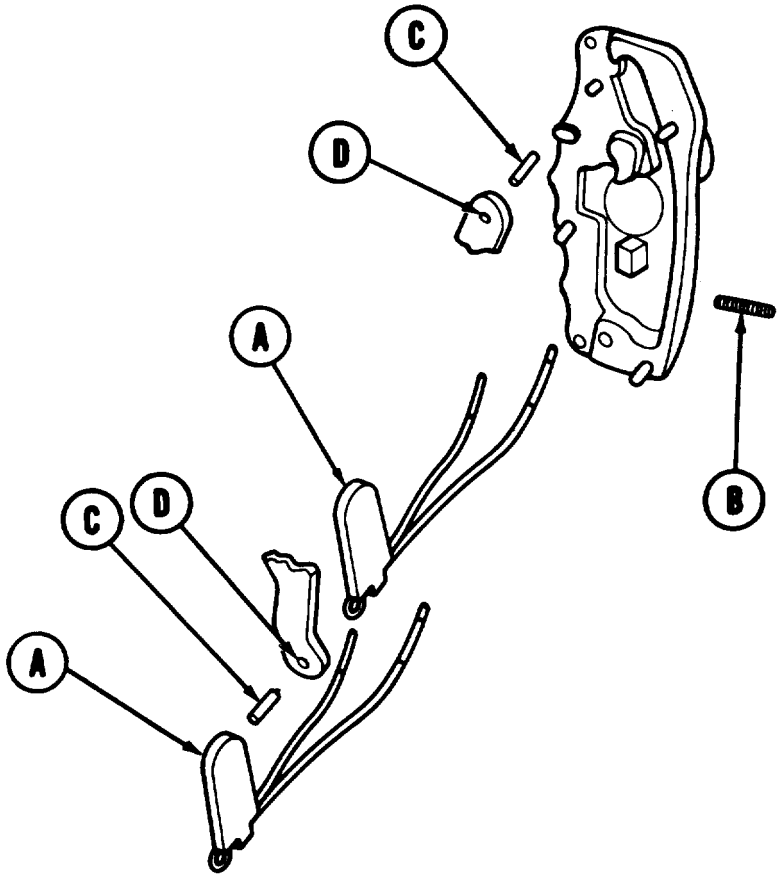
Step	Procedure
	SUPPORT SHOP WORK
1.	Take handle parts to shop where inspection equipment is available.
2.	Make dimensional checks.

Reference Number	Point of Measurement	Measurement: Early Model	Measurement: Late Model
A	Switches:		
	Pretravel	0.020 minimum	0.045 minimum
	Overtravel	0.010 minimum	0.010 minimum
	Operating effort at center of switch	16 to 32 oz	15 to 32 oz
B	Spring:		
	Force required to compress spring to 0.703	0.27 to 0.33 oz	0.27 to 0.33 oz
	Force required to compress spring to 0.547	0.60 to 0.72 oz	0.60 to 0.72 02
C	OD of pins	0.1855 to 0.1875	0.1855 to 0,1875
D	Diameter of hole in triggers	0.1880 to 0.1910	0.1880 to 0.1910

NOTE

Tag parts that are out of tolerance.

3.	After shop support, return parts to turret shop.
	END OF TASK


C
D
A
B
C
D
A

13-87. HANDLE REMOVAL PROCEDURE

TOOLS: Diagonal cutting pliers
1/8 in. socket head screw key (Allen wrench)
Soldering iron
1/8 in. flat tip screwdriver

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

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to lower hydraulic system pressure
TM 9-2350-222-10 for procedures to:
Unload guns
Turn off machine gun and main gun
JPG for procedures to:
Remove sealing compound
Tag wires
Use soldering iron

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-3	11
Gunner's Control Box	FO-1	2

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV, MAIN GUN, and MACHINE GUN switches set to OFF
Guns unloaded (TM-10)

PRELIMINARY PROCEDURES: Remove control box cover (para 13-82)

GENERAL INSTRUCTIONS:

NOTE

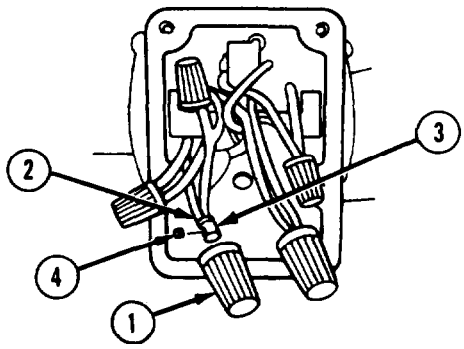
This procedure is for removal of either left or right, early or late model handles.

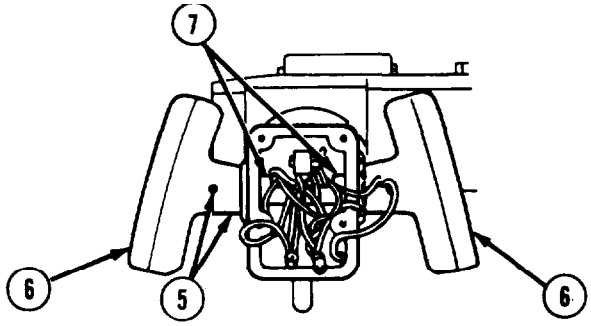
Equipment conditions apply only if task is being done on vehicle.

13-87. HANDLE REMOVAL PROCEDURE (CONT)

FRAME 1

STEP	PROCEDURE
	WARNING Before doing work on gunner's control, hydraulic system pressure must be reduced to 0 psi, or you could get hurt by movement of turret or gun.
1.	Lower hydraulic system pressure to 0 psi (TM-20-2-3).
	NOTE It may be necessary to cut wires at connector nuts (1) if molding compound in nuts has hardened. The following steps are typical for removal of all handle switches.
2.	Using hands, remove connector nuts (1) from wire connections (2) of switch to be removed.
3.	Remove molding compound from connector nuts (1), inserts (3), and wire connections (2) (JPG).
4.	Remove solder from open end of insert (3) and wire connections (2) (JPG).
5.	Using screwdriver, loosen screws (4) that attach wire connections (2) to inserts (3). Tag wires (JPG).
	CAUTION During removal of handles (6), switch wires (1) should be slowly guided through shaft hole (7) to prevent damage to wire insulation.
6.	Using Allen wrench, remove four setscrews (5) from two handles (6).
7.	Using hands, remove two handles (2).
	END OF TASK





13-88. HANDLE INSTALLATION PROCEDURE

TOOLS: Pocket knife
1/8 in. socket head screw key (Allen wrench)
1/8 in. flat-tip screwdriver
Needle nose pliers
Soldering iron

SUPPLIES: Nut, large (8735997)
Screw (8735998) (for large nut)
Insert (8735998) (for large nut)
Nut, small (8735994)
Screw (8735995) (for small nut)
Insert (8735993) for small nut)
Solder (item 31, App. A)
Sealing compound

PERSONNEL: One

REFERENCES: TM 9-2350-222-10 for procedure to check operation of gun firing circuit
JPG for using soldering iron

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	F0-3	11
Gunner's Control Box	FO-1	2
Gunner's Control Handles	FO-1	25

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV switch set to OFF

GENERAL INSTRUCTIONS:

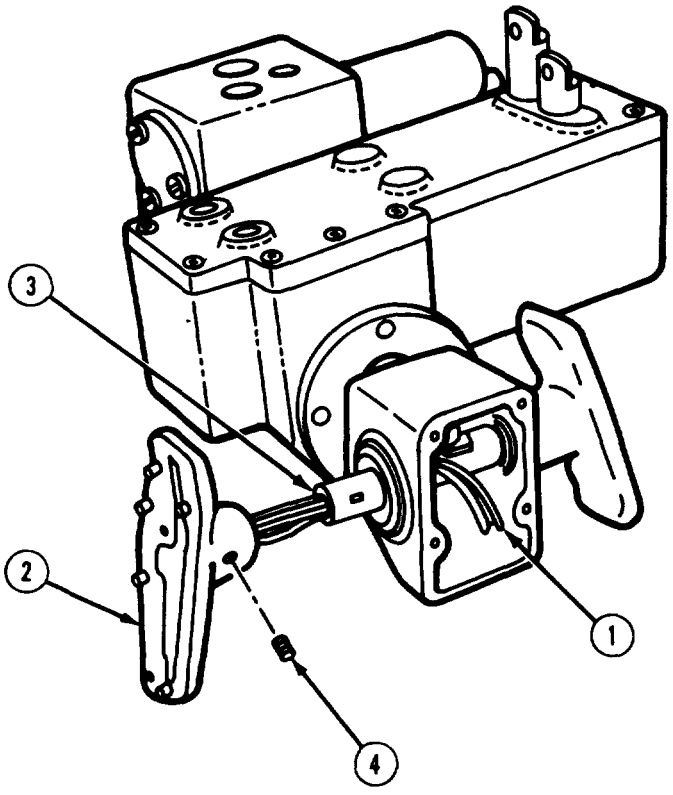
NOTE

This procedure is for installation of either left or right, early or late model handles.

13-88. HANDLE INSTALLATION PROCEDURE (CONT)

FRAME 1

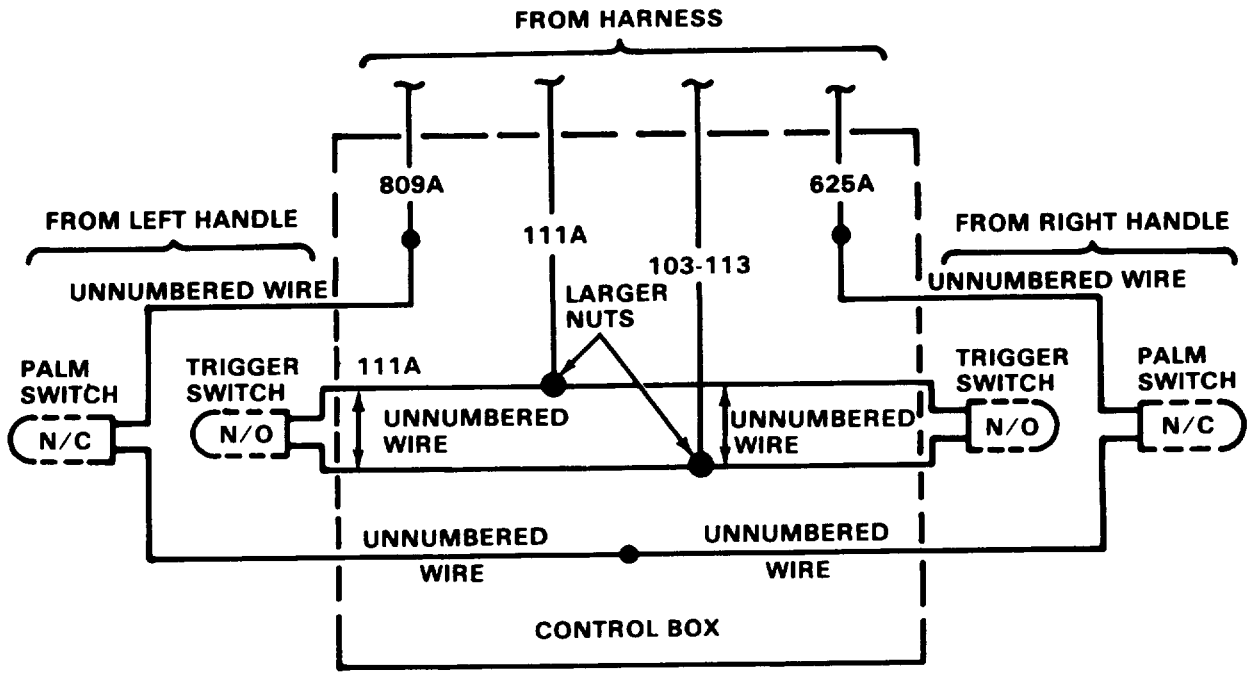
STEP	PROCEDURE
	NOTE **It may be necessary to use pliers to pull wires (1) through shaft (3).**
1.	Put four wires (1) from handle (2) through hole in shaft (3).
2.	Put handle (2) on shaft (3) with setscrew holes lined up with flat surfaces on shaft.
3.	Using 1/8 inch Allen wrench, attach handle (2) to shaft (3) with two setscrews (4).
	GO TO FRAME 2

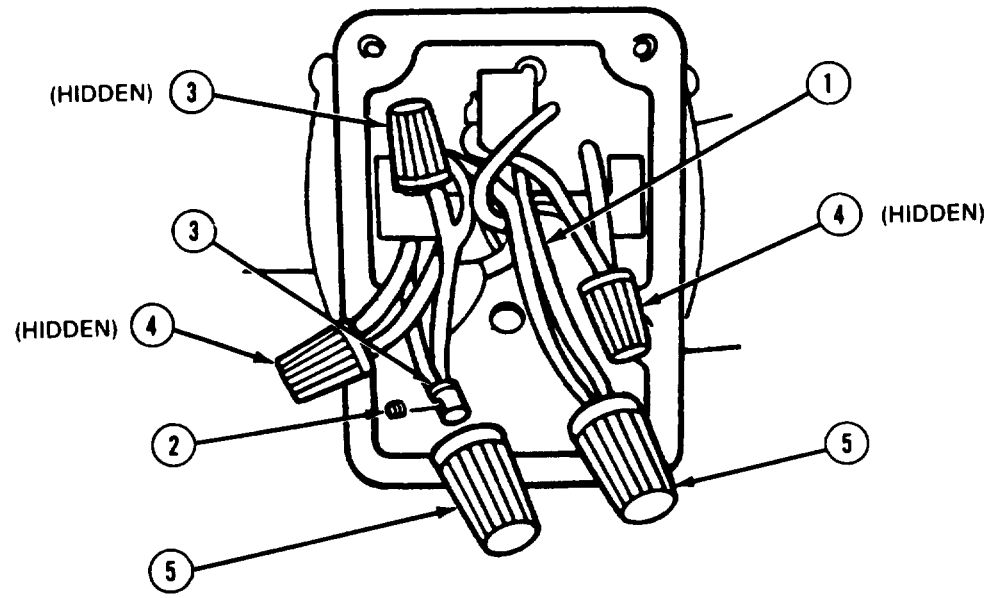


13-88. HANDLE INSTALLATION PROCEDURE (CONT)

FRAME 2

STEP	PROCEDURE
	NOTE **Insulation stripping and replacement of nuts, inserts, and screws are required if wires were cut off during removal. Wires were tagged during removal. If tags were lost, use schematic (JPG).**
1.	Using pocket knife, remove insulation off wires (1) so about 1/2 inch of wire is exposed.
	NOTE Two inserts (3), holding three wires, are larger than three inserts (4) holding two wires.
2.	Install inserts (3 and 4) on wires (1) to be joined.
3.	Using screwdriver, tighten screws (2).
4.	Apply solder to wires (1) and open end of inserts (3 and 4) (JPG).
5.	Using hands, screw connector nuts (5) on inserts (3 and 4).
6.	Apply sealing compound to connector nut (5), inserts (3 and 4), and wires (1) (JPG).
	GO TO FRAME 3

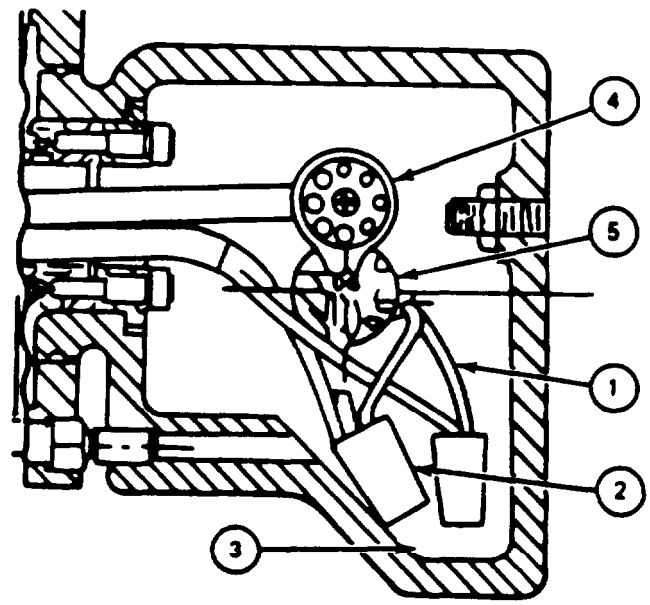

FROM HARNESS
809A
111A
103-113
625A
FROM LEFT HANDLE
FROM RIGHT HANDLE
UNNUMBERED WIRE
LARGER NUTS
UNNUMBERED WIRE
PALM SWITCH
TRIGGER SWITCH
111A
TRIGGER SWITCH
PALM SWITCH
N/C
N/O
UNNUMBERED WIRE
UNNUMBERED WIRE
N/O
N/C
UNNUMBERED WIRE
UNNUMBERED WIRE
CONTROL BOX


(HIDDEN) 3
1
4 (HIDDEN)
3
(HIDDEN) 4
2
5
5

13-88. HANDLE INSTALLATION PROCEDURE (CONT)

FRAME 3

Step	Procedure
	CAUTION Make sure wires (1) and connector nuts (2) are clear of elevation control linkage (4) and under shaft (5).
1.	Bend wires (1) and connector nuts (2) into bottom of control box (3).
	NOTE Follow-on Maintenance Action Required: Install control box cover (para 13-83). Check operation of gun firing circuits (TM-10).
	END OF TASK



13-89. HANDLE DISASSEMBLY PROCEDURE

TOOLS: 5/32” socket head screw key (Allen wrench)
5/64” socket head screw key (Allen wrench)
5/16” open end wrench
11/32” open end wrench
Slip joint pliers
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:
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Test gunner’s control (para 13-78)
Remove handle (para 13-87)

GENERAL INSTRUCTIONS:

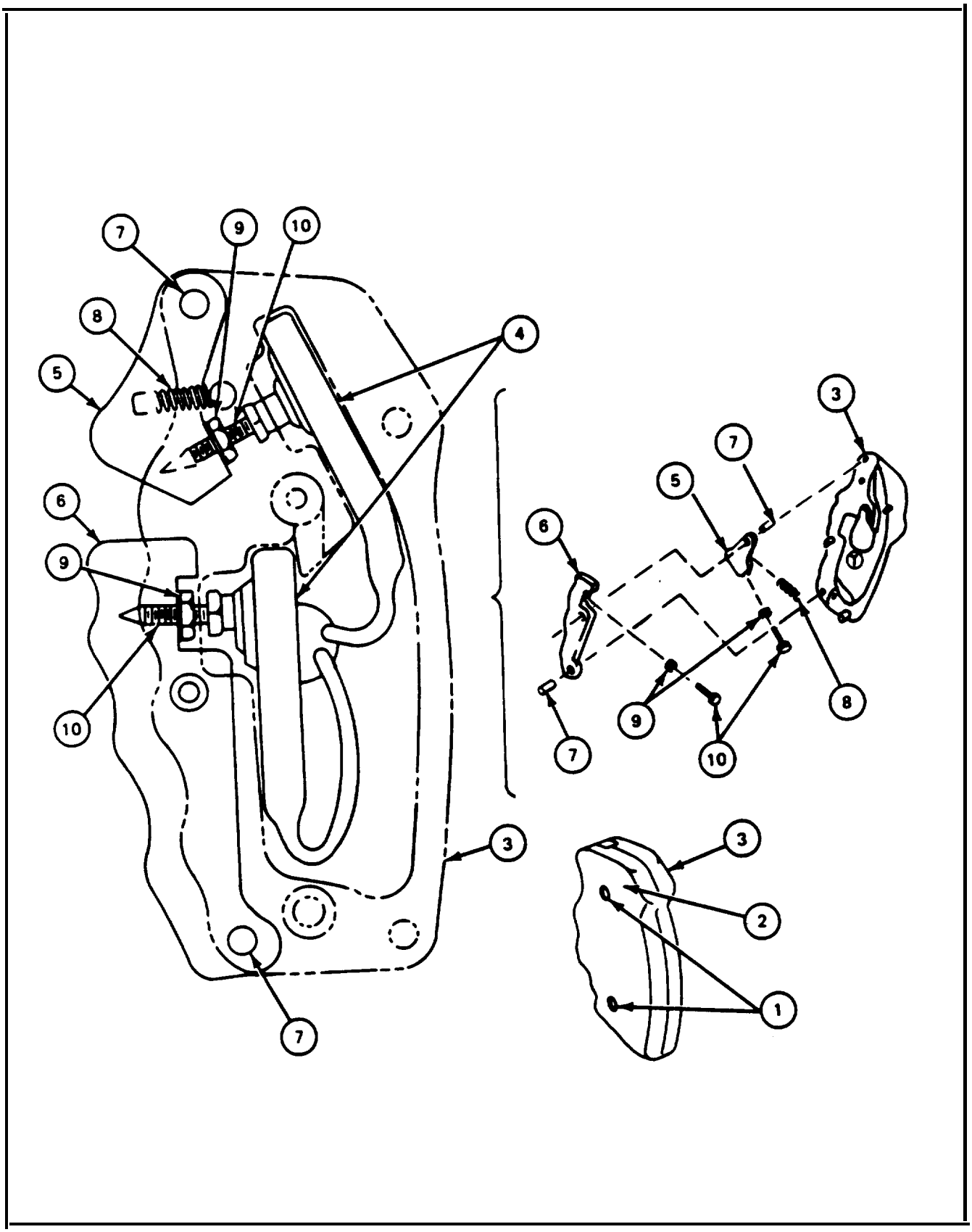
NOTE

This procedure is for disassembly of either left or right, early or late model handles.

13-89. HANDLE DISASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
	NOTE This frame is for early model handle only. For late model handle, go to frame 2.
1.	Using 5/32” Allen wrench, remove two screws (1) and cover (2) from handle (3).
2.	Using hands, remove two switches (4) from handle (3).
	CAUTION Trigger spring (8) is held under compression.
3.	Using hands, remove gun firing trigger (5) and brake trigger (6) from handle (3).
4.	Using pliers, remove two pivot pins (7).
5.	Remove spring (8) from trigger (5).
6.	Using 11/32” open end wrench, loosen locknut (9) on gun firing trigger (5) and brake trigger (6).
7.	Using 5/16” open end wrench, remove screw (10) with locknut (9) from triggers (5) and (6).
8.	Using hands, remove two locknuts (9) from two screws (10).
	GO TO FRAME 2


7
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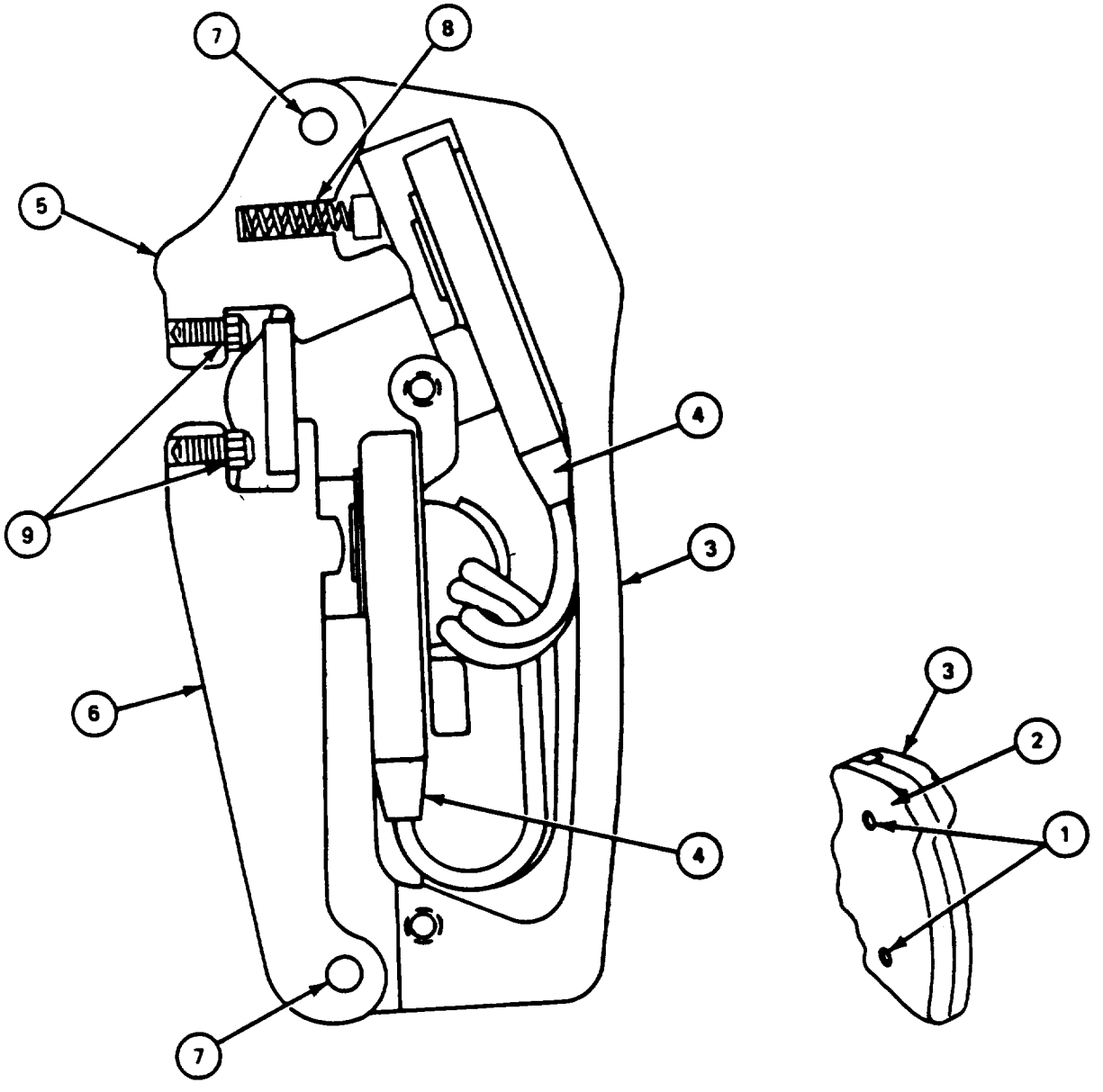
7
3
7
5
6
9
10
8
7
3
2
1

13-89. HANDLE DISASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE This frame is for late model handle only.
1.	Using 5/32” Allen wrench, remove two screws (1) and cover (2) from handle (3).
2.	Using hands, remove two switches (4) from handle (3).
	CAUTION Trigger spring (8) is held under compression.
3.	Using hands, remove gun firing trigger (5) and brake trigger (6) from handle (3).
4.	Using pliers, remove two pivot pins (7).
5.	Remove spring (8) from gun firing trigger (5).
6.	Using 5/64” Allen wrench, remove two setscrews (9) from gun firing trigger (5) and brake trigger (6).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Inspect handles (para 13-86).
	END OF TASK


7
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4
7
3
2
1

13-90. HANDLE ASSEMBLY PROCEDURE

TOOLS: 5/64” socket head screw key (Allen wrench)
5/16” open end wrench
11/32” open end wrench

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedures to:
Adjust handle triggers
Install handle covers

PRELIMINARY PROCEDURES: Inspect handle (para 13-86)

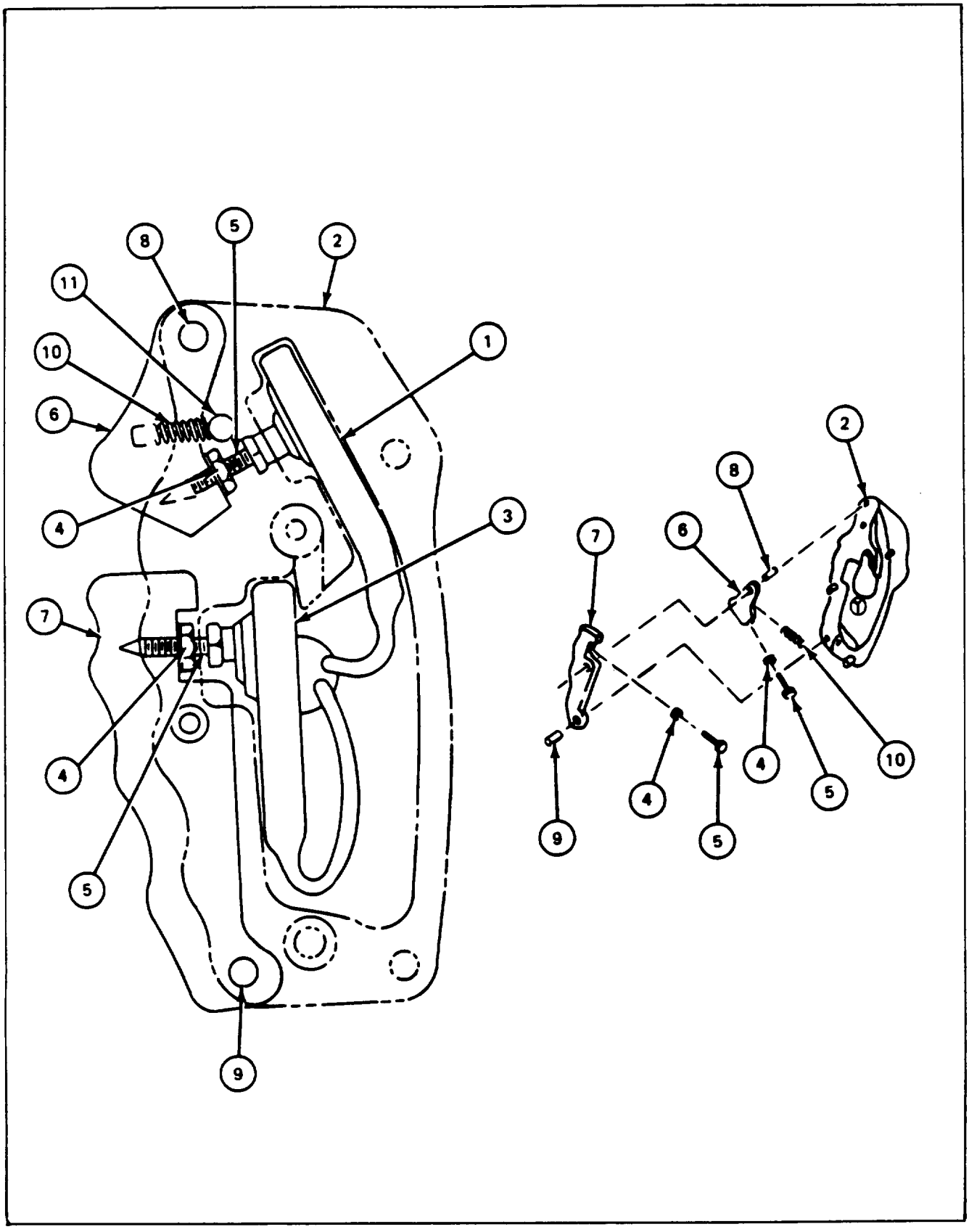
GENERAL INSTRUCTIONS:

NOTE

This procedure is for assembly of either left or right, early or late model handles.

FRAME 1

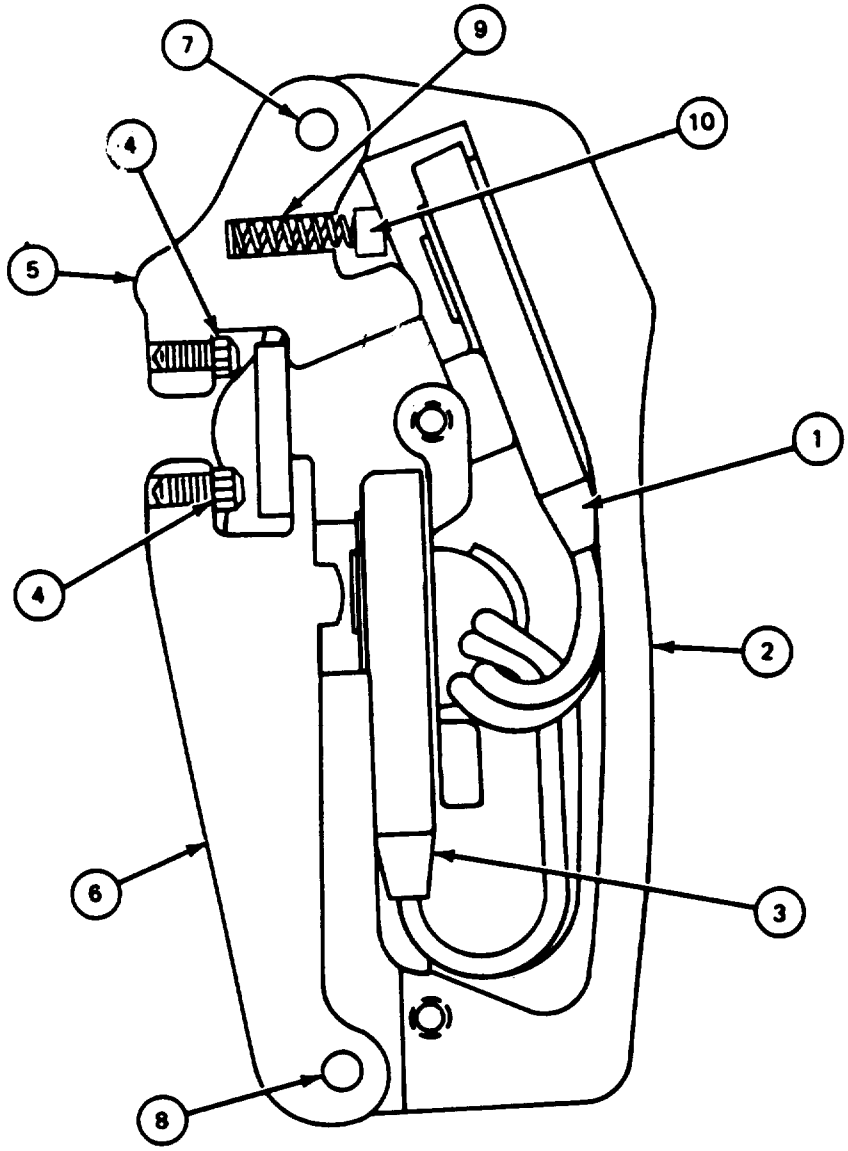
Step	Procedure
	NOTE This frame is for early model handle only. For late model handle, go to frame 2.
1.	Install gun firing switch (MS 39058-1) (1) in handle (2).
2.	Install brake switch (MS 39058-2) (3) in handle (2).
3.	Using 11/32” open end wrench, put locknuts (4) on screws (5).
4.	Using 5/16” open end wrench, put screws (5) in gun firing trigger (6) and brake trigger (7).
	NOTE Pivot pin (8) is shorter than pivot pin (9).
5.	Put pivot pins (8) and (9) in handle (2).
6.	Put spring (10) in gun firing trigger (6).
7.	Compressing spring (10), put gun firing trigger (6) on pivot pin (8) so that spring is against spring stop (11).
8.	Put brake trigger (7) on pivot pin (9).
	GO TO FRAME 2


8
5
2
11
1
10
6
4
3
7
4
5
9
2
8
7
6
4
5
9
4
5
10

13-90. HANDLE ASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE This frame is for late model handle only.
1.	Install gun firing switch (MS 39058-1) (1) in handle (2).
2.	Install brake switch (MS 39058-2) (3) in handle (2).
3.	Using Allen wrench, put setscrews (4) in gun firing trigger (5) and brake trigger 6).
4.	Put pivot pins (7) and (8) in handle (2).
5.	Put spring (9) in gun firing trigger (5).
6.	Compressing spring (9), put gun firing trigger (5) on pivot pin (7) so that spring is against spring stop (10).
7.	Put brake trigger (6) on pivot pin (8).
	NOTE Follow-on Maintenance Action Required: Adjust handle triggers (TM-20-2-3). Install handle covers (TM-20-2-3).
	END OF TASK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4
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4
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6
3
8

13-91. CONTROL BOX INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Remove control box (para 13-92)

GENERAL INSTRUCTIONS:

NOTE

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

13-91. CONTROL BOX INSPECTION PROCEDURE (CONT)

FRAME 1

Step	Procedure
	SUPPORT SHOP WORK
1.	Take pans to shop where inspection equipment is available.
2.	Make dimensional checks.

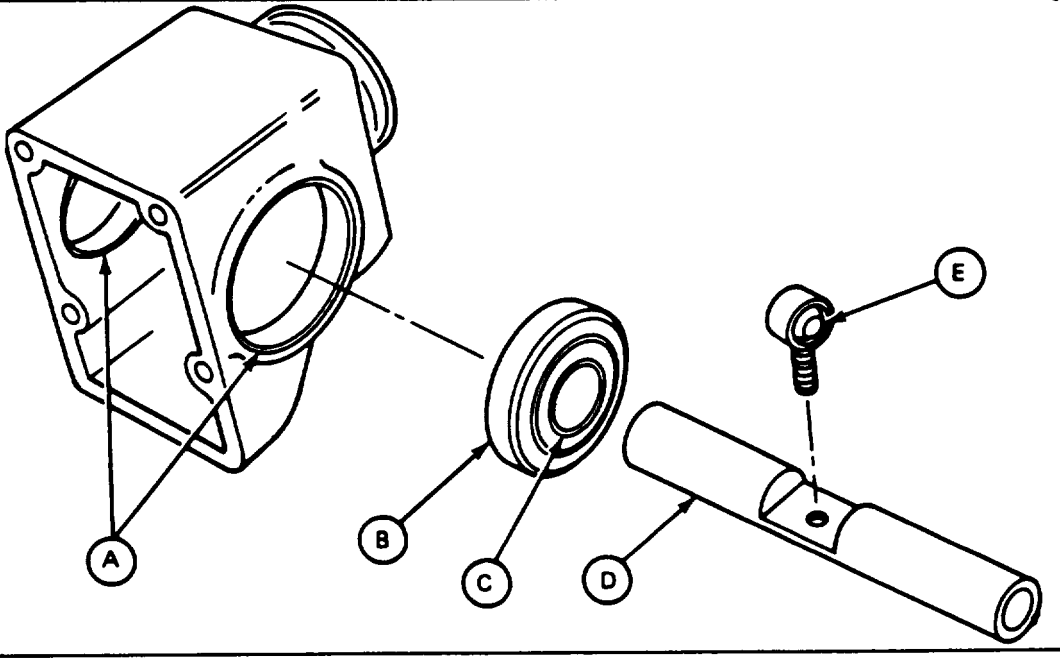
Reference Letter	Point of Measurement	Measurement
A	ID of bore in handle box	1.8503 to 1.8509
B	OD of bearing	1.8499 to 1.8504
C	ID of bearing	0.7870 to 0.7874
D	OD of shaft	0.7853 to 0.7868
E	ID of bearing	0.1895 to 0.1900

NOTE

Tag parts that are out of tolerance.

3.	After support shop work, return pans to turret shop.

END OF TASK



13-92. CONTROL BOX REMOVAL AND DISASSEMBLY PROCEDURE

TOOLS: Needle nose pliers
1/8” socket head screw key (Allen wrench)
3/8” drive speed handle
5/32” hex head socket (3/8” drive)
20 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

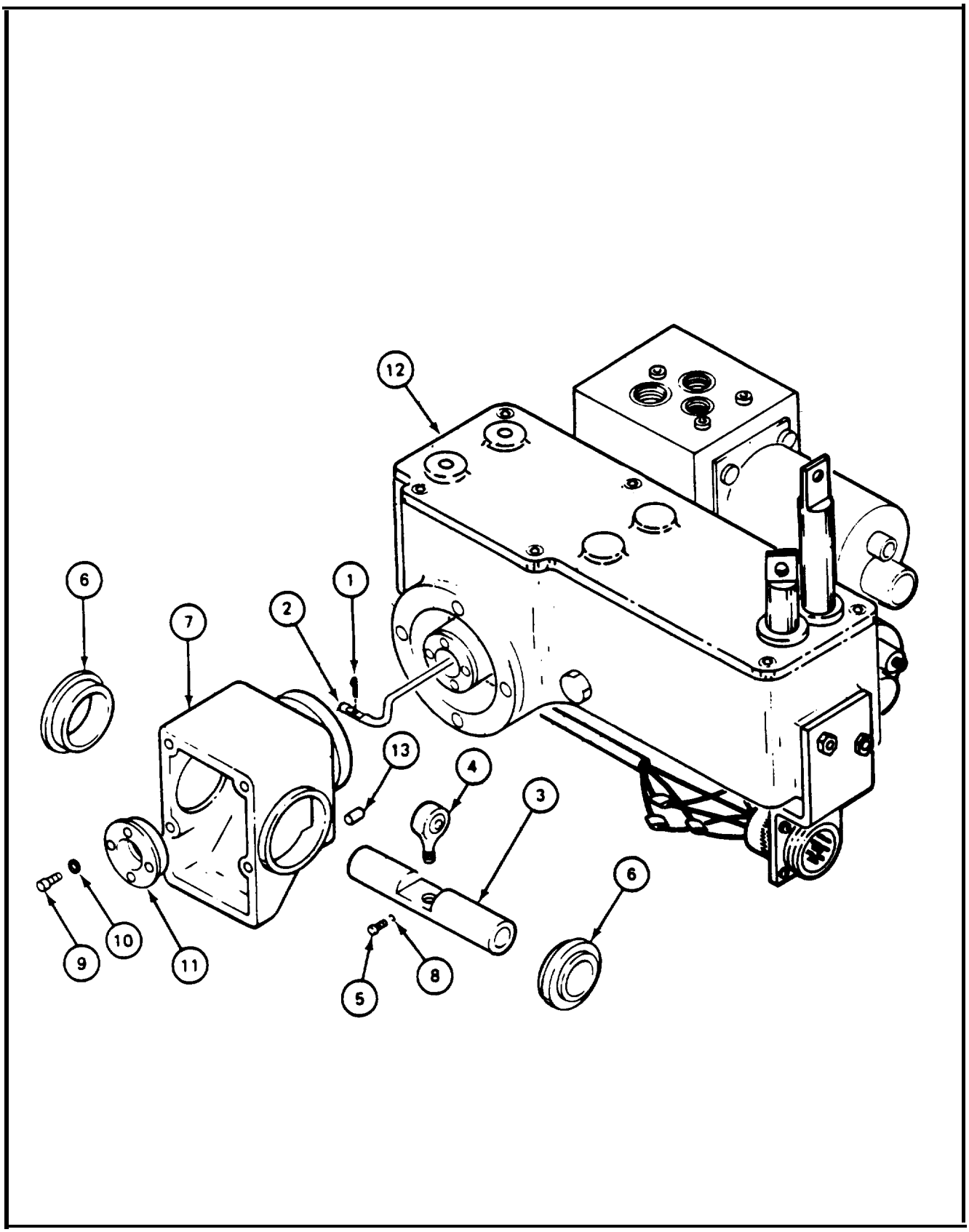
REFERENCES: JPG for procedures to:
Remove cotter pins
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove control box cover (para 13-82)
Remove handles (para 13-87)

13-92. CONTROL BOX REMOVAL AND DISASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using pliers, remove cotter pin (1) from rigid linkage (2) (JPG).
2.	Slide shaft (3) to side and remove rigid linkage (2) from rod end bearing (4).
3.	Using Allen wrench, remove setscrew (5) from shaft (3).
4.	Remove rod end bearing (4).
5.	Remove shaft (3) and two bearings (6) from box (7).
	NOTE Pellet (8) may remain in shaft (3).
6.	Using Allen wrench, put setscrew (5) in shaft (3) to remove pellet (8). Remove setscrew (5).
7.	Using hex head socket with speed handle, remove four screws (9), four lockwashers (10), and bushing (11) that attach control box (7) to housing (12).
8.	Remove control box (7) from housing (12).
	NOTE If stop pin (13) is to be removed, do step 9.
9.	Using hammer and punch, remove stop pin (13).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JFG). inspect control box (para 13-91).
	END OF TASK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13-93. CONTROL BOX ASSEMBLY AND INSTALLATION PROCEDURE

TOOLS: 5/32” hex head socket (3/8” drive)
Needle nose pliers
1/8” socket head screw key (Allen wrench)
3/8” drive speed handle
5/32” socket head screw key (Allen wrench)
Plastic face hammer
6” machinist steel rule (two)

SUPPLIES: Cotter pin, MS 24665-132
Grease (item 12, App. A)
Lead pellet (10911146)

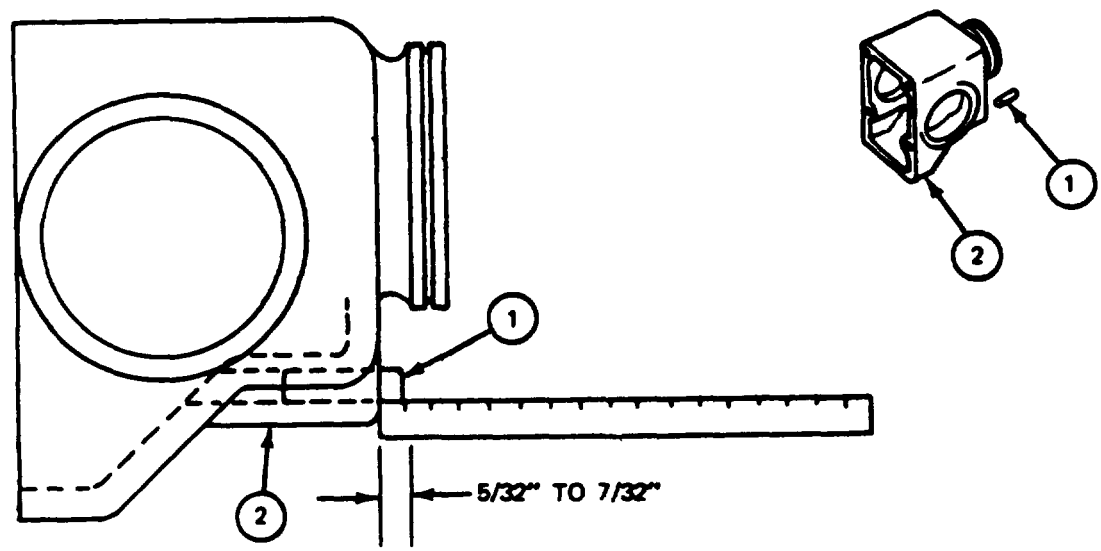
PERSONNEL: One

REFERENCES: JPG for procedures to:
Install cotter pins
Use machinist rule
Grease bearings

13-93. CONTROL BOX ASSEMBLY AND INSTALLATION PROCEDURE (CONT)

FRAME 1

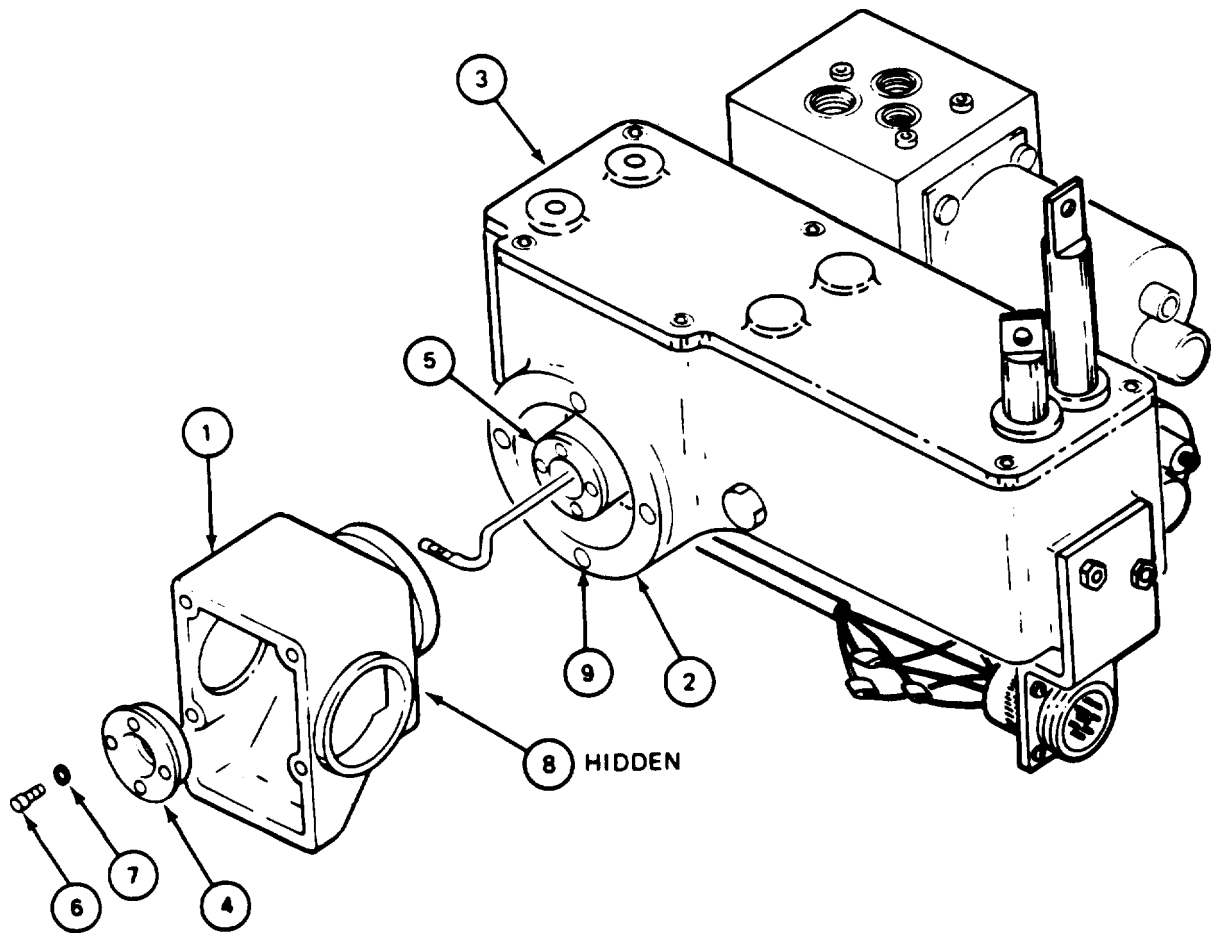
Step	Procedure
	NOTE If stop pin (1) is installed in control box (2), go to frame 2. **NOTE** Stop pin (1) should stick out of control box (2) between 5132" and 7/32".
1.	Using hammer, tap stop pin (1) in control box (2), while holding steel rule against control box (JPG). GO TO FRAME 2



13-93. CONTROL BOX ASSEMBLY AND INSTALLATION PROCEDURE (CONT)

FRAME 2

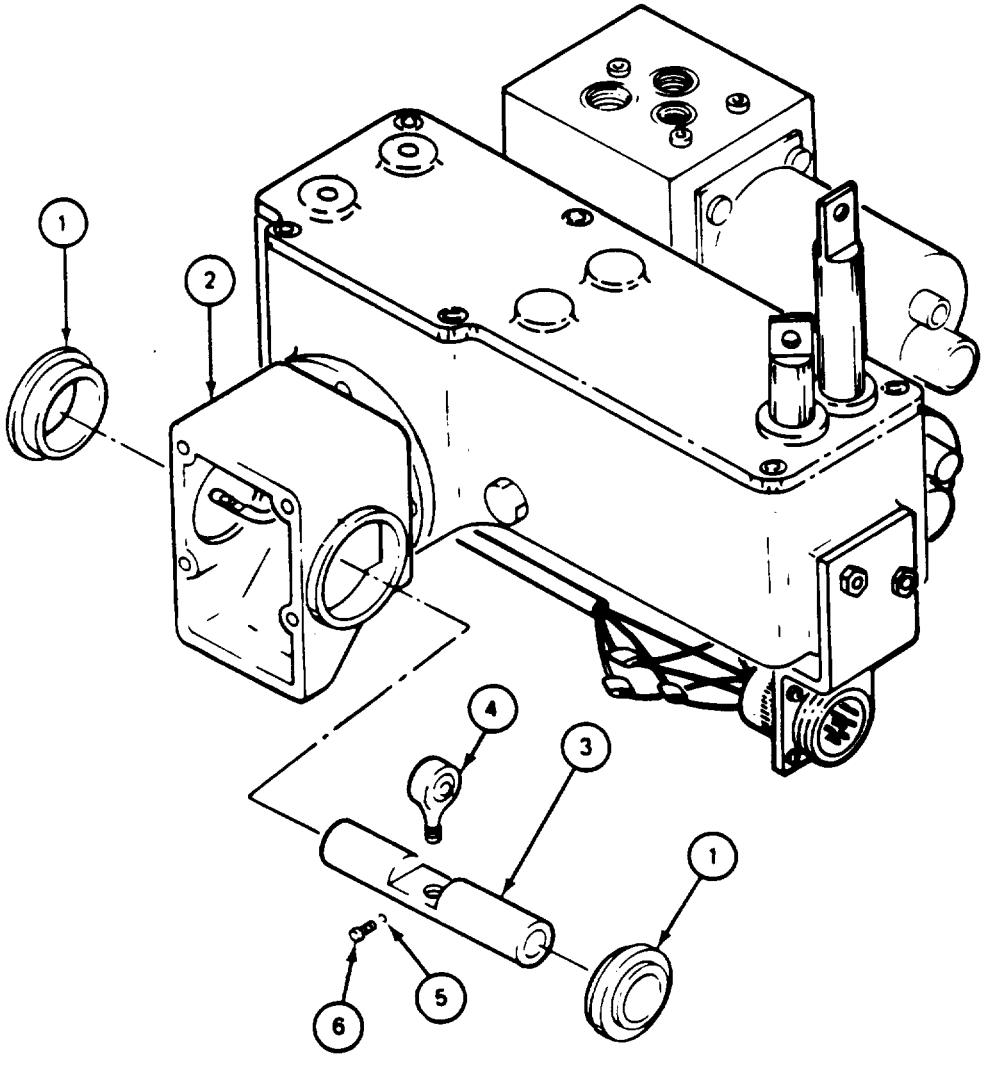
Step	Procedure
1.	Put flanged end of control box (1) inside cam bearing cover (2) on gunner's control (3).
	NOTE
	Small end of cam bushing (4) goes into gunner's control (3).
2.	Put cam bushing (4) inside control box (1) against cam (5). Line up screw holes.
3.	Using 5/32" Allen wrench, loosely attach cam bushing (4) to cam (5) with four screws (6) and four lockwashers (7).
4.	Line up stop pin (8) with bottom screw (9) of bearing cover (2).
5.	Using hex head socket with speed handle, tighten four screws (6).
	GO TO FRAME 3



13-93. CONTROL BOX ASSEMBLY AND INSTALLATION PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Lubricate two bearings (1) (JPG).
2.	Using hands. put two bearings (1) in box (2).
	NOTE Do not put grease in cutout area at center of shaft (3).
3.	Apply thin coating of grease on shaft (3) where it will go through bearings.
4.	Put shaft (3) through two bearings (1).
5.	Using hands, put rod end (4) in shaft (3).
6.	Using steel rule, measure from flat portion of shaft (3) to bottom of rod end (4) bearing opening. Adjust height of rod end (4) on shaft (3) to between 15/32” and 17/32”.
7.	Put new lead pellet (5) and setscrew (6) in hole of shaft (3).
8.	Using 1/8” Allen wrench, tighten setscrew (6) in hole of shaft (3).
	GO TO FRAME 4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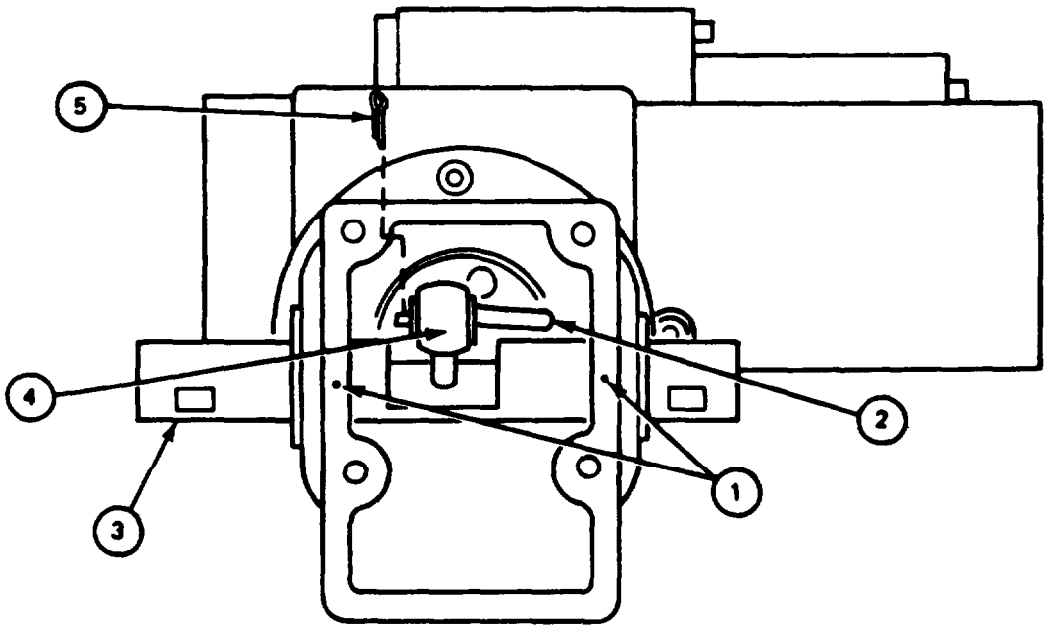
13-93. CONTROL BOX ASSEMBLY AND INSTALLATION PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Put one ruler across cover mounting surface (1) and use second ruler to measure from small part of rigid linkage (2) to cover mounting surface (first ruler). Measurement should read between 1-1/32" and 1-1/16".
	NOTE Turn rigid linkage (2) in to increase measurement and out to decrease measurement.
2.	If measurement is incorrect, adjust rigid linkage (2) to obtain proper measurement.
3.	Check that shaft (3) and rigid linkage (2) have film of grease on rubbing areas.
4.	Slide shaft (3) sideways, putting rigid linkage (2) in rod end (4).
5.	Using pliers, install cotter pin (5) in end of rigid linkage (2) (JPG).
	NOTE Follow-on Maintenance Action Required: **Install handles (para 13-88).** **Adjust gunner's control (para 13-79).**
	END OF TASK



13-94. HOUSING AND HOUSING COVER INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble housing (para 13-99)

GENERAL INSTRUCTIONS:

NOTE

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

FRAME 1

Step	Procedure
	SUPPORT SHOP WORK
1.	Take housing or cover to shop where inspection equipment is available.
2.	Make dimensional check.

