TM 9-1450-500-34

TECHNICAL MANUAL

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

LOADER-TRANSPORTER GUIDED MISSILE (HAWK GUIDED MISSILE SYSTEM)

XM5O1E3 (GASOLINE ENGINE)
NSN 1450-00-0668873
XM5O1L1 (MULTIFUEL ENGINE)
NSN 1450401-392-9869

Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY

JUNE 1979
Change 4

WARNING
CARBON MONOXIDE POISONING CAN BE DEADLY

Carbon monoxide is a colorless, odorless, DEADLY POISONOUS gas which, when breathed, deprives the body of oxygen and causes SUFFOCATION. Exposure to air contaminated with carbon monoxide produces symptoms of headache, dizziness, loss of muscular controls apparent drowsiness, and coma. Permanent BRAIN DAMAGE or DEATH can result from severe exposure.

It occurs in the exhaust fumes of internal-combustion engines and becomes DANGEROUSLY CONCENTRATED under conditions of INADEQUATE VENTILATION. The following precautions MUST be observed to insure the safety of personnel whenever the engine of any vehicle is operated for maintenance purposes or tactical use.

a. DO NOT operate engine or vehicle in an enclosed area unless it is ADEQUATELY VENTILATED.

b. DO NOT idle engine for long periods without maintaining ADEQUATE VENTILATION.

c. DO NOT drive any vehicle with inspection plates, cover plates, engine compartment doors removed unless necessary for maintenance purposes.

d. BE ALERT at all times during vehicle operation for exhaust odors and exposure symptoms. If either are present, IMMEDIATELY VENTILATE the immediate area. If symptoms persist, remove affected personnel from vehicle and treat as follows: expose to fresh air; keep warm; DO NOT PERMIT PHYSICAL EXERCISE; if necessary, administer artificial respiration.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS ADEQUATE VENTILATION.

PIN: 027049-004

CHANGE No. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D. C., 15 January 1997

**DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL
FOR
LOADER-TRANSPORTER
GUIDED MISSILE
(HAWK GUIDED MISSILE SYSTEM)
XM501E3 (GASOLINE ENGINE)
NSN 1450-00-066-8873
XM501Ll (MULTIFUEL ENGINE)
NSN 1450-01-392-9869**

TM 9-1450-500-34, dated 29 June 1979, is changed as follows:

1. Remove old pages and insert new pages as indicated below.
2. New and changed material is indicated by a vertical bar in the margin of the page.
3. This change provides for the addition of a multifuel engine (XM501 L1) and the title is changed as above.
4. File this change sheet in front of the publication for reference purposes.

Remove Pages	Insert Pages
i thru ii	i thru ii
1-1 thru 1-18 (blank)	1-1 thru 1-18 (blank)
none	3-111 thru 3-179
4-3 thru 4-4	4-3 thru 4-4
none	4-47 thru 4-118
Index 1 thru Index 2	Index 1 thru Index 2
Cover	Cover

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General, United States Army
Chief of Staff

Official:

JOEL B.HUDSON
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CHANGE NO. 3

HEADQUARTERS
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**DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL
LOADER-TRANSPORTER,
GUIDED MISSILE: XM501E3
(HAWK GUIDED MISSILE SYSTEM)
PART NUMBER 11675300
(1450-00-066-8873)**

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2. New or changed material is indicated by a vertical bar in the margin of the page.
3. Added illustrations are indicated by a vertical bar adjacent to the illustration identification number.
4. Illustration changes are indicated by a pointing hand.
5. This change supports the change to elevation cylinder clevis and missile support block, and change in gear shift lever to prevent accidental shifting of transmission if missile support fails.

Remove Pages	**Insert Pages**
2-21 and 2-22	2-21 and 2-22
3-15 through 3-20	3-15 through 3-20
3-89 and 3-90	3-89 and 3-90
3-91 and 3-92	3-91 and 3-92
3-93 and 3-94	3-93 and 3-94
3-94.1 / (3-94.2 blank)	3-94.1/(3-94.2 blank)
4-1 and 4-2	4-1 and 4-2
4-2.1 and 4-2.2	4-2.1 and 4-2.2

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By Order of the Secretary of the Army:

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Brigadier General United States Army
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CHANGE
NO. 2

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**DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL
LOADER-TRANSPORTER,
GUIDED MISSILE: XM50IE4 3
(HAWK GUIDED MISSILE SYSTEM)
PART NUMBER 11675300
NSN 1450-00-0668873**

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2. New or changed material is indicated by a vertical bar in the margin of the page.
3. Added illustrations are indicated by a vertical bar adjacent to the illustration identification number.
4. Illustration revisions are indicated by a pointing hand.
5. This change supports installation of latch load limiter, roll lock-out kit, and safety straps and provides a revised proofloading test.

Remove Pages	**Insert Pages**
None	a/(b blank)
i and ii	i and ii
1-1 through 1-4	1-1 through 1-4
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2-25 through 2-28	2-25 through 2-27/(2-28 blank)
3-1 through 3-4	3-1 through 3-4
None	3-4.1/(3-4.2blank)
3-5 and 3-6	3-5 and 3-6
3-11 through 3-14	3-11 through 3-14
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None	3-36.1/(3-36.2 blank)
3-37 and 3-38	3-37 and 3-38
3-41 through 3-46	3-41 through 3-46
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3-73 and 3-74	3-73 and 3-74

Remove Pages	Insert Pages
None	3-78.1 through 3-78.4
None	4-2.1 and 4-2.2
None	4-2.7 through 4-2.10
6-3 through 6-36	6-3 through 6-32
C-1 and C-2	C-1 and C-2

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

Official:
WILLIAM J. MEEHAN II
Brigadier General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-32, Direct Support and General Support requirements for XM501 E HAWK Loader Transporter.

WARNING

DRY CLEANING SOLVENT P-D-680

- Dry cleaning solvent (P-D-680), used to clean parts is TOXIC and FLAMMABLE.

1. WEAR protective goggles and gloves and use only in a well ventilated area.
2. AVOID CONTACT with the skin, eyes, and clothes. Don't breathe vapors, or smoke near this solvent.
3. DO NOT USE near open flame or excessive heat. The flash point for Type No.1 is 100 degrees Fahrenheit (38 degrees Celsius), for Type No. 2 it is 138 degrees Fahrenheit (58 degrees Celsius).
4. IF YOU BECOME DIZZY while using cleaning solvent, get fresh air immediately, and if necessary, seek medical aid.
5. IF CONTACT WAITH EYES IS MADE wash your eyes with large quantities of water and get medical attention immediately.

- Personnel not involved in proof-loading test should stay at least 30 feet away from the loader during the proof-load testing.

- Conduct all proof-load tests with the operator's protective device in place and with the operator under it.

- Be sure to wear protective head covering when involved in proof-load testing, such as a hard hat or steel helmet and safety glasses. All instructions are mandatory unless stated otherwise.

- Do not overload the hydraulic system or equipment damage may result.

- If any new hydraulic line, hose, cylinder, seal, valve, or other hydraulic component is installed, a proof load check MUST be performed. If check is not done, injury to personnel or death could result. Damage to equipment may also occur.

CHANGE NO. 1

**HEADQUARTERS
DEPARTMENT OF THE ARMY**
WASHINGTON, D.C., 1 Aug 83

**DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL
LOADER-TRANSPORTER,
GUIDED MISSILE: XM5O1E3
(HAWK GUIDED MISSILE SYSTEM)
PART NUMBER 11675300
NSN 1450-00-066-8873**

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1-17 and 1-18	1-17 and 1-18
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4-1 and 4-2	41 through 4-2.91(4-2.10 blank)
5-1(5-2 blank)	5-1(5-2 blank)
6-3 through 6-45	6-3 through 6-8-2 and 6-9 through 6-36
A-1 and A-2	A-1 and A-2
Index 1 through Index 18	Index 1 through Index 171(18 blank)

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By Order of the Secretary of the Army:

JOHN A. WICKAM, 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 12-32, Direct Support and General Support Maintenance Manual, Loader Transporter, Guided Missile: XM5O1E3 (Hawk Guided Missile System).

WARNING

Personnel not involved in proof-loading tests should stay at least 30 feet away from the loader during proof-load testing.

Conduct all proof-load tests with the operator's protective device in place and with the operator under it.

Be sure to wear protective head covering when involved in proof-load testing, such as a hard hat or steel helmet and safety glasses. All instructions are mandatory unless stated otherwise.

Do not overload the hydraulic system or equipment damage may result.

Technical Manual
No. 9-1450-500-34

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D. C., 29 June 1979

DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL
FOR
LOADER-TRANSPORTER
GUIDED MISSILE
(HAWK GUIDED MISSILE SYSTEM)
XM5OIE3 (GASOLINE ENGINE)
NSN 1450-00-066-8873
XM5O1L1 (MULTIFUEL ENGINE)
NSN 1450-01-392-9869

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Tank-automotive and Armaments Command, ATTN: AMSTA-IM-OPIT, Warren, MI 48397-5000. A reply will be furnished to you. You may also provide DA Form 2028-2 information to TACOM via datafax or e-mail. TACOM's fax number is DSN 7866323. TACOM's e-mail address is amsta-opit-cc.tacom.army.mil.

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*This manual supersedes TM 9-1450-500-34, 29 June 1979, including all changes.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope.
This manual is for your use in performing Direct Support and General Support maintenance on the Loader Transporter, Hawk Guided Missile System, XM501E3 (Gasoline Engine) and XM501Ll (Multifuel Engine).

1-2. Maintenance Forms and Records
Maintenance forms and records which you are required to use are listed and explained in DA PAM 738-750.

1-3. Calibration.
Refer to TB 9-5210-211-50 for calibration requirements of the profile setting.

1-4. Destruction of Army Materiel to Prevent Enemy Use.
Refer to TM 750-244-6 for instructions governing destruction of the vehicle and equipment when subject to capture or abandonment in a combat zone.

1-5. Reporting of Equipment Improvement Recommendations (EIRs).
Equipment improvements recommendations will be prepared on SF 368, Quality Deficiency Report (QDR). Instructions for preparing EIRs are provided in DA PAM 738-750, The Army Maintenance Management System. EIRs should be mailed to: Commander, US Army Tank Automotive and Armaments Command, ATTN: AMSTAIM-ACH, Warren, MI 48397-5000.

1-6. Differences Among Models.
Any differences among models that exist in this equipment are described below.

a. If the differences between models are extensive, the earlier model will be covered in detail, and then the later model.

b. Where the differences among models are less extensive, both models will be covered in the same paragraph, with the earlier model covered first.

c. Minor differences among models are covered in the same paragraph at the point where in the text where the differences exist.

Section II. DESCRIPTION AND TABULATED DATA

1-7. Definition of Locational Terms.
The locational terms as used throughout the book are as follows:

a. All components except the power unit are designated by right and left in respect to the normal position of the operator in the driver's seat.

b. The engine and transmission and related accessories are defined by right and left when viewed from the transmission end and looking toward the fan side of the engine. This designation is directly opposite to that for the other vehicular components as specified above.

1-8. Description.

a. General. The loader (Figs. 1-1 and 1-2) is a self-propelled, full tracked vehicle used in and around the HAWK missile battery. It is designed for transporting one, two, or three missiles between pallet and launcher. Automatic line-up features on the superstructure enable the operator to place the missiles on the launcher in a fire-ready position, on slopes up to I0 degrees.

* The 4-cylinder gasoline engine Model XM501E3 has a maximum placarded rpm equivalent to 17.7 mph.

* The 4-cylinder multifuel engine Model XM501L1 has a maximum placarded rpm equivalent to l6 km/hr.

A 2 1 /2-ton cargo truck is used to transport the loader when distance is a factor. The loader can be converted into a general purpose crane by using one of the transportation vehicle loading ramps and assorted crane accessories. An engine driven hydraulic pump supplies the hydraulic power for operating the superstructure.
All the necessary controls for maneuvering the superstructure are located on the hydraulic console adjacent to the operator's seat. A complete operational description of the loader and its characteristics are contained in TM 9-1450-500-10. The following paragraphs describe the major systems used on the loader:

1. Carrier (Loader). The carrier is a mobile mounting base for the hydraulically operated superstructure and its supporting superstructure. Power is supplied by a four cylinder engine (XM501E3 Gasoline engine, XM501L1 Multifuel engine) coupled to a three speed automatic transmission through specially-designed adapters. Pressure and temperature elements provide visual indications of engine transmission status through associated warning lights mounted on the operator's instrument panel.

2. lower Train. Engine power is supplied through one of two engine systems (Model XM501E3 is a gasoline-powered engine, Model XM501L1 is a multifuelpowered engine). Engine power is transmitted to the

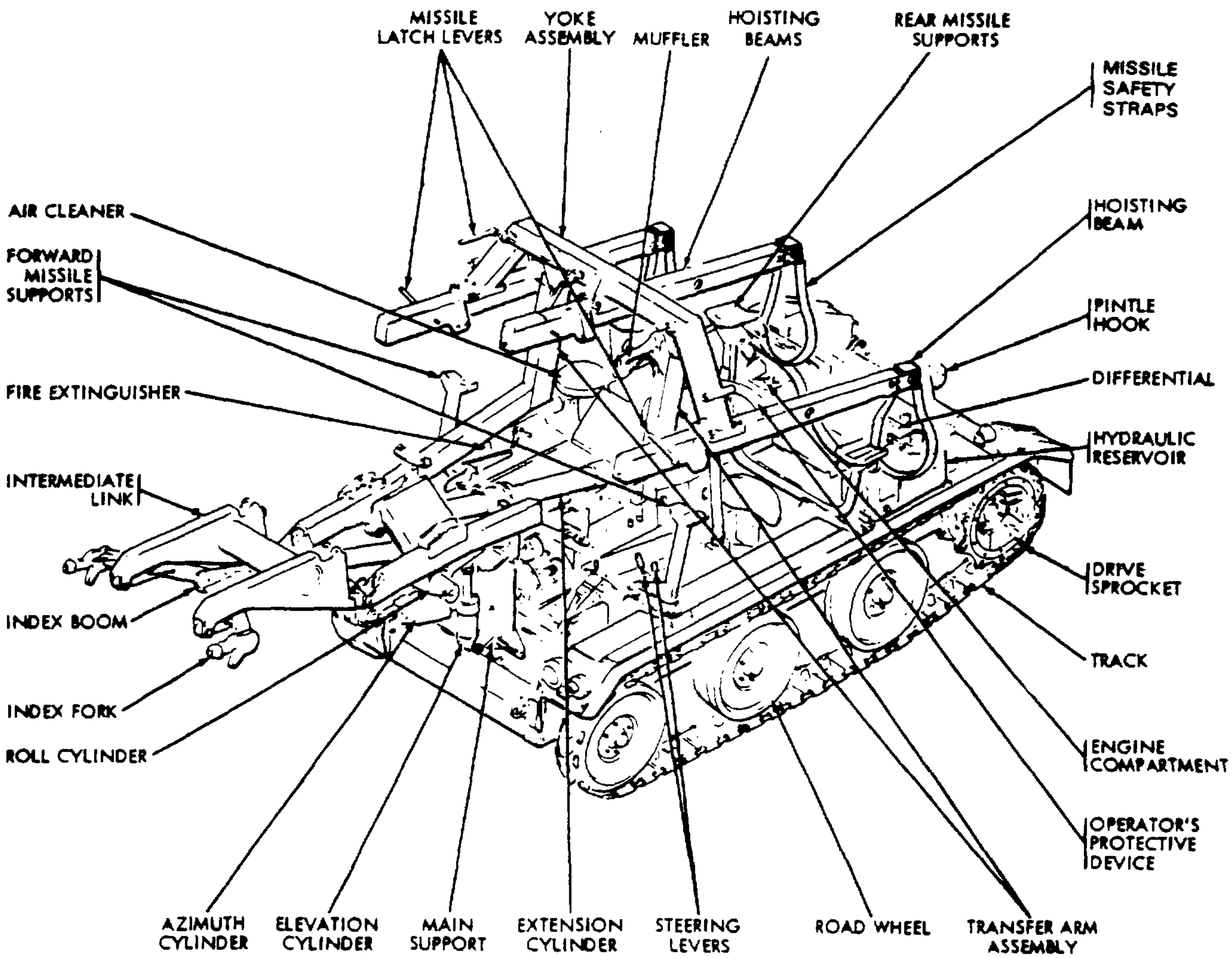


Figure 1-1. Loader-Transporter. Model XM5O1E3. Gasoline Engine.

transfer transmission through the torque converter and transmission and redirected to the differential and drive assembly via the main propeller shaft. Double universal joints are used at all coupling points. The differential and drive assembly output is distributed to the final drives which transmit the power to the drive sprockets. Brake bands in the differential and drive assembly provide steering and braking control. Excessive heat is indicated by a heat sensing element coupled to a warning light on the operator's instrument panel.

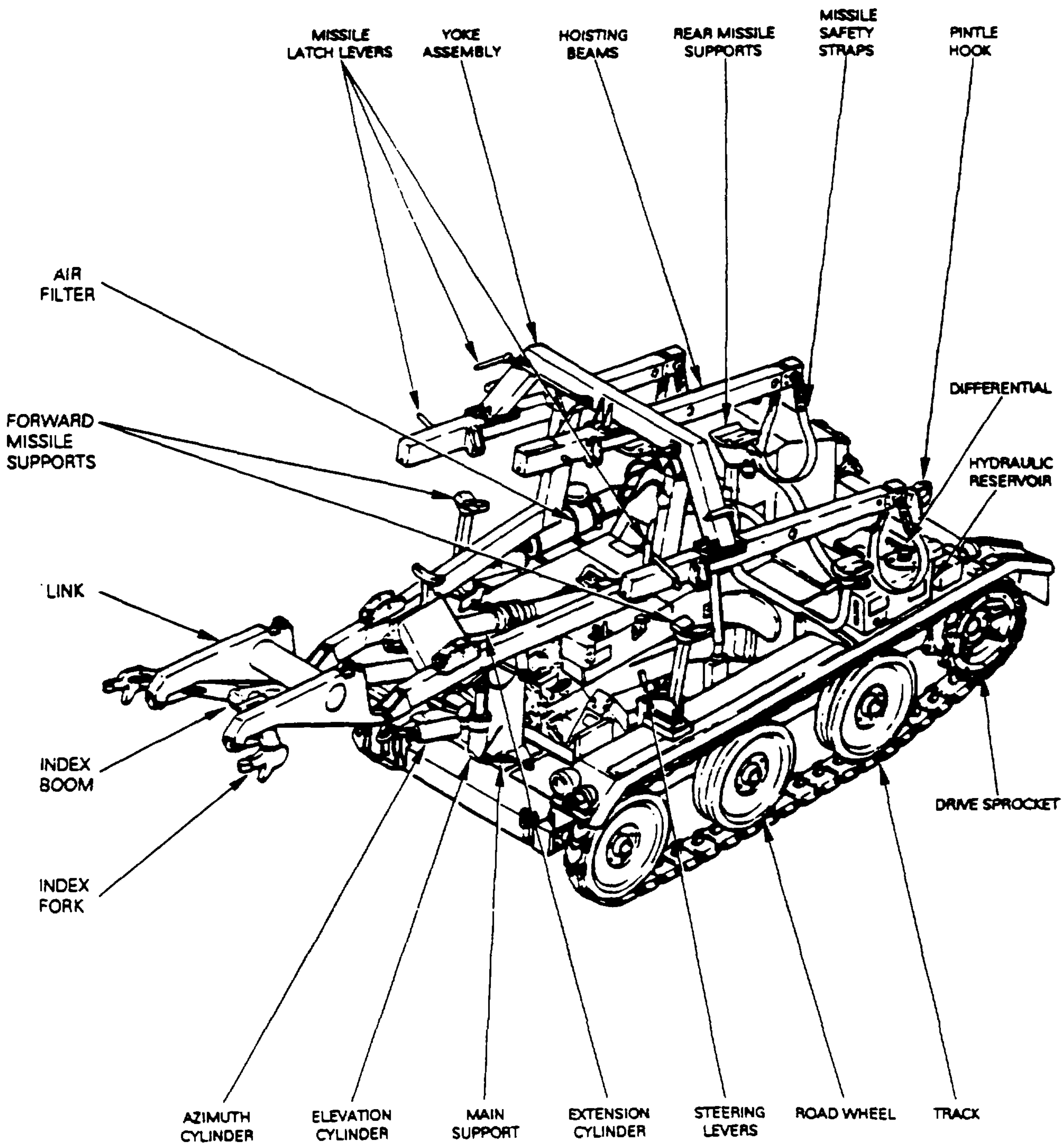


Figure 1-2. Loader-Transporter. Model XM501L1. Multifuel Engine.

3. Fuel, Air Intake and Exhaust System. The fuel system consists of a welded steel fuel tank, gauge, and sending unit, an electric fuel pump, sediment bowl, fuel quantity transmitter, fuel gauge, and associated fuel lines. The XM501E3 (gasoline engine) has a 13 U.S. gallon fuel tank and the XM50ILl (multifuel engine) has a 12 U. S. gallon fuel tank. Both are located on the left side of the loader, directly behind the operator's seat. A screen-type sediment strainer in the filler opening reduces the possibility of contaminated fuel entering the tank. Additional filtering is provided by a sediment bowl trap installed between the tank and the 24-volt electric fuel pump. The XM501L1 provides an extra measure of protection by installing another filter with controlled heating elements installed between the pump and the engine and transmission unit.

When the MASTER Switch and IGNITION Switch are turned on, the fuel pump is activated. In the XM501E3, filtered air for combustion is provided by an oilbath reusable element air cleaner. The air cleaner. The air cleaner is mounted on the right fender. A flexible duct directs the filtered air from the air cleaner to the carburetor.

The exhaust system is composed of the manifold, muffler, and connecting pipes. This system carries away combustion products and minimizes engine noise. The muffler is mounted on the right fender and is equipped with an expanded metal shield over the muffler to prevent accidental burns. In the XM501L1, filtered air for combustion is provided by an air cleaner. The air cleaner is mounted on the right fender. A flexible duct directs the filtered air from the cleaner to the engine,

4. Cooling System (XM501E3). Engine cooling is done by a forced water circulation system and proper air circulation. An engine-driven, seven blade, reverse pitch fan pulls air across the transmission, and out through the radiator core, dissipating accumulated engine heat. Water circulation is sustained by a belt driven water pump. Additional engine compartment cooling is provided by a door on the side of the engine hood. Normally, this additional cooling feature is not required unless the ambient temperature exceeds 100 degrees F. Transmission oil is circulated through two small radiator units mounted at the rear of the chassis. A hole in the chassis allows sufficient air to flow through the radiators, maintaining the proper oil temperature.

(XM501L1) Engine cooling is accomplished by a forded air circulation system and a transmission cooler mounted on top of the engine.

5. Track and Suspension. The loader is equipped with a torsion bar suspension system. Momentary overloads are absorbed by four direct-action shock absorbers mounted on the front and rear road wheels. Center guide, double pin, rubberized chevrons, endless tracks are driven by sprocket wheels and run on six independently suspended road wheels. Track tension is adjustable to compensate for wear. A road wheel arm lockout feature is incorporated into the suspension system to provide additional stability when the loader is used as a crane, when fitted with a hoist adapter, or when transporting a pallet. The torsion bar lockout control levers are located on the front of the loader, adjacent to the lifting shackles.

6. Chassis. The basic loader chassis construction consists of welded box-type structural members, sheet steel, and steel plate,

7. Controls. All the necessary controls for operating the loader are located in and about the operator's compartment. These controls consist of steering and braking levers, accelerator pedal, gear selector, choke, hand throttle, etc. For a complete description of all controls, refer to TM 9-1450-50010.

b. Superstructure. The superstructure is the lifting mechanism of the loader, It consists of the main boom support, index boom, link assembly, transfer arm assembly, yoke assembly, and hoisting beams with missile safety straps. The hydraulically operated superstructure performs the complete missile handling operation. The hydraulic console located to the right of the loader operator contains all the controls necessary to index and perform missile transfer three hoisting beams are bolted to the yoke assembly which is pivoted on the transfer arm assembly. Latching mechanisms in the hoisting beams are manually actuated for missile latching and released by solenoid action from the operator's instrument panel or manually by depressing the solenoid plunger. Manual release is accomplished through the manual latch release cover located at the forward ends of the hoisting beams.

c. Hydraulic Systems. (XM501E3). Power for superstructure operation is provided by an engine driven hydraulic pump, hydraulic cylinders, and associated hydraulic fluid reservoir, filters, valves, swivels, lines, fittings, and hoses. The main oil filter and all manual controls and associated components are mounted on a single, hinged cover forming the hydraulic console. Flexible hoses leading from the console are distributed to the various cylinders. Hydraulic oil pressure is registered on the operator's instrument panel and oil quantity is visually monitored through a transparent sight indicator on the outboard side of the fluid reservoir.

(XM501L1). The hydraulic installation consists essentially of the pressure supply, return, azimuth, extension, and elevations. The supply and return systems consist of the hydraulic fluid reservoir, control block filter, hydraulic pump, starter dump valve, dampener valve, pressure gauge, solenoid valves, flow regulator valves, check valves, relief valves, rotary control valves, and associated lines and fittings.

When starting the engine, system pressure is automatically dumped through the dump valve, thus allowing the engine to crank more easily. A temperature sensing element is incorporated into the reservoir supply line at the pump inlet which warns the operator when fluid temperature rises above 165 degrees F. Flow regulator valves restrict the amount of fluid made available to the azimuth, roll, and elevation control valves. The system is relieved at 3050 psi by a control block to prevent excessive pressures from damaging system components. Then the superstructure is in the transport position (full retracted) the azimuth system is isolated, thus preventing damage to missiles, superstructure or missile-reports.

d. Electrical System. A 24-volt dc system supplies electrical current for the loader. Two 12-volt batteries, connected in series, supply electrical energy for the ignition, fuel pump, and starting motor.

The major components of the electrical system are the batteries, distributor, ignition coil, starting motor, generator/alternator, spark plugs, (XM501E3 only) voltage regulator (with generator only) missile release solenoids. solenoid valves (hydraulic), switches accessory equipment and necessary wiring. Electrical accessories consist of headlights, blackout marker lights, stop and tail lights, gauges and sending units. Two limit switches and one cut out switch are mounted on the superstructure to prevent equipment damage and/or non-intended release of the missile.

e. Accessories and Auxiliary Equipment. A shatter-proof, carbon dioxide fire extinguisher is mounted on top of the right fender. A quick release clamp secures the extinguisher to its mounting bracket. Two ramp assemblies are provided for loading the loader on the cargo truck. The MI 5 Hoist Beam is used for handling missiles individually. A hoist adapter is applied to the index boom for missile handling.

1-9. Tabulated Data.

Figure 1-4 shows identification plates and their location. For operating instructions plates and decals refer to TM 9-4150-500-l0.

1-10. Luminous Markers(XM501L1).

To make the loader compatible with the launcher and pallet for indexing operations at night, the loader superstructure is provided with luminous markers. This assists operating personnel in indexing the fork tips to the pallet and/or launcher.

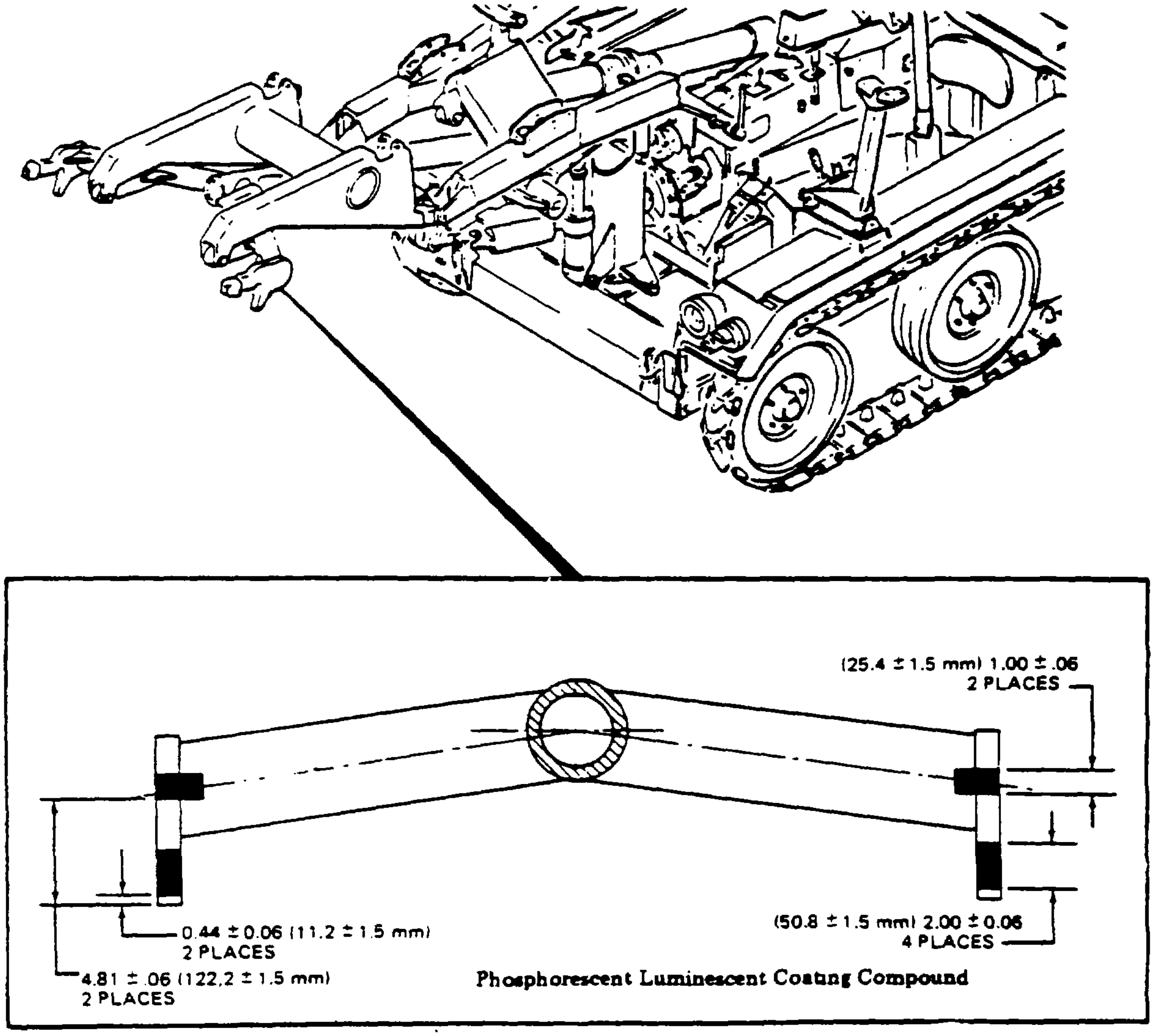


Figure 1-3. Luminous Markers.

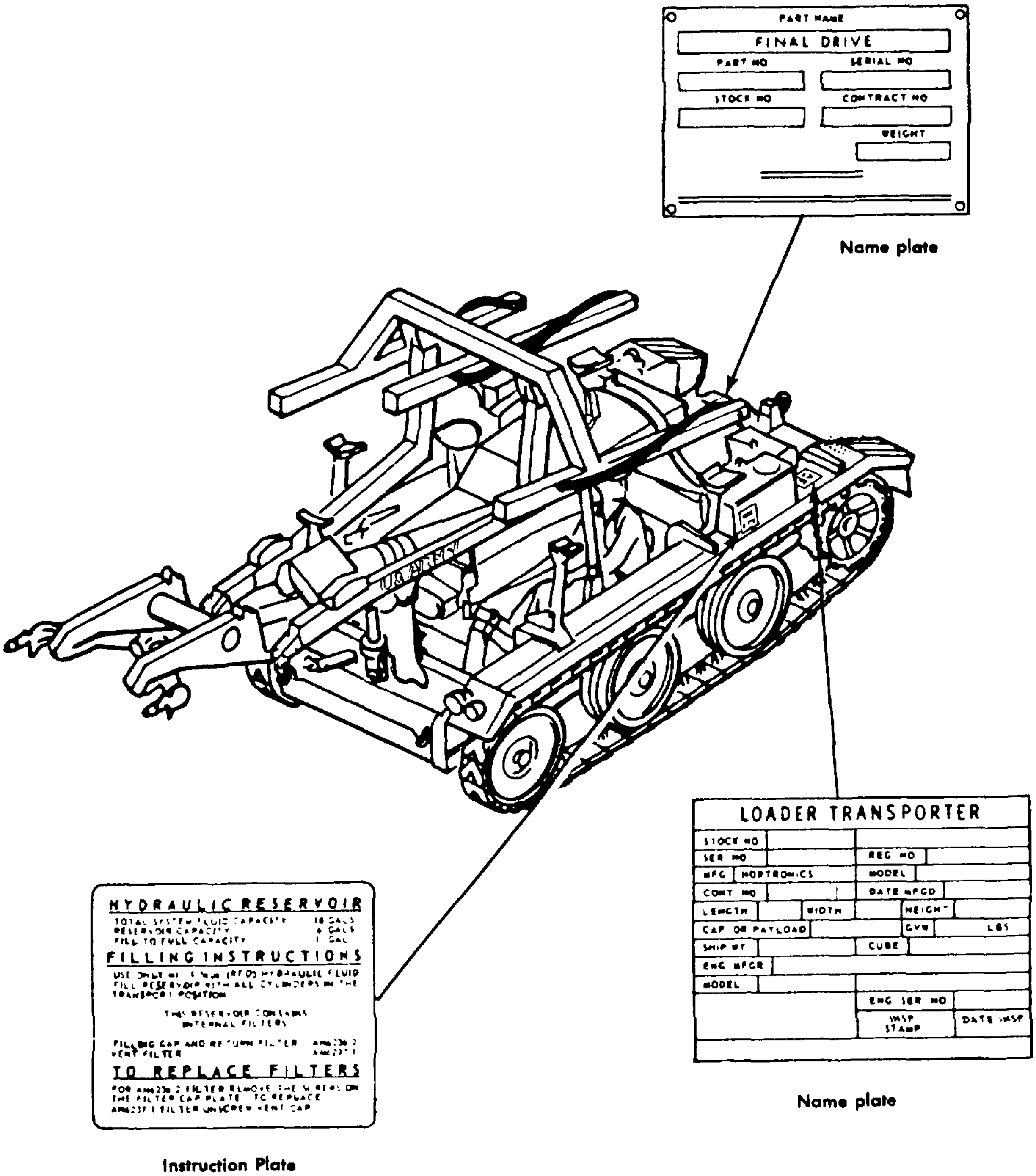


Figure 1-4. Name, Caution, and Instruction Plates (Sheet 1 of 4).

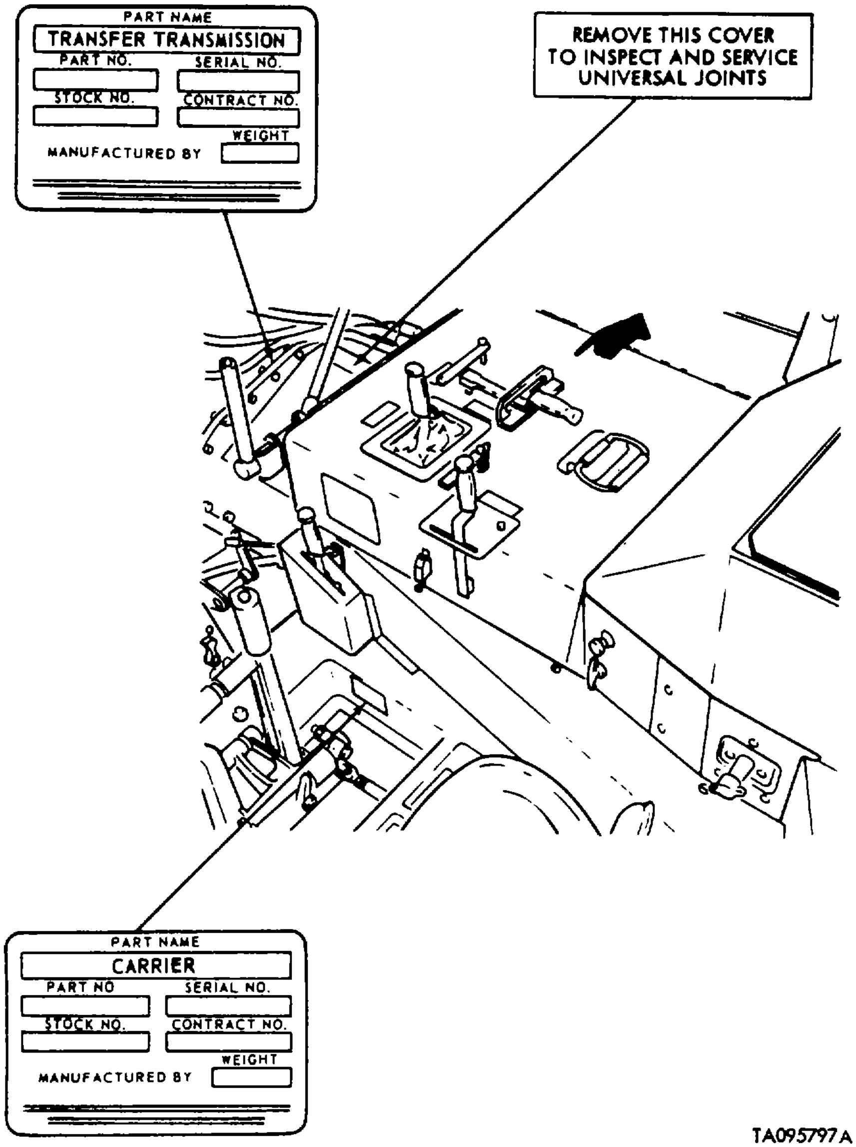


Figure 1-4. Name, Caution, and Instruction Plates (Sheet 2 of 4).

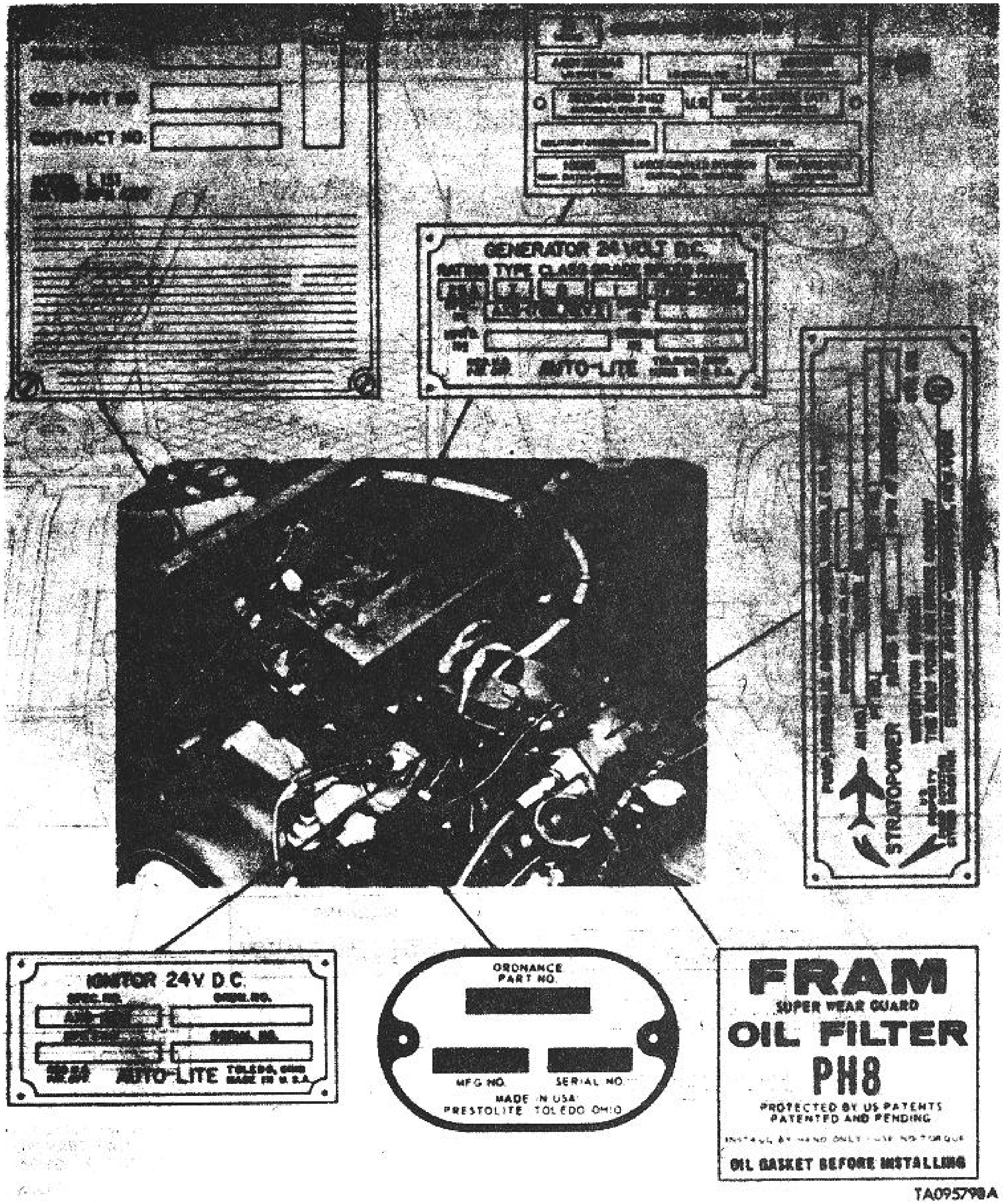


Figure 1-4. Name, Caution, and Instruction Plates (Sheet 3 of 4).

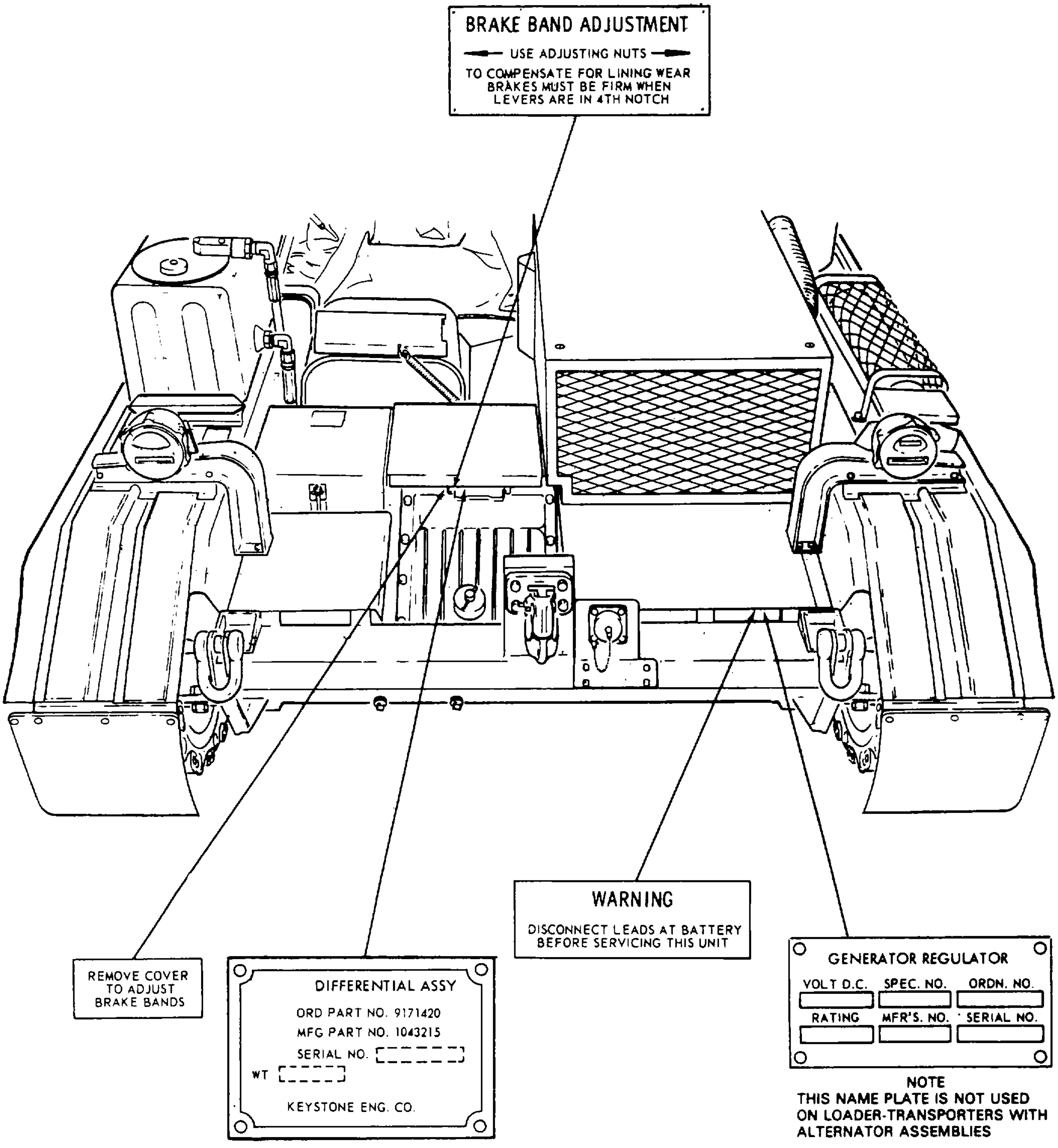


Figure 1-4. Name, Caution, and Instruction Plates (Sheet 4 of 4).

1-11. Vehicle Data.

1. Engine (Gasoline)
- Gross horsepower...72 at 4200 rpm.
- Net horsepower...62.7 at 3600 rpm.
- Compression ratio....7.50:1.
- Compression at cranking speed ....135 to 145 psi.
- Gross torque (max.).... 124.5 ft-lb at 1800 rpm.
- Displacement ....141.5 cu. in.
- Spark plug gap.. .0.030 in.
- Firing order 1-3-4-2.
- Distributor point gap 0.020 in.
- Timing ...6 degrees before top dead center @ 500 to 550 rpm.
- Exhaust valve clearance (hot)....0.015 in.
- Intake valve clearance (hot) ....0.0 l 5 in.

2. Oil System.
- Type ...pressure-fed.
- Pressure (700-800 rpm)...l15-30 psi.
- Pressure (1000-1200 rpm)....35-45 psi.
- Filter... Disposable cartridge.

3. Cooling System.
- Water type with radiator and fan
  Radiator pressure...7 psi.

4. Hydraulic System.
- Rated flow ....3 gpm at l500 rpm.

5. Engine (Multifuel)
- Refer to TM 9-1450-500-10 for Tabulated Data

1-12. Spares, Repair Parts, Special Tools, Special Test, Maintenance and Diagnostic Equipment and Other Special Support Equipment.

a. Special Tools and Equipment. Special tools and equipment especially designed for Direct Support and General Support maintenance, repair, and general use with the materiel are illustrated in Figs. 1-5 and 1-6, and listed in Tables l-I and 1-2. Authorized special tools and equipment are also listed in TM 91450-500-24P, which is the authority for requisitioning replacements.

b. Spares and Repair Parts. Repair parts authorized to Direct Support and General Support maintenance for the loader are listed in TM 9-1450500-24P which is the authority for requisitioning replacements.

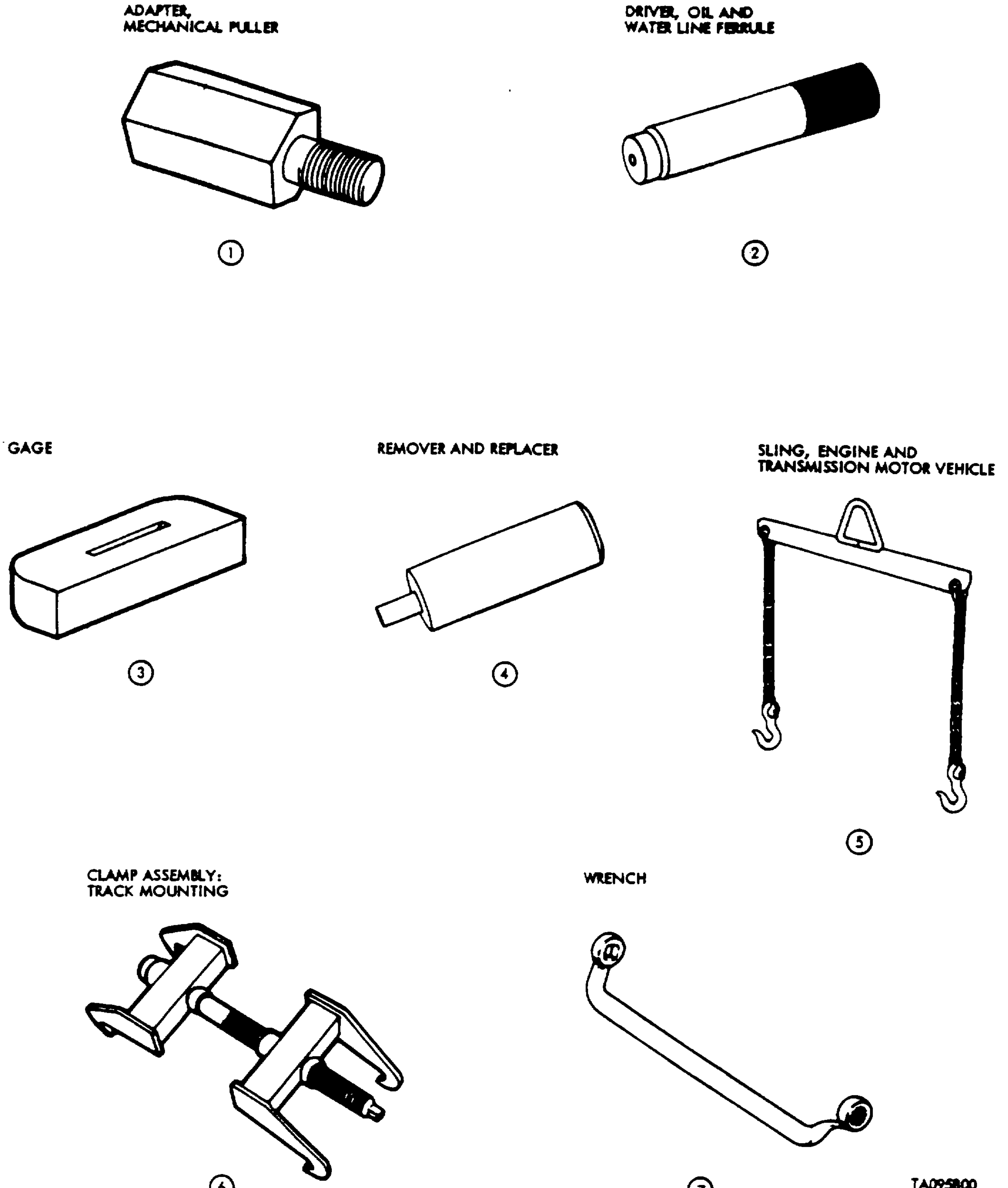


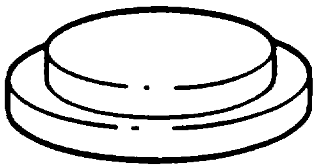
Figure 1-5. Special Tools and Equipment

Table 1-1. Special Tools and Equipment - Gasoline Engine.

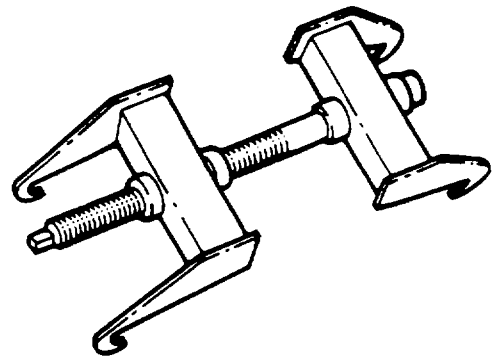
Item (fig. 1-4)	Identifying number	Use
1 Adapter, mechanical puller	5120-00-708-3254 (7083254)	To remove torsion bar; used with puller NSN 5120-00-423-1596 in the common mechanic tool kit
2. Driver, oil and water line ferrule	5120-00-473-7025 (7079403)	To install bushings, housing mounting, differential and transfer
3. Gage	5220-00-443-0529 (11626018)	To check wear limits of drive sprocket
4. Remover and replacer	5120-00-991-3150 (10892939)	To remove or install differential, transfer case or mounts
5. Sling, engine and transmission motor vehicle	3940-00-692-9112 (7345279)	To replace engine transmission mount insulators
6. Clamp assembly: track mounting	4910-00-799-0018 (10943651)	To install track
7. Wrench	5120-00-337-9134 (7084207)	To remove or install cylinder head holddown bolts

Table 1-2. Special Tools and Equipment - Multifuel Engine.

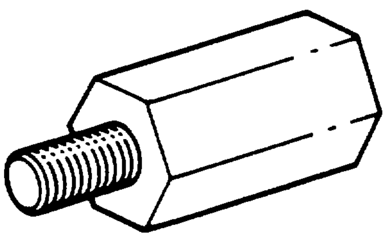
Item	Identifying number	References Fig.	References Par.	Use
Adapter	5120-00-991-3172 (10892973)	2-1		To remove road wheel upper spindle bearings;; used w/PULLER - 5120-00-423-1596.
Adapter, mechanical puller	5120-00-708-3254 (7083254)	2-1	2-60	To remove torsion bar, use w/PULLER - 5120-00-313-9496.
Driver, oil and water line ferrule	5120-00-473-7025 (7079403)	2-1		To remove differential and transfer case mount bushing.
Track clamp	4910-00-799-0018 (10943651)	2-3	2-56	To break or connect track.
Missile hoist beam M15	1450-00-665-3234 (9089788)	2-1		Used with adapter 2590-00-060-7042 to remove missile sections from container and transport to test fixture, used also to transport missile from test fixture to storage pallet.
Puller.....................................	5120-00-423-1596 (45225PE12)	2-1		To remove road wheel upper spindle bearings.
Puller.....................................	5120-00-313-9496 (93389-4056B)			To remove torsion bar.
Ramps..................................	3990-00-679-6924 (9098330)	2.2		To load and unload loader on truck
Remover and replacer............	5120-00-991-3150 (10892939)	2-2		To remove and install transfer or differential mounts.
Replacer................................	5120-00-991-3151 (10892942)	2-2		To install transfer case, pinion housing, or pinion shaft bearing cup seals.
Replacer	5120-00-991-3152 (10892946)	2-2		To install differential output shaft or road wheel upper spindle oil seals.
Replacer	5120-00-991-3171 (10892969)	2-2		To install differential input shaft seal.
Replacer assembly, bearing cone	5120-00-343-0122 (8708067)	2-2		To install transmission output shaft outer oil seal
Replacer, welded construction	5120-00-707-6254 (7076254)	2-3		To install road wheel upper arm spindle bearings and spacer or differential output shaft bearing retainer oil seal.
Replacer. cup Type.................	5120-00-098-6727 (8390373)	2-3		To install transfer case cover oil seal.
Replacer. oil seal....................	5120-00-473-7471 (7082882)	2-3		To install final drive output shaft bearing cup oil seal.
Wrench, box	5120-00-337-9134 (7084207)	2-3		To remove or install cylinder head holddown bolts.
Hoisting Assembly	(50008551)	2-3		To lift engine & transmission.
Hose assembly, oil drain.........	(50008724)	2-3		To drain oil from engine and from transmission..



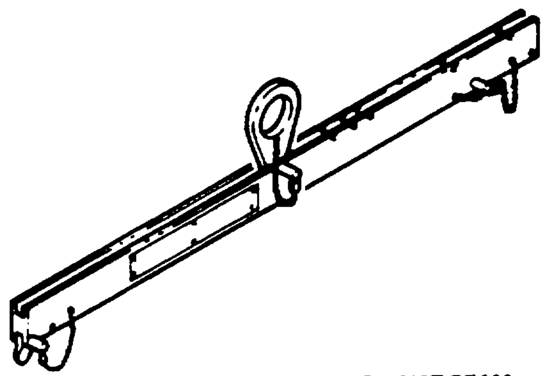
ADAPTER
5120-00-991-3172



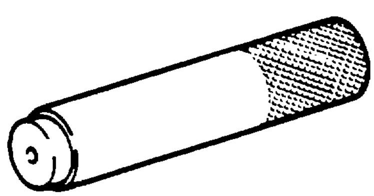
TRACK CLAMP
4910-00-799-0018



ADAPTER
5120-00-708-3254

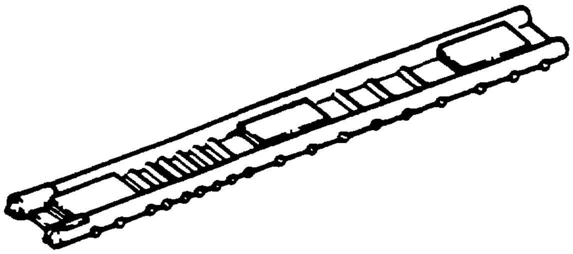


MISSILE HOIST BEAM
1450-00-665-3234

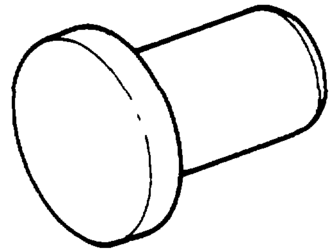


DRIVER
5120-00-473-7025

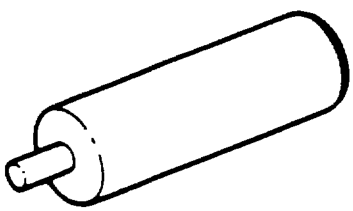
Figure 1-6. Special Tools and Equipment - Multifuel Engine (Sheet 1 of 3).



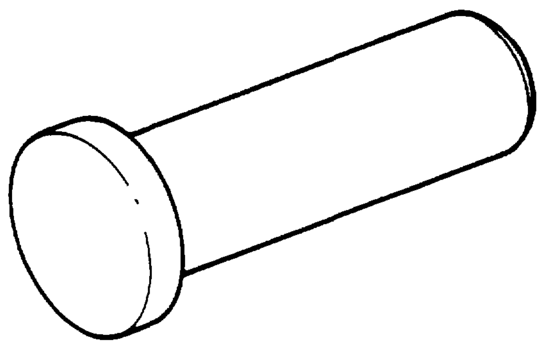
RAMP
3990-00-679-6924



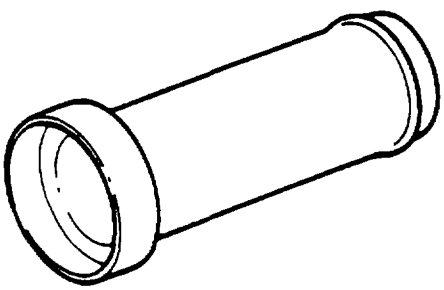
REPLACER
5120-00-991-3152



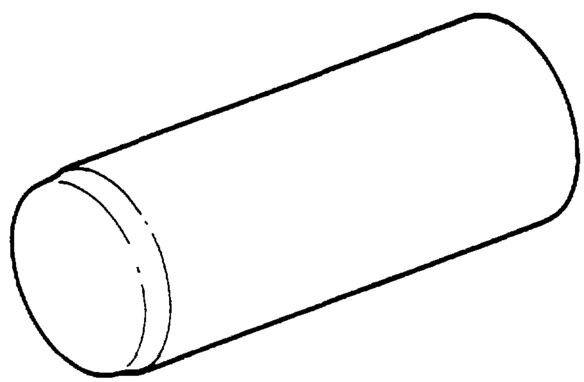
REMOVER AND REPLACER
5120-00-991-3150



REPLACER
5120-00-991-3171



REPLACER
5120-00-991-3151



REPLACER ASSEMBLY
5120-00-343-0122

Figure 1-6 Special Tools and Equipment - Multifuel Engine (Sheet 2 of3).

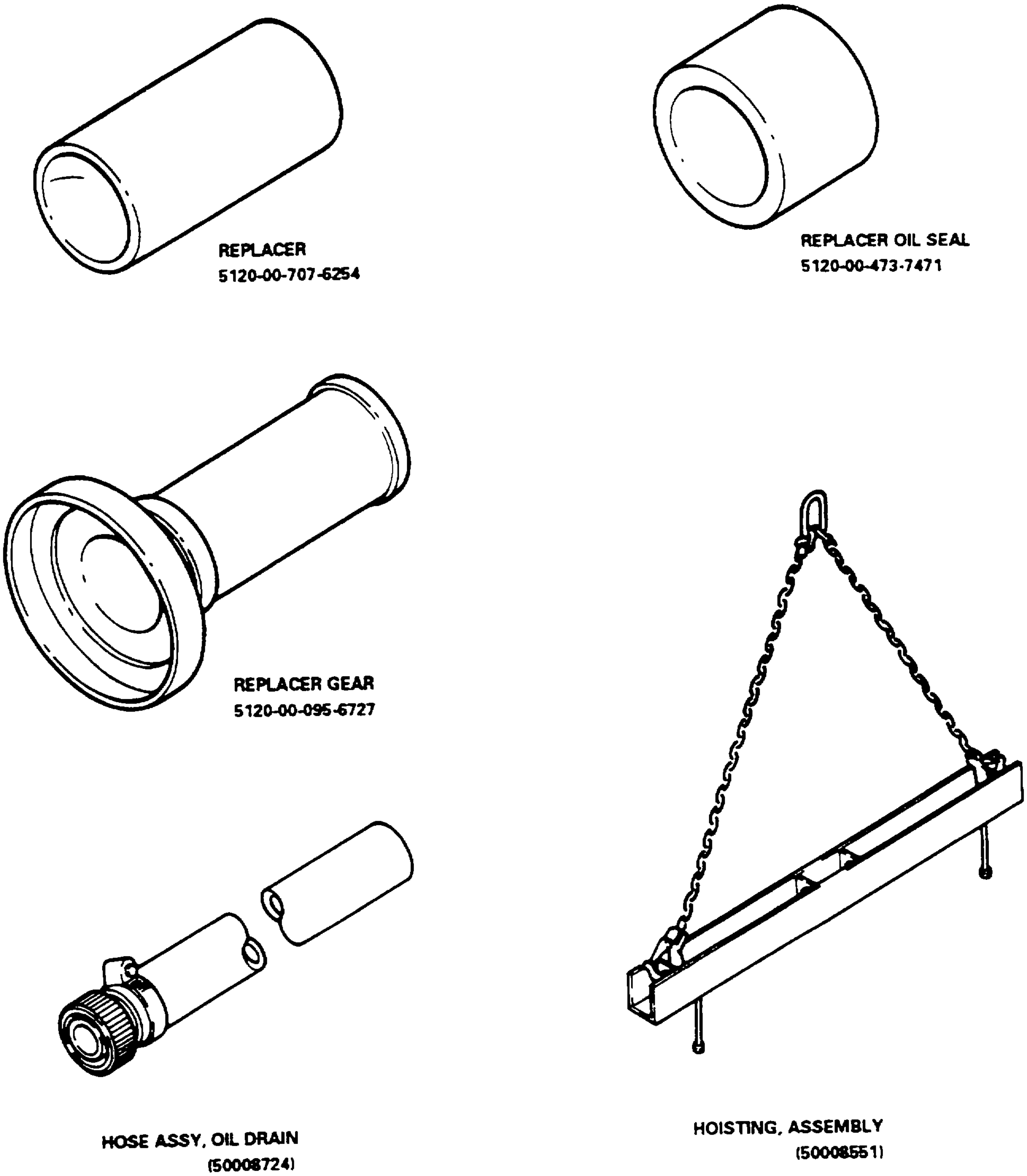


Figure 1-6. Special Tools and Equipment - Multifuel Engine (Sheet 3 of 3).

CHAPTER 2

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

2-1. Inspecting, Servicing, Installing, Setting-Up Instructions

a. General Procedures.

(1) If any exterior surfaces are coated with rust preventive compound, remove it with drycleaning solvent item 6, App. C, or mineral spirits paint thinner, item 7, App. C.

(2) Read the processing and Deprocessing Record for Shipment, Storage and Issue of Vehicles and Spare Engines Tag (DD Form 1397) and follow all precautions checked thereon. This tag should be attached to a steering lever, the shift lever, or the ignition switch in the operator's compartment.

(3) Before starting engine, turn MASTER SWITCH ON and leave IGNITION switch in OFF position. Turn engine over at least two revolutions with starter button to test for hydrostatic lock. This precaution is taken because there may be an excess of preservation oil or other fluids in the cylinder chamber.

b. Specific Procedures. Refer to table 2-1. TM 9-1450-500-10 contains daily preventive checks and services (PMCS) performed by the operator. Quarterly checks are in TM 9-1450-500-20.

2-2. Equipment Conversion

Instructions for adapting the loader to crane configuration are included in TM 9-1450-500-20 chapter 4.

Table 2-1. Service Upon Receipt

Step	Action	Reference
1	Remove Basic Issue Item boxes.	TM 9-1450-500-20
2	Restore tension to all drive belts.	
3	Remove tape and protective paper from operator's seat.	
4	Remove tape and protective paper from instrument panel and hydraulic console.	
5	Open Basic Issue Item boxes and inventory contents with packing list furnished with each container. Record missing items. a Open inner packs and remove packaging material. b. Degrease equipment such as tools, hardware, beam cable, sheaves, and missile handling beam.	

Table 2-1. Service Upon Receipt - Continued

Step	Action	Reference
5 (cont)	c. Stow Basic Issue Items which are not to be installed on the vehicle, in their respective stowage facility.	
6	Check radiator coolant. If cooling system has been drained, fill with proper coolant.	TM 9-1450-500-10
7	Install driveshaft, using hardware in bag attached to starter.	TM 9-1450-500-20
8	Unpack batteries, add electrolyte, and install, noting polarity.	TM 9-1450-500-20
9	Gasoline engines not processed or reprocessed within the time limitation established in the block titled "Reprocessing Cycle-Days" on the face of DD Form 1397 will be serviced prior to use as follows: a. Remove spark plugs from each cylinder. b. Atomize-spray 2 ounces of lubricating oil, item 4, App. C, into each cylinder through the spark plug opening. c. After interval of 15 minutes, rotate engine with starter for 30 seconds.	
10	Install spark plugs. When an engine is received for use without a DD Form 1397 attached, refer to TB 9-300-2/1 for method of establishing time limits of reprocessing cycles. **NOTE** If the vehicle has been driven to the using organization, most or all of the foregoing procedures should have been performed.	TM 9-1450-500-20
11	Tighten cylinder head bolts before starting engine.	TM 9-1450-500-20
12	Perform the Quarterly (Q) preventive maintenance service every 3 months or 75 hours, whichever occurs first) using Equipment Inspection and Maintenance Worksheet, DA Form 2404 as a worksheet.	
13	Lubricate all points of vehicle in accordance with reference regardless of interval. Check processing tag (DD Form 1397) for gearcase (transfer, differential, and transmission) and engine oil. If tag indicates oil is of correct viscosity for local operation, check level but do not change engine or gearcase oils.	LO 9-1450-500-12
14	Schedule second Q (PM) service on Preventive-Maintenance Roster, DA Form 314.	

Section II. PREEMBARKATION INSPECTION OF MATERIEL IN UNITS ALERTED FOR OVERSEAS MOVEMENT

Refer to TM 9-1400-514-15, Depot Maintenance Manual for shipment, handling, storage, inspection, care, and preservation.

Section III. TROUBLESHOOTING

2-3. Purpose

a. This section contains the troubleshooting information for locating and correcting most of the operating troubles which may develop in the loader. Each malfunction for an individual component unit or system is followed by a list of tests for inspections which will help you to determine the corrective actions to take. You should perform the tests/ inspections and corrective actions in the order listed.

b. This manual cannot list all possible malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed (except when malfunction and cause are obvious), or is not corrected by listed corrective actions, notify your supervisor.

NOTE

Information in this section is for use of maintenance personnel in conjunction with, and as a supplement to, the troubleshooting section in the organizational maintenance manual (TM 9-1450-500-20). It provides continuation of instructions where a remedy in TM 91450-500-20 refers to direct support maintenance personnel for corrective action.

c. Operation of a deadlined vehicle without a preliminary examination can cause further damage to a disabled component and possible injury to personnel. By careful inspection and troubleshooting, such damage and injury can be avoided and, in addition, the causes of faulty operation of a vehicle or component can often be determined without extensive disassembly.

2-4. General Instructions and Procedures

This section contains inspection and troubleshooting procedures to be performed while a disabled component is still mounted in the vehicle and then the procedure to be followed after it is removed.

a. The inspections made while the component is mounted in the vehicle are visual and are to be performed before attempting to operate the vehicle. The object of these inspections is to determine the condition of the component, and if found defective, to take precautions to prevent any further damage to it.

b. The troubleshooting performed while the component is mounted in the vehicle is that which is beyond the normal scope of the using organization. Check the troubleshooting section of TM 9-1450-500-20, then proceed as outlined herein.

c. Inspection after the component is removed from the vehicle is performed to verify the diagnosis made when the component was 4in the vehicle, to uncover further defects, or to determine malfunctions if the component alone is received by the ordnance establishment. This inspection is particularly important because it is often the only means of determining the malfunction without completely disassembling the component.

d. Troubleshooting a disabled component after it has been removed from the vehicle consists of subjecting it to tests on its respective test stand. This section also discusses those symptoms which can be diagnosed by using the testing equipment and interprets the results in terms of probable causes.

2-5. Troubleshooting Procedures

a. **Troubleshooting The Mechanical Systems**. Refer to table 2-2.

b. **Troubleshooting The Electrical System**. Refer to table 2-3.

Table 2-2. Troubleshooting the Mechanical Systems

Malfunction	Probable Cause	Corrective Action
	ENGINE	
1. Engine fails to crank when starter switch is held on.	Mechanical seizure of engine parts.	Remove cylinder head. Refer to TM 9-2805-213-34. Check For defective or seized parts. Repair or replace as necessary.
2. Engine does not develop full power or overheats.	Pre-ignition	Adjust engine timing. Refer to TM 9-2805-213-34.
3. Engine misfires	Defective valve action	Replace or adjust valves as necessary. Refer to TM 9-2805-213-34. Remove carbon from valves.
4. Engine oil consumption excessive.	Internal components of engine worn or defective lubrication system.	Remove cylinder head. Refer to TM 9-2805-213-34. Inspect piston. Replace if necessary.
5. Engine cranks but fails to start.	No current to electronic ignitor (distributor). Defective electronic ignitor (distributor) circuit in main harness.	- Check continuity of circuit per schematic in TM 9-1450-500-20. If break is found, replace defective wire.

Table 2-2. Troubleshooting the Mechanical Systems - Continued

Malfunction	Probable Cause	Corrective Action
	ENGINE - Continued	
6. Engine oil pressure low as Indicated by engine low oil pressure light.	Defective engine lubrucation system.	Remove and disassemble low oil pump. Refer to TM 9-2805-213-34. Repair or replace pump as necessary. Refer TM 9-2805-213-34.
	DIFFERENTIAL AND FINAL DRIVE ASSEMBLY	
7. Engine and transmission operate properly but vehicle will not move with shift lever in any position.	Defective differential drive assembly.	Disassemble and inspect differential for defective parts.
8. Vehicle is difficult to steer.	Brake linings wornReplace brake linings. beyond adjustable limits.	
9. Vehicle steers abruptly, or one or both brakes or grab.	Defective brake drums or linings not adjusted properly.	Adjust brake linings or replace brake drums.
10. Vehicle is hard to stop or brakes do not hold properly when applied.	Brake linings worn beyond adjustable limits or not adjusted properly.	Adjust or replace brake lining.
11. Oil leak from final drive.	Final drive output shaft oil seal defective.	Replace oil seal.
12. Water in final drive	Final drive output shaft oil seal defective.	Replace oil seal.
	HYDRAULIC SYSTEM	
13. Boom does not roll maximum right when ROLL/ELEVATION lever is moved to the right and engine speed is at 2000 rpm.	Boom roll arm broken. Roll cylinder Roll cylinder defective. Broken hydraulic line or hose	Replace boom. Disassemble and replace defective parts. Replace defective parts.
14. Boom does not extend placed in extend position.	Extension cylinder defective place defective	Disassemble and replace defective parts
15. Boom does not swing in azimuth when Control is actuated.	Broken hydraulic line or hose	Replace defective part.

Table 2-2. Troubleshooting the Mechanical Systems - Continued

Malfunction	Probable Cause	Corrective Action
	HYDRAULIC SYSTEM - Continued	
16. Boom does not elevate when control part. Disassemble is actuated.	Broken hydraulic line cylinder defective.	or hose. Elevation Replace defective and replace defective parts.
17. Excessive wear on main support bushings caused by accumulated water, rust and contaminants in main support busing	Water seeping down main support during rain or when washing vehicle, or accumulated through condensation	Inspect boom housing for water or contaminants monthly by removing the bottom cover. Inspection intervals may e adjusted to meet local requirements. When water or contaminants are present, remove main support, and clean and dry interior of boom housing. Clean and dry top and bottom bushings and main support. Replace excessively worn or damaged bushings. Check that lubricating fittings are in serviceable condition and that grease passages are clear. Reinstall main support and install new packing. Inspect packing retainers for deformation and straighten if necessary to be sure of close, tight fit. Before washing, wrap protective material around base of main support to prevent water from seeping into boom housing.

Table 2-3. Troubleshooting the Electrical System

Malfunction	Probable Cause	Corrective Action
	SUPERSTRUCTURE	
Missile latch and missile release lights do not operate properly with MISSILE LATCH RELEASE switch actuated, extension cylinder extended to maximum, and end of index boom raised until a gap of 1 inch appears between the link assembly, striker plate and transfer arm.	Defective circuit breakers	Replace circuit breakers. (Refer to TM 9-1450-500-20).
	Defective latch release	Disassemble and inspect latch and release assembly for defective parts. Check adjustment of latch.
	Defective solenoid	Remove wires from terminals of solenoid and check continuity through solenoid. Circuit must have continuity. If circuit is open, replace solenoid.

Section IV. GENERAL MAINTENANCE

2-6. General

This section includes general information for disassembly, cleaning, inspection, and assembly of the loader component parts. Specific instructions, when necessary, are included in paragraphs which cover particular components and operations.

2-7. Disassembly

These instructions are based on exploded views. It is recommended that groups of related parts be kept together, preferably in a tray, at all times to prevent their being mislaid. Parts which are pressed in, or which are riveted, are to be removed only if, during inspection, they are judged to be unserviceable.

2-8. Cleaning

All metal parts, except electrical parts and bearings, are cleaned as specified in TM 9-247. Refer to TM 9-214 for inspection and maintenance of antifriction bearings.

2-9. Inspection

Each part must be individually inspected for serviceability. Special instructions for particular parts are included in appropriate paragraphs. New parts, and parts marked serviceable at inspection, must be treated with a preservative. Critical dimensions are outlined in wear limit illustrations and instructions throughout the manual.

a. *Inspection of Metallic Parts*. Listed below are the most common flaws related to metallic parts.

(1) *Rust*. The appearance of rust or mating surfaces is cause for rejection of both parts. Rust on polished non-mating surfaces, of otherwise serviceable parts, must be removed before assembly or installation. Rust may be removed with a fine oxide abrasive paper and the surface polished with crocus cloth. After removal of heavy rust deposits, verify that the part is within the wear limits as specified in the applicable illustration in this manual. After repair, remove all abrasive deposits

by cleaning the part as specified in paragraph 2-8.

(2) *Burrs*. Burrs should be removed from gear teeth, retaining ring grooves, or mating surfaces with a fine oil stone. On non-mating surfaces, a smooth file or a hone may be used.

(3) *Nicks and scratches*. Nicks or scratches on a polished surface are cause for rejection. Minor nicks or scratches on unfinished surfaces are not cause for rejection.

(4) *Damaged threads*. Any part which has damaged external threads must be replaced.

(5) *Damaged threaded holes*. Parts which have incurred this defect may be repaired by retapping the hope. If this is undesirable or ineffective, the hole may be drilled out oversize, a suitable insert or bushing installed, and then drilled and tapped to the original thread size.

(6) *Dents in sheet metal parts*. Sheet metal parts which are bent or distorted are unserviceable unless they can be reformed to their original contour without damaging effects.

(7) *Damaged helical inserts*. Helical inserts, when damaged or missing, must be replaced.

(8) *Cracks*. Parts which are cracked must be replaced unless they can be rewelded without fear of distortion or impairing the strength of the component. For welding procedures refer to TM 9-237. Heat-treated parts cannot be welded or heated unless otherwise specified.

b. Inspection of Nonmetallic Parts. No inspection is prescribed for nonmetallic parts such as packings, gaskets, seals, nonmetallic washers, filter elements, and locknuts of the fiber inserted type. All such parts are automatically classified as unserviceable when removed during disassembly and should be discarded unless otherwise specified.

c. Inspection of Bearings. Inspect bearings as prescribed in TM 9-214.

d. Inspection of Springs. All springs that are distorted or otherwise damaged must be replaced. Spring rates must be checked when values are given.

e. Inspection of Hardware. Discard all cotter pins and roll pins during disassembly. All nuts, bolts, or screws which have damaged threads, or which have damaged heads that could prevent proper tightening, must be replaced.

f. Inspection of Gears. In many cases, the experience and good judgment of the inspector will determine whether a gear must be replaced. Listed below are a few of the more common inspection and repair procedures to be used when handling gears.

(1) *Nicks and burrs*. Small nicks and/or burrs on the engaging ends of the teeth may be removed with a small honing stone. This is only practical for minor defects. Fractures that extend below the hardened surface of the teeth are cause for rejection.

(2) *Cracks*. Cracks or fractures due to metal fatigue are cause for immediate rejection.

(3) *Gear hubs*. When the hubs of gears are scored, gouged, or burred seriously, the gears must be discarded. Minor imperfections may be smoothed out by honing.

(4) *Gear splines.* If the gear is splined, it must be replaced if the splines are twisted, scored or badly worn.

(5) *Bearing journals*. Examine the bearing journals of gears for scores or galled spots or wear beyond limits established in the repair and overhaul standards. All of these defects are cause for rejection.

2-10. Repair

Parts which pass the visual inspection and fall within the wear limits of the repair and overhaul standards can be reused. Some parts can be repaired. The repair work is outlined in the individual inspection procedures of the repair chapters.

2-11. Assembly

a. _General_. The repair chapters provide step-by-step procedures for assembly of the loader components. In addition, observe the following practices.

(1) *Preformed packings*. Lubricate all preformed packings and their associated grooves with hydraulic fluid, item 2, App. C.

(2) *Backup rings*. Soak backup rings for approximately four hours in hydraulic fluid, item 2, App. C prior to use, to make them more pliable and easier to install. Soaking time may be reduced by working the rings with the fingers while they are immersed in the fluid. When installing backup rings, the rough (hair) side of the backup ring should be toward the packing.

(3) *Safety wiring*. This is to be done with the safety wire designated in the assembly procedures and in accordance with accepted safety wiring procedures.

(4) *Torque values*. Critical torque values are specified in the assembly procedure. When not specified, bolts, screws, and nuts are to be tightened in accordance with military specifications.

(5) *Hydraulic components*. All hydraulic components must be kept thoroughly clean at all times. Plug all open ports until the component is installed to the vehicle.

b. After assembly and installation are completed, refer to Chapter 6 for final inspection procedures.

2-12. Lubrication

Lubricate the loader in accordance with LO 9-1450-500-12.

Section V. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS AND AUXILIARIES

2-13. General

The following paragraphs contain information for personnel performing major repair and overhaul work on the loader. They provide procedures for disassembly of the vehicle into its major components and reassembly. Refer to chapter 6 for final inspection procedures.

a. _Disassembly and Reassembly of Superstructure_. Refer to paragraphs 2-14 through 2-21 and figure 2-1.

b. _Disassembly and Reassembly of Carrier Components_. Refer to TM 9-1450-500-20.

Paragraph 2-13c deleted.

d. _Disassembly and Reassembly of Missile Hoisting Beam XM15_. Refer to TM 9-1450-500-20.

2-14. Yoke Assembly

a. _Removal_.

(1) Start the engine. (Refer to TM 9-1450-500-10.)

(2) Lower index forks onto wooden blocks.

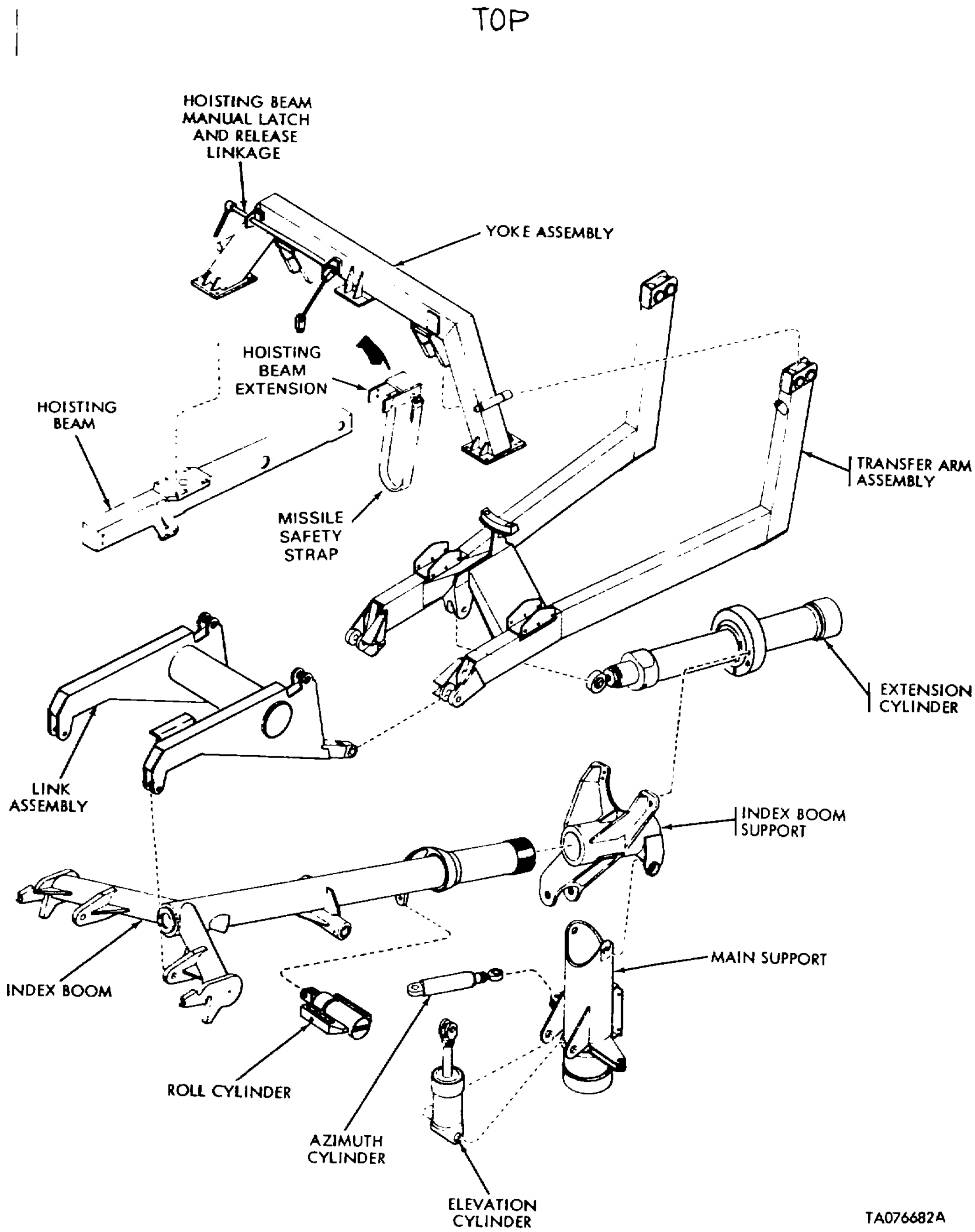


Figure 2-1. Superstructure Components

(3) Extend extension cylinder rod as far as possible

NOTE

When extension cylinder rod is extended, it should be wrapped with soft material for protection against damage (i.e., nicks, scratches, burrs). Prior to operation, wipe rod clean and oil with hydraulic fluid, item 2, App. C.

(4) Shut down engine and cycle all manual control valves several times to relieve hydraulic system pressure.

(5) Turn MASTER SWITCH to OFF position.

(6) Turn fuel shutoff valve off.

(7) Disconnect battery ground cable (refer to TM 9-1450-500-20.

(8) Disconnect electrical cabling at connector on yoke assembly.

NOTE

If transfer arm assembly is to be removed, disconnect electrical cabling at connector on transfer arm.

(9) Support yoke assembly in a suitable manner (a sling may be used) to relieve strain on quick release pins which act as pivots for yoke assembly in transfer arm journal box.

(10) Remove quick release pins and yoke assembly.

b. *Disassembly*. No further disassembly is authorized other than the removal of the center hoisting beam manual linkage and wiring harnesses.

c. *Inspection and Repair*. Check the yoke assembly for cracks and deformation. Broken or cracked welds may be rewelded in accordance with TM 9-237. Use extreme care during welding repairs to prevent the application of excessive or uncontrolled heat. If deformation is detected the yoke assembly may be straightened to the dimensions specified in figure 6-42. Replace the yoke assembly if worn beyond the wear limits specified in figure 3-8. Refer to paragraph 3-4 for additional inspection criteria.

CAUTION

Application of uncontrolled or excessive heat during welding repair procedures may weaken yoke assembly and result in its eventual failure under heavy loads.

d. *Assembly*. None, except for components removed in paragraph b.

e. *Installation*. Install the yoke assembly by reversing the sequence of the removal procedure.

f. *Test and Adjustment*.

(1) Start engine (refer to TM 9-1450-500-10) and after initial warm-up actuate elevation cylinder to raise index forks off supports.

(2) Actuate extension cylinder.

(3) The yoke assembly should swing freely in the transfer arm assembly.

2-15. Center Hoisting Beam Manual Linkage

a. Removal (fig. 2-2).

NOTE

Prior to removing handle (3) and actuator arm (15) from pin (7), and actuator arm (13) from hoisting beam, mark each part for alinement to aid in reinstallation.

(1) Remove cotter pin (11) from clevis pin (19) and disconnect link rod (17) from actuator arm (18).

(2) Remove two each screws (8 and 4), washers (5 and 9), and remove brackets (6 and 10) and linkage assembly.

(3) Remove spring pin (1 and 2) from handle (3) and remove handle from pin (7).

(4) Remove spring pin (14) from actuator arm (15) and remove pin (7) from brackets (6 and 10).

(5) Remove cotter pin (13) and clevis pin (19) and remove actuator arm (15) from link rod (17).

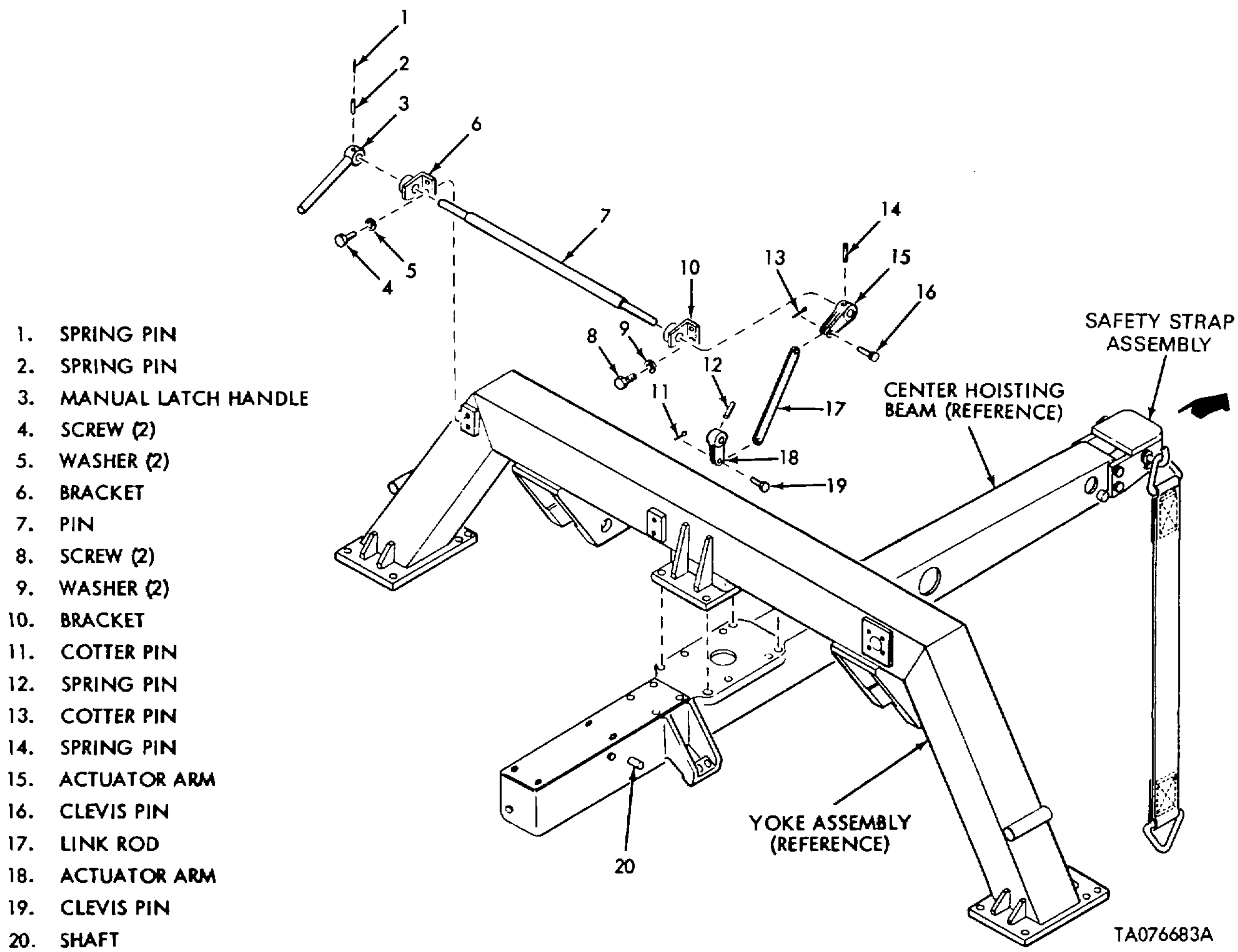


Figure 2-2. Center Hoisting Beam - Manual Linkage Removal

(6) Remove spring pin (12) from actuator arm (18) to remove arm from hoisting beam shaft (20).

b. *Disassembly*. No further disassembly is authorized.

c. *Inspection*. Inspect all parts for excessive wear and/or deformation. Excessively worn or deformed parts must be replaced.

d. *Assembly*. None.

e. *Installation*. Install the center hoisting beam manual linkage by reversing the sequence of the removal procedure.

2-16. Hoisting Beam

a. *General*. The three hoisting beams are identical in construction and their removal and installation procedures are the same with the following exception. The center and right-hand hoisting beams (as viewed from the operator's seat) have the manual latch handles on the right side while the left-hand beam has the handle on the left side. To remove the center hoisting beam it is necessary to disconnect the link rod at the actuator arm on the hoisting beam (paragraph 2-15). Operation of the latch and release mechanism is described in TM 9-1450-500-10.

b. *Removal (fig. 2-3)*.

(1) Remove eight each screws (2) and washers (3) on top forward end of hoisting beam and remove inspection cover (1).

NOTE

If right-hand hoisting beam has a movable weight installed, remove weight and retain for reinstallation.

(2) Disconnect electrical cabling from solenoid terminals and terminal board assembly.

NOTE

Identify wires before disconnecting to aid in installation. Wires must be reinstalled on same terminals from which they were removed.

(3) Loosen solenoid mounting bracket bolt (5) to release clamp which holds electrical cabling in place inside beam housing. Remove clamp.

(4) Attach a strong line to the free ends of electrical cabling which was disconnected from solenoid terminals.

NOTE

Omit step (5) if only right-hand or left-hand hoisting beam is being removed.

(5) Disconnect linkage (4) from the actuator arm on center hoisting beam.

(6) Remove six bolts (6), associated nuts (8), and flat washers (7).

(7) Support hoisting beam and remove two bolts (11), lockwashers (10), and flat washers (9).

(8) Slowly lower hoisting beam away from yoke assembly. Be careful not to foul electrical cabling and clamp inside beam housing and damage wiring. When cabling is free of housing, disconnect line from cabling. Leave line in hoisting beam to aid in reinstalling electrical cabling.

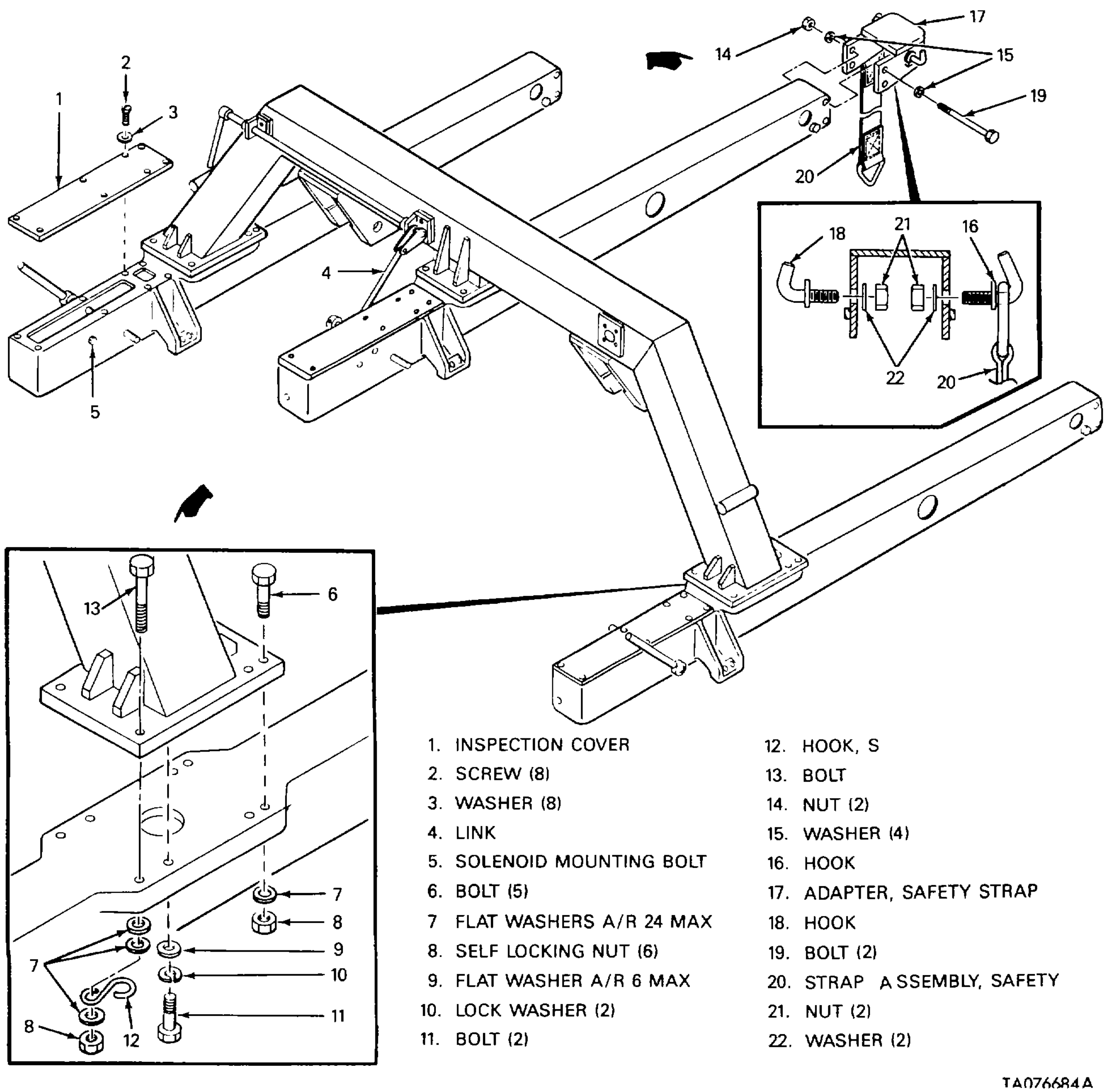


Figure 2-3. Hoisting Beam--Manual Linkage/Removal

c. *Inspection and Repair*. The following special tools are required to perform the inspection and repair procedures:

Special tool	NSN	Part number
Extractor, coil thread insert	5120-00-251-1525	7751050
Tool, inserting	5120-00-816-5706	A190-3

(1) Inspect housing for damaged helical inserts.

(2) Replace damaged inserts by removing inserts with an extractor, special tool (4, figure 1-2).

(3) Install new inserts using an inserting tool, special tool (40, figure 1-2).

NOTE

Cracks in housing are cause for replacing housing. Refer to paragraph 3-2 for inspection of interior components of the hoisting beam.

CAUTION

Do not make welding repairs to beam housing.

(1) Connect line to terminals of electrical wiring. (Refer to step (8) of removal.).

(2) Mate hoisting beam with yoke assembly and simultaneously pull electrical cabling into position inside hoisting beam housing.

(3) Install two bolts (11), lockwashers (10), and flat washers (9) to establish adequate grip length for bolt (11). See figure 2-3.

NOTE

Inspect routing of electrical cabling inside housing. Wiring must be routed in such a way that it is shielded from internal mechanism by strip (23 fig. 3-1).

(4) Install five bolts (6), associated flat washers (7), to establish adequate grip length for bolt (6), and self-locking nuts (8). Install bolt (13) washers (7) stowage hook (12) and self locking nut (7) to establish adequate grip length for bolt (13). See figure 2-3.

NOTE

Omit step (5) if only right-hand and/or left-hand hoisting beam is being installed.

(5) Connect link rod (4) to actuator arm on center hoisting beam.

(6) Disconnect line from electrical cabling and remove line from hoisting beam housing.

(7) Position electrical cabling clamp around solenoid bracket mounting bolt (5) and tighten bolt.

(8) Connect electrical wiring to terminals of terminal board assembly and solenoid. One of the solenoid terminals should have only one wire connected. Depending on which hoisting beam is being installed, the single wire must be 102G (red). 101G (red), or 100G (red). The other solenoid terminal should have three wires installed. Refer to schematic diagram in TM 9-1450-500-20.

(9) Position inspection cover (1) on top forward portion of hoisting beam and install eight each washer (3) and screw (2). See figure 2-3.

2-16.1 Safety Strap Assembly

a. *General*. A Safety Strap Assembly (see fig. 2-3) is bolted to the aft end of each hoisting beam. The assemblies are identical. The purpose of the Safety Strap Assembly is to provide a protective measure against a missile falling from the hoisting beams during missile movement using a Hawk Transporter Loader. Use of the Safety Strap is described in TM 9-1450-500-10.

b. *Removal (fig. 2-3)*.

(1) Remove Safety Strap Assembly (20) from the stowage hook (12).

(2) Remove nuts (14) washers (15) and bolts (19) from the Safety Strap Adapter (17).

(3) Slide the Safety Strap Adapter (17) off the end of the hoisting beam.

(4) Remove nuts (21) and washers (22) to remove the hooks (16) and (18).

(5) The Safety Strap Assembly (20) is removed with the hooks.

c. *Installation*. Install the Safety Strap Assembly by reversing the sequence of the removal procedure.

NOTE

Hook (16) is installed on opposite side of hoisting beam from S hook (12).

2-17. Transfer Arm Assembly

a. *Removal (fig. 2-4)*.

(1) Remove yoke assembly (para 2-14).

(2) Disconnect electrical cabling (8) from electrical connectors on transfer arm assembly.

(3) Remove two spring pins (2) from pins (1).

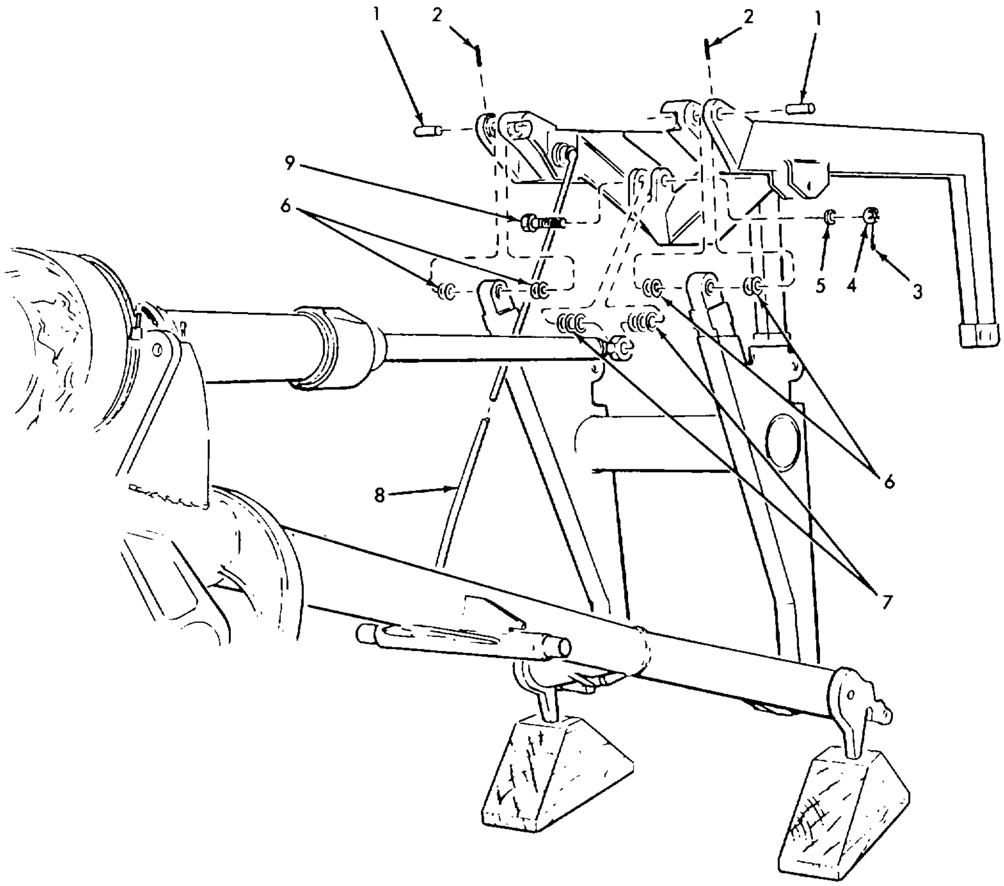
(4) Support transfer arm assembly and extension cylinder separately and disconnect extension cylinder rod end from transfer arm assembly by removing cotter pin (3), nut (4), flat washer (5), bolt (9) and shimming washers (6).

NOTE

Determine position and tie shimming washers together (one pack for each side) to aid in reinstallation.

(5) Identify pins (1) and remove. Remove shimming washers (6) and retain with individual pin to aid in installation.

b. *Inspection and Repair*. Inspect the transfer arm assembly for cracks, especially in the welded areas. If cracks are detected in structural members, the transfer arm must be replaced. If the transfer arm is bent, it may be straightened to the dimensions specified in figure 6-41. Replace transfer arm if worn beyond the limits specified in figure 3-10. Refer to paragraph 3-6 for additional inspection and repair criteria.



1. PIN (2)
2. SPRING PIN (2)
3. COTTER PIN
4. HEX NUT
5. FLAT WASHER
6. FLAT WASHER (4 MAX)
7. FLAT WASHER (6 MAX)
8. ELECTRICAL CABLING
9. BOLT

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Figure 2-4. Transfer Arm Assembly Removal

NOTE

If heat is required for straightening transfer arm assembly, remove electrical cabling before applying heat. Refer to TM 9-1450-500-20 for cabling removal.

CAUTION

Use of heat when making repairs to transfer arm is very critical. Excessive or uncontrolled heat applied during repair procedures may weaken transfer arm assembly and result in its eventual failure under heavy loads. Observe temperature limitations given in figure 6-39.

c. *Installation*.

(1) Install electrical cabling (if applicable). Refer to TM 9-1450-500-20.

(2) Lift transfer arm assembly to mating position with link assembly, install shimming washers (6) and insert attach pins (1) in the same position as before removal.

NOTE

Verify transfer arm limit actuator roller is properly positioned against link assembly arm and that pins (1) are reinstalled in same holes from which they were removed.

(3) Install spring pins (2) in attach pins (1).

(4) Connect extension cylinder rod end to transfer arm assembly by installing bolt (9), shimming washers (7), flat washer (5), nut (4), and cotter pin (3).

NOTE

Install shimming washers as required (6 maximum) to position extension cylinder rod end in center of transfer arm torque box. With extension cylinder fully retracted, and without missiles loaded and full roll applied, a minimum clearance of 0.250 inch must be maintained between extension cylinder end cap and transfer arm torque box. If pins (1) are new replacement parts, they must be installed as shown in figure 2-5. After installation drill a 0.187 + 0.005 inch diameter hole through pins, using holes in transfer arms as pilot holes.

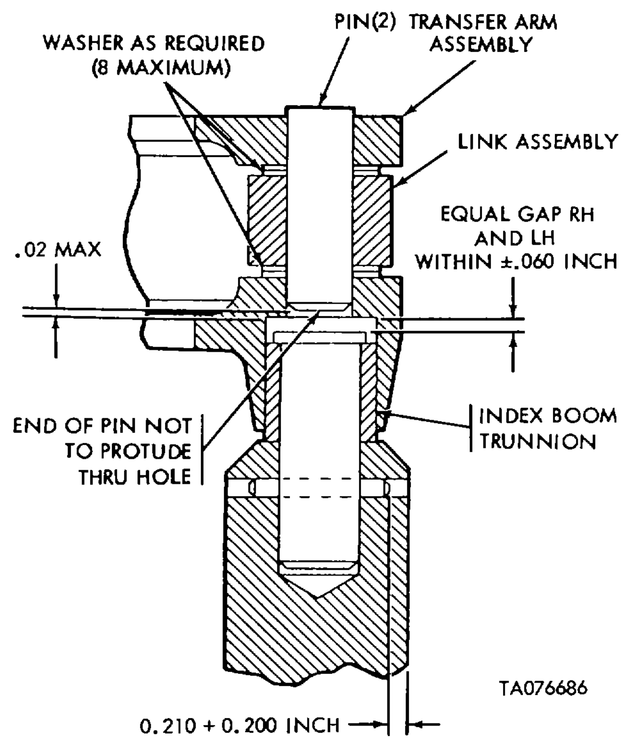


Figure 2-5. Index Boom and Link Assembly Clearance

(5) Connect electrical cabling (8) to electrical connectors on transfer arm and index boom.

(6) Check clearance between end of index boom trunnion and transfer arm assembly on both sides. They should be equal within ±0.060 inch. Refer to figure 2-5.

NOTE

Verify transfer arm limit switch roller is properly positioned against link assembly arm.

(7) Install yoke assembly. (Refer to para 2-14).

(8) Verify all electrical connections are made.

d. *Test and Adjustment*. Start the engine and after initial warm-up operate the hydraulic system to extend and retract the superstructure. Verify that the clearances specified in the preceding installation procedure are maintained and that interference does not exist between superstructure components. Perform the indexing operation as specified in TM 9-1450-500-10, and if necessary adjust the superstructure limit switches as specified in TM 9-1450-500-20.

2-18. Link Assembly

a. *Removal*.

(1) Remove yoke assembly (para 2-14).

(2) Remove transfer arm assembly (para 2-17).

(3) Disconnect link assembly to index boom electrical cabling at index boom connector.

(4) Support link assembly and remove two hex-head bolts, shimming washers, and two locknuts which attach link assembly to index boom forks.

NOTE

Determine the position and tie shimming washers together (one pack for each side) to aid in installation.

(5) Remove link assembly.

b. *Inspection and Repair*. Inspect the link assembly for cracks, especially in welded areas. Cracks in welds may be rewelded in accordance with TM 9-237. Cracks in structural members are cause for replacement of the link assembly. If the link assembly is bent, it may be straightened to the dimensions specified in figure 6-29. Refer to paragraph 3-8 for additional inspection and repair criteria.

NOTE

If welding repairs are required, remove electrical cabling before welding.

CAUTION

Use of heat in making repairs to welds of link assembly is very critical. Application of excessive or uncontrolled heat during repair procedures may weaken link assembly structural members and result in its eventual failure under heavy loads.

c. *Installation*.

(1) Install electrical cabling (if applicable). Refer to TM 9-1450-500-20.

(2) Lift link assembly to alinement with index boom forks.

(3) Install two hex-head bolts, shimming washers (as required to maintain equal gal ±0.060 inch on both sides between front end of transfer arm and index boom trunnion) and two locknuts. Refer to figures 2-5 and 2-6.

(4) Install transfer arm assembly (para 2-17).

(5) Install yoke assembly (para. 2-14).

(6) Connect all electrical cabling.

d. *Test and Adjustment*. Start the engine and after initial warm-up operate the superstructure. Movement of the transfer arm, link assembly, and index boom must be without evidence of binding of restriction.

2-19. Index Boom

a. *Removal (fig. 2-7).* The following special tool is required to perform the removal and installation procedures:

Special tool	NSN	Part number
Wrench, spanner	5120-00-991-3166	10892984

(1) Remove yoke assembly (para 2-14).

(2) Remove transfer arm assembly (para 2-17).

(3) Remove link assembly (para 2-18).

(4) Remove cotter pin, nut, washer, and bolt, and disconnect roll cylinder from index boom roll arm. Disengage cylinder rod from index boom roll arm.

(5) Disconnect connector (3) from electrical receptacle on rear of index boom and connect to dummy receptacle on top of distribution box. Install protective cap on electrical receptacle on rear of index boom.

(6) Straighten tangs of external tooth key washer (4) to release nuts (1 and 2).

(7) Using spanner wrench, special tool (45, fig. 1-2), loosen and remove locknut (1) as shown in figure 2-8. Remove external tooth key washer (4).

(8) Using spanner wrench, special tool (45, fig. 1-2), loosen and remove locknut (2).

(9) Remove index boom (6) from index boom support (5).

CAUTION

Be very careful during removal procedure not to damage bearings in index boom support or threads on end of boom.

b. *Inspection and Repair*. Refer to paragraph 3-10.

c. *Installation*.

(1) Insert index boom (6) into index boom support (15).

CAUTION

Use extreme care to prevent damage to bearings in index boom support and threads on end of boom.

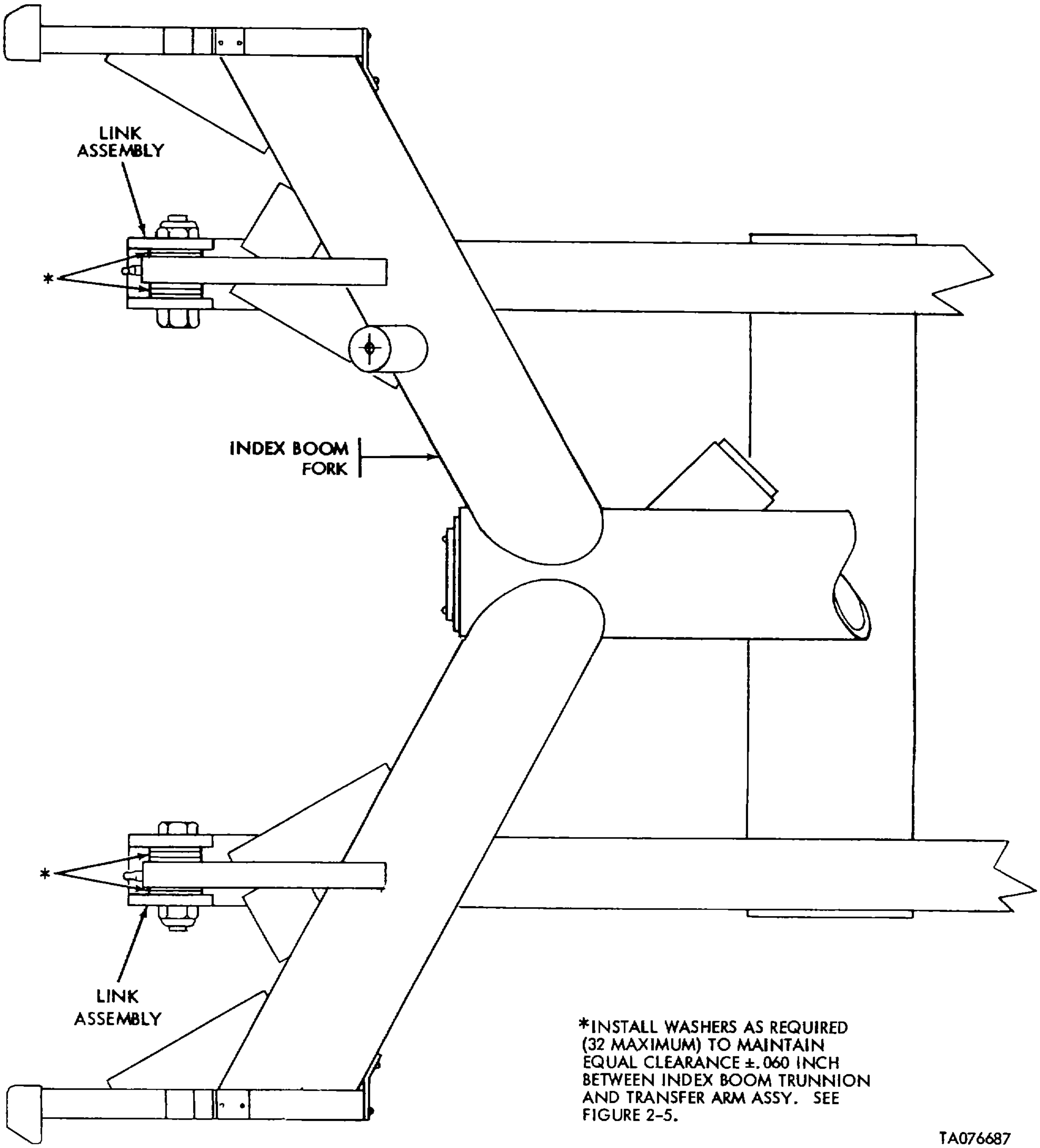


Figure 2-6. Link Assembly - Shimming Washers Installation

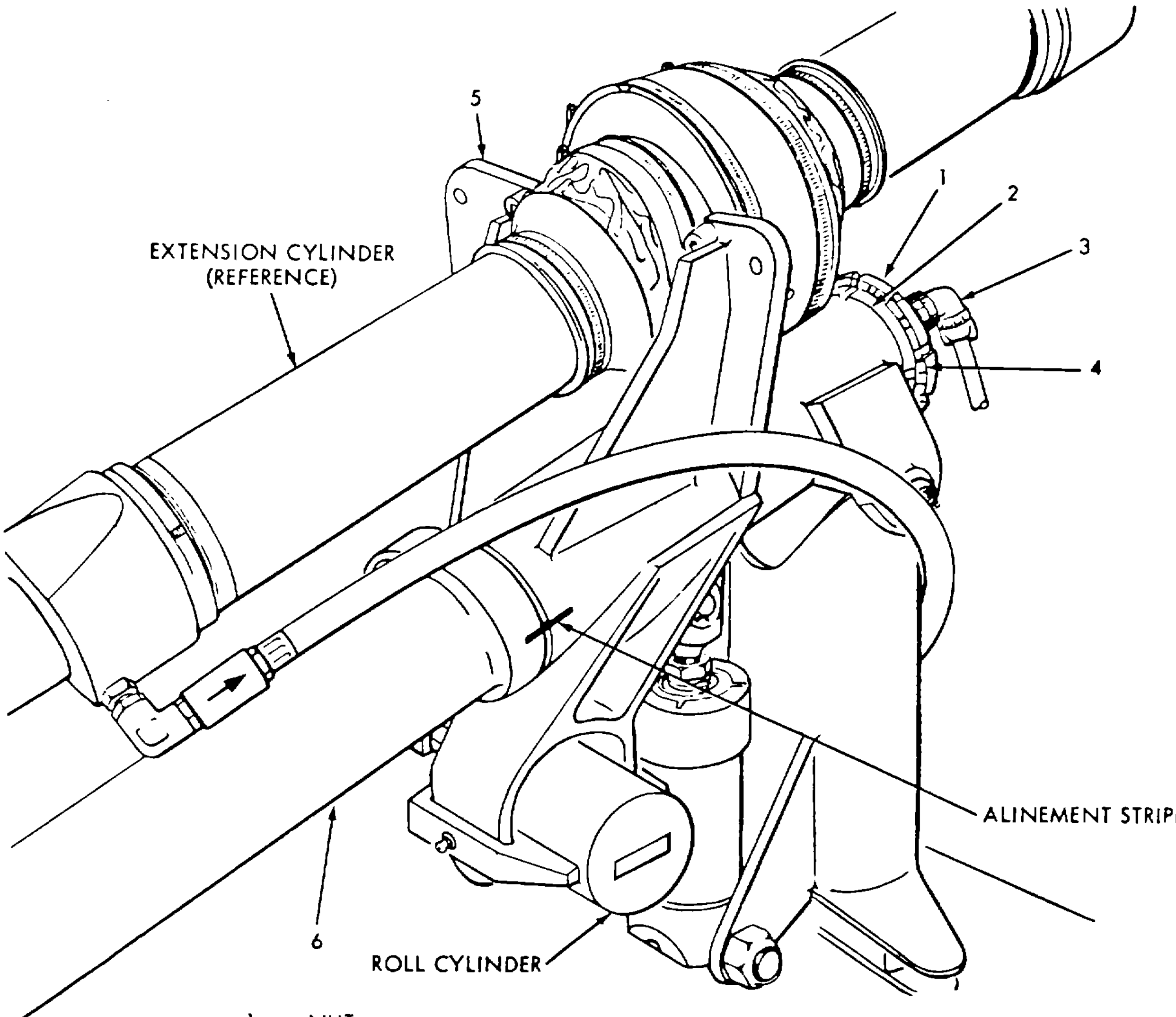


Figure 2-7. Index Boom Removal

(2) Slide index boom through index boom support and install nut (2) using spanner wrench, special tool (45, fig. 1-2).

(3) Check end play of index boom in index boom support. End play must be 0.008 +0.005 inch, and nut and bearing surfaces must be parallel within 0.010 inch. Index boom must move freely in bearings within limits imposed by cylinder support.

(4) Install external tooth key washer (4) and nut (1). Use spanner wrench, special tool (45, fig. 1-2) to tighten nut (1).

(5) Bend a tang of external tooth key washer (4) into a slot in each of the nuts (1 and 2) to keep locknuts from turning.

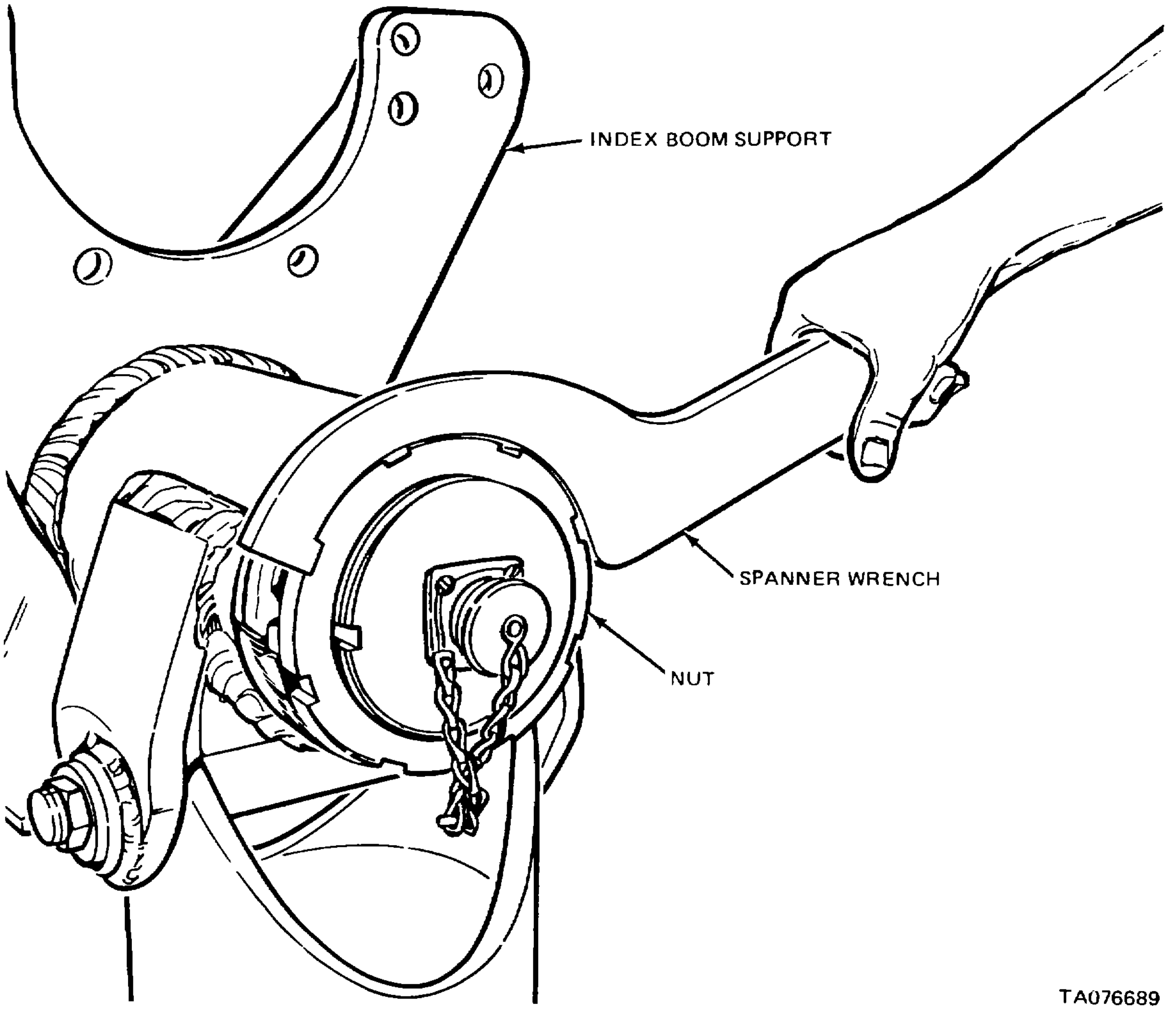


Figure 2-8. Index Boom - Nut Removal Using Spanner Wrench

(6) Engage roll cylinder rod end with index boom roll arm and install bolt, washer, nut, and cotter pin.

(7) Install link assembly (para 2-18).

(8) Install transfer arm assembly (para 2-17).

(9) Install yoke assembly (para 2-14).

(10) Remove protective cap from electrical connector on the rear of the index boom and connect electrical connector (3).

d. *Test and Adjustment*.

(1) Start engine (refer to TM 9-1450-500-10) and rotate index boom throughout limits of its travel. Movement must be smooth and without excessive tightness and binding.

(2) If index forks have been removed, accomplish the indexing operation as specified in TM 9-1450-500-10.

(3) If index boom is a new part position index boom horizontal, with respect to the loader, and paint an alignment stripe on index boom to match existing stripe on index boom support.

2-20. Index Boom Support

a. *Removal (fig. 2-9)*.

(1) Remove yoke assembly (para 2-14).

(2) Remove transfer arm assembly (para 2-17).

(3) Remove link assembly (para 2-18).

(4) Remove extension cylinder (para 3-14).

(5) Remove index boom (para 2-19).

(6) Remove elevation cylinder (para 3-40).

(7) Remove roll cylinder (para 3-39).

(8) Remove two each nut (2) and washer (3).

(9) Support index boom support and remove stud (4).

(10) Remove index boom support.

(11) Remove lubrication fittings (1) from stud (4).

b. *Inspection and Repair*. Refer to paragraph 3-15.

c. *Installation*.

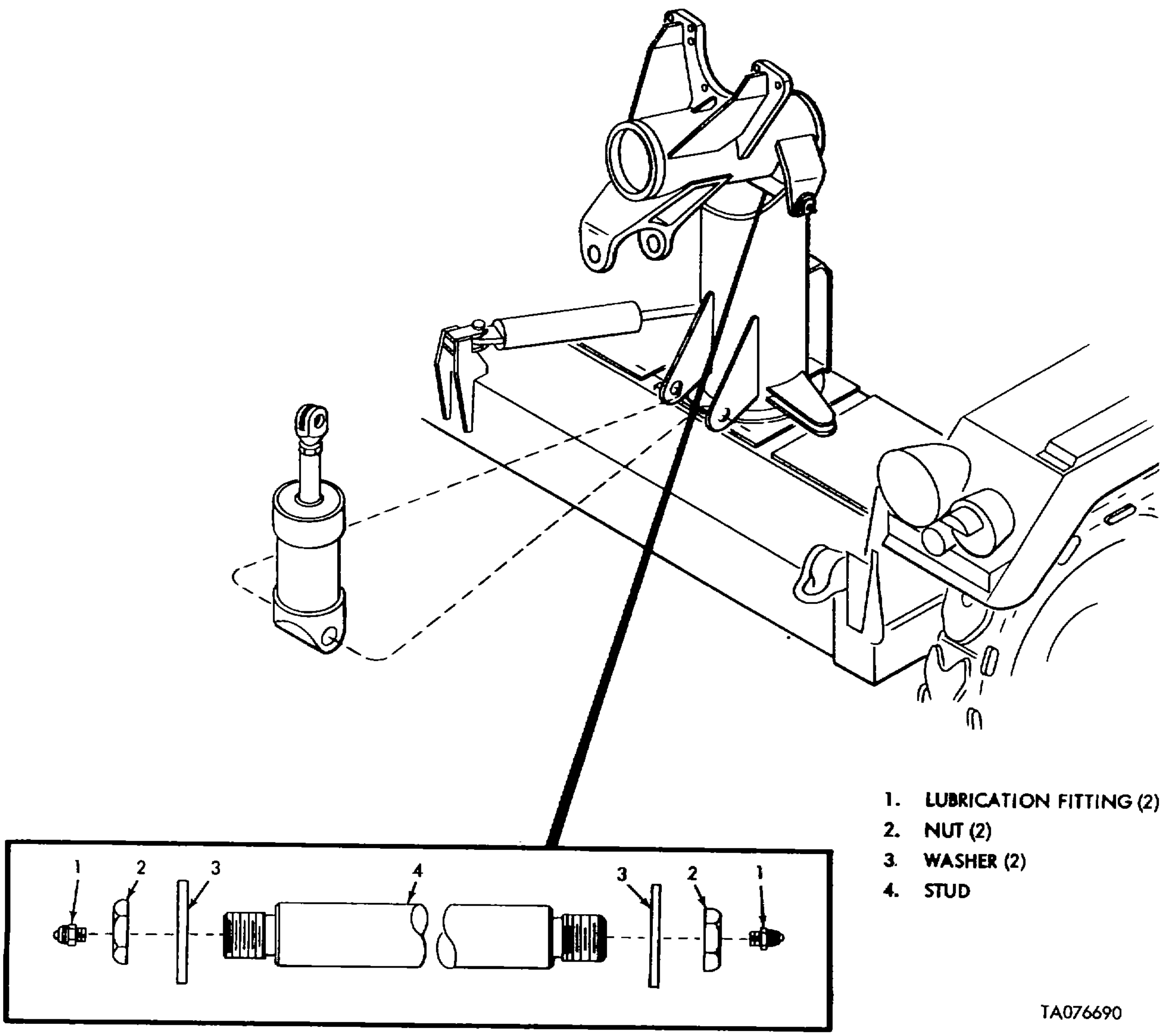
(1) Aline mounting holes of index boom support with mounting holes of main support and install stud (4).

(2) Install washers (3) and nuts (2).

(3) Check index boom support for freedom of movement about its pilot points. Movement must be free with no evidence of binding or restriction of sleeve bearings.

(4) Install lubrication fittings (1).

(5) Install roll cylinder (para 3-39).



1. LUBRICATION FITTING (2)
2. NUT (2)
3. WASHER (2)
4. STUD

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Figure 2-9. Index Boom Support Removal

(6) Install elevation cylinder (para 3-40).

(7) Install index boom (para 2-19).

(8) Install extension cylinder (para 3-41).

(9) Install link assembly (para 2-18).

(10) Install transfer arm assembly (para 2-17).

(11) Install yoke assembly (para 2-14).

d. *Test and Adjustment*. Start the engine and after initial warm-up operate the roll, elevation, and extension cylinders. Superstructure operation must be without evidence of binding and clearances between superstructure components must be as specified in the respective installations procedures. Verify that hydraulic hose assemblies are routed correctly so that superstructure operation will not cause restriction or damage to hoses.

2-21. Main Support

a. *Removal (fig. 2-10)*.

(1) Remove yoke assembly (para 2-14).

(2) Remove transfer arm assembly (para 2-17).

(3) Remove link assembly (para 2-18).

(4) Remove extension cylinder (para 3-41).

(5) Remove index boom (para 2-19).

(6) Remove elevation cylinder (para 3-40).

(7) Remove roll cylinder (para 3-39).

(8) Remove index boom support (para 2-20).

(9) Remove quick release pin (2) to disconnect azimuth cylinder rod end clevis from main support swivel arm.

(10) Remove four bolts (13), associated nuts (5) and washers (4) and two screws (9) and associated nuts (6) and washers (7) to remove hydraulic lines and swivel joints from main support.

(11) Remove eight screws (12) and lockwashers (11) and remove retainers (3).

(12) Remove main support (1).

(13) Remove ring (14).

CAUTION

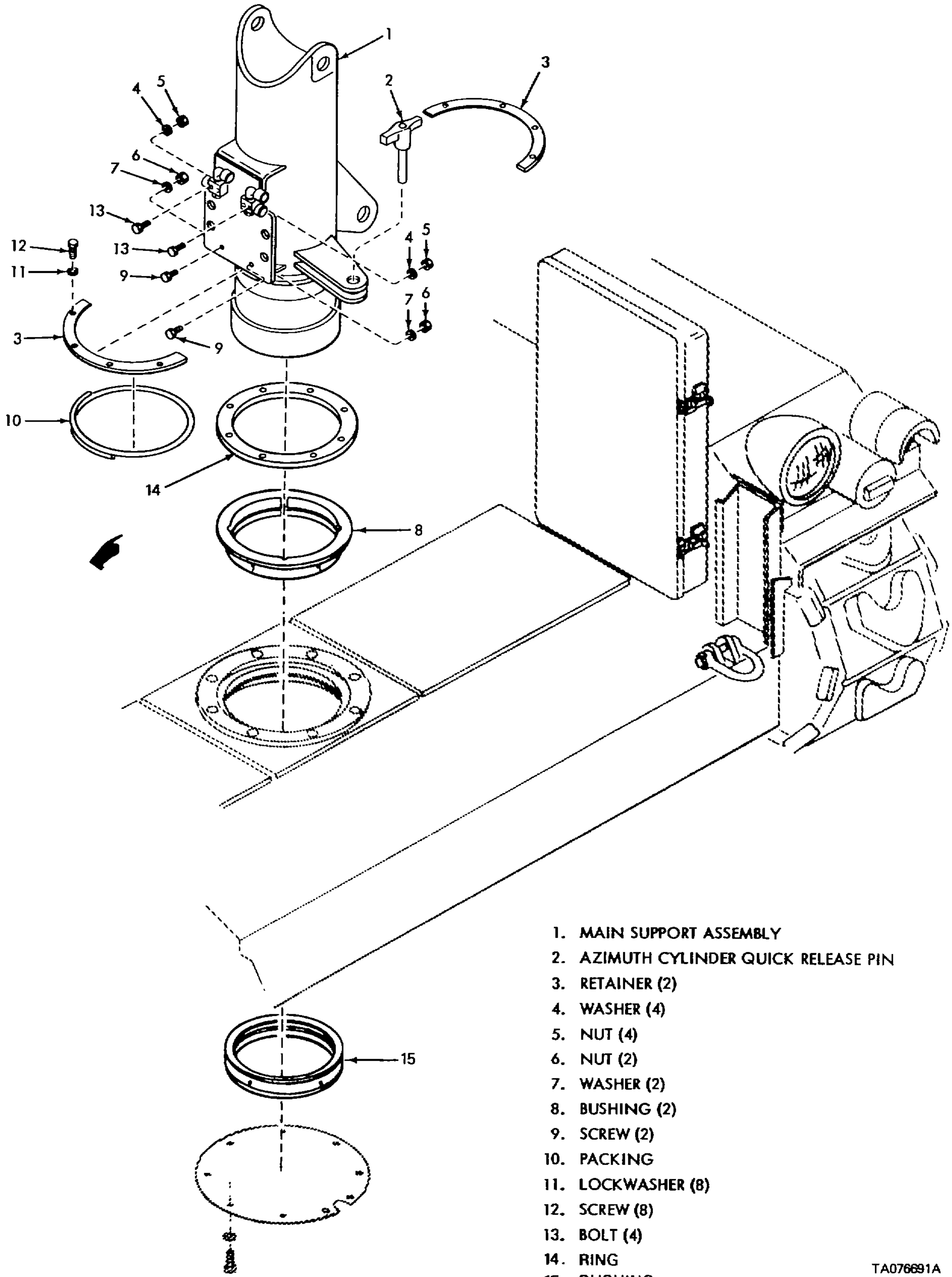
Use extreme care during removal to prevent damage to bushings (8) installed in chassis. If bushings are damaged, refer to para 3-15.

(14) Remove packing (10).

b. *Inspection and Repair*. Refer to paragraph 3-14.

c. *Installation*.

(1) Locate ring (14) by temporarily installing three or more retaining screws equally spaced.



1. MAIN SUPPORT ASSEMBLY
2. AZIMUTH CYLINDER QUICK RELEASE PIN
3. RETAINER (2)
4. WASHER (4)
5. NUT (4)
6. NUT (2)
7. WASHER (2)
8. BUSHING (2)
9. SCREW (2)
10. PACKING
11. LOCKWASHER (8)
12. SCREW (8)
13. BOLT (4)
14. RING
15. BUSHING

Figure 2-10. Main Support Removal

(2) Use one continuous strand of packing (10) approximately 0.06 inches in diameter (App C, item'7). Apply oil to packing (10) and place between ring (14) and flange of main support assembly (l) by making the number of revolutions as required to completely fill the packing groove.

NOTE

Do not use more than the maximum required length of 132 inches of packing.

(3) Remove the three or more retaining screws used in step (1) leaving the ring (14) undisturbed. Install retainers (3) with eight screws (12) and associated lockwashers (11).

(4) Rotate main support and check for freedom of movement. The main support should swivel freely with no evidence of bindings or restriction of movement in bushings.

(5) Install hydraulic lines and components on main support by installing four bolts (13) two screws (9) and associated nuts and washers (4, 5, 6, and 7).

(6) Aline azimuth cylinder rod end clevis with main support swivel arm and install quick release pin (2).

(7) Install index boom support (para 2-20).

(8) Install roll cylinder (para 3-39).

(9) Install elevation cylinder (para 3-40).

(10) Install index boom (para 2-19).

(11) Install extension cylinder (para 3-41).

(12) Install link assembly (para 2-18).

(13) Install transfer assembly (para 2-17).

(14) Install yoke assembly (para 2-14).

d. *Test and Adjustment*. Start the engine and after initial warm-up extend and retract the superstructure. Superstructure operation must be smooth and without evidence of restriction or binding. The main support must swivel freely in the chassis bushings. Hydraulic hoses must be routed correctly so that superstructure operation does not cause damage or restriction.

CHAPTER 3

REPAIR OF SUPERSTRUCTURE

Section I. REPAIR OF HOISTING BEAMS

3-1. Description

The three hoisting beams are mounted on a yoke which is attached to the trans-arm. It attaches to the missile or missile subassemblies by manually operated latches, located on each end of the frame, which engage the missile pockets.

3-2. Repair Procedure

a. *Disassembly (fig. 3-1).* The following special tools are required to perform the disassembly procedures. This procedure is predicated on the assumption that the hoisting beam is removed from the superstructure. Refer to paragraph 2-16.

Special tool	NSN	Part number
Lever	5120-00-987-5056	10892992
Replacer, spring	5120-00-987-5055	10892991

(1) Remove two self-locking nuts (22), flat washers (21), and machine bolts (56) to remove stop (20). Remove stop.

CAUTION

Do not release latch mechanism with stop removed. Straight headed pin (8) must be removed to prevent damage to screw (34) by pins (8 and 10).

(2) Remove two screws (46), disconnect leads from terminal board assembly (49) and remove terminal board assembly. If necessary, disassemble parts (49A through 49L).

NOTE

When removing self-locking nut (48) use lever, special tool (12, fig. 1-2) with replacer, special tool (41, fig. 1-2) to prevent sudden recoil of spring (6). Refer to figure 3-6.

(3) Remove self-locking nut (48) and flat washer (47) from eyebolt (5) so that hook (7) can be disengaged from spring (6).

(4) Remove bolts (42) and flat washers (43) from bracket (76) and remove housing (29). Remove self-locking nut (44) and shear bolt (66) and plate (53). Remove solenoid (1), bracket (76), spacer (70), eyebolt (82), arm (79), plunger (3), and spring (2) from housing (29). Remove hook (7), spring (6), and eyebolt (5) from housing (29).

(5) Remove cotter pin (80) from flat head pin (78) and remove flat head pin (78), spring pin (77), and bearing (81) from arm (79).

(6) Remove screw (74) and washer (73) from bracket (76) and remove bracket (76) from solenoid (1).

(7) Remove self-locking nut (35), flat washers (36 and 59) and hex head bolt (60).

(8) Remove plate (63) and associated parts. Remove two self-locking nuts (57), flat washers

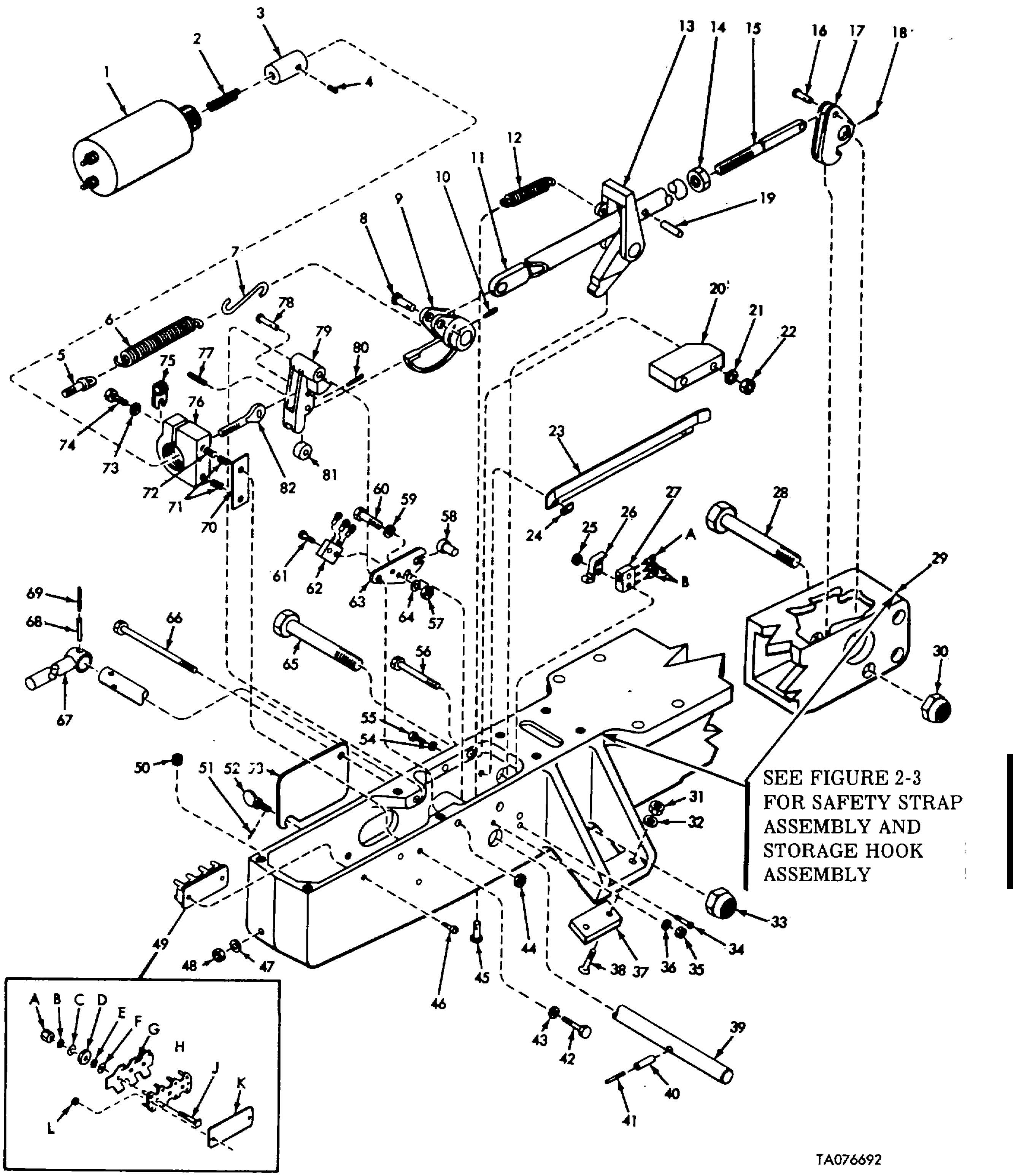


Figure 3-1. Hoisting Beam Disassembly (Sheet 1 of 2)

ITEM NUMBER	NAME
1	SOLENOID ASSEMBLY
2	SOLENOID SPRING
3	SOLENOID PLUNGER
4	SETSCREW
5	EYEBOLT
6	SPRING
7	HOOK
8	STRAIGHT HEADED PIN
9	LOCK
10	COTTER PIN
11	LINK ROD
12	SPRING
13	LATCH
14	LOCKNUT
15	CONNECTOR
16	STRAIGHT HEADED PIN
17	LATCH
18	COTTER PIN
19	SPRING PIN
20	STOP
21	FLAT WASHER
22	SELF - LOCKING NUT
23	STRAP
24	NUT
25	NUT
26	SWITCH ACTUATOR
27	SWITCH ASSEMBLY
	A TERMINAL
	B TERMINAL
28	SHEAR BOLT
29	HOUSING
30	SELF - LOCKING NUT
31	SELF - LOCKING NUT
32	FLAT WASHER
33	SELF - LOCKING NUT
34	SCREW
35	SELF - LOCKING NUT
36	FLAT WASHER
37	PAD
38	FLAT HEAD SCREW
39	PIN
40	SPRING PIN
41	SPRING PIN
42	BOLT
43	FLAT WASHER
44	SELF - LOCKING NUT
45	PIN
46	SCREW
47	FLAT WASHER
48	SELF - LOCKING NUT
49	TERMINAL BOARD ASSEMBLY
	A NUT
	B LOCKWASHER
	C FLAT WASHER
	D NUT
	E LOCKWASHER
	F FLAT WASHER
	G TAG
	H TERMINAL BOARD
	J STUD
	K STRIP
	L NUT
50	INSERT
51	SPRING PIN
52	THUMBSCREW
53	PLATE
54	FLAT WASHER
55	SCREW
56	BOLT
57	NUT
58	ECCENTRIC PIN
59	FLAT WASHER
60	HEX - HEAD BOLT
61	FILLISTER HEAD SCREW
62	SWITCH
63	PLATE
64	LOCKWASHER
65	BOLT
66	SHEAR BOLT
67	HANDLE
68	SPRING PIN
69	SPRING PIN
70	SPACER
71	INSERT
72	INSERT
73	FLAT WASHER
74	SCREW
75	CLAMP
76	BRACKET
77	SPRING PIN
78	FLAT HEAD PIN
79	ARM
80	COTTER PIN
81	BEARING
82	EYEBOLT

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Figure 3-1. Hoisting Beam Disassembly (Sheet 2 of 2)

(64) and screws (61) to remove switch (69) from plate (63). Remove pin (58).

(9) Remove two screws (34) and nuts (25) to remove switch actuator (26) and switch (27).

(10) Remove cotter pin (10) and straight headed pin (8). Remove spring pins (41 and 40) and pin (39).

(11) Remove spring pins (68 and 69) and remove handle (67) from pin (39).

NOTE

Omit step (11) for center hoisting beam.

(12) Remove lock (9).

(13) (fig. 2-3) Remove Safety Strap Assembly (20) from the stowage hook (18).

(14) Remove nuts (14), washers (15) and bolts (19) from the Safety Strap Adapter (17).

(15) Slide the Safety Strap Adapter (17) off the end of the hoisting beam.

(16) (Fig. 3-1) Remove cotter pin (18) and straight headed pin (16). Slide link rod assembly (11, 19, 14, and 15) through hole in rear of housing (29) until pin (19) is visible and aligns with the cast hold in side of housing (29). Support link rod (11) and drive out pin (19).

(17) Remove link rod (11) with connector (15) attached, through the hole in the end of housing (29). Loosen locknut (14) and separate connector (15) from link rod (11).

(18) Disengage and remove spring (12 and pin (45).

(19) Remove latch (13) by removing self-locking nut (33) and bolt (65). Remove latch (17) by removing self-locking nut (30) shear bolt (23).

(20) Remove screws (55), flat washers (54)) and two nuts (24) to remove strap (23).

(21) Support thumbscrew (52) and drive out spring pin (51). Remove thumbscrew (52).

(22) Remove two pads (37) by removing four self-locking nuts (31), flat washers (32), and flat head screws (38).

b. *Inspection and Repair*. The following special tools are required to perform the inspection and repair procedures:

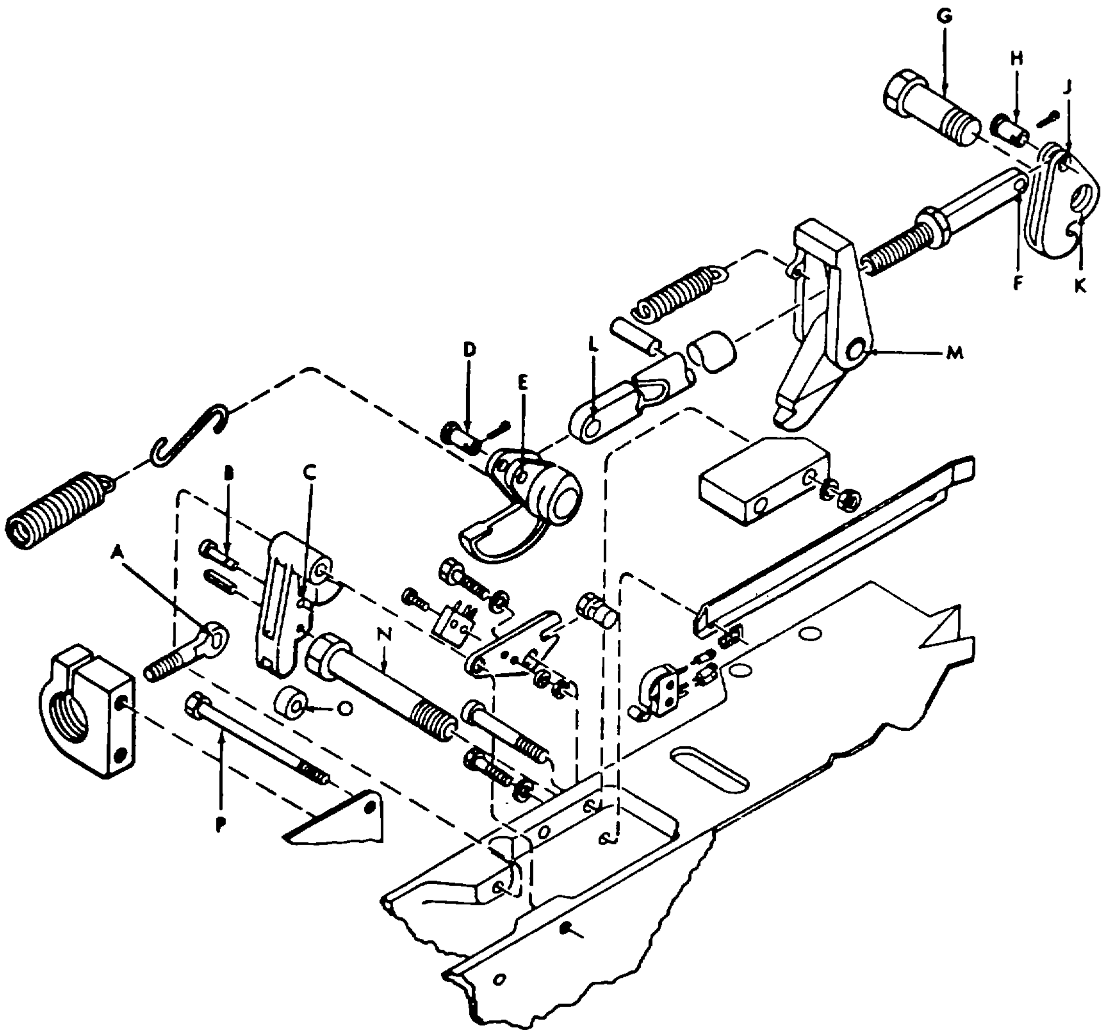
Special tool	NSN	Part number
Extractor, coil thread insert	5120-00-251-1525	7751050
Tool, inserting	5120-00-816-5706	A190-3
Gage, feeler	5210-00-991-3157	10892966

In addition to checking the following components of the hoisting beam as specified, replace any items which are worn beyond the limits specified in figure 3-2. A double asterisk (**) indicates that the part may be used for selective fitting as long as the mating part permits the fit required between the two. All dimensions are in inches.

(1) (fig. 3-1) Hook (7). If hook is broken, distorted, or cracked, it must be replaced.

(2) Bracket (76). Inspect inserts for damaged threads and other obvious defects. Replace damaged inserts by using extractor, special tool (4, fig. 1-2) and inserting tool, special tool (43, Fig 1-2). If bracket is bent or broken, it must be replaced.

(Continued on Page 3-6).



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS
A	WIDTH OF SLOT	0.188 TO 0.192	0.199 MAX
B	OUTSIDE DIAMETER OF PIN	0.184 TO 0.186	(**)
C	INSIDE DIAMETER OF HOLE	0.187 TO 0.190	0.197
D	OUTSIDE DIAMETER OF PIN	0.309 TO 0.311	(**)
E	SIZE OF HOLE	0.312 TO 0.316	0.320 MAX
F	LENGTH OF ELONGATED HOLE	0.308 TO 0.316	0.500 MAX
G	DIAMETER OF BOLT	0.4986 TO 0.4991	0.4936 MIN
H	OUTSIDE DIAMETER OF PIN	0.309 TO 0.311	(**)
J	SIZE OF HOLE	0.312 TO 0.313	0.320
K	SIZE OF HOLE	0.4995 TO 0.5005	0.5200
L	WIDTH OF SLOT	0.312 TO 0.313	0.320 MAX
	LENGTH OF SLOT	0.470 TO 0.490	0.520 MAX
M	INSIDE DIAMETER OF HOLE	0.4955 TO 0.5005	0.5200
N	DIAMETER OF BOLT	0.4986 TO 0.4991	0.4936 MIN
O	INSIDE DIAMETER OF BEARING	0.1895 TO 0.1900	0.2150
P	DIAMETER OF BOLT	0.2487 TO 0.2492	0.2437 MIN

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Figure 3-2. Hoisting Beam - Latch and Release Mechanism Component Wear Limits

(1) (fig 3-1) Hook (7). If hook is broken, distorted, or cracked, it must be replaced.

(2) Bracket (76). Inspect inserts for damaged threads and other obvious defects. Replace damaged inserts by using extractor, special tool (4, fig. 1-2) and inserting tool, special tool (43, fig. 1-2). If bracket is bent or broken, it must be replaced.

(3) Solenoid (1). Check for stripped or galled stud threads or missing studs. If either condition exists, replace solenoid. Check for continuity across solenoid studs. If an open circuit is indicated, replace solenoid. Inspect solenoid plunger (3) and spring (2) for evidence of wear, deformation, corrosion, or galling. The plunger must move freely in solenoid. If galled or corroded to the extent where free movement is affected, replace solenoid. Replace spring if corroded, weak, or deformed.

(4) Switches (62 and 27). Check switches for dents and chafed leads. If either condition exists, replace switch. Inspect switches closely for evidence of separation of sealant from metal housing. If separation is detected, replace switch. Inspect switch actuator (26) for deformation and actuator roller for freedom of movement. If actuator is deformed, or roller movement restricted, replace actuator. Check both switches for continuity as follows:

(a) With switch button released, there must be continuity across leads marked C and NC, and an open circuit across leads C and NO.

(b) With switch button depressed, there must be an open circuit across leads marked NC and C and a closed circuit across leads NO and C. If requirements are not met, replace switch.

(5) Link rod (11) and connector (15). Inspect these parts for damaged threads, sloppy threads, and distortion. Replace part if these defects are detected and/or if wear limits specified in figure 3-2 are exceeded.

(6) Strap (23). The strap is acceptable for reuse if bent, provided it can be reworked to its original shape and afford adequate protection for the electrical wiring. If the strap is badly bent or twisted to the point where stresses could cause cracks to develop after being placed back in service, replacement should be made. Any cracks observed in the strap is cause for replacement.

(7) Latches (13 and 17), lock (9) and pads (37). Check latches (13 and 17) and lock (9) for cracks, chips, indentations; or any noticeable deformation of their original shape. Inspect, adjust, or replace latches in accordance with paragraph 6-6a (1). Check pads (37) for tears and wear. Replace if screws (38) are not seated below surface of pad.

(8) Housing (29). Inspect housing for damaged inserts (50). Replace damaged inserts with extractor, special tool (4, fig. 1-2) and installing new ones with inserting tool, (43, fig. 1-2). Cracks in housing are cause for housing replacement. Do not make welding repairs to housing. Do not attempt to straighten cold or by the application of heat.

(9) Terminal board (48H) and tag (49G). If any of the tags are broken or missing, or if the terminal board is cracked, reace the terminal board.

(10) Bolts (65 and 28). Check the bolt shank at the point where the latches pivot. Replace bolt if surface is rough. Threads cannot be repaired and bolt wear cannot exceed limits specified in figure 3-2.

(11) Springs (2, 6, and 12). Check for damage or corrosion. Replace if damaged or corroded.

(12) Bearing (81). Check for free rotation. Replace if rotation is restricted or if inner or outer race is cracked or damaged and if wear exceeds limits specified in figure 3-2.

c. *Assembly*. The following special tools are required to perform the assembly procedures:

Special tool	NSN	Part number
Lever	5120-00-987-5056	10892992
Replacer, spring	5120-00-987-5055	10892991
Gage, setting	5210-00-987-5057	10892994
Gage, setting	5210-00-987-5058	10892995
Gage, feeler	5210-00-991-3157	10892996

(1) Mount two pads (37) to housing (29) and secure with four flat head screws (38), flat washers (32) and self-locking nuts (31).

(2) Assemble thumbscrew (52) to housing (29) and secure thumbscrew to housing by driving in spring pin (51). Mount strap (23) to housing (29) and secure with two machine bolts (55), flat washers (54), and nuts (24).

(3) Assemble latch (13) to housing (29) and put in bolt (65). Put on new self-locking nut (33) and tighten nut until it bottoms out. Allow 0.010-inch minimum clearance between the nut and housing for bolt end play. Insert pin (45) through hole in bottom of housing (29) and assemble spring (12) to latch (13) and to pin (45).

(4) Install switch (27) and switch actuator (26) to housing (29). Secure switch assembly (26 and 27) to housing (29) with two screws (34) and nuts (25).

(5) Mount switch (62) to plate (63) using two screws (61), lockwashers (64), and self-locking nuts (57).

NOTE

Mount switch (62) so it is in the position shown in figure 3-3.

(6) Insert pin (58) in housing (29). Slide slot in plate (63) over grooved portion of pin (58) and secure plate (63) to housing (29) with hex head bolt (60), flat washers (36 and 59), and self-locking nut (35).

NOTE

To prevent damage to switch (62), plate (63) should be set in full up position by eccentric pin (58). This is a preliminary adjustment only to prevent damage to switch while remainder of assembly procedure is being accomplished.

(7) Install lock (9) with straight headed pin (8) in place in the lock. Insert pin (39) through the lock (9) and secure lock (9) to pin (39) with spring pins (40 and 41). Assemble handle (67) to the end of pin (39) and secure with spring pins (68 and 69), if applicable.

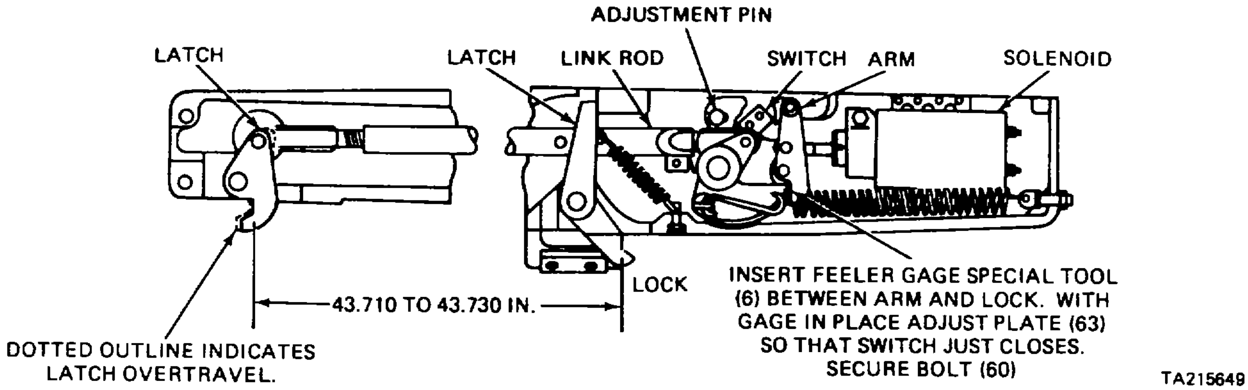


Figure 3-3. Latch and Release Mechanism Components Installation and Adjustment

(8) Assemble latch (17) to housing (29) with shear bolt (28) and self-locking nut (30). Tighten the self-locking nut (30) until it bears against the housing, then back nut off until there is a minimum clearance of 0.010-inch between nut and housing.

(9) Screw locknut (14) on connector (15) as far as it will go. Assemble connector (15) to link rod (11) and insert link rod into housing (29) so that the hole for pin (19) is alined with the cast access hole in side of housing (29). Insert pin (19) through hole in link rod so that pin protrudes an equal amount on each side of the link rod within 0.06 inch. Insert straight headed pin (16) through latch (17) and connector (15) and check for free movement. Position link rod (11) in lock (9) and secure with straight headed pin (8). Check assembly for free movement.

