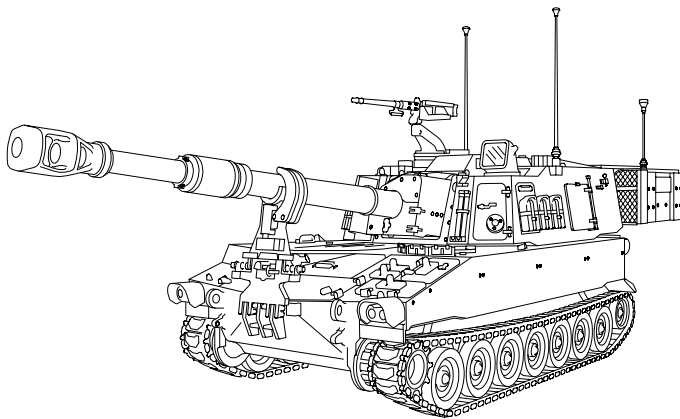


**TECHNICAL MANUAL
DIRECT SUPPORT AND GENERAL
SUPPORT MAINTENANCE
FOR
CAB SYSTEMS
AND
COMPONENTS**



**HOWITZER, MEDIUM,
SELF-PROPELLED:
155MM, M109A6
(NSN 2350-01-305-0028)
(EIC: 3FC)**

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CHANGE
NO.2

TM 9-2350-314-34-2
C2
HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 1 SEPTEMBER, 2002

**TECHNICAL MANUAL
DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL
FOR
CAB SYSTEMS AND COMPONENTS
HOWITZER, MEDIUM,
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(NSN 2350-01-305-0028) (EIC: 3FC)**

TM 9-2350-314-34-2, 8 February, 1999, is changed as follows:

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1-1 and 1-2

1-25 and 1-26

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8-75 and 8-76

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Official:



JOEL B. HUDSON

*Administrative Assistant to the
Secretary of the Army*

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ERIC K. SHINSEKI
*General, United States Army
Chief of Staff*

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WASHINGTON, D.C., 1 APRIL 2001

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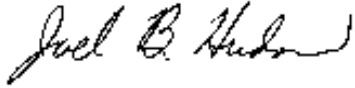
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*Administrative Assistant to the
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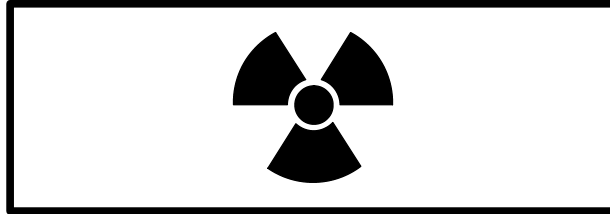
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ERIC K. SHINSEKI
*General, United States Army
Chief of Staff*

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WARNING

RADIOACTIVE MATERIAL(S)



TRITIUM (HYDROGEN-3) GAS

This item contains radioactive material. Control of this radioactive material is mandated by federal law. Immediately report any suspected lost or damaged items to your Radiation Safety Officer (RSO). If your RSO cannot be reached, contact the TACOM-RI safety office.

Handle with care. In the event the radioluminous source is broken, cracked, or there is no illumination, immediately wrap device in plastic bag (item 5, Appendix D) and notify the local RSO. Contact the base safety office for the name and telephone number of your local RSO:

LOCAL RSO: _____ TELEPHONE: _____

SAFETY PROCEDURES FOR NUCLEAR REGULATORY COMMISSION (NRC) TRITIUM FIRE CONTROL DEVICES

1. Purpose: To implement mandatory license requirements for use and maintenance of tritium radioluminous fire control devices used on howitzers, mortars, tanks, and rifles.
2. Scope: This procedure is applicable to all personnel working with tritium devices, including unit, direct support, general support maintenance; and operator's levels.
3. Radiological hazard: The beta radiation emitted by tritium presents no external radiation hazard. However, if taken internally, it can damage soft tissue. If a capsule is broken, the tritium gas will dissipate into the surrounding air and surfaces near the vicinity of the break may become contaminated. Tritium can be taken into the body by inhalation, ingestion, or skin absorption/injection.
4. Safety precautions.
 - a. Check for illumination prior to use or service in low light or darkroom. If not illuminated, do not repair. Wrap the entire device in plastic bag (item 15, Appx B) and notify the local RSO.
 - b. No eating, drinking, or smoking will be allowed in tritium device work areas.
5. Emergency procedures: If a tritium source breaks, inform other personnel to vacate the area or move upwind. If skin contact is made with any area contaminated with tritium, wash immediately with nonabrasive soap and water. Report the incident to the local RSO. Actions below will be taken under supervision or direction of the local RSO.

- a. Personnel handling the device should wear rubber or latex gloves (item 44, Appx B). Device must be immediately double wrapped in plastic bag (item 15, Appx B), sealed (item 74, Appx B), and marked as "Broken Tritium Device — Do Not Open" per RSO direction. Dispose of used gloves as radioactive waste, per instructions from local RSO and wash hands well.
- b. Personnel who may have handled the broken tritium should report to health clinic for tritium bioassay. Optimum bioassay sample is at least 4 hours after exposure.
- c. Broken tritium sources indoors may result in tritium contamination in the area, such as work bench or table. The area must be cordoned off, restricted until wipe tests indicate no contamination.

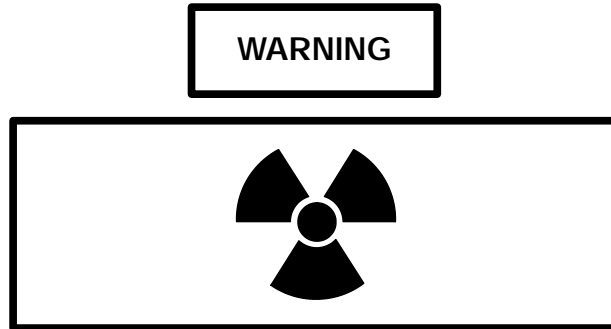
6. Further information.

- a. Requirements for safe handling and maintenance are located in TM 9-254, General Maintenance Procedures for Fire Control Materiel.
- b. If assistance is needed, contact your local or major command (MACOM) safety office(s) for information on safe handling, shipping, storage, maintenance, or disposal of radioactive devices.
- c. The TACOM-RI RSO/licensee may be contacted by calling: DSN 793-2965/2969/2995, Commercial (309) 782-2965/2969/2995. After duty hours contact the Staff Duty Office through the operator at DSN 793-6001, Commercial (309) 782-6001. The following rules and regulations are available from TACOM-RI, ATTN: AMSTA-LC-SF, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. Copies may be requested, or further information obtained by contacting the TACOM-RI Radiation Safety Office (RSO).
 - (1) Title 10 CFR Part 19 - Notices, Instructions, and Reports to Workers.
 - (2) Title 10 CFR Part 20 - Standards for Protection Against Radiation.
 - (3) Title 10 CFR Part 21 - Reporting of Defects and Noncompliance.
 - (4) NRC License, License Conditions, and License Application.

7. Safety, Care, and Handling

WARNING

Nuclear, Biological, and Chemical (NBC) agents can kill you. If NBC exposure is suspected, all air filter media must be handled by personnel wearing full NBC protective equipment (FM 21-11).



RADIATION HAZARD

Fire control instruments containing Tritium are used as a part of a backup system for manual firing. Loss of illumination may indicate that leakage has occurred. Do not attempt to repair a non-illuminated device.

Pre-Maintenance Check:

- a. Prior to taking any maintenance action on fire control devices (e.g., purging or charging M1A1 Collimator), check for broken/cracked reticle or loss of illumination as follows:
 - (1) Place device in the dark for at least four hours to prevent exterior light from activating the phosphor.
 - (2) Check for cracks/illumination in a low light environment after allowing sufficient time to accustom eyes to the dark.
- b. If illumination is not observed, or illuminated but cracks are observed, take following actions:
 - (1) Personnel handling the device should wear rubber or plastic gloves (item 44, Appx B).
 - (2) Seal entire device in two plastic bags (item 15, Appx B).
 - (3) Mark the outer bag as "Broken tritium device - do not open."
 - (4) Dispose of used gloves as radioactive waste as per instructions from local Radiation Safety Officer (RSO). Wash well with nonabrasive soap and water.
- c. If illumination is observed, maintenance actions may proceed.



WARNING

CARBON MONOXIDE POISONING IS DEADLY

Carbon monoxide is a colorless, odorless, deadly poisonous gas, which, when breathed, deprives the body of oxygen and causes suffocation. Exposure to carbon monoxide produces headache, dizziness, loss of muscular control, drowsiness, and coma. Permanent brain damage or death can result from severe exposure.

Carbon monoxide occurs in the exhaust of fuel-burning heaters and internal-combustion engines and becomes dangerously concentrated under conditions of inadequate ventilation. The following precautions must be observed to ensure the safety of personnel whenever the personnel heater, main, or auxiliary engine of any vehicle is operated for maintenance purposes or tactical use.

1. DO NOT operate heater or engine of vehicle in an enclosed area unless it is ADEQUATELY VENTILATED.
2. DO NOT idle engine for long periods without maintaining adequate ventilation in personnel compartments.
3. DO NOT drive any vehicle with inspection plates, cover plates, or engine compartment doors removed unless necessary for maintenance purposes.
4. BE ALERT at all times during vehicle operation for exhaust odors and exposure symptoms. If either are present, immediately ventilate personnel compartments. 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**

WARNING

- Do not purge and charge any instrument containing a radioluminous source if there is not illumination in the assembly. The local Radiation Safety Officer (RSO) must be notified and the defective unit will be replaced by a serviceable one.
- Do not use mineral spirits or paint thinner to clean the howitzer. Mineral spirits and paint thinners are highly toxic and combustible. Prolonged breathing can cause dizziness, nausea and even death. Do not use these materials.
- Avoid prolonged contact with adhesives, to prevent damage to eyes, skin and lungs.
- Always use cleaning solvents and adhesives in a well-ventilated area. Do not permit smoking. Do not use near open flame. Wear gloves and eye protection.
- When removing and installing heavy items, make sure to have sufficient personnel and adequate lifting equipment. Equipment can cause serious injury if dropped.
- Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause SERIOUS INJURY. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contact your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).
- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.
- Never torque hydraulic lines or fittings when hydraulic system is pressurized. Damage to tubes and fittings could result in injury to personnel.
- Do not drop tank of compressed nitrogen gas. Do not tap nitrogen tank. Tank can explode when tapped or dropped. When using in confined areas, use extreme care; gas could cause suffocation.
- High pressure gas is used in charging the accumulators and fire control equipment. Do not exceed recommended psi when charging these components. Keep face and body clear of release valves. Failure to observe safety precautions may result in injury or death.
- High levels of radio frequency radiation can be damaging. Stay at least two feet away from the antenna of any operating radio transmitter.
- Refer to FM 21-11, First Aid for Soldiers, for correct procedures to be taken if personnel are injured.

WARNING

■ Observe the following precautions when using R134A Refrigerant:

- Wear protective thermal gloves and goggles to prevent tissue damage from freezing.
 - Keep liquid refrigerant away from flames or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride, a highly toxic and corrosive gas.
-
- To prevent accidental exposure to R134A, leading to serious personal injury, make sure all manifold shutoff valves are completely closed unless otherwise specified.
 - Freon loop must be discharged before performing debrazing and brazing procedure. Heat will be applied to Freon components during this procedure. Heat causes the refrigerant to break down and form carbonyl chloride, a highly toxic and corrosive gas.

INSERT LATEST CHANGED PAGES.
DESTROY SUPERSEDED PAGES

LIST OF EFFECTIVE PAGES

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Date of issue for original and changed pages are:

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 Change 1 1 April, 2001
 Change 2 1 September, 2002

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**DIRECT SUPPORT AND
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HOWITZER, MEDIUM, SELF-PROPELLED:
155MM
M109A6 (2350-01-305-0028)
(EIC: 3FC)**

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HOW TO USE THIS MANUAL

Indexing

Five major indexing procedures are used in this manual to help the technician locate information rapidly.

1. Cover index: Lists sections of text and page number. Includes Index Mark which lines up with Index Marks on the actual page of reference.
2. Table of Contents: Pages i through ii.
3. Chapter indexes: Lists information covered within the chapter and section.
4. Troubleshooting symptoms: Identifies system malfunction and provides page reference for specific troubleshooting procedures.
5. Index, page INDEX-1: Alphabetical listing of information.

Maintenance Text and Illustrations (Chapter 4 through 13)

1. Maintenance procedures are to be performed in the sequence shown in the text and illustrations. Step 1 must be performed before Step 2. Procedure a must be performed before Procedure b, and so on.
2. Equipment illustrations use numbers to identify parts of the system/components.

Example:

1. Remove both wiring harnesses (1) and (2).
2. Remove four screws (3), four flat washers (4), four lockwashers (5), and four nuts (6).

CHAPTER 1

INTRODUCTION

GENERAL

This chapter provides the maintenance technician with basic information for the M109A6 primary armament, elevating, traversing, and other cab-related components. This information is provided through a physical description of major components, which the technician is required to maintain, service, inspect, replace, or repair.

Additional information is provided as reference and guidance on use of forms, maintenance of records, and filing reports.

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Section I. GENERAL INFORMATION

1-1 SCOPE.

This manual contains instructions for direct and general support level maintenance on the howitzer primary armament, elevating, and traversing systems, as well as other cab-related components.

Appendix A lists references which are applicable to the M109A6 howitzer.

Appendix B lists expendable and durable items required to support M109A6 maintenance functions.

Appendix C provides an illustrated list of fabricated items.

Appendix D provides torque limits.

Appendix E provides mandatory parts replacement.

Appendix F provides a tool identification list.

Appendix G provides information on corrosion prevention control.

1-2 MAINTENANCE ALLOCATION.

The prescribed maintenance responsibilities, as allocated in the Maintenance Allocation Chart (MAC) (TM 9-2350-314-20-2-2), are reflected in this manual. In all cases where nature of repair, modification, or adjustment is beyond the scope and/or facilities of direct support and general support maintenance, depot maintenance unit should be informed in order that trained personnel with suitable tools and equipment may be provided or further instructions issued.

1-3 MAINTENANCE FORMS, RECORDS, AND REPORTS.

For instructions on how to use these forms, refer to DA PAM 738-750, The Army Maintenance Management System (TAMMS), as contained in Maintenance Management Update.

Accidents involving injury to personnel or damage to materiel will be reported on DA Form 285 (Accident Report) in accordance with AR 385-40.

Any accident or malfunction involving use of ammunition must be reported in accordance with AR 75-1.

1-4 DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

Refer to TM 750-244-6 for procedures on how to destroy howitzer. You will find procedures for destruction of munitions in TM 750-244-5-1 (Conventional Ammunition and Improved Conventional Munitions).

1-5 CALIBRATION.

For fire control alignment tests and measurements, refer to TM 9-2350-314-10.

For illustration and description of how to synchronize, adjust, and test M109A6 sighting and fire control equipment, see TM 9-2350-314-20-2-1.

For further information, refer to the following technical manuals as necessary:

TM 9-1240-401-34 & P for DS/GS Maintenance on:
M117A2 Telescope
M145A1 Mount

RPSTL for above items is contained in TM 9-1240-401-34&P.

■ For maintenance of M1/M1A1/M1A2 Collimator, see TM 9-1240-324-34&P.

1-6 NOMENCLATURE CROSS-REFERENCE LIST.

Nomenclature in this manual was chosen in accordance with terms used for provisioning as they appear in RPSTL and MAC (see TM 9-2350-314-20-2-2 and TM 9-2350-314-24P-2).

A few cab components, however, are frequently referred to by terms more common than those in the RPSTL. In many cases the more common name is a shorter name for same component.

<u>OFFICIAL PROVISIONING NOMENCLATURE</u>	<u>MORE COMMON NAME</u>
Ballistic cover assembly	Panoramic telescope (PANTEL) ballistic cover
Cab ammunition rack	Ready rack
Caliber .50 machine gun M2	Machine gun M2
Electrical arm	Electrical contact arm or contact arm
Electrical arm holder assembly	Brush holder
Electrical contact segment ring	Slip ring segment board
Elevation mechanism assembly (equilibrator)	Elevating cylinder
Howitzer M182A1 mount	M182A1 mount
M284 cannon assembly	Cannon
155MM medium self-propelled howitzer M109A6	Howitzer
Selector valve assembly	Elevation or traverse selector valve
Spindle assembly	Obturator group or bump spindle
Tetrafluoroethane, T	R134A refrigerant, Freon
Tube assembly	Cannon tube
Valve assembly, actuating rammer	Rammer actuating valve
Valve assembly, safety	Blocking valve

1-7 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs).

EIRs must be submitted by anyone who is aware of an unsatisfactory condition with equipment design or use. It is not necessary to show a new design or list a better way to perform a procedure. Simply tell why the design is unfavorable or why a procedure is difficult. EIRs will be submitted on Standard Form 368. Mail directly to

Department of the Army
 U.S. Army Tank-automotive and Armaments Command
 ATTN: AMSTA-LC-CIP-W
 Rock Island, IL 61299-7630

We'll send you a reply.

NOTE

When equipment failure occurs, but is not caused by normal wear, poor operation, or accident, you must submit an Equipment Improvement Recommendation.

1-8 ADMINISTRATIVE STORAGE.

The procedures for administrative storage are contained in TM 9-2350-314-20-2-2.

Section II. EQUIPMENT LOCATION, DESCRIPTION, AND DATA

1-9 EQUIPMENT LOCATION AND DESCRIPTION.

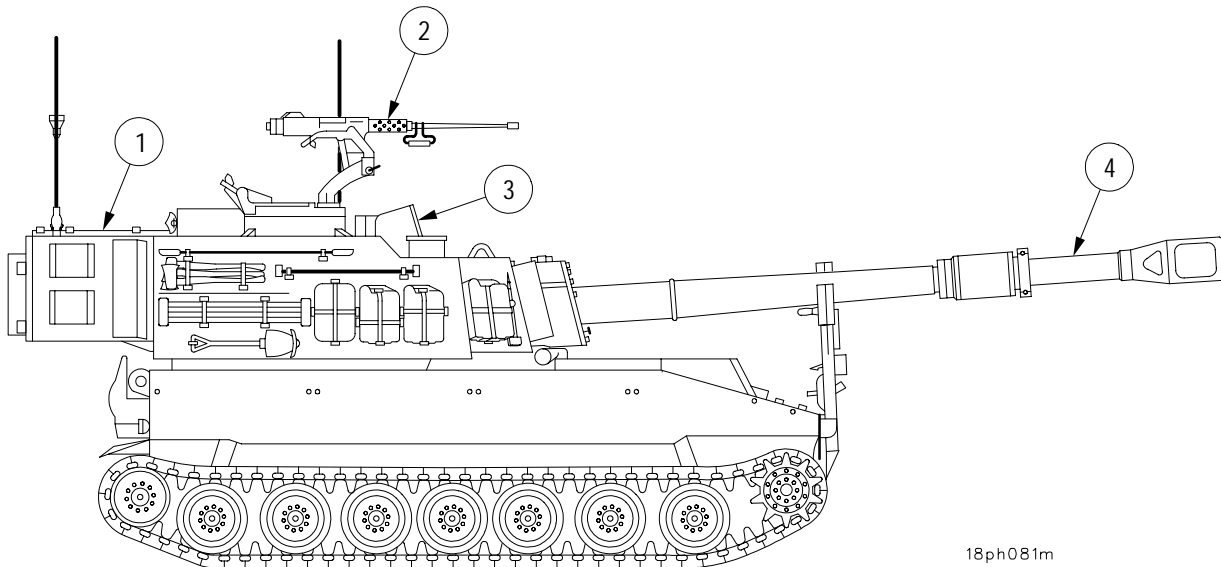
1-9.1 Description of Major Components.

This paragraph covers the location and description of the 155MM Cannon Assembly M284, Mount M182A1, equilibrated elevating mechanism assembly, elevation control assembly, weapon-mounted loader rammer assembly, traversing mechanism, hydraulic powerpack, and related cab subassemblies. This description is supplemental to information given in TM 9-2350-314-10 and TM 9-2350-314-20-2-1.

1-9.2 Location of Major External Components.

Legend

1. Stowage basket
2. .50 caliber machine gun
3. Ballistic cover, panoramic telescope
4. 155MM cannon M284



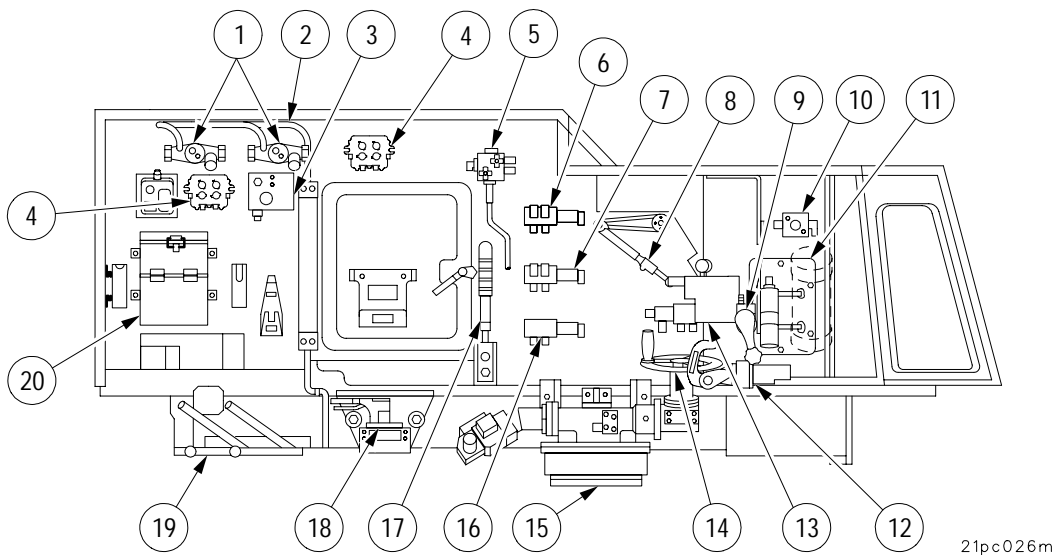
18ph081m

1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.3 Location of Major Internal Components (Left Cab Configuration).

Legend

1. Heater (M3)
2. Driver's hose
3. MCS control box
4. Full function crew station (FFCS)
5. Equilibration manifold
6. Elevation selector valve
7. Azimuth selector valve
8. Pantel linkage
9. Elevation hand pump
10. Return manifold
11. Hydraulic interior compartment panel
12. Gunner's control handle
13. Fuse manifold
14. Handwheel assembly
15. Turret traverse mechanism
16. Traverse limit valve
17. Equilibration hand pump
18. Turret lock
19. Crew seat
20. Periscope box



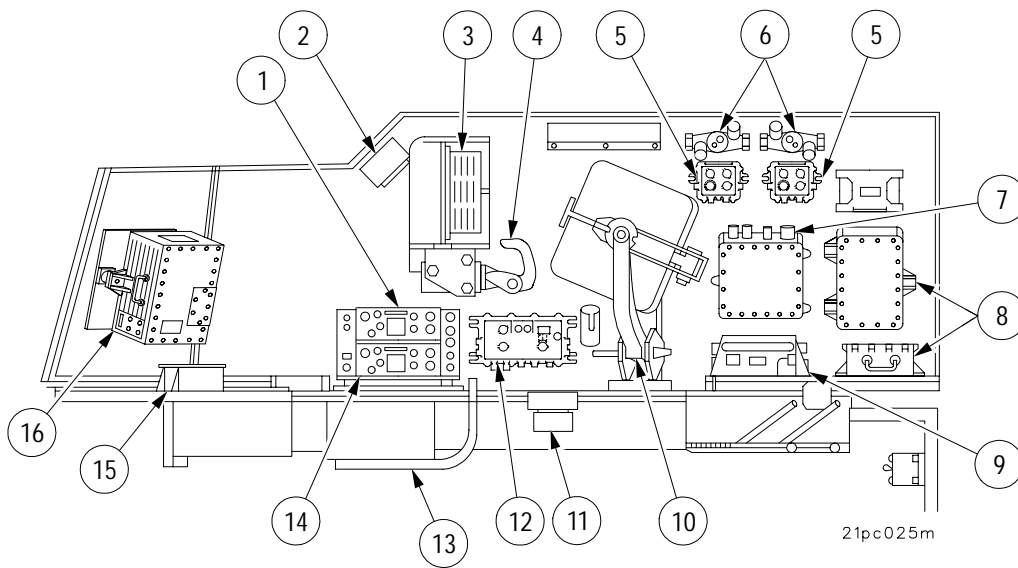
21pc026m

1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.3 Location of Major Internal Components (Right Cab Configuration) - Continued

Legend

1. VRC radio (voice)
2. Hydraulic control box
3. Display unit (DU)
4. Chief of section control handle
5. Full function crew station (FFCS)
6. M3 heaters
7. Prognostic/diagnostic interface unit (PDIU)
8. Automatic fire control system batteries
9. Power conditioner unit (PCU)
10. Commander's seat assembly (stowed)
11. Azimuth tachometer
12. Master control station (MCS)
13. Footrest (stowed)
14. VRC radio (digital)
15. Vehicle motion sensor (VMS) modem
16. AFCS computer unit (ACU)



1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

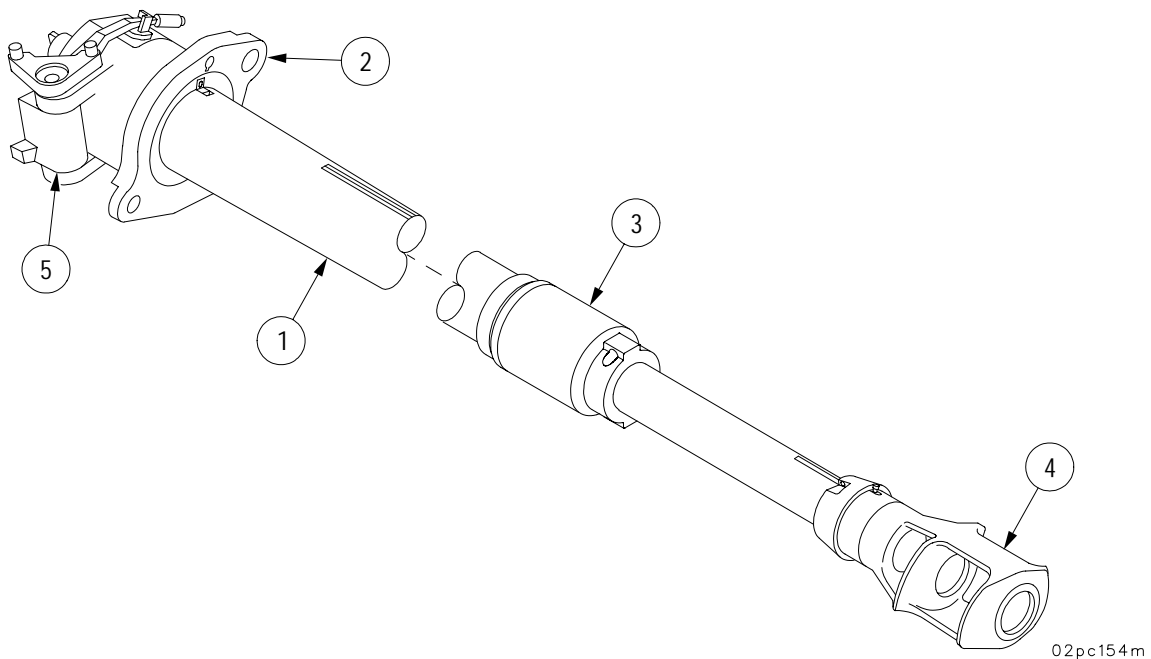
1-9.4 155MM Cannon.

The principal components of the cannon M284 are as follows:

- a. Tube (1). The tube incorporates a chamber designed to receive the projectile and powder charge and is rifled throughout the length of the bore to assure accuracy of trajectory. Interrupted threads are machined on the outside diameter at breech end of tube to facilitate mounting of the tube in the breech ring. Further machining adapts tube for mounting evacuator and muzzle brake.
- b. Breech ring band (2). The breech ring band connects the tube and recoil system and mounts the breech mechanism.
- c. Bore evacuator (3). The bore evacuator clears tube of gases after a round has been fired, thereby reducing contamination of air inside cab.
- d. Muzzle brake (4). The muzzle brake reduces forward muzzle flash and recoil while expelling gases to the sides to increase visibility for crew.
- e. Breech mechanism assembly (5). The breech mechanism assembly contains the tube chamber, locking mechanism, and firing mechanism. The principle components of the breech assembly are the breechblock, carrier, operating crank, obturator, firing mechanism, and operating handle. The semiautomatic screw block-type breech mechanism is designed for separate loading ammunition.

Legend

1. Tube
2. Breech ring band
3. Bore evacuator
4. Muzzle brake
5. Breech mechanism assembly



1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

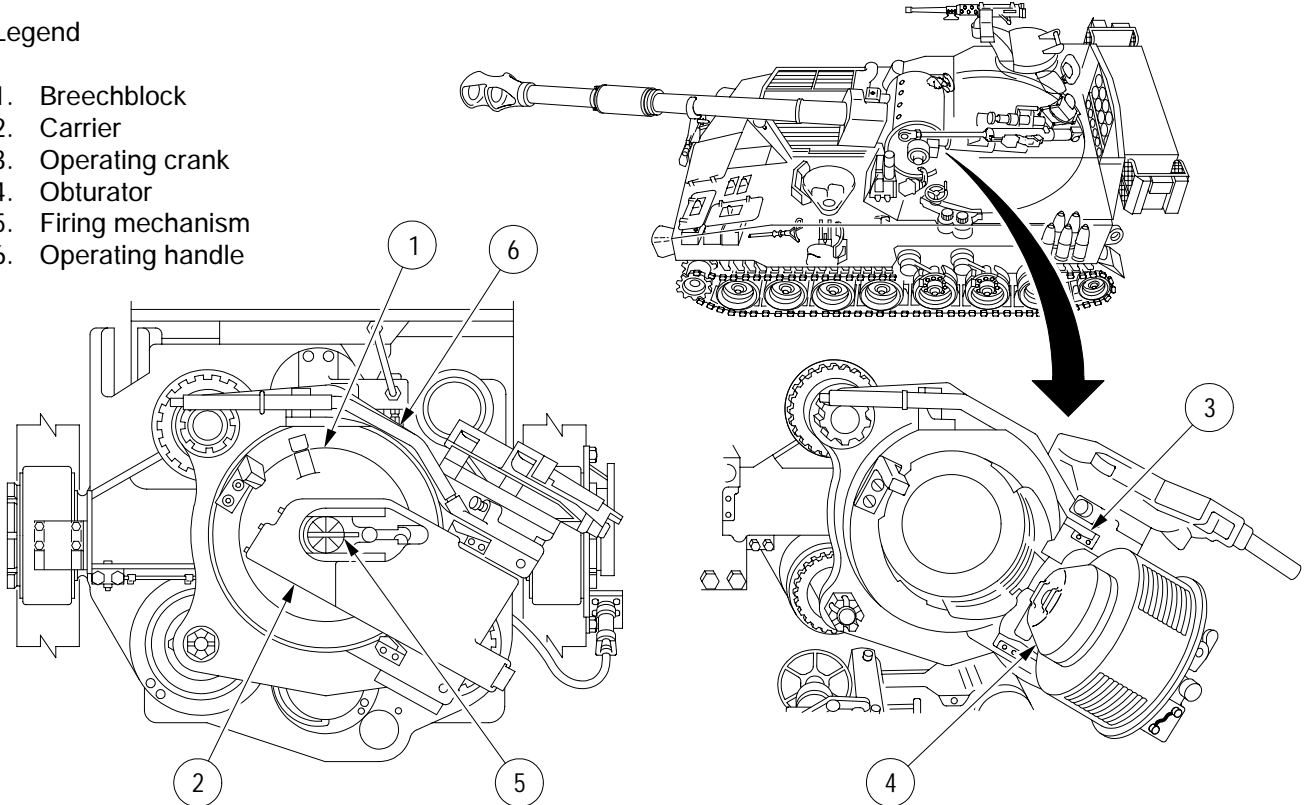
1-9.4 155MM Cannon - Continued

e. Breech mechanism assembly - Continued

- (1) Breechblock. Breechblock (1) encloses projectile and powder charge within chamber and remains in closed position until opened by breech operating cam during latter stages of counterrecoil cycle.
- (2) Carrier. Carrier (2) mounts breechblock (1) and firing mechanism (5). A system of springs and gears within carrier (2) opens and closes breechblock (1). Breechblock (1) is opened by power transmitted through gearing from operating crank (3). Compression-type coil springs transmit power through gearing to lock breechblock (1) after it has been closed by torsion from laminated closing springs.
- (3) Operating crank. Operating crank (3), mounted on breech ring rides within camming recesses machined in breech operating cam. A portion of counterrecoil force is converted by action of cam and crank to torque which is transmitted to carrier (2) gearing.
- (4) Obturator. Obturator group (4), mounted on forward face of breechblock (1), serves as a seal between chamber and breechblock (1), preventing entry of gases from chamber to cab at time of firing.
- (5) Firing mechanism. Firing mechanism (5) is a continuous pull, percussion type. Impact force is transmitted through a firing pin in block assembly which strikes a percussion-type primer, detonating propellant powder charge.
- (6) Operating handle. Operating handle (6) connected to operating crank (3) allows manual opening and closing of breech mechanism and is normally kept in stowed position, latched to operating handle stop.

Legend

1. Breechblock
2. Carrier
3. Operating crank
4. Obturator
5. Firing mechanism
6. Operating handle



02pc156m

1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

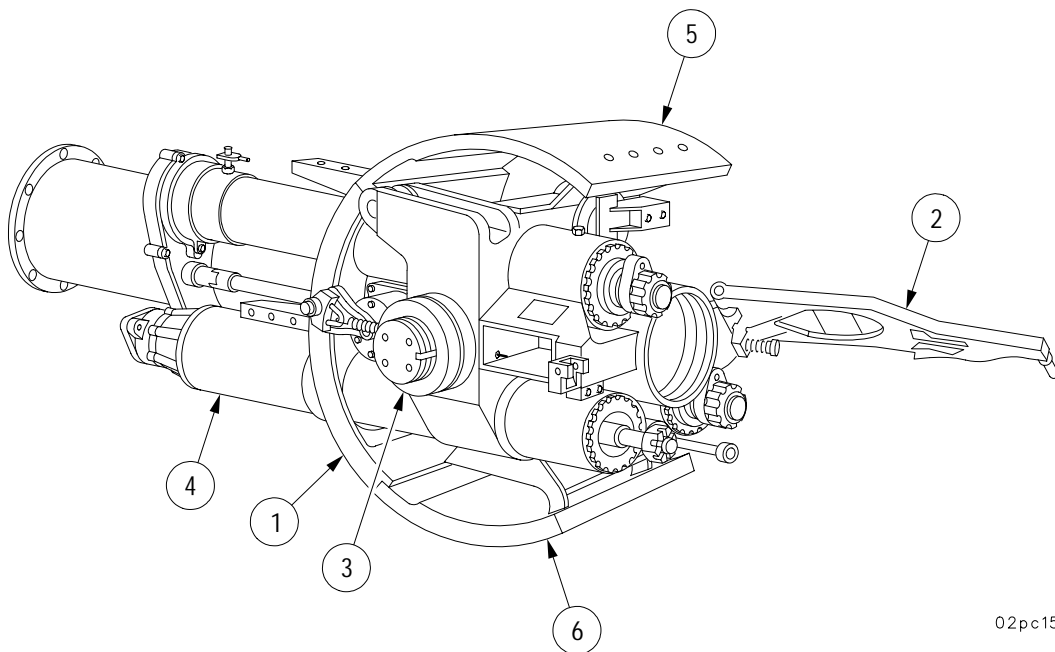
1-9.5 Mount M182A1.

M182A1 mount secures 155MM cannon to vehicle cab. It permits the cannon to be elevated or depressed within prescribed limits. Major components of M182A1 mount are as follows:

- a. Cradle. The cradle (1) is a machined casting in which cannon rides and carries the components of variable recoil systems, breech operating cam (2), trunnion bearing (3), and recuperator cylinder (4).
- b. Breech operating cam. The breech operating cam (2) is a flat plate with camming surfaces machined into it and is hinged to the cradle (1). The breech operating cam (2), having assisted in unlocking and opening breechblock, holds it open after weapon returns to battery. When breech operating cam (2) is lifted manually from contact with operating crank, breechblock is allowed to close and lock automatically.
- c. Trunnion bearing. Trunnion bearing (3), mounted on each side of cradle (1), is attached to cab by a trunnion bearing bracket and cap and carries weight of cannon and mount. This permits cannon to be elevated and depressed within limits set by stops welded to mount.
- d. Upper and lower rotors. The upper rotor (5) and lower rotor (6) are heavy aluminum plate extensions bolted to gun shield. These aluminum plates function to inhibit effects of enemy fire.

Legend

1. Cradle
2. Breech operating cradle cam
3. Trunnion bearing
4. Recuperator cylinder
5. Upper rotor shield
6. Lower rotor shield



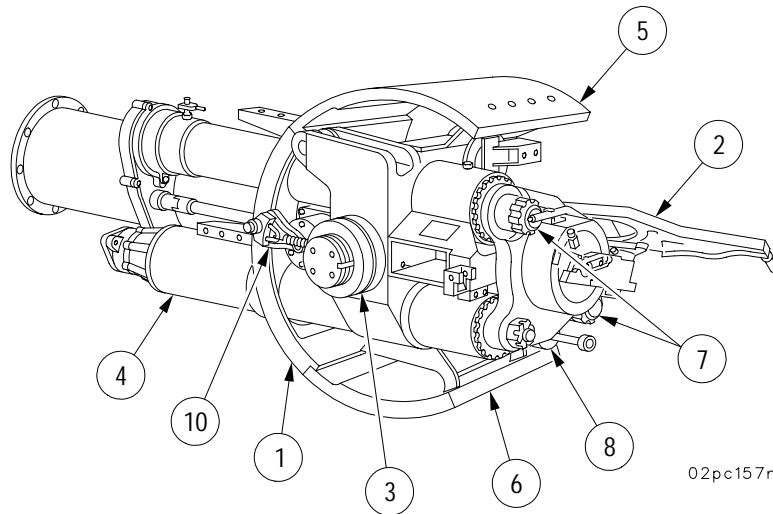
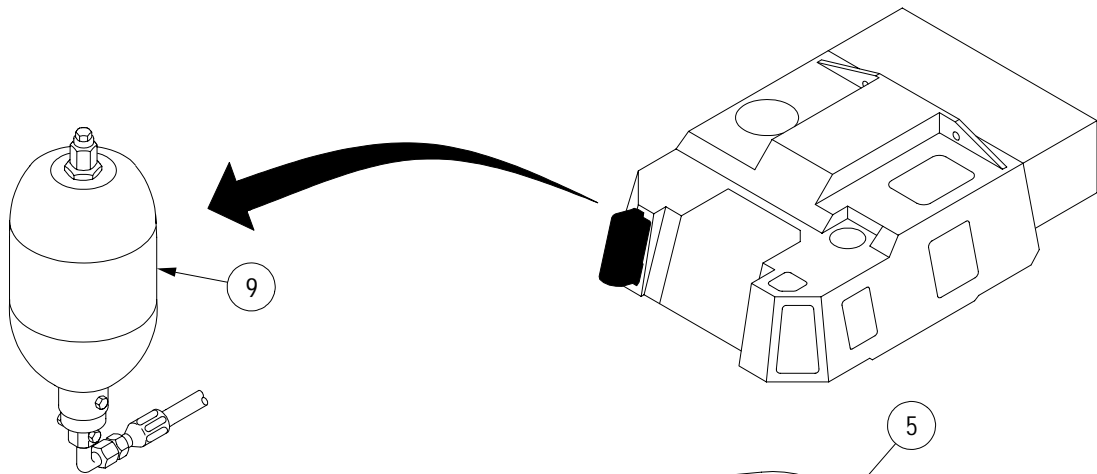
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1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.5 Mount M182A1 - Continued

e. Independent variable recoil system. Variable recoil system compensates for cannon's tendency to recoil violently after firing. Principle components of recoil system are buffer cylinder (8), variable recoil cylinders (7), replenisher accumulator (9), and recuperator cylinder (4). The variable recoil cylinders (7) are governed by an actuator (10) which shortens length of recoil in relation to extent of weapon's elevation. In effect, a shorter recoil is allowed for higher elevations.

- (1) Variable recoil cylinders. Variable recoil cylinders (7) operate hydraulically to restrict recoil length and are attached to cradle (1) and breech ring band. Pistons contain orifices to allow fluid to flow from one side of piston to other during recoil. Orifices are tapered to provide a progressively greater restriction of flow as weapon approaches full recoil. Rotation of inner orifices regulates length of recoil, these same orifices permit a return flow of fluid past piston.
- (2) Buffer cylinder. Recuperator cylinder (4) tends to slam weapon into battery. Buffer cylinder (8) functions to govern slamming action and eases weapon into battery. Buffer cylinder (8) operates hydraulically and contains a spring-loaded piston which is free to move rearward during recoil. Buffer cylinder (8) is filled with hydraulic fluid which passes freely through a flutter valve in the piston during rearward movement. During counterrecoil, flutter valve closes and piston rod contacts forward face of breech ring band. Fluid flow is now permitted only through three orifices in flutter valve. Restriction of fluid flow by piston effectively counteracts slamming action of recuperator cylinder (4).



Legend

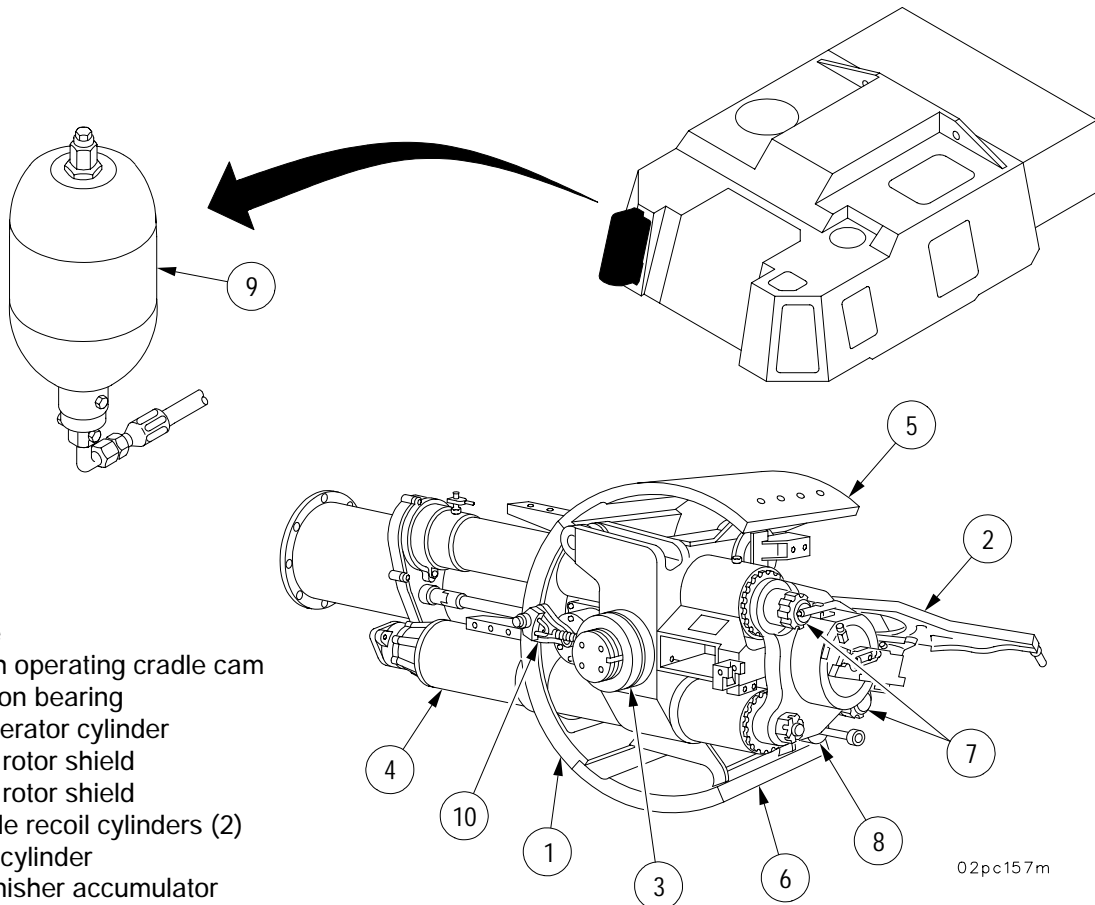
1. Cradle
2. Breech operating cradle cam
3. Trunnion bearing
4. Recuperator cylinder
5. Upper rotor shield
6. Lower rotor shield
7. Variable recoil cylinders (2)
8. Buffer cylinder
9. Replenisher accumulator
10. Actuator and linkage

02pc157m

1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.5 Mount M182A1 - Continued

- (3) Actuator. Orifices in variable recoil cylinders (7) and pistons are aligned to provide a predetermined orifice area. Actuator (10) which is sensitive to elevation or depression of cannon, functions through gearing to alter orifice opening within variable recoil cylinders (7). Shorter recoil results from reduced orifice opening.
- (4) Replenisher accumulator. Replenisher accumulator (9) functions to maintain proper hydraulic fluid level in buffer cylinder (8) and variable recoil cylinders (7). Hydraulic fluid is forced through tubes to buffer cylinder (8) and variable recoil cylinders (7). A gas valve supplies pressurized hydraulic fluid. Replenisher accumulator (9) is located and mounted on exterior of right front cab wall.
- (5) Recuperator cylinder. The recuperator cylinder (4) operates pneumatically and returns weapon from full recoil to battery position. During recoil, a piston (connected to breech ring band) moves within recuperator cylinder (4) against a preload of 700 ± 50 psi (4826 ± 345 kPa) of nitrogen at 70°F (21°C). When recoil force is spent, nitrogen pressure working against piston returns cannon to battery.



Legend

1. Cradle
2. Breech operating cradle cam
3. Trunnion bearing
4. Recuperator cylinder
5. Upper rotor shield
6. Lower rotor shield
7. Variable recoil cylinders (2)
8. Buffer cylinder
9. Replenisher accumulator
10. Actuator and linkage

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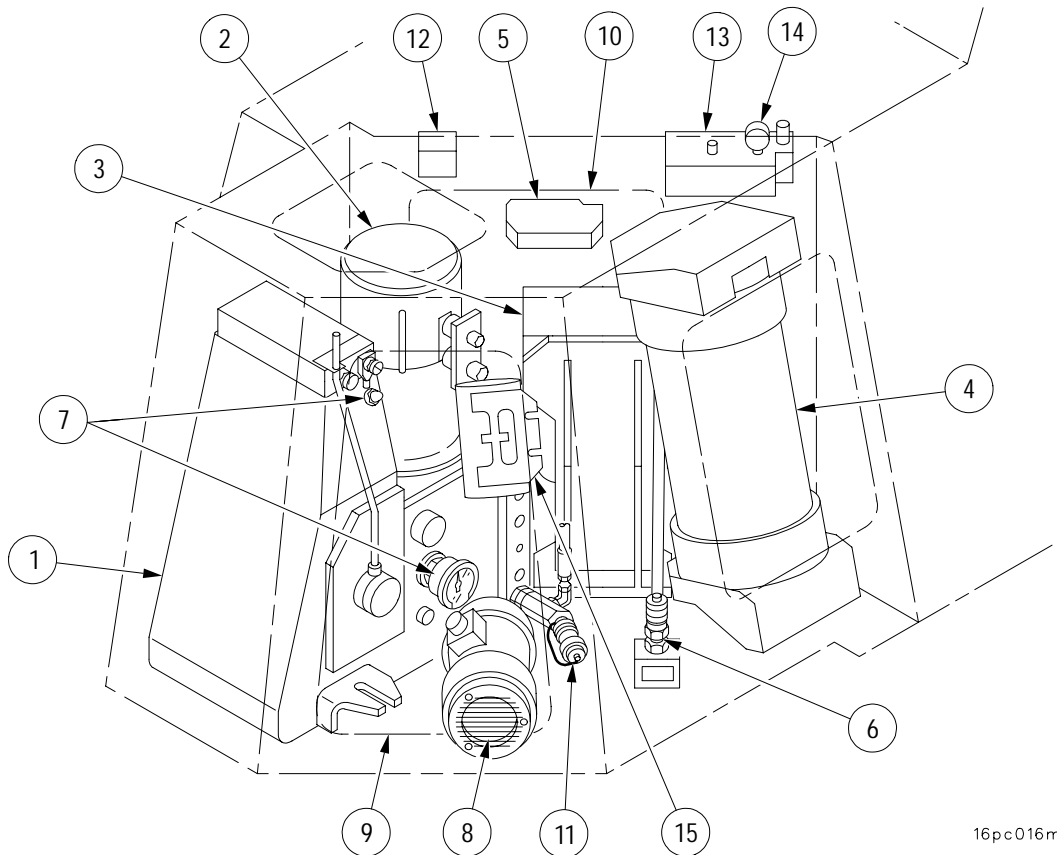
1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.6 Hydraulic System.

Hydraulic system provides a supply of hydraulic fluid at constant pressure for control and actuation of elevating, traversing, and ramming systems. Hydraulic components are contained in a compartment at the left front corner of the cab.

Legend

1. Hydraulic powerpack
2. Hydraulic pump motor
3. Filter manifold assembly
4. Equilibration accumulator
5. Mode selector valve
6. Fill port
7. Sight/temperature gages
8. Cooling fan
9. Exterior door
10. Interior access panel
11. Reservoir drain
12. Return manifold
13. Fuse manifold
14. Pressure gage
15. Pulse accumulator



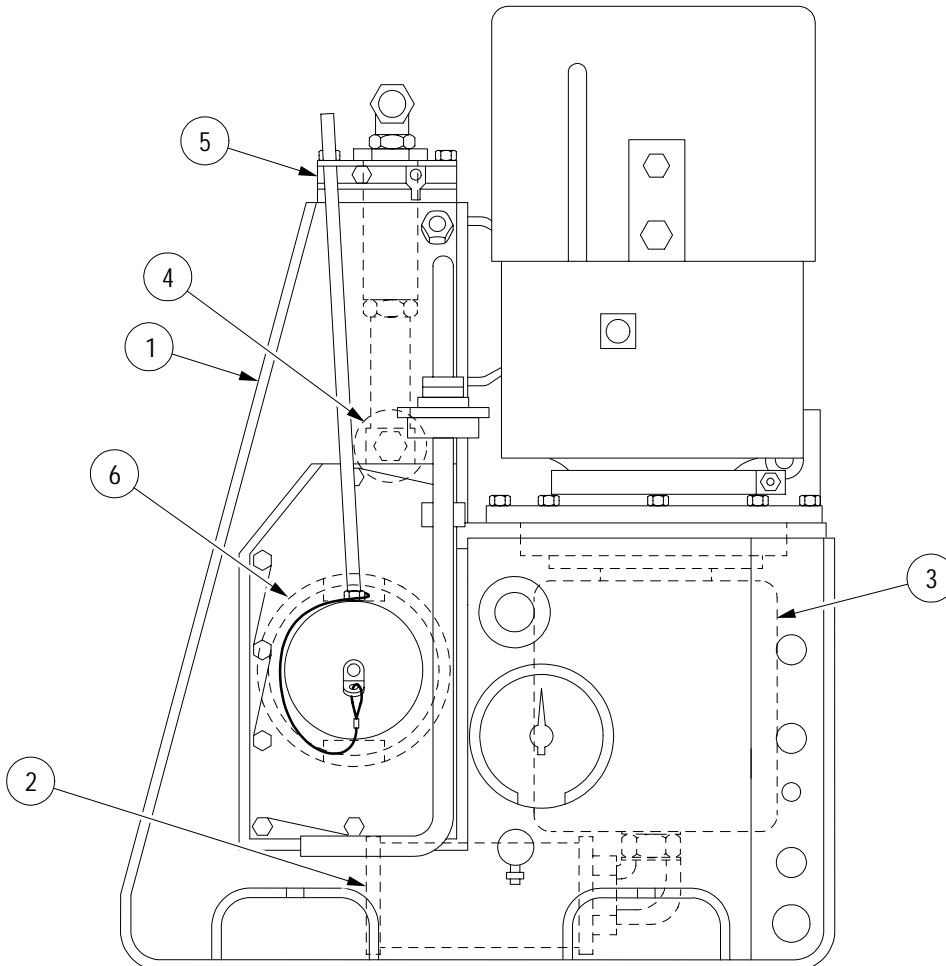
16pc016m

1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.6 Hydraulic System - Continued

a. Hydraulic Powerpack. Powerpack which is mounted in front corner of the hydraulic compartment provides a supply of hydraulic fluid at a constant pressure for control and actuation of elevating, traversing, and ramming systems. Powerpack consists of the following:

- (1) Reservoir. The reservoir (1) has an approximate fluid capacity of 13 gallons. Mounted in the reservoir is a 149 micron mesh screen (2) that filters the hydraulic fluid before it is drawn into the hydraulic pump (3). Hydraulic fluid returning to the reservoir passes through a flow diffuser (4) mounted in the reservoir. The flow diffuser causes the warm returning hydraulic fluid to mix with cooler fluid and directs flow away from intake screen (2). Access to the diffuser (4) is through a side access plate (5).
- (2) Metal Bellows. Mounted inside the reservoir (1) is a metal bellows (6). A metal bellows is able to accommodate for the thermal expansion of hydraulic fluid over the entire operating range of -50° to $+225^{\circ}$ F low and high temperature range. As hydraulic fluid is drawn from the reservoir, the bellows expands by drawing in air. As fluid returns, air is forced from the bellows.



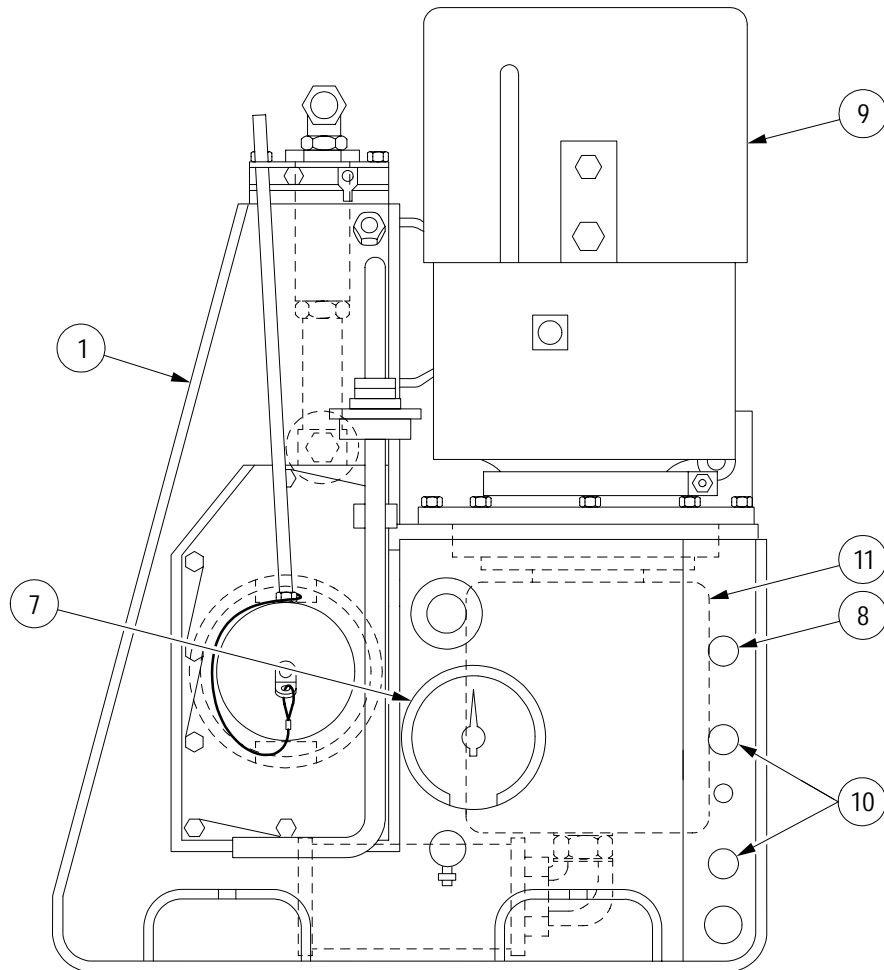
16pc017m

1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.6 Hydraulic System - Continued

a. Hydraulic Powerpack - Continued

- (3) Temperature Gage. The temperature gage (7) shows the temperature of the hydraulic fluid in the reservoir.
- (4) Fluid Level Sensor. The fluid level sensor (8) mounts horizontally in the reservoir (1). When the fluid level is lower than the sensor, the sensor will cut electric power to the powerpack motor (9).
- (5) Temperature Switches. Two temperature switches (10) are mounted in the reservoir. One of the switches activates a solenoid that allows fluid to circulate when the temperature is below -25°F (-32°C). The second switch activates a cooling fan when fluid temperature reaches 160°F (72°C).
- (6) Hydraulic Pump. The hydraulic pump (11) is mounted directly in the reservoir (1) and totally submerged in hydraulic fluid.

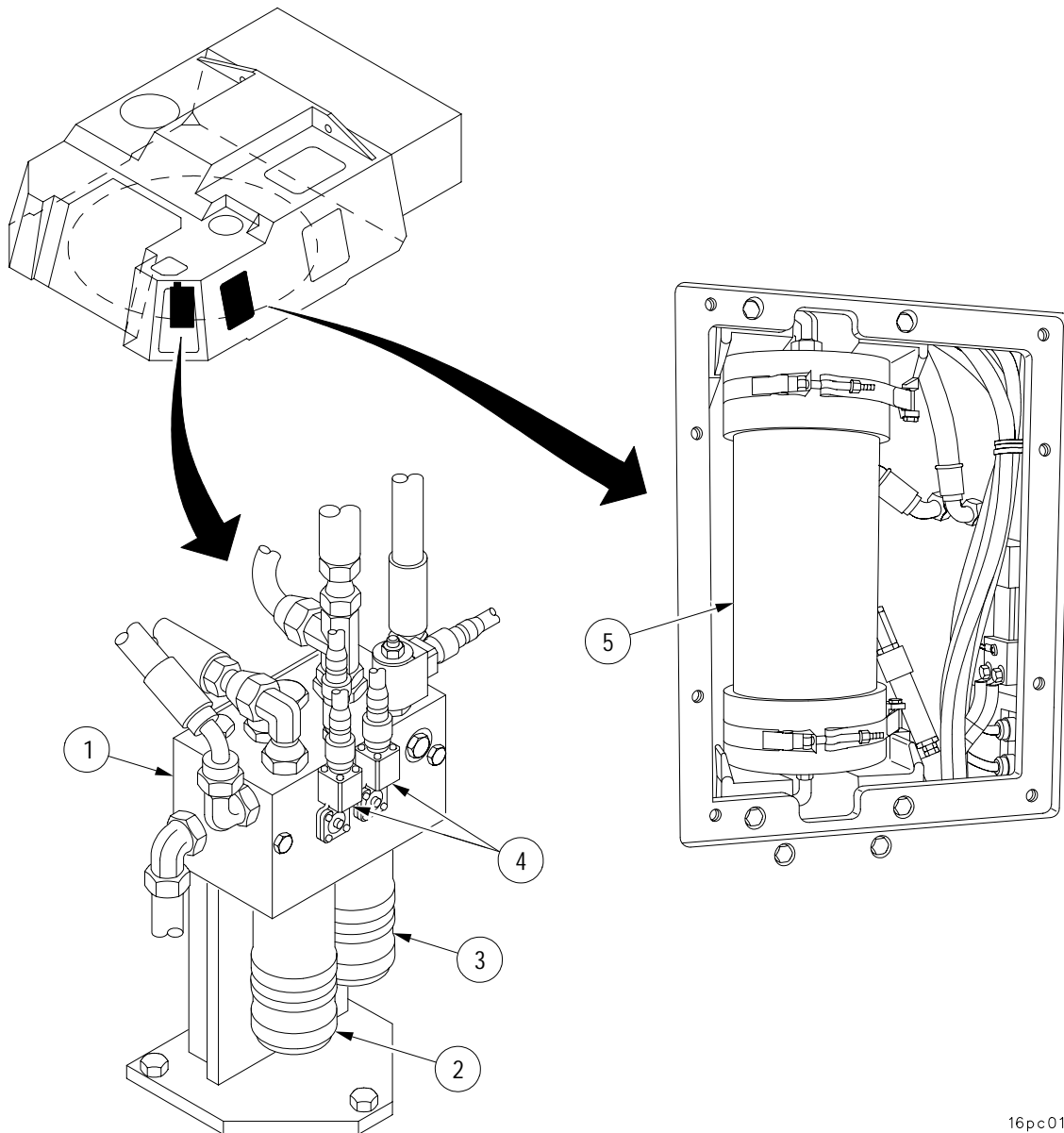


16pc017ma

1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.6 Hydraulic System - Continued

- b. Filter Manifold Assembly. The filter manifold assembly (1) is located in the hydraulic compartment. Mounted on the manifold are pressure (2) and return (3) hydraulic filters. The manifold is equipped with an automatic shutoff device to prevent drainage when filter elements are removed and to prevent air from entering the system. Visual indicators (4) will activate when filters become 70-75% clogged. The manifold contains a relief valve that routes fluid back to reservoir when system pressure exceeds 1800 psi.
- c. Equilibration Accumulator. The equilibration accumulator (5) is mounted inside the hydraulic compartment. It contains 1 qt of fluid and is charged with dry nitrogen. It is used to dampen the pressure shock developed by the hydraulic pump.



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1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

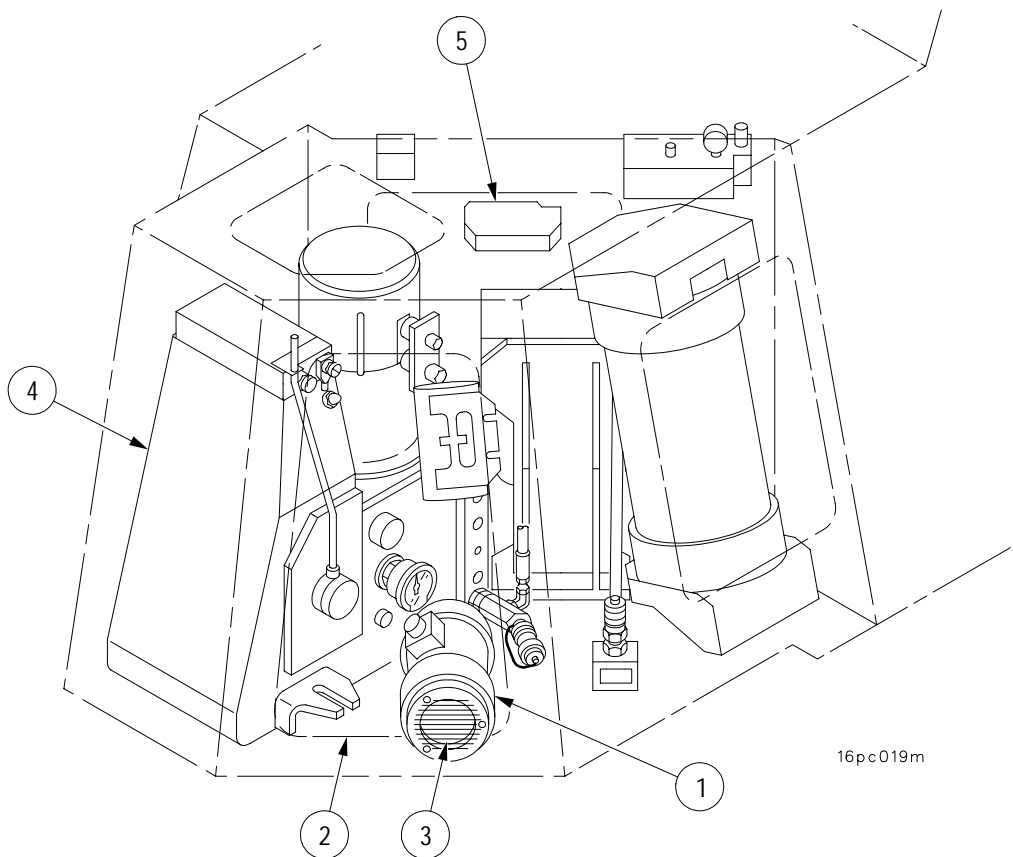
1-9.6 Hydraulic System - Continued

- d. Cooling Fan. A vaneaxial cooling fan (1) is mounted in the hydraulic compartment. The cooling fan draws air through a grille on the hydraulic compartment access door (2), through a duct (3), circulates it around the hydraulic powerpack (4), and expels it through an outlet cover mounted into the cab structure. The cooling fan has two operational modes:

AUTO. When hydraulic cooling switch is in AUTO position, cooling fan will come on when temperature exceeds 160°F (72°C). Cooling fan will turn off when temperature drops below 160°F (72°C).

ON. When hydraulic cooling switch is in the ON position, the cooling fan will run continuously.

- e. Mode Selector Valve. The mode selector valve (5) is located in the ceiling of the hydraulic compartment. When the gun drive servo switch is in the ON position, mode selector valve allows hydraulic fluid to flow to the traversing and elevating gun drive servos and stops flow to the Chief of Section and gunner's control handles. When the gun drive servo switch is in the OFF position, the mode selector valve routes flow to the Chief of Section and gunner's control handles.



1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.6 Hydraulic System - Continued

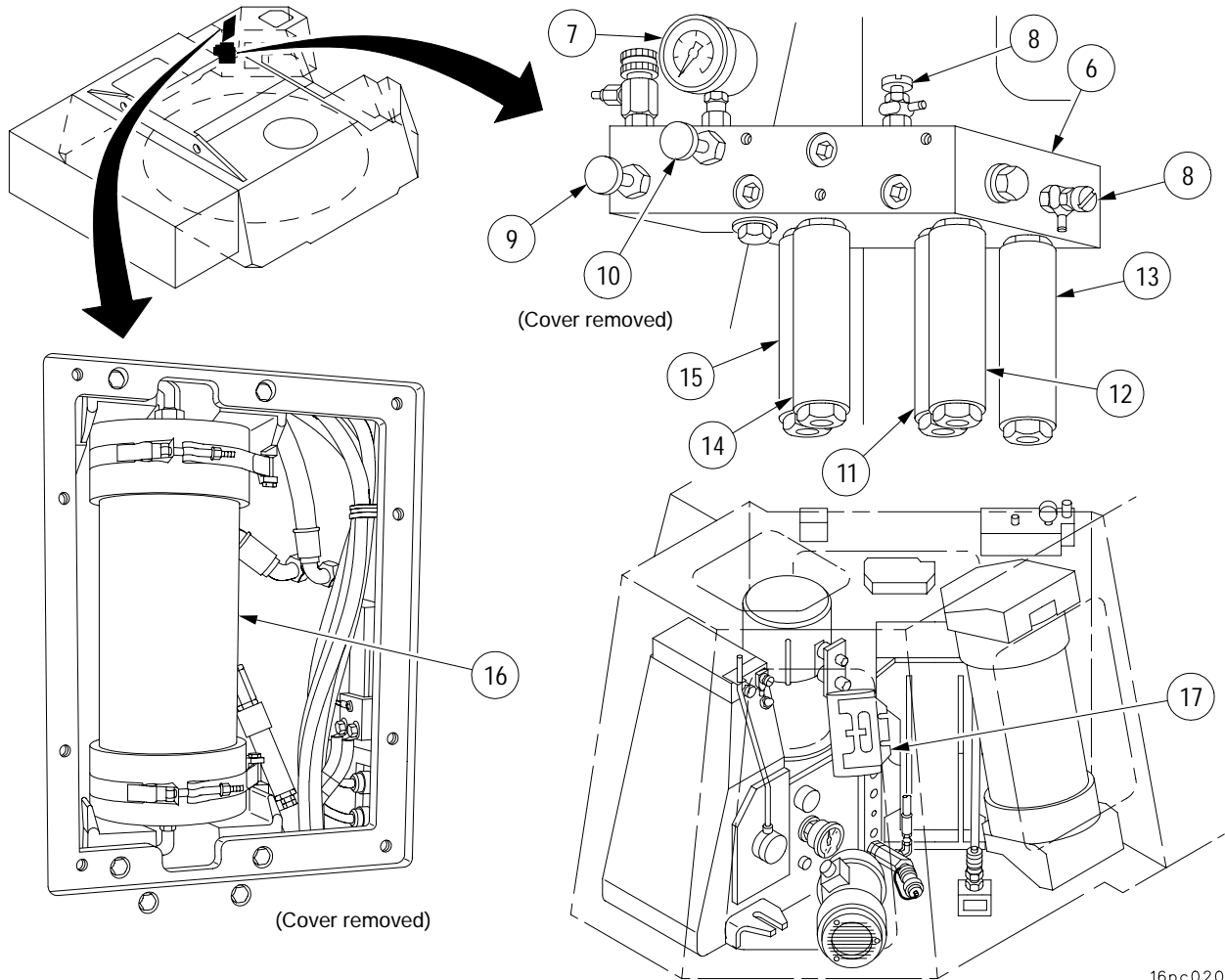
f. Velocity fuses are used to safeguard the hydraulic system. If hydraulic flow exceeds the preset rate, the velocity fuse snaps shut, stopping the flow. The fuse will remain closed until pressure to the fuse ceases. When pressure is reduced to zero psi, the fuse returns to open position.

- (1) The fuse/pressure manifold assembly (6) contains a hydraulic pressure gage (7), bleeder valves (8), equilibrator charge valve (9), pressure check valve (10), and six velocity fuses to protect the following hydraulic systems:

- Chief of Section Control Handle (11)
- Gunner's Control Handle (12)
- Elevation Servo (13)
- Rammer Assist (14)
- Traversing Clutch (15)
- Elevation Equilibration Accumulator (16)

- (2) The hydraulic system pressure gage (7) is mounted on the fuse manifold assembly (6). The gage reads from 0-2000 psi.

g. Pulse accumulator (17). The pulse accumulator (17) is located in the hydraulic compartment. The pulse accumulator (17) assists in the functioning of velocity fuses should a hydraulic line rupture.



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1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

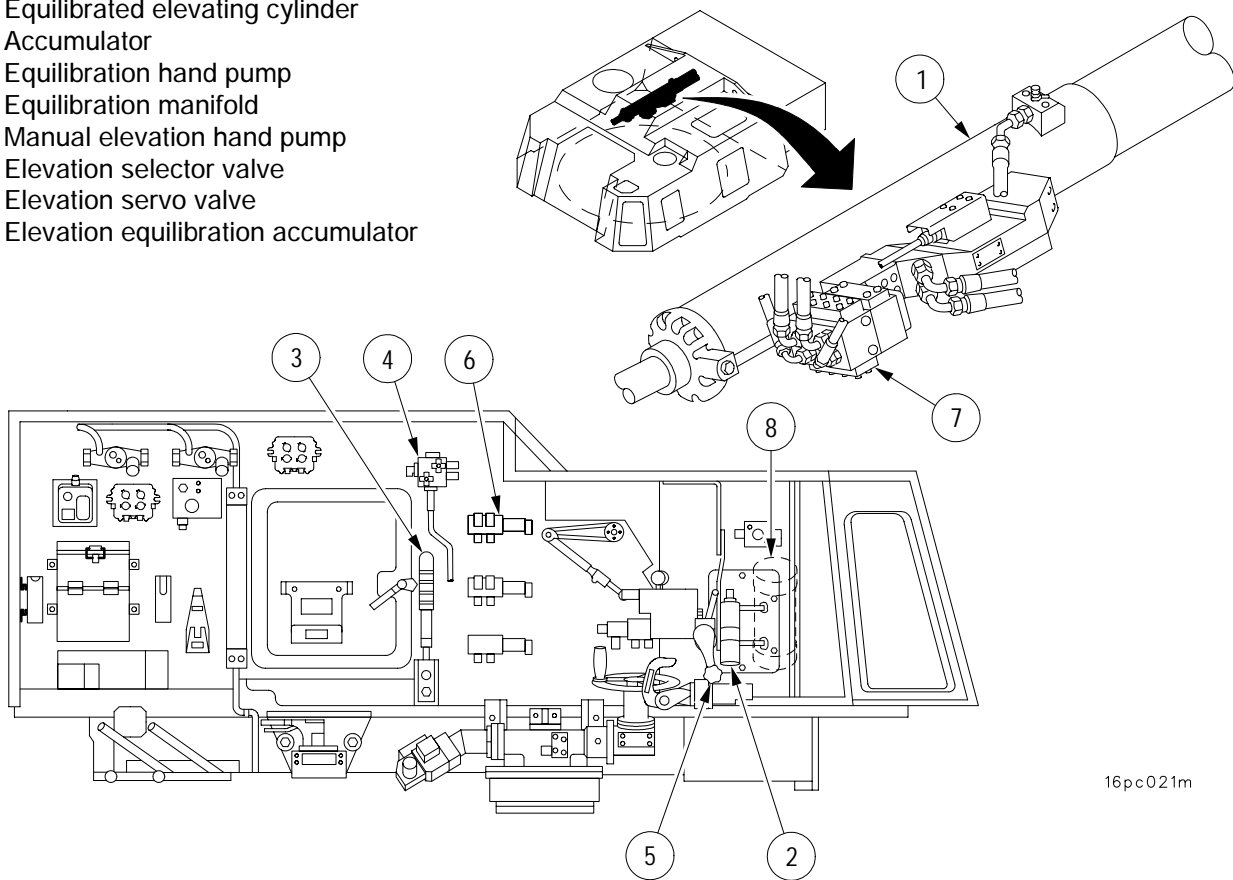
1-9.7 Elevation System.

Elevation system is used to elevate, depress, and balance cannon. System may be controlled from either gunner's control, Chief of Section control, or the Automatic Fire Control System.

- a. Equilibrated elevating cylinder (1). Rear end of equilibrated elevating cylinder (1) is attached to bracket on ceiling of cab by a pin and bearing. At forward end, piston rod is similarly attached to arm of cradle. Horizontal travel of piston causes rotation of cradle and cannon around trunnion axis.
- b. Accumulators (elevation equilibration and manual elevation hand pump). Primary accumulator (8) and manual elevation hand pump accumulator (2) are cylinders containing hydraulic fluid and compressed nitrogen separated by a floating piston. Hydraulic fluid is forced from elevation equilibration accumulator (8) and manual elevation hand pump (2) accumulators to equilibrated elevating cylinder by action of compressed nitrogen acting against floating piston.
- c. Equilibration hand pump. A hand pump (3) permits equilibration adjustment by increasing hydraulic fluid pressure. This permits equilibration system to be adjusted to compensate for variations in ground slope and temperature.

Legend

1. Equilibrated elevating cylinder
2. Accumulator
3. Equilibration hand pump
4. Equilibration manifold
5. Manual elevation hand pump
6. Elevation selector valve
7. Elevation servo valve
8. Elevation equilibration accumulator



16pc021m

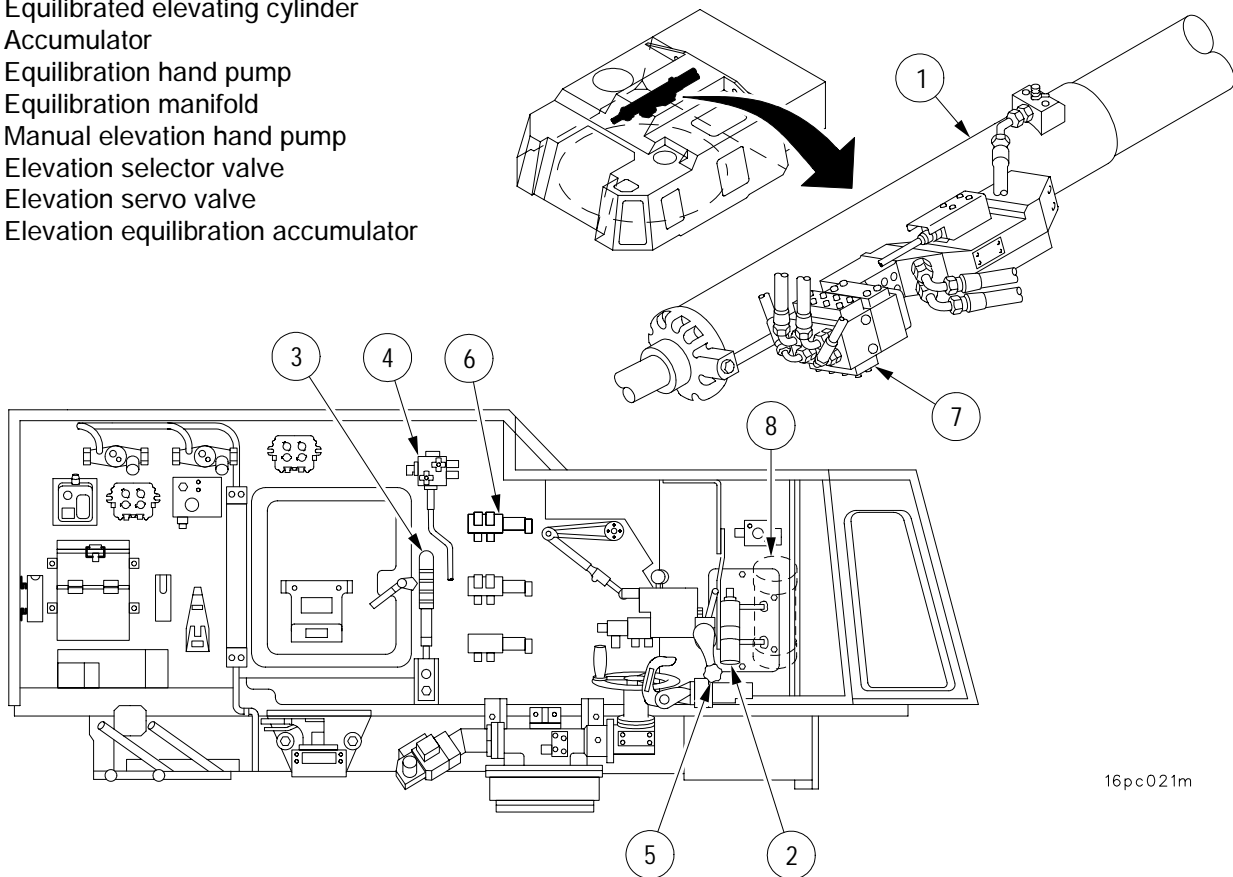
1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.7 Elevation System - Continued

- d. Equilibration manifold. Equilibration manifold (4) controls flow of hydraulic fluid to equilibrated elevating cylinder (1).
- e. Manual elevation hand pump. Manual elevation hand pump (5) is used to manually elevate or depress cannon. It is a piston type pump containing eight sliding pistons. Cannon may be elevated or depressed without energizing power control system.
- f. Elevation selector valve assembly. Elevation selector valve (6) is located at right front of cab, forward of manual elevation accumulator. It is actuated by elevation control gunner's switch to determine which control (gunner's or Chief of Section) regulates hydraulic fluid flow into elevation cylinder.
- g. Elevation servo valve. The elevation servo (7) is mounted on the equilibrated elevating cylinder (1). Electrical impulse from the Automatic Fire Control System shifts the spool valve inside the servo, allowing hydraulic fluid to enter cylinder. Cylinder will extend or retract, depending on the electrical input.

Legend

- 1. Equilibrated elevating cylinder
- 2. Accumulator
- 3. Equilibration hand pump
- 4. Equilibration manifold
- 5. Manual elevation hand pump
- 6. Elevation selector valve
- 7. Elevation servo valve
- 8. Elevation equilibration accumulator

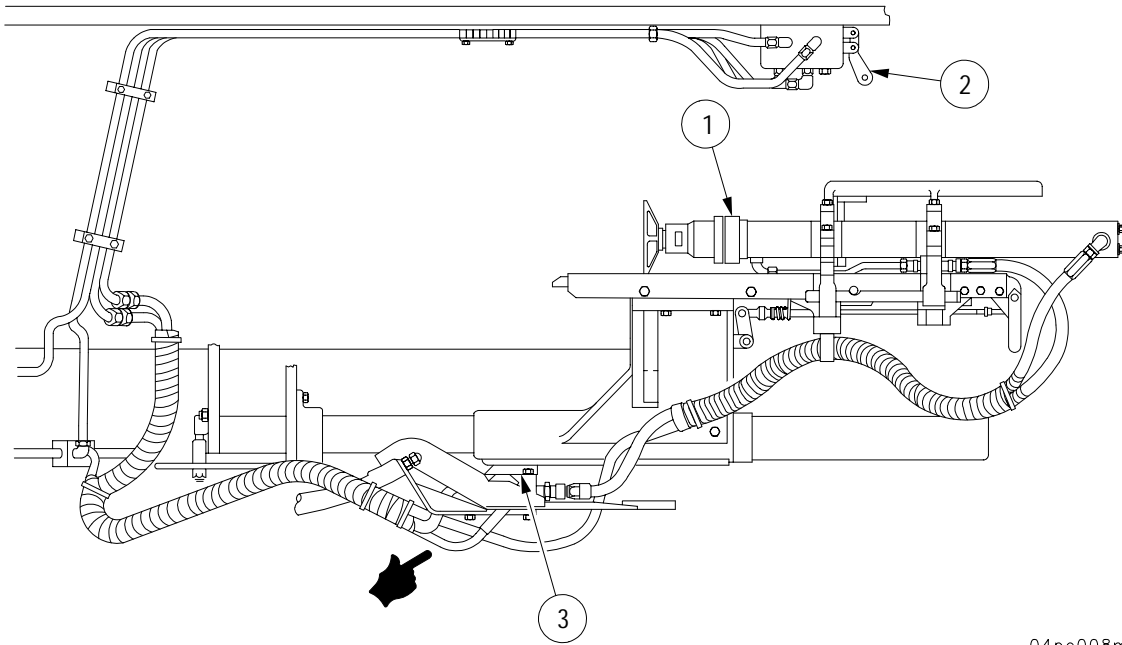


16pc021m

1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.8 Loader Rammer System.

Projectile loader rammer (1) is a hydraulically-operated device controlled by a hand-operated rammer actuating valve (2) on the cab roof. No electrical circuits are used in system. A blocking valve (3) prevents rammer from being operated unless it is correctly aligned with the firing chamber of the cannon.

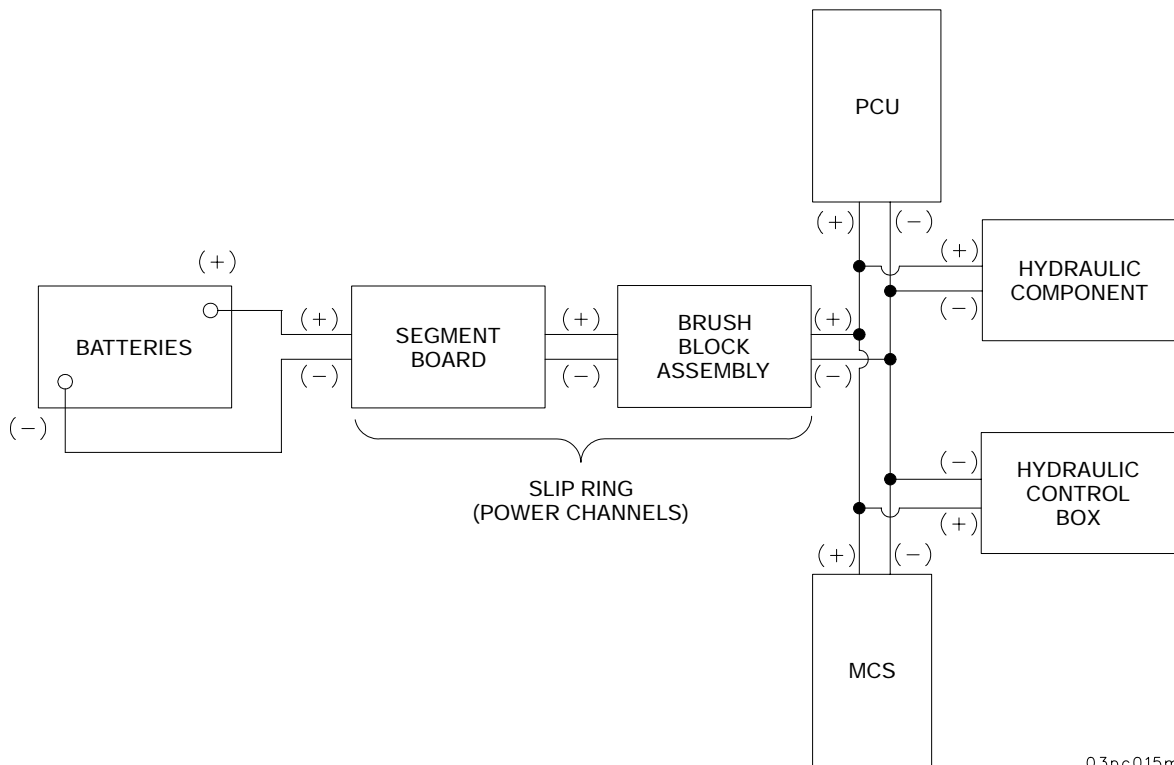
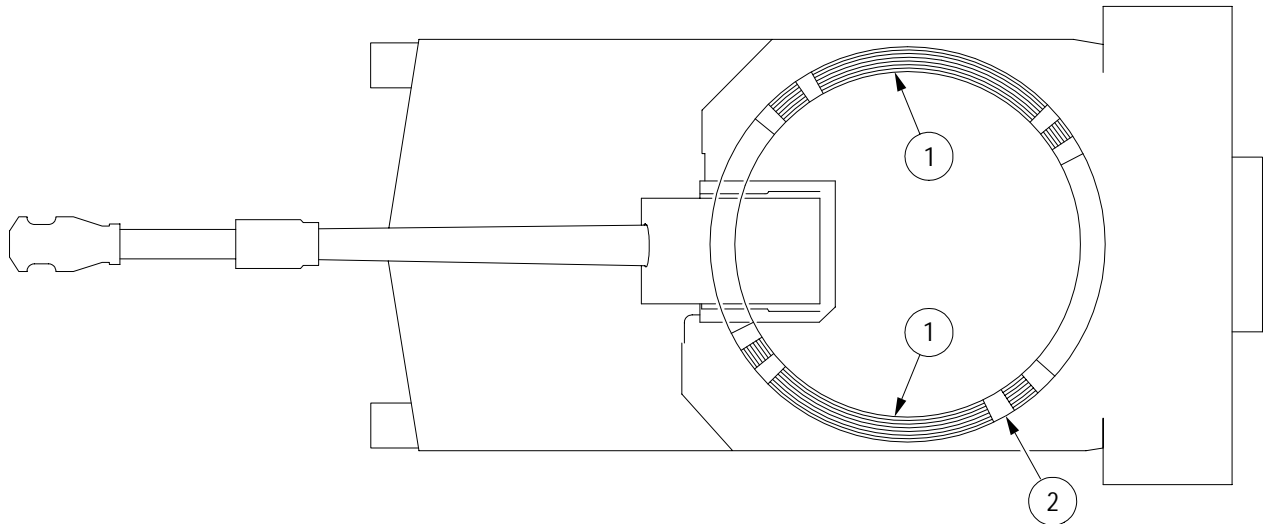


04pc008m

1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.9 Electrical Contact Segment Ring.

The cab uses a 28 V dc electrical system with power furnished from the hull. Electrical contact is made with bus bars fastened to two 1/4 segments (1) of the hull race ring. Power reaches the cab through whichever four of the eight cab electrical contact arm assemblies (2) happen to be in contact with the bus bars on the hull. Seven lines are available for communication and navigation signals (three are used for communication, two for navigation, and two are spares). The cab power is distributed through four principal circuits.



03pc015m

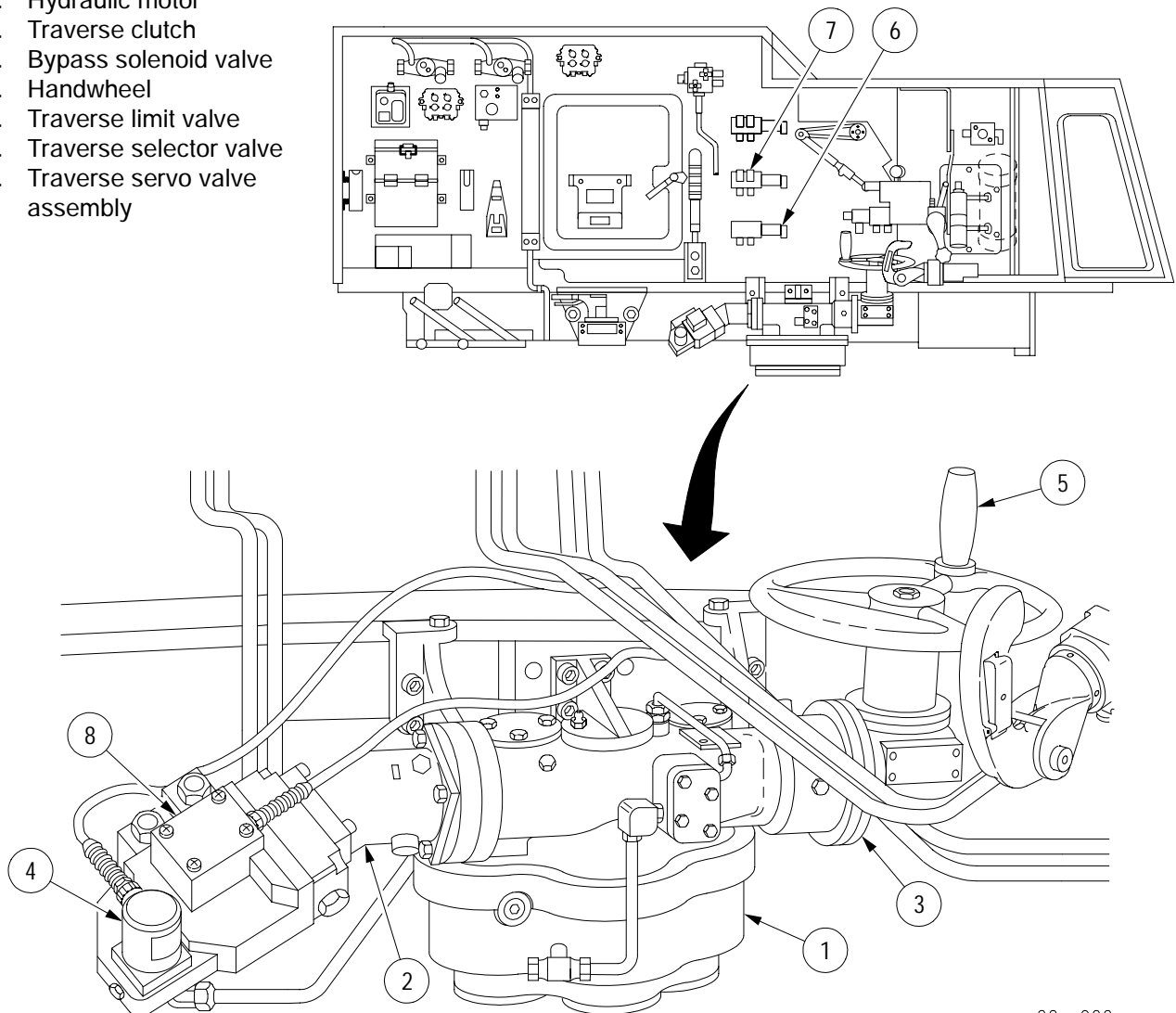
1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.10 Cab Traversing System.

Traversing mechanism (1) is driven by a fixed-displacement hydraulic motor (2) through a hydraulically-operated clutch (3). Bypass solenoid valve (4), when activated by the Gunner, allows only manual operation of traversing mechanism (1). A handwheel (5) is used to operate the traversing mechanism (1) manually. Two limit switches mounted on the cab ring activate the traverse limit valve (6), stopping hydraulic flow to traverse motor (2) if cab is traversed more than 40° from center. Traverse selector valve (7) regulates which control (Chief of Section or Gunner's) is used to operate traverse system. Traverse system can also be controlled by the Automatic Fire Control System which operates the traverse servo valve assembly (8).

Legend

1. Traversing mechanism
2. Hydraulic motor
3. Traverse clutch
4. Bypass solenoid valve
5. Handwheel
6. Traverse limit valve
7. Traverse selector valve
8. Traverse servo valve assembly



20pc002m

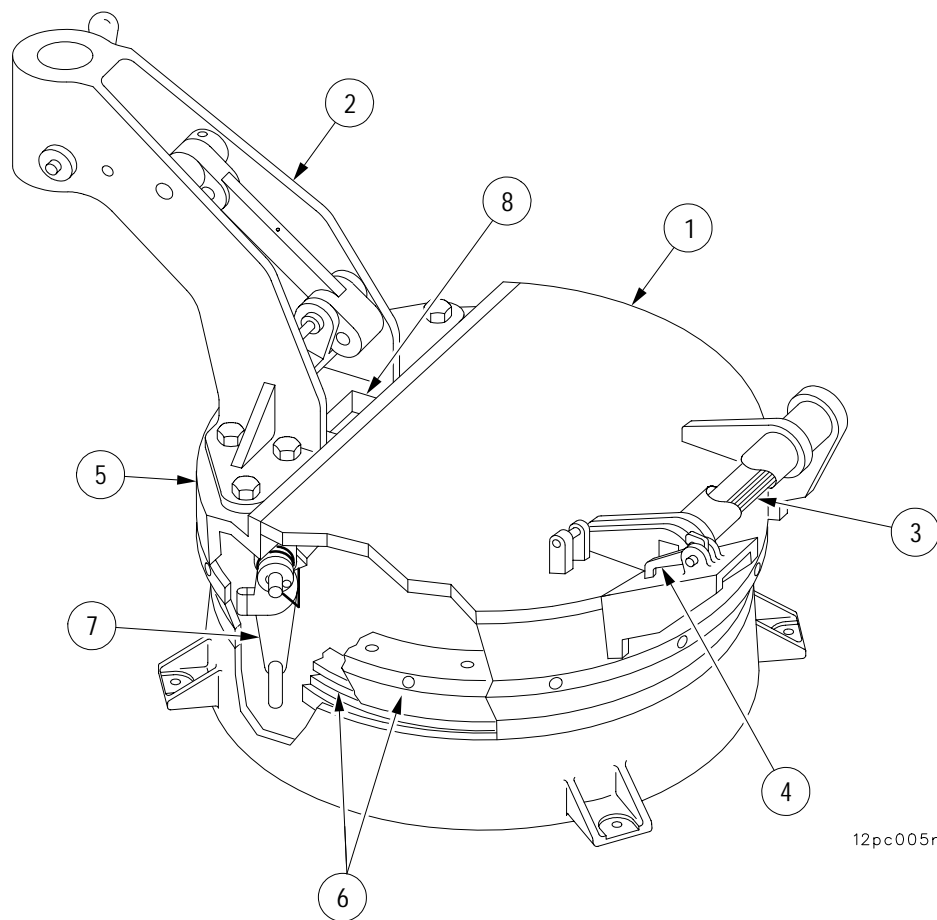
1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.11 Commander's Cupola.

The commander's cupola hatch cover (1) is hinged on side opposite the machine gun support assembly (2) and counterbalanced with a torsion bar (3) for ease of opening. A spring-loaded latch (4) holds hatch cover (1) in full open position, a positive lock in closed position. Cupola body assembly (5) is supported by a mechanism of race rings (6) and ball bearings to permit easy 360° manual traverse. A spring-loaded latch (7) can lock commander's cupola in traverse at intervals of 30° around the circle. A periscope slot (8) at front of commander's cupola permits mounting of a periscope for observation by commander.

Legend

1. Hatch cover
2. Machine gun support assembly
3. Torsion bar
4. Spring-loaded latch
5. Cupola body assembly
6. Race rings
7. Spring-loaded latch (rotation)
8. Periscope slot



12pc005m

1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

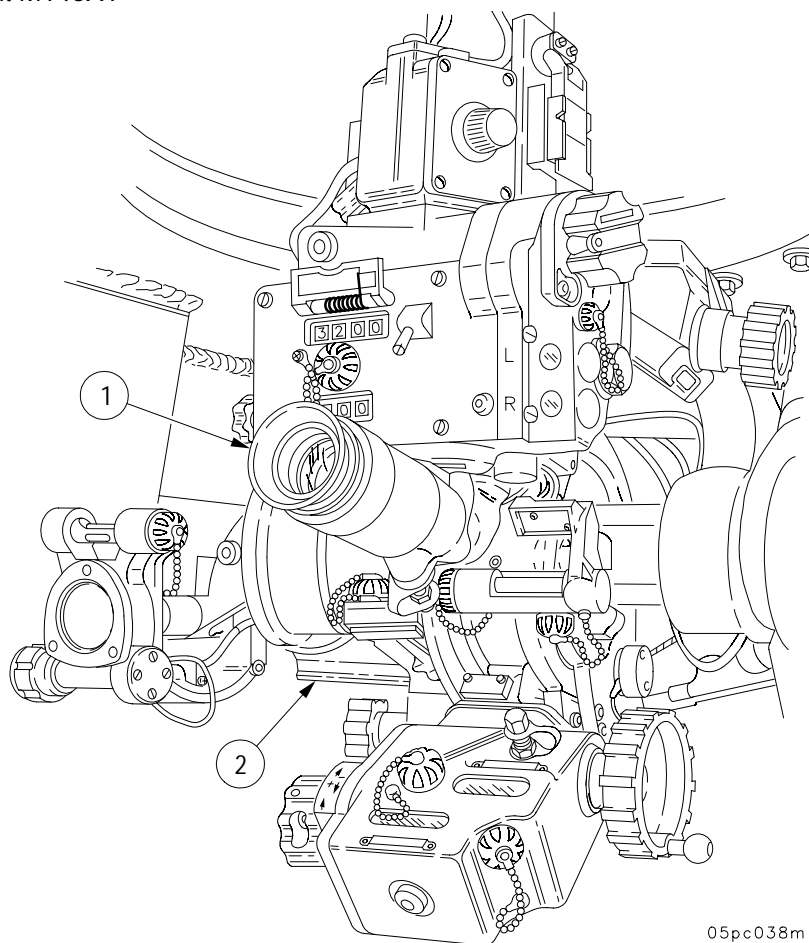
1-9.12 Overall Sighting and Fire Control System.

Howitzer is provided with a sighting and fire control system capable of delivering direct or indirect fire. Location and description of the specific equipment is as follows:

- a. Panoramic telescope M117A2 and telescope mount M145A1. These are mounted at the Gunner's position and are used for indirect fire. The telescope mount M145A1 (2) provides adjustable base with azimuth and elevation controls. It holds the panoramic telescope M117A2 (1) sight in position. Head of scope sights through the panoramic telescope cover on top of cab. For information on panoramic telescope M117A2 and telescope mount M145A1, refer to TM 9-1240-401-34&P.

Legend

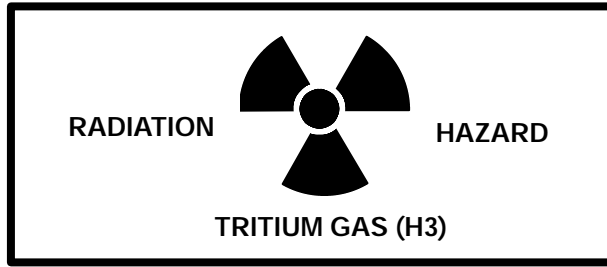
1. Panoramic telescope M117A2
2. Telescope mount M145A1



05pc038m

1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.12 Overall Sighting And Fire Control System - Continued

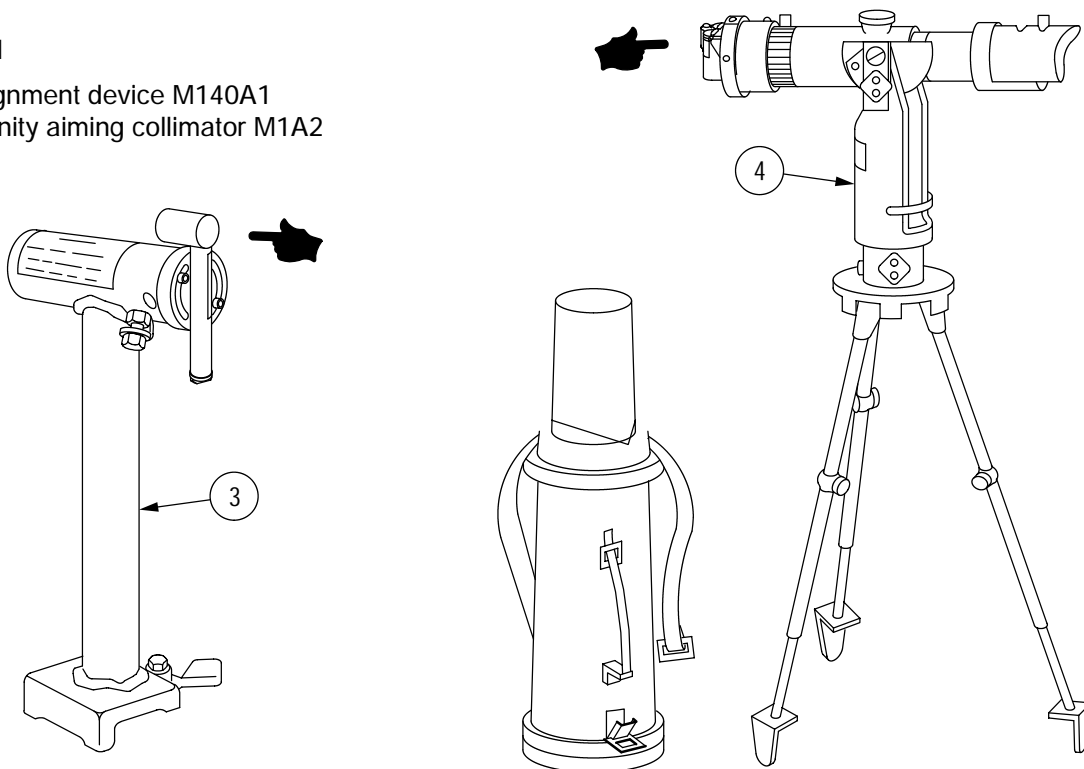


RADIOACTIVE MATERIALS

- b. Alignment device M140/M140A1. When mounted on cab exterior bracket, panoramic telescope M117A2 sights through alignment device M140A1 (3) to check crosshair alignment. The alignment device M140 (3) is radioactively illuminated. Check for presence of illumination in a low-light environment. If illumination is not present, notify Radiation Safety Officer. Do not attempt to repair. For information on DS/GS repairs of the alignment device M140/M140A1 (3), refer to TM 9-4931-710-14&P.
- c. Infinity aiming M1A1/M1A2 collimator. When in use, the M1A1/M1A2 collimator (4) is mounted on a tripod a short distance from vehicle. The illuminated reticle provides a fixed reference point to correct sighting after a round has been fired. The infinity aiming M1A1 collimator (4) is radioactively illuminated. Check for presence of illumination in a low-light environment. If illumination is not present, notify Radiation Safety Officer. Do not attempt to repair. For further information on infinity aiming M1A1/M1A2 collimator (4), refer to TM 9-1240-324-34&P.

Legend

- 3. Alignment device M140A1
- 4. Infinity aiming collimator M1A2



05pc037m

1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

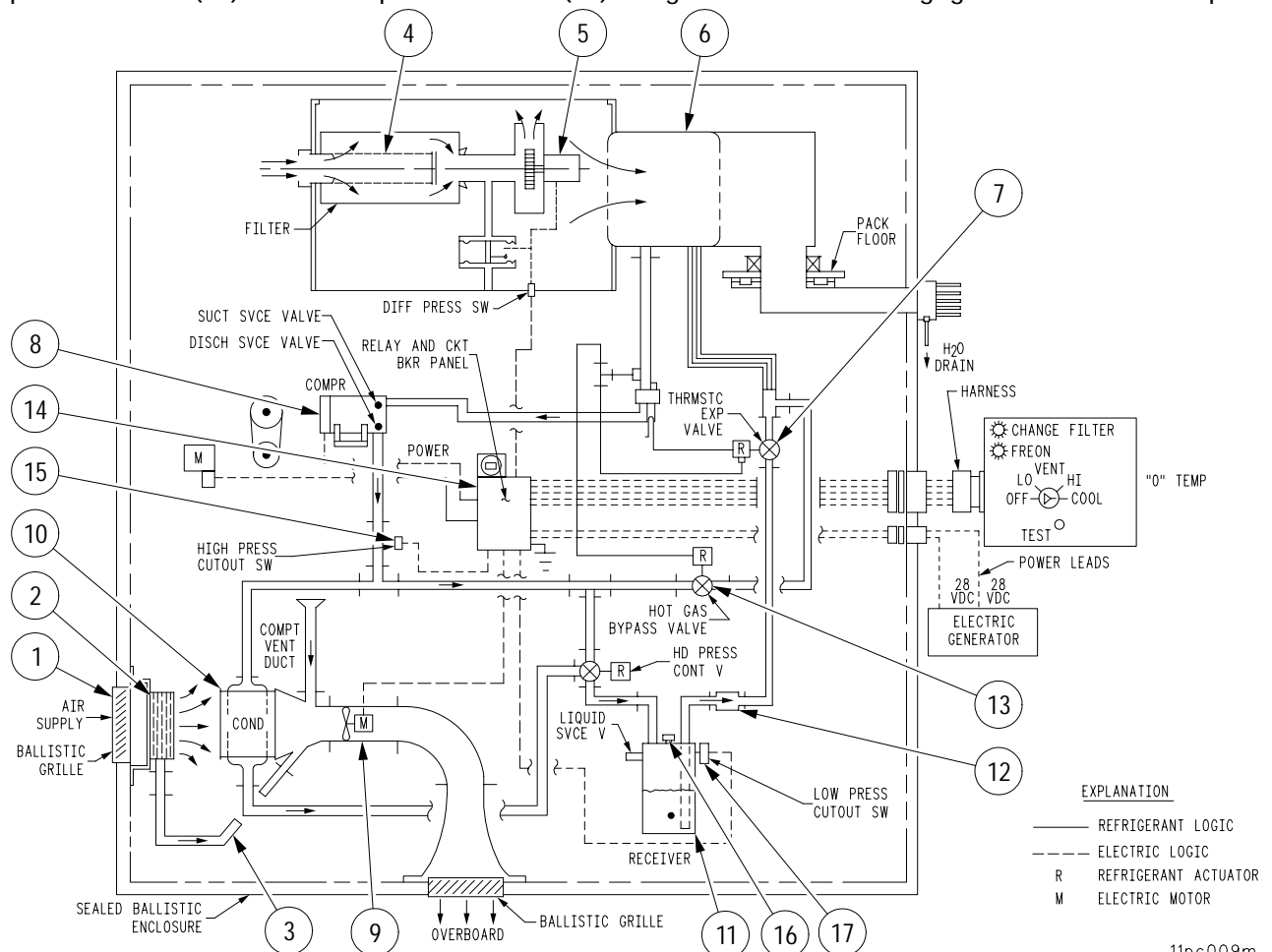
1-9.13 Microclimate Conditioning System (MCS).

Air is drawn in through the ballistic grille (1) and enters the Air Particle Separator (APS) (2). In the APS the larger dust particles are separated and then expelled through the APS scavenge duct (3). The partially cleansed air is then pulled through the M48 filter (4) for final cleaning. The air then enters the crew blower (5) and is pushed through the evaporator (6) to the M3 heaters in the crew compartment.

Liquid refrigerant (Freon R134A) is boiled in the evaporator (6) as heat is removed from the air passing through. The thermostatic expansion valve (7) measures the temperature of the gas leaving the evaporator and restricts flow to assure that all Freon is boiled. The Freon gas enters the compressor (8) and is elevated in temperature and pressure. The vaneaxial fan (9) cools the Freon in the condenser (10) causing it to condense and collect in the receiver (11). The liquid Freon passes through a filter (12) to assure cleanliness. A hot gas bypass valve (13) senses evaporator pressure and bypasses Freon around the condenser (10) to keep temperature from falling below 35°F (1.6°C).

The MCS contains a relay panel (14). The relays are activated by the MCS control panel to switch power to the various motors. In addition to relays, the relay panel (14) contains self-resetting circuit breakers that respond to temperature sensors in each motor.

The Freon system is protected by an overpressure cutout switch (15) that responds to excessive pressure in the compressor discharge line by declutching the compressor (8) and a pressure relief valve (16) that vents overpressurized Freon. An underpressure switch (17) protects that equipment in case of a Freon leak. Either the overpressure switch (15) or the underpressure switch (17) will light the FREON warning light on the MCS control panel.



11pc009m

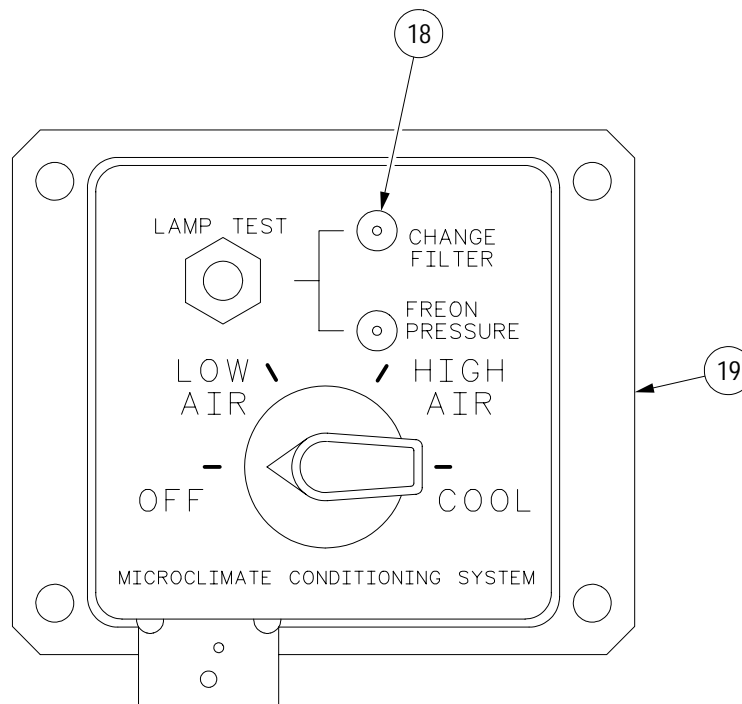
1-9 EQUIPMENT LOCATION AND DESCRIPTION - CONTINUED

1-9.13 Microclimate Conditioning System (MCS) - Continued

The MCS is a Freon R134A vapor compression, closed-loop refrigeration cycle system that provides conditioned, cleaned, and filtered air for the vehicle crew. The MCS is mounted inside a ballistic compartment. There are three operating modes:

- AIR LOW. About 15 cubic feet per minute of filtered air is supplied.
- AIR HIGH. About 90 cubic feet per minute of filtered air is supplied.
- COOL. A flow of 90 cubic feet per minute of filtered air, cooled to 55°F (12°C), is supplied on a 95°F (35°C) day with 74% humidity.

An M48 filter pressure drop is sensed by a pressure differential switch. When filter pressure drop increases to about 12 in. of water, the CHANGE FILTER light (18) on the MCS control panel (19) goes on.



11pc010m

1-10 EQUIPMENT DATA.

Tabulated data concerning the cannon M284, mount M182A1, equilibration system, loader rammer and equilibrated elevating cylinder can be found below. This is supplemental to data contained in TM 9-2350-314-20-2-1.

a. Cannon M284.

Bore diameter	155MM
Center of gravity of tube (forward from rear face of tube)	93.87 in. (238 cm)
Center of gravity of cannon (complete from rear face of breech ring)	98.12 in. (249 cm)
Chamber volume	1150 in. ³ (19,166 cc)
Length:	
Tube	240.5 in. (605 cm)
Cannon	271.38 in. (689 cm)
Shot travel	200 in. (508 cm)
Weight:	
Tube	3166 lb (1437 kg)
Muzzle brake	350 lb (158 kg)
Evacuator chamber (approx)	75 lb (34 kg)
Cannon (complete)	4400 lb (1898 kg)
Rifling:	
Length	199.15 in. (506 cm)
Depth of groove	0.05 in. (0.127 cm)
Width of lands	0.15 in. (0.381 cm)
Number of grooves	48
Twist	Uniform right hand: one turn in 20 calibers
Type of breech mechanism	Semiautomatic screw block
Type of firing mechanism	Continuous pull percussion
Effective range	(18,000 m)
Tube wear life	2500-3000 EFC rounds
Ammunition	Separate loading - See TM 9-2350-314-10 for authorized ammunition

b. Mount M182A1.

Weight of cradle assembly	1200 lb (544.32 kg)
Length of mount (minus howitzer dust shield) (approx.)	48-3/4 in. (124 cm)
Overall height of mount (with rotors) (approx.)	37 in. (94 cm)
Overall width of mount (approx.)	43 in. (109 cm)
Elevation (max)	+1333 mils
Depression (max)	-53 mils
Variable recoil assembly:	
Length of recoil (from -53 mils to +906 mils elevation)	36 in. (91 cm)
Length of recoil (+1333 mils elevation)	27 in. (69 cm)
Preload on recuperator (nitrogen pressure)	700 ± 50 psi (4827 ± 345 kPa)

1-10 EQUIPMENT DATA - CONTINUED

Preload on replenisher accumulator:

- Nitrogen pressure 7-8 psi (48-55 kPa)
- Hydraulic fluid MIL-H-6083
(item 42, Appx B) pressure 17-24 psi (117-165 kPa)

c. Equilibration system.

Preload in accumulators

Nitrogen pressure:

- Primary 1100-1200 psi (7584-8274 kPa)

d. Loader rammer and equilibrated elevating cylinder.

- Hydraulic pressure source Cab power hydraulic system
- Regulated system hydraulic pressure available 1750-2000 psi (12,066-13,790 kPa)

e. Cab traversing mechanism.

- Traverse of cab 360 degrees (6400 mils)

Hydraulic motor:

- Estimated displacement
per revolution 1.52 in.³ (11.26 cc)
- Maximum speed 3500 rpm
- Maximum operating speed 2680 rpm

f. Manual elevating accumulator.

- Capacity, hydraulic oil 10 in.³ (167 cc)

g. Main accumulator.

Type: Piston

h. Powerpack (complete).

- Reservoir capacity, hydraulic oil Approx 13 gallons

Electric drive motor:

- Rated speed (full load) 3800 rpm
- Rated power output (27 vdc) 12.5 hp
- Power unit (max.) 460 amps at 27 vdc
- Rotation (as viewed from drive end) clockwise
- Weight 95 lbs
- Motor life 1000 hrs
- Brush life 500 hrs

Performance

Flow (gpm)	Pressure (psi)	Speed (rpm)
18.5 (max)	800	5000
10.0	1600 (max)	5000

- Efficiency (Overall) 53%

- Velocity Fuses 6

- Rated flow 22 gpm

- Fusing flow 28.6 ±10% gpm

1-11 DIFFERENCES BETWEEN MODELS

There are no differences between models of the M109A6 Howitzer.

CHAPTER 2

GENERAL CAB MAINTENANCE

GENERAL

This chapter contains information on repair parts, tools, inspection procedures, general maintenance practices, and troubleshooting. All information in this chapter is presented for implementation by direct and general support maintenance shops.

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

2-1 SCOPE.

This chapter contains general maintenance, inspection, and repair data for cab, armament, elevating and traversing systems, and associated components used on 155MM self-propelled howitzers. Expendable and durable supplies normally required in performing maintenance and repair operations are listed in Appendix B.

Section I provides guidelines on the use of tools and repair parts. Tools, equipment, and repair parts are issued to supporting maintenance units for maintaining and repairing the materiel. Tools and equipment should not be used for purposes other than those prescribed and, when not in use, should be properly stowed in chest and/or roll provided.

2-2 COMMON TOOLS AND EQUIPMENT.

Standard and commonly used tools and equipment having general application to this materiel are authorized for issue by Tables of Allowances (TA) and Tables of Organization and Equipment (TOE) listed in SC 4933-95-A12, SC 4933-95-A10, SC 4933-95-E19, and SC 5180-95-A12.

2-3 SPECIAL TOOLS AND SUPPORT EQUIPMENT.

Tools and equipment specially designed for supporting maintenance are tabulated in Appendix F. The list in Appendix F is not to be used for requisitioning replacements. Special tools and equipment are listed in TM 9-2350-314-24P-2, which is the authority for requisitioning replacements for supporting maintenance.

2-4 REPAIR PARTS.

Repair parts are listed and illustrated in TM 9-2350-314-24P-2. The parts listed in the RPSTL are used in ordering repair parts and special tools for direct support and general support maintenance of the howitzer cab.

It is important that careful troubleshooting be used to determine what parts are to be replaced before the component is disassembled for repair.

For replacement of seals, packings, gaskets, etc., in certain component assemblies, refer to TM 9-2350-314-24P-2 for the following authorized repair kits:

- Elevating cylinder valves and bracket (locking valve)
- Equilibrated elevating cylinder
- Manual elevation handle and pump assembly (hydraulic pump)
- Powerpack accumulator assembly (accumulator)
- Loader rammer cylinder assembly
- Variable recoil assemblies
- Variable recoil recuperator matched heads
- Counterrecoil buffer assembly (buffer cylinder)
- Powerpack reservoir cover assembly (power valve)
- Traversing mechanism hydraulic motor assembly (hydraulic motor) (lubricating pump)
- Lower housing drive shaft, driven gear shaft drive gear and bearings (shim set)
- Variable recoil actuator assembly (shim set)

2-5 FABRICATED TOOLS.

Appendix C illustrates fabricated tools which direct support and general support maintenance shops can make locally. The fabricated tools are helpful to units which repair a number of identical components.

NOTE

Fabricated tools are not available for issue.

Section II. INSPECTION PROCEDURES

2-6 GENERAL INSPECTION AND TYPES OF INSPECTION.

2-6.1 Introduction.

Inspections are made to determine the condition of an item as to serviceability, recognizing conditions that would cause failure, and assuring proper application of maintenance policies at prescribed levels.

NOTE

Make sure identification markings on major assemblies correspond to those entered in weapon record book.

2-6.2 General Procedures.

Initial inspection information is included to aid maintenance personnel in determining cause of unserviceability, extent of repairs, and an estimate of replacement parts needed. If materiel is received in a maintenance shop for repair without complete information regarding deficiencies, perform a complete maintenance shop inspection to determine required parts. More common malfunctions, with probable causes and corrective actions, are given in Chapter 3, Troubleshooting. Malfunctions which can be diagnosed and/or corrected by crew or unit maintenance personnel are provided in TM 9-2350-314-10, TM 9-2350-314-20-2-1 and TM 9-2350-314-20-2-2.

2-6.3 Inspection.

- a. Maintenance Shop Inspection (see AR-750-51).
- b. Inspections made while components are mounted in vehicle are, for the most part, visual and are to be performed before attempting to operate these components. The purpose of these inspections is to determine condition of materiel, and if found not operating efficiently, to take precautions to prevent any further damage.
- c. For troubleshooting performed while materiel is mounted in vehicle and which is beyond scope of the using unit, refer to TM 9-2350-314-20-2-1. Then proceed as outlined in this section.
- d. Inspection after material is removed from vehicle is performed to verify diagnosis made while installed and to uncover further defects.
- e. Standard armament theories and principles of operation apply in troubleshooting materiel. The greater number of symptoms of troubles that can be calculated, the easier will be isolation of defect.
- f. The troubleshooting procedures beginning with page 3-6 are for supporting maintenance and are supplemental to troubleshooting procedures outlined in TM 9-2350-314-20-2-1.

2-6 GENERAL INSPECTION AND TYPES OF INSPECTION - CONTINUED

2-6.3 Inspection - Continued

- g. In-process inspection instructions on materiel are contained at the end of each repair chapter together with applicable repair instructions.
- h. Final inspection instructions for materiel in supporting maintenance shops are contained in para 2-8.
- i. Hydraulic system inspection tests on components and system can only be checked with elevating, traversing systems, and rammer valve completely installed in vehicle. Refer to TM 9-2350-314-20-2-1 and TM 9-2350-314-20-2-2 for checkout procedure of system and external leakage allowance criteria for components.
- j. Pre-embarkation inspection (DS/GS category) is to determine whether preventive maintenance has been performed. It is critical that equipment in units alerted for overseas movement be fully mission capable.
- k. Inspection of materiel in the hands of the troops is performed after pre-embarkation inspection and is part of the preparation for overseas movement. DS/GS performs this inspection (para 2-9).

2-7 INSPECTION AND REPAIR DATA AND GENERAL INSPECTION GUIDELINES.

2-7.1 Inspection and Repair Data.

Inspection and repair data are included with exploded view illustrations in Chapters 4 thru 13.

Inspection and repair tabulated data give inspection requirements. Wear limits are listed which indicate the point to which parts may be worn before replacement. Normally all parts which have not been worn beyond dimensions given in the "Wear limit" column or those damaged by corrosion will be approved for service.

2-7.2 General Inspection Guidelines.

- a. Inspect cast parts for cracks or fractures and inspect interiors for scores and burrs.

NOTE

Inspection of sleeves is to be accomplished without removing sleeves from valve bodies. Use a small mirror and pencil-type flashlight. Spools and sleeves are noninterchangeable. If one is rejected, also reject its mating part.

- b. Inspect pistons, spools, and sleeves, checking to see that bores and parts are clean and free of foreign matter and burrs.
- c. Refer to TM 9-214 "Inspection and Care of Bearings", for cleaning, inspection, and lubrication of bearings, and instructions for evaluation of bearing life.

2-7 INSPECTION AND REPAIR DATA AND GENERAL INSPECTION GUIDELINES - CONTINUED

2-7.2 General Inspection Guidelines - Continued

- d. Inspect bushing-type bearings.



Never scribe-mark bearing surfaces.

NOTE

- Do not remove bearings for inspections. Use a small mirror or pencil-type flashlight when necessary.
 - Observe position of defective bearing within housing so that new bearing may be replaced in a similar manner.
- 1 Inspect bearing for cracks, fractures, signs of galling, pitting, scoring, or corrosion.
 - 2 Replace bearing if damaged.
- e. Nonmetallic seals, gaskets, and preformed packings are not to be inspected or evaluated. Replace all seals, gaskets, and preformed packings.
- f. Inspect gears.
- 1 Inspect gears for wear, nicks, flaking, scoring, and burring. Check gears that have been shrunk or pressed with component parts.



Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause SERIOUS INJURY. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).

- 2 Remove minor nicks with a fine stone or crocus cloth that has been dipped in dry-cleaning solvent P-D-680 (item 69, Appx B). Replace gears if teeth are damaged.

2-7 INSPECTION AND REPAIR DATA AND GENERAL INSPECTION GUIDELINES - CONTINUED

- g. Inspect splined parts.
 - 1 Inspect splines and shafts for cracks, fractures, scores, and deformation.
 - 2 Replace any splined part if splines do not permit secure fit.
 - 3 Replace shafts if cracked, fractured, scored, or deformed.
- h. Inspect threaded parts. Inspect all screws, bolts, nuts, studs, and threaded holes for worn or damaged threads.
- i. Inspect snaprings.
 - 1 Inspect snaprings for damage that would impair use.
 - 2 Replace snaprings, if damaged.
- j. Inspect soldered joints for defects.
 - 1 Inspect soldered components for cold joints. If soldered component or wire lead is mobile, desolder and solder the joint again (TM 9-2350-314-20-2-1, TM 9-2350-314-20-2-2 and TB SIG 222).
 - 2 Inspect soldered electrical components for solder bridges. Desolder and resolder to eliminate bridges (TM 9-2350-314-20-2-1 and TM 9-2350-314-20-2-2).
- k. Inspect welds. Inspect all weldments for broken or defective welds.
- l. Inspect finishes and plated surfaces.
 - 1 Inspect all painted surfaces. Repaint surfaces where required.
 - 2 Inspect plated surfaces for signs of flaking, wear, or deterioration of plating.
 - 3 Remove old plating, if necessary. Replace according to standard shop practice.
- m. Inspect for emulsified fluids. Emulsified fluid in hydraulic systems, characterized by milky color, can result from air becoming trapped in the fluid or from nitrogen leaking past piston seals. If milky hydraulic fluid is observed, drain, purge, and refill hydraulic system. Observe hydraulic fluid again after several days. If hydraulic fluid is again emulsified, repair defective cylinder.

2-8 FINAL INSPECTION.

2-8.1 General.

Final inspection is performed after repair has been completed to ensure that cab, howitzer, cannon mount, elevating and traversing systems, rammer, and all components are in serviceable condition before returning to user. All materiel will meet performance and serviceability requirements of this section prior to acceptance for delivery.

2-8.2 Procedure.

- a. Check all painted surfaces for conformance to the standards of TM 43-0139.

2-8 FINAL INSPECTION - CONTINUED

2-8.2 Procedure - Continued

- b. Ensure that all unpainted surfaces are lightly coated with grease, automotive and artillery (item 45, Appx B).
- c. Inspect nuts, bolts, screws, pins, and fastening devices for security of installation.
- d. Observe rotating parts in motion to determine smooth operation without excessive play and/or bind.
- e. Test operation of exterior spring-loaded devices to ensure proper spring compression.
- f. Inspect locations of gaskets, seals, wipers, ports, and packings for evidence of leakage (refer to applicable test procedure).
- g. Inspect hydraulic tubes, fittings, and components for leakage. Exercise hydraulic components (TM 9-2350-314-10).
- h. Check for proper nitrogen pressure in recuperator systems (refer to applicable test procedure).
- i. Examine canvas items for tears or deterioration.
- j. Make sure a detailed inspection of repaired systems and components, as described above in the paragraph on General Inspection, has been performed.
- k. Check level of howitzer cannon trunnions and gun travel lock alignment (TM 9-2350-314-20-1-2 and TM 9-2350-314-20-2-1).

2-8.3 Repair Parts and Equipment.

All repair parts and equipment must be complete or requisitions initiated for procurement of damaged, missing, or unserviceable parts.

2-8.4 Lubrication.

Lubrication must be complete and in accordance with TM 9-2350-314-10.

2-9 DS/GS PRE-EMBARKMENT INSPECTION FOR OVERSEAS ALERT.

- a. Prior to inspection of materiel in hands of troops preparatory to overseas movement, make a general inspection to determine whether preventive maintenance has been performed. Report neglect of maintenance to higher authority.
- b. The howitzer cannon M284 and mount M182A1, either in the hands of troops alerted for overseas movement, or supporting maintenance shops being processed for overseas shipment, must conform to standards as set forth herein. All replacement materiel issued from storage or withdrawn from higher levels of maintenance expressly for replacement of like serviceable materiel will conform in detail to standards of overhauled materiel.
- c. Inspect all components and assemblies for smooth operation and satisfactory performance. Replace all incomplete or unserviceable components or assemblies. Inspect all screws and locking devices for secure installation.
- d. Paint on materiel must be of regulation color and luster and must cover all specified surfaces thoroughly and sufficiently in order to prevent corrosion.

2-9 DS/GS PRE-EMBARKMENT INSPECTION FOR OVERSEAS ALERT - CONTINUED

- e. Inspect all points of lubrication for compliance with TM 9-2350-314-10.
- f. Inspect all unpainted metal surfaces and coat with film of medium preservative lubricating oil. This coating of oil is only a protection until materiel is processed for shipment.
- g. The vehicle must be accompanied by complete sets of organizational spare parts and equipment as normally issued with the vehicle, when shipped overseas.
- h. Inspect all accessories, tools, and spare parts for serviceability and completeness. All defective items must be replaced. Normally, it is not necessary to inspect items in sealed packages since they have been inspected for serviceability prior to packaging and during storage.
- i. Perform inspections as prescribed for inspection of materiel in the hands of troops outlined in para 2-10.

2-10 INSPECTION OF MATERIEL IN THE HANDS OF TROOPS.

WARNING

Before starting an inspection on armament, be sure to clear weapon. Do not actuate firing mechanism until weapon has been cleared. Inspect chamber to ensure that it is empty and no ammunition is in position to be introduced. Avoid having live ammunition in vicinity of work area. Serious injury or death to personnel could result.

- a. Refer to AR 750-51 for responsibilities and fundamental duties of inspecting personnel, necessary notice and preparations to be made, forms to be used, general procedures, and methods to be followed by inspectors.
- b. Inspector will accomplish the following:
 - 1 Determine serviceability, i.e., degree of serviceability, completeness, and readiness for immediate use, with special reference to safe and proper functioning of the materiel. If materiel is found unserviceable or incipient failures are disclosed, deficiencies will be corrected on the spot or advice given as to corrective measures when applicable or, if necessary, materiel will be tagged for delivery to, and repair by, maintenance personnel.
 - 2 Determine cause of mechanical and functional difficulties that troops may be experiencing and check for apparent results of lack of knowledge, misinformation, neglect, improper handling and storage, security, and preservation.
 - 3 Inspect to see that all authorized modifications have been applied, that no unauthorized alterations have been made, and that no work beyond the authorized scope of unit is being attempted. Check index in DA PAM 310-2 and the current MWO files for any MWOs printed after this publication.
 - 4 Instruct using personnel in proper preventive maintenance procedures where found inadequate.
 - 5 Check completeness of unit maintenance allowances and procedures for obtaining replacements.

2-10 INSPECTION OF MATERIEL IN THE HANDS OF TROOPS - CONTINUED

- 6 Inspect lettering on name plates and direction plates for legibility.
- 7 Inspect materiel for paint which has deteriorated or chipped off, exposing bare metal.
- 8 Determine when materiel was last exercised, if not fired recently. Refer to TB-1000-234-30 for exercising.
- 9 Note general appearance. Check exterior for missing or broken parts.
- 10 Check storage conditions of general supplies and ammunition.
- 11 Initiate a thorough report on materiel on "deadline", with reasons for further appropriate action.
- 12 Report to responsible officer any carelessness, negligence, unauthorized modifications, or tampering. This report should be accompanied by recommendations for correcting unsatisfactory conditions.
- 13 Inspection will be inclusive of all assemblies and parts described herein. All bolts, screws, nuts, and mounting and locking devices will be securely installed.
- 14 See that Weapon Record Data entries (DA Form 2408-4, which provides a continuous record of firings and other related service life data pertaining to weapon tubes) are complete and up-to-date as required by the provisions of DA PAM 738-750.
- 15 All components and assemblies of the mount will operate smoothly and perform satisfactorily.
- 16 Painting procedures will conform to those outlined in TM 43-0139.
- 17 Lubrication must be complete and in accordance with lubrication charts in TM 9-2350-314-10.
- 18 Cleaning will be performed in accordance with TM 9-2350-314-10 and TM 9-2350-314-20-2-1.
- 19 On completion of inspection, all unpainted surfaces will be coated lightly with a film of Cleaner, Lubricant, Preservative (CLP) per TM 9-2350-314-10.
- 20 All accessories and spare parts will be inspected for serviceability and completeness.
- 21 Minor indentations, scratches, or rust pits will not be cause for rejection or replacement of parts unless the damage is of sufficient magnitude to cause unsatisfactory functioning of component or assembly.

Section III. GENERAL MAINTENANCE PRACTICES**2-11 DISASSEMBLY AND ASSEMBLY GUIDELINES.****NOTE**

Gears, bearings, sleeves, and other components mounted on shaft may require use of arbor press for disassembly and assembly.

- a. Complete disassembly of a component is not always necessary to make a required repair or replacement. Good judgement should be used to keep disassembly operations to a minimum.

2-11 DISASSEMBLY AND ASSEMBLY GUIDELINES - CONTINUED

- b. In disassembling a unit, first follow basic inspection procedures, then remove as many major components and subassemblies as possible. These components may then be reduced, as necessary, into individual parts.
- c. During disassembly, tag critical parts such as shims, bearings, and electrical harnesses and leads to facilitate reassembly. This is especially important for electrical equipment if circuit number tags are illegible or missing.



Do not scribe bearing surfaces. Scribing bearing surfaces can cause equipment damage.

- d. Mark gears on mating teeth by scribe marks, or with dye, indelible ink, or paint to be certain of correct positioning at assembly. Use of chalk or crayon for marking should be avoided because of lack of permanence.
- e. During assembly, subassemblies should be assembled first, combined into major components where possible, and then installed to form complete component.
- f. Records to provide repair and replacement data and statistics should be carefully prepared and maintained according to DA PAM 738-750.

2-12 REPLACEMENT OF PARTS.

- a. Unserviceable and unrepairable assemblies will be broken down into Items of Issue; serviceable parts will be returned to stock. Parts or assemblies which cannot be repaired, selective-fitted, or reclaimed to standards contained in this manual will be salvaged and new parts used to replace them.
- b. When assembling components and assemblies, replace damaged keys with new ones, if possible. Tighten all loose screws, bolts, and nuts. Replace all damaged screws, bolts, and nuts, if possible.
- c. Gaskets, packings, preformed packings, seals, lockwashers, locknuts, cotter pins, and spring pins must be replaced. Bushings must be replaced only if removed.
- d. Springs must be replaced if broken, kinked, cracked, or do not conform to standards specified in the repair data.
- e. If a required part is not available, reconditioning of old part should be considered. Such parts should be inspected carefully after reconditioning to determine their suitability and probable service life. Replacement parts should be requisitioned immediately.
- f. Use tools that are suitable for the work to be performed to avoid damage to tools and equipment or injury to personnel.
- g. Special tools are listed in Appendix F. Fabricated tools are listed and illustrated in Appendix C. These tools should only be used for maintenance operations for which they were designed and personnel should be carefully instructed in their specialized operation.

2-13 BALL AND ROLLER BEARINGS.

Reference paragraph 2-7 for general guidelines for inspecting ball bearings. Refer to TM 9-214, "Inspection and Care of Bearings," for cleaning, inspection, and lubrication of bearings, and instructions for evaluation of bearing life.

2-14 REMOVING BURRS, SCRATCHES, AND RAISED METAL.

- a. Use fine mill file, soft stone, or abrasive cloth dipped in CLP (TM 9-2350-314-10) to remove burrs, scratches, or raised metal.
- b. When filing aluminum, clean file often with steel file brush to avoid lodging file with aluminum particles which will gouge work surface.

2-15 REPAIRING DAMAGED THREADS.

- a. When determined feasible by inspection, damaged threads should be repaired by retapping, use of thread die, or by chasing on lathe.
- b. Tapped holes for screw thread inserts that have mutilated threads may be repaired by:
 - 1 Drilling and tapping oversize and installing larger inserts.
 - 2 Filling tapped hole by welding, redrilling, and tapping hole to original size.

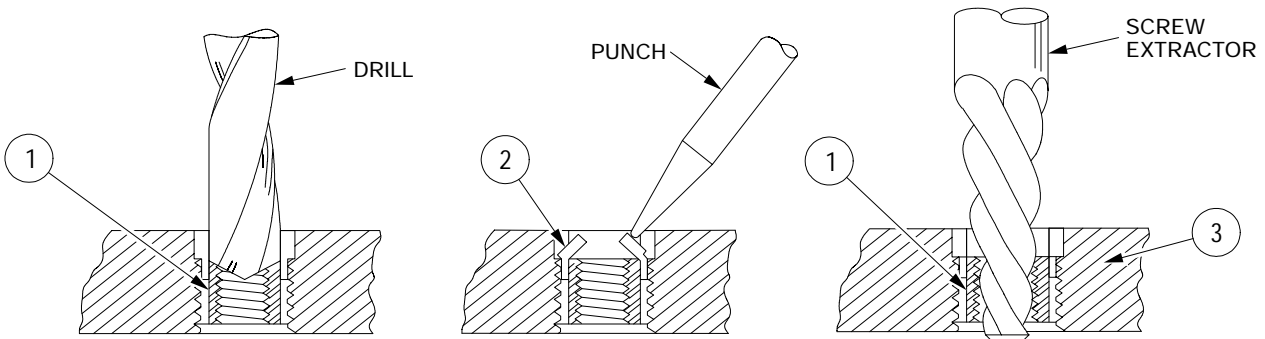
2-16 REMOVAL AND INSTALLATION OF SCREW THREAD INSERT (ONE-PIECE TYPE).

a. Removal.

NOTE

- When determined feasible by inspection, damaged threads should be repaired by rethreading, use of thread restorer, tap die, or by "chasing" on lathe.
- Tapped holes for screw thread inserts that have mutilated threads may be repaired by:
 - 1 Drilling and tapping hole oversize and installing larger inserts.
 - 2 Filling tapped hole by welding, redrilling, and tapping hole to original size.
- Refer to Table 2-1 for drill size and depth.

- 1 Drill thread insert (1).
- 2 Deflect keys (2) inwardly and break off.
- 3 Remove remainder of thread insert (1) from plate (3) with screw extractor.



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2-16 REMOVAL AND INSTALLATION OF SCREW THREAD INSERT (ONE-PIECE TYPE) - CONTINUED

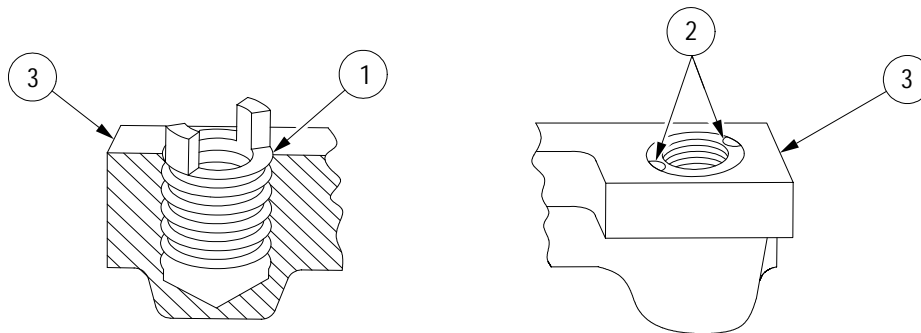
a. Removal - Continued

Table 2-1 Thread inserts: Drill Size and Depths

THREAD INSERT		TAP DRILL Diameter	COUNTERSINK Diameter	REMOVAL DRILL	
Internal Thread	External Thread			Diameter	Drilling Depth
10-24 10-32	3/8-16	Q (.332)	25/64	9/32	1/4
1/4-20 1/4-28	7/16-14	X (.397)	29/64	11/32	1/4
5/16-18 5/16-24	1/2-13	29/64	33/64	13/32	1/4
3/8-16 3/8-24	9/16-12	33/64	37/64	15/32	1/4
7/16-14 7/16-20	5/8-11	37/64	41/64	17/32	1/4
1/2-13 1/2-20	11/16-11	41/64	45/64	19/32	1/4

b. Installation.

- 1 Screw thread insert (1) in until 0.010 to 0.030 in. below surface of plate (3).
- 2 Drive keys (2) in flush with plate (3).



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2-17 REMOVAL AND INSTALLATION OF SELF-LOCKING STUDS

a. Removal of Self-Locking Studs.

Position stud remover/setter over stud to be replaced. Remove and discard stud.

b. Installation of Self-Locking Studs.

Install new stud and tighten with remover/setter.

2-18 WIRING HARNESS AND CABLE REPAIR.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Heat gun (item 17, Appx F)
Electrical connector repair tool kit
(item 29, Appx F)
Soldering gun (item 19, Appx F)

Equipment Conditions

Vehicle MASTER power switch OFF
(TM 9-2350-314-10)

References

TB SIG 222

Materials/Parts

Solder (item 66, Appx B)

NOTE

- When removing more than one wire from a multiple wire receptacle, record which line was removed from which pin hole.
- Before proceeding, see detailed instructions on soldering and solder (TB SIG 222).
- Cable identifiers are attached to cables. These tags are embossed with the cable identification number. Cable identifier numbers are shown on the system's wiring diagrams.
- Wire identifiers are embossed with the same individual wire number. Wire identifier numbers are also shown on system's wiring diagrams.
- If cables or wires are replaced, remove tags from old wire and place them on new wire.
- All pins (male connectors) and sockets (female connectors) are alphabetically coded. Coded identification starts at connector key or groove.
- Male connectors' identifying letters run clockwise.
- Female connectors' identifying letters run counterclockwise.

2-18 WIRING HARNESS AND CABLE REPAIR - CONTINUED

2-18.1 Heat Shrink Insulation Sleeving.

a. Disassembly.

Cut and discard insulation sleeving.

b. Assembly.

NOTE

Insulation sleeving tubing should be twice the diameter of the part over which it will be shrunk.

- 1 Slide sleeving over wire and terminal.

NOTE

Remove thermal heat gun from sleeving as soon as sleeving forms to shape of wire and terminal.

- 2 Hold thermal heat gun 4 or 5 inches away from sleeving and apply heat for about 30 seconds.
- 3 Let sleeving cool 30 seconds before handling.

2-18.2 Wire Contacts.

a. Disassembly.

- 1 Cut off contacts with diagonal cutting pliers.
- 2 Strip about 1/2 inch of insulation from the end of the wire.

b. Assembly.

NOTE

Color bands on contacts indicate wire size. For example, contacts with green color bands are for 22-gage to 26-gage wire. Contacts with red color bands are for 20-gage to 24-gage wire.

- 1 Place contact in the crimping tool with the color band toward the rear.
- 2 Bare wire in the contact and squeeze the crimping tool.
- 3 Remove crimped contact out of the tool and check the crimp by looking in the inspection hole. Make sure the end of the bare wire is visible.

2-18.3 Terminal-Type Cable Connectors.

a. Disassembly.

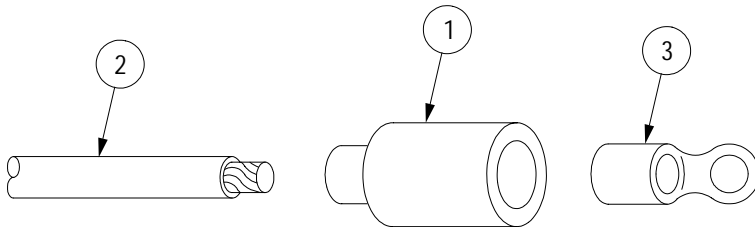
Cut and discard connector.

2-18 WIRING HARNESS AND CABLE REPAIR - CONTINUED

2-18.3 Terminal-Type Cable Connectors - Continued

b. Assembly.

- 1 Strip cable insulation equal to depth of terminal well.
- 2 Slide insulator (1) over cable (2).
- 3 Insert cable (2) into terminal (3).



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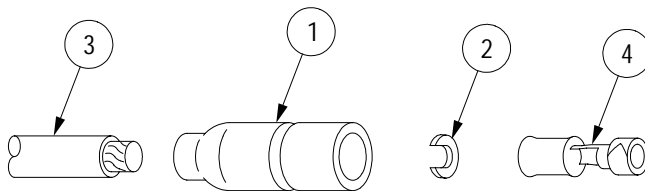
2-18.4 Female Cable Connector with Washer.

a. Disassembly.

Cut and discard connector.

b. Assembly.

- 1 Strip cable insulation approximately 1/8 in. (3.2 mm).
- 2 Slide shell (1) and washer (2) over cable (3).
- 3 Place cable (3) in cylinder end of terminal (4).



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2-18.5 Male Cable Connector with Washer.

a. Disassembly.

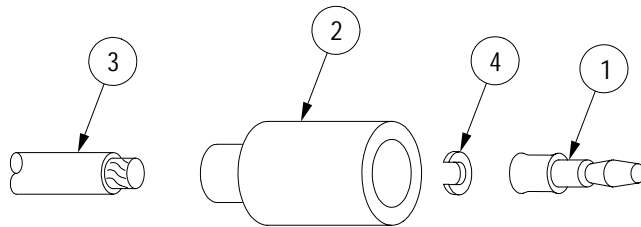
Cut and discard connector.

2-18 WIRING HARNESS AND CABLE REPAIR - CONTINUED

2-18.5 Male Cable Connector with Washer - Continued

b. Assembly.

- 1 Strip cable insulation equal to depth of terminal (1) well.
- 2 Slide shell (2) over cable (3).
- 3 Insert cable (3) into terminal (1) well and crimp.
- 4 Place C-washer (4) over cable (3) at crimped junction and slide shell (2) over C-washer (4) and terminal (1).



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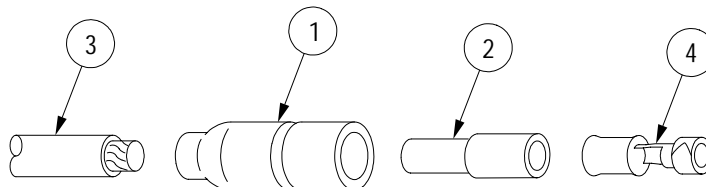
2-18.6 Female Cable Connector with Sleeve.

a. Disassembly.

Cut and discard connector.

b. Assembly.

- 1 Strip cable insulation approximately 1/8 in. (3.2 mm).
- 2 Slide shell (1) and sleeve (2) over cable (3).
- 3 Place cable (3) in cylinder end of terminal (4) and crimp.
- 4 Slide shell (1) and sleeve (2) over terminal (4).



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2-18 WIRING HARNESS AND CABLE REPAIR - CONTINUED

2-18.7 Typical Female-Type Panel Mounting Receptacle.

a. Disassembly.

- 1 Drive socket contacts (1) out through rear of insert (2) with pin extractor.
- 2 Unsolder cable (3) leads from solder wells on socket contacts (1).
- 3 Slide insert (2) out through rear of shell (4).

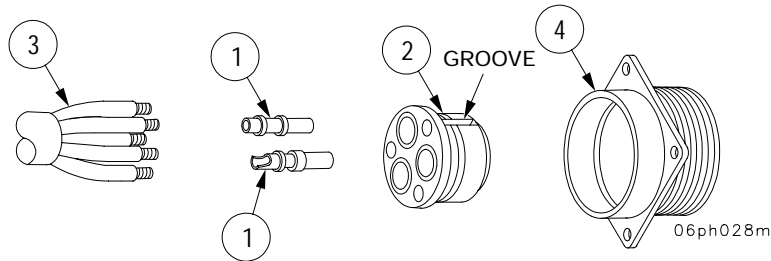
b. Assembly.

- 1 Strip cable (3) insulation equal to depth of solder wells of pin contacts (1).
- 2 Insert cable (3) leads into solder wells of socket contacts (1) and solder using resin core solder.

NOTE

Groove in insert must be aligned with guide in shell to ensure proper fit.

- 3 Push insert (2) into shell (4) from rear until seated.
- 4 Push socket contacts (1) into insert (2) from rear until seated.



2-18.8 Typical Male - Type Panel Mounting Receptacle.

a. Disassembly.

- 1 Drive pin contacts (1) out through rear of insert (2) with pin extractor.
- 2 Unsolder cable (3) leads from solder wells on pin contacts (1).
- 3 Slide insert (2) out through rear of shell (4).

b. Assembly.

- 1 Strip cable (3) insulation equal to depth of solder wells of pin contacts (1).
- 2 Insert cable (3) leads into solder wells of pin contacts (1) and solder using resin core solder.

2-18 WIRING HARNESS AND CABLE REPAIR - CONTINUED

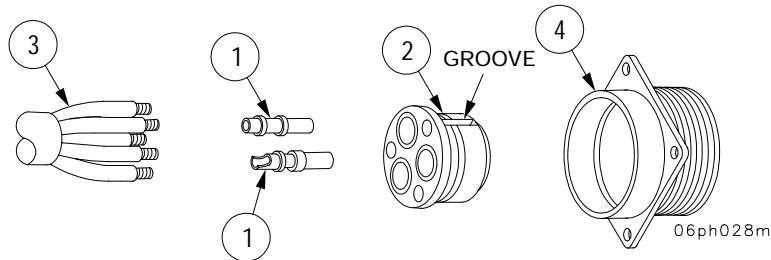
2-18.8 Typical Male-Type Panel Mounting Receptacle - Continued

b. Assembly - Continued

NOTE

Groove in insert must be aligned with guide in shell to ensure proper fit.

- 3 Push insert (2) into shell (4) from rear until seated.
- 4 Push pin contacts (1) into insert (2) from rear until seated.



2-18.9 Typical Female-Type Panel Mounting Receptacle with Ridged Locking Nut.

a. Disassembly.

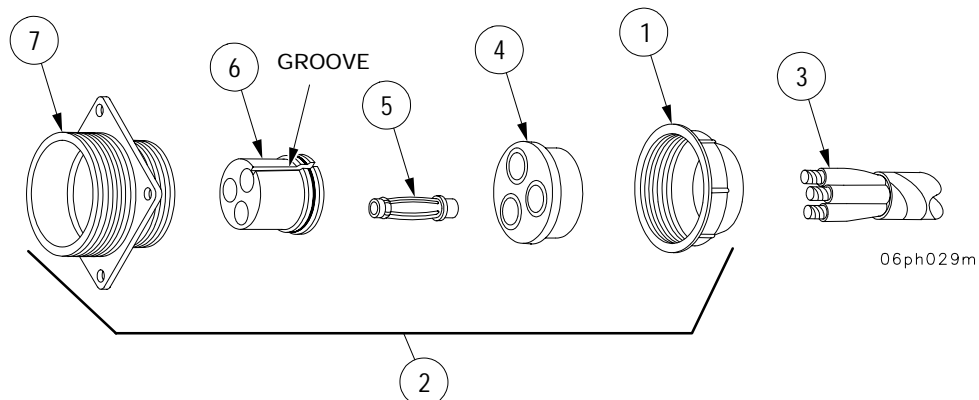
- 1 Unscrew nut (1) from shell assembly (2) and slide back on cable (3).
- 2 Slide grommet (4) back on cable (3) leads.
- 3 Drive socket contacts (5) out through front of insert (6) with pin extractors.
- 4 Unsolder leads from socket contacts (5).
- 5 Push insert (6) out through rear of shell (7).

b. Assembly.

- 1 Strip cable (3) insulation equal to depth of solder wells of pin contacts (5).
- 2 Slide nut (1) over cable (3).
- 3 Slide grommet (4) over cable (3) leads.
- 4 Insert cable (3) leads into solder wells of pin contacts (5) and solder using resin core solder.

NOTE

Groove in insert must be aligned with guide in shell to ensure proper fit.

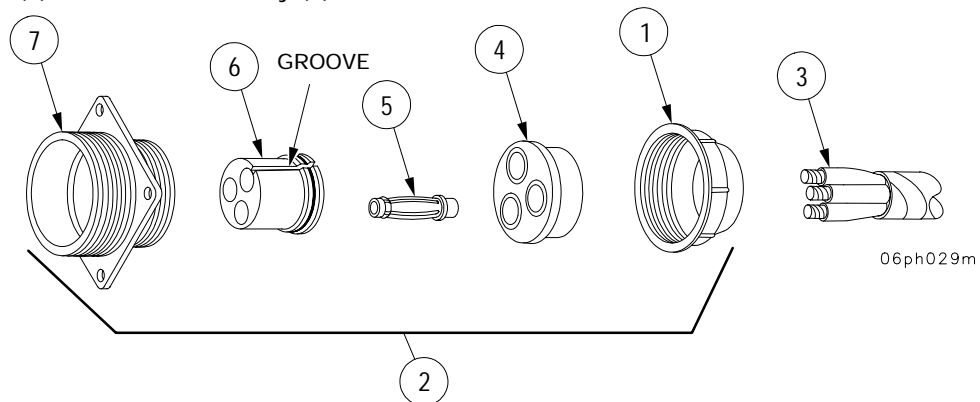


2-18 WIRING HARNESS AND CABLE REPAIR - CONTINUED

2-18.9 Typical Female-Type Panel Mounting Receptacle with Ridged Locking Nut - Continued

b. Assembly - Continued

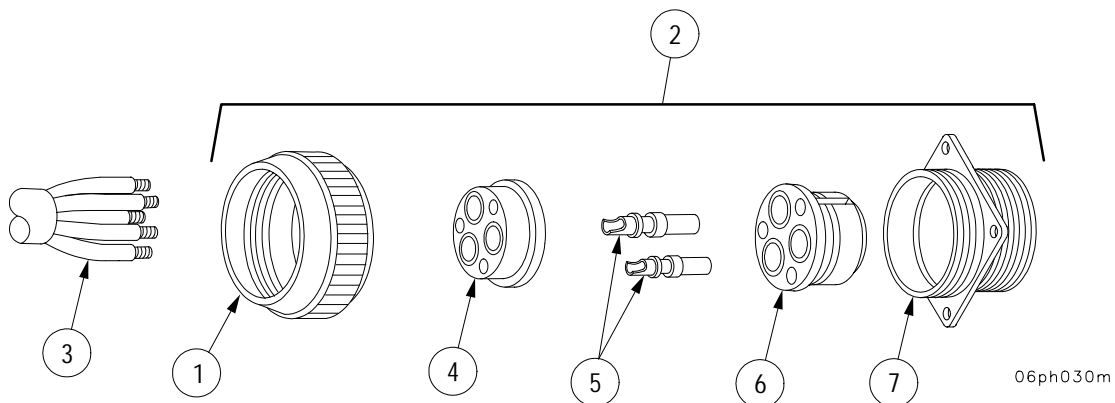
- 5 Push insert (6) into shell (7) from rear until seated.
- 6 Push socket contacts (5) into insert (6) from rear until seated.
- 7 Push grommet (4) down cable (3) leads and over solder wells of pin contacts (5).
- 8 Screw nut (1) onto shell assembly (2).



2-18.10 Typical Male-Type Panel Mounting Receptacle with Ridged Locking Nut.

a. Disassembly.

- 1 Unscrew nut (1) from shell assembly (2) and slide back on cable (3).
- 2 Slide grommet (4) back on cable (3) leads.
- 3 Drive pin contacts (5) out through rear of insert (6) with pin extractor.
- 4 Push insert (6) out through rear of shell (7).
- 5 Unsolder leads from pin contacts (5).



2-18 WIRING HARNESS AND CABLE REPAIR - CONTINUED

2-18.10 Typical Male-Type Panel Mounting Receptacle with Ridged Locking Nut - Continued

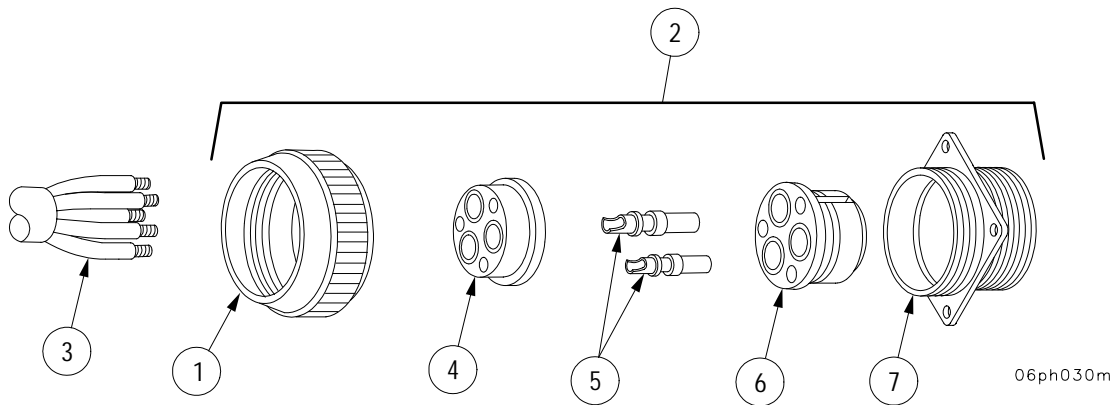
b. Assembly.

- 1 Strip cable (3) insulation equal to depth of solder wells of pin contacts (5).
- 2 Slide nut (1) onto cable (3).
- 3 Slide grommet (4) over cable (3) leads.
- 4 Insert cable (3) leads into solder wells of pin contacts (5) and solder using resin core solder.

NOTE

Groove in insert must be aligned with guide in shell to ensure proper fit.

- 5 Push insert (6) into shell (7) from rear until seated.
- 6 Push pin contacts (5) into insert (6) from rear until seated.
- 7 Push grommet (4) down cable (3) leads and over solder wells of pin contacts (5).
- 8 Screw nut (1) onto shell assembly (2).



2-18 WIRING HARNESS AND CABLE REPAIR - CONTINUED

2-18.11 Typical Female-Type Plug with Ridged Locking Nut.

a. Disassembly.

- 1 Unscrew nut (1) from shell assembly (2) and slide back on cable (3).
- 2 Slide grommet (4) back on cable (3) leads.
- 3 Slide coupling nut (5) off shell (6).
- 4 Drive pin contacts (7) out through rear of insert (8) with pin extractor.
- 5 Push insert (8) out through rear of shell (6).
- 6 Unsolder leads from pin contacts (7).

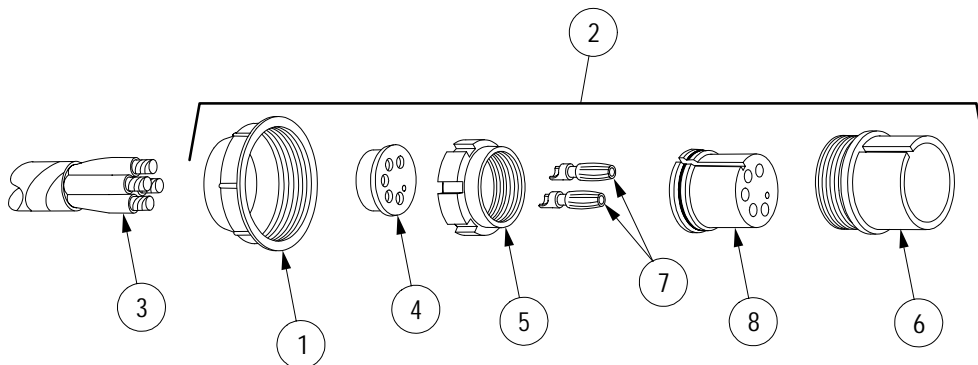
b. Assembly.

- 1 Strip cable (3) insulation equal to depth of solder wells of pin contacts (7).
- 2 Slide nut (1) over cable (3) leads.
- 3 Slide grommet (4) over cable (3) leads.
- 4 Insert cable (3) leads into solder wells of pin contacts (7) and solder using resin core solder.

NOTE

Groove in insert must be aligned with guide in shell to ensure proper fit.

- 5 Push insert (8) into shell (6) from rear until seated.
- 6 Push pin contacts (7) into insert (8) from rear until seated.
- 7 Slide coupling nut (5) onto shell assembly (2).
- 8 Push grommet (4) down cable (3) leads and over solder wells of pin contacts (7).
- 9 Screw nut (1) onto shell assembly (2).



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2-18 WIRING HARNESS AND CABLE REPAIR - CONTINUED

2-18.12 Typical Male-Type Plug with Ridged Locking Nut.

a. Disassembly.

- 1 Unscrew nut (1) from shell assembly (2) and slide back on cable (3).
- 2 Slide grommet (4) back on cable (3) leads.
- 3 Slide coupling nut (5) off shell (6).
- 4 Drive pin contacts (7) out through rear of insert (8) with pin extractor.
- 5 Push insert (8) out through rear of shell (6).
- 6 Unsolder cable (3) leads from pin contacts (7).

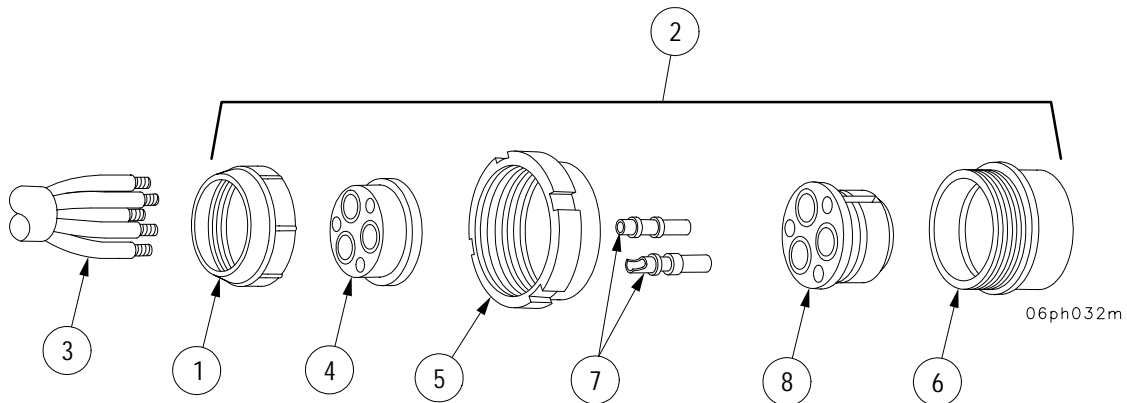
b. Assembly.

- 1 Strip cable (3) insulation equal to depth of solder wells of pin contacts (7).
- 2 Slide nut (1) over cable (3)
- 3 Slide grommet (4) over cable (3) leads.
- 4 Insert cable (3) leads into solder wells of pin contacts (7) and solder using resin core solder.

NOTE

Groove in insert must be aligned with guide in shell to ensure proper fit.

- 5 Push insert (8) into shell (6) from rear until seated.
- 6 Push pin contacts (7) into insert (8) from rear until seated.
- 7 Slide coupling nut (5) onto shell assembly (2).
- 8 Push grommet (4) down cable (3) leads and over solder wells of pin contacts (7).
- 9 Screw nut (1) onto shell assembly (2).



2-19 WELDING.

For welding instructions and welding materials, refer to TM 9-237.

2-20 ELECTRICAL TEST EQUIPMENT AND ELECTRICAL TESTING.

Refer to the operator's manual provided with multimeter for proper multimeter operation.

2-21 SHAFTS, GEARS, AND BEARINGS.

Most gears and bearings are installed on shafts tightly. Use arbor press, gear pullers, or other appropriate tools for removal and installation. General inspection guidelines for gears and bearings are outlined in para 2-7.

2-22 SOLDERING.

For soldering instructions, see TB SIG 222.

2-23 APPLICATION OF ADHESIVES (CONTACT CEMENT).

WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

- a. Clean surfaces to be bonded with tool cleaner. Surface must be free of grease, paint, talc, soapstone, or any foreign substance.
- b. Apply an even coat of adhesive to each mating surface. Let dry until tacky. (Temperature and humidity will be controlling factors in drying time.)
- c. Apply another even coat of adhesive to both coated surfaces. Let dry until tacky (approximately 20 minutes). Adhesive should not transfer to finger when touched lightly.

CAUTION

Do not attempt to pull or pry on either bonded surface after mating.

- d. Press rubber or fabric to metal or other mating surface, applying pressure by using a roller or other suitable tool to ensure full contact between surfaces.

Section IV. CLEANING, PAINTING, AND LUBRICATION

2-24 CLEANING.

Refer to TM 9-247 for instructions on cleaning; TM 9-208-2 for equipment used in cleaning and TM 9-247 for necessary cleaning materials. Also refer to TM 9-2350-314-10 for specific areas to be cleaned.

- Clean all parts before inspection, after repair, and before assembly.
- Hands should be kept free of grease which can collect dust and dirt.
- After cleaning, all parts should be covered to protect them from dust and dirt.

2-25 PAINTING.

- a. Clean and repaint all surfaces on which paint has deteriorated or become damaged.
- b. Do not paint electrical harnesses or leads.
- c. Paint interior surfaces with primer coating (item 29, Appx B).
- d. Apply coat of white semi-gloss enamel No. 17875 (item 55, Appx B) to interior of cab.
- e. Refer to TM 9-2350-314-20-2-1 and TB 43-0209 for application of stencil.

2-26 LUBRICATION.

Refer to TM 9-2350-314-10 and to specific procedures within this publication for lubrication requirements.

2-27 HYDRAULIC INSPECTION AND TROUBLESHOOTING PROCEDURES.

2-27.1 Automatic Test Procedure.

The PDIU should always be used as a first means of verifying a fault. It will help you isolate the problem to a small group of components and, in some cases, a single component.

2-27.2 System Operation Check.

If the PDIU is not working, try to recreate the problem. Use all of the system capabilities: MANUALS, POWER, and AFCS. During this operation, use the following procedures to fault isolate:

- a. Visually inspect the cab interior and hydraulic compartment for signs of leakage (wet hoses, components, oil stains, and low levels in reservoirs), and kinked or flattened lines. Watch the main pressure gage during operation and watch the cab and gun tube for jerky movement (indicates air in the system).
- b. Listen for any unusual sounds during operation. A shot-like sound could mean a sudden stop or restriction of moving fluid. This may cause high pressure surges that can damage system components. Pump cavitation can be heard from the hydraulic compartment when not enough fluid is supplied to the hydraulic pump or when there is too much air in the system. When there is no back pressure on the pump, it will sound like the pump is pumping marbles. A shrill sound will be heard when there is too much back pressure.

2-27 HYDRAULIC INSPECTION AND TROUBLESHOOTING PROCEDURES - CONTINUED

2-27.2 System Operation Check - Continued

- c. Place the back of your hand against components to check for differences of temperature. If after trying to operate the system a line is very hot compared to others, a restriction may be present. If a supply line to a component feels to be at operating temperature, but the output side feels cold, the component is failing to operate. Valves that are electrically activated can be heard and felt when they shift. When a velocity fuse resets, you can feel and hear it.
- d. If a pump cavitates, the high pressure can produce temperatures as high as 2000°F (1093°C) for a short time. This can cause the oil to burn and create an easily detected odor.

NOTE

Ask the crew as many questions as possible about any unusual smells or sounds they might have heard before the fault happened. This may help to pinpoint a particular faulty component.

CHAPTER 3 TROUBLESHOOTING

GENERAL

Information in this section is for use by maintenance personnel in conjunction with, and as a supplement to, the troubleshooting sections in TM 9-2350-314-10 and TM 9-2350-314-20-2-1. This section provides a continuation of troubleshooting instructions where a remedy in TM 9-2350-314-20-2-1 refers to direct or general support maintenance for corrective actions.

CONTENTS

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3-1	QUICK GUIDE TO TROUBLESHOOTING	3-2
3-2	HYDRAULIC INSPECTION AND TROUBLESHOOTING PROCEDURES	3-5



3-1 QUICK GUIDE TO TROUBLESHOOTING.

3-1.1 Purpose.

The purpose of troubleshooting is to quickly and accurately diagnose a problem, to correct it without unnecessary labor and expense, to avoid further damage to a component, and to restore vehicle system to full operational capability.

3-1.2 General Principles of Troubleshooting.

- a. Try to identify cause of problem without removing component from vehicle.
- b. Determine if continued operation of system with problem would be dangerous or would result in damage to components.
- c. If there is a choice between tests to determine what is wrong with a component, perform least time-consuming tests first, progressing toward lengthier tests, if necessary.
- d. Do not perform any disassembly unless a test has first indicated that it is necessary to correct the problem or to conduct further testing.
- e. Aside from authorized, scheduled preventive maintenance, do not disassemble any component that is working satisfactorily.

3-1.3 Inspection.

Always conduct a detailed and thorough visual inspection before operating or disassembling a component. Look for damaged, distorted, or deformed parts; loose electrical connections; hydraulic oil leakage; dirt or foreign matter where it shouldn't be; evidence of overheating, indicated by burnt paint or blued steel; insufficient or excess lubrication; excessive wear; loose fittings or missing fasteners; rust or corrosion; obstructions and interference with other parts; or anything else that does not look normal.

3-1.4 How to Proceed with Troubleshooting.

If no electrical failure is involved, go to the QUICK GUIDE TO TROUBLESHOOTING and find component or system affected listed at the left of the page, just below the paragraph heading. The QUICK GUIDE lists an item being checked, problems with item, and a paragraph and page number where a corrective action for problem can be found. Follow the step-by-step procedure, which progresses from simplest to most complex remedies until problem is corrected.

Other parts of this manual or other manuals may be referenced from time to time. If so, be sure to have these manuals available before beginning actual work.

3-1 QUICK GUIDE TO TROUBLESHOOTING - CONTINUED

<u>ITEM</u>	<u>SYMPTOM</u>	<u>PAGE</u>	<u>PARAGRAPH</u>
CANNON PROBLEM	CANNON HAS JERKY RECOIL, EXCESSIVE RECOIL FORCE, EXCESSIVE RECOIL TRAVEL, OR INSUFFICIENT RECOIL TRAVEL.	3-7	para 3-2.a(1)
	CANNON WILL NOT MAINTAIN PROPER HYDRAULIC PRESSURE IN VARIABLE RECOIL SYSTEM.	3-11	para 3-2.a(2)
	CANNON WILL NOT RETURN TO BATTERY (REPAIR RECOIL ASSEMBLY).	3-12	para 4-8
	BREECH DOES NOT OPEN MANUALLY (REPAIR BREECH MECHANISM).	4-107	para 4-16
	PRIMER DOES NOT FIRE - PRIMER NOT INDENTED (REPAIR BREECH MECHANISM).	4-107	para 4-16
ELEVATION PROBLEM	INABILITY TO TRAVERSE AND ELEVATE IN POWER MODE (AFCS AND MANUAL MODE NORMAL).	3-15	para 3-2.b(1)
	CANNON DOES NOT ELEVATE OR ELEVATES SLOWLY USING MANUAL ELEVATION SYSTEM	3-17	para 3-2.b(2)
	CANNON WILL ONLY MOVE A FEW MILS OR WILL NOT ELEVATE OR DEPRESS (REPAIR ELEVATION MECHANISM).	10-36	para 10-8
	CANNON WILL ONLY ELEVATE A FEW MILS OR ELEVATES SLOWLY (REPAIR ELEVATION MECHANISM).	10-36	para 10-8
	CANNON DRIFTS IN POWER MODE.	3-19	para 3-2.b(3)
	CANNON CANNOT BE EQUILIBRATED.	3-22	para 3-2.b(4)
HYDRAULIC SYSTEM PROBLEM	LOW OR NO HYDRAULIC PRESSURE	3-28	para 3-2.c(1)
	NO CLOGGED FILTER INDICATION ON DISPLAY UNIT. MECHANICAL RETURN OR SUPPLY CLOGGED FILTER INDICATION IS PRESENT (REPLACE FILTER INDICATORS).	10-107	para 10-17
	RAMMER DOES NOT OPERATE (EXTEND OR RETRACT). TRAVERSE AND ELEVATE ARE NORMAL (REPAIR RAMMER CYLINDER ASSEMBLY).	5-23	para 5-2
	HYDRAULIC PRESSURE GREATER THAN 1975 PSI.	3-30	para 3-2.c(2)
MCS PROBLEM	CHANGE FILTER LAMP WILL NOT LIGHT.	3-32	para 3-2.d(1)
	FREON PRESSURE LAMP WILL NOT LIGHT.	3-36	para 3-2.d(2)
	MODE SELECT WILL NOT OPERATE IN HIGH, LOW, OR COOL MODE (REPLACE WIRING HARNESS 800340-1).	8-91	para 8-20

3-1 QUICK GUIDE TO TROUBLESHOOTING - CONTINUED

<u>ITEM</u>	<u>SYMPTOM</u>	<u>PAGE</u>	<u>PARAGRAPH</u>
MCS PROBLEM - CONTINUED	NO INDICATION ON FREON AND CHANGE FILTER LAMPS DURING LAMP TEST (REPLACE WIRING HARNESS 800340-1).	8-91	para 8-20
	MCS DOES NOT OPERATE IN LO MODE.	3-40	para 3-2.d(3)
	MCS DOES NOT OPERATE IN HI MODE.	3-43	para 3-2.d(4)
	MCS DOES NOT OPERATE IN COOL MODE.	3-46	para 3-2.d(5)
	VANEAXIAL FAN FAILS TO OPERATE.	3-52	para 3-2.d(6)
TRAVERSE PROBLEM	INABILITY TO MANUALLY TRAVERSE. AFCS AND POWER MODES ARE NORMAL.	3-57	para 3-2.e(1)
	CAB WILL NOT TRAVERSE IN POWER OR AFCS OPERATION. CANNON ELEVATES, MANUAL TRAVERSE OPERATES.	3-59	para 3-2.e(2)
	UNREQUESTED CAB TRAVERSE WHEN HYDRAULIC POWER SWITCH IS TURNED ON.	3-61	para 3-2.e(3)
	MANUAL TRAVERSE HANDWHEEL ROTATES WHEN CAB IS TRAVERSED IN POWER.	3-64	para 3-2.e(4)
WINTERIZATION KIT PROBLEM, MCS	NO HEAT OR LOW HEAT FROM PREHEATER	3-65	para 3-2.f(1)

3-2 HYDRAULIC INSPECTION AND TROUBLESHOOTING PROCEDURES.

3-2.1 Automatic Test Procedure.

The PDIU should always be used as a first means of verifying a fault. It will help you isolate the problem to a small group of components and, in some cases, a single component.

3-2.2 System Operation Check.

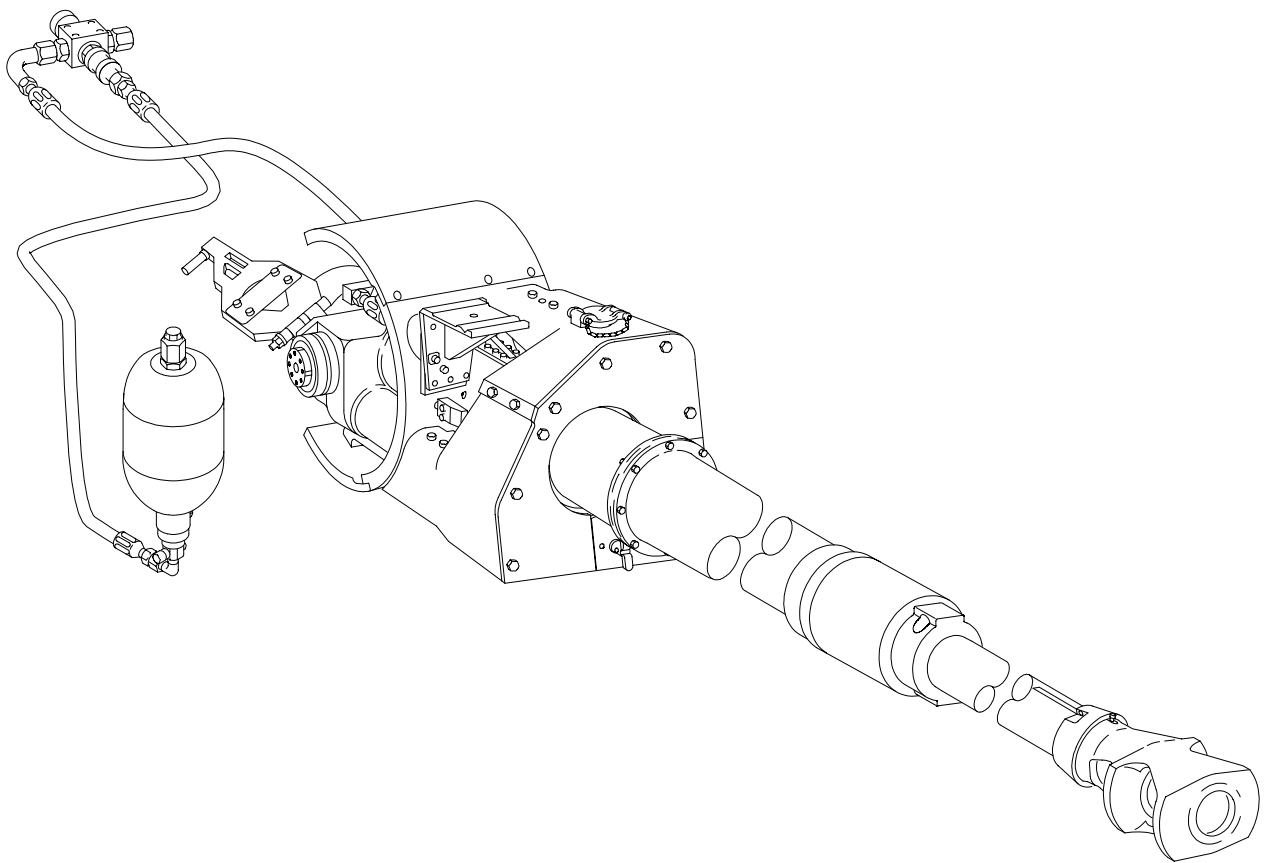
If the PDIU is not working, try to recreate the problem. Use all of the system capabilities; MANUAL, POWER, and AFCS. During this operation, use the following procedures to fault isolate:

- a. Visually inspect the cab interior and hydraulic compartment for signs of leakage (wet hoses, components, oil stains, and low levels in reservoirs), and kinked or flattened lines. Watch the main pressure gage during operation and watch the cab and gun tube for jerky movement (indicates air in the system).
- b. Listen for any unusual sounds during operation. A shot-like sound could mean a sudden stop or restriction of moving fluid. This may cause high pressure surges that can damage system components. Pump cavitation can be heard from the hydraulic compartment when not enough fluid is supplied to the hydraulic pump or when there is too much air in the system. When there is no back pressure on the pump, it will sound like the pump is pumping marbles. A shrill sound will be heard when there is too much back pressure.
- c. Place the back of your hand against components to check for differences of temperature. If, after trying to operate the system, a line is very hot compared to others, a restriction may be present. If a supply line to a component feels to be at operating temperature, but the output side feels cold, the component is failing to operate. Valves that are electrically activated can be heard and felt when they shift. When a velocity fuse resets, you can feel and hear it.

3-2 TROUBLESHOOTING CHART.

a. CANNON PROBLEM

The cannon consists of the muzzle brake, barrel, evacuator, mount, recoil mechanism, breech assembly, and firing mechanism. Below is a pictorial view of the cannon with all the major assemblies installed. The muzzle brake and recoil mechanism reduce and absorb the recoil of the barrel during the firing sequence. The breech assembly houses the projectile and propellant during a firing. The firing mechanism is used to fire the cannon.



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3-2 TROUBLESHOOTING CHART - CONTINUED

a. CANNON PROBLEM - CONTINUED (1) CANNON HAS JERKY RECOIL, EXCESSIVE RECOIL FORCE, EXCESSIVE RECOIL TRAVEL, OR INSUFFICIENT RECOIL TRAVEL.

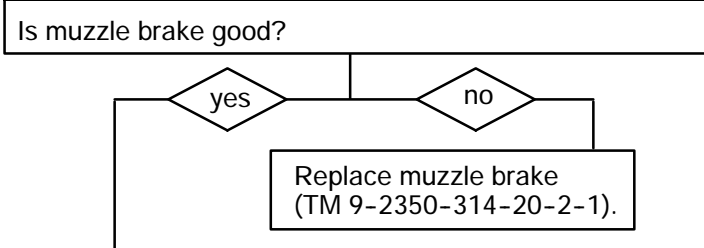
INITIAL SETUP

Tools
 Artillery and turret mechanic's tool kit
 (SC 5180-95-A12)

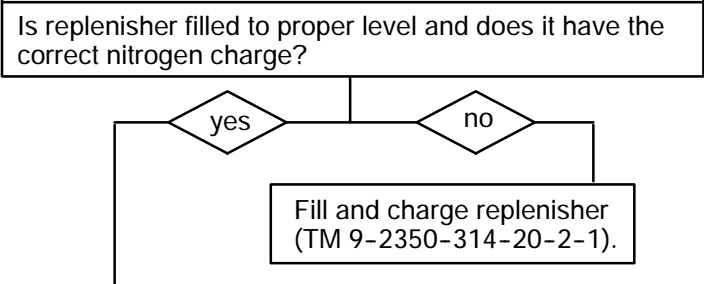
NOTE

Check the mount assembly for any hydraulic leaks. Repair as necessary. Make sure TM 9-2350-314-20-2-1 troubleshooting procedures have been done before doing this tree.

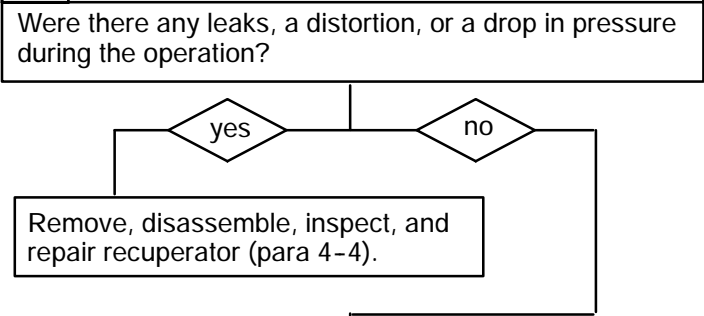
A Check for a defective muzzle brake (cracks longer than 1 inch) (TM 9-2350-314-20-2-1).



B Check replenisher for correct fluid level and nitrogen charge (TM 9-2350-314-20-2-1).



C Operate the system (TM 9-2350-314-10).



CONTINUED ON NEXT PAGE

3-2 TROUBLESHOOTING CHART - CONTINUED

a. CANNON PROBLEM - CONTINUED (1) CANNON HAS JERKY RECOIL, EXCESSIVE RECOIL FORCE, EXCESSIVE RECOIL TRAVEL, OR INSUFFICIENT RECOIL TRAVEL. - CONTINUED

CONTINUED FROM STEP C

D Check buffer tension (TM 9-2350-314-20-2-1 PMCS).
Is buffer easy to push in and was any damage found?



Remove, disassemble, inspect, and repair buffer assembly as necessary (para 4-12).

E

1. Remove dust cover bolts, slide it forward, and secure in place (TM 9-2350-314-20-2-1).
2. Remove variable recoil housing, slide it forward and secure in place (TM 9-2350-314-20-2-1).
3. Turn vehicle MASTER power switch ON and start engine (TM 9-2350-314-10).
4. Turn HYDRAULIC POWER switch ON (TM 9-2350-314-10).
5. Release travel lock, raise cannon, and lower travel lock (TM 9-2350-314-10).
6. Elevate cannon above 750 mils (TM 9-2350-314-10) while having assistant watch actuator linkage for both internal and external rotation.

Does linkage rotate with index arrows separating?



Go to Step H.

F

1. Depress cannon to 100 mils (TM 9-2350-314-10).
2. Remove spur gear from end of actuator shaft (para 4-8).
3. Elevate cannon while checking arm for gouges and bends and check actuator, follower assembly, and linkage for proper operation.

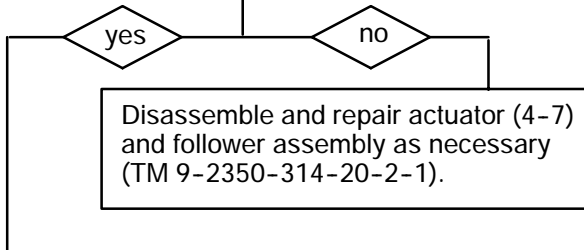
Are actuator, follower assembly, and linkage operating properly and are they free of damage?

CONTINUED ON NEXT PAGE

3-2 TROUBLESHOOTING CHART - CONTINUED

a. CANNON PROBLEM - CONTINUED (1) CANNON HAS JERKY RECOIL, EXCESSIVE RECOIL FORCE, EXCESSIVE RECOIL TRAVEL, OR INSUFFICIENT RECOIL TRAVEL. - CONTINUED

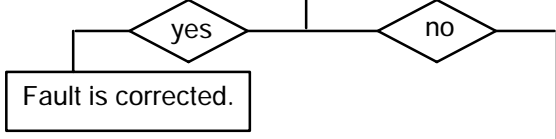
CONTINUED FROM STEP F



G

1. Depress cannon to 100 mils (TM 9-2350-314-10).
2. Using a large flat-tip screwdriver, try to rotate segment gear on variable recoil housing by placing screwdriver in gear teeth and across actuator linkage and applying light pressure.

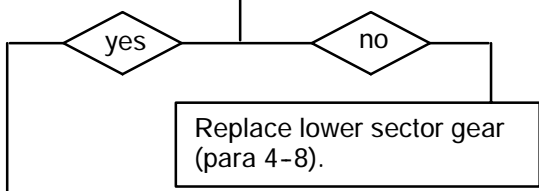
Does gear rotate freely in both directions until upper and lower stops on recoil cylinder are reached?



H

1. Make sure spur gear is removed (para 4-8).
2. Remove upper sector gear (para 4-8).
3. Do Step G-2.

Does segment gear rotate freely?

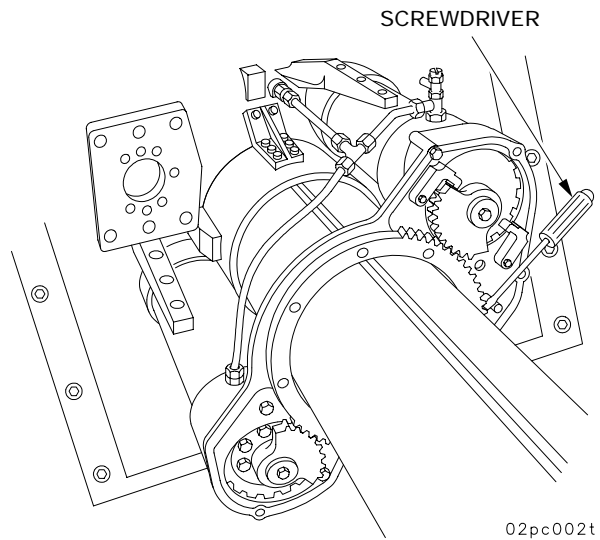


I

1. Install upper sector gear and remove lower sector gear (para 4-8).
2. Do Step G-2 again.

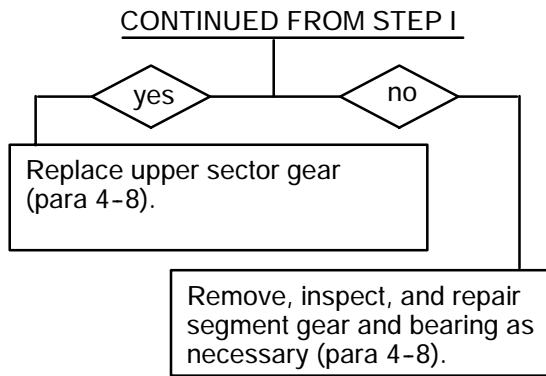
Does segment gear rotate freely?

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3-2 TROUBLESHOOTING CHART - CONTINUED

a. CANNON PROBLEM - CONTINUED (1) CANNON HAS JERKY RECOIL, EXCESSIVE RECOIL FORCE, EXCESSIVE RECOIL TRAVEL, OR INSUFFICIENT RECOIL TRAVEL. - CONTINUED



END OF TASK

3-2 TROUBLESHOOTING CHART - CONTINUED

a. CANNON PROBLEM - CONTINUED (2) CANNON WILL NOT MAINTAIN PROPER HYDRAULIC PRESSURE IN VARIABLE RECOIL SYSTEM.

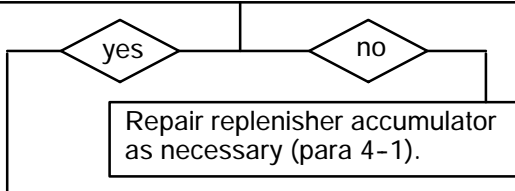
INITIAL SETUP

Tools
 Artillery and turret mechanic's tool kit
 (SC 5180-95-A12)

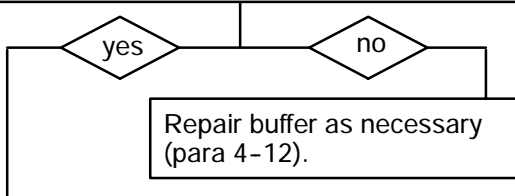
NOTE

Make sure TM 9-2350-314-20-2-1 troubleshooting procedures have been done before doing this procedure. If replenisher is leaking, do Step A. If buffer is leaking, do Step B. If recoil cylinder is leaking, do Step C.

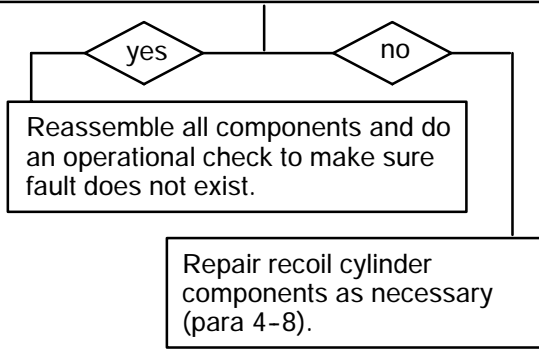
A Remove, disassemble, and check replenisher accumulator for serviceability (para 4-1).
 Is replenisher accumulator serviceable?



B Remove, disassemble, and inspect buffer (para 4-12).
 Is buffer serviceable?



C Remove, disassemble, and inspect recoil cylinder components (para 4-8).
 Are recoil cylinders serviceable?



END OF TASK

3-2 TROUBLESHOOTING CHART - CONTINUED

a. CANNON PROBLEM - CONTINUED (3) CANNON DOES NOT RETURN TO BATTERY.

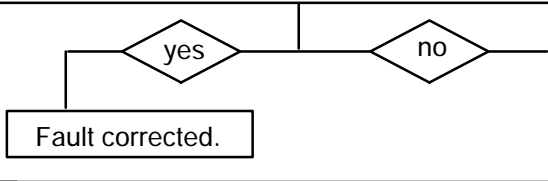
INITIAL SETUP
Tools
 Artillery and turret mechanic's tool kit
 (SC 5180-95-A12)

NOTE
 Check mount assembly for hydraulic leaks and repair as necessary. Make sure troubleshooting procedures in TM 9-2350-314-20-2-1 have been done before starting this procedure.

A

1. Disassemble, inspect and repair recuperator (para 4-4).
2. Return cannon to firing ready condition (TM 9-2350-314-10).
3. Fire cannon (TM 9-2350-314-10).

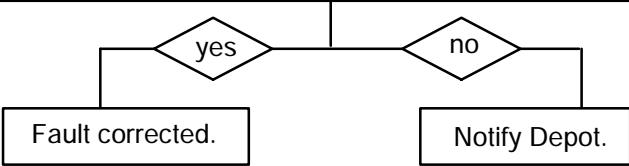
Does cannon return to battery?



B

1. Disassemble and inspect all recoil system components. Repair as necessary (para 4-8).
2. Return cannon to firing ready condition (TM 9-2350-314-10).
3. Fire cannon (TM 9-2350-314-10).

Does cannon return to battery?



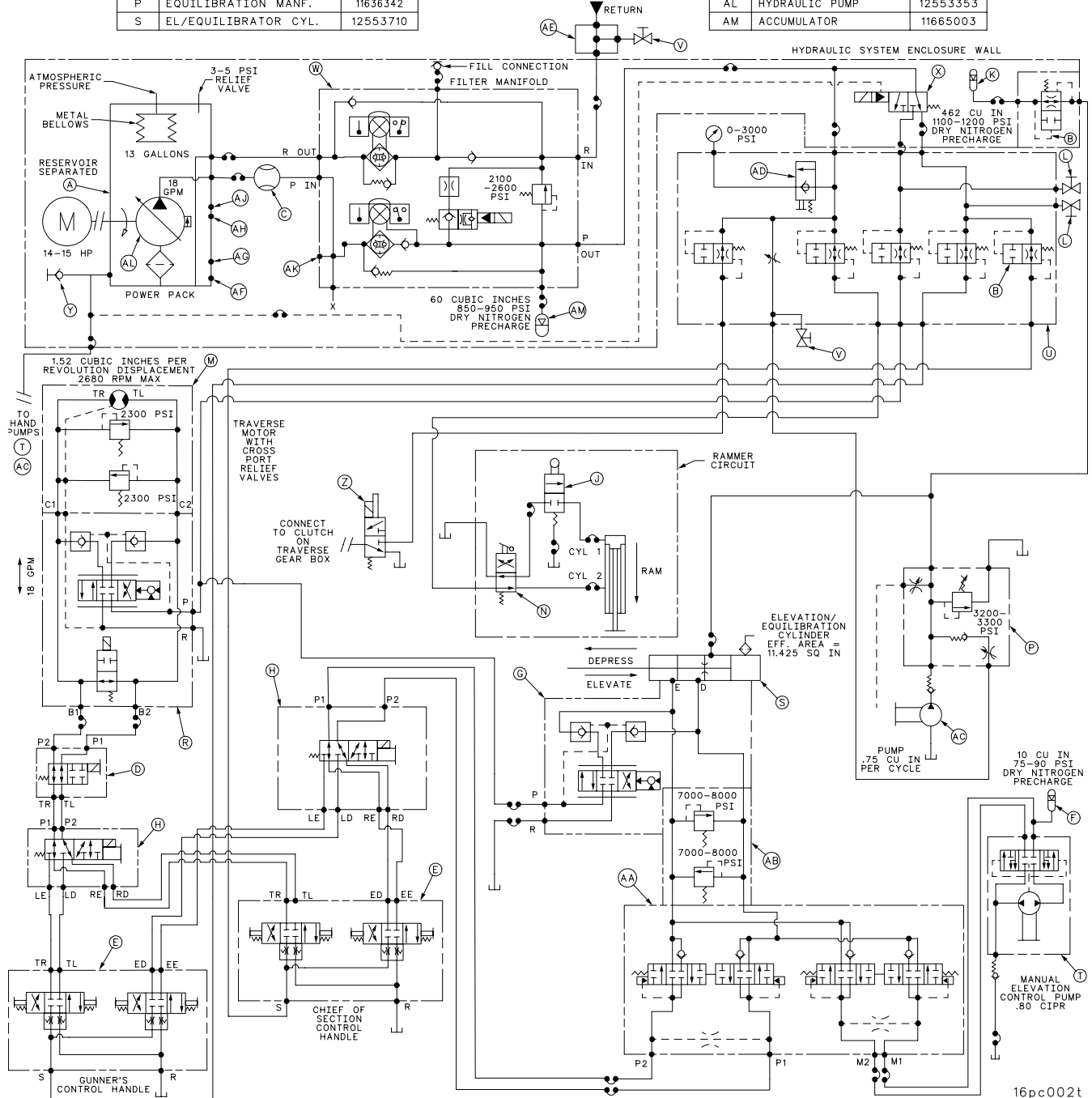
END OF TASK

3-2 TROUBLESHOOTING CHART - CONTINUED

b. ELEVATION PROBLEM - CONTINUED

The equilibration hand pump, manifold, velocity fuse and accumulator work together to provide hydraulic pressure to the elevation cylinder for a smooth rate of elevation or depression.

ITEM	DESCRIPTION	PART NO.	ITEM	DESCRIPTION	PART NO.	ITEM	DESCRIPTION	PART NO.
A	POWERPACK	12927783	T	EL ASSY., MANUAL	12563247	AD	MANUAL PULL VALVE	12948159
B	VELOCITY FUSE	12553425	U	MANIFOLD, FUSE	12553540	AE	RETURN MANIFOLD	12553564
C	FLOW METER	12562735	V	SAMPLING BLEED VALVE	M81940/1-2	AF	COOLING TEMP. SWITCH	M24236/25AGJBA
E	GUNNER'S CONTROL	10922902	W	FILTER ASSY.	12553354	AG	TEMP. TRANSDUCER	12554015
F	ACCUMULATOR	7974982	X	MODE SELECTOR VALVE	12561784	AH	LEVEL SENSOR	12934603
G	EL SERVOVALVE ASSY.	12553898	Y	QUICK DISC. CPL. & HALF	12910614-1	AJ	WARM UP TEMP. SWITCH	M24236/2A8DUCS
H	SELECTOR VALVE	12553595	AA	LOCKING VALVE ASSY.	11784023	AK	PRESSURE TRANSDUCER	12554014
K	ACCUMULATOR,EQUILIBRATION	12553726	AB	RELIEF VALVE	9399024	AL	HYDRAULIC PUMP	12553353
L	BLEED VALVE	11783927	AC	EQUILIBRATION HANDPUMP	7382992	AM	ACCUMULATOR	11665003
P	EQUILIBRATION MANF.	11636342						
S	EL/EQUILIBRATOR CYL.	12553710						



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3-2 TROUBLESHOOTING CHART - CONTINUED

b. ELEVATION PROBLEM - CONTINUED (1) INABILITY TO TRAVERSE AND ELEVATE IN POWER MODE (AFCS and MANUAL mode normal).

INITIAL SETUP

Tools
 Artillery and turret mechanic's tool kit
 (SC 5180-95-A12)

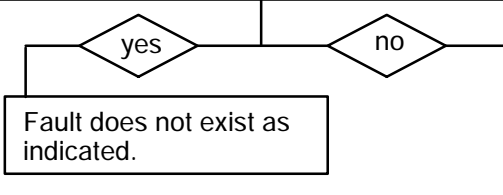
NOTE

- Prior to starting this tree, ensure that the velocity fuse is reset.
- Hydraulic fluid must be between 10° and 250° F operating temperature.

A

1. Turn vehicle MASTER power switch ON (TM 9-2350-314-10).
2. Start engine (TM 9-2350-314-10).
3. Turn HYDRAULIC POWER switch ON (TM 9-2350-314-10).
4. Place traverse control switch in POWER position (TM 9-2350-314-10).
5. Using either the COS or gunner's control handle, try to traverse and elevate (TM 9-2350-314-10).

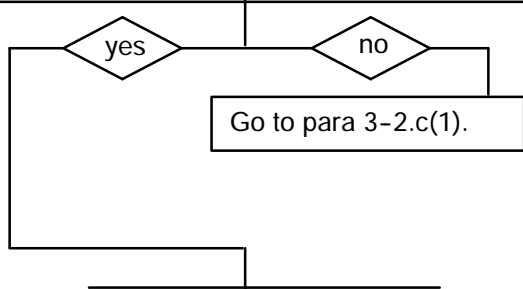
Does cab traverse and gun elevate?



B

1. Hold out pull-to-test handle on hydraulic manifold and check main system pressure (TM 9-2350-314-10).
2. Try to elevate from full depression to maximum elevation and traverse from stop to stop (TM 9-2350-314-10).

Did main system pressure stay at 1500 psi (10342 kPa) during elevation and 1200 psi (8274 kPa) during traverse?



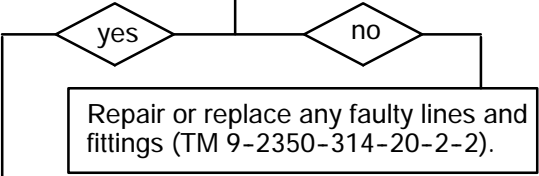
CONTINUED ON NEXT PAGE

3-2 TROUBLESHOOTING CHART - CONTINUED

b. ELEVATION PROBLEM - CONTINUED (1) INABILITY TO TRAVERSE AND ELEVATE IN POWER MODE (AFCS and MANUAL mode normal) - CONTINUED

CONTINUED FROM STEP B

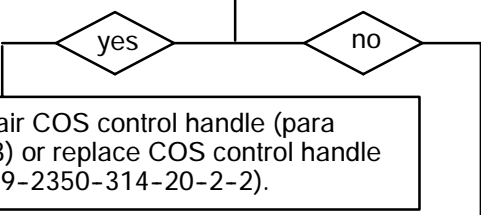
C Inspect all hydraulic lines and fittings for breaks, leaks, and obstructions (TM 9-2350-314-20-2-2).
Are all lines and fittings good?



D 1. Using back of your hand, feel for a difference in temperature between gunner's control handle supply line and lines TL, TR, D and E coming from gunner's control handle.
2. Listen for unusual sounds coming from gunner's control handle.
3. Check the supply line to gunner's control handle for excessive vibration.
Are there excessive vibrations, unusual sounds or temperature differences in lines?

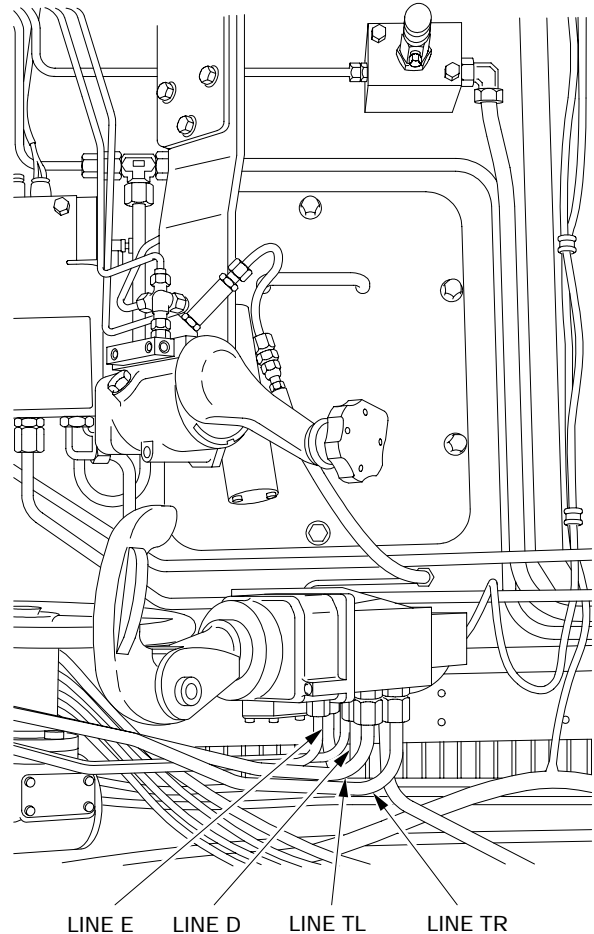


E Do Steps D-1 thru D-3 for COS control handle.
Does COS control handle have excessive vibrations, unusual sounds or any temperature differences?



Fill and bleed system (TM 9-2350-314-20-2-2) and recheck for fault indication.

END OF TASK



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3-2 TROUBLESHOOTING CHART - CONTINUED

b. ELEVATION PROBLEM -
CONTINUED

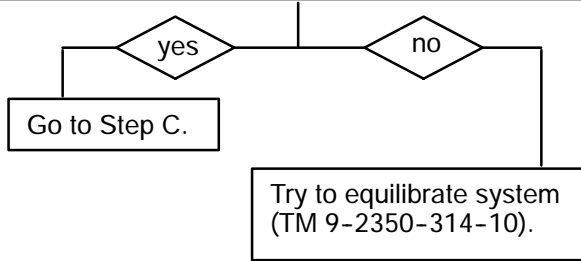
(2) CANNON DOES NOT ELEVATE OR ELEVATES SLOWLY
USING MANUAL ELEVATION SYSTEM.

INITIAL SETUP

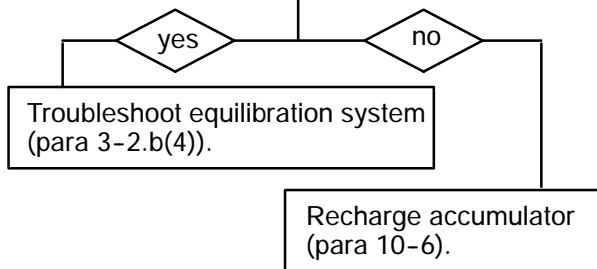
Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Nitrogen charging kit (item 31, Appx F)

A Check equilibration adjustment
(TM 9-2350-314-10).
Is elevation system equilibrated properly?



B Check pressure of elevation hand pump
accumulator (TM 9-2350-314-20-2-2).
Is pressure between 75 and 90 psi?



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3-2 TROUBLESHOOTING CHART - CONTINUED

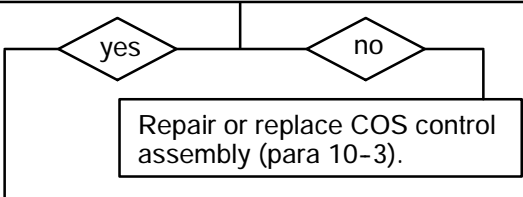
b. ELEVATION PROBLEM - (3) CANNON DRIFTS IN POWER MODE.
CONTINUED

INITIAL SETUP

Tools
Artillery and turret mechanic's tool kit
(SC 5180-95-A12)

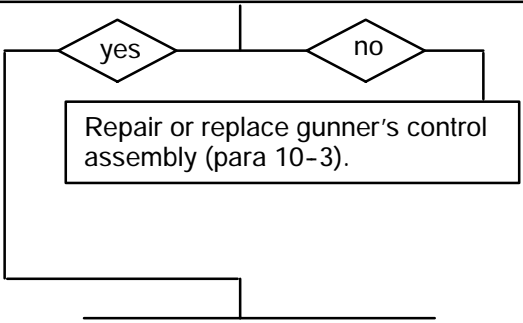
- A**
1. Disconnect harness W7 connector P5 from elevation servovalve (TM 9-2350-314-20-2-1).
 2. Move COS control handle to rear and release (TM 9-2350-314-10).
 3. Move COS control handle forward and release (TM 9-2350-314-10).

Does COS control handle return freely to center (neutral) position?



- B**
1. Move gunner's control handle to rear and release (TM 9-2350-314-10).
 2. Move gunner's control handle forward and release (TM 9-2350-314-10).

Does gunner's control handle return freely to center (neutral) position?



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3-2 TROUBLESHOOTING CHART - CONTINUED

b. ELEVATION PROBLEM - CONTINUED (3) CANNON DRIFTS IN POWER MODE - CONTINUED

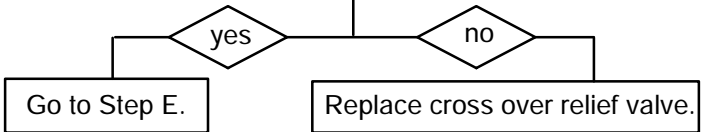
CONTINUED FROM STEP B

WARNING
 Ensure area around cannon is clear and cannon is free to move. Cannon may move when hydraulic power is turned ON, causing injury to personnel or equipment damage.

NOTE
 If cannon elevates or depresses when HYDRAULIC POWER switch is turned ON, turn switch OFF immediately.

- C**
1. Reconnect harness W7 connector P5 to elevation servo valve (TM 9-2350-314-20-2-1).
 2. Turn MASTER switch ON and start engine (TM 9-2350-314-10).
 3. Unlock and lower travel lock (TM 9-2350-314-10).
 4. Make sure gun servo is OFF on DU.
 5. Turn ELEVATE switch to COS (TM 9-2350-314-10).
 6. Turn HYDRAULIC POWER switch ON (TM 9-2350-314-10).
 7. Elevate cannon to 800 mils (or 45°).
 8. Turn HYDRAULIC POWER switch OFF.
 9. Operate control handles until residual hydraulic pressure is dissipated. Manually reset elevation to 800 mils.
 10. Observe cannon for about 5 minutes.

Does cannon hold position?



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3-2 TROUBLESHOOTING CHART - CONTINUED

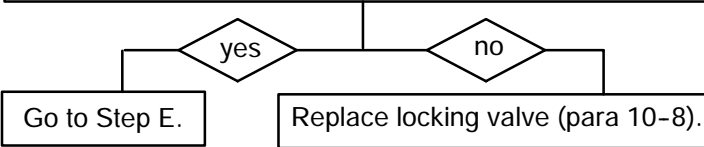
b. ELEVATION PROBLEM - (3) CANNON DRIFTS IN POWER MODE - CONTINUED

CONTINUED FROM STEP C

D

1. Elevate cannon to 800 mils (or 45°).
2. Turn HYDRAULIC POWER switch OFF.
3. Operate control handles until residual hydraulic pressure is dissipated. Manually reset elevation to 800 mils.
4. Observe cannon for about 5 minutes.

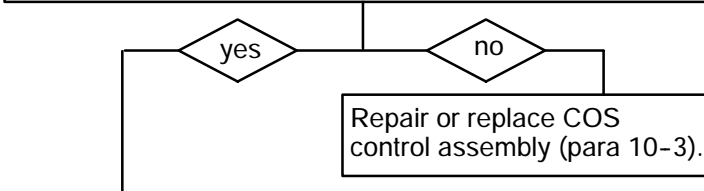
Does cannon hold position?



E

1. Turn HYDRAULIC POWER switch ON.
2. Use the COS control handle to raise cannon to max. elevation, then reset elevation to 800 mils.
3. Observe cannon for about 5 minutes.

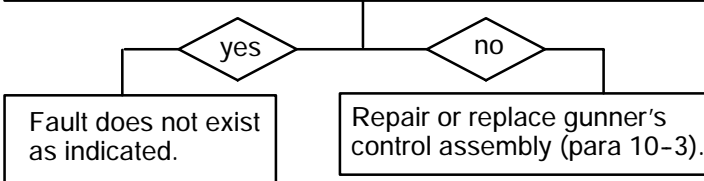
Does cannon hold position?



F

1. Use gunner's control handle to raise cannon to max. elevation, then reset elevation to 800 mils.
2. Observe cannon for about 5 minutes.

Does cannon hold position?



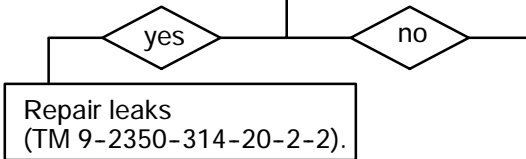
END OF TASK

3-2 TROUBLESHOOTING CHART - CONTINUED

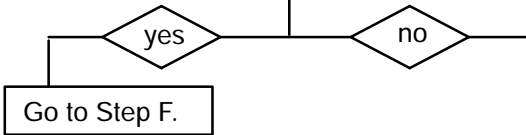
b. ELEVATION PROBLEM - CONTINUED (4) CANNON CANNOT BE EQUILIBRATED - CONTINUED

CONTINUED FROM STEP B

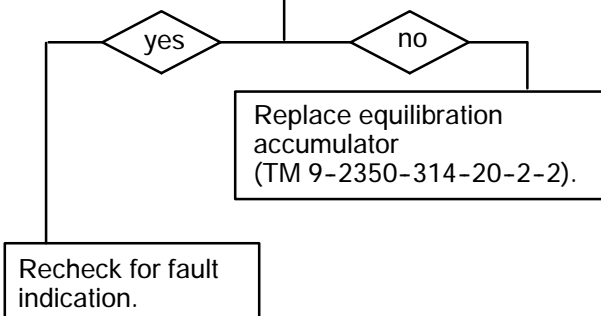
C Inspect all hydraulic lines and fittings for leaks (TM 9-2350-314-20-2-2).
Do leaks exist?



D Hook up nitrogen charging kit to equilibration accumulator and check nitrogen pressure (para 10-6).
Does 1100 to 1200 psi exist?



E 1. Charge accumulator to 1100 to 1200 psi (para 10-6).
2. Let system stand for 1 hour.
3. Check nitrogen pressure (para 10-6).
Did system hold nitrogen pressure?



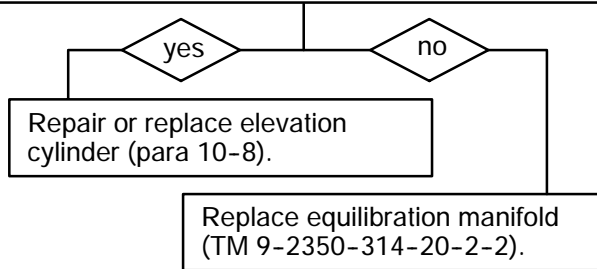
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3-2 TROUBLESHOOTING CHART - CONTINUED

b. ELEVATION PROBLEM - CONTINUED (4) CANNON CANNOT BE EQUILIBRATED - CONTINUED

CONTINUED FROM STEP D

F	<ol style="list-style-type: none">1. Depress cannon to zero mils (TM 9-2350-314-10).2. Open bleed knob on equilibration manifold (TM 9-2350-314-10).3. Elevate cannon to maximum and then depress to zero mils (TM 9-2350-314-10).4. Check nitrogen pressure.
Was pressure maintained between 1100 and 1200 psi?	



END OF TASK

3-2 TROUBLESHOOTING CHART - CONTINUED

c. HYDRAULIC SYSTEM PROBLEM - CONTINUED

The Hydraulic System consists of five major subsystems: hydraulic compartment components, traverse components, elevation components, equilibration components, and the loader/rammer components. The diagram below shows the relationship of these components.

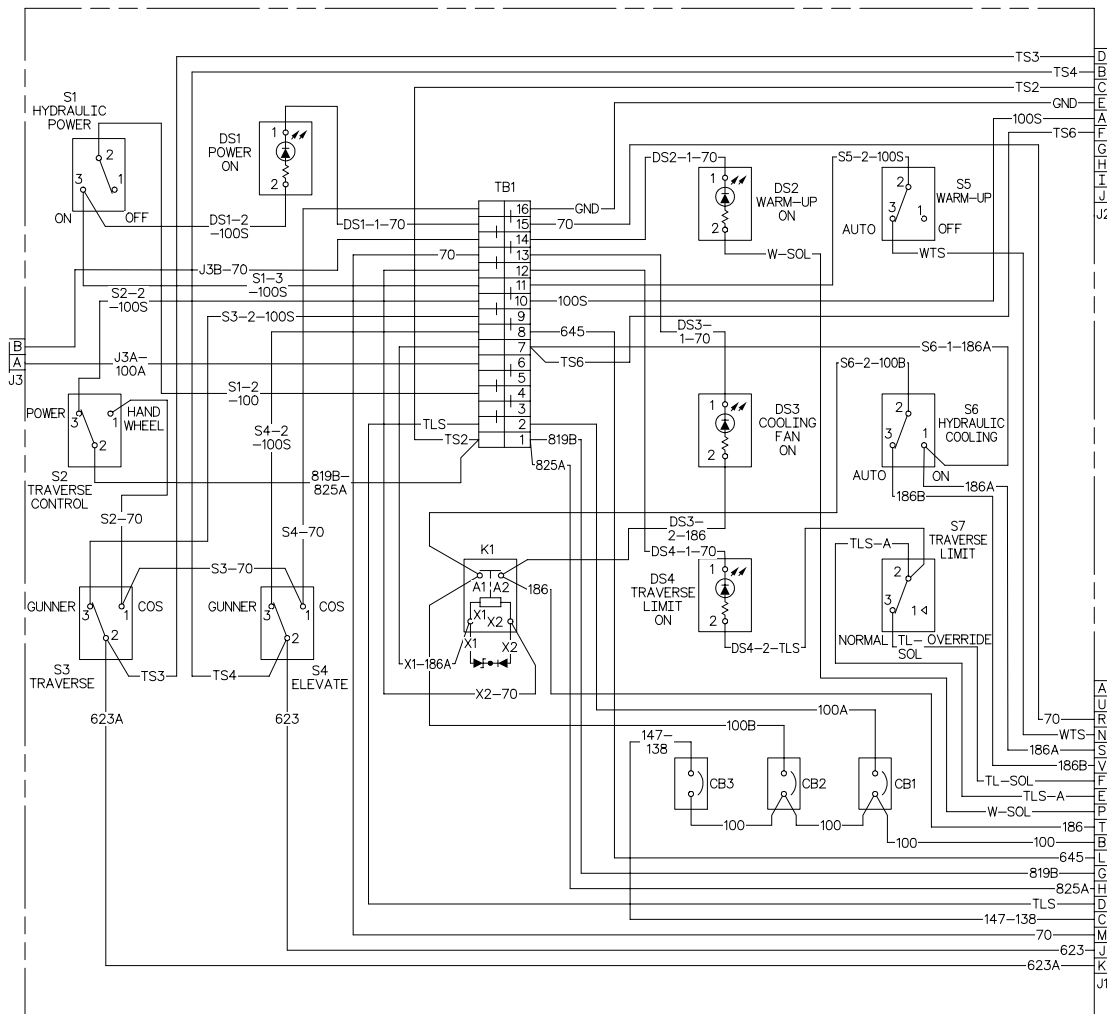
The hydraulic compartment components are used by each of the other four subsystems and consist of the powerpack (hydraulic motor, pump, reservoir, warm-up temperature sensor, cooling temperature sensor, level sensor and temperature transducer), filter assembly, mode selector valve, velocity fuse, and equilibration accumulator.