Reference Letter	Point of Measurement	Measurement
A	ID of cover counterbore	0.3750 to 0.3765
B	ID of cover counterbore	0.6865 to 0.6875
C	Diameter of cover counterbore	0.3120 to 0.3135
D	ID of housing bores	0.3750 to 0.3765
E	ID of housing counterbores	0.6865 to 0.6875
F	Diameter of housing counterbore	0.3120 to 0.3135

NOTE

Tag parts that are out of tolerance.

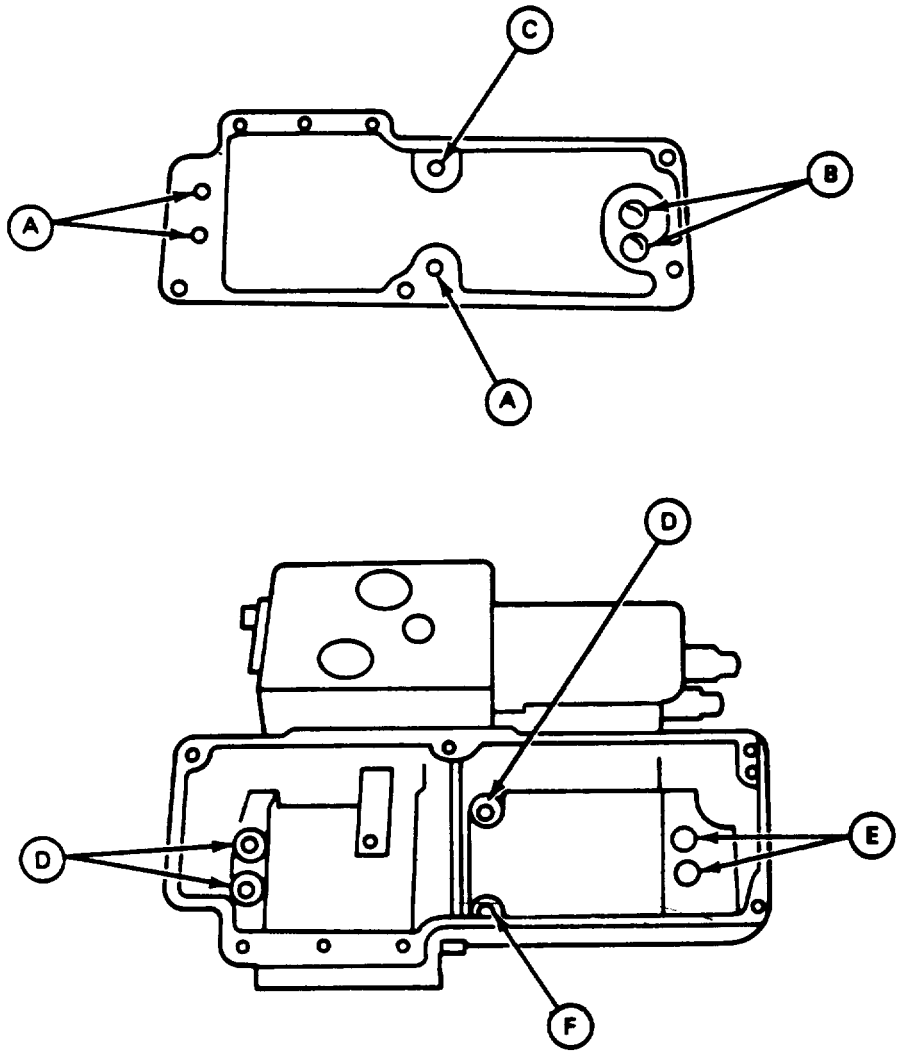
3. After support shop work, return parts to turret shop.

NOTE

If bearings in housing are out of tolerance, replace bearings (para 13-106).

If bearings in housing cover are out of tolerance, replace bearings (para 13-97).

END OF TASK


C
A
B
A
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D
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F

13-95. HOUSING COVER REMOVAL PROCEDURE

TOOLS: 3/16" socket head screw key (Allen 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

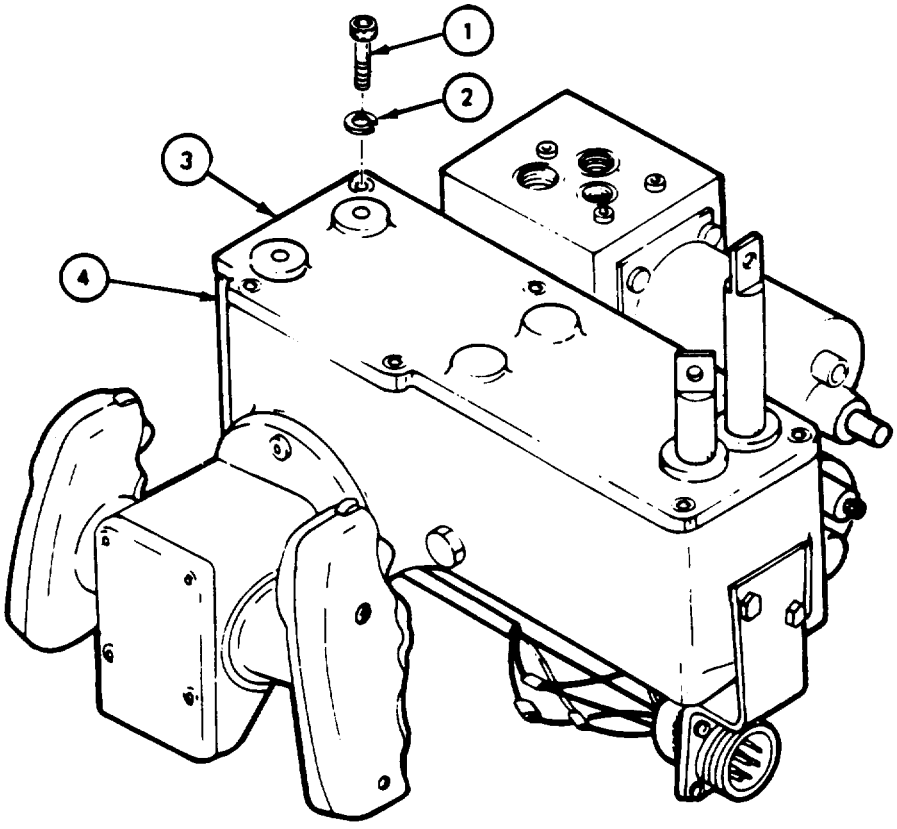
REFERENCES: TM 9-2350-222-20-2-3 for procedures to:
Remove gunner's control
JPG for procedures to:
Clean parts
Inspect and repair parts

EQUIPMENT CONDITION: Gunner's control removed (TM-20-2-3)

13-95. HOUSING COVER REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using Allen wrench, remove six screws (1) and six lockwashers (2) that attach cover (3) to housing (4).
	NOTE It may be necessary to use hammer to tap cover (3) loose from housing (4).
2.	Remove cover (3).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Inspect housing cover (para 13-94).
	END OF TASK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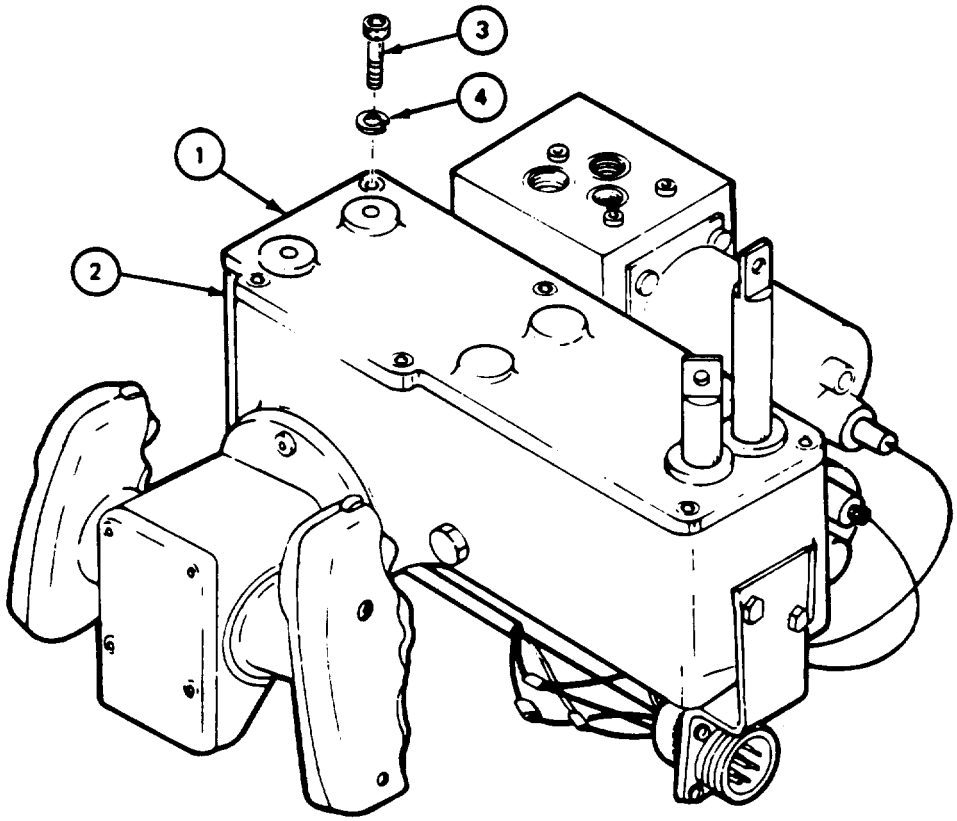
13-96. HOUSING COVER INSTALLATION PROCEDURE

TOOLS: 3/16” socket head screw key (Allen wrench)

PERSONNEL: One

FRAME 1

Step	Procedure
1.	Put cover (1) on housing (2).
2.	Using Allen wrench, attach cover (1) to housing (2) with six screws (3) and six lockwashers (4).
	END OF TASK



13-97. HOUSING COVER REPAIR PROCEDURE

SUPPLIES: Pins 7974645 (two)
Bearings MS 17131-13 (two)

PERSONNEL: One

PRELIMINARY PROCEDURES: Inspect housing cover (para 13-94)

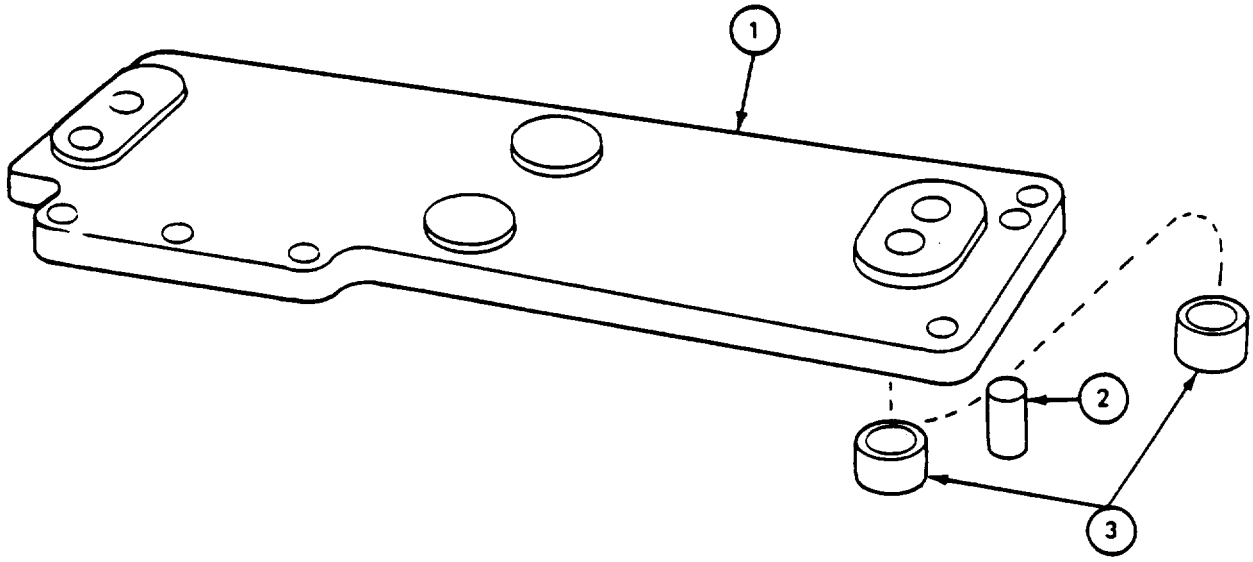
GENERAL INSTRUCTIONS:

NOTE

This procedure is used to replace bad pins and bearings in housing cover. If pins or bearings are bad, order repair part or next higher assembly.

FRAME 1

Step	Procedure
	SUPPORT SHOP WORK
1.	Take cover (1) to shop where press is available.
	a. Press out two pins (2). b. Press out two bearings (3). c. Press in two bearings (3). d. Press in two pins (2).
2.	After support shop work, return cover to turret shop.
	END OF TASK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13-98. TRAVERSING AND ELEVATING ARMS INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Remove traversing and elevating arms (para 13-99)

GENERAL INSTRUCTIONS:

NOTE

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

FRAME 1

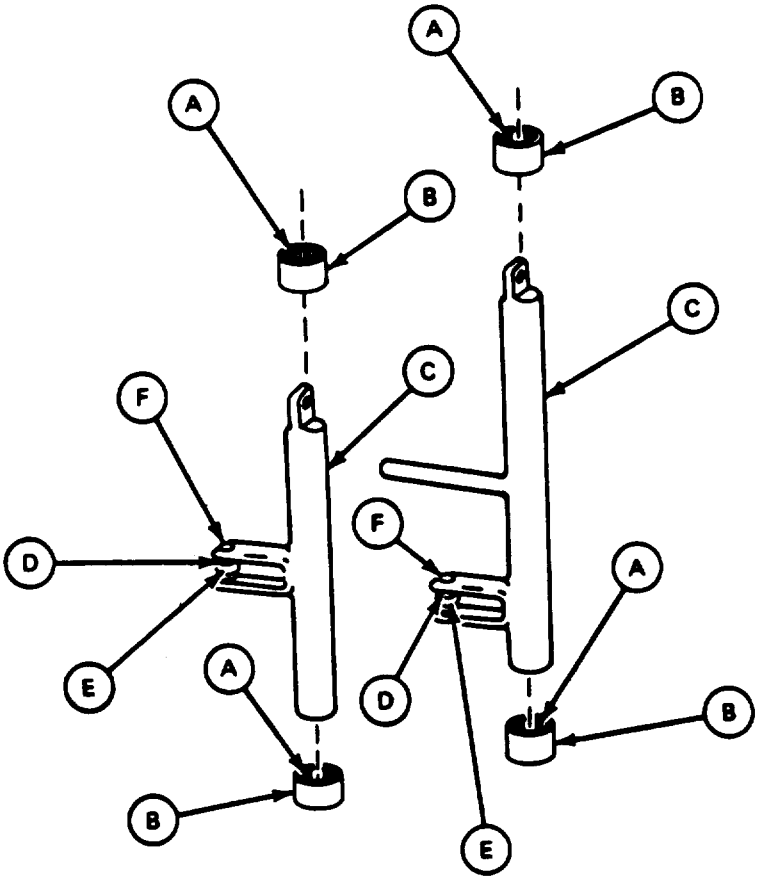
Step	Procedure
	SUPPORT SHOP WORK
1.	Take arms and linkage parts to shop where inspection equipment is available.
2.	Make dimensional check.

Reference Letter	Point of Measurement	Measurement
A	ID of bearing	0.5000 to 0.5005
B	OD of bearing	0.6870 to 0.6880
C	OD of shafts	0.4975 to 0.4990
D	OD of roller	0.3746 to 0.3750
E	ID of roller	0.1898 to 0.1905
F	OD of pin	0.1893 to 0.1898

NOTE

Tag parts that are out of tolerance.

GO TO FRAME 2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E
A
B

13-98. TRAVERSING AND ELEVATING ARMS INSPECTION PROCEDURE (CONT)

FRAME 2

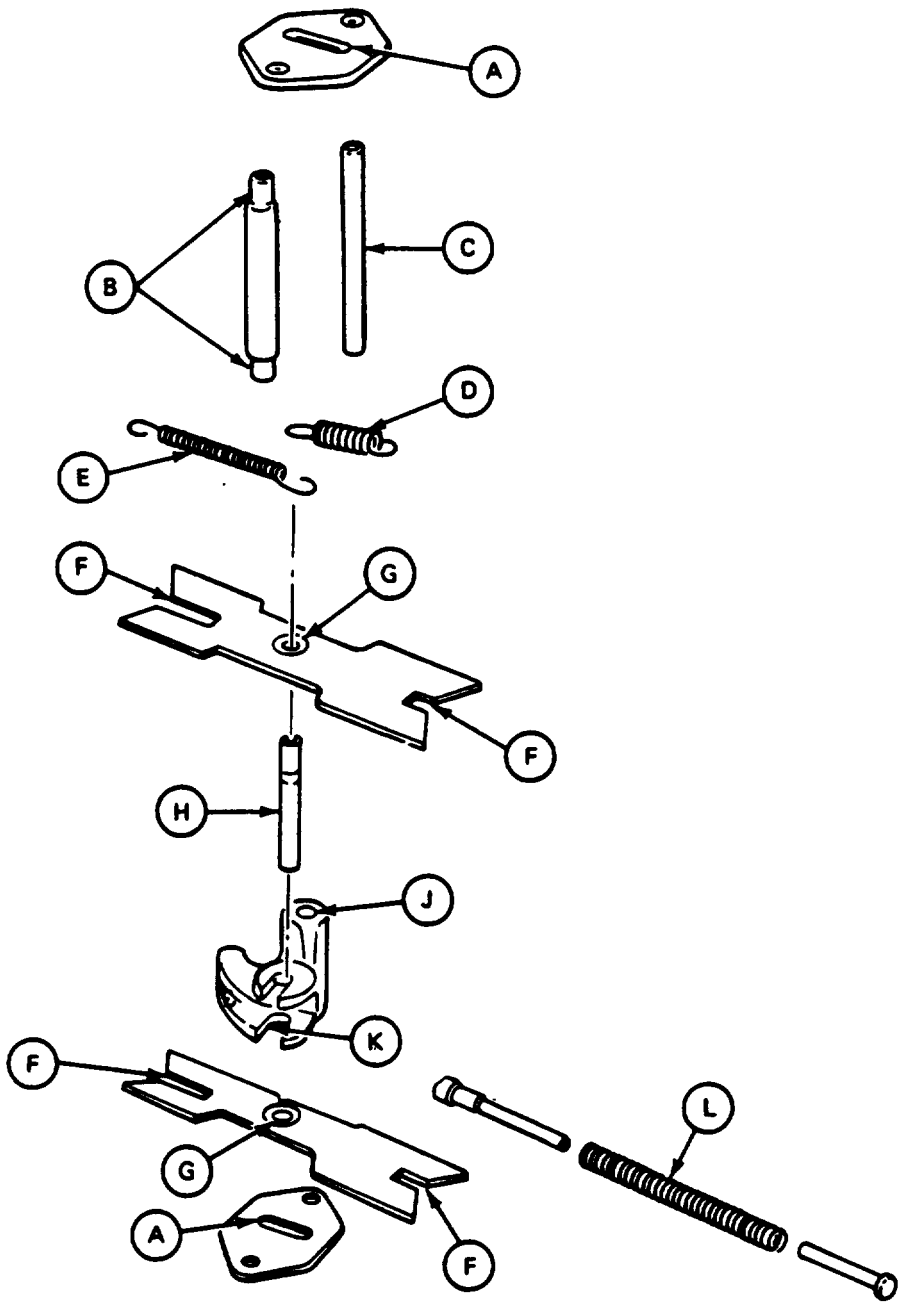
Step	Procedure
	SUPPORT SHOP WORK
1.	Make dimensional check.

Reference Letter	Point of Measurement	Measurement
A	Width of slot in blade plate	0.3760 to 0.3800
B	Diameter of pin ends	0.3105 to 0.3115
C	OD of blade plate pin	0.3750 to 0.3735
D	Spring:	
	Free Length	1-5/8 inches
	Load required to extend 2 inches	4.8 to 6.8 lb
	Load required to extend to 2-7/8 inches	11 to 13 1b
E	Spring:	
	Free Length	3.4800 to 3.5200
	Load required to extend to 4 inches	8 to 10 lb
	Load required to extend to 4.8750	23 to 25 lb
F	Width of slot in elevating and traversing blade	0.3750 to 0.3756
G	ID of hole in blade	0.3750 to 0.3760
H	OD of pin	0.3745 to 0.3750
J	ID of override arm bore	0.3750 to 0.3765
K	Width of slots in override arm	0.3760 to 0.3768
L	Spring:	
	Free Length	0.9170 to 0.9470
	Load required to compress to 4 inches	26.1 to 81.9 lb
	Load required to compress to 4.87 inches	18.45 to 22.55 lb

NOTE

Tag parts that are out of tolerance.

GO TO FRAME 3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L

13-98. TRAVERSING AND ELEVATING ARMS INSPECTION PROCEDURE (CONT)

FRAME 3

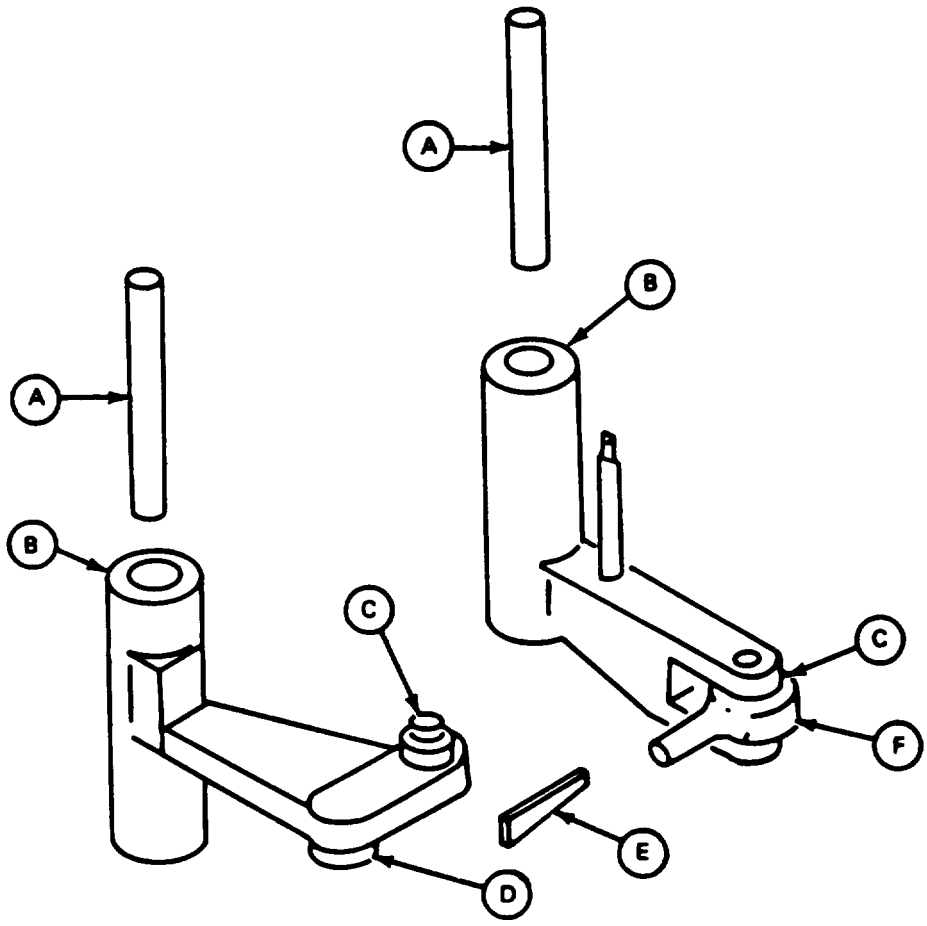
Step	Procedure
	SUPPORT SHOP WORK
1.	Make dimensional check.

Reference Letter	Point of Measurement	Measurement
A	Diameter of pins	0.3735 to 0.3745
B	ID of arm bore	0.3750 to 0.3765
C	OD of elevating and traversing rollers	0.3748 to 0.3750
D	OD of traversing arm bearing	0.6840 to 0.6870
E	Load required to deflect spring 1/8 inch	4 to 6 1b
F	ID of bearing	0.1895 to 0.1900

NOTE

Tag parts that are out of tolerance.

GO TO FRAME 4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13-98. TRAVERSING AND ELEVATING ARMS INSPECTION PROCEDURE (CONT)

FRAME 4

Step	Procedure
	SUPPORT SHOP WORK
1.	Make dimensional check.

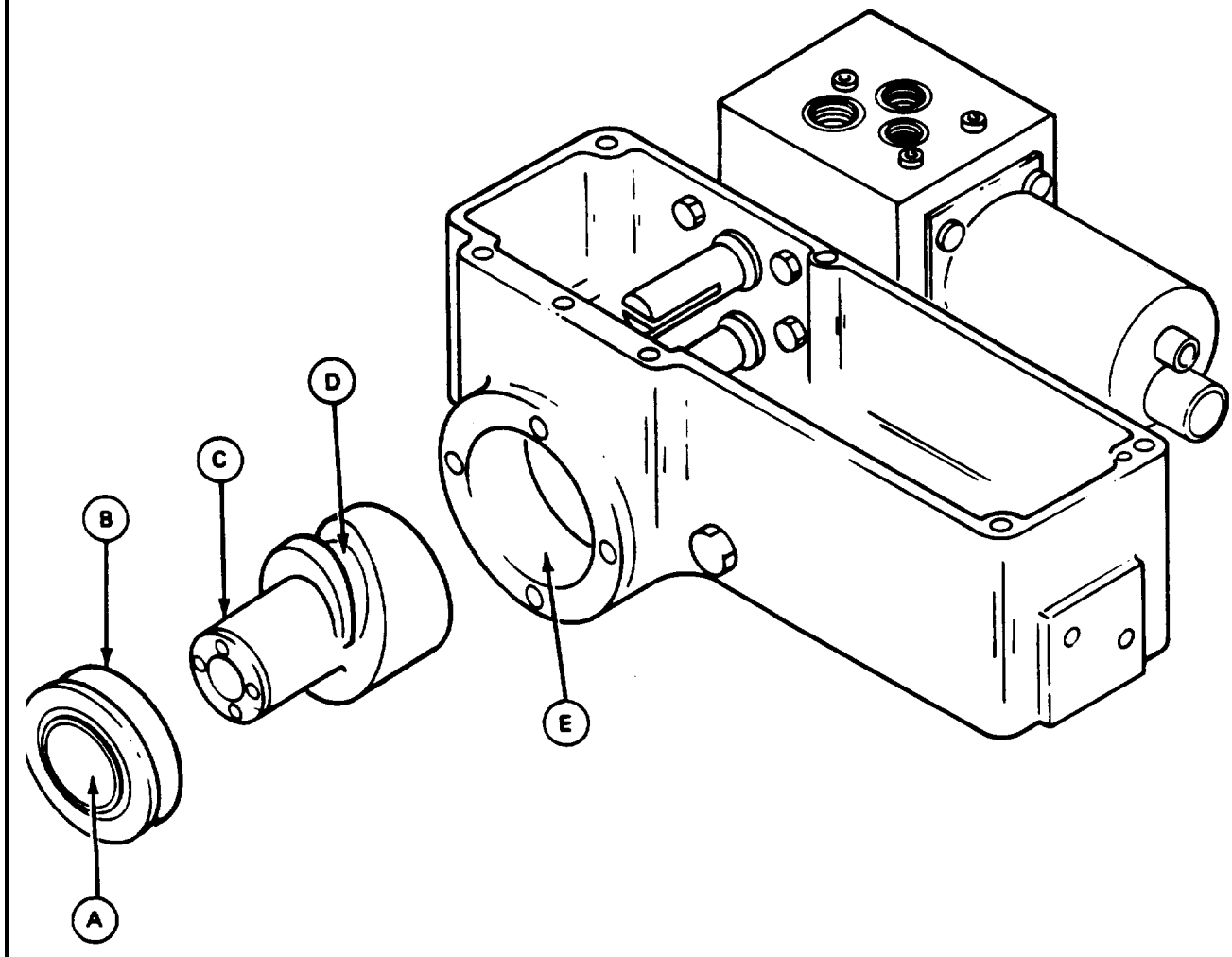
Reference Letter	Point of Measurement	Measurement
A	ID of bearing	1.3775 to 1.3780
B	OD of bearing	2.8341 to 2.8346
C	OD of cam shank	1.3760 to 1.3775
D	Width of traversing cam groove	0.6872 to 0.6882
E	ID of housing bore	2.8350 to 2.8358

NOTE

Tag parts that are out of tolerance.

2. After support shop work, return parts to turret shop.

END OF TASK


A
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13-99. TRAVERSING AND ELEVATING ARMS REMOVAL AND HOUSING DISASSEMBLY PROCEDURE

TOOLS: External retaining ring pliers
1/4" flat tip screwdriver
3/16" socket head screw key (Allen wrench)
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Screw, 10-24 thread, 1-1/2" long
10 flat washer
Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

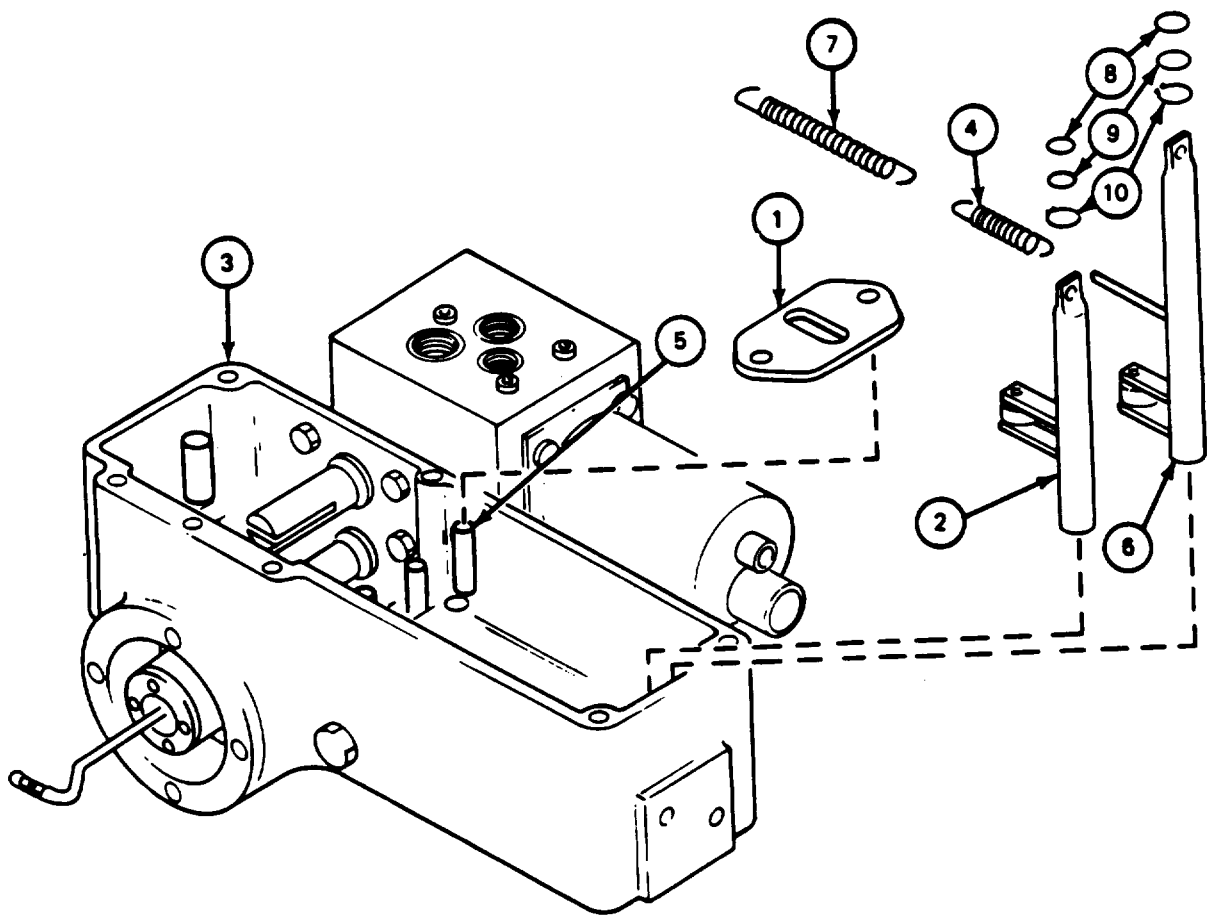
REFERENCES: JPG for procedures to:
Remove retaining rings
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Test gunner's control (para 13-78)
Remove handles (para 13-87)
Remove control box (para 13-92)
Remove harness and bracket (para 13-84)
Remove housing cover (para 13-95)

13-99. TRAVERSING AND ELEVATING ARMS REMOVAL AND HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 1

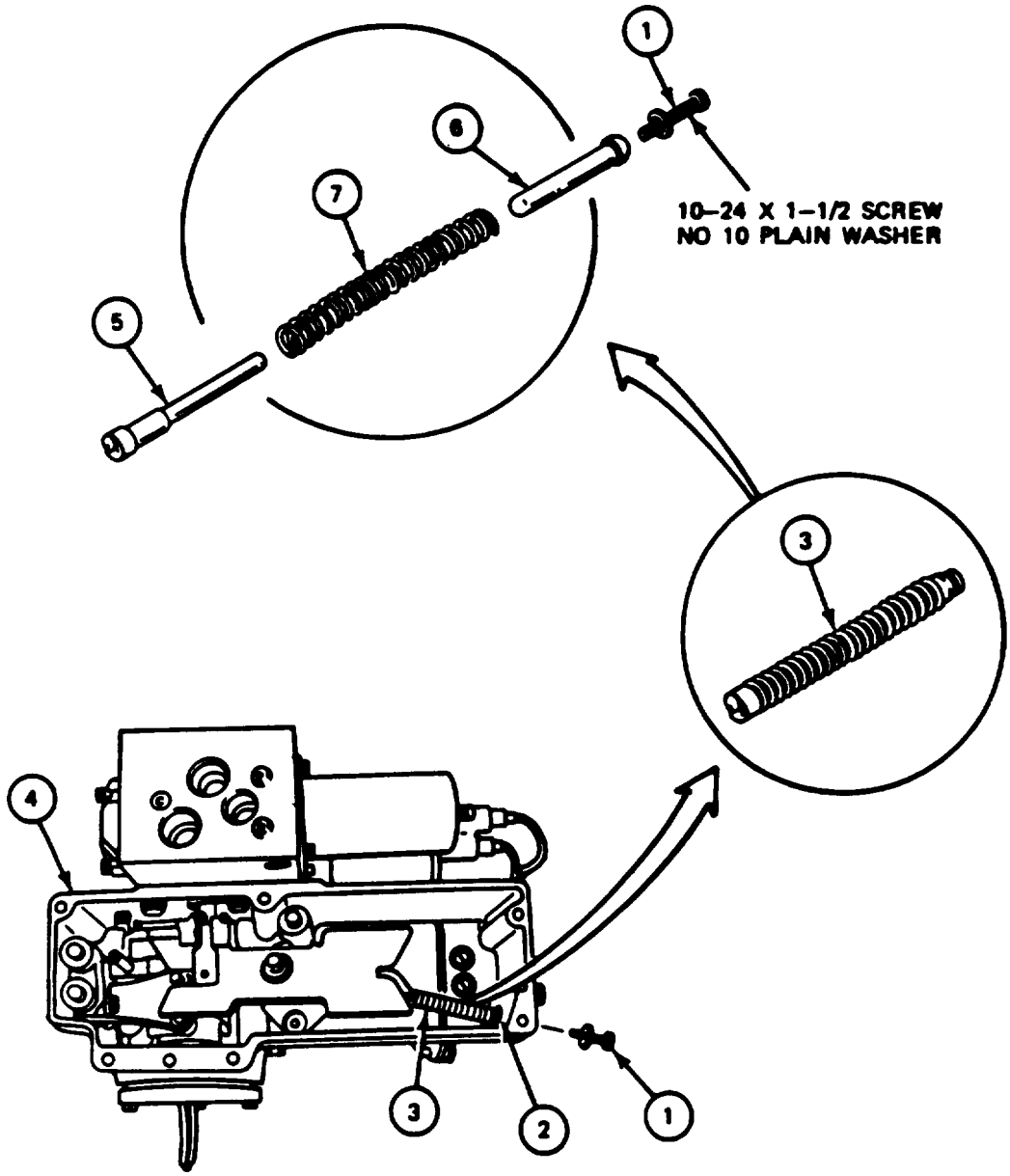
Step	Procedure
1.	Using hands, remove upper blade plate (1).
2.	Using hands, pull traverse shaft (2) from housing (3).
3.	Using hands, remove spring (4) from pin (5).
4.	Using hands, pull elevation shaft (6) from housing (3). Remove spring (4).
5.	Using hands, remove spring (7) from pins in housing (3).
6.	Using hands, remove shims (8) and flat washer (9) from shafts (2) and (6).
7.	Using pliers, remove retaining rings (10) from shafts (2) and (6) (JPG).
	GO TO FRAME 2



13-99. TRAVERSING AND ELEVATING ARMS REMOVAL AND HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Put screw with washer (1) through access hole (2) into spring assembly (3).
2.	Using screwdriver, tighten screw and washer (1) until spring assembly (3) is compressed and free of housing (4).
3.	Using hands, remove spring assembly (3) from housing (4).
	WARNING Spring (7) is compressed. Parts could fly out and hurt you if not held tightly when spring and washer (1) are removed.
	NOTE If spring assembly needs to be disassembled, do step 4; if not, go to frame 3.
4.	Using screwdriver, remove screw and washer (1). Remove guide (5) and retainer (6) from spring (7). GO TO FRAME 3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10–24 X 1–1/2 SCREW
NO 10 PLAIN WASHER
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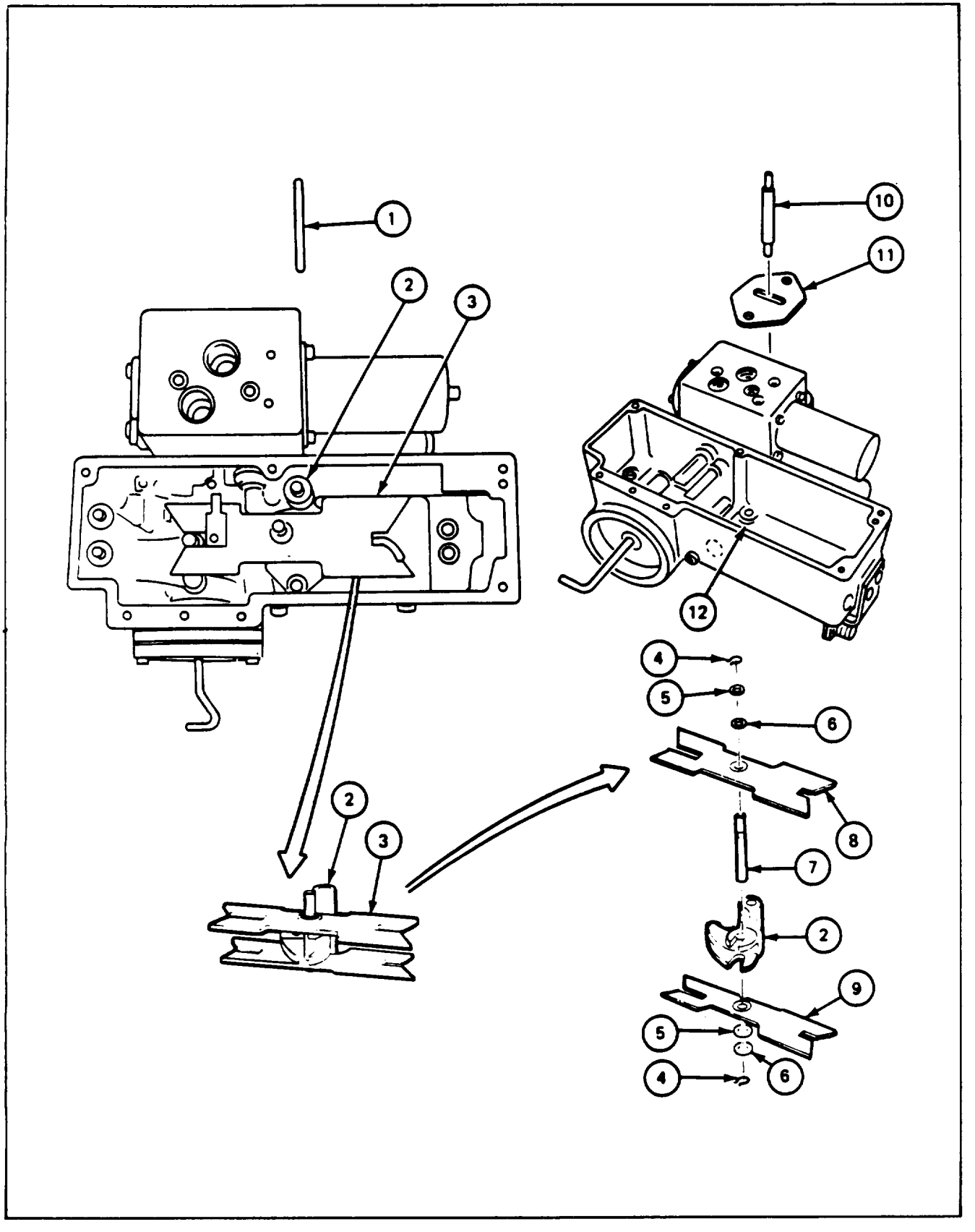
1

13-99. TRAVERSING AND ELEVATING ARMS REMOVAL AND HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Using hands, remove regulating plate pin (1) from override lever (2).
2.	Using hands, remove blade assembly (3) and override lever (2) as a unit.
3.	Remove override lever (2) from blade assembly (3).
4.	Using pliers, remove two retaining rings (4), two washers (5), and shims (6) from blade pin **(7)** (JPG).
5.	Remove traversing blade (8) and elevating blade (9) from blade pin (7).
6.	Using hands, remove regulating plate pin (10) and lower regulating plate (11) from housing (12).
	GO TO FRAME 4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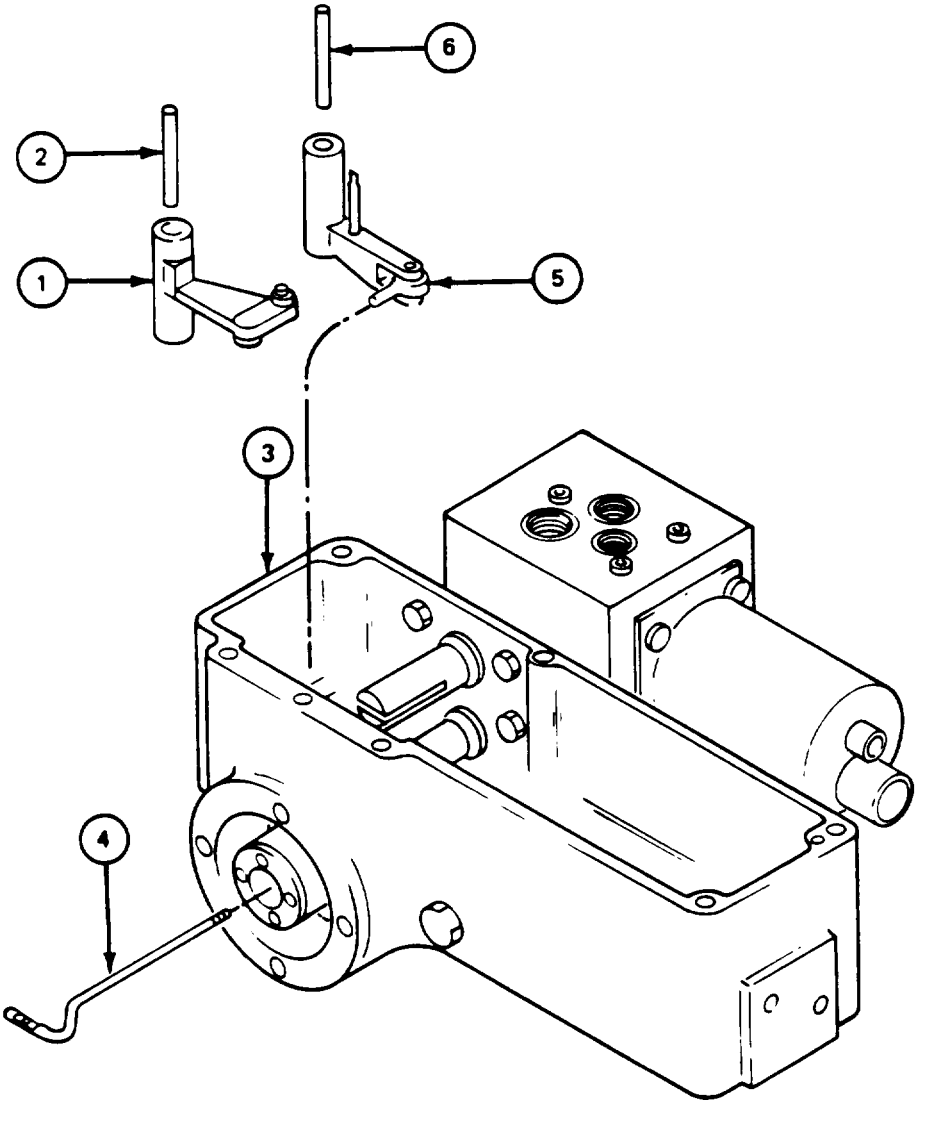
13-99. TRAVERSING AND ELEVATING ARMS REMOVAL AND HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 4