NOTE

If restricted movement is detected, check flat surfaces of connector (15). They must be parallel with flat surface of link rod (11).

(10) Assemble hook (7) to lock (9) and to spring (6). Assemble spring (6) to eyebolt (5) and, using lever, special tool (12, fig. 1-2), with replacer, special tool (41, fig. 1-2), secure eyebolt to housing (29) with self-locking nut (48) and flat washer (47). Refer to figure 3-4 for use of lever and replacer.

(11) Position bearing (81) in slot of arm (79) and secure with spring pin (73). Position arm assembly (79) and bearing (81) in housing (29), bearing side toward lock (9). Refer to figure 3-3. Slide shear bolt (66) through plate (53), housing (29), and arm (79). Secure with self-locking nut (44). Tighten thumbscrew (52) to secure plate (53).

(12) Screw solenoid assembly consisting of (1, 3, and 2) into bracket (76) and secure with screw (74) and flat washer (73). Screw eyebolt (82) into solenoid plunger but do

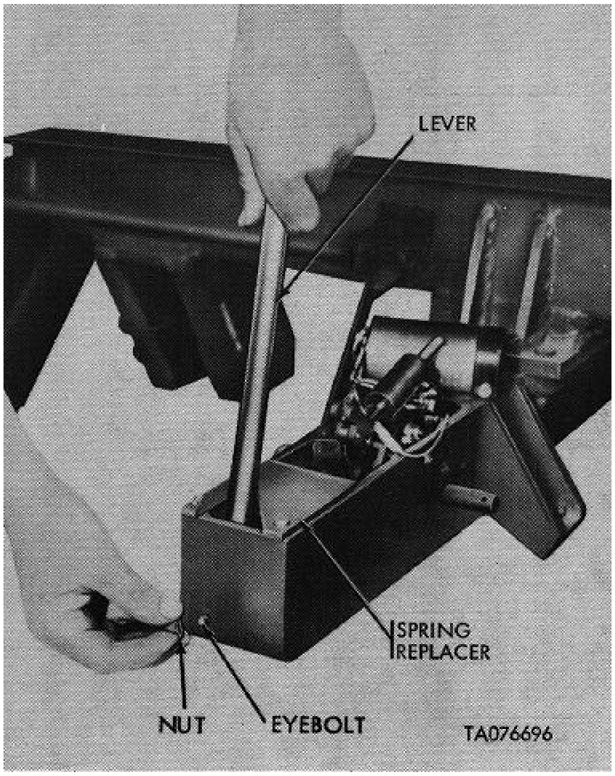


Figure 3-4. Hoisting Beam - Eyebolt Installation Using Spring Replacer Lever and Spring Replacer

not tighten setscrew (4). Insert flat head pin (78) with cotter pin (80). Assemble solenoid and bracket assembly (1 and 76) and spacer (70) to housing (29) and secure to housing with bolts (42) and flat washers (43).

NOTE

With reference to figure 3-5, use setting gage, special tool (7, fig. 1-2), and adjust eyebolt (82) so the solenoid plunger rear surface alines with gage when arm (79) is seated against lock (9) in locked position. Tighten setscrew (4) when correct adjustment is obtained.

(13) With reference to figures 3-3 and 3-6, insert feeler gage, special tool (6, fig. 1-2), between arm (79) and lock (9). With feeler gage in place, adjust plate (63) by rotating pin (58) until switch (62) just closes. Secure plate (63) by tightening nut (35).

NOTE

This adjustment is necessary to prevent damage to the switch by overtravel of arm (79). Refer to TB 9-5210-211-50 for calibration requirements of profile setting gage.

(14) Using profile setting gage, special tool (8, fig. 1-2) (fig. 3-7), adjust latch spacing to dimensions specified in figure 3-3 as follows:

(a) Remove straight headed pin (16) and pull straight headed pin (8) to free link rod (11).

(b) Slide link rod (11) aft through the hole in housing until locknut (14) and connector (15) are accessible.

(c) Adjust connector (15) as required to obtain specified dimension.

(d) Tighten locknut (14); reinsert link rod (11) in housing and install straight headed pins (8 and 16).

(e) Check dimension and repeat steps (a) through (d) as necessary.

NOTE

Pull aft latch tip forward to remove overtravel when making measurement with profile gage.

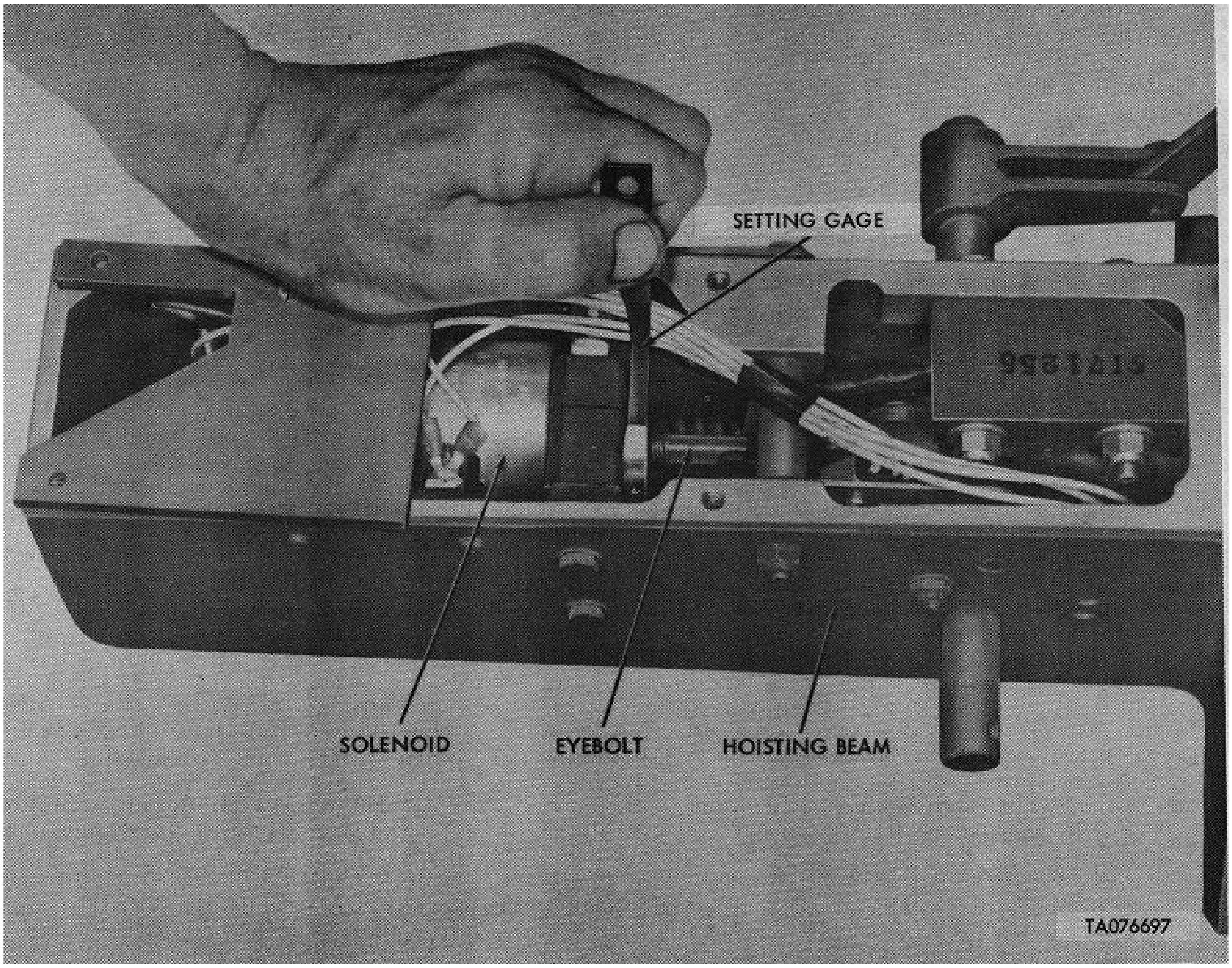


Figure 3-5. Latch and Release Mechanism Adjustment

(15) Install cotter pins (18 and 80) when adjustments are completed.

NOTE

Latches (13 and 17) must be checked and adjusted after 75 hours of operation or every 90 days, whichever comes first.

(16) If necessary, assemble terminal board (49H) to tag (49G) after placing three nuts (49L) in slots of terminal board (49H). Assemble three studs (49J) followed by three flat washers (49F), lockwashers (49E), nuts (49D), flat washers (49C), lockwashers (49B), and nuts (49A). Assemble terminal board assembly (49) and strip (49K) to housing (29) with three screws (46).

(17) Connect leads of switches (27 and 62) to terminal board as specified in table 3-1. Connect electrical wiring to solenoid terminals as specified in paragraph 2-16.

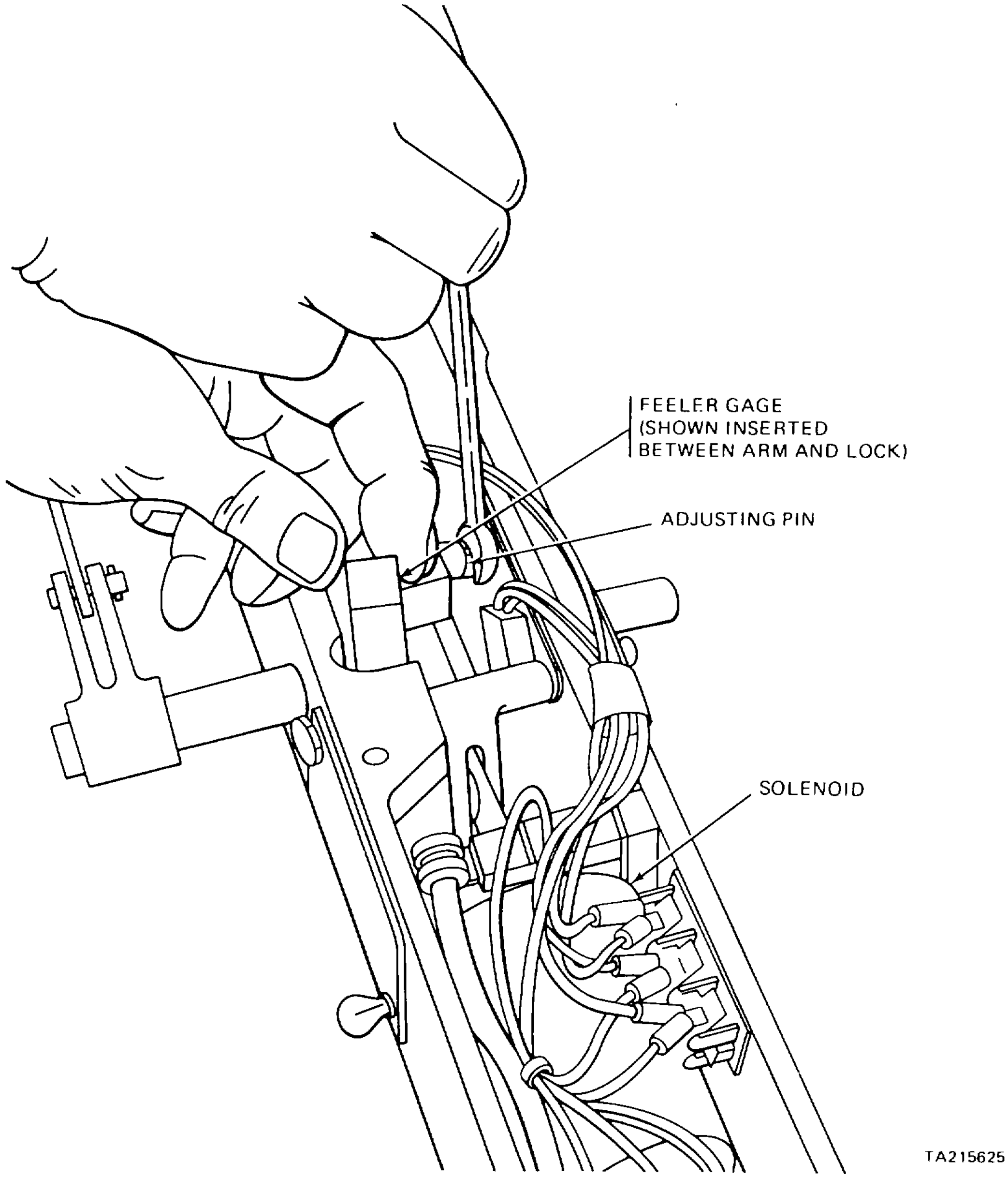


Figure 3-6. Latch and Release Mechanism - Arm and Lock Clearance Adjustment Using Feeler Gage

NOTE

The item numbers in parenthesis ( ) in table 3-1 refer to figure 3-1.

(18) Assemble stop (20) to housing (29). Secure with two machine bolts (56), flat washers (21), and self-locking nuts (22).

(19) (figure 2-3). Slide the Safety Strap Adapter (17) onto end of hoisting beam.

(20) Install Safety Strap Adapter (17) with bolts (19), washers (15), and nuts (14).

(21) Replace Safety Strap Assembly (17) on stowage hook (18).

NOTE

Hook (16) is installed on opposite side of housing beam from hook (12).

(22) Refer to para 3-16 for installation of hoisting beam on superstructure.

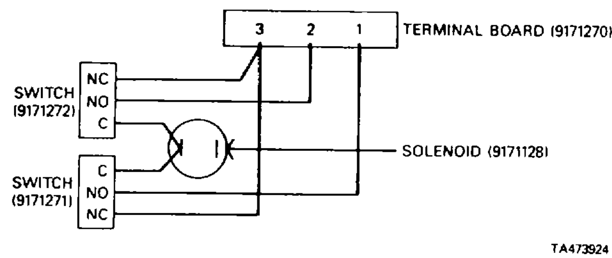
d. *Adjustment and Maintenance Instructions*.

(1) The safe and expeditious transfer of missiles is dependent on the operational efficiency of the three hoisting beams and correct alignment of the superstructure. Constant use and/or misuse can cause damage, wear and maladjustment of functional components and create a safety hazard to personnel and equipment. The following instructions must be followed to reduce safety hazards and maintain operational efficiency.

(2) Each hoisting beam contains one spring-loaded latch and one manual locking latch to secure a missile to the beam during transfer to launcher or pallet. The spring-loaded latch engages the missile rear latch pocket, and the locking latch is manually engaged into the missile front latch pocket by hand pressure on the hand lever.

Table 3-1. Latch and Release Mechanism Limit Switch Connections

From	Lead	To
Switch (62)	NC	Terminal 3 of terminal board (49)
	NO	Terminal 2 of terminal board (49)
Switch (27)	NC	Terminal 3 of terminal board (49)
	NO	Terminal 1 of terminal board (49)



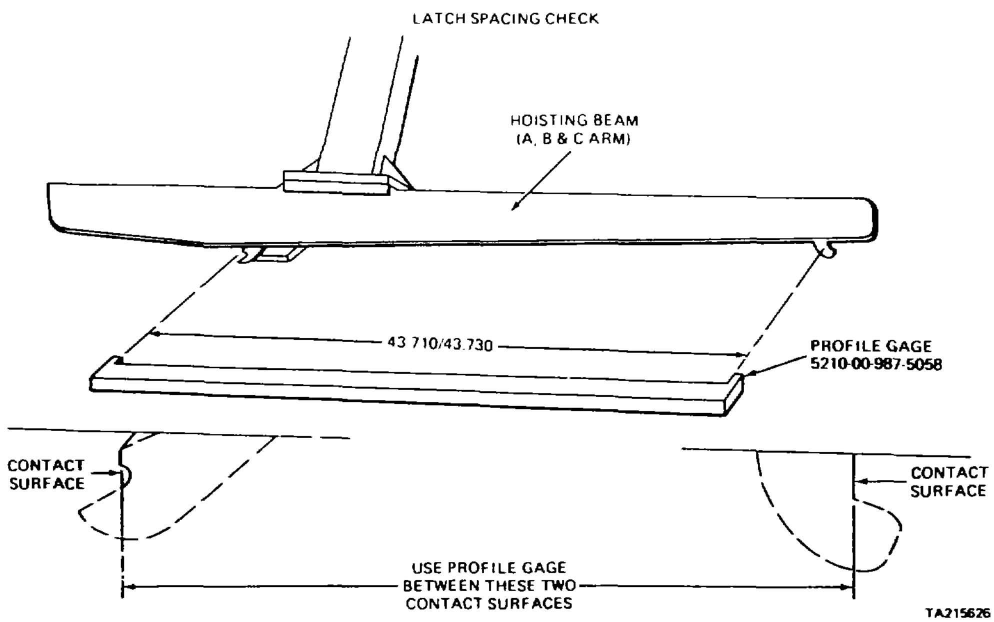


Figure 3-7. Latch and Release Mechanism - Latch Setting Adjustment Using Profile Gage

(3) Disengagement of the locking latch is accomplished electrically by activating the missile release CIRCUIT BREAKERS switches and then the MISSILE LATCH RELEASE switch on the instrument panel. If malfunction occurs, the latches may be released by manually depressing the solenoid eyebolt.

CAUTION

When manually depressing the solenoid, keep body clear of the latching hand lever.

(4) The position of the spring-loaded latch is fixed and cannot be adjusted. It is spring-loaded to permit easy engagement and withdrawal of the hoisting beam during latching operations.

(5) The locking latch is linked to and is activated by the electrical solenoid through the actuator cam lock, connecting link and the rod end connector. The rod end connector is threaded into the connecting link and is utilized to adjust the position of the locking latch to achieve the correct measurement between the two latches. A safety jam nut on the rod end connector serves to retain the correct position.

(6) The correct measurement between the flat vertical surfaces of the extended latches is 43.710 to 43.730 inches. This measurement is critical and must be maintained at all times. The free play of approximately 1/8-inch in the locking latch must be taken up by rotating the latch toward the opposite latch when the distance is measured. If the measurement is less than 43.710 to 43.730 inches, the missile can fall from the hoisting beam during transfer operations.

(7) The electrical release of the locking latches through the solenoid causes the actuator cam lock to rotate until it strikes the release cam latch stop. The stop absorbs the impact of the actuator cam lock and limits the retraction of the latch into the housing.

(8) DELETED.

(9) Instructions for the installation and correct adjustment of the solenoid, solenoid eyebolt release lock arm, actuator cam lock and light switches are contained herein. These adjustments should be checked every 180 days and whenever components are replaced.

(10) Difficulty in latching the hoisting beams to the missile assemblies is due to sticking or banding within the latching mechanism or the misalignment or deformation of the superstructure components. The latches should engage freely with the application of hand pressure only. All pivot points of the release mechanisms must be lubricated as recommended on LO 9-1450-500-12. To prevent the latches from sticking or binding on their pivot bolts, a minimum clearance of 0.010 inches between the nut and beam housing must be maintained.

(11) Frequent and periodic exercising of the latching mechanism is recommended as follows:

(a) Place the loader superstructure in transport position as shown in TM 9-1450-500-10.

(b) Keep the right swing stop spacer (located on the lower section of the right transfer arm) flipped forward on its hinge pin. Flip the left swing stop spacer (left transfer arm) back towards the driver to keep the transfer arm limit switch extended.

(c) Lower the index forks to the full down position as shown in TM 9-1450-500-10.

(d) Extend the superstructure until the transfer arms contact the link assembly as shown in TM 9-1450-500-10 and then continue the extension until the pivot (trunnion) is about 6 inches above the index boom, to extend the index arm limit switch plunger.

(e) Apply the hand levers and extend the missile latches on each hoisting beam to the full latching position. The action should be smooth, free from binding and not require more than normal hand pressure.

(f) To begin release, flip all three missile release CIRCUIT BREAKERS to ON position.

(g) Keep personnel clear of the hand levers. Flip MISSILE LATCH RELEASE switch to momentary ON position to retract the latches.

(h) Confirm end play by pushing the forward latches up into housing by applying light thumb pressure; the latches should return to original position when pressure is released.

(i) Repeat paragraphs (e) through (h) as required to obtain free movement, and lubricate as necessary. (Reference LO 9-1450-500-12).

(j) If binding or sticking still occurs, disassemble both latches, examine for foreign material or scoring, clean and oil, replace worn parts as required and reassemble.

(k) Return superstructure to transport position and flip left swing stop spacer to the forward position.

(12) Alinement instructions to correct latching difficulties due to misalignment or deformation of hoisting beams, yoke, transfer arms, intermediate link, index boom and index forks are contained in paragraph 6-10.

Section II. REPAIR OF YOKE ASSEMBLY

3-3. Description

The yoke assembly is mounted on the index boom. It pivots freely on the transfer arm and it provides a support structure for the three missile hoisting beams.

3-4. Repair-Procedure

a. _Disassembly_. The yoke assembly is of welded construction and no further disassembly is authorized.

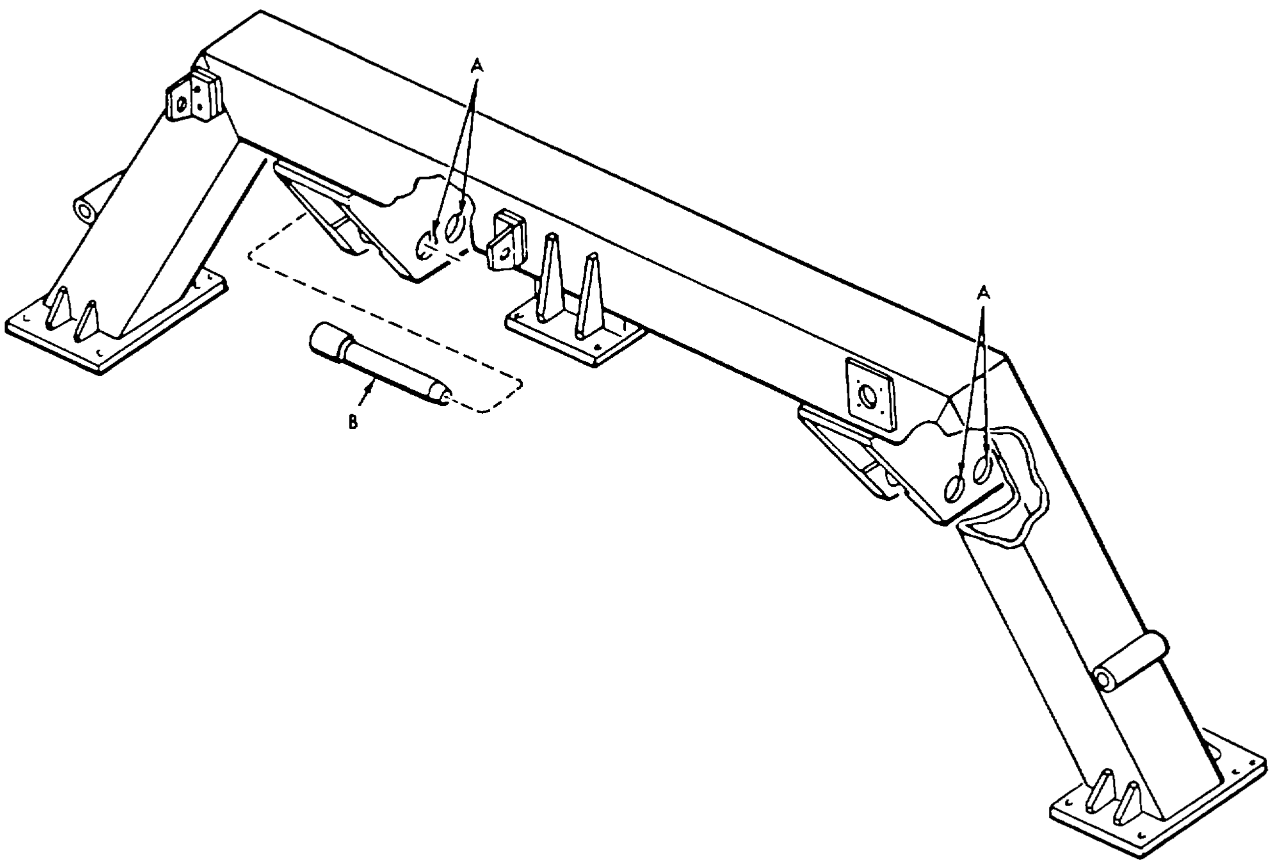
b. Inspection and Repair.

(1) Threaded holes. If threaded holes in yoke assembly are damaged, repair by retapping hole with the same size tap. If threads are damaged beyond repair, yoke assembly must be replaced.

(2) Pivot holes. Inspect pivot holes and pins at the transfer arm assembly attach points. If worn beyond the limits specified in figure 3-8, yoke assembly and/or pins must be replaced.

CAUTION

Use of heat when making welding repairs to yoke assembly is very critical. Excessive or uncontrolled heat applications during repair procedures may weaken yoke assembly and result in its eventual failure under heavy loads.



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS (FIELD)
A	DIAMETER OF HOLE	1.005 TO 1.007	1.140
B	OUTSIDE DIAMETER OF PIN	0.9970 TO 0.9985	0.992 MIN

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Figure 3-8. Yoke Assembly Wear Limits

(3) Welds and structural members. Inspect yoke assembly for deformation in accordance with the dimensions specified in figure 6-36. If deformation is minor, yoke assembly may be straightened to the dimensions given in figure 6-36. Major deformation of, or cracks in structural members are cause for replacement of the yoke assembly. Weld beads, if cracked, may be revealed in accordance with TM 9-237.

(4) Center hoisting beam manual linkage. Inspect all parts for excessive wear and/or deformation. Excessive worn or deformed parts must be replaced.

Section III. REPAIR OF TRANSFER ARM ASSEMBLY

3-5. Description

The transfer arm assembly is mounted on the index boom. The yoke assembly and the three attached missile hoisting beams are pivot-mounted to the transfer arm with quick release pins. The transfer arms support the yoke assembly.

3-6. Repair Procedure

a. Disassembly (fig. 3-9). The following special tool is required to perform the disassembly and assembly procedures:

Special tool	NSN	Part number
Remover and Replacer, bearing	5120-00-795-0903	7950903

(1) Remove two stops (1).

(a) Drive out spring (roll) pin (7).

(b) Push out stop pin (8).

(2) Remove missile pad (2). Refer to TM 9-1450-500-20.

(3) Disconnect electrical wiring from azimuth control limit switch (6) and remove limit switch. Refer to TM 9-1450500-20.

(4) Remove electrical cabling and associated parts (5).

Refer to TM 9-1450-500-20.

(5) Using remover and replacer, special tool (27, fig. 1-2), remove bearings (3 and 4).

b. Inspection arid Repair.

(1) Bearings. Inspect bearings (3 and 4) for gouging, and excessive scoring. If gouged, scored, or worn beyond the limits specified in figure 3-10 they must be replaced.

(2) Welds and structural members. Inspect transfer arm assembly for deformation in accordance with the dimensions specified in figure 6-37. If deformation is minor, the transfer arm assembly may be straightened in accordance with dimensions given in figure 6-37, observing temperature

limitations and critical heat areas shown in figure 6-38. If major deformation of, or cracks in structural members are detected, the transfer arm assembly must be replaced.

CAUTION

Use of heat when straightening the transfer arm assembly is very critical. Excessive or uncontrolled heat applications during repair procedures may weaken the transfer arm assembly and result in its eventual failure under heavy loads. Observe the temperature limitations given in figure 6-38.

(3) Electrical cabling and switches. Refer to TM 9-1450-500-20.

(4) Inspect stop parts for visible cracks or excessive wear and corrosion. Discard spring pin (7) regardless of visible condition. Slide straight pin on stop to one side to make sure bolt and spring work freely.

c. Assembly.

(1) Using remover and replacer, special tool (27, fig. 1-2), install bearings (3 and 4).

(2) Install electrical cabling and associated parts (5).

Refer to TM 9-1450-500-20.

(3) Install azimuth control limit switch (6) and connect electrical wiring to switch terminals. (Refer to TM 9-1450-500-20 for schematic diagram.)

(4) Install missile pad (2).

(5) Install used stop. Used parts in good condition may be used except for spring pin (7) which must be new.

Reassemble in reverse order of para a(l).

(6) Installation of stop (1) and pin (8) when either are removed. Install flat washer and stop on transfer arm. The hole for spring pin (7) must be redrilled per following procedure:

(a) New stop and new or used pin. Assemble as in para (5). Hold pin centered in bracket and drill a hole .094 to .097 in diameter through both the aluminum stop and steel pin. Try to keep the old and new holes in the pin approximately 1/4 to 1/2 inch apart.

(b) Used stop and new pin. Assemble as in para (5).

Hold pin centered in bracket and using the existing holes in stop (make sure they go all the way through and are not larger than .097 diameter) drill a new hole through the pin. If the hole in the used stop is larger than .097 diameter, redrill a hole through both parts as in para (6) (a). Install new spring pin (7).

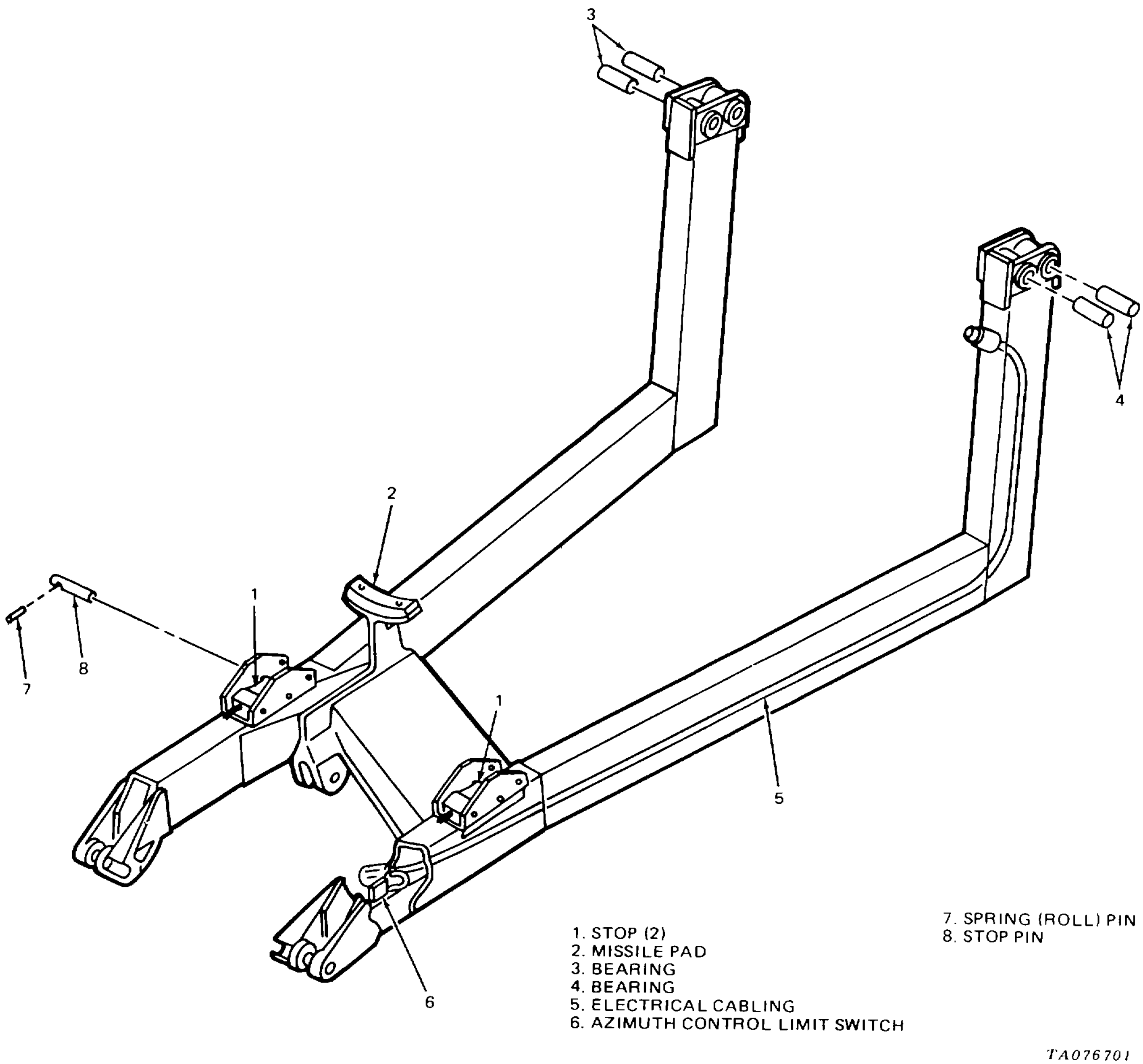
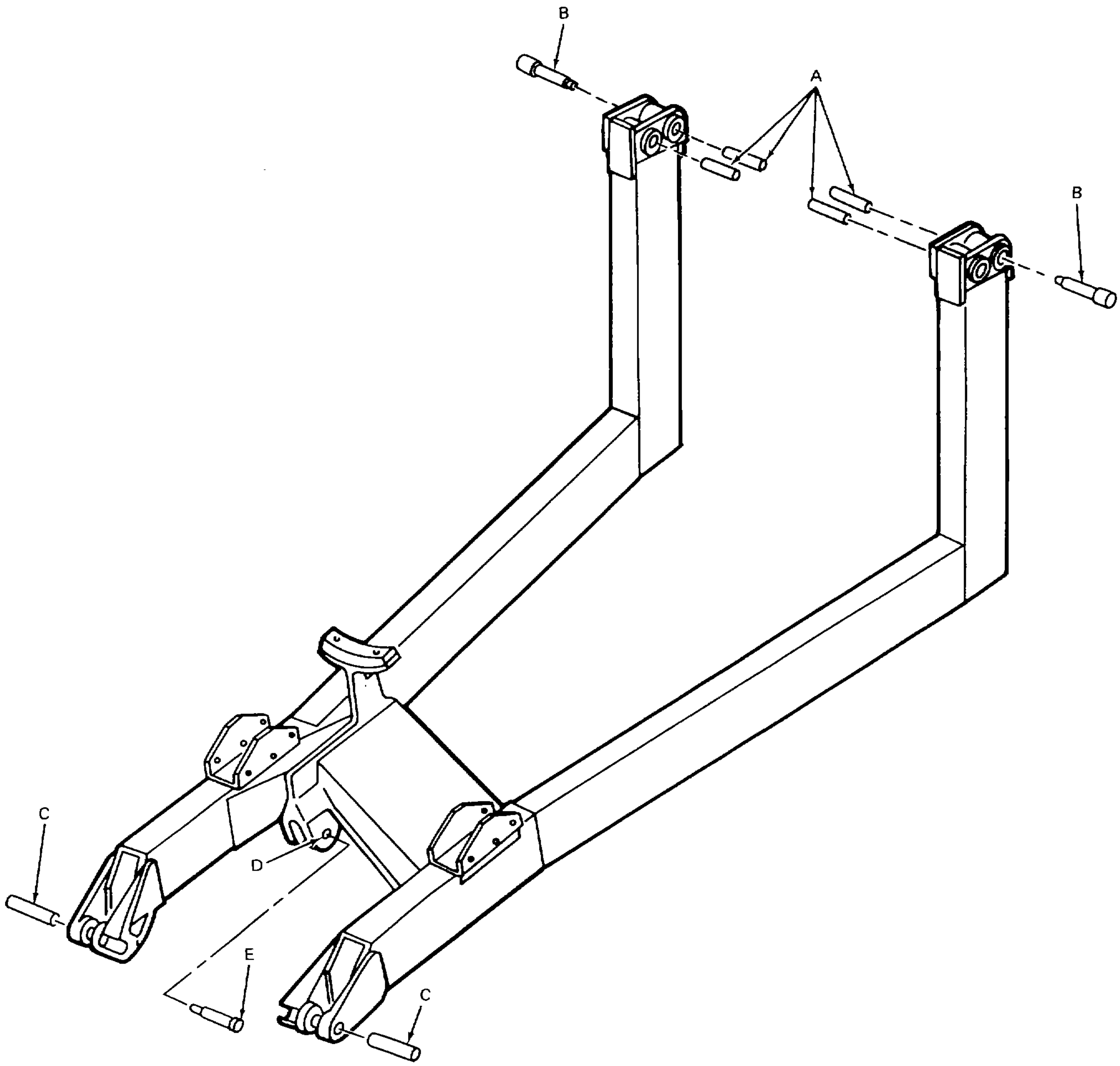


Figure 3-9. Transfer Arm Assembly Disassembly



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS
A	INSIDE DIAMETER OF BEARING	1.005 TO 1.015	1.140
B	OUTSIDE DIAMETER OF PIN	0.9985 TO 0.9970	0.995 MIN
C	OUTSIDE DIAMETER OF PIN	0.999 TO 1.001	0.995 MIN
D	DIAMETER OF PIVOT PIN HOLE	0.999 TO 1.001	1.130
E	OUTSIDE DIAMETER OF BOLT	0.9971 TO 0.9985	0.9967

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Figure 3-10. Transfer Arm Assembly Wear Limits

Section IV. REPAIR OF LINK ASSEMBLY

3-7. Description

The link assembly is mounted on the index boom. The link assembly links the forks of the index boom to the transfer arm assembly. Its point of attachment to the index forks functions as the pivot axis during the second phase of superstructure extension, its point of attachment to the transfer arm functions as a pivot axis during the first phase of superstructure extension.

3-8. Repair Procedure

a. Disassembly (fig. 3-11). The following special tool is required to perform the disassembly and assembly procedures:

Special tool	NSN	Part number
Remover and 5120-99-795-0903 replacer,	7950903	

(1) Remove two screws (18), two lockwashers (17), and remove angle bracket (16).

(2) Remove socket head capscrews (7 and 10), associated lockwashers (6 and 11) and remove striker plates (5 and 12).

(3) Remove lubrication fittings (8) and electrical cabling (15).

(4) Remove index boom limit switch (1) by removing screws (2) and associated nuts and washers (3 and 4). Refer to TM 9-1450-500-20.

(5) Remove transfer arm limit switch (13). Refer to TM 9-1450-500-20.

(6) Remove electrical cabling (14). Refer to TM 9-1450500-20.

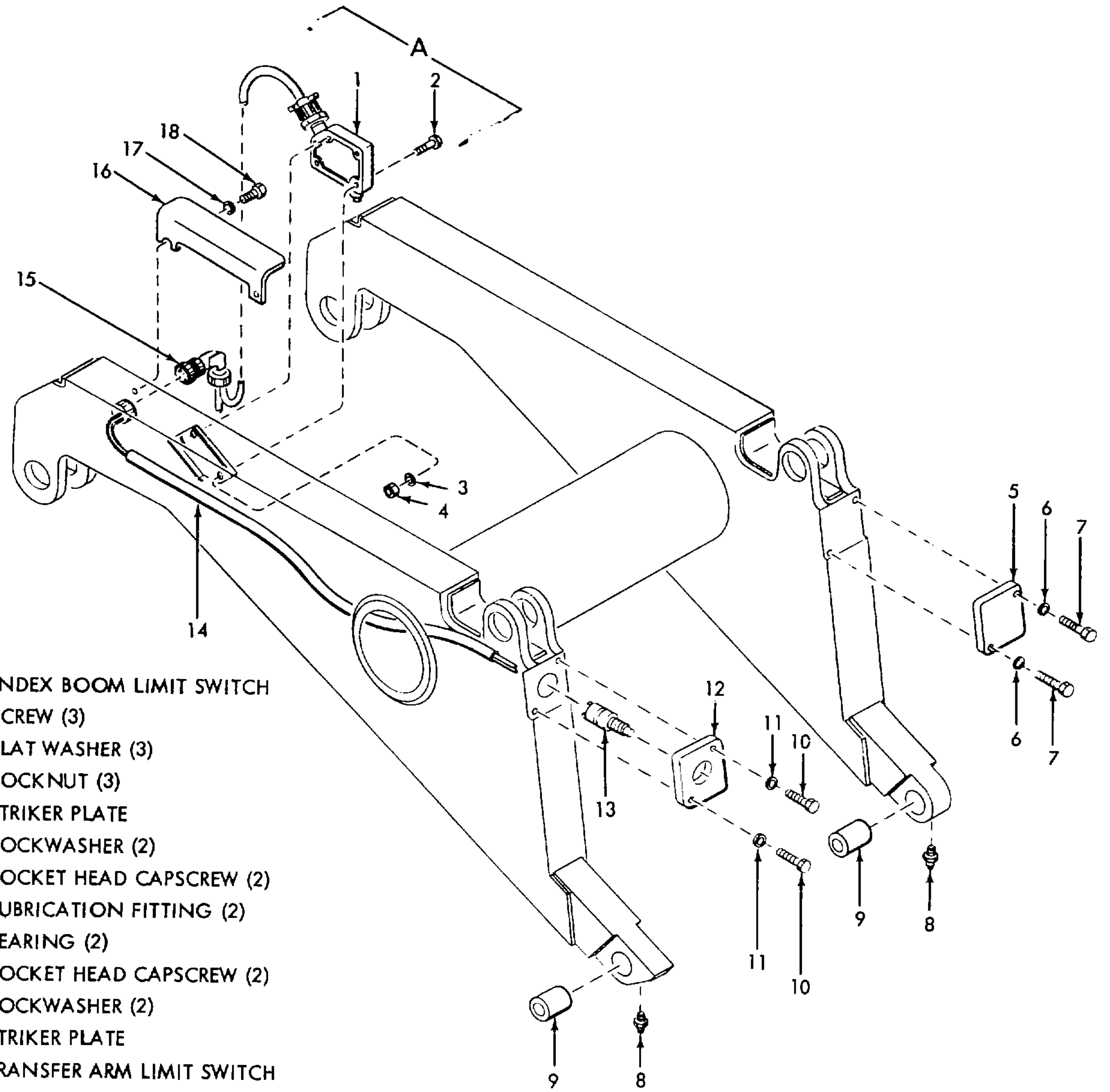
(7) Using remover and replacer, special tool (27, fig. 1-2), remove bearings (9).

b. Inspection and Repair.

(1) Electrical cabling and switcher. Refer to TM 9-1450-500-20.

(2) Bearings. Bearings which are gouged, scored, galled, or worn beyond the limits specified in figure 3-12 must be replaced.

(3) Welds and structural members. Inspect the link assembly for deformation of structural members and cracks, particularly in the welded areas. If minor deformation is detected, the link assembly may be straightened to the alignment dimensions given in figure 6-39. Major deformation is cause for replacement of the link assembly. If cracks are detected in the welded bead areas, they may be welded in accordance with TM 9-237. Cracks in structural members of the link assembly is cause for replacement of the link assembly. Replace damaged lubrication fittings and deformed striker plates.



1. INDEX BOOM LIMIT SWITCH
2. SCREW (3)
3. FLAT WASHER (3)
4. LOCKNUT (3)
5. STRIKER PLATE
6. LOCKWASHER (2)
7. SOCKET HEAD CAPSCREW (2)
8. LUBRICATION FITTING (2)
9. BEARING (2)
10. SOCKET HEAD CAPSCREW (2)
11. LOCKWASHER (2)
12. STRIKER PLATE
13. TRANSFER ARM LIMIT SWITCH
14. ELECTRICAL CABLING
15. ELECTRICAL CABLING
16. ANGLE BRACKET
17. LOCKWASHER (2)
18. SCREW (2)

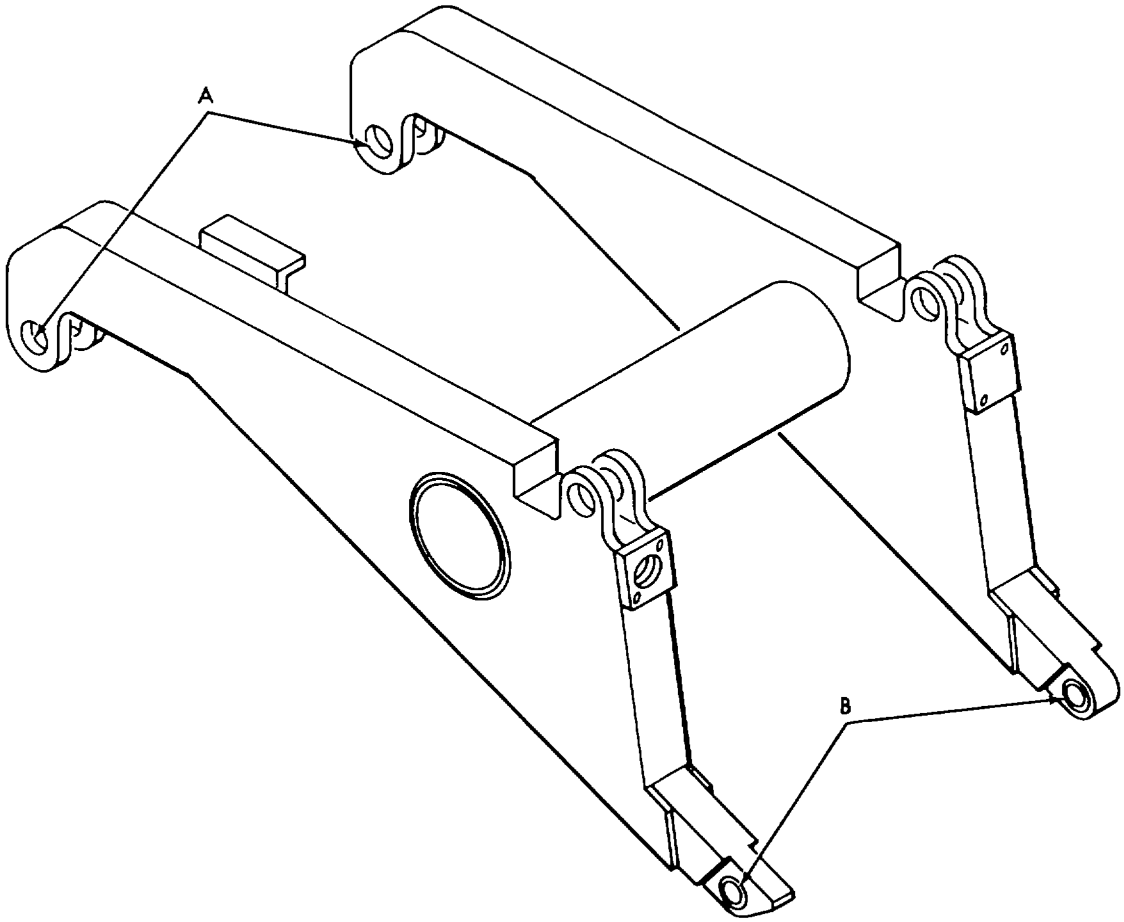
Figure 3-11. Link Assembly Disassembly

c. Assembly.

(1) Install bearings (9) using remover and replacer special tool (27, fig. 1-2).

(2) Install electrical cabling (14). Refer to TM 9-1450-500-20.

(3) Install transfer arm limit switch (13), index boom limit switch (1), and electrical cabling (15) and connect electrical wiring to switch terminals. Refer to TM 9-1450-500-20.



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS
A	DIAMETER OF HOLE	0.874 TO 0.876	0.895 MAX
B	DIAMETER OF HOLE	1.002 TO 1.003	1.033 MAX

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Figure 3-12. Link Assembly Wear Limits

(4) Install lubrication fittings (8).

(5) Install striker plates (5 and 12) using socket head capscrews (7 and 10) with associated lockwashers (6 and 11).

(6) Install angle bracket (16) using two screws (18) and associated lockwashers (17).

Section V. REPAIR OF INDEX BOOM

3-9. Description

The index boom supports the link assembly, transfer arm assembly, yoke assembly, and hoisting beams. The whole assembly is free to rotate in the index boom support.

3-10. Repair Procedure

a. Disassembly (fig. 3-13). The following special tool is required to perform the disassembly and assembly procedures:

Special tool	NSN	Part number
Puller	5120-00-991-3167	10892982

(1) Remove two bolts (9), washers (8) and remove index boom fork tips (7).

(2) Remove four screws (14), washers (13), and remove plate (12).

(3) Remove electrical cabling (4) and connectors (5, 6, and 10).

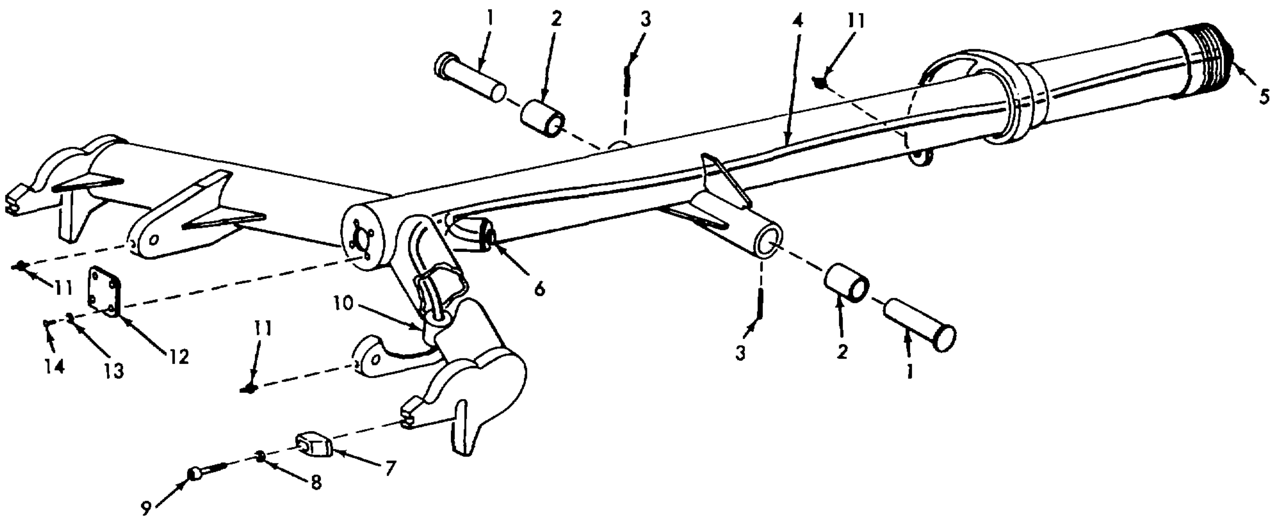
(4) Remove lubrication fittings (11).

(5) Remove spring pins (3) and, using puller, special tool (13, fig. 1-2), remove pin (1) and bushing (2). Refer to figure 3-14.

b. Inspection and Repair.

(1) Electrical cabling. Refer to TM 9-1450-500-20.

(2) Welds and structural members. Inspect index boom for deformation of structural members



1. PIN (2)
2. BUSHING (2)
3. SPRING PIN (2)
4. ELECTRICAL CABLING
5. ELECTRICAL CONNECTOR
6. ELECTRICAL CONNECTOR
7. FORK TIP (2)
8. WASHER (2)
9. BOLT (2)
10. ELECTRICAL CONNECTOR
11. LUBRICATION FITTING (3)
12. PLATE
13. LOCKWASHER (4)
14. SCREW (4)

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Figure 3-13. Index Boom Assembly Disassembly

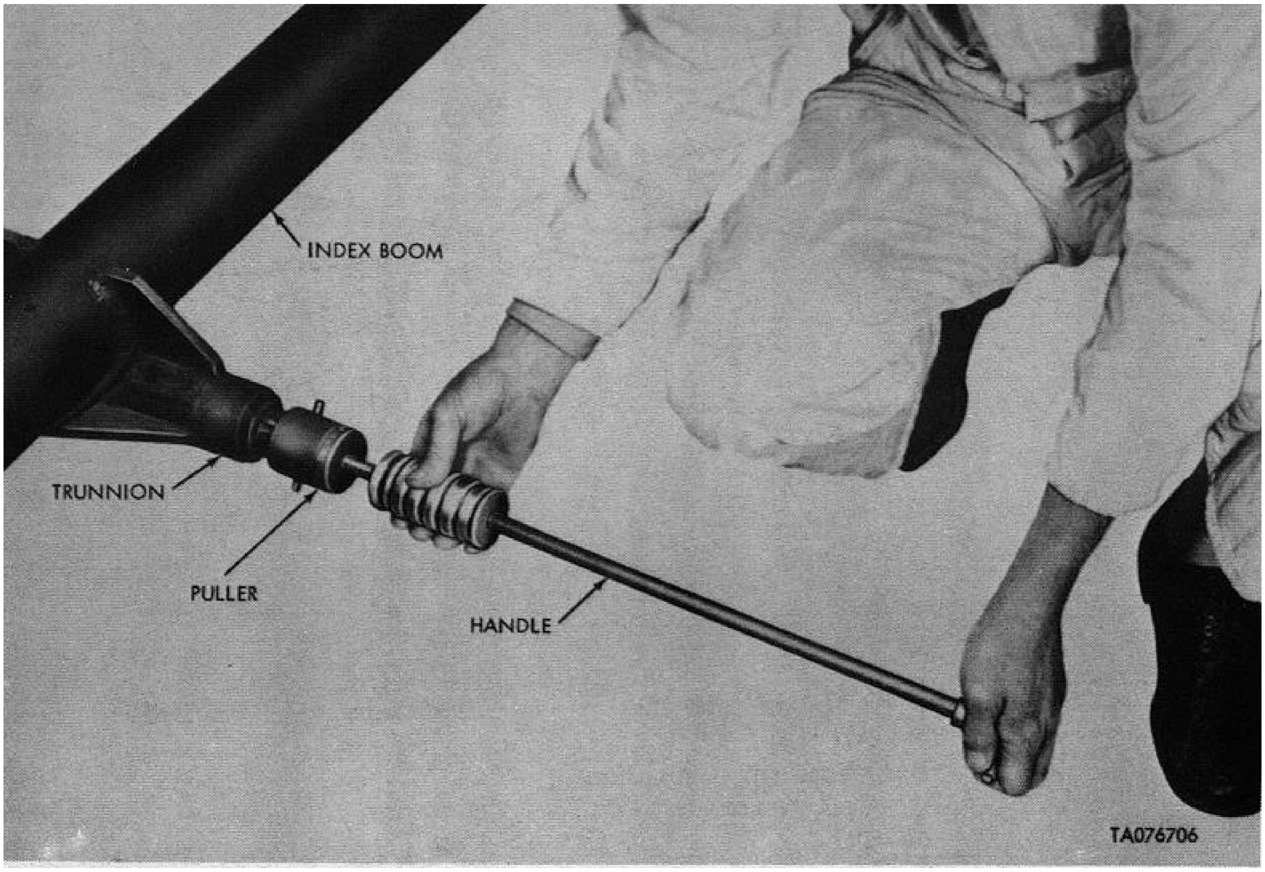


Figure 3-14. Index Boom - Pin and Bushing Removal Using Puller with Handle

and cracks, particularly in the welded areas. If deformation of index boom is detected, boom must be replaced. Do not attempt to make welding repairs to cracks in structural members of index boom. Replace defective or damaged lubrication fittings.

NOTE

Inspect roll cylinder arm for cracks by using dye penetrant methods. Replace index boom if cracks are revealed in roll cylinder arm. Repair of cracked roll cylinder arms is not authorized.

(3) Bushings. Replace bushings which are scored or gouged. If bushings are worn beyond the limits specified in figure 3-15, they must be replaced.

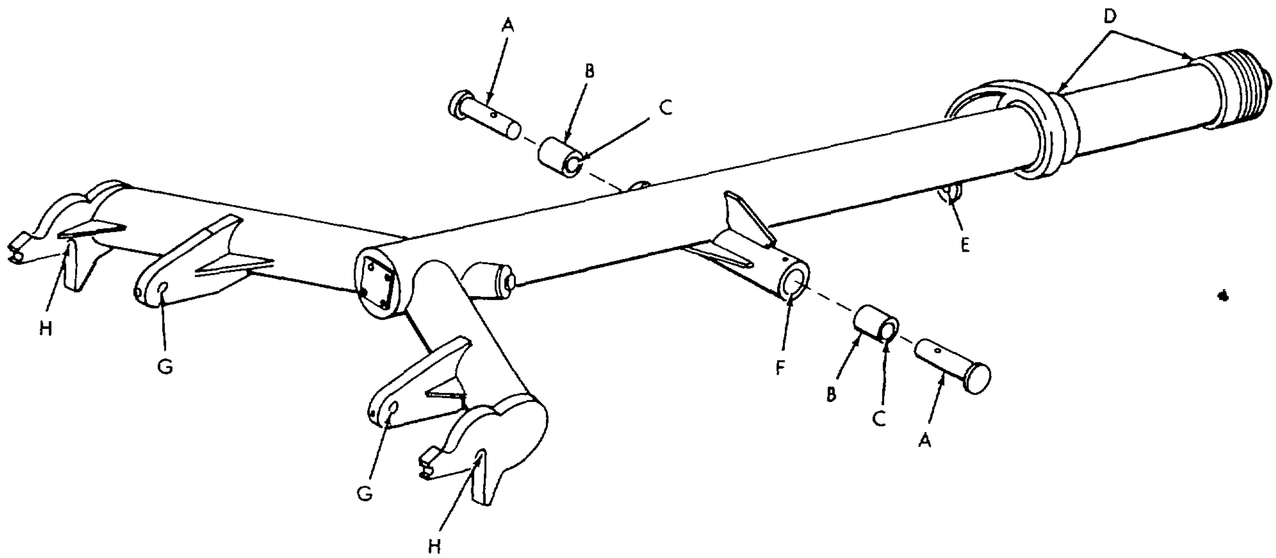
c. Assembly.

(1) Assemble bushings (2) to pins (1) and using puller, special tool (13, fig. 1-2), install bushings (2) and pins (1) in index boom trunnion.

(2) Install spring pins (3) through boom trunnion and pins (1).

(3) Install electrical cabling (4). Refer to TM 9-1450-500-20.

(4) Install lubrication fittings (11).



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS
A	DIAMETER OF PIN	1.2490 TO 1.2499	1.245 MIN
B	OUTSIDE DIAMETER OF BUSHING	1.500	1.470 MAX
C	INSIDE DIAMETER OF BUSHING	1.254 TO 1.259	1.264
D	DIAMETER OF RACE	4.429 TO 4.437	4.410
E	DIAMETER OF HOLE	0.766 TO 0.776	0.786
F	INSIDE DIAMETER OF HOLE	1.250 TO 1.258	1.258 MAX
G	DIAMETER OF HOLE	0.874 TO 0.876	0.895
H	RADIUS OF SLOT	1.010 TO 1.040	1.125

Figure 3-15. Index Boom Assembly Wear Limits

(5) Install fork tips (7) to index forks with bolts (9) and washer (8). Tighten bolts (9).

NOTE
Perform alinement test (para 6-10) to determine final position of fork tips.

(6) Install plate (12) with four each washer (13) and screw (14).

Section VI. REPAIR OF INDEX BOOM SUPPORT

3-11. Description

The index boom support is mounted to the top of the main support. These two supports provide mounting facilities for the roll and extension cylinders.

3-12. Repair Procedure

a. Disassembly (fig. 3-16). The following special tools are required to perform the disassembly procedures:

Special tool	NSN	Part number
Remover	5120-00-991-3165	10892985
Remover and replacer	5120-00-987-5054	10892990

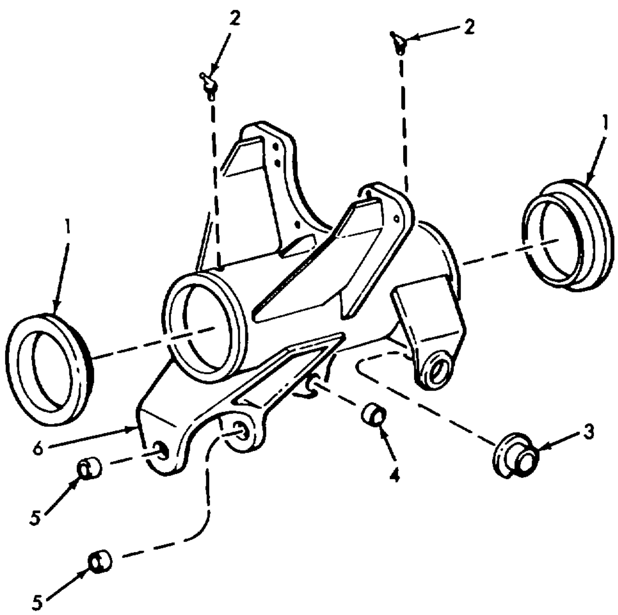


Figure 3-16. Index Boom Support Disassembly

(1) Using remover, special tool (20, fig. 1-2) (fig. 3-17), remove two bearings (1).

(2) Remove two lubrication fittings (2).

(3) Using remover and replacer, special tool (21, fig. 1-2), remove bearing (4).

(4) Using round bar stock of proper diameter, press out two bushings (5), if applicable.

(5) Remove two bearings (3).

b. Inspection and Repair.

(1) Welds and structural members.
Inspect for cracks, especially in the welded bead areas. If cracks are found in structural members or welds of support, support must be replaced.

(2) Bearings and bushings. Replace bearings and bushings which are gouged, scored, or worn beyond the limits specified in figure 3-18. Damaged or obstructed lubrication fittings must be replaced.

c. Assembly. The following special tools are required to perform the assembly procedures:

Special tool	NSN	Part number
Remover and replacer	5120-00-987-5054	10892990
Replacer	5120-00-987-5053	10892986

(1) Install two bearings (3).

NOTE
Refer to figure 3-19 for installation details of bearings.

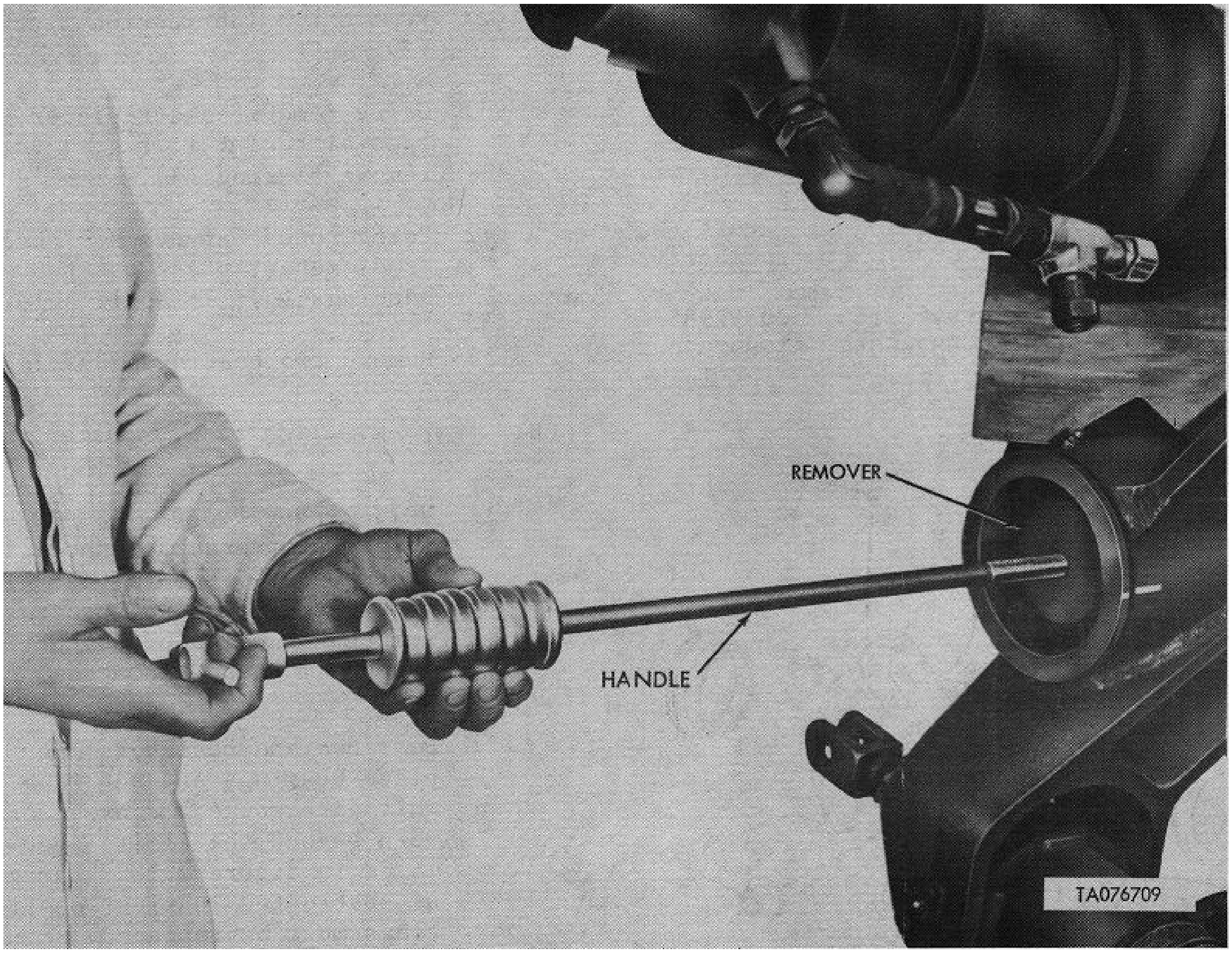


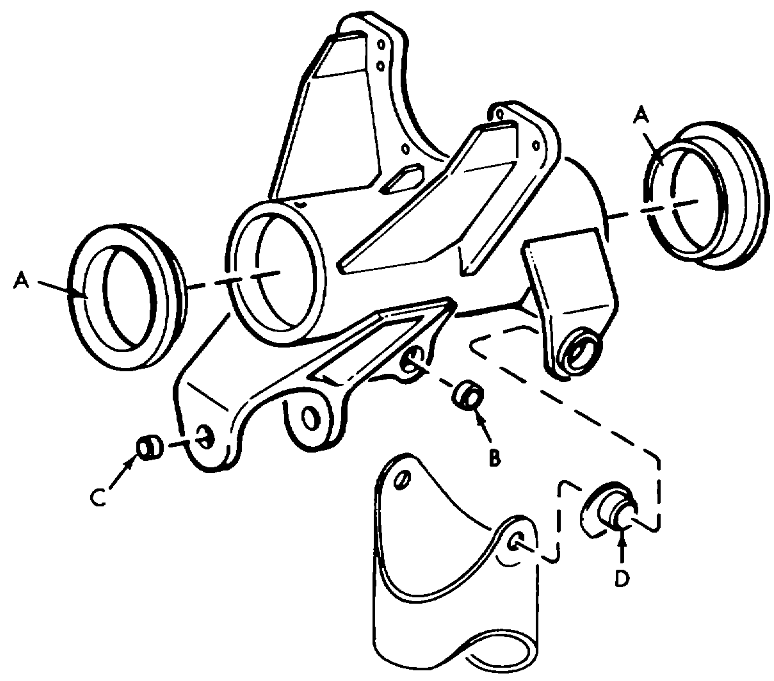
Figure 3-17. Index Boom Support - Bearing Removal Using Remover with Mechanic Kit Handle

(2) Press in two bushings (5).

(3) Using remover and replacer, special tool (21, fig. 1-2), install bearing (4).

(4) Install lubrication fittings (2).

(5) Using replacer, special tool (28, fig. 1-2) (fig. 3-20), install bearings (1).



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS (FIELD)
A	INSIDE DIAMETER OF BUSHING	4.441 TO 4.443	4.483
B	INSIDE DIAMETER OF BUSHING	1.127 TO 1.128	1.158
C	INSIDE DIAMETER OF BUSHING	0.820 TO 0.821	0.860
D	INSIDE DIAMETER OF BUSHING	1.1265 TO 1.1275	1.1580

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Figure 3-18. Index Boom Support Wear Limits

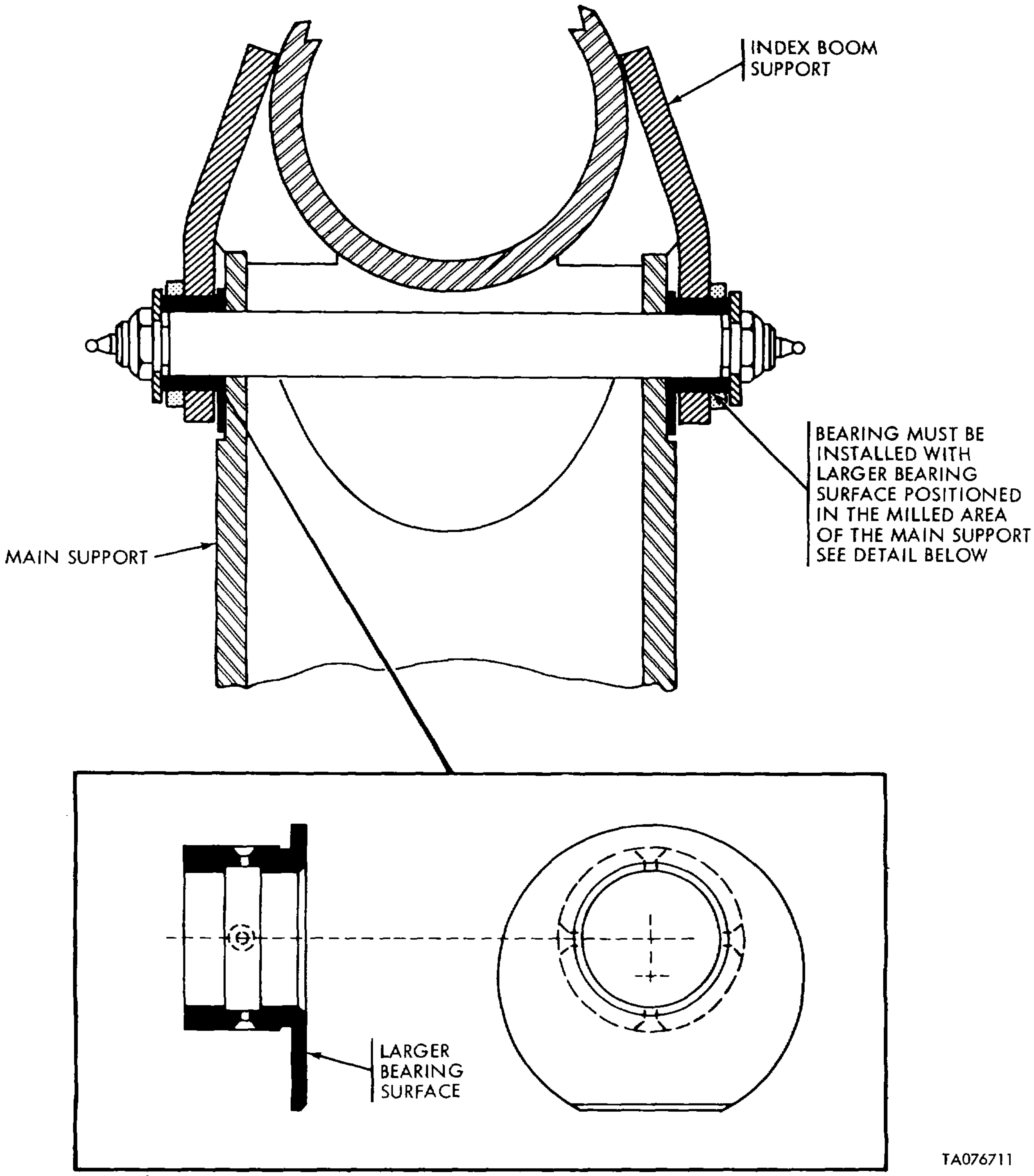


Figure 3-19. Index Boom Support - Bearing Installation

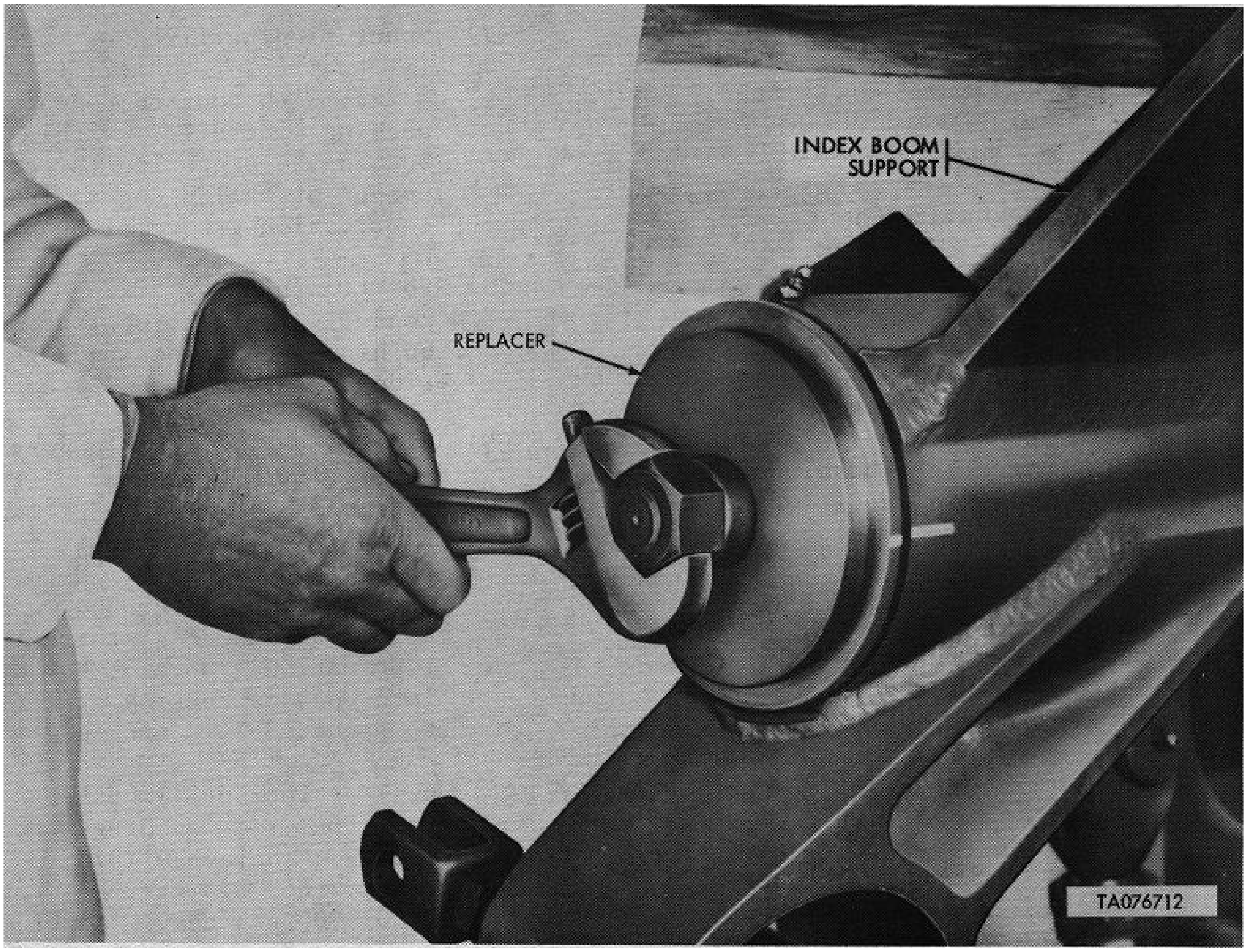


Figure 3-20. Index Boom Support - Bearing Installation Using Replacer

Section VII. REPAIR OF MAIN SUPPORT

3-13. Description

The main support of the superstructure supports the index boom support. These two supports provide mounting facilities for the roll and extension cylinders. The index boom which supports the link assembly, transfer arm assembly, yoke assembly, and hoisting beams are free to rotate in the index boom support, which in turn, is supported by the main support of the superstructure.

3-14. Repair Procedure

a. Disassembly. The main support is a welded assembly and no further disassembly is authorized.

b. Inspection and Repair. Inspect main support for deformation and cracks, especially in the welded areas. If cracks are detected in any structural member or weld, the main support must be replaced.

If the wear limits specified in figure 3-21 are exceeded, the main support must be replaced.

C. Assembly None.

3-15. Chassis Main Support Bushing

a. Removal (fig. 3-22).

NOTE

Perform a physical inspection to determine need for replacement. Do not remove bushings unless wear limits specified in figure 3-21 are exceeded.

(1) Remove nine screws (6), lockwashers (5) and cover plate (4) from under side of chassis.

(2) Drill out, or remove by other suitable means, pins (1) from bushings (2 and 3).

(3) Use a length of nonmetallic material (phenolic rod) and tap around outer periphery of bushings to remove bushings (2 and 3).

b. Inspection and Repair. If the bushings are gouged, scored, or worn beyond the limits specified in figure 3-21, the bushings must be replaced.

c. Installation- The following special tools are required to perform the installation procedures:

Special tool	NSN	Part number
Replacer	5120-00-991-3173	10892974
Fixture, pinning	4910-00-991-3140	10892775

(1) Using replacer, special tool (35, fig. 1-2) (fig. 3-23), install bushing (2) in chassis housing.

(2) Mount pinning fixture, special tool (5, fig. 1-2) (fig. 3-24), with four component bushings installed, within the bushing by centering three component ball plungers in lubrication groove of bushing.

(3) Position pinning fixture horizontally by locating four drill bushings 30 degrees on either side of lateral centerline.

(4) Tighten three ball plungers evenly to secure pinning fixture and bushing for drilling.

(5) Drill four holes, 0.170 to 0.175 inch diameter and 0.380 to 0.500 inch deep, through lubrication groove of bushing into chassis housing. Refer to figure 3-25.

(6) Replace four drill bushings with four ream bushings and ream four holes, 0.1875 to 0.1885 inch diameter by 0.350 to 0.380 inch deep. Refer to figure 3-25.

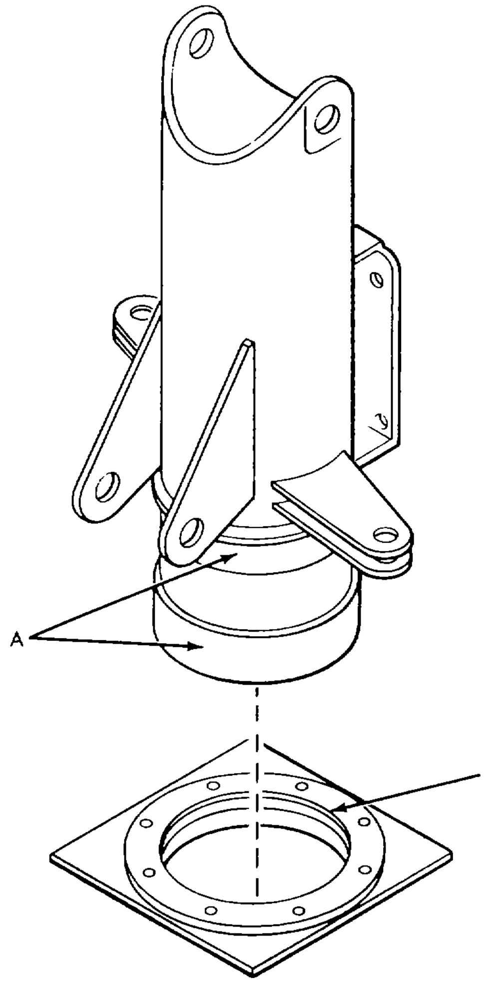
(7) Rotate pinning fixture clockwise 15° and repeat steps (4), (5) and (6). Remove pinning fixture.

(8) Drive four pins to bottom of reamed holes and clear of bushing lubrication groove.

(9) Repeat steps (1) through (8) for other bushing.

(10) Machine all new bushings to 7.4464 to 7.4481 inches diameter. Inner faces of bushings must be perpendicular to top face of bushing (2) within 0.0020 inch.

(11) Install cover plate (4) with nine each screw (6) and lockwasher (5).



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS (FIELD)
A	OUTSIDE DIAMETER OF SUPPORT	7.4430 TO 7.4417	7.4230
B	INSIDE DIAMETER OF BUSHINGS	7.4464 TO 7.4481	7.4630

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Figure 3-21. Main Support Assembly Wear Limits

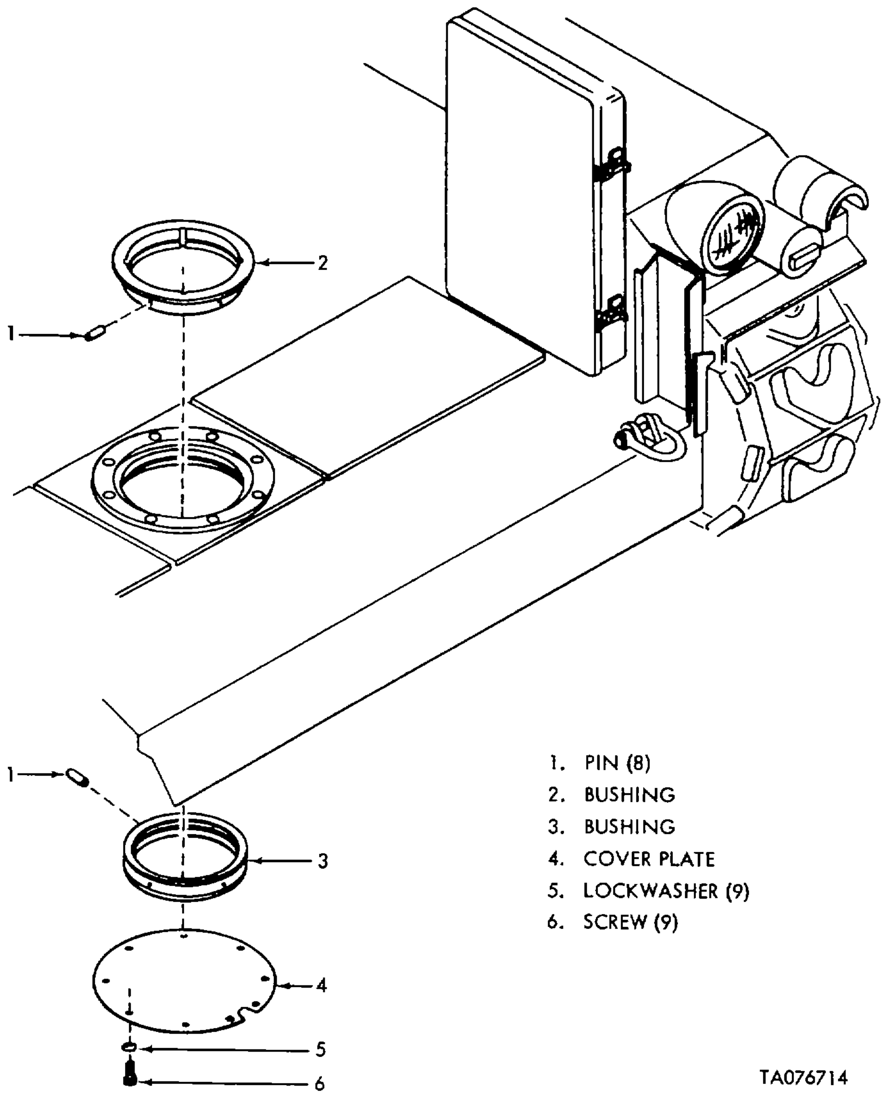


Figure 3-22. Main Support - Bushing Removal from Chassis

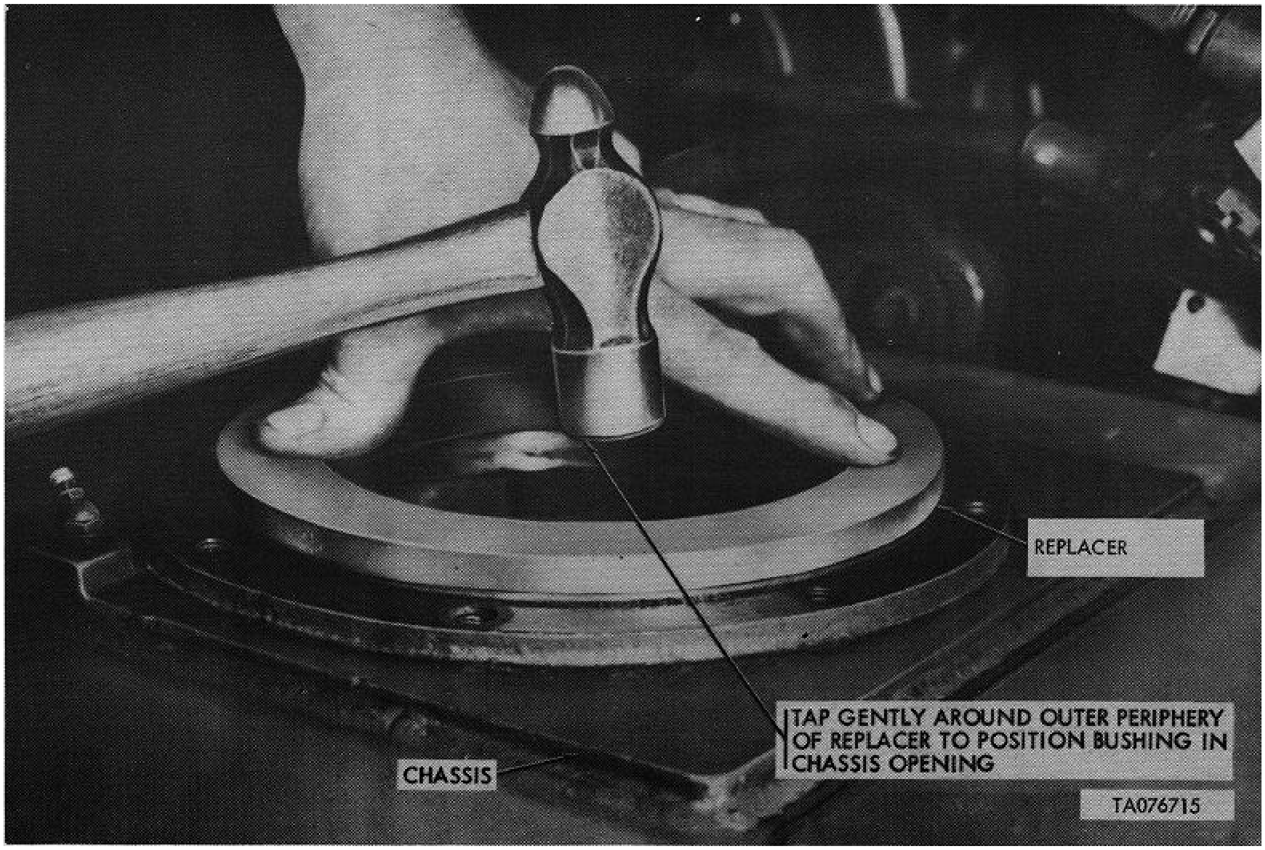


Figure 3-23. Main Support - Bushing Installation Using Replacer

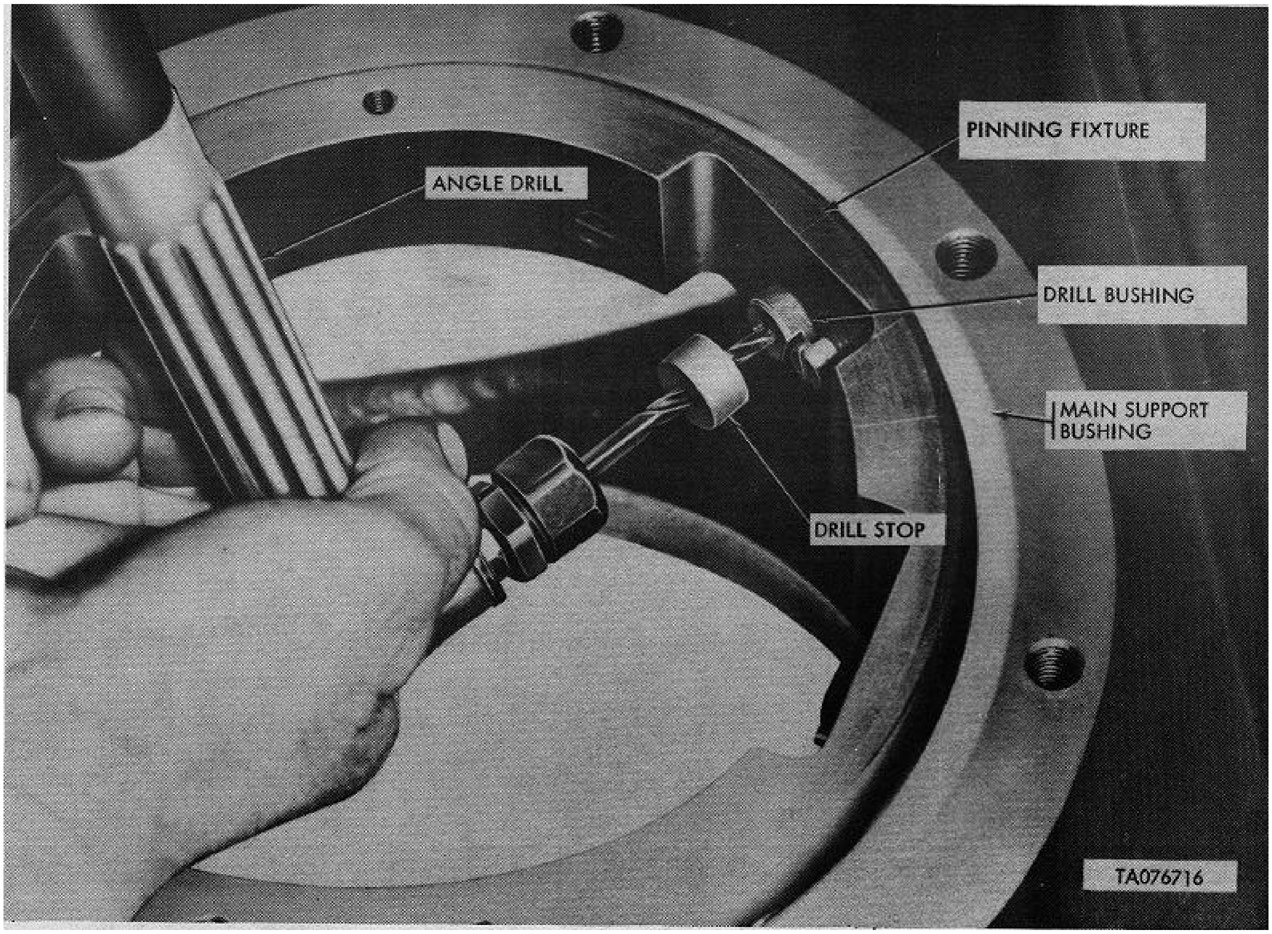


Figure 3-24. Main Support - Bushing Hole Drilling Using Pinning Fixture

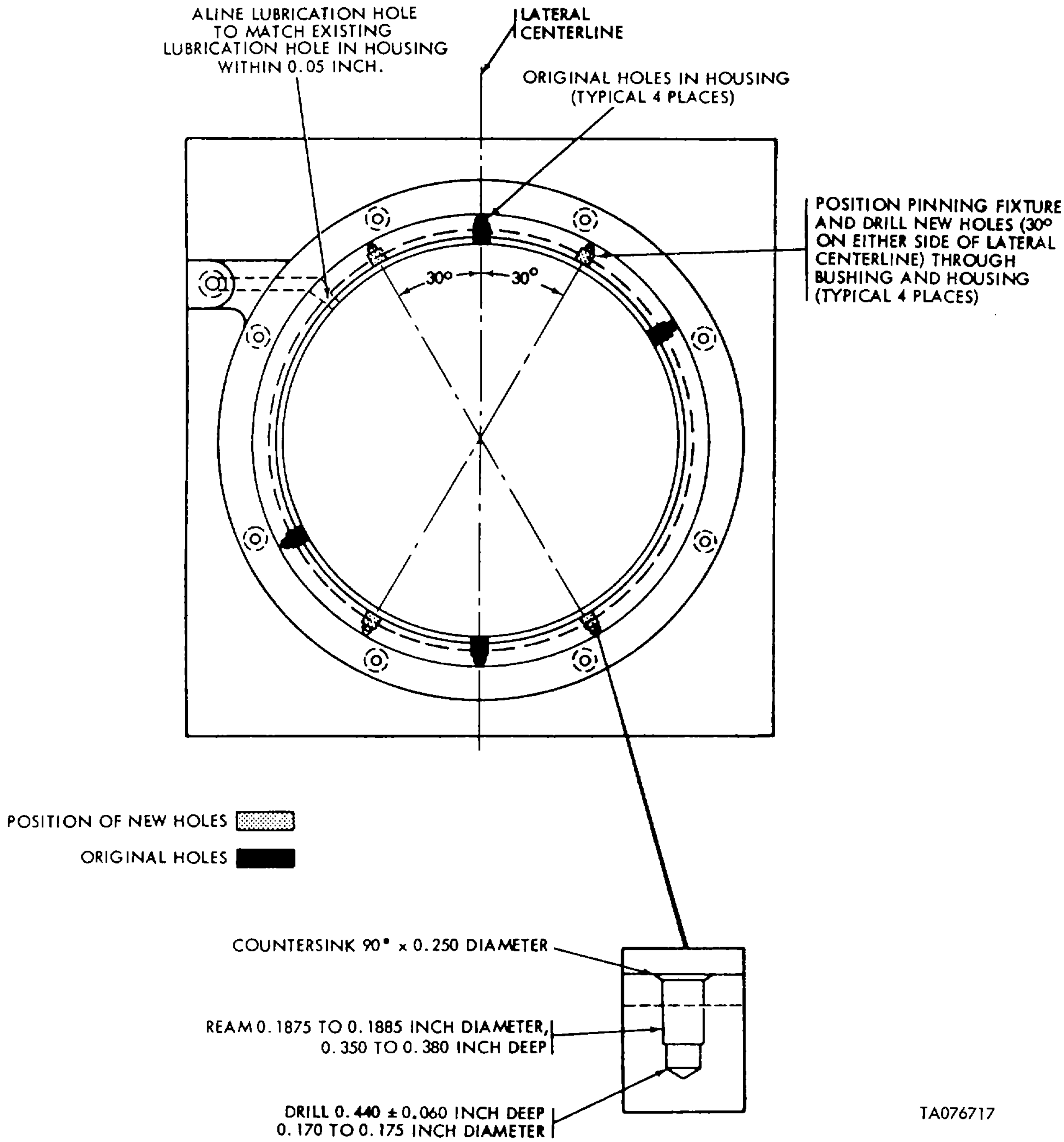


Figure 3-25. Main Support - Bushing Retaining Pins Installation

Section VIII. REPAIR OF HYDRAULIC SYSTEM

3-16. Description

Power for the superstructure operation is provided by an engine-driven hydraulic pump, hydraulic cylinders, a six-gallon hydraulic oil reservoir, filters, valves, swivel lines, fittings and hoses. This section details repair and overhaul standards for the hydraulic system components. Included are points of measurement, sizes and fits of new parts, wear limits for field and depot maintenance levels, and code symbols for coordinate information. The letter L indicates a loose, clearance fit between parts. The letter T indicates a tight or interference fit between parts. A double asterisk (**) indicates that the part may be used for selective fitting as long as the mating part permits the fit required between the two. All dimensions are in inches.

3-17. Hydraulic System Components

a. Wear Limits.

(1) Hydraulic pump drive. Refer to figure 3-31.

(2) Hydraulic control console control linkage. Refer to figure 3-49.

(3) Roll cylinder assemblies. Refer to figure 3-59.

(4) Elevation cylinder assembly. Refer to figure 3-63.

(5) Extension cylinder assembly. Refer to figure 3-68.

(6) Azimuth cylinder assembly. Refer to figure 3-71.

b. Testing Procedures.

(1) Testing extension cylinder flow regulator valve. Refer to table 3-2.

(2) Testing roll cylinder and azimuth cylinder flow regulator valve. Refer to table 3-3.

(3) Testing swivel joint. Refer to table 3-4.

(4) Testing elevation cylinder flow regulator valve. Refer to table 3-5.

(5) Testing 615 psi pressure regulator valve. Refer to table 3-6.

(6) Testing roll and azimuth lockout solenoid valve and reduced pressure solenoid valve.
Refer to table 3-7.

(7) Testing extension, elevation, roll, and azimuth control valves. Refer to table 3-8.

(8) Testing filter assembly. Refer to table 3-9.

(9) Testing thermal relief valve. Refer to 3-10.

(10) Testing starter relief solenoid valve. Refer to table 3-11.

(11) Testing system pressure relief valve. Refer to table 3-12.

(12) Testing reduced pressure switch. Refer to table 3-13.

(13) Testing roll cylinder, extension cylinder, azimuth cylinder, and elevation cylinder. Refer to table 3-14.

(14) Testing check valves. Refer to table 3-15.

(15) Testing hydraulic fluid reservoir. Refer to table 3-16.

WARNING

If any new hydraulic line, hose, cylinder, seal, valve, or other hydraulic component is installed, a proof load check MUST be performed.

If check is not done, injury to personnel or death could result. Damage to equipment may also occur.

3-18. Hydraulic System Maintenance

a. Contamination. Every precaution must be taken to prevent contamination of hydraulic fluid. Storage containers should be kept clean and sealed. All handling containers must be kept clean and used only for hydraulic fluid. Do not leave the container or the reservoir open any longer then necessary, since dust and grit in the air may get into the fluid. Fluid that has been exposed to dust or other contamination must be filtered before being used again, or if badly contaminated, be discarded. Filtering will remove sludge as well as metal flakes, dust, and grit.

b. Dust Plugs. Upon removal of a hydraulic component or line, dust plugs must be installed immediately to ensure cleanliness of the system. These plugs must be kept in a clean, closed container and checked prior to using to make certain the threads are not damaged. This will prevent damage to threaded components or fittings in which the lugs are used.

c. Seals. Upon removal or disassembly of hydraulic components, discard all packings and backup rings. Use only new packings, seals, and backup rings, coated with a film of clean hydraulic fluid, item 2, App. C. If an installation tool is not available, a tube of paper slipped over the threads will protest the packing, seal, or backup ring.

d. Containers. A clean, preferably plastic, parts container should be used to hold and protect parts from damage or loss during the repair or replacement of hydraulic components.

CAUTION

Use care to prevent damage to parts due to their striking against each other.

e. Safety Wiring. Parts such as bolts, nuts, adjustment screws, plugs, etc., are sometimes safety-wired. If a safety wire tool is not available, the twisting may be done by hand, except for the last few turns, which are made with pliers to apply tension and secure the wire ends properly. In all applications, the wire must be installed in such a manner as to oppose the loosening of the part.

f. Fittings. When a wrench is used on an extended shoulder of a female fitting, a male fitting or rigid plug must be installed to prevent collapse or distortion of the shoulder.

g. Removal and Replacement of Hydraulic Lines. Defective lines should be replaced immediately. Replace lines with the equivalent replacement part.

h. Hydraulic Line Installation. Figure 3-26 shows the correct methods of installing flexible hose assemblies. The important consideration in routing hose is to produce a smooth, even band, without flattening or buckling the hose.

i. Flareless Fittings. The flareless fitting is subjected to high pressures in the loader. The sleeve on the end of the tubing must therefore be installed correctly if reliable operation is to be realized. Figure 3-27 shows the correct way to install sleeves.

j. Impurities. All reasonable means should be taken to prevent the entrance of foreign matter during operation or when oil is added to the system, or when maintenance work is performed. Covers should be kept closed whenever possible.

k. Water. Although water may be considered a contaminant, its universal presence in the surrounding atmosphere makes it impossible to prevent at least small quantities of water from entering the hydraulic system. Precipitation of moisture occurs principally when ambient temperatures fall below the dew point of the air in the reservoir. Small quantities of water of hydraulic system are not likely to cause harm, nevertheless inspection should be made period

NOTE

WHEN DISCONNECTING TWO OR MORE HYDRAULIC LINES, TAG EACH LINE TO ENSURE CORRECT INSTALLATION.

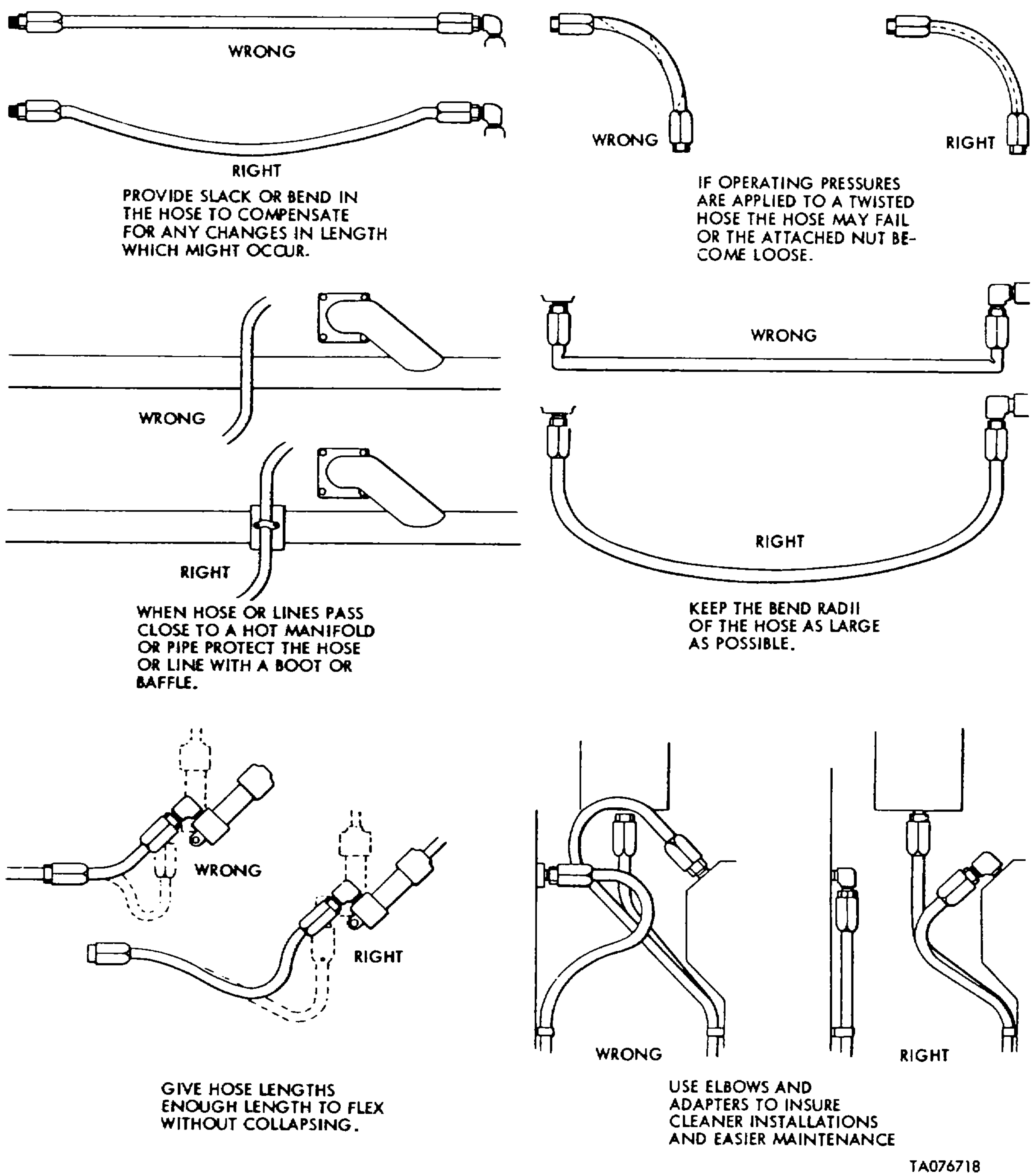


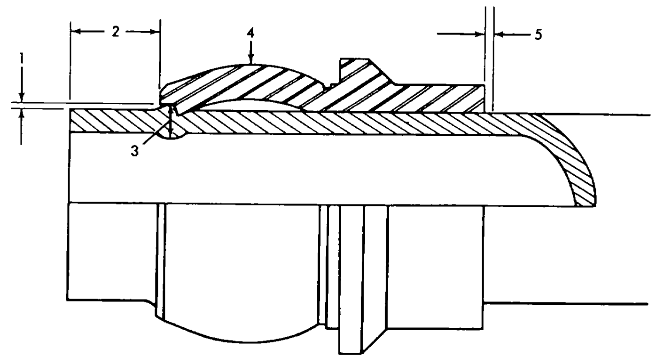
Figure 3-26. Hose Assembly Installation Aids

1. SLEEVE PILOT MUST CONTACT TUBE SURFACE OR BE WITHIN MAXIMUM GAP SPECIFIED:

TUBING SIZE (INCHES)	MAX GAP (INCHES)
1/4	.007
3/8	.013
1/2	.015

2. TUBE PROJECTION FROM SLEEVE PILOT TO TUBE END MUST BE AS SPECIFIED:

TUBING SIZE (INCHES)	PROJECTION (INCHES)
1/4	.109
3/8	.172
1/2	.168



3. A SLIGHT PROJECTION OR LIP WILL BE RAISED BY THE FORWARD MOTION OF CUTTING EDGE OF SLEEVE PILOT. BURRS ARE NOT PERMITTED.
4. SLEEVE SHOULD BE BOWED SLIGHTLY.
5. LONGITUDINAL MOVEMENT OF SLEEVE MUST NOT EXCEED .016 BUT SLEEVE MAY ROTATE ON TUBING.

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Figure 3-27. Flareless Tube Fitting Dimensions

cally by removing the reservoir drain plug and inspecting a small quantity of oil for contamination.

l. Excessive Foaming or Entrapped Air. Foaming is caused by the release of air entrapped in the oil. The presence of air in the hydraulic oil may cause irregular operation of the system because it changes the hydraulic oil from noncompressible to compressible medium. Some of the most common causes for the presence of air are: too low a level in the reservoir permitting the intake tube to suck air as well as oil, and air entrapped due to component replacement.

m. High Oil Temperature- Operating temperatures above normal range are hard on both the hydraulic fluid and the equipment, and frequently cause excessive down time. High temperature lowers the viscosity of the oil and reduces its ability to lubricate and seal effectively, thus permitting greater wear. High temperature also increases the rate of oxidation and hastens the formation of deposits or corrosive acidity making it necessary to change the hydraulic oil more often. For reasons mentioned previously, it is highly advisable to keep oil temperature under observation. If the loader hydraulic system reaches 165°F, an indicator light on the control panel comes on. If a loading or offloading procedure is in process and this happens, the procedure may be completed and then the loader must be shut down and given sufficient time to cool and then the cause for overheating determined.

3-19. Superstructure Hydraulic Pressure Supply System

The hydraulic system (fig. 3-28) provides power to actuate the superstructure in the direction selected by the operator. Control is maintained at the hydraulic console. The hydraulic system consists of the supply and return systems, the roll system, the azimuth system, the elevation system, and an extension system. The supply and return system includes a belt-driven pump which is gravity-fed by a hydraulic fluid reservoir. Provisions for thermal relief are incorporated into the return system. A flow diagram of the hydraulic system is shown in figure 3-29.

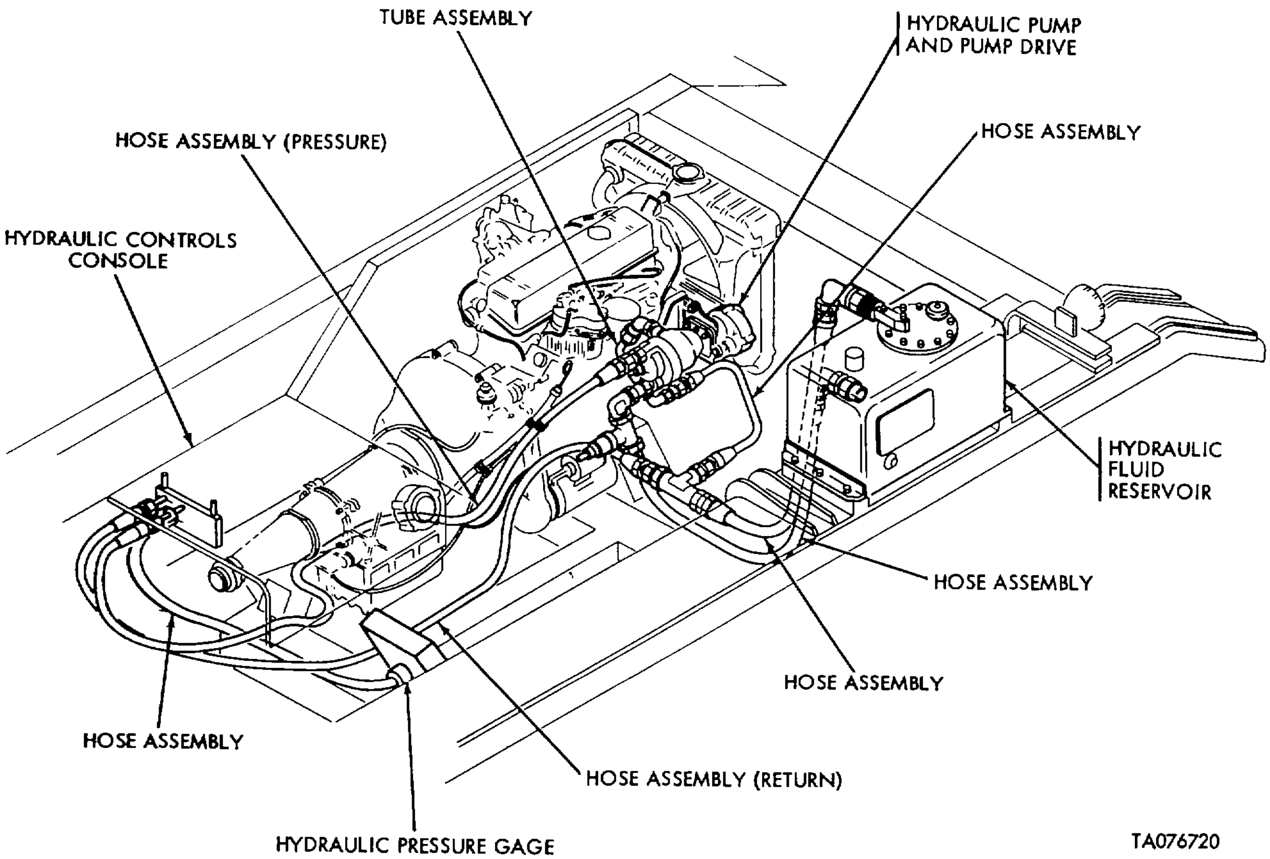


Figure 3-28. Hydraulic Systems Components (Sheet 1 of 2)

320. Hydraulic Pump and Pump Drive

NOTE

When replacing hydraulic system components, new seals, packings, and backup rings must be used.

a. Removal and Installation. Refer to TM 9-1450-500-20.

b. Disassembly of Pump Drive (fig. 3-30).

(1) Remove hydraulic pump drive from hydraulic pump. Refer to TM 9-1450-500-20.

(2) Remove three setscrews (10) and remove tapered insert (9), pulley (8), and key (6) from pinion gear shaft (5).

(3) Remove four pan head screws (12) and four flat head machine screws (11), remove cover (13) and gasket (14).

(4) Remove adapter (24). Press drive gear shaft (17) and gear (16) from bracket (1).

(5) Remove setscrew (15) from drive gear (16) and remove gear (16) from shaft (17).

(6) Remove retaining rings (18), (20) and (21).

(7) Remove bearings (19) and (23).

(8) Remove setscrew (4) from pinion gear (3) and seal (25) from bracket (1).

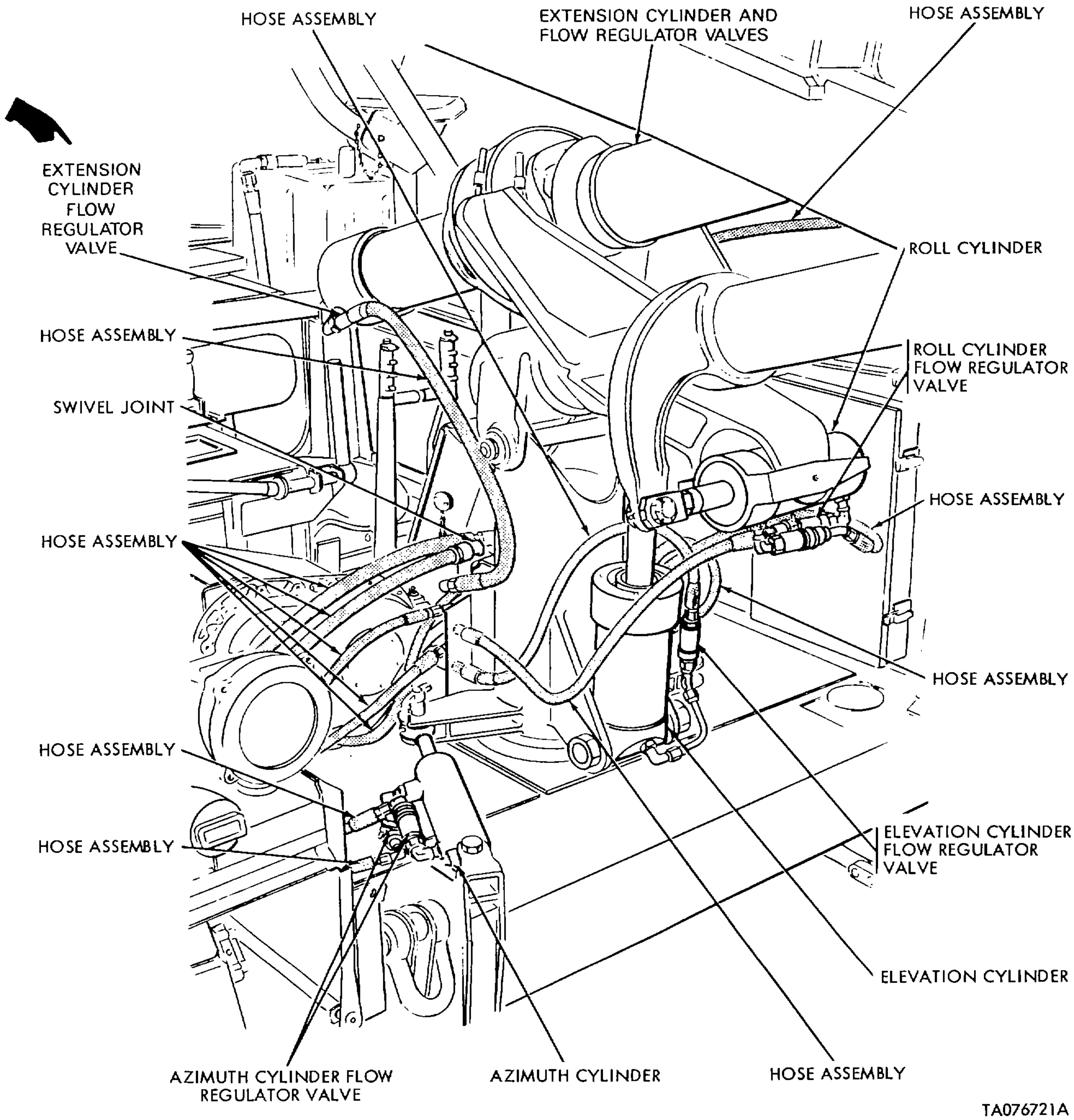


Figure 3-28. Hydraulic Systems Components (Sheet 2 of 2)

(9) Press pinion gear shaft (5) and bearing (7) from bracket (1).

(10) Remove pinion gear (3) from bracket (1).

(11) Remove bearing (7) from pinion gear shaft (5) by pulling on inner race of bearing (7).

(12) Remove bearing (2) from bracket (1).

c. Inspection. The following special tools are required to perform the inspection procedures:

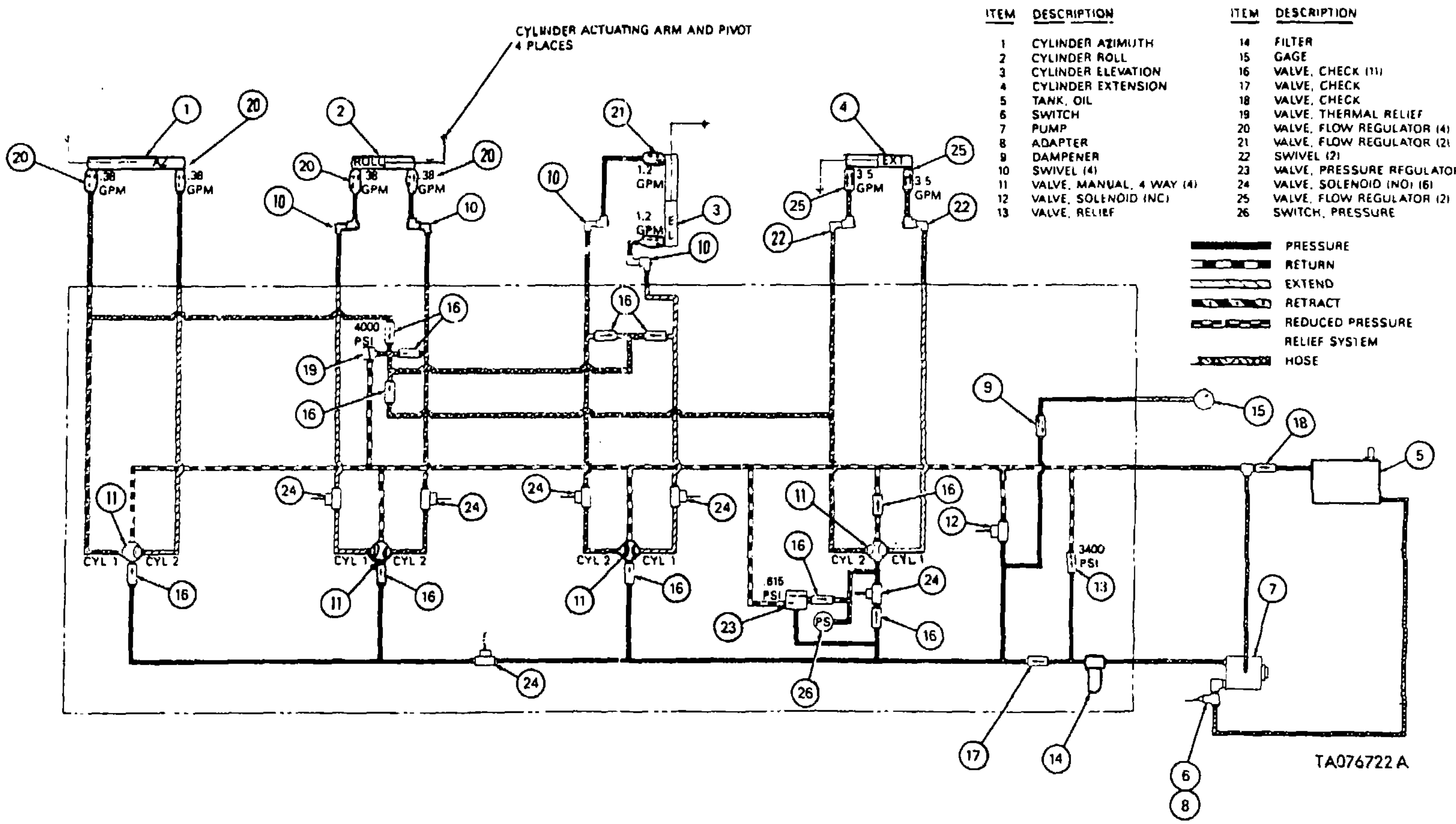


Figure 3-29. Hydraulic System Flow Diagram

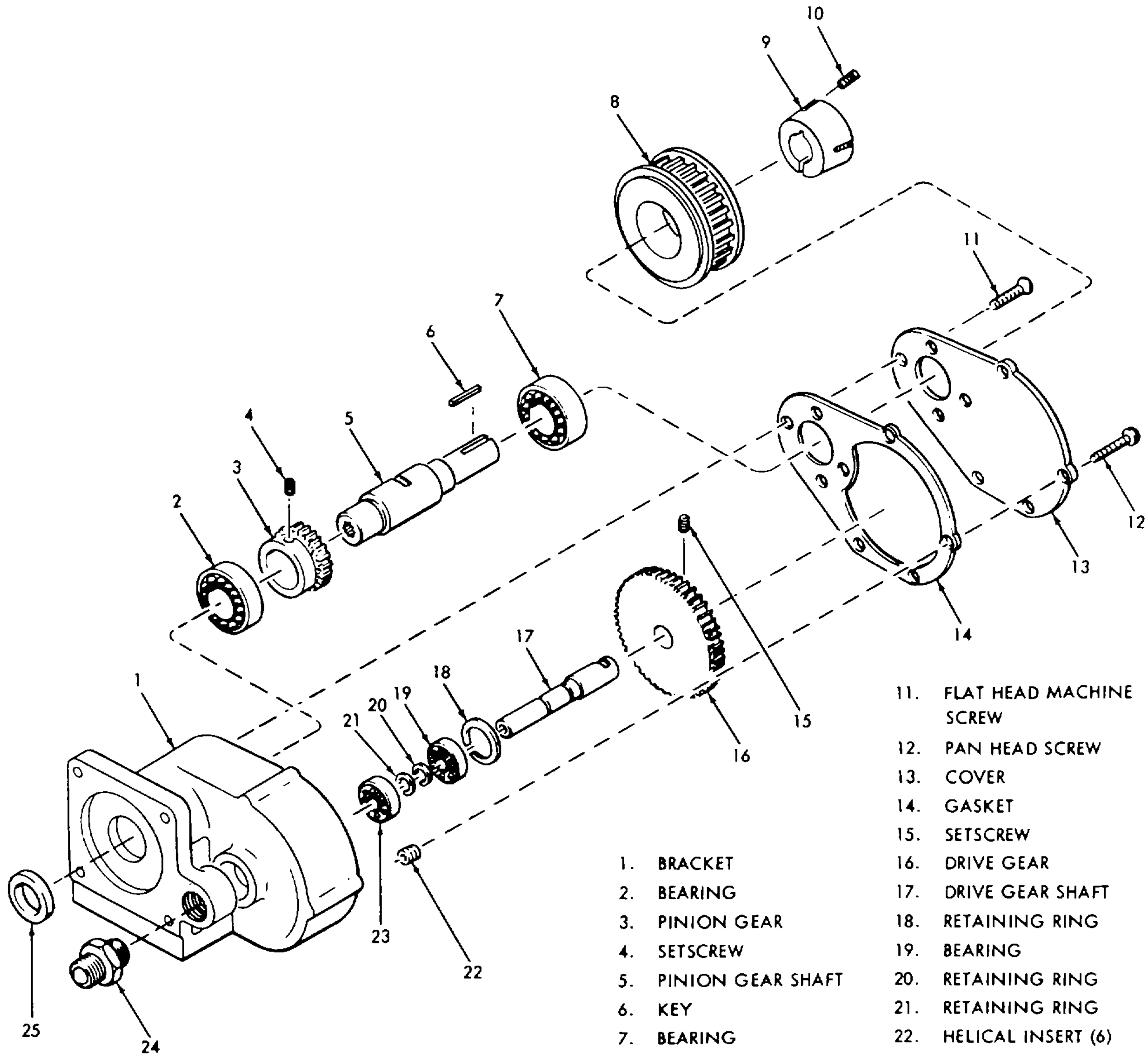


Figure 3-30. Hydraulic Pump Drive Disassembly

Special tools	NSN	Part Number
Extractor, coil thread insert	5120-00-251-1525	7751050
Inserter, heli-coil1 screw-lock	5120-00-710-7437	8375324

(1) Bracket (1). Remove and replace helical inserts (22) if inspection discloses damage. Use extractor, special tool (4, fig. 1-2), and inserter, special tool (11, fig. 1-2), respectively for removing and installing inserts. Replace the bracket if it is cracked, if the threaded hole for the adapter (24) has damaged

threads or if the bearing seats are worn beyond the limits specified in figure 3-31.

(2) Cover (13). Check for dents or deformation. Straighten all dents. If extensive deformation is noted, the cover must be replaced.

(3) Pinion gear (3) and drive gear (16). If teeth are broken, missing, damaged, or if backlash exceeds the limits specified in figure 3-31, the gear must be replaced. Remove minor scratches and burrs with a fine file or honing stone. If wear exceeds the limits specified in figure 3-31, the gears must be replaced.

(4) Adapter (24). Replace the adapter if damaged.

(5) Gear shafts (5 and 17). If scored, spline damaged, or worn beyond the limits specified in figure 3-31, the shafts must be replaced.

(6) Pulley (8) and tapered insert (9). Inspect for nicks, gouges and other obvious defects. Remove sharp edges of nicks using a fine file or honing stone. If the threads for the set-screws in the tapered insert are damaged, the insert must be replaced.

d. Assembly. Assemble the hydraulic pump drive by reversing the sequence of the disassembly procedure.

NOTE

Apply sealant, item 5 App. C, to the threads of setscrews (4) and (15). Lubricate gear teeth and pack triangular cavity with grease, item 3, App. C.

3-44 Change 2 3-21. Extension Cylinder Flow Regulator Valve

a. Removal (fig. 3-32).

(1) Place vehicle in park position.

(2) Fully retract extension cylinder piston and cycle all manual control valves to relieve hydraulic system pressure.

Refer to TM 9-1450-500-10.

(3) Disconnect hose assemblies (2) from reducers (3). Cap open end of hose assemblies to prevent system contamination.

(4) Remove reducers (3) from end of flow regulator valves (5) and disassemble packings (4) from reducers (3).

(5) Remove flow regulator valves (5) with packing (4) and reducers (3) from elbows (6).

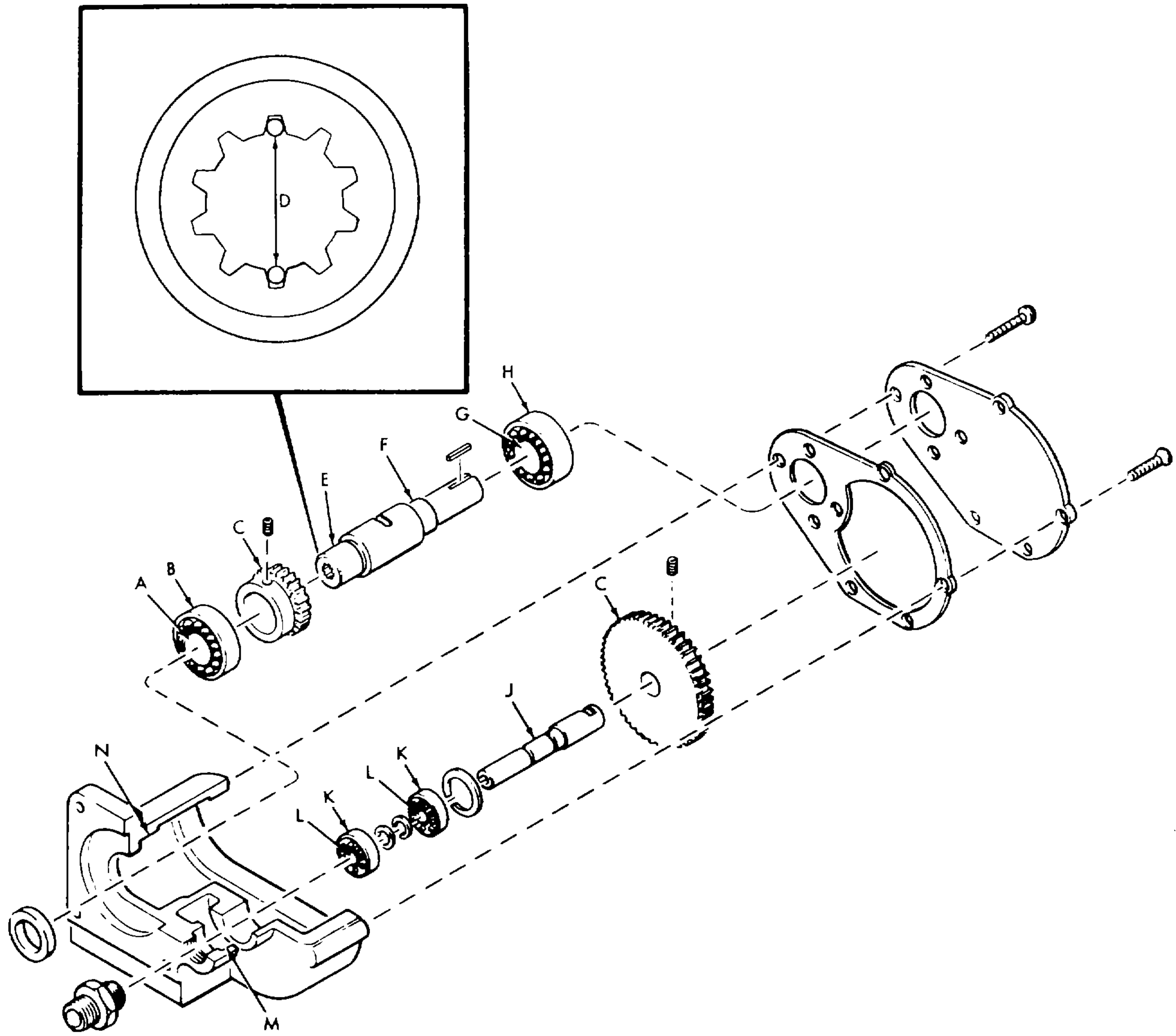
(6) Disassemble reducers (3) and packings (4) from flow regulator valves (5).

(7) Disassemble elbows (6) and unions (9) with associated packings (4), backup rings (7) and nuts (8) from cylinder (1).

(8) Cap open port of cylinder (1) to prevent system contamination.

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks, and stripped or crossed threads accomplish operation and leakage tests as specified in table 3-2. If visual inspection discloses cracks or damaged threads, or if the valve fails the operation and leakage test, the valve must be replaced.



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS (FIELD)
A, G	INSIDE DIAMETER OF BEARING	0.9839 TO 0.9843	(**)
B, H	OUTSIDE DIAMETER OF BEARING	2.0467 TO 2.0472	(**)
C	BACKLASH BETWEEN GEARS ON 3.000 RADIUS FROM CENTER OF DRIVE GEAR	0.0020 TO 0.0040	0.0100
D	SPLINE DIAMETER BETWEEN 0.0864 PINS	0.4751 TO 0.4775	(**)
E, F	BEARING JOURNAL DIAMETER	0.9843 TO 0.9846	0.9838
A-E G-F	FIT BETWEEN BEARING AND JOURNAL	0.0007T TO 0.0000	0.0005L
J	BEARING JOURNAL DIAMETER	0.4999 TO 0.5002	0.4994
K	OUTISDE DIAMETER OF BEARING	1.1250 TO 1.1254	(**)
L	INSIDE DIAMETER OF BEARING	0.5000 TO 0.5003	(**)

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Figure 3-31. Hydraulic Pump Drive wear Limits (Sheet 1 of 2)

Reference Letter	Point of Measurement	Sizes and Fits of New Parts	Wear Limits (Field)
L-J	Fit Between Bearing and Journal	0.0002T to 0.0004L	0.0009L
M	Bearing Seat Diameter	1.1249 to 1.1254	1.1259
K-M	Fit Between Bearing and Housing	0.0005T to 0.0004L	0.o009L
N	Bearing Seat Diameter	2.0471 to 2.0477	2.0482
B-N H-N	Fit Between Bearing and Housing	0.00010L to 0.00010L	0.0015L

Figure 3-31. Hydraulic Pump Drive Wear Limits (Sheet 2 of 2)

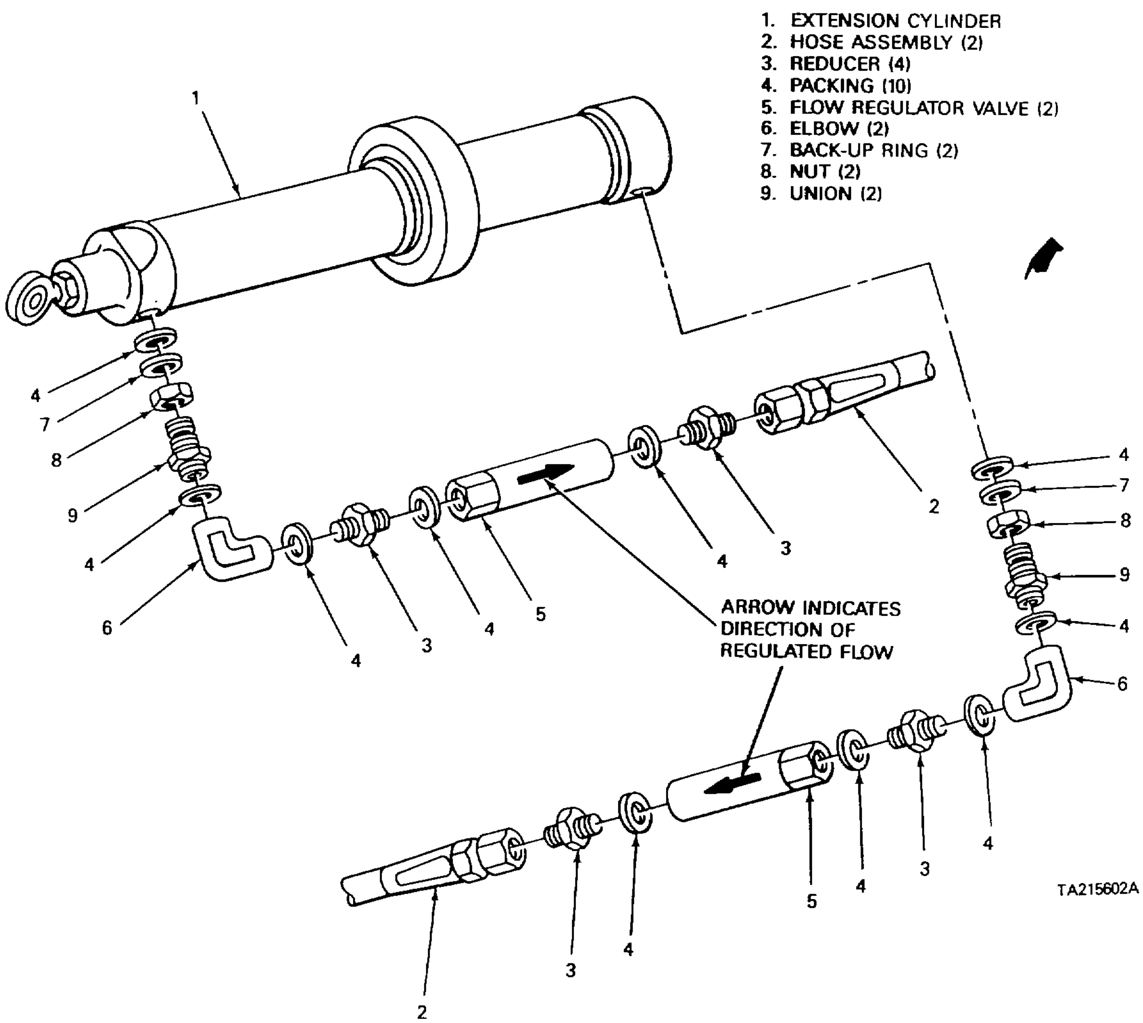


Figure 3-32. Extension Cylinder - Flow Regulator Valve Removal

d. Assembly. None.

e. Installation. Install the flow regulator valve by reversing the sequence of removal procedure.

CAUTION

Observe directional flow arrow on valve body. It must be pointing in same relative direction as shown in figure 3-32.

Table 3-2. Testing Extension Cylinder Flow Regulator Valve

Procedure	Normal indication	Probable defect.
	LEAKAGE TEST	
1. Plug outlet port and apply 4500 psig to the inlet port.	No external leakage or permanent set.	Valve body or seals faulty.
2. Apply 5 psig to the inlet port.	No external leakage.	Seals faulty.
	FLOW TEST	
3. Connect outlet port to a flowmeter and inlet port to pressure port of external fluid source.		
4. Apply 3000 psig.	Flow rate as stamped on regulator +5%, -10%.	Valve.
5. Vary pressure from 3000 to 1000 psig, then return to 3000 psig.	Flow rate remains constant throughout all pressure variations.	Valve.

f. Installation Test and Inspection.

Start engine (refer to TM 9-1450500-10) and after initial warmup, actuate extension cylinder sufficiently to eliminate air in lines. Operation must be as specified in TM 9-1450-500-10 and system must be free of leaks in area where lines are disconnected.

3-22. Azimuth Cylinder Flow Regulator Valves

a. Removal (fig. 3-33).

(1) Position loader in park position and cycle all manual control valves to relieve hydraulic system pressure. Refer to TM 9-1450-500-10.

(2) Disconnect hose assemblies (30 and 36) from elbows (27 and 35). Cap the open ends of the hose assemblies to prevent system contamination.

(3) Loosen nuts (26 and 34) and remove elbows (27 and 35), nuts (26 and 34), backup rings (25 and 33), and packings (24 and 32).

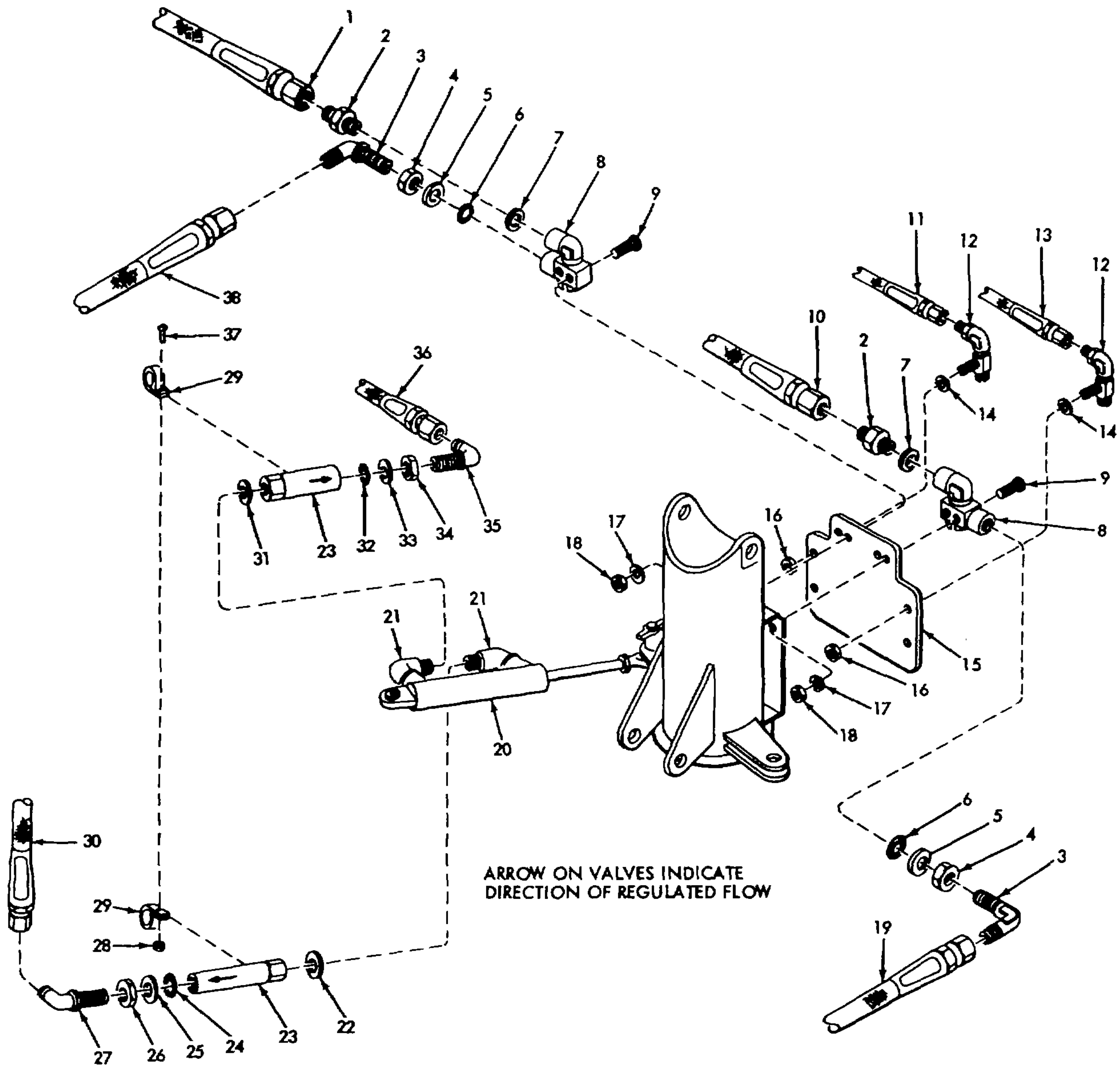
(4) Remove nut (28) from screw (37) and remove two clamps (29) from flow regulator valves (23).

(5) Remove flow regulator valves (23) from elbows (21).

(6) Remove packings (22 and 31) from elbows (21) and install protective caps on the open ends of the elbows to prevent system contamination.

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks, and stripped or crossed threads. Accomplish



1. HOSE ASSEMBLY
2. UNION (2)
3. ELBOW (2)
4. NUT (2)
5. BACK-UP RING (2)
6. PACKING (2)
7. PACKING (2)
8. SWIVEL JOINT (2)
9. BOLT (4)
10. HOSE ASSEMBLY
11. HOSE ASSEMBLY
12. SWIVEL JOINT (4)
13. HOSE ASSEMBLY
14. WASHER (4)
15. BRACKET
16. NUT (4)
17. WASHER (4)
18. NUT (4)
19. HOSE ASSEMBLY
20. AZIMUTH CYLINDER
21. ELBOW (2)
22. PACKING
23. FLOW REGULATOR VALVE (2)
24. PACKING
25. BACK-UP RING
26. NUT
27. ELBOW
28. NUT
29. CLAMP (2)
30. HOSE ASSEMBLY
31. PACKING
32. PACKING
33. BACK-UP RING
34. NUT
35. ELBOW
36. HOSE ASSEMBLY
37. SCREW
38. HOSE ASSEMBLY

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Figure 3-33. Azimuth Cylinder - Flow Regulator Valves and Swivel Joints Removal

operation and leakage tests as specified in table 3-3. If visual inspection discloses cracks or damaged threads, or if valve fails operation and leakage test, the valve must be replaced.

d. Assembly. None.

e. Installation. Install the regulator valve by reversing the sequence of the removal procedure.

CAUTION

Observe directional flow arrow on valves. Arrows must be pointing in same relative direction as shown in figure 3-33.

f. Installation Test and Inspection.

Start engine (refer to TM 9-1450500-10) and after initial warmup, actuate azimuth cylinder sufficiently to eliminate air in lines. Operation of azimuth cylinder should be as specified in TM 91450-500-10, and system should be free of leaks in areas where lines were disconnected.

3-23. Swivel Joints

a. Removal (fig. 3-33).

(1) Place vehicle in park position, fully retract extension and elevation cylinder pistons and cycle all manual control valves to relieve hydraulic system pressure.

(2) Disconnect hose assemblies (1 and 10) from unions (2), hose assemblies (19 and 38) from elbows (3) and hose assemblies (11 and 13) from swivel joints (12). Cap open ends of hose assemblies to prevent system contamination.

(3) Remove unions (2) and packings (7) from swivel joints (8).

Table 3-3. Testing Roll Cylinder and Azimuth Cylinder Flow Regulator Valves

Procedure	Normal indication	Probable defect.
	LEAKAGE TEST	
1. Plug outlet port and apply 4500 psig to the inlet port.	No external leakage or permanent set.	Valve body or seals faulty.
2. Apply 5 psig to the inlet port.	No external leakage.	Seals faulty.
	FLOW TEST	
3. Connect outlet port to a flowmeter and inlet port to pressure port of external fluid source.		
4. Apply 3000 psig.	Flow rate as stamped on regulator ± 20%.	Valve.
5. Vary pressure from 3000 to 1000 psig, then return to 3000 psig.	Flow rate remains constant throughout all pressure variations.	Valve

(4) Remove four each nut (18) and washer (17) from bolts (9) and remove swivel joints (8).

(5) Remove elbows (3) from swivel joints (8).

(6) Remove nuts (4), backup rings (5), and packings (6) from elbows (3).

(7) Remove nuts (16) and washers (14) and remove swivel joints (12).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Test the swivel joints as specified in table 3-4. Perform a visual inspection of swivel joints for cracks and stripped or crossed threads. If visual inspection discloses cracks or damaged threads, or if swivel joints fail to meet test requirements, they are to be replaced with new ones.

d. Assembly. None.

e. Installation. Install the swivel joints by reversing the sequence of the removal procedure.

f. Installation Test and Inspection. Start engine (refer to TM 9-1450500-10) and after initial warmup actuate extension, roll, elevation, and azimuth cylinders sufficiently to eliminate air in the lines. There should be no leaks at the swivel joints in the areas where the lines were disconnected.

3-24. Elevation Cylinder Flow Regulator Valves

a. Removal (fig. 3-34).

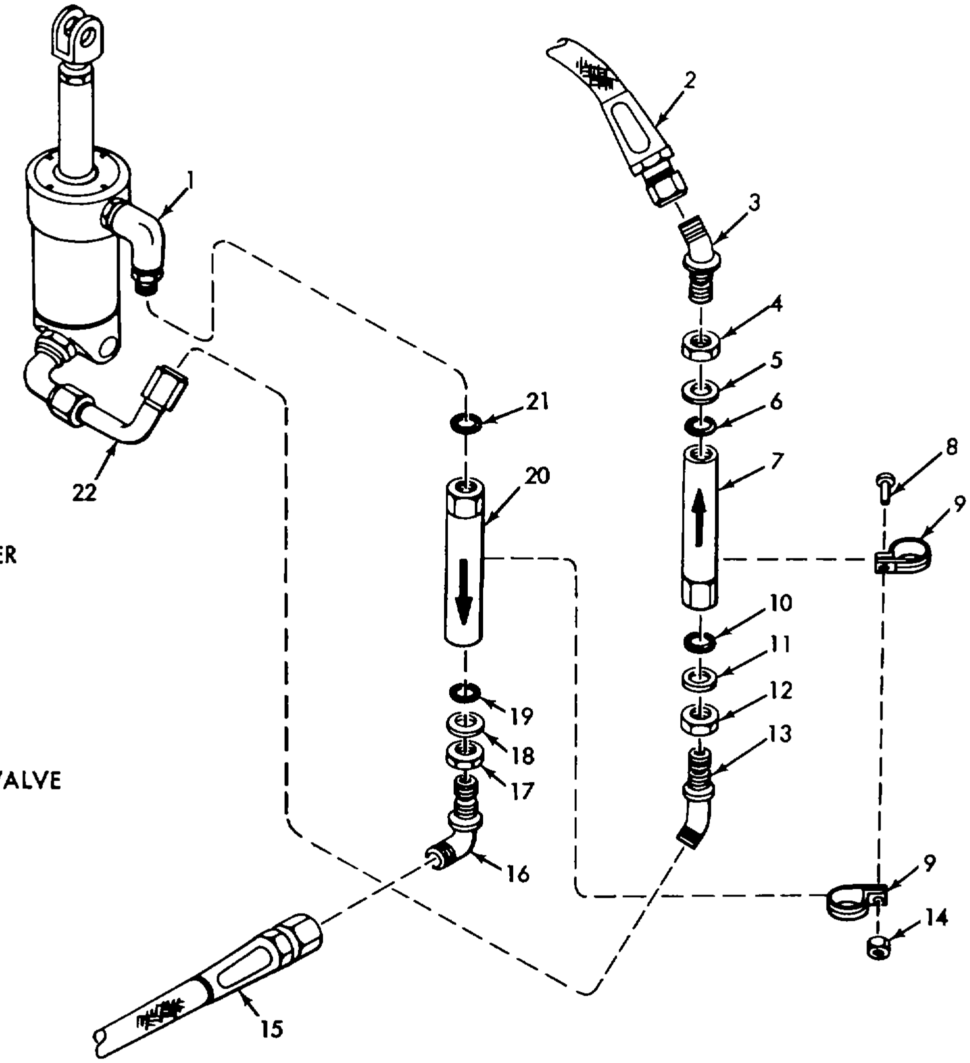
(1) Place vehicle in park position, fully retract elevation cylinder piston and cycle all manual control valves to relieve hydraulic system pressure.

(2) Disconnect hose assemblies (2 and 15) from elbows (3 and 16). Install protective caps on the open ends of the hose assemblies to prevent system contamination.

(3) Loosen nuts (4 and 17) and remove elbows (3 and 16), nuts (4 and 17), backup rings (5 and 18), and packings (6 and 19) from flow regulator valves (7 and 20).

Table 3-4. Testing Swivel Joint

Procedure	Normal indication	Probable defect.
	PROOF PRESSURE AND LEAKAGE TEST	
1. Plug movable port and apply 4500 psig to stationary port for two minutes (minimum).	No measurable external leakage, failure, or restriction of swivel action.	Joint body or seals faulty.
2. With pressure applied, rotate swivel port two complete revolutions (minimum).	No measurable external leakage, failure, or restriction of swivel action.	Joint body or seals faulty.



1. ELBOW AND REDUCER
2. HOSE ASSEMBLY
3. ELBOW
4. NUT
5. BACK-UP RING
6. PACKING
7. FLOW REGULATOR VALVE
8. SCREW
9. CLAMP (2)
10. PACKING
11. BACK-UP RING
12. NUT
13. ELBOW
14. NUT
15. HOSE ASSEMBLY
16. ELBOW
17. NUT
18. BACK-UP RING
19. PACKING
20. FLOW REGULATOR VALVE
21. PACKING
22. TUBE ASSEMBLY

ARROWS ON VALVES INDICATE
DIRECTION OF REGULATED FLOW

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Figure 3-34. Elevation Cylinder - Flow Regulator Valves Removal

(4) Remove nut (14) from screw (8) and remove clamps (9).

(5) Remove flow regulator valve (20) and remove packing (21) from reducer (1).

(6) Loosen nut (12) and remove flow regulator valve (7), packing (10) and backup ring (11) from elbow (13).

(7) Cap all ports.

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valves for cracks, stripped or crossed threads. Accomplish operation and leakage tests as specified in table 3-5. If visual inspection discloses cracks or damaged threads, or if the valves fail the operation and leakage test, the valves must be replaced.

d. Assembly. None.

e. Installation. Install the flow regulator valves by reversing the sequence of the removal procedure.

CAUTION

Observe directional flow arrow on valves. They must be pointing in same relative direction as shown in figure 3-34.

f. Installation Test and Inspection.

Start the engine (refer to TM 91450-500-10) and after initial warmup, actuate the elevation cylinder sufficiently to eliminate air from the lines. Operation of the elevation cylinder should be as specified in TM 9-1450-50010 and the system should be free of leaks in the areas where the lines were disconnected.

3-25. Roll Cylinder Flow Regulator Valves

a. Removal (fig. 3-35).

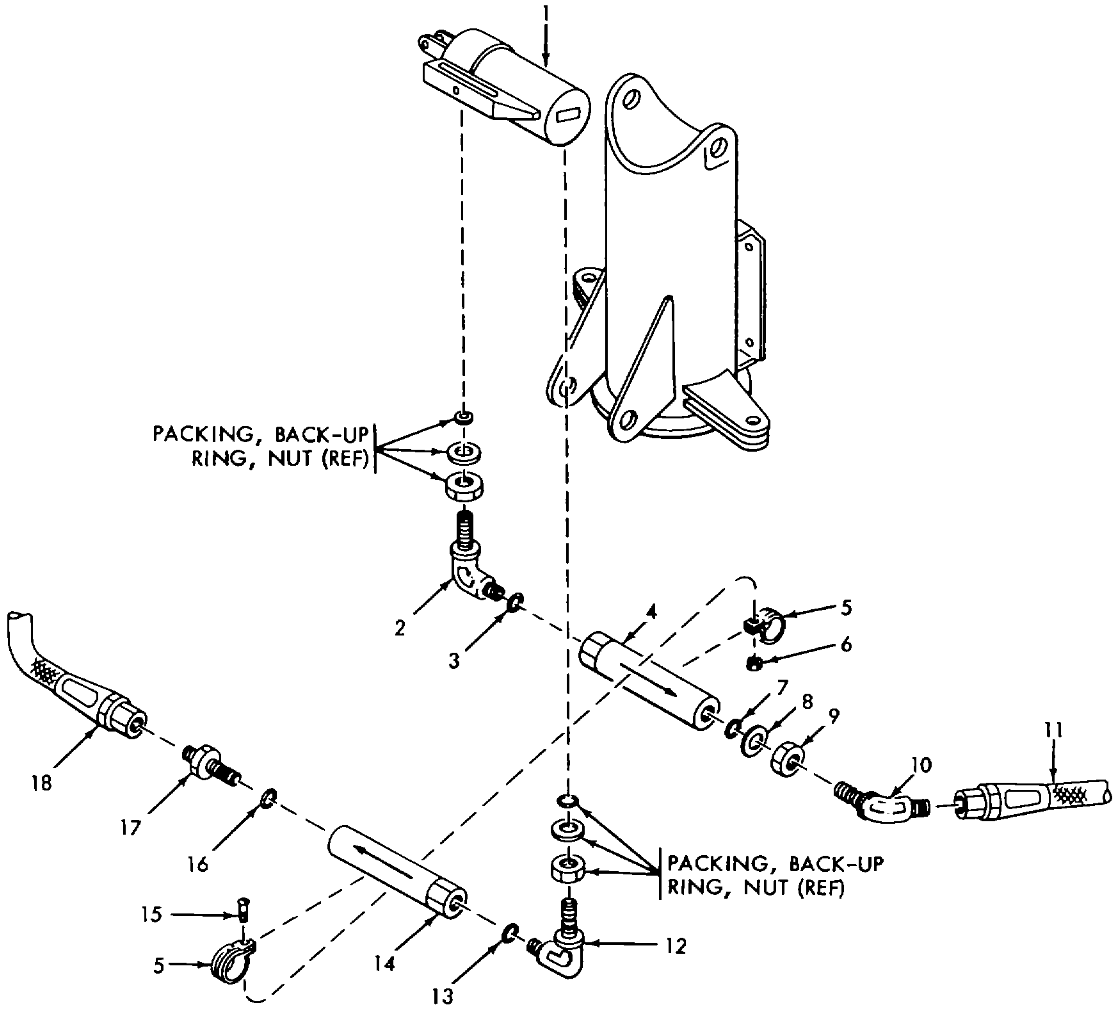
(1) Disconnect hose assemblies (11 and 18) from elbow (10) and union (17). Cap open ends of hose assemblies to prevent system contamination.

(2) Loosen nut (9) and remove elbow (10) with nut (9), backup ring (8), and packing (7); remove union (17) and packing (16) from valve (4).

(3) Remove nut (6) from screw (15) and remove clamp (5).

Table 3-5. Testing Elevation Cylinder Flow Regulator Valve

Procedure	Normal indication	Probable defect.
	LEAKAGE TEST	
1. Plug outlet port and apply 4500 psig to the inlet port.	No external leakage or permanent set.	Valve body or seals faulty.
2. Apply 5 psig to the inlet port.	No external leakage.	Seals faulty.
	FLOW TEST	
3. Connect outlet port to a flowmeter and inlet port to pressure port of external fluid source.		
4. Apply 3000 psig.	Flow rate as stamped on regulator +10%, -15%.	Valve.
5. Vary pressure from 3000 to 1000 psig, then return to 3000 psig.	Flow rate remains constant throughout all pressure variations.	Valve.



1. ROLL CYLINDER	8. BACK-UP RING	15. SCREW
2. ELBOW	9. NUT	16. PACKING
3. PACKING	10. ELBOW	17. UNION
4. FLOW REGULATOR VALVE	11. HOSE ASSEMBLY	18. HOSE ASSEMBLY
5. CLAMP (2)	12. ELBOW	
6. NUT	13. PACKING	
7. PACKING	14. FLOW REGULATOR VALVE	TA076729

Figure 3-35. Roll Cylinder - Flow Regulator Valves Removal

(4) Remove flow regulator valves (4 and 14) from elbows (2 and 12).

(5) Remove packings (3 and 13) from elbows (2 and 12).

(6) Install protective caps on open ends of elbows (2 and 12) to prevent system contamination.

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valves for cracks, stripped or crossed threads. Accomplish operation and leakage tests as specified in table 3-3. If visual inspection discloses cracks or damaged threads, or if the valves fail the operation and leakage test, the valves must be replaced.

d. Assembly. None.

e. Installation. Install the regulator valves by reversing the sequence of the removal procedure.

CAUTION

Observe directional flow arrow on valves. Arrows must point in same relative direction as shown in figure 3-35.

f. Installation Test and Inspection. Start the engine (refer to TM 9-1450-500-10) and after initial warmup, actuate roll cylinder sufficiently to eliminate air from lines. Operation of the roll cylinder should be as specified in TM 9-1450-500-10, and the system should be free of leaks in the areas where the lines were disconnected.

3-26. Hydraulic Controls Console Assembly

a. General. Figure 3-36 shows the hydraulic controls console in the open position and identifies each major interior component. Refer to this illustration for general orientation and identification of parts during disassembly and assembly procedures. Figures 3-37 through 3-43 respectively, isolate the pressure, return, roll, elevation, extension, azimuth, and thermal relief systems of the hydraulic console. Refer to these figures for specific orientation of parts installed in each of the systems. Complete disassembly procedures for the hydraulic controls console assembly are not provided. Remove components only as necessary to provide access to components to be inspected or replaced. Removal of rigid tube assemblies is considered straightforward and therefore no procedures are included. Only those procedures necessary to remove major components from the console assembly are included.

b. Removal.

(1) Place loader in park position. Refer to TM 9-1450-500-10.

(2) Shut down engine and cycle all control valves several times to dump pressure from all hydraulic systems.

(3) Loosen turnlock fasteners and raise console forward.

(4) Place a suitable container under flexible hose disconnect joints.

(5) Tag and disconnect flexible hoses from the console. Cap all openings.

(6) Disconnect all electrical leads from solenoid valves and starter switch and pull out wiring harness.

(7) Close the console and remove five screws and washers which secure console hinge to support frame. Remove console.

c. Inspection. Inspect the console for cracks, dents, and deformation. Small dents may be straightened using a hammer and a flat metal backup bar. Small cracks may be stop-drilled. If structural members of the console are twisted or bent excessively, the console assembly must be replaced. Replace broken turnlock fasteners.