The traverse components are used during a cab traverse and consist of velocity fuses, clutch valve, gunner and COS control handles, traverse selector valve, traverse limit solenoid valve, azimuth servo valve assembly, and hydraulic motor.

The elevation components are used for cannon elevation and consist of velocity fuses, gunner and COS control handles, elevation selector valve, locking valve assembly, relief valves, elevation servo valve assembly, elevation/equilibration cylinder, manual elevation hand pump assembly, and accumulator.

The equilibration components provide a constant rate of cannon elevation/depression and consist of the equilibration hand pump and the equilibration manifold.

The loader/rammer components are used in loading the projectile into the cannon and consist of the velocity fuse, loader/rammer valve, loader valve, and ram cylinder.



16pc005t

3-2 TROUBLESHOOTING CHART - CONTINUED

c. HYDRAULIC SYSTEM PROBLEM - CONTINUED

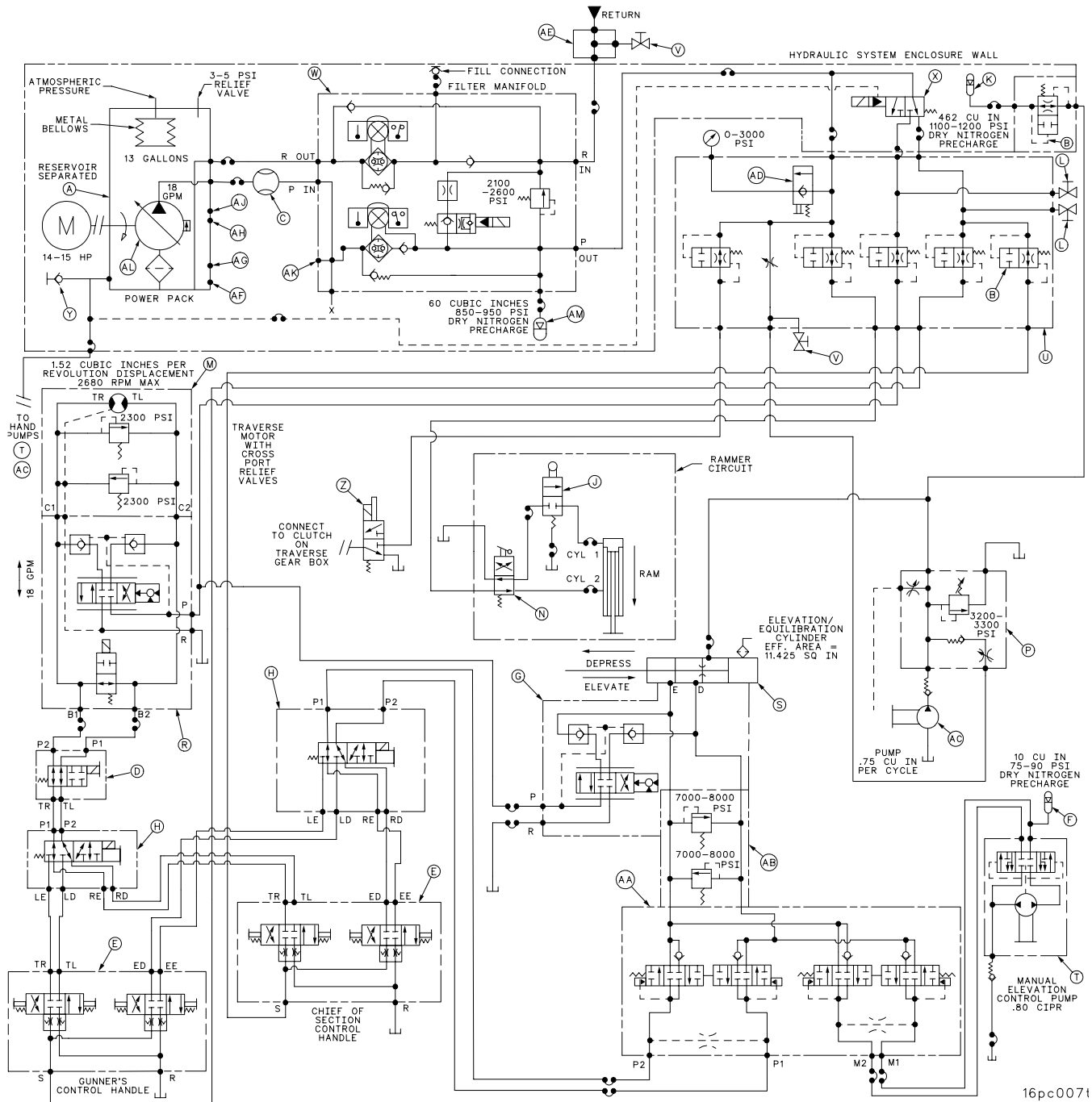
With the MASTER power switch ON, 24 V dc is supplied through the brush blocks to the hydraulic control panel. When HYDRAULIC POWER switch (S1) on the hydraulic control box is ON, 24 V dc is applied to energize the hydraulic motor which in turn provides hydraulic pressure to the system. The hydraulic system is controlled through the hydraulic control box.

ITEM	DESCRIPTION	PART NO.	ITEM	DESCRIPTION	PART NO.	ITEM	DESCRIPTION	PART NO.
A	POWERPACK	12927783	T	EL ASSY., MANUAL	12563247			
B	VELOCITY FUSE	12553425	U	MANIFOLD, FUSE	12553540	AF	COOLING TEMP. SWITCH	M24236/ 25AGJBA
C	FLOW METER	12562735	V	SAMPLING BLEED VALVE	M81940/1-2	AG	TEMP. TRANSDUCER	12554015
E	GUNNER'S CONTROL	10922902	W	FILTER ASSY.	12553354	AH	LEVEL SENSOR	12934603
F	ACCUMULATOR	7974982	X	MODE SELECTOR VALVE	12561784			
G	EL SERVOVALVE ASSY.	12553898	Y	QUICK DISC. CPL. & HALF	12910614-1	AJ	WARM UP TEMP. SWITCH	M24236/ 2A8DUCS
H	SELECTOR VALVE	12553595	AA	LOCKING VALVE ASSY.	11784023	AK	PRESSURE TRANSDUCER	12554014
K	ACCUMULATOR,EQUILIBRATION	12553726	AB	RELIEF VALVE	9399024	AL	HYDRAULIC PUMP	12553353
L	BLEED VALVE	11783927	AC	EQUILIBRATION HANDPUMP	7382992	AM	ACCUMULATOR	11665003
P	EQUILIBRATION MANF.	11636342	AD	MANUAL PULL VALVE	12948159			
S	EL/EQUILIBRATOR CYL.	12553710	AE	RETURN MANIFOLD	12553564			

16pc006t

3-2 TROUBLESHOOTING CHART - CONTINUED

c. HYDRAULIC SYSTEM PROBLEM - CONTINUED



3-2 TROUBLESHOOTING CHART - CONTINUED

c. HYDRAULIC SYSTEM PROBLEM - (1) LOW OR NO HYDRAULIC PRESSURE. CONTINUED

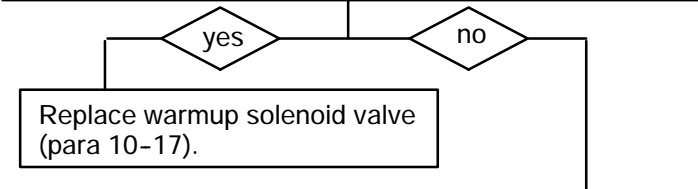
<u>INITIAL SETUP</u>	
Tools Artillery and turret mechanic's tool kit (SC 5180-95-A12)	Materials / Parts Hydraulic fluid (item 42, Appx B)

NOTE

Do PDIU system test (TM 9-2350-314-10). If the test shows "WTV", replace the warmup solenoid valve (para 10-17). If the test shows "FLA", replace the main pressure relief valve (TM 9-2350-314-20-2-2). After repairs, run a system check. If a group of components shows faulty or if the PDIU is not working, make sure paras 3-3.f(1) and 3-3.f(2) of TM 9-2350-314-20-2-1 have been done.

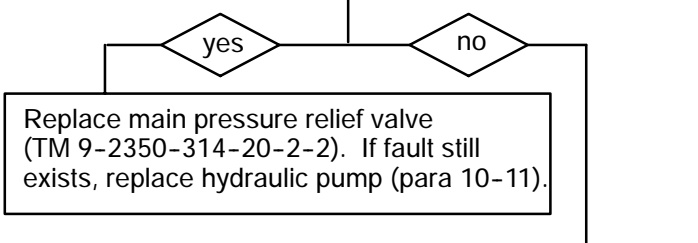
- A**
1. Bleed hydraulic system pressure to zero (TM 9-2350-314-20-2-2).
 2. Fill main hydraulic system and bleed as necessary (TM 9-2350-314-20-2-2).
 3. Turn vehicle MASTER power switch ON (TM 9-2350-314-10).
 4. Start engine (TM 9-2350-314-10).
 5. Turn HYDRAULIC POWER switch ON (TM 9-2350-314-10).
 6. Read hydraulic pressure on system gage and check flow rate.

Is hydraulic pressure below 1500 psi and flow rate more than 10 gpm?



B Check readings again.

Is flow rate between 5 and 10 gpm?



CONTINUED ON NEXT PAGE

3-2 TROUBLESHOOTING CHART - CONTINUED

c. HYDRAULIC SYSTEM PROBLEM - (1) LOW OR NO HYDRAULIC PRESSURE. - CONTINUED
CONTINUED

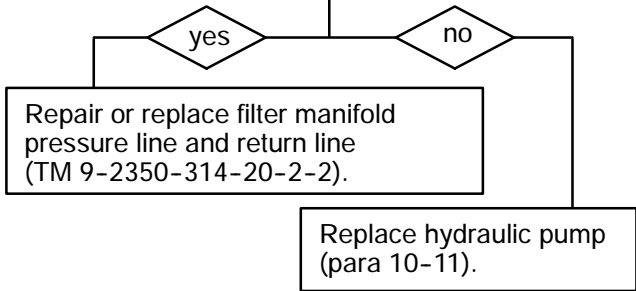
CONTINUED FROM STEP B

WARNING
To prevent injury to personnel, safely seat yourself in cab while traversing cab 360° and ensure area around cannon is clear and cannon is free to move.

CAUTION
To prevent equipment damage, make sure cab and cannon are free of obstructions.

- C**
1. Holding traverse override limit switch (TM 9-2350-314-20-2-1), traverse cab 360°.
 2. Read system gage when you bring cab to a stop.

Is pressure 1500 psi while traversing and 1925 ± 50 psi when stopped?



END OF TASK

3-2 TROUBLESHOOTING CHART - CONTINUED

c. HYDRAULIC SYSTEM PROBLEM - (2) HYDRAULIC PRESSURE GREATER THAN 1975 PSI. CONTINUED

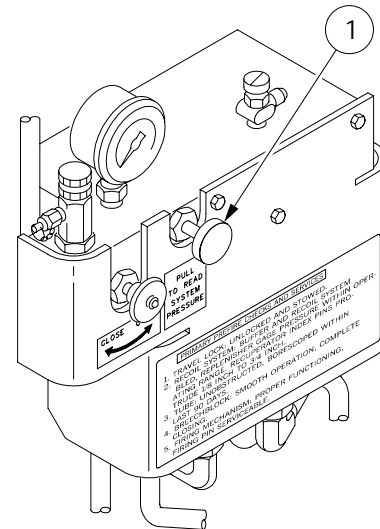
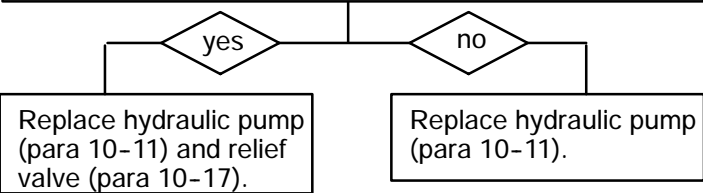
INITIAL SETUP
 Tools
 Artillery and turret mechanic's tool kit
 (SC 5180-95-A12)

NOTE

Make sure PDIU system test (TM 9-2350-314-10) and troubleshooting steps in TM 9-2350-314-20-2-1 have been done before doing this troubleshooting tree. Check for clogs and damaged return lines.

- A**
1. Place vehicle MASTER power switch ON (TM 9-2350-314-10).
 2. Start engine (TM 9-2350-314-10).
 3. Place HYDRAULIC POWER switch ON.
 4. Pull valve (1) open.

Does pressure gage read greater than 1975 PSI?



16pc003t

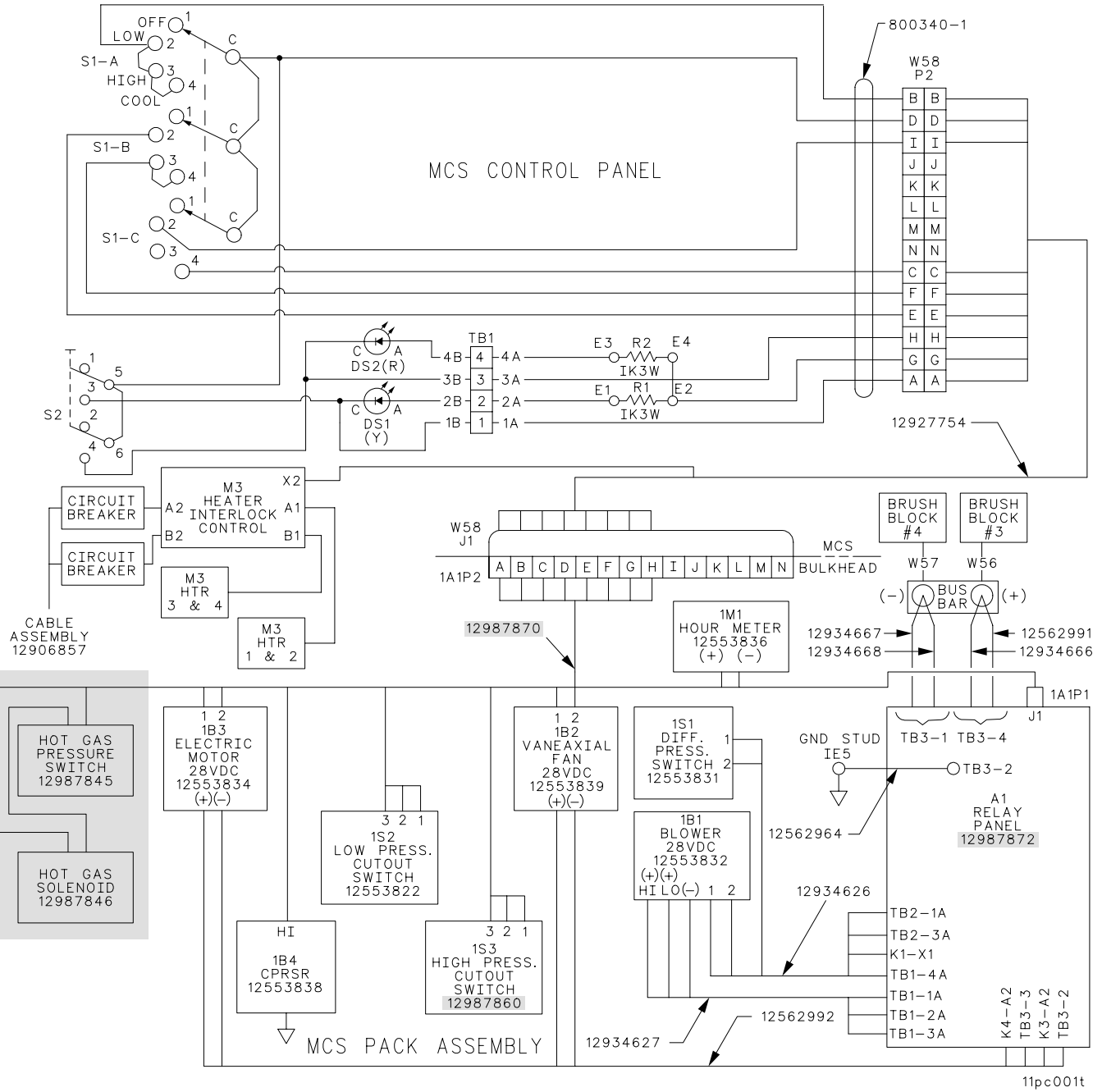
END OF TASK

3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM

The Microclimate Conditioning System (MCS) consists of the MCS control panel, MCS assembly (hourmeter, relay panel, differential pressure switch, blower, vane axial fan, motor, compressor, low pressure cutoout switch and high pressure cutout switch, and associated wiring. The diagram below shows the relationship between these components.

With MASTER power switch ON, 24 V dc is supplied through slip ring brush blocks and bus bar to the MCS assembly and MCS control panel. Switch S1 on the MCS control panel enables the MCS assembly to provide low speed air, high speed air, or cool conditioned air to the crew.



3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (1) CHANGE FILTER LAMP WILL NOT LIGHT.

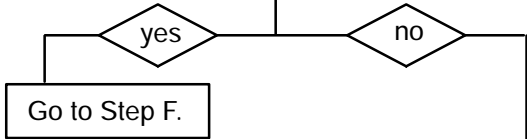
INITIAL SETUP	
<p><u>Tools</u> Artillery and turret mechanic's tool kit (SC 5180-95-A12) Multimeter (item 34, Appx F) TA-1 probe kit (item 53, Appx F)</p>	<p><u>Equipment Conditions</u> MCS control panel removed (TM 9-2350-314-20-2-2) MCS control panel cover plate removed (para 8-20)</p>

NOTE

Prior to performing step A, make sure all screws on terminal board 1 (TB1) are tightened and that all leads are secure.

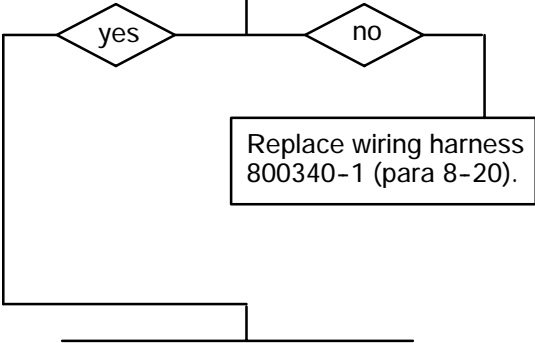
A 1. Press and hold LAMP TEST switch.
 2. Check the MCS control panel for continuity by placing one multimeter lead on MCS control panel connector J1 pin A and placing other lead on MCS control panel connector J1 pin D.

Is continuity present?

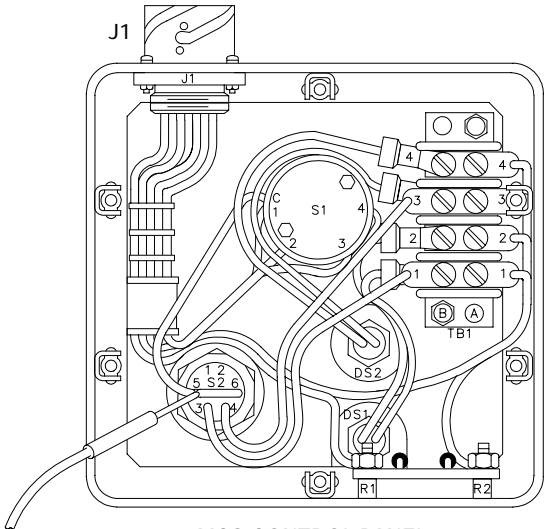
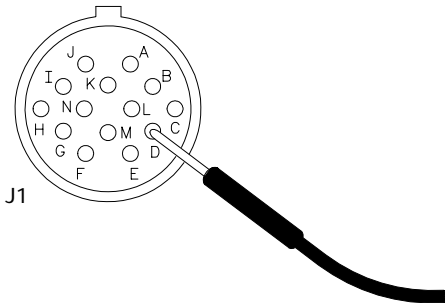
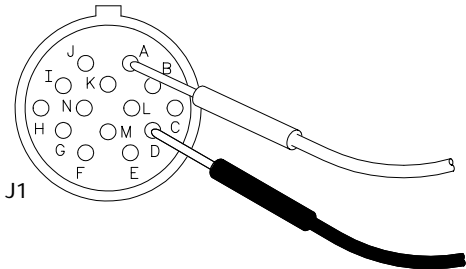


B Check wiring harness 800340-1 for continuity by placing one multimeter lead on MCS control panel J1 pin D and other lead on LAMP TEST switch (S2) terminal 5 (S2-5).

Is continuity present?



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MCS CONTROL PANEL
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11pc002t

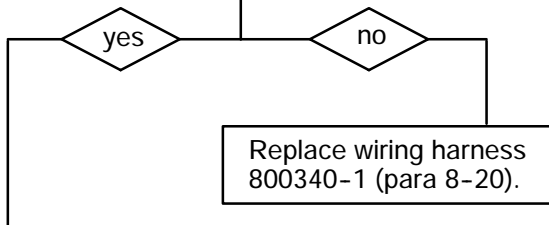
3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (1) CHANGE FILTER LAMP WILL NOT LIGHT. - CONTINUED

CONTINUED FROM STEP B

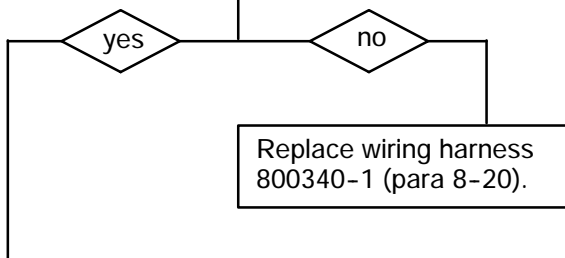
C 1. Press and hold LAMP TEST switch.
2. Check LAMP TEST switch for continuity by placing one multimeter lead on S2-5 and other lead on S2-3.

Is continuity present?



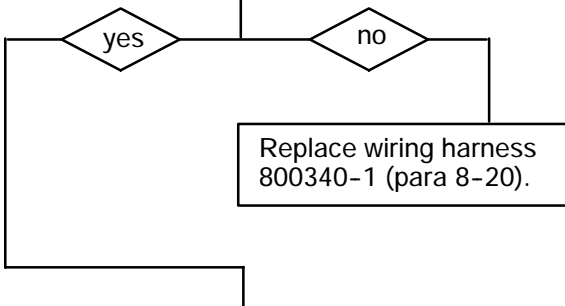
D Check wiring harness 800340-1 for continuity by placing one multimeter lead on TB1-1B and other lead on S2-3.

Is continuity present?

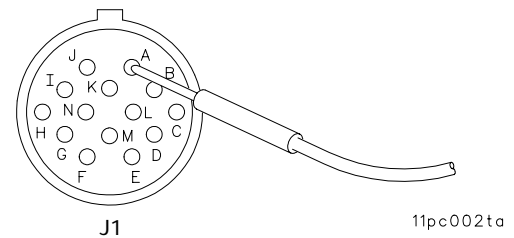
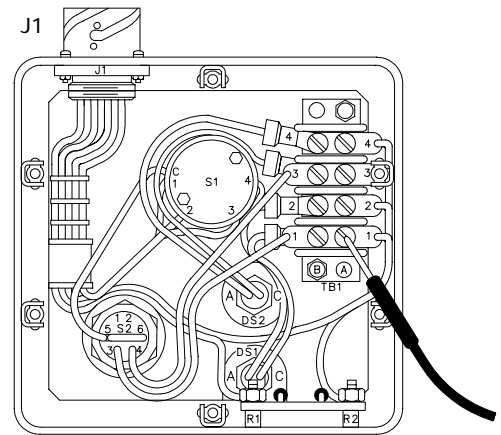
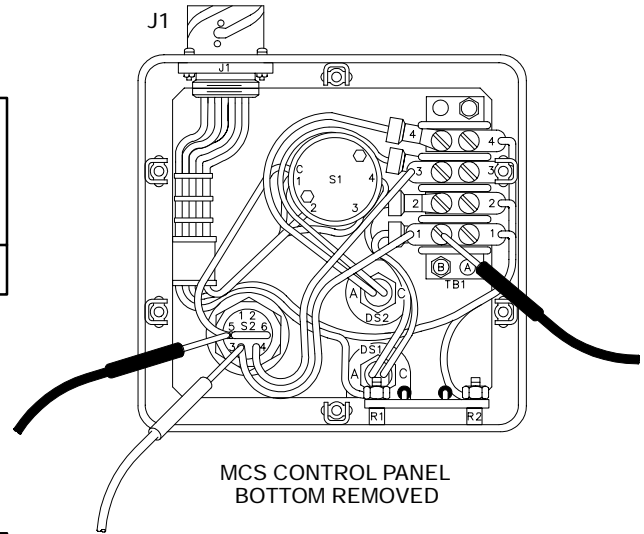


E Check wiring harness 800340-1 for continuity by placing one multimeter lead on MCS control panel connector J1 pin A and other lead on TB1-1A.

Is continuity present?



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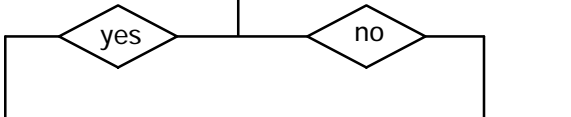
3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (1) CHANGE FILTER LAMP WILL NOT LIGHT. - CONTINUED

CONTINUED FROM STEP E AND A

F Check resistor R1 for resistance by placing one multimeter lead on resistor R1 terminal E1 (R1-E1) and other lead on resistor R1 terminal E2 (R1-E2).

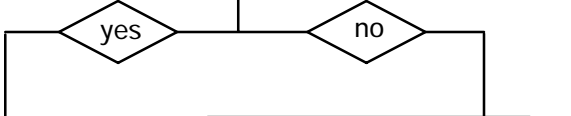
Is resistance greater than 1.1 K ohms?



Replace wiring harness
800340-1 (para 8-20).

G Check wiring harness 800340-1 for continuity by placing one multimeter lead on R1-E1 and other lead on TB1-2A.

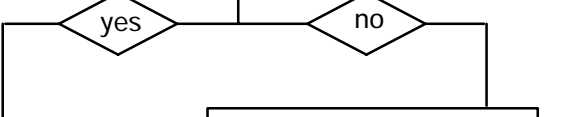
Is continuity present?



Replace wiring harness
800340-1 (para 8-20).

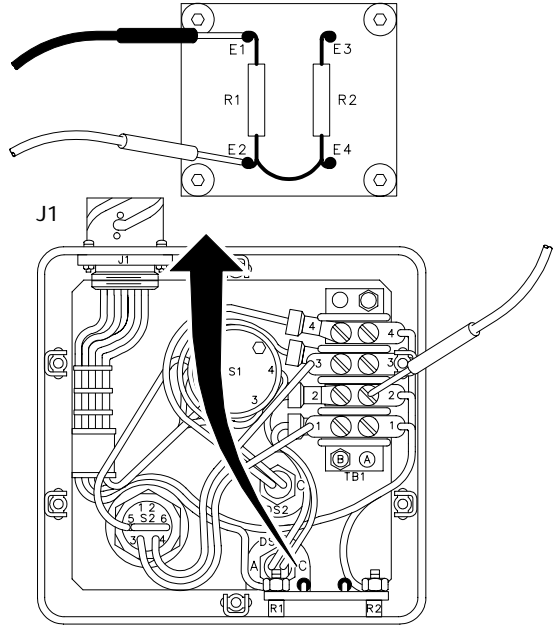
H Check wiring harness 800340-1 for continuity by placing one multimeter lead on TB1-2B and other lead thru insulation on CHANGE FILTER lamp DS1 terminal A (DS1-A).

Is continuity present?

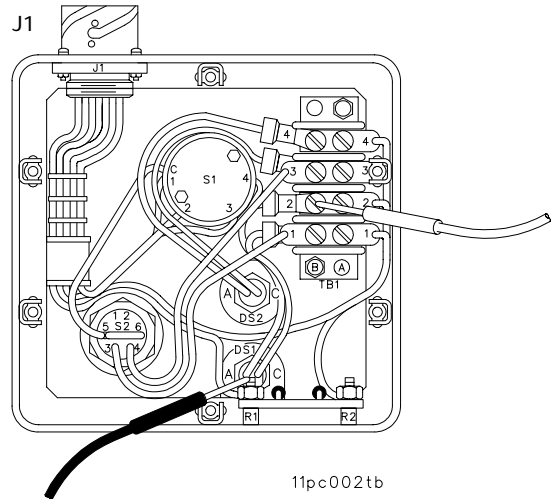


Replace wiring harness
800340-1 (para 8-20).

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MCS CONTROL PANEL
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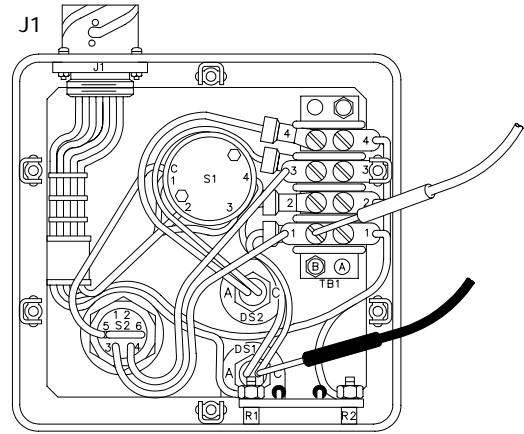
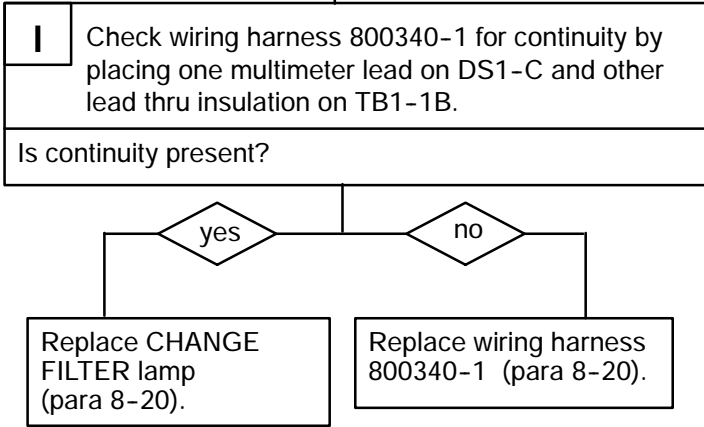


11pc002tb

3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (1) CHANGE FILTER LAMP WILL NOT LIGHT. - CONTINUED

CONTINUED FROM STEP H



MCS CONTROL PANEL
BOTTOM REMOVED

11pc002tc

END OF TASK

3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (2) FREON PRESSURE LAMP WILL NOT LIGHT.

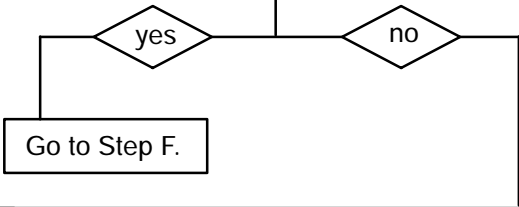
<p>INITIAL SETUP</p> <p><u>Tools</u> Artillery and turret mechanic's tool kit (SC 5180-95-A12) Multimeter (item 34, Appx F) TA-1 probe kit (item 53, Appx F)</p>	<p><u>Equipment Conditions</u> MCS control panel removed (TM 9-2350-314-20-2-2) MCS control panel cover plate removed (para 8-20)</p>
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NOTE

Prior to performing step A, make sure all screws on terminal board 1 (TB1) are tightened and that all leads are secure.

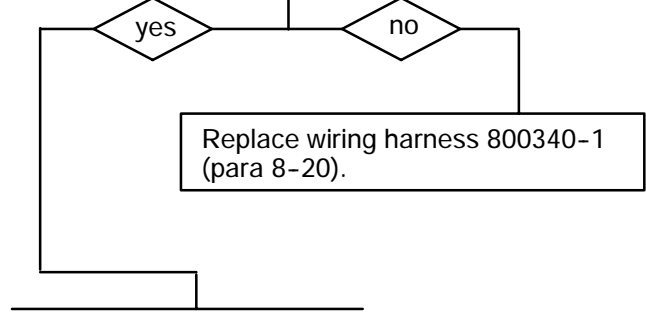
- A**
1. Press and hold LAMP TEST switch.
 2. Check MCS control panel for continuity by placing one multimeter lead on MCS control panel connector J1 pin H and other lead on MCS control box connector J1 pin D.

Is continuity present?

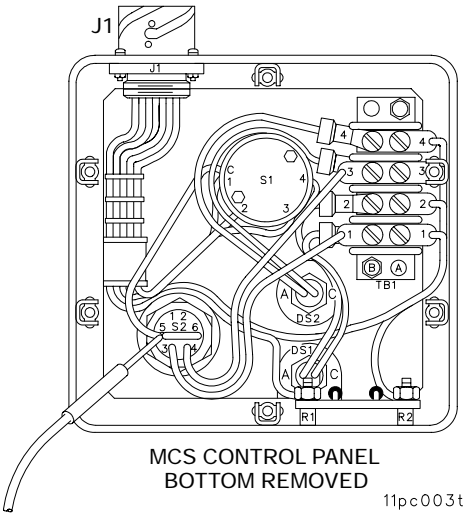
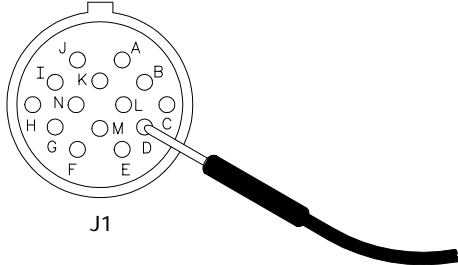
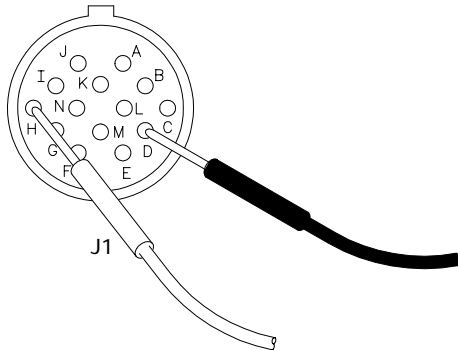


- B**
- Check MCS control panel for continuity by placing one multimeter lead on MCS control panel J1 pin D and other lead on LAMP TEST switch (S2) terminal 5 (S2-5).

Is continuity present?



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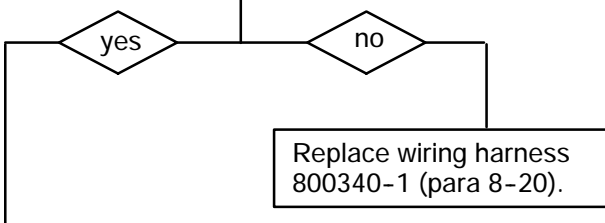
3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (2) FREON PRESSURE LAMP WILL NOT LIGHT. - CONTINUED

CONTINUED FROM STEP B

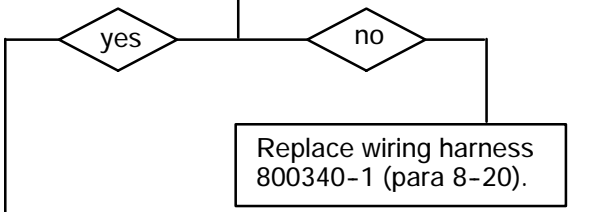
C 1. Press and hold LAMP TEST switch.
2. Check LAMP TEST switch for continuity by placing one multimeter lead on LAMP TEST switch S2-6 and other lead on LAMP TEST switch S2-4.

Is continuity present?



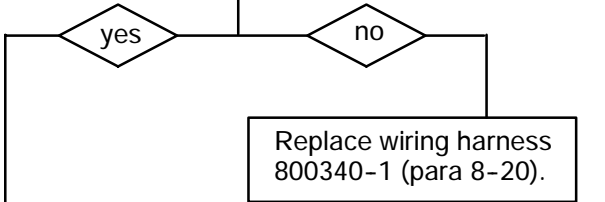
D Check wiring harness 800340-1 for continuity by placing one multimeter lead on TB1-3B and other lead on S2-4.

Is continuity present?

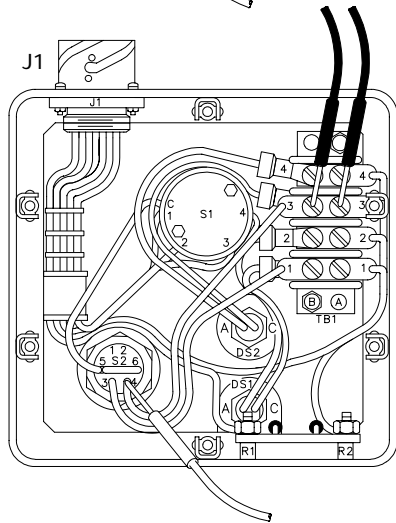
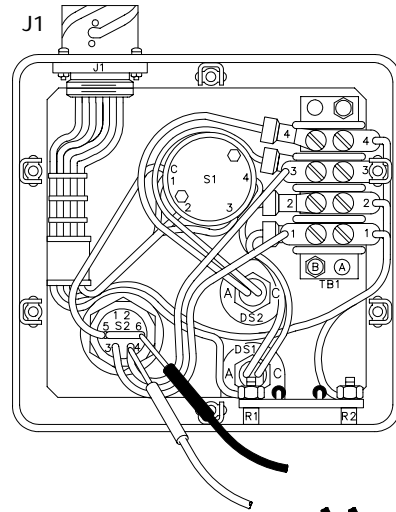


E Check wiring harness 800340-1 for continuity by placing one multimeter lead on TB1-3A and other lead on MCS control panel connector J1 pin H.

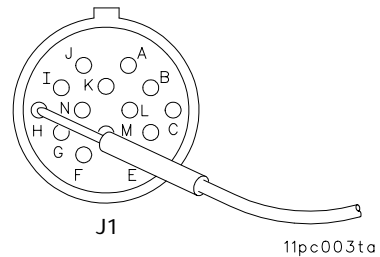
Is continuity present?



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MCS CONTROL PANEL
BOTTOM REMOVED

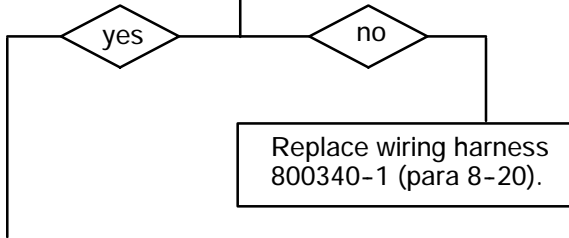


3-2 TROUBLESHOOTING CHART - CONTINUED

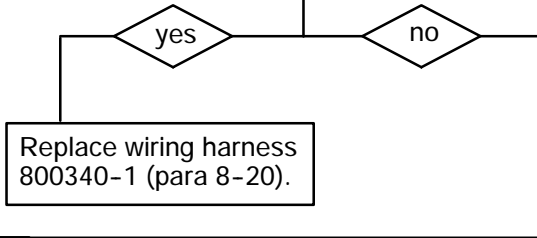
d. MCS PROBLEM - CONTINUED (2) FREON PRESSURE LAMP WILL NOT LIGHT. - CONTINUED

CONTINUED FROM STEP E

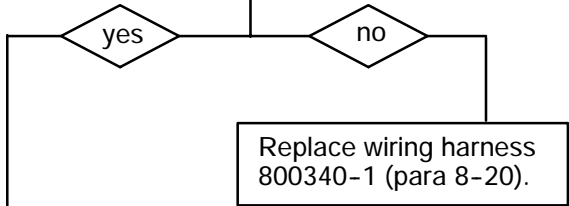
F Check resistor for continuity by placing one multi-meter lead on circuit board terminal E2 and other lead on circuit board terminal E4.
Is continuity present?



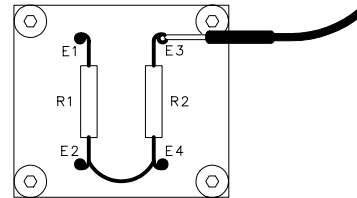
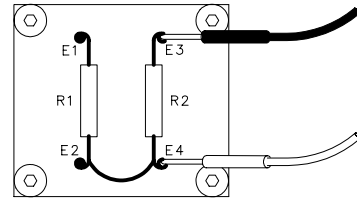
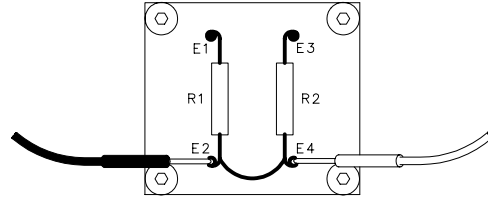
G Check resistor for resistance by placing one multi-meter lead on resistor R2 terminal E3 and other lead on resistor R2 terminal E4.
Is resistance greater than 1.1 K ohms?



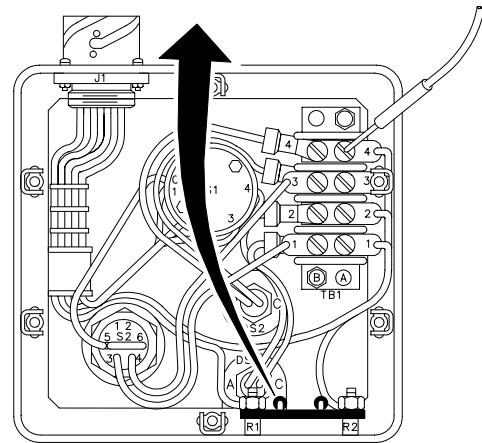
H Check wiring harness 800340-1 for continuity by placing one multimeter lead on R2-E3 and other lead on TB1-4A.
Is continuity present?



CONTINUED ON NEXT PAGE



MCS CIRCUIT BOARD



MCS CONTROL PANEL
BOTTOM REMOVED

11pc003tb

3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (2) FREON PRESSURE LAMP WILL NOT LIGHT. - CONTINUED

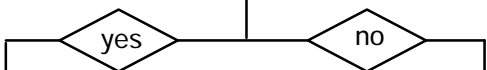
CONTINUED FROM STEP H

I Check wiring harness 800340-1 for continuity by placing one multimeter lead on TB1-3B and other lead on FREON PRESSURE lamp DS2-A.
Is continuity present?



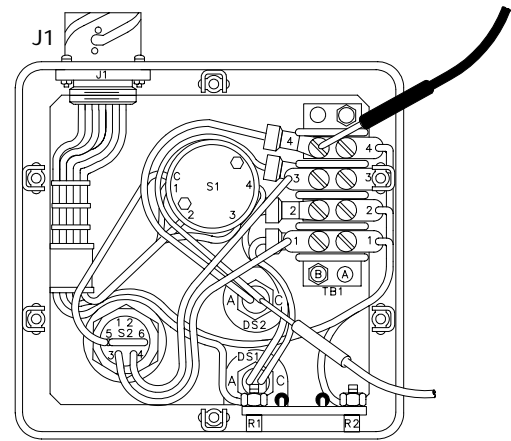
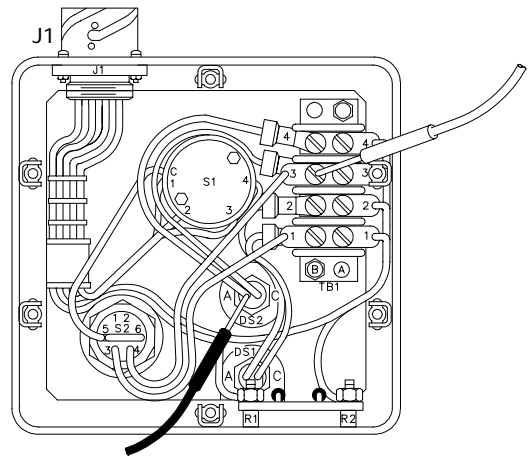
Replace wiring harness 800340-1 (para 8-20).

J Check wiring harness 800340-1 for continuity by placing one multimeter lead on DS2-C and other lead on TB1-4B.
Is continuity present?



Replace FREON PRESSURE lamp (para 8-20).

Replace wiring harness 800340-1 (para 8-20).



MCS CONTROL PANEL
BOTTOM REMOVED

11pc003tc

END OF TASK

3-2 TROUBLESHOOTING CHART - CONTINUED

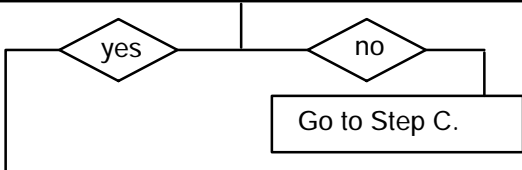
d. MCS PROBLEM - CONTINUED (3) MCS DOES NOT OPERATE IN LO MODE.

INITIAL SETUP	
<p><u>Tools</u> Artillery and turret mechanic's tool kit (SC 5180-95-A12) Multimeter (item 34, Appx F) TA-1 probe kit (item 53, Appx F)</p>	<p><u>Equipment Conditions</u> MCS relay panel cover removed (TM 9-2350-314-20-2-2) Filter cover assembly removed (TM 9-2350-314-20-2-2)</p>

A

1. Place red multimeter lead on IN side of circuit breaker 2 (CB2) and place black lead to ground.
2. Place vehicle MASTER power switch to ON and place MCS control panel switch to LO mode (TM 9-2350-314-10).
3. Check for voltage.

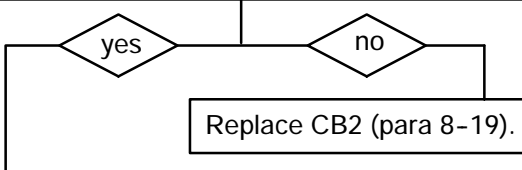
Is voltage present?



B

1. Place red multimeter lead on OUT side of CB2 and place black lead to ground.
2. Check for voltage.

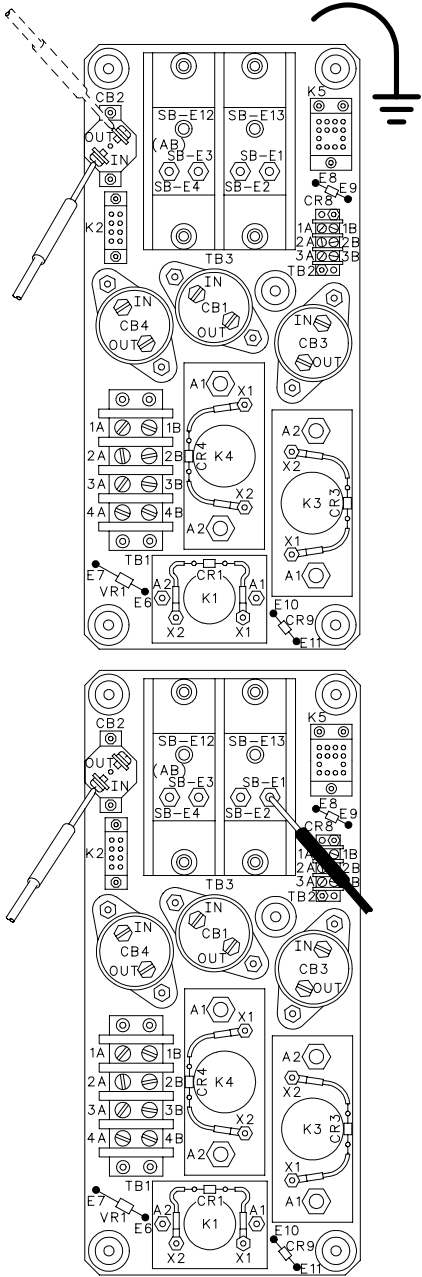
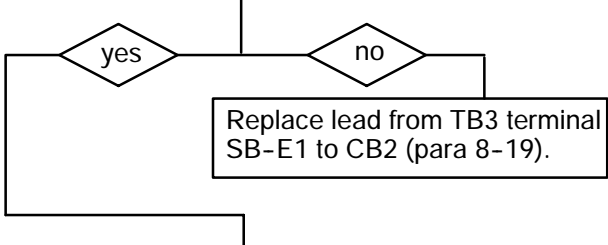
Is voltage present?



C

1. Turn vehicle MASTER power switch and MCS control panel switch OFF (TM 9-2350-314-10).
2. Place one multimeter lead on TB3 terminal SB-E1 and other lead on CB2 IN side.
3. Check for continuity.

Is continuity present?



CONTINUED ON NEXT PAGE

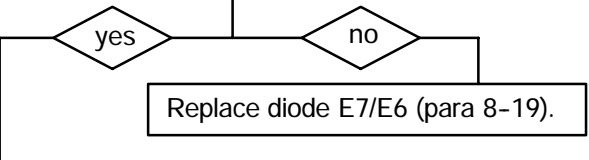
3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (3) MCS DOES NOT OPERATE IN LO MODE. - CONTINUED

CONTINUED FROM STEP C

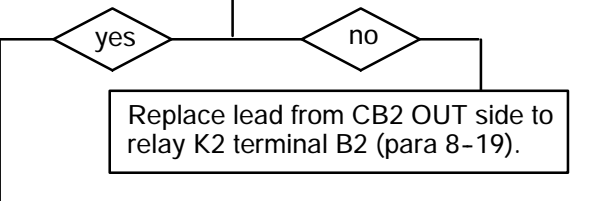
D 1. Place one multimeter lead on diode terminal E7 and other lead on diode terminal E6.
2. Check for continuity.

Is continuity present?



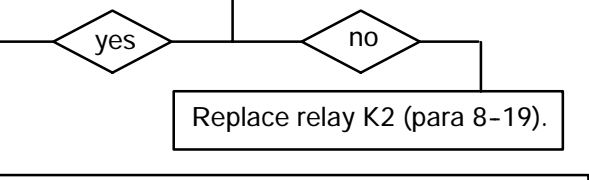
E 1. Place one multimeter lead on CB2 OUT side and other lead on relay K2 terminal B2.
2. Check for continuity.

Is continuity present?



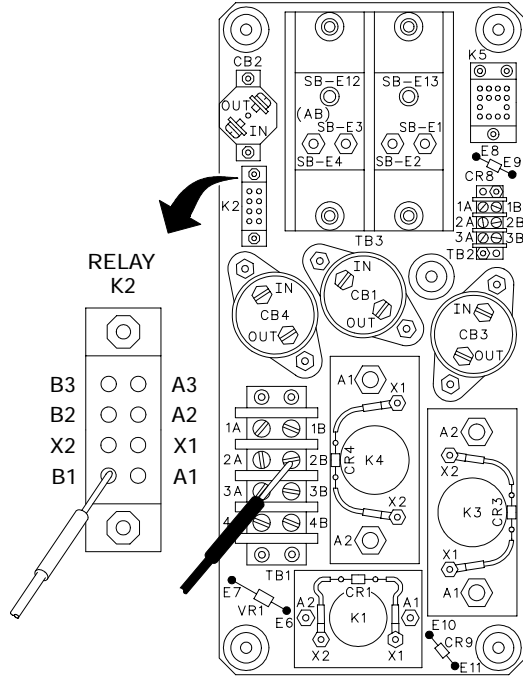
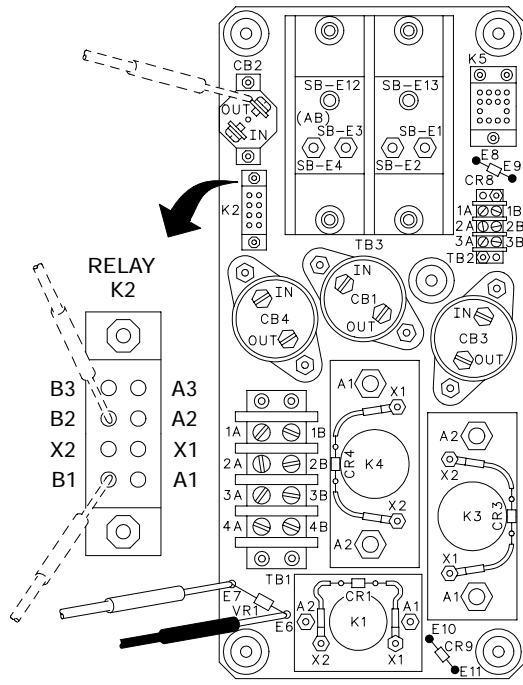
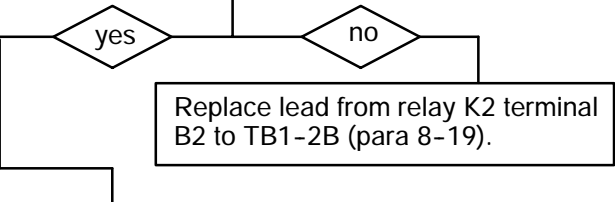
F 1. Turn MCS control panel to LO mode (TM 9-2350-314-10).
2. Place one multimeter lead on relay K2 terminal B2 and other lead on relay K2 terminal B1.
3. Check for continuity.

Is continuity present?



G 1. Place one multimeter lead on relay K2 terminal B1 and other lead on terminal board 1 (TB1) terminal 2B.
2. Check for continuity.

Is continuity present?



11pc004ta

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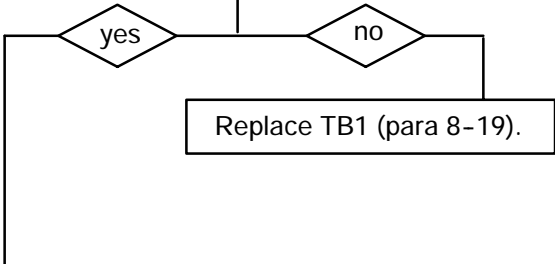
3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (3) MCS DOES NOT OPERATE IN LO MODE. - CONTINUED

CONTINUED FROM STEP G

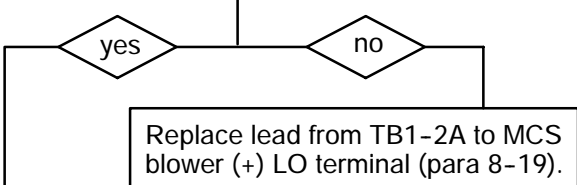
H 1. Place one multimeter lead on TB1-2B and other lead on TB1-2A.
2. Check for continuity.

Is continuity present?



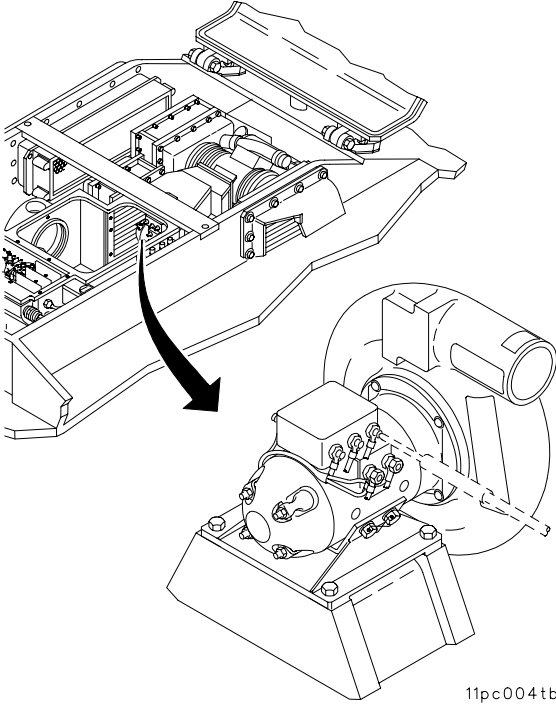
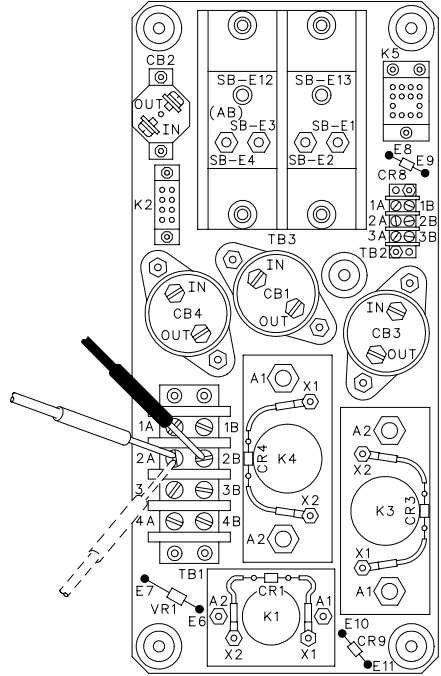
I 1. Place one multimeter lead on TB1-2A and place other lead on MCS blower (+) LO terminal.
2. Check for continuity.

Is continuity present?



Repair MCS blower (para 8-14).

END OF TASK



11pc004tb

3-2 TROUBLESHOOTING CHART - CONTINUED

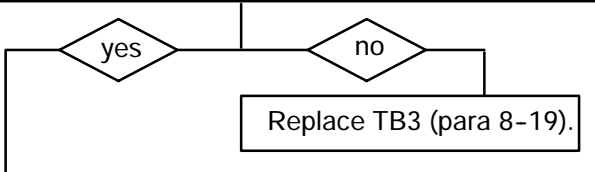
d. MCS PROBLEM - CONTINUED (4) MCS DOES NOT OPERATE IN HI MODE.

INITIAL SETUP	
<p><u>Tools</u> Artillery and turret mechanic's tool kit (SC 5180-95-A12) Multimeter (item 34, Appx F) TA-1 probe kit (item 53, Appx F)</p>	<p><u>Equipment Conditions</u> MCS relay panel cover removed (TM 9-2350-314-20-2-2) Filter cover assembly removed (TM 9-2350-314-20-2-2)</p>

A

1. Turn vehicle MASTER power switch ON and MCS control panel switch to HI (TM 9-2350-314-10).
2. Place red multimeter lead on terminal board 3 (TB3) terminal SB-E1 and black lead to ground.
3. Check for voltage.

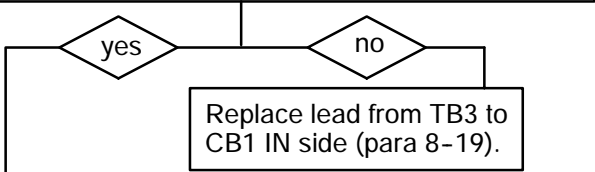
Is voltage present?



B

1. Place red multimeter lead on circuit breaker 1 (CB1) IN side and black lead to ground.
2. Check for voltage.

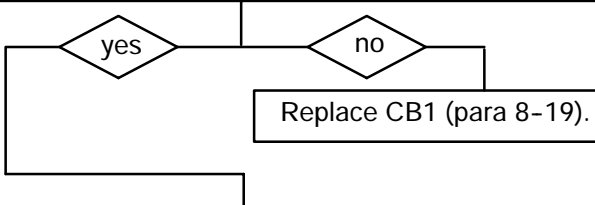
Is voltage present?



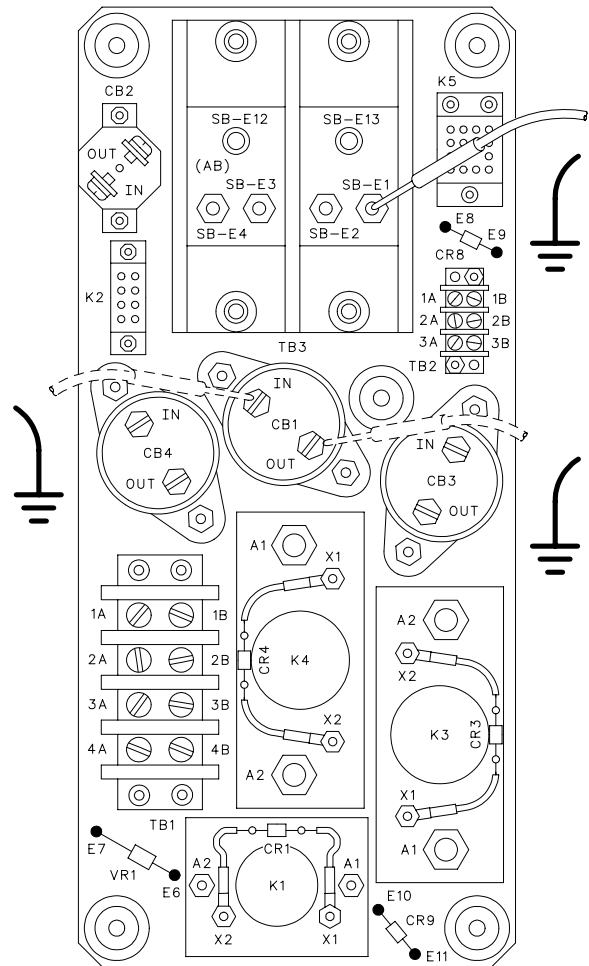
C

1. Place red multimeter lead on CB1 OUT side and black lead to ground.
2. Check for voltage.

Is voltage present?



CONTINUED ON NEXT PAGE



11pc005t

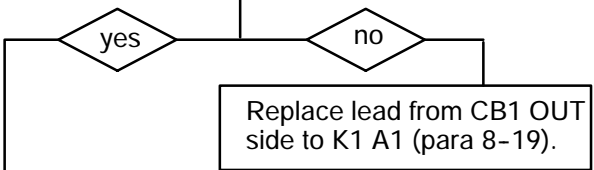
3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (4) MCS DOES NOT OPERATE IN HI MODE. - CONTINUED

CONTINUED FROM STEP C

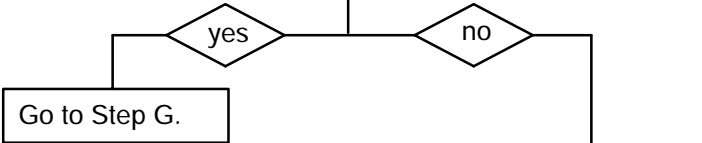
D 1. Place red multimeter lead on relay K1 terminal A1 and black lead to ground.
2. Check for voltage.

Is voltage present?



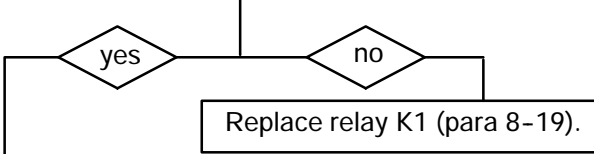
E 1. Place red multimeter lead on relay K1 terminal A2 (K1-A2) and black lead to ground.
2. Check for voltage.

Is voltage present?

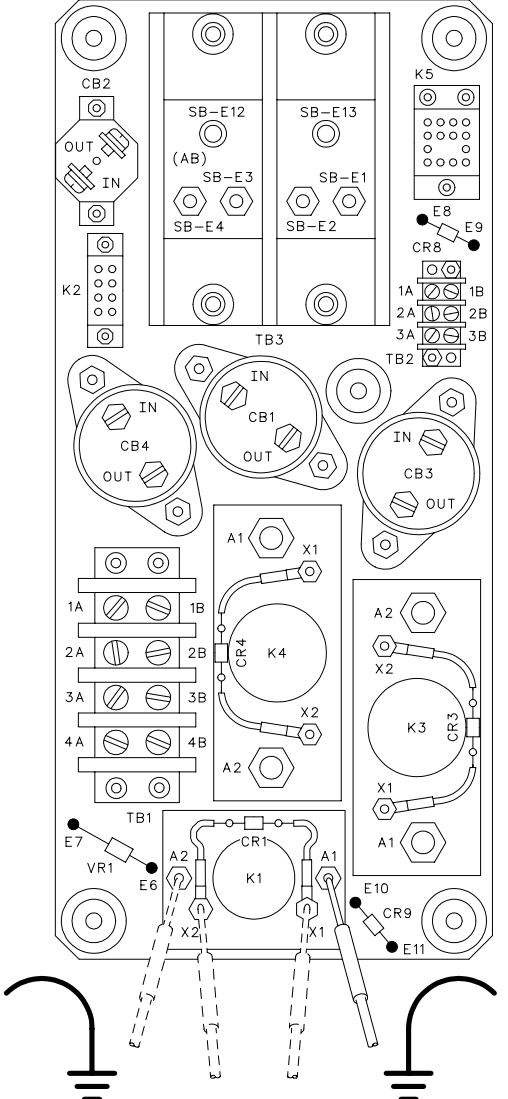


F 1. Turn vehicle MASTER power switch OFF (TM 9-2350-314-10).
2. Disconnect wire from relay K1 terminal X1 (K1-X1).
3. Place one multimeter lead on K1- X1 and other lead on relay K1 terminal X2 (K1-X2).
4. Check for continuity.

Is continuity present?



Replace lead CR1 from K1-X1 to K1-X2 (para 8-19).



11pc005ta

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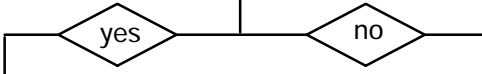
3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (4) MCS DOES NOT OPERATE IN HI MODE. - CONTINUED

CONTINUED FROM STEP E

G 1. Place red multimeter lead on terminal board 1 terminal 1B (TB1-1B) and black lead to ground.
2. Check for voltage.

Is voltage present?



Replace lead from K1-A2 to TB1-1B (para 8-19).

H 1. Turn vehicle MASTER power switch OFF (TM 9-2350-314-10).
2. Place one multimeter lead on TB1-1B and other lead on TB1-1A.
3. Check for continuity.

Is continuity present?



Replace TB1 (para 8-19).

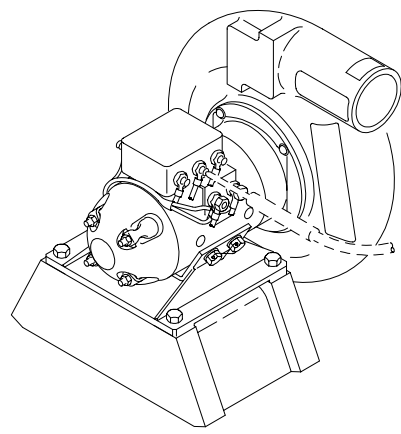
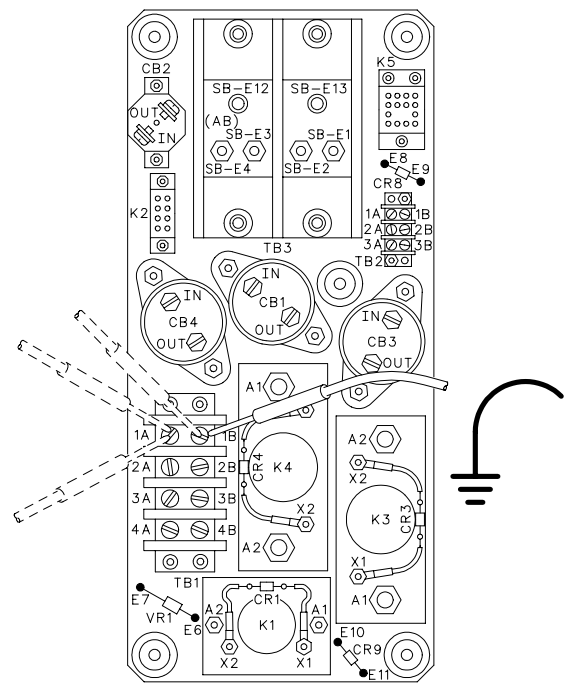
I 1. Place one multimeter lead on TB1-1A and other lead on blower terminal (+) HI.
2. Check for continuity.

Is continuity present?



Replace lead from TB1-1A to MCS blower (para 8-19).

Repair MCS blower (para 8-14).



11pc005tb

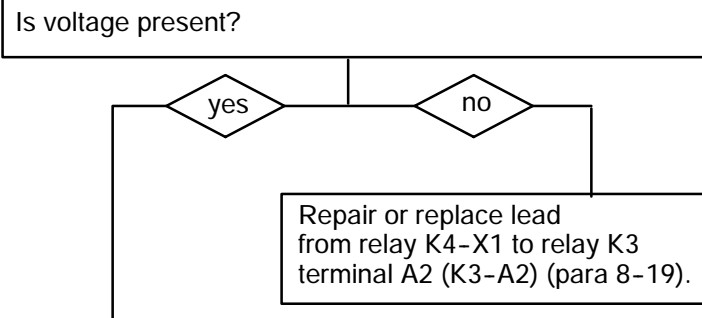
END OF TASK

3-2 TROUBLESHOOTING CHART - CONTINUED

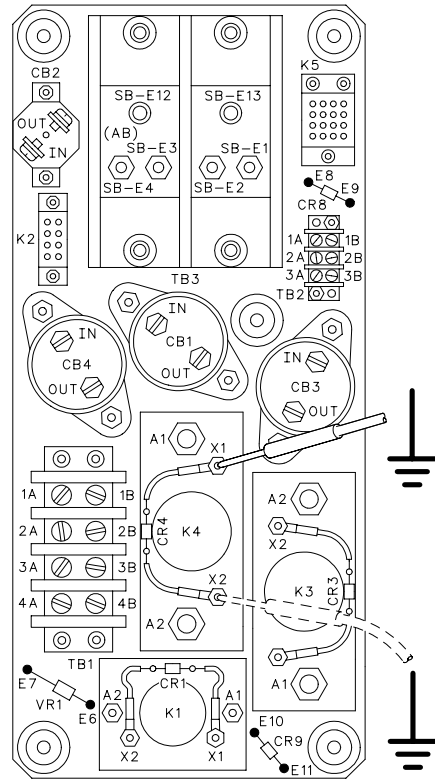
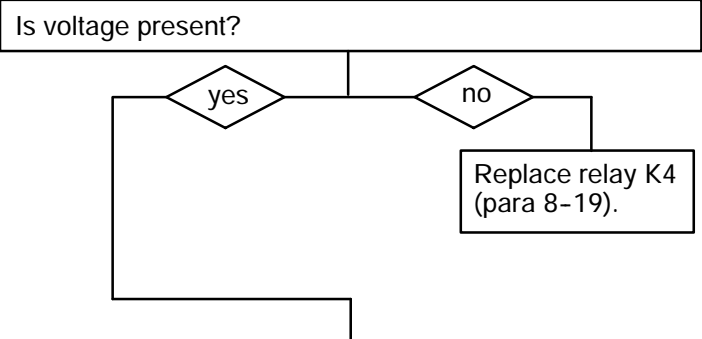
d. MCS PROBLEM - CONTINUED (5) MCS DOES NOT OPERATE IN COOL MODE.

INITIAL SETUP	
<p><u>Tools</u> Artillery and turret mechanic's tool kit (SC 5180-95-A12) Multimeter (item 34, Appx F) TA-1 probe kit (item 53, Appx F)</p>	<p><u>Equipment Conditions</u> MCS relay panel cover removed (TM 9-2350-314-20-2-2) Filter cover assembly removed (TM 9-2350-314-20-2-2)</p>

- A**
1. Turn vehicle MASTER power switch ON and turn MCS control panel switch to COOL (TM 9-2350-314-10).
 2. Place red multimeter lead on relay K4-X1 and black lead to ground.
 3. Check for voltage.



- B**
1. Place red multimeter lead on relay K4 terminal X2 (K4-X2) and black lead to ground.
 2. Check for voltage.



11pc006t

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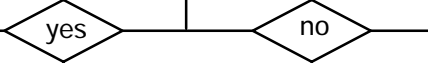
3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (5) MCS DOES NOT OPERATE IN COOL MODE - CONTINUED

CONTINUED FROM STEP B

C 1. Place red multimeter lead on relay K4 terminal A2 (K4-A2) and black lead to ground.
2. Check for voltage.

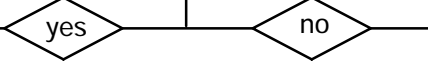
Is voltage present?



Go to step H.

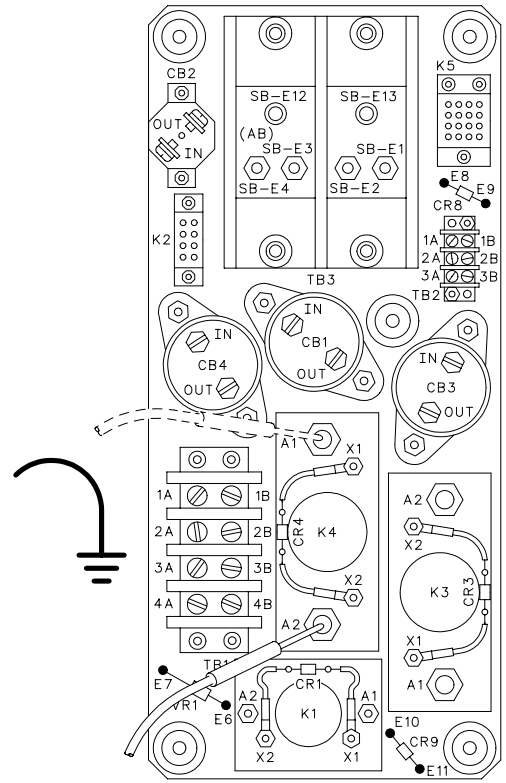
D 1. Place red multimeter lead on relay K4 terminal A1 (K4-A1) and black lead to ground.
2. Check for voltage.

Is voltage present?



Replace relay K4 (para 8-19).

CONTINUED ON NEXT PAGE



11pc006ta

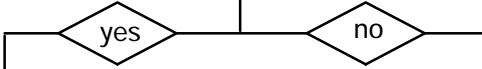
3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (5) MCS DOES NOT OPERATE IN COOL MODE - CONTINUED

CONTINUED FROM STEP D

E 1. Place red multimeter lead on circuit breaker 4 (CB4) OUT side and black lead to ground.
2. Check for voltage.

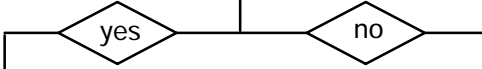
Is voltage present?



Replace lead from CB4 OUT side to K4-A1 (para 8-19).

F 1. Place red multimeter lead on CB4 IN side and black lead to ground.
2. Check for voltage.

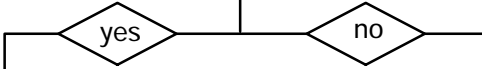
Is voltage present?



Replace CB4 (para 8-19).

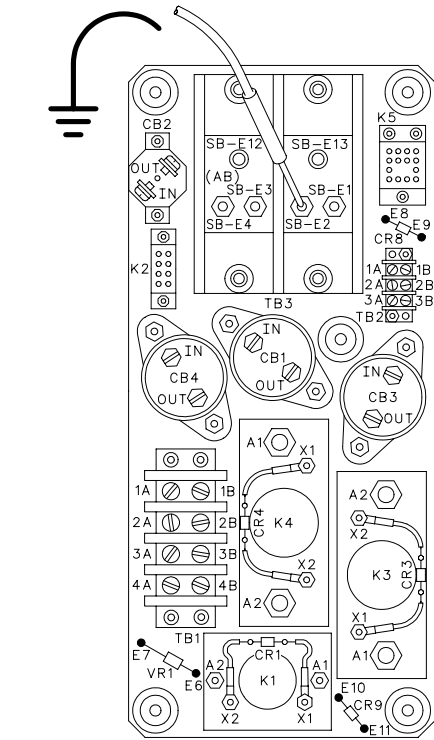
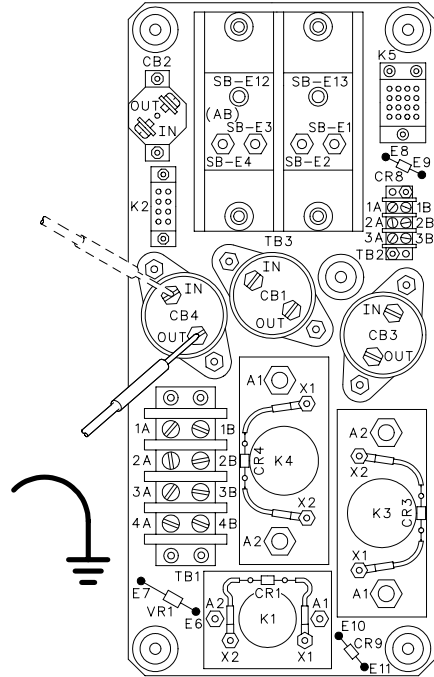
G 1. Place red multimeter lead on terminal board 3 (TB3) terminal SB-E2 and black lead to ground.
2. Check for voltage.

Is voltage present?



Replace TB3 (para 8-19).

Replace lead from TB3 terminal SB-E2 to CB4 (para 8-19).



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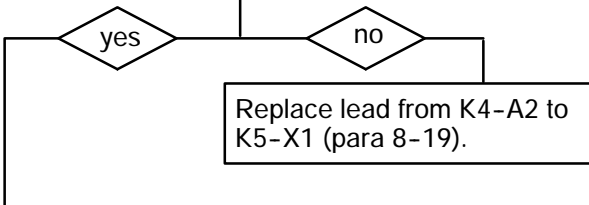
3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (5) MCS DOES NOT OPERATE IN COOL MODE. - CONTINUED

CONTINUED FROM STEP C

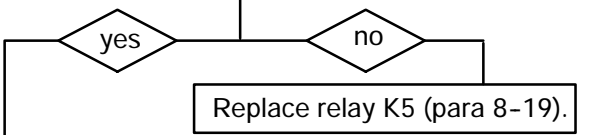
H 1. Place red multimeter lead on relay K5 terminal X1 (K5-X1) and black lead on ground.
2. Check for voltage.

Is voltage present?



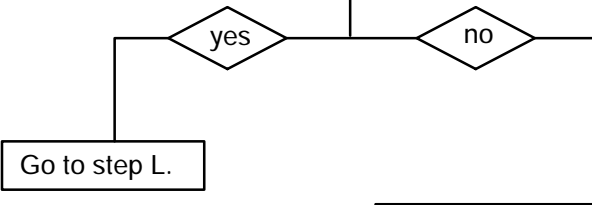
I 1. Place red multimeter lead on relay K5 terminal X2 (K5-X2) and black lead to ground.
2. Check for voltage.

Is voltage present?

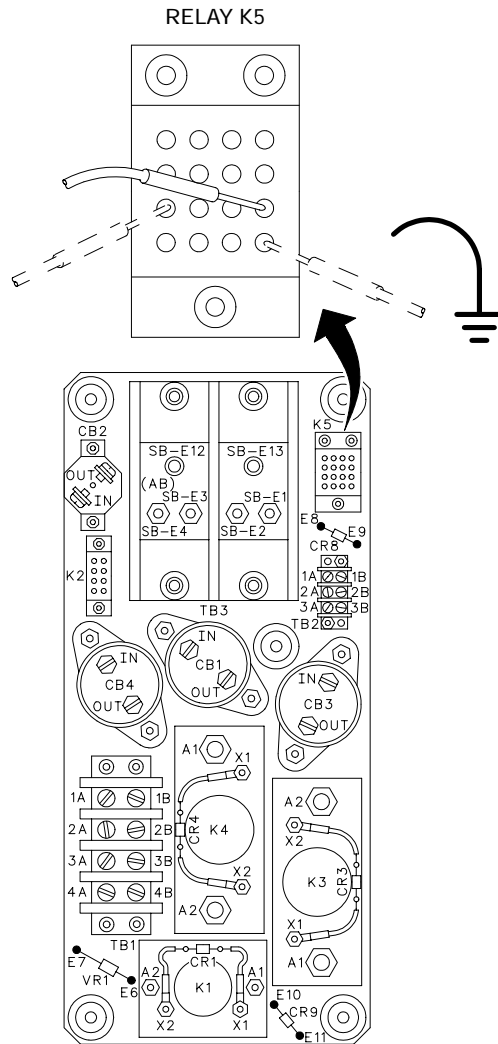


J 1. Place red multimeter lead on relay K5 and black lead to ground.
2. Check for voltage.

Is voltage present?



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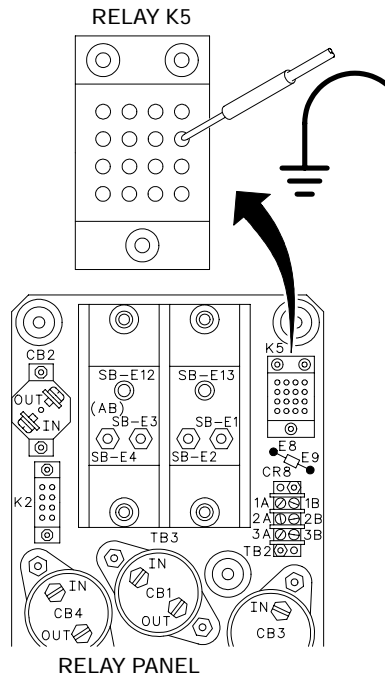
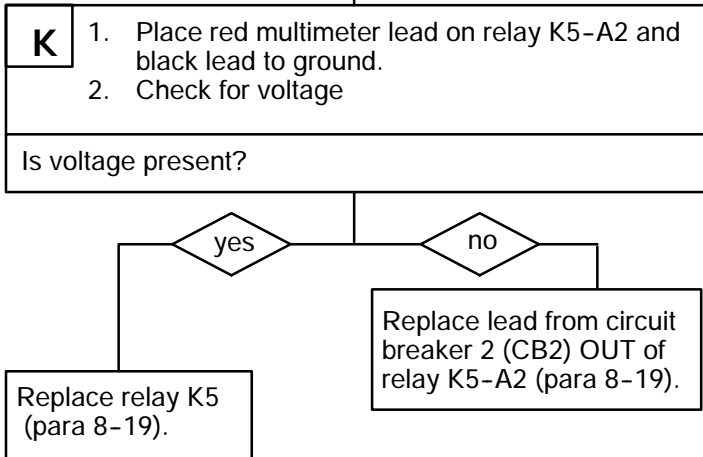


11pc006tc

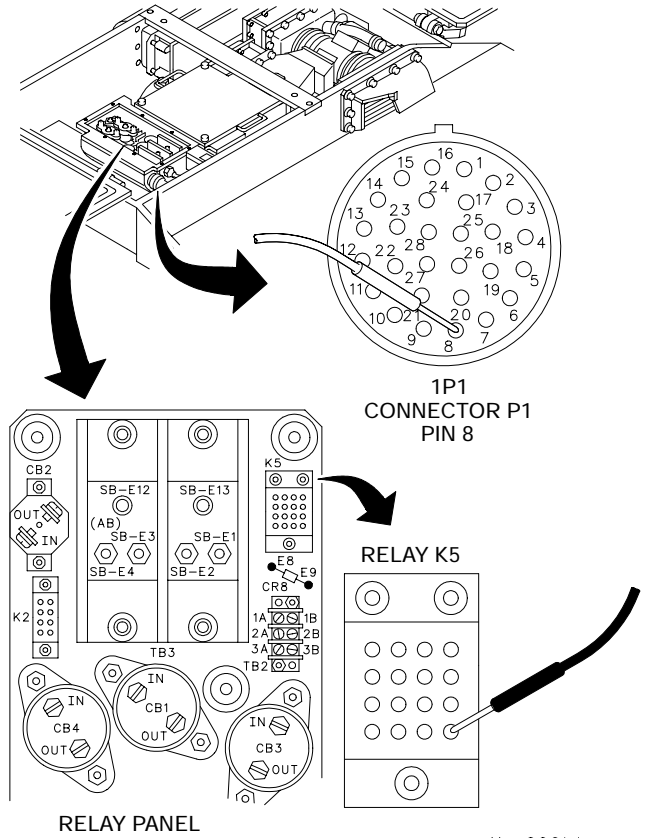
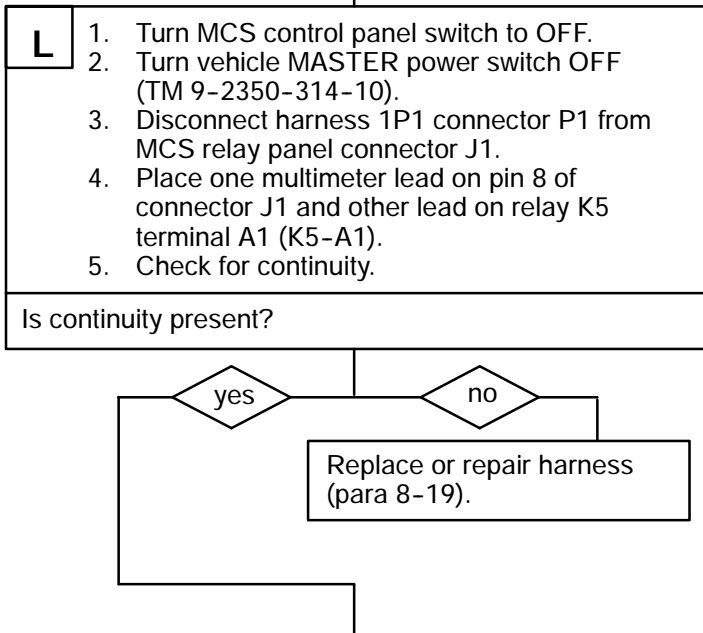
3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (5) MCS DOES NOT OPERATE IN COOL MODE. - CONTINUED

CONTINUED FROM STEP J



CONTINUED FROM STEP J



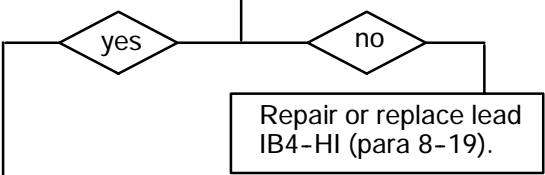
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3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (5) MCS DOES NOT OPERATE IN COOL MODE. - CONTINUED

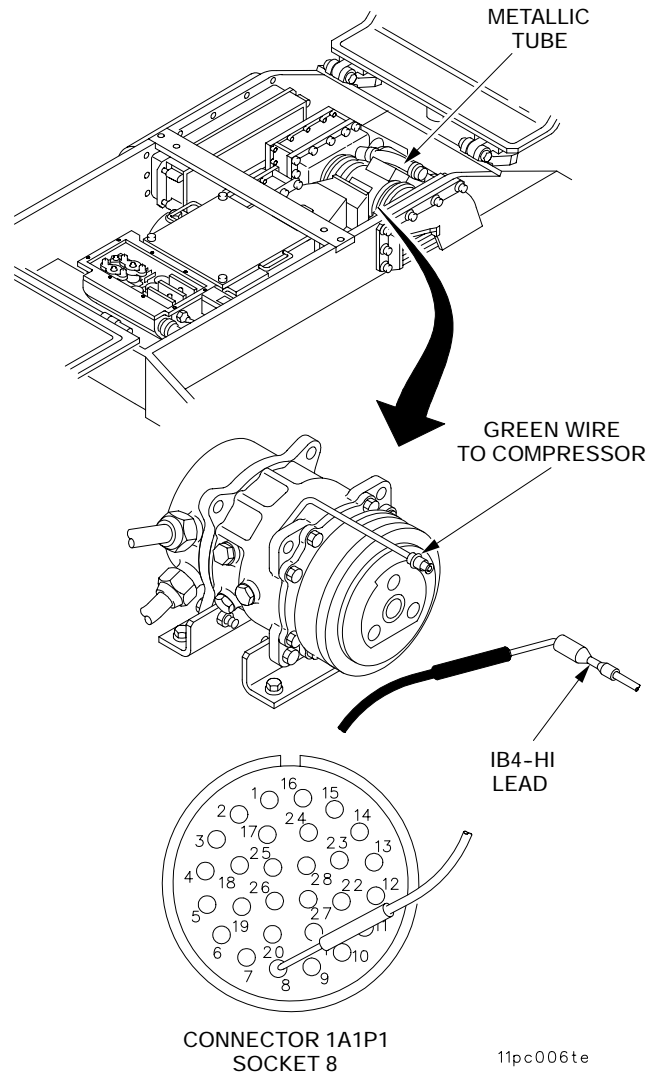
CONTINUED FROM STEP L

- | | |
|------------------------|---|
| M | <ol style="list-style-type: none"> 1. Remove metal tube from evaporator cover. 2. Disconnect IB4-HI from green wire of compressor. 3. Place one multimeter lead in socket 8 of connector IAIP1 and other lead in IB4-HI connector. 4. Check for continuity. |
| Is continuity present? | |



Replace compressor (para 8-11).

END OF TASK

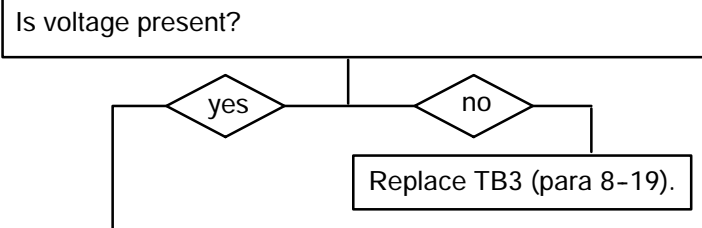


3-2 TROUBLESHOOTING CHART - CONTINUED

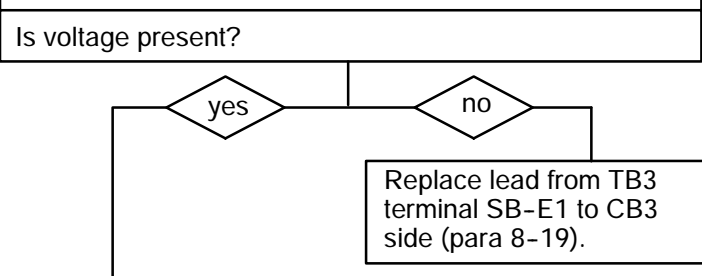
d. MCS PROBLEM - CONTINUED (6) VANEAXIAL FAN FAILS TO OPERATE.

<p>INITIAL SETUP</p> <p><u>Tools</u> Artillery and turret mechanic's tool kit (SC 5180-95-A12) Multimeter (item 34, Appx F) TA-1 probe kit (item 53, Appx F)</p>	<p><u>Equipment Conditions</u> MCS relay panel cover removed (TM 9-2350-314-20-2-2) Filter cover assembly removed (TM 9-2350-314-20-2-2)</p>
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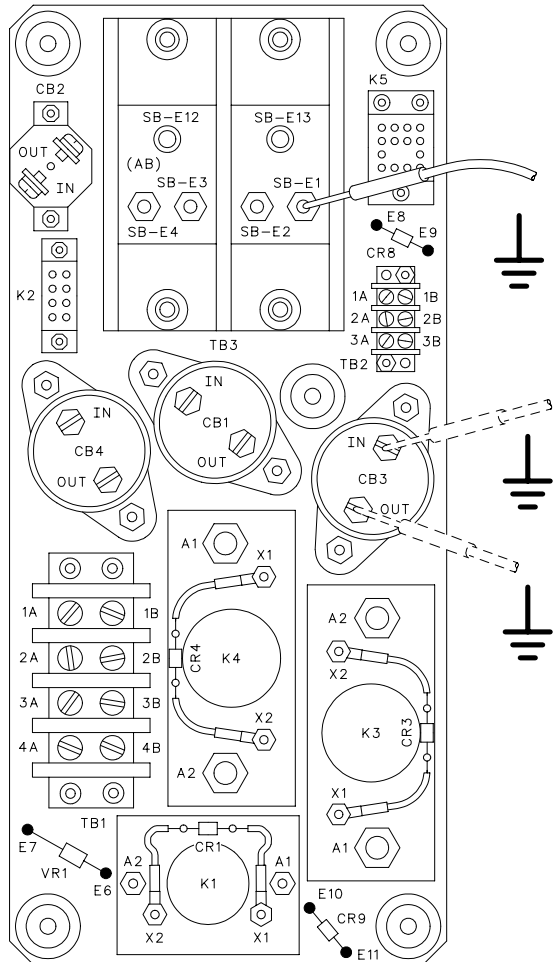
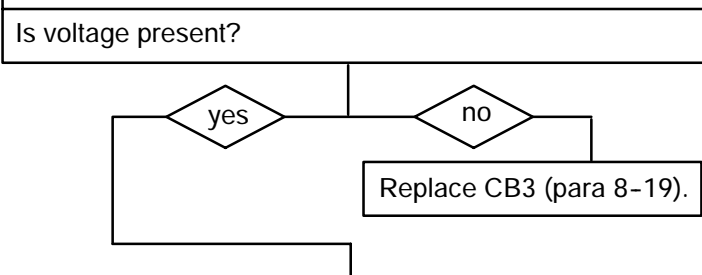
- A**
1. Turn vehicle MASTER power switch ON and turn MCS control panel switch to any mode (TM 9-2350-314-10).
 2. Place red multimeter lead on terminal board 3 (TB3) terminal SB-E1 and black lead to ground.
 3. Check for voltage.



- B**
1. Place red multimeter lead on circuit breaker 3 (CB3) IN side and black lead to ground.
 2. Check for voltage.



- C**
1. Place red multimeter lead on CB3 OUT side and black lead to ground.
 2. Check for voltage.



11pc007t

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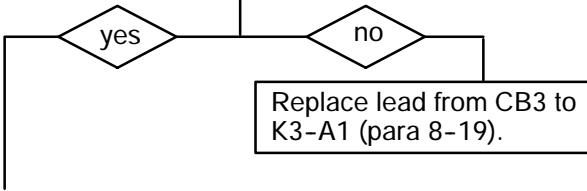
3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (6) VANEAXIAL FAN FAILS TO OPERATE. - CONTINUED

CONTINUED FROM STEP C

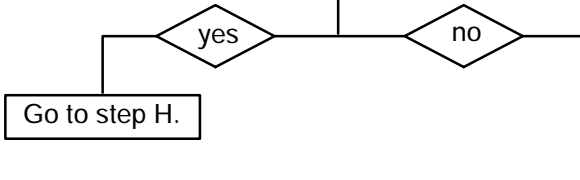
D 1. Place red multimeter lead on relay K3 terminal A1 (K3-A1) and black lead to ground.
2. Check for voltage.

Is voltage present?



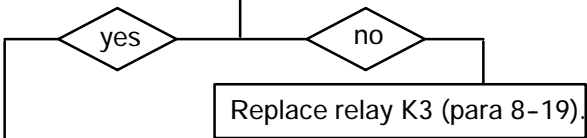
E 1. Place red multimeter lead on relay K3 terminal A2 (K3-A2) and black lead to ground.
2. Check for voltage.

Is voltage present?



F 1. Turn vehicle MASTER power switch OFF (TM 9-2350-314-10).
2. Disconnect two lead wires from relay K3 terminal X2 (K3-X2).
3. Place one multimeter lead on relay K3 terminal X1 (K3-X1) and other lead on K3-X2.
4. Check for continuity.

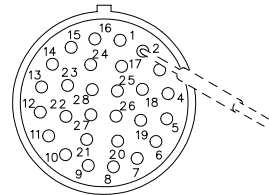
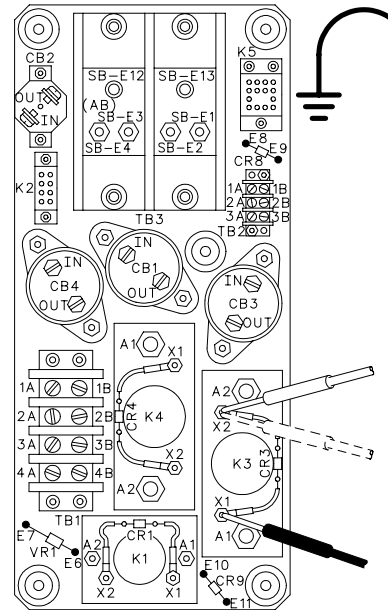
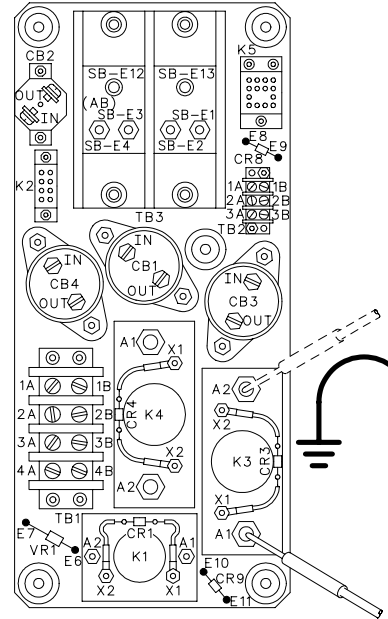
Is continuity present?



G 1. Place one multimeter lead on K3-X2 and other lead on connector J1 pin 2.
2. Check for continuity.

Is continuity present?

CONTINUED TO NEXT PAGE



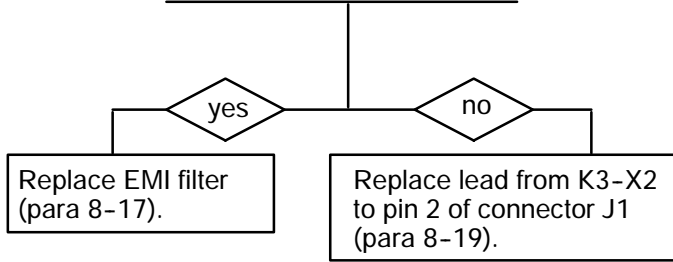
RELAY PANEL
CONNECTOR J1
PIN 2

11pc007ta

3-2 TROUBLESHOOTING CHART - CONTINUED

d. MCS PROBLEM - CONTINUED (6) VANEAXIAL FAN FAILS TO OPERATE. - CONTINUED

CONTINUED FROM STEP G

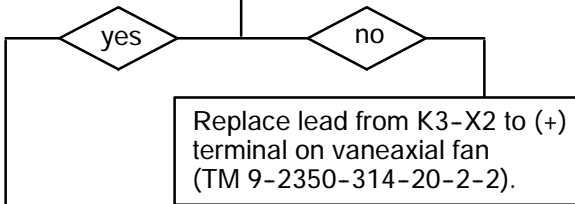


CONTINUED FROM STEP E

H

1. Place red multimeter lead on vaneaxial fan (+) terminal and black lead to ground.
2. Check for voltage.

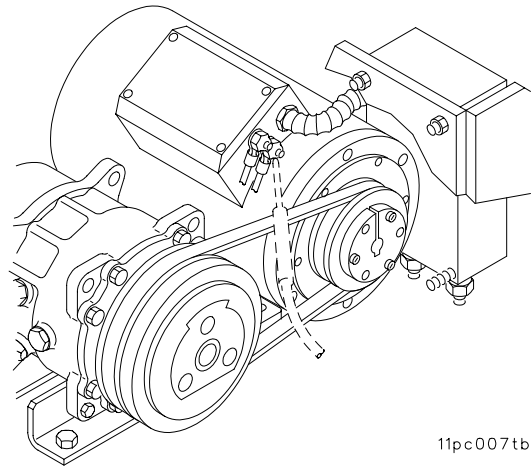
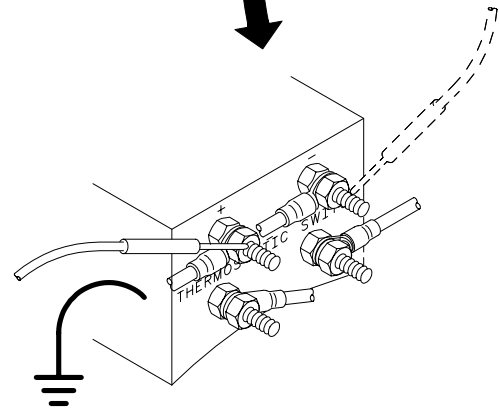
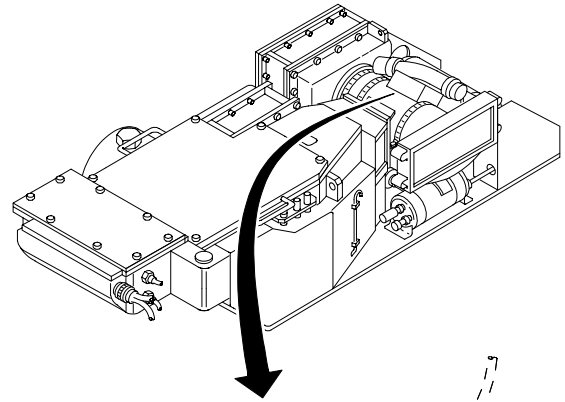
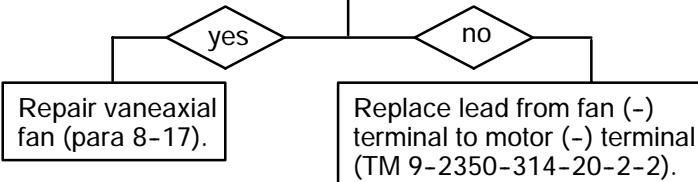
Is voltage present?



I

1. Turn vehicle MASTER power switch OFF (TM 9-2350-314-10).
2. Place one multimeter lead on vaneaxial fan (-) terminal and other lead on MCS electric motor (-) terminal.
3. Check for continuity.

Is continuity present?



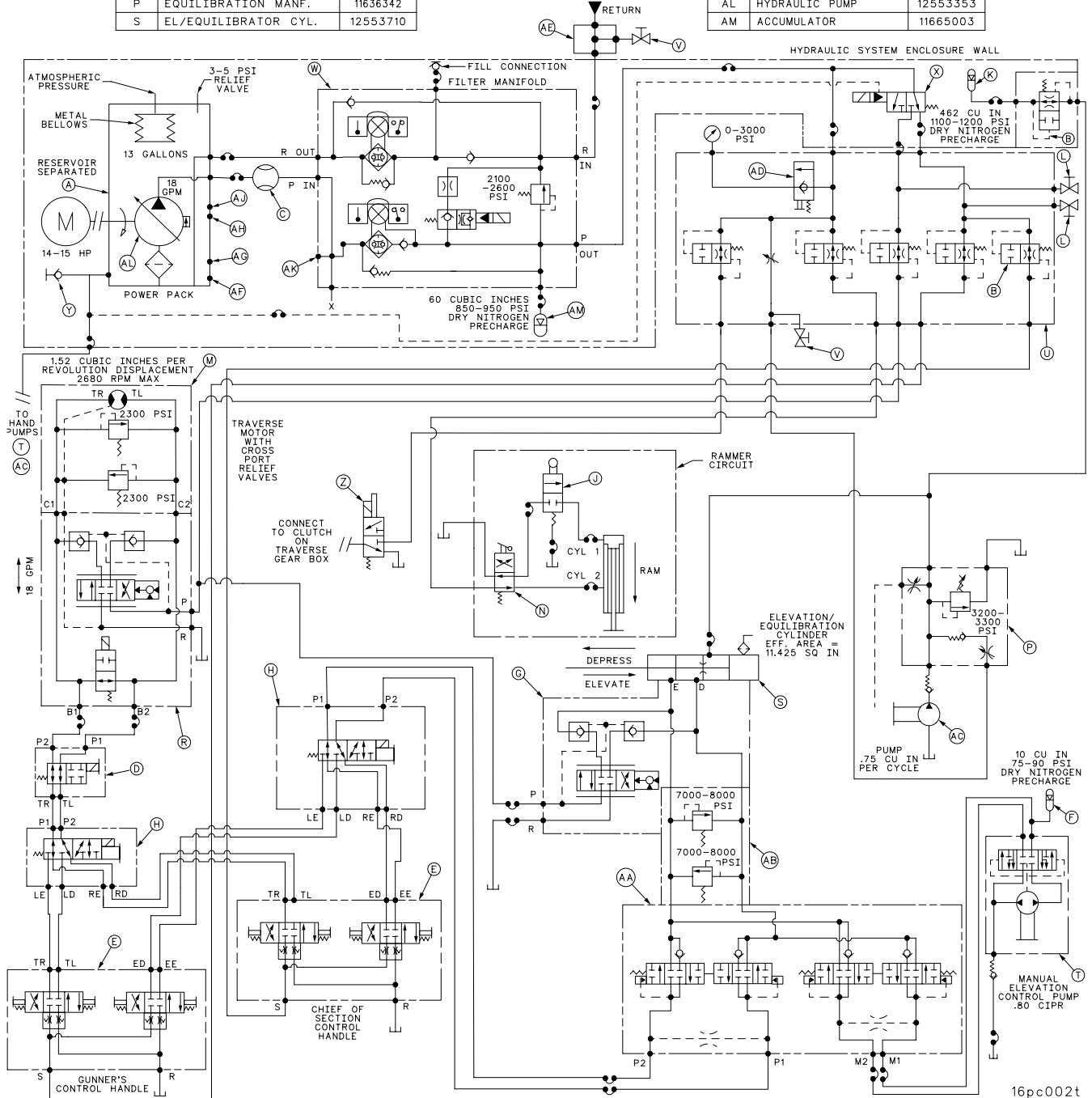
11pc007tb

END OF TASK

3-2 TROUBLESHOOTING CHART - CONTINUED

e. TRAVERSE PROBLEM - CONTINUED

ITEM	DESCRIPTION	PART NO.	ITEM	DESCRIPTION	PART NO.	ITEM	DESCRIPTION	PART NO.
A	POWERPACK	12927783	T	EL ASSY., MANUAL	12563247	AD	MANUAL PULL VALVE	12948159
B	VELOCITY FUSE	12553425	U	MANIFOLD, FUSE	12553540	AE	RETURN MANIFOLD	12553564
C	FLOW METER	12562735	V	SAMPLING BLEED VALVE	M81940/1-2	AF	COOLING TEMP. SWITCH	M24236/ 25AGJBA
E	GUNNER'S CONTROL	10922902	W	FILTER ASSY.	12553354			
F	ACCUMULATOR	7974982	X	MODE SELECTOR VALVE	12561784	AG	TEMP. TRANSDUCER	12554015
G	EL SERVOVALVE ASSY.	12553898	Y	QUICK DISC. CPL. & HALF	12910614-1	AH	LEVEL SENSOR	12934603
H	SELECTOR VALVE	12553595	AA	LOCKING VALVE ASSY.	11784023	AJ	WARM UP TEMP. SWITCH	M24236/ 2A8DUCS
K	ACCUMULATOR,EQUILIBRATION	12553726	AB	RELIEF VALVE	9399024			
L	BLEED VALVE	11783927	AC	EQUILIBRATION HANDPUMP	7382992	AK	PRESSURE TRANSDUCER	12554014
P	EQUILIBRATION MANF.	11636342				AL	HYDRAULIC PUMP	12553353
S	EL/EQUILIBRATOR CYL.	12553710				AM	ACCUMULATOR	11665003



16pc002t

3-2 TROUBLESHOOTING CHART - CONTINUED

e. TRAVERSE PROBLEM - CONTINUED (1) INABILITY TO MANUALLY TRAVERSE. AFCS AND POWER MODES ARE NORMAL.

INITIAL SETUP

Tools
 Artillery and turret mechanic's tool kit
 (SC 5180-95-A12)

WARNING

Ensure that area around cab and cannon are clear before traversing to prevent injury to personnel.

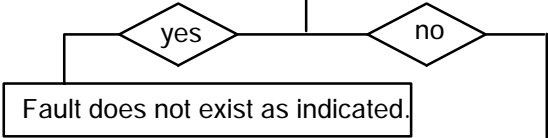
NOTE

Make sure para 3-3.l(3) of TM 9-2350-314-20-2-1 has been done before doing this tree.

A

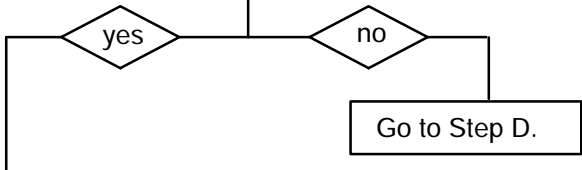
1. Turn vehicle MASTER power switch ON (TM 9-2350-314-10).
2. Release cannon travel lock (TM 9-2350-314-10).
3. Manually elevate cannon and lower travel lock (TM 9-2350-314-10).
4. Inspect cab ring for obstructions.
5. Unlock cab traverse lock (TM 9-2350-314-10).
6. Manually attempt to traverse cab in both directions (TM 9-2350-314-10).

Does cab traverse?



B Rotate manual traverse handle (TM 9-2350-314-10).

Does manual traverse handle spin freely?



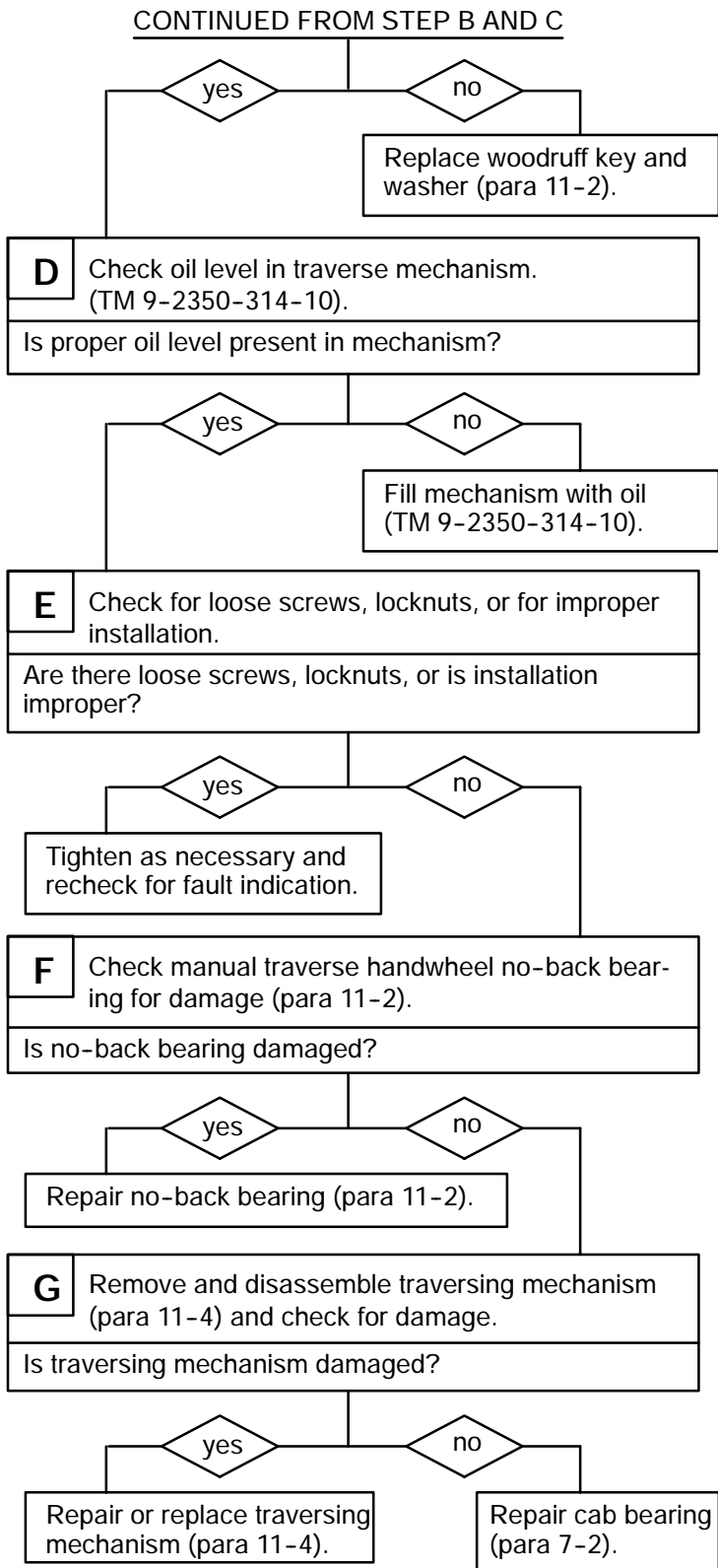
C Inspect manual traverse handle assembly.

Are woodruff key and washer present?

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3-2 TROUBLESHOOTING CHART - CONTINUED

e. TRAVERSE PROBLEM - CONTINUED (1) INABILITY TO MANUALLY TRAVERSE. AFCS AND POWER MODES ARE NORMAL. - CONTINUED



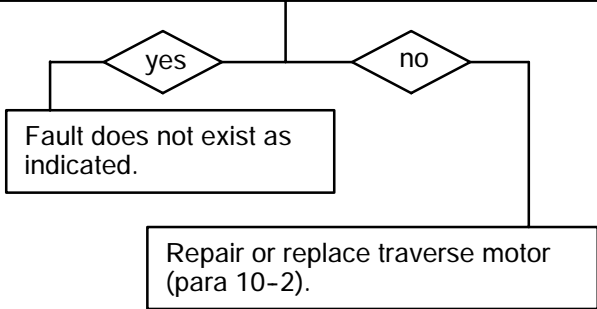
END OF TASK

3-2 TROUBLESHOOTING CHART - CONTINUED

e. TRAVERSE PROBLEM - CONTINUED (2) CAB WILL NOT TRAVERSE IN POWER OR AFCS OPERATION. CANNON ELEVATES, MANUAL TRAVERSE OPERATES. - CONTINUED

CONTINUED FROM STEP B

C	<ol style="list-style-type: none">1. Turn vehicle MASTER power switch ON and start engine (TM 9-2350-314-10).2. Turn HYDRAULIC POWER switch ON (TM 9-2350-314-10).3. Turn traverse control switch to POWER (TM 9-2350-314-10).4. Attempt to power traverse cab (TM 9-2350-314-10).
Does cab traverse?	



END OF TASK

3-2 TROUBLESHOOTING CHART - CONTINUED

e. TRAVERSE PROBLEM - CONTINUED (3) UNREQUESTED CAB TRAVERSE WHEN HYDRAULIC POWER SWITCH IS TURNED ON.

INITIAL SETUP

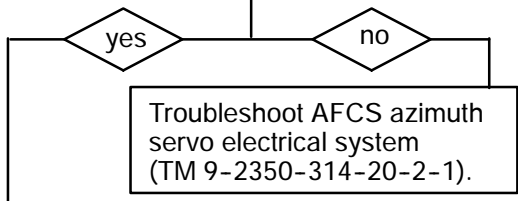
Tools
 Artillery and turret mechanic's tool kit
 (SC 5180-95-A12)

WARNING

Ensure that area around cab and cannon is clear. Cab may move when HYDRAULIC POWER switch is turned ON, causing personnel injury or equipment damage.

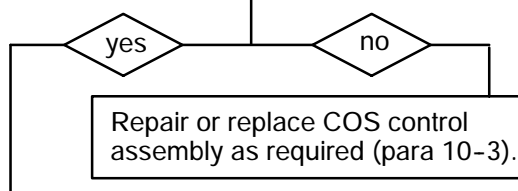
- A**
1. Place traverse control in HANDWHEEL position (TM 9-2350-314-10).
 2. Disconnect harness W7 connector P6 from azimuth servo valve (TM 9-2350-314-20-2-1).
 3. Turn vehicle MASTER power switch ON and start engine (TM 9-2350-314-10).
 4. Turn HYDRAULIC POWER switch ON (TM 9-2350-314-10).

Does cab move?



- B**
1. Turn HYDRAULIC POWER switch OFF, shut off engine and turn vehicle MASTER power switch OFF (TM 9-2350-314-10).
 2. Move COS control handle to right and release (TM 9-2350-314-10).
 3. Move COS control handle to left and release (TM 9-2350-314-10).
 4. Handle should return freely to center (neutral) position when released.

Does COS control handle return freely to center (neutral) position?



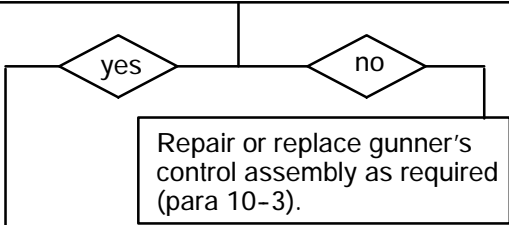
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3-2 TROUBLESHOOTING CHART - CONTINUED

e. TRAVERSE PROBLEM - CONTINUED (3) UNREQUESTED CAB TRAVERSE WHEN HYDRAULIC POWER SWITCH IS TURNED ON. - CONTINUED

CONTINUED FROM STEP B

C	<ol style="list-style-type: none"> 1. Move gunner's control handle to right and release (TM 9-2350-314-10). 2. Move gunner's control handle to left and release (TM 9-2350-314-10). 3. Handle should return freely to center (neutral) position when released.
Does gunner's control handle return freely to center (neutral) position?	



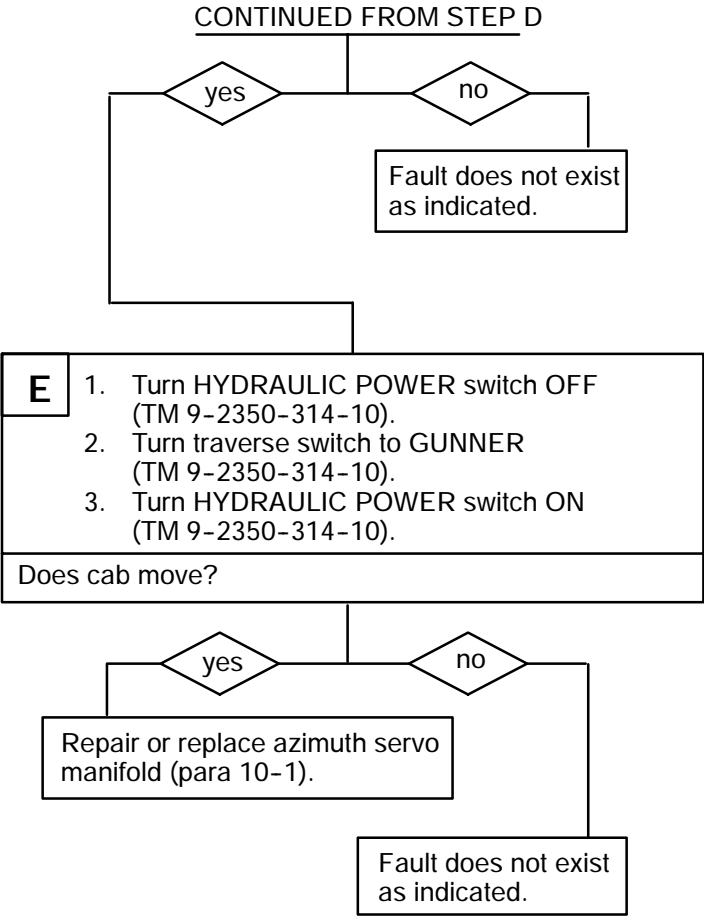
WARNING
<ul style="list-style-type: none"> • Ensure that area around cab and cannon is clear. Cab may move when HYDRAULIC POWER switch is turned ON, causing personnel injury or equipment damage. • If cab traverses in either direction when HYDRAULIC POWER switch is turned ON, turn switch OFF immediately.

D	<ol style="list-style-type: none"> 1. Turn MASTER switch ON and start engine (TM 9-2350-314-10). 2. Unlock and lower travel lock (TM 9-2350-314-10). 3. Unlock cab traverse lock (TM 9-2350-314-10). 4. Turn traverse control switch to POWER (TM 9-2350-314-10). 5. Turn traverse switch to COS (TM 9-2350-314-10). 6. Turn HYDRAULIC POWER switch ON (TM 9-2350-314-10).
Does cab move?	

CONTINUED ON NEXT PAGE

3-2 TROUBLESHOOTING CHART - CONTINUED

e. TRAVERSE PROBLEM - CONTINUED (3) UNREQUESTED CAB TRAVERSE WHEN HYDRAULIC POWER SWITCH IS TURNED ON. - CONTINUED



END OF TASK

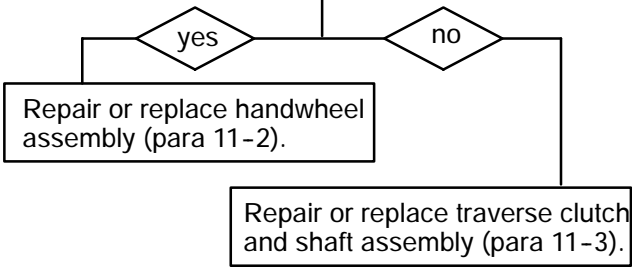
3-2 TROUBLESHOOTING CHART - CONTINUED

e. TRAVERSE PROBLEM - CONTINUED (4) MANUAL TRAVERSE HANDWHEEL ROTATES WHEN CAB IS TRAVERSED IN POWER.

INITIAL SETUP
Tools
Artillery and turret mechanic's tool kit
(SC 5180-95-A12)

NOTE
Make sure para 3-3.I(12) of TM 9-2350-314-20-2-1 has been done before doing this tree.

Disassemble manual traverse handwheel assembly and no-back bearing (para 11-2) and check for faulty components.
Are any faulty components found?

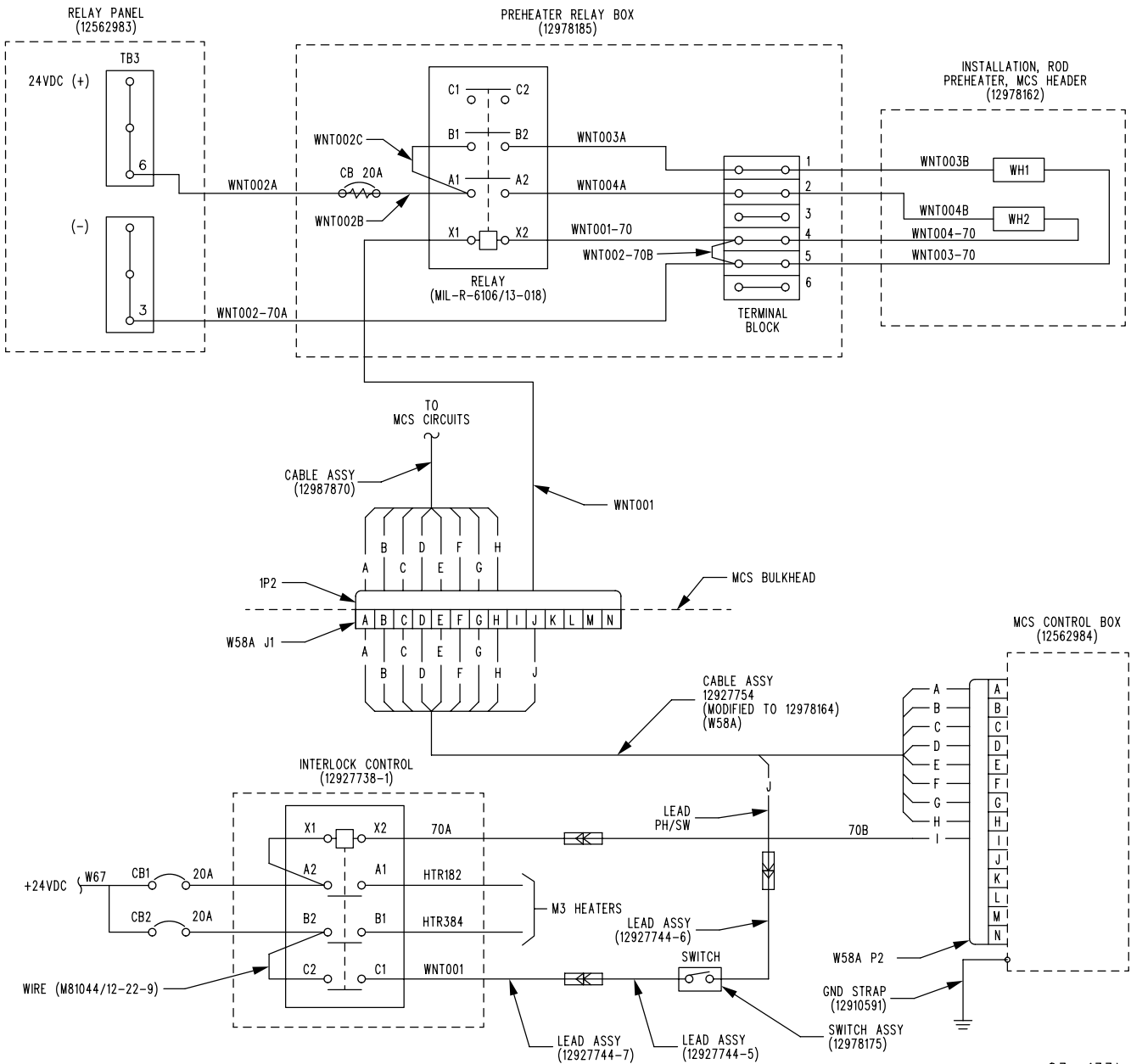


END OF TASK

3-2 TROUBLESHOOTING CHART - CONTINUED

f. WINTERIZATION KIT PROBLEM, MCS

For vehicles with the MCS winterization kit installed, a preheater is added to the MCS to provide a heating capability when the MCS operates in the LOW AIR mode. When the MCS control switch is set to LOW AIR position and the preheater switch is set to ON, the preheater relay box supplies 24 V dc and return signals to evaporator header preheater rods to produce heated air for the crew via the MCS. The relationship of the various assemblies and the interface to the MCS is shown in the following diagram.



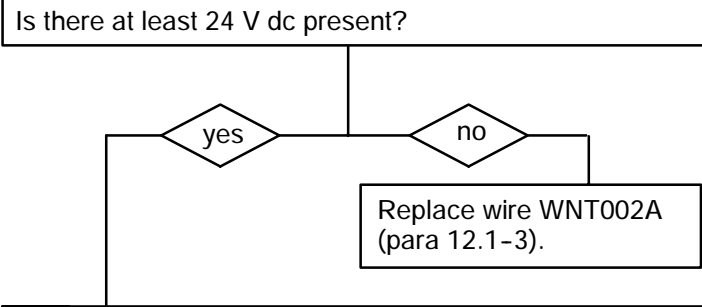
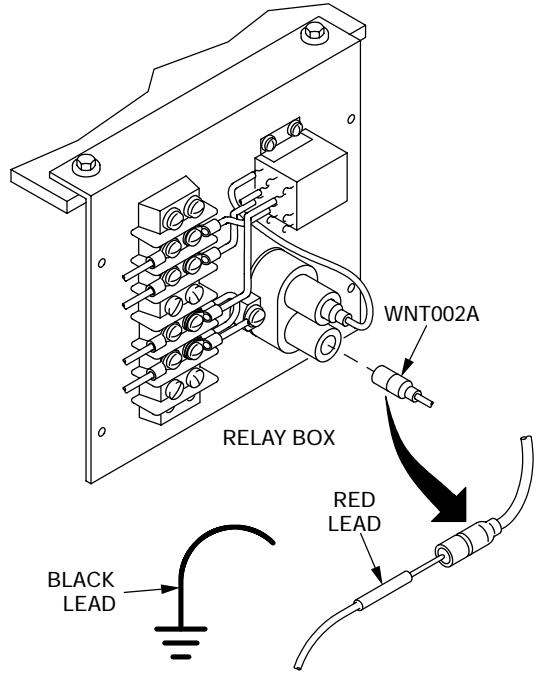
03pc133t

3-2 TROUBLESHOOTING CHART - CONTINUED

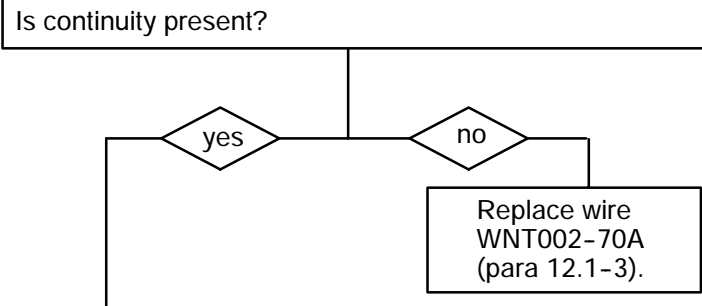
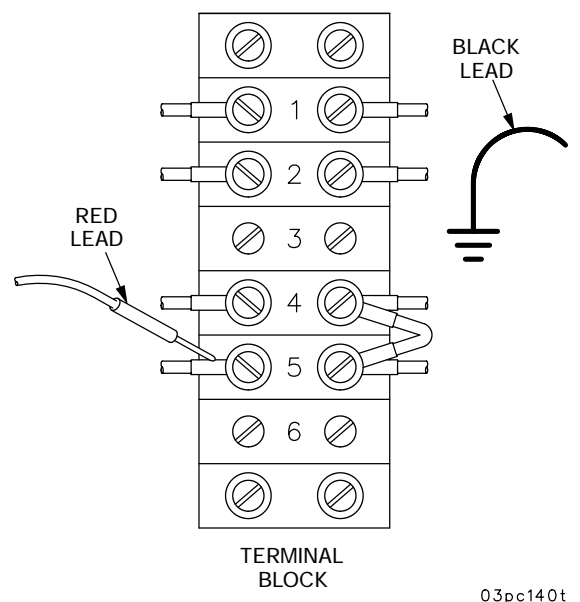
f. WINTERIZATION KIT PROBLEM, MCS - CONTINUED (1) NO HEAT OR LOW HEAT FROM PREHEATER.

<p><u>INITIAL SETUP</u></p> <p><u>Tools</u> Artillery and turret mechanic's tool kit (SC 5180-95-A12)</p>	<p><u>Equipment Conditions</u> Relay panel cover removed (TM 9-2350-314-20-2-2) MASTER POWER switch OFF (TM 9-2350-314-10)</p>
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- A**
1. Remove relay box cover (para 12.1-3).
 2. Disconnect wire WNT002A from circuit breaker.
 3. Turn vehicle MASTER POWER switch ON and start engine (TM 9-2350-314-10).
 4. Turn MCS control box switch to LOW AIR (TM 9-2350-314-10).
 5. Turn preheater switch to ON (TM 9-2350-314-10).
 6. Place red multimeter lead on wire WNT002A and black lead on ground.
 7. Measure voltage.



- B**
1. Shut down engine and turn vehicle MASTER POWER switch OFF (TM 9-2350-314-10).
 2. Place red multimeter lead on terminal block terminal 5 and black lead to ground.
 3. Measure continuity.



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03pc140t

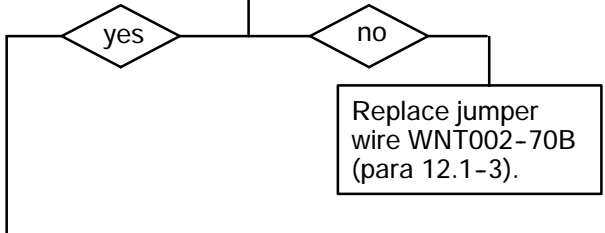
3-2 TROUBLESHOOTING CHART - CONTINUED

f. WINTERIZATION KIT PROBLEM, MCS - CONTINUED (1) LOW HEAT OR NO HEAT FROM PREHEATER. - CONTINUED

CONTINUED FROM STEP B

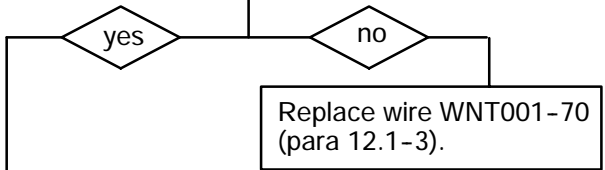
C 1. Place red multimeter lead on terminal block terminal 4 and black lead to ground.
2. Measure continuity.

Is continuity present?

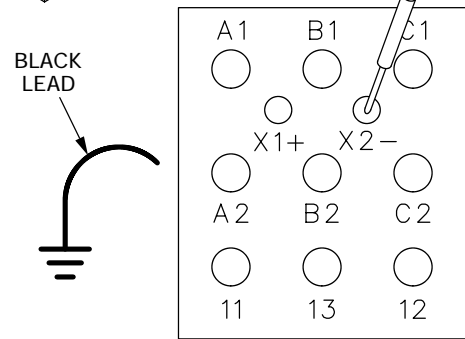
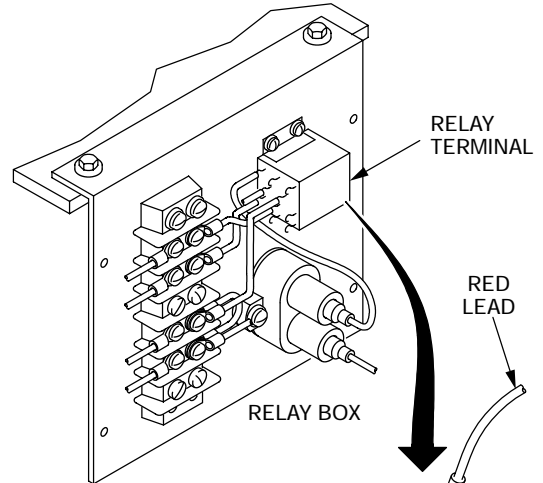
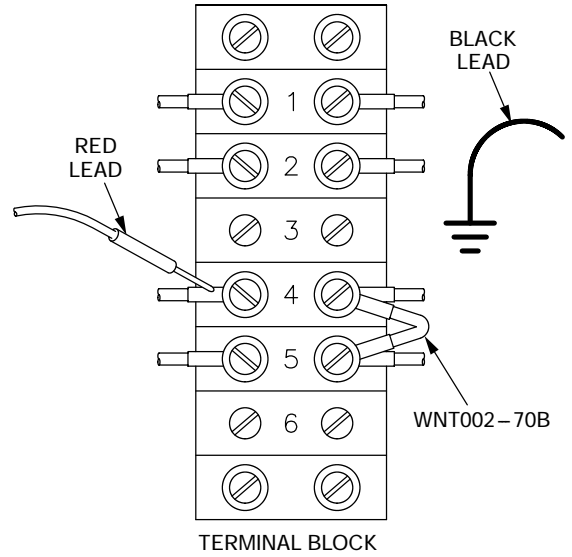


D 1. Place red multimeter lead on relay terminal X2 and black lead to ground.
2. Measure continuity.

Is continuity present?



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03pc141t

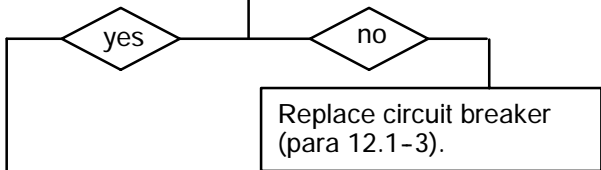
3-2 TROUBLESHOOTING CHART - CONTINUED

f. WINTERIZATION KIT PROBLEM, MCS - CONTINUED (1) LOW HEAT OR NO HEAT FROM PREHEATER. - CONTINUED

CONTINUED FROM STEP D

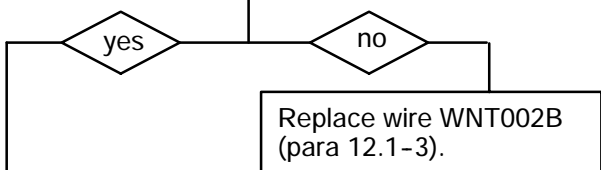
- E**
1. Reconnect wire WNT002A to circuit breaker.
 2. Disconnect wire WNT002B at circuit breaker.
 3. Place red multimeter lead on the open circuit breaker terminal and the black lead on ground.
 4. Turn vehicle MASTER POWER switch ON and start engine (TM 9-2350-314-10).
 5. Measure voltage.

Is there at least 24 V dc present?

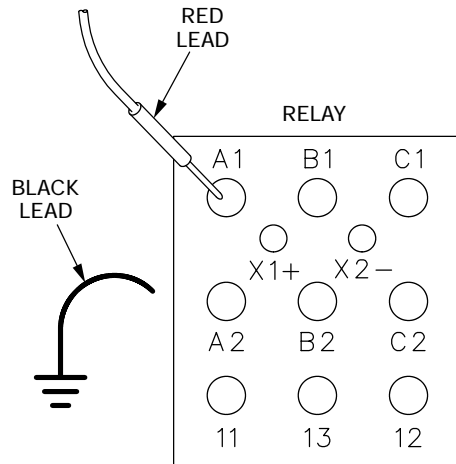
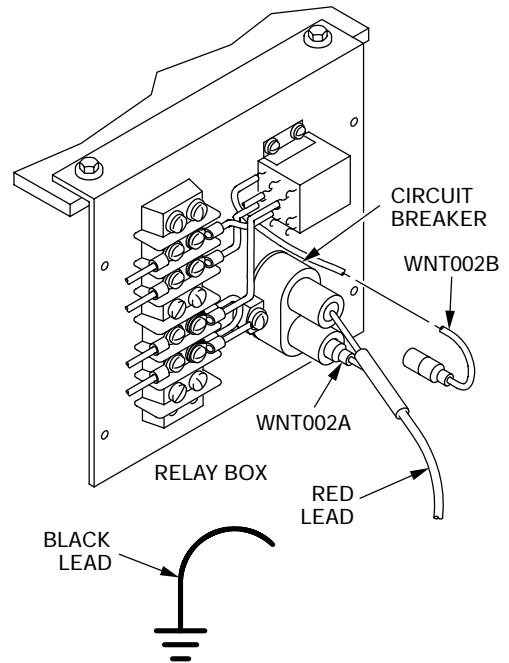


- F**
1. Shut down engine and turn vehicle MASTER POWER switch OFF (TM 9-2350-314-10).
 2. Reconnect wire WNT002B at circuit breaker.
 3. Turn vehicle MASTER POWER switch ON and start engine (TM 9-2350-314-10).
 4. Place red multimeter lead on relay terminal A1 and black lead to ground.
 5. Measure voltage.

Is there at least 24 V dc present?



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03pc142t

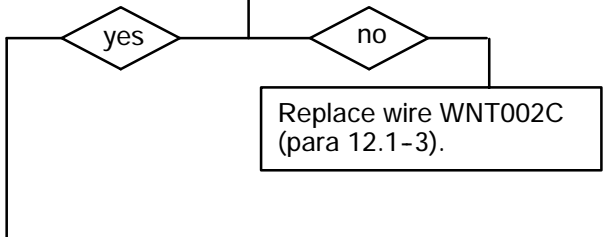
3-2 TROUBLESHOOTING CHART - CONTINUED

f. WINTERIZATION KIT PROBLEM, MCS - CONTINUED (1) LOW HEAT OR NO HEAT FROM PREHEATER. - CONTINUED

CONTINUED FROM STEP F

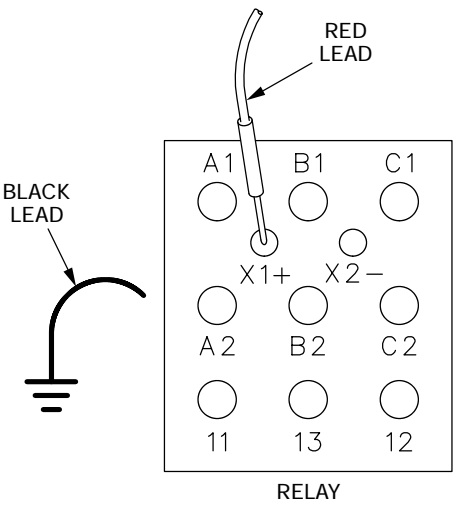
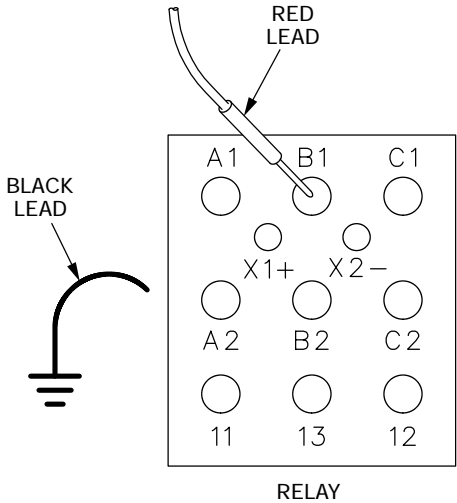
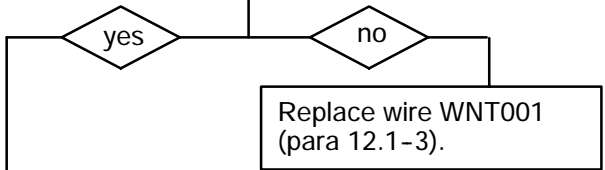
G 1. Place red multimeter lead on relay terminal B1 and black lead on ground.
2. Measure voltage.

Is there at least 24 V dc present?



H 1. Place red multimeter lead on relay terminal X1 and black lead on ground.
2. Measure voltage.

Is there at least 24 V dc present?



03pc143t

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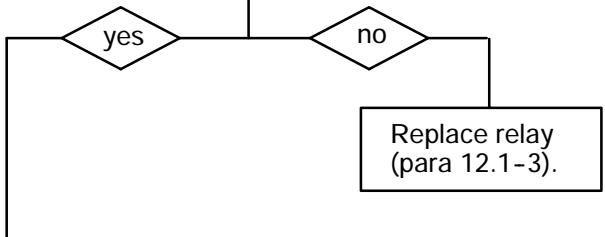
3-2 TROUBLESHOOTING CHART - CONTINUED

f. WINTERIZATION KIT PROBLEM, MCS - CONTINUED (1) LOW HEAT OR NO HEAT FROM PREHEATER. - CONTINUED

CONTINUED FROM STEP H

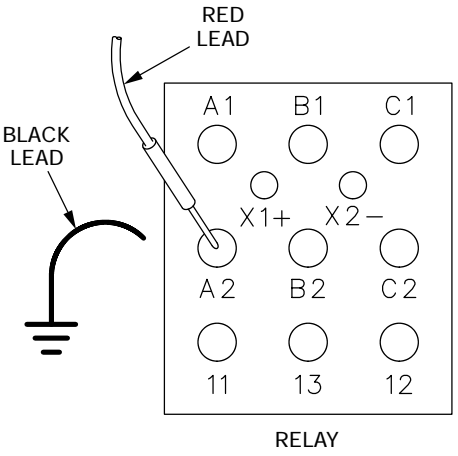
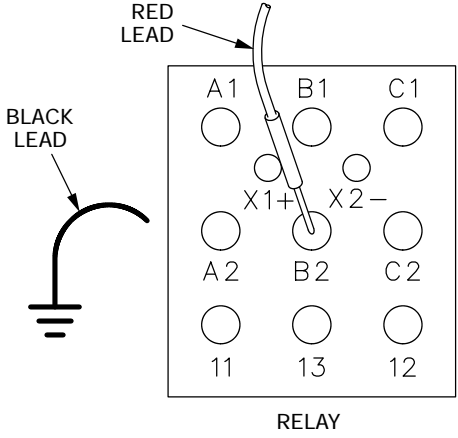
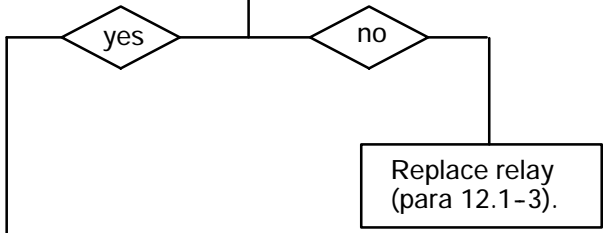
I 1. Place red multimeter lead on relay terminal B2 and black lead to ground.
2. Measure voltage.

Is there at least 24 V dc present?



J 1. Place red multimeter lead on relay terminal A2 and black lead to ground.
2. Measure voltage.

Is there at least 24 V dc present?



03pc144t

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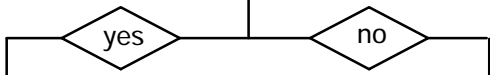
3-2 TROUBLESHOOTING CHART - CONTINUED

f. WINTERIZATION KIT PROBLEM, MCS - CONTINUED (1) LOW HEAT OR NO HEAT FROM PREHEATER. - CONTINUED

CONTINUED FROM STEP J

K 1. Place red multimeter lead on terminal block terminal 1 and black lead to ground.
2. Measure voltage.

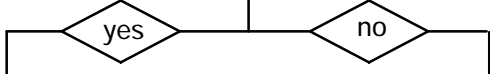
Is there at least 24 V dc present?



Replace wire WNT003A (para 12.1-3).

L 1. Place red multimeter lead on terminal block terminal 2 and black lead to ground.
2. Measure voltage.

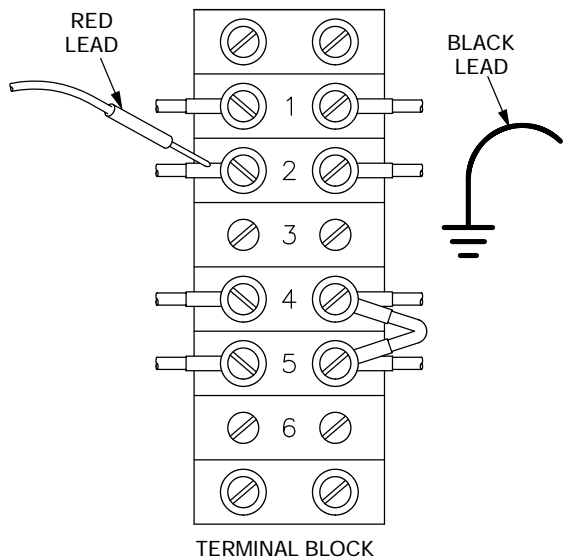
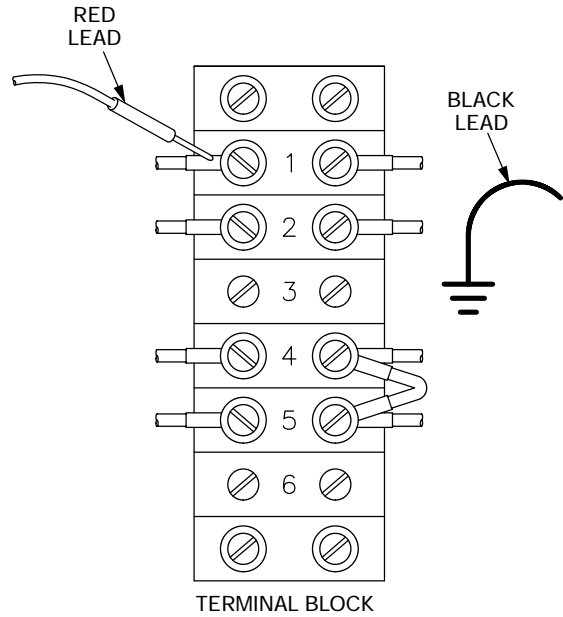
Is there at least 24 V dc present?



Replace preheater rods WH1 and WH2 (para 12.1-2).

Replace wire WNT004A (para 12.1-3).

END OF TASK



03pc145t

CHAPTER 4

MOUNT AND HOWITZER ASSEMBLY

GENERAL

This chapter illustrates and provides maintenance procedures for the mount and howitzer assembly. These procedures are functions authorized for direct support level maintenance. The paragraphs deal with removal, disassembly, cleaning, inspection, repair, assembly, testing, adjustment, and installation.

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4-1 REPLENISHER ACCUMULATOR ASSEMBLY.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Vise (item 61, Appx F)
Fire control purging and charging kit
(item 30, Appx F)
Caps, vise (item 7, Appx F)

Equipment Conditions

Accumulator removed
(TM 9-2350-314-20-2-2)

References

TM 9-2350-314-20-2-2

Materials/Parts

Hydraulic fluid (item 42, Appx B)
Nitrogen (item 53, Appx B)
Preformed packing (item 73, Appx E)
Self-locking nut (item 240, Appx E)

a. Disassembly.

- 1 Remove cap assembly (1) and release nitrogen pressure from valve (2).
- 2 Clamp shell (3) in vise with padding to protect shell (3).
- 3 Remove nut (4) and spacer ring (5).
- 4 Push port assembly (6) into shell (3) with palm of hand.

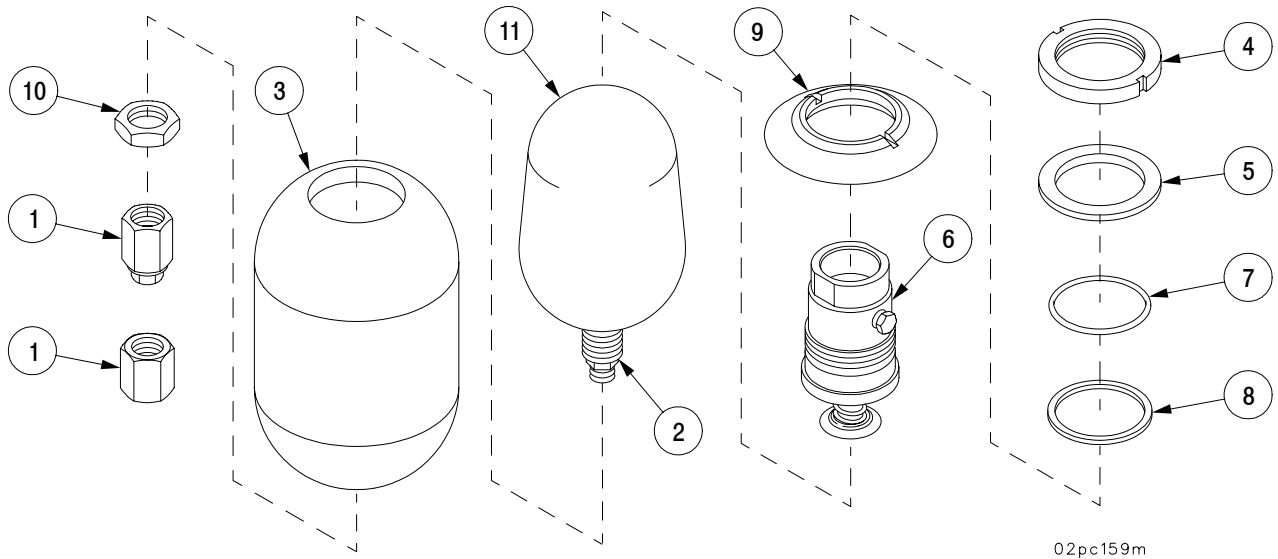
NOTE

Anti-extrusion ring must be bent at grooves to
remove from shell.

- 5 Lift preformed packing (7), backup ring (8), and anti-extrusion ring (9) out of shell (3). Discard preformed packing.
- 6 Remove port assembly (6) from shell (3).
- 7 Remove nut (10) from bladder assembly (11).
- 8 Compress bladder assembly (11) to remove all gas. Withdraw bladder assembly (11) from shell (3). Discard bladder, if damaged.

4-1 REPLENISHER ACCUMULATOR ASSEMBLY - CONTINUED

a. Disassembly - Continued



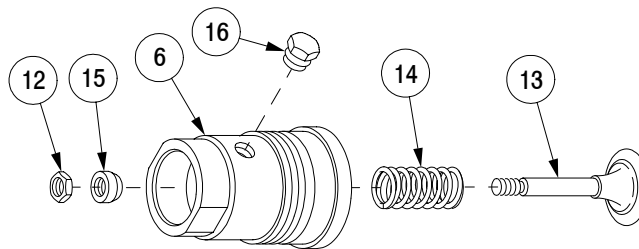
WARNING

Compressed springs are under preload. Wear eye protection and make provision to contain parts when preload is released during disassembly. Injury to personnel may occur if parts are suddenly released.

- 9 Remove self-locking nut (12) from fluid valve stem (13), and remove fluid valve stem (13), helical spring (14), and piston valve (15) from port assembly (6). Discard self-locking nut.
- 10 Remove pipe plug (16) from port assembly (6).

b. Assembly

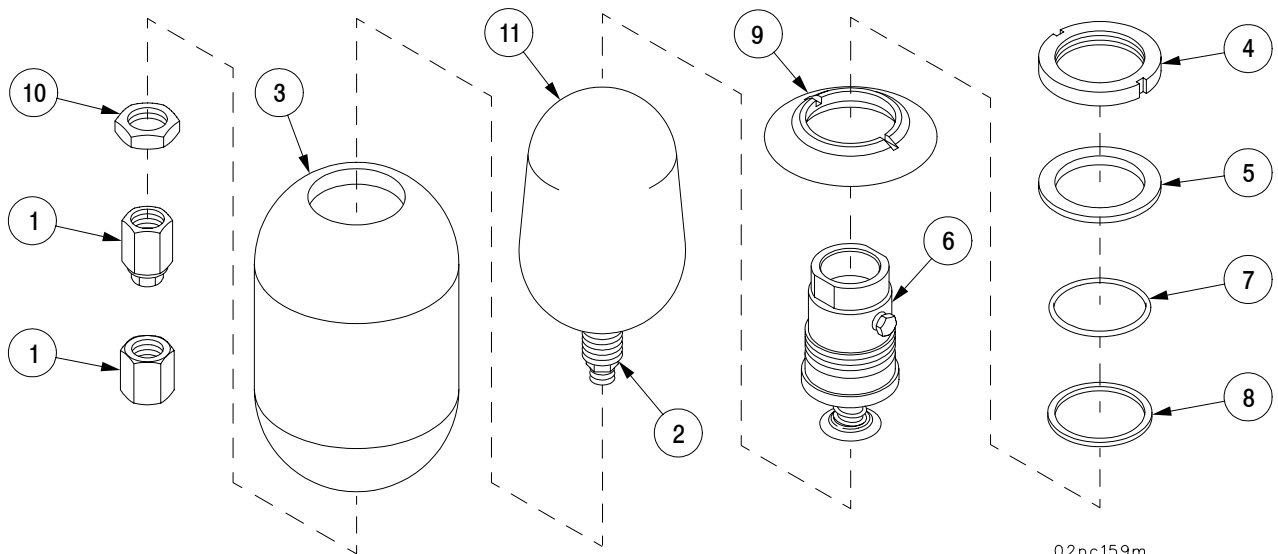
- 1 Install pipe plug (16) to port assembly (6).
- 2 Install piston valve (15), helical spring (14), fluid valve stem (13), and new self-locking nut (12) to port assembly (6).



4-1 REPLENISHER ACCUMULATOR ASSEMBLY - CONTINUED

b. Assembly - Continued

- 3 Heavily coat interior sides of shell (3) with hydraulic fluid, leaving fluid in shell (3) as a cushioning fluid.
- 4 Fold bladder assembly (11) to enter shell (3) with minimum friction. Guide bladder assembly (11) stem through hole in wider end of shell (3).
- 5 Install nut (10) securely on bladder assembly (11).
- 6 Install port assembly (6) into shell (3).
- 7 Place anti-extrusion ring (9) on port assembly (6) with small shoulder toward shell mount.
- 8 Place backup ring (8) and new preformed packing (7) on port assembly (6).
- 9 Withdraw port assembly (6) threaded portion through shell mouth. Pull until solidly seated and packing (7) is squeezed.
- 10 Install spacer ring (5) and nut (4) and tighten securely.
- 11 Remove shell (3) from vise.
- 12 Install cap assembly (1).
- 13 Charge accumulator replenisher (TM 9-2350-314-20-2-2).



4-2 BREECH CAM ASSEMBLY, SHOULDER PIN, AND CAM STOP - CONTINUED

c. Inspection.

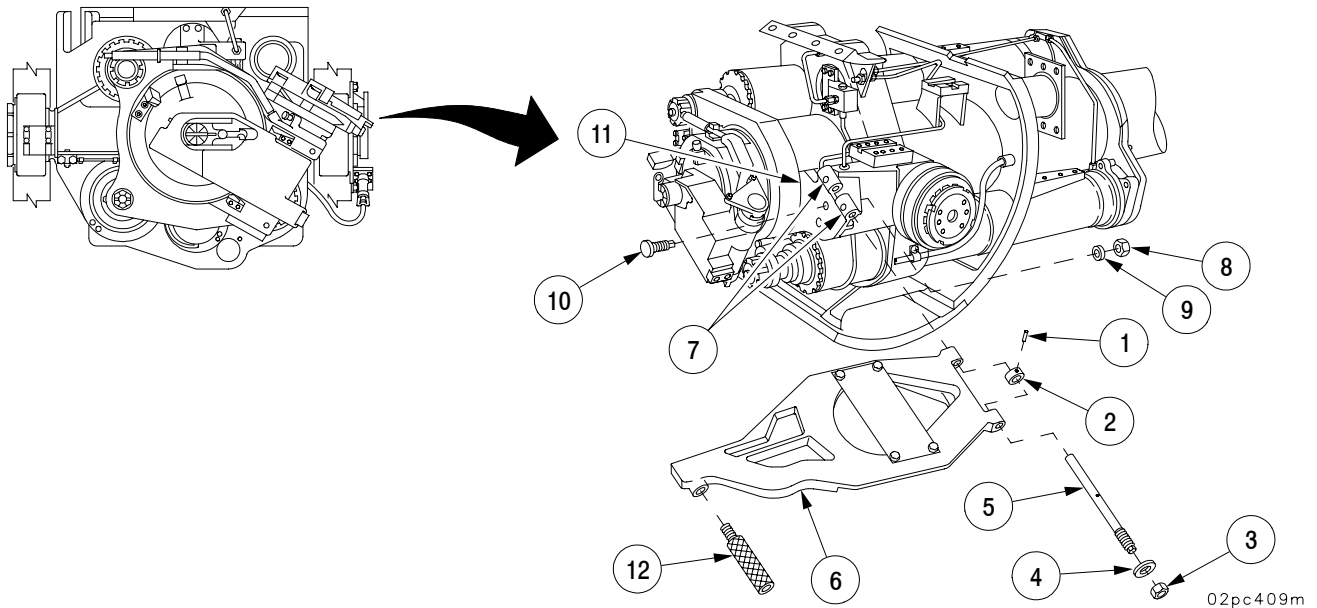
- 1 Measure outside diameter (OD) of shoulder pin (5) bearing surface. Replace if less than 0.748 inches (18.99 mm).
- 2 Inspect breech cam (6). Replace if cracked or cam path is distorted.

d. Assembly.

Install handle (12) on breech cam (6).

e. Installation.

- 1 Install stop (10), flat washer (9), and new self-locking nut (8) on cradle assembly (11).
- 2 Lift breech cam (6) into position, aligning holes in cam assembly with hinges (7). Support breech cam (6).
- 3 Install shoulder pin (5) and pin collar (2). Ensure that holes in pin collar (2) are aligned with holes in shoulder pin (5).
- 4 Install flat washer (4) and new self-locking nut (3). Do not tighten self-locking nut (3).
- 5 Install new spring pin (1) and tighten self-locking nut (3).
- 6 Install cam damper assembly (TM 9-2350-314-20-2-1).
- 7 Adjust breech cam (TM 9-2350-314-20-2-1).



4-3 HOWITZER MOUNT M182A1 - CONTINUED

a. Removal.

WARNING

- Gloves and steel-tipped safety shoes will be worn when performing maintenance procedures on heavy components to prevent serious injury to personnel.
- Support lower rotor during removal. Lower rotor weighs approximately 57 lbs (26 kg) and may cause serious injury to personnel if dropped.

NOTE

- The repair of the howitzer mount is included in the removal/installation procedures. The mount cannot be removed or separated from the trunnion bracket before most of the repairable components are removed.
- All attaching hardware must be tagged before removal for location and identification during installation.

4-3 HOWITZER MOUNT M182A1 - CONTINUED

a. Removal - Continued

- 1 Support lower rotor (1), and remove eight screws (2) and eight lockwashers (3) securing lower rotor (1) to mount (4). Discard lockwashers.
- 2 Attach gun tube sling to muzzle brake (5) and, using a suitable lifting device, raise cannon tube (6) to 300 mils of elevation or until all attaching hardware of upper rotor (7) is accessible.

NOTE

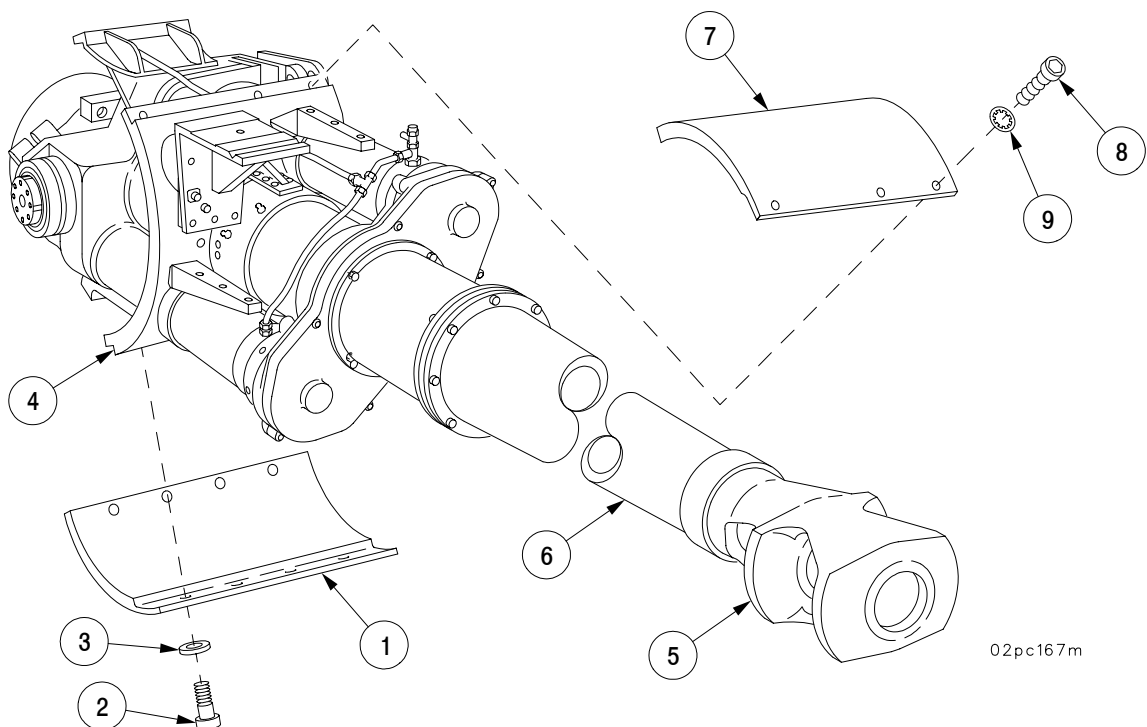
Upper rotor will remain in place until cannon tube is raised to maximum elevation.

- 3 Support upper rotor (7) and remove seven screws (8) and seven lockwashers (9) securing upper rotor (7) to mount (4). Discard lockwashers.

WARNING

Two personnel are required for removal of upper rotor. Upper rotor weighs approximately 75 lbs (34 kg) and may cause injury to personnel if dropped.

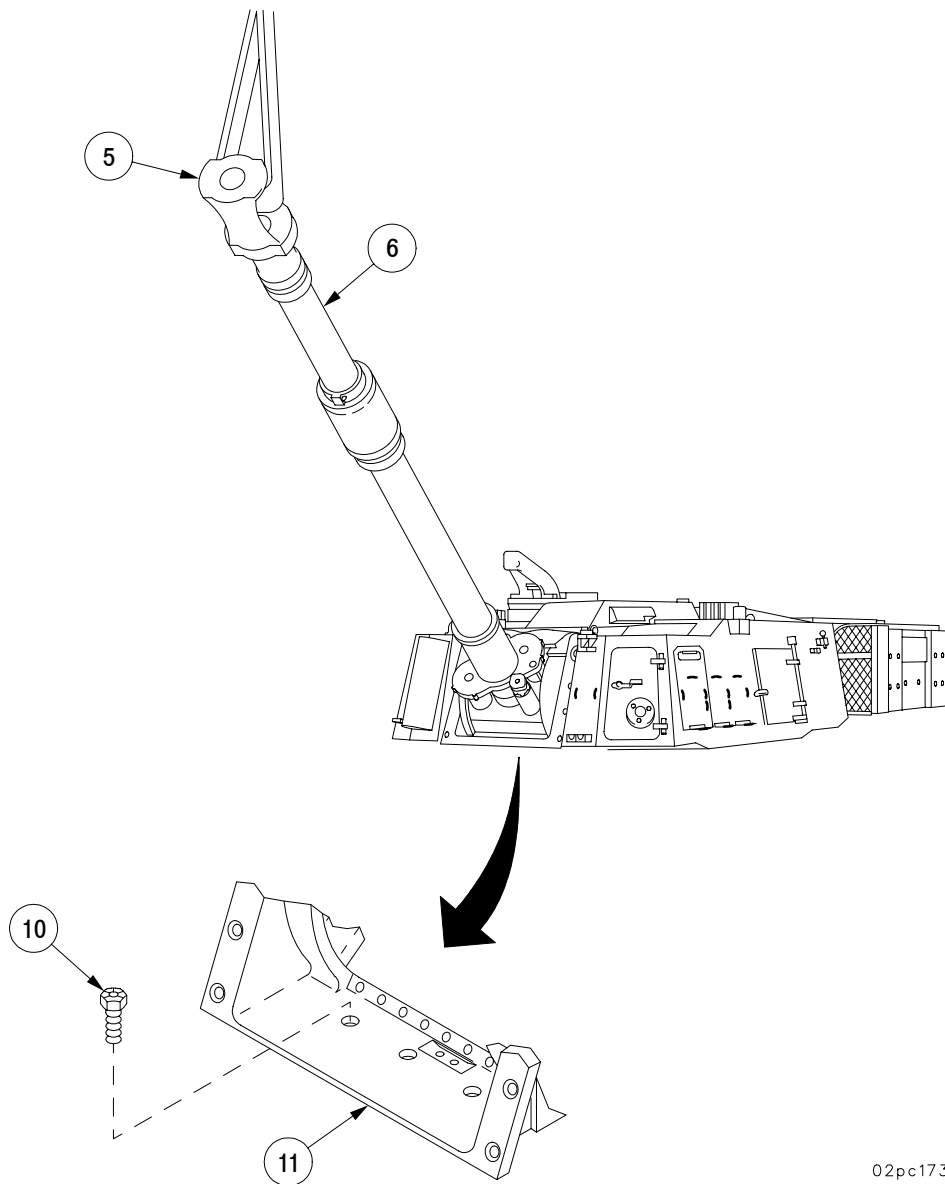
- 4 Support upper rotor (7). Raise cannon tube (6) to maximum elevation and remove upper rotor (7) from inside cab.



4-3 HOWITZER MOUNT M182A1 - CONTINUED

a. Removal - Continued

- 5 With cannon tube (6) at maximum elevation, remove three self-locking bolts (10) securing trunnion bracket (11) to cab. Discard self-locking bolts.
- 6 Stow travel lock (TM 9-2350-314-10).
- 7 Lower cannon tube (6) to a horizontal position and support with wood blocks on engine deck. Remove gun tube sling from muzzle brake (5).

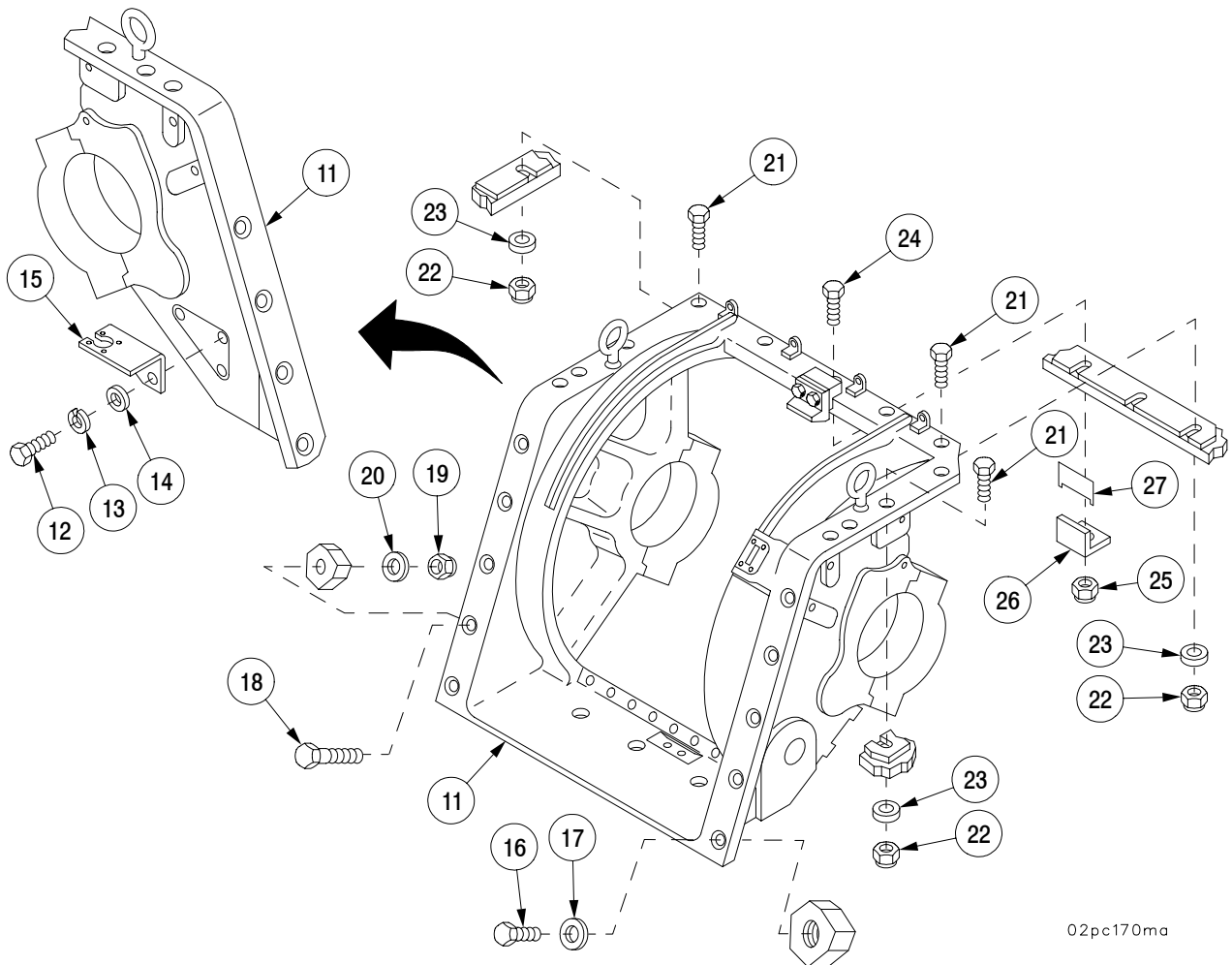


02pc173m

4-3 HOWITZER MOUNT M182A1 - CONTINUED

a. Removal - Continued

- 8 Disconnect battery ground leads (TM 9-2350-314-20-1).
- 9 Remove screw (12), lockwasher (13), and flat washer (14) securing tube temperature sensor mounting bracket (15) to trunnion bracket (11). Discard lockwasher.
- 10 Remove two screws (16) and two flat washers (17) securing trunnion bracket (11) to cab.
- 11 Remove eight screws (18), eight self-locking nuts (19), and eight flat washers (20) securing trunnion bracket (11) to cab. Discard self-locking nuts.
- 12 Remove nine screws (21), nine self-locking nuts (22), and nine flat washers (23) securing trunnion bracket (11) to cab. Discard self-locking nuts.
- 13 Remove screw (24) and self-locking nut (25) securing trunnion bracket (11), spacer (26), and shims (27) to cab. Discard self-locking nut.

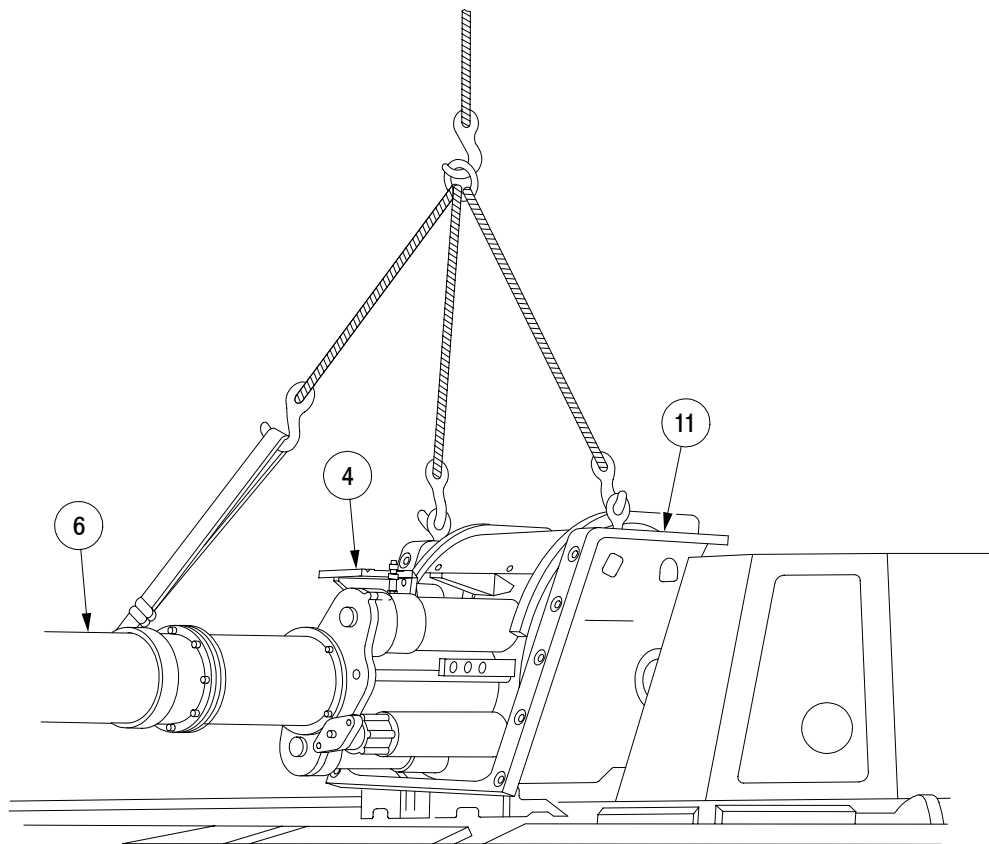


02pc170ma

4-3 HOWITZER MOUNT M182A1 - CONTINUED

a. Removal - Continued

- 14 Attach gun tube sling to cannon tube (6) and attach lifting sling to eyebolts on trunnion bracket (11) and to gun tube sling, as illustrated.
- 15 Attach lifting sling to suitable lifting device.
- 16 Raise cannon (6), mount (4), and trunnion bracket (11) slightly, then move horizontally to remove from cab, guiding breech operating cam away from all hydraulic lines.

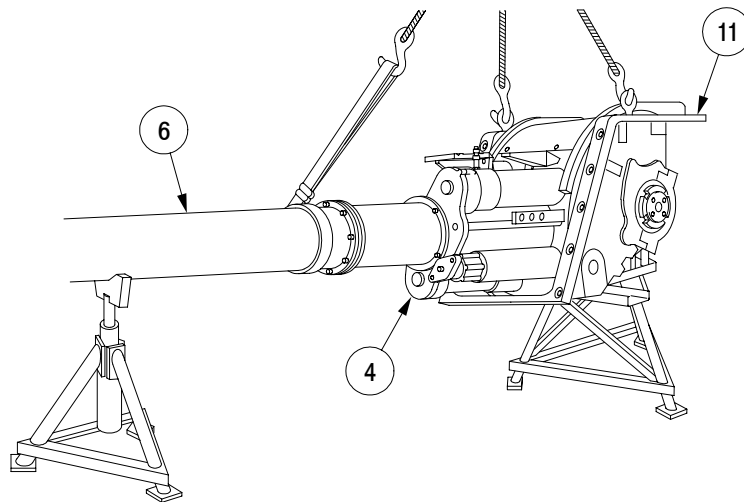


02pc160m

4-3 HOWITZER MOUNT M182A1 - CONTINUED

a. Removal - Continued

- 17 Place cannon tube (6), mount (4), and trunnion bracket (11) on fabricated cradle mount and cannon tube tripods or suitable wooden blocks.
- 18 Remove lifting sling from cannon tube (6) and trunnion bracket (11).

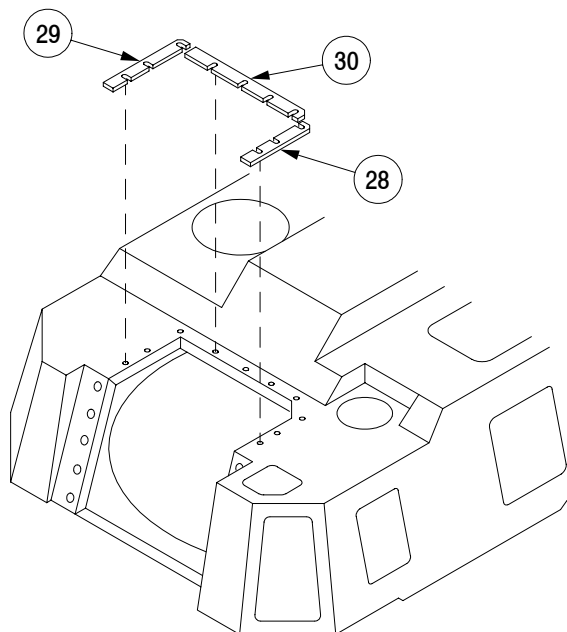


02pc162m

NOTE

Note location of shims to aid in installation or replace with new shims of same thickness.

- 19 Remove shims (28, 29, and 30) from cab.



02pc163m

4-3 HOWITZER MOUNT M182A1 - CONTINUED

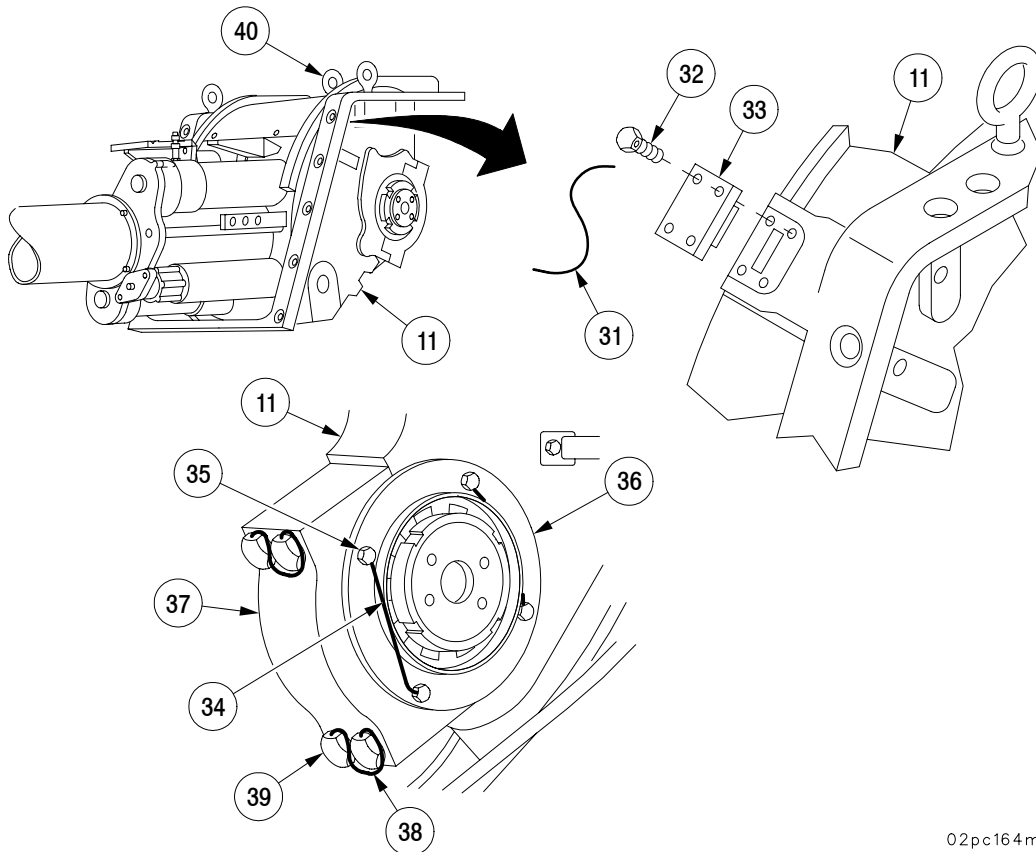
a. Removal - Continued

- 20 Remove lockwire (31) and four screws (32) securing follower assembly (33) to trunnion bracket (11). Discard lockwire.
- 21 Remove lockwire (34) and four screws (35) securing bearing retainer (36) to trunnion cap (37) and trunnion bracket (11). Discard lockwire.

NOTE

- Trunnion caps are matched to trunnion bracket and are not to be interchanged.
- Trunnion caps must be tagged before removal for location and identification during installation.

- 22 Remove lockwire (38) from eight trunnion cap bolts (39). Discard lockwire.
- 23 Install eyebolt (40) in top center hole of trunnion bracket (11).
- 24 Attach lifting sling to three eyebolts on trunnion bracket (11) and to a suitable lifting device.
- 25 Remove eight trunnion cap bolts (39) and two trunnion caps (37) from trunnion bracket (11).



02pc164m

4-3 HOWITZER MOUNT M182A1 - CONTINUED

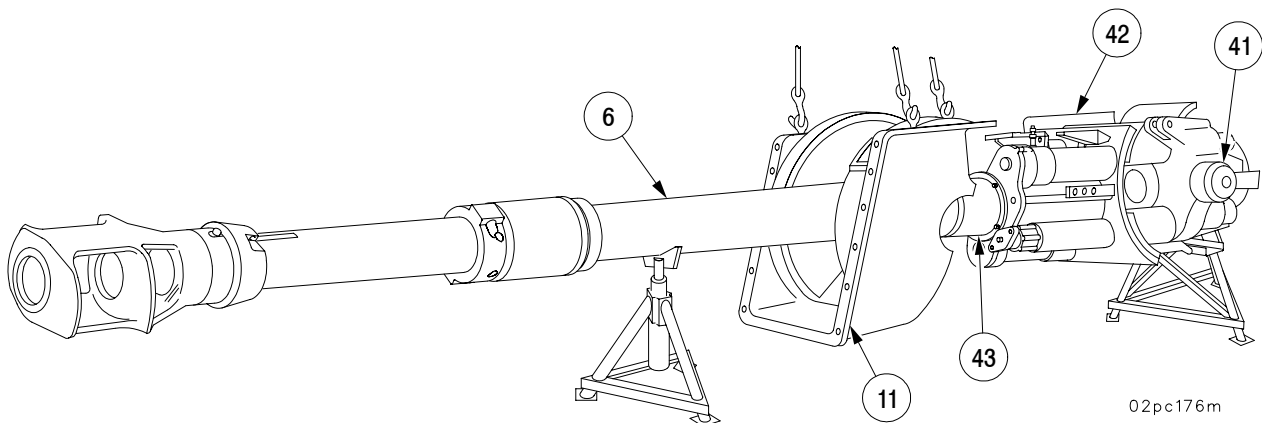
a. Removal - Continued

- 26 Raise trunnion bracket (11) slightly off trunnion bearings (41) and move it forward along cannon tube (6). Use care in clearing variable recoil cover and housing group (42), and dust shield (43).

CAUTION

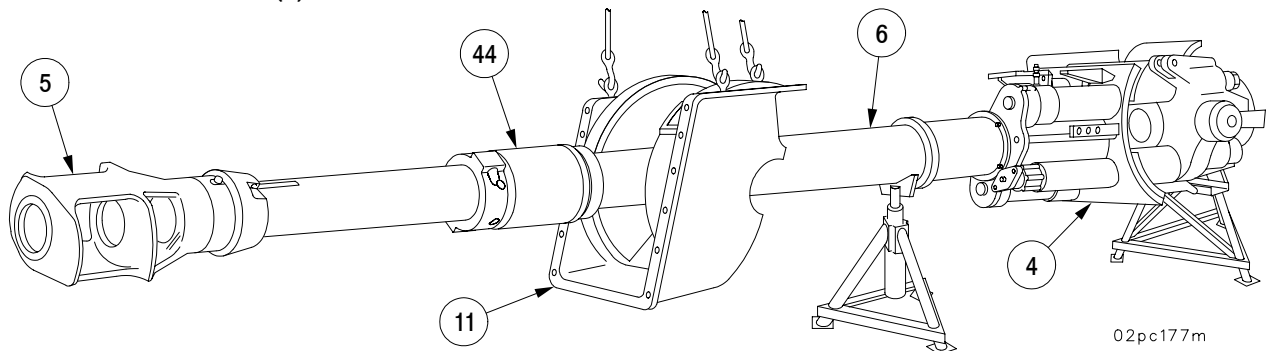
To prevent damage to polished and finished surfaces, do not place cannon tube tripod beneath bore evacuator or any other machined surface.

- 27 Support cannon tube (6) with trunnion bracket (11) and reposition cannon tube tripod towards muzzle end of cannon tube.



- 28 Move trunnion bracket (11) toward muzzle end of cannon tube (6) and reposition cannon tube tripod between trunnion bracket and mount (4).

- 29 Remove trunnion bracket (11) from cannon tube (6). Use care in clearing bore evacuator (44) and muzzle brake (5).

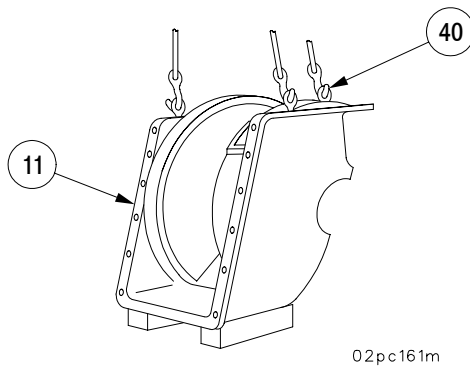


4-3 HOWITZER MOUNT M182A1 - CONTINUED

a. Removal - Continued

30 Remove lifting sling from trunnion bracket (11).

31 Remove eyebolt (40) from trunnion bracket (11).

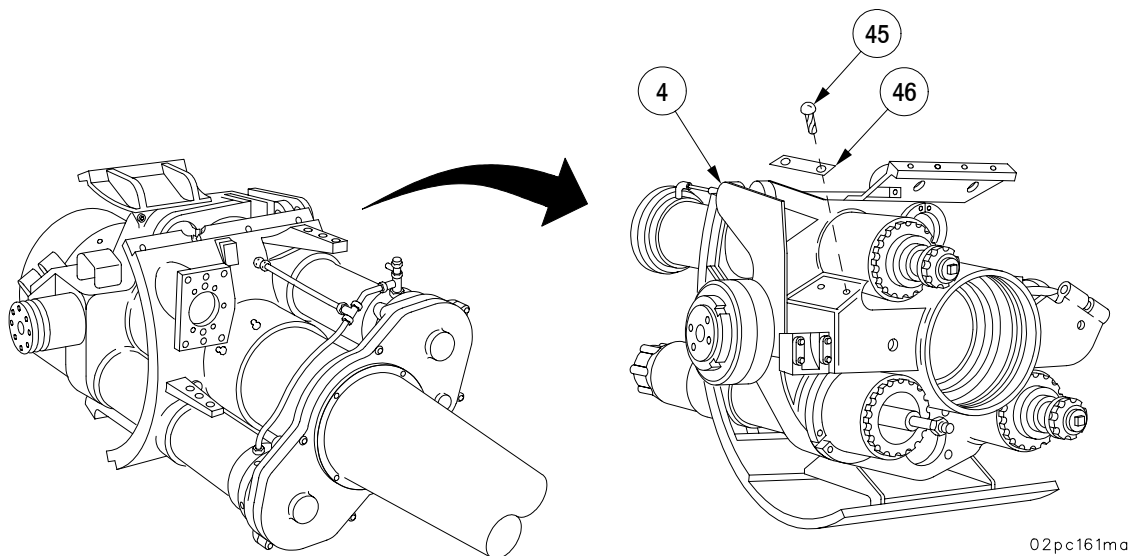


b. Disassembly.

Remove two screws (45) securing data plate (46) to mount (4). Discard screws.

c. Assembly.

Install data plate (46) onto the mount (4) and secure with two new screws (45).



4-3 HOWITZER MOUNT M182A1 - CONTINUED

d. Installation.

WARNING

Gloves and steel-tipped safety shoes will be worn when performing maintenance procedures on heavy components to prevent serious injury to personnel.

NOTE

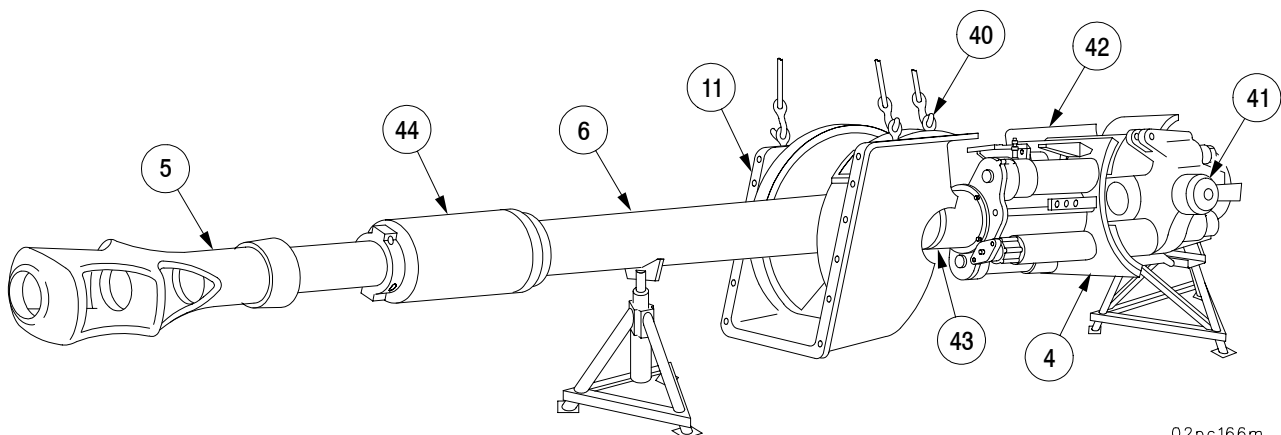
Before trunnion bracket is installed, cannon and mount must be resting on fabricated cannon tube and cradle mount tripods or wooden blocks.

- 1 Install eyebolt (40) in top center hole of trunnion bracket (11).
- 2 Attach lifting sling to three eyebolts on trunnion bracket (11) and suitable lifting device.
- 3 Raise trunnion bracket (11) and slide over muzzle brake (5) and bore evacuator assembly (44). Use care in clearing muzzle brake and bore evacuator assembly.

CAUTION

To prevent damage to polished and finished surfaces, do not place cannon tube tripod beneath bore evacuator or any other machined surface.

- 4 As trunnion bracket (11) nears cannon tube tripod, support cannon tube (6) with trunnion bracket and reposition cannon tube tripod toward muzzle end of cannon tube.
- 5 Move trunnion bracket (11) along cannon tube (6) toward mount (4). Use care in clearing dust shield (43) and variable recoil cover and housing group (42).
- 6 Position trunnion bracket (11) on trunnion bearings (41).



02pc166m

4-3 HOWITZER MOUNT M182A1 - CONTINUED

d. Installation - Continued

NOTE

Ensure trunnion caps are not interchanged during installation.

- 7 Loosely install two trunnion caps (37) onto trunnion bracket (11) with eight trunnion cap bolts (39).
- 8 Install bearing retainer (36) onto trunnion cap (37) and trunnion bracket (11) with four screws (35) to align brackets onto trunnion bearings.

NOTE

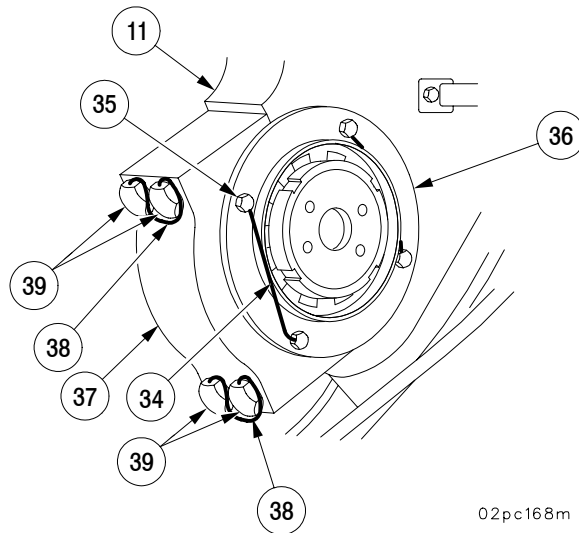
Torque sequence ("X" pattern).
Initial: 212-225 lb-ft (287-305 N·m)
Final: 425-450 lb-ft (576-610 N·m)

- 9 Progressively torque eight trunnion cap bolts (39) from 425 to 450 lb-ft (576-610 N·m) using "X" pattern.
- 10 Secure eight trunnion cap bolts (39) with new lockwire (38) (item 85, Appx B).

NOTE

Torque sequence ("X" pattern).

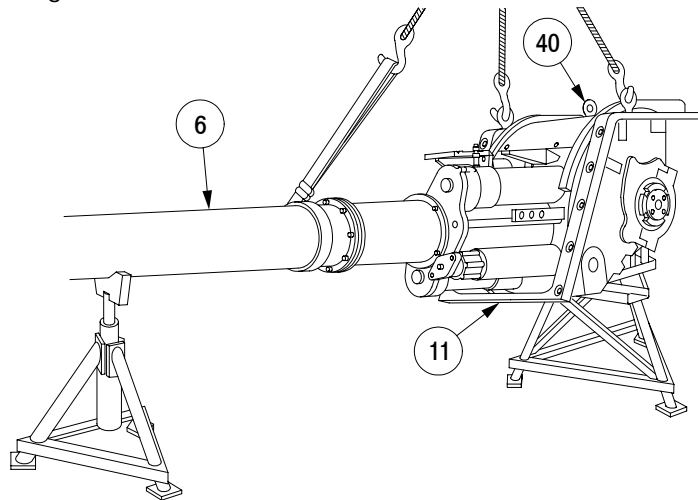
- 11 Progressively torque four screws (35) to 90 lb-ft (122 N·m) using "X" pattern.
- 12 Secure four screws (35) with new lockwire (34) (item 82, Appx B).



4-3 HOWITZER MOUNT M182A1 - CONTINUED

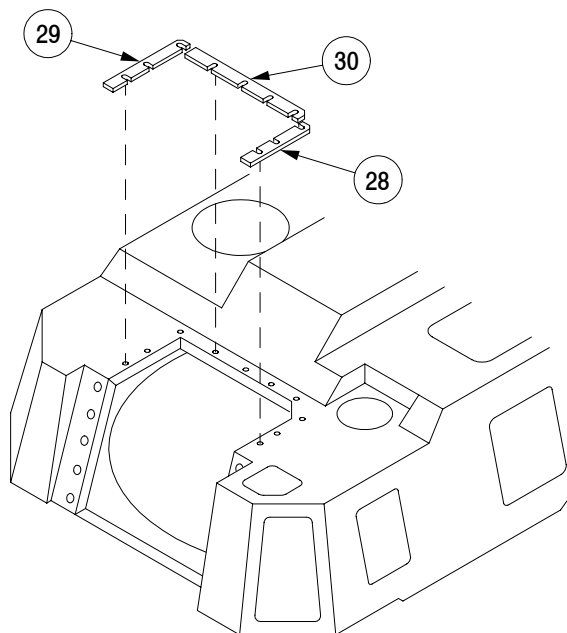
d. Installation - Continued

- 13 Remove lifting sling from trunnion bracket (11).
- 14 Remove eyebolt (40) from trunnion bracket (11).
- 15 Attach gun tube sling to cannon tube (6). Attach lifting sling to eyebolt on trunnion bracket (11) and to gun tube sling.



02pc169m

- 15.1 Apply sealing compound (item 39.1, Appx B) to aluminum/steel interfaces of shims (28, 29 and 30) and trunnion bracket (11).
- 16 Install shims (28, 29, and 30) onto cab in same location and/or thickness as removed.

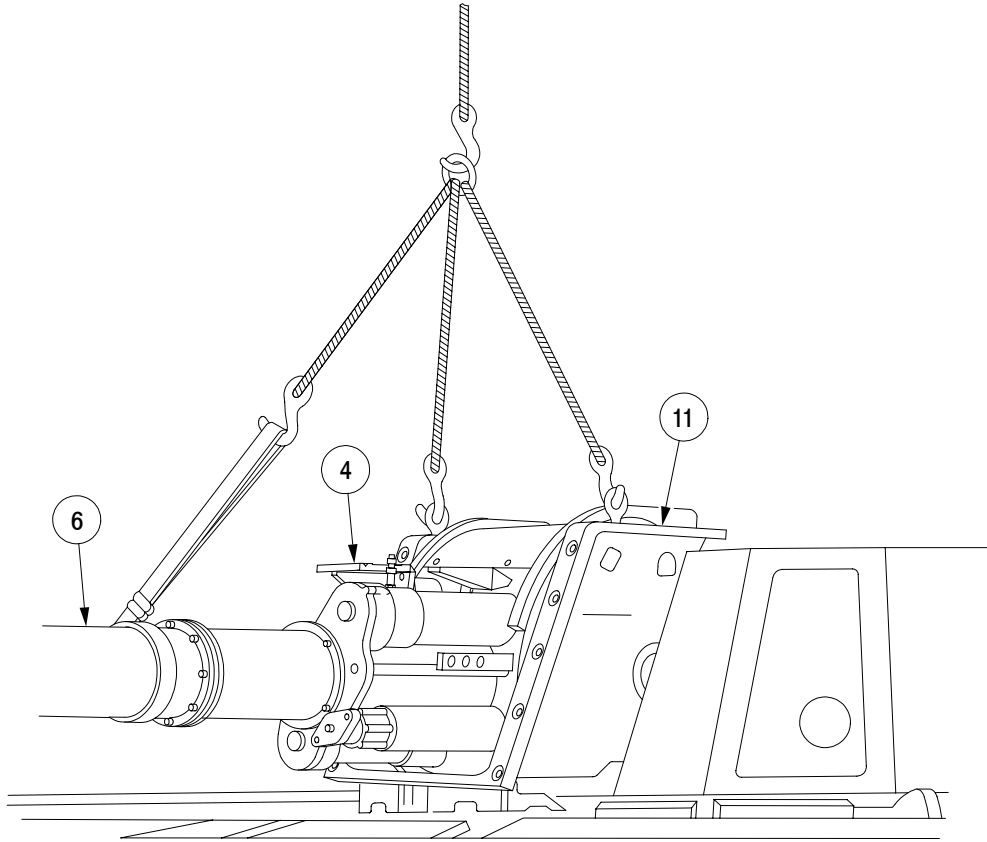


02pc163m

4-3 HOWITZER MOUNT M182A1 - CONTINUED

d. Installation - Continued

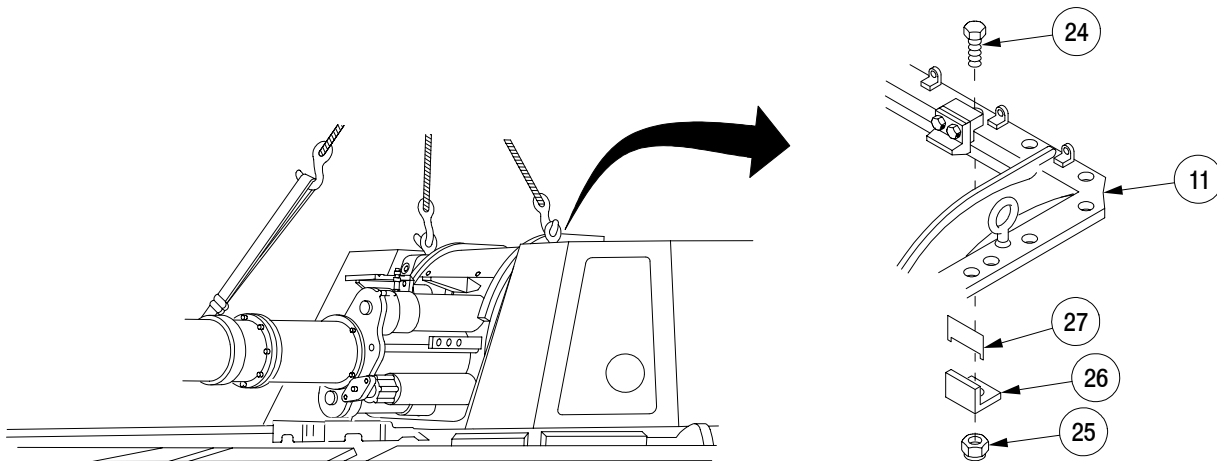
17 Using suitable lifting device, install cannon tube (6), mount (4), and trunnion bracket (11) into cab.



02pc160m

17.1 Apply sealing compound (item 39.1, Appx B) to aluminum/steel interface of shims (27).

18 Install screw (24), new self-locking nut (25), and spacer (26) to secure trunnion bracket (11) and shims (27) to cab.

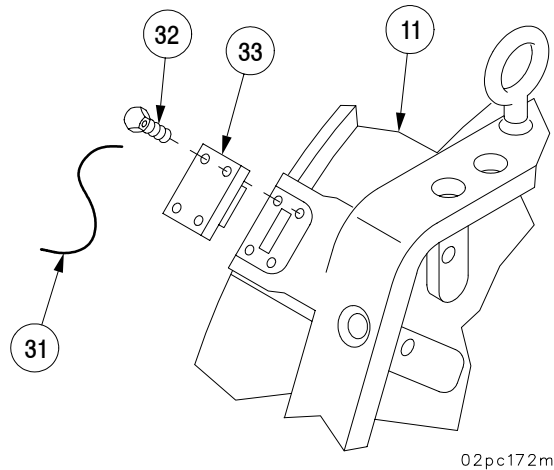


02pc171m

4-3 HOWITZER MOUNT M182A1 - CONTINUED

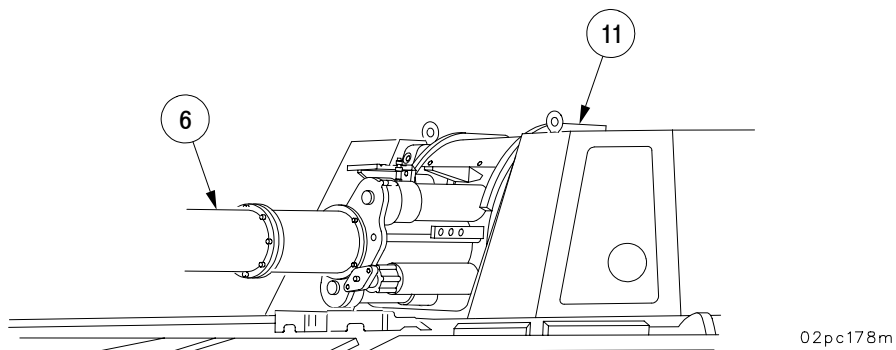
d. Installation - Continued

- 19 Install follower assembly (33) onto trunnion bracket (11) and secure with four screws (32) and new lockwire (31) (item 82, Appx B).

**NOTE**

Make sure all shims and spacers are properly located prior to removing lifting sling and gun tube sling. Minor adjustments may be required to align shims, spacers, and trunnion bracket to cab.

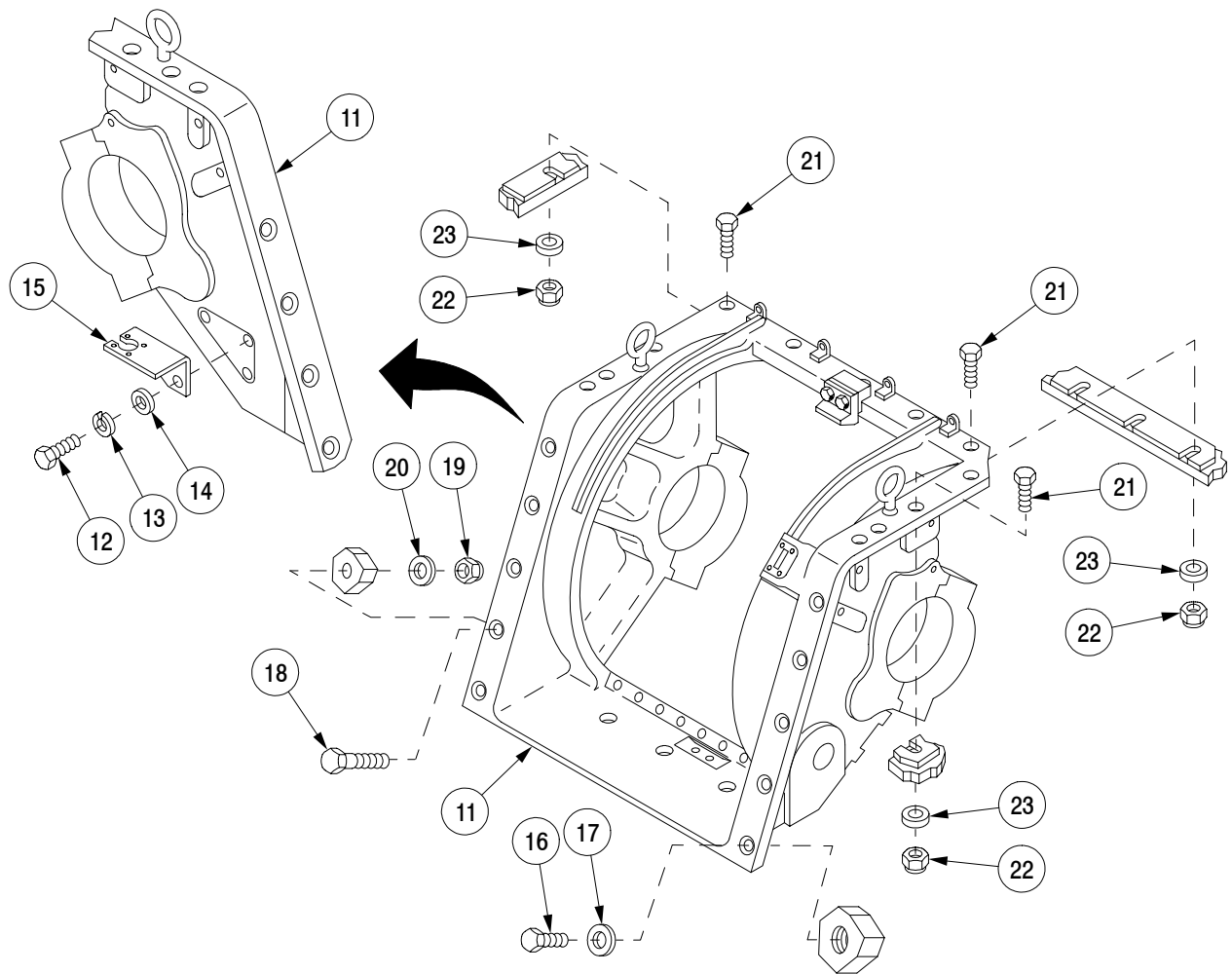
- 20 Support cannon tube (6) with wood blocks on engine deck. Remove lifting sling from trunnion bracket (11) and gun tube sling from cannon tube (6).



4-3 HOWITZER MOUNT M182A1 - CONTINUED

d. Installation - Continued

- 21 Install nine screws (21), nine new self-locking nuts (22), and nine flat washers (23) to secure trunnion bracket (11) to cab.
- 22 Install eight screws (18), eight new self-locking nuts (19), and eight flat washers (20) to secure trunnion bracket (11) to cab.
- 23 Install two screws (16) and two flat washers (17) to secure trunnion bracket (11) to cab.
- 24 Install tube temperature sensor mounting bracket (15) onto trunnion bracket (11) and secure with screw (12), new lockwasher (13), and flat washer (14).

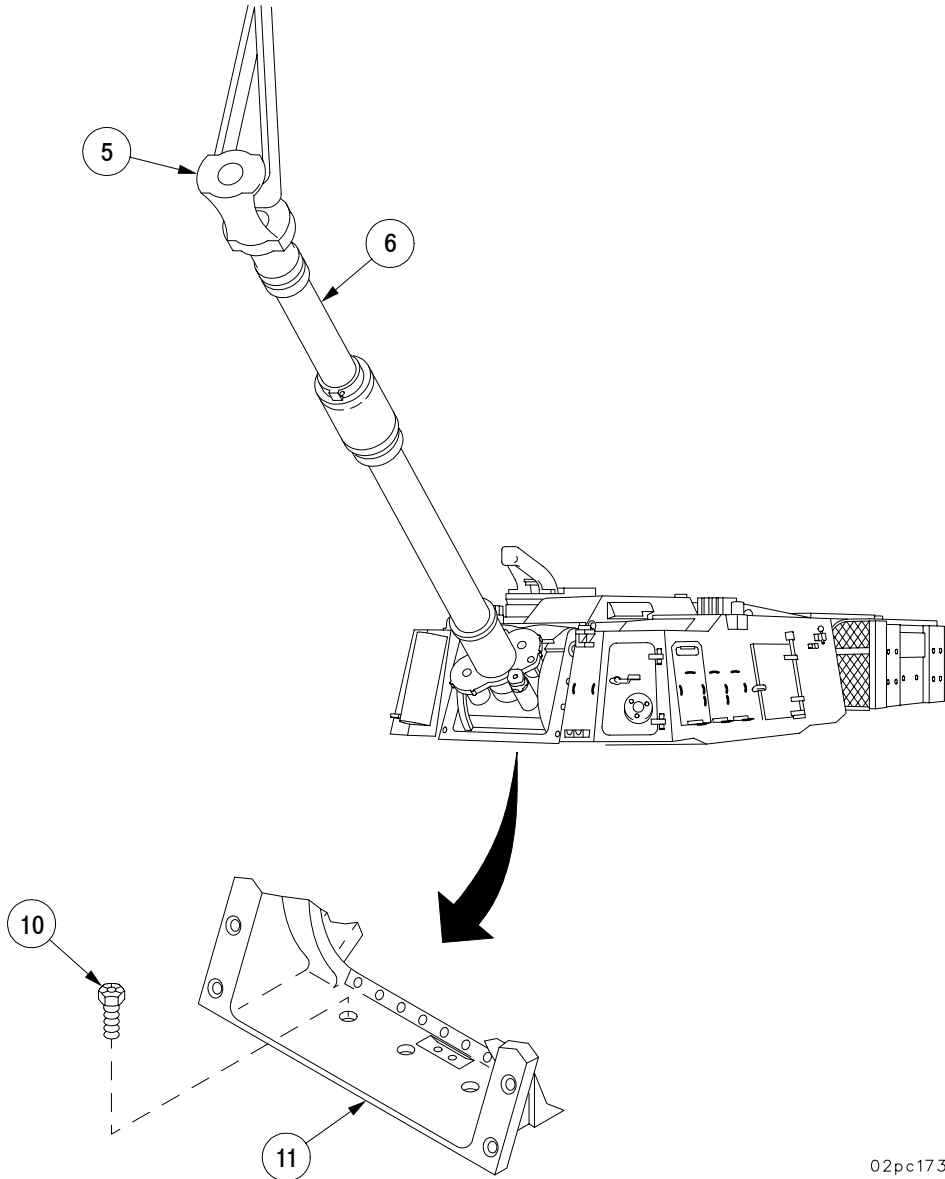


02pc170m

4-3 HOWITZER MOUNT M182A1 - CONTINUED

d. Installation - Continued

- 25 Attach gun tube sling to muzzle brake (5) and to suitable lifting device.
- 26 Using suitable lifting device, raise cannon tube (6) to maximum elevation.
- 27 Install three new self-locking bolts (10) to secure trunnion bracket (11) to cab. Torque bolts (10) from 340-380 lb-ft (461-515 N-m).



02pc173m

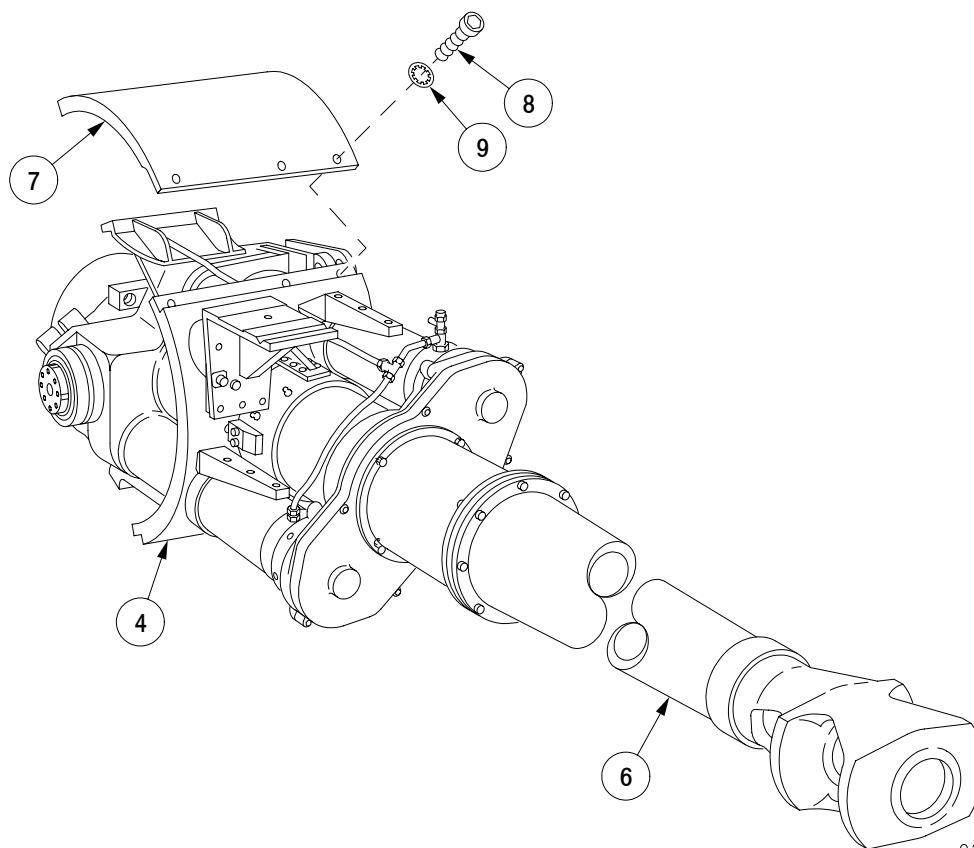
4-3 HOWITZER MOUNT M182A1 - CONTINUED

d. Installation - Continued

WARNING

Two personnel are required to install upper rotor.
Upper rotor weighs approximately 75 lbs (34 kg) and
may cause serious injury to personnel if dropped.