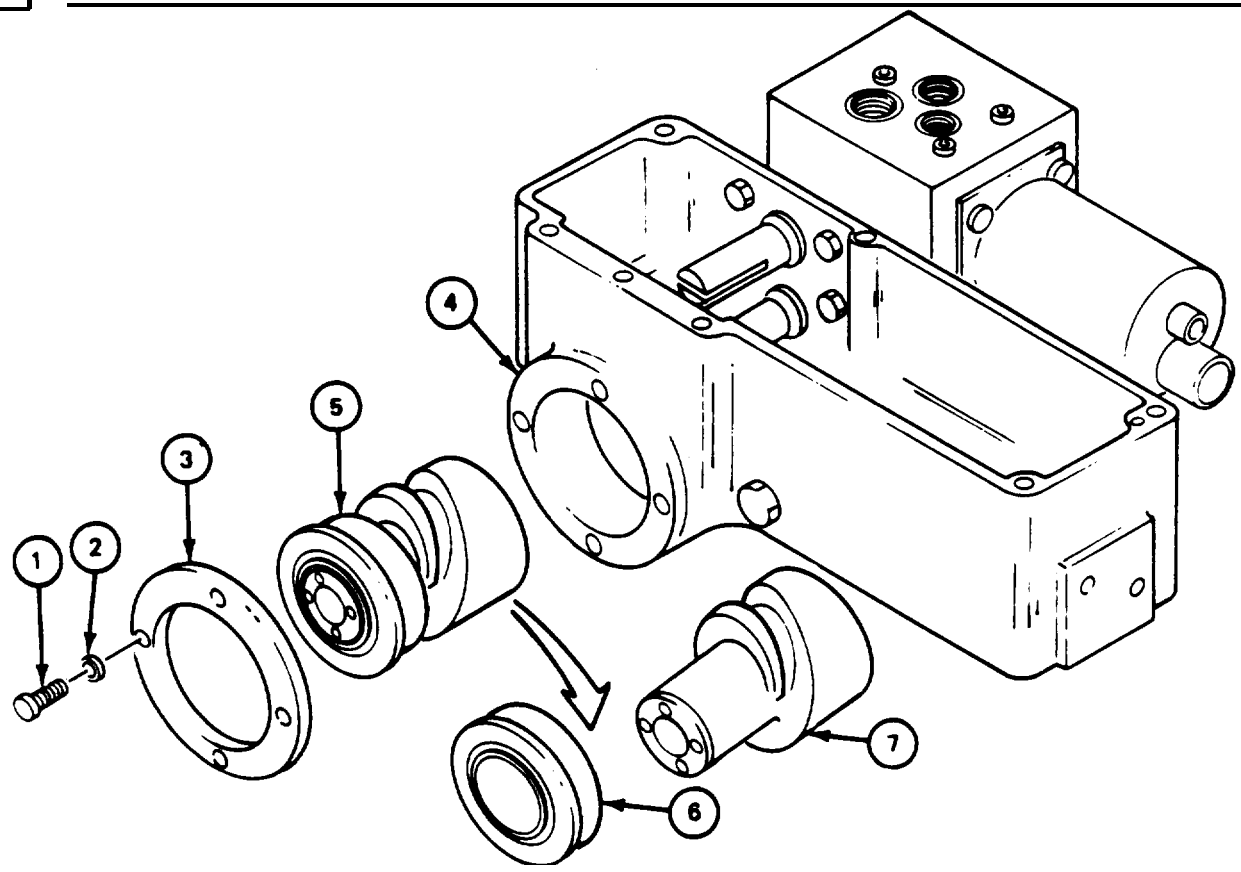
Step	Procedure
1.	Using hands, remove traversing arm (1) and traversing arm pin (2) from housing (3),
2.	Using hands, unscrew rigid linkage (4) from elevating arm assembly (5).
3.	Using hands, remove elevating arm (5) and elevating arm pin (6) from housing (3).
	GO TO FRAME 5



13-99. TRAVERSING AND ELEVATING ARMS REMOVAL AND HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 5

Step	Procedure
1.	Using Allen wrench, remove four screws (1) and four lockwashers (2) that attach cam bearing cover (3) to housing (4).
2.	Using hands, remove cam bearing cover (3) and bearing cam assembly (5) from housing (4).
3.	Using hands, separate bearing (6) from cam (7).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Inspect traversing and elevating arms (para 13-98).
	END OF TASK



13-100. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE

TOOLS: Plastic face hammer
External retaining ring pliers
6” machinist steel rule
Feeler gauge, 0.0015" to 0.025”
1/4” flat tip screwdriver
3/16” socket head screw key (Allen wrench)

SUPPLIES: Screw, 10-24 thread, 1-1/2” long
#10 flat washer

PERSONNEL: One

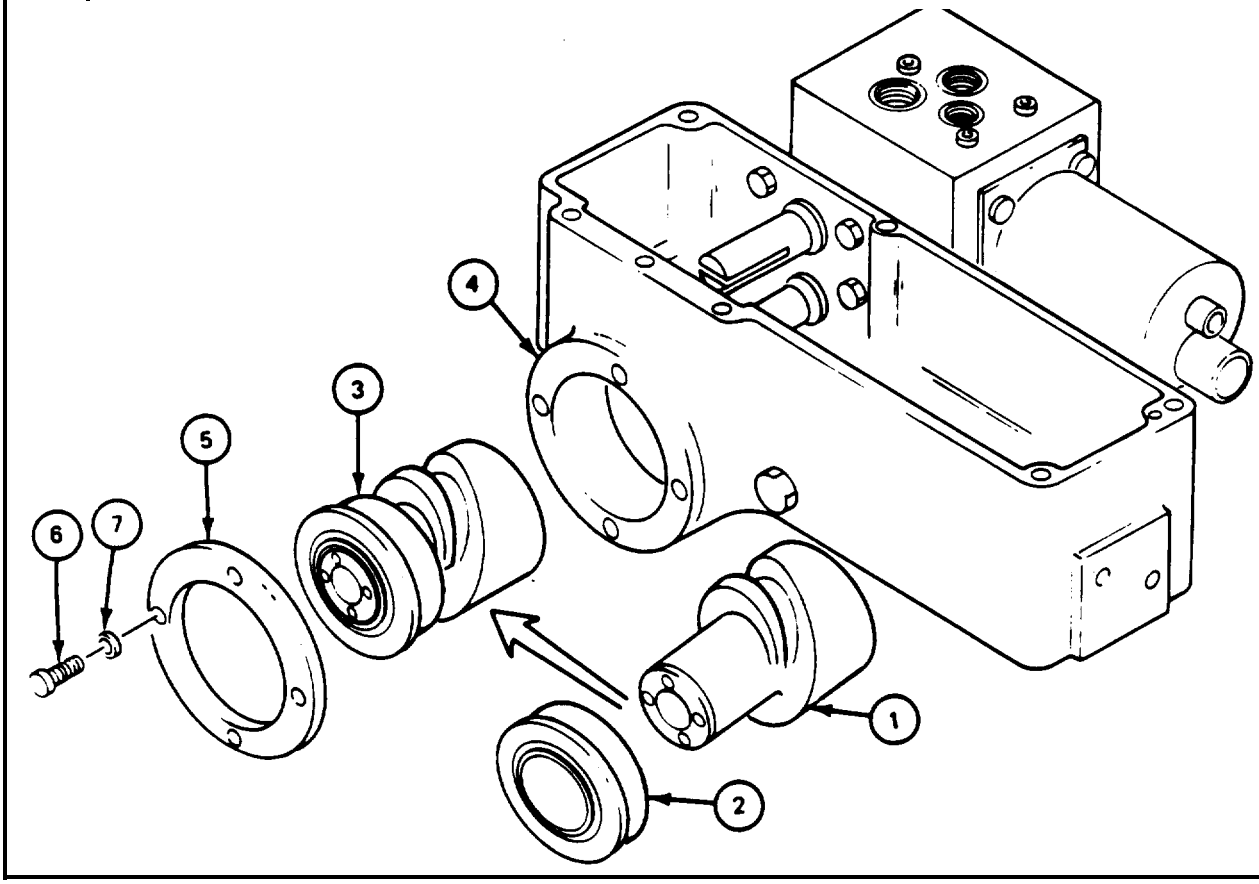
REFERENCES: JPG for procedures to:
Install retaining rings
Use feeler gauge

PRELIMINARY PROCEDURES: Assemble traversing arm (para 13-102)

13-100. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 1

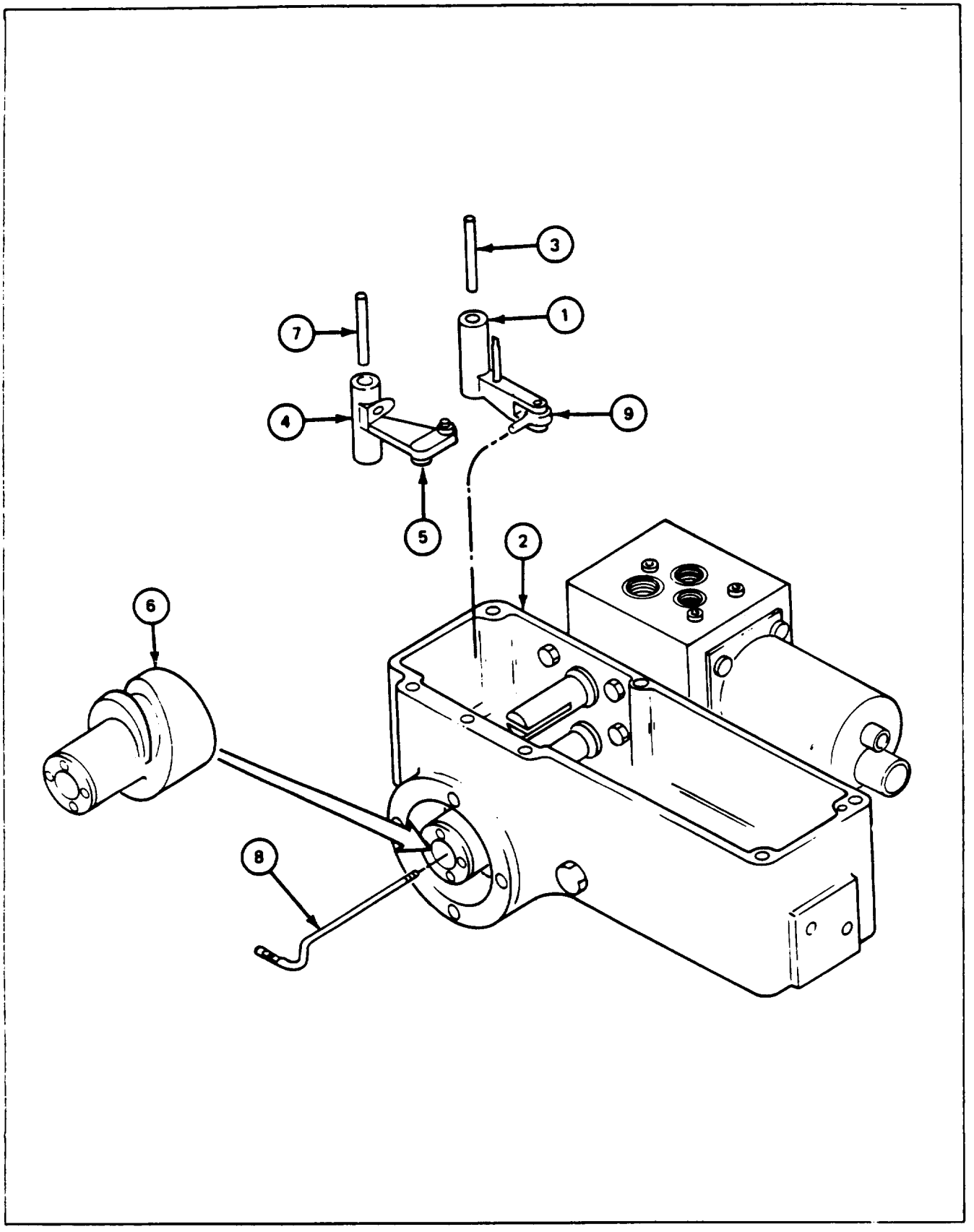
Step	Procedure
1.	Using hands, put cam (1) in bearing (2).
2.	Using fingers, push cam bearing assembly (3) in housing (4).
3.	Put cam bearing cover (5) over cam bearing assembly (3), with counterbored side of screw holes facing out. Line up all four screw holes with holes in housing (4).
	NOTE Two screws on sides will stick out farther than top and bottom screws. Side screws are traverse stop screws for box.
4.	Using 3/16" Allen wrench, install four screws (6) and four lockwashers (7) that attach cam bearing cover (5) to housing (4).
	GO TO FRAME 2



13-100. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Put elevating arm (1) in housing (2). Line up with elevating pin hole in housing.
2.	Put elevating arm pin (3) through elevating arm (1), and in elevating pin hole in housing (2). Tap pin gently with hammer if hole in housing is tight.
3.	Put traversing arm (4) in housing (2). Put cam roller (5) in slot of cam (6), lining up traversing arm with traversing arm pin hole in housing.
4.	Put traversing arm pin (7) through traversing arm (4) and in traversing pin hole in housing (2).
5.	Using hands, put rigid linkage (8) through hole in cam (6). Screw rigid linkage into rod end (9).
	GO TO FRAME 3


3
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2
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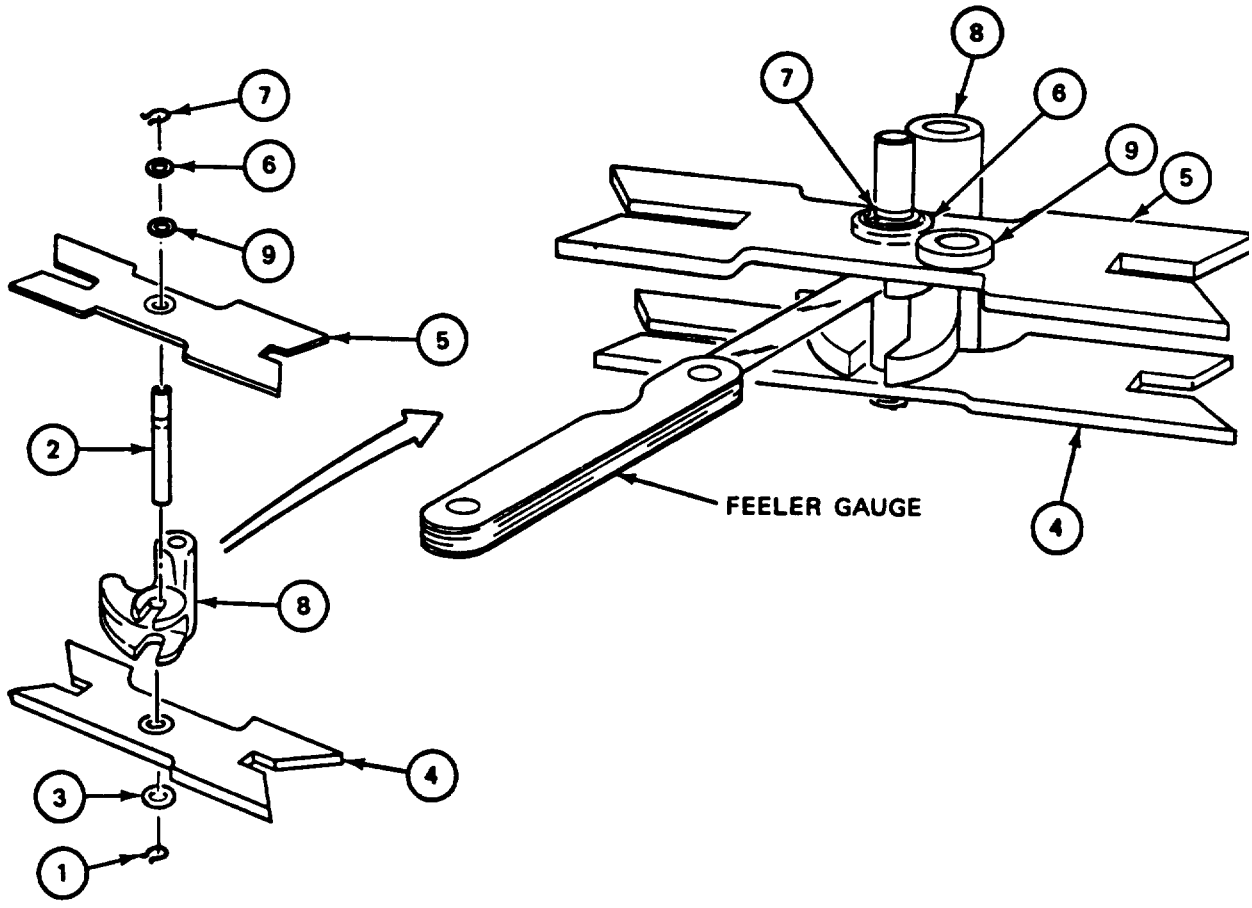
13-100. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Using pliers, install retaining ring (1) on lower end of blade pin (2) (JPG). NOTE Elevating blade (4) should be placed on blade pin (2) so that long slot of blade is to your left and pin hole in blade is close to edge nearest you. Traversing blade (5) should be placed on blade pin so that long slot of blade is to your left and pin hole in blade is close to edge away from you. Part numbers should face up.
2.	Put washer (3). elevating blade (4), traversing blade (5), and washer (6) on blade pin (2).
3.	Using pliers, install retaining ring (7) in narrow groove at top of blade pin (2) (JPG).
4.	Put override lever (8) between blades (4) and (5). Make sure slots in lever are around blade pin (2). NOTE Feeler gauge is used to measure gap between override lever (8) and traversing blade (5) (JPG).
5.	Slide shims (9) under edge of washer (6) until measurement of gap is between 0.001" and 0.008".
6.	Using pliers, remove retaining ring (7) and washer (6) (JPG).
7.	Put shims (9) (from step 5) on blade pin (2).
8.	Put washer (6) on blade pin (2).
9.	Using pliers, install retaining ring (7) in narrow groove at top of pin (2) (JPG). GO TO FRAME 4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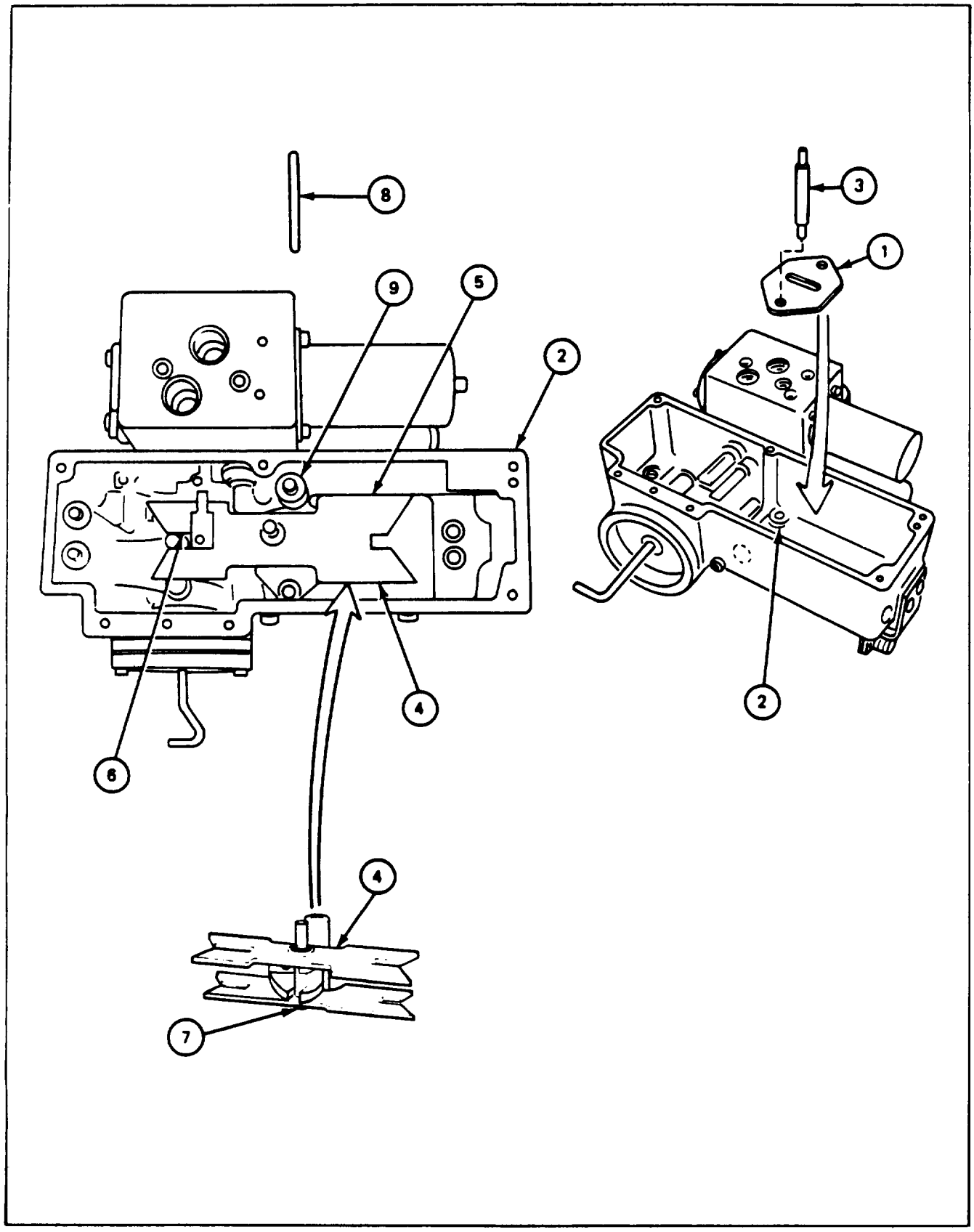
FEELER GAUGE
4

13-100. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Put lower regulating blade (1) in bottom of housing (2) with small hole to front. Line up pin holes and put in regulating plate pin (3).
2.	Put blade and override lever assembly (4) in housing (2).
3.	Slide long slots of two blades (5) into slots and around two rollers of two hydraulic valve spools (6).
4.	Put lower end of blade pin (7) in slot of lower regulating plate (1).
	NOTE It may be necessary to use plastic face hammer to put in pin (8).
5.	Put pin (8) through override arm (9), lower regulating plate (1), and into hole in bottom of housing (2).
	GO TO FRAME 5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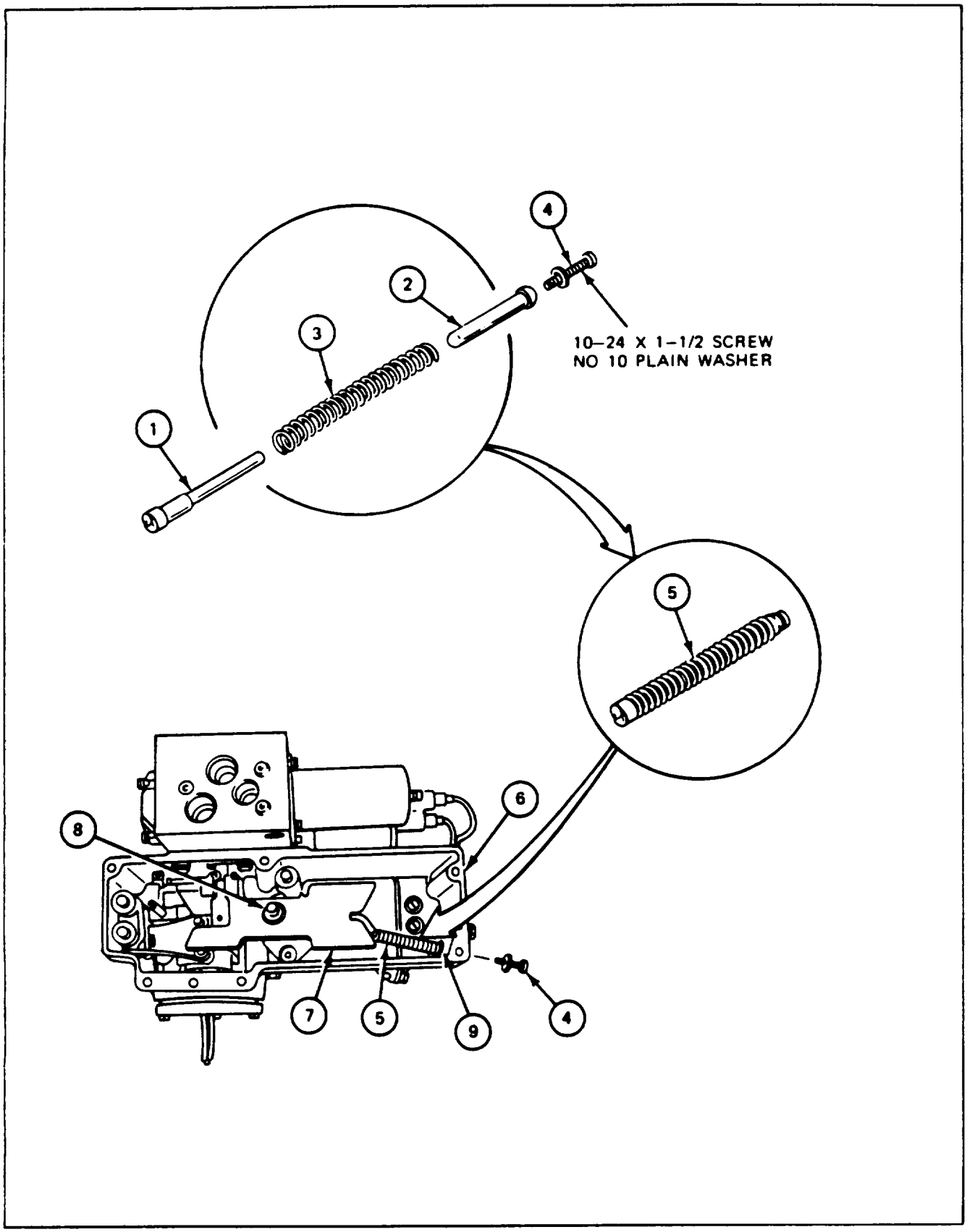
13-100. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 5

Step	Procedure
1.	Using fingers, put guide (1) and retainer (2) in spring (3).
2.	Using screwdriver, and washer with screw (4), compress spring (3) as far as possible.
3.	Using fingers, put spring assembly (5) in housing (6) with guide end between two blades (7).
4.	Put groove of guide (1) around blade pin (8). Line up retainer (2) with access hole (9) in housing (6).
5.	Hold spring assembly (5) in place. Using screwdriver, remove screw and washer (4).
	GO TO FRAME 6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10–24 X 1–1/2 SCREW
NO 10 PLAIN WASHER
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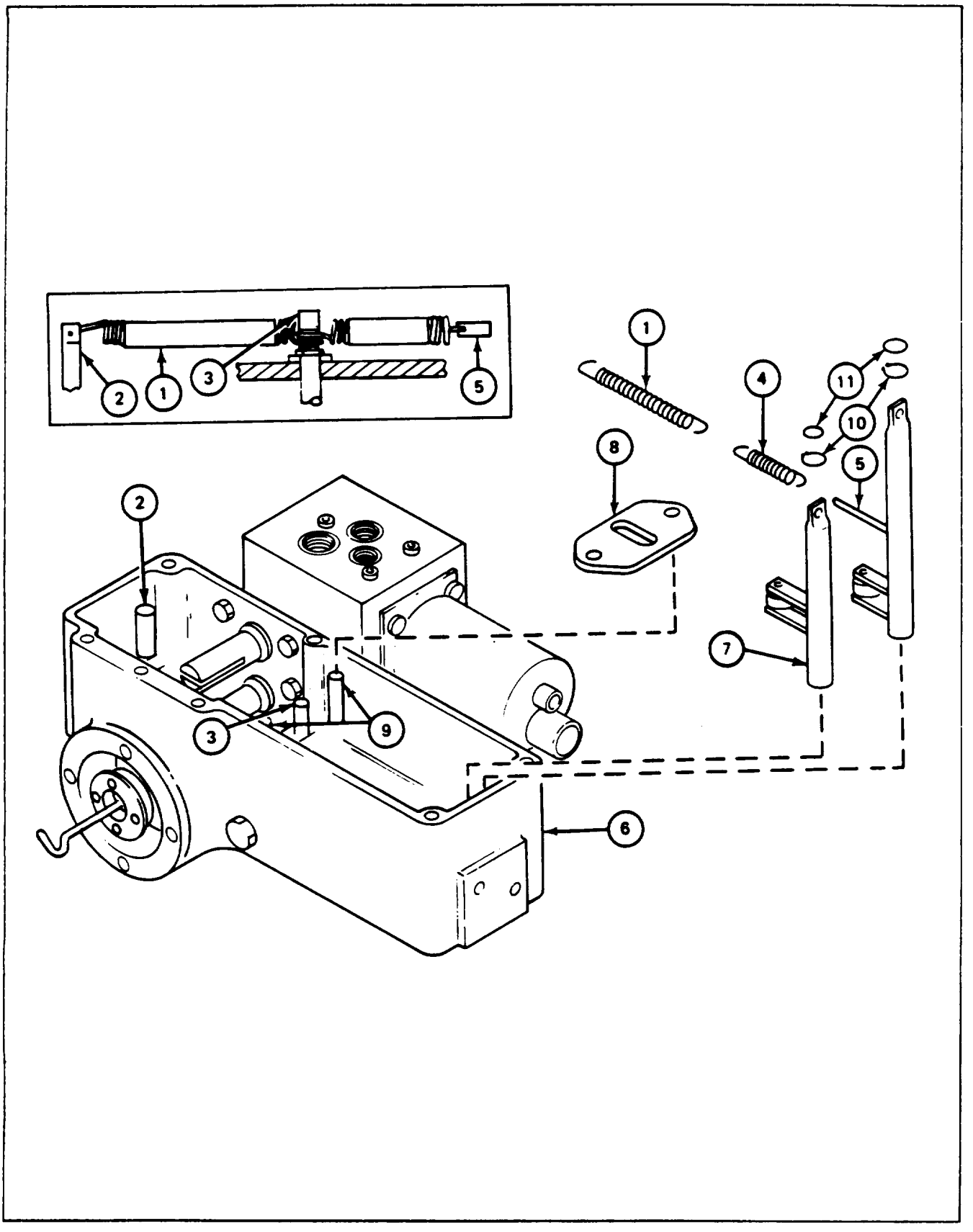
13-100. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 6

Step	Procedure
1.	Using hands, hook small loop end of spring (1) through hole in elevation arm spring pin (2).
2.	Using hands, hook large loop of spring (1) over blade pin (3) and seat loop in groove in blade pin (3).
3.	Using hands, hook small loop end of spring (4) through hole in spring pin of elevation shaft (5).
4.	Using hands, hook large loop of spring (4) over blade pin (3), seat loop in groove on blade pin (3), and put elevation shaft (5) in bearing in housing (6).
5.	Put traverse shaft (7) in bearing in housing (6).
6.	Using hands, put upper regulating plate (8) on two regulating plate pins (9) and blade pin (3).
7.	Using pliers, put one of two retaining rings (10) on groove of elevation shaft (5) and second one on traverse shaft (7) (JPG).
8.	Using hands, put one of two flat washers (11) on elevation shaft (5) and second one on traverse shaft (7).
	GO TO FRAME 7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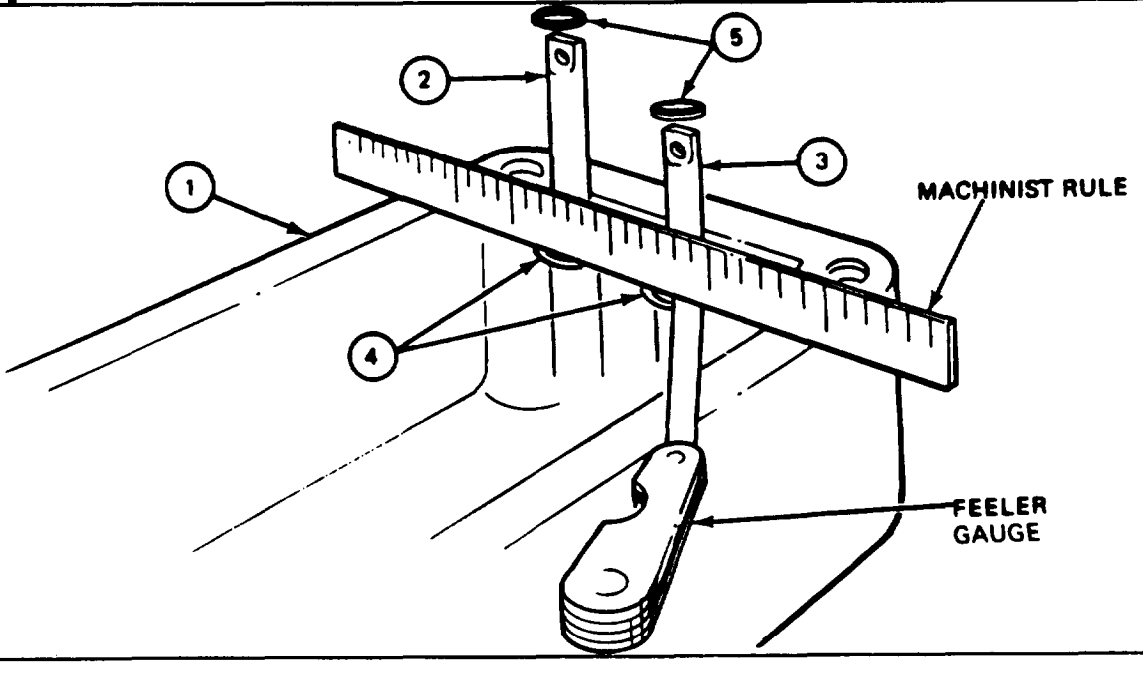
13-100. TRAVERSING AND ELEVATION ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 7

Step	Procedure
1.	Put machinist rule on edge across housing (1) and up against elevating shaft (2) and traversing shaft (3).
	NOTE Make sure elevating shaft (2) and traversing shaft (3) are fully seated.
2.	Using feeler gauge, measure gap between rule and washers (4) on shafts (2) and (3). Gap should be between 0.002" and 0.006" (JPG).
3.	Put shim on two shafts (2) and (3) until proper gap is measured between shim (5) and ruler (JPG).
	NOTE Follow-on Maintenance Action, Required: Install gunner's control box (para 13-93). Install harness and bracket (pars 13-85). Install housing cover (13-96). Install handles (para 13-88).
	END OF TASK



13-101. TRAVERSING ARM DISASSEMBLY PROCEDURE

TOOLS: 5/32" socket head screw key (Allen wrench)
3/16" drive pin punch
20 ounce ball peen hammer
Vise with brass caps
Scraper
Stiff bristled brush
Fine stone

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

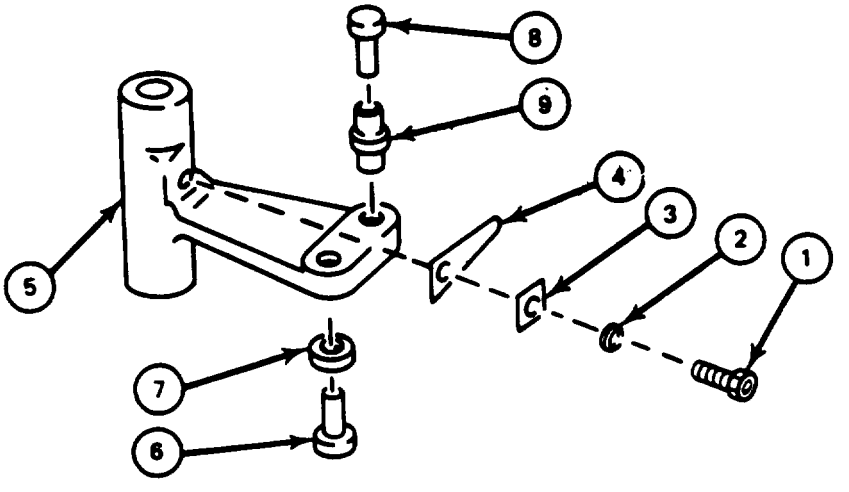
PERSONNEL: One

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

PRELIMINARY PROCEDURES: Remove traversing arm (para 13-99)

FRAME 1

Step	Procedure
1.	Using Allen wrench, remove screw (1), lockwasher (2), square washer (3). and spring (4) from arm (5).
	NOTE Roller pins (6) and (8) are staked in and should not be removed unless necessary.
2.	Put arm (5) in vise.
3.	Using hammer and punch, remove pin (6) and bearing (7) from arm (5).
4.	Using hammer and punch, remove pin (8) and roller (9) from arm (5).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of parts (para 13-98).
	END OF TASK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13-102. TRAVERSING ARM ASSEMBLY PROCEDURE

TOOLS: 5/32" socket head screw key (Allen wrench)
20 ounce ball peen hammer
Center punch

SUPPLIES: Grease (item 12, App. A)
Spring roller, blade (7973627)
Pin. blade roller (7973806)
Roller, cam (7973875)
Pin, cam roller (7973810)

PERSONNEL: One

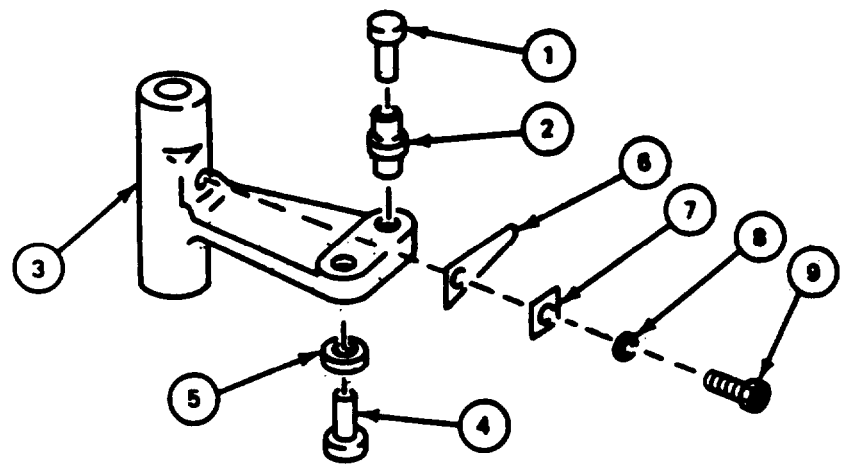
REFERENCES: JPG for procedures to:
Lubricate parts
Stake pins

PRELIMINARY PROCEDURES: Inspect traversing arm (para 13-98)

13-102. TRAVERSING ARM ASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Lubricate moving parts (JPG).
	NOTE Pins (1) and (4) must be loose enough to let rollers move freely.
2.	Using hammer, drive in new blade roller pin (1) through roller (2) and arm (3).
3.	Using hammer, drive in new cam roller pin (4) through roller (5) and arm (3).
4.	Using hammer and punch, stake pins (1) and (4) (JPG).
5.	Using Allen wrench, put spring (6), square washer (7), lockwasher (8), and screw (9) on arm (3).
	NOTE Follow-on Maintenance Action Required: Install traversing arm (para 13-100).
	END OF TASK



13-103. ELEVATING ARM REPAIR PROCEDURE

TOOLS: 7/16 combination wrench (two)
6" machinist steel rule

SUPPLIES: Roller 7973627
Pin 7974223
Rod end 712015
Pin 7973811

PERSONNEL: One

PRELIMINARY PROCEDURES: Inspect elevating arm (para 13-98)

GENERAL INSTRUCTIONS:

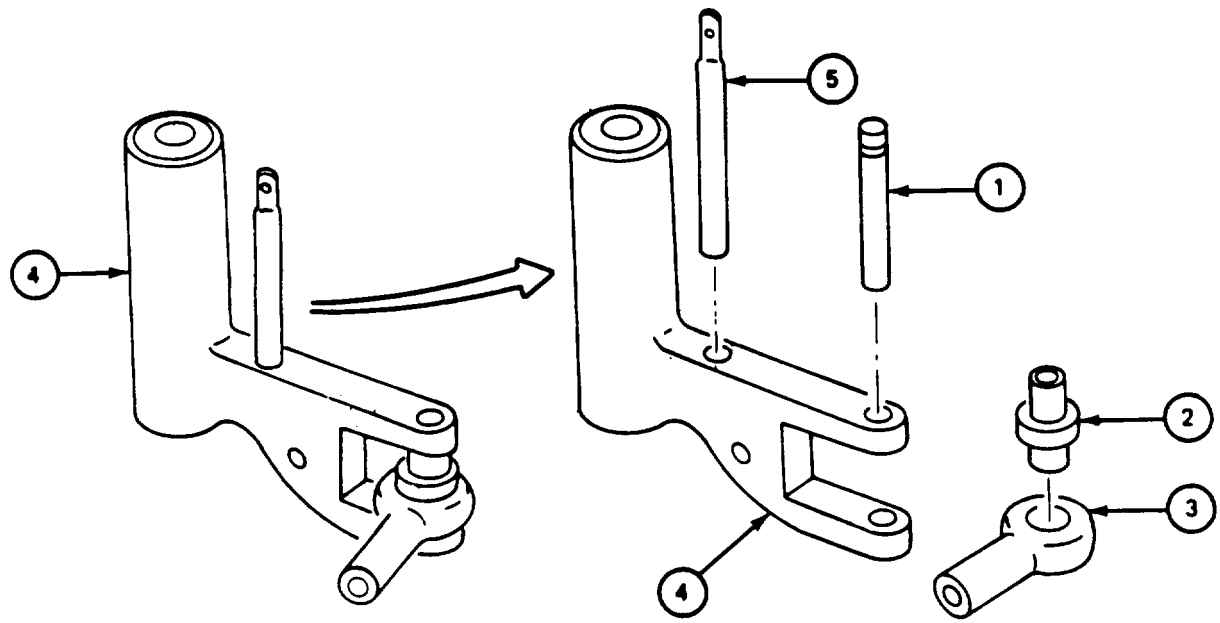
NOTE

This procedure is used to replace bad stop screw, roller pin, rod end, and spring attach pin in elevating arm. If parts are bad, order repair parts or next higher assembly as required.

13-103. ELEVATING ARM REPAIR PROCEDURE (CONT)

FRAME 1

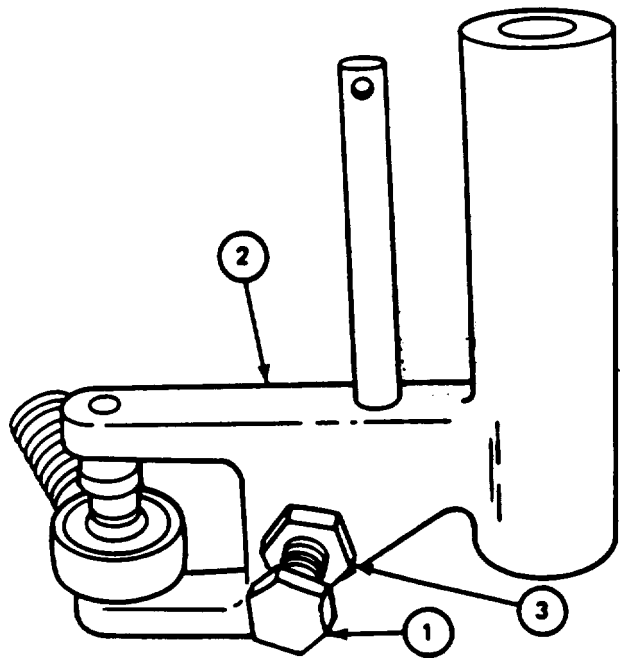
Step	Procedure
	SUPPORT SHOP WORK
1.	Take elevating arm (4) to shop where press is available. a . Press out roller pin (1). Remove roller (2) and rod end (3) from elevating arm (4). b. Press out spring attach pin (5). c . Press in new spring attach pin (5). d Put new roller (2) and new rod end (3) on elevating arm (4). Press in new roller pin (l).
2.	After support shop work, return parts to turret shop. GO TO FRAME 2



13-103. ELEVATING ARM REPAIR PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE **Do this frame to replace stopscrew (1).**
1.	Using rule, measure distance from end of stopscrew (1) to face of elevating arm (2).
2.	Using wrench, loosen jamnut (3) on stopscrew (1).
3.	Using wrench, remove stopscrew (1) from elevating arm (2).
4.	Using hands and rule, put new jamnut (3) on new stopscrew (1).
5.	Using hands, put stopscrew (1) in elevating arm (2).
6.	Using wrench and rule, adjust stopscrew (1) to obtain measurement of step
7.	Using two wrenches, tighten jamnut (3) while holding stopscrew (1).
	END OF TASK



13-104. HOUSING OR HYDRAULIC VALVE REMOVAL PROCEDURE

TOOLS: 7/64" socket head screw key (Allen wrench)
1/2" combination wrench
Scraper
Stiff bristled brush
Fine stone

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

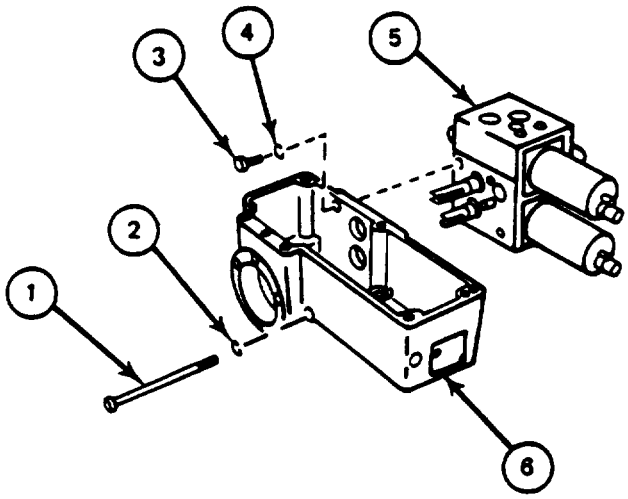
PERSONNEL: One

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

PRELIMINARY PROCEDURES: Test gunner's control (para 13-78)
Remove control box cover (para 13-82)
Remove gunner's control handles (para 13-87)
Remove gunner's control box (para 13-92)
Remove harness (para 13-84)
Remove housing cover (para 13-95)
Remove elevating arm and traversing arm (para 13-99)

FRAME 1

Step	Procedure
1.	Using combination wrench, remove screw (1) and lockwasher (2).
2.	Using combination wrench, remove two screws (3) and two lockwashers (4) that attach hydraulic valve (5) to housing (6). Using hand, remove hydraulic valve (5) from housing (6). **NOTE** Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Inspect housing (para 13-94). END OF TASK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13-105. HOUSING OR HYDRAULIC VALVE INSTALLATION PROCEDURE

TOOLS: 7/64" socket head screw key (Allen wrench)
1/2" combination wrench

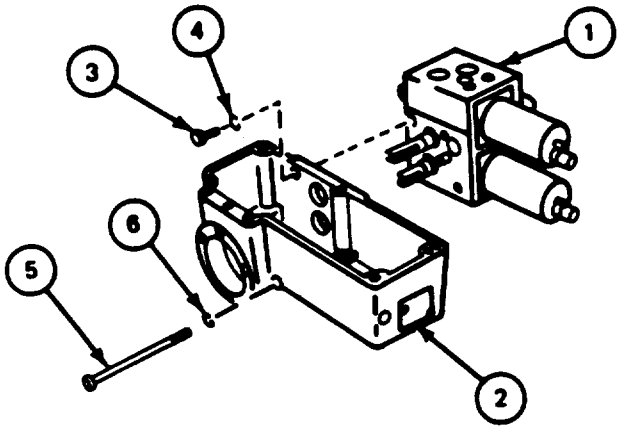
SUPPLIES: Sealing compound (item 27, App A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Use sealing compound
Use torque wrench

FRAME 1

Step	Procedure
1.	Put hydraulic valve (1) against housing (2). Line up attaching screw holes.
2.	Using hands, put in two screws (3) and two lockwashers (4) that hydraulic valve (1) to housing (2). Do not tighten screws.
3.	Using hands, put in screw (5) and lockwasher (6).
4.	Using combination wrench, tighten two screws (3) and screw (5).
	NOTE Follow-on Maintenance Action Required: Install elevating arm and traversing arm (para 13-100). Install housing cover (para 13-96). Assemble and install control box (para 13-93). Install handles (para 13-88). Install harness and bracket (para 13-85). Install control box cover (para 13-83). Test gunner's control (para 13-78).
	END OF TASK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13-106. HOUSING REPAIR PROCEDURE

SUPPLIES: Bearing MS 17131-13 (two)
Disk 7974643 (two)
Pins 11610847 (two)
Rod ends 11637334 (two)

PERSONNEL: One

PRELIMINARY PROCEDURES: Inspect housing (para 13-94)

GENERAL INSTRUCTIONS:

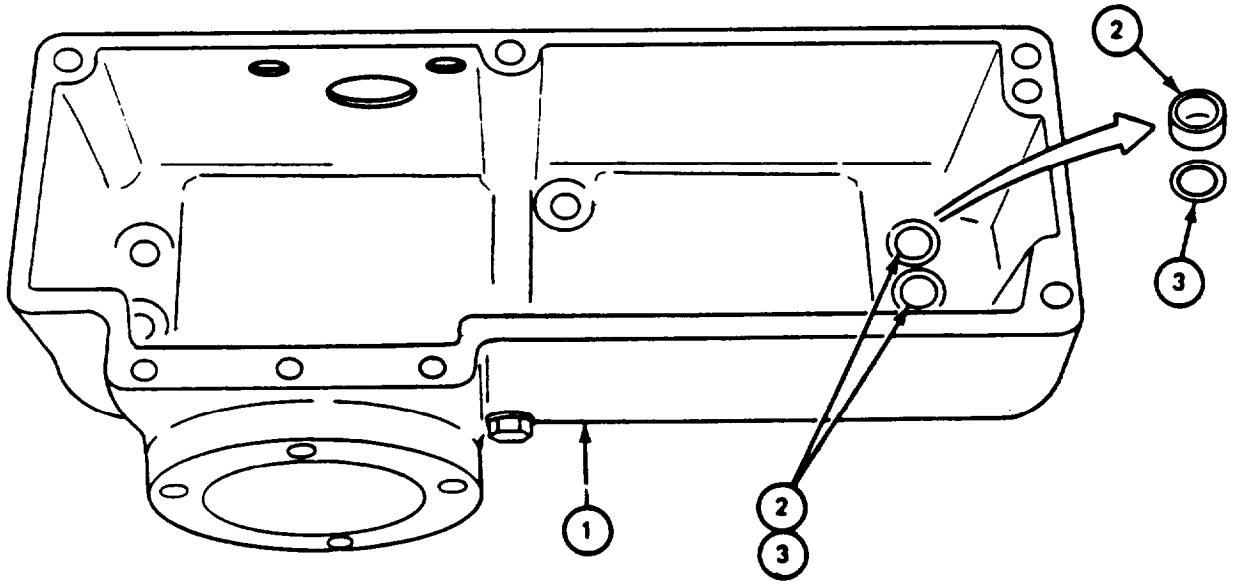
NOTE

This procedure is used to replace bad bearings and supports in housing. If bearings or supports are bad, order repair parts or next higher assembly.