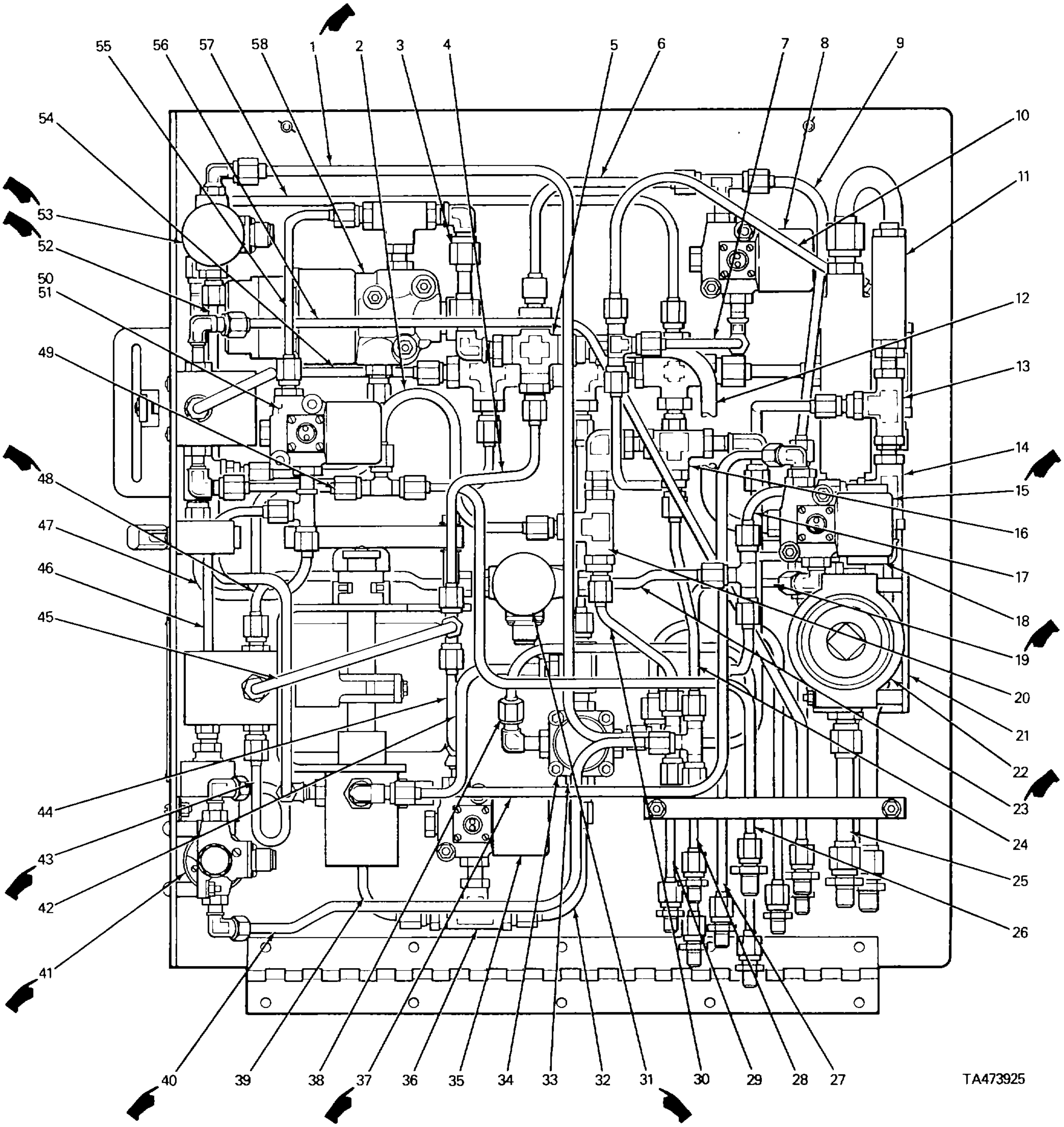


Figure 3-36. Hydraulic Control Console - Bottom View (Sheet 1 of 2)

Item Number	Name	Item Number	Name
1	TUBE ASSEMBLY, 11675162	30	TUBE ASSEMBLY, 10943702
2	TUBE ASSEMBLY, 10943692	31	VALVE, 8738105-1
3	TUBE ASSEMBLY, 10943676	32	TUBE ASSEMBLY, 10943710
4	TUBE ASSEMBLY, 10943690	33	VALVE, MS24423-4
5	VALVE, MS24423-6	34	VALVE, 10943585
6	TUBE ASSEMBLY, 10943674	35	VALVE, 8738105-1
7	TUBE ASSEMBLY, 10943672	36	VALVE, MS24423-4
8	VALVE, 8738105-1	37	TUBE ASSEMBLY, 11675163
9	TUBE ASSEMBLY, 10943677	38	TUBE ASSEMBLY, 10943707
10	TUBE ASSEMBLY, 10943673	39	TUBE ASSEMBLY, 10943711
11	VALVE, AN6245B4 (4000)	40	TUBE ASSEMBLY, 11675143
12	TUBE ASSEMBLY, 10943680	41	VALVE, 8738105-1
13	VALVE, MS24423-4	42	TUBE ASSEMBLY, 10943705
14	VALVE, MS24423-4	43	TUBE ASSEMBLY, 11675146
15	VALVE, 11675174	44	TUBE ASSEMBLY, 10943697
16	VALVE, MS24423-4	45	TUBE ASSEMBLY, 10943696
17	TUBE ASSEMBLY, 10943671	46	TUBE ASSEMBLY, 10943023
18	TUBE ASSEMBLY, 10943679	47	TUBE ASSEMBLY, 10944022
19	TUBE ASSEMBLY, 11675164	48	TUBE ASSEMBLY, 11675144
20	VALVE, MS24423-4	49	TUBE ASSEMBLY, 10943691
21	BRACKET, 10943559	50	VALVE, MS24423-4
22	FILTER, MS28720-8	51	VALVE, 8738105-1
23	TUBE ASSEMBLY, 11675145	52	TUBE ASSEMBLY, 11675161
24	TUBE ASSEMBLY, 10943695	53	VALVE, 8738105-1
25	TUBE ASSEMBLY, 10943688	54	TUBE ASSEMBLY, 10943693
26	TUBE ASSEMBLY, 10943684	55	TUBE ASSEMBLY, 10943885
27	TUBE ASSEMBLY, 10943682	56	TUBE ASSEMBLY, 10943683
28	TUBE ASSEMBLY, 10943686	57	TUBE ASSEMBLY, 10943675
29	TUBE ASSEMBLY, 10943703	58	VALVE, 11626026

Figure 3-36. Hydraulic Control Console - Bottom View (Sheet 2 of 2)

d. Installation.

NOTE

If console assembly is not removed from loader and replacement of console components is necessary, do not reinstall console until replacement of components is completed.

(1) Position console on support frame. Secure console hinge to support frame with five screws and washers.

(2) Raise console forward and connect all flexible hose assemblies. Remove tags.

(3) Route electrical leads to solenoid valves and starter

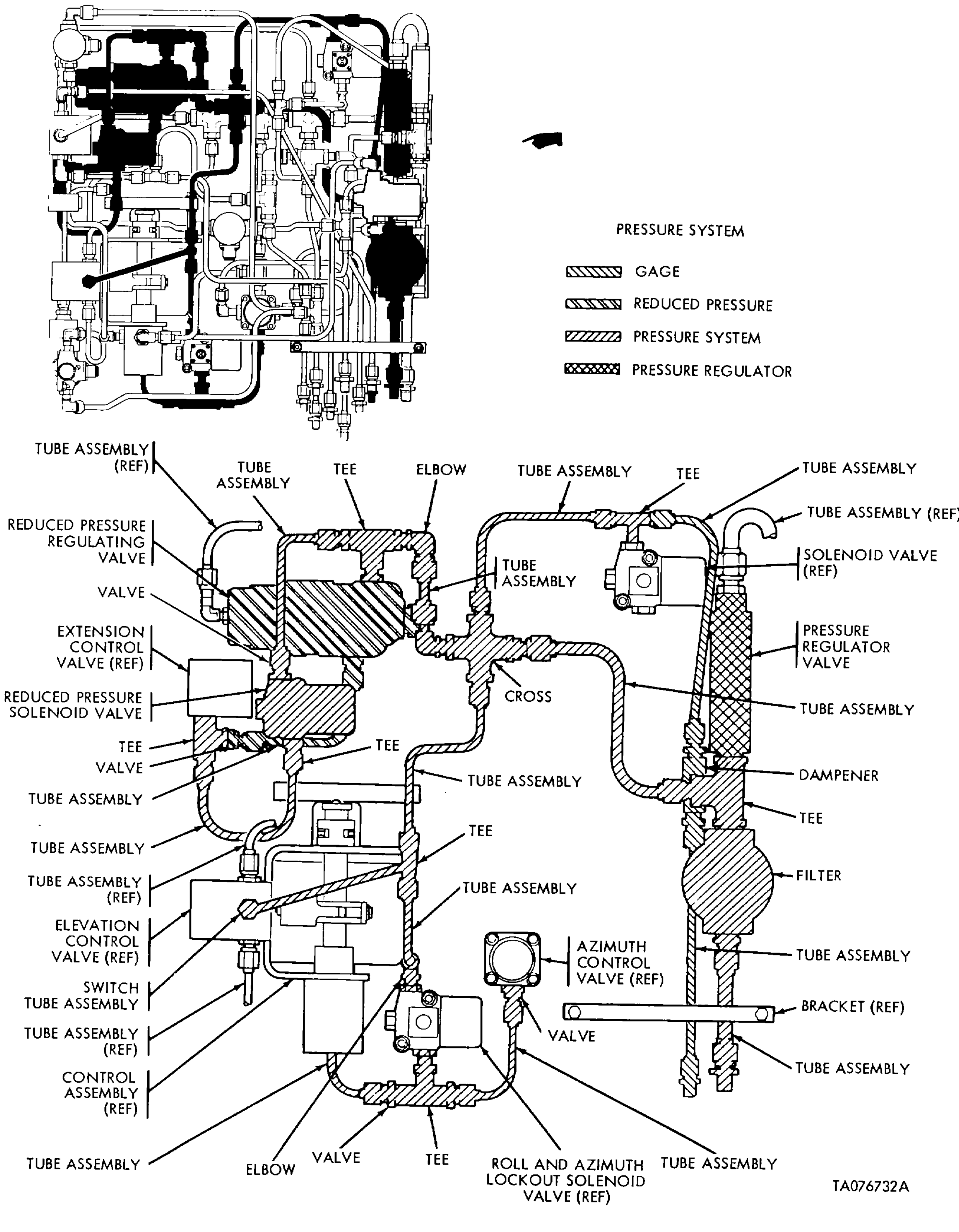


Figure 3-37. Hydraulic Control Console - Pressure System Flow Diagram

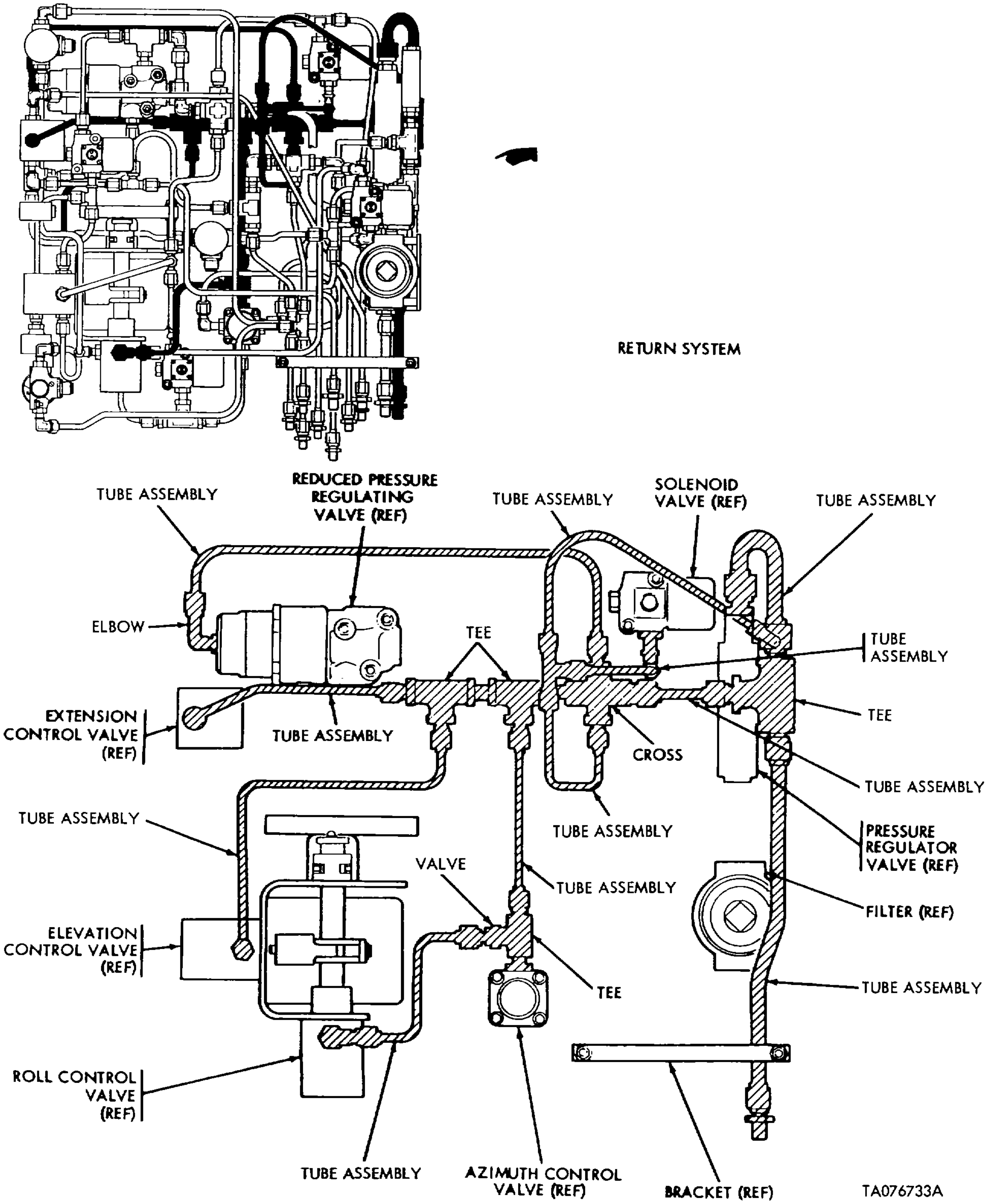


Figure 3-38. Hydraulic Control Console - Return System Flow Diagram

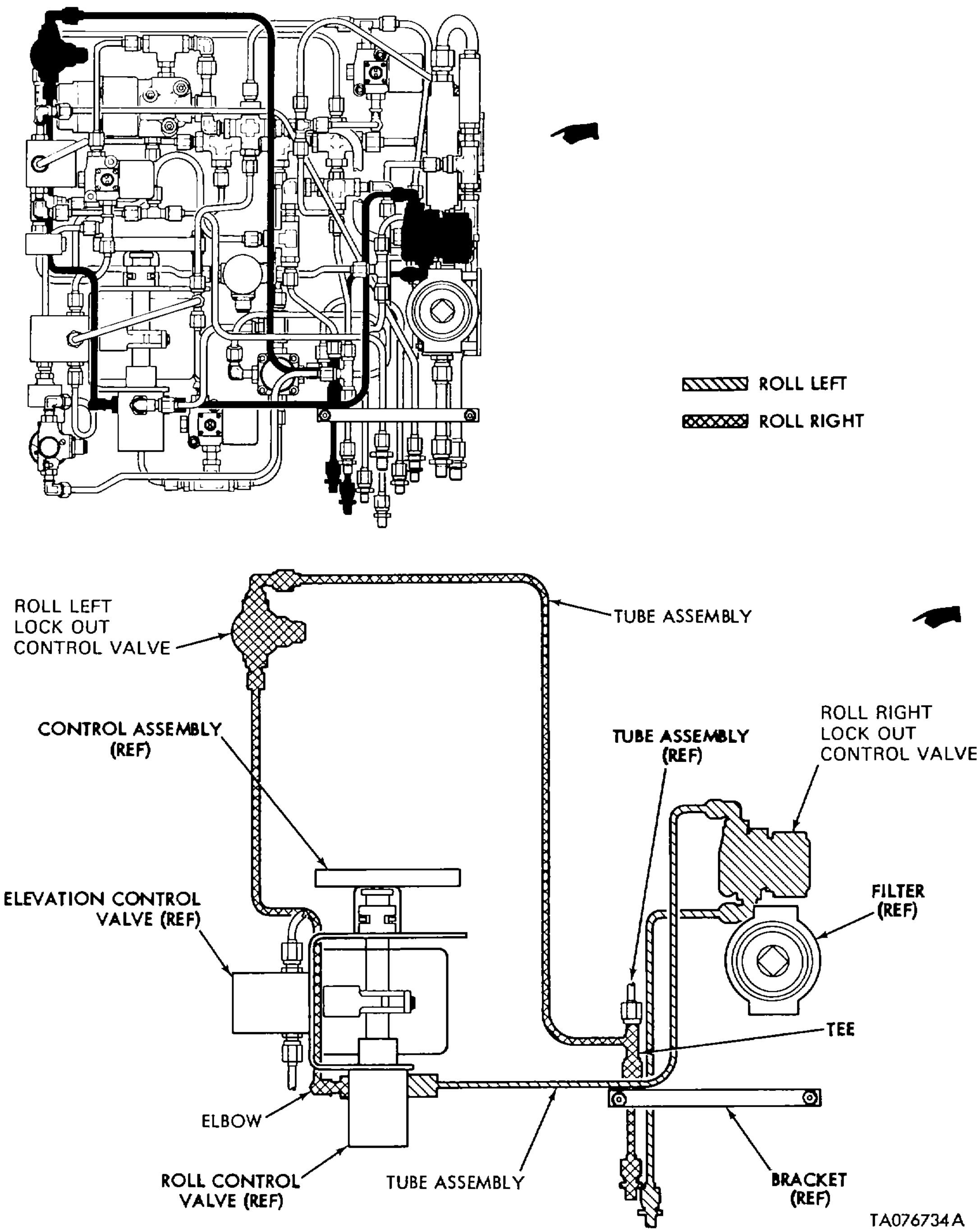


Figure 3-39. Hydraulic Control Console - Roll System Flow Diagram

switch and install all connectors. If necessary, refer to electrical schematic in TM 91450-500-20.

(4) Close console and place all hydraulic control levers in neutral position.

(5) Check fluid level in reservoir and start engine. Operate all hydraulic systems to verify satisfactory console replacement and system operation.

(6) Deleted.

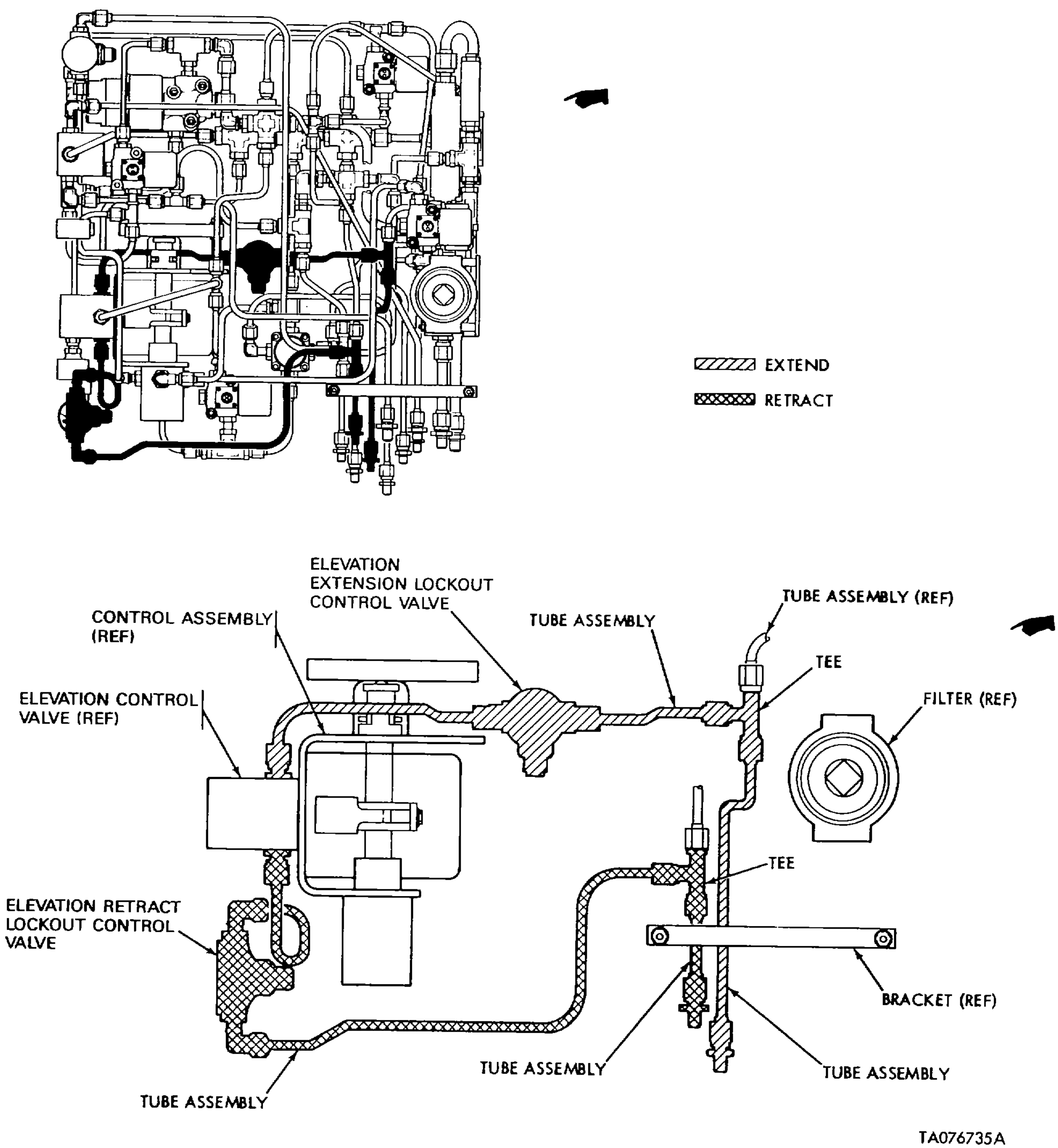


Figure 3-40. Hydraulic Control Console - Elevation System Flow Diagram

Check fluid level in reservoir and add fluid if necessary.

NOTE

After one hour of loader operation, replace the hydraulic filter element. Refer to TM 9-1450-500-20.

3-27. 615 PSI Pressure Regulator Valve

a. Removal (fig. 3-44).

(1) Disconnect tube assemblies (3, 10, 16, and 25) from the pressure regulator valve fittings.

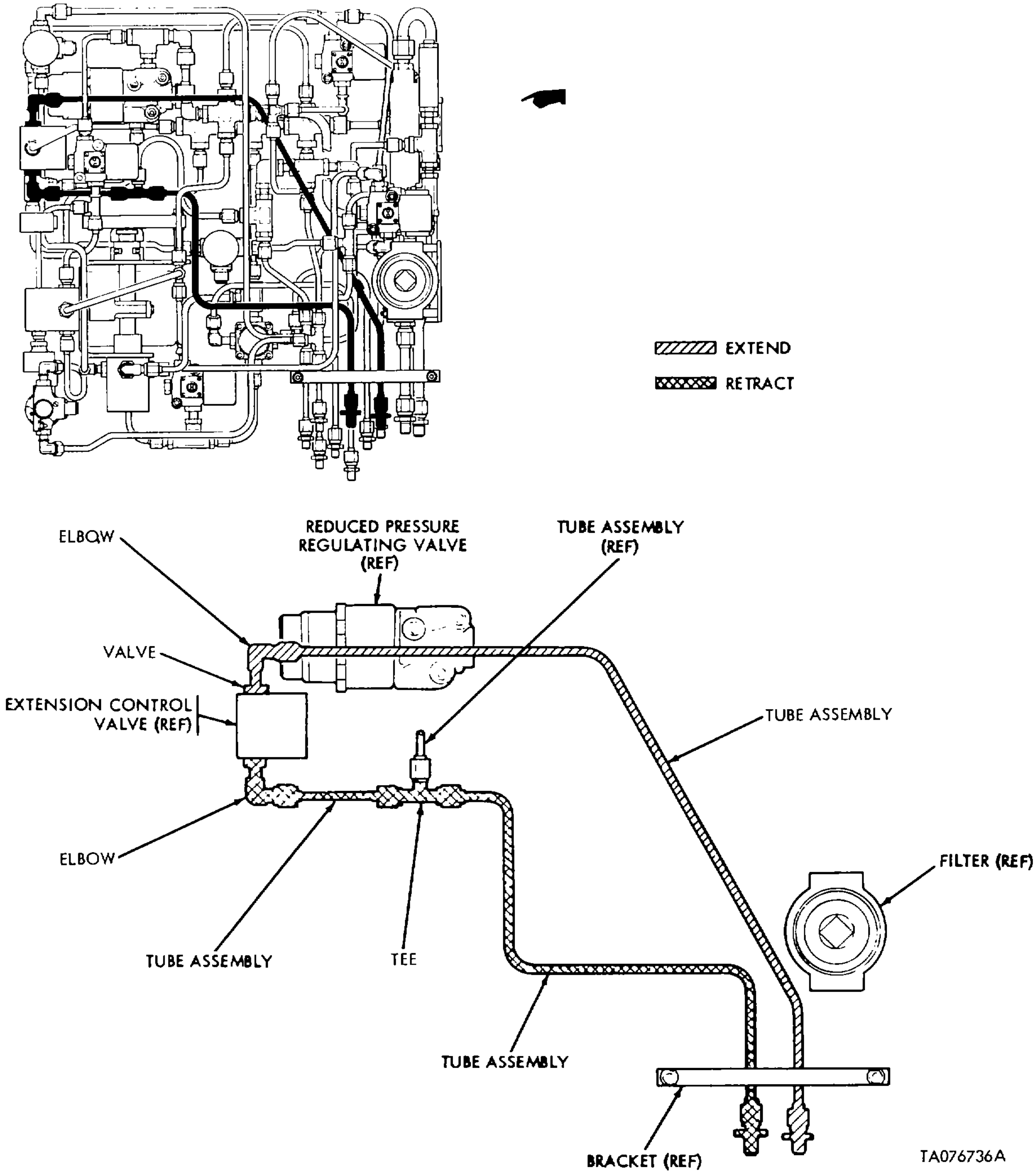


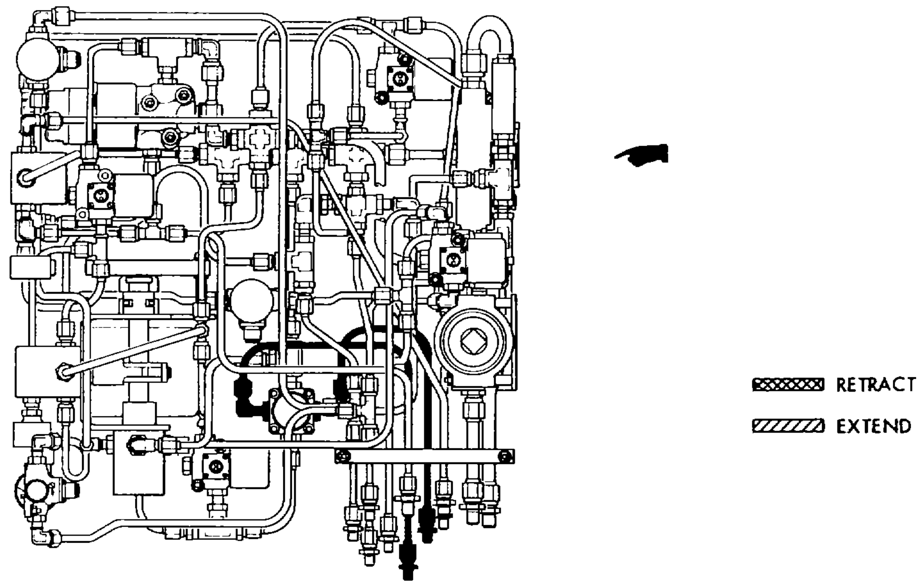
Figure 3-41. Hydraulic Control Console - Extension System Flow Diagram

(2) Unscrew three nuts (22) and remove three screws (1) and spacers (2).

(3) Remove pressure regulator valve (21).

(4) Remove tee (8) with reducer (9) and associated parts (4, 5, 6, 7, and 11).

(5) Remove union (12) with associated parts (11, 13, 14, and 15).



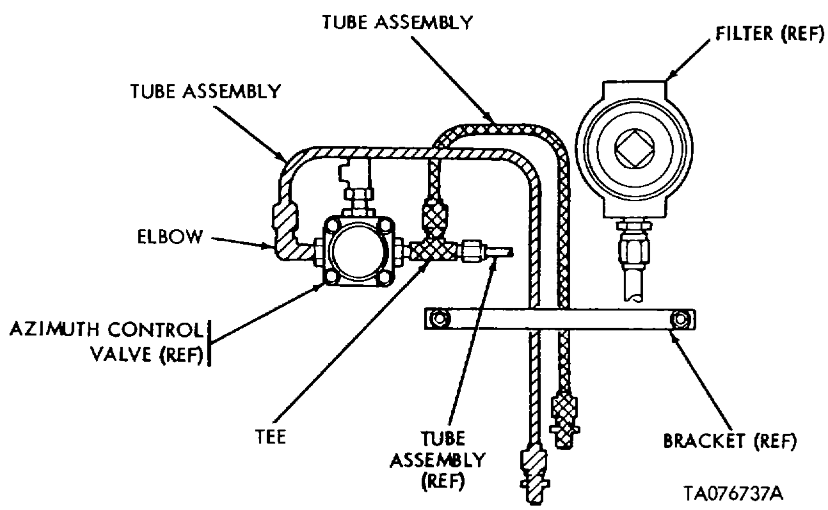


Figure 3-42. Hydraulic Control Console - Azimuth System Flow Diagram

(6) Remove elbow (17) with associated parts (18, 19 and 20).

(7) Remove reducer (24) and packing (23).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection for cracks and stripped or crossed threads. Accomplish an operation and leakage test as specified in table 3-6. If visual inspection discloses cracks or damaged threads, or if the pressure regulator valve fails the operation and leakage test, the valve must be replaced.

d. Assembly. None.

e. Installation. Install the 615 psi pressure regulator valve by reversing the sequence of the removal procedure.

f. Installation Test and Inspection. Start the engine (refer to TM 91450-500-10) and after initial

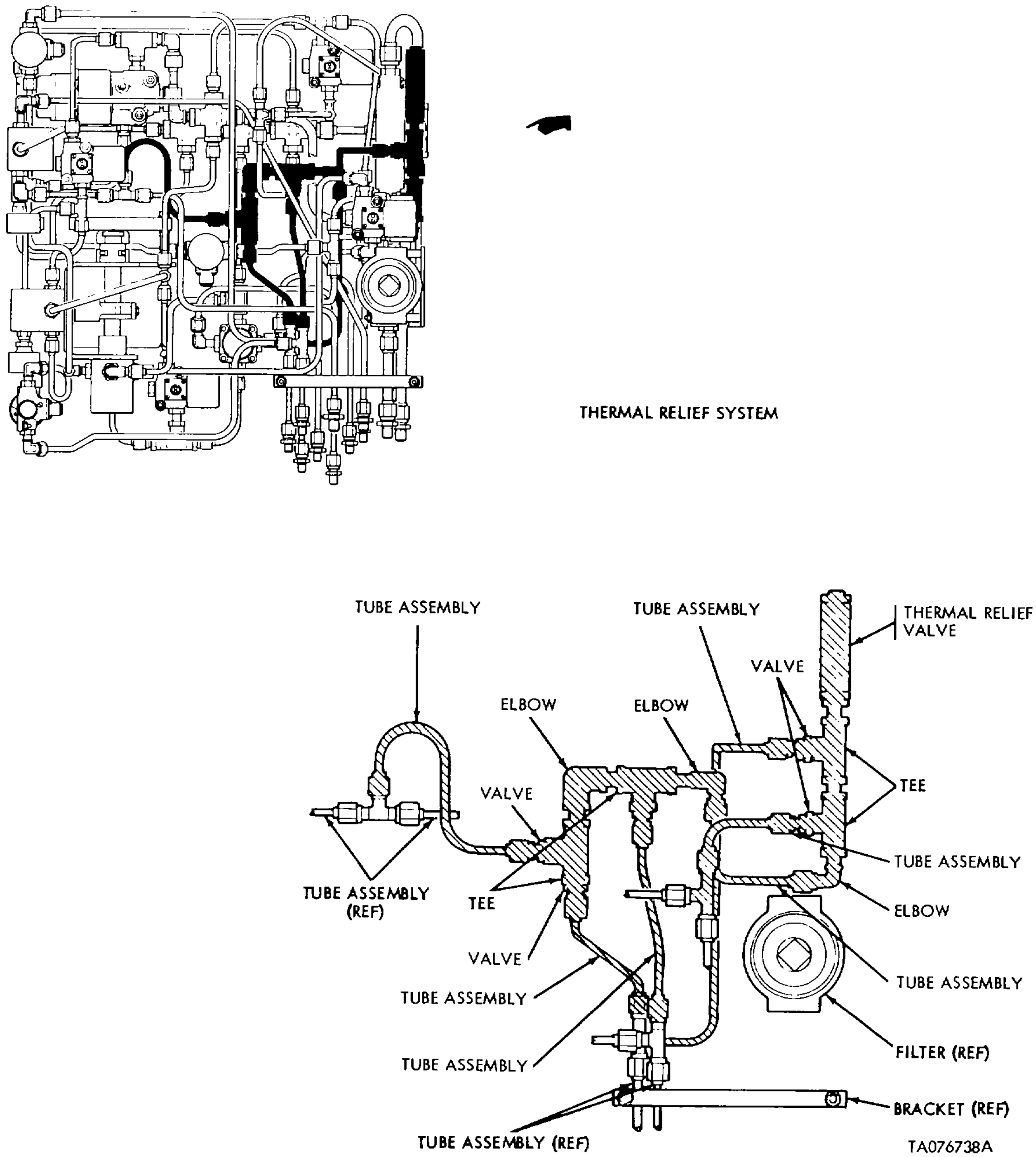


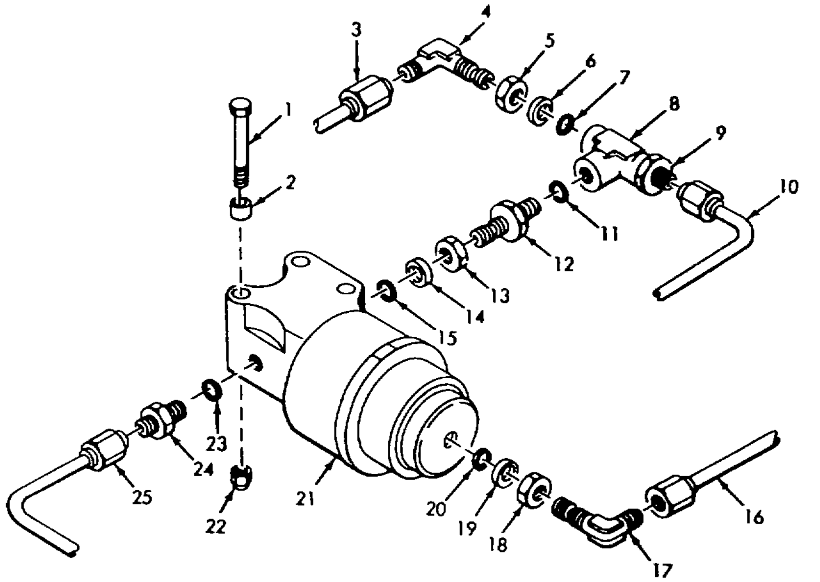
Figure 3-43. Hydraulic Control Console - Thermal Relief System Flow Diagram

warmup actuate the hydraulic system sufficiently to eliminate air from the lines. Operation of the hydraulic system should be as described in TM 9-1450-500-10, and the system should be free of leaks in the area where the lines were disconnected.

3-28. Roll and Azimuth Lockout Solenoid Valve and Azimuth Control Valve

a. Removal (fig. 3-45).

(1) Disconnect tube assemblies (36, 14, 15, 20, 27, 33, 3, and 1) from valves (9 and 35).



1. SCREW (3)
2. SPACER (3)
3. TUBE ASSEMBLY
4. ELBOW
5. NUT
6. BACK-UP RING
7. PACKING
8. TEE
9. REDUCER
10. TUBE ASSEMBLY
11. PACKING
12. UNION
13. NUT
14. BACK-UP RING
15. PACKING
16. TUBE ASSEMBLY
17. ELBOW
18. NUT
19. BACK-UP RING
20. PACKING
21. 615 PSI PRESSURE REGULATOR VALVE
22. NUT (3)
23. PACKING
24. REDUCER
25. TUBE ASSEMBLY

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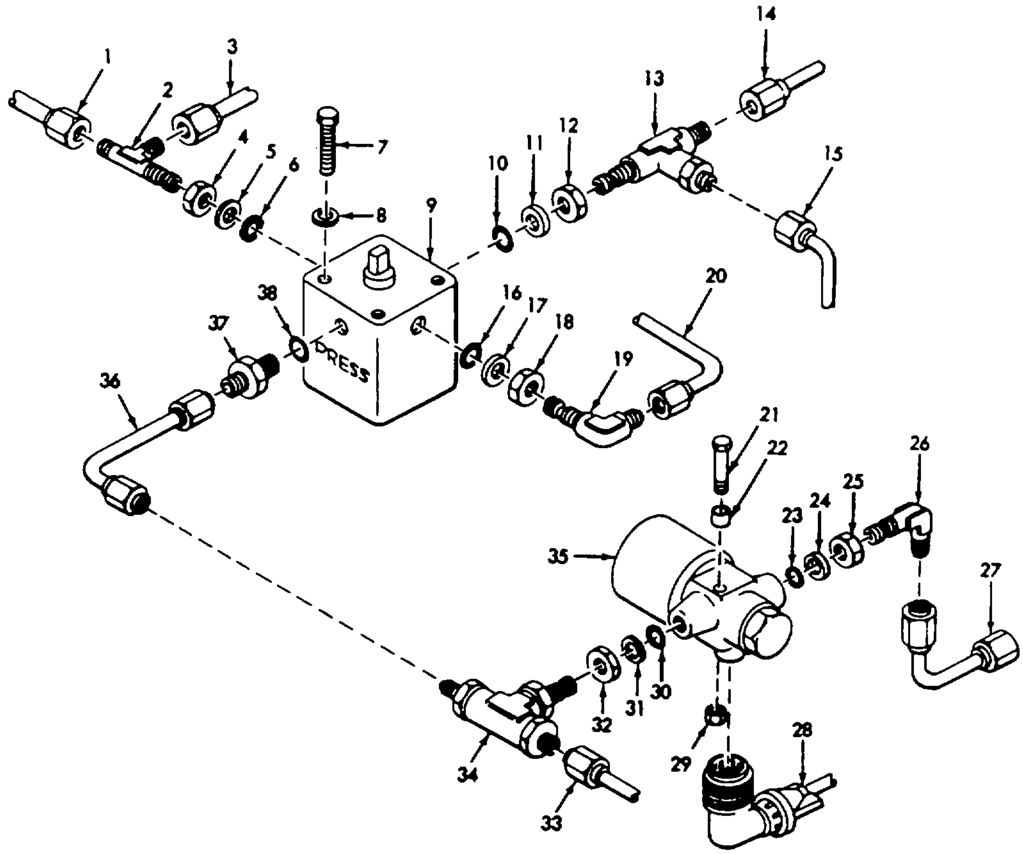
Figure 3-44. 615 PSI Pressure Regulator Valve Removal

Table 3-6. Testing 615 PSI Pressure Regulator Valve

Procedure	Normal indication	Probable defect.
	PROOF PRESSURE AND LEAKAGE TEST	
1. Plug return and outlet port and apply 4500 psig to inlet port.	No measurable external leakage, failure, or permanent set.	Valve body or seals faulty.
2. Remove pressure and plug inlet port.		
3. Remove plug from return port and apply 1500 psig to return port.	No measurable external leakage, failure, or permanent set.	Valve body or seals faulty.
	PRESSURE TEST	
4. Connect a gage at the outlet port and apply 3000 psig at a flow rate of 0.5 to 4.0 gpm to the inlet port.	Gage pressure reads 615 +10 psig.	Valve faulty.



1. TUBE ASSEMBLY
2. TEE
3. TUBE ASSEMBLY
4. NUT
5. BACK-UP RING
6. PACKING
7. SCREW (4)
8. LOCK WASHER
9. AZIMUTH CONTROL VALVE
10. PACKING
11. BACK-UP RING
12. NUT
13. TEE ASSEMBLY
14. TUBE ASSEMBLY
15. TUBE ASSEMBLY
16. PACKING
17. BACK-UP RING
18. NUT
19. ELBOW
20. TUBE ASSEMBLY
21. SCREW (2)
22. SPACER (2)
23. PACKING
24. BACK-UP RING
25. NUT
26. ELBOW
27. TUBE ASSEMBLY
28. ELECTRICAL CONNECTOR
29. NUT (2)
30. PACKING
31. BACK-UP RING
32. NUT
33. TUBE ASSEMBLY
34. TEE ASSEMBLY
35. ROLL AND AZIMUTH LOCKOUT SOLENOID VALVE
36. TUBE ASSEMBLY
37. VALVE
38. PACKING

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Figure 3-45. Roll and Azimuth Lockout Solenoid Valve and Azimuth Control Valve Removal

(2) Disconnect electrical connector (28) from solenoid valve (35).

(3) Disconnect control handle from valve. Refer to paragraph 3-32.

(4) Remove four each screw (7) and washers (8) and remove azimuth control valve (9).

(5) Remove tee assembly (13) with associated parts (10, 11, and 12), elbow (19) with associated parts (16, 17, and 18), tee (2) with associated parts (4, 5, and 6) and valve (37) with packing (38) from azimuth control valve (9).

(6) Remove two nuts (29), screws (21), and spacers (22) and remove solenoid valve (35).

(7) Remove elbow (26) with associated parts (23, 24, and 25), and tee assembly (34) with associated parts (30, 31, and 32) from solenoid valve (35).

Paragraph 3-28b deleted.

c. Inspection and Testing. Perform a visual inspection for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in tables 3-7 and 3-8. If visual inspection discloses cracks or damaged threads on the valve(8), they must be replaced. If the solenoid valve fails the operation or leakage test it must be replaced. If the control valve fails the operation or leakage test it may be disassembled and repaired.

d. Disassembly, Repair and Assembly of Azimuth Con trol Valve: There- are currently two types of valves that may be installed on the vehicle. One is manufactured by Benton Division of Ambac Industries and the other by Barksdale Valve. The valves are labeled according to their manufacturer and each valve requires a slightly different procedure and different parts. Follow the procedure that is for the valve you are to disassemble and repair.

(1) Control valves manufactured by Benton Division of Ambac Industries.

(a) Remove four cap screws and remove the cover.

(b) Remove flat valve from shaft. Check for scoring between the holes on the inside valve surface. If the scratches on the flat valve are deep, do not continue with this repair. Discard the 4-Way Control Valve.

(c) Remove the piston valves, marking the holes from which the valves were re-

Table 3-7. Testing Roll and Azimuth Lockout Solenoid Valve and Reduced Pressure Solenoid Valve (NO)

Procedure	Normal indication	Probable defect.
	PROOF PRESSURE AND LEAKAGE TEST	
1. Plug outlet port and apply 4500 psig to inlet port for 2 minutes (minimum).	No evidence of permanent deformation, malfunction, or external leakage.	Valve body or seals.
	INTERNAL LEAKAGE TEST	
2. Remove pressure and remove plug from outlet port.		
3. Apply 3000 psig to inlet port.		
4. Apply 18 volts dc to solenoid connector pins.	Internal leakage does not exceed 5 cc/minute during third minute after two-minute wait.	Seals faulty.
5. Reduce pressure to 250 psig and apply for 2 minutes.	Internal leakage does not exceed 5 cc/minute.	Seals faulty.

moved. Keep the spring washers with their original piston valves. Check the piston valve faces for scoring. If the scratches on the piston valves are deep, do not continue with this repair. Discard the 4-Way Control Valve.

NOTE

Some valves may contain four pistons. If this is the case, remove the piston from the return port. No piston is required on the return port.

(d) The following parts will be required for the repair of this valve:

NSN	PN	NOMENCLATURE	QTY
5330-00-248-3832	MS29513-007	Packing, preformed	3
5330-00-584-0266	MS28775-10	Packing, preformed	1
5330-00-894-1954	MS28774-007	Packing, preformed	3
5330-00-777-6348	MS29513-031	Packing, preformed	1

(e) Remove the preformed packing and the teflon retainer from each piston valve and replace with packing 5330-00-248-3832 and 5530-00-894-1954.

(f) Remove woodruff key from shaft.

(g) Remove snap ring.

(h) Remove steel ring underneath snap ring.

(i) Remove the shaft and replace shaft preformed packing with packing NSN 5330-00-584-0266.

(j) Replace cover preformed packing with packing NSN 5330-00-777-6348.

(k) Reassemble the 4-Way Control Valve in reverse order. Make sure that the flat valve stop pin is positioned so that the stop is between the two housing pins. Then, the shaft will have a turning radius of about 60 degrees.

(2) Control valves manufactured by Barksdale Valve.

(a) Remove safety wire.

(b) Punch out the pin on the bottom of the valve that connects the stop with the shaft. Remove the stop from the shaft.

(c) Remove the cap bolts.

(d) Remove the roller bearing cup.

(e) Check the flat valve for scoring between the holes on the inside surface. If the scratches are deep, do not continue with this repair. Discard the 4-Way Control Valve.

(f) Remove the piston valves, marking the holes from which the valves were removed. Keep the washers with their original valves. Check the piston valves for scoring. If the scratches on the piston valves are deep, do not continue with this repair. Discard the 4-Way Control Valve.

(g) The following parts will be required for the repair of this valve:

NSN	PN	NOMENCLATURE	QTY
5330-00-842-5505	219130131	Retainer, packing	4
5330-00-584-0266	MS28775-010	Packing, preformed	4
5330-00-265-1086	MS29513-130	Packing preformed	1

(h) Remove the preformed packing and retainer from each piston valve and replace with retainer NSN 533000-842-5505 and packing NSN 5330-00-584-0266.

(i) Remove the preformed packing and the teflon retainer from the shaft and replace with retainer NSN 533000-842-5505 and packing NSN 5330-00-584-0266.

(j) Replace the preformed packing on the housing insert with packing NSN 5330-00-265-1086.

(k) Reassemble the 4-Way Control Valve in reverse order, making sure that the flat stop cups the stop pin on the valves base. Then, the shaft will have a turning radius of about 60 degrees.

d.1. Test. Apply the proof pressure and leakage test and the internal leakage test on page 3-67 to each valve. When the valve is under pressure, it should take 20 inch pounds to turn the shaft (handle).

e. Installation. Install the valves by reversing the sequence of the removal procedure.

3-29. Extension Control Valve

a. Removal (fig. 3-46).

(1) Disconnect tube assemblies (1, 14, 23, 28, and 30) from valve (29).

(2) Disconnect control handle from valve. Refer to paragraph 3-32.

(3) Remove four each screw (20) and lock washer (19) and remove extension control valve (29) from console.

(4) Remove valve (2) with packing (3) from tee (4).

(5) Loosen nut (5) and remove tee (4) with associated parts (5, 6, and 7) from elbow (8).

(6) Remove elbow (8) and packing (9).

Table 3-8. Testing Extension, Elevation, Roll, and Azimuth Control Valves

Procedure	Normal indication	Probable defect.
	PROOF PRESSURE AND LEAKAGE TEST	
1. Plug CYL 1 and CYL 2 ports.		
2. Position shaft to fully clockwise position and apply 4500 psig to PRES port.	No external leakage or damage after 1 minute.	Valve body or seals faulty.
3. Position shaft to center position (neutral).	No external leakage or damage after 1 minute.	Valve body or seals
4. Position shaft to fully counterclockwise position.	No external leakage or damage after 1 minute.	Valve body or seals
5. Remove pressure and plug PRES port.		
6. Apply 1500 psig to RET port.	No external leakage or damage	Valve body or seals faulty.
7. Position shaft to center position	No external leakage or damage.	Valve body or seals faulty.
8. Position shaft to fully clockwise position.	No external leakage or damage.	Valve body or seals faulty.
9. Reduce pressure to 5 psig.	No external leakage.Seals faulty.	
10. Position shaft to center position.	No external leakage.	Seals faulty.
11. Position shaft to fully counterclockwise position.	No external leakage.	Seals faulty.
	INTERNAL LEAKAGE TEST	
12. Remove pressure from RET port and plugs from CYL 1, CYL 2, and PRES ports.		
13. Position shaft to center position and apply 3000 psig to PRES port.	No external leakage. Total maximum internal leakage of one drop per minute after 3-minute seating period.	Seals faulty.
14. Remove pressure and plug CYL 1 and CYL 2 ports.		
15. Position shaft to fully clockwise position.		
16. Apply 3000 psig to PRES port.	No external leakage. Total maximum internal leakage of one drop per minute after 3-minute seating period.	Seals faulty.

Table 3-8. Testing Extension, Elevation, Roll, and Azimuth Control Valves - Continued

Procedure	Normal indication	Probable defect.
	INTERNAL LEAKAGE TEST - Continued	
17. Position shaft to fully counterclockwise-position.	No external leakage. Total maximum internal leakage of one drop per minute after 3-minute seating period.	Seals faulty.

(7) Loosen nut (11) and remove union (10) with associated parts (11, 12, and 13) from valve (29).

(8) Loosen nut (16) and remove elbow (15) with associated parts (16, 17, and 18) from valve (29).

(9) Remove valve (22) with packing (21) from valve (29).

(10) Loosen nut (26) and remove elbow (27) with associated parts (24, 25, and 26) from valve (29).

Paragraph 3-29b deleted.

c. Inspection and Testing. Perform a visual inspection of all parts for cracks and stripped or crossed threads. Accomplish an operation and leakage test as specified in table 3-8. If visual inspection discloses cracks or damaged threads, the valve must be replaced. If the valve fails the operation and leakage test, it may be disassembled and repaired.

d. Disassembly, Repair and Assembly. Refer to paragraph 3-28d.

d.1. Test. Refer to paragraph 3-28d.

e. Installation. Install the control valve by reversing the sequence of the removal procedure.

3-30. Roll Control Valve and Elevation Control Valve

a. Removal (Fig. 3-69).

(1) Disconnect tube assemblies (1, 4, 33, and 38) from roll control valve (39).

(2) Disconnect tube assemblies (16, 17, 23, and 26) from elevation control valve (20).

(3) Remove four each screw (27) and washer (28) and remove roll control valve (39) from bracket (9).

(4) Remove elbow (5) with associated parts (6, 7, and 8) from roll control valve.

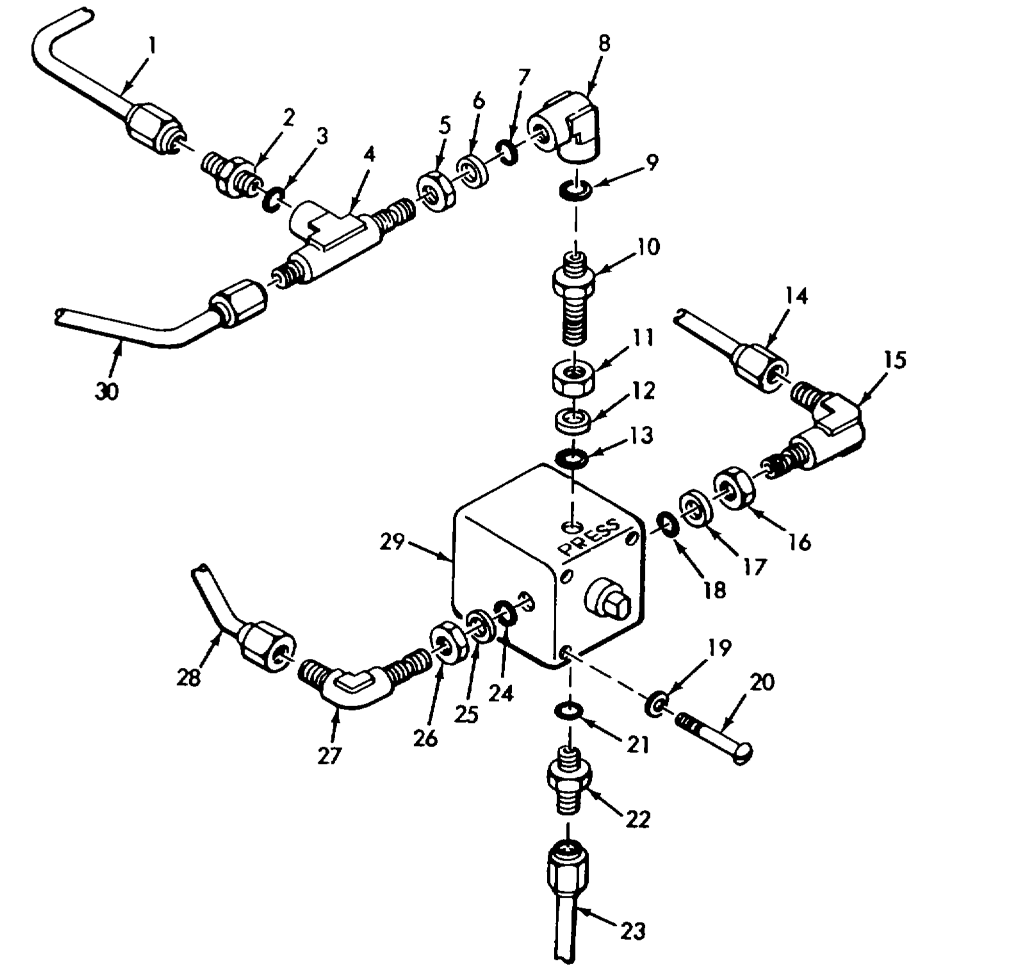
(5) Remove union (2) with packing (3) from roll control valve.

(6) Remove elbow (37) with associated parts (34, 35, and 36) from roll control valve.

(7) Remove elbow (32) with associated parts (29, 30, and 31) from roll control valve.

(8) Remove extension (24, fig. 3-48) from control valve.

(9) Disconnect lever from elevation control valve shaft. Refer to paragraph 3-32.



1. TUBE ASSEMBLY	11. NUT	21. PACKING
2. VALVE	12. BACK-UP RING	22. VALVE
3. PACKING	13. PACKING	23. TUBE ASSEMBLY
4. TEE	14. TUBE ASSEMBLY	24. PACKING
5. NUT	15. ELBOW	25. BACK-UP RING
6. BACK-UP RING	16. NUT	26. NUT
7. PACKING	17. BACK-UP RING	27. ELBOW
8. ELBOW	18. PACKING	28. TUBE ASSEMBLY
9. PACKING	19. LOCKWASHER (4)	29. EXTENSION CONTROL VALVE
10. UNION	20. SCREW (4)	30. TUBE ASSEMBLY

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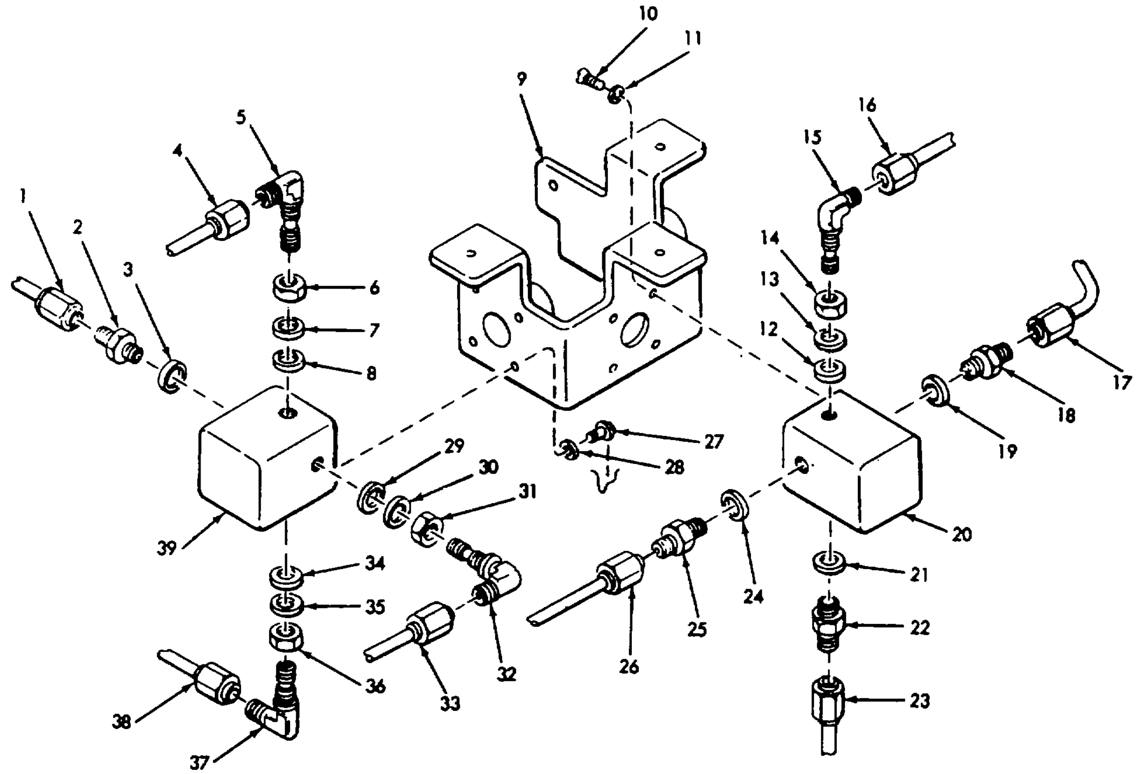
Figure 3-46. Extension Control Valve Removal

(10) Remove four each screw (10) and lockwasher (11) and remove elevation control valve (20) from bracket (9).

(11) Remove elbow (15) with associated parts (14, 13, and 12) from elevation control valve.

(12) Remove unions (18 and 25) with their respective packings (19 and 24) from elevation control valve.

(13) Remove valve (22) and packing (21) from elevation control valve.



1. TUBE ASSEMBLY
2. UNION
3. PACKING
4. TUBE ASSEMBLY
5. ELBOW
6. NUT
7. BACK-UP RING
8. PACKING
9. BRACKET
10. SCREW (4)
11. LOCKWASHER (4)
12. PACKING
13. BACK-UP RING
14. NUT
15. ELBOW
16. TUBE ASSEMBLY
17. TUBE ASSEMBLY
18. UNION
19. PACKING
20. ELEVATION CONTROL VALVE
21. PACKING
22. VALVE
23. TUBE ASSEMBLY
24. PACKING
25. UNION
26. TUBE ASSEMBLY
27. SCREW (4)
28. WASHER (4)
29. PACKING
30. BACK-UP RING
31. NUT
32. ELBOW
33. TUBE ASSEMBLY
34. PACKING
35. BACK-UP RING
36. NUT
37. ELBOW
38. TUBE ASSEMBLY
39. ROLL CONTROL VALVE

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Figure 3-47. Roll and Elevation Control Valves Removal'

Paragraph 3-30b deleted.

c. Inspection and Testing. Perform a visual inspection of the valves for cracks and stripped or crossed threads. Accomplish an operation and leakage test as specified in table 3-8. If visual inspection discloses cracks or damaged threads, the valve must be replaced. If the control valve(s) fail the operation and leakage test, they may be disassembled and repaired.

d. Disassembly, Repair and Assembly. Refer to paragraph 3-28d.

d1. Test. Refer to paragraph 3-28d.

e. Installation. Install valves by reversing the sequence of the removal procedure.

3-31. Hydraulic Control Console Assembly Control Linkage

a. Removal (fig. 3-48).

(1) Remove grip (1). Remove boot. Refer to paragraph 3-32.

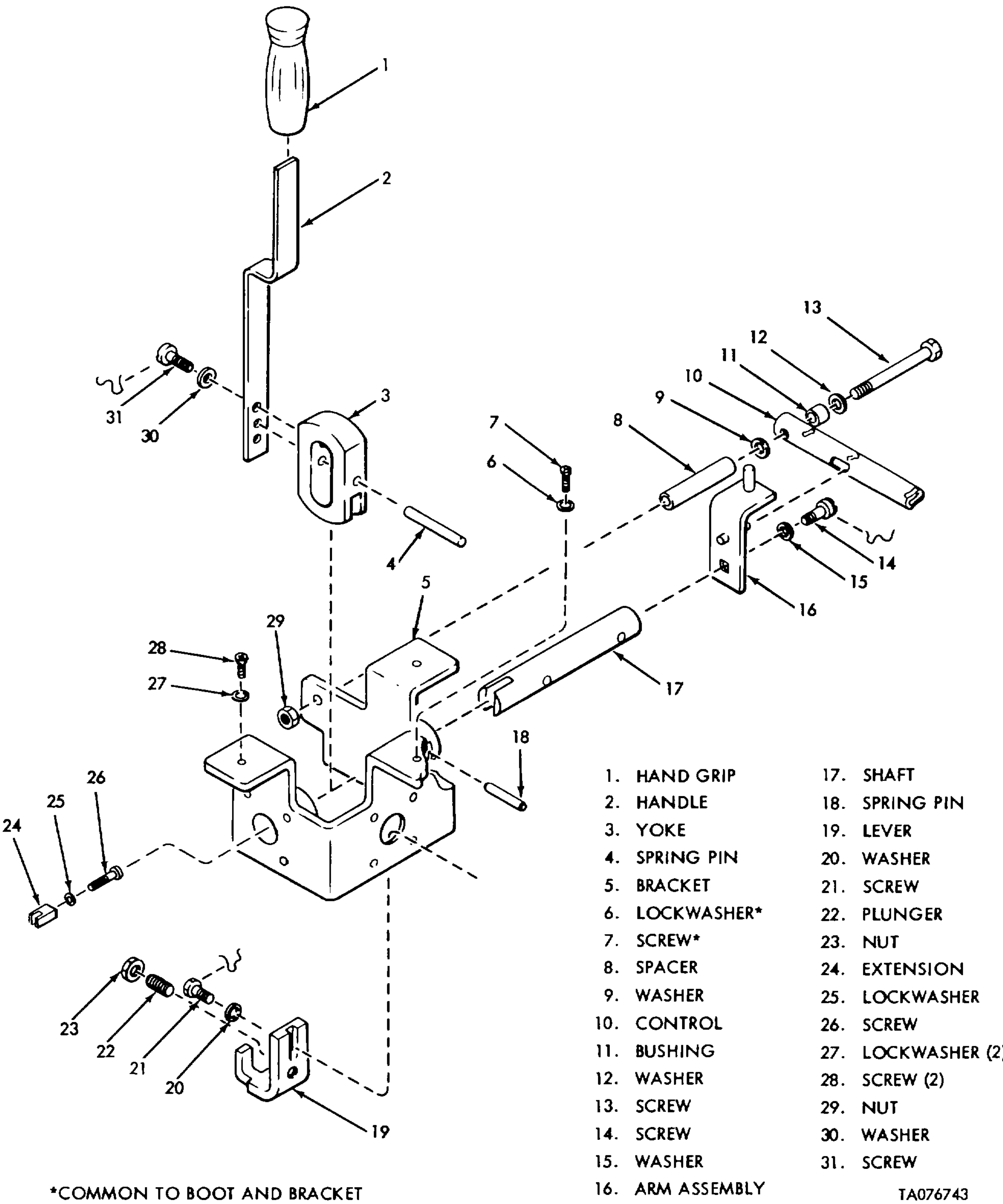


Figure 3-48. Hydraulic Control Console - Control Linkage Removal

(2) Remove two screws (28), two lockwashers (27), and remove control linkage and bracket assembly from console.

(3) Remove screw (31) with washer (30) and remove handle (2).

(4) Remove roll control valve. Refer to paragraph 3-30.

(5) Remove screw (21) with washer (20) and remove lever (19).

(6) Remove elevation control valve. Refer to paragraph 3-30.

NOTE

Do not remove hydraulic fittings from roll and elevation control valve ports.

b. Disassembly.

(1) Loosen nut (23) and remove plunger (22) from level (19). Remove extension.(24), lockwasher (25), and screw (26) from roll control valve shaft.

(2) Remove pin (4) to release yoke (3) from shaft (17).

(3) Remove nut (29) from screw (13) and remove screw (13), spacer (8), washer (9), control (10), bushing (11), and washer (12) from bracket (5).

(4) Remove pin (18); remove shaft (17) with arm assembly (16) from bracket (5) and yoke (3).

(5) Remove screw (14) with washer (15) and remove arm assembly (16) from shaft (17).

c. Inspection. Inspect the linkage for cracks, deformation, and mounting holes for crossed or stripped threads. Inspect all moving parts for excessive wear. If the wear limits specified in figure 3-49 are exceeded, the defective part must be replaced.

NOTE

If plunger (22) is excessively worn, its detenting action will be affected. Consideration for replacing worn or inoperative plungers should be made before reassembling control linkage.

d. Assembly.

(1) Position yoke (3) in bracket (5) and insert shaft (17) through bracket (5) and yoke (3). Secure shaft (17) to bracket (5) with pin (18).

(2) Assemble arm assembly (16) to shaft (17) with screw (14) and washer (15).

(3) Safety tie screw (14) to arm assembly (16) with lockwire.

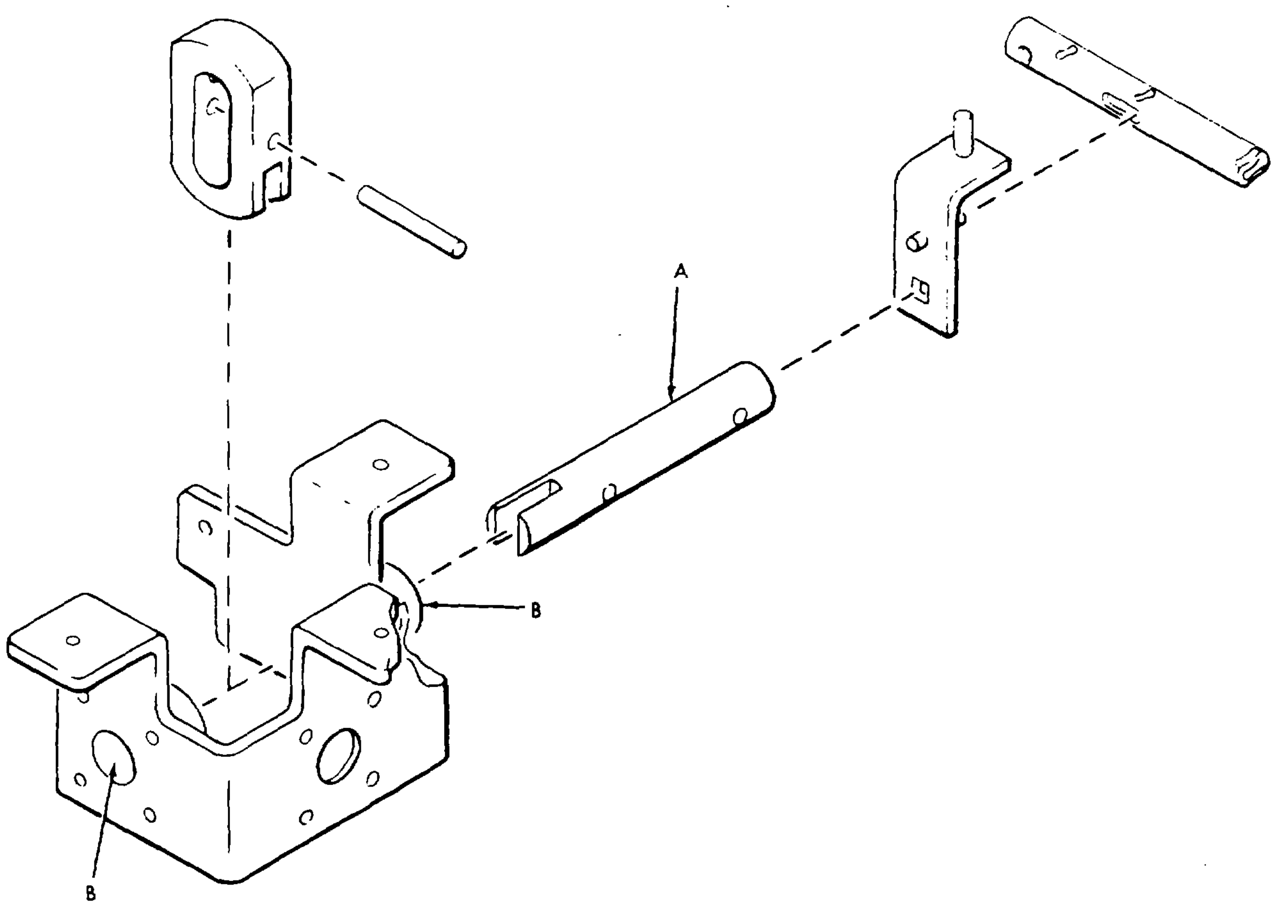
(4) Install pin (4) through yoke (3) and shaft (17).

(5) Assemble washer (12), bushing (11), control (10), washer (9), and spacer (8) to screw (13) and install to bracket (5). Engage pin of arm assembly (16) in hole of control (10) and secure with nut (29).

(6) Install extension (24), washer (25), and screw (26) on roll control valve shaft and install roll and elevation control valves. Refer to paragraph 3-30.

(7) Install lever (19) to elevation control valve shaft using washer (20) and screw (21). Safety tie screw (21) to lever (19) with lockwire.

(8) Install handle (2) using washer (30) and screw (31)



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS (FIELD)
A	DIAMETER OF SHAFT	0.745 TO 0.742	0.722
B	INSIDE DIAMETER OF BORE	0.749 TO 0.755	0.775

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Figure 3-49. Hydraulic Control Console - Control Linkage Wear Limits

on yoke (3). Safety tie screw (31) to yoke using lockwire.

(9) Install plunger (22) and secure in position with nut (23).

NOTE

Adjust plunger (22) for proper detenting.

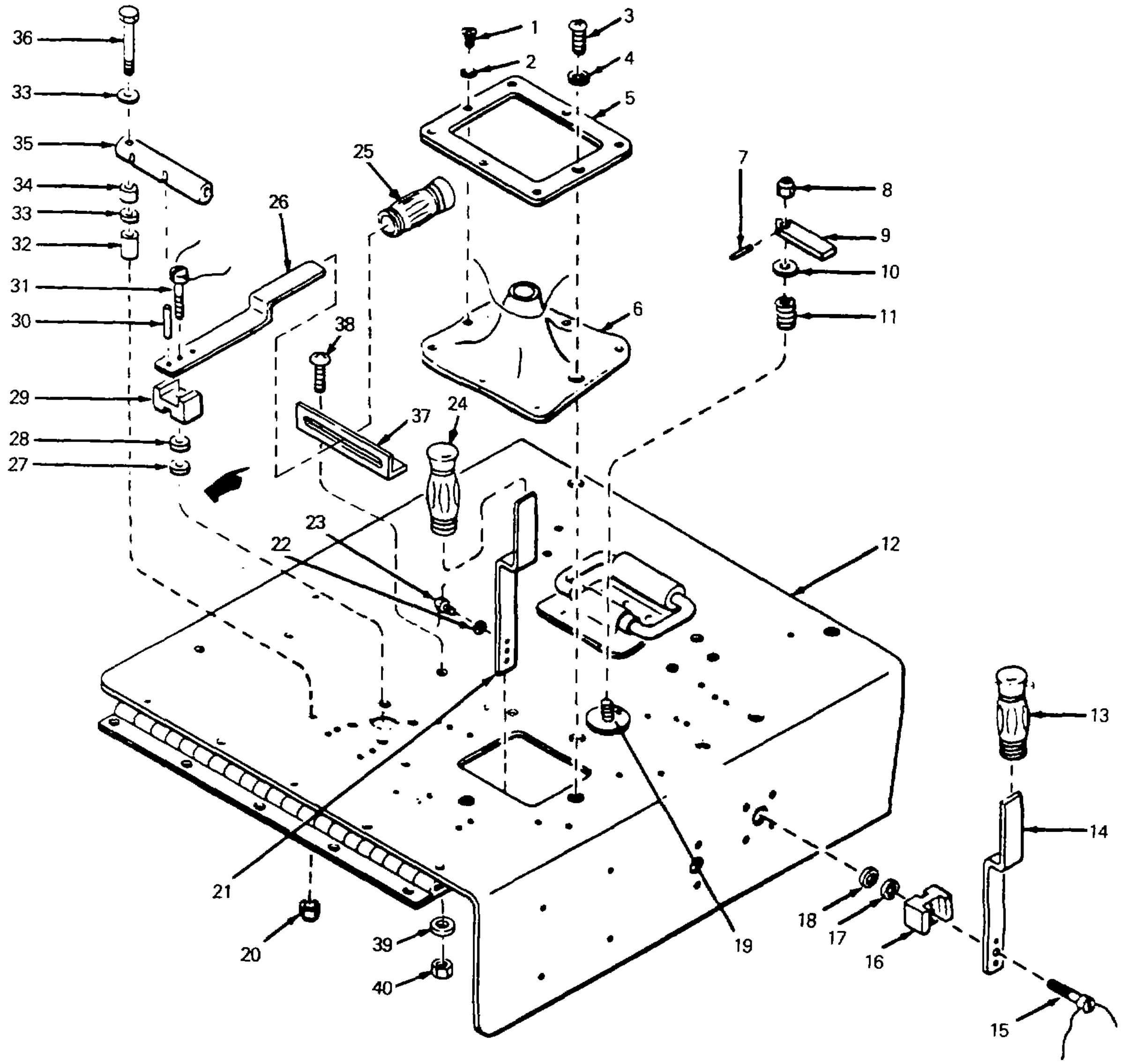
e. Installation. Install control linkage by reversing the sequence of the removal procedure.

3-32. Azimuth, Extension, and Elevation/Roll Control Handles

a. Removal (fig. 3-50).

(1) Remove plate (5) by removing screw (3), lockwasher (4) and seven each screw (1) and lockwasher (2).

(2) Remove grip (24), fold boot up and remove safety wire from top of boot. Remove boot.



1. SCREW (7)	11. SPRING	21. ELEVATION/ROLL CONTROL HANDLE	31. SCREW
2. LOCKWASHER (7)	12. CONSOLE	22. WASHER	32. SPACER
3. SCREW	13. HANDLE GRIP	23. SCREW	33. WASHER (2)
4. LOCKWASHER	14. EXTENSION HANDLE	24. HANDLE GRIP	34. BUSHING
5. PLATE	15. SCREW	25. HANDLE GRIP	35. CONTROL
6. BOOT	16. ADAPTER	26. AZIMUTH HANDLE	36. SCREW
7. SPRING PIN	17. SEAL	27. SEAL	37. BRACKET
8. NUT	18. SEAL	28. SEAL	38. SCREW (2)
9. HANDLE	19. SHAFT	29. ADAPTER	39. WASHER (2)
10. WASHER	20. NUT	30. SPRING PIN	40. NUT (2)

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Figure 3-50. Azimuth, Extension, and Elevation/Roll, Control Handles Removal

(3) Remove nut (20) from screw (36).

(4) Remove screw (36) with two washers (33), control (35), bushing (34) and spacer (32).

(5) Remove screw (31) and remove azimuth control handle (26) with grip (25), adapter (29) and seals (27 and 28).

(6) Remove nut (8) and spring pin (7) to remove handle (9), washer (10), and spring (11) from shaft (19).

(7) Remove screw (23) and washer (22) and remove elevation/roll control handle (21) from the control linkage yoke. Refer to figure 3-48.

(8) Remove screw (15) and remove extension control handle (14) with grip (13).

b. Disassembly. No further disassembly is authorized.

c. Inspection. Inspect all parts for evidence of excessive wear and deformation. Defective parts must be replaced.

d. Assembly. None.

e. Installation. Install control handles by reversing the sequence of the removal procedure.

NOTE

Replace all seals. Use lockwire as required.

3-33. Hydraulic Control Console Assembly Filter

a. Removal (fig. 3-51).

(1) Loosen nut (22).and screw (9) sufficiently to allow movement of tube assembly (19) in bracket (20).

(2) Disconnect tube assemblies (7, 8, and 19) from union (18) and tee assembly (4), and valve (6).

(3) Remove relief valve (6) and packing (5).

(4) Loosen nut (3) and remove tee (4) and associated parts (1, 2, and 3).

(5) Slip tube assembly (19) away from union (18) and remove union and packing (17).

(6) Remove two each nut (16) and washer (15).

(7) Remove two each screw (11) and spacer (13) and remove filter (14) from bracket (12).

b. Disassembly. Disassembly procedures for replacing filter element are contained in TM 9-1450-500-20.

c. Inspection and Testing. Inspect the threaded ports in the filter head for stripped or crossed threads. If the threads are defective, the filter assembly must be replaced. Inspect the mounting bracket for cracks and deformation. If badly deformed or bent, it may be straightened by placing the bracket in a vise and applying pressure to the deformed area. Cracked brackets must be replaced. If leakage is apparent, it may be remedied by tightening the filter case assembly. Verify that the filter does not leak after tightening the case by performing the leakage and pressure test as specified in table 3-9. If the filter assembly fails the leakage and pressure tests, it must be replaced.

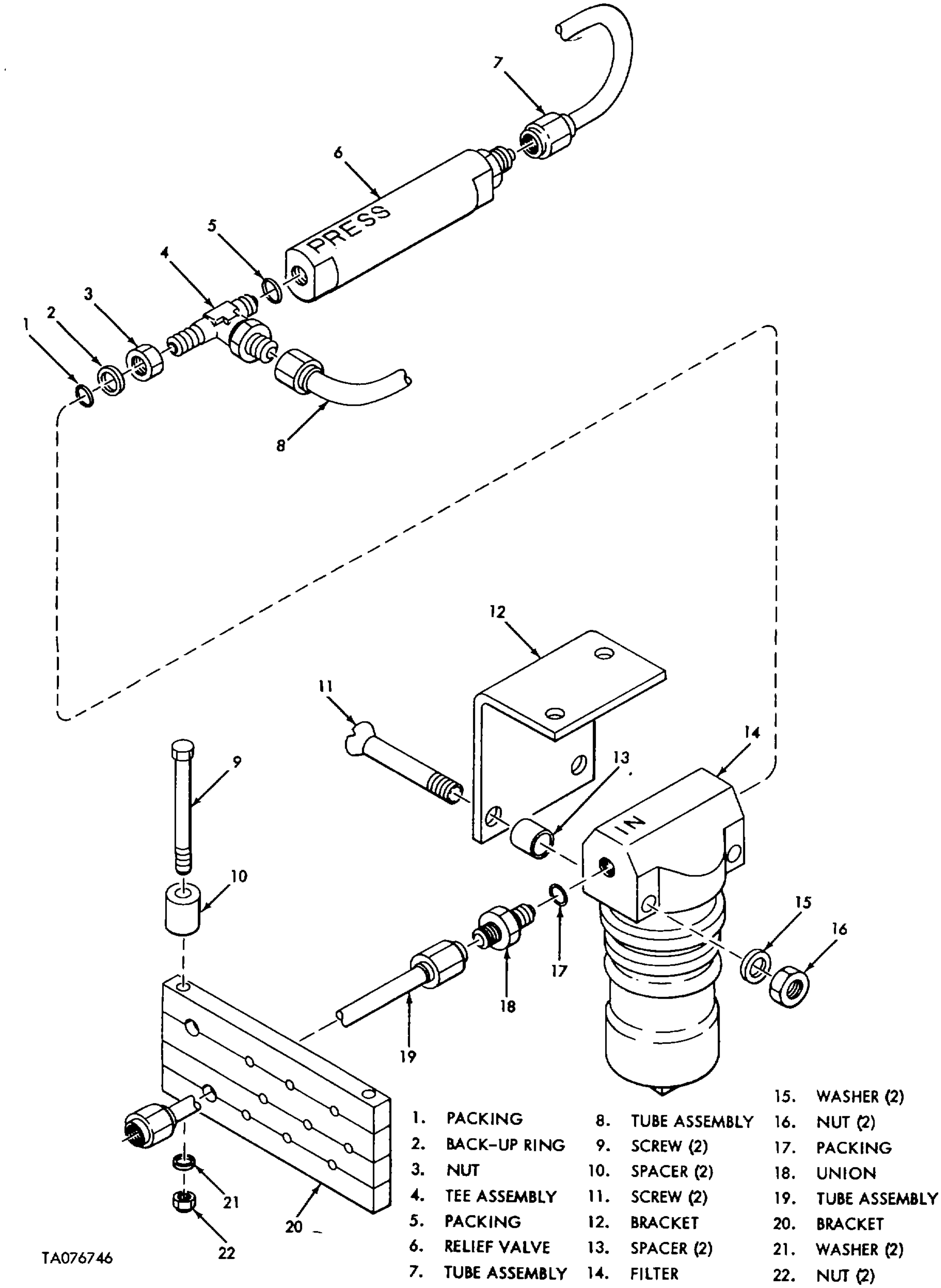


Figure 3-51. Hydraulic Fluid Filter Removal

Table 3-9. Testing Filter Assembly

Procedure	Normal indication	Probable defect.
	PROOF PRESSURE AND LEAKAGE TEST	
1. Plug outlet port and apply 4500 psig to inlet port for 2 minutes (minimum). 2. Remove pressure and repeat step 1.	No evidence of permanent deformation, malfunction, or external leakage.	Filter body or seals faulty.

d. Assembly. Refer to TM 9-1450500-20.

e. Installation. Install the hydraulic fluid filter by reversing the sequence of the removal procedure.

3-34. Thermal Relief Valve

a. Removal (fig. 3-52).

(1) Disconnect tube assembly (9), loosen nut (7) and remove elbow (8) with associated parts (5, 6 and 7).

(2) Loosen nut (2) and remove thermal relief valve (10), packing (4), and backup ring (3) from tee and tube assembly (1).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in table 3-10. If visual inspection discloses cracks or damaged threads, or if the relief valve fails the operation and leakage test, the valve must be replaced.

d. Assembly. None.

e. Installation. Install thermal relief valve by reversing the sequence of the removal procedure.

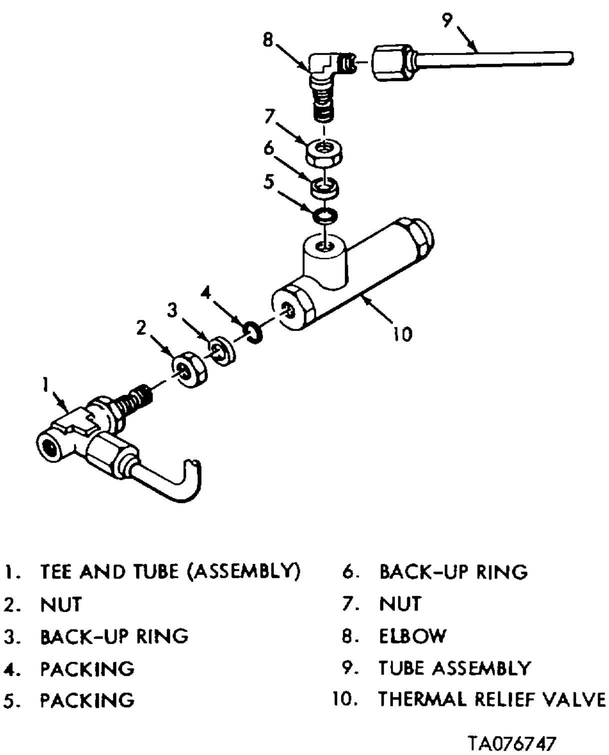


Figure 3-52. Thermal Relief Valve Removal

3-35. Starter Relief Solenoid Valve

a. Removal (fig. 3-53).

(1) Disconnect tube assemblies (1, 12, and 15).

Table 3-10. Testing Thermal Relief Valve

Procedure	Normal indication	Probable defect.
	PROOF PRESSURE AND LEAKAGE TEST	
1. Plug all ports except pressure port and apply 6150 psig to pressure port for 2 minutes (minimum).	No measurable external leakage, failure, or permanent set.	Valve body or seals faulty.
	OPERATIONAL TEST	
2. Apply 3500 psig to pressure port and increase presure in 100 psig increments until valve relieves.	Valve relieves at 4000 ±100 psig.	Valve faulty.

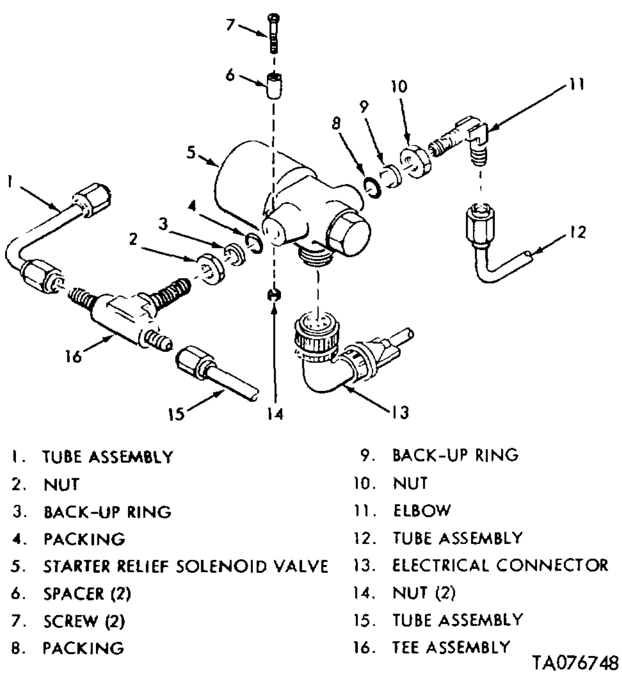


Figure 3-53. Starter Relief Solenoid Valve Removal

(2) Disconnect electrical connector (13).

(3) Remove valve (5), by removing two each nut (14), spacer (6), and screw (7).

(4) Loosen nut (2) and remove tee (16) and associated parts (2, 3, and 4) from valve (5).

(5) Loosen nut (10) and remove elbow (11) and associated parts (8, 9, and 10) from valve (5).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in table 3-11. If the visual inspection discloses cracks or damaged threads, or if the valve fails the operation and leakage test the valve must be replaced.

d. Assembly. None.

e. Installation. Install starter relief solenoid valve by reversing the sequence of the removal procedure.

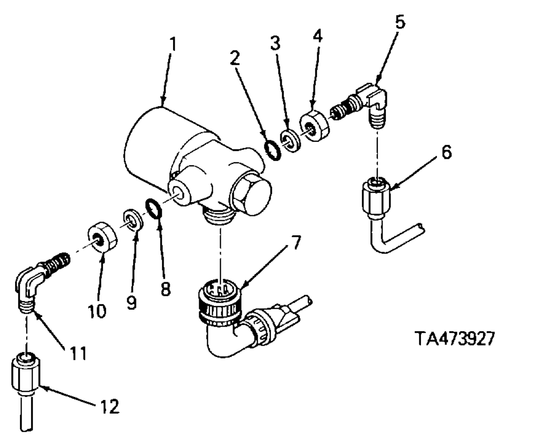
Table 3-10A. Roll Left, Roll Right, Elevation Extension and Elevation Retract Lockout Control Solenoid Valves

Procedure	Normal indication	Probable defect.
	PROOF PRESSURE AND LEAKAGE TEST	
1. Plug outlet port and apply 4500 psig to inlet port for 2 minutes (minimum).	No evidence of permanent deformation, malfunction, or external leakage.	Valve body or seals.
2. Remove pressure and remove plug from outlet port.		
3. Apply 3000 psig to inlet port.		
4. Apply 18 volts dc to solenoid connector pins.	Internal leakage does not exceed 5 cc/minute during third minute after two-minute wait.	Seals faulty.
5. Reduce pressure to 250 psig and apply for 2 minutes.	Internal leakage does not exceed 5 cc/minute.	Seals faulty.

3-35.1 ROLL LEFT LOCKOUT CONTROL SOLENOID VALVE. (fig. 3-39)

a. Removal (fig. 3-53A).
   (1) Disconnect electrical connector (7).
   (2) Disconnect tube assemblies (6,12).
   (3) Remove tie down line (if used) and remove solenoid valve (1).
   (4) Remove elbows (5,11), nuts (4,10), back-up rings (3,9) and packings (2,8).

b. Disassembly. No further disassembly is authorized.



1. ROLL LEFT LOCKOUT CONTROL SOLENOID VALVE
2. PACKING
3. BACK-UP RING
4. NUT
5. ELBOW
6. TUBE ASSEMBLY
7. ELECTRICAL CONNECTOR
8. PACKING
9. BACK-UP RING
10. NUT
11. ELBOW
12. TUBE ASSEMBLY

Figure 3-53A. Roll Left Lockout Control Solenoid (console right)

c. Inspection and Testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in Table 3-10A. If the visual inspection discloses cracks or damaged threads, or if the valve fails the operation and leakage tests, the valve must be replaced.

d. Assembly. None.

NOTE

When installing solenoid (7) make sure that no part of installation interferes with accelerator linkage rod near vehicle transmission housing when console is closed. Tie down solenoid securely with tie-down material.

e. Installation. Install valve by reversing the sequence of the removal procedure.

3-35B. ROLL RIGHT LOCKOUT CONTROL SOLENOID VALVE. (fig. 3-39)

a. Removal (fig. 3-53B).

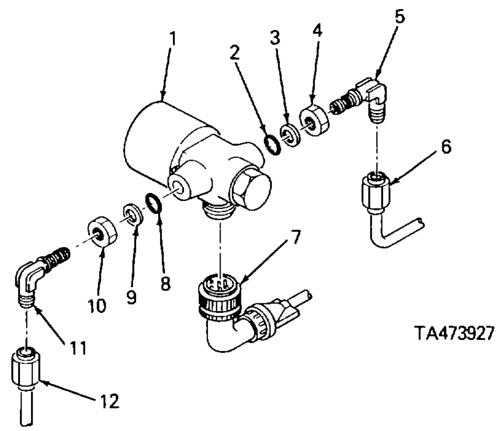
(1) Disconnect electrical connector (8).
(2) Disconnect tube assemblies (7 and 14).
(3) Remove screws (2), washers (3), spacers (4), nuts (9) and remove solenoid valve (1).
(4) Remove elbow (13), nut (12), back-up ring (11), packings (5,10) and union (6).

b. Disassembly. No further disassembly is authorized.

c. Inspection and testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in Table 3-10A. If the visual inspection discloses cracks or damaged threads or if the valve fails the operation and leakage tests, the valve must be replaced.

d. Assembly. None.

e. Installation. Install valve by reversing the sequence of the removal procedure.



1. ROLL LEFT LOCKOUT CONTROL SOLENOID VALVE
2. PACKING
3. BACK-UP RING
4. NUT
5. ELBOW
6. TUBE ASSEMBLY
7. ELECTRICAL CONNECTOR
8. PACKING
9. BACK-UP RING
10. NUT
11. ELBOW
12. TUBE ASSEMBLY

Figure 3-53B. Roll Right Lockout Control Solenoid (console left)

3-35C. ELEVATION EXTENSION LOCKOUT CONTROL SOLENOID VALVE. (fig. 3-40)

a. Removal (fig. 3-53C).

(1) Disconnect electrical connector (8) from valve (4).

(2) Disconnect tube assemblies (1 and 7).

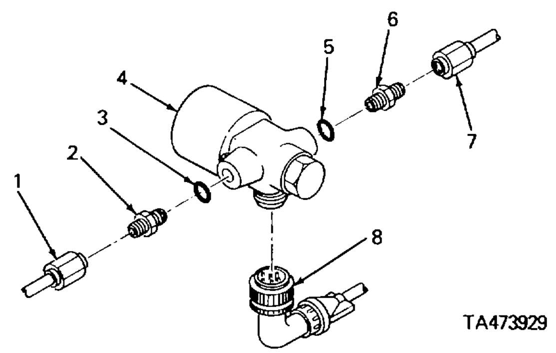
(3) Remove union (2,6) and packings (3,5).

b. Disassembly. No further disassembly is authorized.

c. Inspection and testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in Table 3-10A. If the visual inspection discloses cracks or damaged threads or if the valve fails the operation and leakage tests, the valve must be replaced.

d. Assembly. None.

e. Installation. Install valve by reversing the sequence of the removal procedure.



1. TUBE ASSEMBLY
2. UNION/CHECK VALVE
3. PACKING
4. ELEVATION EXTENSION LOCKOUT CONTROL VALVE
5. PACKING
6. UNION/CHECK VALVE
7. TUBE ASSEMBLY
8. ELECTRICAL CONNECTOR

Figure 3-53C. Elevation Extension Lockout Control Valve.

3-35D. ELEVATION RETRACT LOCKOUT CONTROL SOLENOID VALVE.
(fig. 3-40)

a. Removal (fig. 3-53D).

(1) Disconnect electrical connector (15).

(2) Disconnect tube assemblies (1 and 14).

(3) Remove screws (7), washers (8), spacers (9), nuts (16) and remove solenoid valve (6).

(4) Remove elbow (2 and 13), nut (3 and 12), back up ring (4 and 11) and packing (5 and 10).

b. Disassembly. No further disassembly is authorized.

c. Inspection and testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in Table 3-10A. If the visual inspection discloses cracks or damaged threads or if the valve fails the operation and leakage tests, the valve must be replaced.

d. Assembly. None.

e. Installation. Install valve by reversing the sequence of the removal procedure.

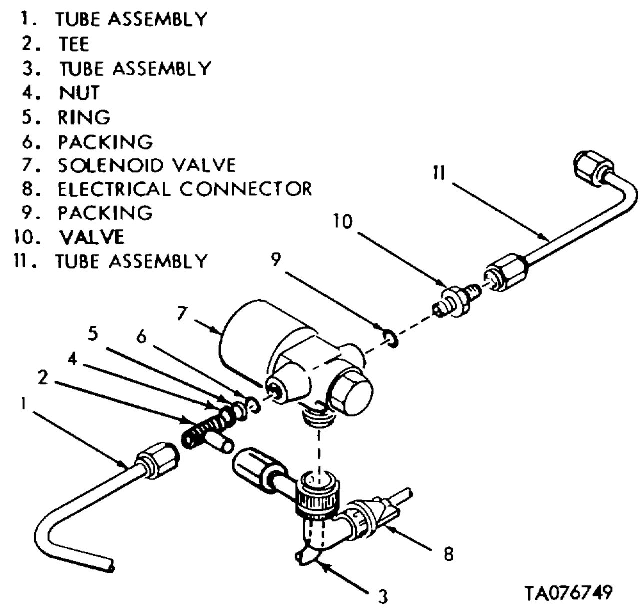


Figure 3-53D. Elevation Retract Lockout Control Solenoid Valve.

Table 3-11. Testing Starter Relief Solenoid Valve

Procedure	Normal indication	Probable defect.
	PROOF PRESSURE AND LEAKAGE TEST	
1. Apply 18 volts dc to solenoid connector pins.		
2. Plug outlet port and apply 4500 psig to inlet port for 2 minutes (minimum).	No evidence of permanent deformation, malfunction or external leakage.	Valve body or seals faulty.
3. Remove 18 volts dc from solenoid connector.		
4. Remove plug from outlet port and apply 4500 psig to inlet port for 2 minutes (minimum).	No evidence of permanent deformation, malfunction, or external leakage.	Valve body or seals faulty.
	INTERNAL LEAKAGE TEST	
5. Remove pressure and apply 250 psig to inlet port for 2 minutes (minimum)	Internal leakage does not exceed 5 cc/minute.	Seals faulty.
6. Increase pressure to 3000 psig and apply fdr 2 minutes (minimum).	Internal leakage does not exceed 5 cc/minute.	Seals faulty.

3-36. Reduced Pressure Solenoid Valve

a. Removal (fig. 3-54).

(1) Disconnect electrical connector (8).

(2) Disconnect tube assemblies (1, 3 and 11) and remove solenoid valve (7).

(3) Remove tee (2), nut (4), ring (5) and packing (6).

(4) Remove valve (10) and packing (9).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks and stripped or

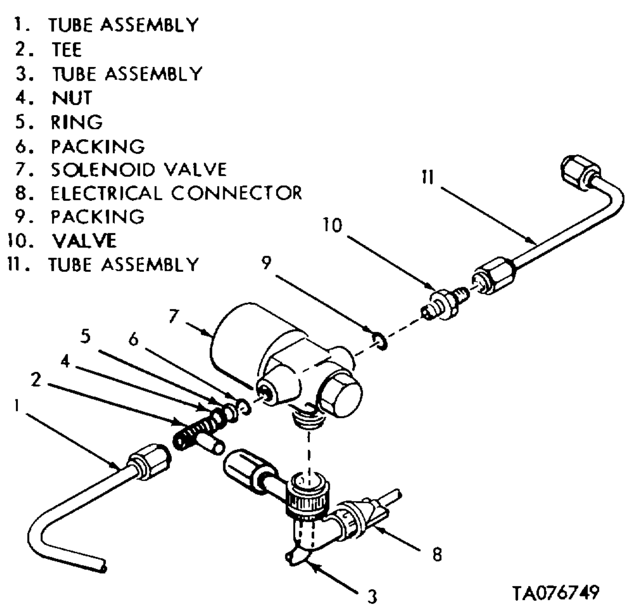


Figure 3-54. Reduced Pressure Solenoid Valve Removal

crossed threads. Accomplish operation and leakage tests as specified in table 3-7. If the visual inspection discloses cracks or damaged threads, or if the valve fails the operation and leakage tests, the valve must be replaced.

d. Assembly. None.

e. Installation. Install valve by reversing the sequence of the removal procedure.

3-37. System Pressure Relief Valve

a. Removal (fig. 3-55).

(1) Disconnect tube assembly (7).

(2) Remove union (6) with packing (5) from valve (4).

(3) Remove valve (4) and packing (3) from tee (2).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in table 3-12. If the visual inspection discloses cracks or damaged threads, or if the valve fails the operation and leakage tests, the valve must be replaced.

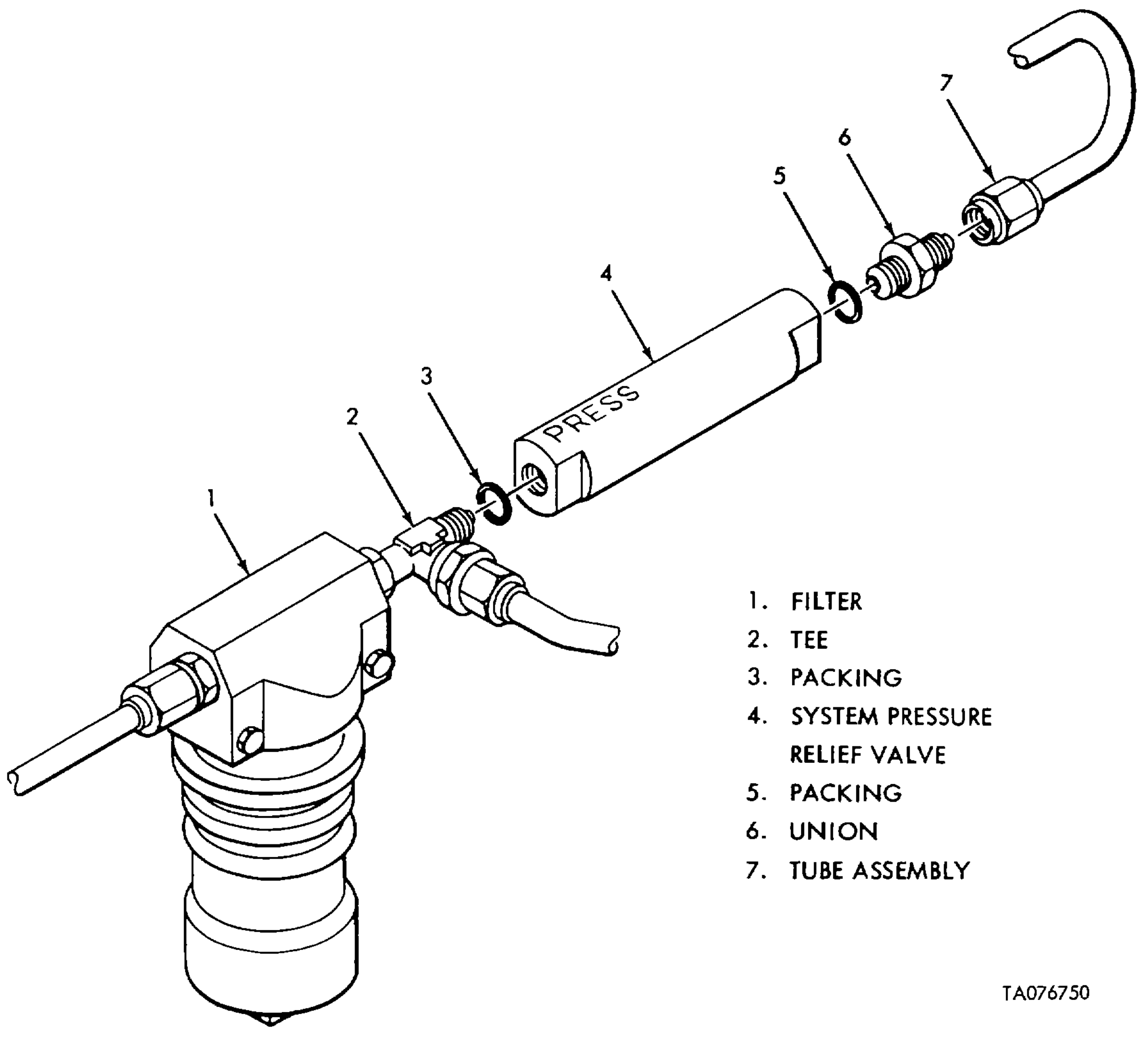


Figure 3-55. System Pressure Relief Valve Removal

Table 3-12. Testing System Pressure Relief Valve

Procedure	Normal indication	Probable defect.
	PROOF PRESSURE AND LEAKAGE TEST	
1. Plug return port and apply 4500 psig to pressure port for 2 minutes (minimum).	No measurable external leakage, failure, or permanent set.	Valve body or seals faulty.
2. Remove pressure and plug pressure port. Apply 4500 psig to return port and hold for 2 minutes (minimum).	No measurable external leakage, failure, or permanent set.	Valve body or seals faulty.
	OPERATIONAL TEST	
3. Apply 3000 psig and increase pressure in 100 psig increments until valve relieves.	Valve relieves at 3400 ±100 psig.	Valve faulty.

d. Assembly. None.

e. Installation. Install valve by reversing the sequence of the removal procedure.

3-38. Reduced Pressure Switch

a. Removal (fig. 3-56).

(1) Disconnect electrical connector (1).
(2) Disconnect tube assembly (9), screw (2), nut (5), washer (3), clamp (4) and remove switch (6).
(3) Remove union (8) and packing (7).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in table 3-13. If the visual inspection discloses cracks or damaged threads, or if the valve fails the operation and leakage tests, the valve must be replaced.

d. Assembly. None.

e. Installation. Install valve by reversing the sequence of removal procedure.

3-39. Roll Cylinder Assembly

a. Removal (fig. 3-57).

(1) Place superstructure in transport position, lower index forks onto blocks, shut down engine and cycle all valves to relieve pressure.
(2) Tag and disconnect both hydraulic hose assemblies (9) from cylinder. Cap cylinder ports and install plugs in open ends of hoses.

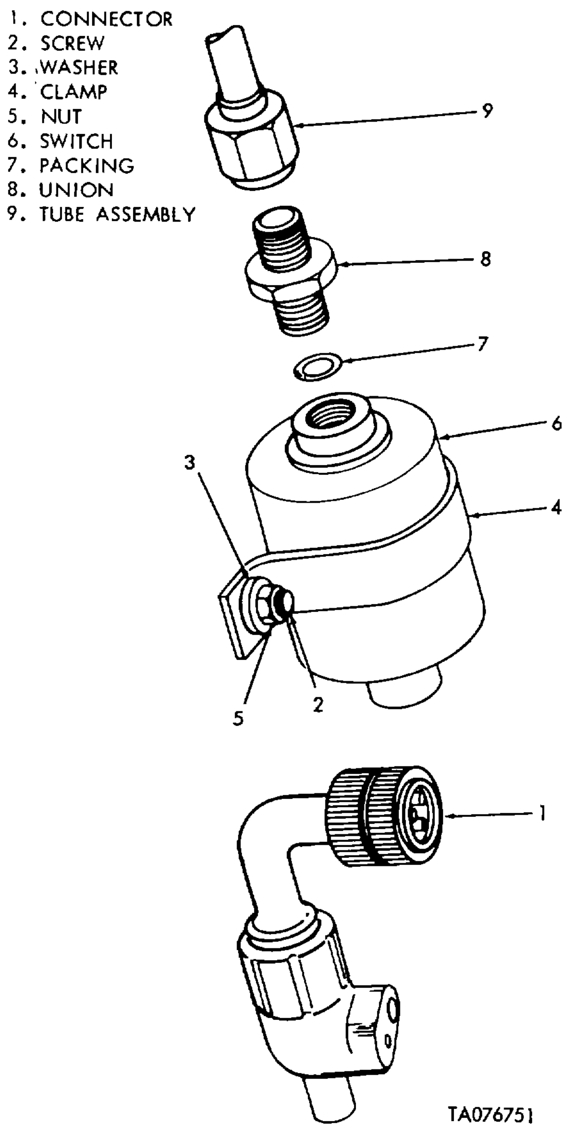


Figure 3-56. Reduced Pressure Switch Removal

(3) Remove cotter pin (2) slotted hex nut (1), flat washer (3), and hex-head bolt (4) which secures rod end of cylinder to index boom roll arm.

(4) Remove both spring pins (5) by driving up from bottom with a drive pin punch (both sides of cylinder).

(5) Support the cylinder (8) and remove two headless pins (7) and flat spacer washers (6). Remove cylinder.

b. Disassembly (fig. 3-58).

(1) Loosen nut (12) and remove reducer elbow (11) and associated parts (12, 13, and 14) from cylinder (6).

(2) Loosen nut (9) and remove reducer elbow (10) and associated parts (9, 8, and 7) from cylinder (6).

(3) Remove safety wire from locknut (3) and lockwasher (4), loosen locknut (3), unseat lockwasher (4), and unscrew rod end (2).

(4) Remove locknut (3) and lockwasher (4) from rod end (2).

(5) Remove safety wire from retainer assembly (5) and cylinder (6) and, using a spanner wrench, unscrew retainer assembly (5) from cylinder (6).

(6) Remove ring (5A), washer (5B), scraper (5C), felt (5D), ring (5E), packing (5F), ring (5G), ring (5J), and packing (5K) from retainer (5H).

(7) Remove piston assembly (1) from cylinder (6).

(8) Remove ring (ID), packing (IC), and ring (IB) from piston (IA).

c. Inspection and Testing. Inspect rod end (2), piston (1A) and cylinder (6) for wear. If these parts are worn beyond the limits specified in figure 3-59, the roll cylinder must be replaced. Accomplish operation and leakage tests as specified in table 3-14 upon completion of the assembly procedure. If the roll cylinder assembly fails either of the tests, it must be replaced.

Table 3-13. Testing Reduced Pressure switch (NC)

Procedure	Normal indication	Probable defect.
	PROOF PRESSURE AND LEAKAGE TEST	
1. Apply 4500 psig to port or damage	No external leakage	Switch body or seals faulty.
	FUNCTIONAL TEST	
1. Connect 24 VDC power source, test light or voltmeter and pressure switch in series (use pins B and C). 2. Slowly apply pressure to switch 0 to 500 psig and decrease to 0 psig.	Switch should actuate at ascending pre-sure of 300 to 400 psig. Switch should deactuate at descend-ing pressure of 340 psig min.	Switch faulty.

d. Assembly.

(1) Install packing (1C) between rings (1B and 1D) in groove of piston (1A).

(2) Insert piston assembly (1) into cylinder (6).

NOTE

Lubricate piston and cylinder with hydraulic fluid, item 2, App. C, prior to assembly.

(3) Install, in bore of retainer (5H), packing (5F) between rings (5E and 5G) in the groove nearest to the small end of the retainer.

(4) Install felt (5D) in the next groove in the bore of the retainer.

(5) Install packing (5K) and ring (5J) on outside groove of retainer (5H) with packing toward small diameter end of retainer.

(6) Insert scraper (5C), large diameter side first, washer (5B), and ring (5A) into retainer (5H).

(7) Place cylinder (6) in a vertical position and, using a spanner wrench, install retainer assembly (5), small diameter end first, into cylinder (6). Tighten retainer assembly (5) until it bottoms in cylinder (6).

(8) Safety tie the retainer assembly (5) to cylinder (6) with lockwire.

(9) Install locknut (3) and lockwasher (4) on rod end (2) and screw rod end (2) into rod of piston (1) until, with piston fully retracted, a dimension of 5.50 + 0.06 inches of obtained between centerline of cylinder mounting holes and centerline of holes in rod end.

(10) Seat lockwasher (4) in groove of piston rod (1) and tighten locknut (3). Safety tie locknut to lockwasher with lockwire.

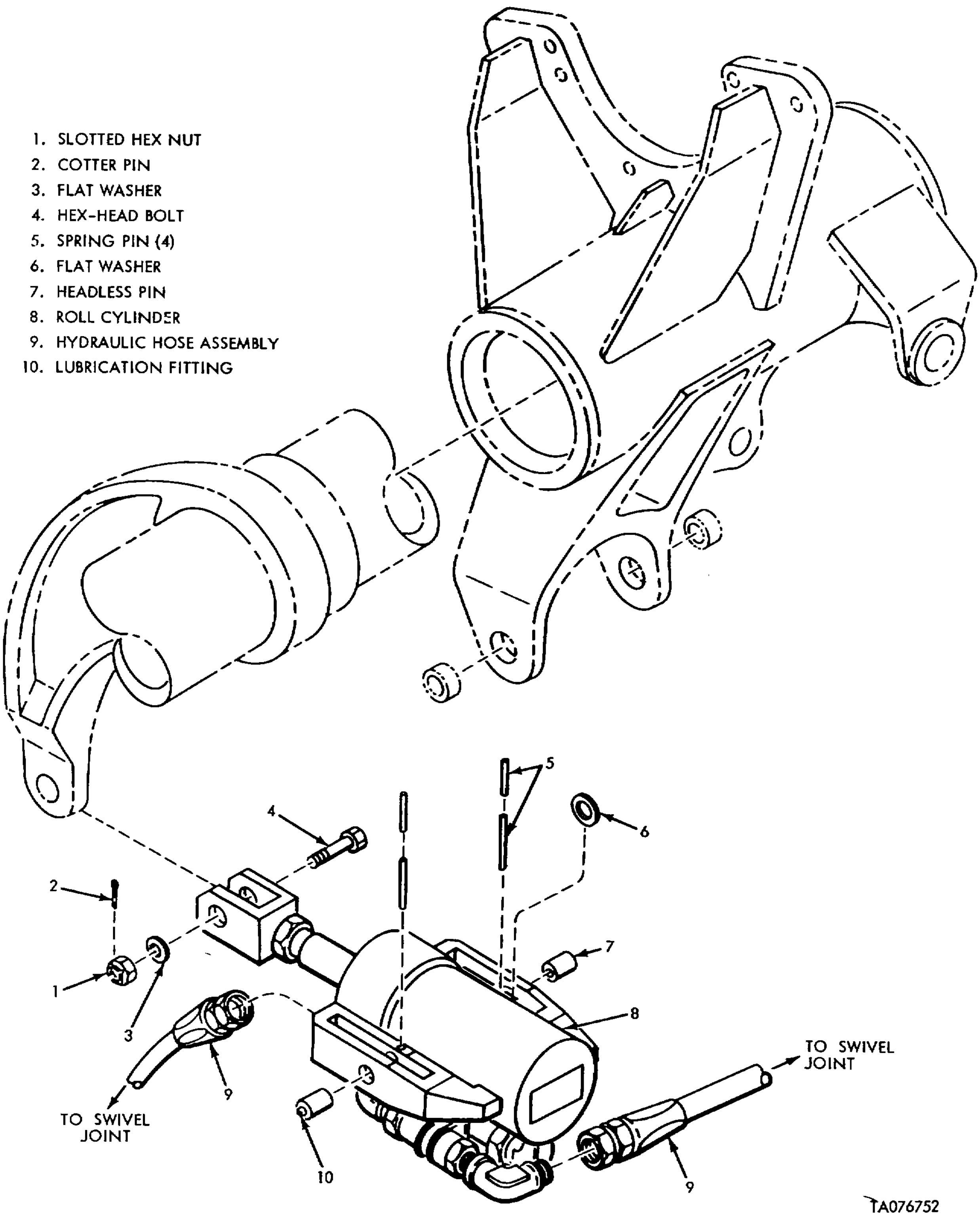


Figure 3-57. Roll Cylinder Removal

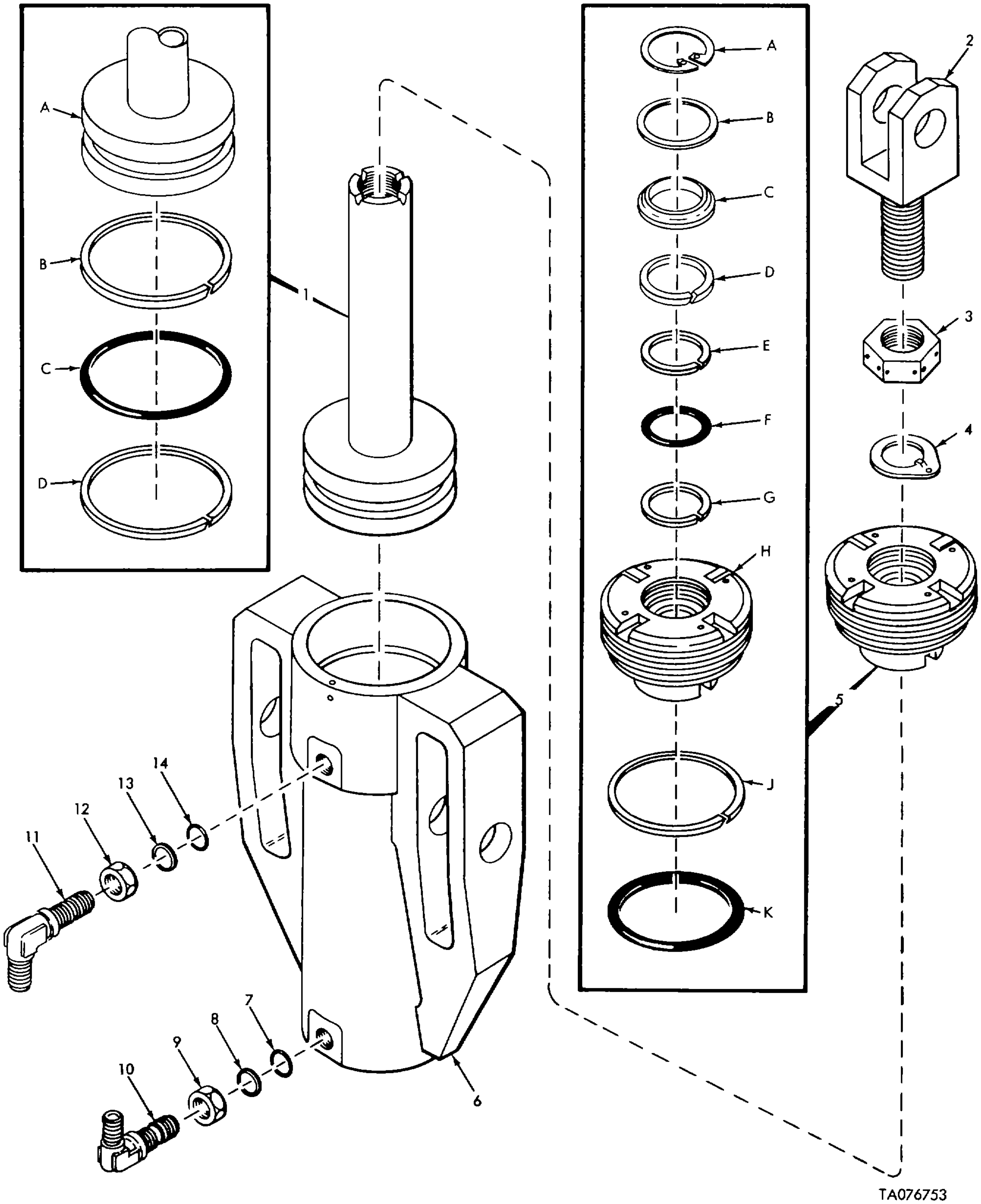


Figure 3-58. Roll Cylinder Disassembly (Sheet 1 of 2)

ITEM NUMBER	NAME	ITEM NUMBER	NAME
1	PISTON ASSEMBLY		F PACKING
	A PISTON		G RING
	B RING		H RETAINER
	C PACKING		J RING
	D RING		K PACKING
2	ROD END	6	CYLINDER
3	LOCKNUT	7	PACKING
4	LOCKWASHER	8	BACKUP KING
5	RETAINER ASSEMALY	9	NUT
	A RING	10	REDUCER ELBOW
	B WASHER	11	REDUCER ELBOW
	C SCRAPER	12	NUT
	D FELT	13	BACK-UP RING
	E RING	14	PACKING

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Figure 3-58. Roll Cylinder Disassembly (Sheet 2 of 2)

(11) Assemble nut (12), backup ring (13) and packing (14) to reducer elbow (11).

(12) Install reducer elbow (1) in cylinder (6) and tighten nut (12) (finger tight).

(13) Assembly nut (9), backup ring (8), and packing (7) to elbow (10).

(14) Install elbow (10) in cylinder (6) and tighten nut (9) finger tight.

(15) Lubricate in accordance with LO 9-1450-500-12 when cylinder assembly is installed in the loader.

e. Installation.

(1) Install the roll cylinder by reversing the sequence of the removal procedure.

NOTE

Flat washers must be installed so that cylinder clevis end is centered on index boom roll arm.

(2) Lubricate cylinder in accordance with LO 9-1450-500-12.

(3) Start loader and elevate superstructure sufficiently to remove blocking. Extend superstructure sufficiently to actuate azimuth and roll cutout switch. Roll the superstructure in both directions until the cylinder bottoms out. Repeat several times. Return superstructure to transport position and inspect all connections for leaks.

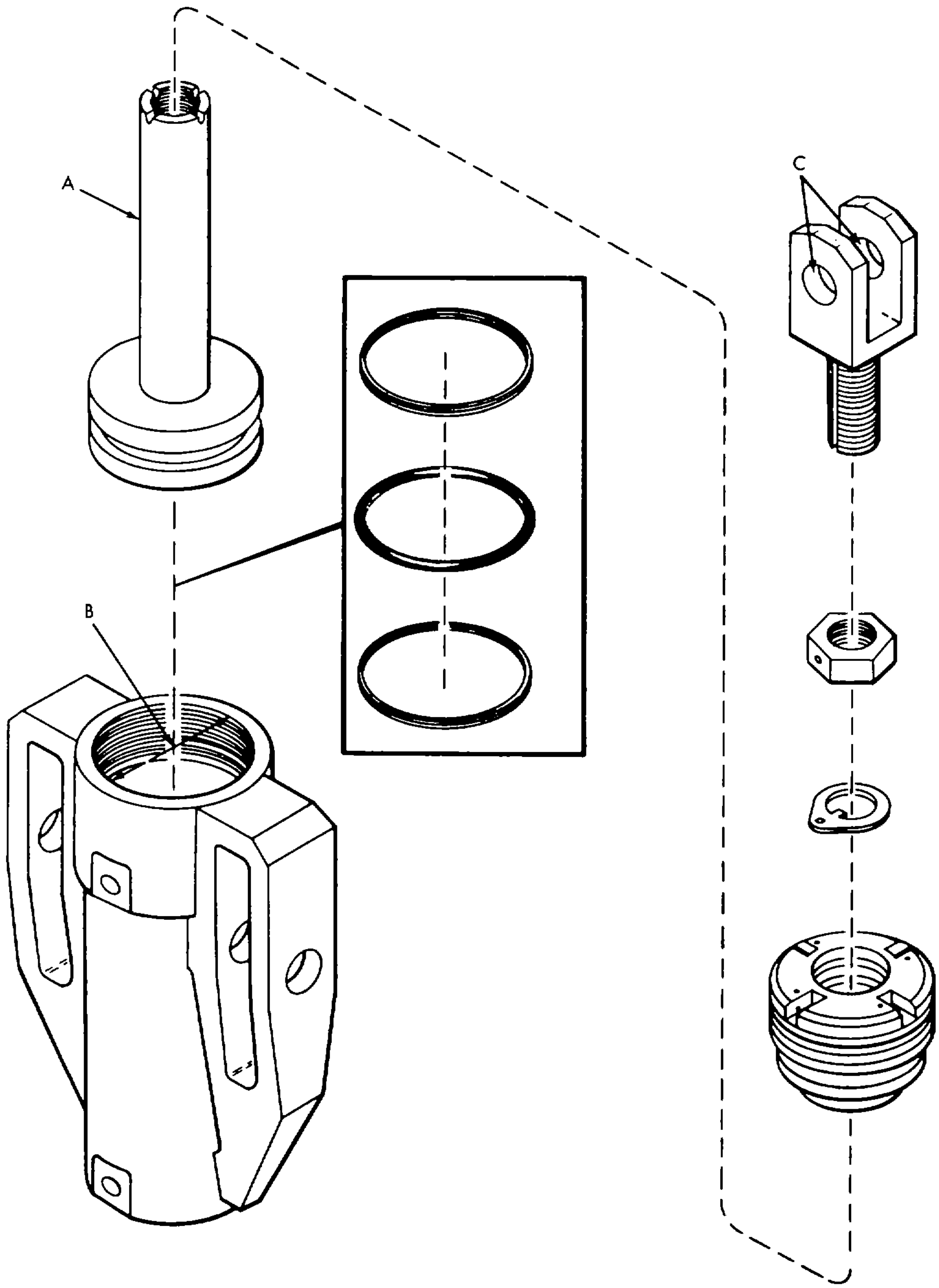
(4) Shut down engine and fill hydraulic fluid reservoir to capacity.

3-40. Elevation Cylinder Assembly

a. Removal (fig. 3-60).

(1) Start engine. Fully extend elevation cylinder. Center azimuth and roll cylinders.

(2) Install blocking under index boom to support both index forks in the horizontal position.



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS (FIELD)
A	OUTSIDE DIAMETER OF PISTON ROD	1.2465 TO 1.2475	1.2445
B	CYLINDER BORE DIAMETER	3.000 TO 3.002	3.012
C	INSIDE DIAMETER OF HOLE	0.750 TO 0.752	0.765

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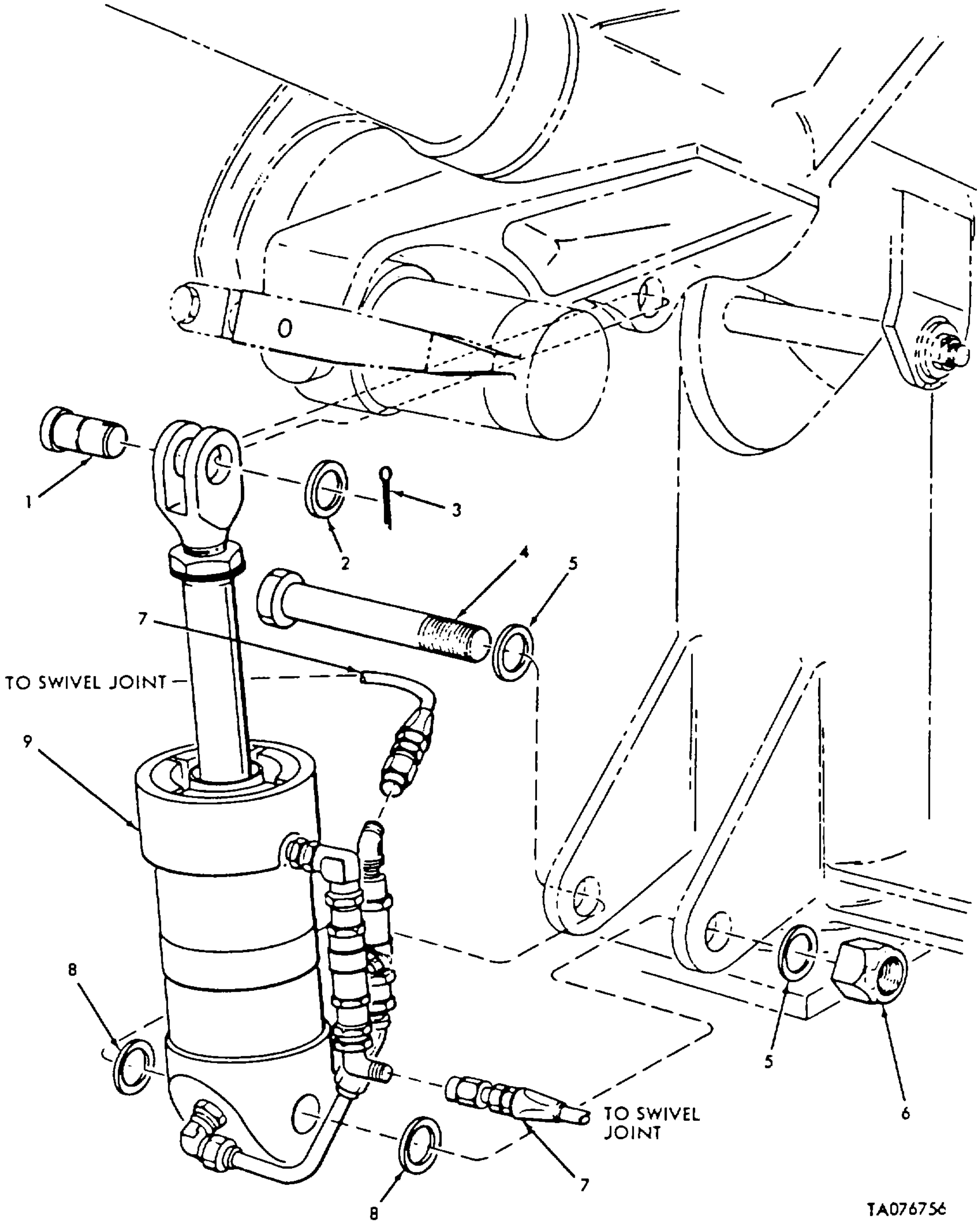
Figure 3-59. Roll Cylinder Wear Limits

Table 3-14. Testing Roll Cylinder, Extension Cylinder, Azimuth Cylinder, and Elevation Cylinder

Procedure	Normal indication	Probable defect.
	LEAKAGE TEST	
1. Install cylinder in suitable holding device with piston at mid-position.		
2. Connect gross side of cylinder to pressure port of external fluid source (hand pump) and bleed air.		
3. Fill net side of cylinder with hydraulic fluid, item 2, App. C, and vent to atmosphere.		
4. Apply 4500 psig with hand pump. Leave pressure applied for 5 minutes.	No external leakage or permanent set.	Piston rod scored. Cylinder scored. Seals faulty.
5. Open hand pump dump valve.	Cylinder operates smoothly with no evidence of binding.	Piston rod scored. Cylinder scored. Seals faulty.
	OPERATION TEST	
6. With gross side of cylinder connected to external fluid source and no pressure applied, bleed air.		
7. Connect another external fluid source to the cylinder net side.		
8. Retract piston fully with 2 to 5 psig applied to the cylinder net side.		
9. Apply 3000 psig with hand pump which is connected to the cylinder gross side.		
10. Operate cylinder piston.	Leakage past piston rod seal does not drop for each 10 cycles of operation.	Piston rod scored. Cylinder scored. Seals faulty.



1. PIN
2. FLAT WASHER
3. COTTER PIN
4. HEX-HEAD BOLT
5. FLAT WASHER (2)
6. SELF-LOCKING NUT
7. HYDRAULIC HOSE ASSEMBLY
8. FLAT WASHER (2)
9. ELEVATION CYLINDER

Figure 3-60. Elevation Cylinder Removal

(3) Lower index boom onto blocking and shut down engine. Operate elevation cylinder control valve to relieve hydraulic pressure in the hydraulic cylinder and lines.

(4) Tag and disconnect both hydraulic hose assemblies (7) from cylinder. Cap cylinder ports and install plugs in open ends of hoses.

(5) Remove cotter pin (3), flat washer (2), and pin (1) which secures rod end of elevation cylinder to boom, figure 3-60.

(6) Force rod end and piston into fully retracted position in the elevation cylinder.

(7) Remove self-locking nut (6), flat washers (5), and hexhead bolt (4) and remove elevation cylinder (9).

b. Disassembly (fig. 3-61). The following special tool is required to perform the disassembly and assembly procedures:

Special tool	NSN	Part number
Wrench, spanner	5120-00-991-3175	10892976

(1) Remove lockwire from locknut (2) and lockwasher (3), loosen locknut (2), unseat lockwasher (3), and unscrew rod end (1) from piston assembly (20).

(2) Remove locknut (2) and lockwasher (3) from rod end (1).

(3) Using spanner wrench, special tool (48, fig. 1-2) (fig. 3-62), unscrew retainer assembly (4) from cylinder (19). Remove parts 3-90 Change 3 (4A through 4G) and parts (4J and 4K) from retainer (4H).

(4) Remove piston assembly (20) from cylinder (19) and remove parts (20B, 20C, and 20D) from piston (20A).

(5) Loosen nut (16) and remove reducer elbow (15) and associated parts (16, 17, and 18).

(6) Loosen nut (10) and remove union (9) with associated parts (10, 11, and 12).

NOTE

It is not necessary to remove parts (5, 6, 7 and 8).

(7) Remove lubrication fitting (14) from cylinder (19).

c. Inspection and Testing. Inspect the inside diameter of bushings (9) for excessive wear. If worn beyond the limits specified in figure 3-63 repair section, the bushings must be replaced. If piston (20A), cylinder (19), and/ or rod end (1) are worn beyond the specified limits, they must be replaced.

NOTE

If piston (20A) or rod end (1) is to be replaced, inspect threads of rod end to make sure they match mating threads of piston rod. If threads are not the same, replace both parts as a unit.

Replace damaged lubrication fittings. Accomplish operation and leakage tests as specified in table 3-14. If the cylinder assembly fails the operation and/or leakage tests, the cylinder assembly must be replaced.

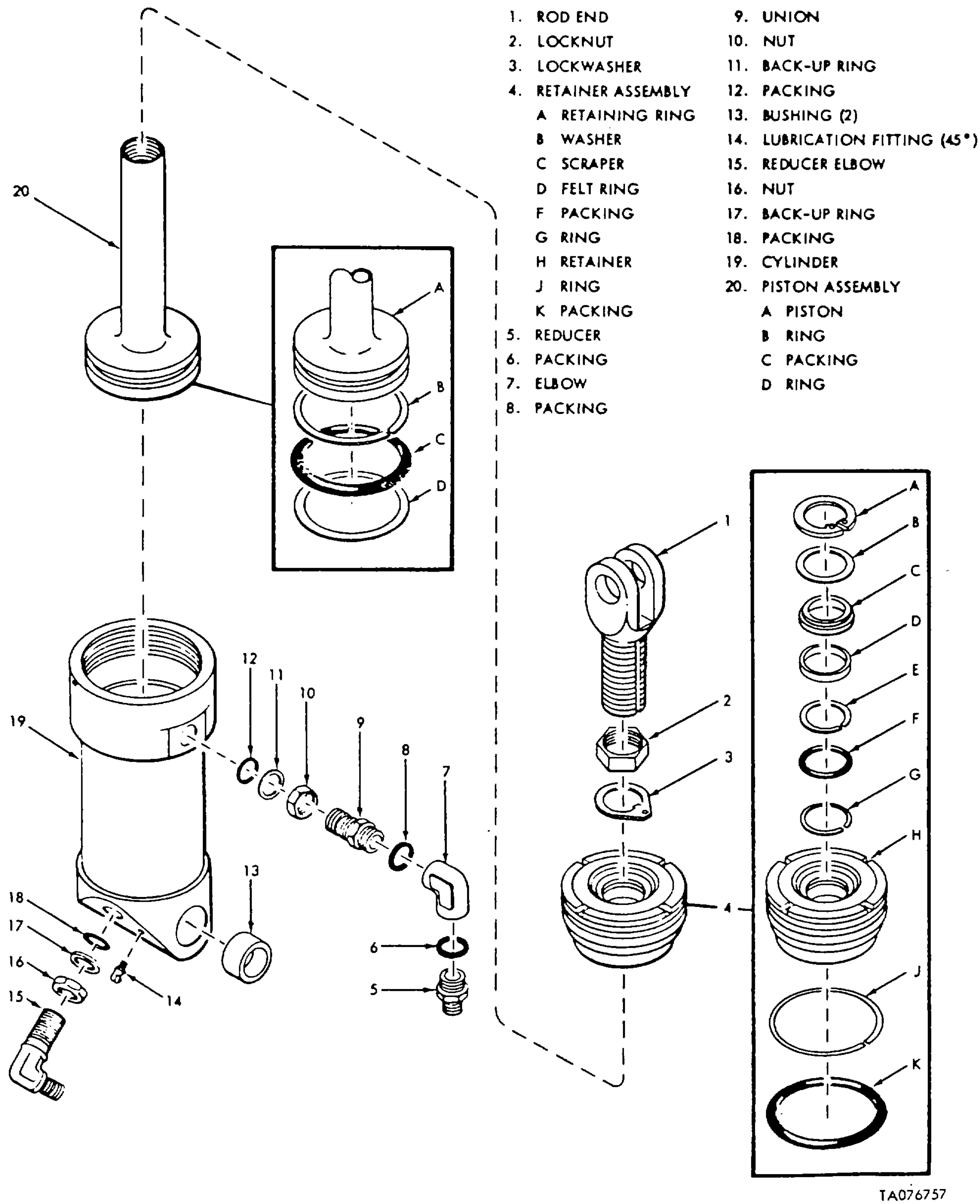


Figure 3-61. Elevation Cylinder Disassembly

d. Assembly.

(1) Install packing (20C) between rings (20B and 20D) in the groove of piston (20A). Insert piston assembly (20) into cylinder (19).

NOTE

Lubricate all surfaces of piston assembly (20) with hydraulic fluid, item 2, App. C, before inserting piston into cylinder, to aid in installation.

(2) Insert packing (4K) and ring (4J) in large groove on outside diameter of retainer (4H), with packing nearest the small diameter end of retainer.

(3) Place packing (4F) between rings (4E and 4G) in innermost groove of retainer (4H). Insert felt ring (4D) in next groove. Place scraper (4C), large diameter first, washer (4B), and retaining ring (4A) in next groove in retainer (4H).

(4) Install retainer assembly (4) in cylinder (19) and, using spanner wrench special tool (48, fig. 3-62), tighten retainer assembly.

(5) Screw locknut (2) on rod end (1) until it bottoms. Seat lockwasher (3) on rod end (1) with tab side facing away from locknut (2).

(6) With piston assembly fully retracted, screw rod end (1) into piston assembly (20). Seat lockwasher (3) in groove of piston rod and tighten locknut (2) (100 to 125 lb-ft) so that approximately 0.50 inch of threads are visible above locknut (2).

(7) Safety tie locknut (2) to lockwasher (3) with lockwire.

(8) Assemble packing (18), backup ring (17), and nut. (16) to reducer elbow (15). Install reducer elbow (15) in the extend port of cylinder (19).

(9) Assemble packing (12), backup ring (11), and nut (10) to union assembly. Install union assembly in the port of cylinder (19). Tighten nuts (10 and 16) finger tight.

(10) Install lubrication fitting (14) in cylinder (19).

e. Inspection and Checks.

(1) Clean and inspect threaded portions of rod end and elevation cylinder piston for rust, corrosion, thread condition, and signs of wear.

(2) Using a go/no-go type gage, check piston and rod end threads for the following tolerances:

Piston Threads	Rod End Threads
Minor diameter: 1.0348 to 1.0438 inches maximum	Major diameter: 1.1250 to 1.1138 inches minimum
Pitch diameter: 1.0709 to 1.0749 inches maximum	Pitch diameter: 1.0709 to 1.0669 inches minimum

CAUTION

Do not install any items not meeting the maximum or minimum tolerances specified in this step.

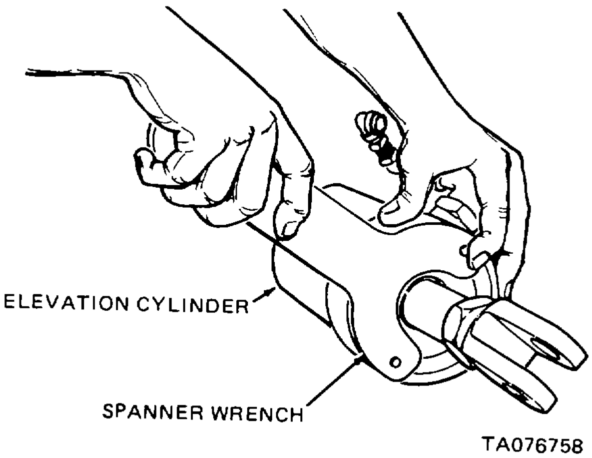


Figure 3-62. Elevation Cylinder Retainer Assembly Removal Using Spanner Wrench

f. Installation.

(1) Verify that lockwasher and locknut lockwire are installed on rod end. If rod end hole does not align rod end hole does not align with the mounting hole in the index boom, extend or retract piston as required until pin can be inserted.

(2) Secure rod end in index boom with pin, washer, and cotter pin.

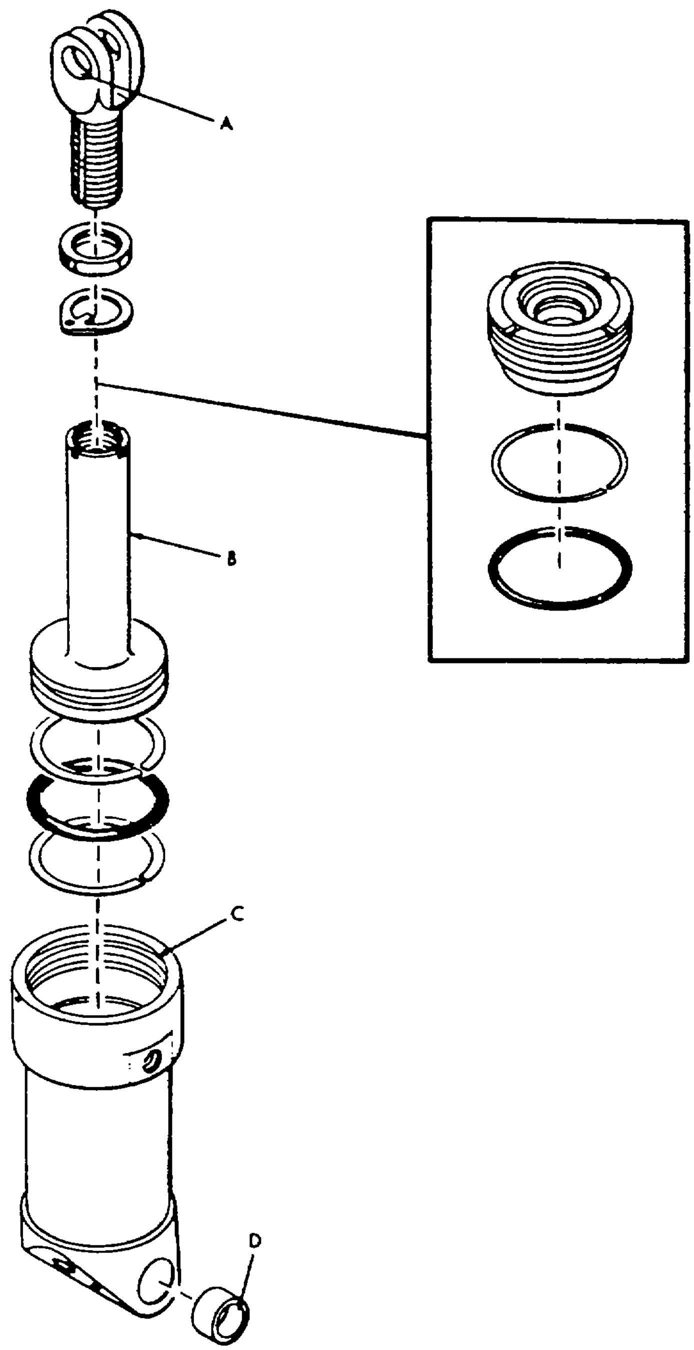
(3) Coat locknut, lockwasher, and piston with a waterproof sealant compound equal to item 1, App. C.

(4) Lubricate elevation cylinder in accordance with LO 9-1450-500-12, and check hydraulic fluid reservoir for fluid capacity.

(5) Start engine, engage hydraulic system, and raise index boom. Remove blocking and perform elevation cylinder operations.

(6) Return superstructure to transport position and inspect all hydraulic connections for leaks.

(7) Shut down engine and recheck hydraulic fluid reservoir fluid capacity.



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS (FIELD)
A	INSIDE DIAMETER OF HOLE	1.1250 TO 1.1255	1.140
B	OUTSIDE DIAMETER OF PISTON ROD	1.496 TO 1.498	1.494
C	INSIDE DIAMETER OF CYLINDER	4.000 TO 4.002	4.010
D	INSIDE DIAMETER OF BUSHING	1.2500 TO 1.2515	1.265

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Figure 3-63. Elevation Cylinder Wear Limits

3-41. Extension Cylinder Assembly

a. Removal (fig. 3-64)

(1) Lower index forks onto blocks.

(2) Extend extension cylinder until transfer arm assembly contacts link assembly. Shut down loader.

NOTE

The following step is necessary to prevent transfer arm and link assembly from collapsing when cylinder is disconnected.

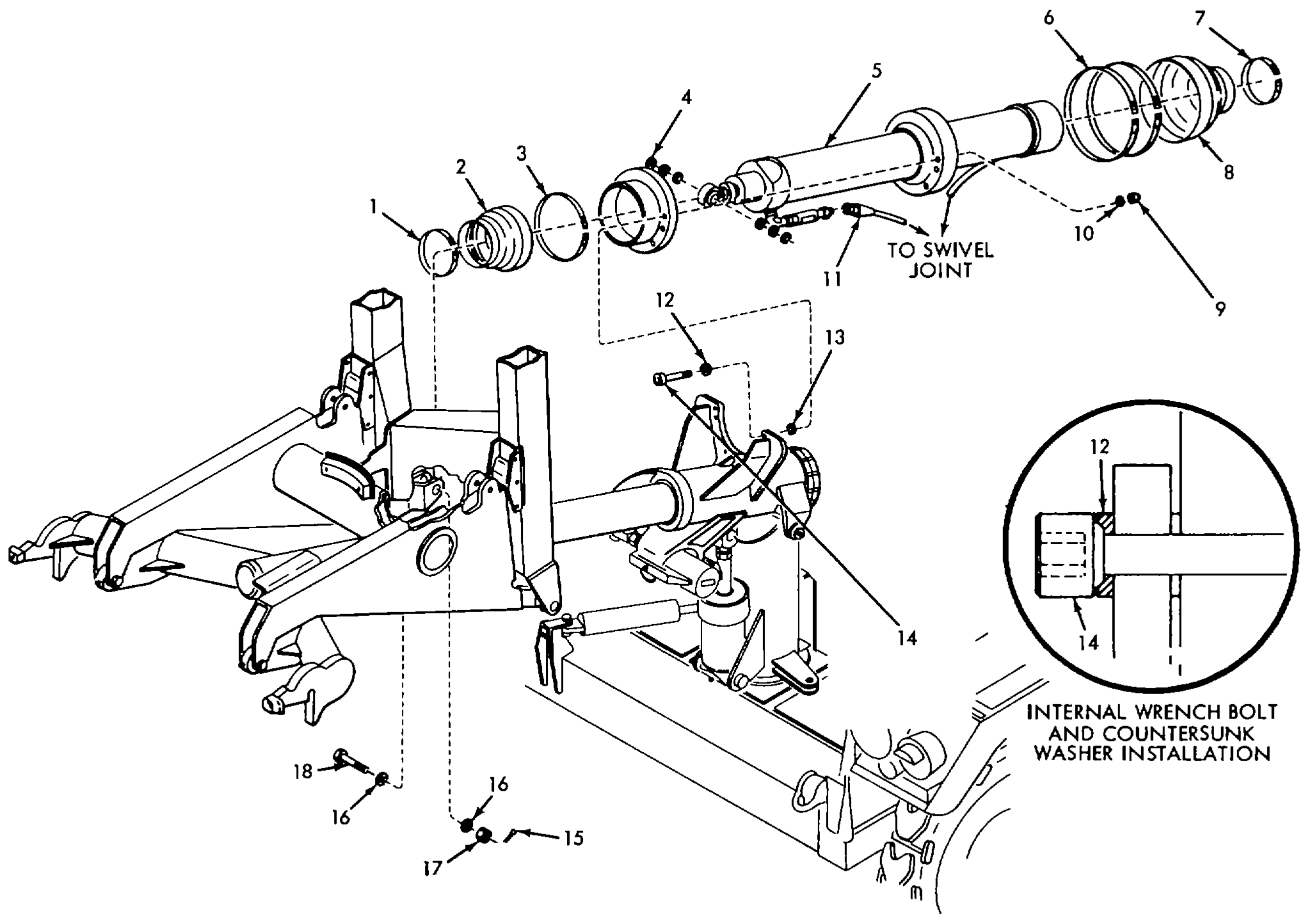
(3) Secure link assembly crosstube member to index boom using heavy rope or chain.

(4) Relieve hydraulic system pressure by cycling all manual control valves several times.

(5) Tag and disconnect both hydraulic hoses (11) from cylinder. Install protective caps in all openings.

(6) Disconnect cylinder rod end from transfer arm clevis by removing cotterpin (15), slotted hex nut (7), flat spacer washers (16), shims (4), and hex-head shear bolt (18).

(7) Remove four clamps (6) which retain larger rubber boot to boot bracket. Roll boot (8) back to expose attaching hardware.



1. CLAMP
2. BOOT
3. CLAMP (2)
4. SHIMS (AS REQUIRED)
5. EXTENSION CYLINDER
6. CLAMP (4)
7. CLAMP
8. BOOT
9. EXTENDED WASHER NUT (6)
10. FLAT WASHER (6)
11. HYDRAULIC HOSE ASSEMBLY
12. SPECIAL FLAT WASHER
13. FLAT WASHER (6)
14. INTERNAL WRENCH BOLT
15. COTTER PIN
16. WASHER (2)
17. NUT
18. BOLT

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Figure 3-64. Extension Cylinder Removal

(8) Remove six each extended washer nuts (9), flat washers (10), special flat washers (12), and internal wrench bolts (14) which secure cylinder support ring to index boom support bracket. Remove cylinder (5) and six flat washers from cylinder support bracket.

(9) Remove clamps (1, 3 and 7), and boots (2 and 8).

b. Disassembly (fig. 3-65). The following special tools are required to perform the disassembly and assembly procedures:

Special tool	NSN	Part number
Remover and replacer	5120-00-991-3162	1089278
Wrench, spanner	5120-00-991-3175	10892976
Wrench, spanner	5120-00-991-3169	10892980
Wrench, spanner	5120-00-991-3174	10892979

(1) Remove reducer (17.4) and associated parts (17.3), (17.5), (17.6), (17.7) and (17.8) from elbow (17.2). Discard packings (17.3), (17.5) and (17.7).

(2) Loosen nut (16) and remove union (17) and associated parts (14), (15), (16), (17.1) and (17.2). Discard packings (14) and (17.1).

(3) Remove reducer (22) and associated parts, packings (23), (21.4), (21.2), flow regulator (21.3) and reducer (21.1). Discard packings (23), (21.4) and (21.2).

(3.1) Loosen nut (27) and remove union (26) and associated parts (24), (25), (27), (28) and (29). Discard packings (25) and (29).

(3.2) Remove lubrication fitting (2) from rod end bearing assembly (1).

NOTE

Remove lubrication fitting only it visual inspection discloses damage.

(4) Using spanner wrench, special tool (48, fig. 1-2) (fig. 3-66), loosen locknut (10) and remove cap (13), packing (12), ring (11), and locknut (10).

(5) Remove lock (9) and, using spanner wrench, special tool (46, fig. 1-2), remove locknut (8); remove bearing (7).

(6) Loosen locknut (37), unseat tab washer (36), and remove rod end bearing assembly (1).

(7) Remove tab washer (36) and locknut (37) from rod end bearing assembly (1).

(8) Using spanner wrench, special tool (47, fig. 1-2) (fig. 3-67), loosen locknut (19) and remove retainer (30) and associated parts (20, 21, 31, 32, 33, 34 and 35).

(9) Remove packings (20, 21 and 31), retainer (32), packing (33), scraper (34), and retaining ring (35) from retainer (30).

(10) Remove locknut (19) from cylinder (6).

(11) Remove piston (18) and associated parts (5, 4, and 3) from cylinder (6).

(12) Remove rings (5 and 3) and packing (4) from piston (18).

c. *Inspection and Testing*.

(1) *Bearing (7).* If the inner ring of the bearing moves radially within the outer ring,

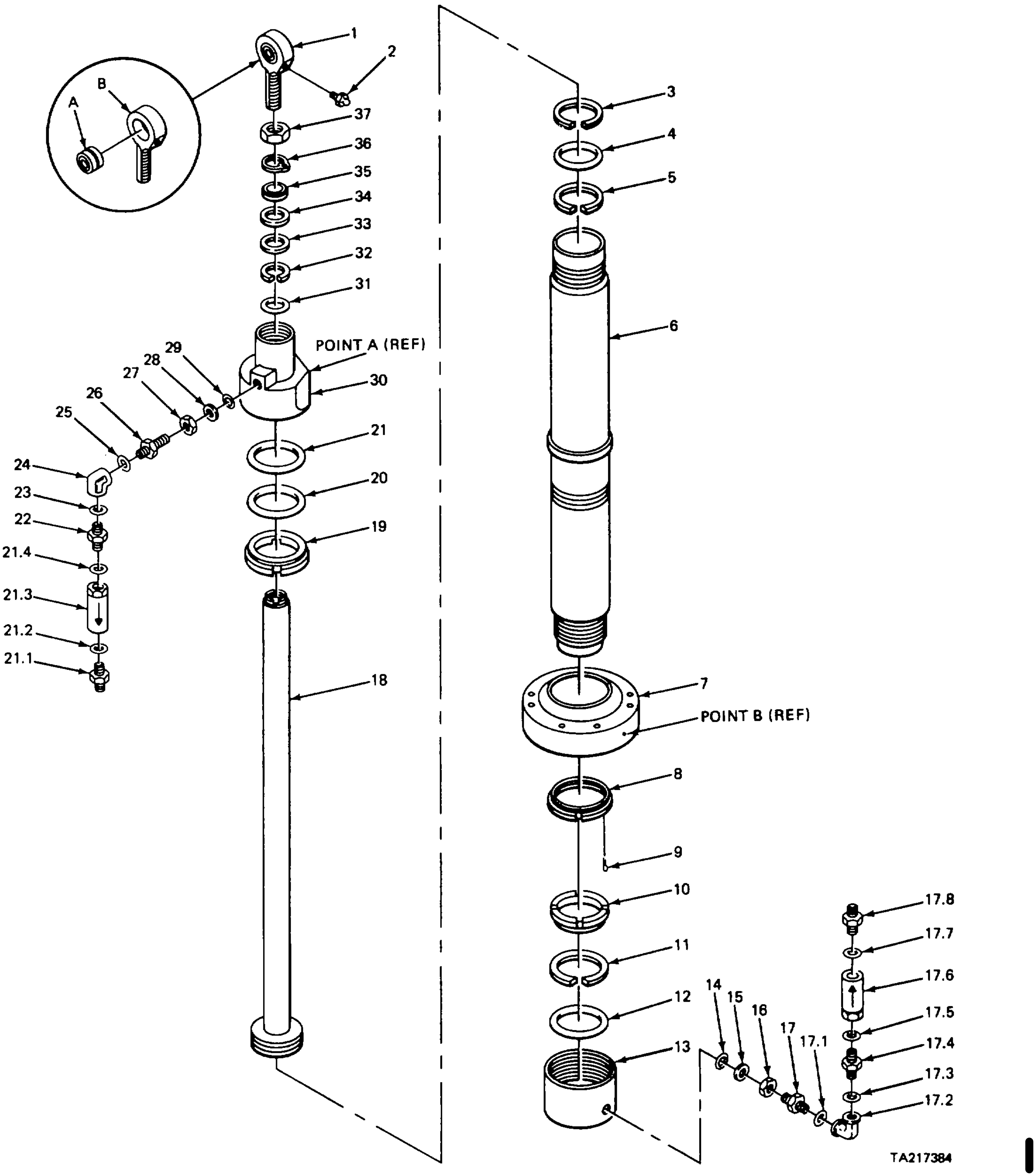

Figure 3-65. Extension Cylinder Disassembly (Sheet 1 of 2)

ITEM NUMBER	NAME
1	ROD END AND BEARING ASSEMBLY
	A BEARING
	B ROD END
2	LUBRICATION FITTING
3	TEFLON RETAINER
4	PACKING
5	TEFLON RETAINER
6	CYLINDER
7	BEARING
8	LOCKNUT
9	LOCK
10	LOCKNUT
11	TEFLON RETAINER
12	PACKING
13	CAP
14	PACKING
15	BACK-UP RING
16	NUT
17	UNION
17-1.	PACKING
17-2.	ELBOW
17-3.	PACKING
17-4.	REDUCER
17-5.	PACKING
17-6.	FLOW REGULATOR VALVE
17-7.	PACKING
17-8.	REDUCER
18	PISTON
19	LOCKNUT
20	PACKING
21	PACKING
21-1.	REDUCER
21-2.	PACKING
21-3.	FLOW REGULATOR VALVE
21-4.	PACKING
22	REDUCER
23	PACKING
24	ELBOW
25	PACKING
26	UNION
27	NUT
28	BACK-UP RING
29	PACKING
30	RETAINER
31	PACKING
32	RETAINER
33	PACKING (FELT RING)
34	SCRAPER
35	RETAINING RING
36	TAB WASHER
37	LOCKNUT

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Figure 3-65. Extension Cylinder Disassembly (Sheet 2 of 2)

through even a small arc, the bearing must be replaced. If the bearing has deep scratches or scores on the mating surface, or if the wear limits specified in figure. 3-68 are exceeded, the bearing must be replaced.

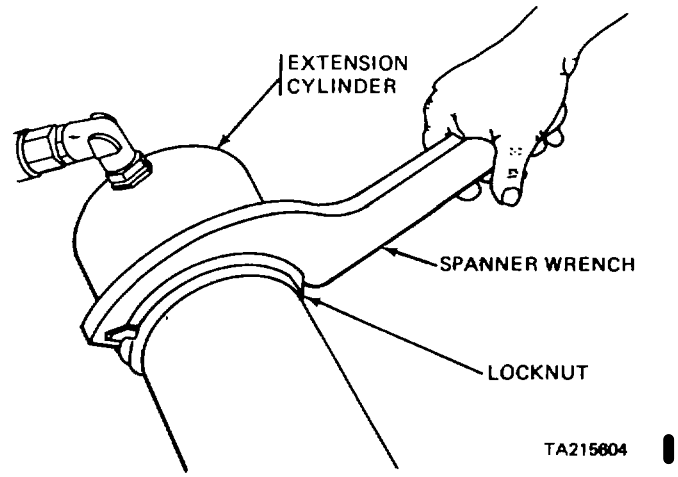


Figure 3-66. Extension Cylinder-Bearing Locknut Removal Using Spanner Wrench

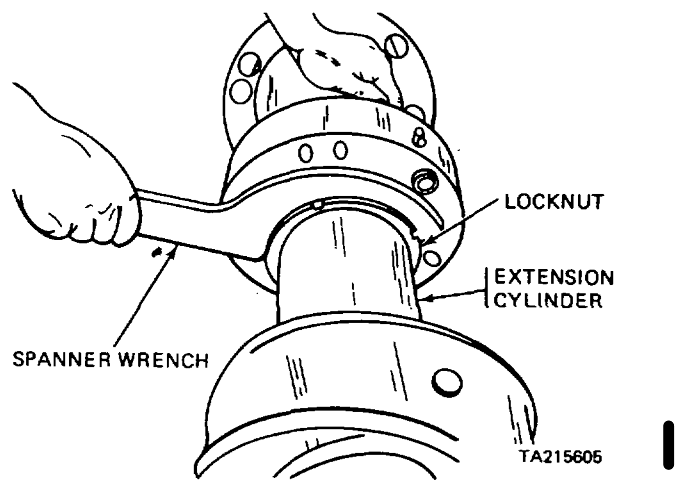
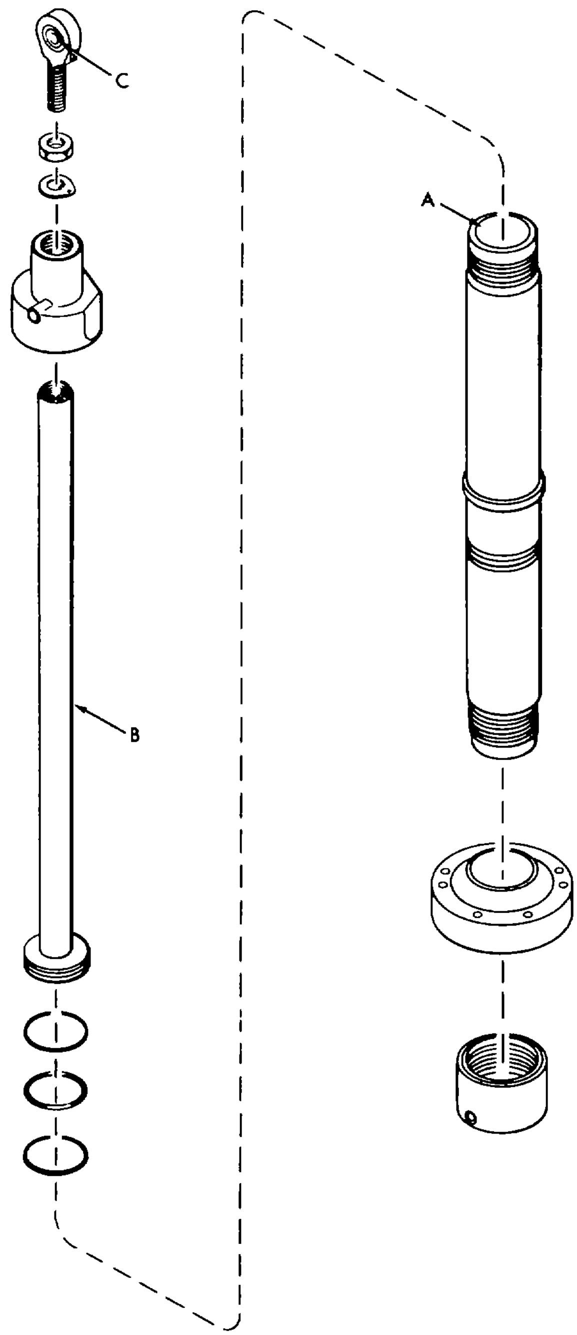


Figure 3-67. Extension Cylinder-Piston Locknut Removal Using Spanner Wrench

(2) *Rod end bearing assembly* (1). If bearing (1A) is damaged and rod end (1B) is serviceable, press out the damaged bearing using remover and replacer, special tool (24, fig. 1-2), and press in a new one.