- 28 Install upper rotor (7) onto mount (4) and depress cannon tube (6) to 300 mils of elevation.
- 29 Supporting upper rotor (7), install seven screws (8) and seven new lockwashers (9) to secure upper rotor (7) to mount (4).



02pc174m

4-3 HOWITZER MOUNT M182A1 - CONTINUED

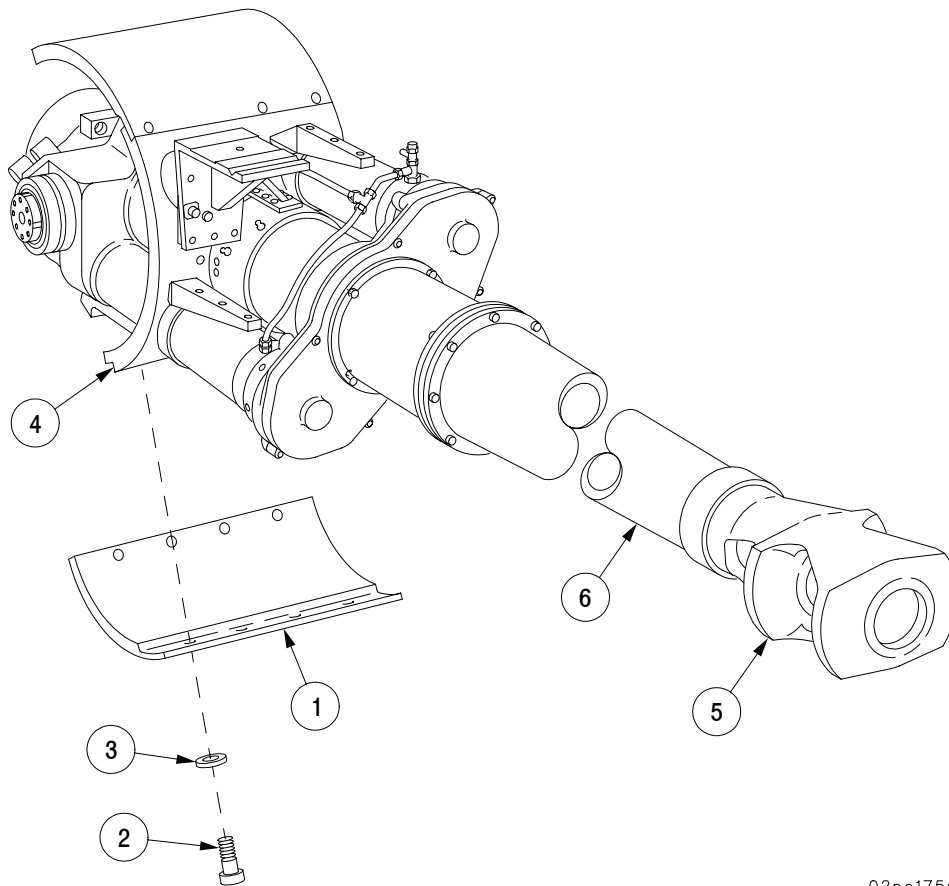
d. Installation - Continued

- 30 Raise travel lock and open lockjaw (TM 9-2350-314-10).
- 31 Lower cannon tube (6) into travel lock and remove gun tube sling from muzzle brake (5) and suitable lifting device.

WARNING

Support lower rotor during installation. Lower rotor weighs approximately 57 lbs (26 kg) and may cause serious injury to personnel if dropped.

- 32 Supporting lower rotor (1), install eight screws (2) and eight new lockwashers (3) to secure lower rotor (1) to mount (4).
- 33 Connect battery ground leads (TM 9-2350-314-10).



02pc175m

4-4 RECUPERATOR ASSEMBLY - CONTINUED

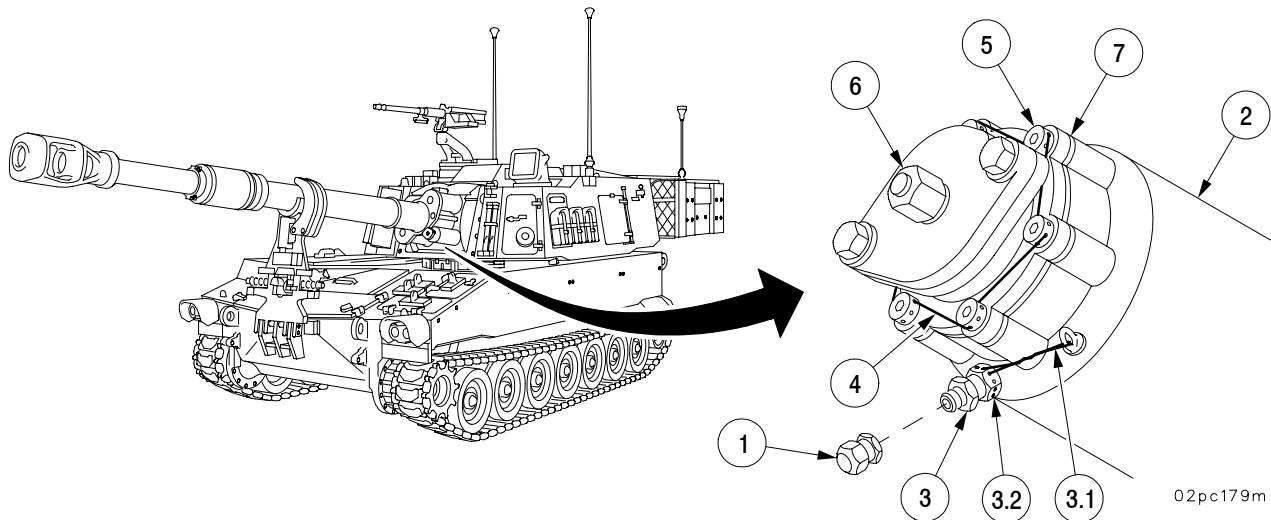
a. Removal.

- 1 Depress cannon to 0 mils.
- 2 Remove nitrogen valve cap (1) from right front of recuperator cylinder (2) and loosen nut (3) on valve two turns to release nitrogen. Ensure all nitrogen is vented from recuperator.

WARNING

Ensure all nitrogen is vented from recuperator before loosening the nitrogen drain valve to prevent serious injury.

- 2.1 Remove lockwire (3.1) from nitrogen drain valve (3.2). Discard lockwire.
- 2.2 Remove nitrogen drain valve (3.2).
- 3 Remove lockwire (4) from six screws (5). Discard lockwire.
- 4 Remove six screws (5), cover adapter group (6) and gasket (7) from front end of recuperator cylinder (2). Discard gasket.



4-4 RECUPERATOR ASSEMBLY - CONTINUED

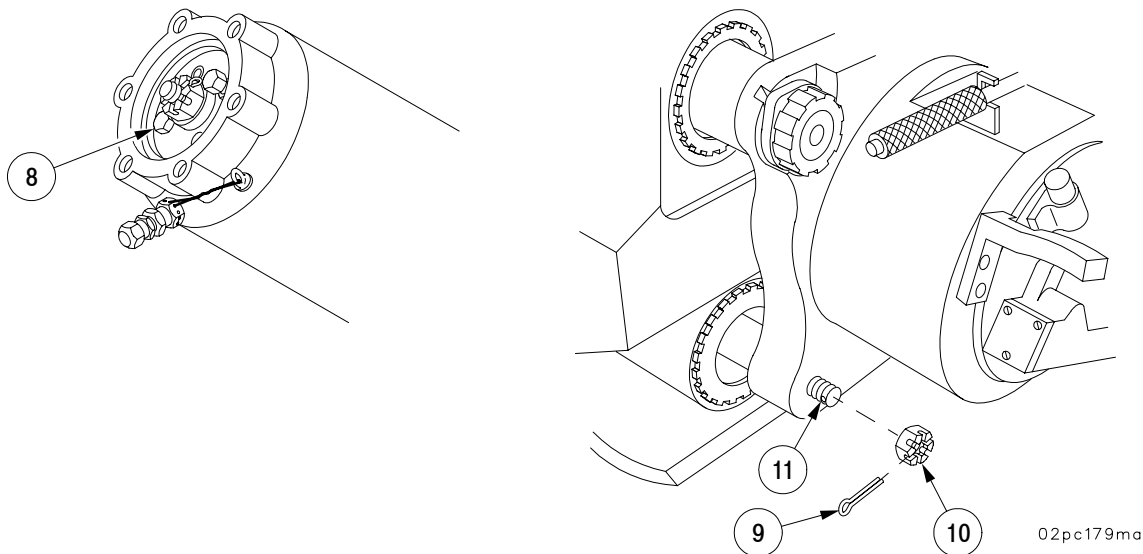
a. Removal - Continued

- 5 Loosen front drain plug (8) and catch fluid in drain pan. When fluid is drained, tighten front drain plug (8).
- 6 Push cannon out of battery about 18 in. (457 mm) (TM 9-2350-314-20-2-1).

WARNING

Block cannon with breech stand or chain tube to hull when working on mount components with cannon pushed out of battery. This will prevent serious injury or damage to equipment caused by accidental elevation of the cannon.

- 7 Remove cotter pin (9) and rear slotted nut (10) from shouldered shaft (11). Discard cotter pin.



- 8 Remove spring pin (12) with suitable punch. Discard spring pin.
- 9 Unscrew and remove shaft collar (13).
- 10 Remove drain plug (14) at rear of recuperator cylinder (2) and drain hydraulic fluid into drain pan. Reinstall drain plug (14).
- 11 Remove lockwire (15), screw (16), and key (17). Discard lockwire.
- 12 Remove retaining ring (18) using spanner wrench.

4-4 RECUPERATOR ASSEMBLY - CONTINUED

a. Removal - Continued

CAUTION

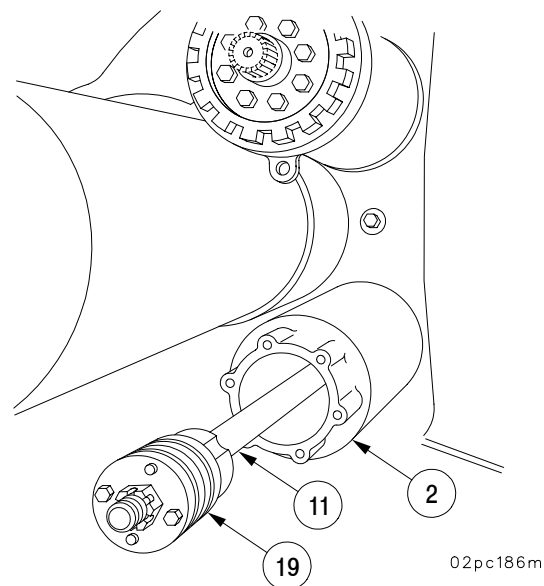
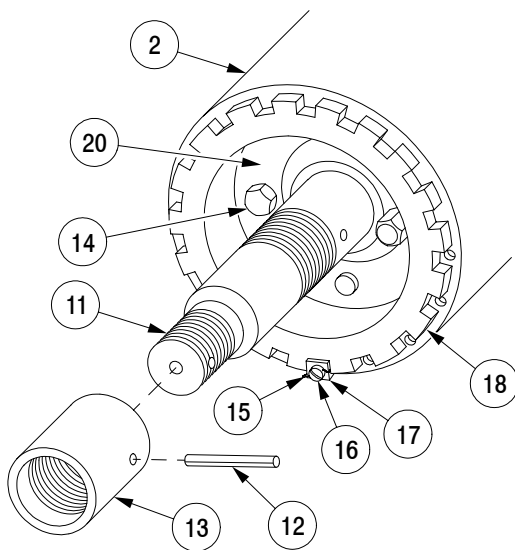
Use care not to damage threads on rear of shaft.

- 13 Push shouldered shaft (11) forward into recuperator cylinder (2).

CAUTION

Use care not to scratch or damage shaft during removal. Do not touch shaft with bare hands. Oils on skin will etch polished surface of shaft, allowing rust to form.

- 14 When piston group (19) comes out of front of recuperator cylinder (2) (outside cab), it must be supported by a second soldier.
- 15 Outside soldier must pull piston group (19) and shouldered shaft (11) forward sufficiently to disengage the other end of the shouldered shaft (11) from the cylinder head group (20) at the rear of the recuperator cylinder (2).
- 16 Gently push shouldered shaft (11) back into position, locating cylinder head group (20) with end of shouldered shaft (11).
- 17 Tap cylinder head group (20) out of back end of recuperator cylinder (2).
- 18 Wrap shouldered shaft (11) with a rag and remove it from the front end of the recuperator cylinder (2).



4-4 RECUPERATOR ASSEMBLY - CONTINUED

a. Removal - Continued

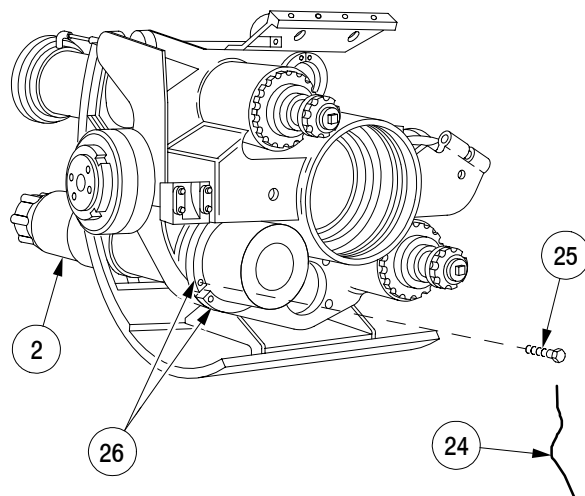
19 Deleted

20 Deleted

WARNING

Block cannon with breech stand or chain tube to hull when working on mount components with cannon pushed out of battery. This will prevent serious injury to personnel or damage to equipment caused by accidental elevation of the cannon.

- 21 Push cannon out of battery 37-1/2 in. (952.5 mm) (TM 9-2350-314-20-2-1).
- 22 Retract rammer and swing cylinder down for clearance (TM 9-2350-314-10).
- 23 Remove paint from front bearing surface of the recuperator cylinder (2).
- 24 Remove lockwire (24) and six screws (25) from retainer (26). Discard lockwire.



NOTE: Items 21 and 22 deleted.

02pc185m

4-4 RECUPERATOR ASSEMBLY - CONTINUED

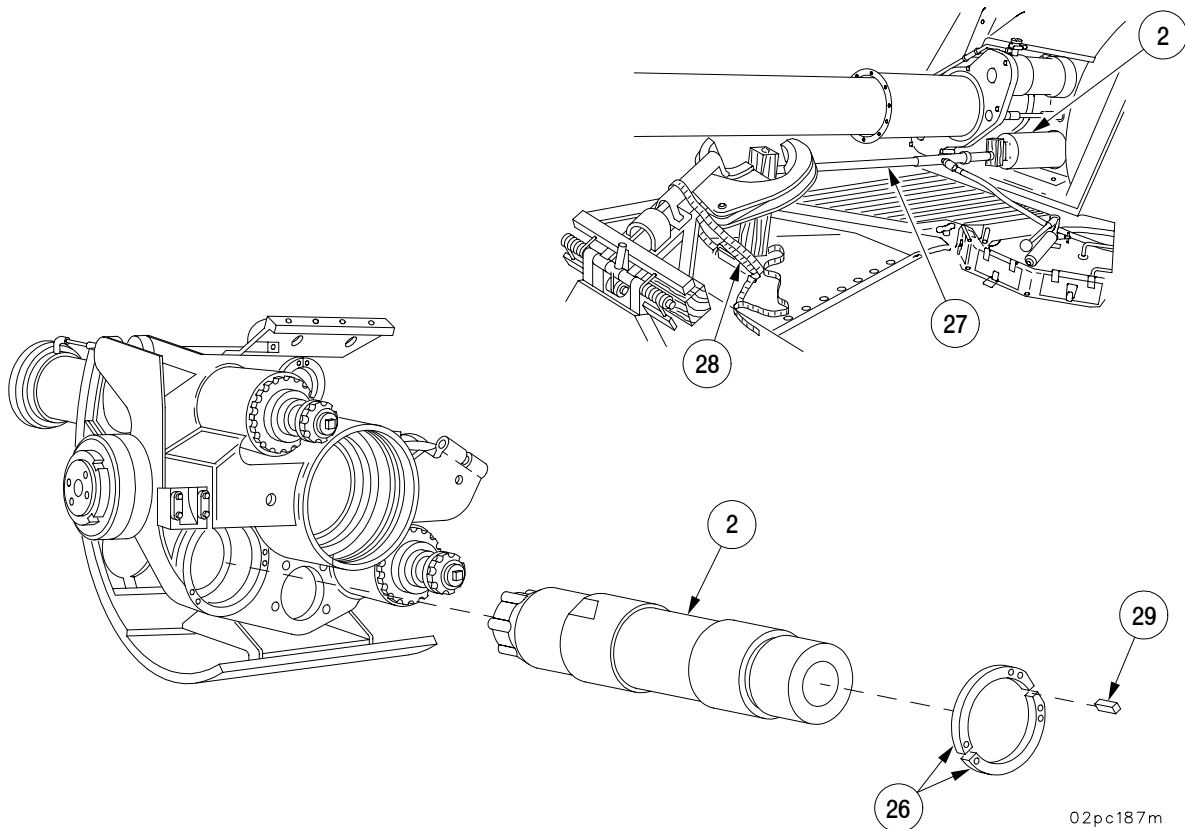
a. Removal - Continued

- 25 Position hydraulic jack (port-a-power) (27) using appropriate adapters with a 6x4x2-in. block on front face of the recuperator cylinder (2), suitable blocks on cannon travel lock, and sling (28).
- 26 Press recuperator cylinder (2) rearward approximately 1/8-in. (3 mm) and remove retainer (26) from groove of recuperator cylinder (2).

WARNING

Use care while removing recuperator. Cylinder weighs approximately 177 lbs (80 kg) and can cause serious injury to personnel or damage to equipment if dropped.

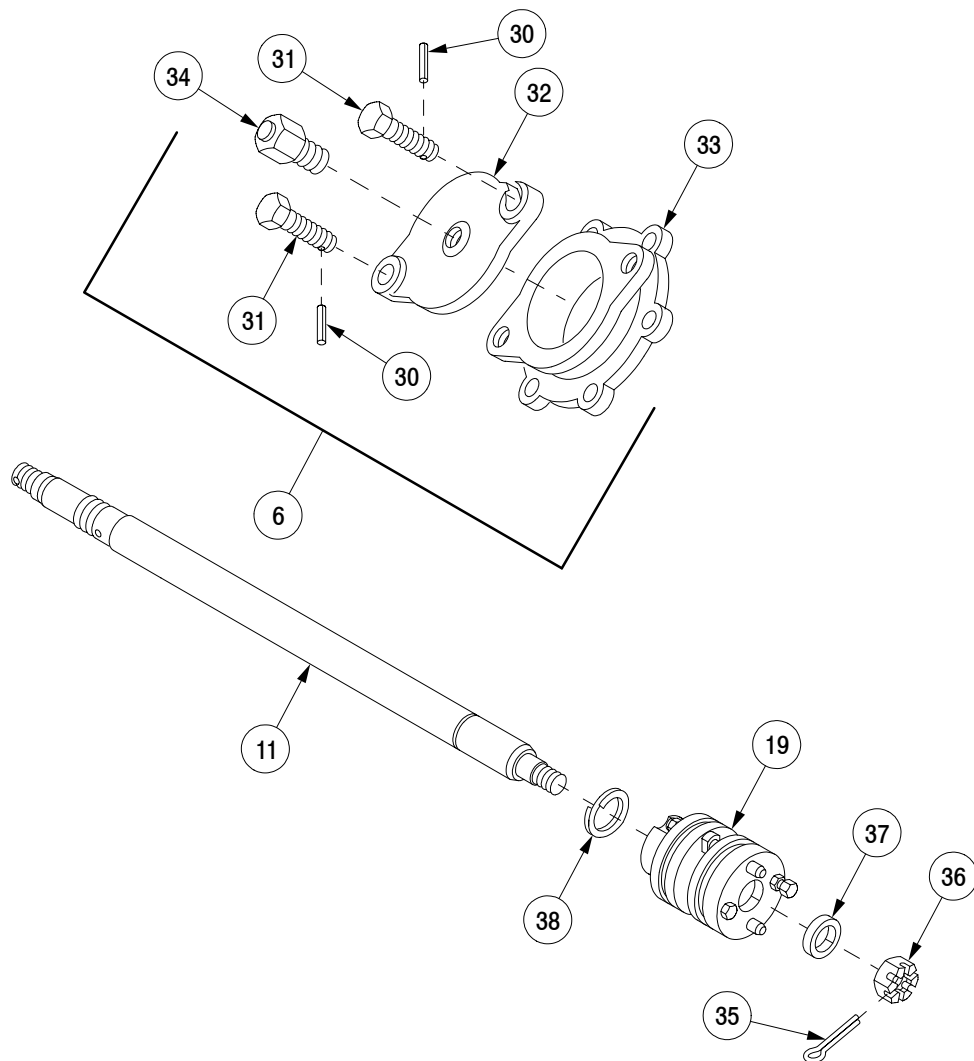
- 27 Using nylon sling inside of cab to support recuperator cylinder (2), continue to press recuperator cylinder (2) rearward through mount.
- 28 When recuperator cylinder (2) clears rear of mount, lower to floor and remove through rear door.
- 29 Remove key (29) from keyway.



4-4 RECUPERATOR ASSEMBLY - CONTINUED

b. Disassembly.

- 1 To disassemble cover adapter group (6), remove two spring pins (30) from screws (31). Discard spring pins.
- 2 Remove two screws (31) and cover assembly (32) from cover adapter (33).
- 3 Remove safety relief valve (34) from cover (32).
- 4 Remove cotter pin (35), slotted nut (36), flat washer (37), piston group (19), and retaining ring (38) from shaft (11). Discard cotter pin and retaining ring.

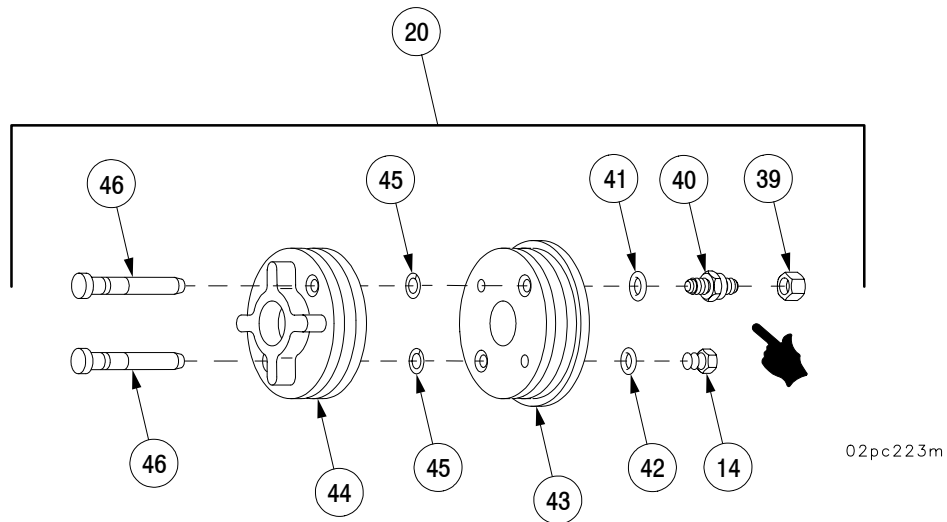


02pc189m

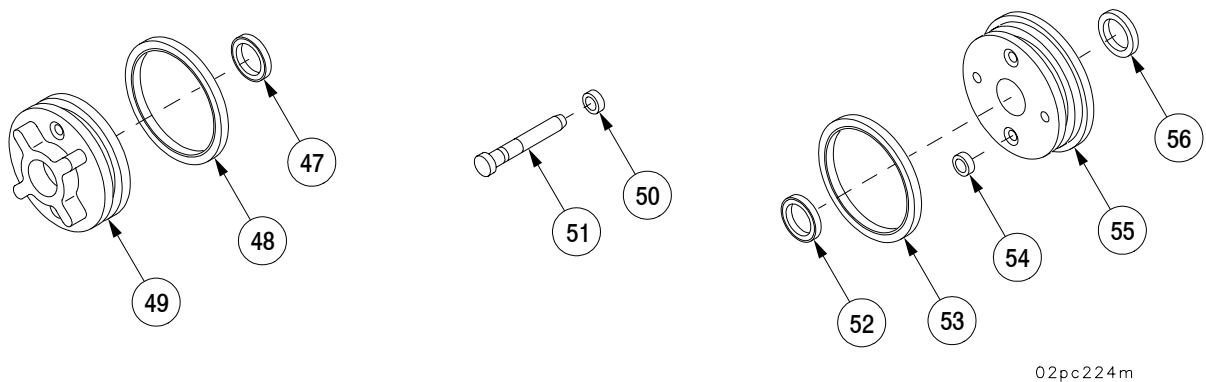
4-4 RECUPERATOR ASSEMBLY - CONTINUED

b. Disassembly - Continued

- 5 To disassemble the cylinder head group (20), remove cap (39), valve (40), and preformed packing (41). Discard preformed packing.
- 6 Remove drain plug (14) and preformed packing (42). Discard preformed packing.
- 7 Separate inner and outer head assembly (43 and 44) and remove two retaining rings (45). Discard retaining rings.
- 8 Separate pin with seal group (46).



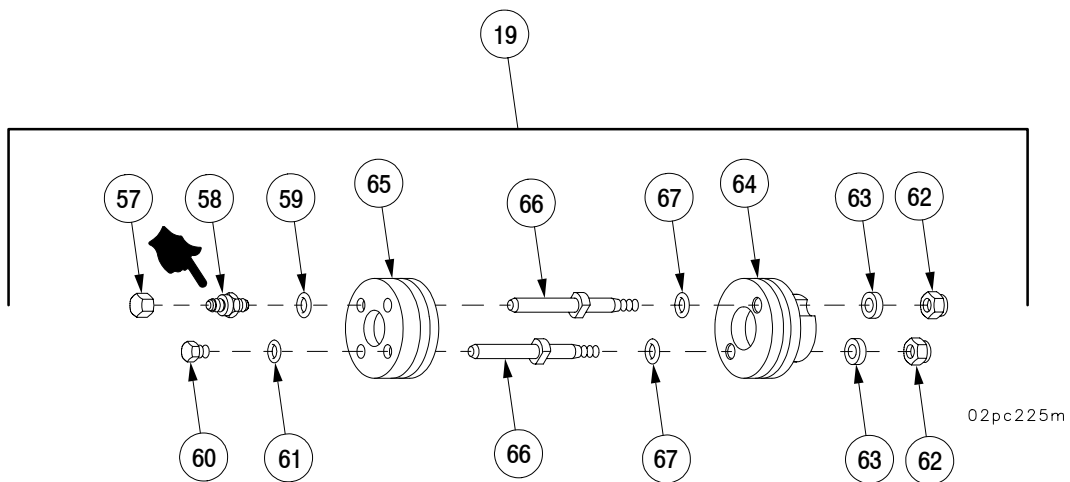
- 9 Remove seal assemblies (47 and 48) from inner cylinder head (49). Discard seal assemblies.
- 10 Remove two seal assemblies (50) from two pins (51). Discard seal assemblies.
- 11 Remove seal assemblies (52, 53, and 54) from outer cylinder head (55). Remove piston wiper (56). Discard seal assemblies and piston wiper.



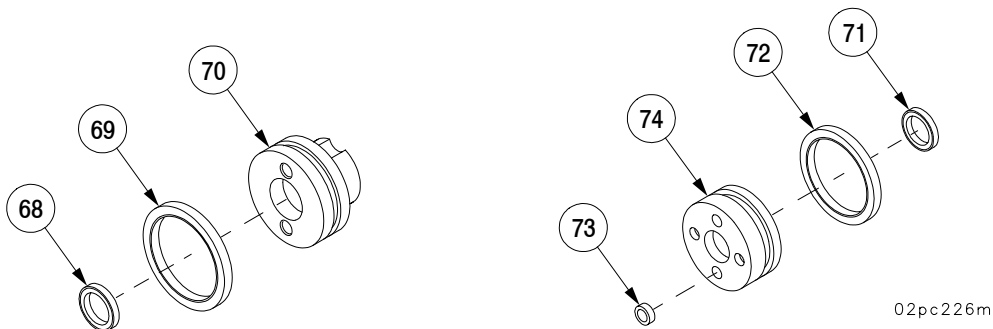
4-4 RECUPERATOR ASSEMBLY - CONTINUED

b. Disassembly - Continued

- 12 To disassemble piston group (19), remove cap (57), valve (58), and preformed packing (59). Discard preformed packing.
- 13 Remove plug (60) and preformed packing (61). Discard preformed packing.
- 14 Remove two self-locking nuts (62) and two washers (63) and separate the inner piston (64), outer piston (65), and two shafts (66). Discard self-locking nuts.
- 15 Remove and discard two preformed packings (67).



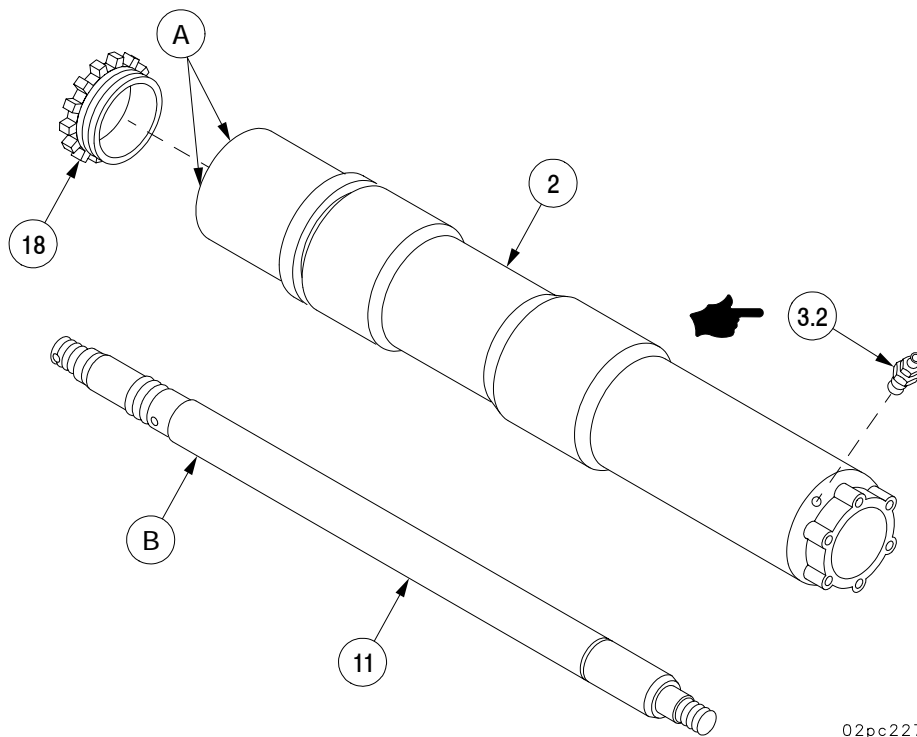
- 16 Remove seal assemblies (68 and 69) from inner piston assembly (70) and discard seals.
- 17 Remove seal assemblies (71, 72, and 73) from outer piston assembly (74). Discard seal assemblies.



4-4 RECUPERATOR ASSEMBLY - CONTINUED

c. Inspection.

- 1 Inspect retaining ring (18). Replace if cracked, spanner slot shoulders are rounded, or if threads are mutilated.
- 2 Inspect recuperator cylinder (2) for any indication of surface cracks or if bore is scratched, scored, or galled. Replace if damaged.
- 3 Measure recuperator cylinder (2) inside diameter at point A. Replace if greater than 3.877 in. (98.47 mm).
- 4 Inspect nitrogen valve (3.2). Replace if damaged in any way that could affect operation. ■
- 5 Inspect shouldered shaft (11) for nicks, scratches, cracks, or mutilation of threads. Replace if damaged.
- 6 Measure shouldered shaft (11) outside diameter at point B. Replace if less than 1.6215 in. (41.18 mm).



02pc227m

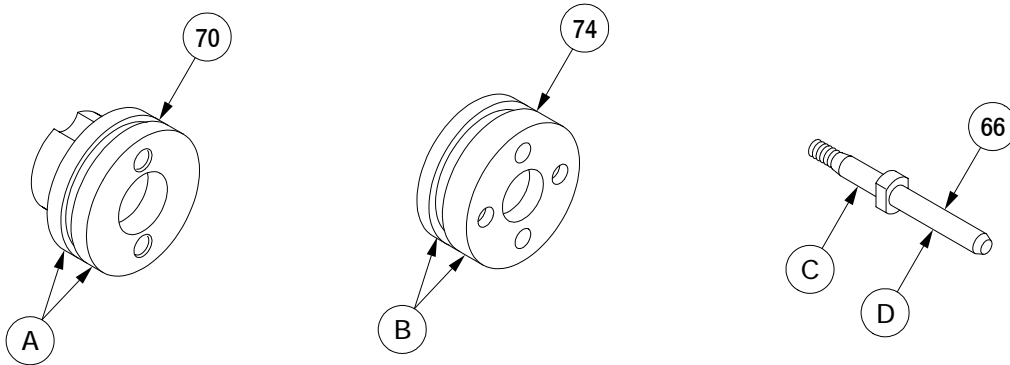
4-4 RECUPERATOR ASSEMBLY - CONTINUED

c. Inspection - Continued

NOTE

Inner and outer pistons are a matched set. If either component is defective, both must be replaced.

- 7 Inspect inner piston (70) and outer piston (74). Replace if marked or damaged in any way to affect operation.
- 8 Measure inner piston (70) at point A and outer piston (74) at point B. Replace if outside diameter is less than 3.869 in. (98.27 mm).
- 9 Inspect two shafts (66) for straightness, nicks, cracks, or burrs. Replace if damaged.
- 10 Measure two shafts (66) at points C and D. Replace if outside diameter is less than 0.499 in. (12.67 mm).

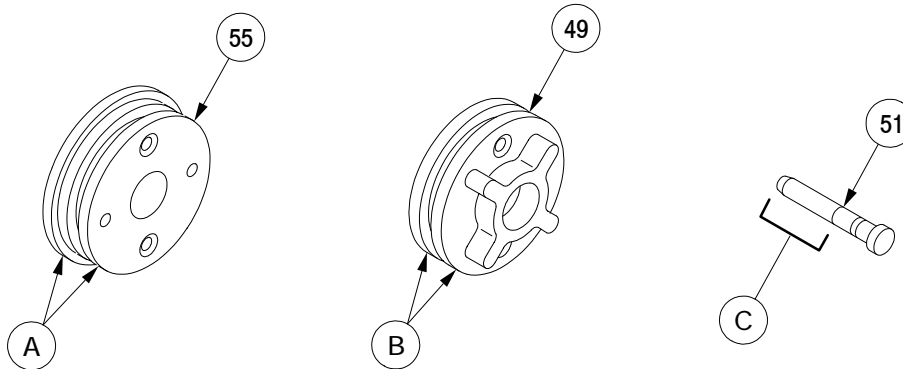


02pc228m

NOTE

Inner and outer pistons are a matched set. If either component is defective, both must be replaced.

- 11 Inspect inner and outer cylinder heads (49 and 55). Replace if cracked, nicked, or damaged in any way affecting operation.
- 12 Measure inner cylinder head (49) at point B and outer cylinder head (55) at point A. Replace if outside diameter is less than 5.493 in. (139.52 mm).
- 13 Inspect two pins (51) and replace if not straight or if nicked, cracked, or burred.
- 14 Measure two pins (51) at point C. Replace if outside diameter is less than 0.499 in. (12.67 mm).



02pc229m

4-4 RECUPERATOR ASSEMBLY - CONTINUED

d. Assembly.

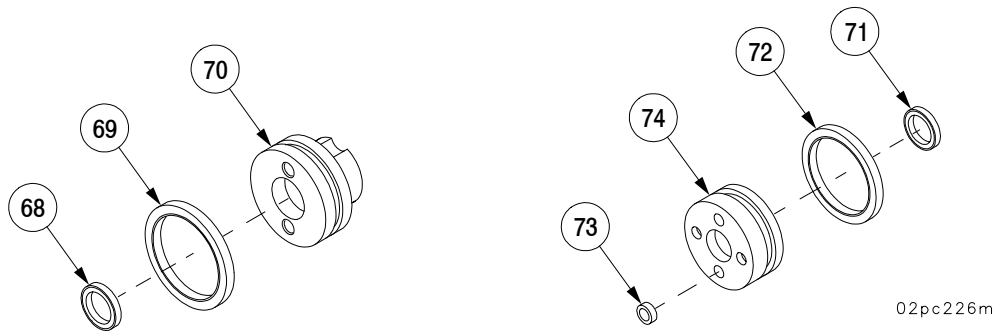
CAUTION

During assembly and installation of recuperator, use extreme care to prevent contamination.

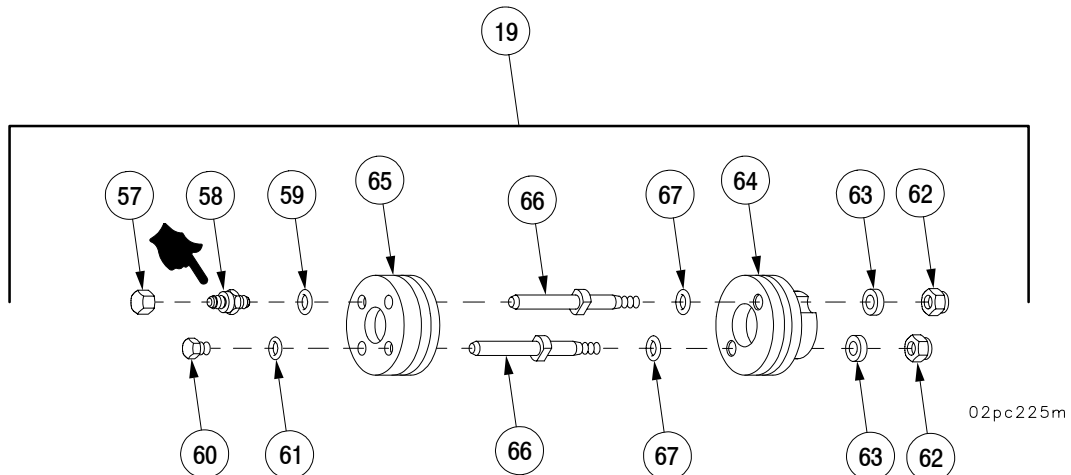
NOTE

Coat all packings, seals, pistons and cylinder head groups with hydraulic fluid before installation.

- 1 Install new seal assemblies (73, 72, and 71) on outer piston (74).
- 2 Install new seal assemblies (69 and 68) on inner piston (70).



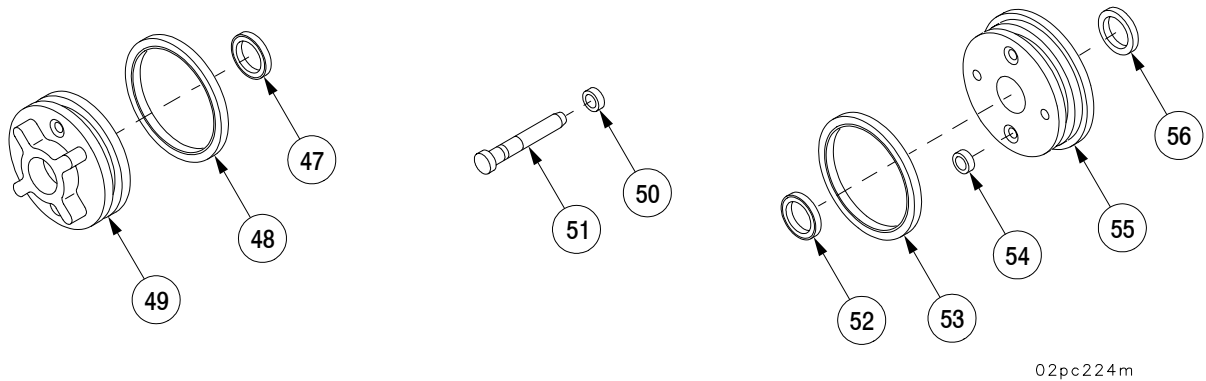
- 3 Assemble piston group (19) by installing two new preformed packings (67) and two shafts (66).
- 4 Assemble outer piston (65) and inner piston (64) with inner-face marks coinciding.
- 5 Install two washers (63) and two new self-locking nuts (62).
- 6 Install new preformed packing (61) and plug (60).
- 7 Install new preformed packing (59), valve (58), and cap (57).



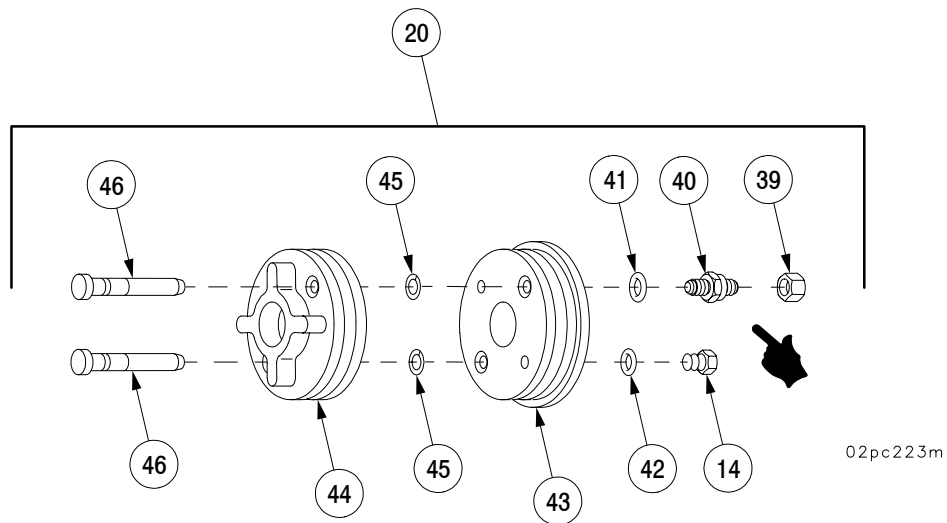
4-4 RECUPERATOR ASSEMBLY - CONTINUED

d. Assembly - Continued

- 8 Install two new seal assemblies (50) on two pins (51).
- 9 Split new piston wiper (56) diagonally 3/4 in. (19.05 mm) front to rear and cement in place on outer cylinder head (55) using adhesive.
- 10 Install new seal assemblies (54, 53, and 52) on outer cylinder head (55).
- 11 Install new seal assemblies (48 and 47) on inner cylinder head (49).



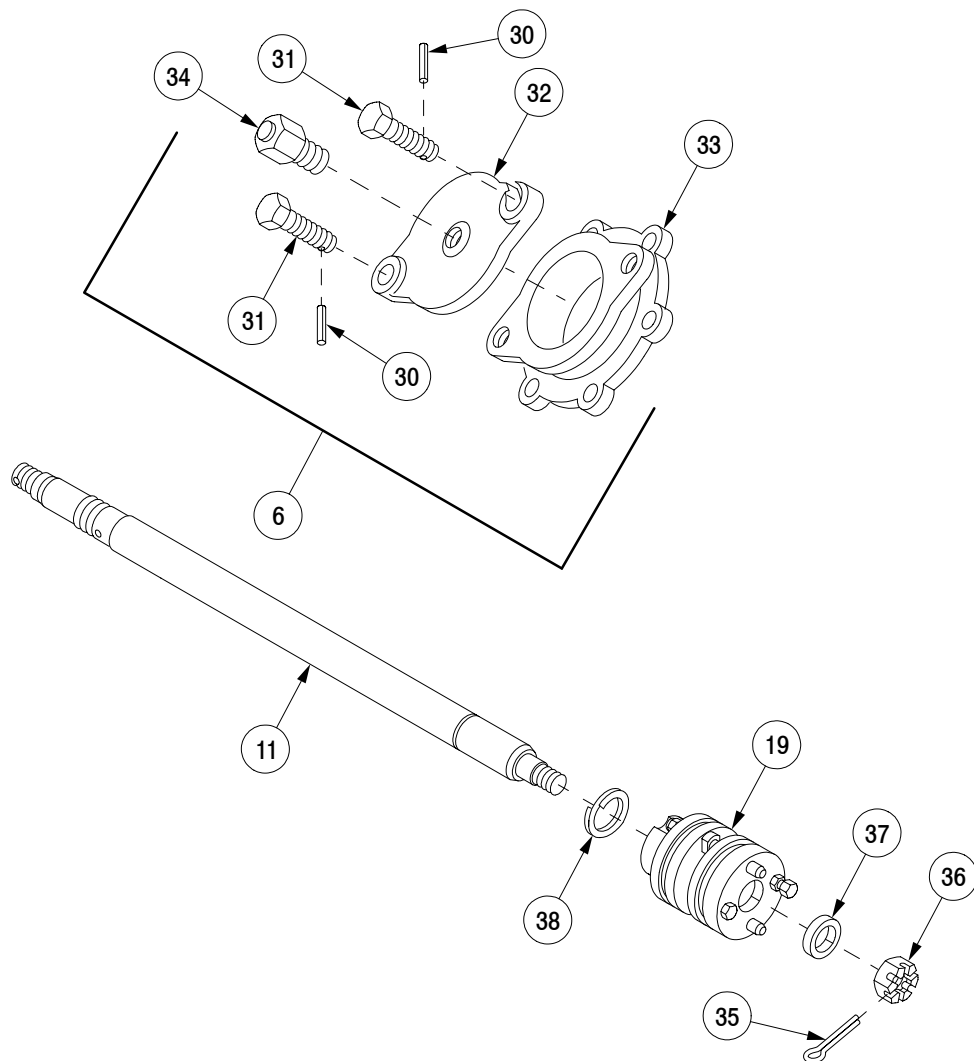
- 12 To assemble cylinder head group (20), install pin and seal group (46) in inner cylinder head (44).
- 13 Install two retaining rings (45) and assemble inner (44) and outer (43) heads.
- 14 Install new preformed packing (42) and drain plug (14).
- 15 Install new preformed packing (41) and valve (40) and cap (39).



4-4 RECUPERATOR ASSEMBLY - CONTINUED

d. Assembly - Continued

- 16 Install retaining ring (38), piston group (19), flat washer (37), and slotted nut (36) on shaft (11).
Torque nut to 40 lb-ft \pm 6 lb-ft (54.2 N·m \pm 8.1 N·m).
- 17 Install new cotter pin (35) on shouldered shaft (11).
- 18 Assemble cover adapter group (6) by installing safety relief valve (34).
- 19 Install cover assembly (32) (includes gasket) and two screws (31) on cover adapter (33).
- 20 Install two new spring pins (30).



02pc189m

4-4 RECUPERATOR ASSEMBLY - CONTINUED

e. Installation.

CAUTION

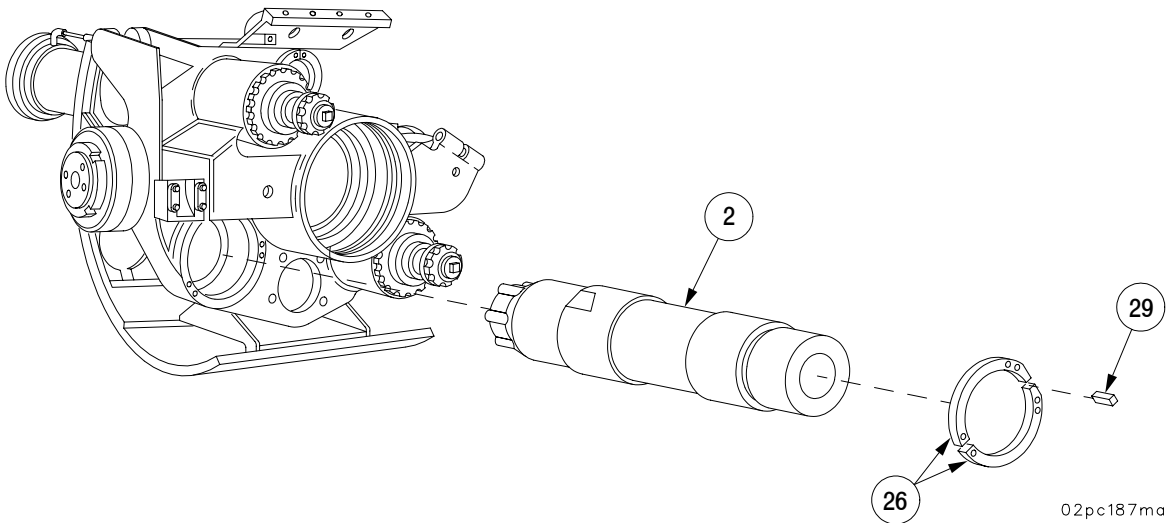
Use extreme care when installing recuperator and components to prevent contamination.

- 1 Clean two large diameters of recuperator cylinder (2) removing all paint, nicks, scratches, and gouges. Coat two diameters with grease.
- 2 Remove all paint, nicks, scratches, and gouges from M178 mount at bearing surface for recuperator cylinder (2).
- 3 Install key (29) in keyway.

WARNING

Use care while installing the recuperator cylinder. Cylinder weighs approximately 177 lbs (80 kg) and can cause serious injury to personnel or damage to equipment if dropped.

- 4 Using nylon sling inside cab to support recuperator cylinder (2), position milled flat on left side of recuperator cylinder (2) and slide forward until bearing surfaces meet.



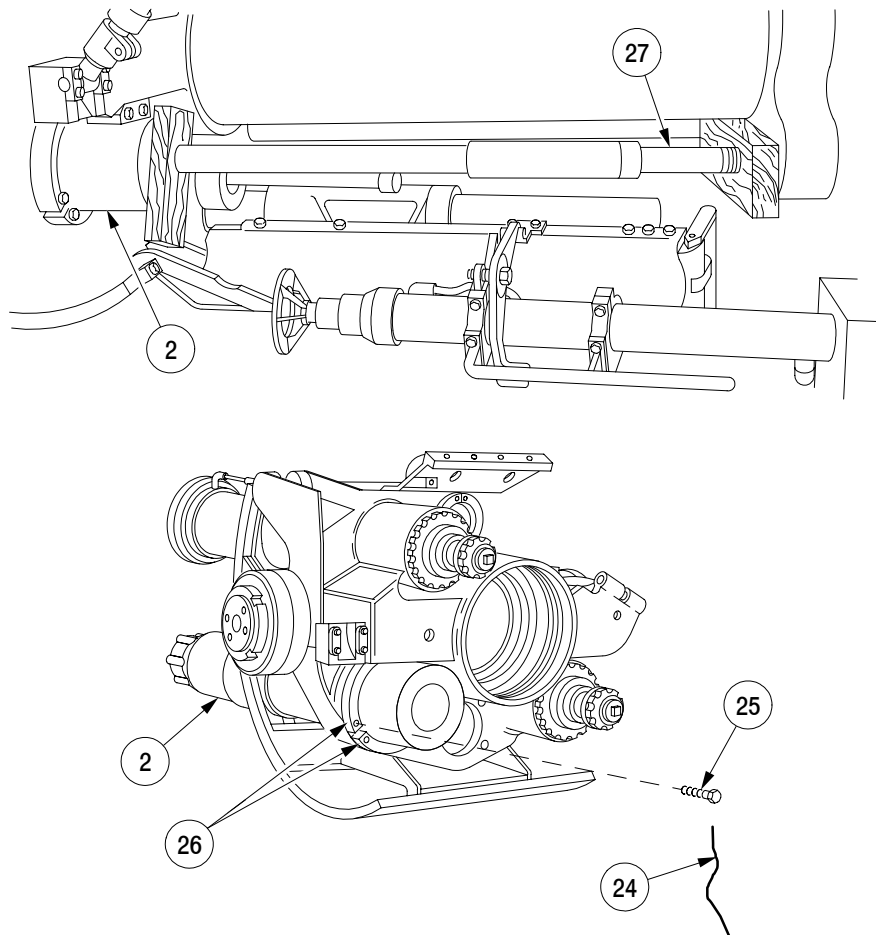
4-4 RECUPERATOR ASSEMBLY - CONTINUED

e. Installation - Continued

NOTE

Do not press cylinder all the way into mount. Stop approximately 1/8 in. (3 mm) short of retainer groove.

- 5 Position hydraulic jack (port-a-power) (27) between blocks of wood against breech ring of cannon assembly and rear face of recuperator cylinder (2).
- 6 Press recuperator cylinder (2) to approximately 1/8 in. (3 mm) short of retainer (26) groove.
- 7 Position retainer (26) in groove and align screw holes.
- 8 Press recuperator cylinder (2) until retainer (26) rings contact mount.
- 9 Remove hydraulic jack (port-a-power) (27) and install six screws (25) and new lockwire (24).
- 10 Return weapon-mounted rammer to stowed position (TM 9-2350-314-10).



02pc250m

4-4 RECUPERATOR ASSEMBLY - CONTINUED

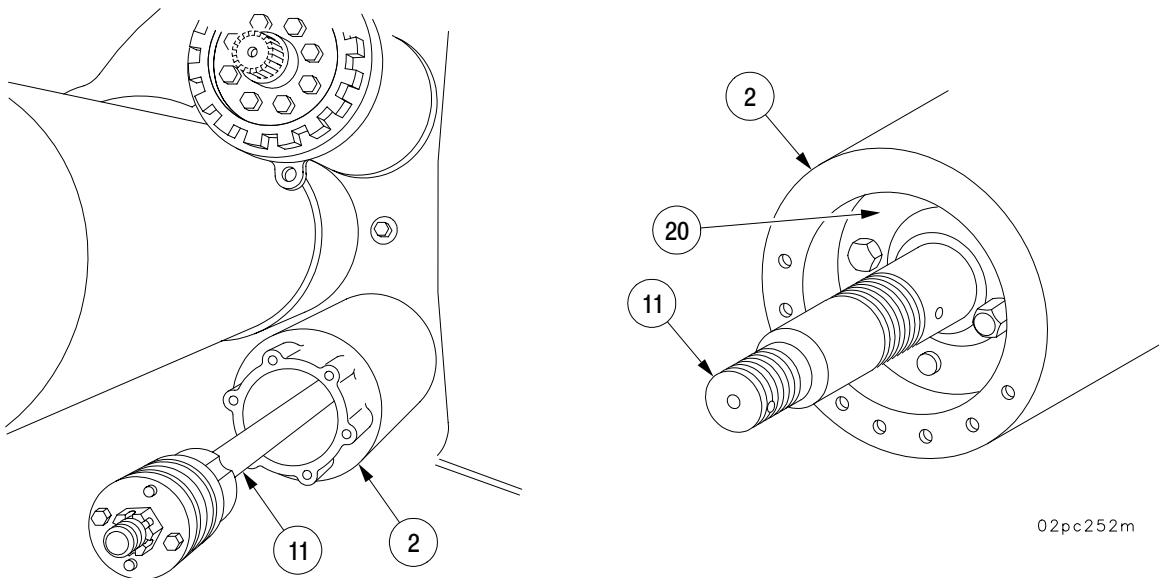
e. Installation - Continued

11 Deleted

CAUTION

Use care not to scratch or damage shaft during installation. Do not touch shaft with bare hands. Oils on skin will etch polished surface of shaft, allowing rust to form.

- 12 Wrap shouldered shaft (11) with clean rag and gently insert into recuperator cylinder (2) from the outside.
- 13 Slowly push forward until inside end of shouldered shaft (11) extends slightly from recuperator cylinder (2).
- 14 Locate inside end of shouldered shaft (11) in the cylinder head group (20) and gently tap cylinder head group (20) into end of recuperator cylinder (2).



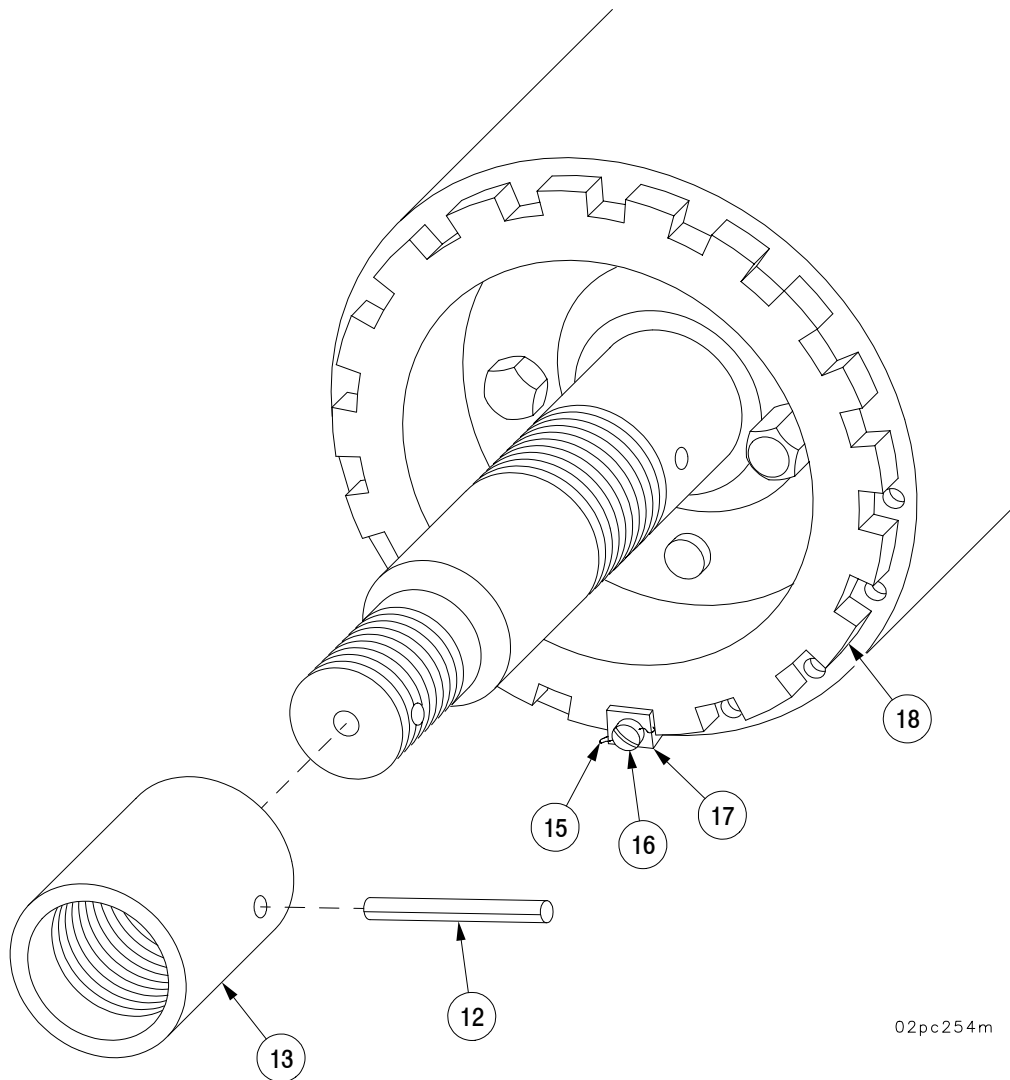
02pc252m

NOTE: Items 21 and 22 deleted.

4-4 RECUPERATOR ASSEMBLY - CONTINUED

e. Installation - Continued

- 15 Install retaining ring (18) and tighten, using spanner wrench.
- 16 Install key (17), screw (16), and new lockwire (15).
- 17 Install shaft collar (13) and new spring pin (12).
- 18 Return cannon to battery (TM 9-2350-314-20-2-1).

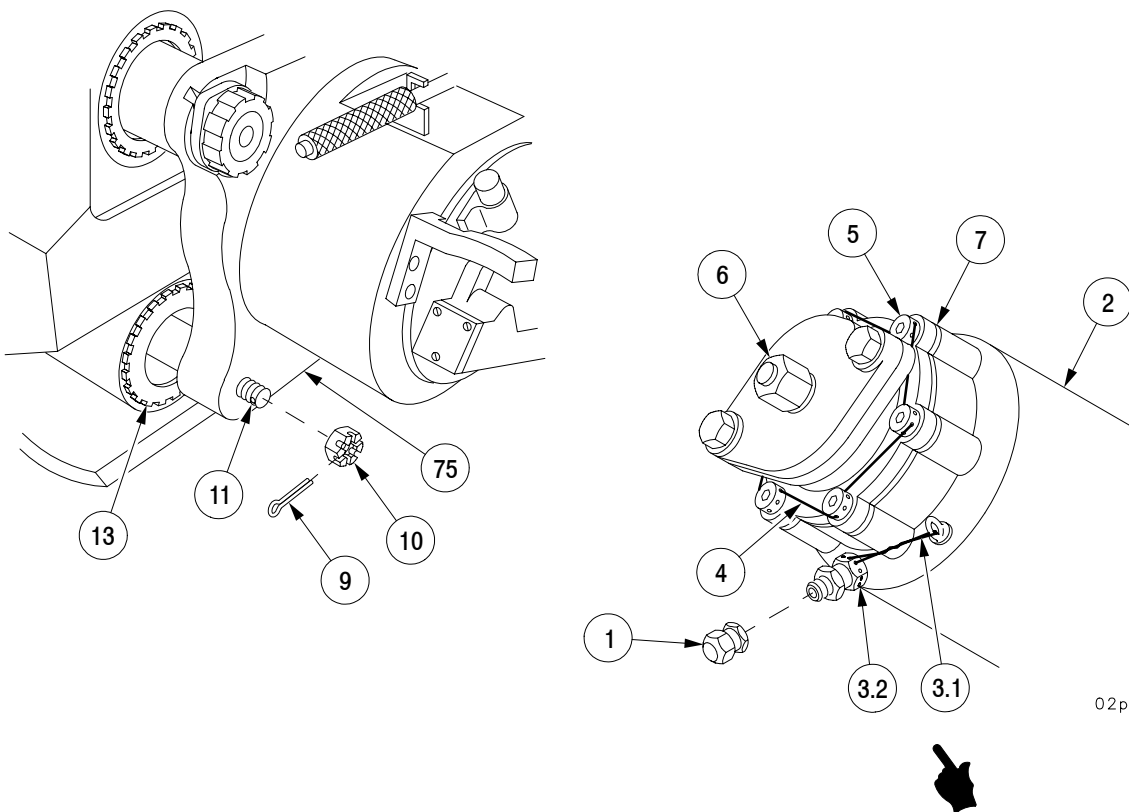


02pc254m

4-4 RECUPERATOR ASSEMBLY - CONTINUED

e. Installation - Continued

- 19 While holding collar (13) with pipe wrench, install rear slotted nut (10) on shouldered shaft (11). Nut should be tightened until nut (10) and collar (13) are just beginning to touch breech ring adapter (75).
- 20 Loosen nut (10) 1/6 to 1/3 turn while aligning cotter pin hole in rod with slots in nut. Install new cotter pin (9).
- 21 Install new gasket (7), cover adapter group (6), six screws (5), and new lockwire (4) on front of recuperator cylinder (2).
- 21.1 Install nitrogen drain valve (3.2) and secure with new lockwire (3.1).
- 22 Service recuperator with hydraulic fluid (TM 9-2350-314-10).
- 23 Service recuperator with nitrogen (TM 9-2350-314-20-2-2).
- 24 Install nitrogen valve cap (1) on valve (3.2).



02pc256m

4-5 VARIABLE RECOIL ASSEMBLY (BLOCK, VALVE, MANIFOLD, TUBES, AND FITTINGS).

This task covers: Removal and Installation

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Drain pan (item 35, Appx F)

Materials/Parts

Dust protective plug (item 59, Appx B)
Plastic bag (item 14, Appx B)
Marking tag (item 71, Appx B)
Hydraulic fluid (item 42, Appx B)
Seal kit (item 191, Appx E)
Lockwire (item 83, Appx B)

Equipment Conditions

Replenisher pressure discharged
(TM 9-2350-314-20-2-1)
Gun mount ballistic shield removed
(TM 9-2350-314-20-1)

Removal and Installation.

- 1 For removal and installation, follow illustration and legend as a guide. Replace all packings.

WARNING

Eye protection will be worn when performing maintenance procedures on all hydraulic components to avoid injury to personnel.

CAUTION

- All hydraulic lines and ports must be capped to prevent contaminants from entering the hydraulic system and causing internal damage to hydraulic components.
- All serviceable components must be placed in plastic bags to prevent contamination of hydraulic system during installation.

NOTE

All hydraulic lines and components must be tagged before removal for identification during installation.

4-5 VARIABLE RECOIL ASSEMBLY (BLOCK, VALVE, MANIFOLD, TUBES, AND FITTINGS) - CONTINUED

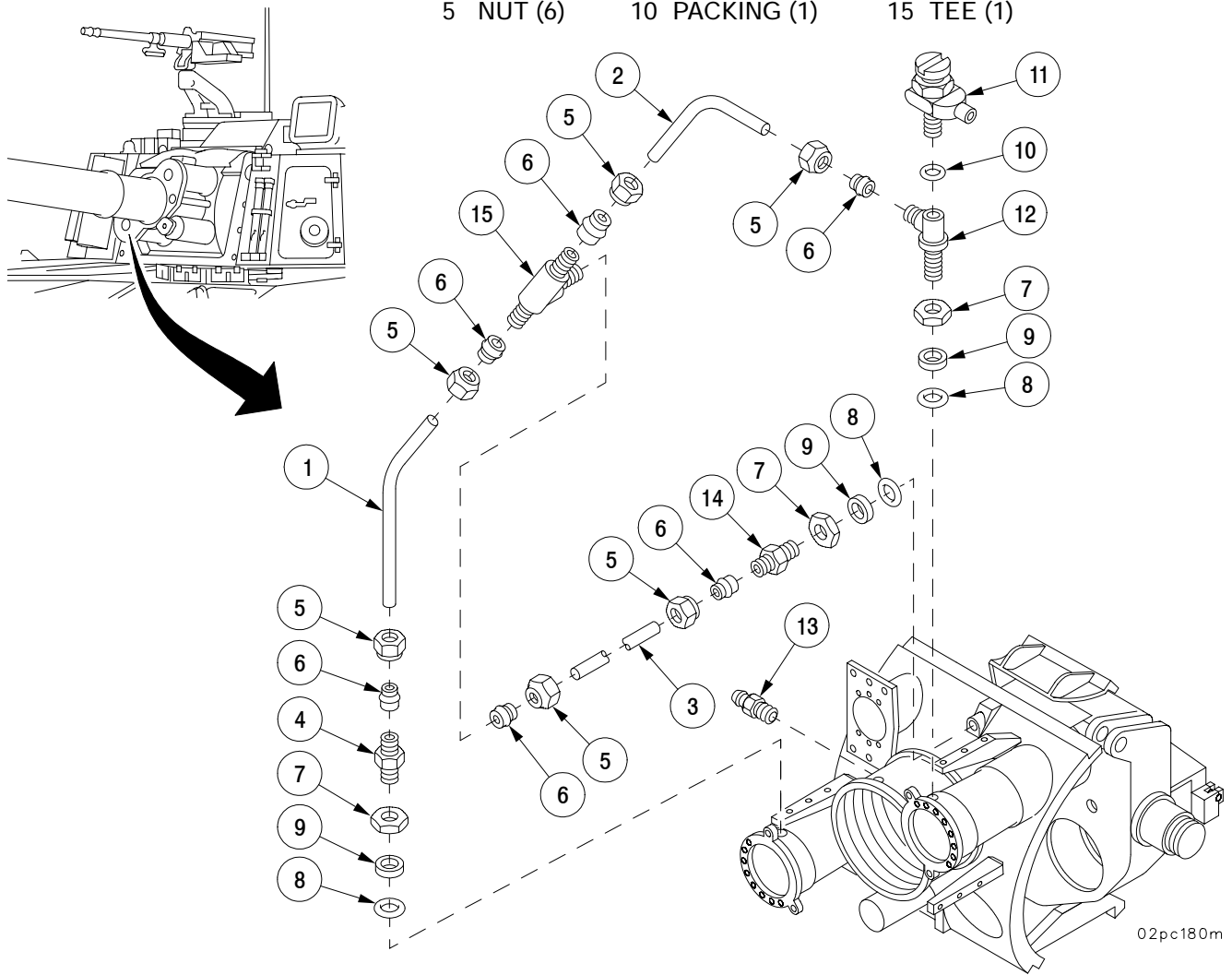
Removal and Installation - Continued

NOTE

A thin even coat of clean hydraulic fluid must be applied to ALL new packing material to form a good seal between hydraulic components during installation.

Legend

- | | | |
|--------------|----------------|-----------------------|
| 1 TUBE (1) | 6 SLEEVE (6) | 11 BLEEDER VALVE (1) |
| 2 TUBE (1) | 7 LOCKNUT (3) | 12 TEE (1) |
| 3 TUBE (1) | 8 PACKING (3) | 13 GREASE FITTING (4) |
| 4 NIPPLE (1) | 9 RETAINER (3) | 14 NIPPLE (1) |
| 5 NUT (6) | 10 PACKING (1) | 15 TEE (1) |



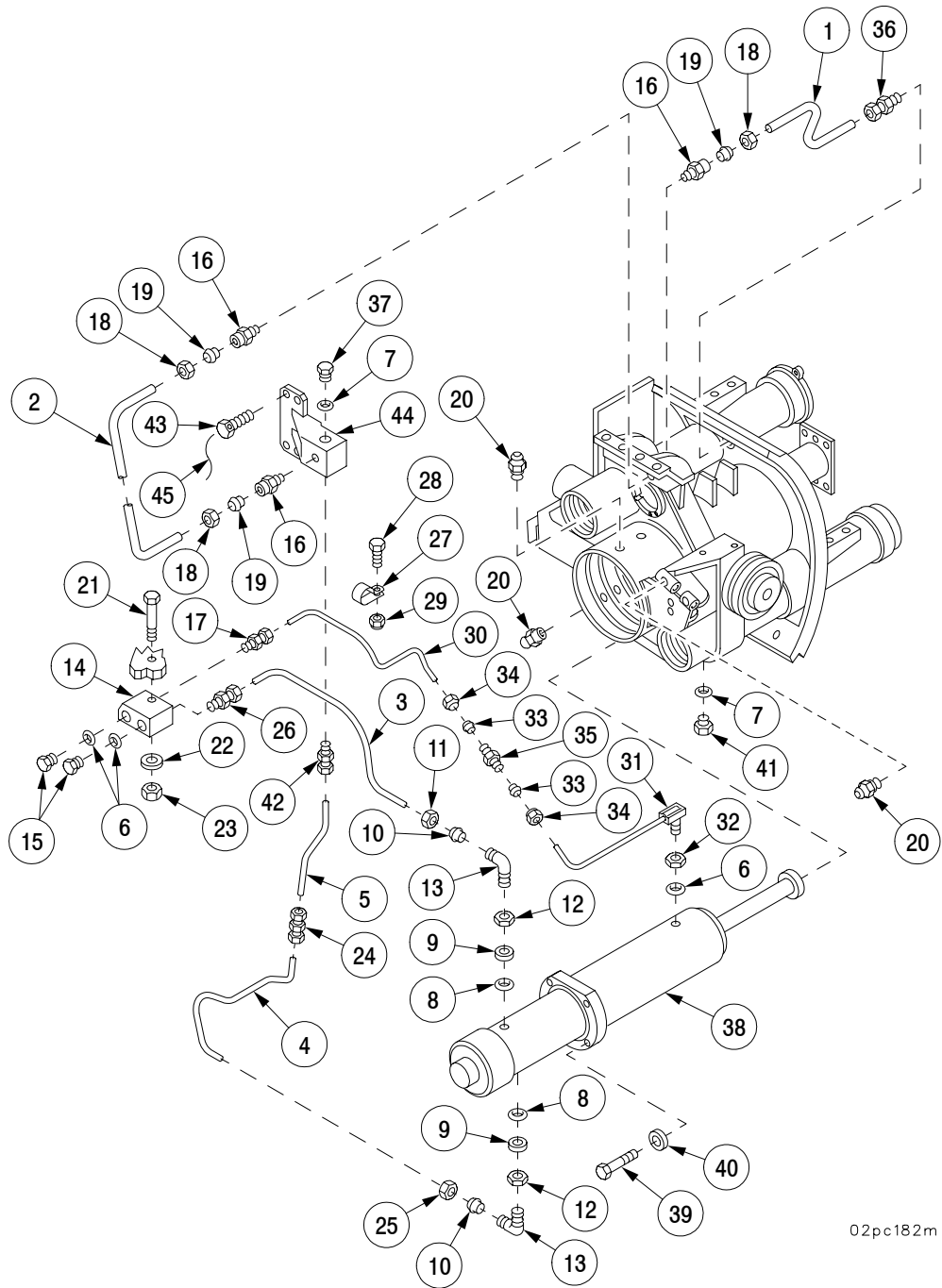
02pc180m

4-5 VARIABLE RECOIL ASSEMBLY (BLOCK, VALVE, MANIFOLD, TUBES, AND FITTINGS) - CONTINUED

Removal and Installation - Continued

Legend

- 1 TUBE (1)
- 2 TUBE (1)
- 3 TUBE (1)
- 4 TUBE (1)
- 5 TUBE (1)
- 6 PACKING (3)
- 7 PACKING (5)
- 8 PACKING (2)
- 9 RETAINER (3)
- 10 SLEEVE (2)
- 11 NUT (1)
- 12 NUT (2)
- 13 ELBOW (2)
- 14 BLOCK (1)
- 15 PLUG (2)
- 16 ADAPTER (3)
- 17 ADAPTER (1)
- 18 NUT (3)
- 19 SLEEVE (3)
- 20 GREASE FITTING (6)
- 21 SCREW (1)
- 22 WASHER (1)
- 23 NUT (1)
- 24 NIPPLE (1)
- 25 NUT (1)
- 26 ADAPTER (1)
- 27 CLAMP (2)
- 28 SCREW (2)
- 29 NUT (2)
- 30 TUBE (1)
- 31 ELBOW (1)
- 32 NUT (1)
- 33 SLEEVE (2)
- 34 NUT (2)
- 35 NIPPLE (1)
- 36 ADAPTER (1)
- 37 PLUG (1)
- 38 BUFFER ASSY (1)
- 39 SCREW (4)
- 40 WASHER (4)
- 41 PLUG (4)
- 42 ADAPTER (1)
- 43 BOLT (4)
- 44 MANIFOLD (1)
- 45 LOCKWIRE



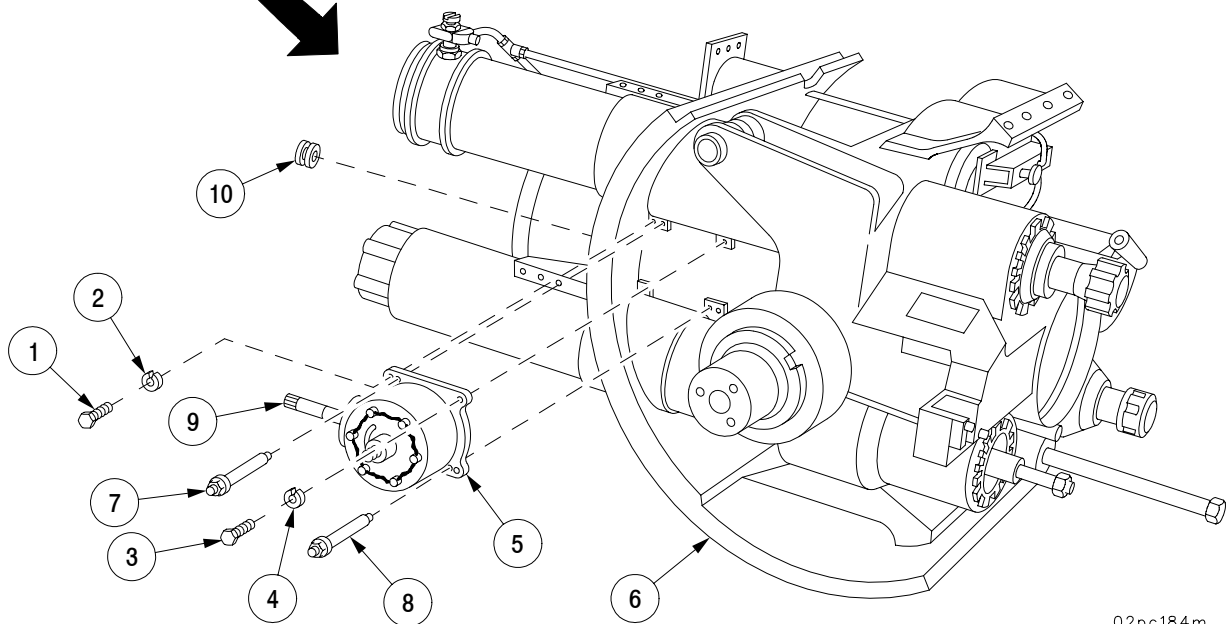
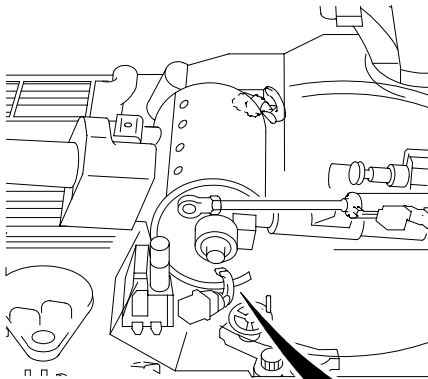
02pc182m

2 Charge accumulator replenisher (TM 9-2350-314-20-2-1).

4-7 ACTUATOR ASSEMBLY - CONTINUED

b. Installation.

- 1 If removed, apply adhesive to grommet (10), and install into mount (6).
- 2 Depress cannon (TM 9-2350-314-10).
- 3 Position actuator (5) on mount (6) and move actuator forward to engage bevel gear shaft (9) in universal joint.
- 4 Install lower rear dowel pin (8) and loosely install three new lockwashers (4) and three screws (3).
- 5 Elevate cannon (TM 9-2350-314-10). Install upper front dowel pin (7), and loosely install new lockwasher (2) and screw (1).
- 6 Tighten four screws (1 and 3).
- 7 Install actuator lever assembly (para 4-6).



02pc184m

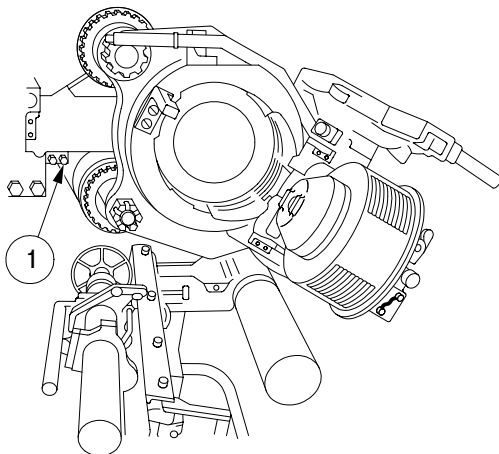
4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

a. Disassembly.

NOTE

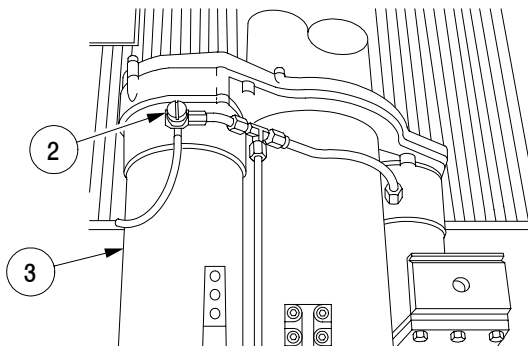
Variable recoil assembly can be disassembled and repaired with mount and cannon installed in vehicle.

- 1 Open accumulator replenisher right manifold bleeder plug (1) and discharge hydraulic pressure by draining fluid into container.



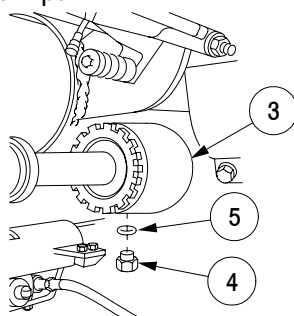
02pc190m

- 2 Open bleeder "tee" (2) at front of left recoil cylinder (3).



02pc191m

- 3 Remove two recoil cylinder drain plugs (4) and two preformed packings (5) at rear of each recoil cylinder (3). Discard preformed packings.
- 4 Drain system and catch fluid in drain pan.

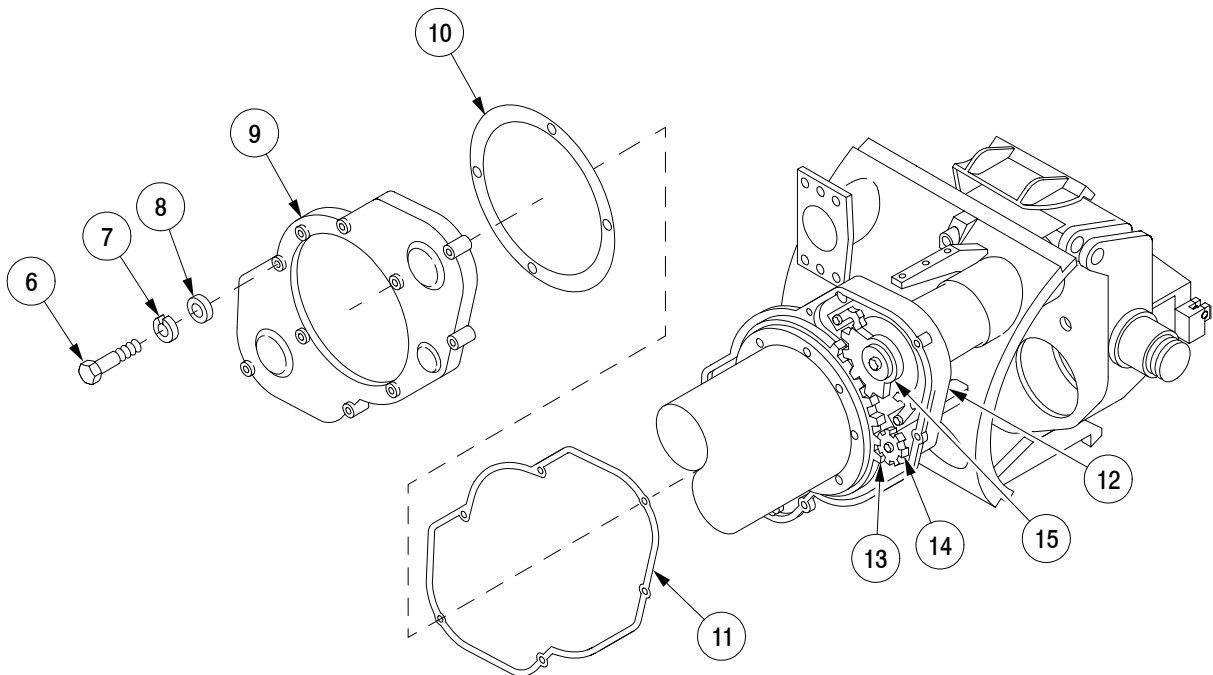


02pc192m

4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

a. Disassembly - Continued

- 5 Remove six screws (6), six lockwashers (7), six flat washers (8), and cover (9). Discard lockwashers.
- 6 Remove gasket (10) from cover (9) and gasket (11) from variable recoil housing (12). Discard gaskets.
- 7 Measure backlash between sector gear (13), spur gear (14), and two sector gears (15) before removal.
 - (a) Measure backlash between two sector gears (15) and sector gear (13). Replace if greater than 0.018 inch (.45 mm).
 - (b) Measure backlash between spur gear (14) and sector gear (13). Replace if greater than 0.018 inch (.45 mm).



02pc193m

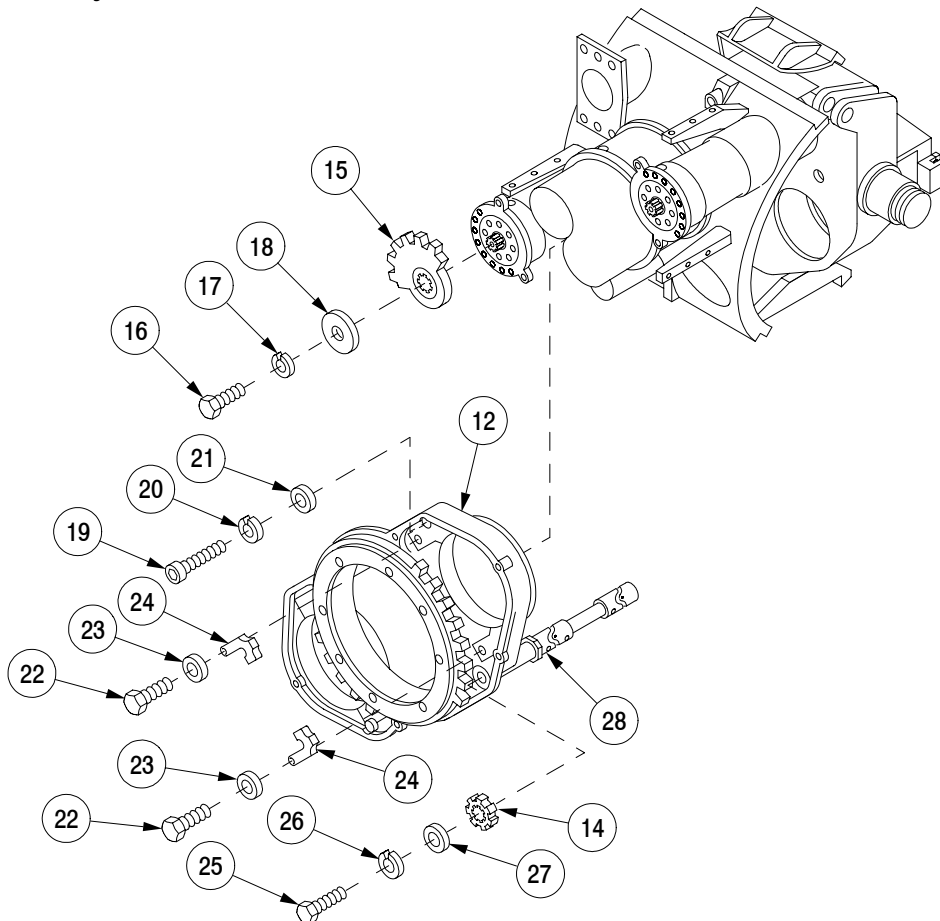
4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

a. Disassembly - Continued

NOTE

Note alignment of index arrows on segment gear, spur gear, and sector gears for identification during installation.

- 8 Remove two screws (16), two lockwashers (17), two flat washers (18), and two sector gears (15). Discard lockwashers.
- 9 Remove four screws (19), four lockwashers (20), and four flat washers (21) from variable recoil housing (12). Discard lockwashers.
- 10 Remove two screws (22), two flat washers (23), and two sector gear stops (24) from variable recoil housing (12).
- 11 Remove screw (25), lockwasher (26), flat washer (27), and spur gear (14) from connecting link assembly (28). Discard lockwasher.
- 12 Remove variable recoil housing (12) from cannon tube and connecting link assembly (28) from actuator assembly.



02pc194m

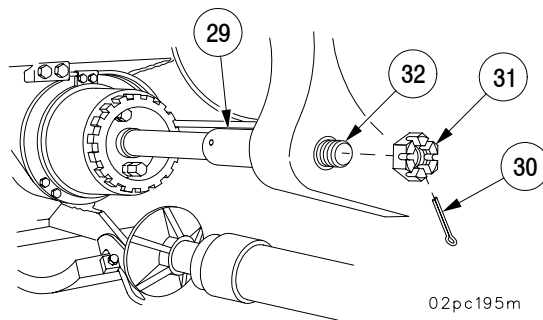
4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

a. Disassembly - Continued

WARNING

Stay clear of vent when discharging nitrogen pressure to prevent serious injury to personnel.

- 13 Release nitrogen from recuperator (TM 9-2350-314-20-2-2).
- 14 While holding collar (29) with pipe wrench, remove cotter pin (30) and nut (31) from recuperator assembly shaft (32). Discard cotter pin.



- 15 Push cannon out of battery 18 inches (457 mm) (TM 9-2350-314-20-2-1).

WARNING

Cannon must be blocked with breech stand or chain cannon tube to hull when working on mount components with cannon pushed out of battery. This will prevent serious injury to personnel caused by accidental elevation of cannon.

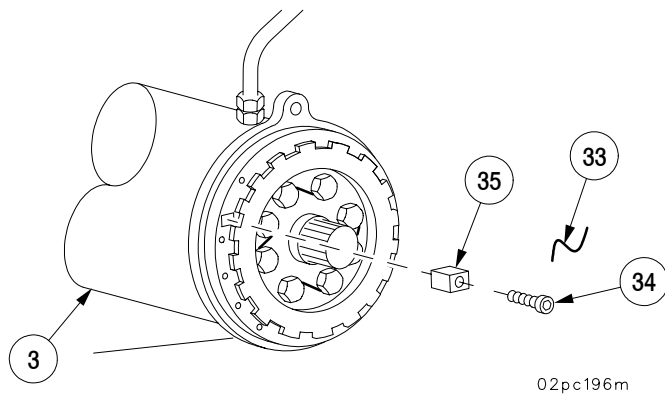
NOTE

- Both recoil cylinders are identical. The following maintenance procedure is applicable to only one recoil cylinder. Repeat this procedure if it is necessary to repair both cylinders.
- If metal shavings or particle contamination is seen or felt in recoil oil, both recoil cylinders, the buffer cylinder, and the replenisher accumulator should be disassembled and thoroughly cleaned. All gun mount hydraulic tubes and hoses should also be flushed.

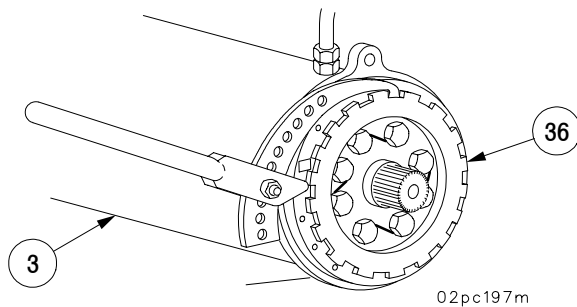
4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

a. Disassembly - Continued

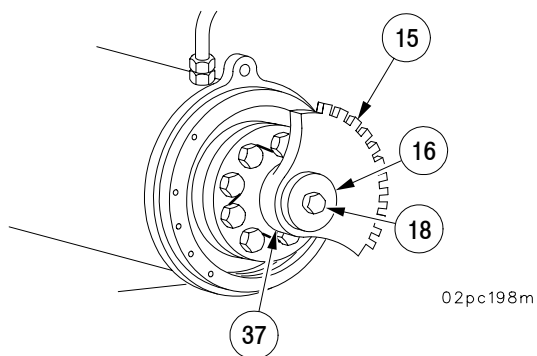
16 Remove lockwire (33), screw (34), and key (35) from front of recoil cylinder (3). Discard lockwire.



17 Remove bushing (36) from front of recoil cylinder (3) using adjustable hook spanner wrench.



18 Install sector gear (15), flat washer (18), and screw (16) onto inner orifice rod (37).



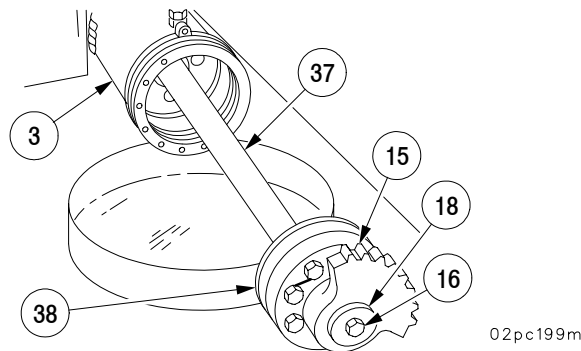
4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

a. Disassembly - Continued

WARNING

Use gloves or rags to grip inner orifice and sector gear. Edge of orifice and sector gear is extremely sharp and could cause serious injury to personnel.

- 19 Using a pry bar, pry inner orifice rod (37) and front follower group (38) out of recoil cylinder (3). Place a drain pan under recoil cylinder (3) to catch fluid while withdrawing front follower group.
- 20 Remove screw (16), flat washer (18), and sector gear (15) from inner orifice rod (37).

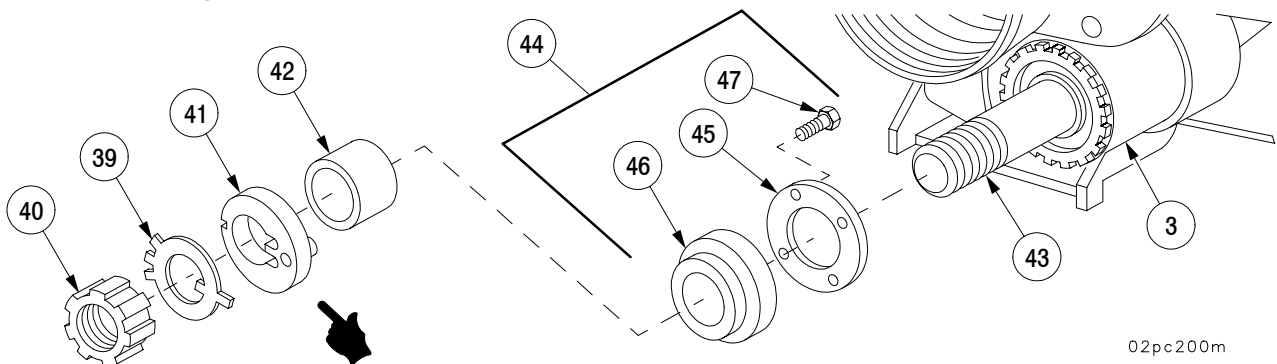


- 21 Disengage two tabs on key washer (39) from nut (40) at rear of recoil cylinder (3).
- 22 Remove nut (40) and key washer (39) from recoil cylinder (3). Discard key washer.
- 23 Remove key assembly (41) and spacer (42) from recoil cylinder (3).
- 24 Gradually move piston assembly (43) towards front of recoil cylinder (3) while removing thrust plate group (44).

NOTE

Do not separate thrust plate group unless repair or replacement of a component is necessary.

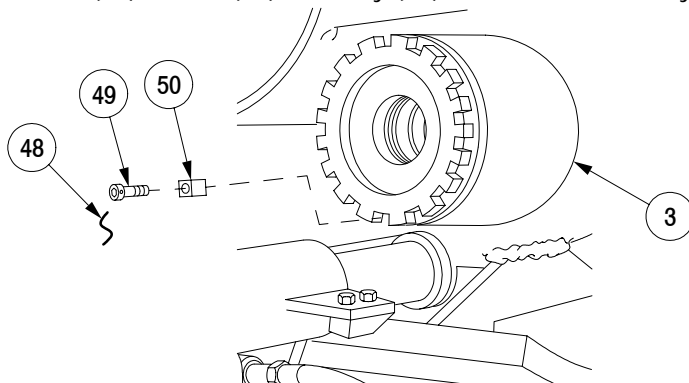
- 25 Separate plate spacer (45) and thrust plate (46) by removing four self-locking screws (47). Discard self-locking screws.



4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

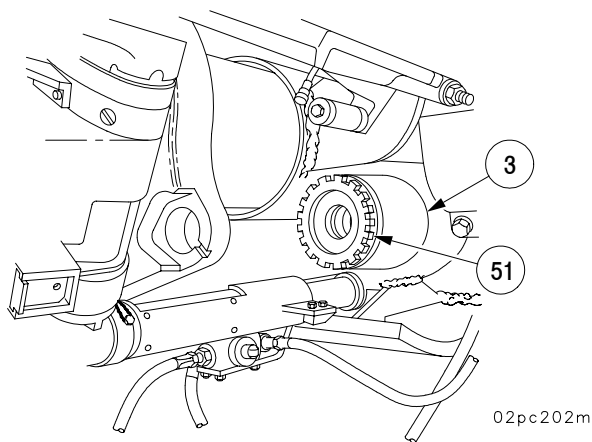
a. Disassembly - Continued

26 Remove lockwire (48), screw (49), and key (50) from rear of recoil cylinder (3). Discard lockwire.



02pc201m

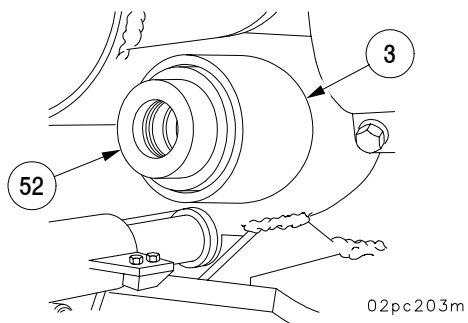
27 Remove bushing (51) from rear of recoil cylinder (3), using adjustable hook spanner wrench.



02pc202m

28 Use piston rod to tap gently on inside of rear follower group (52).

29 Remove rear follower group (52) from rear of recoil cylinder (3).



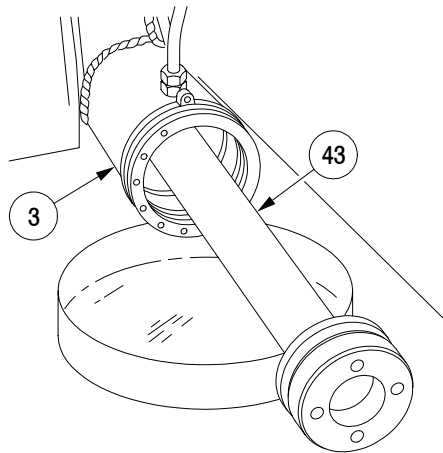
02pc203m

4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

a. Disassembly - Continued**CAUTION**

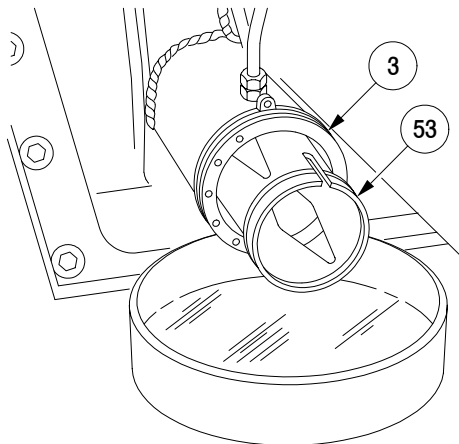
Use care not to scratch or damage piston rod during removal. Do not touch with bare hands. Oils on skin will etch polished surfaces allowing rust to form.

- 30 Remove piston assembly (43) from front of recoil cylinder (3).



02pc204m

- 31 Slide outer orifice (53) out of front of recoil cylinder (3). If outer orifice is tight, a sliding hammer-type puller may be used.



02pc205m

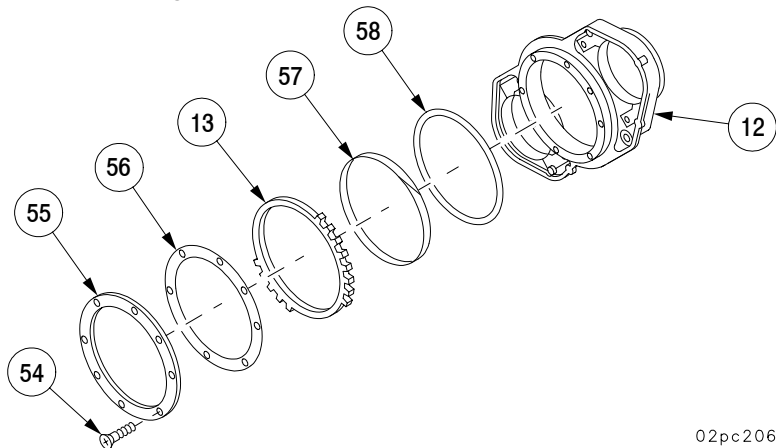
4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

a. Disassembly - Continued

NOTE

Note alignment of index arrows on sector gear and spur gear before removal.

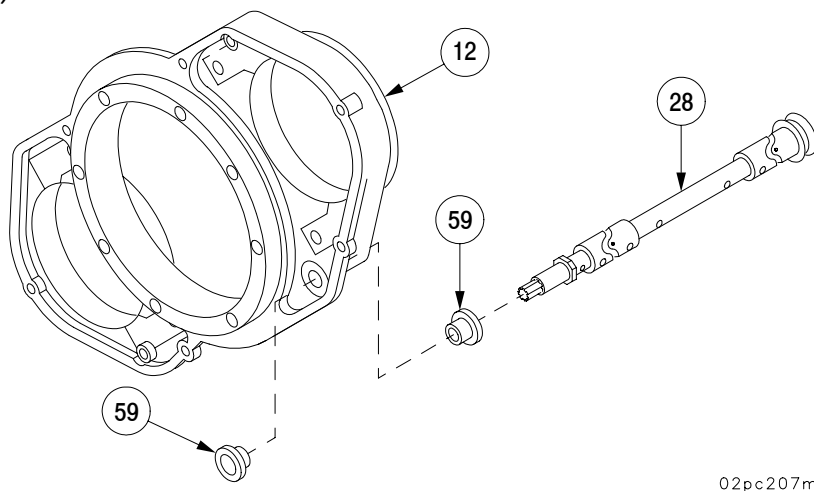
- 32 Remove four screws (54), retainer (55), shim (56), sector gear (13), bearing (57), and spacer ring (58) from variable recoil housing (12).



NOTE

Do not remove bearings from housing unless installation of new bearings is necessary.

- 33 Remove connecting link assembly (28) and two sleeve bearings (59) from variable recoil housing (12).

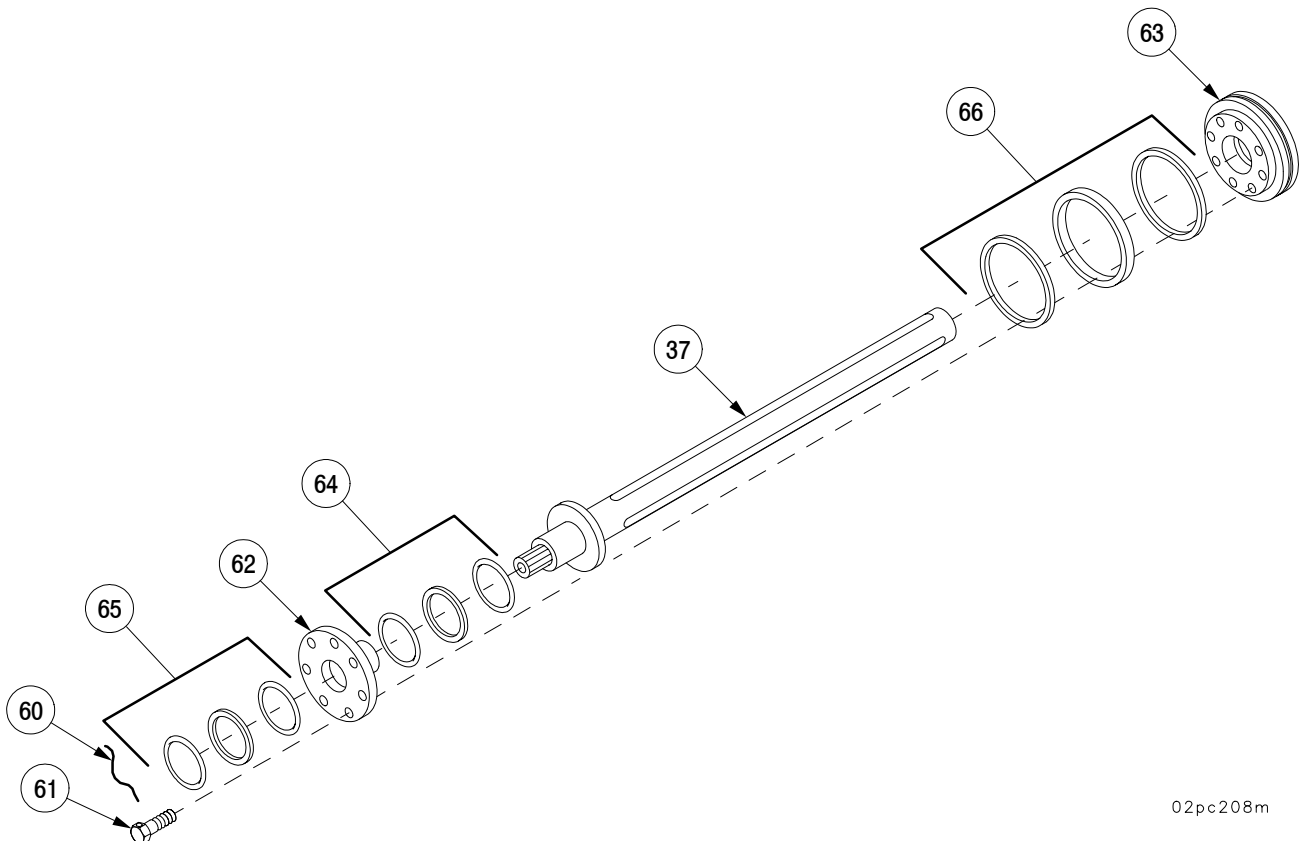


4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

a. Disassembly - Continued**NOTE**

Both inner orifice and front follower groups are identical. Disassembly instructions pertain to one. Repeat instructions for remaining group.

- 34 Remove lockwire (60) and eight screws (61) from front retainer (62). Discard lockwire.
- 35 Remove front retainer (62) from front follower (63).
- 36 Remove seal assembly (64) from inside the shaft hole of front retainer (62). Discard seal assembly.
- 37 Remove seal assembly (65) from outside of front retainer (62). Discard seal assembly.
- 38 Remove front follower (63) from inner orifice rod (37).
- 39 Remove seal assembly (66) from outside of front follower (63). Discard seal assembly.



02pc208m

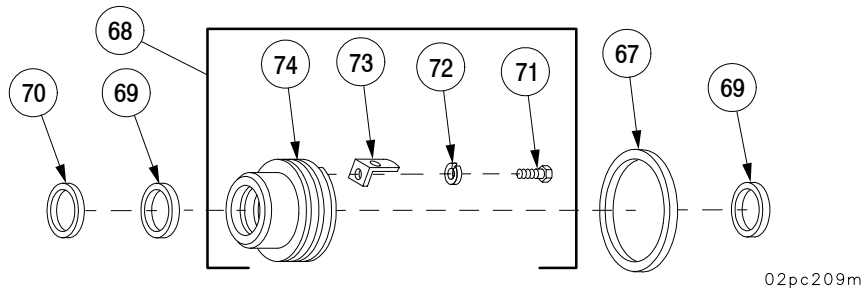
4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

a. Disassembly - Continued

NOTE

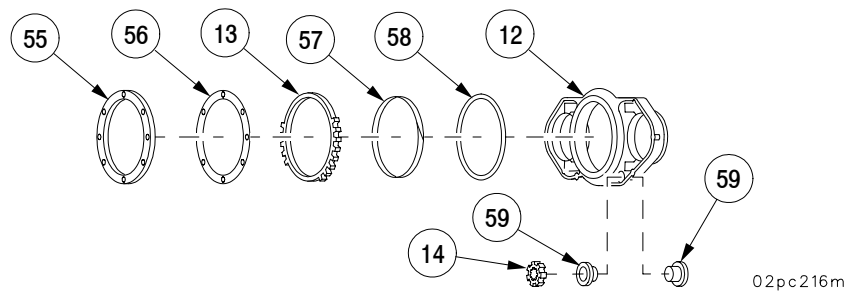
Both rear follower groups are identical. Disassembly instructions pertain to one. Repeat instructions for remaining group.

- 40 Remove seal assembly (67) from outside of rear follower assembly (68). Discard seal assembly.
- 41 Remove seal assembly (69) from inside of rear follower assembly (68). Discard seal assembly.
- 42 Remove seal assembly (69) from inside rear of rear follower assembly (68). Discard seal assembly.
- 43 Remove wiper (70) from rear follower assembly (68). Discard wiper.
- 44 Remove screw (71), lockwasher (72) and key (73) from follower (74). Discard lockwasher.



b. Inspection.

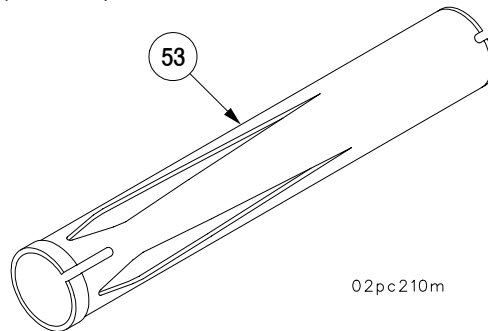
- 1 Inspect variable recoil housing (12). Replace if cracked or distorted. Repair or replace housing if any burrs are evident on gasket mounting surface.
- 2 Inspect spur gear (14). Replace if cracked, broken, or if any of the splines are distorted.
- 3 Inspect two sleeve bearings (59). Replace if cracked, broken, or distorted.
- 4 Inspect spacer ring (58). Replace if cracked, broken, or distorted.
- 5 Inspect bearing (57). Replace if cracked, broken, or distorted.
- 6 Inspect sector gear (13). Replace if cracked, broken, or if any of the splines are distorted.
- 7 Measure inside diameter of sector gear (13). Replace if greater than 13.281 inches (337 mm).
- 8 Inspect shim (56). Replace if cracked, broken, or distorted.
- 9 Inspect retainer (55). Replace if cracked, broken, or distorted.



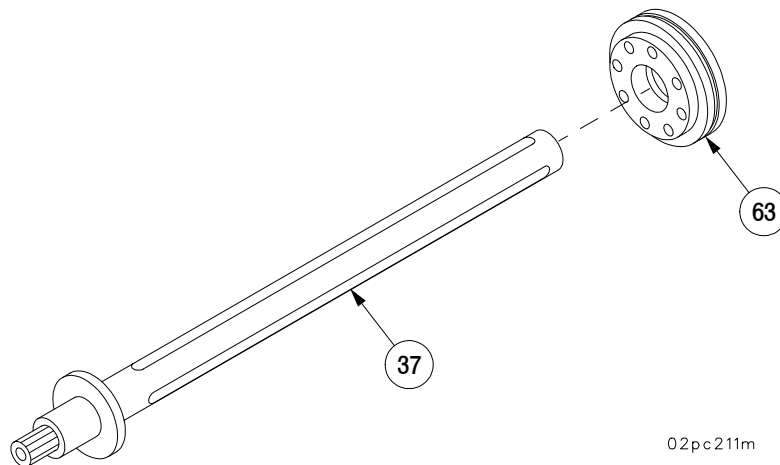
4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

b. Inspection - Continued

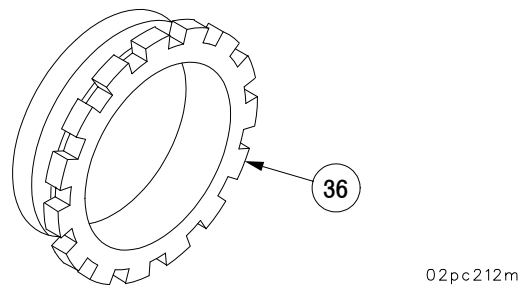
- 10 Inspect outer orifice (53). Replace if cracked, broken, or distorted. Measure inside diameter. Replace if greater than 5.502 inches (140 mm).



- 11 Inspect front follower (63). Replace if cracked, burred, or distorted.
- 12 Inspect inner orifice rod (37). Replace if cracked, burred, or distorted. Measure outer diameter of orifice area. Replace if less than 1.992 inches (50.59 mm).



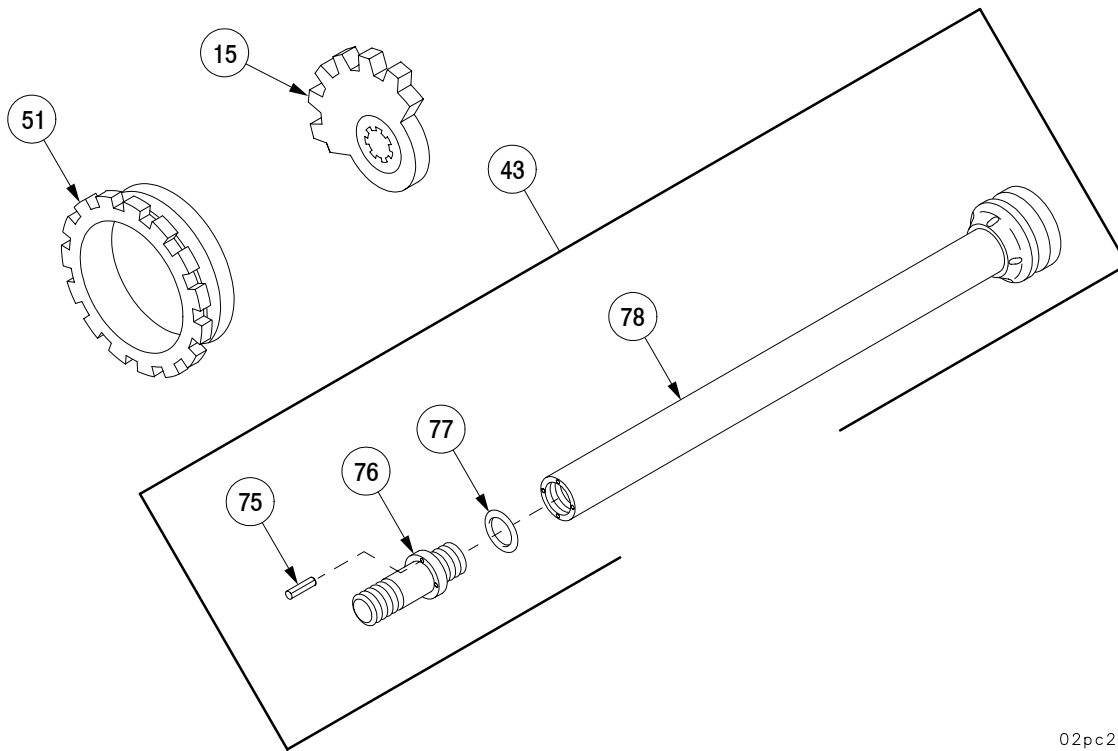
- 13 Inspect bushing (36). Replace if cracked, spanner shoulders are rounded, or threads are mutilated.



4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

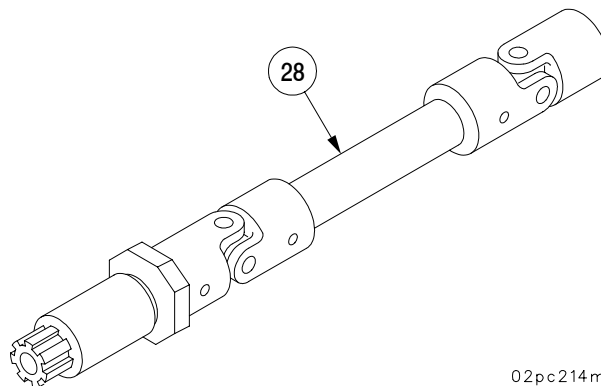
b. Inspection - Continued

- 14 Inspect two sector gears (15). Replace if gear teeth are cracked, broken, or splines are distorted.
- 15 Inspect bushing (51). Replace if cracked, spanner slot shoulders are rounded, or threads are mutilated.
- 16 Inspect piston assembly (43). Replace piston assembly if pins (75) are broken, plug (76) threads are mutilated, preformed packing (77) is leaking, or tube (78) is cracked, burred, or distorted.



02pc213m

- 17 Inspect connecting link assembly (28). Replace if cracked, broken, distorted, or splines are mutilated.



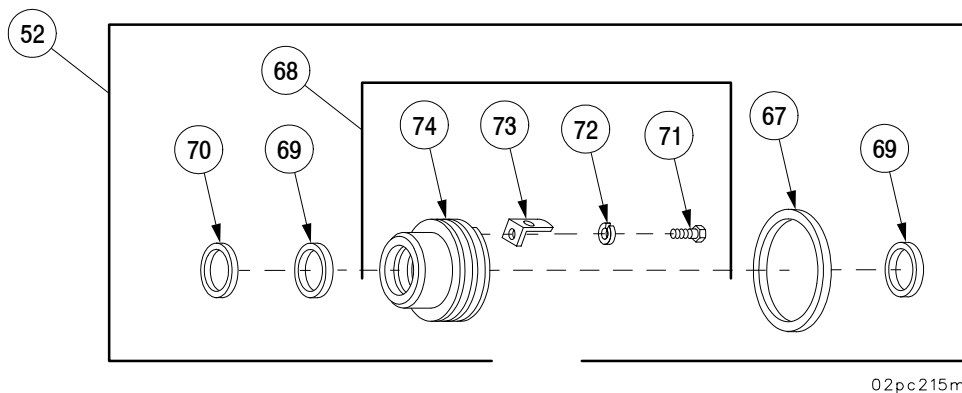
02pc214m

4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

c. Assembly.**NOTE**

- New seal assemblies and wiper are provided with seal replacement kit.
- All seals must be lubricated with hydraulic fluid prior to installation.
- All gears must be lubricated with grease prior to installation.
- Assembly instructions pertain to one recoil cylinder. Repeat instructions if assembling two cylinders.
- When replacing seal assemblies, stagger the gaps in adjacent rings 180 degrees apart.

- 1 Install key (73), new lockwasher (72) and screw (71) on follower (74).
- 2 To assemble rear follower group (52), install new wiper ring (70) on rear follower assembly (68).
- 3 Install new seal assembly (69) on inside rear of rear follower assembly (68).
- 4 Install new seal assembly (69) on inside front of rear follower assembly (68).
- 5 Install new seal assembly (67) on outside of rear follower assembly (68).



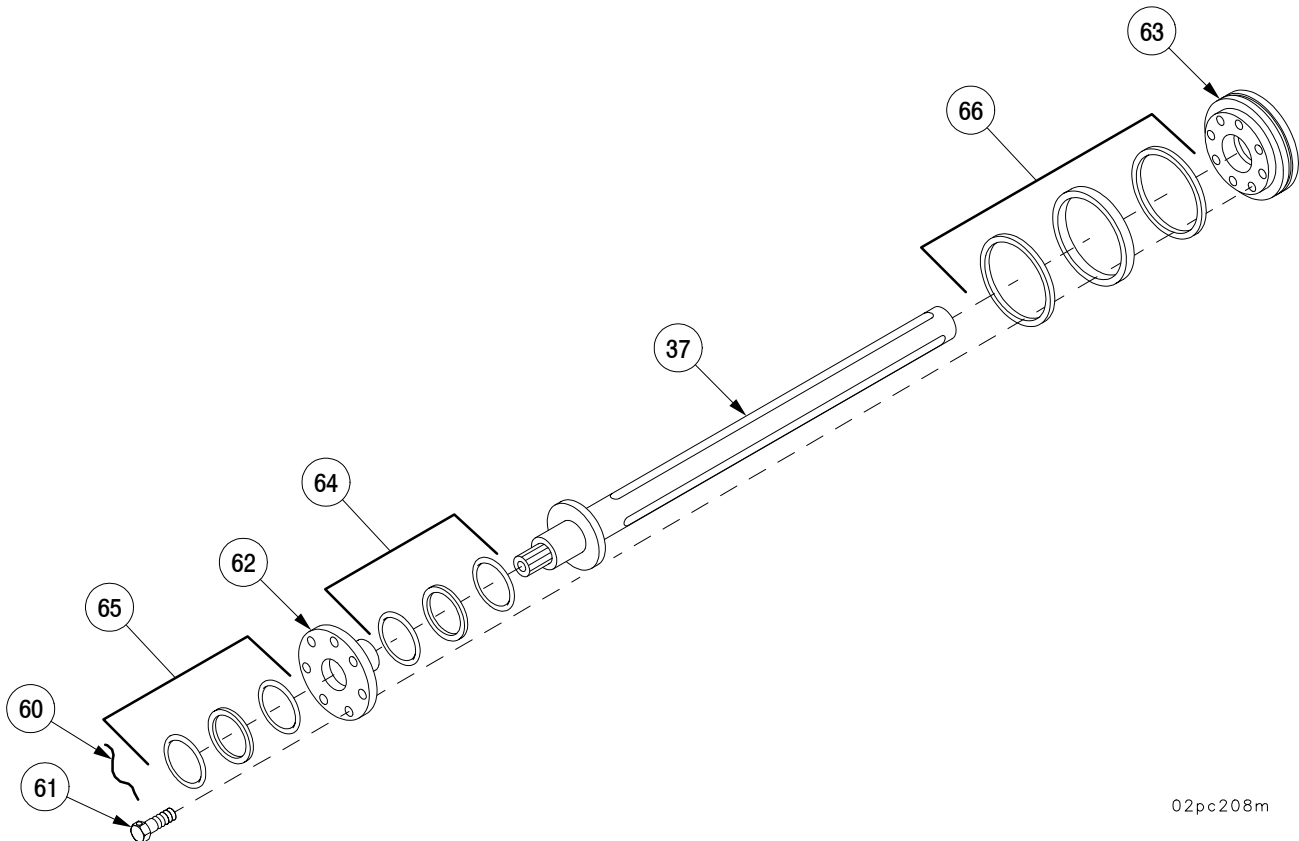
4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

c. Assembly - Continued

NOTE

Both inner orifice and front follower groups are identical. Assembly instructions pertain to one. Repeat instructions for remaining group.

- 6 To assemble inner orifice rod (37) and front follower group, install new seal assembly (66) on outside of front follower (63).
- 7 Install front follower (63) on inner orifice rod (37).
- 8 Install new seal assembly (64) on outside of front retainer (62).
- 9 Install new seal assembly (65) in inside shaft hole of front retainer (62).
- 10 Install front retainer (62) on front follower (63) and secure with eight screws (61) and new lockwire (60).

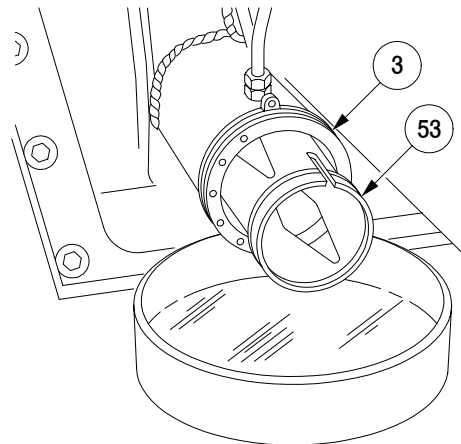


02pc208m

4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

c. Assembly - Continued

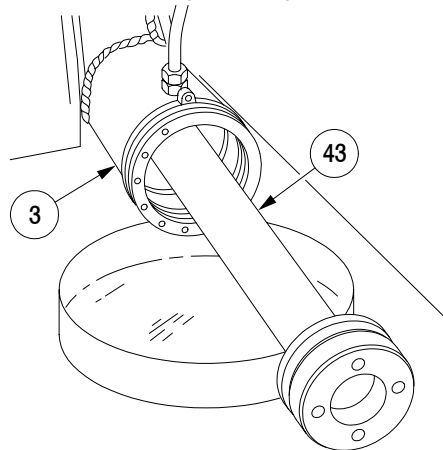
- 11 Slide outer orifice (53) into front of recoil cylinder (3), making sure slot of outer orifice is at top, lined up with oil fitting.



CAUTION

Use care not to scratch or damage piston rod during installation. Do not touch with bare hands. Oils on skin will etch polished surfaces, allowing rust to form.

- 12 Install piston assembly (43) approximately halfway into front of recoil cylinder (3).



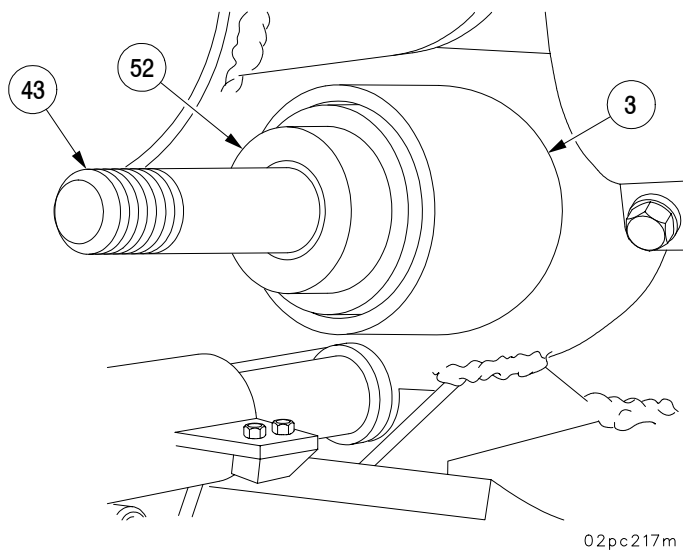
NOTE

Align key on rear follower with recesses in outer orifice during installation.

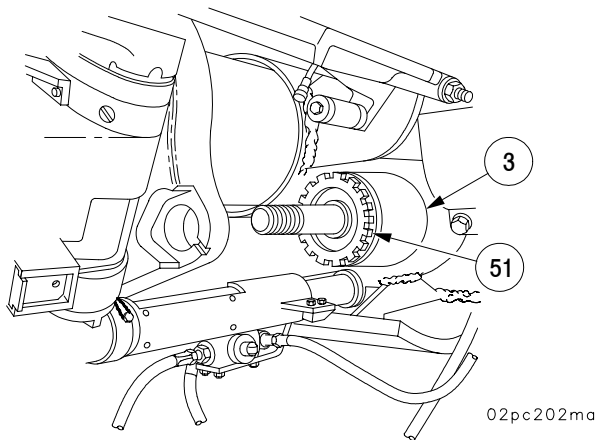
4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

c. Assembly - Continued

- 13 Slide piston assembly (43) further into recoil cylinder (3). Install rear follower group (52) at rear of recoil cylinder (3), over piston assembly (43) rod.



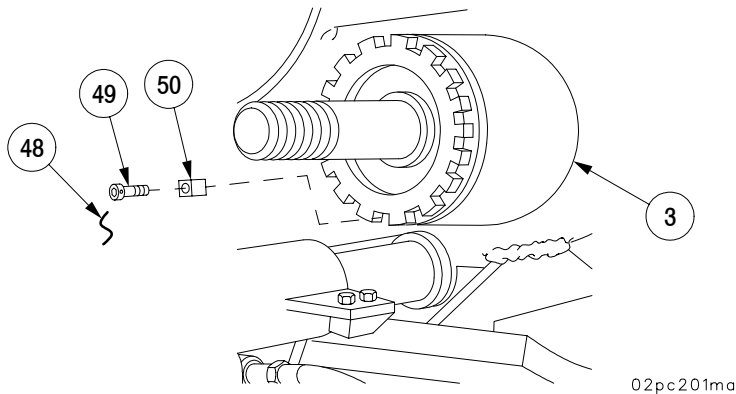
- 14 Install bushing (51) into recoil cylinder (3), using adjustable hook spanner wrench.



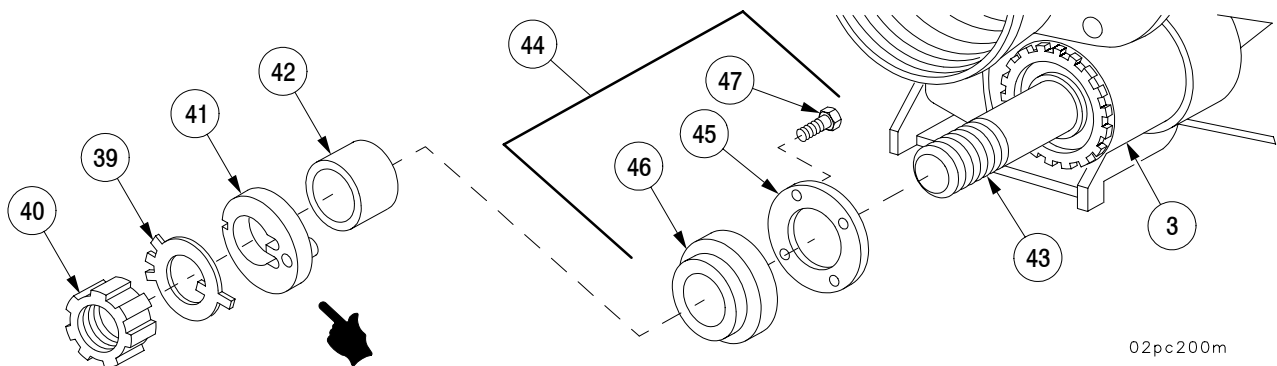
4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

c. Assembly - Continued

- 15 Install key (50), screw (49), and new lockwire (48) into recoil cylinder (3).



- 16 Attach thrust plate (46) to plate spacer (45) using four new self-locking screws (47).
- 17 Install thrust plate group (44) on rear of piston assembly (43) as piston assembly is pushed into position.
- 18 Install spacer (42) and key assembly (41) on threaded end of piston assembly (43).
- 19 Install new key washer (39) onto piston assembly (43).
- 20 Install nut (40) onto piston assembly (43). Tighten nut (40) until piston assembly is pulled through breech ring band adapter. Loosen nut (40). Retighten until it begins to press against key washer (39).
- 21 Bend two tabs 90 degrees apart on key washer (39) to engage a slot on nut (40).



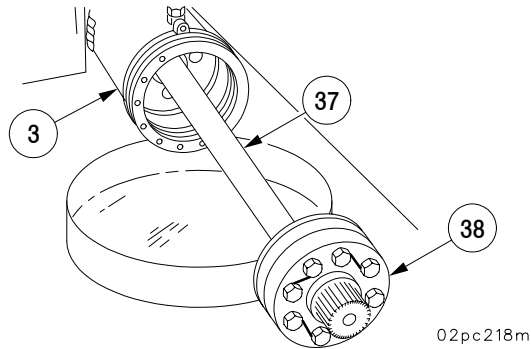
4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

c. Assembly - Continued

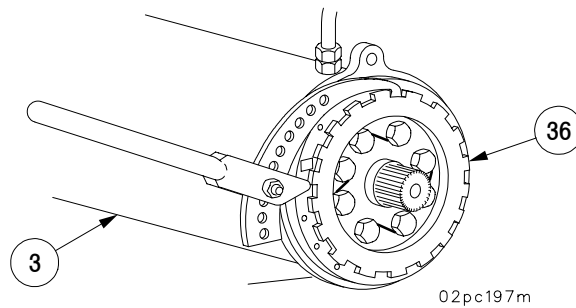
WARNING

Use gloves or rags to grip inner orifice. Edge of orifice is extremely sharp and could cause injury.

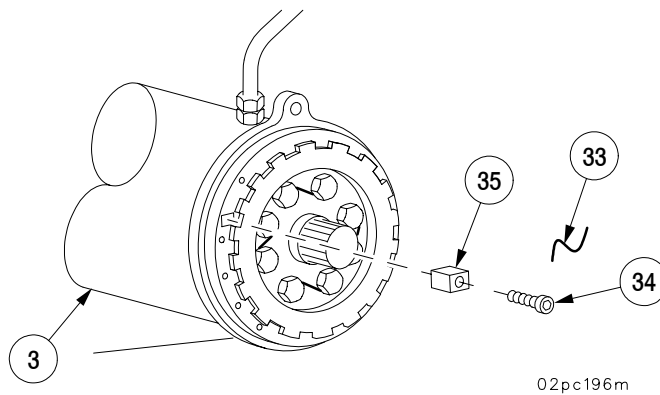
- 22 Install inner orifice rod (37) and front follower group (38) into recoil cylinder (3).



- 23 Install bushing (36) on front of recoil cylinder (3) using adjustable hook spanner wrench.



- 24 Install key (35), screw (34) and new lockwire (33) onto front of recoil cylinder (3).

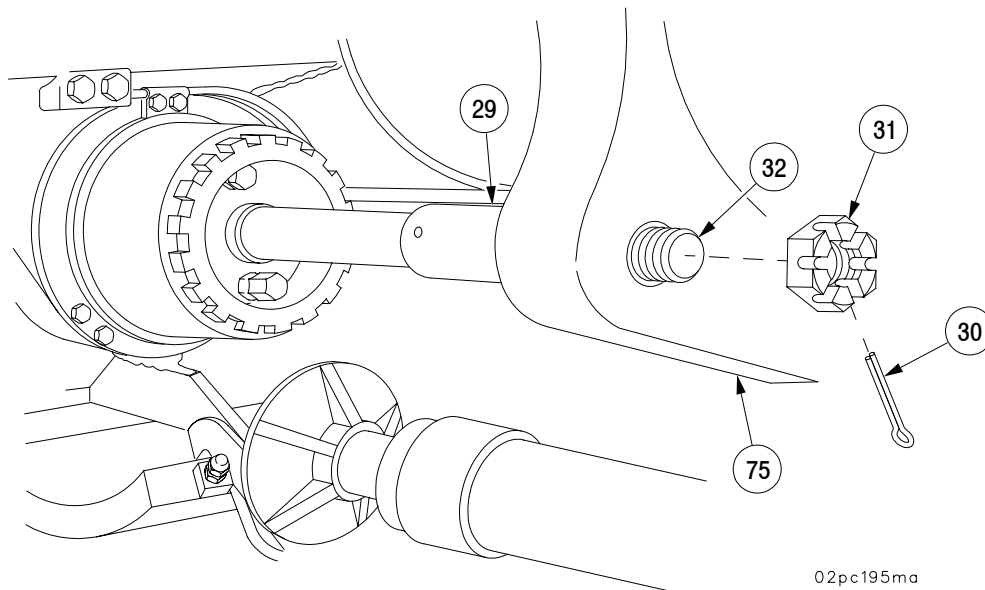


4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

c. Assembly - Continued**NOTE**

- Preferred method of returning cannon to battery is to apply nitrogen pressure to the recuperator cylinder. A wrecker boom can be used as an alternative method.
- If using preferred method, recuperator rod must be extended, by hand, through breech ring.

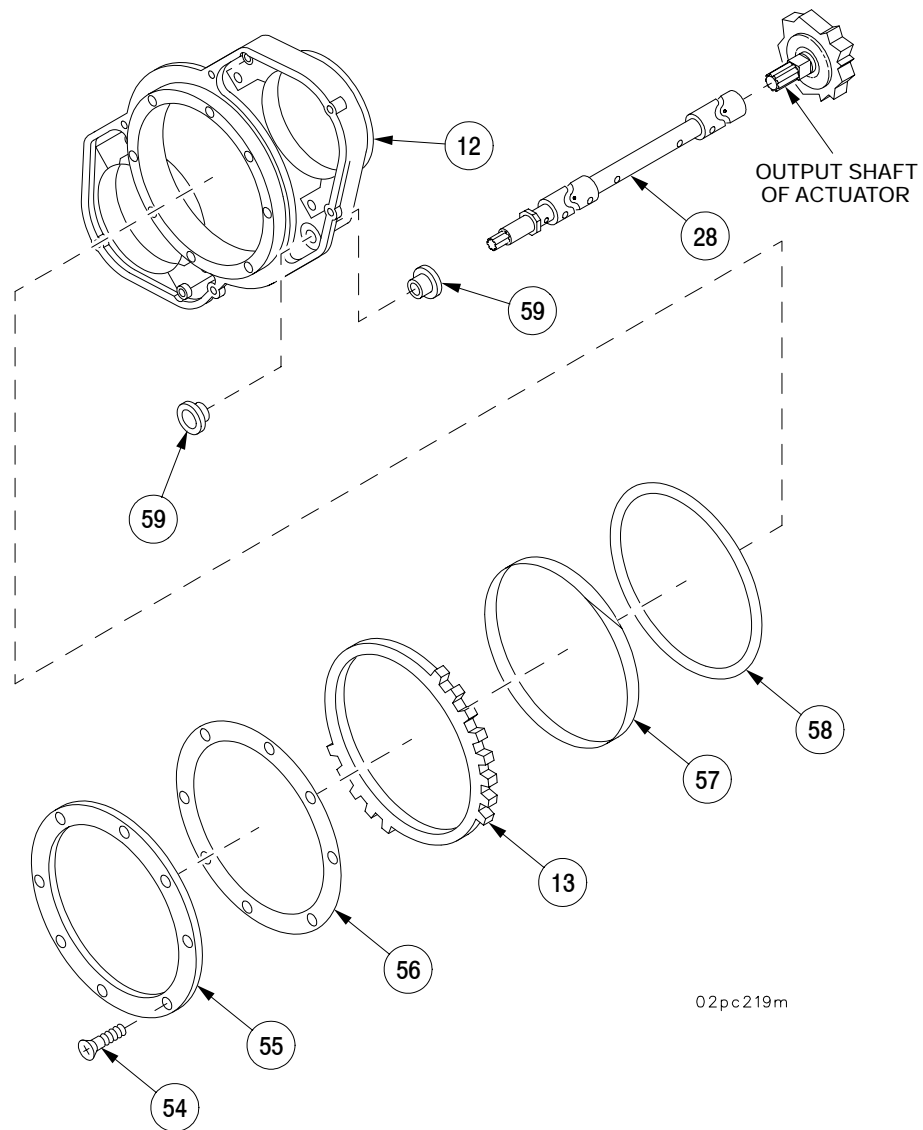
- 25 While holding collar (29) with pipe wrench, install nut (31) on recuperator assembly shaft (32). Tighten nut until nut and collar are just beginning to touch breech ring adapter (75).
- 26 Loosen nut (31) 1/6 to 1/3 turn while aligning cotter pin hole in recuperator assembly shaft (32) with slots in nut. Install new cotter pin (30).
- 27 Return cannon into battery (TM 9-2350-314-20-2-1).



4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

c. Assembly - Continued

- 28 Install two sleeve bearings (59) into variable recoil housing (12). If new parts, ream inside diameter to 1.000-1.001 in.
- 29 Install spacer ring (58), bearing (57), sector gear (13), shim (56), and retainer (55) in variable recoil housing (12) and secure with four screws (54).
- 30 Apply a thin even coat of grease to sleeve bearings (59) and end of connecting link assembly (28).
- 31 Install connecting link assembly (28) onto output shaft of actuator assembly.

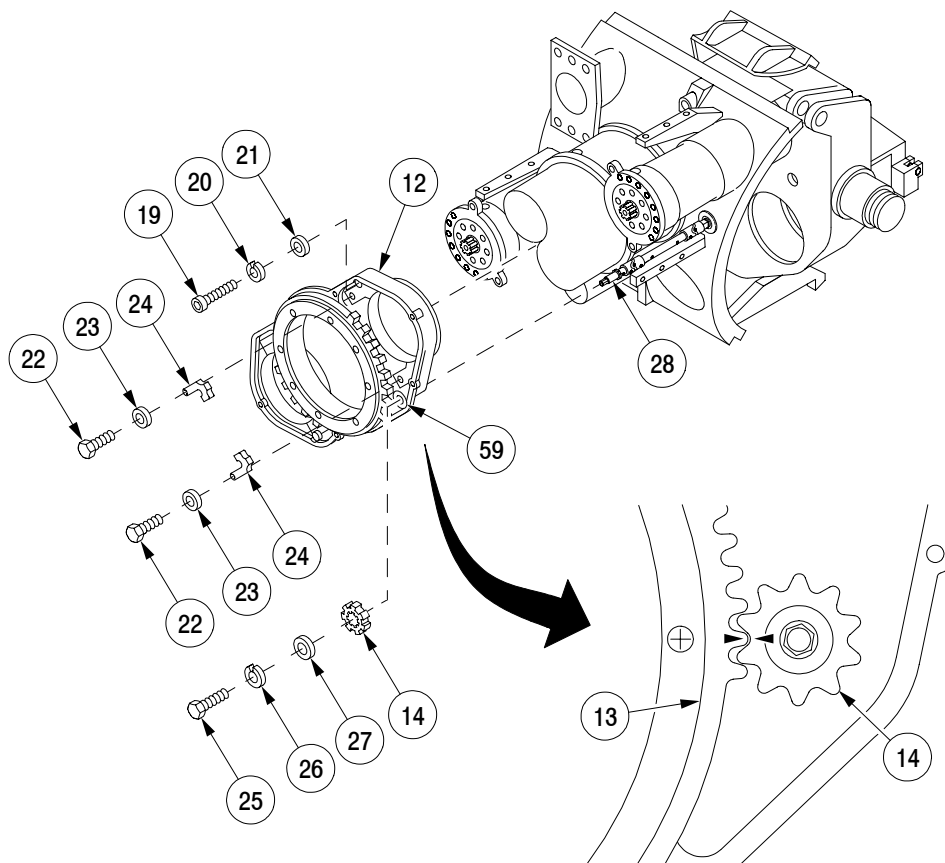


02pc219m

4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

c. Assembly - Continued

- 32 Install variable recoil housing (12) onto cannon tube and slide forward toward front of cannon mount.
- 33 Slide connecting link assembly (28) through sleeve bearings (59) while positioning variable recoil housing (12) onto cannon mount.
- 34 Install four screws (19), four new lockwashers (20), and four flat washers (21) to secure variable recoil housing (12) to cannon mount.
- 35 Align spur gear (14) with splines on connecting link assembly (28) and to alignment arrow on sector gear (13).
- 36 Install flat washer (27), new lockwasher (26), and screw (25) to secure spur gear (14) to connecting link assembly (28). Do not torque screw at this time.
- 37 Install two sector gear stops (24) onto housing (12) and secure with two screws (22) and two flat washers (23). Torque screws to 216 lb-in. (24 N·m).



02pc222m

4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

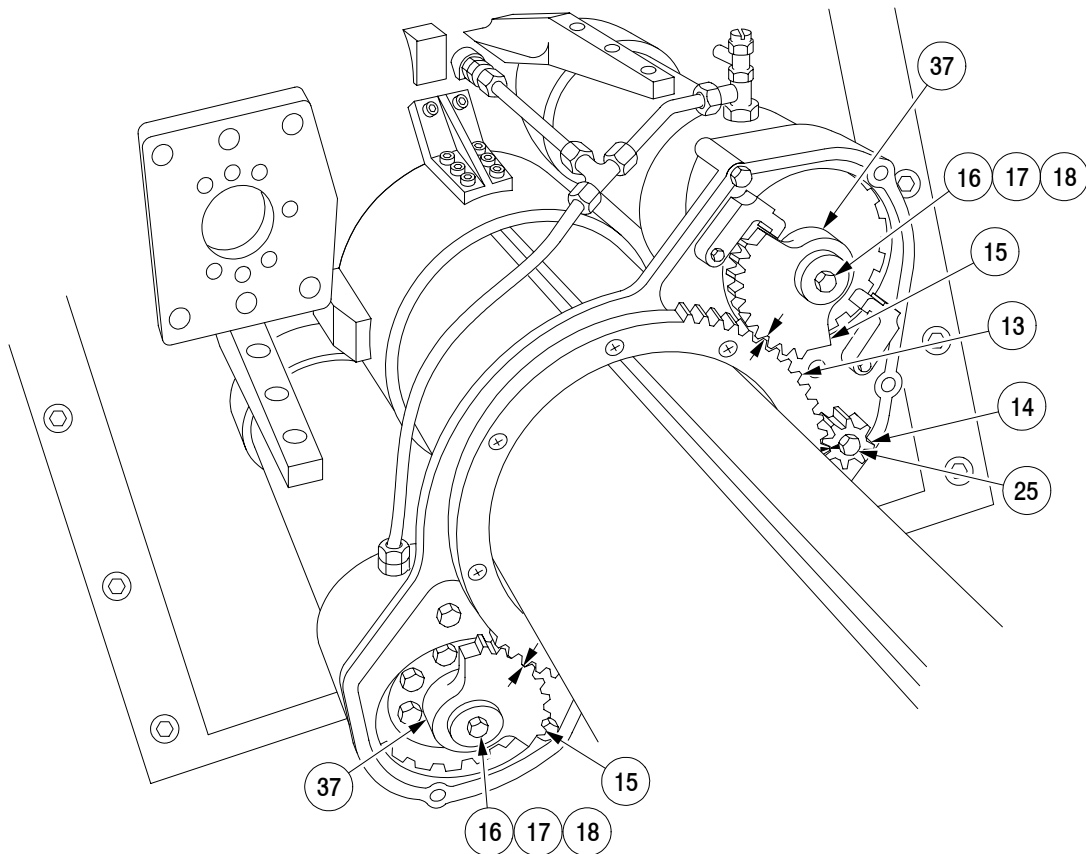
c. Assembly - Continued

- 38 Apply a thin even coat of grease to two sector gears (15) and screws (16).

NOTE

Coat sector gears and head of screws on front follower (TM 9-2350-314-10) before installing sector gears.

- 39 Align arrow on two sector gears (15) with arrows on sector gear (13) and onto two inner orifice rods (37), insuring that splines are aligned.
- 40 Install two screws (16), two new lockwashers (17), and two flat washers (18) to secure two sector gears (15).
- 41 Torque screw (25) securing spur gear (14) to 35 lb-ft (47 N·m).

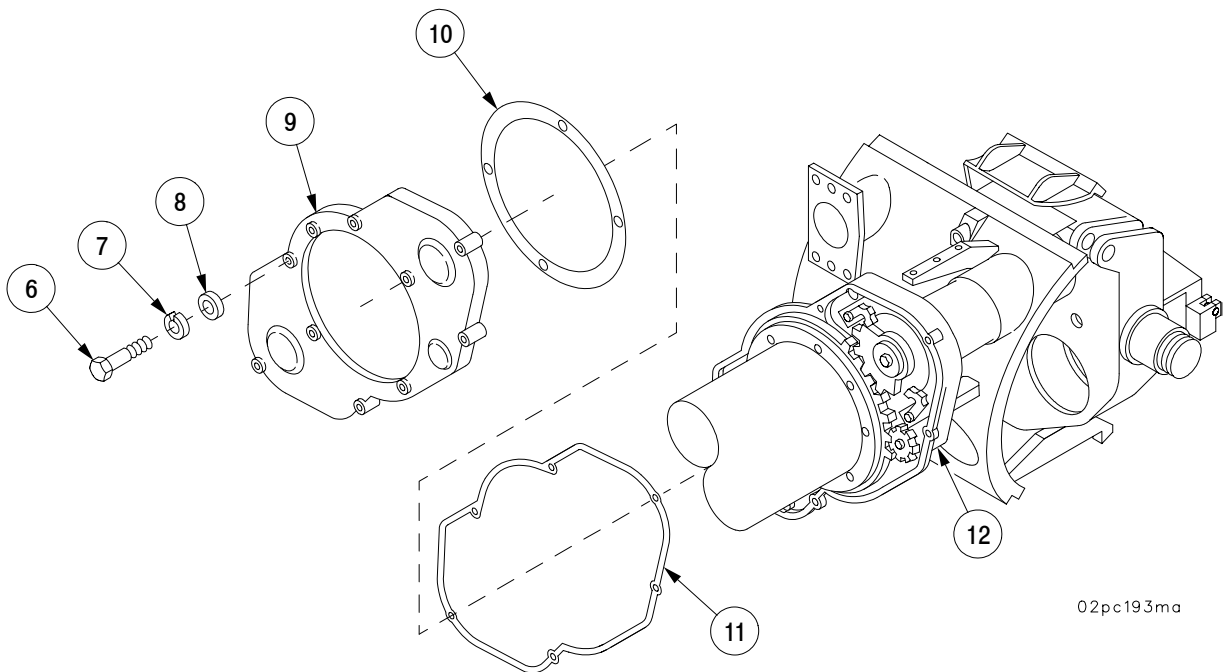


02pc220m

4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

c. Assembly - Continued

- 42 Apply adhesive to new gasket (11) and install onto variable recoil housing (12).
- 43 Apply adhesive to new gasket (10) and install onto housing cover (9).
- 44 Install housing cover (9) onto variable recoil housing (12) and secure with six screws (6), six new lockwashers (7), and six flat washers (8).

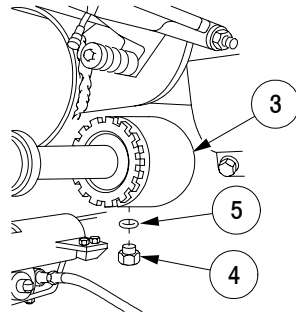


02pc193ma

4-8 VARIABLE RECOIL ASSEMBLY - CONTINUED

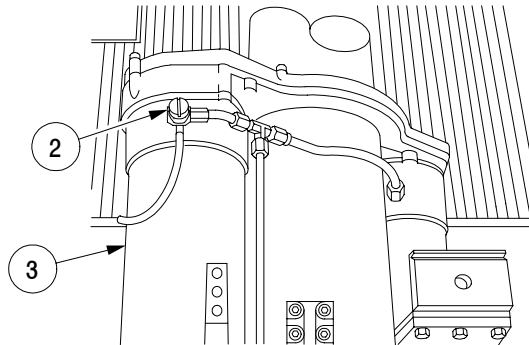
c. Assembly - Continued

- 45 Install two new preformed packings (5) and two drain plugs (4) at rear of each recoil cylinder (3)



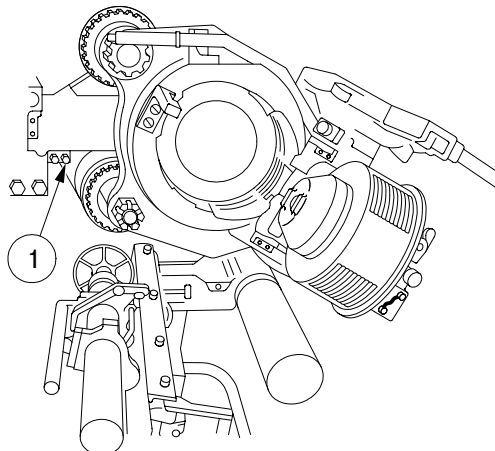
02pc192m

- 46 Close bleeder "tee" (2) at front of left recoil cylinder (3).



02pc191m

- 47 Close accumulator replenisher right manifold bleeder plug (1).



02pc190m

- 48 Recharge recuperator with dry nitrogen (TM 9-2350-314-20-2-2).
49 Fill and charge accumulator replenisher assembly (TM 9-2350-314-20-2-2).
50 Check variable recoil cylinder for hydraulic leaks.
51 Install dust shield (TM 9-2350-314-20-2-1).

4-9 CONNECTING LINK ASSEMBLY.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Vise caps (item 7, Appx F)
Vise (item 61, Appx F)
Portable drill (item 10, Appx F)
Twist drill set (item 44, Appx F)

Materials/Parts

Spring pins (3) (item 19, Appx E)

Equipment Conditions

Connecting link assembly removed (para 4-8)

a. Disassembly.

- 1 Place connecting link assembly (1) in vise with vise clamps and secure.

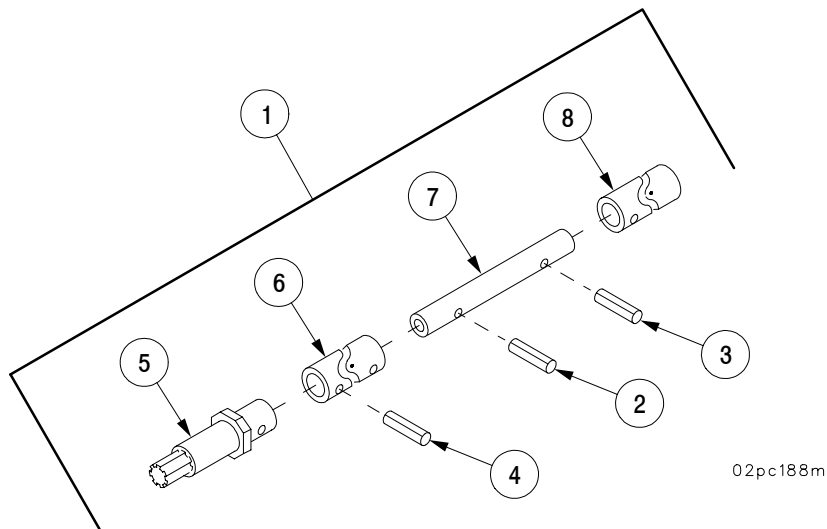
NOTE

Remove only those spring pins required to replace worn or defective parts.

- 2 Remove three spring pins (2, 3, and 4). Separate shaft (5), front universal joint (6), straight pin (7), and rear universal joint (8). Discard spring pins.

b. Assembly.

- 1 Assemble shaft (5) to front universal joint (6) and install new spring pin (4).



4-9 CONNECTING LINK ASSEMBLY.

b. Assembly - Continued

NOTE

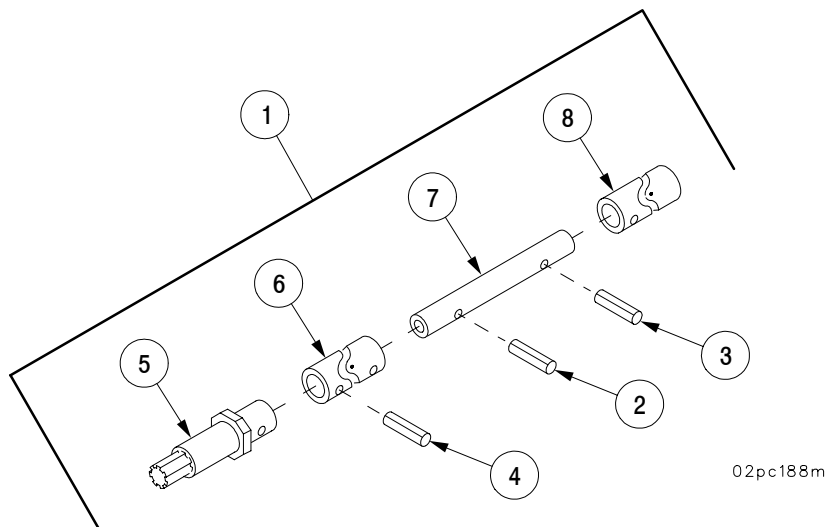
- If straight pin is being replaced, hole for straight pin, connecting straight pin, and front universal joint can not be drilled until connecting link assembly is installed and spur gear and sector gears are aligned.
- If straight pin is being replaced, perform next step. If not, go to step 3.

- 2 Drill 0.250-0.256 in. (6.35-6.50 mm) hole in straight pin (7) for spring pin (3).
- 3 Assemble straight pin (7) to rear universal joint (8) and install new spring pin (3).

NOTE

If straight pin was replaced, go to step 6. If not, perform steps 4 and 5 only.

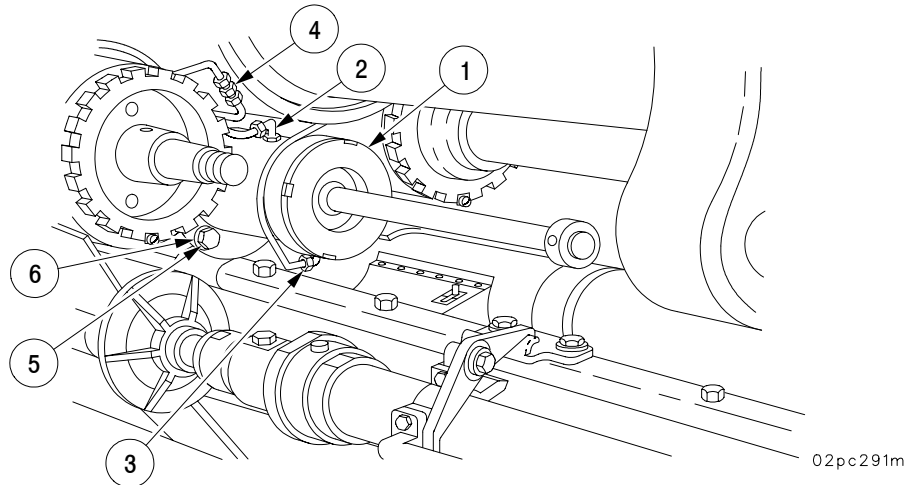
- 4 Assemble straight pin (7) to front universal joint (6) and install new spring pin (2).
- 5 Install connecting link assembly (1) (para 4-8).
- 6 Assemble straight pin (7) to front universal joint (6).
- 7 Install connecting link assembly (1), variable recoil housing, sector gears, and spur gear (para 4-8).
- 8 Check alignment of sector gears and spur gear and position of actuator output shaft for long recoil length (para 4-8).
- 9 Drill 0.250-0.256 inch (6.35-6.50 mm) hole in straight pin (7) for spring pin (2).
- 10 Install new spring pin (2).



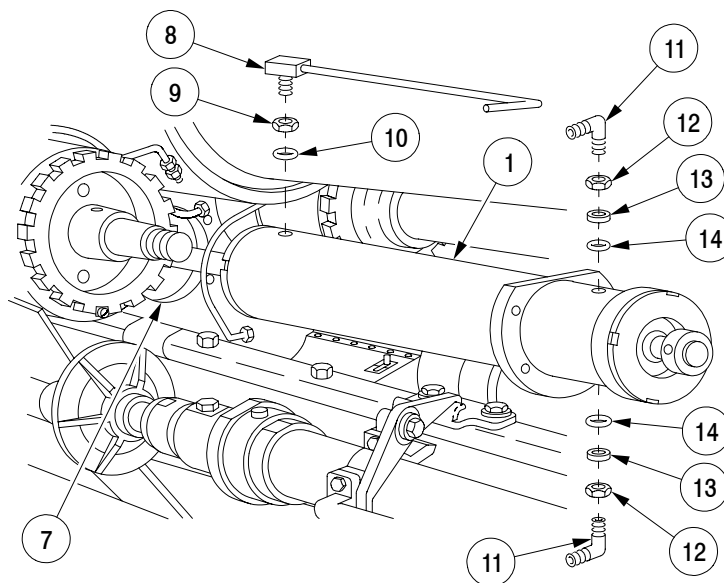
4-12 BUFFER ASSEMBLY - CONTINUED

a. Removal - Continued

- 1 Disconnect three rear hydraulic lines from buffer assembly (1) at top nut (2) and bottom nut (3), and union (4).
- 2 Remove four screws (5) and four washers (6) from buffer assembly (1).



- 3 Withdraw buffer assembly (1) from cradle assembly (7).
- 4 Remove elbow (8), nut (9) and preformed packing (10) from front of buffer assembly (1). Discard preformed packing.
- 5 Remove two elbows (11), two nuts (12), two retainers (13), and two preformed packings (14) from rear of buffer assembly (1). Discard preformed packings.



4-12 BUFFER ASSEMBLY - CONTINUED

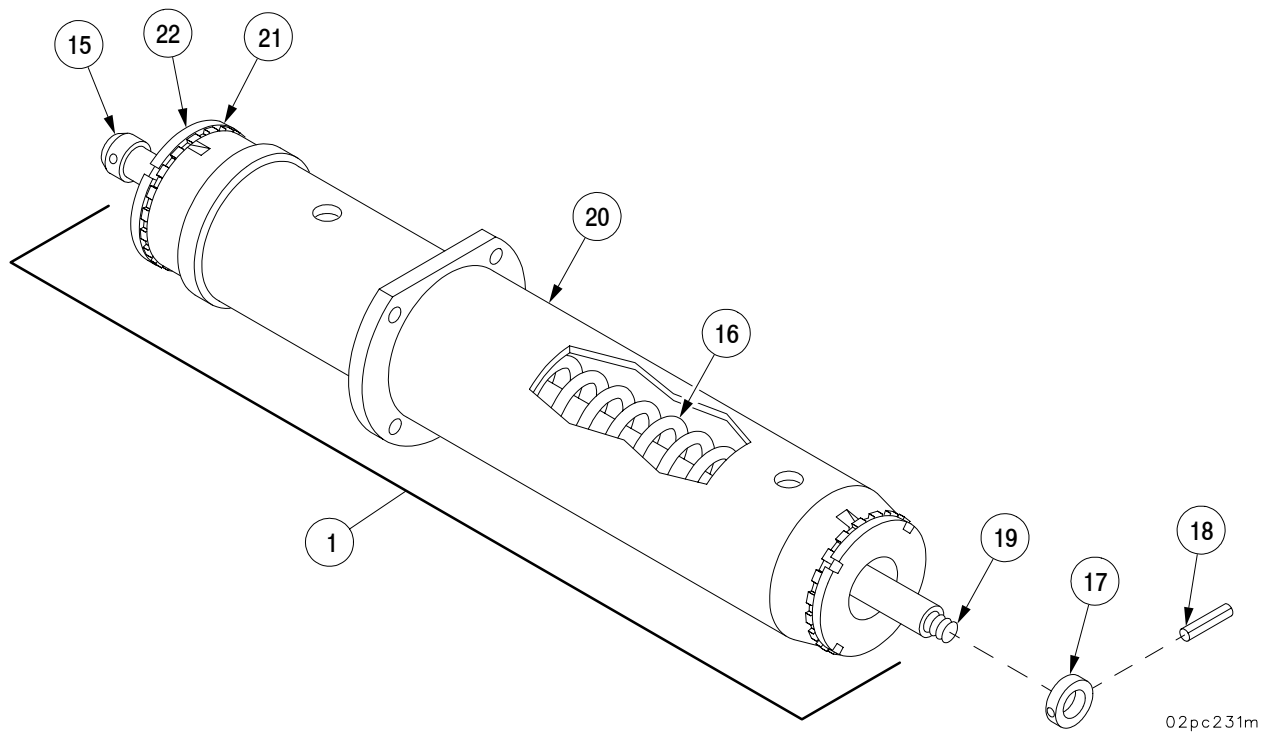
b. Disassembly.

- 1 Place buffer assembly (1) in vise with vise caps and secure.
- 2 Push in bumper (15) against spring (16) to gain access to nut (17).

WARNING

Spring is under compression. Use care in disassembly to avoid personnel injury.

- 3 Drive out spring pin (18) and remove nut (17). Allow bumper (15) and piston rod (19) to extend fully out of cylinder (20). Discard spring pin.
- 4 Disengage key washer (21) locking teeth from machine bushing (22) at end of bumper (15).
- 5 Restrain bumper (15) against further extension. Have an assistant unscrew machine bushing (22). Allow bumper (15) and piston rod (19) to extend slowly.



4-12 BUFFER ASSEMBLY - CONTINUED

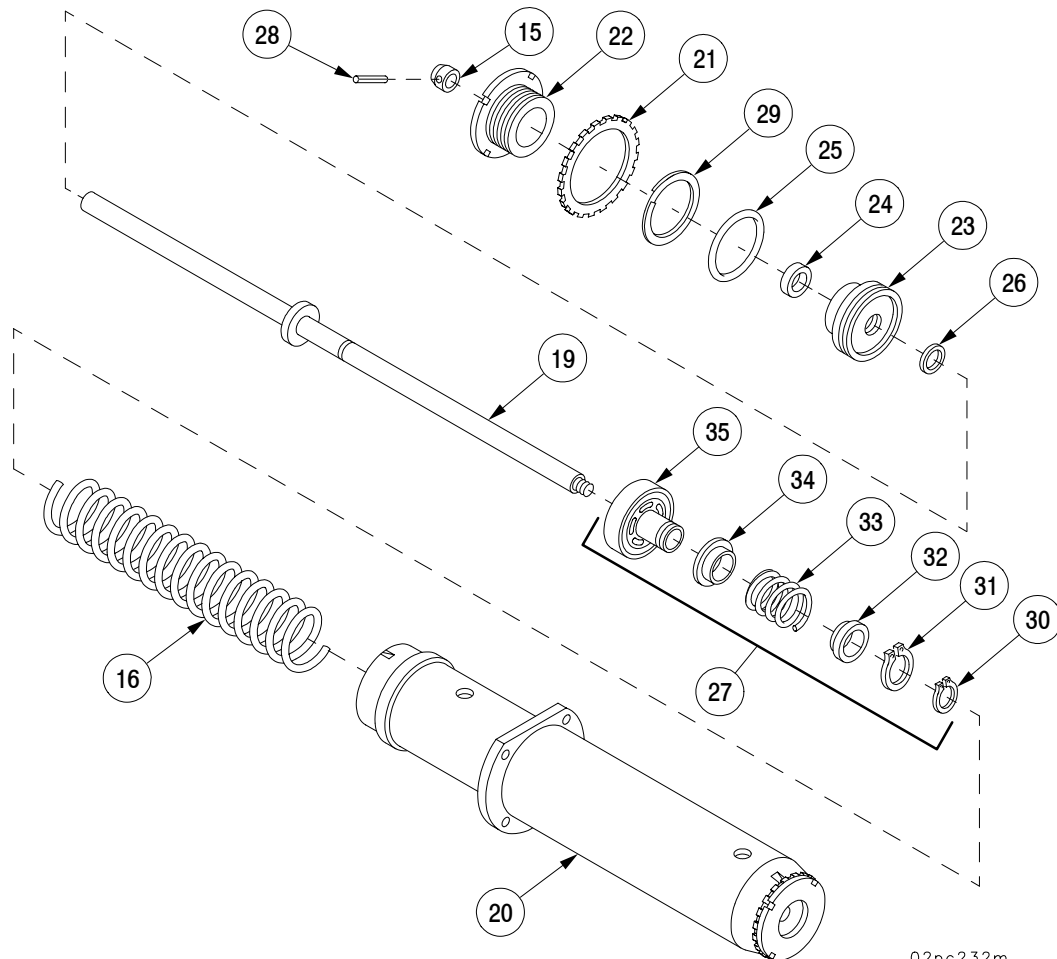
b. Disassembly - Continued

- 6 Withdraw bumper (15) and piston rod (19) from cylinder (20) along with key washer (21), machine bushing (22), and bushing (23), seal (24), preformed packing (25), seal (26), piston group (27), and spring (16).
- 7 Remove bumper (15) by driving out spring pin (28). Discard spring pin.
- 8 Remove machine bushing (22), key washer (21), bushing (23), retainer (29), preformed packing (25), seal (26), and seal (24). Discard retainer, preformed packing, seals, and key washer.

WARNING

Spring is under compression. Use care in disassembly to avoid possible injury to personnel.

- 9 Disassemble piston group (27) by removing retaining rings (30 and 31). Separate guide (32), spring (33), valve (34), and piston (35).

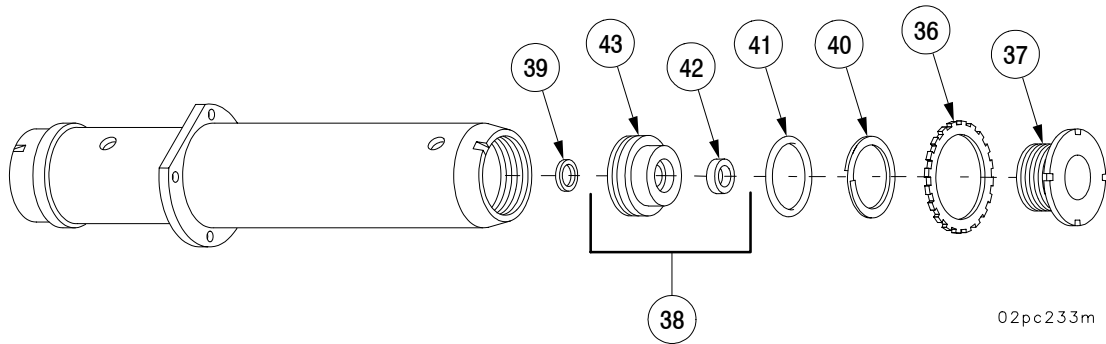


02pc232m

4-12 BUFFER ASSEMBLY - CONTINUED

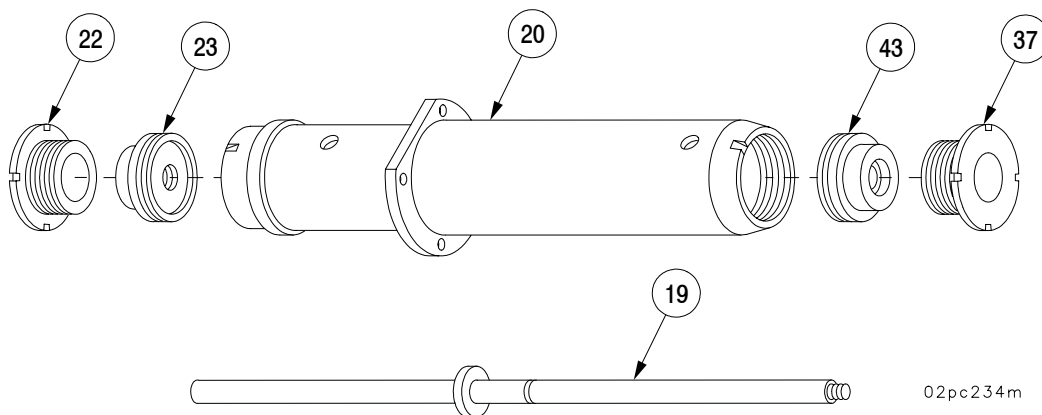
b. Disassembly - Continued

- 10 Disengage key washer (36) locking teeth from machine bushing (37) at stop end.
- 11 Unscrew machine bushing (37) and remove with key washer (36). Discard key washer.
- 12 Withdraw bushing assembly (38) along with seal (39), retainer (40), and preformed packing (41). Separate seal (42) and bushing (43). Discard seals, retainer, and preformed packing.



c. Inspection.

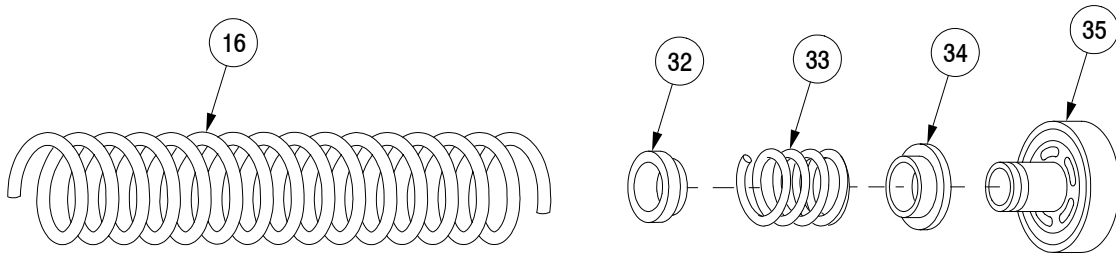
- 1 Inspect bushings (22, 23, 37, and 43) for burrs or sharp edges. Replace if needed.
- 2 Measure inside diameter of bushings (37 and 43). Replace if inside diameter is greater than 1.000 inch (25.4 mm).
- 3 Inspect piston rod (19) for damage or wear. Replace if scored, scratched, or excessively worn. Replace if threads are burred or nicked. Remove any paint on rod.
- 4 Inspect cylinder (20) for damage. Replace if exterior is cracked, dented, or deformed. Replace if interior is scratched, galled, or excessively worn.
- 5 Measure inside diameter of cylinder (20) in two places. At 20 inches (508 mm) from stop end, replace if greater than 3.51 inches (89.15 mm). At 8.5 inches (215.9 mm) from stop end, replace if greater than 3.5 inches (89 mm).



4-12 BUFFER ASSEMBLY - CONTINUED

c. Inspection - Continued

- 6 Inspect piston (35) for damage. Replace if nicked, scratched, or burred.
- 7 Measure outside diameter of piston (35). Replace if less than 3.487 inches (88.56 mm).
- 8 Inspect valve (34) for burrs or sharp edges. Replace as required.
- 9 Measure valve (34) thickness. Replace if flange is less than 0.12 inch (3 mm).
- 10 Inspect guide (32) for burrs or sharp edges. Replace as required.
- 11 Inspect two springs (16 and 33). Replace if cracked or distorted.



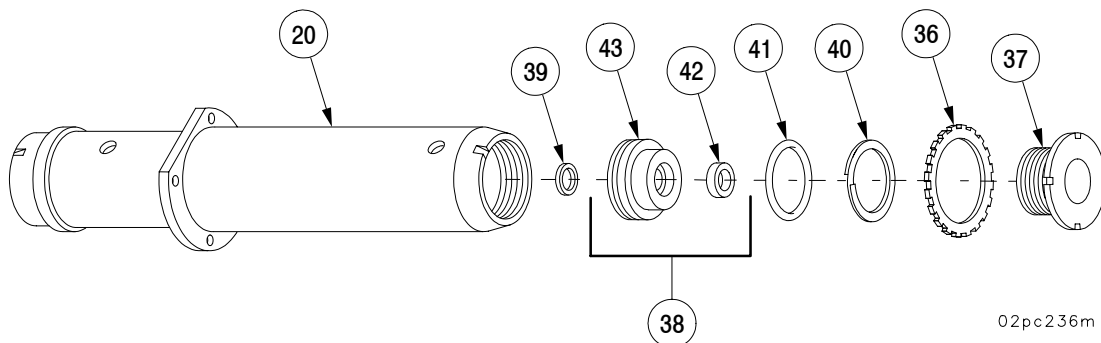
02pc235m

d. Assembly.

NOTE

Use new seals, preformed packings, and retainers on assembly, from seal replacement kit.

- 1 Install two new seals (39 and 42) on bushing (43).
- 2 Install new preformed packing (41) and new retainer (40) on bushing assembly (38) and insert bushing assembly (38) into cylinder (20).
- 3 Install machine bushing (37) with new key washer (36).
- 4 Engage key washer (36) locking teeth to machine bushing (37) at stop end.

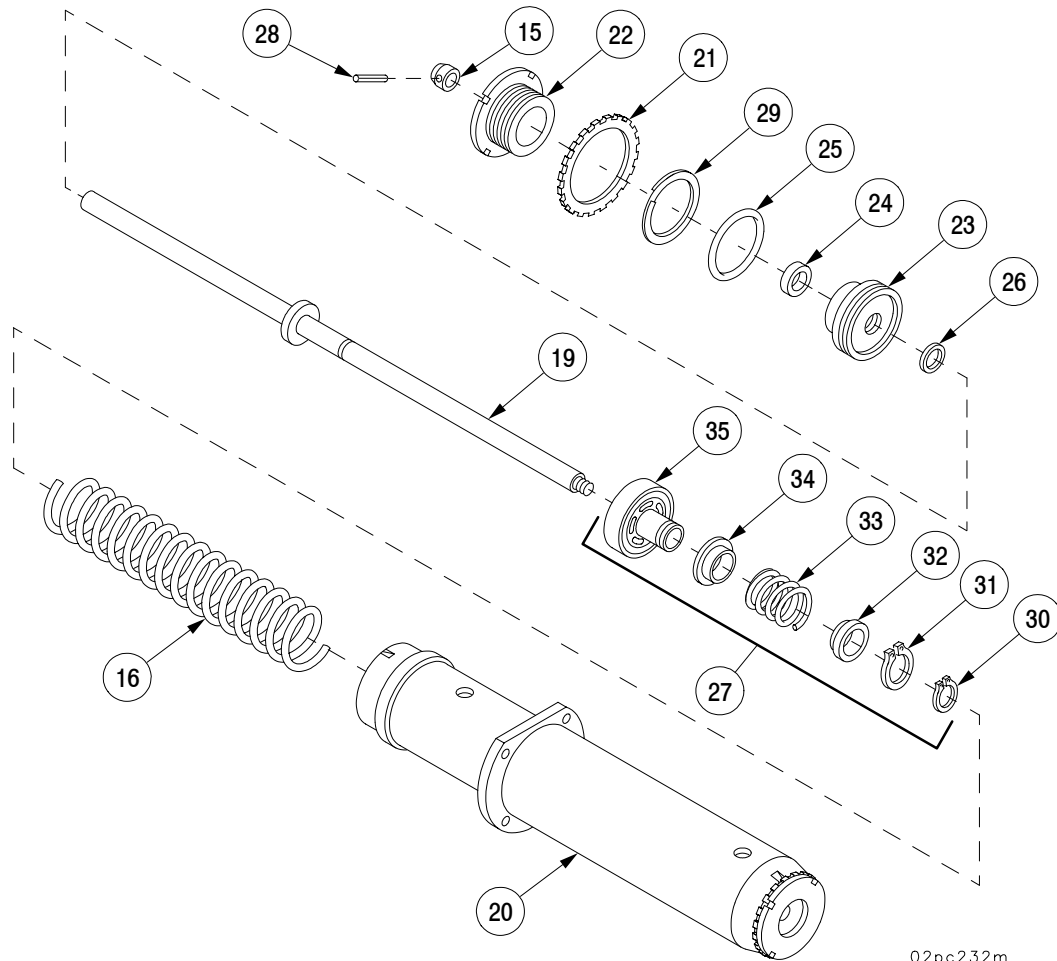


02pc236m

4-12 BUFFER ASSEMBLY - CONTINUED

d. Assembly - Continued

- 5 Assemble piston (35), valve (34), spring (33), and guide (32). Carefully compress spring (33). Install retaining rings (30 and 31).
- 6 Install two new seals (26 and 24), new preformed packing (25), and new retainer (29) on bushing (23).
- 7 Install machine bushing (22), key washer (21), bumper (15), and new spring pin (28) on end of piston rod (19).
- 8 Install piston rod (19) into cylinder (20), along with spring (16), piston group (27), new seals (26 and 24), new preformed packing (25), new retainer (29), and bushing (23).



02pc232m

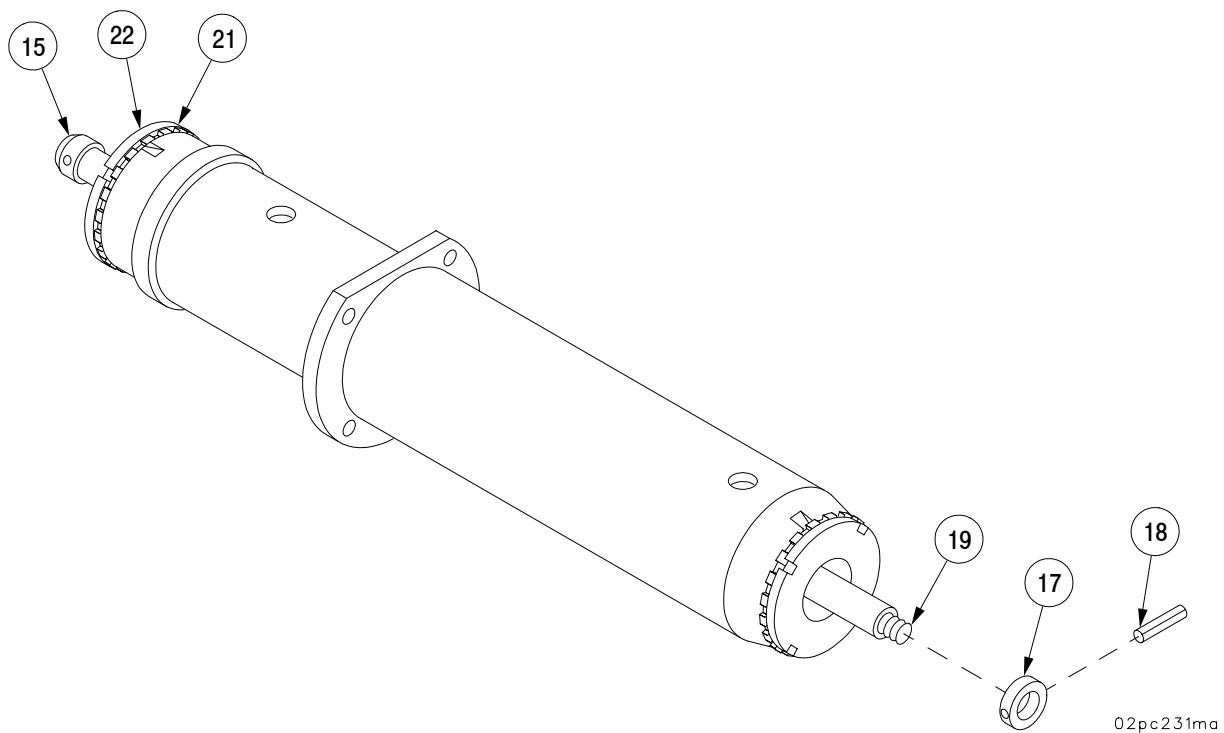
4-12 BUFFER ASSEMBLY - CONTINUED

d. Assembly - Continued

WARNING

Ensure spring is tightly compressed. Use care in assembly to prevent accidental release of spring, resulting in possible injury to personnel.

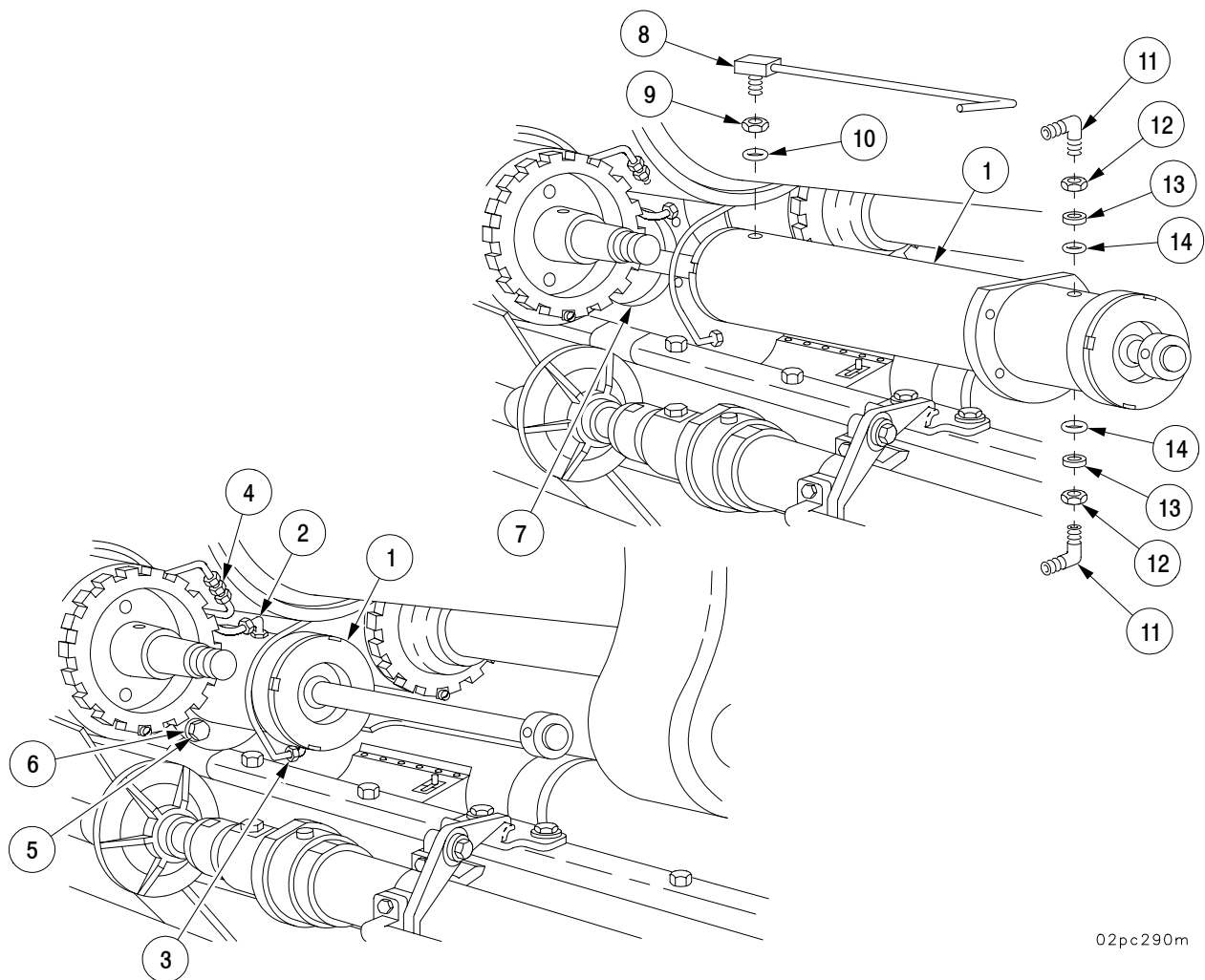
- 9 Push bumper (15) until piston rod (19) is positioned so that it allows assistant to install key washer (21) and machine bushing (22). Allow bumper (15) to extend slowly.
- 10 Engage key washer (21) locking teeth with machine bushing (22) at end of bumper (15).
- 11 While one person compresses bumper (15) and holds it in position, assistant installs nut (17) and new spring pin (18).



4-12 BUFFER ASSEMBLY - CONTINUED

e. Installation.

- 1 Install two new preformed packings (14), two retainers (13), two nuts (12), and two elbows (11) onto buffer assembly.
- 2 Install new packing (10), nut (9), and elbow (8) onto buffer assembly.
- 3 Insert buffer assembly (1) into cradle assembly (7).
- 4 Install four washers (6) and four screws (5) into buffer assembly (1) flange. Torque screws to 38 lb-ft (51 N·m).
- 5 Connect front line union (4) and three rear hydraulic lines to buffer (1) at bottom nut (3) and top nut (2) on buffer assembly (1).
- 6 Return cannon to battery position (TM 9-2350-314-20-2-1).



02pc290m

4-13 TORQUE KEY.

This task covers: a. Removal b. Inspection c. Installation

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit (SC 5180-95-A12)
 Vernier caliper (item 6, Appx F)
 Torque wrench (item 72, Appx F)

Materials/Parts

Lockwashers (8) (item 117, Appx E)
 Lockwire (item 83, Appx B)
 Grease (item 46, Appx B)

Equipment Conditions

Gun shield removed (TM 9-2350-314-20-2-1)
 Gun tube stowed in travel lock (TM 9-2350-314-10)
 Cab traverse lock locked (TM 9-2350-314-10)

References

TM 9-2350-314-10
 TM 9-2350-314-20-2-1

NOTE

After firing 1000 rounds, torque key must be removed and measured for wear.

a. Removal.

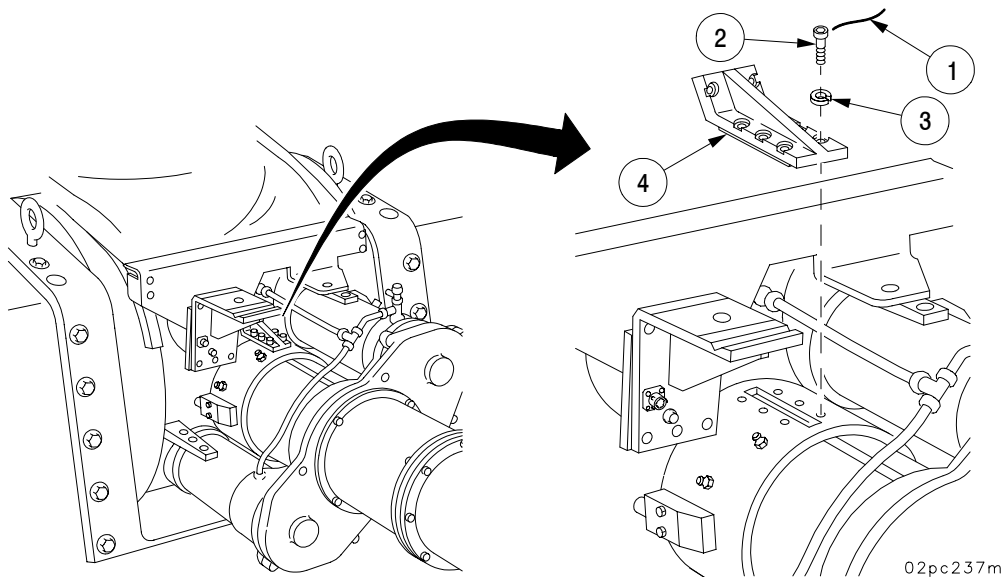
Remove lockwire (1), eight screws (2), eight lockwashers (3), and torque key (4). Discard lockwire and lockwashers.

b. Inspection.

NOTE

Wear limit for torque key is .495 inch for each torque key rail. If measurement is less than .495 inch in any location, replace torque key.

Using a Vernier caliper, measure width of each torque key rail, at three locations each along its entire length to ensure that wear limit has not been exceeded.



02pc237m

4-13 TORQUE KEY - CONTINUED

c. Installation

- 1 Lubricate torque key mating surfaces with GGP or with the lubricant for expected operating temperature range (GAA below 0°F temperature).

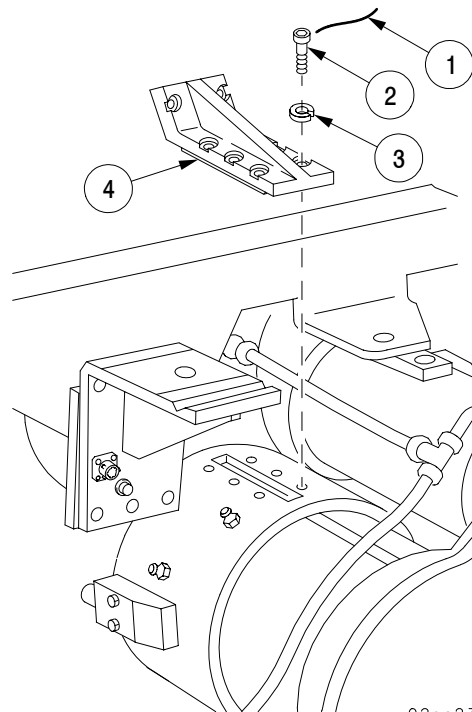
CAUTION

Do not hammer torque key into keyway. If key does not slide into place, rotate the cannon tube slightly.

- 2 Install torque key (4) with eight new lockwashers (3) and eight screws (2). Torque screws to 15-25 lb-ft (20-33 N·m),
- 3 Install new lockwire (1) on eight screws (2).

CAUTION

After installing a new torque key or cannon tube, the torque key and cannon tube must be properly mated by firing an M4 CHARGE 6 (white bag) for the first round. Failure to follow this procedure could result in damage to the equipment.

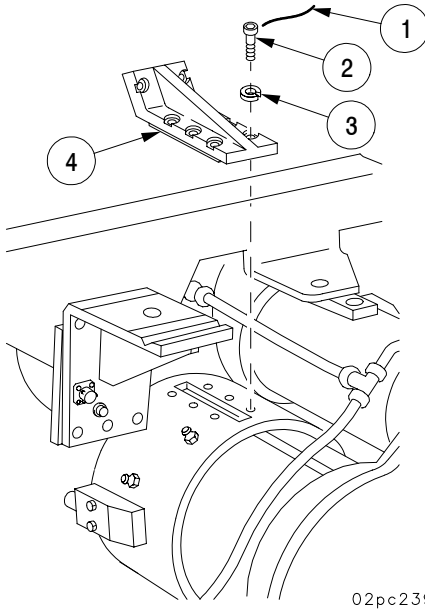


02pc238m

4-14 CANNON TUBE - CONTINUED

a. Removal.

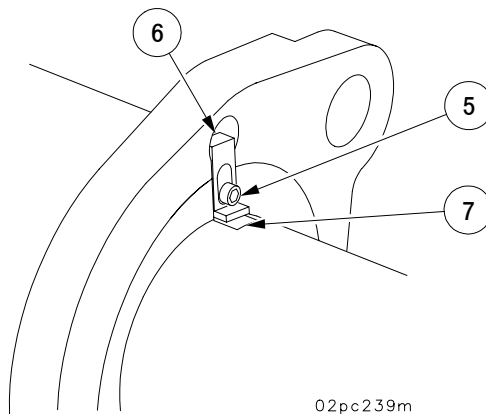
- 1 Drain oil from equilibration system manifold (TM 9-2350-314-20-2-2).
- 2 Remove lockwire (1), eight screws (2), eight lockwashers (3), and torque key (4). Discard lockwashers and lockwire.



NOTE

Cannon must be pushed out of battery (TM 9-2350-314-20-2-1) to gain access to screw.

- 3 Loosen screw (5).
- 4 Slide breech ring key (6) up and out of slot (7). Do not remove screw (5) or breech ring key (6).
- 5 Tighten screw (5).
- 6 Open breechblock.



4-14 CANNON TUBE - CONTINUED

a. Removal - Continued

CAUTION

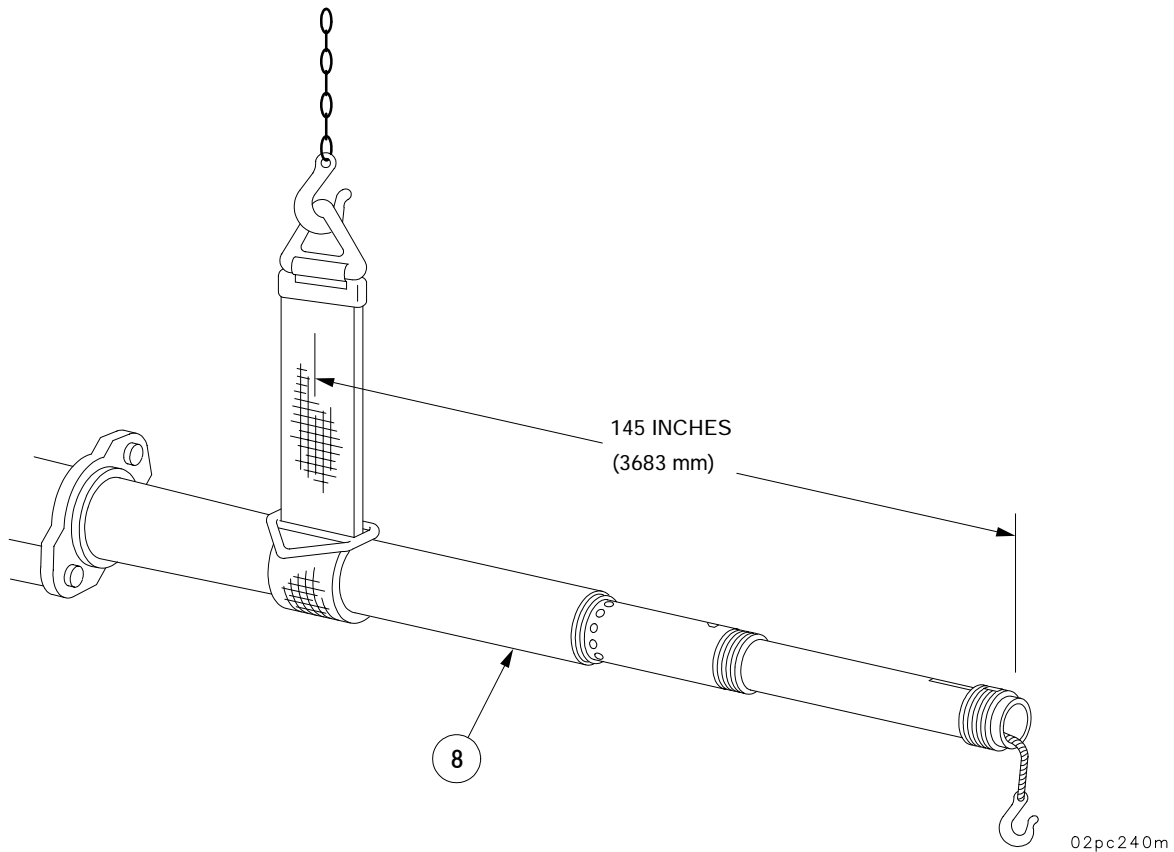
Tie greased rag around hook to avoid damage to lands of cannon tube.

- 7 Thread one end of a 30 ft rope or cable, with hooks at each end, through cannon tube (8) until hook comes out muzzle end.

WARNING

Use hoist of at least 3500 lb (1589 kg) capacity to prevent injury to personnel.

- 8 Attach gun tube sling in choke hitch at point of cannon tube (8) indicated as center of balance (center of balance is 145 in. (3683 mm) from muzzle end).



02pc240m

4-14 CANNON TUBE - CONTINUED

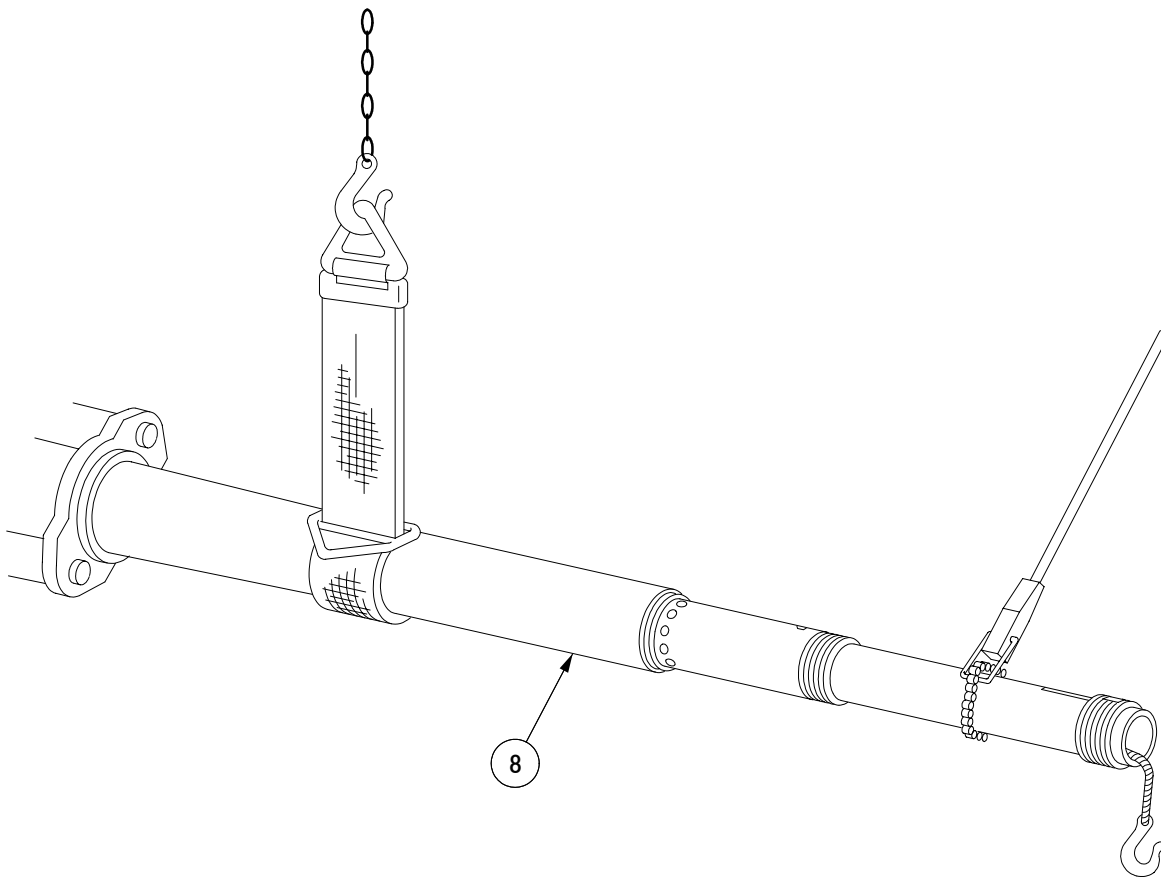
a. Removal - Continued

- 9 Sustain weight of cannon tube (8) with hoist but do not lift cannon tube (8). Place breech stand (not shown) between the breech ring (not shown) and the floor of the vehicle, as required, to support the breech ring (not shown) after withdrawal of cannon tube (8).

NOTE

Refer to steps 12 and 13 for alternate method of rotating cannon tube if chain-type pipe wrench is NOT available and muzzle brake has NOT been removed.

- 10 Install chain-type pipe wrench on cannon tube (8) at a location without threads or key slots.



02pc241m

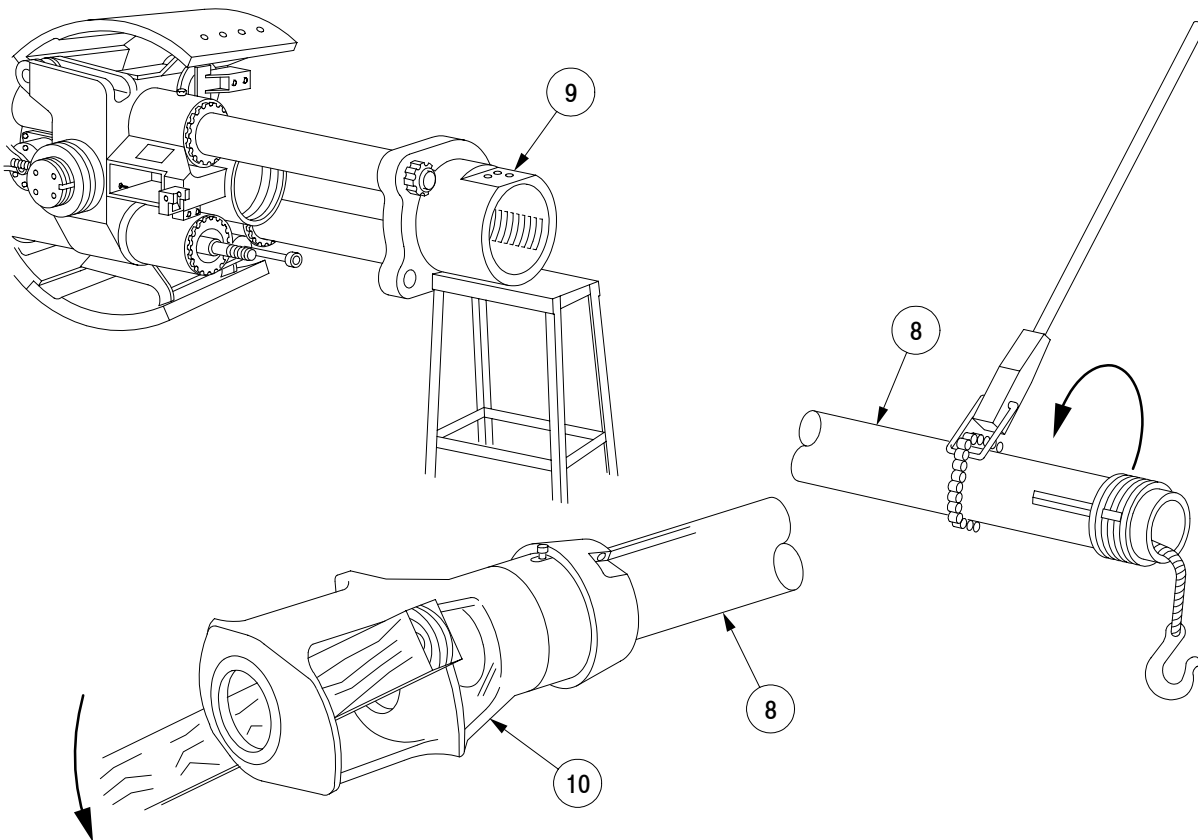
4-14 CANNON TUBE - CONTINUED

a. Removal - Continued

NOTE

- Cannon tube is rotated 45° when keyway on cannon tube is aligned with upper left bolt hole for dust shield.
- If tube is difficult to rotate, some of the nitrogen pressure in the recuperator may have to be drained to relieve binding on breech ring band.

- 11 Rotate cannon tube (8) 45° counterclockwise to disengage cannon tube (8) from breech ring (9) threads.
- 12 If chain-type pipe wrench is not available, install muzzle brake (10) and insert a 4 x 4 in. or 2 x 4 in. wooden timber at least 5 ft long into muzzle brake (10).
- 13 Using wooden timber for leverage, rotate muzzle brake (10) and cannon tube (8) 45° counterclockwise to disengage cannon tube (8) from breech ring (9) threads.



02pc242m

4-14 CANNON TUBE - CONTINUED

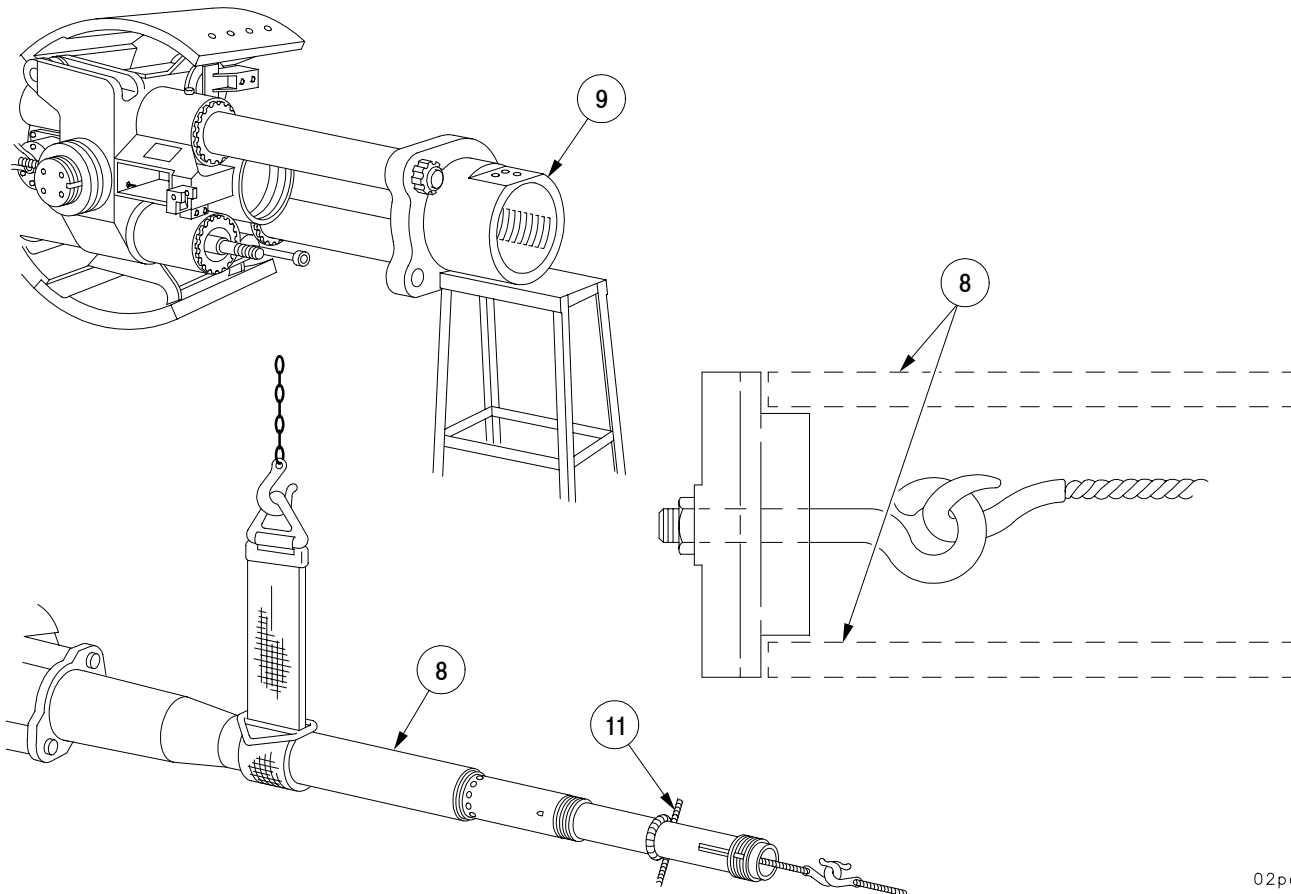
a. Removal - Continued**WARNING**

Breech ring must be supported prior to removal of cannon tube to prevent injury to personnel.

- 14 Support breech ring (9) with breech stand before beginning removal of cannon tube (8).
- 15 Connect rear fabricated eyebolt assembly to rope or cable, with hooks at each end, in breech ring (9) and center at rear face of cannon tube (8) as rope or cable is pulled tight from other end.
- 16 Attach other end horizontally to hoist and fixed object, such as a vehicle. Keep rope or cable tight.
- 17 Attach guide ropes (11) to muzzle end of cannon tube (8).

NOTE

Use guide ropes to help balance and prevent swinging of tube during removal.



02pc243m

4-14 CANNON TUBE - CONTINUED

a. Removal - Continued

CAUTION

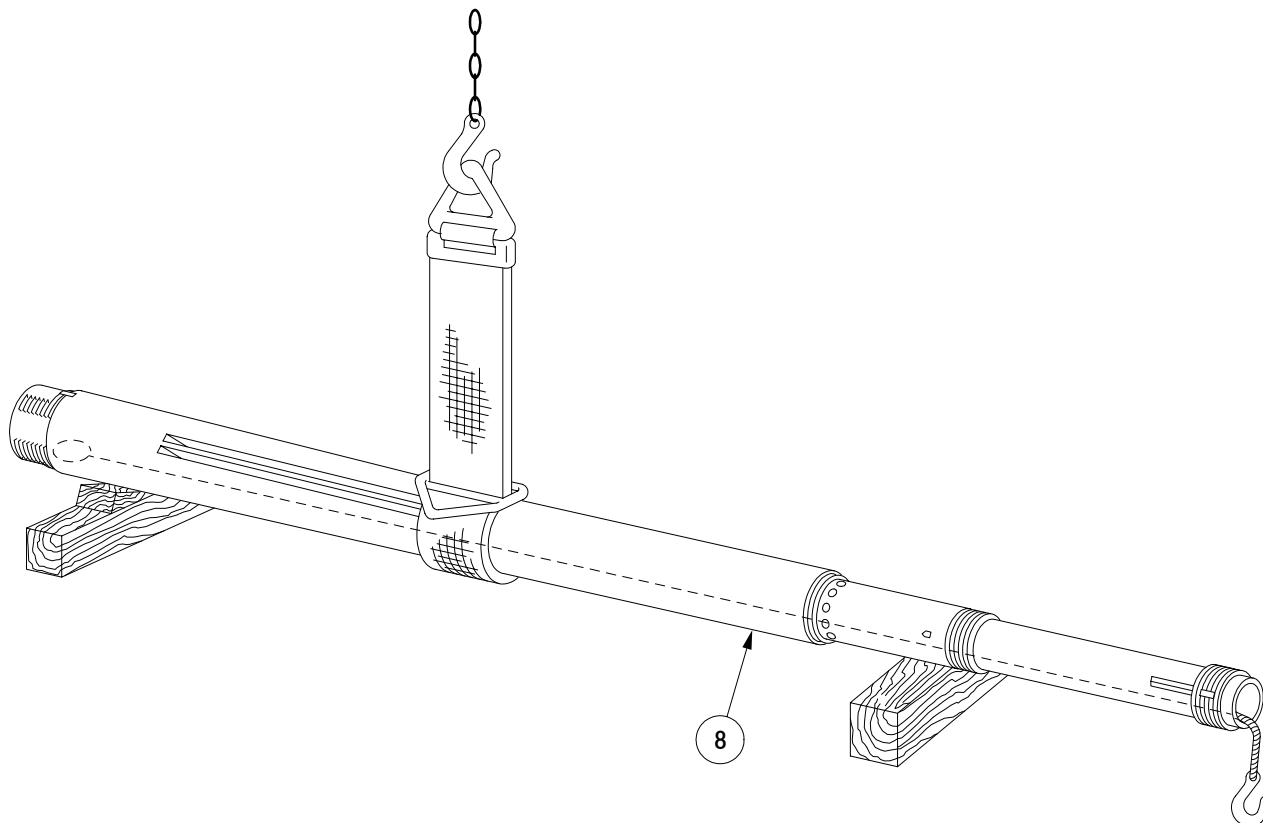
As gun tube is withdrawn horizontally, the hoist sustaining the weight of the cannon should follow this movement to maintain the gun tube sling vertical and tight. Use care and withdraw slowly to prevent damaging gun tube.

- 18 Withdraw cannon tube (8) from mount.

NOTE

Place cannon tube on blocks and secure to prevent rolling. Blocks should be placed on a level hardened surface such as concrete.

- 19 Remove rear fabricated eyebolt assembly, hook, and greased rag.
20 Remove muzzle brake, bore evacuator, and dust shield, if installed.



02pc244m

4-14 CANNON TUBE - CONTINUED

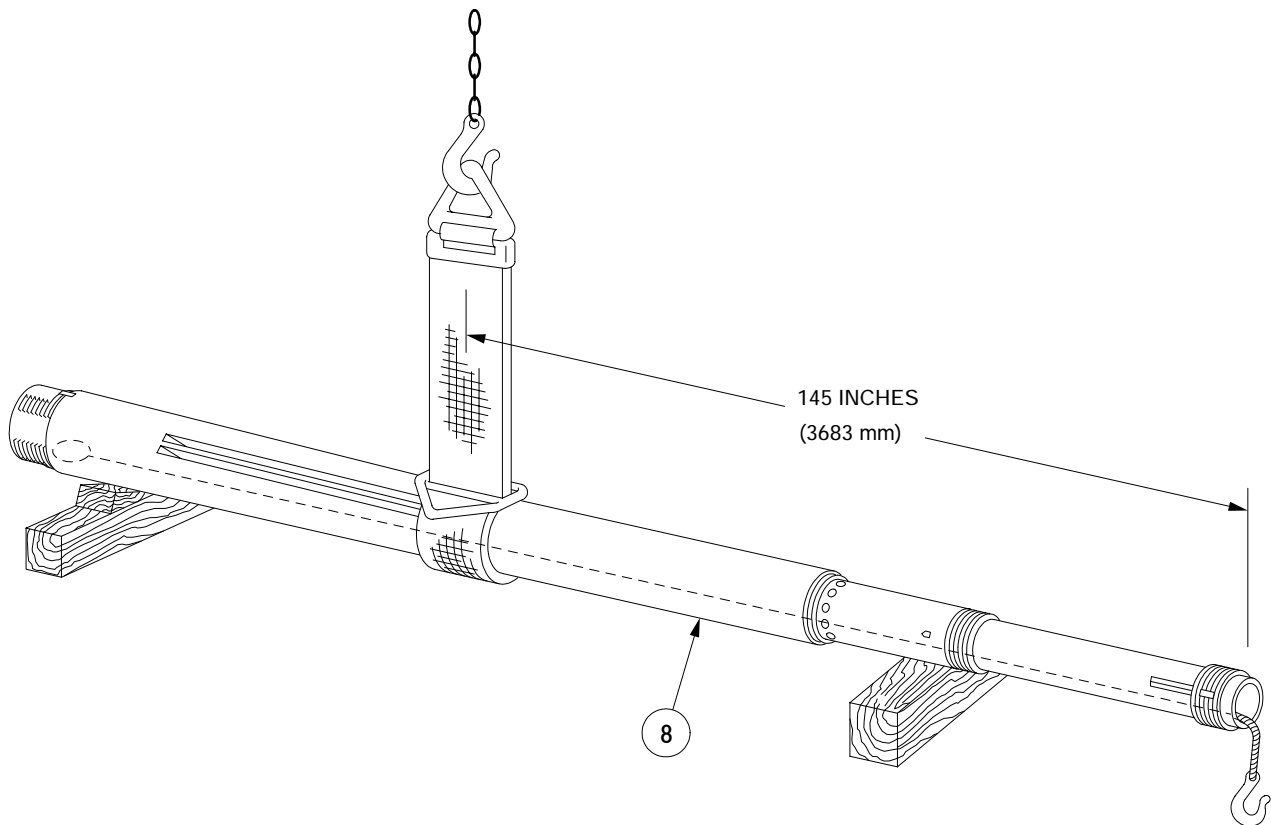
b. Installation.