13-106. HOUSING REPAIR PROCEDURE (CONT)

FRAME 1

Step	Procedure
	SUPPORT SHOP WORK
1.	Take housing (1) to shop where press is available.
	a. Press out two bearings (2). b. Press out two bearing disks (3). c. Press in two new bearing disks (3). d. Press in two new bearings (2).
2.	After support shop work, return parts to turret shop.
	END OF TASK



13-107. POWER SOLENOID AND OVERRIDE SOLENOID TEST PROCEDURE

TEST EQUIPMENT: Multimeter

PERSONNEL: One

REFERENCES: JPG for procedures to check continuity

PRELIMINARY PROCEDURES: Remove power solenoid and override solenoid (para 13-108)

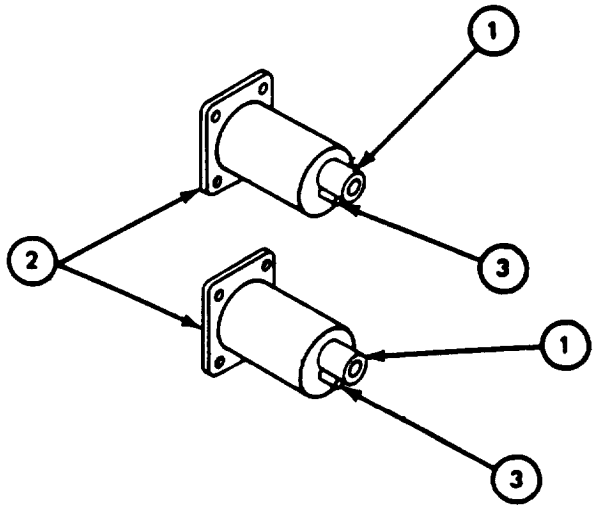
GENERAL INSTRUCTIONS:

NOTE

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

FRAME 1

Step	Procedure
1.	Using multimeter, check continuity of each solenoid winding between electrical connector (1) and solenoid case (2) (JPG). Normal indication is less than 2 ohms.
	NOTE
	If solenoid plunger (3) does not move easily, solenoid is bad.
2.	Using hand, carefully move solenoid plunger (3) in and out.
	END OF TASK



13-108. POWER SOLENOID AND OVERRIDE SOLENOID REMOVAL PROCEDURE

TOOLS: 5/32” socket head screw key (Allen wrench)

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to lower hydraulic system pressure
JPG for procedure to disconnect electrical connectors

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver’s Master Control Panel	FO-3	11
Gunner’s Control Box	FO-1	2
Turret Traverse Lock	FO-3	7
Gunner’s Control	FO-1	4

EQUIPMENT CONDITION: Driver’s master control panel MASTER BATTERY switch set to OFF
Gunner’s control box ELEV/TRAV switch set to OFF
Turret traverse lock set to LOCKED

GENERAL INSTRUCTIONS:

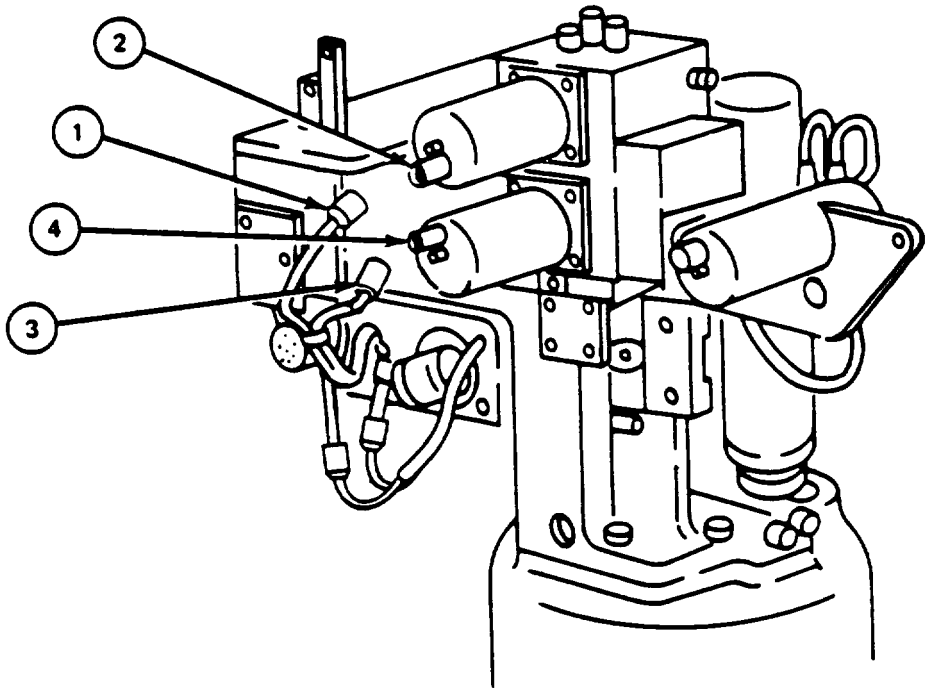
NOTE

Equipment conditions apply only if task is being done on vehicle.

13-108. POWER SOLENOID AND OVERRIDE SOLENOID REMOVAL PROCEDURE (CONT)

FRAME 1

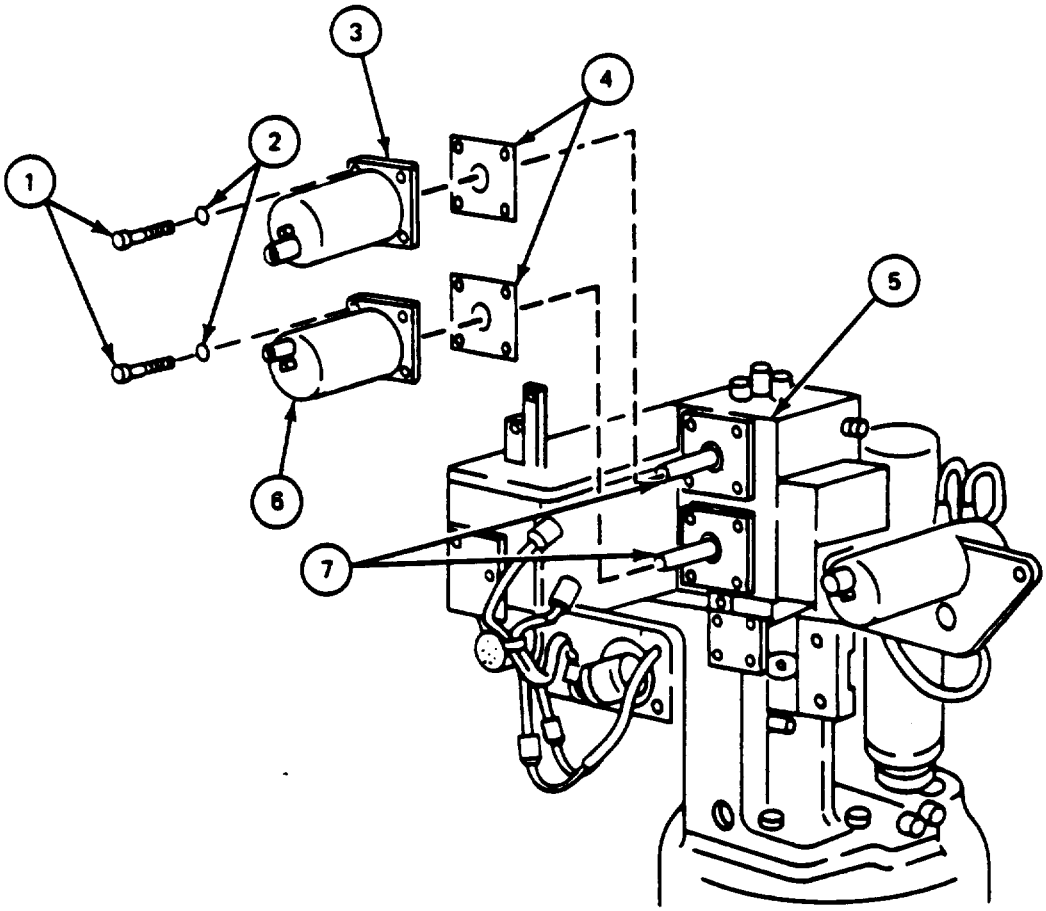
Step	Procedure
	WARNING Before removing hydraulic tubes or parts, hydraulic pressure must be lowered to 0 psi. Hydraulic fluid under pressure can hurt you.
1.	Lower hydraulic system pressure to 0 psi (TM-20-2-3).
2.	Using hands, disconnect electrical connector 625A (1) from power solenoid (2) (JPG).
3.	Using hands, disconnect electrical connector 623 (3) from override solenoid (4) (JPG).
	G0 TO FRAME 2



13-108. POWER SOLENOID AND OVERRIDE SOLENOID REMOVAL PROCEDURE (CONT)

FRAME 2

Step	Procedure
	CAUTION Spring-loaded parts (7) may drop out of hydraulic valve body (5) when solenoids (3) and (6) are removed.
1.	Using Allen wrench. remove four screws (1) and four lockwashers (2) that attach power solenoid (3) and gasket (4) to hydraulic valve body (5). Remove solenoid (3). Throw gasket away.
2.	Using Allen wrench, remove four screws (1) and four lockwashers (2) that attach override solenoid (6) and gasket (4) to hydraulic valve body (5). Remove solenoid. Throw gasket away.
	NOTE Follow-on Maintenance Action Required: Test power solenoid and override solenoid (para 3-107).
	END OF TASK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13-109. POWER SOLENOID AND OVERRIDE SOLENOID INSTALLATION PROCEDURE

TOOLS: 5/32” socket head screw key (Allen wrench)
5/32” hex head socket (3/8” drive)
3/8” drive torque wrench (0 to 100 inch-pounds)
6" extension (3/8” drive)

SUPPLIES: Gasket, 10916206 (two)

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to bleed hydraulic system
JPG for procedures to:
Connect electrical connectors
Use torque wrench
TM 9-2350-222-10 for procedure to traverse turret and elevate and depress guns in power mode

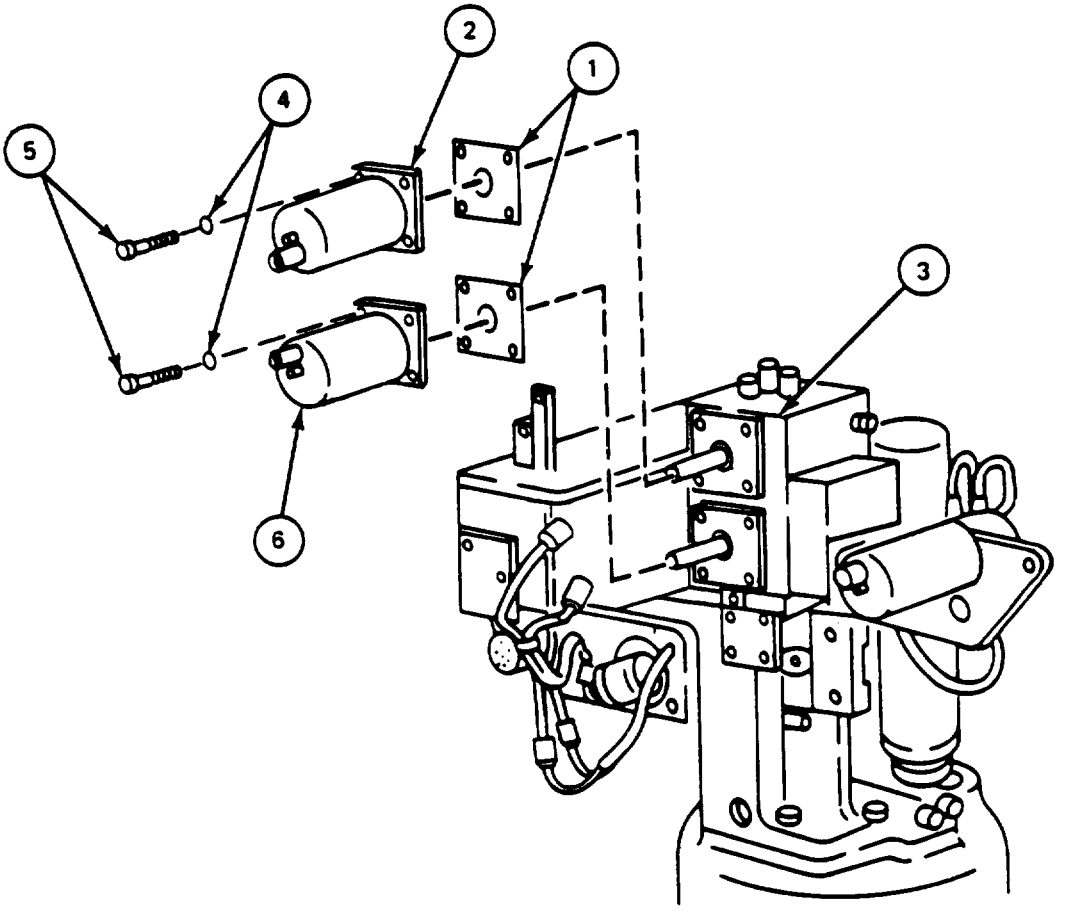
GENERAL INSTRUCTIONS:

CAUTION

All hydraulic parts being assembled must be clean. Dirt can damage hydraulic parts.

FRAME 1

Step	Procedure
	NOTE Power solenoid (2) electrical connector must be below solenoid pushbutton.
1.	Using Allen wrench, attach gasket (1) and power solenoid (2) to valve body (3) with four lockwashers (4) and four screws (5).
2.	Using hex head socket with torque wrench and extension, torque four screws (5) to between 24 and 36 inch-pounds (JPG).
	NOTE Override solenoid (6) electrical connector must be above solenoid pushbutton.
3.	Repeat steps 1 and 2 to install override solenoid (6). GO TO FRAME 2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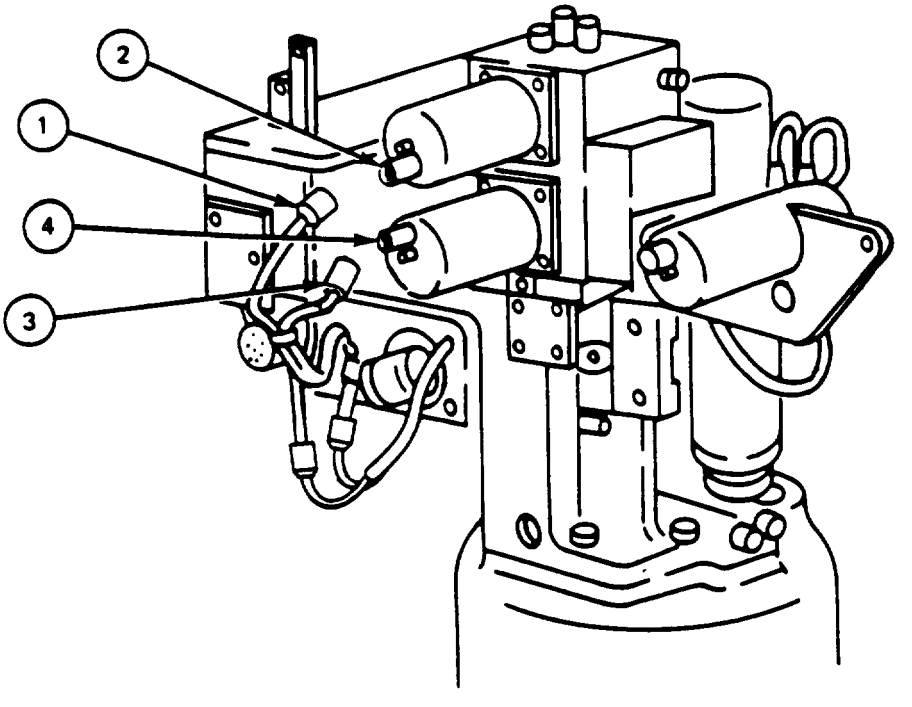
13-109. POWER SOLENOID AND OVERRIDE SOLENOID INSTALLATION PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Using hands, connect electrical connector 625A (1) to power solenoid (2).
2.	Using hands, connect electrical connector 623 (3) to override solenoid (4).
	NOTE Follow-on Maintenance Action Required: Bleed hydraulic system (TM-20-2-3). Traverse turret and elevate and depress guns in power mode to check operation of power and override solenoids (TM-10).
	END OF TASK



(All data on pages 13-408 thru 13-411, including frames 1 and 2, deleted)

13-111. HYDRAULIC VALVE TEST PROCEDURE

TEST EQUIPMENT:
- 0-36 VDC power supply
- Watch with sweep-second hand
- M3 oil pump (NSN 4933-00-449-7166) (7550134)
- Hydraulic test kit (NSN 1015-01-151-6441) (9337932)
- Hydraulic valve test manifold (fabricated tool, item 13, App. B)
- Hydraulic valve test fixture (fabricated tool, item 14, App. B)
- Hydraulic valve test fixture adapter (fabricated tool, item 15, App. B)
- Drift pin punch

SUPPLIES:
- Hydraulic fluid (item 10, App. A)
- Rags (item 21, App. A)

PERSONNEL: One

PRELIMINARY PROCEDURES:
- Remove hydraulic valve (para. 13-104)
- Assemble hydraulic valve (para. 13-113)
- Install power solenoid and override solenoid (para. 13-109)

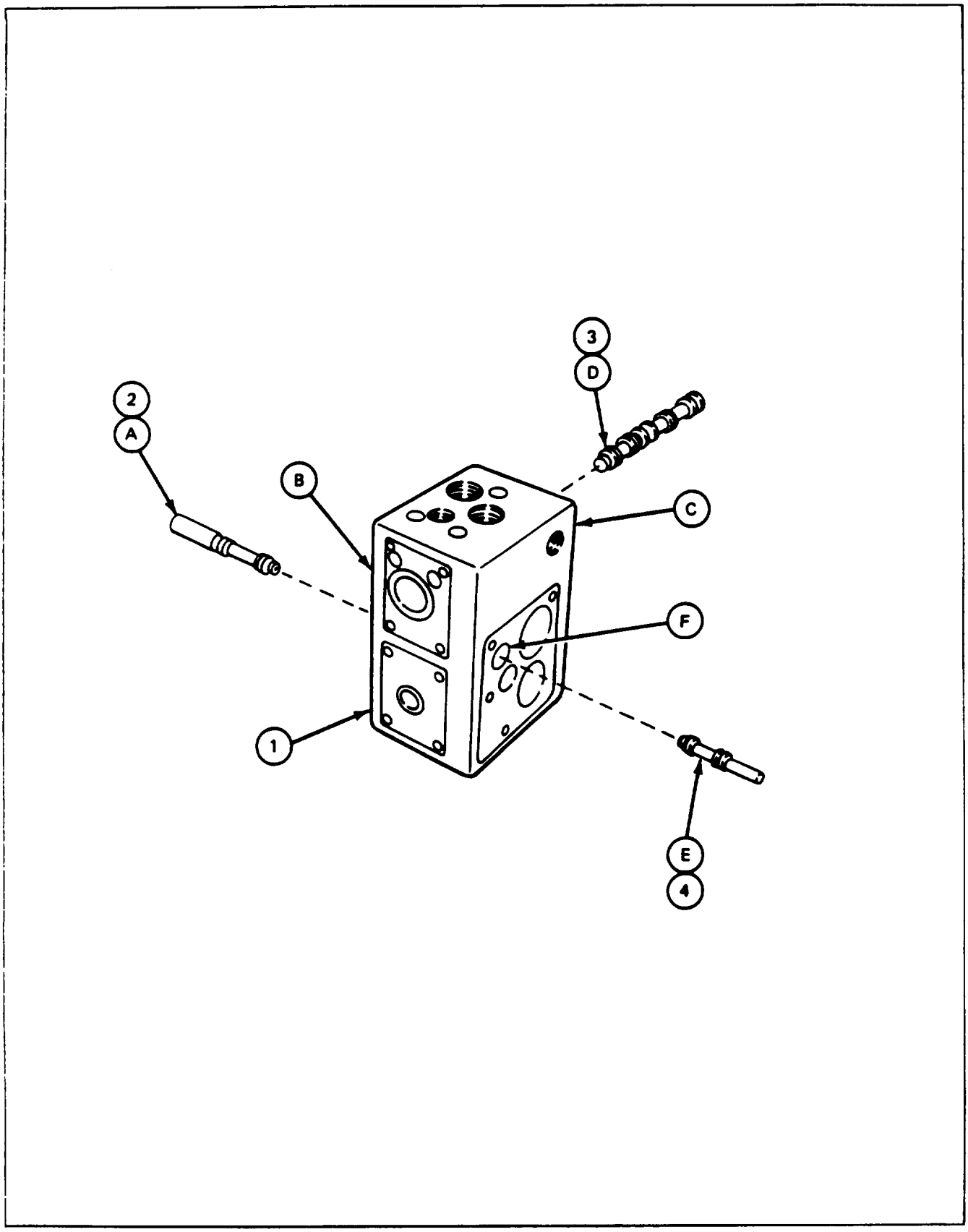
GENERAL INSTRUCTIONS:

NOTE

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

Rags should be used to clean up spilled oil.

If normal indication is not obtained, hydraulic valve is bad. Disassemble bad hydraulic valve (para. 13-112).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13-110. HYDRAULIC VALVE INSPECTION PROCEDURE (CONT)

FRAME 2

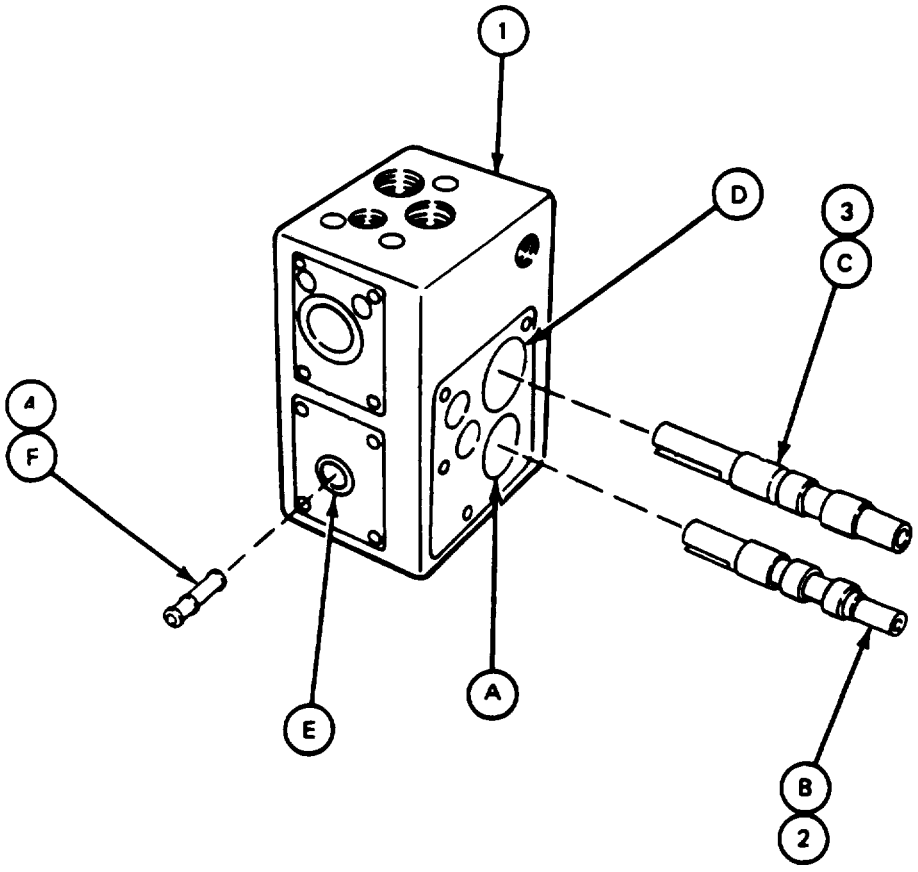
Step	Procedure
	SUPPORT SHOP WORK
1.	Take valve body (1), elevating spool (2), traversing spool (3), and override spool (4) to shop where inspection equipment is available.
2.	Make dimensional check.

Reference Letter	Point of Measurement	Measurement
A	ID of elevating spool sleeve in body (7973756)	0.751" max
B	OD of elevating spool (7973744)	0.752" min
C	OD of traversing spool (7973742)	0.876" min
D	ID of traversing spool sleeve in body (7973741)	0.876" max
E	ID of override spool sleeve in body (7973754)	0.376" max

NOTE

Tag parts that are out of tolerance.

3.	After support shop work, return parts to turret shop.
	END OF TASK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13-111. HYDRAULIC VALVE TEST PROCEDURE

TEST EQUIPMENT:
- 0-36 VDC power supply
- Watch (or clock) with sweep-second hand
- M3 oil pump
- Pressure gauge (0-500 psi)
- Hydraulic valve test manifold (fabricated tool, item 13, App. B)
- Hydraulic valve test fixture (fabricated tool, item 14. App. B)
- Hydraulic valve test fixture adapter (fabricated tool. item 15. App. B)
- Measuring cup (two)
- Suitable hydraulic fittings, packings, and tools
- Pressure gauge (0-2000 psi)
- Drift pin punch

SUPPLIES: Rags (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
- Use M3 oil pump
- Use 0-36 VDC power supply

PRELIMINARY PROCEDURES:
- Remove hydraulic valve (para 13-104)
- Assemble hydraulic valve (para 13-113)
- Install power solenoid and override solenoid (para 13-109)

GENERAL INSTRUCTIONS:

NOTE

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

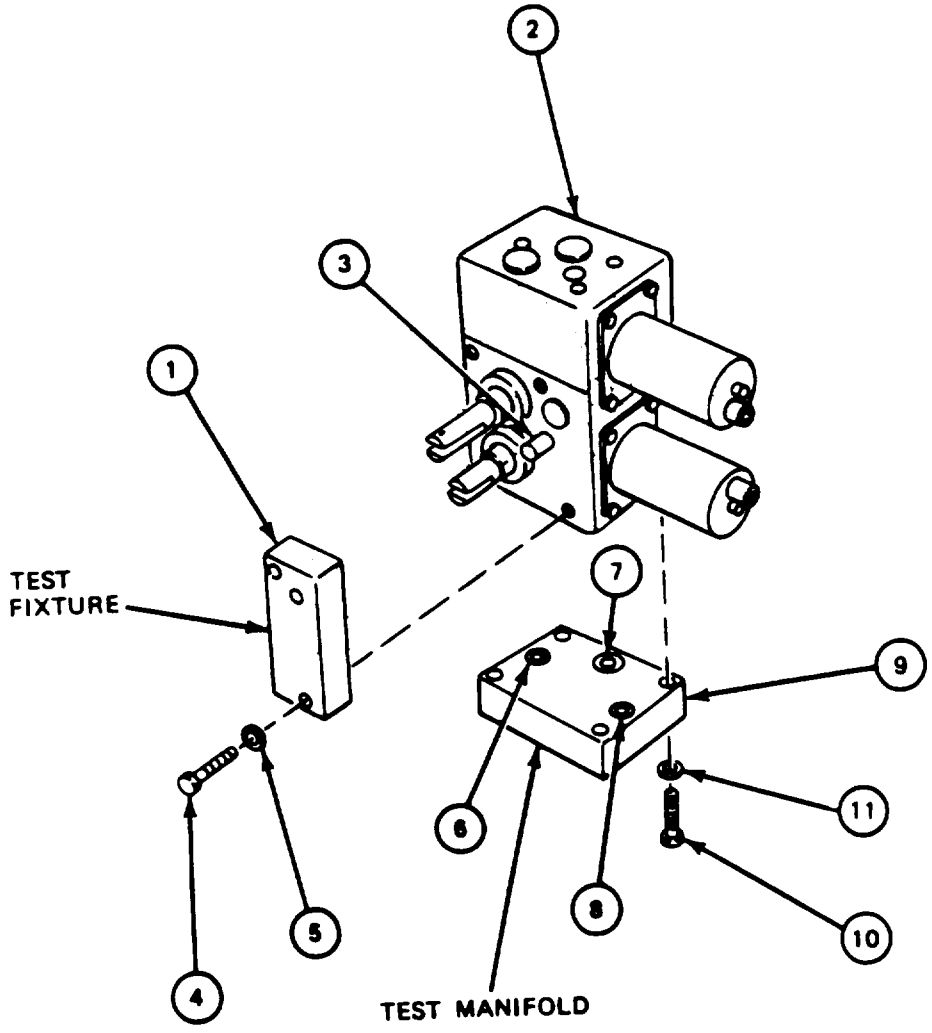
Rags should be used to clean up spilled oil.

If normal indication is not obtained, hydraulic valve is bad. Disassemble bad hydraulic valve (para 13-112).

13-111 HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 1

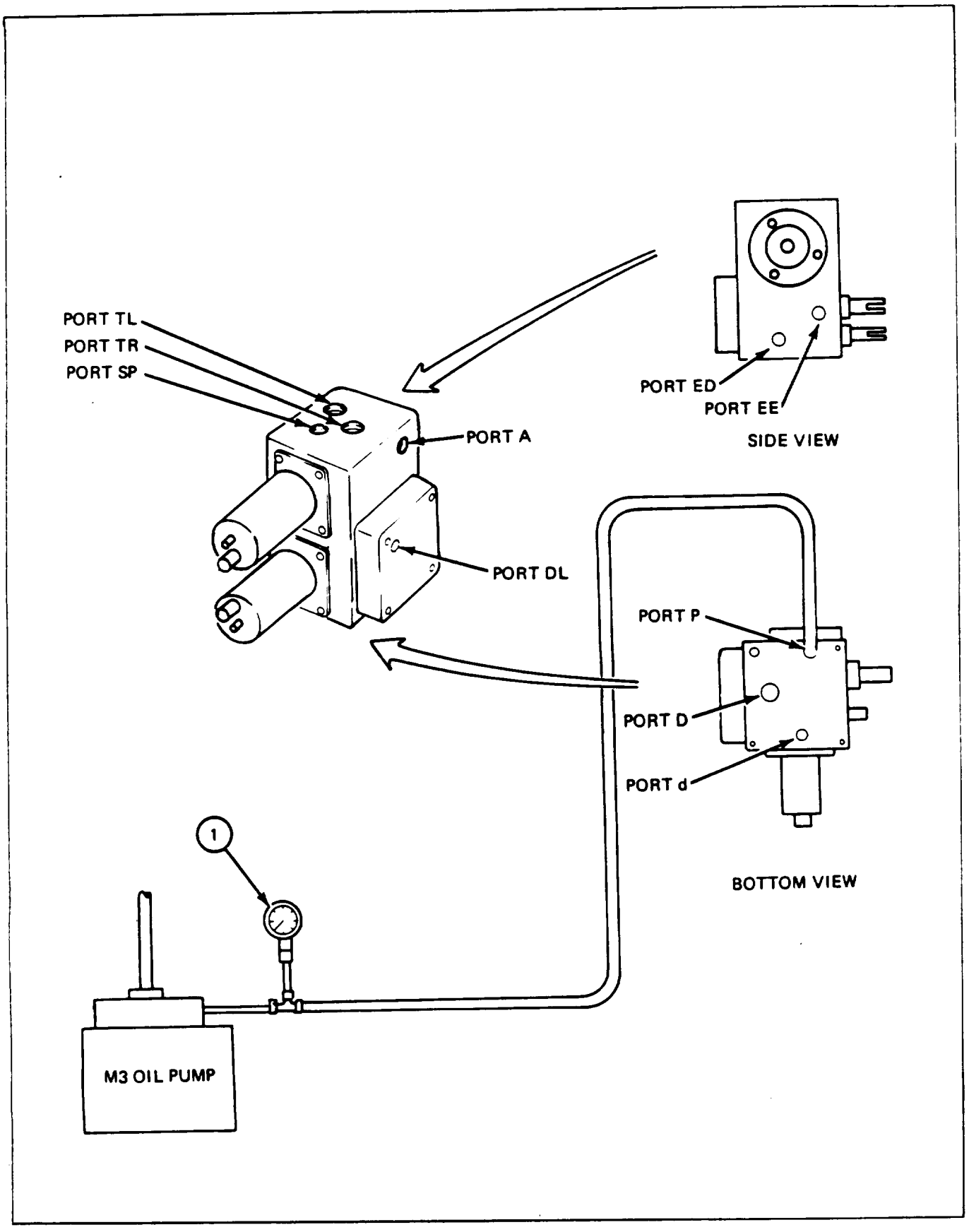
Step	Procedure
1.	Put hydraulic valve test fixture (1) on side of hydraulic valve (2) over end of override piston (3) and attach with two screws (4) and two washers (5).
2.	Coat three preformed packings (6), (7) and (8) with hydraulic fluid.
3.	Put preformed packings (6), (7) and (8) in three packing recesses on inner surface of test manifold (9).
4.	Attach test manifold (9) to bottom of hydraulic valve (2) with four screws (10) and four washers (11).
	GO TO FRAME 2



13-111. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 2

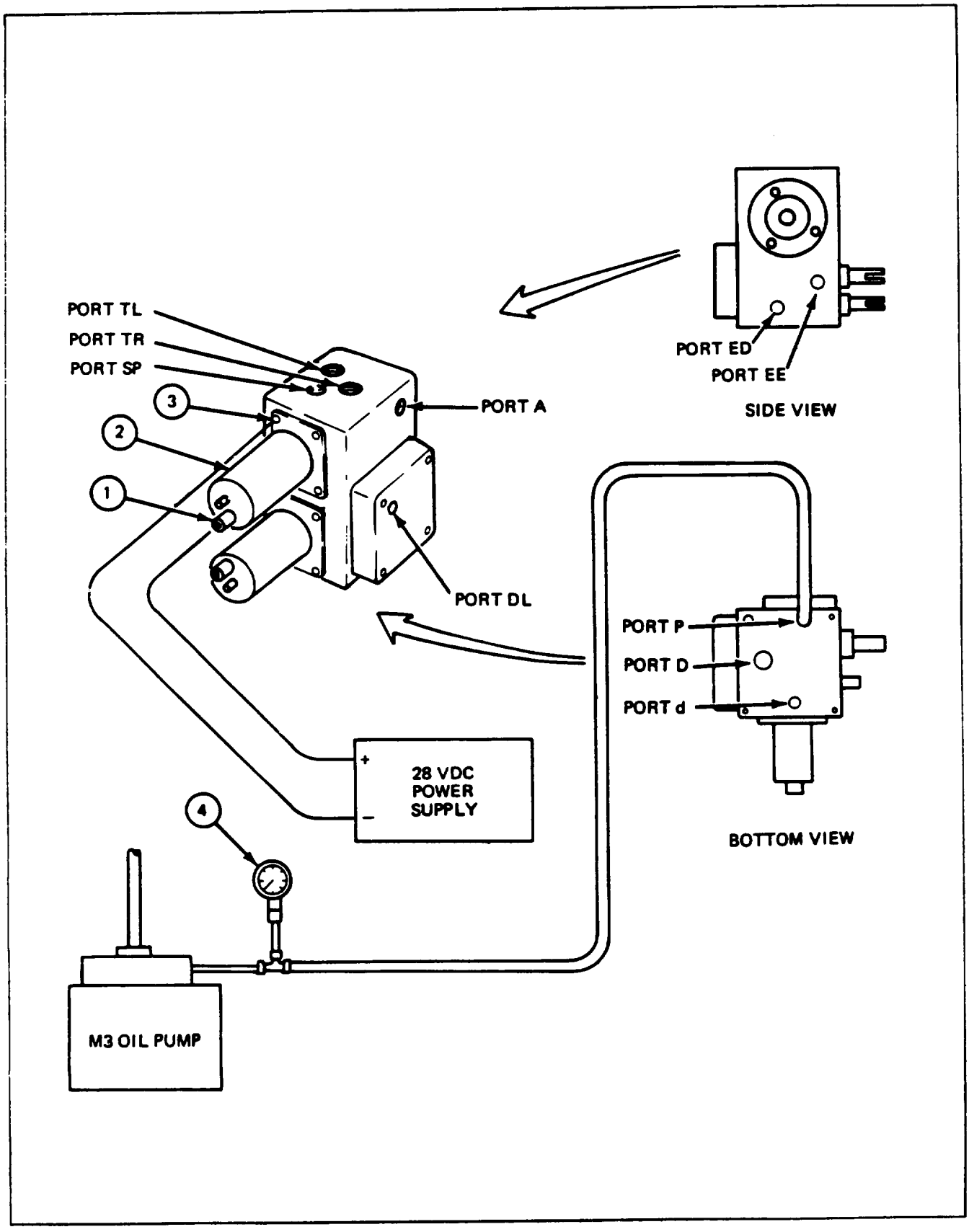
Step	Procedure
1.	Assemble M3 oil pump with 2000 psi gauge (1) as shown.
2.	Connect M3 oil pump to port P.
3.	Plug port SP.
4.	Slowly operate M3 oil pump until gauge (1) indicates between 900 and 950 psi,
5.	Using watch and graduated cylinder, check for leakage at port A and port D. Leakage at either port shall not exceed 3.5 mL (0.12 oz) at 75 F (23.9° C) or 5.0 mL (0.17 oz) at 95°F (34.9°C) per minute.
6.	Check for any leakage at ports TL, TR, ED EE, d, and DL. There shall be no leakage.
7.	Slowly release M3 oil pump pressure until gauge (1) indicates 0 psi.
	GO TO FRAME 3


PORT TL
PORT TR
PORT SP
PORT A
PORT DL
PORT ED
PORT EE
SIDE VIEW
PORT P
PORT D
PORT d
BOTTOM VIEW
1
M3 OIL PUMP

13-111. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 3

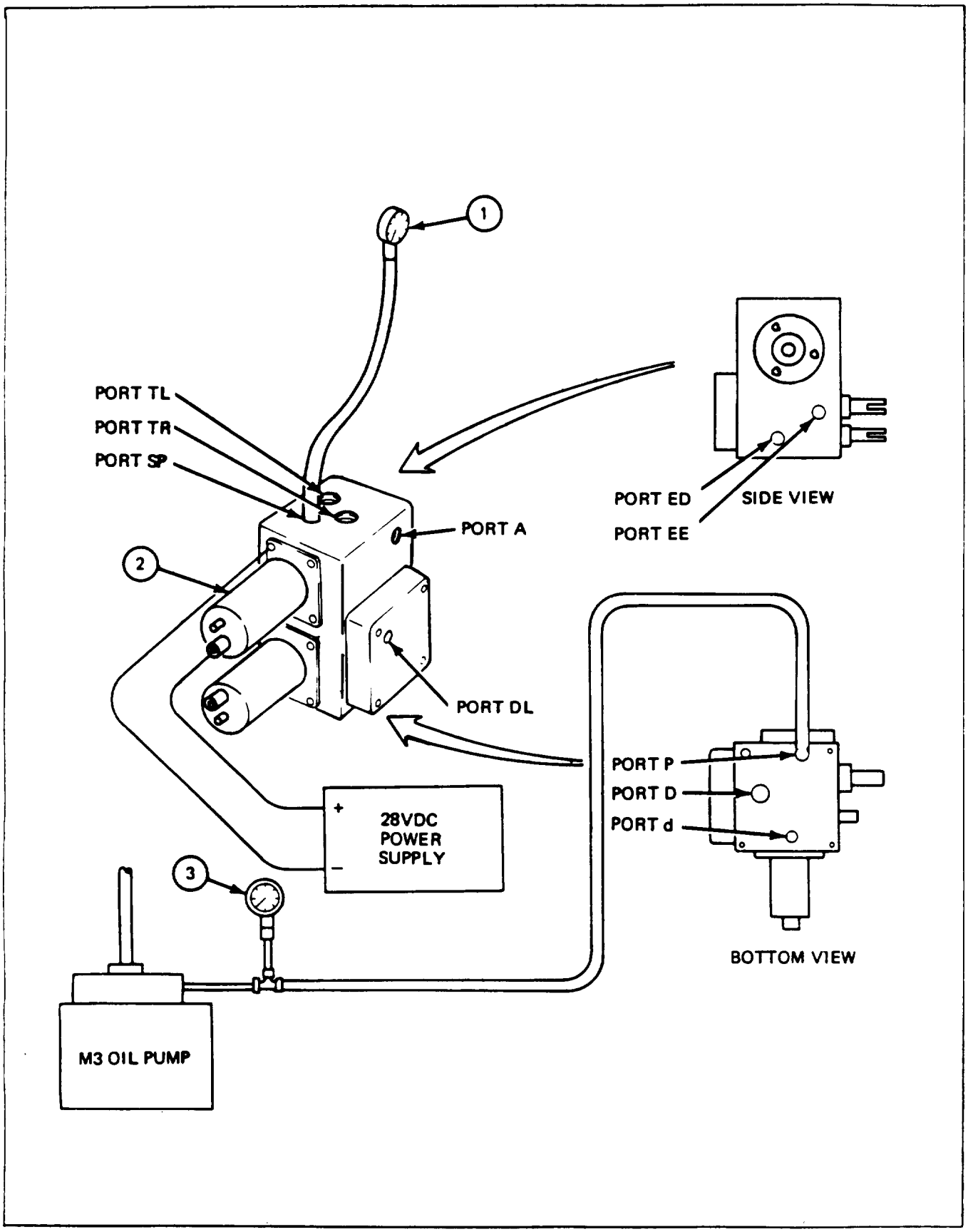
Step	Procedure
1.	Plug ports TL, TR, DL, and A
2.	Connect 0-36 VDC power supply positive lead to connector (1) of power solenoid (2).
3.	Connect 0-36 VDC power supply negative lead to mounting screw (3) of power solenoid (2).
4.	Adjust power supply to 28 VDC.
5.	Energize power solenoid (2).
6.	Slowly operate M3 oil pump until gauge (4) indicates between 900 and 950 psi.
7.	Using watch and graduated cylinder, check for leakage at ports ED, EE, and D. Leakage at each port shall not exceed 2.5 mL (0.08 OZ) at 75°F (23.9°C) or 3.5 mL (0.12 OZ) at 95°F (34.9°C) per minute.
8.	Using watch and graduated cylinder, check for leakage at port D. Leakage shall not exceed 5.0 mL (0.17 OZ) at 75°F (23.9°C) or 7.5 mL (0.25 OZ) at 95°F (34.9°C) per minute.
9.	De-energize power solenoid (2).
10.	Slowly release M3 oil pump pressure until gauge (4) indicates 0 psi.
	GO TO FRAME 4


PORT TL
PORT TR
PORT SP
3
2
1
PORT A
PORT DL
PORT ED
PORT EE
SIDE VIEW
PORT P
PORT D
PORT d
BOTTOM VIEW
+
28 VDC
POWER
SUPPLY
–
4
M3 OIL PUMP

13-111. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 4

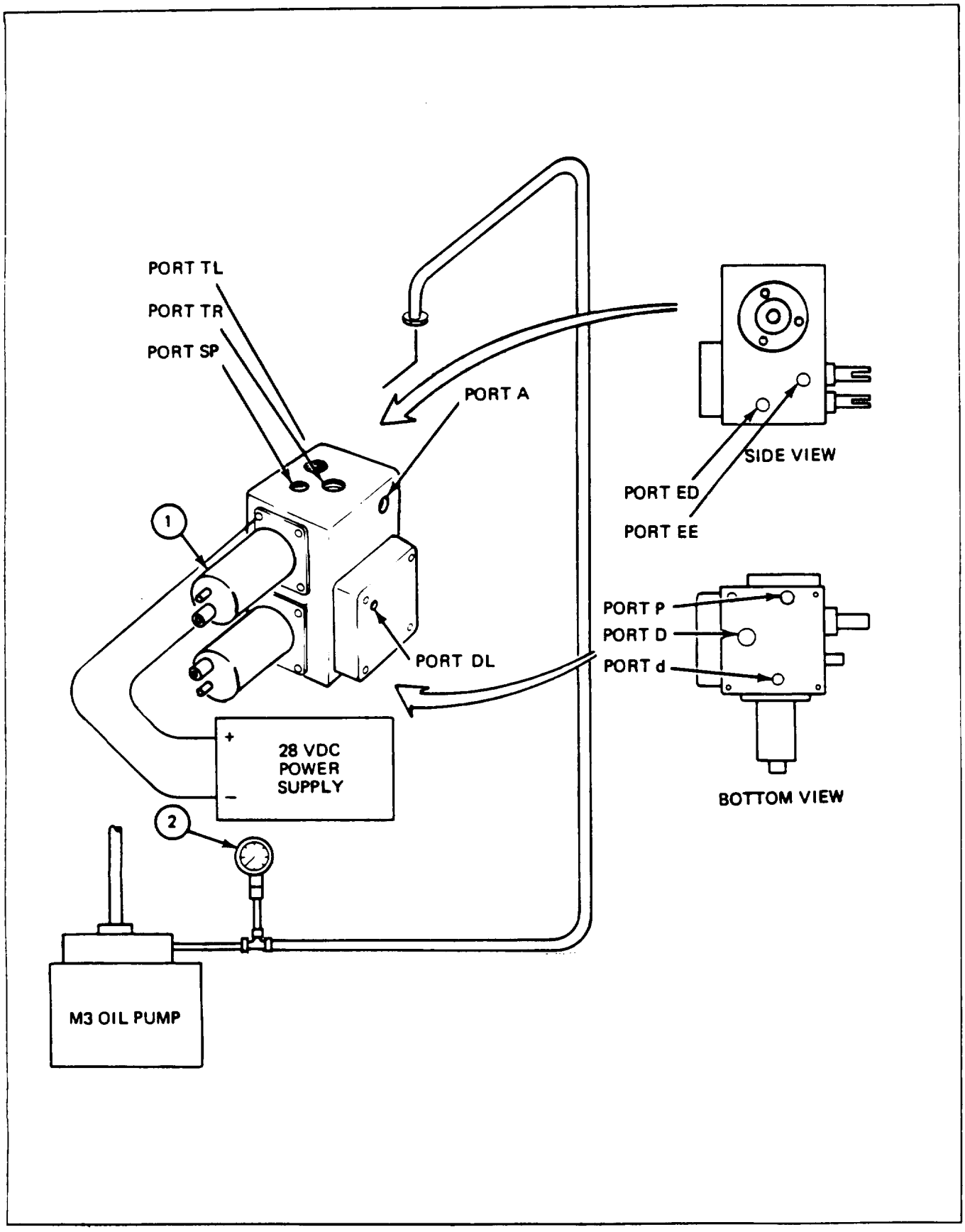
Step	Procedure
1.	Unplug ports SP and DL.
2.	Connect 0 to 500 psi gauge (1) to port SP.
3.	Energize power solenoid (2) (JPG).
4.	Slowly operate M3 oil pump until gauge (3) indicates between 900 and 950 psi (JPG).
5.	Pressure indicated on gauge (1) shall indicate between 100 and 150 psi.
6.	Slowly release M3 oil pump pressure until gauge (3) indicates 0 psi (JPG).
7.	De-energize power solenoid (2) (JPG).
8.	Disconnect 0 to 500 psi gauge (1) from port SP.
	GO TO FRAME 5


1
PORT TL
PORT TR
PORT SP
PORT A
2
PORT DL
PORT ED
PORT EE
SIDE VIEW
PORT P
PORT D
PORT d
BOTTOM VIEW
+
28VDC
POWER
SUPPLY
−
3
M3 OIL PUMP

13-111. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 5

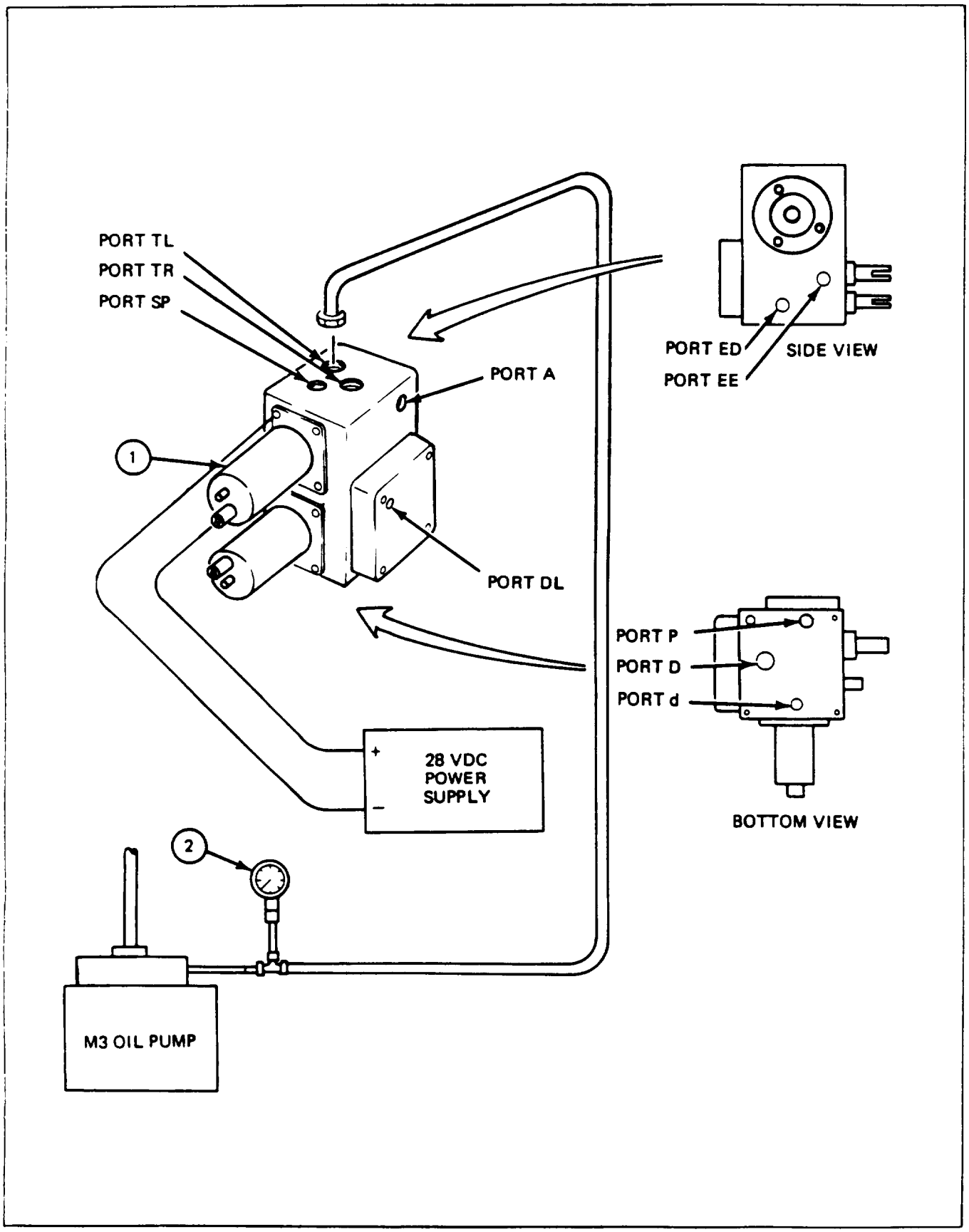
Step	Procedure
1.	Unplug ports TR, TL, and A.
2.	Disconnect M3 oil pump from port P.
3.	Connect M3 oil pump to port TR.
4.	Energize power solenoid (1).
5.	Slowly operate M3 oil pump until gauge (2) indicates between 900 and 950 psi.
6.	Using watch and graduated cylinder, check for leakage at port D. Leakage shall not exceed 3.0 mL (0.1 oz) at 75° F (23.9°C) or 4.5 mL (0.15 oz) at 95 F (34.9°C) per minute.
7.	Slowly release M3 oil pump pressure until gauge (2) indicates 0 psi .
8.	De-energize power solenoid (1).
	GO TO FRAME 6


PORT TL
PORT TR
PORT SP
PORT A
PORT DL
1
2
+
28 VDC
POWER
SUPPLY
−
M3 OIL PUMP
SIDE VIEW
PORT ED
PORT EE
PORT P
PORT D
PORT d
BOTTOM VIEW