(3) *Operation and leakage*. After completion of the assembly procedure, accomplish operation and leakage teats as specified



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS (FIELD)
A	INSIDE DIAMETER OF CYLINDER	4.626 TO 4.628	4.635
B	OUTSIDE DIAMETER OF PISTON ROD	2.121 TO 2.122	2.118
C	ROD END BEARING	BEARING MUST ROTATE FREELY WITHOUT EXCESSIVE END PLAY	

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Figure 3-68. Extension Cylinder Wear Limits

in table 3-14. If the cylinder fails the operation and leakage tests, the cylinder assembly must be replaced. Replace damaged lubrication fittings.

d. *Assembly.*

(1) Assembly packing (4) between rings (5 and 3) in groove on head of piston (18).

NOTE

Apply a coating of hydraulic fluid, item 2, App. C, to all surfaces of piston before it is inserted into cylinder.

(2) Insert piston (18), head end first, into end of cylinder (6) and slide piston into cylinder.

(3) Screw locknut (19) on end of cylinder (6).

NOTE

Cylinder end specified in preceeding two steps is opposite the end over which bearing is installed.

(4) Install packing (21) and packing (20) in groove in large end of retainer (30). Install packing (31) and retainer (32) in innermost groove in small end of retainer (30). Install packing (33) in next groove. Install scraper (34), large diameter side first, in next groove and secure in place with retaining ring (35).

(5) Slip retainer (30) over end of piston rod and screw retainer (30) on end of cylinder (6) until retainer bottoms.

(6) Using spanner wrench, special tool (47, fig. 1-2) (fig. 3-67), tighten locknut (19) against retainer (30).

(7) Safety tie locknut (19) to retainer (30) with lockwire.

(8) Install lubrication fitting (2) in rod end bearing assembly (1). Screw locknut (37) on rod end bearing assembly (1) until it bottoms.

(9) Place tab washer (36) on rod end with tab side away from locknut (37).

(10) Screw rod end of rod end bearing assembly (1) into piston rod until there are approximately five threads showing between locknut (37) and piston rod. Aline slot of piston rod with groove in rod end of bearing assembly (1), seat tab washer (36), and tighten locknut (37).

(11) Safety tie tab washer (36) to locknut (37) with lockwire after installing cylinder on loader and final adjustments are completed.

(12) Assemble bearing (7), with pin (point B) alined with point A of retainer (30) (vertical position when installed on loader) and ball loading slots toward rod end of cylinder, to cylinder (6). Insert side of bearing must rest against shoulder in middle of cylinder (6).

(13) Assembly locknut (8), small diameter side first, to cylinder (6) and, using spanner wrench, special tool (46, fig. 1-2) (fig. 3-66) tighten locknut (8) to 500 ft-lb torque minimum,

to aline slot in locknut (8) with slot in cylinder (6).

(14) Insert lock (9), small tab first, in slot of cylinder (6). Safety tie lock (9) to locknut (8) with lockwire.

(15) Screw locknut (10) on end of cylinder (6) until locknut bottoms.

(16) Install packing (12) and retainer (11) in the large groove in cap (13). Screw cap (13) to the end of cylinder (6) and, using spanner wrench, special tool (47, fig. 1-2), (fig. 3-67) tighten locknut (10) against cap (13).

(17) Safety tie locknut (10) to cap (13) with lockwire.

(18) Lubricate rod end bearing assembly (1) and bearing (7) in accordance with LO 9-1450-500-12 after installation.

(19) Assemble nut (27), backup ring (28), and packing (29) to union and install union in the port of retainer (30).

(20) Install reducers (21.1) and (22) into each end of flow regulator valve (21.3) with new packings (21.2) and (21.4).

(21) Install a new packing (23) onto reducer at opposite end of "Regulated Flow" arrowhead on flow regulator.

(22) Install the flow regulator, with reducers attached, into the elbow (24) with "Regulated Flow" arrow pointing away from the elbow and tighten.

(23) Install new packing (14), backup ring (15), nut (16), union (17), new packing (17.1) and elbow (17.2) in the port of cap (13).

(24) Install reducers (17.4) and (17.8) into each end of flow regulator valve (17.6) with new packing (17.5) and (17.7).

(25) Install a new packing (17.3) onto reducer at opposite end of "Regulated Flow" arrowhead on flow regulator.

(26) Install the flow regulator, with reducers attached, into the elbow (17.2) with "Regulated Flow" arrow pointing away from the elbow and tighten.

e. *Installation*.

(1) Install extension cylinder by reversing the sequence of the removal procedure. Tighten six internal wrench bolts to 2500 ±100 in-lb torque.

NOTE

Shim as required to center extension cylinder rod end in transfer arms cross-members clevis. Install special flat washers as shown in figure 3-64.

(2) Lubricate cylinder in accordance with LO 9-1450-500-12.

NOTE

Prior to operating cylinder, wipe piston rod with a clean cloth and lubricate rod with clean hydraulic fluid, item 2, App. C.

(3) Start loader and test cylinder operation by bottoming piston in both directions. Repeat several times. Inspect all connections for evidence of leaks.

(4) Return superstructure to transport position, shut down loader and fill hydraulic fluid reservoir to capacity.

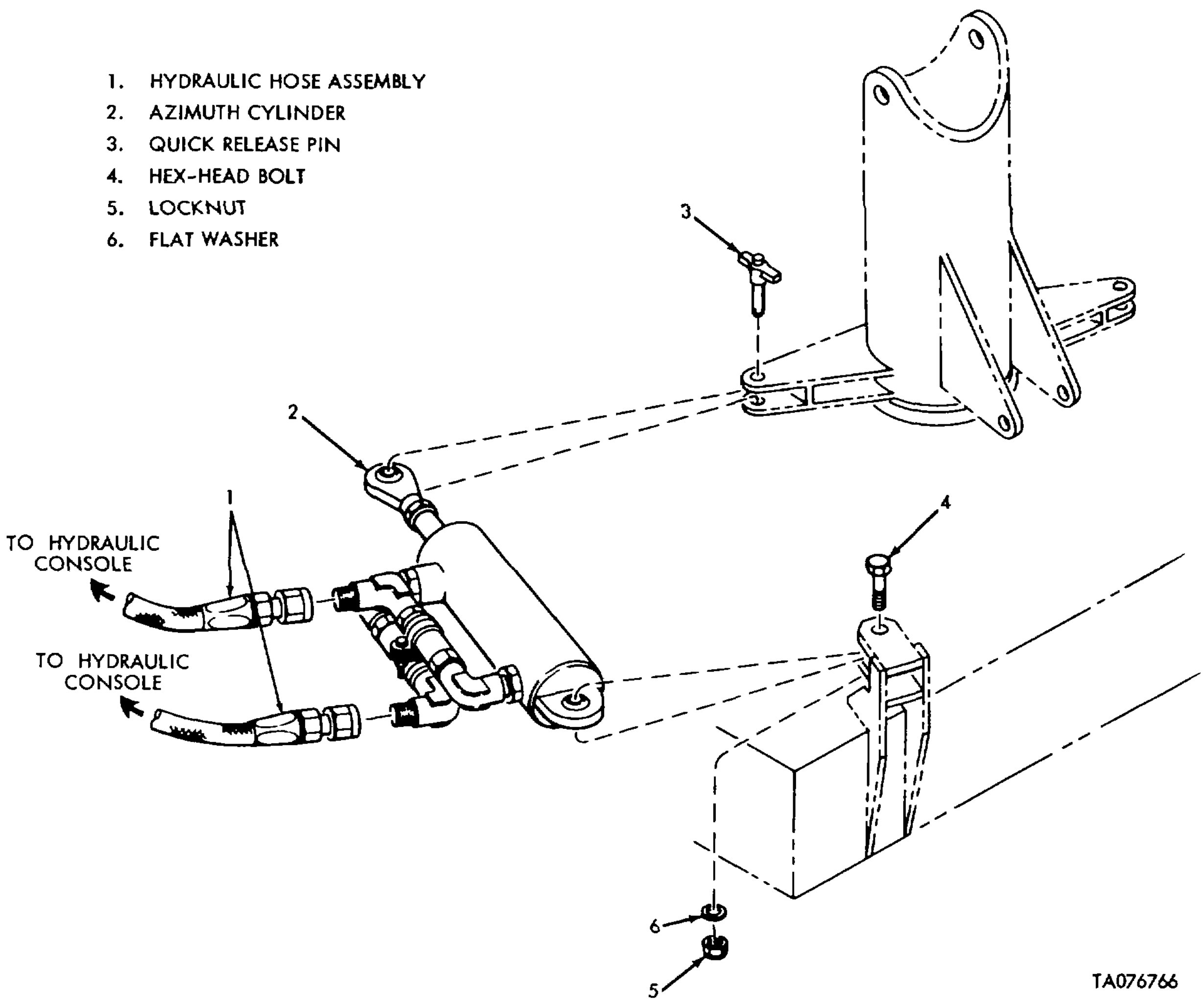

Figure 3-69. Azimuth Cylinder Replacement

(2) Loosen nut (10) and remove reducer elbow (11) and associated parts (8, 9, and 10).

(3) Loosen locknut (20), unseat lockwasher (19), and unscrew rod end bearing assembly (2). Remove lubrication fitting (1) from rod end bearing assembly (2).

NOTE

Remove lubrication fitting only if visual inspection discloses damage.

(4) Remove locknut (20) and lockwasher (19) from rod end bearing assembly (2).

(5) Remove retaining ring (18) and rings (16, 17, and 15) from cylinder assembly (13).

(6) Remove retainer assembly (14) from cylinder assembly (13).

(7) Remove parts (14A through 14G, 14J, and 14K) from retainer (14H).

(8) Remove piston assembly (3) from cylinder assembly (13).

Remove parts (3B, 3C, and 3D) from piston (3A).

(9) Remove lubrication fitting (12) from cylinder assembly (13).

NOTE

Remove lubrication fitting only if visual inspection discloses damage.

(4) Remove locknut (20) and lockwasher (19) from rod end bearing assembly (2).

(5) Remove retaining ring (18) and rings (16, 17, and 15) from cylinder assembly (13).

(6) Remove retainer assembly (14) from cylinder assembly (13).

(7) Remove parts (14A through 14G, 14J, and 14K) from retainer (14H).

(8) Remove piston assembly (3) from cylinder assembly (13).

Remove parts (3B, 3C, and 3D) from piston (3A).

(9) Remove lubrication fitting (12) from cylinder assembly (13).

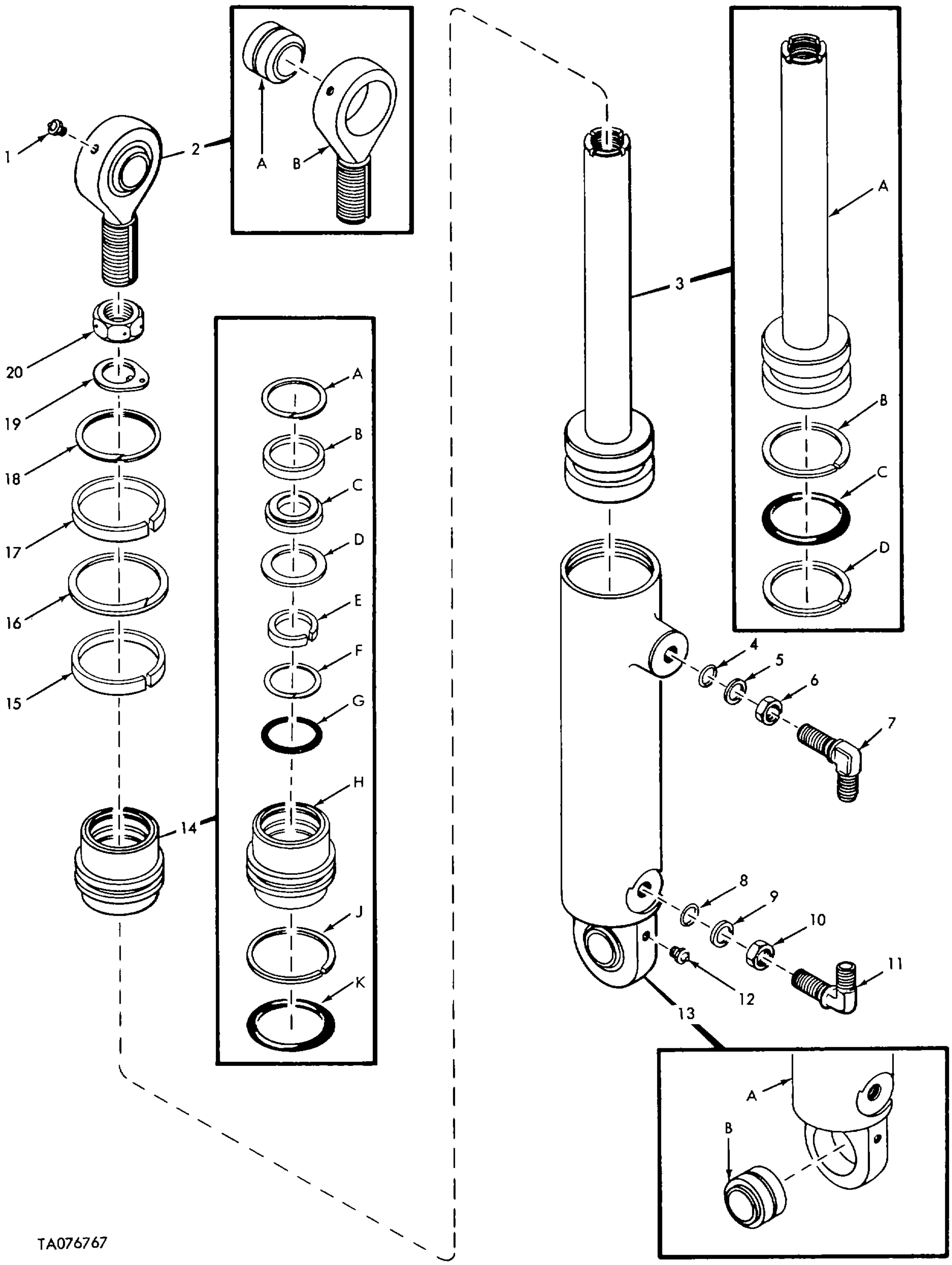

Figure 3-70. Azimuth Cylinder Disassembly (Sheet 1 of 2)

ITEM NUMBER	NAME
1	LUBRICATION FITTING
2	ROD END BEARING ASSEMBLY
	A BEARING
	B ROD END
3	PISTON ASSEMBLY
	A PISTON
	B RING
	C PACKING
	D RING
4	PACKING
5	BACK-UP-RING
6	NUT
7	REDUCER ELBOW
8	PACKING
9	BACK-UP-RING
10	NUT
11	REDUCER ELBOW
12	LUBRICATION FITTING
13	CYLINDER ASSEMBLY
	A CYLINDER
	B BEARING
14	RETAINER ASSEMBLY
	A RETAINING RING
	B SCRAPER RETAINER
	C SCRAPER
	D WASHER
	E FELT RING
	F RING
	G PACKING
	H RETAINER
	J RING
	K PACKING
15	RING
16	RETAINING RING
17	RING
18	RETAINING RING
19	TAB WASHER
20	LOCKNUT

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Figure 3-70. Azimuth Cylinder Disassembly Sheet 2 of 2)

NOTE

Remove lubricating fitting only if visual inspection discloses damage.

c. *Inspection and Testing*. The following special tool is required to perform the inspection and testing procedures:

Special tool	NSN	Part number
Remover and replacer	5120-00-991-3176	10892975

(1) *Rod end bearing assembly (2).* If bearing (2A) is damaged and rod end (2B) is serviceable, press out the damaged bearing and press in a new one using remover and replacer, special tool (26, fig. 1-2).

(2) *Cylinder assembly (13).* Inspect cylinder assembly and if bearing (13B) is damaged, press out damaged bearing and press in a new one. The new bearing must be staked (four places) in place after it is pressed into cylinder assembly. If cylinder (13) and piston (3A) are worn beyond the limits specified in figure 3-71, the defective parts must be replaced.

(3) *Operation and leakage.* Accomplish operation and leakage tests as specified in table 3-14. If the cylinder assembly fails either the operation or leakage test, the cylinder assembly must be replaced.

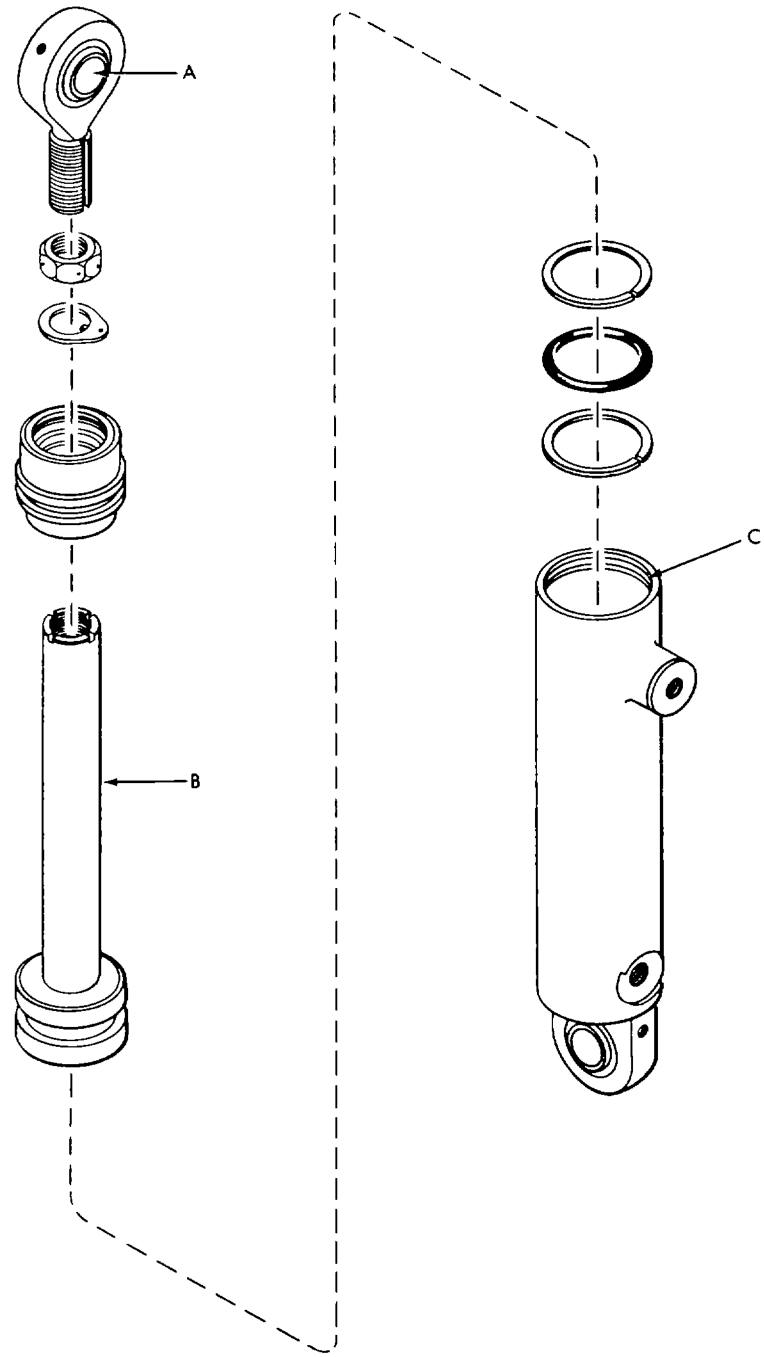
d. *Assembly*.

(1) Install lubrication fitting (12) in cylinder assembly (13).

(2) Insert packing (3C) between rings (3B and 3D) in groove in head of piston (3). Insert piston assembly (3) into cylinder assembly (13).

NOTE

Coat piston assembly with hydraulic fluid, item 2, App. C before inserting piston into cylinder.



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS (FIELD)
A	ROD END BEARING	BEARING MUST ROTATE FREELY WITHOUT EXCESSIVE END PLAY	
B	OUTSIDE DIAMETER OF PISTON ROD	0.9965 TO 0.9975	0.9945
C	INSIDE DIAMETER OF CYLINDER	2.000 TO 2.002	2.012

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Figure 3-71. Azimuth Cylinder Wear Limits

(3) Insert packing (14K) and ring (14J) in the groove on outside diameter of retainer (14H), packing toward small diameter end of retainer.

(4) Insert packing (14G), followed by ring (14F) in innermost groove in bore of retainer (14H). Place felt ring (14E) in next groove. Install washer (14D). Insert scraper (14C), large diameter side first. Fit scraper retainer (14B) over scraper. Secure scraper retainer with retaining ring (14A).

(5) Place cylinder assembly (13) in vertical position and insert retainer assembly (14), small diameter end first, into cylinder until approximately one eight of retainer protrudes from the cylinder bore. Place ring (15) in space between retainer assembly (14) and cylinder assembly (13). Secure with retaining ring (16). Place ring (17) on top of retaining ring (16) and secure with retaining ring (8).

(6) Install lubrication fitting (1) in rod end bearing assembly (2). Screw locknut (20) on rod end of bearing assembly (2) as far as it will go. Place lockwasher (19) on rod end bearing assembly (2), tab away from the nut. With piston fully retracted, screw bearing assembly into piston to establish a dimension of 13.81 ±0.06 inches between centerlines of the rod end holes and cylinder mounting holes. Seat lockwasher (19) and tighten locknut (20).

NOTE

Safety tie locknut (20) to lockwasher (19) with lockwire.

(7) Assemble nut (6), backup ring (5), and packing (4) to reducer elbow (7) and install reducer elbow (7) in port of cylinder assembly (13). Tighten nut (6) finger tight.

(8) Assemble nut (10), backup ring (9) and packing (8) to reducer elbow (11) and install reducer elbow (11) on port of cylinder assembly (13). Tighten nut (10) finger tight.

(9) Lubricate bearings of rod end bearing assembly and cylinder assembly in accordance with LO 9-1450-500-12 after installation of cylinder on loader.

e. *Installation.*

(1) Install the azimuth cylinder by reversing the sequence of the removal procedure.

(2) Lubricate cylinder in accordance with LO 9-1450-500-12.

(3) Start loader, elevate boom, and extend superstructure sufficiently to actuate azimuth and roll cutout switch. Operate AZIMUTH control lever to actuate azimuth cylinder to full extend and full retract positions. Repeat several times. Return superstructure to transport position and inspect all connections for leaks.

(4) Shut down engine and fill hydraulic fluid reservoir to capacity.

3-43. Check Valves.

Test all check valves as specified in table 3-15.

3-44. Hydraulic Fluid Reservoir Assembly.

a. *Removal and Installation*. Refer to TM 9-1450-500-20.

Table 3-15. Testing Check Valve

Procedure	Normal indication	Probable defect.
	PROOF PRESSURE AND LEAKAGE TEST	
1. Plug return port and apply 4500 psig to pressure port for 2 minutes (minimum).	No measurable external leakage, failure, or permanent set.	Valve body or seals faulty.
2. Remove pressure and re-peat step 1.		
3. Remove pressure and plug pressure port. Apply 4500 psig to return port and hold for 2 minutes (minimum).	No measurable external leakage, failure, or permanent set.	Valve body or seals faulty
4. Remove pressure and repeat step, 3.		
	OPERATIONAL TEST	
5. Apply 3000 psig to pressure port.	Flow indication.	Valve faulty.

b. *Disassembly* (fig. 3-72).

(1) Remove lockwire from screws (9).

(2) Remove 11 screws (10) which secure cover (11) to tank and remove cover.

(3) Remove two each screws (2) and packing (28), and one each bolt (3), gasket (27), washer (26) and nut (25) which secure inlet port (29) to cover. Remove inlet port.

(4) Remove bolt (6), washer (7), and nut (15) which secure chain to cover. Remove cap (8) and two leaf springs (14) from cover.

(5) Remove cover gasket (12) from reservoir.

(6) Remove safety valve (16), gasket, element, gasket, holder, and packing (in that order) from inside reservoir.

(7) Reach inside reservoir opening and remove pins (17 and 23) and spacers (18 and 22).

(8) Slide glass tube (20) up and out of packings (19 and 21).

(9) Remove packings (19 and 21) from reservoir (24).

c. *Inspection and Testing*. Perform a visual inspection of the reservoir interior to verify that no broken pieces or small particles of glass or other foreign material are in reservoir. If glass particles are detected, the reservoir must be flushed and cleaned to remove particles. Accomplish leakage and pressure tests as specified in table 3-16. If leaks are detected around sight indicator, remove and replace the packings (19 and 21). If the reservoir leaks, it must be repaired or replaced.

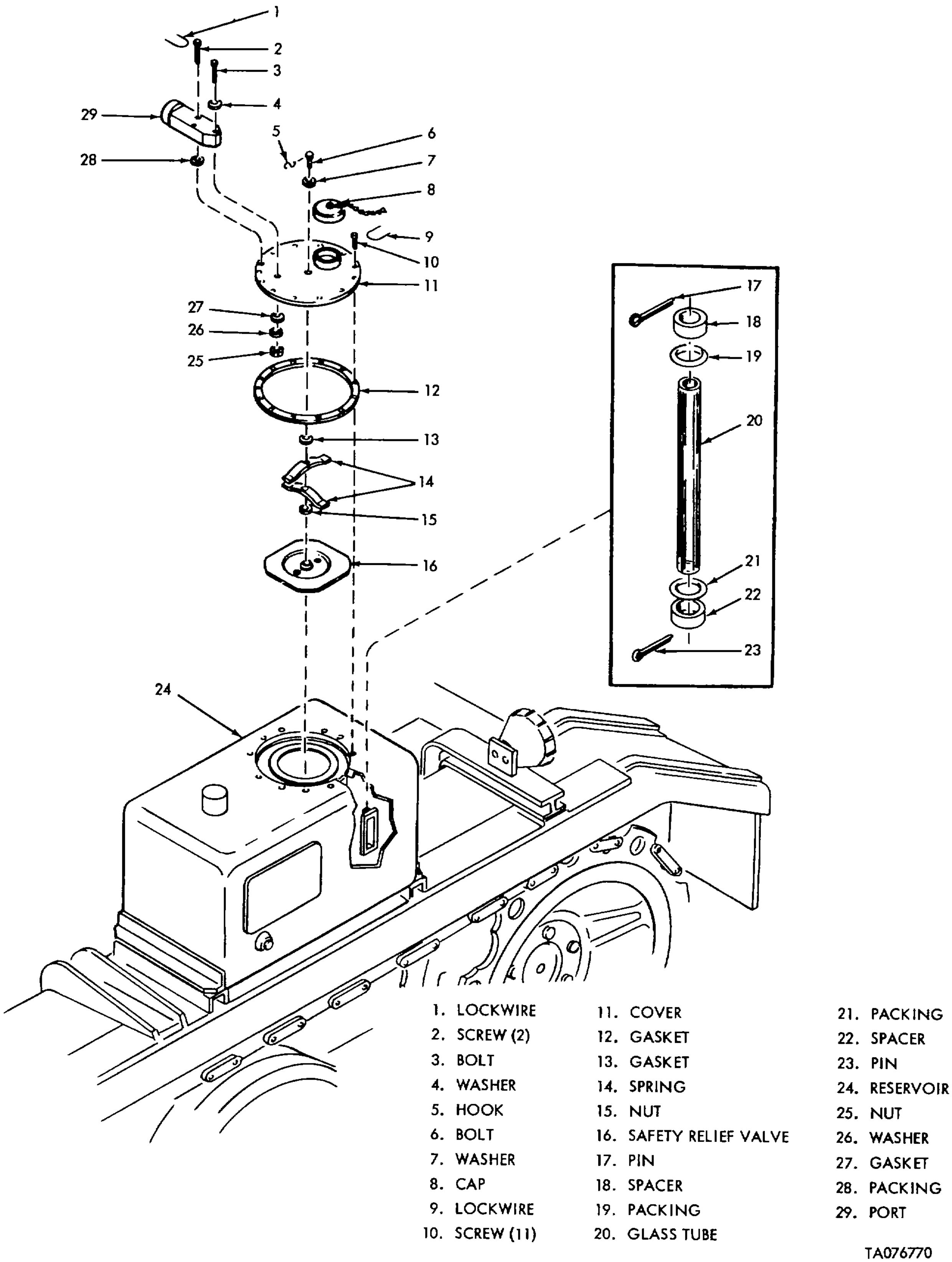


Figure 3-72. Hydraulic Fluid Reservoir Assembly Disassembly

Table 3-16. Testing Hydraulic Fluid Reservoir

Procedure	Normal indication	Probable defect.
	LEAKAGE TEST	
Apply internal pressure of 8 psig for 2 minutes (minimum).	No leakage or permanent deformation.	Gaskets or seals faulty.
	DIFFERENTIAL PRESSURE TEST	
Apply an outside to inside differential pressure of 4 psig for 2 minutes (minimum).	No permanent deformation or pressure drop.	Gaskets or seals faulty.

d. *Assembly.* Assemble the cover and sight tube indicator by reversing the sequence of the disassembly procedure. For other parts, refer to TM 9-1450-500-20. After assembly and installation is complete, energize loader and operate hydraulic system to eliminate air trapped in system. Check for leaks at all connections. Add fluid as required.

SECTION VIII.1 (SEE NOTE) SUPERSTRUCTURE HYDRAULIC PRESSURE SUPPLY SYSTEM

3-45 Description

Power for the superstructure operation is provided by an engine-driven hydraulic pump, hydraulic cylinders, a six-gallon hydraulic oil reservoir, filters, valves, swivel lines, fittings and hoses. This section details repair and overhaul standards for the hydraulic system components. Included are points of measurement, sizes and fits of new parts, wear limits for field and depot maintenance levels, and code symbols for coordinate information. The letter L indicates a loose, clearance fit between parts. The letter T indicates a tight or interference fit between parts. A double asterisk (**) indicates that the part may be used for selective fitting as long as the mating part permits the fit required between the two. All dimensions are in inches.

3-46 Hydraulic System Components

a. Wear Limits.

(1) *Hydraulic Control Console*. Control linkage refer to fig. 3-95.

(2) *Roll cylinder assemblies*. Refer to figure 3-109.

(3) *Elevation cylinder assembly*. Refer to figure 3-113.

(4) *Extension cylinder assembly*. Refer to figure 3-118.

(5) *Azimuth cylinder assembly*. Refer to figure 3-121.

b. Testing procedures.

The following components are to be tested in FME 5 according to TM 9-4935-543-14.

(1) Extension cylinder flow regulator valve (para 3-49).

(2) Cylinder azimuth flow regulator valve (para 3-50).

(3) Swivel joint (para 3-51).

(4) Elevation cylinder flow regulator valve (para 3-52).

(5) Roll cylinder flow regulator valve (para 3-53).

(6) Control block (para 3-54).

(7) 615 psi pressure regulator valve (para 3-56).

(8) Roll and azimuth lockout solenoid valve and azimuth control valve (para 3-57).

(9) Extension control valve (para 3-58).

(10) Roll control valve and elevation control valve (para 3-59).

(11) Hydraulic control console assembly filter (para 3-62).

(12) Thermal relief valve (para 3-63).

(13) Starter relief valve (para 3-64).

(14) Roll left lockout control solenoid valve (para 3-65).

(15) Roll right lockout control solenoid valve (para 3-66).

(16) Elevation/extension lockout control solenoid valve (Para 3-67).

(17) Elevation/retract lockout control solenoid valve (para 3-68).

(18) Reduced pressure solenoid valve (para 3-69).

(19) System pressure relief valve (para 3-70).

(20) Reduced pressure switch (para 3-71).

(21) Roll cylinder, extension cylinder, azimuth cylinder, and elevation cylinder (para 3-72) through (para 3-75).

(22) Check valves (para 3-76).

(23) Hydraulic fluid reservoir (para 3-77).

NOTE: Section VIII. 1 applies to Loader PN 50008600.
Refer to Section VIII for Loader PNs 9099200, 50092260 or 50092266.

3-47 Hydraulic System Maintenance

a. Contamination. Every precaution must be taken to prevent contamination of hydraulic fluid. Storage containers should be kept clean and sealed. All handling containers must be kept clean and used only for hydraulic fluid. Do not leave the container or the reservoir open any longer then necessary, since dust and grit in the air may get into the fluid. Fluid that has been exposed to dust or other contamination must be filtered before being used again, or if badly contaminated, be discarded. Filtering will remove sludge as well as metal flakes, dust, and grit.

b. Dust Plugs. Upon removal of a hydraulic component or line, dust plugs must be installed immediately to ensure cleanliness of the system. These plugs must be kept in a clean, closed container and checked prior to using to make certain the threads are not damage. This will prevent damage to threaded components or fittings in which the plugs are used.

c. Seals. Upon removal or disassembly of hydraulic components, discard all packings and backup rings. Use only new packings, seals, and backup rings, coated with a film of clean hydraulic fluid, item 2, App. C. If an installation tool is not available, a tube of paper slipped over the threads will protect the packing, seal, or backup ring.

d. Containers. A clean, preferably plastic, parts container should be used to hold and protect parts from damage or loss during the repair or replacement of hydraulic components.

CAUTION

Use care to prevent damage to parts due to their striking against each other.

e. Safety Wiring. Parts such as bolts, nuts, adjustment screws, plugs, etc., are sometimes safety wired. If a safety wire tool is not available, the twisting may be done by hand, except for the last few turns, which are made with pliers to apply tension and secure the wire ends properly. In all applications, the wires must be installed in such a manner as to oppose the loosening of the part.

f. Fittings. When a wrench is used on an extended shoulder of a female fitting, a male fitting or rigid plug must be installed to prevent collapse or distortion of the shoulder.

g. Removal and Replacement of Hydraulic Lines. Defective lines should be replaced immediately. Replace lines with the equivalent replacement part.

h. Hydraulic Line Installation. Figure 3-73 shows the correct methods of installing flexible hose assemblies. The important consideration in routing hose is to produce a smooth, even band, without flattening or buckling the hose.

i. Flareless Fittings. The Careless fitting is subjected to high pressures in the loader. The sleeve on the end of the tubing must therefore be installed correctly if reliable operation is to be realized. Figure 3-74 shows the correct way to install sleeves.

j. Impurities. All reasonable means should be taken to prevent the entrance of foreign matter during operation or when oil is added to the system, or when maintenance work is performed. Covers should be kept closed whenever possible.

k. Water. Although water may be considered a contaminant, its universal presence in the surrounding atmosphere makes it impossible to prevent at least small quantities of water from entering the hydraulic system. Precipitation of moisture occurs principally when ambient temperatures fall below the dew point of the air in the reservoir. Small quantities of water in hydraulic system are not likely to cause harm, nevertheless inspection should be made periodically by removing the reservoir drain plug and inspecting a small quantity of oil for contamination.

l. Excessive Foaming or Entrapped Air. Foaming is caused by the release of air entrapped in the oil. The presence of air in the hydraulic oil may cause irregular operation of the system because it changes the hydraulic oil from noncompressible to compressible medium. Some of the most common causes for the presence of air are: too low a level in the reservoir permitting the intake tube to suck air as well as oil, and air entrapped due to component replacement.

m. High Oil Temperature. Operating temperatures above normal range are hard on both the hydraulic fluid and the equipment, and frequently cause excessive down time. High temperature lowers the viscosity of the oil and reduces its ability to lubricate and seal effectively, thus permitting greater wear. High temperature also increases the rate of oxidation and hastens the formation of deposits or corrosive acidity making it necessary to change the hydraulic oil more often. For reasons mentioned previously, it is highly advisable to keep oil temperature under observation. If the loader hydraulic system reaches 165°F, an indicator light on the control panel comes on. If a loading or offloading procedure is in process and this happens, the procedure may be completed and then the loader

NOTE

When disconnecting two or more hydraulic lines, tag each line to ensure correct installation .

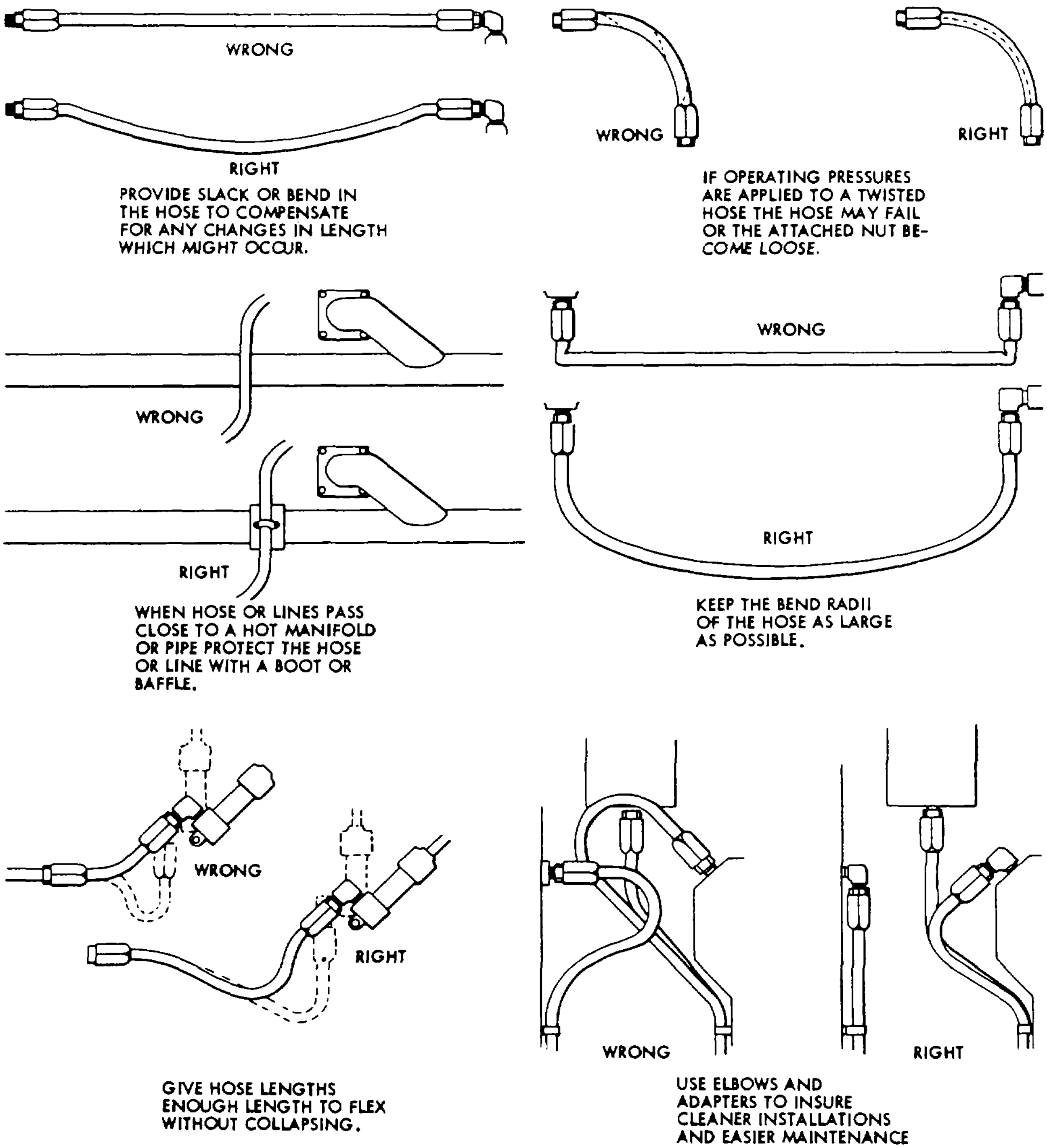
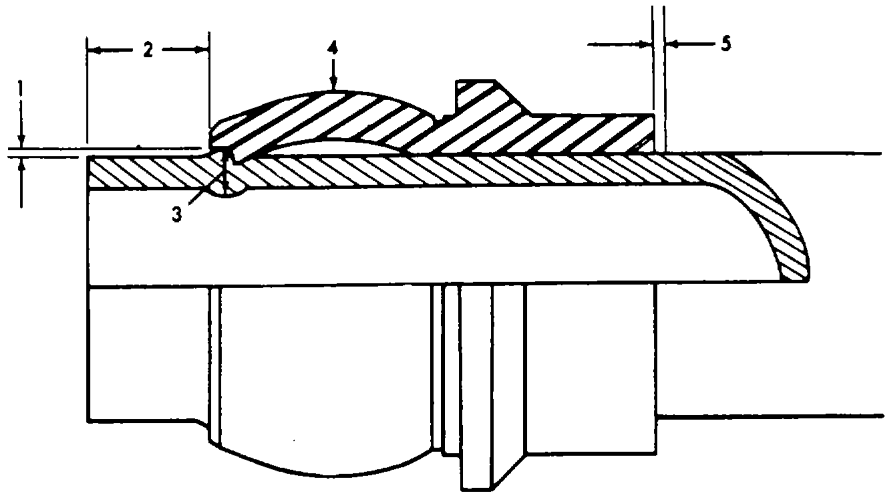


Figure 3-73 Hose Assembly Installation Aids.



1. SLEEVE PILOT MUST CONTACT TUBE SURFACE OR BE WITHIN MAXIMUM GAP SPECIFIED:

TUBING SIZE (INCHES)	MAX GAP (INCHES)
1/4	.007
3/1	.013
1/2	.015

2. TUBE PROJECTION FROM SLEEVE PILOT TO TUBE END MUST BE AS SPECIFIED.

TUBING SIZE (INCHES)	PROJECTION (INCHES)
1/4	.109
3/8	.172
1/2	188

3. A SLIGHT PROJECTION OR LIP WILL BE RAISED BY THE FORWARD MOTION OF CUTTING EDGE OF SLEEVE PILOT. BURRS ARE NOT PERMITTED.
4. SLEEVE SHOULD BE BOWED SLIGHTLY.
5. LONGITUDINAL MOVEMENT OF SLEEVE MUST NOT EXCEED .016 BUT SLEEVE MAY ROTATE ON TUBING.

TA076719

Figure 3-74 Flareless Tube Fitting Dimensions.

must be shut down and given sufficient time to cool and then the cause for overheating determined.

3-48 Superstructure Hydraulic Pressure Supply System

The hydraulic system (fig. 3-75) provides power to actuate the superstructure in the direction selected by the operator. Control is maintained at the hydraulic console. The hydraulic system consists of the supply and return systems, the roll system, the azimuth system, the elevation system, and an extension system. The supply and return system includes a pump.

Due to the fact that the hydraulic gear pump is integrated in the engine and is not equipped with a volume control device, it is mandatory to insert in the circuit a control block which enables the fluid to flow back into the hydraulic tank., This will prevent the complete hydraulic fluid, when not used during loader travel on the road, to flow via the pressure control valve installed in the hydraulic console, which would cause overheating within a very short period of time.

When the superstructure is operating with the engine system at 1000 - 1500 rpm approximately 8-12 1 /min flow from the pump via the control block to the valves and cylinders of the superstructure (max. 0.35 gal/min), and from there back to the tank.

The stored quantity keeps the hydraulic system under pressure, until the HYDRAULIC PRESSURE RELEASE SWITCH is depressed.

The reservoir is kept under a pressure of 180 - 210 bar by means of the storage loading valve.

Thermal switch is incorporated in return line. A flow diagram of the hydraulic system is shown in figure 3-76.

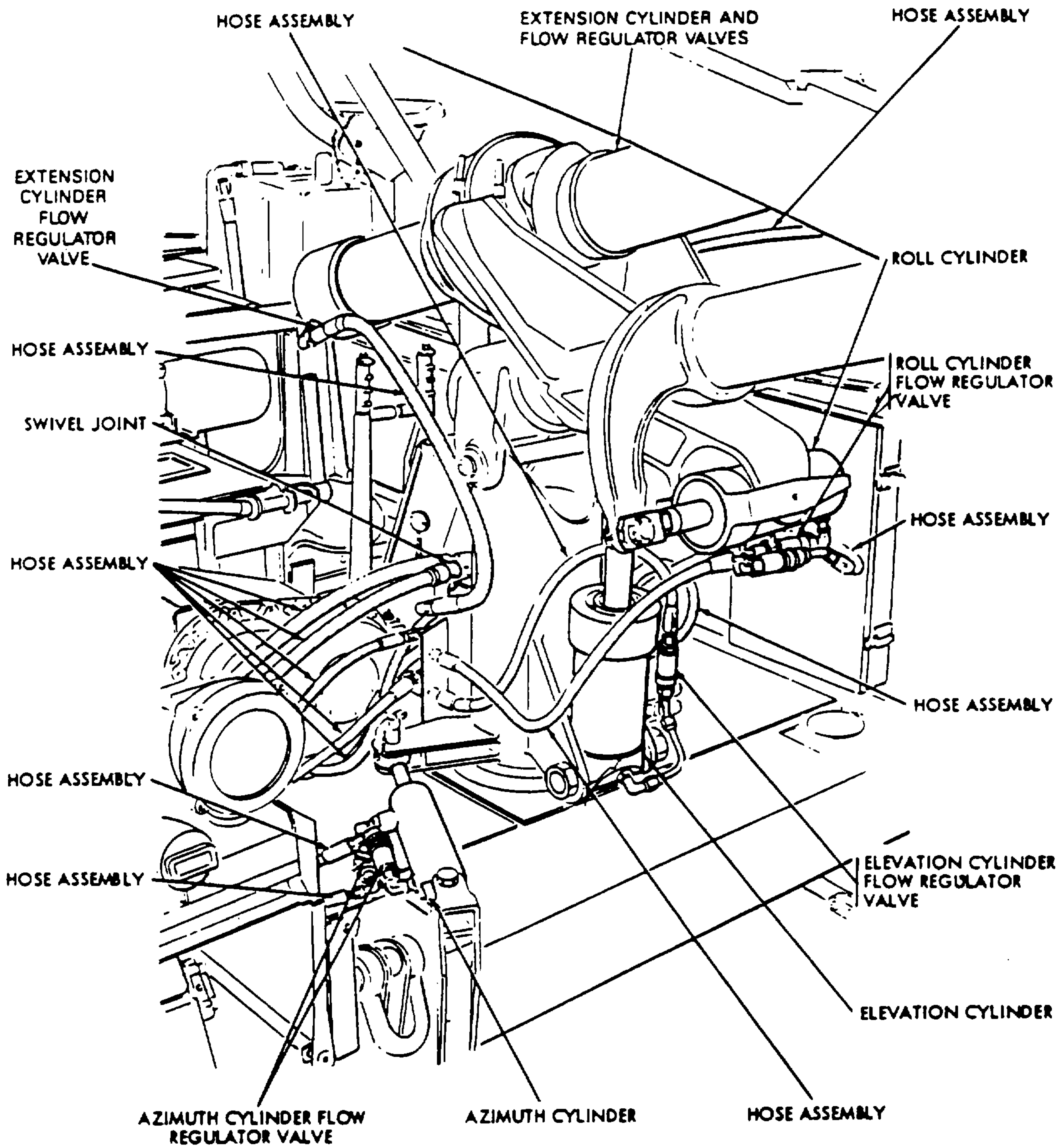


Figure 3-75 Hydraulic Systems Components (Sheet 1 of 2).

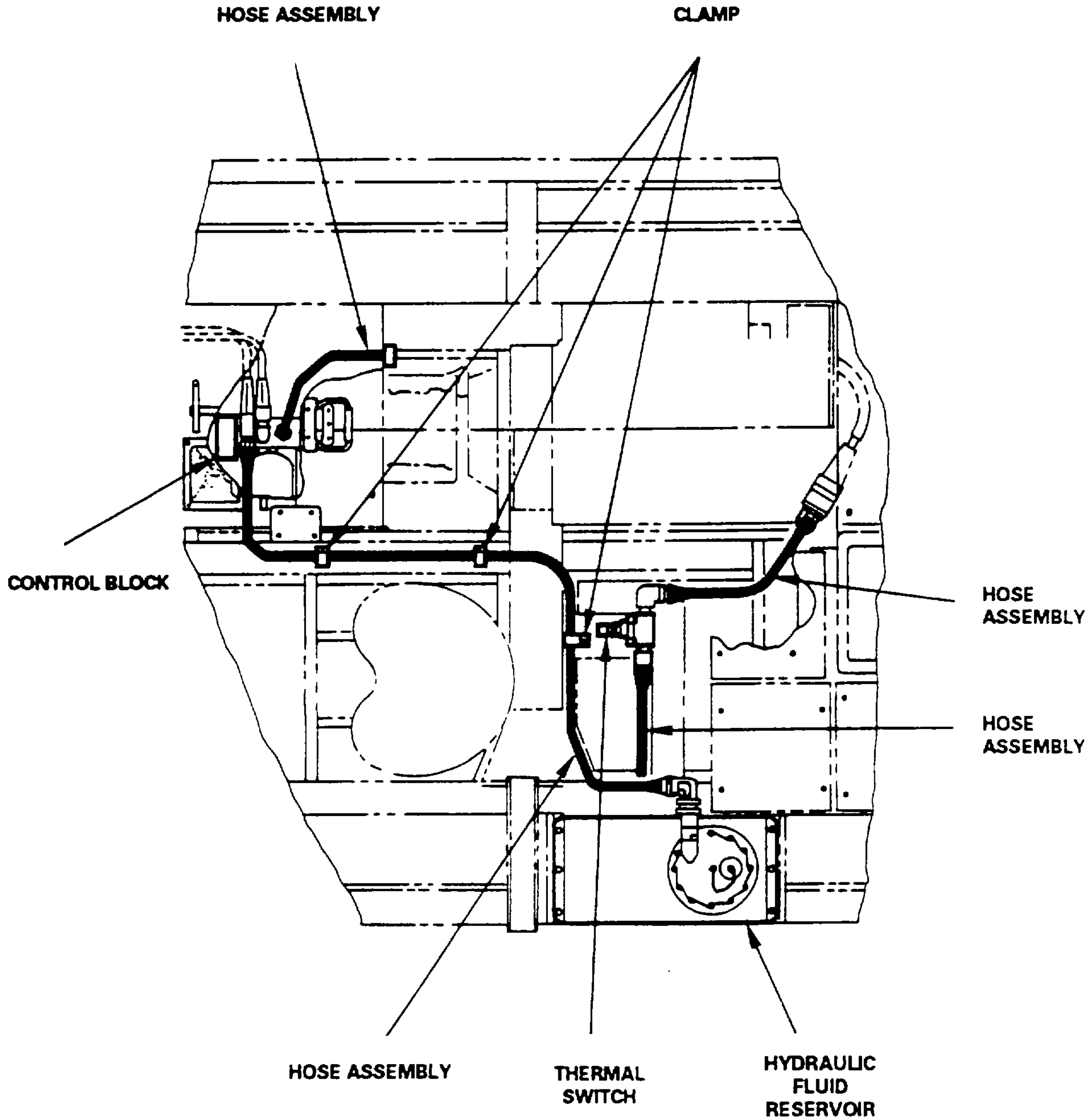


Figure 3- 75 Hydraulic Systems Components (Sheet 2 of 2).

ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	CYLINDER AZIMUTH	14	FILTER
2.	CYLINDER ROLL	15	GAGE
3.	CYLINDER ELEVATION	16.	VALVE, CHECK (11)
4.	CYLINDER EXTENSION	17.	VALVE, CHECK
5.	TANK OIL	18.	CONTROL BLOCK
6.	SWITCH	19.	VALVE, THERMAL RELIEF
7.	PUMP	20.	VALVE, FLOW REGULOR (4)
8.	ADAPTER	21.	VALVE, FLOW REGULATOR (2)
9.	DAMPENER	22.	SWIVEL (2)
10.	SWIVEL (4)	23.	VALVE, PRESSURE REGULATOR
11.	VALVE, MANUAL, 4-WAY (4)	24.	SOLENOID IND. VALVE (6)
12.	VALVE, SOLENOID (NC)	25.	VALVE, FLOW REGULATOR (2)
13.	VALVE, RELIEF	26.	SWITCH, PRESSURE

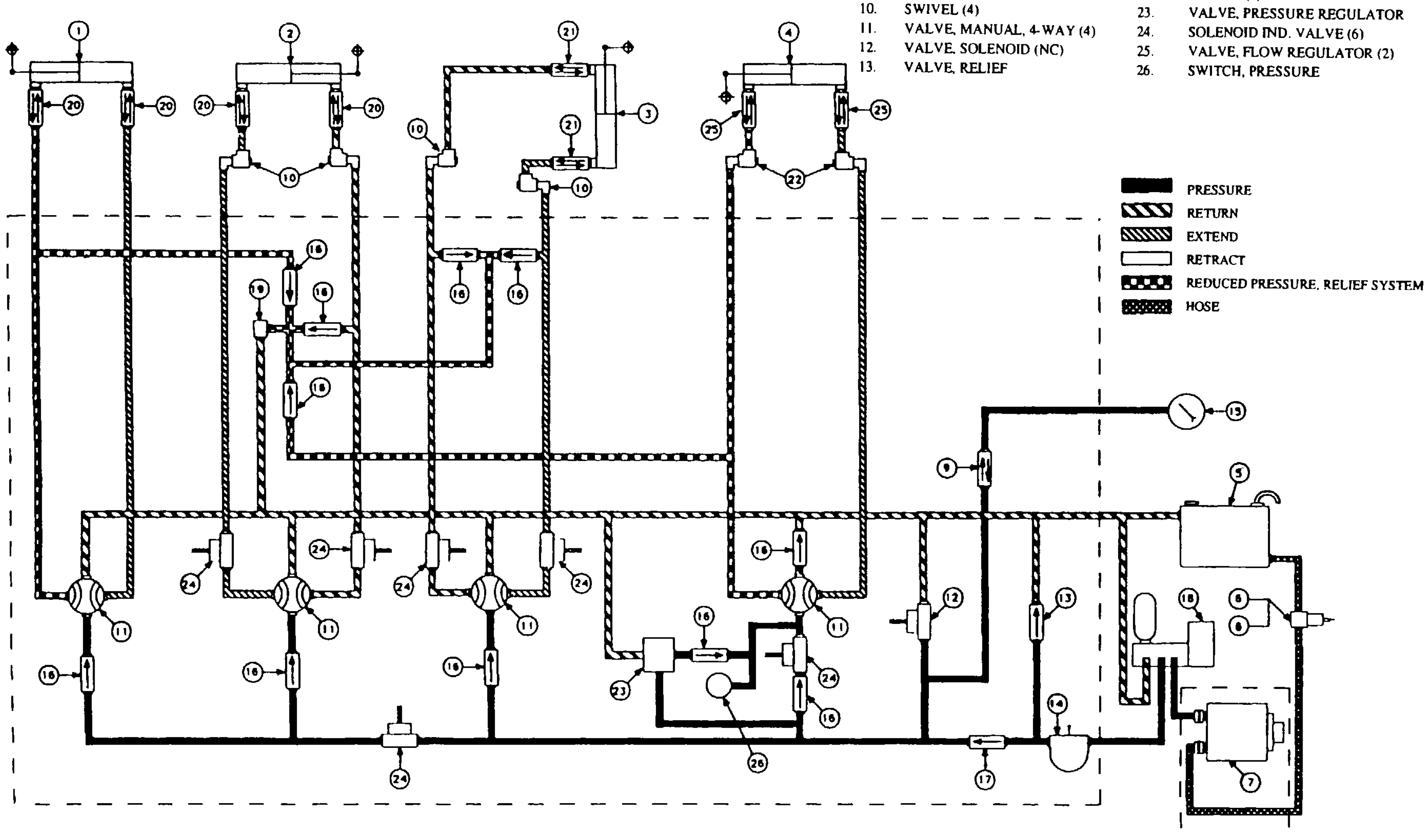


Figure 3- 76 Hydraulic System Flow Diagram

3-49 Extension Cylinder Flow Regulator Valve

a. Removal (fig. 3-77)

(1) Place vehicle in park position.

(2) Fully retract extension cylinder piston.

WARNING

Set the MASTER SWITCH to ON and press the HYDRAULIC PRESSURE RELEASE SWITCH until the HYDRAULIC PRESSURE indicator on the instrument panel drops to zero. Release the HYDRAULIC PRESSURE RELEASE SWITCH and turn the MASTER SWITCH to OFF.

(3) Disconnect hose assemblies (2) from reducers (3). Cap open end of hose assemblies to prevent system contamination.

(4) Remove reducers (3) from end of flow regulator valves (5) and disassemble packings (4) from reducers (3).

(5) Remove flow regulator valves (5) with packing (4) and reducers (3) from elbows (6).

(6) Disassemble reducers (3) and packings (4) from flow regulator valves (5).

(7) Disassemble elbows (6) and unions (9) with associated packings (4), backup rings (7) and nuts (8) from cylinder (1).

(8) Cap open port of cylinder (1) to prevent system contamination.

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks, and stripped or crossed threads accomplish operation and leakage tests as specified in TM 9-493543-14. If visual inspection discloses cracks or damaged threads, or if the valve fails the operation and leakage test, the valve must be replaced.

d. Assembly. None.

e. Installation. Install the flow regulator valve by reversing the sequence of removal procedure.

CAUTION

Observe directional flow arrow on valve body. It must be pointing in same relative direction as shown in figure 3-77.

f. Installation Test and Inspection. Start engine (refer to TM 9-1450500-10) and after initial warm-up, actuate extension cylinder sufficiently to eliminate air in lines. Operation must be as specified in TM 9-1450-500-10 and system must be free of leaks in area where lines are disconnected.

3-50 Azimuth Cylinder Flow Regulator Valves

a. Removal (fig. 3-78) (1) Position loader in park position.

WARNING

Set the MASTER SWITCH to ON and press the HYDRAULIC PRESSURE RELEASE SWITCH until the HYDRAULIC PRESSURE indicator on the instrument panel drops to zero. Release the HYDRAULIC PRESSURE RELEASE SWITCH and turn the MASTER SWITCH to OFF.

(2) Disconnect hose assemblies (30 and 36) from elbows (27 and 35). Cap the open ends of the hose assemblies to prevent system contamination.

(3) Loosen nuts (26 and 34) and remove elbows (27 and 35), nuts (26 and 34), backup rings (25 and 33), and packings (24 and 32).

(4) Remove nut(28)from screw(37) and remove two clamps (29) from flow regulator valves (23).

(5) Remove flow regulator valves (23) from elbows (21).

(6) Remove packings (22 and 31) from elbows (21) and install protective caps on the open ends of the elbows to prevent system contamination.

b. Disassembly. No further disassembly is authorized.

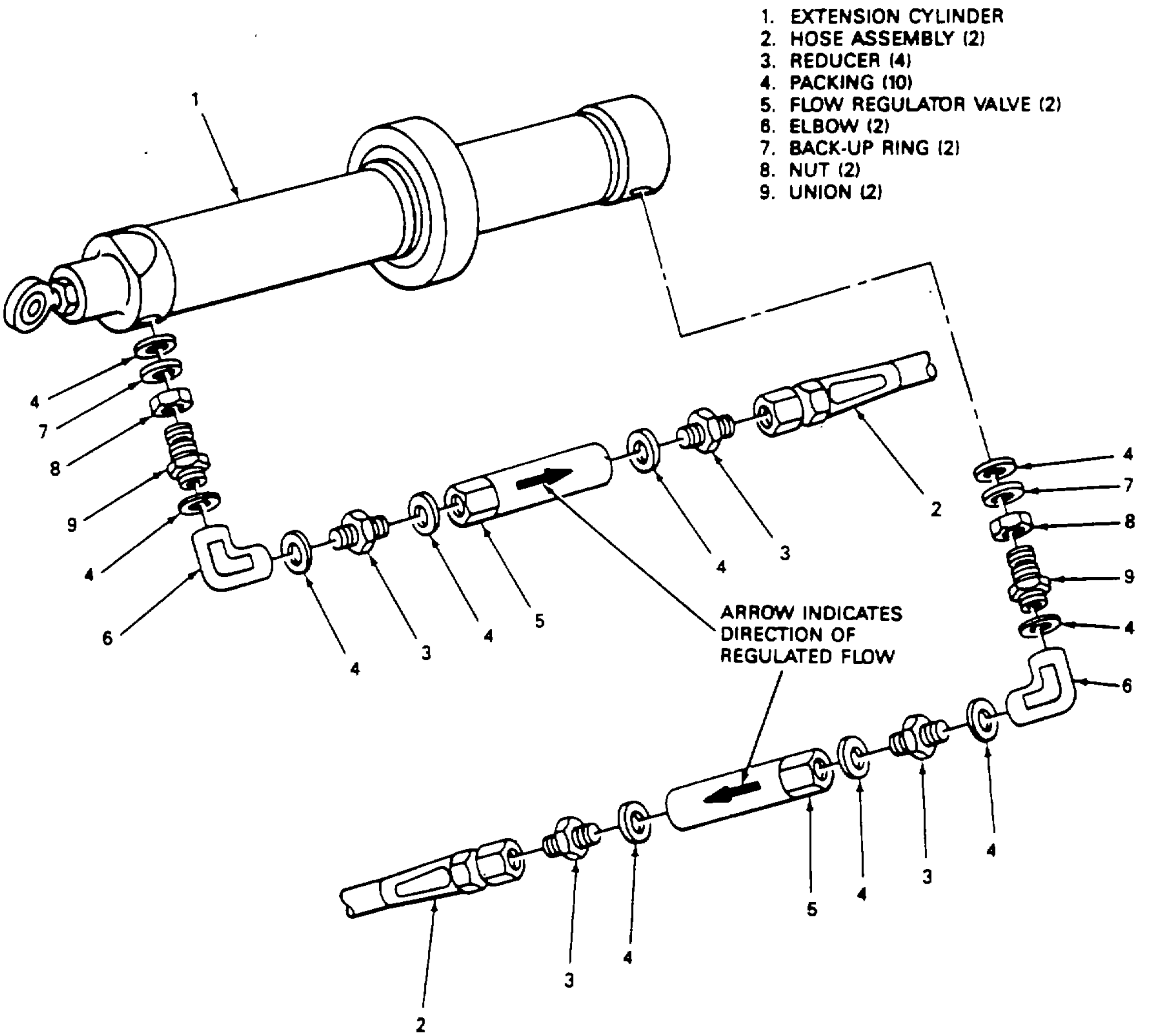
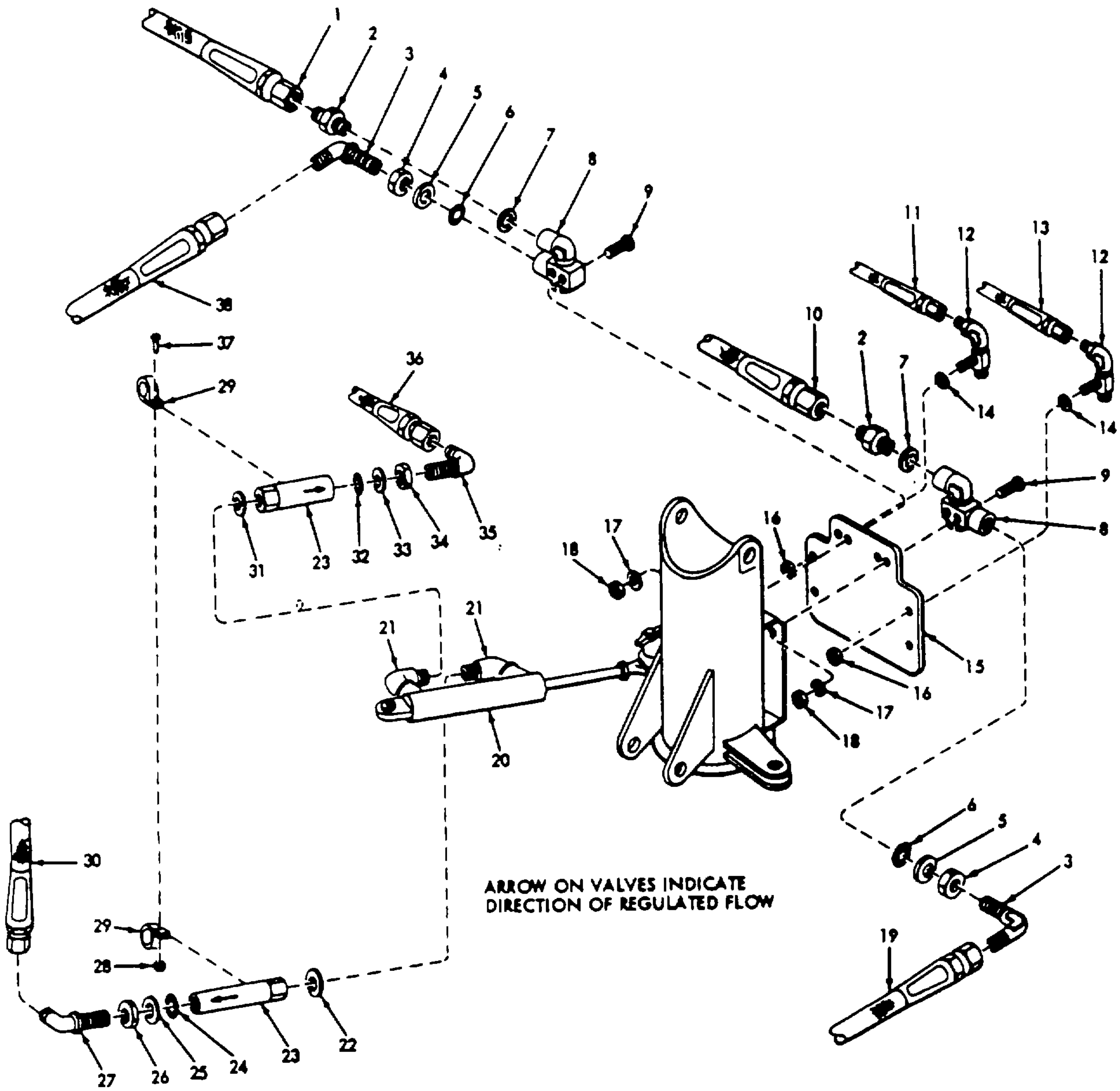


Figure 3-77 Extension Cylinder - Flow Regulator Valve Removal.



1. HOSE ASSEMBLY	11. HOSE ASSEMBLY	21. ELBOW (2)	31. PACKING
2. UNION (2)	12. SWIVEL JOINT (4)	22. PACKING	32. PACKING
3. ELBOW (2)	13. HOSE ASSEMBLY	23. FLOW REGULATOR VALVE (2)	33. BACK-UP RING
4. NUT (2)	14. WASHER (4)	24. PACKING	34. NUT
5. BACK-UP RING (2)	15. BRACKET	25. BACK-UP RING	35. ELBOW
6. PACKING (2)	16. NUT (4)	26. NUT	36. HOSE ASSEMBLY
7. PACKING (2)	17. WASHER (4)	27. ELBOW	37. SCREW
8. SWIVEL JOINT (2)	18. NUT (4)	28. NUT	38. HOSE ASSEMBLY
9. BOLT (4)	19. HOSE ASSEMBLY	29. CLAMP (2)	
10. HOSE ASSEMBLY	20. AZIMUTH CYLINDER	30. HOSE ASSEMBLY	

Figure 3-78 Azimuth Cylinder - Flow Regulator Valves and Swivel Joints Removal.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks, and stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 9493443-14. If visual inspection discloses cracks or damaged threads, or if valve fails operation and leakage test, the valve must be replaced.

d. Assembly. None.

e. Installation. Install the regulator valve by reversing the sequence of the removal procedure.

CAUTION

Observe directional flow arrow on valves. Arrows must be pointing in same relative direction as shown in figure 3-78.

f. Installation Test and Inspection. Start engine (refer to TM 9-1450-500-10) and after initial warmup, actuate azimuth cylinder sufficiently to eliminate air in lines. Operation of azimuth cylinder should be as specified in TM 9-1450-500-10, and system should be free of leaks in areas where lines were disconnected.

3-51. Swivel Joints

a. Removal (fig. 3-78)

(1) Place vehicle in park position, fully retract extension and elevation cylinder pistons.

WARNING

Set the MASTER SWITCH to ON and press the HYDRAULIC PRESSURE RELEASE SWITCH until the HYDRAULIC PRESSURE indicator on the instrument panel drops to zero. Release the HYDRAULIC PRESSURE RELEASE SWITCH and turn the MASTER SWITCH to OFF.

(2) Disconnect hose assemblies (1 and 10) from unions (2), hose assemblies (19 and 38) from elbows (3) and hose assemblies (11 and 13)from swivel joints (12). Cap open ends of hose assemblies to prevent system contamination.

(3) Remove unions (2) and packings (7) from swivel joints (8).

(4) Remove four each nut (18) and washer (17) from bolts (9) and remove swivel joints (8).

(5) Remove elbows (3) from swivel joints (8).

(6) Remove nuts (4), backup rings (5) and packings (6) from elbows (3).

(7) Disconnect hose assemblies(11, 12, 30 and 36) from swivels (12).

(8) Remove nuts (16) and washers (14) and remove swivel joints (12).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Test the swivel joints as specified in TM 4935-543-14. Perform a visual inspection of swivel joints for cracks and stripped or crossed threads. If visual inspection discloses cracks or damaged threads, or if swivel joints fail to meet test requirements, they are to be replaced with new ones.

d. Assembly. None.

e. Installation. Install the swivel joints by reversing the sequence of the removal procedure.

f. Installation Test and Inspection. Start engine (refer to TM 9-1450-50010) and after initial warmup actuate extension, roll, elevation, and azimuth cylinders sufficiently to eliminate air in the lines. There should be no leaks at the swivel joints in the areas where the lines were disconnected.

3-52. Elevation Cylinder Flow Regulator Valves

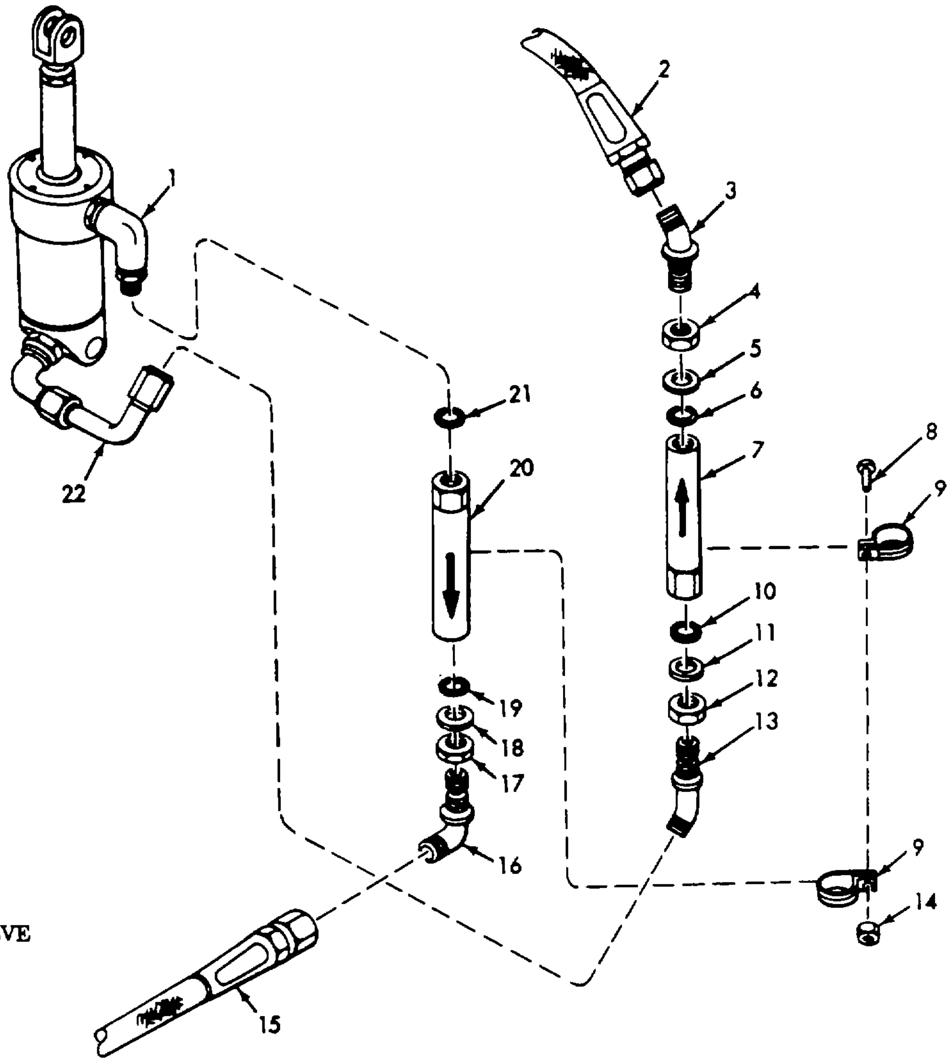
a. Removal (fig. 3-79)

(1) Place vehicle in park position, fully retract elevation cylinder piston.

WARNING

Set the MASTER SWITCH to ON and press the HYDRAULIC PRESSURE RELEASE SWITCH until the HYDRAULIC PRESSURE indicator on the instrument panel drops to zero. Release the HYDRAULIC PRESSURE RELEASE SWITCH and turn the MASTER SWITCH to OFF.

(2) Disconnect hose assemblies (2and 15) from elbows (3 and 16). Install protective caps on the open ends of the hose assemblies to prevent system contamination.



1. ELBOW AND REDUCER
2. HOSE ASSEMBLY
3. ELBOW
4. NUT
5. BACK-UP RING
6. PACKING
7. FLOW REGULATOR VALVE
8. SCREW
9. CLAMP (2)
10. PACKING
11. BACK-UP RING
12. NUT
13. ELBOW
14. NUT
15. HOSE ASSEMBLY
16. ELBOW
17. NUT
18. BACK-UP RING
19. PACKING
20. FLOW REGULATOR VALVE
21. PACKING
22. TUBE ASSEMBLY

ARROWS ON VALVES INDICATE
DIRECTION OF REGULATED FLOW

Figure 3-79. Elevation Cylinder -Flow Regulator Valves Removal.

(3) Loosen nuts (4 and 17) and remove elbows (3 and 16), nuts (4 and 17), backup rings (5 and 18), and packings (6 and 19) from flow regulator valves (7 and 20).

(4) Remove nut (14) from screw (8) and remove clamps (9).

(5) Remove flow regulator valve (20) and remove packing (21) from reducer (1).

(6) Loosen nut (12) and remove flow regulator valve (7), packing (10) and backup ring (11) from elbow (13).

(7) Cap all ports.

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valves for cracks, stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 4935543-19. If visual inspection discloses cracks or damaged threads, or if the valves fail the operation and leakage test, the valves must be replaced.

d. Assembly. None.

e. Installation. Install the flow regulator valves by reversing the sequence of the removal procedure.

CAUTION

Observe directional flow arrow on valves. They must be pointing in same relative direction as shown in figure 3-79.

f. Installation Test and Inspection. Start the engine (refer to TM 9-1450500-10) and after initial warmup, actuate the elevation cylinder sufficiently to eliminate air from the lines. Operation of the elevation cylinder should be as specified in TM 91450500-10 and the system should be free of leaks in the areas where the lines were disconnected.

3-53. Roll Cylinder Flow Regulator Valves

a. Removal (fig. 3-80)

WARNING

Set the MASTER SWITCH to ON and press the HYDRAULIC PRESSURE RELEASE SWITCH until the HYDRAULIC PRESSURE indicator on the instrument panel drops to zero. Release the HYDRAULIC PRESSURE RELEASE SWITCH and turn the MASTER SWITCH to OFF.

(1) Disconnect hose assemblies (11 and 18) from elbow (10) and union (17). Cap open ends of hose assemblies to prevent system contamination.

(2) Loosen nut (9) and remove elbow (10) with nut (9), backup ring (8), and packing (7); remove union (17) and packing (16) from valve (4).

(3) Rernove nut(6)from screw (15) and remove clamp (5).

(4) Remove flow regulator valves (4 and 14) from elbows (2 and 12).

(5) Remove packings (3 and 13), from elbows (2 and 12).

(6) Install protective caps on open ends of elbows (2 and 12) to prevent system contamination.

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valves for cracks, stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 94935-43-14. If visual inspection discloses cracks or damaged threads, or if the valves fail the operation and leakage test, the valves must be replaced.

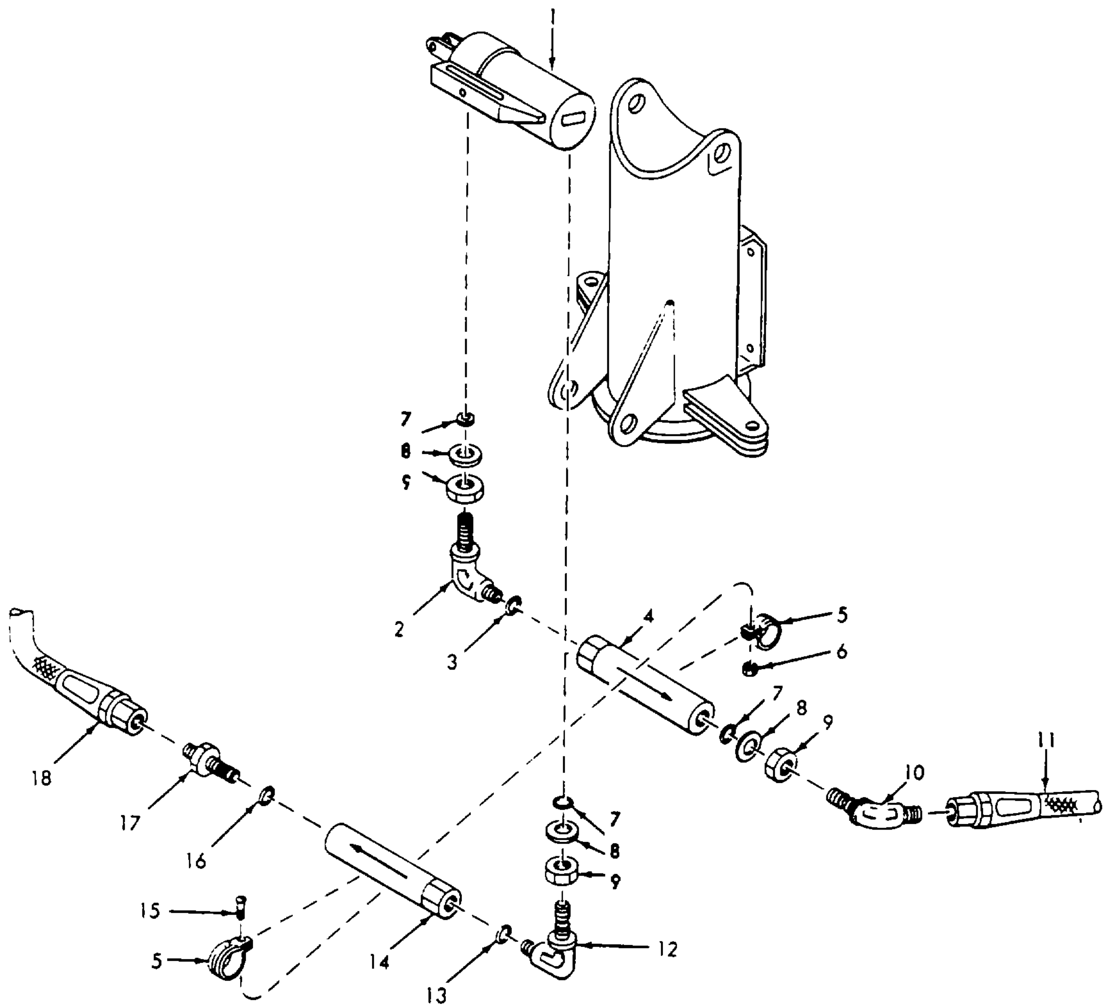
d. Assembly. None.

e. Installation. Install the regulator valves by reversing the sequence or the removal procedure.

CAUTION

Observe directional flow arrow on valves. Arrows must point in same relative direction as shown in figure 3-80

f. Installation Test and Inspection. Start the engine (refer to TM 9-1450-500-10) and after initial warmup, actuate roll cylinder sufficiently to eliminate air from lines. Operation of the roll cylinder should be as specified in TM 9-1450-500-10, and the system should be free of leaks in the areas where the lines were disconnected.



1. ROLL CYLINDER
2. ELBOW
3. PACKING
4. FLOW REGULATOR VALVE
5. CLAMP (2)
6. NUT
7. PACKING
8. BACK-UP RING
9. NUT
10. ELBOW
11. HOSE ASSEMBLY
12. ELBOW
13. PACKING
14. FLOW REGULATOR VALVE
15. SCREW
16. PACKING
17. UNION
18. HOSE ASSEMBLY

Figure 3-80. Roll Cylinder - Flow Regulator Valves Removal.

3-54. Control Block

a. Removal (fig. 3-81)

(1) Position loader in park position.

WARNING

Set the MASTER SWITCH to ON and press the HYDRAULIC PRESSURE RELEASE SWITCH until the HYDRAULIC PRESSURE indicator on the instrument panel drops to zero. Release the HYDRAULIC PRESSURE RELEASE SWITCH and turn the MASTER SWITCH to OFF.

(2) Raise the hydraulic console assembly cover and secure it in the open position.

(3) Disconnect hose assemblies (10) and (11) from unions (9) and (12). Cap open ends of hose assemblies and unions to prevent system contamination.

(4) Loosen nut (4) and remove tee (7) with packings (8), union (5), nut (4), backup ring (3) and packings (2) and (6) from control block (1).

(5) Disconnect hose assembly (13) from union (14). Cap open ends of hose assembly to prevent system contaminations.

(6) Loosen nut (17) and remove elbow (16) with packings (18), back up ring (19), union (20) from control block (1).

(7) Disconnect hose assembly (21) from elbow (22). Cap open end of hose assembly to prevent system contamination.

(8) Remove union (23) with gaskets (24) from control block (1).

(9) Unscrew the four screws (25) and remove the control block (1).

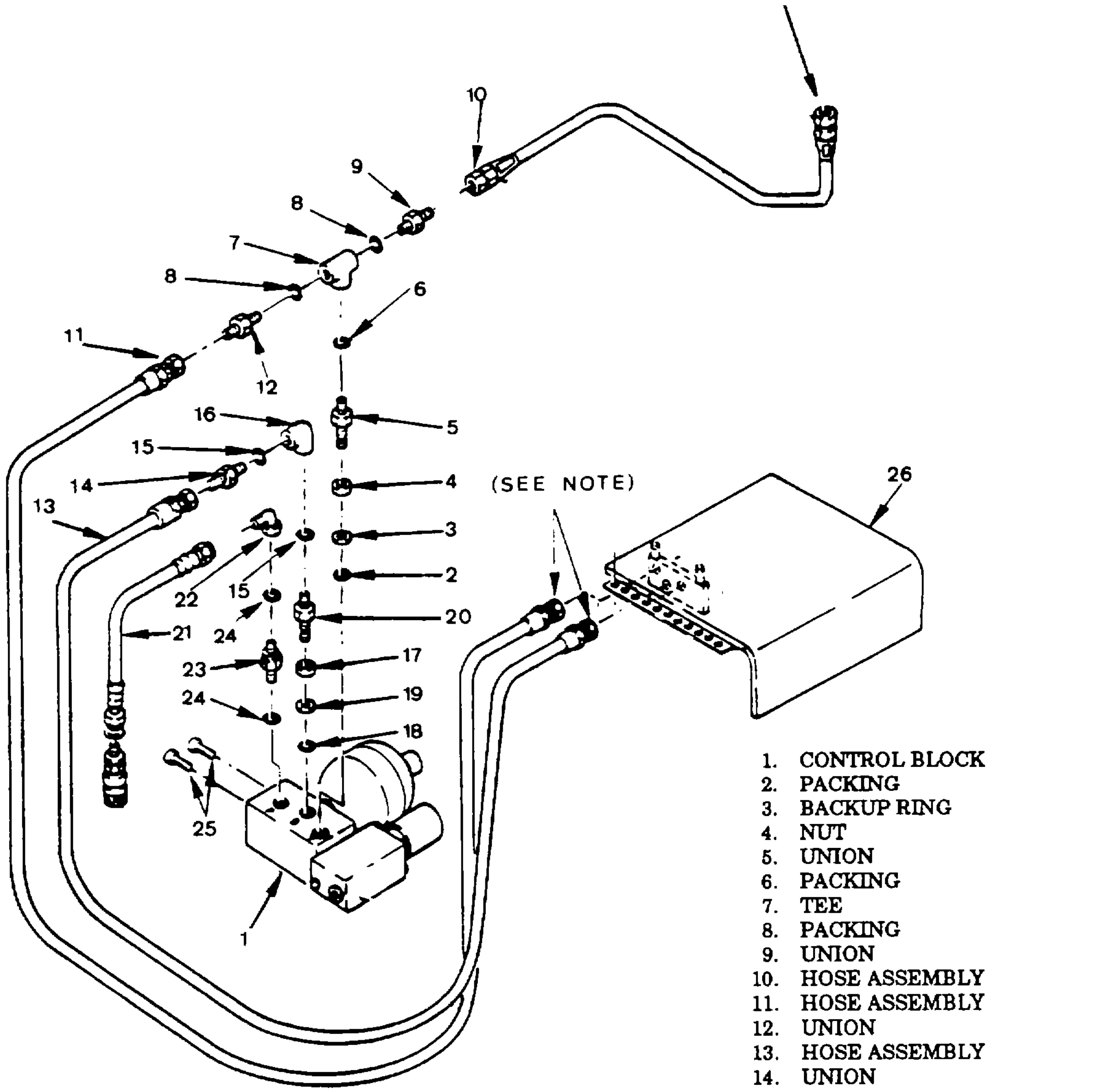
b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the control block for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 9-4935-543-14. If the visual inspection discloses cracks or damaged threads or if the valve fails the operation and leakage tests, the valve must be replaced.

d. Assembly. None.

e. Installation. Install the control block reversing the sequence of the removal procedure.

f. Installation Test and Inspection. Start the engine (refer to TM 9-1450-500-10) and after initial warm ups, actuate extension, roll, elevation and azimuth cylinders sufficiently to eliminate air in the lines. There should be no leaks at the control block in the areas where the lines were disconnected.



1. CONTROL BLOCK
2. PACKING
3. BACKUP RING
4. NUT
5. UNION
6. PACKING
7. TEE
8. PACKING
9. UNION
10. HOSE ASSEMBLY
11. HOSE ASSEMBLY
12. UNION
13. HOSE ASSEMBLY
14. UNION
15. PACKING
16. ELBOW
17. NUT
18. PACKING
19. BACKUP RING
20. UNION
21. HOSE ASSEMBLY
22. ELBOW
23. UNION
24. GASKET
25. SCREW (4)
26. HYDRAULIC CONSOLE COVER

NOTE

Do not disconnect these hoses from the hydraulic console.

NOTE

Do not disconnect these hoses from the hydraulic console.

Figure 3-81. Control Block - Removal.

3-55. Hydraulic Controls Console Assembly

a. General. Figure 3-82 shows the hydraulic controls console in the open position and identifies each major interior component. Refer to this illustration for general orientation and identification of parts during disassembly and assembly procedures. Following figures isolate the pressure, return, roll, elevation, extension, azimuth, and thermal relief systems of the hydraulic console. Refer to these figures for specific orientation of parts installed in each of the systems. Complete disassembly procedures for the hydraulic controls console assembly are not provided. Remove components only as necessary to provide access to components to be inspected or replaced. Removal of rigid tube assemblies is considered straightforward and therefore no procedures are included. Only those procedures necessary to remove major components from the console assembly are included.

b. Removal.

(1) Place loader in park position. Refer to TM 9-1450-500-10.

WARNING

Set the MASTER SWITCH to ON and press the HYDRAULIC PRESSURE RELEASE SWITCH until the HYDRAULIC PRESSURE indicator on the instrument panel drops to zero. Release the HYDRAULIC PRESSURE RELEASE SWITCH and turn the MASTER SWITCH to OFF.

(2) Loosen turnlock fasteners and raise console forward.

(3) Place a suitable container under flexible hose disconnect joints.

(4) Tag and disconnect flexible hoses from the console. Cap all openings.

(5) Disconnect all electrical leads from solenoid valves and starter switch and pull out wiring harness.

(6) Close the console and remove five screws and washers which secure console hinge to support frame. Remove console.

c. Inspection. Inspect the console for cracks, dents, and deformation. Small dents may be straightened using a hammer and a flat metal backup bar. Small cracks may be stop-drilled. If structural members of the console are twisted or bent excessively, the console assembly must be replaced. Replace broken turnlock fasteners.

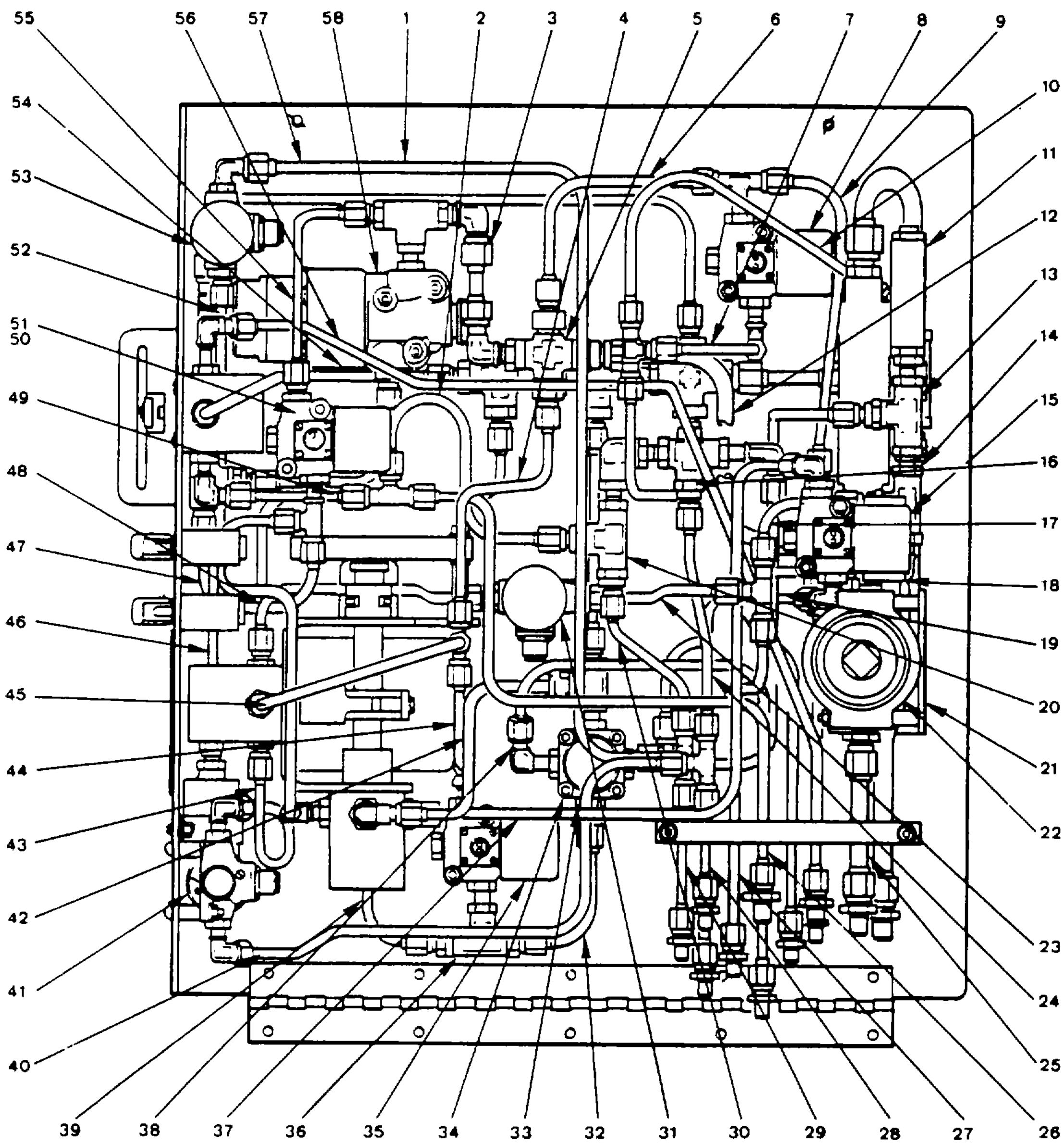


Figure 3-82. Hydraulic Control Console - Bottom View (Sheet 1 of 3).

Item Number	Name	Item Number	Name
1	Tube assembly	30	Tube assembly
2	Tube assembly	31	Valve
3	Tube assembly	32	Tube assembly
4	Tube assembly	33	Valve
5	Valve	34	Valve
6	Tube assembly	35	Valve
7	Tube assembly	36	Valve
8	Valve	37	Tube assembly
9	Tube assembly	38	Tube assembly
10	Tube assembly	39	Tube assembly
11	Valve	40	Tube assembly
12	Tube assembly	41	Valve
13	Valve	42	Tube assembly
14	Valve	43	Tube assembly
15	Valve	44	Tube assembly
16	Valve	45	Tube assembly
17	Tube assembly	46	Tube assembly
18	Tube assembly	47	Tube assembly
19	Tube assembly	48	Tube assembly
20	Valve	49	Tube assembly
21	Bracket	50	Valve
22	Filter	51	Valve
23	Tube assembly	52	Tube assembly
24	Tube assembly	53	Valve
25	Tube assembly	54	Tube assembly
26	Tube assembly	55	Tube assembly
27	Tube assembly	56	Tube assembly
28	Tube assembly	57	Tube assembly
29	Tube assembly	58	Valve

Figure 3-82. Hydraulic Control Console (Sheet 2 of 3).

d. Installation.

NOTE

If console assembly is not removed from loader and replacement of console components is necessary, do not reinstall console until replacement of components is completed.

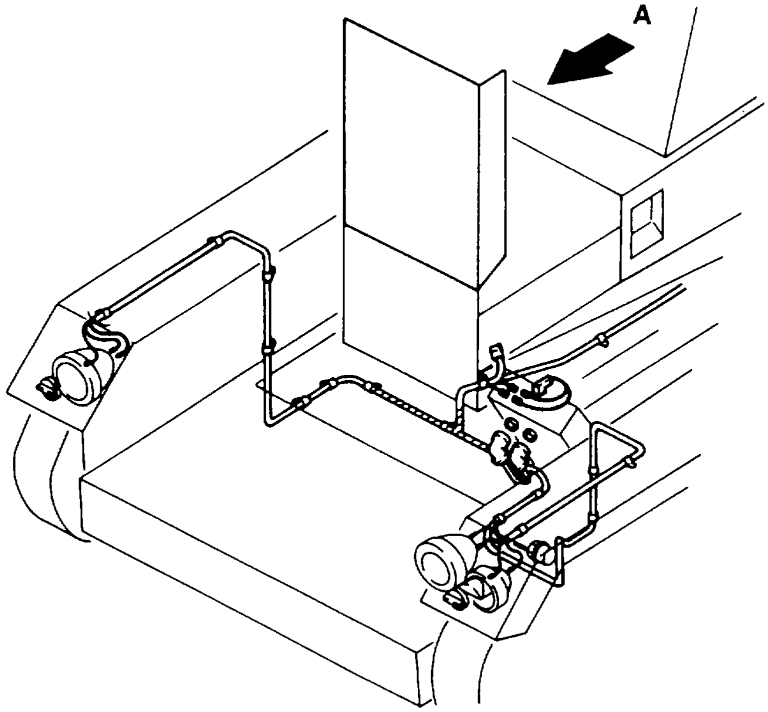
(1) Position console on support frame. Secure console hinge to support frame with five screws and washers.

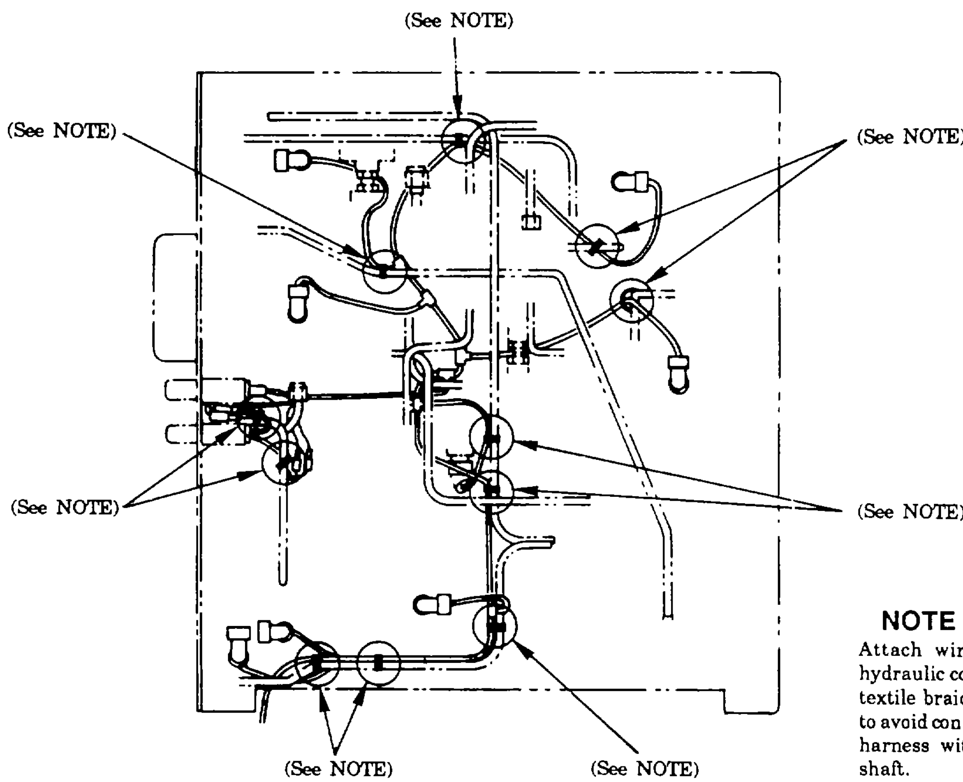
(2) Raise console forward and connect all flexible hose assemblies. Remove tags.

(3) Route electrical leads to solenoid valves and starter switch and install all connectors. If necessary, refer to electrical schematic in TM 91450-0020-2.

(4) Close console and place all hydraulic control levers in neutral position.

(5) Check fluid level in reservoir and start engine. Operate all hydraulic systems to verify satisfactory console replacement and system operation.





NOTE (11 places)
Attach wiring harness to hydraulic components using textile braid or cable straps to avoid contact of the wiring harness with the propeller shaft.

VIEW A

Figure 3-82. Hydraulic Control Console (Sheet 3 of 3).

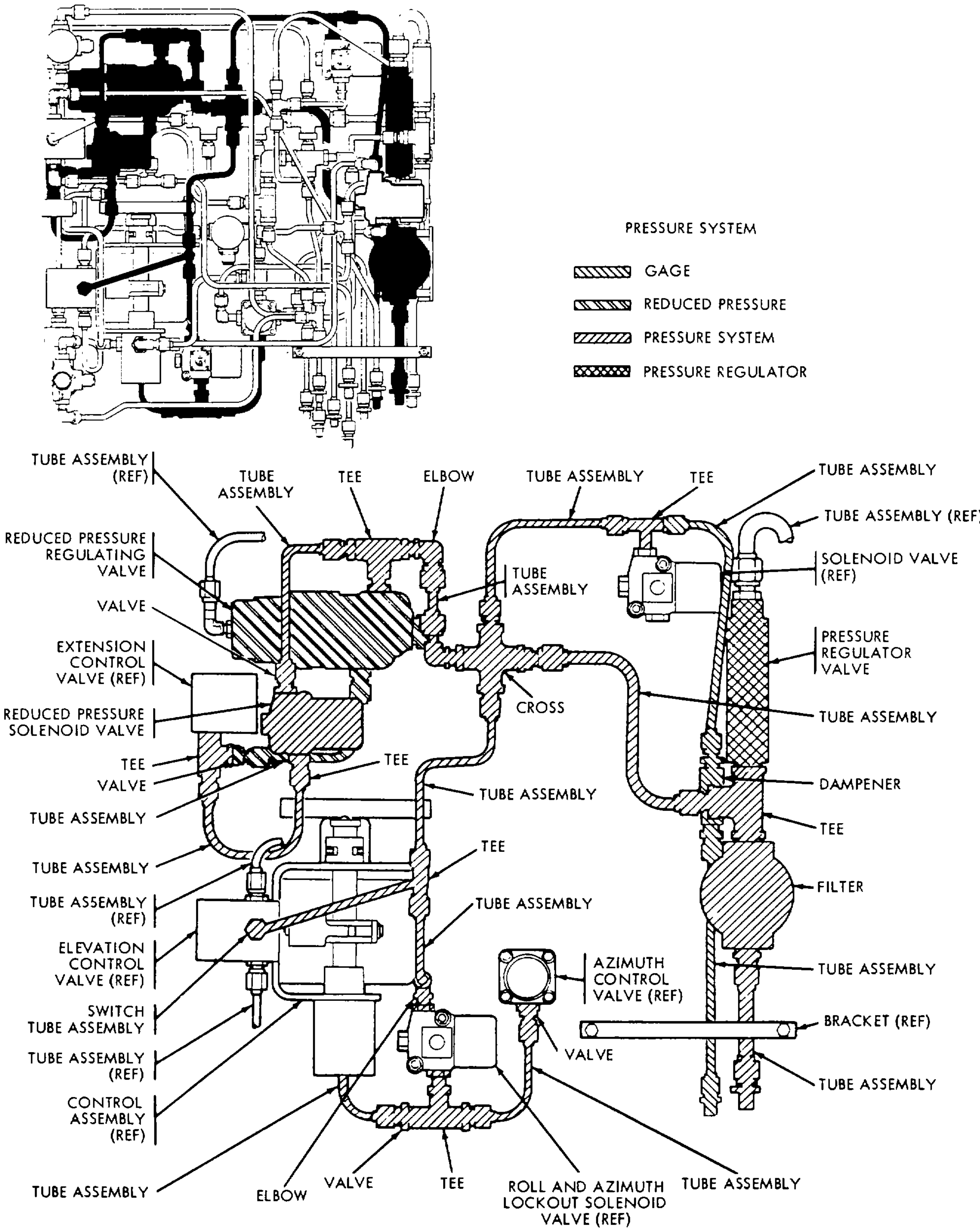


Figure 3-83. Hydraulic Control Console - Pressure System Flow Diagram.

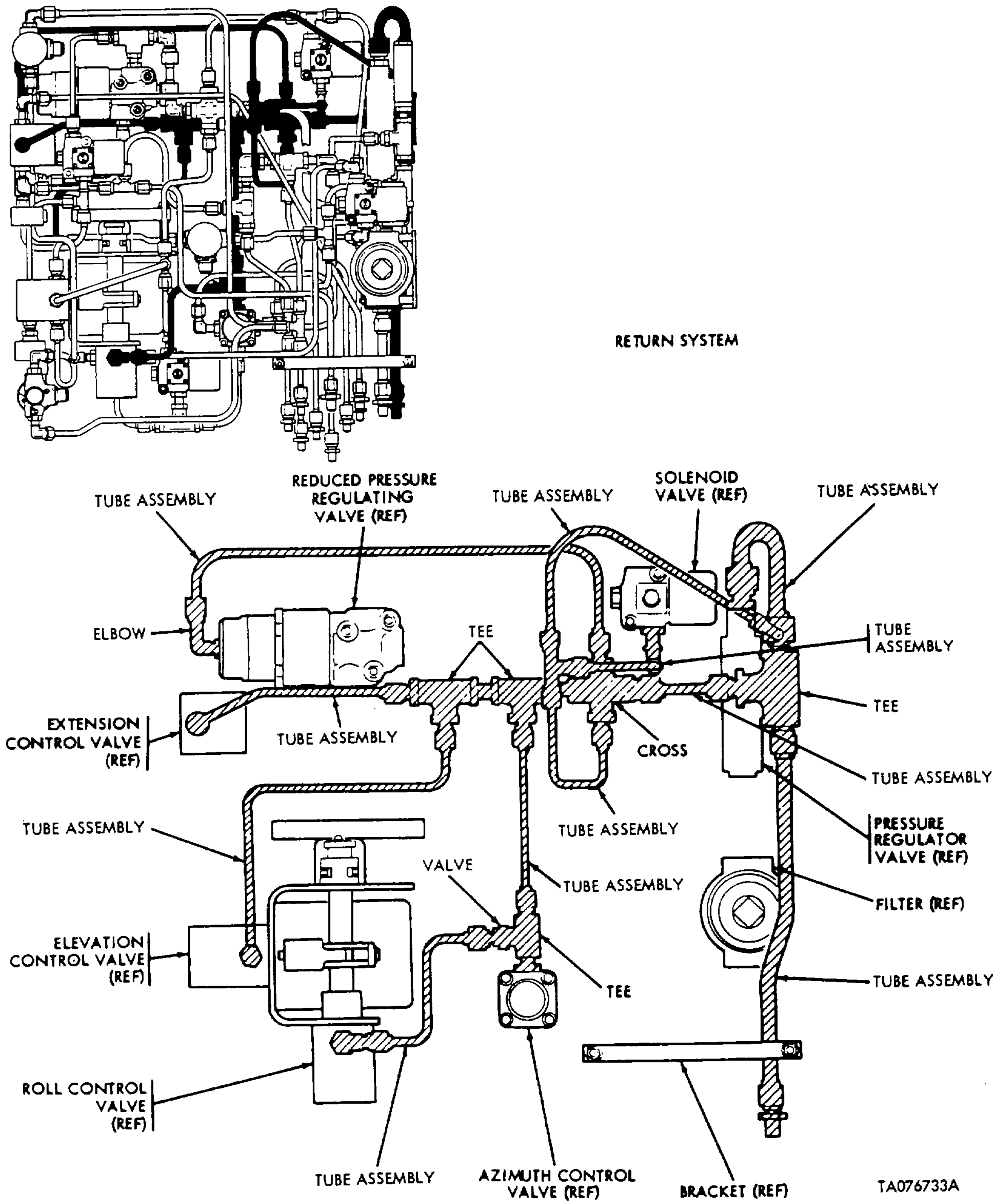


Figure 3-84. Hydraulic Control Console - Return System Flow Diagram.

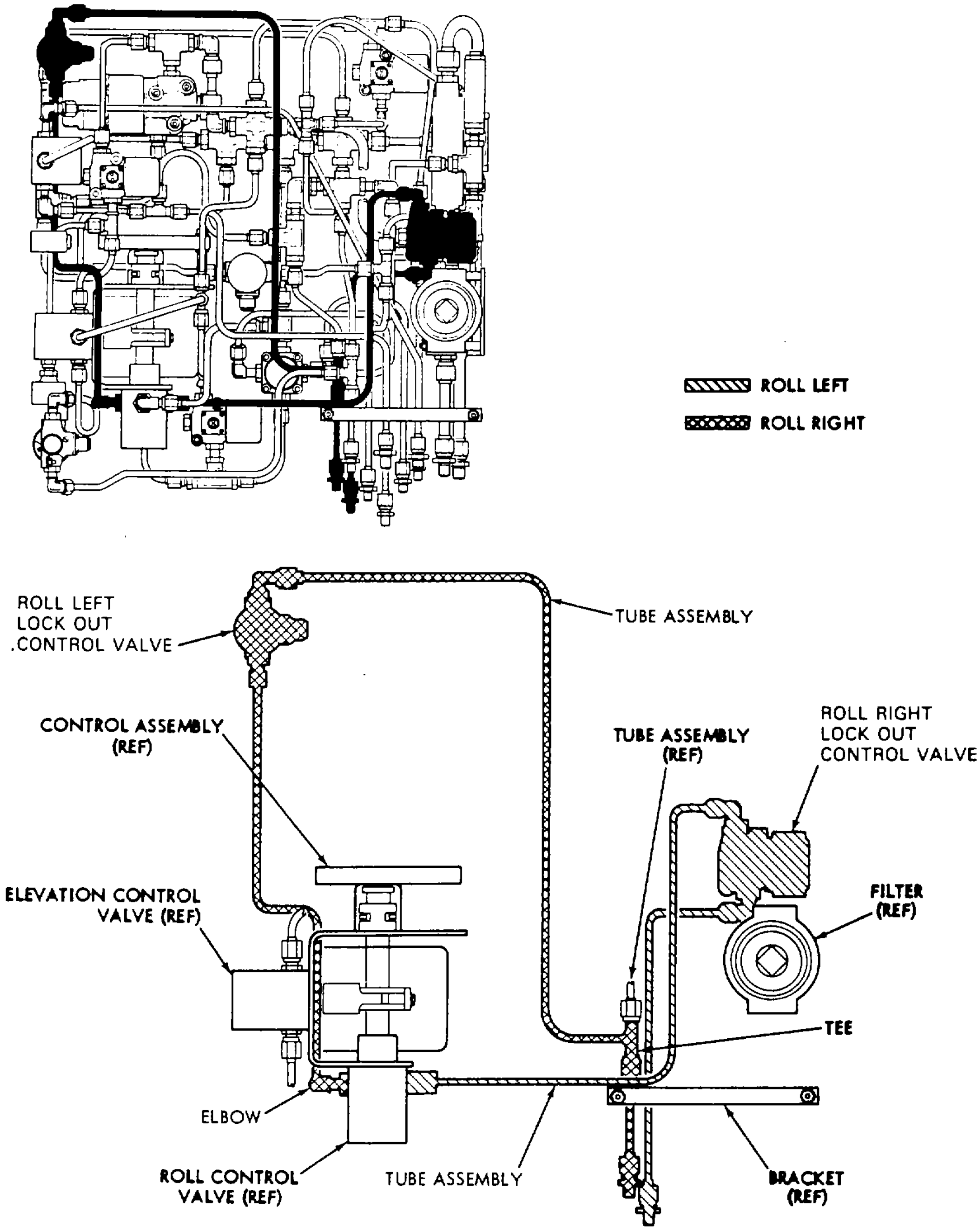


Figure 3-85. Hydraulic Control Console - Roll System Flow Diagram.

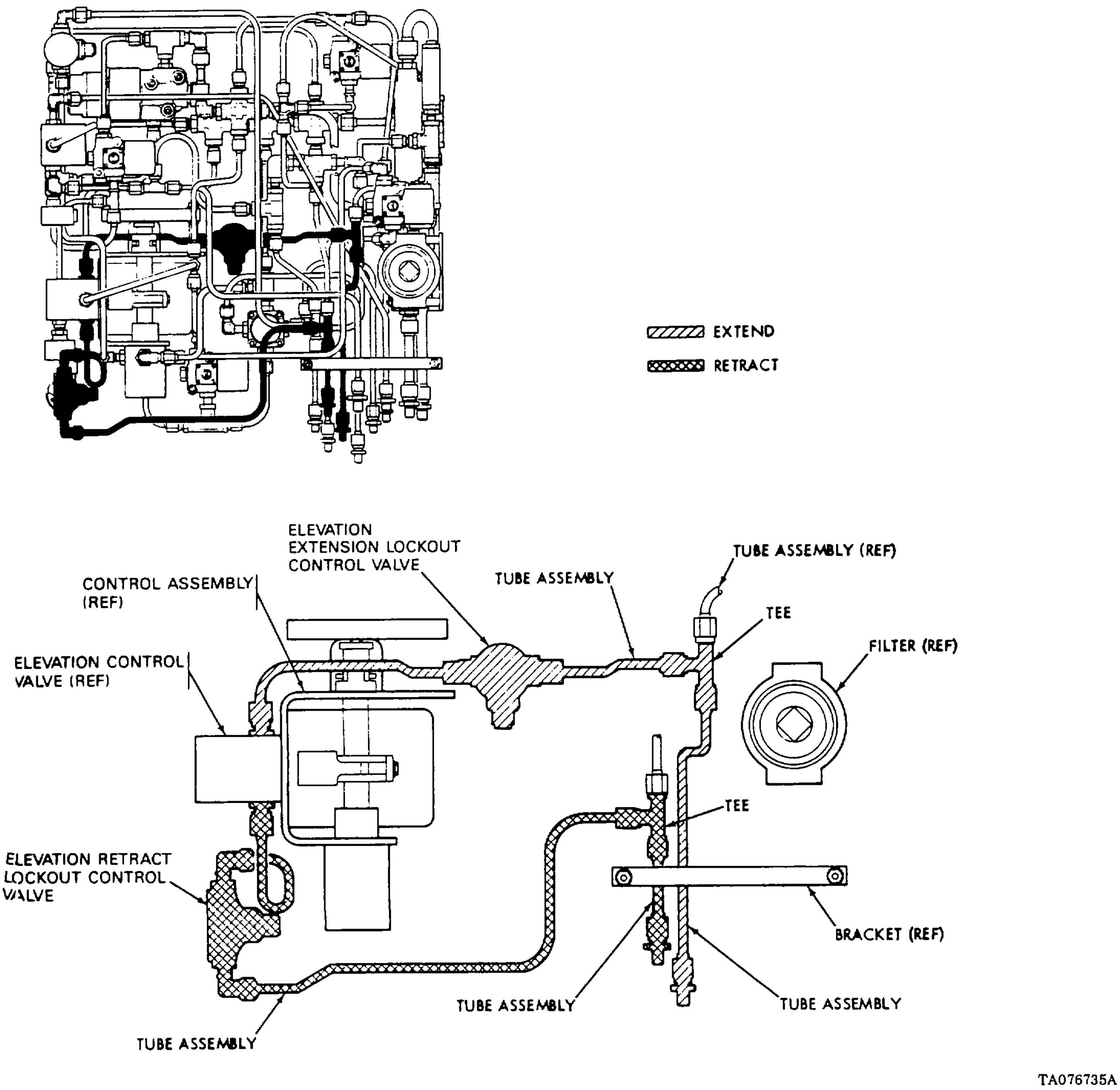


Figure 3-86. Hydraulic Control Console - Elevation System Flow Diagram.

Check fluid level in reservoir and add fluid if necessary.

NOTE

After one hour of loader operation, replace the hydraulic filter element. Refer to TM 9-1450-500-10.

3-56. 615 PSI Pressure Regulator Valve

a. Removal (fig. 3-90)

(1) Disconnect tube assemblies (3, 10, 16 and 25) from the pressure regulator valve fittings.

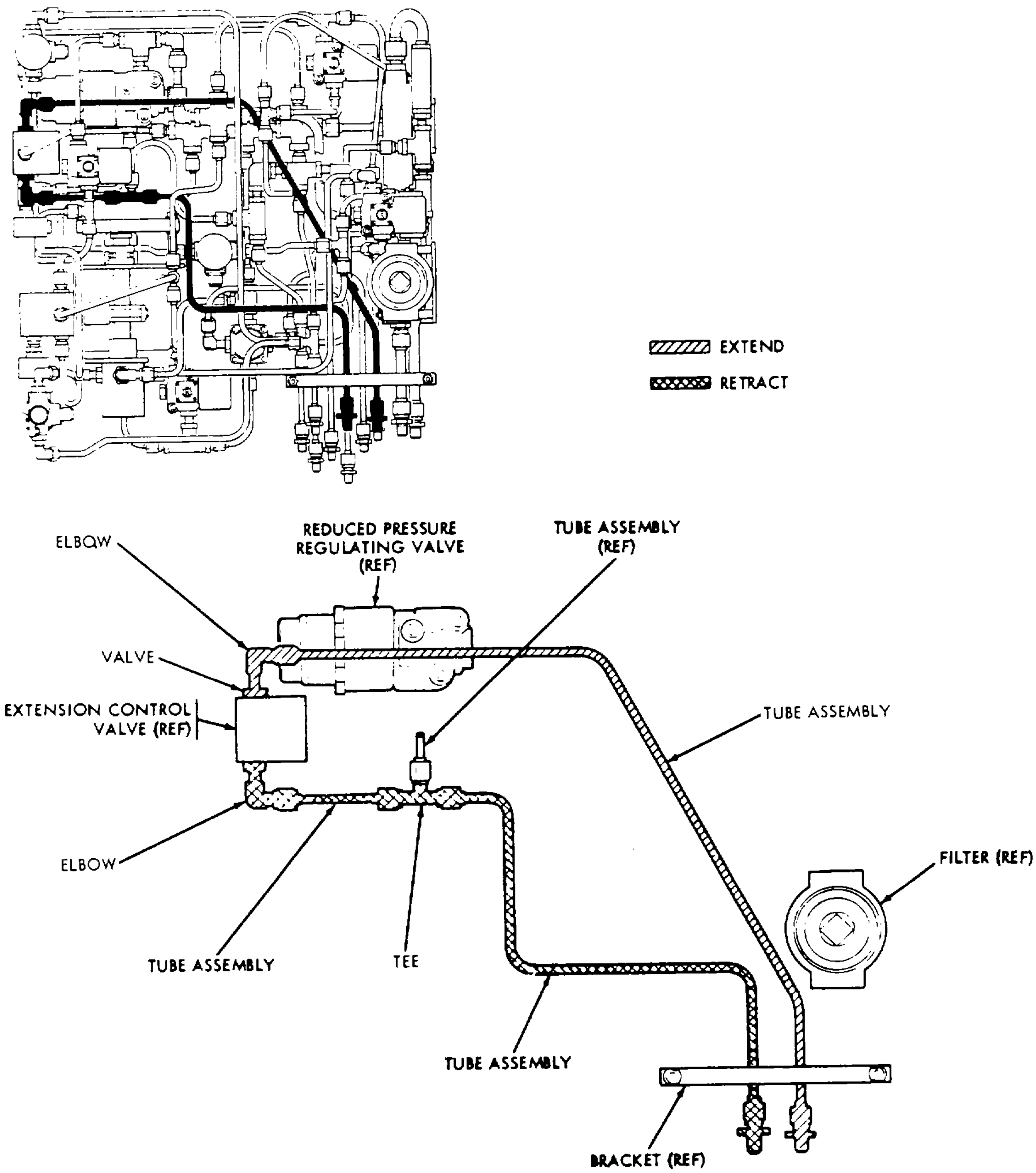


Figure 3-87. Hydraulic Control Console - Extension System Flow Diagram.

(2) Unscrew three nuts (22) and remove three screws (1) and spacers (2).

(3) Remove pressure regulator valve (21).

(4) Remove tee (8) with reducer (9) and associated parts (4, 5, 6, 7 and 11).

(5) Remove union (12) with associated parts (11, 13, 14 and 15).

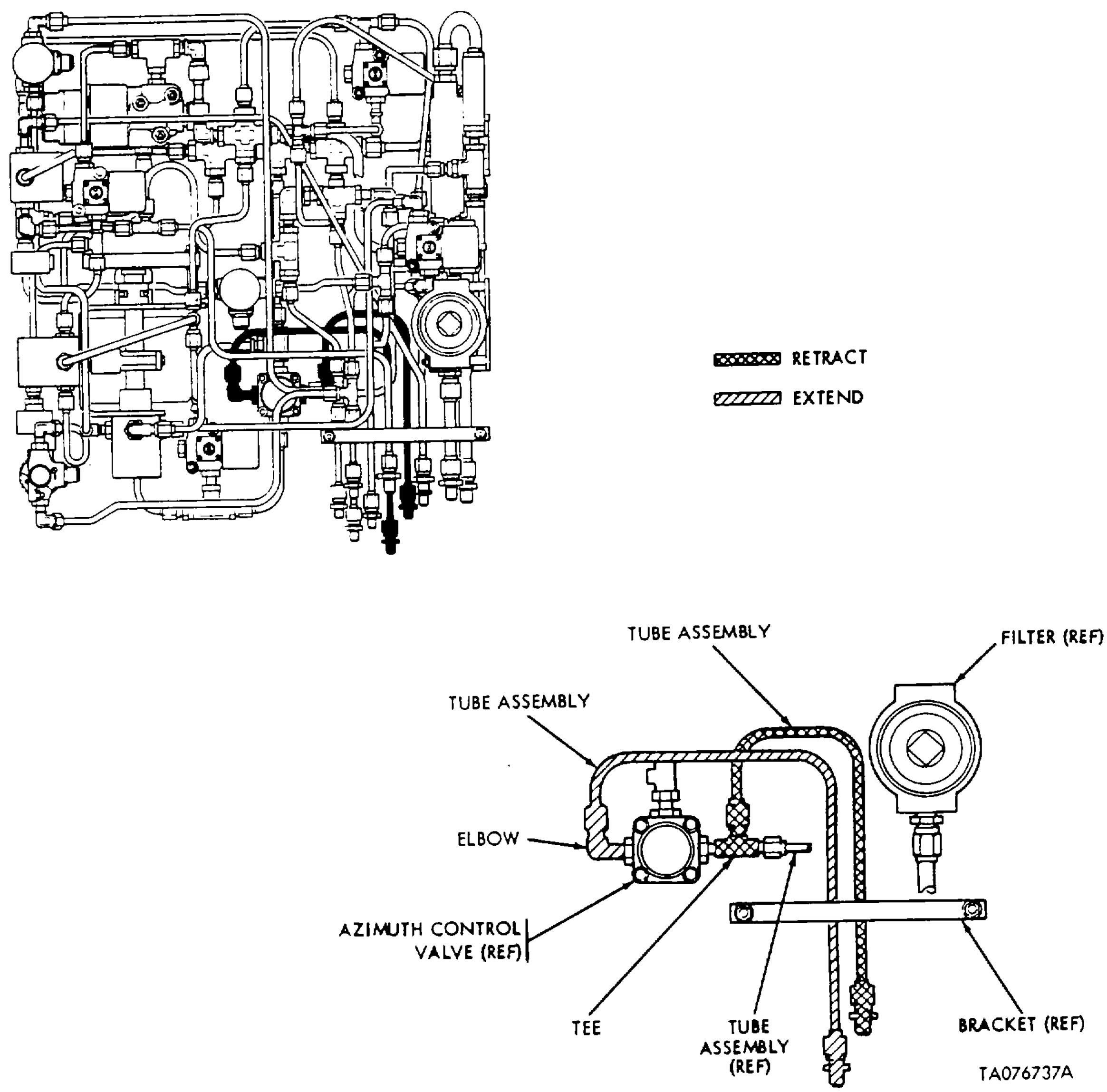


Figure 3-88. Hydraulic Control Console - Azimuth System Flow Diagram

(6) Remove elbow (17) with associated parts (18, 19 and 20).

(7) Remove reducer (24) and packing (23).

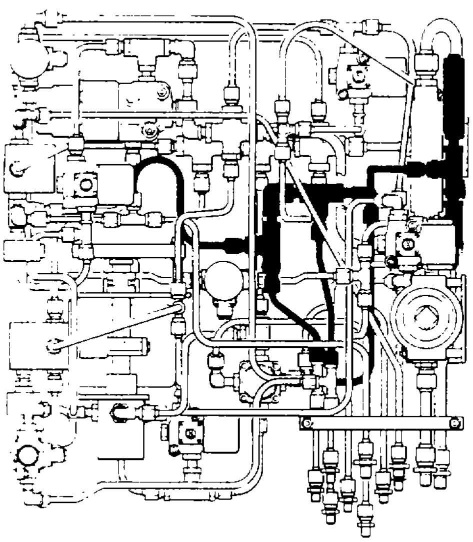
b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection for cracks and stripped or crossed threads. Accomplish an operation and leakage test as specified in TM 9-493554314. If visual inspection discloses cracks or damaged threads, or if the pressure regulator valve fails the operation and leakage test, the valve must be replaced.

d. Assembly. None.

e. Installation. Install the 615 psi pressure regulator valve by reversing the sequence of the removal procedure.

f. Installation Test and Inspection. Start the engine (refer to TM 9-1450-500-10) and after initial



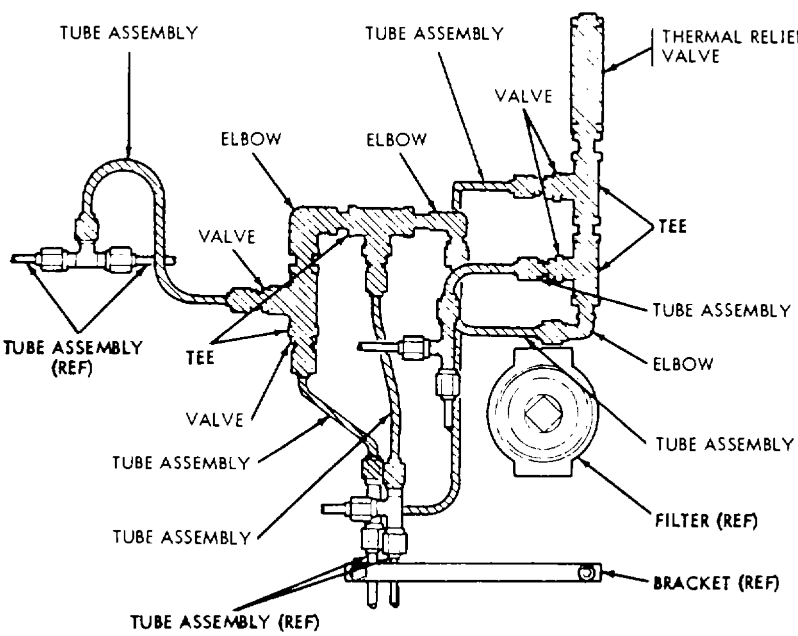


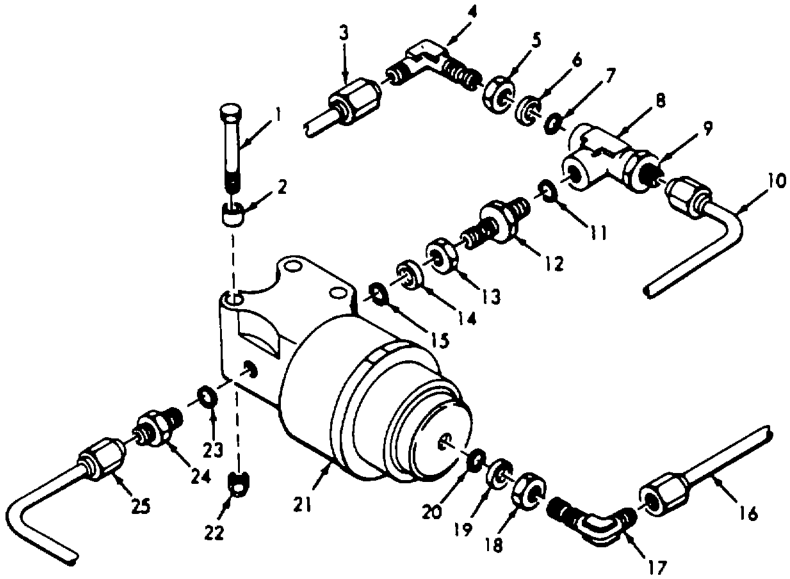
Figure 3-89. Hydraulic Control Console - Thermal Relief System Flow Diagram.

warmup actuate the hydraulic system sufficiently to eliminate air from the lines. Operation of the hydraulic system should be as described in TM 9-1450-500-10, and the system should be free of leaks in the area where the lines were disconnected.

3-57. Roll and Azimuth Lockout Solenoid Valve and Azimuth Control Valve

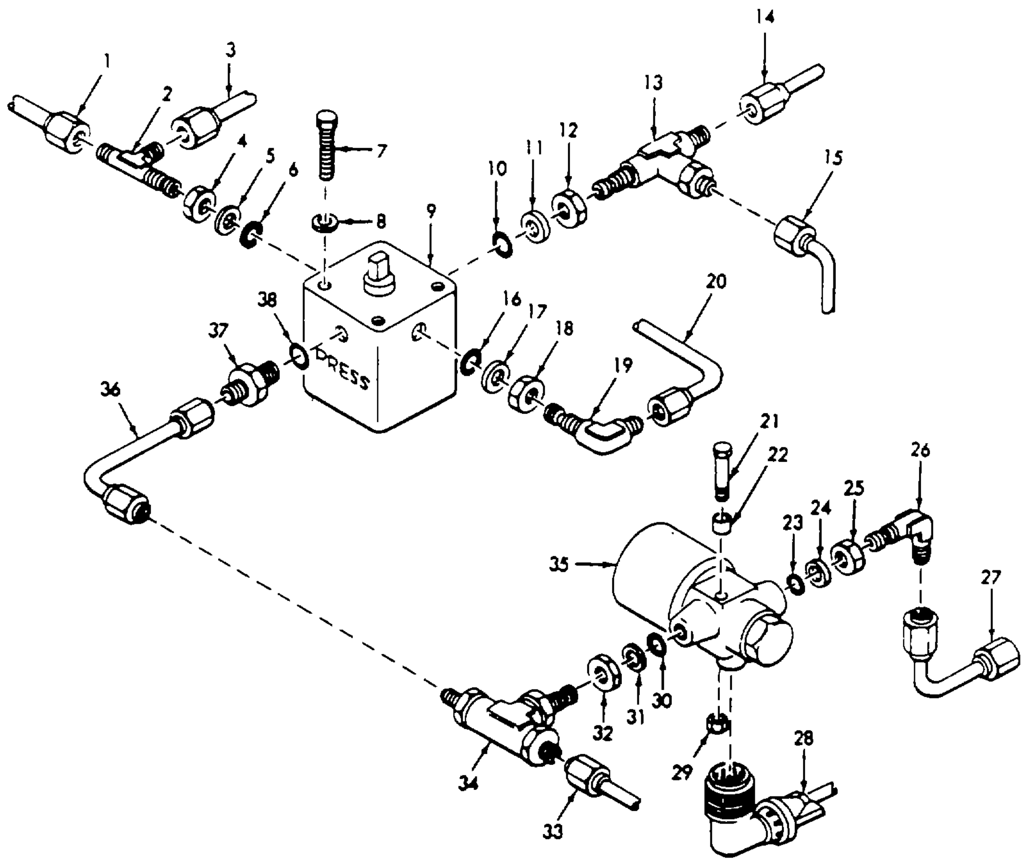
a. Removal (fig. 3-91)

(1) Disconnect tube assemblies (36, 14, 15, 20, 27, 33, 3 and 1) from valves (9 and 35).



1. SCREW (3)
2. SPACER (3)
3. TUBE ASSEMBLY
4. ELBOW
5. NUT
6. BACK-UP RING
7. PACKING
8. TEE
9. REDUCER
10. TUBE ASSEMBLY
11. PACKING
12. UNION
13. NUT
14. BACK-UP RING
15. PACKING
16. TUBE ASSEMBLY
17. ELBOW
18. NUT
19. BACK-UP RING
20. PACKING
21. 615 PSI PRESSURE REGULATOR VALVE
22. NUT (3)
23. PACKING
24. REDUCER
25. TUBE ASSEMBLY

Figure 3-90. 615 psi Pressure Regulator Valve Removal.



1. TUBE ASSEMBLY
2. TEE
3. TUBE ASSEMBLY
4. NUT
5. BACK-UP RING
6. PACKING
7. SCREW (4)
8. LOCK WASHER
9. AZIMUTH CONTROL VALVE
10. PACKING
11. BACK-UP RING
12. NUT
13. TEE ASSEMBLY
14. TUBE ASSEMBLY
15. TUBE ASSEMBLY
16. PACKING
17. BACK-UP RING
18. NUT
19. ELBOW
20. TUBE ASSEMBLY
21. SCREW (2)
22. SPACER (2)
23. PACKING
24. BACK-UP RING
25. NUT
26. ELBOW
27. TUBE ASSEMBLY
28. ELECTRICAL CONNECTOR
29. NUT (2)
30. PACKING
31. BACK-UP RING
32. NUT
33. TUBE ASSEMBLY
34. TEE ASSEMBLY
35. ROLL AND AZIMUTH LOCKOUT SOLENOID VALVE
36. TUBE ASSEMBLY
37. VALVE
38. PACKING

Figure 3-91. Roll and Azimuth Lockout Solenoid Valve Azimuth Control Valve Removal.

(2) Disconnect electrical connector (28) from solenoid valve (35).

(3) Disconnect control handle from valve. Refer to paragraph 3-60.

(4) Remove four each screw (7) and washers (B) and remove azimuth control valve (9).

(5) Remove tee assembly (13) with associated parts (10, 11 and 12), elbow (19) with associated parts (16, 17 and 18), tee (2) with associated parts (4, 5 and 6) and valve (37) with packing (38) from azimuth control valve (9).

(6) Remove two nuts (29), screws (21), and spacers (22) and remove solenoid valve (35).

(7) Remove elbow (26) with associated parts (23,24 and 25), and tee assembly (34) with associated parts (30, 31 and 32) from solenoid valve (35).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valves for cracks, stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 9-4935-443-14. If visual inspection discloses cracks or damaged threads, or if the valves fail the operation and leakage test, the valves must be replaced.

d. Assembly. None.

e. Installation. Install the valves by reversing the sequence of the removal procedure.

3-58. Extension Control Valve

a. Removal (fig. 3-92)

(1) Disconnect tube assemblies (1, 14, 23, 28 and 30) from valve (29).

(2) Disconnect control handle from valve. Refer to paragraph 3-60.

(3) Remove four each screw (20) and lockwasher (19) and remove extension control valve (29) from console.

(4) Remove valve (2) with packing (3) from tee (4).

(5) Loosen nut (5) and remove tee (4) with associated parts (5, 6 and 7) from elbow (8).

(6) Remove elbow (8) and packing (9).

(7) Loosen nut (11) and remove union (10) with associated parts (11, 12 and 13) from valve (29).

(8) Loosen nut (16) and remove elbow (15) with associated parts (16, 17 and 18) from valve (29).

(9) Remove valve (22) with packing (21) from valve (29).

(10) Loosen nut (26) and remove elbow (27) with associated parts (24,25 and 26) from valve (29).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valves for cracks, stripped or crossed threads. Accomplish operation and leakage tests as specified TM 9-4935-543-14. If visual inspection discloses cracks or damaged threads, or if the valves fail the operation and leakage test, the valves must be replaced.

d. Assembly. None.

e. Installation. Install the valves by reversing the sequence of the removal pr4cedure.

3-59. Roll Control Valve and Elevation Control Valve

a. Removal (fig. 3-93)

(1) Disconnect tube assemblies (1, 4, 33 and 38) from roll control valve (39).

(2) Disconnect tube assemblies (16, 17,23 and 26) from elevation control valve (20).

(3) Remove four each screw (27) and washer (28) and remove roll control valve (39) from bracket (9).

(4) Remove elbow (5) with associated parts (6, 7 and 8) from roll control valve.

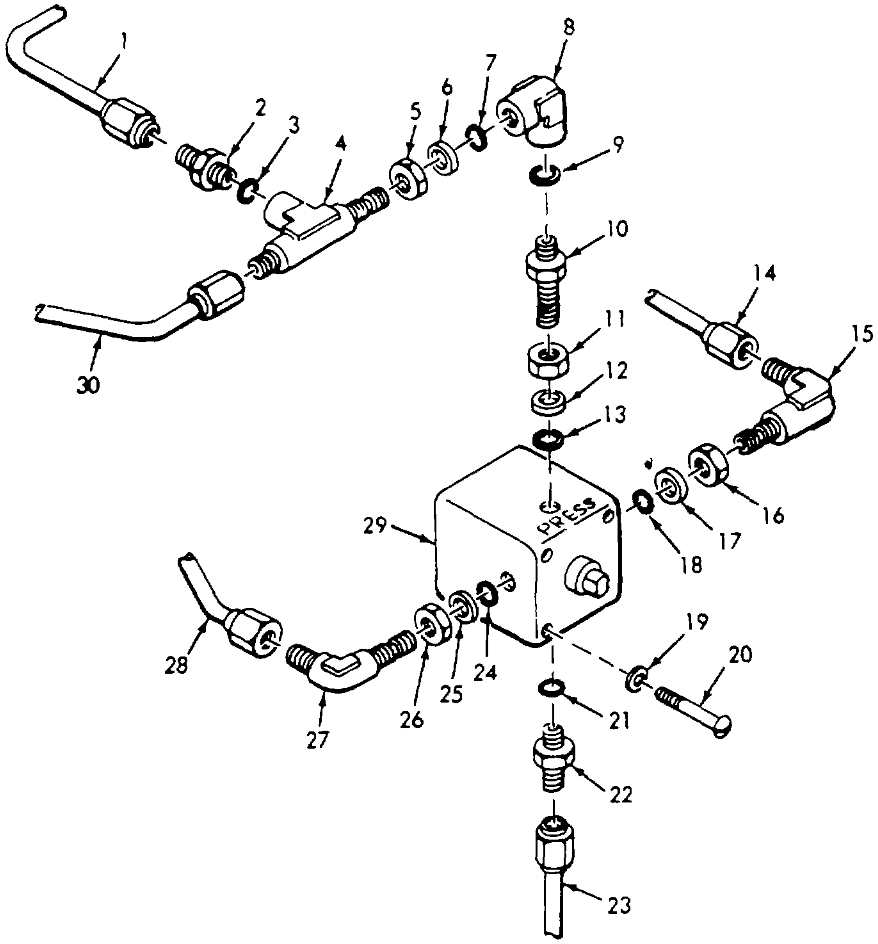
(5) Remove union (2) with packing (3) from roll control valve.

(6) Remove elbow (37) with associated parts (34, 35 and 36) from roll control valve.

(7) Remove elbow (32) with associated parts (29, 30 and 31) from roll control valve.

(8) Remove extension (24, fig. 3-94) from control valve.

(9) Disconnect lever from elevation control valve shaft. Refer to paragraph 3-60



1.	TUBE ASSEMBLY	11.	NUT	21.	PACKING
2.	VALVE	12.	BACK-UP RING	22.	VALVE
3.	PACKING	13.	PACKING	23.	TUBE ASSEMBLY
4.	TEE	14.	TUBE ASSEMBLY	24.	PACKING
5.	NUT	15.	ELBOW	25.	BACK-UP RING
6.	BACK-UP RING	16.	NUT	26.	NUT
7.	PACKING	17.	BACK-UP RING	27.	ELBOW
8.	ELBOW	18.	PACKING	28.	TUBE ASSEMBLY
9.	PACKING	19.	LOCKWASHER (4)	29.	EXTENSION CONTROL VALVE
10.	UNION	20.	SCREW (4)	30.	TUBE ASSEMBLY

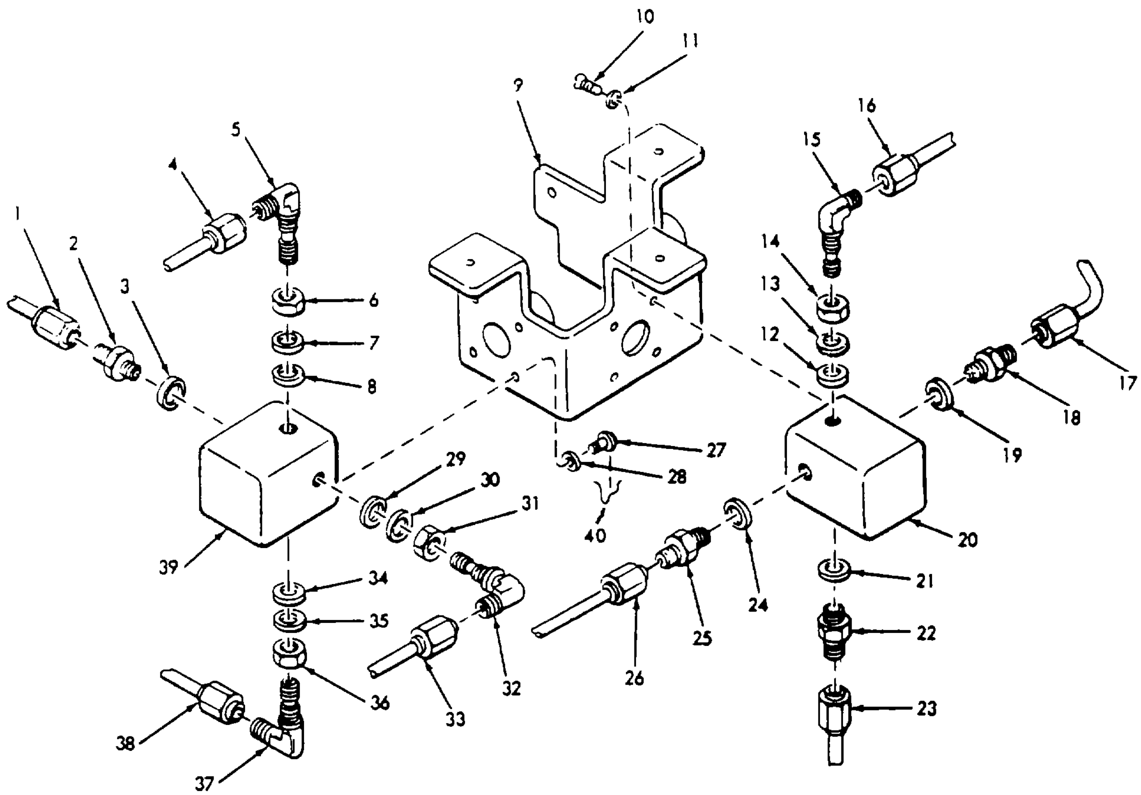
Figure 3-92. Extension Control Valve Removal.

(10) Remove four each screw (10) and lockwashers (11) and remove elevation control valve (20) from bracket (9).

(11) Remove elbow (15) with associated parts (14, 13 and 12) from elevation control valve.

(12) Remove unions (18 and 25) with their respective packings (19 and 24) from elevation control valve.

(13) Remove valve (22) and packing (21) from elevation control valve.



1. TUBE ASSEMBLY
2. UNION
3. PACKING
4. TUBE ASSEMBLY
5. ELBOW
6. NUT
7. BACK-UP RING
8. PACKING
9. BRACKET
10. SCREW (4)
11. LOCKWASHER (4)
12. PACKING
13. BACK-UP RING
14. NUT
15. ELBOW
16. TUBE ASSEMBLY
17. TUBE ASSEMBLY
18. UNION
19. PACKING
20. ELEVATION CONTROL VALVE
21. PACKING
22. VALVE
23. TUBE ASSEMBLY
24. PACKING
25. UNION
26. TUBE ASSEMBLY
27. SCREW (4)
28. WASHER (4)
29. PACKING
30. BACK-UP RING
31. NUT
32. ELBOW
33. TUBE ASSEMBLY
34. PACKING
35. BACK-UP RING
36. NUT
37. ELBOW
38. TUBE ASSEMBLY
39. ROLL CONTROL VALVE
40. SAFETY WIRE

Figure 3-93. Roll and Elevation Control Valves Removal.

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valves for cracks, stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 9-4935-543-14. If visual inspection discloses cracks or damaged threads, or if the valves fail the operation and leakage test, the valves must be replaced.

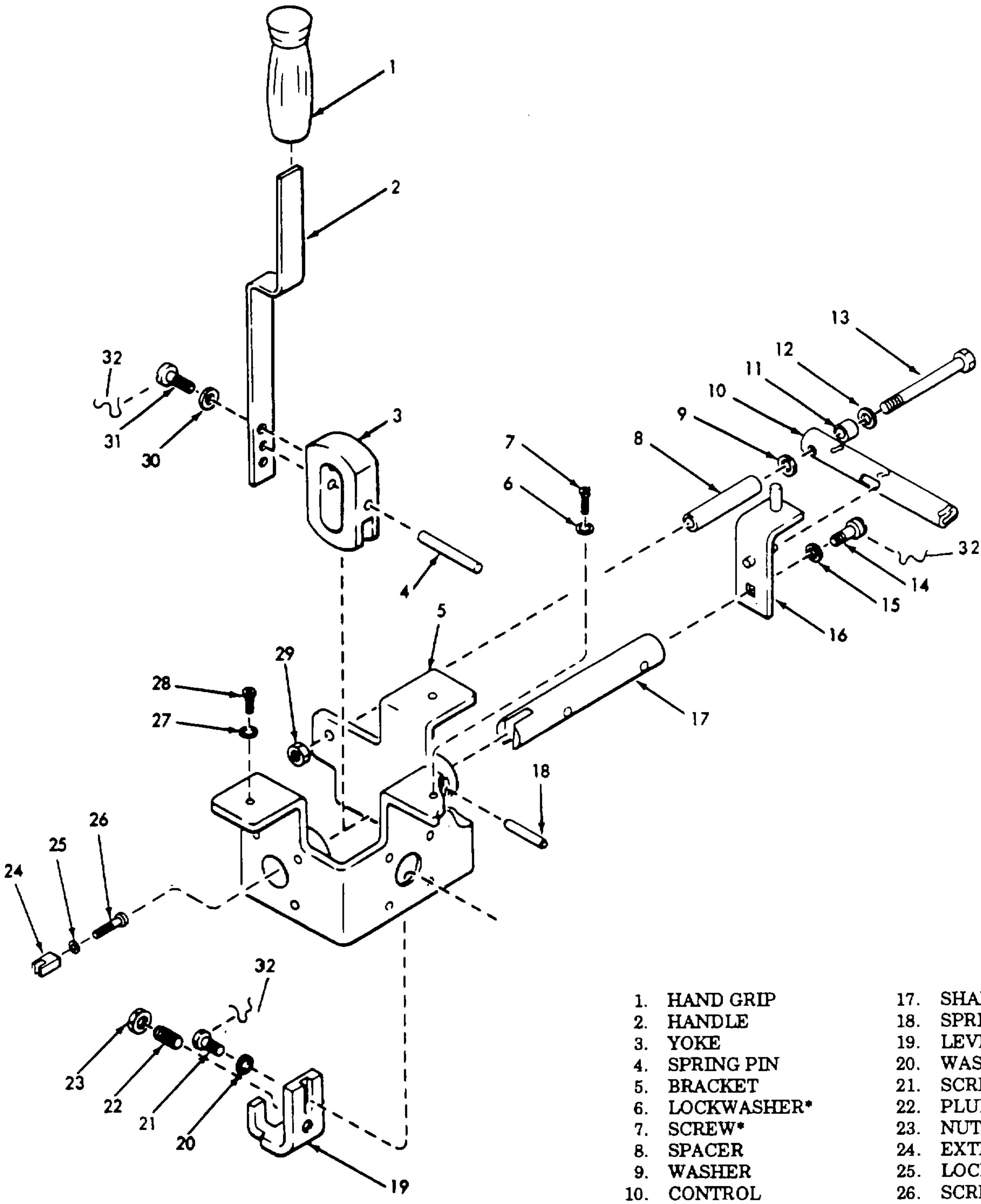
d. Assembly. None.

e. Installation. Install the valves by reversing the sequence of the removal procedure.

3-60. Hydraulic Control Console Assembly Control Linkage

a. Removal (fig. 3-94)

(1) Remove grip (1). Remove boot. Refer to paragraph 3-60



*COMMON TO BOOT AND BRACKET

1.	HAND GRIP	17.	SHAFT
2.	HANDLE	18.	SPRING PIN
3.	YOKE	19.	LEVER
4.	SPRING PIN	20.	WASHER
5.	BRACKET	21.	SCREW
6.	LOCKWASHER*	22.	PLUNGER
7.	SCREW*	23.	NUT
8.	SPACER	24.	EXTENSION
9.	WASHER	25.	LOCKWASHER
10.	CONTROL	26.	SCREW
11.	BUSHING	27.	LOCKWASHER (2)
12.	WASHER	28.	SCREW (2)
13.	SCREW	29.	NUT
14.	SCREW	30.	WASHER
15.	WASHER	31.	SCREW
16.	ARM ASSEMBLY	32.	SAFETY WIRE

Figure 3-94. Hydraulic Control Console - Control Linkage Removal.

(2) Remove two screws (28), two lockwashers (27), and remove control linkage and bracket assembly from console.

(3) Remove screw (31) with washer (30) and remove handle (2).

(4) Remove roll control valve. Refer to paragraph 3-59 (5) Remove screw (21) with washer (20) and remove lever (19).

(6) Remove elevation control valve. Refer to paragraph 3-59

NOTE

Do not remove hydraulic fittings from roll and elevation control valve ports.

b. Disassembly.

(1) Loosen nut (23) and remove plunger (22) from level (19). Remove extension (24), lockwasher (25), and screw (26) from roll control valve shaft.

(2) Remove pin (4) to release yoke (3) from shaft (17).

(3) Remove nut(29)from screw(13) and remove screw (13), spacer (8), washer (9), control (10), bushing (11), and washer (12) from bracket (5).

(4) Remove pin (18); remove shaft (17) with arm assembly (16) from bracket (5) and yoke (3).

(5) Remove screw (14) with washer (15) and remove arm assembly (16) from shaft (17).

c. Inspection. Inspect the linkage for cracks, deformation and mounting holes for crossed or stripped threads. Inspect all moving parts for excessive wear. If the wear limits specified in figure 3-95 are exceeded, the defective part must be replaced.

NOTE

If plunger (22) is excessively worn, its detenting action will be affected. Consideration for replacing worn or inoperative plungers should be made before reassembling control linkage.

d. Assembly.

(1) Position yoke (3) in bracket (5) and insert shaft (17) through bracket (5) and yoke (3). Secure shaft (17) to bracket (5) with pin (18).

(2) Assemble arm assembly (16) to shaft (17) with screw (14) and washer (15).

(3) Safety tie screw (14) to arm assembly (16) with lockwire.

(4) Install pin (4) through yoke (3) and shaft (17).

(5) Assemble washer(12),bushing(11), control (10), washer (9) and spacer (8) to screw (13) and install to bracket (5). Engage pin of arm assembly (16) in hole of control (10) and secure with nut (29).

(6) Install extension (24), washer (25), and screw (26) on roll control valve shaft and install roll and elevation control valves. Refer to paragraph 536.15.

(7) Install lever (19) to elevation control valve shaft using washer (20) and screw (21). Safety tie screw (21) to lever (19) with lockwire.

(8) Install handle (2) using washer (30) and screw (31) on yoke (3). Safety tie screw (31) to yoke using lockwire.

(9) Install plunger (22) and secure in position with nut (23).

NOTE

Adjust plunger (22) for proper detenting.

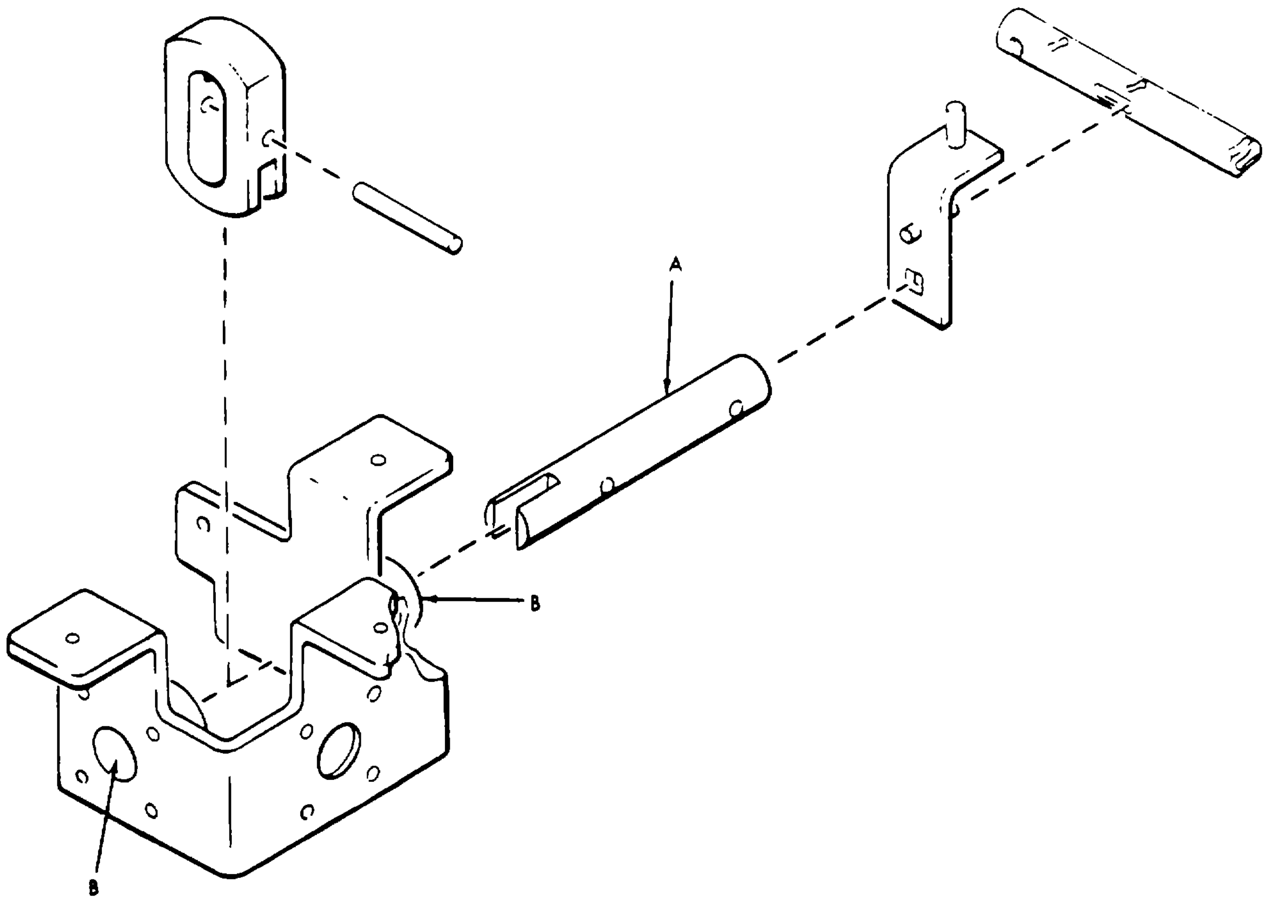
e. Installation. Install control linkage by reversing the sequence of the removal procedure.

3-61. Azimuth, Extension and Elevation/Roll Control Handles

a. Removal (fig. 3-96)

(1) Remove plate (5) by removing screw (3), lockwasher (4) and seven each screw (1) and lockwasher (2).

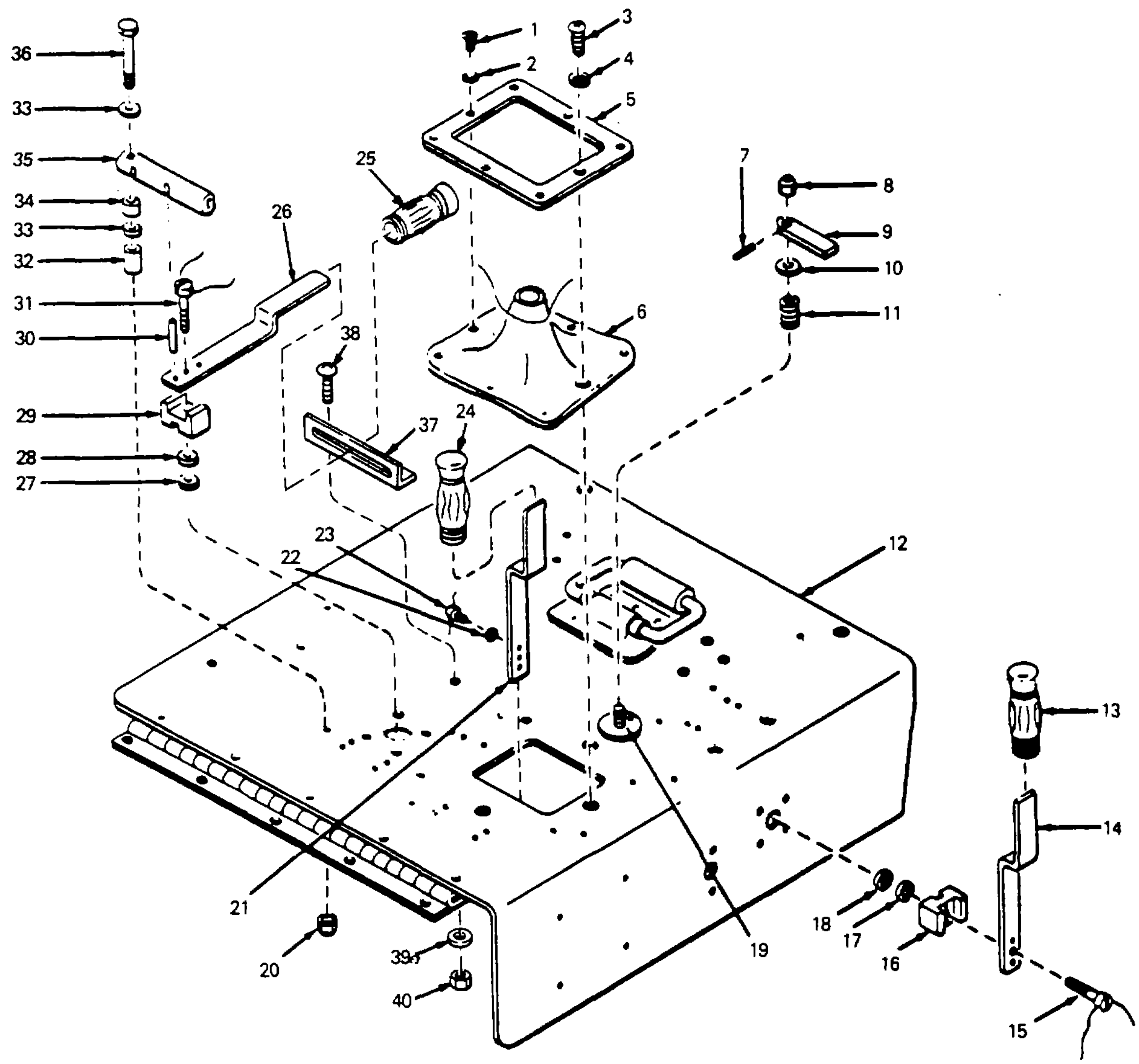
(2) Remove grip (24), fold boot up and remove safety wire from top of boot. Remove boot.



Reference Letter	Point of Measurement	Sizes and Fits of New Parts	Wear Limits (Field)
A	Diameter of shaft	0.745 to 0.742	0.722
B	Inside diameter of bore	0.749 to 0.755	0.775

TA076744

Figure 3-95. Hydraulic Control Console - Control Linkage Wear Limits.



1. SCREW (7)
2. LOCKWASHER (7)
3. SCREW
4. LOCKWASHER
5. PLATE
6. BOOT
7. SPRING PIN
8. NUT
9. HANDLE
10. WASHER
11. SPRING
12. CONSOLE
13. HANDLE GRIP
14. EXTENSION HANDLE
15. SCREW
16. ADAPTER
17. SEAL
18. SEAL
19. SHAFT
20. NUT
21. ELEVATION/ROLL CONTROL HANDLE
22. WASHER
23. SCREW
24. HANDLE GRIP
25. HANDLE GRIP
26. AZIMUTH HANDLE
27. SEAL
28. SEAL
29. ADAPTER
30. SPRING PIN
31. SCREW
32. SPACER
33. WASHER (2)
34. BUSHING
35. CONTROL
36. SCREW
37. BRACKET
38. SCREW (2)
39. WASHER (2)
40. NUT (2)

TA076745A

Figure 3-96. Azimuth, Extension and Elevation/Roll, Control Handles Removal.