- 1 Wrap one hook of 30 ft rope or cable with greased rag and thread rope or cable into muzzle end of cannon tube (8). Hook, wrapped in greased rag, is in chamber end of cannon tube (8). Allow other end of rope to dangle out of muzzle end.
- 2 Attach gun tube sling in choke hitch at point in cannon tube (8) indicated as center of balance 145 in. (3683 mm) from muzzle end.

WARNING

Use hoist of at least 3500 lb (1589 kg) lifting capacity to prevent injury to personnel.

- 3 Attach gun tube sling to hoist.



02pc244ma

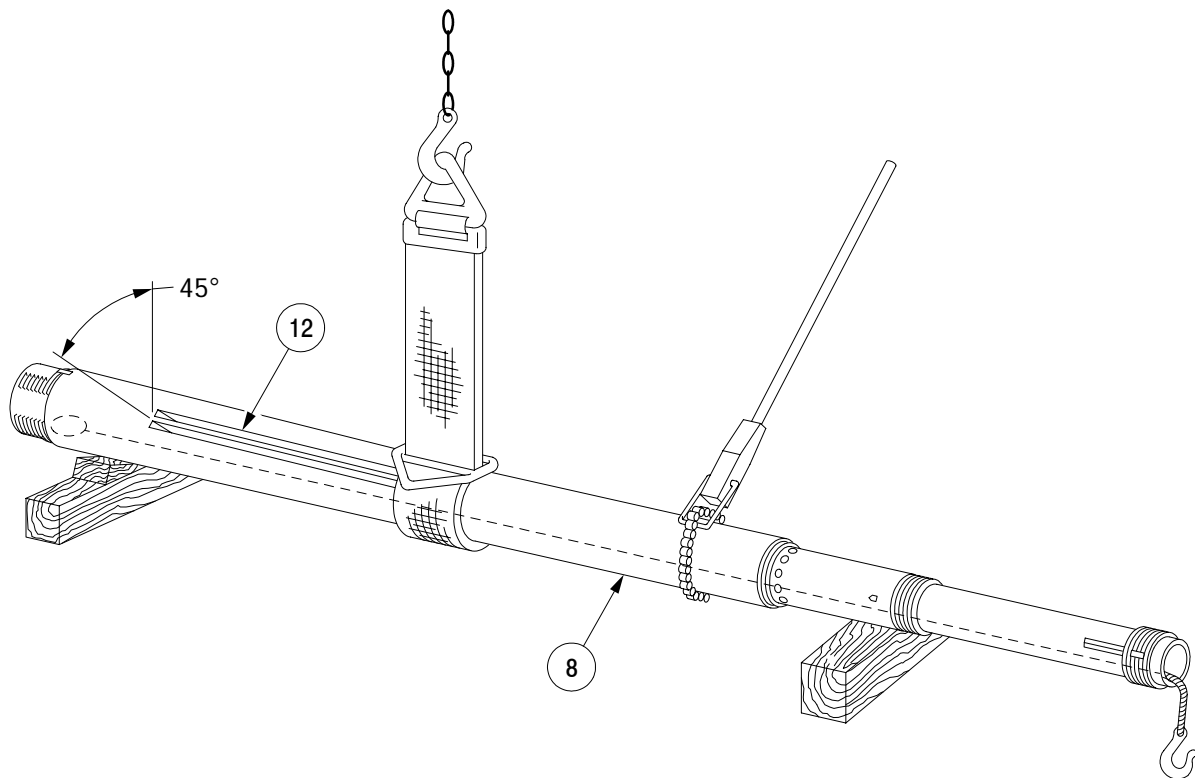
4-14 CANNON TUBE - CONTINUED

b. Installation - Continued

NOTE

Mount in vehicle should be horizontal. Breech ring key should be up and secured out of the way.

- 4 Rotate cannon tube (8), if necessary, to cant torque key groove (12) 45° counterclockwise from normal position for installation.
- 5 Loosen gun tube sling. Move one wedge away from cannon tube (8) making it free to rotate. Using chain-type pipe wrench, rotate cannon tube (8) 45°. Secure cannon tube (8) in position.



02pc245m

4-14 CANNON TUBE - CONTINUED

b. Installation - Continued**NOTE**

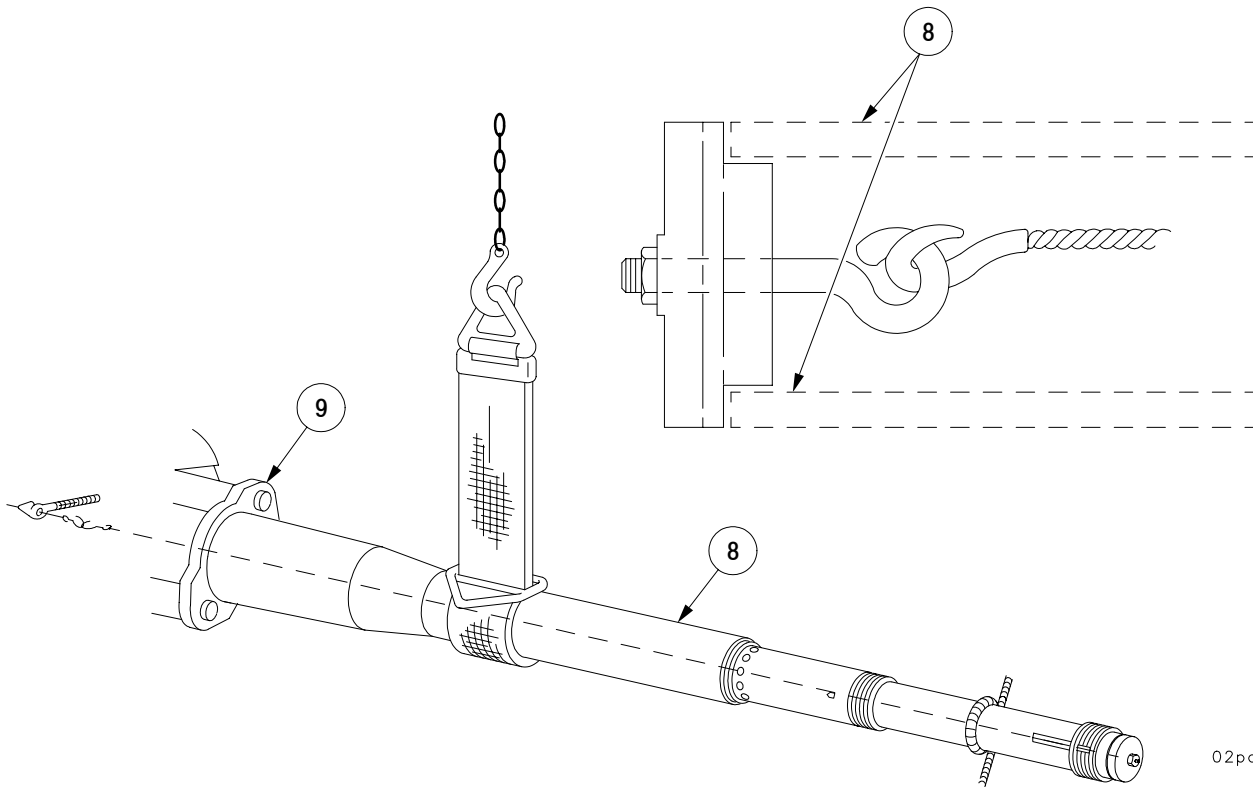
Before installation, clean and lube mount cradle bearings and cannon tube outer surface per TM 9-2350-314-10.

- 6 Lift cannon tube (8) horizontally and insert breech end into mount. Push cannon tube (8) carefully into mount, and attach front fabricated eyebolt assembly to front hook at muzzle.

NOTE

If nitrogen has not been released from recuperator, the breech ring band may be out of line and will prevent tube installation.

- 7 Draw rope or cable tight from within cab. Pull cannon tube (8) into mount until breech end is flush with front face of breech ring (9).
- 8 Attach come-along to rear hook of cable or rope if necessary to seat cannon tube (8) in breech ring (9).



02pc246m

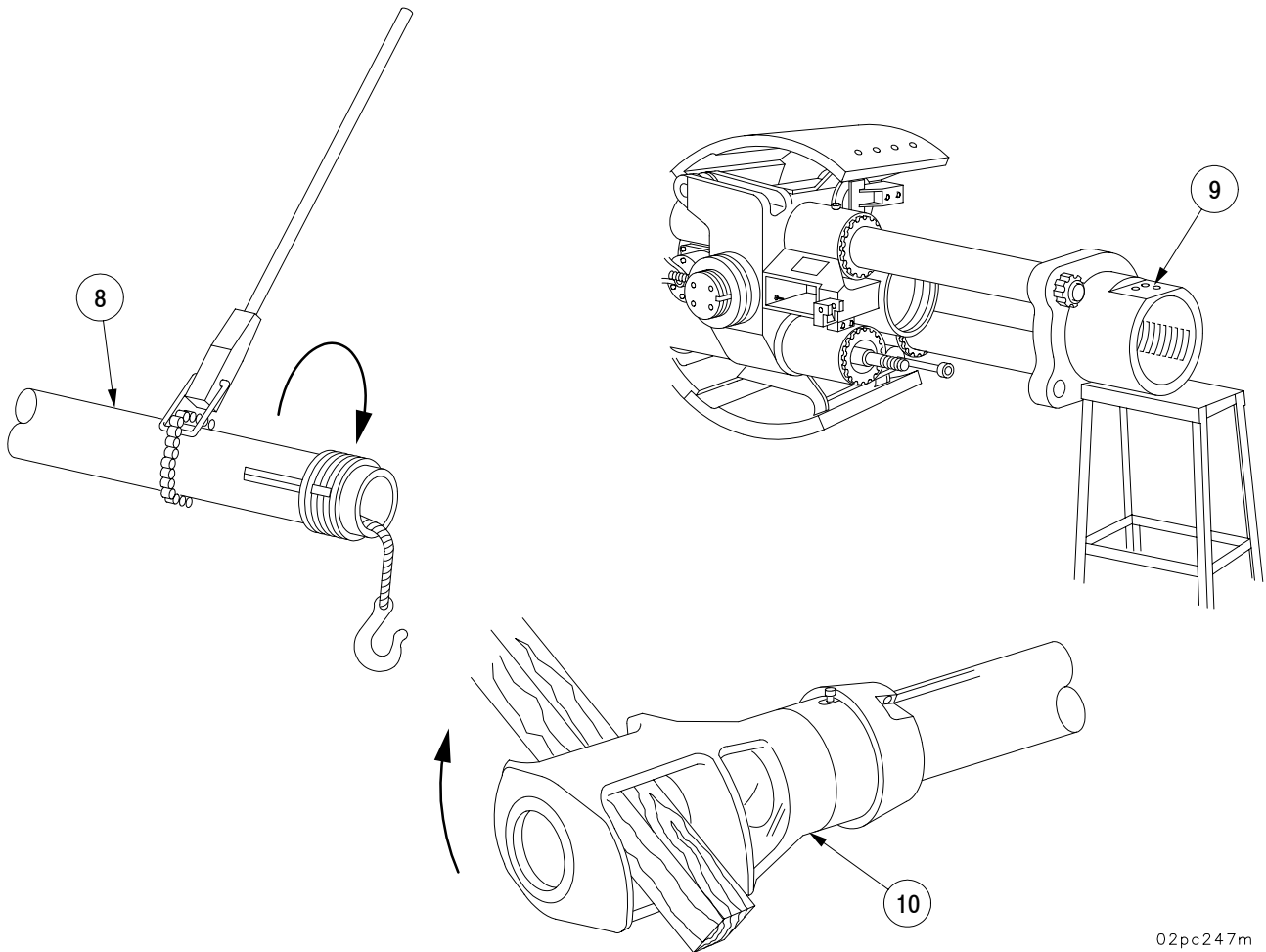
4-14 CANNON TUBE - CONTINUED

b. Installation - Continued

NOTE

There is an alternate method for rotating cannon tube for installation if pipe wrench is not available and muzzle brake has not been removed. To use alternate method, perform procedural steps 11 and 12 instead of 9 and 10.

- 9 Place chain-type pipe wrench on cannon tube (8) at approximately 6 to 8 inches behind thrust collar threads.
- 10 Rotate cannon tube (8) 45° clockwise to engage cannon tube (8) and breech ring (9) threads.
- 11 Insert available 4 x 4 in. or 2 x 4 in. wooden timber approximately 5-ft long into muzzle brake (10).
- 12 Using wooden timber for leverage, rotate muzzle brake (10) and cannon tube (8) 45° clockwise to engage cannon tube (8) and breech ring (9) threads.



02pc247m

4-14 CANNON TUBE - CONTINUED

b. Installation - Continued

- 13 To install breech ring key (6), loosen screw (5). Slide breech ring key (6) downward into slot (7) and tighten screw (5).
- 14 If nitrogen pressure has been depleted, reestablish pressure in recuperator. Remove hoist, gun tube sling and chain-type pipe wrench from cannon tube (8) or 4 x 4-in. timber. Remove breech stand from under breech ring (9).

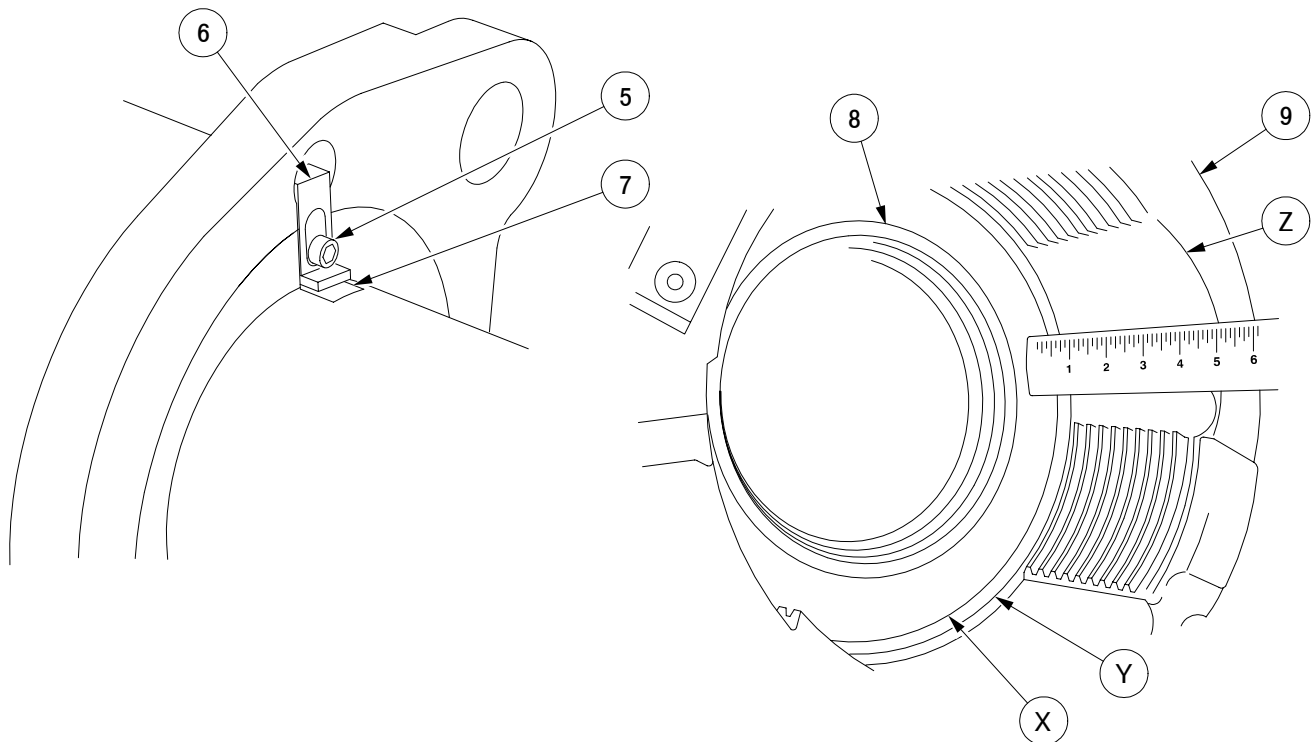
WARNING

Cannon will not be fired until cannon tube and breech ring are properly assembled, aligned, and adjusted to prevent serious injury or possible death to personnel.

- 15 To ensure proper fit of cannon tube (8) and breech ring (9), inspect inner breech ring (9) surfaces.

NOTE

Rear face of gun tube (X) must be flush with front face of breech ring (Y). Distance from rear face of cannon tube to rear face of breech ring (Z) must be no more than 5 inches (127 mm).



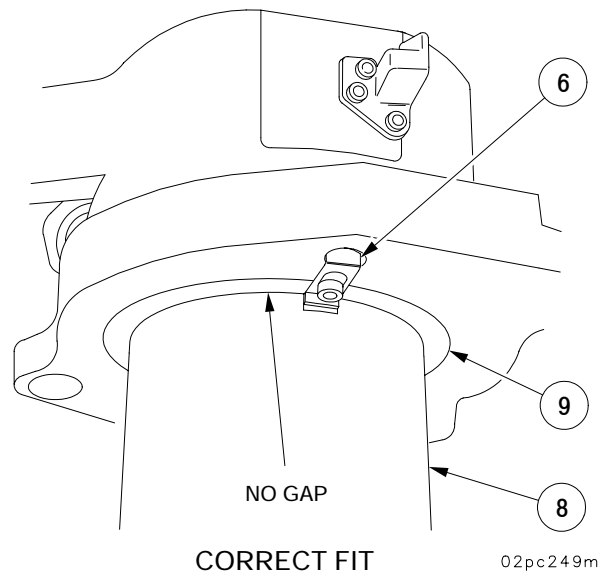
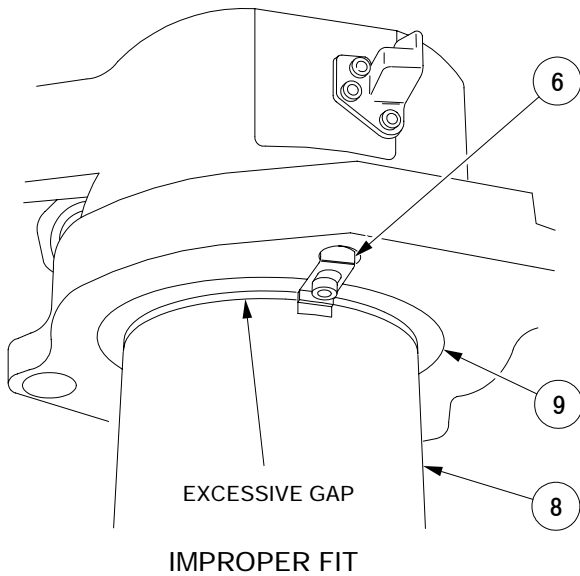
02pc248m

4-14 CANNON TUBE - CONTINUED

b. Installation - Continued

NOTE

- Rectangular key should fill all but the rounded end of the slot. This is difficult to see with cannon installed in mount; feel with little finger to make sure.
- Machined end of gun tube should not show if tube is properly installed in breech ring. There should be no gap between front face of breech ring and the facing tube.



02pc249m

16 Refer to para 4-13 c for installation of torque key.

NOTE

- After replacement of cannon tube, all fire control components must be checked for bore alignment (TM 9-2350-314-20-2-1).
- After cannon tube replacement, adjustment of breech cam roller clearance must be checked and adjusted (TM 9-2350-314-20-2-1).

4-15 CARRIER ASSEMBLY.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)

Materials/Parts

Spring (item 55, Appx E)
Lockwire (item 82, Appx B)
Plunger (item 170, Appx E)

Equipment Conditions

Carrier assembly removed
(TM 9-2350-314-20-2-1)
Plunger assembly removed
(TM 9-2350-314-20-2-1)
Rack gear and springs removed
(TM 9-2350-314-20-2-1)

WARNING

Rack plate holds compressed springs. Restrain rack plate during disassembly to avoid personal injury.

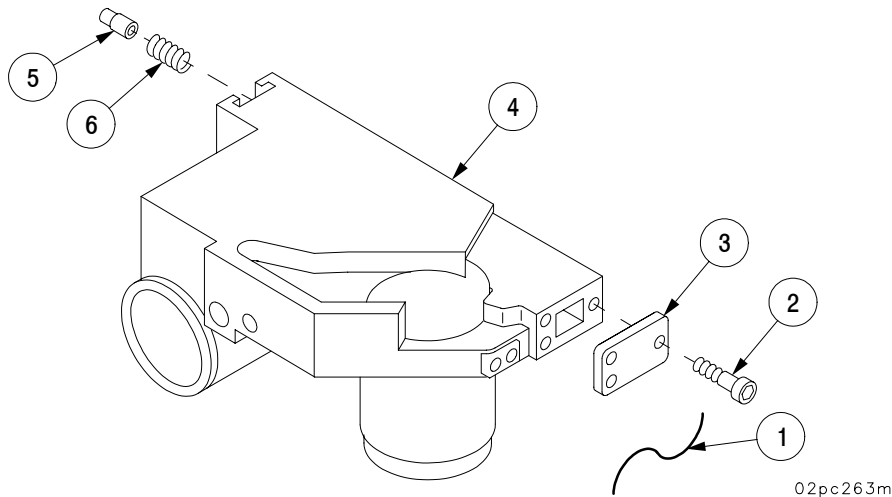
a. Disassembly.

- 1 Remove spur lockwire (1), three screws (2), and cover (3) from carrier (4). Discard lockwire.

NOTE

Plunger is staked in two places 180° apart.
Do not remove unless damaged.

- 2 Remove plunger (5) and spring (6). Discard plunger and spring.



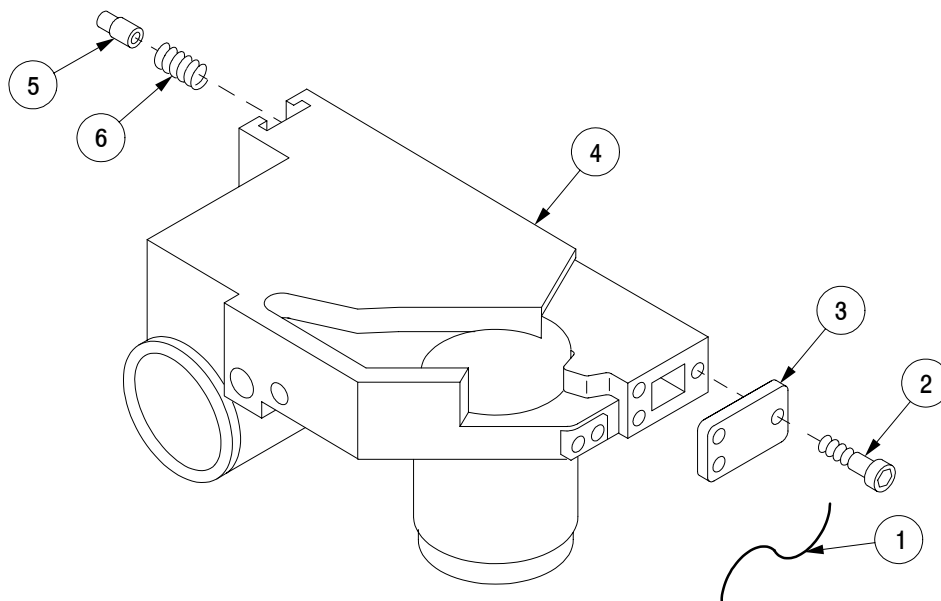
4-15 CARRIER ASSEMBLY - CONTINUED

b. Assembly.

WARNING

Plunger holds a compressed spring. Use care to restrain plunger during assembly to avoid possible injury.

- 1 Install cover (3) with three screws (2) and secure with new lockwire (1).
- 2 Install new spring (6) and new plunger (5). Stake plunger in two places 180° apart.



02pc264m

4-16 BREECH ASSEMBLY.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)

Equipment Conditions

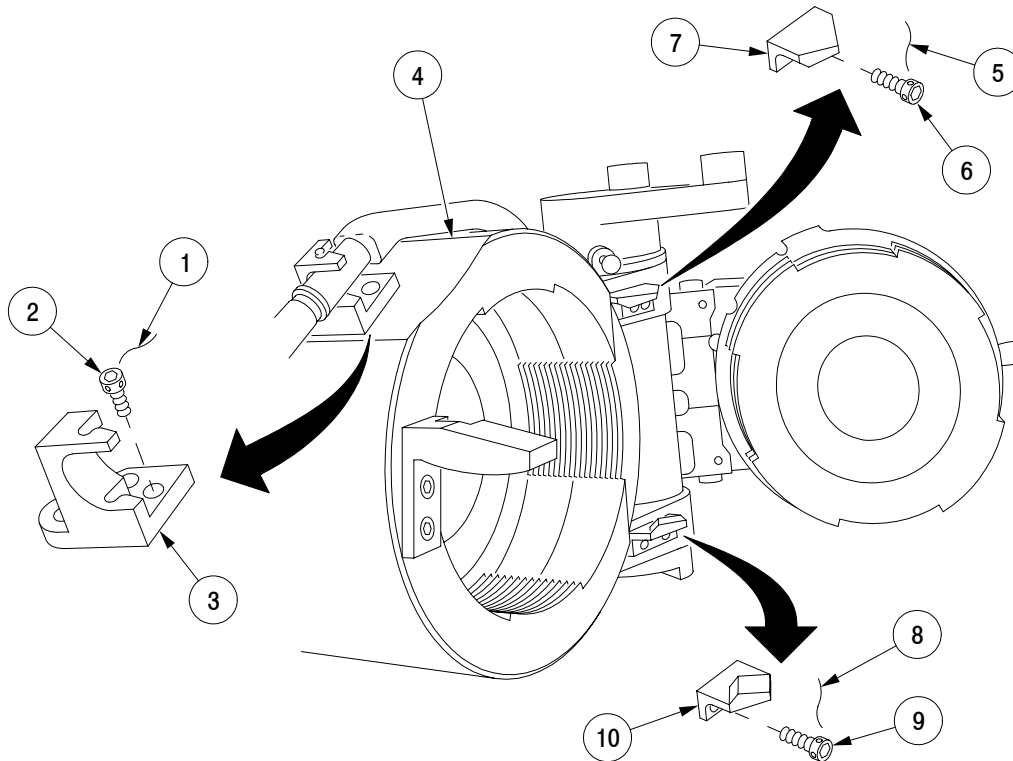
Breech opened
(TM 9-2350-314-10)

Materials/Parts

Lockwire (item 82, Appx B)
Screws (2) (item 171, Appx E)

a. Disassembly.

- 1 Remove lockwire (1), three screws (2), and operating handle stop (3) from breech ring body (4). Discard lockwire.
- 2 Remove lockwire (5), two screws (6), and right catch (upper) (7). Discard lockwire.
- 3 Remove lockwire (8), two screws (9), and right catch (lower) (10). Discard lockwire.



02pc251m

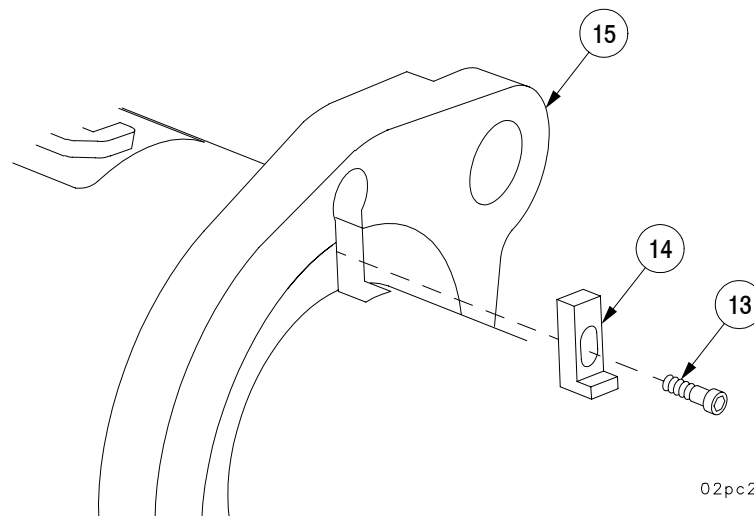
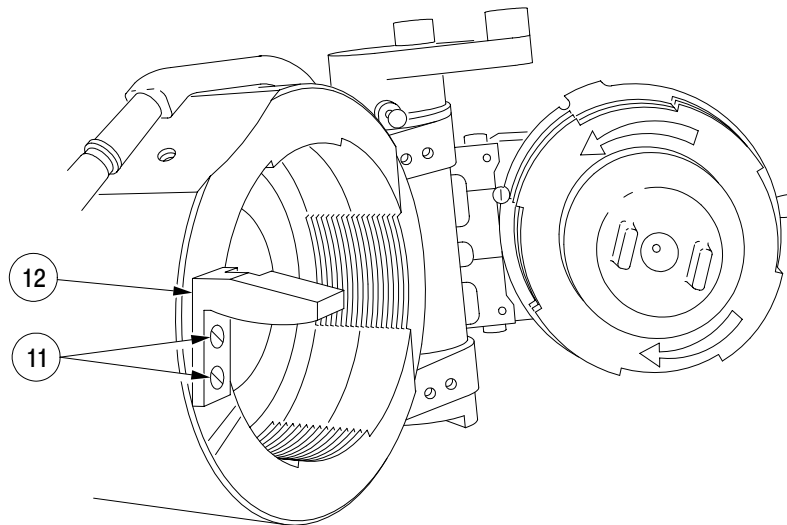
4-16 BREECH ASSEMBLY - CONTINUED

a. Disassembly - Continued

- 4 Remove two staked-in screws (11) and cam (12). Discard screws.
- 5 Remove screw (13) and breech ring key (14) from front of breech ring band (15).

b. Assembly.

- 1 Install breech ring key (14) with screw (13) on breech ring band (15).
- 2 Install cam (14) and two new screws (13). Stake screws.

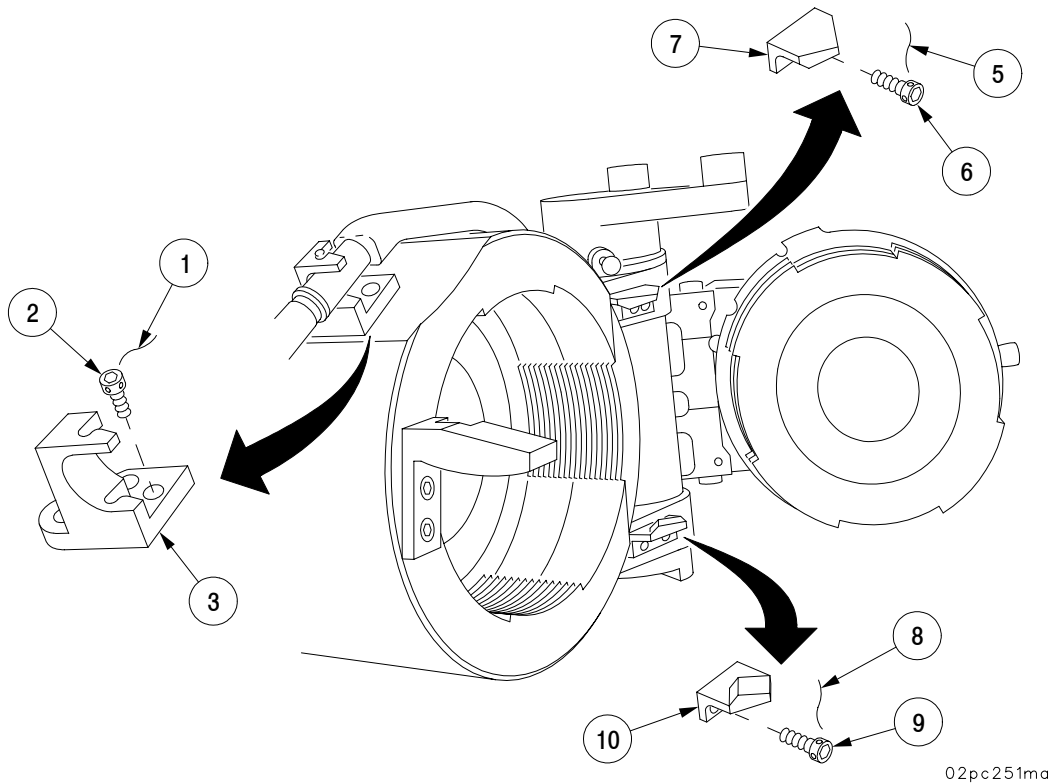


02pc253m

4-16 BREECH ASSEMBLY - CONTINUED

b. Assembly - Continued

- 3 Install right catch (lower) (10) and two screws (9). Install new lockwire (8).
- 4 Install right catch (upper) (7) and two screws (6). Install new lockwire (5).
- 5 Install operating handle stop (3) and three screws (2). Install new lockwire (1).



02pc251ma

4-17 CRANK ASSEMBLY.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)

Equipment Conditions

Operating crank assembly removed
(TM 9-2350-314-20-2-1)

Materials/Parts

Spring pins (2) (item 9, Appx E)

References

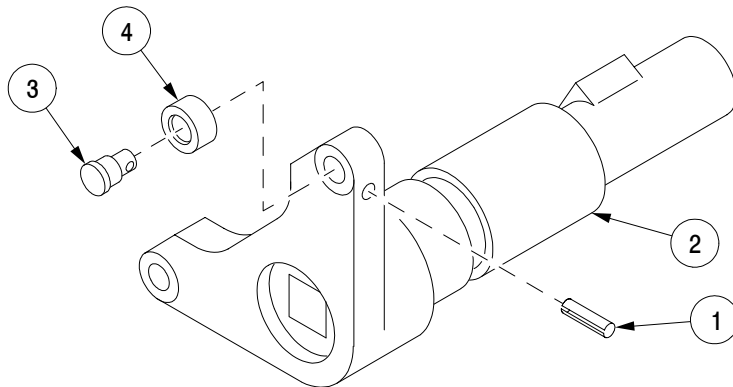
TM 9-2350-314-10
TM 9-2350-314-20-2-1

a. Disassembly.

- 1 Remove two spring pins (1) from breech crank (2). Discard spring pins.
- 2 Remove two pins (3) and two rollers (4).

b. Assembly.

- 1 Place breech crank (2) on solid surface.
- 2 Install two rollers (4) and two pins (3).
- 3 Install two new spring pins (1) to serve two rollers (4). Make sure end of pins (1) are flush with crank assembly (2).



02pc255m

4-18 HANDLE ASSEMBLY.

This task covers: a. Disassembly b. Inspection c. Assembly

INITIAL SETUPTools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Vernier caliper (item 6, Appx F)

Equipment Conditions

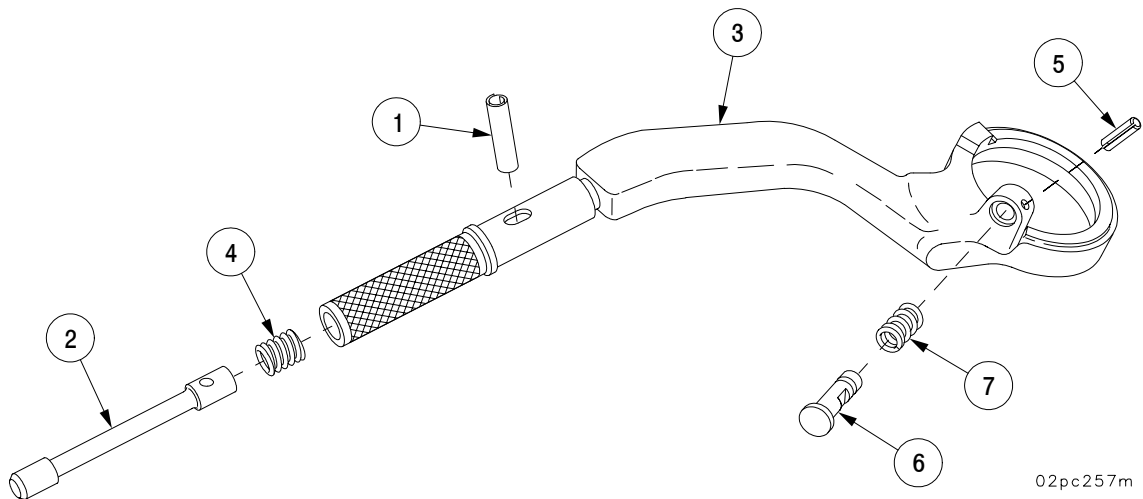
Handle assembly removed
(TM 9-2350-314-20-2-1)

Materials/Parts

Spring pin (item 7, Appx E)
Spring pin (item 121, Appx E)

a. Disassembly.

- 1 Remove spring pin (1) and plunger (2) from handle assembly (3). Discard spring pin.
- 2 Remove spring (4) from handle assembly (3).
- 3 Remove spring pin (5) from handle assembly (3). Discard spring pin.
- 4 Remove clutch (6) and spring (7).



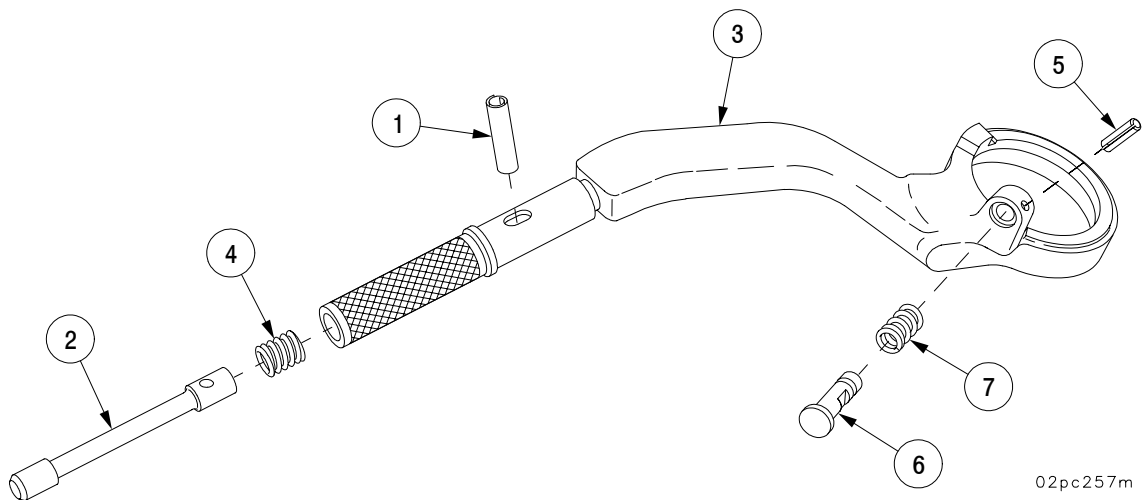
4-18 HANDLE ASSEMBLY - CONTINUED

b. Inspection.

- 1 Measure clutch (6). Replace if end measures less than 0.493 in. (12.916 mm).
- 2 Measure free length of spring (7). Replace if less than 1.4 in. (35.56 mm).
- 3 Measure inner diameter of handle lever hubs. Replace if greater than 3.735 in. (94.869 mm).

c. Assembly.

- 1 Install spring (7) and clutch (6) on handle assembly (3).
- 2 Install new spring pin (5), securing clutch (6).
- 3 Install spring (4) and plunger (2) in handle assembly (3).
- 4 Install new spring pin (1) securing plunger (2) in handle assembly (3).
- 5 Operate handle to ensure plunger is operating correctly.



02pc257m

4-19 BREECHBLOCK ASSEMBLY - CONTINUED

b. Inspection and Repair - Continued

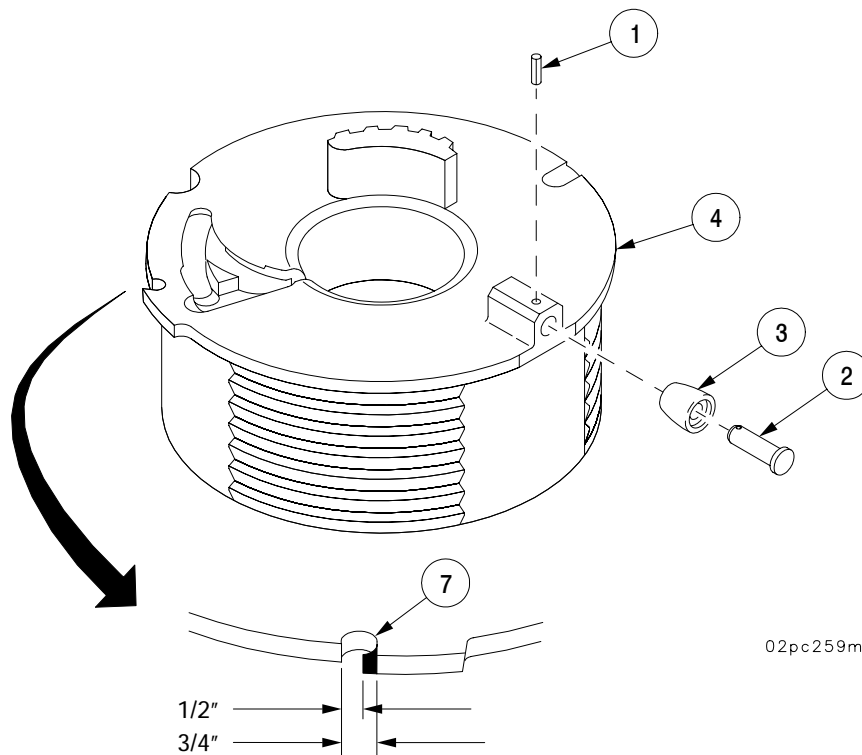
- 4 Replace roller (3) if broken or cracked, if outside diameter is less than 0.995 in. (25.3 mm), or if inside diameter is greater than 0.506 in. (12.7 mm).
- 5 Inspect pivot (2). Replace if damaged or distorted.
- 6 Inspect width of notch (7). New part width is 1/2 in. (12.7 mm). If notch width is worn greater than 3/4 in. (19 mm), replace breechblock (4).

c. Assembly.

NOTE

If pivot (2) is new from supply, perform step 1.

- 1 Drill a 5/32 hole in the pivot using the breechblock as a pilot hole.
- 2 Install roller (3) and pivot (2) in breechblock (4).
- 3 Install new spring pin (1).



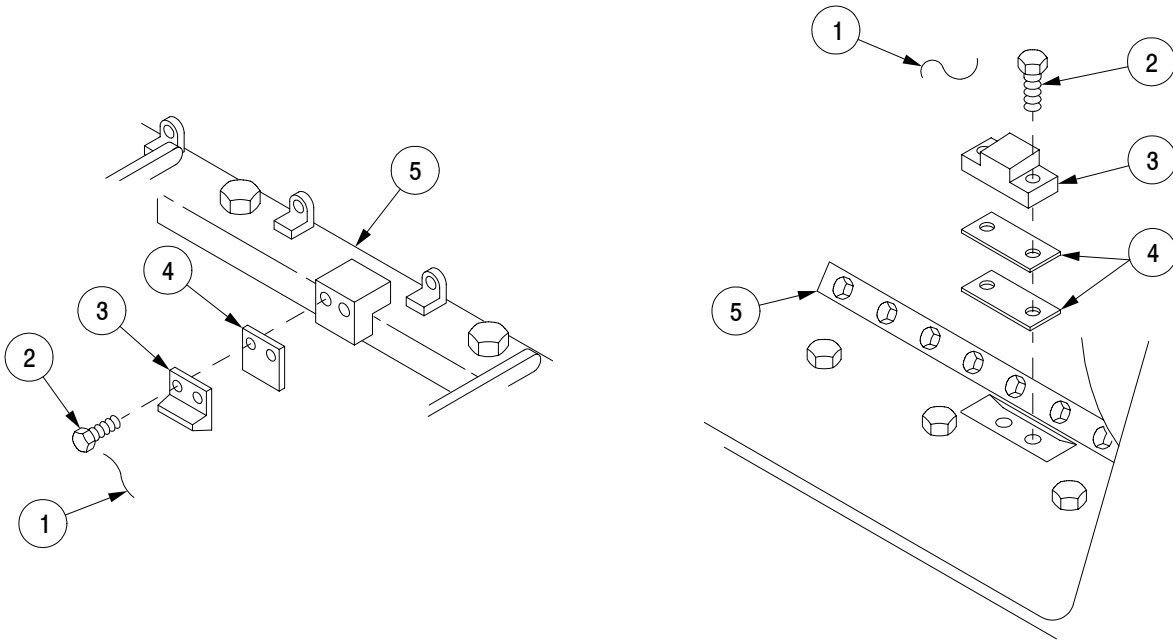
4-20 STOP (ELEVATION/DEPRESSION) - CONTINUED

b. Installation.

NOTE

To install elevation stop, perform steps 1,2, and 4. To install depression stop, perform steps 1,3, and 4.

- 1 Install block (3) with shim (4) on trunnion bracket (5) with two screws (2).
- 2 Manually elevate gun tube to ensure that new block allows $75^\circ \pm 15^\circ$ (1333 MILS \pm 4) elevation. Adjust shim (4) as necessary.
- 3 Manually depress gun tube to ensure that new block allows $2^\circ \pm 15^\circ$ (36 mils \pm 4) depression. Adjust shims (4) as necessary.
- 4 Secure two screws (2) with new lockwire (1).



02pc262m

4-21 TUBE TEMPERATURE SENSOR WIRING HARNESS ASSEMBLY.

This task covers: a. Assembly

INITIAL SETUP

Tools

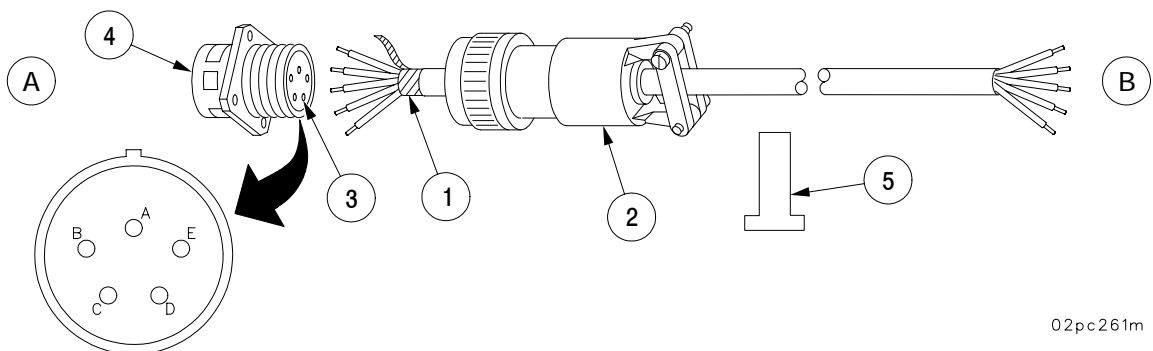
Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Electrical connector repair tool kit
(item 29, Appx F)
Soldering gun (item 19, Appx F)

Materials/Parts

Flux core solder (item 68, Appx B)

a. Assembly

- 1 Strip plastic shielding from shielded cable (1) three inches from end A and strip all shielding four inches from end B.
- 2 Peel wire shielding of end A to one side and strip insulation one half inch from each wire of end A of shielded cable (1).
- 3 Thread end A of shielded cable (1) through electrical accessory (2).
- 4 Tin solder end of each wire of shielded cable (1) end A.
- 5 Twist wire shielding of shielded cable (1) and tin solder.
- 6 Position and crimp pins (3) of connector (4) onto each tin soldered wire and shielding.
- 7 Heat pins (3) with soldering gun to melt solder and bond wires and shielding of shielded cable (1) to pins (3).
- 8 Insert pins (3) into back of connector (4) pushing them through until seated in connector (4) in the following order:
 - Pin A - Orange striped wire
 - Pin B - Green striped wire
 - Pin C - Cable shielding
 - Pin D - White wire
 - Pin E - Blue striped wire
- 9 Install band marker (5) behind electrical accessory (2).



02pc261m

CHAPTER 5

LOADER RAMMER

GENERAL

This chapter illustrates and describes maintenance of the weapon-mounted projectile rammer. The rammer is a hydraulically-powered device which is controlled by a hand-operated rammer actuating valve. No electrical circuits are used in the system. A second valve in the system, the blocking valve, prevents rammer from being operated unless it is correctly aligned with the chamber.

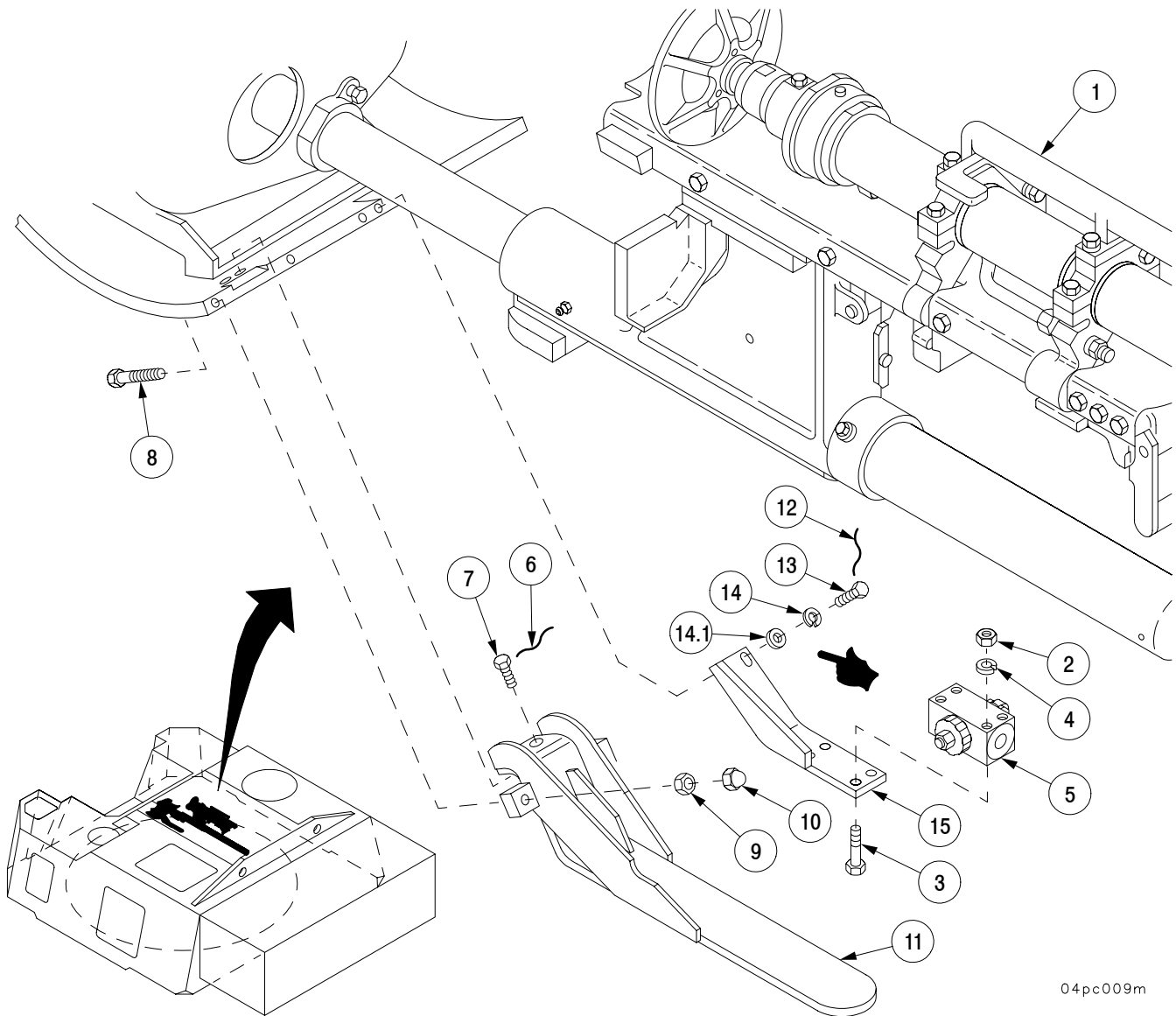
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5-1 RAMMER ASSEMBLY	5-2
5-2 RAMMER CYLINDER ASSEMBLY	5-23

5-1 RAMMER ASSEMBLY - CONTINUED

a. Removal - Continued

- 3 Remove four nuts (2), four screws (3), four lockwashers (4), and blocking valve (5). Discard lockwashers.
- 4 Remove lockwire (6), two screws (7), two screws (8), two nuts (9), two caps (10), and rammer support bracket (11). Discard lockwire.
- 5 Remove lockwire (12), two screws (13), two lockwashers (14), two flat washers (14.1), and valve support bracket (15). Discard lockwasher and lockwire.



04pc009m

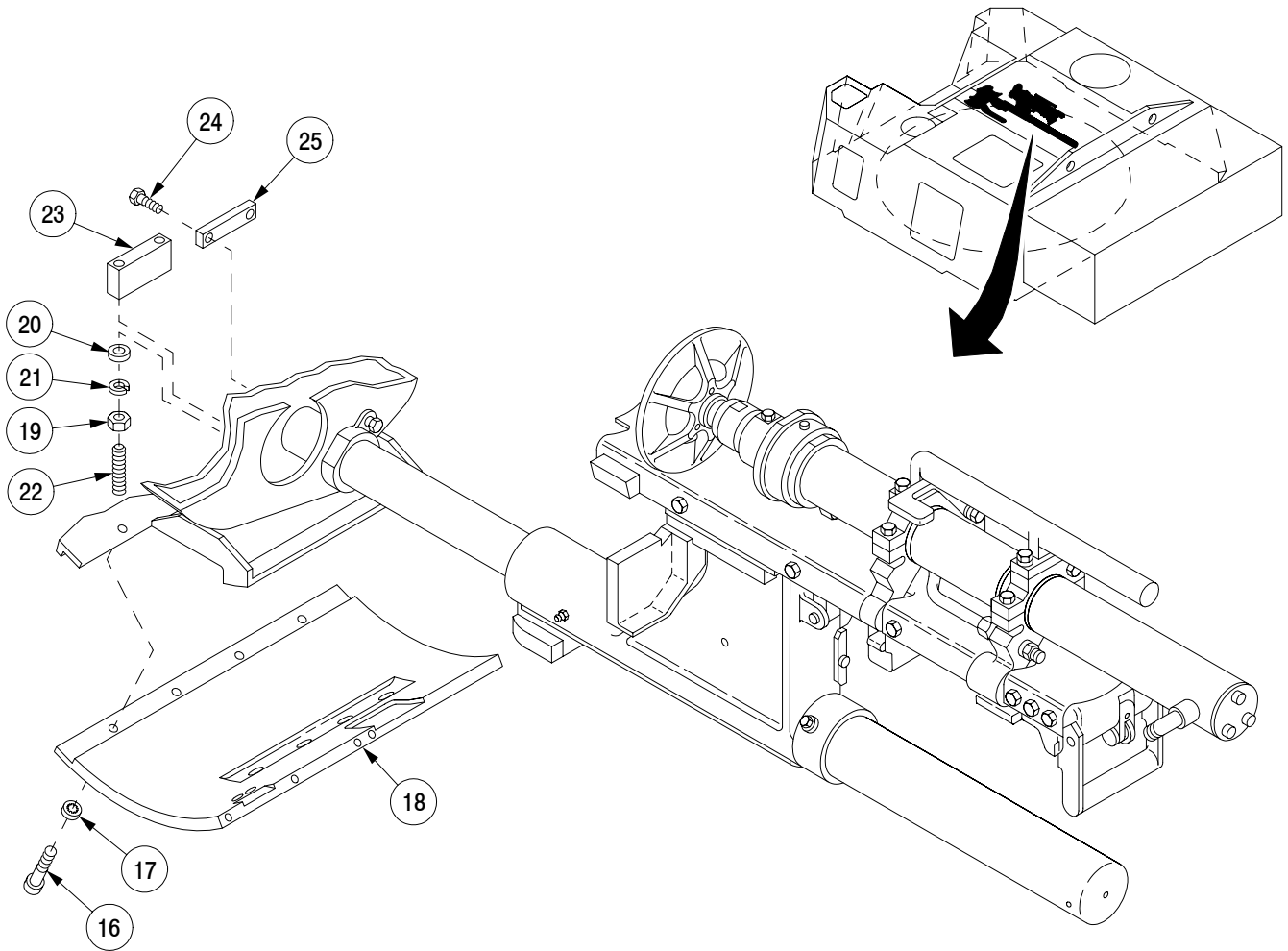
5-1 RAMMER ASSEMBLY - CONTINUED

a. Removal - Continued

WARNING

Weight of lower rotor shield is approximately 57 lb (26 kg). Two persons are required for removal and installation. Lower rotor shield must be supported during removal and installation.

- 6 Remove eight screws (16), eight lockwashers (17), and lower rotor shield (18). Discard lockwashers.
- 7 Loosen two jamnuts (19) with two flat washers (20), two lockwashers (21), two shaft adjusting setscrews (22), and positioning block (23). Discard lockwashers.
- 8 Remove two screws (24) and locking plate (25).



04pc010m

5-1 RAMMER ASSEMBLY - CONTINUED

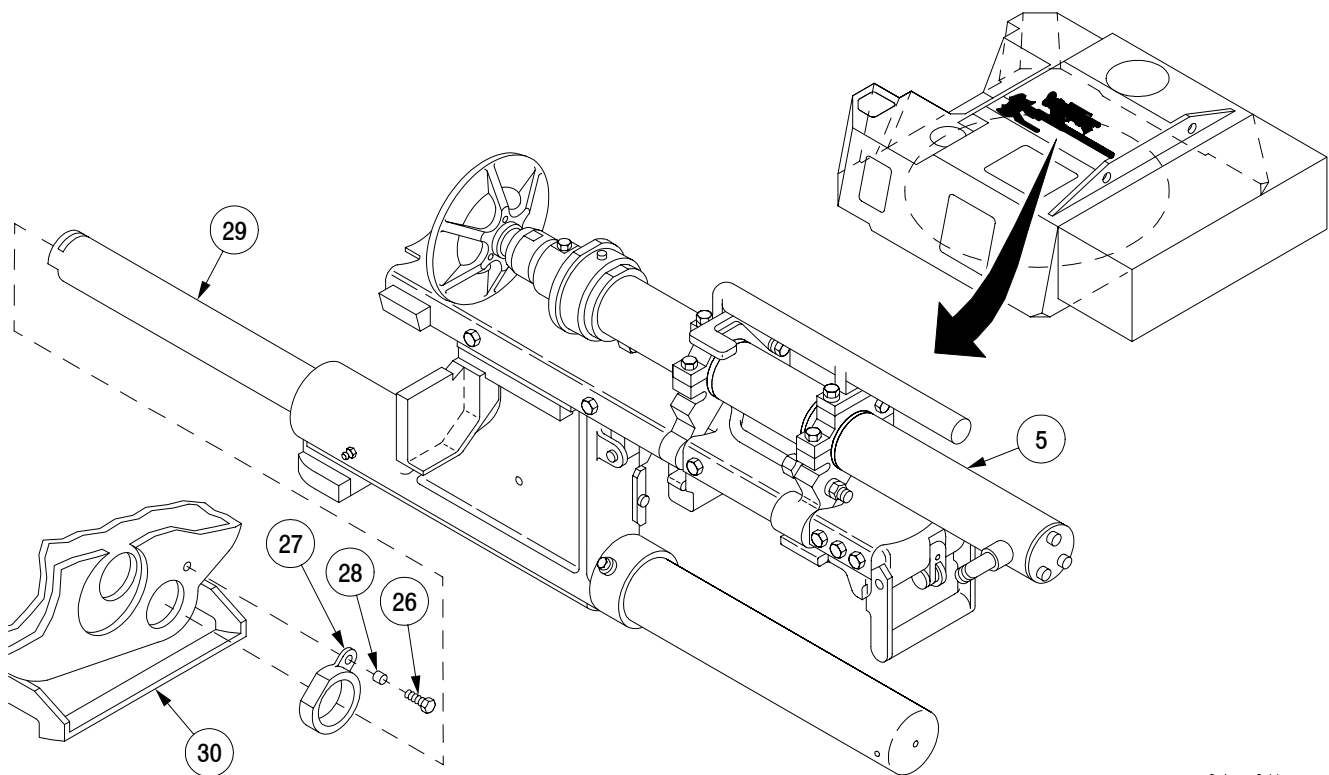
a. Removal - Continued

- 9 Remove screw (26) from front bumper (27) and spacer (28).

WARNING

Weight of rammer and shaft assembly is approximately 198 lb (90 kg). Two persons are required for removal and installation.

- 10 Slide rammer assembly (5) rearward on shaft (29) until clear of mount (30).
- 11 Reset leaf spring rack tension (TM 9-2350-314-10).
- 12 Close breechblock (TM 9-2350-314-10).



04pc011m

5-1 RAMMER ASSEMBLY - CONTINUED

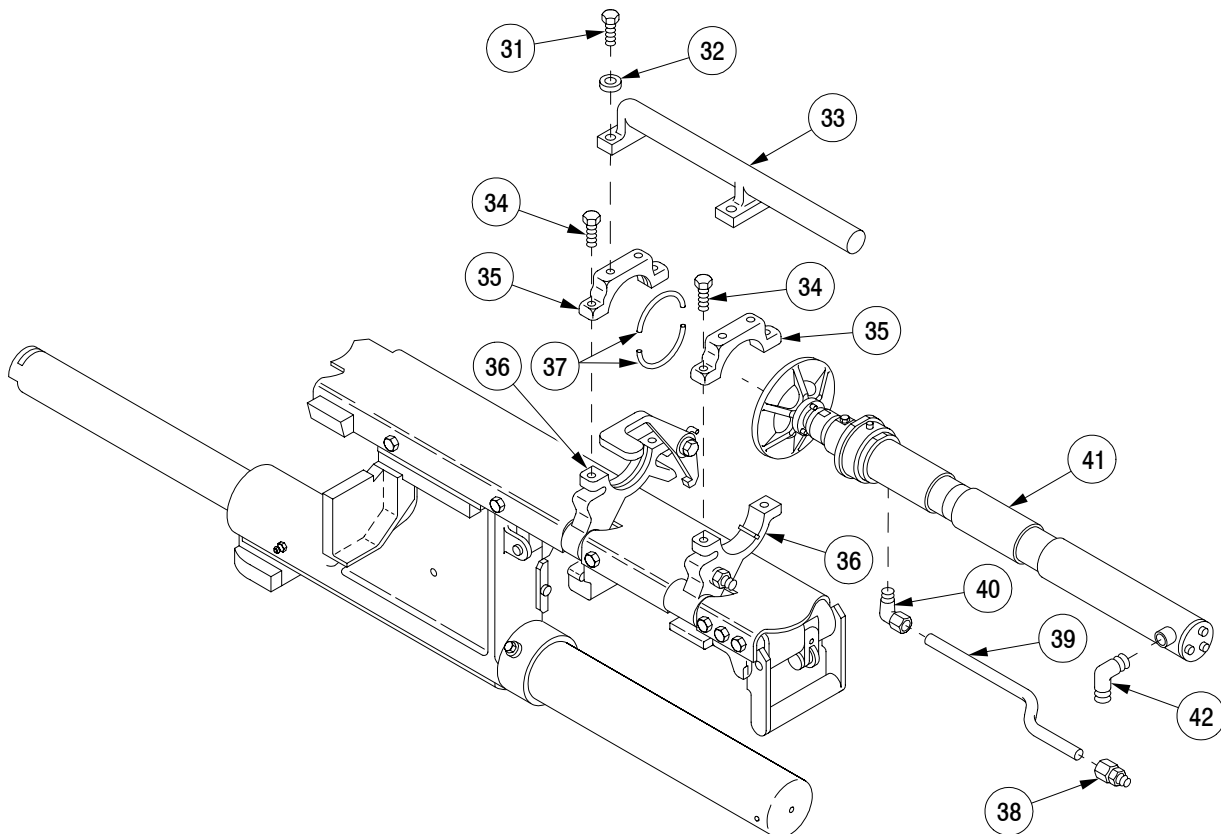
b. Disassembly.

- 1 Remove four screws (31), four flat washers (32), and handle (33).

NOTE

Two caps and front and rear cylinder supports are matched sets.

- 2 Remove four screws (34) and two caps (35). Identify each cap with its cylinder support (36).
- 3 Remove upper half of lockring (37).
- 4 Remove adapter (38) from cylinder support (36).
- 5 Disconnect line (39) from elbow (40) and adapter (38).
- 6 Remove cylinder assembly (41).
- 7 Remove lower half of lockring (37).
- 8 Remove elbows (40 and 42) from cylinder assembly (41).

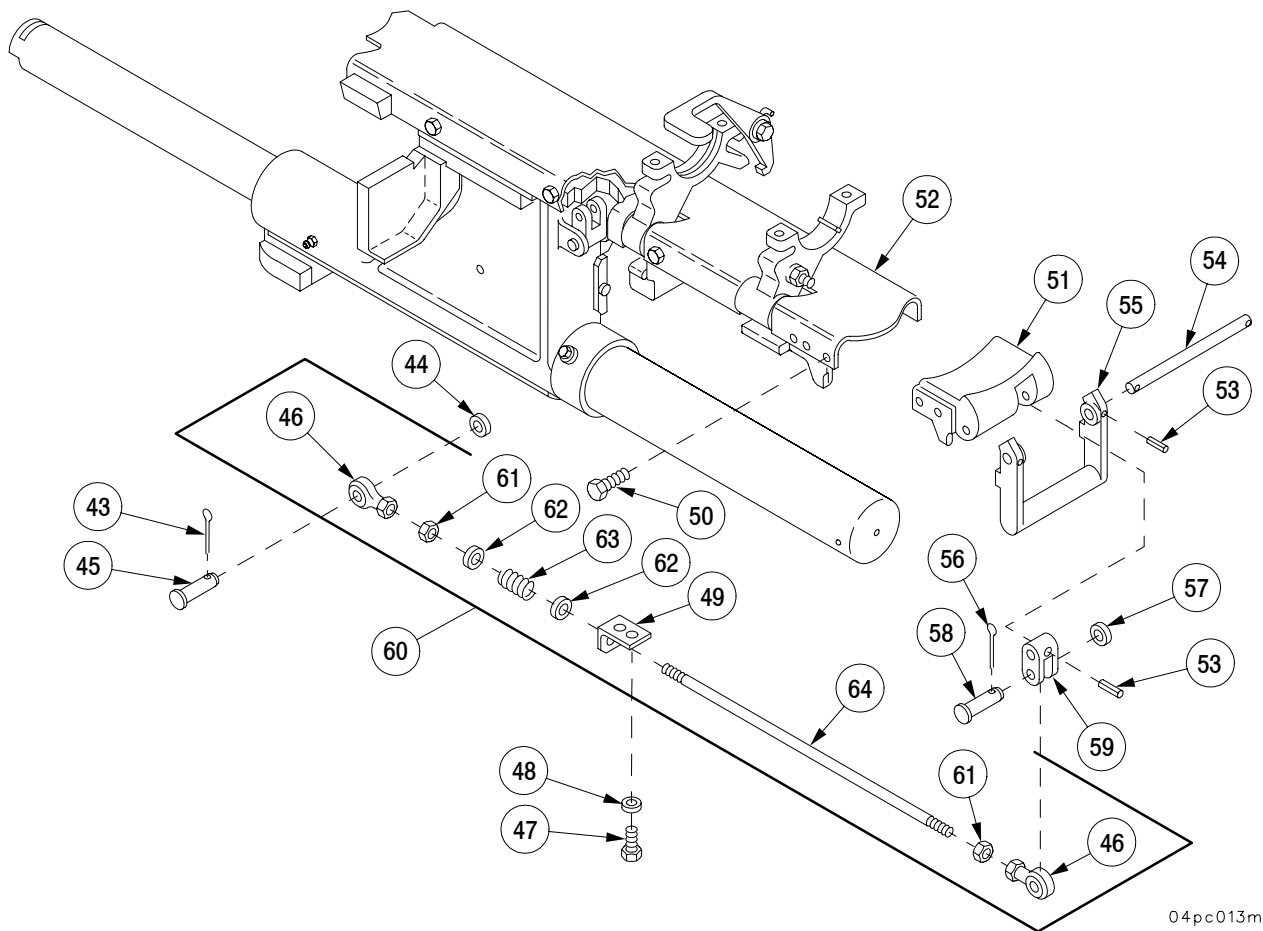


04pc012m

5-1 RAMMER ASSEMBLY - CONTINUED

b. Disassembly - Continued

- 9 Remove cotter pin (43) and washer (44) from straight-headed pin (45). Discard cotter pin.
- 10 Withdraw straight-headed pin (45) from spherical rod end bearing (46).
- 11 Remove two screws (47) and two flat washers (48) from bracket (49).
- 12 Remove four screws (50) and handle support (51) from tray (52).
- 13 Remove three spring pins (53), straight-headed pin (55), and handle (56) from handle support (51). Discard spring pins.
- 14 Remove cotter pin (56), flat washer (57), straight-headed pin (58), and lever (59) from spherical rod end bearing (46). Discard cotter pin.
- 15 Remove rod group (60).
- 16 Remove two spherical rod end bearings (46), two hexnuts (61), two flat washers (62), spring (63), and bracket (49) from rod (64).



5-1 RAMMER ASSEMBLY - CONTINUED

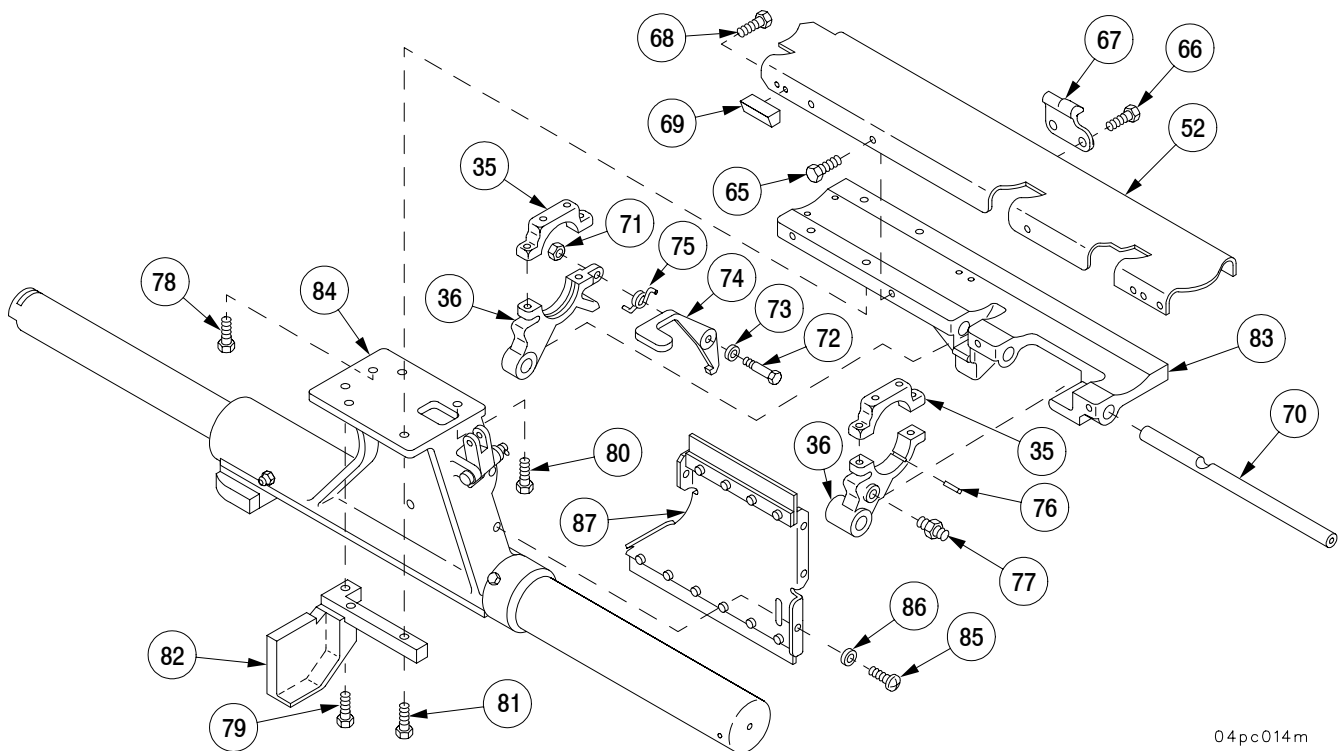
b. Disassembly - Continued

- 17 Remove seven screws (65), two screws (66), latch (67), and tray (52).
- 18 Remove two screws (68) and block (69) from tray (52).

NOTE

A 0.25 in. (6.4 mm) threaded hole in end of straight-headless pin can be used to install a pulling device to remove straight-headless pin.

- 19 Remove straight-headless pin (70).
- 20 Remove front and rear cylinder supports (36) and retain together with two caps (35) (see step 2, Disassembly).
- 21 Remove nut (71), bolt (72), washer (73), lever (74), and helical spring (75) from front cylinder support (36).
- 22 Remove machine key (76) and adapter (77) from rear cylinder support (36).
- 23 Remove screw (78), screw (79), two screws (80), two screws (81), rammer stop (82), and rammer tray support (82) from flange of rammer support (84).
- 24 Remove five screws (85), five flat washers (86), and cover (87) from rammer support (84).

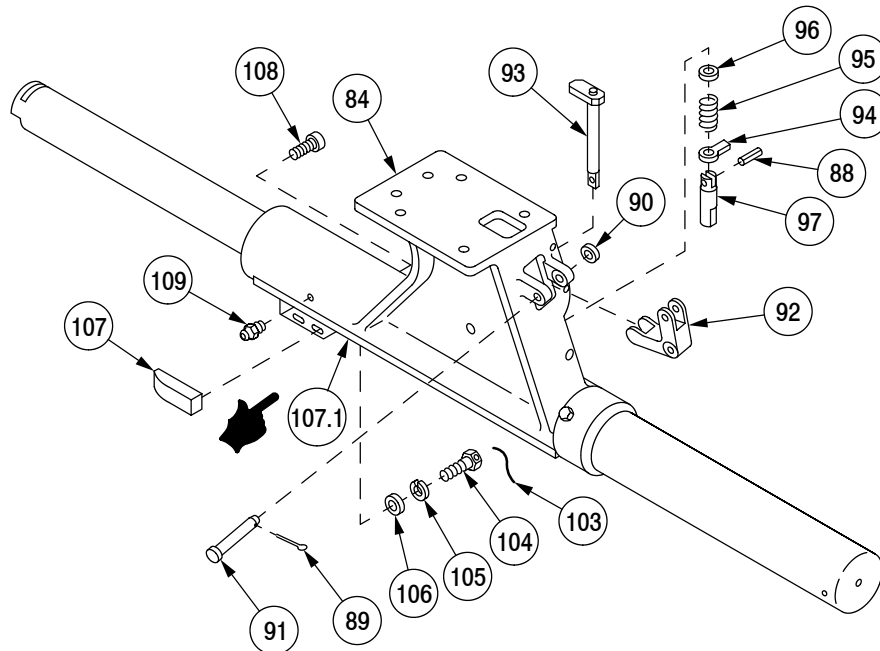


04pc014m

5-1 RAMMER ASSEMBLY - CONTINUED

b. Disassembly - Continued

- 25 Remove and discard spring pin (88).
- 26 Remove cotter pin (89), flat washer (90), straight-headed pin (91), and lockpin actuating lever (92). Discard cotter pin.
- 27 Remove shaft lockpin (93), position pointer (94), helical spring (95), flat washer (96), and actuator (97).
- 28 Deleted
- 29 Remove lockwire (103), two screws (104), two lockwashers (105), two flat washers (106), and ramp (107) from cover (107.1). Discard lockwire and lockwashers.
- 30 Remove guide (108).
- 31 Remove two lubrication fittings (109).



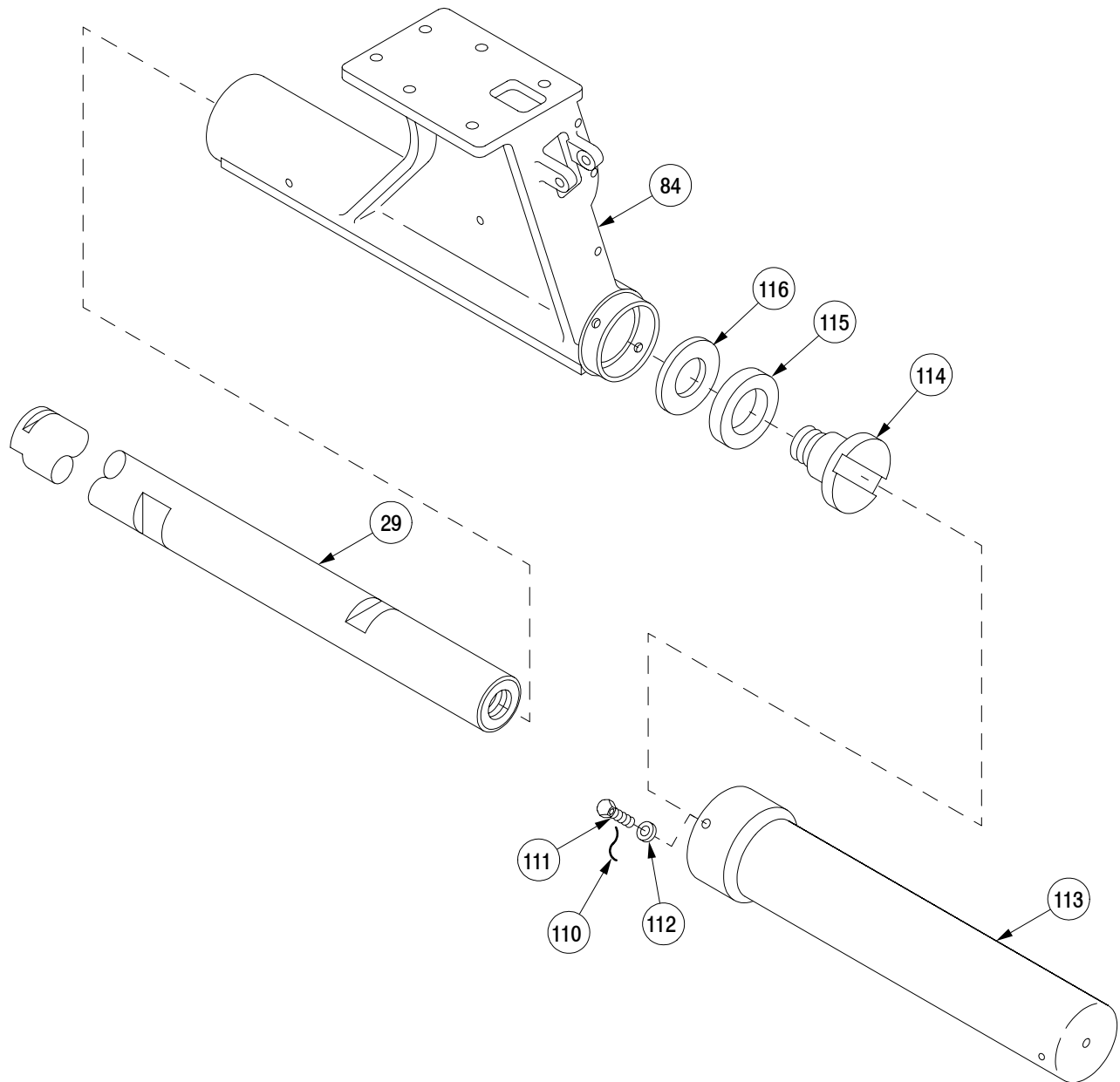
NOTE: Items 98, 99, 100, 101 and 102 Deleted.

04pc015m

5-1 RAMMER ASSEMBLY - CONTINUED

b. Disassembly - Continued

- 32 Remove lockwire (110), four screws (111), four flat washers (112), and shaft cover (113) from rear of rammer support (84). Discard lockwire.
- 33 Remove shoulder screw (114), rubber bumper (115), and bumper washer (116).
- 34 Remove shaft (29) from rammer support (84).

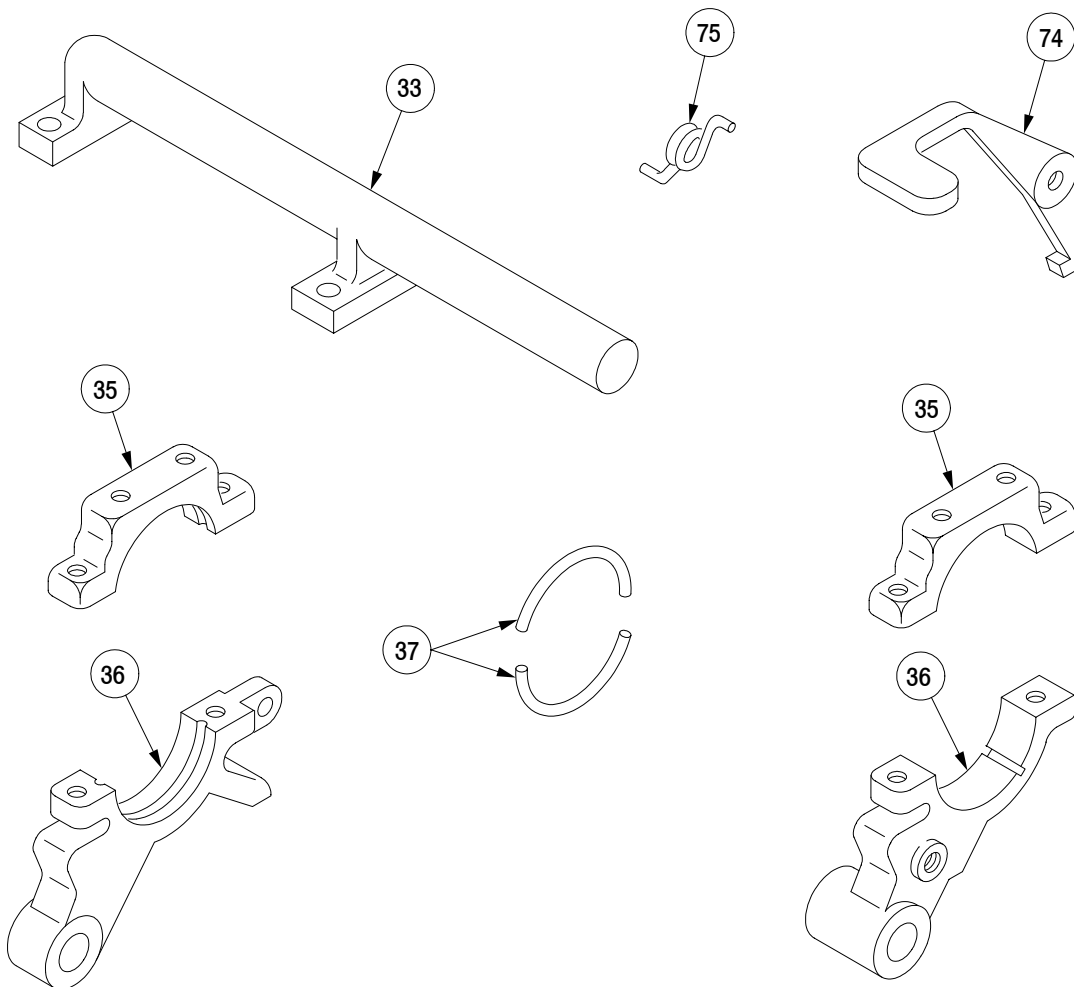


04pc016m

5-1 RAMMER ASSEMBLY - CONTINUED

c. Inspection and Repair.

- 1 Inspect handle (33). Replace if cracked, broken, or distorted.
- 2 Inspect lever (74). Replace if cracked or severely worn.
- 3 Inspect helical spring (75). Replace if distorted or cracked.
- 4 Inspect locking ring (37). Replace if distorted or cracked. Remove burrs or sharp edges with abrasive cloth.
- 5 Inspect matched sets of front and rear cylinder supports (36) and caps (35). Remove burrs with abrasive cloth. Chase threads if damaged. Replace as matched sets if cracked or distorted.

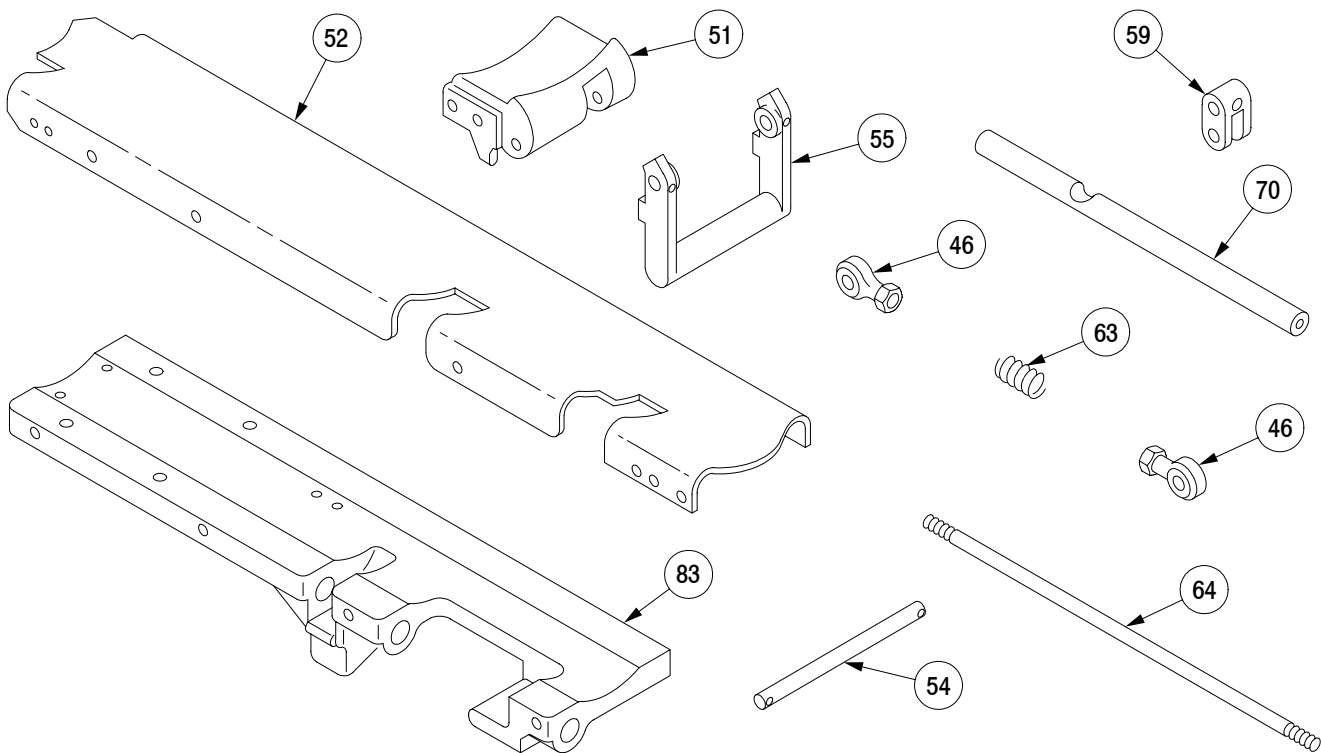


04pc017m

5-1 RAMMER ASSEMBLY - CONTINUED

c. Inspection and Repair - Continued

- 6 Inspect tray (52). Replace if cracked, broken, or distorted.
- 7 Inspect straight-headless pin (70) for burrs or other damage. Replace if cracked or distorted.
- 8 Inspect tray support (83). Replace if cracked, broken, or distorted. Remove burrs with abrasive cloth. Chase damaged threads.
- 9 Inspect handle support (51). Replace if cracked, broken, or distorted. Remove burrs with abrasive cloth. Chase damaged threads.
- 10 Inspect straight-headless pin (54). Replace if bent, cracked, or distorted.
- 11 Inspect lever (59) for cracks, burrs, or visible distortion. Replace if cracked, burred, or distorted.
- 12 Inspect handle (55). Replace if cracked, broken, or distorted.
- 13 Inspect and rotate two spherical rod end bearings (46). Bearings must rotate freely. Replace if cracked or corroded.
- 14 Inspect rod (64). Replace if bent or distorted.
- 15 Inspect spring (63). Replace if distorted, cracked, or nicked.

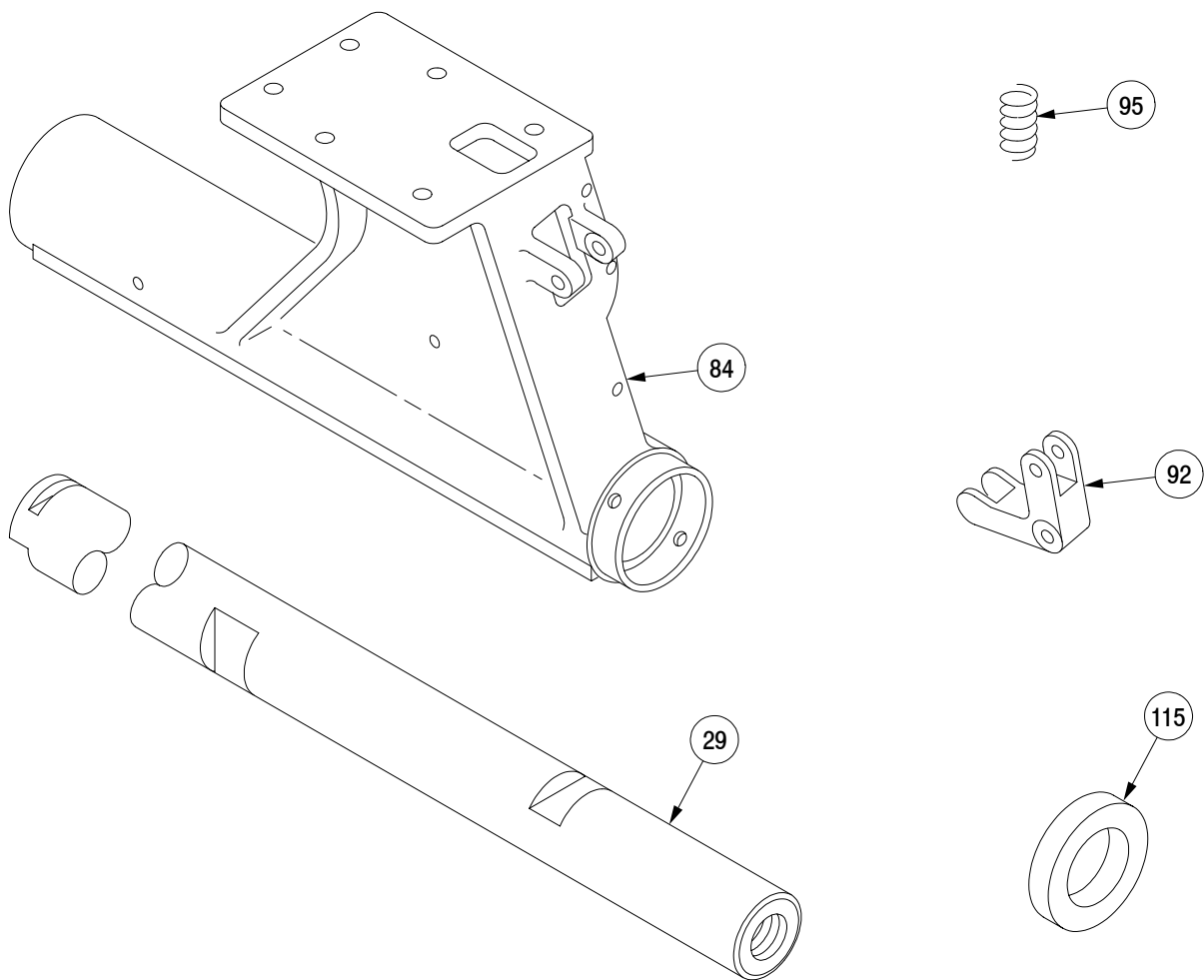


04pc018m

5-1 RAMMER ASSEMBLY - CONTINUED

c. Inspection and Repair - Continued

- 16 Inspect helical spring (95). Replace if cracked or distorted.
- 17 Inspect lockpin actuating lever (92). Replace if cracked or severely worn.
- 18 Inspect rammer support (84) for burrs, cracks, or visible damage. Remove burrs with abrasive cloth. Replace if cracked or damaged. Chase damaged threads.
- 19 Inspect rubber bumper (115). Replace if brittle, cracked, or distorted.
- 20 Inspect shaft (29) for burrs, wear, or damaged threads. Remove burrs with abrasive cloth. Replace if cracked or damaged. Chase damaged threads.

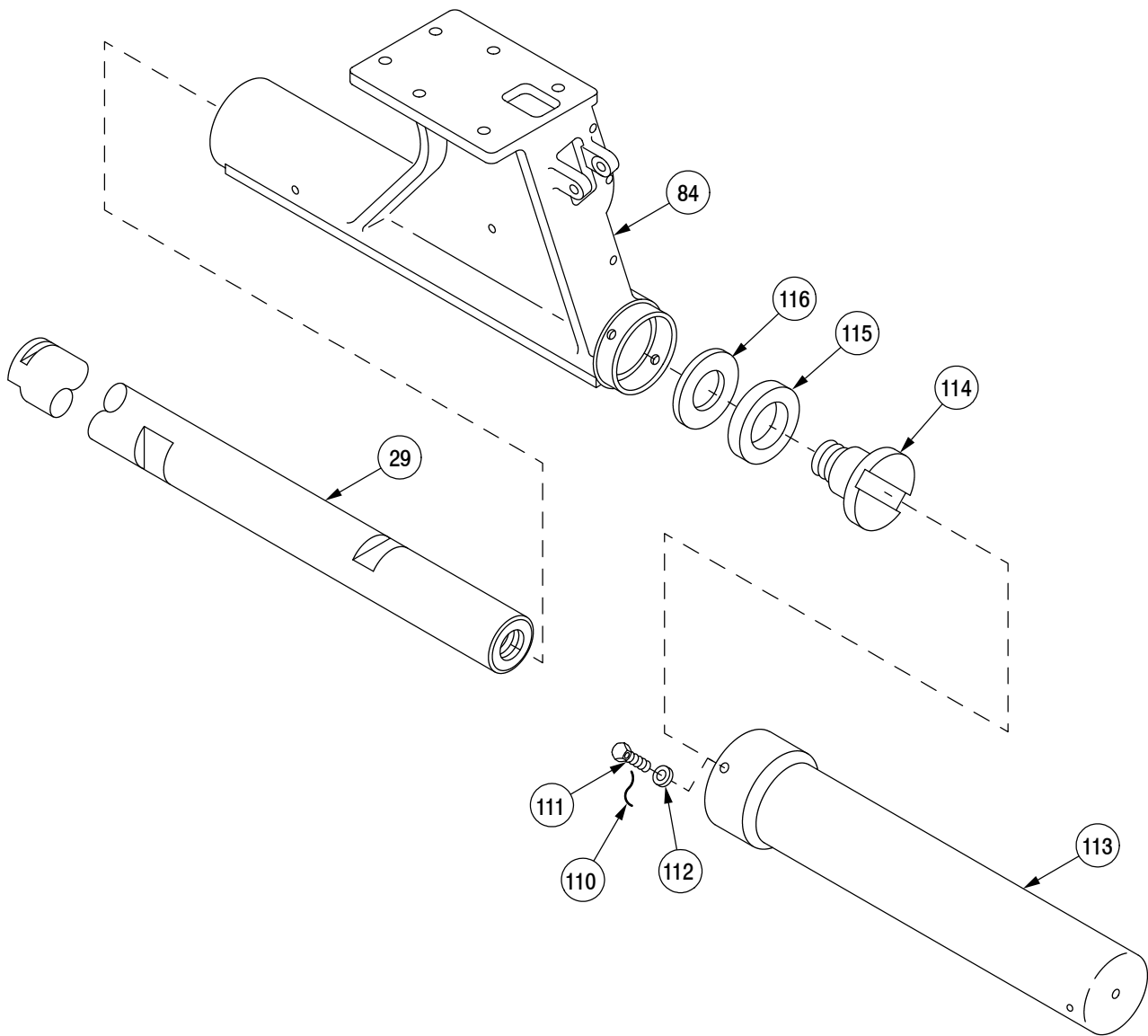


04pc019m

5-1 RAMMER ASSEMBLY - CONTINUED

d. Assembly.

- 1 Install shaft (29) in rammer support (84).
- 1.1 Apply sealing compound (item 32, Appx B) to threads of shoulder screw (114).
- 2 Install bumper washer (116), rubber bumper (115), and shoulder screw (114).
- 3 Install shaft cover (113) with vent hole positioned as shown, four flat washers (112), and four screws (111) with sealing compound (item 33, Appx B) applied on rear of rammer support (84). Torque four screws (111) to 8-11 lb-ft (10-14 N•m). Secure screws by installing new lockwire (110).

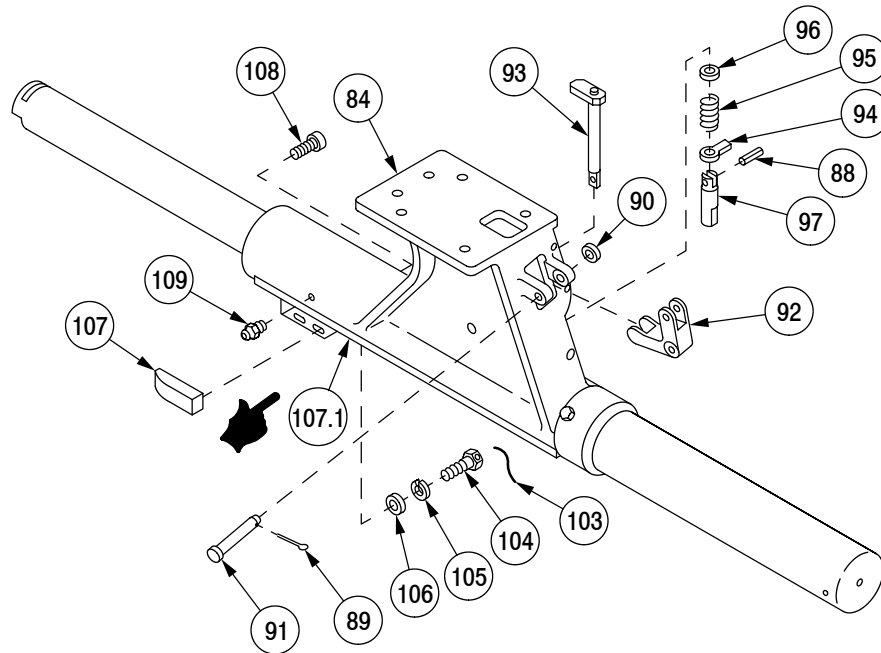


04pc016m

5-1 RAMMER ASSEMBLY - CONTINUED

d. Assembly - Continued

- 4 Install two lubrication fittings (109). Lubricate two lubrication fittings (109) (TM 9-2350-314-10).
- 5 Apply sealing compound (item 32, Appx B) to threads of guide (108). Install guide (108).
- 5.1 Torque guide (108) to 144-176 lb-ft (195-238 N•m).
- 6 Install ramp (107), two flat washers (106), two new lockwashers (105), and two screws (104) on cover (107.1). Torque two screws (104) to 12-14 lb-ft (16-19 N•m). Secure two screws (104) with new lockwire (103).
- 7 Step deleted.
- 8 Install actuator (97), flat washer (96), helical spring (95), position pointer (94), and shaft lockpin (93).
- 9 Install lockpin actuating lever (92), straight-headed pin (91), flat washer (90), and new cotter pin (89).
- 10 Install new spring pin (88).



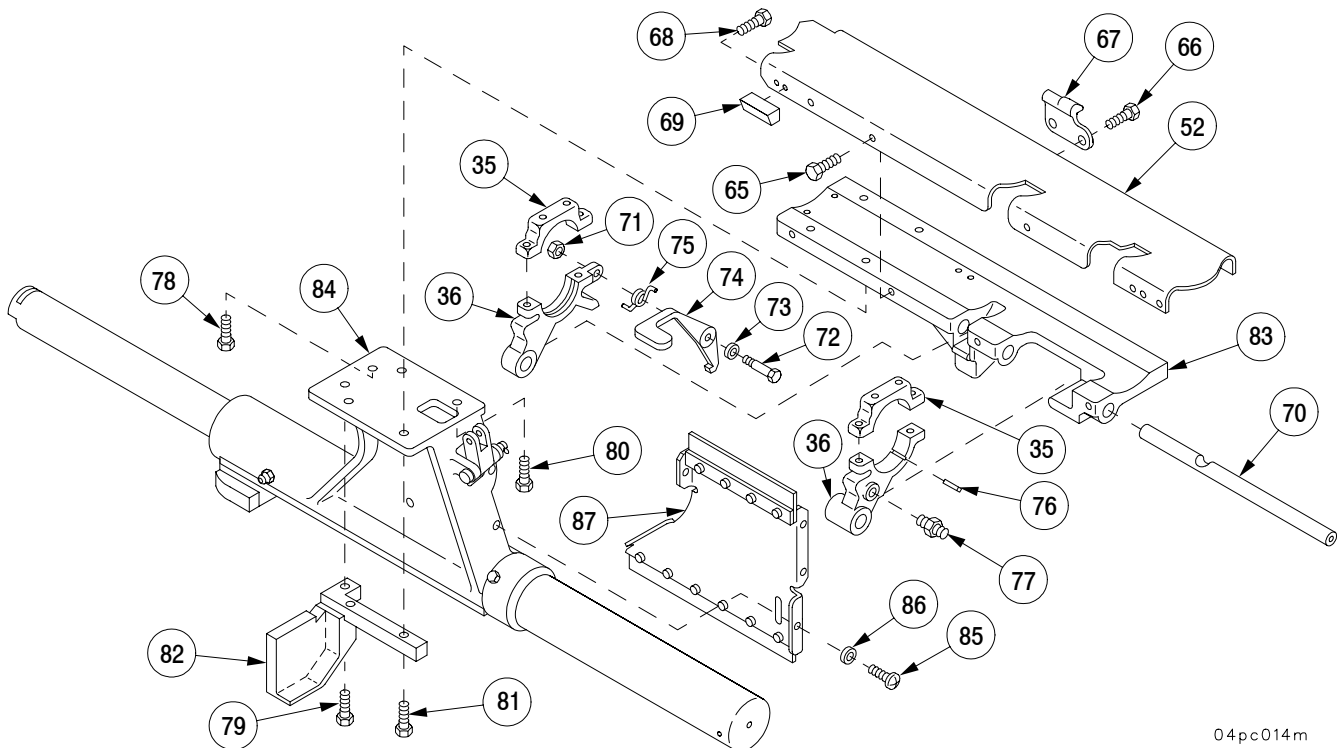
NOTE: Items 98, 99, 100, 101 and 102 Deleted.

04pc015m

5-1 RAMMER ASSEMBLY - CONTINUED

d. Assembly - Continued

- 11 Apply sealing compound (item 33, Appx B) to threads of two screws (80), two screws (81), screw (79), and screw (78). Install tray support (83), rammer stop (82), two screws (80), screw (79), and screw (78) to flange of rammer support (84). Torque screws to 32-39 lb-ft (43-53 N•m).
- 12 Install cover (87), five flat washers (86), and five screws (85) to rammer support (84).
- 13 Install machine key (76) and adapter (77) in rear cylinder support (36).
- 14 Apply sealing compound (item 33, Appx B) to threads of nut (71) and bolt (72). Install helical spring (75), lever (74), washer (73), bolt (72), and nut (71) to front cylinder support (36). Torque bolt (72) to 34-42 lb-ft (45-57 N•m).
- 15 Install front and rear cylinder supports (36).
- 16 Install straight-headless pin (70).
- 17 Install block (69) and two screws (68) to tray (52).
- 18 Apply sealing compound (item 33, Appx B) to threads of seven screws (65) and two screws (66). Install tray (52), latch (67), two screws (66), and seven screws (65). Torque seven screws (65) and two screws (66) to 32-39 lb-ft (43-53 N•m).

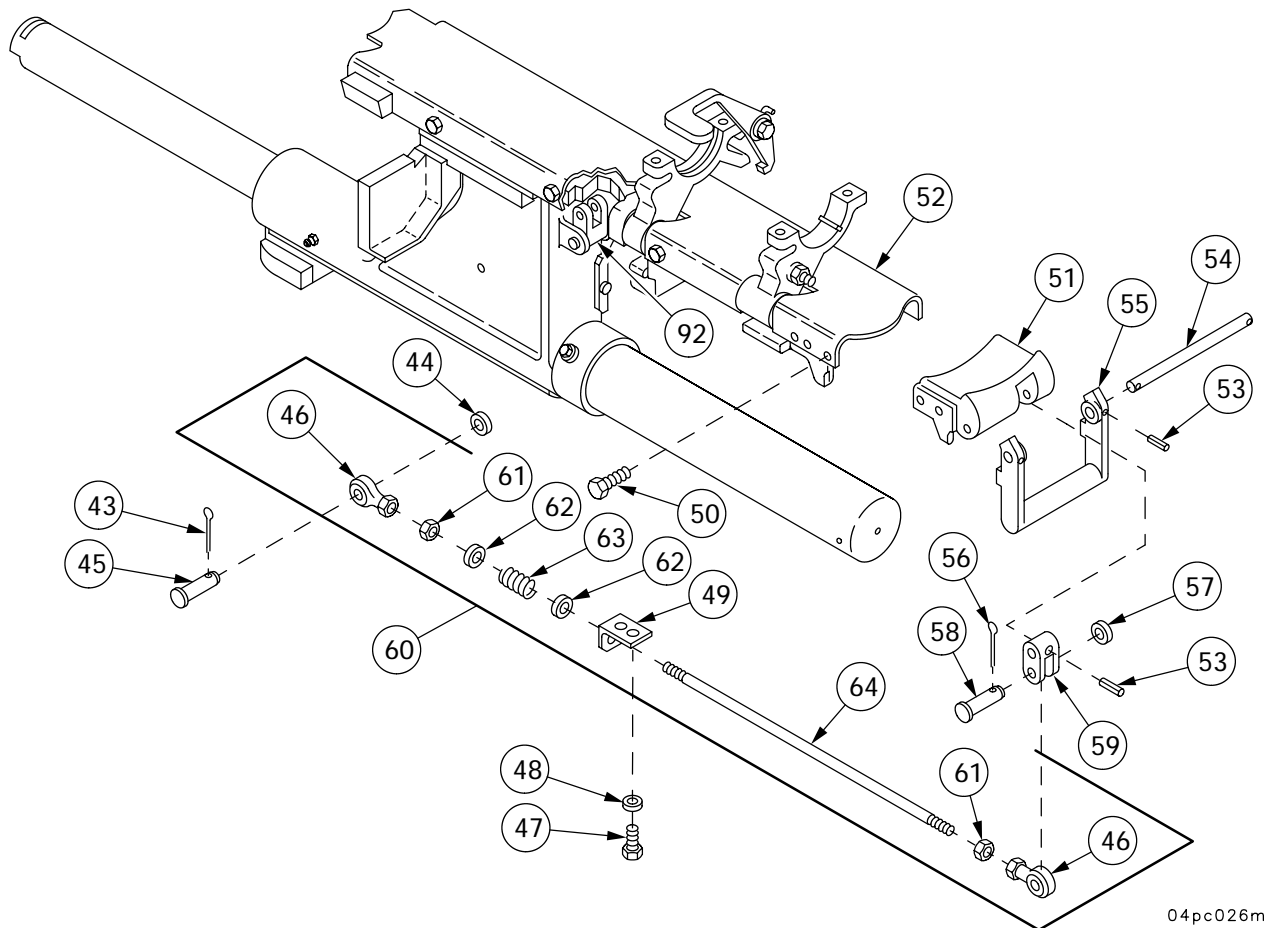


04pc014m

5-1 RAMMER ASSEMBLY - CONTINUED

d. Assembly - Continued

- 19 Apply sealing compound (item 33, Appx B) to two screws (47). Install bracket (49) using two screws (47) and two flat washers (48). Torque two screws (47) to 8-11 lb-ft (10-14 N•m).
- 20 Apply sealing compound (item 33, Appx B) to threads of four screws (50). Install handle support (51) and four screws (50) to tray (52). Torque screws to 32-39 lb-ft (43-53 N•m).
- 21 Install handle (55), lever (59), and straight-headless pin (54) on handle support (51).
- 22 Install two new spring pins (53).
- 23 Insert rod (64) through bracket (49).
- 24 Install two flat washers (62), spring (63), two hexnuts (61), and two spherical rod end bearings (46) to rod (64). Adjust nuts (61) so length of spring (63) is 1.25 inches (31.75 mm).
- 25 Install rod group (60) to lock pin actuating lever (92) and lever (59) with straight-headed pins (45 and 58), flat washers (44 and 57), and new cotter pins (43 and 56).



04pc026m

5-1 RAMMER ASSEMBLY - CONTINUED

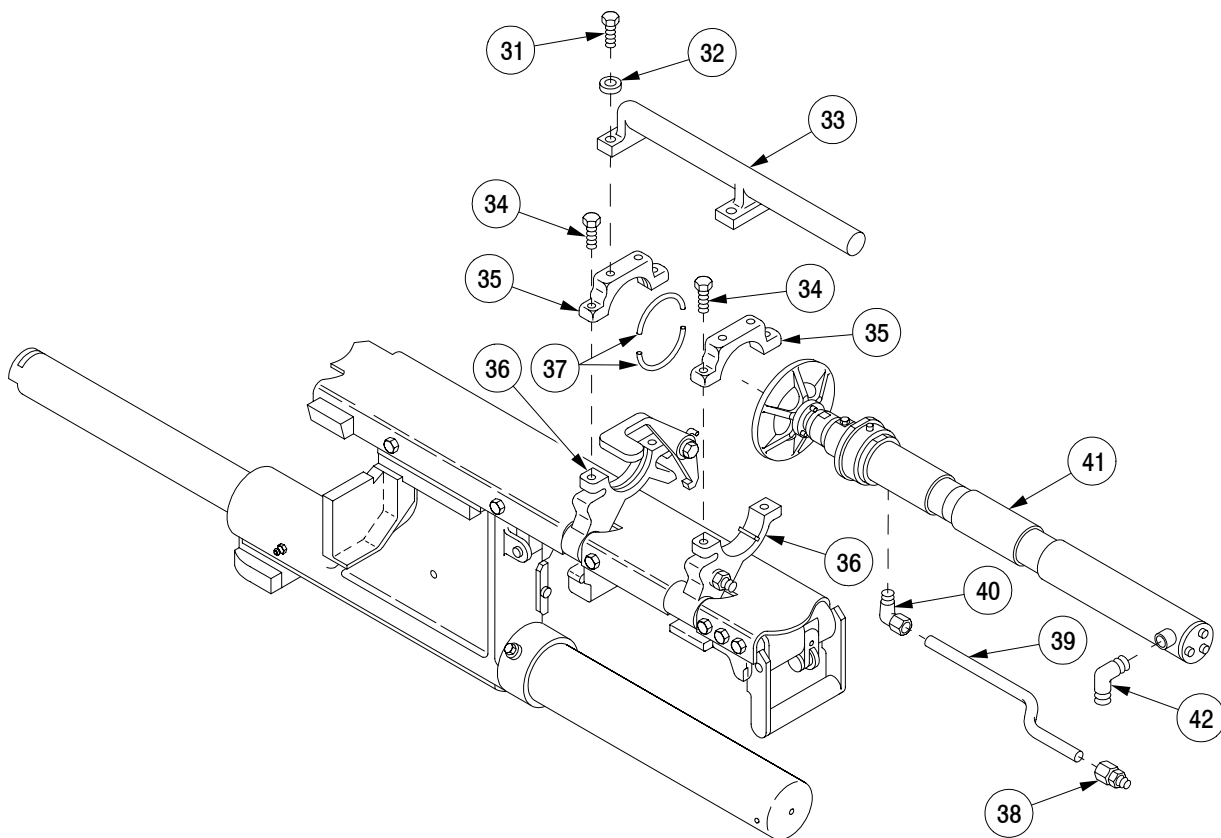
d. Assembly - Continued

- 26 Install elbows (40 and 42) on cylinder (41).
- 27 Install lower half of lockring (37).
- 28 Install cylinder assembly (41).
- 29 Install fitting (38) on cylinder support (36).
- 30 Connect line (39) to elbow (40) and adapter (38).
- 31 Install upper half of lockring (37).

NOTE

Be sure to install two caps with their respective matched front and rear cylinder supports.

- 32 Apply primer coating to mating surfaces of two caps (35) and two cylinder supports (36). Install two caps (35) and four screws (34) onto two cylinder supports (36).
- 33 Apply primer coating to mating surfaces of handle (33). Install handle (33), four flat washers (32), and four screws (31).



04pc012m

5-1 RAMMER ASSEMBLY - CONTINUED

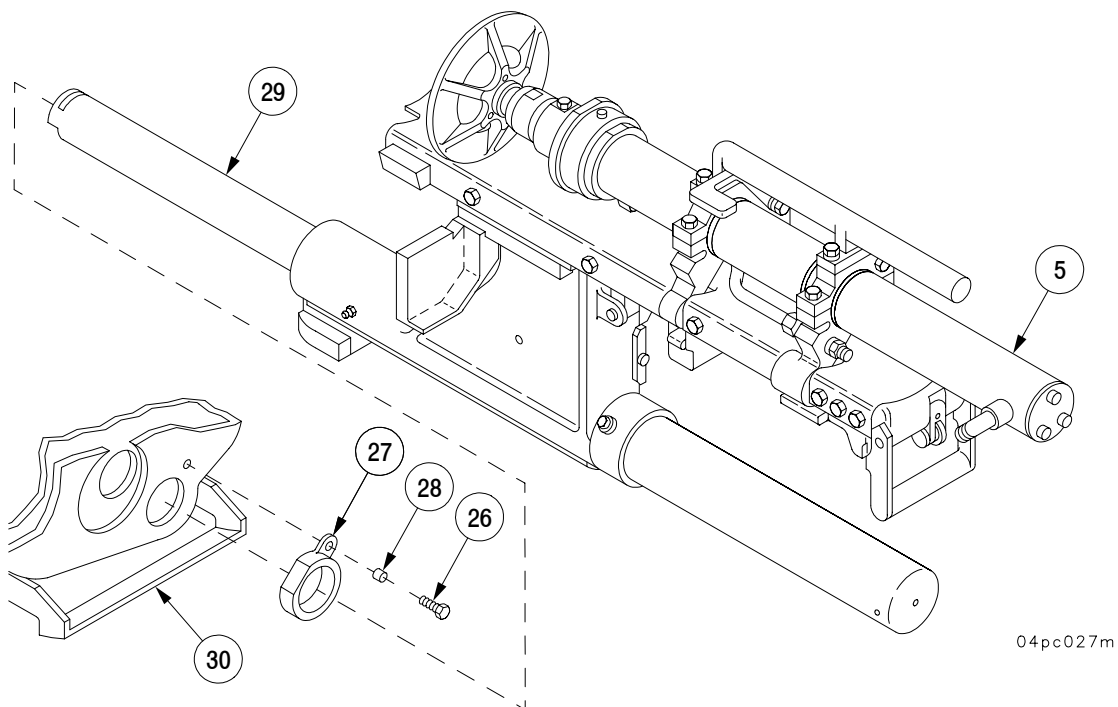
e. Installation.

- 1 Open breechblock (TM 9-2350-314-10).
- 2 Reduce leaf spring rack tension (TM 9-2350-314-10).

WARNING

Weight of rammer and shaft assembly is approximately 198 lb (90 kg). Two persons are required for removal and installation.

- 3 Slide rammer assembly (5) with front bumper (27) and spacer (28) into mount (30) on shaft (29).
- 4 Install screw (26) to front bumper (27) and spacer (28).



5-1 RAMMER ASSEMBLY - CONTINUED

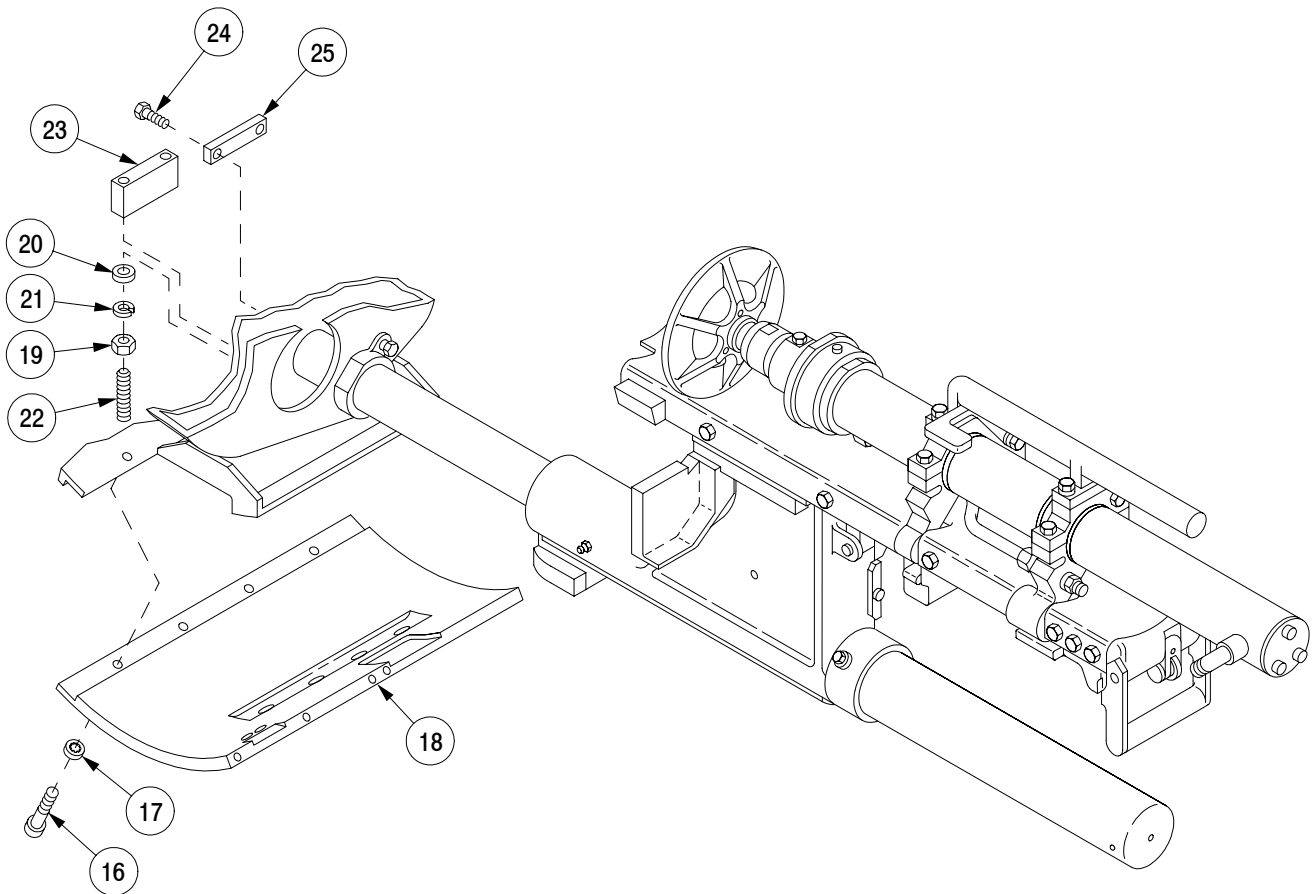
e. Installation - Continued

- 5 Install locking plate (25) and two screws (24).
- 6 Adjust positioning block (23) and two shaft adjusting socket head setscrews (22) to align rammer in cannon breech.
- 7 Hold two socket head setscrews (22) while tightening two jamnuts (19) with two flat washers (20) and two new lockwashers (21).

WARNING

Weight of lower rotor shield is approximately 57 lb (26 kg). Two persons are required for removal and installation. Lower rotor shield must be supported during removal and installation.

- 8 Install lower rotor shield (18), eight new lockwashers (17), and eight screws (16).

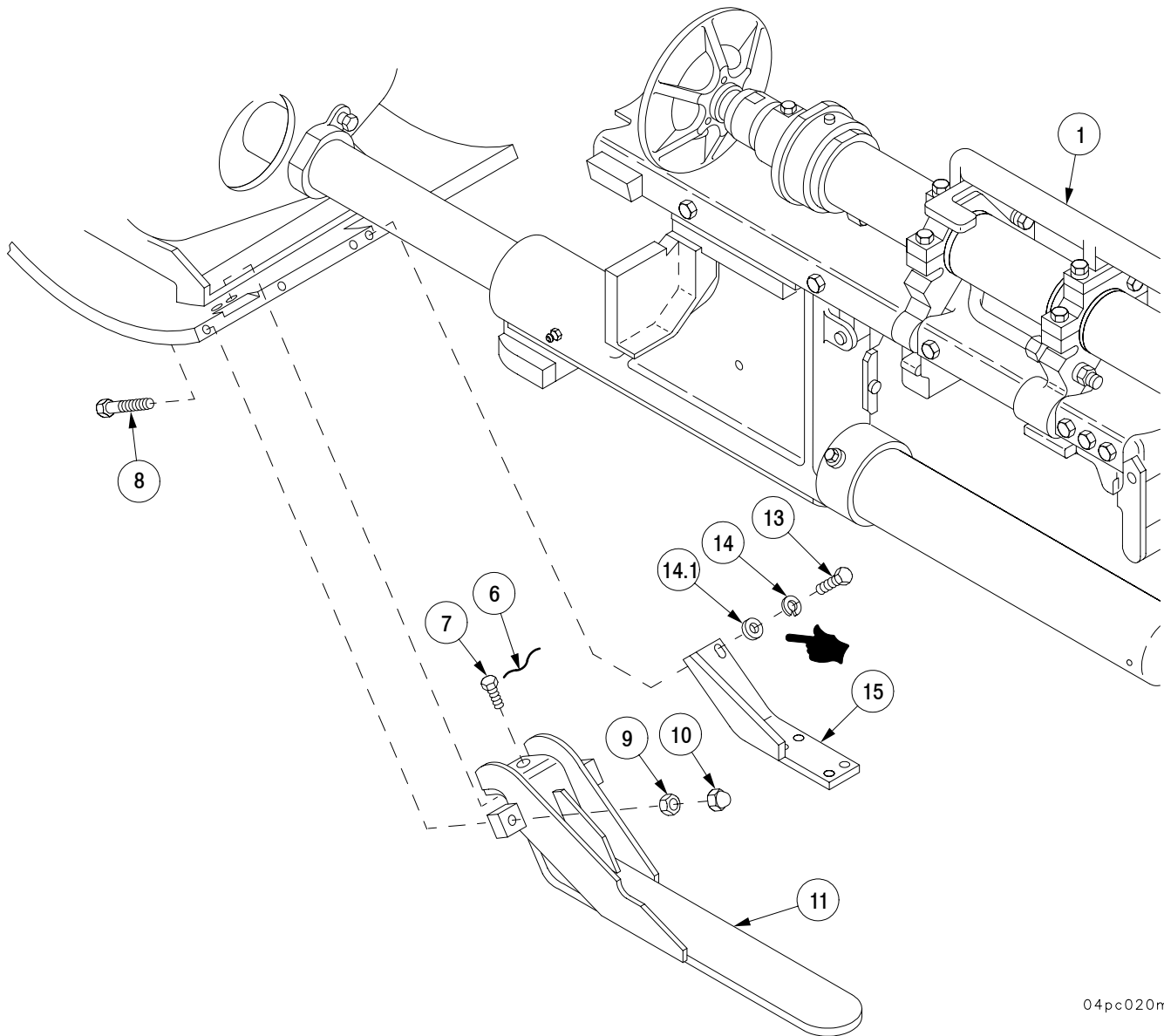


04p028m

5-1 RAMMER ASSEMBLY - CONTINUED

e. Installation - Continued

- 9 Install valve support bracket (15), two flat washers (14.1), two new lockwashers (14), and two screws (13). Do not tighten two screws yet.
- 10 Install rammer support bracket (11), two screws (8), two nuts (9), two caps (10), two screws (7), and new lockwire (6).
- 11 Move rammer assembly (1) to retracted position (TM 9-2350-314-10).
- 12 Close breechblock (TM 9-2350-314-10).



04pc020m

5-1 RAMMER ASSEMBLY - CONTINUED

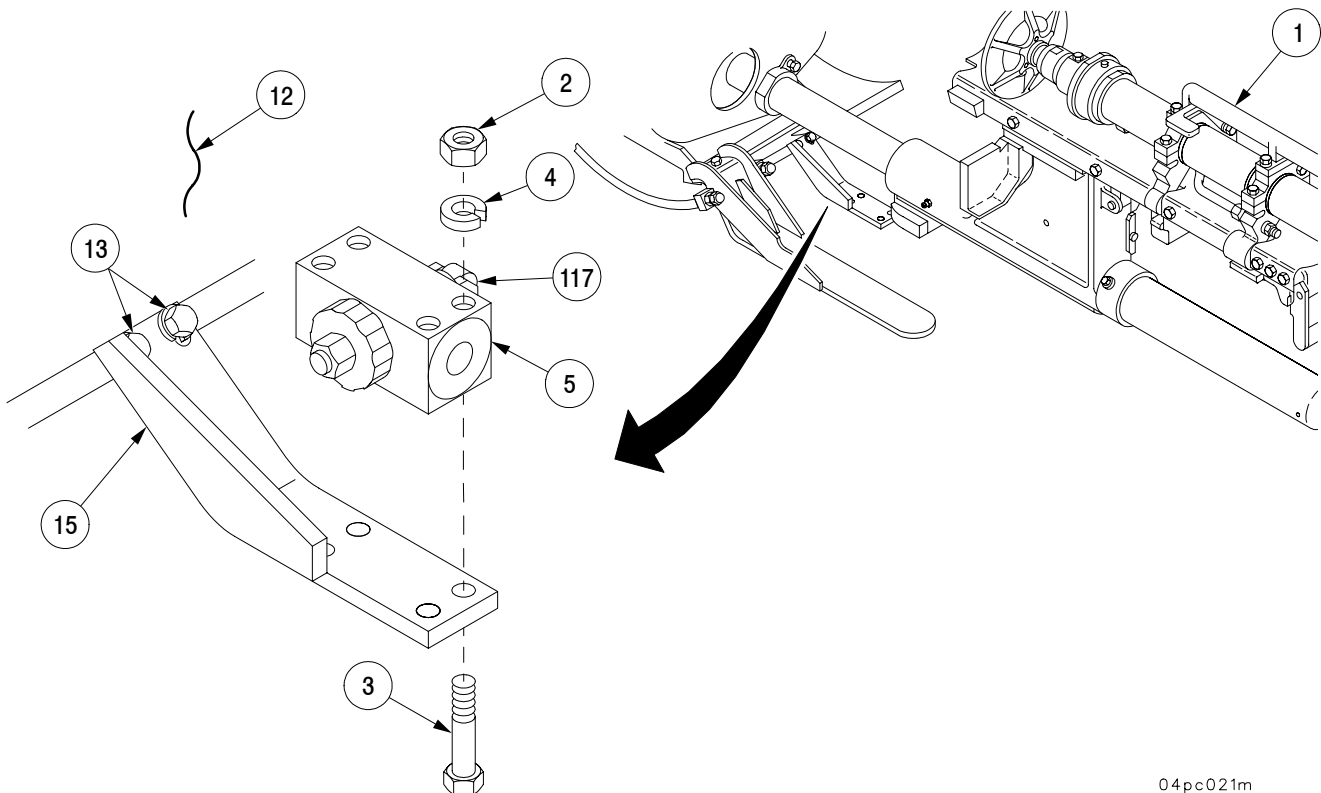
e. Installation - Continued

- 13 Install blocking valve (5), four new lockwashers (4), four screws (3), and four nuts (2).

NOTE

Do not spot paint ramp or plunger. Lubricate with grease (TM 9-2350-314-10).

- 14 Adjust valve support bracket (15) so that plunger (117) of blocking valve (5) is depressed when rammer assembly (1) is in ram position, tighten two screws (13) and torque to 40 ± 5 lb. ft (54 ± 7 N•m). Install new lockwire (12) to secure two screws (13).
- 15 Install rammer lines and fittings (TM 9-2350-314-20-2-2).
- 16 Adjust the rammer stowage bracket (TM 9-2350-314-20-2-1).
- 17 Fill, charge, and bleed hydraulic system (TM 9-2350-314-20-2-2).
- 18 Operate rammer five strokes (TM 9-2350-314-10), observe hydraulic filter pop-out indicators, and replace filters if necessary (TM 9-2350-314-20-2-2).
- 19 Reset leaf spring rack tension (TM 9-2350-314-10)



04pc021m

5-2 RAMMER CYLINDER ASSEMBLY.

This task covers: a. Removal b. Disassembly c. Inspection and Repair
 d. Assembly e. Installation

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)

Vernier caliper (item 6, Appx F)

Materials/Parts

Repair parts kit (item 196, Appx E)

Self-locking nut (item 221, Appx E)

Lockwire (item 86, Appx B)

Lockwire (item 87, Appx B)

Primer coating (item 29, Appx B)

Hydraulic fluid (item 42, Appx B)

Equipment Conditions

Cannon set to 0 degrees

(TM 9-2350-314-10)

Hydraulic system discharged

(TM 9-2350-314-20-2-2)

Rammer lines and fittings removed

(TM 9-2350-314-20-2-2)

Breechblock opened

(TM 9-2350-314-10)

References

TM 9-2350-314-20-2-2

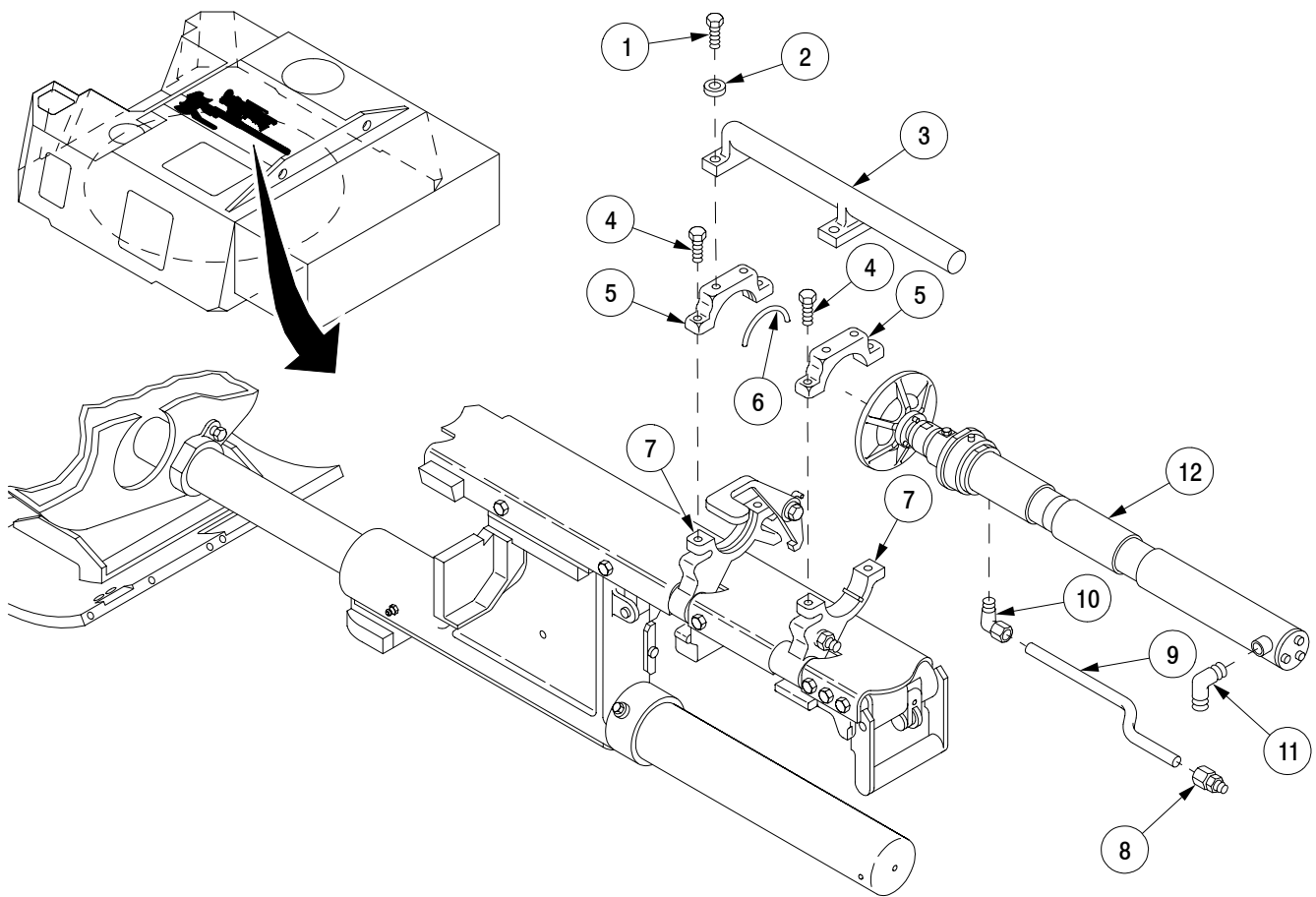
5-2 RAMMER CYLINDER ASSEMBLY - CONTINUED

a. Removal.

NOTE

Two caps and front and rear cylinder supports are matched sets. Identify each cap with its cylinder support at removal to aid in installation.

- 1 Remove four screws (1) and four flat washers (2) from handle (3). Remove handle (3).
- 2 Remove four screws (4) and two caps (5).
- 3 Remove upper half of lockring (6) from cylinder support (7).
- 4 Remove adapter (8) and tube (9) from cylinder support (7).
- 5 Remove elbow (10) and elbow (11) from cylinder (12).
- 6 Remove cylinder assembly (12).

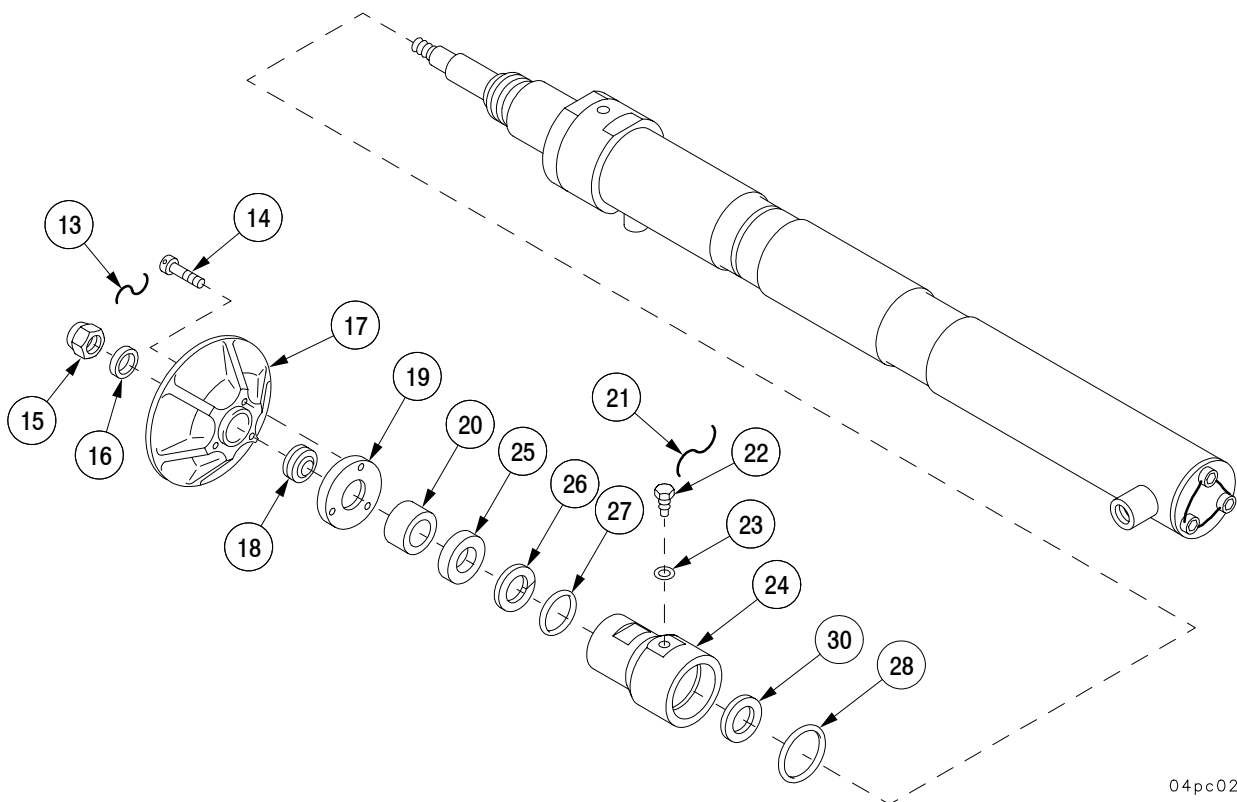


04pc022m

5-2 RAMMER CYLINDER ASSEMBLY - CONTINUED

b. Disassembly.

- 1 Remove and discard lockwire (13).
- 2 Remove three socket head capscrews (14), self-locking nut (15), and sleeve spacer (16). Discard self-locking nut.
- 3 Remove swivel bearing (17).
- 4 Remove aligning bearing (18).
- 5 Remove bearing collar (19).
- 6 Remove bearing cap (20).
- 7 Remove and discard lockwire (21).
- 8 Remove plug (22).
- 9 Remove and discard preformed packing (23).
- 10 Remove outer end housing (24).
- 11 Remove and discard piston wiper (25), retainer (26), preformed packing (27), and preformed packing (28), from outer end housing (24).
- 12 Remove washer (30).

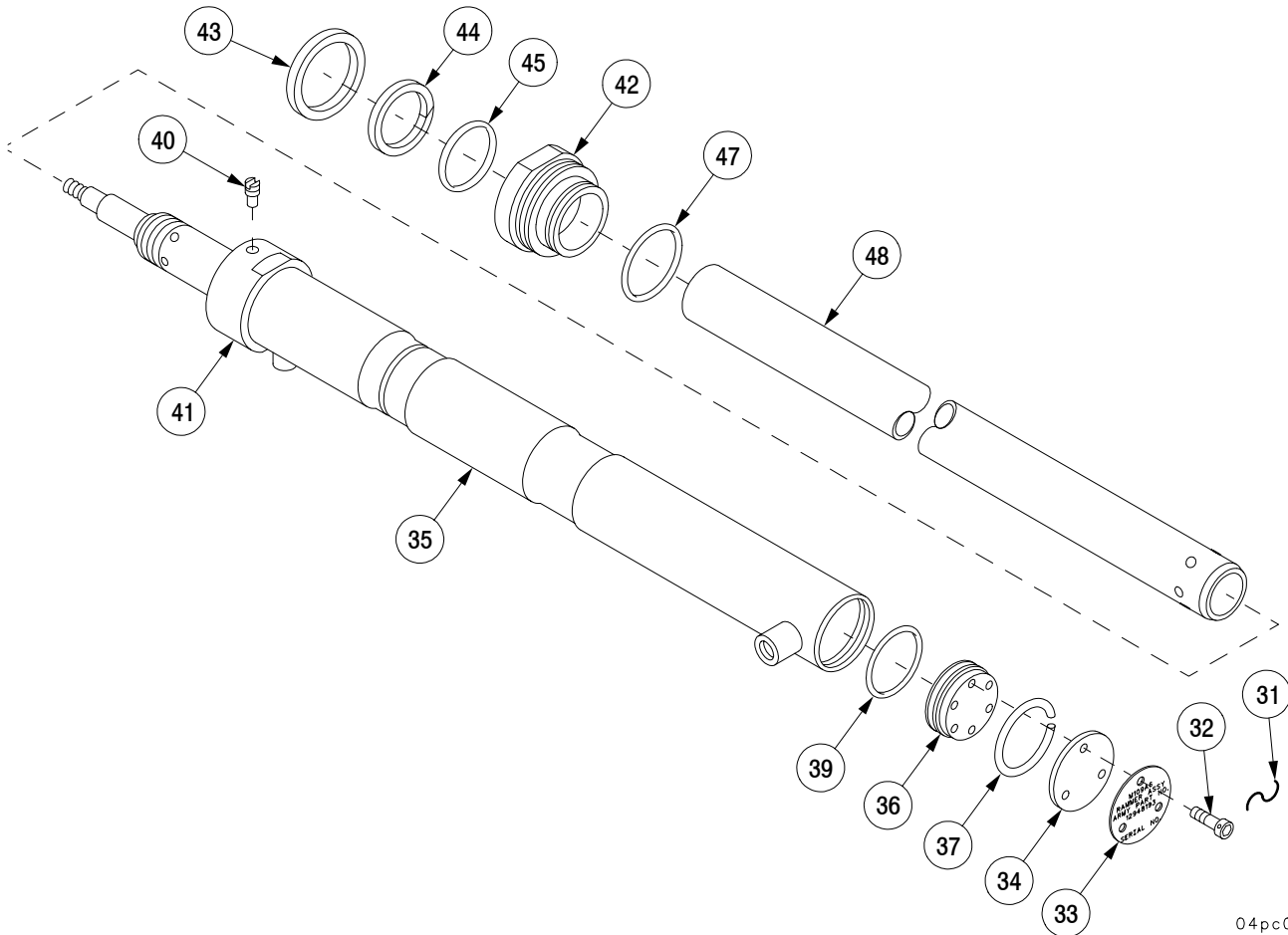


04pc023m

5-2 RAMMER CYLINDER ASSEMBLY - CONTINUED

b. Disassembly - Continued

- 13 Remove and discard lock wire (31).
- 14 Remove three internal wrench bolts (32) and identification plate (33).
- 15 Remove outer end cap plate (34) from outer piston cylinder (35).
- 16 Push outer end cap (36) and internal components forward so that outer end locking (37) can be removed.
- 17 Remove cylinder outer end locking (37) and outer end cap (36).
- 18 Remove and discard preformed packing (39).
- 19 Remove setscrew (40).
- 20 Hold cylinder outer guide (41) from turning, and remove cylinder guide (42).
- 21 Remove and discard piston wiper (43), retainer (44), preformed packing (45), and preformed packing (47) from cylinder guide (42).
- 22 Remove outer piston rammer tube (48).

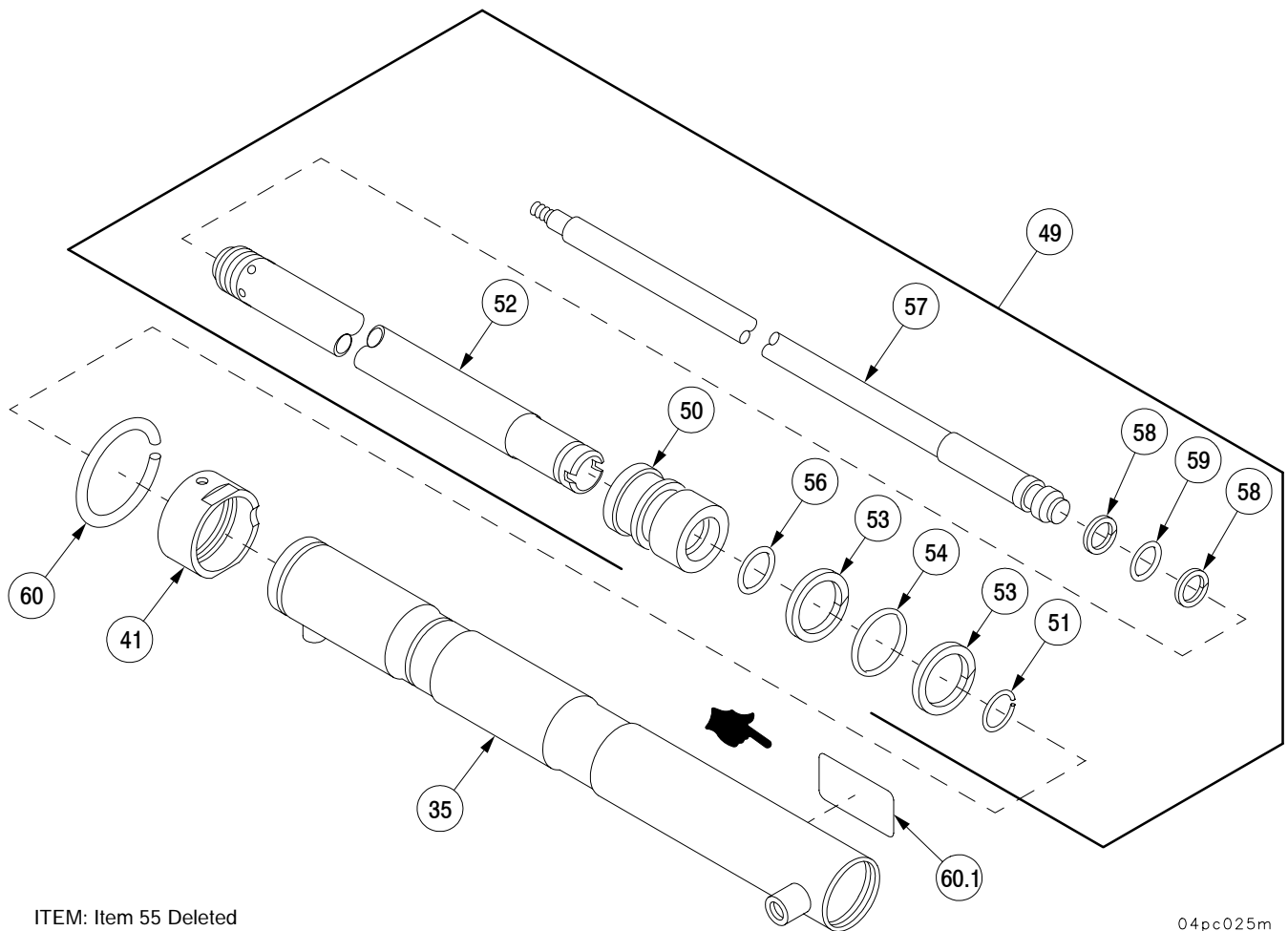


04pc024m

5-2 RAMMER CYLINDER ASSEMBLY - CONTINUED

b. Disassembly - Continued

- 23 Remove rammer cylinder piston assembly (49) from front of piston cylinder (35).
- 24 Push sleeve bushing (50) forward and remove lockring (51) from piston rammer tube (52).
- 25 Remove sleeve bushing (50) from piston rammer tube (52).
- 26 Remove and discard two retainers (53), preformed packing (54) and preformed packing (56) from sleeve bushing (50).
- 27 Remove piston (57) from piston rammer tube (52).
- 28 Remove and discard two retainers (58) and preformed packing (59) from piston (57).
- 29 Push cylinder outer guide (41) rearward and remove cylinder outer guide lockring (60) from piston cylinder (35).
- 30 Remove cylinder outer guide (41) from piston cylinder (35).
- 30.1 Remove label (60.1) from piston cylinder (35).



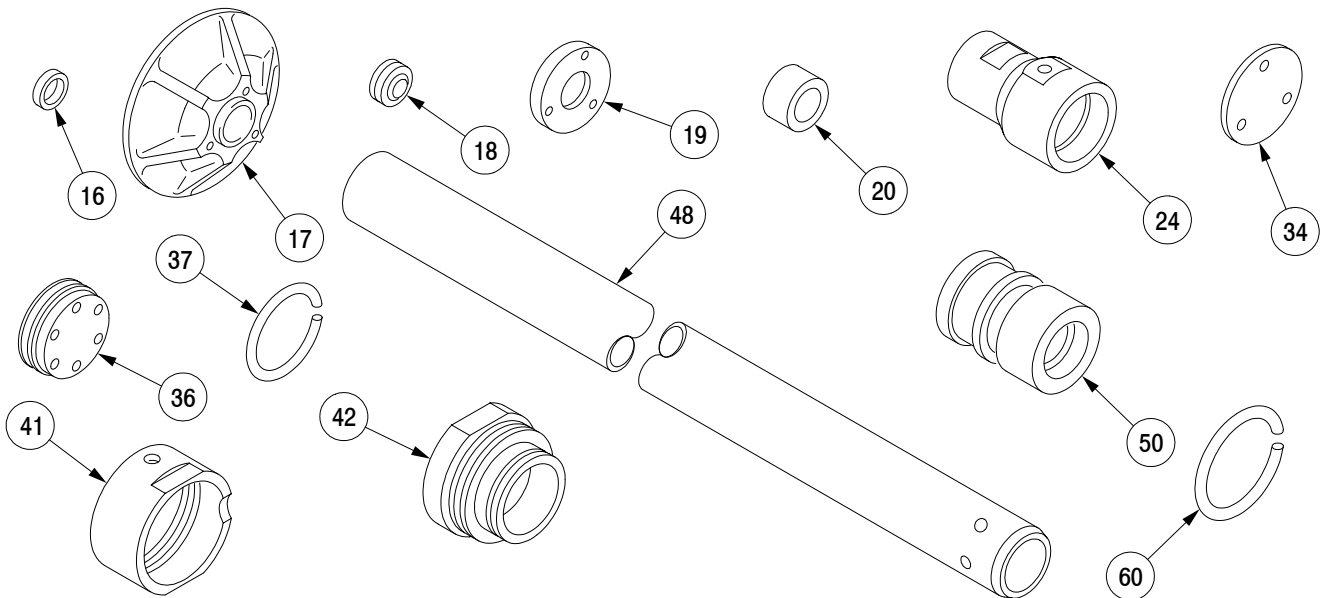
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04pc025m

5-2 RAMMER CYLINDER ASSEMBLY - CONTINUED

c. Inspection and Repair.

- 1 Inspect swivel bearing (17). Replace if scratched, scarred, or severely worn.
- 2 Inspect outer end housing (24). Replace if cracked or if threads are damaged.
- 3 Inspect outer end cap (36). Replace if damaged.
- 4 Inspect cylinder outer end lockring (37). Replace if deformed.
- 5 Inspect outer end cap plate (34). Replace if broken.
- 6 Inspect outer piston rammer tube (48). Replace if scratched, broken, or severely worn.
- 7 Inspect sleeve bushing (50). Replace if cracked, burred, nicked, or distorted.
- 8 Inspect cylinder guide (42). Replace if cracked, burred, nicked, or distorted.
- 9 Inspect cylinder outer guide lockring (60). Replace if deformed.
- 10 Inspect cylinder outer guide (41). Replace if cracked, burred, nicked, or distorted.
- 11 Inspect sleeve spacer (16). Replace if distorted.
- 12 Inspect aligning bearing (18). Replace if distorted or excessively worn.
- 13 Inspect bearing collar (19). Replace if distorted or excessively worn.
- 14 Inspect bearing cap (20). Replace if cracked, burred, nicked, or distorted.

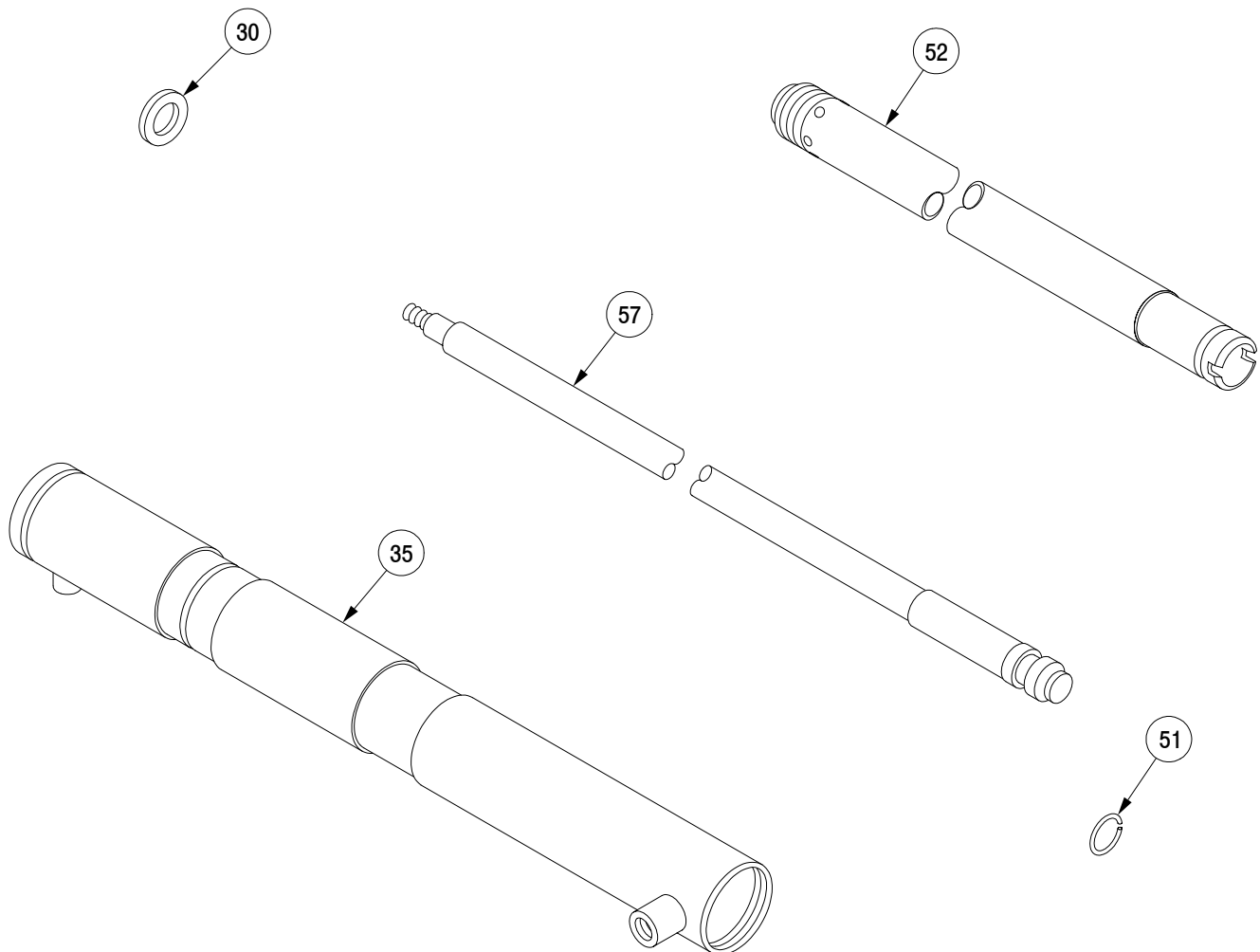


04pc029m

5-2 RAMMER CYLINDER ASSEMBLY - CONTINUED

c. Inspection and Repair - Continued

- 15 Inspect washer (30). Replace if distorted.
- 16 Inspect inner piston rammer tube (52). Replace if cracked, nicked, burred, distorted, or if inside diameter is greater than 0.898 in. (22.8 mm).
- 17 Inspect lockring (51). Replace if distorted.
- 18 Inspect rammer cylinder piston assembly (57). Replace if cracked, nicked, burred, distorted, or if outside diameter is less than 0.892 in. (22.7 mm).
- 19 Inspect outer piston cylinder (35). Replace if cracked, nicked, burred, distorted, or if inside diameter is greater than 2.155 in. (54.7 mm).



04pc030m

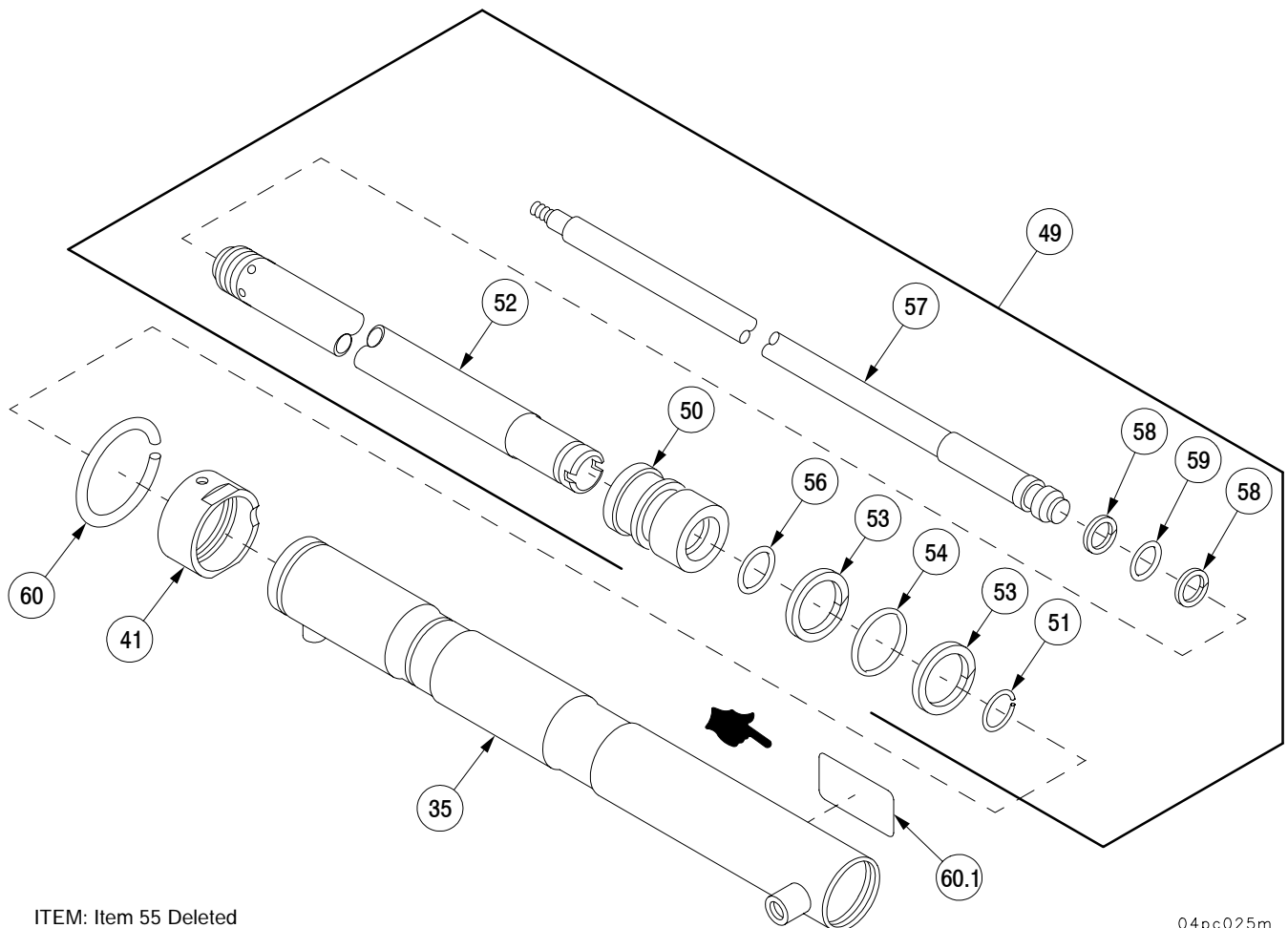
5-2 RAMMER CYLINDER ASSEMBLY - CONTINUED

d. Assembly.

NOTE

Coat all new preformed packings with hydraulic fluid before installation.

- 1 Slide cylinder outer guide (41) onto outer piston cylinder (35).
- 1.1 Apply decal (60.1) to piston cylinder (35).
- 2 Install cylinder outer guide lockring (60) onto outer piston cylinder (35).
- 3 Install new preformed packing (56) in sleeve bushing (50).
- 4 Install two new retainers (53) and new preformed packing (54) onto sleeve bushing (50).
- 5 Install sleeve bushing (50) onto piston rammer tube (52) and secure with lockring (51).
- 6 Install two new retainers (58) and new preformed packing (59) onto piston (57).
- 7 Slide piston (57) into piston rammer tube (52).
- 8 Install rammer cylinder piston assembly (49) into outer piston cylinder (35).



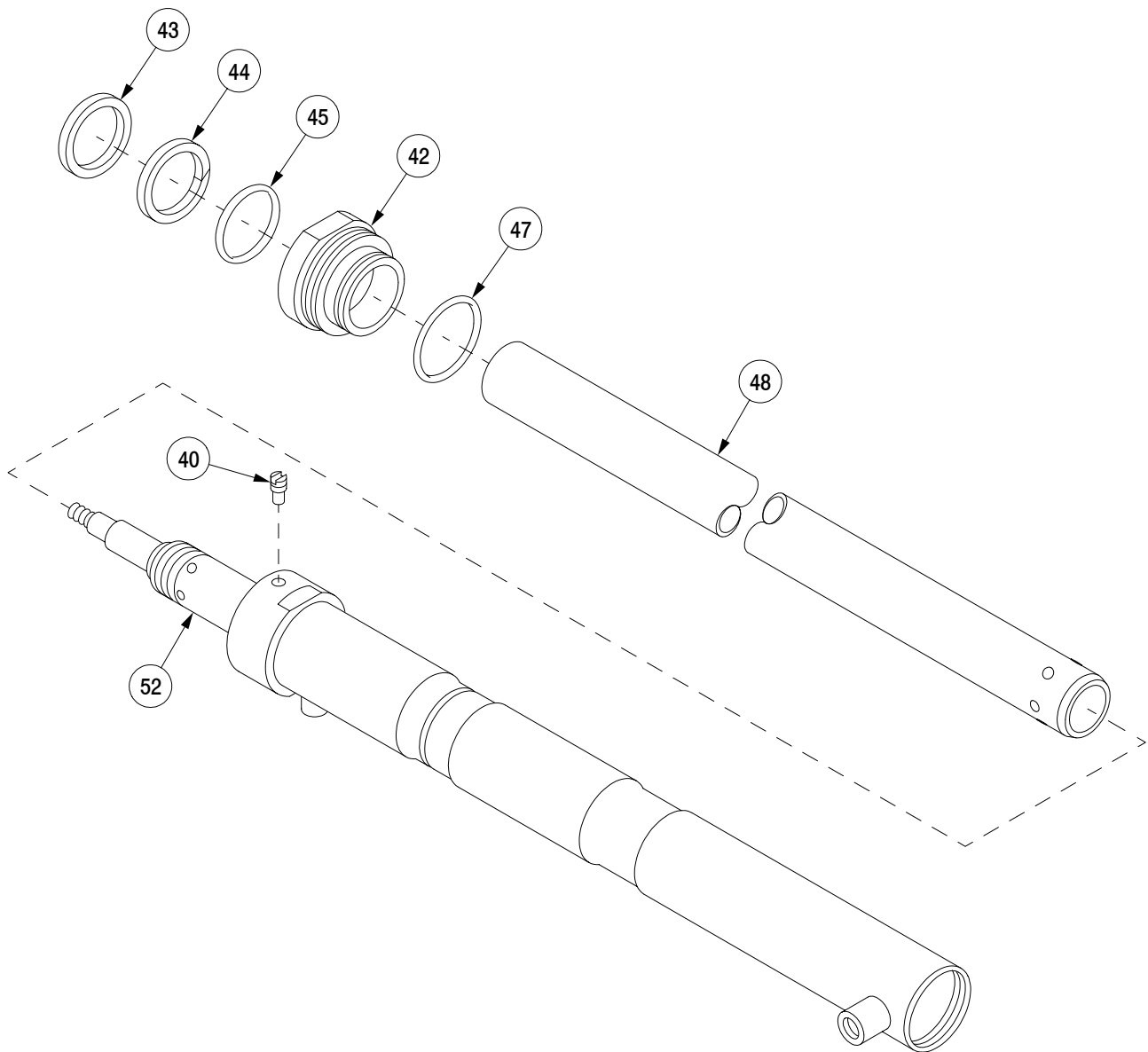
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04pc025m

5-2 RAMMER CYLINDER ASSEMBLY - CONTINUED

d. Assembly - Continued

- 9 Slide outer piston rammer tube assembly (48) over inner piston rammer tube assembly (52).
- 10 Install new preformed packing (47), new preformed packing (45), new retainer (44), and new piston wiper (43).
- 11 Install cylinder guide (42) on outer piston rammer tube (48).
- 12 Install setscrew (40).

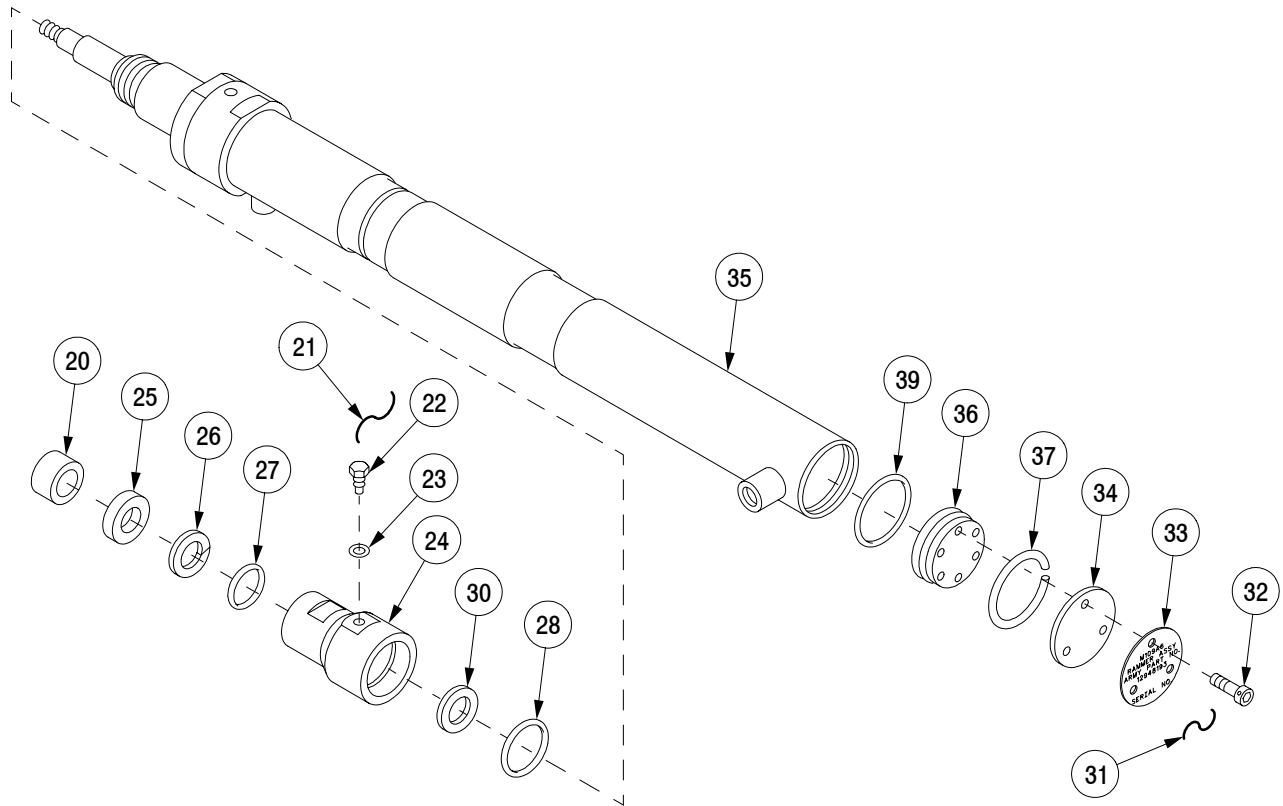


04pc031m

5-2 RAMMER CYLINDER ASSEMBLY - CONTINUED

d. Assembly - Continued

- 13 Install new preformed packing (39) on outer end cap (36).
- 14 Install outer end cap (36) in outer piston cylinder (35).
- 15 Install cylinder outer end locking (37).
- 16 Install outer end cap plate (34) and identification plate (33) on outer piston cylinder (35) with three internal wrench bolts (32).
- 17 Secure three internal wrench bolts (32) with new lockwire (31).
- 18 Install washer (30).
- 19 Install new preformed packing (27), new retainer (26), new preformed packing (28), and new piston wiper (25) on outer end housing (24).
- 20 Install outer end housing (24).
- 21 Install new performed packing (23) and plug (22).
- 22 Secure plug (22) with new lockwire (21).
- 23 Install bearing cap (20).

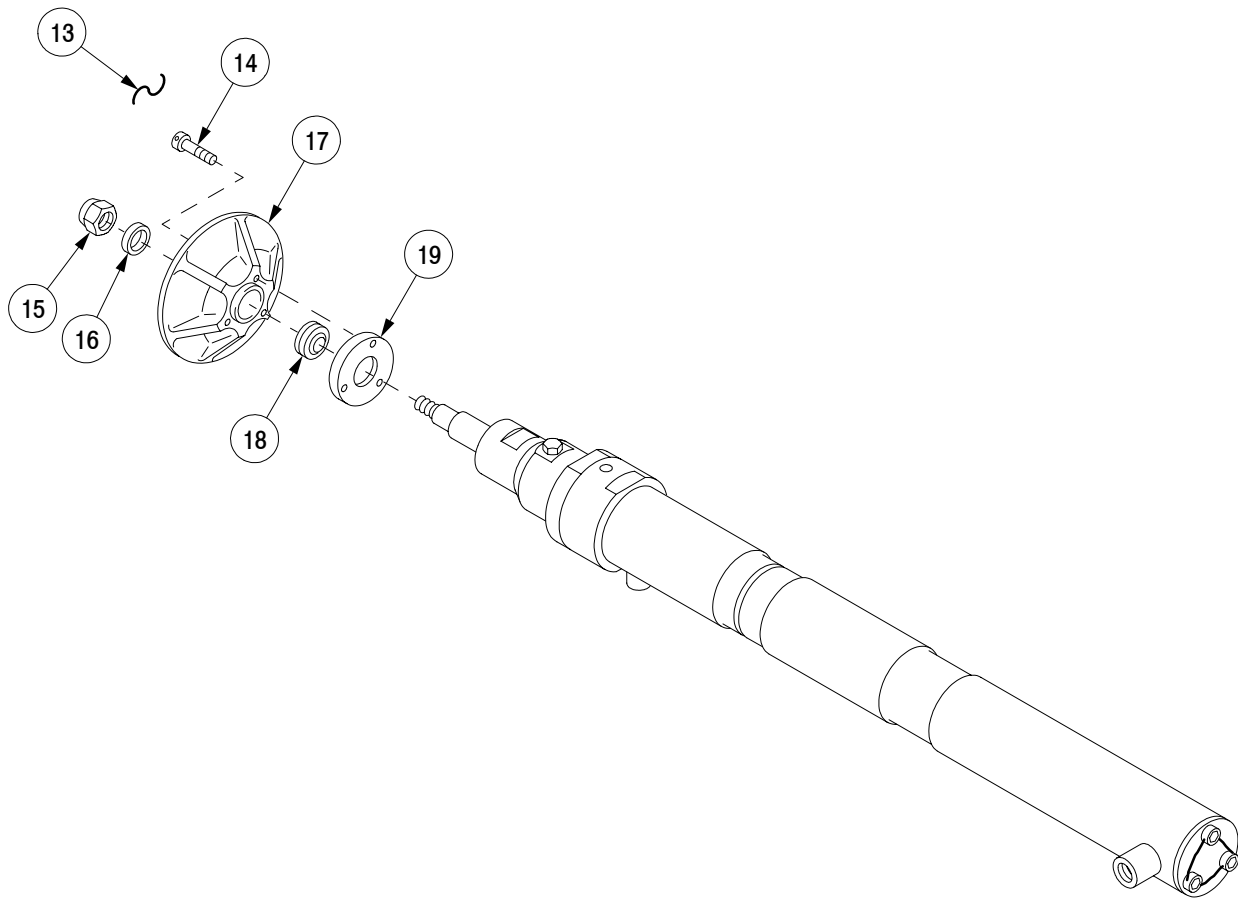


04pc032m

5-2 RAMMER CYLINDER ASSEMBLY - CONTINUED

d. Assembly - Continued

- 24 Install bearing collar (19) aligning bearing (18) to swivel bearing (17) using three screws (14).
- 25 Install swivel bearing (17) with sleeve spacer (16) and new self-locking nut (15).
- 26 Secure three socket head cap screws (14) with new lockwire (13).



04pc033m

5-2 RAMMER CYLINDER ASSEMBLY - CONTINUED

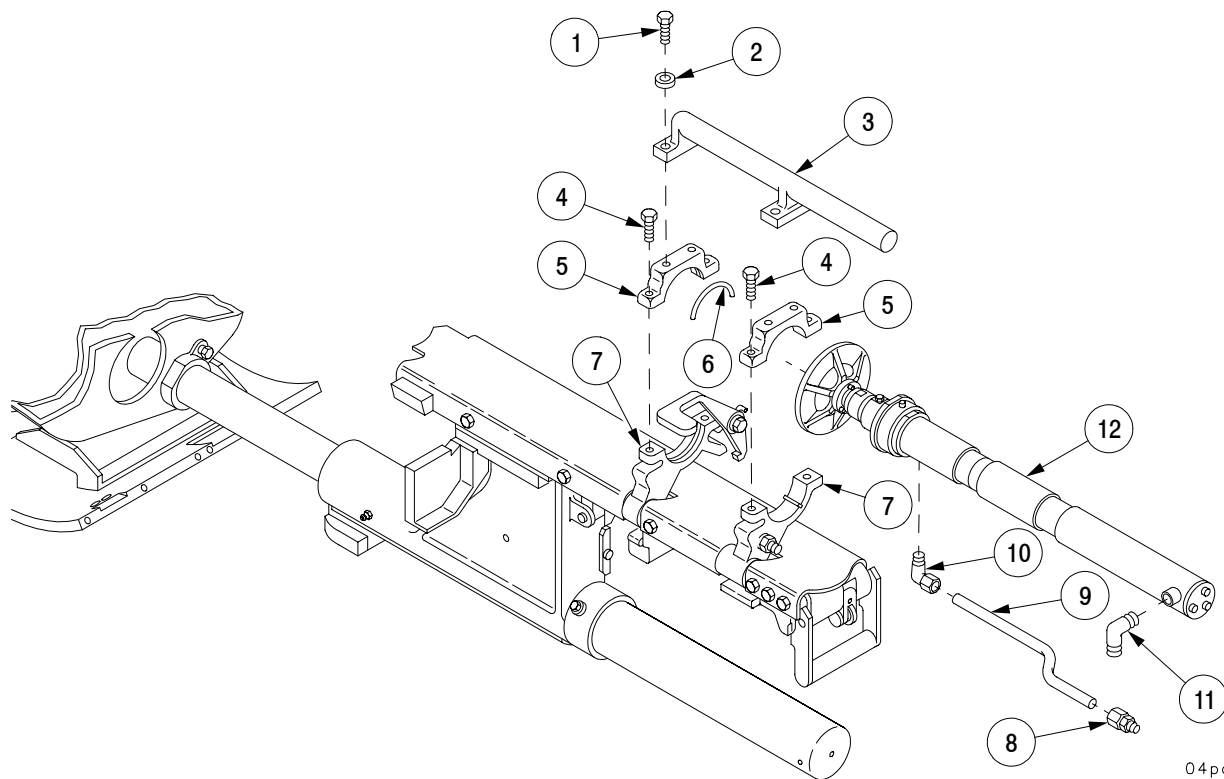
e. Installation.

- 1 Position cylinder assembly (12) to two cylinder supports (7).
- 2 Install elbow (11) and elbow (10) onto cylinder (12).
- 3 Install tube (9) and adapter (8) onto cylinder support (7).
- 4 Install upper half of lockring (6).

NOTE

Be sure to install two caps with their respective matched front and rear cylinder supports.

- 5 Apply primer coating to the mating surfaces of caps (5) and cylinder supports (7). Install caps to supports and secure by installing four screws (1).
- 6 Install rammer lines and fittings (TM 9-2350-314-20-2-2).
- 7 Fill, charge and bleed hydraulic system (TM 9-2350-314-20-2-2).
- 8 Operate rammer five strokes (TM 9-2350-314-10), observe hydraulic filter pop-out indicators, and replace filters if necessary (TM 9-2350-314-20-2-2).
- 9 Install handle (3) with four flat washers (2) and four screws (1).



04pc034m

CHAPTER 6

SIGHTING EQUIPMENT

GENERAL

This chapter illustrates and describes the maintenance procedures for the panoramic telescope ballistic cover. The chapter deals with disassembly and assembly.

CONTENTS

Page

6-1	BALLISTIC COVER..	6-2
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6-1 BALLISTIC COVER.

This task covers: a. Disassembly b. Inspection and Repair c. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Torque wrench (item 76, Appx F)

Equipment Conditions

Ballistic cover removed
(TM 9-2350-314-20-2-2)

Materials/Parts

Self-locking screws (12) (item 46, Appx E)
Seals, nonmetallic (2) (item 173, Appx E)
Spring pins (2) (item 12, Appx E)
Ball bearings (58) (item 242, Appx E)
Ball bearings (5) (item 27, Appx E)
Ball bearings (54) (item 241, Appx E)
Sealing compound (item 35, Appx B)
Dry-cleaning solvent (item 69, Appx B)

Personnel Required

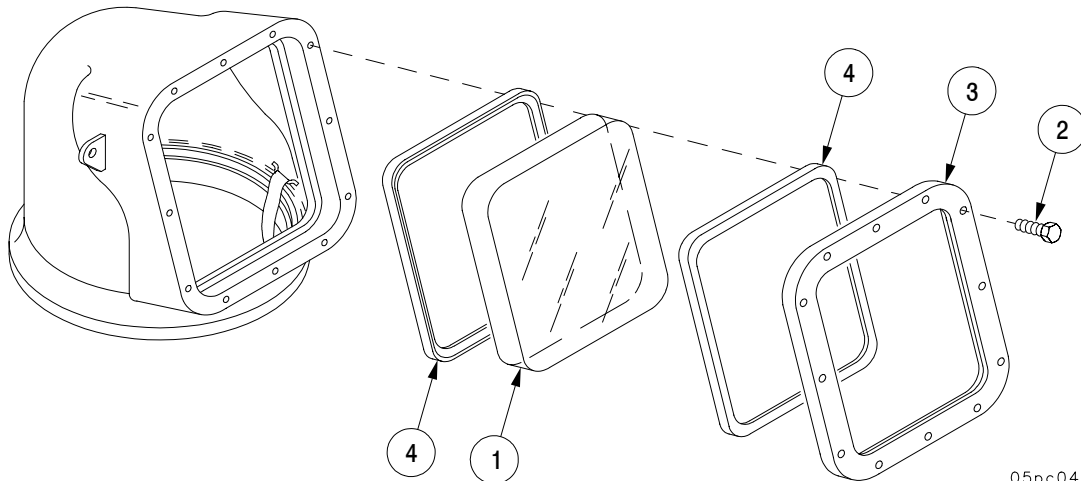
Two

a. Disassembly.

CAUTION

Cover window after removal to prevent damage to window.

- 1 Remove window (1) by removing 12 self-locking screws (2) and retainer (3). Discard self-locking screws.
- 2 Remove and discard two seals (4) from window (1).



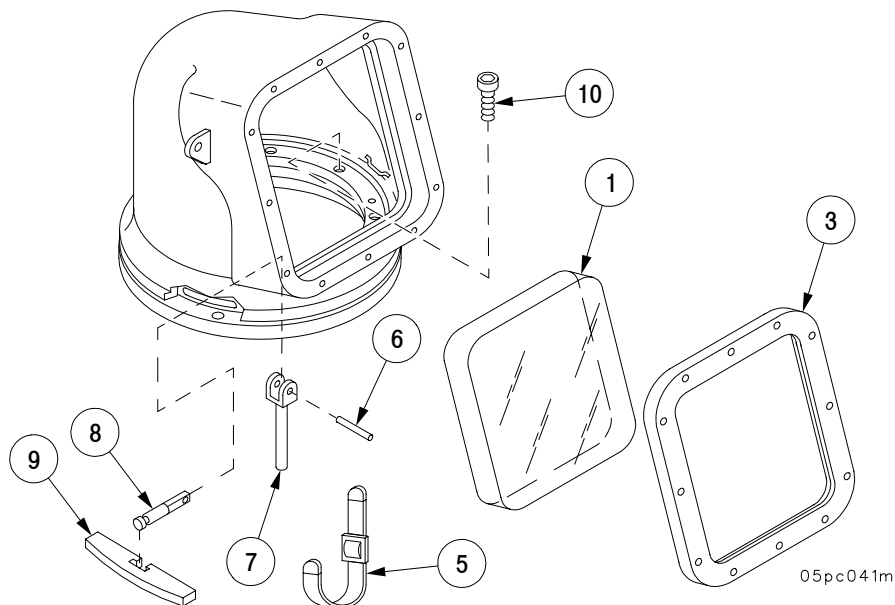
6-1 BALLISTIC COVER - CONTINUED

a. Disassembly - Continued

WARNING

Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause **SERIOUS INJURY**. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).

- 3 Using dry-cleaning solvent, remove sealing compound from window (1) and retainer (3).
- 4 Remove two straps (5).
- 5 Remove two spring pins (6), two clevises (7), two pins (8), and two brakes (9). Discard spring pins.
- 6 Remove eight socket head screws (10).



6-1 BALLISTIC COVER - CONTINUED

a. Disassembly - Continued

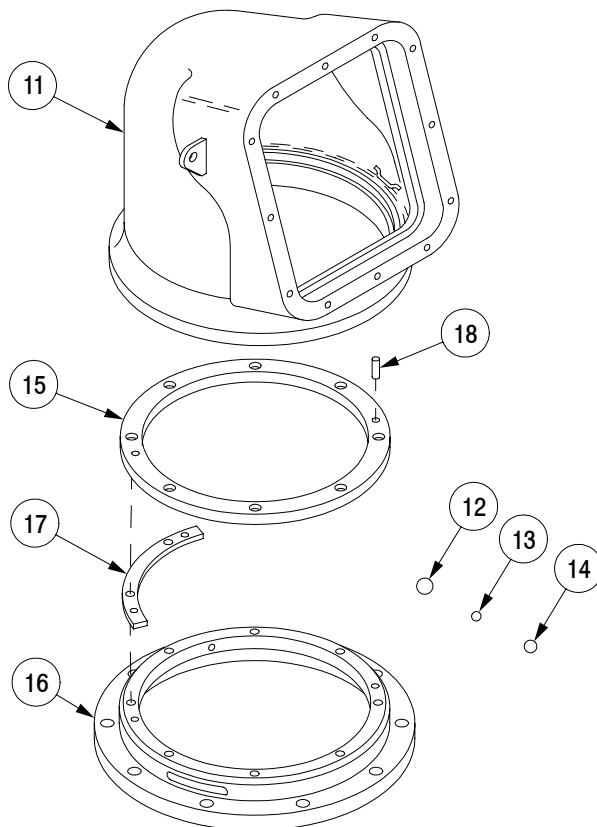
WARNING

Cover is heavy and exceeds one man lift. Use assistant to remove cover to avoid personnel injury.

CAUTION

Ball bearings will fall from ring assembly when cover is lifted. Ensure that all 117 ball bearings are recovered.

- 7 Remove cover (11). Recover and discard all ball bearings (12, 13, and 14).
- 8 Separate upper ring (15) from lower ring (16) and remove shims (17).
- 9 Remove two guide pins (18) from upper ring (15).



05pc042m

6-1 BALLISTIC COVER - CONTINUED

b. Inspection and Repair.**NOTE**

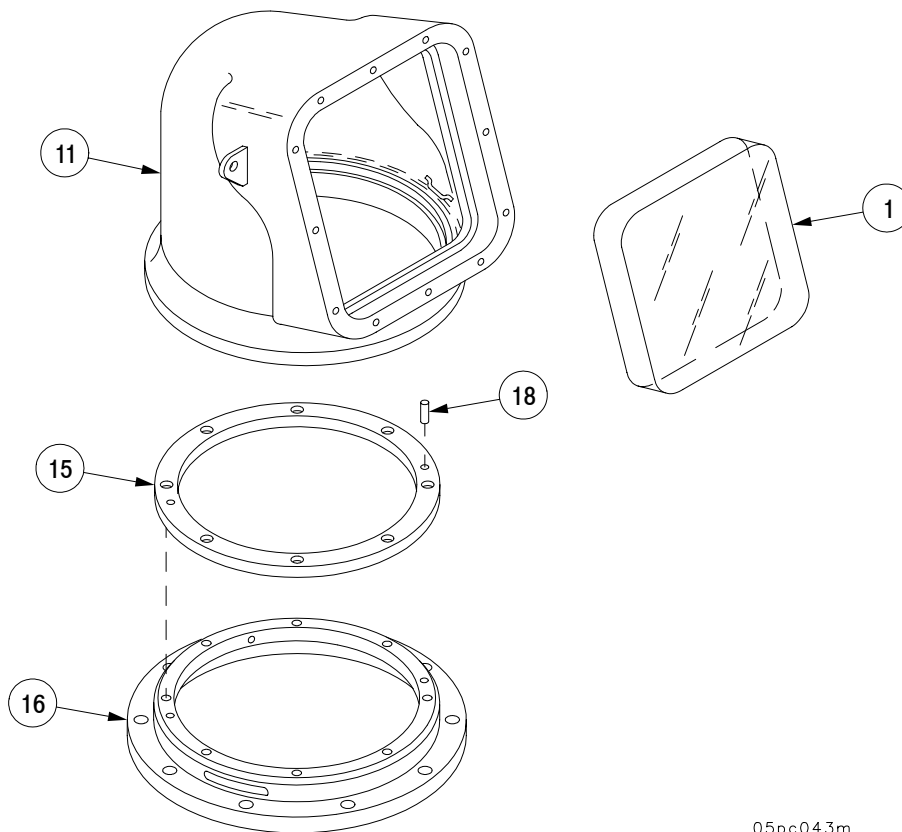
Upper ring and lower ring must be replaced as a matched set.

- 1 Inspect cover (11), upper ring (15), and lower ring (16). Replace if cracked or distorted.
- 2 Inspect threaded holes of cover (11) and lower ring (16). Repair threads if damaged.

NOTE

Replace window if blemishes extend more than two inches from window edge.

- 3 Inspect window (1). Replace if scratched, cracked, or difficult to see through.
- 4 Inspect two alignment pins (18). Replace if bent, cracked, or otherwise damaged.



05pc043m

6-1 BALLISTIC COVER - CONTINUED

c. Assembly.

- 1 Install two guide pins (18) in upper ring (15).

NOTE

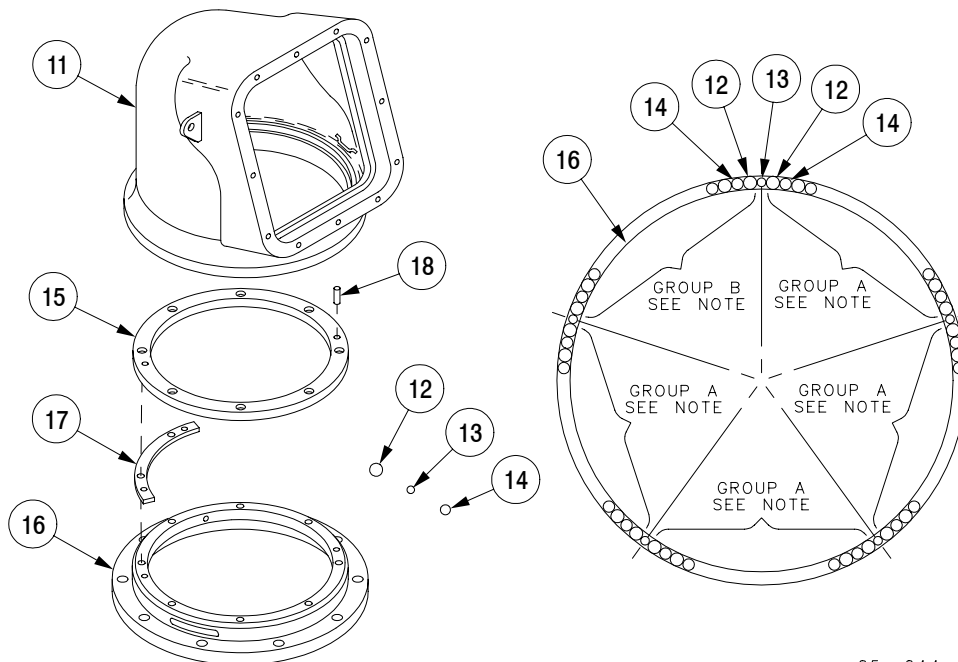
Final number of shims required is determined after assembly. Install original number of shims removed as a starting reference.

- 2 Position shims (17) on lower ring.
- 3 Position upper ring (15) and cover (11) on lower ring (16).

NOTE

Arrangement of ball bearings is as follows: Each group A consists of 23 ball bearings, 12 of 7328567 (12) and 11 of 7328568 (14). Arrange ball bearings in alternating order. Group B consists of 20 ball bearings, 10 of 7328567 (12) and 10 of 7328568 (14). Arrange ball bearings in alternating order. Five ball bearings MS19060-1018 (13) are used to separate each group.

- 4 Install 58 new ball bearings (12), five new ball bearings (13), and 54 new ball bearings (14) into groove formed by lower ring (16), upper ring (15), and cover (11).



05pc044m

6-1 BALLISTIC COVER - CONTINUED

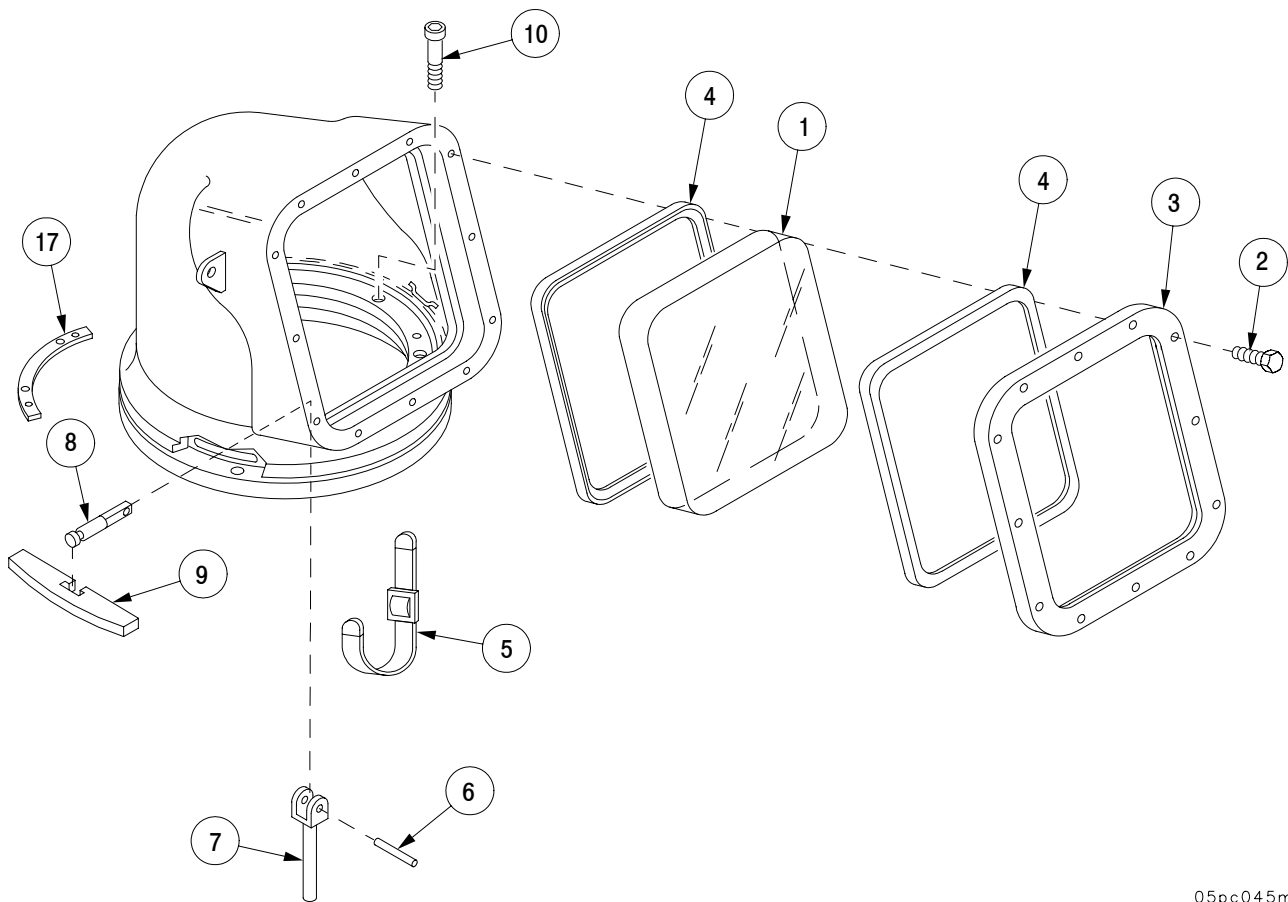
c. Assembly - Continued

- 5 Install eight socket head screws (10) and torque to 34-42 lb-ft. (46-57 N·m).
- 6 Rotate cover to check operations. Add/remove shims (17) to achieve smooth rotation.
- 7 Install two brakes (9), two pins (8), two clevises (7), and two new spring pins (6).
- 8 Install two straps (5).
- 9 Install two new seals (4) on window (1).
- 10 Apply sealing compound to mounting area of retainer (3).

NOTE

Small plate of window must face inside of cover.

- 11 Install window (1) with retainer (3) and 12 new self-locking screws (2). Torque screws to 60-84 lb-in. (6.7-9.4 N·m).



05pc045m

CHAPTER 7

CAB AND CAB BEARING

GENERAL

This chapter illustrates and provides maintenance procedures for the cab and cab bearing. The paragraphs deal, as applicable, with removal, cleaning, inspection, and installation.

CONTENTS

	<u>Page</u>
7-1 CAB REMOVAL	7-2
7-2 CAB BEARING ASSEMBLY	7-10

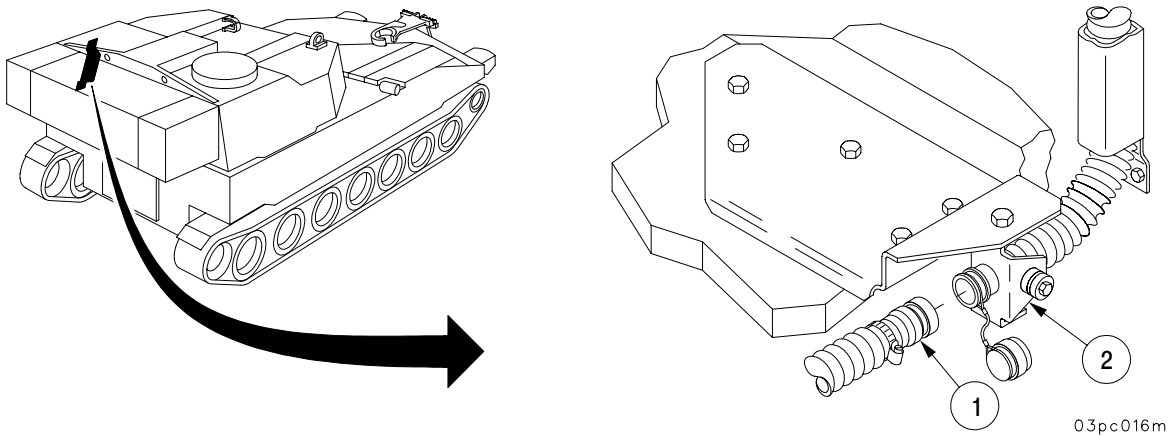
7-1 CAB REMOVAL - CONTINUED

a. Removal.

WARNING

Use a suitable lifting device with a capacity of at least 22,000 pounds (10,000 kilograms) to avoid possible injury or death.

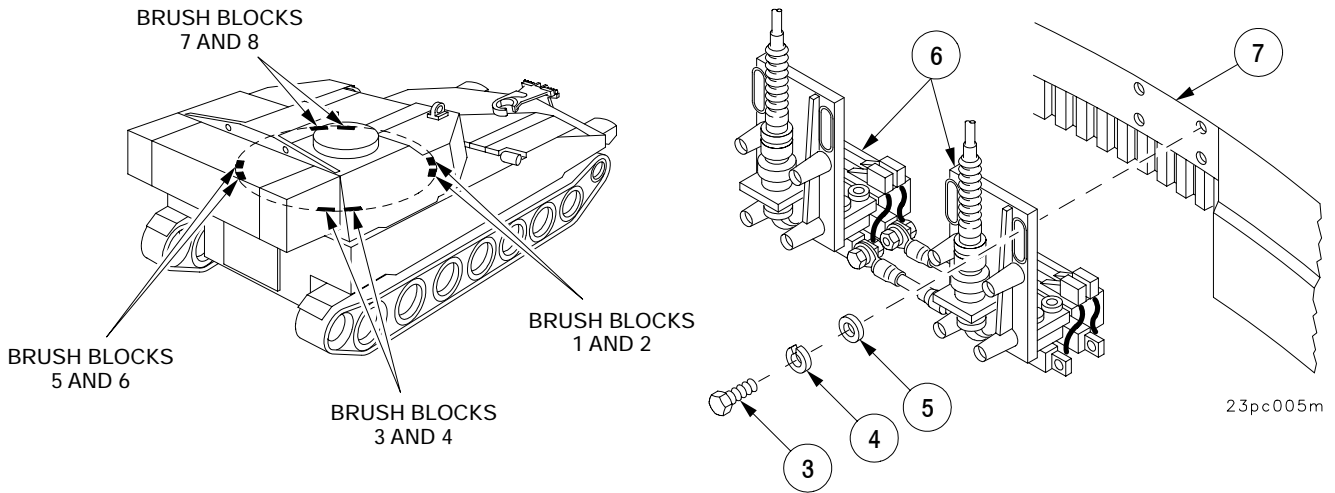
- 1 Disconnect driver's air duct hose coupling half (1) from cab mounting bracket (2).



NOTE

Brush blocks 7 and 8 are removed from cab. Brush blocks 1-6 are disconnected from cab bearing and secured in cab.

- 2 Remove brush blocks 7 and 8 (TM 9-2350-314-20-2-1).
- 3 Remove 24 screws (3), 24 lockwashers (4), and 24 flat washers (5) attaching brush blocks 1-6 (6) to cab bearing (7). Secure brush block sets in cab. Discard lockwashers.



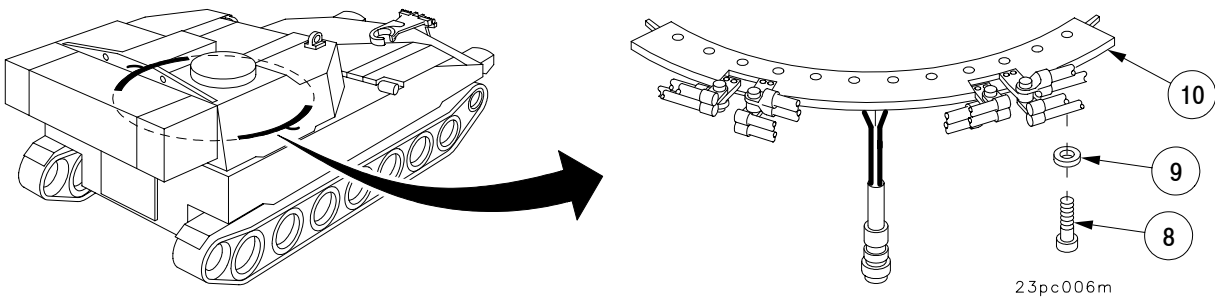
7-1 CAB REMOVAL - CONTINUED

a. Removal - Continued

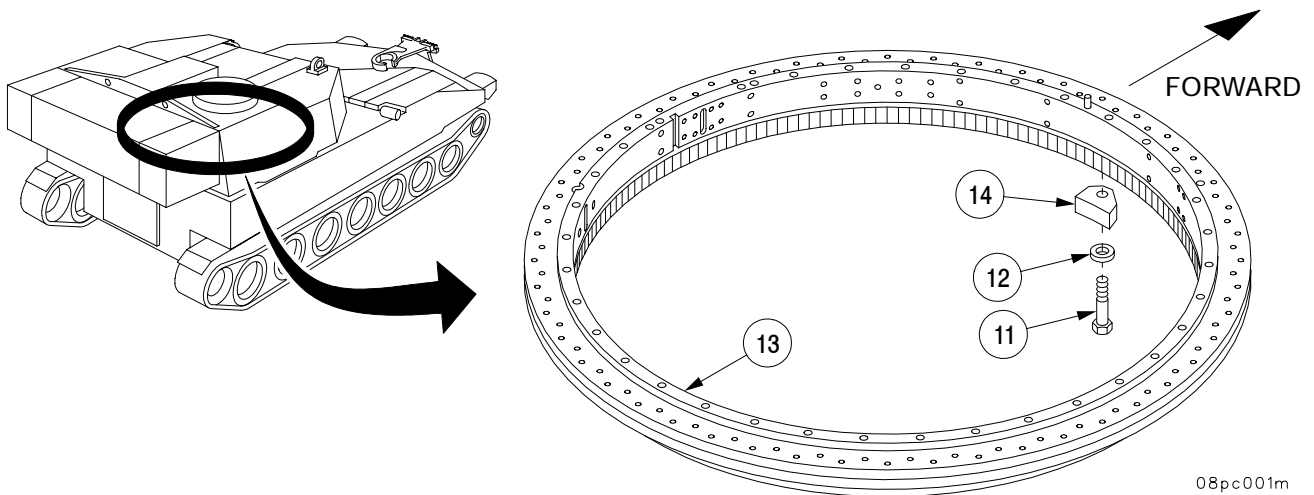
NOTE

Do not disconnect segment assembly leads.

- 4 Remove 24 self-locking screws (8) and 24 flat washers (9) from two segment assemblies (10). Lower segment assemblies. Discard self-locking screws.



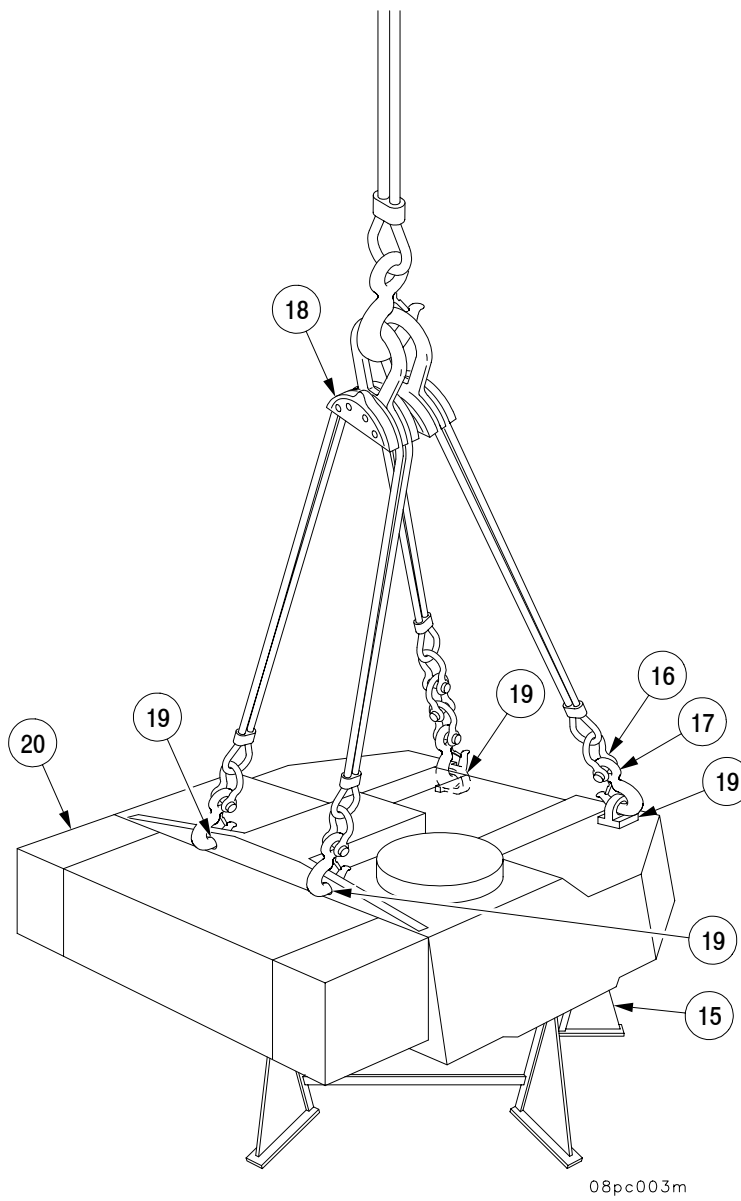
- 5 Remove 48 self-locking screws (11) and 48 flat washers (12) securing cab bearing (13) to hull (14). Discard self-locking screws.



7-1 CAB REMOVAL - CONTINUED

a. Removal - Continued

- 6 Position fabricated stand (15) adjacent to howitzer.
- 7 Attach six shackles (16) and four hooks (17) to cab lifting sling (18).
- 8 Attach cab lifting sling (18) to four cab lifting eyes (19) as shown.
- 9 Raise cab (20) slowly and position on fabricated stand (15).
- 10 Detach cab lifting sling (18) from four cab lifting eyes (19).



7-1 CAB REMOVAL - CONTINUED

b. Installation.

WARNING

Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause **SERIOUS INJURY**. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).

- 1 Using dry-cleaning solvent, clean mating surface of hull prior to installation.
- 2 Ensure threaded holes and locating pins are free of any debris that may interfere with proper installation.
- 3 Apply an even coat of primer coating to the mating surfaces of the hull and cab bearing prior to installation.
- 4 Apply sealant to mating surface of the cab bearing prior to installation on hull.
- 5 Attach cab lifting sling (18) to four cab lifting eyes (19) as shown.
- 6 Raise cab (20) off cab stand (15) and slowly position it over hull (14).

NOTE

A guide rope may be used to align hull alignment pin with alignment hole in cab bearing.

- 7 Align unthreaded cab bearing alignment hole with alignment pin (21) in hull (14).

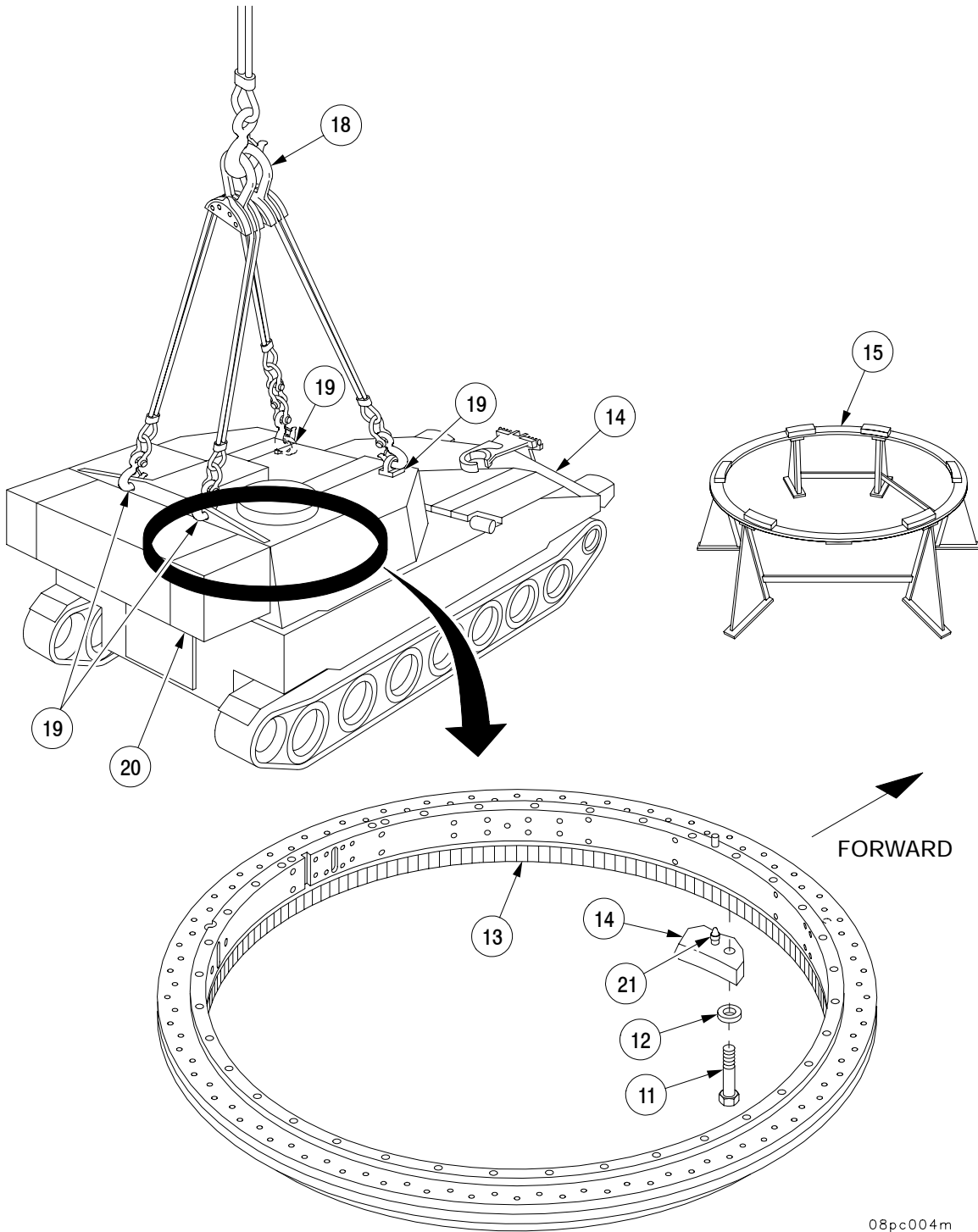
NOTE

Drift bar may be used to align bolt holes.

- 8 Lower cab (20) onto hull (14) slowly.
- 9 Detach cab lifting sling (18) from four cab lifting eyes (19).
- 10 Install 48 new self-locking screws (11) and 48 flat washers (12) to secure cab bearing (13) to hull (14).

7-1 CAB REMOVAL - CONTINUED

b. Installation - Continued



08pc004m

7-1 CAB REMOVAL - CONTINUED

b. Installation - Continued

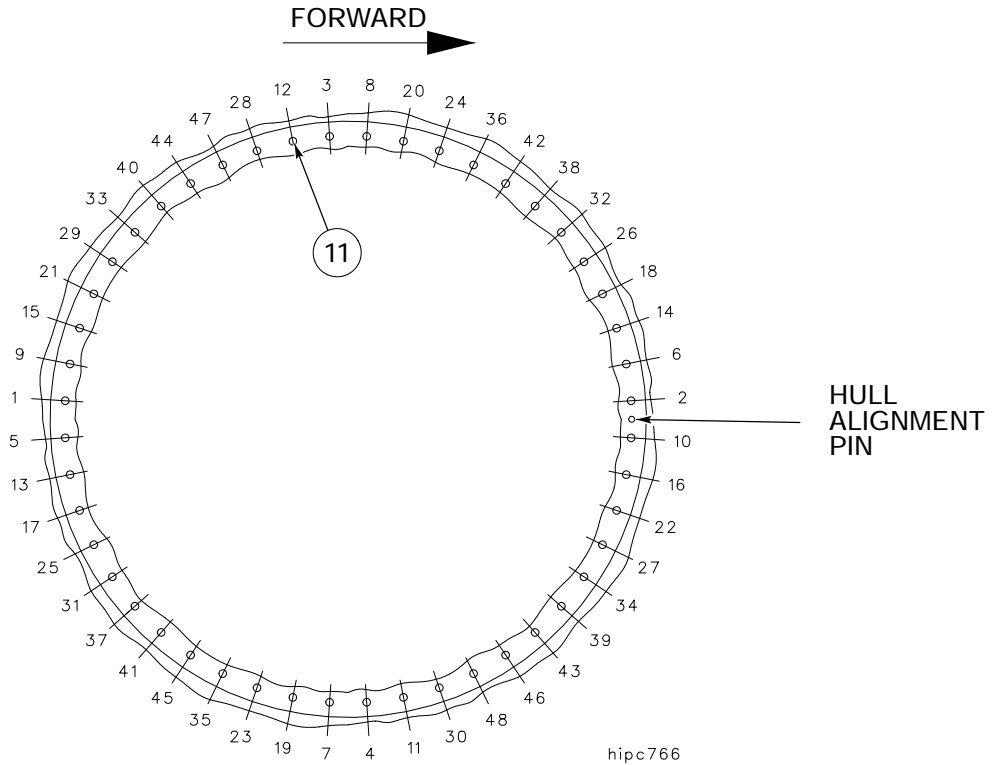
11 Torque 48 bolts (11) using the following torque sequence and values.