13-111. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 6

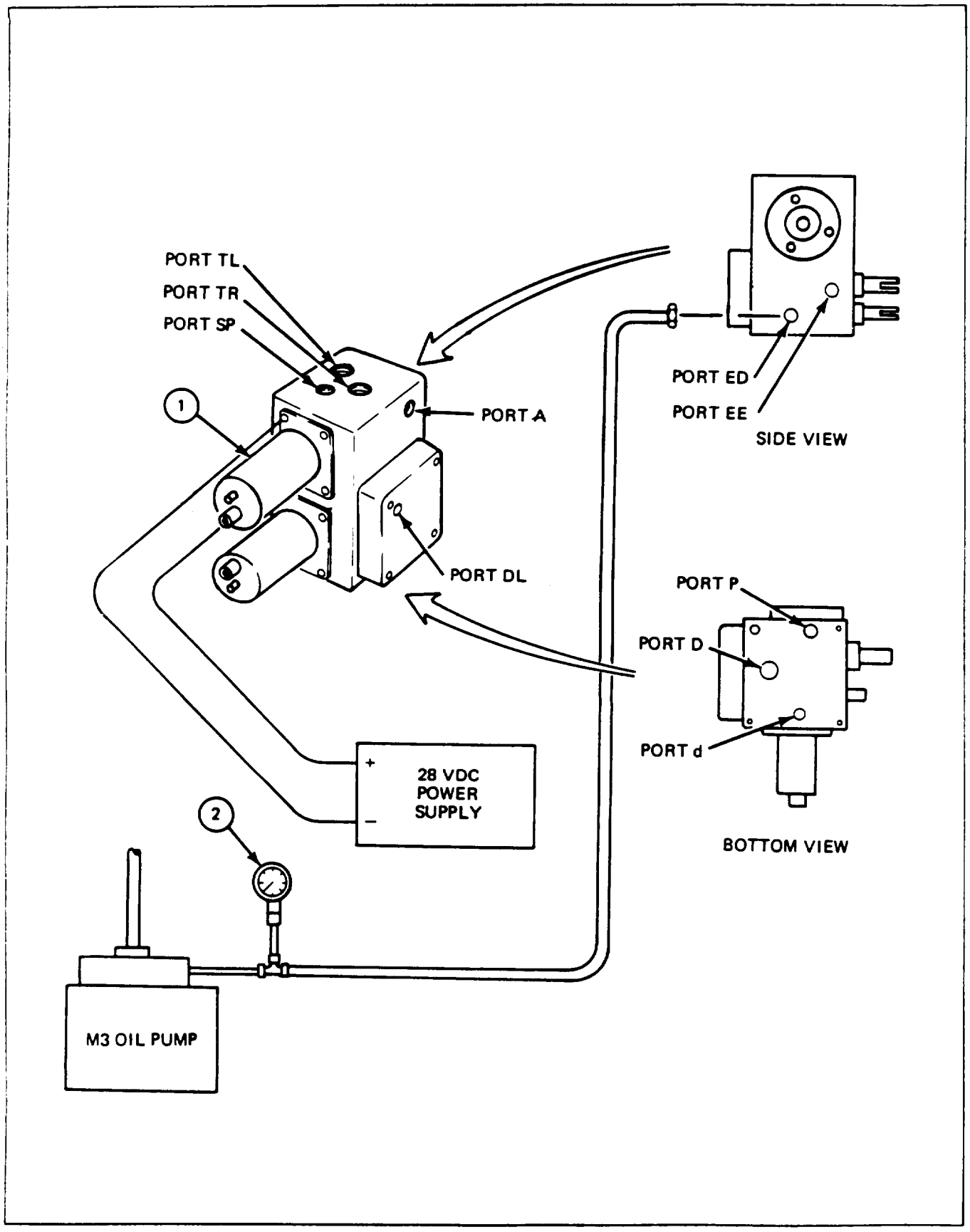
Step	Procedure
1.	Disconnect M3 oil pump from port TR.
2.	Connect M3 oil pump to port TL.
3.	Energize power solenoid (1).
4.	Slowly operate M3 oil pump until gauge (2) indicates between 900 and 950 psi.
5.	Using watch and graduated cylinder, check for leakage at port D. Leakage shall not exceed 3.0 mL (0.1 OZ) at 75° F (23.9°C) or 4.5 mL (0.15 OZ) at 95 F (34.9°C) per minute
6.	Slowly release M3 oil pump pressure until gauge (2) indicates 0 psi.
7.	De-energize power solenoid (1).
	GO TO FRAME 7


PORT TL
PORT TR
PORT SP
PORT A
PORT DL
PORT ED
PORT EE
SIDE VIEW
PORT P
PORT D
PORT d
BOTTOM VIEW
28 VDC
POWER
SUPPLY
M3 OIL PUMP
1
2

13-111. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 7

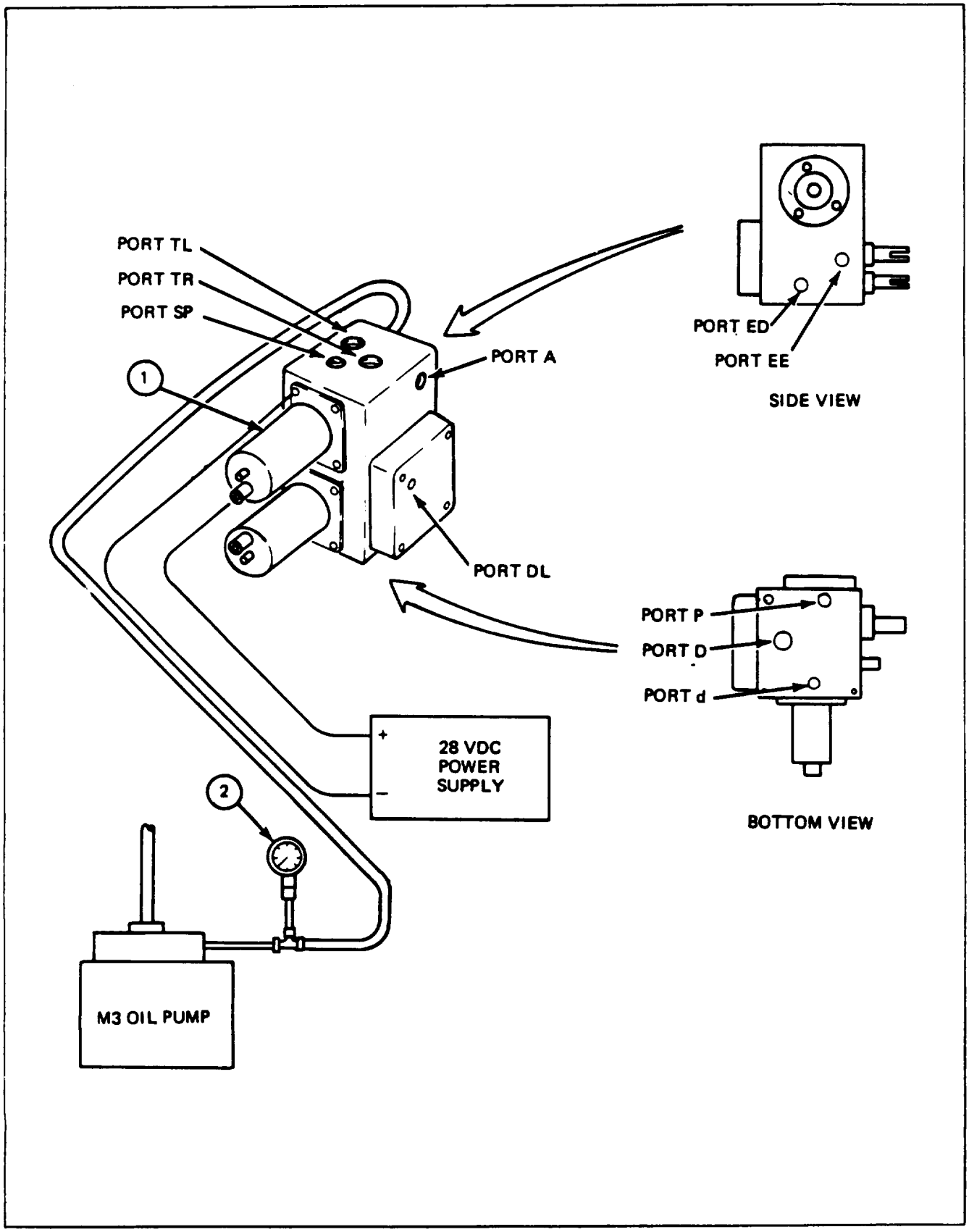
Step	Procedure
1.	Disconnect M3 oil pump from port TL.
2.	Connect M3 oil pump to port ED.
3.	Energize power solenoid (1).
4.	Slowly operate M3 oil pump until gauge (2) indicates between 900 and 950 psi.
5.	Using watch and graduated cylinder, check for leakage at port D. Leakage shall not exceed 2.0 mL (0.07 OZ) at 75°F (23.9°C) or 3.0 mL (0.1 OZ) at 95°F (34.9°C) per minute.
6.	Slowly release M3 oil pump pressure until gauge (2) indicates 0 psi .
7.	De-energize power solenoid (1).
	GO TO FRAME 8


PORT TL
PORT TR
PORT SP
1
PORT A
PORT DL
PORT ED
PORT EE
SIDE VIEW
PORT P
PORT D
PORT d
BOTTOM VIEW
+
28 VDC
POWER
SUPPLY
–
2
M3 OIL PUMP

13-111. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 8

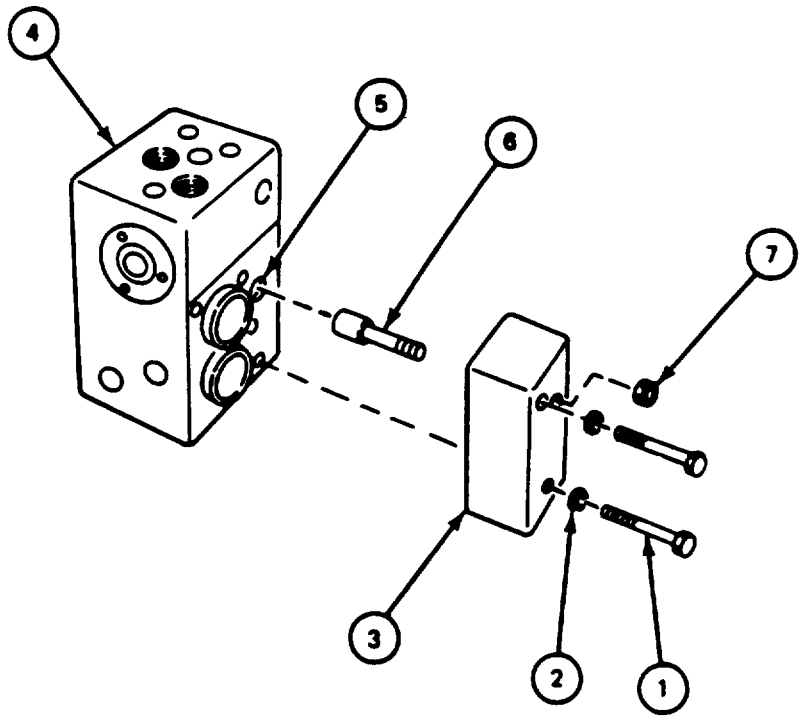
Step	Procedure
1.	Disconnect M3 oil pump from port ED.
2.	Connect M3 oil pump to port EE.
3.	Energize power solenoid (1).
4.	Slowly operate M3 oil pump until gauge (2) indicates between 900 and 950 psi.
5.	Using watch and graduated cylinder, check for leakage at port D. Leakage shall not exceed 2.0 mL (0.07 OZ) at 75°F (23.9°C) or 3.0 mL (0.1 OZ) at 95°F (34.9°C) per minute.
6.	Slowly release M3 oil pump pressure until gauge (2) indicates 0 psi.
7.	De-energize power solenoid (1).
8.	Disconnect M3 oil pump from port EE.
	GO TO FRAME 9


PORT TL
PORT TR
PORT SP
PORT A
PORT DL
PORT ED
PORT EE
SIDE VIEW
PORT P
PORT D
PORT d
BOTTOM VIEW
28 VDC
POWER
SUPPLY
+
–
1
2
M3 OIL PUMP

13-111. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 9

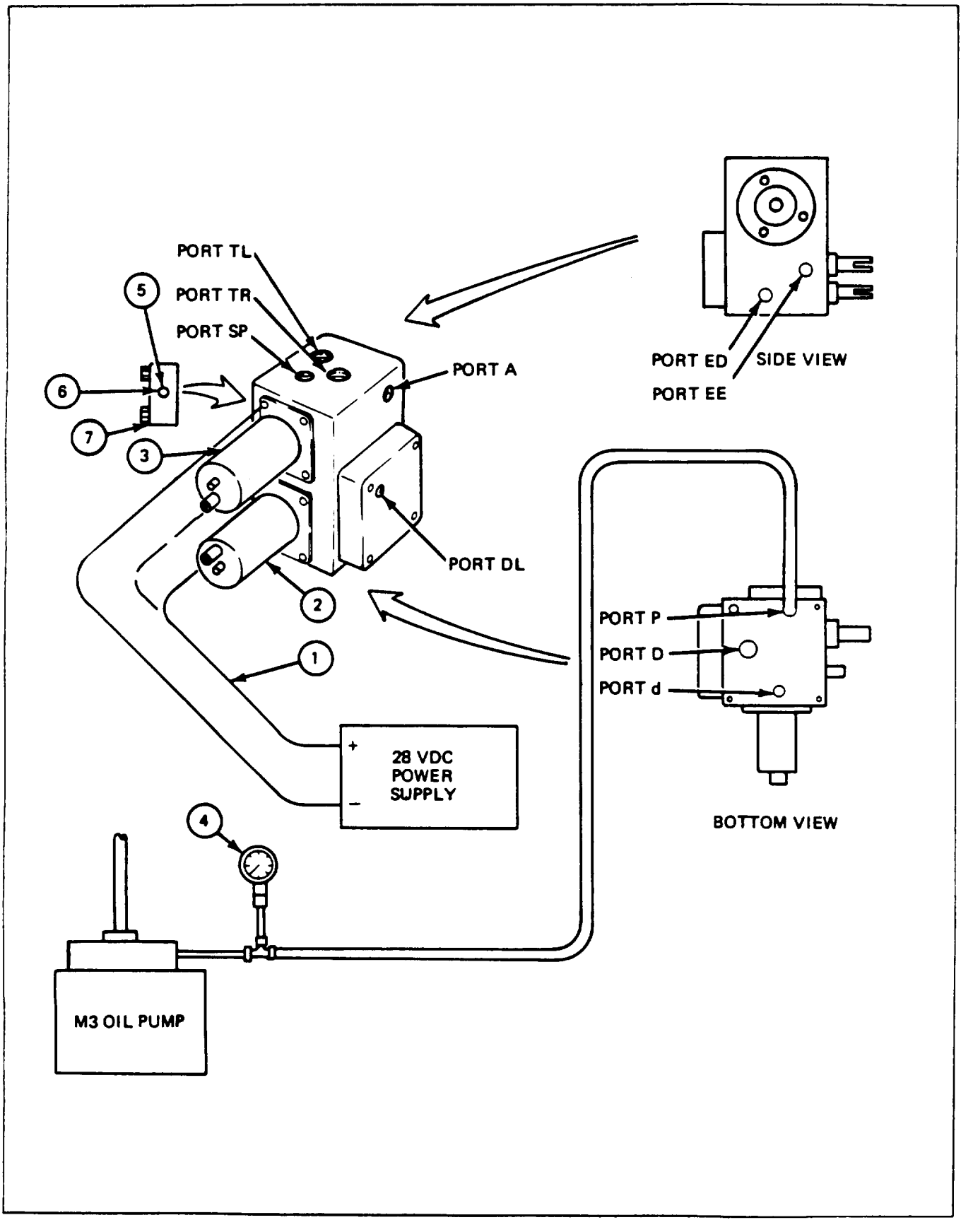
Step	Procedure
1.	Remove two screws (1) and two washers (2) holding test fixture (3) on hydraulic valve (4).
2.	Using drift pin punch. remove low pressure regulator plug (5) from hydraulic valve (4).
3.	Put test fixture adapter (6) in test fixture (3).
4.	Put nut (7) on adapter (6) and tighten nut finger tight.
5.	Place test fixture (3) on hydraulic valve (4). Install two screws (1) and two washers (2).
	GO TO FRAME 10



13-111. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 10

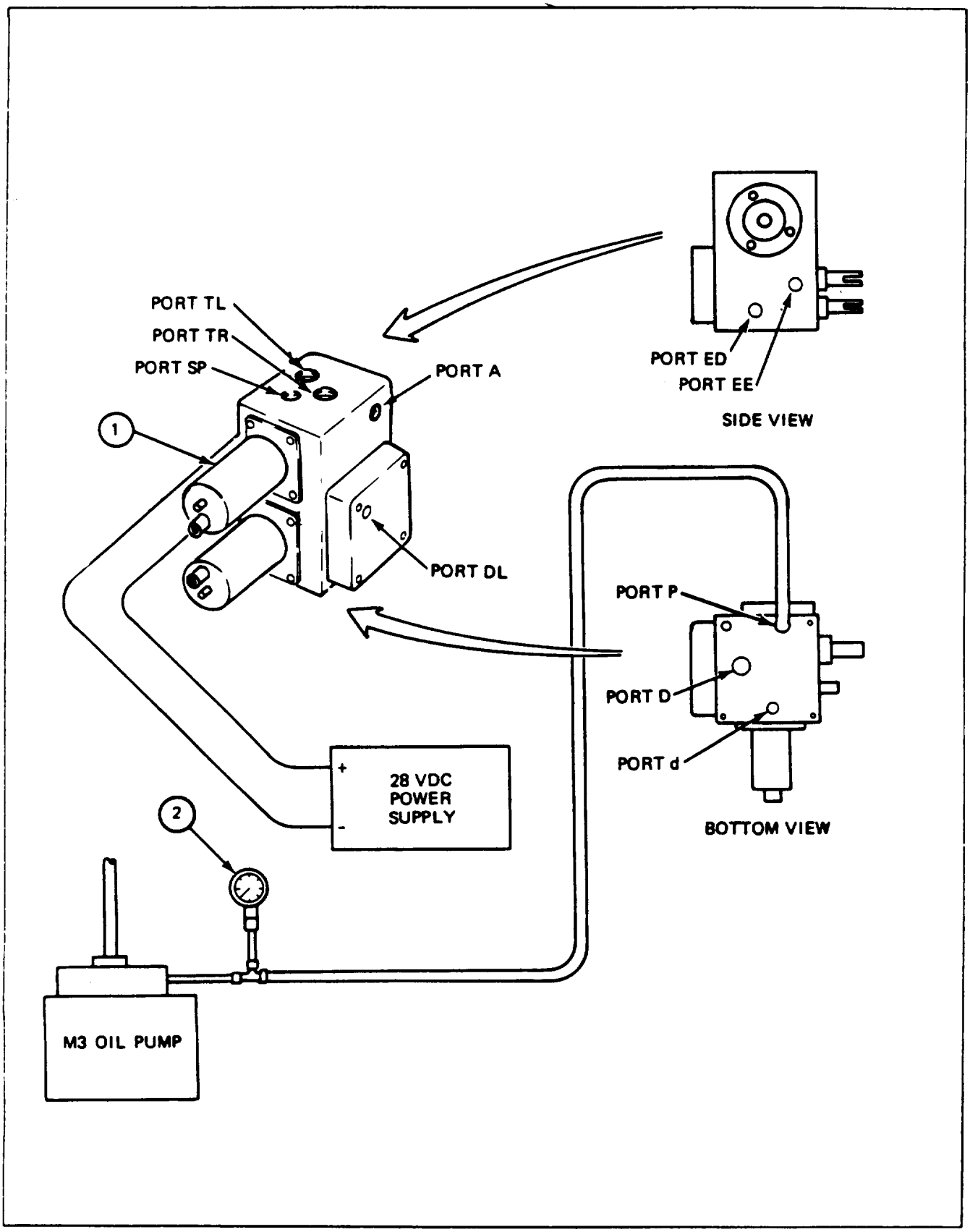
Step	Procedure
1.	Plug port A.
2.	Connect M3 oil pump to port P.
3.	Connect another positive test lead (1) to connector on override solenoid (2).
4.	Energize power solenoid (3) and override solenoid (2) (JPG).
5.	Slowly operate M3 oil pump until gauge (4) indicates between 900 and 950 psi (JPG).
	NOTE Movement and leakage (if any) of override piston (5) can be seen through hole (6) in side of hydraulic valve test fixture (7).
6.	Check for override piston (5) movement and leakage. There shall be no leakage. Piston should be visible (extended) through hole (6).
7.	Slowly release M3 oil pump pressure until gauge (4) indicates 0 psi 0JPG).
8.	De-energize power solenoid (3) and override solenoid (2) (JPG).
9.	Check that override piston (5) has moved inward. Piston should not be visible through hole (6).
10.	Remove test lead (3) to connector on override solenoid (2).
	GO TO FRAME 11


PORT TL
PORT TR
PORT SP
PORT A
PORT DL
PORT ED
PORT EE
SIDE VIEW
PORT P
PORT D
PORT d
BOTTOM VIEW
28 VDC
POWER
SUPPLY
M3 OIL PUMP
1
2
3
4
5
6
7

13-111. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 11

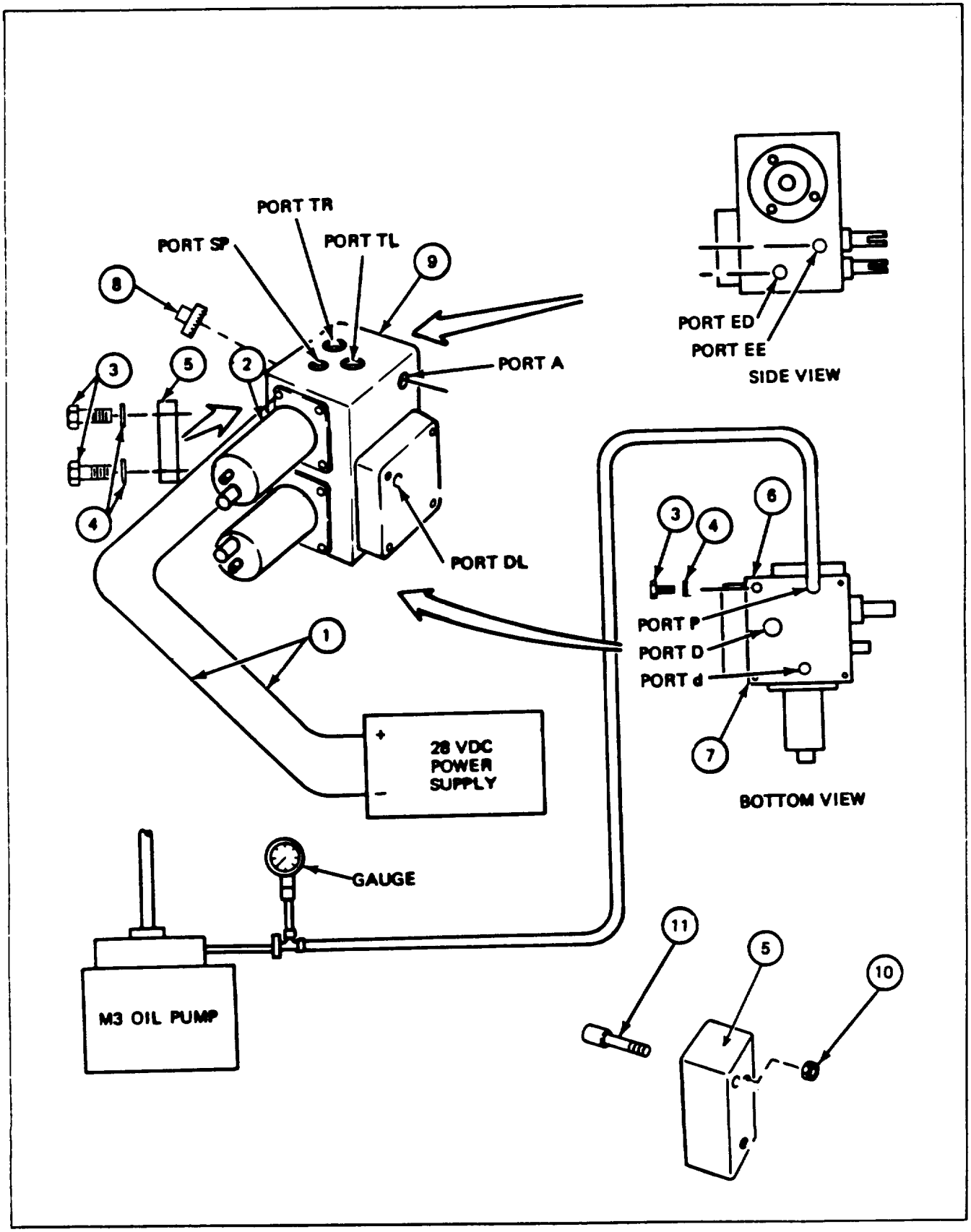
Step	Procedure
1.	Energize power solenoid (1).
2.	Slowly operate M3 oil pump until gauge (2) indicates between 900 and 950 psi.
3.	Using watch and graduated cylinder, check for leakage at ports TL and TR. Leakage at each port shall not exceed 3.5 mL (0.12 oz) at 75°F (23.9°C) or 5.0 mL (0.17 oz) at 95°F (34.9°C) per minute.
4.	Slowly release M3 oil pump pressure until gauge (2) indicates 0 psi.
5.	De-energize power solenoid (1).
	GO TO FRAME 12


PORT TL
PORT TR
PORT SP
PORT A
1
PORT DL
PORT ED
PORT EE
SIDE VIEW
PORT P
PORT D
PORT d
BOTTOM VIEW
+
28 VDC
POWER
SUPPLY
-
2
M3 OIL PUMP

3-111. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 12

Step	Procedure
1.	Unblock port A.
2.	Disconnect M3 oil pump from port P.
3.	Disconnect 28 volt power supply test leads(1) from power solenoid (2) (JPG).
4.	Disassemble M3 oil pump and remove gauge.
5.	Remove two screws (3), two washers (4), and hydraulic valve test fixture (5).
6.	Remove four screws (3), four washers (4), and hydraulic valve test manifold (6).
7.	Remove three preformed packings (7) from hydraulic valve test manifold (6). Put pressure regulator plug (8) in valve body (9).
8.	Remove nut (10) from adapter (11) and remove adapter from test fixture (5).
	NOTE Do not drain hydraulic fluid from valve.
9.	Put protective plugs in open ports.
	NOTE If normal indication is obtained in Frames 1 through 12, hydraulic valve is good.
	END OF TASK


PORT TR
PORT SP
PORT TL
PORT A
PORT DL
PORT ED
PORT EE
SIDE VIEW
PORT P
PORT D
PORT d
BOTTOM VIEW
28 VDC
POWER
SUPPLY
GAUGE
M3 OIL PUMP

13-112. HYDRAULIC VALVE DISASSEMBLY PROCEDURE

TOOLS: O-ring extractor kit
3/16" socket head screw key (Allen wrench)
Internal retaining ring pliers
1/4" socket head screw key (Allen wrench)
Scraper
Stiff bristled brush
Fine stone

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

PERSONNEL: One

REFERENCES: JPG for procedures to:
Remove preformed packing
Remove retaining rings
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES:
Test gunner's control (para 13-78)
Remove hydraulic valve (para 13-104)
Test hydraulic valve (para 13-111)
Remove power solenoid and override solenoid (para 13-108)

GENERAL INSTRUCTIONS:

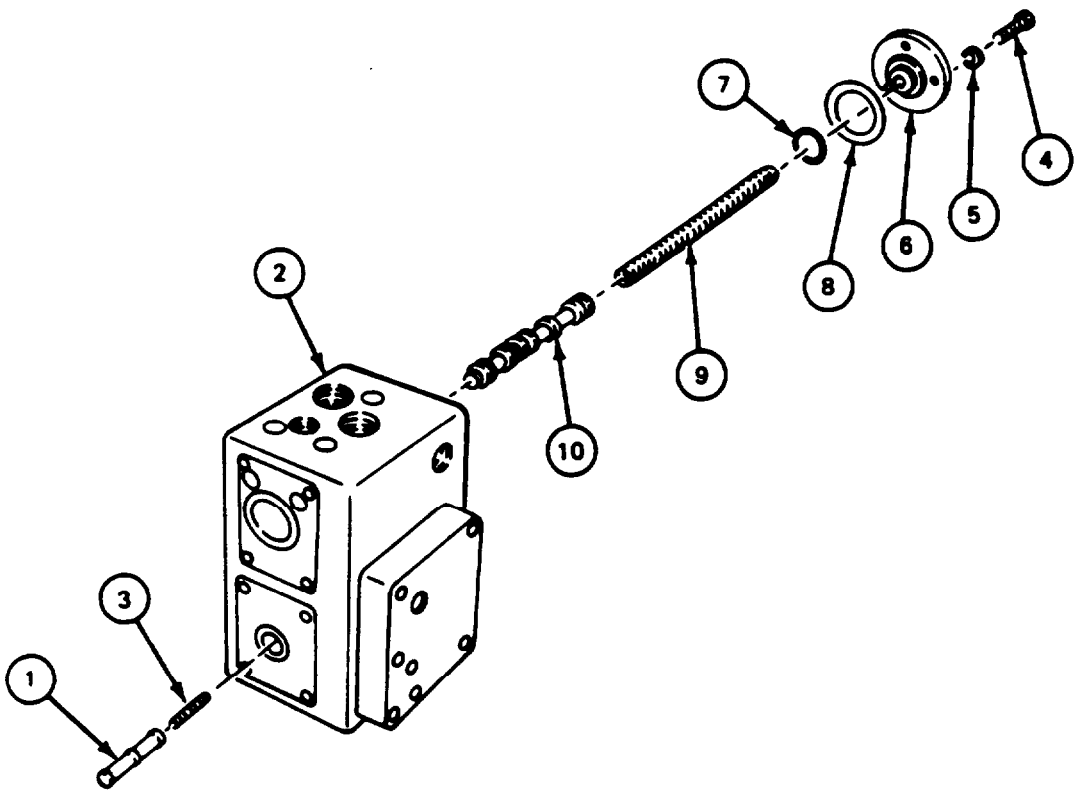
NOTE

Use lint-free cloths to keep hydraulic parts clean.

13-112. HYDRAULIC VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 1

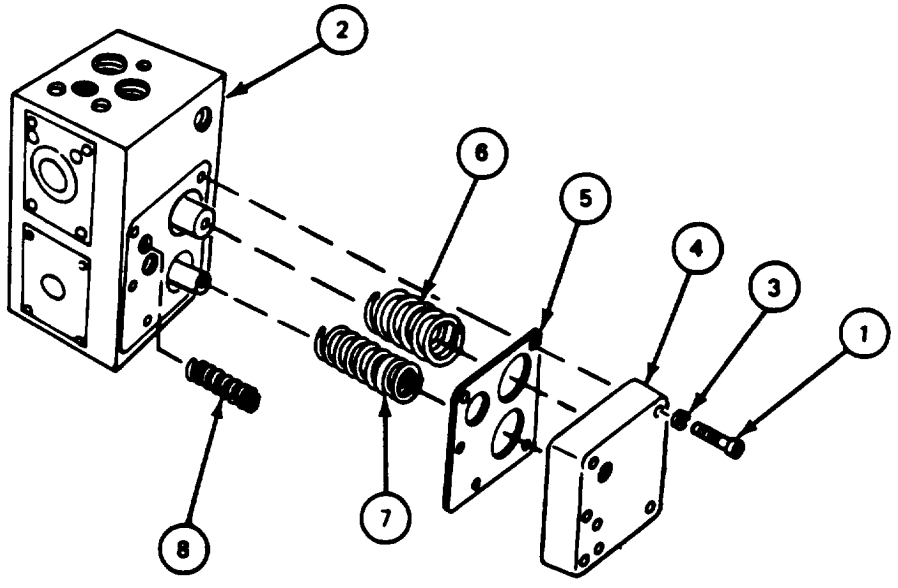
Step	Procedure
1.	Using hands, remove override spool (1) from valve body (2).
2.	Remove spring (3) from valve body (2).
3.	Using 3/16" Allen wrench, remove three screws (4), three lockwashers (5), and body cover (6) from valve body (2).
4.	Using O-ring extractor tool, remove preformed packing (7) from cap (6) (JPG). Throw preformed packing away.
5.	Remove gasket (8).
6.	Pull spring (9) and power spool (10) out of valve body (2).
	GO TO FRAME 2



13-112. HYDRAULIC VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 2

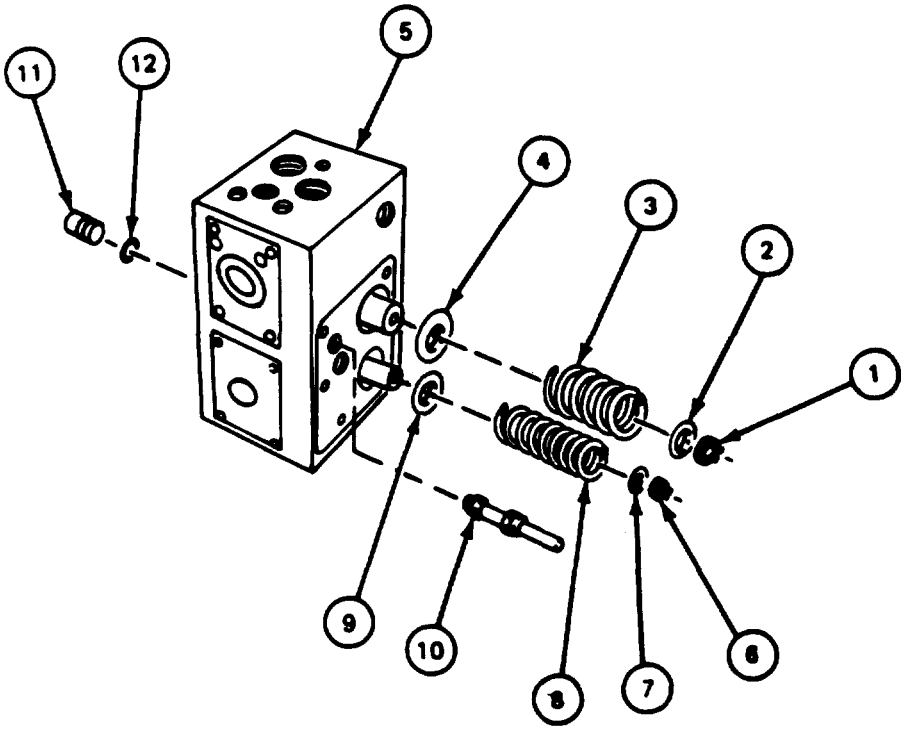
Step	Procedure
1.	Using 3/16” Allen wrench, carefully loosen five screws (1) until each is almost free of valve body (2).
2.	Carefully remove five screws (1) and five lockwashers (3) from cover (4) and remove cover and gasket (5) from valve body (2).
3.	Remove traversing spool spring (6), elevation spool centering spring (7), and regulator spool spring (8) from valve body (2).
	GO TO FRAME 3



13-112. HYDRAULIC VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 3

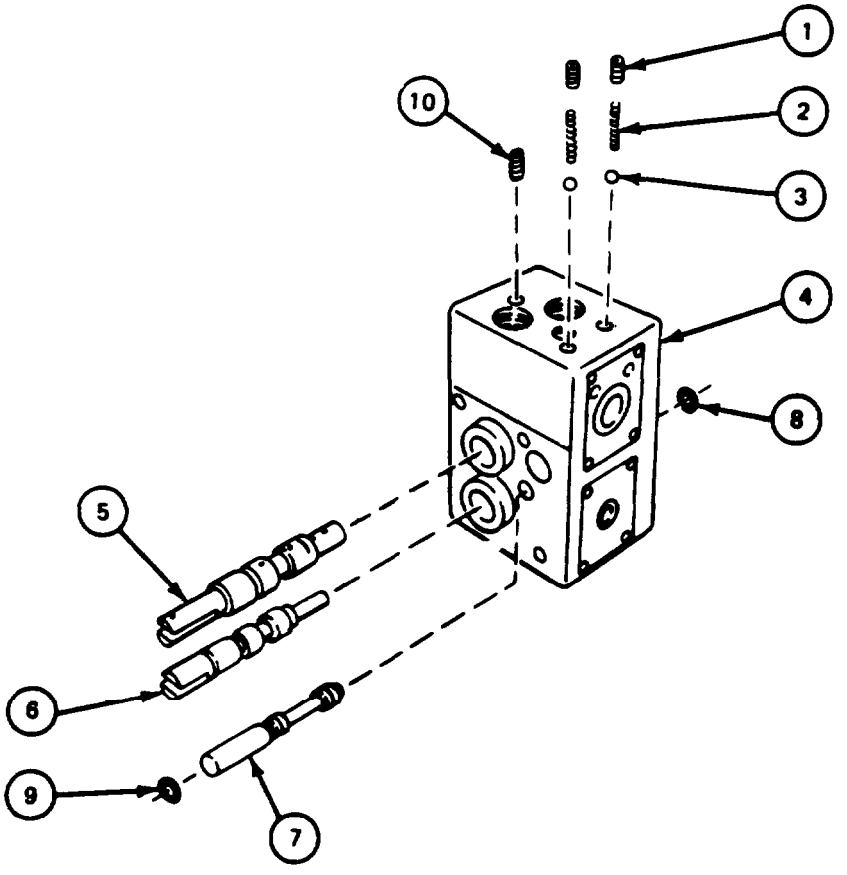
Step	Procedure
1.	Using pliers. remove retaining ring (1) that holds retainer (2), small traversing spool spring (3) and stop (4) (JPG).
2.	Remove retainer (2), spring (3), and stop (4) from valve body (5).
3.	Using pliers, remove retaining ring (6) that holds retainer (7), elevating spool small spring (8) and stop (9) (JPG).
4.	Remove retainer (7), spring (8), and stop (9) from valve body (5).
5.	Using low pressure regulating spool (10), push retainer (11) out of valve body (5). Remove spool (10).
6.	Using O-ring extractor tool, remove preformed packing (12) from retainer (11) (JPG). Throw preformed packing away.
	GO TO FRAME 4



13-112. HYDRAULIC VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 4

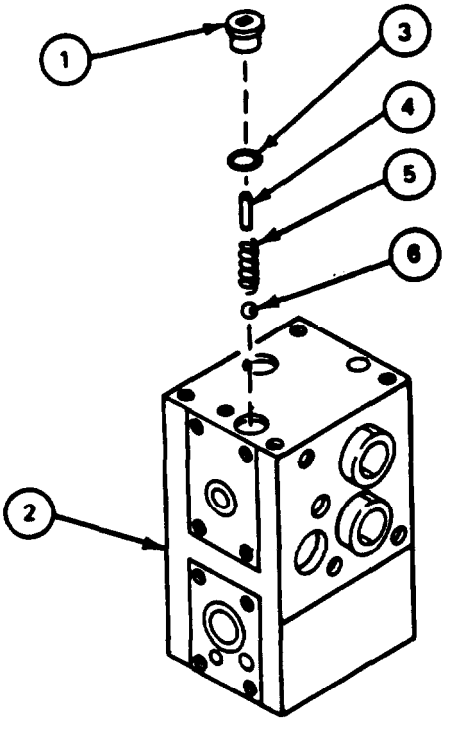
Step	Procedure
1.	Using 3/16” Allen wrench, remove two plugs (1), two springs (2), and two ball bearings (3) from valve body (4).
2.	Remove traversing spool (5) from valve body (4).
3.	Remove elevating spool (6) from valve body (4).
4.	Remove override piston (7) from valve body (4).
5.	Using O-ring extractor tool, remove preformed packing (8) from body (4) and preformed packing (9) from override piston (7) (JPG). Throw preformed packing away.
6.	Using 1/4” Allen wrench, remove plug (10) from valve body (4).
	GO TO FRAME 5



13-112. HYDRAULIC VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 5

Step	Procedure
1.	Using 3/16" Allen wrench, remove plug (1) from valve body (2).
2.	Using O-ring extractor tool, remove preformed packing (3) from plug (1). Throw preformed packing away.
3.	Remove pin (4), spring (5), and ball (6) from valve body (2).
	NOTE **FoIlow-on Maintenance Action Required:** **Clean all parts (JPG).** **Inspect and repair all parts (JKG).** **Inspect hydraulic valve (para 13-110).**
	END OF TASK



13-113. HYDRAULIC VALVE ASSEMBLY PROCEDURE

TOOLS: 1/4” socket head screw key (Allen wrench)
3/16” socket head screw key (Allen wrench)
3/8” drive torque wrench (0 to 200 inch-pounds)
3/16” hex head socket (3/8” drive)
O-ring extractor kit
Internal retaining ring pliers

SUPPLIES: Hydraulic valve repair kit
Hydraulic fluid (item 10, App. A)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Use torque wrench
Install retaining ring
Install preformed packing

PRELIMINARY PROCEDURES: Inspect hydraulic valve (para 13-110)

GENERAL INSTRUCTIONS:

CAUTION

All hydraulic parts being assembled must be clean. Dirt can damage hydraulic parts.

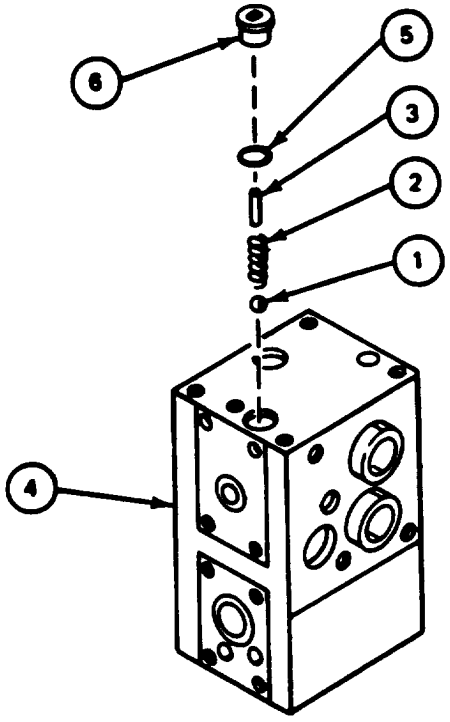
NOTE

Use lint-free cloth to keep hydraulic parts clean. Before assembly, lightly coat surfaces of hydraulic parts with hydraulic fluid.

13-113. HYDRAULIC VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 1

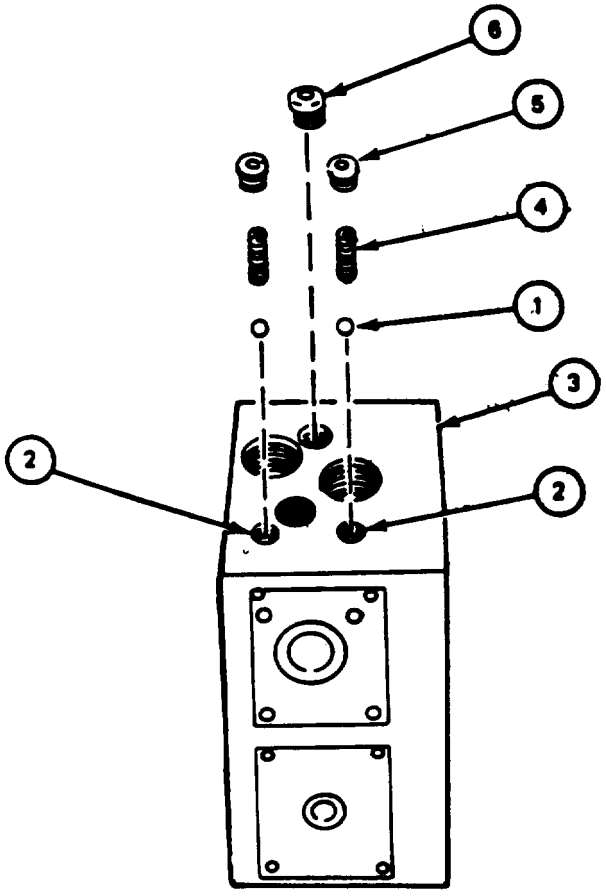
Step	Procedure
1.	Put ball (1), spring (2), and pin (3) in valve body (4).
2.	Using O-ring extractor tool, install preformed packing (5) on plug (6) (JPG).
3.	Using 3/16” Allen wrench, put plug (6) in valve body (4).
	GO TO FRAME 2



13-113. HYDRAULIC VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 2

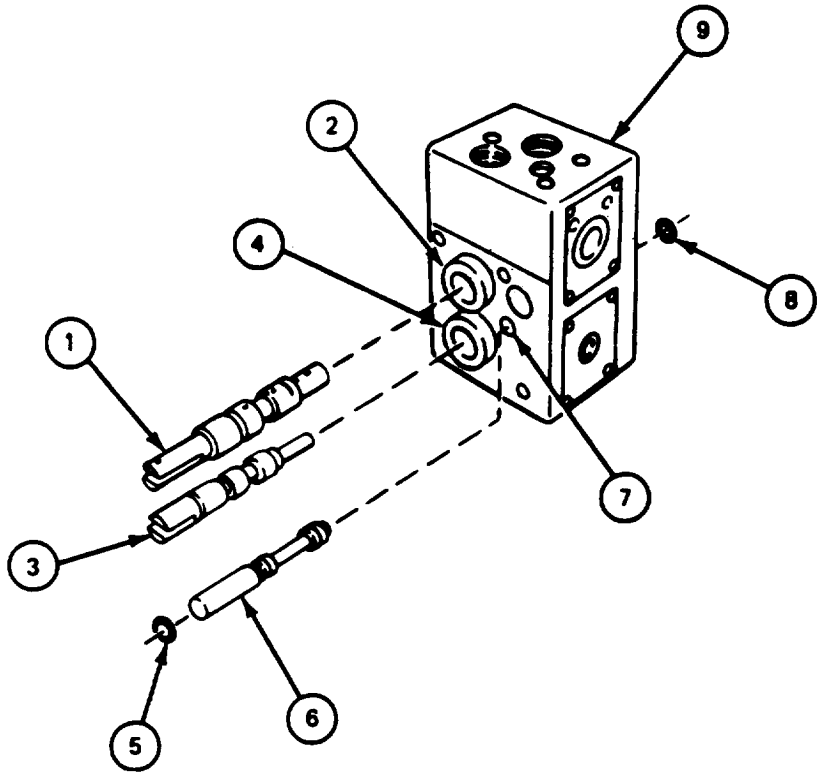
Step	Procedure
1.	Put one ball bearing (1) in each of two check valve ports (2) in valve body (3).
2.	Put one spring (4) in each of two check valve ports (2).
3.	Using 3/16” Allen wrench, put one plug (5) in each of two check valve ports (2). Tighten plugs.
4.	Using 1/4” Allen wrench, put plug (6) in body (3).
	GO TO FRAME 3



13-113. HYDRAULIC VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 3

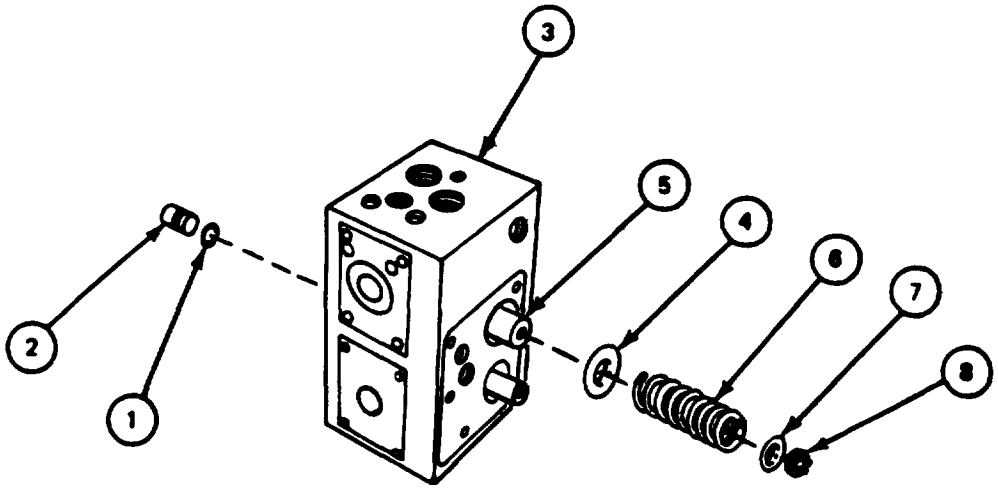
Step	Procedure
	NOTE Traversing spool (1) and elevating spool (3) must slide smoothly in valve block. Make sure spools are coated with hydraulic fluid before assembly.
1.	Put traversing spool (1), with slotted end out, in upper boss (2).
2.	Put elevating spool (3), with slotted end out, in lower boss (4).
3.	Using O-ring extractor tool, put preformed packing (5) on override piston (6) (JPG).
4.	Put override piston (6), small end first, in piston port (7).
5.	Using O-ring extractor tool, put preformed packing (8) in valve body (9) (JPG).
	GO TO FRAME 4



13-113. HYDRAULIC VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 4

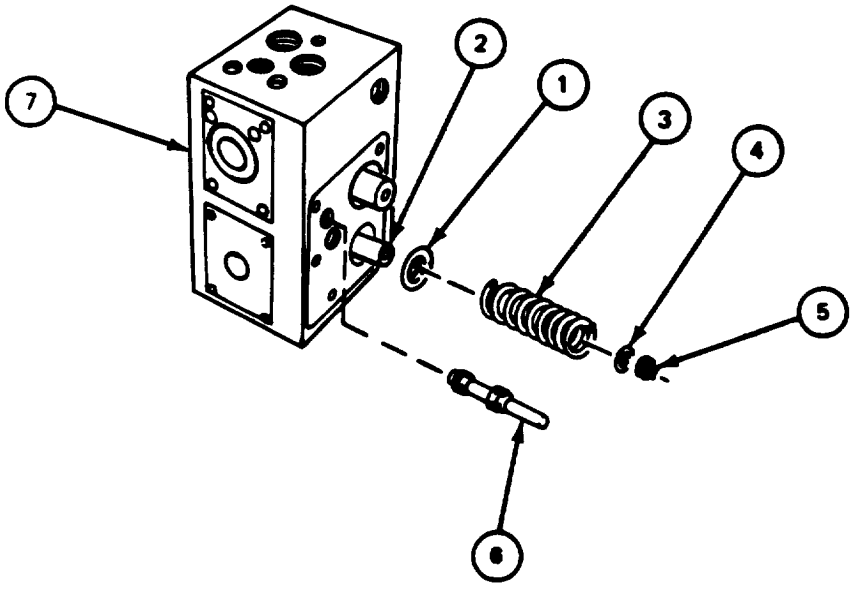
Step	Procedure
1.	Using O-ring extractor tool, put preformed packing (1) on retainer (2) and put retainer (2) in body (3) (JPG).
2.	Put stop (4) with raised part out, over end of traversing spool (5).
3.	Put traversing spool small spring (6) and retainer (7), with raised part in, over end of traversing spool (5).
	NOTE It may be necessary to get help to hold spring (6) compressed while retaining ring (8) is put in.
4.	Using pliers, secure retainer (7), spring (6), and stop (4) with retaining ring (8) (JPG). GO TO FRAME 5



13-113. HYDRAULIC VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 5

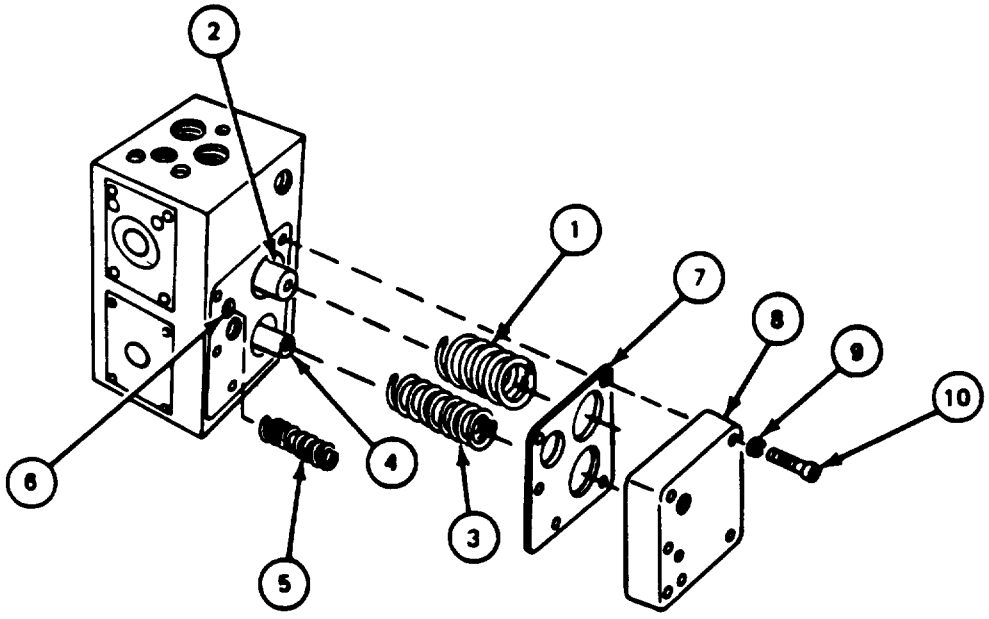
Step	Procedure
1.	Put stop (1), with raised part out, over end of elevation spool (2).
2.	Put elevation spool small spring (3) and retainer (4), with raised part in, over end of elevation spool (2).
	NOTE It may be necessary to get help to hold spring (3) compressed while retaining ring (5) is put in.
3.	Using pliers, secure retainer (4), spring (3), and stop (1) with retaining ring (5) (JPG).
4.	Put low pressure regulating spool (6) in valve body (7).
	GO TO FRAME 6