(3) Remove nut (20) from screw (36).

(4) Remove screw (36) with two washers (33), control (35), bushing (34) and spacer (32).

(5) Remove screw (31) and remove azimuth control handle (26) with grip (25), adapter (29) and seals (27 and 28).

(6) Remove nut (8) and spring pin (7) to remove handle (9), washer (10), and spring (11) from shaft (19).

(7) Remove screw (23) and washer (22) and remove elevation/roll control handle (21) from the control linkage yoke. Refer to figure 3-94 (8) Remove screw (15) and remove extension control handle (14) with grip (13).

b. Disassembly. No further disassembly is authorized.

c. Inspection. Inspect all parts for evidence of excessive wear and deformation. Defective parts must be replaced.

d. Assembly. None.

e. Installation. Install control handles by reversing the sequence of the removal procedure.

NOTE
Replace all seals. Use lockwire as required.

3-62. Hydraulic Control Console Assembly Filter

a. Removal (fig. 3-97)

(1) Loosen nut (22) and screw (9) sufficiently to allow movement of tube assembly (19) in bracket (20).

(2) Disconnect tube assemblies (7, 8 and 19) from union (18) and tee assembly (4), and valve (6).

(3) Remove relief valve (6) and packing (5).

(4) Loosen nut (3) and remove tee (4) and associated-parts (1, 2 and 3).

(5) Slip tube assembly (19) away from union (18) and remove union and packing (17).

(6) Remove two each nut (16) and washer (15).

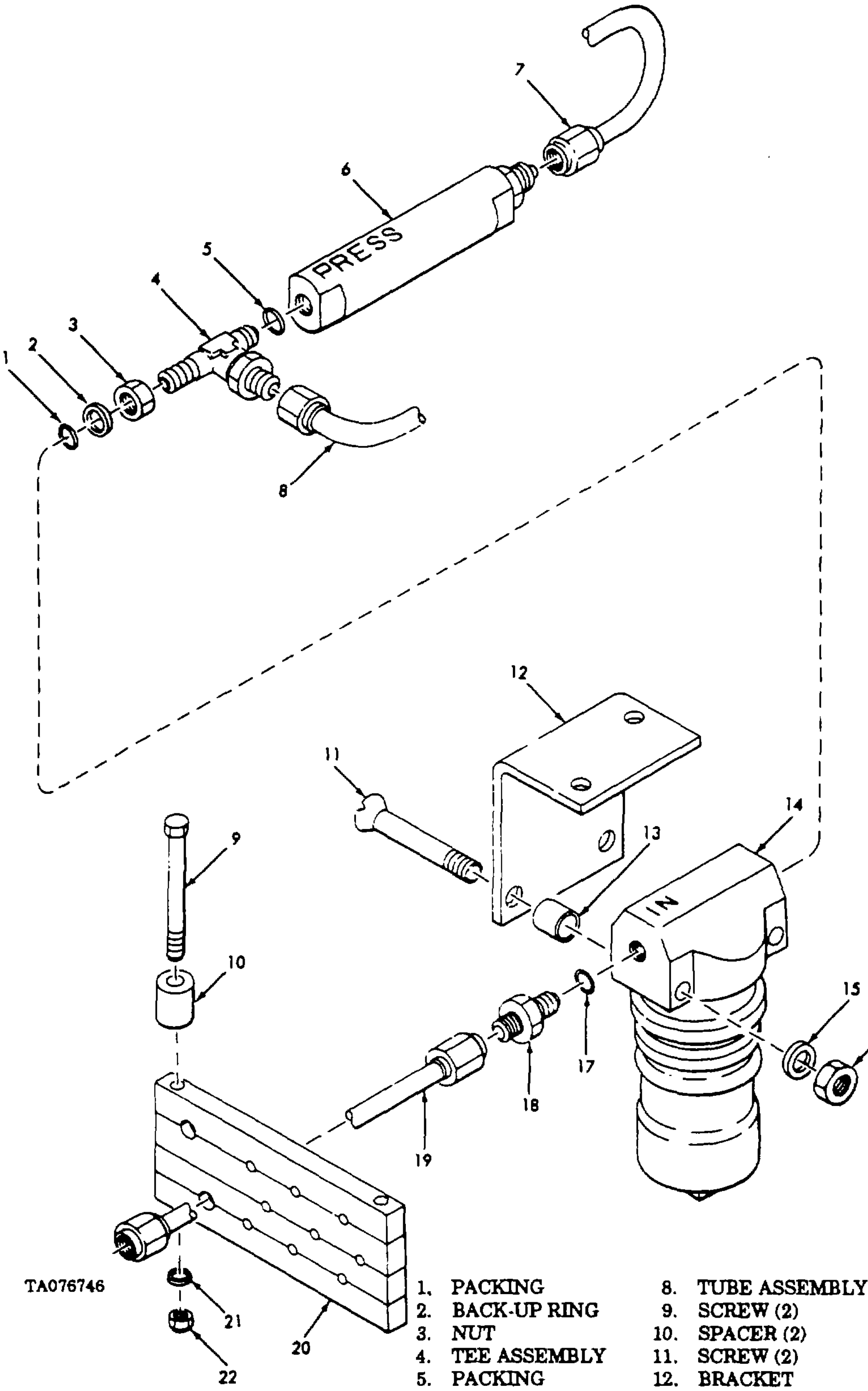
(7) Remove two each screw (11) and spacer (13) and remove filter (14) from bracket (12).

b. Disassembly. Disassembly, procedures for replacing filter element are contained in TM 9-1450-500-20-2.

c. Inspection and Testing. Inspect the threaded ports in the filter head for stripped or crossed threads. If the threads are defective, the filter assembly must be replaced. Inspect the mounting bracket for cracks and deformation. If badly deformed or bent, it may be straightened by placing the bracket in a vise and applying pressure to the deformed area. Cracked brackets must be replaced. If leakage is apparent, it may be remedied by tightening the filter case assembly. Verify that the filter does not leak after tightening the case by performing the leakage and pressure test as specified in TM 9-4935-543-14. If the filter assembly fails the leakage and pressure tests, it must be replaced.

d. Assembly. Refer to TM 9-1450-500-20-2.

e. Installation. Install the hydraulic fluid filter by reversing the sequence of the removal procedure.



1. PACKING
2. BACK-UP RING
3. NUT
4. TEE ASSEMBLY
5. PACKING
6. RELIEF VALVE
7. TUBE ASSEMBLY
8. TUBE ASSEMBLY
9. SCREW (2)
10. SPACER (2)
11. SCREW (2)
12. BRACKET
13. SPACER (2)
14. FILTER
15. WASHER (2)
16. NUT (2)
17. PACKING
18. UNION
19. TUBE ASSEMBLY
20. BRACKET
21. WASHER (2)
22. NUT (2)

Figure 3-97. Hydraulic Fluid Filter Removal.

3-63. Thermal Relief Valve

a. Removal (fig. 3-98)

(1) Disconnect tube assembly (9), loosen nut (7) and remove elbow (8) with associated parts (5, 6 and 7).

(2) Loosen nut (2) and remove thermal relief valve (10), packing (4), and backup ring (3) from tee and tube assembly (1).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 9-4935-543-14. If visual inspection discloses cracks or damaged threads, or if the relief valve fails the operation and leakage test, the valve must be replaced.

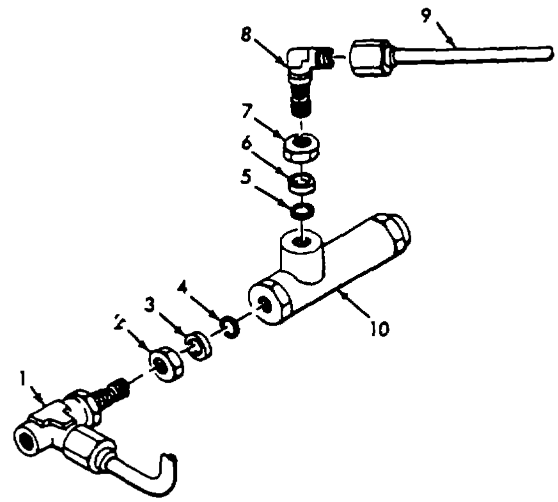
d. Assembly. None.

e. Installation

CAUTION

Before installation the relief valve AN6245B4 has to be adjusted to the 4000 psi cracking pressure (see NHTM 9-4935-543-14).

Install thermal relief valve by reversing the sequence of the removal procedure.



1. TEE AND TUBE (ASSEMBLY)	6. BACK-UP RING
2. NUT	7. NUT
3. BACK-UP RING	8. ELBOW
4. PACKING	9. TUBE ASSEMBLY
5. PACKING	10. THERMAL RELIEF VALVE

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Figure 3-98. Thermal Relief Valve Removal.

3-64. Starter Relief Solenoid Valve

a. Removal (fig. 3-99)

(1) Disconnect tube assemblies (1, 12 and 15).

(2) Disconnect electrical connector (13).

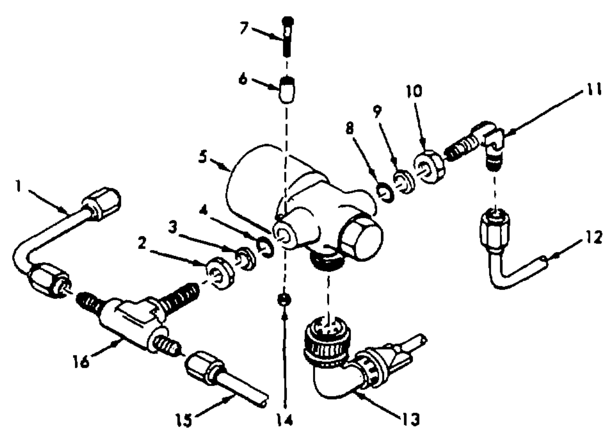
(3) Remove valve (5), by removing two each nut (14), spacer (6) and screw (7).

(4) Loosen nut (2) and remove tee (16) and associated parts (2, 3 and 4) from valve (5).

(5) Loosen nut (10) and remove elbow (11) and associated parts (8, 9 and 10) from valve (5).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 9-4935-543-14. If the visual inspection discloses cracks or damaged threads, or if the valve fails the operation and leakage test the valve must be replaced.



1. TUBE ASSEMBLY	9. BACK-UP RING
2. NUT	10. NUT
3. BACK-UP RING	11. ELBOW
4. PACKING	12. TUBE ASSEMBLY
5. STARTER RELIEF SOLENOID VALVE	13. ELECTRICAL CONNECTOR
6. SPACER (2)	14. NUT (2)
7. SCREW (2)	15. TUBE ASSEMBLY
8. PACKING	16. TEE ASSEMBLY

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Figure 3-99. Starter Relief Solenoid Valve Removal.

d. Assembly. None.

e. Installation. Install starter relief solenoid valve by reversing the sequence of the removal procedure.

3-65. Roll Left Lockout Control Solenoid Valve (fig. 5-67.14)

a. Removal (fig. 3-100)

(1) Disconnect electrical connector (7).

(2) Disconnect tube assemblies (6, 12).

(3) Remove tie down line (if used) and remove solenoid valve (1).

(4) Remove elbows (5, 11), nuts (4, 10), backup rings (3, 9) and packings (2, 8).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 9-4935-543-14. If the visual inspection discloses cracks or damaged threads, or if the valve fails the operation and leakage tests, the valve must be replaced.

d. Assembly. None.

NOTE

When installing solenoid (7) make sure that no part of installation interferes with accelerator linkage rod near vehicle transmission housing when console is closed. Tie down solenoid securely with tie down material.

e. Installation. Install valve by reversing the sequence of the removal procedure.

3-66. Roll Right Lockout Control Solenoid Valve

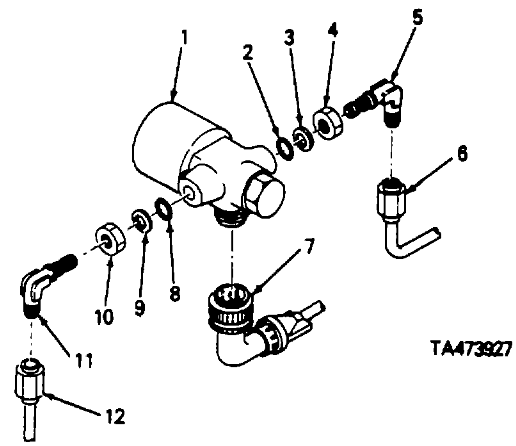
a. Removal (fig. 3-101)

(1) Disconnect electrical connector (8).

(2) Disconnect tube assemblies (7 and 14).

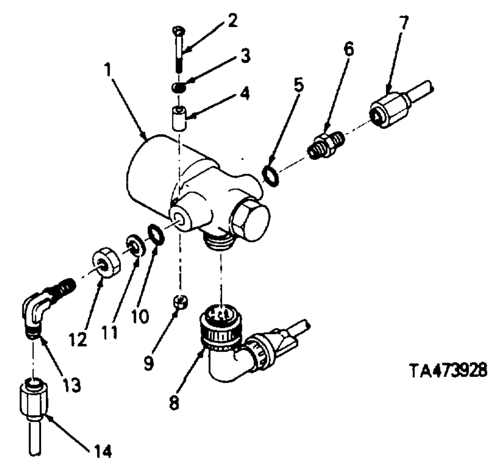
(3) Remove screws (2), washers (3), spacers (4), nuts (9) and remove solenoid valve (1).

(4) Remove elbow (13), nut (12), back-up ring (11), packings (5, 10) and union (6).



1. ROLL LEFT LOCKOUT CONTROL SOLENOID VALVE
2. PACKING
3. BACK-UP RING
4. NUT
5. ELBOW
6. TUBE ASSEMBLY
7. ELECTRICAL CONNECTOR
8. PACKING
9. BACK-UP RING
10. NUT
11. ELBOW
12. TUBE ASSEMBLY

Figure 3-100. Roll Left Lockout Control Solenoid (console left)



1. ROLL RIGHT LOCKOUT CONTROL SOLENOID VALVE
2. SCREW (2)
3. WASHER (2)
4. SPACER (2)
5. PACKING
6. UNION
7. TUBE ASSEMBLY
8. ELECTRICAL CONNECTOR
9. NUT (2)
10. PACKING
11. BACK-UP RING
12. NUT
13. ELBOW
14. TUBE ASSEMBLY

Figure 3-101. Roll Right Lockout Control Solenoid (console left)

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 9-4935-543-14. If the visual inspection discloses cracks or damaged threads or if the valve fails the operation and leakage tests, the valve must be replaced.

d. Assembly. None.

e. Installation. Install valve by reversing the sequence of the removal procedure.

3-67. Elevation Extension Lockout Control Solenoid Valve (fiq. 366)

a. Removal (fig. 3-102)

(1) Disconnect electrical connector (8) from valve (4).

(2) Disconnect tube assemblies (1 and 7).

(3) Remove union (2, 6) and packings (3, 5).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 9-4935-534-14. If the visual inspection discloses cracks or damaged threads or if the valve fails the operation and leakage tests, the valve must be replaced.

d. Assembly. None.

e. Installation. Install valve by reversing the sequence of the removal procedure.

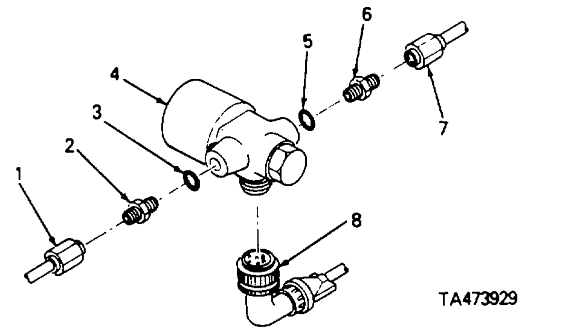
3-68. Elevation Retract Lockout Control Solenoid Valve (fig. 3-86)

a. Removal (fig. 3-103)

(1) Disconnect electrical connector (15).

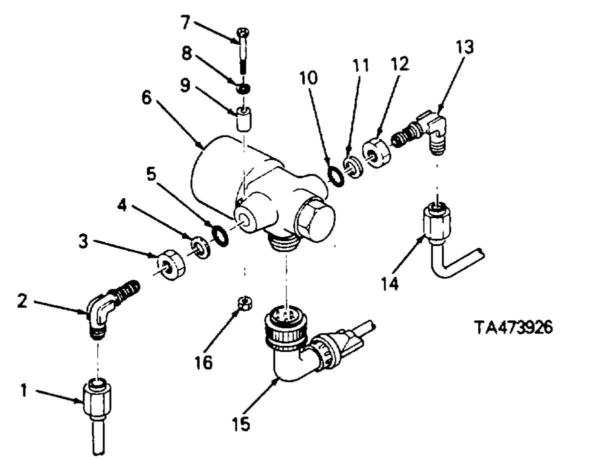
(2) Disconnect tube assemblies (1 and 14).

(3) Remove screws (7), washers (8), spacers (9), nuts (16) and remove solenoid valve (6).



1. TUBE ASSEMBLY
2. UNION/CHECK VALVE
3. PACKING
4. ELEVATION EXTENSION LOCKOUT CONTROL VALVE
5. PACKING
6. UNION/CHECK VALVE
7. TUBE ASSEMBLY
8. ELECTRICAL CONNECTOR

Figure 3-102. Elevation Extension Lockout Control Valve.



1. TUBE ASSEMBLY
2. ELBOW
3. NUT
4. BACK-UP RING
5. PACKING
6. ELEVATION RETRACT LOCKOUT CONTROL SOLENOID VALVE
7. SCREWS (2)
8. WASHERS (2)
9. SPACERS (2)
10. PACKING
11. BACK-UP RING
12. NUT
13. ELBOW
14. TUBE ASSEMBLY
15. ELECTRICAL CONNECTOR
16. NUT (2)

Figure 3-103. Elevation Retract Lockout Control Solenoid Valve.

(4) Remove elbow (2 and 13), nut (3 and 12), back up ring (4 and 11) and packing (5 and 10).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 9-4935-543-14. If the visual inspection discloses cracks or damaged threads or if the valve fails the operation and leakage tests, the valve must be replaced.

d. Assembly. None.

e. Installation. Install valve by reversing the sequence of the removal procedure.

3-69. Reduced Pressure Solenoid Valve

a. Removal (fig. 3-104)

(1) Disconnect electrical connector (8).

(2) Disconnect tube assemblies (1, 3 and 11) and remove solenoid valve (7).

(3) Remove tee (2), nut (4), ring (5) and packing (6).

(4) Remove valve (10) and packing (9).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 9-4935-543-14. If the visual inspection discloses cracks or damaged threads or if the valve fails the operation and leakage tests, the valve must be replaced.

d. Assembly. None.

e. Installation. Install valve by reversing the sequence of the removal procedure.

1. TUBE ASSEMBLY
2. TEE
3. TUBE ASSEMBLY
4. NUT
5. RING
6. PACKING
7. SOLENOID VALVE
8. ELECTRICAL CONNECTOR
9. PACKING
10. VALVE
11. TUBE ASSEMBLY

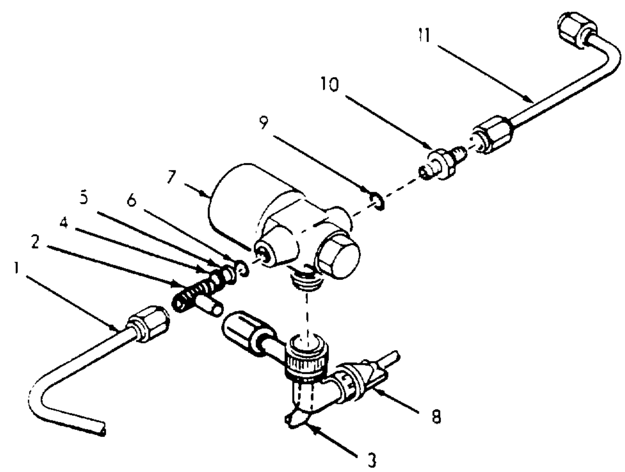


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Figure 3-104. Reduced Pressure Solenoid Valve Removal.

3-70. System Pressure Relief Valve

a. Removal (fig. 3-105)

(1) Disconnect tube assembly (7).

(2) Remove union (6) with packing (5) from valve (4).

(3) Remove valve (4) and packing (3) from tee (2).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 9-4935-543-14. If the visual inspection discloses cracks or damaged threads or if the valve fails the operation and leakage tests, the valve must be replaced.

d. Assembly. None.

e. Installation. Install valve by reversing the sequence of the removal procedure.

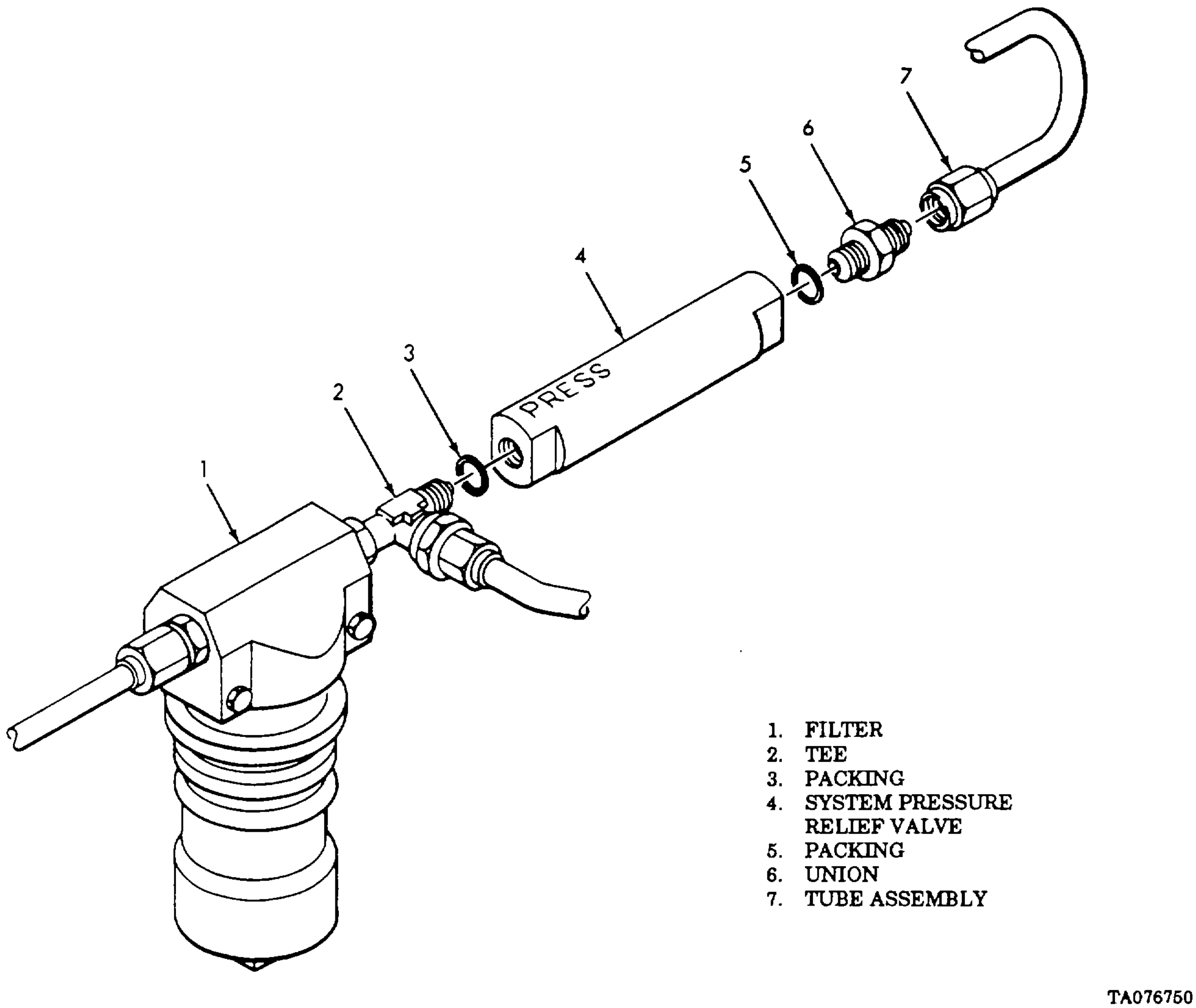


Figure 3-105. System Pressure Relief Valve Removal,

3-71. Reduced Pressure Switch

a. Removal (fig. 3-106)

(1) Disconnect electrical connector (1).

(2) Disconnect tube assembly (9), screw (2), nut (5), washer (3), clamp (4) and remove switch (6).

(3) Remove union (8) and packing (7).

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Perform a visual inspection of the valve for cracks and stripped or crossed threads. Accomplish operation and leakage tests as specified in TM 9-4935-543-14. If the visual inspection discloses cracks or damaged threads or if the valve fails the operation and leakage tests, the valve must be replaced.

d. Assembly. None.

e. Installation. Install valve by reversing the sequence of the removal procedure.

3-72. Roll Cylinder Assembly

a. Removal (fig. 3-107)

(1) Place superstructure in transport position, lower index forks onto blocks.

WARNING

Set the MASTER SWITCH to ON and press the HYDRAULIC PRESSURE RELEASE SWITCH until the HYDRAULIC PRESSURE indicator on the instrument panel drops to zero. Release the HYDRAULIC PRESSURE RELEASE SWITCH and turn the MAS ER SWITCH to OFF.

(2) Tag and disconnect both hydraulic hose assemblies (9) from cylinder. Cap cylinder ports and install plugs in open ends of hoses.

(3) Remove cotter pin (2) slotted hex nut (1), flat washer (3) and hex-head bolt (4) which secures rod end of cylinder to index boom roll arm.

(4) Remove both spring pins (5) by driving up from bottom with a drive pin punch (both sides of cylinder).

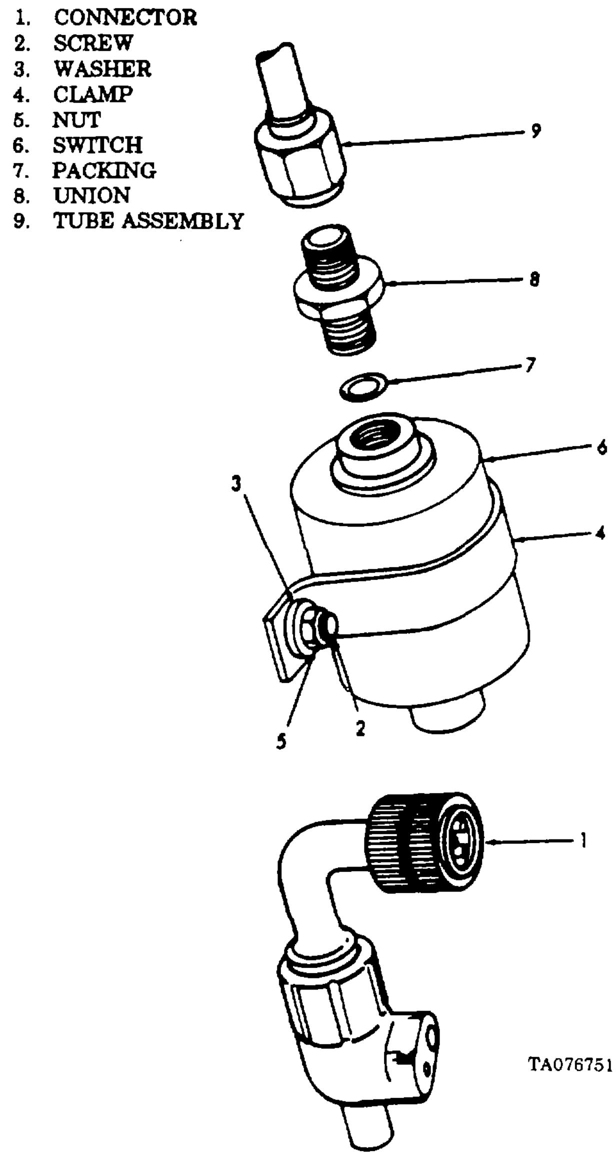


Figure 3-106. Reduced Pressure Switch Removal.

(5) Support the cylinder (8) and remove two headless pins (7) and flat spacer washers (6). Remove cylinder.

b. Disassembly (fig. 3-108)

(1) Loosen nut(12) and remove reducer elbow (11) and associated parts (12, 13 and 14) from cylinder (6).

(2) Loosen nut (9) and remove reducer elbow (10) and associated parts (9, 8 and 7) from cylinder (6).

(3) Remove safety wire (15) from locknut (3) and lockwasher (4), loosen locknut (3), unseat lockwasher (4), and unscrew rod end (2).

(4) Remove locknut (3) and lockwasher (4) from rod end (2).

(5) Remove safety wire from retainer assembly (5) and cylinder (6) and, using a spanner wrench, unscrew retainer assembly (5) from cylinder (6).

(6) Remove ring (5A), washer (5B), scraper (5C), felt (5D), ring (5E), packing (5F), ring (5G), ring (5J), and packing (5K) from retainer (5H).

(7) Remove piston assembly (1) from cylinder (6).

(8) Remove ring (1D), packing (1C), and ring (1B) from piston (1A).

c. Inspection and Testing. Inspect rod end (2), piston (1A) and cylinder (6) for wear. If these parts are worn beyond the limits specified in figure 3-109, the roll cylinder must be replaced. Accomplish operation and leakage tests as specified in TM 9-4935-543-14 upon completion of the assembly procedure. If the roll cylinder assembly fails either of the tests, it must be replaced.

d. Assembly.

(1) Install packing (1C) between rings (1Band 1D) in groove of piston (1A).

(2) Insert piston assembly (1) into cylinder (6).

NOTE

Lubricate piston and cylinder with hydraulic fluid, item 2, App. C, prior to assembly.

(3) Install, in bore of retainer (5H), packing (5F) between rings (5E and 5G) in the groove nearest to the small end of the retainer.

(4) Install felt (5D) in the next groove in the bore of the retainer.

(5) Install packing (5K) and ring (5J) on outside groove of retrainer (5H) with packing toward small diameter end of retainer.

(6) Insert scraper (5C), large diameter side first, washer (5B), and ring (5A) into retainer (5H).

(7) Place cylinder (6) in a vertical position and, using a spanner wrench, install retainer assembly (5), small diameter end first, into cylinder (6). Tighten retainer assembly (5) until it bottoms in cylinder (6).

(8) Safety tie the retainer assembly (5) to cylinder (6) with lockwire.

(9) Install locknut (3) and lockwasher (4) on rod end (2) and screw rod end (2) into rod of piston (1) until, with piston fully retracted, a dimension of 5.50 ± 0.06 inches of obtained between centerline of cylinder mounting holes and centerline of holes in rod end.

(10) Seat lockwasher (4) in groove of piston rod (1) and tighten locknut (3). Torque it to 70 to 85 ft. lbs. Safety tie locknut to lockwasher using MS20995NC32 wire.

(10.1) Coat the locknut (3) and tabwasher (4) with waterproof sealing compound NSN 8040-00-728-3088 or equivalent.

1. SLOTTED HEX NUT
2. COTTER PIN
3. FLAT WASHER
4. HEX-HEAD BOLT
5. SPRING PIN (4)
6. FLAT WASHER
7. HEADLESS PIN
8. ROLL CYLINDER
9. HYDRAULIC HOSE ASSEMBLY
10. LUBRICATION FITTING

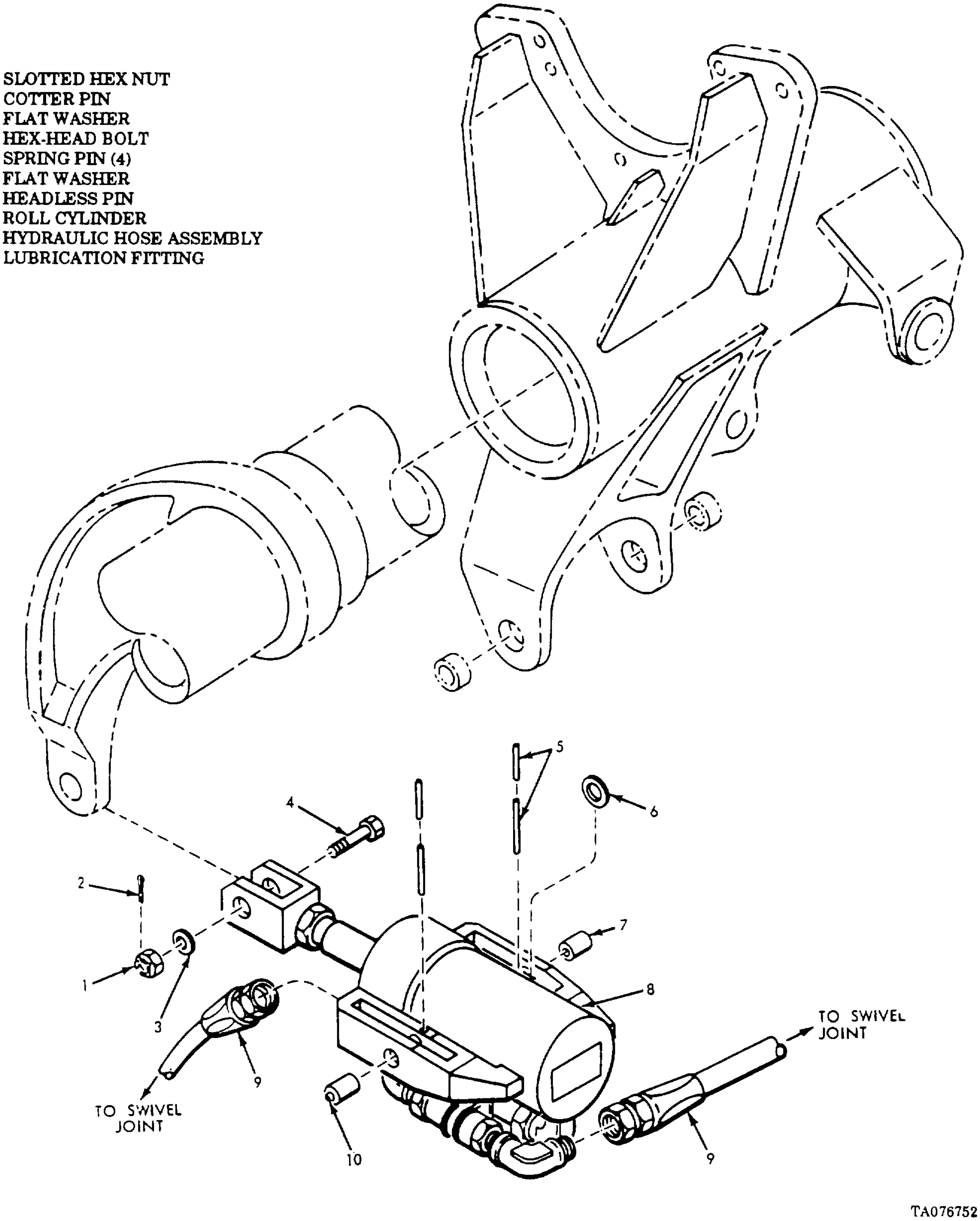


Figure 3-107. Roll Cylinder Removal

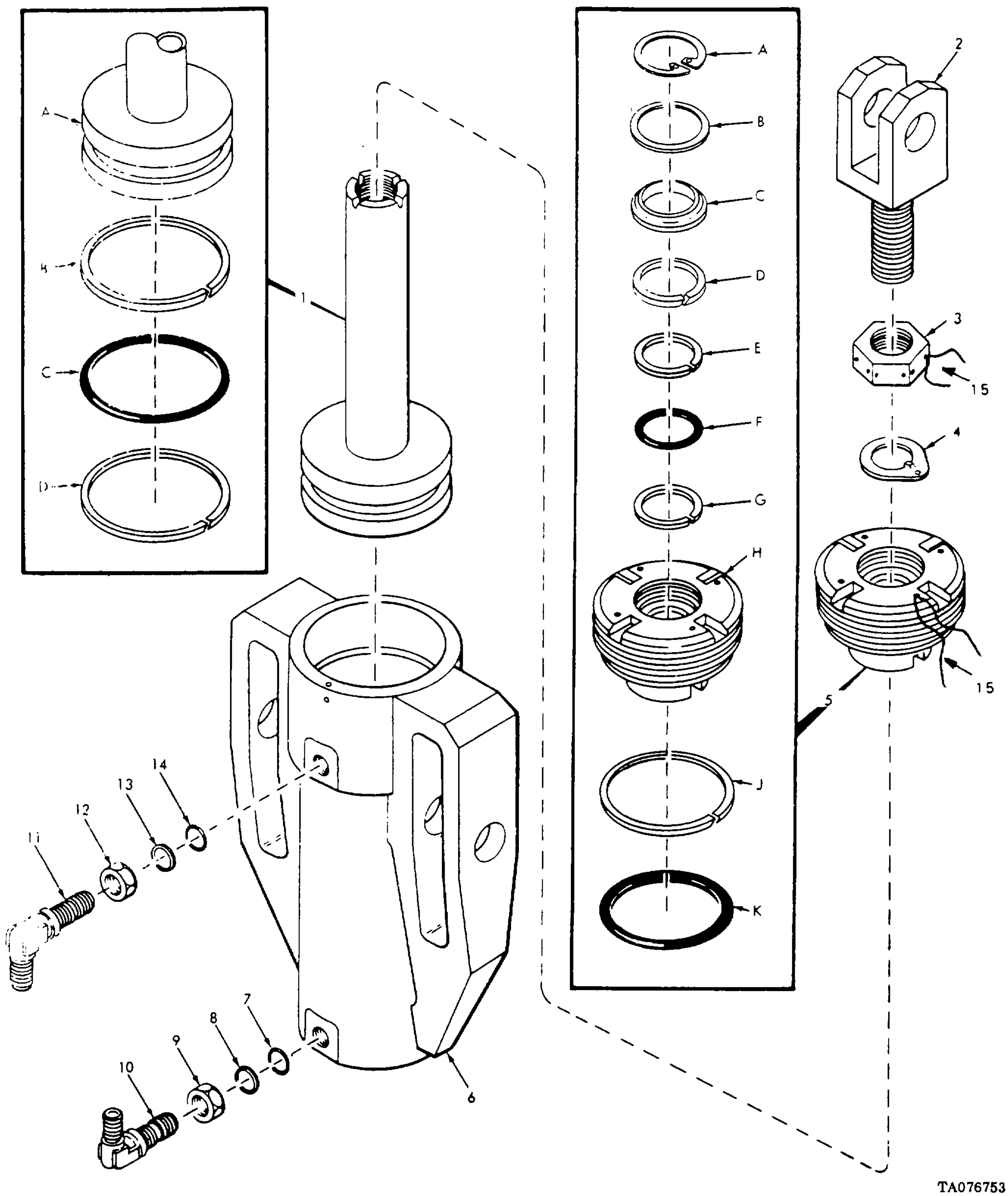


Figure 3-108. Roll Cylinder Disassembly (Sheet 1 of 2).

Item Number	Name	Item Number	Name
1	Piston assembly		F Packing
	A Piston		G ring
	B Ring		H Retainer
	C Packing		J Ring
	D Ring		K Packing
2	Rod end	6	Cylinder
3	Locknut	7	Packing
4	Lockwasher	8	Back-up ring
5	Retainer assembly	9	Nut
	A Ring	10	Reducer elbow
	B Washer	11	Reducer elbow
	C Scraper	12	Nut
	D Felt	13	Back-up ring
	E Ring	14	Packing
		15	Safety wire

Figure 3-108. Roll Cylinder Disassembly (Sheet 2 of 2).

(11) Assemble nut (12), backup ring (13) and packing (14) to reducer elbow (11).

(12) Install reducer elbow (1) in cylinder (6) and tighten nut (12) (finger tight).

(13) Assembly nut (9), backup ring (8), and packing (7) to elbow (10).

(14) Install elbow (10) in cylinder (6) and tighten nut (9) finger tight.

(15) Lubricate in accordance with LO 9-1450-500-12-2 when cylinder assembly is installed in the loader.

e. Installation.

(1) Install the roll cylinder by reversing the sequence of the removal procedure.

NOTE

Flat washer must be installed so that cylinder clevis end is centered on index boom roll arm.

(2) Lubricate cylinder in accordance with LO 9-1450-500-12-2.

(3) Start loader and elevate superstructure sufficiently to remove blocking. Extend superstructure sufficiently to actuate azimuth and roll cutout switch. Roll the superstructure in both directions until the cylinder bottoms out. Repeat several times. Return superstructure to transport position and inspect all connections for leaks.

(4) Shut down engine and fill hydraulic fluid reservoir to capacity.

3-73. Elevation Cylinder Assembly

a. Removal (fig. 3-110).

(1) Start engine. Fully extend elevation cylinder. Center azimuth and roll cylinders.

(2) Install blocking under index boom to support both index forks in the horizontal position.

(3) Lower index boom onto blocking and shut down engine. Operate elevation cylinder control valve to relieve hydraulic pressure in the hydraulic cylinder and lines.

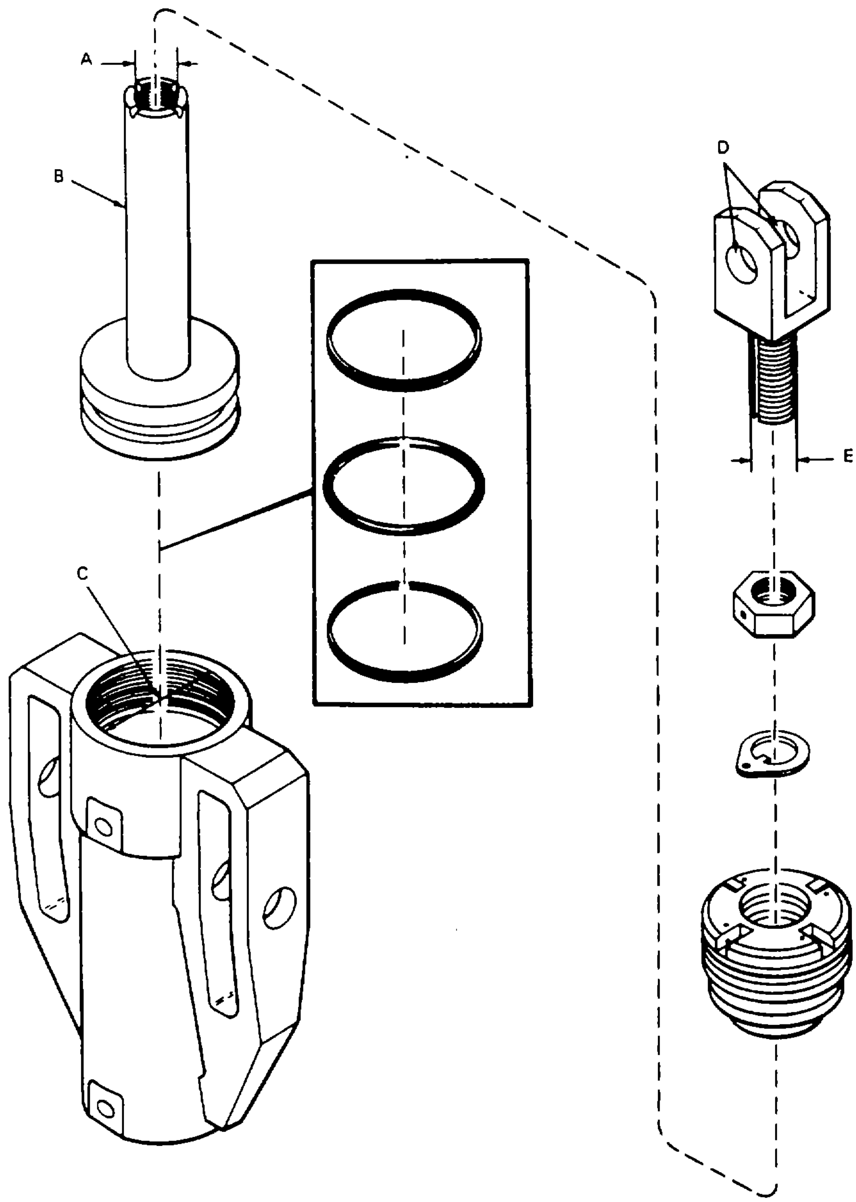
(4) Tag and disconnect both hydraulic hose assemblies (7) from cylinder. Cap cylinder ports and install plugs in open ends of hoses.

(5) Remove cotter pin (3), flat washer (2), and pin (1) which secures rod end of elevation cylinder to boom, figure 3-102

(6) Force rod end and piston into fully retracted position in the elevation cylinder.

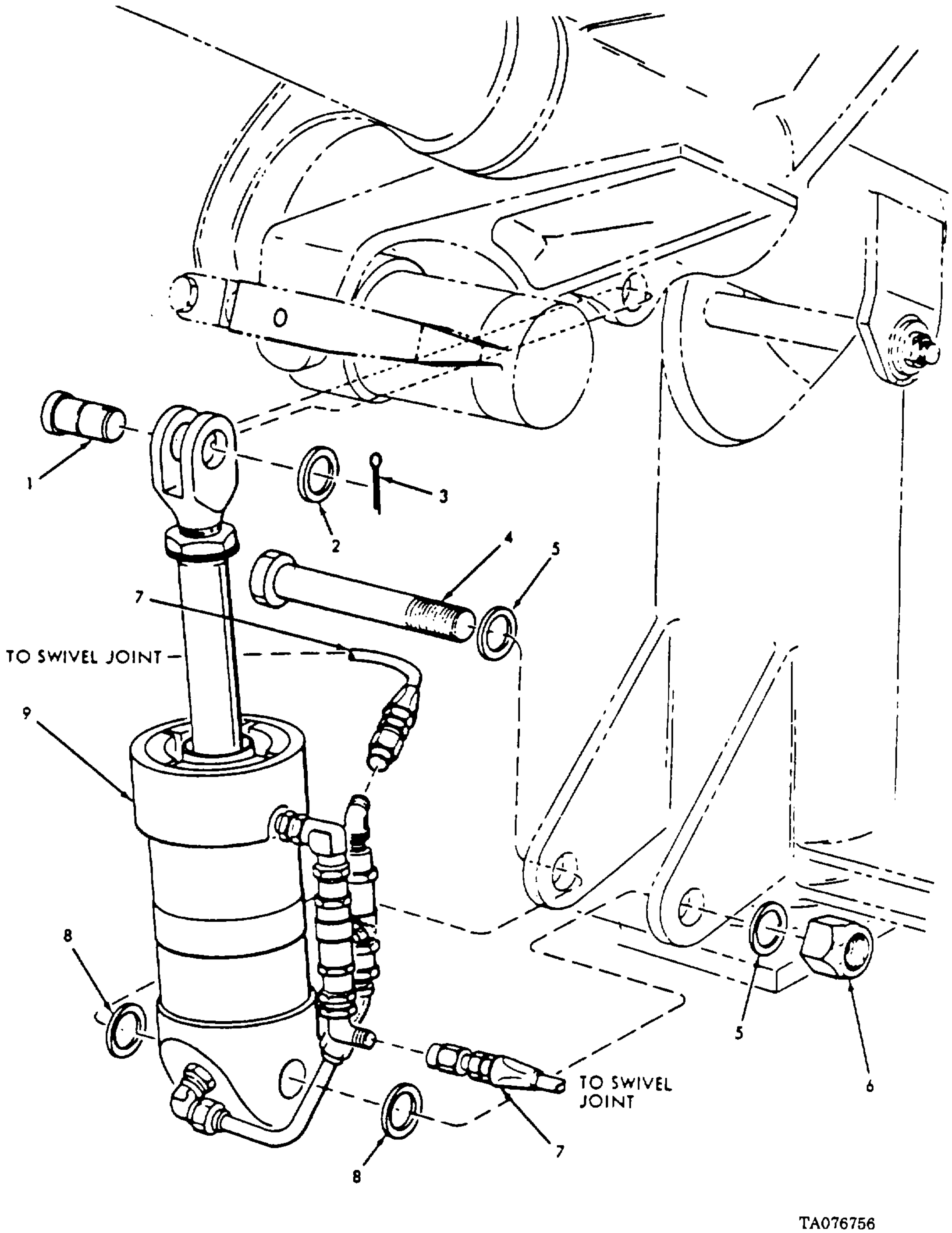
(7) Remove self-locking nut (6), flat washers (5), and hex-head bolt (4) and remove elevation cylinder (9).

b. Disassembly (fig. 3-111). The following special tool is required to perform the disassembly and assembly procedures.



Reference Letter	Point of Measurement	Sizes and Fits of New Parts	Wear Limits (Field)
A	Outside diameter of piston rod	1.2465 to 1.2475	1.2445
B	Cylinder bore diameter	3.000 to 3.002	3.012
C	Inside diameter of hole	0.750 to 0.752	0.765
D	Inside diemetor of piston	0.798 to 0.806	0.798
E	Rod end thread diametre	0.864 to 0.875	0.864

Figure 3-109. Roll Cylinder Wear Limit.



1. PIN
2. FLAT WASHER
3. COTTER PIN
4. HEX-HEAD BOLT
5. FLAT WASHER (2)
6. SELF-LOCKING NUT
7. HYDRAULIC HOSE ASSEMBLY
8. FLAT WASHER (2)
9. ELEVATION CYLINDER

Figure 3-110. Elevation Cylinder Removal.

(1) Remove lockwire from locknut (2) and lockwasher(3), loosen locknut(2), unseat lockwasher (3), and unscrew rod end (1) from piston assembly (20).

(2) Remove locknut (2) and lockwasher (3) from rod end (1).

(3) Using spanner wrench, special tool 5120-00-991-3175 (fig. 3-112) , unscrew retainer assembly (4) from cylinder (19). Remove parts (4A through 4G) and parts (4J and 4K) from retainer (4H).

(4) Remove piston assembly (20) from cylinder (19) and remove parts (20B, 20C and 20D) from piston (20A).

(5) Loosen nut (16) and remove reducer elbow (15) and associated parts (16, 17 and 18).

(6) Loosen nut (10) and remove union (9) with associated parts (10, 11 and 12).

NOTE

It is not necessary to remove parts (5, 6, 7 and 8).

(7) Remove lubrication fitting (14) from cylinder (19).

c. Inspection and Testing. Inspect the inside diameter of bushings (9) for excessive wear. If worn beyond the limits specified in figure 3-113 repair section, the bushings must be replaced. If piston (20A), cylinder (19) and/or rod end (1) are worn beyond the specified limits, they must be replaced.

NOTE

If piston (20A) or rod end (1) in to be replaced, inspect threads, or rod end to make sure they match mating threads of piston rod. If threads are not the same, replace both parts as a unit. Replace damaged lubrication fittings. Accomplish operation and leakage tests as specified in TM 9-4935-543-14. If the cylinder assembly fails the operation and/or leakage tests, the cylinder assembly must be replaced.

1. ROD END
2. LOCKNUT
3. LOCKWASHER
4. RETAINER ASSEMBLY
   A RETAINING RING
   B WASHER
   C SCRAPER
   D FELT RING
   F PACKING
   G RING
   H RETAINER
   J RING
   K PACKING
5. REDUCER
6. PACKING
7. ELBOW
8. PACKING
9. UNION
10. NUT
11. BACK-UP RING
12. PACKING
13. BUSHING (2)
14. LUBRICATION FITTING (45°)
15. REDUCER ELBOW
16. NUT
17. BACK-UP RING
18. PACKING
19. CYLINDER
20. PISTON ASSEMBLY
    A PISTON
    B RING
    C PACKING
    D RING

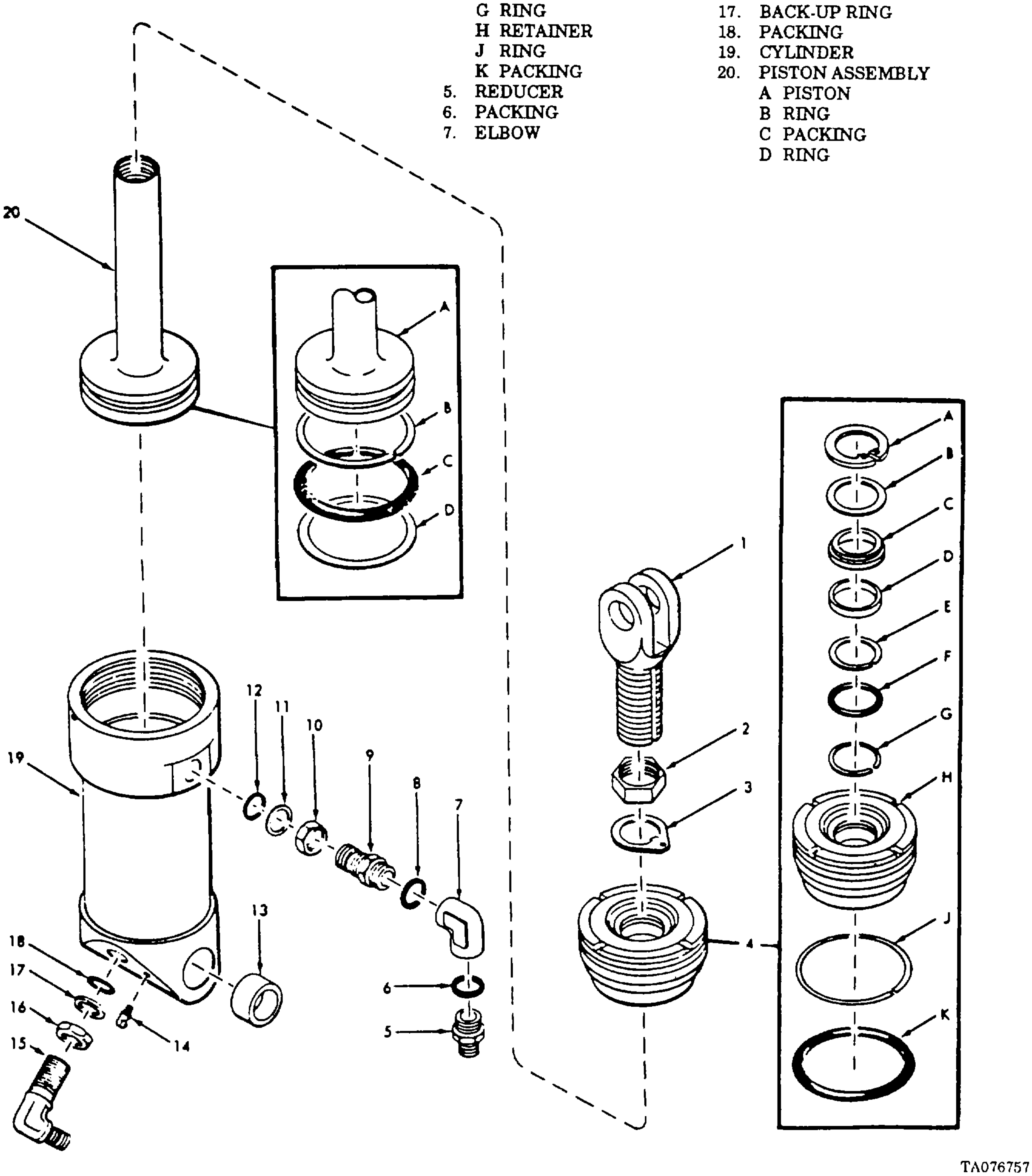


Figure 3-111. Elevation Cylinder Disassembly.

d. Assembly

(1) Install packing (20C) between rings (20B and 20D) in the groove of piston (20A). Insert piston assembly (20) into cylinder (19).

NOTE

Lubricate all surfaces of piston assembly (20) with hydraulic fluid, item 2, App. C, before inserting piston into cylinder, to aid in installation.

(2) Insert packing (4K) and ring (4J) in large groove on outside diameter of retainer (4H), with packing nearest the small diameter end of retainer.

(3) Place packing (4F) between rings (4E and 4G) in inner-most groove of retainer (4H). Insert felt ring (4D) in next groove. Place scraper (4C), large diameter first, washer (4B), and retaining ring (4A) in next groove in retainer (4H).

(4) Install retainer assembly (4) in cylinder (19) and, using spanner wrench special tool NSN 5120-00-991-3175 (3, 4 2-10) tighten retainer assembly.

(5) Screw locknut (2) on rod end (1) until it bottoms. Seat lockwasher (3) on rod end (1) with tab side facing away from locknut (2).

(6) With piston assembly fully retracted, screw rod end (1) into piston assembly (20). Seat lockwasher (3) in groove of piston rod and tighten locknut (2) (100 to 125 lb-ft) so that approximately O.50 inch of threads are visible above locknut (2).

NOTE

After cylinder assembly is installed on loader and final adjustments are completed, torque locknut (2) to 100 to 125 and safety tie it to lock washer (3) using MS2099SNC32 wire. Coat the locknut (2) and tab washer (3) with waterproof sealing compound NSN 8040-00-728-3088 or equivalent.

(7) Assemble packing (18), backup ring (17), and nut (16) to reducer elbow (15). Install reducer elbow (15) in the extend port of cylinder (19).

(8) Assemble packing (12), backup ring (11), and nut (10) to union assembly. Install union assembly in the port of cylinder (19). Tighten nuts (10 and 16) finger tight.

(9) Install lubrication fitting (14) in cylinder (19).

e. Inspection and Checks

(1) Clean and inspect threaded portions of rod end and elevation cylinder piston for rust, corrosion, thread condition, and signs of wear.

(2) Using a go/no-go type gage, check piston and rod end threads for the following tolerances:

Piston Threads	Rod End Threads
Minor diameter: 1.0348 to 1.0438 inches maximum	Major diameter: 1.1250 to 1.1138 inches minimum
Pitch diameter: 1.0709 to 1.0749 inches maximum	Pitch diameter: 1.0709 to 1.0669 inches minimum

CAUTION

Do not install any items not meeting the maximum or minimum tolerances specified in this step.

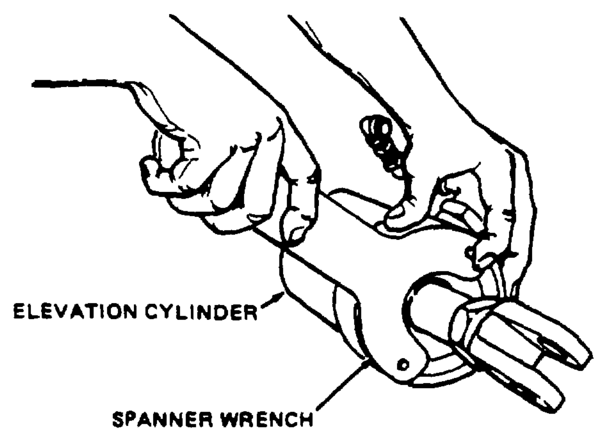


Figure 3-112. Elevation Cylinder Wear Limits

f. Installation

(1) Verify that lockwasher and locknut lockwire are installed on rod end. If rod end hole does not align with the mounting hole in the index boom, extend or retract piston as required until pin can be inserted.

(2) Secure rod end in index boom with pin, washer, and cotter pin.

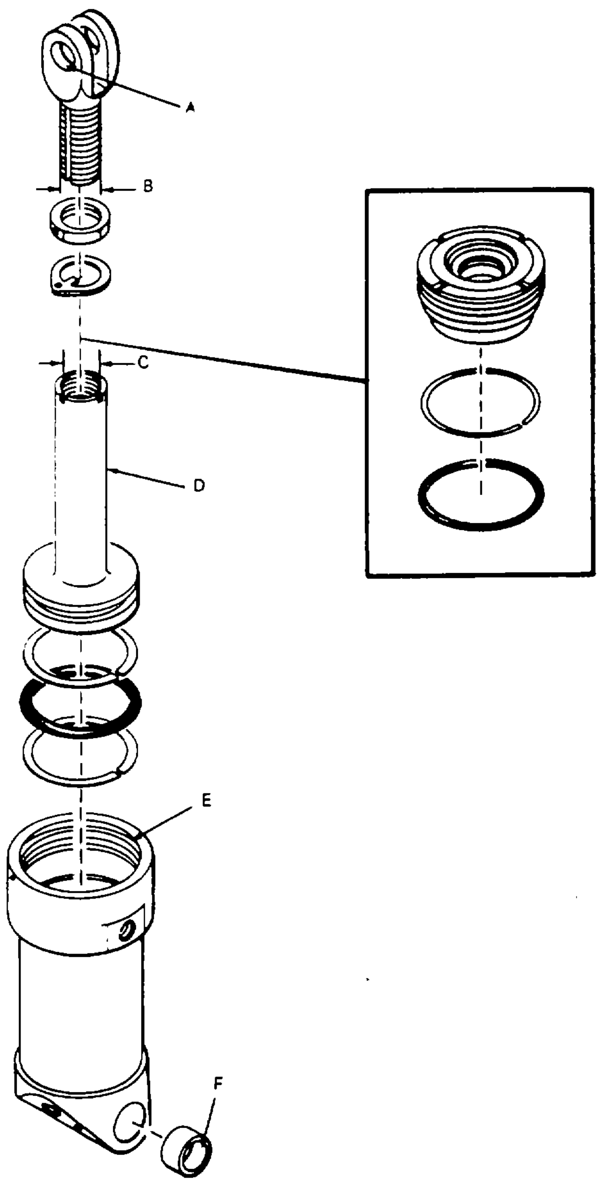
(3) Coat locknut, lockwasher, and piston with a waterproof sealant compound.

(4) Lubricate elevation cylinder in accordance with LO 9-1450-500-12-2 and check hydraulic fluid reservoir for fluid capacity.

(5) Start engine, engage hydraulic system, and raise index boom. Remove blocking and perform elevation cylinder operations.

(6) Return superstructure to drive position and inspect all hydraulic connections for leaks.

(7) Shut down engine and recheck hydraulic fluid reservoir fluid capacity.



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS (FIELD)
A	INSIDE DIAMETER OF HOLE	1.1250 TO 1.1255	1.140
B	ROD END THREAD DIAMETER	1.1136 TO 1.125	1.1136
C	INSIDE DIAMETER OF PISTON	1.0348 TO 1.0448	1.0348
D	OUTSIDE DIAMETER OF PISTON ROD	1.496 TO 1.498	1.494
E	INSIDE DIAMETER OF CYLINDER	4.000 TO 4.002	4.010
F	INSIDE DIAMETER OF BUSHING	1.2500 TO 1.2515	1.265

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Figure 3-113. Elevation Cylinder

3-74. Extension Cylinder Assembly

a. Removal (fig. 3-114)

(1) Lower index forks onto blocks.

(2) Extend extension cylinder until transfer arm assembly contacts link assembly. Shut down loader.

NOTE

The following step is necessary to prevent transfer arm and link assembly from collapsing when cylinder is disconnected.

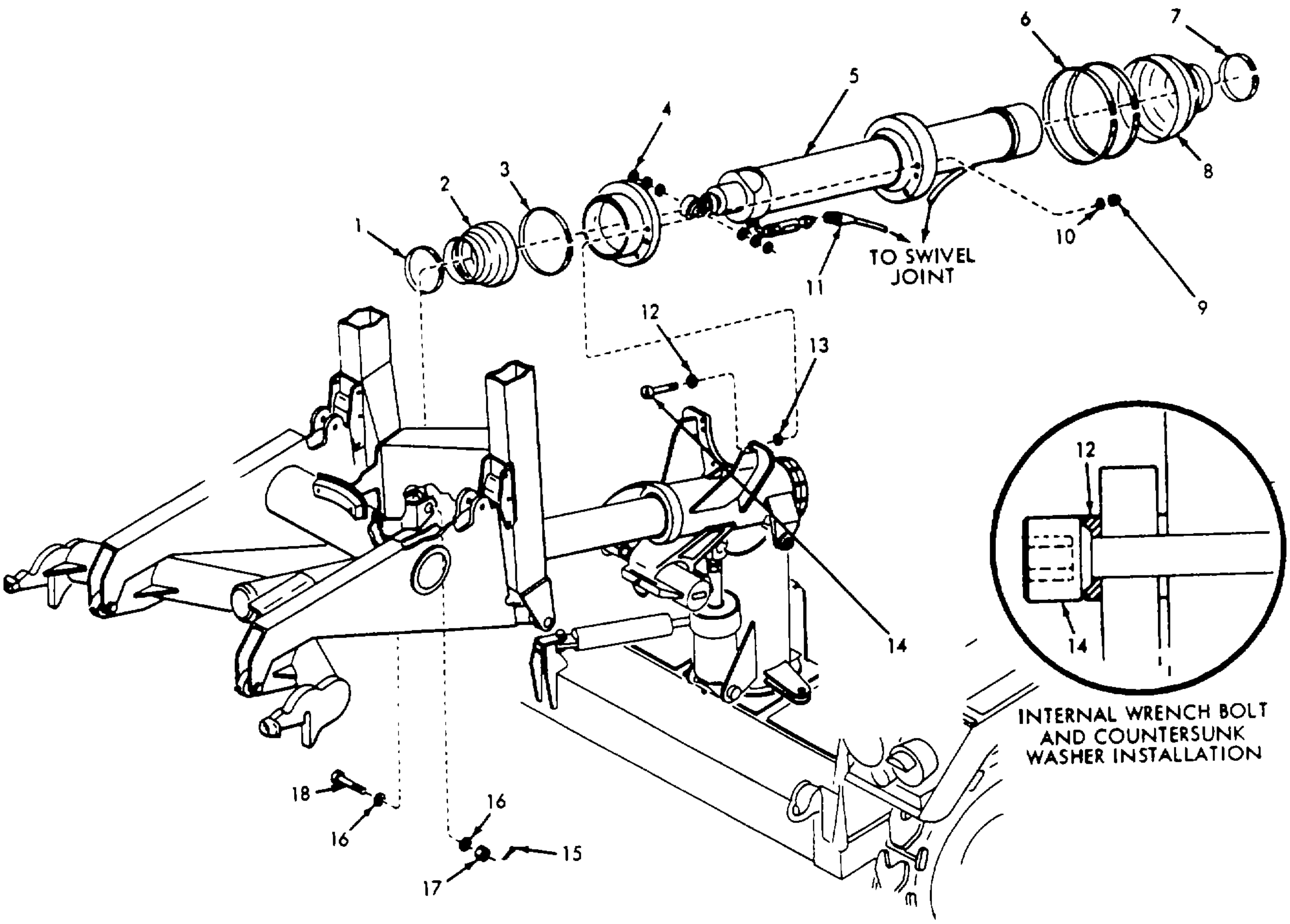
(3) Secure link assembly cross-tube member to index boom using heavy rope or chain.

(4) Relieve hydraulic system pressure by cycling all manual control valves several times.

(5) Tag and disconnect both hydraulic hoses (11) from cylinder. Install protective caps in all openings.

(6) Disconnect cylinder rod end from transfer arm clevis by removing cotterpin (15), slotted hex nut (7), flat spacer washers (16), shims (4), and hex-head shear bolt (18).

(7) Remove four clamps (6) which retain larger rubber boot to boot bracket. Roll boot (8) back to expose attaching hardware.



1.	CLAMP	10.	FLAT WASHER (6)
2.	BOOT	11.	HYDRAULIC HOSE ASSEMBLY
3.	CLAMP (2)	12.	SPECIAL FLAT WASHER
4.	SHIMS (AS REQUIRED)	13.	FLAT WASHER (6)
5.	EXTENSION CYLINDER	14.	INTERNAL WRENCH BOLT
6.	CLAMP (4)	15.	COTTER PIN
7.	CLAMP	16.	WASHER (2)
8.	BOOT	17.	NUT
9.	EXTENDED WASHER NUT (6)	18.	BOLT

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Figure 3-114. Extension Cylinder Removal.

(8) Remove six each extended washer nuts (9), flat washers (10), special flat washers (12), and internal wrench bolts (14) which secure cylinder support ring to index boom support bracket. Remove cylinder (5) and six flat washers from cylinder support bracket.

(9) Remove clamps (1, 3 and 7), and boots (2 and 8).

b. Disassembly (fig. 3-115)

(1) Remove reducer (17.4) and associated parts (17.3), (17.5), (17.6), (17.7) and (17.8) from elbow (17.2). Discard packings (17.3), (17.5) and (17.7).

(2) Loosen nut (16) and remove union (17) and associated parts (14), (15), (16), (17.1) and (17.2). Discard packings (14) and (17.1).

(3) Remove reducer (22) and associated parts, packings (23), (21.4), (21.2), flow regulator (21.3) and reducer (21.1). Discard packings (23), (21.4) and (21.2).

(3.1) Loosen nut (27) and remove union (26) and associated parts (24), (25), (27), (28) and (29). Discard packings (25) and (29).

(3.2) Remove lubrication fitting (2) from rod end bearing assembly (1).

NOTE
Remove lubrication fitting only it visual inspection discloses damage.

(4) Using spanner wrench, special tool 5120-00-991-3175 (4, fig. 2-10), loosen locknut (10) and remove cap (13), packing (12), ring (11), and locknuts (10).

(5) Remove lock (9) and, using spanner wrench, special tool 5120-00-991-3169 (6, fig. 2-10), remove locknut (8); remove bearing (7).

(6) Loosen locknut (37), unseat tab washer (36), and remove rod end bearing assembly (1).

(7) Remove tab washer (36) and locknut (37) from rod end bearing assembly (1).

(8) Using spanner wrench, special tool 5120-00-991-3174 (5, fig. 2-10) loosen locknut (19) and remove retainer (30) and associated parts (20, 21, 31, 32, 33, 34 and 35).

(9) Remove packings (20, 21 and 31), retainer (32), packing (33), scraper (34), and' retaining ring (35) from retainer (30).

(10) Remove locknut (19) from cylinder (6).

(11) Remove piston (18) and associated parts (5, 4, and 3) from cylinder (6).

(12) Remove rings (5 and 3) and packing (4) from piston (18).

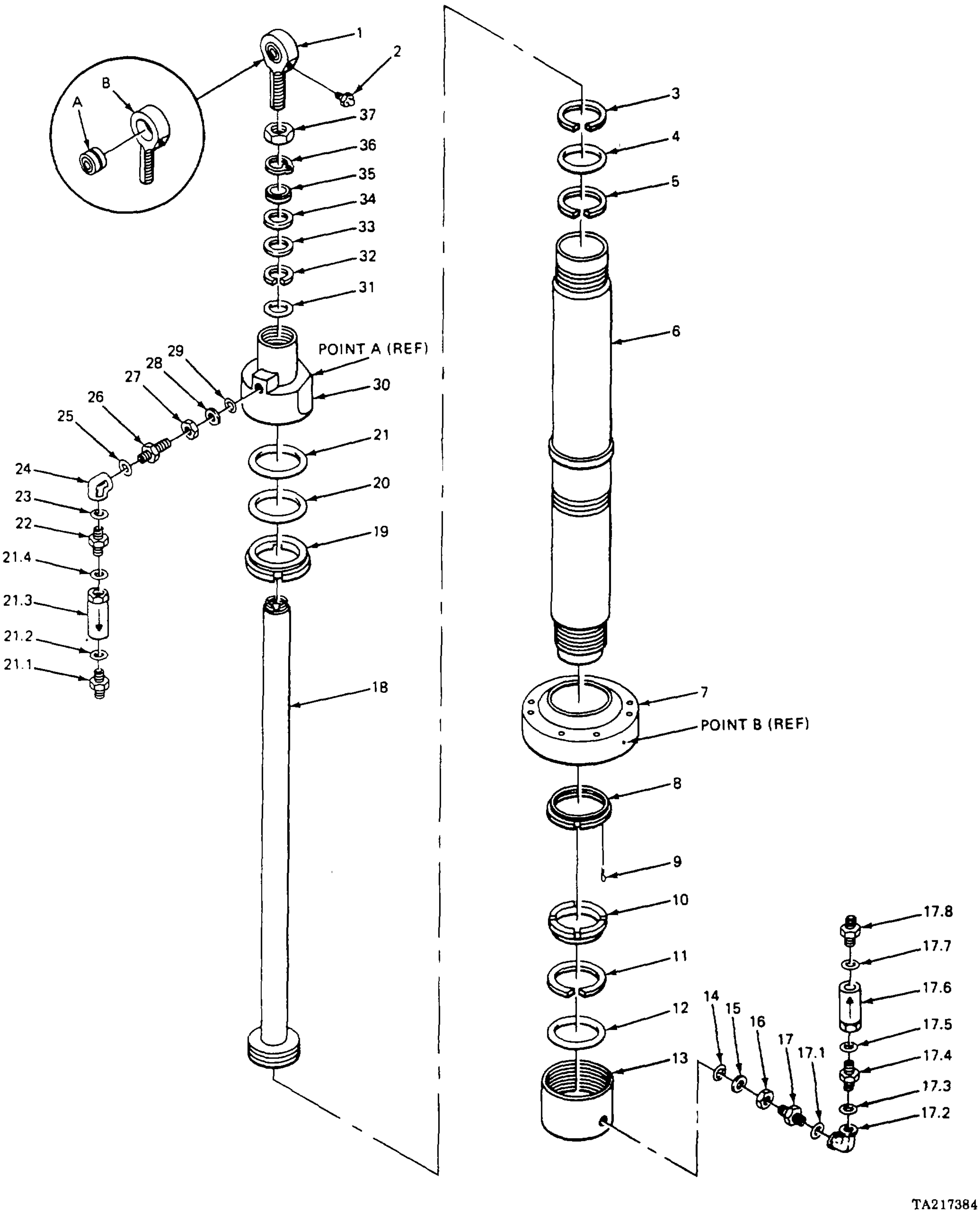

Figure 3-115. Extension Cylinder Disassembly (Sheet 1 of 2).

Item Number	Name
1	ROD END BEARING ASSEMBLY
	A BEARING
	B ROD END
2	LUBRICATION FITTING
3	TEFLON RETAINER
4	PACKING
5	TEFLON RETAINER
6	CYLINDER
7	BEARING
8	LOCKNUT
9	LOCK
10	LOCKNUT
11	TEFLON RETAINER
12	PACKING
13	CAP
14	PACKING
15	BACK-UP RING
16	NUT
17	UNION
17.1	PACKING
17.2	ELBOW
17.3	PACKING
17.4	REDUCER
17.5	PACKING
17.6	FLOW REGULATOR VALVE
17.7	PACKING
17.8	REDUCER
18	PISTON
19	LOCKNUT
20	PACKING
21	PACKING
21.1	REDUCER
21.2	PACKING
21.3	FLOW REGULATOR VALVE
21.4	PACKING
22	REDUCER
23	PACKING
24	ELBOW
25	PACKING
26	UNION
27	NUT
28	BACK-UP RING
29	PACKING
30	RETAINER
31	PACKING
32	RETAINER
33	PACKING (FELT RING)
34	SCRAPER
35	RETAINING RING
36	TAB WASHER
37	LOCKNUT

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Figure 3-115. Extension Cylinder Disassembly (Sheet 2 of 2).

c. Inspection and Testing.

(1) Bearing (7). If the inner ring of the bearing moves radially within the outer ring, through even a small arc, the bearing must be replaced. If the bearing has deep scratches or scores on the mating surface, or if the wear limits specified in figure 3-68 are exceeded, the bearing must be replaced.

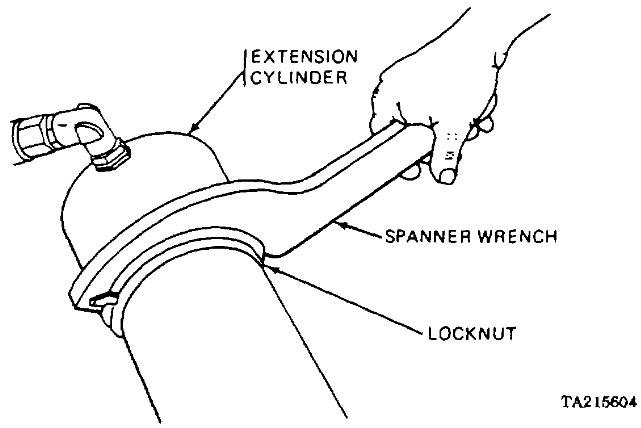


Figure 3-116. Extension Cylinder - Being Locknut Removal Using Spanner Wrench.

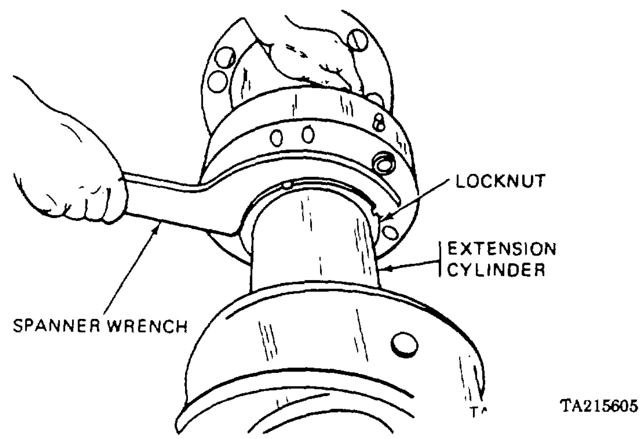


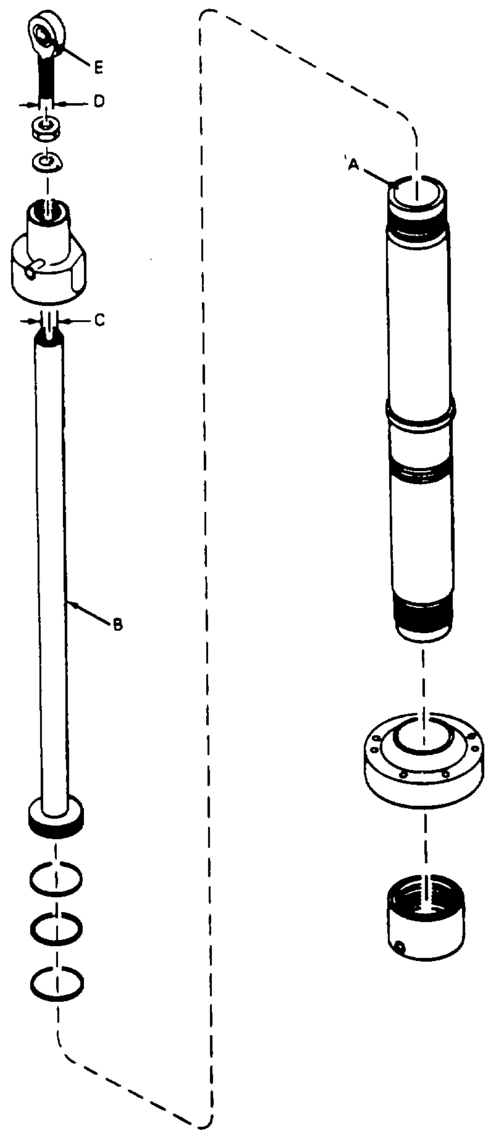
Figure 3-117. Extension Cylinder - Piston Locknut Removal Using Spanner Wrench.

(2) Rod end bearing assembly (1). If bearing (1A) is damaged and rod end (1B)is serviceable, press out the damaged bearing using remover and replacer, special tool (24, fig. 1-2), and press in a new one.

(3) Operation and leakage. After completion of the assembly procedure, accomplish operation and leakage tests as specified in TM 9-4939-543-14. If the cylinder fails the operation and leakage tests, the cylinder assembly must be replaced. Replace damaged lubrication fittings.

d. Assembly.

(1) Assembly packing (4) between rings (5 and 3) in groove on head of piston (18).



Reference Letter	Point of Measurement	Sizes and Fits of New Parts	Wear Limits (Field)
A	Inside diameter of cylinder	4.626 to 4.628	4.635
B	Outside diameter of piston rod	2.121 to 2.122	2.118
C	Inside diameter of piston	1.160 to 1.169	1.160
D	Rod end thread diameter	1.238 to 1.250	1.238
E	Rod end bearing	Bearing must rotate freely without excessive end play	

Figure 3-118. Exxon Cylinder Wear Limits.

NOTE

Apply a coating of hydraulic fluid, item 2, App. C to all surfaces of piston before it is inserted into cylinder.

(2) Insert piston (18), head end first, into end of cylinder (6) and slide piston into cylinder.

(3) Screw locknut (19) on end of cylinder (6).

NOTE

Cylinder end specified in preceding two steps is opposite the end over which bearing is installed.

(4) Install packing (21) and packing (20) in groove in large end of retainer (30). Install packing (31) and retainer (32) in innermost groove in small end of retainer (30). Install packing (33) in next groove. Install scraper (34), large diameter side first, in next groove and secure in place with retaining ring (35).

(5) Slip retainer(30) over end of piston rod and screw retainer(30) on end of cylinder (6) until retainer bottoms.

(6) Using spanner wrench, special tool NSN 5120-00-991-3174 (fig. 3-117) tighten locknut (19) against retainer (30).

(7) Safety tie locknut (19) to retainer (30) with lockwire.

(8) Install lubrication fitting (2) in rod end bearing assembly (1). Screw locknut (37) on rod end bearing assembly (1) until it bottoms.

(9) Place tab washer (36) on rod end with tab side away from locknut (37).

(10) Screw rod end of rod end bearing assembly (1) into piston rod until there are approximately five threads showing between locknut (37) and piston rod. Aline slot of piston rod with groove in rod end of bearing assembly (1), seat tab washer (36), and tighten locknut (37).

(11) After installing cylinder on loader transporter and final adjustments are completed torque locknut (37) to 110 to 135 ft. lbs and safety tie tabwasher (36) to locknut (37) using MS20995NC32 wire.

(11.1) Coat the locknut (37) and tabwasher (36) with waterproof sealing compound NSN 8040-00-728-3088 or equivalent.

(12) Assemble bearing (7), with pin (point B) alined with point A of retainer (30) (vertical position when installed on loader) and ball loading slots toward rod end of cylinder, to cylinder (6). Insert side of bearing must rest against shoulder in middle of cylinder (6).

(13) Assembly locknut (8), small diameter side first, to cylinder (6) and, using spanner wrench, special tool NSN 5120-00-991-3169 (fig. 5-67.45) tighten locknut (8) to 500 ft-lb torque minimum, to aline slot in locknut (8) with slot in cylinder (6).

(14) Insert lock (9), small tab first, in slot of cylinder (6). Safety tie lock (9) to locknut (8) with lockwire.

(15) Screw locknut (10) on end of cylinder (6) until locknut bottoms.

(16) Install packing(12) and retainer (11) in the large groove in cap (13). Screw cap (13) to the end of cylinder (6) and, using spanner wrench, special tool NSN 5120-00-991-3175 (4, fig. 2-10) tighten locknut (10) against cap (13).

(17) Safety tie locknut (10) to cap (13) with lockwire.

(18) Lubricate rod end bearing assembly (1) and bearing (7) in accordance with LO 9-1450-500-12-2 after installation.

(19) Assemble nut (27), backup ring (28), and packing (29) to union and install union in the port of retainer (30).

(20) Install reducers (21.1) and (22) into each end of flow regulator valve (21.3) with new packings (21.2) and (21.4).

(21) Install a new packing (23) onto reducer at opposite end of "Regulated Flow" arrowhead on flow regulator.

(22) Install the flow regulator, with reducers attached, into the elbow (24) with "Regulated Flow" arrow pointing away from the elbow and tighten.

(23) Install new packing (14), backup ring (15), nut (16), union (17), new packing (17.1) and elbow (17.2) in the port of cap (13).

(24) Install reducers (17.4) and (17.8) into each end of flow regulator valve (17.6) with new packing (17.5) and (17.7).

(25) Install a new packing (17.3) onto reducer at opposite end of "Regulated Flow" arrowhead on flow regulator.

(26) Install the flow regulator, with reducers attached, into the elbow (17.2) with "Regulated Flow" arrow pointing away from the elbow and tighten.

e. Installation.

(1) Install extension cylinder by reversing the sequence of the removal procedure. Tighten six internal wrench bolts to 2500 ± 100 in-lb torque.

NOTE

Shim as required to center extension cylinder rod end in transfer arms cross-members clevis. Install special flat washers as shown in figure 3-114

(2) Lubricate cylinder in accordance with LO 9-1450-500-12-2.

NOTE

Prior to operating cylinder, wipe piston rod with a clean cloth and lubricate rod with clean hydraulic fluid.

(3) Start loader and test cylinder operation by bottoming piston in both directions. Repeat several times. Inspect all connections for evidence of leaks.

(4) Return superstructure to transport position, shut down loader and fill hydraulic fluid reservoir to capacity.

3-75. Azimuth Cylinder Assembly

a. Removal (fig. 3-119)

(1) Place superstructure in the transport position, lower index boom forks onto blocks, shut down engine and cycle all manual control valves several times to relieve system pressure.

(2) Tag and disconnect both hydraulic hose assemblies (1) from cylinder (2). Install protective caps and plugs to all openings.

(3) Remove quick release pin (3) from rod end of cylinder.

(4) Remove hex-head bolt (4), washer (6), and locknut(5) which secures cylinder to bracket. Remove cylinder.

b. Disassembly (fig. 5-67.49).

(1) Loosen nut (6) and remove reducer elbow (7) and associated parts (4, 5 and 6).

(2) Loosen nut (10) and remove reducer elbow (11) and associated parts (8, 9 and 10).

(3) Loosen locknut (20), unseat lockwasher (19), and unscrew rod end bearing assembly (2). Remove lubrication fitting (1) from rod end bearing assembly (2).

NOTE

Remove lubrication fitting only if visual inspection discloses damage.

(4) Remove locknut (20) and lockwasher (19) from rod end bearing assembly (2).

(5) Remove retaining ring (18) and rings (16, 17 and 15) from cylinder assembly (13).

(6) Remove retainer assembly (14) from cylinder assembly (13).

(7) Remove parts (14A through 14G, 14J and 14K) from retainer (14H).

(8) Remove piston assembly (3) from cylinder assembly (13). Remove parts (3B, 3C and 3D) from piston (3A).

(9) Remove lubrication fitting (12) from cylinder assembly (13).

1. HYDRAULIC HOSE ASSEMBLY
2. AZIMUTH CYLINDER
3. QUICK RELEASE PIN
4. HEX-HEAD BOLT
5. LOCKNUT
6. FLAT WASHER

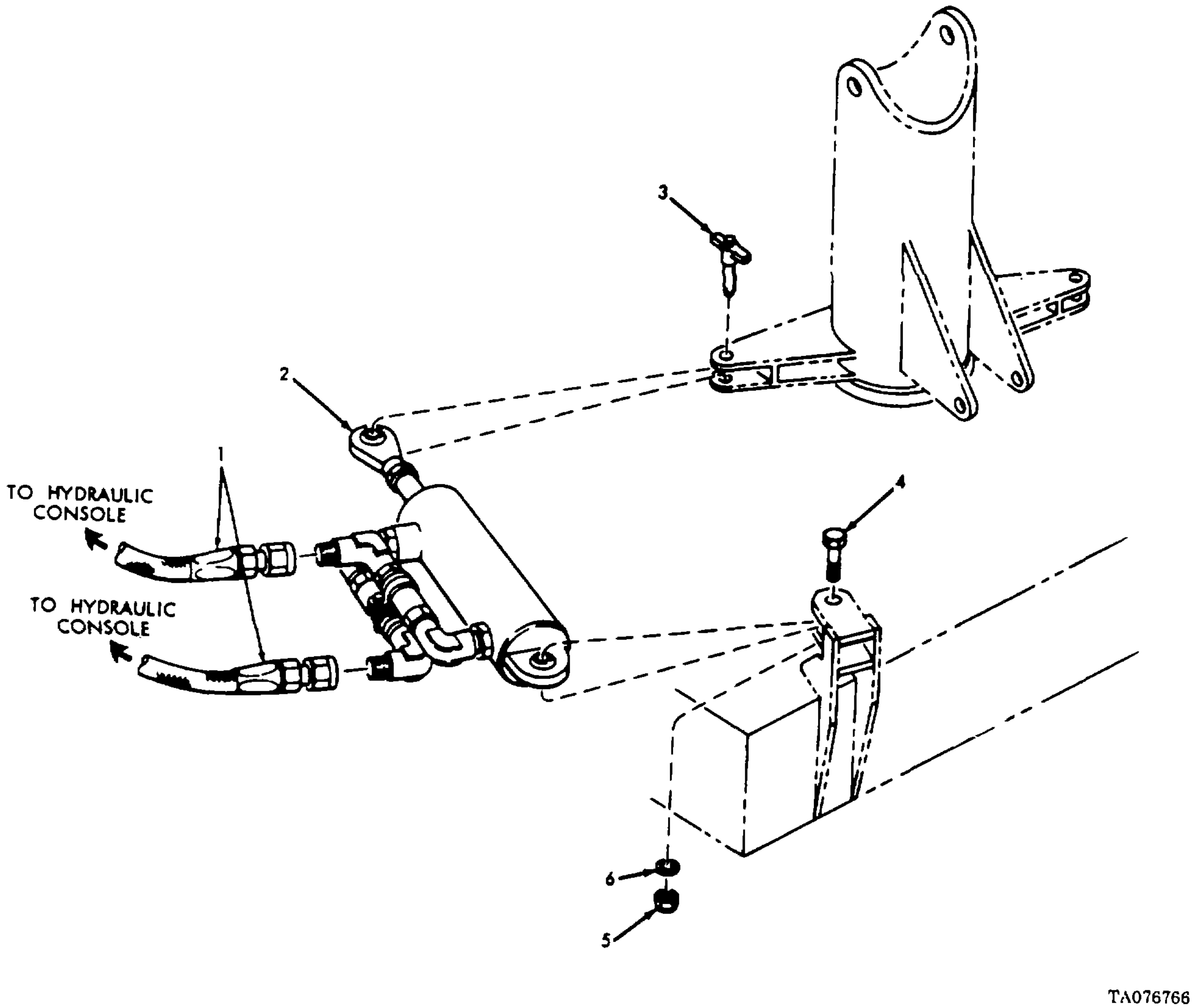


Figure 3-119. Azimuth Cylinder Replacement

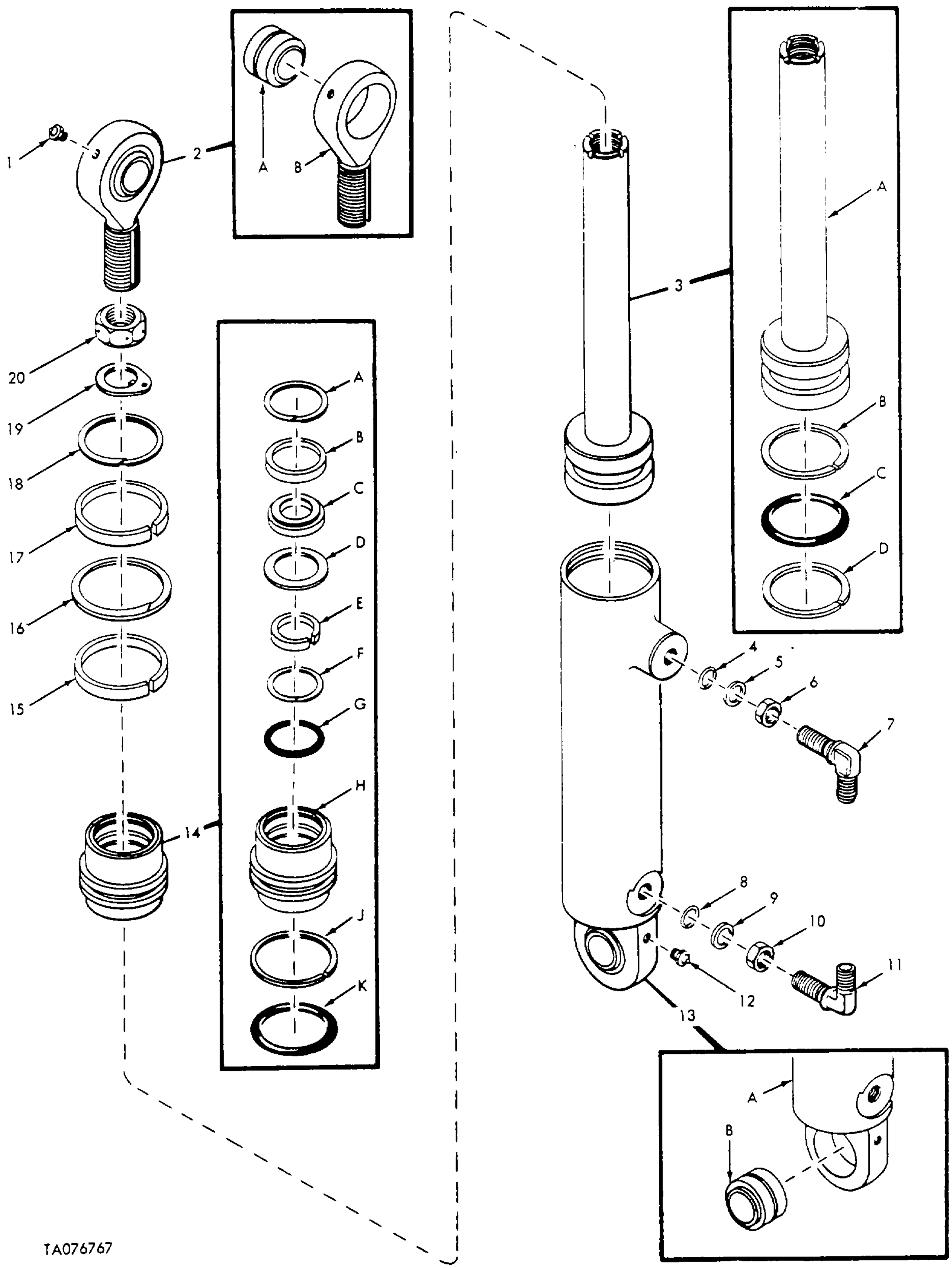


Figure 3-120. Azimuth Cylinder Disassembly (Sheet 1 of 2)

Item Number	Name
1	Lubrication fitting
2	Rod end bearing assembly
	A Bearing
	B Rod end
3	Piston assembly
	A Piston
	B Ring
	C Packing
	D Ring
4	Packing
5	Back-up ring
6	Nut
7	Reducer elbow
8	Packing
9	Back-up ring
10	Nut
11	Reducer elbow
12	Lubrication fitting
13	Cylinder assembly
	A Cylinder
	B Bearing
14	Retainer assembly
	A Retaining ring
	B Scraper retainer
	C Scraper
	D Washer
	E Felt ring
	F Ring
	G Packing
	H Retainer
	J Ring
	K Packing
15	Ring
16	Retaining ring
17	Ring
18	Retaining ring
19	Tab washer
20	Locknut

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Figure 3-120. Azimuth Cylinder assembly Sheet 2 of 2).

NOTE
Remove lubricating fitting only if visual inspection discloses damage.

c. Inspection and Testing. The following special tool is required to perform the inspection and testing procedures: NSN 5120-00-991-3176.

(1) Rod end bearing assembly (2). If bearing (2A) is damaged and rod end (2B) is serviceable, press out the damaged bearing and press in a new one using remover and replacer, special tool (NSN 5120-00-991-3176 (5, fig. 2-9).

(2) Cylinder assembly (13). Inspect cylinder assembly and if bearing (13B) is damaged, press out damaged bearing and press in a new one. The new bearing must be staked (four places) in place after it is pressed into cylinder assembly. If cylinder (13) and piston (3A) are worn beyond the limits specified in figure 3-121 , the defective parts must be replaced.

(3) Operation and leakage. Accomplish operation and leakage tests as specified in TM 9-4935-543-14. If the cylinder assembly fails either the operation or leakage test, the cylinder assembly must be replaced.

d. Assembly.

(1) Install lubrication fitting (12) in cylinder assembly (13).

(2) Insert packing (3C) between rings (3B and 3D) in groove in head of piston (3). Insert piston assembly (3) into cylinder assembly (13).

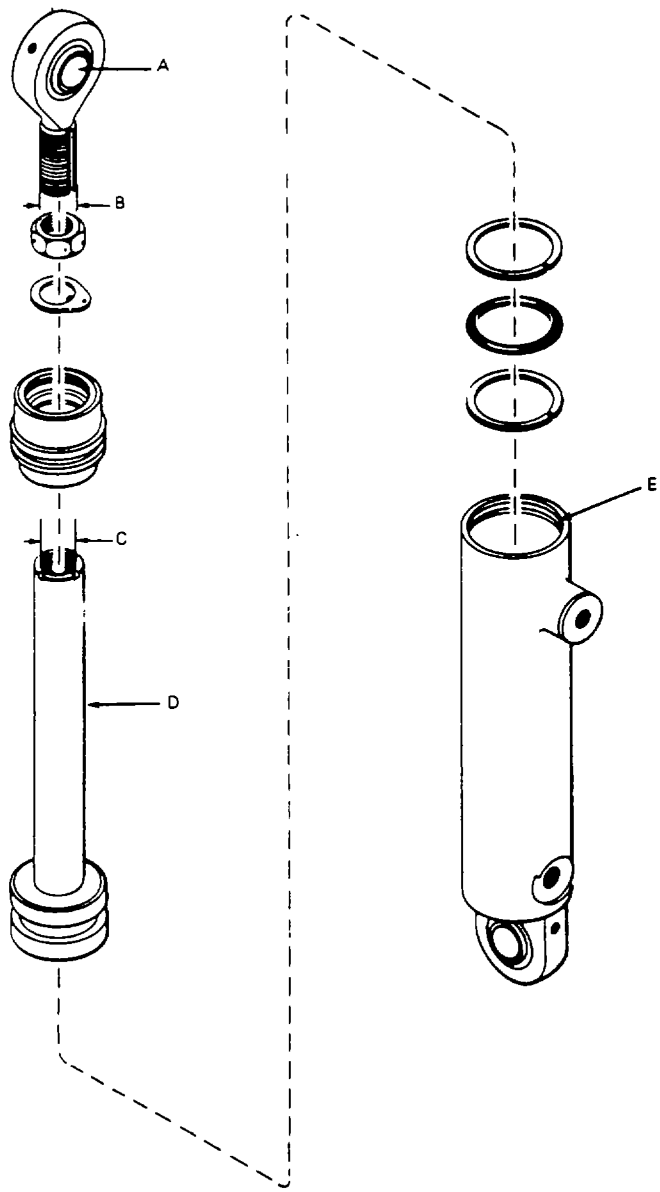
NOTE
Coat piston assembly with hydraulic fluid, item 2, App. C before inserting piston into cylinder.

(3) Insert packing (14K) and ring (14J) in the groove on outside diameter of retainer (14H), packing toward small diameter end of retainer.

(4) Insert packing (14G), followed by ring (14F) in innermost groove in bore of retainer (14H). Place felt ring (14E) in next groove. Install washer (14D). Insert scraper (14C), large diameter side first. Fit scraper retainer (14B) over scraper. Secure scraper retainer with retaining ring (14A).

(5) Place cylinder assembly (13) in vertical position and insert retainer assembly (14), small diameter end first, into cylinder until approximately one-eight of retainer protrudes from the cylinder bore. Place ring (15) in space between retainer assembly (14) and cylinder assembly (13). Secure with retaining ring (16). Place ring (17) on top of retaining ring (16) and secure with retaining ring (8).

(6) Install lubrication fitting (1) in rod end bearing assembly (2). Screw locknut (20) on rod end of bearing assembly (2) as far as it will go. Place lockwasher(19) on rod end bearing assembly (2), tab



Reference Letter	Point of Measurement	Sizes and Fits of New Parts	Wear Limits (Field)
A	Rod end bearing	Bearing must rotate freely without excessive end play	
B	Rod end thread diameter	0.740 to 0.750	0.740
C	Inside diameter of piston	0.682 to 0.690	0.682
D	Outside diameter of piston rod	0.9965 to 0.9975	0.9945
E	Inside diameter of cylinder	2.000 to 2.002	2.012

Figure 3-121. Azimuth Cylinder Wear Limits.

away from the nut. With piston fully retracted, screw bearing assembly into piston to establish a dimension of 13.81 ± 0.06 inches between centerlines of the rod end holes and cylinder mounting holes. Seat lockwasher (19) and tighten locknut (20). Torque it to 65 to 75/ft. lbs.

(6.1) Safety tie locknut (20) to lockwasher (19) using safety wire M520995NC32. Coat the locknut and tab washer with waterproof sealing compound NSN 804()00728-3088 or equivalent.

(7) Assemble nut (6), backup ring (5), and packing (4) to reducer elbow (7) and install reducer elbow (7) in port of cylinder assembly (13). Tighten nut (6) finger tight.

(8) Assemble nut (10), backup ring (9) and packing (8) to reducer elbow (11) and install reducer elbow (11) on port of cylinder assembly (13). Tighten nut (10) finger tight.

(9) Lubricate bearings of rod end bearing assembly and cylinder assembly in accordance with LO 9-1450-500-12-2 after installation of cylinder on loader.

e. Installation.

(1) Install the azimuth cylinder by reversing the sequence of the removal procedure.

(2) Lubricate cylinder in accordance with LO 9-1450-500-12-2.

(3) Start loader, elevate boom, and extend superstructure sufficiently to actuate azimuth and roll cutout switch. Operate AZIMUTH control lever to actuate azimuth cylinder to full extend and full retract positions. Repeat several times. Return superstructure to transport position and inspect all connections for leaks.

(4) Shut down engine and fill hydraulic fluid reservoir to capacity.

3-76. Check Valves

Test all check valves as specified in TM 9-4935-543-14.

3-77. Hydraulic Fluid Reservoir Assembly

a. Removal and Installation. Refer to TM 9-1450 50-20-2.

b. Disassembly (fig. 3-122)

(1) Remove lockwire from screws (9).

(2) Remove 11 screws (10) which secure cover (11) to tank and remove cover.

(3) Remove two each screws (2) and packing (28), and one each bolt (3), gasket (27), washer (26) and nut (25) which secure inlet port (29) to cover. Remove inlet port.

(4) Remove bolt (6), washer (7), and nut (15) which secure chain to cover. Remove cap (8) and two leaf springs (14) from cover.

(5) Remove cover gasket (12) from reservoir.

(6) Remove safety valve (16), gasket, element, gasket, holder, and packing (in that order) from inside reservoir.

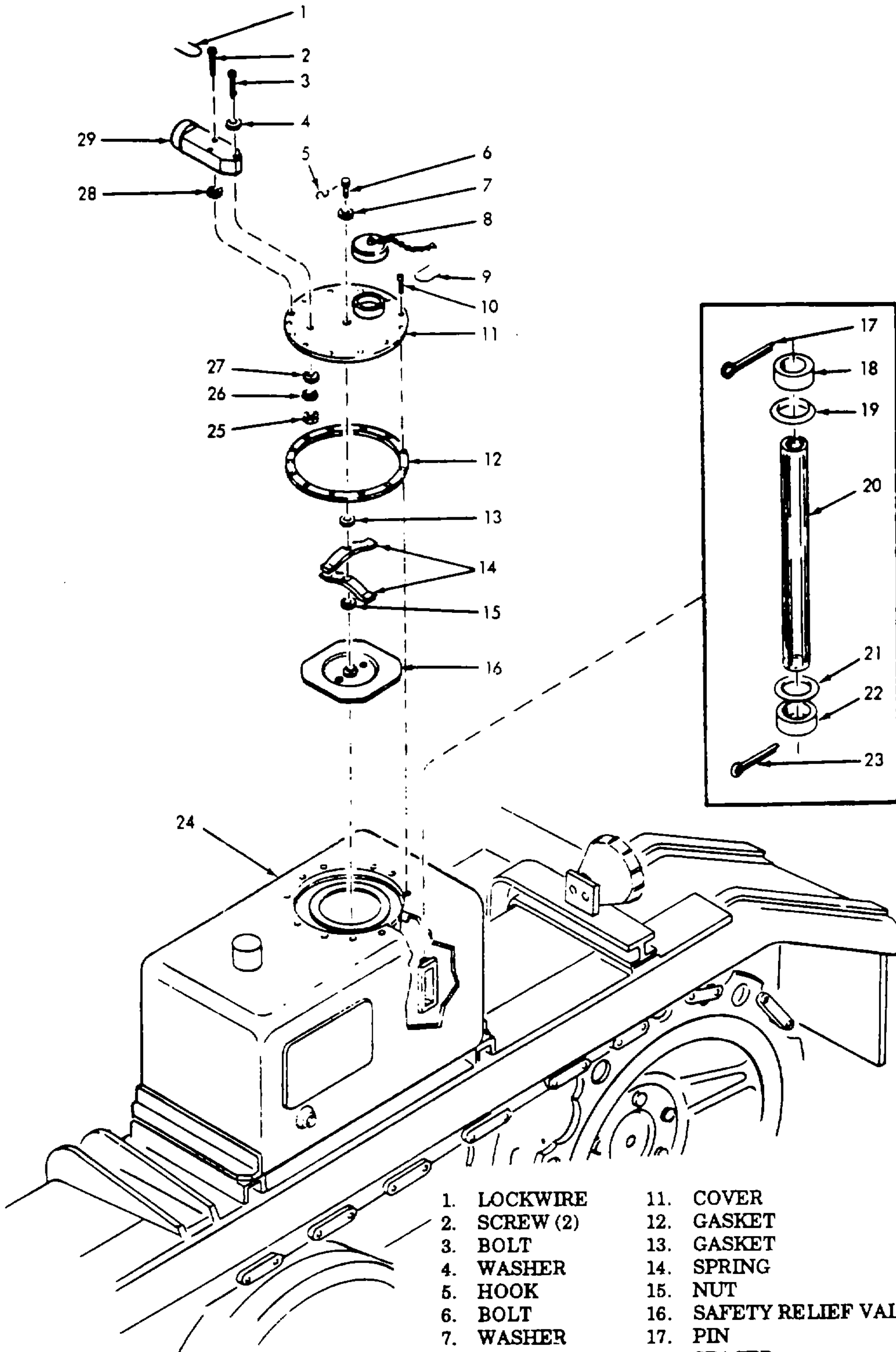
(7) Reach inside reservoir opening and remove pins (17 and 23) and spacers (18 and 22).

(8) Slide glass tube (20) up and out of packings (19 and 21).

(9) Remove packings (19 and 21) from reservoir (24).

c. Inspection and Testing. Perform a visual inspection of the reservoir interior to verify that no broken pieces or small particles of glass or other foreign material are in reservoir. If glass particles are detected, the reservoir must be flushed and cleaned to remove particles. Accomplish leakage and pressure tests as specified in TM 9-4935-543-14. If leaks are detected around sight indicator, remove and replace the packings (19 and 21). If the reservoir leaks, it must be repaired or replaced.

d. Assembly. Assemble the cover and sight tube indicator by reversing the sequence of the disassembly procedure. For other parts, refer to TM 9-1450-500-20-2. After assembly and installation is complete, energize loader and operate hydraulic system to eliminate air trapped in system. Check for leaks at all connections. Add fluid as required.



1. LOCKWIRE
2. SCREW (2)
3. BOLT
4. WASHER
5. HOOK
6. BOLT
7. WASHER
8. CAP
9. LOCKWIRE
10. SCREW (11)
11. COVER
12. GASKET
13. GASKET
14. SPRING
15. NUT
16. SAFETY RELIEF VALVE
17. PIN
18. SPACER
19. PACKING
20. GLASS TUBE
21. PACKING
22. SPACER
23. PIN
24. RESERVOIR
25. NUT
26. WASHER
27. GASKET
28. PACKING
29. PORT

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Figure 3-122. Hydraulic Fluid Repair Assembly Disassembly.

CHAPTER 4
REPAIR OF CARRIER

Section I. REPAIR OF ENGINE-TRANSMISSION ASSEMBLY

4-1. Description

The carrier is the mobile mounting base for the hydraulically operated superstructure and its supporting subsystems. Loader power is supplied by a four-cylinder internal combustion gasoline engine, coupled to a three-speed automatic transmission through specially designed adapters. The engine has a maximum placarded RPM equivalent to 12.7 mph.

4-2. Repair Procedure - Engine/Transmission Assembly

a. *Removal* (fig. 4-1 through 4-1.5).

(1) Position superstructure to park position and relieve hydraulic pressure (refer to TM 9-1450-500-10).

(2) Remove quick release pin which secures end of operator's protective device to rear missile support leaving other end attached to mounting stanchion. Position free end forward and lay on lowered forward missile support.

(3) Remove air cleaner assembly.

(4) Remove two nuts and screws securing rear missile support. Remove rear missile support.

(5) Remove battery cover and propeller shaft rear cover (refer to TM 9-1450-500-20).

(6) Disconnect ground cable first, then disconnect battery cables at battery.

(7) Remove grille, hood cover, hood, and right drive shaft cover (refer to TM 9-1450-500-20). Remove nut, two screws, and three washers, disconnect turnlock fasteners and remove engine hood assembly support frame.

CAUTION

Fabricate a protective cover and place over oil cooler to protect grids of cooler from damage.

(8) Disconnect turnlock fasteners (fig. 4-1.1) which secure master switch.

(9) Remove clamp from choke cable. Disconnect choke cable at carburetor. Remove mounting nut from choke knob and remove choke cable.

(10) Remove universal joint covers and propeller shaft forward cover (refer to TM 9-1450-500-20).

(11) Disconnect master switch wiring.

(12) Disconnect two turnlock fasteners and remove starter access panel (fig. 4-1.2).

(13) Disconnect air-intake sleeve from carburetor (fig. 4-1.3).

(14) Remove exhaust pipe clamps at each end (refer to TM 9-1450-500-20).

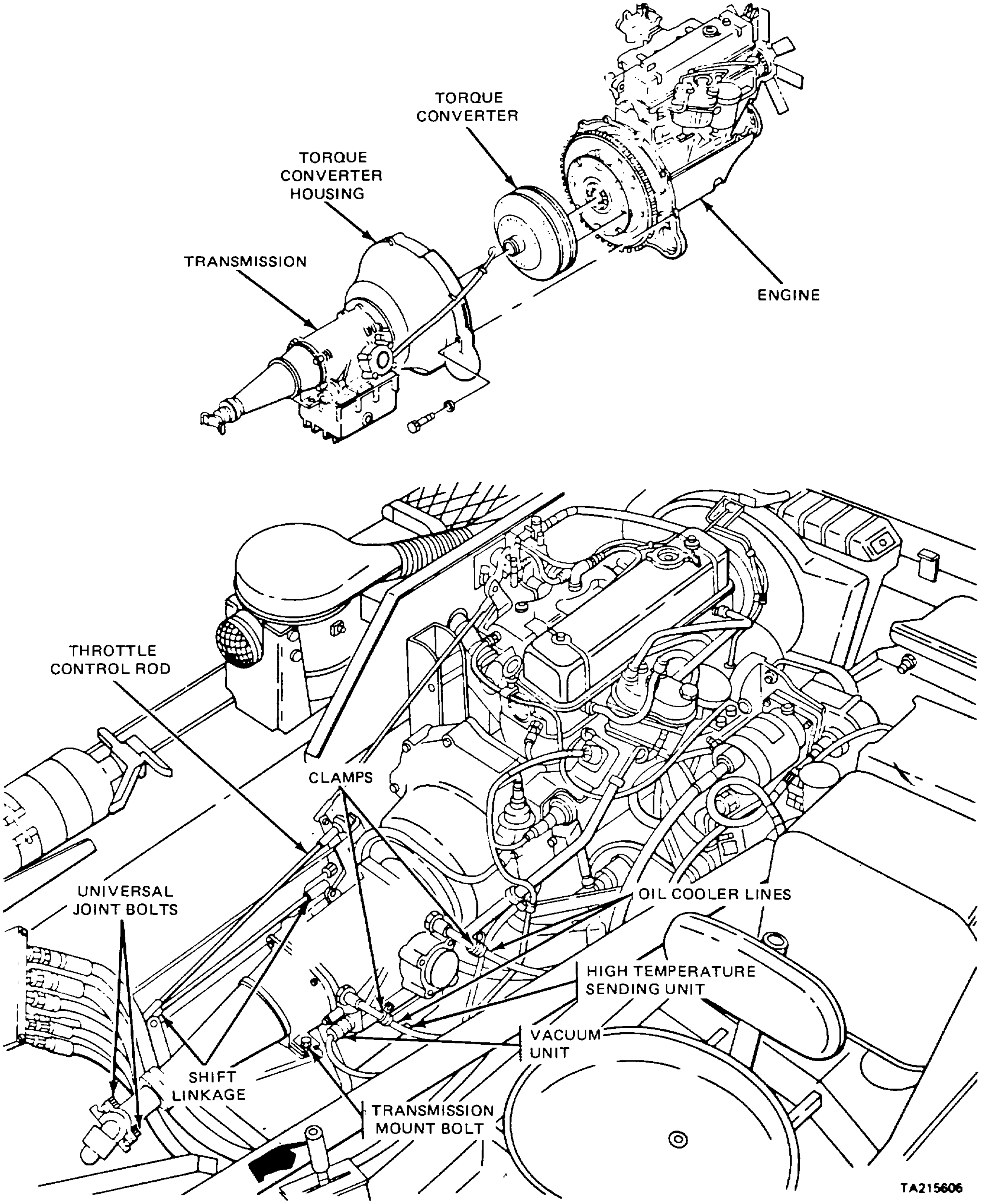


Figure 4-1. Engine and Transmission Replacement - Throttle and Shift Linkage Removal

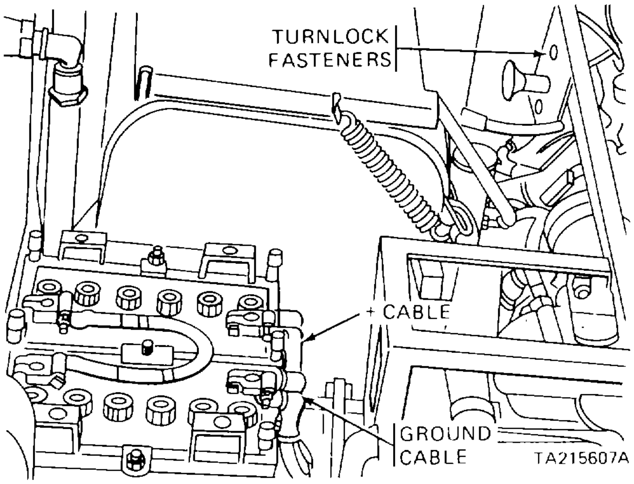


Figure 4-1.1. Engine and Transmission Replacement - Battery Cable and Master Switch Removal

(15) Loosen muffler and slide toward rear of vehicle.

(16) Disconnect generator cable at generator.

(17) Remove engine and transmission access covers (refer to TM 9-1450-500-20).

NOTE
Oil and coolant can be drained at this point, or after power pack has been removed from vehicle.

(18) Disconnect fuel supply line and remove clamp from chassis crossbeam which secures line. Disconnect hydraulic pump supply hose and hose from bypass

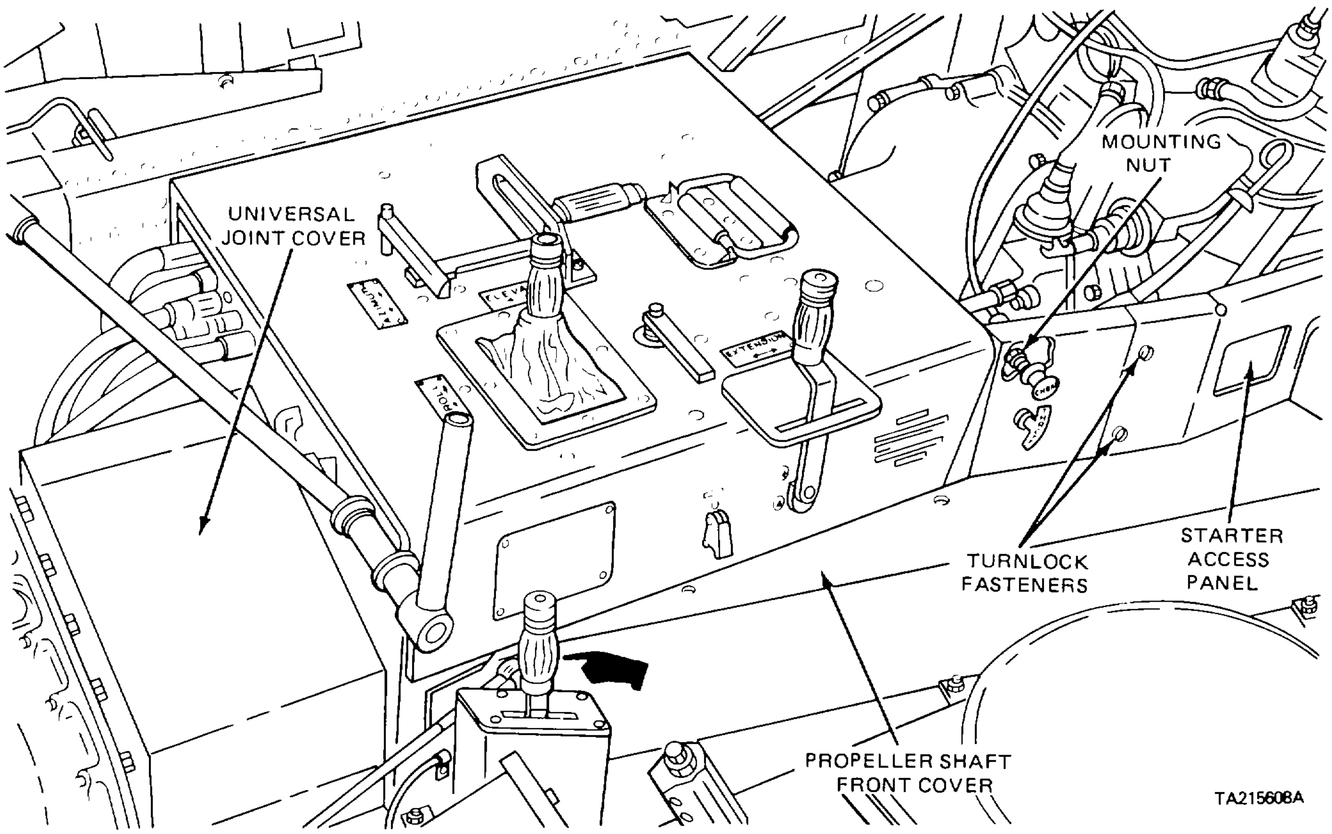


Figure 4-1.2. Engine and Transmission Replacement - Starter Switch Access Panel Removal

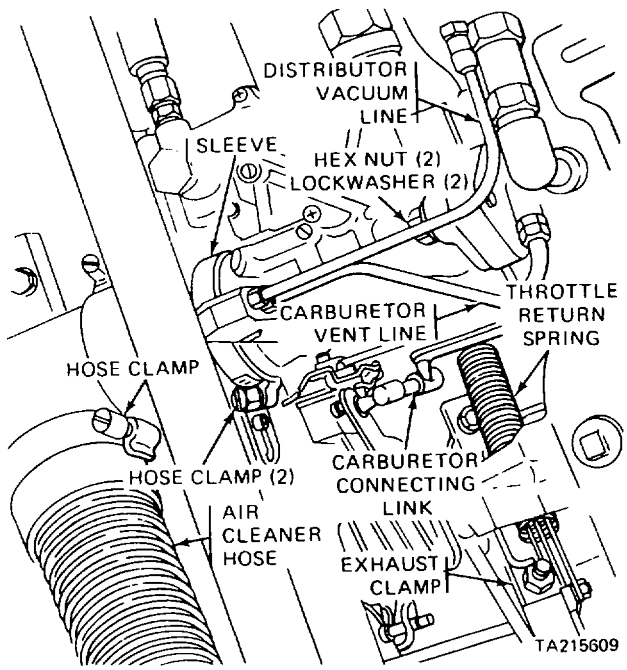


Figure 4-1.3. Engine and Transmission Replacement - Air Intake Sleeve and Exhaust Clamp Removal

line. Remove clamp which secures hydraulic pressure line to transmission oil level gage tube. Disconnect pressure line and hydraulic high temperature indicator connector. Cap all ports.

(19) Disconnect tachometer cable (fig. 4-1.4).

(20) Remove four screws, washers, and nuts which secure right-hand, forward, missile support handle to console frame.

(21) Remove screw, five nuts and five washers which secure console and console frame to chassis. Lay console and frame forward over transfer transmission and against fender.

(22) Disconnect throttle and shift linkages at transmission. Remove clamps and disconnect oil cooler lines (fig. 4-1). Cap ports.

(23) Disconnect ground bonding cable, starter battery cable, and starter solenoid wires (fig. 4-1.4).

(24) Disconnect main wiring harness from engine wiring harness.

(25) Attach suitable lifting device to engine lifting eyes.

(26) Remove engine mount bolts (fig. 4-1.4).

(27) Remove nut from transmission mount bolt and remove four screws and washers from universal joint.

(28) Hoist engine-transmission from loader. Place engine transmission assembly on blocks to prevent damage.

(29) Plug and cap all lines and fittings.

b. _Disassembly and Assembly_. Engine Refer to TM 9-2805-213-34 for engine disassembly and repair procedures. This manual also includes starter disassembly and repair procedures.

c. _Installation_. Install engine and transmission assembly in reverse order of removal and/or disassembly.

NOTE

Refer to TM 9-1450-500-20 for transmission adjustment procedures. Overhaul of the transmission is not authorized. Refer to the Maintenance Allocation Chart in TM 9-1450-500-20.

4-2.1. Repair Procedure - Transmission and Torque Converter Replacement (Engine Transmission Assembly Removed)

a. *Removal* (fig. 4-1.5).

(1) Remove engine-transmission assembly (para 4-2).

(2) Remove engine-transmission throttle linkage.

(3) Remove torque converter access cover.

(4) Drain transmission and torque converter (refer to LO 9-1450-500-12).

(5) Remove four nuts from torque converter studs. Safety wire torque converter to transmission to prevent torque converter from sliding off splined shaft when disassembling transmission from engine.

(6) Disconnect transmission pressure switch hose at upper connection.

(7) Disconnect transmission high temperature sending unit lead at sending unit (fig. 4-1.5).

(8) Remove vacuum line from transmission and oil level tube.

(9) Remove two bolts and washers which secure pressure switch mounting bracket.

(10) Remove seven bolts from adapter assembly and separate transmission and torque converter from engine.

(11) Remove safety wire and slide torque converter carefully from transmission to prevent damage to seal. Wrap splines and cover torque converter opening.

b. *Installation*.

(1) Replace torque converter being careful to engage transmission spline shafts fully. Safety wire torque converter to transmission.

(2) Position replacement transmission, carefully aligning guide pins into holes and torque converter studs with flex plate. Secure transmission to engine with seven bolts through adapter assembly. Use one bolt to secure oil level gage tube. Tighten bolts and torque to 12-15, then to 25-28 ft-lbs in opposing sequence.

(3) Remove safety wire and install four nuts on torque connector studs. Tighten nuts to 12-15, then to 25-28 ft-lbs in opposing sequence.

Replace torque converter access cover, if applicable.

(4) Replace pressure switch bracket and secure with two bolts and washers.

(5) Connect transmission high temperature sending unit lead, transmission pressure switch hose and transmission vacuum line.

(6) Replace engine-transmission assembly (para 4-2).

4-2.2. Repair Procedure - Transmission and Torque Converter Replacement (Engine Transmission Assembly Installed)

a. *Removal* (fig. 4-1.5). The following special tool is required to perform the removal and installation procedures:

Special tool	NSN	Part number
Sling, engine and transmission motor vehicle	3940-00-692-9112	7345279

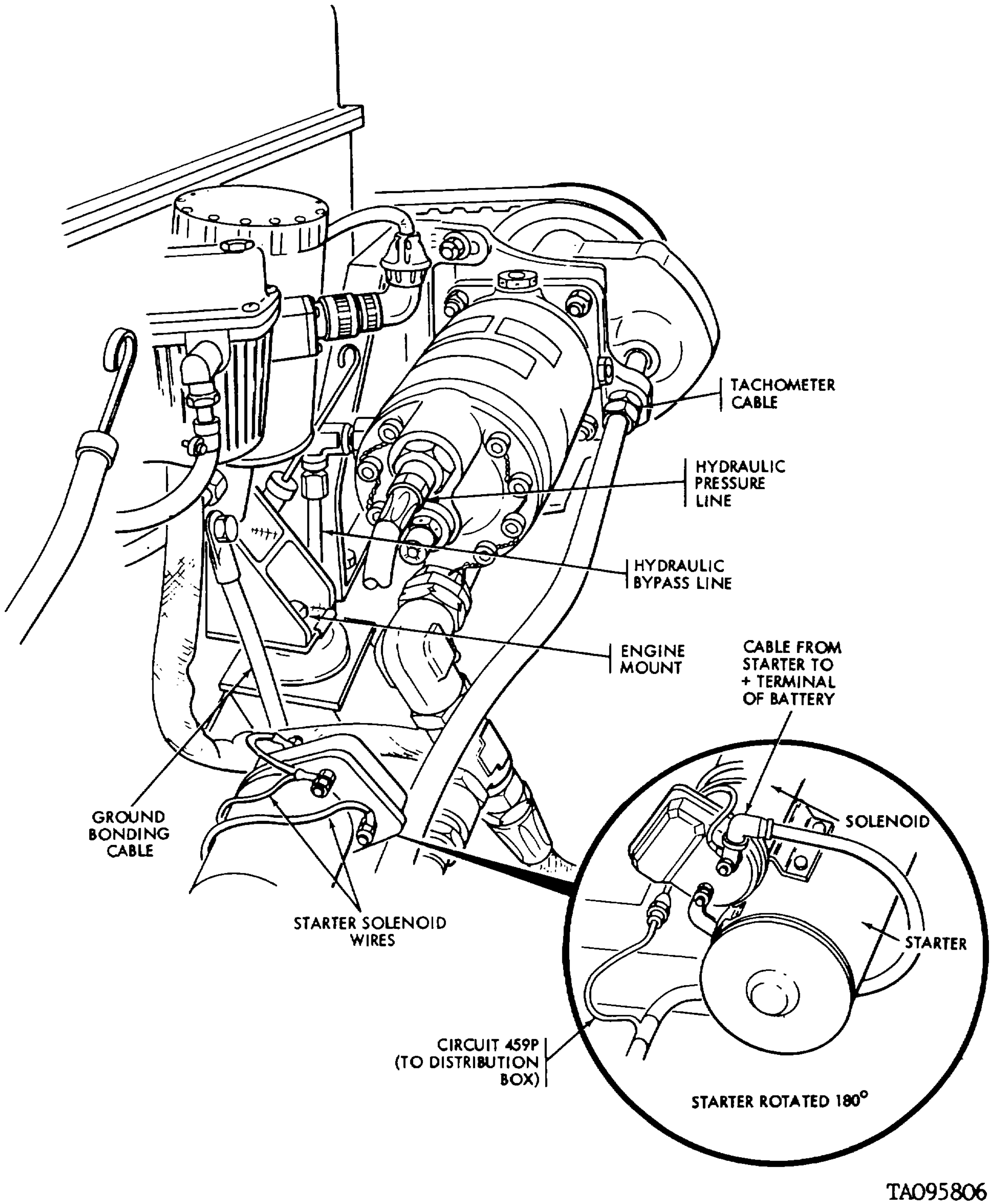


Figure 4-1.4. Engine and Transmission Replacement -Cabling and Line Removal

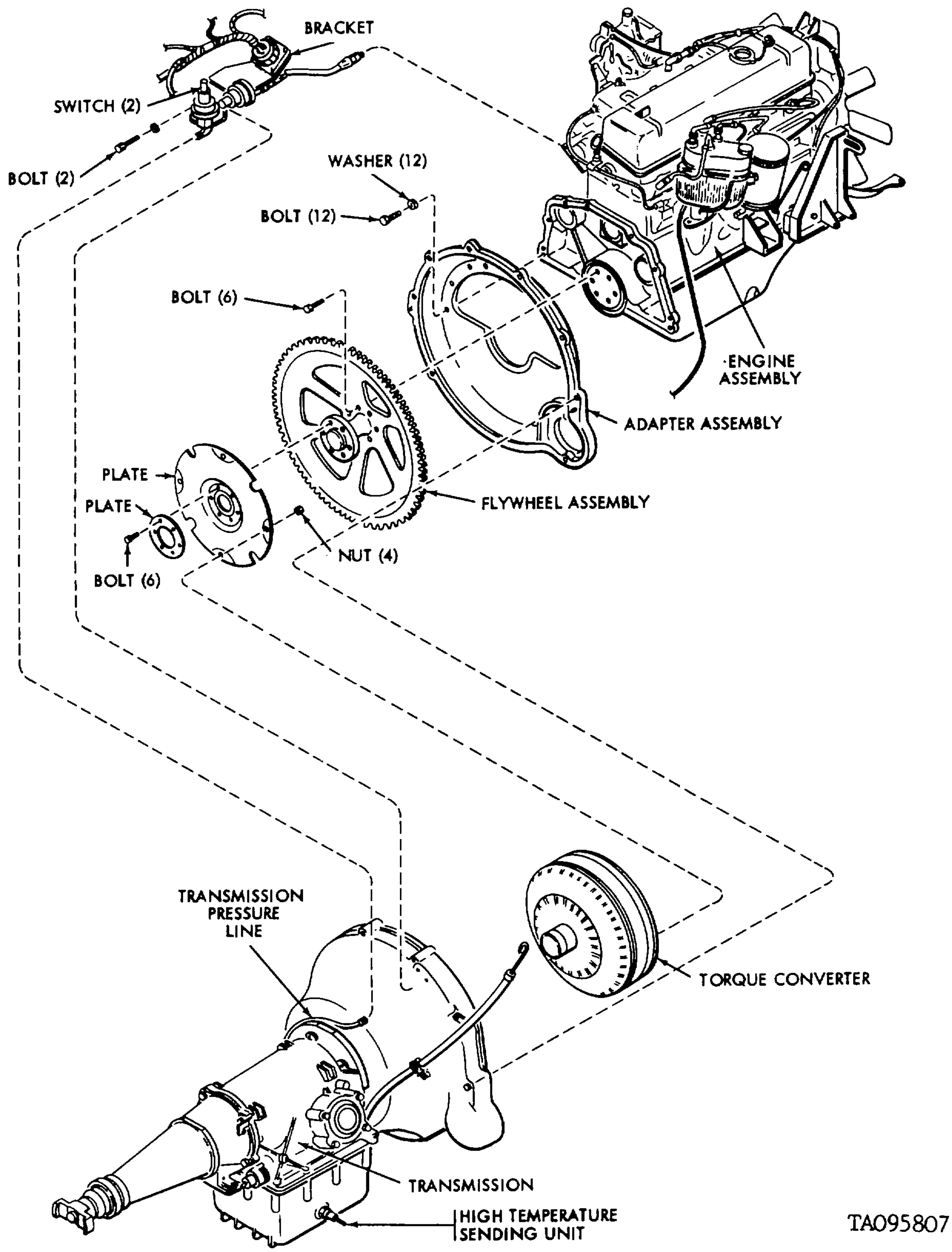


Figure 4-1.5. Transmission and Torque Converter Replacement

(1) Place superstructure in park position (refer to TM 9-1450-500-10).

(2) Remove battery cover and disconnect ground cable. Disconnect battery cables at battery (fig. 4-1.1).

(3) Remove grille, hood cover, hood and rear propeller shaft cover (refer to TM 9-1450-500-20).

(4) Remove propeller shaft forward cover.

(5) Disconnect three turnlock fasteners (fig. 4-1.1) which secure master switch.

(6) Disconnect four turnlock fasteners and remove starter access panel (fig. 4-1.2).

(7) Loosen choke cable clamp on rocker arm cover. Disconnect cable at carburetor. Remove mounting nut from choke knob and remove choke cable.

(8) Remove four screws, washers, and nuts which secure right forward missile support handle to console frame.

(9) Remove universal joint access cover (refer to TM 9-1450-500-20).

(10) Remove screw, five nuts and five washers which secure console and console frame to chassis. Lay console and frame forward over transfer transmission and fender.

(11) Disconnect throttle and shift linkages including transmission-to-engine throttle rod, at transmission.

(12) Remove vacuum hose at transmission and remove clamp from oil level gage tube leaving hydraulic pressure line clamp, transmission high temperature lead and vacuum line free of gage tube.

(13) Remove transmission bottom access cover (refer to TM 9-1450-500-20).

(14) Remove torque converter access' cover.

(15) Drain transmission and torque converter (refer to LO 9-1450-500-12).

(16) Remove clamps and disconnect oil cooler lines (fig. 4-1). Cap ports.

(17) Remove nut from transmission mount bolt and remove four screws and tab washers from universal joint.

(18) Remove four nuts from torque converter studs. Safety wire torque converter to transmission.

(19) Disconnect transmission pressure switch hose at upper connection.

(20) Disconnect transmission high temperature sending unit lead. Remove pressure switch mounting bracket.

(21) Support front of engine and attach suitable lifting device to transmission.

NOTE

It may be necessary to remove carburetor sleeve.

(22) Remove seven bolts from adapter assembly to separate transmission and torque converter from engine.

(23) Using sling, special tool (48.1, fig. 1-2), raise transmission to clear transmission mounting bolt, and slide forward to separate from housing. Hoist transmission from loader.

(24) Remove safety wire and slide torque converter carefully from transmission to prevent damage to seal. Wrap splines and cover torque converter opening.

b. *Installation*.

(1) Inspect mount insulator and replace if necessary (refer to TM 9-1450-500-20).

(2) Remove wrapping from splines and torque converter opening. Replace torque converter, being careful to engage transmission splined shafts fully. Safety wire torque converter to transmission.

(3) Use sling, special tool (48.1, fig. 1-2) to position transmission and torque converter in loader. Position adapter guide pins into holes, aline studs with flex plate. Guide bolt into mount.

(4) Install seven bolts through torque converter housing adapter with gage tube in position. Remove temporary support from front of engine. Tighten bolts to 12-15, then 25-28 ft-lb torque in opposing sequence.

(5) Install nut on transmission mount bolt. Secure carburetor sleeve if removed.

(6) Connect output yoke to universal joint.

(7) Remove safety wire and install four nuts on torque converter studs. Tighten to 12-18, then to 23-28 ft-lb torque in opposing sequence.

(8) Install torque converter and transmission access covers.

(9) Connect throttle and shift linkages and oil cooler lines (fig. 4-1).

(10) Install pressure switch bracket and connect transmission pressure hose.

(11) Connect transmission vacuum hose and install clamp securing lines to oil level gage tube. Connect transmission temperature sending unit lead.

(12) Position hydraulic console and frame on chassis and secure with screw, five nuts and washers. Install choke cable and clamp. Connect choke cable to carburetor.

(13) Position the right, forward missile support handle on console frame and install four screws, washers, and nuts.

(14) Install universal joint cover, starter access cover (fig. 4-1.2) and master switch.

(15) Install propeller shaft forward cover (refer to TM 9-1450-500-20).

(16) Service transmission and torque converter in accordance with LO 9-1450-500-12.

(17) Install hood, hood cover, and grille (refer to TM 9-1450-500-20).

(18) Connect battery cables then connect ground (negative) cable.

(19) Install battery cover and propeller shaft rear cover (refer to TM 9-1450-500-20).

4-3. TRANSMISSION OIL COOLER

a. Removal (fig. 4-1.6).

NOTE

If transmission oil cooler does not have a protective cover, fabricate a cover to place over transmission oil cooler to protect it whenever right drive shaft cover is removed.

(1) Remove right drive shaft access cover. Refer to TM 9-1450-500-20.

(2) Remove transmission oil cooler cover, if applicable.

(3) Loosen loop clamp which secures hose to cooler port.

(4) Remove hose and plug port. Repeat procedure for remaining hose.

NOTE

Raise hose ends immediately upon removal to prevent fluid loss. Hose ends must be plugged to prevent contamination of fluid.

(5) Remove four bolts, eight washers, and four locknuts which secure oil cooler to chassis. Remove cooler assembly.

b. Disassembly. No further disassembly is authorized.

c. Inspection and Testing. Subject the cooler to a hydrostatic pressure of 150 psig. If the transmission oil cooler leaks, it must be replaced. Flush the cooler thoroughly with cleaning solvent and allow to drain completely.

d. Assembly. None.

e. Installation. Install the transmission oil cooler by reversing the removal procedure.

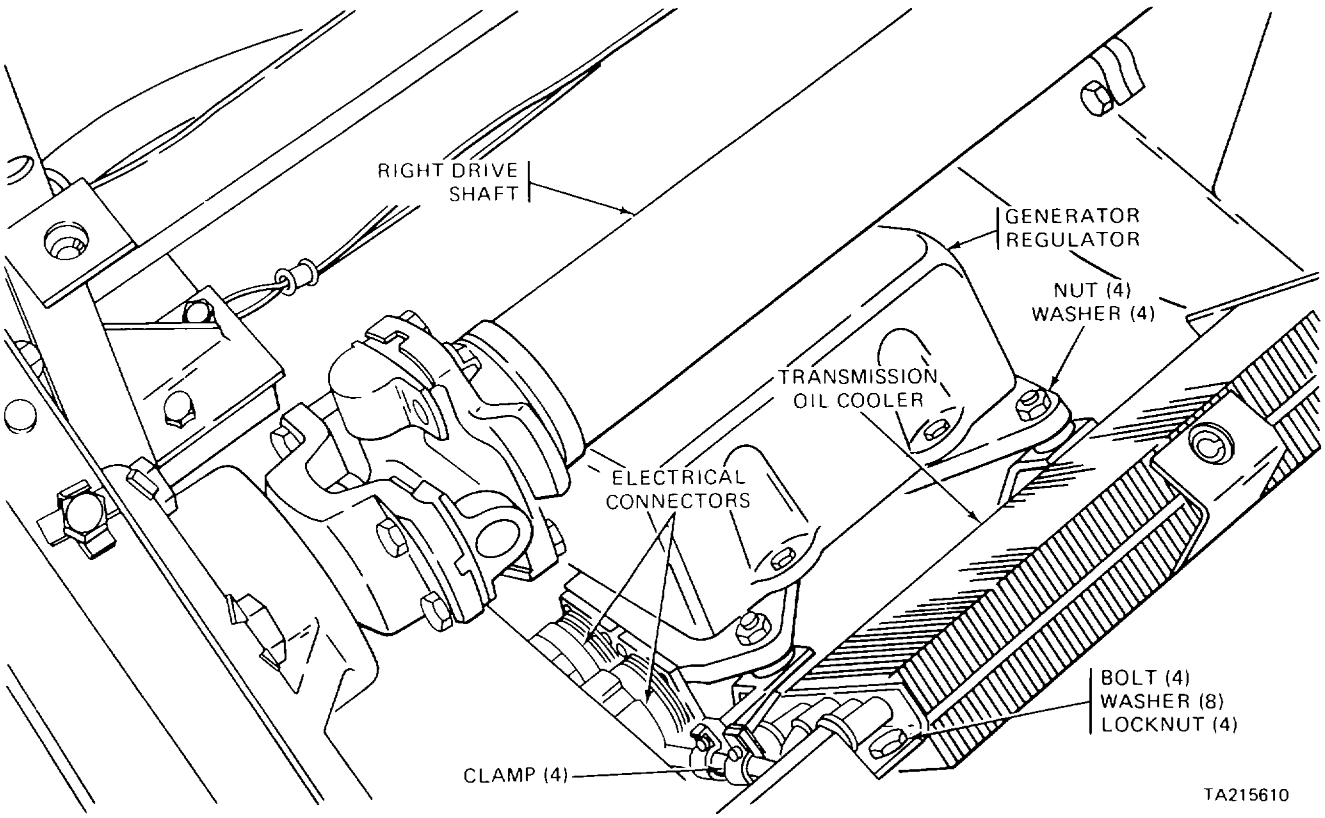


Figure 4-1.6. Transmission Oil Cooler Replacement

NOTE

When installing the oil cooler on the chassis, one washer is to be positioned under the bolt head an the other located between the oil cooler and chassis.

4-4. Transmission Oil Cooler Lines

a. *Removal.*

(1) Remove differential. Refer to TM 9-1450-500-20.

(2) Remove propeller shaft forward access cover. Refer to TM 91450-500-20.

(3) Remove clamps which secure oil cooler hoses to chassis (one forward and one rear).

(4) Remove transmission oil cooler cover, if applicable, (see fig. 4-1.6A).

(5) Remove loop clamps from hoses at oil cooler ports.

(6) Disconnect lines from oil cooler. Note which one is the inlet line (fig. 4-2).

CAUTION

Plug oil cooler ports immediately to prevent fluid contamination.

(7) Disconnect lines from 90° tubes at the transmission.

(8) Remove oil cooler lines.

b. *Installation*. Install the transmission oil cooler lines by reversing the removal procedure.

NOTE

Use bulk stock to cut new lines if needed. Refer to TM 9-1450-500-24P for precise hose type and lengths.

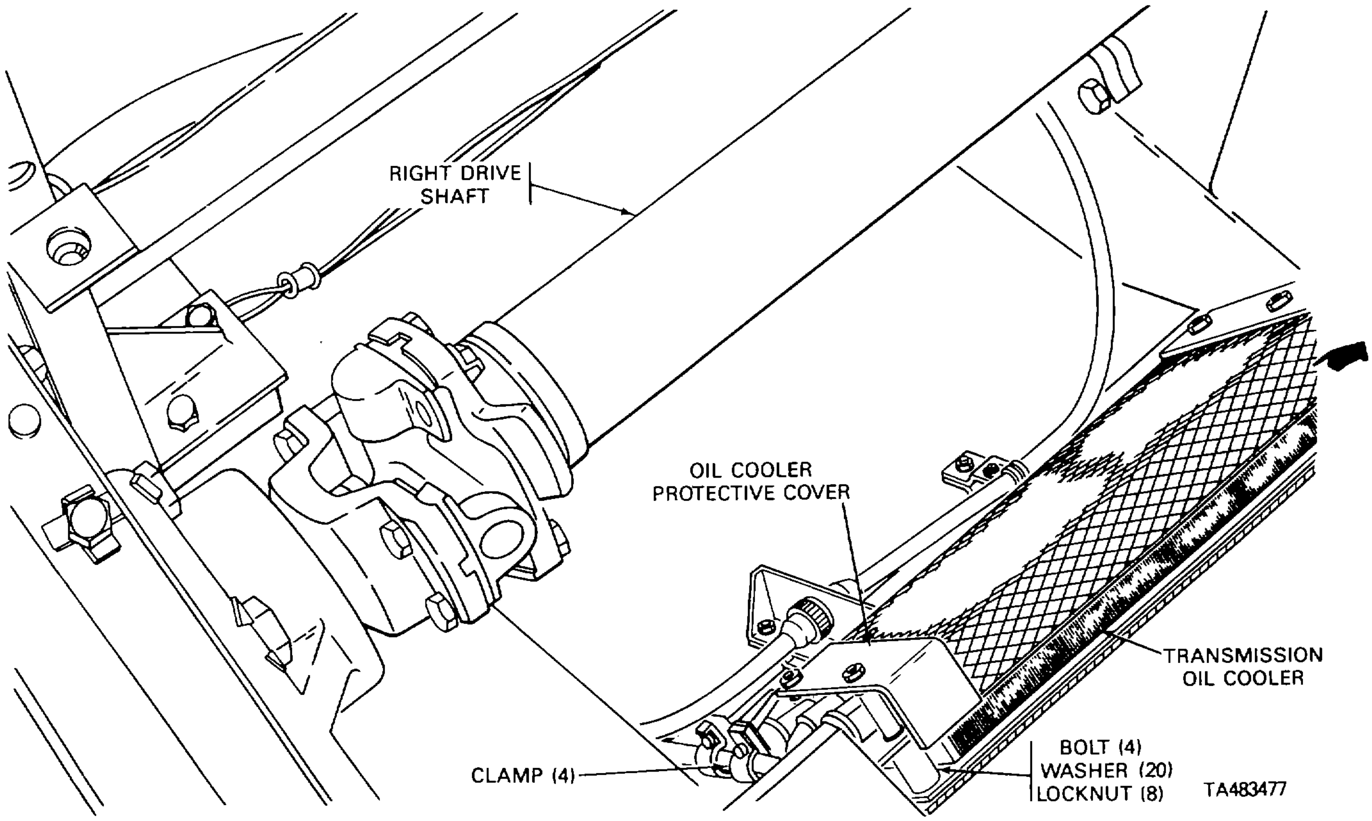


Figure 4-1.6A. Transmission Oil Cooler Replacement

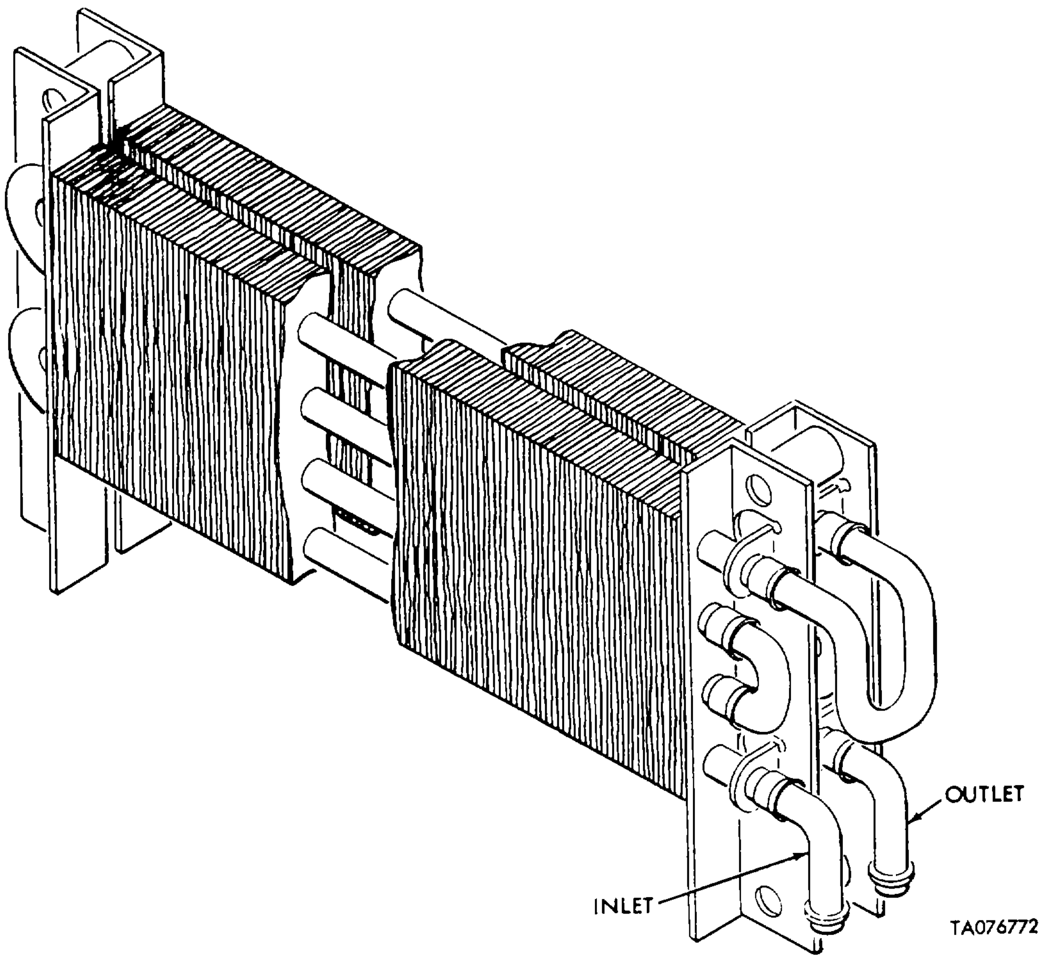


Figure 4-2. Transmission Oil Cooler

4-5. Fan Shroud

a. Removal and Installation. Refer to TM 9-2805-213-34.

b. Disassembly and Assembly.. No further disassembly is authorized.

4-6. Drive Pulley

a. Removal and Installation. Refer to TM 9-1450-500-20.

b. Disassembly (fig. 4-3). Remove three self-locking screws (1) to separate the grooved and flat pulleys (3 and 2).

c. Inspection. Replace the pulleys if they are cracked. Replace the flat pulley if the rubber and metal races have become loose. Damaged threaded holes of the grooved pulley must be retapped. Minor nicks or gouges may be dressed out using a fine file or honing stone.

d. Assembly. Secure the flat pulley to the grooved pulley with the three self-locking screws.

4-7. Radiator

a. Removal and Installation. Refer to TM 9-1450-500-20.

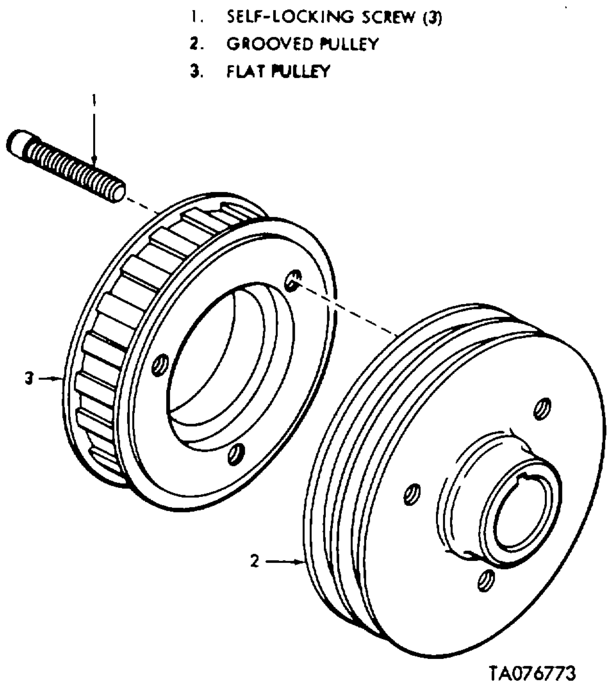


Figure 4-3. Drive Pulley Disassembly

b. *Inspection and Repair*. Refer to TM 10-450.

4-8. Repair and Overhaul Standards for Engine and Transmission Assembly

a. *Engine*. Refer to TM 9-2805-213-34 and TM 9-2320-218-34.

b. *Transmission.* Disassembly of the transmission is not authorized.

SECTION I.1 (SEE NOTE) REPAIR OF MULTIFUEL ENGINE & TRANSMISSION ASSEMBLY

4-8.1 Transmission Oil Cooler Assembly

a. Removal. Refer to TM 9-1450500-20-2.

b. Disassembly (fig. 4-3.1).

(1) Remove four nuts (1), washers (2) and screws (3) and remove the oil cooler (4) from the housing (5).

(2) Carefully remove the sealant compound 50008932 around the oil cooler and the housing. Refer to figure 4-3.1 to locate the compound areas.

c. Inspection and Testing. Subject the oil cooler a hydrostatic pressure of 165 psig. If the oil cooler leaks, it must be replaced Flush the oil cooler thoroughly with cleaning solvent and allow to drain completely.

d. Assembly.

(1) Reassemble the oil cooler (4) on the housing(5) using the retained four nuts(1), washers (2) and screws (3).

(2) Carefully apply the sealant at the location shown in figure 4-3.1 using sealant compound 50008932. Refer to the manufacturer's instructions for the use of sealant compound.

e. Installation. Refer to TM 9-1450-500-20-2.

4-8.2 Transmission Oil Cooler Fan

a. Removal (fig. 4-3.1).

(1) Remove oil cooler assembly (para 4-8.1).

(2) Remove one nut (8) and one washer (7) securing the clamp (6) to the housing (5).

(3) Remove the three remaining nuts and washers (7, 8) and remove the fan (9) from the housing (5).

b. Disassembly. None.

c. Inspection and Test.

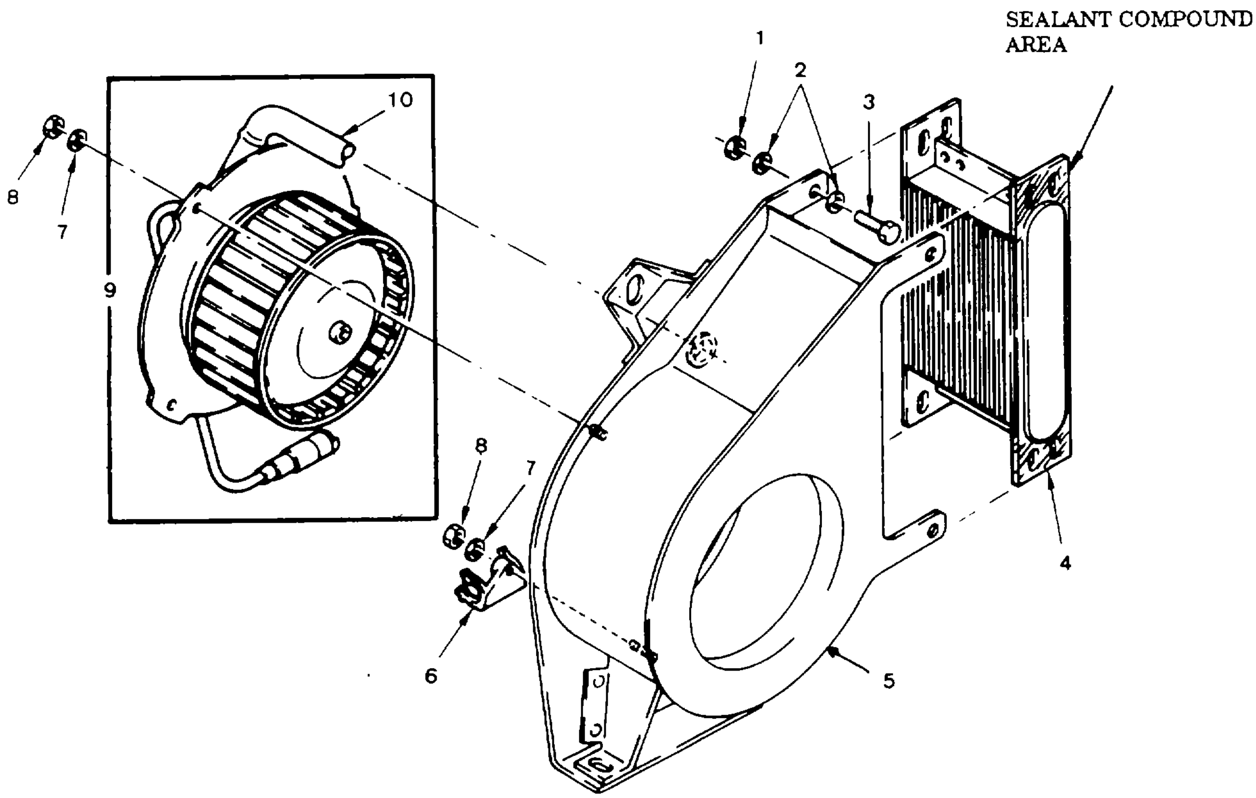
(1) Fan. Inspect fan for damaged blades a damaged wiring harness.

(2) Housing. Inspect housing for finish, cracks, broken or worn parts.

d. Assembly. None.

e. Installation. Assemble the fan (9) on the housing (5) using retained hardware.

NOTE: Section I.1 applies to Loader PN 50008600.
Refer to Section I for Loader PNs 9099200, 50092260 or 50092266.



1. NUT, SELF LOCKING
2. WASHER, FLAT
3. SCREW, MACHINE, HEXAGON HEAD
4. OIL COOLER
5. HOUSING
6. CLAMP, CABLE
7. WASHER, FLAT
8. NUT, SELF LOCKING
9. FAN ASSY
10. HOSE, AIR

Figure 4-3.1. Transmission Oil Cooler.

Section II. REPAIR OF SUSPENSION SYSTEM

4-9. Description

The loader is equipped with a torsion bar suspension system. Center guide, double-pin, rubberized chevrons, endless tracks are driven by sprocket wheels and run on six independently suspended road wheels. A road-wheel arm lockout feature is incorporated into the suspension system to provide additional stability when the loader is used as a crane, when fitted with the hoist adapter, or when transporting a pallet. The torsion bar lockout control levers are located on the front of the loader, adjacent to the lifting shackles.

4-10. Repair Procedure

a. *Drive Sprockets and Wheels.* For removal and installation procedures, refer to TM 9-1450-500-20.

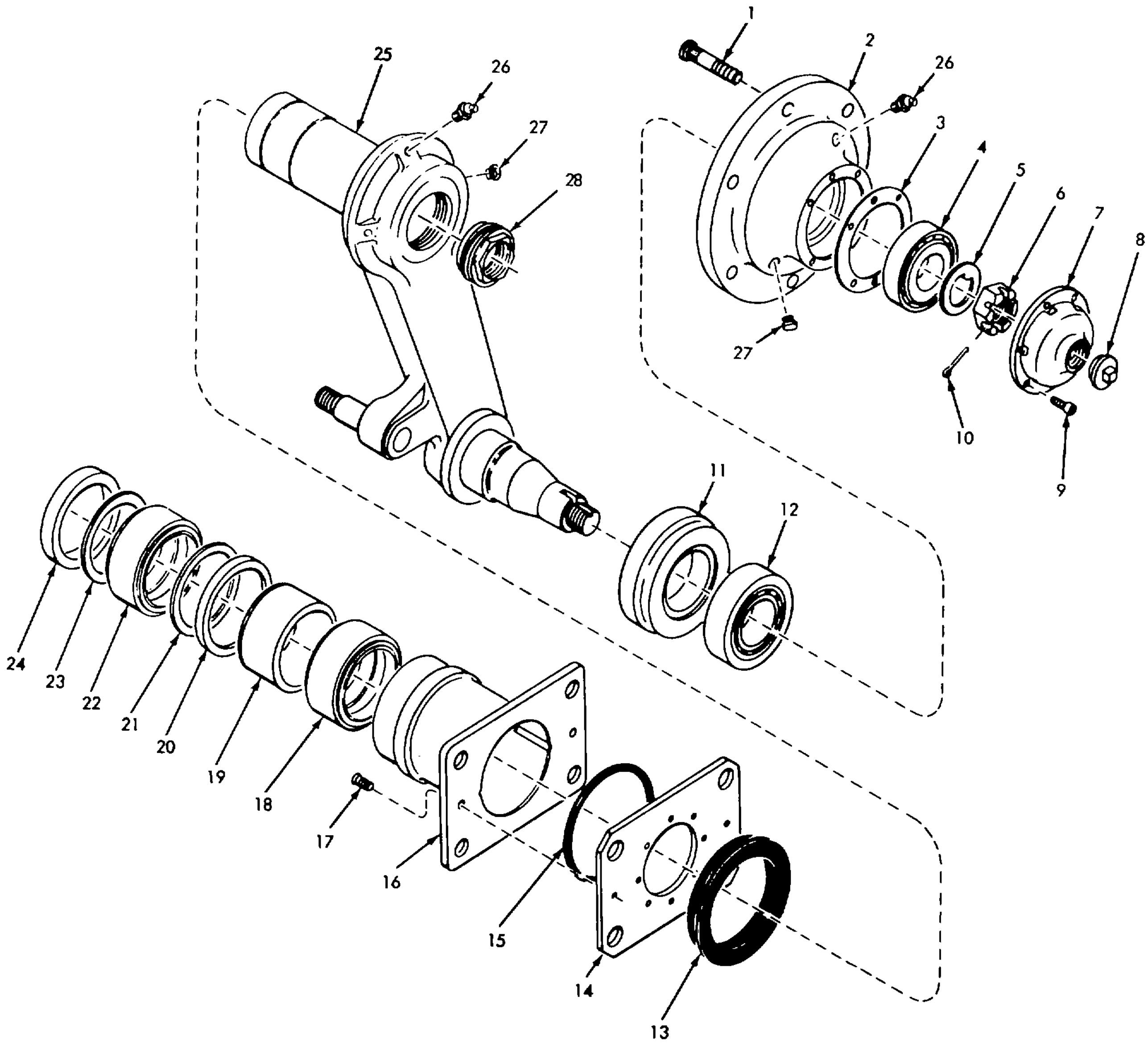
b. *Suspension Controls, Front Levers, Actuator Levers, Bumpers, Anchor Retainers, Lever Shafts, Right Hook, Track Hooks, Left Hook and Actuating Hangers, and Wheel Retainers.* For removal and installation procedures, refer to TM 9-1450-500-20.

c. *Torsion Bars and Anchors.* For removal and installation procedures, refer to TM 9-1450-500-20.

d. *Shock Absorbers.* For removal and installation, refer to TM 9-1450-500-20.

e. *Axle and Hub Assemblies.* For removal and installation procedures, refer to TM 9-1450-500-20.