NOTE

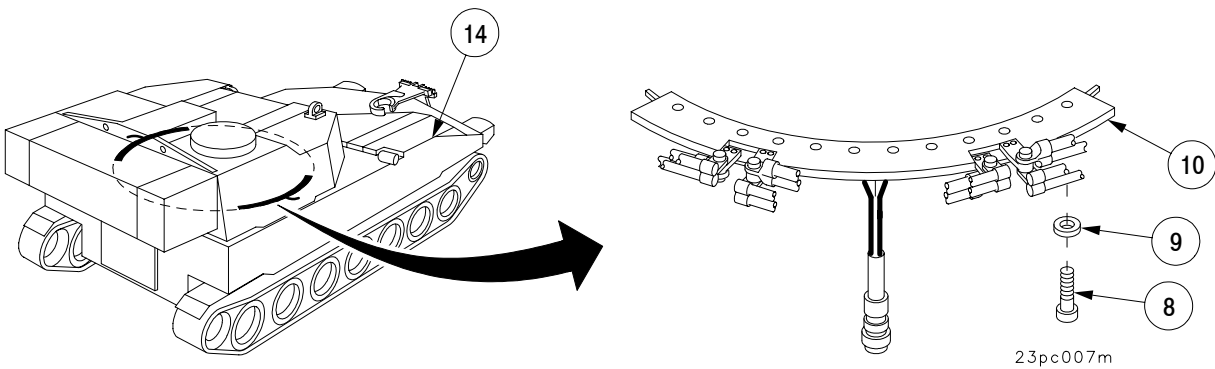
Torque sequentially as indicated:

Initial: 50-80 lb-ft (68-108 N·m)

Final: 340-380 lb-ft (461-515 N·m)



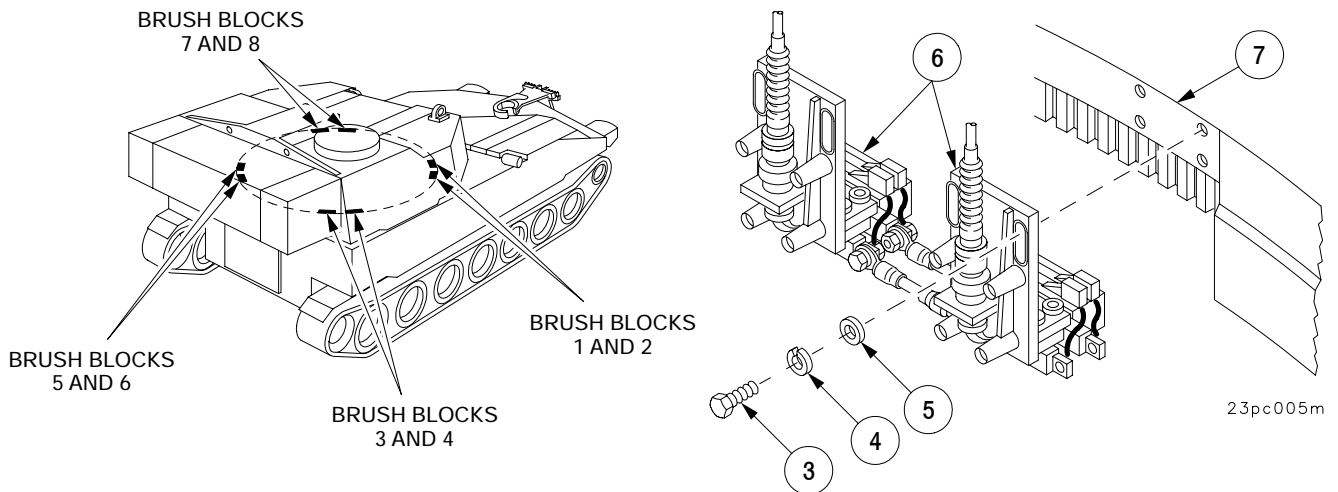
12 Attach two segment assemblies (10) to hull (14) with 24 new self-locking screws (8) and 24 flat washers (9).



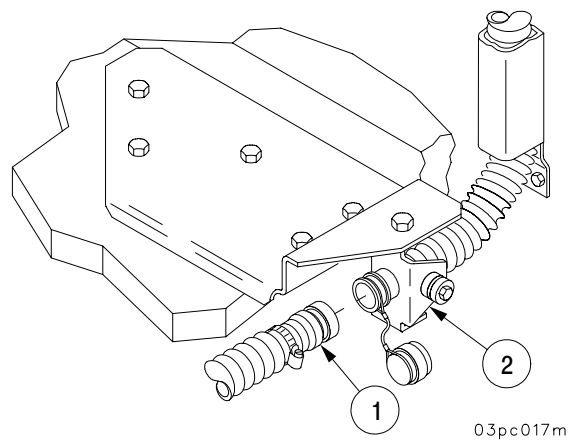
7-1 CAB REMOVAL - CONTINUED

b. Installation - Continued

- 13 Install and adjust brush blocks 7 and 8 (TM 9-2350-314-20-2-1).
- 14 Attach brush blocks 1-6 (6) to cab bearing (7) with 24 screws (3), 24 new lockwashers (4), and 24 flat washers (5).
- 15 Adjust brush blocks 1-6 (6) (TM 9-2350-314-20-2-1).
- 16 Install lead assemblies between brush block sets (TM 9-2350-314-20-2-1).
- 17 Reinstall equipment removed in equipment conditions.

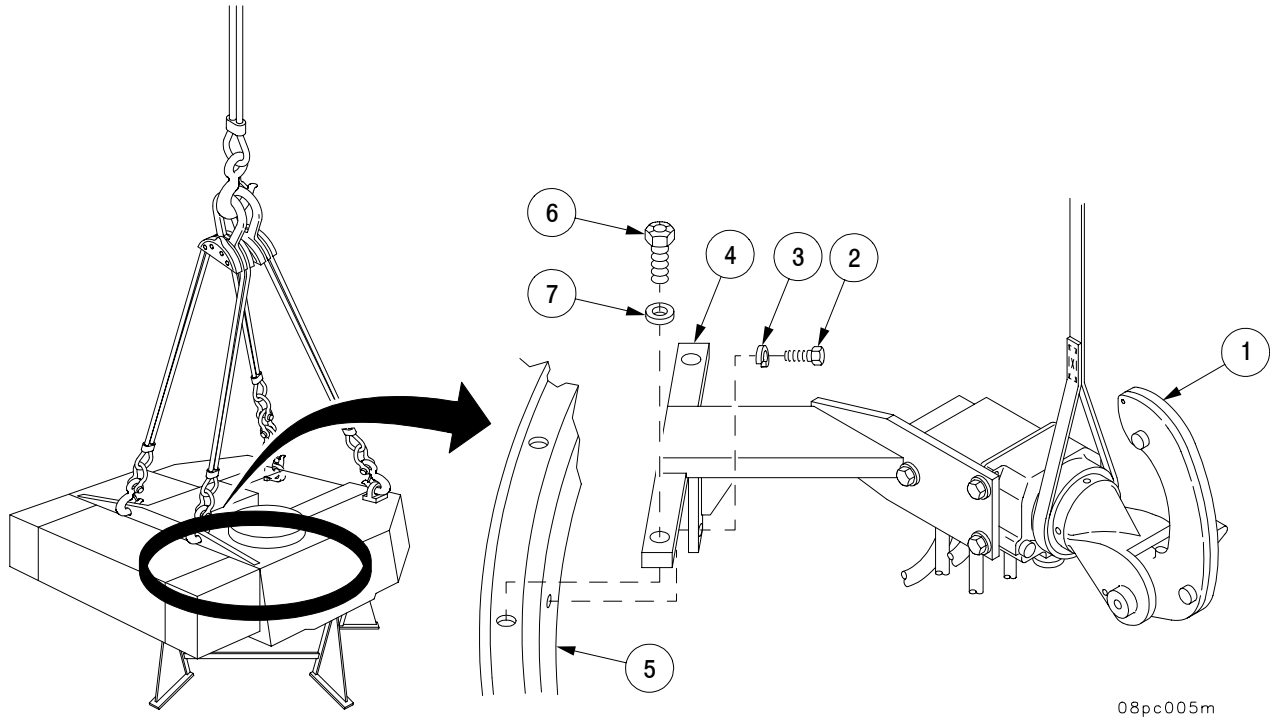


- 18 Reconnect driver's air duct hose coupling half (1) to cab mounting bracket (2).

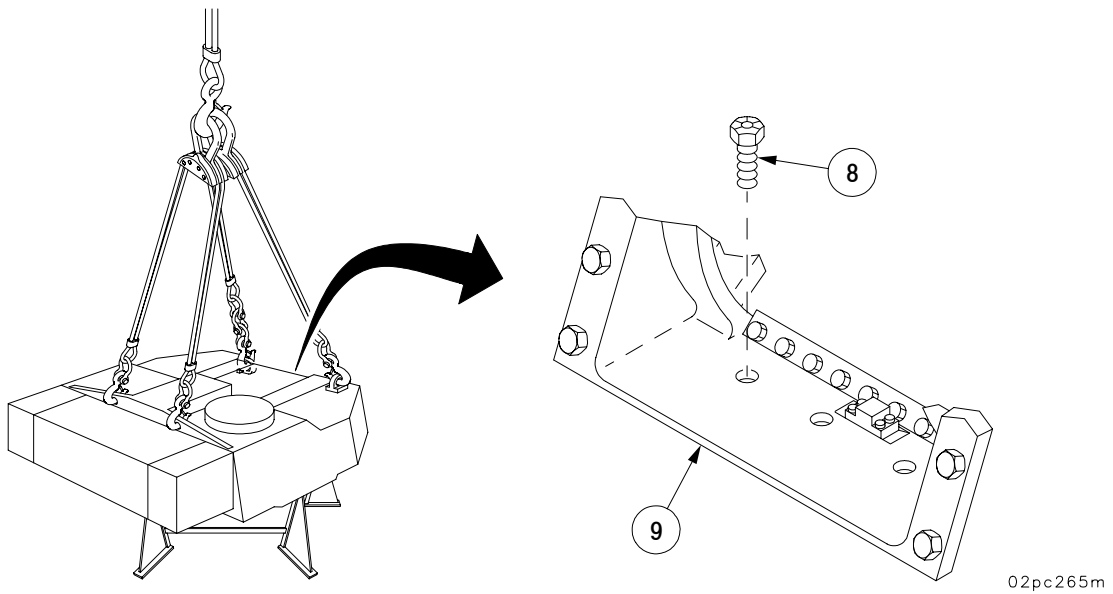


7-2 CAB BEARING ASSEMBLY - CONTINUED

a. Removal - Continued



4 Remove three self-locking bolts (8) from trunnion (9).



7-2 CAB BEARING ASSEMBLY - CONTINUED

a. Removal - Continued

- 5 Remove 21 self-locking bolts (10) and 21 flat washers (11) securing cab bearing (5) to cab (12). Discard self-locking bolts.

WARNING

Use a suitable lifting device with a capacity of at least 22,000 pounds (10,000 kilograms) to avoid possible injury or death.

NOTE

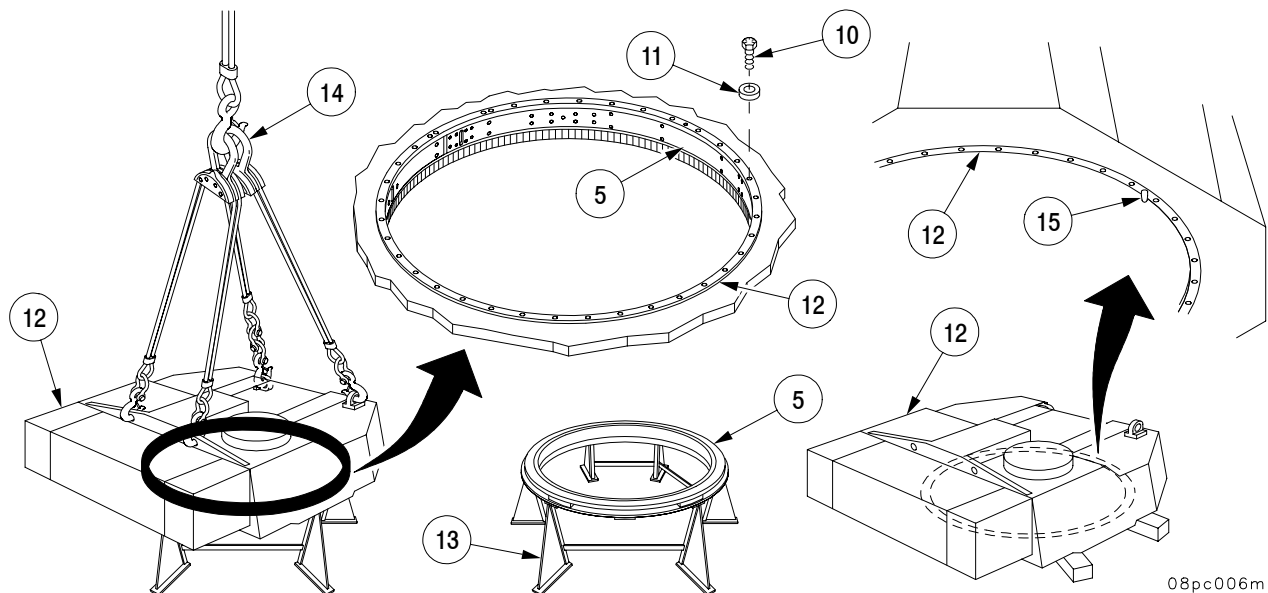
Pry bar may be required to remove cab bearing from cab.

- 6 Lift cab (12) off of cab bearing (5) leaving cab bearing on fabricated stand (13).
- 7 Place cab (12) on suitable wooden blocks. Remove cab lifting sling (14) from cab.

NOTE

If cab alignment pin cannot be removed by grasping with pliers, trunnion bracket must be removed to gain access to top of pin.

- 8 Inspect cab alignment pin (15). Replace if damaged.



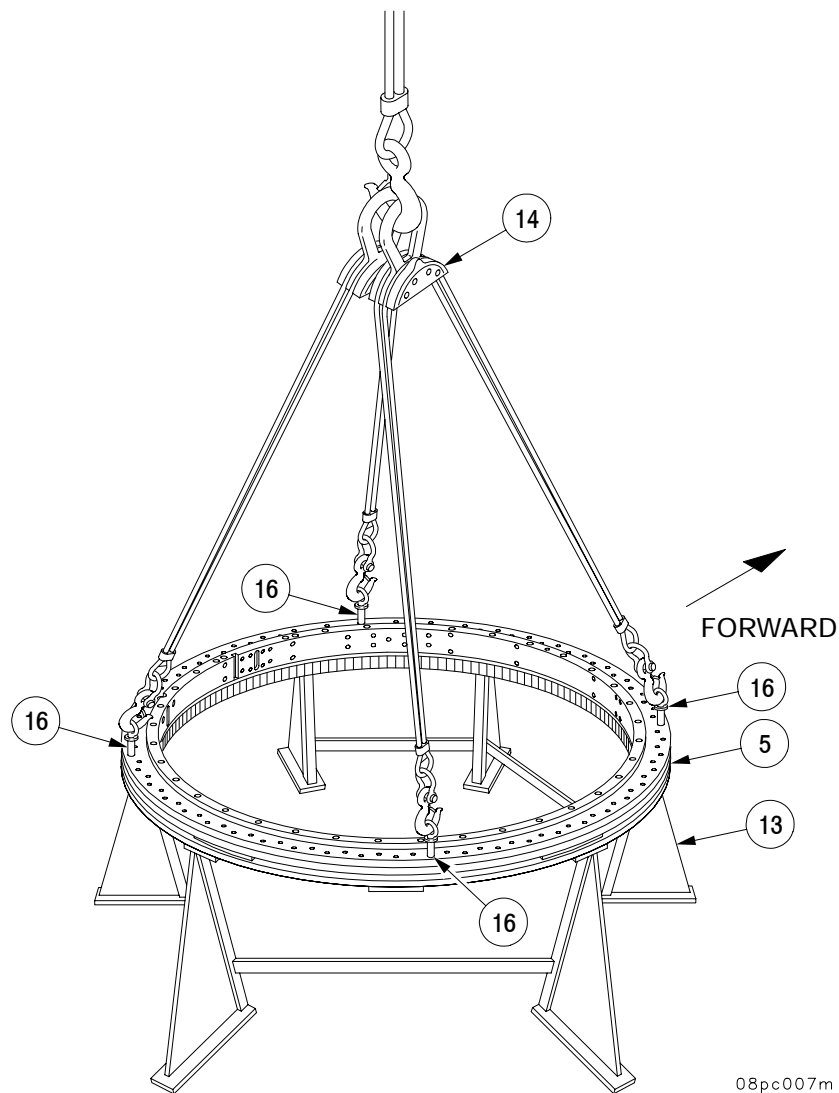
08pc006m

7-2 CAB BEARING ASSEMBLY - CONTINUED

b. Repair.**NOTE**

If cab bearing must be moved from fabricated stand, perform steps 1-3. If not, go to step 4.

- 1 Install four eyebolts (16) (one in every 12th hole) in cab bearing (5).
- 2 Attach cab lifting sling (14) to four eyebolts (16), lift cab bearing (5) off of fabricated stand (13) and position on suitable wooden blocks.
- 3 Disconnect cab lifting sling (14) and remove four eyebolts (16).



7-2 CAB BEARING ASSEMBLY - CONTINUED

b. Repair - Continued

WARNING

Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause **SERIOUS INJURY**. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).

- 4 Clean top and bottom mating surfaces of cab bearing (5) using dry-cleaning solvent.
- 5 Inspect cab bearing (5) for cracks. Remove minor nicks and burrs with a fine stone. Inspect threaded holes for damaged threads. Retap threads, if damaged.

c. Installation.

- 1 Apply sealing compound at top mating surface of cab bearing (5) before installation.
- 2 Attach cab lifting sling (14) to cab (12).
- 3 Position cab (12) over cab bearing (5) on fabricated stand (13).

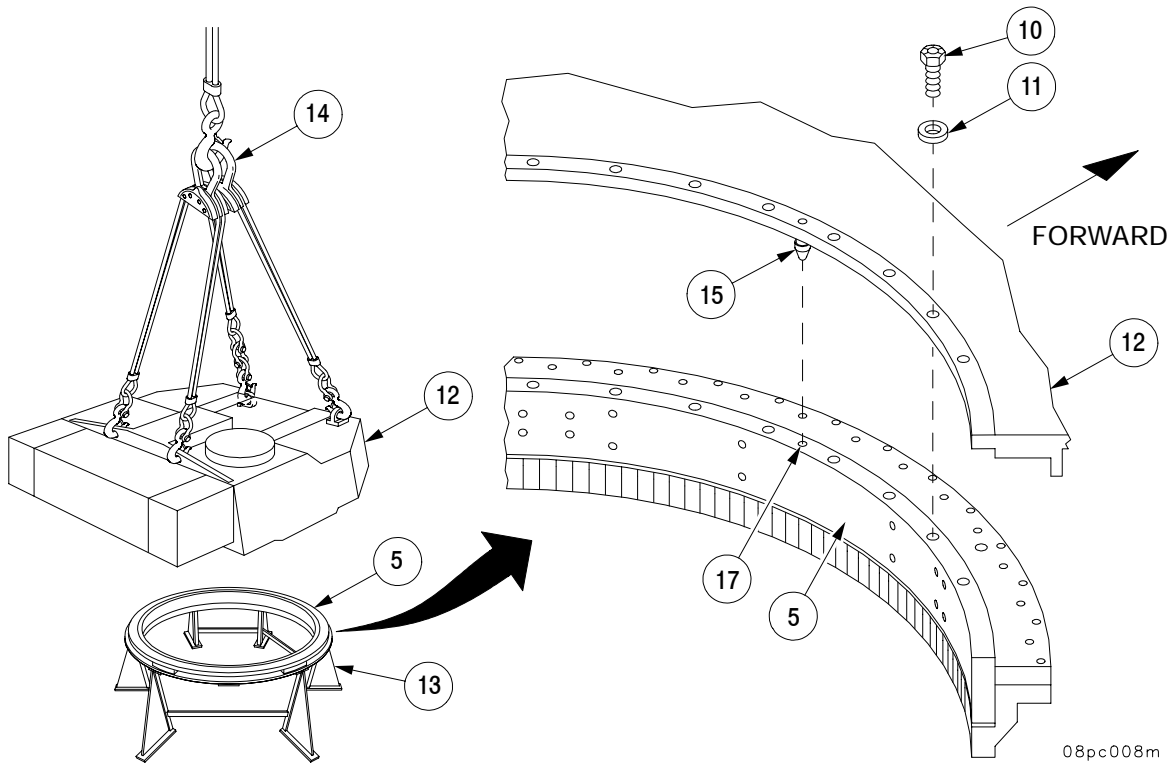
NOTE

Drift bar may be used to align holes.

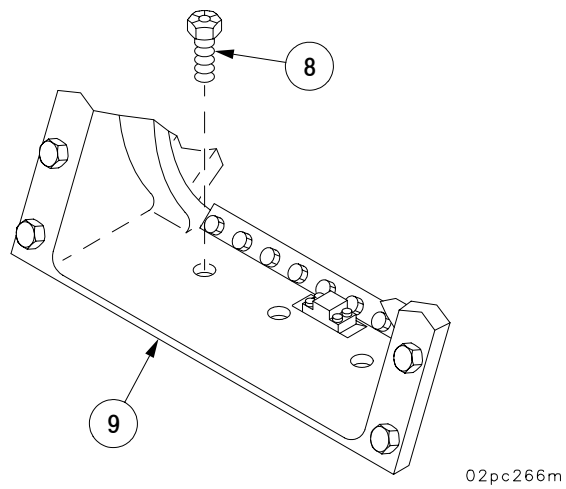
- 4 Align unthreaded cab bearing alignment hole (17) with cab alignment pin (15).
- 5 Lower cab (12) onto cab bearing (5) slowly.
- 6 Install 21 flat washers (11) and 21 new self-locking bolts (10).

7-2 CAB BEARING ASSEMBLY - CONTINUED

c. Installation - Continued



7 Install three new self-locking bolts (8) in trunnion (9).



7-2 CAB BEARING ASSEMBLY - CONTINUED

c. Installation - Continued

- 8 Install two new self-locking bolts (6) and two flat washers (7) securing gunner's control handle bracket (4) to cab (12).
- 9 Install screw (2) and new lockwasher (3) securing gunner's control handle mounting bracket (4) to cab bearing (5).
- 10 Remove endless sling from gunner's control handle (1) and cab ceiling.

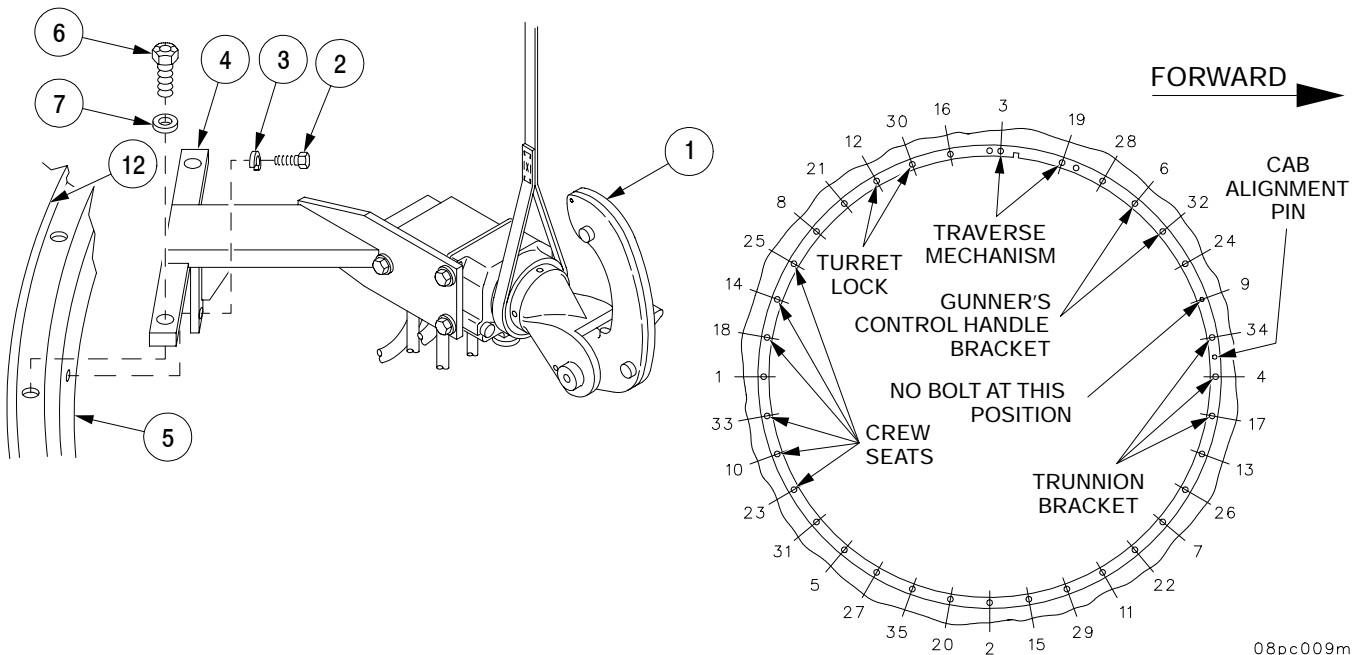
NOTE

Do not torque bolts until crew seats, traverse mechanism, and turret lock have been installed in cab and cab has been installed on hull.

- 11 Torque 34 bolts using the following torque values and sequence.

NOTE

Torque sequence criss-cross:
 INITIAL: 50-80 lb-ft (68-108 N·m)
 FINAL: 340-380 lb-ft (461-515 N·m)



08pc009m

CHAPTER 8

MICROCLIMATE CONDITIONING SYSTEM

GENERAL

This chapter illustrates and provides the removal, inspection, repair, installation, and replacement procedures for the Microclimate Conditioning System (MCS). These maintenance procedures are functions authorized for direct support level maintenance.

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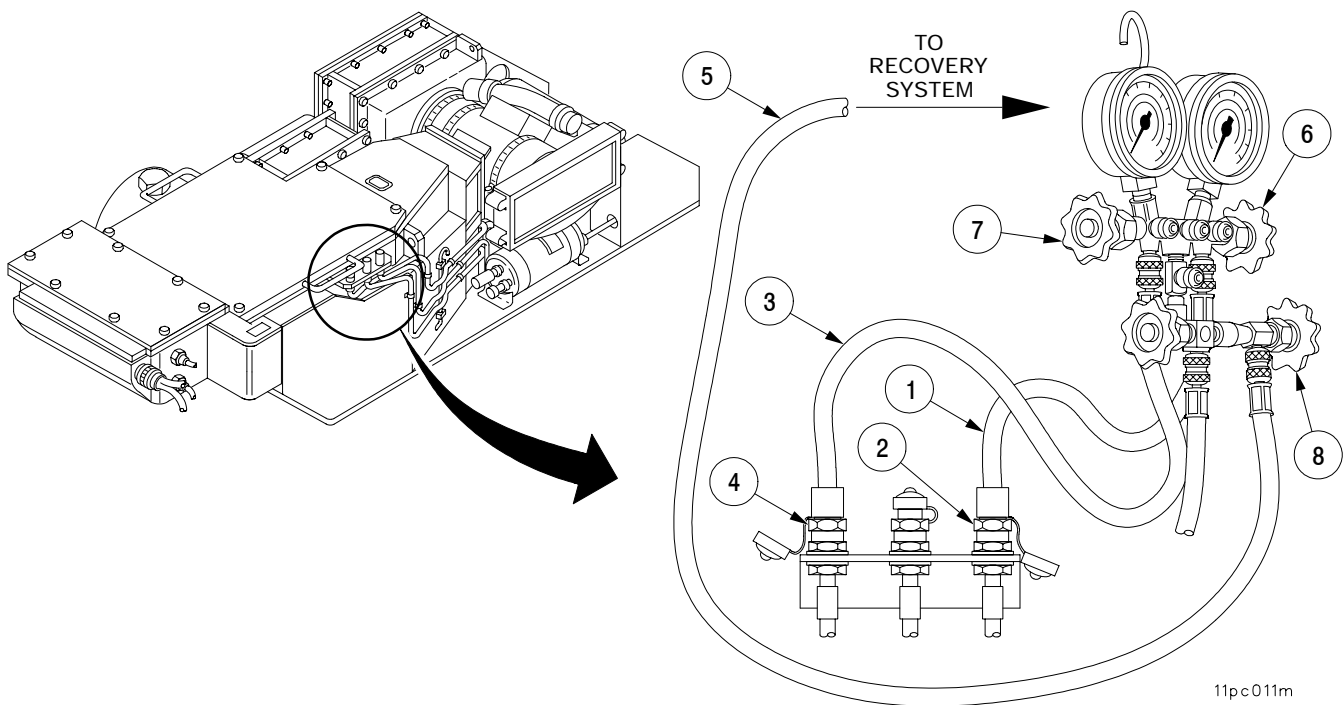
8-1 MCS PACK SERVICE - CONTINUED

a. Discharging - Continued

WARNING

To prevent accidental exposure to R134A, leading to serious personal injury, make sure all manifold shutoff valves are completely closed unless otherwise specified.

- 1 Connect service manifold discharge line (1) to MCS discharge port (2).
- 2 Connect manifold suction line (3) to MCS suction port (4).
- 3 Connect end of manifold common line (5) to recovery system.
- 4 Open service manifold discharge valve (6) and suction valve (7).
- 5 Open manifold common valve (8). Operate recovery system until 9-in. mercury vacuum is maintained.
- 6 When refrigerant gas stops flowing (hissing sound stops), close manifold common valve (8), service manifold discharge valve (6), and suction valve (7).
- 7 Remove manifold common line (5) from recovery system.
- 8 Remove suction (3) from MCS suction port (4).



8-1 MCS PACK SERVICE - CONTINUED

b. Preparation for debrazing and brazing.

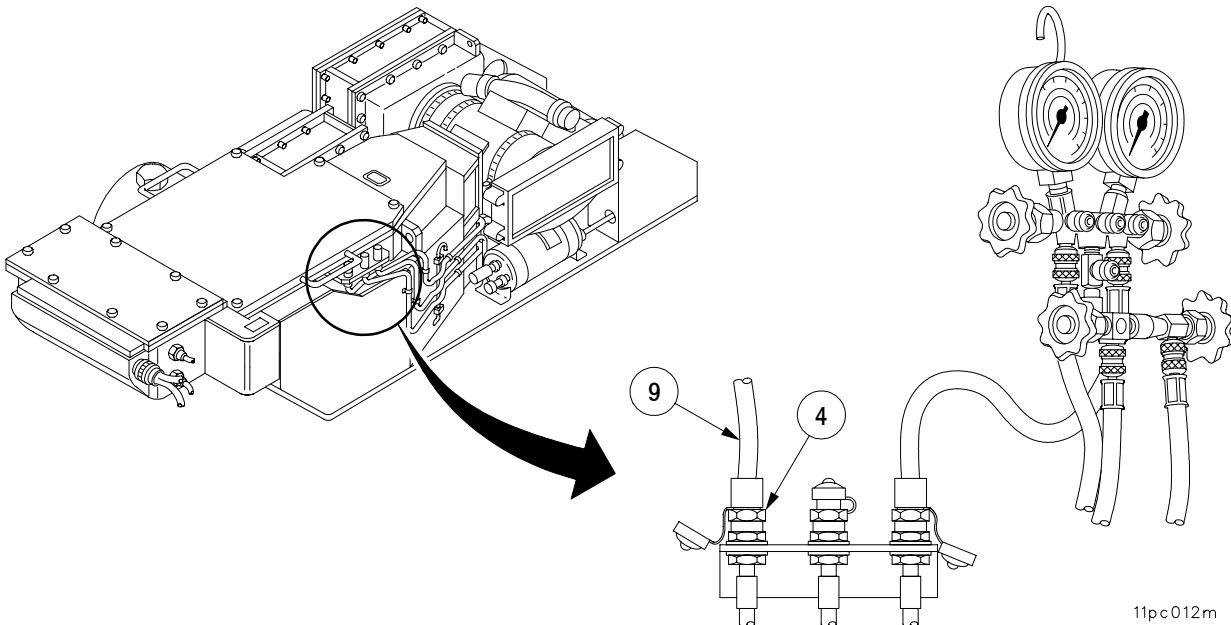
WARNING

- Freon loop must be discharged before performing debrazing and brazing procedure. Heat will be applied to Freon components during this procedure. Heat causes the refrigerant to break down and form carbonyl chloride, a highly toxic and corrosive gas.
- To prevent accidental exposure to R134A, make sure that all manifold valves are completely closed unless otherwise specified.

CAUTION

Perform this procedure even if there are no brazed parts to be replaced. This procedure minimizes residual moisture in Freon loop and prevents oxidation of metal parts.

- 1 Connect an open vent line (9) (unconnected line supplied in refrigeration service tool kit) to MCS manifold suction port (4).



11pc012m

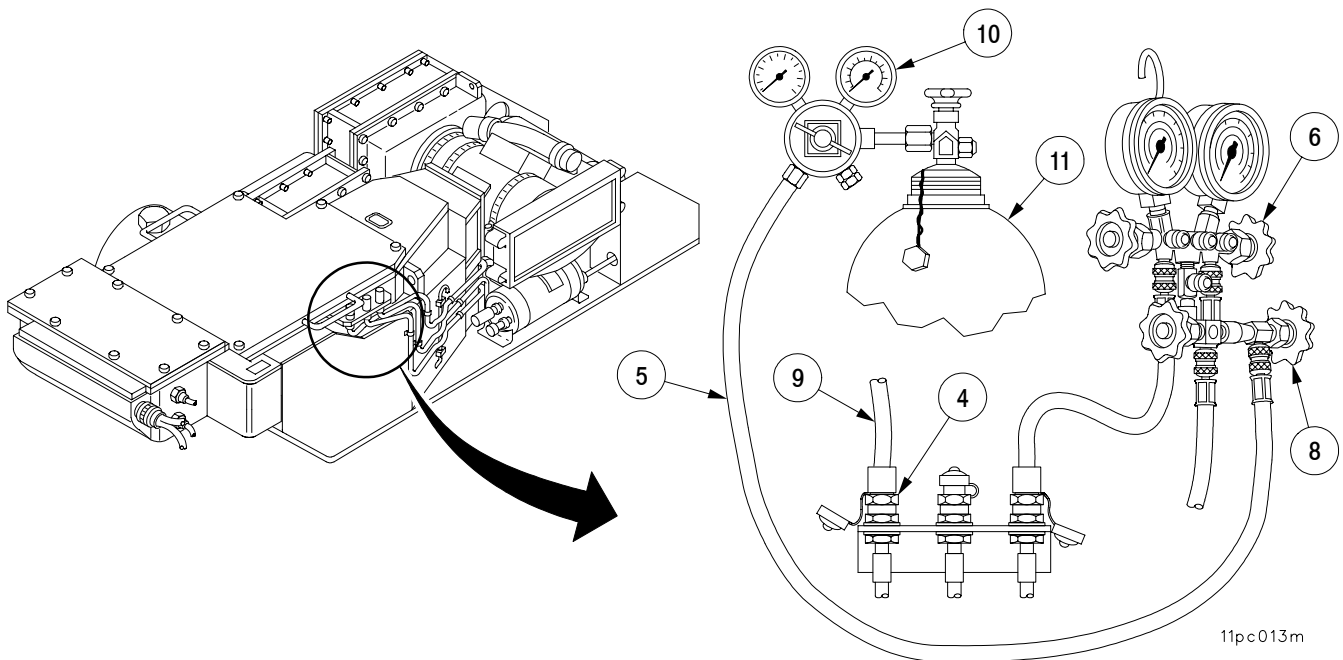
8-1 MCS PACK SERVICE - CONTINUED

b. Preparation for debrazing and brazing - Continued

WARNING

- Make sure that your work area is well ventilated. Exposure to nitrogen can cause asphyxiation.
- Make sure bottle being used contains nitrogen. Nitrogen bottles are marked with one or two black bands.

- 2 Connect nitrogen regulator (10) to bottle of nitrogen (11).
- 3 Connect service manifold common line (5) to nitrogen regulator (10).
- 4 Open service manifold discharge valve (6) and common valve (8).
- 5 Open nitrogen bottle (11) and adjust nitrogen regulator (10) to obtain a flow of less than 1-2 cfm.
- 6 Replace faulty portion of Freon system.
- 7 Close nitrogen regulator (10).
- 8 Close service manifold discharge valve (6) and common valve (8).
- 9 Disconnect open vent line (9) from MCS suction port (4).
- 10 Disconnect service manifold common line (5) from nitrogen regulator (10) and disconnect nitrogen regulator (10) from nitrogen bottle (11).



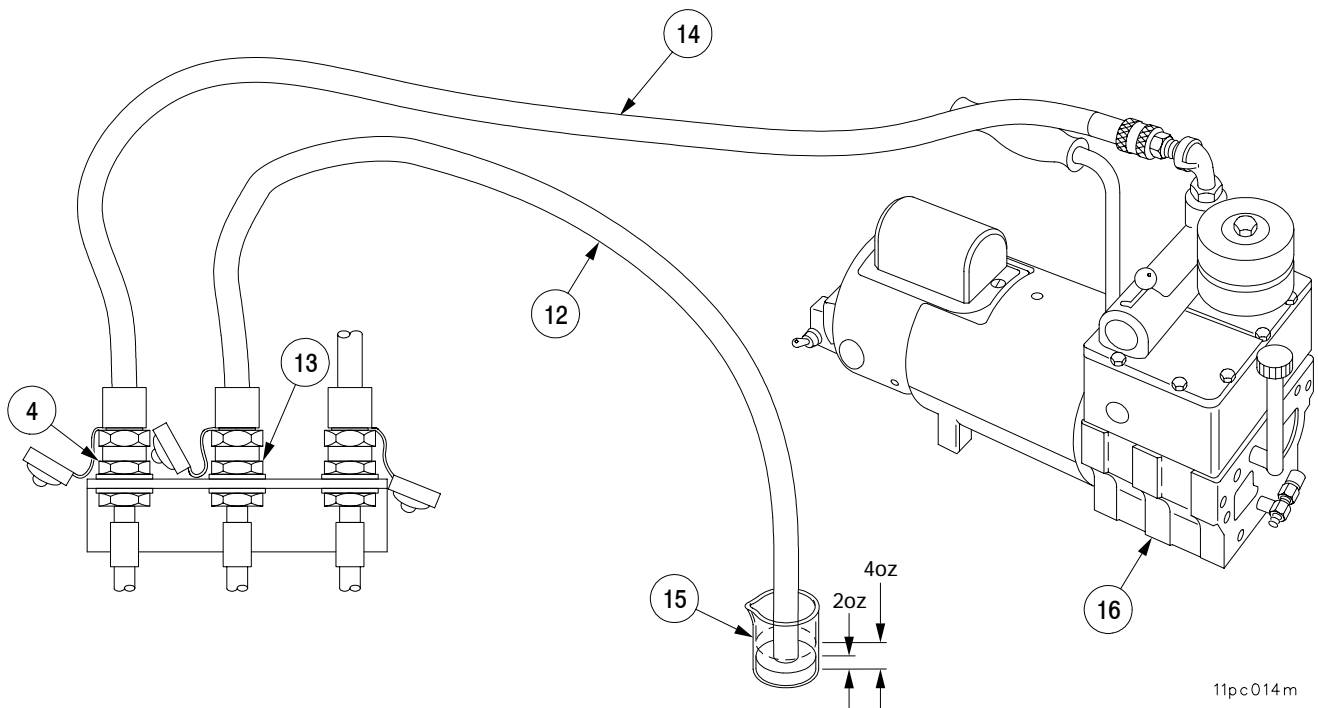
8-1 MCS PACK SERVICE - CONTINUED

c. Evacuating.

NOTE

- If a new filter drier was not installed, install new filter drier prior to evacuating.
- The procedures described in steps 1 thru 7 are performed on a drained system prior to evacuation.
- If no oil loss has occurred, proceed to step 8.

- 1 Connect hose (12) to MCS liquid port (13).
- 2 Connect vacuum pump hose (14) to MCS service manifold suction port (4).
- 3 Fill graduated beaker (15) with 4 oz of refrigerant oil.
- 4 Submerge open end of hose (12) into beaker of oil (15).
- 5 Turn on vacuum pump (16).
- 6 When quantity of oil left in beaker (15) is 2 oz, remove open end of hose (12) from oil and hold up.
- 7 When all of the oil is drawn into MCS pack from hose (12), turn off vacuum pump (16), disconnect hose (12) from MCS service manifold liquid port (13), and disconnect vacuum pump hose (14) from MCS service manifold suction port (4).



11pc014m

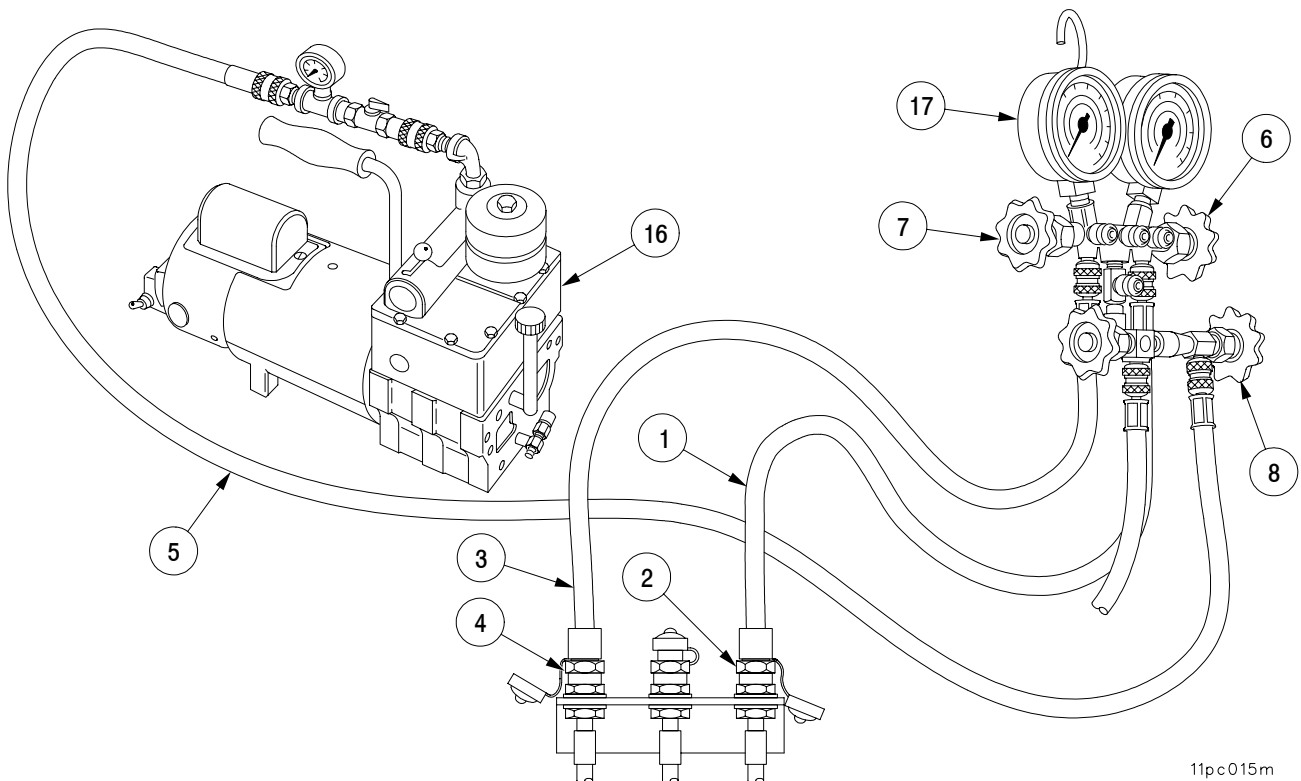
8-1 MCS PACK SERVICE - CONTINUED

c. Evacuating - Continued

- 8 Connect vacuum pump (16) to manifold common line (5).
- 9 Connect service manifold suction line (3) to MCS suction port (4).
- 10 Connect service manifold discharge line (1) to MCS discharge port (2).
- 11 Turn on vacuum pump (16).
- 12 Open service manifold discharge valve (6), suction valve (7), and common valve (8).
- 13 Continue running vacuum pump (16) to maintain reading of 29-in. Hg on compound gage (17) for a minimum of 1 hour.

NOTE

If a compound gage indication of 29-in. Hg cannot be reached, there may be a problem with the pump or a leak in the system. In either case, do not continue the evacuation procedure until 29-in. Hg on compound gage can be maintained.



11pc015m

8-1 MCS PACK SERVICE - CONTINUED

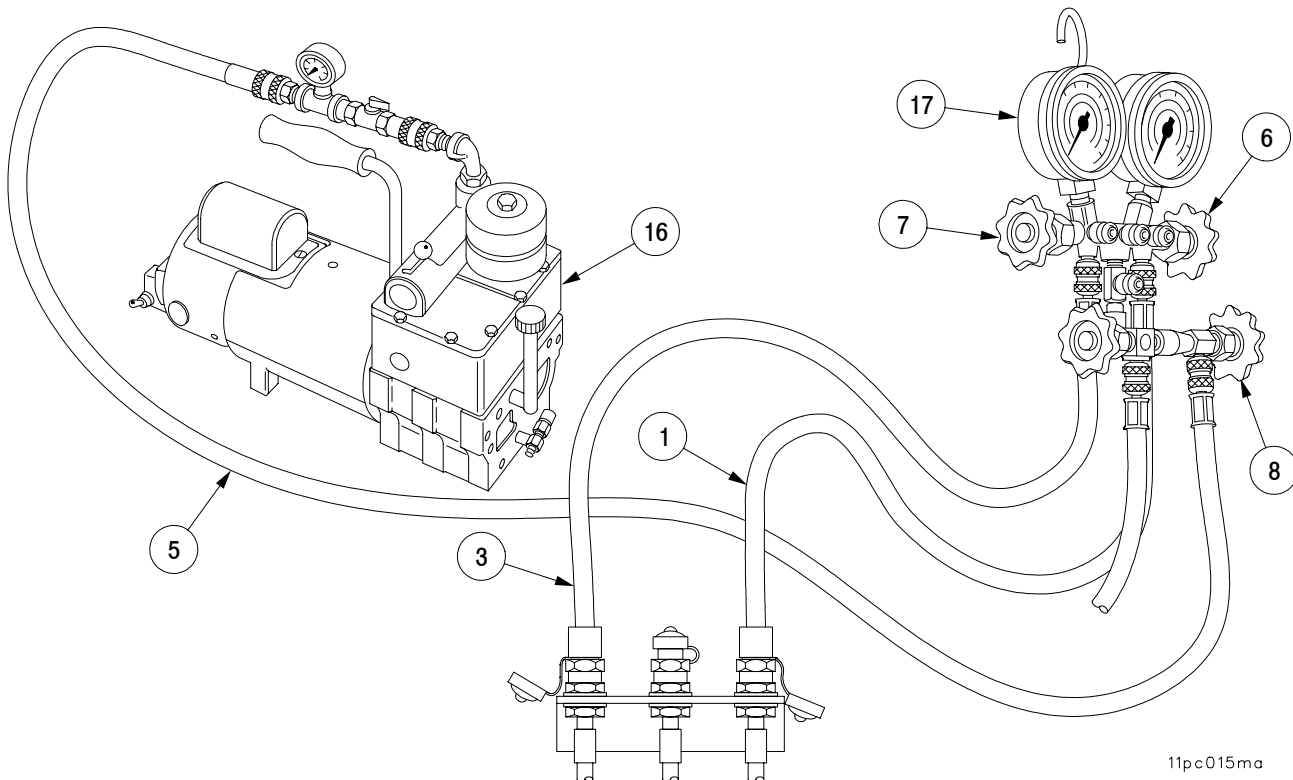
c. Evacuating - Continued

- 14 Close common valve (8).
- 15 Remove common hose (5) from vacuum pump (16).
- 16 Turn off vacuum pump (16).

NOTE

There will be an initial decrease in the compound gage reading after the vacuum pump is turned off. The decrease will take less than 3 minutes after which the compound gage reading must remain constant.

- 17 After allowing the system to stabilize, note the compound gage (17) reading and determine if there is a leak.
- 18 Close service manifold discharge valve (6) and suction valve (7).
- 19 Disconnect service manifold discharge line (1) and suction line (3).



11pc015ma

8-1 MCS PACK SERVICE - CONTINUED

d. Charging.**WARNING**

To prevent accidental exposure to R134A, make sure all manifold valves are completely closed, unless otherwise specified, to prevent serious injury.

CAUTION

Make sure R134A is introduced only through manifold common port. Introduction of R134A into suction port of MCS pack can result in pressure buildup that could permanently damage compressor.

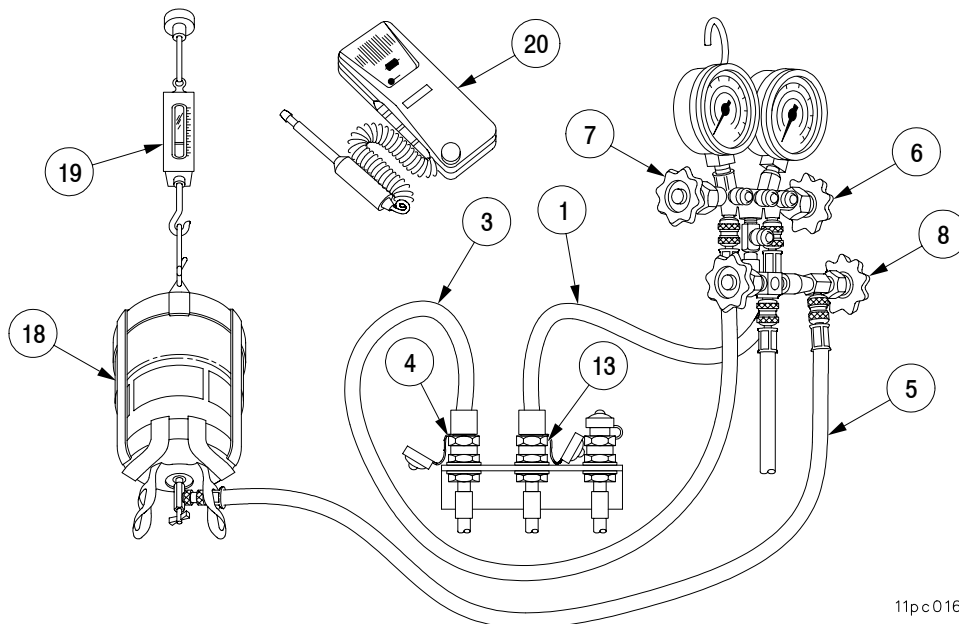
NOTE

- The system must be evacuated before it can be charged. Evacuation will minimize residual moisture in Freon loop and prevent oxidation of metal parts.
- If R134A cylinder is equipped with LIQUID-GAS ONLY switch, use switch accordingly. If cylinder is not equipped with a switch, it must be held rightside-up to flow gas or upside-down to flow liquid.

8-1 MCS PACK SERVICE - CONTINUED

d. Charging - Continued

- 1 Connect R134A bottle (18) to scale (19) and connect service manifold common line (5).
- 2 Connect service manifold suction line (3) to MCS suction port (4) and service manifold discharge line (1) to MCS liquid port (13).
- 3 Open R134A bottle (18) to flow refrigerant gas.
- 4 Open service manifold discharge valve (6), suction valve (7), and common valve (8) to purge the lines with refrigerant gas.
- 5 Close R134A bottle (18).
- 6 Close service manifold discharge valve (6), suction valve (7), and common valve (8).
- 7 Hang R134A bottle (18) on hanging scale (19) and determine bottle weight.
- 8 Subtract 3 lbs 10 oz. from R134A bottle weight, determined above. This will be weight of R134A bottle when system is fully charged with liquid refrigerant.
- 9 Open service manifold discharge valve (6) and common valve (8).
- 10 Slowly open R134A bottle (18).
- 11 When R134A bottle weight has decreased to the weight determined above \pm 2 ounces, close R134A bottle (18), service manifold common valve (8) and discharge valve (6).
- 12 Disconnect service manifold discharge line (1) and suction line (3).
- 13 Check system for leaks with electronic leak detector (20) (part of refrigeration service tool kit). Pay particular attention to brazed joints.



11pc016m

8-2 GAS REGULATING VALVE.

This task covers: a. Removal

b. Installation

INITIAL SETUP

Tools

Refrigeration service tool kit
(SC 5180-90-N18)

Equipment Conditions

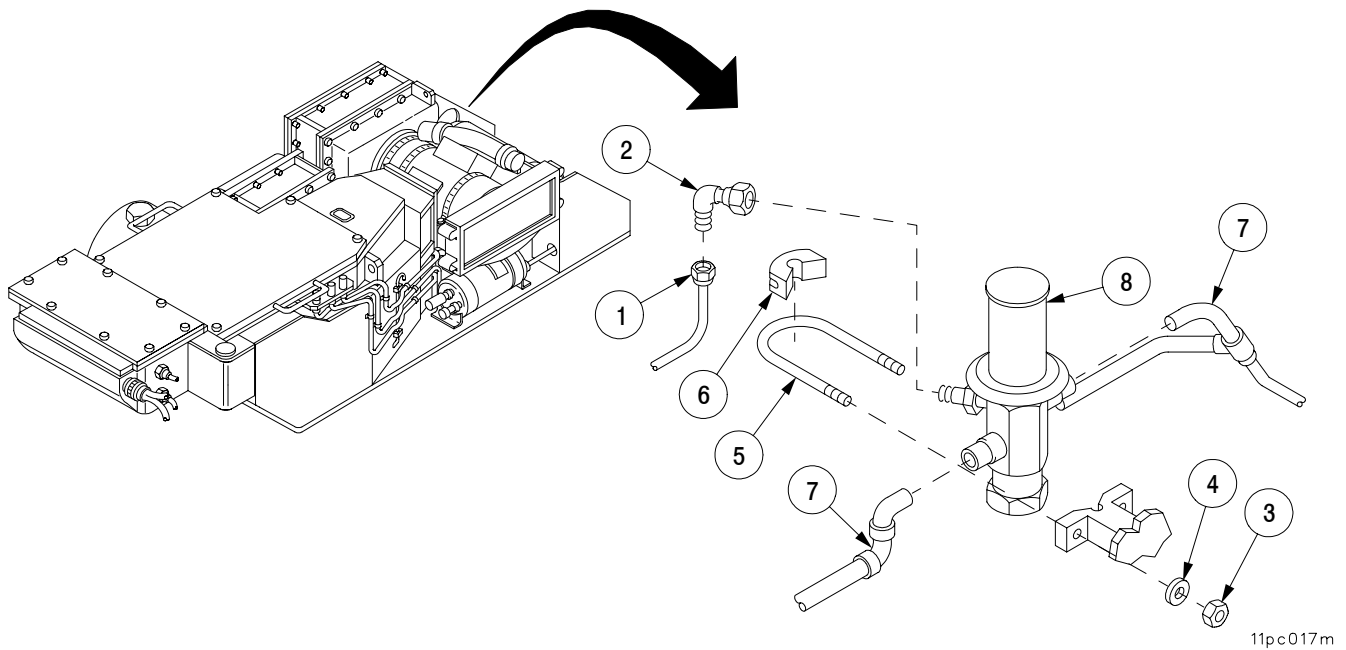
MCS pack removed (TM 9-2350-314-20-2-2)
MCS pack discharged and prepared
for debrazing and brazing (para 8-1)

Materials/Parts

Oil lubricant (item 50, Appx B)
Self-locking nut (2) (item 35, Appx E)
Sealing compound (item 37, Appx B)
Alloy braze (item 17, Appx B)
Silver braze (item 18, Appx B)

a. Removal.

- 1 Loosen and remove nut (1) from elbow (2).
- 2 Remove two self-locking nuts (3) and two flat washers (4). Discard self-locking nuts.
- 3 Remove U-bolt (5) and rubber spacer (6).
- 4 Debraze two lines (7) from gas regulating valve (8).



8-2 GAS REGULATING VALVE - CONTINUED

a. Removal - Continued

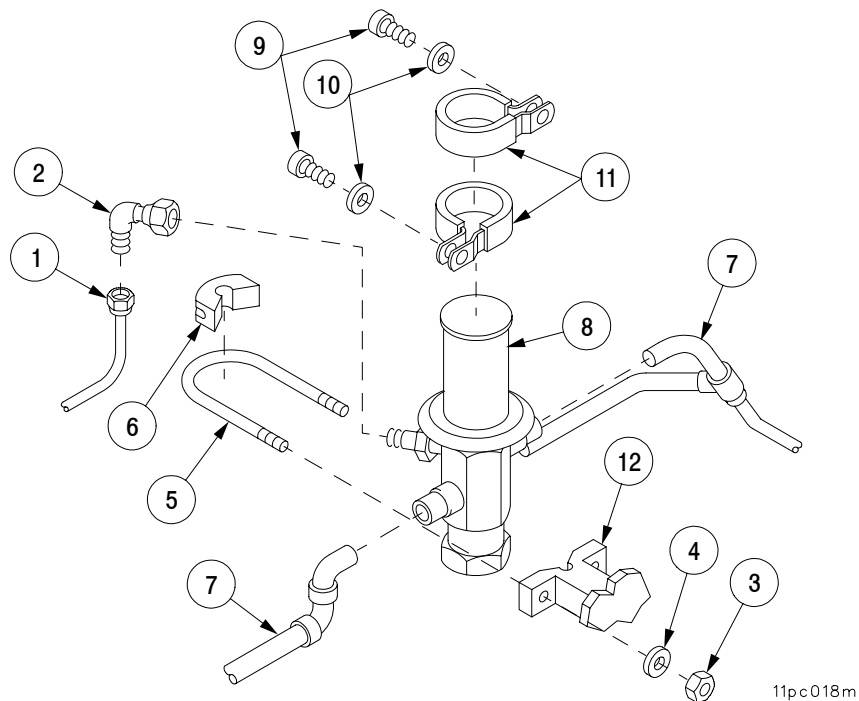
- 5 Remove two screws (9), two flat washers (10), and two clamps (11) securing gas regulating valve (8) to MCS weldment (12).
- 6 Remove gas regulating valve (8) from MCS weldment (12).
- 7 Remove elbow (2) from gas regulating valve (8).



Gas regulating valve is factory set. Do not adjust to prevent equipment damage.

b. Installation.

- 1 Coat female threads of elbow (2) with sealing compound and install elbow (2) on gas regulating valve (8).
- 2 Position gas regulating valve (8) on MCS weldment (12).
- 3 Braze two lines (7) to gas regulating valve (8).
- 4 Coat threads of U-bolt (5) with thread lubricant and install rubber spacer (6), U-bolt (5), two flat washers (4), and two new self-locking nuts (3).
- 5 Coat threads of nut (1) with sealing compound and install nut (1) on elbow (2).
- 6 Install two clamps (11) with two screws (9) and two flat washers (10) securing gas regulating valve (8) to MCS weldment (12).



11pc018m

8-6 LOW PRESSURE SWITCH.

This task covers:

a. Removal

b. Installation

INITIAL SETUP

Tools

Refrigeration service tool kit
(SC 5180-90-N18)

Equipment Conditions

MCS pack removed (TM 9-2350-314-20-2-2)
MCS pack discharged (para 8-1)

Materials/Parts

Sealing compound (item 38, Appx B)
Marking tags (item 71, Appx B)

a. Removal.

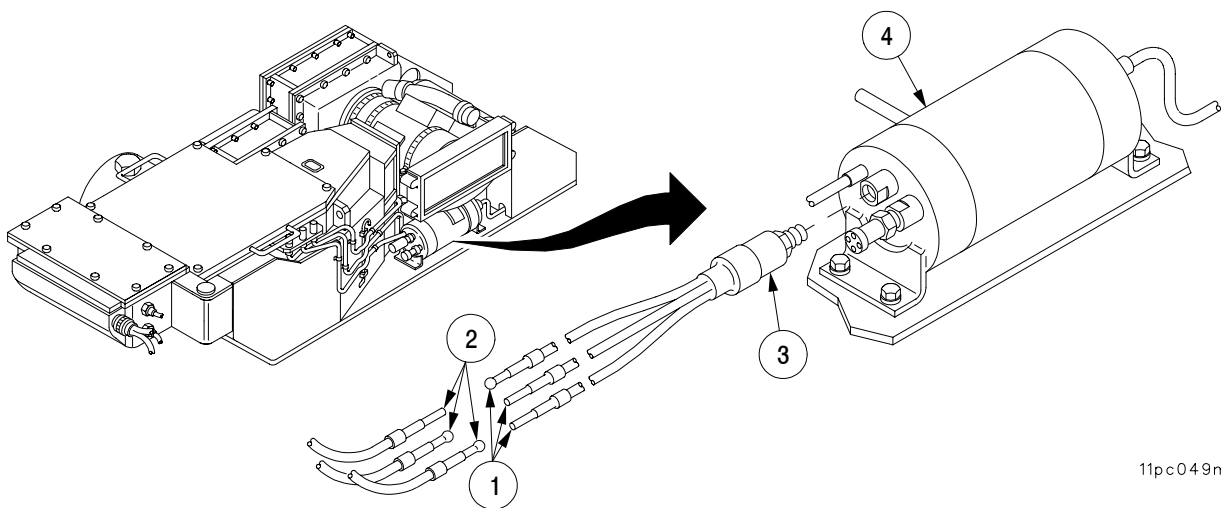
NOTE

Prior to removal, tag all electrical connectors for identification during installation.

- 1 Disconnect three electrical connectors (1) from wiring harness 1A1 connectors (2).
- 2 Remove low pressure switch (3) from pressure tank (4).

b. Installation.

- 1 Apply sealing compound to low pressure switch (3) threads.
- 2 Install low pressure switch (3) to pressure tank (4). Tighten only until firmly seated.
- 3 Connect three electrical connectors (1) to wiring harness 1A1 connectors (2).



11pc049m

8-6.1 SOLENOID ASSEMBLY.

This task covers:

a. Removal

b. Installation

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)

Equipment Conditions

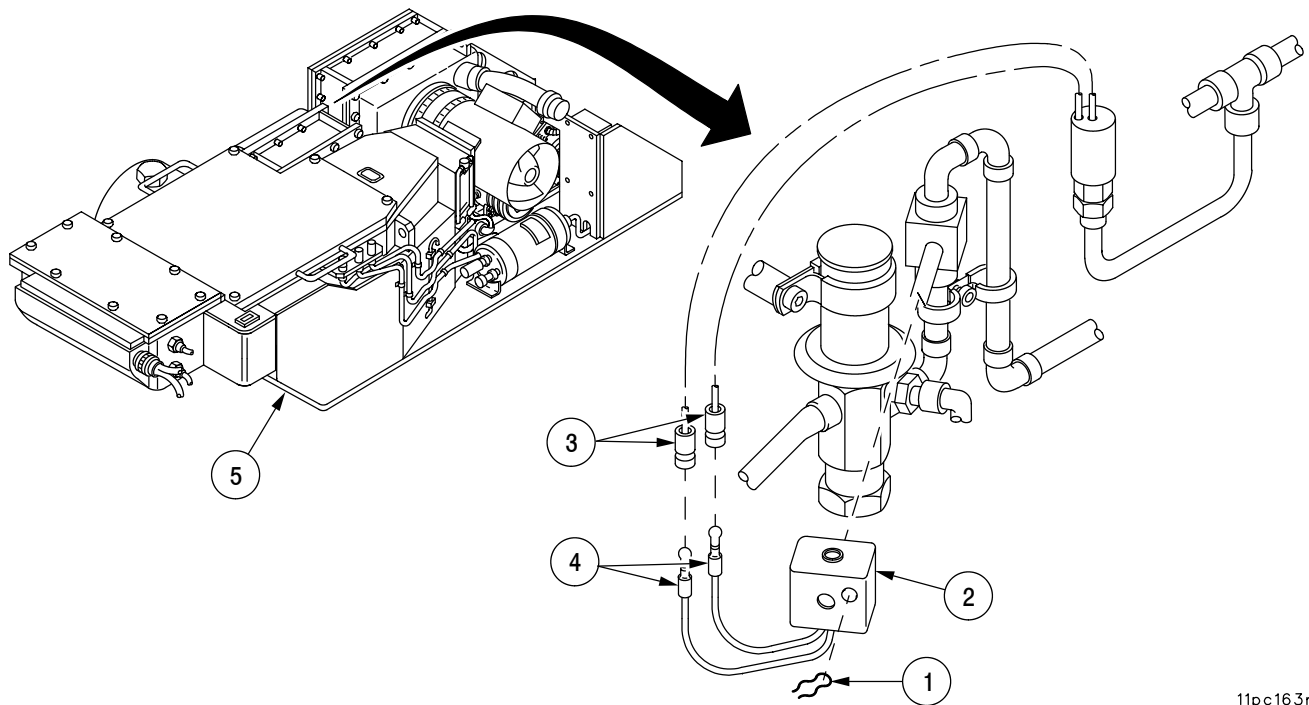
Vehicle MASTER power switch OFF
(TM 9-2350-314-10)
Battery ground leads disconnected
(TM 9-2350-314-20-1-2)
Ballistic cover open (TM 9-2350-314-10)

a. Removal.

- 1 Remove clip (1) from side of solenoid assembly (2).
- 2 Disconnect two electrical leads (3) at quick-disconnects (4).
- 3 Remove solenoid assembly (2) from MCS weldment (5).

b. Installation.

- 1 Position solenoid assembly (2) in MCS weldment (5).
- 2 Install clip (1) on side of solenoid assembly (2) securing solenoid in place.
- 3 Connect two electrical leads (3) to quick-disconnects (4).



11pc163m

8-6.2 HOT GAS VALVE.

This task covers:

a. Removal

b. Installation

INITIAL SETUP

Tools

Refrigeration service tool kit
(SC 5180-90-N18)

Materials/Parts

Alloy braze (item 17, Appx B)
Silver braze (item 18, Appx B)

Equipment Conditions

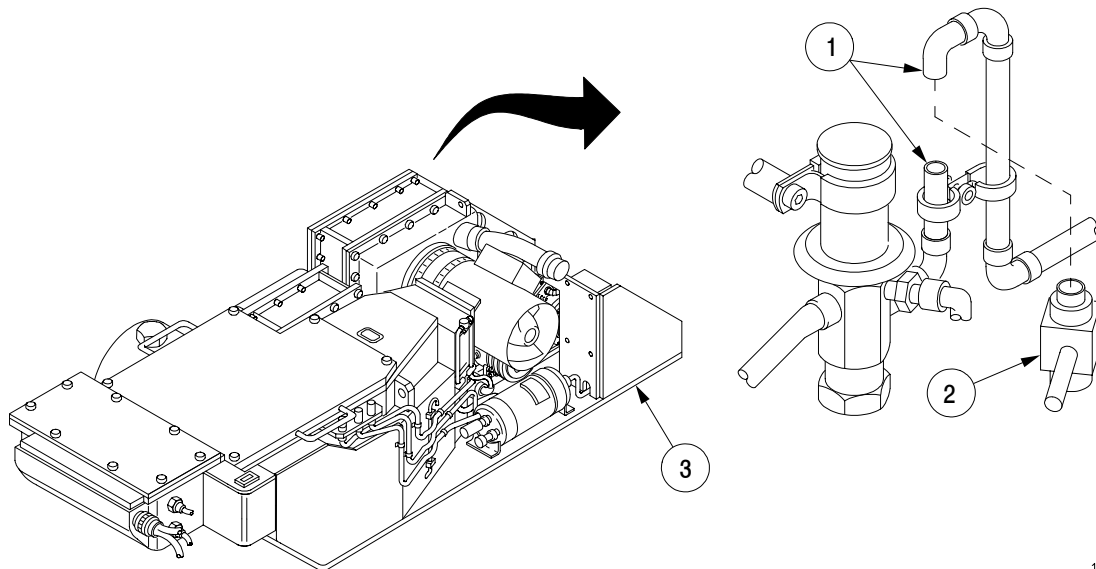
MCS pack removed (TM 9-2350-314-20-2-2)
MCS pack discharged and prepared for
debrazing and brazing (para 8-1)

a. Removal.

- 1 Debraze two tubes (1) from hot gas valve (2).
- 2 Remove hot gas valve (2) from MCS weldment (3).

b. Installation.

- 1 Position hot gas valve (2) in MCS weldment (3).
- 2 Braze two tubes (1) to hot gas valve (2).



11pc165m

8-6.3 SIGHT GLASS AND BRACKET.

This task covers:

a. Removal

b. Installation

INITIAL SETUP

Tools

Refrigeration service tool kit
(SC 5180-90-N18)

Materials/Parts

Alloy braze (item 17, Appx B)
Silver braze (item 18, Appx B)
Lockwasher (2) (item 112, Appx E)
Nut, self-locking (2) (item 35, Appx E)

Equipment Conditions

MCS pack removed (TM 9-2350-314-20-2-2)
MCS pack discharged and prepared for
debrazing and brazing (para 8-1)

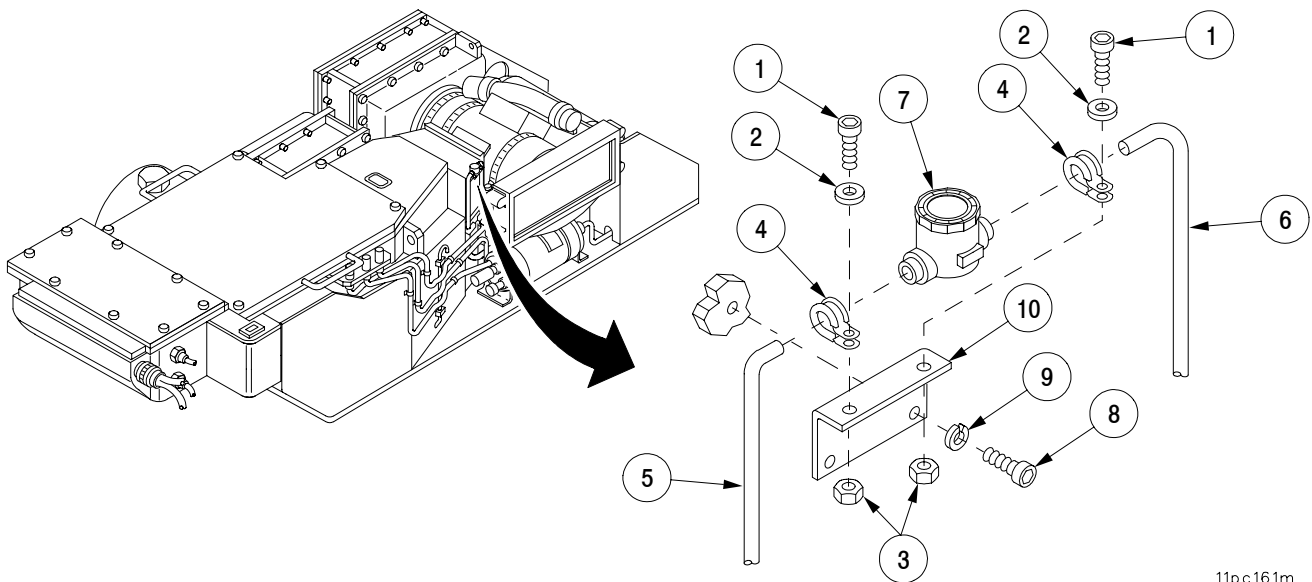
a. Removal.

- 1 Remove two screws (1), two flat washers (2) and two self-locking nuts (3) securing two clamps (4). Discard self-locking nuts.
- 2 Slide two clamps (4) back on inlet and outlet tubes (5 and 6).
- 3 Debraze inlet and outlet tubes respectively (5 and 6) from sight glass (7).
- 4 Remove sight glass (7).

NOTE

If sight glass bracket is damaged and requires replacing, perform step 5.

- 5 Remove two screws (8), two lockwashers (9) and bracket (10). Discard lockwashers.

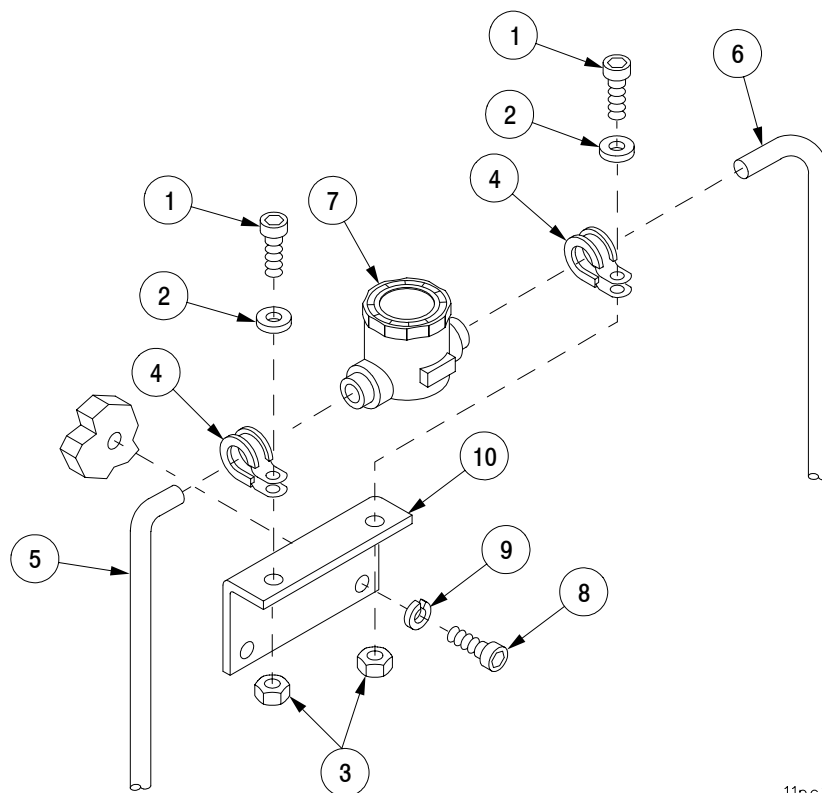


11pc161m

8-6.3 SIGHT GLASS AND BRACKET - CONTINUED

b. Installation.

- 1 If sight glass bracket (10) required replacing, position new bracket (10) and install two screws (8) and two new lockwashers (9).
- 2 Position sight glass (7) on bracket (10).
- 3 Braze inlet and outlet tubes respectively (5 and 6) to sight glass (7).
- 4 Slide two clamps (4) into position on inlet and outlet tubes (5 and 6).
- 5 Install two screws (1), two flat washers (2) and two new self-locking nuts (3) securing two clamps (4).



11pc162m

8-6.4 HOT GAS ASSEMBLY PRESSURE SWITCH AND BRACKETS.

This task covers:

a. Removal

b. Installation

INITIAL SETUP

Tools

Refrigeration service tool kit
(SC 5180-90-N18)

Equipment Conditions

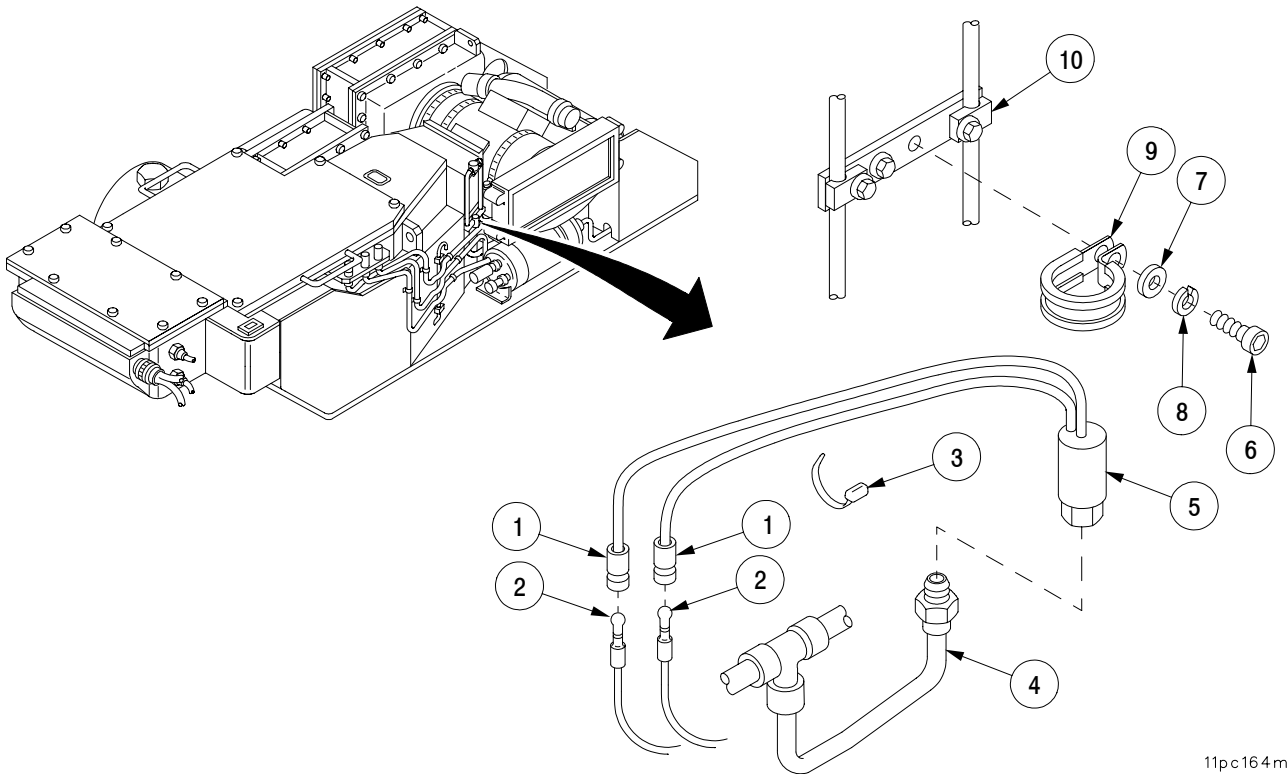
MCS pack removed (TM 9-2350-314-20-2-2)
MCS pack discharged (para 8-1)

Materials/Parts

Lockwashers (4) (item 111, Appx E)
Tiedown strap (2) (item 75.1, Appx B)

a. Removal.

- 1 Disconnect two electrical leads (1) at quick-disconnects (2) and remove tiedown straps (3).
- 2 Disconnect tube (4) from bottom of pressure switch (5).
- 3 Remove screw (6), flat washer (7), and lockwasher (8) securing clamp (9) to bracket (10). Discard lockwasher.
- 4 Remove clamp (9) from bracket (10) and pressure switch (5).
- 5 Remove pressure switch (5).



11pc164m

8-6.4 HOT GAS ASSEMBLY PRESSURE SWITCH AND BRACKETS - CONTINUED

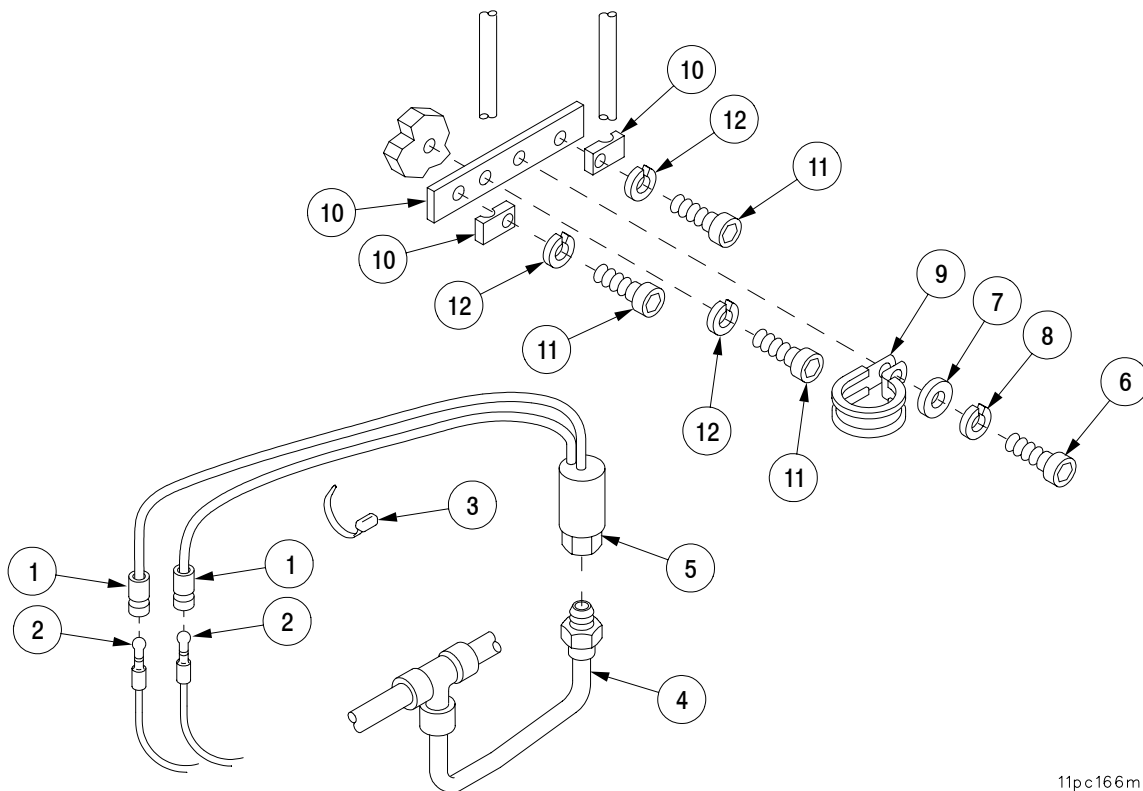
NOTE

If pressure switch brackets are damaged and require replacing, perform step 6.

- 6 Remove three screws (11), three lockwashers (12) and three brackets (10). Discard lockwashers.

b. Installation.

- 1 If pressure switch brackets (10) required replacing, position new brackets (10) and install three screws (11) and three new lockwashers (12).
- 2 Position clamp (9) around pressure switch (5).
- 3 Install clamp (9) to bracket (10) using screw (6), flat washer (7), and new lockwasher (8).
- 4 Connect two electrical leads (1) to wiring harness at quick-disconnects (2).
- 5 Connect tube (4) to bottom of pressure switch (5).
- 6 Install tiedown straps (3).



11pc166m

8-7 FILTER.

This task covers:

a. Removal

b. Installation

INITIAL SETUP

Tools

Refrigeration service tool kit
(SC 5180-90-N18)

Materials/Parts

Alloy braze (item 17, Appx B)
Silver braze (item 18, Appx B)

Equipment Conditions

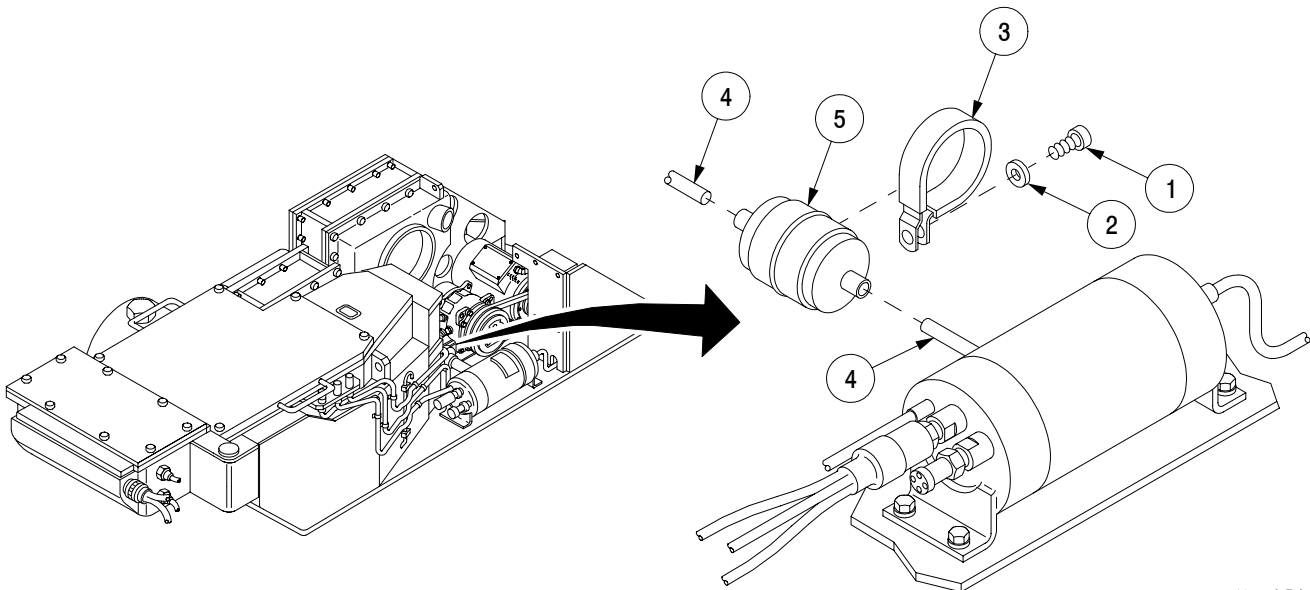
MCS pack removed (TM 9-2350-314-20-2-2)
MCS pack vaneaxial fan assembly removed
(TM 9-2350-314-20-2-2)
MCS pack discharged and prepared for
debrazing and brazing (para 8-1)

a. Removal.

- 1 Remove screw (1), flat washer (2), and loop clamp (3).
- 2 Debraze two lines (4) from filter (5).
- 3 Remove filter (5).

b. Installation.

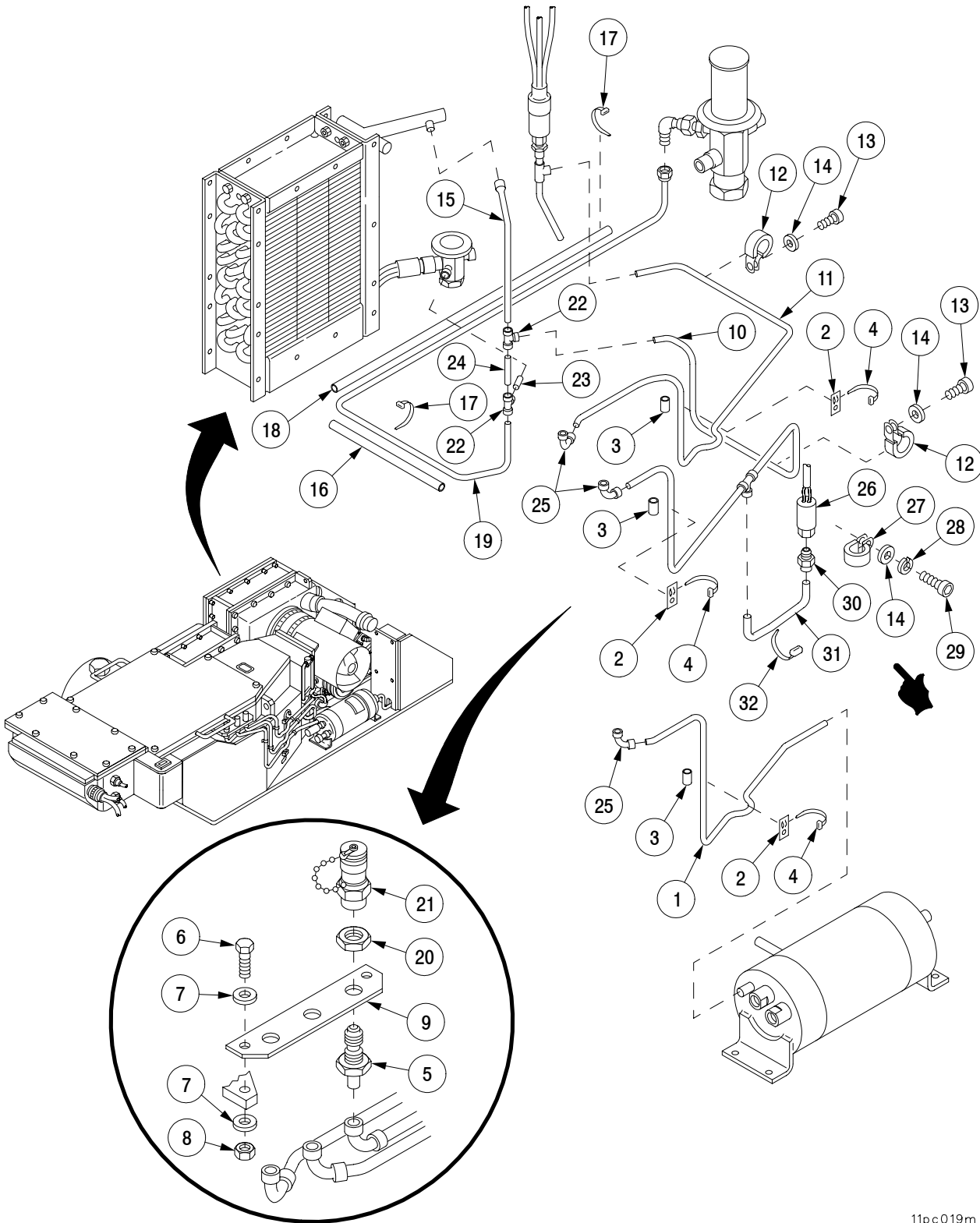
- 1 Braze two lines (4) to filter (5).
- 2 Install filter (5) with screw (1), flat washer (2), and loop clamp (3).



11pc050m

8-8 MCS PACK LINES, FITTINGS, AND MOUNTING HARDWARE - CONTINUED

a. Removal - Continued



11pc019m

8-8 MCS PACK LINES, FITTINGS, AND MOUNTING HARDWARE - CONTINUED

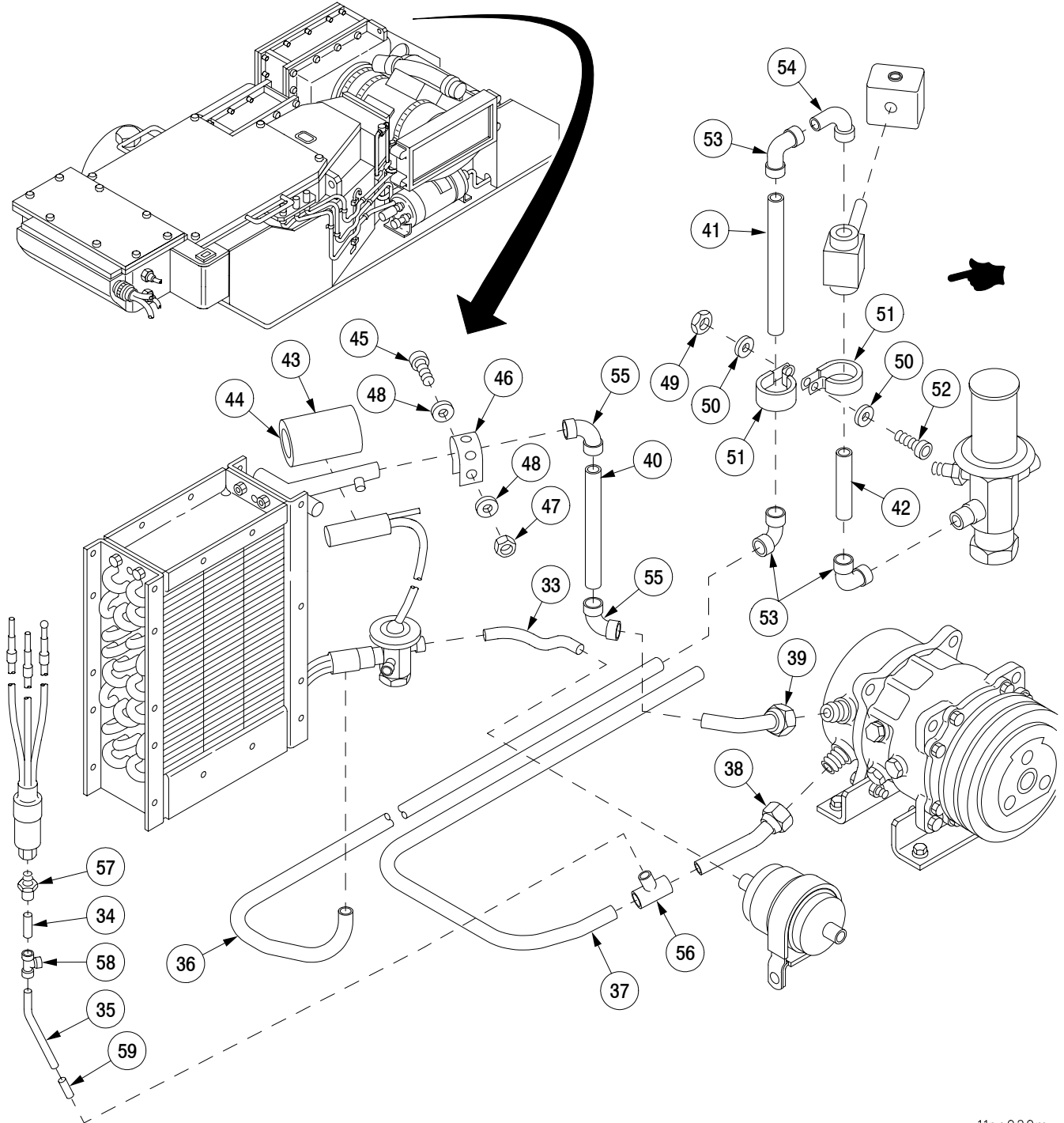
a. Removal - Continued

LEGEND

- 33. TUBE, BENT, COPPER (1)
- 34. TUBE, BENT, COPPER (1)
- 35. TUBE, BENT, COPPER (1)
- 36. TUBE, BENT, COPPER (1)
- 37. TUBE, BENT, COPPER (1)
- 38. TUBE, BENT, COPPER (1)
- 39. TUBE, BENT, COPPER (1)
- 40. TUBE, BENT, COPPER (1)
- 41. TUBE, STRAIGHT (1)
- 42. TUBE, STRAIGHT (1)
- 43. INSULATION
- 44. TAPE (1)
- 45. SCREW (2)
- 46. CLAMP (2)
- 47. NUT (2)
- 48. WASHER (4)
- 49. NUT (1)
- 50. WASHER (2)
- 51. CLAMP, HOSE (2)
- 52. SCREW (1)
- 53. ELBOW, TUBE (3)
- 54. ELBOW, TUBE TO BOSS (1)
- 55. ELBOW, TUBE (2)
- 56. TEE, TUBE (1)
- 57. COUPLING, TUBE (1)
- 58. TEE, TUBE (1)
- 59. TUBE, COPPER (1)

8-8 MCS PACK LINES, FITTINGS, AND MOUNTING HARDWARE - CONTINUED

a. Removal - Continued



11pc020m

8-8 MCS PACK LINES, FITTINGS, AND MOUNTING HARDWARE - CONTINUED

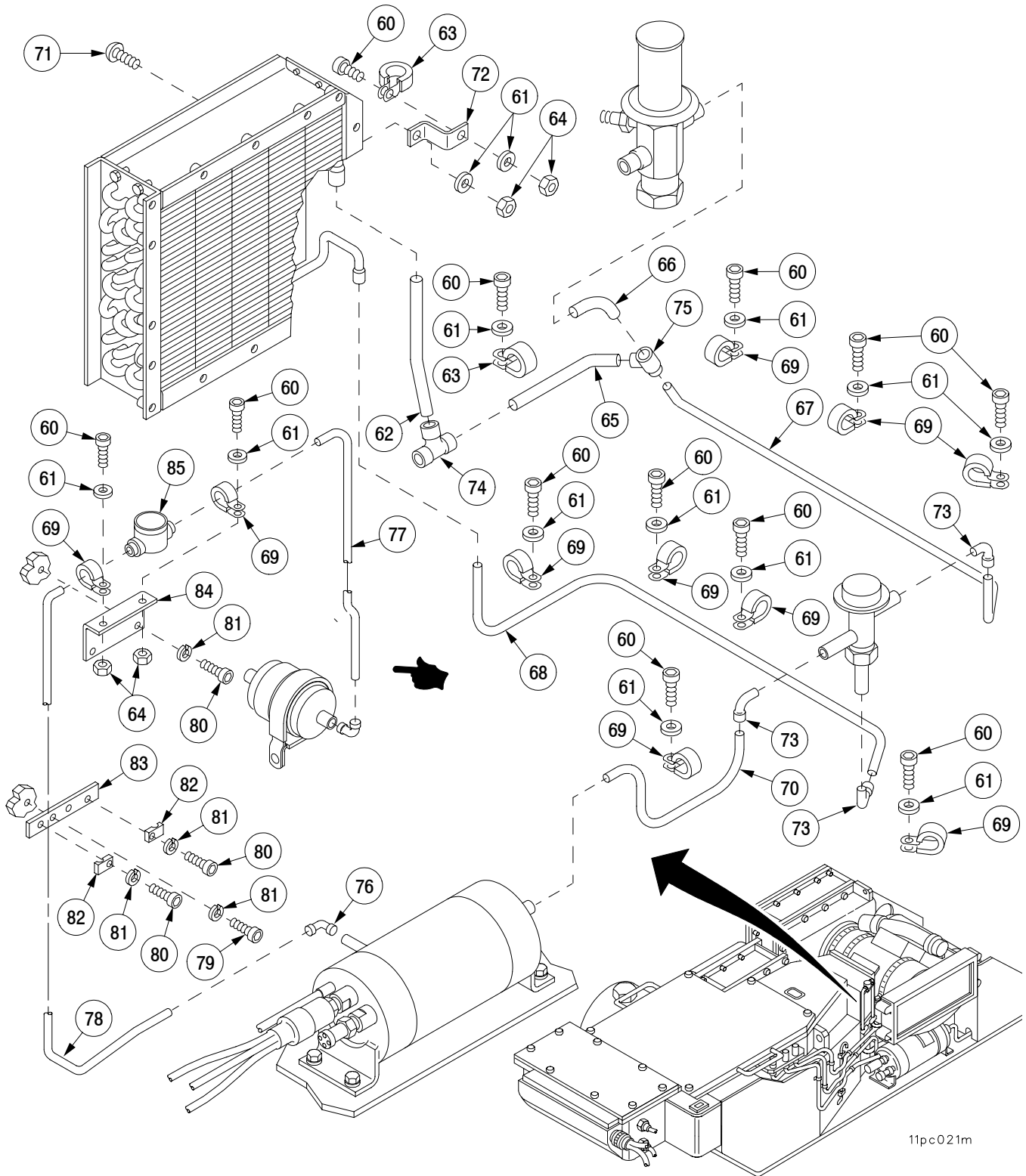
a. Removal - Continued

LEGEND

- 60. SCREW, CAP, SOCKET (12)
- 61. WASHER, FLAT (13)
- 62. TUBE, BENT, COPPER (1)
- 63. CLAMP, LOOP (2)
- 64. NUT, SELF-LOCKING (4)
- 65. TUBE, BENT, COPPER (1)
- 66. TUBE, BENT, COPPER (1)
- 67. TUBE, BENT, COPPER (1)
- 68. TUBE, BENT, COPPER (1)
- 69. CLAMP, LOOP (10)
- 70. TUBE, BENT, COPPER (1)
- 71. SCREW, MACHINE (1)
- 72. BRACKET (1)
- 73. ELBOW, TUBE (3)
- 74. TEE, TUBE (1)
- 75. TEE, TUBE (1)
- 76. ELBOW TUBE (1)
- 77. TUBE, BENT, COPPER (1)
- 78. TUBE, BENT COPPER (1)
- 79. SCREW (1)
- 80. SCREW (4)
- 81. WASHER, LOCK (5)
- 82. CLAMP, BRACKET (2)
- 83. CLAMP, BRACKET (1)
- 84. BRACKET (1)
- 85. SIGHT GLASS (1)

8-8 MCS PACK LINES, FITTINGS, AND MOUNTING HARDWARE - CONTINUED

a. Removal - Continued



8-8 MCS PACK LINES, FITTINGS, AND MOUNTING HARDWARE - CONTINUED

b. Installation.

- 1 For installation follow illustration and legend as a guide.
- 2 Braze lines and fittings.

LEGEND

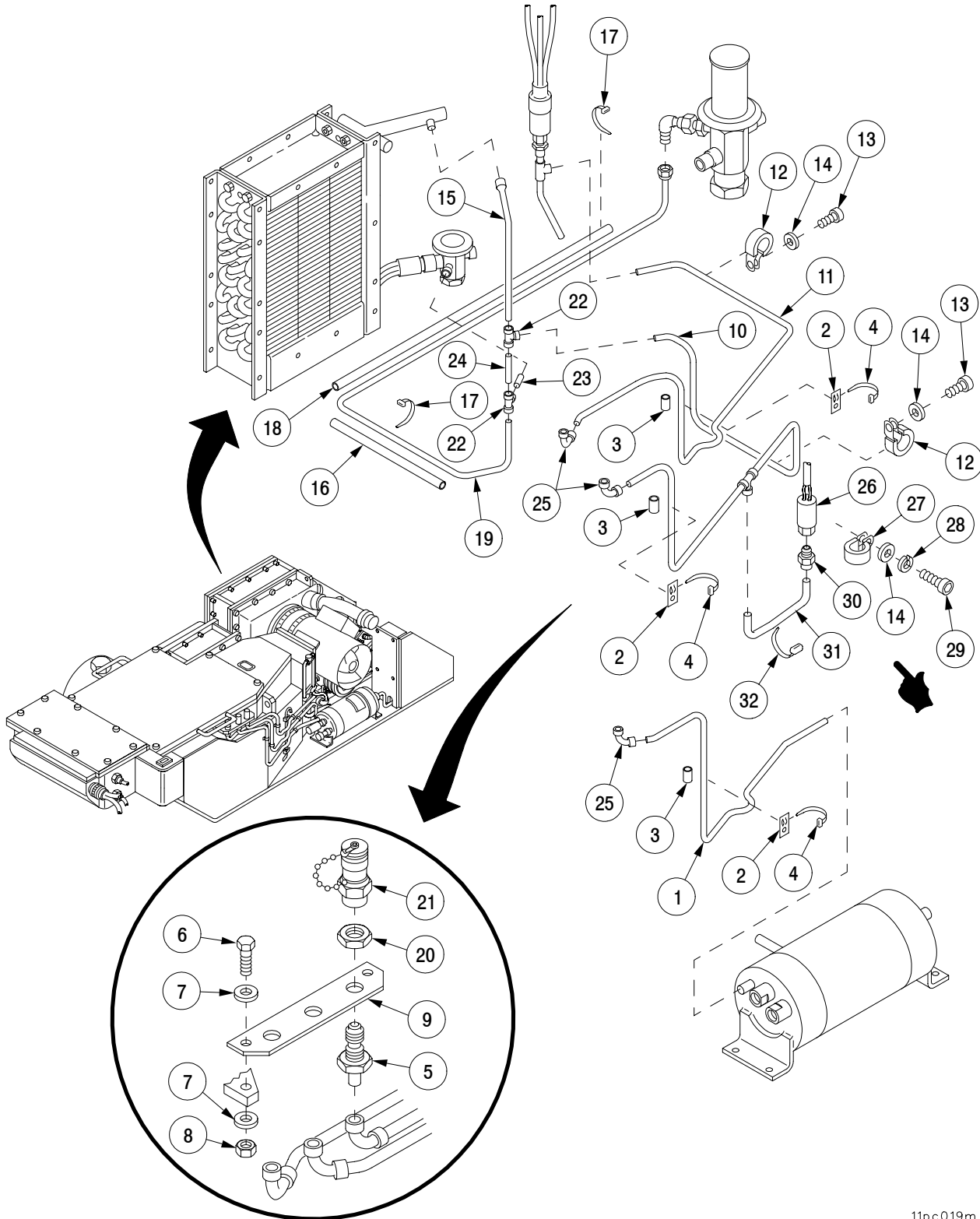
1. TUBE, BENT, COPPER (1)
2. PLATE, MOUNTING (5)

PREPARE SURFACE OF MOUNTING PLATE AND AREA WHEN PLATE IS TO BE MOUNTED BY CLEANING WITH ISOPROPYL ALCOHOL. USING AN APPLICATOR, APPLY ADHESIVE TO THE BOTTOM OF THE MOUNTING PLATE. IMMEDIATELY BOND IN PLACE USING PRESSURE TO SQUEEZE ADHESIVE INTO A UNIFORM BOND LINE. HOLD IN PLACE FOR 5-10 SECONDS. THE MOUNTING PLATE WILL BE READY FOR USE IN 30-60 SECONDS.

3. TUBING RUBBER 1 IN. (5)
4. STRAP, TIEDOWN (5)
5. FITTING, BULKHEAD (3)
6. SCREW, CAP, HEXAGON (2)
7. WASHER, FLAT (4)
8. NUT, SELF-LOCKING (2)
9. SUPPORT, SVC FTG (1)
10. TUBE, BENT, COPPER (1)
11. TUBE, BENT, COPPER (1)
12. CLAMP, LOOP (2)
13. SCREW, CAP, SOCKET (2)
14. WASHER, FLAT (3)
15. TUBE, BENT, COPPER (1)
16. TUBING, RUBBER 6 IN. (1)
17. STRAP, TIEDOWN (5)
18. TUBING RUBBER 15 IN. (1)
19. TUBE, BENT, COPPER (1)
20. NUT, PLAIN, HEXAGON (3)
21. ACCESS VALVE(3)
22. TEE, TUBE (2)
23. TUBE, COPPER (1)
24. TUBE, COPPER (1)
25. ELBOW, TUBE (3)
26. PRESSURE SWITCH (1)
27. CLAMP (1)
28. WASHER, LOCK (1)
29. SCREW (1)
30. ADAPTER, STRAIGHT (1)
31. TUBE, BENT, COPPER (1)
32. STRAP, TIEDOWN (1)

8-8 MCS PACK LINES, FITTINGS, AND MOUNTING HARDWARE - CONTINUED

b. Installation - Continued



11pc019m

8-8 MCS PACK LINES, FITTINGS, AND MOUNTING HARDWARE - CONTINUED

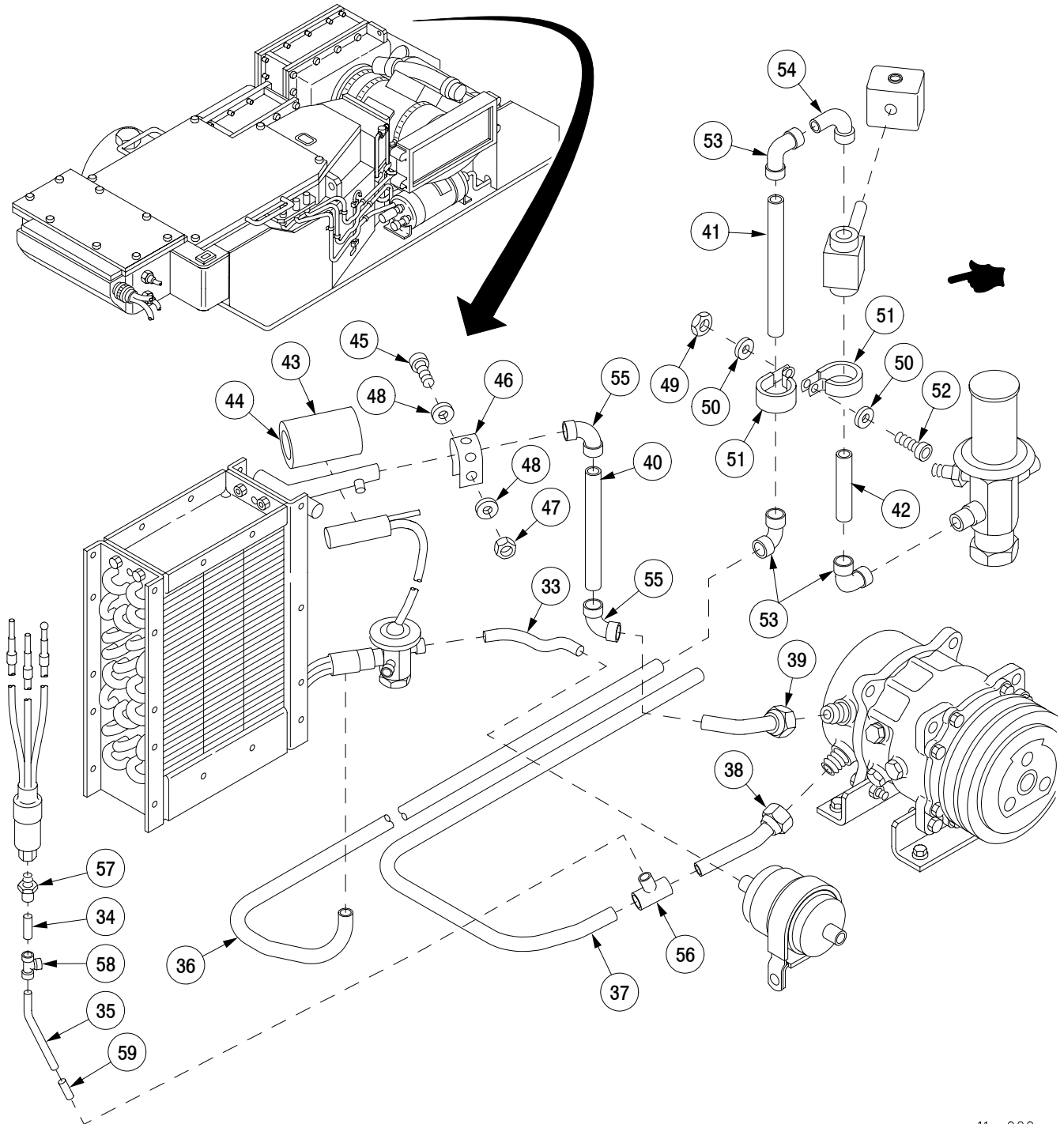
b. Installation - Continued

LEGEND

- 33. TUBE, BENT, COPPER (1)
- 34. TUBE, BENT, COPPER (1)
- 35. TUBE, BENT, COPPER (1)
- 36. TUBE, BENT, COPPER (1)
- 37. TUBE, BENT, COPPER (1)
- 38. TUBE, BENT, COPPER (1)
- 39. TUBE, BENT, COPPER (1)
- 40. TUBE, BENT, COPPER (1)
- 41. TUBE, STRAIGHT (1)
- 42. TUBE, STRAIGHT (1)
- 43. INSULATION
- 44. TAPE (1)
- 45. SCREW (2)
- 46. CLAMP (2)
- 47. NUT (2)
- 48. WASHER (4)
- 49. NUT (1)
- 50. WASHER (2)
- 51. CLAMP, HOSE (2)
- 52. SCREW (1)
- 53. ELBOW, TUBE (3)
- 54. ELBOW, TUBE TO BOSS (1)
- 55. ELBOW, TUBE (2)
- 56. TEE, TUBE (1)
- 57. COUPLING, TUBE (1)
- 58. TEE, TUBE (1)
- 59. TUBE, COPPER (1)

8-8 MCS PACK LINES, FITTINGS, AND MOUNTING HARDWARE - CONTINUED

b. Installation - Continued



11pc020m

8-8 MCS PACK LINES, FITTINGS, AND MOUNTING HARDWARE - CONTINUED

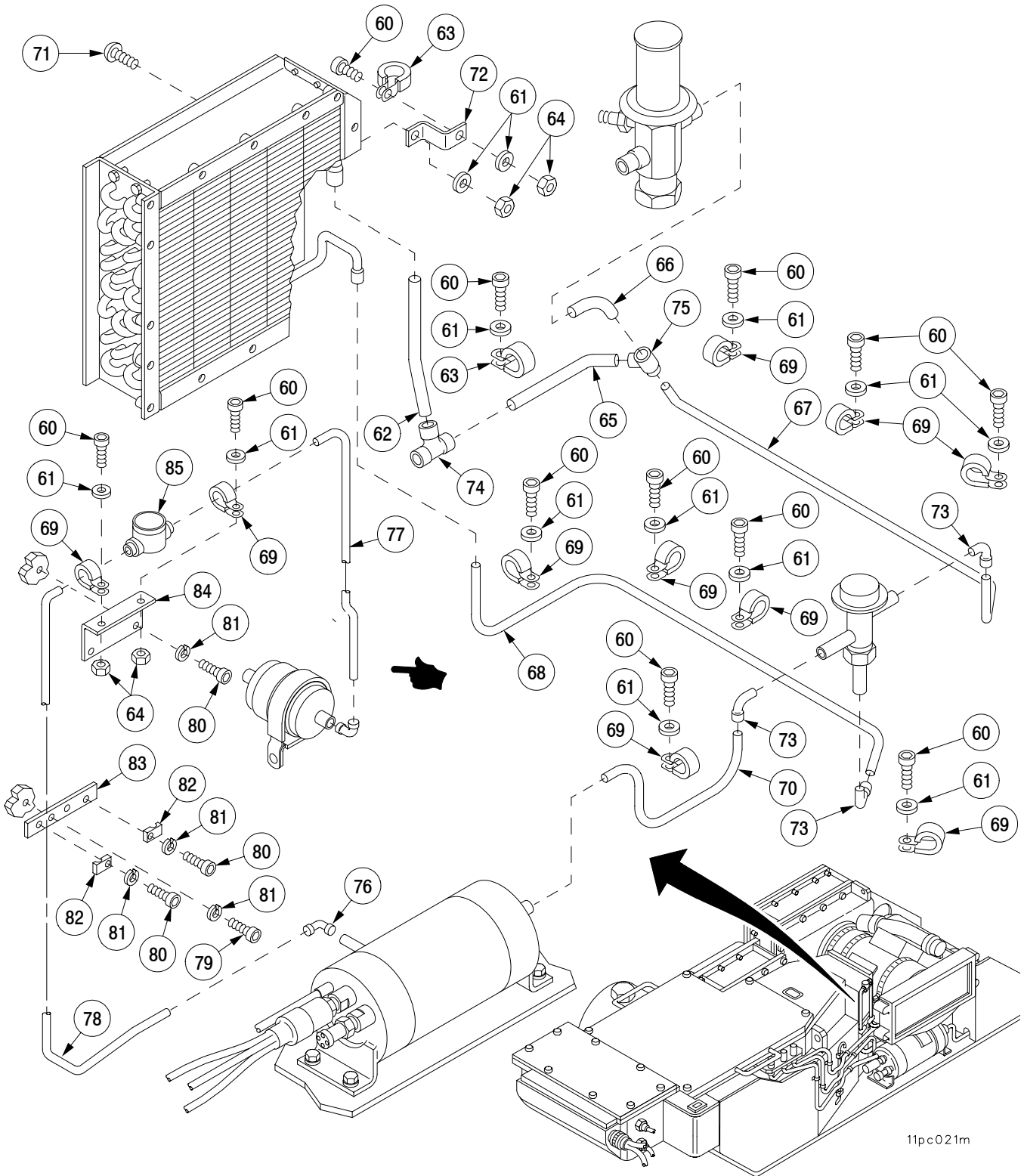
b. Installation - Continued

LEGEND

- 60. SCREW, CAP, SOCKET (12)
- 61. WASHER, FLAT (13)
- 62. TUBE, BENT, COPPER (1)
- 63. CLAMP, LOOP (2)
- 64. NUT, SELF-LOCKING (4)
- 65. TUBE, BENT, COPPER (1)
- 66. TUBE, BENT, COPPER (1)
- 67. TUBE, BENT, COPPER (1)
- 68. TUBE, BENT, COPPER (1)
- 69. CLAMP, LOOP (11)
- 70. TUBE, BENT, COPPER (1)
- 71. SCREW, MACHINE (1)
- 72. BRACKET (1)
- 73. ELBOW, TUBE (3)
- 74. TEE, TUBE (1)
- 75. TEE, TUBE (1)
- 76. ELBOW TUBE (1)
- 77. TUBE, BENT, COPPER (1)
- 78. TUBE, BENT COPPER (1)
- 79. SCREW (1)
- 80. SCREW (4)
- 81. SCREW (5)
- 82. CLAMP, BRACKET (2)
- 83. CLAMP, BRACKET (1)
- 84. BRACKET (1)
- 85. SIGHT GLASS (1)

8-8 MCS PACK LINES, FITTINGS, AND MOUNTING HARDWARE - CONTINUED

b. Installation - Continued

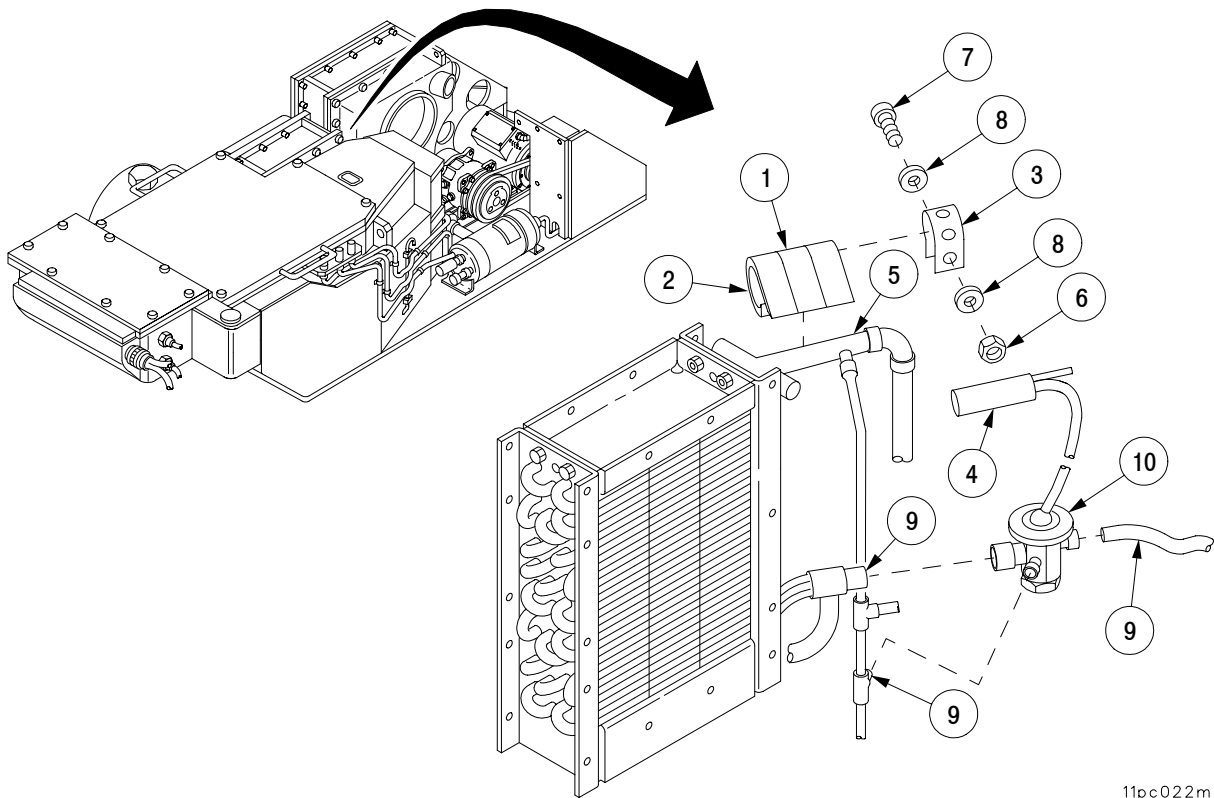


11pc021m

8-9 THERMOSTATIC EXPANSION VALVE - CONTINUED

b. Installation - Continued

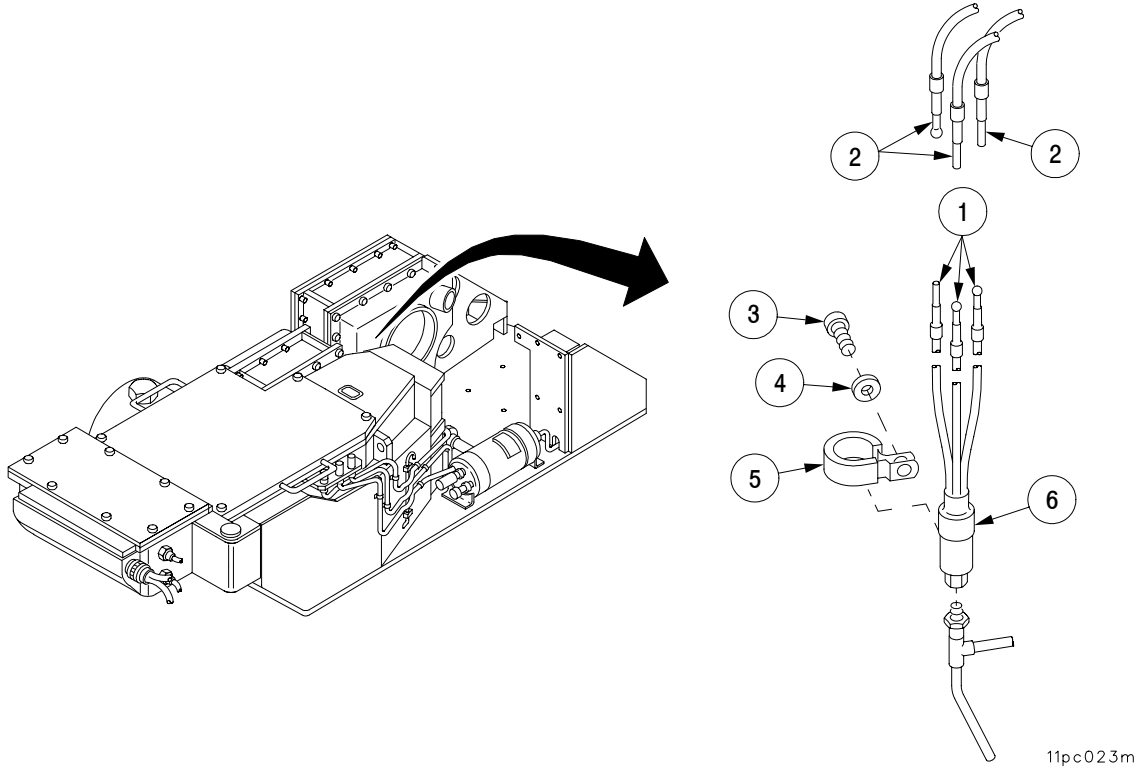
- 4 Install insulation (2) around thermobulb (4), two clamps (3), and suction tube (5) covering both ends of thermobulb (4).
- 5 Secure insulation (2) with tape (1). Each wrap of tape should overlap one half of the previous wrap.



11p022m

8-10 HIGH PRESSURE SWITCH - CONTINUED

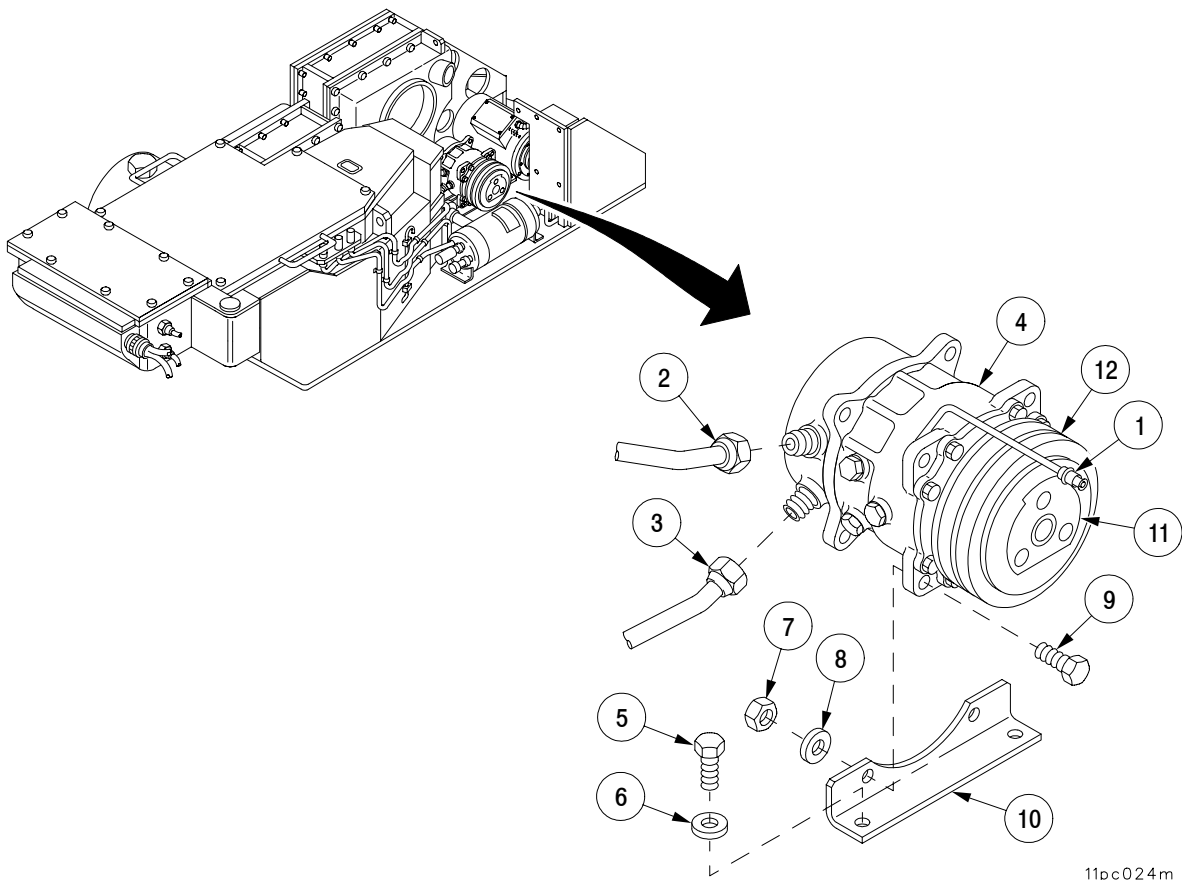
b. Installation - Continued



8-11 COMPRESSOR AND CLUTCH - CONTINUED

c. Installation - Continued

- 5 Connect compressor clutch electrical connector (1).
- 6 Apply sealing compound to threads of discharge line (3) and suction line (2).
- 7 Attach discharge line (3) and suction line (2) to compressor (4).



8-12 MCS COMPRESSOR MOTOR ASSEMBLY.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Fuel and electric automotive tool kit
(SC 5180-95-B08)
Gun solder (item 19, Appx F)
Torque wrench (item 71, Appx F)

Equipment Conditions

Compressor motor removed
(TM 9-2350-314-20-2-2)

Materials/Parts

Braid wire (item 80, Appx B)
Self-locking nuts (2) (item 40, Appx E)
Drive screw (4) (item 51, Appx E)
Gasket (item 230, Appx E)
Solder (item 67, Appx B)
Shrink tubing (item 78, Appx B)
Nonmetallic tubing (item 77, Appx B)
Sealing compound (item 37, Appx B)
Adhesive (item 6, Appx B)
Sealing compound (item 39, Appx B)
Marking tags (item 71, Appx B)
Splice conductor (2) (item 231, Appx E)
Cable tie (item 76, Appx B)

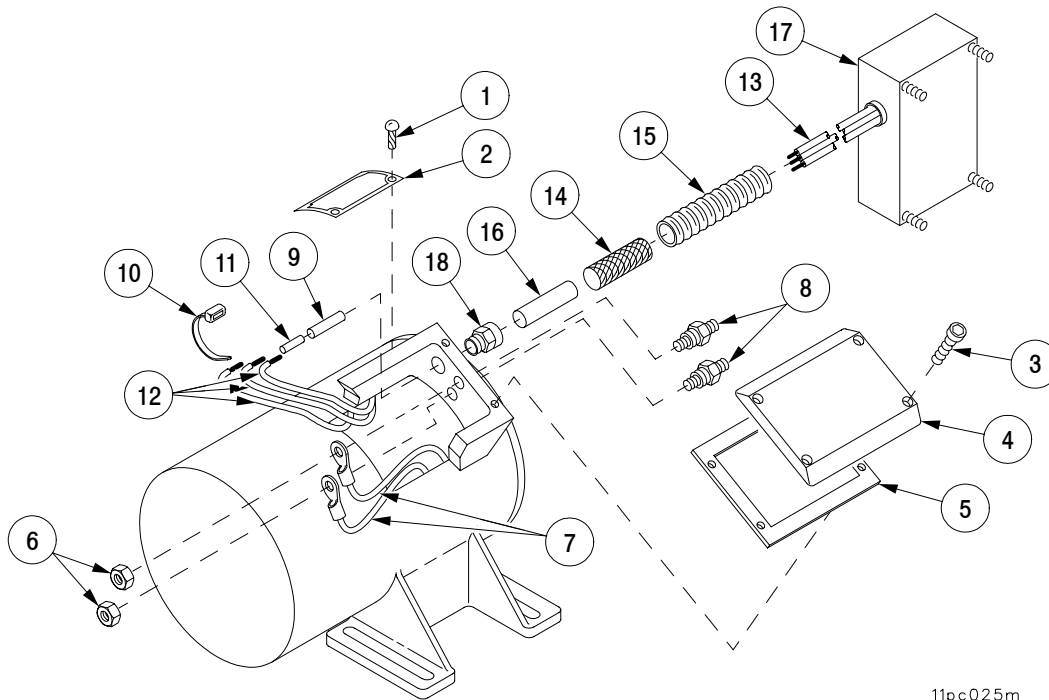
8-12 MCS COMPRESSOR MOTOR ASSEMBLY - CONTINUED

a. Disassembly.

NOTE

Tag electrical leads before disconnecting to aid in installation.

- 1 If damaged, remove four drive screws (1) and nameplate (2). Discard drive screws.
- 2 Remove four screws (3), cover (4), and gasket (5). Discard gasket.
- 3 Remove two self-locking nuts (6) and thermostat leads (7) from two terminal studs (8). Discard self-locking nuts.
- 4 Remove heat shrink tubing (9), cable tie (10), splice conductor (11) and motor leads (12) from EMI filter leads (13). Discard heat shrink tubing.
- 5 Desolder braided wire (14), and remove non-metallic tubing (15), sleeving (16), and EMI filter (17).
- 6 Remove two terminal studs (8) and adapter (18).

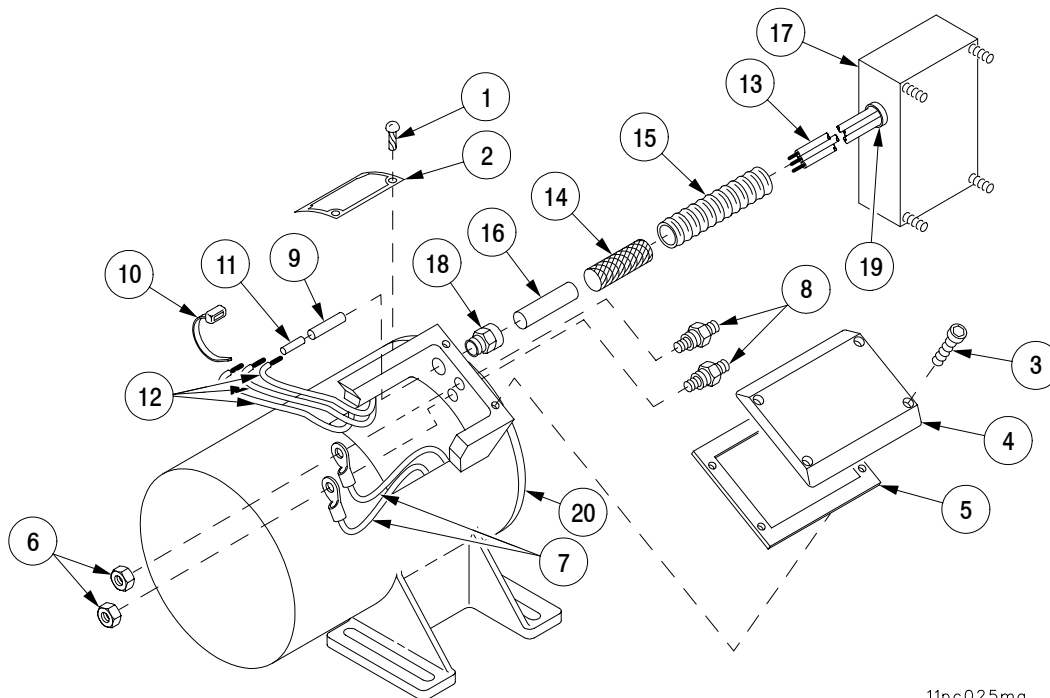


11p025m

8-12 MCS COMPRESSOR MOTOR ASSEMBLY - CONTINUED

b. Assembly.

- 1 Apply sealing compound (item 39, Appx B) to two terminal studs (8) and adapter (18).
- 2 Install two terminal studs (8) and adapter (18).
- 3 Thread EMI filter leads (13) thru braided wire (14) and solder filter end of braided wire (14) to filter exit adapter (19).
- 4 Thread EMI filter leads (13), braided wire (14), and sleeving (16) thru non-metallic tubing (15).
- 5 Using adhesive, bond filter end of non-metallic tubing (15) to exit filter adapter (19).
- 6 Thread EMI filter leads (13) thru adapter (18) and solder end of braided wire (14) to motor end (20).
- 7 Using adhesive, bond loose end of non-metallic tubing (15) to end of motor (20).
- 8 Slide a new piece of heat shrink tubing (9) onto motor leads (12) and connect end of filter leads (13) to end of motor leads (12) using splice conductor (11).
- 9 Cover splice conductor (11) with heat shrink tubing (9) and shrink into place.
- 10 Connect two thermostat leads (7) to terminal studs (8) using two new self-locking nuts (6).
- 11 Install cable tie (10) connecting leads (7) to leads (12).
- 12 Apply sealing compound to four screws (3).
- 13 Install a new gasket (5) and cover (4) with four screws (3).
- 14 Install nameplate (2) with four new drive screws (1).



11pc.025ma

8-13 COMPRESSOR MOTOR BRUSH AND END BELL ASSEMBLY.

This task covers:

a. Removal	b. Disassembly
c. Inspection	d. Assembly
e. Installation	

INITIAL SETUPTools

Fuel and electric automotive tool kit
(SC 5180-95-B08)
Heater gun (item 17, Appx F)

Equipment Conditions

Compressor motor removed
(TM 9-2350-314-20-2-2)

Materials/Parts

Preformed packing (item 85, Appx E)
Preformed packing (item 83, Appx E)
Preformed packing (item 84, Appx E)
Gasket (item 230, Appx E)
Sealing compound (item 32, Appx B)
Sealing compound (item 38, Appx B)
Tubing (item 77, Appx B)
Seal cover (item 229, Appx E)
Cable tie (item 76, Appx B)
Seal (item 201, Appx E)
Splice conductor (item 70, Appx B)
Shrink tubing (item 79, Appx B)
Marking tags (item 71, Appx B)

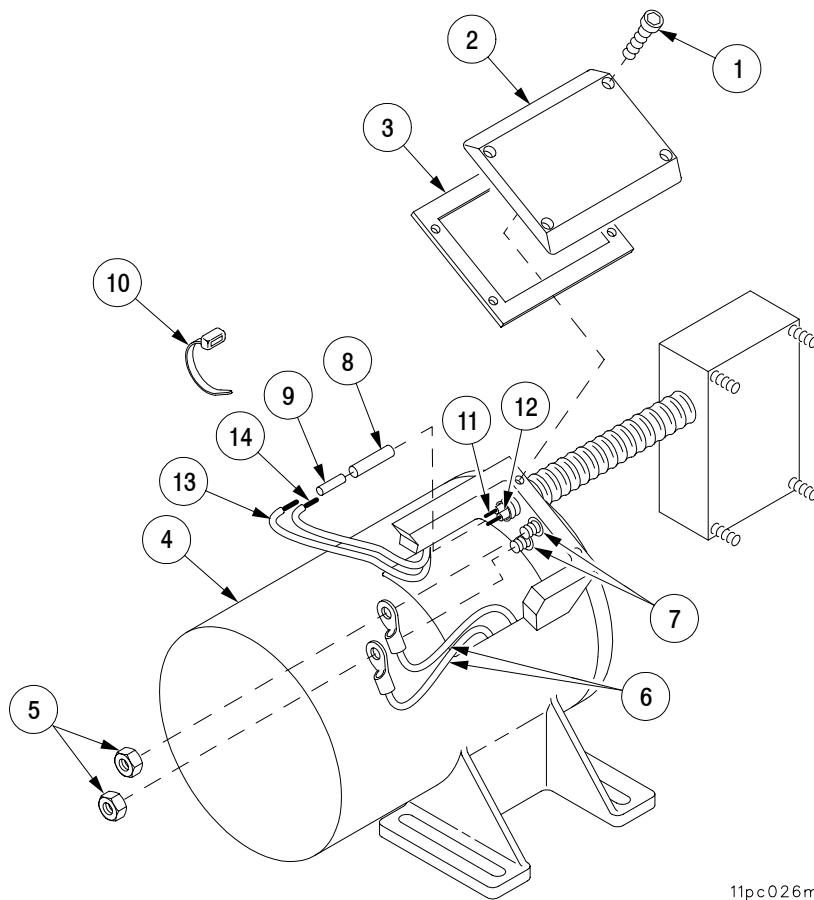
8-13 COMPRESSOR MOTOR BRUSH AND END BELL ASSEMBLY - CONTINUED

NOTE

Tag electrical leads before disconnecting to aid in installation.

a. Removal.

- 1 Remove four screws (1), cover (2), and gasket (3) from motor assembly (4). Discard gasket.
- 2 Remove two nuts (5) and two thermostat leads (6) from terminal studs (7).
- 3 Remove two heat shrink tubes (8), two splice conductors (9), cable tie (10), and separate EMI filter leads (11 and 12) from motor leads (13 and 14). Discard cable tie.

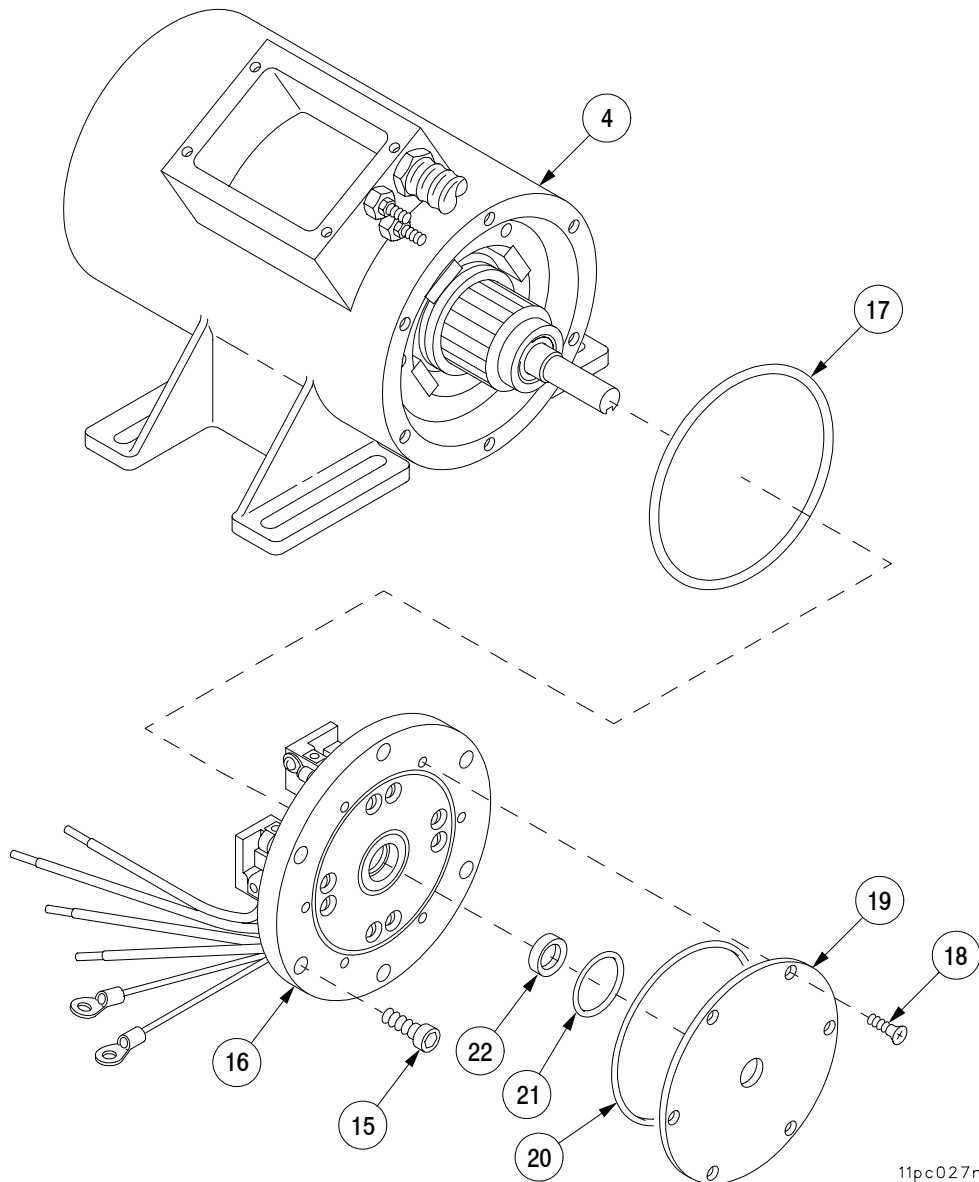


11pc026m

8-13 COMPRESSOR MOTOR BRUSH AND END BELL ASSEMBLY - CONTINUED

a. Removal - Continued

- 4 Remove six screws (15), end bell assembly (16), and preformed packing (17) from motor assembly (4). Discard packing.
- 5 Remove six screws (18), cover seal (19), and two preformed packings (20 and 21) from end bell assembly (16). Discard packings and cover seal.
- 6 Remove shaft seal (22) from end bell assembly (16). Discard shaft seal.

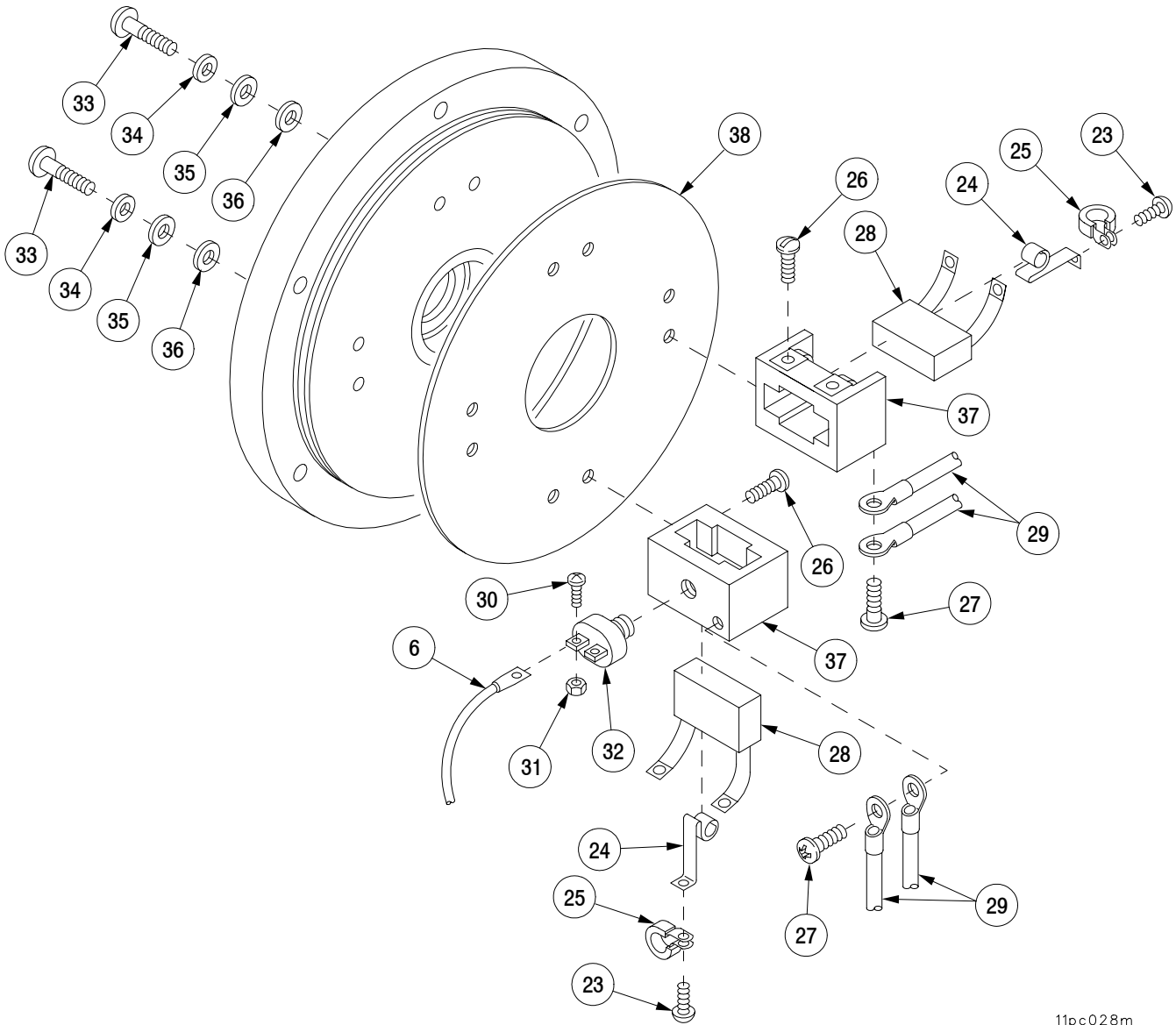


11pc027m

8-13 COMPRESSOR MOTOR BRUSH AND END BELL ASSEMBLY - CONTINUED

b. Disassembly.

- 1 Remove eight screws (23), eight brush springs (24), and two clamps (25).
- 2 Remove eight screws (26), four screws (27), four brushes (28), and eight leads (29).
- 3 Remove two screws (30) and two nuts (31) issued with thermostat (32). Remove leads (6).
- 4 Remove thermostat (32).
- 5 Remove eight screws (33), eight insulating washers (34), eight flat washers (35), eight screw insulators (36), four brush holders (37), and brush insulator (38).

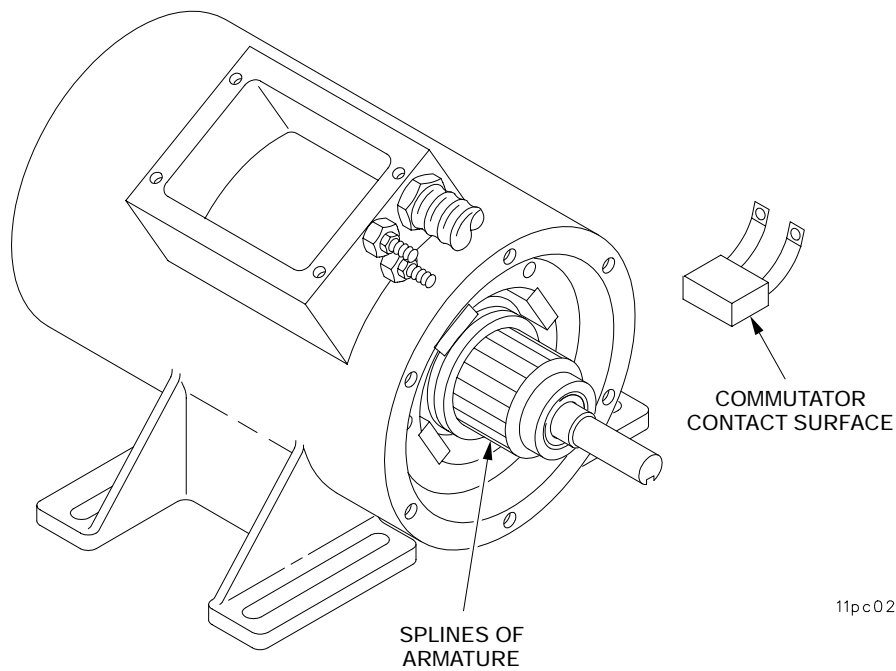


11pc028m

8-13 COMPRESSOR MOTOR BRUSH AND END BELL ASSEMBLY - CONTINUED

c. Inspection.

Armature: Inspect the commutator contact surface. A satisfactory is indicated by an even highly burnished dark copper color. If the contact surface is rough, pitted, scored, burned or coated with hard carbon or oil the commutator must be resurfaced provided it is in good electrical and mechanical condition as a result of the following inspection. Inspect the splines of the armature for wear or damage. If any of the above faults exist, forward motor to depot for repair.



11pc029m

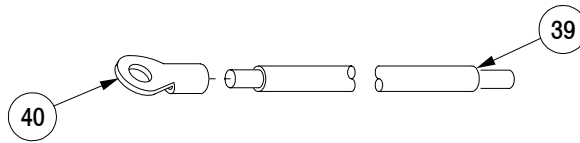
8-13 COMPRESSOR MOTOR BRUSH AND END BELL ASSEMBLY - CONTINUED

d. Assembly.

NOTE

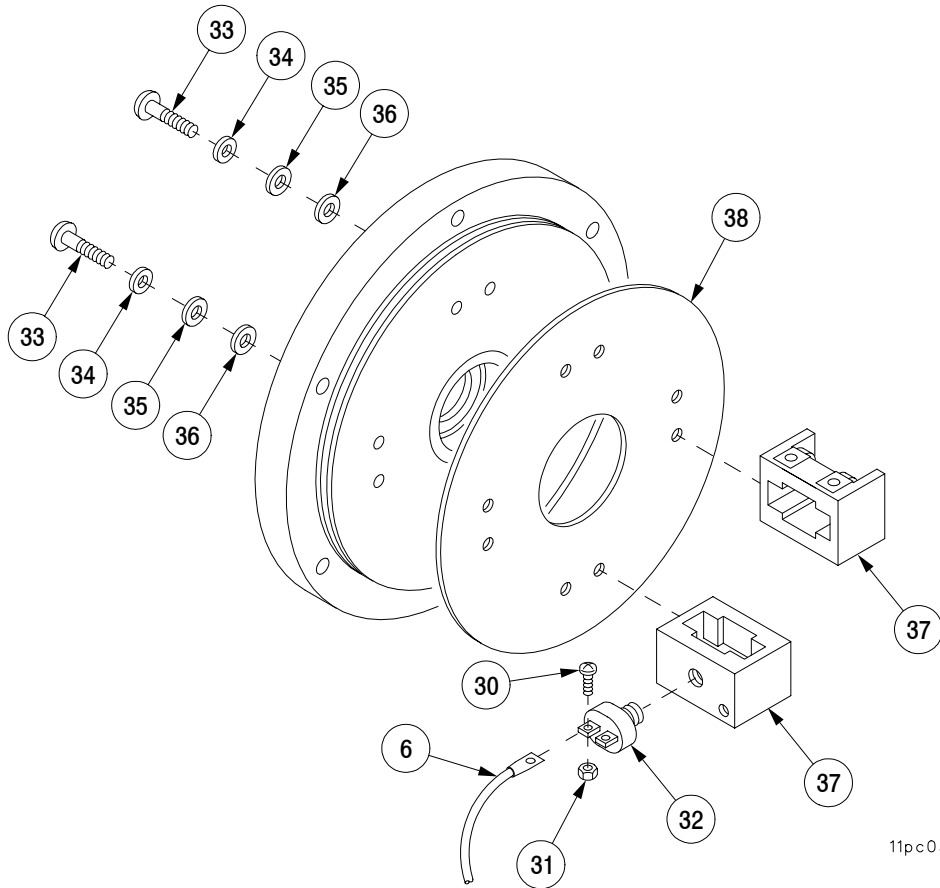
The procedure to repair all cable leads are identical.

- 1 Cut wire (39) to length. Crimp one terminal lug (40) on each terminal end of wire (39).



11pc030m

- 2 Install brush insulator (38), four brush holders (37), eight screw insulators (36), eight flat washers (35), and eight insulating washers (34) with eight screws (33).
- 3 Install thermostat (32) into brush holder (37).
- 4 Install thermostat leads (6) using two screws (30) and two nuts (31) issued with thermostat (32).

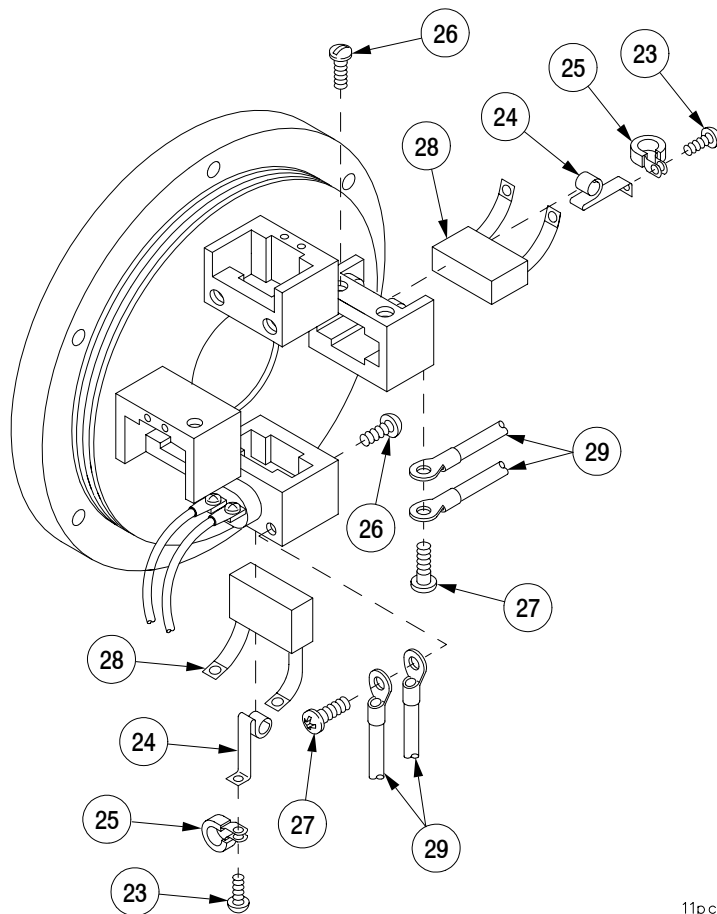


11pc031m

8-13 COMPRESSOR MOTOR BRUSH AND END BELL ASSEMBLY - CONTINUED

d. Assembly - Continued

- 5 Install eight leads (29) with four screws (27).
- 6 Install four brushes (28) and eight screws (26).
- 7 Install two clamps (25) and eight brush springs (24) with eight screws (23).



11pc032m

8-13 COMPRESSOR MOTOR BRUSH AND END BELL ASSEMBLY - CONTINUED

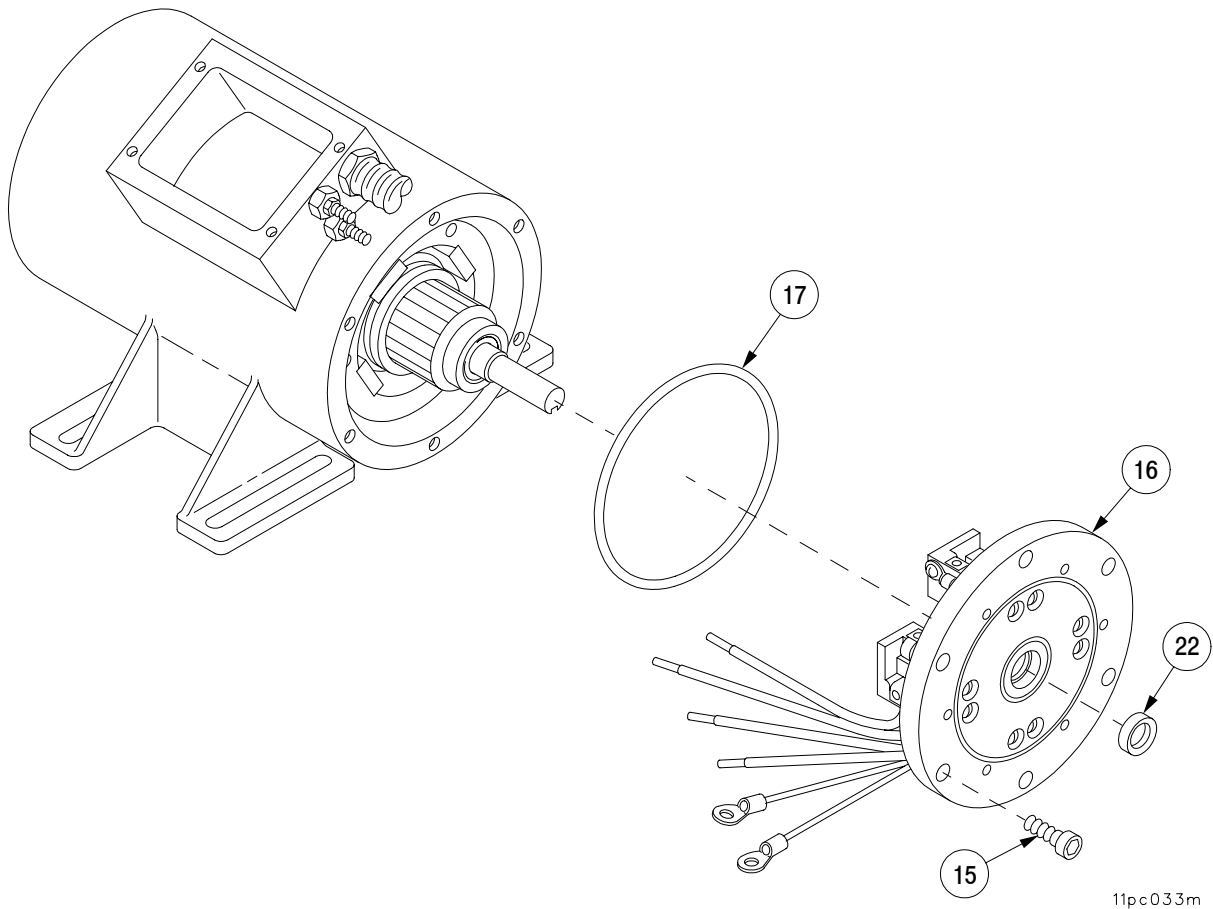
e. Installation.

- 1 Apply sealing compound (item 32, Appx B) to six screws (15).

NOTE

When installing brush and end bell assembly, make sure thermostat is facing EMI filter.

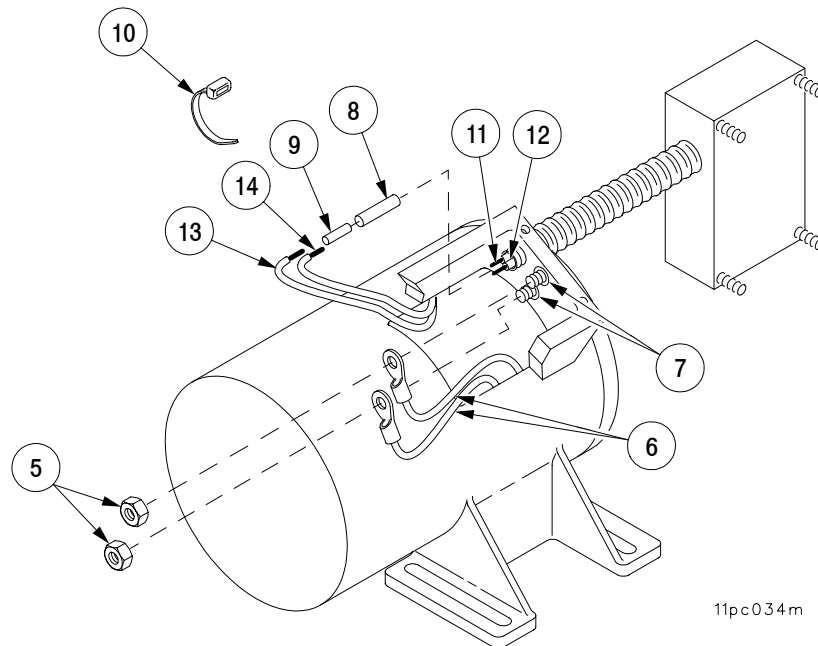
- 2 Install brush and end bell assembly (16), new shaft seal (22), and new preformed packing (17) with six screws (15).



8-13 COMPRESSOR MOTOR BRUSH AND END BELL ASSEMBLY - CONTINUED

e. Installation - Continued

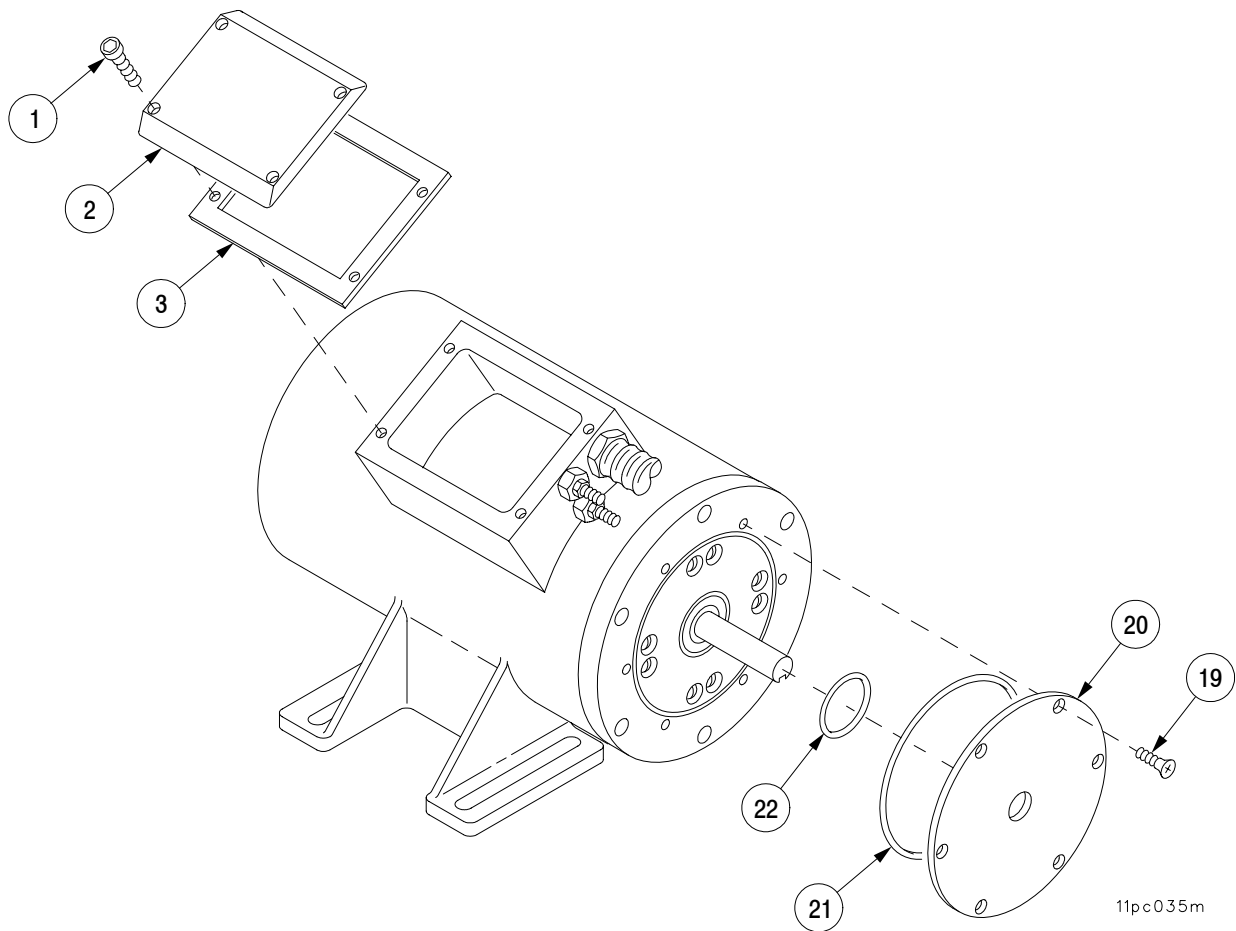
- 3 Thread motor leads (13 and 14) through new heat shrink tubes (8).
- 4 Connect motor leads (13 and 14) to EMI filter leads (11 and 12) with new splice conductors (9).
- 5 Apply new heat shrink tubes (8) over splice conductors (9).
- 6 Secure motor leads (13 and 14) and EMI filter leads (11 and 12) with new cable tie (10).
- 7 Connect thermostat leads (6) to terminal studs (7) with two nuts (5).



8-13 COMPRESSOR MOTOR BRUSH AND END BELL ASSEMBLY - CONTINUED

e. Installation - Continued

- 8 Apply sealing compound (item 38, Appx B) to six screws (19).
- 9 Install new cover seal (20) and two new preformed packings (21 and 22) with six screws (19).
- 10 Apply sealing compound (item 38, Appx B) to four screws (1).
- 11 Install cover (2) and new gasket (3) with four screws (1).



8-14 MCS PACK BLOWER ASSEMBLY.

This task covers: a. Disassembly b. Assembly

INITIAL SETUPTools

Refrigeration service tool kit
(SC 5180-90-N18)
Torque wrench (item 76, Appx F)

Equipment Conditions

Crew blower motor removed
(TM 9-2350-314-20-2-2)

Materials/Parts

Dry-cleaning solvent (item 69, Appx B)
Sealant (item 62, Appx B)
Lockwire (item 82, Appx B)
Lockwashers (4) (item 97, Appx E)
Lockwashers (4) (item 103, Appx E)
Ball bearing (2) (item 5, Appx E)
Lockwashers (2) (item 94, Appx E)
Self-locking nut (item 36, Appx E)
Lubricant (item 49, Appx B)
Electrical brushes (4) (item 200, Appx E)
Marking tags (item 71, Appx B)
Self-locking nuts (2) (item 35, Appx E)

8-14 MCS PACK BLOWER ASSEMBLY - CONTINUED

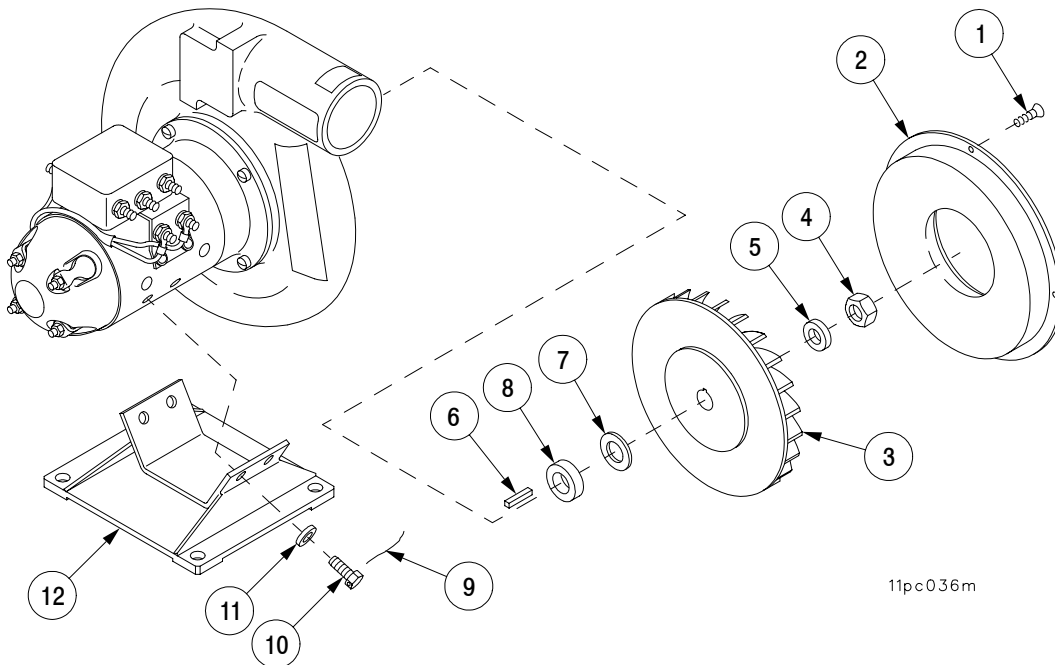
a. Disassembly.

- 1 Remove four screws (1) from airfoil entrance cover (2).

WARNING

Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause **SERIOUS INJURY**. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).

- 2 Remove airfoil entrance cover (2) and clean sealant from mating surfaces.
- 3 While holding impeller (3), remove self-locking nut (4) and flat washer (5), then remove impeller (3), machine key (6), laminated shims (7), and sleeve spacer (8) from motor shaft. Discard self-locking nut.
- 4 Remove lockwire (9), four screws (10), four flat washers (11) and motor support (12). Discard lockwire.



11pc036m

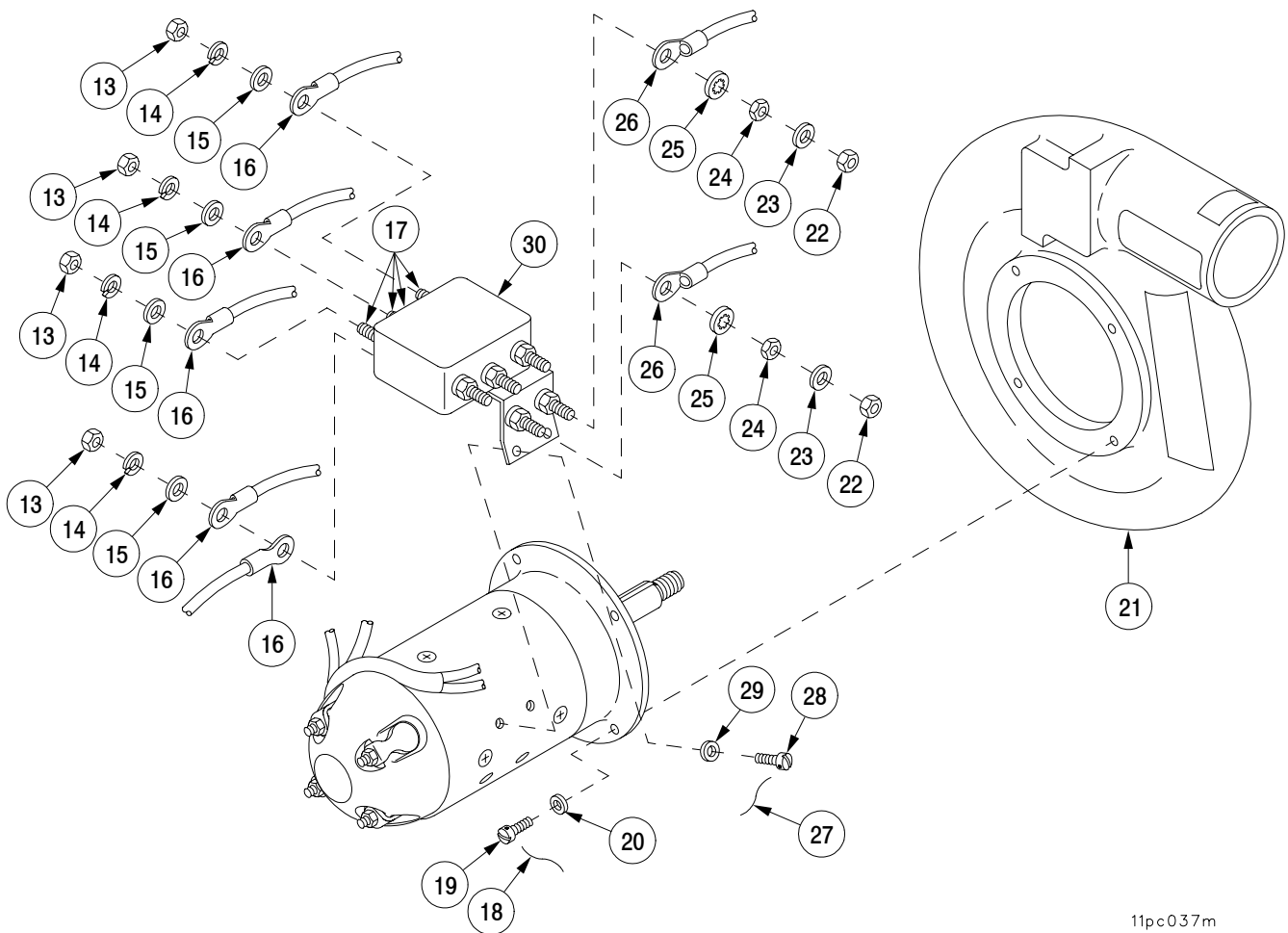
8-14 MCS PACK BLOWER ASSEMBLY - CONTINUED

a. Disassembly - Continued

NOTE

Tag leads before disconnecting to aid in installation.

- 5 Remove four nuts (13), four lockwashers (14), four flat washers (15), and five wires (16) from four terminals (17). Discard lockwashers.
- 6 Remove lockwire (18), four screws (19), four flat washers (20), and fan housing (21). Discard lockwire.
- 7 Remove two self-locking nuts (22), two flat washers (23), two nuts (24), two lockwashers (25), and two wires (26). Discard lockwashers and self-locking nuts.
- 8 Remove lockwire (27), four screws (28), four flat washers (29) and EMI filter (30). Discard lockwire.

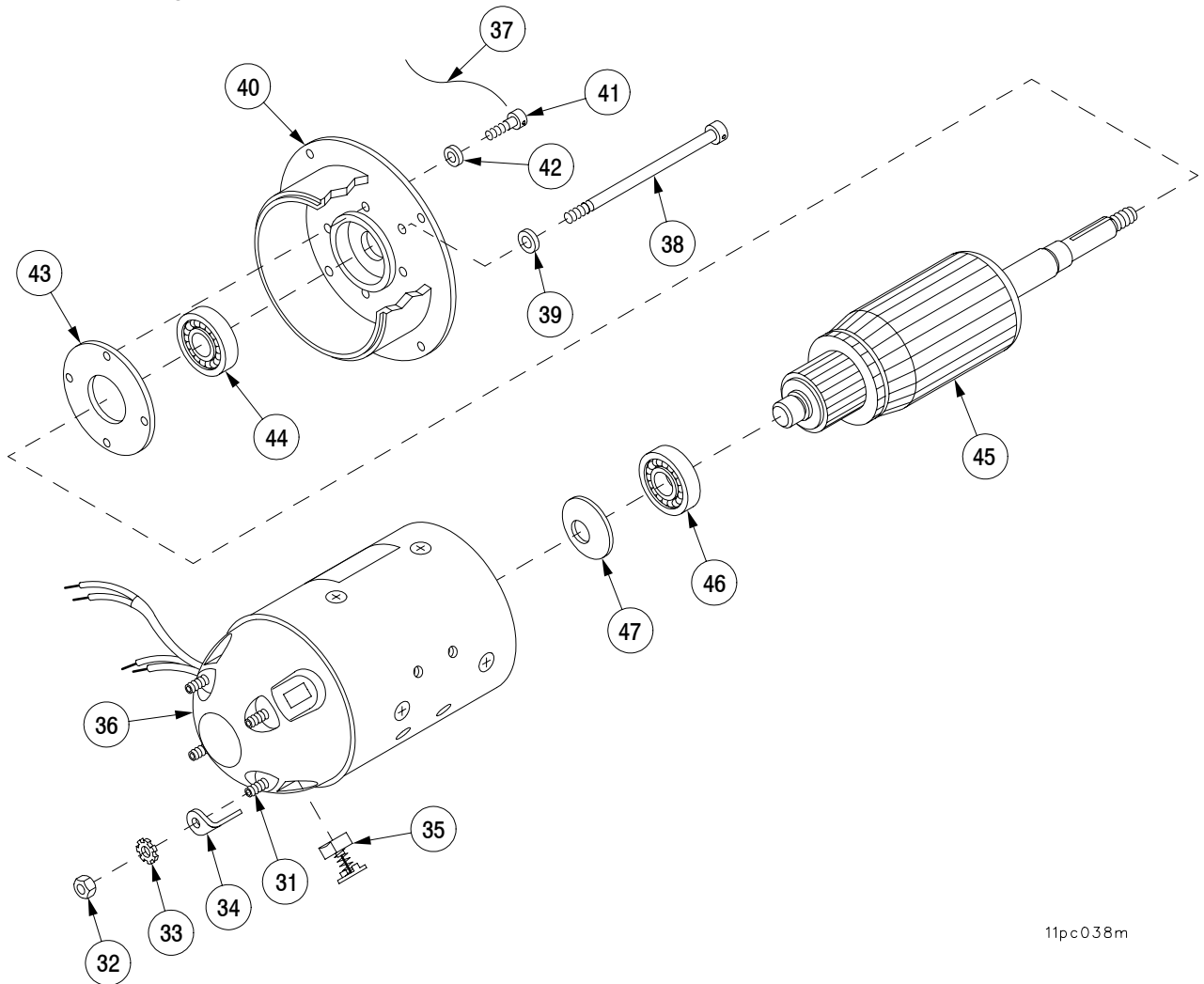


11pc037m

8-14 MCS PACK BLOWER ASSEMBLY - CONTINUED

a. Disassembly - Continued

- 9 In each of four places, hold setscrew (31) and remove nut (32) and lockwasher (33). Discard lockwashers.
- 10 Remove four brush access caps (34) and four electrical contact brushes (35) from stator end bell (36). Discard brushes.
- 11 Remove lockwire (37), two screws (38), two flat washers (39), and shaft end bell (40). Discard lockwire.
- 12 Remove four screws (41), four flat washers (42), bearing retainer (43), and ball bearing (44). Discard ball bearing.
- 13 Remove motor armature (45), ball bearing (46), and spring (47) from stator end bell (36). Discard ball bearing.



11pc038m

8-14 MCS PACK BLOWER ASSEMBLY - CONTINUED

a. Disassembly - Continued**WARNING**

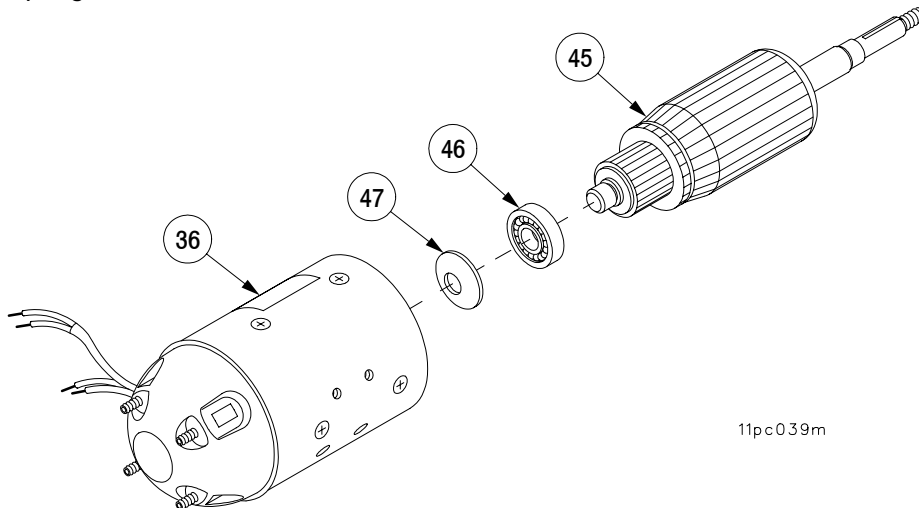
Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause **SERIOUS INJURY**. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).

- 14 Clean sealant from mating surfaces of access caps (34), shaft (40), and stator (36) end bells with dry-cleaning solvent.

b. Assembly.**NOTE**

- Make sure that all potential external leak paths are sealed. Wipe off excess sealant with solvent immediately after assembly.
- Lubricate bearings with lubricant prior to installation.

- 1 Install new ball bearing (46) on motor armature (45).
- 2 Install spring (47) and motor armature (45) in stator end bell (36).



8-14 MCS PACK BLOWER ASSEMBLY - CONTINUED

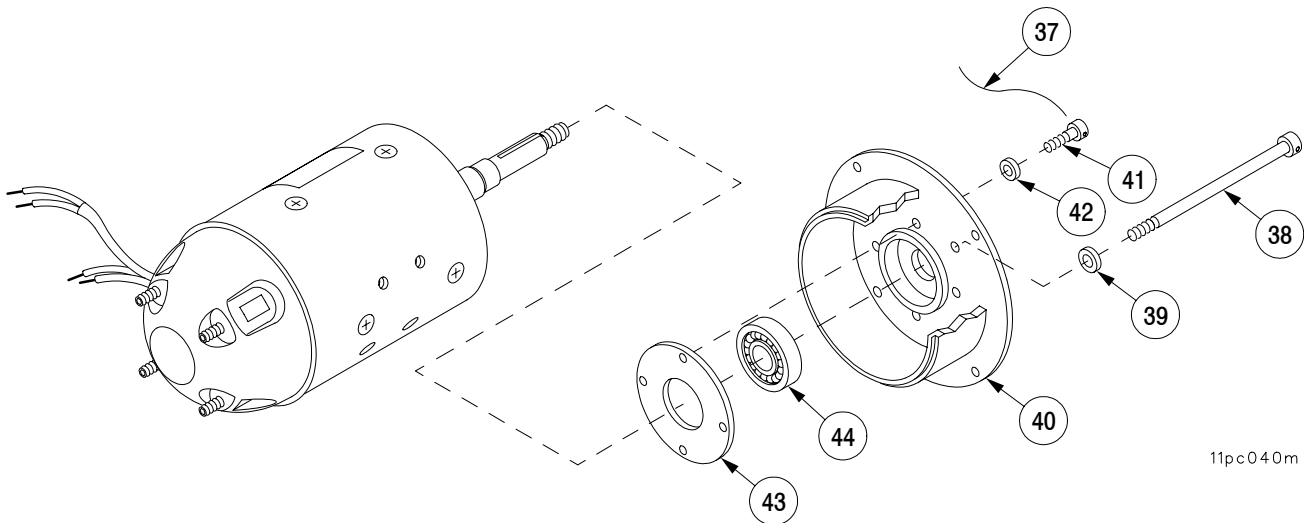
b. Assembly - Continued

- 3 Install new ball bearing (44) in shaft end bell (40).
- 4 Install bearing retainer (43) with four flat washers (42) and four screws (41).
- 5 Apply sealant to mating surfaces of shaft end bell (40), four flat washers (39), and under the heads of four screws (38).

WARNING

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- 6 Install shaft end bell (40) with four screws (41) and four flat washers (42). Remove excess sealant with clean rag soaked in dry-cleaning solvent. Secure with new lockwire (37).

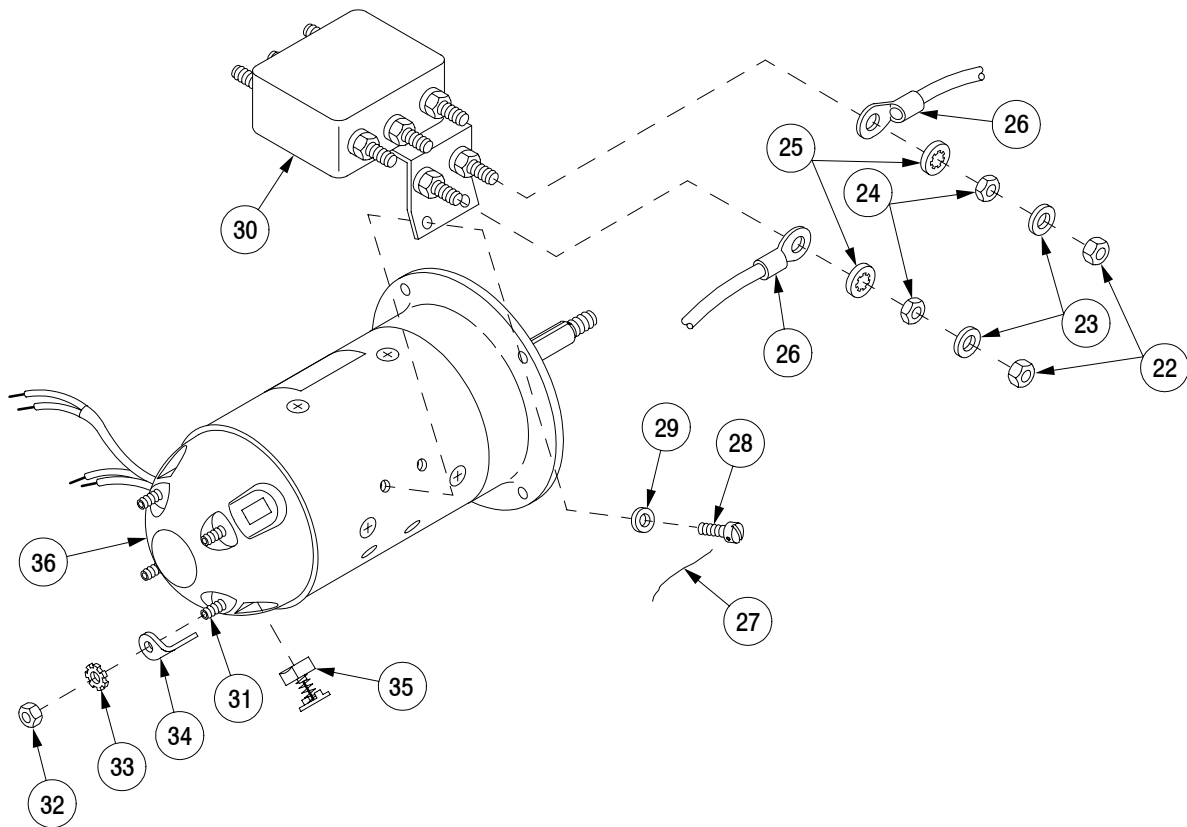


11pc040m

8-14 MCS PACK BLOWER ASSEMBLY - CONTINUED

b. Assembly - Continued

- 7 Install four new electrical contact brushes (35) into stator end bell (36). Apply sealant to mating surfaces of four brush access caps (34), four new lockwashers (33), and four nuts (32).
- 8 Install four brush access caps (34), four new lockwashers (33), and four nuts (32) on stator end bell (36).
- 9 In each of four places, hold setscrew (31) and tighten nut (32). Remove excess sealant.
- 10 Apply sealant to mating surfaces of EMI filter (30), four flat washers (29), and under heads of four screws (28).
- 11 Install EMI filter (30) with four screws (28) and four flat washers (29). Remove excess solvent and secure screws with new lockwire (27).
- 12 Secure two wires (26) with two new lockwashers (25), two nuts (24), two flat washers (23), and two new self-locking nuts (22).

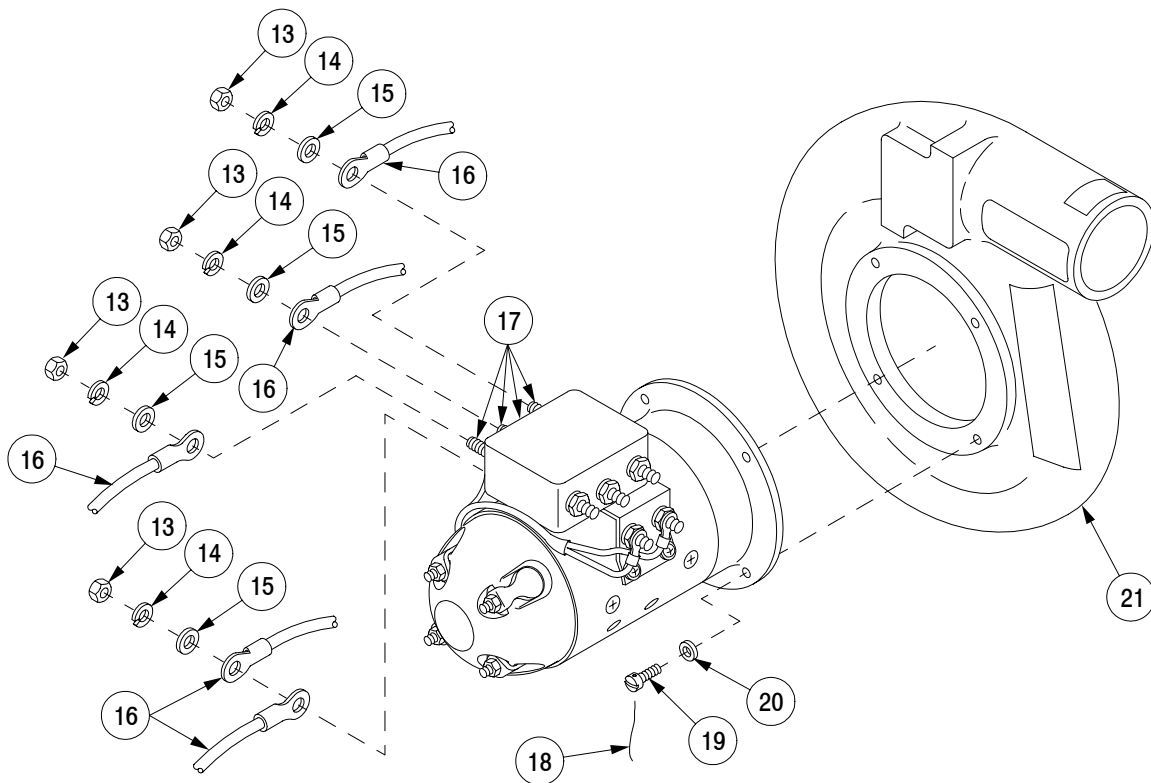


11pc041m

8-14 MCS PACK BLOWER ASSEMBLY - CONTINUED

b. Assembly - Continued

- 13 Apply sealant to mating surfaces of fan housing (21), four flat washers (20), and under heads of four screws (19).
- 14 Install fan housing (21) with four screws (19) and four flat washers (20). Remove excess sealant. Secure screws with new lockwire (18).
- 15 Secure five wires (16) to four terminals (17) with four flat washers (15), four new lockwashers (14), and four nuts (13).



11pc042m

8-14 MCS PACK BLOWER ASSEMBLY - CONTINUED

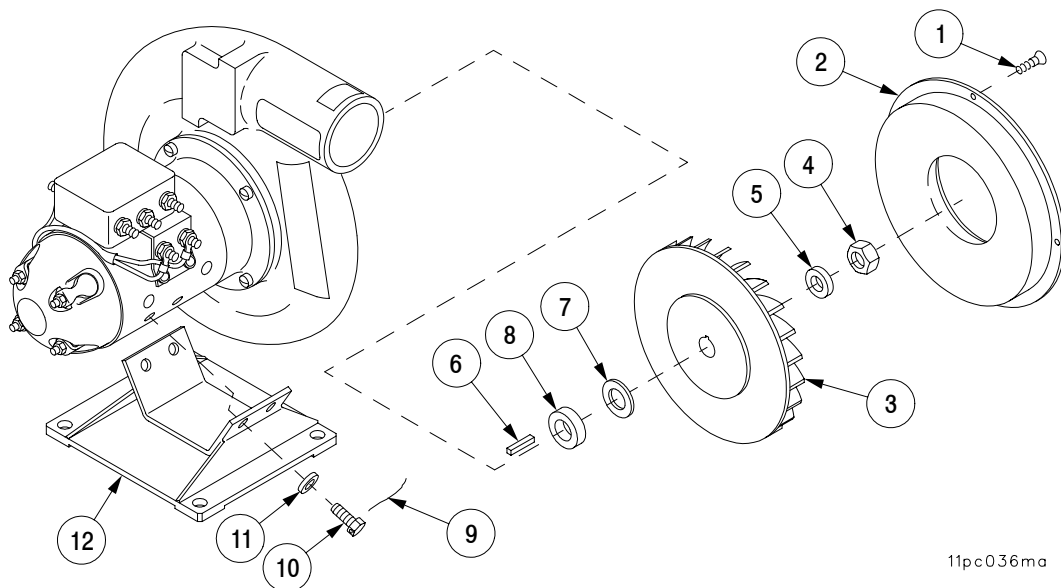
b. Assembly - Continued

- 16 Apply sealant to mating surfaces of motor mounting support (12), four flat washers (11), and under heads of four screws (10).

WARNING

Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause **SERIOUS INJURY**. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).

- 17 Install motor mounting support (12) with four screws (10) and four flat washers (11). Remove excess sealant with clean rag soaked in solvent. Secure screws with new lockwire (9).
- 18 Install sleeve spacer (8), laminated shims (7), and machine key (6) on motor shaft.
- 19 Temporarily install impeller (3), flat washer (5), new self-locking nut (4), airfoil entrance cover (2), and four screws (1).
- 20 Measure clearance between impeller (3) and airfoil entrance cover (2). Select thickness of laminated shims (7) to reduce clearance to 0.010 to 0.015 in. Remove temporarily installed parts.



11pc036ma

8-14 MCS PACK BLOWER ASSEMBLY - CONTINUED

b. Assembly - Continued

NOTE

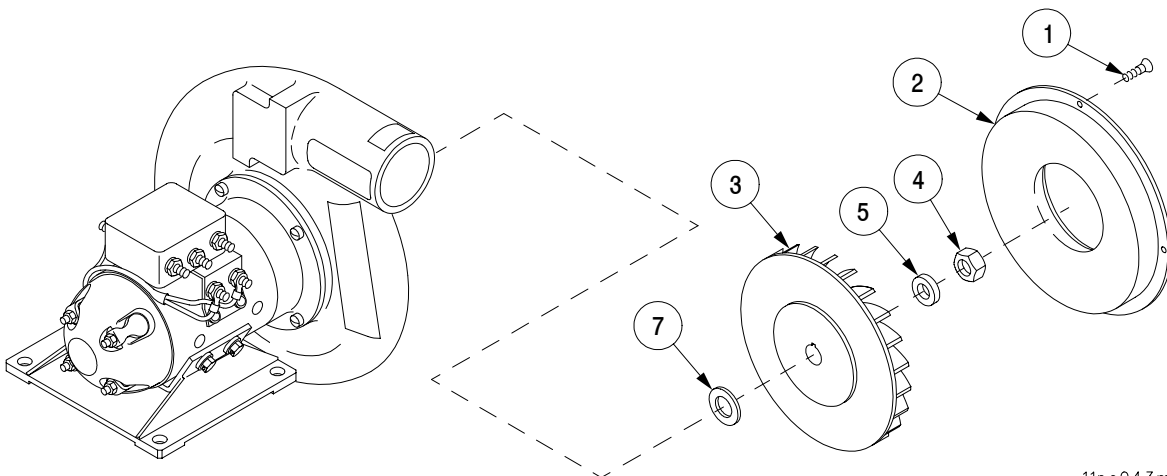
Laminated shims can be peeled off in 0.002-in. increments.

- 21 Install laminated shims (7), impeller (3), flat washer (5), and new self-locking nut (4). Torque nut to 55-65 lb-in. (6.2-7.3 N-m).
- 22 Apply sealant to mating surfaces of airfoil entrance cover (2) and under heads of four screws (1).

WARNING

Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause **SERIOUS INJURY**. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).

- 23 Install airfoil entrance cover (2) with four screws (1). Remove excess sealant with clean rag soaked in solvent.



11pc043m

8-15 CONDENSER.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools

Refrigeration service tool kit
(SC 5180-90-N18)
Torque wrench (item 76, Appx F)

Materials/Parts

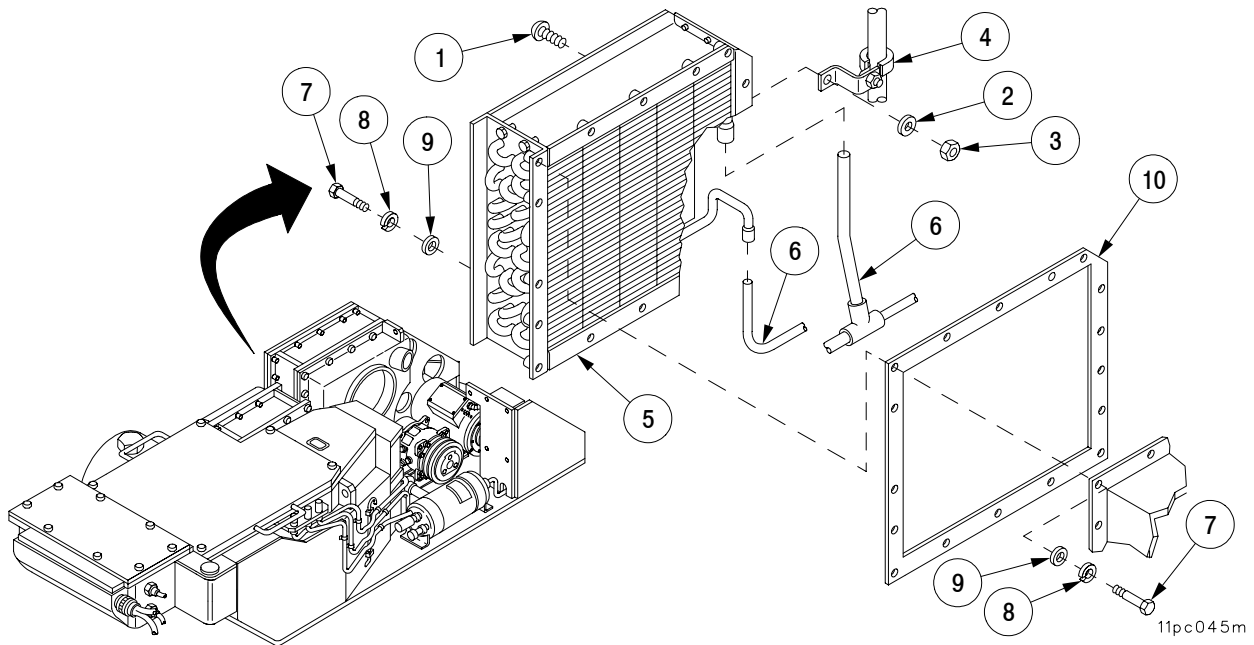
Curing agent (item 10, Appx B)
Adhesive (item 1, Appx B)
Methyl alcohol (item 13, Appx B)
Gasket (item 195, Appx E)
Thread lubricant (item 50, Appx B)
Lockwashers (17) (item 104, Appx E)
Self-locking nut (item 35, Appx E)
Alloy braze (item 17, Appx B)
Silver braze (item 18, Appx B)

Equipment Conditions

MCS pack removed (TM 9-2350-314-20-2-2)
MCS pack discharged and prepared for
debrazing and brazing (para 8-1)
MCS vanaxial fan assembly removed
(TM 9-2350-314-20-2-2)

a. Removal.

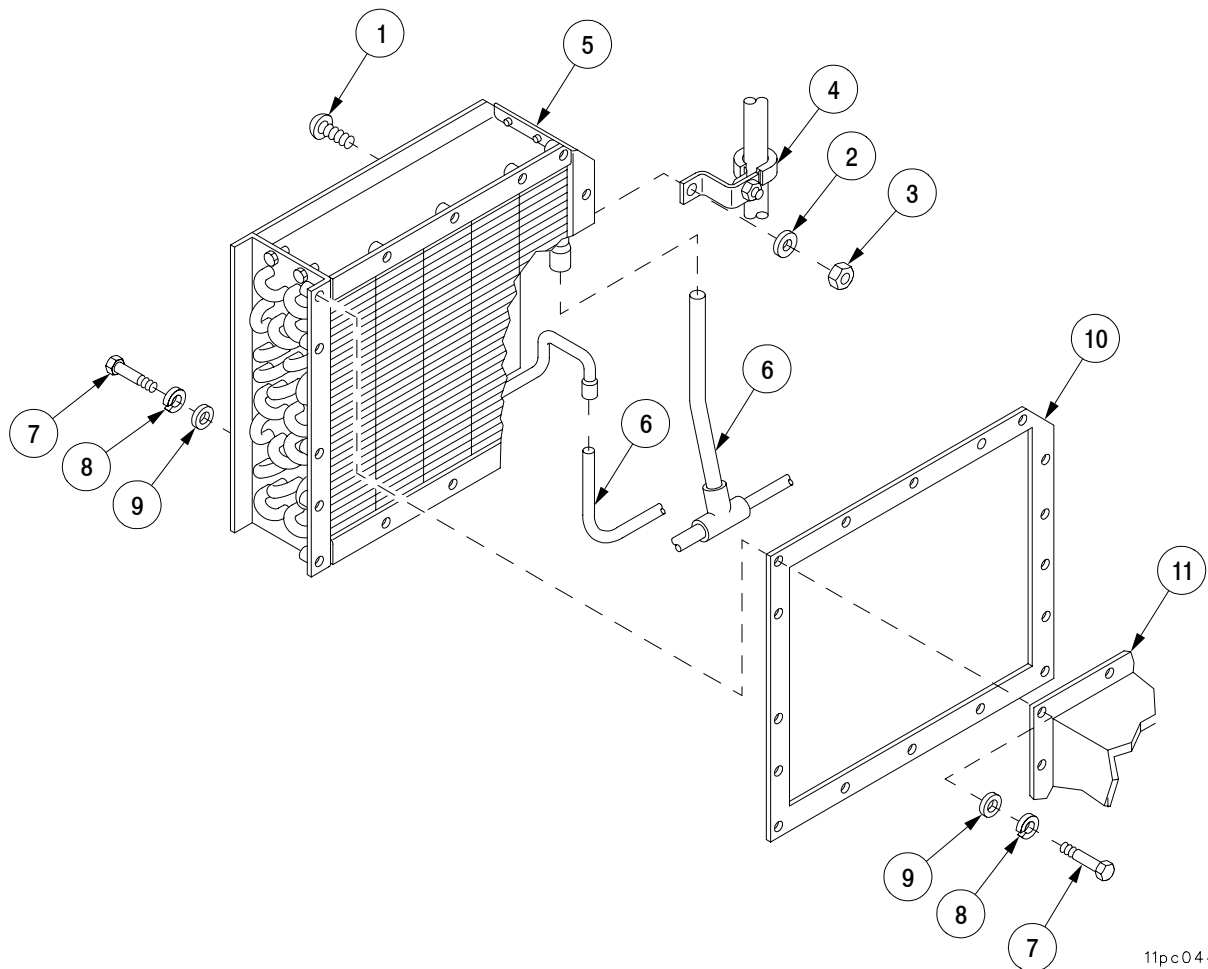
- 1 Remove screw (1), flat washer (2), and self-locking nut (3) securing clamp bracket (4) to condenser (5). Discard self-locking nut.
- 2 Debraze two lines (6) from condenser (5).
- 3 Remove 17 screws (7), 17 lockwashers (8), 17 flat washers (9), gasket (10), and condenser (5). Discard lockwashers.
- 4 Remove residual gasket and adhesive material from mating surface of condenser (5) with methyl alcohol.



8-15 CONDENSER - CONTINUED

b. Installation.

- 1 To prepare adhesive mixture, combine seven parts adhesive to one part curing agent. Mix thoroughly.
- 2 Apply a coat of adhesive mixture to the mating surface of the condenser (5) and new gasket (10).
- 3 Apply a second coat of adhesive to previously coated area. Allow adhesive to set for 30 to 60 minutes.
- 4 Install new gasket (10) onto condenser (5).
- 5 Coat threads of 17 screws (7) with thread lubricant.
- 6 Install condenser outlet duct (11) and condenser (5) with 17 screws (7), 17 new lockwashers (8), and 17 flat washers (9). Torque to 35-45 lb-in (4.0-5.1 N.m).
- 7 Braze two lines (6) to condenser (5).
- 8 Install clamp bracket (4) to condenser (5) with new self-locking nut (3), flat washer (2), and screw (1). Torque nut to 20-25 lb-in. (2.3-2.8 N.m).



11pc044m

8-17 MCS PACK VANEAXIAL FAN ASSEMBLY.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Refrigeration service tool kit
(SC 5180-90-N18)
Torque wrench (item 76, Appx F)

Equipment Conditions

MCS pack removed (TM 9-2350-314-20-2-2)
MCS pack vaneaxial fan assembly
motor removed (TM 9-2350-314-20-2-2)

Materials/Parts

Cotter pins (2) (item 52, Appx E)
Self-locking nuts (4) (item 39, Appx E)
Dry-cleaning solvent (item 69, Appx B)
Sealant (item 62, Appx B)
Lockwire (item 82, Appx B)
Electric brushes (4) (item 199, Appx E)
Ball bearings (2) (item 5, Appx E)
Lockwashers (2) (item 94, Appx E)
Lockwashers (2) (item 95, Appx E)
Lockwashers (4) (item 97, Appx E)
Retaining rings (item 23, Appx E)
Marking tags (item 71, Appx B)
Lubricant (item 49, Appx B)

WARNING

Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause **SERIOUS INJURY**. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).

8-17 MCS PACK VANEAXIAL FAN ASSEMBLY - CONTINUED

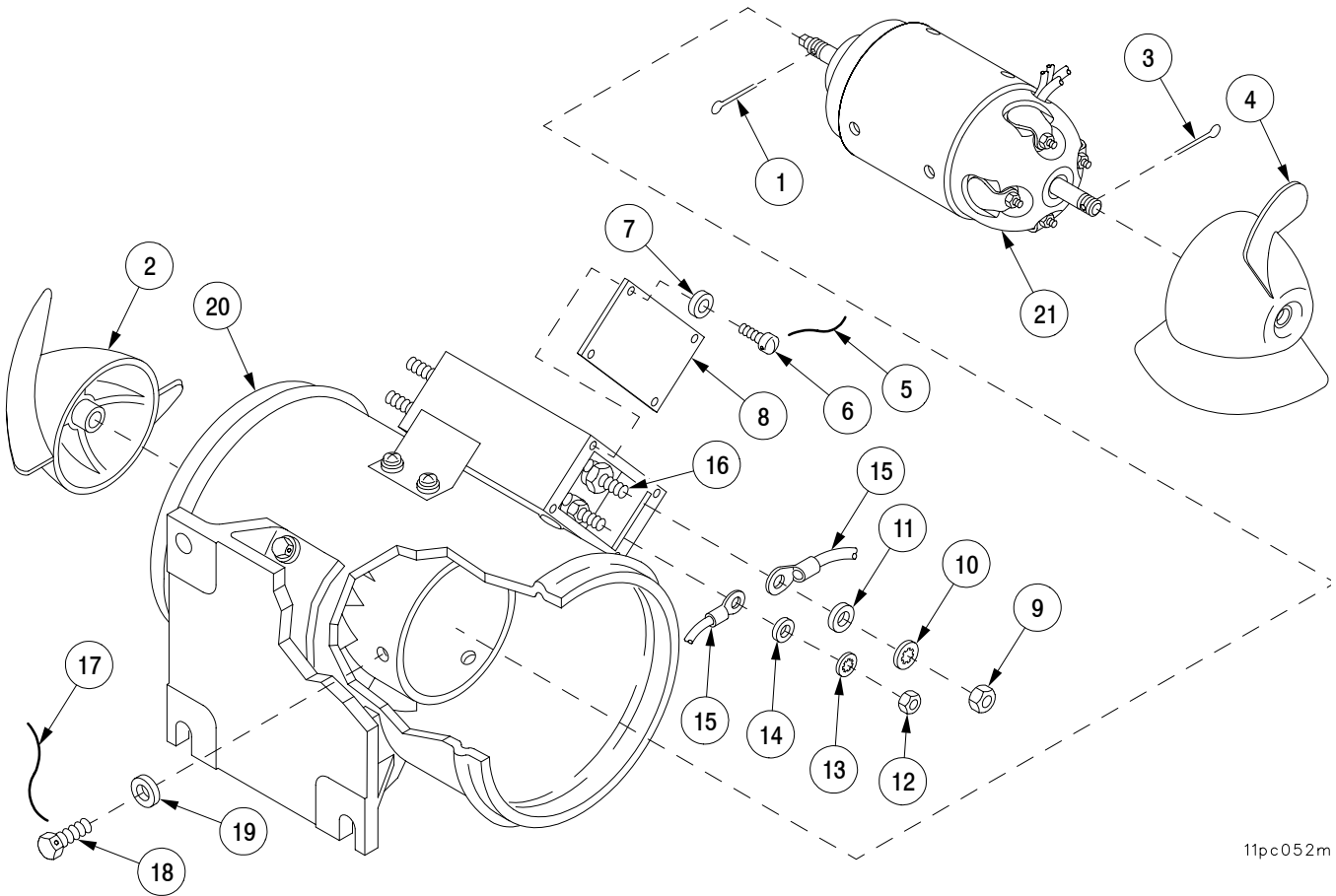
a. Disassembly.

- 1 Remove and discard cotter pin (1). Unscrew first stage propeller (2) counter clockwise from motor shaft.
- 2 Remove and discard cotter pin (3). Unscrew second stage propeller (4) clockwise from motor shaft.
- 3 Remove and discard lockwire (5) from four screws (6). Remove four screws (6), four flat washers (7), and filter access cover (8).

NOTE

Tag leads before disconnecting to aid in installation.

- 4 Remove two nuts (9), two lockwashers (10), two flat washers (11), two nuts (12), two lockwashers (13), and two flat washers (14). Discard all lockwashers. Remove four wires (15) from four terminal posts (16).
- 5 Remove lockwire (17), six screws (18), six flat washers (19), and fan housing (20) from fan motor (21). Discard lockwire.

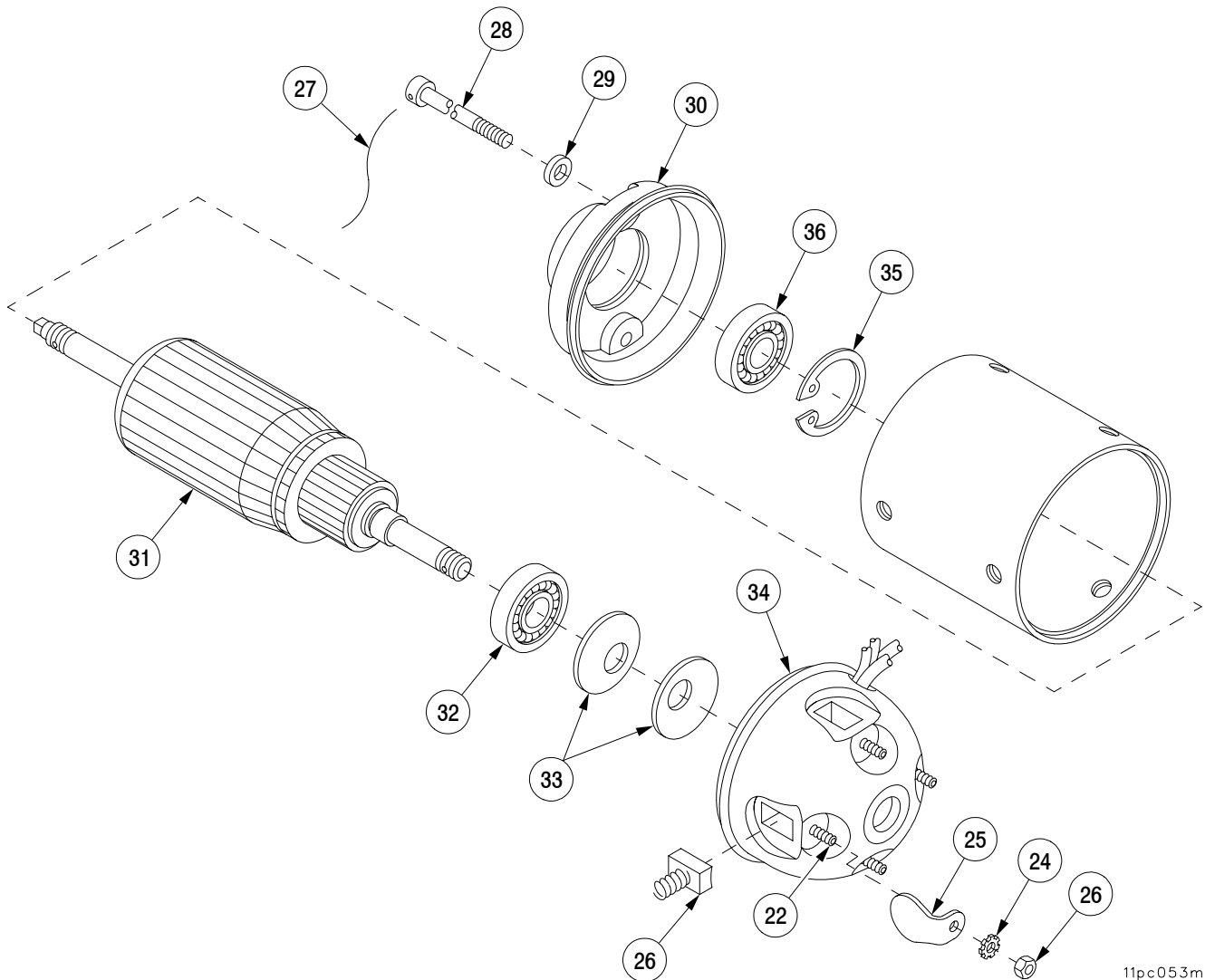


11pc052m

8-17 MCS PACK VANEAXIAL FAN ASSEMBLY - CONTINUED

a. Disassembly - Continued

- 6 In each of four places, hold setscrew (22) and remove nut (23) and lockwasher (24). Discard lockwashers.
- 7 Remove four brush access caps (25) and four electrical contact brushes (26). Discard brushes.
- 8 Cut and remove lockwire (27), two screws (28), two flat washers (29), and shaft end bell (30). Discard lockwire.
- 9 Remove motor armature (31), bearing (32) and two springs (33) from stator end bell (34). Discard bearing.
- 10 Remove retaining ring (35) and bearing (36) from shaft end bell (30). Discard bearing and retaining ring.