13-113. HYDRAULIC VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 6

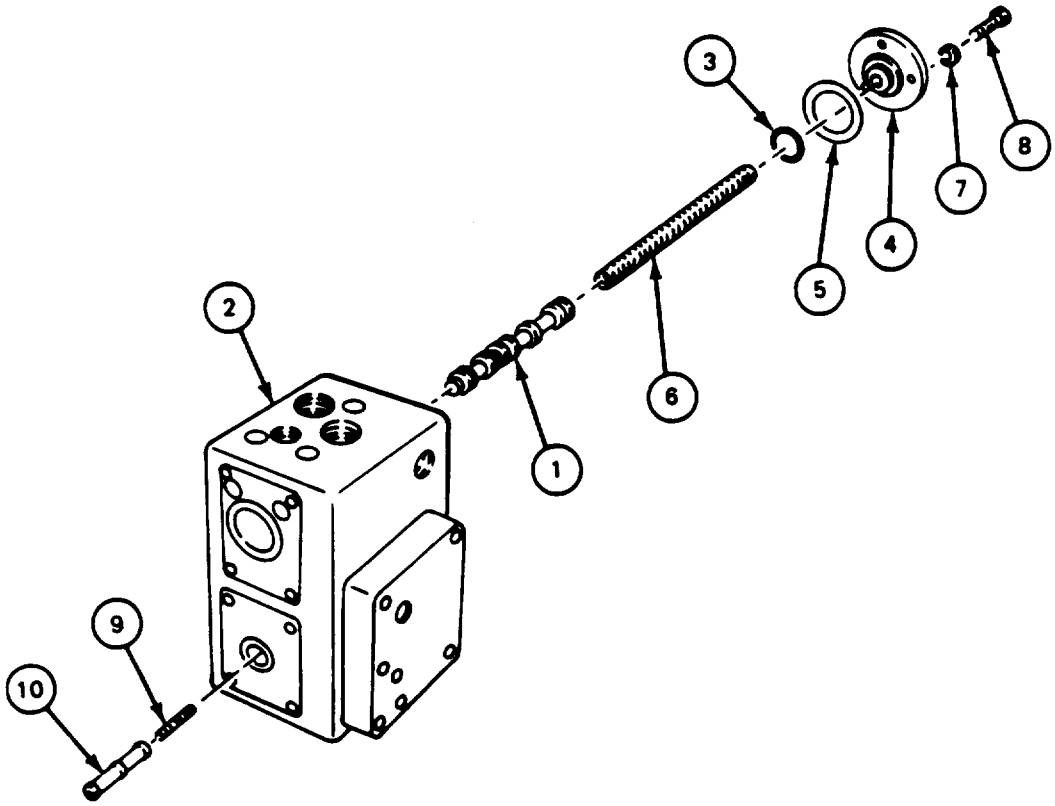
Step	Procedure
1.	Put traversing spool large spring (1) over spool end (2).
2.	Put elevation spool large spring (3) over spool end (4).
3.	Put regulator spool spring (5) in valve body (6).
	CAUTION Be careful when installing cover (8). Components in valve body are spring loaded. Tighten each screw (10) about one-turn and then go to the-next one until cover is in place.
4.	Put gasket (7) and cover (8) on valve body (6).
5.	Put five lockwashers (9) and five screws (10) in cover (8). Press down on cover (8) to compress springs.
	NOTE Start first screw (10) in comer of cover having the least spring tension against it. (Lower left hand corner.)
6.	Using 3/16” Allen wrench, slowly tighten each screw (10) so that cover (8) is evenly tightened down on the valve body (6).
7.	Using torque wrench with hex head socket, torque screws (10) to between 60 and 85 inch-pounds (JPG).
	GO TO FRAME 7


2
1
7
8
9
10
6
4
3
5

13-113. HYDRAULIC VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 7

Step	Procedure
1.	Put power spool (1) in valve body (2).
2.	Put packing (3) in body cover (4).
3.	Put gasket (5) on valve body (2).
4.	Put spring (6) on power spool (1).
5.	Using 3/16” Allen wrench, put three lockwashers (7) and three screws (8) through body cover (4) and in valve body (2).
6.	Using torque wrench with hex head socket, torque screws (8) to between 60 and 85 inch-pounds (JPG).
7.	Put spring (9) in override spool (10) and put in valve body (2).
	NOTE Follow-on Maintenance Action Required: Install power solenoid and override solenoid (para 13-109). Test hydraulic valve (para 13-111). Install hydraulic valve (para 13-105). Test gunner’s control (para 13-78).
	END OF TASK


1
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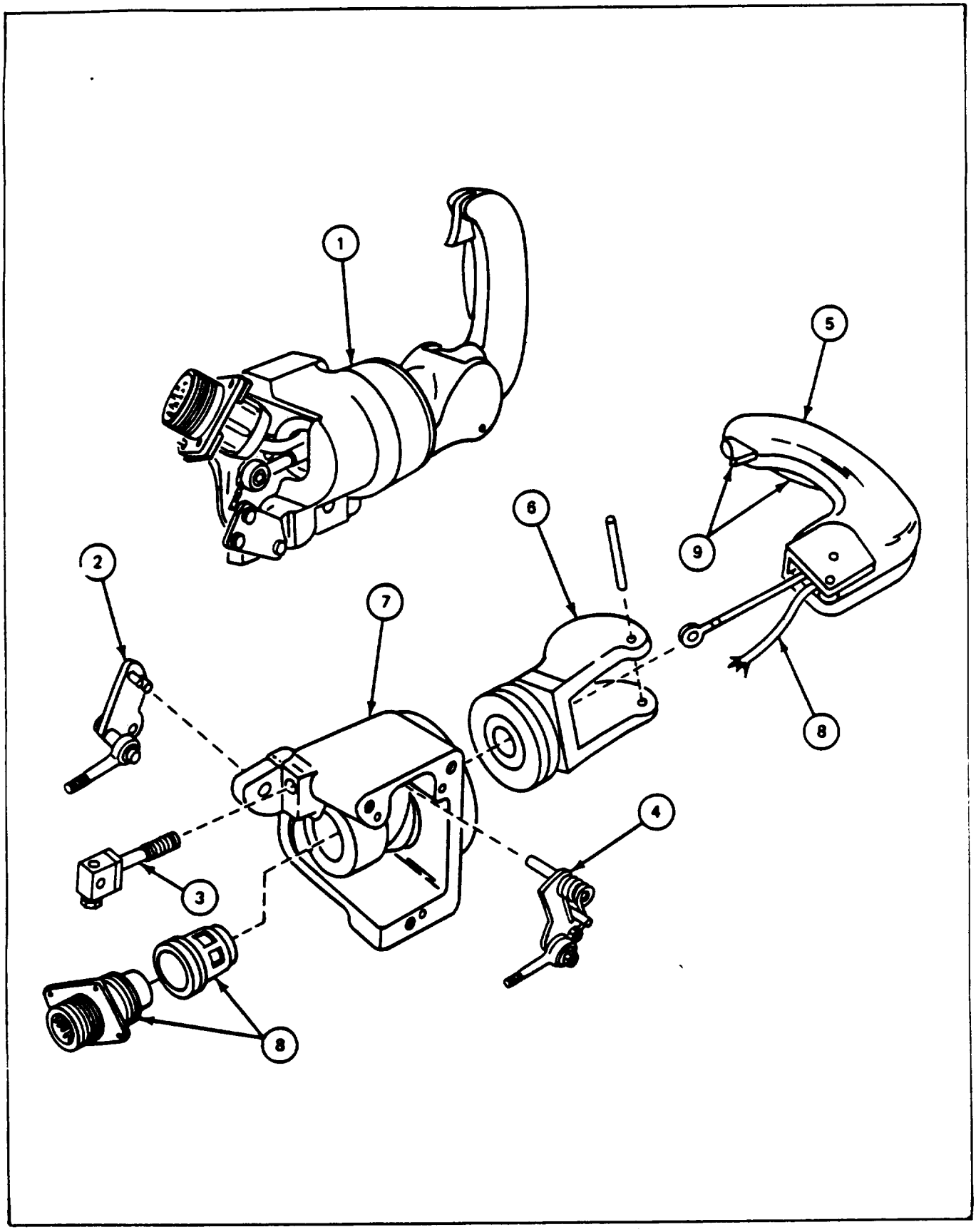
5
6
7
8
9
10

CHAPTER 14
COMMANDER'S CONTROL HANDLE

14-1. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks: Test	Adjustment	Removal	Installation	Disassembly	Assembly	Repair
. Commander's Control Handle	14-2	14-3	. . .	. . .	14-4	14-5	. . .
. Elevation Arm	. . .	. . .	14-6	14-7	. . .	. . .	. . .
. Plunger	. . .	. . .	14-6	14-7	. . .	. . .	. . .
. Traverse Arm	. . .	. . .	14-8	14-9	14-10	14-11	
. Grip	. . .	. . .	14-12	14-13	14-14	14-15	. , .
. Bracket	. . .	. . .	14-16	14-17	. . .	. . .	. . .
. Housing	. . .	. . .	14-16	14-17	14-18	14-19	14-20
. Harness	. . .	. . .	14-12	14-13	. . .	. . .	. . .
. Switch	. . .	. . .	14-14	14-15	. . .	. . .	. . .


1
2
3
4
5
6
7
8
9
8

14-2. COMMANDER'S CONTROL HANDLE TEST PROCEDURE

TEST EQUIPMENT: Elevating protractor (fabricated tool, item 1, App. B)
Traversing protractor (fabricated tool, item 1, App. B)
Multimeter
Spring scale
6" machinist steel rule

TOOLS: 3/8" flat tip screwdriver
7/16" combination wrench

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to remove commander's control handle
JPG for procedures to:
Use multimeter
Check continuity

EQUIPMENT CONDITION: Commander's control handle removed (TM-20-2-3)

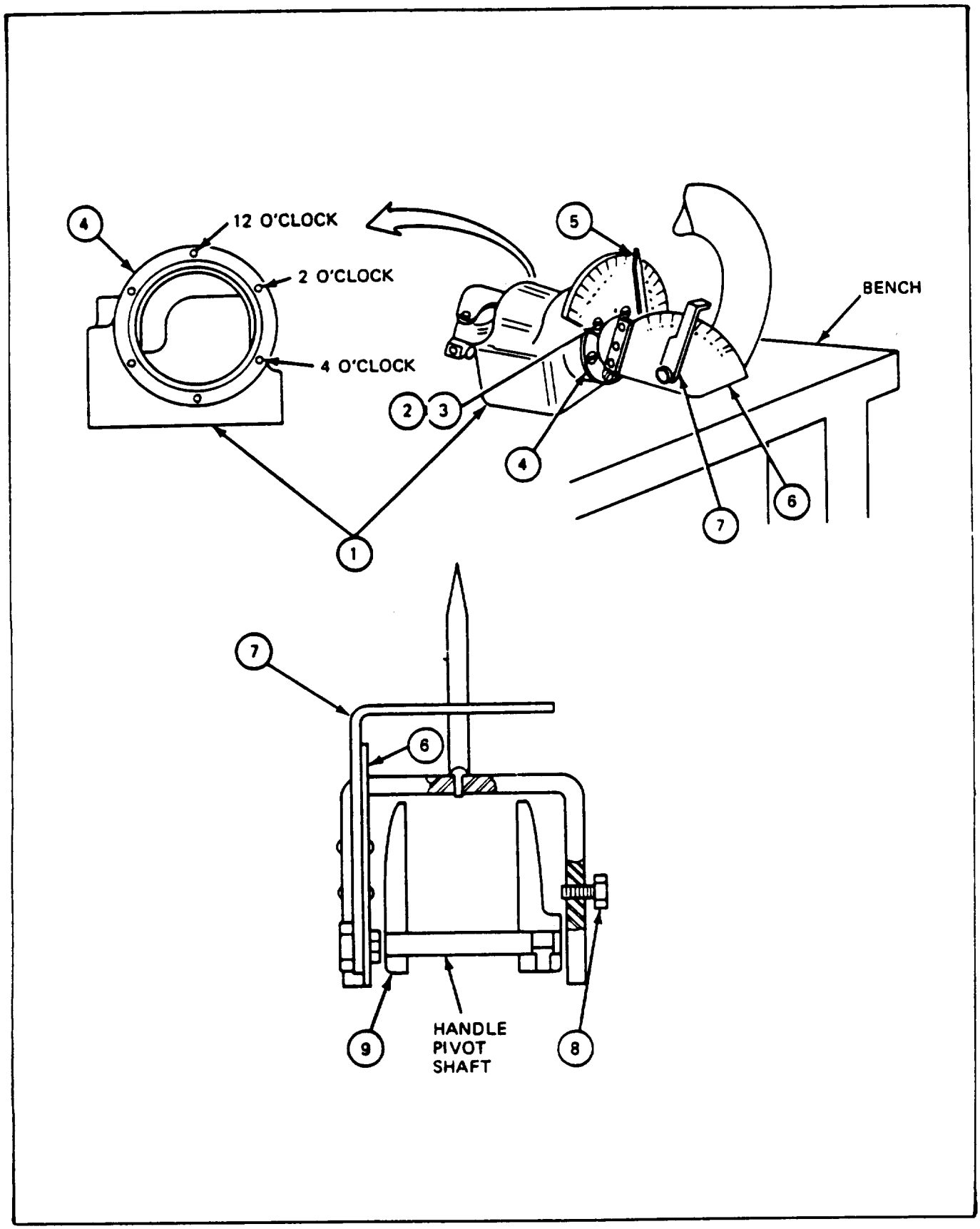
GENERAL INSTRUCTIONS:

NOTE

If normal indication is not obtained, commander's control handle is bad or out of adjustment. Refer to section index (para 14-1) for adjustments or for replacement of bad parts.

FRAME 1

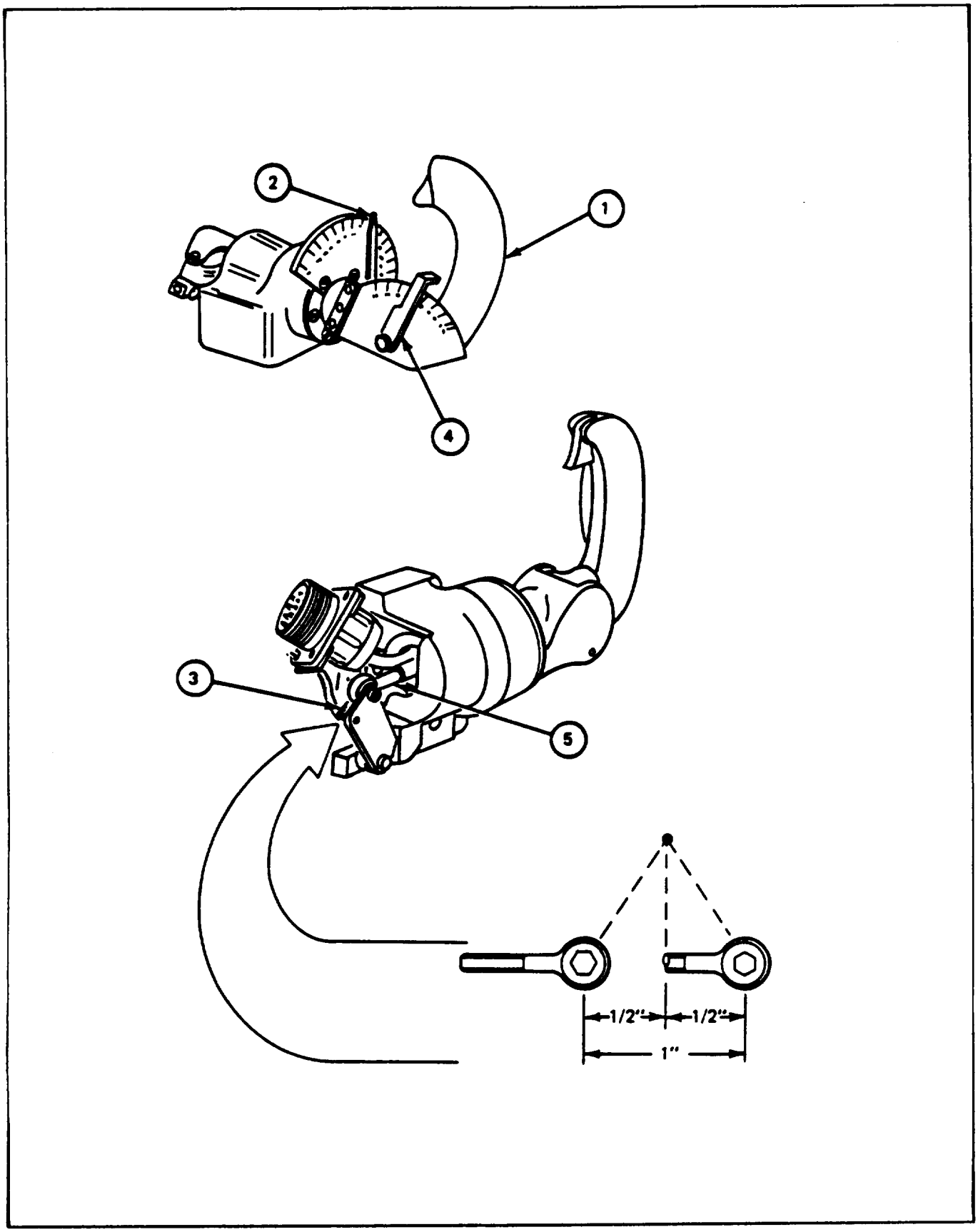
Step	Procedure
1.	Place control handle on bench resting on housing cover (1).
2.	Using screwdriver, remove three screws (2) and three lockwashers (3) attaching cam plate (4) to housing (1) at the 12, 2, and 4 o'clock positions.
3.	Line up hole below zero degree mark on traversing protractor (5) with hole at 2 o'clock position on cam plate (2).
4.	Using screwdriver, attach traversing protractor (5) to cam plate (4) with three screws (2) and three lockwashers (3) in holes at 12, 2 and 4 o'clock positions.
5.	Place elevating protractor (6) over handle so that pivot of elevating protractor pointer (7) is directly over end of handle pivot shaft.
6.	Using wrench, tighten screw (8) against handle bracket (9).
	GO TO FRAME 2


4
12 O'CLOCK
2 O'CLOCK
4 O'CLOCK
5
BENCH
2
3
4
6
7
1
7
6
9
HANDLE
PIVOT
SHAFT
8

14-2. COMMANDER'S CONTROL HANDLE TEST PROCEDURE (CONT)

FRAME 2

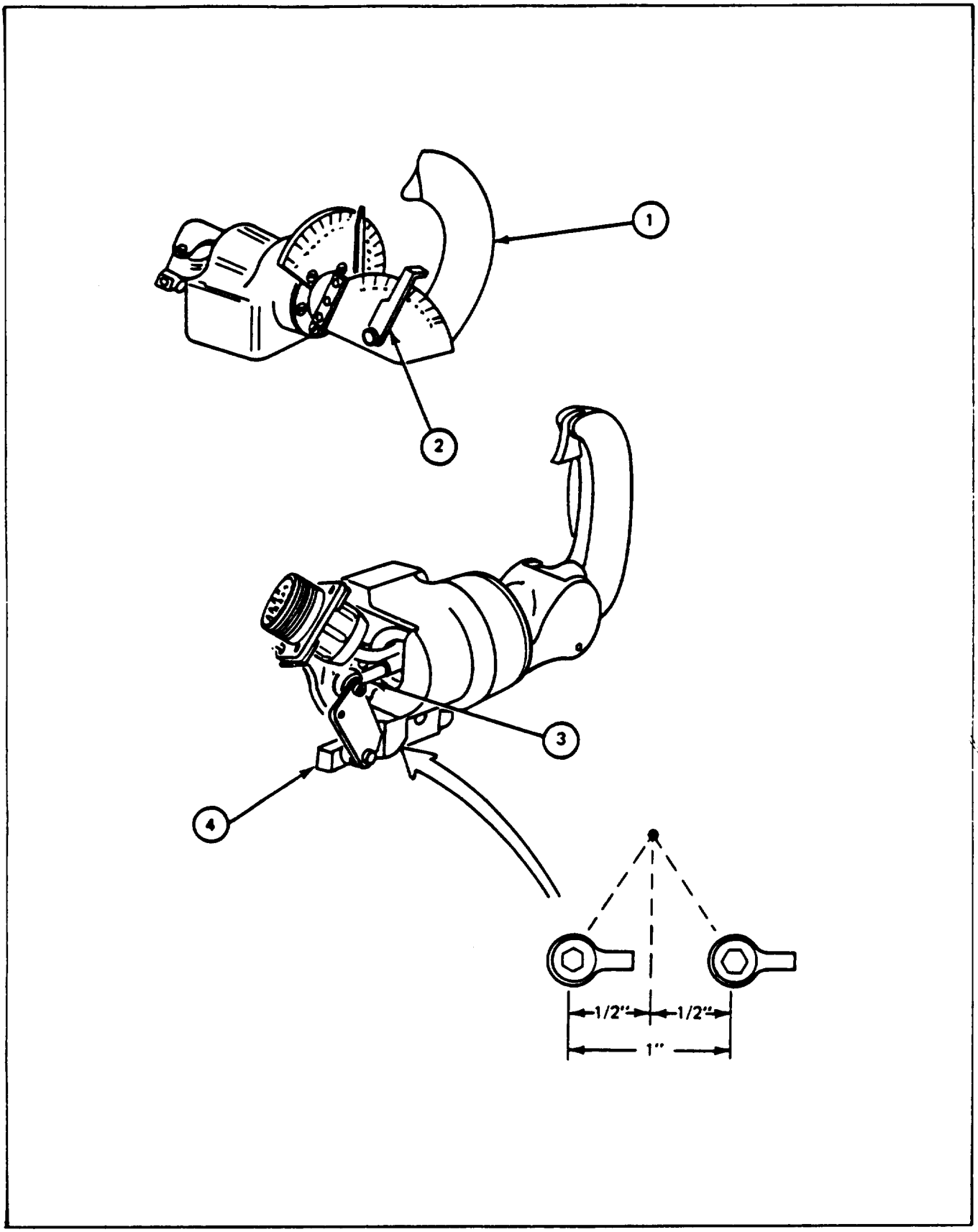
Step	Procedure	Normal Indication	Probable Fault
1.	Move handle (1) left.	Traversing pointer (2) moves to between 85 and, 95 degrees. Traversing arm rod end (3) moves at least, 1/2 inch.	a. Surfaces of traversing arm worn b. Handle bracket out of adjustment.
2.	Let handle (1) go to neutral.	Handle automatically returns to neutral (0 degree mark).	a. Bad traversing arm centering spring. b. Bad cam bearing
3.	Move handle (1) right.	Same as step 1.	Same as step 1.
4.	Let handle (1) go to neutral.	Same as step 2.	Same as step 2.
5.	Push handle (1) forward until it touches stop.	. . .	. . .
6.	Set rear edge of elevating pointer (4) against front part of handle (1).	Pointer (4) should be between 25 and 30 degrees. Elevation arm rod end (5) should move at least 1/2 inch.	a. Elevating arm rod end out of adjustment. b. Camlock block out of adjustment.
7.	Let handle (1) go to neutral and push pointer against handle.	Handle automatically returns to neutral (0 degree mark).	a. Bad plunger spring. b. Plunger binding c. Cam lock block out of adjustment
	GO TO FRAME 3		


2
1
4
3
5
1/2"
1/2"
1"

14-2. COMMANDER'S CONTROL HANDLE TEST PROCEDURE (CONT)

FRAME 3

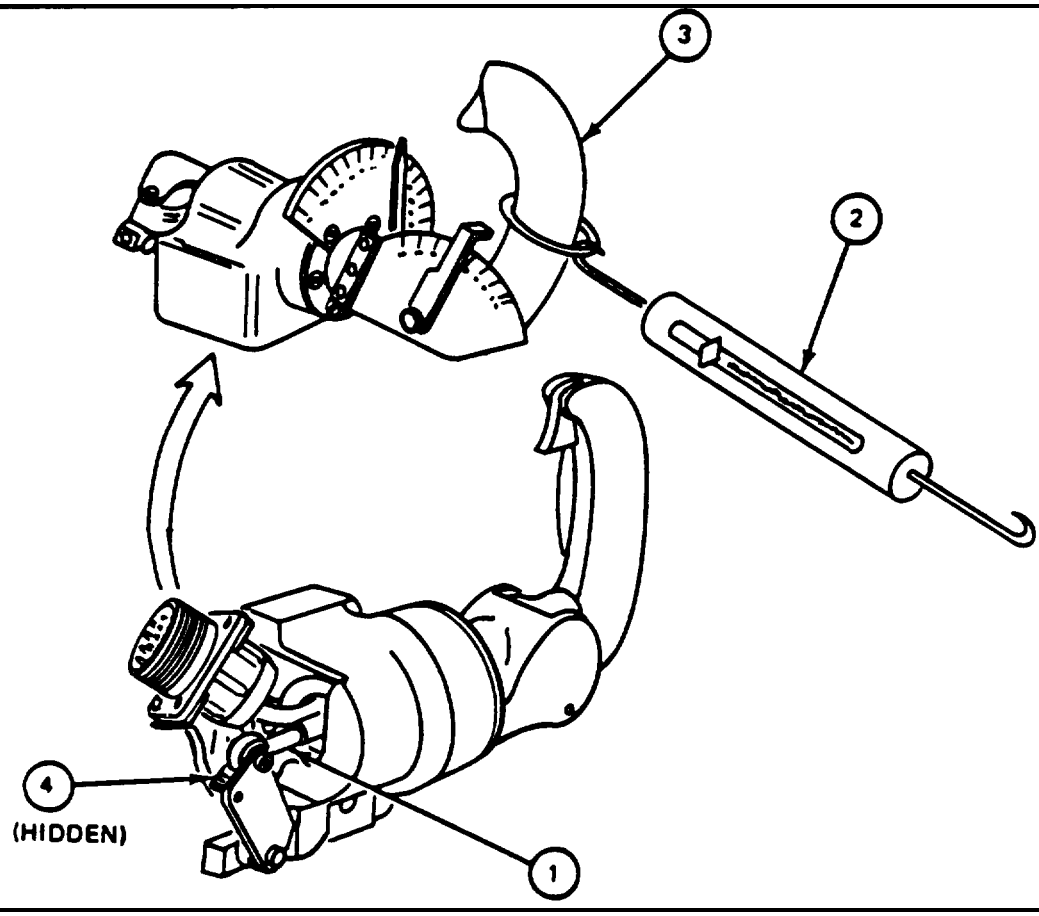
Step	Procedure	Normal Indication	Probable Fault
1.	Pull handle (1) to rear until it touches stop.	. . .	. . .
2.	Set rear edge of elevation pointer (2) against front part of handle (1).	Pointer (2) between 25 and 30 degrees. Elevation arm rod end (3) moves at least 1/2 inch.	a. Elevation rod end (3) out of adjustment. b. Cam lock block (4) out of adjustment.
3.	Let handle (1) go to neutral.	Handle automatically returns to neutral (0 degree mark).	a. Bad plunger spring. b. Plunger binding.
4.	Move handle (1) from stop to stop for both elevation and traverse.	Movement smooth and even from stop to stop for both elevation and traverse.	Dirty, worn, or bad parts.
	GO TO FRAME 4		


1
2
3
4
1/2"
1/2"
1"

14-2. COMMANDER'S CONTROL HANDLE TEST PROCEDURE (CONT)

FRAME 4

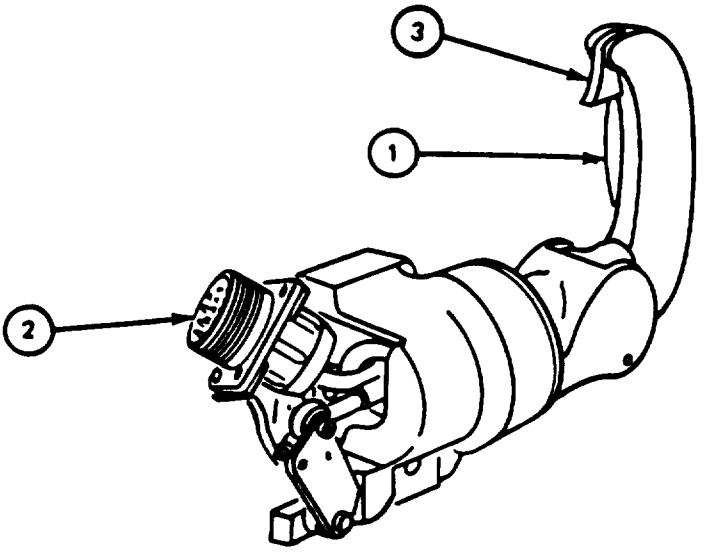
Step	Procedure	Normal Indication	Probable Fault
1.	Hold elevation arm rod end (1) so it cannot move.	. . .	. . .
2.	Attach spring-scale (2) to handle (3). Using spring-scale, pull handle backward.	Handle (3) moves not more than 2 degrees with a pull of 35 to 45 ounce-inches.	Too much backlash because of worn parts.
3.	Repeat steps 1 and 2 for handle (3) forward direction.	Same as step 2.	Same as step 2.
4.	Hold traverse arm rod end (4) so it cannot move.	. . .	. . .
5.	Repeat step 2 for handle (3) left and right directions.	Same as step 2.	Same as step 2.
	GO TO FRAME 5		

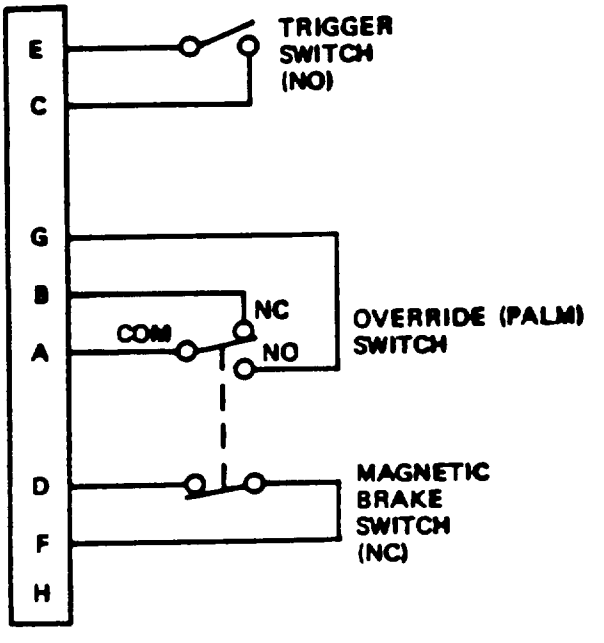


14-2. COMMANDER'S CONTROL HANDLE TEST PROCEDURE (CONT)

FRAME 5

Step	Procedure	Normal Indication	Probable Fault
1.	Make sure palm switch (1) is not pressed in.	. . .	. . .
2.	Using multimeter, check continuity at electrical connector (2) between (JPG):		
	a. pins A and B	a. Less than 2 ohms	a. Bad override switch or bad wiring.
	b. pins D and F	b. Less than 2 ohms	b. Bad magnetic brake switch or bad wiring.
	c. pins A and G	c. Greater than 10 million ohms	c. Bad override switch or switch out of adjustment.
3.	Press in palm switch (1).	. . .	. . .
4.	Using multimeter, check continuity at electrical connector (2) between pns A and G (JPG).	Less than 2 ohms	Bad override switch or bad wiring.
5.	Using multimeter, check continuity at electrical connector (2) between pins D and F (JPG).	Greater than 10 million ohms	Bad magnetic brake switch or bad wiring.
6.	Let go of palm switch (1) and press in trigger switch (3).	. . .	. . .
7.	Using multimeter, check continuity at electrical connector (2) between pins C and E (JPG).	Less than 2 ohms	Bad trigger switch or bad wiring.
8.	Let go of trigger switch (3).	. . .	. . .
	GO TO FRAME 6		

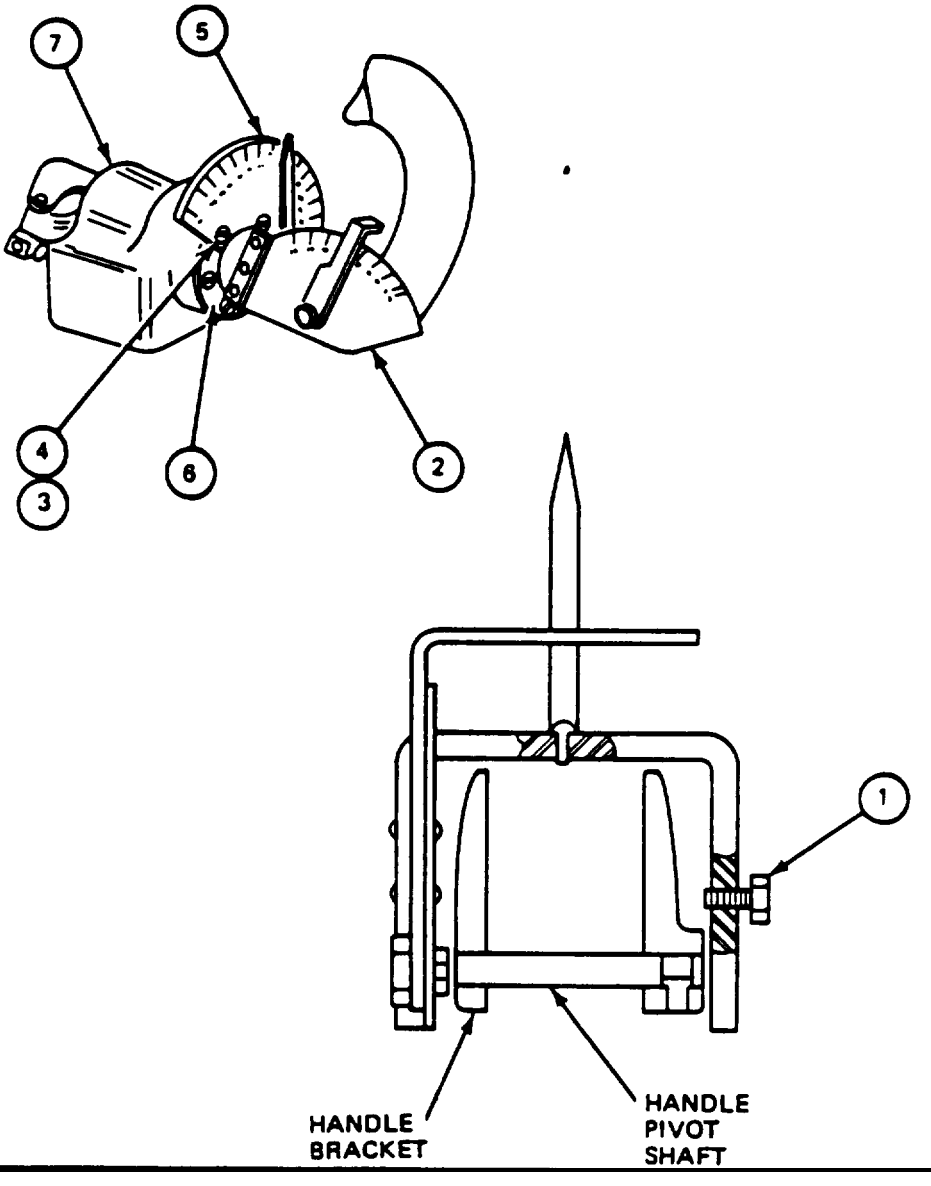

3
1
2


E
C
G
B
A
D
F
H
TRIGGER SWITCH (NO)
NC
COM
NO
OVERRIDE (PALM) SWITCH
MAGNETIC BRAKE SWITCH (NC)

14-2. COMMANDER'S CONTROL HANDLE TEST PROCEDURE (CONT)

FRAME 6

Step	Procedure
1.	Using wrench, loosen screw (1) and remove elevating protractor (2).
2.	Using screwdriver, remove three screws (3), three lockwashers (4), and traversing protractor (5) from cam plate (6).
3.	Using screwdriver, attach cam plate (6) to housing (7) with three screws (3) and three lockwashers (4).
	END OF TASK



14-3. COMMANDER'S CONTROL HANDLE ADJUSTMENT PROCEDURE

TEST EQUIPMENT Elevating protractor (fabricated tool, item 1, App. B)
Traversing protractor (fabricated tool, item 1, App B)

TOOLS: Smooth file
3/32" socket head screw key (Allen wrench)
1/2" open end wrench
3/8" combination wrench
3/8" drive ratchet
5/16" socket (3/8" drive)

SUPPLIES: Thread sealing compound (item 27, App. A)

PERSONNEL: One

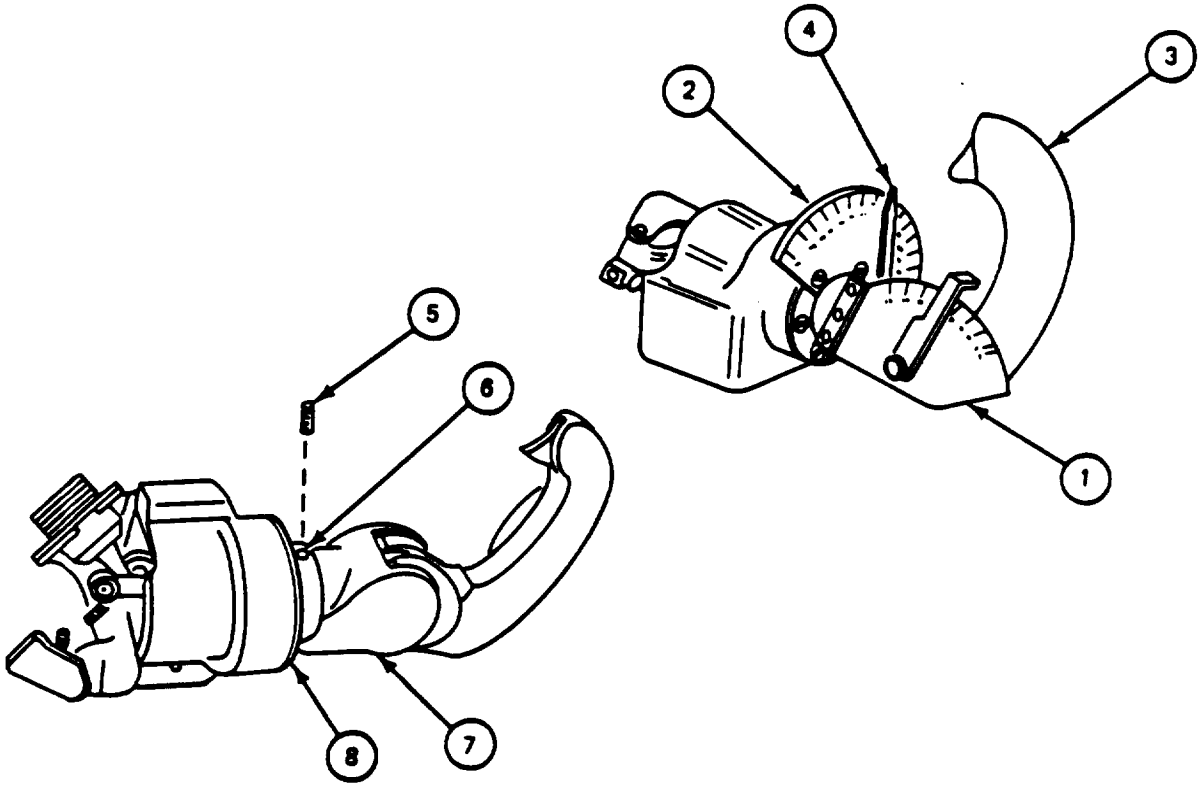
REFERENCES: TM 9-2350-222-20-2-3 for procedure to remove commander's control handle
JPG for procedure to use thread sealing compound

EQUIPMENT CONDITION: Commander's control handle removed (TM-20-2-3)

14-3. COMMANDER'S CONTROL HANDLE ADJUSTMENT PROCEDURE (CONT)

FRAME 1

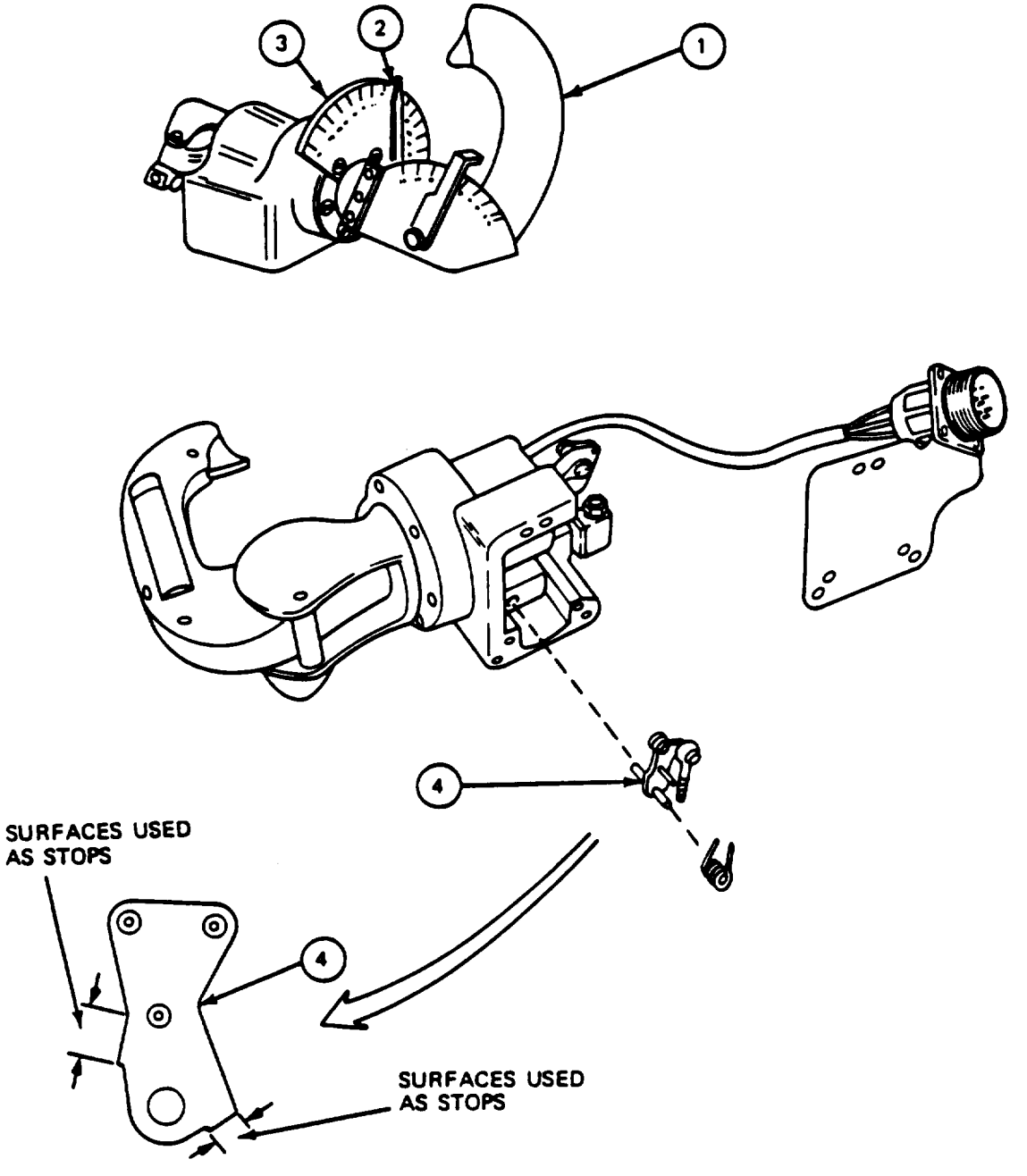
Step	Procedure
1.	Install elevating protractor (1) and traversing protractor (2) (para 14-2, frame 2).
2.	With handle (3) at neutral, traversing pointer (4) should be lined up with 0 degree mark on traversing protractor (2).
	NOTE If traversing pointer (4) is lined up with 0 degree mark, go to frame 2.
3.	Using Allen wrench, remove three setscrews (5).
4.	Using Allen wrench, loosen three setscrews (6) holding handle bracket (7) to cam (8).
5.	Holding cam (8), turn handle bracket (7) until traversing pointer (4) is lined up with 0-degree mark on traversing protractor (2).
6.	Using Allen wrench tighten three setscrews (6) holding handle bracket (7) to cam (8).
7.	Using Allen wrench, put in three setscrews (5).
	GO TO FRAME 2



14-3. COMMANDER'S CONTROL HANDLE ADJUSTMENT PROCEDURE (CONT)

FRAME 2

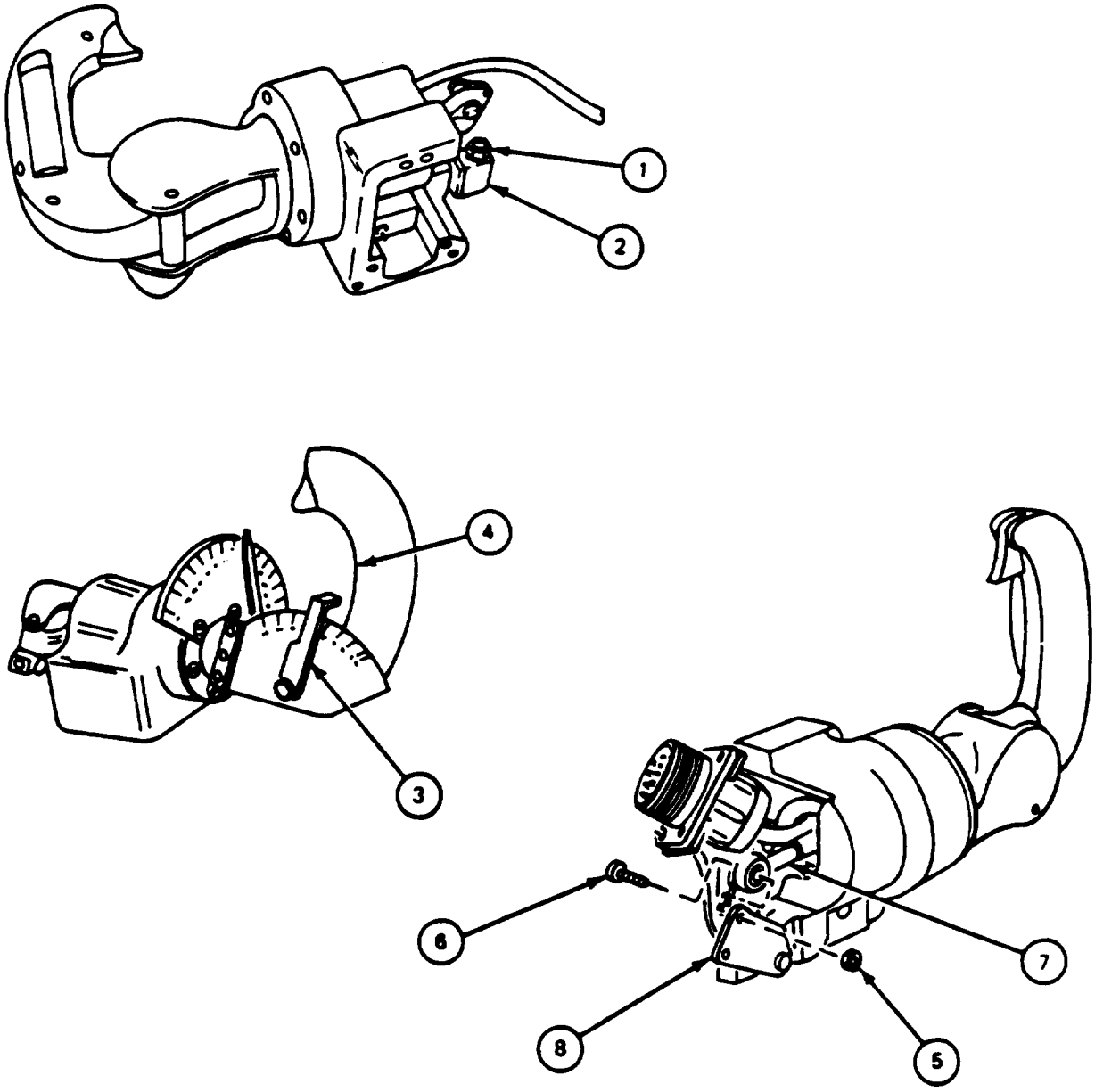
Step	Procedure
1.	Move handle (1) left until it stops. Traversing pointer (2) should move to between 85 and 95 degrees marks on traverng protractor (3).
2.	Repeat step 1 for right movement of handle (1).
	NOTE If traversing travel is good, go to frame 3.
3.	Remove traverse arm (4) (para 14-8).
	NOTE If traversing travel is less than 85 degrees left or right, surfaces of traverse arm (4) used as stops may be filed down, as necessary. If traversing travel is more than 95 degrees, replace traverse arm.
4.	Install traverse arm (para 14-9).
5.	Repeat steps 1 and 2 above to check adjustment of traversing travel.
	GO TO FRAME 3


3
2
1
4
SURFACES USED
AS STOPS
4
SURFACES USED
AS STOPS

14-3. COMMANDER'S CONTROL HANDLE ADJUSTMENT PROCEDURE (CONT)

FRAME 3

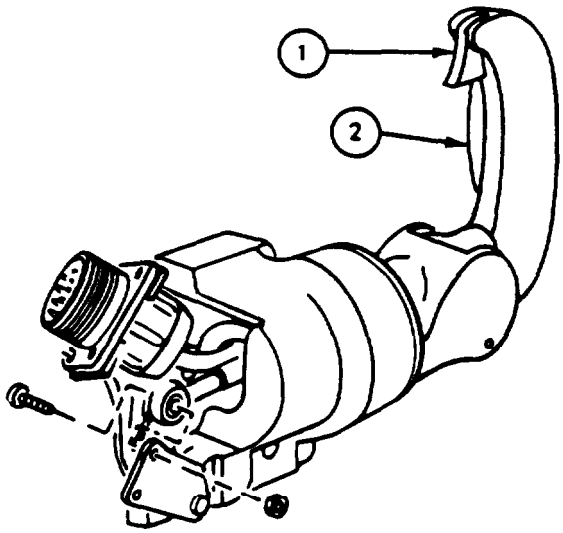
Step	Procedure
1.	Using 1/2" wrench, loosen nut (1) on cam lock block (2).
2.	Set rear edge of protractor pointer (3) on zero degree mark.
3.	Set forward edge of grip (4) against protractor pointer (3).
4.	Using 1/2" wrench, tighten nut (1) on cam lock block (2).
5.	Pull grip (4) rearward and check movement on protractor (should travel 25 to 30 degrees). NOTE If movement is more than 25 degrees and less than 30 degrees, go to frame 4.
6.	Using 3/8" wrench on nut (5) and 5/16" wrench on screw (6), remove nut and screw from rod end (7) and elevation arm (8). NOTE Rod end (7) should be turned counterclockwise for movement less than 25 degrees and clockwise for movement greater than 30 degrees.
7.	Using hands, turn rod end (7) to get proper movement. Repeat steps 1 through 6 as required.
8.	Put thread sealing compound on rod end (7) threads (JPG).
9.	Using 3/8" wrench on nut (5) and 5/16" wrench on screw (6), attach rod end (7) to elevation arm (8) with nut and screw. GO TO FRAME 4


1
2
4
3
6
7
8
5

14-3. COMMANDER'S CONTROL HANDLE ADJUSTMENT PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Check movement of trigger (1) and override actuator (2) and listen for click.
	NOTE
	If trigger and override actuator movement is good, omit step 2 and go to step 3.
2.	Make adjustments if necessary (para 14-15, frame 5).
3.	When adjustments are complete, remove elevating and traversing protractor (para 14-2, frame 6).
	END OF TASK



14-4. COMMANDER'S CONTROL HANDLE DISASSEMBLY PROCEDURE

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to remove commander's control handle

EQUIPMENT CONDITION: Commander's control handle removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test commander's control handle (para 14-2)

FRAME 1

Step	Procedure
1.	Remove elevation arm and plunger (para 14-6).
2.	Remove traverse arm (para 14-8).
3.	Remove grip (para 14-12).
4.	Remove housing and bracket (para 14-16).
5.	Disassemble traverse arm (para 14-10).
6.	Disassemble housing (para 14-18).
7.	Disassemble grip (para 14-14).
	END OF TASK