(1) *Disassembly* (fig. 4-4). The following special tools are



1. RIBBED SHOULDER BOLT
2. HUB
3. GASKET
4. ROLLER BEARING
5. TAB WASHER
6. CASTELLATED NUT
7. CAP
8. PLUG
9. SOCKET-HEAD CAPSCREW
10. COTTER PIN
11. SEAL
12. ROLLER BEARING
13. SEAL
14. PLATE
15. PACKING
16. HOUSING
17. FLATHEAD SCREW
18. NEEDLE BEARING
19. SPACER
20. WASHER
21. RETAINING RING
22. NEEDLE BEARING
23. RETAINING RING
24. SEAL
25. ARM
26. LUBRICATION FITTING (2)
27. PRESSURE RELIEF FITTING (2)
28. PLUG

TA076774

Figure 4-4. Axle and Hub Assembly Disassembly

required to perform the - disassembly procedures:

Special tool	NSN	Part number
Puller	5120-00-708-3384	7083384
Adapter	5120-00-991-3172	10892973

(a) Remove seal (24) from housing (16). Remove two flat head screws (17). Remove housing (16) from arm (25). Remove packing (15) and plate (14) from arm (25).

(b) Remove retaining ring (23). Remove needle bearing (22) from trunnion of arm (25), using puller, special tool (14, fig. 1-2) (fig. 4-5) and adapter, special tool (1, fig. 1-2). Remove retaining ring (21), washer (20), and spacer (19). Remove plate (14) and needle bearing (18) from trunnion, using common puller kit, and adapter, special tool (1, fig. 1-2).

(c) Remove and discard seal (13).

(d) Remove lubrication fittings (26), pressure relief fittings (27), and plugs (28) and (8).

(e) Remove six socket head capscrews (9), cap (7), and gasket (3). Remove cotter pin (10), castellated nut (6), and tab washer (5).

(f) Remove hub (2) from spindle of arm (25). Press six ribbed shoulder bolts (1) from hub (2). Remove cone of roller bearing (12) from spindle of arm (25) and cone of roller bearing (4) from hub (2).

(g) Press cup of roller bearing (4) from hub (2). Press cup of roller bearing (12) from hub. Remove and discard seal (11).

(2) *Inspection.*

(a) Arm (25) and housing (16). If arm and housing are worn in excess of the limits specified in figure 4-6, arm and housing must be replaced. Remove nicks and burrs from bore, outside diameter, and sealing surface of housing.

(b) Fittings and plugs (26), (27), (28) and (8). Replace plugs which have damaged threads.

(c) Plate (14). Straighten the plate if it is bent.

(d) Arm (25). Replace arms which have damaged components, i.e., twisted splines, damaged threads, etc. Remove minor nicks and burrs from the mating surfaces of arms.

(e) Hub (2). Replace if hub bores are scored. Retap damaged threaded holes.

(3) *Assembly.* The following special tools are required to perform the assembly procedures:

Special tool	NSN	Part number
Replacer, oil seal	5120-00-473-7471	7082882
Replacer	5120-00-991-3152	10892946

(a) Install new seal (11) on spindle of arm (25). Press cup of roller bearing (4) into hub (2). Press cup

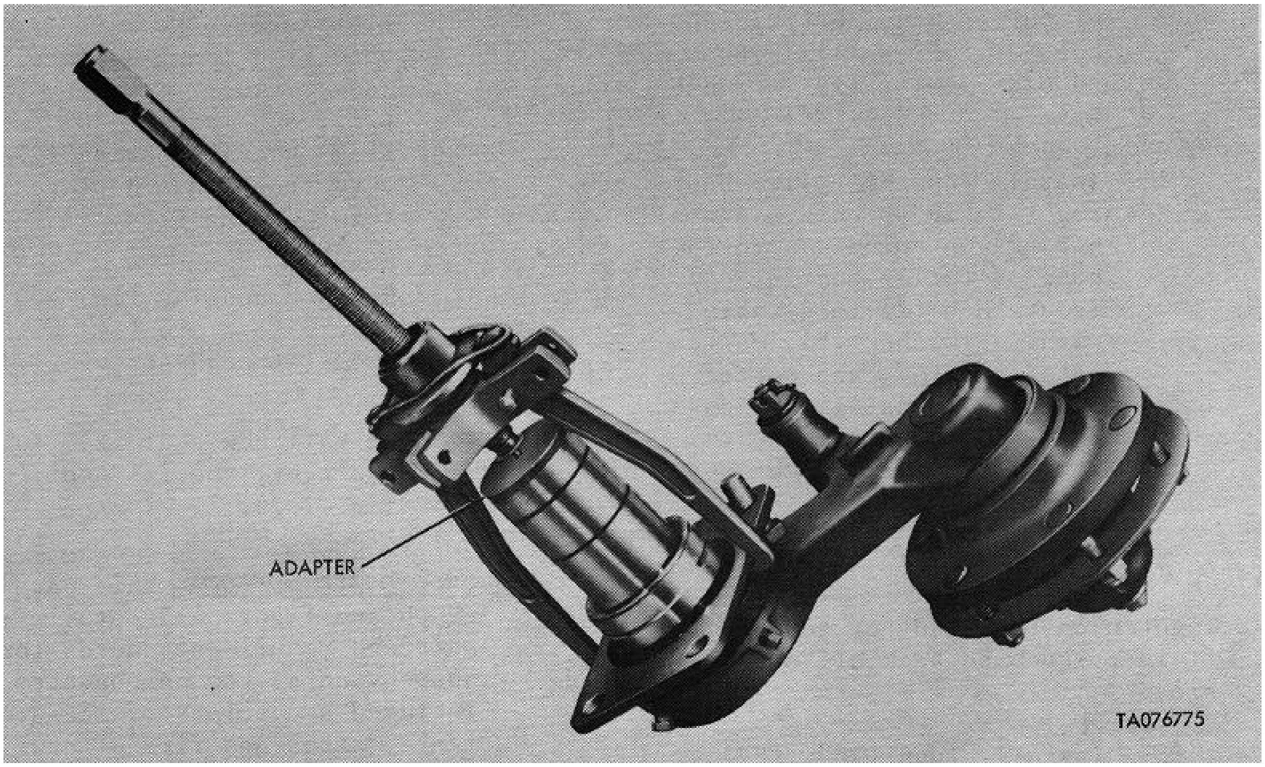


Figure 4-5. Trunnion - Plate and Needle Bearings Removal Using Puller with Adapter

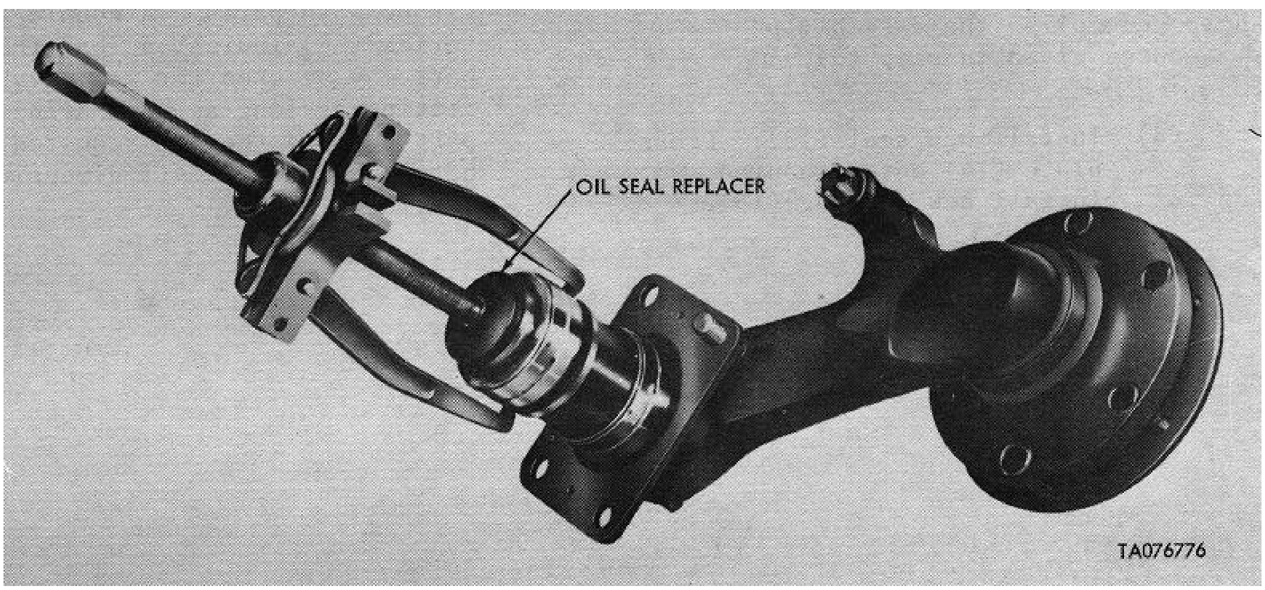


Figure 4-6. Trunnion - Bearings and Spacers Replacement Using Replacer

of roller bearing (12) into hub (2). Press six ribbed shoulder bolts (1) into hub (2).

(b) Install cone of roller bearing (12) in spindle. Install hub (2) on spindle. Install cone of roller bearing (4). Secure hub (2) to spindle with tab washer (5), castellated nut (6), and cotter pin (10). Install new gasket (3) and secure cap (7) to arm with six socket head capscrews (9).

NOTE

Tighten castellated nut to 75 ft-lb torque and back off one slot.

(c) Install plugs (26), (27), and (8).

NOTE

Use oil seal replacer, special tool (39, fig. 1-2) (fig. 4-5) to accomplish the assembly procedures given in step (d).

(d) Install new seal (13). Press plate (14) onto trunnion. Install new packing (15). Press needle bearing (18) onto trunnion. Replace spacer (19), retaining ring (21), and washer (20). Press needle bearing (22) onto trunnion. Replace retaining ring (23).

(e) Replace housing (16) and secure to plate (14) with two flat head screws (17).

(f) Install new seal (24), using replacer, special tool (30, fig. 1-2).

f. *Suspension System*. This paragraph and figure 4-7 details repair and rebuild standards for suspension system components. Included are points of measurements, sizes and fits of new parts, wear limits for field and depot, and code symbols for coordinate information. The letter L indicates a loose or clearance fit between parts. The letter T indicates a tight or interference fit between parts. A double asterisk (**) indicates chat the part may be used for selective fitting as long as the mating part permits the fit required between the two. All dimensions are in inches.

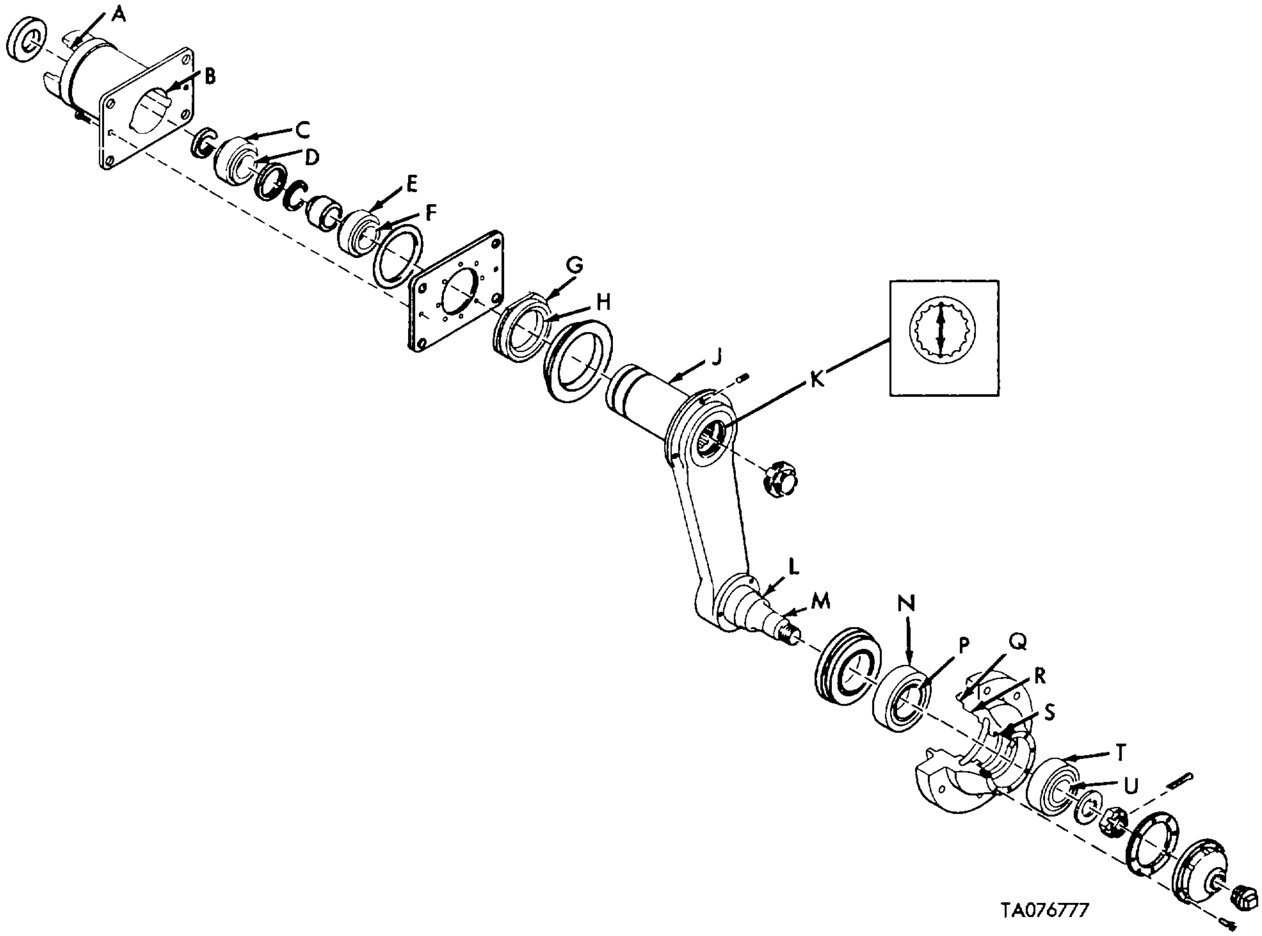


Figure 4-7. Axle and Hub Assembly Wear Limits (Sheet 1 of 2)

REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS (FIELD)
A	SEAL SEAT DIAMETER	3.3485 TO 3.3515	3.3530
B	BEARING SEAT DIAMETER	3.2495 TO 3.2515	3.2525
C, E	OUTSIDE DIAMETER OF BEARING	3.2492 TO 3.2500	(**)
C-B			
E-B	FIT OF BEARING IN HOUSING	0.0005T TO 0.0023L	0.003L
D, F	INSIDE DIAMETER OF BEARING	2.4993 TO 2.5000	(**)
G	LENGTH OF SPACER	0.500 TO 0.505	0.480
H	INSIDE DIAMETER OF SPACER	2.4985 TO 2.4995	2.5002
J	OUTSIDE DIAMETER OF TRUNNION	2.4996 TO 2.5003	2.4991
K	SPLINE DIAMETER	1.5699 TO 1.5727	1.5827
J-D	FIT BETWEEN BEARING AND TRUNNION	0.0001T TO 0.0004L	0.009L
J-F			
J-H	FIT BETWEEN SPACER AND TRUNNION	0.0018T TO 0.0001T	0.0011L
L	BEARING JOURNAL DIAMETER	1.6858 TO 1.6863	1.6848
M	BEARING JOURNAL DIAMETER	1.2493 TO 1.2498	1.2483
N	OUTSIDE DIAMETER OF BEARING	3.265 TO 3.266	(**)
P	INSIDE DIAMETER OF BEARING	1.6875 TO 1.6880	(**)
P-L	FIT BETWEEN BEARING AND JOURNAL	0.0022L TO 0.0012L	0.0032L
Q	SEAL SEAT DIAMETER	3.750 TO 3.752	3.754
R	BEARING SEAT DIAMETER	3.2610 TO 3.2625	3.2650
R-N	FIT BETWEEN BEARING AND SEAT	0.005T TO 0.0025T	0.000
S	BEARING SEAT DIAMETER	2.6840 TO 2.6855	2.6875
T	OUTSIDE DIAMETER OF BEARING	2.6875 TO 2.6885	(**)
T-S	FIT BETWEEN BEARING AND SEAT	0.0045T TO 0.002T	0.000
U	INSIDE DIAMETER OF BEARING	1.2500 TO 1.2505	(**)
U-M	FIT BETWEEN BEARING AND JOURNAL	0.0012L TO 0.0002L	0.0022L

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Figure 4-7. Axle and Hub Assembly Wear Limits (Sheet 2 of 2)

Section III. REPAIR OF POWER TRAIN

4-11. Description

Engine power is transmitted to the transfer transmission through the torque converter and transmission. The automatic transmission is coupled to a transfer box which redirects the power to the main drive shaft and into a controlled differential; and is transmitted to the final drives located on opposite sides of the carrier.

4-12. Repair Procedure

a. _Transfer Transmission Assembly_.

(1) *Removal (fig. 4-8).*

(a) Remove universal joint access covers. Refer to TM 9-1450-500-20.

(b) Remove four screws and two locking plates which secure

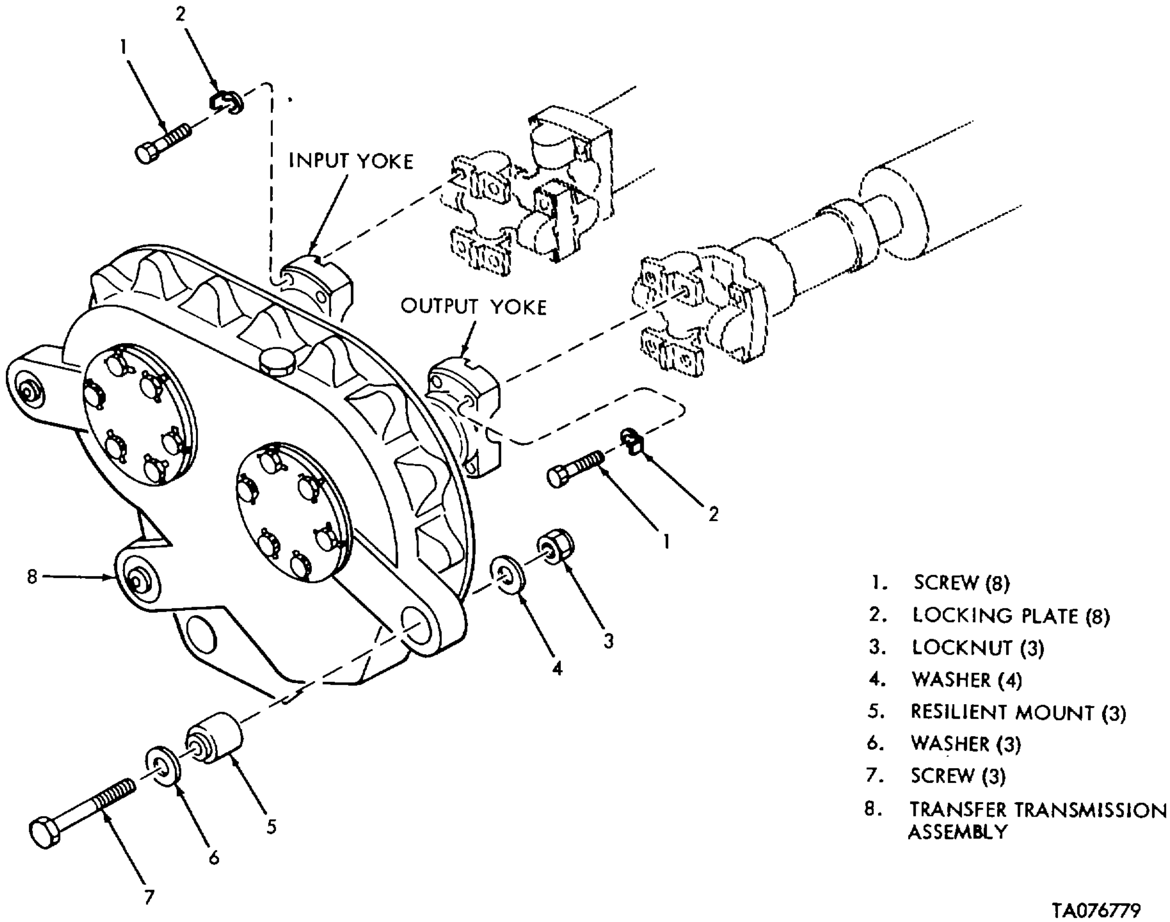


Figure 4-8. Transfer Transmission Removal

transfer transmission input yoke to universal joint.

(c) Remove four screws and two locking plates which secure output yoke to propeller shaft spider assembly.

(d) Remove three screws, washers, and nuts which secure transfer transmission assembly (8) to loader. Remove transfer transmission assembly.

(2) Disassembly (fig. 4-9). The following special tools are required to perform the disassembly and assembly procedures:

Special tool	NSN	Part number
Replacer	5120-00-991-3151	10892942
Replacer, gear	5120-00-098-6727	8390373

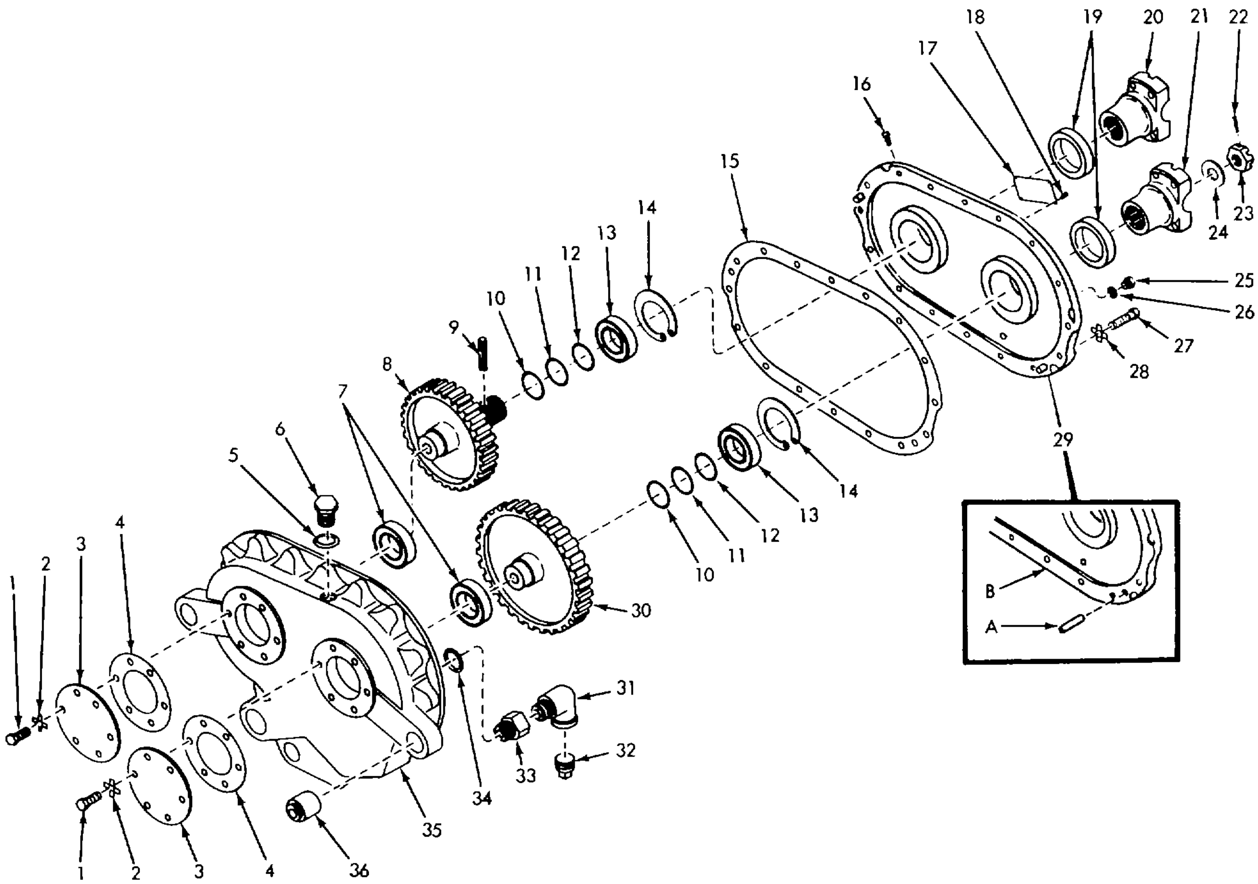
(a) Remove plug (32).

(b) Drain the oil from the transfer transmission assembly.

(c) Remove elbow (31). Remove bushing (33) and gasket (34).

(d) Remove mount (36).

(e) Remove cotter pin (22), castellated nut (23), and



1. HEX-HEAD CAPSCREW
2. TAB WASHER
3. PLATE
4. GASKET
5. GASKET
6. PLUG
7. BALL BEARING
8. PINION
9. PIN
10. SHIM
11. SHIM
12. SHIM
13. BALL BEARING
14. RETAINING RING
15. GASKET
16. VALVE
17. PLATE
18. DRIVE SCREW
19. SEAL
20. YOKE
21. YOKE
22. COTTER PIN
23. CASTELLATED NUT
24. FLAT WASHER
25. PLUG
26. GASKET
27. HEX-HEAD CAPSCREW
28. TAB WASHER
29. COVER ASSEMBLY
    A. DOWEL PIN
    B. COVER
30. GEAR
31. ELBOW
32. PLUG
33. BUSHING
34. GASKET
35. HOUSING
36. MOUNT

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Figure 4-9. Transfer Transmission Assembly Disassembly

flat washer (24). Remove yoke (21).

(f) Remove pin (9). Remove yoke (20).

(g) Remove 12 each capscrew (1) and tab washer (2). Remove two plates (3) and two gaskets (4).

(h) Remove plugs (6 and 25), gaskets (5 and 26), and valve (16).

(i) Remove 16 each capscrew (27) and tab washer (28). Separate transfer box housing (35) and cover assembly (29) and discard gasket (15).

(j) Remove gear (30), pinion gear (8), and shims (10, 11, and 12).

(k) Using replacer, special tool (29, fig. 1-2), remove two bearings (13) from cover (29).

(l) Using gear replacer, special tool (38, fig. 1-2), remove two seals (19) from cover (29).

(m) Using replacer special tool (29, fig. 1-2), remove two bearings (7) from housing (35).

(n) Remove retaining ring (14) from cover (29).

(3) Inspection. The following special tool is required to perform the inspection procedures:

Special tool	NSN	Part number
Remover and replacer	5120-00-991-3150	10892939

(a) *Yokes (20 and 21)*. If the splines of either yoke are twisted or broken, replace the damaged yoke. Remove any burrs or slight scores that are on the splines with a fine file or honing stone.

(b) *Housing (35) and cover (29)*. These parts form a matched assembly. If either part is rejected, both parts must be replaced. Inspect both parts for cracks, broken lugs, or deep cuts in the mating surface. If any of these conditions exist, replace both parts. Remove minor burrs, scratches, or gouges with a fine honing stone. If dowel pins (29A) are missing or loose, they must be replaced. If mount (36) is loose within the housing, or if the inner bushing of the mount is loose, remove and replace the mount, using remover and replacer, special tool (22, fig. 1-2).

(c) *Pinion (8) and gear (30)*. If these parts have damaged teeth, they must be replaced. Check the backlash of the gears. On a standard center of 6.645 to 6.665 inches, the backlash must be as specified in figure 4-8.

If these limits are not met, replace the worn gear.

(d) Replace parts that are worn beyond the limits specified in figure 4-8.

(4) *Assembly*.

(a) Insert two retaining rings (14) into grooves of cover assembly (29).

(b) Heat housing (35) and cover assembly (29) in oil, to a temperature of 225 to 250°F and install bearings (7 and 13), using replacer, special tool (29, fig. 1-2).

NOTE

The two bearings which are installed in cover must rest against the retaining rings (14). The two bearings which are installed in housing must be installed so they are flush with outside surface of the housing.

(c) Secure two plates (3) and two gaskets (4) to housing (35) with 12 each tab washer (2) and capscrew (1). Bend one tab of each washer over the edge of plate (3) and one tab up against the head of capscrew (1).

(d) Install pinion (8), gear (30) into bearings (7).

(e) Install a combination of shims (10, 11, and 12) on splines of pinion (8) and gear (30) so there is an axial clearance of 0.001 to 0.004 inches between the gears and the bearings when the housing and cover are assembled.

(f) Place gasket (15) on housing (35). Assemble the housing and cover by pressing the cover over the splines of the pinion (8) and the gear (30) until the cover seats against the housing. Secure with 16 each capscrew (27) and tab washer (28). Bend one tab of each washer over edge of cover assembly (29) and one tab up against the head of capscrew (27).

(g) Press two seals (19), casing side first, into the bores of cover assembly (29) until they seat, using replacer, special tool (29, fig. 1-2).

(h) Place yoke ( ) over spline of gear (30) and slide it down until it bottoms. Place flat washers (24) inside yoke. Secure with castellated nut (23) and cotter pin (22)

(i) Place yoke (20 over spline of pinion (8) and slide it down until it bottoms. Secure with pin (9) (if applicable).

(j) Install gaskets (5, 26, and 34), plugs (6 and 25), and bushing (33). Install elbow (31) and plug (32). Assemble valve (16) to cover assembly (29)

(k) Lubricate in accordance with LO 9-1450-500-12.

(l) Install access covers.

(5) Installation. Install the transfer transmission assembly by reversing the sequence of the removal procedure.

b. *Power Train Components*. This paragraph and figures 4-10 through 4-32 detail repair and rebuilding standards for power train components. Included are points of measurement, sizes and fits of new parts, wear limits for field and depot, and code symbols for coordination information. The letter L indicates a loose or clearance fit between parts. The letter T indicates a tight or interference fit between parts. The asterisk (*) indicates that tolerances on an individual part must be the same as a new part.

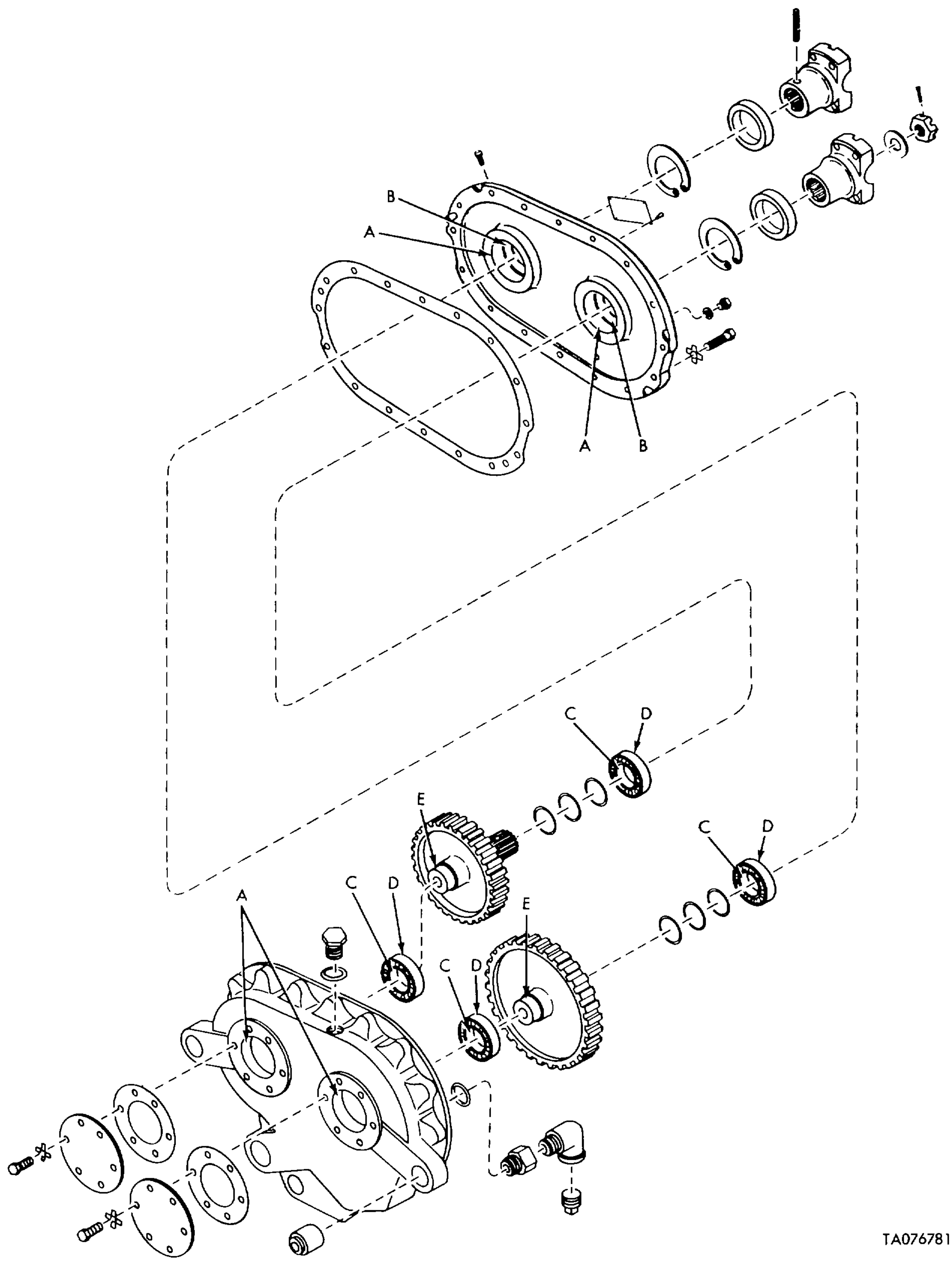

Figure 4-10. Transfer Transmission Assembly Wear Limits (Sheet 1 of 2)

REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS (FIELD)
A	BEARING SEAT DIAMETER	2.8331 TO 2.8337	2.8341
B	SEAL SEAT DIAMETER	2.874 TO 2.876	2.877
C	INSIDE DIAMETER OF BEARING	1.3775 TO 1.3780	(**)
D	OUTSIDE DIAMETER OF BEARING	2.8341 TO 2.8346	(**)
D-A	FIT BETWEEN BEARING AND HOUSING	0.0015T TO 0.0004T	0.000
E	BEARING JOURNAL DIAMETER	1.3770 TO 1.3775	1.375
E-C	FIT BETWEEN BEARING AND JOURNAL	0.000 TO 0.0010L	0.003L
	BACKLASH BETWEEN GEARS ON A STANDARD CENTER OF 6.645 TO 6.655	0.006 TO 0.010	0.013

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Figure 4-10. Transfer Transmission Assembly Wear Limits (Sheet 2 of 2)

A double asterisk (**) indicates that the part may be used for selective fitting as long as the mating part permits the fit required between the two. All dimensions are in inches.

c. *Propeller Shaft*. For removal and installation procedure, refer to TM 9-1450-500-20.

d. *Right and Left Drive Shafts.* For removal and installation procedure, refer to TM 9-1450-500-20.

e. *Yokes*. For removal and installation procedure, refer to TM 91450-500-20.

f. *Differential*. For removal and installation procedure, refer to TM 9-1450-500-20.

(1) *Disassembly (fig. 4-9)*. The following special tools are required to perform the disassembly procedures:

Special tool	NSN	Part number
Remover	5120-00-991-3156	10892957
Replacer, oil seal	5120-00-795-0908	7950908
Remover	5120-00-991-3154	10892952
Remover	5120-00-991-3153	10892950
Handle, replacer, oil seal	5120-00-316-9182	7950864
Driver, oil and water line ferrule	5120-00-473-7025	7079403
Puller, mechanical	5120-00-473-7316	7078129

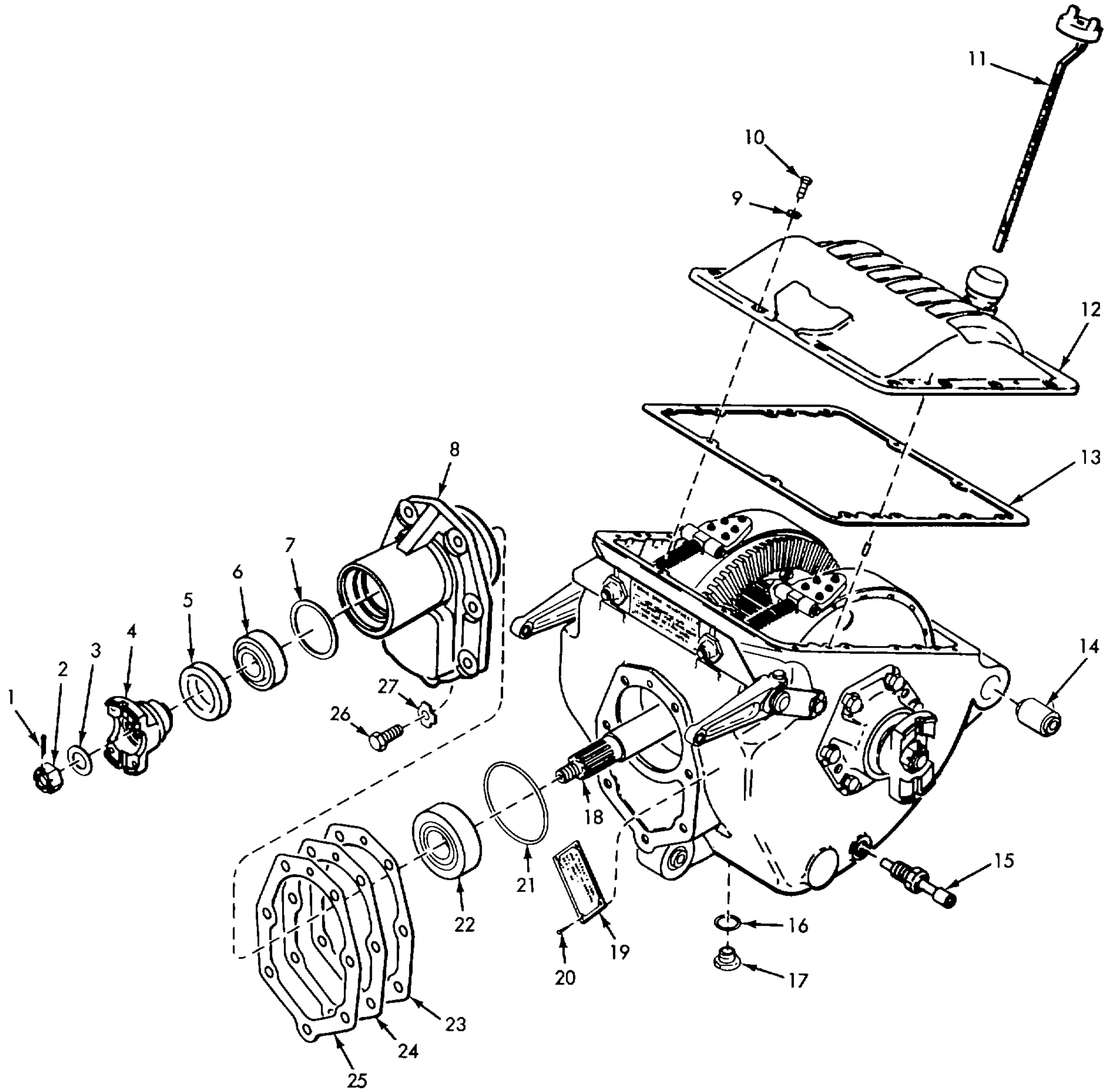
NOTE

Key numbers in parentheses ( ) in steps (a) through (f) refer to figure 4-9.

(a) Remove plug (17) and gasket (16) and allow differential housing to drain. Remove oil level indicator (11).

(b) Remove cotter pin (1), castellated nut (2), and flat washer (3). Remove yoke (4).

(c) Remove seven capscrews (26) and seven tab washers (27). Separate pinion gear housing (8) from differential housing.



1.	COTTER PIN	12.	COVER	22.	ROLLER BEARING
2.	CASTELLATED NUT	13.	GASKET	23.	SHIM
3.	FLAT WASHER	14.	MOUNT	24.	SHIM
4.	YOKE	15.	THERMOSWITCH	25.	SHIM
5.	SEAL	16.	GASKET	26.	HEX-HEAD CAPSCREW
6.	ROLLER BEARING	17.	PLUG	27.	TAB WASHER
7.	SHIM	18.	PINION GEAR		
8.	PINION GEAR HOUSING	19,	IDENTIFICATION PLATE		
9.	TAB WASHER	20.	DRIVESCREW		
10.	HEX-HEAD CAPSCREW	21.	PACKING		
11.	OIL LEVEL INDICATOR				

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Figure 4-11. Differential External Disassembly

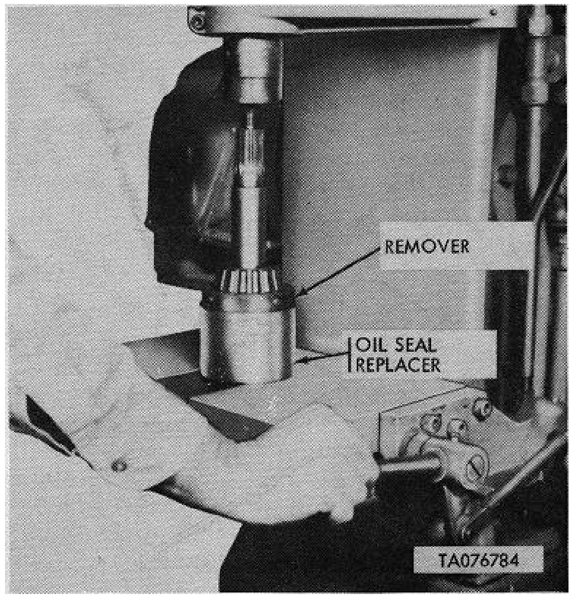

Figure 4-12. Pinion Shaft - Inner Bearing Cone Removal Using Remover with Oil Seal Replacer

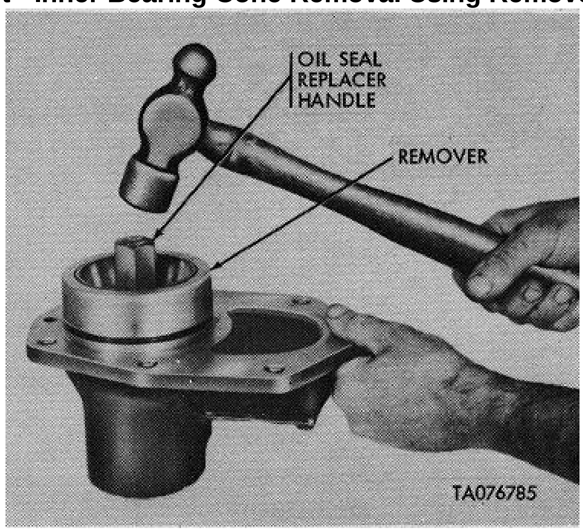

Figure 4-13. Output Shaft - Bearing Removal Using Remover with Oil Seal Replacer Handle

(d) Remove packing (21) and shims (23, 24, and 25). Press out pinion gear (18). Remove seal (5). Remove cone of roller bearing (22) from pinion gear (18) using remover, special tool (18, fig. 1-2), and oil seal replacer, special tool (40, fig. 1-2). Press cup of roller bearing (22) from housing (8), using remover, special tool (17, fig. 1-2), and oil seal replacer, special tool (40, fig. 1-2). Refer to figure 4-12. Remove cone of roller bearing (6) from cup. Remove cup of roller bearing (6) from housing (8), using remover, special tool (16, fig. 1-2), and handle, special tool (10, fig. 1-2). Refer to figure 4-13. Remove shim (7) from housing (8).

(e) Remove 12 capscrews (10) and 12 tab washers (9). Remove cover assembly (12) from differential housing. Remove and discard gasket (13). Remove thermoswitch (15).

(f) Remove three mounts (14).

NOTE

Key numbers shown in parentheses ( ) in steps (g) through (t) refer to figure 4-14 unless otherwise noted.

Disassembly procedures following through step (m) are same for both sides of differential.

(g) Remove capscrew (13), tab washer (14), and steering arm support (15). Remove steering arm assembly (37) and seal (36) from differential housing (34). Press needle bearing (35) from differential housing (34), using driver, special tool (3, fig. 1-2). Disassemble

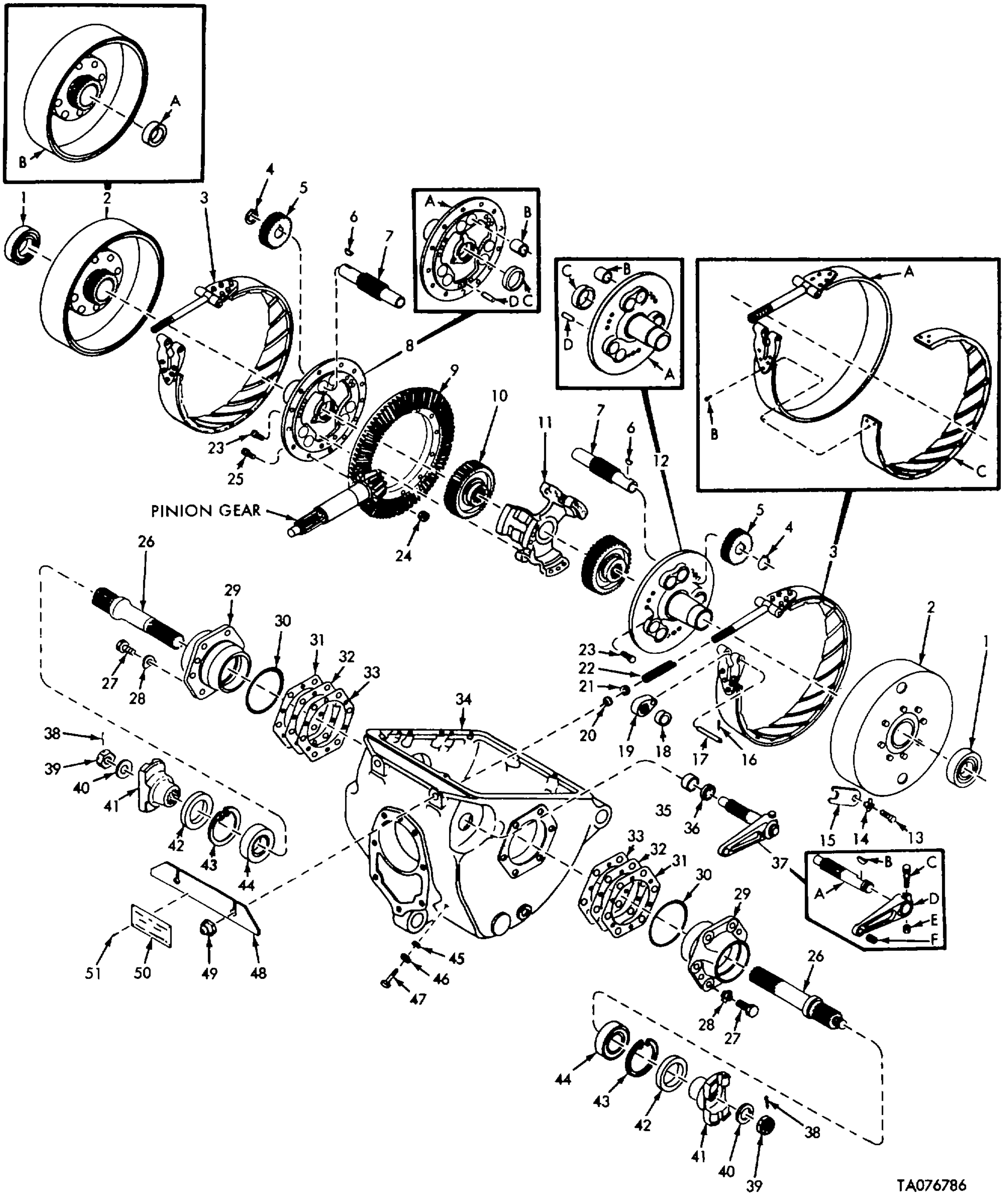

Figure 4-14. Differential Internal Disassembly (Sheet 1 of 2)

ITEM NUMBER	NAME	ITEM NUMBER	NAME
1	ROLLER BEARING	23	HEX - HEAD CAPSCREW (12)
2	BRAKE DRUM ASSEMBLY	24	NUT
	A BUSHING	25	BOLT
	B BRAKE DRUM	26	OUTPUT SHAFT
3	BRAKE BAND ASSEMBLY	27	HEX - HEAD CAPSCREW
	A BRAKE BAND	28	TAB WASHER
	B RIVET	29	RETAINER
	C FRICTION LINING	30	PACKING
4	RETAINING RING	31	SHIM
5	PLANETARY GEAR	32	SHIM
6	WOODRUFF KEY	33	SHIM
7	PINION GEAR	34	HOUSING
8	AXLE HOUSING ASSEMBLY R	35	NEEDLE BEARING
	A AXLE HOUSING	36	SEAL
	B BUSHING	37	STEERING ARM ASSEMBLY
	C BUSHING		A SHAFT
	D DOWEL PIN		B KEY
9	RING GEAR		C HEX - HEAD CAPSCREW
10	AXLE DRIVE GEAR		D LEVER
11	SPIDER		E NUT
12	AXLE HOUSING ASSEMBLY L		F BUSHING
	A AXLE HOUSING	38	COTTER PIN
	B BUSHING	39	CASTELLATED NUT
	C BUSHING	40	FLAT WASHER
	D DOWEL PIN	41	YOKE
13	HEX - HEAD CAPSCREW	42	SEAL
14	TAB WASHER	43	RETAINING RING
15	STEERING ARM SUPPORT	44	BALL BEARING
16	COTTER PIN	45	GASKET
17	PIN	46	JAM NUT
18	NEEDLE BEARING	47	BACK UP BOLT
19	ACTUATING ARM	48	LOCKING PLATE
20	PACKING	49	ADJUSTING NUT
21	FLAT WASHER	50	INSTRUCTION PLATE
22	SPRING	51	RIVET

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Figure 4-14. Differential Internal Disassembly (Sheet 2 of 2)

steering arm assembly (37) into parts (A) through (E).

(h) Remove four cotter pins (16) and two pins (17). Remove two actuating arms (19).

(i) Press two needle bearings (18) from differential housing (34), using driver, special tool (3, fig. 1-2).

(j) Remove cotter pins (38), castellated nut (39), and flat washer (40) from output shaft (26). Remove yoke (41) and seal (42) from output shaft (26). Remove retaining ring (43) (both sides).

(k) Remove adjusting nut (49) and locking plate (48). Retract adjusting rods of brake band assemblies (3) from differential housing (34). Remove two washers (21), two packings (20), and two springs (22) from adjusting rods. Turn differential housing assembly over with open side on bench.

CAUTION

Gear cluster, brake drum assemblies, and band assemblies are supported by the output shafts and shaft retainers. The weight of these components must be relieved and supported when output shafts and retainers are withdrawn.

(l) Pull output shaft (26) and ball bearing (44) free of retainer (29). Remove ball bearing (44) from output shaft.

(m) Mark housing (34) and retainer (29) for assembly purposes. Remove six capscrews (27) and six tab washers (28) . Remove retainers (29), packing (30), and shims (31, 32 and 33). Keep shims together (tied in a packet) to aid in reinstallation. Press cup of roller bearing (1) out of retainer, using remover, special tool (16, fig. 1-2), and handle, special tool (10, fig. 1-2)

NOTE

Scribe gears at disassembly of gear cluster to insure their return to original position at assembly.

(n) Remove as a unit, gear cluster (spider, six pinion gears, bevel ring gear, two axle housings, and six planetary gears), two brake drum assemblies (2), and two brake band assemblies (3).

(o) Remove brake band assemblies from brake drum assemblies. Remove cones of two roller bearings (1) from axle housing assemblies (8 and 12). Remove brake drum assemblies (2) from axle housing assemblies.

(p) Remove six retaining rings (4) which secure planetary gears (5) to pinion gears (7). Remove six planetary gears (5), using mechanical puller, special tool (15, fig. 1-2). Remove six woodruff keys (6).

(q) Remove lockwire from 12 capscrews (23) which secure axle housing assemblies (8 and 12) to spider (11). Remove 12 capscrews (23).

(r) Separate right axle housing assembly (8) and attached ring gear (9) from spider (11). Remove six pinion gears (7) and axle drive gear (10).

(s) Remove ring gear (9) from right axle housing assembly (8) by removing 12 each nut (24) and bolt (25).

(t) Remove six pinion gears (7), spider (11), and axle drive gear (10) from left axle housing (12).

(2) Inspection. The following special tools are required to perform the inspection procedures:

Special tool	NSN	Part number
Replacer, bushing	5120-00-473-7444	5380300
Handle, remover and replacer	5120-00-708-3241	7083241
Remover and replacer	5120-00-991-3164	10892960
Remover and replacer	5120-00-991-3150	10892939'
Remover and replacer	5120-00-991-3155	10892959

NOTE

Key numbers shown in parentheses for steps (a) through (f) refer to figure 4-11 except where indicated.

(a) Yoke (4) and pinion gear (18). Replace if splines are twisted, broken, or otherwise badly damaged. Remove burrs or slight scores on splines with a fine file or honing stone. Gear (18) and ring gear (9, fig. 4-14) are a matched set. If either gear is defective, or bearing journals worn beyond the limits specified in figure 4-15 (sheet 1), both gears must be replaced. Backlash between gears running on standard centers to be 0.006 to 0.010 inches.

(b) Cover (12). Replace if warped, or if mating surface is scored, pitted, or otherwise damaged.

(c) Thermoswitch (15). Switch is calibrated to make contact at 285 ±5 degrees F with increasing temperature. If contact is not made within these limits, switch must be replaced. Switch must be tapped when checking calibration.

(d) Housing (8). Replace pinion gear housing (8) if damaged, cracked, or worn beyond the limits specified in figure 4-15 (sheet 1).

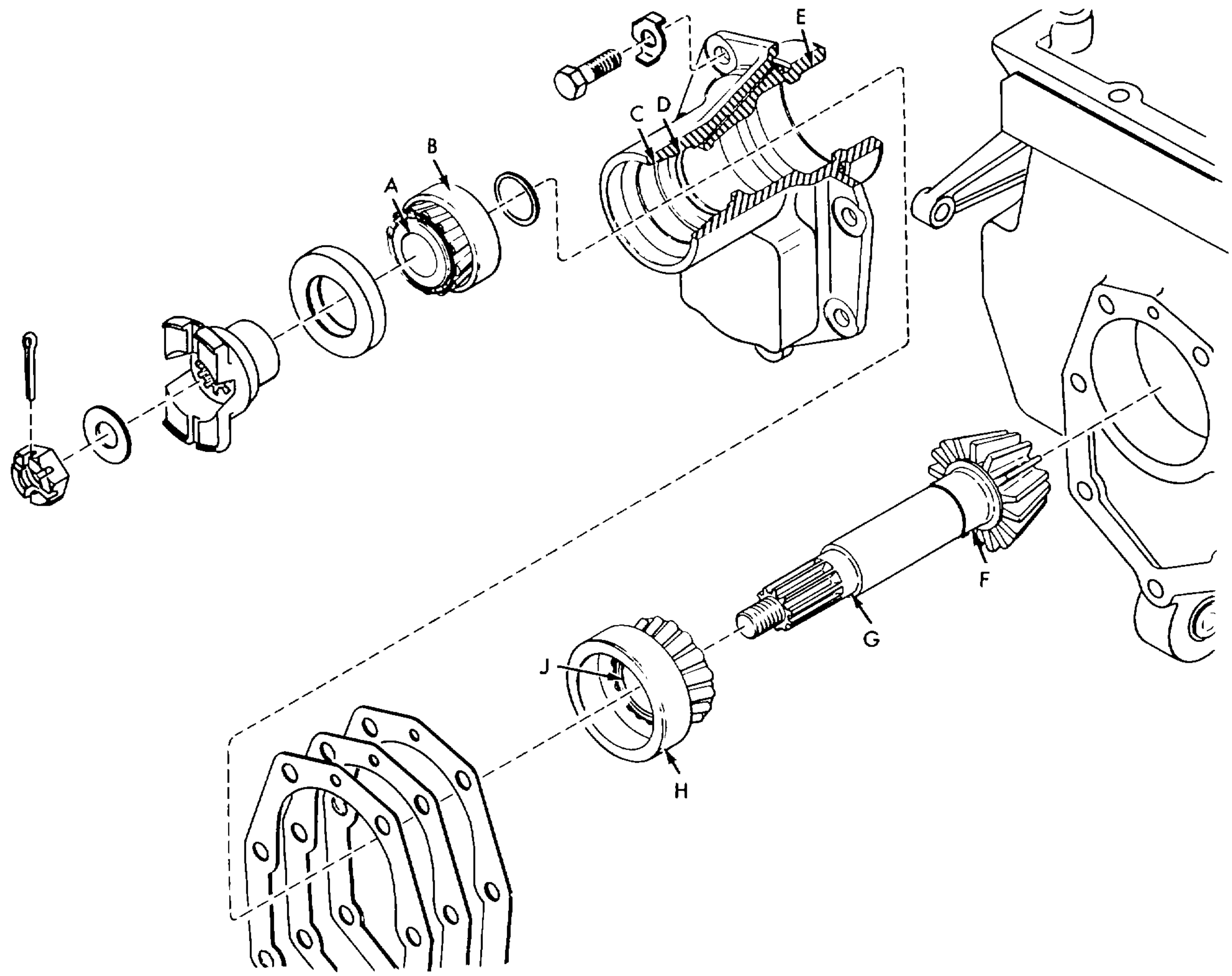
(e) Bearings (6) and (22). Replace bearings (6) and (22) if scored, pitted or worn beyond the limits specified in figure 4-15 (sheet 1).

(f) Mounts (14). Replace mounts if loose in housing and/or if their bushing is loose.

NOTE

Key numbers shown in parentheses ( ) in steps (g) through (p) refer to figure 4-14 unless otherwise indicated.

(g) Yokes (41), output shafts (26), steering arm assemblies (37), and actuating arm (19). Replace if splines are twisted, broken, or otherwise seriously damaged. Remove slight burrs or scratches on splines with a fine file or honing stone.



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS
A	INSIDE DIAMETER OF BEARING	1.2500 TO 1.2505	(**)
B	OUTSIDE DIAMETER OF BEARING	2.750 TO 2.751	(**)
C	SEAL SEAT DIAMETER	2.874 TO 2.876	2.877
D	BEARING SEAT DIAMETER	2.7459 TO 2.7472	2.7500
D-B	FIT BETWEEN BEARING AND HOUSING	0.0051T TO 0.0028T	0.000
E	BEARING SEAT DIAMETER	3.3720 TO 3.3730	3.375
F	BEARING JOURNAL DIAMETER	1.5010 TO 1.5015	1.5000
G	BEARING JOURNAL DIAMETER	1.2500 TO 1.2505	1.2490
G-A	FIT BETWEEN BEARING AND JOURNAL	0.0005T TO 0.0005T	0.0015L
H	OUTSIDE DIAMETER OF BEARING	3.3750 TO 3.3760	(**)
H-E	FIT BETWEEN BEARING AND HOUSING	0.002T TO 0.0040T	0.000
J	INSIDE DIAMETER OF BEARING	1.5000 TO 1.5005	(**)
J-F	FIT BETWEEN BEARING AND JOURNAL	0.0015T TO 0.005T	0.000

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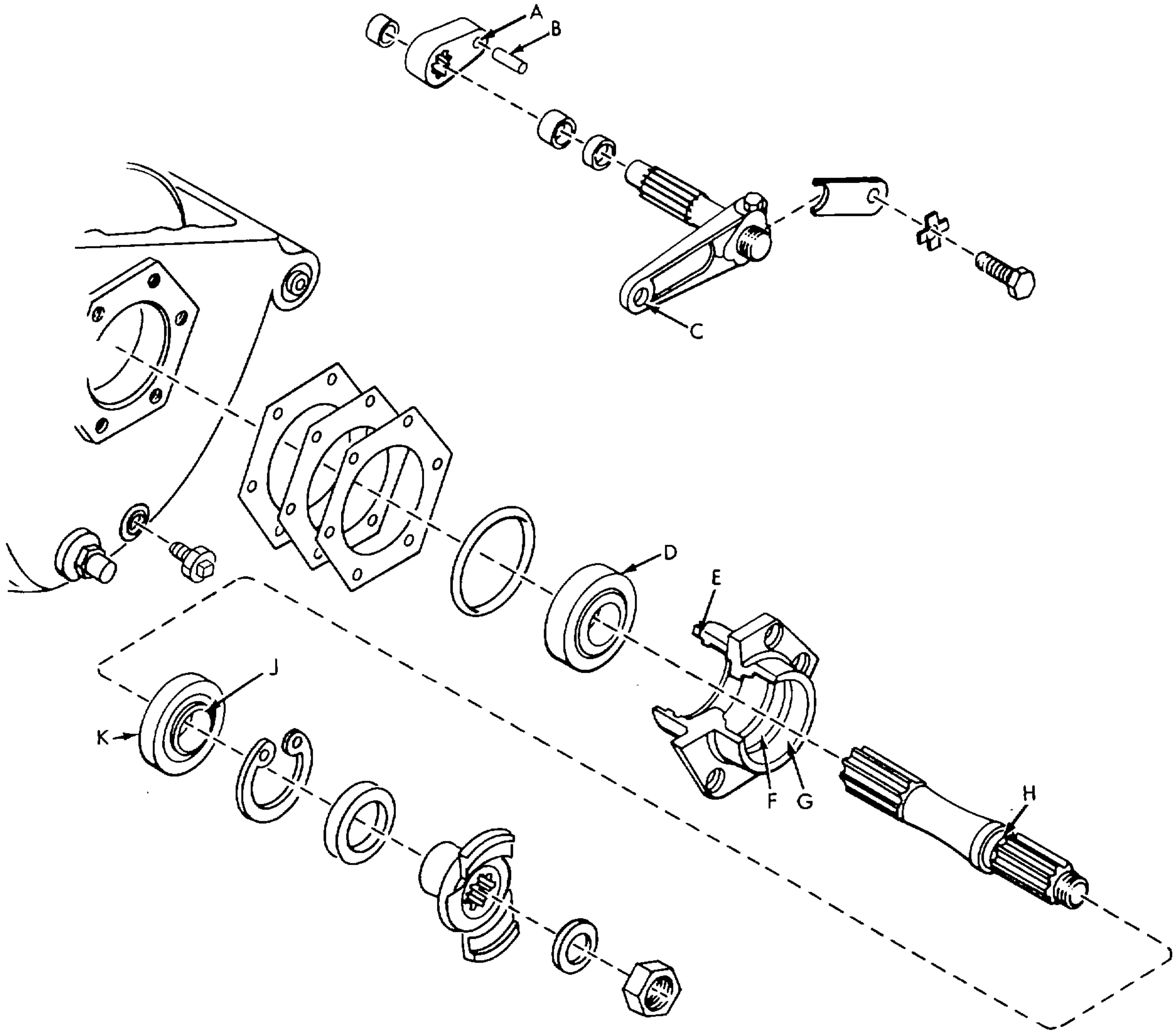
Figure 4-15. Differential Wear Limits (Sheet 1 of 5)



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS
A	DIAMETER OF HOLE	0.439 TO 0.441	0.445
B	PIN DIAMETER	0.435 TO 0.438	(**)
B-A	FIT BETWEEN PIN AND HOLE	0.006 TO 0.001	0.010L
C	INSIDE DIAMETER OF BUSHING	0.377 TO 0.380	0.400
D	OUTSIDE DIAMETER OF BEARING	3.2650 TO 3.2655	(**)
E	BEARING SEAT DIAMETER	3.2635 TO 3.2645	3.2650
E-D	FIT BETWEEN BEARING AND RETAINER	0.002T TO 0.0005T	0.000
F	BEARING SEAT DIAMETER	3.1494 TO 3.1501	3.1510
G	SEAL SEAT DIAMETER	3.2505 TO 3.2535	3.254
H	BEARING JOURNAL DIAMETER	1.5735 TO 1.5744	1.5725
J	INSIDE DIAMETER OF BEARING	1.5743 TO 1.5748	(**)
J-H	FIT BETWEEN BEARING AND JOURNAL	0.001T TO 0.0013L	0.0023L
K	OUTSIDE DIAMETER OF BEARING	3.1491 TO 3.1496	(**)

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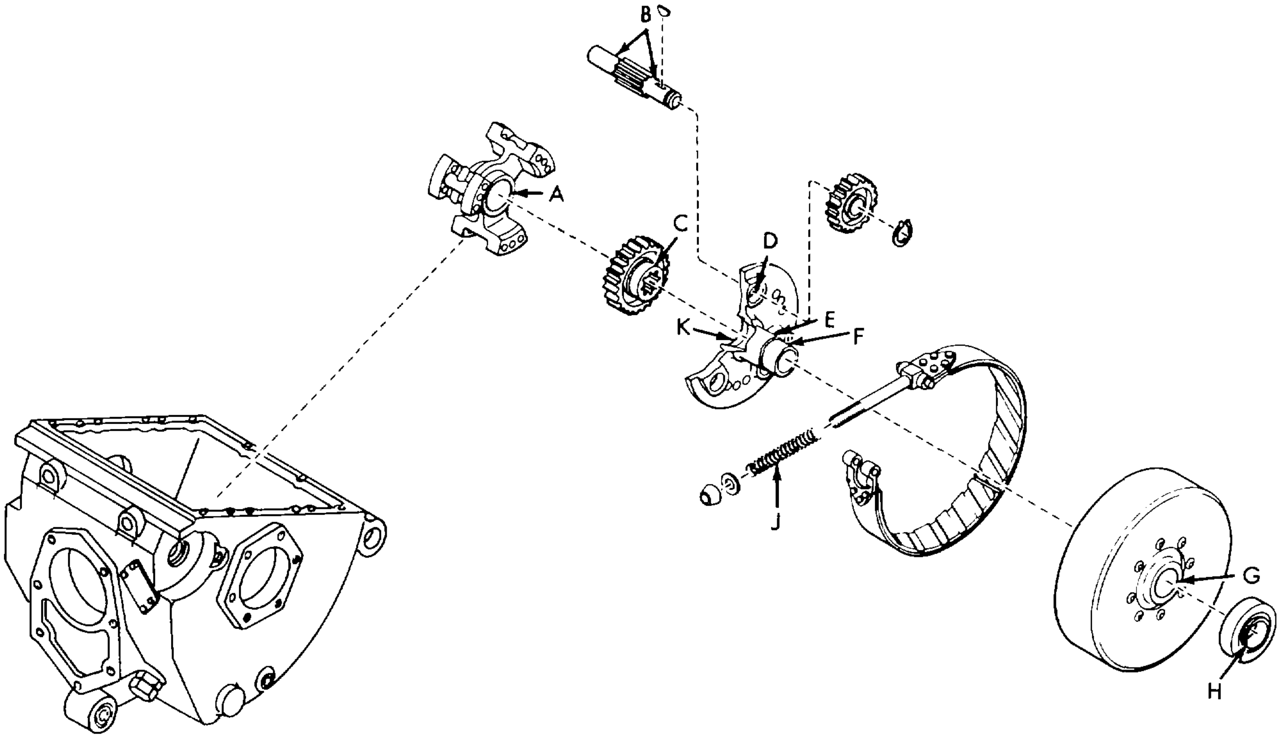
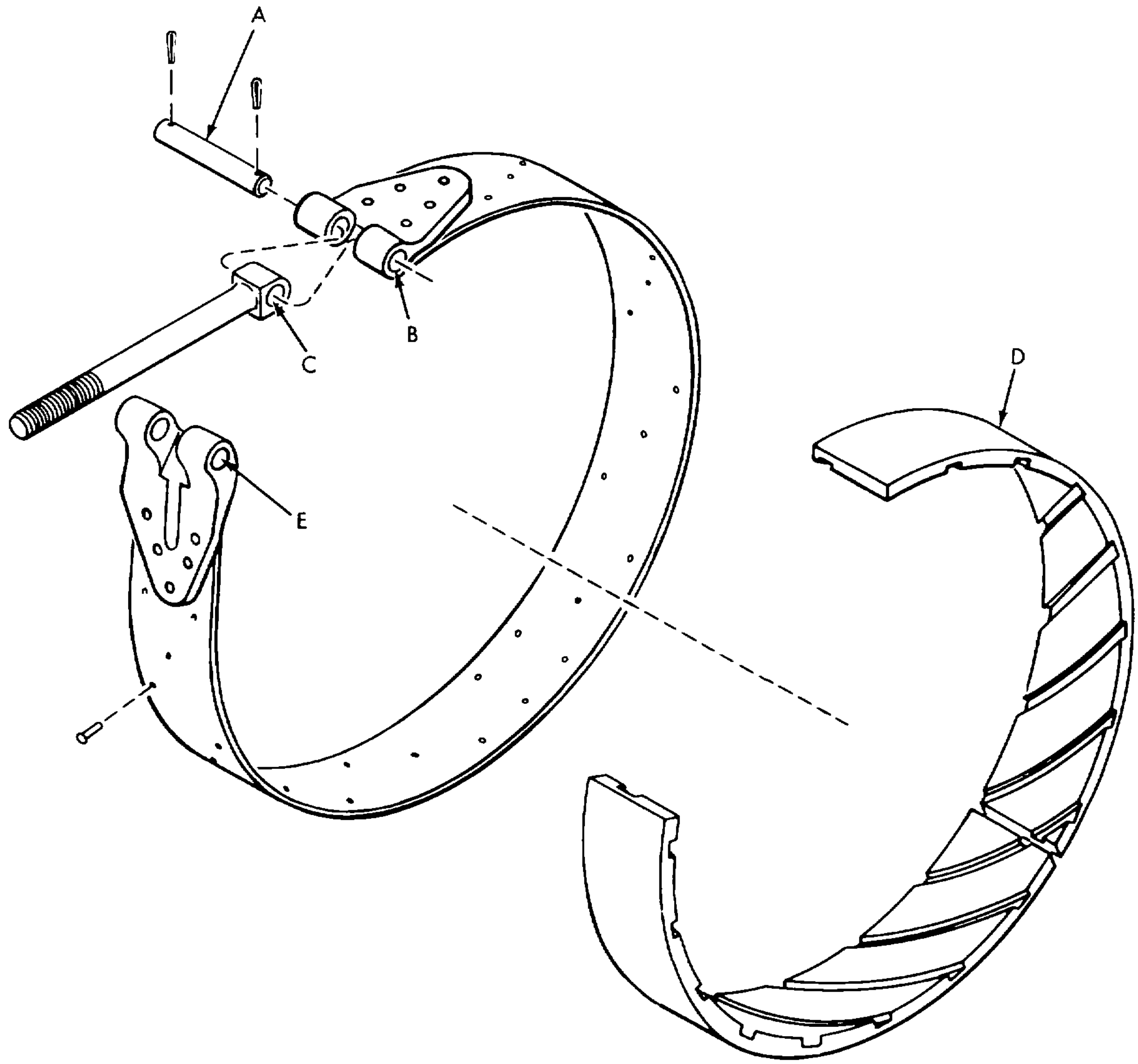
Figure 4-15. Differential Wear Limits (Sheet 2 of 5)



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS
A	INSIDE DIAMETER OF SPIDER	1.818 TO 1.821	1.846
B	JOURNALS OF PINION GEAR	0.935 TO 0.936	0.932
C	JOURNALS OF SPUR GEAR	1.808 TO 1.810	1.805
C-A	FIT BETWEEN GEAR AND SPIDER	0.008L TO 0.013L	0.041L
D	INSIDE DIAMETER OF BUSHING	0.939 TO 0.941	0.966
D-B	FIT BETWEEN PINION GEAR AND BUSHING	0.003L TO 0.006L	0.034L
E	OUTSIDE DIAMETER	1.944 TO 1.946	1.919
E-G	FIT BETWEEN BRAKE DRUM AND AXLE HOUSING	0.006L TO 0.002L	0.056L
F	BEARING JOURNAL DIAMETER	1.7505 TO 1.7515	1.7485
F-H	FIT BETWEEN BEARING AND AXLE HOUSING	0.0015T TO 0.0000	0.0020L
G	INSIDE DIAMETER OF BRAKE DRUM BUSHING	1.948 TO 1.950	1.975
H	INSIDE DIAMETER OF BEARING	1.7500 TO 1.7505	(**)
J	SPRING RATE	13 TO 17 LB/IN.	(*)
	FREE LENGTH OF SPRING	5.500 TO 5.575	(*)
K	INSIDE DIAMETER OF BEARING	1.821 TO 1.824	1.849
K-C	FIT BETWEEN GEAR AND BUSHING	0.011L TO 0.016L	0.044L

TA076790

Figure 4-15. Differential Wear Limits (Sheet 3 of 5)



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS
A	OUTSIDE DIAMETER OF PIN	0.435 TO 0.438	0.405
B, C, E	INSIDE DIAMETER	0.451 TO 0.458	0.488
D	THICKNESS OF LINING	0.242 TO 0.258	0.150

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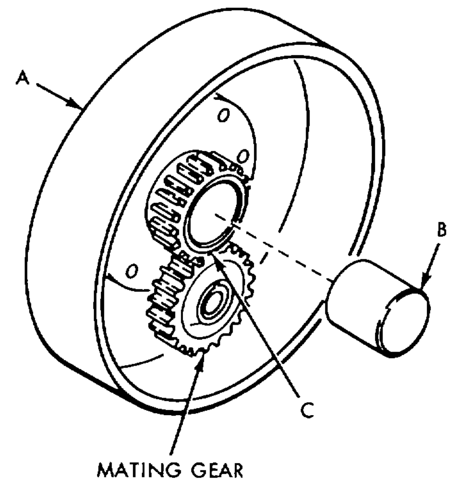
Figure 4-15. Differential Wear Limits (Sheet 4 of 5)



REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS
A	OUTSIDE DIAMETER	10.964 TO 11.00	10.850
B	INSIDE DIAMETER	1.948 TO 1.950	1.975
C	BACKLASH BETWEEN GEARS WHEN RUNNING ON 2.763 CENTER DISTANCE	0.012 TO 0.015	0.019

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Figure 4-15. Differential Wear Limits (Sheet 5 of 5)

Check conditions and dimensions of bearing journals on output shafts (26) and shafts (37A) of steering arm assemblies. Replace shafts which are scored, pitted, or excessively worn. Replace steering arm assembly bushing (37F) if loose, damaged, or excessively worn. Check dimensions of clevis pin hole in actuating arm (19). Replace parts damaged and/or worn beyond limits specified in figure 4-15 (sheet 2).

(h) Retainers (29). Check diameter of bearing seats. Replace if mating or seating surfaces are pitted, deeply scored and/or worn beyond limits specified in figure 4-15 (sheet 2). Remove minor scratches with a fine honing stone. Clean lubrication passages.

(i) Instruction plate (50). Replace if illegible.

(j) Axle housing assemblies (8 and 12). Replace worn or loose dowel pins and bushings if worn beyond limits specified in figure 4-15 (sheet 3). Clean lubrication passages in bushings.

NOTE

Use bushing replacer, special tool (37, fig. 1-2), and handle, special tool (9, fig. 1-2) (fig. 4-16), to replace bushings (8C and 12C). Use remover and replacer, special tool (25, fig. 1-2), and handle, special tool (9, fig. 1-2) (fig. 4-17), to remove and replace bushings (8B and 12B).

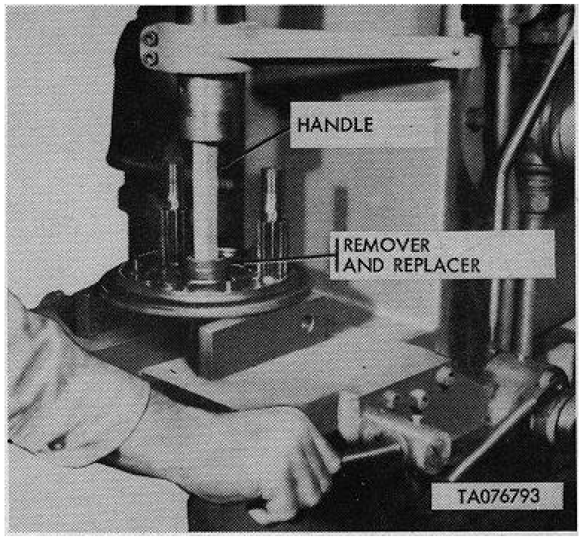


Figure 4-16. Axle Housing - Large Bushing Replacement Using Remover and Replacer with Handle

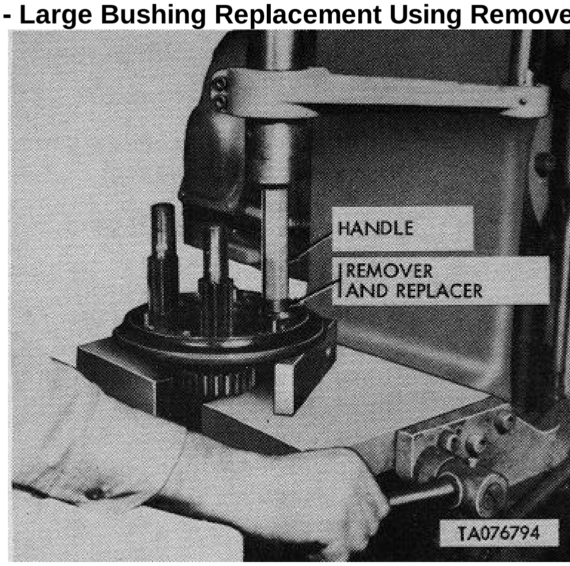


Figure 4-17. Axle Housing - Small Bushing Replacement Using Remover and Replacer with Handle

(k) *Pinion gear (7)*. Check condition and dimensions of bearing journals. Replace if damaged or worn beyond limits specified in figure 4-15 (sheet 3).

(l) *Spider (11)*. Retap damaged threaded holes. Check inside diameter of spider. Replace if damaged or worn beyond limits specified in figure 4-15 (sheet 3).

(m) *Housing (34)*. Retap damaged threaded holes. Repair cracks in housing as per TM 9-237. Replace screws (20, fig. 4-11) which hold identification plate (19, fig. 4-11) to housing if loose or missing. Remove and replace worn or loose mounting bushings, using remover and replacer, special tool (22, fig. 1-2).

(n) *Ring gear (9) and pinion gear (18, fig. 4-11)*. Gears are a matched set. If either gear is defective, the set must be replaced. Backlash between gears running on standard centers to be 0.006 to 0.010 inches.

(o) *Brake band assembly (3)*. Replace missing rivets. If lining (3C) is cracked, or if wear exceeds limits specified in figure 4-15, (sheet 4), it must be replaced. New lining must be tight to the band within 0.020 inches except at lining end.

NOTE

Refer to FM 43-4 for rivet replacement procedures

(p) *Brake drum assembly (2)*. If bushing (2A) is loose, or is worn beyond limits specified in figure 4-15, it must be replaced. Use remover and replacer, special tool (23, fig. 1-2), and handle, special tool (9, fig. 1-2). Refer to figure 4-18. Inspect gear for broken or missing teeth.

If friction surface of brake drum is badly scored, it must be replaced. Minor scratches may be removed by machining within the limits specified in figure 4-15 (sheet 5). Gear of brake drum assembly and mating gears when meshed and running on 2.763 center distance must have a backlash of 0.012 to 0.015 inch.

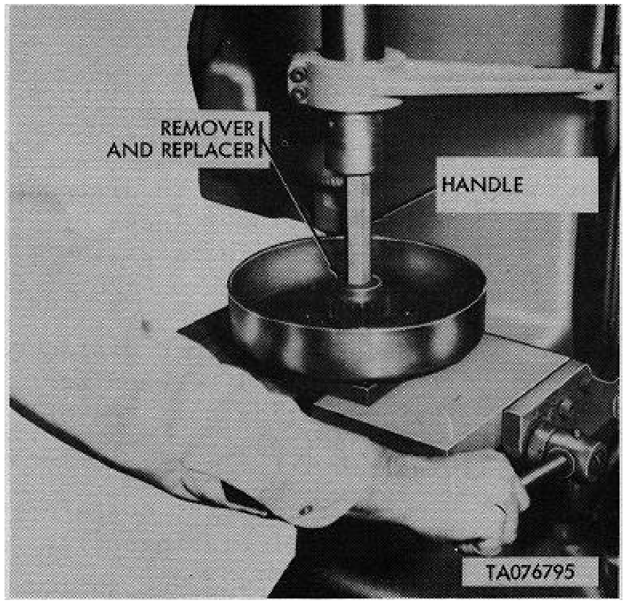


Figure 4-18. Brake Drum Assembly - Bushing Replacement Using Remover and Replacer with Handle

(3) *Assembly*. The following special tools are required to perform the assembly procedures:

Special tool	NSN	Part number
Replacer	5120-00-991-3170	10892953
Replacer	5120-00-991-3152	10892946
Compressor	5120-00-991-3136	10892961
Replacer	5120-00-991-3159	10892954
Replacer	5120-00-991-3151	10892942
Driver, oil and water line ferrule	5120-00-473-7025	7079403

NOTE

Key numbers shown in parentheses ( ) in steps (a) through (w), refer to figure 4-14, unless otherwise specified. Assemble gear cluster according to scribing done at disassembly.

(a) Insert axle drive gear (10) in receiving shoulder of left axle housing assembly (12). Join left axle housing assembly to spider (11) by pressing in dowel pins and seating axle drive gear (10) in bore of spider (11).

(b) Install six pinion gears (7) in left axle housing assembly (12) so that pinions alternate as to assembly; i.e., end receiving woodruff key is always in left hole of each pair of holes in axle housing.

NOTE

Each pinion gear must be positioned so woodruff key (6) slot is directed toward center of axle housing assembly. This insures proper mesh between planetary and brake drum gears.

(c) Attach ring gear (9) to right axle housing assembly (8) using 12 each nuts (24) and bolts (25). Tighten bolts (25) to 33 - 37 ft-lb torque. Install axle drive gear (10) in spider (11). Join right axle housing assembly (8) and attached ring gear (9) to spider (11) by pressing in dowel pins and seating axle drive gear (10) and six pinion gears (7) in proper holes in right axle housing assembly (8). Secure axle housing assemblies (12) and (8) to spider (11) using 12 capscrews (23). Tighten capscrews (23) to 60 - 65 ft-lb torque. Safety tie screws in pairs with lockwire.

(d) Key six planetary gears (5) to ends of six pinion gears (7) installed in axle housing assemblies, using six woodruff keys (6). Secure planetary gears (5) to pinion gears using six retaining rings (4).

(e) Press two brake drum assemblies (2) on axle housing assemblies (8 and 12).

(f) Press cones of two roller bearings (1) on axle housing assemblies (8 and 12). Press cups of two roller bearings (1) in retainers (29) using replacer, special tool (33, fig. 1-2). Refer to figure 4-19.

(g) Install shims (31, 32, and 33) to give 0.002 to 0.007inch preload on bearings as follows:

(h) Firmly support assembled gear cluster and associated parts and snugly install

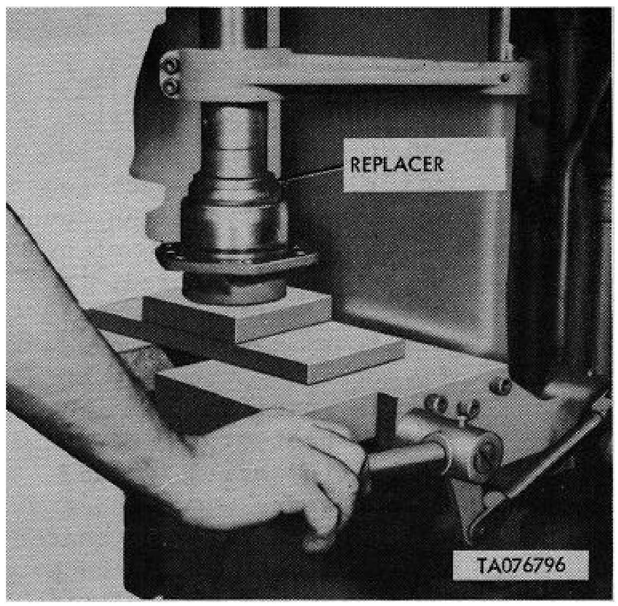


Figure 4-19. Axle - Roller Bearing Cups Installation Using Replacer

retainers (29) on axle housing assemblies.

(i) Measure and record distance X between inner faces of mounted retainers as indicated in figure 4-20.

(j) Measure and record distance Y (fig. 4-20) between retainer mating surfaces of housing (34).

(k) Remove retainers, containing cups of bearings (1).

(l) Place gear cluster and associated parts, including brake band assemblies (3) within housing (34), resting on four backup bolts (47).

(m) Subtract 0.002 to 0.007 inch from the difference between the two dimensions X and Y. Resultant number represents total shim thickness that must be introduced between retainers (29) and housing (34).

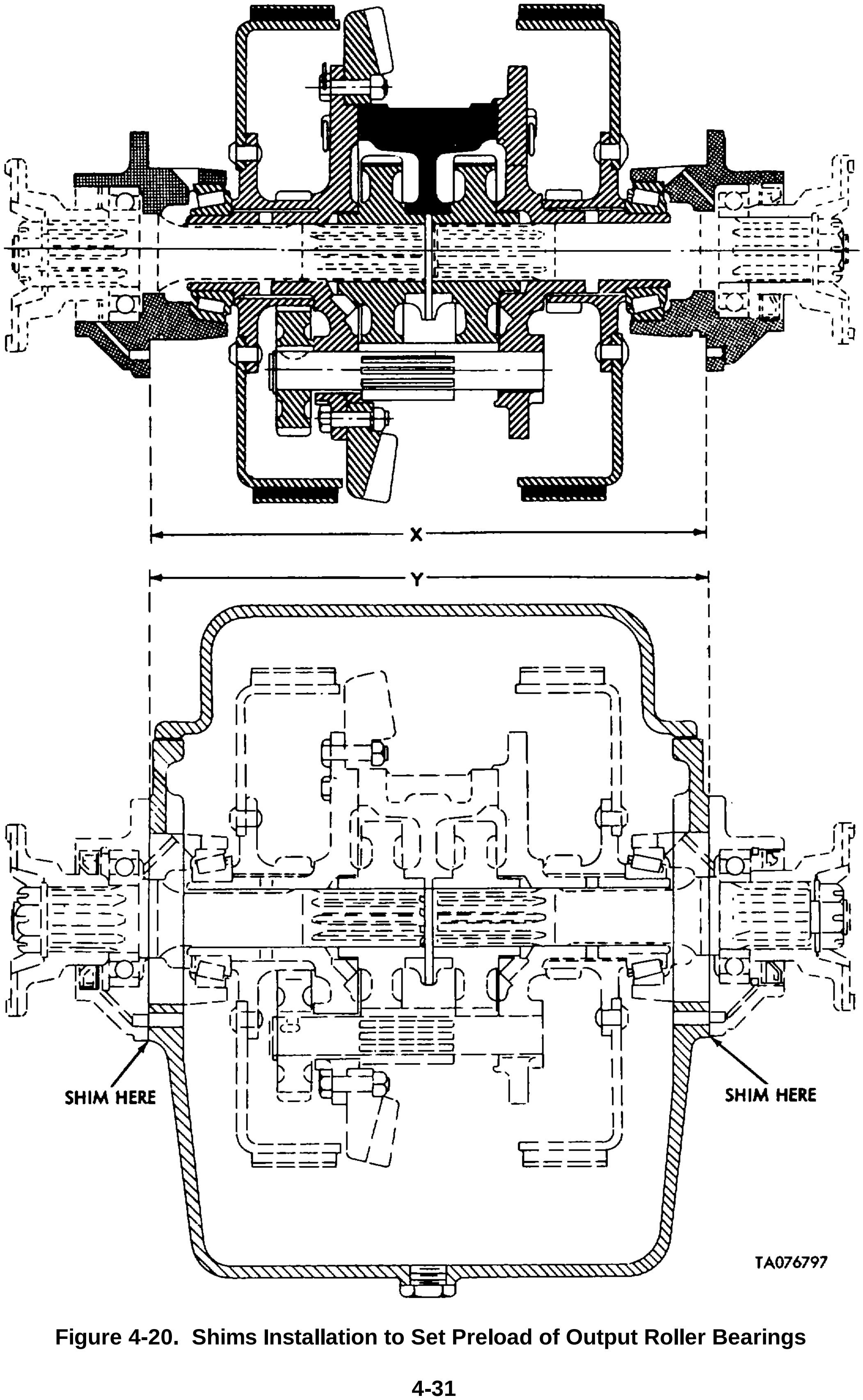


Figure 4-20. Shims Installation to Set Preload of Output Roller Bearings

(n) Install shims equal to half this thickness on each retainer.

(o) Adjust four backup bolts (47) so that gear cluster is in position to receive retainers (29) and output shafts (26).

NOTE

Assembly procedure following through step (w) is same for both sides of differential.

(p) Install retainer (29) and parts assembled to it in differential housing (34) taking care not to damage splines or bearings. Secure retainer to housing using six capscrews (27) and tab washers (28).

(q) Press ball bearing (44) on output shaft (26) and install shaft in retainers. Secure bearing (44) with retaining ring (43). Press seal (42) into retainer, lip side first, until flush, using replacer, special tool (30, fig. 1-2). Place packing (30) on retainer.

(r) Install spring (22), washer (21), and packing (20) on the two brake band adjusting bolts, using compressor, special tool (2, fig. 1-2) to compress spring. Refer to figure 4-21. Insert brake band adjusting bolts into holes at front of differential housing and mount locking plate (48) and two adjusting nuts (49) on adjusting bolts. Tighten adjusting nuts (49) until brake band is snug against drum. Screw four brake band backup bolts (47) into housing until they touch brake bands, then back off the bolts one turn and set jam nuts (46). Loosen adjusting nuts (49) until drums turn freely.

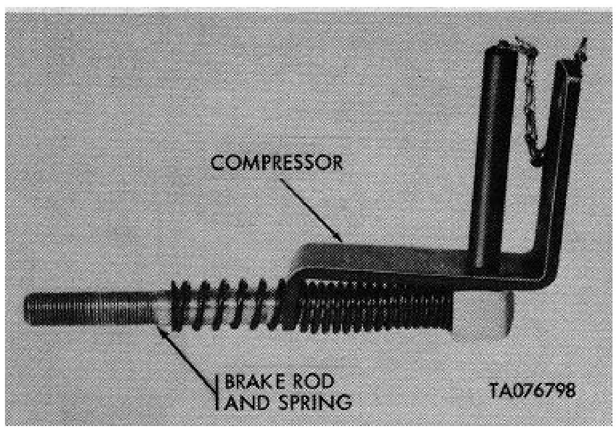


Figure 4-21. Brake Band - Springs Installation Using Compressor

(s) Install output yoke (41) on output shaft (26) taking care not to damage splines.
Secure with flat washer (40), castellated nut (39) and cotter pin (38).

(t) Install needle bearing (35), needle bearing (18), and seal (36) in differential housing, using driver, special tool (3, fig. 1-2).

(u) Secure actuating arm (19) to brake band assemblies using pin (17) and two cotter pins (16).

(v) Assemble parts (A) through (E) of steering arm assembly (37). Aline actuating arm (19) with bearings (18 and 35) and install steering arm assembly. Take care not to damage splines.

(w) Secure steering arm support (15) to differential housing using tab washer (14) and capscrew (13). Tighten capscrew to 15 - 20 ft-lb torque, NOTE Key numbers in parentheses ( ) in steps (x) through (ee) refer to figure 4-11.

(x) Install three mounts (14) and thermoswitch (15).

(y) Press cone of roller bearing (22) on pinion gear (18), using replacer, special tool (31, fig. 1-2). Refer to figure 4-22. Press cup of roller bearing (22) into housing (8) using replacer, special tool (33, fig. 1-2). Refer to figure 4-23.

NOTE

Input pinion gear (18, fig. 4-10) and ring gear (9, fig. 4-14) are a matched pair. Note dimensions X marked on face of pinion gear before installation.

(z) Install shims (23, 24, and 25) and packing (21) on housing (8). Shim to set pinion gear (18) to dimension Z. Dimension Z is the distance between center of ring gear (9, fig. 4-14) and the face of the matching pinion gear (18, fig. 4-11). Refer to figure 4-24. Secure housing (8) to differential housing using seven capscrews (26) and seven tab washers (27). Tighten screws to 45 - 50 ft-lb torque. After final shim adjustment, secure capscrews by bending up tab washers.

Figure 4-22. Pinion Shaft - Inner Bearing Cone Installation Using Replacer

Figure 4-23. Roller Bearing Cup Pressed onto Pinion Gear Housing Using Replacer

(aa) Install shims (7). Install cup of roller bearing (6). Install seal (5), using

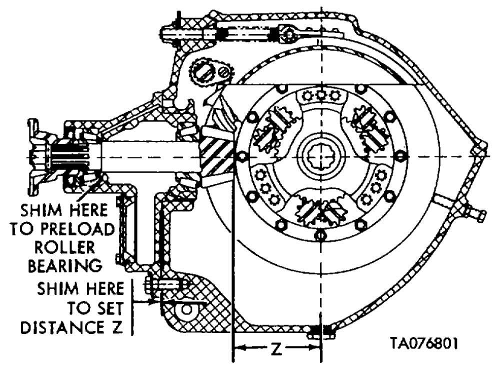


Figure 4-24. Shims Installation to Set Gear Shaft to Dimension Z

replacer, special tool (29, fig. 1-2). Install yoke (4) on pinion gear (18) and secure with flat washer (3), castellated nut (2), and cotter pin (1).

NOTE

Install shims (7) on pinion gearshaft as indicated in figure 4-24 to preload gear shaft roller bearings (6 and 22) so that a torque of 2 to 7 in-lbs is required to rotate pinion after break away.

(bb) Adjust differential gear system laterally by shifting shims (31, 32, and 33, fig. 4-14) from one side to the other, as required to obtain 0.013 to 0.027 inch backlash at 2.16 radius from center of yoke (41, fig. 4-14). Remove 12 hexhead capscrews (27, fig. 4-14) and tab washers (28, fig. 4-14) to free retainers for shifting shims. Remove retainers, output shafts, and associated parts as units when shifting shims. After proper backlash has been obtained, tighten capscrews to 45 - 50 ft-lb torque, then bend up tab washers to secure capscrews.

(cc) Install gasket (16) and plug (17).

(dd) Place new gasket (13) on differential housing. Mount cover assembly (12) to differential housing and secure with 12 each capscrews (10) and tab washers (9).

(ee) Install oil level indicator (11) in port of cover assembly (12).

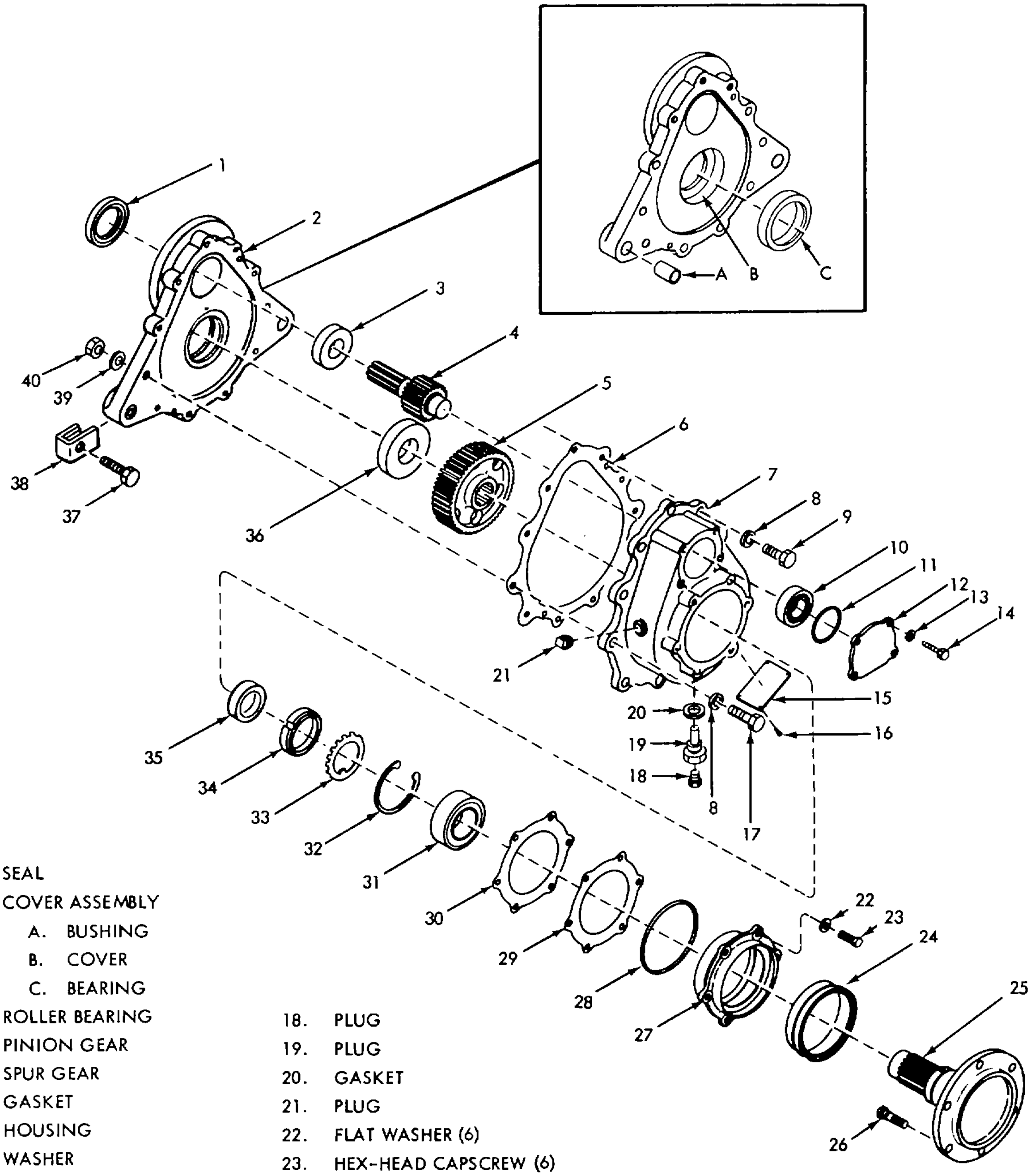
g. *Final Drive Assembly*. For removal and installation procedure, refer to TM 9-1450-500-20.

(1) *Disassembly (fig. 4-25)*. The following special tools are required to perform the disassembly procedures:

Special tool	NSN	Part number
Remover	5120-00-991-3161	10892964
Replacer, oil seal	5120-00-795-0908	7950908
Wrench, socket	5120-00-987-5059	10893002
Stand, arbor press	5120-00-991-3158	10892968
Remover and replacer	5120-00-991-3150	10892939

(a) Remove plugs (18 and 19) and two plugs (21) and associated gaskets. Drain oil from housing into a suitable container. Discard oil.

(b) Remove four each capscrews (14) and flat washers (13). Remove retainer (12); remove packing (11) from retainer (12).



1. SEAL
2. COVER ASSEMBLY
   A. BUSHING
   B. COVER
   C. BEARING
3. ROLLER BEARING
4. PINION GEAR
5. SPUR GEAR
6. GASKET
7. HOUSING
8. WASHER
9. HEX-HEAD CAPSCREW
10. ROLLER BEARING
11. PACKING
12. RETAINER
13. FLAT WASHER (4)
14. HEX-HEAD CAPSCREW (4)
15. IDENTIFICATION PLATE
16. DRIVE SCREW (4)
17. HEX-HEAD CAPSCREW
18. PLUG
19. PLUG
20. GASKET
21. PLUG
22. FLAT WASHER (6)
23. HEX-HEAD CAPSCREW (6)
24. SEAL
25. OUTPUT SHAFT
26. SHOULDER BOLT
27. BEARING CAP
28. PACKING
29. SHIM
30. SHIM
31. ROLLER BEARING
32. RETAINING RING
33. LOCK WASHER
34. BEARING NUT
35. SPACER
36. BALL BEARING
37. SCREW
38. CLIP
39. FLAT WASHER
40. SAFETY NUT

Figure 4-25. Final Drive Assembly Disassembly

(c) Remove eight capscrews (17), three capscrews (9), eight safety nuts (40), eleven flat washers (8), and eight flat washers (39). Separate housing (7) and cover assembly (2). Discard gasket (6).

(d) Remove seal (1) and bearing (36) from cover (2).

(e) Remove bearing (2C) from cover (2).

(f) Remove pinion gear (4). Press roller bearings (3 and 10) from pinion gear (4) using remover, special tool (19, fig. 1-2) and oil seal replacer, special tool (40, fig. 1-2). Refer to figure 4-26.

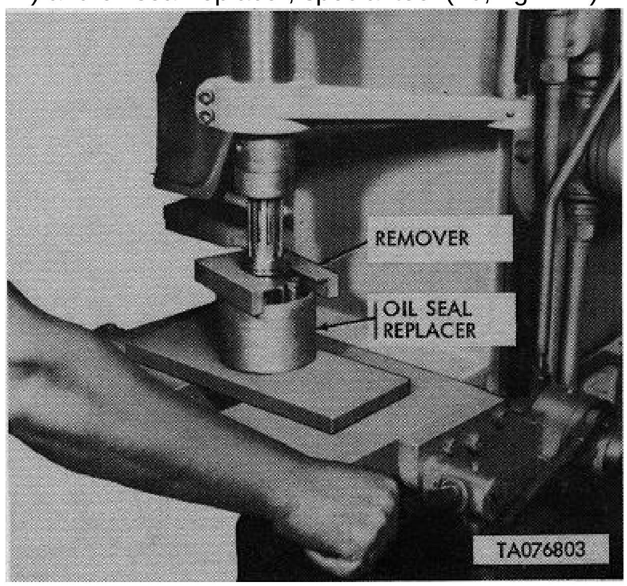


Figure 4-26. Gear Bearing Removal Using Remover with Oil Seal Replacer

(g) Remove spur gear (5) and spacer (35) from output shaft (25).

(h) Remove six each capscrew (23) and flat washer (22). Separate bearing cap (27) and associated parts from housing (7).

(i) Unscrew bearing nut (34) using socket wrench, special tool (44, fig. 1-2) (fig. 4-27). Remove bearing lockwasher (33).

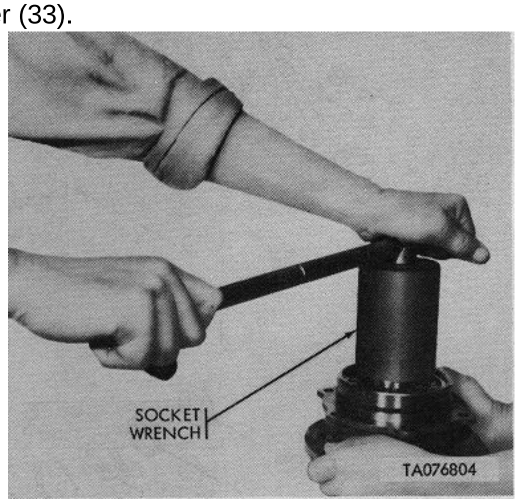


Figure 4-27. Bearing Cap - Retaining Nut Removal Using Socket Wrench

(j) Press output shaft (25) from bearing cap (27) using arbor press stand, special tool (42, fig. 1-2) and remover, special tool (19, fig. 1-2) (fig. 4-28).

(k) Press shoulder bolts (26) from output shaft (25).

(l) Remove retaining ring (32) and press roller bearing (31) from bearing cap. Discard seal (24). Remove shims (29 and 30) and packing (28) from bearing cap (27).

(m) Remove screw (37) and remove clip (38).

Figure 4-28. Output Shaft Removal from Bearing Cap Using Arbor Press Stand

(n) Press bushing (2A) from cover (2B) using remover and replacer, special tool (22, fig. 1-2).

(2) Inspection.

(a) Pinion gear (4), spur gear (5), and output shaft (25). If teeth or splines are broken, missing, damaged or worn beyond the limits specified in figure 4-30 the part must be replaced. Remove minor scratches and burrs with a fine file or honing stone.

(b) Bearing (2C) and bushing (2A). Replace if loose, badly scored, or if worn beyond the limits specified in figure 4-30.

(c) Housing (7), cover assembly (2), bearing cap (27) and retainer (12). Retap damaged threaded holes. Remove scratches and burrs from mating surfaces with a fine file or honing stone. Replace drive screws (16) which hold identification plate (15) to housing if loose or missing. Repair cracks in housing per TM 9-237. Replace parts worn beyond the limits specified in figure 4-30.

(3) Assembly (fig. 4-25). The following special tools are required to perform the assembly procedures:

Special tool	NSN	Part number
Replacer, oil seal	5120-00-473-7471	7082882
Stand, arbor press	5120-00-991-3158	10892968
Wrench, socket	5120-00-987-5059	10893002
Remover and replacer	5120-00-991-3150	10892939
Replacer	5120-00-991-3160	10892965
Replacer assembly, bearing cone	5120-00-343-0122	8708067

(a) Install clip (38) on cover assembly (2) with screw (37).

(b) Install new seal (24) using oil seal replacer, special tool (39, fig. 1-2), and packing (28) in bearing cap (27). Install roller bearing (31) in bearing cap (27) and secure with retaining ring (32).

(c) Insert six ribbed shoulder bolts (26) in holes of ring of output shaft (25). Press output shaft (25) through bearing cap (27) using arbor press stand, special tool (42, fig. 1-2). Refer to figure 4-29.

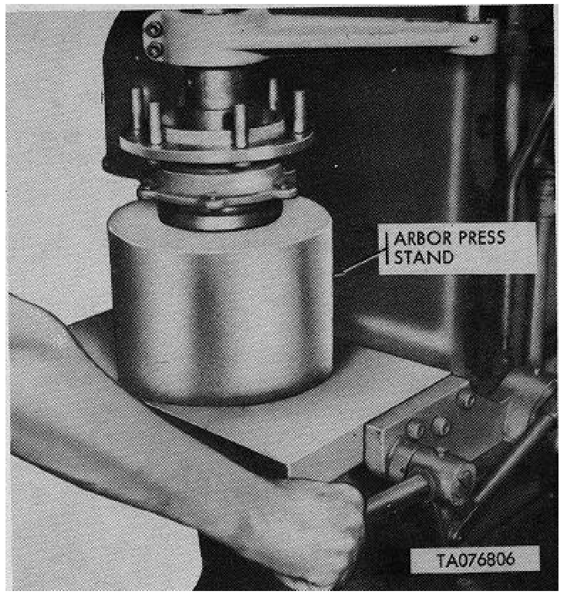


Figure 4-29. Output Shaft Installed in Bearing Cap Using Arbor Press Stand

(d) Seat lockwasher (33) in groove on output shaft (25). Secure shaft with bearing nut (34) using socket wrench, special tool (44, fig. 1-2).

(e) Install bearing cap assembly and output shaft in housing. Press ball bearing (36) into cover assembly (2). Press bushing (2A) into cover (if applicable) using remover and replacer, special tool (22, fig. 1-2).

(f) Press output shaft (25) into ball bearing (36). If necessary, use replacer, special tool (36, fig. 1-2). Temporarily secure housing (7) and cover assembly (2) together with several capscrews (17 and 9), flat washers (8 and 39) and safety nuts (40).

(g) Measure and record the gap (X in fig. 4-31) between bearing cap and housing mating surfaces. Add 0.005 to 0.010 inch to this measurement. The resultant total represents the shim thickness to be installed between the bearing cap and housing. Separate cover and housing and remove bearing cap and associated parts from housing.

(h) Using shims removed in shim pack (step g(e)), add shims (30 and 29) between bearing cap and housing to provide for proper gap as determined in step (g) preceding.

NOTE

If desired, new shims may be obtained from shim set listed in TM 9-1450-500-24P. Use as required to obtain proper gap.

(i) Secure bearing cap (27) to housing (7) with six each capscrew (23) and flat washer (22). Tighten capscrews to 110 - 130 in-lb torque. Safety wire capscrews (23) together in pairs with lock wire.

(j) Insert packing (11) on retainer (12). Fasten retainer to housing (7) using four each capscrew (14) and flat washer (13). Safety wire capscrews in pairs with lockwire.

(k) Install spacer (35) and spur gear (5) on output shaft (25).

(l) Install new seal (1), lip side outermost, using replacer, special tool (34, fig. 1-2).

(m) Install outer races of roller bearings (3 and 10) in pinion

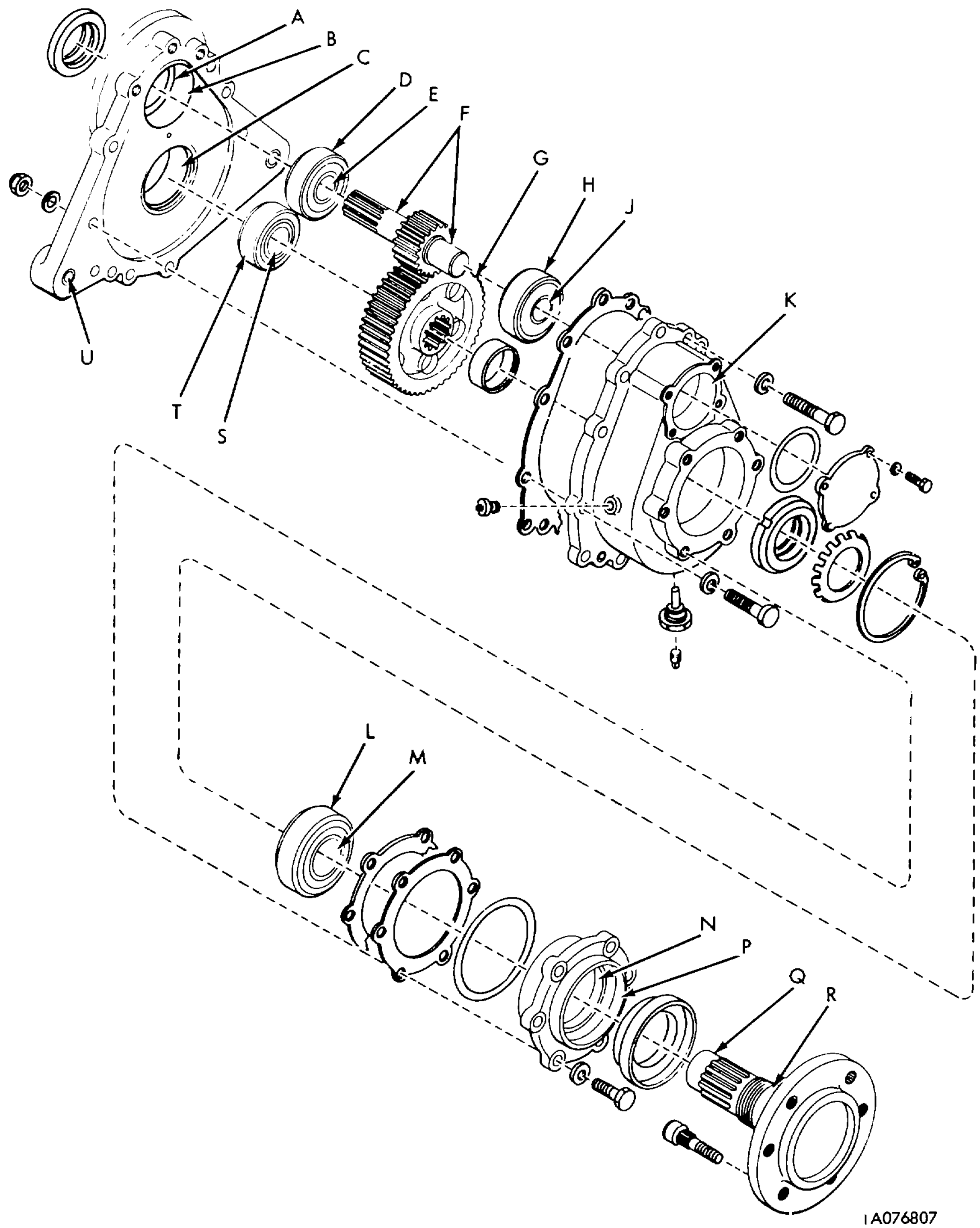


Figure 4-30. Final Drive Assembly Wear Limits (Sheet 1 of 2)

REFERENCE LETTER	POINT OF MEASUREMENT	SIZES AND FITS OF NEW PARTS	WEAR LIMITS
A	SEAL SEAT DIAMETER	3.1875 TO 3.1905	3.192
B, K	BEARING SEAT DIAMETER	3.1490 TO 3.1498	3.1503
C	BEARING SEAT DIAMETER	3.3447 TO 3.3457	3.3459
D, H	BEARING OUTER DIAMETER	3.1493 TO 3.1496	(**)
D-B, H-K	FIT BETWEEN BEARING AND COVER AND BEARING AND HOUSING	0.0006T TO 0.0005L	0.0007L
E, J	BEARING INNER DIAMETER	1.5746 TO 1.5748	(**)
F	BEARING JOURNAL	1.5749 TO 1.5753	1.5748
F-E, F-J	FIT BETWEEN BEARING AND JOURNAL	0.0007T TO 0.0001T	0.0000
G	BACKLASH BETWEEN GEARS ON 1.20 RADIUS FROM CENTER OF GEAR SHAFT	0.006 TO 0.025	0.030
L	OUTSIDE DIAMETER OF BEARING	4.3304 TO 4.3307	(**)
M	INSIDE DIAMETER OF BEARING	2.3619 TO 2.3622	(**)
N	BEARING SEAT	4.3307 TO 4.3315	4.3320
L-N	FIT BETWEEN BEARING AND CUP	0.000 TO 0.0011L	0.0013L
P	SEAL SEAT DIAMETER	4.749 TO 4.751	4.753
Q	BEARING JOURNAL	1.7706 TO 1.7712	1.7701
R	BEARING JOURNAL	2.3626 TO 2.3631	2.3622
R-M	FIT BETWEEN BEARING AND JOURNAL	0.0012T TO 0.0004T	0.0000
S	INSIDE DIAMETER OF BEARING	1.7712 TO 1.7717	(**)
S-Q	FIT BETWEEN BEARING AND JOURNAL	0.0000 TO 0.0011L	0.0016L
T	OUTSIDE DIAMETER OF BEARING	3.3459 TO 3.3465	(**)
T-C	FIT BETWEEN BEARING AND COVER	0.0018 TO 0.0002T	0.0000
U	INSIDE DIAMETER OF BUSHING	0.8710 TO 0.8715	(*)

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Figure 4-30. Final Drive Assembly Wear Limits (Sheet 2 of 2)

gear bore of cover assembly (2) and housing (7). Press inner races of roller bearings (3 and 10) on pinion gear (4) using replacer, special tool (32, fig. 1-2). Refer to figure 4-32.

(n) Install pinion gear (4) in housing so that it is meshed with spur gear (5).

(o) Place new gasket (6) on housing. Fit cover assembly to pinion shaft (4) and output shaft (25). Secure housing (7) to cover assembly (2) with 3 capscrews (9), 8 capscrews (17), 11 flat washers (8), 8 flat washers (39), and 8 safety nuts (40). Tighten capscrews to 110 130 in-lb torque. Safety wire capscrews (17) together in pairs with lockwire.

(p) Install new gasket (20) on plug (19). Install plugs (18 and 19).

(q) Lubricate final drive assembly in accordance with LO 9-1450-500-12.

(r) Install two plugs (21).

(s) Apply torque to output shaft. Torque required to turn output shaft must not exceed 20 in-lb.

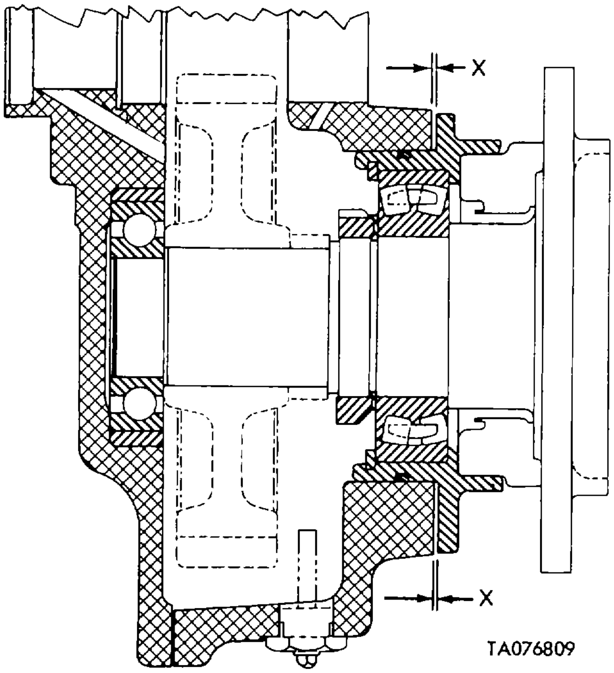


Figure 4-31. Final Drive Assembly Shim Measurement

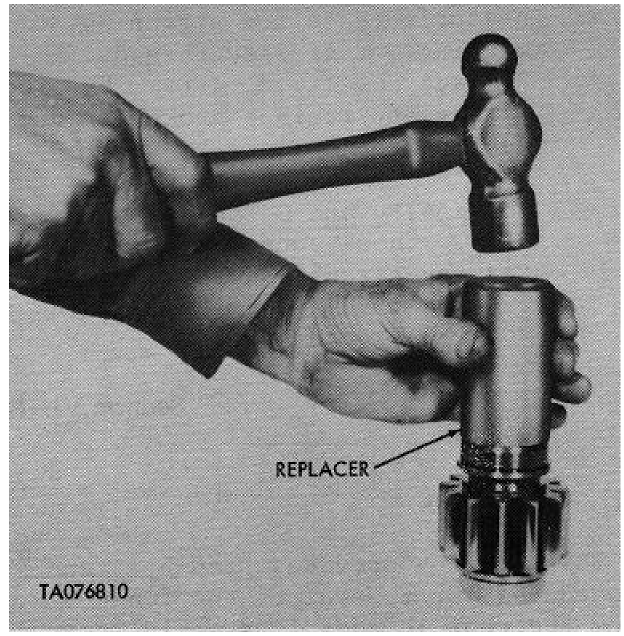


Figure 4-32. Inner Race of Bearings Pressed onto Pinion Gear Shaft

Section IV. REPAIR OF FUEL SYSTEM

4-13. Description

The fuel system consists of a 13 U.S. gallon fuel tank, an electric fuel pump, sediment bowl, carburetor, fuel quantity transmitter, and fuel gage. It is mounted on the left side of the loader, directly behind the operator's seat.

4-14. Repair Procedure

All components of the fuel system are authorized for repair or replacement at the organizational level of maintenance. Refer to TM 9-1450-500-20.

Section V. REPAIR OF CARRIER AND SUPERSTRUCTURE ELECTRICAL CIRCUITS

4-15. Description

This section provides information with respect to general visual inspections and minor repairs for electrical harnesses, cable assemblies and electrical components used in the vehicle. Refer to TM 9-1450-500-24P for authorized repair parts at the direct support level of maintenance. Refer to TM 91450-500-20 for electrical troubleshooting.

4-16. Repair Procedure

a. <u>Removal and Installation</u>. Refer to TM 9-1450-500-20.

b. <u>Visual Inspection</u>. Visually inspect wiring harnesses and insulation for evidence of shorts, insulation breakdown, or abrading away of the protective coverings. Inspect connector dielectrics for cracks or breaks that could permit flashover. Inspect connector threads for stripping, marring, or crossed threads.

Replace defective parts. Unsolder wiring and replace broken or defective terminals.

c. *Continuity and Circuit Shorts Test*. Check connector shells for any circuit shorts or grounding between them and the contacts, conductors or wire leads. Using a standard ohmmeter, check each individual connector contact, conductor and wire lead for continuity and circuits. Replace defective parts. If necessary, use circuit tester TV-100 to make pin-to-pin continuity tests. Refer to TM 9-1450-500-20.

Section VI. REPAIR OF BODY

4-17. Description

This section provides step-by-step procedures for removal of the fenders from the vehicle and disassembly instructions for repair or replacement of component parts.

4-18. Repair Procedure

a. *Fender Assemblies*

(1) *Removal (fig. 4-33).*

NOTE

Removal procedure is identical for right and left fenders.

(a) Remove three capscrews (3), three flat washers (4), and three self-locking nuts (5).

(b) Remove four capscrews (6), four washers (7), and four self-locking nuts (8).

(c) Remove two capscrews (9), two flat washers (10), and two self-locking nuts (11).

(d) Remove two capscrews (12), two flat washers (16), and two self-locking nuts (17).

(e) Remove 10 capscrews (13), 10 flat washers (14), and 10 self-locking nuts (15).

(f) Remove five capscrews (1) and five flat washers (2) to remove fender assembly.

(2) *Disassembly (fig. 4-34).*

(a) Remove 26 pan head screws (1), 26 flat washers (9), and 26 self-locking nuts (10) to remove two strips (7 and 12), strip (11), guard (6), and flap assembly (8).

(b) Remove six capscrews (4) and six flat washers (5) to remove bracket (3) from fender.

(c) Remove four machine screws (8G), four flat washers (8B), and four self-locking nuts (8A), to remove strips (8D and 8F) and bracket (8C) from flap (8E).

(3) *Inspection.*

(a) *Strips (7, 11, and 12)*. Replace strips if they are cracked or otherwise deteriorated.

(b) *Flap (8).* Replace flap if torn or deteriorated.

(c) *Guard (6).* Replace guards if they are deteriorated.

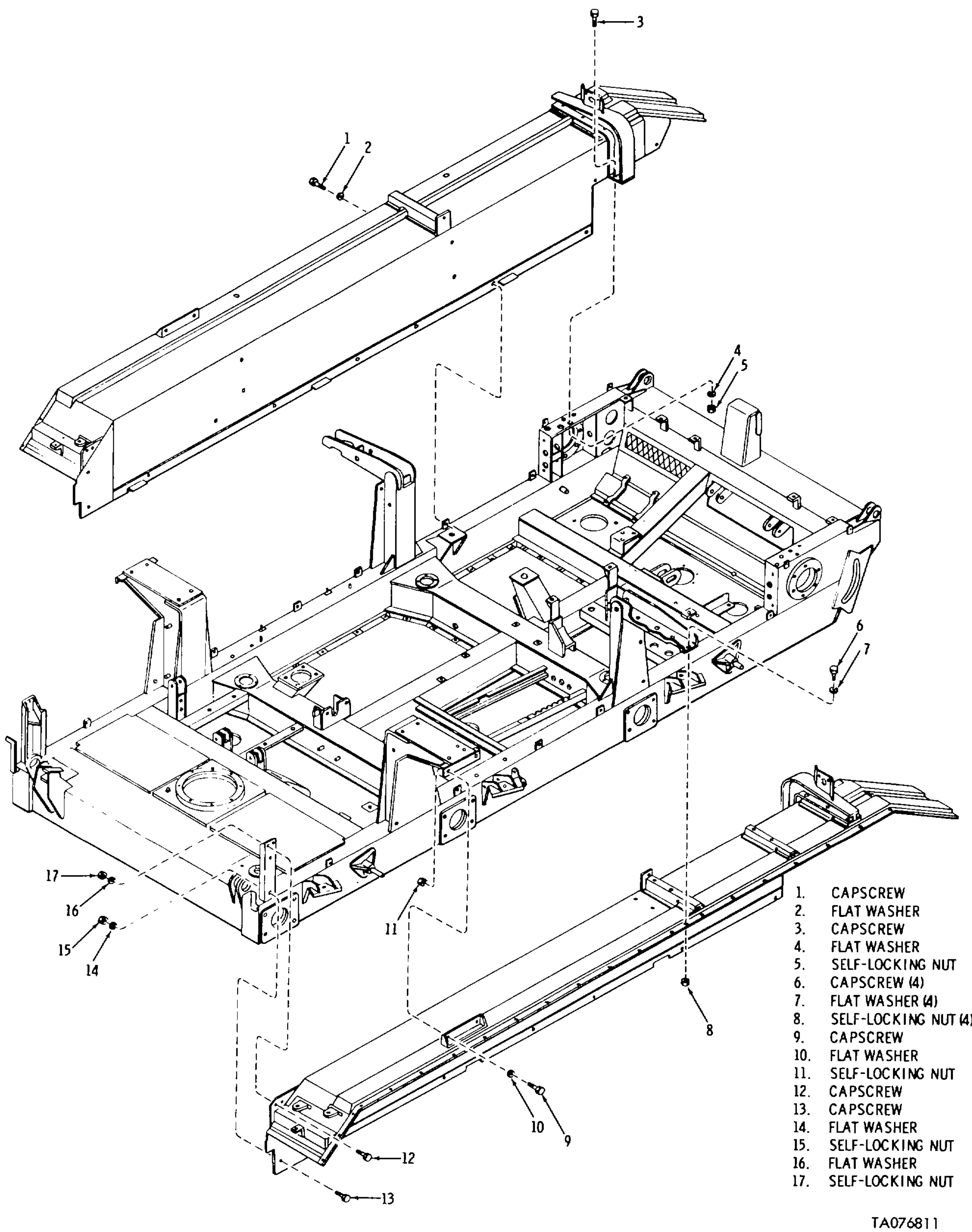
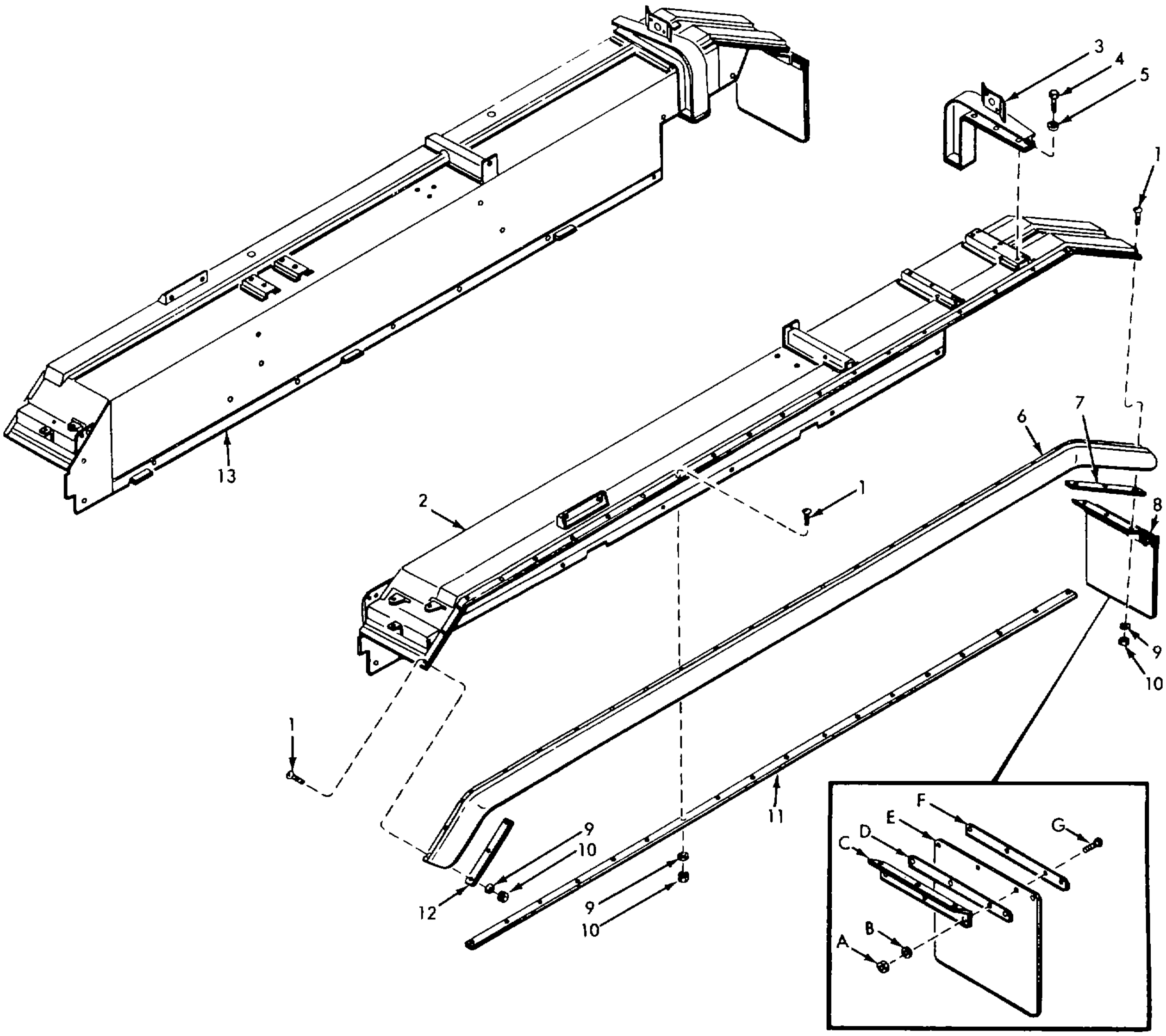


Figure 4-33. Fender Assemblies Removal



1. PAN-HEAD SCREW
2. LEFT FENDER
3. BRACKET
4. CAPSCREW
5. FLAT WASHER
6. GUARD
7. STRIP
8. FLAP ASSEMBLY
   A. SELF-LOCKING NUT
   B. FLAT WASHER
   C. BRACKET
   D. STRIP
   E. FLAP
   F. STRIP
   G. MACHINE SCREW
9. FLAT WASHER
10. SELF-LOCKING NUT
11. STRIP
12. STRIP
13. RIGHT FENDER

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Figure 4-34. Fender Assemblies Disassembly

NOTE

Rubber guard replacements must be pierced in 24 places, corresponding to mounting holes in the fender, prior to installation.

(d) *Fenders*. Dents in fenders may be hammered out. Loose mounting brackets may be rewelded. Refer to TM 9237 .

(4) *Installation*. Install the fender by reversing the sequence of the removal procedure.

(5) *Assembly*. Assemble the fender by reversing the sequence of the disassembly procedure.

SECTION VII. (SEE NOTE) OVERHAUL OF FUEL SYSTEM

4-19. Fuel Tank Assembly (Fig. 435)

a. Removal and Installation. Refer to TM 9-1450-500-20-1.

b. Disassembly.

(1) Remove plug (9) and drain the fuel from the tank.

(2) Remove spring (1), two flat washers (23), and two clevis pins (2) to remove cover (3).

(3) Remove five pan-head screws (4) and flat washers (5) to remove gage (6). Remove gasket (24).

(4) Disconnect and remove hose (13 and 18). Remove elbows (12, 14, 15 and 19).

(5) Remove two capscrews (16) and flat washers (17) to remove bracket (21) and pump (20). Remove strainer assembly (10) from bracket (21) and remove elbow (11) from strainer assembly.

(6) Separate strainer (10B) and bowl (10A). Loosen cover of tank and remove inlet strainer (7) from tank (8).

c. Inspection. Inspect all parts according to Chapter 2. In addition, inspect individual parts as described below.

(1) *Cover (3).* Inspect for dents. Dents may be hammered out.

(2) *Gage (6).* Check the sending unit of the gage with an ohmmeter. With the float in the empty position, the ohmmeter must read from 0.0 to 0.5 ohms. With the float in the full position, the ohmmeter must read between 29.6 and 31.3 ohms. otherwise, replace the gage. Check gage float by immersing it in 200°F (90°C) water. If bubbles appear, replace the gage.

(3) *Inlet strainer (7).* If the screen is torn or broken, replace the strainer. If the strainer components become unsoldered, they must be resoldered.

(4) *Hose (13 and 18).* Replace the hose if they are turn, cut, or deteriorated.

(5) *Pump (20).* Replace the pump if the electrical lead is chafed or deteriorated. Retape the electrical lead, between the pump and the mounting clip, using electrical tape, one-half inch wide. Use two layers of tape, allowing one-quarter inch overlay.

(6) *Strainer Assembly (10).* Replace the strainer if it is cracked or has damaged threads. Replace the strainer bowl if cracked.

(7) *Fuel Tank (8).* Clean tank by inserting steam hose in tank opening and thoroughly clean interior of tank. Inspect bottom and sides of tank for scale, sludge, or sediment. Remove with' grease cleaning compound or a mineral spirits paint thinner. Use a wire brush to remove stubborn deposits. Repeat steam cleaning process until tank is entirely clean. With all other ports blocked off, apply 2 psig (0.14 bar). Air pressure to the small port in the top of the tank. Apply a soapy solution to the seams of the tank and to all welded areas. No leaks shall occur when observed for 5 minutes. If leaks occur at the seams, the tank must be replaced. Replace damaged or missing rubber pads.

d. Assembly.

(1) Assemble bowl (10A) to strainer (10B). Install elbow (11) to strainer assembly (10). Turn elbow in all the way and then back it off until it points straight down.

(2) Assemble strainer assembly (10) to bracket (21). Mount fuel pump (20) and bracket (21) to tank (8) and secure with two capscrews (16) and flat washers (17).

(3) Assemble elbow (12) to bracket (21) and elbow (14) to port near top of fuel pump (20). Aline elbow (14) so it is in a horizontal position facing strainer assembly (10). Form a loop in hose (13) and assemble to elbows (12 and 14). Tighten hose.

(4) Install elbow (19) to port in top of fuel tank (8). Install elbow (15) to fuel pump (20) and turn it in all the way. Back elbow off until it is in a horizontal position, facing the electrical lead of the pump.

(5) Assemble hose (18) to elbows (15 and 19). Tighten hose.

(6) Place inlet strainer (7) in tank (8) and tighten cover. Install gasket (24) and gage (6). Orient gage so the electrical connection faces toward the fuel pump side of tank (8). Secure gage with five flat washers (5) and panhead screws (4).

(7) Aline cover (3) with brackets in tank (8). Insert two clevis pins (2) through cover and bracket. Place two flat washers (23) over two clevis pins (2) and secure with two cotter pins (22). Assemble spring (1) to cover (3) and to tank (8). Install plug (9).

NOTE:
Section VII applies to Loader (Gasoline Engine) Part Numbers 9099200,50092260 or 50092266.
Section VII.1 applies to Loader (Multifuel Engine) Part Number 50008600.

1. SPRING
2. CLEVIS PIN
3. COVER
4. PAN-HEAD SCREW
5. FLAT WASHER
6. GAGE
7. INLET STRAINER
8. TANK
9. PLUG
10. STRAINER ASSEMBLY
    A. BOWL
    B. STRAINER
11. ELBOW
12. ELBOW
13. HOSE
14. ELBOW
15. ELBOW
16. HEX-HEAD CAPSCREW
17. FLAT WASHER
18. HOSE
19. ELBOW
20. PUMP
21. BRACKET
22. COTTER PIN
23. FLAT WASHER
24. GASKET

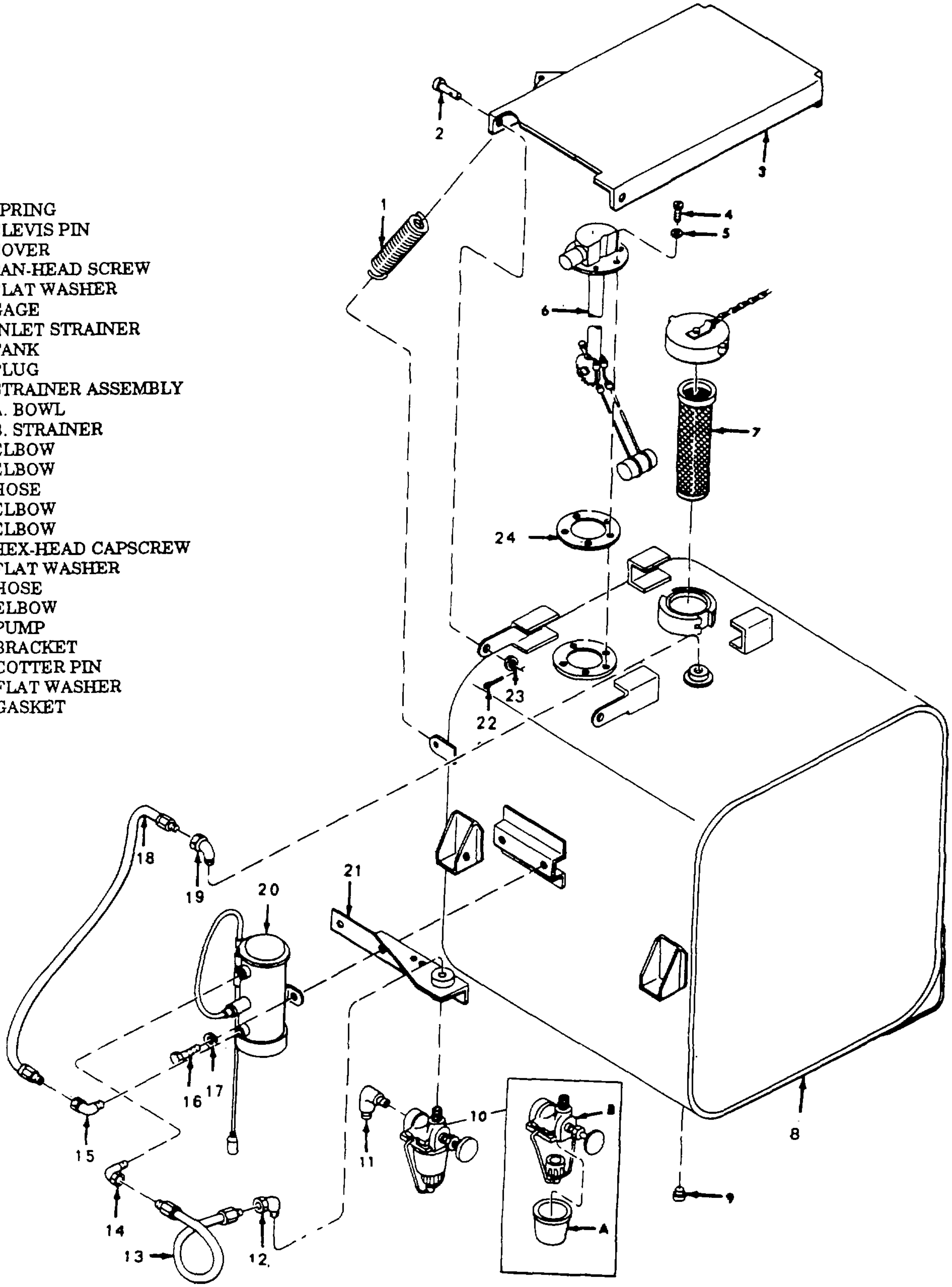


Figure 4-35. Rebuild of Fuel Tank Assembly.

SECTION VII.1. (SEE NOTE) OVERHAUL OF FUEL SYSTEM INSTALLATION

4-20. Fuel Tank Assembly (Fig. 4-36)

a. Removal and Installation. Refer toTM9-1450 500-20-2.

b. Disassembly.

(1) Remove plug (2) and drain fuel from the tank.

(2) Remove spring (3), two flat washers (4), two cotter pins (5) and two clevis pins (6) to remove cover (7).

(3) Remove five panhead screws (8), flat washers (9) and gage (10). Remove gasket (11).

(4) Remove inlet strainer (12).

c. Inspection. Inspect all parts according to Chapter 2 In addition, inspect individual parts as described below.

(1) *Cover (7).* Inspect for dents. Dents may be hammered out.

(2) *Gage (10).* Check the sending unit of the gage with an ohmmeter. With the float in the empty position, the ohmmeter must read from 0.0 to 0.5 ohms. With the float in the full position, the ohmmeter must read between 29.6 and 31.3 ohms. Otherwise, replace the gage. Check gage float by immersing it in 200°F (90°C) water. If bubbles appear, replace the gage.

(3) *Inlet strainer*. If the screen is torn or broken, replace the strainer. If the strainer components become unsoldered, they must be resoldered.

(4) *Fuel Tank*. Clean tank by inserting steam hose in tank opening and thoroughly clean interior of tank. Inspect bottom and sides of tank for scale, sludge, or sediment. Remove with grease cleaning compound or a mineral spirits paint thinner. Use a wire brush to remove stubborn deposits. Repeat steam cleaning process until tank is entirely clean. With all other ports blocked off, apply 2 psig(0.14 bar). Air pressure to the small port in the top of the tank. Apply a soapy solution to the seams of the tank and to all welded areas. No leaks shall occur when observed for 5 minutes. If leaks occur at the seams, the tank must be replaced. Replace damaged or missing rubber pads.

d. Assembly.

(1) Install inlet stainer (12).

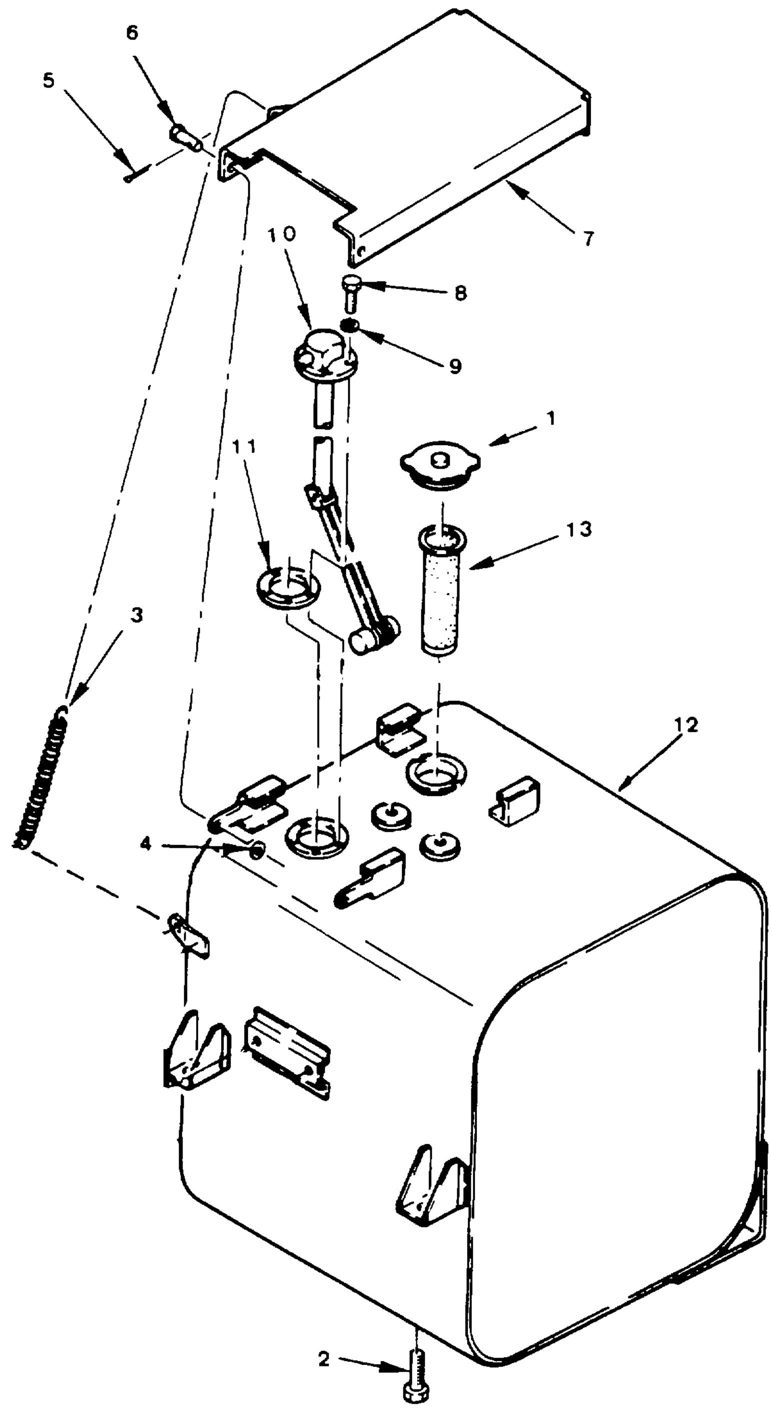
(2) Install gasket (11) and gage (10). Secure gage (10) with four flat washers (9) and panhead screw (8).

(3) Install a fifth panhead screw(8) and washer (9) to secure terminal A7E1 of electrical lead.

(4) Aline cover (7) with brackets in tank (12). Insert two clevis pins (6) through cover and bracket. Place two flat washers (4) over two clevis pins (6) and secure with two cotter pins (5). Assemble spring(3) to cover (7) and to tank (8). Install plug (2).

NOTE

Section VII.1 applies to Loader (Multifuel Engine) Part Number 50008600.
Section VII applies to Louder (Gasoline Engine) Part Numbers 9099200, 50092260 or 50092266.



1. CAP
2. PLUG
3. SPRING
4. WASHER, FLAT
5. PIN
6. PIN
7. COVER
8. SCREW
9. WASHER
10. GAGE
11. GASKET
12. TANK
13. INLET STRAINER

Figure 4-36. Disassembly of Fuel Tank

SECTION VIII. (SEE NOTE) OVERHAUL OF LOADER ELECTRICAL INSTALLATION

4-21. Distribution Box (Figs. 4-37, 438, and 4-39)

a. Removal and Installation. RefertoTM9-1450 500-20-1.

b. Disassembly.

NOTE

The key numbers shown below in parentheses refer to figure 642 except where otherwise indicated.

(1) Separate distribution box panel assembly (11) from instrument box assembly (25) by loosening six captive screws(10) and unscrewing bulkhead fitting nut (60, Fig. 4-39). Pull the distribution box panel assembly straight out. Put bulkhead fitting nut (60, fig. 4-39) fingertight.

CAUTION

Be extremely careful not to pull the distribution box panel assembly out too far as damage to electrical connections could result.

(2) Remove wiring harness connectors on the distribution box panel assembly from the distribution box assembly by removing four pan-head screws (2), hex nuts (10), and lockwashers (9), pan-head screws (28), hex nuts (13), and lockwashers (14), and by unscrewing connector cover assembly (1).

NOTE

Identify and tag all electrical connections to facilitate proper locating at assembly.

(3) Identify, tag, and disconnect all electrical connections to the three circuit breakers in the distribution box assembly by removing six terminal screws (3) from their terminals.

NOTE

Terminal screws (3) are parts supplied with their respective circuit breakers, and should be put back into their terminal screw holes to prevent their being misplaced or lost. This is also suggested for all other items supplied with mounting or attaching hardware.

(4) Identify, tag, and disconnect electrical connections to electrical relay(19) by removing three relay cover screws (15), relay cover (16), eight terminal nuts (17) and eight terminal washers (18). Remove relay electrical lead (5) by removing four pan-head screws (27), hex nuts (7), and lockwashers (6). Remove two relay electrical jumpers(8). Put eight terminal washers(18), eight terminal nuts (17), relay cover (16), and three relay cover screws (15) back in their appropriate locations.

(5) Identify, tag, and disconnect all grounded leads from grounding stud (29), by removing two grounding nuts (22), lockwashers (23), and grounding washers (24). Remove grounding stud (1).

CAUTION

Separate distribution box panel assembly (11) from distribution box assembly (25). Make sure that all electrical leads have been identified, tagged, and disconnected.

(6) Remove CB2 electrical load (4) from distribution box utility outlet.

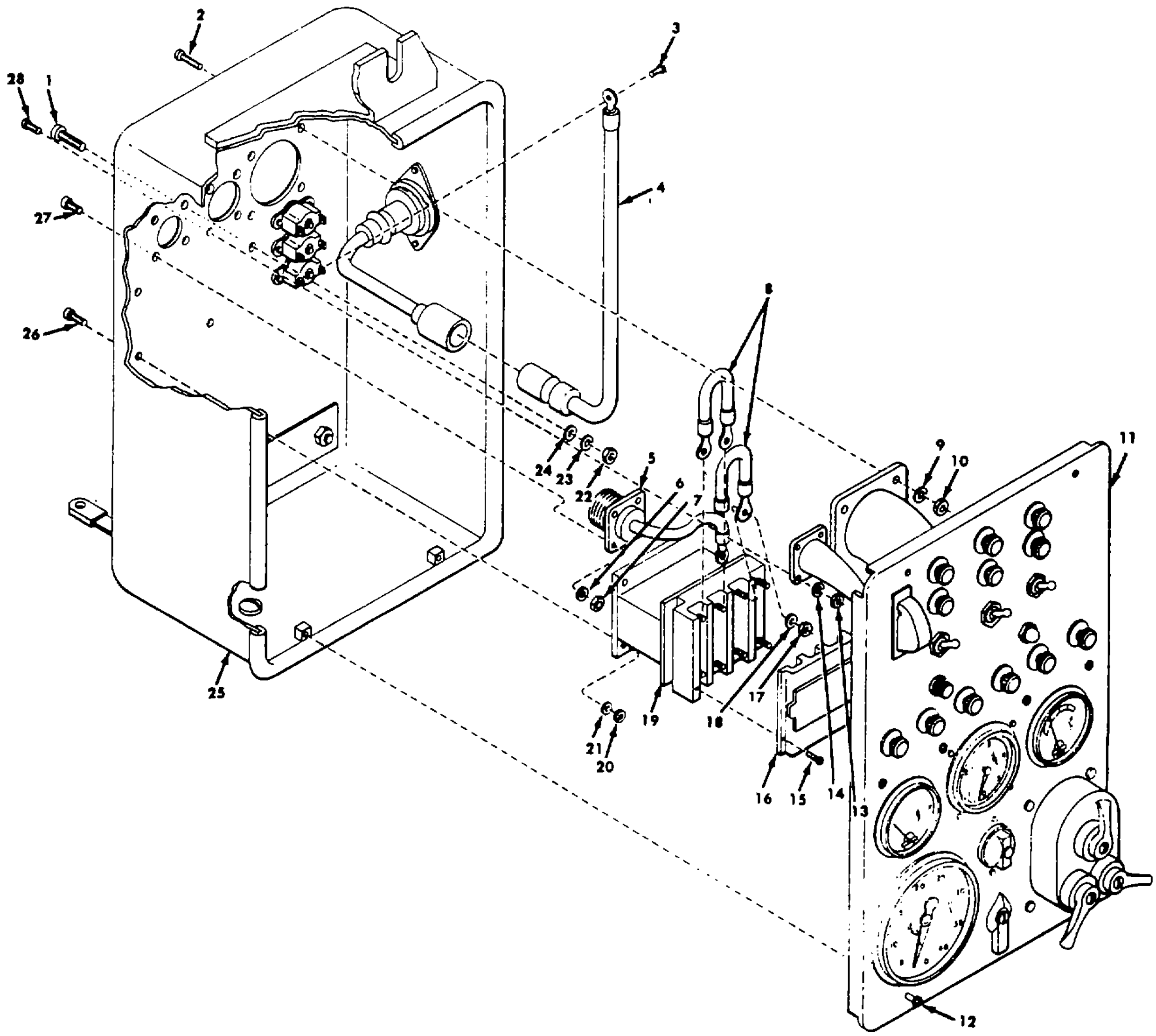
(7) Separate electrical relay (19) from the distribution box assembly by removing four pan-head screws (26), hex nuts (20), and lockwashers (21).

NOTE

The key numbers shown below in parentheses refer to Figure 4-38 except where otherwise indicated.

NOTE

Section VIII applies to Loader (Gasoline Engine) Part Numbers 9099200, 50092260 or 50092266.
Section VIII.1 applies to Loader (Multifuel Engine) Part Number 50008600.

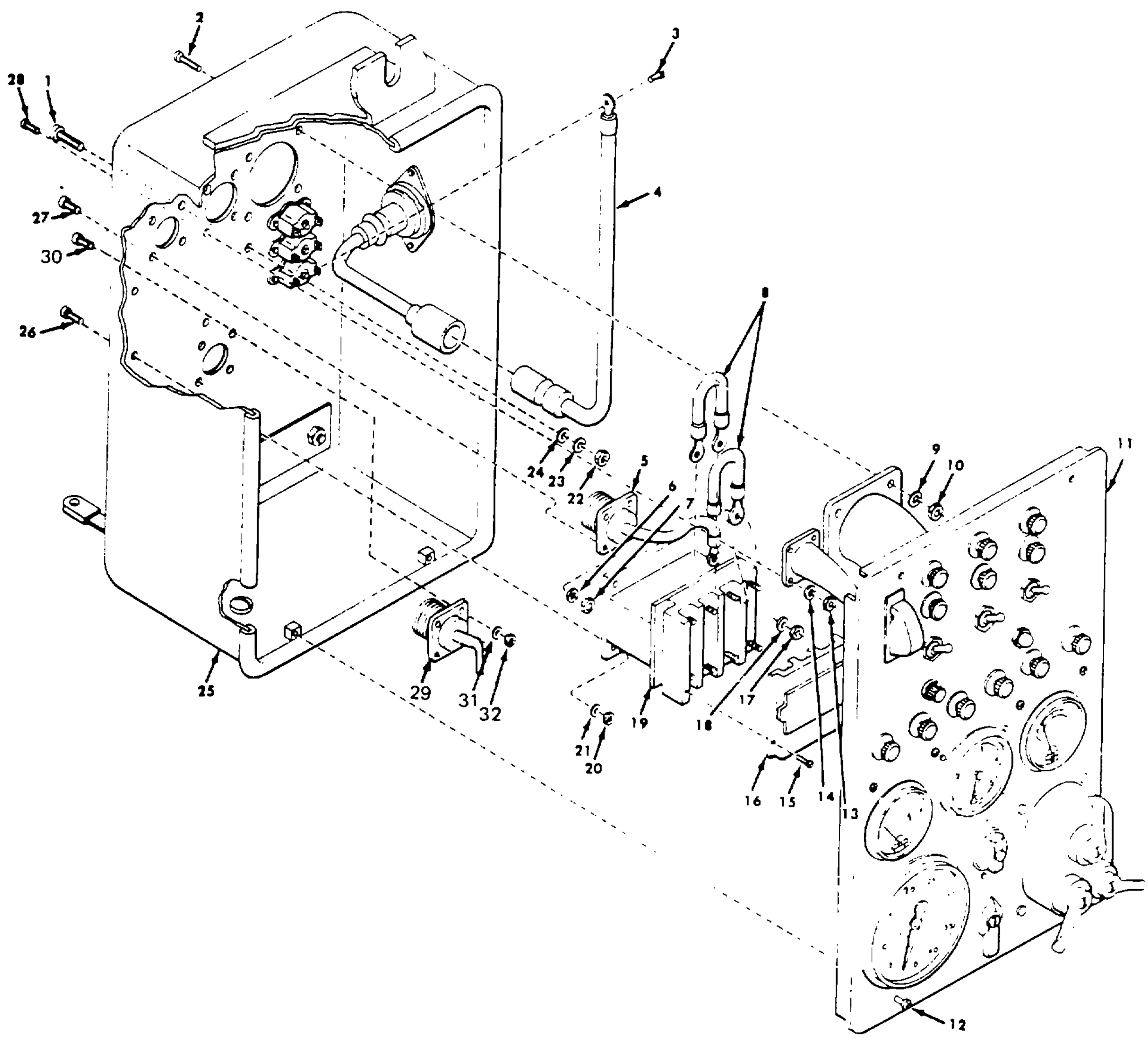


NHK 725

1–Grounding stud
2–Pan-head screw
3–Terminal screw (CB1, CB2, and CB3)
4–CB2 electrical lead.
5–Relay electrical lead
6–Lockwasher
7–Hex nut
8–Relay electrical jumpers
9–Lockwasher
10–Hex nut
11–Distribution box panel assembly
12–Captive screw
13–Hex nut
14–Lockwasher
15–Relay cover screw
16–Relay cover
17–Terminal nut
18–Terminal washer
19–Electrical relay
20–Hex nut
21–Lockwasher
22–Ground nut
23–Lockwasher
24–Grounding washer
25–Distribution box assembly
26–Pan-head screw
27–Pan-head screw
28–Pan-head screw

Note: Provided NAMWO 9–1450–500–30/31 has not been applied.