11pc053m

8-17 MCS PACK VANEAXIAL FAN ASSEMBLY - CONTINUED

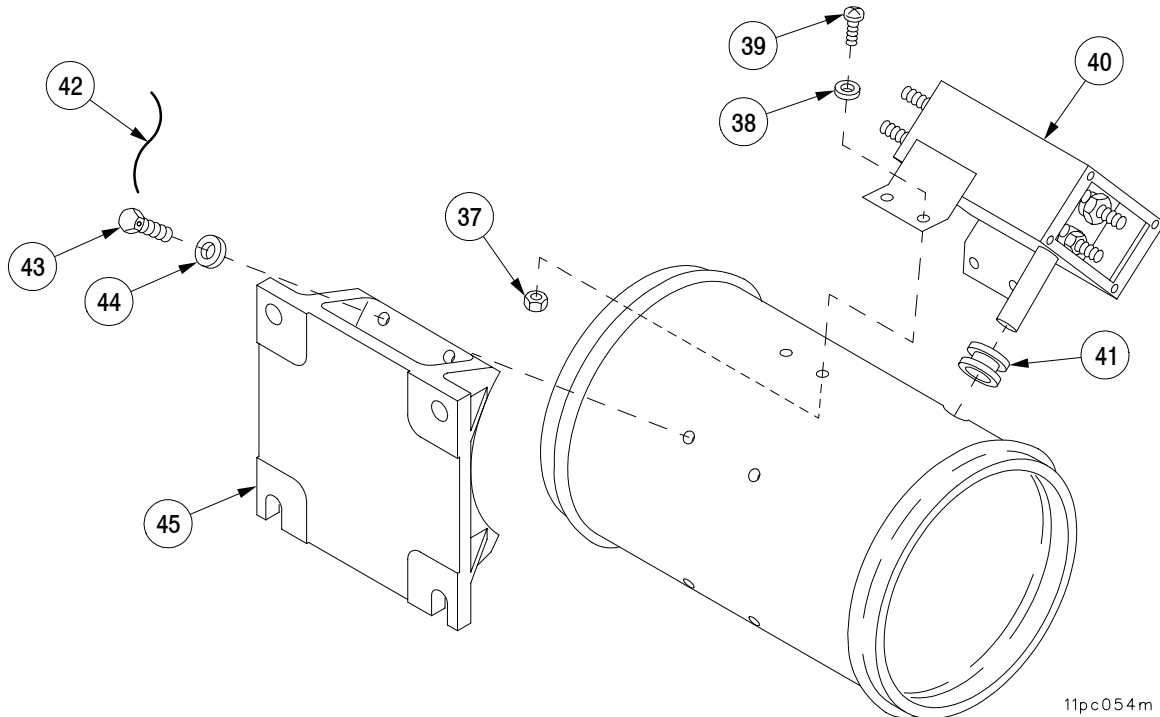
a. Disassembly - Continued

- 11 Remove four self-locking nuts (37), four flat washers (38), four screws (39), EMI filter (40), and grommet (41). Discard self-locking nuts.
- 12 Remove lockwire (42), four screws (43), four flat washers (44), and support (45). Discard lockwire.

WARNING

Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause **SERIOUS INJURY**. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).

- 13 Clean sealant from all mating surfaces using a clean rag soaked in solvent.



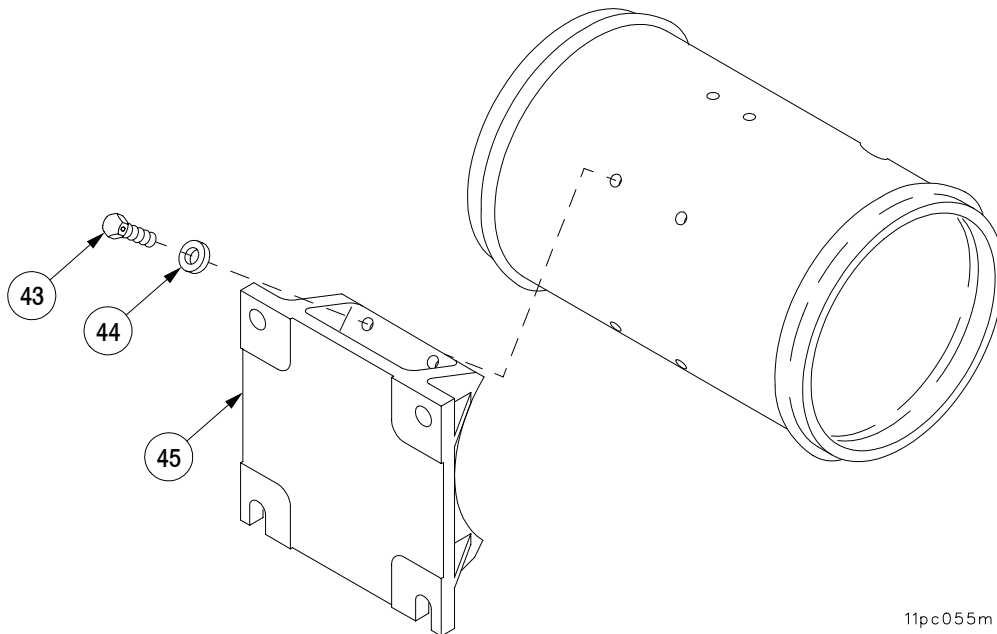
8-17 MCS PACK VANEAXIAL FAN ASSEMBLY - CONTINUED

b. Assembly.

NOTE

Ensure that all potential external leak paths are sealed. Wipe off excess sealant immediately after assembly using solvent.

- 1 Apply continuous bead of sealant around housing mating surface of support (45), and apply sealant to surface of four flat washers (44), and under heads of four screws (43).
- 2 Install support (45) with four flat washers (44) and four screws (43).



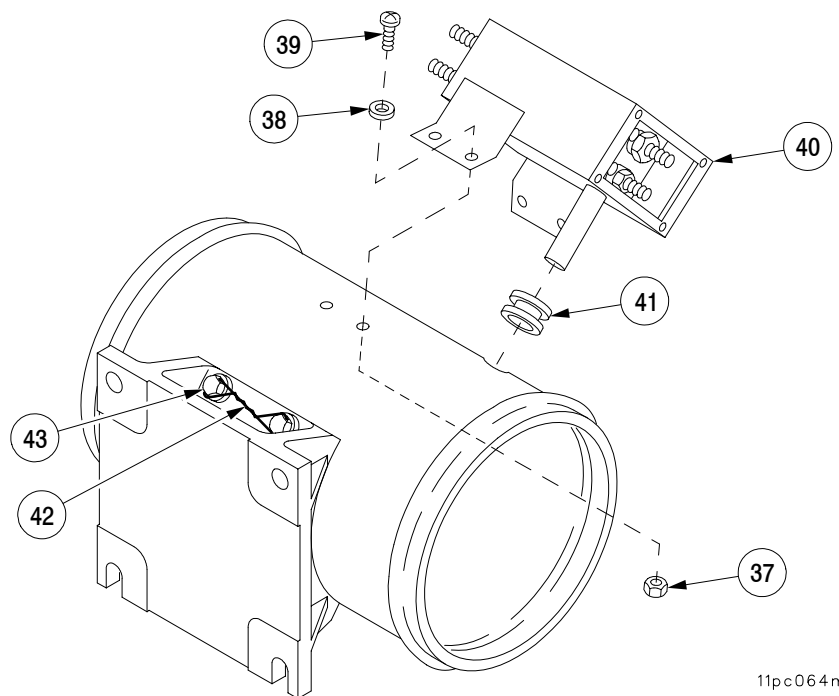
11pc055m

8-17 MCS PACK VANEAXIAL FAN ASSEMBLY - CONTINUED

b. Assembly - Continued**WARNING**

Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause **SERIOUS INJURY**. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).

- 3 Remove excess sealant with solvent and secure screws (43) with new lockwire (42).
- 4 Apply continuous bead of sealant around both mating surfaces of EMI filter (40), four flat washers (38), and under heads of four screws (39).
- 5 Install grommet (41) and EMI filter (40) with four screws (39), four flat washers (38), and four new self-locking nuts (37). Remove excess sealant with solvent.



11pc064m

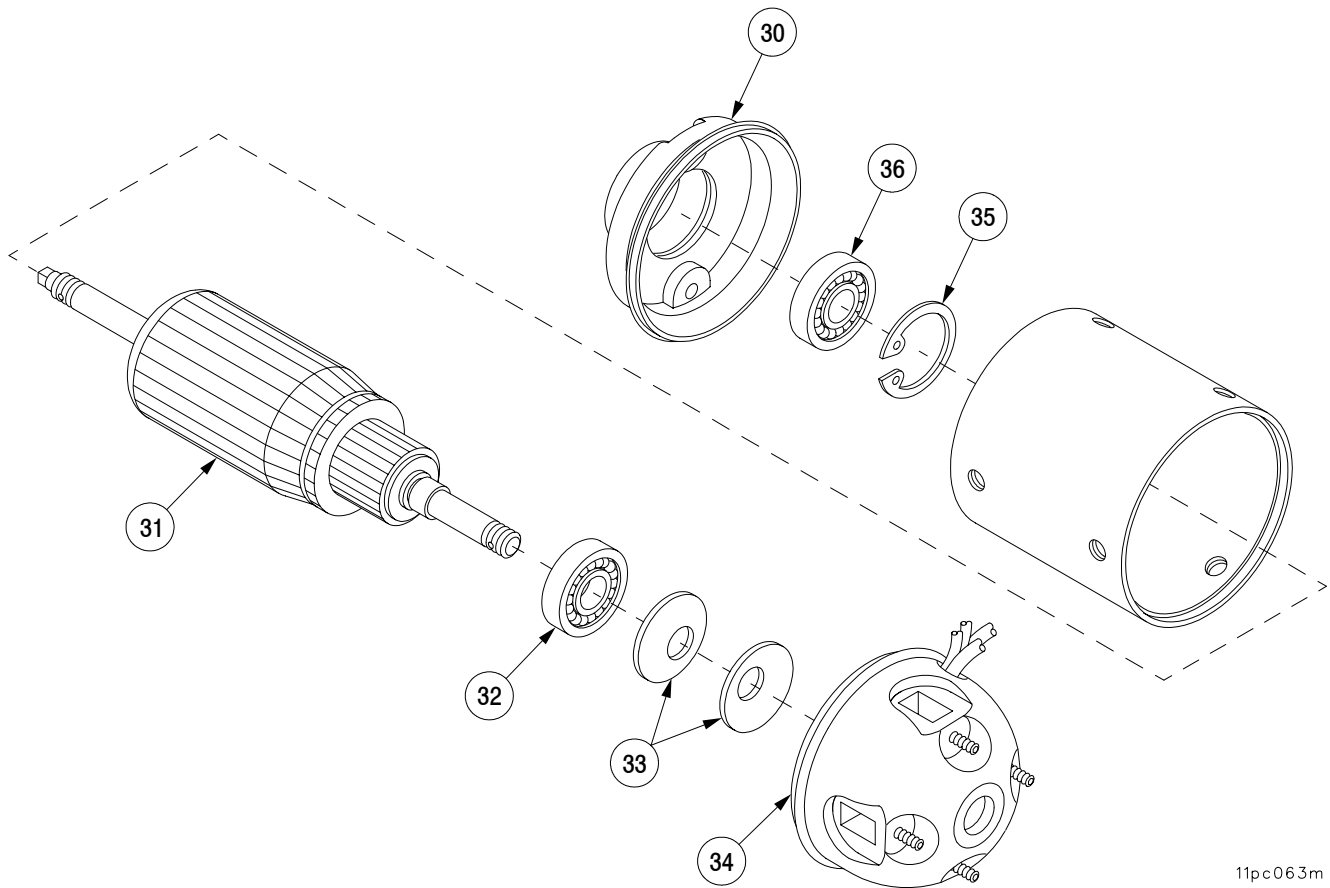
8-17 MCS PACK VANEAXIAL FAN ASSEMBLY - CONTINUED

b. Assembly - Continued

NOTE

Lubricate bearings prior to installation.

- 6 Install new bearing (36) and new retaining ring (35) in shaft end bell (30).
- 7 Install two springs (33) and new bearing (32) in stator end bell (34).
- 8 Carefully install motor armature (31) into stator end bell (34).



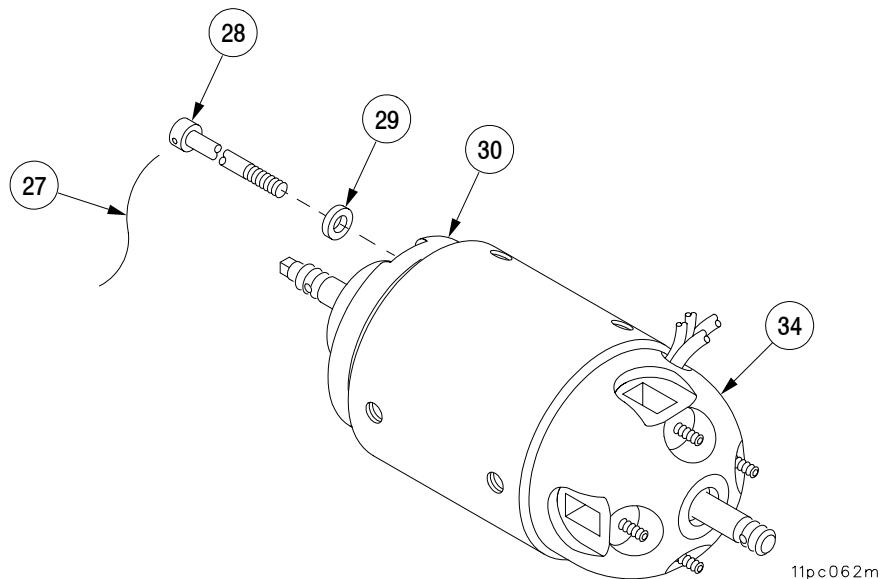
11pc063m

8-17 MCS PACK VANEAXIAL FAN ASSEMBLY - CONTINUED

b. Assembly - Continued**WARNING**

Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause **SERIOUS INJURY**. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).

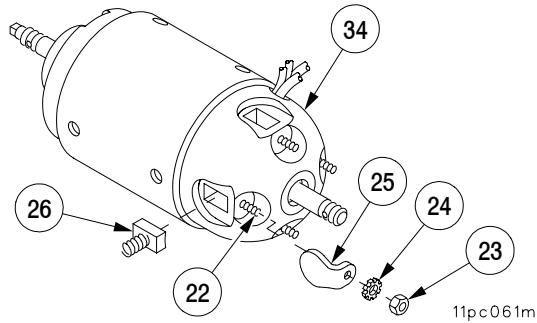
- 9 Apply sealant to mating surfaces of shaft end bell (30), stator end bell (34), two flat washers (29), and under the heads of two screws (28).
- 10 Install shaft end bell (30) with two screws (28) and two flat washers (29). Remove excess sealant with clean rag soaked in solvent. Secure with new lockwire (27).



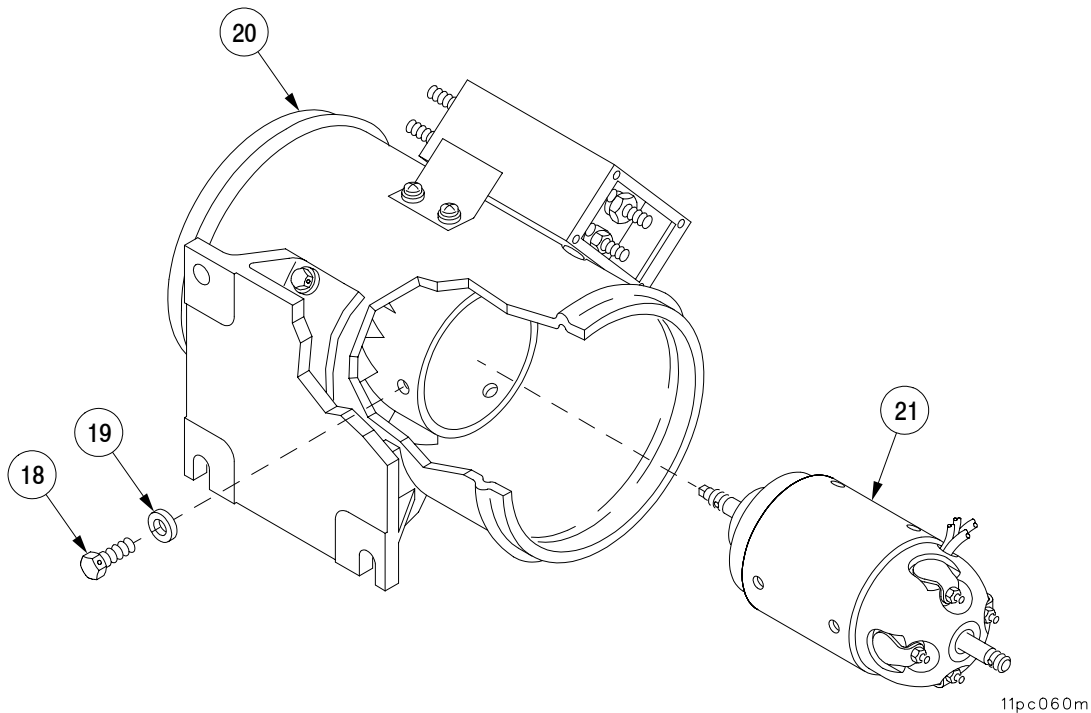
8-17 MCS PACK VANEAXIAL FAN ASSEMBLY - CONTINUED

b. Assembly - Continued

- 11 Install four new electrical contact brushes (26) into stator end bell (34).
- 12 Apply sealant to mating surfaces and install four brush access caps (25), four new lockwashers (24), and four nuts (23).
- 13 In each of four places, hold setscrew (22), and tighten nut (23). Remove excess sealant with clean rag, soaked in solvent.



- 14 Apply sealant to mating surfaces of fan motor (21) and fan housing (20), six flat washers (19), and under heads of six screws (18).
- 15 Install fan motor (21) into fan housing (20) and secure with six screws (18) and six flat washers (19).



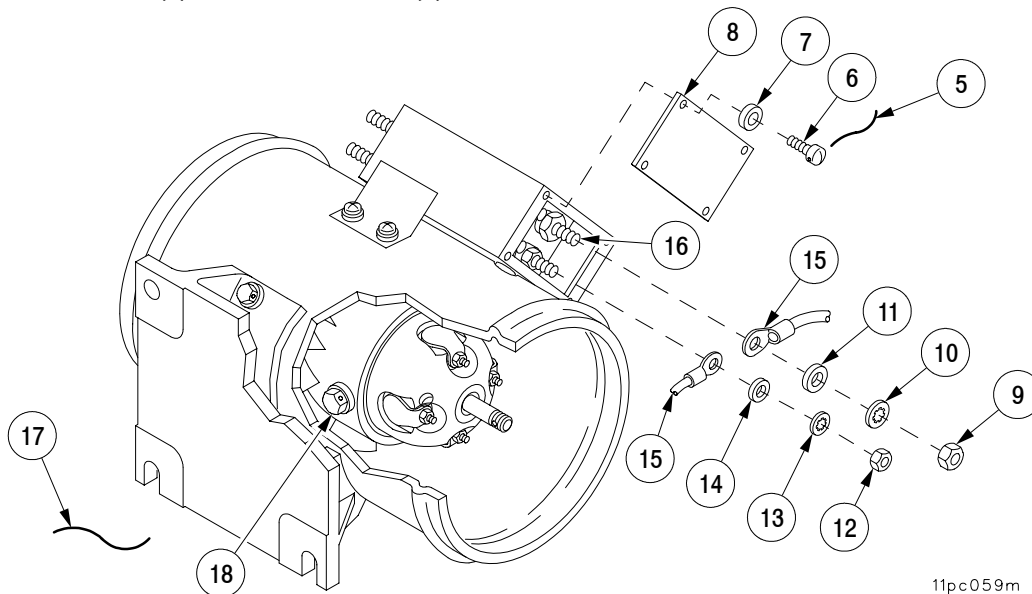
8-17 MCS PACK VANEAXIAL FAN ASSEMBLY - CONTINUED

b. Assembly - Continued

WARNING

Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause **SERIOUS INJURY**. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).

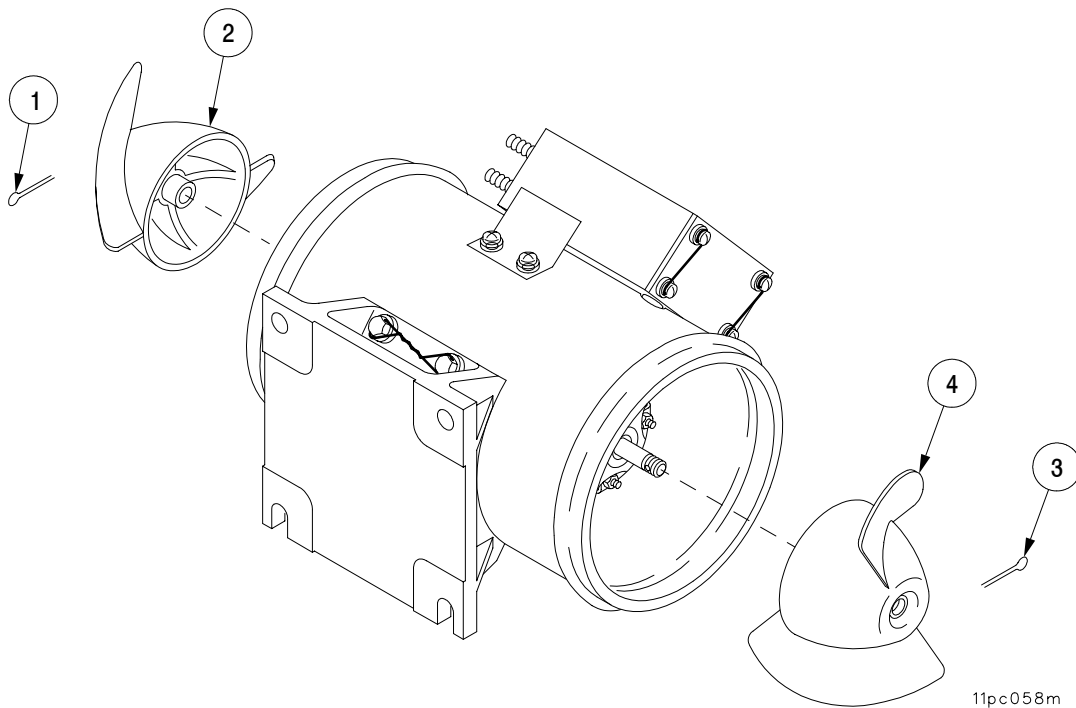
- 16 Remove excess sealant with clean rag soaked in solvent and secure screws (18) with new lockwire (17).
- 17 Install four wires (15) to four terminals (16) with two flat washers (14), two new lockwashers (13), two nuts (12), two flat washers (11), two new lockwashers (10), and two nuts (9).
- 18 Apply sealant to mating surfaces of filter access cover (8), four flat washers (7), and under the heads of four screws (6). Install access cover (8), four flat washers (7), and four screws (6). Remove excess sealant with clean rag soaked in solvent.
- 19 Secure screws (6) with new lockwire (5).



8-17 MCS PACK VANEAXIAL FAN ASSEMBLY - CONTINUED

b. Assembly - Continued

- 20 Install second stage propeller (4) by turning counter clockwise onto motor shaft and install new cotter pin (3).
- 21 Install first stage propeller (2) by turning clockwise onto motor shaft and install new cotter pin (1).



8-18 EVAPORATOR AND EVAPORATOR HEADER ASSEMBLIES - CONTINUED

b. Disassembly.

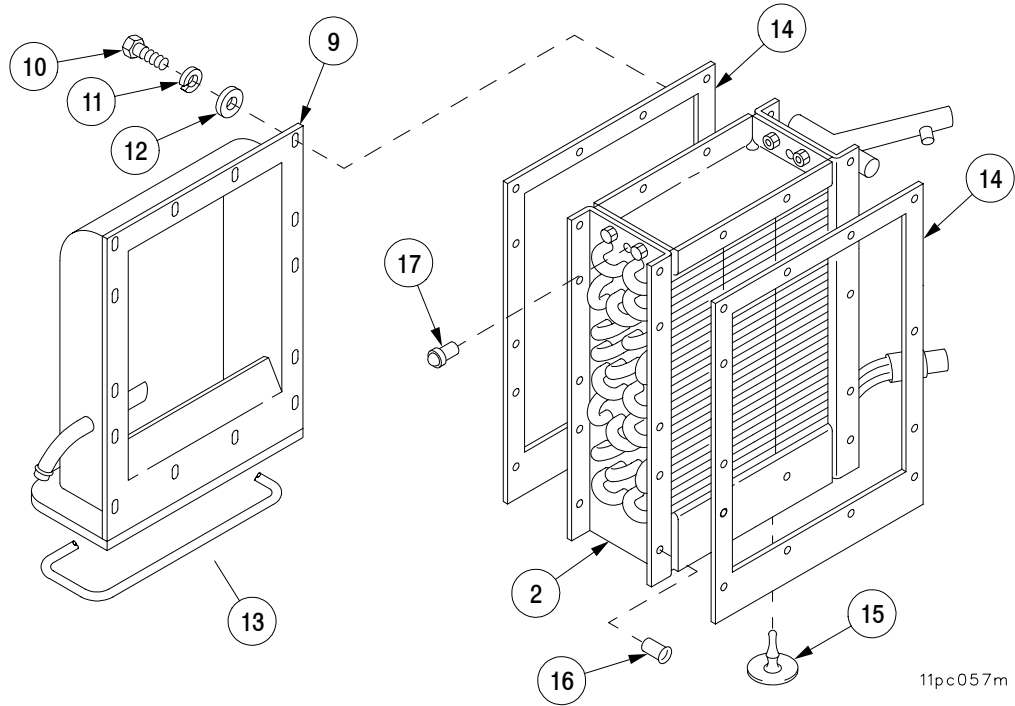
- 1 Remove 14 screws (10), 14 lockwashers (11), 14 flat washers (12), and evaporator header (9) from evaporator (2). Discard lockwashers.
- 2 Remove and discard rubber tubing (13) from evaporator header (9).
- 3 Remove two gaskets (14) from evaporator (2). Discard gaskets.
- 4 Use rag moistened with methyl alcohol to remove residual adhesive material from mating surfaces of evaporator (2).
- 5 Remove two valves (15).
- 6 Remove 28 inserts (16) (para 2-16).
- 7 Remove two eyelets (17).

c. Assembly.

- 1 Install two eyelets (17).
- 2 Install 28 inserts (16) (para 2-16).
- 3 Install two valves (15).
- 4 Clean mating surface and 45° bend splice area of the new rubber tubing (13) with methyl alcohol. Abrade the mating surface with fine abrasive cloth. Repeat methyl alcohol cleaning and air dry.
- 5 Prepare adhesive mixture by combining seven parts adhesive to one part curing agent. Mix thoroughly.
- 6 Apply a coat of adhesive mixture to the sealing surfaces of evaporator (2) and two new gaskets (14). Allow adhesive to cure for 60 minutes.
- 7 Apply a coat of adhesive mixture to the rubber and metal mounting surfaces of the evaporator header (9) and mating surface and bend splice area of new rubber tubing (13). Allow adhesive to dry for 2 hours.
- 8 Apply a second coat of adhesive to previously coated areas. Allow adhesive to set for 30 to 60 minutes.
- 9 Install new rubber tubing (13) onto bottom of evaporator header (9).
- 10 Install two new gaskets (14) onto evaporator (2).
- 11 Apply thread lubricant to 14 screws (10).
- 12 Install evaporator header (9) to evaporator (2) with 14 flat washers (12), 14 new lockwashers (11), and 14 screws (10). Torque screws to 35-45 lb-in. (4-5 N·m).

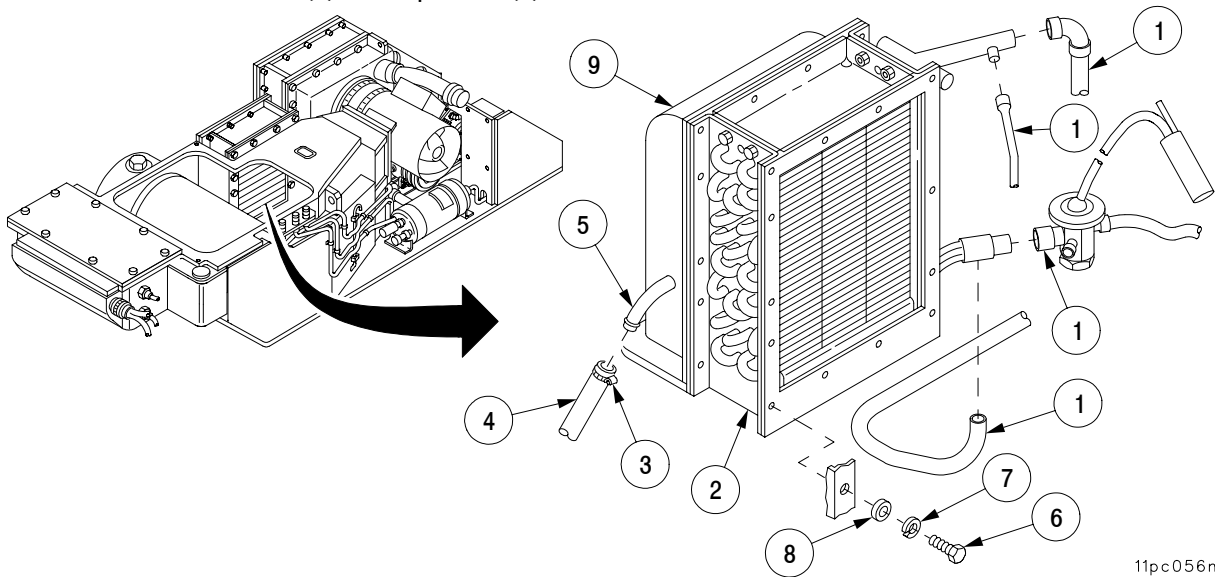
8-18 EVAPORATOR AND EVAPORATOR HEADER ASSEMBLIES - CONTINUED

c. Assembly - Continued



d. Installation.

- 1 Install evaporator (2) and evaporator header (9) with 14 screws (6), 14 new lockwashers (7) and 14 flat washers (8). Torque screws to 35-45 lb-in. (4-5 N·m).
- 2 Connect hose (4) to evaporator header inlet tube (5). Tighten clamp (3).
- 3 Braze four lines (1) to evaporator (2).



8-19 MCS PACK RELAY PANEL.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Refrigeration service tool kit
(SC 5180-90-N18)
Soldering gun (item 19, Appx F)

Equipment Condition

Relay panel removed
(TM 9-2350-314-20-2-2)

Materials/Parts

Self-locking nut (9) (item 42, Appx E)
Self-locking nut (10) (item 45, Appx E)
Lockwashers (4) (item 101, Appx E)
Lockwashers (6) (item 116, Appx E)
Lockwashers (4) (item 102, Appx E)
Solder (item 68, Appx B)
Adhesive (item 3 or 4, Appx B)
Marking tags (item 71, Appx B)
Lacing cord tape (item 72, Appx B)
Insulation sleeving (item 64, Appx B)

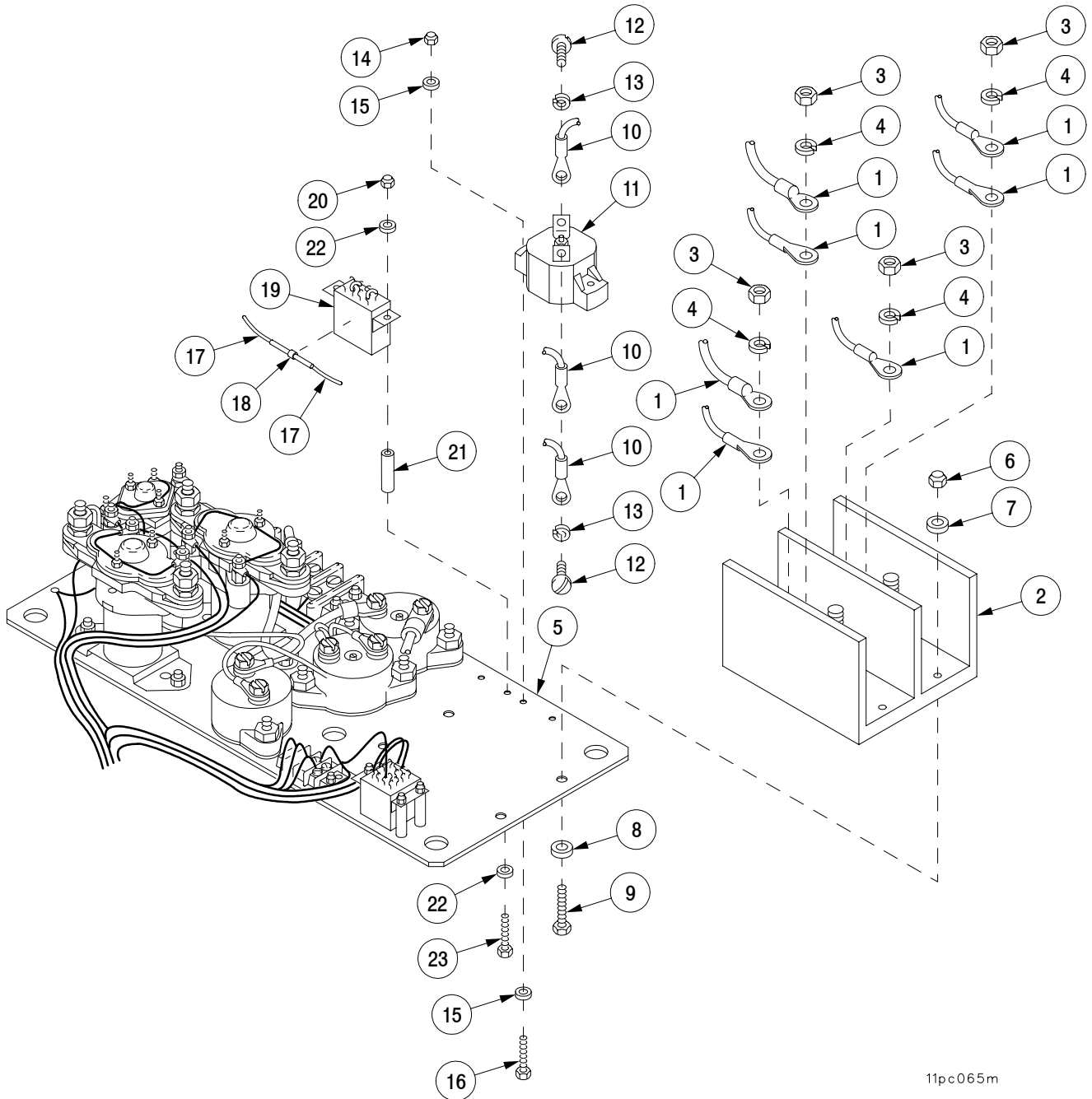
a. Disassembly.

NOTE

- Tag all leads before disconnecting to aid in installation.
- If MCS Winterization Kit is installed wire WNT002A must be removed from power block (TB3-6) (+) and wire WNT002-70A must be removed from power block (TB3-3) (-).

- 1 Remove seven terminal leads (1) from power block (2) by removing four nuts (3) and four lockwashers (4). Discard lockwashers.
- 2 Remove power block (2) from mounting plate (5) by removing four self-locking nuts (6), four flat washers (7), four flat washers (8), and four screws (9). Discard self-locking nuts.
- 3 Remove three terminal leads (10) from circuit breaker 2 (11) by removing two screws (12) and two lockwashers (13) (supplied with circuit breaker).
- 4 Remove circuit breaker 2 (11) from mounting plate (5) by removing two self-locking nuts (14), four flat washers (15), and two screws (16). (Self-locking nuts and two flat washers supplied with circuit breaker.)
- 5 Remove five wires (17) from diode (18) and relay K2 (19) by unsoldering terminals.
- 6 Remove diode (18) from relay (19) by removing adhesive.
- 7 Remove relay (19) from mounting plate (5) by removing two self-locking nuts (20), two spacers (21), four flat washers (22), and two screws (23). Discard self-locking nuts.

8-19 MCS PACK RELAY PANEL - CONTINUED

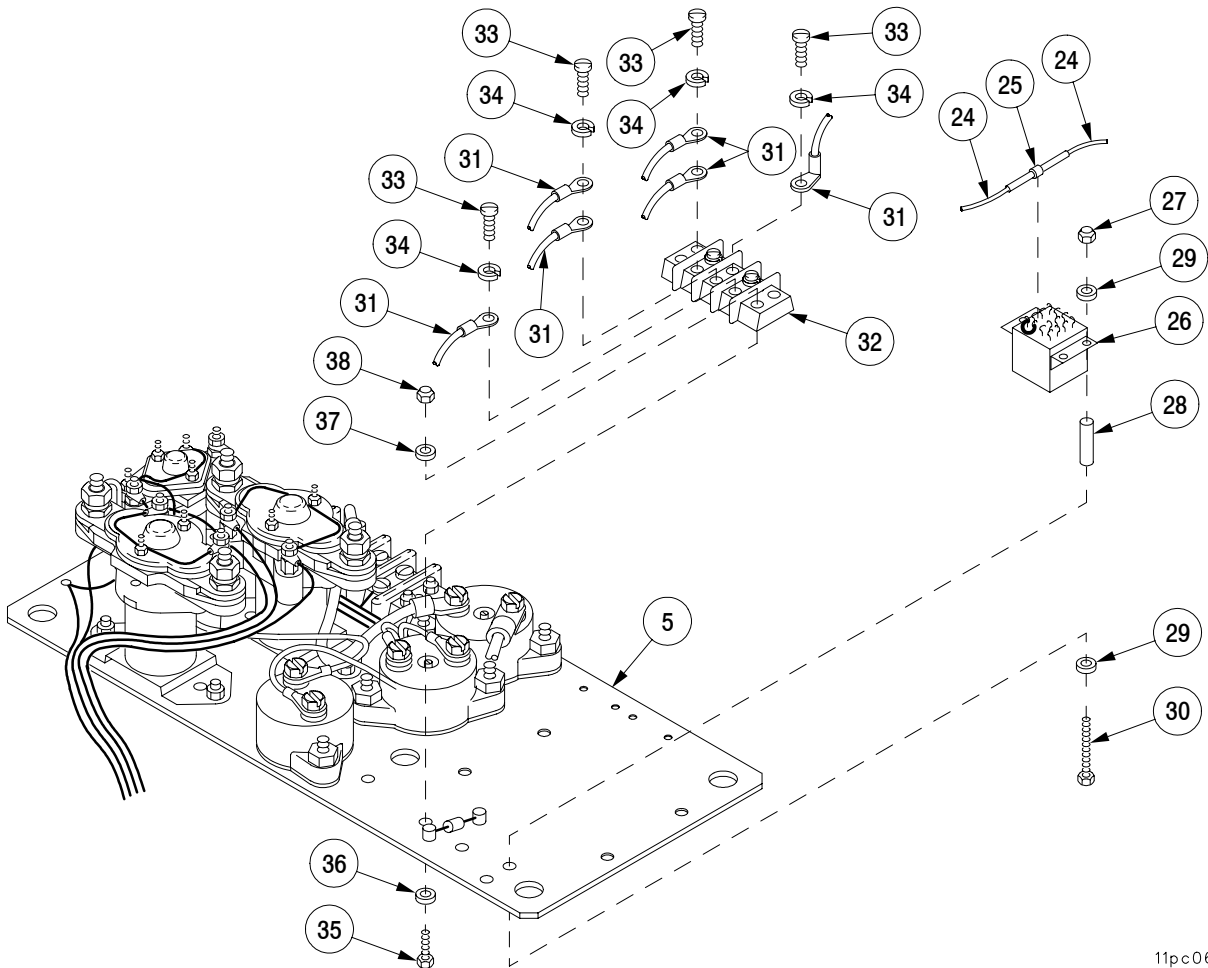


11pc065m

8-19 MCS PACK RELAY PANEL - CONTINUED

a. Disassembly - Continued

- 8 Remove four wires (24) at diode (25) from relay (26) by unsoldering terminals.
- 9 Remove diode (25) from relay (26) by removing adhesive.
- 10 Remove relay (26) from mounting plate (5) by removing three self-locking nuts (27), three spacers (28), six flat washers (29) and three screws (30). Discard self-locking nuts.
- 11 Remove six terminal leads (31) from small terminal board (32) by removing four screws (33) and four lockwashers (34). Discard lockwashers.
- 12 Remove small terminal boards (32) from mounting plate (5) by removing two screws (35), two flat washers (36), two flat washers (37), and two self-locking nuts (38). Discard self-locking nuts.



11pc066m

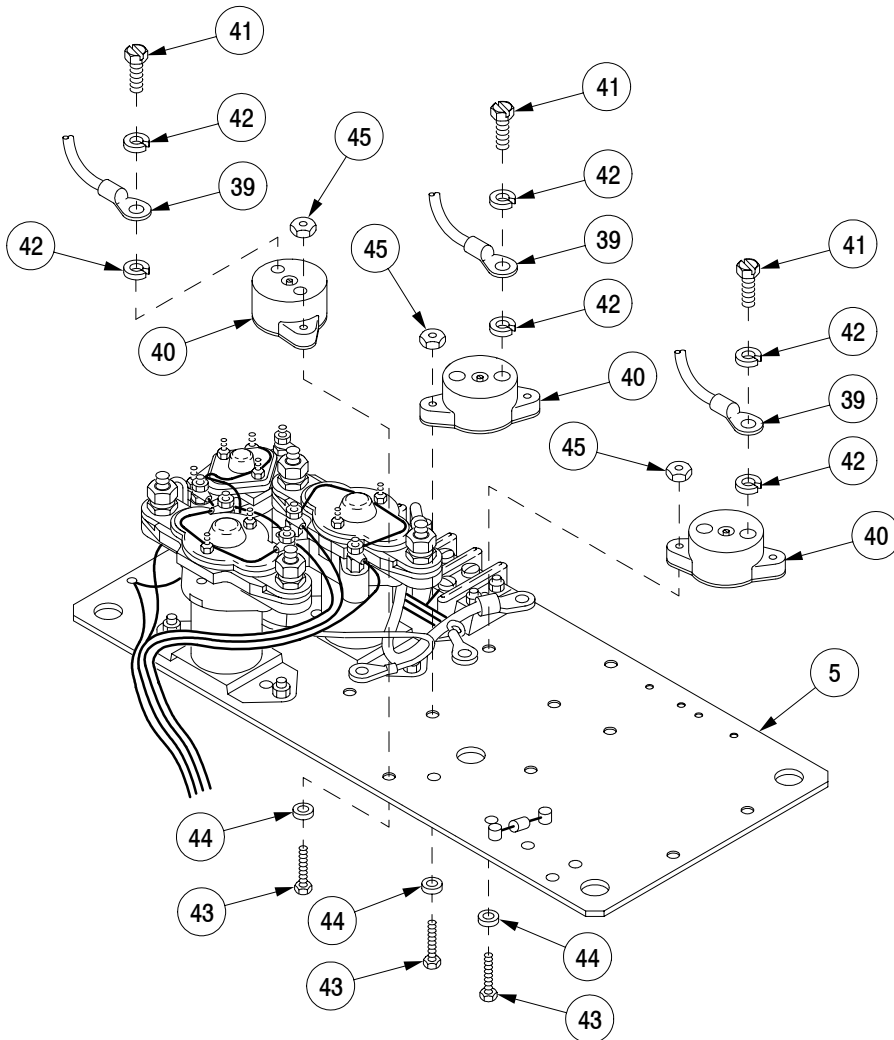
8-19 MCS PACK RELAY PANEL - CONTINUED

a. Disassembly - Continued

NOTE

Steps 13 and 14 apply to the removal of any one of three circuit breakers (CB1, CB3, or CB4).

- 13 Remove two terminal leads (39) from circuit breaker (40) by removing two screws (41) and four lockwashers (42). (Screws and lockwashers supplied with circuit breaker.)
- 14 Remove circuit breaker (40) from mounting plate (5) by removing two screws (43), two flat washers (44), and two nuts (45).



11pc067m

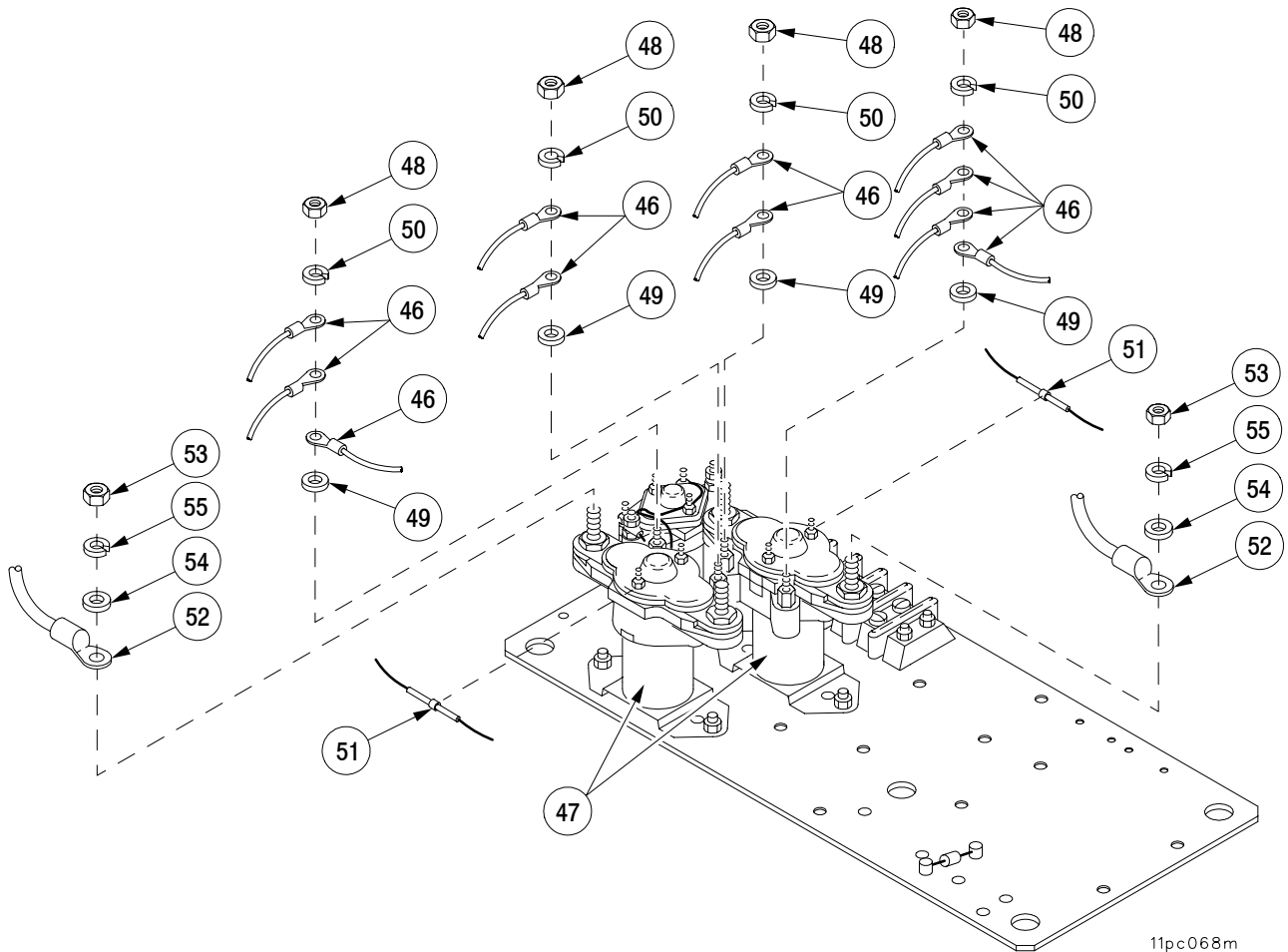
8-19 MCS PACK RELAY PANEL - CONTINUED

a. Disassembly - Continued

NOTE

Steps 15 thru 18 apply to the removal of either one of two relays (K1 or K3).

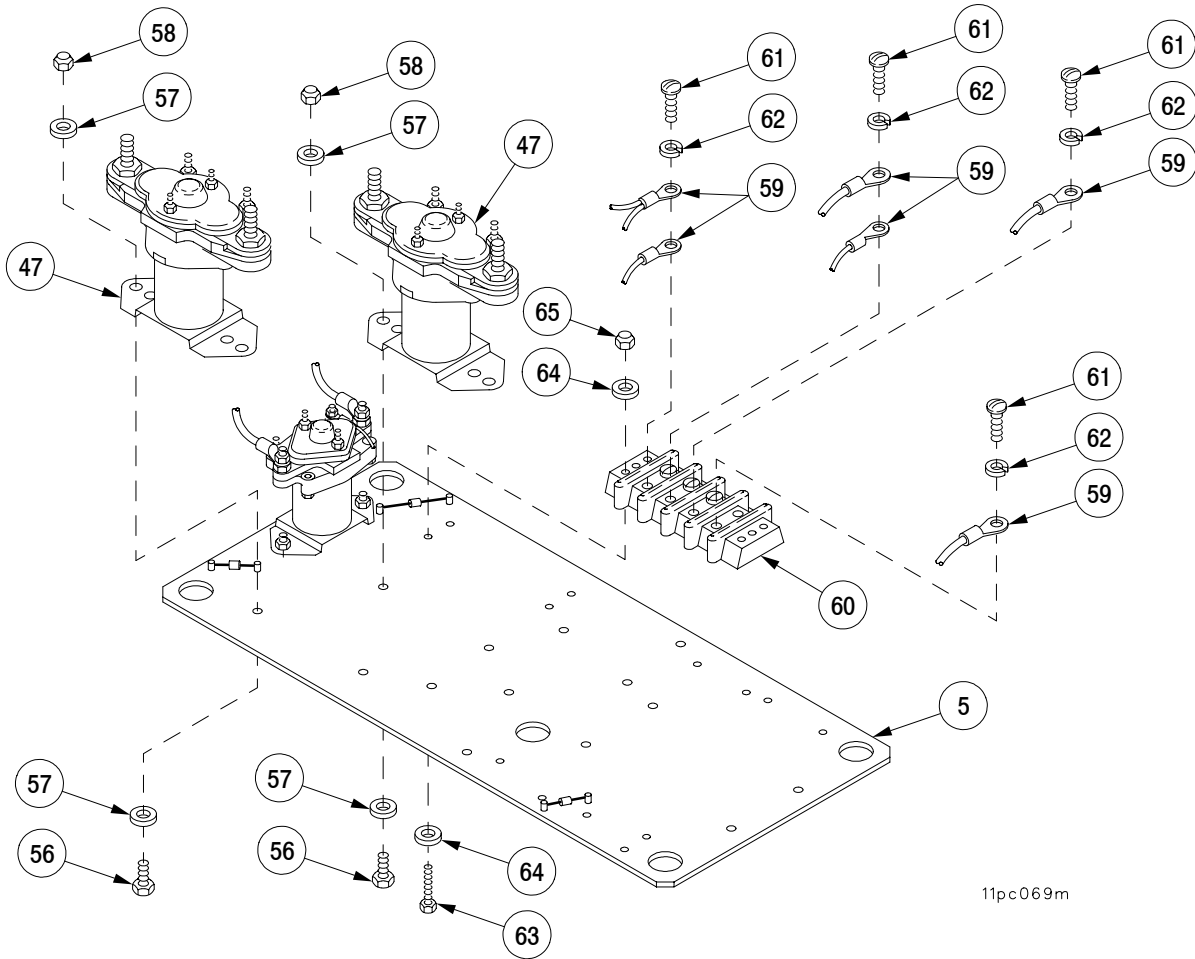
- 15 Remove eleven terminal leads (46) from relay (47) by removing two nuts (48), two flat washers (49), and two lockwashers (50). (All hardware supplied with relay.)
- 16 Remove diode (51) from relay (47) by unsoldering leads and removing adhesive.
- 17 Remove terminal lead (52) from relay (47) by removing nut (53), flat washer (54), and lockwasher (55). (All hardware supplied with relay.)



8-19 MCS PACK RELAY PANEL - CONTINUED

a. Disassembly - Continued

- 18 Remove relay (47) from mounting plate (5) by removing two screws (56), four flat washers (57) and two self-locking nuts (58). Discard self-locking nuts.
- 19 Remove seven terminal leads (59) from large terminal board (60) by removing four screws (61) and four lockwashers (62). Discard lockwashers.
- 20 Remove terminal boards (60) from mounting plate (5) by removing four screws (63), eight flat washers (64), and four self-locking nuts (65). Discard self-locking nuts.

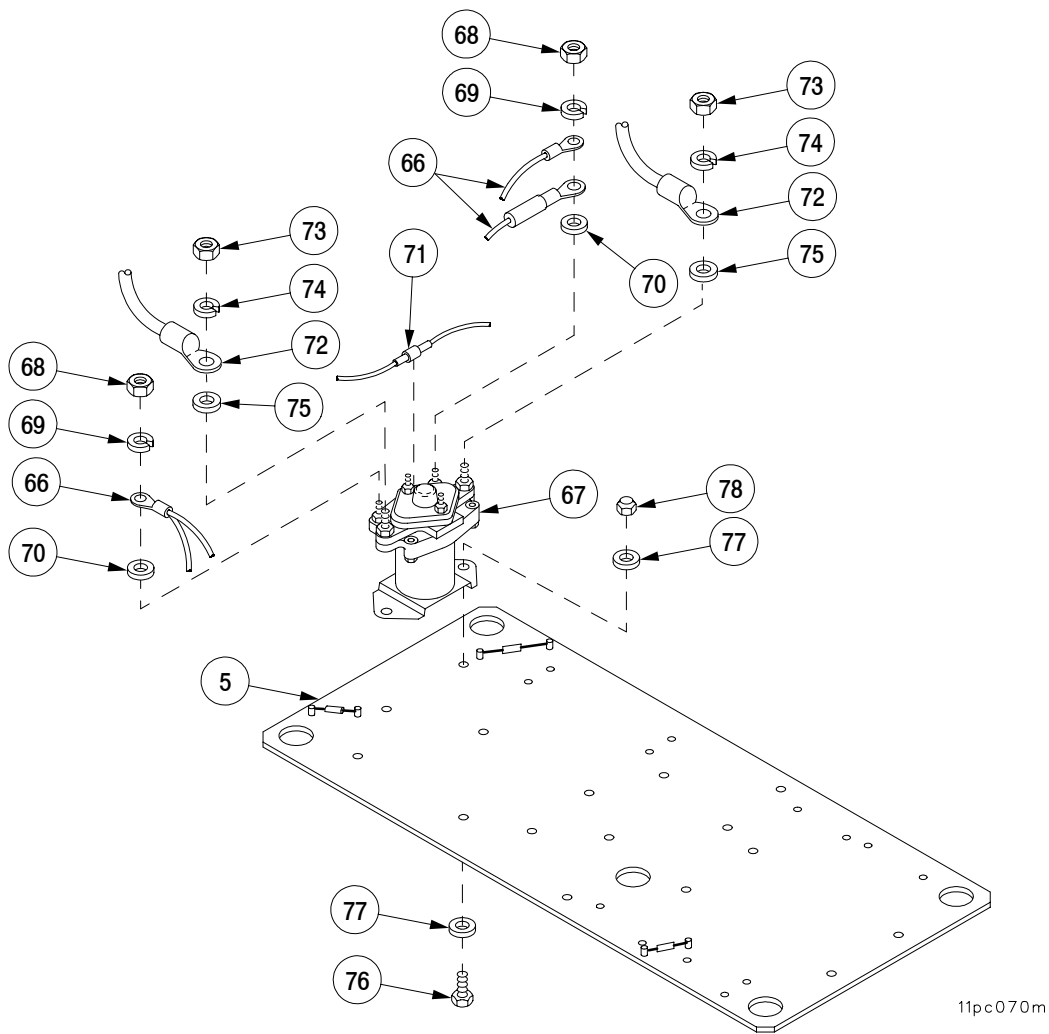


11pc069m

8-19 MCS PACK RELAY PANEL - CONTINUED

a. Disassembly - Continued

- 21 Remove three terminal leads (66) from relay (67) by removing two nuts (68), two lockwashers (69), and two flat washers (70). (Hardware supplied with relay.)
- 22 Remove diode (71) from relay (67) by removing adhesive.
- 23 Remove two terminal leads (72) from relay (67) by removing two nuts (73), and two lockwashers (74), and two flat washers (75). Discard lockwashers.
- 24 Remove relay (67) from mounting plate (5) by removing two screws (76), four flat washers (77), and two self-locking nuts (78). Discard self-locking nuts.

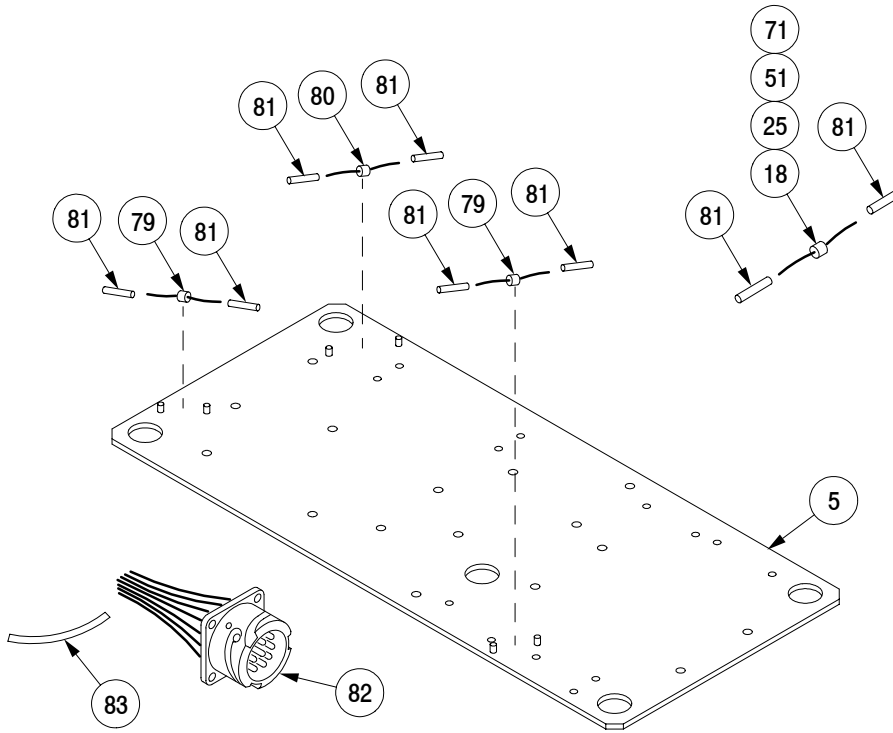


11pc070m

8-19 MCS PACK RELAY PANEL - CONTINUED

a. Disassembly - Continued

- 25 Remove two diodes (79) and diode (80) from mounting plate (5) by unsoldering terminals.
- 26 Remove insulation sleeving (81) on diodes (18, 25, 51, 79, 71, or 80) as necessary.
- 27 Remove connector (82) from mounting plate (5) by cutting necessary lacing cord (83).



11pc071m

b. Assembly.

CAUTION

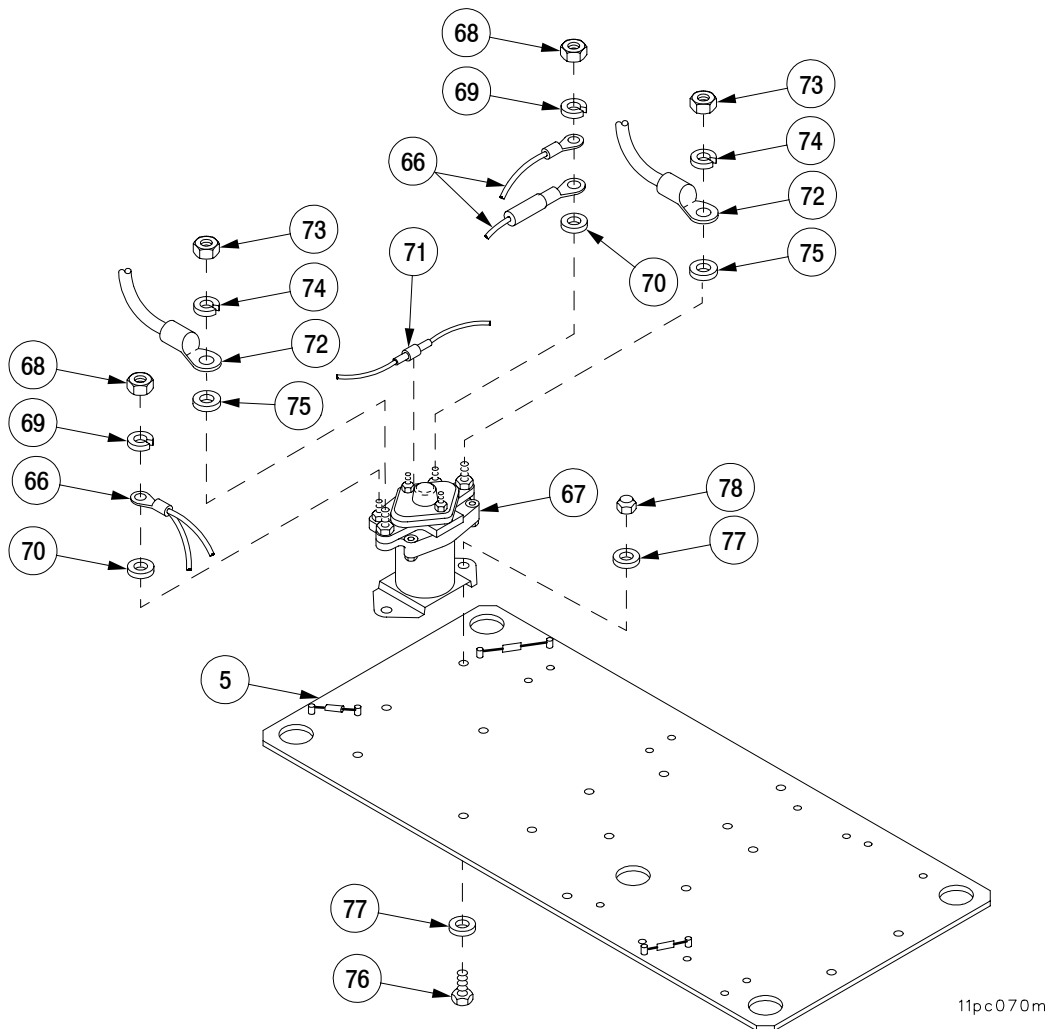
Do not overtighten attaching hardware, components and threaded fasteners may be damaged if excessively tightened.

- 1 Install connector (82) to mounting plate (5) with new lacing cord (83).
- 2 Install new insulation sleeving (81) on diodes (18, 25, 51, 71, 79, or 80) as necessary.
- 3 Install two diodes (79) and diode (80) to mounting plate (5) by soldering terminals.

8-19 MCS PACK RELAY PANEL - CONTINUED

b. Assembly - Continued

- 4 Install relay (67) to mounting plate (5) with two screws (76), four flat washers (77), and two new self-locking nuts (78).
- 5 Install two terminal leads (72) to relay (67) with two nuts (73), two flat washers (75), and two lockwashers (74).
- 6 Secure diode (71) to relay (67) using adhesive.
- 7 Install three terminal leads (66) to relay (67) with two new lockwashers (69), two flat washers (70), and two nuts (68) (supplied with relay).



8-19 MCS PACK RELAY PANEL - CONTINUED

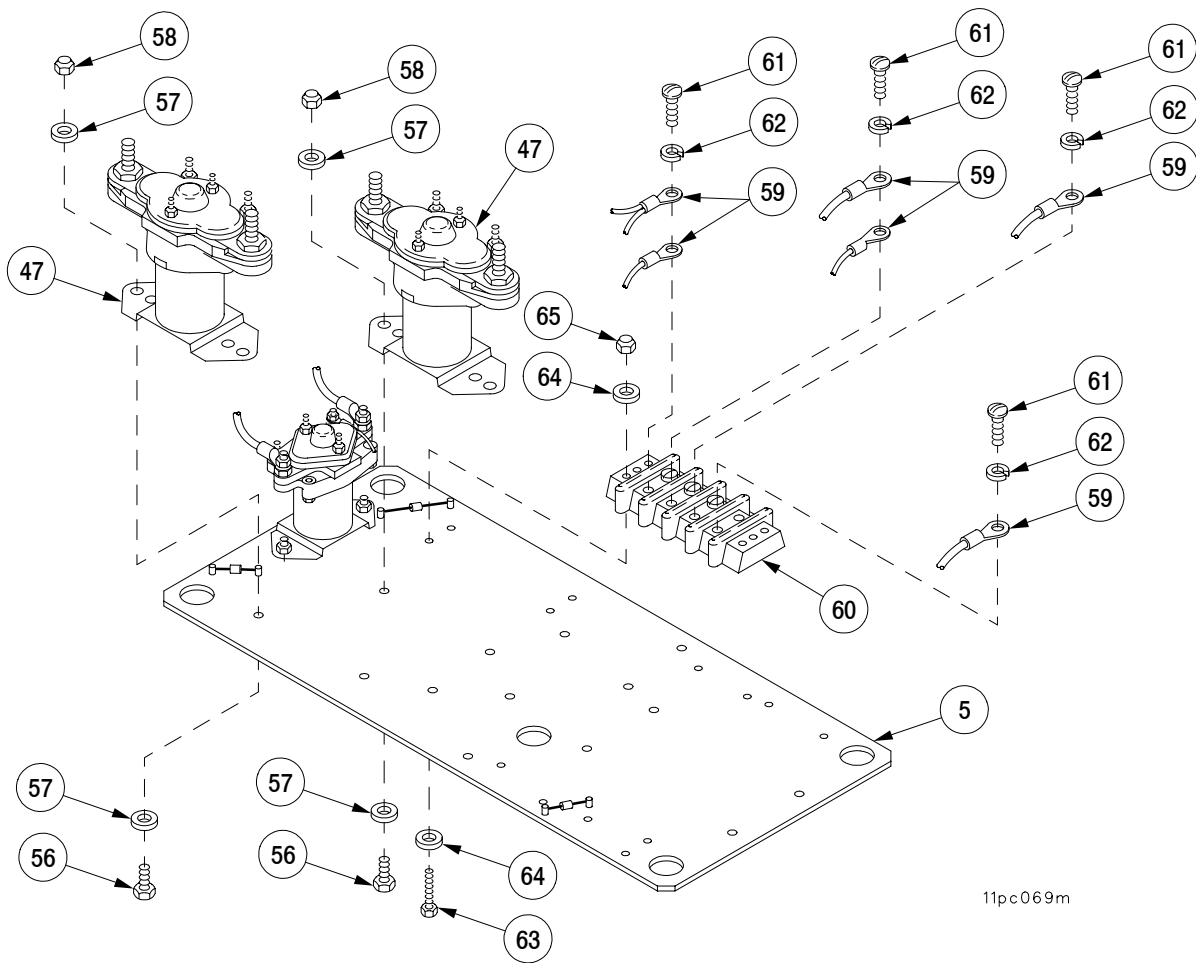
b. Assembly - Continued

- 8 Install large terminal board (60) to mounting plate (5) with four screws (63), eight flat washers (64), and four new lockwashers (65).
- 9 Install seven terminal leads (59) to large terminal board (60) with four new lockwashers (62) and four screws (61).

NOTE

Steps 10 thru 13 apply to the installation of either one of two relays (K1 or K3).

- 10 Install relay (47) to mounting plate (5) with two screws (56), four flat washers (57), and two new self-locking nuts (58).

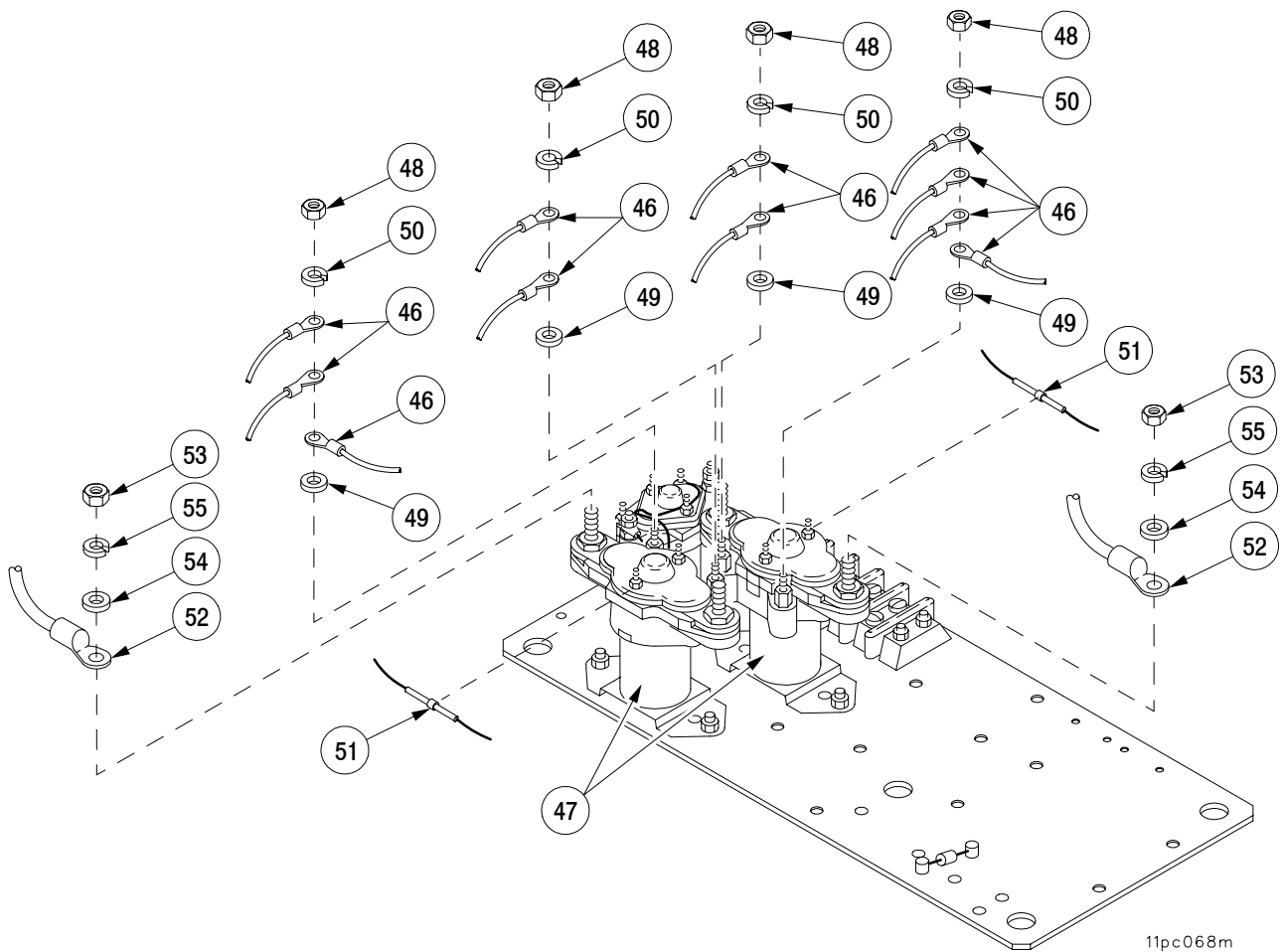


11pc069m

8-19 MCS PACK RELAY PANEL - CONTINUED

b. Assembly - Continued

- 11 Install terminal lead (52) to relay (47) with new lockwasher (55), flat washer (54), and nut (53) (supplied with relay).
- 12 Secure diode (51) to relay (47) with adhesive.
- 13 Install eleven terminal leads (46) to relay (47) with two new lockwashers (50), four flat washers (49), and two nuts (48) (supplied with relay).



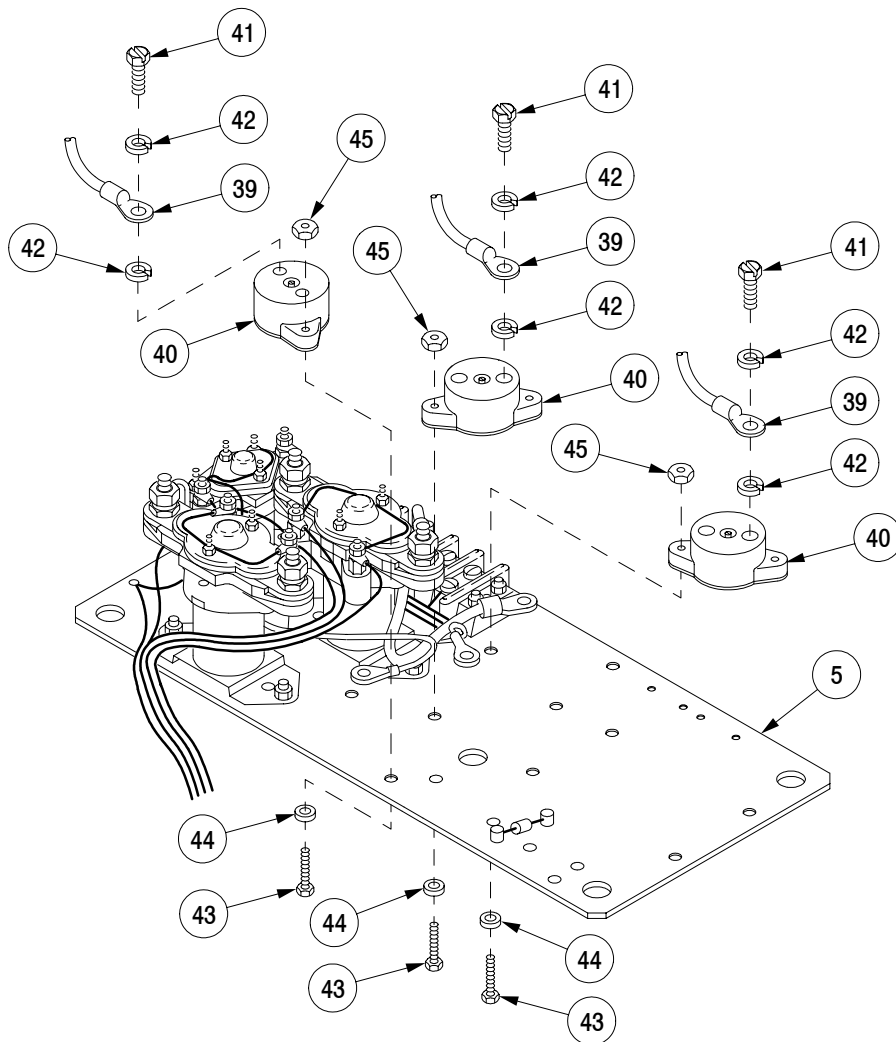
8-19 MCS PACK RELAY PANEL - CONTINUED

b. Assembly - Continued

NOTE

Steps 14 and 15 apply to the installation of any one of three circuit breakers (CB1, CB3, or CB4).

- 14 Install circuit breaker (40) to mounting plate (5) with two screws (43), two flat washers (44), and two nuts (45).
- 15 Install two terminal leads (39) to circuit breaker (40) with four new lockwashers (42) and two new screws (41) (supplied with circuit breaker).

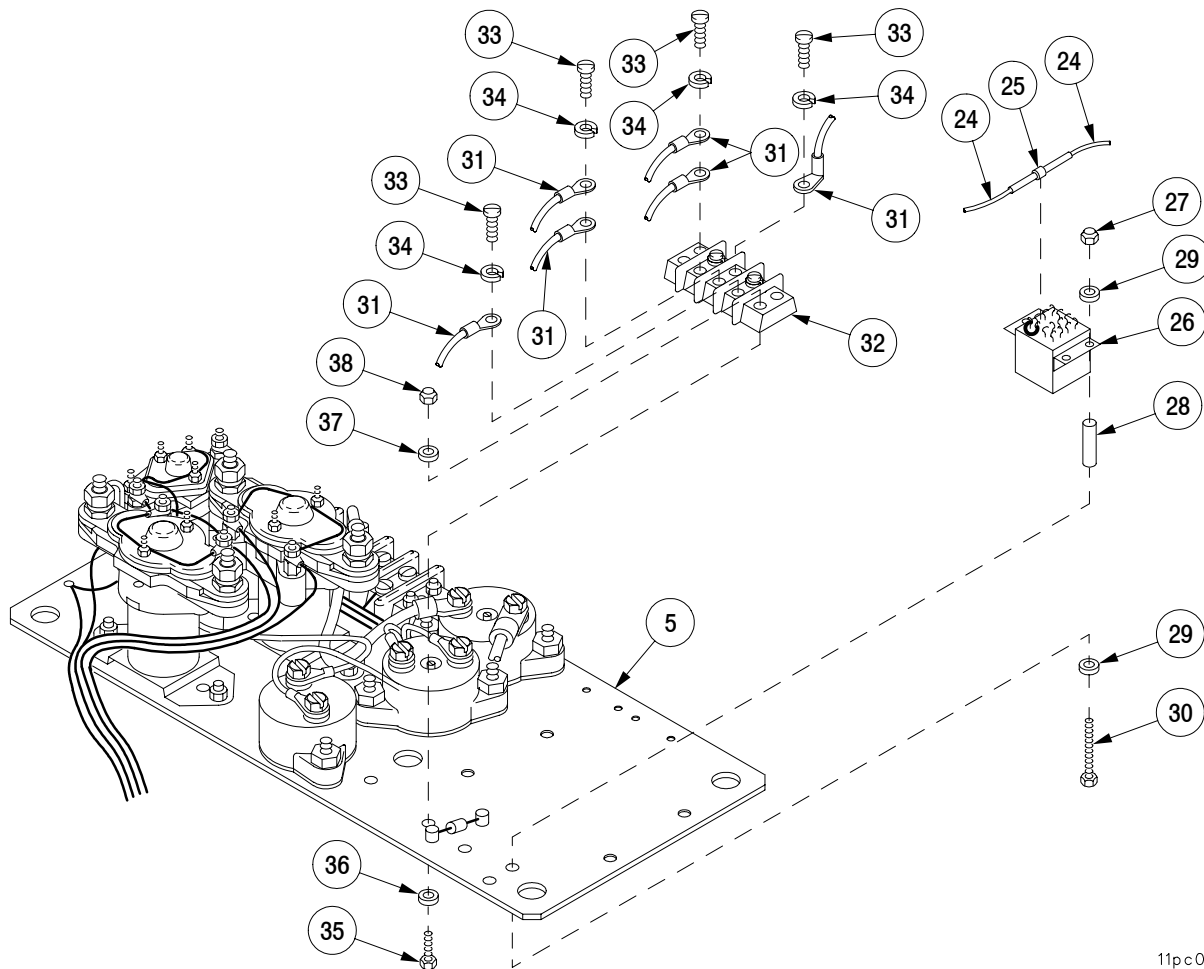


11pc067m

8-19 MCS PACK RELAY PANEL - CONTINUED

b. Assembly - Continued

- 16 Install small terminal board (32) to mounting plate (5) with two screws (35), two flat washers (36), two flat washers (37), and two new self-locking nuts (38).
- 17 Install six terminal leads (31) to small terminal boards (32) with four new lockwashers (34) and four screws (33).
- 18 Install relay (26) to mounting plate (5) with three screws (30), six flat washers (29), three spacers (28) and three new self-locking nuts (27).
- 19 Secure diode (25) to relay (26) with adhesive.
- 20 Install four wires (24) and diode (25) to relay (26) by soldering terminals.

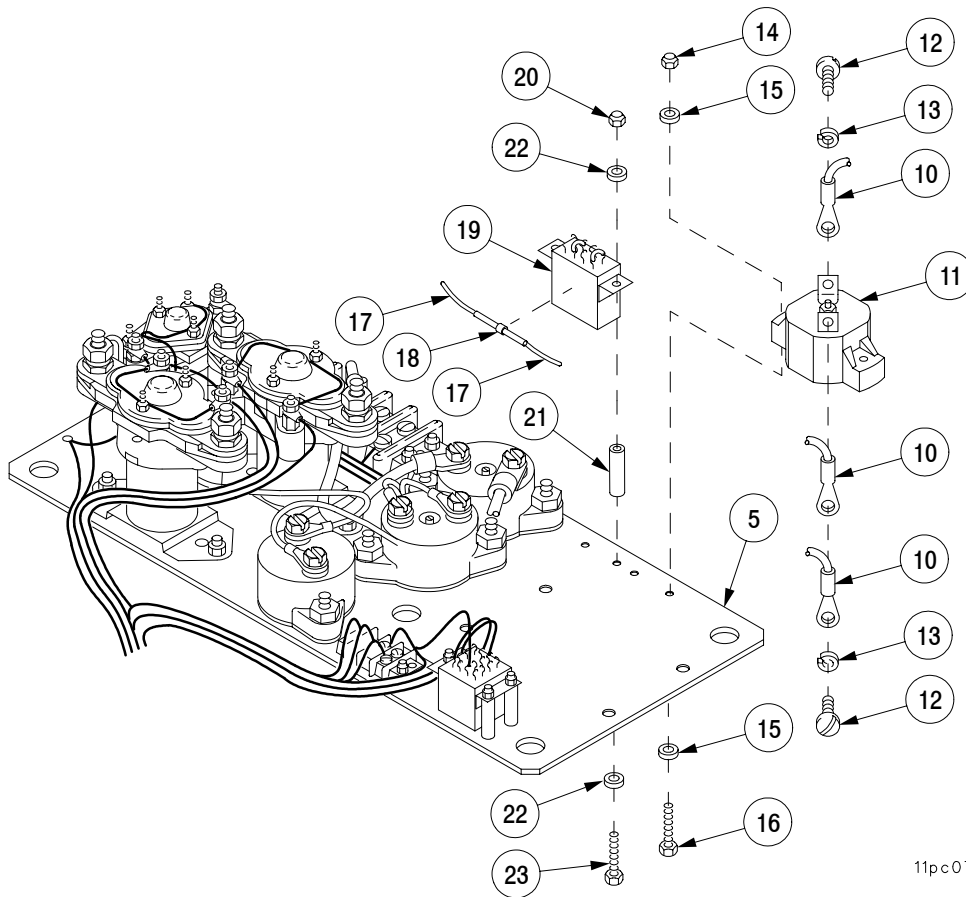


11pc066m

8-19 MCS PACK RELAY PANEL - CONTINUED

b. Assembly - Continued

- 21 Install relay (19) to mounting plate (5) with two screws (23), four flat washers (22), two spacers (21), and two new self-locking nuts (20).
- 22 Secure diode (18) to relay (19) with adhesive.
- 23 Install five wires (17) and diode (18) to relay (19) by soldering terminals.
- 24 Install circuit breaker (11) to mounting plate (5) with two screws (16), four flat washers (15), and two new self-locking nuts (14) (supplied with circuit breaker).
- 25 Install three terminal leads (10) to circuit breaker (11) with two new lockwashers (13) and two screws (12) (supplied with circuit breaker).



11pc072m

8-19 MCS PACK RELAY PANEL - CONTINUED

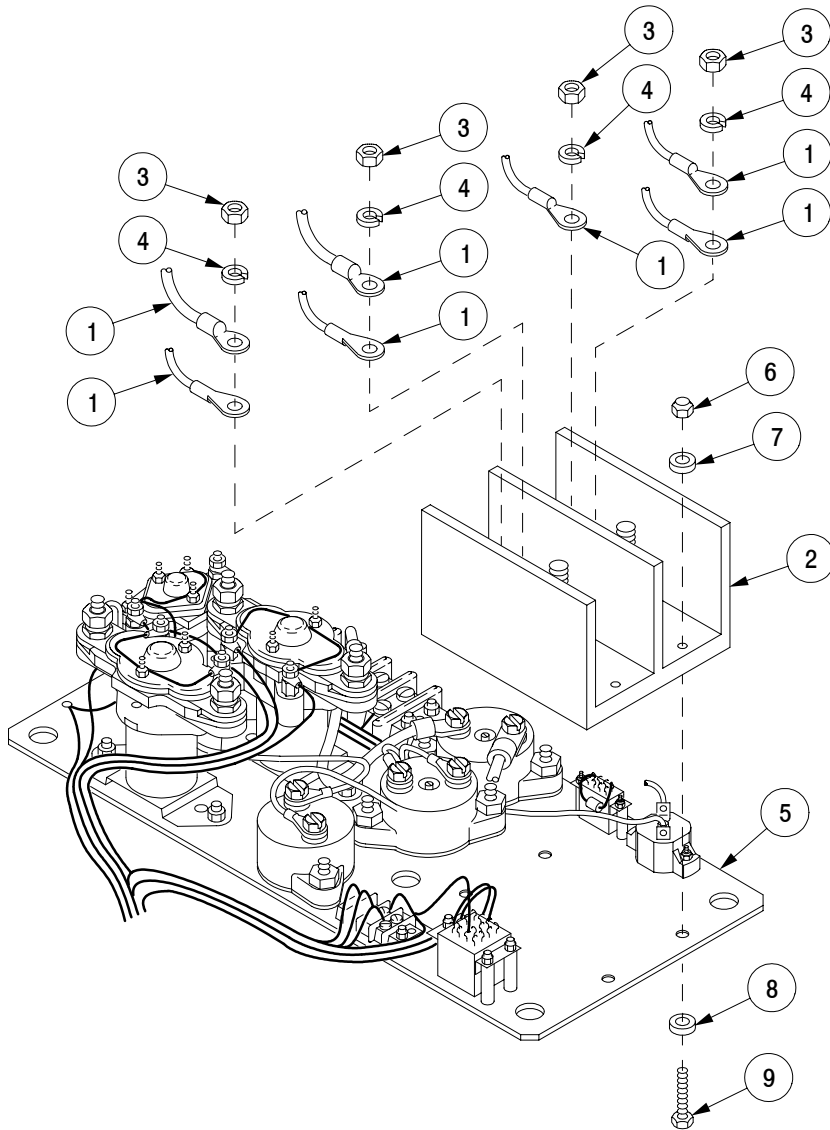
b. Assembly - Continued

- 26 Install power block (2) to mounting plate (5) with four screws (9), four flat washers (8), four flat washers (7), and four new self-locking nuts (6).

NOTE

If MCS Winterization Kit is installed, wire WNT002A must be installed on power block (TB3-6) (+) and wire WNT002-70A must be installed on power block (TB3-3) (-).

- 27 Install seven terminal leads (1) to power block (2) with four new lockwashers (4) and four nuts (3).



11pc073m

8-20 MCS CONTROL PANEL.

This task covers: a. Disassembly b. Assembly

INITIAL SETUPTools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Vernier calipers (item 6, Appx F)

Equipment Conditions

MCS control panel removed
(TM 9-2350-314-20-2-2)

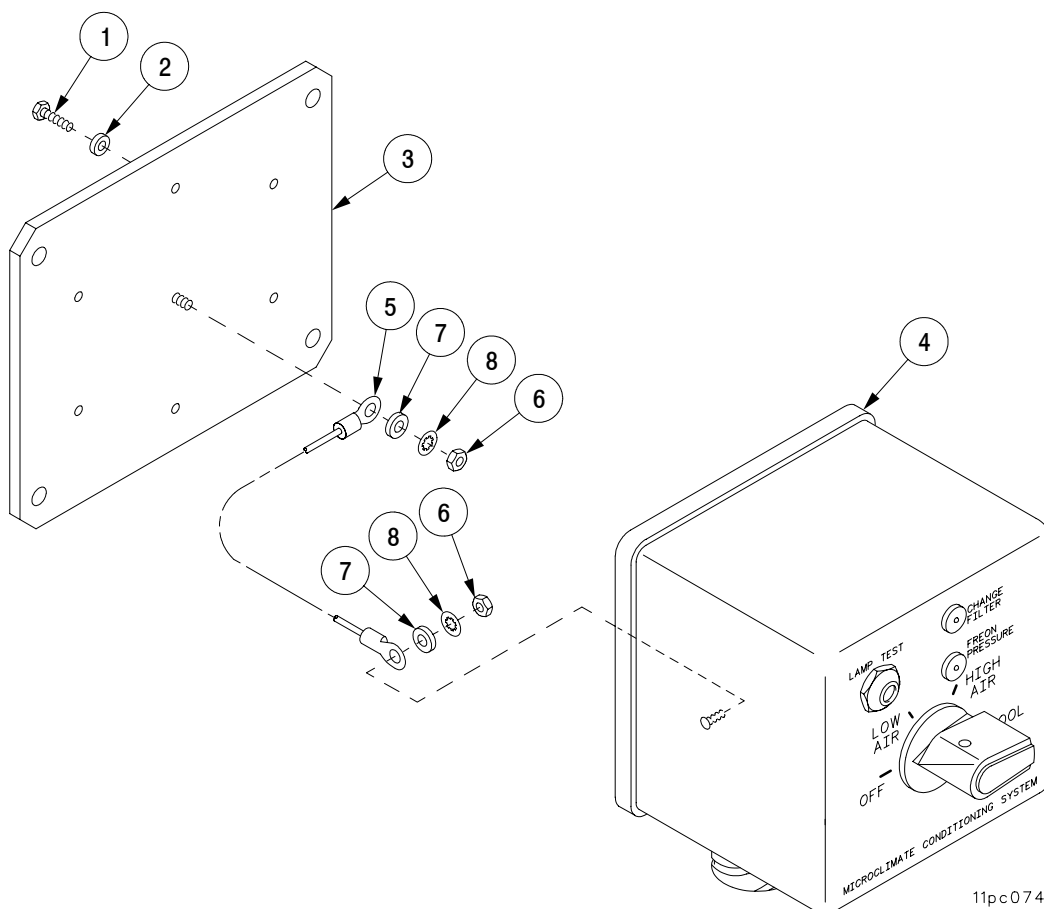
Materials/Parts

Adhesive (item 5, Appx B)
Adhesive (item 1, Appx B)
Isopropyl alcohol (item 11, Appx B)
Primer coating (item 28, Appx B)
Marking tags (item 71, Appx B)
Swabbing brush (item 19, Appx B)
Self-locking nuts (9) (item 41, Appx E)
Preformed packings (2) (item 158, Appx E)
Preformed packing (item 159, Appx E)
Preformed packing (item 160, Appx E)
Preformed packings (6) (item 157, Appx E)
O-ring (item 216, Appx E)
Gasket (item 215, Appx E)
Lockwashers (8) (item 109, Appx E)
Lockwashers (2) (item 91, Appx E)
Rubber channel (item 217, Appx E)
Sealing compound (item 41, Appx B)
Primer coating (item 25, Appx B)
Primer coating (item 26, Appx B)

8-20 MCS CONTROL PANEL - CONTINUED

a. Disassembly.

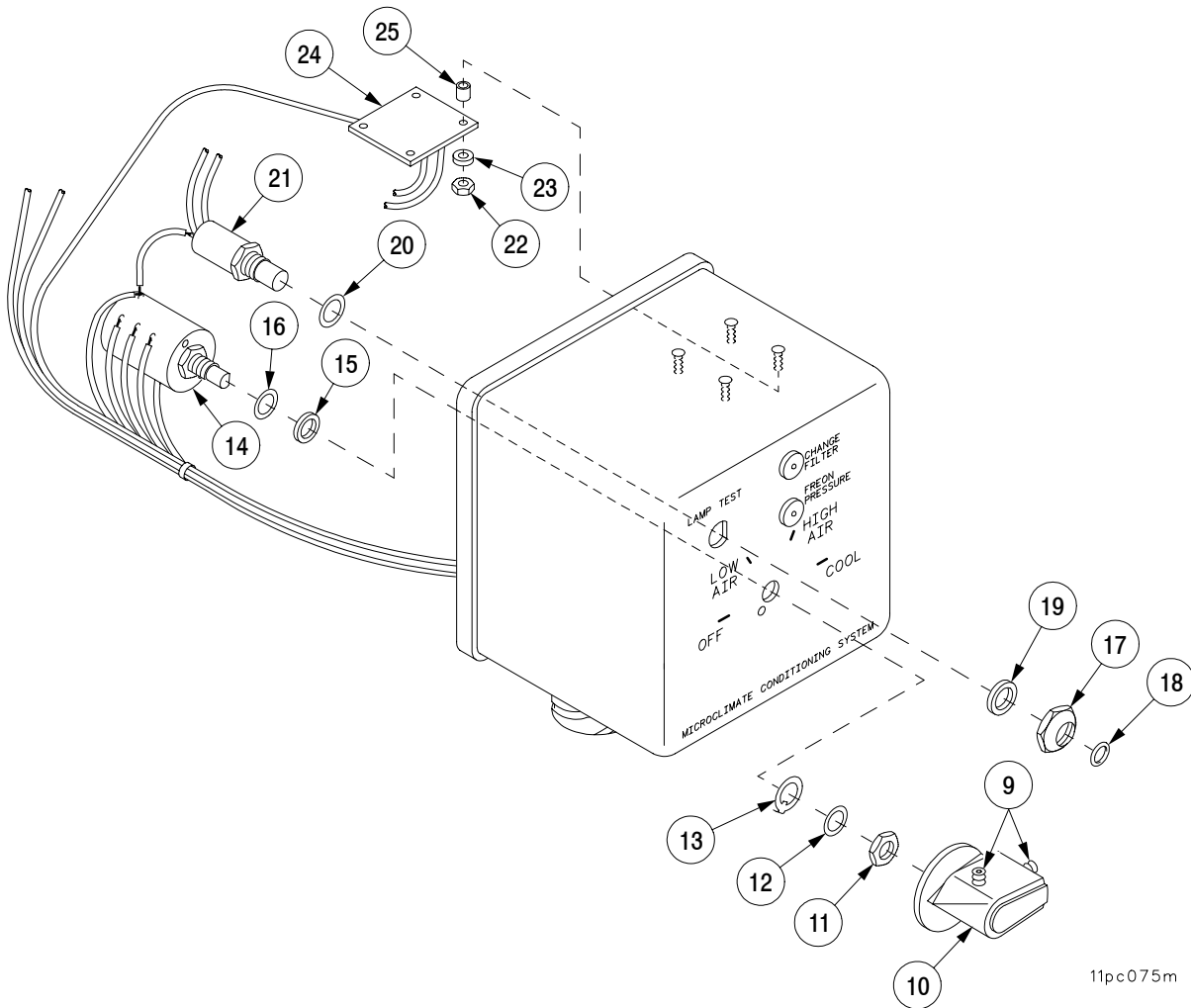
- 1 Remove six screws (1) and six preformed packings (2). Discard packings.
- 2 Remove cover plate (3) from housing (4), being careful not to pull ground wire (5).
- 3 Remove two self-locking nuts (6), two flat washers (7), two lockwashers (8), and ground wire (5) from cover plate (3) and housing (4). Discard self-locking nuts and lockwashers.



8-20 MCS CONTROL PANEL - CONTINUED

a. Disassembly - Continued

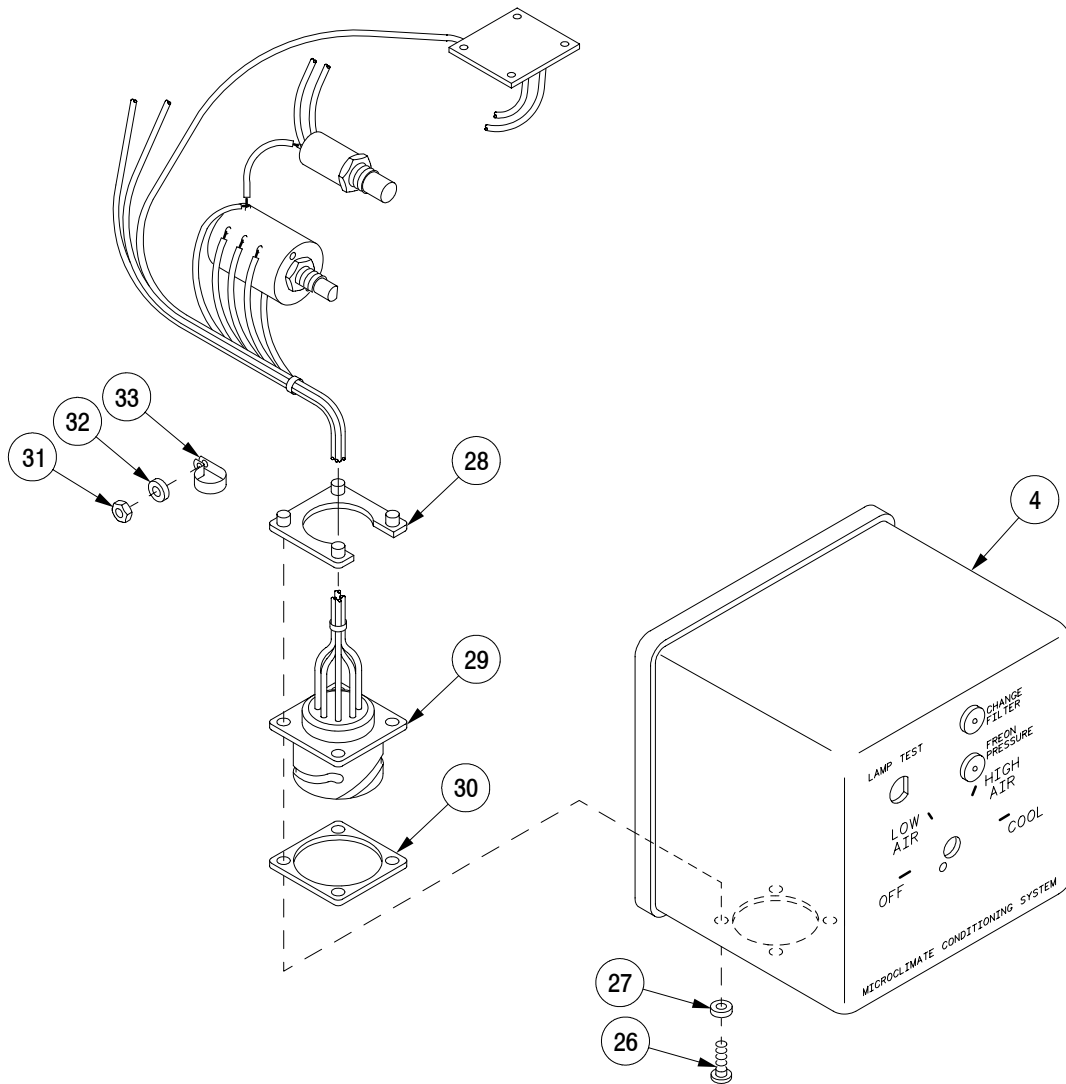
- 4 Loosen two setscrews (9) and remove knob (10).
- 5 Remove nut (11), flat washer (12), keywasher (13), mode selector switch (14), preformed packing (15), and flat washer (16). Discard keywasher and preformed packing.
- 6 Remove dress ring (17), o-ring (18), preformed packing (19), flat washer (20), and lamp test switch (21). Discard o-ring and preformed packing.
- 7 Remove four self-locking nuts (22), four flat washers (23), wires, resistor holder (24), and four spacers (25). Discard self-locking nuts.



8-20 MCS CONTROL PANEL - CONTINUED

a. Disassembly - Continued

- 8 Remove four screws (26), four flat washers (27), nut ring (28), connector (29), and gasket (30) from housing (4). Discard gasket.
- 9 Remove self-locking nut (31), flat washer (32), and clamp (33).



11pc076m

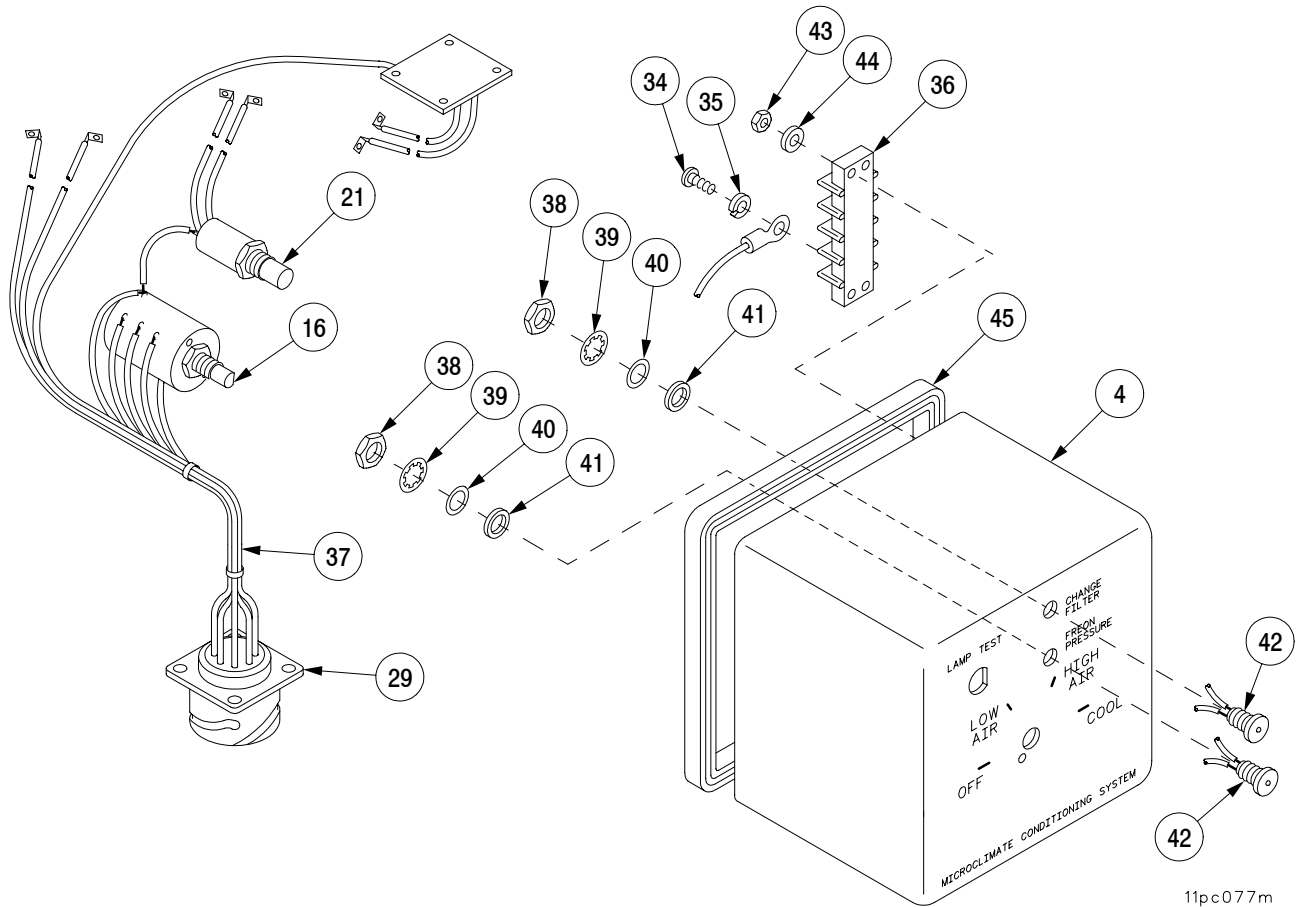
8-20 MCS CONTROL PANEL - CONTINUED

a. Disassembly - Continued

NOTE

Tag all leads and wires before disconnecting to aid installation.

- 10 Remove eight screws (34), eight lockwashers (35), and disconnect wires from terminal board (36). Discard lockwashers.
- 11 Remove harness (37) with connector (29) and switches (16 and 21) from housing (4).
- 12 Remove two nuts (38), two lockwashers (39), two flat washers (40), two preformed packings (41), and two lamps (42). Discard lockwashers and preformed packings.
- 13 Remove two self-locking nuts (43), two flat washers (44) and terminal board (36). Discard self-locking nuts.
- 14 Remove rubber channel (45) from housing (4). Discard rubber channel.
- 15 Clean rubber channel mounting area with alcohol.



8-20 MCS CONTROL PANEL - CONTINUED

b. Assembly.

CAUTION

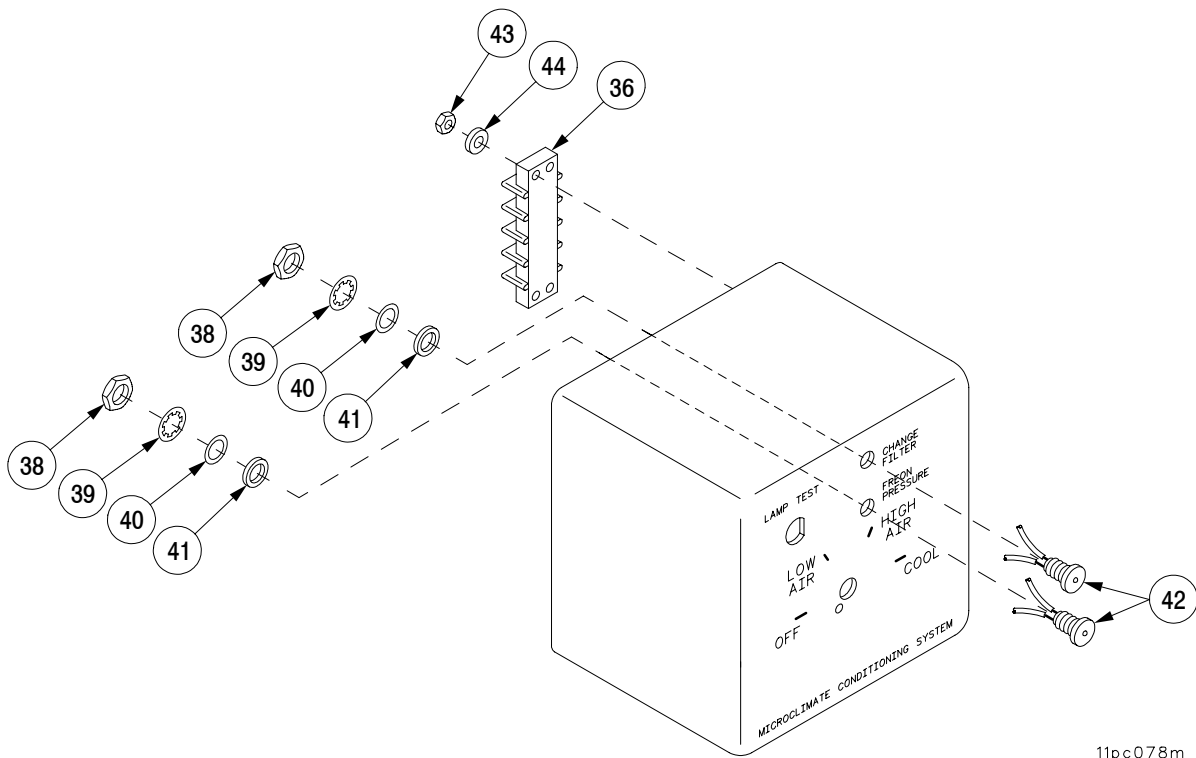
Do not over tighten attaching hardware. Components and threaded fasteners may be damaged if excessively tightened.

- 1 Install terminal board (36), two flat washers (44), and two new self-locking nuts (43).

NOTE

Nut and lockwasher are supplied with lamp.

- 2 Clean two nuts (38) with alcohol and coat mating surfaces of nuts (38) with primer coating (item 28, Appx B). Allow to dry for 3 minutes and then coat primed surfaces with sealing compound.
- 3 Install two lamps (42), two new preformed packings (41), two flat washers (40), two new lockwashers (39) and two nuts (38).



8-20 MCS CONTROL PANEL - CONTINUED

b. Assembly - Continued

NOTE

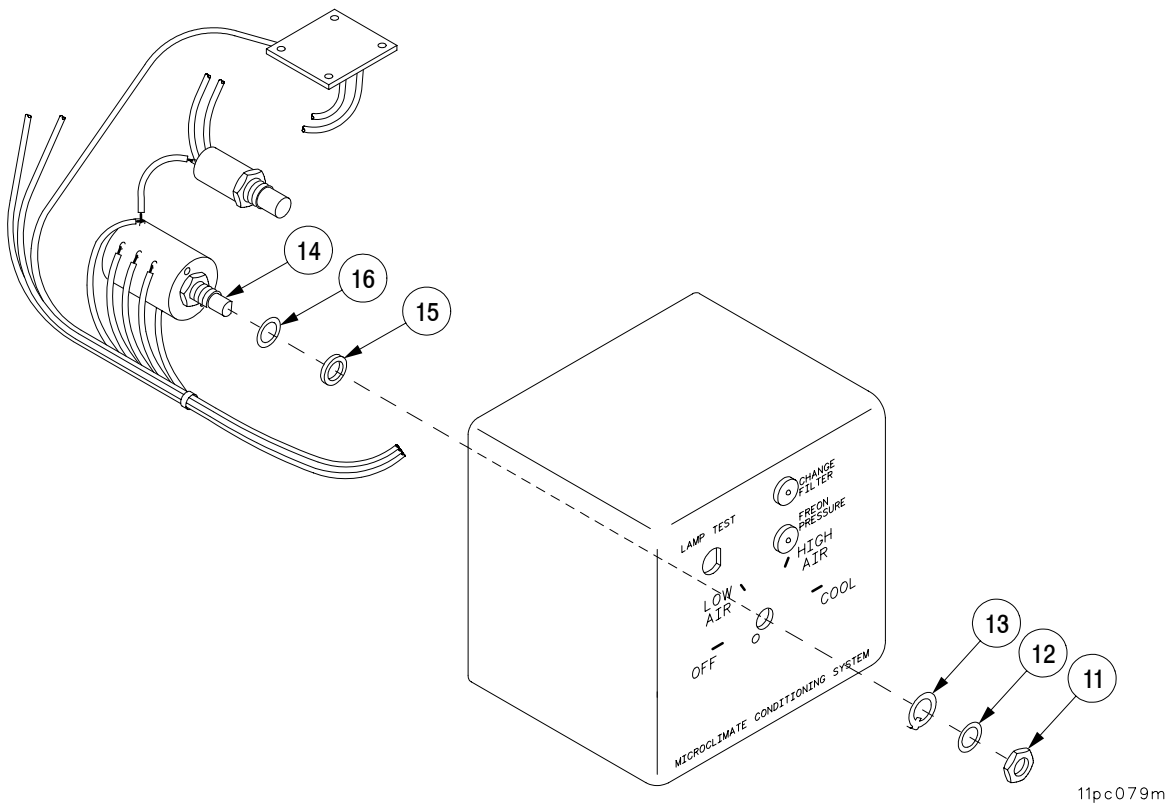
Attaching hardware for mode selector switch is supplied with switch. Discard used hardware.

- 4 Clean nut (11) with alcohol (item 11, Appx B) and then coat with primer (item 28, Appx B). Allow to dry for 3 minutes and then coat with sealing compound (item 41, Appx B).

NOTE

Before installing mode selector switch, turn shaft counter clockwise to "OFF" position. Mount switch with the shaft flat facing the "COOL" label on housing.

- 5 Install flat washer (16), new preformed packing (15), mode selector switch (14), new keywasher (13), flat washer (12), and nut (11).



8-20 MCS CONTROL PANEL - CONTINUED

b. Assembly - Continued

NOTE

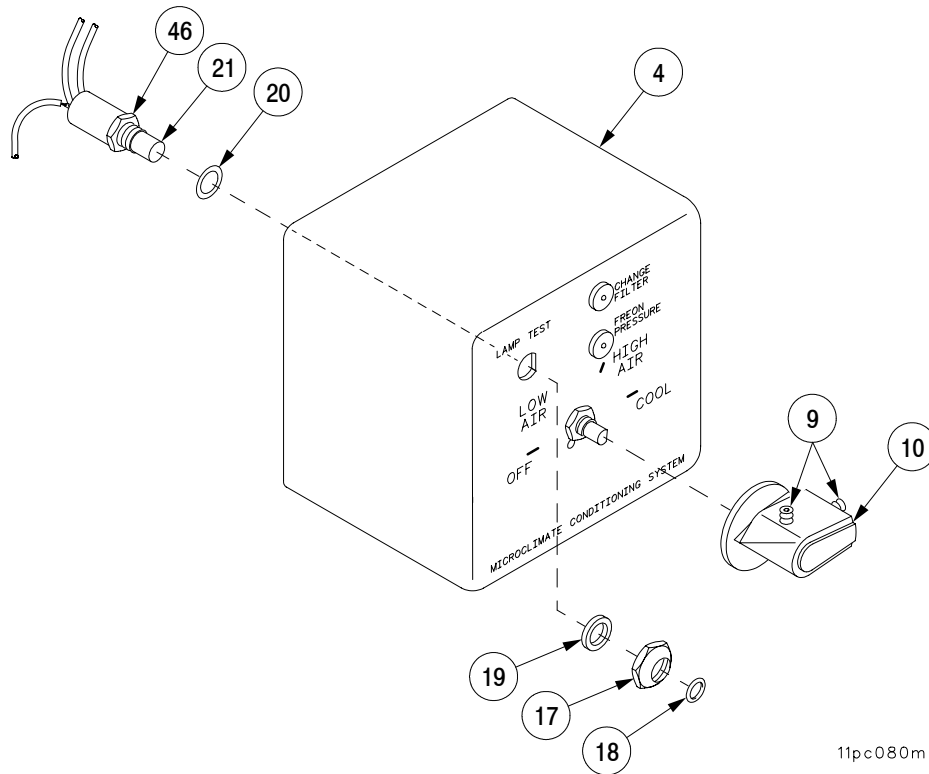
Before installing knob, seal keywasher keying hole top and bottom with adhesive (item 1, Appx B).

- 6 Install knob (10) with arrow pointing to OFF position and tighten two setscrews (9).

NOTE

Nut, dress ring, gasket, keywasher, and lockwasher are supplied with lamp test switch. Discard used lamp test switch hardware.

- 7 Turn nut (46) fully clockwise until it seats against body of lamp test switch (21).
- 8 Install lamp test switch (21), flat washer (20), new preformed packing (19), new o-ring (18) and dress ring (17).
- 9 Tighten dress ring (17) until o-ring (18) engages switch (21), then tighten 1/4 turn more.
- 10 Tighten nut (46) against housing (4).

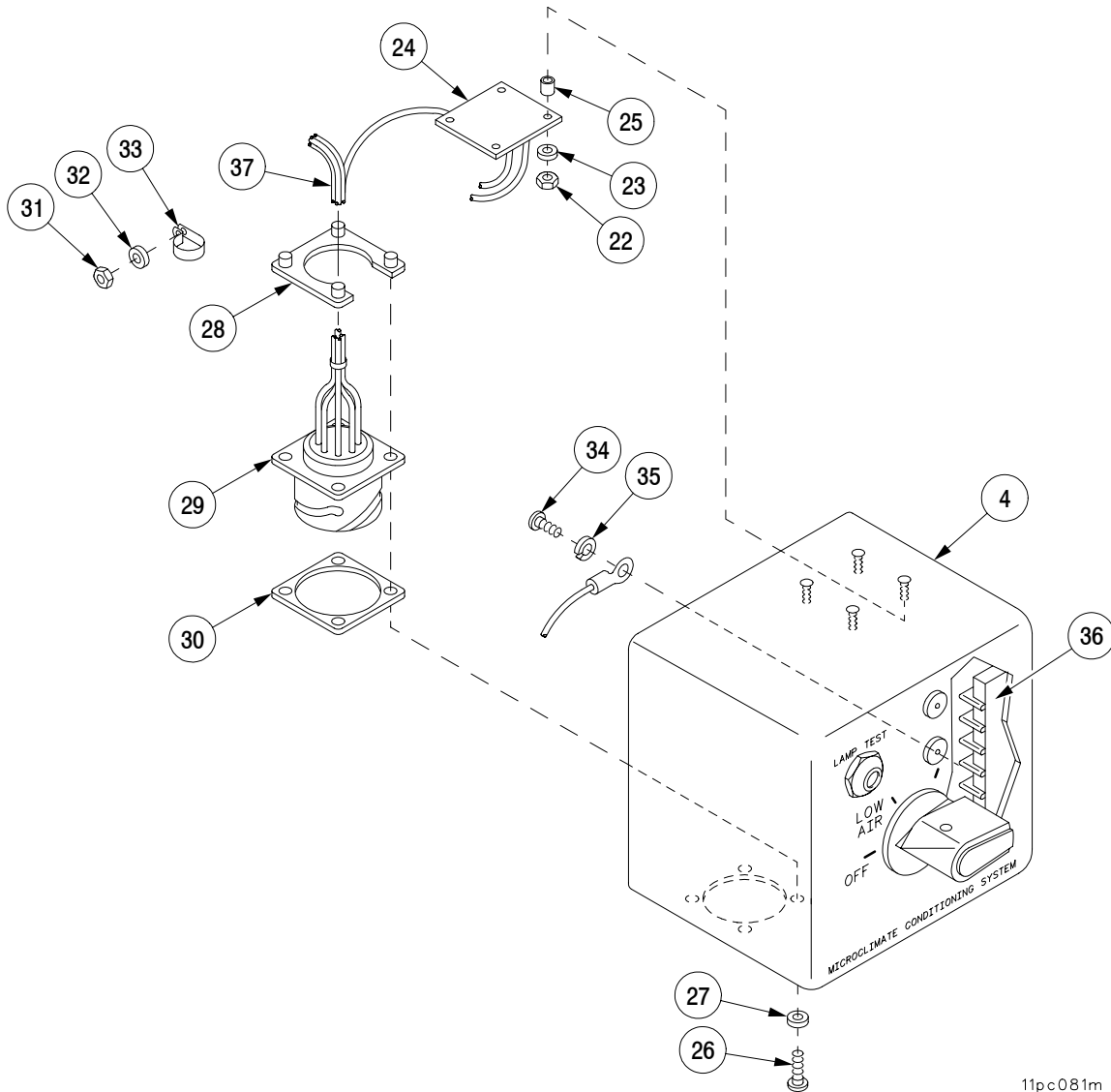


11pc080m

8-20 MCS CONTROL PANEL - CONTINUED

b. Assembly - Continued

- 11 Attach wires to terminal board (36) with eight screws (34) and eight new lockwashers (35).
- 12 Install clamp (33) around harness (37) and attach to housing (4) with flat washer (32) and new self-locking nut (31).
- 13 Install new gasket (30), connector (29), and nut ring (28) with four screws (26) and four flat washers (27).
- 14 Install four spacers (25), resistor holder (24), wires, four flat washers (23), and four new self-locking nuts (22).



11pc081m

8-20 MCS CONTROL PANEL - CONTINUED

b. Assembly - Continued

- 15 Install ground wire (5), two flat washers (7), two new lockwashers (8), and two new self-locking nuts (6).
- 16 Apply adhesive (item 5, Appx B) to complete surface of rubber channel (45) with brush.
- 17 Install new rubber channel (45) on housing (4) with split in rubber channel (45) at bottom of control panel.

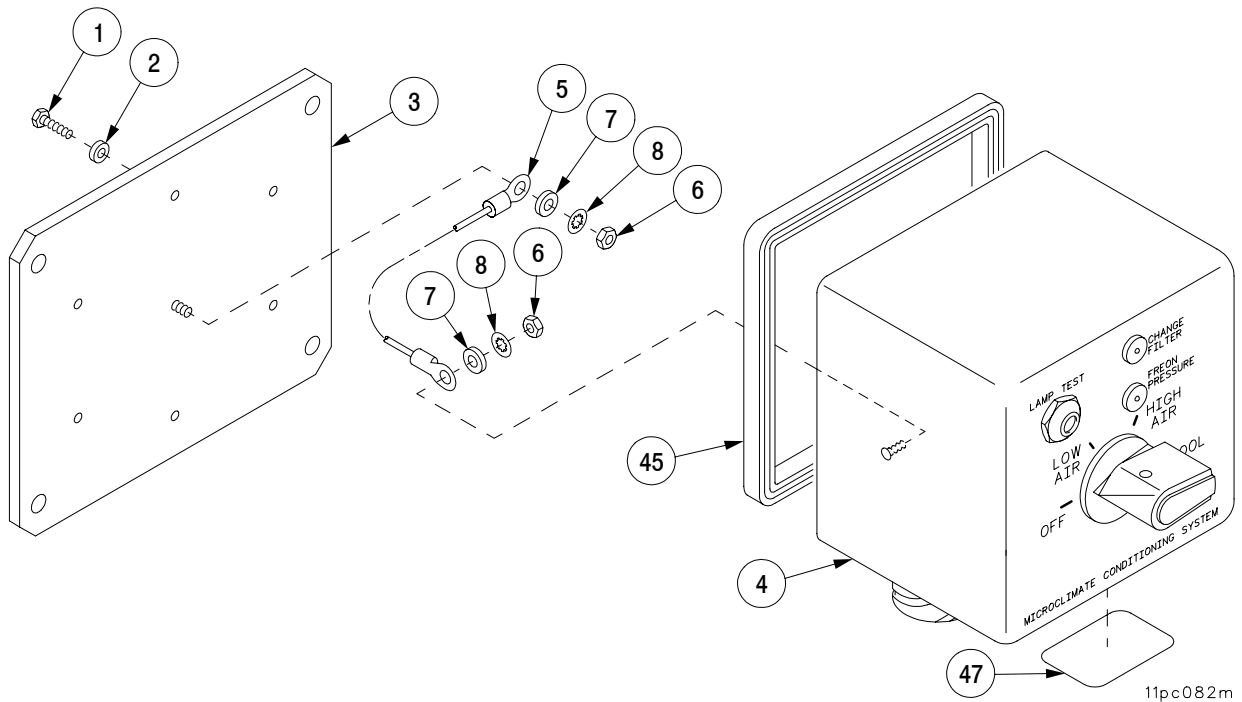
NOTE

Apply grease to screws before installation.

- 18 Install cover plate (3) on housing (4) with six new preformed packings (2) and six screws (1).

NOTE

If identification plate (47) must be replaced, coat the identification plate with clear epoxy primer coat (item 26, Appx B) and clear epoxy finish coat (item 25, Appx B) after installing the plate.



11pc082m

CHAPTER 9

COMMANDER'S CUPOLA

GENERAL

This chapter illustrates and describes the removal, disassembly, assembly, installation, inspection, repair, and adjustment procedures for the howitzer commander's cupola assembly. These maintenance procedures are functions authorized for direct support level maintenance.

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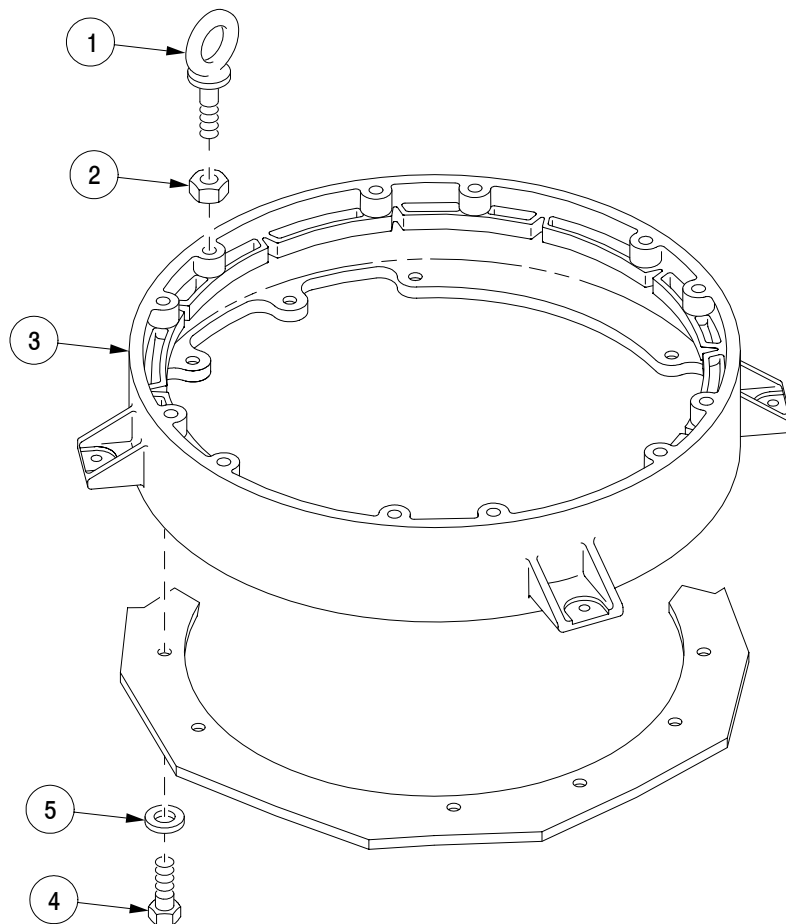
9-1	CUPOLA ADAPTER RING	9-2
9-2	CUPOLA ASSEMBLY	9-4



9-1 CUPOLA ADAPTER RING - CONTINUED

b. Installation - Continued

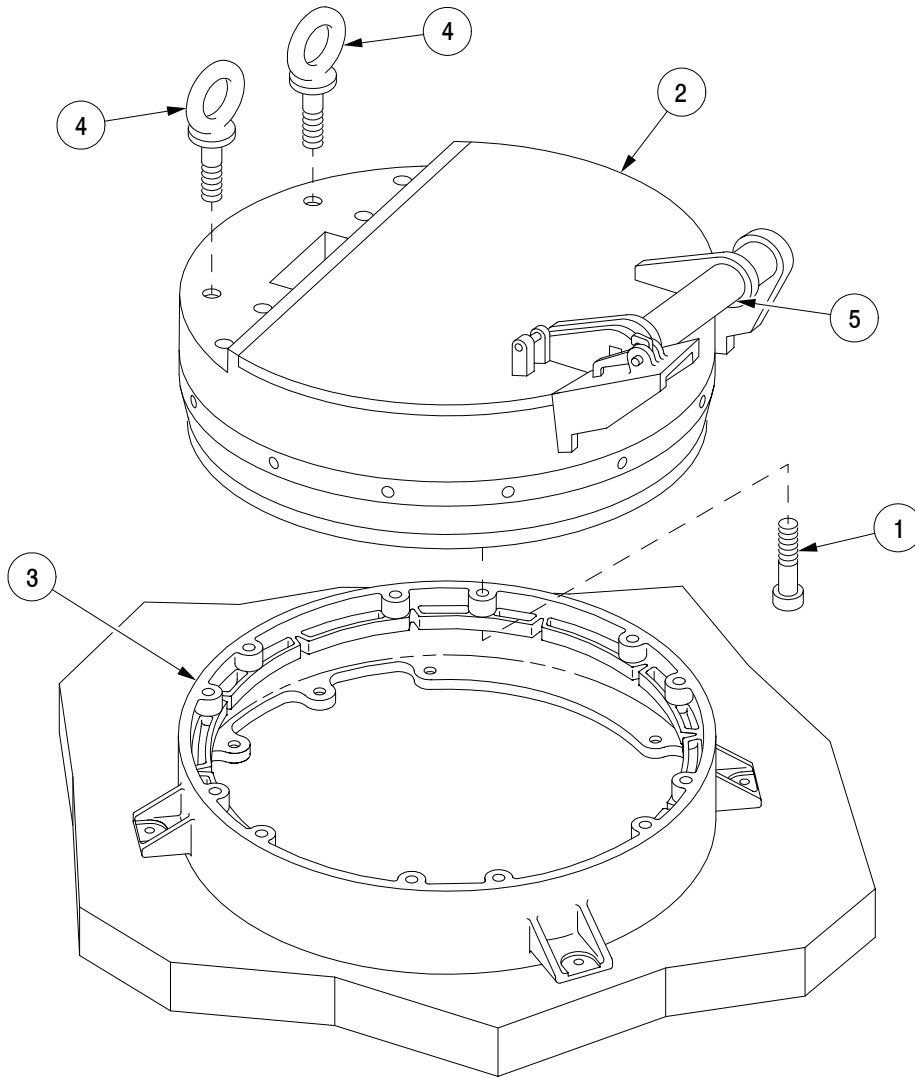
- 2 Attach two lifting slings to four eyebolts (1) and to suitable lifting device.
- 3 Apply sealing compound to mating surface of cab and adapter ring and position adapter ring (3) on cab. Align mounting holes and secure with 10 new self-locking screws (4) and 10 flat washers (5). Torque screws to 299-330 lb-ft (405-447 N·m).
- 4 Remove slings, four eyebolts (1), and four nuts (2) from adapter ring (3).



12pc007m

9-2 CUPOLA ASSEMBLY - CONTINUED

a. Removal - Continued



12pc008m

9-2 CUPOLA ASSEMBLY - CONTINUED

b. Disassembly.

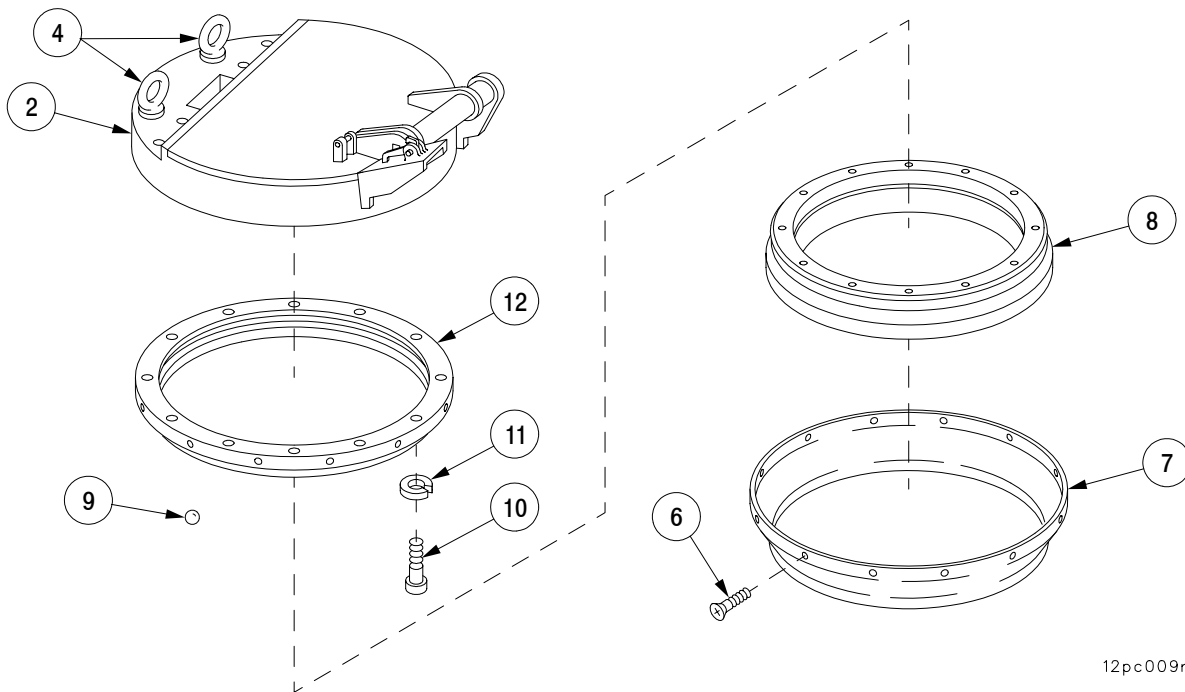
WARNING

Cupola weighs 360 lb (163.4 kg). Use hoist and sling capable of lifting 1000 lb (454 kg) to provide adequate lifting capacity and prevent injury.

- 1 With sling still attached invert commander's cupola assembly (2) using an assistant. Remove sling and two eyebolts (4).
- 2 Remove 12 screws (6), race ring shield (7), and lower race ring (8).
- 3 Remove 252 white or cream balls (9). Discard balls.
- 4 Remove 12 screws (10), 12 lockwashers (11), and outer race ring (12). Discard lockwashers.

c. Assembly.

- 1 Install outer race ring (12) to commander's cupola assembly (2) and secure with 12 new lockwashers (11) and 12 screws (10).
- 2 Install 252 new cream or white balls (9).
- 3 Install lower race ring (8) and race ring shield (7) and secure with 12 screws (6).



12pc009m

9-2 CUPOLA ASSEMBLY - CONTINUED

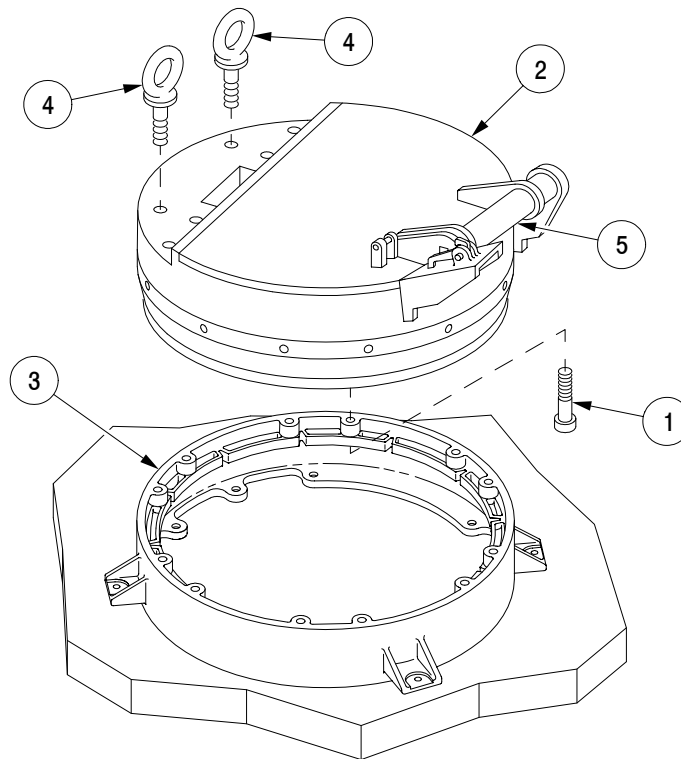
d. Installation.**WARNING**

Cupola weighs 360 lb (163.4 kg). Use a hoist and sling capable of lifting 1000 lb (454 kg) to prevent accidental slippage or injury.

- 1 Attach two eyebolts (4) to cupola (2) in screw holes for machine gun support.
- 2 Attach sling to two eyebolts (4) and hinge tube cover (5).
- 3 Apply sealing compound to mating surface of adapter ring and cupola and attach suitable lifting device to sling and position cupola (2) on adapter ring (3) and align mounting holes.
- 4 Install 12 new self-locking screws (1) securing cupola assembly (2) to adapter ring (3). Torque screws to 299-330 lb-ft (405-447 N-m).
- 5 Remove sling and two eyebolts (4) from cupola assembly (2).

NOTE

For installation of machine gun support after cupola assembly installation, see TM 9-2350-314-20-2-1.



12pc010m

CHAPTER 10 CAB HYDRAULICS

GENERAL

This chapter illustrates and describes the maintenance of the cab hydraulic system which supplies and controls fluid power to operate the howitzer elevating, cab traversing, and projectile rammer systems.

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10-1 TRAVERSE SERVOVALVE ASSEMBLY

This task covers:

a. Removal	b. Disassembly
c. Assembly	d. Installation

INITIAL SETUP

Tools

Artillery & turret mechanic's tool kit
(SC 5180-95-A12)
Torque wrench (item 78, Appx F)

Materials/Parts

Plastic bag (item 14, Appx B)
Marking tag (item 71, Appx B)
Hydraulic fluid (item 42, Appx B)
Preformed packing (item 141, Appx E)
Preformed packings (2) (item 89, Appx E)
Preformed packings (2) (item 86, Appx E)
Preformed packings (6) (item 138, Appx E)
Backup rings (2) (item 61, Appx E)
Drive screws (4) (item 48, Appx E)
Lockwashers (16) (item 125, Appx E)
Lockwashers (4) (item 127, Appx E)
Lockwashers (4) (item 111, Appx E)
Backup rings (2) (item 62, Appx E)
Preformed packing (item 144, Appx E)
Preformed packings (2) (item 137, Appx E)
Preformed packings (9) (item 140, Appx E)
Preformed packings (3) (item 153, Appx E)
Dust protective caps (AR) (item 22, Appx B)
Lockwire (item 86, Appx B)
Preformed packing (item 145, Appx E)

Equipment Conditions

Hydraulic system pressure discharged
(TM 9-2350-314-20-2-2)
Traverse mechanism guard removed
(TM 9-2350-314-20-2-2)

References

TM 9-2350-314-20-2-2

10-1 TRAVERSE SERVOVALVE ASSEMBLY - CONTINUED

a. Removal.**WARNING**

- Hydraulic system pressure is 1925 ± 50 psi. Do not torque hydraulic fittings or perform removal procedures when hydraulic system is pressurized. Discharging system pressure before performing any maintenance procedures will avoid serious injury to personnel.
- Eye protection will be worn when performing maintenance procedures on all hydraulic components to avoid injury to personnel.

CAUTION

- All hydraulic lines and ports must be capped to prevent contaminants from entering the hydraulic system and causing internal damage to hydraulic components.
- All serviceable components must be placed in plastic bags to prevent contamination of hydraulic system during installation.

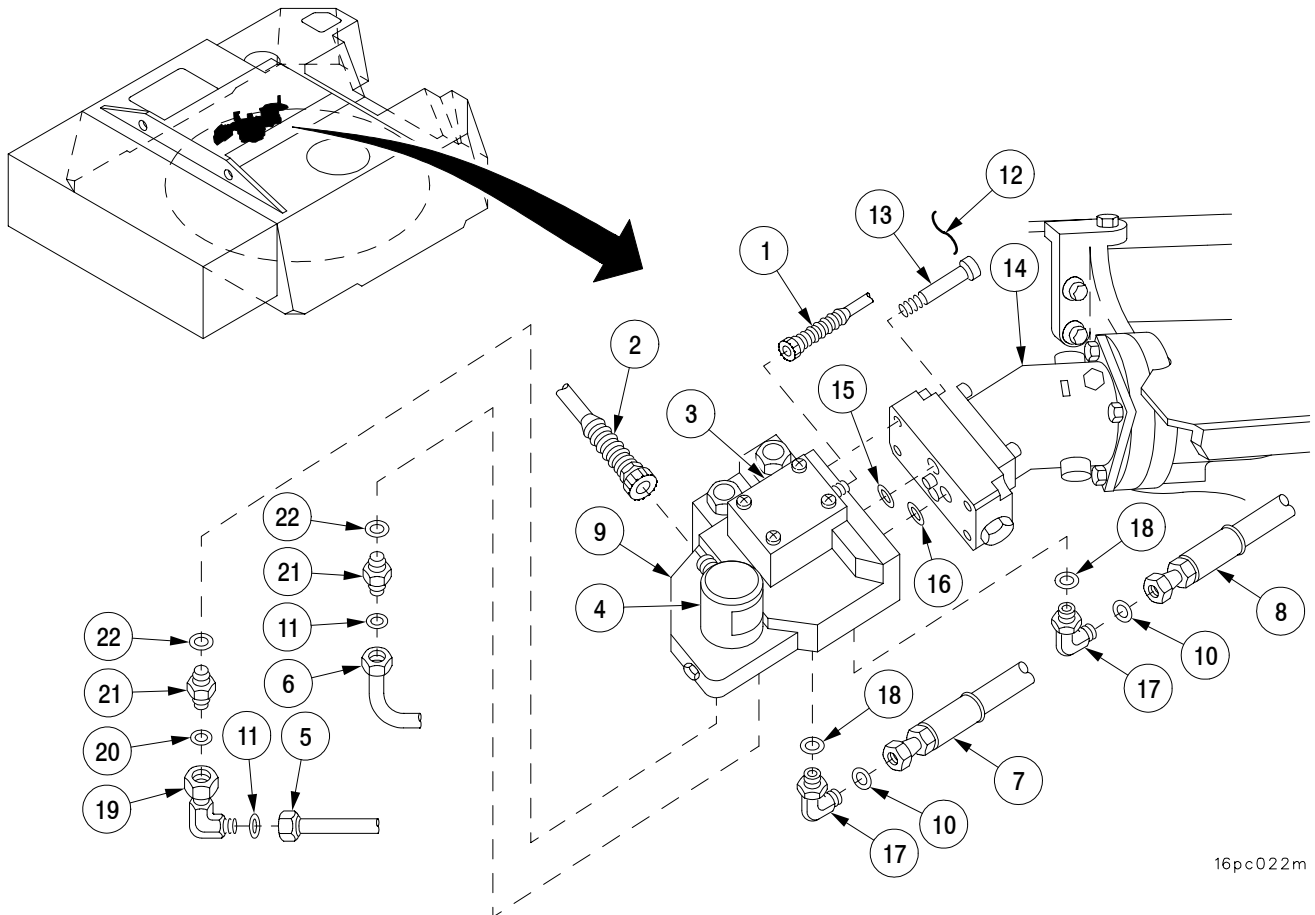
NOTE

A thin even coat of clean hydraulic fluid must be applied to ALL new packing material to form a good seal between hydraulic components during installation.

10-1 TRAVERSE SERVOVALVE ASSEMBLY - CONTINUED

a. Removal - Continued

- 1 Disconnect electrical connectors (1 and 2) from traverse servovalve assembly (3) and solenoid valve (4).
- 2 Disconnect four lines (5, 6, 7 and 8) from manifold (9).
- 3 Remove two preformed packings (10) and two preformed packings (11) from lines (5, 6, 7 and 8). Discard preformed packings.
- 4 Cut lockwire (12) and remove four screws (13) securing traverse servovalve assembly (3) to hydraulic motor (14). Discard lockwire.
- 5 Remove traverse servovalve assembly (3), two preformed packings (15) and preformed packing (16). Discard preformed packings.
- 6 Remove two elbows (17) and two preformed packings (18) from manifold (9). Discard preformed packings.
- 7 Remove elbow (19) and preformed packing (20) from manifold (9). Discard preformed packing.
- 8 Remove two connectors (21) and two preformed packings (22) from manifold (9). Discard preformed packings.

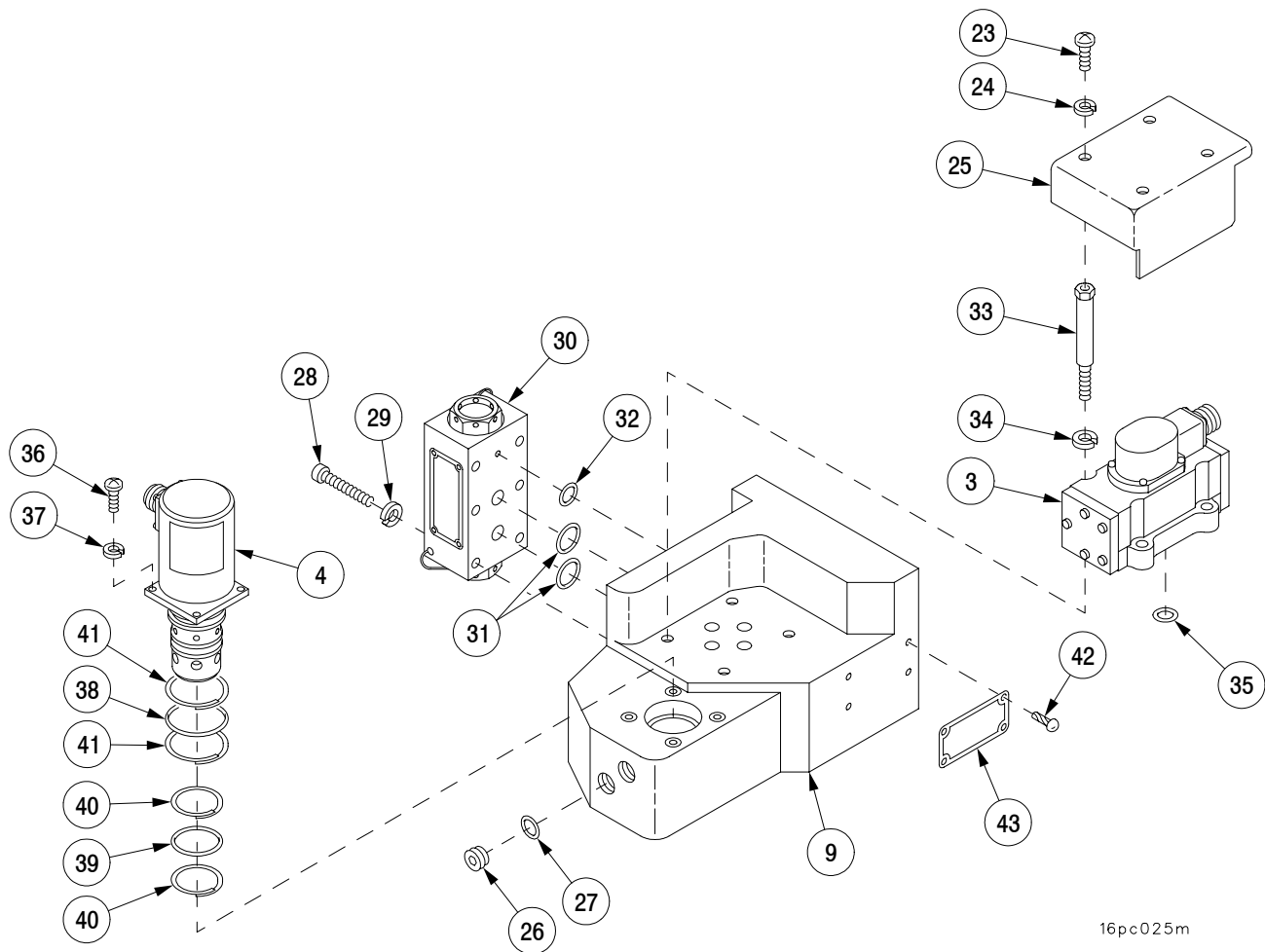


16pc022m

10-1 TRAVERSE SERVOVALVE ASSEMBLY - CONTINUED

b. Disassembly.

- 1 Remove four screws (23), four lockwashers (24), and cover (25) from manifold (9). Discard lockwashers.
- 2 Remove three plugs (26) and three preformed packings (27) from manifold (9). Discard preformed packings.
- 3 Remove 12 socket head screws (28), 12 lockwashers (29), two check valves (30), four preformed packings (31), and two preformed packings (32). Discard lockwashers and preformed packings.
- 4 Remove four studs (33), four lockwashers (34), traverse servovalve assembly (3), and four preformed packings (35) from manifold (9). Discard lockwashers and preformed packings.
- 5 Remove four screws (36), four lockwashers (37), bypass solenoid valve (4), two preformed packings (38 and 39), and four retainers (40 and 41). Discard preformed packings, retainers, and lockwashers.
- 6 Remove four drive screws (42) and identification plate (43) from manifold (9). Discard screws.

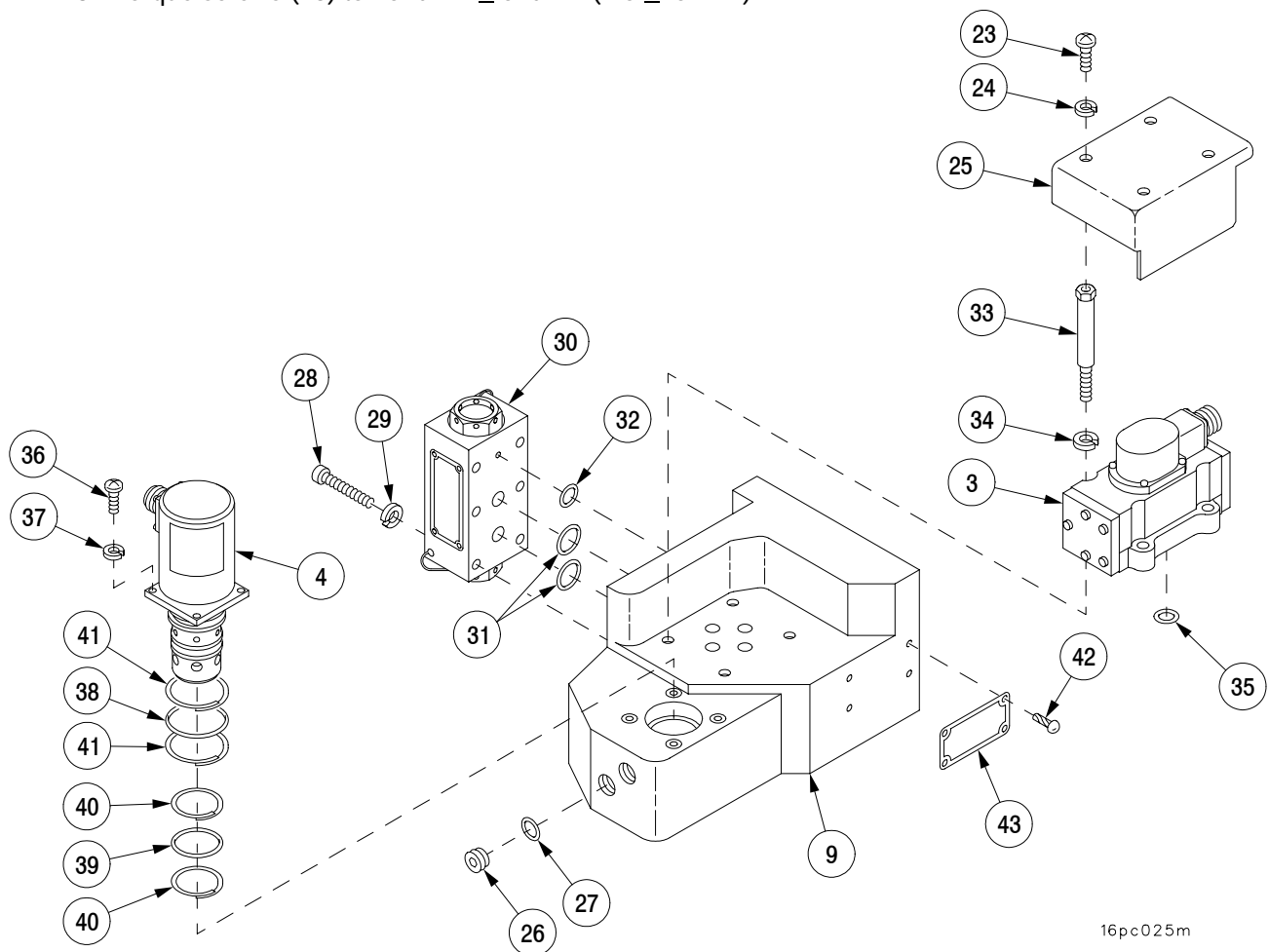


16pc025m

10-1 TRAVERSE SERVOVALVE ASSEMBLY - CONTINUED

c. Assembly.

- 1 Install identification plate (43) to manifold (9) with four new drive screws (42).
- 2 Install bypass solenoid valve (4), two new preformed packings (38 and 39), and four new retainers (40 and 41) and secure bypass solenoid valve (4) with four new lockwashers (37) and four screws (36).
- 3 Secure traverse servovalve assembly (3) to manifold (9) with four studs (33), four new lockwashers (34), and four new preformed packings (35). Wet torque studs (34) to 28 lb-in. \pm 10 lb-in. (3.2 ± 1.1 N·m).
- 4 Secure two check valves (30) to manifold (9) with four new preformed packings (31), two new preformed packings (32), 12 new lockwashers (29) and 12 screws (28).
- 5 Wet torque screws (28) to 70 lb-in. \pm 10 lb-in. (7.9 ± 1.1 N·m).
- 6 Install three plugs (26) with three new preformed packings (27) into manifold (9).
- 7 Secure cover (25) to manifold (9) with four screws (23) and four new lockwashers (24).
- 8 Torque screws (23) to 15 lb-in. \pm 5 lb-in. ($1.6 \pm .5$ N·m).

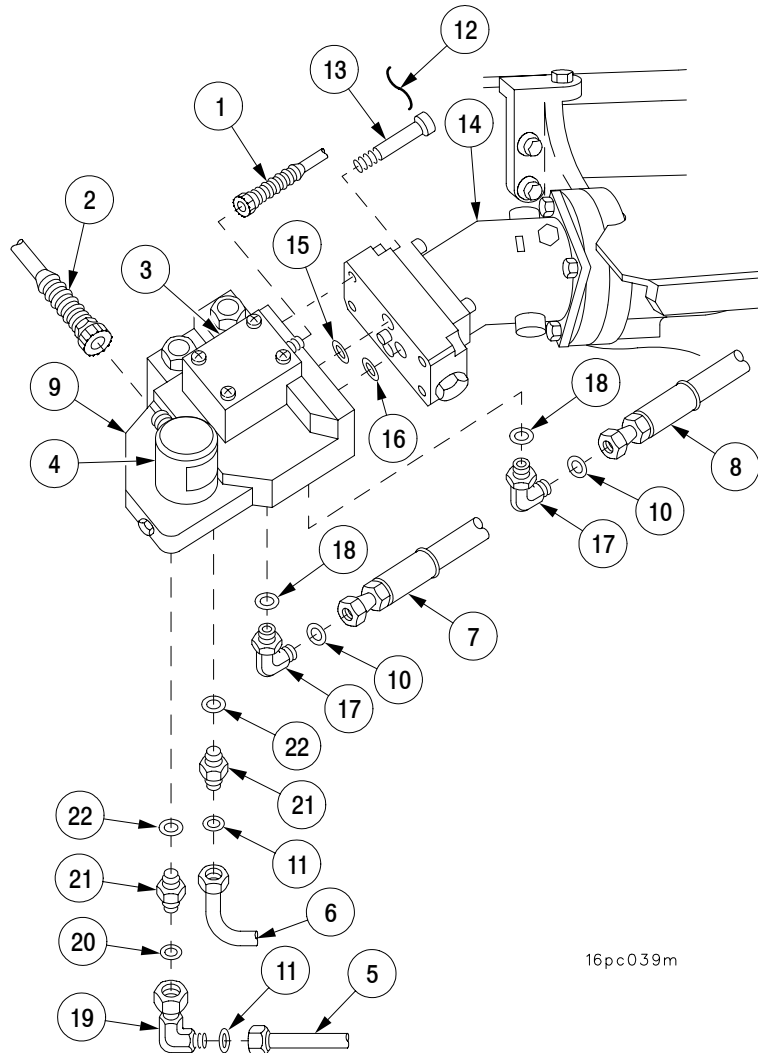


16pc025m

10-1 TRAVERSE SERVOVALVE ASSEMBLY - CONTINUED

d. Installation.

- 1 Install two connectors (21) and two new preformed packings (22) into manifold (9).
- 2 Install elbow (19) and new preformed packing (20) into manifold (9).
- 3 Install two elbows (17) and two new preformed packings (18) into manifold (9).
- 4 Secure traverse servovalve assembly (3) to hydraulic motor (14) with four screws (13), new lockwire (12), two new preformed packings (15), and new preformed packing (16).
- 5 Connect lines (5, 6, 7, and 8) with two new preformed packings (10) and two new preformed packings (11) to manifold (9).
- 6 Connect electrical connectors (1 and 2) to traverse servovalve assembly (3) and solenoid valve (4).
- 7 Flush traverse system (TM 9-2350-314-20-2-2).
- 8 Fill cab hydraulic system (TM 9-2350-314-20-2-2).



16pc039m

10-2 HYDRAULIC MOTOR ASSEMBLY.

This task covers: a. Removal b. Installation

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Drain pain (item 35, Appx F)

Materials/Parts

Lockwashers (3) (item 100, Appx E)
Lockwire (item 88, Appx B)
Marking tags (AR) (item 71, Appx B)
Oil (item 54, Appx B)
Protective dust caps (item 22, Appx B)

Equipment Conditions

Hydraulic system pressure discharged
(TM 9-2350-314-20-2-2)
Traverse servovalve assembly removed
(para 10-1)

References

TM 9-2350-314-20-2-2

a. Removal.

WARNING

The hydraulic system pressure is 1925 ± 50 psi.
Never torque hydraulic fittings or perform removal
procedures when system is pressurized. Make sure
system pressure is discharged before performing
maintenance to avoid serious injury to personnel.

CAUTION

Cap hydraulic lines and ports immediately after
disconnecting to prevent contaminants from entering
hydraulic system and components.

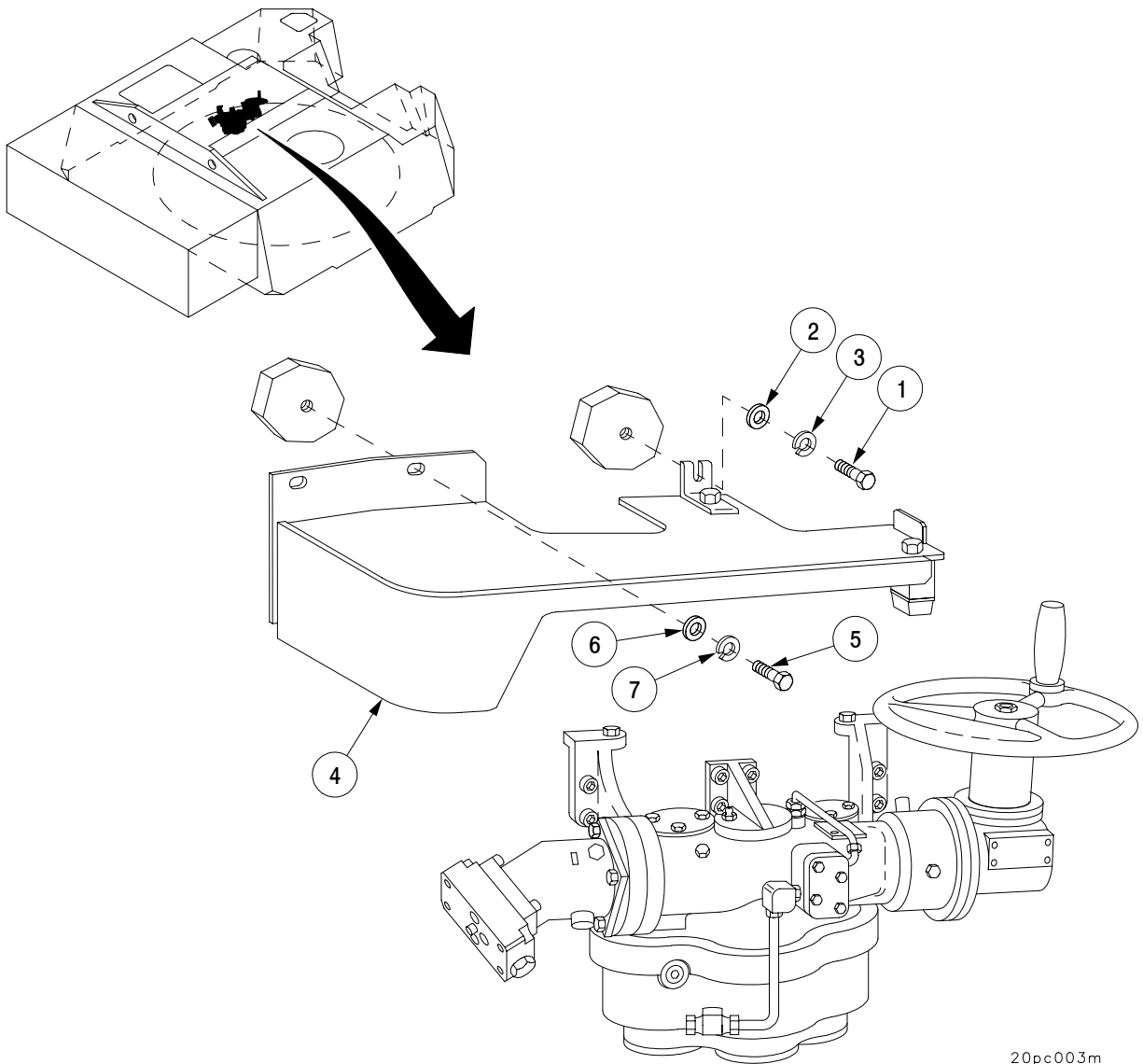
NOTE

Prior to removal, tag all hydraulic lines and
components for identification during installation.

10-2 HYDRAULIC MOTOR ASSEMBLY - CONTINUED

a. Removal - Continued

- 1 Remove screw (1), flat washer (2), and lockwasher (3) from traverse mechanism guard (4). Discard lockwasher.
- 2 Remove two screws (5), two flat washers (6), and two lockwashers (7) from traverse mechanism guard (4). Discard lockwashers.
- 3 Remove traverse mechanism guard (4).



20pc003m

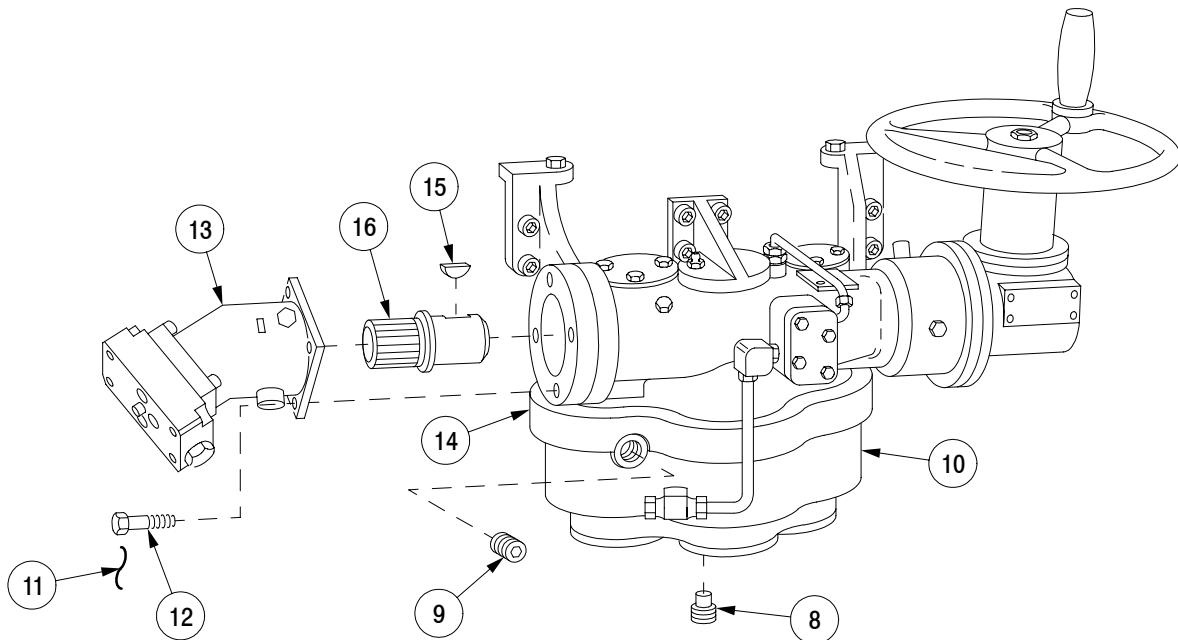
10-2 HYDRAULIC MOTOR ASSEMBLY - CONTINUED

a. Removal - Continued

- 4 Place drain pan under magnetic drain plug (8).
- 5 Remove check/fill plug (9) and magnetic drain plug (8) from traverse mechanism gear box (10).
- 6 Remove lockwire (11) from four screws (12). Discard lockwire.
- 7 Remove four screws (12) and hydraulic motor assembly (13) from traverse mechanism (14).
- 8 Remove woodruff key (15) from hydraulic motor coupling drive shaft (16).

b. Installation.

- 1 Install woodruff key (15) on hydraulic motor coupling drive shaft (16).
- 2 Position hydraulic motor assembly (13) on traverse mechanism (14). Ensure woodruff key (15) aligns with keyway on traverse mechanism (14).
- 3 Secure hydraulic motor assembly (13) with four screws (12).
- 4 Install new lockwire (11) on screws (12).
- 5 Install drain plug (8) in traverse mechanism gear box (10).
- 6 Fill with approximately four quarts of lubrication oil or until oil is level with bottom of oil level check/fill hole.
- 7 Install check/fill plug (9).

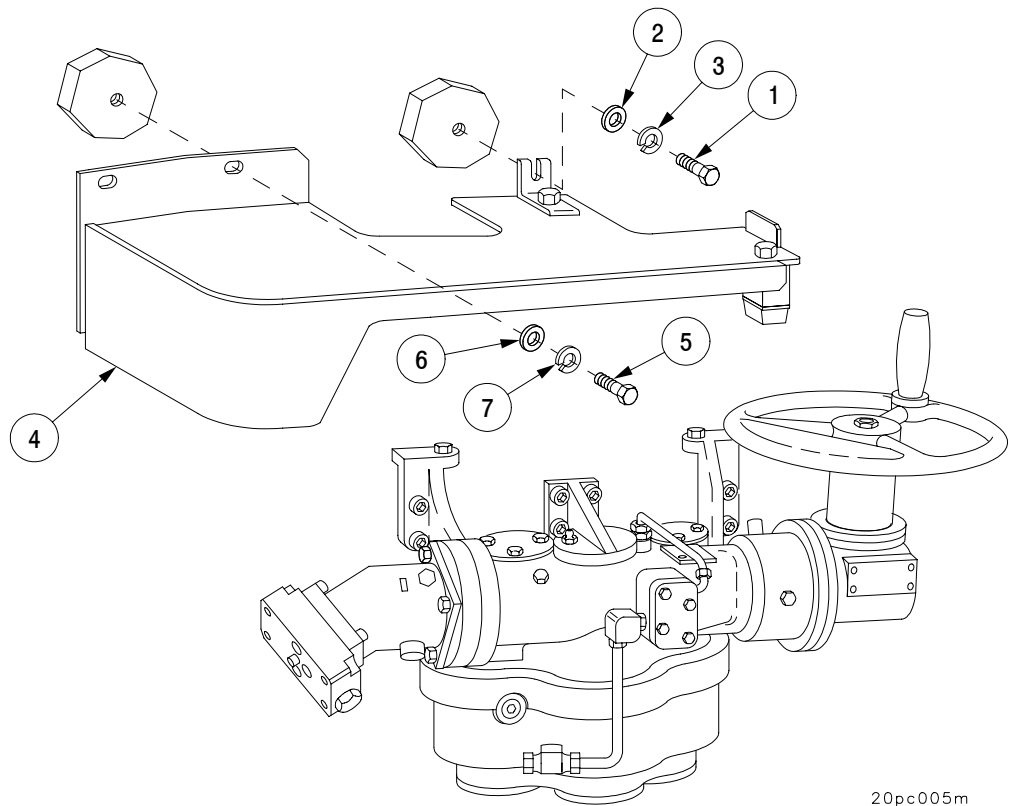


20pc004m

10-2 HYDRAULIC MOTOR ASSEMBLY - CONTINUED

b. Installation - Continued

- 8 Install traverse mechanism guard (4) with two new lockwashers (7), two flat washers (6), and two screws (5).
- 9 Install new lockwasher (3), flat washer (2), and screw (1) on traverse mechanism guard (4).
- 10 Flush traverse system (TM 9-2350-314-20-2-2).
- 11 Fill cab hydraulic system (TM 9-2350-314-20-2-2).



20pc005m

10-3 GUN CONTROL ASSEMBLIES.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's

tool kit (SC 5180-95-A12)

■ Torque wrench (item 75, Appx F)

Materials/Parts

Lockwashers (6) (item 111, Appx E)

Lockwashers (5) (item 125, Appx E)

Preformed packings (14) (item 71, Appx E)

Preformed packings (4) (item 72, Appx E)

Preformed packing (item 79, Appx E)

Dust protective plug (item 59, Appx B)

Hydraulic fluid (item 42, Appx B)

Sealing compound (item 33, Appx B)

Lockwashers (4) (item 110, Appx E)

Lockwashers (6) (item 100, Appx E)

Retaining rings (2) (item 21, Appx E)

Retaining rings (2) (item 22, Appx E)

Retaining ring (item 20, Appx E)

Retaining rings (2) (item 219, Appx E)

Bearing (item 212, Appx E)

Bearing (item 208, Appx E)

Sealing compound (item 31, Appx B)

Plastic bag (AR) (item 14, Appx B)

Marking tag (AR) (item 71, Appx B)

Equipment Conditions

Hydraulic system discharged

(TM 9-2350-314-20-2-2)

Gunner's or COS control assembly removed

(TM 9-2350-314-20-2-2)

Gunner's or COS control handle removed

(TM 9-2350-314-20-2-2)

References

TM 9-2350-314-20-2-2

10-3 GUN CONTROL ASSEMBLIES - CONTINUED

a. Disassembly.

WARNING

- Wear safety glasses and steel-tipped shoes to avoid possible injury while handling equipment.
- Never tighten hydraulic lines or fittings or perform maintenance procedures when hydraulic system is pressurized to avoid serious injury to personnel.

CAUTION

- Cap hydraulic lines and ports to prevent contaminants from entering hydraulic system and causing internal damage to hydraulic components.
- All serviceable components must be placed in plastic bags to prevent contamination of hydraulic system during installation.

NOTE

- Prior to removal, tag all hydraulic lines and components for identification during installation.
- There are two gun control assemblies, COS control and gunner's control. The disassembly and assembly procedures for both are identical. This procedure covers only one control assembly.
- Vehicle serial numbers 001 - 164 have an electrical lead assembly inside the gun control assembly housing. If this component is present, follow Disassembly step 5 to remove it. Discard it and replace with plate upon assembly. If the gun control assembly housing does not have an electrical lead inside it, disregard Disassembly step 5 and follow Disassembly step 5.1 instead.

10-3 GUN CONTROL ASSEMBLIES - CONTINUED

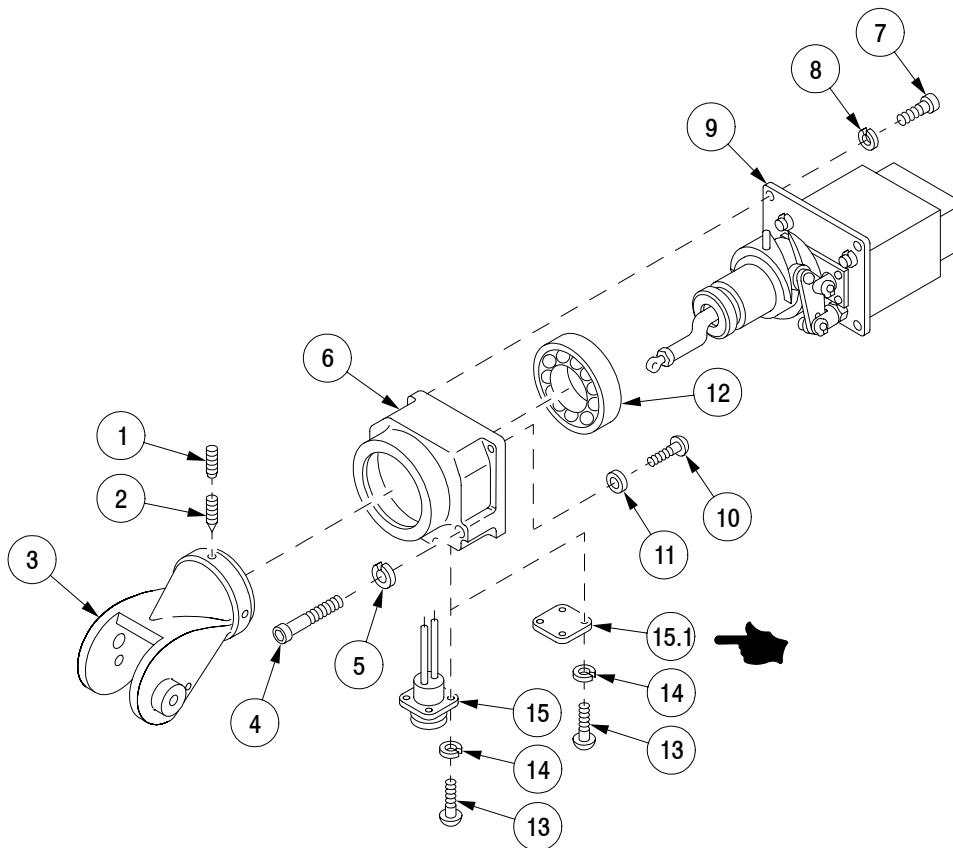
a. Disassembly - Continued

- 1 Remove three setscrews (1) and three setscrews (2) from bracket (3).
- 2 Remove socket head capscrew (4) and lockwasher (5) from lower rear corner of housing assembly (6). Discard lockwasher.
- 3 Remove three screws (7), three lockwashers (8), and control valve body (9). Discard lockwashers.
- 4 Remove four screws (10), four flat washers (11), and bearing (12) from housing assembly (6). Discard bearing.

NOTE

Vehicle serial numbers 001 - 164 may have lead assembly rather than plate. If lead assembly is present, remove and discard it. Replace with plate when assembling the control assembly.

- 5 Remove four screws (13), four lockwashers (14), and lead assembly (15) from housing assembly (6). Discard lockwashers and lead assembly.
- 5.1 Remove four screws (13), four lockwashers (14), and plate (15.1) from housing assembly (6). Discard lockwashers.

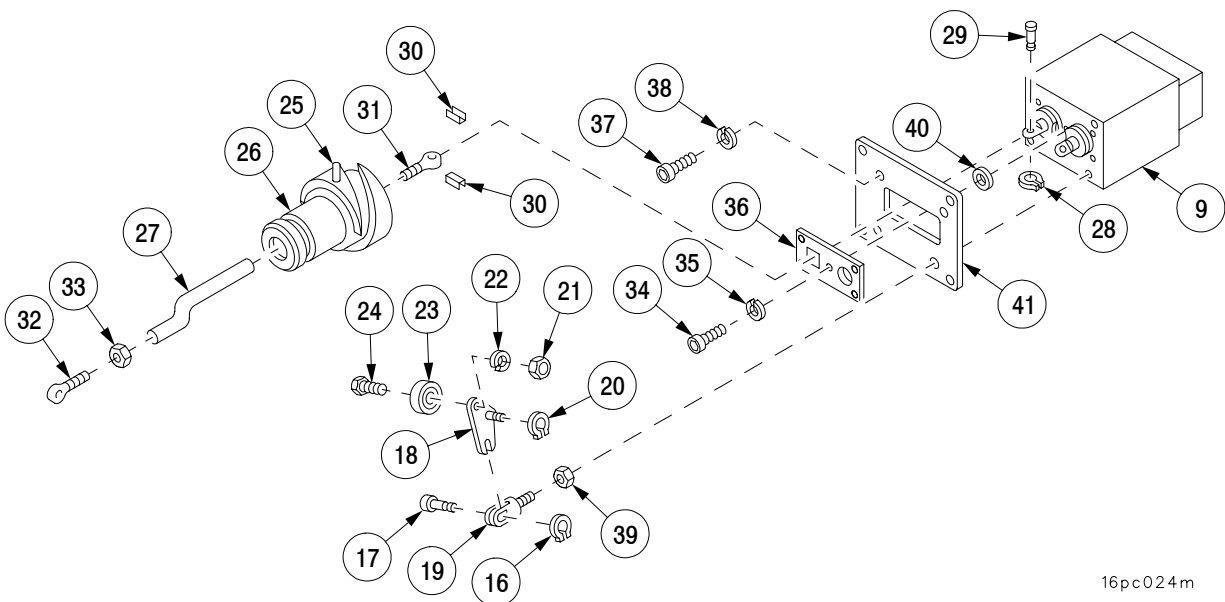


16pc023m

10-3 GUN CONTROL ASSEMBLIES - CONTINUED

a. Disassembly - Continued

- 6 Remove retaining ring (16) and clevis pin (17). Discard retaining ring.
- 7 Remove and discard retaining ring (20) from arm assembly (18).
- 8 Remove arm assembly (18) from control valve body (9).
- 9 Remove nut (21), lockwasher (22), bearing (23), and screw (24) from arm assembly (18). Discard bearing and lockwasher.
- 10 Loosen pin (25) of cam assembly (26). Slide cam assembly back on rod (27).
- 11 Remove retaining ring (28), grooved headed pin (29), two guides (30), and rod (27) from control valve (9). Discard retaining ring.
- 12 Remove eye bolt (31), eye bolt (32), nut (33), and cam assembly (26) from rod (27).
- 13 Remove five screws (34), five lockwashers (35), and plate (36) from control valve body (9). Discard lockwashers.
- 14 Remove three screws (37), three lockwashers (38), clevis (19), nut (39), flat washer (40), and plate (41) from control valve body (9). Discard lockwashers.



16pc024m

10-3 GUN CONTROL ASSEMBLIES - CONTINUED

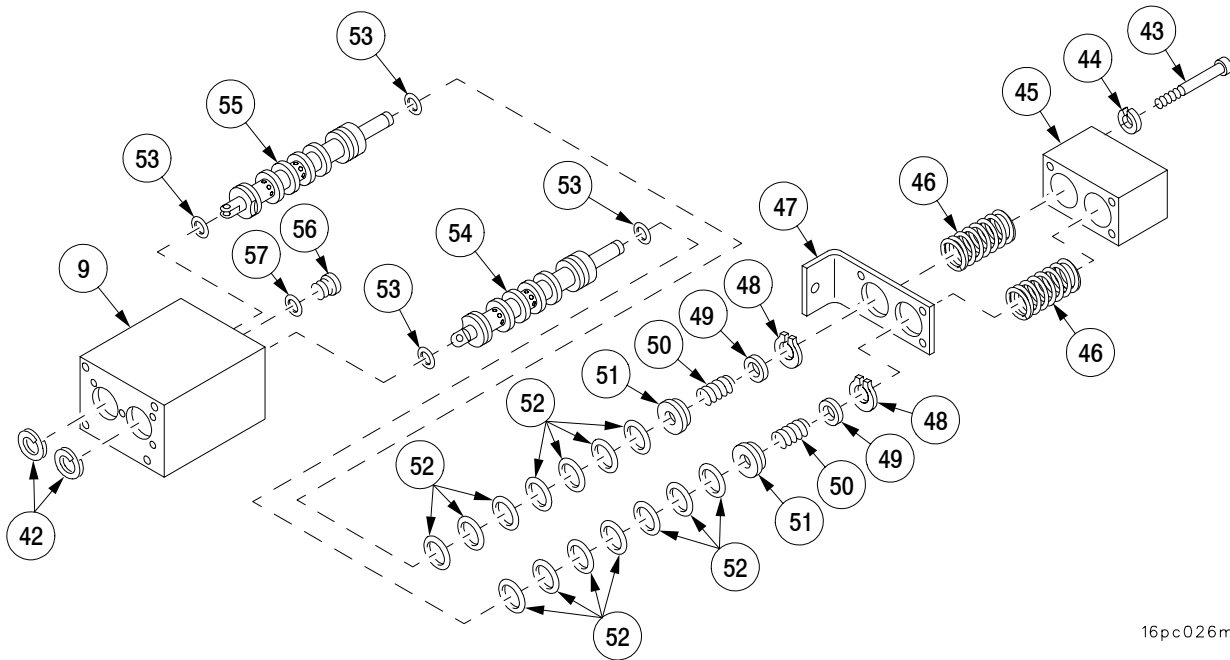
a. Disassembly - Continued

- 15 Remove and discard two retaining rings (42) from control valve body (9).
- 16 Remove four screws (43) and four lockwashers (44) securing cover (45) to control valve body (9). Discard lockwashers.

NOTE

There are two configurations of sleeve and slide assemblies. Some sleeve and slide assemblies have 14 preformed packings and some have 12 preformed packings. This task covers 14 preformed packings.

- 17 Separate cover (45) from control valve body (9) and remove the following: two springs (46), support (47), two retainers (48), two flat washers (49), two springs (50), two stops (51), 14 preformed packings (52), four preformed packings (53), sleeve and slide (54), and sleeve and slide (55). Discard retainers and preformed packings.
- 18 Remove plug (56) and preformed packing (57) from control valve body (9). Discard preformed packing.



16pc026m

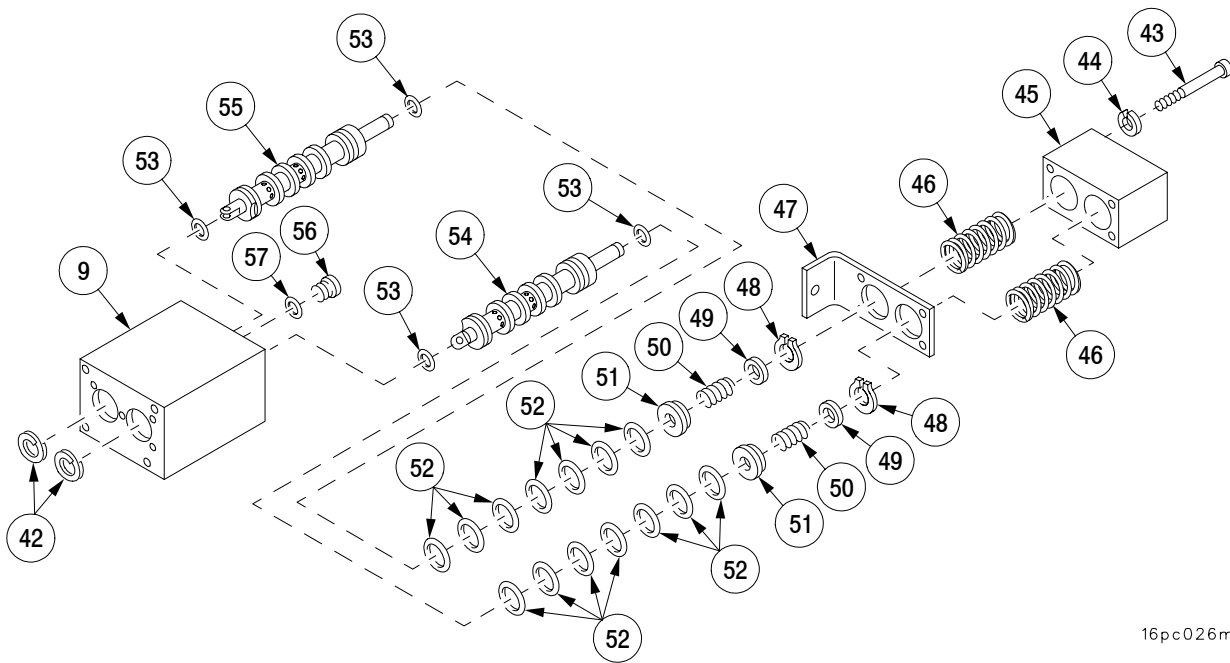
10-3 GUN CONTROL ASSEMBLIES - CONTINUED

b. Assembly.

NOTE

- A thin even coat of clean hydraulic fluid must be applied to ALL new preformed packing material to form a good seal between hydraulic components during assembly.
- There are two configurations of sleeve and slide assemblies. Some sleeve and slide assemblies have 14 preformed packings and some have 12 preformed packings. This task covers 14 preformed packings.

- 1 Apply sealing compound (item 31, Appx B) to plug (56) and install plug (56) with new preformed packing (57) to control valve body (9).
- 2 Install two new retaining rings (42) to control valve body (9).
- 3 Install the following components into control valve body (9), sleeve and slide (55), sleeve and slide (54), four new preformed packings (53), 14 new preformed packings (52), two stops (51), two springs (50), two flat washers (49), two new retainers (48), support (47), two springs (46), and cover (45). Secure by installing four screws (43) and four new lockwashers (44).

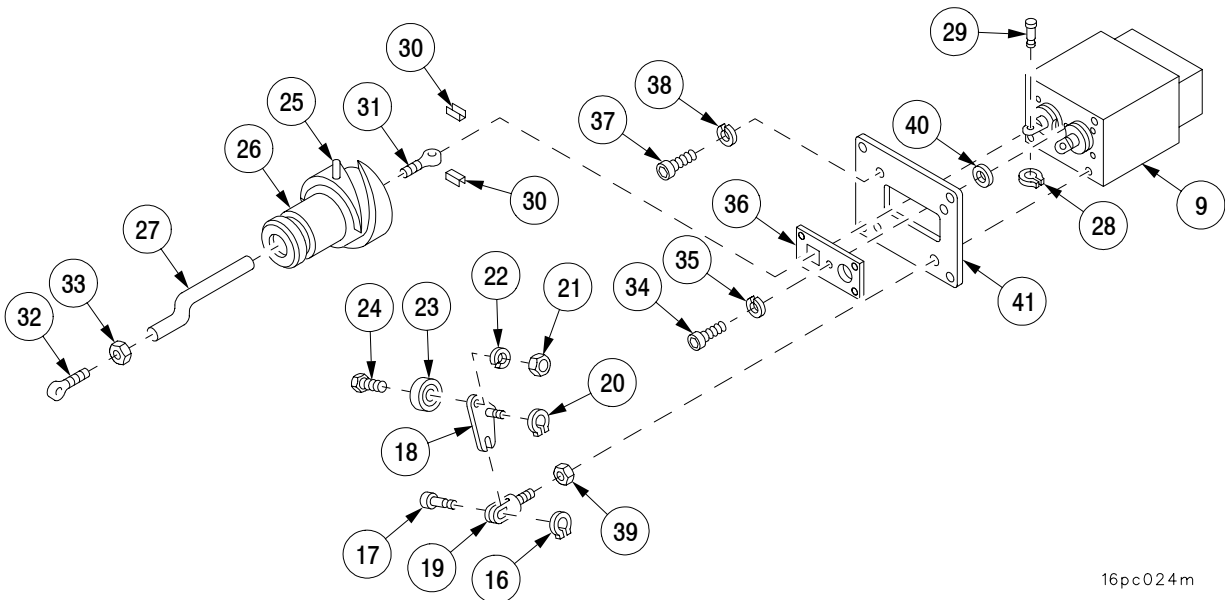


16pc026m

10-3 GUN CONTROL ASSEMBLIES - CONTINUED

b. Assembly - Continued

- 4 Install flat washer (40), plate (41), nut (39), clevis (19), three new lockwashers (38), and three screws (37) to control valve body (9).
- 5 Position plate (36) to control valve body (9) and secure by installing five new lockwashers (35) and five screws (34). Torque screws to 30-35 in-lbs (3.4-4 N•m).
- 6 Apply sealing compound (item 31, Appx B) to nut (33) and install cam assembly (26), nut (33), eye bolt (32), and eye bolt (31) to rod (27).
- 7 Attach eye bolt (31) to control valve body (9) by installing two guides (30), grooved headed pin (29) and new retaining ring (28).
- 8 Position arm assembly (18) to control valve body (9) and secure by installing new retaining ring (20).
- 9 Install screw (24), new bearing (23), new lockwasher (22), and nut (21) to arm assembly (18).
- 10 Slide cam assembly (26) forward on rod (27) until bearing (23) contacts cam assembly. Secure cam assembly to rod by tapping cam assembly pin (25) into cam assembly (26).
- 11 Secure arm assembly (18) to clevis (19) by installing clevis pin (17) and new retaining ring (16).

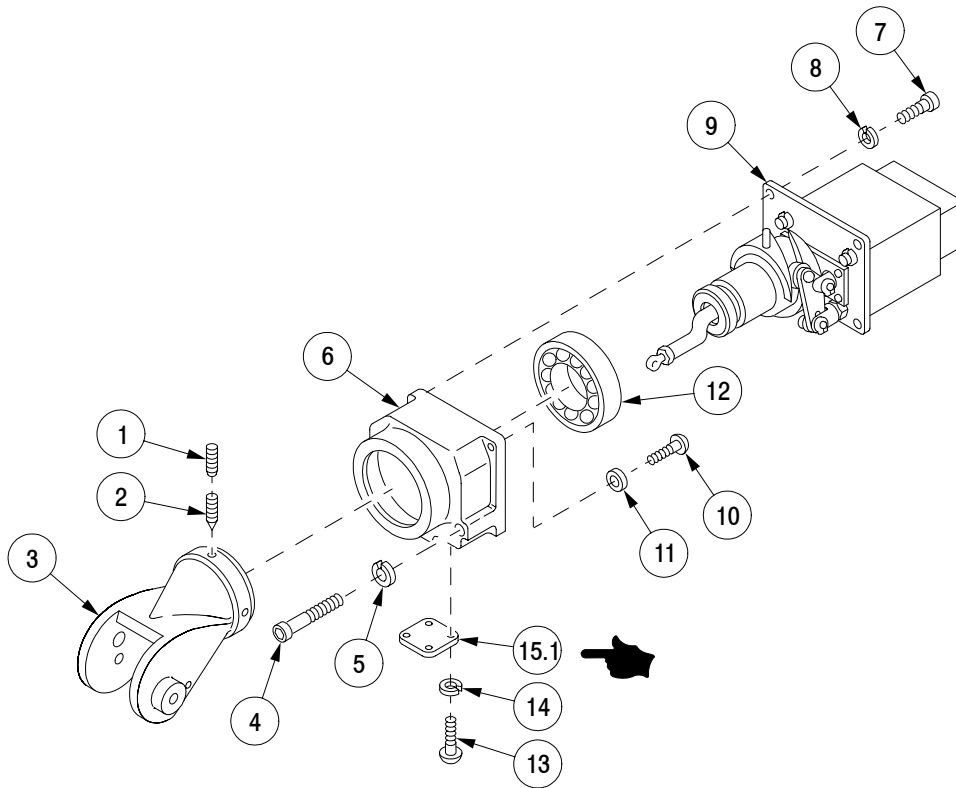


16pc024m

10-3 GUN CONTROL ASSEMBLIES - CONTINUED

b. Assembly - Continued

- 12 Position plate (15.1) on housing assembly (6) and secure by installing four new lockwashers (14) and four screws (13).
- 13 Apply sealing compound (item 33, Appx B) to four screws (10) and install new bearing (12) into housing assembly (6). Secure by installing four flat washers (11) and four screws (10).
- 14 Position control valve body (9) to housing assembly (6) and secure by installing three screws (7), three new lockwashers (8), new lockwasher (5) and socket head cap screw (4).
- 15 Position bracket (3) to housing assembly (6) and secure by installing three set screws (2) and three set screws (1).



16pc023ma

10-4 ACCUMULATOR ASSEMBLY (MANUAL ELEVATION PUMP).

This task covers: a. Disassembly b. Inspection c. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Nitrogen charging kit (item 31, Appx F)
Vernier caliper (item 6, Appx F)

Materials/Parts

Parts kit (item 203, Appx E)
Dust protective plug (item 59, Appx B)
Hydraulic fluid (item 42, Appx B)
Preformed packing (item 88, Appx E)

Equipment Conditions

Hydraulic system pressure discharged
(TM 9-2350-314-20-2-2)
Accumulator assembly (manual elevation pump)
removed (TM 9-2350-314-20-2-2)

References

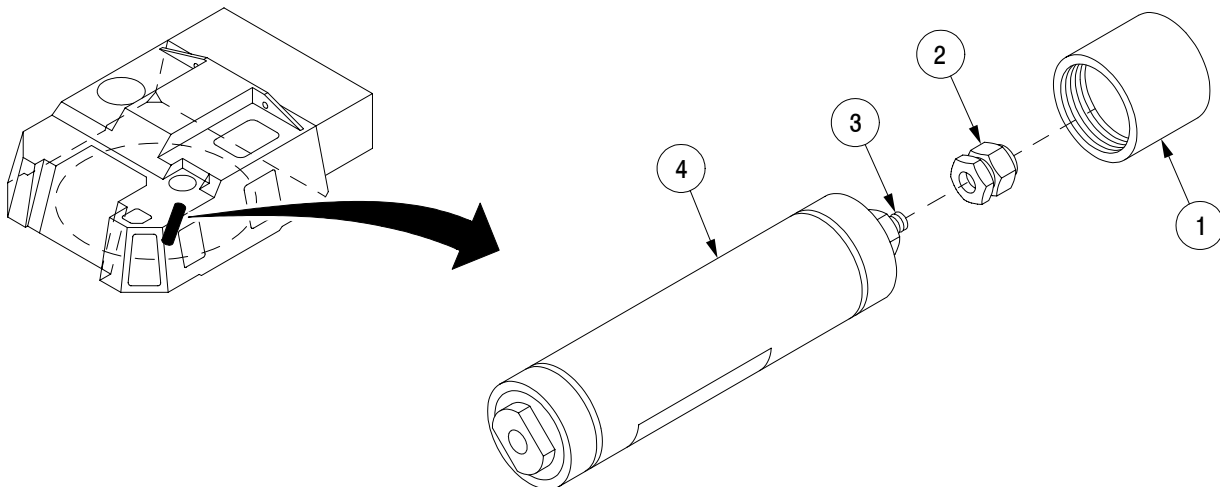
TM 9-2350-314-20-2-2

a. Disassembly.

WARNING

Accumulator contains dry nitrogen at 75–90 psi
(517–620 kPa). Do not disassemble until all pressure
is relieved to prevent injury to personnel.

- 1 Remove end cap (1).
- 2 Unscrew and remove pneumatic valve cap (2).
- 3 Depress valve core (3) and relieve all nitrogen pressure in accumulator (4).

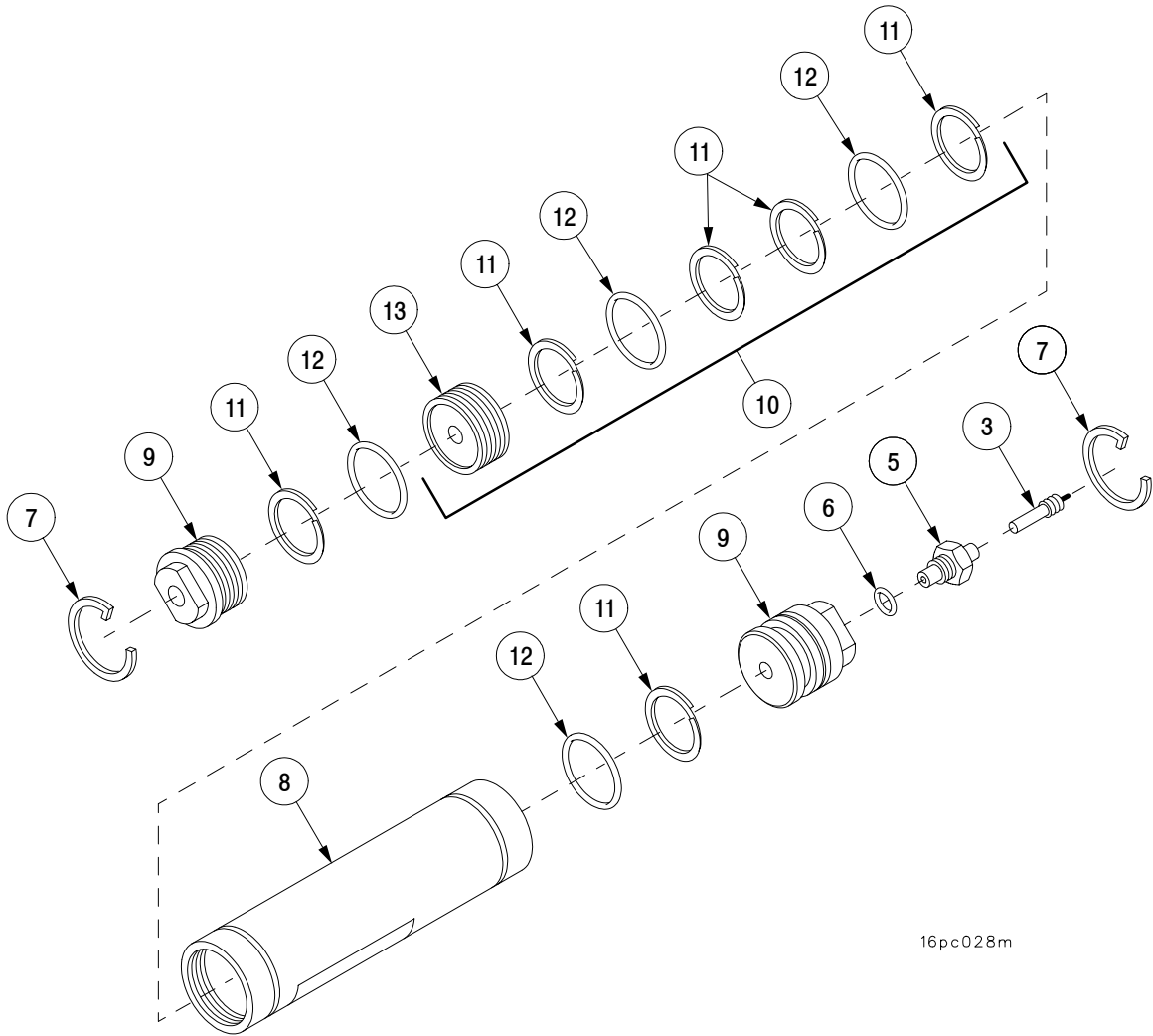


16pc027m

10-4 ACCUMULATOR ASSEMBLY (MANUAL ELEVATION PUMP) - CONTINUED

a. Disassembly - Continued

- 4 Unscrew and remove valve core (3) from air valve body (5).
- 5 Unscrew and remove air valve body (5).
- 6 Remove and discard preformed packing (6).
- 7 Remove two retaining rings (7) from outside of cylinder (8) at each end.
- 8 Remove two fittings (9) and piston assembly (10) from cylinder (8).
- 9 Remove and discard four packing ring retainers (11) and two preformed packings (12) from piston (13).
- 10 Remove and discard two packing ring retainers (11) and two preformed packings (12) from two fittings (9).

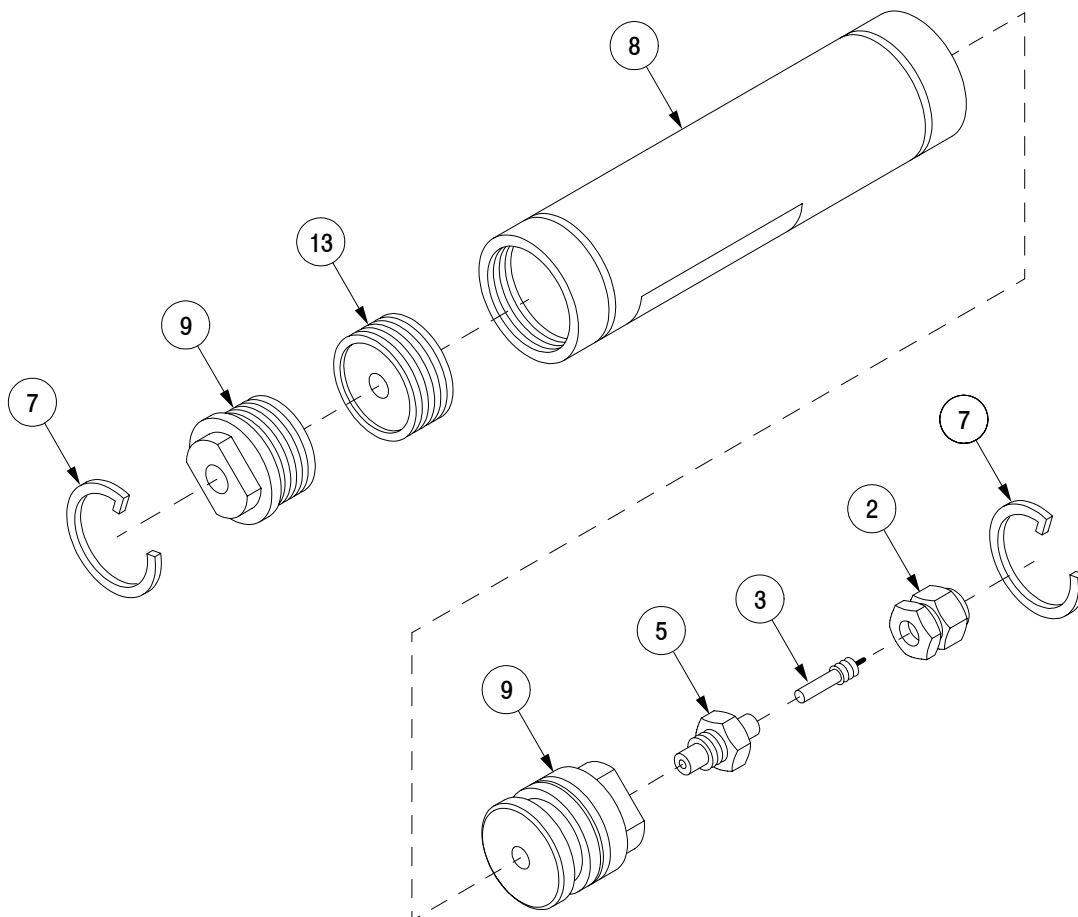


16pc028m

10-4 ACCUMULATOR ASSEMBLY (MANUAL ELEVATION PUMP) - CONTINUED

b. Inspection.

- 1 Inspect two fittings (9). Replace if damaged.
- 2 Inspect two retaining rings (7). Replace if damaged.
- 3 Inspect cylinder (8). Replace complete accumulator assembly if cylinder (8) is cracked or scored inside, if threads are damaged, or if inside diameter is greater than 1.518 in. (38.5 mm).
- 4 Inspect piston (13). Replace if cracked, grooves are burred, or outside diameter is less than 1.5 in. (38.2 mm).
- 5 Inspect air valve body (5). Replace if threads are damaged.
- 6 Replace valve core (3) if it leaks.
- 7 Inspect pneumatic valve cap (2). Replace if cracked.



16pc029m

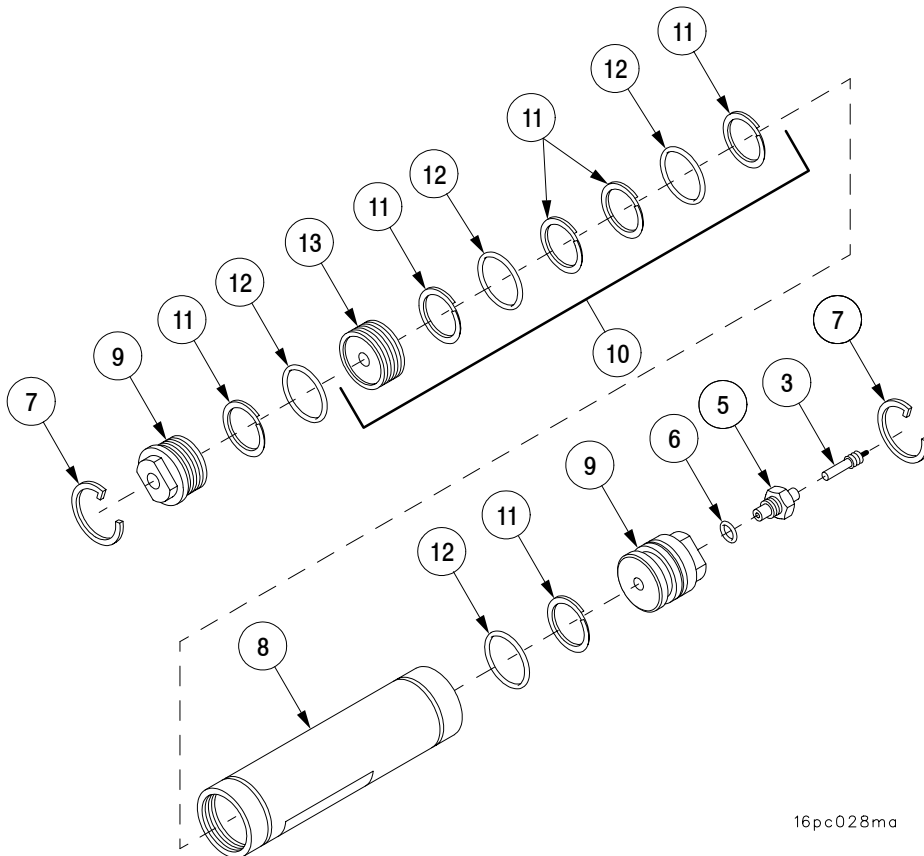
10-4 ACCUMULATOR ASSEMBLY (MANUAL ELEVATION PUMP) - CONTINUED

c. Assembly.

CAUTION

Do not distort preformed packings when installing. Be careful not to damage machined surfaces of piston, inside surface of cylinder, or threads at each end of cylinder. Avoid damage when inserting piston into cylinder.

- 1 Coat two new preformed packings (12) with hydraulic fluid. Install two new preformed packings (12) and four new packing ring retainers (11) on piston (13).
- 2 Coat two new performed packings (12) with hydraulic fluid. Install two new preformed packings (12) and two new packing ring retainers (11) on two fittings (9).
- 3 Install piston assembly (10) and two fittings (9) in cylinder (8).
- 4 Install two retaining rings (7), one at each end of cylinder (8).
- 5 Coat new preformed packing (6) with hydraulic fluid and install new preformed packing (6) and air valve body (5) on fitting (9).
- 6 Screw valve core (3) into air valve body (5).

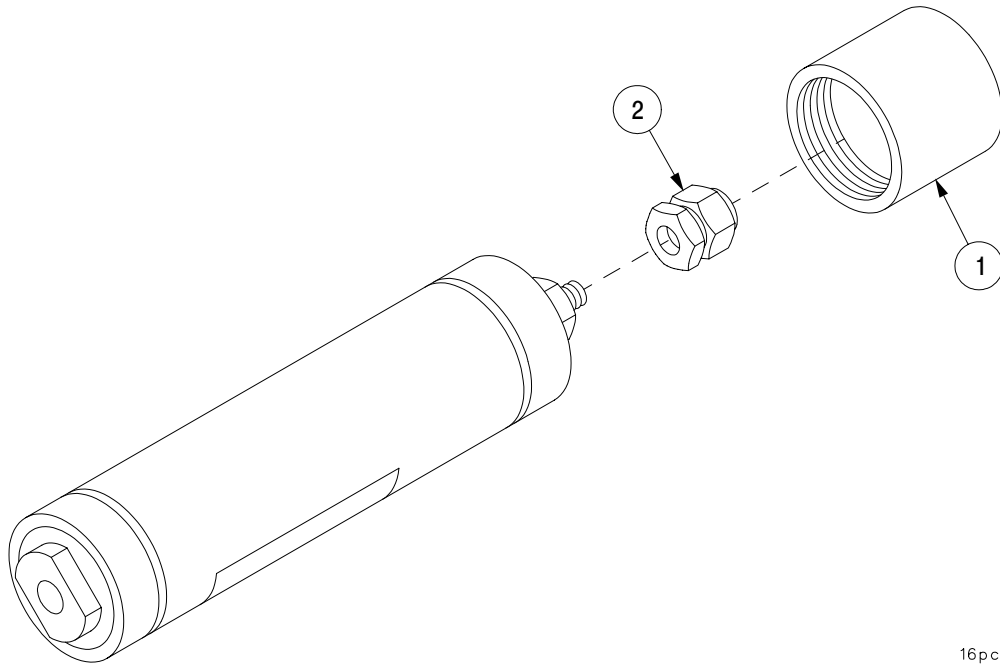


16pc028ma

10-4 ACCUMULATOR ASSEMBLY (MANUAL ELEVATION PUMP) - CONTINUED

c. Assembly - Continued

- 7 Charge accumulator with dry nitrogen (TM 9-2350-314-20-2-2).
- 8 Install pneumatic valve cap (2) and end cap (1).



16pc030m

10-5 EQUILIBRATION MANIFOLD.

This task covers: a. Disassembly b. Assembly
 c. Adjustment

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
 (SC 5180-95-A12)
 Drain pan (item 35, Appx F)

Materials/Parts

Lockwire (item 83, Appx B)
 Hydraulic fluid (item 42, Appx B)
 Dust protective plug (item 59, Appx B)
 Parts kit (item 180, Appx E)

Equipment Conditions

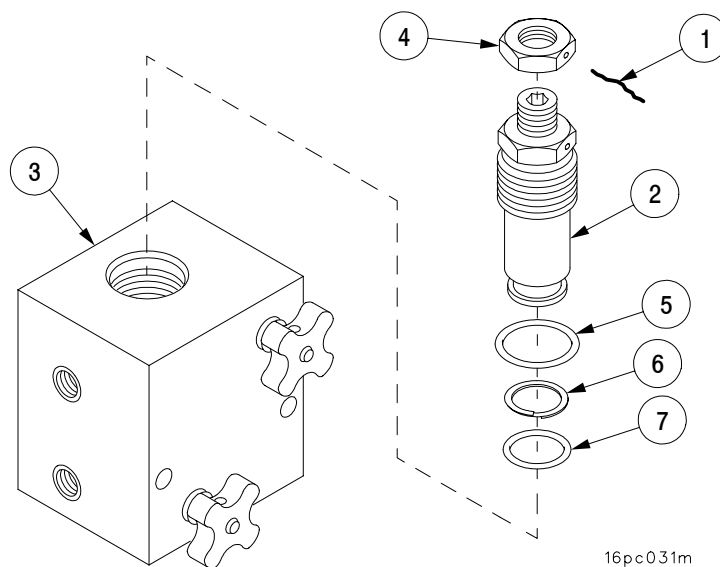
Hydraulic system pressure discharge
 (TM 9-2350-314-20-2-2)
 Equilibration manifold removed
 (TM 9-2350-314-20-2-2)

a. Disassembly.

NOTE

Do not disassemble relief valve unless there has been leakage.

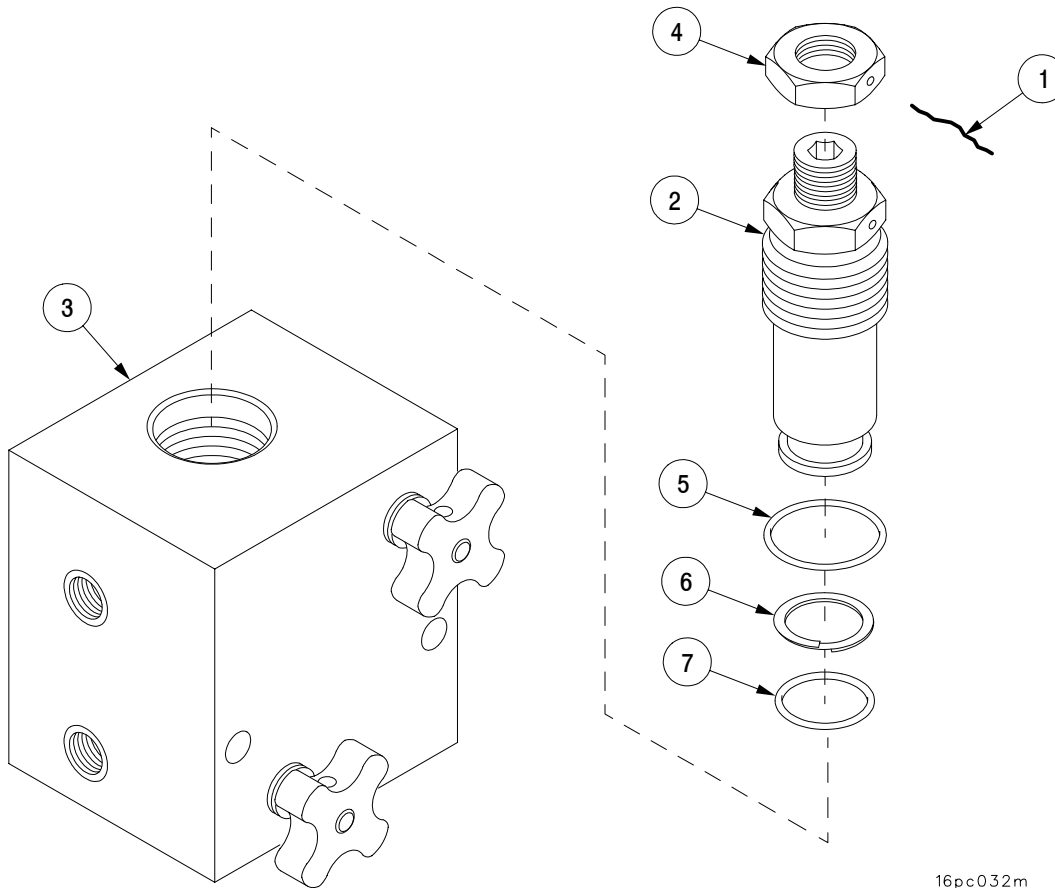
- 1 Remove and discard lockwire (1).
- 2 Remove valve assembly (2) from equilibrator manifold assembly (3).
- 3 Remove outer nut (4) from valve assembly (2).
- 4 Remove preformed packing (5), retainer (6), and preformed packing (7) from valve assembly (2). Discard packings and retainer.



10-5 EQUILIBRATION MANIFOLD - CONTINUED

b. Assembly - Continued

- 1 Install new preformed packing (7), new retainer (6), and new preformed packing (5) on valve assembly (2).
- 2 Coat valve assembly (2) with hydraulic fluid, and carefully install in equilibrator manifold assembly (3).
- 3 Install outer nut (4) on valve assembly (2).
- 4 Secure outer nut (4) to valve assembly (2) with new lockwire (1).



16pc032m

c. Adjustment.

- 1 Turn drain valve (8) clockwise to close drain port (9).
- 2 Open equilibrator valve (10).
- 3 Plug ACC port (11) and MANPUMP port (12).

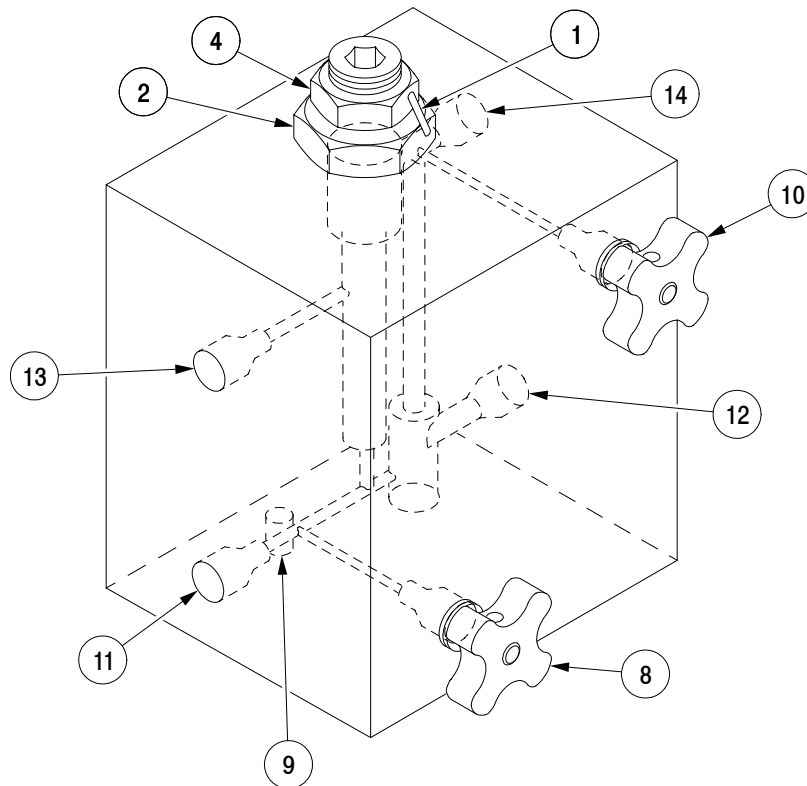
10-5 EQUILIBRATION MANIFOLD - CONTINUED

c. Adjustment - Continued

WARNING

Hydraulic fluid flow from RET port will be under high pressure. Use caution to prevent serious injury.