14-5. COMMANDER'S CONTROL HANDLE ASSEMBLY PROCEDURE

PERSONNEL: One

FRAME 1

Step	Procedure
1.	Assemble housing (para 14-19).
2.	Assemble grip (para 14-15).
3.	Assemble traverse arm (para 14-11).
4.	Install bracket (para 14-17).
5.	Install grip (para 14-13).
6.	Install traverse arm (para 14-9).
7.	Install elevation arm and plunger (para 14-7).
	NOTE Follow-on Maintenance Action Required: Test commander's control handle (para 14-2).
	END OF TASK

14-6. ELEVATION ARM AND PLUNGER REMOVAL PROCEDURE

TOOLS: 5/16" socket (3/8" drive)
3/8" drive ratchet
3/8" combination wrench (two)
1/2" combination wrench
5/16’” combination wrench
1/4" drive pin punch
8 oz ball peen hammer
Scraper
Stiff bristled brush
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 commander’s control handle
JPG for procedures to
Clean parts
Inspect and repair parts

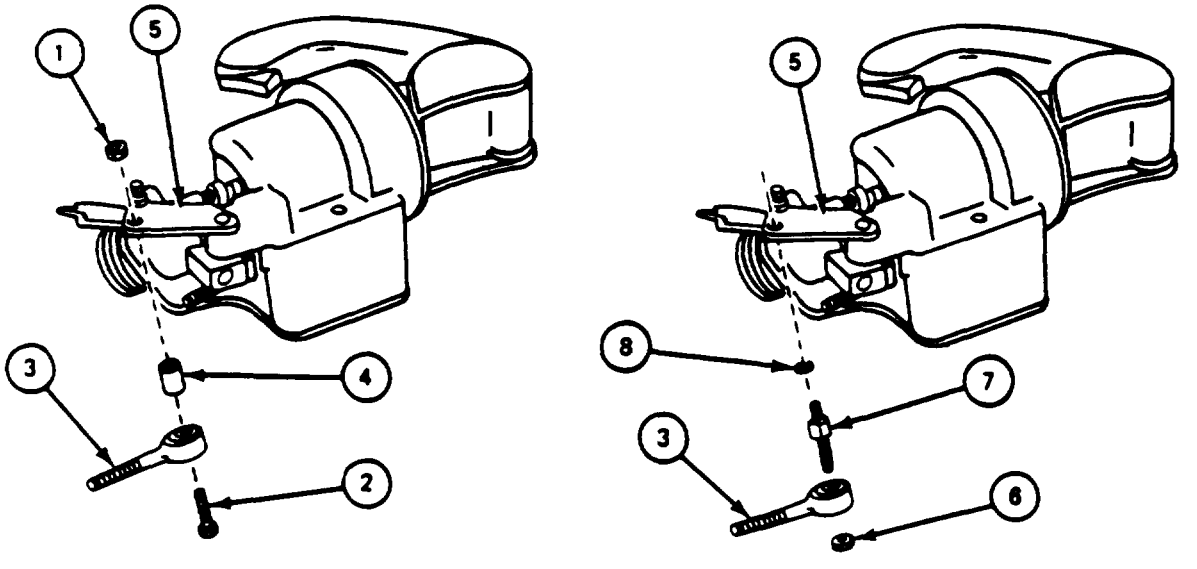
EQUIPMENT CONDITION: Commander’s control handle removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test commander’s control handle (para 14-2)

14-6. ELEVATION ARM AND PLUNGER REMOVAL PROCEDURE (CONT)

FRAME 1

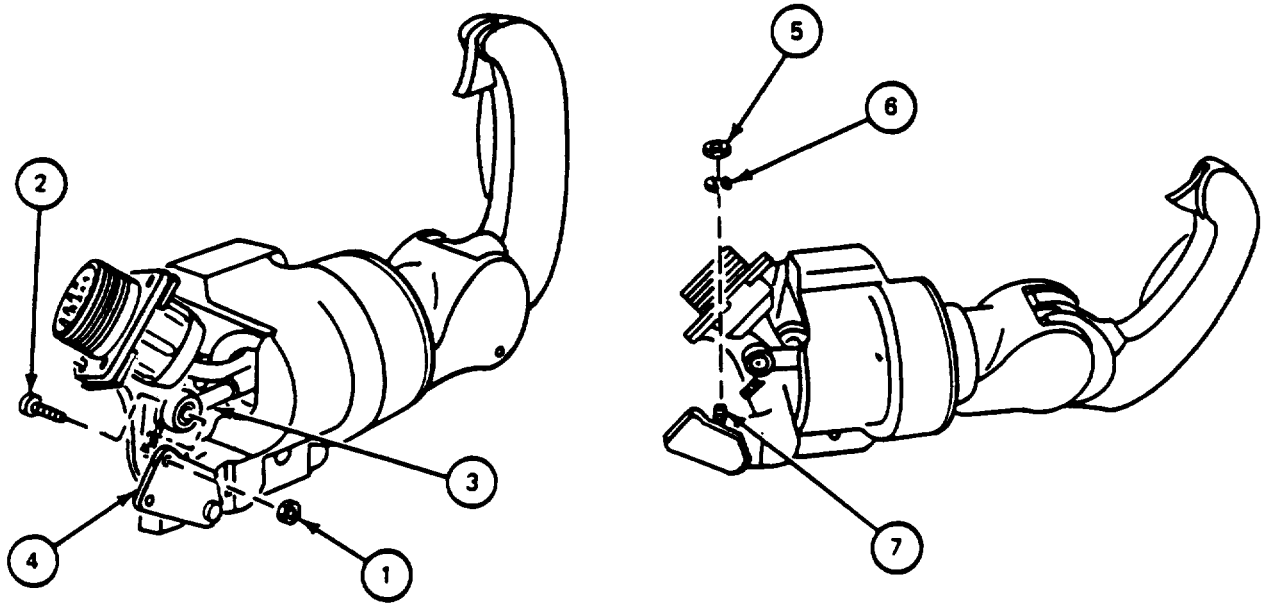
Step	Procedure
	NOTE If nut (1) and screw (2) are used to attach rod end (3) and spacer (4) to elevation arm (5), do step 1. Otherwise, do steps 2 and 3.
1.	Using 5/16" and 3/8" combination wrenches, remove nut (1) and screw (2) attaching rod end (3) and spacer (4) to elevation arm (5).
2.	Using two 3/8" combination wrenches, remove nut (6) attaching rod end (3) to stud (7).
3.	Using 3/8" combination wrench, remove stud (7) and lockwasher (8) from elevation arm (5).
	GO TO FRAME 2



14-6. ELEVATION ARM AND PLUNGER REMOVAL PROCEDURE (CONT)

FRAME 2

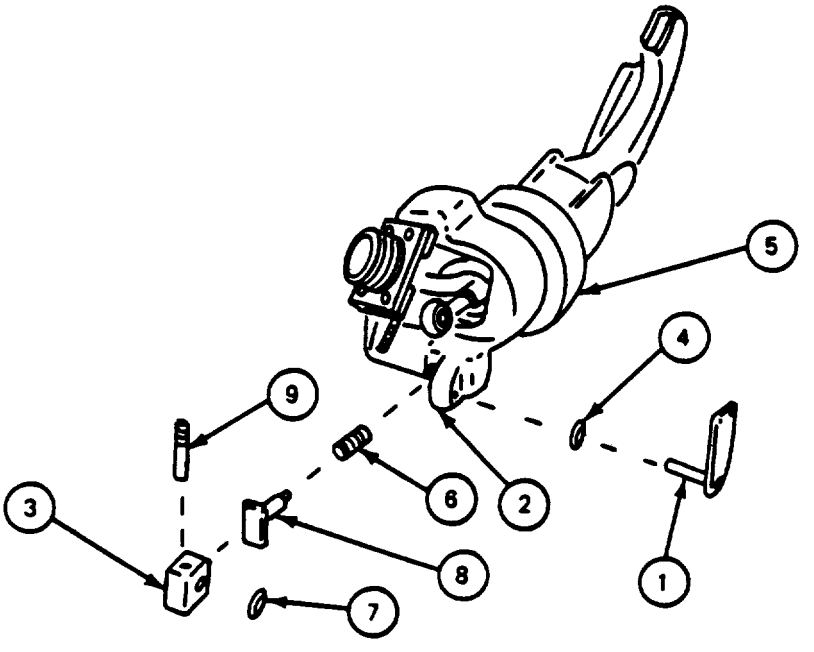
step	Procedure
1.	Using socket wrench and 3/8” combination wrench, remove nut (1) and screw (2) attaching rod end (3) to elevation arm (4).
2.	Using 1/2” combination wrench, remove nut (5) and lockwasher (6) from threaded pm (7).
	00 TO FRAME 3



14-6. ELEVATION ARM AND PLUNGER REMOVAL PROCEDURE (CONT)

FRAME 3

Step	Procedure
	WARNING Cam lock block (3) is under spring pressure. Be careful when removing elevation arm (1) that parts do not fly out and hit you.
1.	Using punch and hammer, lightly tap shaft of elevation arm (1) just enough to move elevation arm away from housing lug (2).
2.	Using one hand, hold cam lock block (3) in place and remove elevation arm (1) and spacer (4).
3.	Slowly let cam lock block (3) come out of housing (5) until there is no more pressure on spring (6).
4.	Remove cam lock block (3), spacer (7), plunger (8), and spring (6).
5.	Remove threaded pin (9) from cam lock block (3).
	NOTE Follow-on Maintenance Action Required Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK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14-7. ELEVATION ARM AND PLUNGER INSTALLATION PROCEDURE

TOOLS: 5/16" combination wrench
5/16" socket (3/8” drive)
3/8"drive ratchet
3/8" combination wrench (two)
8 ounce ball peen hammer

SUPPLIES: Grease (item 12, App. A)

PERSONNEL: One

REFERENCES: JPG for procedure to apply grease

EQUIPMENT CONDITION: Install grip (para 14-13)

GENERAL INSTRUCTIONS:

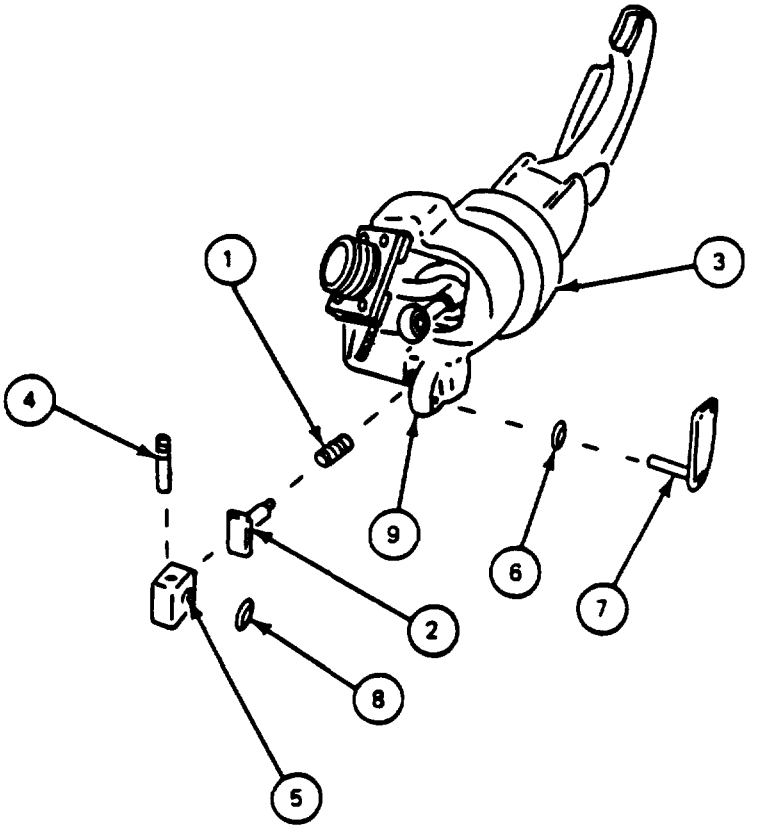
NOTE

Put a coating of grease on all mechanical parts that turn or slide (JPG).

14-7. ELEVATION ARM AND PLUNGER INSTALLATION PROCEDURE (CONT)

FRAME 1

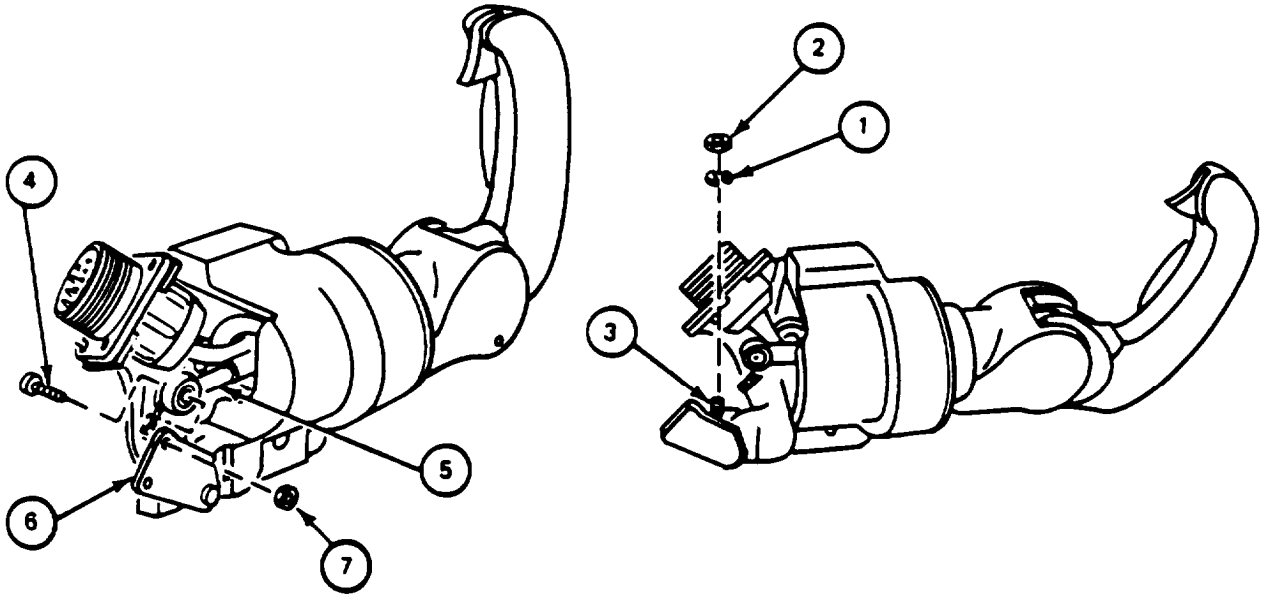
Step	Procedure
1.	Using hand, put spring (1) and plunger (2) into hole in housing (3) and hold spring pressed together.
2.	Put threaded pin (4) into cam lock block (5). Line up notch in threaded pin (4) with hole in cam lock block (5).
3.	Put spacer (6) on shaft of elevation arm (7).
4.	Put spacer (8) between cam lock block (5) and housing lug (9).
5.	Using hammer, carefully tap shaft of elevation arm (7) through lug (9), spacer (8), cam lock block (5), and threaded pin (4).
	GO TO FRAME 2



14-7. ELEVATION ARM AND PLUNGER INSTALLATION PROCEDURE (CONT)

FRAME 2

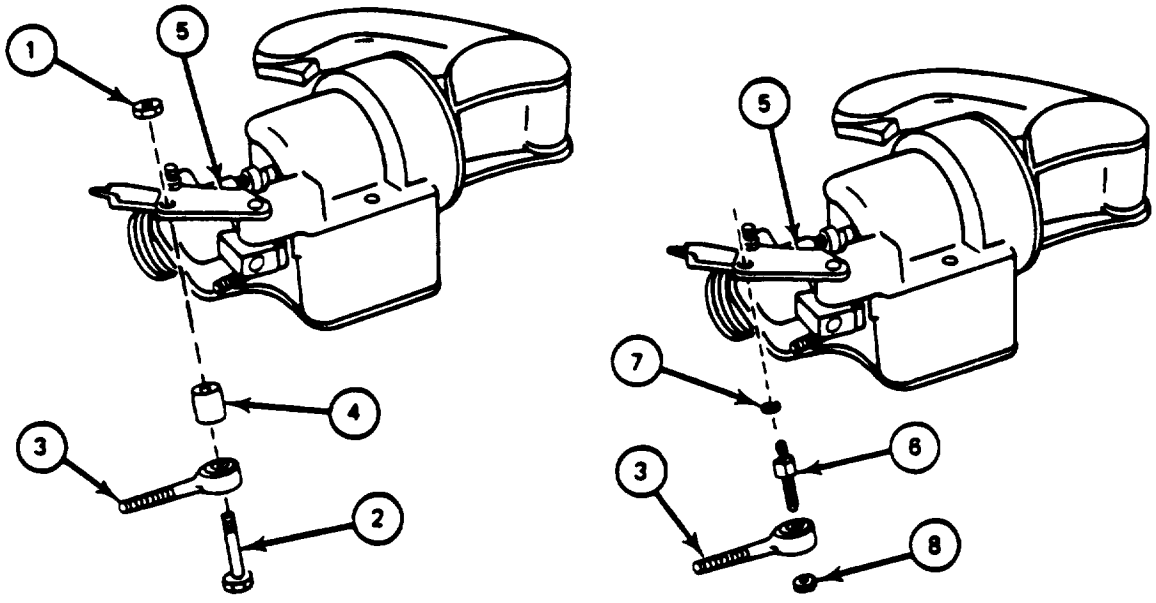
Step	Procedure
1.	Put lockwasher (1) and nut (2) on threaded pin (3). (Do not tighten.)
2.	Using socket wrench, put screw (4) through rod end bearing (5) and into threaded hole in elevation arm (6).
3.	Using 3/8” combination wrench, put nut (7) on screw (4).
	GO TO FRAME 3



14-7. ELEVATION ARM AND PLUNGER INSTALLATION PROCEDURE (CONT)

FRAME 3

Step	Procedure
	NOTE If a nut (1) and screw (2) are used to attach rod end (3) and spacer (4) to elevation arm (5), do step 1. Otherwise, do steps 2 and 3.
1.	Using 5/16" and 3/8" combination wrenches, attach rod end (3) and spacer (4) to elevation arm (5) with screw (2) and nut (1).
2.	Using 3/8” combination wrench, attach stud (6) and lockwasher (7) to elevation arm (5).
3.	Using two 3/8” combination wrenches, attach rod end (3) to stud (6) with nut (8).
	NOTE Do following if this procedure completes maintenance of commander’s control handle. Follow-on Maintenance Action Required: Test commander’s control handle (para 14-2).
	END OF TASK



14-8. TRAVERSE ARM REMOVAL PROCEDURE

TOOLS: 1/4" flat tip screwdriver

PERSONNEL: One

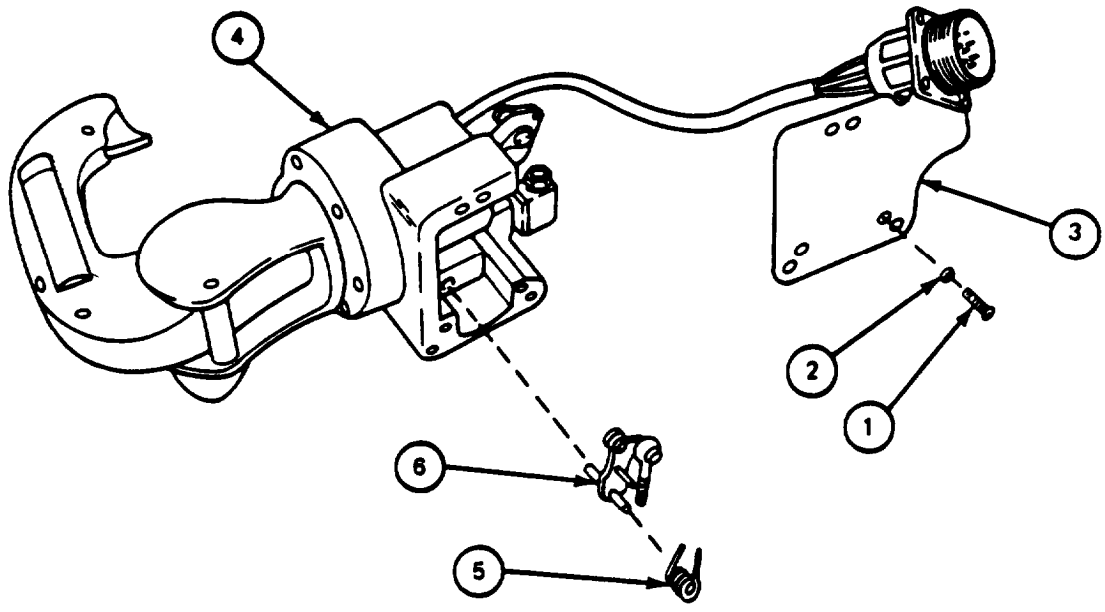
REFERENCES: TM 9-2350-222-20-2-3 for procedure to remove commander's control handle

EQUIPMENT CONDITION: Commander's control handle removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test commander's control handle (para 14-2)

FRAME 1

Step	Procedure
1.	Using screwdriver, remove three screws (1) and three lockwashers (2) attaching housing cover (3) to housing (4). Pull housing cover away from housing.
2.	Using hand, remove centering spring (5) and traverse arm (6) from housing (4).
	END OF TASK



14-9. TRAVERSE ARM INSTALLATION PROCEDURE

TOOLS: 1/4" flat tip screwdriver

SUPPLIES: Grease (item 12, App. A)

PERSONNEL: One

REFERENCES: JPG for procedure to apply grease

PRELIMINARY PROCEDURES: Assemble traverse arm (para 14-11)
Install housing and bracket (para 14- 17)

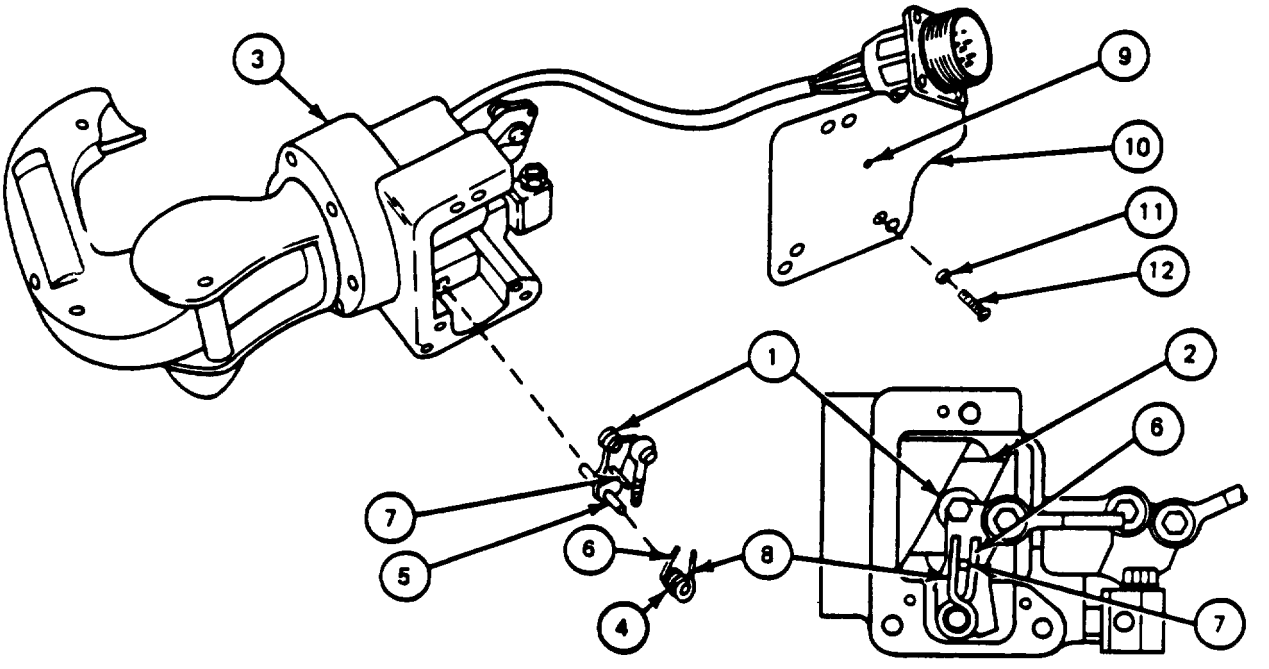
GENERAL INSTRUCTIONS:

NOTE

Put light coating of grease on all parts of traverse arm that turn or slide (JPG).

FRAME 1

Step	Procedure
1.	Line up bearing (1) on traverse arm with traversing cam slot (2) and put traverse arm into housing (3).
2.	Put centering spring (4) on pin (5) of traverse arm.
3.	Hook extended end (6) of centering spring (4) on right side of pin (7).
4.	Hook extended end (8) of centering spring (4) on left side of pin (7).
	NOTE The spring anchor pin (9) in housing cover (10) must be placed between extended ends (6) and (8) of spring (4) when attaching housing cover to housing (3).
s.	Using screwdriver, attach housing cover (10) to housing (3) with three lockwashers (11) and three screws (12).
	NOTE Do following if this procedure completes maintenance of commander's control handle. Follow-on Maintenance Action Required: Test commander's control handle (para 14-2).
	END OF TASK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14-10. TRAVERSE ARM DISASSEMBLY PROCEDURE

TOOLS: 3/8" socket (3/8" drive)
3/8" drive ratchet
5/16" socket (3/8" drive)
Scraper
Stiff bristled brush
Fine stone

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

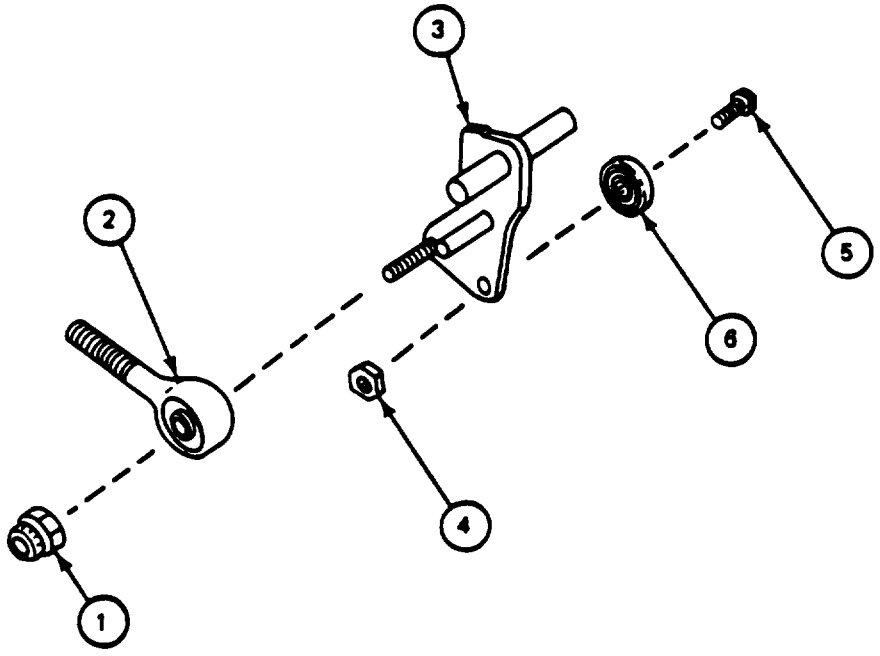
PERSONNEL: One

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

PRELIMINARY PROCEDURES: Test commander's control handle (para 14-2)
Remove traverse arm (para 14-8)

FRAME 1

Step	Procedure
1.	Using 3/8" socket wrench, remove nut (1) attaching rod end (2) to traverse arm (3). Remove rod end.
2.	Using 3/8" socket wrench remove nut (4).
3.	Using 5/ 16"' socket wrench, remove screw (5) and bearing (6) from traverse arm (3).
	NOTE
	Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK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14-11. TRAVERSE ARM ASSEMBLY PROCEDURE

TOOLS: 5/16” socket (3/8” drive)
3/8” socket (3/8” drive)
3/8” drive ratchet

SUPPLIES: Thread sealing compound (item 28, App. A)
Grease (item 12, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to
Use thread sealing compound
Apply grease

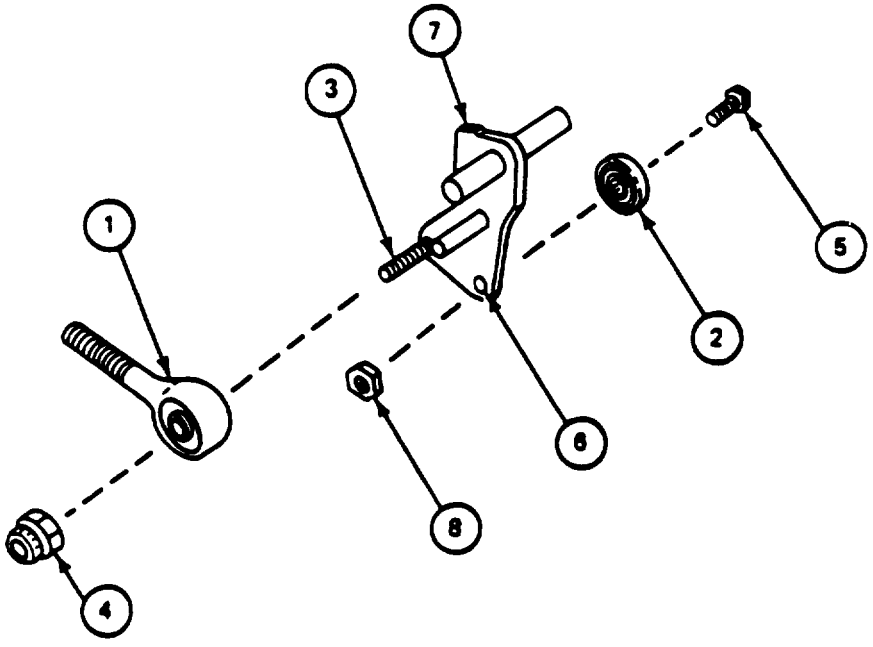
GENERAL INSTRUCTIONS:

NOTE

During assembly, put grease on all parts that turn or slide (JPG).

14-11. TRAVERSE ARM ASSEMBLY PROCEDURE (CONT)

Step	Procedure
1.	Using hand, apply coating of grease to rod end bearing (1) and bearing (2) (JPG).
2.	Put thread sealing compound on threads of stud (3) (JPG).
3.	Using 3/8” socket wrench, attach rod end (1) to stud (3) with nut (4).
4.	Put bearing (2) on screw (5).
5.	Using 5/16” socket wrench, put screw (5) in threaded hole (6) of traverse arm (7).
6.	Put thread sealing compound on threads of screw (5) (JPG).
7.	Using 3/8” socket wrench, tighten nut (8) attaching bearing (2) and screw (5) to traverse arm (7).
	NOTE Follow-on Maintenance Action Required: Install traverse arm (para 14-9).
	END OF TASK



14-12. GRIP AND HARNESS REMOVAL PROCEDURE

TOOLS: 1/4” flat tip screwdriver
3/8” socket (3/8" drive)
3/8” drive ratchet
3/8” combination wrench
1/4” drive pin punch
1/16” socket head screw key (Allen wrench)
Slip joint pliers with plastic jaws
Soldering iron
8 ounce ball peen hammer

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

PERSONNEL: One

REFERENCES: TM 9-2350-222-20-2-3 for procedure to remove commander’s control handle
JPG for procedures to:
Use soldering iron
Tag electrical wires

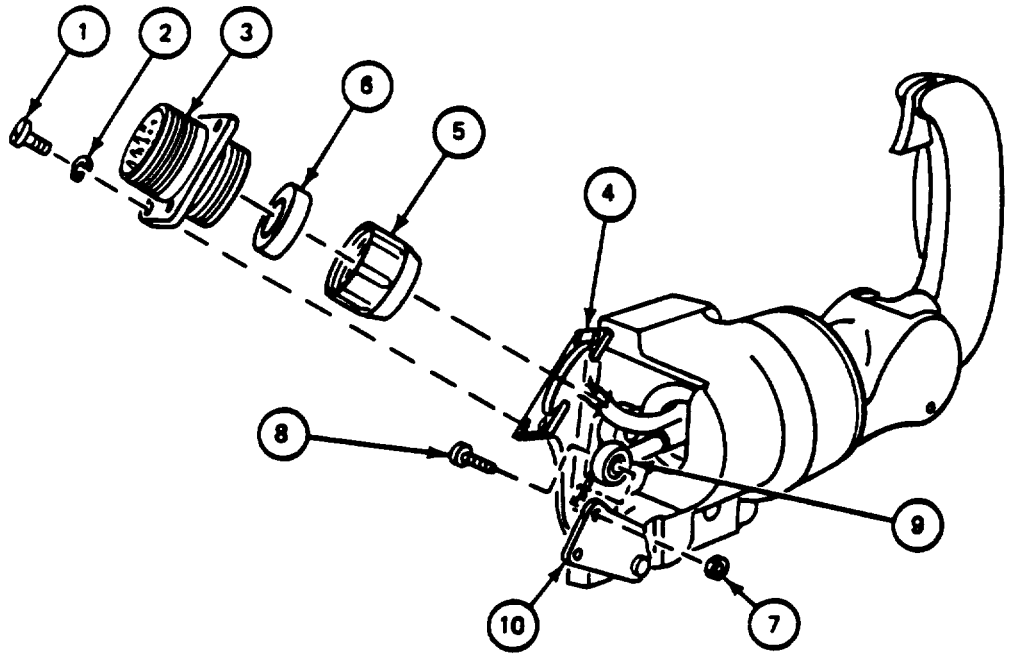
EQUIPMENT CONDITION: Commander’s control handle removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test commander’s control handle (para 14-2)

14-12. GRIP AND HARNESS REMOVAL PROCEDURE (CONT)

FRAME 1

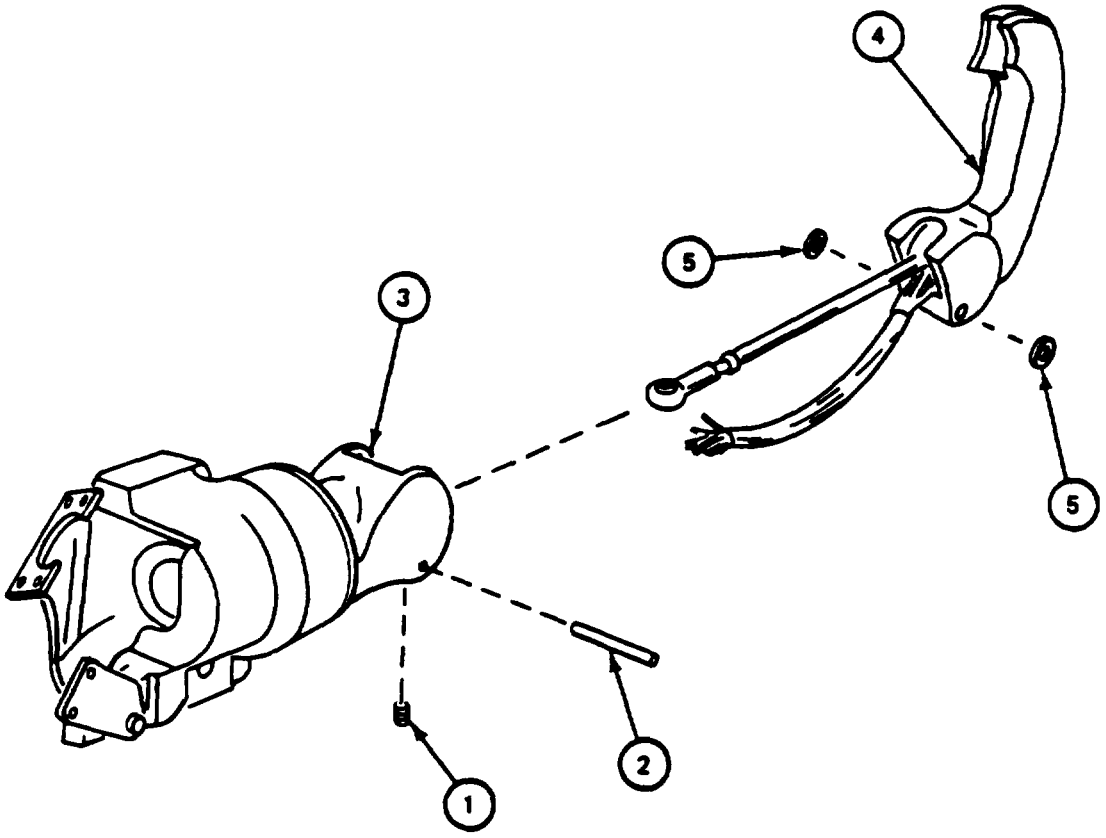
Step	Procedure
1.	Using screwdriver, remove four screws (1) and four lockwashers (2) attaching electrical connector (3) to housing cover (4).
2.	Using pliers, unscrew nut (5) from electrical connector (3).
3.	Using hand, pull nut (5) and grommet (6) away from electrical connector (3)
4.	Using masking tape and pen, tag each electrical lead connected to electrical connector (3) (JPG).
5.	Using soldering iron, unsolder electrical leads from electrical connector (3) pins (JPG).
6.	Remove grommet (6) and nut (5) from harness.
7.	Using socket wrench and combination wrench, remove nut (7) and screw (8) attaching rod end (9) to elevation arm (10).
	GO TO FRAME 2



14-12. GRIP AND HARNESS REMOVAL PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Using Allen wrench, remove setscrew (1) that holds pivot shaft (2) in bracket (3).
2.	Using drift punch and hammer, drive pivot shaft (2) out of bracket (3).
3.	Remove grip (4) (with rod and harness) and spacers (5) from bracket (3). Note number of spacers removed so that the same number are used when attaching grip to bracket.
	END OF TASK



14-13. GRIP AND HARNESS INSTALLATION PROCEDURE

TOOLS: 1/16" socket head screw key (Allen wrench)
Feeler gauge
1/4" flat tip screwdriver
Soldering iron
Slip joint pliers with plastic jaws
3/8"socket (3/8" drive)
3/8" drive ratchet
3/8" combination wrench
8 ounce ball peen hammer

SUPPLIES: Grease (item 12, App. A)
Solder (item 31, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Use soldering iron
Apply grease

PRELIMINARY PROCEDURES: Assemble grip (para 14- 15)
Install housing and bracket (para 14-17)
Install traverse arm (para 14-9)

GENERAL INSTRUCTIONS:

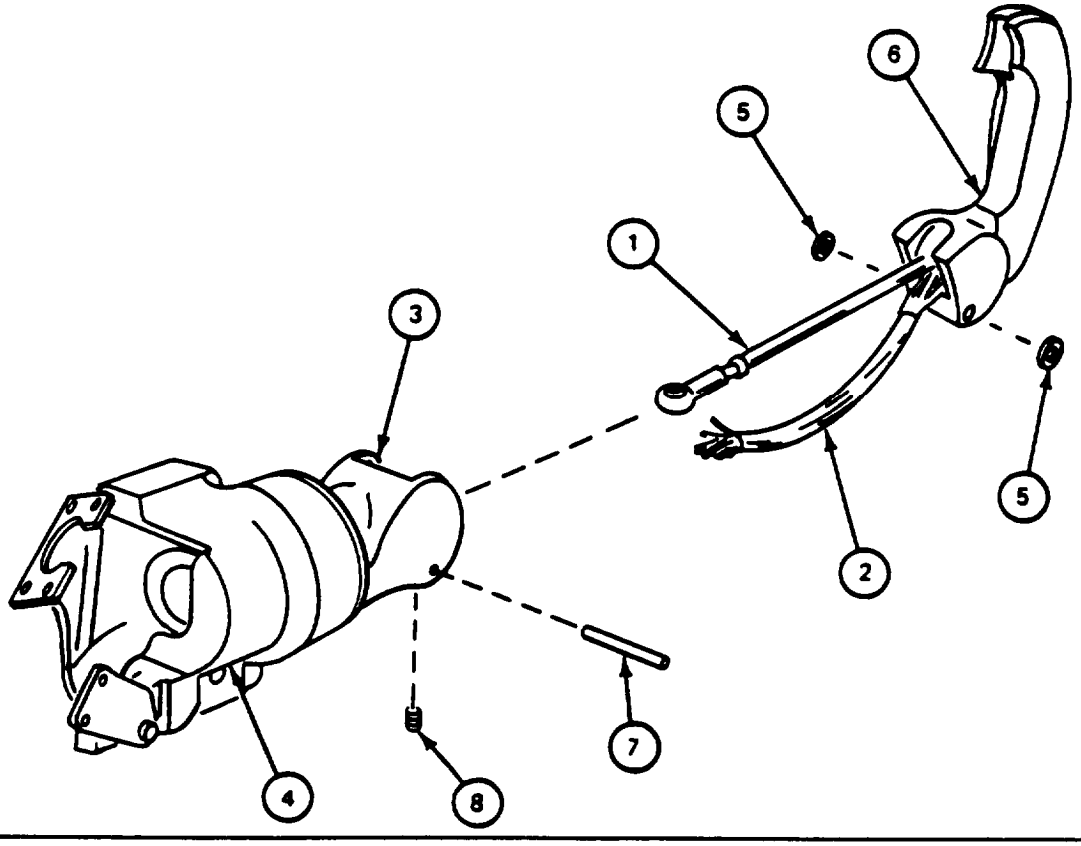
NOTE

Put coating of grease on all mechanical parts that turn or slide (JPG).

4-13. GRIP AND HARNESS INSTALLATION PROCEDURE (CONT)

FRAME 1

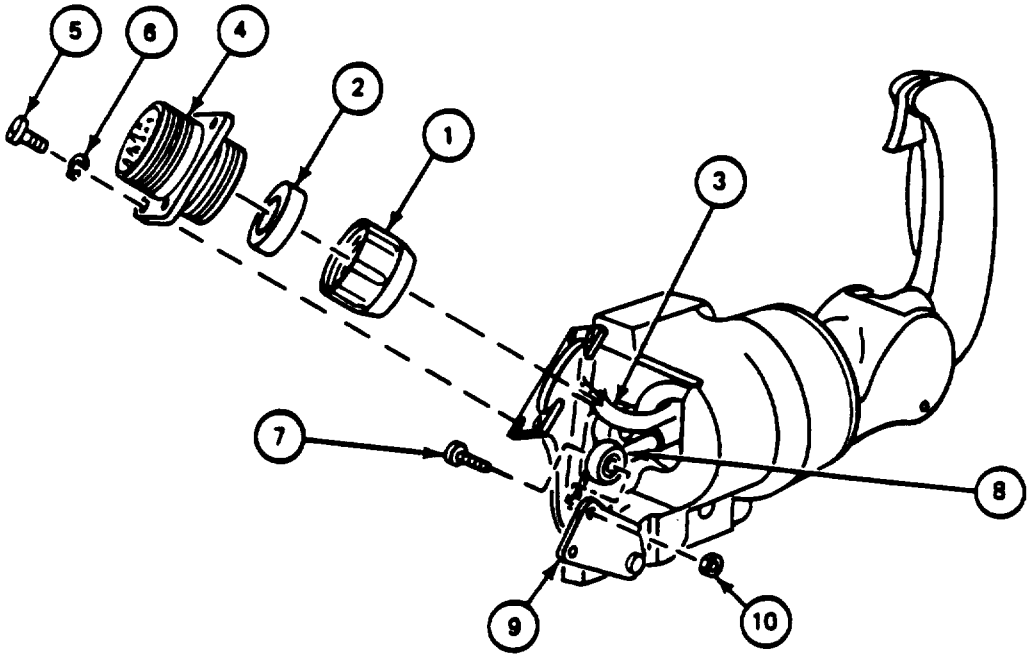
Step	Procedure
1.	Put rod (1) and harness (2) into bracket (3) and housing (4).
2.	Put spacers (5) between bracket (3) and grip (6). Using feeler gauge, check for 0.003" to 0.008" clearance between bracket (3) and each side of grip (6). Add spacers as required to get this clearance.
	NOTE Pivot shaft (7) has a groove with a flat surface on one end. This must be lined up with hole for setscrew in hub of bracket (3).
3.	Put a coating of grease on pivot shaft (7) (JPG).
4.	Using hammer, carefully tap pivot shaft (7) through bracket (3) hole, spacer (5), and grip (6).
5.	Using Allen wrench, put setscrew (8) into hole in bracket (3).
	GO TO FRAME 2



14-13. GRIP AND HARNESS INSTALLATION PROCEDURE (CONT)

FRAME 2

Step	Procedu
1.	Place electrical connector nut (1) and grommet (2) on electrical harness leads (3).
2.	Using soldering iron, solder harness leads to pins of electrical connector (4) (JPG).
3.	Remove tags from leads.
4.	Using pliers, put nut (1) on electrical connector (4).
5.	Using screwdriver, attach electrical connector (4) to housing cover with four screws (5) and four lockwashers (6).
6.	Put screw (7) through rod end (8) and hole in elevation arm (9).
7.	Put nut (10) on screw (7).
8.	Using socket wrench and combination wrench, tighten nut (10) on screw (7).
	NOTE
	Follow-on Maintenance Action Required:
	Test commander's control handle (para 14-2).
	END OF TASK



14-14. GRIP DISASSEMBLY AND SWITCH REMOVAL PROCEDURE

TOOLS: 3/16" flat Up screwdriver
3/16" drive pin punch
8 ounce ball men hammer
3/32" socket'head screw key (Allen wrench)
5/32". socket head screw key (Allen wrench)
1/16" drive pill punch
Scraper
Stiff bristled brush
Fine stone

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

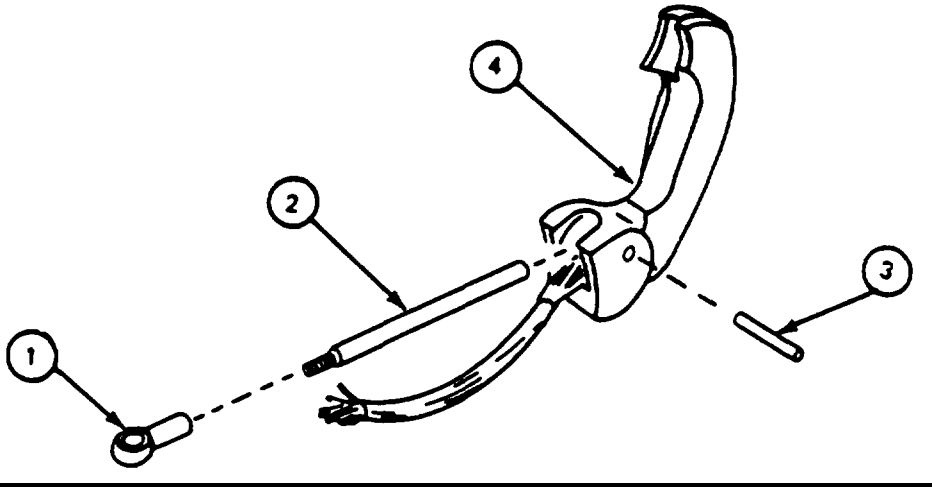
PERSONNEL: One

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

PRELIMINARY PROCEDURES: Test commander's control handle (para 14-2)
Remove grip (para 14-12)

FRAME 1

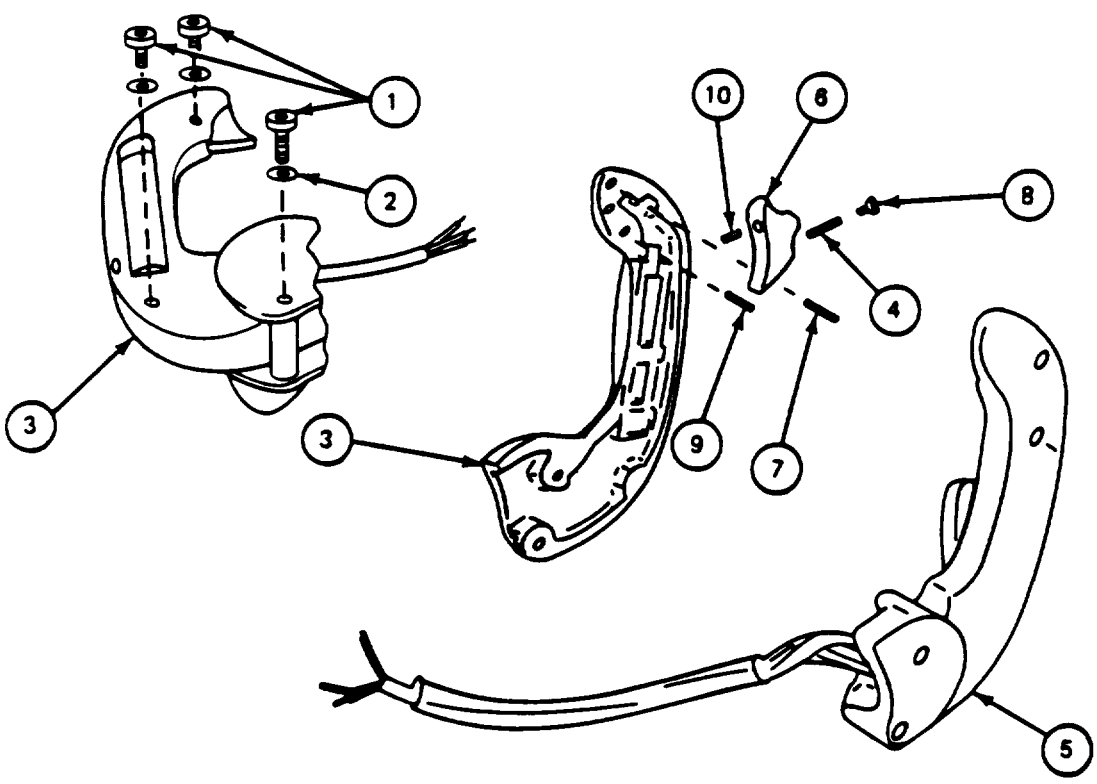
Step	Procedure
1.	Using hands, remove rod end (1) from control rod (2).
2.	Using 3/16" punch and hammer, remove pivot pin (3) attaching control rod (2) to grip (4).
3.	Remove control rod (2) from grip (4).
	GO TO FRAME 2



14-14. GRIP DISASSEMBLY AND SWITCH REMOVAL PROCEDURE (CONT)

FRAME 2

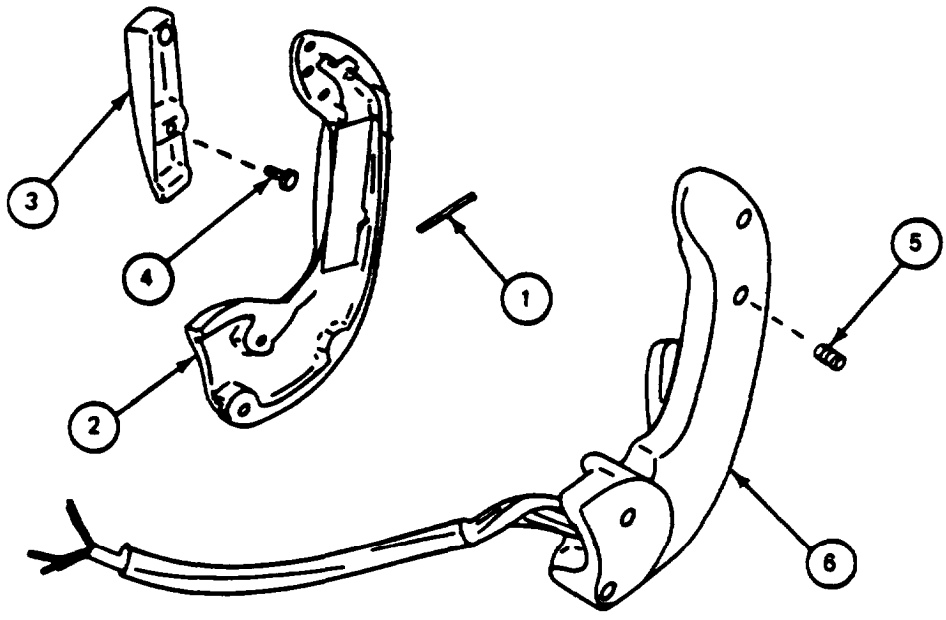
Step	Procedure
1.	Using 5/32” Allen wrench, remove three screws (1) and three lockwashers (2) from right half of grip (3).
	NOTE When separating two halves of grip, use care to prevent spring (4) and trigger pivot pin (7) from flying out and becoming lost.
2.	Separate grip into a right half (3) and a left half (5).
3.	Carefully remove trigger (6) from trigger pivot pin (7).
4.	Remove trigger return spring (4) and pin (8) from trigger (6).
5.	Using 1/16" punch and hammer, remove trigger pivot pin (7) from grip half (3).
6.	Using l/16" punch and hammer, remove trigger stop pin (9) from grip half (3).
7.	Using 3/32” Allen wrench, remove setscrew (10) from trigger (6).
	GO TO FRAME 3