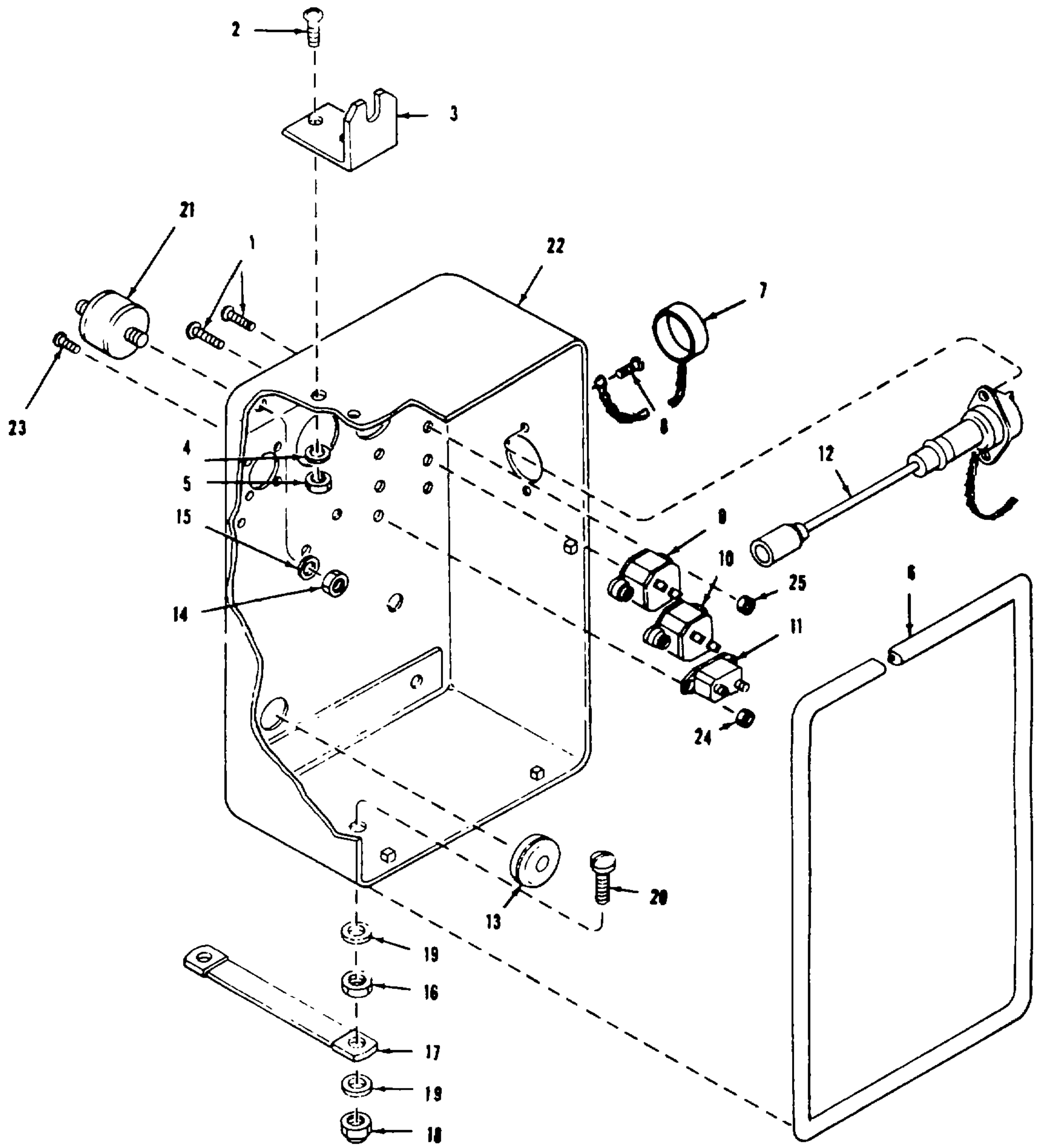
Figure 4-37. Separation of Distribution Box and Distribution Box Panel Assemblies (Sheet 1 of 2)



1. GROUNDING STUD
2. PAN-HEAD SCREW
3. TERMINAL SCREW (CB1, CB2 AND CB3)
4. CB2 ELECTRICAL LEAD
5. RELAY ELECTRICAL LEAD
6. LOCKWASHER
7. HEX NUT
8. RELAY ELECTRICAL JUMPERS
9. LOCKWASHER
10. HEX NUT
11. DISTRIBUTION BOX PANEL ASSEMBLY
12. CAPTIVE SCREW
13. HEX NUT
14. LOCKWASHER
15. RELAY COVER SCREW
16. RELAY COVER
17. TERMINAL NUT
18. TERMINAL WASHER
19. ELECTRICAL RELAY
20. HEX NUT
21. LOCKWASHER
22. GROUND NUT
23. LOCKWASHER
24. GROUNDING WASHER
25. DISTRIBUTION BOX ASSEMBLY
26. PAN-HEAD SCREW
27. PAN-HEAD SCREW
28. PAN-HEAD SCREW
29. ELECTRICAL CONNECTOR (See Note)
30. SCREW (See Note)
31. WASHER (See Note)
32. NUT (See Note)

Note: Provided NAMWO 9—1450—500—30/31 has been applied.

Figure 4-37. Separation of Distribution Box and Distribution Box Panel Assemblies (Sheet 2 of 2)



1–Pan-head screw
2–Pan-head screw
3–Support bracket
4–Flat washer
5–Hex nut
6–Box assembly gasket
7–Connector cover assembly
8–Lockwasher screw
9–Circuit breaker (CB1)
10–Circuit breaker (CB2)
11–Circuit breaker (CB3)
12–Utility outlet assembly
13–Split rubber grommet
14–Safety nut
15–Flat washer
16–Hex nut
17–Grounding strap
18–Self-locking nut
19–Flat washer
20–Pan-head screw
21–Vibration insulator
22–Distribution box
23–Screw
24–Nut
25–Nut

Figure 4-38. Disassembly of Distribution Box Assembly.

(8) Remove support bracket (3) by removing two pan-head screws (2), hex nuts (5), and flat washers (4).

(9) Remove distribution box assembly gasket (6) by scraping under cemented portions of gasket with a dull blade and peeling back progressively along both inner and outer sealed edges. Pull gasket from distribution box (22).

NOTE

Unless box assembly gasket is perforated, crystallized, worn or broken, it is not necessary to remove.

(10) Identify, tag, and remove circuit breakers (9, 10, and 11) by removing four pan-head screws (1) with four nuts (25) and two pan-head screw (23) with two nuts (24).

(11) Remove utility outlet assembly (12) by unscrewing its connector cover (part of assembly) and removing two lockwasher screws (8). Remove connector cover assembly (7).

NOTE

Since connector cover and chain are a pat of utility outlet assembly (12), the connector cover should be screwed beck onto the connector to prevent loss of the cover and chain.

(12) Remove split rubber grommet (13) by pinching toward center and pulling out from hole.

(13) Remove grounding strap (17) by removing self-locking nut (18), two flat washers (19), hex nut (16), and pan-head screw (20).

(14) Remove four vibration insulators (21) by removing four safety nuts (14) and flat washers (15).

NOTE

The key numbers shown below in parentheses refer to Figure 4-39 except where otherwise indicated.

NOTE

When complete disassembly of the distributor box panel assembly is required, it is advisable to disconnect, identify and tag all electrical leads to the terminal board assembly (4) and on the wiring harness (1) as one operation before removing any of the controls and indicators from the distribution panel (44). If complete disassembly is not required, it is necessary only to disconnect the electrical leads or connector to that individual control or indicator to be removed. The 12 diodes (5), which are mounted on the terminal board assembly, do not have to be removed unless it is determined during inspection that the diodes are defective. It is extremely important that leads to the diodes be properly identified to insure correct connections and proper operation of the indicator lights upon assembly. If there is any doubt as to their proper biasing, refer to the distribution box electrical schematic in TM 9-1450-500-20.

(15) Remove terminal board assembly (4) and 12 diodes (5), together, by removing four pan-head screws (24), hexnuts (2), and lockwashers (3).

(16) Identify, tag, and remove toggle switch (8) by removing two pan-head screws (29), two lockwashers (28), toggle switch guard (27), and toggle switch boot (26).

(17) Remove three circuit breakers (10) by removing jam nut (21) and keying washer (15).

NOTE

Preformed packing (13) is delivered with the circuit breaker. It is not necessary to remove shouldered washer (14) which is bonded to panel (44) with zinc chromate putty.

(18) Remove 12 indicator light assemblies (19) by removing 12 mounting nuts (I1), flat washers (12), and panel sealing gaskets (18).

NOTE

Identify and tag each indicator light assembly to obtain proper lead length, and proper orientation for assembly.

(19) Remove pushbutton switch (22) by removing stop nut (16), mounting nut (17), and panel sealing gasket (20).

(20) Remove battery-generator indicator (30) by removing two hex nuts (6), two lockwashers (7), and meter mounting bracket (9).

(21) Remove fuel-level gage (37) by removing two hex nuts (51), two lockwashers (50), and meter mounting bracket (49).

(22) Remove tachometer (41) by removing two hex nuts (47), two lockwashers (46), and meter mounting bracket (45).

(23) Remove rotary switch assembly (48) by removing round-head screw (38), flat washer (39), and switch lever assembly (40).

(24) Remove indicator light assembly (52) by unscrewing light assembly lens (42), panel-sealing gasket (43), and removing two pan-head screws (36) and lockwashers (35).

(25) Remove rotary light switch assembly (53) by removing four pan-head screws (25) and lockwashers (23).

NOTE

It may be necessary to rotate switch levers and the mechanical camlock to enable orientation and removal of the rotary light switch assembly.

(26) Remove rheostat (54) by removing control knob (32) and mounting nut (31).

(27) Remove hydraulic pressure gage (55) and associated parts by removing four pan-head screws (34) and lockwashers (33).

(28) Disconnect bulkhead fitting nut (60), two 90-degree elbows (59), high pressure hose assembly (61), pressure back-up gasket (56), tube fitting gasket (57), and hydraulic tube fitting (58) from hydraulic pressure gage (55).

c. *Inspection.*

NOTE

The following paragraphs cover two types of inspection procedures, visual inspection, and functional testing. Generally, these procedures will follow the same chronological sequence so that of the legends for figures 4-37, 4-38, and 4-39.

(1) Distribution box (22, Fig. 4-38), and distribution panel (44, Fig. 4-39). Inspect the distribution box and panel for cracks and broken welds. Repair or replace as necessary. If the identification callouts on the distribution panel have become illegible, paint on new callouts using Figure 4-60 as a guide.

(2) CB2 Electrical lead (4, Fig. 4-37), relay electrical lead (5, Fig. 4-37), relay electrical jumpers (8, Fig- 4-37), utility outlet assembly (12, Fig. 4-38), wiring hamess assembly (Fig. 4-39).

(a) Visual inspection. Visually inspect all wiring and insulation covering for evidence of shorts, insulation breakdown, or abrading away of the protective coverings. Inspect all connector dielectrics for cracks or breaks that could permit flashover. Also inspect all connector threads for stripping, marring, or crossed threads. Replace defective parts.

(b) Continuity and circuit shorts. Using a standard ohmmeter, check each individual connector contact, conductor, and wire lead for continuity and circuit shorts. Check the connectors shells for any circuit shorts or grounding between them and the contacts, conductors, or wire leads. Replace defective parts.

(3) *Electrical relay* (19, Fig. 4-37)

NOTE

Since construction of the relay does not permit internal visual inspection of contacts or relay coil insulation, internal conditions will be determined by the following functional tests. External visual inspection will be performed for any obvious defects such as damage to the case terminal post threads or the breaking away of the terminal posts.

(a) *Short circuits continuity, and spring-load failure*. Using any standard ohmmeter, check for existing circuit shorts between each of the eight terminals (X1, X2, A1, A2, B1, B2, C1, and C2) and the relay case. Also check for continuity between terminals A1 and A2, between B1 and B2, and between C1 and C2 while the relay is deenergized.

NOTE

Existing continuity under any of the conditions in the above paragraph is an indication that either a short circuit exists or the spring-load return mechanism has failed. In either case, the relay must be replaced and it becomes unnecessary to subject the relay to any of the succeeding tests.

(b) Pickup voltage. Using suitable indicating devices (see suggested test set up in Fig. 4-40), apply a varying electrical potential from zero to 28 volts dc to the relay coil to determine that the relay contacts close at no greater potential level than 18 volts.

CAUTION

Do not apply more than 29 volts dc to the relay coil as damage may result.

(c) Dropout voltage. Using suitable indicating devices (see Fig. 4-40), apply 28 volts dc to the relay coil. Vary the potential from 28 volts to zero to determine that the contacts open between 17 and 1.5 volts (nominally at 7 volts).

NOTE

It may be desirable to combine the pickup and dropout voltage tests into one test, checking each pair of contacts as noted in Figure 4-40.

(d) Coil current. Using suitable indicating devices (see suggested test set up in Fig. 4-41), apply 18 volts dc to the relay coil and measure the coil current 10 seconds after application of voltage. Current should be 1.5 amperes.

(4) Vibration insulators (21, Fig. 4-38), box assembly gasket(6, Fig. 4-38), and split rubber grommet (13, Fig. 4-38). Inspect for crystallization, torn places, milling, or permanent set or perforations. Replace defective parts.

(5) *Circuit breakers (9, 10, and 11, fig. 4-38).*

(a) Visual inspection. Visually inspect the circuit breaker cases and mounting wings for damage and for the absence of clinch-nut mountings. Inspect terminal tabs to insure their presence and for sufficient tightness. Also check the terminal screw hole threads for crossed or stripped threads. Replace defective circuit breakers.

(b) Overload test. Using suitable indicating device (see suggested test setup in figure 4-42), apply 24 volts dc to the circuit breaker after first adjusting variable load resistor so that 115 percent of circuit breaker-rated current is indicated on the ammeter(5.75 amperes for CB3, 11.50 amperes for CB1, and 17.25 amperes for CB2). Hold for approximately 5 minutes to determine that the circuit breaker does not open its circuit. Adjust the variable load resistor so that 200 percent of circuit breaker-rated current is indicated on the ammeter (10 amperes for CB3, 20 amperes for CB1, and 30 amperes for CB2).

CAUTION

Each and every circuit breaker should open its circuit within 100 seconds at 200 percent rated load. If any circuit breaker does not meet this requirement, it must be replaced as damage to electrical circuitry could result.

(6) *Terminal board assembly (4, fig. 4-39) and diodes (5, Fig. 4-39).*

(a) Wiring continuity. Using any standard ohmmeter, check for continuity between all junctions and terminals not blocked by diodes.

(b) Forward current flow. At normal ambient room temperature and using suitable indicating device (see suggested test setup in figure 4-43) apply 24 volts dc to the diode under test (negative to emitter and positive to collector). The indicator light should illuminate.

(c) Reverse voltage breakdown. At normal room temperature, and using suitable indicating device, apply zero to 27 volts dc to the diode under test (positive to emitter and negative to collector).

NOTE

Reverse breakdown should not occur until a nominal electrical potential of 27 volts dc is applied. Replace defective diodes.

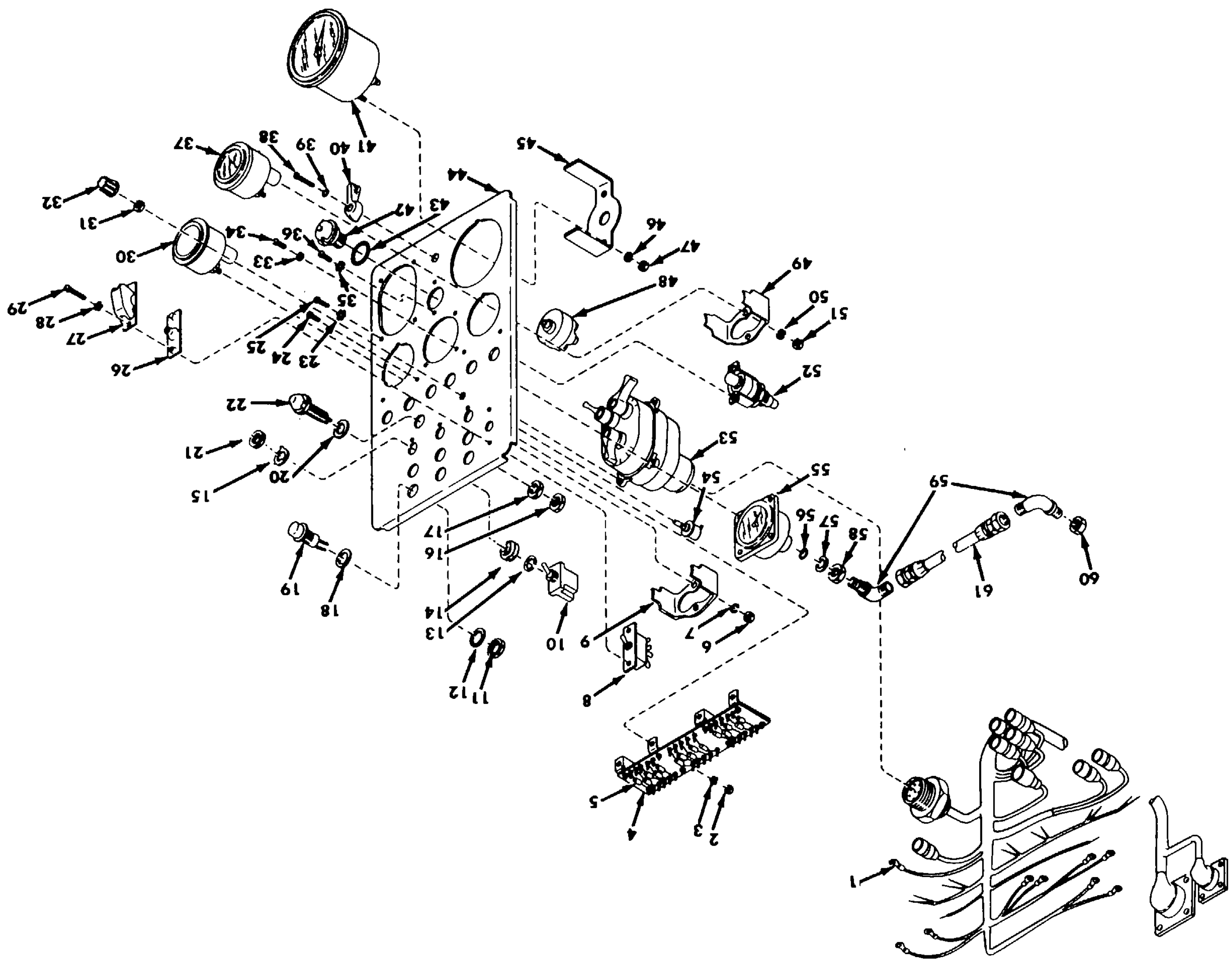


Figure 4-39. Disassembly of Distribution Box Panel Assembly (Sheet 1 of 2).

1. Wiring harness assembly
2. Hex nut
3. Lockwasher
4. Terminal board assembly
5. Diode
6. Hex nut
7. Lockwasher
8. Toggle switch
9. Meter retaining bracket
10. Circuit breaker (CB4, CB5, and CB6)
11. Mounting nut
12. Flatwasher
13. Preformed packing
14. Shouldered washer
15. Keying washer
16. Stop nut
17. Mounting nut
18. Panel sealing gasket
19. Indicator light assembly
20. Panel sealing gasket
21. Jam nut
22. Pushbutton switch
23. Lockwasher
24. Pan-head screw
25. Pan-head screw
26. Toggle switch boot
27. Toggle switch guard
28. Lockwasher
29. Pan-head screw
30. Battery-generator indicator
31. Mounting nut
32. Control knob
33. Lockwasher
34. Pan-head screw
35. Lockwasher
36. Pan-head screw
37. Fuel-level gage
38. Round-head screw
39. Flat washer
40. Switch lever assembly
41. Tachometer
42. Light assembly
43. Panel sealing gasket
44. Distribution panel
45. Meter mounting bracket
46. Lockwasher
47. Hex nut
48. Rotary switch assembly
49. Meter mounting bracket
50. Lockwasher
51. Hex nut
52. Indicator light assembly
53. Rotary light switch assembly
54. Rheostat (variable resistor)
55. Hydraulic pressure gage
56. Pressure back-up gasket
57. Tube fitting gasket
58. Hydraulic tube fitting
59. 90° elbow
60. Bulkhead fitting nut
61. High pressure hose assembly

Figure 4-39. Disassembly of Distribution Box Panel Assembly (Sheet 2 of 2).

(7) Toggle switch (8, Fig. 4-39), circuit breakers (10, Fig. 4-39), pushbutton switch (22, Fig. 4-39), and rotary switch assembly (48, Fig. 4-39).

(a) Visual inspection. Visually inspect all switches and their terminals and receptacles for any defects that could render the switches inoperable, such as broken easings or armatures, or cracks and breaks in the receptacles that could permit flashover. Also inspect receptacle threads for stripping, marring, or cross threading. Replace defective parts.

(b) Make and break continuity. Using standard ohmmeter connected to both terminals, operate the switch or circuit breaker to each ON" and OFF" position several times to determine that continuity is being made and broken.

(8) *Rotary light assembly (53, fig*. 4-39).

(a) Internal circuit breaker. Using suitable indicating device (see suggested test setup in fig. 646), connect the negative terminal of the power supply to pin M and the positive terminal to pin F, making sure that the variable load resistor is turned to its minimum load position. Turn the main switch to the SER DRIVE position and adjust the variable load resistor so that 115 percent of the circuit-breaker-rated current (23 amperes) is indicated on the ammeter. Hold for approximately 5 minutes to determine that the circuit breaker does not open the circuit. Then adjust the variable load resistor so that 200 percent of the circuit breaker-rated current (40 amperes) is indicated on the ammeter.

(b) Make and break continuity. With one lead of standard ohmmeter connected to terminal F, test the switch positions shown in table 4-1 and their related terminals first to determine that they make continuity, then by switching to some other position to determine that they break continuity.

CAUTION

This test also serves as a random internal circuit short indication. Should the ohmmeter indicate continuity between a terminal and any other unrelated switch position. and internal circuit short does exist and the rotary light switch assembly (53, fig. 4-39) must be replaced.

NOTE

Pin F (not shown in Table 4-1) is for battery input common. Also, when the switch assembly is in its STOPLIGHT and both BO positions, there should be continuity between pins K (stop light switch side) and C (service stop light) and between K and N (BO stop light).

(c) Mechanical interlock. Place the main switch in the B O MARKER position. The mechanical interlock switch must remain in the LOCK position. Place the main switch in the B O DRIVE position. The mechanical interlock switch must be held in the UNLOCK position.

WARNING

With both switches in the positions above indicated, it must be impossible to make any other switch positions with the main switch and any switch position other than OFF with the auxiliary switch. There should be no continuity between pin F and any other pins other than pins A, E, and D as tested in (c) above. Should rotary light switch assembly (53, Fig. 4-39) fail to comply with this requirement, destruction of both personnel and equipment could result by the giving away of their tactical position to the enemy.

(d) Connect shell circuit shorts. Using standard ohmmeter, check the connectors for any circuit shorts between the shells and pins.

(9) *Indicator light assemblies (19 and 52,fig*. 4-39).

(a) Visual inspection. Visually inspect light assemblies for cracked or broken lenses, stripped or crossed bushing and mounting hole threads, dents or cracks in the case, and the presence of a lamp in the socket. Replace defective indicator light assemblies.

(b) Glow and continuity test. Apply 24 volts dc to the terminals, and if the lamp does not light, remove the lamp and perform a continuity check of terminal-to-socket elements to determine that the connections are intact. Replace with new lamp and perform glow test again. If light assembly does not function, replace with new unit.

(10) *Battery-generator indicator (30, fig*. 4-39).

(a) Visual inspection. Visually inspect the battery-generator indicator for a cracked or broken window, stripped or crossed threads on the mounting or grounding studs, dents in the case, or any other defect that could render the indicator inoperable.

(b) Connector to case short. Using standard ohmmeter, check for continuity between the input connector and the case. If continuity exists, the indicator is defective and should be replaced.

(c) Scale error test. Use test setup shown in Figure 4-4 4 Apply 18 volts dc to the indicator. Scale deflection)f needle should be 24° 33' ± 20 to the left from the vertical centerline. Apply 26 volts dc to the indicator. Scale deflection of needle should be centered on vertical centerline within ± 2°. Apply 32 volts dc to the indicator. Scale deflection of the needle should be 24° 33' clockwise from the vertical centerline.

NOTE

If the battery-generator does not comply with the above requirements, it is defective and must be replaced.

(11) *Fuel-level gage (37, fig*. 4-39).

(a) Visual inspection. Perform step (10) (a) above with exception of grounding stud threads inspection.

(b) Connectors to case short. Perform step (10) (b) above on both input and ignition connectors.

Table 4-1. Switch Positions and Related Connector Pins.

Control	Switch position	Connector pin (s)
Main switch	SER DRIVE	A, H, J and M
Main switch	STOP LIGHT	A and J
Main switch	OFF	None
Main switch	BO MARKER	A and E
Main switch	BO DRIVER	A, D and E
Auxiliary switch	PANEL BRT	B
Auxiliary switch	PANEL DIM	B
Auxiliary switch	OFF	None
Auxiliary switch	PARK	L

(c) Scale error test. Use setup shown in Figure 4-45. Apply zero ohms resistance in series with the indicator with an input voltage at the ignition connector of 28.5 ± 0.2 volts dc. Scale deflection of the needle should be 27° ± 2° to the right from the vertical centerline. Adjust the calibrated variable resistor to 15 ohms with the same voltage applied. Scale deflection of the needle should be centered on the vertical centerline ± 20. Adjust the calibrated variable resistor to 30 ohms. Scale deflection of the needle should be 27° ± 3° to the left from. the vertical centerline.

NOTE

If the fuel-level indicator does not comply with the above inspection requirements, it is defective and must be replaced.

(12) *Tachometer (41, figure* 4-39).

(a) Visual inspection. Perform procedure covered in (10) (*a*) above with exception of grounding stud threads inspection. Also inspect square coupling hole in drive shaft for deformation.

(b) Functional test and calibration. Test and calibrate in accordance with TM 9-1829A.

(13) *Rheostat (variable resistor) (54, fig*. 4-39).

(a) Visual inspection. Visually inspect the rheostat (variable resistor) bushing threads for cross threading or stripping, inspect the shaft to determine that it is free to rotate, inspect the casing and knob for cracks or breaks, and inspect the knob setscrew mating threads to insure that they are not stripped. Replace defective rheostats.

(b) Resistance check. Using Standard voltmeter connected as shown in suggested test setup in Figure 4-46 apply 24 volts dc to the two input terminals (outside) and rotate the control knob clockwise to its extreme position. Voltage indicated should be 24 volts. Rotate the control knob fully counterclockwise. Voltage indicated should be minimum.

(c) Element shorts. Using standard ohmmeter, check for continuity between all three terminals and the outside case on metal case variable resistors. If continuity exists, the variable resistor is defective and should be replaced.

(14) *Hydraulic pressure gage (55, fig*. 4-39).

*(*a) Visual *inspection*. Visually inspect the hydraulic pressure gage and its inlet port for any defects that could render the gage inoperable, such as broken glass, bent indicator needle, marred face markings, cracked case, and stripped or crossed threads. Replace defective gages.

(b) Operating proof pressure and leakage test. Refer to UUT manual.

d. Assembly.

NOTE

The key numbers shown below in parentheses refer to Figure 4-38 except where otherwise indicated.

(1) Insert the shorter of two studs on four vibration insulators (21) and secure with four flat washers (15) and safety nuts (14).

(2) Attach grounding strap (17) to distribution box (22) with pan-head screw (20), hex nut (16), two flat washers (19), and self-locking nut (18) in order as shown in Figure 4-39. Orient the grounding strap so it is perpendicular to the back of the distribution box.

(3) Pinch rubber grommet (13) and insert into mounting hole.

(4) Install utility outlet assembly (12) in its mounting hole. Screw on the connector cover and secure the utility outlet and the connector cover chain (7) with two lockwasher screws (8).

(5) Install circuit breakers (9, 10, and 11) and secure with four pan-head screws (1) with four nuts (25) and two pan-head screws (23) with two nuts (24).

CAUTION

Circuit breakers (9, 10, and 11) must be located so that CB1 (9) is at the top, CB2 (10) in the middle, and CB3 (11) is at the bottom to prevent overloading. CB1 is rated at 10 amperes, CB2 at 15 amperes, and CB3 at 5 amperes.

(6) If box assembly gasket (6) has been removed, install the new gasket.

(7) Install and secure support bracket (3) with four pan-head screws (2), flat washers (4), and hex nuts (5).

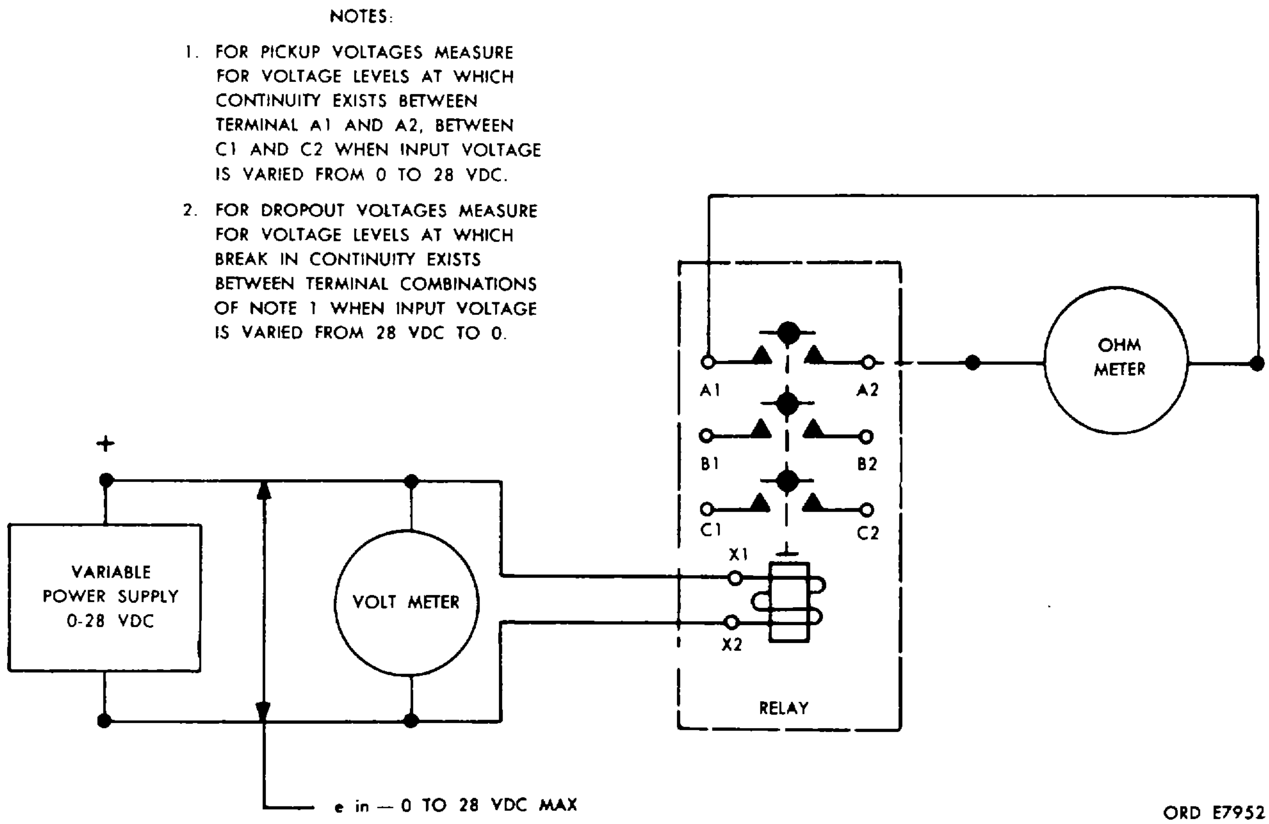


Figure 4-40. Relay Pickup and Dropout Voltages Test Setup.

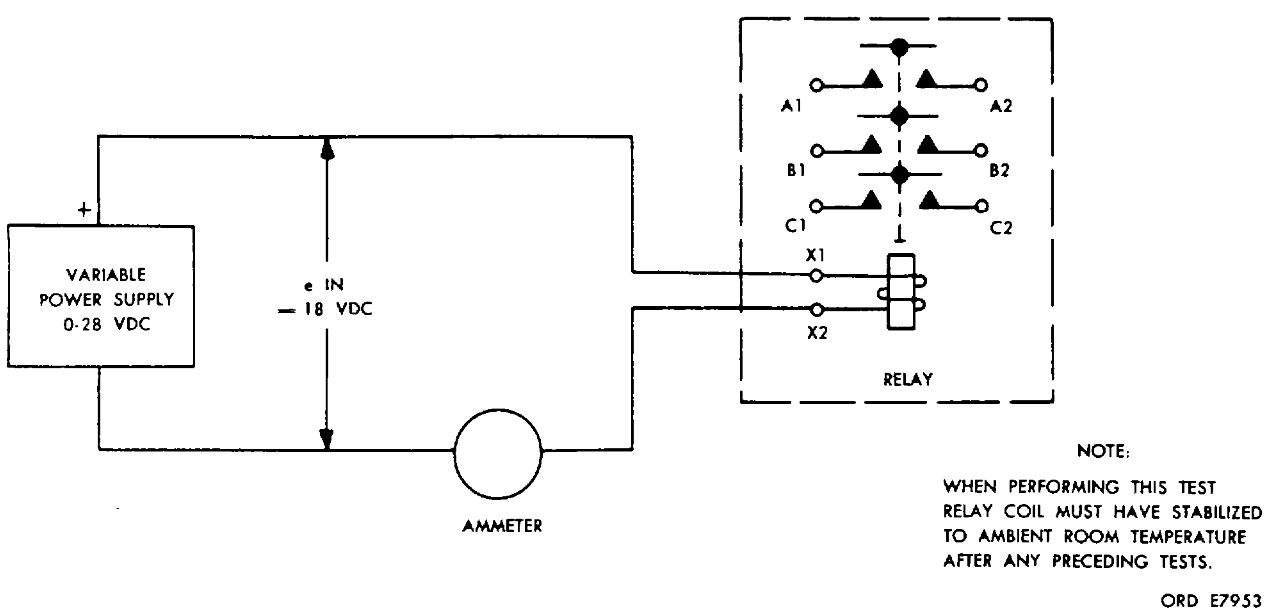


Figure 4-41. Relay Coil Current Test Setup.

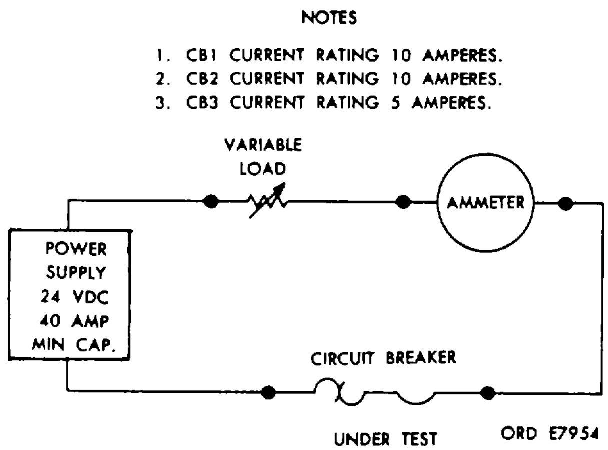


Figure 4-42. Thermal Switch Overload Breaker Test Setup.

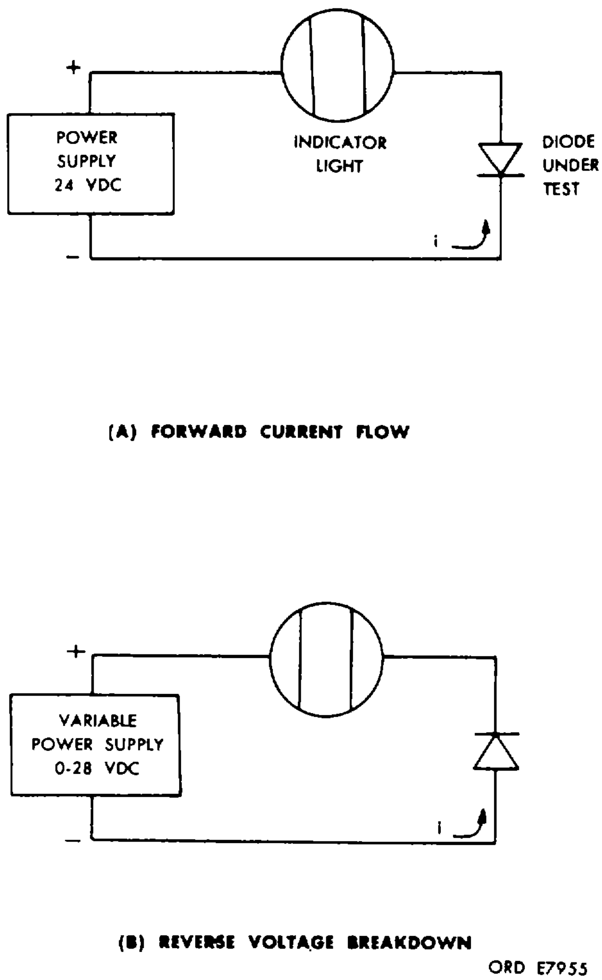


Figure 4-43. Crystal Rectifier Test Setup.

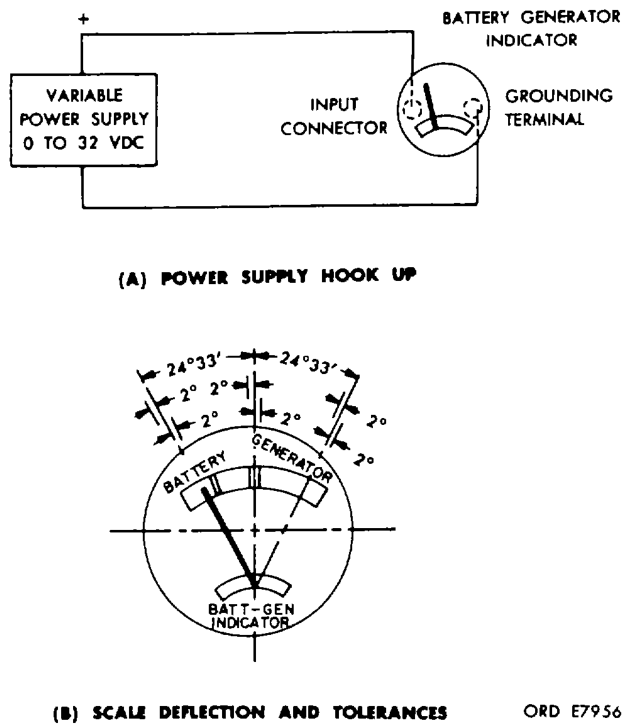


Figure 4-44. Battery-Generator Indicator Scale Error Test Setup.

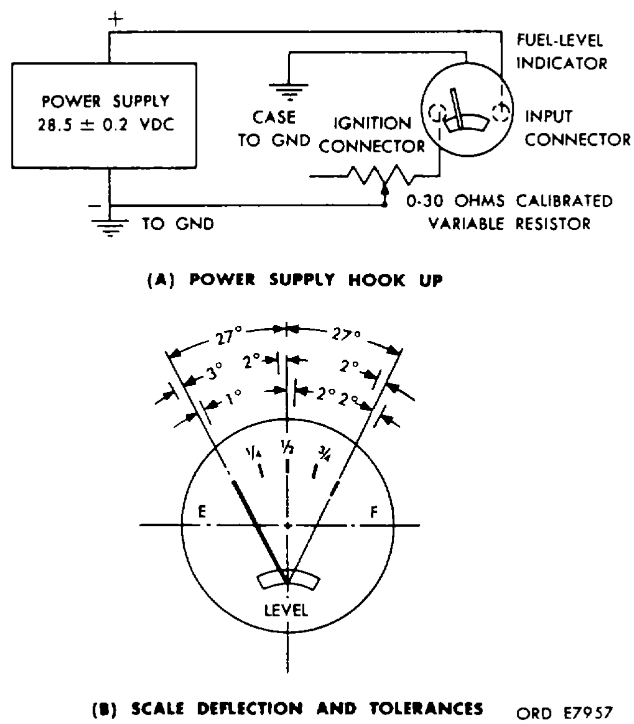


Figure 4-45 Fuel Level Indicator Scale Error Test Setup.

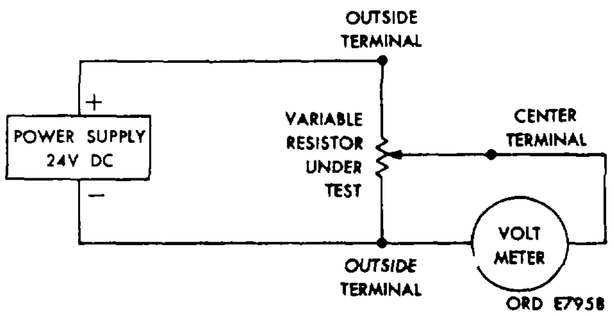


Figure 4-46. Variable Resistance Test Setup.

NOTE

The key numbers shown below in parentheses refer to Figure 4-39 except where otherwise indicated.

(8) Screw both elbows (59) onto the high pressure hose assembly. Add hydraulic tube fitting (58) and tube fitting gasket (57). Orient completed assembly to hydraulic pressure gage (55) as shown in figure 4-39.

NOTE

Bulkhead fitting nut (60) is not to be installed until after the distribution panel and distribution box are assembled.

CAUTION

Be extremely careful not to tighten hose connections too much as split connections may result.

(9) Attach hydraulic pressure gage (55) and its associated parts by orientating the gage to the distribution panel (44) and securing with four pan-head screws and lockwashers.

(10) Insert rotary switch assembly (48) through the back of the panel and secure switch lever assembly (40) to the switch assembly with round-head screw and flat washer (38 and 39).

(11) Install rheostat (54) to the distribution panel with the three solder lugs pointing down. Secure control knob (32) to the rheostat shaft by tightening setscrew.

(12) If necessary, rotate switch levers and the mechanical camlock inward and install rotary light switch assembly (53) to the distribution panel and secure with four pan-head screws and lockwashers (25 and 23).

(13) Insert indicator light assembly (52) into its mounting hole. Attach with two pan-head screws and lockwashers. Install light assembly lens (42) and panel sealing gasket by inserting and screwing finger-tight on the front side of the panel.

CAUTION

Be sure not to tighten light assembly lens too much as lens is plastic and may crack.

(14) Install tachometer (41) on the front side of the panel. Place meter mounting bracket (45) over the securing studs on the back side. Secure with two lockwashers and hex nuts (46 and 47).

CAUTION

If the tachometer is dropped, bumped or subjected to any extremes in shock or vibration, it must be replaced with another unit as it may be knocked out of calibration.

(15) Install fuel-level gage (37) on the front side of the panel. Place meter mounting bracket (49) over the securing studs on the back side. Secure with two lockwashers and hex nuts (50 and 51).

(16) Install battery-generator indicator (6) on the front of the panel. Place meter mounting bracket (9) over the securing studs on the back side. Secure with two lockwashers and hex nuts (7 and 6).

(17) Install pushbutton switch (22) and panel sealing gasket (20) on the front side of the panel so the solder lugs are parallel to the vertical centerline. Secure on the back side with mounting nut and stop nut (17 and 16).

(18) Install 12 indicator lamp assemblies (19) and panel sealing gaskets (18) on the front of the panel and secure with 12 flat washers and mounting nuts.

(19) Insert three circuit breakers (10) on the back of the panel by first mounting packings (13), shouldered washers (14), and keying washers (15) and jam nuts (21) on the front of the panel. If shouldered washers (14) have been removed apply a light coat of zinc chromate putty around flanges and shoulders to insure proper tightness.

NOTE

The three circuit breakers (10) must be oriented so that the circuit open or OFF position is down.

(20) Insert toggle switch (8) into the back side of the panel. Install the toggle switch boot (26) and toggle switch guard (27). Secure with two pan-head screws (29) and lockwashers (28).

NOTE

Toggle switch (8) must be carefully installed to the panel to insure proper operation. It must be positioned so that when the toggle lever is switched up, the MISSILE LATCHED RELEASE coil circuit is energized.

(21) Install terminal board assembly (4) and 12 diodes (5) and secure with four pan-head screws (24), lockwashers (3), and hex-nuts (2). Solder all electrical connections.

NOTE

If any diodes must be replaced, it is important that they be connected properly by direction of current flow. Refer to distribution box electrical schematic in TM 9-1450-500-20-1.

(22) Install wiring harness (1) to the distribution panel assembly. Refer to the electrical schematic in TM 9-1450-500}20-1.

NOTE

The key numbers shown below in parentheses refer to Figure 4-37 except where otherwise indicated.

(23) Install electrical relay (19) into distribution box assembly (25) and secure with four pan-head screws (26), lockwashers (21), and hex nuts (20).

(24) Plug CB2 electrical lead (4) to distribution box assembly utility outlet.

(25) Insert grounding stud (1) and secure with one of the two lockwashers (23) and one of the two ground nuts (22). Connect all grounding leads to the grounding stud between the two grounding washers (24). Secure with the other lockwasher (23) and ground nut (22).

NOTE

Refer to distribution box electrical schematic in TM 9-1450-500-20-1.

(26) Remove electrical relay cover (16) by unscrewing three relay cover screws (15). Remove eight terminal nuts (17) and terminal washers (18). Install relay electrical lead (5), two relay electrical jumpers (8), and all other electrical connections to the relay. Secure with the terminal nuts and washers. Replace the relay cover and its attaching nuts.

NOTE

Refer to electrical schematic in TM 9-1450-500-20-1.

(27) Make all electrical connections to the three circuit breakers in the distribution box assembly by removing and securing with siw terminal screws (3).

CAUTION

Circuit breakers must be wired in their respective circuit to prevent overloading or too high overload circuit breaker point. Refer to distribution box assembly electrical schematic in TM 9-1450-500-20-1.

(28) Attach wiring harness relay electrical leads connectors to the distribution box assembly and secure with four pan-head screws (2), lockwashers (9), and hex nuts (10), pan-head screws (27), lockwashers (14), and hex nuts (13), pan-head screws (28), lockwashers (6), and hex nuts (7).

(29) Attach distribution box panel assembly (11) to distribution box assembly (25) and secure by engaging and tightening six captive screws (12). Install bulkhead fitting nut (60, fig. 4-39).

4-22. Blackout Marker Lamp Assembly (Fig. 4-47)

a. Removal and Installation. Refer to TM 9-1450 500-20-1.

b. Disassembly.

(1) Remove the door assembly by removing two flat-head screws. Remove the door gasket.

(2) Remove the "C" washer. Remove the shell from the end of the lamp assembly lead.

(3) Remove two shouldered screws, flat washers, and grommets to release the lamp holder assembly. Remove the lamp holder assembly. Remove the lamp from the lamp holder assembly.

(4) Remove the stud from the blackout marker lamp body only if the stud is damaged.

c. Inspection.

(1) Door assembly. Inspect the door assembly for a cracked lens. If the lens is cracked, replace the door assembly.

(2) Shell. Replace the shell if it shows signs of deterioration.

(3) Lamp holder assembly. Inspect the lamp holder assembly for chafed of broken leads and for deterioration of the rubber components. Replace the lamp holder assembly if any of these conditions exist.

(4) Lamp. If the lamp filaments are not intact, replace the lamp.

d. Assembly.

(1) Install the lamp in the lamp holder assembly. Install the lamp holder assembly in the door assembly. Secure the lamp holder assembly to the door assembly with two grommets, flat washers, and two shouldered screws.

(2) Slide the shell over the lead of the lamp holder assembly. Install the "C" washer on the lead and pull the shell up against the washer.

(3) Place the door gasket in the recess of the door assembly. Secure the door assembly and door gasket to the blackout marker lamp body with two flat-head screws.

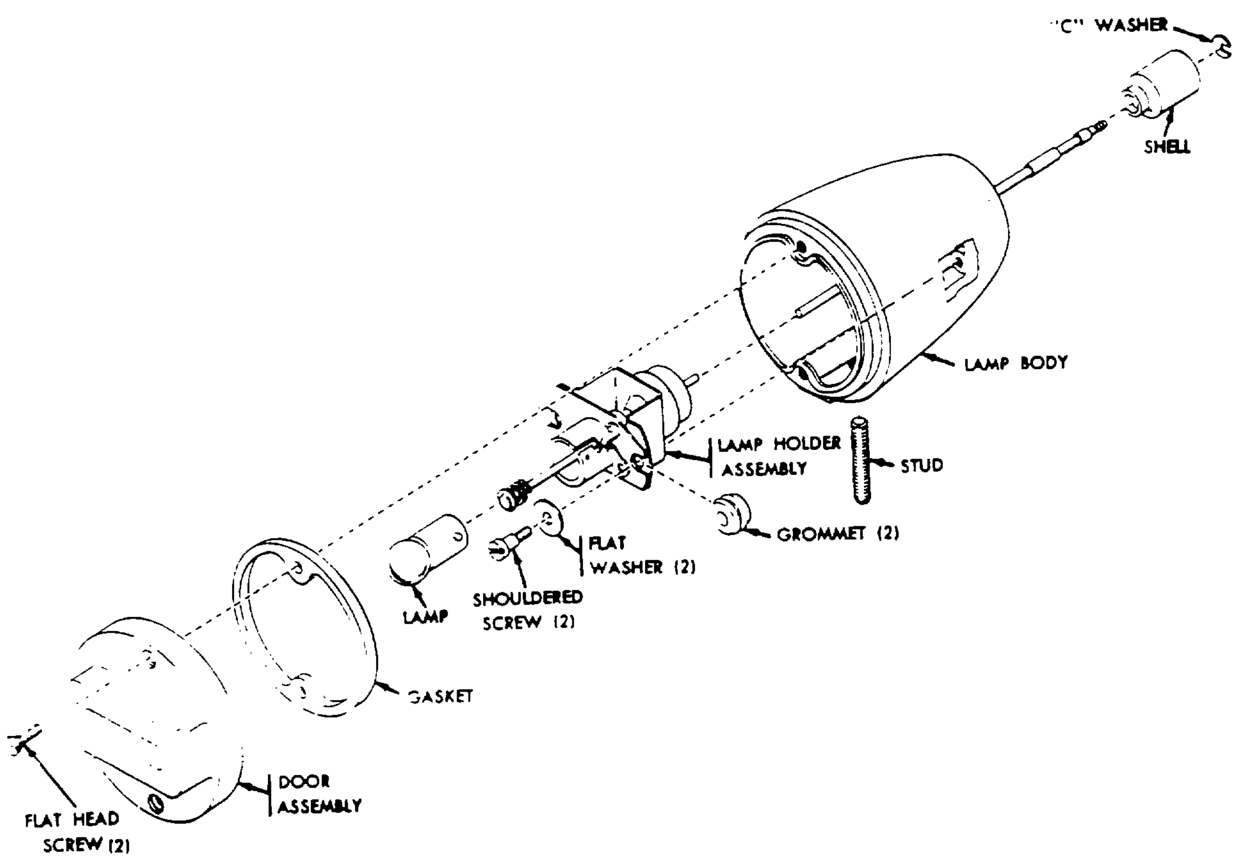


Figure 4-47. Disassembly of Blackout Marker Lamp Assembly.

4-23. Blackout Headlamp Assembly (Fig. 4-48)

a. Removal and Installation. Refer to TM 9-1450-500-20-1.

b. Disassembly.

(1) Slide two shells along wire to expose C" washers that secure them to wire. Remove washers and slide shells off the wires.

(2) Separate grommet from body assembly and slide it off wires of lamp unit.

(3) Remove three screws that secure the door assembly to body assembly. Remove three springs that secure lamp unit and door assembly, and separate door assembly from lamp unit.

(4) Separate the lamp unit from the body assembly.

c. Inspection.

(1) *Door assembly*. Replace if bent or dented to a degree that prohibits secure fit. Replace missing or damaged screws and rings.

(2) *Springs*. Replace springs that do not firmly press the lamp unit to door assembly.

(3) *Lamp unit*. Replace unit if ferrules are not secure, wire insulation is deteriorated or if lamp filament is not intact.

(4) *Body assembly*. Replace if bent or dented to a degree that prohibits secure fit.

(5) *Grommet and shells*. Replace if rubber is torn or deteriorated. Replace missing "C" washers.

d. Assembly.

(1) Secure lamp unit to door assembly using three springs.

(2) Pass wires of lamp unit through port in rear of body assembly. Secure door assembly and body assembly using three screws. At assembly, position three rings on screws between tabs of door and body assemblies.

(3) Slip grommet over wires of lamp unit and seat the grommet in port of body assembly.

(4) Secure shells to wire ends using C" washers.

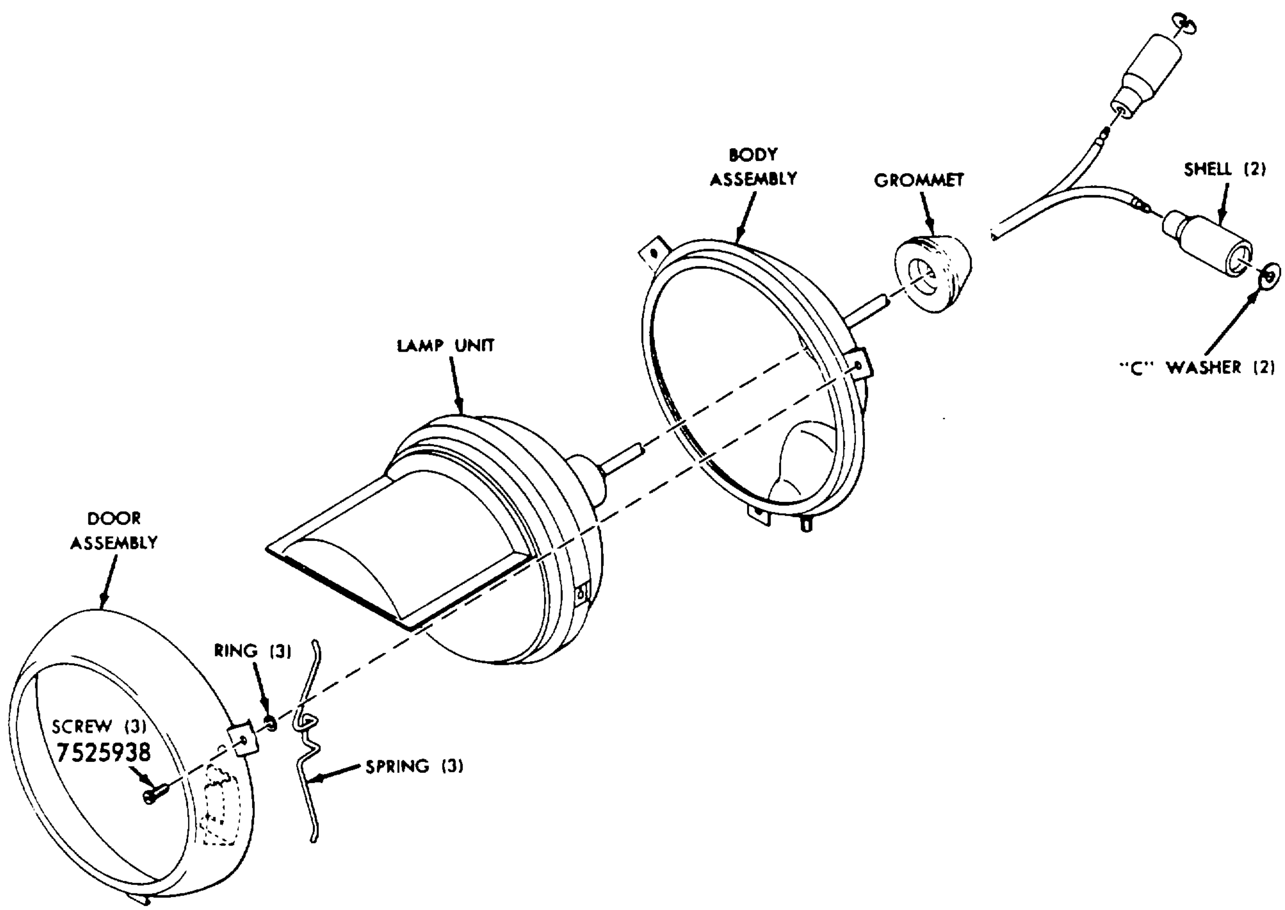


Figure 4-48. Disassembly of Blackout Headlamp Assembly

4-24. Engine wiring Hamess Assembly, Generator Wiring Hamess Assembly, Starter wiring Hamess Assembly, and Main wiring Hamess Assembly.

a. Removal and Installation. Refer to TM 9-1450500-20-1.

b. Disassembly. The only disassembly that can be performed is the replacement of damaged connectors.

c. Inspection. Perform a continuity check on the harnesses using the schematic in TM 91450-500-20-1 as a guide. If the continuity has been interrupted because of a lead breaking away from the connector, resolder the lead. If the break is due to a short or a broken wire within the cable, the defective wire must be replaced. To replace the wire, use the following procedure.

(1) Unsolder the leads from the connector and tag them.

(2) Remove the cabled wires from the shielding.

(3) Replace the defective wire.

(4) Recable the wires and pull them through the shielding.

(5) Slide insulation sleeving over the leads. Solder the leads to the connector and pull the insulation sleeving down over the soldered leads.

(6) Check the continuity of the harness.

d. Assembly. None.

4-25. Stoplight Switch Assemblies and Horn Switch Assembly

a. Removal and Installation. Refer to TM 9-1450500-20-1.

b. Disassembly. None required.

c. Inspection.

(1) Visual inspection. Perform step covered by paragraph 4-21*c* (7) *(a)*.

(2) Make and break continuity. Perform continuity check with switch depressed and with switch released.

NOTE

If any of the switches tested do not comply with the requirements of the above test, they are defective and must be replaced.

d. Assembly. None.

4-26. Master Switch Assembly

a. Removal and Inspection. Refer to TM 9-1450600-20-1.

b. Disassembly. None required.

c. Inspection.

(1) Visual inspection. Perform step covered by paragraph 4-21*c* (7) (*a*) and in addition, check the connector terminal to determine that the silver plating has not been abraded away.

(2) Make and break continuity. Perform step covered by paragraph 4-21*c* (7) (*a*) by pulling out and turning the control knob to its on position, then turning back and pushing in.

NOTE

If the switch does not comply with the requirements of the above tests, it is defective and must be replaced.

d. Assembly. None.

4-27. Dimmer Switch Assembly

a. Removal and Inspection. Refer to TM 9-1450-50-20-1.

b. Disassembly. None required.

Table 4-2. Dimmer Switch Connector Pin Make or Break Schedule.

Switch position	Pins tested	Make or break continuity
Low-beam	A and C	Make for B O Low
Hi-beam	A and C	Break for B O Low
Hi-beam	B and C	Make for B O Hi
Low-beam	B and C	Break for B O Hi
Low-beam	E and G	Make for Service, Low
Hi-beam	E and G	Break for Service, Low
Hi-beam	F and G	Make for Service, Hi
Low-beam	F and G	Break for Service, Hi
Hi-beam	G and D	Make for Hi-beam indicator
Low-beam	G and D	Break for Hi-beam indicator
Hi-beam	G and H	Make for Hi-beam indicator
Low-beam	G and H	Break for Hi-beam indicator

c. Inspection.

(1) Visual inspection. Perform step covered by paragraph 4-21*c* (7) (*a*).

(2) Make and break continuity. Using a standard ohmmeter, operate the switch from its lowbeam to high-beam position and check the connector pins for make and break continuity according to the schedule in table 4-2.

NOTE

Before the following tests can be performed, it will be necessary to ascertain whether the switch is in its hi-beam or low-beam position. This can be done by testing for continuity between connector pins A and C and B and C. If continuity exists between pins A and C, the switch is in its low-beam position. If continuity exists between pins B and C, the switch is in its high-beam position.

NOTE

Pins C and G in Table 4-2 are BO and Service feed pins respectively.

d. Assembly. None.

4-28. Engine Low Oil Pressure Switch and Transmission Low Oil Pressure Switch

a. Removal and Installation. Refer to TM 9-1450-500-20-1.

b. Disassembly. None required.

c. Inspection.

(1) Visual inspection. Perform step covered by paragraph 4-21*c* (7) (*a*) and in addition check the connector terminal to determine that the silver plating has not been abraded away.

(2) Make and break continuity. Perform step covered by paragraph 4-21*c* (7) (*b*), actuating switches by applying hydraulic pressures to the switch actuating parts according to the schedule in table 63.

NOTE

If the switches do not close at the pressures or they do not comply with the other inspection requirements specified above, they are defective and should be replaced.

d. Assembly. None.

Table 4-3. Pressure Switch Make Continuity Pressure Levels.

Switch	Pressure applied
ENG LOW OIL PRESS	9 to 13 psig
TRANS LOW OIL PRESS	60 to 65 psig

4-29. Transmission High Temperature Switch, Hydraulic High Temperature Switch, and Water High Temperature Switch

a. Removal and Installation. Refer to TM 9-1450-500-20-1.

b. Disassembly. None required.

c. Inspection.

(1) Visual Inspection. Perform step covered by paragraph 4-21*c* (7) (*a*).

(2) Make and break continuity. Perform step covered by paragraph 4-21*c* (7) (*b*), actuating switches by applying temperatures to the temperature parts according to the schedule in Table 4-4.

NOTE

If the switches do not close at temperature specified in Table 4-4, it may be possible to recalibrate them by unbolting the connector terminal to gain access to the calibrating screw. However, if after the attempt at recalibrating proves unsuccessful or if the switches do not comply with other inspection requirements specified above, they are defective and should be replaced.

d. Assembly, None.

Table 4-4. Temperature Switch Make Continuity Temperature Levels.

Switch	Pressure applied
TRANS HIGH TEMP	305 ± 5° F (149 to 154° C)
IHYD HIGH TEMP	165 ± 5° F (71 to 77° C)
WATER HIGH TEMP	225 ± 5° F (104 to 110° C)

SECTION VIII.1. (SEE NOTE) OVERHAUL OF LOADER ELECTRICAL INSTALLATION

4-30. Distribution Box (Figs. 4-49 through 4-51)

a. Removal and Installation. Refer to TM 9-1450-500-202.

b. Disassembly.

NOTE

The key numbers shown below in parentheses refer to Fig. 4-49 except where otherwise indicated.

(1) Separate distribution box (1) from instrument panel (2) by loosening six captive screws (5) six washers (6) and (7) and unscrewing bulkhead fitting nut (15). Pull the distribution box straight out. Put bulkhead fitting nut (15) back on elbow (21).

CAUTION

Be extremely careful not to pull the distribution box panel assembly out too far as damage to electrical connections could result.

(2) Remove wiring harness connectors J1, J2, J3, J5 and J6 from the distribution box assembly by removing pan-head screws (8), hex nuts (10), and lockwashers (9), pan-head screws (11), hex nuts (13), and lockwashers (12).

NOTE

Identify and tag all electrical connections to facilitate proper locating at assembly.

NOTE

The key numbers shown below in parentheses refer to Fig. 4-50 except where otherwise indicated.

(3) Identify, tag, and disconnect all electrical connections to the three circuit breakers (3, 4, 5) in the distribution box assembly by removing six terminal screws (32) from their terminals.

NOTE

Terminal screws (32) are parts supplied with their respective circuit breakers, and should be put back into their terminal screw holes to prevent their being misplaced or lost. This is also suggested for all other items supplied with mounting or attaching hardware.

(4) Identify, tag, and disconnect electrical connections to electrical relay (6) by removing three relay cover screws, relay cover, eight terminal nuts and eight terminal washers. Remove relay electrical lead (3, Fig. 4-49) by removing four pan-head screws, hex nuts and lockwashers (11, 12, 13, Fig. 4-49). Remove two relay electrical jumpers (14, Fig. 4-49). Put eight terminal washers, eight terminal nuts, relay cover and three relay cover screws back in their appropriate locations.

(5) Identify, tag, and disconnect all grounded leads from grounding stud (21), by removing two grounding nuts (19), lockwashers(23),and grounding washers (22). Remove grounding stud (21).

CAUTION

Separate instrument panel (2, Fig. 4-49) from distribution box (1, Fig. 4-49). Make sure that all electrical leads have been identified, tagged, and disconnected.

(6) Remove CB2 electrical lead (4, fig. 4-49) and (8, Fig. 4-50) by removing one screw (14) from distribution box utility outlet retaining the mounting hardware.

(7) Separate electrical relay (6) from the distribution box by removing four pan-head screws (18), hex nuts (19), and lockwashers (20).

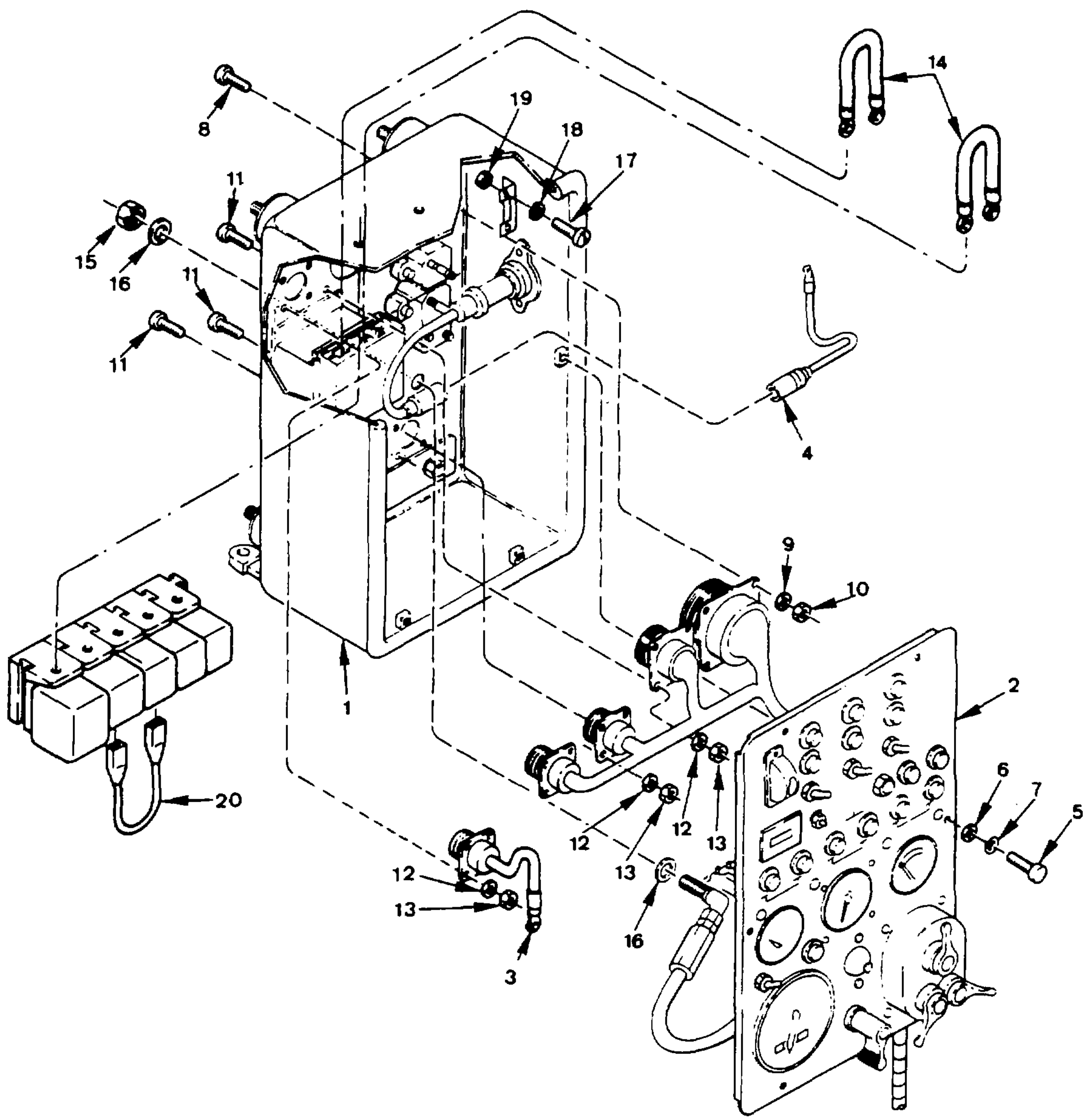
NOTE

The key numbers shown below in parentheses refer to Fig. 4-50 except where otherwise indicated.

NOTE

Section VIII.1 applies to Loader (Multifuel Engine) Part Number 50008600.

Section VIII applies to Loader (Gasoline Engine) Part Numbers 9099200, 50092260 or 50092266.



1	Distribution box	11	Screw, machine
2	Panel, instrument	12	Washer, lock
3	Lead	13	Nut, plain, hexagon
4	Lead , electrical	14	Lead
5	Screw, externally relieved body	15	Nut, plain, hexagon
6	Washer, flat	16	Washer, plat
7	Washer, lock	17	Screw, machine
8	Screw, machine	18	Washer, lock
9	Washer, lock	19	Nut, plain, hexagon
10	Nut, Plain, hexagon	20	Lead, electrical

Figure 4-49. Disassembly of Distribution Box

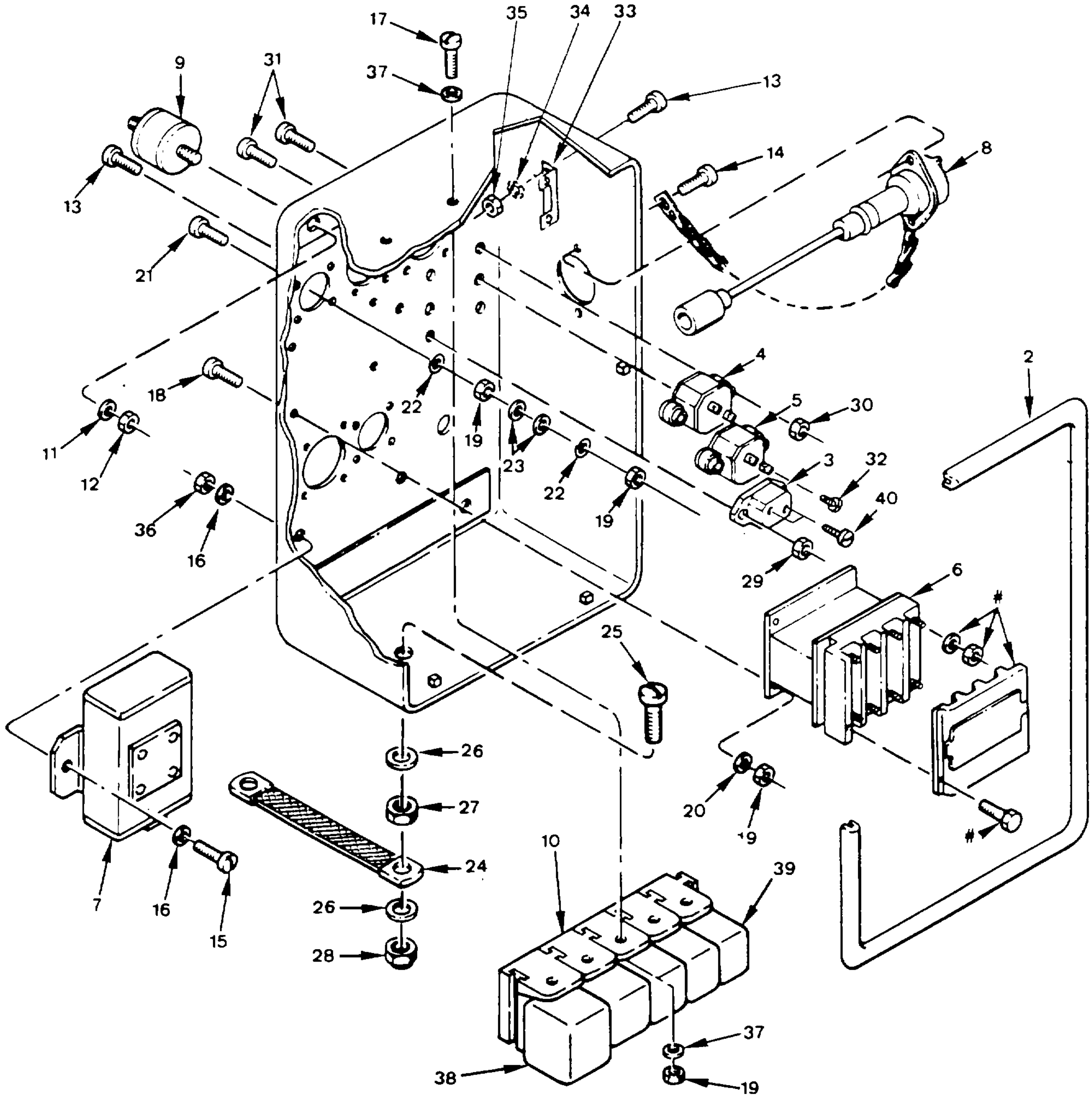


Figure 4-50. Disassembly of Distribution Box (Sheet 1 of 2).

1. JUNCTION BOX
2. RUBBER CHANNEL
3. CIRCUIT BREAKER
4. CIRCUIT BREAKER
5. CIRCUIT BREAKER
6. RELAY
7. SWITCH, ELECTRONIC, SPEED
8. CONNECTOR
9. INSULATOR
10. HOLDER, RELAY
11. WASHER, FLAT
12. NUT, SELF-LOCKING
13. SCREW, MACHINE
14. SCREW
15. SCREW, MACHINE
16. WASHER, FLAT
17. SCREW, MACHINE
18. SCREW
19. NUT, PLAIN, HEXAGON
20. WASHER, LOCK
21. SCREW, MACHINE
22. WASHER, LOCK
23. WASHER, FLAT
24. STRAP
25. SCREW, MACHINE
26. WASHER, FLAT
27. NUT, PLAIN, HEXAGON
28. NUT, SELF-LOCKING
29. NUT, SELF-LOCKING
30. NUT, SELF-LOCKING
31. SCREW, MACHINE
32. SCREW
33. BRACKET ANGLE
34. WASHER, LOCK
35. NUT, PLAIN, HEXAGON
36. NUT, PLAIN, HEXAGON
37. WASHER
38. RELAY, ELECTRONIC
39. RELAY, ELECTRONIC

Figure 4-50. Disassembly of Distribution Box (Sheet 2 of 2)

(8) Remove relay (64) by removing two screws, flat washers and nuts (17, 18, 19, Fig. 4-49).

NOTE

When complete disassembly of the distribution box is required, it is advisable to disconnect, identify, and tag all electrical leads to the terminal board assembly and on the wiring harness (3) as one operation before removing any of the controls and indicators from the instrument panel (1). If complete disassembly is not required, it is necessary only to disconnect the electrical leads or connector to that individual control or indicator to be removed. The 13 diodes (5), which are mounted on the terminal board assembly, do not have to be removed unless it is determined during inspection that the diodes are defective. It is extremely important that leads to the diodes be properly identified to insure correct connections and proper operation of the indicator lights upon assembly. If there is any doubt as to their proper biasing, refer to the electrical schematic (TM 9-1450-500-20-2).

(9) Remove bracket angle (33) by removing two screws (13), washers (34) and nuts (35).

(10) Remove relay (38) and (39) from relay holder (10).

(11) Remove relay holder (10) from distribution box by removing three screws (17), flat washers (37) and nuts (19).

(12) Remove distribution box assembly gasket (2) by scraping under cemented portions of gasket with a dull blade and peeling back progressively along both inner and outer sealed edges. Pull gasket from distribution box (1).

NOTE

Unless box assembly gasket is perforated, crystallized, worn or broken, it is not necessary to remove.

(13) Identify, tag, and remove circuit breakers (3, 4, 5) by removing four pan-head screws (31), four nuts (30) and two pan-head screw (13) with two nuts (29).

(14) Remove grounding strap (24) by removing self-locking nut (28), two flat washers (26), hex nut (27), and pan-head screw (25).

(15) Remove four vibration insulators (9) by removing four safety nuts (12) and flat washers (11).

(16) Remove electronic speed switch (7) by removing two screws (15) four flat wasters (16) and two nuts (36).

(17) Remove one electrical lead (20, fig. 4-49).

NOTE

The key numbers shown below in parentheses refer to Fig. 4-51 except where otherwise indicated.

(18) Remove terminal board assembly (62) and 13 diodes (5), together, by removing four pan-head screws (44), hexnuts (42), and lockwashers (43).

(19) Identify, tag, and remove toggle switch (28) by removing two pan-head screws (48), two lockwashers (43), toggle switch guard (29), and toggle switch boot (46).

(20) Remove three circuit breakers (7) by removing jam nut and anti-rotate washer (45).

(21) Remove 16 indicator light assemblies (8 through 19 and 55, 56, 57, 58) by removing 16 mounting nuts, flat washers, and panel sealing gaskets.

NOTE

Identify and tag each indicator light assembly to obtain proper lead length, and proper orientation for assembly.

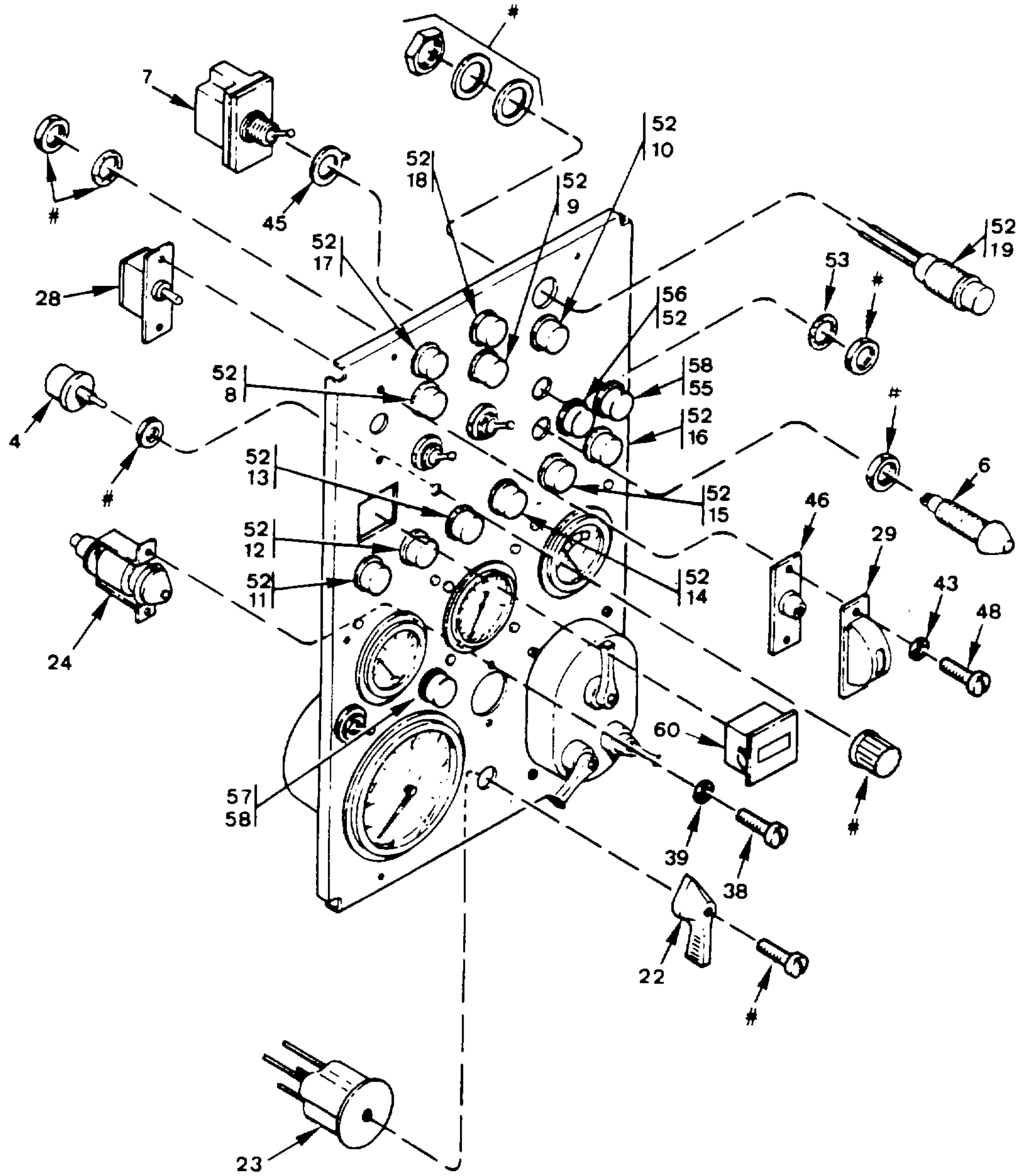


Figure 4-51. Repair of Instrument Panel (Sheet 1 of 3).

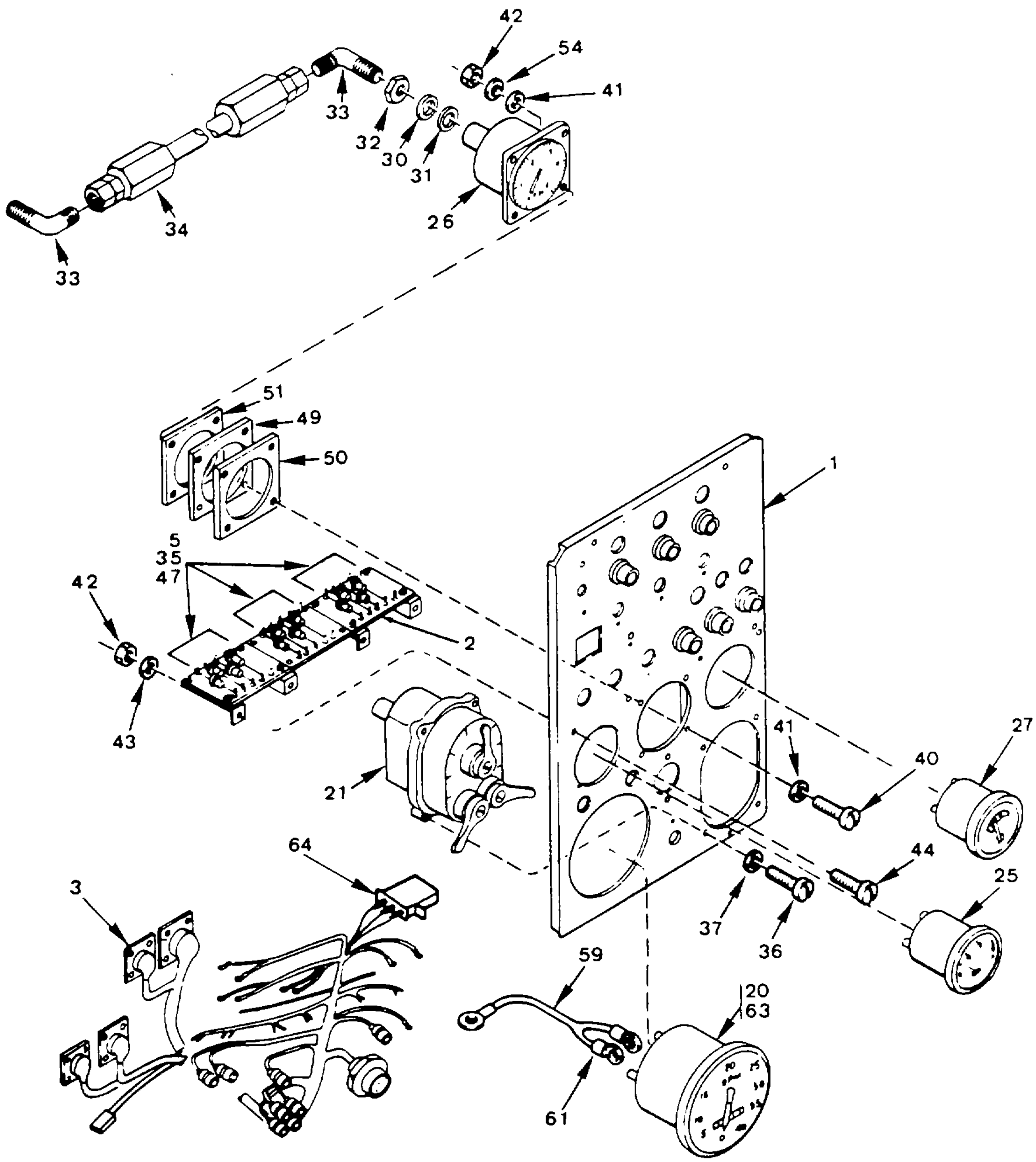


Figure 4-51. Repair of Instrument Panel

1. COVER, JUNCTION BOX
2. TERMINAL BOARD
3. WIRING HARNESS, BRANCHED
4. RHEOSTAT
5. SEMICONDUCTOR DEVICE, DIODE
6. SWITCH, PUSH
7. CIRCUIT BREAKER
8. LIGHT, INDICATOR
9. LIGHT, INDICATOR
10. LIGHT, INDICATOR
11. LIGHT, INDICATOR
12. LIGHT, INDICATOR
13. LIGHT, INDICATOR
14. LIGHT, INDICATOR
15. LIGHT, INDICATOR
16. LIGHT, INDICATOR
17. LIGHT, INDICATOR
18. LIGHT, INDICATOR
19. LIGHT, INDICATOR
20. TACHOMETER, ELECTRICAL
21. SWITCH ASSY
22. LEVER ASSEMBLY
23. SWITCH
24. LAMP ASSEMBLY
25. GAGE, FUEL COMMERCIAL
26. GAGE, PRESSURE
27. INDICATOR BATTERY GENERATOR
28. SWITCH, TOGGLE
29. GUARD, 2 POSITION
30. WASHER, PACKING BACK UP
31. PACKING, PREFORMED
32. LOCKNUT, TUBE COUPLING
33. ELBOW, TUBE
34. HOSE ASSEMBLY
35. DELETED
36. SCREW, MACHINE
37. WASHER, LOCK
38. SCREW, MACHINE
39. WASHER, LOCK
40. SCREW, MACHINE
41. WASHER, FLAT
42. NUT, PLAIN, HEXAGON
43. WASHER
44. SCREW, MACHINE
45. WASHER, SHOULDER
46. BOOT, TOGGLE SWITCH
47. DELETED
48. SCREW, MACHINE
49. WINDOW, OBSERVATION
50. GASKET
51. SPACER
52. LAMP, INCANDESCENT
53. ANTI-ROTATE WASHER
54. WASHER, LOCK
55. LIGHT, INDICATOR
56. LIGHT, INDICATOR
57. LIGHT, INDICATOR
58. LAMP, INCANDESCENT
59. LEAD, ELECTRICAL
60. METER, ELAPSED TIME
61. DELETED
62. DELETED
63. LAMP
64. RELAY
65. NUT, FITTING

Figure 4-51. Repair of Instrument Panel (Sheet 3 of 3).

(22) Remove pushbutton switch (6)by removing mounting hardware.

(23) Remove battery-generator indicator (2) by removing two hex nuts, two lockwashers, and meter mounting bracket.

(24) Remove fuel-level gage (25) by removing two hex nuts, two lockwashers, and meter mounting bracket.

(25) Remove tachometer (20) by removing two hex nuts, two lockwashers, and meter mounting bracket.

(26) Remove rotary switch assembly (23) by removing round-head screw, flat washer, and switch lever assembly (22).

(27) Remove indicator light assembly (24) by unscrewing light assembly lens, panel-sealing gasket, and removing two pan-head screws (38) and lockwashers (39).

(28) Remove rotary light switch assembly (21) by removing four pan-head screws (36) and lockwashers (37).

NOTE

It may be necessary to rotate switch levers and the mechanical camlock to enable orientation and removal of the rotary light switch assembly.

(29) Remove rheostat (4) by removing control knob and mounting nut.

(30) Remove hydraulic pressure gage (26) and associated parts by removing four pan-head screws (40) and lockwashers (41).

(31) Remove elapsed time meter (60).

c. *Inspection.*

NOTE

The following paragraphs cover two types of inspection procedures, visual inspection, and functional testing.

(1) *Distribution box (1, fig*. 4-49), and instruments panel (2, fig. 4-49) . Inspect the distribution box and panel. for cracks and broken welds. Repair or replace as necessary. If the identification callouts on the distribution panel have become illegible, paint on new callouts using figure 64-61 as a guide.

(2) *CB2 Electrical lead(3, Fig. 449), relay electrical lead (4, Fig. 449), relay electrical jumpers (14, Fig. 4-49), utility outlet assembly (8, Fig. 4-50), wiring harness assembly (3, Fig. 4-51).*

(a) Visual inspection. Visually inspect all wiring and insulation covering for evidence of shorts, insulation breakdown, or abrading away of the protective coverings. Inspect all connector dielectrics for cracks or breaks that could permit flashover. Also inspect all connector threads for stripping, marring, or crossed threads. Replace defective parts.

(b) Continuity and circuit shorts. Using a standard ohmmeter, check each individual connector contact, conductor, and ad for continuity and circuit shorts. Check the connectors shells for any circuit shorts or grounding between them and the contacts, conductors, or wire leads. Replace defective parts.

(3) Electrical relay (6, 38, and39, Fig. 4-50), and (64, Fig. 4-51).

NOTE

Since construction of there lay does not permit internal visual inspection of contacts or relay coil insulation, internal conditions will be determined by the following functional tests. External visual inspection will be performed for any obvious detects such as damage to the case terminal post threads or the breaking away of the terminal posts.

(a) Short circuits continuity, and springload failure.

1- Relays K1 and K2. Using any standard ohmmeter, check for existing circuit shorts between each of the eight terminals (X1, X2, A1, A2, B1, B2, C1, and C2) from each of relays K1, K2 and the relay case. Also check for continuity between terminals A1 and A2, between Bland B2, and between C1 and C2 while the relay is energized.

2- Relays K3 to K7. Using any standard ohmmeter, check for existing circuit shorts between each of the four terminals (30, 85, 86,87) from each of relays K3 to K7 and the relay case. Also check for continuity between terminals 30 and 87 while the relay is energized.

NOTE

Existing continuity under any of the conditions in the above paragraph is an indication that either a short circuit exists or the spring-load return mechanism has failed. In either case, the relay must be replaced and it becomes unnecessary to subject the relay to any of the succeeding tests.

(b) Pickup voltage. Using suitable indicating devices (see suggested test set up in fig. 64-52), apply a varying electrical potential from zero to 28 volts dc to the relay coil to determine that the relay contacts close at no greater potential lever than 18 volts for each relay.

CAUTION

Do not apply more than 29 volts dc to the relay coil as damage may result.

(c) Dropout voltage. Using suitable indicating devices (fig. 4-52), apply 28 volts dc to the relay coil. Vary the potential from 28 volts to zero to determine that the contacts open between 17 and 1.5 volts (nominally at 7 volts).

NOTE

It may be desirable to combine the pickup and dropout voltage tests into one test, checking each pair of contacts as noted in figure 4-52.

(4) **Vibration insulators (9, fig. 4-50), box assembly gasket (2, fig. 4-50).** inspect for crystallization, torn places, milling, or permanent set or perforations. Replace defective parts.

(5) *Circuit breakers (3, 4 and 5, fig. 4-50).*

(a) Visual inspection. Visually inspect the circuit breaker cases and mounting wings for damage and for the absence of clinch -nut mountings. Inspect terminal tabs to insure their presence and for sufficient tightness. Also check the terminal screw hole threads for crossed or stripped threads. Replace defective circuit breakers.

(b) Overload test. Using suitable indicating device (see suggested test setup in fig. 4-54), apply 24 volts dc to the circuit breaker after first adjusting variable load resistor so that 115 percent of circuit breaker-rated current is indicated on the ammeter (5,75 amperes for CB3, 11.50 amperes for CB1, and 17.25 amperes for CB2). Hold for approximately 5 minutes to determine that the circuit breaker does not open its circuit. Adjust the variable load resistor so that 200 percent of circuit breaker-rated current is indicated on the ammeter (10 amperes for CB3, 20 amperes for CB1, and 30 amperes for CB2).

CAUTION

Each and every circuit breaker should open its circuit within 100 seconds at 200 percent rated load. If any circuit breaker does not meet this requirement, it must be replaced as damage go electrical circuitry could result.

(6) Terminal board assembly (62, fig. 4-51), and diodes (5, fig. 4-51).

(a) Wiring continuity. Using any standard ohmmeter, check for continuity between all junctions and terminals not blocked by diodes.

(b) Forward current flow. At normal ambient room temperature and using suitable indicating device (see suggested test setup in figure 4-55), apply 24 volts dc to the diode under test (negative to emitter and positive to collector). The indicator light should illuminate.

(c) Reverse voltage breakdown. At normal room temperature, and using suitable indicating device, apply zero to 27 volts dc to the diode under test (positive to emitter and negative to collector).
Reverse breakdown should not occur until a nominal electrical potential of 27 volts dc is applied. Replace defective diodes.

(7) *Toggle switch (28, Fig, 4-51), circuit breakers (7, Fig. 4-51), pushbutton switch (6, Fig. 4-51), and rotary switch assembly (28, Fig. 4-51).*

(a) Visual inspection. Visually inspect all switches and their terminals and receptacles for any defects that could render the switches inoperable, such as broken easings or armatures, or cracks and breaks in the receptacles that could permit flashover. Also inspect receptacle threads for stripping, marring, or cross threading. Replace defective parts.

(b) Make and break continuity. Using standard ohmmeter connected to both terminals, operate the switch or circuit breaker to each ON" and OFF" position several times to determine that continuity is being made and broken.

(8) *Rotary fight assembly (21, Fig. 4-51).*

(a) Internal circuit breaker. Using suitable indicating device (see suggested test setup in fig. 4-53) connect the negative terminal of the power supply to pin M and the positive terminal to pin F, making sure that the variable load resistor is turned to its minimum load position. Turn the main switch to the SER DRIVE position and adjust the variable load resistor so that 115 percent of the circuit-breaker rated current (23 amperes) is indicated on the ammeter. Hold for approximately 5 minutes to determine that the circuit breaker does not open the circuit. Then adjust the variable load resistor so that 200 percent of the circuit-breaker-rated current (40 amperes) is indicated on the ammeter.

(b) Make and break continuity. With one lead of standard ohmmeter connected to terminal F, test the switch positions shown in Table 4-5 and their related terminals first to determine that they make continuity, then by switching to some other position to determine that they break continuity.

CAUTION

This test also serves as a random internal circuit short indication. Should the ohmmeter indicate continuity between a terminal and any other unrelated switch position, and internal circuit short does exist and the rotary light switch assembly (21,Fig. 4-51) must be replaced.

NOTE

Pin F (not shown in Table 4-5) is for battery input common. Also, when the switch assembly is in its STOPLIGHT and both B 0 positions, there should be continuity between pins K (stop light switch side) and C (service stop light) and between K and N (B O stop light).

(c) Mechanical interlock. Place the main switch in the B O MARKER position. The mechanical interlock switch must remain in the LOCK position. Place the main switch in the B 0 DRIVE position. The mechanical interlock switch must be held in the UNLOCK position.

WARNING

With both switches in the positions above indicated, it must be impossible to make any other switch positions with the main switch and any switch position other than OFF with the auxiliary switch. There should be no continuity between pin F and any other pins other than pins A, E, and D as tested in (c) above. Should rotary light switch assembly (21, Fig. 4-51) fail to comply with this requirement, destruction of both personnel and equipment could result by the giving away of their tactical position to the enemy.

(d) Connect shell circuit shorts. Using standard ohmmeter, check the connectors for any circuit shorts between the shells and pins.

(9) *Indicator light assemblies (19and24, Fig, 4-51).*

(a) Visual inspection. Visually inspect light assemblies for cracked or broken lenses, stripped or crossed bushing and mounting hole threads, dents or cracks in the case, and the presence of a lamp in the socket. Replace defective indicator light assemblies.

(b) Glow and continuity test. Apply 24 volts dc to the terminals, and if the lamp does not light, remove the lamp and perform a continuity check of terminal-to-socket elements to determine that the connections are intact. Replace with new lamp and perform glow test again. If light assembly does not function, replace with new unit.

(10) *Bat -generator indicator(27, Fig. 4-51).*

(a) Visual inspection. Visually inspect the battery-generator indicator for a cracked or broken window, stripped or crossed threads on the mounting or grounding studs, dents in the case, or any other defect that could render the indicator inoperable.

(b) Connectors to case short. Using standard ohmmeter, check for continuity between the input connector and the case. If continuity exists, the indicator is defective and should be replaced.

(c) Scale error test. Use set setup shown in figure 6-49. Apply 18 volts dc to the indicator. Scale deflection of needle should be 24° 33' ± 2° to the left from the vertical centerline. Apply 26 volts dc to the indicator. Scale deflection of needle should be centered on vertical centerline within ± 20. Apply 32 volts dc to the indicator. Scale deflection of the needle should be 24° 33' clockwise from the vertical centerline.

NOTE

If the battery-generator indicator does not comply with the above requirements, it is defective and must be replaced.

(11) *Fuel level gage (25, Fig. 4-51).*

(a) Visual inspection. Perform step (10) (*a*) above with exception of grounding stud threads inspection.

(b) Connectors to case short. Perform step (10) (*b*) above on both input and ignition connectors.

Table 4-5. Switch Positions and Related Connector Pins.

Control	Switch position	Connector pin (s)
Main switch	SER DRIVE	A, H, J and M
Main switch	STOP LIGHT	A and J
Main switch	OFF	None
Main switch	B O MARKER	A and E
Main switch	B O DRIVER	A, D and E
Auxiliary switch	PANEL BRT	B
Auxiliary switch	PANEL DIM	B
Auxiliary switch	OFF	None
Auxiliary switch	PARK	L

(c) Scale error test. Use setup shown in Figure 4-45. Apply zero ohms resistance in series with the indicator with an input voltage at the ignition connector of 28.5 ± 0.2 volts dc. Scale deflection of the needle should be 27°± 2° to the right from the vertical centerline. Adjust the calibrated variable resistor to 15 ohms with the same voltage applied. Scale deflection of the needle should be centered on the vertical centerline ± 2°. Adjust the calibrated variable resistor to 30 ohms. Scale deflection of the needle should be 27° ± 3° to the left from the vertical centerline.

NOTE

If the fuel-level indicator does not comply with the above inspection requirements, it is defective and must be replaced.

(12) *Tachometer (20, Fig. 4-51).*

(a) Visual inspection. Perform procedure covered in (10) (*a*) above with exception grounding stud threads inspection.

(13) *Rheostat (variable resistor) (4, Fig. 4-51).*

(a) Visual inspection. Visually inspect the rheostat (variable resistor) bushing threads for cross threading or stripping, inspect the shaft to determine that it is free to rotate, inspect the casing and knob for cracks or breaks, and inspect the knob setscrew mating threads to insure that they are not stripped. Replace defective rheostats.

(b) Resistance check. Using standard voltmeter connected as shown in suggested test setup in Figure 4-46, apply 24 volts dc to the two input terminals (outside) and rotate the control knob clockwise to its extreme position. Voltage indicated should be 24 volts. Rotate the control knob fully counterclockwise. Voltage indicated should be minimum.

(c) Element shorts. Using standard ohmmeter, check for continuity between all three terminals and the outside case on metal case variable resistors. If continuity exists, the variable resistor is defective and should be replaced.

(14) *Hydraulic pressure gage (26, Fig. 4-51)*

(a) Visual inspection. Visually inspect the hydraulic pressure gage and its inlet port for any defects that could render the gage inoperable, such as broken glass, bent indicator needle, marred face markings, cracked case, and stripped or crossed threads. Replace defective gages.

(b) Operating proof pressure and leakage test. Refer to UUT manual (9-4935-543-14).

(c) Assembly. Reassemble the distribution box and instruments panel by reversing the sequence of the disassembly procedure.

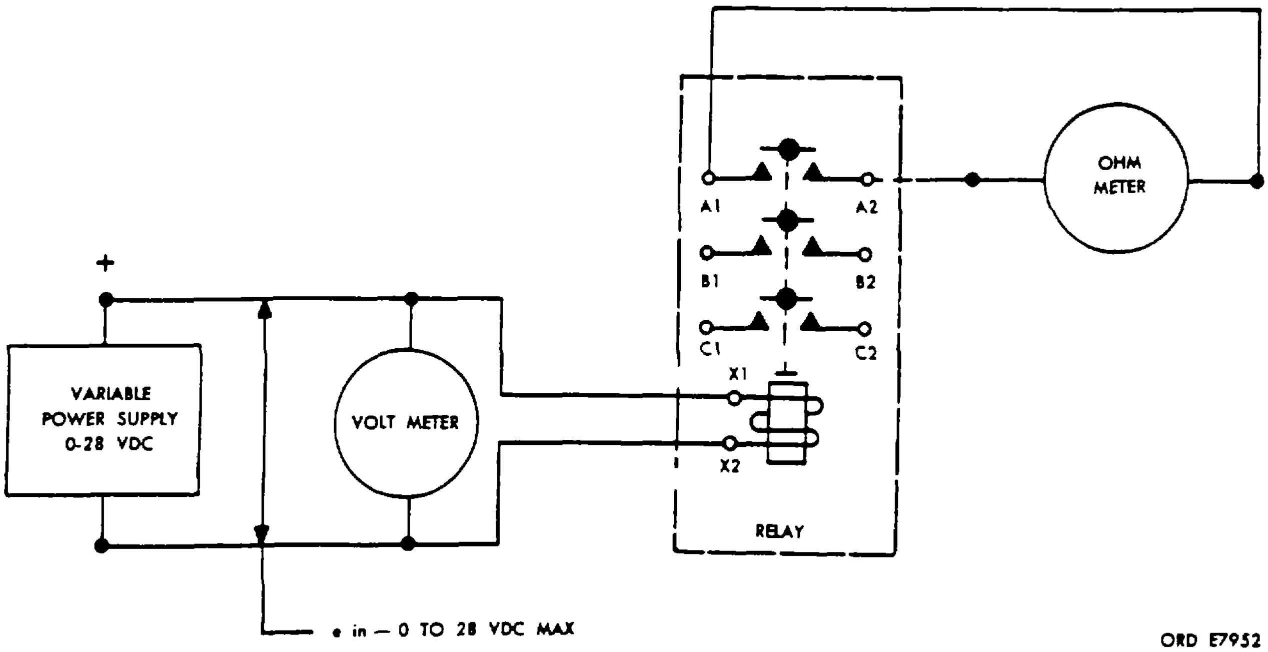


Figure 4-52. Relay Pickup and Dropout Voltages Test Setup.

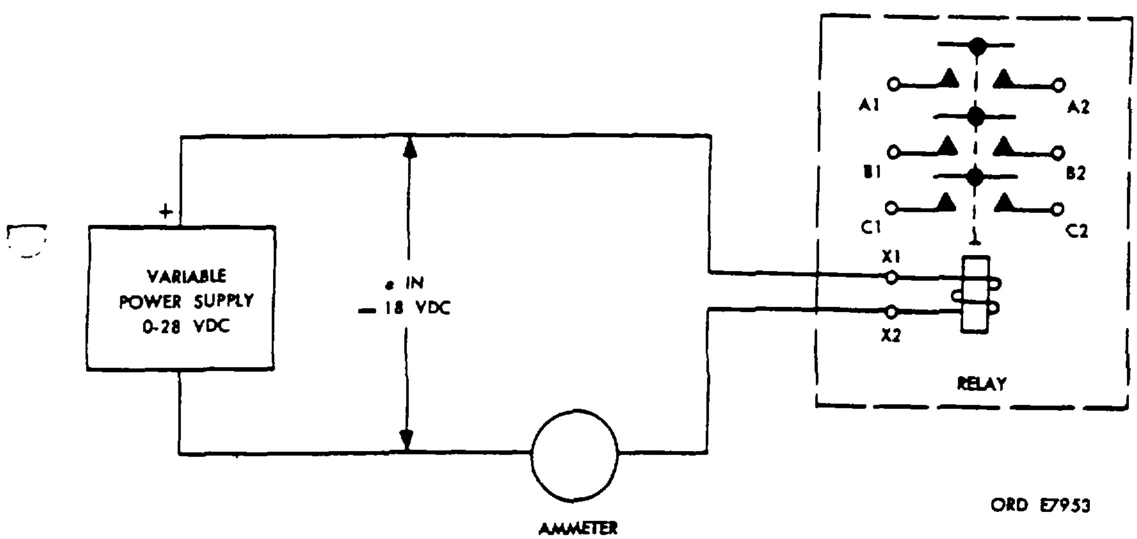


Figure 4-53. Relay Coil Current Test Setup.

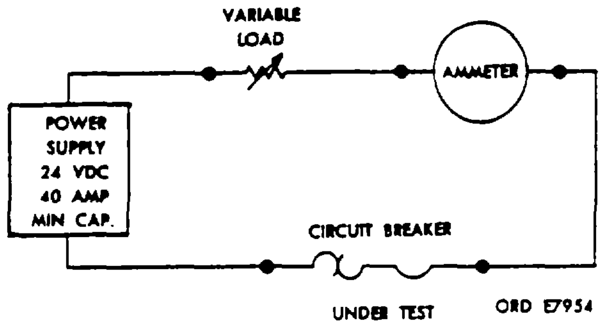


Figure 4-54. Thermal Switch Overload Breaker Test Setup.

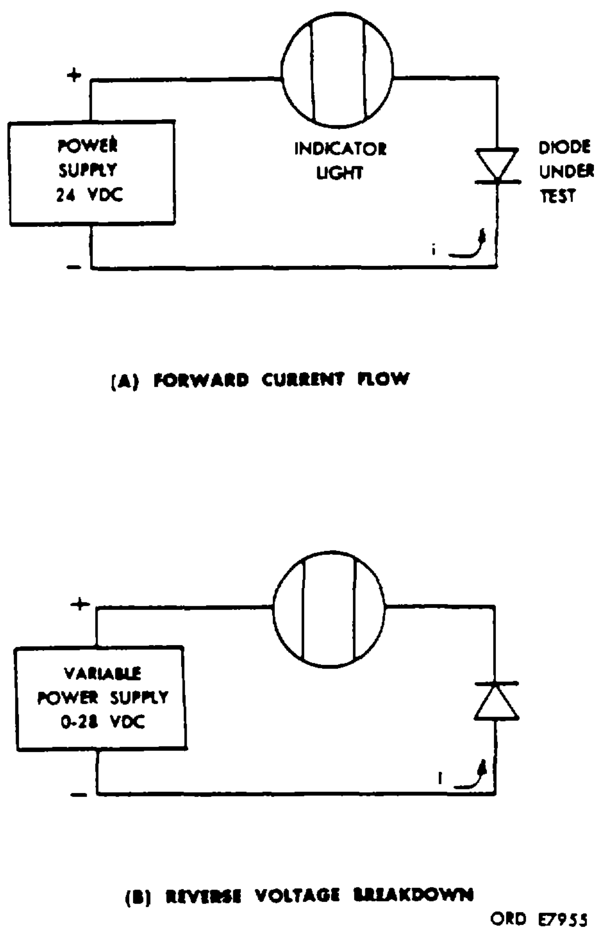


Figure 4-55. Crystal Rectifier Test Setup.

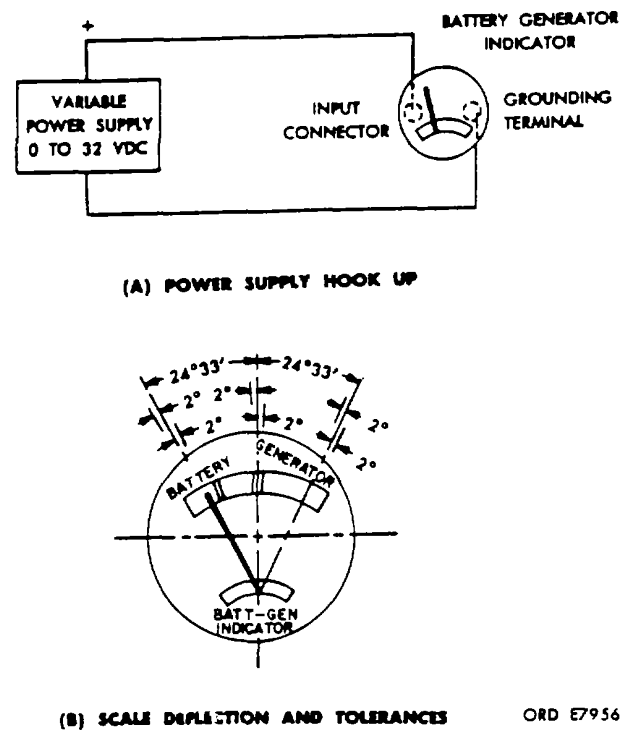


Figure 4-56. Battery-Generator Indicator Scale Error Test Setup.

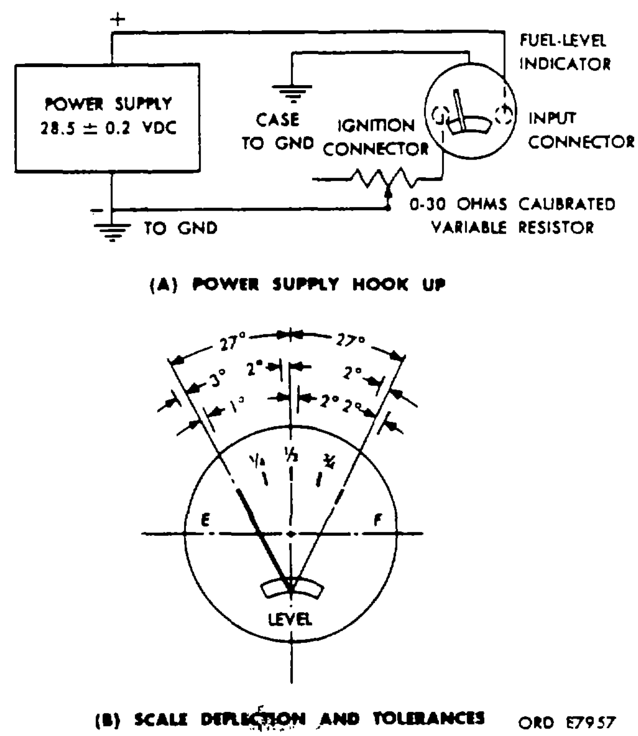


Figure 4-57. Fuel Level Indicator Scale Error Test Setup.

4-31. Blackout Marker Lamp Assembly

a. Removal and Installation. Refer toTM9-1450-500-20-2.

b. Disassembly.

(1) Remove the door assembly by removing two flat-head screws. Remove the door gasket.

(2) Remove the "C" washer. Remove the shell from the end of the lamp assembly lead.

(3) Remove two shouldered screws, flat washers, and grommets to release the lamp holder assembly. Remove the lamp holder assembly. Remove the lamp from the lamp holder assembly.

(4) Remove the stud from the blackout marker lamp body only if the stud is damaged.

c. Inspection.

(1) *Door assembly*. Inspect the door assembly for a cracked lens. If the lens is cracked, replace the door assembly.

(2) *Shell*. Replace the shell if it shows signs of deterioration.

(3) *Lamp holder assembly*. Inspect the lamp holder assembly for chafed of broken leads and for deterioration of the rubber components. Replace the lamp holder assembly if any of these conditions exist.

(4) *Lamp*. If the lamp filaments are not intact, replace the lamp.

d. Assembly.

(1) Install the lamp in the lamp holder assembly. Install the lamp holder assembly in the door assembly. Secure the lamp holder assembly to the door assembly with two grommets, flat washers, and two shouldered screws.

(2) Slide the shell over the lead of the lamp holder assembly. Install the "C" washer on the lead and pull the shell up against the washer.

(3) Place the door gasket in the recess of the door assembly. Secure the door assembly and door gasket to the blackout marker lamp body with two flat-head screws.

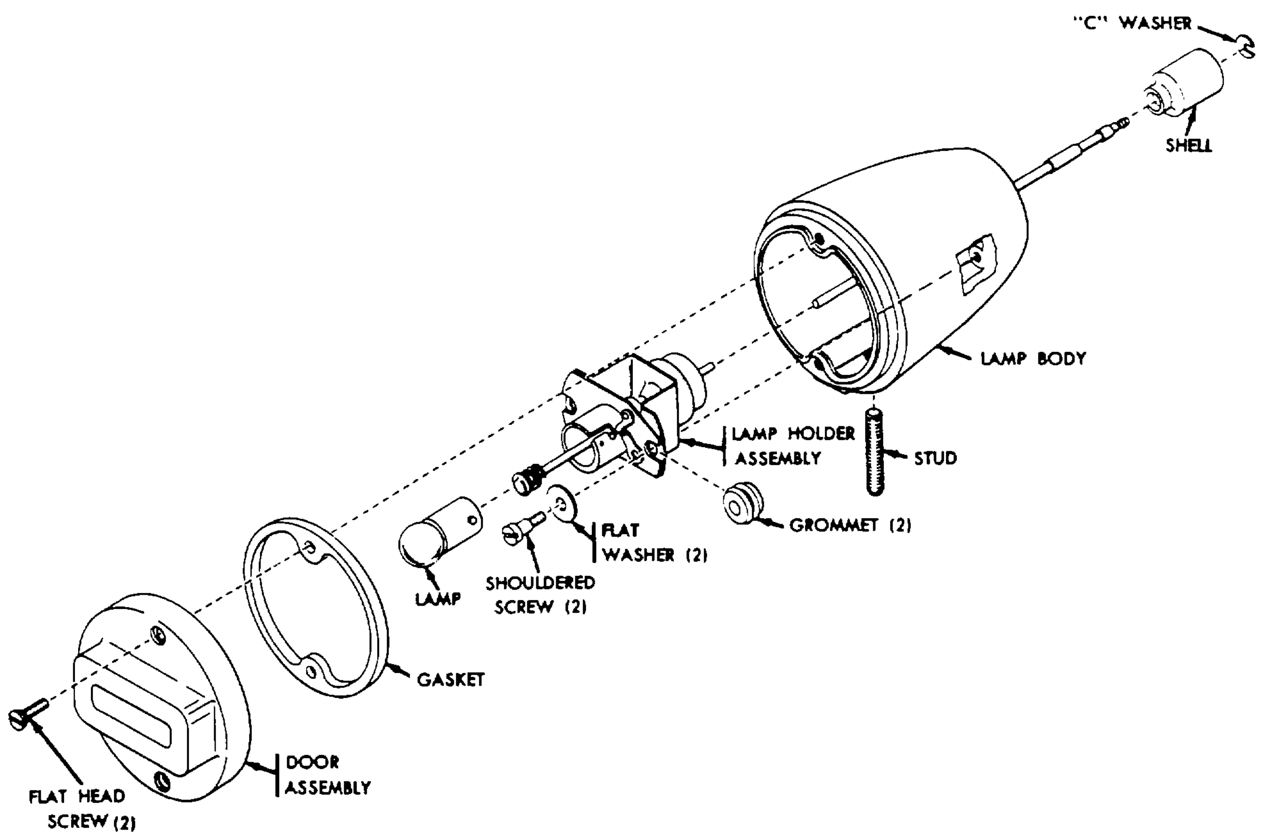


Figure 4-58. Disassembly of Blackout Marker Lamp Assembly

4-32. Blackout Headlamp Assembly

a. Removal and Installation. Refer to TM 9-1450-500-20-2.

b. Disassembly.

(1) Slide two shells along to expose "C" washers that secure them to wire. Remove washers and slide shells off the wires.

(2) Separate grommet from body assembly and slide it off wires of lamp unit.

(3) Remove three screws that secure the door assembly to body assembly. Remove three springs that secure lamp unit and door assembly, and separate door assembly from lamp unit.

(4) Separate the lamp unit from the body assembly.

c. Inspection.

(1) *Door assembly*. Replace if bent or dented to a degree that prohibits secure fit. Replace missing or damaged screws and rings.

(2) *Springs*. Replace springs that do not firmly press the lamp unit to door assembly.

(3) *Lamp unit*. Replace unit if ferrules are not secure, wire insulation is deteriorated or if lamp filament is not intact.

(4) *Body assembly*. Replace if bent or dented to a degree that prohibits secure fit.

(5) *Grommet and shells*. Replace if rubber is torn or deteriorated. Replace missing "C" washers.

d. Assembly.

(1) Secure lamp unit to door assembly using three springs.

(2) Pass wires of lamp unit through port in rear of body assembly. Secure door assembly and body assembly using three screws. At assembly, position three rings on screws between tabs of door and body assemblies.

(3) Slip grommet over wires of lamp unit and seat the grommet in port of body assembly.

(4) Secure shells to wire ends using "C" washers.

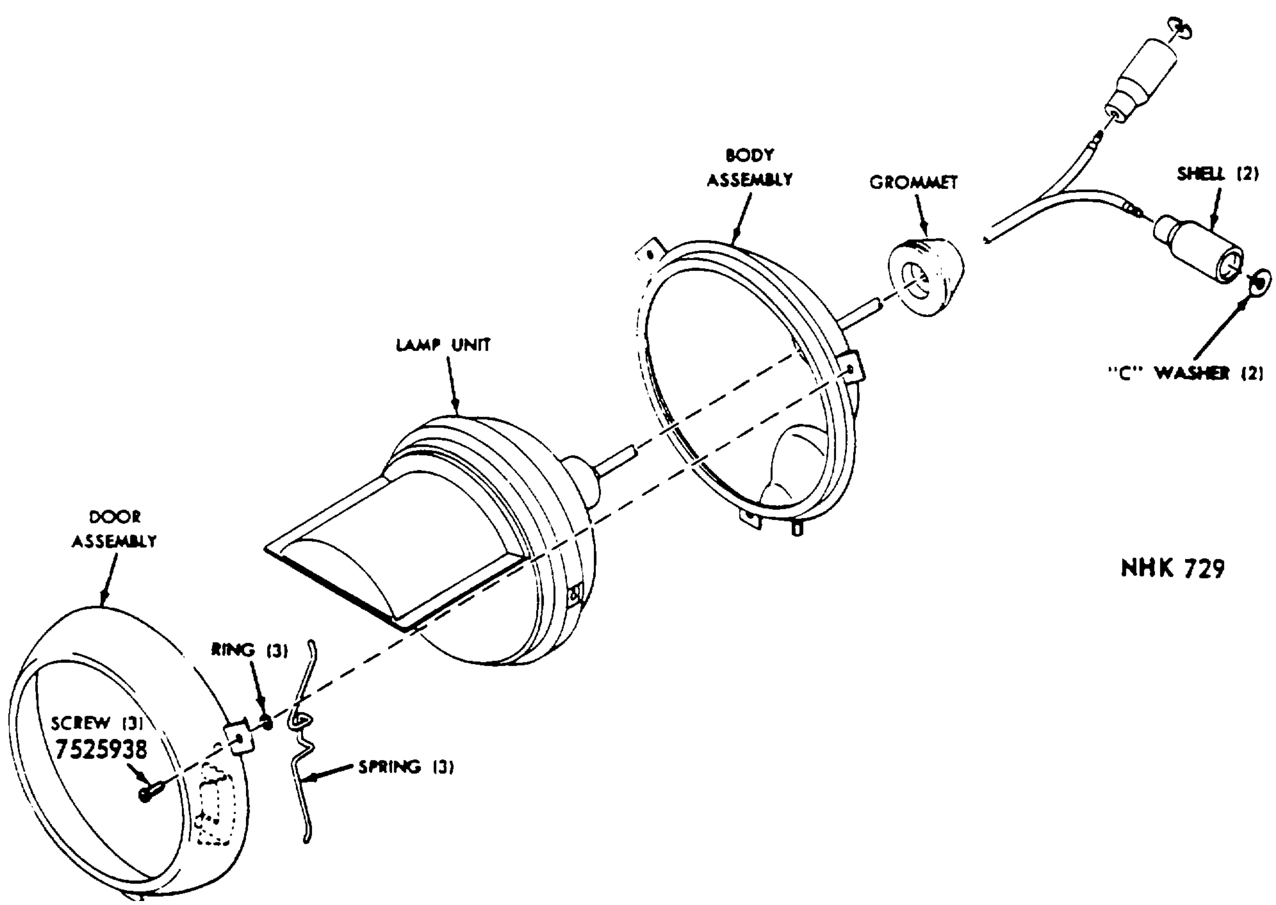


Figure 4-59. Disassembly of Blackout Headlamp Assembly.

4-33. Engine wiring Harness Assemblies, Main Wiring Harness Assemblies

a. Removal and Installation. Refer to TM 9-1450-500-20-2.

b. Disassembly. The only disassembly that can be performed is the replacement of damaged connectors.

c. Inspection. Perform a continuity check on the harnesses using the schematic as a guide. If the continuity has been interrupted because of a lead breaking away from the connector, resolder the lead. If the break is due to a short or a broken wire within the cable, the defective wire must be replace. To replace the wire, use the following procedure.

(1) Unsolder the leads from the connector and tag them.

(2) Remove the cabled wires from the shielding.

(3) Replace the defective wire.

(4) Recable the wires and pull them through the shielding.

(5) Slide insulation sleeving over the leads. Solder the leads to the connector and pull the insulation sleeving down over the soldered leads.

(6) Check the continuity of the harness.

d. Disassembly. None.

4-34. Stoplight Switch Assemblies

a. Removal and Installation. Refer to TM 9-1450-500-2.

b. Assembly. None required.

c. Inspection.

(1) *Visual inspection*. Perform step covered by paragraph 4-34c(7)(a).

(2) *Make and break continuity*. Perform continuity check with switch depressed and with switch released.

NOTE

If any of the watches tested do not comply with the requirements of the above test, they are defective and must be replace.

d. Assembly. None.

4-35. Master Switch Assembly

a. Removal and Inspection. Refer to TM 9-1450-500-20-2.

b. Disassembly. None required.

*c. I*nspection.

(1) *Visual inspection*. Perform step covered by paragraph 4-35c (7) (a) and in addition, check the connector terminal to determine that the silver plating has not been abraded away.

(2) *Make and break continuity*. Perform step covered by paragraph 4-35c (7) (b) by pulling out and turning the control knob to its on position, then turning back and pushing in.

NOTE

If the switch does not comply the requirements of the above tests, it is defective and must be replaced.

d. Assembly. None.

4-36. Dimmer Switch Assembly

a. Removal and Inspection. Refer to TM 9-1450-500-20-2.

b. Disassembly. None required.

Table 4-6. Dimmer Switch Connector Pin Make or Break Schedule.

Switch position	Pins tested	Make or break continuity
Low-beam	A and C	Make for B O Low
Hi-beam	A and C	Break for B O Low
Hi-beam	B and C	Make for B O Hi
Low-beam	B and C	Break for B O Hi
Low-beam	E and G	Make for Service, Low
Hi-beam	E and G	Break for Service, Low
Hi-beam	F and G	Make for Service, Hi
Low-beam	F and G	Break for Service, Hi
Hi-beam	G and D	Make for Hi-beam indicator
Low-beam	G and D	Break for Hi-beam indicator
Hi-beam	G and H	Make for Hi-beam indicator
Low-beam	G and H	Break for Hi-beam indicator

c. Inspection.

(1) *Visual inspection*. Perform step covered by paragraph 4-36c (7) (a).

(2) *Make and break continuity*. Using a standard ohmmeter, operate the switch from its low-beam to high-beam position and check the connector pins for make and break continuity according to the schedule in Table 4-6.

NOTE

Before the following test can be performed, it will be necessary to ascertain whether the switch is in its hi-beam or low-beam position. This can be done by testing for continuity between connector pins A and C and B and C. If continuity exists between pins A and C, the switch is in its low-beam position. If continuity exists between pins B and C, the switch is in its high-beam position.

NOTE

Pins C and G in Table 4-6 and Service feed pins respectively.

d. Assembly. None.

4-37. Engine Low Oil Pressure Switch and Transmission Low Oil Pressure Switch

a. Removal and Installation. Refer to TM 9-1450-500-20-2.

b. Disassembly. None required.

c. Inspection.

(1) *Visual inspection*. Perform step covered by paragraph 4-30c (7) (a) and in addition check the connector terminal to determine that the silver plating has not been abraded away.

(2) *Make and break continuity*. Perform step covered by paragraph 4-30c (7) (b) actuating switches by applying hydraulic pressures to the switch actuating parts according to the schedule in table 4-7.

NOTE

If the switches do not close at the pressures or they do not comply with the other inspection requirements specified above, they are defective and should be replace.

d. Assembly. None.

Table 4-7. Pressure Switch Make Continuity Pressure Levels.

Switch	Pressure applied
ENG LOW OIL PRESS	9 to 13 psig
TRANS LOW OIL PRESS..	60 to 65 psig

4-38. Transmission High Temperature Switch, Hydraulic High Temperature Switch and Engine High Temperature Switch

a. Removal and Installation. Refer to TM 9-1540-500-20-2.

b. Disassembly. None required.

c. Inspection.

(1) *Visual Inspection*. Perform step covered by paragraph 4-30c(7)(a).

(2) *Make and break continuity*. Perform step covered by paragraph 4-30c (7) (b) actuating switches by applying temperatures to the temperature parts according to the schedule in Table 4-8

NOTE

If the witches do not dose at temperature specified in Table 4-8 , it may be possible to recalibrate them by unbolting the connector terminal to gain access to the calibrating screw. However, if after the attempt at recalibrating proves unsuccessful or if the switches do not comply with other inspection requirements specified above, they are defective and should be replaced.

d. Assembly. None.

Table 4-8. Temperature Switch Make Continuity Temperature Levels.

Switch	Temperature applied
TRANS HIGH TEMP	305 ± 5°F (149 to 154°C)
HYD HIGH TEMP	165 ± 5°F (71 to 77°C)
ENG HIGH TEMP	225 ± 5°F (104 to 110°C)

SECTION IX. (SEE NOTE) OPERATIONAL TESTS

4-39. General

The following section on operational tests of the missile loader is divided into two subdivisions. Paragraph 4-40 covers the functional tests required of the vehicle to determine that it is capable of performing of loading the missiles onto the launchers. Paragraph 4-41 covers the road tests required to insure the vehicles capabilities of transporting itself to the missile launching site and transporting the missiles from the location of unpacking and assembling. If the loader does not comply with all of the following requirements, the reasons for its failure must be ascertained and corrected before the loader is made available for service requisition.

4-40. Functional Tests

The functional testing of the missile loader is divided into two procedures, the testing of the controls and indicators on the distribution box and the operation of the boom superstructure through a simulated missile loading procedure. Prior to either set of tests, the maintenance personnel should make a visual inspection for any obvious defects such as loose electrical connections, frayed insulation, and broken safety wiring of connectors.

a. Lights, Controls and Indicators.

NOTE

The controls and indicators designated refer to Figure 4-60 except where otherwise indicated.

CAUTION

During all of the following light tests, be sure to turn the master switch (refer to TM 9-1450-500-10) OFF if there is any delay between tests, as continuous drain on the battery system could render it inoperative.

(1) Service drive lights. Turn the master switch (refer to TM 9-1450-500-10) to ON position. Turn main light switch to the SER DRIVE position. Both headlights and taillights should be on.

NOTE

To locate switches, controls, and lights, not included as a part of this manual, refer to operation manual TM 9-1450 500-10.

(2) Dimmer switch. With the headlights still on, flip dimmer switch (refer to TM 9-1450-500-10) several times. The service headlights should change from low beam to high beam, and from high beam to low beam.

(3) Service stop light. With the taillight still on, apply both brakes to the stop position. The service stoplight should be on. Release the brakes, and the service stoplight should go off. Then turn main light switch to the STOP LIGHT position. Again apply both brakes. The service stoplight should be on. Release the brakes, and the service stoplight should go off. Then turn main light switch to the STOP LIGHT position. Again apply both brakes. The service stoplight should be on. Release the brakes, and the service stoplight should go off.

(4) Blackout marker lights. Turn main light switch to the BO MARK position. Blackout marker lights, apply both brakes. Blackout stoplight of the stoplight assembly should be on. Release brakes, and the blackout stoplight should go off.

NOTE

For location of lights, refer to Fig. 4-60.

(5) Blackout drive light. Turn main switch to the BO DRIVE position. Blackout headlamp and blackout marker lights, front and rear, should be on. Apply both brakes. Blackout stoplight should be on. Release brakes, and the blackout stoplight should go off.

(6) Panel Light (illuminator). Turn auxiliary switch to the DIM position. Panel light should be on and dim. Then turn switch to its PANEL BRT position. The panel light should be on and bright.

(7) Parking lights. Turn the auxiliary switch to the PARK position, and the main switch to the SER DRIVE position. Parking light (tail lamp assembly) should be on.

NOTE: Section IX applies to Loader (Gasoline Engine) Part Numbers 9099200, 50092260 or 50092266.
Section IX.1 applies to Loader (Multifuel Engine) Part Number 50008600.

(8) *Lights off*. With auxiliary switch still in the park position, turn main switch back to the OFF position. All lights should go off.

(9) *Mechanical interlock*. With the mechanical interlock switch in the LOCK position, verify that the only position in which the main switch can be turned is BO MARKER. Then verify that only the lights indicated in steps (4) above are lit.

WARNING

It is extremely vital that these conditions be verified since destruction of both personnel and equipment could result by the giving away of their tactical position to the enemy during maneuvers.

(10) *Indicator readings, ignition OFF*. Turn the main switch OFF, and with the master switch still ON, turn IGNITION switch to the OFF position. Rotate the INDICATOR LIGHTS DIM BRT CONTROL to its BRT position (fully clockwise), then press the INDICATOR LIGHTS TEST button to verify that all three CIRCUIT BREAKERS are switched to the OFF position. The three MISSILE LATCHED (green) lights, LEFT, CENTER, or RIGHT and the three MISSILE RELEASED (red) lights, LEFT CENTER, or RIGHT must remain unlit.

(11) *Indicator readings, ignition ON*. With the master switch still ON, turn ignition switch to the ON position. Each indicator should read as shown in Table 4-9.

Table 4-9. Indicator Readings, Ignition On.

Indicator	Reading
MISSILE LATCHED (green) LEFT, CENTER and RIGHT lights	None
MISSILE RELEASED (red) LEFT, CENTER and RIGHT lights..............................	Illuminated
ENG LOW OIL PRESS (red) light	Illuminated
TRANS LOW OIL PRESS (red) light..	Illuminated
TRANS HIGH TEMP (red) light	None
DIFF HIGH TEMP (red) light	None
HYD HIGH TEMP (red) light..	None
WATER HIGH TEMP (red) light	None
Fuel LEVEL gage	Tank fuel level
HYD OIL PRESS gage..	None
BATT-GEN INDICATOR	Battery current drain
Tachometer..	None

(12) *INDICATOR LIGHTS TEST button*. With both the master switch and the ignition switch ON, press the INDICATOR LIGHTS TEST button. Each indicator should read as shown in Table 4-10.

Table 4-10. Press to Test Indicator Readings, Ignition On.

Indicator	Reading
MISSILE LATCHED (green) LEFT, RIGHT and CENTER lights	Illuminated
MISSILE RELEASED (red) LEFT, RIGHT and CENTER lights.................................	Illuminated
ENG LOW OIL PRESS (red) light	Illuminated.
TRANS LOW OIL PRESS (red) light...	Illuminated
TRANS HIGH TEMP (red) light	Illuminated
DIFF HIGH TEMP (red) light	Illuminated
HYD HIGH TEMP (red) light...	Illuminated
WATER HIGH TEMP (red) light	Illuminated
Fuel LEVEL HYD OIL PRESS gages, BATT-GEN INDICATOR and tachometer	Same as in Table 4-9.

(13) *DIM-BRT CONTROL*. With the INDICATOR LIGHTS TEST button still pressed in as in step (12) above, turn DIM-BRT CONTROL fully clockwise, then fully counterclockwise. Only the three MISSILE LATCHED (green) and the three MISSILE RELEASED (red) lights should go bright, then dim, and yet remain visible. The ENG and TRANS LOW OIL PRESS and TRANS, DIFF. HYD, and WATER HIGH TEMP indicator must be on but not affected by the DIM-BRT CONTROL. Release the INDICATOR LIGHTS TEST button to determine that only the three MISSILE RELEASED (red) and the two ENG and TRANS LOW OIL PRESS (red) indicators remain lit. All other red and green indicators must be out.

(14) *MISSILE LATCHED and RELEASED switching*. With both the master and ignition switches still ON, slowly operate the left missile latching lever. The LEFT MISSILE RELEASED (red) light should go out after the aft latch (relative to the loader) protrudes below the machined bosses of the beam and before the latch is in the fully latched position. Continue pulling the latching lever until the latch is down and fully locked. At this position, the LEFT MISSILE LATCHED (green) light should go on. To operate the manual missile release, push the plunger of solenoid (1, fig. 5-11) plunger of the left latching mechanism. The LEFT MISSILE LATCHED (green) light should go out and the LEFT MISSILE RELEASED (red) light should come on.

NOTE

Perform this same operation for the center and right missile latching mechanisms in the same sequence as above, the CENTER and RIGHT MISSILE LATCHED and RELEASED indicators should operate.

(15) *Indicator readings, engine on*. Start the engine according to TM 9-1450-500-10 and after engine has been warmed up in accordance with TM instructions run engine at a fast idle. Each indicator should read as shown in Table 4-11.

Table 4-11. Indicator Readings, Engine On.

Indicator	Reading
Missile latched (green), LEFT, CENTER and RIGHT lights	Illuminated
All other (red and green) lights	None
Fuel level gage	Tank fuel level
HYD OIL PRESS gage..	3000 ± 300 psig
BATT-GEN INDICATOR	BATTERY current drain on GENERATOR voltage regulator output
Tachometer..	RPM and hours of engine operation

WARNING

At no time during the preceding or following tests should the hydraulic pressure exceed 3300 psig nor should the hydraulic high temperature warning indicator light go on. If either should occur, immediate investigation of the cause should be made and corrective measures taken to prevent possible damage to the equipment or harm to personnel.

(16) *Index and transfer arm limit switches*. With engine still running as in step (15) above, operate the latching lever of all three latching mechanisms described in step (14). Switch the three MISSILE LATCHED and RELEASED CIRCUIT BREAKERS to the ON positions. Hold the MISSILE LATCH RELEASE toggle switch in the momentary on position (toggle up). The three MISSILE LATCHED (green) lights should remain on and the latching mechanisms should remain latched. Then operate the extension cylinder to the point where the actuation plunger of the index arm limit switch (fig. 5-18) located on the forward inboard side of the intermediate link assembly does not make contact with the boom tubing. The transfer arm limit switch (fig. 5-18) located in the end of the link, should be in the actuated open position with the actuator shaft pushed in. The three MISSILE LATCHED (green) lights should remain on and the three missile latching mechanisms should remain in their latched position.

(17) *Solenoid operated hydraulic valves*. With the engine still running, fully retract the extension cylinder, and leave the EXTENSION actuator control lever (TM 9-1450-500-10) in the retract position (opposite direction to EXTENSION). Disconnect cable assembly that connects between the index boom and the distribution box assembly. Using a number 16 AWG insulated jumper, connect the receptacle contact "B" to contact AM". Set the engine to idle at 600 RPM. The pressure in the hydraulic system should drop to 2500 psig or less, since this condition simulates low pressure system actuation due to operation of the solenoid operated hydraulic valves. Remove the jumper that connects pins "B" and "M". Move the EXTENSION actuator control lever to its full EXTENSION position (all the way forward) to fully extend the cylinder. This can be facilitated by momentarily setting the engine to run at 2000 RPM. Leave the EXTENSION actuator control lever in the full EXTENSION position and connect pins "B" and 'M" with the number 16 AWG

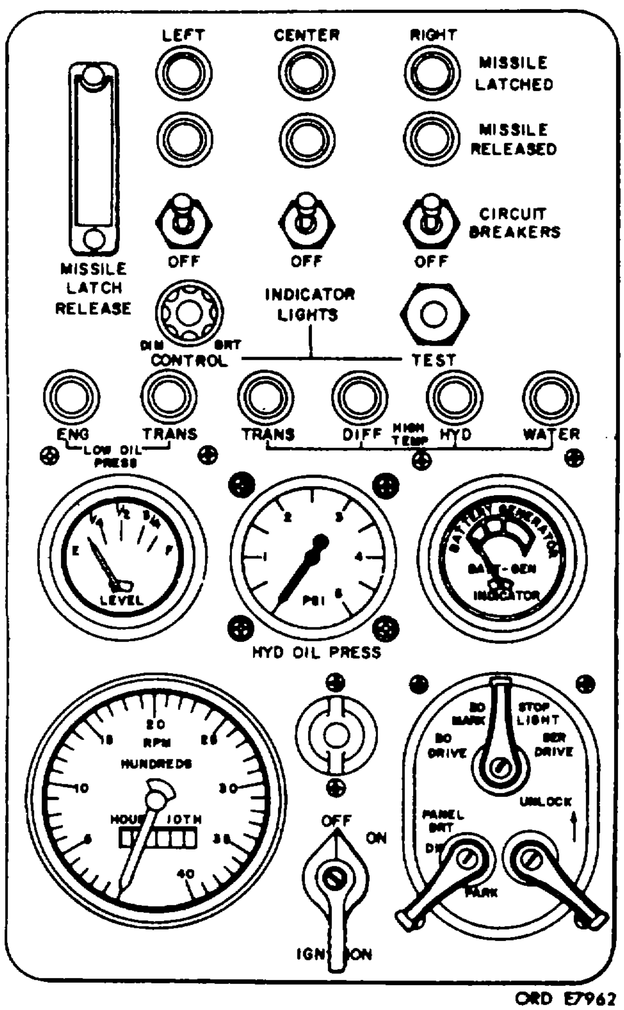


Figure 4-6. Distribution Box Controls and Indicators.

jumper. Set engine to idle at 600 RPM. The pressure in the hydraulic system should again drop to 2500 psig or less. Set the EXTENSION actuator control lever in neutral, remove the jumper, and connect the cable assembly to the superstructure connector.

b. Simulated Missile Latching, Unloading, and Loading Test.

NOTE

The missile loader will be indexed to the pallet and latched to dummy missiles during this operation.

(1) *Latching release solenoid test*. Using dummy missiles, index missile loader to pallet as described in TM 9-1450-500-10. Operate the three manual missile releases by depressing solenoid plunger as described in step (14) above. The three MISSILE LATCHED (green) lights should go out and the three MISSILE RELEASED (red) lights should be on. Extend the transfer arm assembly to a point where the beam makes full contact with the missiles. Mark the initial point of contact. Then with the MISSILE LATCHING RELEASE toggle switch in the momentary on position (toggle up), set the engine at an idle of less than 600 RPM, then continue extending the transfer arm assembly. Mark the point where the missile latching release solenoids operate (indicated by audible clicks). This point should not be more than one inch from the mark made earlier during this test. The energizing of the missile latch release solenoids should be coincidental with reduction of pressure in the hydraulic system. Continue to extend the transfer arm assembly and latch the beams to the missiles as described in TM 9-1450-500-10. The three MISSILE RELEASED (red) lights should go out and the three MISSILE LATCHED (green) lights should go on. Mark the position of the beams on the missiles. Switch the MISSILE LATCH RELEASE toggle switch to its momentary on position (toggle up). The missile latch solenoids should energize, the three MISSILE LATCHED (green) lights should go off and the three MISSILE RELEASED (red) lights should go on.

NOTE

While retracting from the unlatched dummy missiles and with the MISSILE LATCH RELEASE toggle held in its momentary on position (toggle up), determine that the missile latch release solenoids de-energize within a half inch (13mm) from the point of initial energizing.

(2) Azimuth control limit switch test.

NOTE

Dummy missiles will be hoisted during this test.

Using dummy missiles, index missile loader to pallet and latch the missiles as described in TM 9-1450-500-10. Retract the boom superstructure and check to determine that the AZIMUTH control system is inoperative when the missiles are less than two inches (51 mm) from the missile support pads. Then extend the boom superstructure and check to determine that the AZIMUTH control system is operative with the missiles 10 inches from the missile support pads.

CAUTION

It is important that the AZIMUTH control is not operated when missiles are about to be settled (within two inches) on the missile support pads.

4-41. Road Tests

The road testing of the missile loader is divided into three procedures, acceleration, track runs, and braking tests. Prior to, during, and after these tests have been performed, inspect the carrier for oil and water leaks and excessive temperature. Check the horn to see that it works properly. Inspect the tracks for proper tension adjustment and check the gear train for excessive backlash and symptomatic noises. Also, inspect the fan belt to be sure they are tight and check for any other obvious conditions that could cause mechanical failure.

NOTE

Top speed over relatively level and smooth terrain should be at least 10 MP. This can be verified by the use of an attachable speedometer or another vehicle which has a speedometer.

CAUTION

Be sure to warm engine thoroughly according to TM 9-1450-500-10 before performing the following tests.

a. Acceleration test. Perform a zero start at full speed (3800 RPM in D range) acceleration test over level and smooth terrain that is well packed or paved and is void of excessive loose gravel, sand, or dirt. The maximum time to travel 11.2 m from the zero start position should be 5 seconds.

CAUTION

Be sure that none of the HIGH TEMP or LOW OIL PRESS (red) lights indicate malfunctioning of their respective systems during these tests. Also, this test should not be performed until the carrier has been broken in when new or after a major overhaul has been performed on the carrier.

b. Track Runs. Perform the runs outlined in Table 4-12 over the same kind of terrain as described for step (a) above at the following specified speeds, gear ranges, and distances.

Table 4-12. Track Runs Schedule.

Run no.	Engine RPM	Trans gear range	Distance
1	1500	1	800 m
2	2200	1	800 m
3	3000	1	800 m
4	1500	D	800 m
6	2400	D	1600 m
6	2000	R	15 m
7	3000	D	800 m
8	3400	D	800 m
9	3600	D	800 m
10	3800	D	800 m

c. Braking Tests. Perform the braking tests over the same kind of terrain described above by bringing the vehicle to a complete stop from a top speed of 10 MPH within a maximum distance of 3 m. Check to determine that the lever arm forces required to lock the individual brakes shall not vary from each other by more than 5 pounds pressure. Also verify that during stopping and turning operations the track mobility shall be smooth and even without vibration or chatter.

WARNING

The brake levers must have at least two notches of travel remaining when in their locked position. The levers should be adjusted in line with each other at the top of the handles with one-half inch.

SECTION IX.1. (SEE NOTE) OPERATIONAL TESTS

4-42. General

The following section on operational tests of the loader is divided into two subdivisions. Paragraph 4-43 covers the functional tests required of the vehicle to determine that it is capable of performing of loading the missiles onto the launchers. Paragraph 4-44 covers the road tests required to insure the vehicles capabilities of transporting itself to the missile launching site and transporting the missiles from the location of unpacking and assembling. If the loader does not comply with all of the following requirements, the reasons for its failure must be ascertained and corrected before the loader is made available for service requisition.

4-43. Functional Tests

The functional testing of the missile loader is divided into two procedures, the testing of the controls and indicators on the distribution box and the operation of the boom superstructure through a simulated missile loading procedure. Prior to either set of tests, the maintenance personnel should make a visual inspection for any obvious defects such as loose electrical connections, frayed insulation, and broken safety wiring of connectors.

a. Lights, Controls and Indicators.

NOTE

The controls and indicators designated refer to Figure 4-61 except where otherwise indicated.

CAUTION

During all of the following light tests, be sure to turn the master switch (refer to TM 9-1450-500-10) OFF if there is any delay between tests, as continuous drain on the battery system could render it inoperative.

(1) Service drive lights. Turn the master switch (refer to TM 9-1450-500-10) to ON position. Turn main light switch to the SER DRIVE position. Both headlights and taillights should be on.

NOTE

To locate switches, controls, and lights, not included as a part of this manual, refer to operation manual TM 9-1450-500-10.

(2) Dimmer switch. With the headlights still on, flip dimmer switch (refer to TM 9-1450-500-10) several times. The service headlights should change from low beam to high beam, and from high beam to low beam.

(3) Service stop light. With the taillight still on, apply both brakes to the stop position. The service stoplight should be on. Release the brakes, and the service stoplight should go off. Then turn main light switch to the STOP LIGHT position. Again apply both brakes. The service stoplight should be on. Release the brakes, and the service stoplight should go off. Then turn main light switch to the STOP LIGHT position. Again apply both brakes. The service stoplight should be on. Release the brakes, and the service stoplight should go off.

(4) Blackout marker lights. Turn main light switch to the BO MARK position. Blackout marker lights, apply both brakes. Blackout stoplight of the stoplight assembly should be on. Release brakes, and the blackout stoplight should go off.

NOTE

For location of lights, refer to figure 6-54.1.

(5) Blackout drive light. Turn main switch to the BO DRIVE position. Blackout headlamp and blackout marker lights, front and rear, should be on. Apply both brakes. Blackout stoplight should be on. Release brakes, and the blackout stoplight should go off.

(6) Panel Light (illuminator). Turn auxiliary switch to the DIM position. Panel light should be on and dim. Then turn switch to its PANEL BRT position. The panel light should be on and bright.

(7) Parking lights. Turn the auxiliary switch to the PARK position, and the main switch to the SER DRIVE position. Parking light (tail lamp assembly) should be on.

NOTE: Section IX.1 applies to Loader (Multifuel Engine) Part Number 50008600.
Section IX applies to Loader (Gasoline Engine) Part Numbers 9099200, 50092260 or 50092266.

(8) Lights off. With auxiliary switch still in the park position, turn main switch back to the OFF position. All lights should go off.

(9) Mechanical interlock. With the mechanical interlock switch in the LOCK position, verify that the only position in which the main switch can be turned is BO MARKER. Then verify that only the lights indicated in steps (4) above are lit.

WARNING

It is extremely vital that these conditions be verified since destruction of both personnel and equipment could result by the giving away of their tactical position to the enemy during maneuvers.

(10) Indicator readings, electric engine OFF. Turn the main switch OFF, and with the master switch still ON, turn electric engine switch to the OFF position. Rotate the INDICATOR LIGHTS DIM BRT CONTROL to its BRT position (fully clockwise), then press the INDICATOR LIGHTS TEST button to verify that all three CIRCUIT BREAKERS are switched to the OFF position. The three MISSILE LATCHED (green) lights, LEFT, CENTER or RIGHT and the three MISSILE RELEASED (red) lights, LEFT CENTER, or RIGHT must remain unlit.

(11) Indicator readings, electric engine ON. With the master switch still ON, turn electric engine switch to the ON position. Each indicator should read as shown in Table 4-13.

Table 4-13. Indicator Readings.

Indicator	Reading
MISSILE LATCHED (green) LEFT, CENTER and RIGHT lights	None
MISSILE RELEASED (red) LEFT, CENTER and RIGHT lights	Illuminated
GEN (red) light	Illuminated
ENG LOW OIL PRESS (red) light	Illuminated
TRANS LOW OIL PRESS (red) light	Illuminated
TRANS HIGH TEMP (red) light	None
DIFF HIGH TEMP (red) light	None
HYD HIGH TEMP (red) light	None
ENG HIGH TEMP (red) light	None
Fuel LEVEL gage	Tank fuel level
REDUCED PRESSURE (amber) light	None
HYD OIL PRESS gage	None
BATT-GEN INDICATOR	Battery current drain
Tachometer	None

(12) INDICATOR LIGHTS TEST button. With both the master switch and the electric engine switch ON, press the INDICATOR LIGHTS TEST button. Each indicator should read as shown in Table 4-14.

Table 4-14. Press to Test Indicator Readings, Electric Engine On.

Indicator	Reading
MISSILE LATCHED (green) LEFT, CENTER and RIGHT lights	Illuminated
MISSILE RELEASED (red) LEFT, CENTER and RIGHT lights	Illuminated
GEN (red) light	Illuminated
REDUCED PRESSURE (amber) light	Illuminated
ENG LOW OIL PRESS (red) light	Illuminated
TRANS LOW OIL PRESS (red) light	Illuminated
TRANS HIGH TEMP (red) light	Illuminated
DIFF HIGH TEMP (red) light	Illuminated
HYD HIGH TEMP (red) light	Illuminated
ENG HIGH TEMP (red) light	Illuminated
Fuel LEVEL, HYD OIL PRESS gages, BATT-GEN INDICATOR and tachometer	Same as in Table 4-13.
PREHEAT light	Illuminated when preheat switch is ON

(13) DIM.BRT CONTROL. With the INDICATOR LIGHTS TEST button stil pressed in as in step (12) above, turn DIM-BRT CONTROL fully clockwise, then fully counterlockwise. Only the three MISSILE LATCHED (green) and the three MISSILE RELEASED (red) lights should go bright, then dim, and yet remain visible. The ENG and TRANS LOW OIL PRESS and TRANS, DIFF. HYD, ENG. HIGH TEMP and GEN and REDUCED PRESSURE indicators must be on but not affected by the DIMBRT CONTROL Release the INDICATOR LIGHTS TEST button to determine that only the three MISSILE RELEASED (red), the two ENG and TRANS LOW OIL PRESS (red) and the GEN (red) indicators remain lit. All other red and green indicators must be out.

(14) MISSILE LATCHED and RELEASED switching. With both the master and electric engine switches still ON, slowly operate the left missile latching lever. The LEFT MISSILE RELEASED (red) light should go out after the aft latch (relative to the loader) protrudes below the machined bosses of the beam and before the latch is in the fully latched position. Continue pulling the latching lever until the latch is down and fully locked. At this position, the LEFT MISSILE LATCHED (green) light should go on. To operate the manual missile release, push the plunger of solenoid (1, fig. 5-11) plunger of the left latching mechanism. The LEFT MISSILE LATCHED (green) light should go out and the LEFT MISSILE RELEASED (red) light should come on.

NOTE

Perform this same operation for the center and right missile latching mechanisms in the same sequence as above, the CENTER and RIGHT MISSILE LATCHED and RELEASED indicators should operate.

(15) Indicator readings, engine on. Start the engine according to TM 9-1450-500-10 and after engine has been warmed up in accordance with TM instructions run engine at a fast idle. Each indicator should read as shown in Tablc4-15.

Table 4-15. Indicator Readings, Engine On.

Indicator	Reading
Missile latched (green) LEFT, CENTER and RIGHT lights	Illuminated
All other (red and green) lights	None
Fuel LEVEL gage	Tank fuel level
HYD OIL PRESS gage	2600 to 3050 psig
BATT-GEN INDICATOR	BATTERY current drain on
....	GENERATOR voltage regulator
....	output
Tachometer	RPM
RUNNING TIME	Hour of loader operation

WARNING

At no time during the preceeding or following tests should the hydraulic pressure exceed 3000 psig nor should the hydraulic high temperature warning indicator light go on. If either should occur, immediate investigation of the cause should be made and corrective measures taken to prevent possible damage to the equipment or harm to personnel.

(16) Index and transfer arm limit switches. With engine still running as in step (15) above, operate the latching lever of all three latching mechanisms described in step (14). Switch the three MISSILE LATCHED and RELEASED CIRCUIT BREAKERS to the ON positions. Hold the MISSILE LATCH RELEASE toggle switch in the momentary on position (toggle up). The three MISSILE LATCHED (green) lights should remain on and the latching mechanisms should remain latched. Then operate the extension cylinder to the point where the actuation plunger of the index arm limit switch (fig. 5-18) located on the forward inboard side of the intermediate link assembly does not make contact with the boom tubing. The transfer arm limit switch (fig. 5-18) located in the end of the link, should be in the actuated open position with the actuator shaft pushed in. The three MISSILE LATCHED (green) lights should remain on and the three missile latching mechanisms should remain in their latched position.

(17) Solenoid operated hydraulic valves. With the engine still running, fully retract the extension cylinder, and leave the EXTENSION actuator control lever (TM 9-1450-500-10) in the retract position (opposite direction to EXTENSION). Disconnect cable assembly that connects between the index boom and the distribution box assembly. Using a number 16 AWG insulated jumper, connect the receptacle contact "B" to contact "M". Set the engine to idle at 700 RPM. The pressure in the hydraulic system should drop to 2600 psig, since this condition simulates low pressure system actuation due to operation of the solenoid operated hydraulic valves. Remove the jumper that connects pins "B" and "M". Move the EXTENSION actuator control lever to its full EXTENSION position (all the way forward) to fully extend the cylinder. This can be facilitated by momentarily setting the engine to run at 2000 RPM.

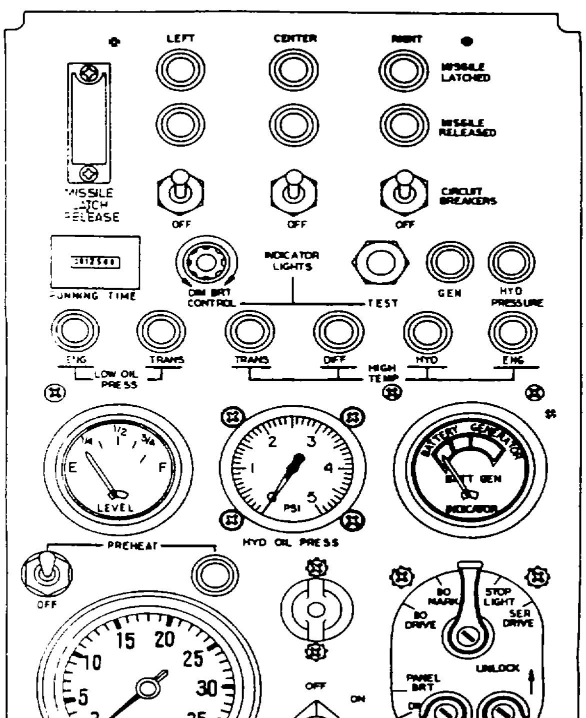


Figure 4-61. Distribution Box Controls and Indicators.

Leave the EXTENSION actuator control lever in the full EXTENSION position and connect pins "B" and "M" with the number 16 AWG jumper. Set the engine to idle at 700 RPM. The pressure in the hydraulic system should again drop to 2600 psig. Set the EXTENSION actuator control lever in neutral, remove the jumper, and connect the cable assembly to the superstructure connector.

b. Simulated Missile latching, Unloading, and Loading Test.

NOTE

The missile loader will be indexed to the pallet and latched to dummy missiles during this operation.

(1) Latching release solenoid test. Using dummy missiles, index missile loader to pallet as described in TM 9-1450-500-10. Operate the three manual missile releases by depressing solenoid plunger as described in step (14) above. The three MISSILE LATCHED (green) lights should go out and the three MISSILE RELEASED (red) lights should be on. Extend the transfer arm assembly to a point where the beam makes full contact with the missiles. Mark the initial point of contact. Then with the MISSILE LATCHING RELEASE toggle switch in the momentary on position (toggle up), set the engine at an idle of less than 700 RPM, then continue extending the transfer arm assembly. Mark the point where the missile latching release solenoids operate Vindicated by audible clicks). This point should not be more than one inch from the mark made earlier during this test. The energizing of the missile latch release solenoids should be coincidental with reduction of pressure in the hydraulic system. Continue to extend the transfer arm assembly and latch the beams to the missiles as described in TM 9-1450-500-10. The three MISSILE RELEASED (red) lights should go out and the three MISSILE LATCHED (green) lights should go on. Mark the position of the beams on the missiles. Switch the MISSILE LATCH RELEASE toggle switch to its momentary on position (toggle up). The missile latch solenoids should energize, the three MISSILE LATCHED (green) lights should go off and the three MISSILE RELEASED (red) lights should go on.

NOTE

While retracting from the unlatched dummy missiles and with the MISSILE LATCH RELEASE toggle held in its momentary on position (toggle up), determine that the missile latch release solenoids deenergize within a half inch (13 mm) from the point of initial energizing.

(2) Azimuth control limit switch test.

NOTE

Dummy missiles will be hoisted during this test.

Using dummy missiles, index missile loader to pallet and latch the missiles as described in TM 9 1450-500-10. Retract the boom superstructure and check to determine that the AZIMUTH control system is inoperative when the missiles are less than two inches (51 mm) from the missile support pads. Then extend the boom superstructure and check to determine that the AZIMUTH control system is operative with the missiles 10 inches from the missile support pads.

CAUTION

It is important that the AZMMIMH control is not operated when missiles are about to be settled (within two inches) on the missile support pads.

4-44. Road Tests

The road testing of the missile loader is divided into three procedures, acceleration, track runs, and braking tests. Prior to, during, and after these tests have been performed, inspect the carrier for oil. Inspect the tracks for proper tension adjustment and check the gear train for excessive backlash and symptomatic noises. Also, inspect the fan belt to be sure it is tight and check for any other obvious conditions that could cause mechanical failure.

NOTE

Top speed over relatively level and smooth terrain should be at least 10 MPH. This can be verified by the use of an attachable speedometer or another vehicle which has a speedometer.

CAUTION

Be sure to warm engine thoroughly according to TM 9-1450-500-10 before performing the following tests.

a. Acceleration test. Perform a zero start at full speed (3000 RPM in D range) acceleration test over level and smooth terrain that is well packed or paved and is void of excessive loose gravel, sand, or dirt. The maximum time to travel 11.2 m from the zero start position should be 5 seconds.

CAUTION

Be sure that none of the HIGH TEMP or LOW OIL PRESS (red) lights indicate malfunctioning of their respective systems during these tests. Also, this test should not be performed until the carrier has been broken in when new or after a major overhaul has been performed on the loader.

b. Track Runs. Perform the runs outlined in Table 4-16 over the same kind of terrain as described for step (a) above at the following specified speeds, gear ranges, and distances.

Table 4-16. Track Runs Schedule.

Run no.	Engine RPM	Trans gear range	Distance
1	1500	1	800 m
2	2200	1	800 m
3	3000	1	800 m
4	1500	D	800 m
5	2400	D	1600 m
6	2000	R	15 m
7	3000	D	800 m

c. Braking Tests. Perform the braking tests over the same kind of terrain described above by bringing the vehicle to a complete stop from a top speed of 10 MPH within a maximum distance of 3 m. Check to determine that the lever arm forces required to lock the individual brakes shall not vary from each other by more than 5 pounds pressure. Also verify that during stopping and turning operations the track mobility shall be smooth and even without vibration or chatter.

WARNING

The brake levers must have at least two notches of travel remaining when in their locked position. The levers should be adjusted in line with each other at the top of the handles with one-half inch.

SECTION X. (SEE NOTE) OVERHAUL OF STEERING AND BRAKING CONTROLS

4-45. Brake Control Assembly (Fig. 4-2)

a. Removal and Disassembly. Refer to TM 9-1450-500-201.

b. Inspection.

(1) Brake levers (1j and 8J). Replace the levers if they are cracked. Retap damaged threaded holes.

(2) Springs (1F and 8L). Inspect the springs for distorsion. Distorted springs must be replaced. Free length of the spring must be between 3 15/16 and 4 V16 inches (100 and 103 mm).

(3) Quadrants (4). Replace quadrants which have damaged or missing teeth.

(4) Bracket(9).Inspect the bracket for cracks. Remove nicks and burs from the boxes of the bracket with a fine stone.

(5) Shaft (11). Replace the shaft if it is deeply scored or gouged. Remove minor nicks and burs with a stone.

(6) Arm (15). Replace the arm if it is cracked.

c. Assembly and Installation. Refer to TM 9-1450-500-20-1.

4-46. Link Rods, Shaft Retaining Plate, Throttle Control Rod, Shaft and Lever Assembly, Shaft Brackets, Accelerator Control Pedal and Shaft, and Remove Control Lever

a. Removal and Installation. Refer to TM 9-1450-500-20-1.

b. Disassembly. No further disassembly can be performed on any of these components.