- 4 Connect hose to RET port (13) and direct flow into suitable container.
- 5 Apply hydraulic pressure to PRESSURE port (14) increasing from 0 psi to 3300 psi (0 kPa to 22754 kPa). Valve assembly (2) should open at 3200 psi + 100 psi (22064 kPa + 690 kPa). Opening of valve assembly (2) is indicated by flow from RET port (13). If opening pressure of valve assembly (2) must be adjusted, perform steps 6 thru 10.
- 6 If adjustment of valve assembly (2) is required, remove lockwire (1).
- 7 Loosen outer nut (4) by turning counterclockwise.



16pc033m

10-5 EQUILIBRATION MANIFOLD - CONTINUED

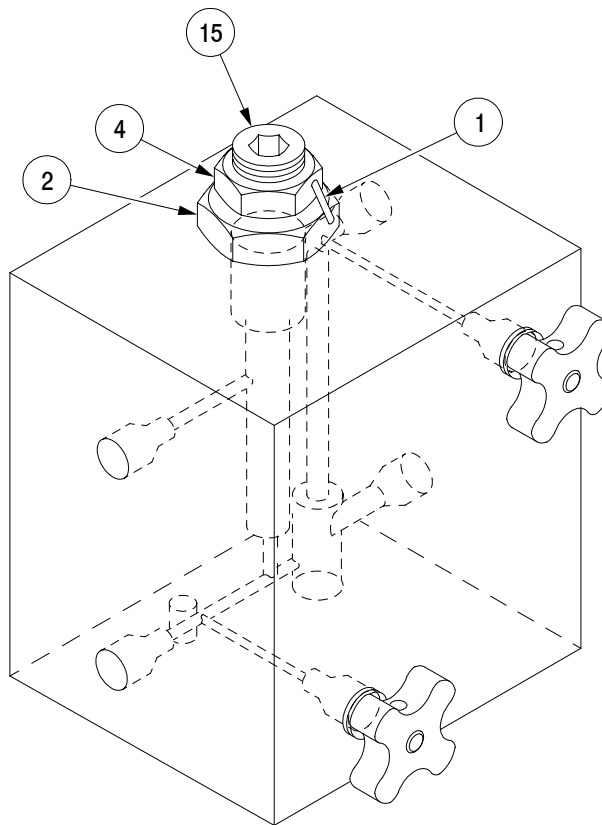
c. Adjustment - Continued

- 8 To increase opening pressure, rotate adjusting screw (15) clockwise with hex key. To decrease opening pressure, rotate adjusting screw (15) counterclockwise.
- 9 Tighten outer nut (4).
- 10 Measure valve assembly (2) opening pressure (step 5). Repeat steps 5 thru 10 as necessary until opening pressure of 3200 + 100 psi (22064 kPa + 690 kPa) is obtained.

NOTE

If valve assembly is defective, replace complete manifold assembly.

- 11 When proper pressure setting is obtained, install new lockwire (1) to secure outer nut (4) to valve assembly (2).



16pc034m

10-6 EQUILIBRATOR ACCUMULATOR.

This task covers: a. Disassembly b. Assembly c. Test

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Nitrogen charging kit (item 31, Appx F)
Extension valve (item 60, Appx F)
Spanner wrench (item 63, Appx F)

Materials/Parts

Prefomed packings (2) (item 151, Appx E)
Nitrogen (item 53, Appx B)
Hydraulic fluid (item 42, Appx B)
Dust protective plugs (2) (item 59, Appx B)
Back-up rings (2) (item 58, Appx E)
Seal assembly (item 181, Appx E)
Lockwire (item 82, Appx B)
Ring guides (2) (item 165, Appx E)

Equipment Conditions

Hydraulic system pressure discharged
(TM 9-2350-314-20-2-2)
Equilibrator accumulator removed
(TM 9-2350-314-20-2-2)

Personnel Required

Two

a. Disassembly.

WARNING

- The equilibrator accumulator is charged to 1200 psi. Ensure nitrogen pressure is released before performing any maintenance procedures to avoid serious injury to personnel.
- Use caution when relieving pressure. Wear gloves and goggles to prevent personal injury.

10-6 EQUILIBRATOR ACCUMULATOR - CONTINUED

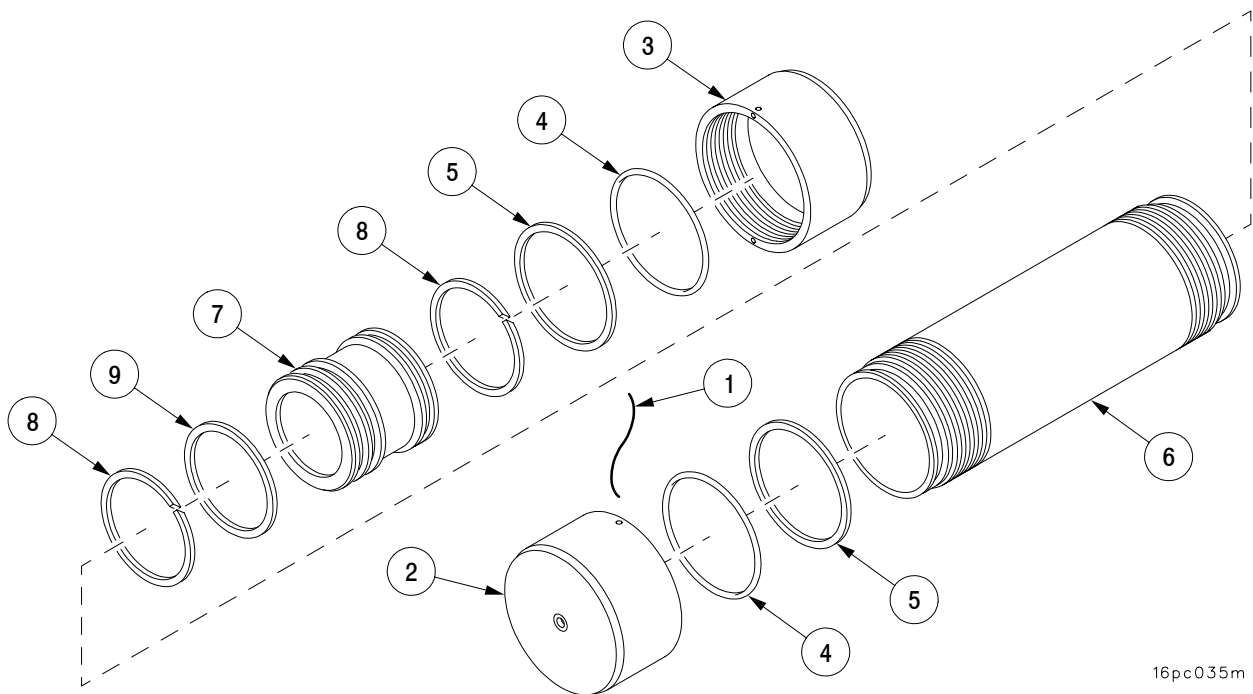
a. Disassembly - Continued

- 1 Cut and remove safety wire (1) from end caps (2 and 3). Discard safety wire.

NOTE

Note the part number on each cap and the position of the components in the cylinder during disassembly to ensure cylinder is assembled correctly.

- 2 Remove end caps (2 and 3) with two preformed packings (4) and two retainers (5) from accumulator cylinder (6). Discard preformed packings and retainers.
- 3 Remove piston (7) with two ring guides (8) and seal assembly (9).
- 4 Remove two ring guides (8) and seal assembly (9) from piston (7). Discard ring guides and seal.



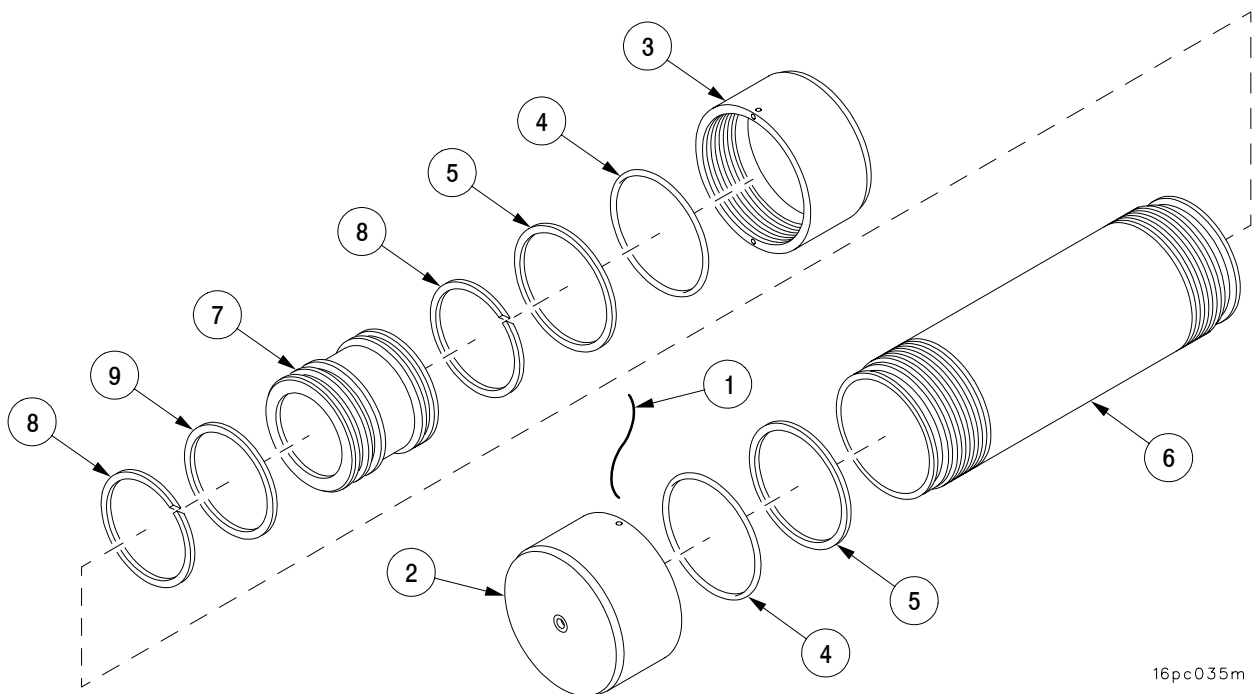
16pc035m

10-6 EQUILIBRATOR ACCUMULATOR - CONTINUED

b. Assembly.**NOTE**

A thin even coat of clean hydraulic fluid must be applied to ALL new packing material to form a good seal between hydraulic components during installation.

- 1 Install two new ring guides (8) and a new seal assembly (9) onto piston (7).
- 2 Install piston (7) with new ring guides (8) and new seal assembly (9) into accumulator cylinder (6).
- 3 Install two new preformed packings (4) and two new retainers (5), one each in end caps (2 and 3).
- 4 Install end caps (2 and 3) with two packings (4) and two retainers (5) onto accumulator cylinder (6).
- 5 Securely tighten end caps (2 and 3).
- 6 Using new safety wire (1), secure end caps (2 and 3) to each other.



16pc035m

10-6 EQUILBRATOR ACCUMULATOR - CONTINUED

c. Test.

NOTE

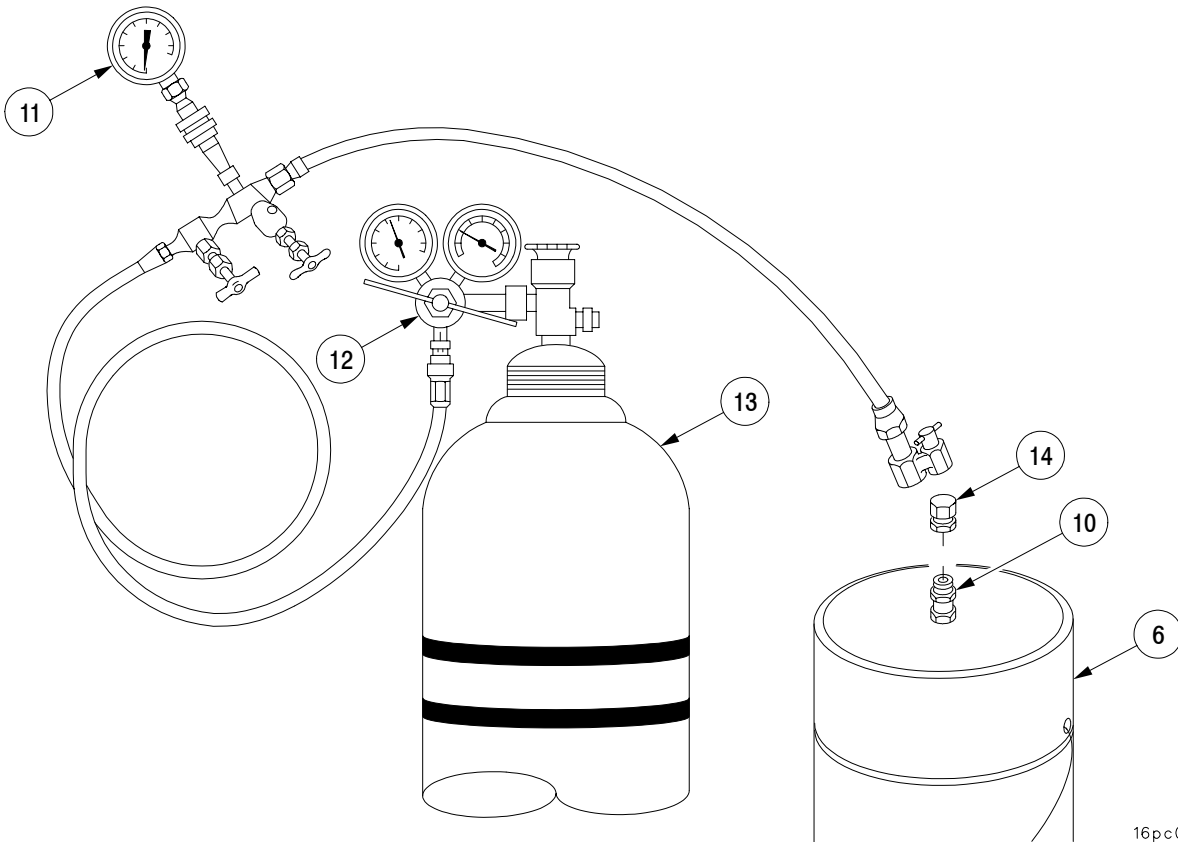
The accumulator assembly must be tested every time after servicing before it is installed in the vehicle.
Accumulator must be charged to 1200 ± 50 psi with dry nitrogen to perform test.

- 1 Install charging valve (10) onto accumulator (6) nitrogen port end of cap 12910595-1.
- 2 Remove low pressure gage (11) from nitrogen charging kit (12).

WARNING

The equilibrator accumulator is charged to 1200 psi.
Use caution when relieving pressure. Wear gloves and goggles to prevent personal injury.

- 3 Attach and tighten nitrogen charging kit (12) to nitrogen charging cylinder (13) as shown.
- 4 Remove pneumatic valve cap (14) from charging valve body (10).



16pc036m

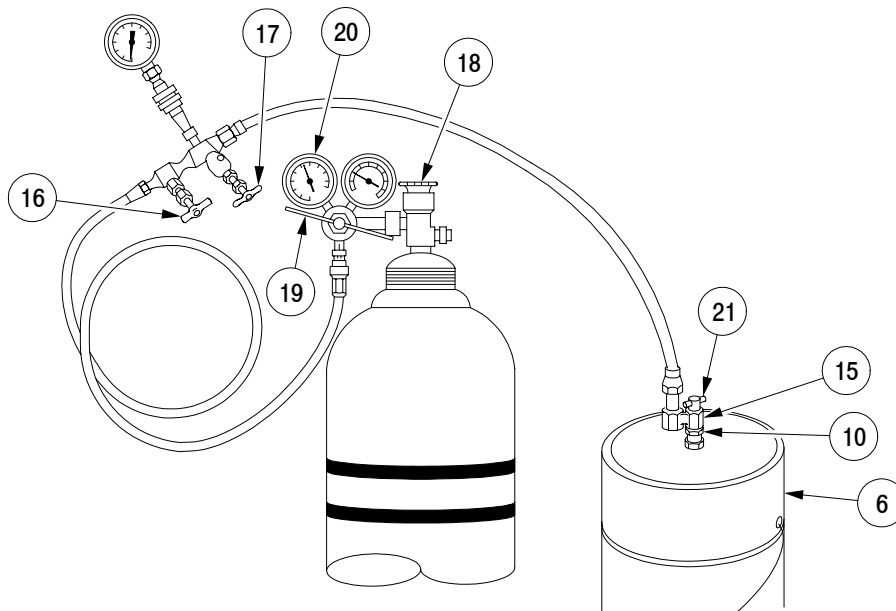
10-6 EQUILIBRATOR ACCUMULATOR - CONTINUED

c. Test - Continued

NOTE

Be sure ports in bottom cylinder cap are not blocked or plugged.

- 5 Attach charging device valve (15) to valve body (10) but do not tighten.
- 6 Open valve (16) and close valve (17). Open shutoff valve (18).
- 7 Open pressure regulator valve (19) until gage (20) registers 16 to 20 psi (103-137 kPa), then close pressure regulator valve (19).
- 8 Tighten charging device valve (15) just before gage (20) registers 0 psi.
- 9 Open pneumatic valve (21) of charging device valve (15) clockwise.
- 10 Open pressure regulator valve (19) by turning handle clockwise until gage (20) registers 100 psi and sound of nitrogen flowing into accumulator (6) has stopped.
- 11 Continue opening pressure regulator valve (19) in 100 psi increments repeating step 10 until 1200 ± 50 psi charge is achieved.
- 12 Close pneumatic valve (21).
- 13 Close shutoff valve (18).
- 14 Slowly open valve (17) to release pressure in the charging device.



16pc037m

10-6 EQUILBRATOR ACCUMULATOR - CONTINUED

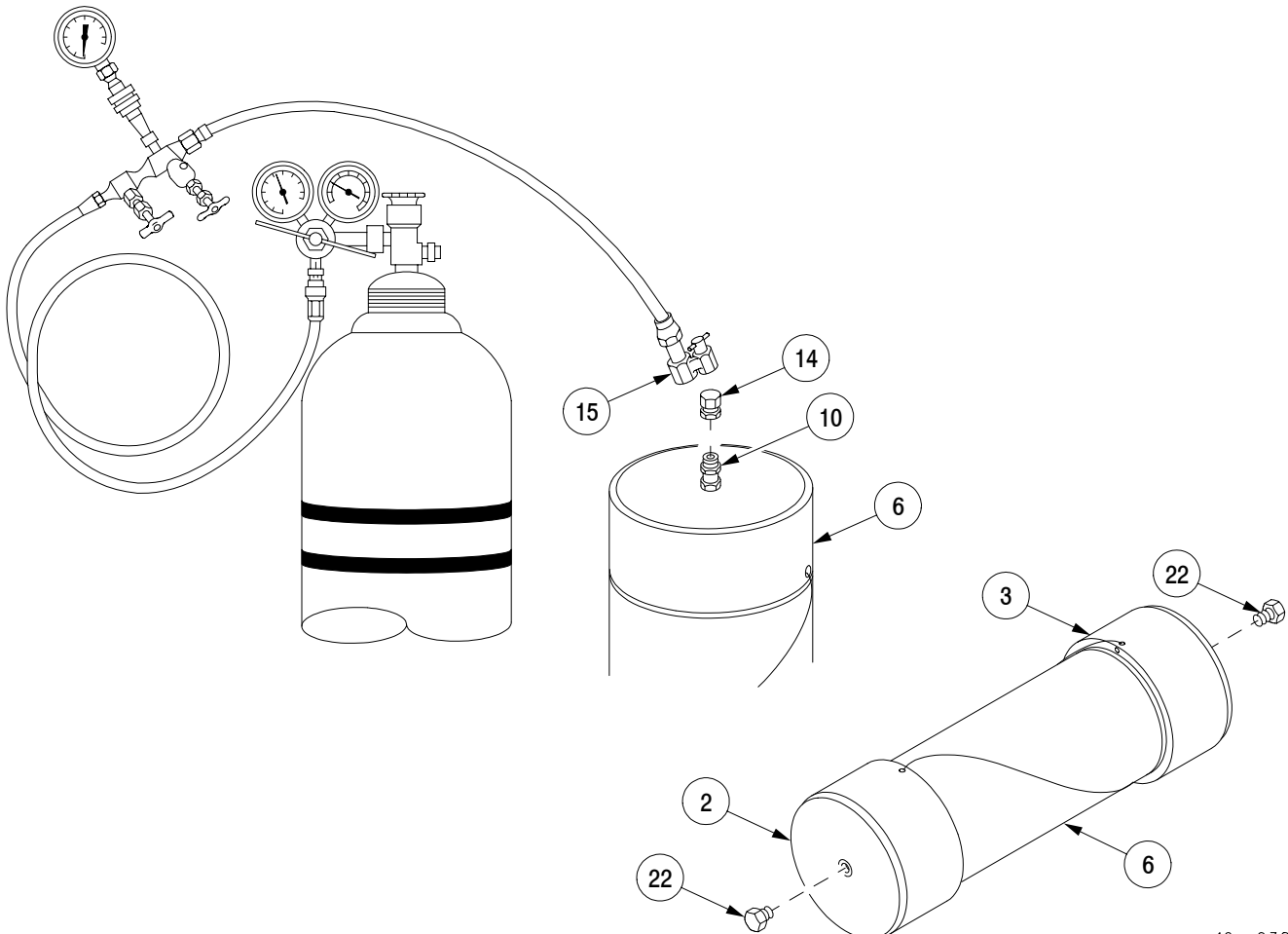
c. Test - Continued

- 15 Remove charging device valve (15) from accumulator.
- 16 Install pneumatic valve cap (14) on accumulator.
- 17 Submerge accumulator (6) completely in hydraulic fluid for a period of ten minutes. There must be no evidence of leakage during this period. If there is leakage, release nitrogen pressure, disassemble, inspect, repair, assemble, service and retest accumulator (6) before installation in cab.
- 18 Remove accumulator (6) from hydraulic fluid and dry thoroughly. Relieve all nitrogen pressure. Ensure all nitrogen has been vented from accumulator (6).

WARNING

Ensure all nitrogen is vented from accumulator before loosening charging valve to prevent serious injury.

- 19 Remove charging valve (10) from accumulator (6).
- 20 Install dust protective plugs (22) loosely into end caps (2 and 3).



16pc038m

10-7 MODE SELECTOR VALVE.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's
tool kit (SC 5180-95-A12)

Materials/Parts

Backup ring (item 58, Appx E)
Hydraulic fluid (item 42, Appx B)
Lockwire (item 81, Appx B)
Preformed packing (item 68, Appx E)

Equipment Conditions

Hydraulic system pressure discharged
(TM 9-2350-314-20-2-2)
Replenisher accumulator removed for access
(TM 9-2350-314-20-2-1)

References

TM 9-2350-314-20-2-2

a. Disassembly.

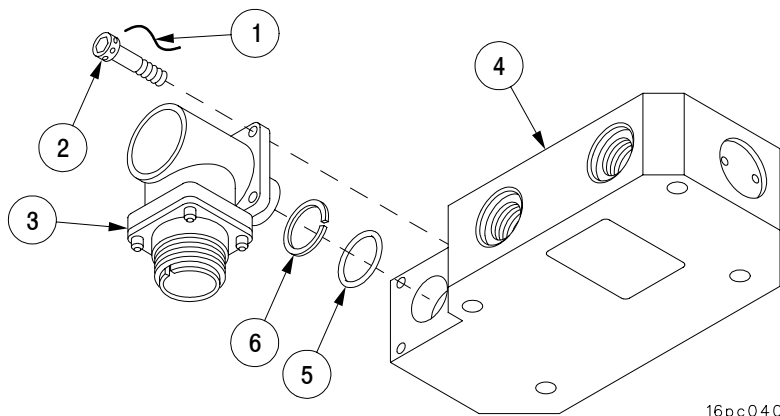
- 1 Cut, remove, and discard lockwire (1) from four screws (2).
- 2 Remove solenoid assembly (3) from body assembly (4) by removing four capscrews (2).
- 3 Remove preformed packing (5) and backup ring (6) from solenoid assembly (3). Discard ring and packing.

b. Assembly.

NOTE

Apply a coat of clean hydraulic fluid to new preformed packing.

- 1 Install new preformed packing (5) and new backup ring (6) on solenoid assembly (3).
- 2 Install solenoid assembly (3) on body assembly (4) and secure with four capscrews (2).
- 3 Secure four screws (2) by installing new lockwire (1).



10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

a. Removal.**WARNING**

- Do not remove/disconnect any hydraulic fittings or lines when hydraulic system is pressurized. Precautions must be followed to prevent serious injury to personnel.
- Eye protection will be worn when performing maintenance procedures on all hydraulic components to avoid injury to personnel.

CAUTION

Cap hydraulic lines and ports to prevent contaminants from entering hydraulic system causing internal damage to hydraulic components.

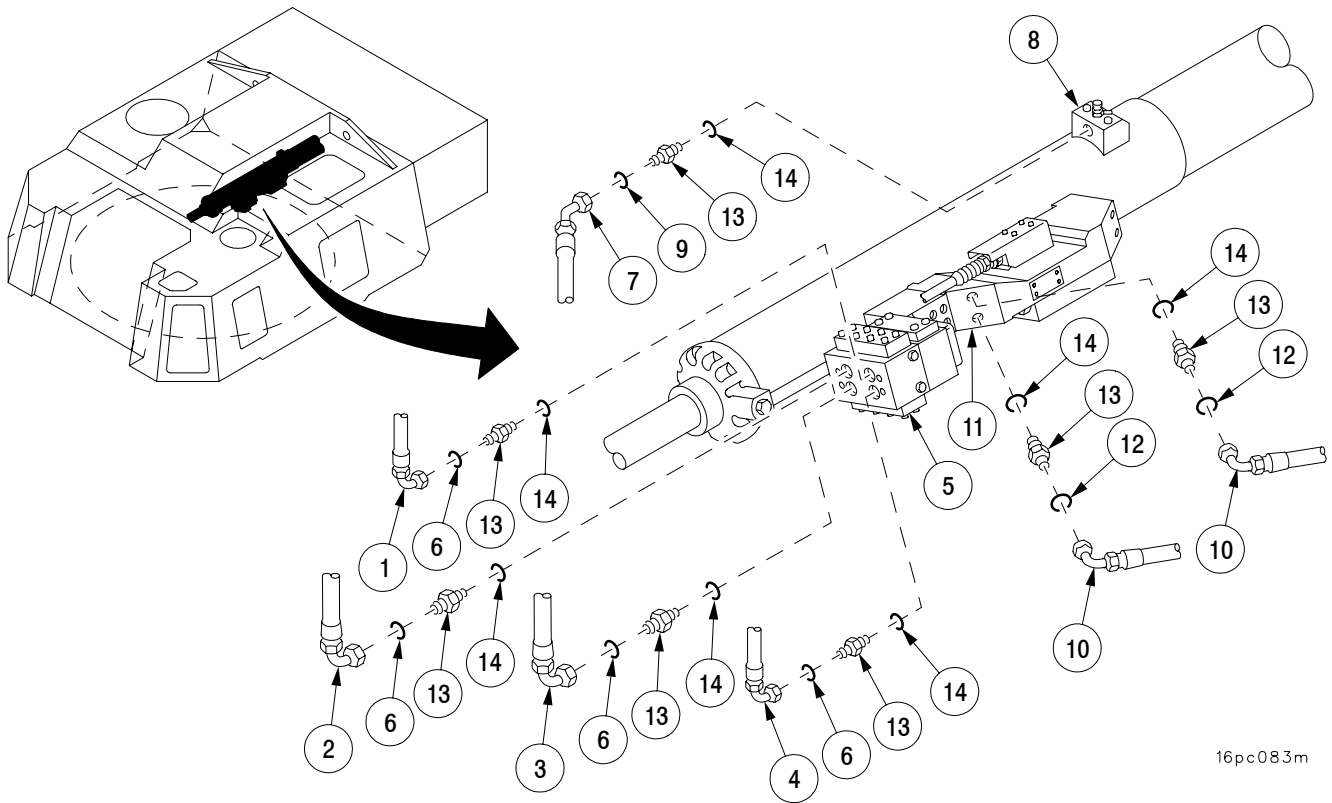
NOTE

- Prior to removal, tag all hydraulic lines and components for identification during installation.
- A thin coat of clean hydraulic fluid must be applied to all new packings to form a good seal between hydraulic components.

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

a. Removal - Continued

- 1 Disconnect four hose assemblies (1, 2, 3, and 4) at lock valve (5). Remove and discard four preformed packings (6).
- 2 Disconnect hose (7) at block (8). Remove and discard preformed packing (9).
- 3 Disconnect two hoses (10) from elevation servovalve assembly (11). Remove and discard two preformed packings (12).
- 4 Remove seven fittings (13) with seven preformed packings (14). Discard packings.



10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

a. Removal - Continued

- 5 Remove four screws (15), four lockwashers (16), and cover (17) from servovalve (18). Discard lockwashers.
- 6 Disconnect electrical connector (19) from servovalve (18).

CAUTION

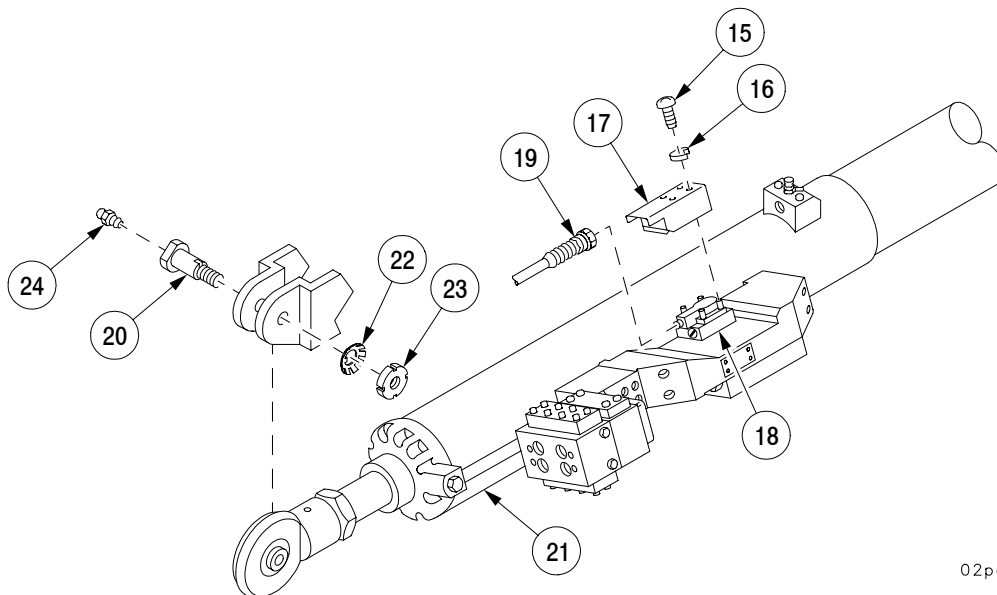
Open cylinder bleeder valve before raising cannon. Failure to do this will damage piston and piston rod causing oil to escape from parts, causing damage to equipment.

- 7 Using suitable lifting device with slings, raise cannon to remove pin (20).
- 8 Support cylinder (21) while removing forward connecting pin (20).

CAUTION

Use a wooden mallet to avoid damage to fitting.

- 9 Bend back locking tabs of keywasher (22), remove nut (23) and fitting (24). Tap out connecting pin (20).
- 10 Using suitable lifting device, lower cannon into travel lock.



02pc268m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

a. Removal - Continued

- 11 Loosen two setscrews (25) at clevis assembly (26).
- 12 Remove lockwire (27) from two screws (28). Discard lockwire.

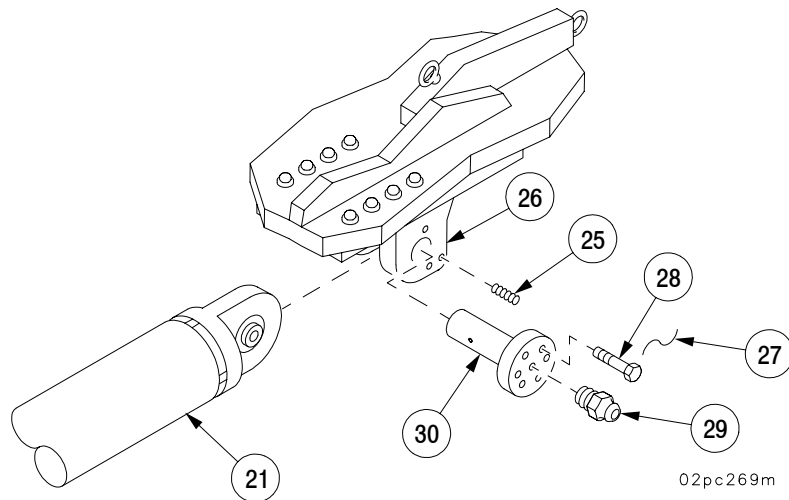
WARNING

Equilibrator weighs approximately 255 lbs (115.77 kgs). Three persons are needed during removal and installation to prevent injury to personnel.

NOTE

Do not remove third screw from rear connecting pin.

- 13 While supporting cylinder (21), remove two screws (28) and fitting (29) from connecting pin (30).
- 14 Install two screws (28) into connecting pin (30) threaded holes. Alternately tighten screws (28) to remove connecting pin (30) securing cylinder (21) to clevis assembly (26).
- 15 Install brass drift through clevis assembly (26) and eye of cylinder (21) and lower front end of cylinder (21) to a vertical position.
- 16 Separate cylinder (21) from rear clevis (26). Remove cylinder (21) from cab.



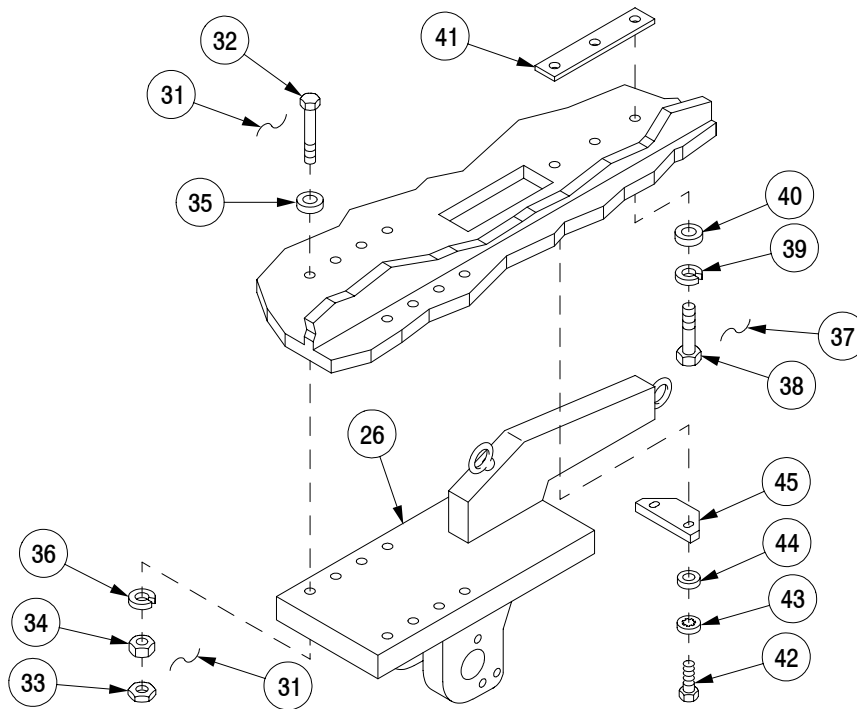
10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

a. Removal - Continued

WARNING

Clevis assembly weighs approximately 181 lbs (90 kgs). Use caution when removing to avoid serious injury.

- 17 Support clevis assembly (26) with suitable lifting device and sling.
- 18 Remove and discard lockwire (31) from eight screws (32) and eight jamnuts (33).
- 19 Remove eight jamnuts (33), eight nuts (34), eight flat washers (35), eight lockwashers (36), and eight screws (32). Discard jamnuts and lockwashers.
- 20 Remove lockwire (37), three screws (38), three lockwashers (39), three flat washers (40), and shim(s) (41). Discard lockwashers.
- 21 Remove two screws (42), two lockwashers (43), two flat washers (44), and cover (45). Discard lockwashers.
- 22 Remove clevis assembly (26).

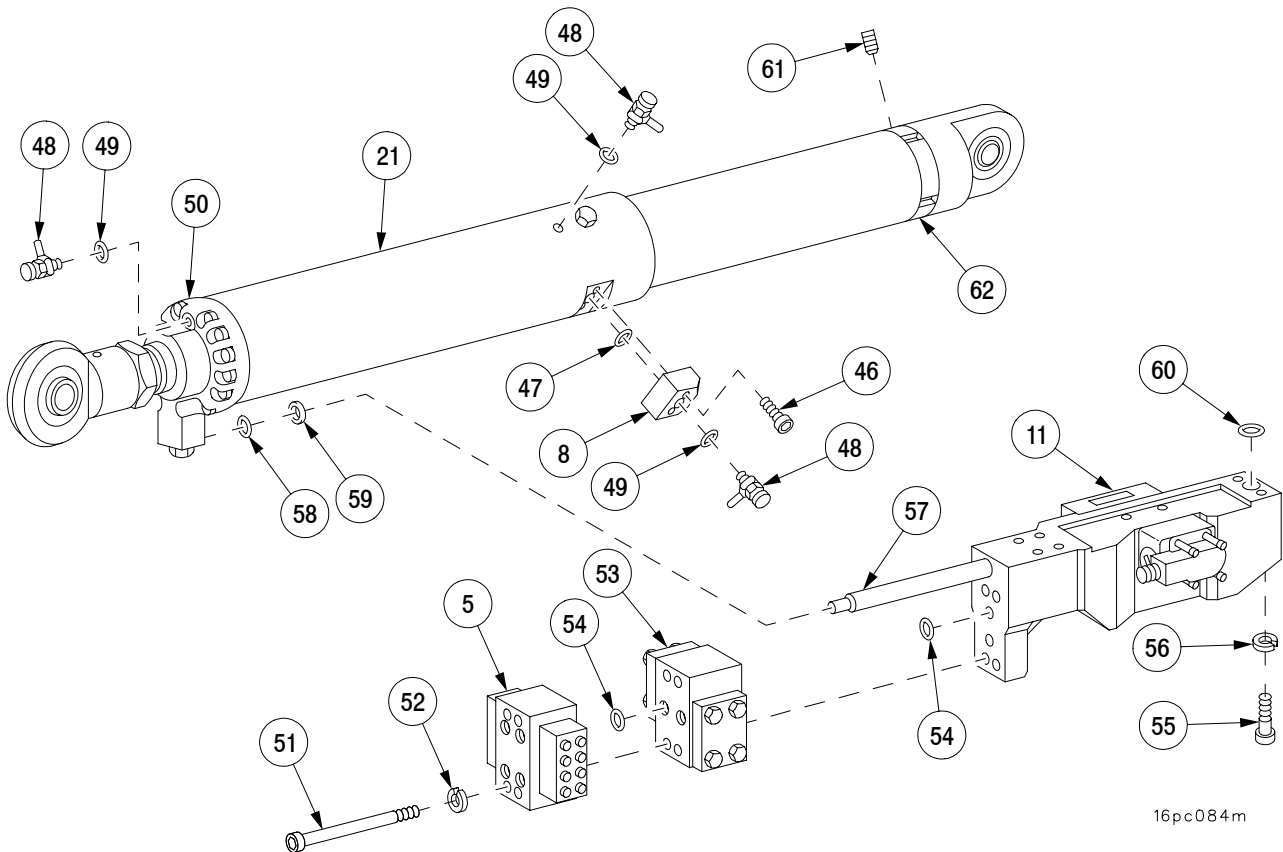


02pc270m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

b. Disassembly.

- 1 Remove two screws (46) and elevation cylinder block (8) from cylinder (21). Remove and discard preformed packing (47).
- 2 Remove three bleeder valves (48) with three preformed packings (49), one each from cylinder (21), end cap (50), and elevation cylinder block (8). Remove and discard preformed packings.
- 3 Remove four screws (51), four lockwashers (52), lock valve (5), and relief valve (53) from servovalve assembly (11). Discard lockwashers.
- 4 Remove and discard four preformed packings (54).
- 5 Remove servovalve assembly (11) from cylinder (21) by removing six screws (55) and six lockwashers (56). Discard lockwashers.
- 6 To disengage tubing (57) from front end cap (50), hold cylinder (21) and pull servovalve assembly (11) rearward.
- 7 Remove preformed packing (58), retainer (59), and preformed packing (60). Discard packings and retainer.
- 8 Loosen two setscrews (61) securing nut (62) to cylinder (21).



16pc084m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

b. Disassembly - Continued

CAUTION

Failure to use wooden block and mallet to remove front and rear eye bearing assemblies from cylinder could damage bearings.

- 9 Turn nut (62) clockwise to release rear eye assembly (63) and remove rear eye assembly (63) and nut (62).

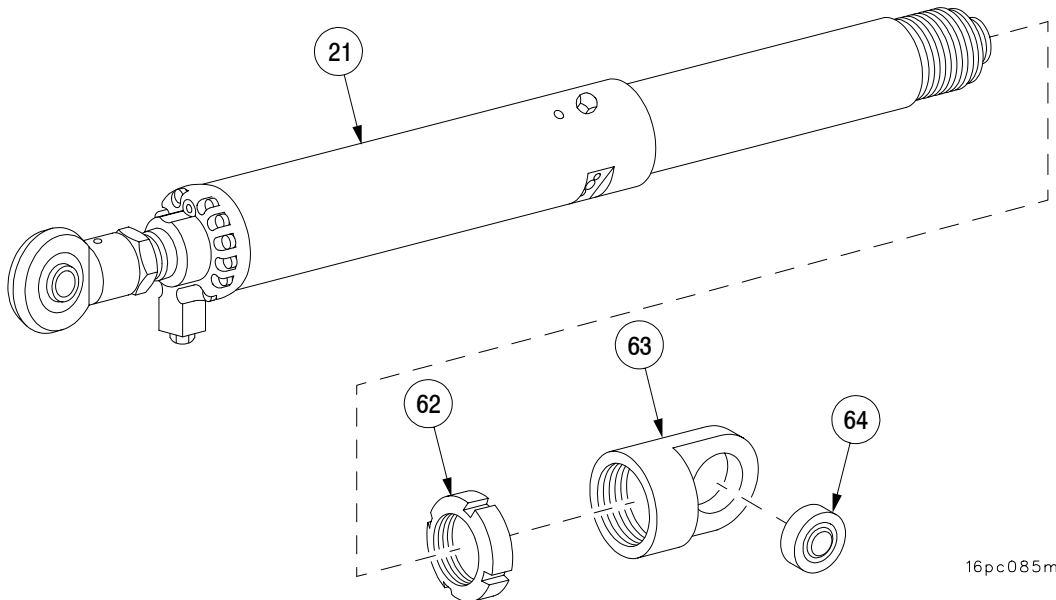
CAUTION

An arbor press is required to remove bearing from rear eye assembly to prevent damage to bearing and housing.

NOTE

Do not remove bearing assembly unless required.

- 10 Remove bearing assembly (64) from rear eye assembly (63).



10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

b. Disassembly - Continued

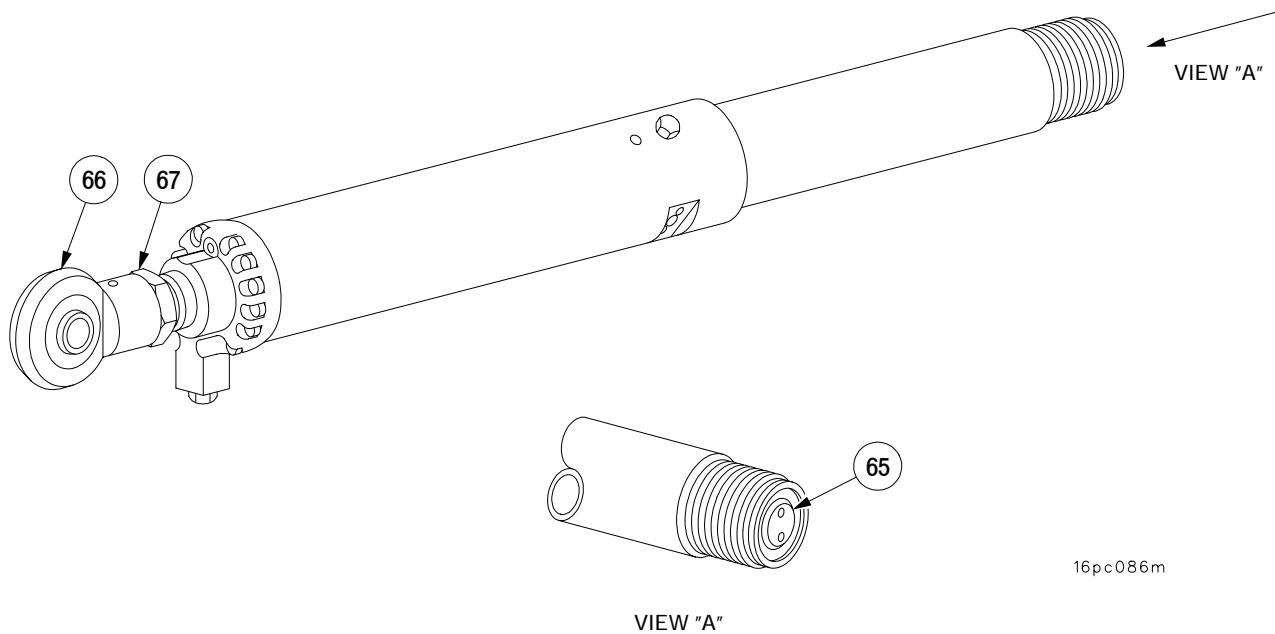
CAUTION

Extensive force is needed to loosen adapter. Avoid side loads to prevent damage to cylinder walls.

NOTE

The front eye and cylinder must be held in a fixed position to loosen adapter. Openings of adapter are located at rear of cylinder.

- 11 Loosen adapter (65) using spanner wrench until almost free. Hold front eye (66) and loosen nut (67).



16pc086m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

b. Disassembly - Continued

- 12 Remove front eye assembly (66) by removing locking setscrew (68) and centering setscrew (69).

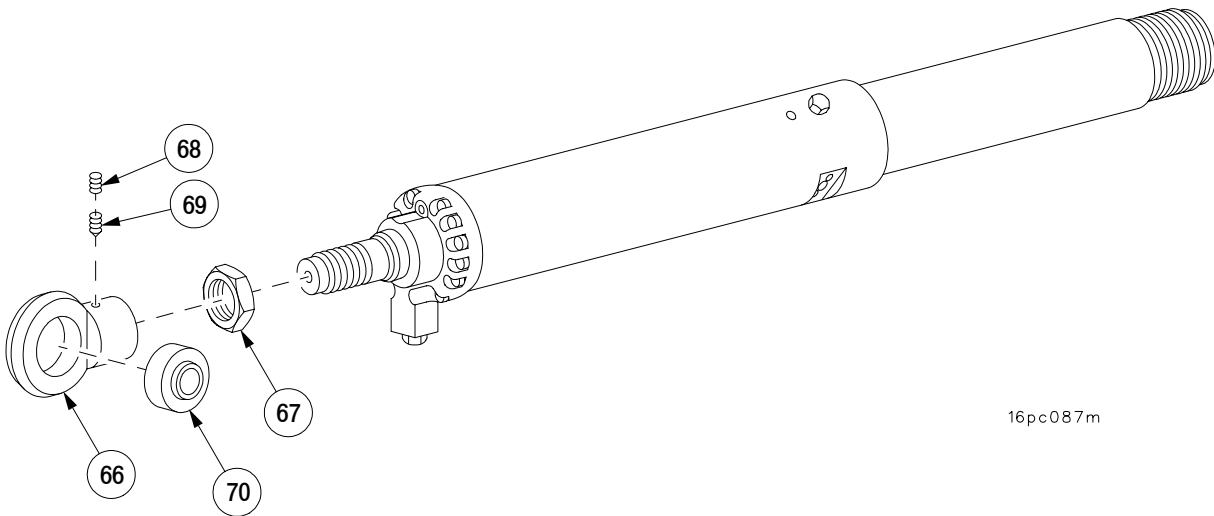
CAUTION

An arbor press is required to remove bearing from front eye assembly to prevent damage to bearing and housing.

NOTE

Do not remove bearing from front eye unless replacement is required.

- 13 Remove bearing (70) from front eye (66). Remove nut (67).



16pc087m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

b. Disassembly - Continued

- 14 Remove plug (71) from end cap (50). Remove and discard preformed packing (72).

NOTE

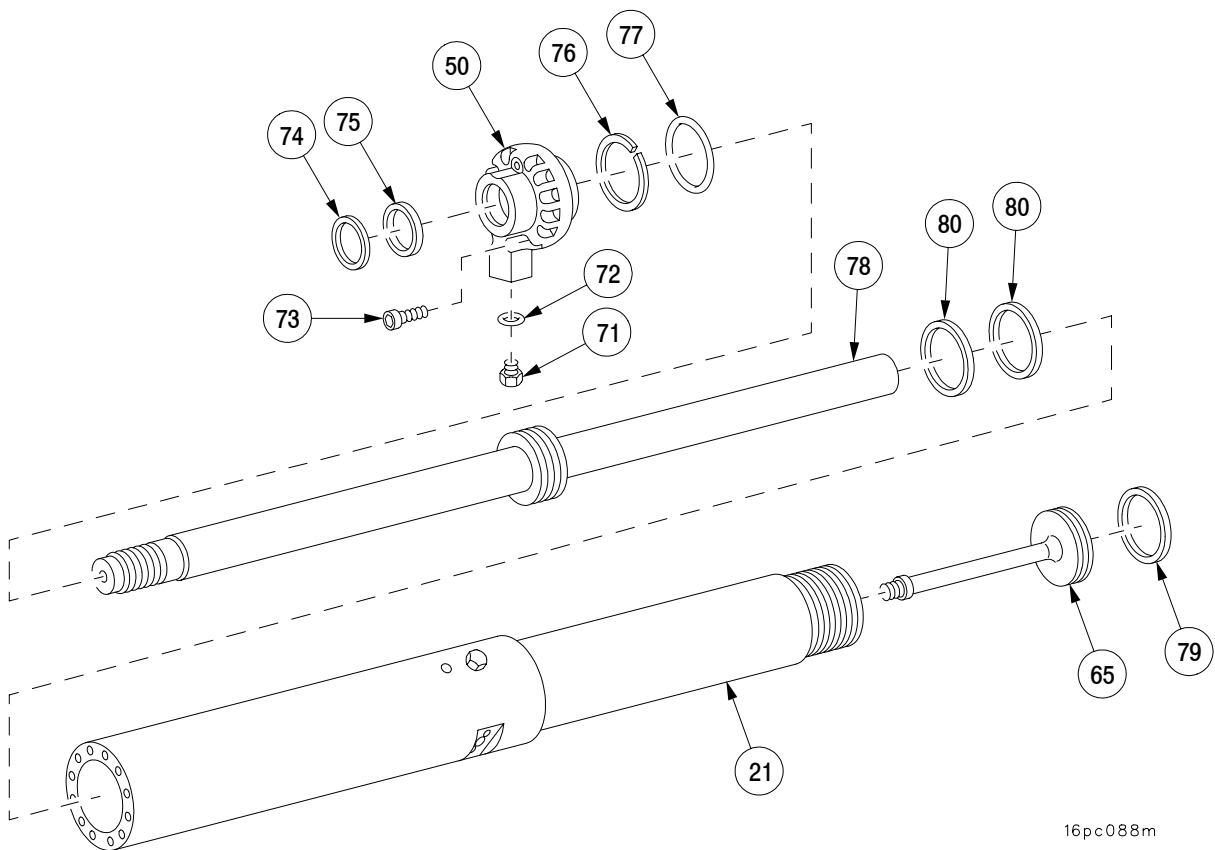
Support cylinder piston rod when removing end caps.

- 15 Remove 12 screws (73) and end cap (50).

NOTE

Support cylinder piston rod.

- 16 Remove and discard ring scraper (74) and seal ring (75).
- 17 Remove and discard split ring (76) and preformed packing (77) from rear of end cap (50).
- 18 Remove adapter (65) from rear of piston rod (78). Remove seal (79) from adapter (65). Discard seal.
- 19 Remove piston rod (78) from front end of cylinder (21).
- 20 Remove two groove seal rings (80) from cylinder piston rod (78). Discard seal rings.



16pc088m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

b. Disassembly - Continued

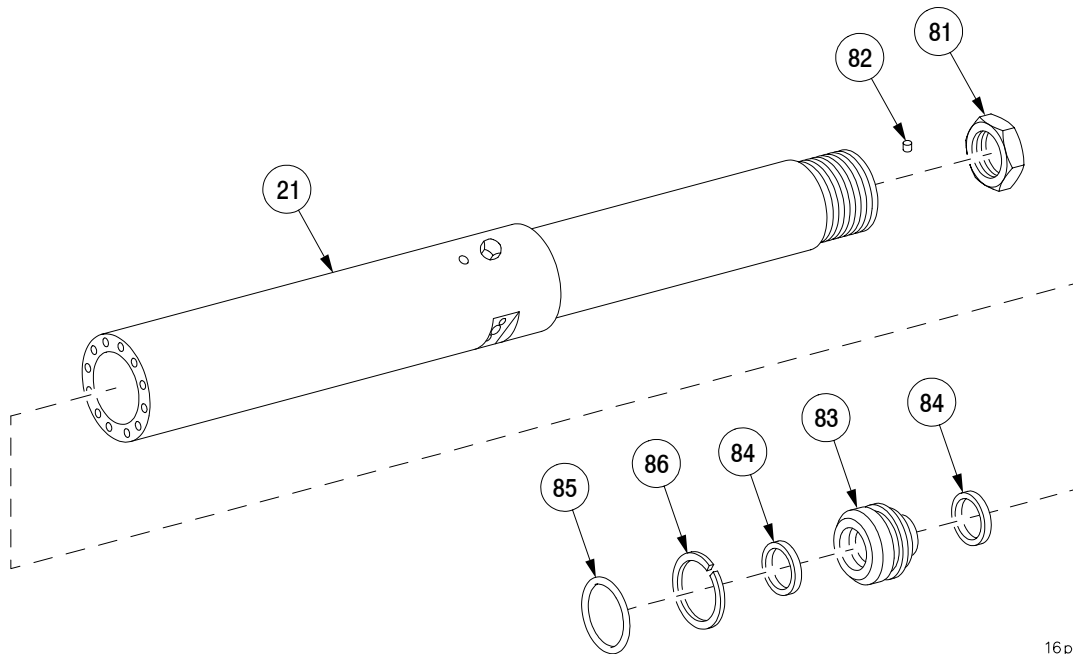
CAUTION

- Wrap spanner and socket with tape before removing cylinder nut to prevent damage to cylinder.
- Clean slide hammer and coat with hydraulic fluid prior to removing front bearing assembly to prevent scratching of cylinder bore.

NOTE

- Place cylinder in fixed position to remove bearing cylinder.
- Cylinder bearing consists of front and rear cylinder bearings and associated hardware.

- 21 Remove nut (81) with pellet (82) on front cylinder bearing (83).
- 22 Remove front cylinder bearing (83) from elevation cylinder (21) using slide hammer.
- 23 Remove and discard two seals (84) from inner grooves of front cylinder bearing (83).
- 24 Remove and discard preformed packing (85) and packing retainer ring (86) from front cylinder bearing (83).



16pc089m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

b. Disassembly - Continued

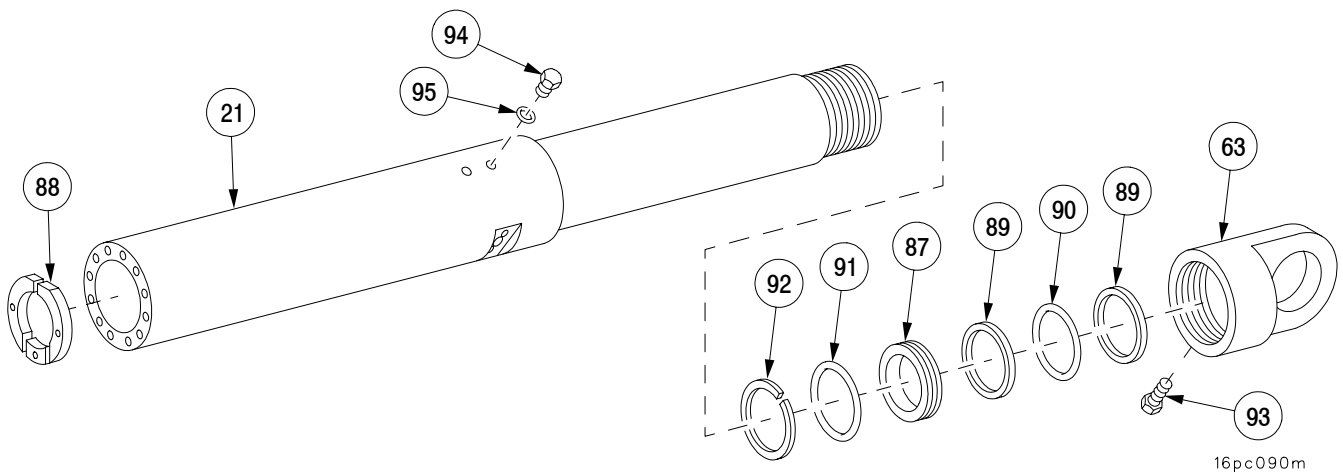
CAUTION

- Do not attempt to remove rear cylinder bearing forward in cylinder bore. Rear bearing may become lodged resulting in damage to rear cylinder bearing and/or cylinder bore.
- Use care not to cock rear cylinder bearing during removal to prevent galling of cylinder bore.

NOTE

- For lock valve cleaning, inspection, and lubrication procedures, refer to TM 9-214.
- Rear cylinder bearing may have to be moved slightly rearward to allow removal of the three piece key ring.

- 25 Remove rear cylinder bearing (87) from cylinder (21) using slide hammer with two cap head screws removed.
- 26 Remove three piece key ring (88) from cylinder (21).
- 27 Remove and discard two retainers (89), preformed packing (90), preformed packing (91), and packing retainer ring (92) from inner and outer grooves of rear cylinder bearing (88).
- 28 Remove breather (93) from end cap (63).
- 29 Remove plug (94) and preformed packing (95) from cylinder (21). Discard preformed packing.



16pc090m

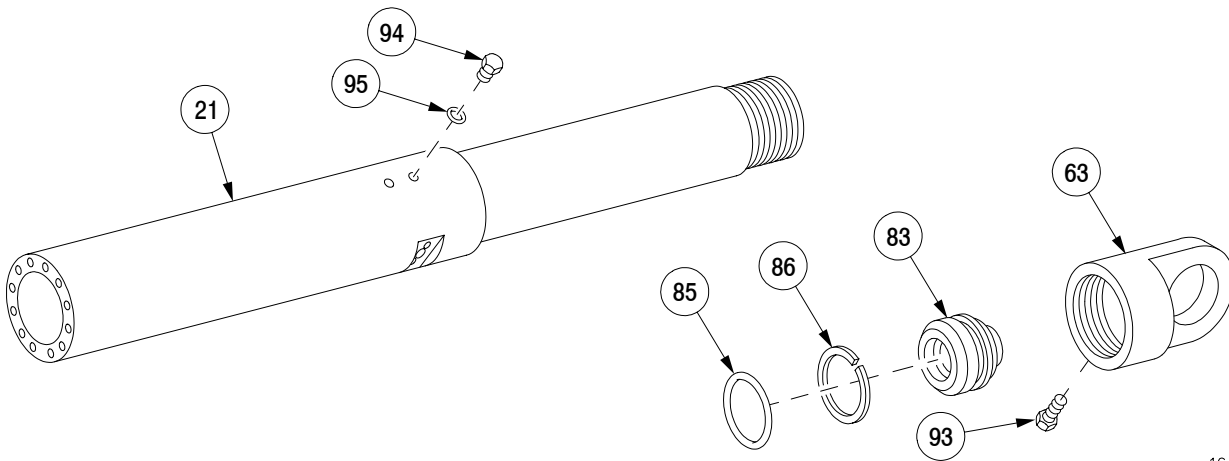
10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

c. Assembly.

NOTE

- Replace defective parts in elevation cylinder as required.
- Cylinder bearing consists of a front and rear cylinder bearing plus associated hardware.
- Lubricate seals, preformed packings, retainers, front and rear bearing, seal rings, pellet, split rings, and ring scraper with hydraulic fluid before installation.

- 1 Install plug (94) and new preformed packing (95) in cylinder (21).
- 2 Install breather (93) in end cap (63).
- 3 Install new preformed packing (85) with new packing retainer ring (86) on front cylinder bearing (83).



16pc091m

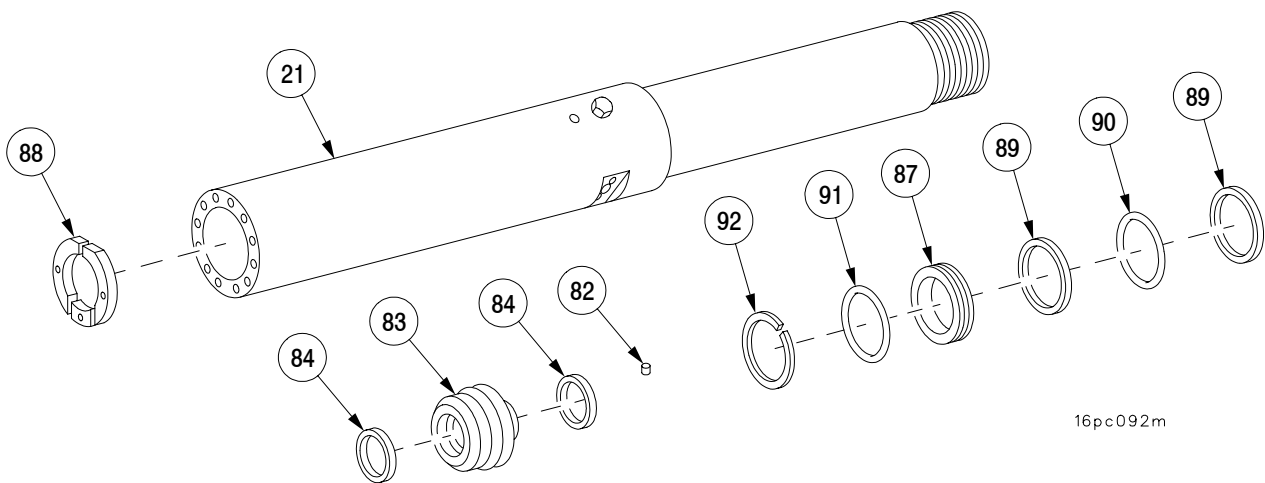
10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

c. Assembly - Continued

NOTE

- Two different designs of seals are approved for use in the elevation cylinder.
- One of these designs is a closed seal and can be installed with either face to the pressurized side of the cylinder.
- The other approved seal design is "unidirectional" and has an open face one side exposing an o-ring "energizer." This open face MUST be installed facing the pressurized side of the cylinder to seal effectively.

- 4 Install two new seals (84) in inner grooves of front cylinder bearing (83).
- 5 Install two new retainers (89) with new preformed packing (90) in inner groove of rear cylinder bearing (87).
- 6 Install new preformed packing (91) and packing retainer ring (92) on rear cylinder bearing (87).
- 7 Install new pellet (82) on front cylinder bearing (83).
- 8 Install three piece key ring (88) to cylinder (21).



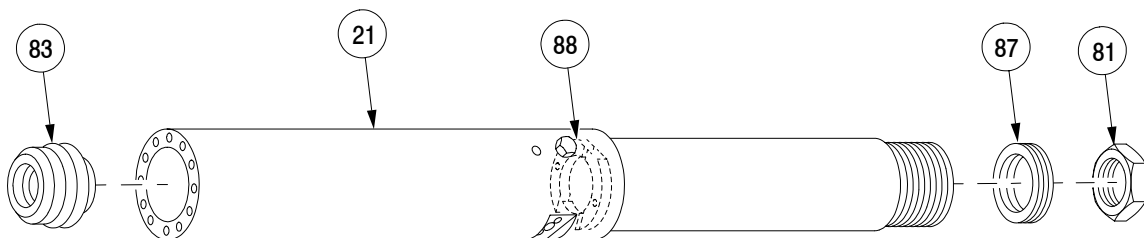
16pc092m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

c. Assembly - Continued

CAUTION

- Clean slide hammer and coat with hydraulic fluid prior to installing rear cylinder bearing to prevent scratching cylinder bore.
 - Use care not to cock rear cylinder bearing when installing same to elevation cylinder to prevent galling of cylinder walls.
 - To prevent seals and backup rings from catching and tearing on oil ports, insert seal pusher tool in oil port when rear cylinder bearing becomes visible through oil port.
 - Use care during installation of rear cylinder bearing to ensure proper o-ring/backup ring orientation. The backup ring should be on the side of the o-rings closest to the key ring.
 - There is a chamfer at the internal diameter on one face of the rear cylinder bearing. This face must be installed toward the front cylinder bearing to achieve proper sealing.
- 9 While assistant holds three piece key ring (88) in place, install front cylinder bearing (83) into cylinder (21) using slide hammer (with two cap screws removed) until front cylinder bearing is flush against key ring (88).
- 10 Install rear cylinder bearing (87) to cylinder (21) using slide hammer (with two cap screws removed) until rear cylinder bearing is flush with key ring (88).
- 11 Install nut (81) on threaded end of front cylinder bearing (83) using spanner and socket. Torque nut to 80-100 lb-ft (108.5-135.6 N-m).



16pc093m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

c. Assembly - Continued

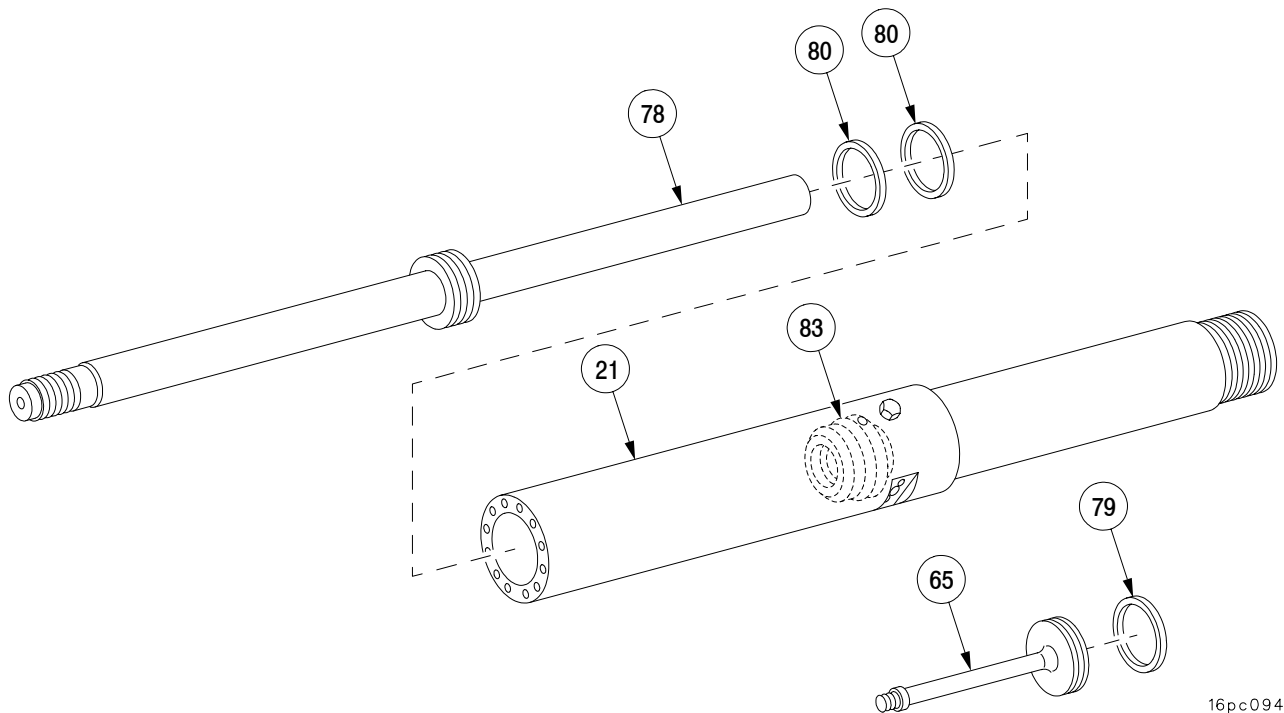
CAUTION

Use care during installation of cylinder piston rod not to scratch smooth finish of cylinder inner bore or damage new groove seal rings.

NOTE

Observe position of cylinder bearing through oil port.

- 12 Install two new groove seal rings (80) on cylinder piston rod (78).
- 13 Holding cylinder (21), install piston rod (78) through front of cylinder (21).
- 14 Force piston rod (78) back until rod touches front cylinder bearing (83).
- 15 Install new groove seal ring (79) on adapter (65).



16pc094m

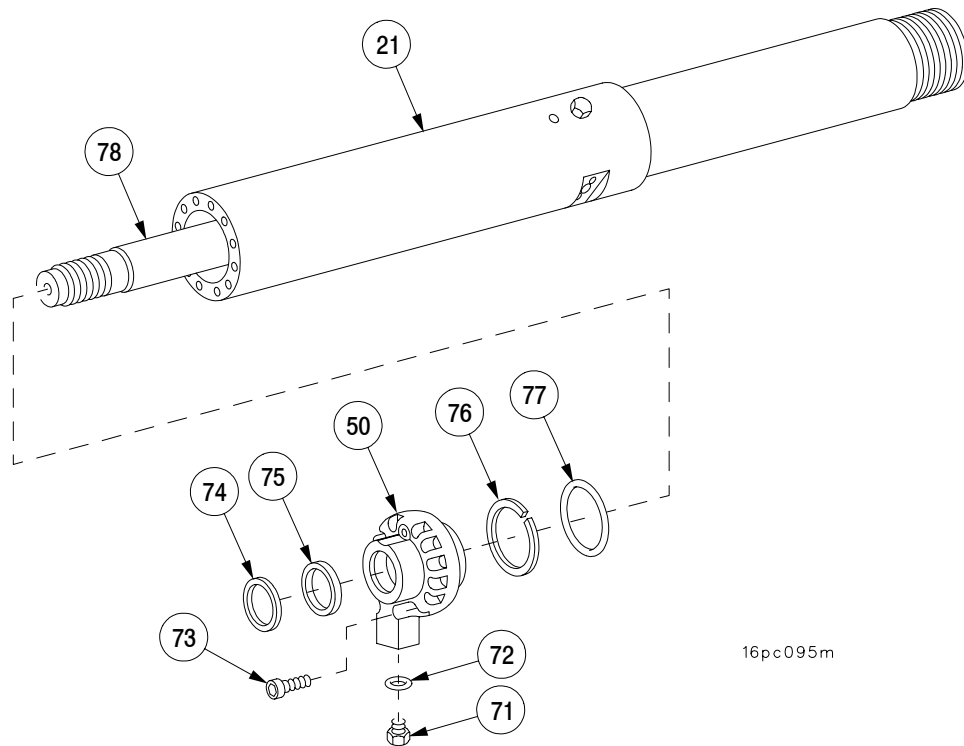
10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

c. Assembly - Continued

CAUTION

Use care when installing adapter to rear of elevation cylinder to prevent damage to elevation cylinder inner bore.

- 16 Install new preformed packing (77) and new split ring (76), new seal ring (75) and new ring scraper (74) on elevation cylinder end cap (50).
- 17 Place end cap (50) over cylinder piston rod (78).
- 18 Apply sealing compound to threads of 12 screws (73). Install 12 screws (73) securing end cap (50) to elevation cylinder (21). Torque screws to 90 lb-ft (122 N·m).
- 19 Install plug (71) with new preformed packing (72) on end cap (50).



16pc095m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

c. Assembly - Continued

CAUTION

When installing front eye bearing, use an arbor press to prevent damage to bearing.

- 20 Install bearing assembly (70) in front eye (66).

NOTE

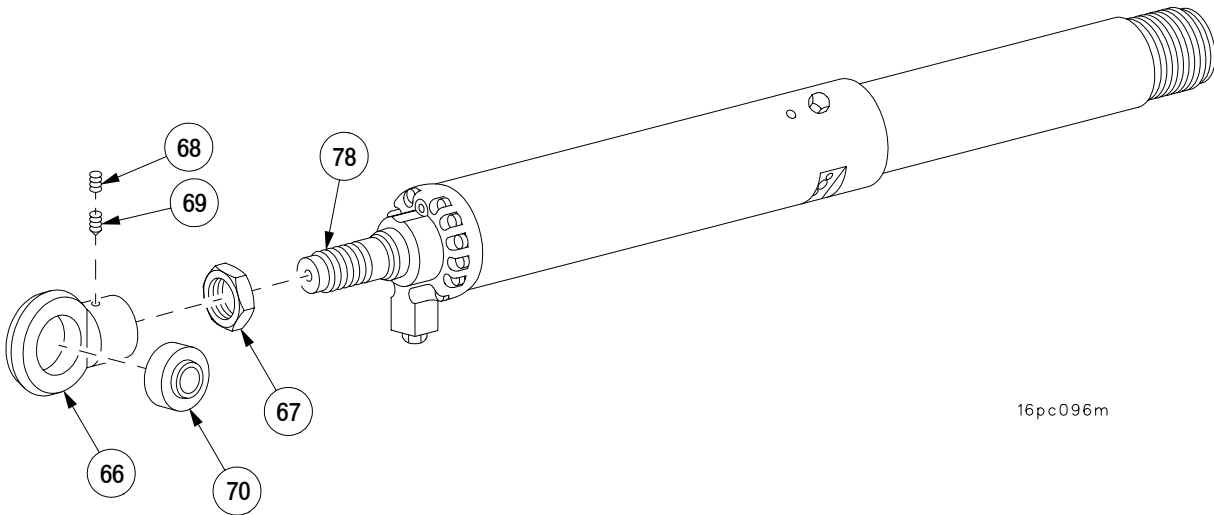
Eye assembly must bottom out on shoulder of piston rod before installing locking setscrew.

- 21 Apply sealing compound to threads of nut (67) and install nut (67) on piston rod (78). Do not tighten nut.

NOTE

Alignment of eye at this point is not critical since rod can be rotated. Final alignment for both eyes will be done after cylinder is installed in vehicle.

- 22 Install front eye assembly (66) on piston rod (78) and secure with nut (67).
- 23 Apply sealing compound to setscrews (68 and 69). Install centering setscrew (69) and locking setscrew (68). Torque each setscrew to 108 lb-in. (12.2 N·m).
- 24 Restrain front eye (66) and torque nut (67) to 200 lb-ft (271.2 N·m).



16pc096m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

c. Assembly - Continued

- 25 Apply sealing compound to adapter (65) and while restraining front eye (66), install adapter (65).
- 26 Torque adapter (65) to 450 lb-ft (610 N-m) and loosen three times before final torque of 450 + 50 lb-ft (610 + 67.8 N-m) is applied.

NOTE

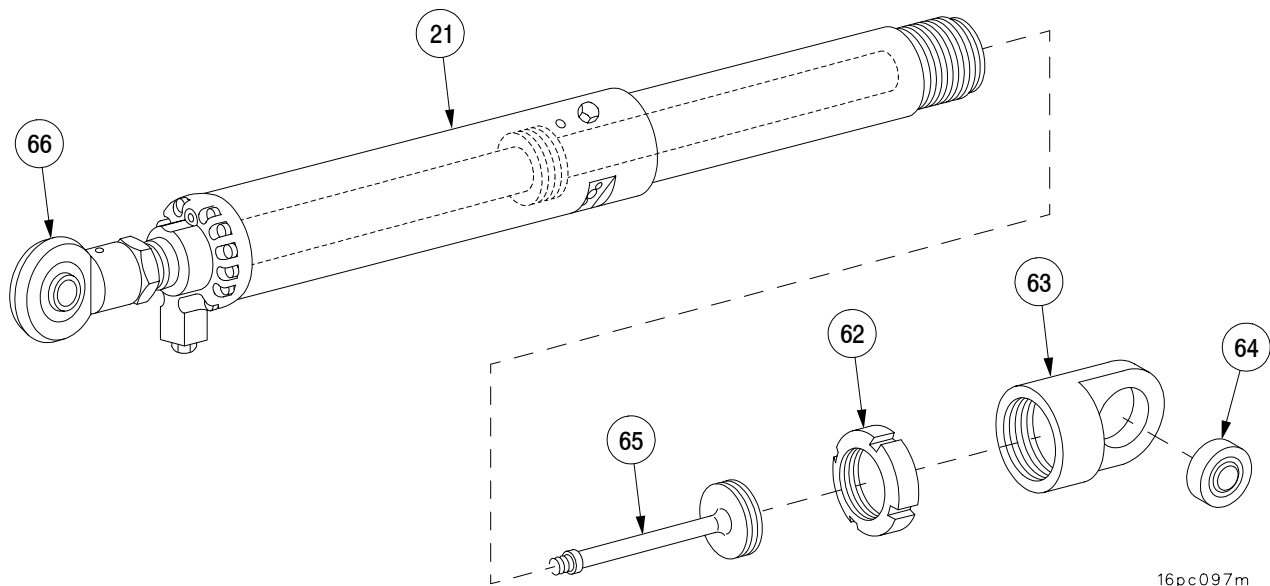
After final torque of adapter, ensure there is a minimum of 0.001 in. between adapter and inner bore of elevation cylinder.

- 27 Install nut (62) on rear of cylinder (21) finger tight.

CAUTION

When installing rear eye bearing assembly, use an arbor press to prevent damage to bearing.

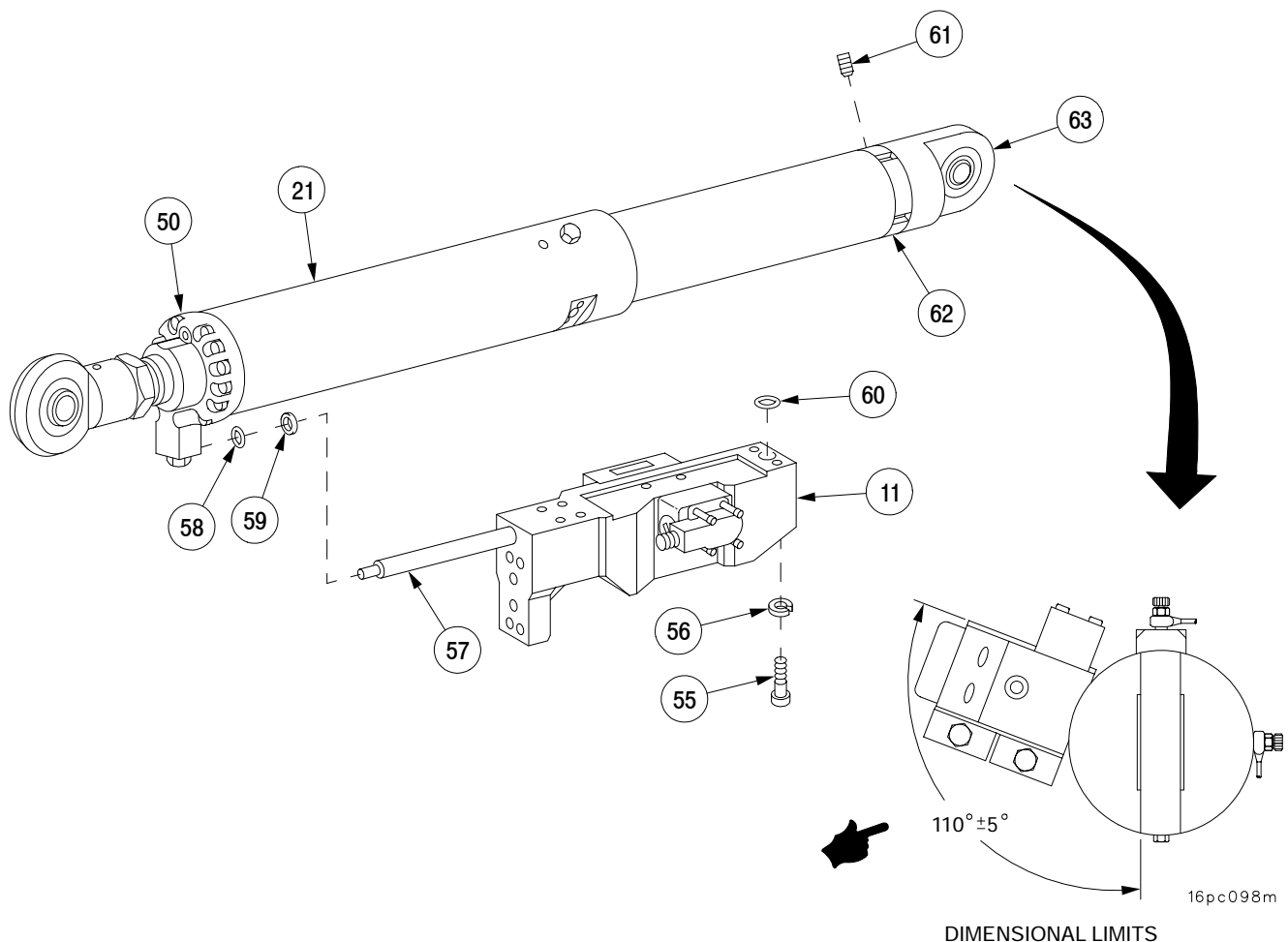
- 28 Install bearing (64) in rear eye (63).
- 29 Install rear eye (63) on elevation cylinder (21) until it bottoms on cylinder.



10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

c. Assembly - Continued

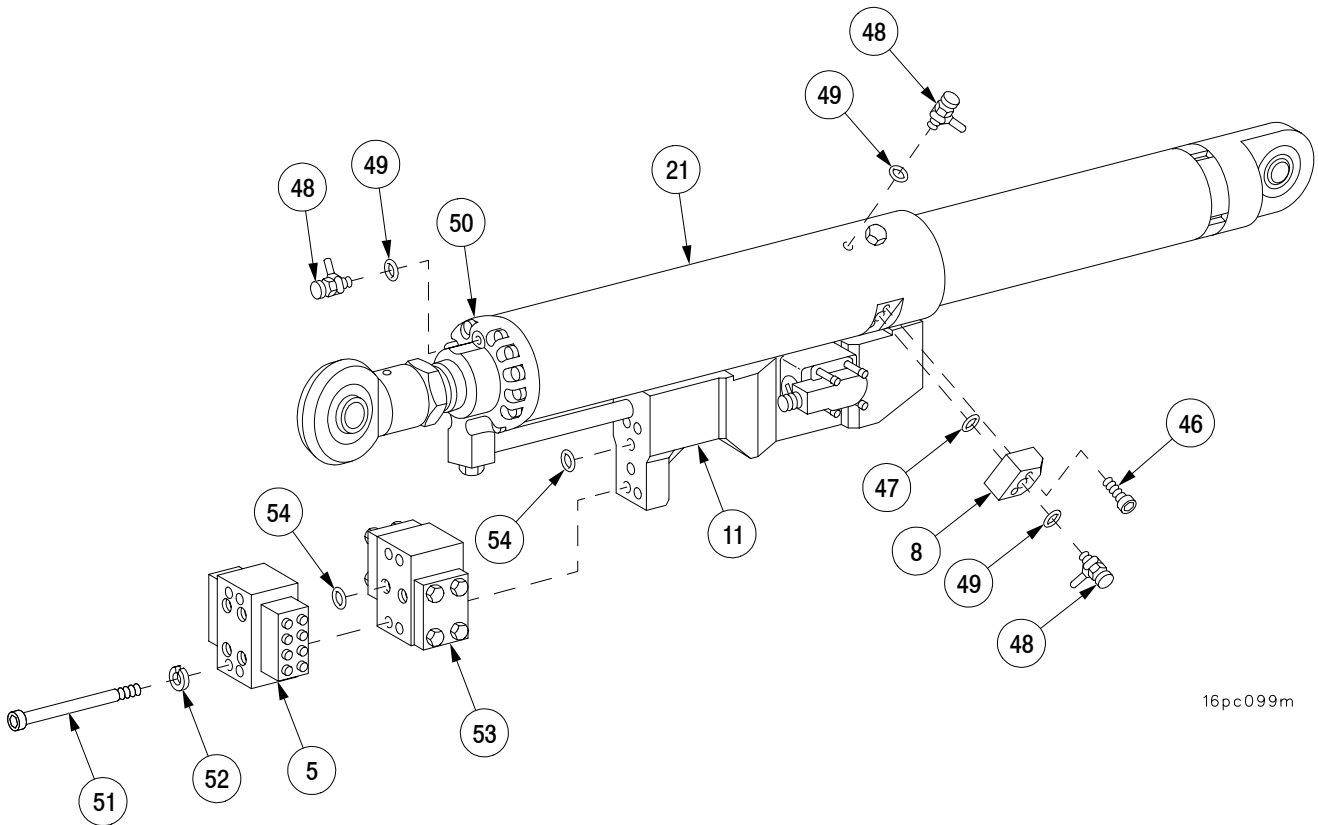
- 30 Loosen rear eye (63) as necessary to position it within dimensional limits (see diagram below).
- 31 When rear eye assembly (63) is aligned, tighten nut (62).
- 32 Apply sealing compound to two setscrews (61) and install two setscrews (61) to secure nut (62) to cylinder (21). Torque setscrews to 8-10 lb-ft (11-14 N•m).
- 33 Install new preformed packing (60) in servovalve assembly (11).
- 34 Position servovalve assembly (11) to install tube (57) with new preformed packing (58) and retainer (59) into end cap (50) orifice.
- 35 Align mounting holes in servovalve assembly (11) with six holes in elevation cylinder (21).
- 36 Apply sealing compound to six screws (55) and install six screws (55) and six new lockwashers (56) to secure servovalve assembly (11) to cylinder (21). Torque screws alternately 18-22 lb-ft (24-30 N•m).



10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

c. Assembly - Continued

- 37 Install four new preformed packings (54) into relief valve (53) and servovalve assembly (11).
- 38 Position relief valve (53) on lock valve (5) and align with mounting holes on servovalve assembly (11).
- 39 Apply sealing compound to four screws (51) and install four screws (51) and four new lockwashers (52) to secure relief valve (53) and lock valve (5) to servovalve assembly (11). Alternately torque screws to 18-22 lb-ft (24-30 N·m).
- 40 Install three bleeder valves (48) with three new preformed packings (49) on end cap (50), elevation cylinder block (8), and cylinder (21). Torque bleeder valve nut to 50-125 lb-in. (5.7-14.1 N·m).
- 41 Install new preformed packing (47) in elevation cylinder block (8).
- 42 Apply sealing compound to two screws (46). Install elevation cylinder block (8) on elevation cylinder (21) with two screws (46). Torque screws to 18-22 lb-ft (24-30 N·m).



16pc099m

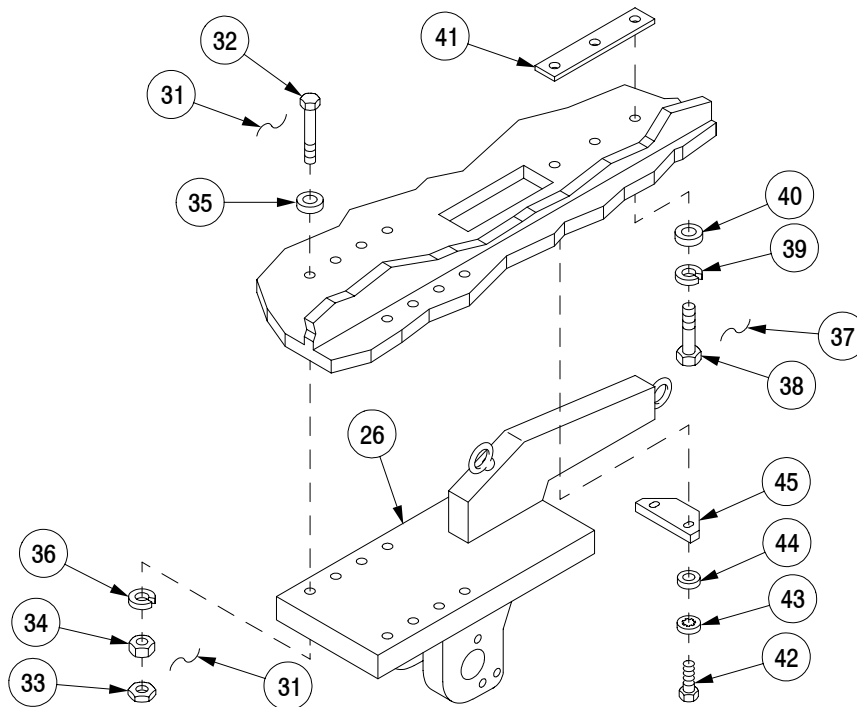
10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

d. Installation.

WARNING

Clevis assembly weighs approximately 181 lbs (90 kgs). Use caution when installing to avoid serious injury.

- 1 Apply sealing compound (item 39.1, Appx C) to unpainted surface of cab and clevis assembly (26) and aluminum/steel interface of shim(s) (41).
- 2 Apply insulating compound to mating surfaces between cab and clevis assembly (26).
- 3 Secure clevis assembly (26) to suitable lifting device using sling.
- 4 Install clevis assembly (26) with shim(s) (41) on cab with three screws (38), three new lockwashers (39), and three flat washers (40). Torque screws to 530–585 lb-ft (718–793 N-m).
- 5 Install lockwire (37) on three screws (38).
- 6 Install cover (45) with two screws (42), two new lockwashers (43), and two flat washers (44).
- 7 Install eight screws (32), eight flat washers (35), eight new lockwashers (36), and eight nuts (34). Torque nuts to 530–585 lb-ft (718–793 N-m).
- 8 Install eight new jamnuts (33) on eight screws (32).
- 9 Install new lockwire (31) on eight screws (32) and eight jamnuts (33).



02pc270m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

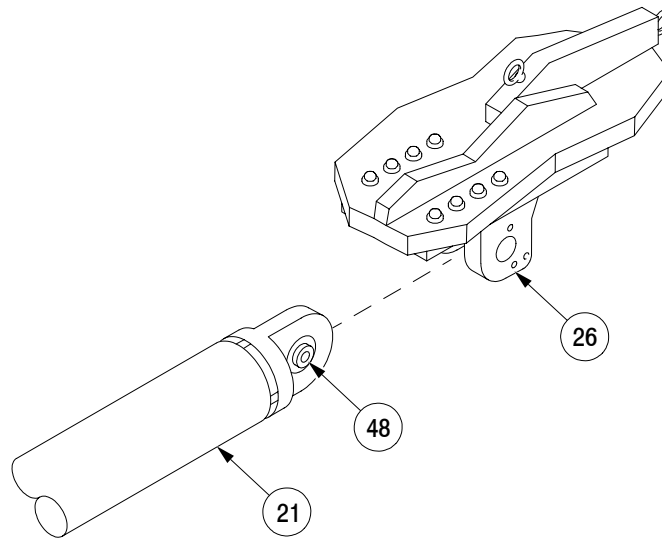
d. Installation - Continued**CAUTION**

Protect cylinder piston rod at all times to prevent damage to machined surfaces.

NOTE

Align rear eye with breather. Alignment should be such that the breather which goes in the rear eye will be at the bottom. Do not align rear eye with front eye, since front eye may have rotated with rod; front eye should be aligned with rear eye, after rear eye is aligned with block and before cylinder is installed in vehicle.

- 10 With suitable lifting device, position rear eye (48) of elevation cylinder (21) into clevis assembly (26).
- 11 Install brass drift through clevis assembly (26) and rear eye (48) of elevation cylinder (21).



02pc286m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

d. Installation - Continued

CAUTION

Protect cylinder piston rod at all times to prevent damage to machined surface.

NOTE

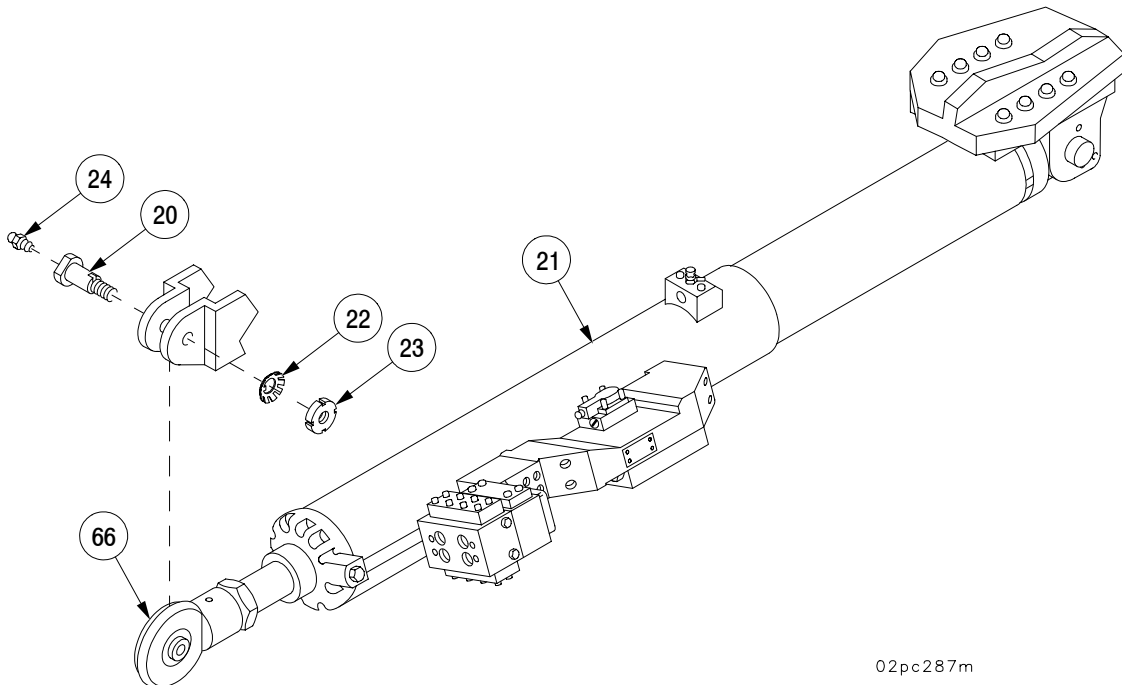
Equal clearance must be obtained between rear eye assembly and each side of clevis assembly.

- 12 With a suitable lifting device, raise cannon high enough to allow installation of pin (20).
- 13 Raise front end of elevation cylinder (21) towards mount inside cab.

CAUTION

Use care to avoid damage to fitting. Make sure connecting pin is gently tapped securing cylinder eye.

- 14 Install elevation cylinder front eye (66) in mount and secure with pin (20).
- 15 Install fitting (24), nut (23), and keywasher (22) on pin (20). Bend locking tabs on key washer (22).



02pc287m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

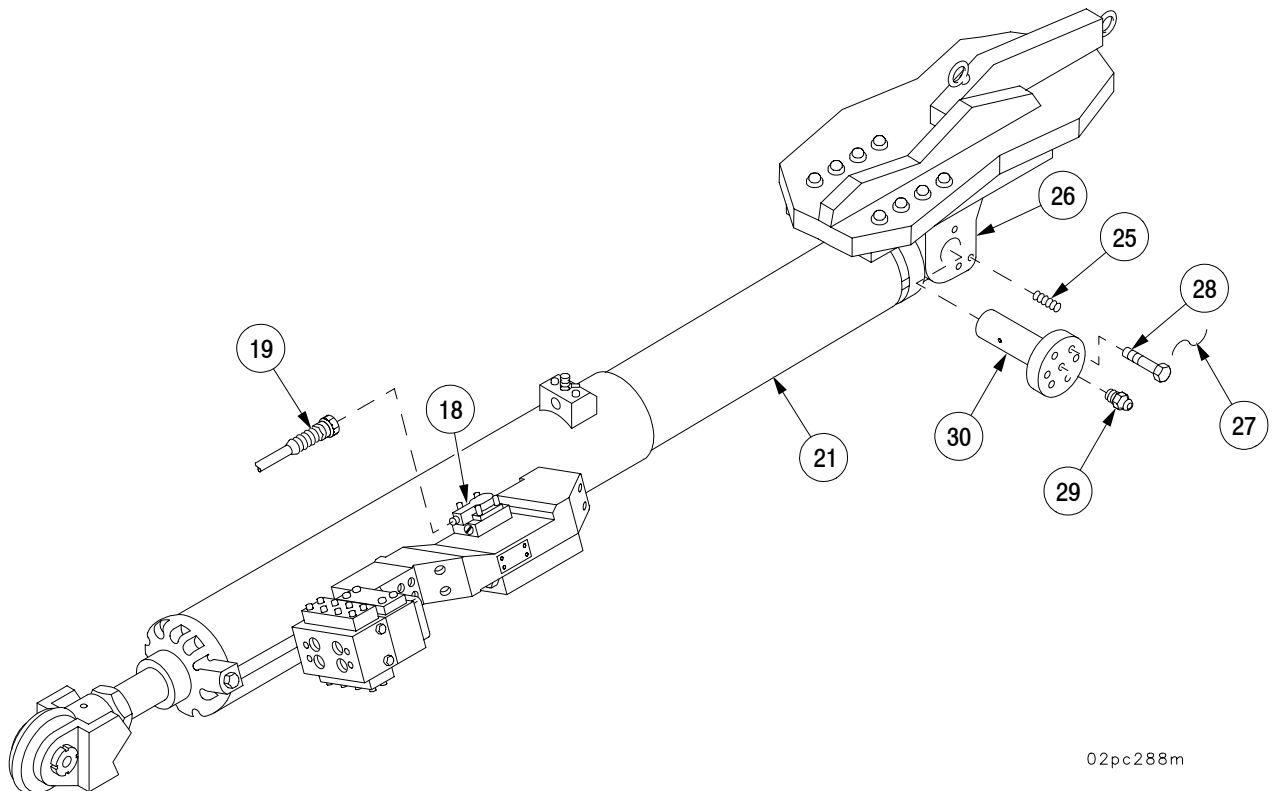
d. Installation - Continued

- 16 Install connecting pin (30) in clevis assembly (26).
- 17 Install two screws (28) finger tight to secure cylinder assembly (21) to clevis assembly (26) and install fitting (29).
- 18 Install new lockwire (27) to secure two screws (28) in position.
- 19 Tighten and adjust two setscrews (25) through clevis assembly (26) to allow elevating mechanism to rotate freely.

CAUTION

Bleeder valves must be open before lowering cannon. Failure to do so could damage piston rod.

- 20 With suitable lifting device, lower cannon into travel lock and remove sling.
- 21 Install electrical connector (19) to elevation servovalve (18).

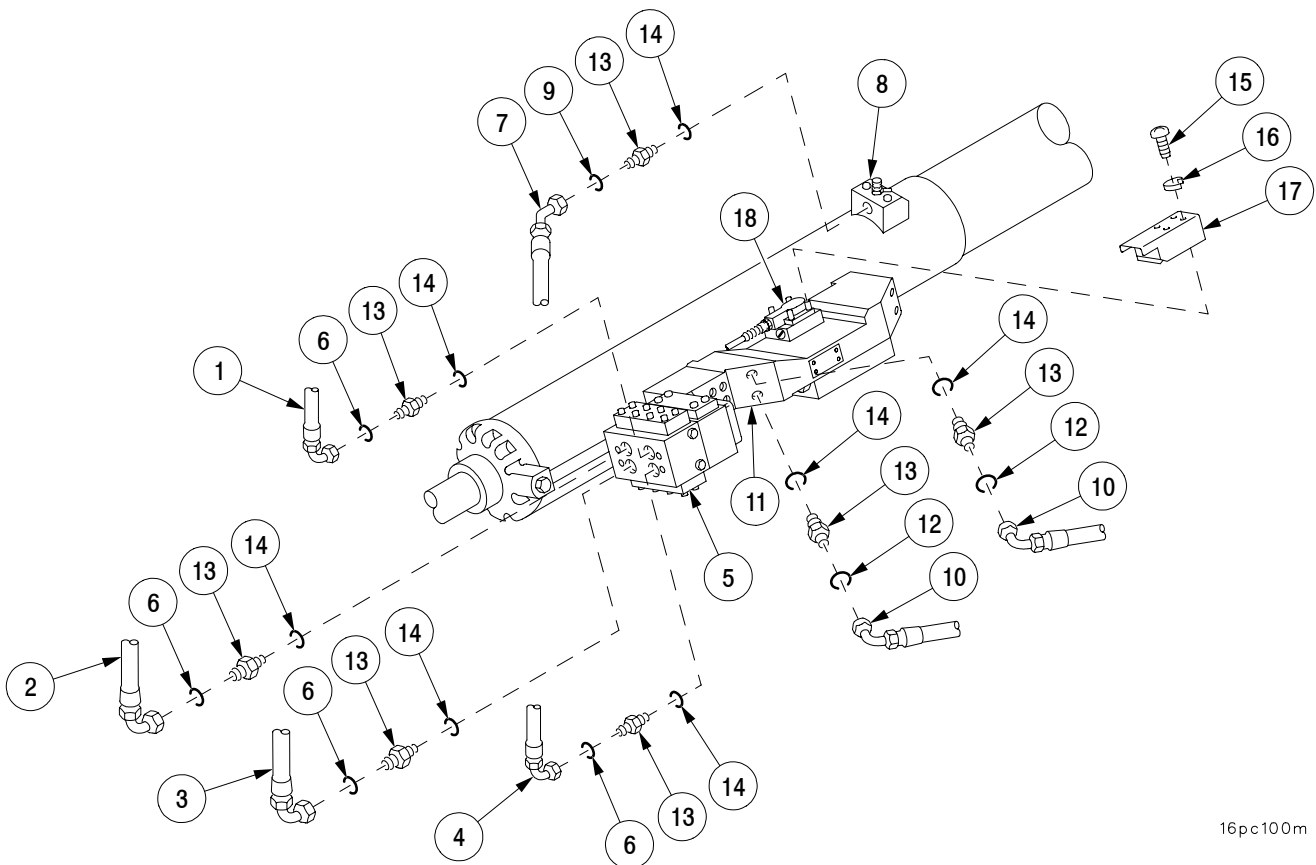


02pc288m

10-8 ELEVATION MECHANISM ASSEMBLY AND CLEVIS ASSEMBLY - CONTINUED

d. Installation - Continued

- 22 Install seven fittings (13) with seven new preformed packings (14).
- 23 Install two hose assemblies (10) with two new preformed packings (12).
- 24 Install hose assembly (7) with new preformed packing (9) to block (8).
- 25 Install four hose assemblies (1, 2, 3, and 4) to lock valve (5) with four new preformed packings (6).
- 26 Install cover (17) with four new lockwashers (16) and four screws (15) to servovalve (18).
- 27 Close bleeder valves.
- 28 Fill, charge, and bleed hydraulic system (TM 9-2350-314-20-2-2).
- 29 Charge and bleed equilibrator system (TM 9-2350-314-20-2-2).
- 30 Flush elevation system (TM 9-2350-314-20-2-2).



16pc100m

10-9 SERVOVALVE ASSEMBLY.

This task covers:

a. Removal	b. Disassembly
c. Assembly	d. Installation

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Torque wrench (item 78, Appx F)
Drain pan (item 35, Appx F)

Materials/Parts

Preformed packings (10) (item 137, Appx E)
Preformed packings (2) (item 147, Appx E)
Preformed packings (6) (item 136, Appx E)
Preformed packings (2) (item 140, Appx E)
Preformed packings (2) (item 89, Appx E)
Preformed packing (item 146, Appx E)
Packing retainers (2) (item 81, Appx E)
Lockwashers (8) (item 127, Appx E)
Lockwashers (12) (item 125, Appx E)
Lockwashers (10) (item 211, Appx E)
Drive screws (4) (item 48, Appx E)
Plastic bags (item 14, Appx B)
Marking tags (item 71, Appx B)
Hydraulic fluid (item 42, Appx B)
Dust protective plug (AR) (item 59, Appx B)
Sealing compound (item 31, Appx B)
Preformed packings (3) (item 153, Appx E)

Equipment Conditions

Hydraulic system pressure discharged
(TM 9-23550-314-20-2-2)

References

TM 9-2350-314-20-2-2

Personnel Required

Two

10-9 SERVOVALVE ASSEMBLY - CONTINUED

a. Removal.

WARNING

- Hydraulic system pressure is 1925 ± 50 psi. Do not torque hydraulic fittings or perform removal procedures when hydraulic system is pressurized. Discharging system pressure before performing any maintenance procedures will avoid serious injury to personnel.
- Eye protection will be worn when performing maintenance procedure on all hydraulic components to avoid injury to personnel.

CAUTION

All hydraulic lines and ports must be capped to prevent contaminants from entering the hydraulic system and causing internal damage to hydraulic components.

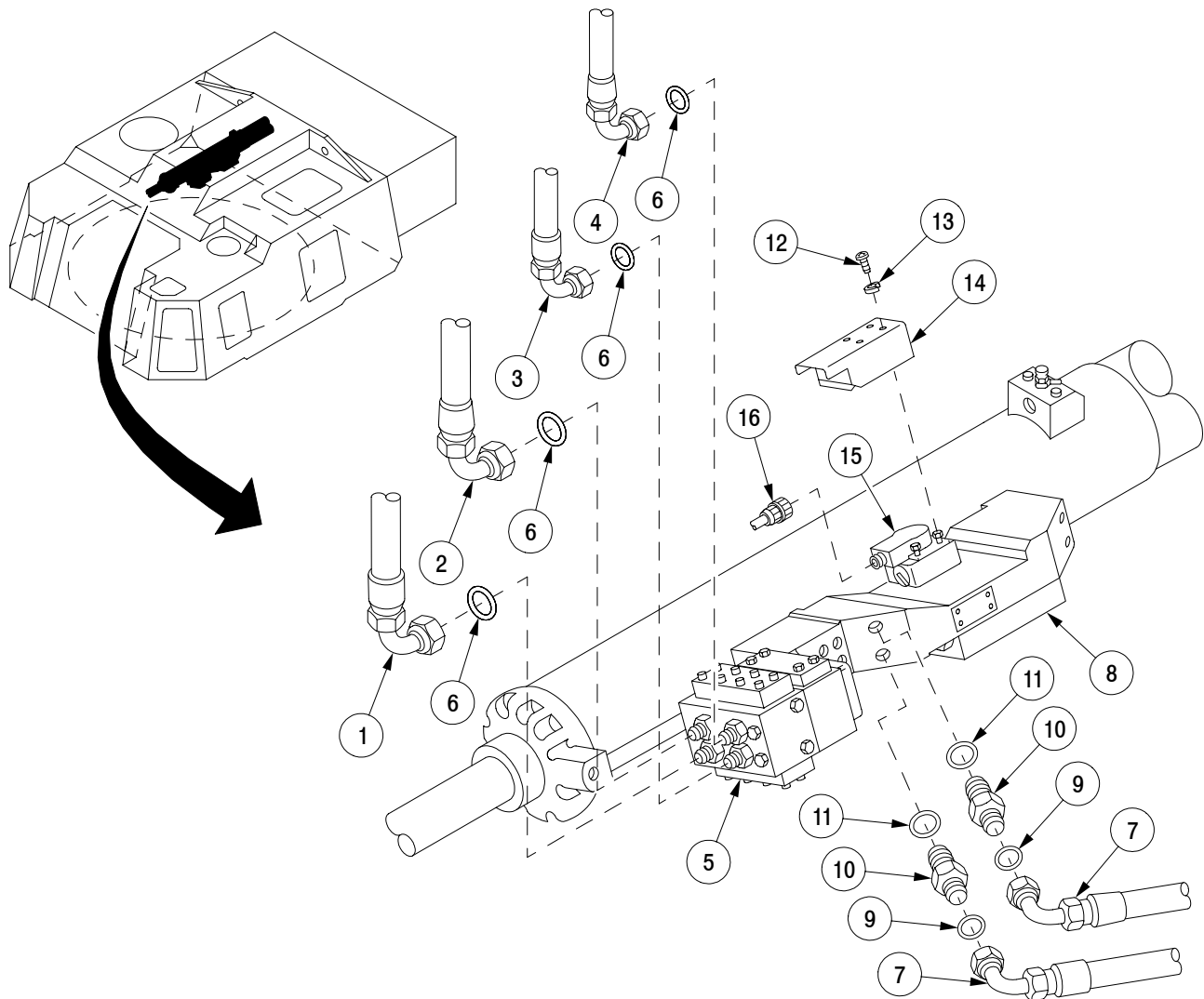
NOTE

- All hydraulic lines and components must be tagged before removal for identification during installation.
- A thin even coat of clean hydraulic fluid must be applied to ALL new packing material to form a good seal between hydraulic components during installation.

10-9 SERVOVALVE ASSEMBLY - CONTINUED

a. Removal - Continued

- 1 Disconnect four hose assemblies (1, 2, 3, and 4) at lock valve (5). Remove and discard four preformed packings (6).
- 2 Disconnect two hoses (7) from manifold (8).
- 3 Remove and discard two preformed packings (9).
- 4 Remove two connectors (10) with two preformed packings (11). Discard packings.
- 5 Remove four screws (12), four lockwashers (13), and cover (14) from servovalve (15). Discard lockwashers.
- 6 Disconnect electrical connector (16) from servovalve (15).

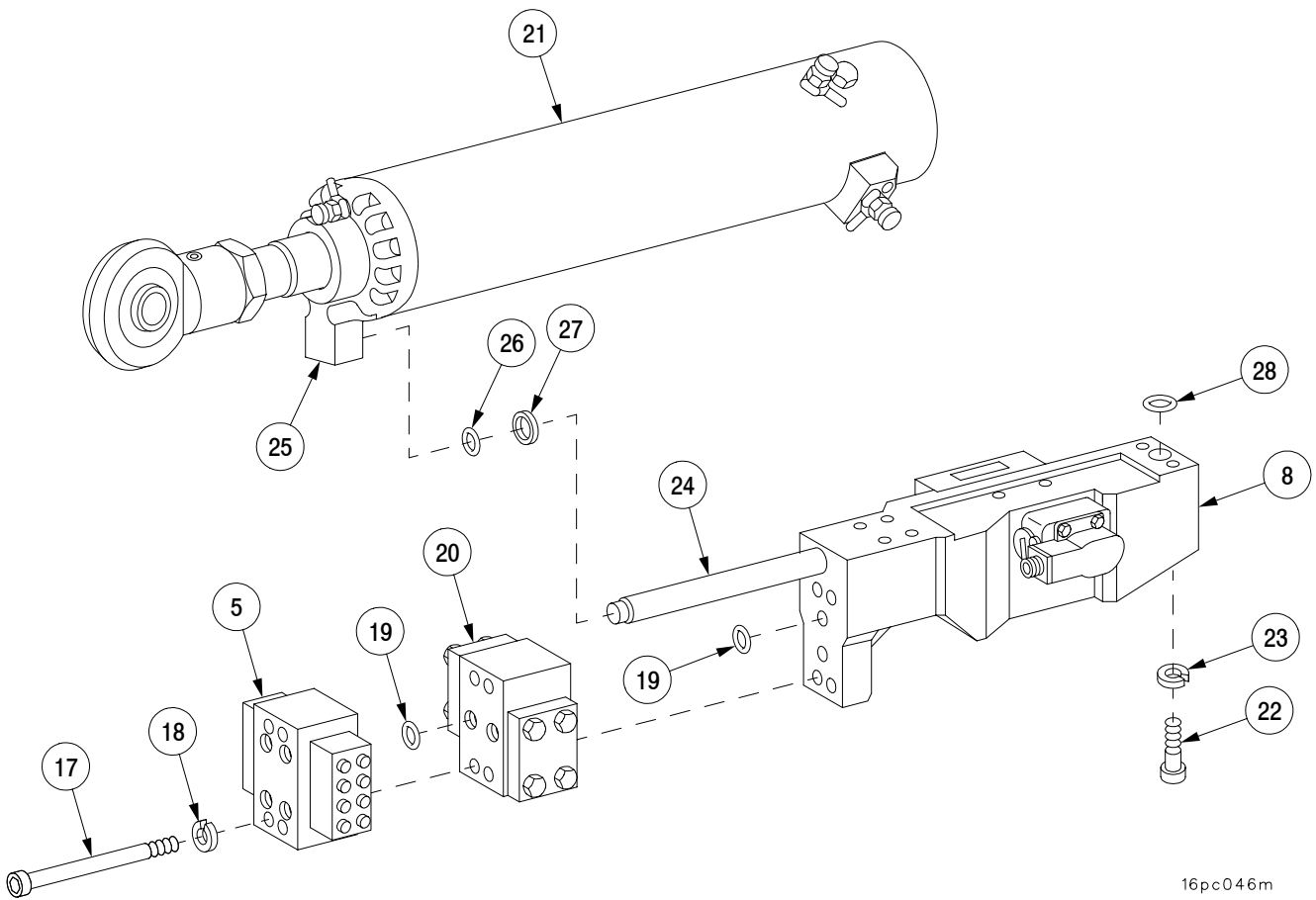


16pc045m

10-9 SERVOVALVE ASSEMBLY - CONTINUED

a. Removal - Continued

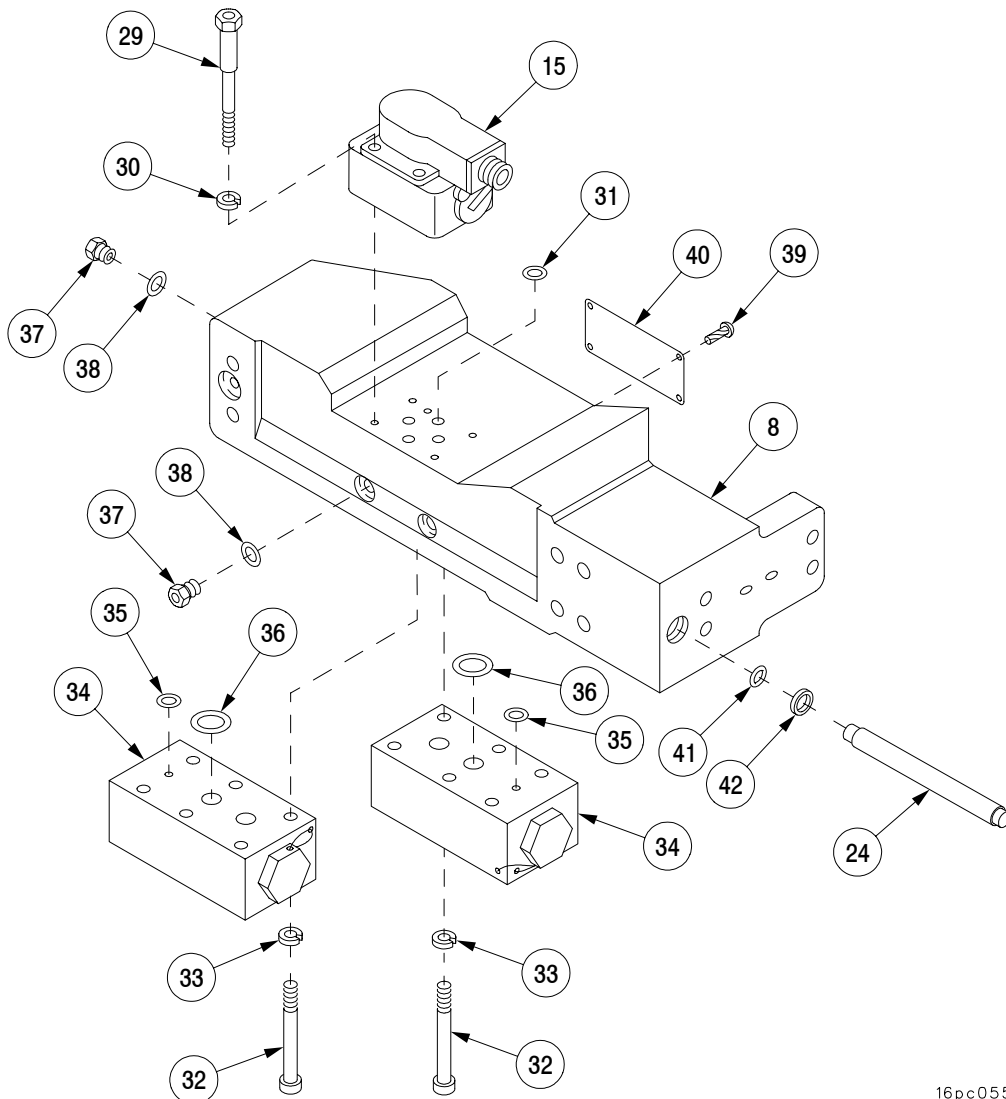
- 7 Remove four screws (17), four lockwashers (18), lock valve (5), four preformed packings (19), and relief valve (20) from manifold (8). Discard lockwashers and preformed packings.
- 8 Remove six screws (22), six lockwashers (23), and manifold (8) from cylinder (21). Discard lockwashers.
- 9 Pull manifold (8) rearward to disengage tubing (24) from front end cap (25).
- 10 Remove and discard preformed packing (26), retainer (27) and preformed packing (28).



10-9 SERVOVALVE ASSEMBLY - CONTINUED

b. Disassembly.

- 1 Remove four studs (29), four lockwashers (30), and servovalve (15) from manifold (8). Discard lockwashers.
- 2 Remove and discard four preformed packings (31) from manifold (8).
- 3 Remove 12 screws (32), 12 lockwashers (33), and two check valves (34). Discard lockwashers.
- 4 Remove and discard preformed packing (35) and preformed packing (36) from each check valve (34).
- 5 Remove three plugs (37) and three preformed packings (38) from manifold (8). Discard preformed packings.
- 6 Remove four drive screws (39) and nameplate (40) from manifold (8). Discard drive screws.
- 7 Remove preformed packing (41), retainer (42), and tube (24) from manifold (8). Discard packings and retainers.

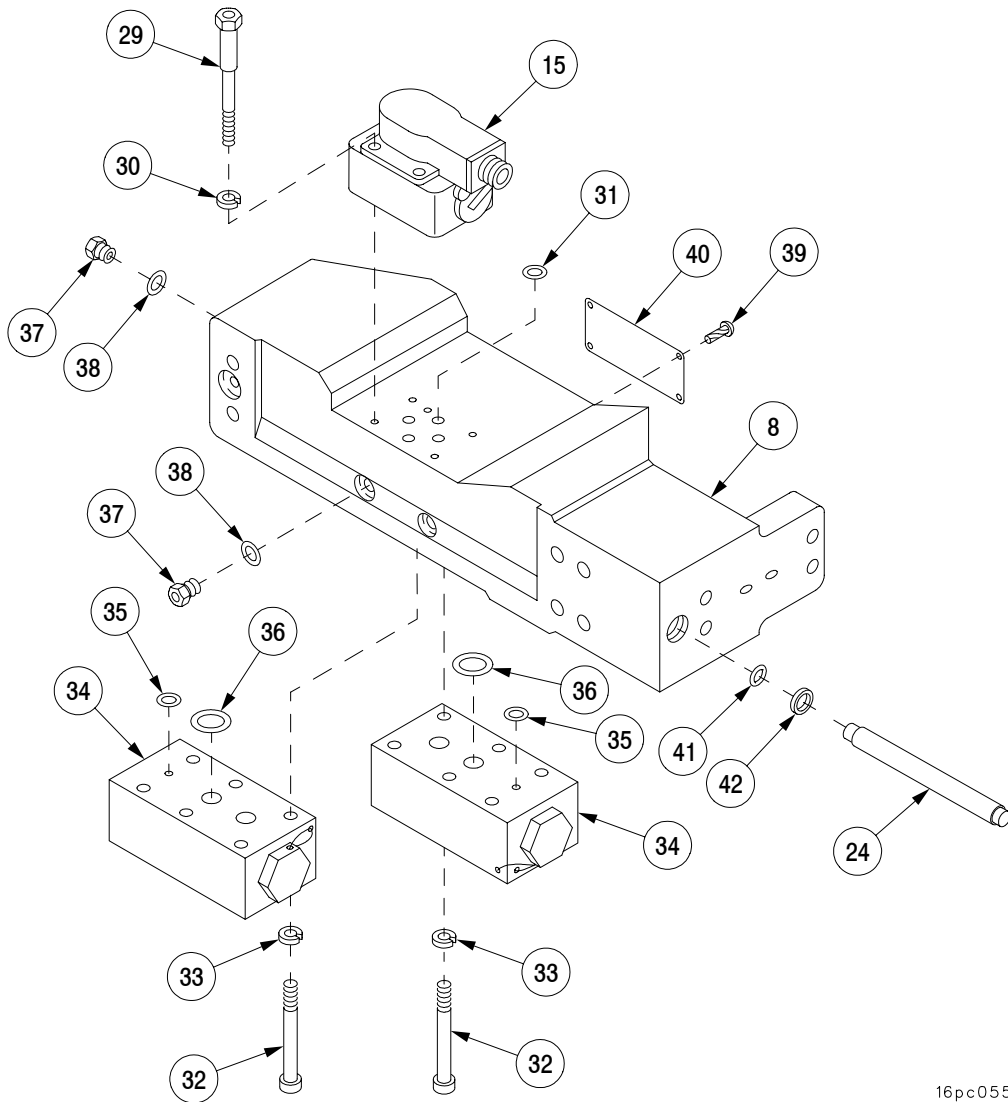


16pc055m

10-9 SERVOVALVE ASSEMBLY - CONTINUED

c. Assembly.

- 1 Install new retainer (42), new packing (41) and tube (24) on manifold (8).
- 2 Install nameplate (40) on manifold (8) and secure with four new drive screws (39).
- 3 Install three plugs (37) and three new preformed packings (38) into manifold (8).
- 4 Install new preformed packing (35) and new preformed packing (36) in each check valve (34).
- 5 Install two check valves (34) on manifold (8) and secure with 12 new lockwashers (33) and 12 screws (32).
- 6 Install four new preformed packings (31) into manifold (8).
- 7 Install servovalve (15) on manifold (8) and secure with four new lockwashers (30) and four studs (29).

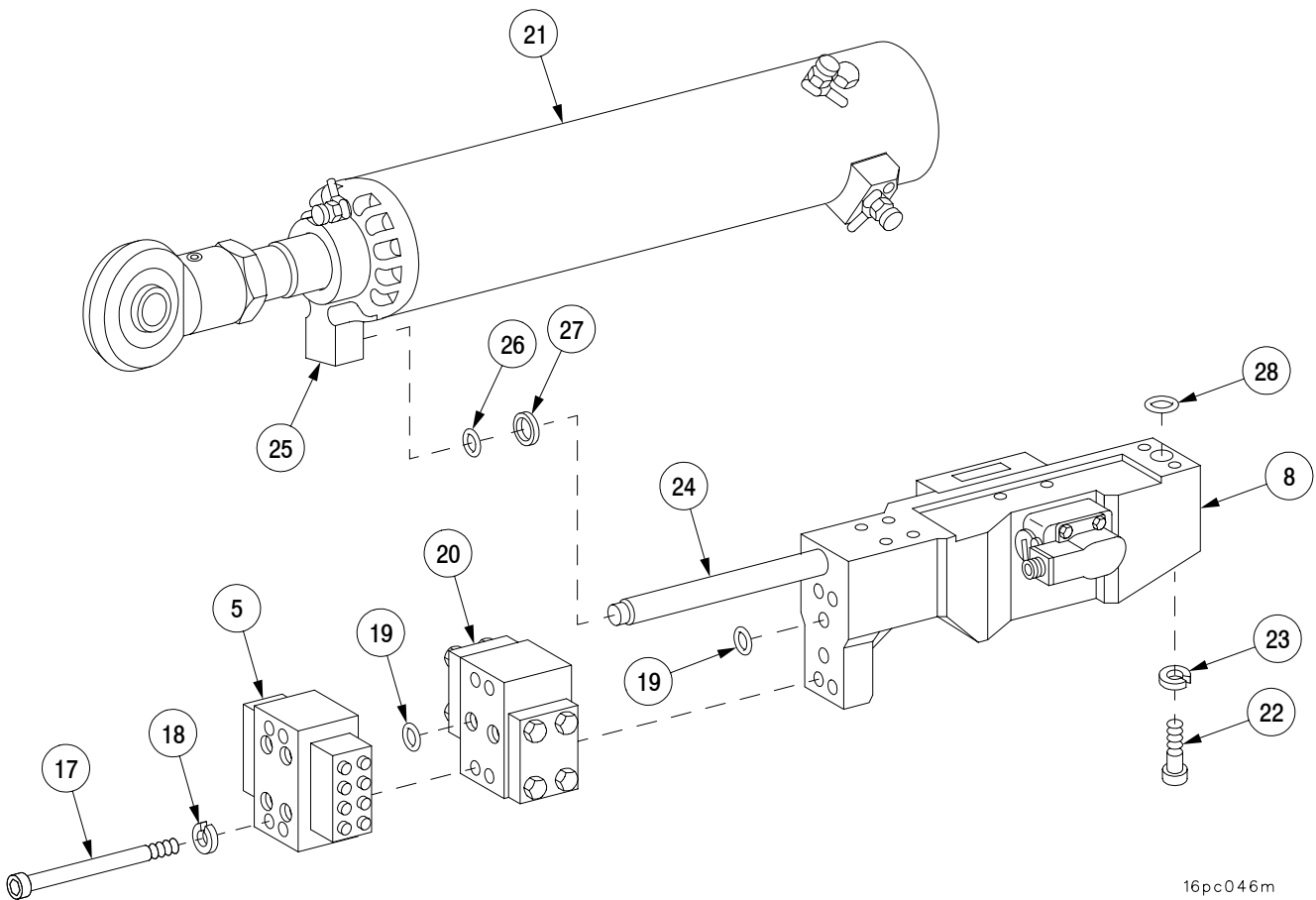


16pc055m

10-9 SERVOVALVE ASSEMBLY - CONTINUED

d. Installation.

- 1 Install three new preformed packings (28) in manifold (8).
- 2 Install new preformed packing (26) and new retainer (27) onto tube (24).
- 3 Position manifold (8) to install tube (24) into end cap (25) orifice.
- 4 Align mounting holes in manifold (8) with six holes in cylinder (21).
- 5 Apply sealing compound to six screws (22). Install six screws (22) and six new lockwashers (23) to secure manifold (8) to cylinder (21). Torque screws alternately to 216 - 264 lb-in. (24.4 - 30 N·m).
- 6 Position relief valve (20) with four new preformed packings (19) on lock valve (5) and align with mounting holes on manifold (8).
- 7 Apply sealing compound to four screws (17). Install four screws (17) and four new lockwashers (18) to secure relief valve (20) and lock valve (5) to manifold (8). Alternately torque screws to 216 - 264 lb-in. (24.4 - 30 N·m).

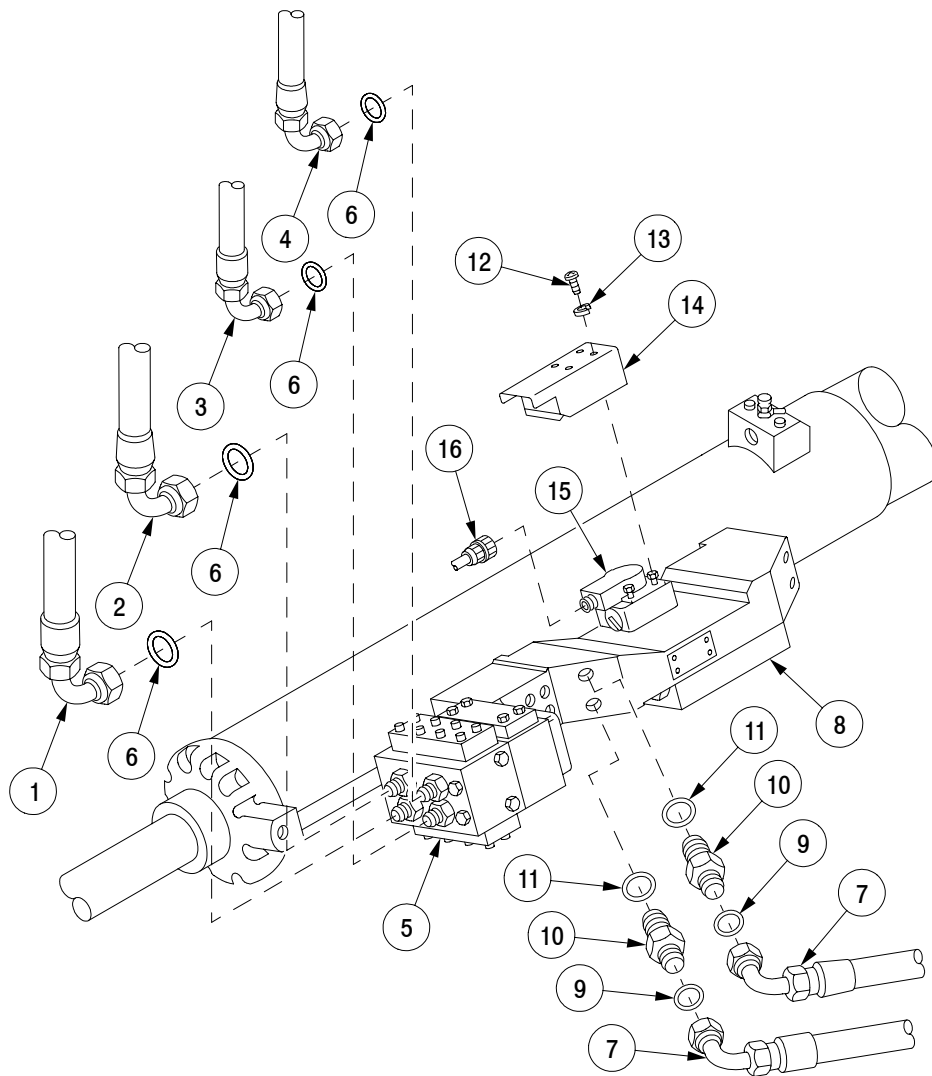


16pc046m

10-9 SERVOVALVE ASSEMBLY - CONTINUED

d. Installation - Continued

- 8 Connect electrical connector (16) to servovalve (15).
- 9 Install two connectors (10) with two new preformed packings (11).
- 10 Install two hose assemblies (7) with two new preformed packings (9) onto manifold (8).
- 11 Install four hose assemblies (1, 2, 3, and 4) to lock valve (5) with four new preformed packings (6).
- 12 Install cover (14) with four new lockwashers (13) and four screws (12) to servovalve (15).
- 13 Fill, charge, and bleed hydraulic system (TM 9-2350-314-20-2-2).



16pc056m

10-10 MANIFOLD ASSEMBLY - CONTINUED

a. Removal - Continued

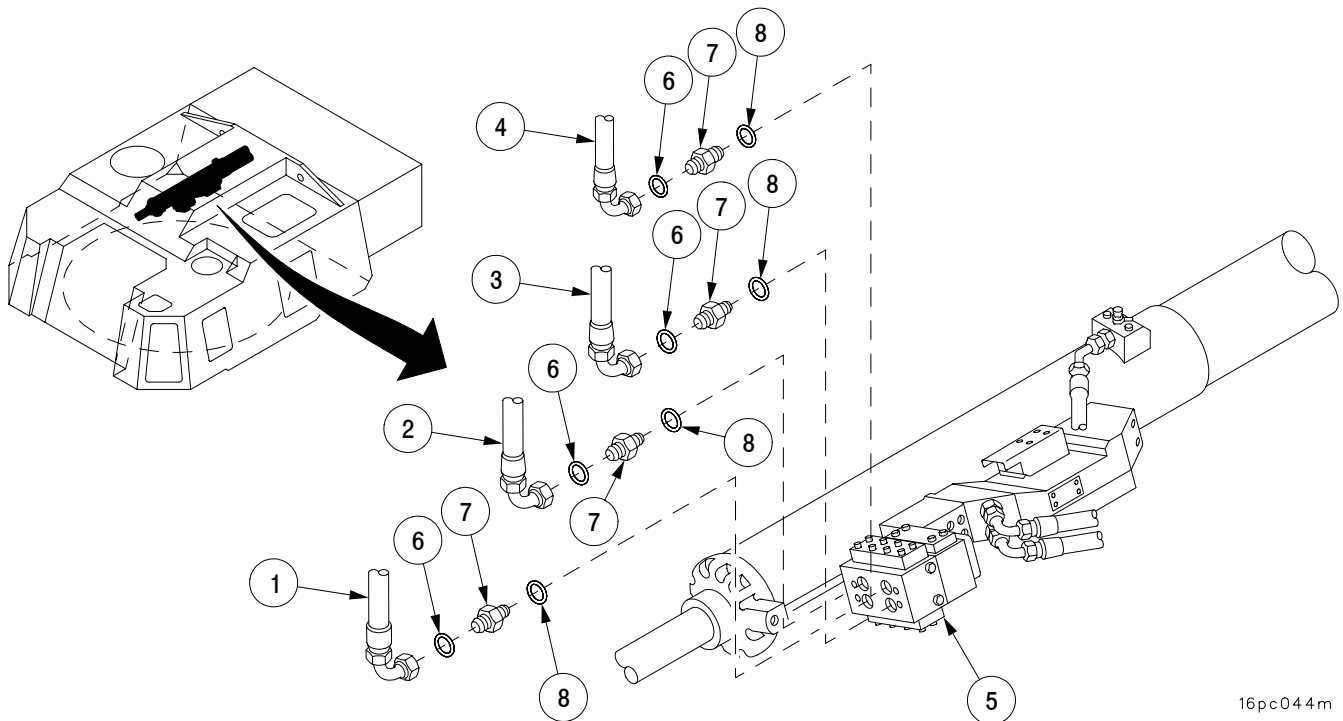
CAUTION

All hydraulic lines and ports must be capped to prevent contaminants from entering the hydraulic system and causing internal damage to hydraulic components.

NOTE

- All hydraulic lines and components must be tagged before removal for identification during installation.
- A thin even coat of clean hydraulic fluid must be applied to ALL new packing material to form a good seal between hydraulic components during installation.

- 1 Disconnect four hose assemblies (1, 2, 3, and 4) at lock valve (5).
- 2 Remove and discard four preformed packings (6).
- 3 Remove four fittings (7) with four preformed packings (8). Discard packings.

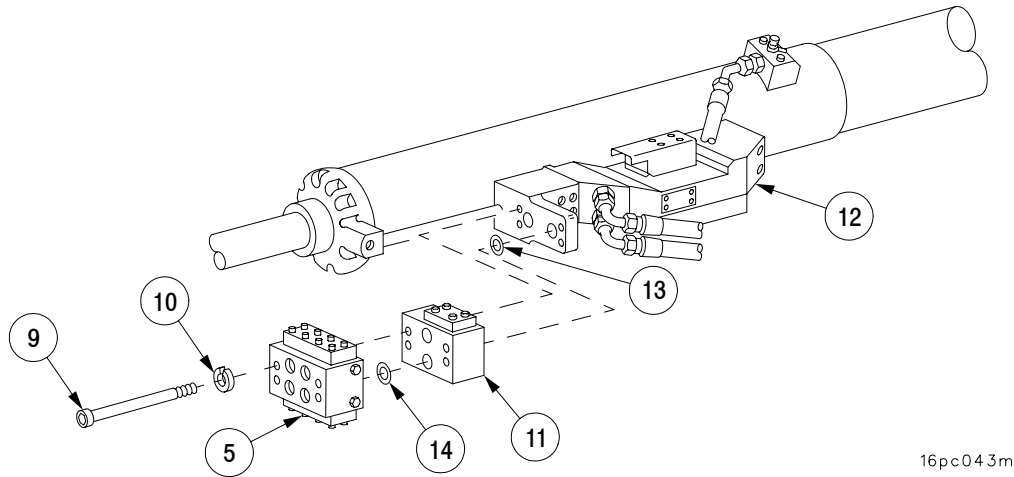


16pc044m

10-10 MANIFOLD ASSEMBLY - CONTINUED

a. Removal - Continued

- 4 Remove four screws (9), four lockwashers (10), lock valve (5), and relief valve (11) from servovalve (12). Discard lockwashers.
- 5 Remove two preformed packings (13). Discard packings.
- 6 Separate lock valve (5) from relief valve (11) and remove and discard two packings (14).

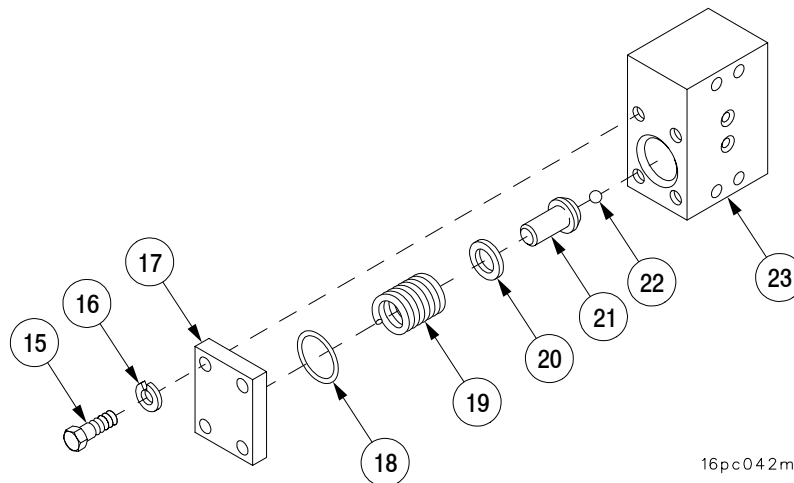


b. Disassembly.

NOTE

The following procedures are the same for either side of valve.

- 1 Remove four screws (15), four lockwashers (16), and plate (17). Discard lockwashers.
- 2 Remove gasket (18), spring (19), shim (20), guide (21), and ball (22) from block (23). Discard gasket.



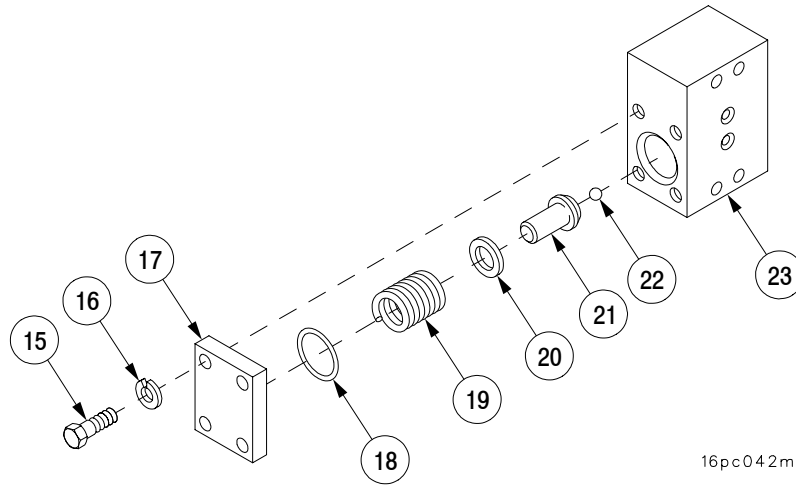
10-10 MANIFOLD ASSEMBLY - CONTINUED

c. Assembly.

NOTE

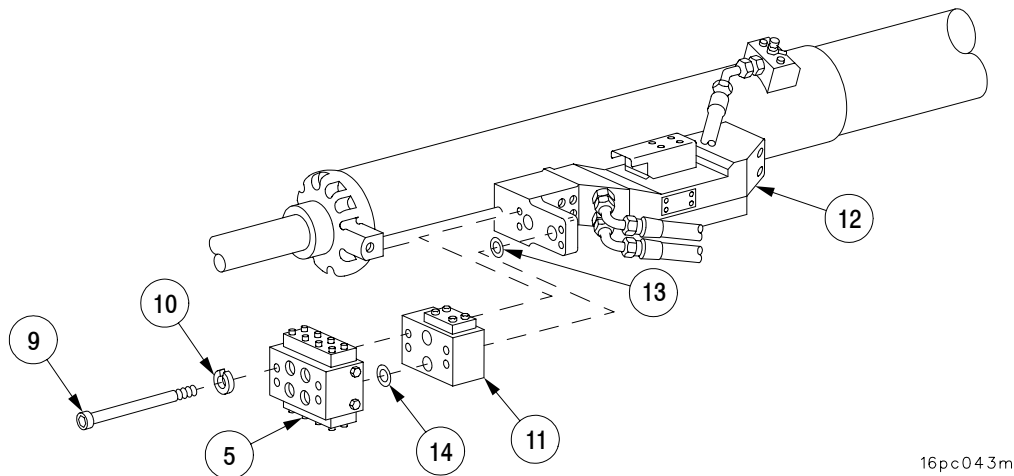
The following procedures are the same for either side of valve.

- 1 Install ball (22), guide (21), shim (20), spring (19) and new gasket (18) in block (23).
- 2 Install plate (17) with four screws (15) and four new lockwashers (16).



d. Installation.

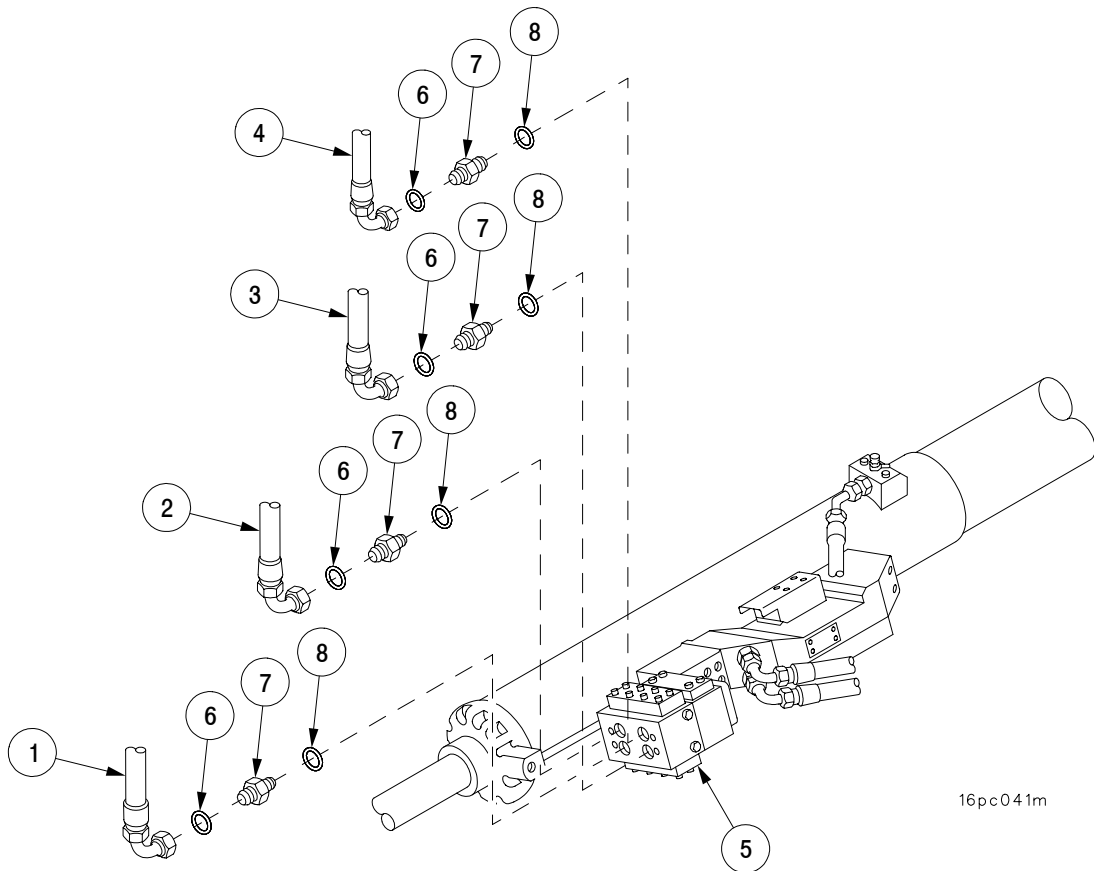
- 1 Apply sealing compound to four screws (9).
- 2 Install lock valve (5), relief valve (11), two new preformed packings (14), and two new preformed packings (13) on servo valve (12) with four screws (9) and four new lockwashers (10). Alternately torque screws (9) to 216-264 lb-in. (24.4 - 30 N·m).



10-10 MANIFOLD ASSEMBLY - CONTINUED

b. Installation - Continued

- 3 Install four fittings (7) with four new preformed packings (8).
- 4 Connect four hose assemblies (1, 2, 3, and 4) to lock valve (5) with four new preformed packings (6).
- 5 Fill, charge, and bleed hydraulic system (TM 9-2350-314-20-2-2).



10-11 HYDRAULIC POWERPACK ASSEMBLY WITH HYDRAULIC PUMP - CONTINUED

a. Removal.**WARNING**

- Hydraulic system pressure is 1925 ± 50 psi (13273 ± 344.7 kPa). Do not torque hydraulic fittings or perform removal procedures when hydraulic system is pressurized. Discharging system pressure before performing any maintenance procedures will avoid serious injury to personnel.
- Eye protection will be worn when performing maintenance procedures on all hydraulic components to avoid injury to personnel.

CAUTION

- Open hydraulic powerpack for maintenance only in a clean environment in order to prevent contamination of hydraulic system.
- All hydraulic lines and ports must be capped to prevent contaminants from entering the hydraulic system and causing internal damage to hydraulic components.
- All serviceable components must be placed in plastic bags to prevent contamination of hydraulic system during installation.

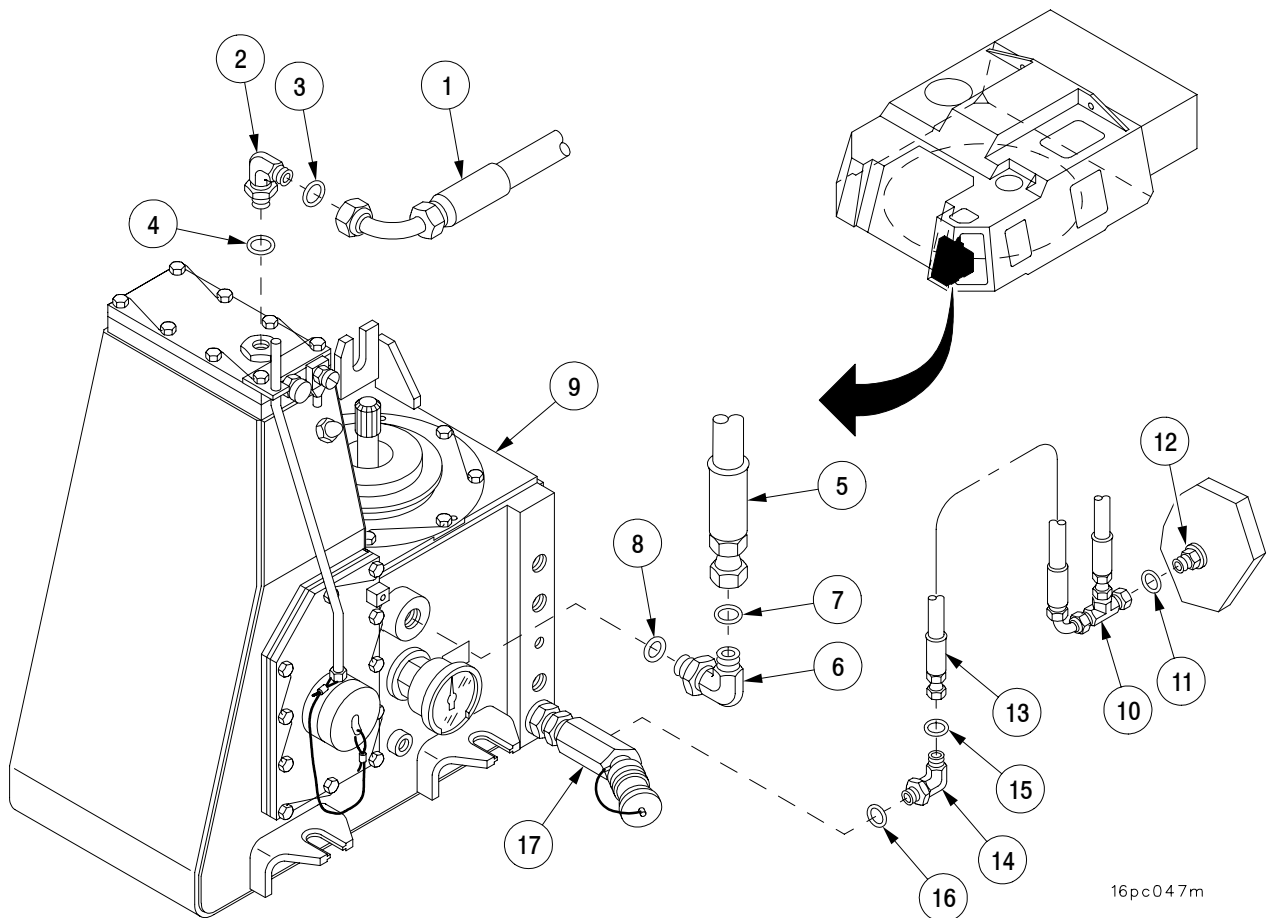
NOTE

All hydraulic lines and components must be tagged before removal for identification during installation.

10-11 HYDRAULIC POWERPACK ASSEMBLY WITH HYDRAULIC PUMP - CONTINUED

a. Removal - Continued

- 1 Disconnect hose (1) from elbow (2) and remove and discard preformed packing (3).
- 2 Remove elbow (2) and remove and discard preformed packing (4).
- 3 Disconnect hose (5) from elbow (6) and remove and discard preformed packing (7).
- 4 Remove elbow (6) and preformed packing (8) from hydraulic powerpack (9). Discard preformed packing.
- 5 Disconnect tee fitting (10) and preformed packing (11) from bulkhead connector (12). Discard packing.
- 6 Disconnect hose (13) from elbow (14) and remove and discard preformed packing (15).
- 7 Remove elbow (14) and preformed packing (16) from manifold (17). Discard preformed packing.



16pc047m

10-11 HYDRAULIC POWERPACK ASSEMBLY WITH HYDRAULIC PUMP - CONTINUED

a. Removal - Continued

- 8 Remove coupling (18), manifold (17) and two preformed packings (19) from union (20). Discard preformed packings.
- 9 Remove union (20) and preformed packing (21) from hydraulic powerpack (9). Discard preformed packing.
- 10 Remove gage (22) from thermowell (23).

NOTE

Pull all components as far out of the way as possible.
 Turn hydraulic reservoir 180 degrees so that the small side is ready to come out of the door first.

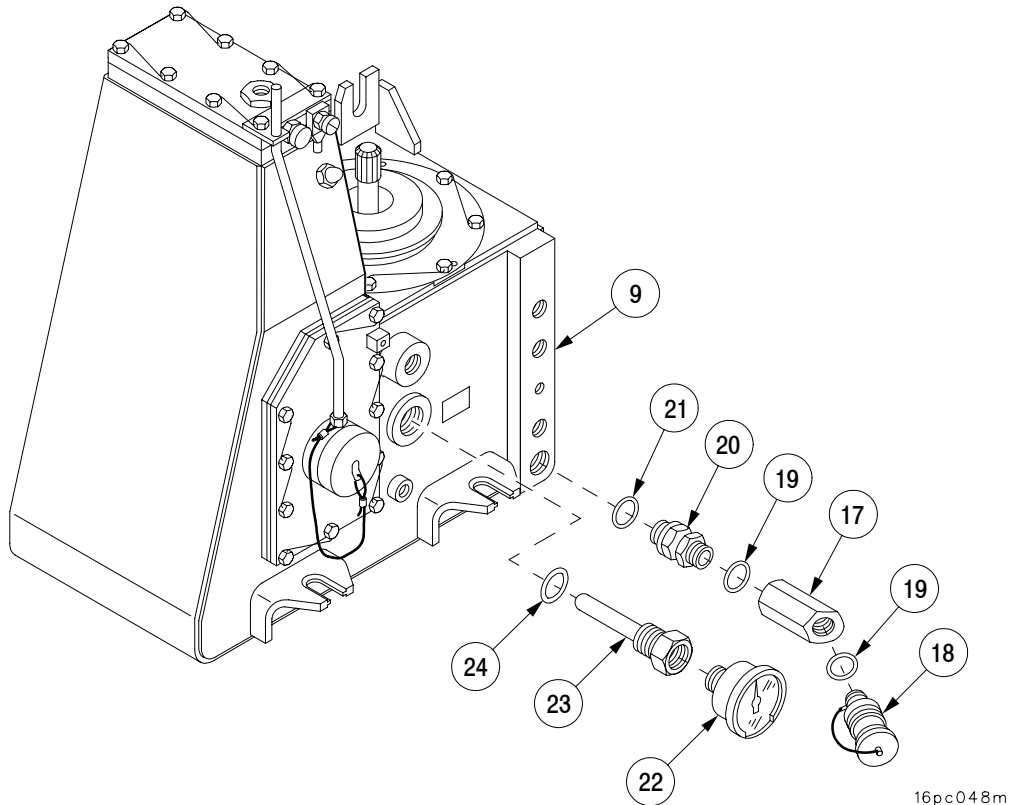
- 11 Slide the small side of hydraulic powerpack (9) out the door, then pick up the small side end and tip the high side end down as it comes through hydraulic compartment access door.

b. Disassembly.

CAUTION

Open hydraulic powerpack for maintenance only in a clean environment in order to prevent contamination of hydraulic system.

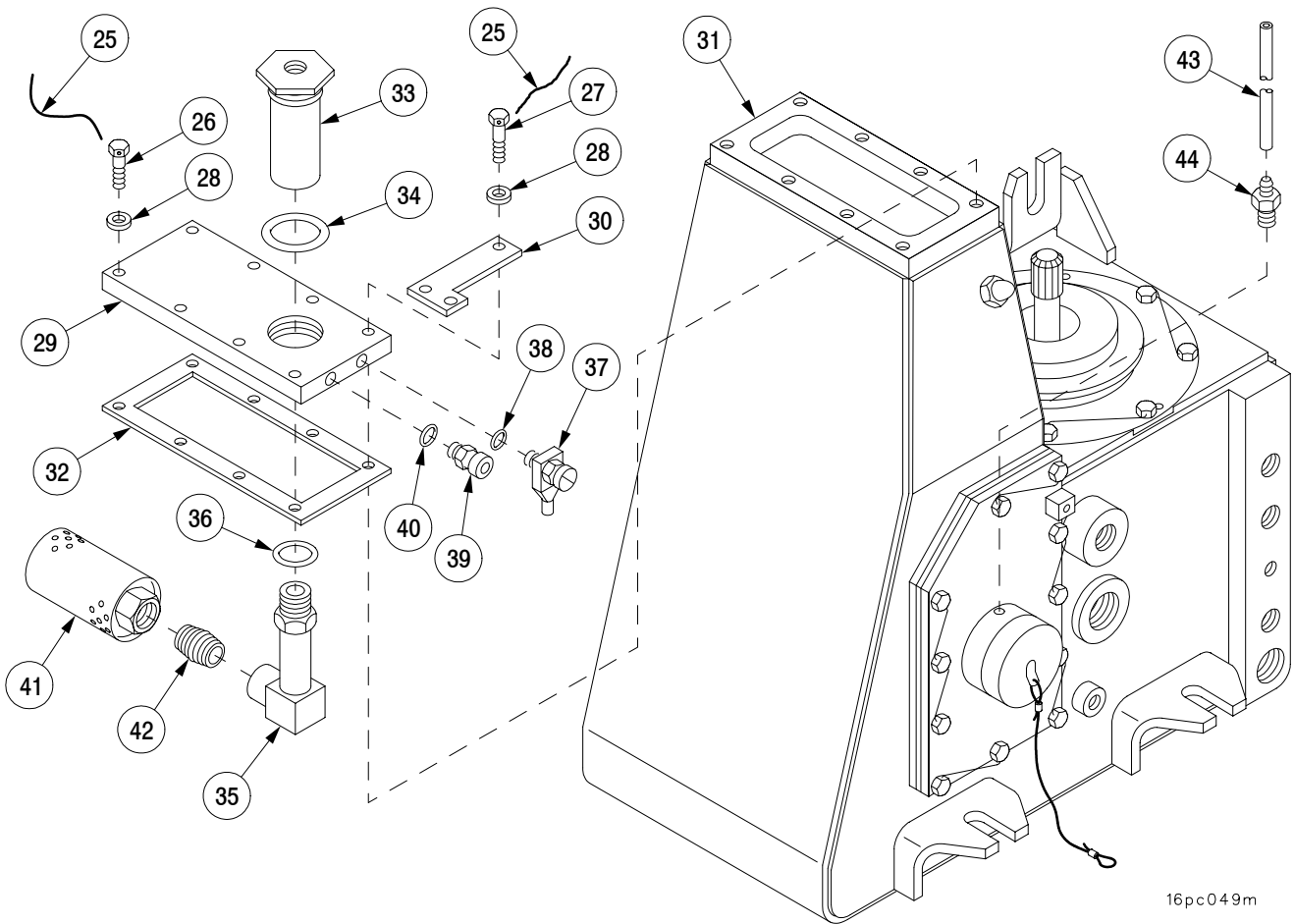
- 1 Remove thermowell (23), and preformed packing (24) from hydraulic powerpack (9). Discard packing.



10-11 HYDRAULIC POWERPACK ASSEMBLY WITH HYDRAULIC PUMP - CONTINUED

b. Disassembly - Continued

- 2 Cut, remove, and discard lockwire (25) from six screws (26) and two screws (27).
- 3 Remove six screws (26), two screws (27), eight flat washers (28), manifold (29), and tube support (30) from reservoir (31). Remove and discard gasket (32).
- 4 Remove adapter (33), preformed packing (34), elbow (35), and preformed packing (36) from manifold (29). Discard preformed packings.
- 5 Remove valve (37), preformed packing (38), valve (39), and preformed packing (40) from manifold (29). Discard preformed packing.
- 6 Remove diffuser (41) and nipple (42) from elbow (35).
- 7 Remove tube (43) and tube fitting (44) from reservoir (31).



16pc049m

10-11 HYDRAULIC POWERPACK ASSEMBLY WITH HYDRAULIC PUMP - CONTINUED

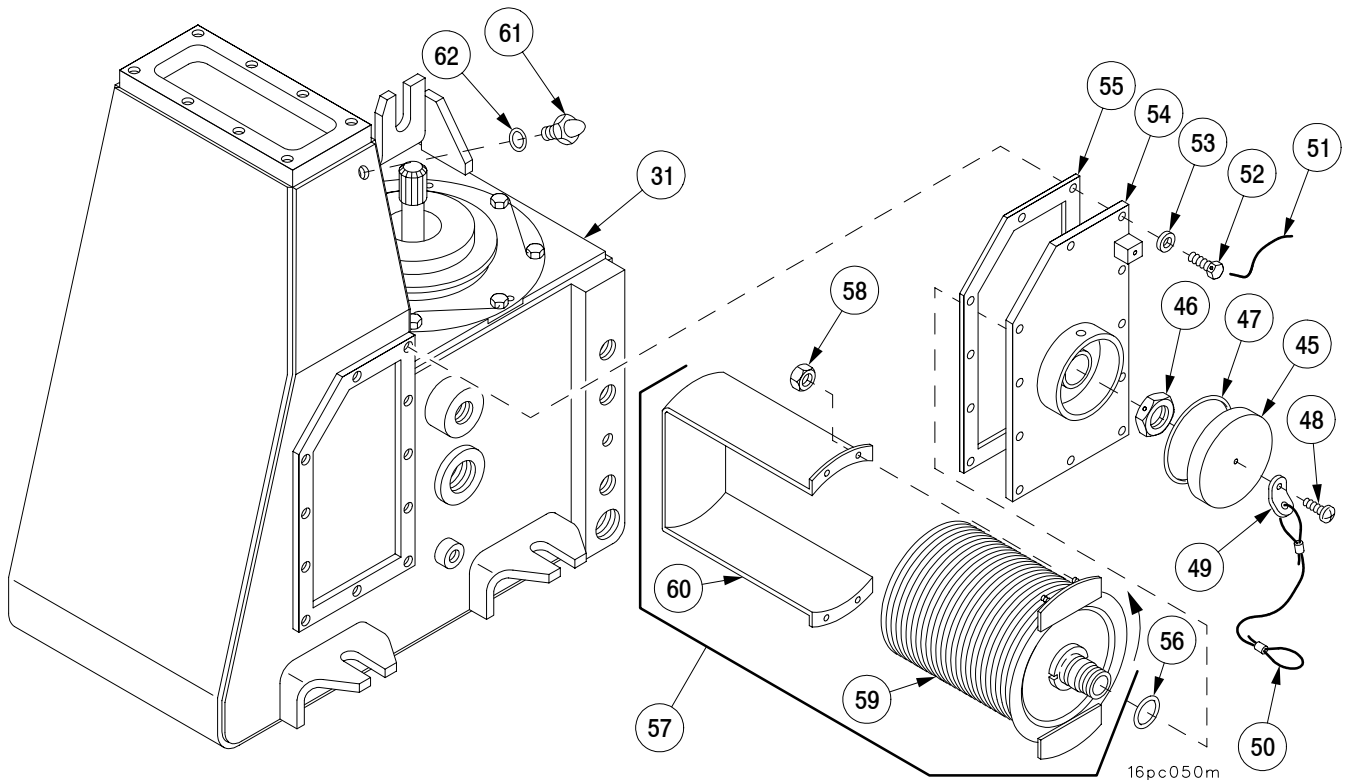
b. Disassembly - Continued

- 8 Remove dust cap (45), nut (46) and preformed packing (47). Discard preformed packing.
- 9 Remove screw (48) and clip (49) with wire (50) attached from dust cap (45).
- 10 Cut, remove, and discard lockwire (51) from 11 screws (52).
- 11 Remove 11 screws (52), 11 flat washers (53), access cover (54), and gasket (55). Discard gasket.
- 12 Remove preformed packing (56) from bellows assembly (57). Discard preformed packing.

NOTE

Bellows assembly must be disassembled in reservoir.

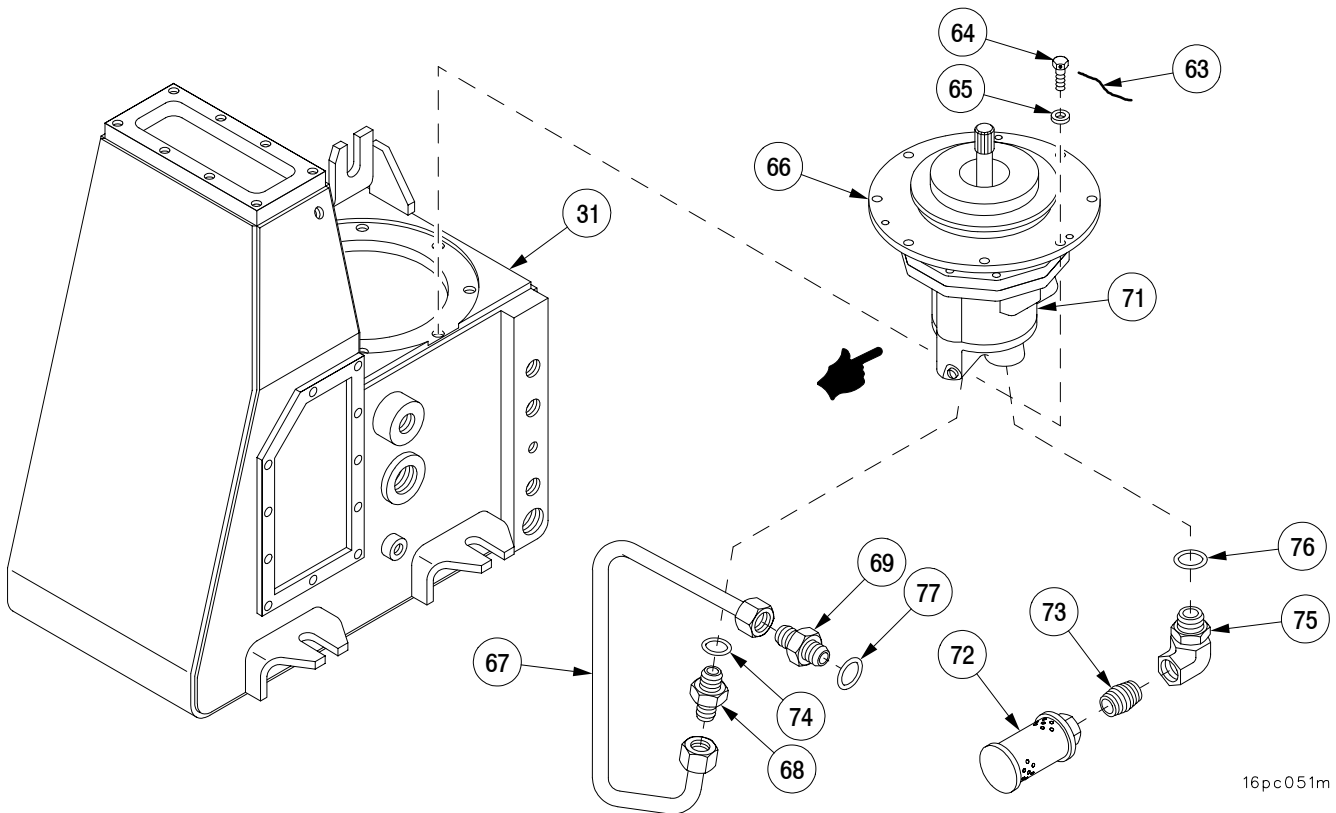
- 13 Disassemble bellows assembly (57) by removing two self-locking nuts (58) from top. Rotate bellows assembly 180° in the direction of arrow and remove the remaining two self-locking nuts (58) from bottom securing bellows (59) to frame (60). Discard self-locking nuts.
- 14 Collapse and plug bellows (59) to prevent expansion. If bellows (59) is damaged with holes, wrap with web strap in addition to plug to prevent expansion. Turn bellows (59) sideways with plugged end facing to the left and remove from reservoir (31).
- 15 Remove frame (60) from reservoir (31).
- 16 Remove sight plug (61) and preformed packing (62). Discard preformed packing.



10-11 HYDRAULIC POWERPACK ASSEMBLY WITH HYDRAULIC PUMP - CONTINUED

b. Disassembly - Continued

- 17 Cut, remove, and discard lockwire (63) from eight screws (64).
- 18 Remove eight screws (64) and eight flat washers (65) that secure adapter plate (66) to hydraulic reservoir (31).
- 19 Disconnect tube assembly (67) from adapters (68 and 69).
- 20 Remove tube assembly (67) from reservoir (31).
- 21 Step deleted.
- 22 Lift hydraulic pump (71) from reservoir (31) and disconnect strainer (72) from nipple (73).
- 23 Remove adapter (68) and preformed packing (74) from hydraulic pump (71). Discard preformed packing.
- 24 Remove nipple (73) from elbow (75).
- 25 Remove elbow (75) and preformed packing (76) from hydraulic pump (71). Discard preformed packing.
- 26 Remove adapter (69) and preformed packing (77) from hydraulic reservoir (31). Discard preformed packing.



16pc051m

10-11 HYDRAULIC POWERPACK ASSEMBLY WITH HYDRAULIC PUMP - CONTINUED

b. Disassembly - Continued

- 27 Remove four screws (78), four lockwashers (79), and four flat washers (80) from hydraulic pump (71). Discard lockwashers.
- 28 Remove adapter plate (66), preformed packing (81), and preformed packing (82) from hydraulic pump (71). Discard preformed packings.

c. Assembly.

NOTE

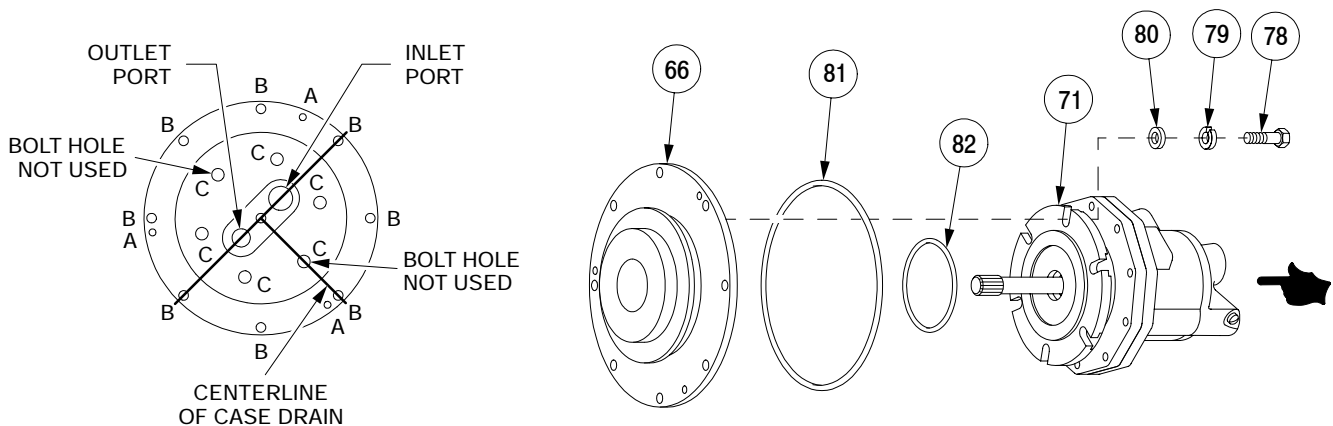
A thin even coat of clean hydraulic fluid must be applied to ALL new packing material to form a good seal between hydraulic components during assembly.

- 1 Install new preformed packing (82) and preformed packing (81) on hydraulic pump (71).

NOTE

Prior to installing adapter plate, orient the pump and adapter plate hole patterns. The view is showing the bottom of the pump orientation of the inlet, outlet and case drain ports relative to each other as well as the three different hole patterns in the pump adapter plate. Hole pattern A is a set of 3 holes that are threaded for jacking screws. Hole pattern B is for 8 screws to secure the adapter plate to the reservoir body. Hole pattern C is to attach the pump to the pump adapter plate. Only 4 of the 6 screw locations are used.

- 2 Install adapter plate (66) on hydraulic pump (71) with four flat washers (80), four new lockwashers (79), and four screws (78).



16pc052m

10-11 HYDRAULIC POWERPACK ASSEMBLY WITH HYDRAULIC PUMP - CONTINUED

c. Assembly - Continued

NOTE

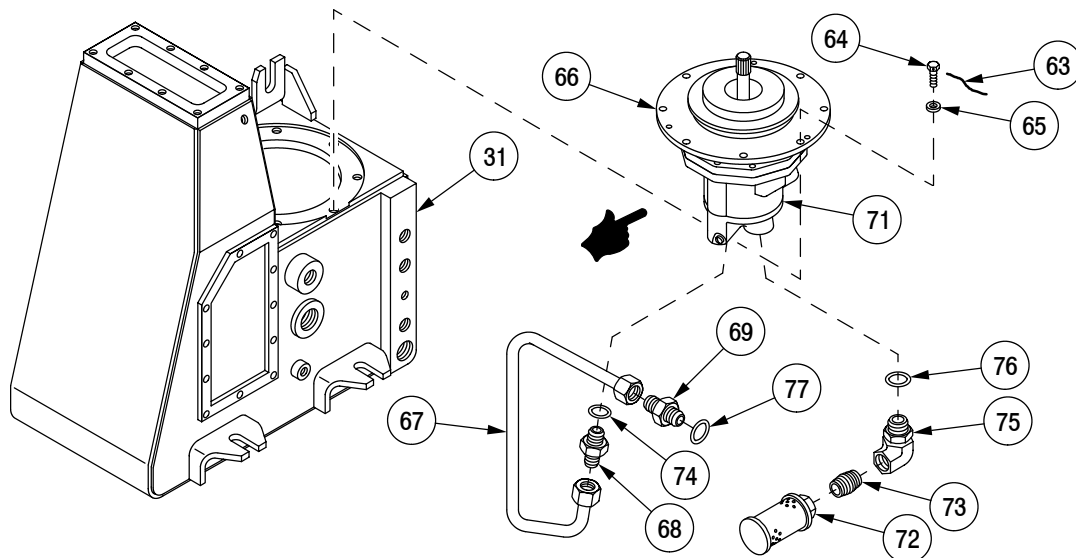
- Do not tighten all connections until hydraulic pump is positioned in reservoir.
- The hose assembly and tube positioned to the hydraulic pump side allowing operation of bellows when installed. If bellows come into contact of hose assembly, reposition hose and tube assembly.
- Be sure to remove plug and O-ring from side of hydraulic pump prior to installation.

- 3 Install adapter (69) with new preformed packing (77) to hydraulic reservoir (31).
- 4 Install elbow (75) with new preformed packing (76) to hydraulic pump (71).
- 5 Install nipple (73) to elbow (75).

CAUTION

The strainer is positioned to the rear of reservoir as far as possible without contacting inside surface of reservoir.

- 6 Connect strainer (72) to nipple (73).
- 7 Install adapter (68) with new preformed packing (74) to hydraulic pump (71).
- 8 Place hydraulic pump (71) into reservoir (31).
- 9 Insert tube assembly (67) into reservoir (31).
- 10 Step deleted.
- 11 Connect tube assembly (67) to adapters (68 and 69).
- 12 Secure plate (66) to reservoir (31) with eight flat washers (65) and eight screws (64).
- 13 Install new lockwire (63) in eight screws (64).



16pc051ma

10-11 HYDRAULIC POWERPACK ASSEMBLY WITH HYDRAULIC PUMP - CONTINUED

c. Assembly - Continued

- 14 Install sight plug (61) and new preformed packing (62).
- 15 Install frame (60) in reservoir (31).

NOTE

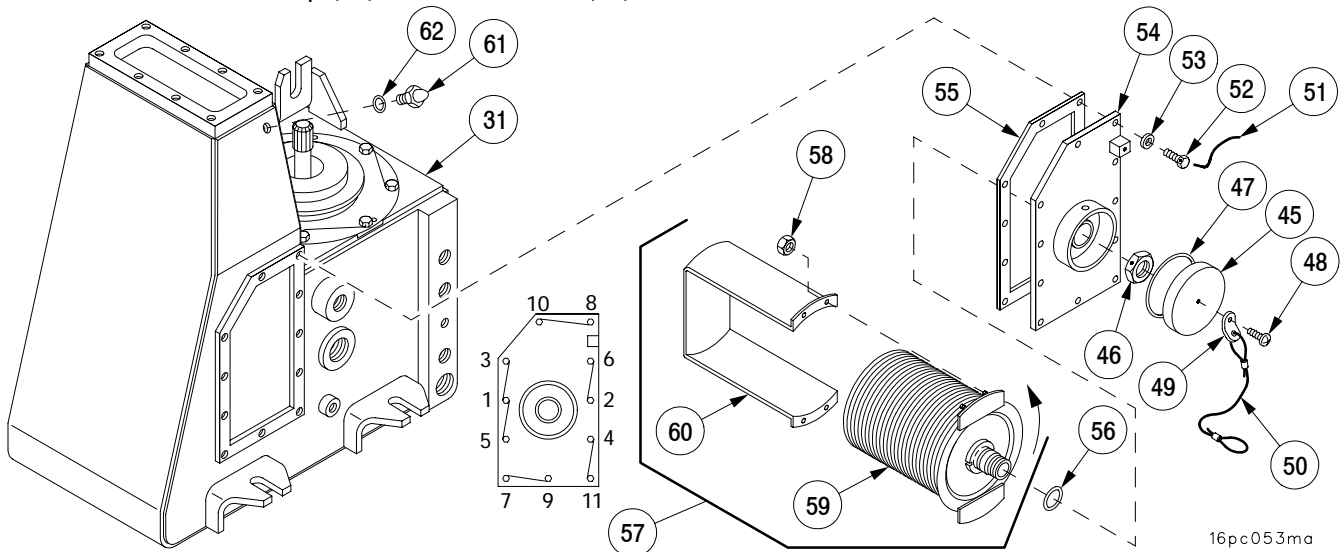
Bellows must be assembled in reservoir.

- 16 Collapse and plug bellows (59). Turn bellows (59) sideways with plugged end facing to the left, position in reservoir (31) and install on frame (60). Rotate bellows assembly (57) in the direction of arrow and install four new self-locking nuts (58). Remove plug from bellows (59).
- 17 Install new preformed packing (56) on bellows (59).

CAUTION

Allowing bellows to bump against the sides or bottom of reservoir or against the filter, lines, and fittings during installation could damage the bellows, requiring replacement of it.

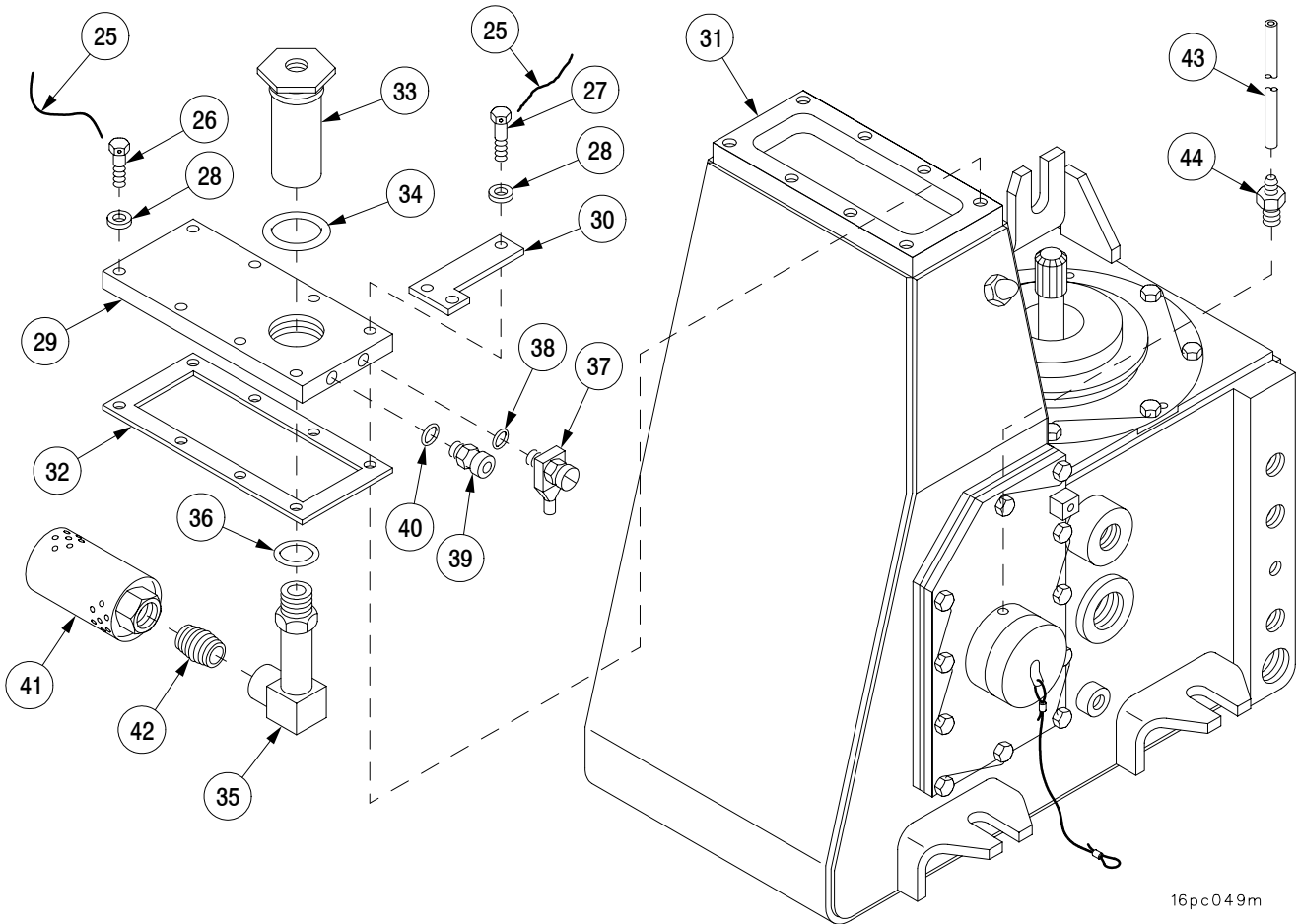
- 18 Install new gasket (55) on access cover (54). While supporting bellows assembly (57), align tabs on access cover (54) boss with notches on bellows (59), install access cover (54) on bellows (59), and secure with nut (46). Do not tighten nut.
- 19 Position access cover (54) and gasket (55) on reservoir (31) and secure with 11 screws (52) and 11 flat washers (53). Torque screws (52) in sequence as shown in illustration to 20 lb-in. (2.26 N-m).
- 20 Torque screws (52) in sequence again as shown in illustration to 35 ± 3 lb-in. (3.39 ± 0.34 N-m).
- 21 Further tighten nut (46) until bellows (59) seats against boss in access cover (54).
- 22 Secure 11 screws (52) by installing new lockwire (51).
- 23 Secure clip (49) with wire (50) and screw (48) attached to dust cap (45).
- 24 Apply adhesive to preformed packing (47). Install preformed packing (47) in groove of dust cap (45).
- 25 Install dust cap (45) on access cover (54).



10-11 HYDRAULIC POWERPACK ASSEMBLY WITH HYDRAULIC PUMP - CONTINUED

c. Assembly - Continued

- 26 Install tube fitting (44) and tube (43) on reservoir (31).
- 27 Install nipple (42) and diffuser (41) on elbow (35).
- 28 Install new preformed packing (40), valve (39), new preformed packing (38), and valve (37) to manifold (29).
- 29 Install adapter (33), new preformed packing (34), elbow (35) and new preformed packing (36) on manifold (29) through new gasket (32).
- 30 Position new gasket (32), manifold (29), and tube support (30) to reservoir (31) and secure with six screws (26), two screws (27), and eight flat washers (28).
- 31 Install new lockwire (25) to secure six screws (26) and two screws (27).



16pc049m

10-11 HYDRAULIC POWERPACK ASSEMBLY WITH HYDRAULIC PUMP - CONTINUED

c. Assembly - Continued

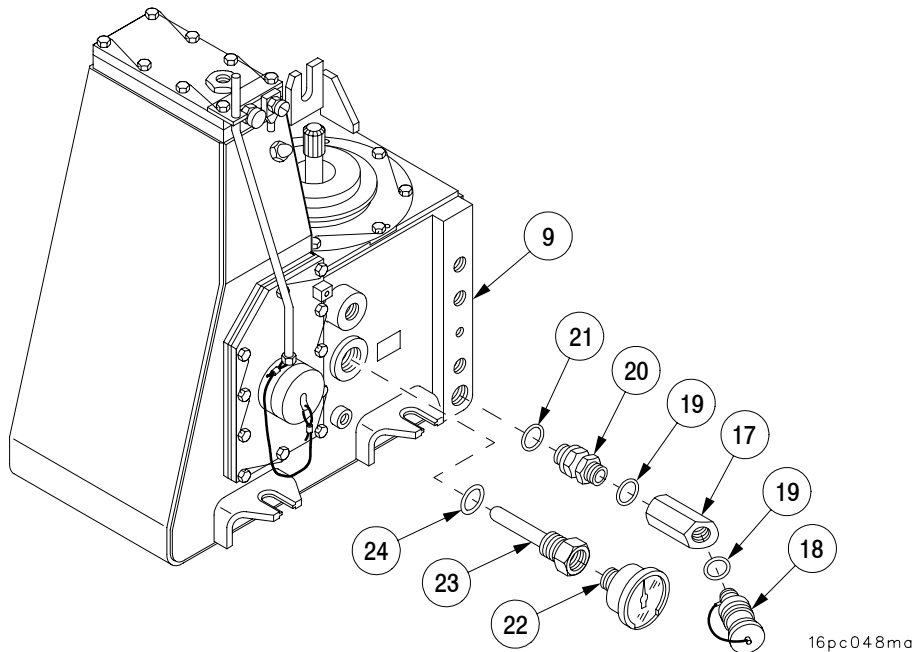
32 Install thermowell (23) with new preformed packing (24) into hydraulic powerpack (9).

d. Installation.

NOTE

- A thin, even coat of clean hydraulic fluid must be applied to ALL new packing material to form a good seal between hydraulic components during installation.
- Slide reservoir into the compartment the same way as it was removed. Turn and position the high side with the opening in the top as close under the access opening as possible.

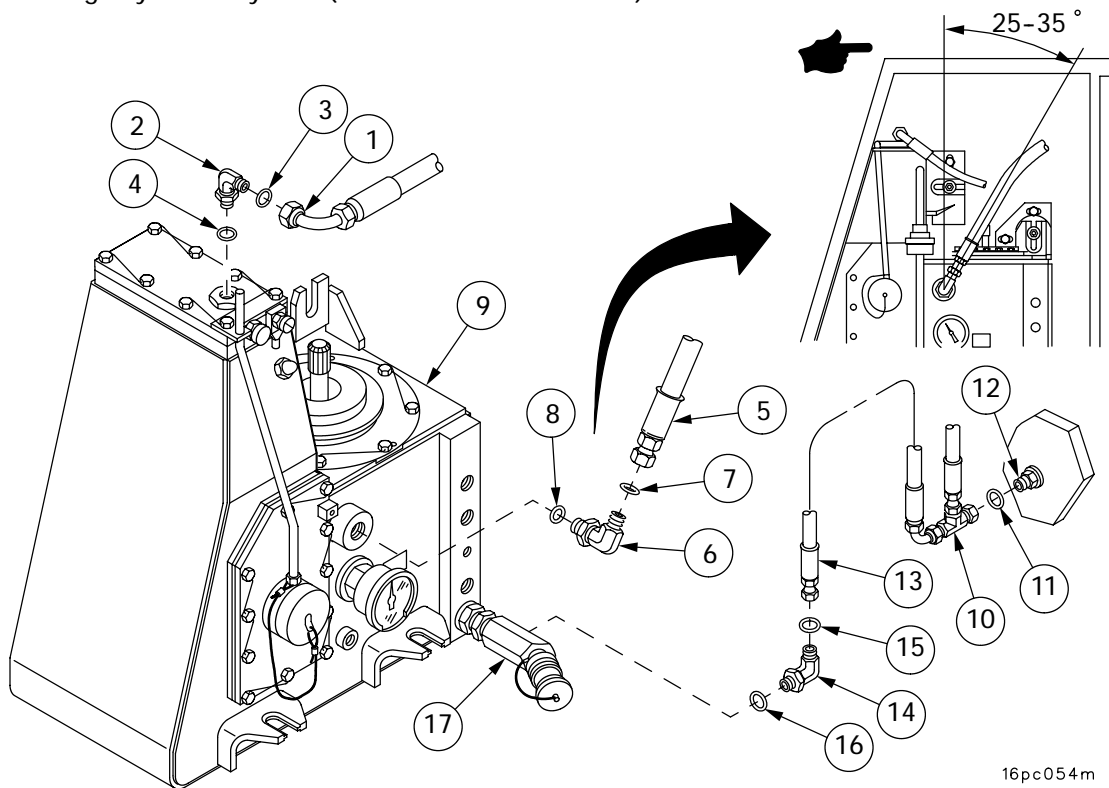
- 1 Position hydraulic powerpack (9) into hydraulic compartment.
- 2 Install hydraulic powerpack shock mounts (TM 9-2350-314-20-2-2).
- 3 Position and install filter assembly with bracket and fill manifold (TM 9-2350-314-20-2-2).
- 4 Position and install equilibration accumulator with bracket and fill manifold (TM 9-2350-314-20-2-2).
- 5 Install gage (22) in thermowell (23).
- 6 Install new preformed packing (21) and union (20) in hydraulic powerpack (9).
- 7 Install coupling (18), manifold (17) and two new preformed packings (19) on union (20).



10-11 HYDRAULIC POWERPACK ASSEMBLY WITH HYDRAULIC PUMP - CONTINUED

d. Installation - Continued

- 8 Install elbow (14) and new preformed packing (16) on manifold (17).
- 9 Connect tee fitting (10) with new preformed packing (11) on bulkhead connector (12).
- 10 Connect hose (13) to elbow (14) using new preformed packing (15).
- 11 Install elbow (6) with new preformed packing (8) in hydraulic powerpack (9).
- 12 Connect hose (5) to elbow (6) using new preformed packing (7).
- 13 Install elbow (2) and new preformed packing (4) on hydraulic powerpack (9) at 25-35° from center.
- 14 Connect hose (1) to elbow (2) using new preformed packing (3).
- 15 Install sampling valve (TM 9-2350-314-20-2-2).
- 16 Install hydraulic sensors (TM 9-2350-314-20-2-1).
- 17 Install dipstick assembly (TM 9-2350-314-20-2-2).
- 18 Install flow meter sensor (TM 9-2350-314-20-2-2).
- 19 Position and install pulse accumulator with bracket (TM 9-2350-314-20-2-2).
- 20 Install hydraulic pump motor (TM 9-2350-314-20-2-1).
- 21 Fill hydraulic reservoir (TM 9-2350-314-20-2-2).
- 22 Charge hydraulic system (TM 9-2350-314-20-2-2).



16pc054m

10-12 HYDRAULIC CLUTCH VALVE ASSEMBLY.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)

Equipment Conditions

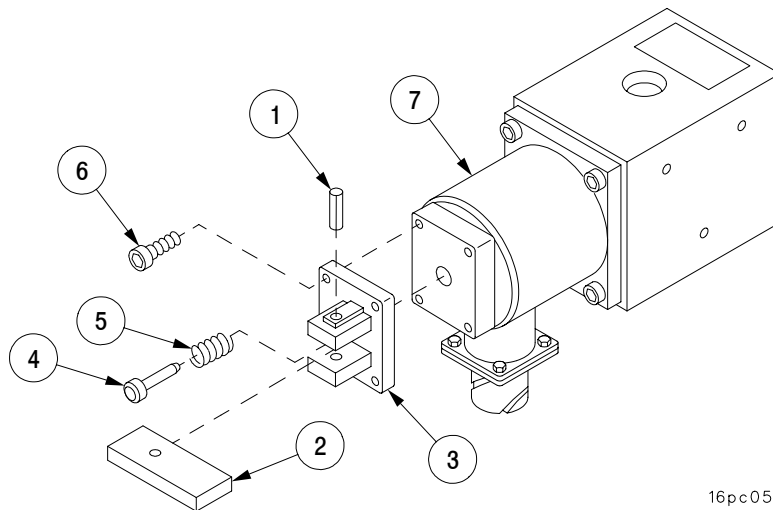
Clutch valve removed
(TM 9-2350-314-20-2-2)

Materials/Parts

Preformed packing (item 63, Appx E)
 Preformed packings (2) (item 69, Appx E)
 Preformed packing (item 68, Appx E)
 Dust protective caps (item 22, Appx B)
 Plastic bag (item 14, Appx B)
 Hydraulic fluid (item 42, Appx B)
 Preformed packing (item 67, Appx E)
 Backup ring (item 59, Appx E)
 Backup ring (item 58, Appx E)
 Backup ring (item 57, Appx E)
 Spring pin (item 10, Appx E)
 T-seal assembly (item 197, Appx E)
 Petrolatum (item 56, Appx B)
 Sealing compound (item 37, Appx B)

a. Disassembly.

- 1 Remove spring pin (1) and lever (2) from cap (3). Discard spring pin.
- 2 Remove pin (4) and spring (5) from cap (3).
- 3 Remove four screws (6) and cap (3) from solenoid assembly (7).

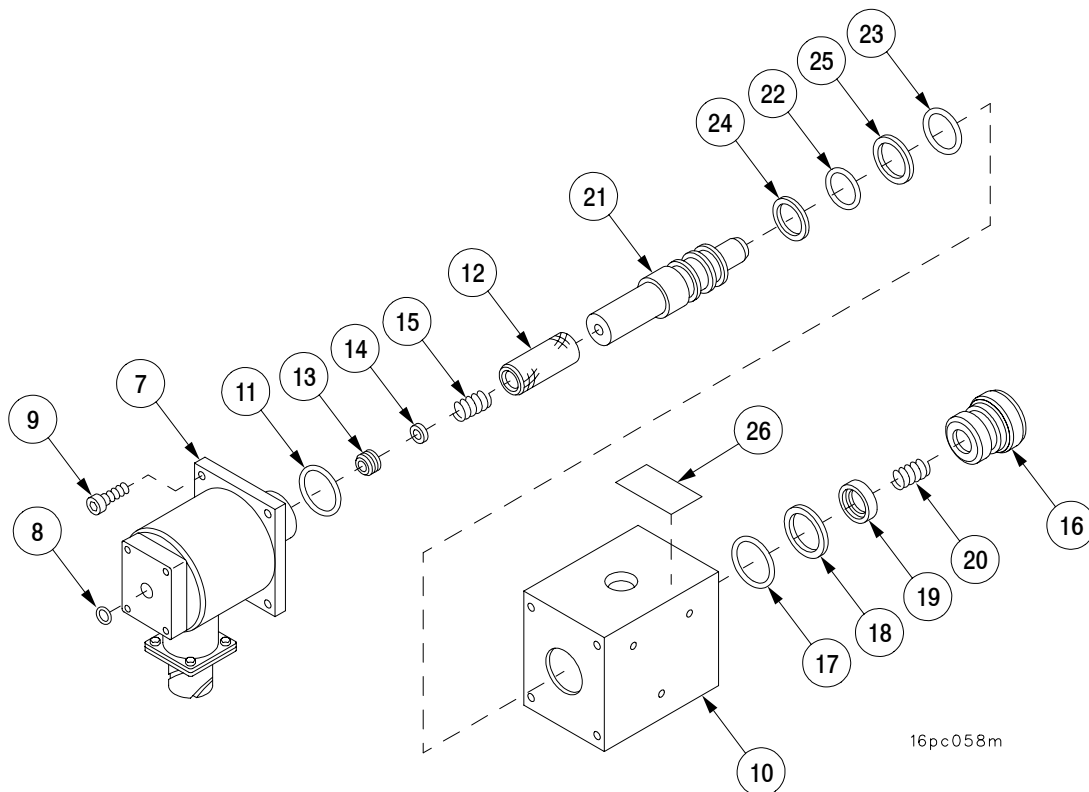


16pc057m

10-12 HYDRAULIC CLUTCH VALVE ASSEMBLY - CONTINUED

a. Disassembly - Continued

- 4 Remove and discard preformed packing (8) from solenoid assembly (7).
- 5 Remove four screws (9) and solenoid assembly (7) from valve body (10).
- 6 Remove preformed packing (11) and armature (12) from solenoid assembly (7). Discard packing.
- 7 Remove disk retainer (13), disk (14), and spring (15) from armature (12).
- 8 Remove cap (16) from valve body (10).
- 9 Remove preformed packing (17), backup ring (18), "T" seal assembly (19), and spring (20) from cap (16). Discard preformed packing, "T" seal assembly and backup ring.
- 10 Remove poppet assembly (21) from valve body (10).
- 11 Remove two preformed packings (22 and 23), and two backup rings (24 and 25) from poppet assembly (21). Discard packings and backup rings.
- 12 Remove identification plate (26) from valve body if necessary.



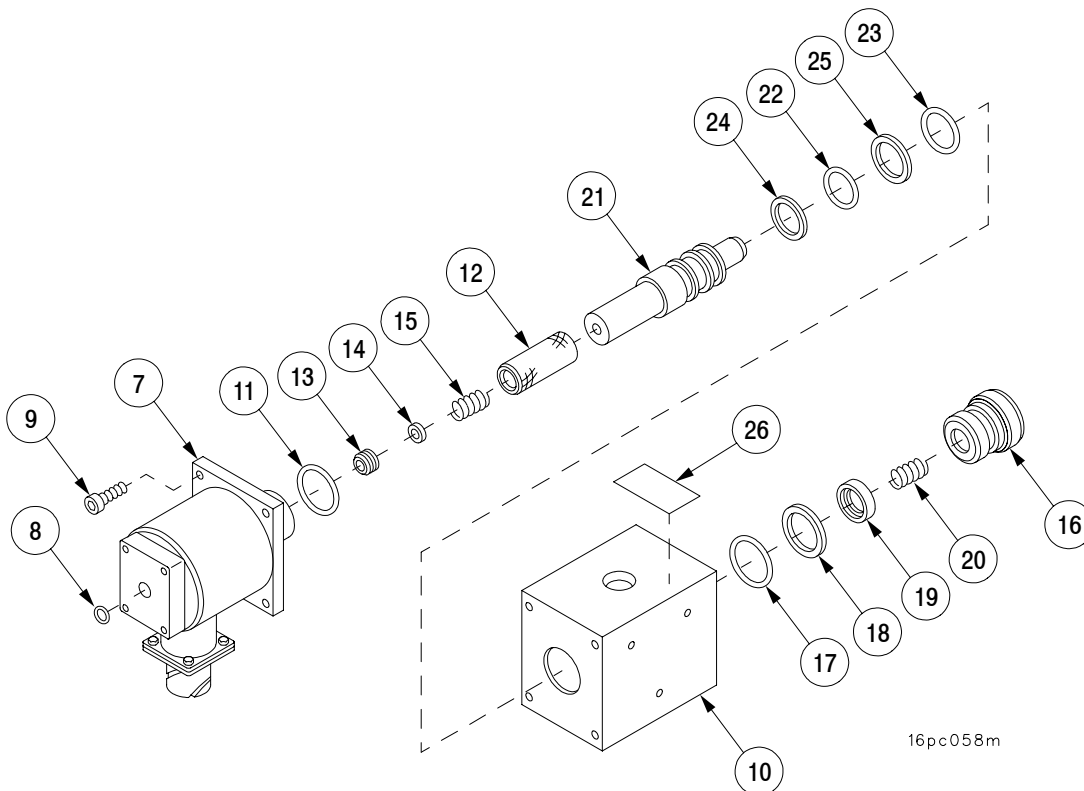
10-12 HYDRAULIC CLUTCH VALVE ASSEMBLY - CONTINUED

b. Assembly.

NOTE

ALL seals and sliding parts require to be lubricated with petrolatum.

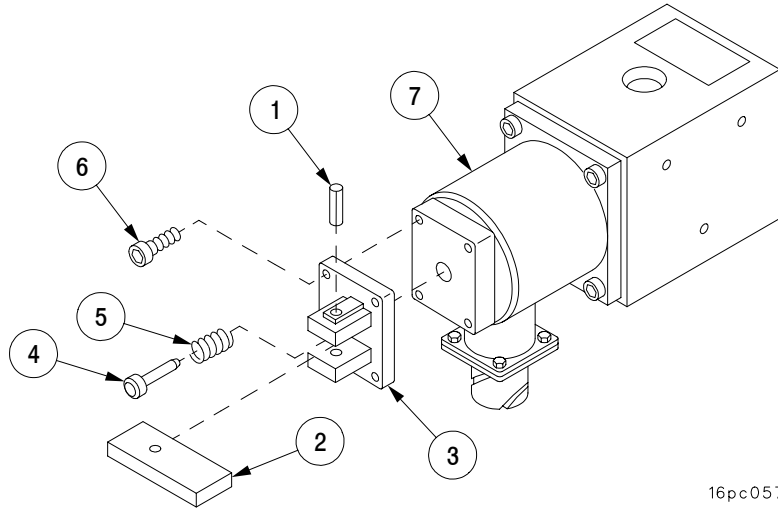
- 1 Install identification plate (26) to valve body (10) if necessary.
- 2 Install two new preformed packings (22 and 23) and two new backup rings (24 and 25) to poppet assembly (21).
- 3 Install poppet assembly (21) to valve body (10).
- 4 Install spring (20), new "T" seal (19), new backup ring (18) and new preformed packing (17) to cap (16).
- 5 Install cap (16) to secure poppet assembly (21) to valve body (10).
- 6 Install spring (15), disk (14) and disk retainer (13) to armature (12).
- 7 Install armature (12) and new preformed packing (11) to solenoid assembly (7).
- 8 Apply sealing compound to threads of four screws (9).
- 9 Position solenoid assembly (7) to valve body (10) and secure with four screws (9).
- 10 Install new preformed packing (8) to solenoid assembly (7).



10-12 HYDRAULIC CLUTCH VALVE ASSEMBLY - CONTINUED

b. Assembly - Continued

- 11 Position cap (3) to solenoid assembly (7) and secure with four screws (6).
- 12 Install spring (5) and pin (4) to cap (3).
- 13 Install lever (2) to cap (3) and secure with new spring pin (1).



16pc057m

10-13 SELECTOR VALVE (ELEVATION OR TRAVERSE).

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)

Equipment Conditions

Selector valve removed
(TM 9-2350-314-20-2-2)

Materials/Parts

Lockwashers (4) (item 218, Appx E)
Dust protective caps (item 22, Appx B)

a. Disassembly.

WARNING

Solenoid spring is under high compression. To avoid injury, restrain solenoid in bench vise during disassembly.

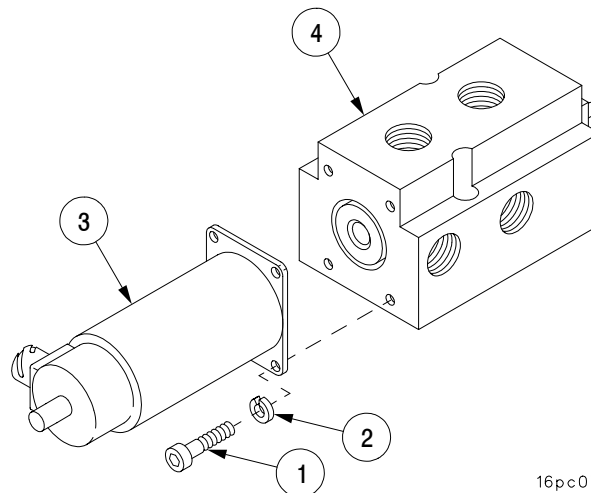
Slowly and evenly remove four capscrews (1), four lockwashers (2), and solenoid (3) from valve body (4). Discard lockwashers.

b. Assembly.

WARNING

Solenoid spring is under high compression. To avoid injury, restrain solenoid during assembly.

Install solenoid (3) on valve body (4) with four capscrews (1) and four new lockwashers (2).



16pc077m

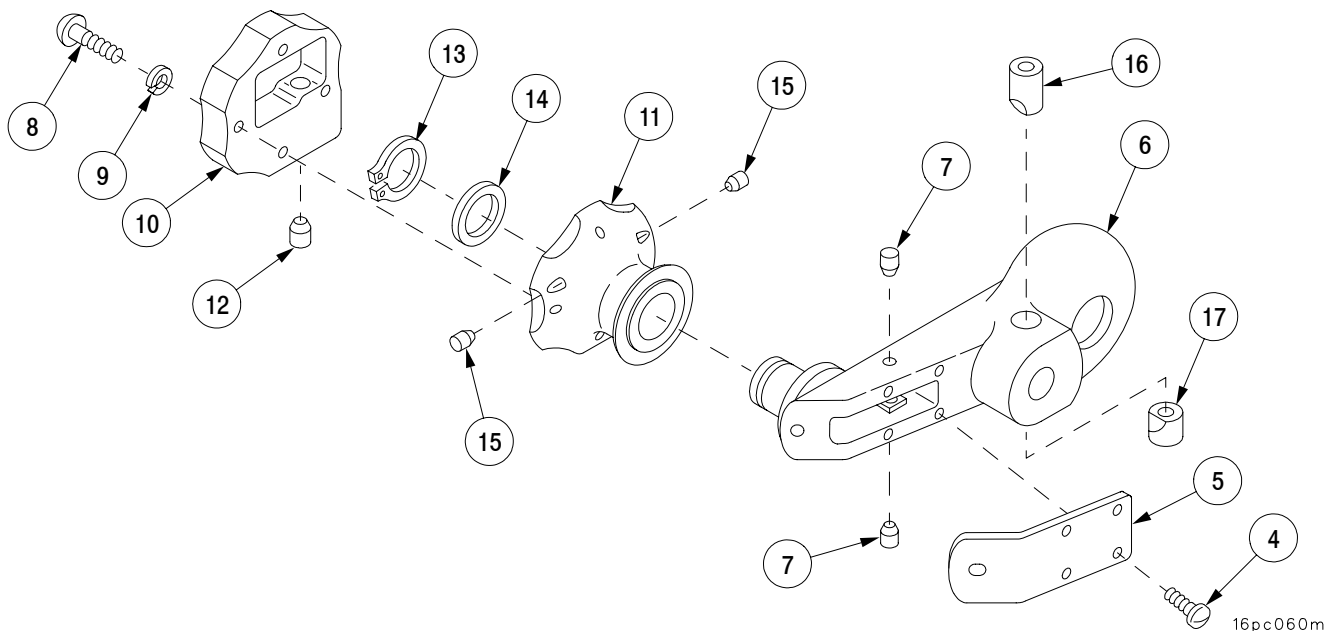
10-14 MANUAL ELEVATION PUMP HANDLE ASSEMBLY - CONTINUED

b. Disassembly.

- 1 Remove five assembled screws (4) and access cover (5) from elevating arm (6). Discard screws.
- 2 Remove two plugs (7) from elevating arm (6).
- 3 Remove four screws (8), four lockwashers (9) and knob cap (10) from knob (11). Discard lockwashers.
- 4 Remove and discard self-locking insert (12) from knob cap (10).
- 5 Remove retaining ring (13), ring spacer (14), and knob (11) from elevating arm (6). Discard retaining ring.
- 6 Remove two plugs (15) from knob (11).
- 7 Remove plain round nut (16) and collar bushing (17) from elevating arm (6).

c. Assembly.

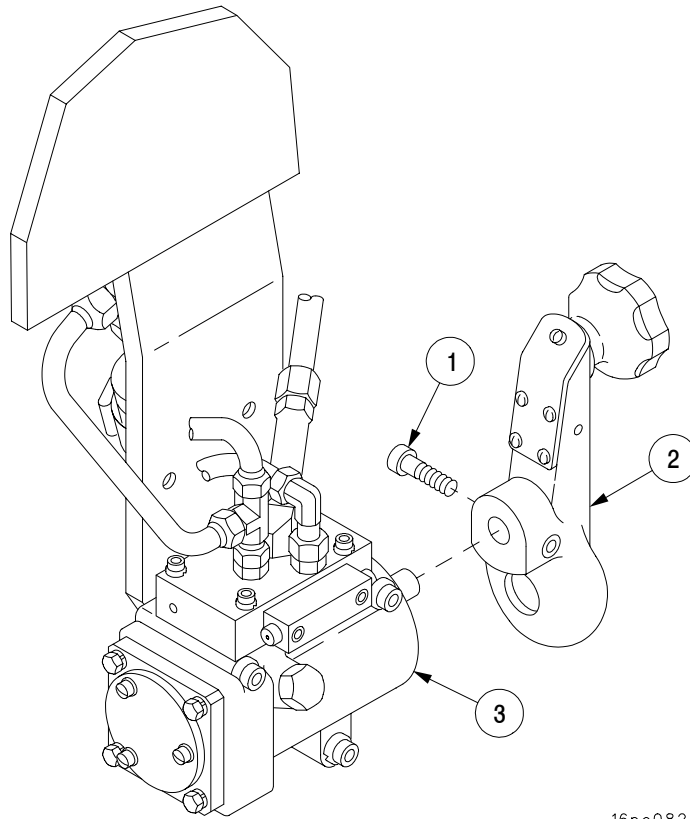
- 1 Install collar bushing (17) and plain round nut (16) to elevating arm (6).
- 2 Install two plugs (15) to knob (11).
- 3 Lubricate and install knob (11) to elevating arm (6). Secure with ring spacer (14) and new retaining ring (13).
- 4 Install knob cap (10) to knob (11) with four new lockwashers (9) and four screws (8).
- 5 Install new self-locking insert (12) to knob cap (10).
- 6 Install two plugs (7) to elevating arm (6).
- 7 Install access cover (5) to elevating arm (6) with five new assembled screws (4).



10-14 MANUAL ELEVATION PUMP HANDLE ASSEMBLY - CONTINUED

d. Installation

Position manual elevation handle assembly (2) to pump assembly (3) and secure with screw (1).

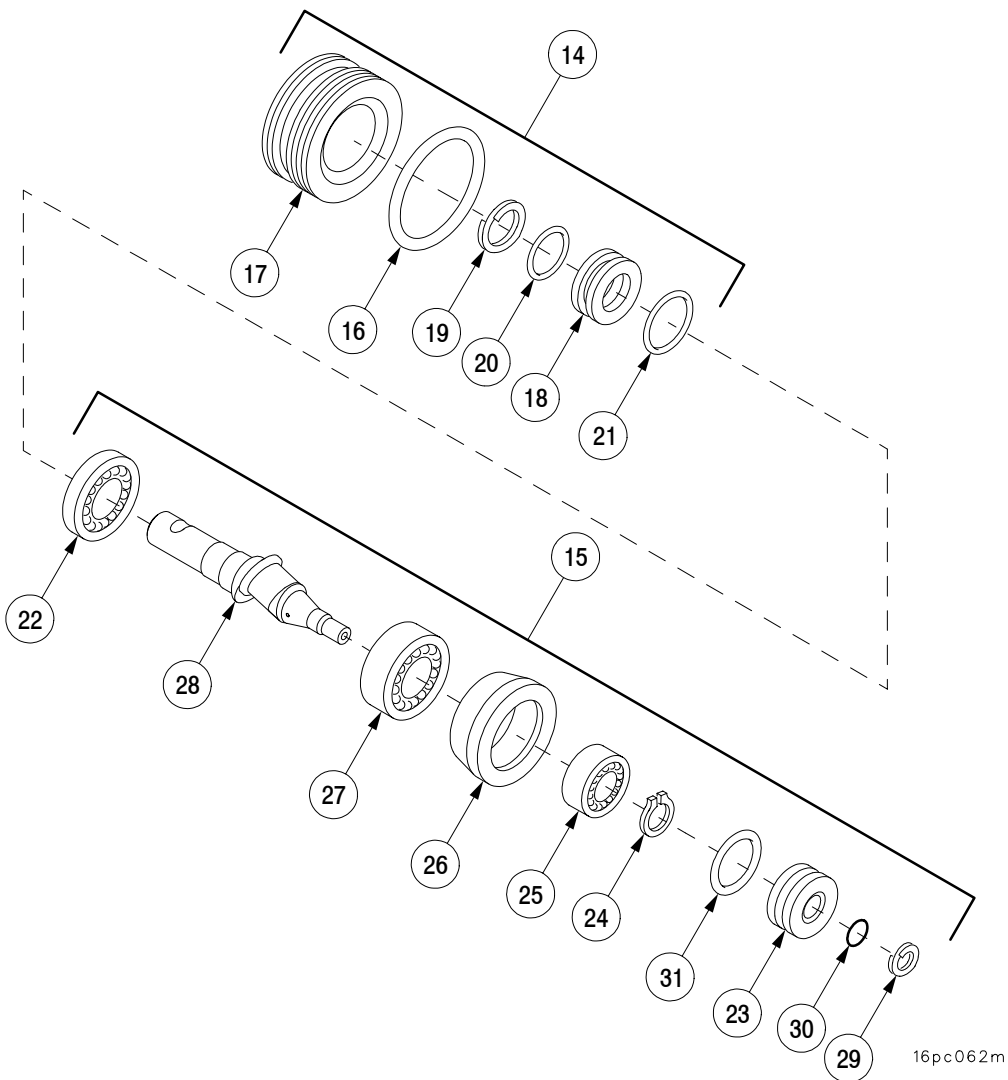


16pc082m

10-15 MANUAL ELEVATION PUMP AND MANIFOLD - CONTINUED

a. Disassembly - Continued

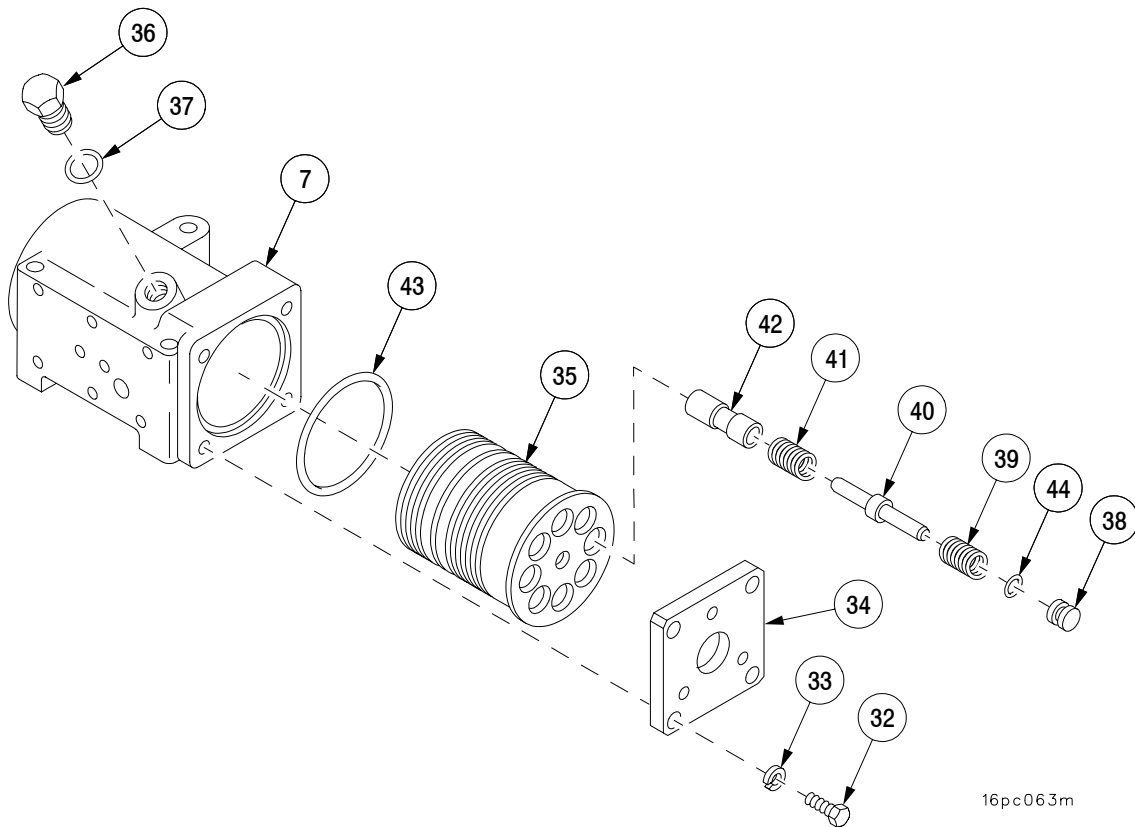
- 7 Remove retainer cover assembly (14) from shaft assembly (15).
- 8 Remove and discard preformed packing (16) from retainer cover (17).
- 9 Remove sleeve spacer (18) from retainer cover (17).
- 10 Remove packing retainer (19), preformed packing (20), and preformed packing (21) from sleeve spacer (18). Discard packing retainer and preformed packings.
- 11 Remove bearing (22), sleeve spacer (23), retaining ring (24), bearing (25), retaining spring (26), and bearing (27) from shaft (28). Discard retaining ring.
- 12 Remove packing retainer (29), preformed packing (30), and preformed packing (31) from sleeve spacer (23). Discard packing retainer and preformed packings.