14-14. GRIP DISASSEMBLY AND SWITCH REMOVAL PROCEDURE (CONT)

FRAME 3

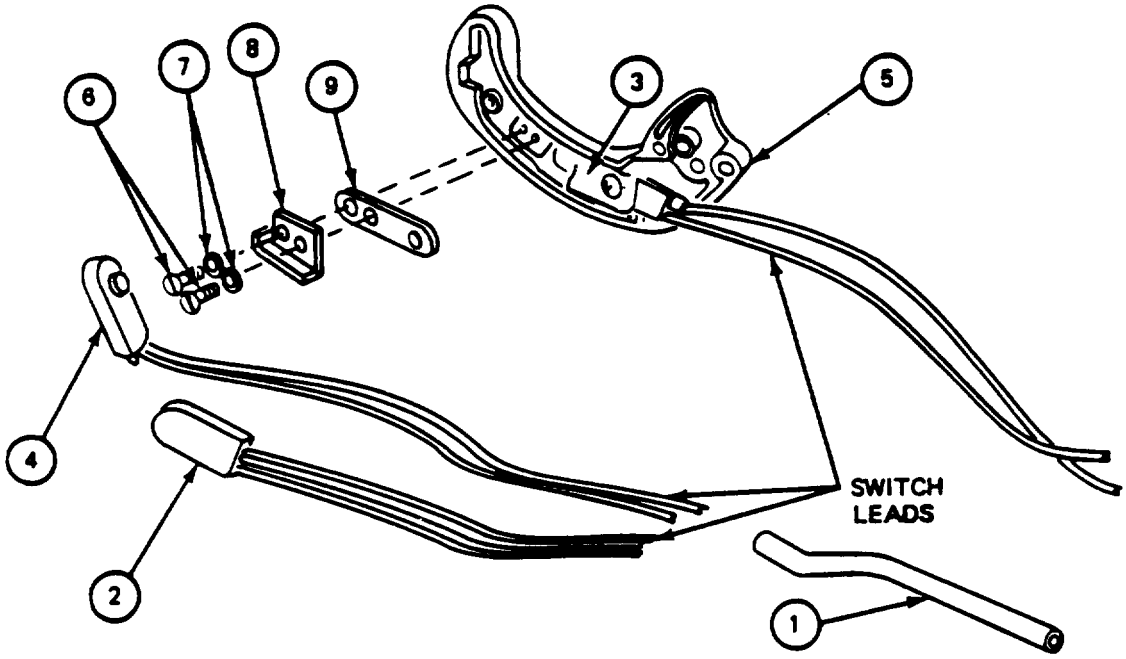
Step	Procedure
1.	Using 1/16” punch and hammer, remove actuator pivot pin (1) from right half of grip (2). Remove actuator (3).
	NOTE Setscrew (4) has a flat washer attached to its inside end and must be turned clockwise to remove without washer dropping off.
2.	Using 3/32" Allen wrench remove setscrew (4) from inside of actuator (3).
3.	Using 3/32" Allen wrench, remove setscrew (5) from left half of grip (6).
	GO TO FRAME 4



14-14. GRIP DISASSEMBLY AND SWITCH REMOVAL PROCEDURE (CONT)

FRAME 4

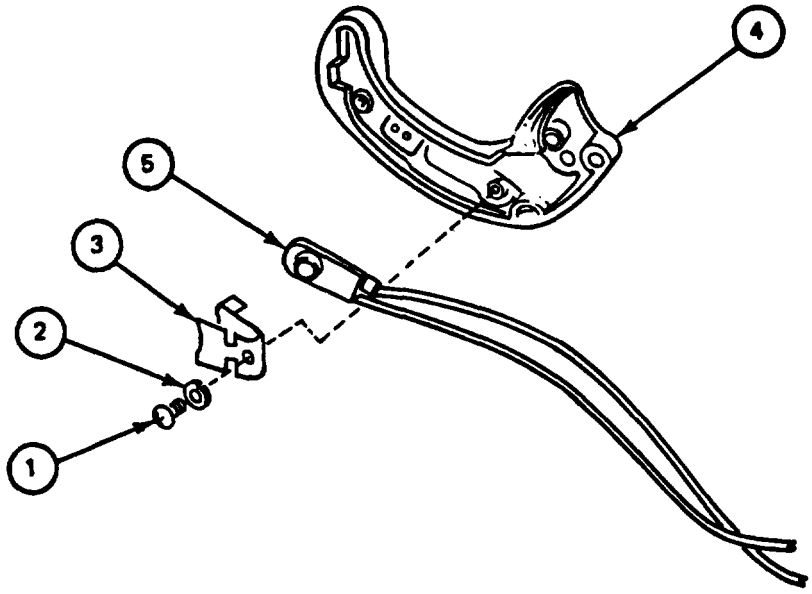
Step	Procedure
1.	Using hand, pull tubing (1) from switch leads.
2.	Using hand, remove override switch (2) from clip (3).
3.	Remove trigger switch (4) from grip half (5).
4.	Using screwdriver, remove two screws (6) and two lockwashers (7) attaching guard (8) and adapter (9) to grip half (5). Remove guard (8) ahd adapter (9).
	GO TO FRAME 5



14-14. GRIP DISASSEMBLY AND SWITCH REMOVAL PROCEDURE (CONT)

FRAME 5

Step	Procedure
1.	Using screwdriver, remove screw (1) and lockwasher (2) attaching clip (3) to grip half (4).
2.	Remove clip (3) and magnetic brake switch (5) from grip half (4).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK



14-15. GRIP ASSEMBLY AND SWITCH INSTALLATION PROCEDURE

TOOLS: Center punch
3/16 in. flat-tip screwdriver
3/32 in. socket head screw key (Allen wrench)
Machinist steel rule
8 ounce ball peen hammer
5/32 in. socket head screw key (Allen wrench)
Heat gun

SUPPLIES Sealing compound (item 25, App. A)
Grease (item 12, App. A)

PERSONNEL One

REFERENCES: JPG for procedures to:
Use sealing compound
Perform staking
Apply grease
Apply shrink tubing

GENERAL INSTRUCTIONS:

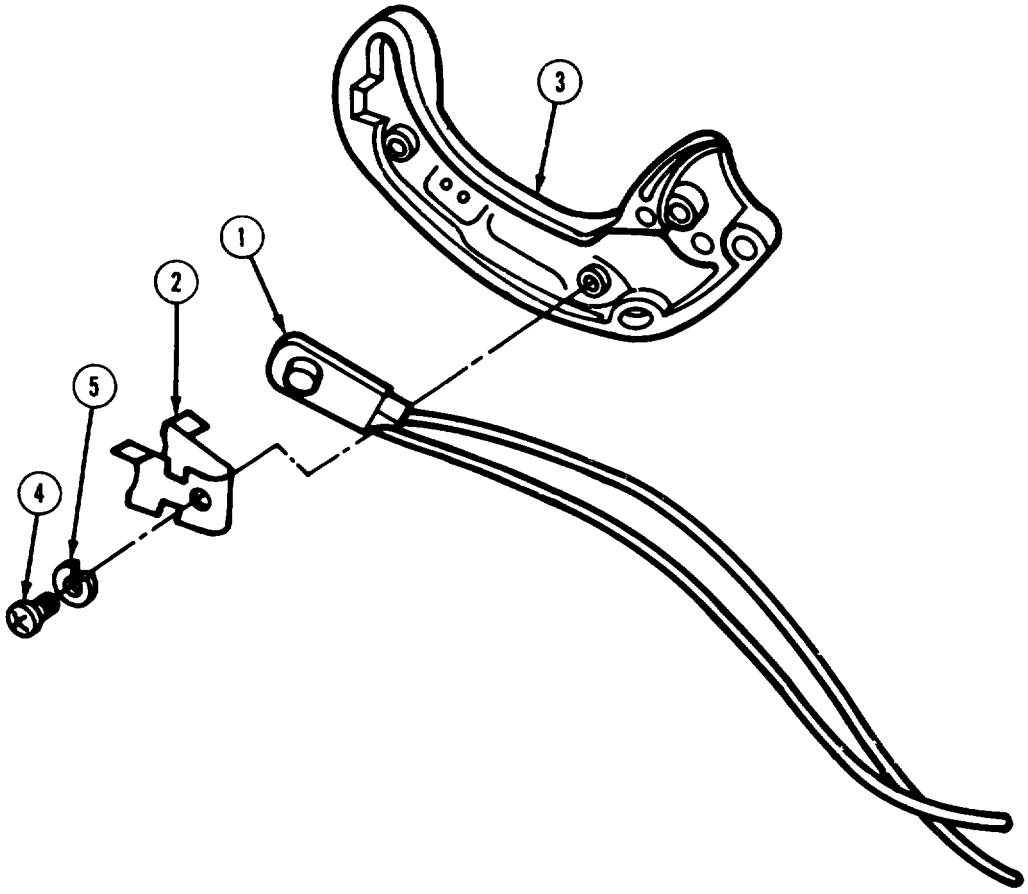
NOTE

During assembly, put a light coating of grease on all mechanical parts that turn or slide (JPG).

14-15. GRIP ASSEMBLY AND SWITCH INSTALLATION PROCEDURE (CONT)

FRAME 1

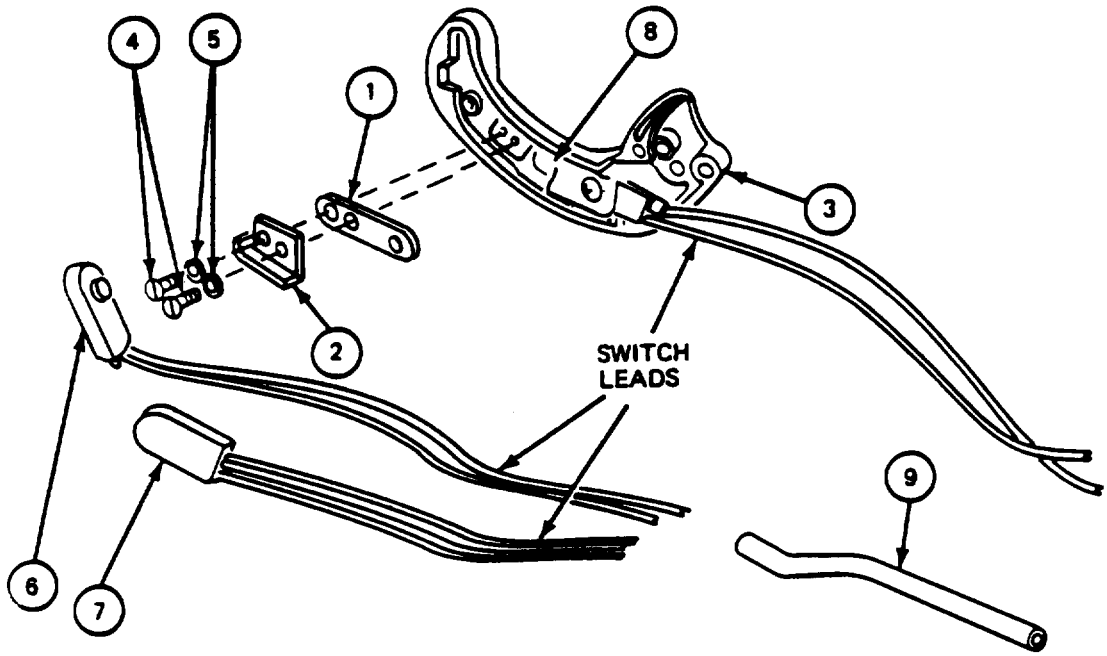
STEP	PROCEDURE
	NOTE Magnetic brake switch (1) has two shorter loads.
1.	Place magnetic brake switch (1) in clip (2).
2.	Using screwdriver, attach clip (2) to left half of grip (3) with screw (4) and lockwasher (5).
	GO TO FRAME 2



14-15. GRIP ASSEMBLY AND SWITCH INSTALLATION PROCEDURE (CONT)

FRAME 2

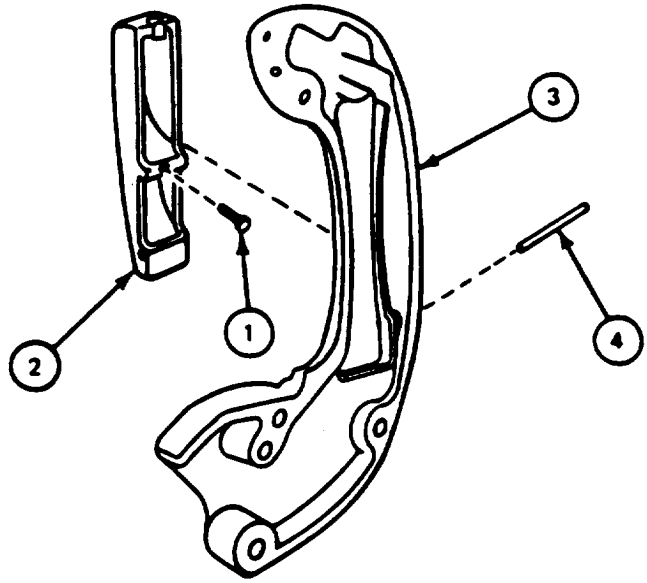
Step	Procedure
1.	Place adapter (1) and guard (2) in grip half (3).
2.	Using screwdriver, attach adapter (1) and guard (2) to grip half (3) with two screws (4) and two lockwashers (5).
3.	Place trigger switch (6) in grip half (3) and push electrical leads behind guard (2).
4.	Place override switch (7) in clip (8) with switch button facing adapter (1).
5.	Put tube (9) over switch electrical leads.
	GO TO FRAME 3



14-15. GRIP ASSEMBLY AND SWITCH INSTALLATION PROCEDURE (CONT)

FRAME 3

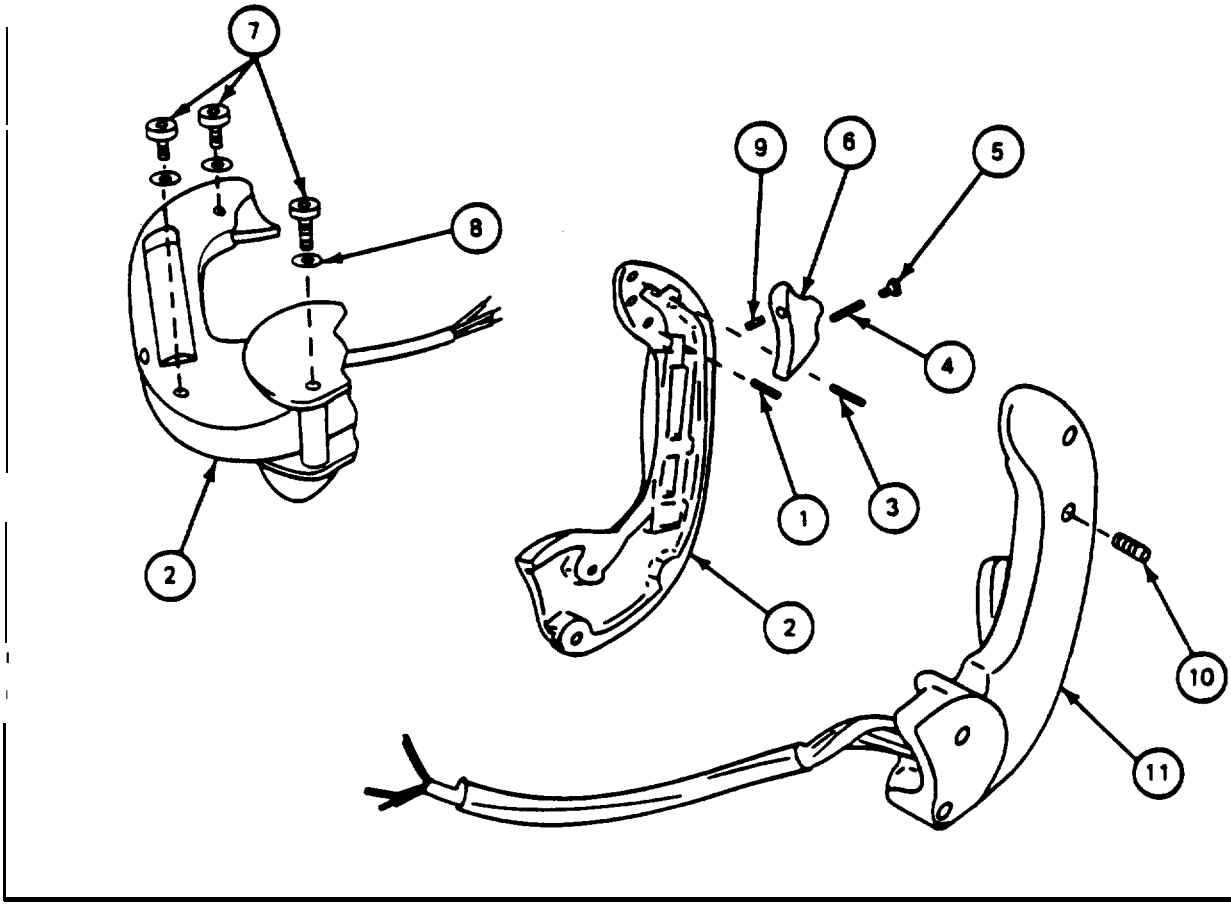
Step	Pocedure
1.	Thread adjusting setscrew (1) into actuator (2) with washer end of setscrew on inside.
2.	Using 3/32" Allen wrench, turn setscrew (1) counterclockwise until washer contacts actuator (2).
3.	Place actuator (2) into right half of grip (3).
4.	Using hammer, put actuator pivot pin (4) through grip half (3) and actuator (2).
	GO TO FRAME 4



14-15. GRIP ASSEMBLY AND SWITCH INSTALLATION PROCEDURE (CONT)

FRAME 4

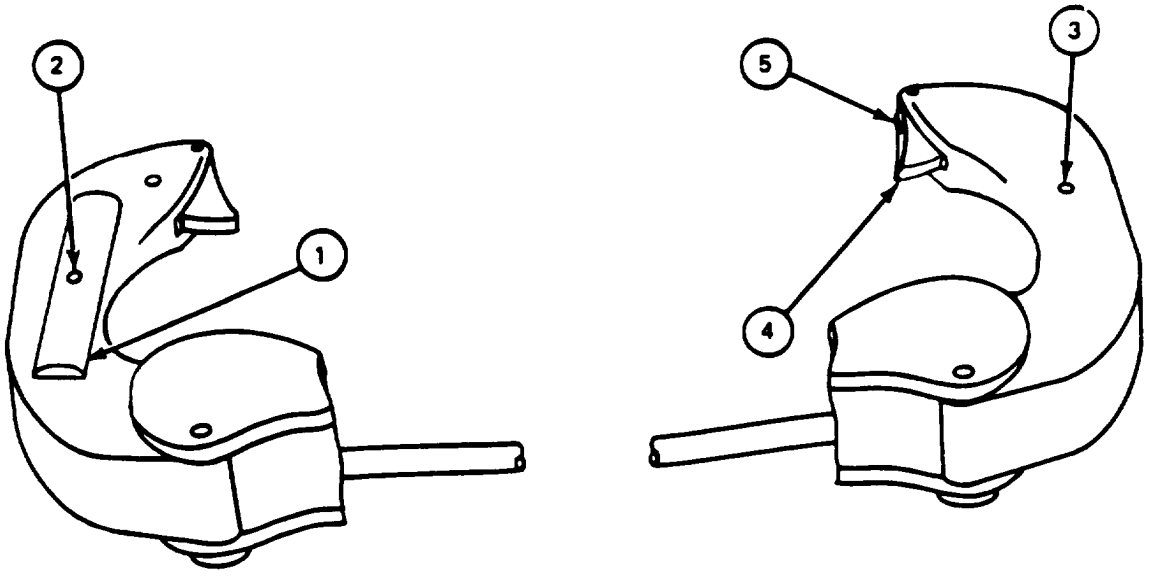
Step	Procedure
1.	Using hammer, put trigger stop pin (1) into right half of grip (2).
2.	Using hammer, put trigger pivot pin (3) into right half of grip (2).
3.	Put trigger return spring (4) and pin (5) into trigger (6).
4.	Place trigger (6) on trigger pivot pin (3) and push in and hold pin (5) in hole. Put one of screws (7) and washer (8) in hole to hold trigger spring (4) and pin (5) in place.
5.	Using 3/32"' Allen wrench, put setscrew (9) into trigger (6).
6.	Using 3/32" Allen wrench, put setscrew (10) into left half of grip (11).
7.	Join grip halves (2) and (11), making sure all parts stay in place.
8.	Using 5/32" Allen wrench, put in three screws (7) and three lockwashers (8) holding grip halves together.
	GO TO FRAME 5



14-15. GRIP ASSEMBLY AND SWITCH INSTALLATION PROCEDURE (CONT)

FRAME 5

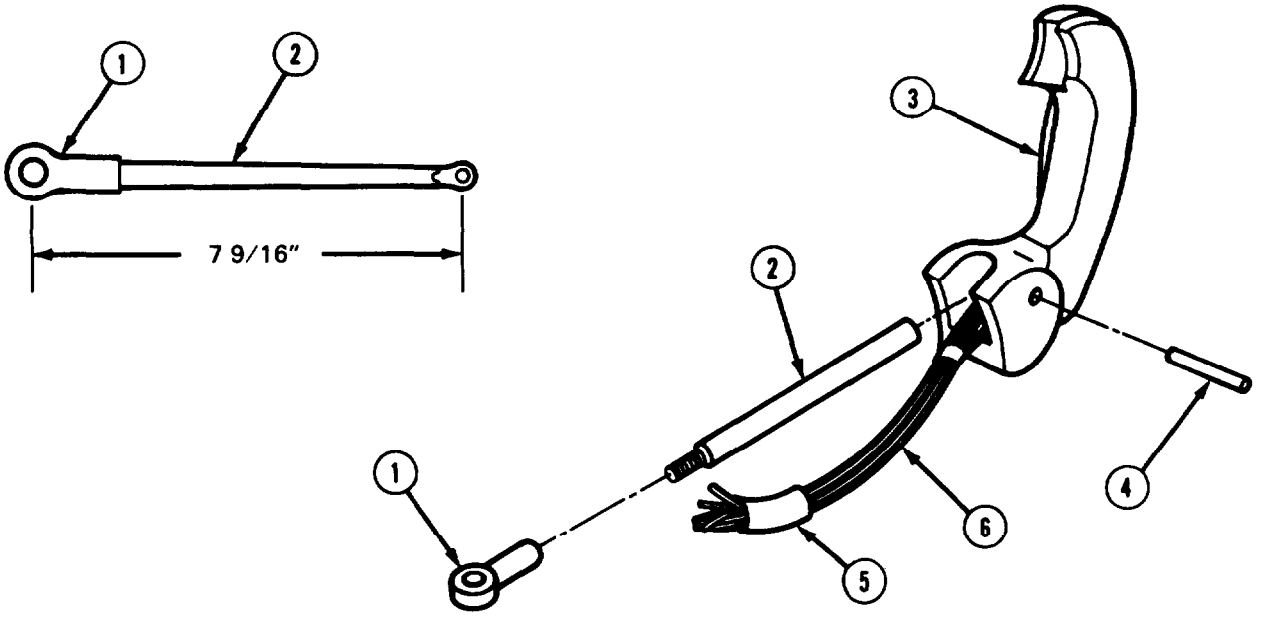
Step	Procedure
1.	Using 3/32" Allen wrench with actuator (1) fully out, turn setscrew (2) clockwise until override switch (located inside grip) clicks. Then turn setscrew (2) counterclockwise 3/4 to 1 turn.
2.	Using 3/32" Allen wrench while pressing and releasing actuator (1), turn setscrew (3) counterclockwise until both override switch and magnetic brake switches (located inside grip) clicks. Then turn setscrew (3) 1/3 turn farther.
3.	Using 3/32'" Allen wrench while pressing and releasing trigger (4), turn setscrew (5) clockwise until trigger switch (located inside grip) will not click.
4.	Using 3/32" Allen wrench while pressing and holding trigger (4), turn setscrew (5) counterclockwise until trigger switch (located inside grip) clicks. Then turn setscrew (5) 1/5 turn farther.
	GO TO FRAME 6



14-16. GRIP ASSEMBLY AND SWITCH INSTALLATION PROCEDURE (CONT)

FRAME 6

STEP	PROCEDURE
1.	Using hand, put rod end (1) on control rod (2).
2.	Using hand and rule, move rod end (1) to get a 7-9/16 inch measurement from center of rod end to center of pivot pin hole.
3.	Line up control rod (2) pivot pin hole with grip (3) pin hole.
4.	Using hammer, put pivot pin (4) through grip (3) and control rod (2).
5.	Using hammer and center punch, stake both ends of pivot pin (4) (JFG).
6.	Install shrink tubing (5) on the end of harness (6) (JPG) if new switih was installed.
	NOTE
	Follow-on Maintenance Action Required:
	Install grip (para 14-13).
	END OF TASK



14-16. HOUSING AND BRACKET REMOVAL PROCEDURE

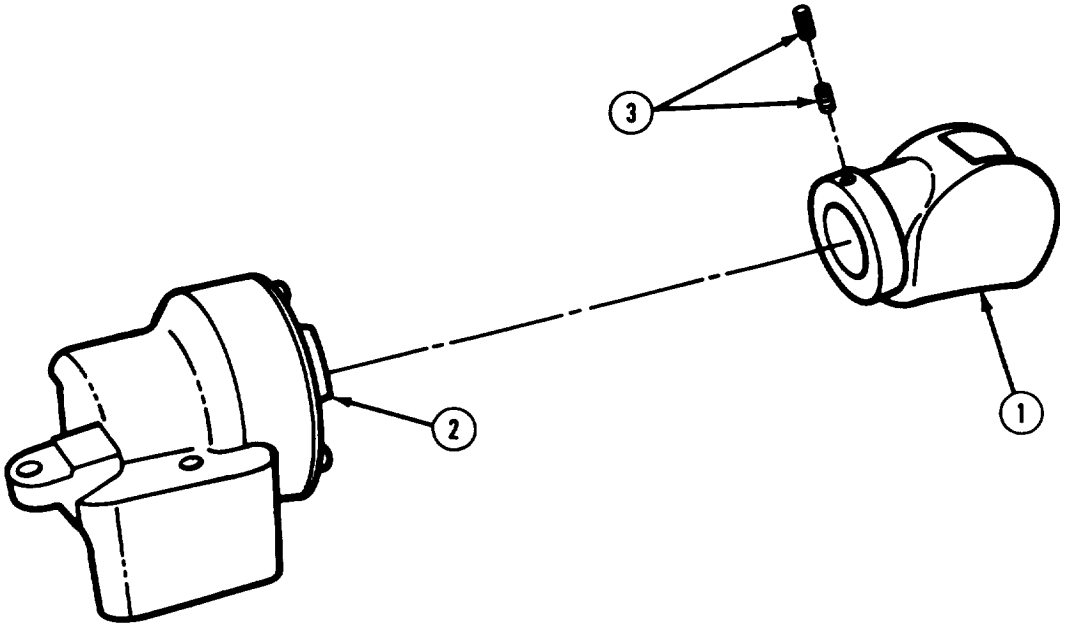
TOOLS: 3/32 in. socket head screw key (Allen wrench)
Machinist's scribe

PERSONNEL: One

PRELIMINARY PROCEDURES: Test commander's control handle (para 14-2)
Remove grip (para 14-12)

FRAME 1

STEP	PROCEDURE
1.	Using metal scribe, make line across bracket (1) and traversing cam (2) so that both parts can be lined up when they are installed.
2.	Using Allen wrench, remove six setscrews (3) (two from each hole) that hold bracket (1) to traversing cam (2).
3.	Remove bracket (1) from traversing cam (2).
	END OF TASK



14-17. HOUSING AND BRACKET INSTALLATION PROCEDURE

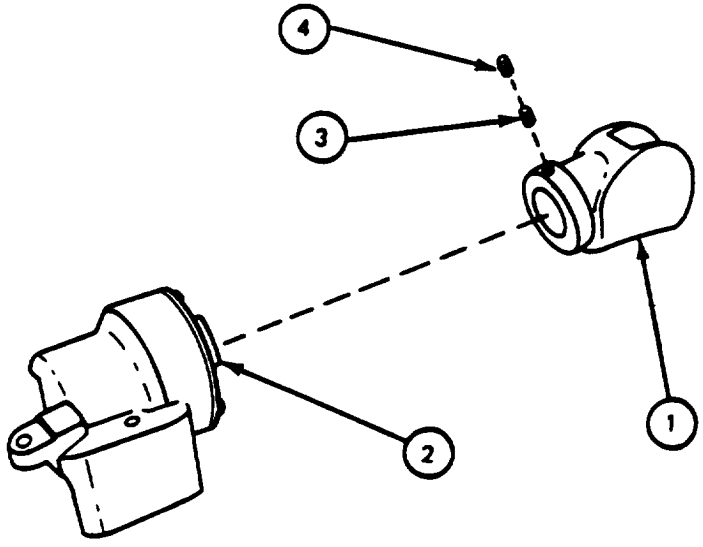
TOOLS: 3/32" socket head screw key (Allen wrench)

PERSONNEL: One

PRELIMINARY PROCEDURES: Assemble housing (para 14-19)

FRAME 1

Step	Procedure
1.	Place bracket (1) on traversing cam (2).
2.	Line up mark on bracket (1) with mark on traversing cam (2) made during removal procedure.
3.	Using Allen wrench, attach bracket (1) to traversing cam (2) with three setscrews (3) (one in each threaded hole).
4.	Using Allen wrench, put three setscrews (4) in same threaded holes as setscrew (3). Do not tighten at this time because setscrew (4) may need to be removed during adjustment procedure (para 14-3).
	NOTE Follow-on Maintenance Action Required: Install traverse arm (para 14-9).
	END OF TASK



14-18. HOUSING DISASSEMBLY PROCEDURE

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

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

PERSONNEL: One

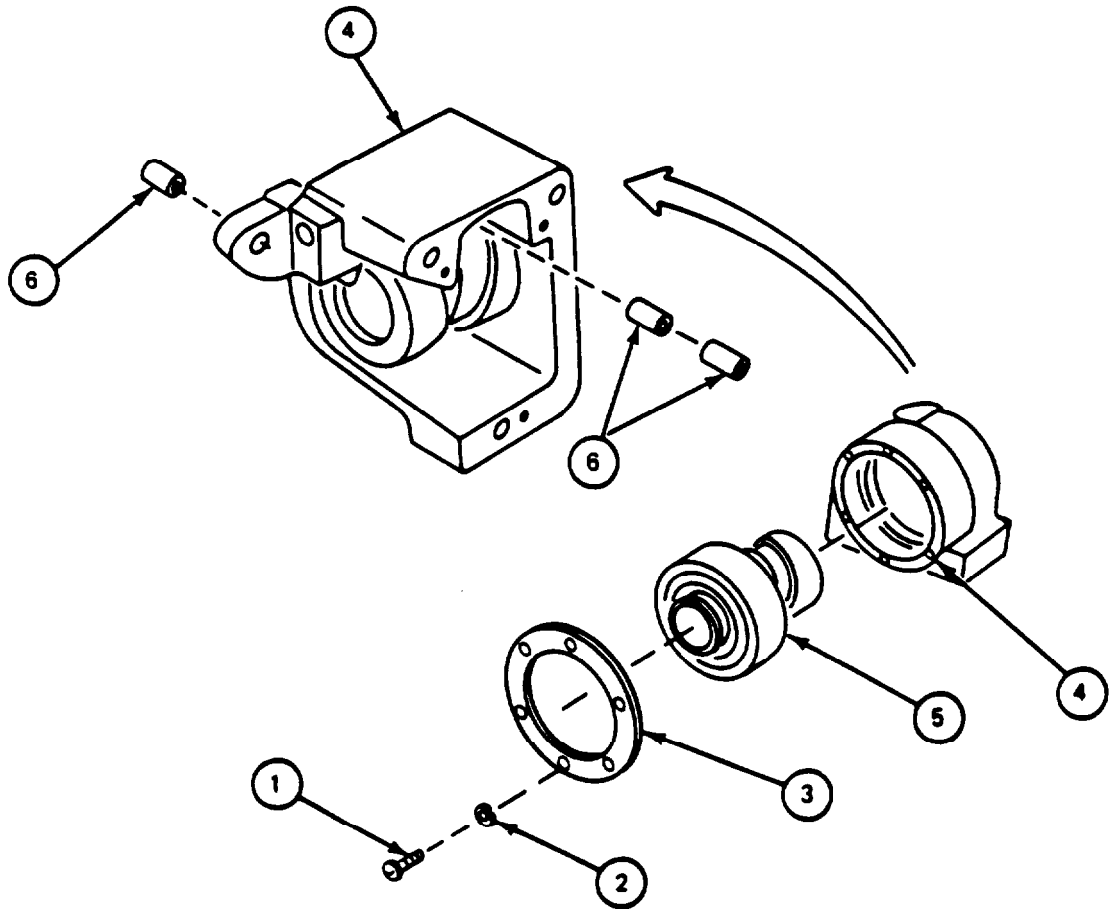
REFERENCES: JPG for procedures to
clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Test commander's control handle (para 14-2)
Remove traverse arm (para 14-8)
Remove grip (para 14-12)
Remove bracket (para 14-16)

14-18. HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using screwdriver, remove six screws (1) and six lockwashers (2) attaching cam plate (3) to housing (4).
2.	Remove cam plate (3) and traversing cam with bearing (5) from housing (4).
3.	Using hammer and punch, carefully tap three bushings (6) out of housing (4).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Repair bad bearing on traversing cam (para 14-20).
	END OF TASK



14-19. HOUSING ASSEMBLY PROCEDURE

TOOLS: 1/4" flat tip screwdriver
Plastic face hammer

SUPPLIES: Grease (item 14, App. A)
Grease (item 12, App. A)

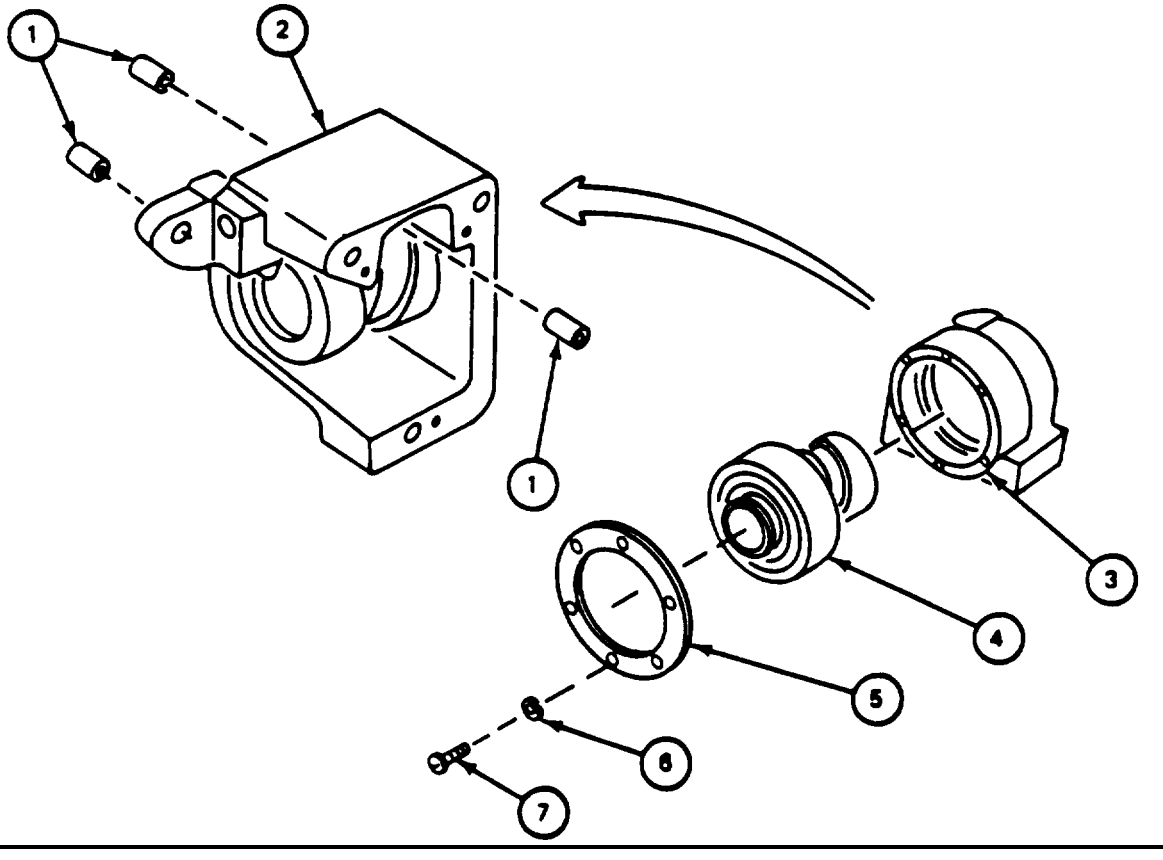
PERSONNEL: One

REFERENCES: JPG for procedure to apply grease

14-19. HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using hammer, tap three bushings (1) all the way into holes in housing (2).
2.	Using hand, put a light coating of grease inside housing surface (3) and on traversing cam (4) (JPG).
3.	Using hand, lubricate cam bearing (3) with grease (JPG).
4.	Put traversing cam with cam bearing (4) into housing (2).
5.	Using screwdriver, attach cam plate (5) to housing (2) with six lockwashers (6) and six screws (7).
	NOTE Follow-on Maintenance Action Required: Install housing (para 14- 17).
	END OF TASK



14-20. HOUSING REPAIR PROCEDURE

SUPPLIES: Bearing (713512)

PERSONNEL. One

PRELIMINARY PROCEDURES: Test commander's control handle (para 14-2)
Remove housing (para 14-16)
Disassemble housing (para 14-18)

FRAME 1

Step	Procedure
	SUPPORT SHOP WORK
1.	Take traversing cam (with bearing) and new bearing to shop where press equipment is available.
	a. Remove bad bearing from traversing cam.
	b. Install new bearing on traversing cam.
2.	After support shop work, return traversing cam (with bearing) to turret shop.
	END OF TASK

By Order of the Secretary of the Army:

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

Offfcial:

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

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DATE: Date you fill out this form.

PUBLICATION NUMBER	DATE	TITLE
TM 9-XXXX-XXX-XX	Date of TM	Title of TM

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.	
3		2		Item 10. Change illustration. Reason: Tube end shown assembled on wrong side of lever cam.
109		51		Item 3. The NSN and P/N are not listed on the AMDF nor the MCRL. Request correct NSN and P/N be furnished.
2-8			2-1	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.
12	1-6a			Since there are both 20- and 30- round magazines for this rifle, data on both should be listed.

SAMPLE

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE:

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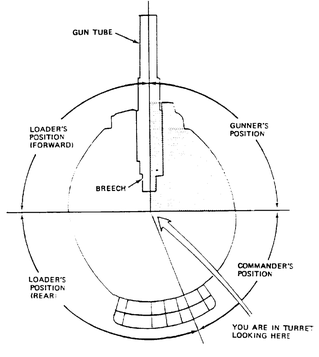
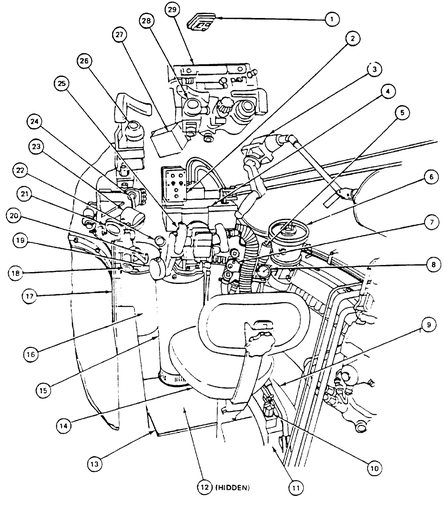
REVERSE OF DA FORM 2028-2

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 M116

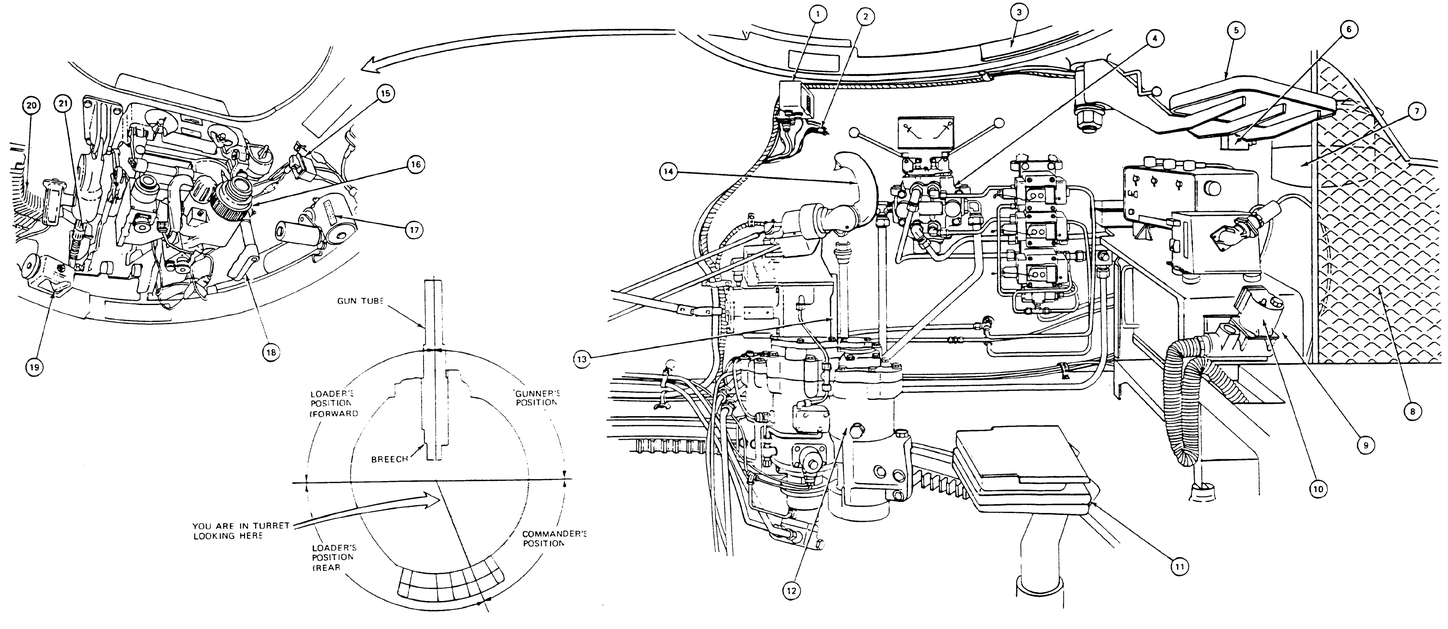




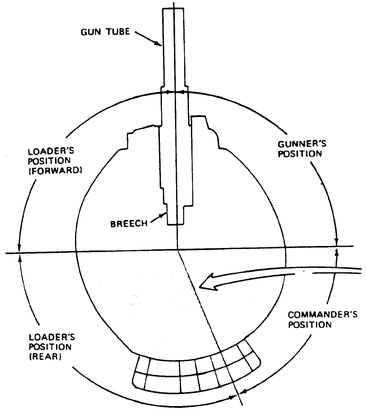
FO-1. EQUIPMENT LOCATION INFORMATION - GUNNER'S POSITION

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

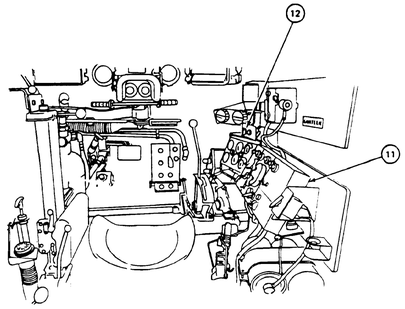


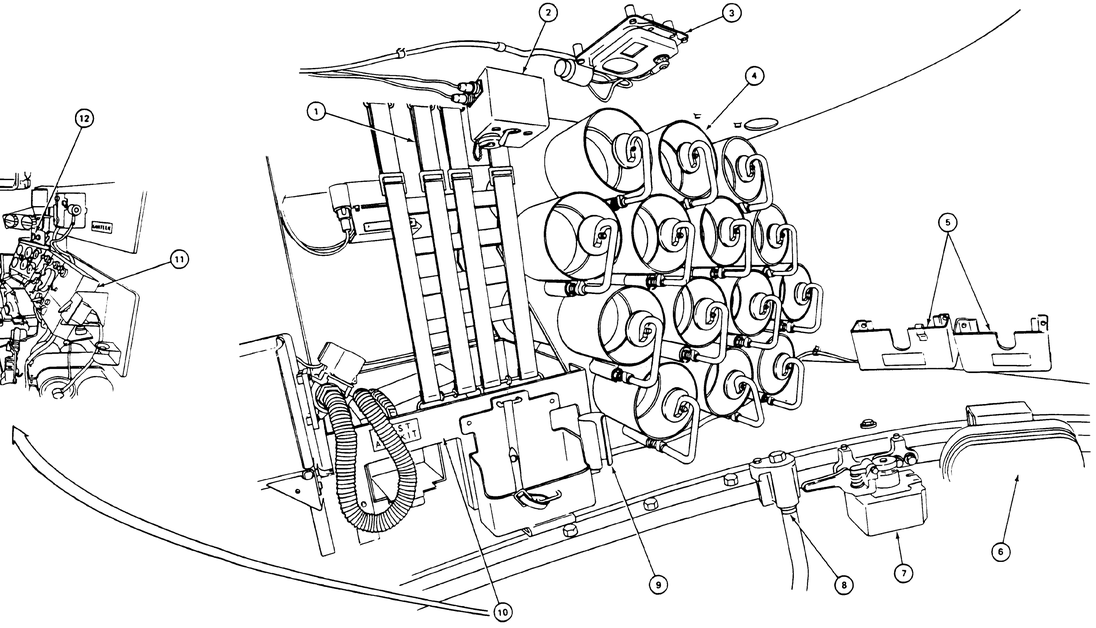
FO-2. EQUIPMENT LOCATION INFORMATION - COMMANDER'S POSITION



LEGEND:

1. RADIO CUARD 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

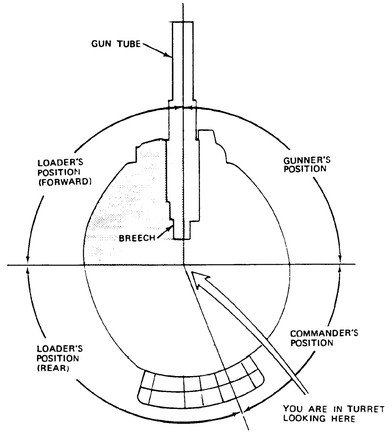


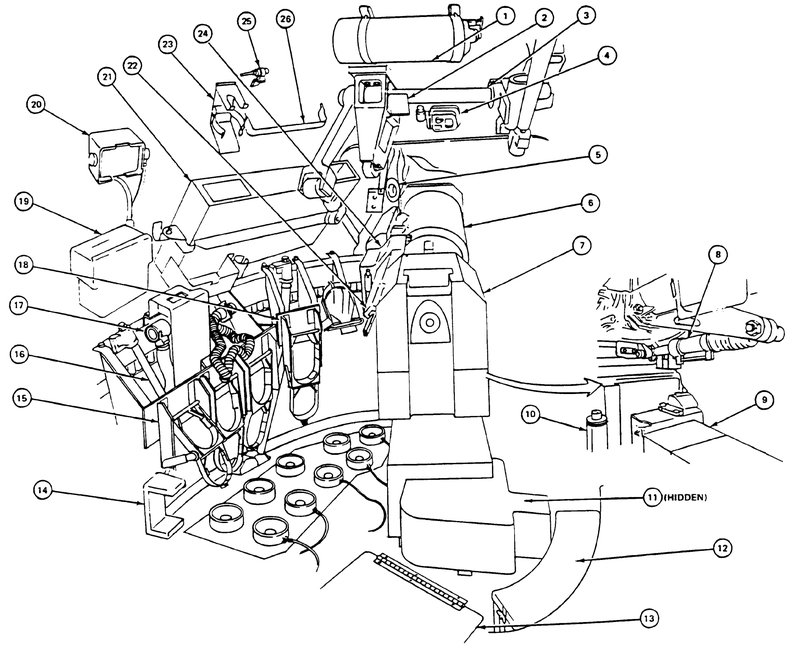


FO-3. EQUIPMENT LOCATION INFORMATION - LOADER'S POSITION REAR

LEGEND:

1. REPLENISHER
2. GUN ELEVATION INTERFERENCE SWITCH
3. BALLISTIC DRIVE
4. LOADER'S DOMELIGHT
5. MACHINE GUN MOUNT
6. 105-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

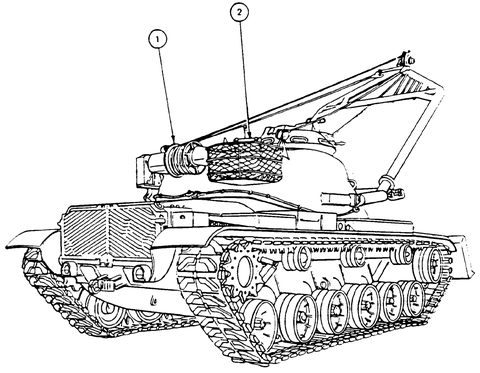


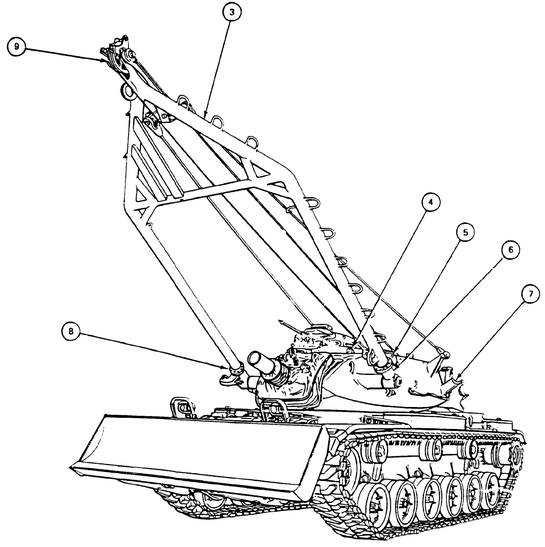


FO-4. EQUIPMENT LOCATION INFORMATION - LOADER'S POSITION FORWARD

LEGEND:

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





FO-5. EQUIPMENT LOCATION INFORMATION - OUTSIDE TANK

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

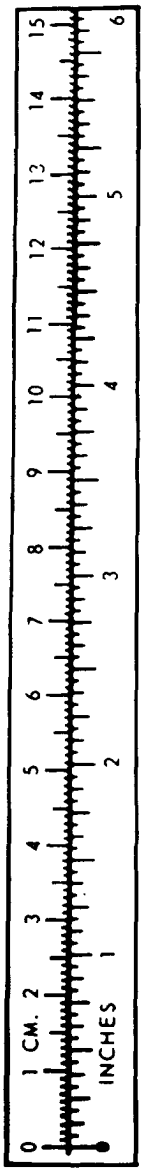
TEMPERATURE

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

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
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

TO CHANGE	TO	MULTIPLY BY
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



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