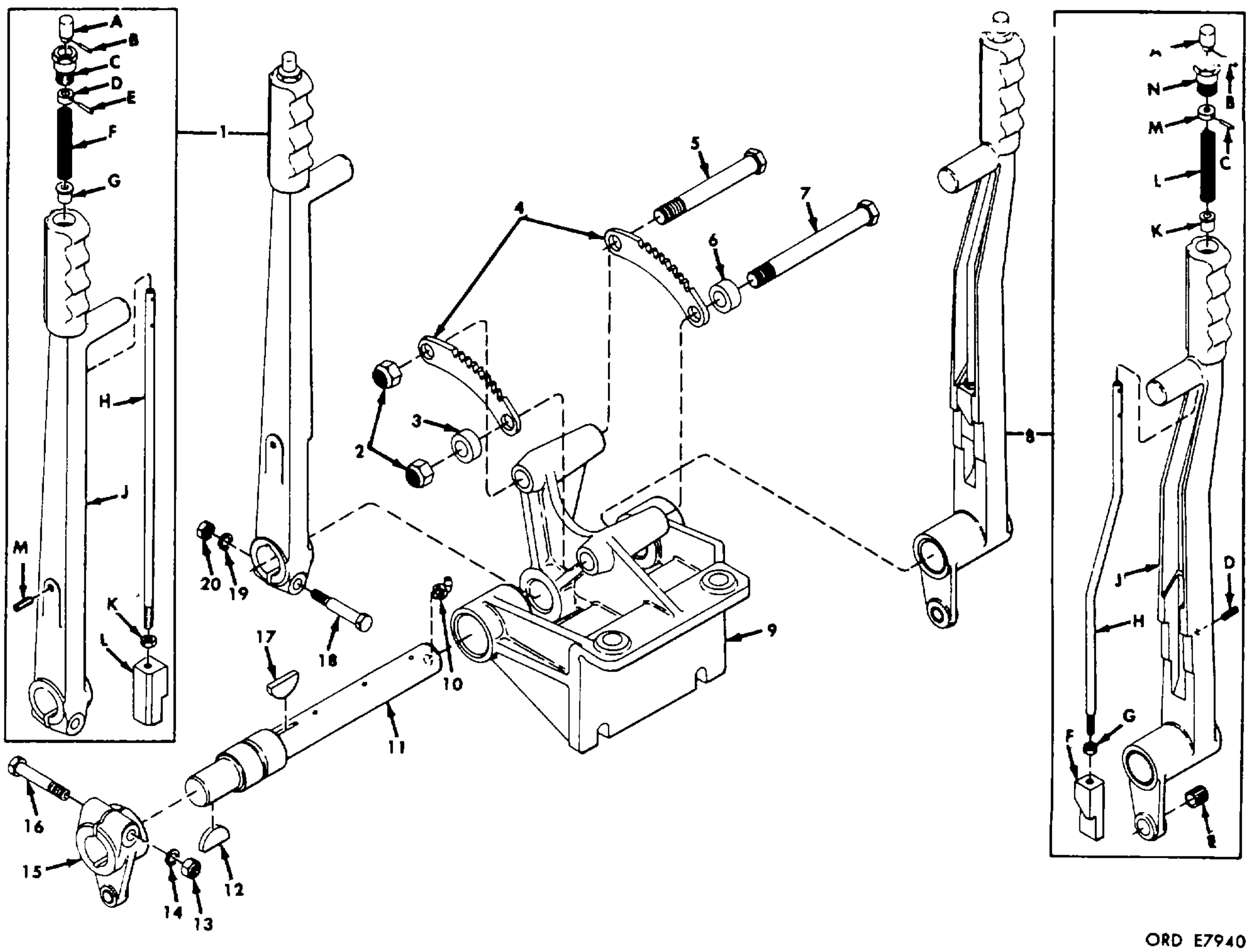
c. Inspection.

(1) Perform a visual inspection for mechanical damage as prescribed in chapter 4, section III.

(2) Check the repair and rebuild paragraph at the end of this section for allowable wear. Replace any part which has worn beyond allowable limits.

d. Assembly. None.

NOTE: Section X applies to Loader (Gasoline Engine) Part Numbers 9099200, 50092260 or 50092266.
Section X.1 applies to Loader (Multifuel Engine) Part Number 50008600.



1–Brake lever
  A–Button
  B–Straight pin
  C–Guide
  D–Collar
  E–Straight pin
  F–Spring
  G–Bushing
  H–Rod
  J–Lever
  K–Nut
  L–Pawl
  M–Setscrew
2–Safety nut
3–Spacer
4–Quadrant
5–Capscrew
6–Spacer
7–Capscrew
8–Brake lever
  A–Button
  B–Straight pin
  C–Straight pin
  D–Setscrew
  E–Bushing
  F–Pawl
  G–Nut
  H–Rod
  J–Lever
  K–Bushing
  L–Spring
  M–Collar
  N–Guide
9–Bracket
10–Lubrication fitting
11–Shaft
12–Woodruff key
13–Safety nut
14–Washer
15–Arm
16–Capscrew
17–Woodruff key
18–Capscrew
19–Washer
20–Safety nut

Figure 4-62. Repair of Brake Control Assembly.

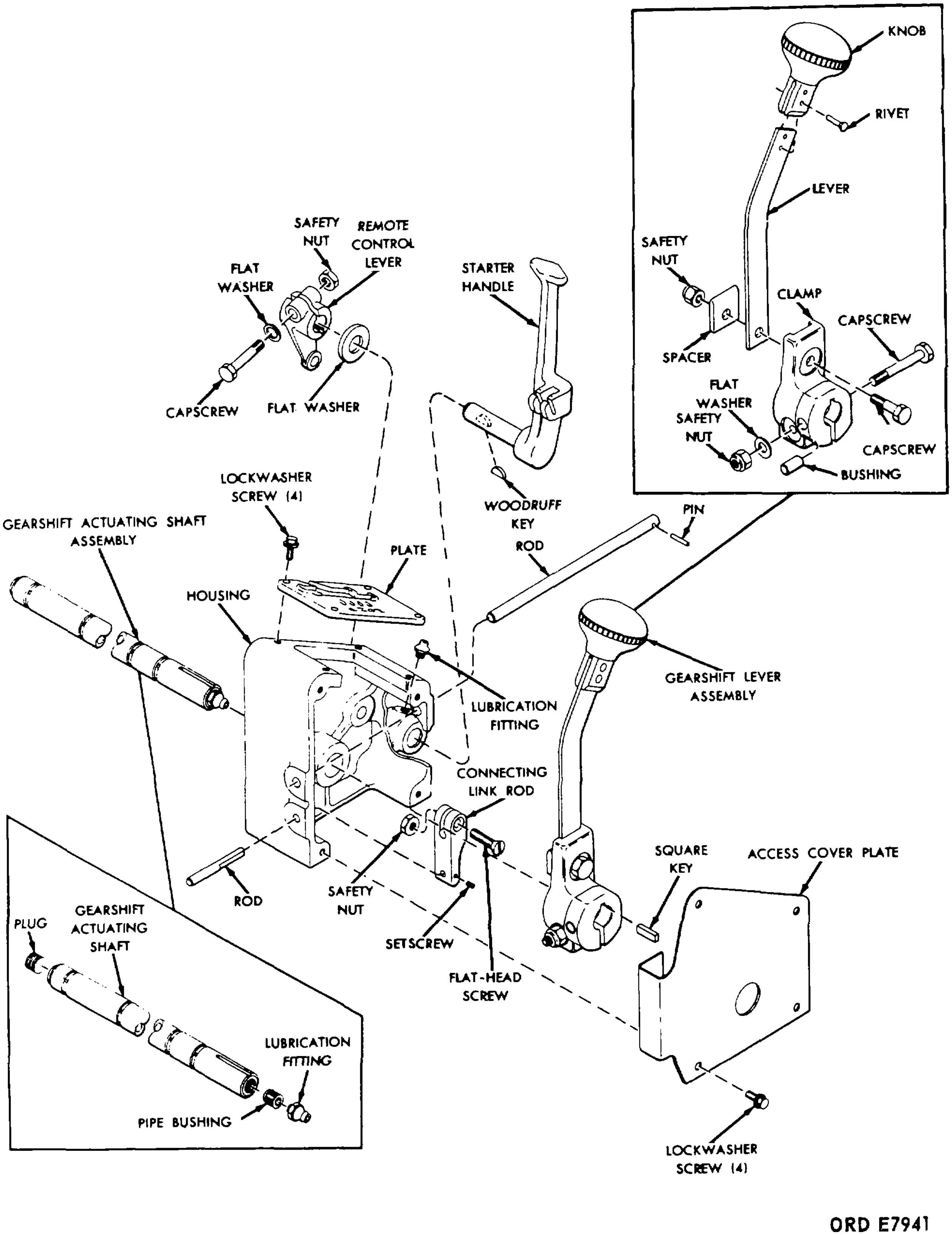


Figure 4-63. Repair of Start and Shift Control Unit.

4-47. Start and Shift Control Assembly (Fig. 4-3)

a. Removal and Disassembly. Refer to TM 9-1450 500-20-1.

b. Inspection.

(1) Perform a visual inspection for mechanical damage as prescribed in chapter 4, section III.

(2) Check the repair and rebuild paragraph at the end of this section for allowable wear. Replace any part which has worn beyond allowable limits.

c. Assembly and Installation. Refer to TM 9-1450-500-201.

4-48. Repair and Overhaul Standards for Controls Installation Components

a. General. This paragraph details repair and overhaul standards for controls installation components. Included are points of measurement, sizes and fits of new parts, wear limits for field and depot, and code symbols for coordinate information. The letter "L" indicates a loose or clearance fit between parts. The letter "T" indicates a tight or interference fit between parts. The asterisk (*) indicates that tolerances on an individual part must be the same as a new part. A double asterisk (**) indicates that the part may be used for selective fitting as long as the mating part permits the fit required between the two. All dimensions are in inches.

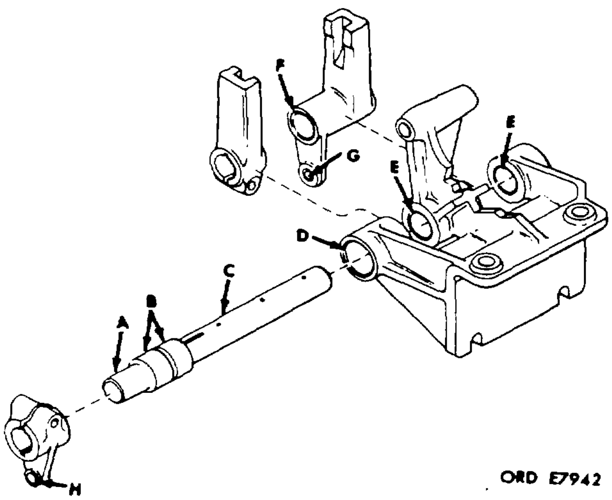


Figure 4-64. Brake Control Assembly Wear Limits.

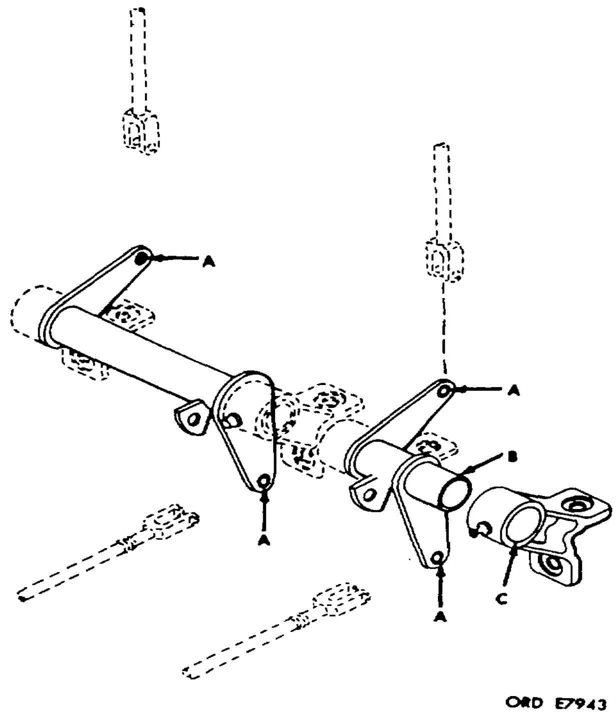


Figure 4-65. Controls Components Wear Limits. (Continued in Figure 4-66)

b. Brake Control Assembly.

Fig. no.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits Field	Depot
6-57	A-C	Diameter of shaft	1.122 to 1.125	1.100	1.105
	B	Diameter of shaft shoulder	1.434 to 1.437	1.400	1.410
	D	Bore diameter	1.440 to 1.444	1.475	1.465
	D-B	Fit between shaft and bore	0.003L to 0.010L	0.075L	0.055L
	E	Bore diameter	1.130 to 1.135	1.170	1.160
	E-C	Fit between shaft and bore	0.005L to 0.013L	0.070L	0.055L
	F	Bore diameter	1.126 to 1.129	1.160	1.150
	F-C	Fit between shaft and bore	0.001L to 0.007L	0.060L	0.045L
	G-H	Inside diameter of bushing	0.377 to 0.380	0.400	0.395

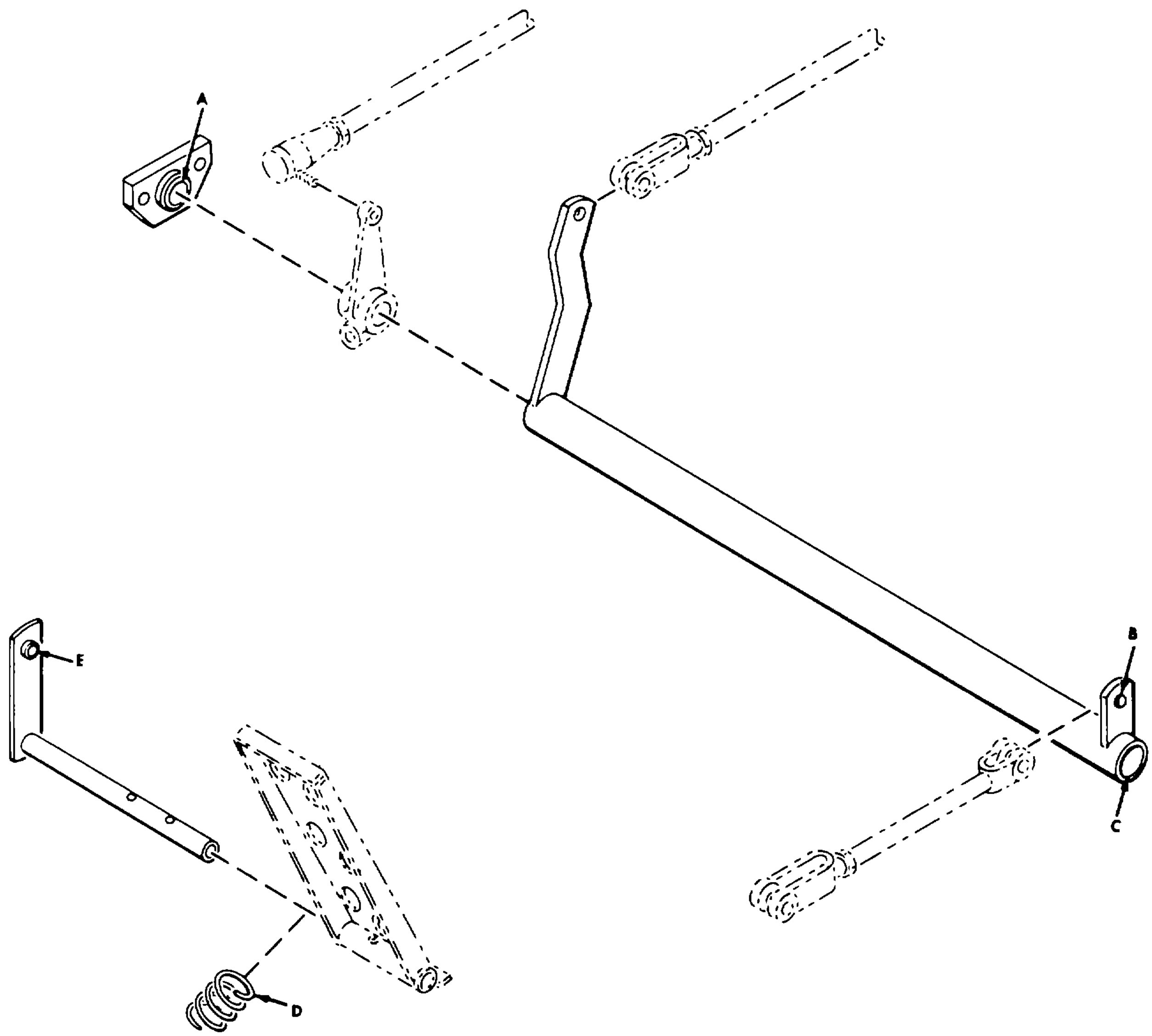


Figure 4-66. Controls Components Wear Limits. (Continued from Figure 4-65)

c. Controls Components

Fig. no.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits Field	Depot
6-58	A	Inside diameter of bushing	0.77 to 0.380	0.400	0.395
	B	Outside diameter of lever assembly	1.250 to 1.260	1.220	1.230
	C	Inside diameter of bracket	1.265 to 1.270	1.300	1.295
	C-B	Fit between bracket and lever assembly	0.005L to 0.020L	0.080L	0.065L
6-59	A	Inside diameter of bushing	0.749 to 0.751	0.786	0.776
	B	Inside diameter of bushing	0.314 to 0.316	0.345	0.335
	C	Inside diameter of bushing	0.60 to 0.70	0.800	0.790
	D	Free length of spring	1.965 to 2.035	(*)	(*)
	E	Inside diameter of bushing	0.14 to 0.316	0.345	0.335

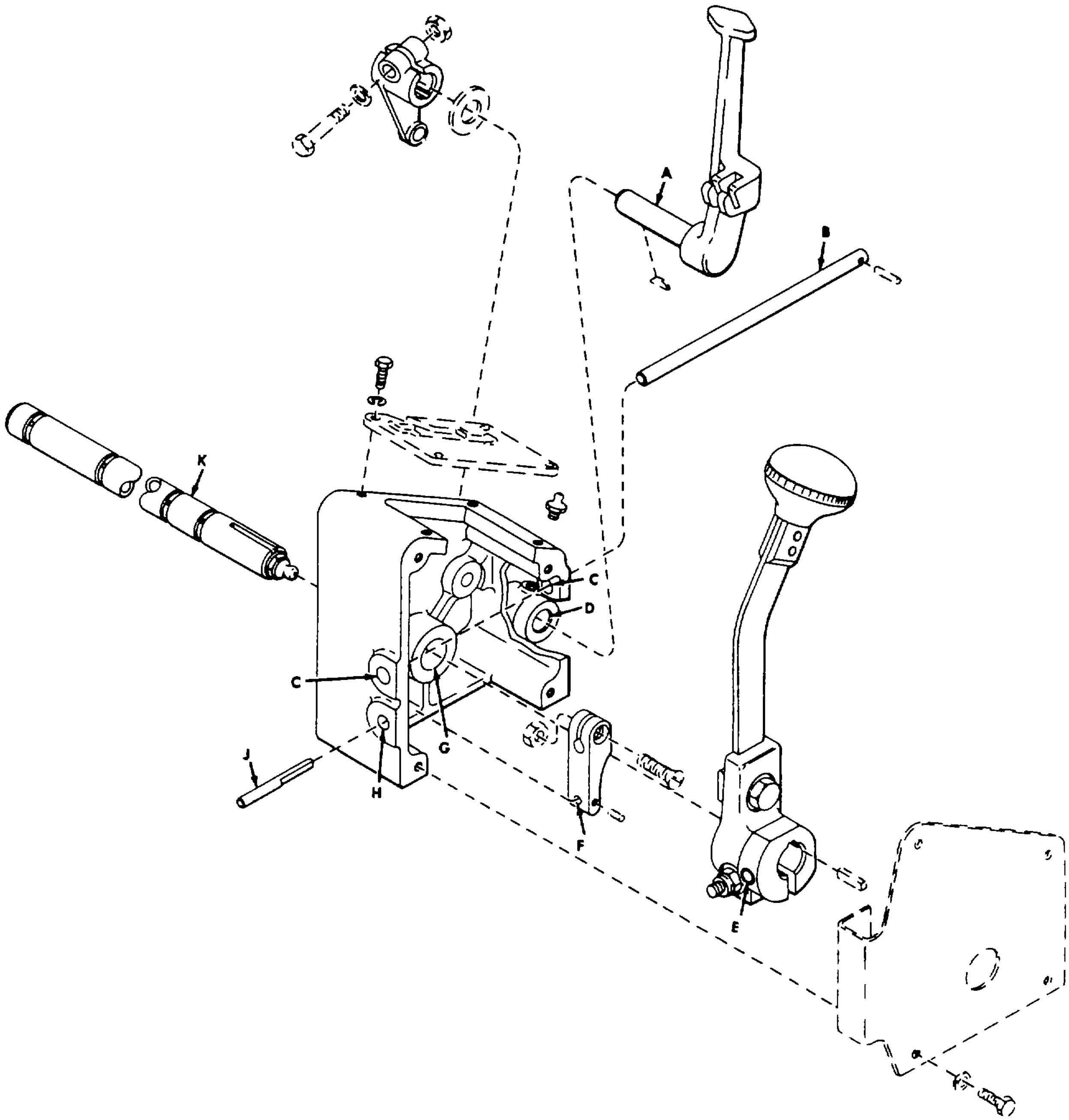


Figure 4-67. Start and Shift Control Unit Wear Limits (Sheet 1 of 2).

d. Start and Shift Control Unit.

Reference Letter	Point of Measurement	Sizes and Fits of New Parts	Wear Limits Field	Wear Limits Depot
A	Shaft diameter	0.494 to 0.496	0.460	0.470
B	Rod diameter	0.310 to 0.313	0.295	0.300
C	Diameter of hole	0.337 to 0.344	0.359	0.354
C–B	Fit between rod and hole	0.024L to 0.034L	0.064L	0.054L
D	Diameter of hole	0.498 to 0.503	0.525	0.515
D–A	Fit between shaft and hole	0.002L to 0.009L	0.065L	0.045L
E	Inside diameter of bushing	0.302 to 0.322	0.350	0.340
F	Diameter of hole	0.253 to 0.259	0.279	0.274
G	Bore diameter	0.750 to 0.752	0.770	0.760
H	Hole diameter	0.255 to 0.262	0.282	0.277
J	Rod diameter	0.249 to 0.250	0.229	0.234
J–H	Fit between rod and hole	0.005L to 0.013L	0.053L	0.043L
J–F	Fit between rod and hole	0.003L to 0.010L	0.050L	0.040L
K	Shaft diameter	0.744 to 0.746	0.710	0.720
K–G	Fit between shaft and bore	0.004L to 0.008L	0.060L	0.040L

Figure 4-67. Start and Shift Control Unit Wear Limits (Sheet 2 of 2).

SECTION X.1. (SEE NOTE) OVERHAUL OF CONTROLS INSTALLATION

4-49. Brake Control Assembly (Fig. 4-68)

a. Removal and Disassembly. Refer to TM 9-1450-500-20-2.

b. Inspection.

(1) Brake levers (1jand 8j). Replace the levers if they are cracked. Retap damaged threaded holes.

(2) Springs (1F and 8L). Inspect the springs for distorsion. Distorted springs must be replaced. Free length of the spring must be between 3 15/16 and 4 1/16 inches (100 and 103 mm).

(3) Quadrants (4). Replace quadrants which have damaged or missing teeth.

(4) Bracket (9). Inspect the bracket for cracks. Remove nicks and burs from the boxes of the bracket with a fine stone.

(5) Shaft (11). Replace the shaft if it is deeply scored or gouged. Remove minor nicks and burs with a stone.

(6) Arm (15). Replace the arm if it is cracked.

c. Assembly and Adjustment. Refer to TM 9-1450-500-20-2.

4-50. Shift Linkage Assembly (Fig. 4-69)

a. Removal. Refer to TM 9-1450-500-20-2.

b. Disassembly. No further disassembly can be performed on any of these components.

c. Inspection.

(1) Perform a visual inspection for mechanical damage as prescribed in chapter 4, section III.

(2) Check the repair and rebuild paragraph at the end of this section for allowable wear. Replace any part which has worn beyond allowable limits.

d. Assembly. None.

e. Installation and Adjustment. Refer to TM 9-1450-500-20-2.

4-51. Accelerator Pedal, Accelerator Linkage and Kickdown Cable (Fig. 4-70)

a. Removal. Refer to TM 9-1450-500-20-2.

b. Disassembly. No further disassembly can be performed on any of these components.

c. Inspection.

(1) Perform a visual inspection for mechanical damage as prescribed in chapter 4, section III.

(2) Check the repair and rebuild paragraph at the end of this section for allowable wear. Replace any part which has worn beyond allowable limits.

d. Assembly. None.

e. Installation and Adjustment. Refer to TM 9-1450-500-20-2.

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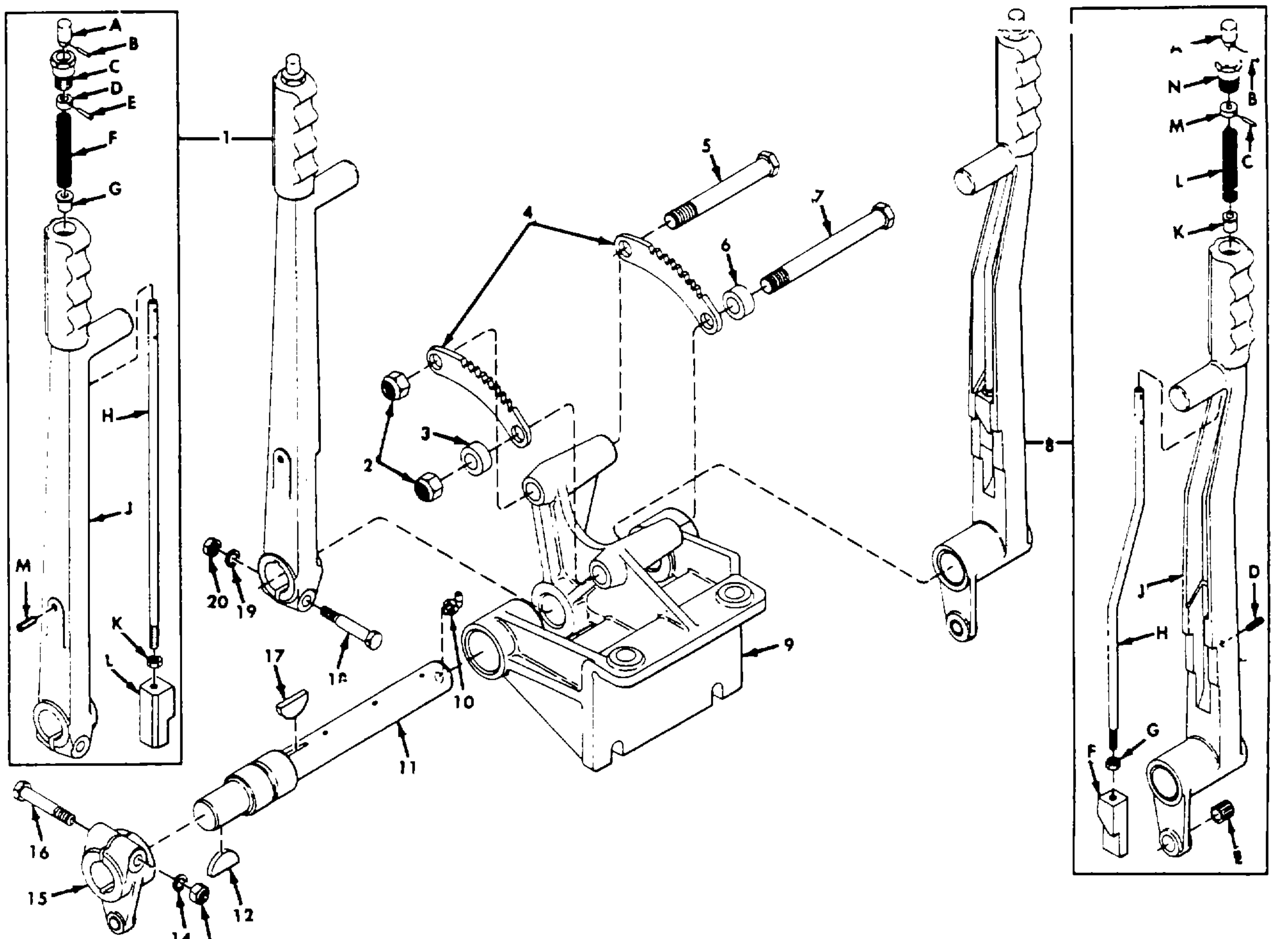
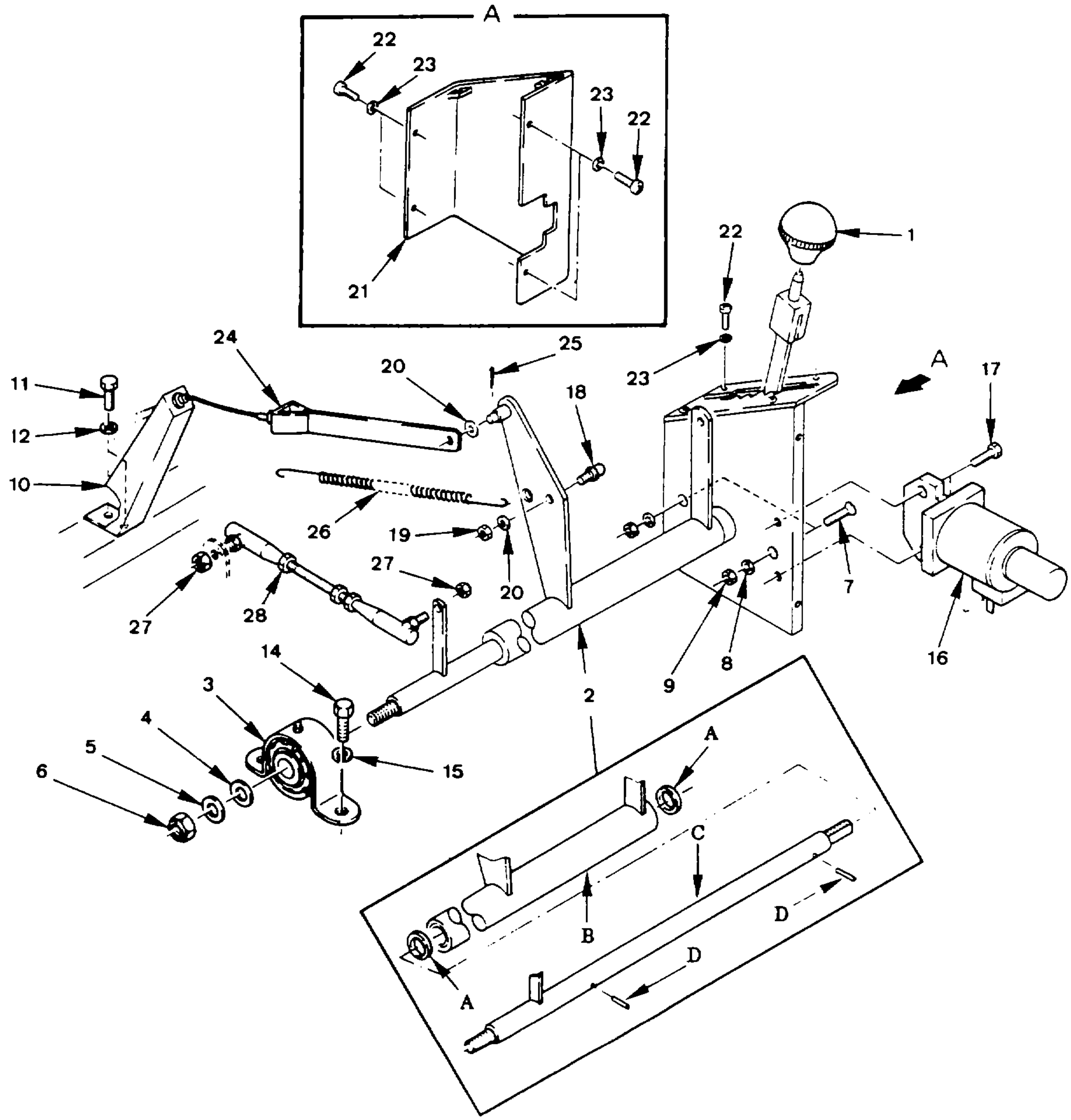
NOTE: Section X.1. applies to Loader (Multifuel Engine) Part Number 50008600.
Section X applies to Loader (Gasoline Engine) Part Numbers 9099200, 50092260 or 50092266.



1. Brake lever
   A. Button
   B. Straight pin
   C. Guide
   D. Collar
   E. Straight pin
   F. Spring
   G. Bushing
   H. Rod
   J. Lever
   K. Nut
   L. Pawl
   M. Setscrew
2. Safety nut
3. Spacer
4. Quadrant
5. Capscrew
6. Spacer
7. Capscrew
8. Brake lever
   A. Button
   B. Straight pin
   C. Straight pin
   D. Setscrew
   E. Bushing
   F. Pawl
   G. Nut
   H. Rod
   J. Lever
   K. Bushing
   L. Spring
   M. Collar
   N. Guide
9. Bracket
10. Lubrication fitting
11. Shaft
12. Woodruff key
13. Safety nut
14. Washer
15. Arm
16. Capscrew
17. Woodruff key
18. Capscrew
19. Washer
20. Safety nut

Figure 4-68. Repair of Brake Control Assembly.



1. Ball
2. Control Assy
   A. Bearing
   B. Tube Assy
   C. Shaft Assy
   D. Pin
3. Bearing Unit
4. Washer
5. Washer
6. Nut
7. Screw
8. Washer
9. Nut
10. Bracket
11. Screw
12. Washer
13. Cap
14. Screw
15. Screw
16. Switch Assy
17. Screw
18. Ball Stud
19. Nut
20. Washer
21. Cover
22. Screw
23. Washer
24. Link
25. Pin
26. Spring
27. Nut
28. Rod Assy

Figure 4-69. Repair of Shift Linkage Assembly

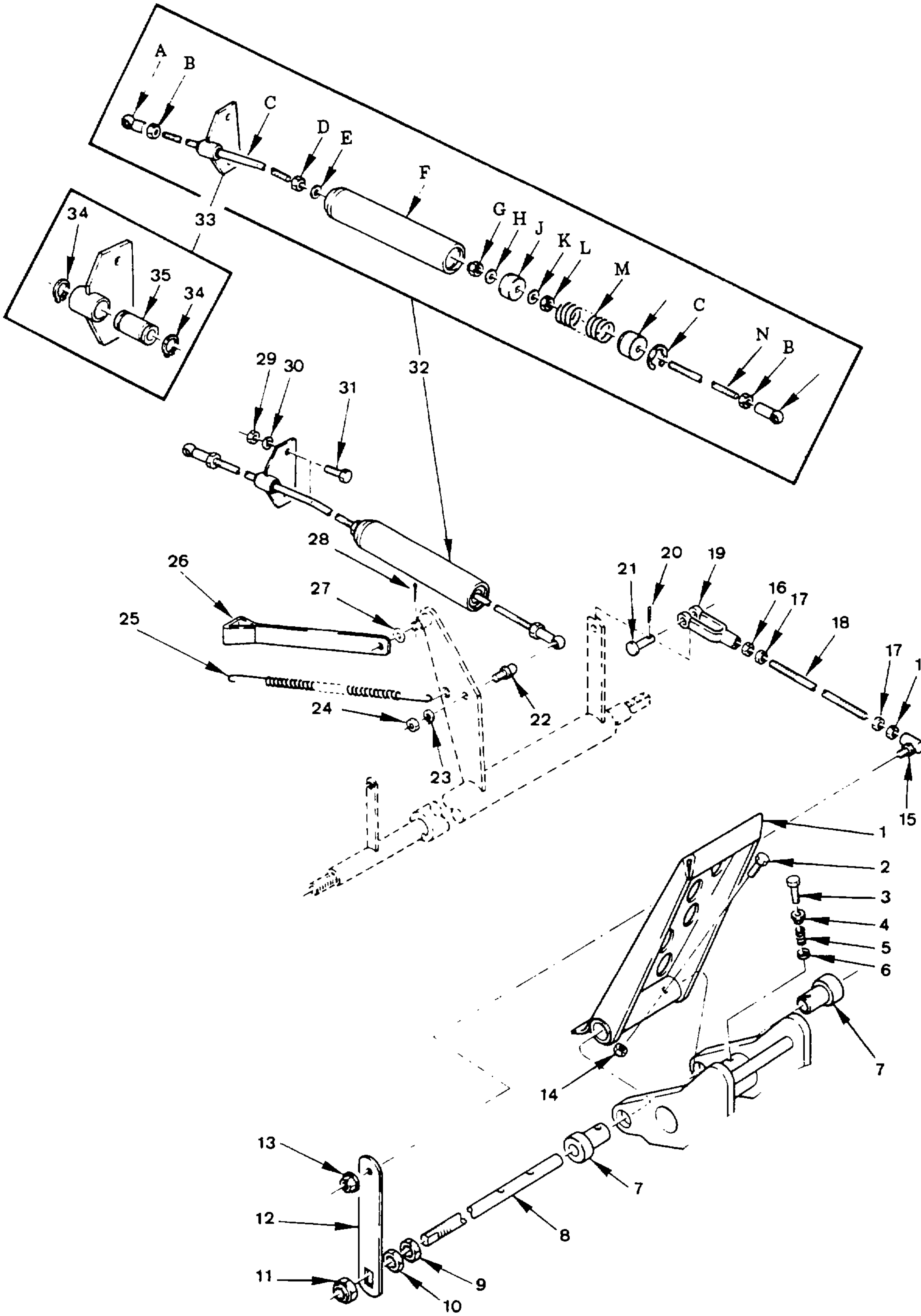


Figure 4-70. Repair of Accelerator Pedal, Pedal Linkage and Kickage and Kickdown Cable (Sheet 1 of 2).

1. Pedal assy
2. Screw
3. Screw, cap
4. Retainer, spring, accelerator
5. Spring, helical, compression
6. Washer, recessed
7. Bearing, sleeve
8. Shaft
9. Nut, plain, hexagon
10. Nut, self locking
11. Nut, self locking
12. Lever, pedal, assy
13. Nut, self locking
14. Nut, self locking
15. Ball, joint
16. Nut, plain, hexagon
17. Nut
18. Rod, threated, end
19. Clevis, rod end
20. Pin cotter
21. Pin
22. Ball, stud
23. Washer flat
24. Nut, self locking
25. Spring, helicoidal
26. Link
27. Washer, flat
28. Pin, cotter
29. Nut
30. Washer, flat
31. Screw, cap
32. Control assy
    A. Ball joint
    B. Nut, plain
    C. Rod
    D. Nut
    E. Washer, flat
    F. Housing, control assy
    G. Nut, self locking
    H. Washer, flat
    J. Washer, special purpose
    K. Washer, flat
    L. Nut, plain
    M. Spring helicoidal
    N. Rod
33. Bearing assy
34. Ring, retaining
35. Bearing, sleeve

Figure 4-70. Repair of Accelerator Pedal, Pedal Linkage and Kickage and Kickdown Cable (Sheet 2 of 2).

4-52. Repair and Overhaul Standards for Controls Installation Components

a. General. This paragraph details repair and overhaul standards for controls installation components. Included are point of measurement, sizes and fits of new parts, wear limits for field and depot, and code symbols for coordinate information. The letter "L" indicates a loose or clearance fit between parts. The letter "T" indicates a tight or interference fit between parts. The asterisk (*) indicates that tolerances on an individual part must be the same as a new part. A double asterisk (**) indicates that the part may be used for selective fitting as long as the mating part permits the fit required between the two. All dimensions are in inches.

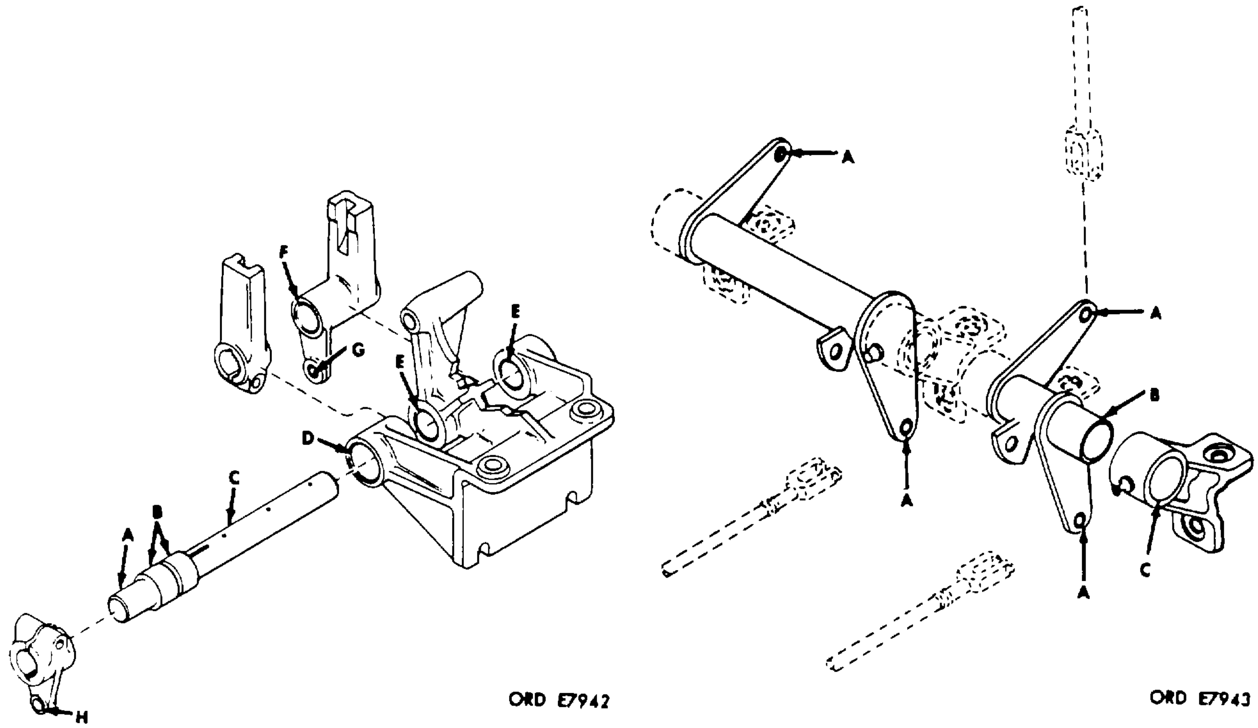


Figure 4-71. Brake Control Assembly Wear Limits.

b. Brake Control Assembly.

Ref	Point of measurement	Sizes and fits	Wear limits	
Letter	of new parts	Field	Depot	
A-C	Diameter of shaft	1.122 to 1.125	1.100	1.105
B	Diameter of shaft shoulder	1.434 to 1.437	1.400	1.410
D	Bore diameter	1.440 to 1.444	1.475	1.465
D-B	Fit be tween shaft and bore	0.003L to 0.010L	0.075L	0.055L
E	Bore diameter	1.130 to 1.135	1.170	1.160
E-C	Fit between shaft and bore	0.005L to 0.013L	0.070L	0.055L
F	Bore diameter	1.126 to 1.129	1.160	1.150
F-C	Fit between shaft and bore	0.001L to 0.007L	0.060L	0.045L
G-H	Inside diameter of bushing	0.377 to 0.380	0.400	0.395
J	Inside diameter of bushing	0.377 to 0.380	0.400	0.395
K	Outside diameter of lever assembly	1.250 to 1.260	1.220	1.230
L	Inside diameter of bracket	1.265 to 1.270	1.300	1.295
K-L	Fit between bracket and lever assembly	0.005L to 0.020L	0.080L	0.065L

c. Controls Installation - Components - Wear limits.

Ref Letter	Point of measurement of new parts	Sizes and fits Field	Wear limits Depot	
A	Diameter of pin, straight....................................	0.2734 to 0.2740	0.2728	0.2731
B	Width of slot	0.346 to 0.354	0.366	0.362
C	Width of slot	0.376 to 0.380	0.387	0.383
D	Width of shaft, end	0.364 to 0.374	0.354	0.359
E	Inside diameter of bearing	0.751 to 0.752	0.759	0.757
F	Diameter of shaft, shift.......................................	0.740 to 0.742	0.726	0.730
E-F	Fit between bearing and shaft............................	0.009L to 0.012L	0.033L	0.027L
G	Diameter of holes	0.315 to 0.321	0.355	0.345
H	Diaameter of pin, straight...................................	0.228 to 0.244	0.212	0.220

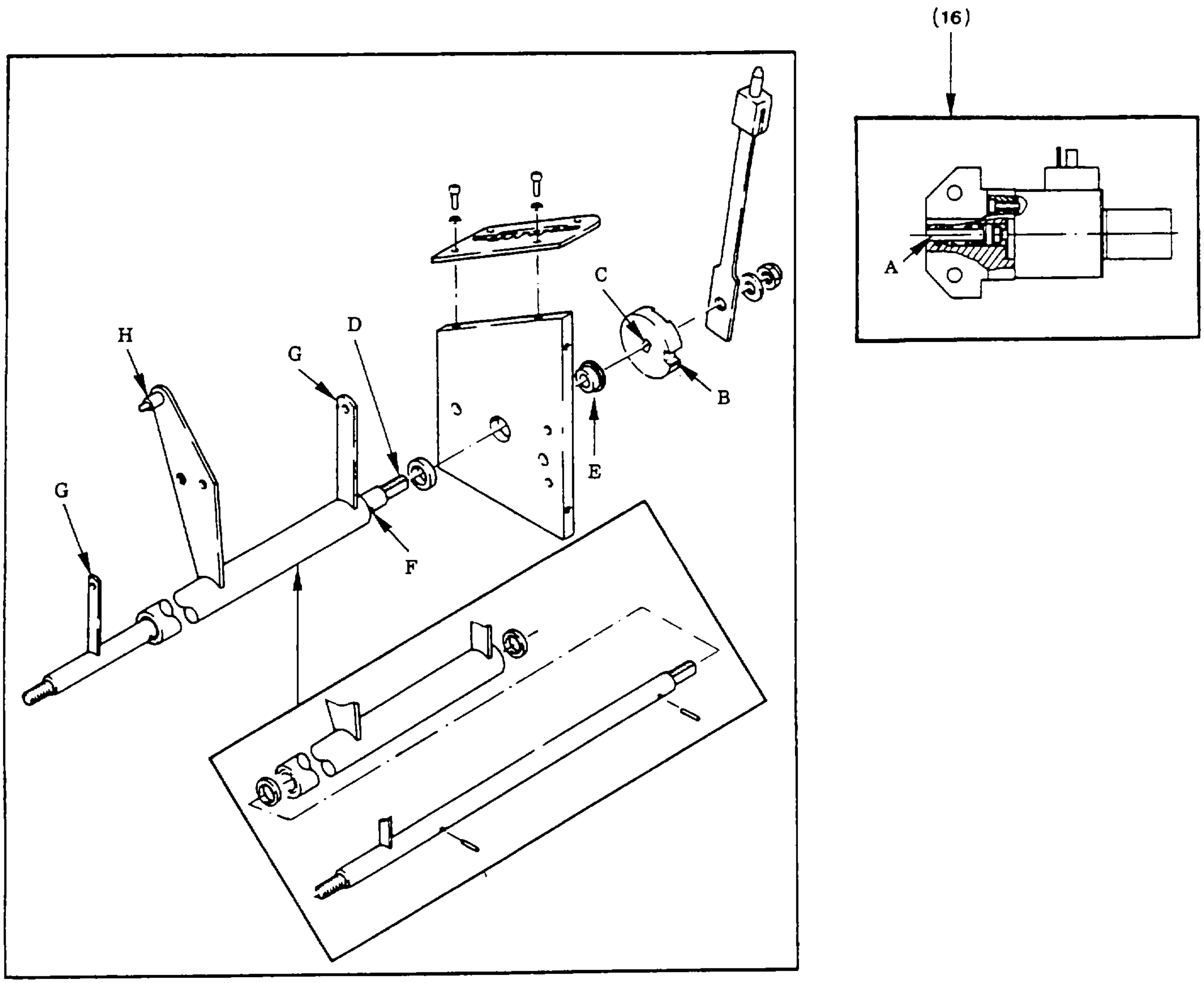


Figure 4-72. Controls Installation Components Wear Limits (Sheet 1 of 2)
Shift Linkage Assembly.

c. Controls Installation - Components - Wear limits (Continued).

Ref Letter	Point of measurement	Sizes and fits of new parts	Wear limits Field	Wear limits Depot
A	Diameter of hole	0.26 to 0.28	0.30	0.29
B	Outside diameter of pin	0.246.to 0.248	(**)	(**)
C	Inside diameter of holes	0.249 to 0.251	(**)	(**)
D	Diameter of hole	0.249 to 0.255	0.285	0.275
E	Width of slot	0.320 to 0.325	0.334	0.330
F	Width of shaft, end	0.314 to 0.319	0.328	0.324
G	Free length of spring	1.965 to 2.035	(*)	(*)

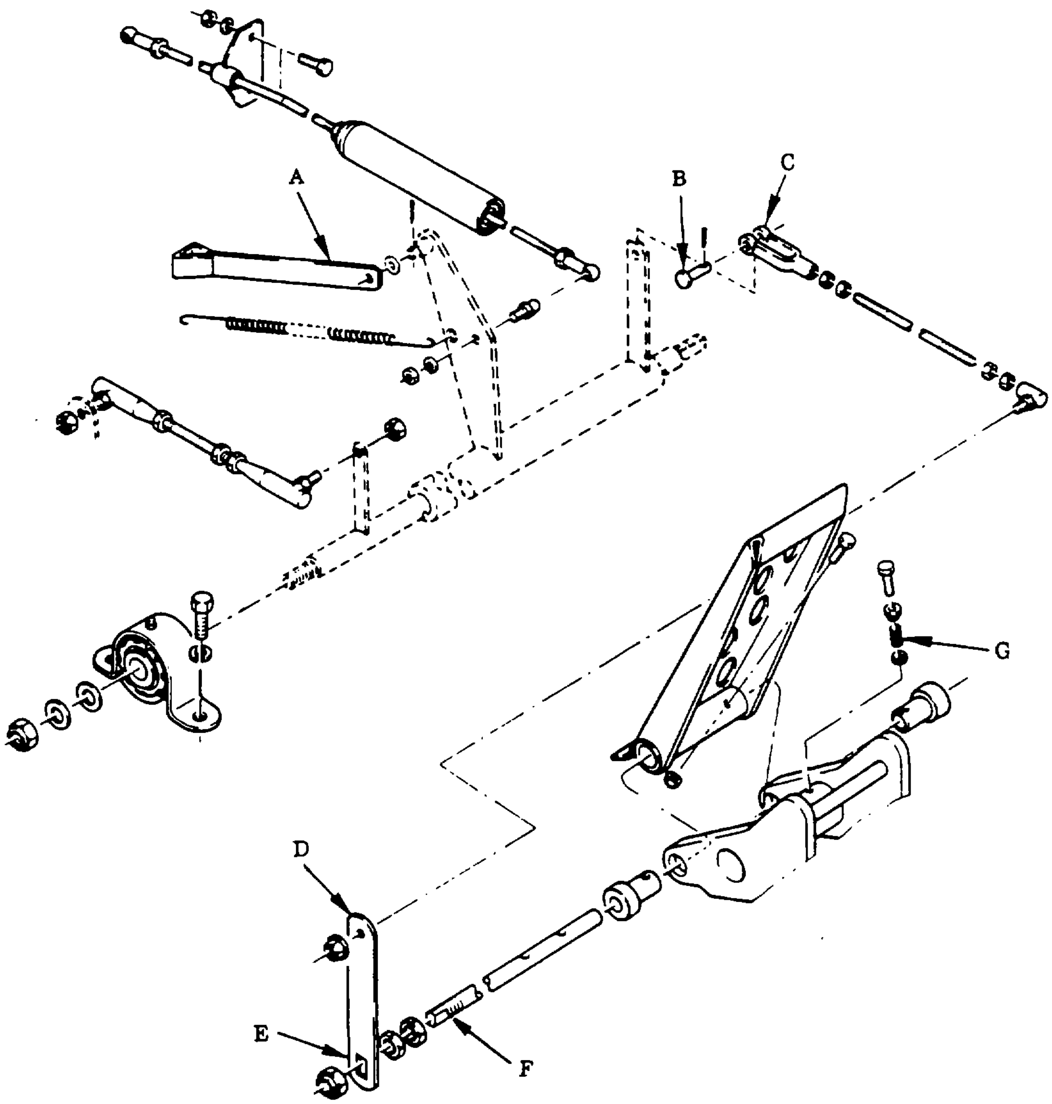


Figure 4-73. Controls Installation Components Wear Limits (Sheet 2 of 2)
Accelerator Pedal, Pedal Linkage and Kickdown Cable

CHAPTER 5
MAINTENANCE OF AUXILIARY EQUIPMENT

Section I. CRANE

5-1. Description

This section contains instructions for the removal and installation of auxiliary equipment for the loader. Auxiliary equipment consists of crane accessories, boom, hoisting beam XM15, and fire extinguisher.

5-2. Repair Procedure

For crane accessories and boom installation and removal instructions, refer to TM 9-1450-500-20. No repairs are required.

Section II. MISSILE HOISTING BEAM XM15

5-3. Description

The missile hoisting beam, used with the crane or hoist adapter, attaches to the missile by manually operated hooks. The movable lifting eye, which functions as a movable pivot, is then fastened by a lock pin through hole number 6 on the beam. Each hole is numbered to indicate the correct lifting point for missiles in various stages of assembly. However, only hole number 6 is used.

5-4. Repair Procedure

Before yearly proof-loading tests outlined in this manual, the two hooks, clevis pins, cotter pin, and washers (refer to TM 9-1450-500-20) must be removed and discarded regardless of their condition. Replace with new parts.

Section III. FIRE EXTINGUISHER

5-5. Description

The fire extinguisher is secured by a quick release clamp to a mounting bracket on the right fender of the loader.

5-6. Removal and Installation

Refer to TM 9-1450-500-10.

5-7. Maintenance

If fire extinguisher needs to be charged, notify chemical corps personnel.

CHAPTER 6
FINAL INSPECTION

Section I. INTRODUCTION

6-1. Purpose

This chapter contains inspection and repair procedures to be performed while the component is mounted in the vehicle. The purpose of these inspections is to determine the operational condition of the vehicle, and if found defective, to take the necessary precautions to prevent further component damage or possible injury to personnel. Inspection after a component is removed from the vehicle is performed to verify the diagnosis made when the component was in the vehicle. This inspection is particularly important because it is often the only means of determining the malfunction without extensive component disassembly.

Section II. CARRIER

6-2. Inspection and Road Test

a. <u>*During Road Test*</u>*.* The driver of the vehicle is often unaware of defects that have developed gradually in the vehicle. It is, therefore, desirable for organizational maintenance personnel to perform before-operation service specified in TM 9-1450-500-10 before performing inspection and road test specified below:

(1) *Differential, steering, and brakes.* Operate steering levers and observe if steering response is satisfactory. With the vehicle operating at a moderate speed and the steering levers released, note if there is any tendency to drift or pull to one side. Release accelerator and apply brakes, observing if the vehicle stops effectively without pulling to one side. With the vehicle stopped on an incline, pull back on steering levers and press lock buttons. Brakes must lock securely and hold vehicle in place. With brake levers fully locked there must be a minimum of two notches of travel remaining.

(2) *Transmission*. Shift through full range of the transmission to see that the linkage does not bind and if vehicle responds satisfactorily. Examine all visible controls for correct adjustment and any restriction or binding action.

(3) *Engine*. Test engine for normal acceleration and power in each transmission range. While testing in H (hilly) range, accelerate rapidly noting any tendency for engine to misfire or stall. Listen for unusual noises or vibrations that might indicate loose, damaged, or worn parts.

b. <u>*After Road Test*</u>*.* During and after road test of the vehicle, any repairs or adjustments necessary to assure safe operation should be made. Inspect the following items:

(1) *Wheel hubs and shock absorbers*. Immediately after road test, feel all wheel hubs cautiously for noticeable variation of temperature between like components. An overheated hub indicates a maladjusted, inadequately lubricated, or damaged bearing. Shock absorbers may feel warmer than the hull.

(2) *Superstructure*. Replace limit switches that are damaged or inoperative. Tighten loose connections. Replace missile support pads that are damaged or missing. Check condition and secureness of extension cylinder gimbal fitting. Replace rubber boot if cracked, cut or deteriorated.

(3) *Hydraulic controls and cylinders.* Operate hydraulic levers to activate extension, azimuth, elevation, and roll cylinders to extreme positions. Check for smooth operation. Tighten, repair, or replace connections where leaks are evident. Replace hydraulic cylinders and hoses if damaged or leaking fluid.

(4) *Boom installation kit.* Replace missing or damaged pins. Clean off corrosion. Replace cables that are frayed, worn, or have broken strands. Confirm that cable ends are visible through inspection hole in the hook socket and that sleeve is tight in the socket before and after each missile transfer. Confirm that terminals are securely fastened. Check for smooth operation of pulleys and sheaves.

(5) *Decals, instruction plates, stencil markings and paint.* Replace decals, instruction plates and stencil markings that are not legible. Clean and paint bare spots in the painted surface that might permit reflection, rust or corrosion.

c. <u>*Final Road Test*</u>. After all services and inspections on the vehicle have been completed, take the vehicle on a road test of sufficient length to be sure that operational difficulties have been corrected. Pay particular attention to those items which were found defective initially. Correct any remaining problems noted during this test run.

Section III. SUPERSTRUCTURE PROOF-LOADING TESTS AND ALIGNMENT

6-3. Purpose of Test and Alignment.

This section provides instructions and procedures for determining if the loader equipment is structurally adequate, properly aligned, and satisfactory for field use.

6-4. Scope.

a. These tests are used to check components of the superstructure and auxiliary items such as the hoist adapter and missile hoisting beam XM15. Each procedure is complete and is preceded by a list of required equipment, tools and parts. Optional test methods are provided for some equipment.

b. Proof-load testing is required before operating loaders which meet the following criteria:

(1) Initial-use vehicles.

(2) In service vehicles not proof-tested within the past year (annually).

(3) Extensively repaired vehicles, that is:

(a) Those vehicles having had hydraulic repairs (excluding those items in NOTE below).

NOTE

Any vehicle with repairs to hydraulic system, such as hoses, hydraulic lines, hydraulic pump, fittings and 0-rings, need be given only the hydraulic pretest, paragraph 6-6e. Proofload test not needed.

(b) Those vehicles having replaced components/devices to include latch replacements.

(4) If any superstructure component is replaced during the test, the test must restart from the beginning.

6-5. Test Requirements.

a. *Proof-Loading Tests.* Tests are comprised basically of two phases: one to verify the structural strength and usability of the equipment, and the other to determine if any part of the superstructure has been distorted as a result of the proof-loading tests. This second phase is accomplished by checking the equipment with an alignment fixture (para. 6-6c) after the proofloading tests have been performed.

b. *Time Estimate and Conditions.*

(1) Estimated time required to prepare for and to perform all proof-loading and alignment checks is about 24 man-hours. (Four persons for six hours).

(2) Time is based on training missiles being in an uncrated condition with wings removed and the missile located on a pallet.

(3) Time is based on alignment fixture being located on a pallet.

(4) The required number of qualified personnel to be used is four.

(5) In addition, one qualified wrecker operator is required.

c. *Recording of Proofload Testing Dates.* Proofload testing dates must be stencilled on loader components as shown in figures 6-1 and 6-2.

d. *Parts and Materials required for Proof-Loading Tests.* Refer to table 6-1 and figure 6-3.

Table 6-1. Parts and Materials for Proof-Loading Tests
NOTE: Letters in parentheses refer to items shown in Figure 6-3.

Name	P/N and NSN	Qty	Remarks
Kit, Proof-Loading, consisting of:	10943923 (2540-00-921-5002)	1	
Load Test Fixture (A)	10943950	1	
Beam (B)	10084195	6	
Safety Strap (C)	10944010 (5340-00-412-1997)	6	
Capscrew (D)	MS90725-62 (5305-00-269-3213)	36	24 used in pre-paring training missiles
Lockwasher(E) (5310-00-004-5033)	MS35338-46	36	(para. 6-6 f)
Support Band (F)	10084194	6	
Support Bracket (G)	10084196	6	
Sling (Wear-Flex) (H)	EE-1004X6	1	
Weight, Beam (66-lb) (I)	Fabricate locally	6	See fig.1-4
Capscrew Hex (J)	MS90725-66 (5305-00-269-3216)	12	
Weight, 1000 lb (K)	Fabricate locally	1	See fig.1-3
Pallet	9196208 (1450-00-768-7045)	1	
Gage, Feeler	10892966 (5210-00-991-3157)	1	
Gage, Gap Setting	10892994 (5210-00-987-5057)	1	
Fixture, Alignment (L)	10893040 (4910-00-987-5060)	1 1	
Missile, training	XM18E2 (6920-01-023-6138)	3	
Alternate	or MTM23 (6920-00-106-4451)		
Beam, Missile hoisting XMI5	9089788 (1450-00-665-3234)	1	
Ramp	9098330 (1450-00-679-6924)	1	
Installation Kit, boom	9098300 (1450-00-710-1755)	1	
Adapter, Hoist	10916330 (2590-00-018-3247)	1	
Washer (wing-bolt)	7767393	18	
Trailer, M390 (5 Jacks)	8736324 (2330-00-446-7515)	1	
Trailer, M390C (3 Jacks) 3 Jacks	8736315 (2330-00-542-3491)		
Shackle	NAS1042-10	3	Optional
Hook	NAS1051-8	1	Optional
Dynamometer	8030812	1	Optional
Gage, Setting, Profile	10892995 (5120-00-987-5058)	1	Refer to table 1-1

6-6. Proof-Load Test Preparations

WARNING

- **Personnel not directly engaged in proof-loading tests are not to enter an area within 30 feet in any direction of the loader during proof-loading testing.**
- **All proof-loading tests must be conducted with the operator's protective halo device in place and with the operator under it. Before starting loader, fasten the operator's seat belt. Be sure to wear protective head covering such as a hard hat or helmet and safety glasses.**
- **All instructions are mandatory unless stated otherwise.**

NOTE

- **All tests may be performed with trailer, truck, or ground mounted pallet.**
- **All location references to "forward" and "aft" are from the driver's seat of the loader. "Forward" is in front of the driver, "aft" is behind the driver's seat. Missile A is at driver's right; missile C at driver's left; missile B is in center.**

a. Visual Inspections. The following visual inspections will be made:

(1) Latches.

(a) Before doing any proof-load testing, remove and identify the type of latches on the vehicle. There are two types: cast and forged. Identify them from this list of PN's.

LATCH	TYPE	PART NUMBER
AFT	Cast	10892778
FWD	Cast	9171259
AFT	Forged	11675118
FWD	Forged	11675117

(b) Remove and discard all cast latches, and replace with forged latches.

NOTE

Destroy or mutilate latches to prevent use.

(c) Annually, prior to and in conjunction with the current annual proof-load test performed by direct support maintenance, the forward latch (PN 11675117) will be removed and checked.

(d) Inspection procedure, visual check-direct support maintenance personnel will inspect the forward and aft latch tips for cracks, chips, indentations, or any noticeable deformation of their original shape.

(e) Inspection procedure, dimensional check-lay forward latch on a flat surface, such as a metal rule. Holding firmly, attempt to insert a 0.010 inch feeler gage between both 3" long rough surfaces, opposite spring eyelet tang (figure 6-4).

NOTE

Do not attempt to insert feeler gage from either end or inward for distance of approximately 3/4 inches. If the feeler gage fits between the flat surface and identified surfaces of the yoke, the latch is unserviceable and must be replaced.

(f) Any and all latches failing the visual check/dimensional check must be destroyed or mutilated to eliminate further use.

(g) Verify correct latch spacing using latch profile gage, special tool (8, figure 1-2, sheet 2)

(continued on page 6-9)

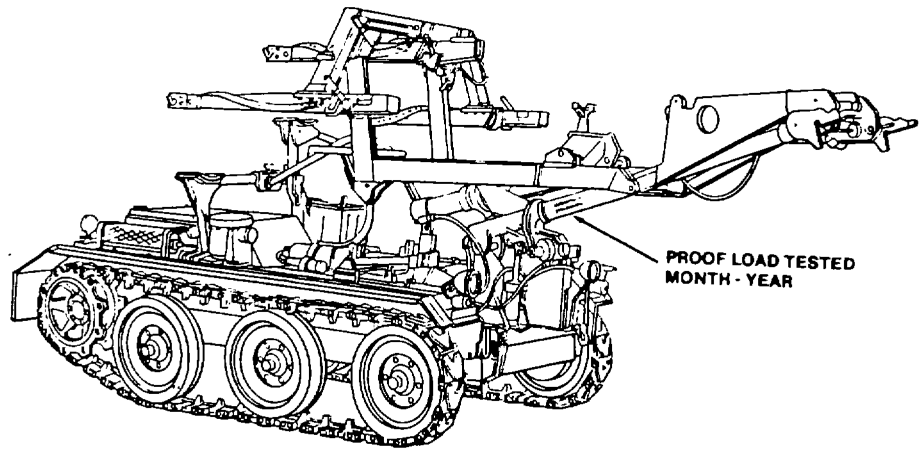


Figure 6-1. Boom Stencil Location.

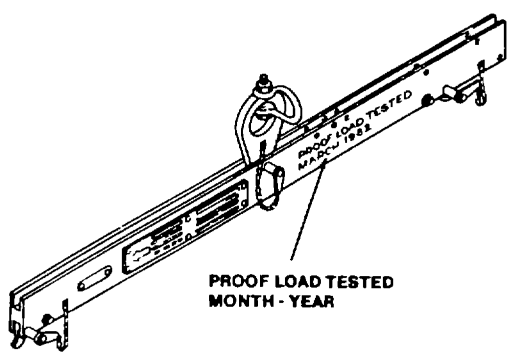


Figure 6-2. Boom Stencil Location.

NOTE

After a hoisting beam and vehicle are proof-load tested, they will be stenciled. The vehicle will be stenciled on the right side of the index boom (as seen when sitting in the vehicle) (Figure 6-1). The hoisting beam will be stenciled on the same flat edge as the nomenclature plate (Figure 6-2). Both stencils will read "PROOF-LOAD TESTED - month and year". The stencils (1/2 inch) will be made from Marking Stencil Set, NSN 7520-00-205-1760, or equivalent.

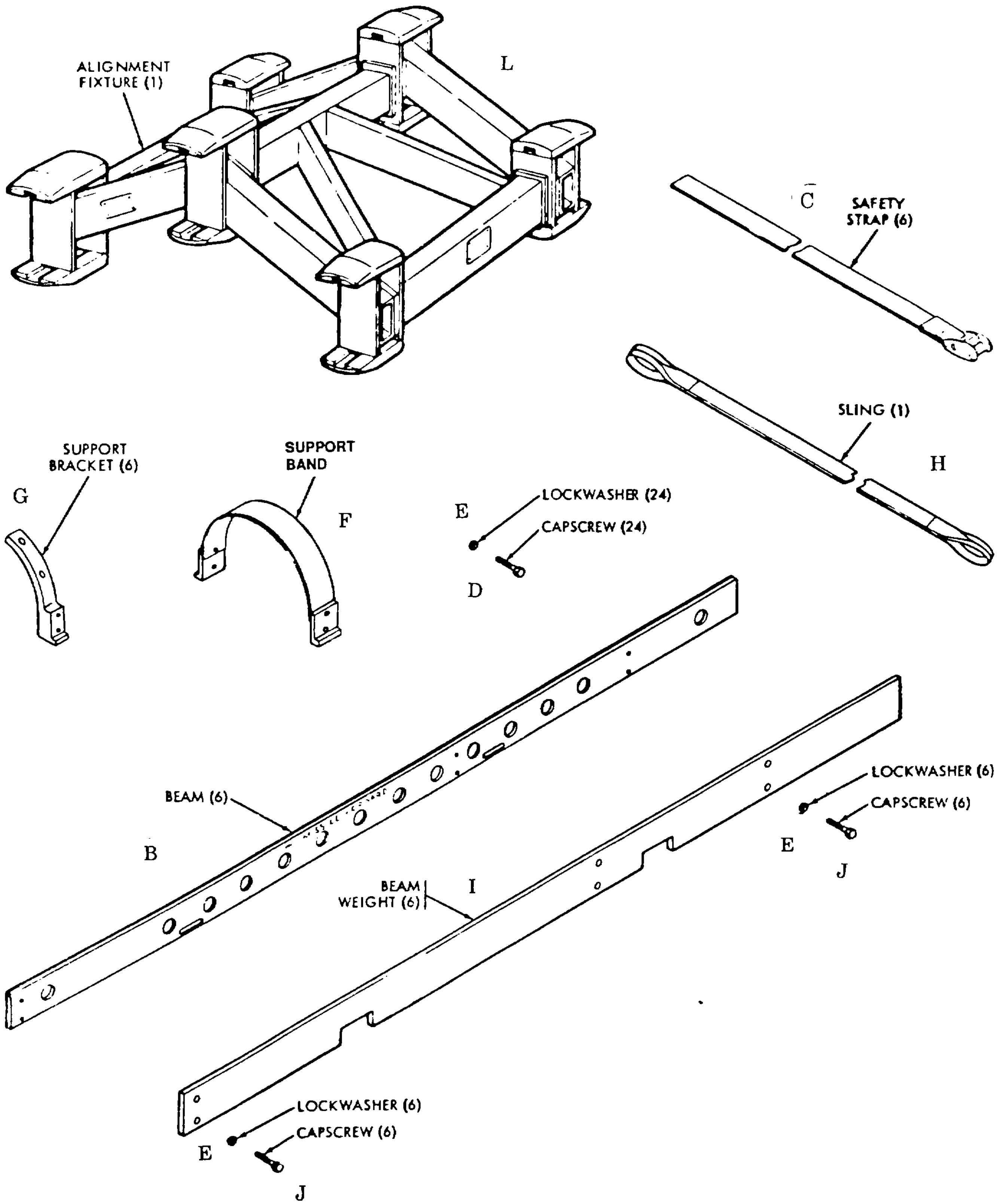
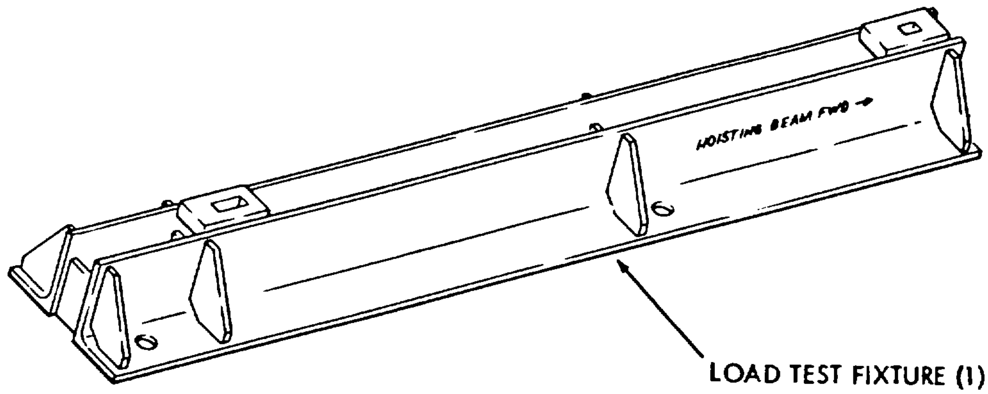


Figure 6-3. Proof-Loading Components (Sheet 1 of 2).



A

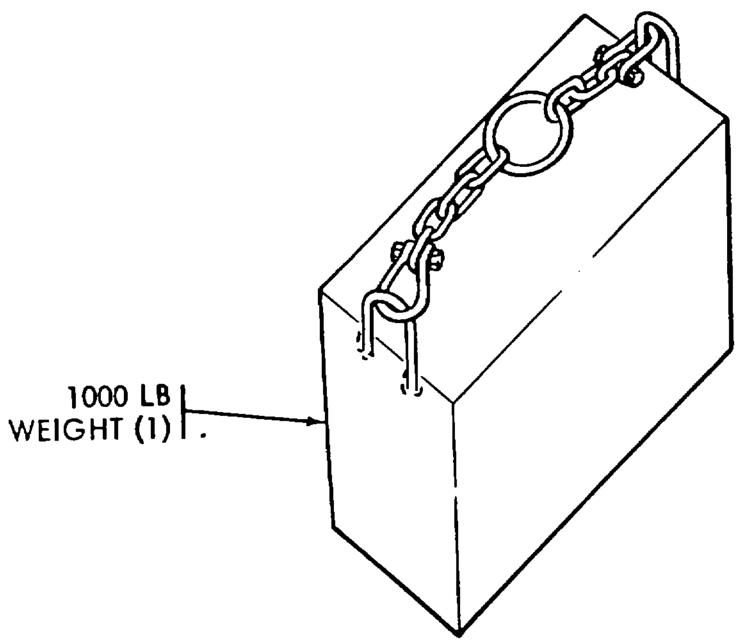


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Figure 6-3. Proof-Loading Components (Sheet 2 of 2).

(2) Superstructure. Clean and inspect the critical areas as defined (figures 6-5 through 6-10) for evidence of chipped, crazed, or cracked paint. If any of these conditions are discovered, remove the paint by hand with a wire brush (do not use power tools) and determine if the weld or the parent material is cracked. If a crack is found, the loader is NOT mission capable.

NOTE

To return the loader to operational condition, replace the defective component and perform the proofload test.

(3) Hydraulic Components. All hydraulic components will be checked for leaks, signs of excessive wear and unsafe operating conditions.

b. Components removed from the loader should be sent to a maintenance facility for disposition.

c. Check loader alignment using alignment fixture (figure 6-11) installed on pallet.

(1) Extend superstructure until hoisting beams are in latching position on the alignment fixture.

(2) Activate the latching levers to slip the latches into the fixture's latch wells.

NOTE

No external force should be used to complete latching to the fixture. Latches should slip easily into the latch wells.

(3) Activate the unlatching solenoid. Check that the latches are completely free of the alignment fixture.

(4) If latches attached easily and released fully as described above, superstructure alignment is good. If any misalignment exists, make necessary corrections before continuing with proof-load testing. Refer to paragraph 6-10 for fault location procedures.

* CHECK LATCH TIPS FOR CRACKS, NOTICEABLE DEFORMATION.

* CHECK FWD LATCH YOKE FOR STRAIGHTNESS.

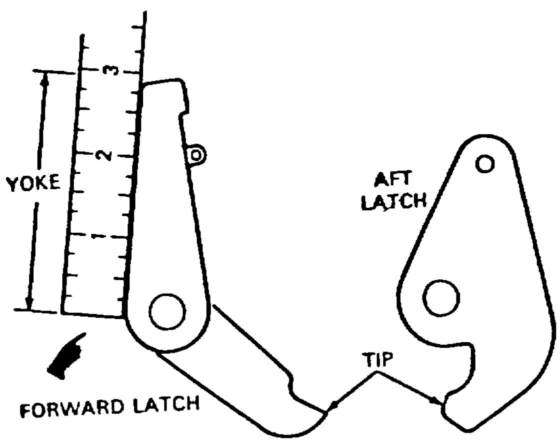


Figure 6-4. Inspection of Latches.

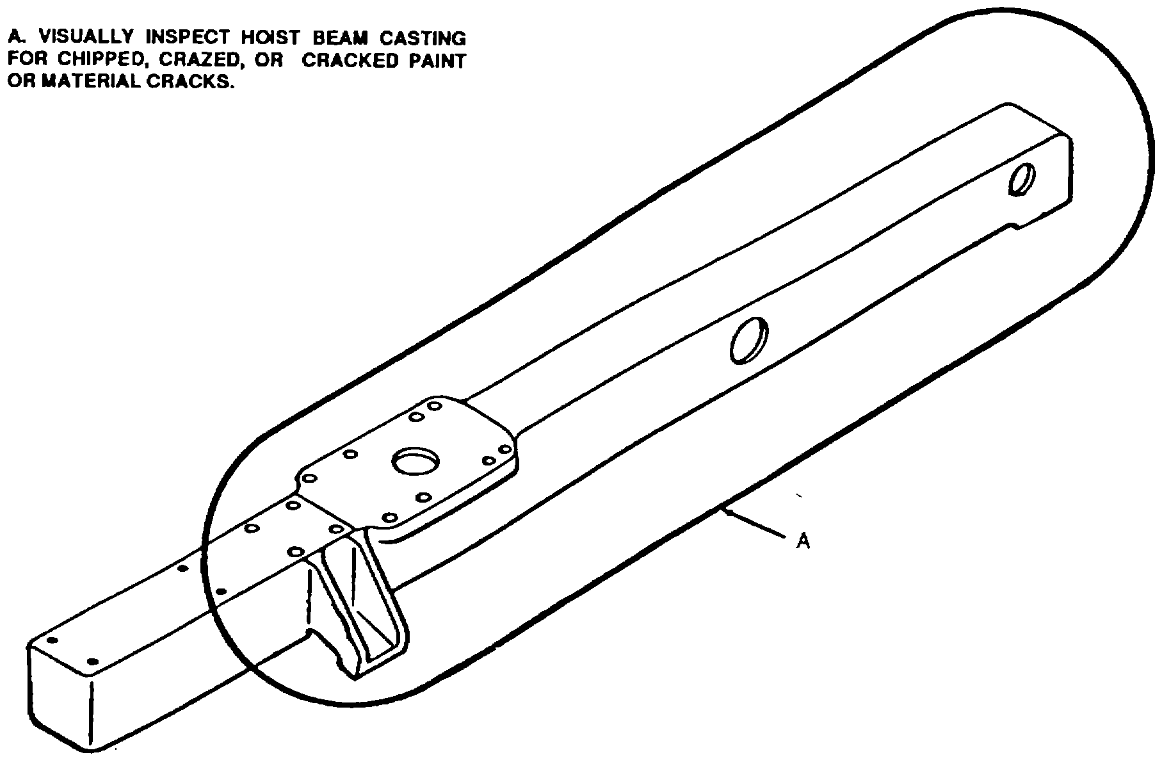


Figure 6-5. Critical Areas for Inspection of Hoist Beam.

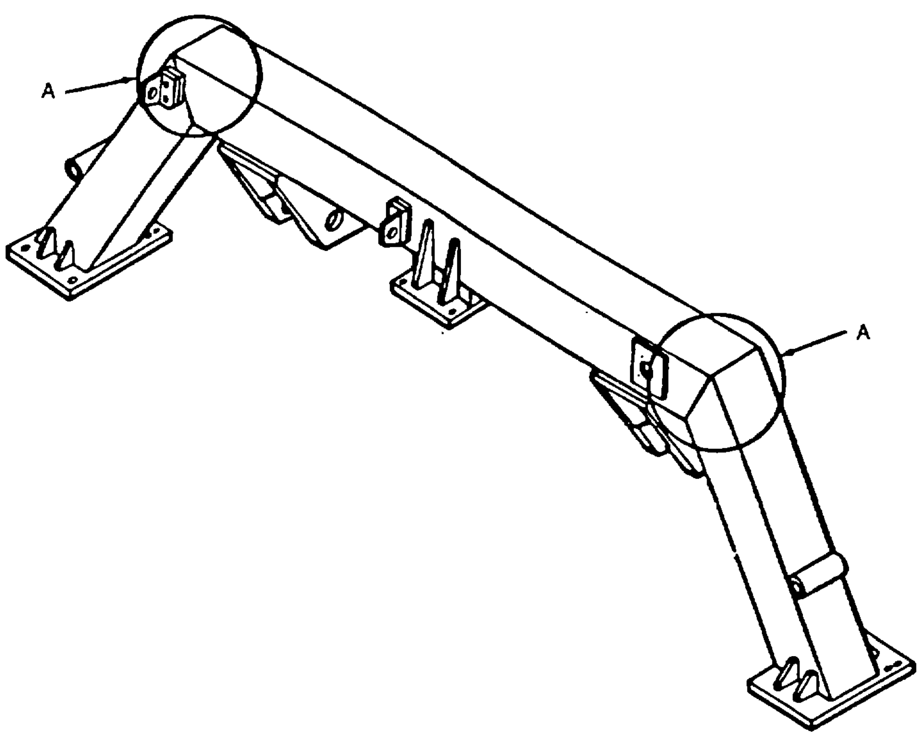


Figure 6-6. Critical Areas for Inspection of Yoke.

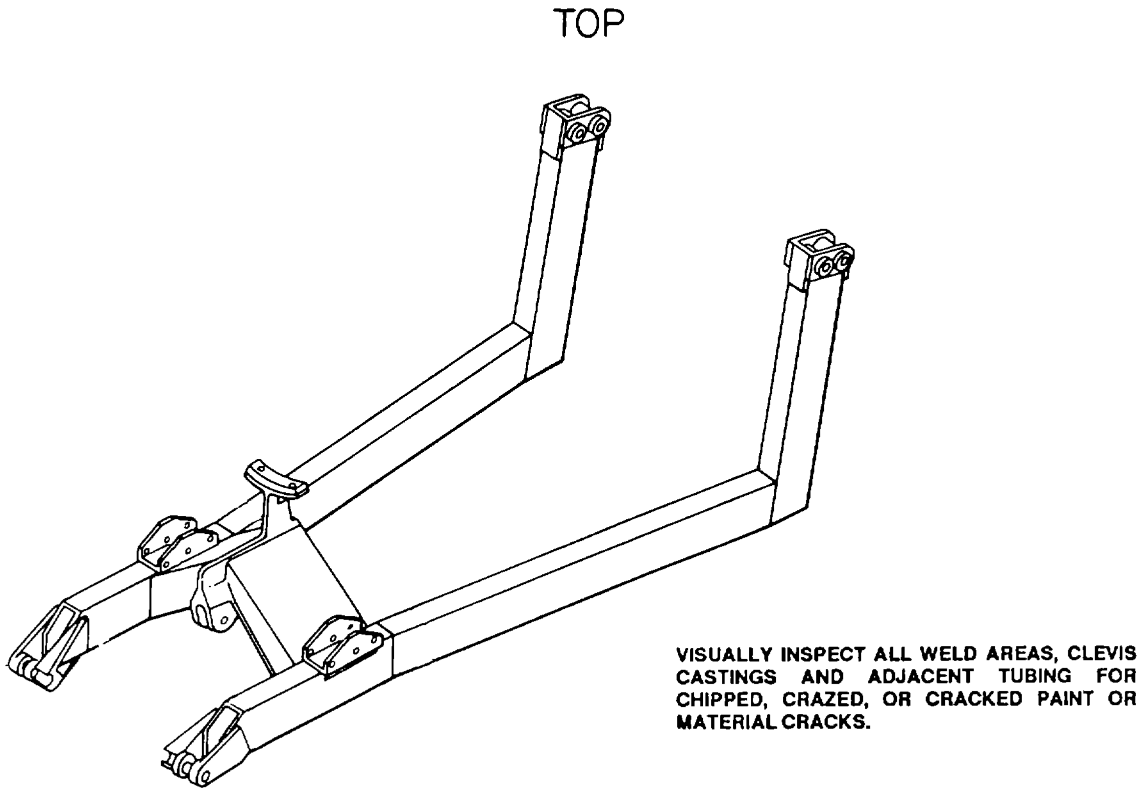


Figure 6-7. Critical Areas for Inspection of Transfer Arm.

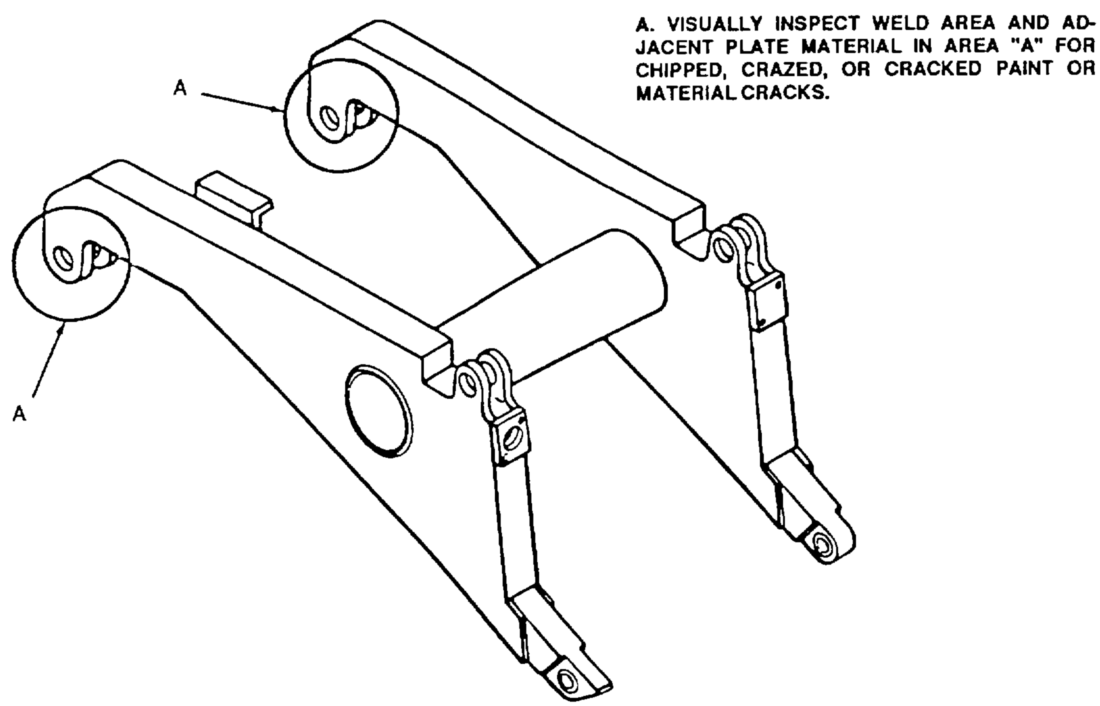


Figure 6-8. Critical Areas for Inspection of Intermediate Link.

A. VISUALLY INSPECT WELD AREA ALL AROUND TUBE JOINTS AND IN AREA "A" FOR CHIPPED, CRAZED, OR CRACKED PAINT OR MATERIAL CRACKS.

B. VISUALLY INSPECT COMPLETE WELD AREA AND ADJACENT PARENT MATERIAL (PORK CHOP) IN AREA -B- FOR CHIPPED, CRAZED, OR CRACKED PAINT OR MATERIAL CRACKS.

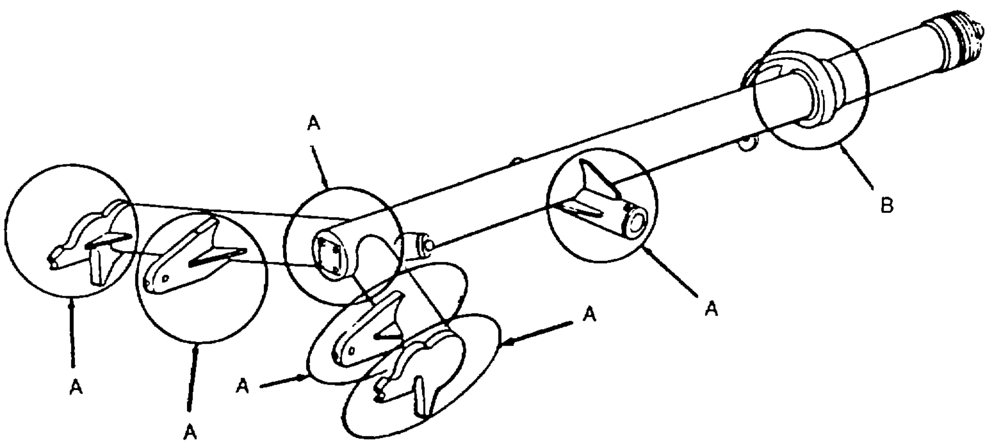
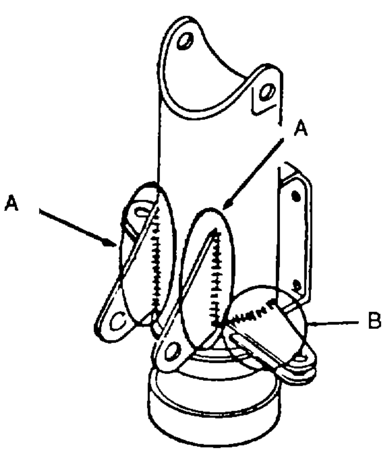


Figure 6-9. All Safety Straps Loosely Secured in Place.



A. VISUALLY INSPECT CASTING AND WELD IN AREA "A" FOR CHIPPED, CRAZED, OR CRACKED PAINT OR MATERIAL CRACKS.

B. VISUALLY INSPECT WELDMENT IN AREA "B" FOR CHIPPED, CRAZED, OR CRACKED PAINT OR MATERIAL CRACKS.

C. VISUALLY INSPECT EXPOSED WELD AND PARENT MATERIAL IN AREA "C" FOR CHIPPED, CRAZED, OR CRACKED PAINT OR MATERIAL CRACKS.

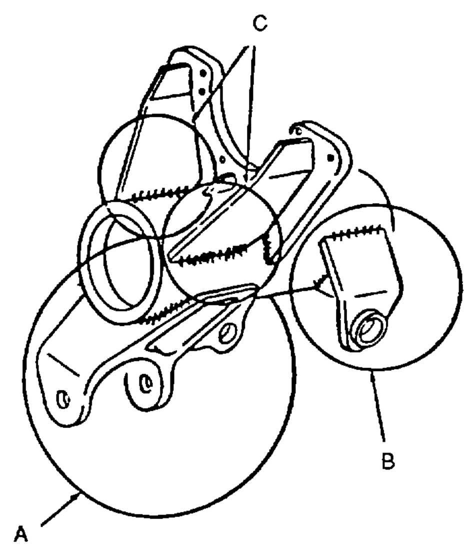


Figure 6-10. Critical Areas for Inspection of Boom Support and Main Support.

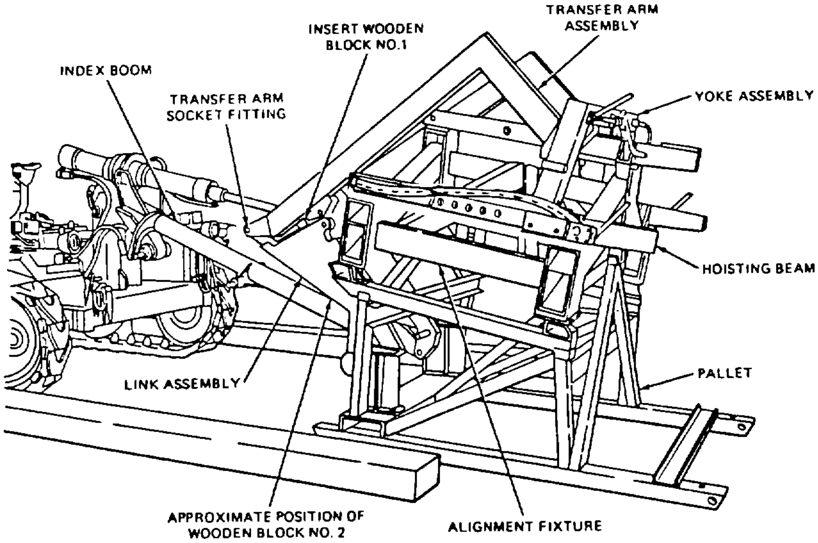


Figure 6-11. Superstructure Alignment Fixture Installation.

Table 6-2. Parts and Materials for Alignment Tests

NOTE: Letters in parentheses refer to items shown in Figure 6-3.

Name	P/N and NSN	Qty	Remarks
Fixture, Alignment (L)	10893040 (4910-00-987-5060)	1	
Pallet	9196208 (1450-00-768-7045)	2	A total quantity of two is required to accomplish proofloading, and alignment test.
Strap, safety (C)	10944010 (5340-00-412-1997)	6	Furnished in proof-loading kit 10943923.
Wooden Block No. 1		1	Size to be determined at time of test.
Wooden Block No. 2		1	Size to be determined at time of test.
Technical Manual	TM 9-1450-500-20	1	

NOTE

Inspect all hydraulic components for frayed hoses, improper fittings, evidence of leaks and for any other bad condition. Replace all suspect items.

d. Reduced Pressure System Test. Test all loaders using the following procedures.

(1) Start loader and fully retract the extension cylinder with fork tips on the ground at their lowest position. No missiles or simulated missile load should be latched to the loader.

(2) Move stop block on the right side of the transfer arm to the STANDARD position (figure 6-12). Position stop block on the left side of the transfer arm to the IMPROVED position.

(3) Extend superstructure. Maintain engine at 1500 + or - 250 RPM, and observe the reduced pressure light until the cylinder has extended a few inches beyond the point where the transfer arms hit the right-hand stop block (figure 6-13).

(4) The reduced pressure light should go on just after the transfer arm hits the stock block. If this does not happen, the pressure reduction system is not working properly. Refer to paragraphs 3-27, 3-36, and 3-38 for fault location and correction before doing the proof-load test.

(5) If the light is observed, return stop blocks to the IMPROVED position.

e. Hydraulic Pre-Test. Position the loader on level ground and in an area where you can extend and retract the superstructure. Watch the loader's HYD OIL PRESS gage at the end of travel of all hydraulic cylinders (elevation, extension, azimuth and roll) during this pre-test. At the end of travel the gage should read between 2900 and 3200 PSI.

NOTE

Normal for pressure to fluctuate during movement.

NOTE

Inspect all hydraulic components for frayed hoses, improper fittings, evidence of leaks and for any other bad condition. Replace all suspect items.

(1) Extend the elevation cylinder as far as you can. Hold the control in that position until the HYD OIL PRESS gage reads between 2900 and 3200 PSI.

(2) Retract the elevation cylinder as far as you can. Hold the control in that position until HYD OIL PRESS gage reads between 2900 and 3200 PSI.

(3) If HYD OIL PRESS gage does not show 2900 - 3200 PSI, do hydraulic trouble-shooting (IAW TM 9-1450-500-20), determine the fault and correct it.

(4) Repeat steps (1) through (3) above for the extension, azimuth and roll cylinder in turn.

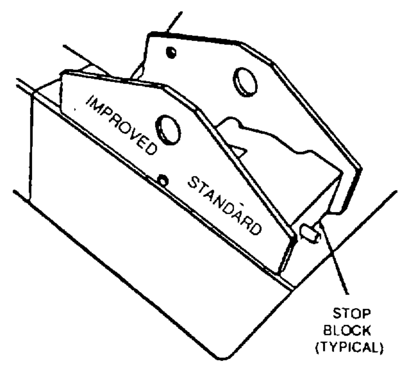


Figure 6-12. Stop Block at Standard Position.

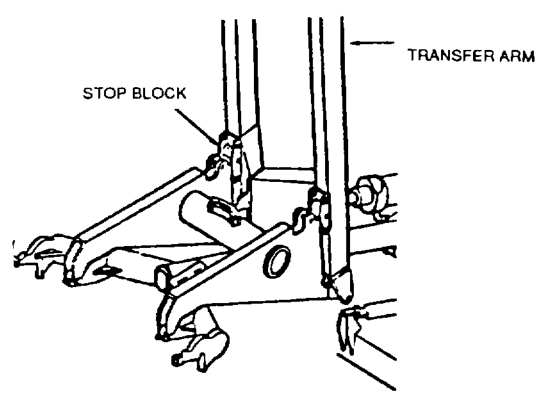


Figure 6-13. Extended Superstructure.

f. Preparing Training Missiles. Use either of the following pallet-mounted training missiles for these tests:

Type	NSN
XM18E2	6920-01-023-6138
MTM23B	6920-00-106-4451

NOTE

If weight support harness is assembled, install harness on missiles and proceed to subparagraph g. If harness is not assembled, perform the following steps.

(1) Remove missile tunnels and side covers.

(2) Remove six shoulder bolts, if installed; refer to TM 9-1410-530-14.

(3) Perform the following steps on each of the three training missiles:

(a) Install two support brackets (figure 6-14 and Item G) using four of the shoulder bolts removed in step (2) above. Do not tighten bolts.

(b) Place two support bands (Figure 6-3, item F and Figure 6-14) on each missile. Locate one strap about 55 inches forward of support bracket installed in steps (a) above, and the second band about 21 inches aft of the support bracket as shown in Figure 6-14.

NOTE

Quantities of the test hardware on the referenced illustration are for each missile.

(c) Thread two safety straps (Figure 6-3, item C) through slots in each beam as shown in figure 6-14.

(d) Attach two beams (Figure 6-3, item B) to support brackets and support straps using eight each capscrews and lockwashers (Figure 6-3, D and E). Leave the bottom fore and aft screw holes empty.

NOTE

Make sure arrow engraved on side of beams is pointing toward the front of the missile as shown in figure 6-14.

(e) Tighten all capscrews and bolts.

(continued on page 6-17)

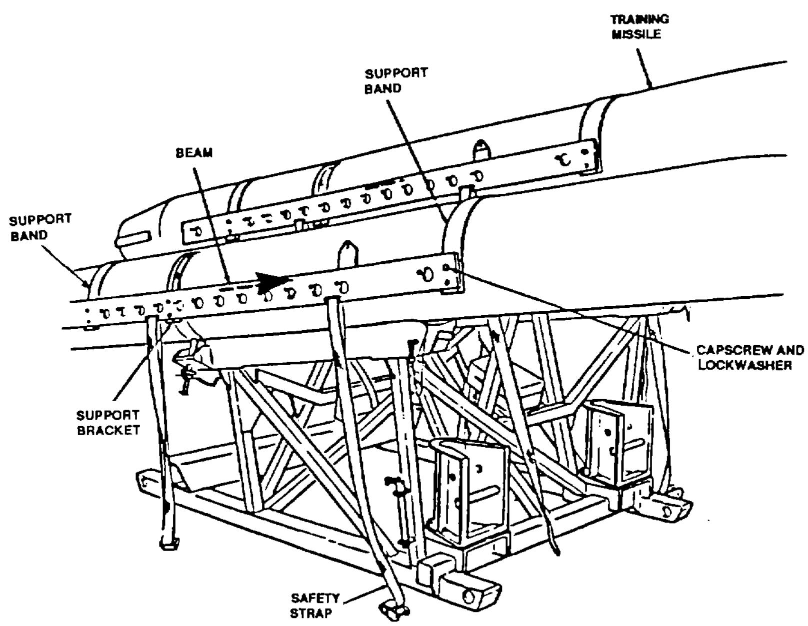


Figure 6-14. Training Missiles with Weight Supporting Components

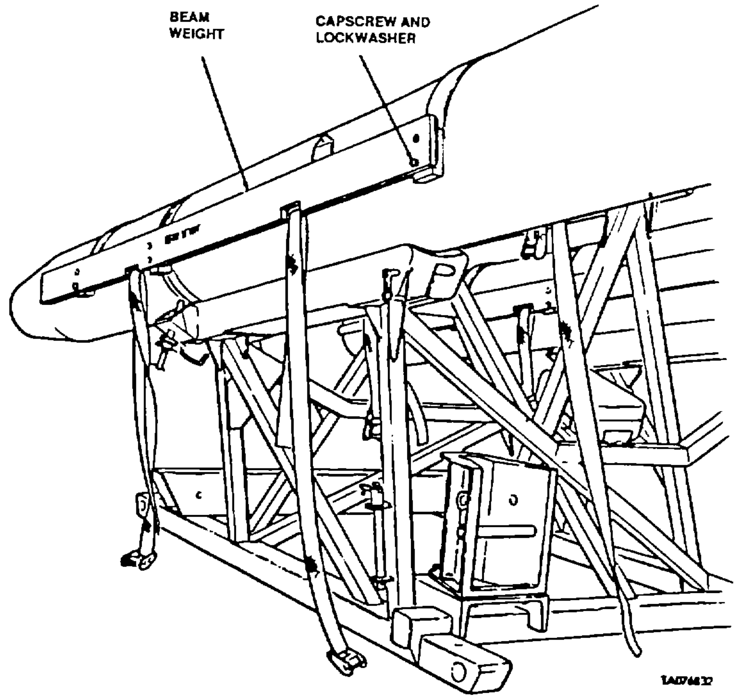


Figure 6-15. Beam Weight Installed on Training Missile.

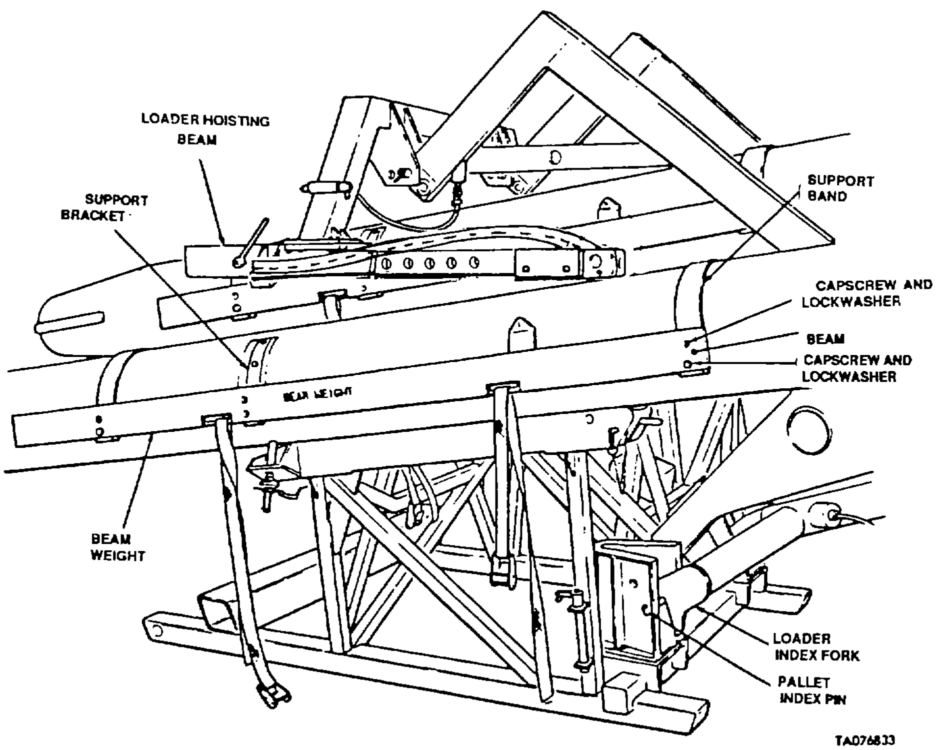


Figure 6-16. Loader Indexed to Training Missile.

(f) Install two 66-pound beam weights as shown in figure 6-15 using four capscrews and lockwashers in the bottom fore and aft of each beam weight only.

(g) Tighten all capscrews.

(h) Remove wing attach pads, if present, from wings numbers 1 and 4 and secure pads in their respective places on the missile using existing hardware.

NOTE

These wing attach pads serve as a bearing surface for hoisting beam sway braces during missile handling.

CAUTION

- **Before indexing to HAWK pallet or launcher, be sure the STOP BLOCKS on the transfer arm cross brace are in the IMPROVED position, to prevent damage to the equipment (Figure 6-13).**
- **Do not unlock suspension until all proof-load testing is completed.**

g. Indexing with Training Missiles.

(1) Engage the loader suspension lockout.

(2) Index the loader to the missile storage pallet loaded with three training missiles (figure 6-16). Each missile must have attached to it the two 66-pound beam weights, two support brackets, two support bands and two beams previously installed in paragraph f above.

NOTE

The combined weight of training missile plus all attached proof-load test items is between 1526 and 1580 pounds (110% weight).

(3) Attach 1000-pound weight to the tow pintle hook (figure 6-17).

(4) Latch hoisting beams to training missiles (figure 6-18) and attach the loader missile safety straps (figure 6-19). Use whisker bar.

CAUTION

Latching shall always be in accordance with TM 9-1450-500-10.

(5) Release missiles from pallet.

(6) Elevate superstructure to a minimum height, not more than 6 inches, sufficient to permit buckling of safety straps, attached to weight support harness, around the superstructure hoisting beams (figure 6-19). Do not tighten.

NOTE

Straps referenced in steps (4) and (6) above shall be fastened only tight enough for protection in event of failure, but not tight enough to carry the missile weight. <u>The latches must support the load at all times during the proof-loading test.</u>

The superstructure is now ready for proof-load testing (paragraph 6-7).

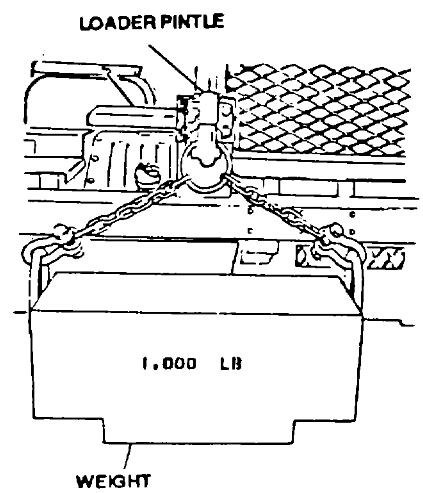


Figure 6-17. Weight Installed at Back of Loader.

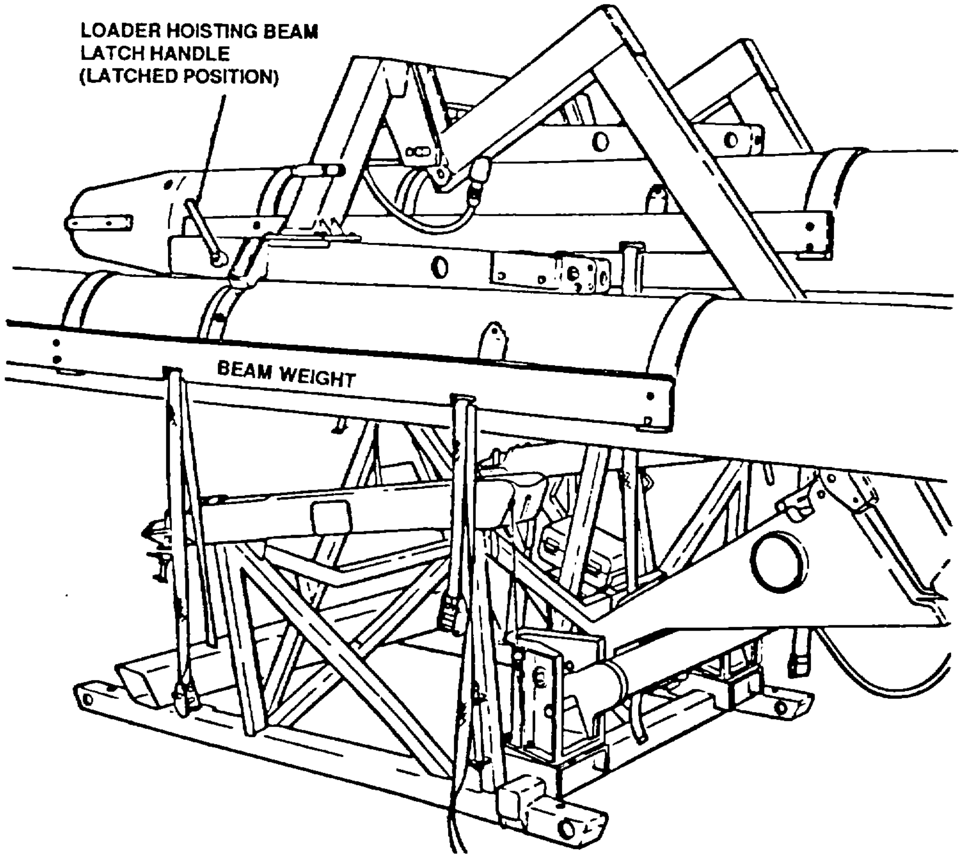


Figure 6-18. Loader Latched to Training Missiles.

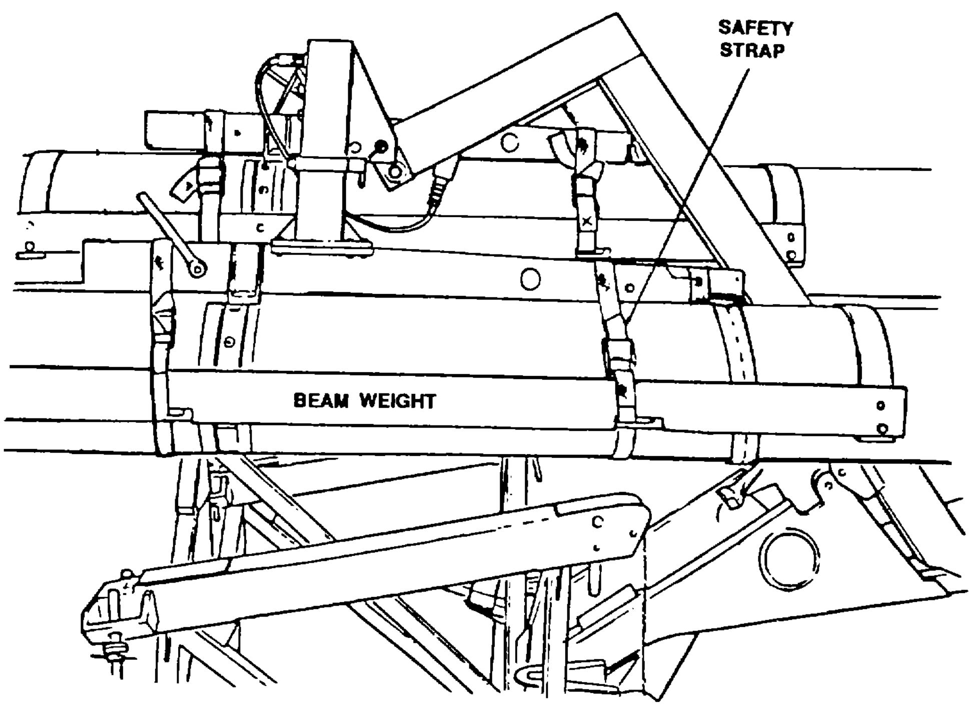


Figure 6-19. All Safety Straps Loosely Secured in Place.

6-7. Proof-Load Testing.

WARNING

- **Personnel not directly engaged in the proof-loading tests are not to enter an area within 30 feet of the loader in any direction during proofload testing.**
- **All proof-load tests are conducted with the operator's protective halo device in place and with the operator under it. Be sure to wear protective head covering such as a hard hat, helmet, or similar protection.**

CAUTION

During proof-load testing, move hydraulic control levers smoothly to prevent abrupt superstructure movement. Keep engine at 1500 rpm + or - 250 rpm.

NOTE

Give wrecker boom cables enough slack to allow the superstructure to roll fully right but tense enough to support loader superstructure in event of failure.

a. Superstructure Proof Load Testing.

(1) With loader indexed to the pallet, retract extension cylinder fully.

(2) Extend extension cylinder until missiles seat on the pallet.

(3) Repeat steps (1) and (2) above for two cycles.

(4) With loader indexed to the pallet, retract extension cylinder fully; then break index by elevating the boom.

(5) Place missiles in transport position.

CAUTION

Keep missile load as far aft on loader as possible by using ELEVATION AND EXTENSION controls in sequence. This procedure will reduce chance of tipover.

NOTE

Azimuth index mark must be aligned as shown in TM 9-1450-500-10.

(6) Raise missiles enough to center azimuth rotation of superstructure at 0 degrees.

(7) Move missiles to full azimuth right.

(8) Move missiles to full azimuth left.

(9) Repeat steps (7) and (8) above for two cycles and center missiles in azimuth.

(10) Index loader to pallet; return superstructure with missiles to a minimum height (not more than 6 inches) above the pallet sufficient to permit removal of straps.

CAUTION

Remove straps from missiles only when directed in the following steps.

(11) Remove straps from C (driver's left) missile only.

(12) Lower C missile on pallet, latch to pallet and release latch on missile C.

(13) Return superstructure with remaining two missiles (driver's right and center) to center azimuth position.

(14) Position 5-ton wrecker for heavy lift, side, in accordance with wrecker operator's manual. Position wrecker to the loader so that loader superstructure yoke is centered directly under the wrecker boom (figure 6-20).

NOTE

Maximum wrecker boom extension is not to exceed 15 feet with wrecker outrigger in place.

(15) Install Wear-Flex Sling or equivalent 4-ton capacity sling, to the yoke of the superstructure and attach to wrecker hook (figure 6-21).

NOTE

- **Give wrecker boom cables enough slack to allow the superstructure to roll fully right but tense enough to support loader superstructure in event of failure.**
- **If hydraulic system pressure is not indicated or maintained during the proofloading test, refer to the hydraulic troubleshooting procedure in TM 9-1450-500-20 to determine the malfunction and corrective action needed.**

(16) Elevate missiles enough to permit roll motions, then roll missiles fully right (figure 6-22).

(17) Repeat for two cycles, then return to center. Align index marks as shown in TM 9-1450-500-10.

(18) Remove sling from wrecker hook and loader superstructure. Remove wrecker from location.

(19) Index loader to missile pallet and transfer missiles onto pallet.

(20) Remove all straps, latch missiles to pallet, release loader missile latches, and retract superstructure.

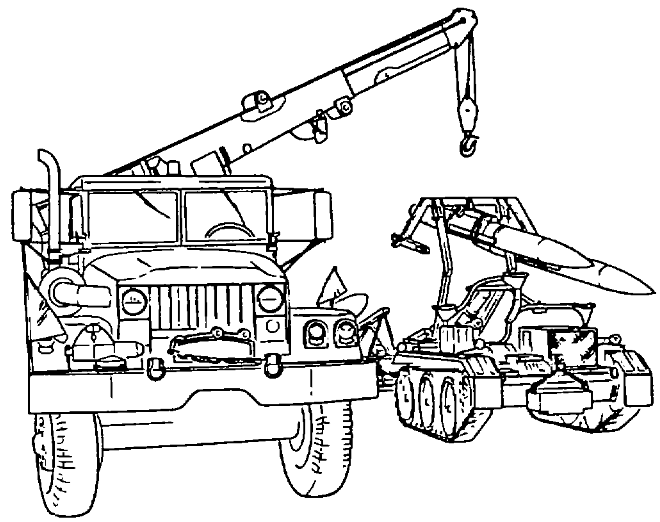


Figure 6-20. Wrecker in Place Next to Loader.

b. Overextension Test.

WARNING

Secure three training missiles to the pallet with the missile anchoring mechanisms, or injury to personnel or severe damage to the pallet and the loader may result.

NOTE

- **Make sure that both stop blocks (figure 6-13) are in IMPROVED position.**
- **If hydraulic system pressure is not indicated or maintained during the proof-load test, refer to the hydraulic trouble-shooting procedure in TM 9-1450-500-20 to determine the malfunction and corrective action needed.**

(continued on page 6-23)

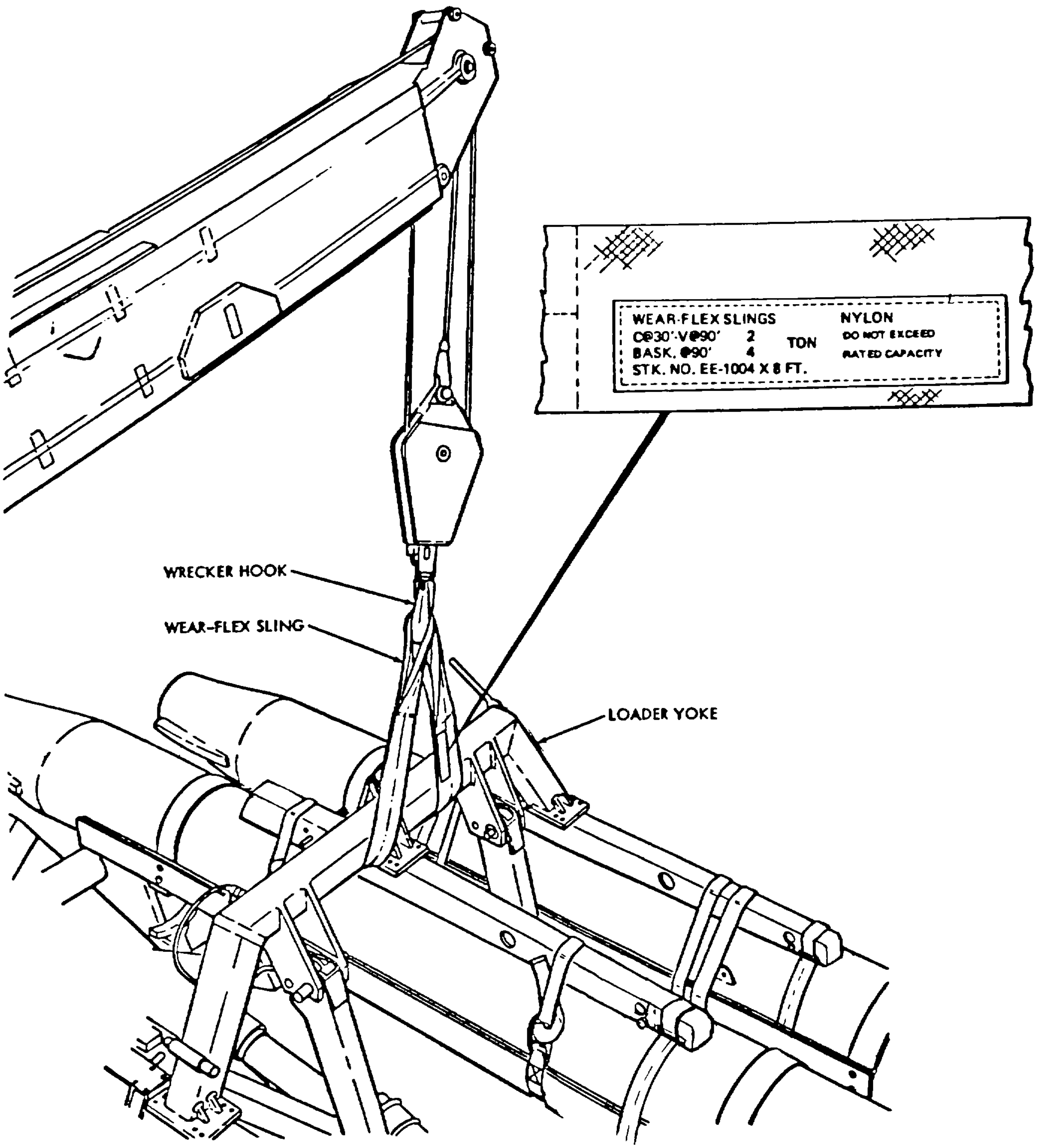


Figure 6-21 Wear-Flex Sling in Place on Loader Yoke.

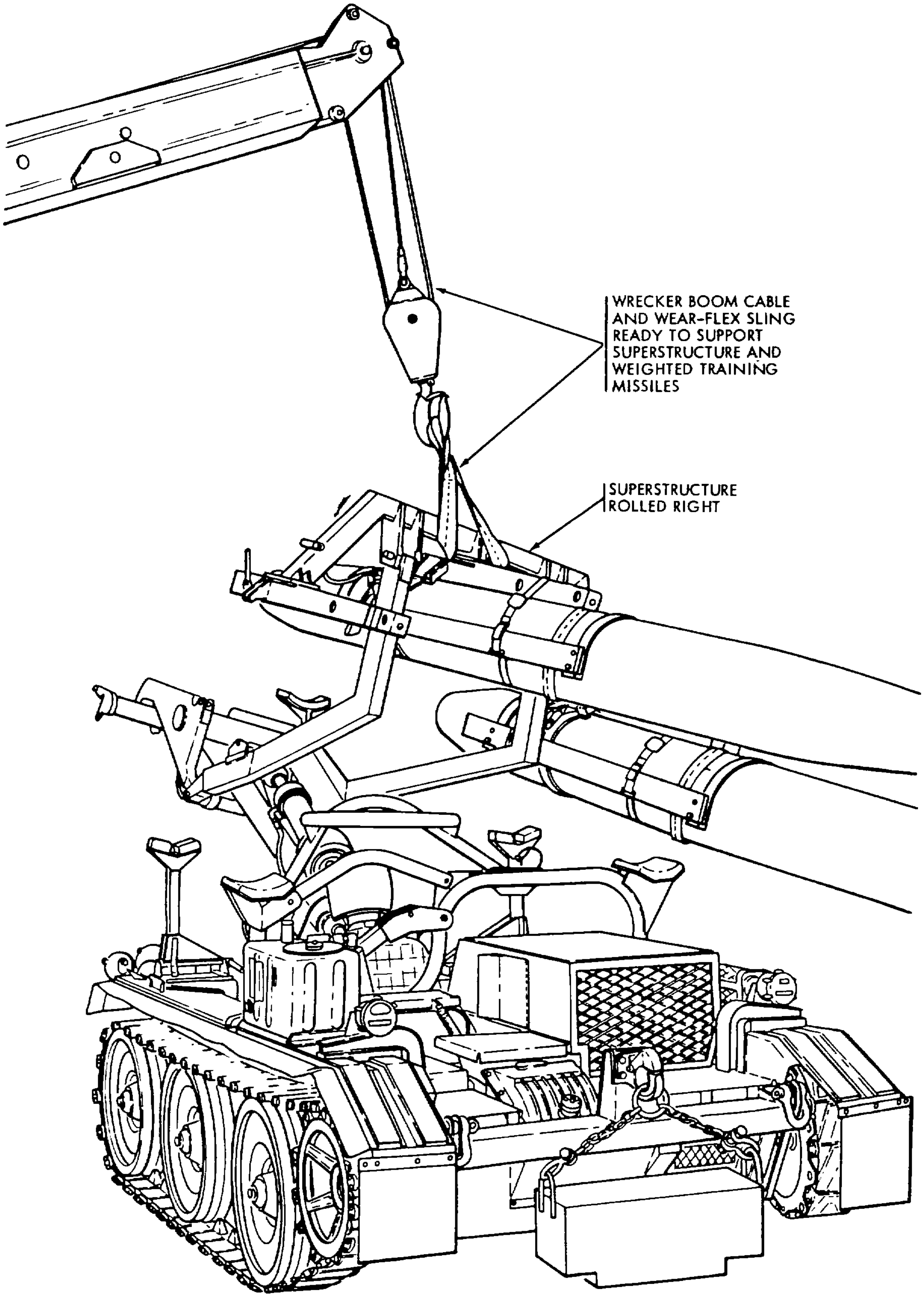


Figure 6-22. Roll Test

(1) Install two of the wing mounting bolts with threaded heads into the bottom two wing mounting holes of each missile using three washers (wing bolts) on each side. The bolts shall be inserted through the washers and fully threaded into the missiles. The anchoring assemblies shall be fully engaged with both bolts of all three missiles (figure 6-23).

CAUTION

Test the hoist beams in the specified order or extensive equipment damage may result.

(2) Strap the latches on left and right hoisting beams to prevent engagement (figure 6-24).

(3) Index the loader to the pallet.

(4) Preload the loader by retracting the elevation cylinder sufficiently to raise the loader front end 2 to 4 inches (figure 6-25).

(5) Extend the extension cylinder (figure 6-26) until center hoisting beam is in latching position. Latch it to the missile.

CAUTION

Before going to the next step, be sure that the extension cylinder is operating under the reduced pressure system (615 PSI). This can be verified by the reduced pressure light.

(6) Increase engine speed to 1000 RPM. Fully extend the extension cylinder and hold the control in that position without causing engine shut down. Then increase engine speed to 2000 RPM and hold that speed for approximately 1 (one) second.

(7) Relax pressure and unlatch center hoisting beam from training missiles.

(8) Retract the extension cylinder and remove strap from left and right hoisting beams. Strap center hoisting beam latch.

(9) Extend the extension cylinder until the left and right hoisting beams are in locking positions. Latch them to the missiles.

CAUTION

Before going to the next step, be sure that the extension cylinder is operating under the reduced pressure system (615 PSI). This can be verified by the reduced pressure light.

(10) Increase engine speed to 1000 RPM. Fully extend the extension cylinder and hold the control in that position without causing engine shut down. Then increase engine speed to 2000 RPM and hold that speed for approximately 1 second.

(11) Relax pressure and unlatch left and right hoisting beams from the training missiles.

(12) Retract the extension cylinder and remove the webbing strap from center hoisting beam.

c. Post-Test Inspection.

(1) Repeat loader alignment check in paragraph 6-6a. If the loader fails the alignment check, there is superstructure component deformation. Use paragraph 6-10 to determine which component is deformed or misalined.

(2) Reinspect the latches per paragraph 6-6a.

NOTE

- **If latches are unserviceable and must be replaced, repeat load test in accordance with paragraph 6-7a.**
- **If latches are serviceable, reinstall and proceed.**
- **If latches were not replaced in proofload test preparations (para. 6-6 a(1), it is not necessary to disassemble them again.**

(continued on page 6-26)

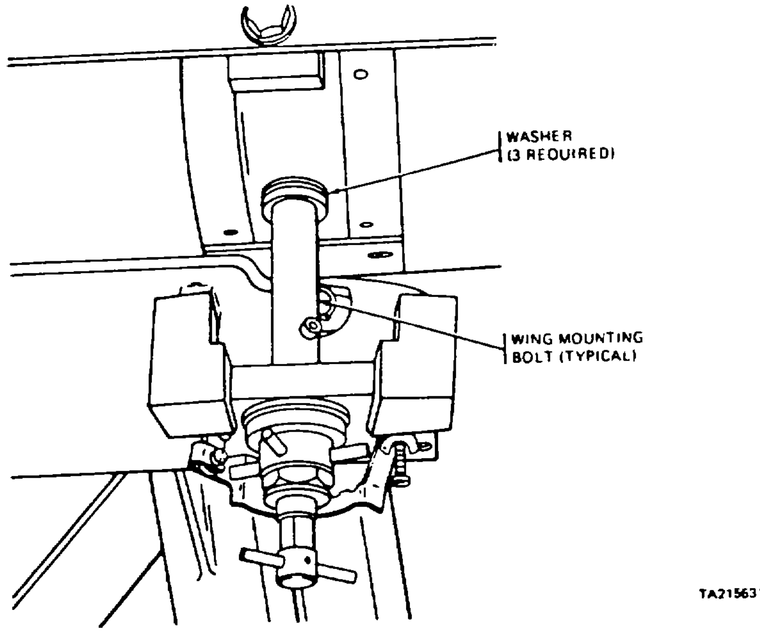


Figure 6-23. Wing Mounting Bolt Installation

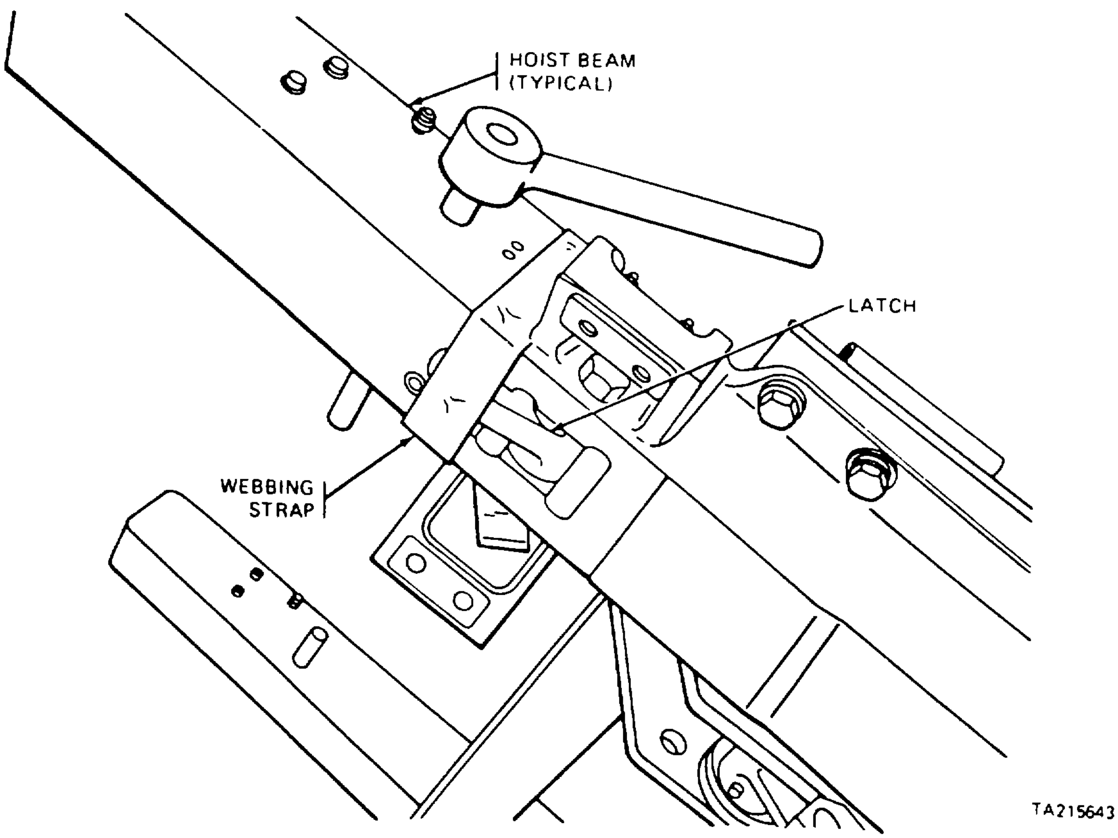


Figure 6-24 Hoist Beam Latches

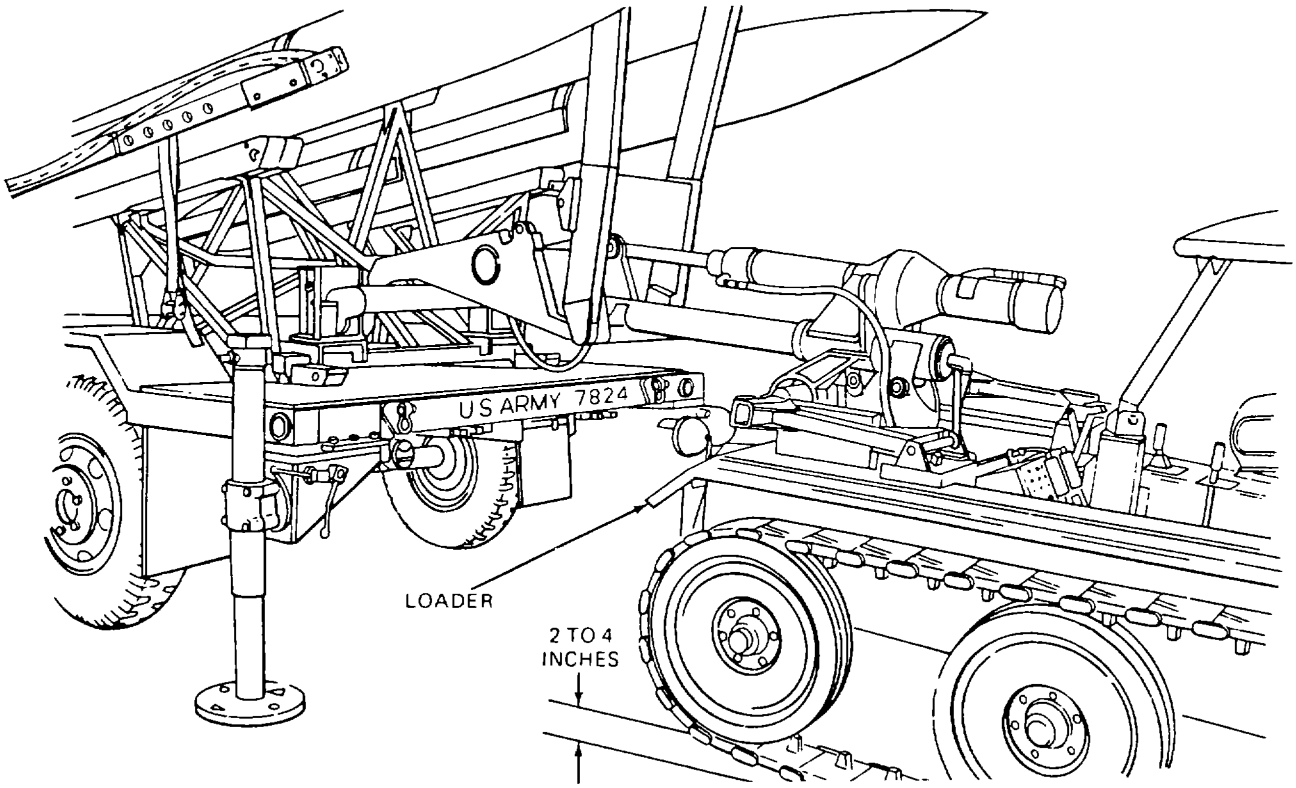


Figure 6-25. Loader's Front End Raised.

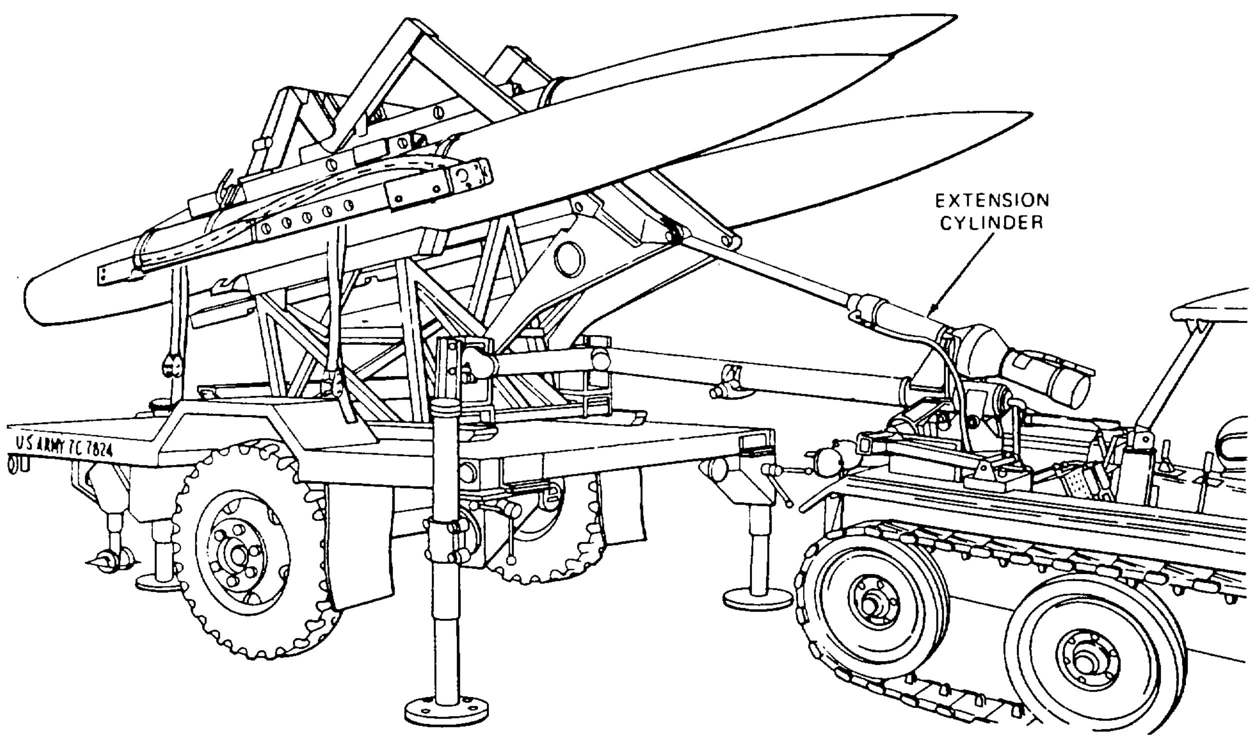


Figure 6-26. Extension Cylinder Extended

(a) Perform a visual inspection (para. 6-6a (1)(d) and verify correct latch spacing using latch profile gage (para. 6-6a (1)(g)). If latch spacing is correct, no further check is required.

(b) If latch spacing is no longer correct, that particular latch must be disassembled and a complete inspection done (para. 6-6a (1)(a) through (g). If latch passes inspection satisfactorily, reinstall.

(c) If latch must be replaced, it is necessary to do a complete proof-load testing (para. 6-7) again.

(3) Repeat superstructure inspection in paragraph 6-6a (2). If any cracks developed during proof-loading, the component has failed proof-load testing and must be replaced.

(4) Reinspect all hydraulic components per paragraph 6-6a (3).

6-8. Auxiliary Items Proof-Load Test.

a. Proof-Loading Test Equipment and Parts. The following test equipment and parts are required to perform auxiliary proof-loading tests: (See table 6-1 and figure 6-3).

Fixture, alignment
Kit, Proof-loading
Missile, training (3)
Missile, training alternate (3)
Pallet
Weight, 1000 pounds.
Shackles
Hooks

NOTE

The training missiles must be mounted to a pallet on the ground.

b. Missile Hoisting Beam XM15 and Hoist Adapter Proof-Loading Test.

WARNING

To avoid personnel injury while the missile is suspended in air:
- **Work on only one side of missile at a time.**
- **One hand should be on missile at all times to push it away in case of shifting.**
- **Hands or feet should never be UNDER MISSILE.**

WARNING

- **Personnel are not to touch hydraulic operating controls, move loader superstructure or start engine while missiles are loaded with weights or during process of loading and unloading weights from missiles.**

(1) Verify that 1000-pound weight (figure 6-17) is installed on back of loader.

NOTE

- **Make sure that both stop blocks are in the IMPROVED position.**
- **If weight harness is assembled, install harness on missile A or C and proceed to step (8).**
- **If harness is not assembled, perform the following steps:**

(2) Remove missile tunnel and side covers.

(3) Remove shoulder bolts if installed; refer to TM 9-1410-530-14.

(4) Install two support brackets (refer to figure 6-14) using four of the shoulder bolts removed in step (8) above. Do not tighten bolts.

(5) Place two support bands (figure 6-14) on missile. Locate one band about 55 inches forward of support bracket installed above and the

second about 21 inches aft of the support bracket as shown in figure 6-14.

NOTE

Quantities of hardware shown on Figure 6-14 are for each missile.

(6) Thread two safety straps through slots in each beam as shown in figure 6-14.

(7) Attach two beams to support brackets and support bands, using eight each capscrews and lockwashers. Leave the bottom fore and aft screw holes empty.

(8) Tighten all capscrews and bolts.

(9) Install two 66-lb. beam weights as shown in figure 6-15, using four capscrews (J) and four lockwashers (E) in the bottom fore and aft holes of each beam weight only.

(10) Tighten all capscrews.

(11) Remove wing attach pads (if present) from wings number 1 and 4 and secure pads in their respective places on the missile, using existing hardware.

NOTE

- **These wing attach pads serve as a bearing surface for hoisting beam sway braces during missile handling.**
- **Make sure arrow engraved on side of beams is pointing toward the front of missile as shown in figure 6-14.**

(12) Lock out suspension system.

(13) Install hoist adapter on index fork which will be nearest to rear of missile.

(14) Attach missile hoisting beam XM15 to missile by inserting both hooks and locking with lock pins (Figure 6-27).

(15) Using EXTENSION lever, <u>extend superstructure about 12 inches</u> (30.5 cm) above rear support pads to activate roll and azimuth controls.

(16) Using ROLL/ELEVATION lever, <u>raise index forks as high as you can</u>.

(17) Approach pallet from side until <u>hoist adapter swivel is directly over lifting hole No. 6 of missile hoisting beam XM15</u>.

(18) Still using ROLL/ELEVATION lever, position hoist adapter swivel above hole No. 6. Attach shackle between swivel and eye at hole No. 6 (figure 6-28). Take up slack.

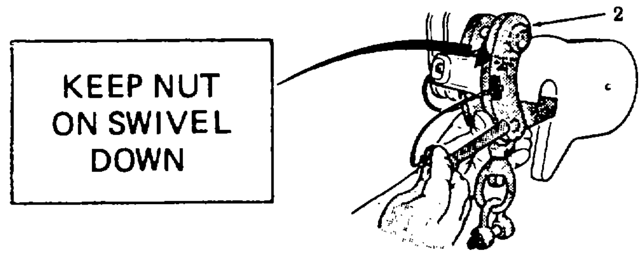


Figure 6-27. Hoist Adapter Installation.

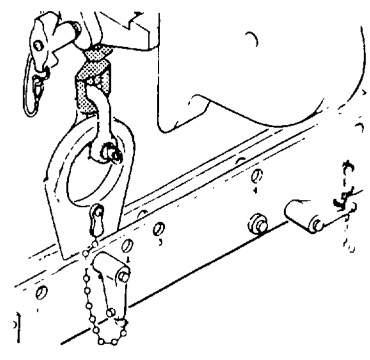


Figure 6-28. Shackle Attachment.

(19) <u>Remove pallet quick release pin and release forward latch</u>.

(20) Using ROLL/ELEVATION lever, carefully <u>lift missile</u> until forward end is about 1 inch (25.4 mm) above pallet saddle.

(21) Using AZIMUTH lever, <u>move missile forward</u> to clear rear pallet latch.

(22) Still using AZIMUTH lever, rotate superstructure toward rear of missile as far as possible.

(23) Raise boom as high as you can using ROLL/ELEVATION lever.

CAUTION

Install two safety straps (figure 6-14) attached to weight support harness around the hoisting beam as shown in figure 6-29.

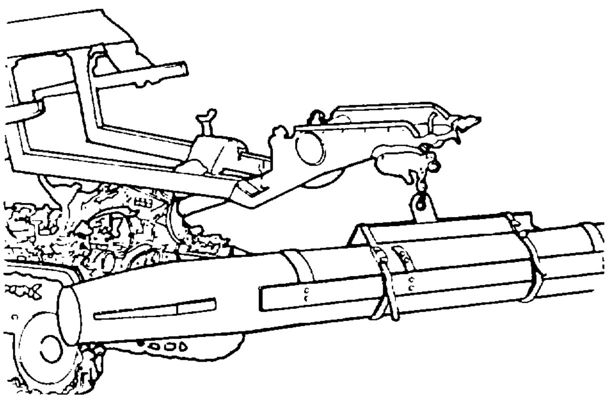


Figure 6-29. Missile Hoisting Beam XM15 and Hoist Adapter Proof Loading Test

(24) Slowly back loader away until missile is clear of pallet.

(25) Locate azimuth rotation of the loader superstructure at zero degrees.

(26) Fully extend elevation cylinder and fully retract roll cylinder (roll right).

(27) Position all hydraulic operating handles in neutral position. Set hand brakes and shut off ignition system.

(28) Allow missile to remain loaded for one minute.

(29) Start loader and transfer training missile back to storage pallet. Remove safety straps from hoisting beam before contact with pallet is made.

(30) Remove weights, harness (optional for harness), and hoisting beam in reverse order of installation.

(31) Unlock suspension.

(32) Remove 1000-lb weight from rear of loader.

(33) Visually inspect missile hoisting beam XM15 for deformation. Manually latch it to alignment fixture and check for proper latching and unlatching. If there are no deformations and it latches and unlatches properly, hoisting beam is satisfactory for handling missiles.

(34) Index the loader to pallet with alignment fixture and accomplish alignment checkout procedure specified in paragraph 6-6c.

NOTE

If loader superstructure is properly aligned, it is satisfactory for handling missiles at index forks by using hoist adapter.

6-9. Optional Missile Hoisting Beam XM15 Proof-Loading Test.

CAUTION

Do not move hoisting unit while connecting test fixtures.

a. Missile Hoisting Beam XM15 Test Preparation. The optional method for proof-loading the hoisting beam requires an anchoring structure (fig. 6-30 and 6-32) that will withstand a load of 2600 pounds when applied in tension by a hoisting unit and can be used to attach the load test fixture which is furnished in the proofloading kit. The load test fixture is designed to fit a deadman already existing at installations which service the HAWK missile system.

1) Secure load test fixture (fig. 6-30 and 6-31) to deadman.

(2) Latch missile hoisting beam XM15 to load test fixture, making sure arrows on side of test fixture and hoisting beam are oriented in same direction.

(3) Position hoisting beam lifting eyes in No. 3 hole in beam.

(4) Attach a shackle on each side of dynamometer. Attach a hook to lower shackle and insert hook into hoisting beam lifting eye.

(5) Attach upper shackle to hoisting equipment. Refer to figure 6-30 and 6-31 for installation details.

(6) Using hoisting equipment, gradually and continually apply tension until 2600 pounds is indicated on dynamometer. Hold this tension for one minute and gradually release the tension.

(7) Remove missile hoisting beam XM15 and visually inspect for any deformation. Manually latch it to alignment fixture and check for proper latching and unlatching. If no deformations are detected, and beam latches and unlatches properly, hoisting beam is satisfactory for handling missiles.

b. Optional Hoisting Beam Proof-Load Test.

CAUTION

Personnel are not to touch hydraulic operating controls or move loader while test fixtures are being attached.

(1) Secure load test fixture (fig. 6-30 or 6-31) to deadman. Refer to step a.

(2) Latch missile hoisting beam XM15 to load test fixture, making sure arrows on side of test fixture and hoisting beam are oriented in same direction.

(3) Position hoisting beam lifting eye in No 3 hole in beam.

(4) Install hoist adapter on right-hand index fork of loader superstructure. Refer to figure 6-27.

(5) Locate azimuth rotation of loader superstructure at zero degrees.

(6) Fully retract roll cylinder (roll right).

NOTE

A fully retracted condition is preferred for extension cylinder so as to locate as much weight as possible towards rear of the loader.

(7) Add 1000-pound weight on rear of loader. Refer to figure 6-19.

(8) Maneuver loader until hoist adapter on right-hand index fork is positioned directly over hoisting beam lifting eye.

(9) Attach a shackle on each side of dynamometer. Attach a hook to lower shackle and insert hook into hoisting beam lifting eye.

(10) Attach upper shackle to hoist adapter.

CAUTION

Do not exceed 2600-pound tension.

(11) Extend elevation cylinder gradually and continually to apply tension until dynamometer indicates a tension of 2600 pounds. Hold this tension for one minute and then release tension gradually.

(12) Remove the 1000-pound weight from rear of loader.

(13) Remove missile hoisting beam XM15 and visually inspect for any deformations. Manually latch it onto alignment fixture and check for proper latching and unlatching. If no deformation is detected, and beam latches and unlatches properly, hoisting beam is satisfactory for handling missiles.

(14) Remove hoist adapter from index fork and inspect the hoist adapter for evidence of yielding of plate sections, pins, holes, and welds. If no deformation is detected, hoist adapter is satisfactory for handling missiles.

(continued on page 6-31)

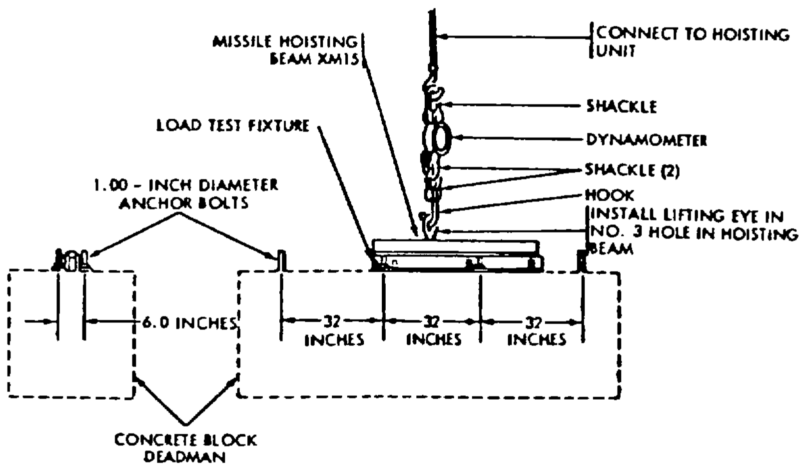


Figure 6-31. Optional Method-Testing Missile Hoisting Beam XM15

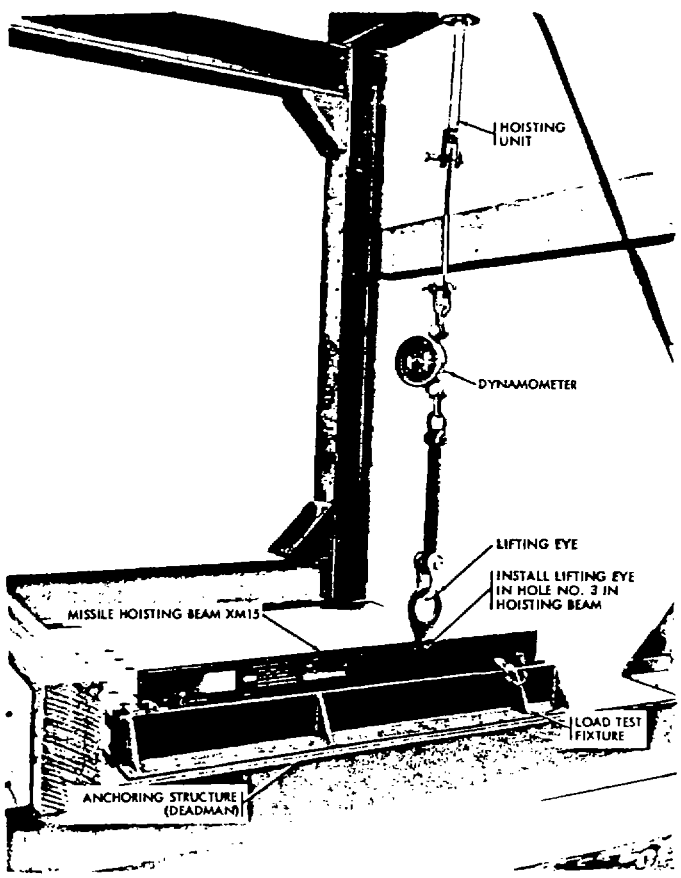


Figure 6-30. Optional Method-Testing Missile Hoisting Beam XM15

(15) Index loader to pallet with alignment checkout procedure as specified in paragraph 6-6a. If loader superstructure is properly aligned, it is satisfactory for handling missiles at index forks by using hoist adapter.

6-10. Misalignment Fault Isolation Procedures.

NOTE

In the event that any of the hoisting beams do not latch and release freely during alinement test (paragraph 6-6a), the superstructure is misalined and not suitable for use.

a. General. Superstructure misalignment can be the result of a deformed yoke assembly, transfer arm, link assembly, index boom, the shifting of one or more hoisting beams on the yoke assembly mounting pads, or by the index fork tips being improperly positioned. The following procedures indicate which component is out of alignment.

Item	NSN	Part Number
Gage, feeler	5210-00-991-3157	10892966
Gage, gap setting	5210-00-987-5057	10892994
Gage, setting (profile)	5210-00-987-5058	10892992
Lever	5120-00-987-5056	10892992
Replacer, spring	5120-00-987-5055	10892991
Fixture, alignment	3465-00-987-5060	10893040
Pallet	1450-00-768-7045	9196208

b. Improperly positioned fork tips.

(1) Index loader to pallet and with hoisting beams in latching position on alignment fixture, observe if all three hoisting beams are displaced laterally (sideways) in the same direction with respect to the alignment fixture pockets and of approximately the same magnitude. This indicates that the index fork tips may have slipped from their correct position on the loader index forks.

(2) Loosen cap screws which attach tips to index forks.

(3) Re-index loader to the alignment fixture pallet enough to compensate for the lateral displacement observed in step 1 above.

(4) Reposition fork tips so there is a one-serration gap between tip and pallet index housing. Tighten cap screws.

(5) Retract extension cylinder until transfer arms are clear of yoke assembly.

(6) Repeat the latching process described in paragraph 6-6a. If satisfactory latching cannot be obtained by this adjustment, proceed to the next alinement check.

c. Hoisting beam slippage on yoke.

(1) Index loader to pallet and locate hoisting beams in latching position on alignment fixture.

(2) Loosen bolts attaching hoisting beam to yoke on each hoisting beam that will not latch and unlatch freely in the alignment fixture pockets.

(3) Rotate hoisting beam laterally (sideways) within the hole limits of attaching hardware until hooks will freely enter alignment fixture pockets.

(4) Tighten hoisting beam attaching bolts while beams are latched to fixture.

(5) Repeat latching process specified in paragraph 6-6a. If satisfactory latching cannot be obtained by this adjustment, proceed to next alinement check.

(5) Repeat latching process specified in paragraph 6-6a. If satisfactory latching cannot be obtained by this adjustment, proceed to next alinement check.

CAUTION

When the quick release pins are removed, the transfer arm will drop approximately 1.5 inches until contact is made with upper portion of link assembly. To prevent this from happening, insert wooden block, #1, between transfer arm and the upper surface of the link assembly, on one side only, before removing pins. (see Figure 611). Block thickness can be best determined by operating personnel.

d. Yoke and hoisting beam assembly.

(1) Index loader to pallet and locate hoisting beams in latching position on alignment fixture, (Figure 6-11).

CAUTION

Secure yoke and hoisting beam to alignment fixture with a safety strap furnished with proof-loading kit. Position safety strap around yoke and center section of alignment fixture and cinch up strap until there is approximately 1/2-inch slack.

(2) Disconnect electrical cabling between yoke and transfer arm at left leg of transfer arm.

(3) Remove two quick release pins which attach yoke to transfer arm.

CAUTION

When the quick release pins are removed, the transfer arm will drop approximately 1.5 inches until contact is made with upper portion of link assembly. To prevent this from happening, insert a small wooden block, between transfer arm and the upper surface of the link assembly, on one side only, before removing pins. Block thickness can be best determined by operating personnel.

(4) Retract extension cylinder until transfer arms are clear of yoke.

(5) Try to latch all hoisting beams to alignment fixture. If latching cannot be accomplished and if the adjustment described in step b does not permit latching of all three hoisting beams, the yoke is deformed and must be replaced.

(6) If the three hoisting beams will latch to alignment fixture freely, the yoke and hoisting beam assembly is in proper alignment. Proceed to step e below.

e. Transfer arm, link assembly and index boom.

(1) To determine which of the remaining members are deformed, retract extension cylinder until socket fitting on transfer arm is just above contact with cross-tube trunnion on index boom. Insert wooden block #2 between link assembly cross-tube and index boom (see Figure 6-11). This will hold the position of the link assembly so that block No. 1 (previously installed) can be removed by retracting the extension cylinder slightly more.

(2) Extend extension cylinder until link assembly is raised sufficiently to remove block No. 2 (two).

(3) Retract extension cylinder until socket fitting on each side of transfer arm makes contact with index boom cross-tube trunnions. If engagement occurs nearly simultaneously on each side and if inside vertical faces of the socket fittings do not interfere with ends of cross-tube trunnion pin, the link assembly and index boom are in alignment. If these components are in alignment, then the transfer arm which is the remaining member, is the deformed part and must be replaced.

(4) If the engagement specified in step 3 above is not simultaneous or if interference occurs, visually check index boom cross-tube trunnions and link assembly hinge points for deformation. If no deformation is present, the link assembly is out of alignment and must be replaced.

f. Fault Isolation Records. Record the results of these tests as directed in DA PAM 738-750.

APPENDIX A
REFERENCES

A-1. SCOPE

This appendix lists all forms, field manuals, and technical manuals referenced in this manual or used with it.

A-2. FORMS

Refer to DA Pam 310-2 for a current and complete list of blank forms. TM 38-750, The Army Equipment Record System and Procedures, contains instructions on the use of maintenance forms pertaining to this materiel.

Quality Deficiency Report (for EIR's) .... SF 368

A-3. FIELD MANUALS

Common Wood and Metal Repair .... FM 43-4

A-4. TECHNICAL MANUALS

Calibration Procedure for Profile Gage .... TB 9-5210-211-50

Direct and General Support Maintenance Manual for Engine
Assembly and Clutch and Engine Assembly .... TM 9-2805-213-34

Inspection, Care and Maintenance of Antifriction Bearings .... TM 9-214

Materials Used for Cleaning, Preserving, Abrading and Cementing
Ordnance Materiel and Related Materials Including Chemicals .... TM 9-247

Operator, Organizational, Field and Depot Maintenance Manual:
Training Guided Missile XM18 .... TM 9-1410-501-15

Operator, Organizational, DS, GS, and Depot Maintenance Manual:
Shipment, Handling, Storage, Inspection, Care, and
Preservation .... TM 9-1400-514-15

Operator's Manual: Loader-Transporter, Guided Missile:
XM5O1E3 (HAWK Guided Missile System) .... TM 9-1450-500-10

Operator's Manual: Welding Theory and Application .... TM 9-237

Organizational, Direct Support, and General Support Maintenance
Repair Parts and Special Tools List: Loader-Transporter,
Guided Missile: XM50E3 (HAWK Guided Missile System) .... TM 9-1450-500-24P

Organizational Maintenance Manual: Loader-Transporter, Guided
Missile: XM501E3 (HAWK Guided Missile System) .... TM 9-1450-500-20

A-5. MISCELLANEOUS PUBLICATIONS

Lubrication Order: Loader-Transporter, Guided Missile:
XM501E3 (HAWK Guided Missile System) .... LO 9-1450-500-12

The Army Equipment Record System and Procedure:
Protection and Storage of Army Equipment Log
Book Assembly .... TM 38-750

APPENDIX B
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOT APPLICABLE

APPENDIX C
EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTIONS

C-1. Scope

This appendix lists expendable supplies and materials you will need to operate and maintain the loader. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

C-2. Explanation of Columns.

a. *Column 1 - Item Number*. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use hydraulic fluid, item 2, App. C").

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

F - Direct Support Maintenance

c. *Column 3 - National Stock Number*. This is the National Stock number assigned to the item; use it to request or requisition the item.

d. *Column 4 - Description*. Indicates the Federal Item name, and, if required, a description to identify the item. The last line of each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parenthesis, if applicable.

e. *Column 5 - Unit of Measure (U./M)*. Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS

(1) Item Number	(2) LEVEL	(3) National Stock Number	(4) Description	(5) U/M
1	F	8040-00-728-3088	Adhesive, Waterproof Sealant Compound MIL-A-46106A, Type II	Oz.
2	0	8030-00-290-5141	Coating Compound, bituminous	Gl
3	0	8010-00-959-4661	Epoxy Coating Kit	Kt
4	F	9150-00-180-6181	Fluid, Hydraulic MIL-H-5606	Cn
5	F	9150-00-190-0904	Grease, Automotive and Artillery Type P-11	Ea
6	F	9150-00-231-6689	Lubricating Oil, General Purpose (PL Special) (NATO Symbol 0-190)	Oz
7	F	5330-00-315-2671	Packing PN 34-47	Ea
8	F		Sealant Class 31	Qt
9	F	6850-00-274-5421	Solvent, Dry Cleaning (P-D-680)	
10	F	8010-00-246-6112	Thinner, Mineral Spirits, Paint	Gl

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Chief of Staff

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	***To***	***Multiply by***	***To change***	***To***	***Multiply by***
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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