10-15 MANUAL ELEVATION PUMP AND MANIFOLD - CONTINUED

a. Disassembly - Continued

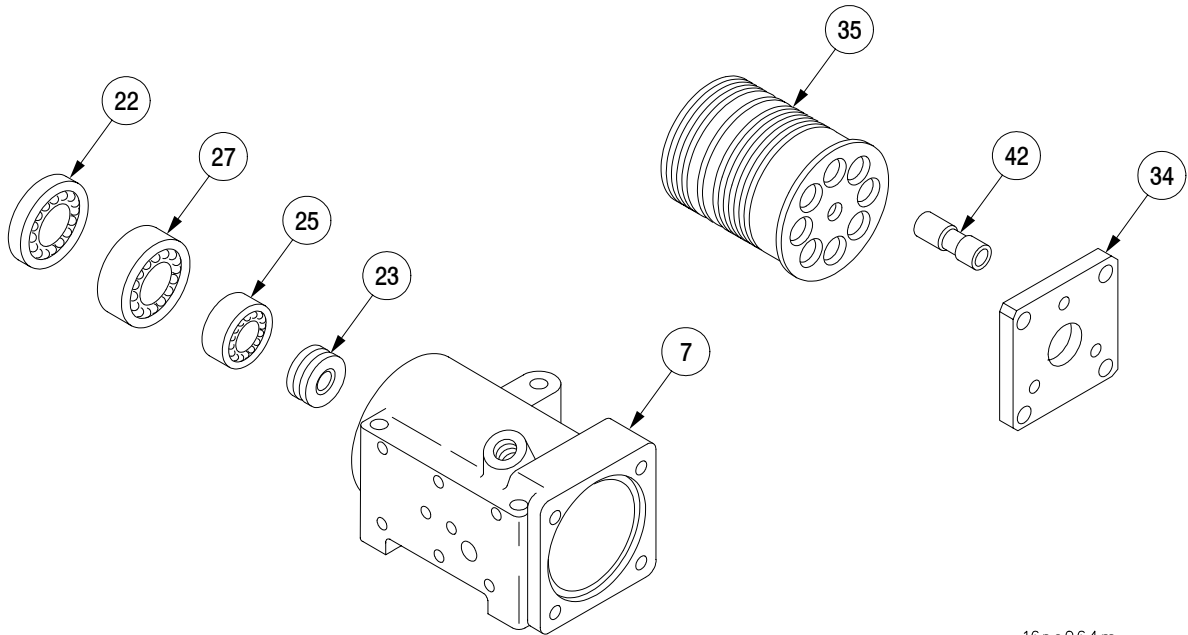
- 13 Remove four hex head capscrews (32), four lockwashers (33), and access cover (34). Discard lockwashers.
- 14 Withdraw block assembly (35) from pump housing (7).
- 15 Remove plug (36) and preformed packing (37) from pump housing (7). Discard preformed packing.
- 16 Remove eight each of the following: pump retainers (38), piston springs (39), piston spring guides (40), piston springs (41) and pistons (42). Discard piston springs and piston guides.
- 17 Remove and discard four preformed packings (43) from block assembly (35).
- 18 Remove and discard eight preformed packings (44) from eight pump retainers (38).



10-15 MANUAL ELEVATION PUMP AND MANIFOLD - CONTINUED

b. Inspection.

- 1 Inspect bearings (22, 25, and 27) (TM 9-214).
- 2 Replace bearing sleeve spacer (23) if outside diameter is less than 0.871 inch (22 mm) or inside diameter is greater than 0.38 inch (10 mm).
- 3 Inspect block assembly (35). Replace if any cylinder bore inside diameter is greater than 0.501 inch (13 mm).
- 4 Inspect eight pistons (42). Replace block assembly (35) if any piston (42) outside diameter is more than 0.001 inch (0.025 mm) less than its respective number piston bore's inside diameter. (Example: if piston bore is 0.500 inch (12.7 mm), then piston outside diameter must be between 0.499 inch and 0.500 inch (12.6 and 12.7 mm).
- 5 Inspect access cover (34) and pump housing (7). Replace if cracked, distorted or damaged.



16pc064m

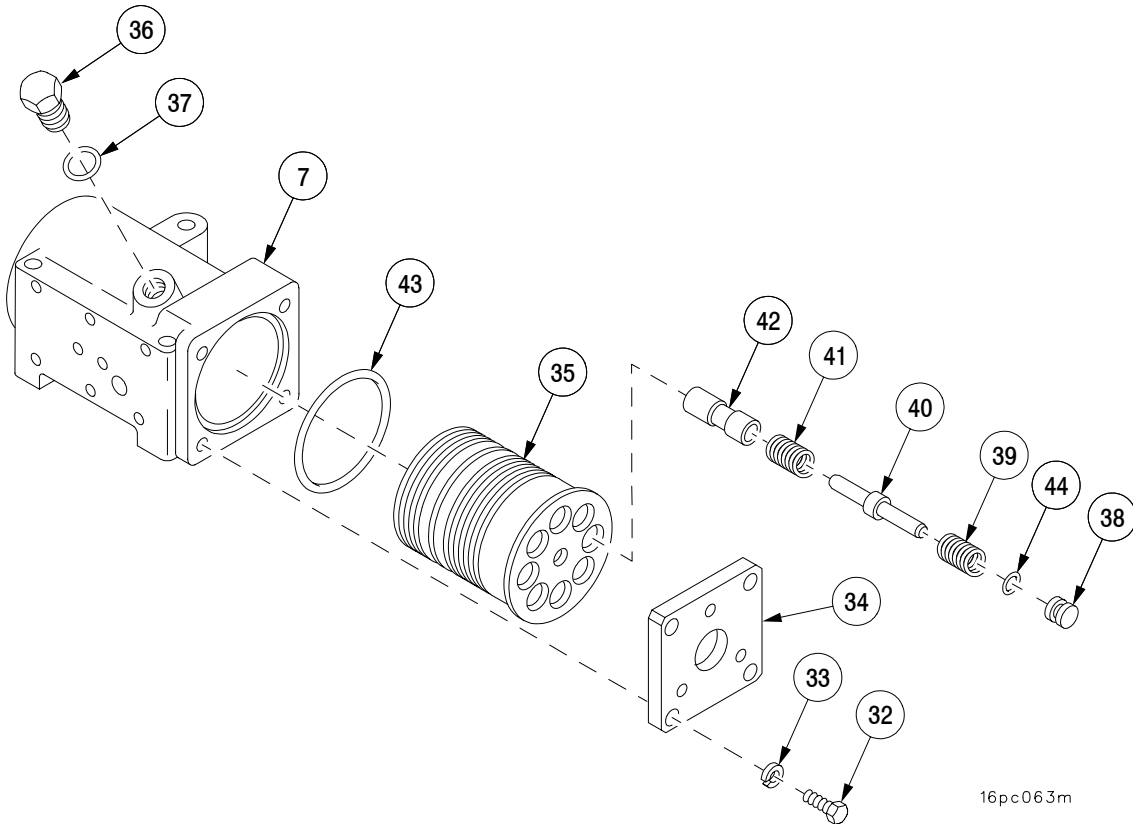
10-15 MANUAL ELEVATION PUMP AND MANIFOLD - CONTINUED

c. Assembly.

NOTE

A thin, even coat of hydraulic fluid must be applied to ALL new preformed packings to form a good seal between hydraulic components during assembly.

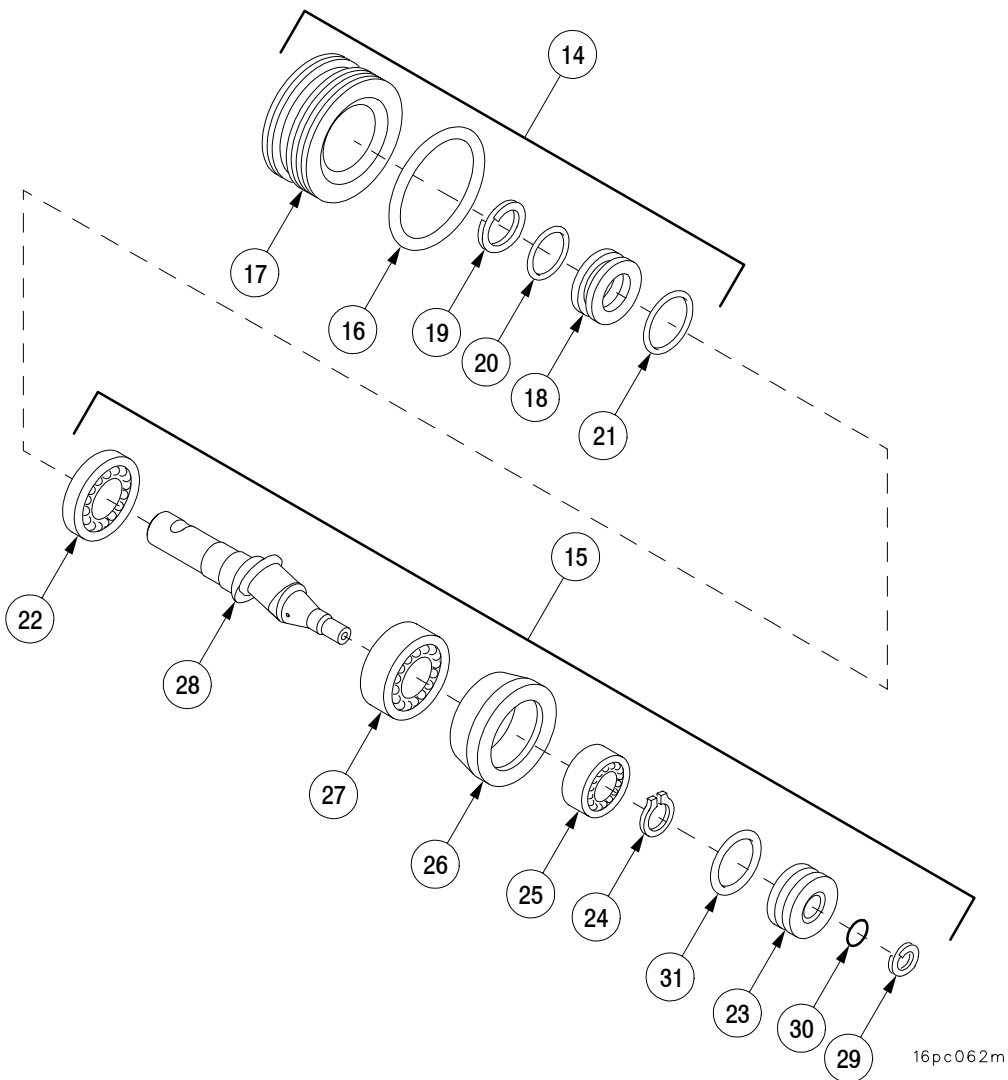
- 1 Install eight new preformed packings (44) on eight pump retainers (38).
- 2 Install four new preformed packings (43) to block assembly (35).
- 3 Install eight each of the following: pistons (42), new piston springs (41), new piston spring guides (40), new piston springs (39), and pump retainers (38).
- 4 Install plug (36) with new preformed packing (37) to pump housing (7).
- 5 Install block assembly (35) in housing (7).
- 6 Install access cover (34), four new lockwashers (33), and four hex head capscrews (32).



10-15 MANUAL ELEVATION PUMP AND MANIFOLD - CONTINUED

c. Assembly - Continued

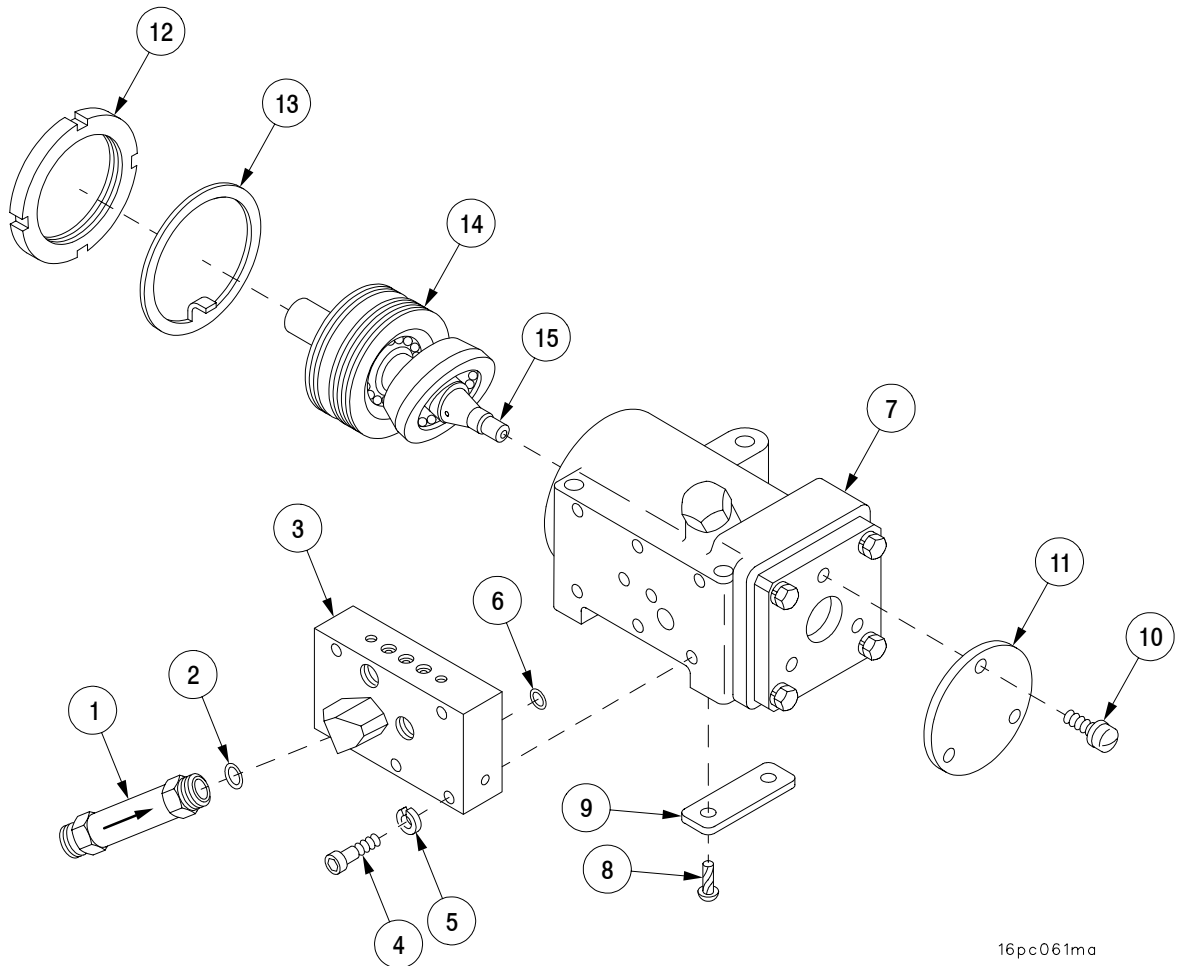
- 7 Install new preformed packing (31), new preformed packing (30), and new packing retainer (29) on sleeve spacer (23).
- 8 Install bearing (27), retaining spring (26), bearing (25), new retaining ring (24), sleeve spacer (23), and bearing (22) on shaft (28).
- 9 Install new preformed packing (21), new preformed packing (20), and new packing retainer (19) on sleeve spacer (18).
- 10 Install sleeve spacer (18) in retaining cover (17).
- 11 Install new preformed packing (16) on retainer cover (17).
- 12 Install retainer cover assembly (14) on shaft assembly (15).



10-15 MANUAL ELEVATION PUMP AND MANIFOLD - CONTINUED

c. Assembly - Continued

- 13 Install retainer cover assembly (14) with shaft assembly (15) in pump housing (7).
- 14 Install new keywasher (13) and plain round nut (12) on retainer cover assembly (14).
- 15 Install cover (11) and three screws (10) on pump housing (7).
- 16 Position nameplate (9) to pump housing (7) and install with two new drive screws (8).
- 17 Position manifold (3) with three new preformed packings (6) to pump housing (7) and install with five screws (4) and five new lockwashers (5).
- 18 Install check valve (1) with new preformed packing (2) to manifold (3).
- 19 Install shuttle valve (para 10-16).
- 20 Install manual elevation mechanism handle assembly (para 10-14).
- 21 Install manual elevation mechanism (TM 9-2350-314-20-2-2).

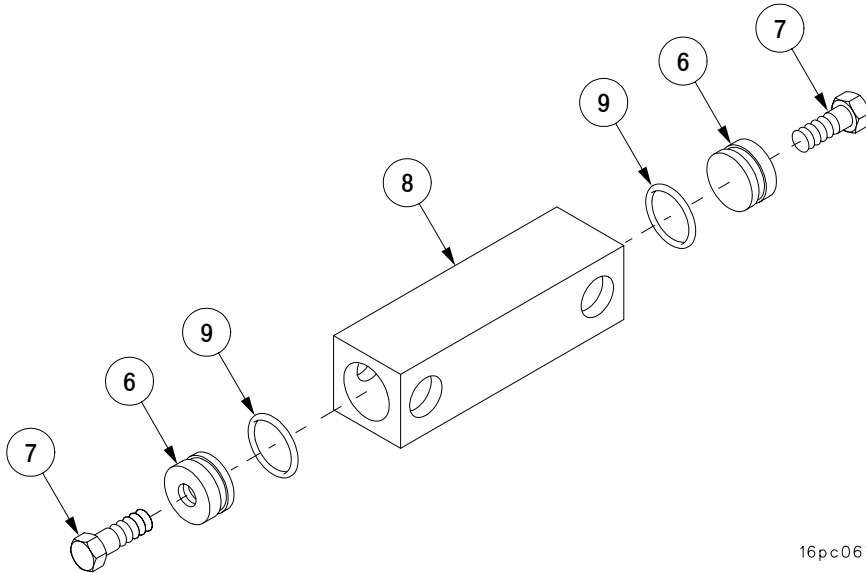


16pc061ma

10-16 SHUTTLE VALVE - CONTINUED

b. Disassembly

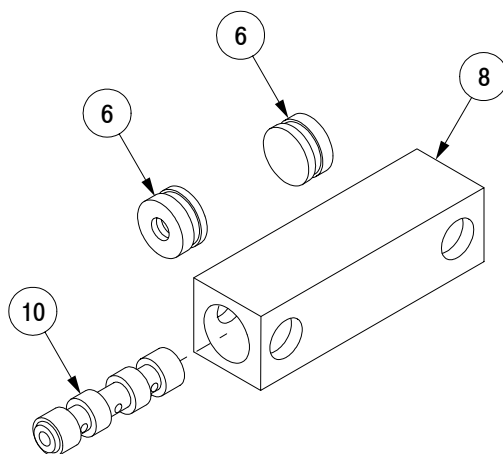
- 1 Remove two end plugs (6) by screwing a No. 4-40 screw (7) into each end plug (6) and pulling end plugs out of body (8).
- 2 Remove and discard two preformed packings (9).
- 3 Remove screws (7) from end plugs (6).



16pc067m

c. Inspection.

- 1 Inspect two end plugs (6). Replace if cracked.
- 2 Inspect spool (10) by sliding spool back and forth within body (8).

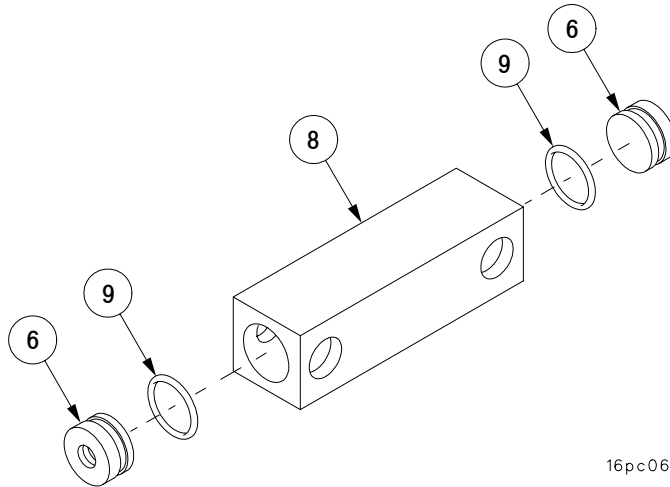


16pc067ma

10-16 SHUTTLE VALVE - CONTINUED

d. Assembly.

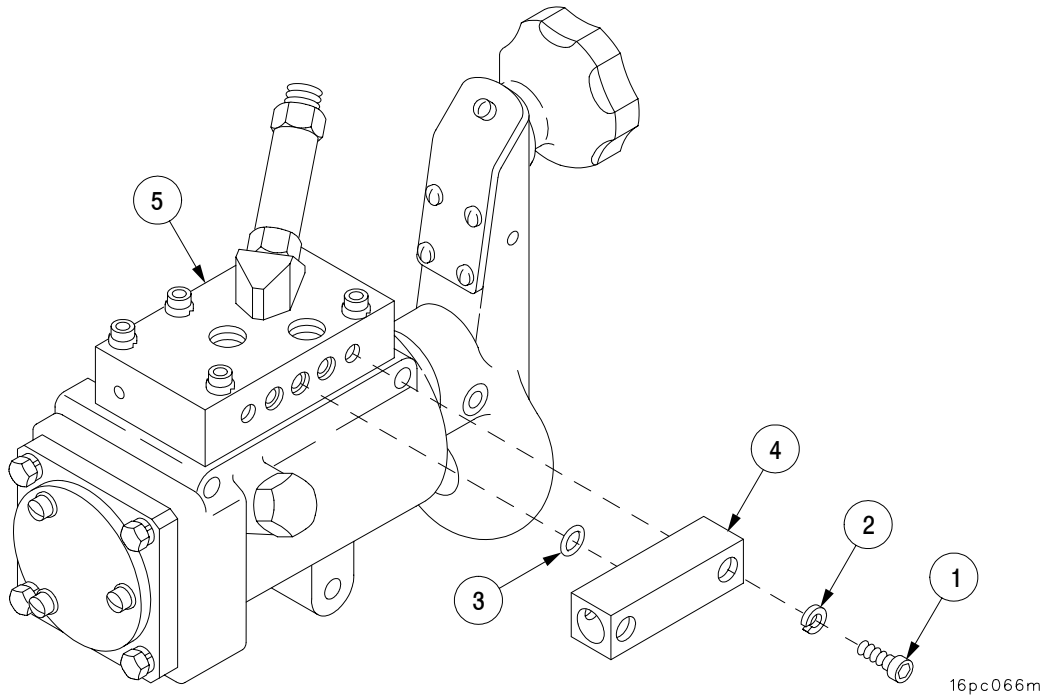
- 1 Install two new preformed packings (9), one each on two end plugs (6).
- 2 Install two end plugs (6) into body (8) being careful not to cut preformed packings (9).



16pc066ma

e. Installation.

- 1 Install shuttle valve (4) to manifold (5) with three new packings (3), two new lockwashers (2) and two screws (1).
- 2 Install manual elevation assembly (TM 9-2350-314-20-2-2).



16pc066m

10-17 HYDRAULIC FLUID FILTER ASSEMBLY.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Torque wrench (item 77, Appx F)

Materials/Parts

Preformed packings (3) (item 75, Appx E)
Preformed packing (item 86, Appx E)
Preformed packing (item 88, Appx E)
Backup rings (2) (item 57, Appx E)
Preformed packings (2) (item 139, Appx E)
Preformed packings (3) (item 138, Appx E)
Hydraulic fluid (item 42, Appx B)
Dust protective plugs (item 59, Appx B)
Sealing compound (item 37, Appx B)
Preformed packing (item 142, Appx E)
Primer (item 60, Appx B)
Marking tags (AR) (item 71, Appx B)

Equipment Conditions

Hydraulic reservoir drained
(TM 9-2350-314-20-2-2)
Hydraulic filter assembly removed
(TM 9-2350-314-20-2-2)

References

TM 9-2350-314-20-2-2

10-17 HYDRAULIC FLUID FILTER ASSEMBLY - CONTINUED

a. Disassembly.

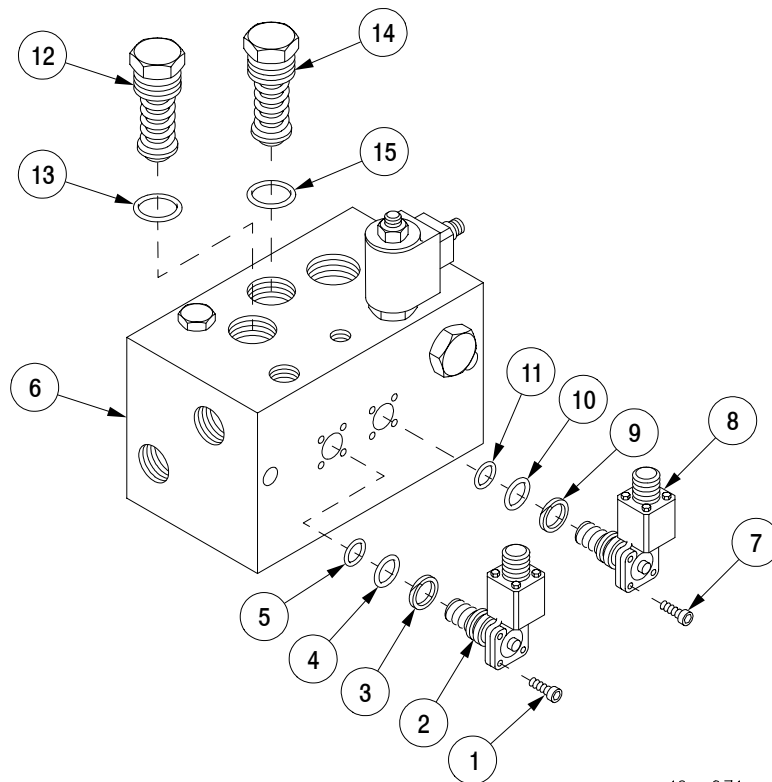
CAUTION

Cap hydraulic lines and ports to prevent contaminants from entering hydraulic system and causing internal damage to hydraulic components.

NOTE

Prior to removal, tag all hydraulic lines and components for identification during installation.

- 1 Remove four screws (1), switch (2), backup ring (3), and two preformed packings (4 and 5) from housing (6). Discard preformed packings and backup ring.
- 2 Remove four screws (7), switch (8), backup ring (9), and two preformed packings (10 and 11) from housing (6). Discard preformed packings and backup ring.
- 3 Remove bypass relief valve (12) and preformed packing (13) from housing (6). Discard preformed packing.
- 4 Remove bypass relief valve (14) and preformed packing (15) from housing (6). Discard preformed packing.



16pc071m

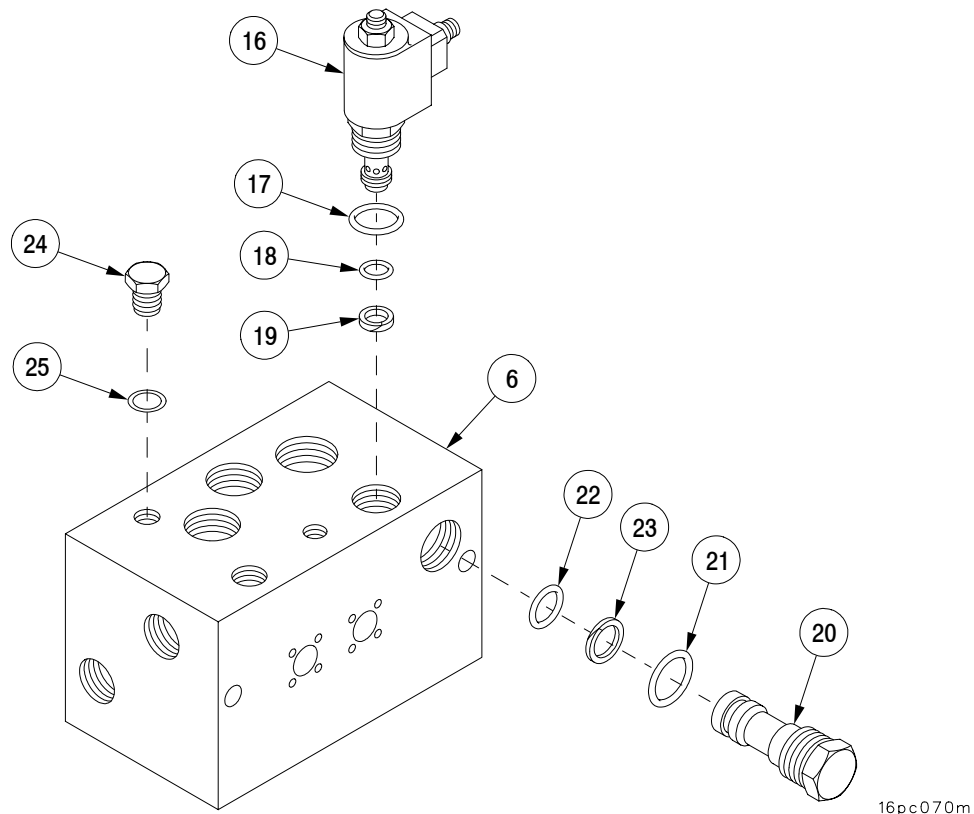
10-17 HYDRAULIC FLUID FILTER ASSEMBLY - CONTINUED

a. Disassembly - Continued

- 5 Remove solenoid valve (16), two preformed packings (17 and 18), and backup ring (19) from housing (6). Discard preformed packings and backup ring.
- 6 Remove system relief valve (20), two preformed packings (21 and 22), and backup ring (23) from housing (6). Discard preformed packings and backup ring.
- 7 Remove plug (24) and preformed packing (25) from housing (6). Discard preformed packing.

b. Assembly.

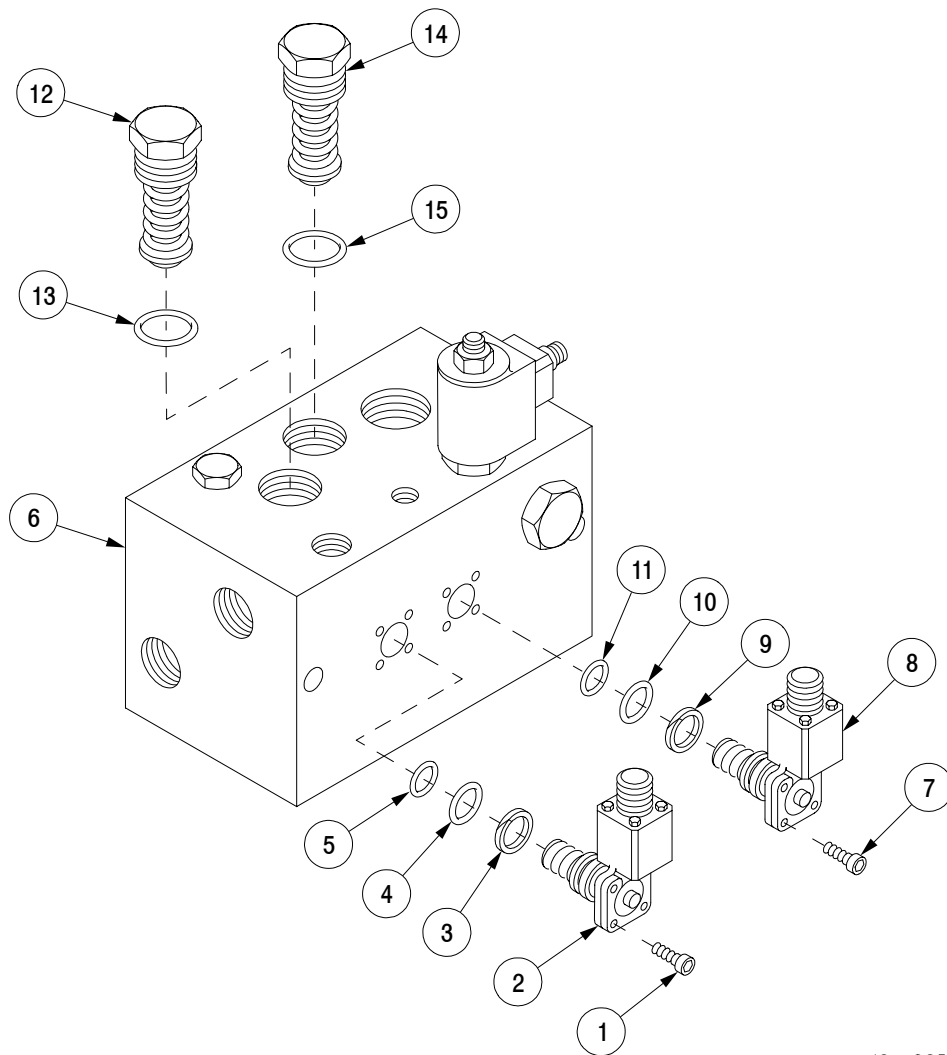
- 1 Install plug (24) with new preformed packing (25) into housing (6).
- 2 Install system relief valve (20) with two new preformed packings (21 and 22) and new backup ring (23) into housing (6). Torque valve to 75 lb-in. (8.47 N-m).
- 3 Install solenoid valve (16) with two new preformed packings (17 and 18) and backup ring (19) into housing (6). Torque valve to 75 lb-in. (8.47 N-m).



10-17 HYDRAULIC FLUID FILTER ASSEMBLY - CONTINUED

b. Assembly - Continued

- 4 Install bypass relief valve (14) with new preformed packing (15) into housing (6).
- 5 Install bypass relief valve (12) with new preformed packing (13) into housing (6).
- 6 Apply primer coating and sealing compound to threads of four screws (1) and four screws (7).
- 7 Install switch (8) with three new preformed packings (9, 10, and 11) and four screws (7) into housing (6). Torque four screws to 17-19 lb-in. (1.9-2.1 N·m).
- 8 Install switch (2) with three new preformed packing (3, 4, and 5) into housing (6). Torque four screws to 17-19 lb-in. (1.9-2.1 N·m).
- 9 Install hydraulic filter assembly (TM 9-2350-314-20-2-2).



16pc065m

10-18 LOADER RAMMER CONTROL VALVE.

This task covers: a. Disassembly b. Inspection and Repair
 c. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Number 4-40 screw (item 42, Appx F)

Equipment Condition

Rammer actuating valve removed
(TM 9-2350-314-20-2-2)

Materials/Parts

Hydraulic fluid (item 42, Appx B)
Preformed packings (2) (item 65, Appx E)
Preformed packings (2) (item 68, Appx E)
Preformed packings (2) (item 77, Appx E)
Retaining ring (item 182, Appx E)
Lockwashers (4) (item 98, Appx E)
Lockwashers (4) (item 111, Appx E)
Spring pins (2) (item 130, Appx E)
Dust protective cap (item 22, Appx B)
Plastic bag (item 14, Appx B)

a. Disassembly.

WARNING

Springs beneath plate are under high preload.
Restrain plate in bench vise during disassembly.
Injury to personnel could occur from flying
components.

NOTE

- A thin even coat of clean hydraulic fluid must be applied to ALL new packing material to form a good seal between hydraulic components during installation.
- All serviceable components must be placed in plastic bags to prevent contamination of hydraulic system during installation.

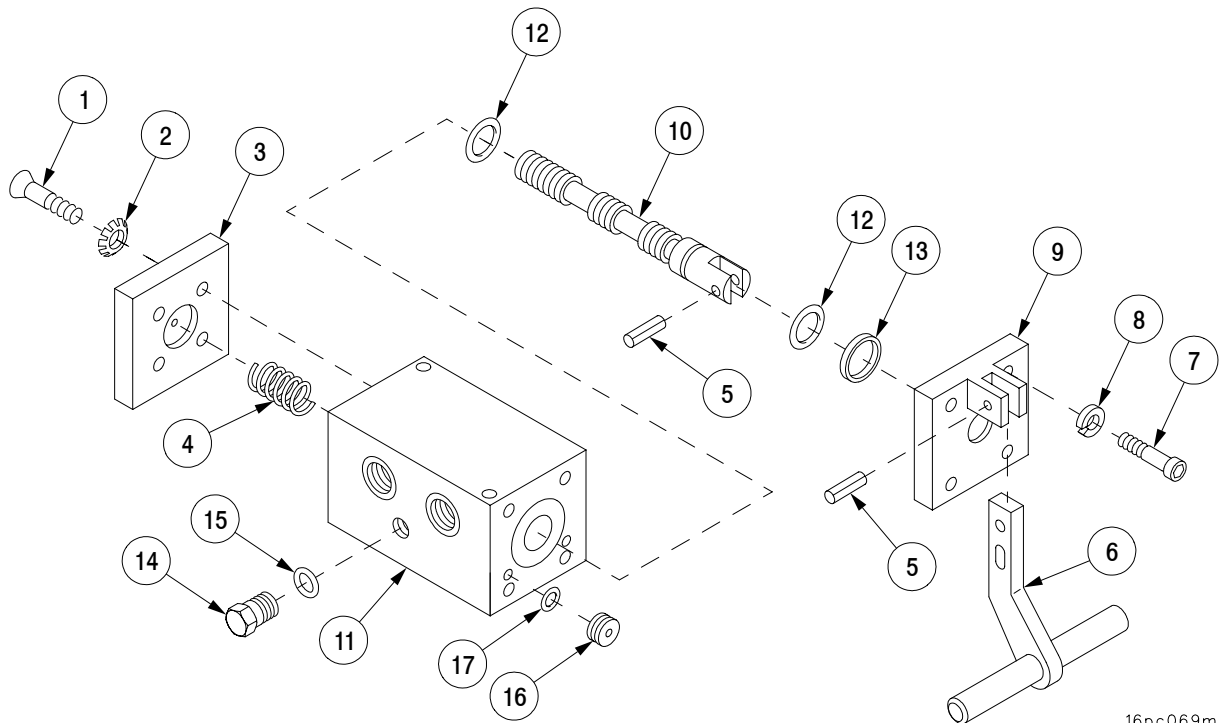
10-18 LOADER RAMMER CONTROL VALVE - CONTINUED

a. Disassembly - Continued

- 1 Remove four socket head capscrews (1), four lockwashers (2), plate (3), and spring (4). Discard lockwashers.
- 2 Remove two spring pins (5) and manual control lever (6). Discard spring pins.
- 3 Remove four socket head capscrews (7), four lockwashers (8), and cover (9). Discard lockwashers.
- 4 Withdraw spool (10) from valve body (11).
- 5 Remove and discard two preformed packings (12) from spool (10).
- 6 Remove retaining ring (13) from spool (10). Discard retaining ring.
- 7 Remove two plugs (14) and two preformed packings (15) from valve body (11). Discard preformed packings.
- 8 Using number 4-40 screw, remove two plugs (16) and two preformed packings (17). Discard preformed packings.

b. Inspection and Repair.

- 1 Inspect spring (4). Replace if cracked, nicked, distorted, or broken.
- 2 Inspect valve body (11). Replace if cracked or distorted.
- 3 Inspect spool (10). Replace if cracked, distorted, or scored.



16pc069m

10-18 LOADER RAMMER CONTROL VALVE - CONTINUED

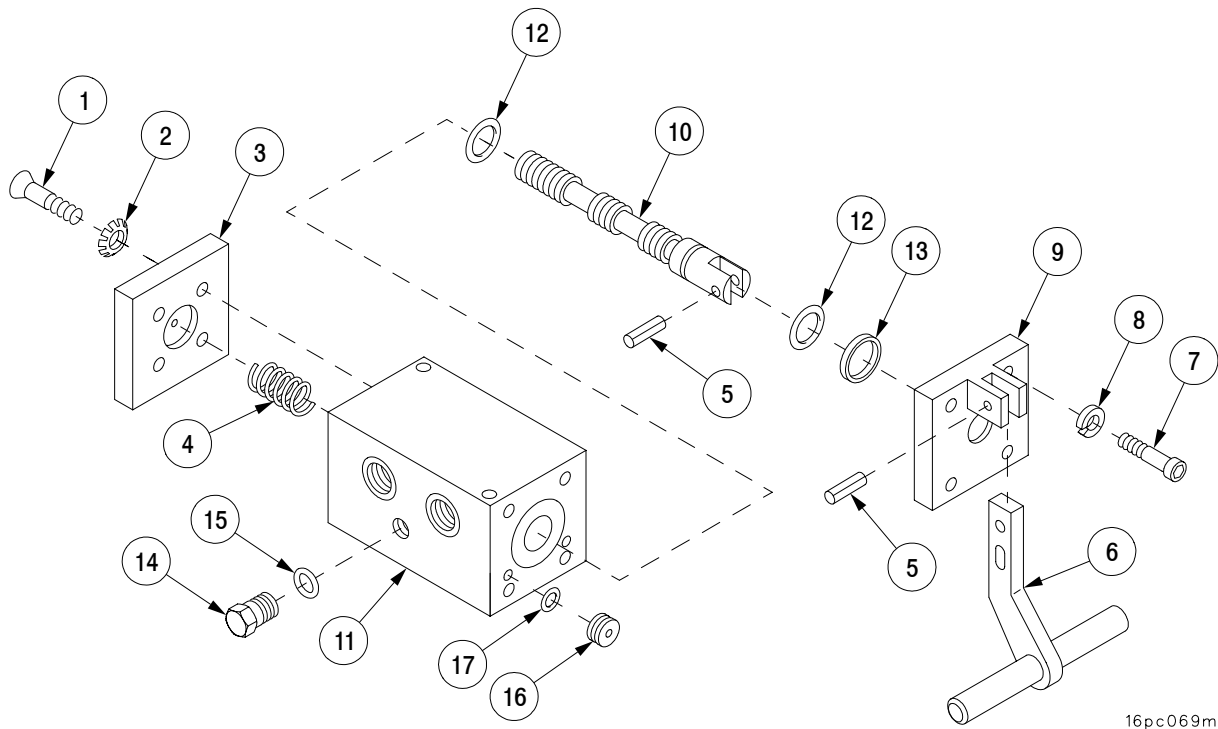
c. Assembly.

- 1 Using number 4-40 screw, install two new preformed packings (17) and two plugs (16).
- 2 Install two new preformed packings (15) and two plugs (14) in valve body (11).
- 3 Install new retaining ring (13) and two new preformed packings (12) on spool (10).
- 4 Coat spool (10) with hydraulic fluid. Install spool (10) in valve body (11).
- 5 Install cover (9), four new lockwashers (8), and four socket head capscrews (7).
- 6 Install manual control lever (6) and two new spring pins (5).

WARNING

Spring must be compressed to assemble. Make provision to contain parts against sudden release during assembly. Injury to personnel could occur if parts are suddenly released.

- 7 Install spring (4), plate (3), four new lockwashers (2), and four socket head capscrews (1).



16pc069m

10-19 TRAVERSE LIMIT VALVE ASSEMBLY.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanics tool kit
(SC 5180-95-A12)

Equipment Conditions

Traverse limit valve removed
(TM 9-2350-314-20-2-2)

Materials/Parts

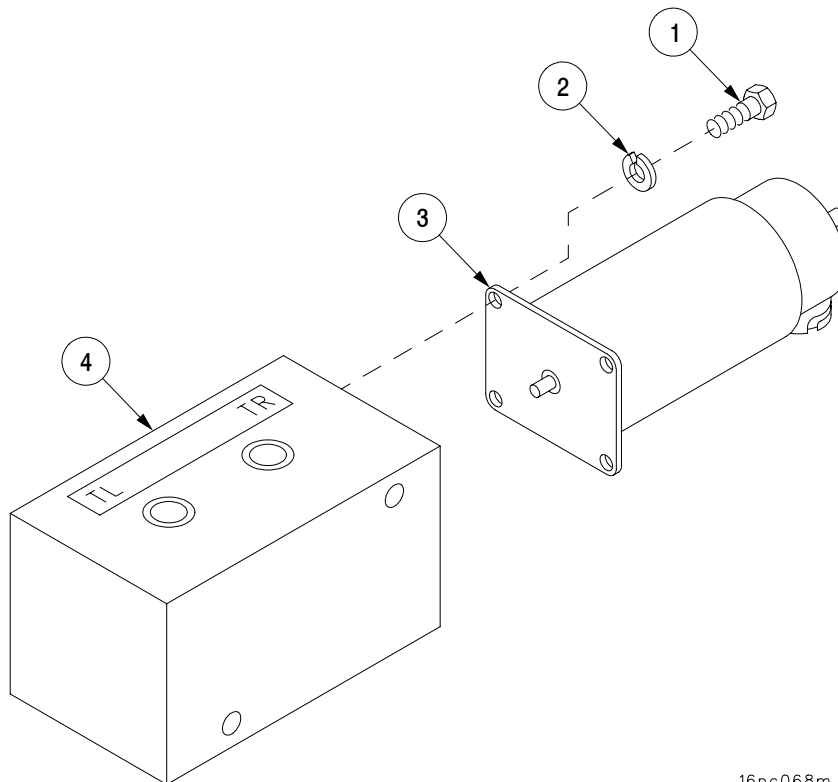
Lockwashers (4) (item 218, Appx E)

a. Disassembly.

Remove four screws (1), four lockwashers (2), and solenoid (3) from valve body (4). Discard lockwashers.

b. Assembly.

Position solenoid (3) to valve body (4) and secure with four new lockwashers (2) and four screws (1).



16pc068m

10-20 PULSE ACCUMULATOR.

This task covers: a. Disassembly b. Assembly c. Test

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Nitrogen charging kit (item 31, Appx F)

Equipment Conditions

Pulse accumulator removed
(TM 9-2350-314-20-2-2)

Materials/Parts

Preformed packings (4) (item 232, Appx E)
Nitrogen (item 53, Appx B)
Hydraulic fluid (item 42, Appx B)
Dust protective plug (item 59, Appx B)

a. Disassembly.

- 1 Remove two screws (1) and guard (2).

WARNING

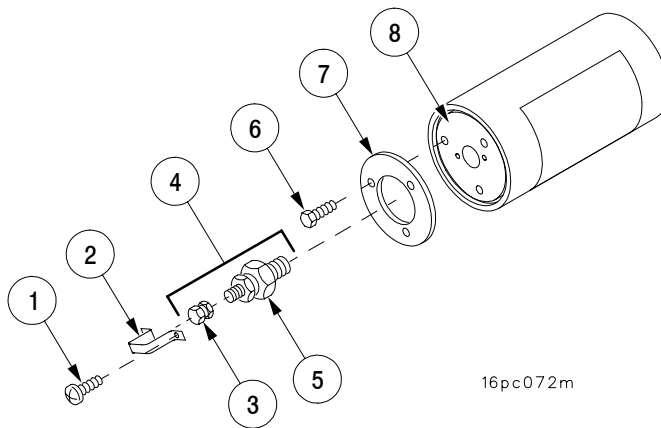
Accumulator may contain high pressure nitrogen. Use caution when handling and working with it or serious injury or death may occur.

- 2 Remove cap (3) from charging valve (4). Loosen charging valve nut (5) on charging valve (4) to release nitrogen pre-charge pressure from accumulator assembly. Ensure all nitrogen has been vented from accumulator assembly.

WARNING

Ensure all nitrogen is vented from accumulator before loosening charging valve to prevent serious injury.

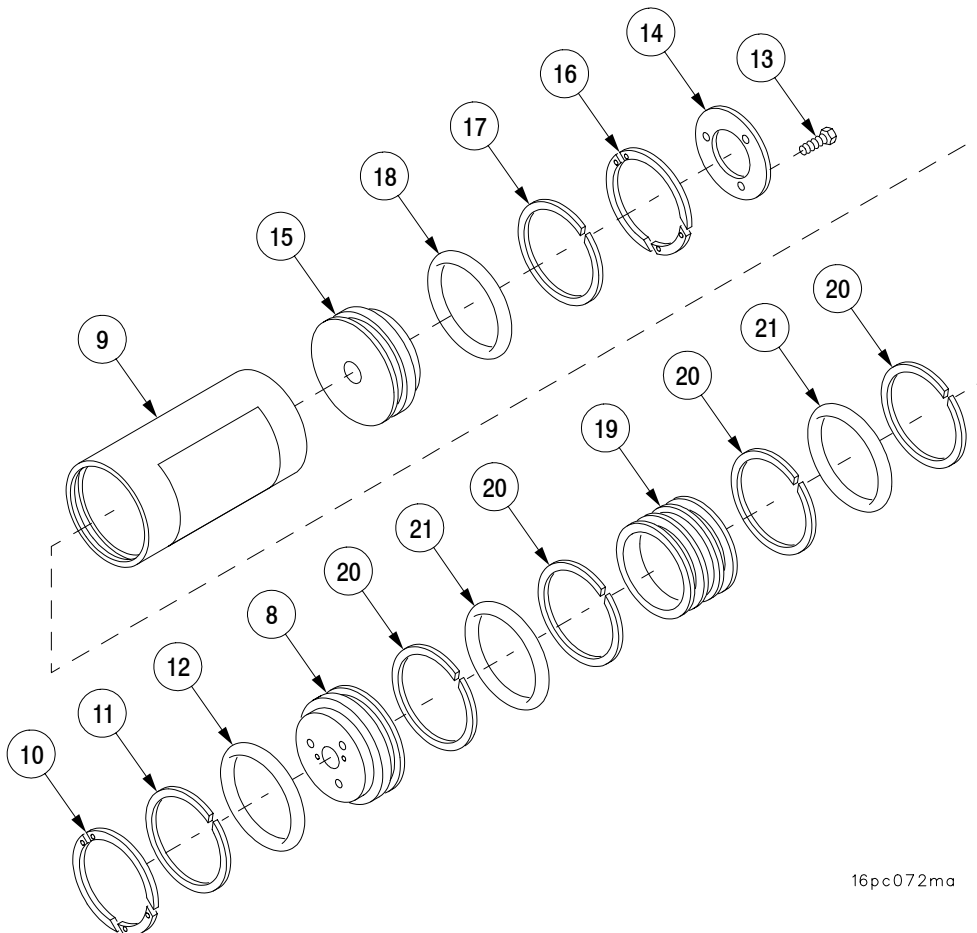
- 3 Remove charging valve (4).
- 4 Remove three capscrews (6) and piston stop plate (7) from head (8).



10-20 PULSE ACCUMULATOR - CONTINUED

a. Disassembly - Continued

- 5 Push head (8) into cylinder (9) about one inch to permit ring segments (10) to be removed from groove on inside of cylinder (9). Remove three ring segments from groove inside cylinder.
- 6 Remove head (8) from cylinder (9).
- 7 Remove packing retainer (11) and preformed packing (12) from head (8). Discard preformed packings.
- 8 Remove three capscrews (13) and hydraulic piston stop plate (14).
- 9 Push base (15) into cylinder (9) about one inch to permit segments of ring (16) to be removed from groove on inside of cylinder (9). Remove three ring segments (16) from groove inside cylinder (9).
- 10 Remove base (15) from cylinder (9).
- 11 Remove packing retainer (17) and preformed packing (18) from base (15). Discard preformed packing.
- 12 Remove hydraulic piston (19) from cylinder (9).
- 13 Remove four packing retainers (20) and two preformed packings (21) from hydraulic piston (19). Discard preformed packings.

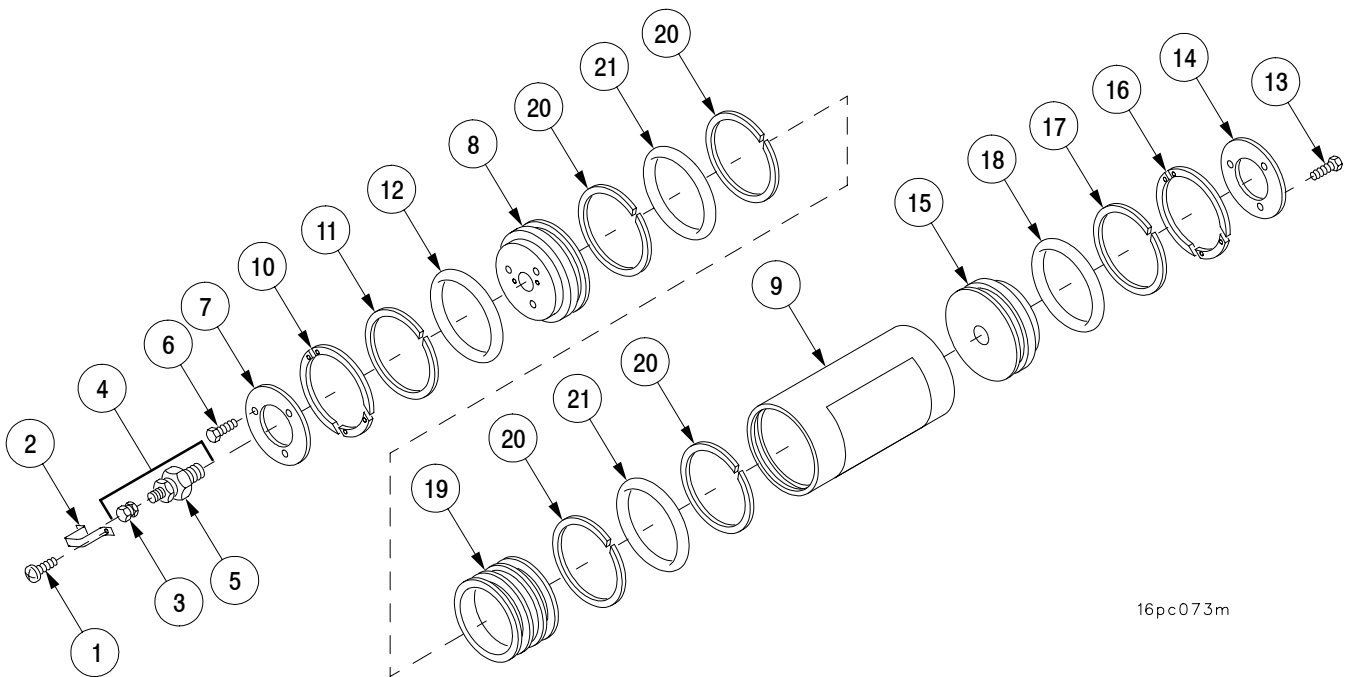


16pc072ma

10-20 PULSE ACCUMULATOR - CONTINUED

b. Assembly.

- 1 Install two new preformed packings (21) and four packing retainers (20) on hydraulic piston (19).
- 2 Coat hydraulic piston (19) with hydraulic fluid and insert into cylinder (9) far enough to allow room for base (15) and three ring segments (16).
- 3 Install new preformed packing (18) and packing retainer (17) on base (15).
- 4 Coat base (15) with hydraulic fluid and insert into cylinder (9), being careful not to scratch finished surfaces of cylinder (9) or base (15). Push base (15) far enough into cylinder (9) to expose groove for three ring segments (16).
- 5 Install three ring segments (16) in groove inside cylinder (9).
- 6 Install piston stop plate (14) and secure with three capscrews (13).
- 7 Install new preformed packing (12) and packing retainer (11) on head (8).
- 8 Coat head (8) with hydraulic fluid and insert into cylinder (9), being careful not to scratch finished surfaces. Push head (8) far enough into cylinder (9) to expose groove for three ring segments (10).
- 9 Install three ring segments (10) in groove inside cylinder (9).
- 10 Install piston stop plate (7) on head (8) with three capscrews (6).
- 11 Install charging valve (4). Tighten charging valve nut (5).
- 12 Install cap (3), guard (2) and two screws (1) after testing of accumulator assembly (para 10-20c).



16pc073m

10-20 PULSE ACCUMULATOR - CONTINUED

c. Test.

NOTE

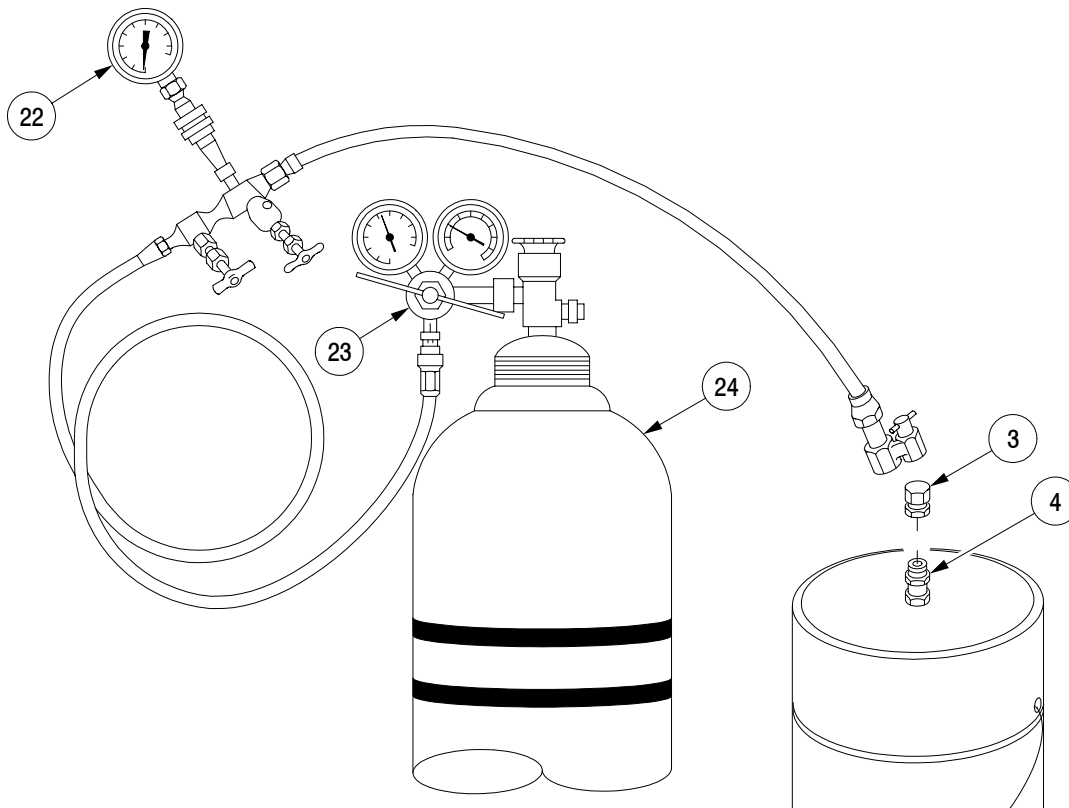
The accumulator assembly must be tested every time after repair before it is installed in the vehicle.
Accumulator must be charged to 900 ± 50 psi with dry nitrogen to perform test.

- 1 Remove low pressure gage (22) from nitrogen charging regulator (23).

WARNING

The pulse accumulator is charged to 900 ± 50 psi.
Use caution when relieving pressure. Wear gloves and goggles to prevent personal injury.

- 2 Attach and tighten nitrogen charging regulator (23) to nitrogen charging cylinder (24) as shown.
- 3 Remove cap (3) from charging valve (4).



16p074m

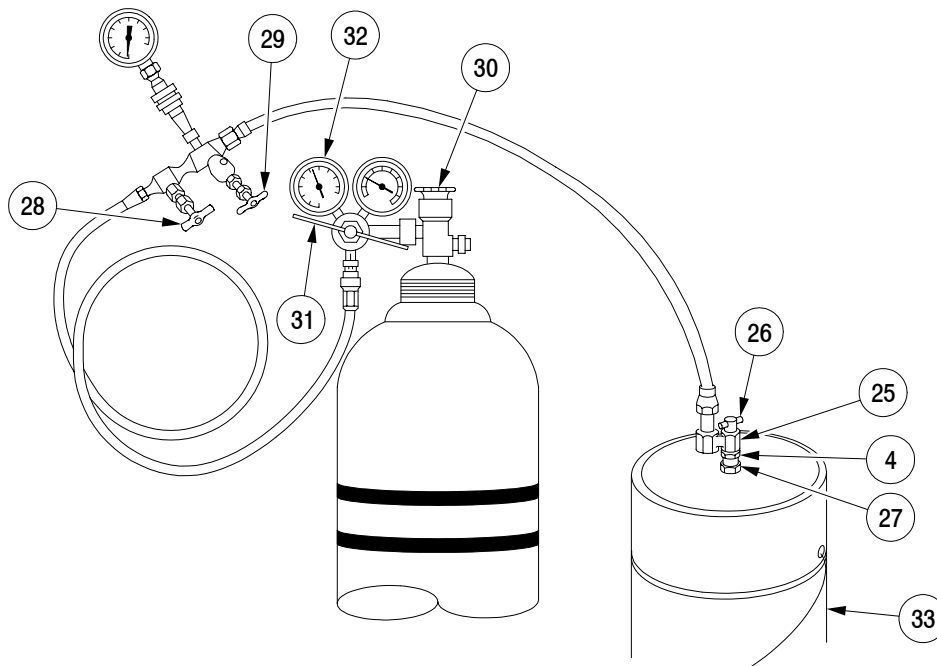
10-20 PULSE ACCUMULATOR - CONTINUED

c. Test - Continued

NOTE

Be sure ports in bottom cylinder cap are not blocked or plugged.

- 4 Attach charging device valve (25) to charging valve body (4) but do not tighten. Close check valve (26) of charging device valve (25).
- 5 Open valve (28) and close valve (29). Open shutoff valve (30).
- 6 Open pressure regulator valve (31) until gage (32) registers 16 to 20 psi (110-137 kPa), then close pressure regulator valve (31).
- 7 Tighten charging device valve (25) just before gage (32) registers 0 psi.
- 8 Open check valve (26) of charging device valve (25) by turning counterclockwise to open valve (27).
- 9 Open pressure regulator valve (31) by turning handle clockwise until gage (32) registers 850 to 950 psi.
- 10 Close pressure regulator valve (31) when sound of nitrogen flowing into accumulator (33) has stopped.
- 11 Close check valve (26) of charging device valve (25) by turning clockwise, closing valve (27).
- 12 Slowly open valve (29) to release pressure in the charging device.

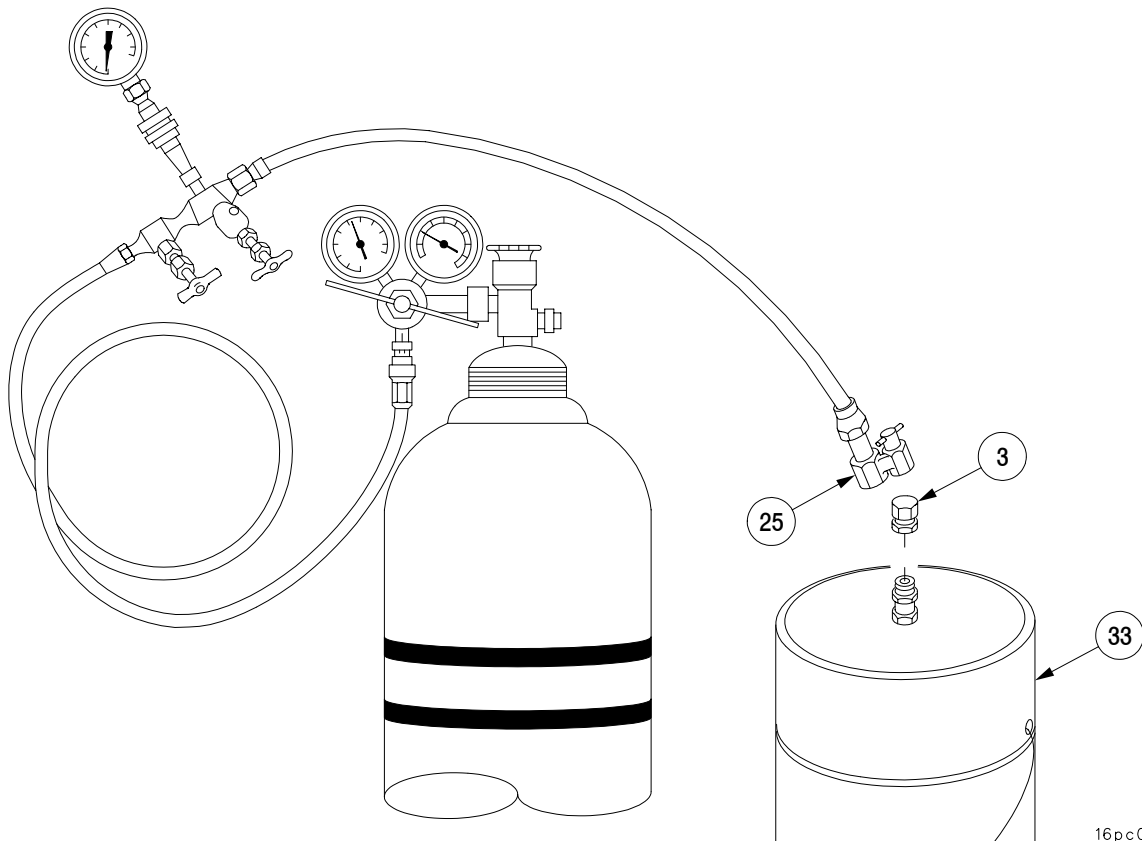


16pc075m

10-20 PULSE ACCUMULATOR - CONTINUED

c. Test - Continued

- 13 Remove charging device valve (25) from accumulator (33).
- 14 Install cap (3) on accumulator (33).
- 15 Submerge accumulator (33) completely in hydraulic fluid for a period of ten minutes. There must be no evidence of leakage during this period. If there is leakage, release nitrogen pressure, disassemble, inspect, repair, assemble, service and retest accumulator (33) before installation in cab.
- 16 Remove accumulator (33) from hydraulic fluid and dry thoroughly. If accumulator (33) is to be stored or transported, relieve all nitrogen pressure.



16pc076m

10-21 HYDRAULIC POWERPACK BELLOWS ASSEMBLY - CONTINUED

a. Removal - Continued

- 4 Remove gage (5) from thermowell (6) and thermowell (6) and preformed packing (7) from reservoir (2). Discard preformed packing.
- 5 Remove nut (8) from access cover (9).
- 6 Cut, remove, and discard lockwire (10) from 11 screws (11).
- 7 Remove 11 screws (11), 11 flat washers (12), access cover (9), and gasket (13) from reservoir (2). Discard gasket.

NOTE

- Bellows assembly must be disassembled in reservoir.
 - Self-locking nuts are supplied with new bellows assembly.
- 8 Disassemble bellows assembly (14) by removing two self-locking nuts (15) from top, rotate bellows assembly 180° in direction of arrow and remove the remaining two self-locking nuts (15) from bottom securing bellows (16) to frame (17).
 - 9 Collapse and plug bellows (16) to prevent expansion while inside reservoir (2). If damaged bellows (16) has holes, wrap with web strap in addition to plug to prevent expansion. Turn bellows (16) sideways with plugged end facing to the left and remove from reservoir (2).
 - 10 Remove and discard preformed packing (18) from bellows (16).
 - 11 Remove frame (17) from reservoir (2).

b. Installation.

- 1 Install frame (17) in reservoir (2).

NOTE

A thin even coat of clean hydraulic fluid must be applied to all new packing material to form a good seal between hydraulic components during installation.

- 2 Install new preformed packing (18) on bellows (16).

NOTE

Bellows must be assembled in reservoir.

- 3 Collapse and plug bellows (16). Turn bellows (16) sideways with plugged end facing to the left, position in reservoir (2), and install on frame (17). Rotate bellows assembly (14) in the direction of arrow and install four new self-locking nuts (15).

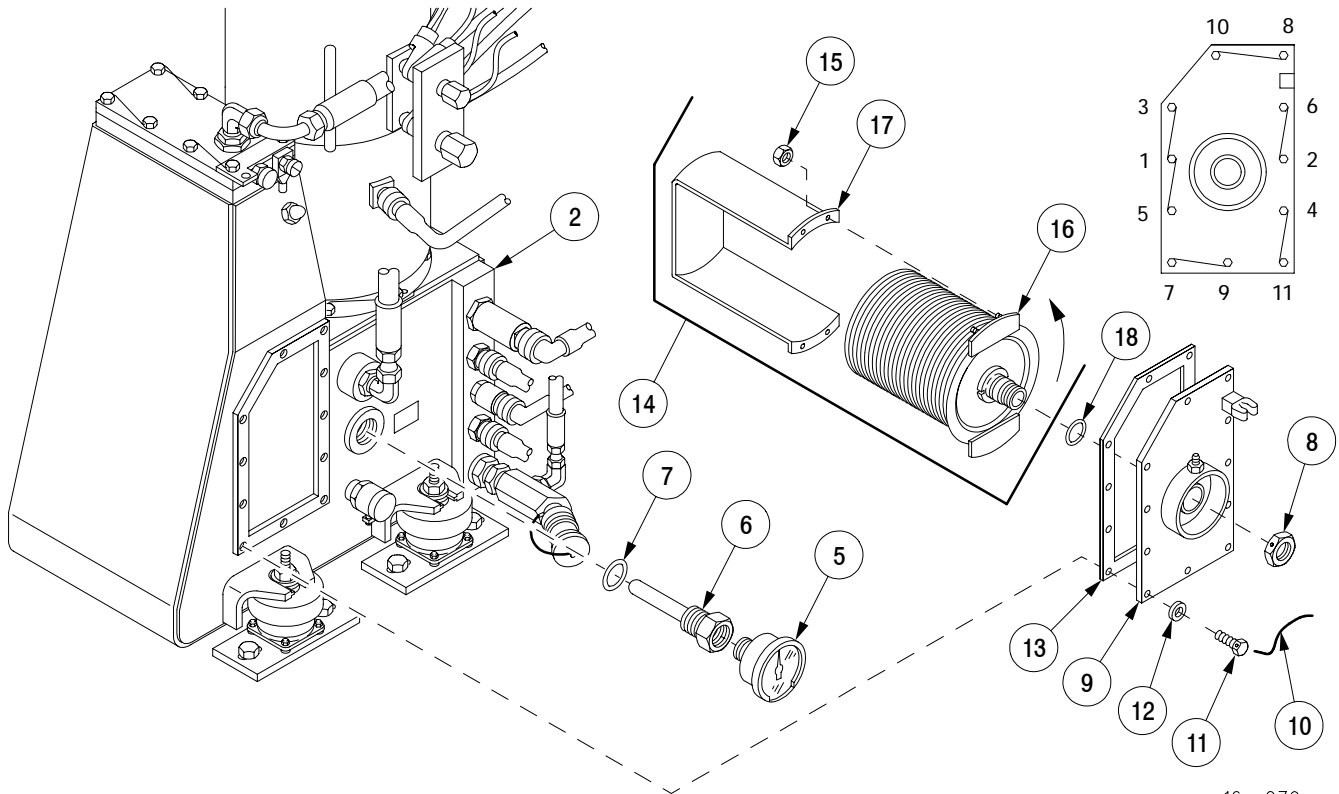
10-21 HYDRAULIC POWERPACK BELLOWS ASSEMBLY - CONTINUED

b. Installation - Continued

CAUTION

Allowing bellows to bump against the sides or bottom of reservoir or against the filter, lines and fittings during installation could damage the bellows, rendering it unserviceable.

- 4 Install new gasket (13) on access cover (9). While supporting bellows assembly (14) align tabs on access cover (9) boss with notches on bellows (16), install access cover (9) on bellows (16), and secure with nut (8). Do not tighten nut.
- 5 Position access cover (9) and gasket (13) on reservoir (2) and secure with 11 screws (11) and 11 flat washers (12). Torque screws (11) in sequence as shown in illustration to 20 in.-lbs (2.26 N•m).
- 6 Torque screws (11) in sequence again as shown in illustration to 35 ± 3 in.-lbs (3.39 ± 0.34 N•m).
- 7 Further tighten nut (8) until bellows (16) seats against boss in access cover (9).
- 8 Secure 11 screws (11) by installing new lockwire (10).
- 9 Install thermowell (6) with new preformed packing (7) in reservoir (2).
- 10 Install gage (5) on thermowell (6).

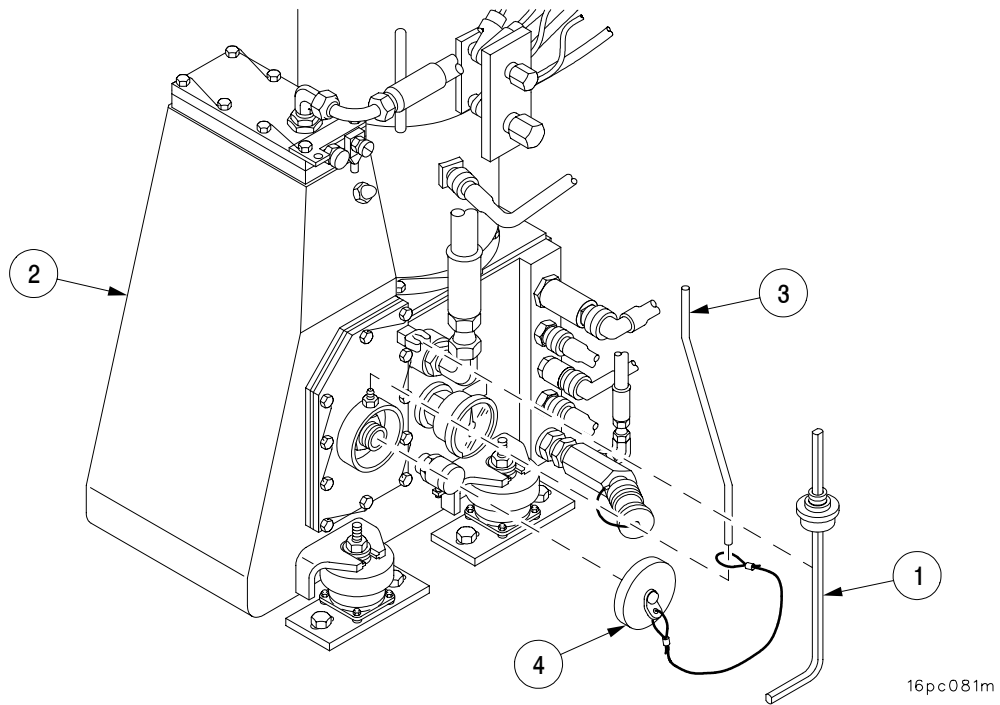


16pc079m

10-21 HYDRAULIC POWERPACK BELLOWS ASSEMBLY - CONTINUED

b. Installation - Continued

- 11 Install dust cap (4) on reservoir (2).
- 12 Install tube (3) on reservoir (2).
- 13 Install dipstick (1) on reservoir (2).
- 14 Fill and charge hydraulic reservoir (TM 9-2350-314-20-2-2).



CHAPTER 11

TRAVERSE MECHANISM

GENERAL

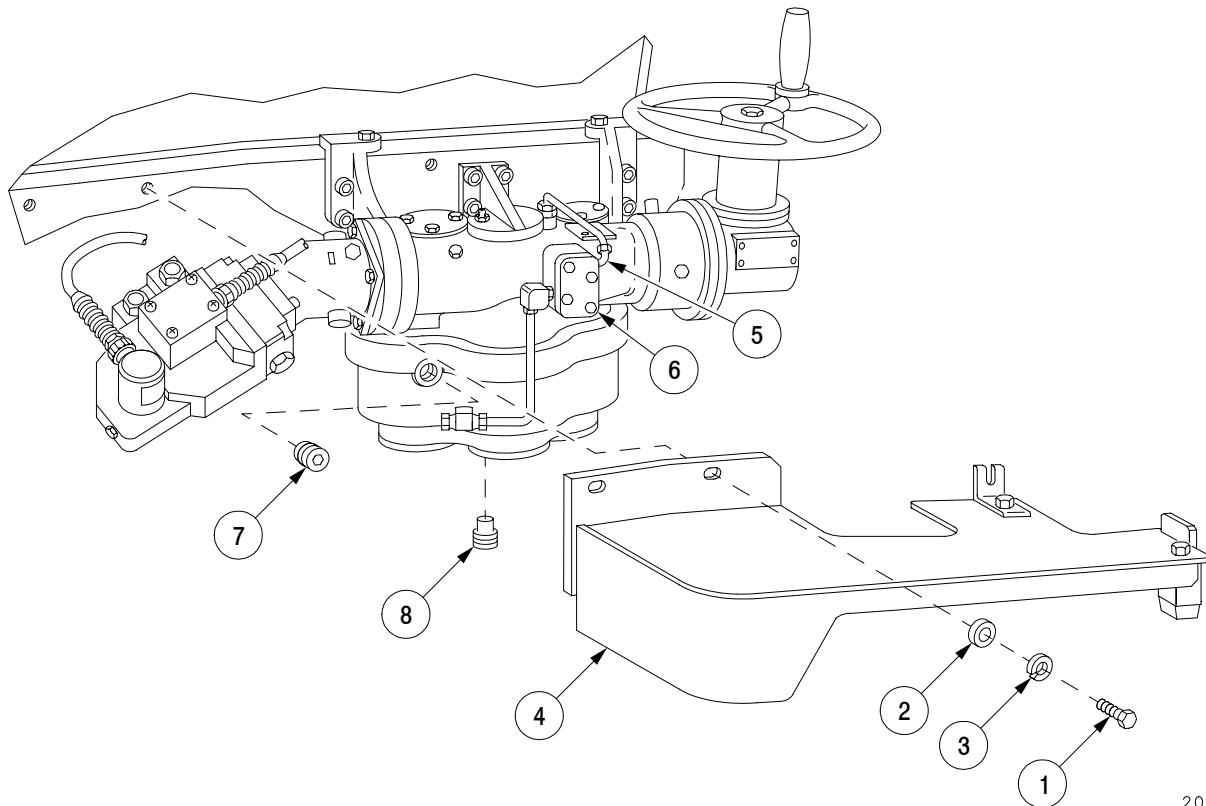
This chapter illustrates and describes the repair of the traversing mechanism assembly which consists of the major components listed below.

<u>CONTENTS</u>	<u>Page</u>
11-1 LUBRICATING PUMP AND LINES	11-2
11-2 MANUAL TRAVERSE HANDWHEEL ASSEMBLY AND NO-BACK BEARING	11-11
11-3 MANUAL TRAVERSE CLUTCH AND GEARSHAFT ASSEMBLY	11-16
11-4 TRAVERSING MECHANISM	11-23

11-1 LUBRICATING PUMP AND LINES - CONTINUED

a. Removal.

- 1 Remove three screws (1), three flat washers (2), three lockwashers (3), and step plate (4) to gain access to outlet tube (5) and lubricating pump assembly (6). Discard lockwashers.
- 2 Remove oil level check and fill hole plug (7).
- 3 Place drain pan of at least 2-gal. capacity under drain plug (8) at bottom center of lower housing.
- 4 Remove drain plug (8) and drain lubricant. Install drain plug (8) and tighten.



20pc012m

11-1 LUBRICATING PUMP AND LINES - CONTINUED

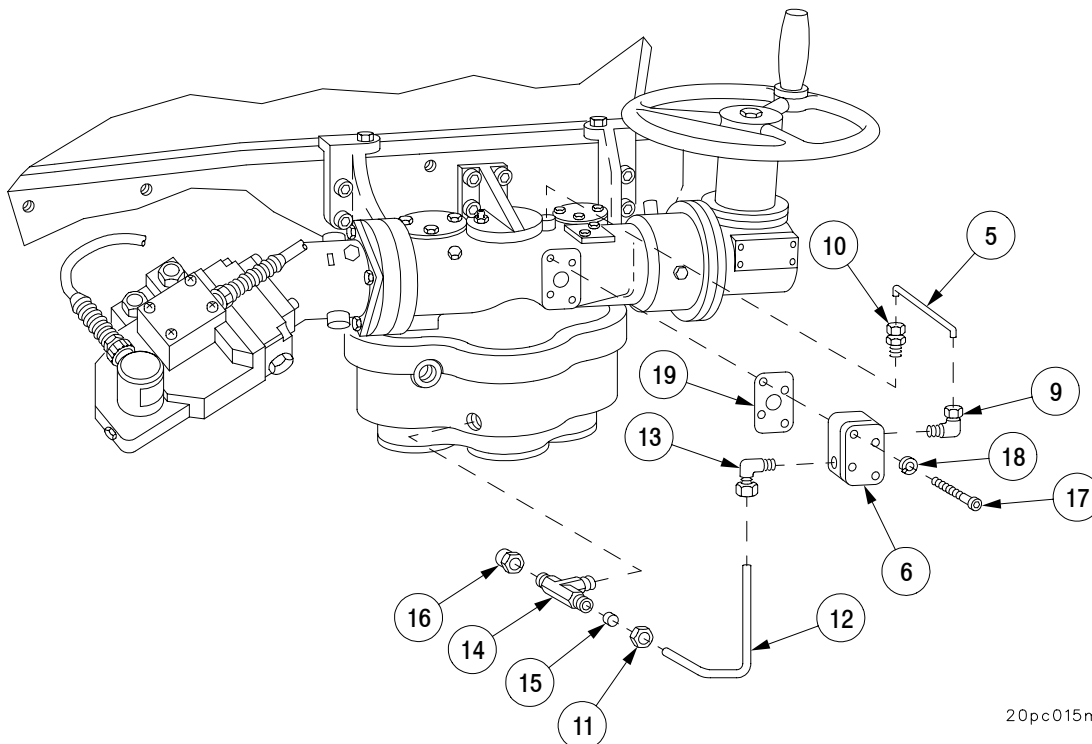
a. Removal - Continued

- 5 Disconnect outlet tube (5) from elbow (9) and adapter (10).
- 6 Remove adapter (10) from upper housing of traversing mechanism assembly.
- 7 Remove elbow (9) from lubricating pump assembly (6).
- 8 Remove nut (11) and disconnect tube (12) from elbow (13) and tee (14). Remove sleeve (15) from tee (14). Discard tube and sleeve.
- 9 Remove elbow (13) from lubricating pump assembly (6).
- 10 Remove cap (16) from tee (14).
- 11 Remove tee (14) from lower housing of traversing mechanism assembly.

NOTE

Hold pump assembly parts together when removing from upper housing of traversing mechanism assembly.

- 12 Remove four capscrews (17), four lockwashers (18), and lubricating pump assembly (6) from traverse mechanism assembly. Discard four lockwashers.
- 13 Remove and discard gasket (19).



20pc015m

11-1 LUBRICATING PUMP AND LINES - CONTINUED

b. Disassembly.

- 1 Separate pump body (20) from valve plate (21). Remove and discard gasket (22).
- 2 Remove and discard two retaining rings (23) from cam roller grooved pin (24).
- 3 Remove cam roller grooved pin (24), cam roller (25), and two flat washers (26) from clevis of stem assembly (27).

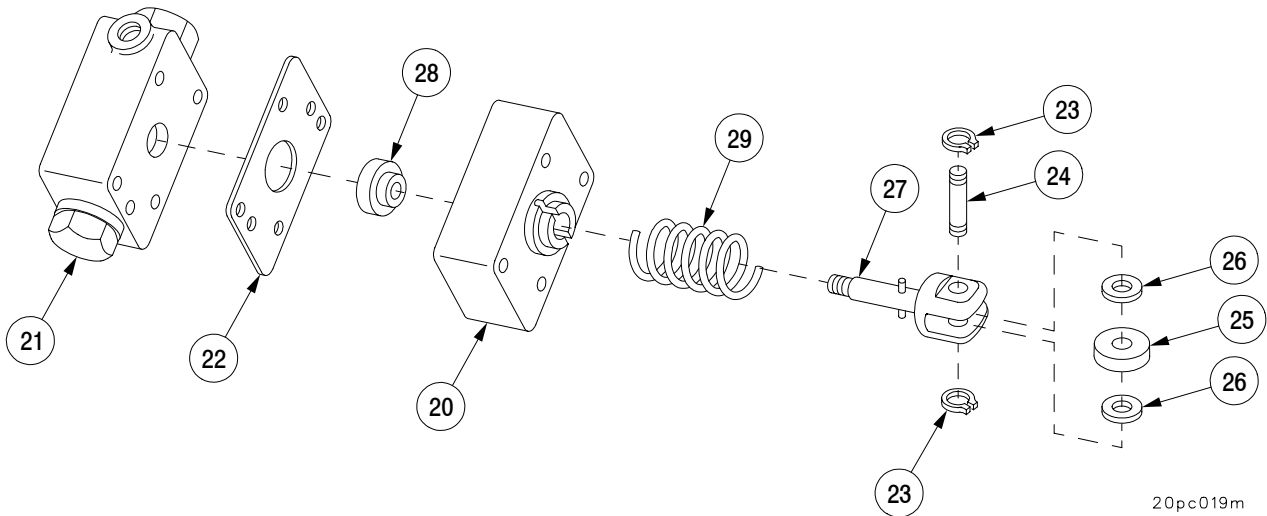
WARNING

Compressed spring is under preload. Wear eye protection and make provision to contain parts when preload is released during disassembly. Injury to personnel may occur if parts are suddenly released.

NOTE

Threads of stem may have been staked to secure plunger.

- 4 Unscrew plunger (28) from threaded end of stem assembly (27).
- 5 Remove stem assembly (27) and spring (29) from pump body (20). Discard spring.



11-1 LUBRICATING PUMP AND LINES - CONTINUED

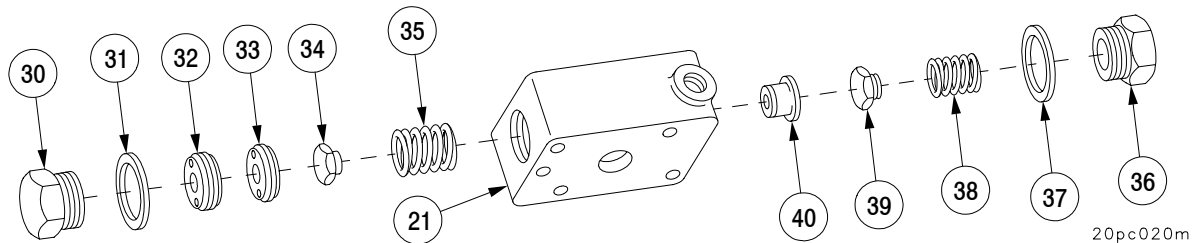
b. Disassembly - Continued

- 6 Place valve plate (21) in soft-jawed vise.
- 7 Remove and discard lower plug (30) and gasket (31).

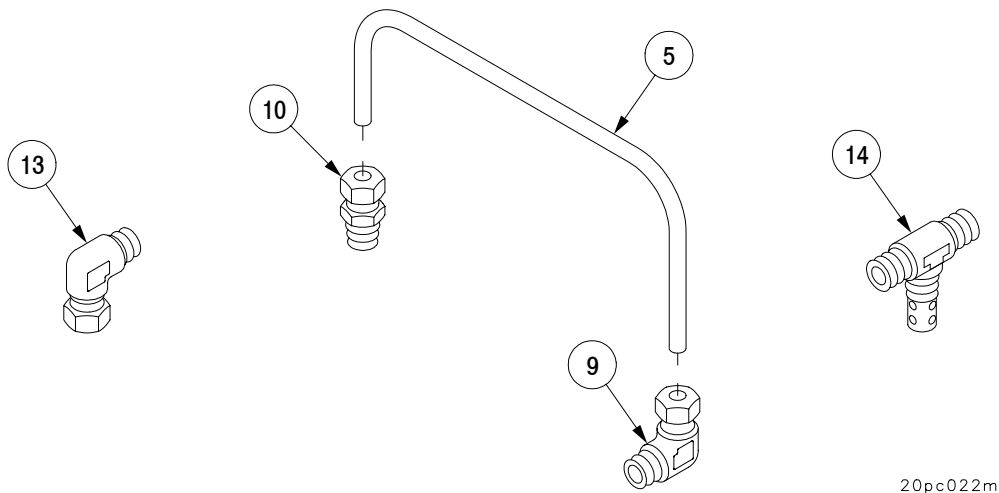
WARNING

Compressed springs are under preload. Wear eye protection and make provision to contain parts when preload is released during disassembly. Injury to personnel may occur if parts are suddenly released.

- 8 Remove and discard retaining ring (32), inlet valve seat (33), inlet valve (34), and spring (35) from valve plate (21).
- 9 Remove and discard upper plug (36), gasket (37), spring (38), outlet valve (39), and outlet valve seat (40) from valve plate (21).



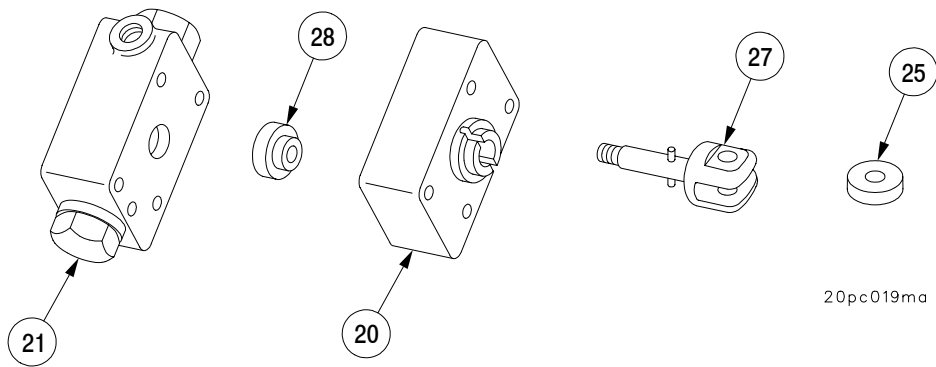
- 10 Replace outer tube (5) if crimped, cracked, bent, or damaged.
- 11 Inspect elbows (9 and 13), adapter (10), and collar assembly of tee (14) to be sure holes are clear. Blow low pressure air through elbows, adapter, and tee assembly to remove all foreign matter. Replace if damaged or obstructed.



11-1 LUBRICATING PUMP AND LINES - CONTINUED

b. Disassembly - Continued

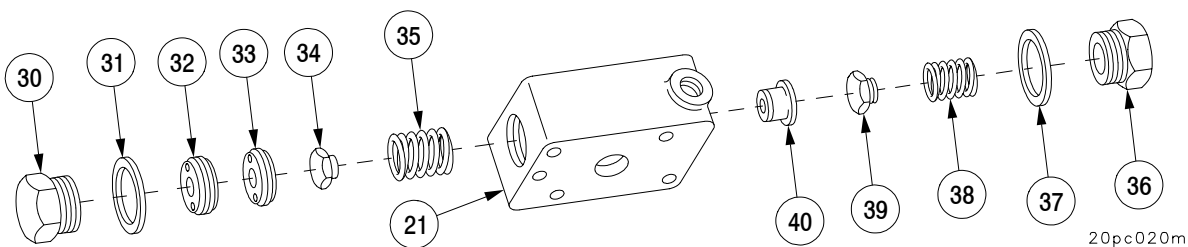
- 12 Measure inside diameter of cam roller (25). Replace if greater than 0.2540 in. (6.5 mm).
- 13 Measure outside diameter of stem assembly (27). Replace if less than 0.3735 in. (9.5 mm).
- 14 Measure inside diameter of stem bore in pump body (20). Replace if greater than 0.3755 in. (9.5 mm).
- 15 Measure inside diameter of plunger bore in pump body (20). Replace if greater than 0.9850 in. (25.0 mm).
- 16 Measure outside diameter of plunger (28). Replace if less than 0.9830 inch (25.0 mm).
- 17 Replace valve (21) if fractured, cracked, or damaged.



20pc019ma

c. Assembly.

- 1 Place valve plate (21) in soft-jawed vise.
- 2 Install new outlet valve seat (40), new outlet valve (39), new spring (38), new gasket (37), and new upper plug (36) in valve plate (21).
- 3 Install new spring (35), new inlet valve (34), new inlet valve seat (33), new retaining ring (32), new gasket (31), and new lower plug (30) in valve plate (21).

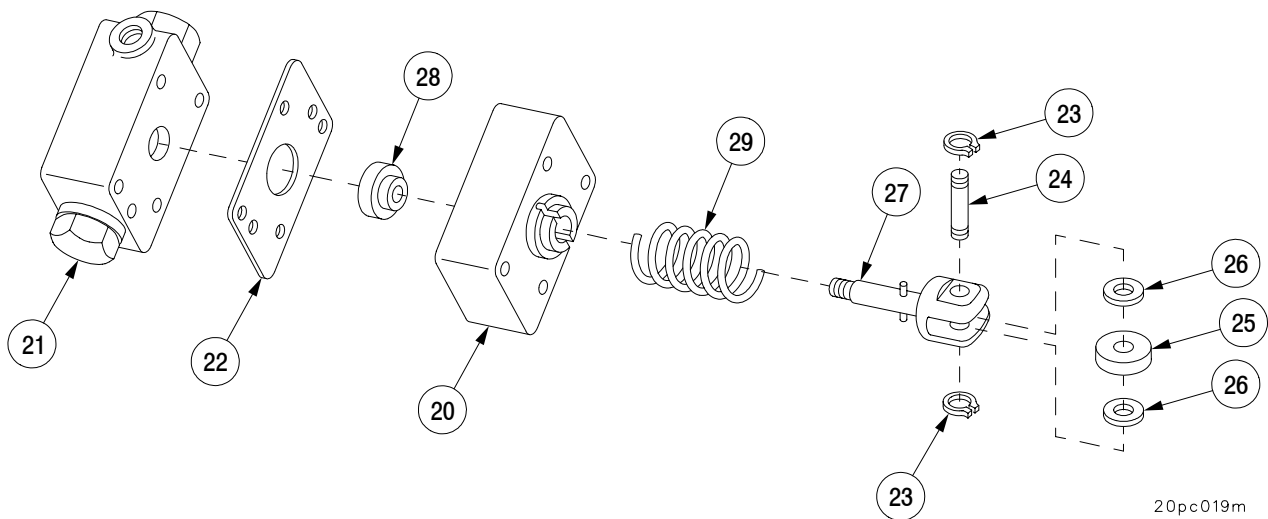


20pc020m

11-1 LUBRICATING PUMP AND LINES - CONTINUED

c. Assembly - Continued

- 4 Place new spring (29) on pump body (20).
- 5 Insert stem assembly (27) through new spring (29) and pump body (20), aligning stem assembly (27) with slot in pump body (20).
- 6 Apply force to stem assembly (27) to compress new spring (29) and thread plunger (28) onto stem of stem assembly (27).
- 7 Turn plunger (28) until completely seated on shoulder of stem assembly (27).
- 8 Lightly peen stem assembly (27) thread in one place to lock plunger (28) to stem.
- 9 Install two flat washers (26), cam roller (25) and cam roller grooved pin (24) in clevis of stem assembly (27).
- 10 Secure cam roller grooved pin (24) with two new retaining rings (23).
- 11 Place new gasket (22) between pump body (20) and valve plate (21).

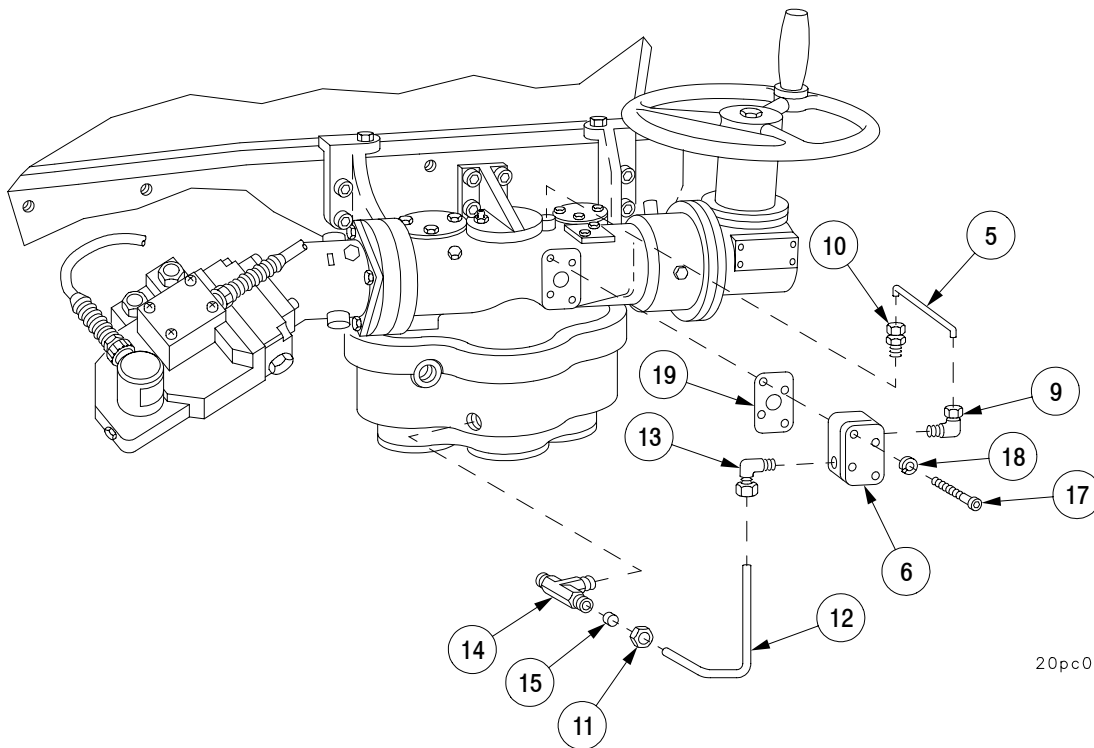


20pc019m

11-1 LUBRICATING PUMP AND LINES - CONTINUED

d. Installation.

- 1 Holding lubricating pump assembly (6) together by hand, install four new lockwashers (18) and four capscrews (17) through lubricating pump assembly (6).
- 2 Place new gasket (19) over capscrews (17).
- 3 Install lubricating pump assembly (6) and new gasket (19) on upper housing of traversing mechanism assembly and tighten four capscrews (17).
- 4 Install elbow (13) on lubricating pump assembly (6).
- 5 Install tee (14) on lower housing of traversing mechanism assembly.
- 6 Slide nut (11) and new sleeve (15) on new inlet tube (12), then install inlet tube (12) in tee (14) and tighten nut (11). Install inlet tube (12) in elbow (13) and tighten elbow (13).
- 7 Install adapter (10) on top housing of traversing mechanism assembly.
- 8 Install elbow (9) on lubricating pump assembly (6).
- 9 Install outlet tube (5) on elbow (9) and adapter (10).



20pc023m

11-1 LUBRICATING PUMP AND LINES - CONTINUED

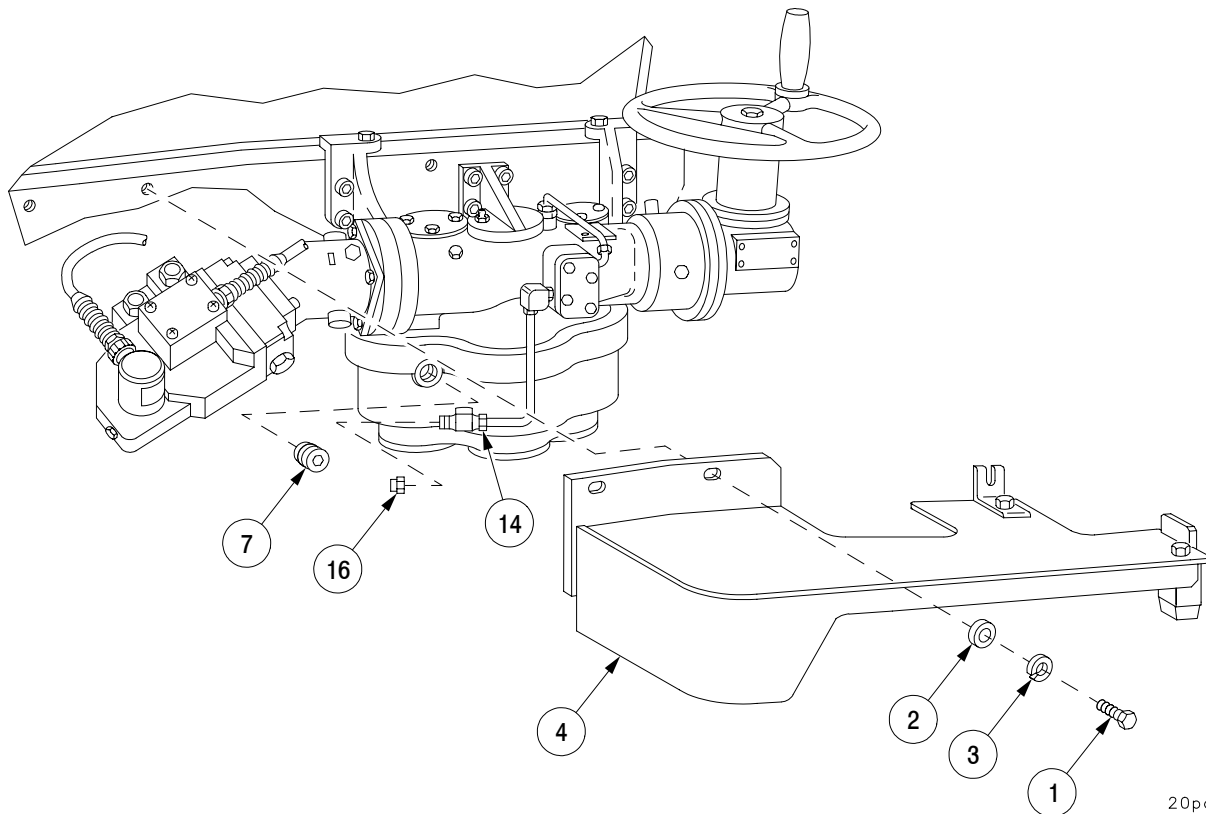
d. Installation - Continued

- 10 Add approximately 4 qt of lubricating oil or fill until oil is level with bottom of oil level check and fill hole plug (7).
- 11 Install fill hole plug (7) and tighten.

WARNING

All personnel located outside the vehicle must be clear of hull while cab is being traversed. Injury or death to personnel could occur by being struck from traversing cab.

- 12 Traverse cab assembly manually or by power until a steady stream of oil comes out of uncapped branch of tee (14). This will purge any air from the lines.
- 13 Install cap (16) on tee (14).
- 14 Install step plate (4), three flat washers (2), three new lockwashers (3), and three screws (1). Torque two screws (1) to 72-88 lb-ft (97-119 N·m).



20pc025m

11-2 MANUAL TRAVERSE HANDWHEEL ASSEMBLY AND NO-BACK BEARING - CONTINUED

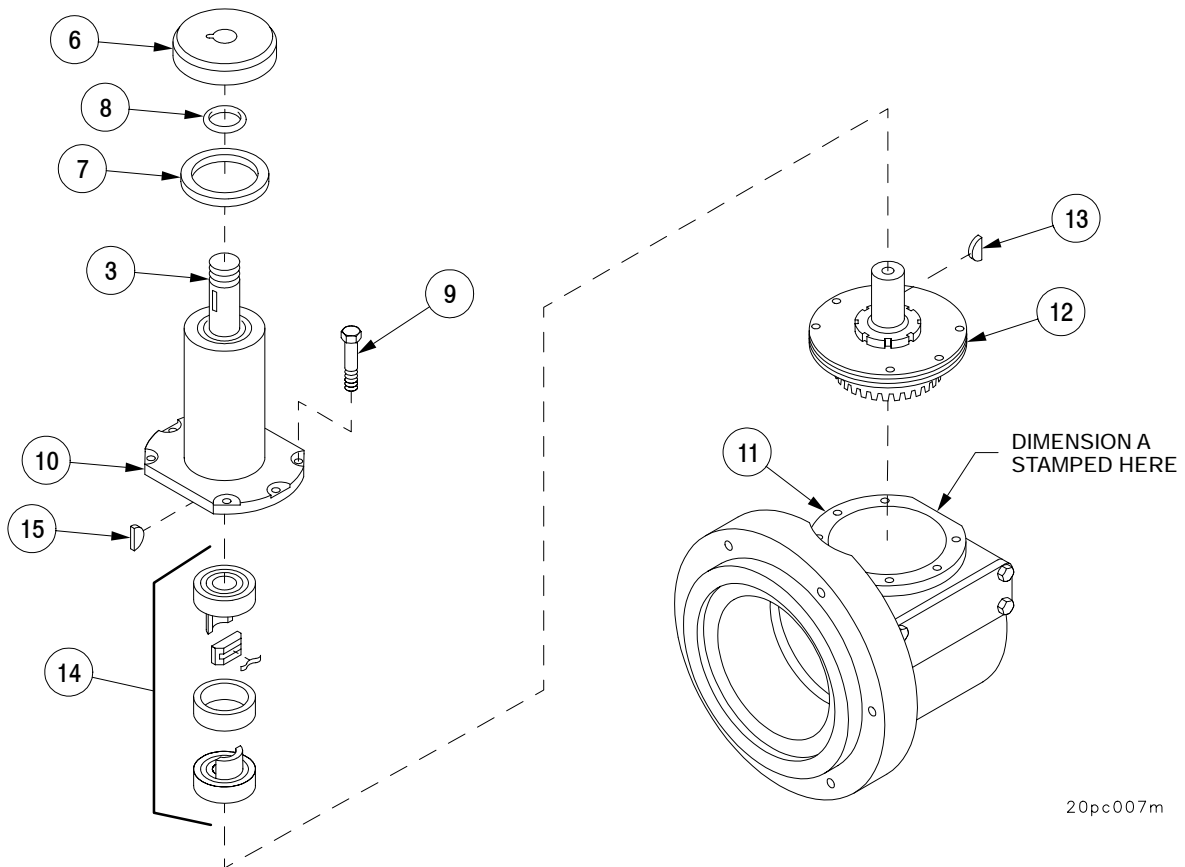
a. Removal - Continued

- 4 Remove cap (6), seal (7), and preformed packing (8) from shaft (3). Discard preformed packing and seal.
- 5 Remove six screws (9) and upper housing assembly (10) from bevel gear housing (11).
- 6 Note and record dimension "A" stamped on bevel gear housing (11).
- 7 Remove bevel gear assembly (12) and key (13) from upper housing assembly (10).

NOTE

No-back components will separate when removed from shaft and housing.

- 8 Remove no-back unit (14) and lower key (15) from shaft (3) at upper housing assembly (10).

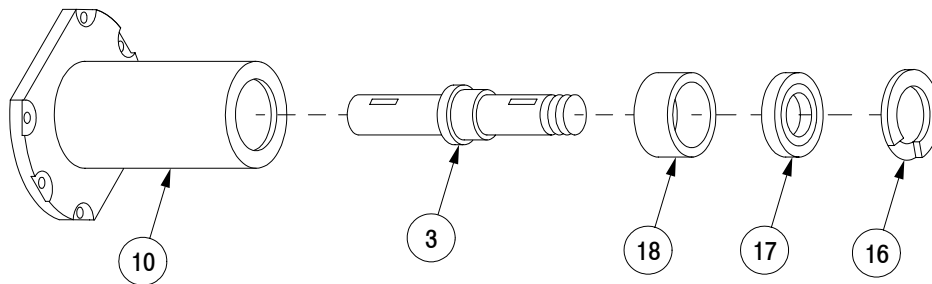


20pc007m

**11-2 MANUAL TRAVERSE HANDWHEEL ASSEMBLY AND NO-BACK BEARING
- CONTINUED**

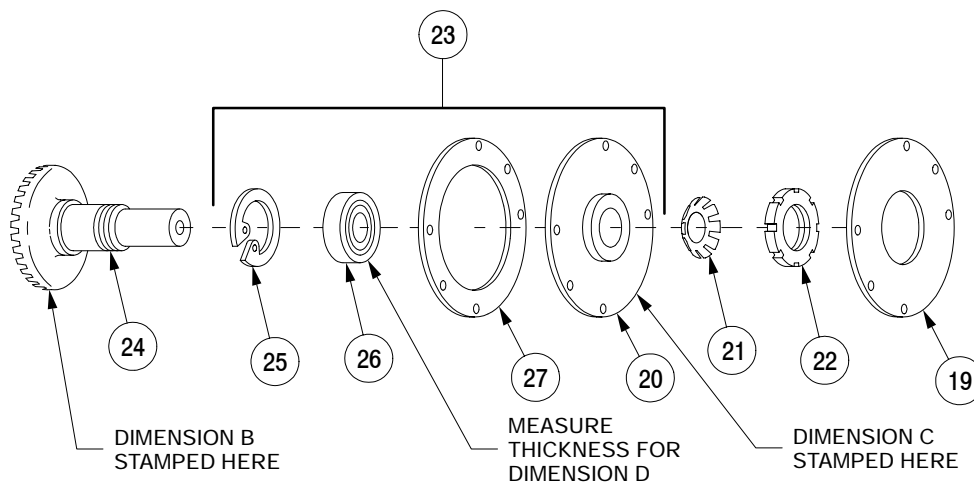
b. Disassembly.

- 1 Remove retaining ring (16) from upper housing assembly (10).
- 2 Remove bearing (17) and shaft (3) from upper housing assembly (10).
- 3 Separate bearing (17) from shaft (3).
- 4 Remove spacer (18) from upper housing (10) only if replacement is required using an arbor press.



20pc008m

- 5 Remove and discard gasket (19) from retainer housing (20).
- 6 Straighten locking tab on keywasher (21).
- 7 Remove nut (22) and keywasher (21) from bevel gearshaft (24).
- 8 Remove retainer assembly (23) from bevel gearshaft (24).
- 9 Note and record dimension "B" stamped on bevel gearshaft (24).
- 10 Remove retaining ring (25), bearing (26), and shim (27) from retainer housing (20).
- 11 Measure and record thickness of bearing (26) for dimension "D". Also note and record dimension "C" stamped on retainer housing (20).



20pc009m

11-2 MANUAL TRAVERSE HANDWHEEL ASSEMBLY AND NO-BACK BEARING - CONTINUED

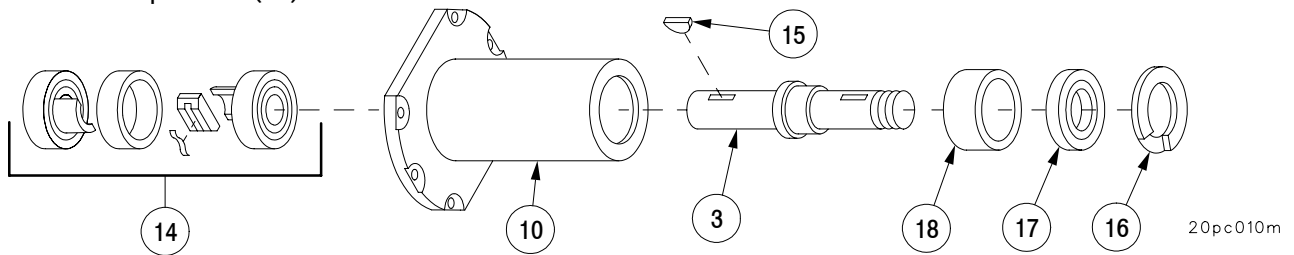
c. Assembly.

- 1 Using an arbor press, install spacer (18) on shaft (3) if removed.
- 2 Assemble shaft (3) and bearing (17) with seal side out. Install in upper housing assembly (10).
- 3 Install retaining ring (16) in upper housing assembly (10).

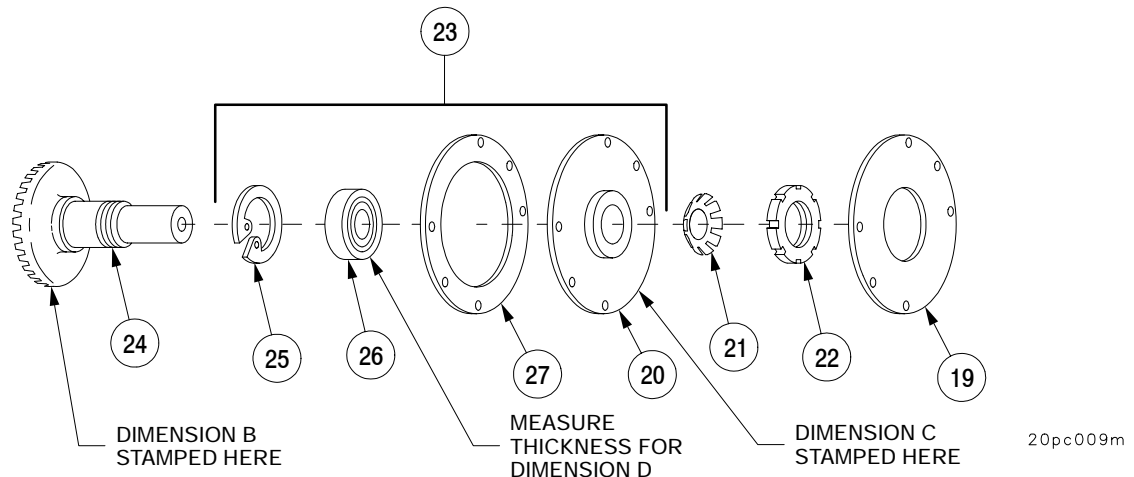
NOTE

Number of springs required in spring pack of no-back unit may vary depending on spring tension.

- 4 Turn upper housing assembly (10) upside down and install lower key (15), and no-back unit components (14).



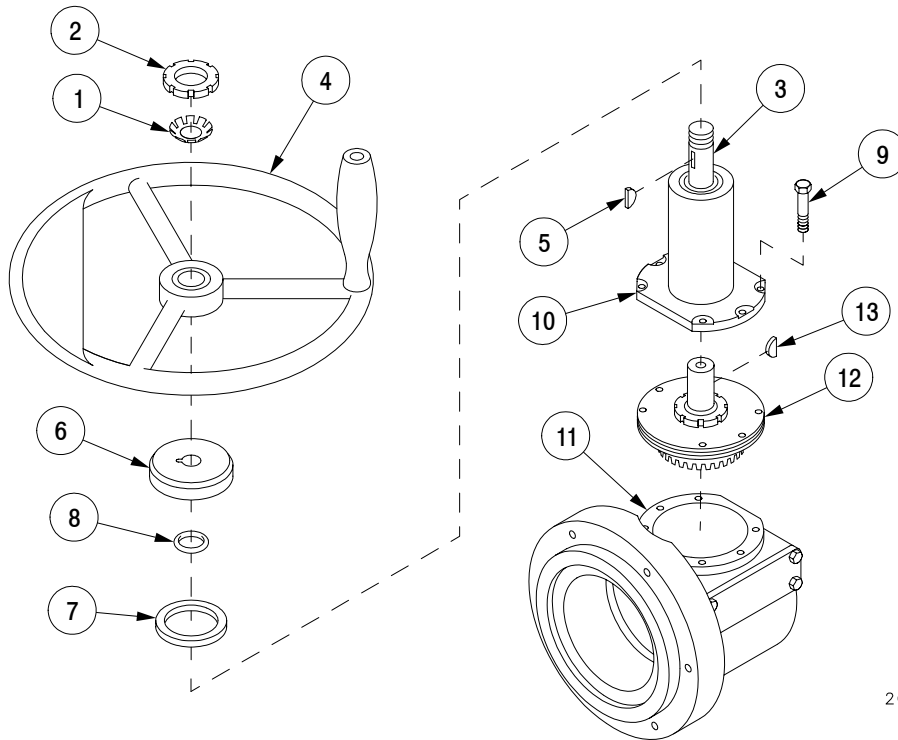
- 5 Pack bearings and coat internal gearing with grease before assembly.
- 6 Install bearing (26) and retaining ring (25) in retainer housing (20).
- 7 Calculate thickness of shim (27). Shim thickness is equal to $B+C+D-A$ to give a 0.001 - 0.004 in. (0.025 - 0.10 mm) backlash. Use shim P/N 11636081. Peel off lamination to obtain required thickness.
- 8 Apply sealing compound (item 36, Appx B) to shim (27) and install.
- 9 Install retainer assembly (23) on bevel gearshaft (24).
- 10 Install keywasher (21) and nut (22) on bevel gearshaft (24).
- 11 Bend locking tab of keywasher (21) to secure nut (22).
- 12 Apply sealing compound (item 37, Appx B) to new gasket (19) and install on retainer housing (20).



**11-2 MANUAL TRAVERSE HANDWHEEL ASSEMBLY AND NO-BACK BEARING
- CONTINUED**

d. Installation.

- 1 Install key (13) and bevel gear assembly (12) in upper housing assembly (10).
- 2 Install upper housing assembly (10), with bevel gear assembly (12), on bevel gear housing (11) and align mounting holes.
- 3 Install six screws (9) to secure upper housing assembly (10) and bevel gear assembly (12) to bevel gear housing (11).
- 4 Install new preformed packing (8), new seal (7), and cap (6) on shaft (3).
- 5 Install upper key (5) and handwheel (4) on shaft (3).
- 6 Install keywasher (1) and nut (2) on shaft (3).
- 7 Bend locking tab of keywasher (1) into slot of nut (2) to secure nut (2).

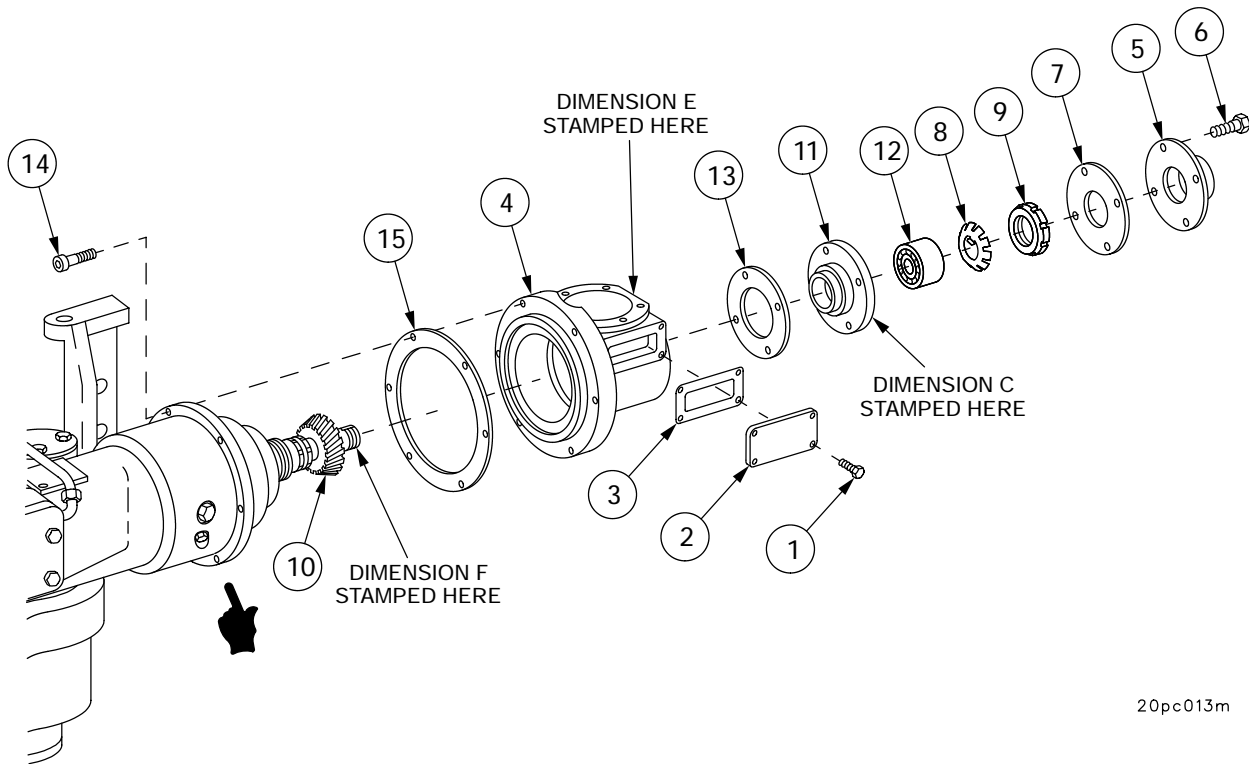


20pc011m

11-3 MANUAL TRAVERSE CLUTCH AND SHAFT ASSEMBLY - CONTINUED

a. Disassembly - Continued

- 7 Remove nut (9) and keywasher (8) from gearshaft assembly (10).
- 8 Remove bearing (12) and retaining plate (11) from gearshaft assembly (10). Remove and discard bearing (12) from retaining plate (11). Support end of gearshaft assembly (10).
- 9 Note and record dimension "C" stamped on retaining plate (11).
- 10 Remove shim (13) and save for reuse during assembly.
- 11 Remove six self-locking screws (14) and bevel gear housing (4). Support gearshaft assembly (10). Discard self-locking screws.
- 12 Remove and discard gasket (15).
- 13 Note and record dimension "F" stamped on end of gearshaft assembly (10).



20pc013m

11-3 MANUAL TRAVERSE CLUTCH AND GEARSHAFT ASSEMBLY - CONTINUED

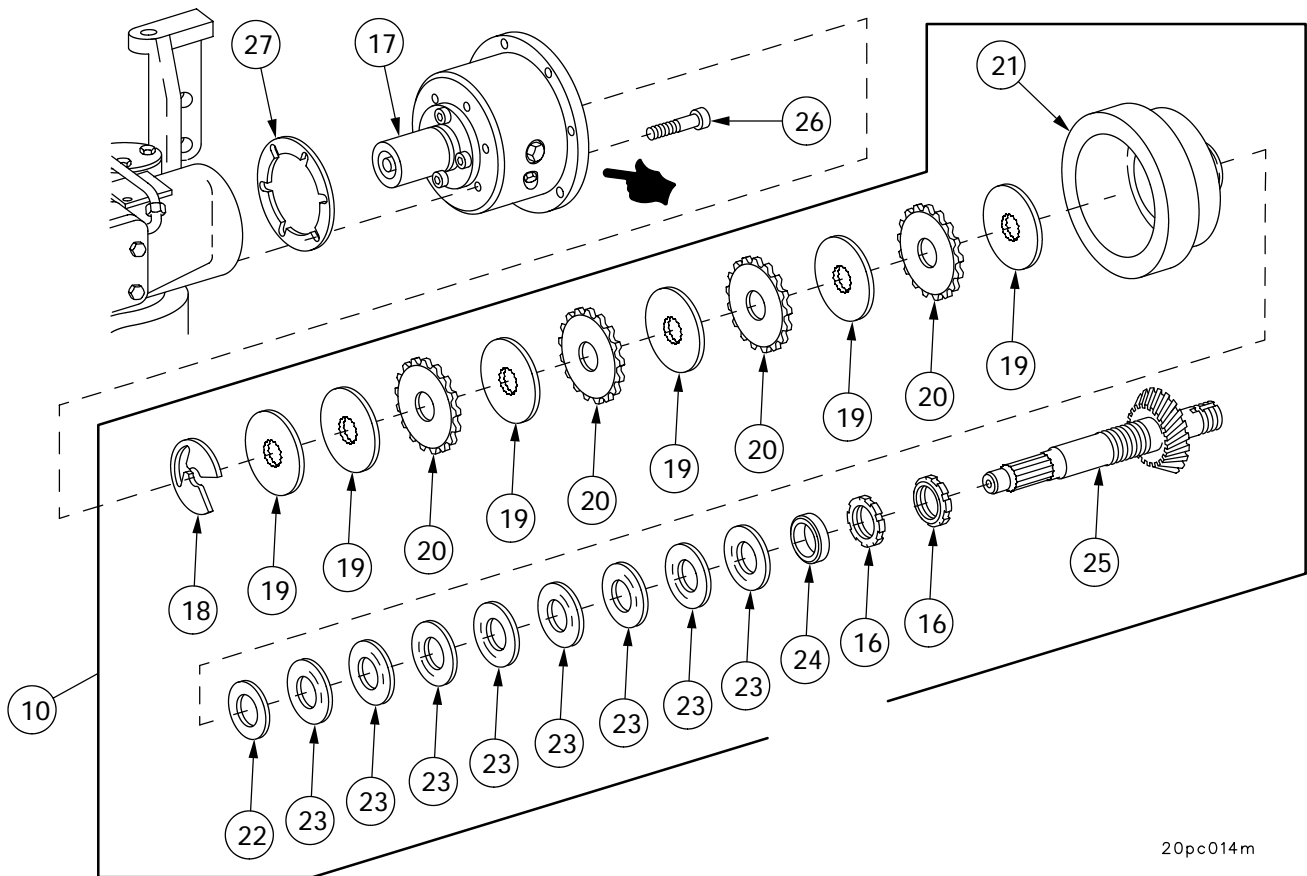
a. Disassembly - Continued

- 14 Back two nuts (16) off threads toward bevel gear end.
- 15 Remove gearshaft assembly (10) from housing (17).
- 16 Remove retainer ring (18), six steel plates (19), and four friction plates (20).
- 17 Remove clutch housing (21) and flat washer (22).

NOTE

Note position of spring washers for assembly.

- 18 Remove eight spring washers (23).
- 19 Remove spacer (24) and two nuts (16) from gearshaft (25).
- 20 Remove six screws (26) from inside housing (17).
- 21 Remove housing (17) and gasket (27) from traverse mechanism. Discard gasket.

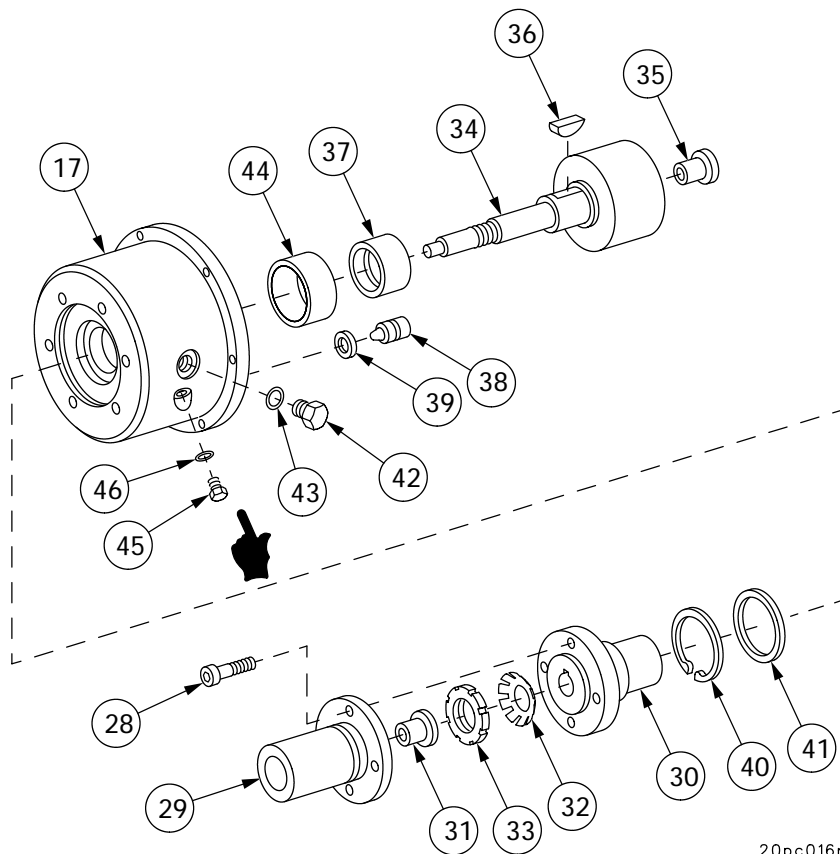


20pc014m

11-3 MANUAL TRAVERSE CLUTCH AND GEARSHAFT ASSEMBLY - CONTINUED

a. Disassembly - Continued

- 22 Remove four screws (28) and adapter (29) from adapter mount (30).
- 23 Remove bearing (31).
- 24 Straighten tabs on keywasher (32) and remove nut (33) and keywasher (32).
- 25 Pull clutch shaft (34) with bearing (35) from adapter mount (30) and housing (17).
- 26 Separate bearing (35) from clutch shaft (34) and remove key (36).
- 27 Remove adapter mount (30).
- 28 Remove inner bearing ring (37).
- 29 Remove three pistons (38) with three packing assemblies (39). Discard packing assemblies.
- 30 Remove snapping (40) to release seal (41). Remove and discard seal.
- 31 Remove two plugs (42) and two preformed packings (43). Discard preformed packings.
- 32 Press bearing (44) from housing (17).
- 33 Remove four plugs (45) and four preformed packings (46) from housing (17). Discard preformed packings.

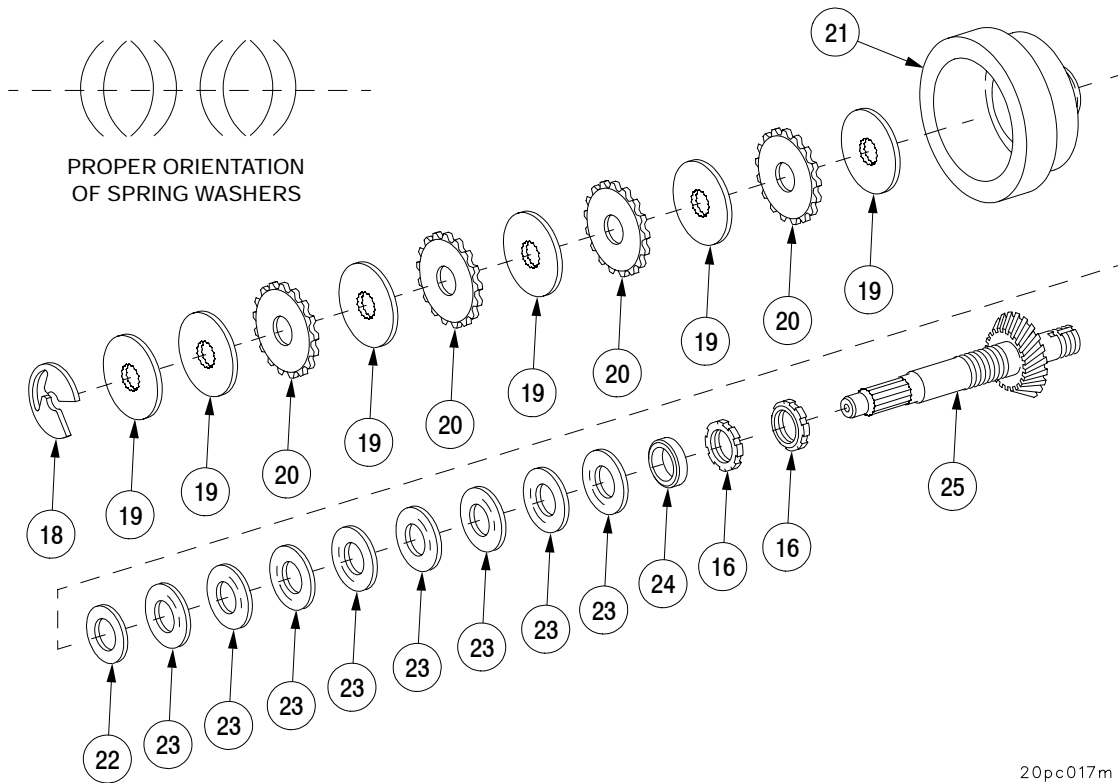


20pc016m

11-3 MANUAL TRAVERSE CLUTCH AND GEARSHAFT ASSEMBLY - CONTINUED

b. Assembly.

- 1 Install two nuts (16) loosely on gearshaft (25).
- 2 Install spacer (24).
- 3 Install eight spring washers (23) on gearshaft (25) according to orientation in illustration.
- 4 Install flat washer (22) and clutch housing (21) on gearshaft (25).
- 5 Soak four friction plates (20) in lubricant before installing.
- 6 Install six steel plates (19), four friction plates (20), and retainer ring (18) on gearshaft (25) in clutch housing (21). Alternate steel plates with friction plates.
- 7 Hand tighten nuts (16) against spacer (24).

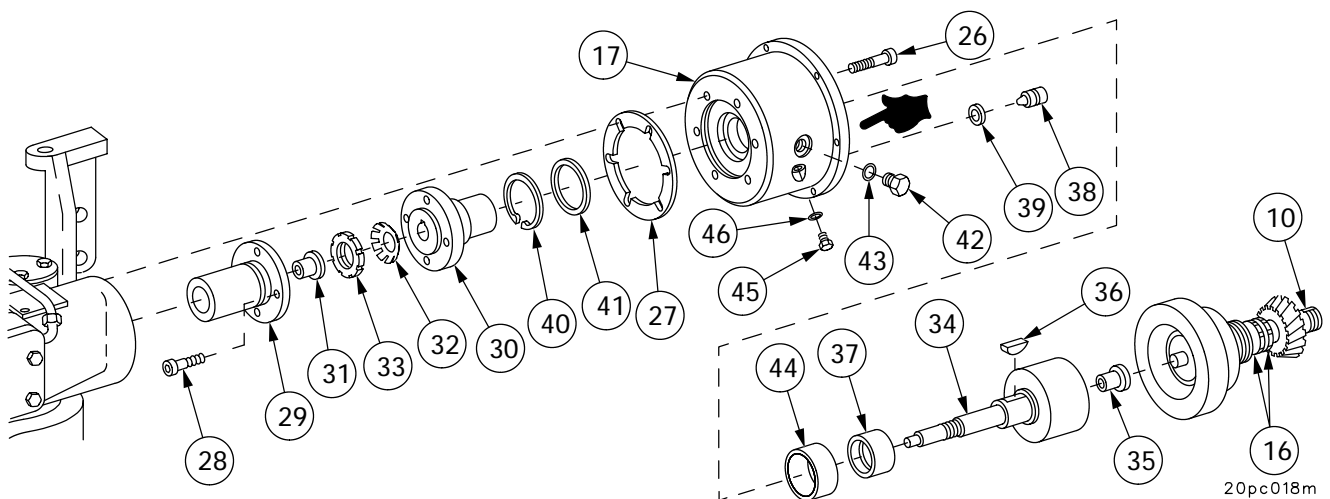


20pc017m

11-3 MANUAL TRAVERSE CLUTCH AND SHAFT ASSEMBLY - CONTINUED

b. Assembly - Continued

- 8 Install bearing (35) on end of gearshaft assembly (10).
- 9 Place gearshaft assembly (10) and clutch shaft (34) in vise.
- 10 Using torque wrench and key socket on hex end of gearshaft assembly (10), torque two nuts (16) 250 ± 25 lb-in. (28.3 ± 2.83 N•m). Remove gearshaft assembly (10) and clutch shaft (34) from vise.
- 11 Press bearing (44) into housing (17).
- 12 Insert inner bearing ring (37) into bearing (44).
- 13 Install two new packings (43) with plugs (42) in housing (17).
- 14 Install new seal (41) in housing (17) and secure with snapping (40).
- 15 Position adapter mount (30) in housing (17).
- 16 Install key (36) in clutch shaft (34).
- 17 Install three new packing assemblies (39) and three pistons (38) into housing (17).
- 18 Pack gears on gearshaft assembly (10) with grease.
- 19 Install clutch shaft (34) in housing (17).
- 20 Install key washer (32) and nut (33) on clutch shaft (34). Bend locking tab of key washer (32) to secure nut (33).
- 21 Apply sealing compound (item 34, Appx B) on four screws (28). Install bearing (31), and adapter (29) on clutch shaft (34) and secure to adapter mount (30) with four screws (28).
- 22 Apply sealing compound (item 40, Appx B) to new gasket (27) and install with housing (17) on traverse mechanism using six screws (26).
- 23 Install gearshaft assembly (10) into housing (17).
- 23.1 Install four plugs (45) and four new preformed packings (46) in housing (17).



11-3 MANUAL TRAVERSE CLUTCH AND GEARSHAFT ASSEMBLY - CONTINUED

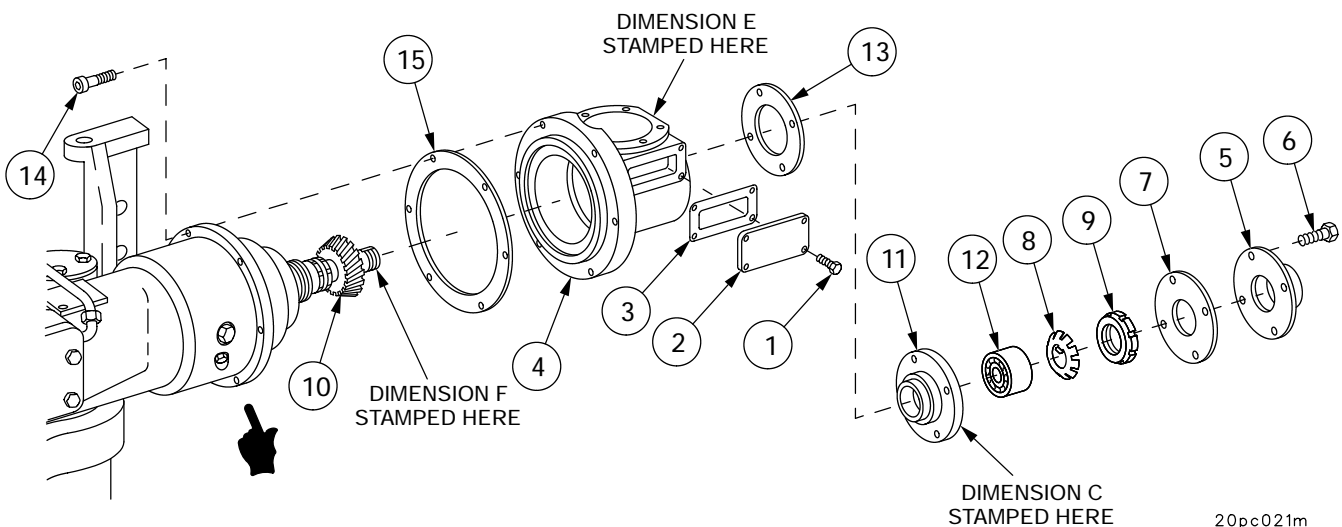
b. Assembly - Continued

- 24 Apply sealing compound (item 34, Appx B) to six new self-locking screws (14).
- 25 Apply sealing compound (item 40, Appx B) to new gasket (15) and install with bevel gear housing (4) and six new self-locking screws (14).
- 26 Install shim (13). Shim thickness must be equal to dimensions F+C-E to give 0.001 - 0.004 in. (0.025 - 0.102 mm) backlash at assembly. Use one shim (13) and peel off laminations to obtain proper thickness.
- 27 Apply sealing compound (item 40, Appx B) to shim (13) and install on retainer plate (11).

CAUTION

To prevent equipment damage pack bearings and coat internal gearing with grease.

- 28 Pack new bearing (12) with grease. Press bearing into retaining plate (11).
- 29 Install retaining plate (11) with bearing (12) onto gearshaft assembly (10).
- 30 Install keywasher (8) and nut (9) onto gearshaft assembly (10). Bend locking tab of keywasher (8) into slot of nut (9) to secure it.
- 31 Apply sealing compound (item 40, Appx B) to new gasket (7) and install with access cover (5) and four hex head capscrews (6).
- 32 Check backlash of bevel gears through hole in bevel gear housing (4) with dial indicator. Adjust shim (13) thickness until backlash of 0.001 - 0.004 in. (0.025 - 0.102 mm) is obtained.
- 33 Apply sealing compound (item 40, Appx B) to new gasket (3) and install with access cover (2) and four bolts (1).
- 34 Fill bevel gear housing (4) with lubricant up to access hole.
- 35 Pressurize system, check for leaks.



11-4 TRAVERSING MECHANISM - CONTINUED

a. Removal.

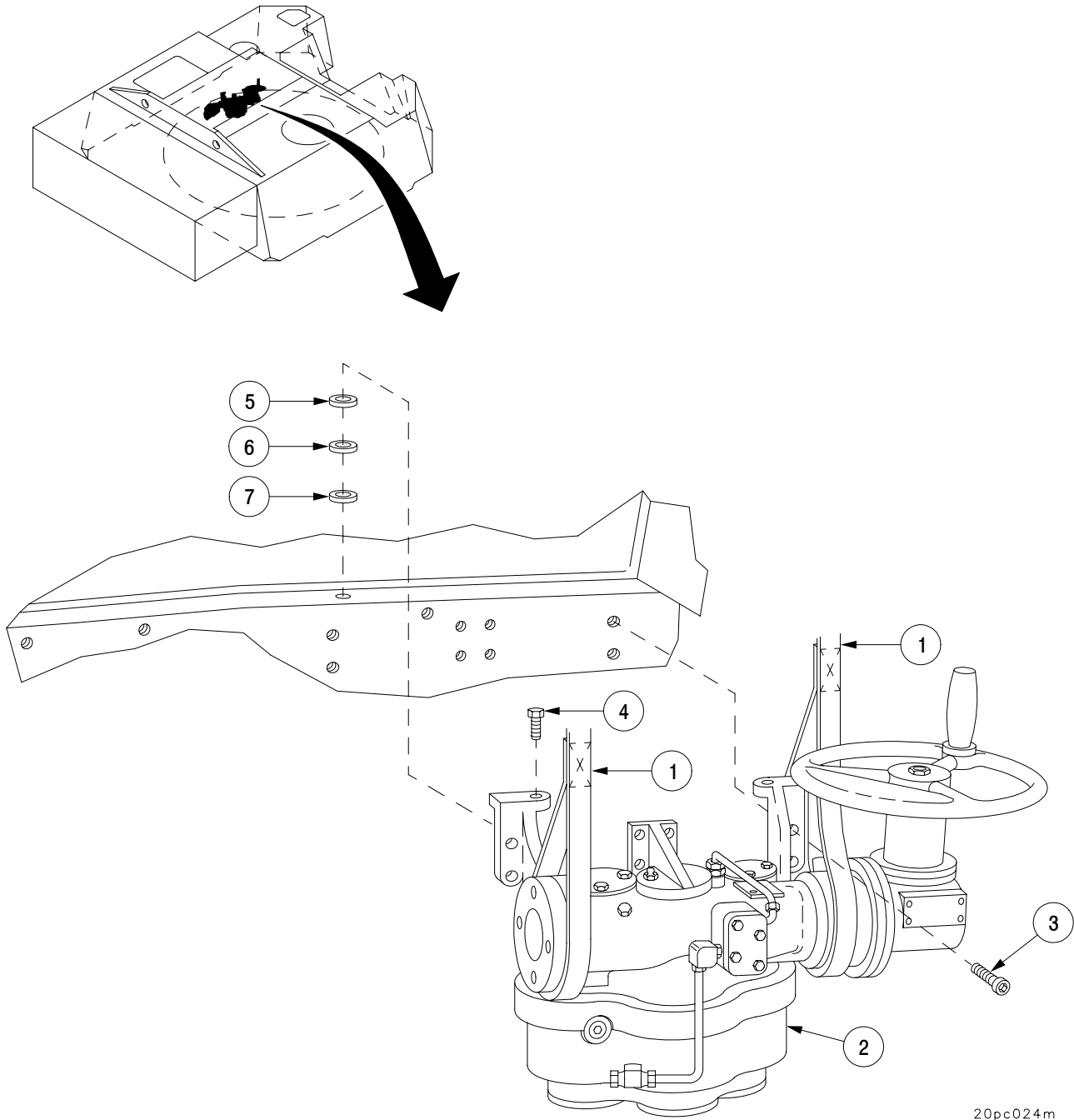
- 1 Attach two nylon slings (1) to traversing mechanism (2).
- 2 Place suitable lifting device inside vehicle and attach to two nylon slings (1). Take up slack and support weight of traversing mechanism (2).
- 3 Remove eight screws (3), two self-locking screws (4), and shims (5, 6, and 7). Discard self-locking screws.
- 4 Using lifting device, lower traversing mechanism (2) to hull floor near rear door.
- 5 Position lifting device outside vehicle and over traversing mechanism (2) and remove from vehicle.
- 6 Remove two nylon slings (1).

b. Installation.

- 1 Attach two nylon slings (1) to traversing mechanism (2).
- 2 Attach suitable lifting device to two nylon slings (1) and place traversing mechanism (2) on floor inside rear entry doors. Disconnect suitable lifting device.
- 3 Position suitable lifting device inside vehicle and over traversing mechanism (2).
- 4 Attach suitable lifting device to two nylon slings (1) and position traversing mechanism (2) for installation. Align mounting holes.
- 5 Secure traversing mechanism (2) with two new self-locking screws (4) and shims (5, 6, and 7) as required for even load on drive gear teeth. Torque screws to 340-380 lb-ft (461-515 N·m).
- 6 Apply sealing compound to eight screws (3), install eight screws (3) and torque to 112-140 lb-ft (108-136 N·m).
- 7 Remove two nylon slings (1).

11-4 TRAVERSING MECHANISM - CONTINUED

b. Installation - Continued



CHAPTER 12

GENERAL SUPPORT MAINTENANCE

GENERAL

This chapter illustrates and describes the replacement, repair, and adjustment of the DRUH mounting plate.

CONTENTS

Page

12-1	DRUH MOUNTING PLATE	12-2
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12-1 DRUH MOUNTING PLATE.

- This task covers:
- | | |
|---|--|
| <ul style="list-style-type: none"> a. Removal b. Installation and alignment of new DRUH mounting plate c. Installation and alignment of existing DRUH mounting plate | <ul style="list-style-type: none"> d. DRUH elevation offset measurement at zero MILS e. DRUH roll offset measurement at 1066.7 MILS f. DA Form 2408-4 example |
|---|--|

Tools

Artillery and turret mechanic's tool kit (SC 5180-95-A12)
 Plumb bob (item 37, Appx F)
 Borescope (item 5, Appx F)
 Variable speed drill (item 11, Appx F)
 Reverse reamers (2) (item 43, Appx F)
 Gunner's quadrant (BII)
 Soft-faced hammer (item 22, Appx F)
 Torque wrench (item 72, Appx F)
 Torque wrench (item 76, Appx F)
 Fixture DRUH alignment (item 15, Appx F)

Materials/Parts

Fishing line (item 48, Appx B)
 Lockwashers (4) (item 107, Appx E)
 Sealing compound (item 39, Appx B)

Equipment Conditions

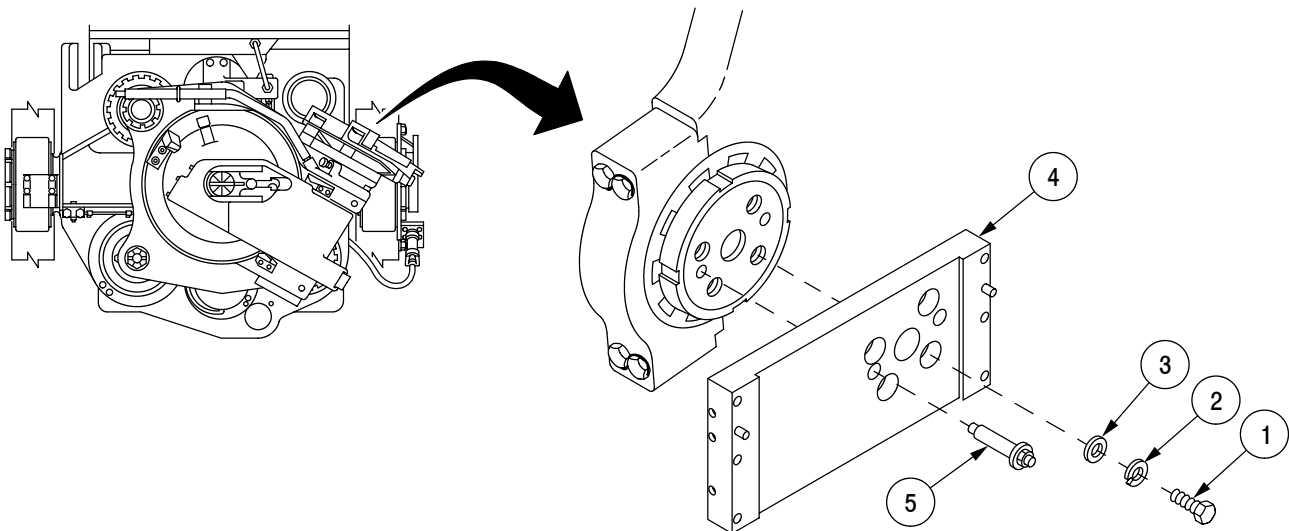
PLGR mount removed (TM 9-2350-314-20-202)
 DRUH removed (TM 9-2350-314-20-2-2)

References

TM 9-2350-314-10

a. Removal.

- 1 Remove four screws (1), four lockwashers (2), and four flat washers (3) from DRUH mounting plate (4). Discard lockwashers.
- 2 Remove two expandable pin assemblies (5) and DRUH mounting plate (4).

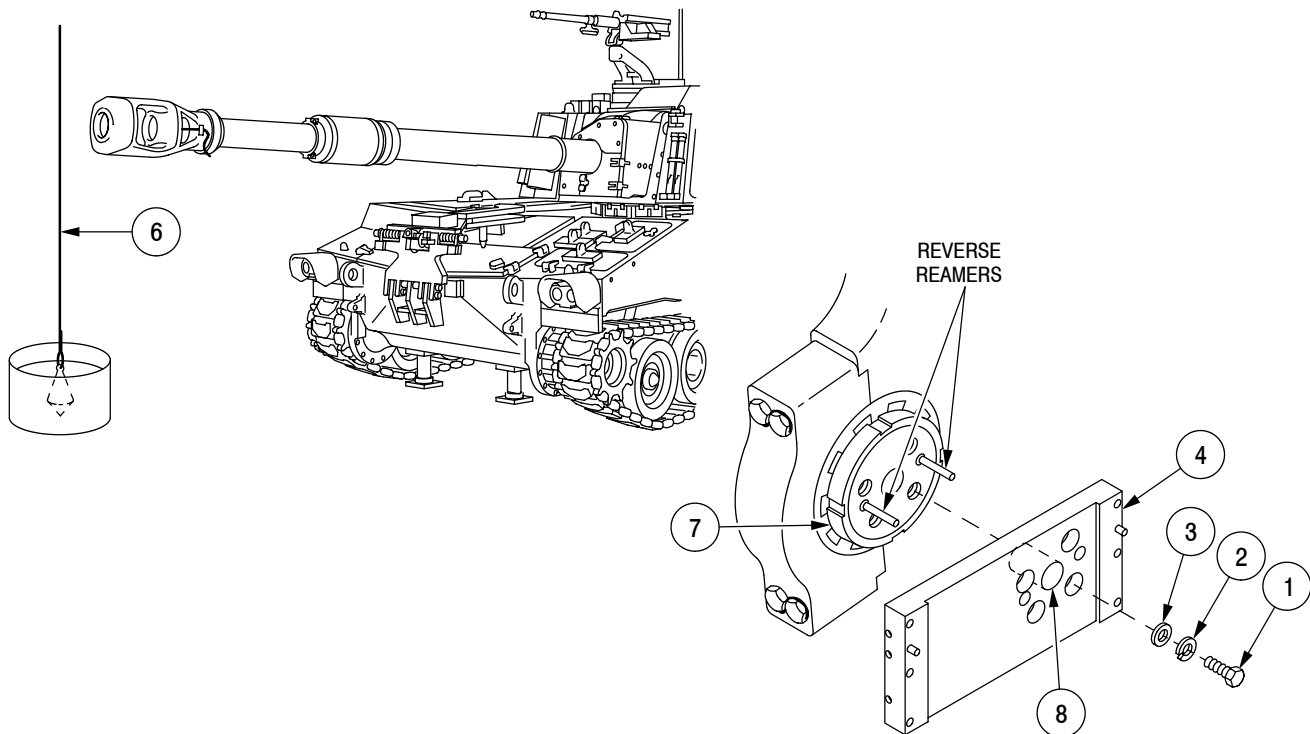


02pc294m

12-1 DRUH MOUNTING PLATE - CONTINUED

b Installation and alignment of new DRUH mounting plate.

- 1 Level the howitzer (TM 9-2350-314-10).
- 2 Install cross hairs on end of cannon (TM 9-2350-314-10).
- 3 Establish a trunnion line by looking through boresite in primer chamber to cross hairs while sighting plumb line (6) and elevating cannon from -10 mils to 1160 mils.
- 4 Determine tracking error by measuring difference between boresite vertical line and plumb line (6). Record tracking error.
- 5 Elevate cannon to maximum elevation while sighting plumb line (6) through boresite in primer chamber to cross hairs. Tracking line should intersect plumb line (6) at 88.9 mils and 1155.6 mils. If at any point between 0 mils and 1160 mils the tracking error is more than ± 0.1 mils, check trunnion (7) for excessive wear.
- 6 Insert two reverse reamers into matching holes in trunnion (7).
- 7 Position DRUH mounting plate (4) on trunnion (7) with alignment pin (8) and reverse reamers protruding through holes in DRUH mounting plate (4).
- 8 Install four flat washers (3), four new lockwashers (2), and four screws (1). Tighten screws until DRUH mounting plate (4) is flush with trunnion (7) and alignment pin (8) is flush with outside surface of DRUH mounting plate (4).



02pc295m

12-1 DRUH MOUNTING PLATE - CONTINUED

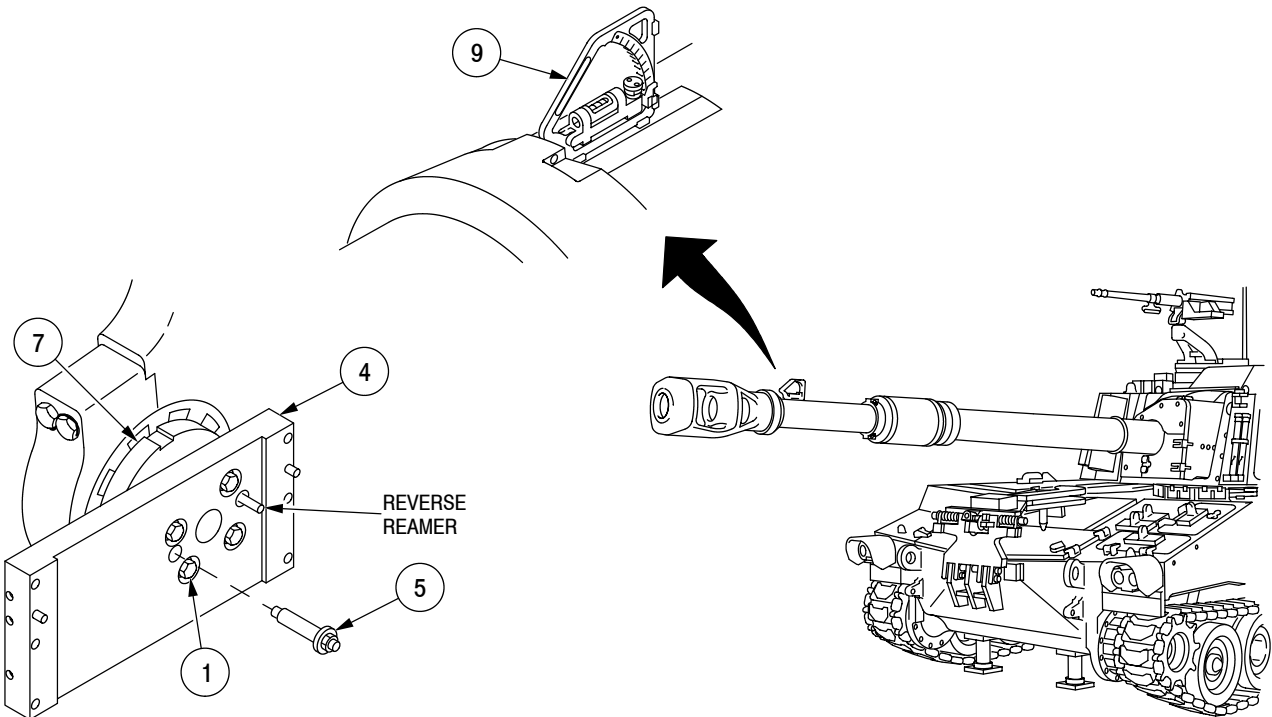
b. Installation and alignment of new DRUH trunnion mount – Continued

- 9 Attach variable speed drill to reverse reamers (one at a time) and, at low speed, pull reverse reamer through DRUH mounting plate (4) and perform step 10 before reverse reaming second hole.
- 10 Clean away metal chips and install expandable pin assembly (5) through DRUH mounting (4) until it bottoms in trunnion (7). Torque expandable pin assembly to 94-96 lb-in. (10.4-10.8 N•m).

NOTE

If it is necessary to loosen one or both of the expandable pin assemblies, the pin assembly nuts should be loosened first. Gently tap the center threaded pin. Do not attempt to twist the center pin. Damage to equipment could result.

- 11 Repeat steps b.9 and b.10 for second expandable pin assembly (5).
- 12 Remove four screws (1), one at a time, and apply sealing compound to the threads and install. Torque screws to 160-170 lb-ft (217-231 N•m).
- 13 Do gunner's quadrant test to calibrate quadrant (TM 9-2350-314-10).
- 14 With cannon at 0 mils, measure difference between muzzle elevation and breech elevation. Record this difference on DA Form 2408-4 in the remarks column as the breech correction (BREECH CORR) (see example para 12-1g).

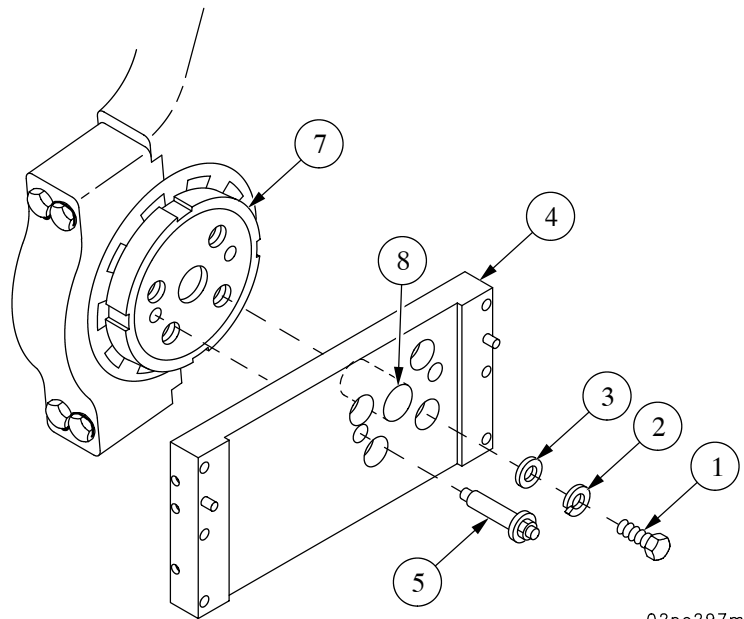


02pc296m

12-1 DRUH MOUNTING PLATE - CONTINUED

c. Installation and alignment of existing DRUH mounting plate.

- 1 Position DRUH mounting plate (4) over alignment pin (8) and install four flat washers (3), four new lockwashers (2), and four screws (1). Tighten screws (1) until DRUH mounting plate (4) is flush with trunnion (7) and alignment pin (8) is flush with outside surface of DRUH mounting plate (4).
- 2 Install two expandable pin assemblies (5) through DRUH mounting plate (4) and into trunnion (7). DRUH mounting plate (4) may be tapped with a soft-faced hammer to align holes for expandable pin assemblies (5). If holes cannot be aligned, a new DRUH mounting plate (4) must be installed.
- 3 Torque expandable pin assemblies (5) to 94-96 lb-in. (10.4-10.8 N•m).
- 4 Remove four screws (1), one at a time, and apply sealing compound to the threads and install. Torque screws to 160-170 lb-ft (217-231 N•m).
- 5 Do gunner's quadrant test to calibrate quadrant (TM 9-2350-314-10).
- 6 With cannon at 0 mils, measure difference between muzzle elevation and breech elevation. Record this difference on DA Form 2408-4 in the remarks column as the breech correction (BREECH CORR) (see example para 12-1g).



12-1 DRUH MOUNTING PLATE - CONTINUED

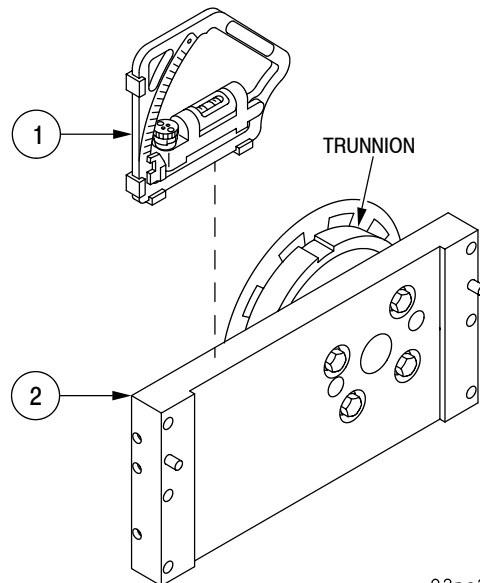
d. DRUH mounting plate elevation offset measurement at zero mils.

- 1 Apply gunner's quadrant correction (if necessary) to the gunner's quadrant (1) (TM 9-2350-314-10).
- 2 Set the gun tube to zero mils at the muzzle (TM 9-2350-314-10).
- 3 Place the gunner's quadrant (1) on top of the DRUH mounting plate (2) parallel to the mounting surface of the mounting plate (2).
- 4 The elevation offset is the difference between the muzzle elevation and the mounting plate (2) elevation on the gunner's quadrant (1).

NOTE

The elevation offset is positive if the line-of-fire arrow on the gunner's quadrant points towards the front of the vehicle, and negative if the line-of-fire arrow on the gunner's quadrant points towards the rear of the vehicle.

- 5 Reverse the gunner's quadrant (end-for-end) to verify calibration. It should read level in both directions. If not, perform the gunner's quadrant end-for-end test and determine gunner's quadrant correction (TM 9-2350-314-10).
- 6 Record this value on the DA Form 2408-4 in the remarks column as the elevation offset (EL OFFSET) (see example para 12-1g). Input data into the AFCS (TM 9-2350-314-20-2-1).

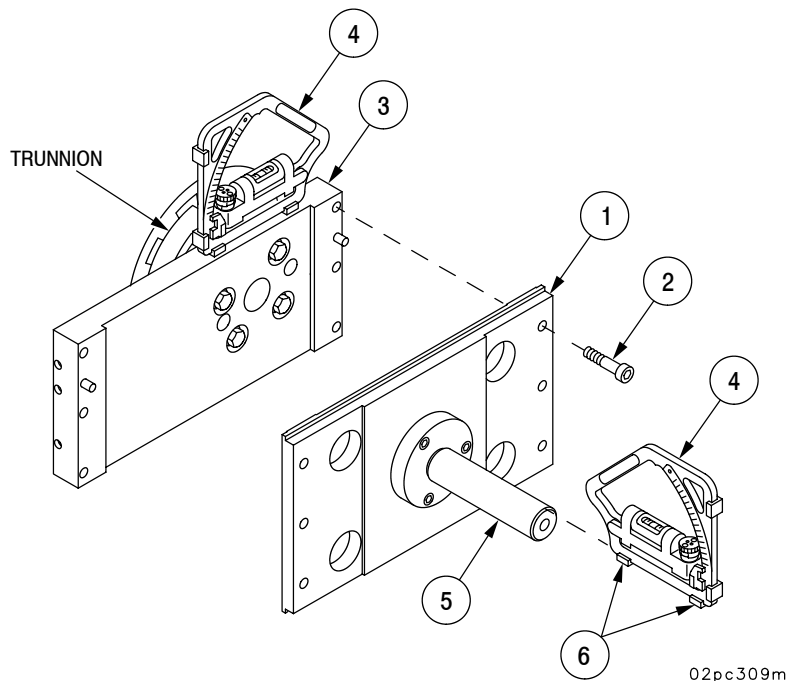


02pc298m

12-1 DRUH MOUNTING PLATE - CONTINUED

e. DRUH mounting plate roll offset measurement at zero mils.

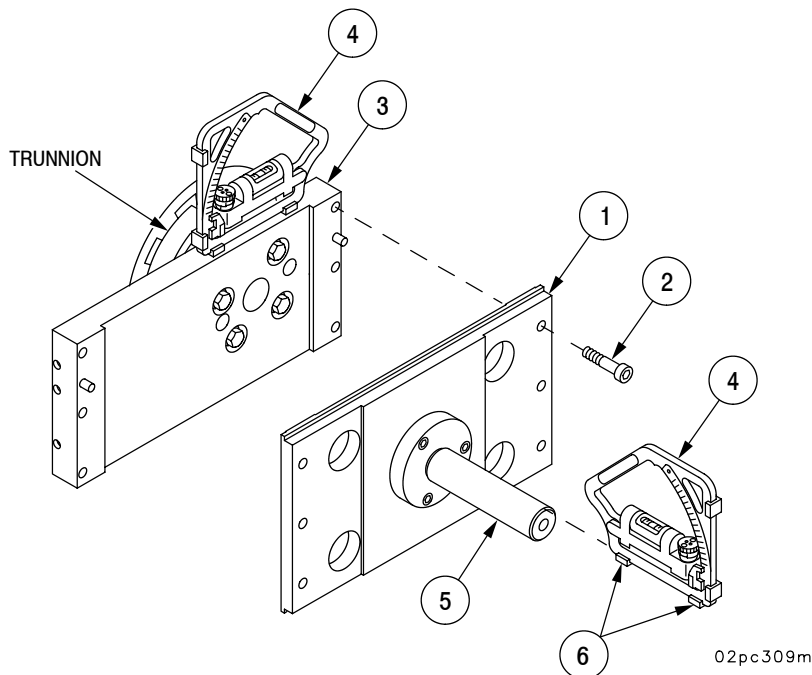
- 1 Install alignment fixture (1) with six capscrews (2) to the DRUH mounting plate (3). Tighten six capscrews (2) to 15–20 lb–ft (20–27 N•m).
- 2 Apply gunner's quadrant correction (if required) to the gunner's quadrant (4) (TM 9-2350-314-10).
- 3 Place the gunner's quadrant (4) on top of the mounting plate (3) and elevate the gun tube so that the gunner's quadrant (4) reads zero mils.
- 4 Place the gunner's quadrant (4) on the alignment fixture assembly pin (5). Ensure the gunner's quadrant (4) is upright and the machine surface of the gunner's quadrant feet (6) are resting flat on the alignment fixture assembly pin (5) and parallel to centerline of the alignment fixture assembly pin (5).
- 5 Read the value on the gunner's quadrant. This is the DRUH mounting plate roll offset measurement. If the line-of-fire arrow on the gunner's quadrant (4) is pointing away from the breech, this value is considered a positive. If the line-of-fire arrow on the gunner's quadrant (4) pointing toward the breech, the value is considered negative.
- 6 Record this value on the DA form 2408-4 in the remarks column as the roll offset (ROLL OFFSET) (see example para 12-1g). Input data into the AFCS (TM 9-2350-314-20-2-1).



12-1 DRUH MOUNTING PLATE - CONTINUED

f. DRUH mounting plate roll offset measurement at 1066.7 mils.

- 1 Install alignment fixture (1) with six capscrews (2) to the DRUH mounting plate (3). Tighten six capscrews (2) to 15–20 lb–ft (20–27 N•m).
- 2 Apply gunner’s quadrant correction (if required) to the gunner’s quadrant (4) (TM 9–2350–314–10).
- 3 Place the gunner’s quadrant (4) on top of the mounting plate (3) and elevate the gun tube so that the gunner’s quadrant (4) reads 1066.7 mils.
- 4 Place the gunner’s quadrant (4) on the alignment fixture assembly pin (5). Ensure the gunner’s quadrant (4) is upright and the machine surface of the gunner’s quadrant feet (6) are resting flat on the alignment fixture assembly pin (5) and parallel to centerline of the alignment fixture assembly pin (5).
- 5 Read the value on the gunner’s quadrant. This is the DRUH mounting plate roll offset measurement. If the line–of–fire arrow on the gunner’s quadrant (4) is pointing away from the breech, this value is considered positive. If the line–of–fire arrow on the gunner’s quadrant (4) pointing toward the breech, the value is considered negative.
- 6 Compute the azimuth offset using the following formula. $(AZ\ OFFSET) = \text{Roll offset measured at 1066.7 mils minus } (1/2 \text{ times roll offset measured at 0 mils}) \text{ divided by } .86$. Or $(AZ\ OFFSET) = [\text{ROLL @ 1066.7} - (.5 \times (\text{ROLL @ 0 mils}))] / .86$.
- 7 If the azimuth offset is negative, subtract the negative number from 6400.0 to obtain a positive number. The azimuth offset number must read between 0 and 6399.9. Round the azimuth offset number one decimal place.
- 8 Record this value on the DA form 2408–4 in the remarks column as the azimuth offset (AZ OFFSET) (see example para 12–1g). This number cannot be negative. Input data into the AFCS (TM 9–2350–314–20–2–1).
- 9 Return the gun tube to zero mils (TM 9–2350–314–10).
- 10 Remove six screws (2) and alignment fixture assembly (1).



BREECH CORRECTIONS & OFFSETS ONLY

C-12

WEAPON RECORD DATA						REQUIREMENT CONTROL SYMBOL			
For use of this form, see TM 38-750; the proponent agency is DCSLOG.						CSGLD-1051			
1. TUBE SERIAL NO.		2. CANNON TYPE, MODEL OR SERIES			3. ORGANIZATION (UIC)		4. SPECIAL LIFE DATA		
1607T		155MM M284			C BTRY 3/41 FA				
5. END ITEM IDENTIFICATION					6. RDS/EFC COMPUTATION				
HOWITZER, MED, S.P., 155MM, M109A6									
7. CANNON SERIAL NO.			8. RETUBINGS	9. REBUSHINGS					
BR 5164									
10. Date	Projectile Type	Zone or Charge	Rounds Fired	EFC RDS Fired	Cumulative RDS Fired	Cumulative EFC RDS	Remaining Life (EFC RDS)	Remarks: Recoil Exercise (RE), Gage or Velocity Reading, Safety Inspection (SI)	Signature
<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>
(Previous DA Form 2408-4 final entries) ←									
4-12-96								DRUH MOUNTING PLATE ALIGNED IAW TM 9-2350-314-34-2 BREECH CORR = 2.7 MILS EL OFFSET = 0.5 MILS ROLL OFFSET = 0.2 MILS AZ OFFSET = 0.3 MILS	SFC JOE FRIDAY

CONTINUE ON REVERSE

EDITION OF 1 DEC 77 WILL BE USED.

DA FORM 1 JAN 79 **2408-4**

BREECH CORRECTIONS & OFFSETS ONLY

g. DA Form 2408-4 Example of Breech Correction and Offsets.

12-1 DRUH MOUNTING PLATE - CONTINUED

TM 9-2350-314-34-2

Change 1

12-9/(12-10 blank)

CHAPTER 12.1

SPECIAL PURPOSE KITS

GENERAL

This chapter illustrates and describes the repair of cab special purpose kits.

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12.1-3 MCS WINTERIZATION KIT RELAY BOX, COVER ASSEMBLY 12.1-12

SECTION I. MCS WINTERIZATION KIT INSTALLATION

12.1-1 MCS WINTERIZATION KIT INSTALLATION

This task covers: Installation

INITIAL SETUP

Tools

Refrigeration service tool kit (SC 5180-90-N18)
 Torque wrench (item 75, Appx F)
 Artillery and turret mechanic's tool kit
 (SC 5180-95-A12)

Materials/Parts

Lockwashers (2) (item 100, Appx E)
 Gasket (item 187, Appx E)
 Lockwashers (14) (item 104, Appx E)
 Methyl alcohol (item 13, Appx B)
 Solder (item 66, Appx B)
 Curing agent (item 10, Appx B)

Materials/Parts-Continued

Adhesive (item 1, Appx B)
 Abrasive cloth (item 23, Appx B)
 Rubber tubing (item 185, Appx E)

Equipment Conditions

MCS pack removed (TM 9-2350-314-20-2-2)
 MCS pack discharged and prepared for debrazing
 and brazing (para 8-1)
 Particulate filter access cover removed
 (TM 9-2350-314-20-2-2)
 Thermostatic expansion valve removed (para 8-9)

References

TM 9-2350-314-20-2-1

Installation.

NOTE

Perform steps 1 thru 5 for cab internal components
 and steps 6 thru 20 for MCS unit components.

- 1 Remove wiring harness W58 (TM 9-2350-314-20-2-1). Retain attaching parts for kit installation.

NOTE

Step 2 is for vehicles with interlock control 12927738
 installed. If modified interlock control 12927738-1 is
 already installed on the vehicle, proceed to step 3.

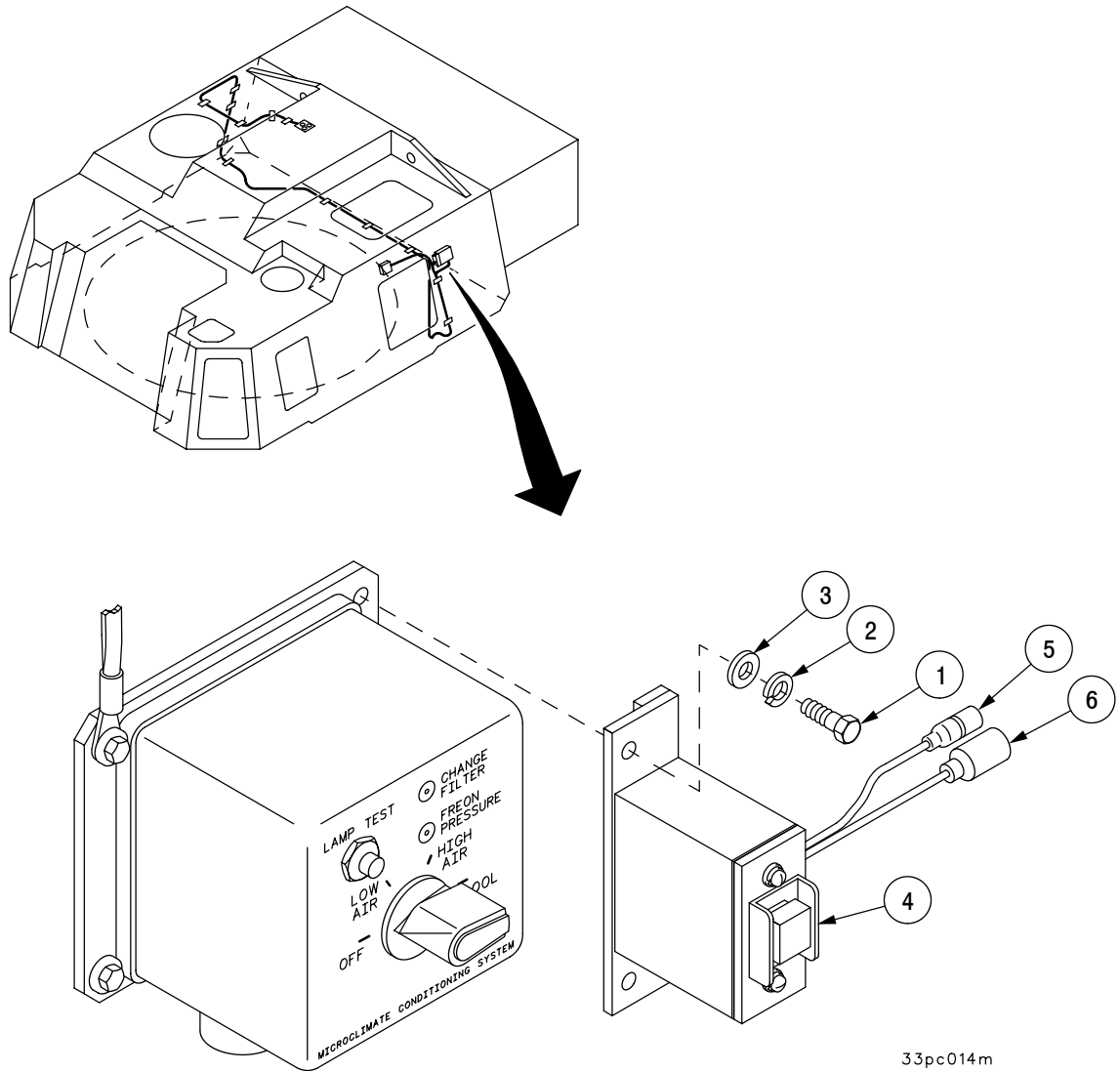
- 2 Modify interlock control 12927738 as follows:
 - a. Remove interlock control 12927738 (TM 9-2350-314-20-2-1). Retain all parts for modification or kit installation.
 - b. Solder jumper wire from relay terminal B2 to relay terminal C2. Use wire M81044/12-22-9 supplied in the kit.
 - c. Solder lead assembly 12927744-7, wire WNT001 supplied from kit, to relay terminal C1. Tag other end of wire WNT001 for connection to lead assembly 12927744-5.
 - d. Mark modified assembly as 12927738-1 per instructions of rework drawing 12978172 supplied in the kit.
 - e. Install modified interlock control 12927738-1 (TM 9-2350-314-20-2-1) using attaching parts from step 2a for installation.

SECTION I. MCS WINTERIZATION KIT INSTALLATION - CONTINUED

12.1-1 MCS WINTERIZATION KIT INSTALLATION - CONTINUED

Installation - Continued

- 3 Remove two screws (1), two lockwashers (2), and two flat washers (3) from MCS control box assembly. Discard lockwashers.
- 4 Install switch assembly (4) to MCS control box assembly with two screws (1), two new lockwashers (2), and two flat washers (3). Tag switch assembly wires (5 and 6) for connection to appropriate wire connectors as indicated in kit installation instructions.



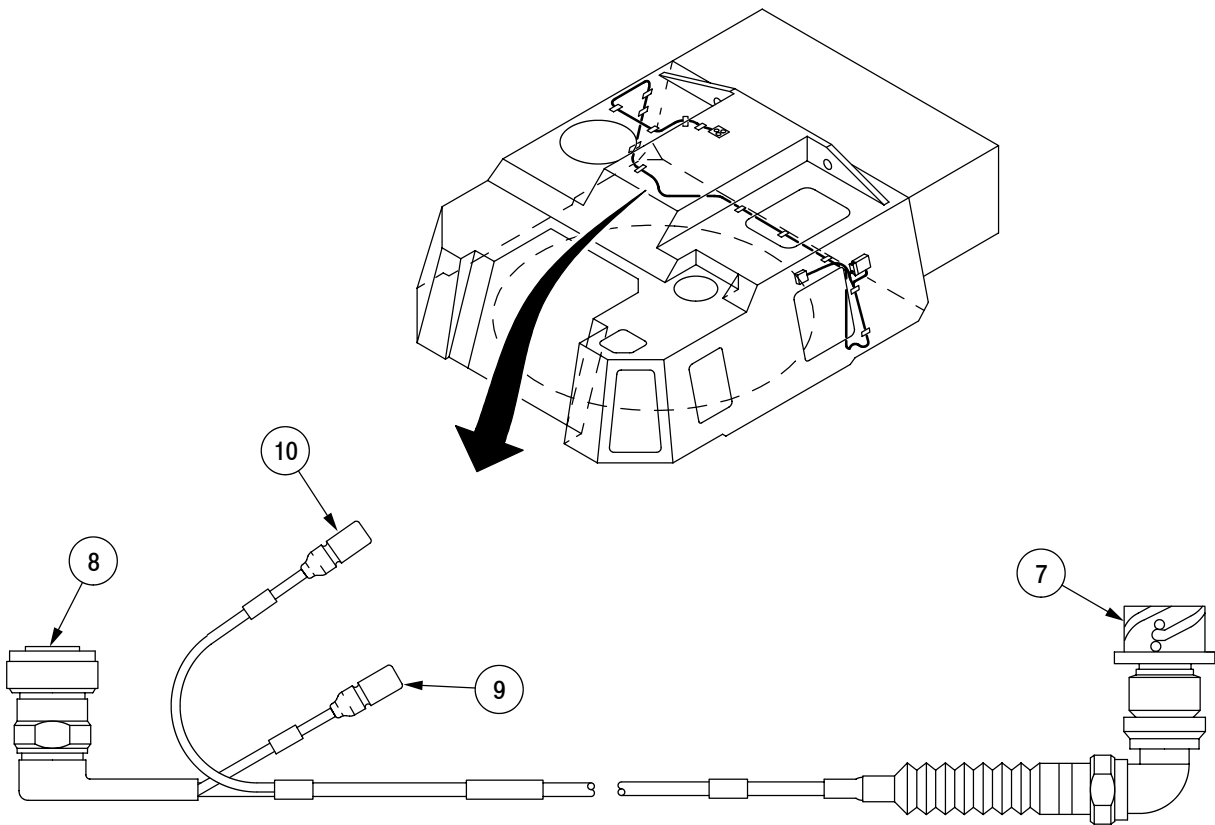
SECTION I. MCS WINTERIZATION KIT INSTALLATION - CONTINUED

12.1-1 MCS WINTERIZATION KIT INSTALLATION - CONTINUED

Installation - Continued

- 5 Install wiring harness W58A, routing it in the same manner as W58 using attaching parts from step 1. Use wiring harness connections as follows:

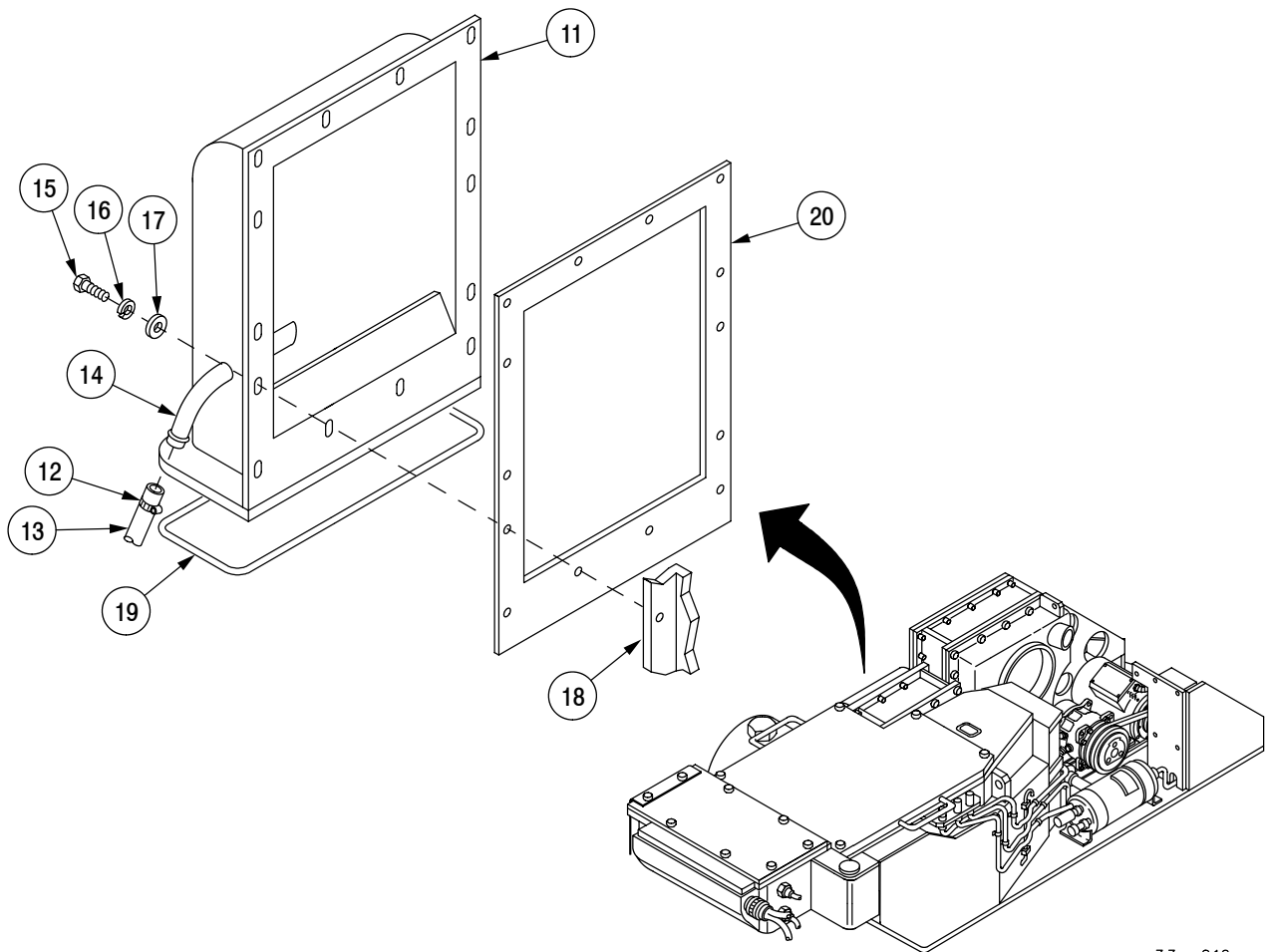
Item No.	W58A Connector/Lead/Wire	Mates With	Location
7	W58A J1	1 P1	Cab roof in MCS compartment
8	W58A P2	MCS control box receptacle	Rear of cab — center beside cab side door
9	W58A wire 70B	Tag for later connection to wire 70A from interlock control	Above side door
10	W58A wire PH/SW	Tag for later connection to lead 12929944-6 from switch assembly	Above side door



33pc015m

SECTION I. MCS WINTERIZATION KIT INSTALLATION - CONTINUED**12.1-1 MCS WINTERIZATION KIT INSTALLATION - CONTINUED****Installation - Continued**

- 6 Remove evaporator header (11) as follows:
 - a. Loosen clamp (12) and remove hose (13) from evaporator inlet tube (14).
 - b. Remove 14 screws (15), 14 lockwashers (16), 14 flat washers (17), and header (11) from evaporator (18). Discard lockwashers.
 - c. Remove rubber tubing (19) from evaporator header (11). Discard rubber tubing.
 - d. Remove gasket (20) from evaporator (18). Discard gasket.
 - e. Use rag moistened with methyl alcohol to remove residual adhesive material from mating surfaces of evaporator (18) and evaporator header (11).



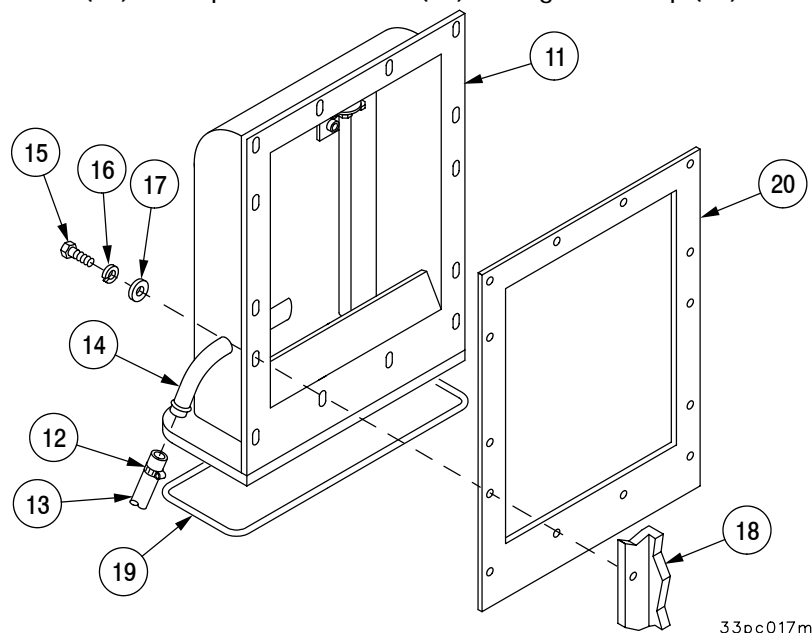
33pc016m

SECTION I. MCS WINTERIZATION KIT INSTALLATION - CONTINUED

12.1-1 MCS WINTERIZATION KIT INSTALLATION - CONTINUED

Installation - Continued

- 7 Modify evaporator header (11) in accordance with altered item drawing 12978160 supplied in the kit.
- 8 Assemble modified evaporator header (11) in accordance with MCS header preheater and rod installation drawing 12978162 using new grommet, pre-heater rods, bracket, and mounting hardware all supplied in the kit.
- 9 Tag preheater rod wires for connection to appropriate terminal number on relay box terminal block as indicated in kit installation instructions.
- 10 Install modified evaporator header preheater rod installation 12978162 as follows:
 - a. Clean evaporator header (11) and gasket (20) mating surfaces and 45-degree bend splice area of new rubber tubing (19) with methyl alcohol. Abrade the mating surface with abrasive cloth. Repeat methyl alcohol cleaning and air dry.
 - b. Prepare adhesive mixture by combining seven parts adhesive to one part curing agent. Mix thoroughly.
 - c. Apply a coat of adhesive mixture to the sealing surfaces of evaporator (18) and new gasket (20). Allow adhesive to cure for 60 minutes.
 - d. Apply a coat of adhesive mixture to the rubber and metal mounting surfaces of the evaporator header (11) and mating surface and bend splice area of new rubber tubing (19). Allow adhesive to dry for 2 hours.
 - e. Apply a second coat of adhesive mixture to previously coated areas. Allow adhesive to set for 30 to 60 minutes.
 - f. Install new rubber tubing (19) onto bottom of evaporator header (11).
 - g. Install new gasket (20) on evaporator (18).
 - h. Install evaporator header (11) on evaporator (18) with 14 screws (15), 14 new lockwashers (16), and 14 flat washers (17). Torque screws to 35-45 lb-in (4-5 N•m).
 - i. Connect hose (13) to evaporator inlet tube (14) and tighten clamp (12).



SECTION I. MCS WINTERIZATION KIT INSTALLATION - CONTINUED

12.1-1 MCS WINTERIZATION KIT INSTALLATION - CONTINUED

Installation - Continued

- 11 Assemble preheater relay box internal wiring in accordance with kit installation instructions, using parts supplied in modification kit and as follows. Do not attach cover at this time.

FROM	WIRE TERMINATION	WIRE DESIGNATION	WIRE PART NUMBER	TO	WIRE TERMINATION
Relay Terminal A1	Solder	WNT002C	M22759/16-12-7	Relay Terminal B1	Solder
Relay Terminal A1	Solder	WNT002B	M22759/16-12-7	Circuit Breaker Output (Top) Terminal	Connector Plug MS27143
Relay Terminal B2	Solder	WNT003A	M22759/16-12-7	Terminal Block - Terminal 1 (TB1-1)	Terminal Lug MS20659-105
Relay Terminal A2	Solder	WNT004A	M22759/16-12-7	Terminal Block - Terminal 2 (TB1-2)	Terminal Lug MS20659-105
Relay Terminal X2	Solder	WNT001-70	M22759/16-18-0	Terminal Block - Terminal 4 (TB1-4)	Terminal Lug MS20659-105
Terminal Block - Terminal 4 (TB1-4)	Terminal Lug MS20659-102	WNT002-70B	M22759/16-12-0	Terminal Block - Terminal 5 (TB1-5)	Terminal Lug MS20659-102

- 12 Install preheater relay box external wiring in accordance with kit installation instructions using parts supplied in modification kit and as follows:

FROM	WIRE TERMINATION	WIRE DESIGNATION	WIRE PART NUMBER	TO (TAG WIRE)
Relay Terminal X1	Solder	WNT001	M22759/16-18-2	Wiring Harness Connector 1 P2 Pin J
Terminal Block - Terminal 5 (TB1-5)	MS20659-105	WNT002-70A	M22759/16-12-0	MCS Relay Panel Terminal Board 3 Pin 3 (TB3-3)
Circuit Breaker Input (Bottom) Terminal	Connector Plug MS27143	WNT002A	M22759/16-12-0	MCS Relay Panel Terminal Board 3 Pin 6 (TB3-6)

SECTION I. MCS WINTERIZATION KIT INSTALLATION - CONTINUED

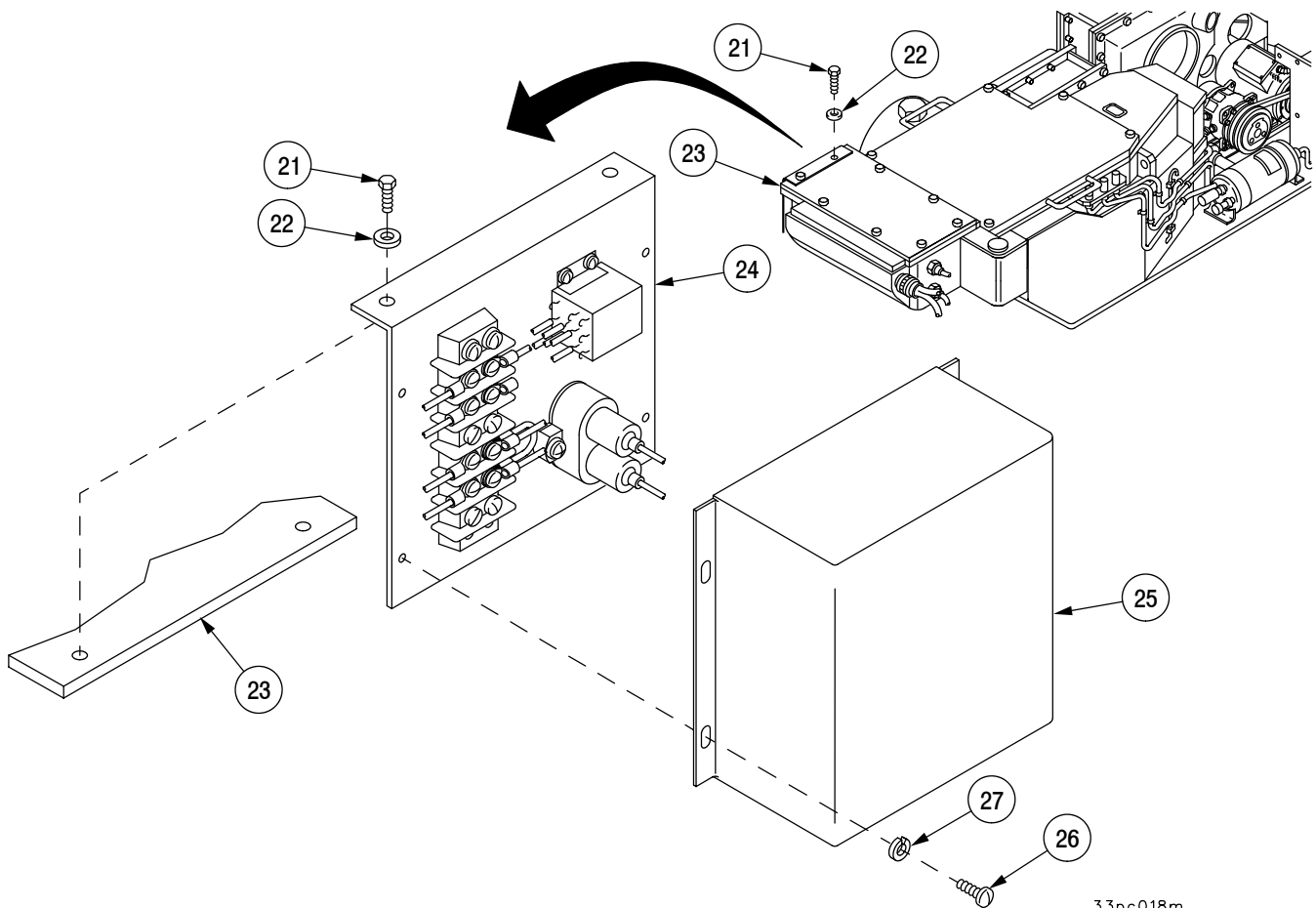
12.1-1 MCS WINTERIZATION KIT INSTALLATION - CONTINUED

Installation - Continued

- 13 Remove two screws (21) and two flat washers (22) from MCS cover (23). Retain parts for installation.
- 14 Install relay box base (24) to MCS cover (23) with two screws (21) and two flat washers (22).
- 15 Complete wiring connections from preheater rod installation (step 9) to the relay box as follows:

FROM	WIRE DESIGNATION	TO	WIRE TERMINATION
Preheater rod WH1	WNT003B	Terminal Block - Terminal 1 (TB1-1)	Terminal Lug MS20659-105
Preheater rod WH2	WNT004B	Terminal Block - Terminal 2 (TB1-2)	Terminal Lug MS20659-105
Preheater rod WH2	WNT004-70	Terminal Block - Terminal 4 (TB1-4)	Terminal Lug MS20659-105
Preheater rod WH1	WNT003-70	Terminal Block - Terminal 5 (TB1-5)	Terminal Lug MS20659-105

- 16 Install cover (25) on relay box base (24) with four screws (26) and four lockwashers (27) supplied from the modification kit.



33pc018m

SECTION I. MCS WINTERIZATION KIT INSTALLATION - CONTINUED

12.1-1 MCS WINTERIZATION KIT INSTALLATION - CONTINUED

Installation - Continued

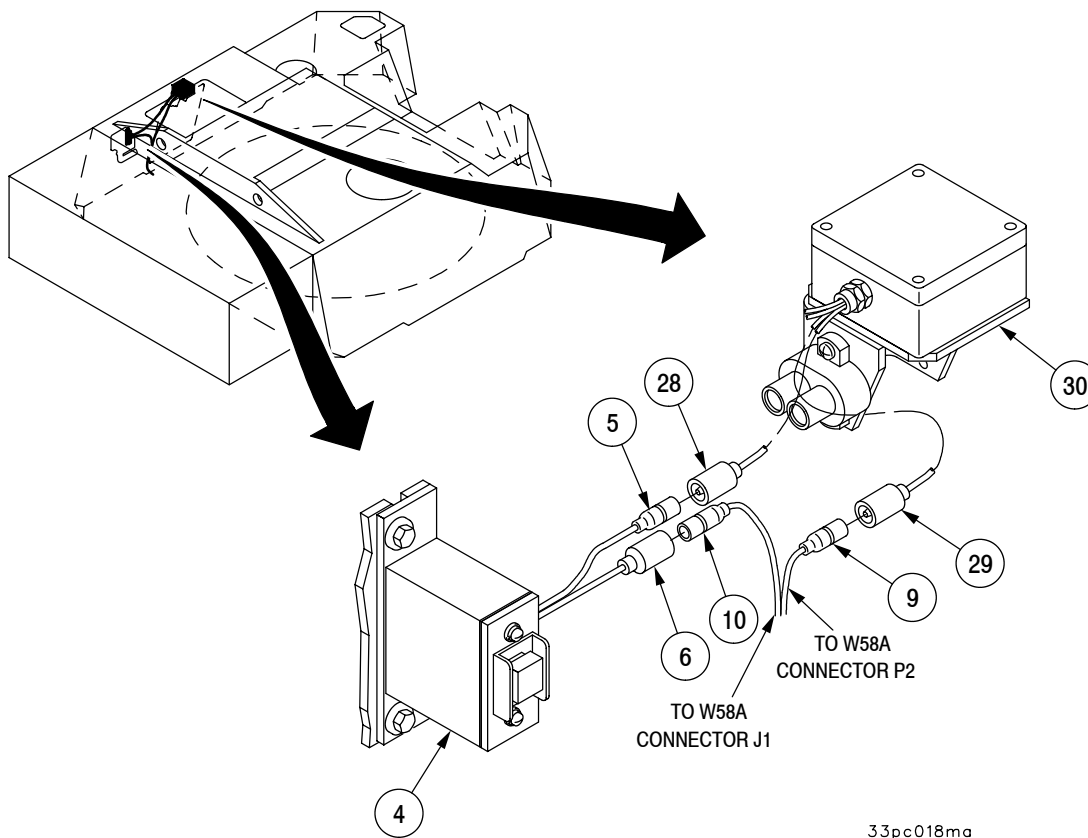
17 Connect wires WNT002-70A, WNT002A, and WNT001 installed in relay box (step 12) as follows:

FROM	WIRE DESIGNATION	TO (see kit installation instructions for routing details)	WIRE TERMINATION
Terminal Block - Terminal 5 (TB1-5)	WNT002-70A	MCS Relay Panel Terminal Board 3 Pin 3 (TB3-3)	Terminal Lug MS20659-106
Circuit Breaker Input Bottom Terminal	WNT002A	MCS Relay Panel Terminal Board 3 Pin 6 (TB3-6)	Terminal Lug MS20659-106
Relay Terminal X1	WNT001	Wiring Harness Connector 1 P2 Pin J	Use contact socket supplied in connector plug

18 Connect lead assembly (28) connected in step 2c. to lead assembly (5) of the switch assembly (4).

19 Connect lead assembly (6) from the switch assembly (4) to wire PH/SW (10) from pin J of wiring harness W58A connector J1.

20 Connect wire 70A (29) from interlock control (30) to wire 70B (9) from pin I of wiring harness W58A connector P2.



SECTION II. MCS WINTERIZATION KIT COMPONENTS

12.1-2 MCS WINTERIZATION KIT ROD PREHEATER, EVAPORATOR HEADER

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

- Artillery and turret mechanic's tool kit (SC 5180-95-A12)
- Torque wrench (item 76, Appx F)

Materials/Parts

- Adhesive (item 1, Appx B)
- Abrasive cloth (item 23, Appx B)
- Adhesive (item 39.2, Appx B)
- Curing agent (item 10, Appx B)
- Thread lubricant (item 51.1, Appx B)
- Methyl alcohol (item 13, Appx B)

Materials/Parts-Continued

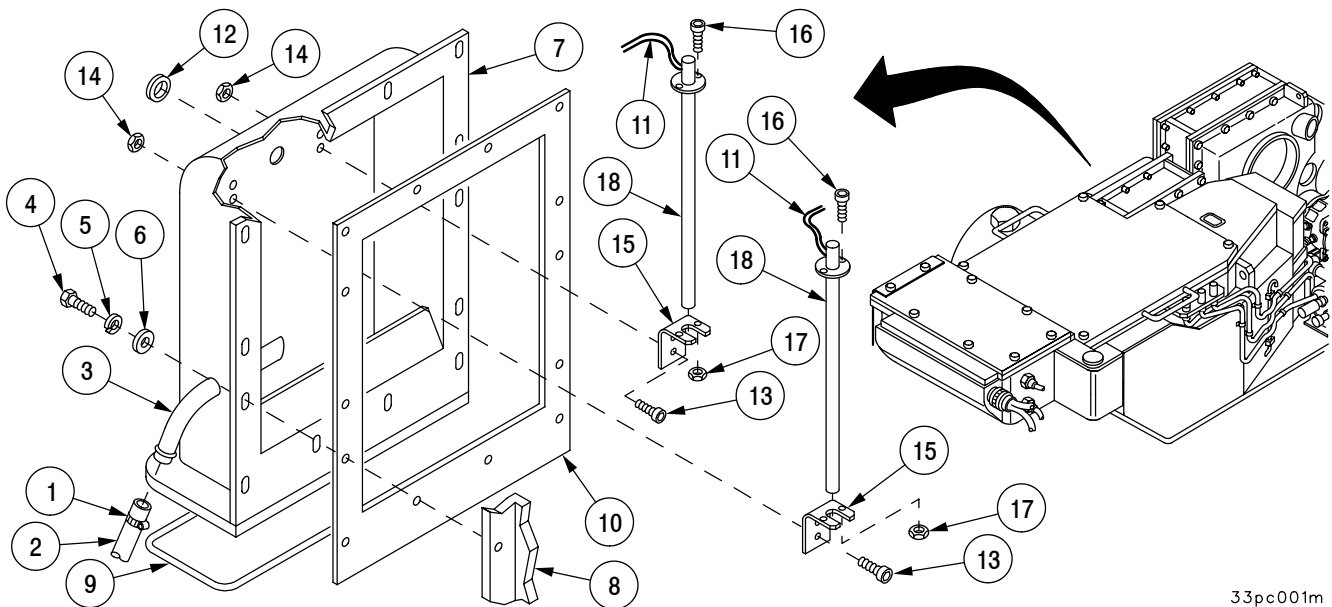
- Lockwashers (14) (item 104, Appx E)
- Rubber tubing (item 185, Appx E)
- Grommet (item 172, Appx E)
- Gasket (item 187, Appx E)

Equipment Conditions

- MCS pack removed (TM 9-2350-314-20-2-2)
- Particulate filter access cover removed (TM 9-2350-314-20-2-2)
- Wires WNT003, WNT004, WNT003-70 and WNT004-70 disconnected from terminal strip (TM 9-2350-314-20-2-2)

a. Disassembly.

- 1 Loosen clamp (1) and remove hose (2) from evaporator inlet tube (3).
- 2 Remove 14 screws (4), 14 lockwashers (5), 14 flat washers (6), and evaporator header (7) from evaporator (8). Discard lockwashers.
- 3 Remove and discard rubber tubing (9) and gasket (10) from evaporator header (7). Discard rubber tubing and gasket.
- 4 Remove four wires (11) through grommet (12).
- 5 Remove four screws (13), four nuts (14), and two brackets (15) from evaporator header (7).
- 6 Remove four screws (16), four nuts (17), and two rods (18) from two brackets (15).
- 7 Remove grommet (12) from evaporator header (7). Discard grommet.



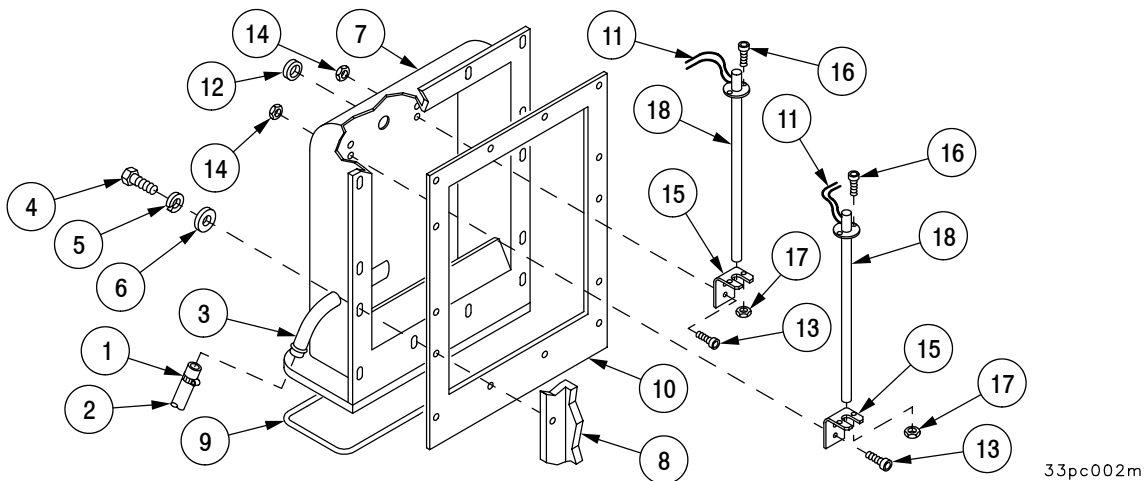
33pc001m

SECTION II. MCS WINTERIZATION KIT COMPONENTS - CONTINUED

12.1-2 MCS WINTERIZATION KIT ROD PREHEATER, EVAPORATOR HEADER - CONTINUED

b. Assembly.

- 1 Clean evaporator header (7) and gasket (10) mating surfaces and 45-degree bend splice area of the new rubber tubing (9) with methyl alcohol. Abrade the mating surface with abrasive cloth. Repeat methyl alcohol cleaning and air dry.
- 2 Prepare adhesive mixture by combining seven parts adhesive (item 1, Appx B) to one part curing agent. Mix thoroughly.
- 3 Apply a coat of adhesive mixture to the sealing surfaces of evaporator (8) and new gasket (10). Allow adhesive to cure for 60 minutes.
- 4 Apply a coat of adhesive mixture to the rubber and metal mounting surfaces of the evaporator header (7) and mating surface and bend splice area of new rubber tubing (9). Allow adhesive to dry for 2 hours.
- 5 Apply a second coat of adhesive mixture to previously coated areas. Allow adhesive to set for 30 to 60 minutes.
- 6 Install new rubber tubing (9) onto bottom of evaporator header (7).
- 7 Install new gasket (10) on evaporator (8).
- 8 Install new grommet (12) on evaporator header (7).
- 9 Thread four wires (11) through grommet (12) and fill grommet hole with adhesive (item 39.2, Appx B).
- 10 Install two rods (18) on two brackets (15) with four nuts (17) and four screws (16).
- 11 Apply adhesive (item 39.2, Appx B) to four screws (13).
- 12 Install two brackets (15) on evaporator header (7) with four screws (13) and four nuts (14).
- 13 Install evaporator header (7) on evaporator with 14 screws (4), 14 new lockwashers (5), and 14 flat washers (6). Torque screws to 35-45 lb-in. (4-5 N•m).
- 14 Connect hose (2) to evaporator inlet tube (3) and tighten clamp (1).



SECTION II. MCS WINTERIZATION KIT COMPONENTS - CONTINUED

12.1-3 MCS WINTERIZATION KIT RELAY BOX, COVER ASSEMBLY

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)

Materials/Parts

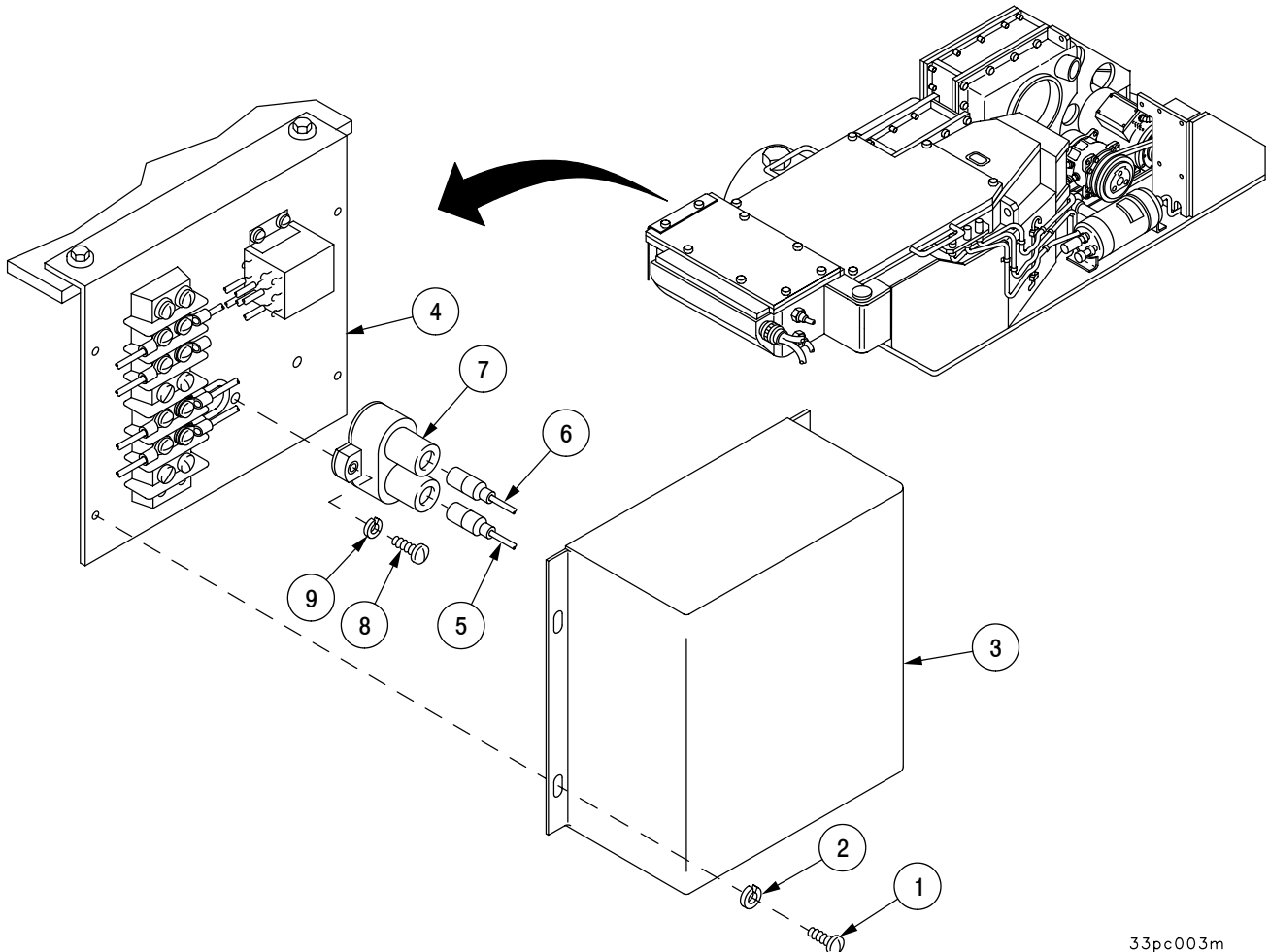
Grommet (item 120.1, Appx E)
Lockwashers (8) (item 106.1, Appx E)
Lockwashers (2) (item 106.2, Appx E)
Lockwashers (4) (item 106.3, Appx E)

Equipment Conditions

Vehicle MASTER power switch OFF
(TM 9-2350-314-10)
Battery ground leads disconnected
(TM 9-2350-314-20-1-2)

a. Disassembly.

- 1 Remove four screws (1), four lockwashers (2), and cover (3) from relay box base (4). Discard lockwashers.
- 2 Disconnect two wires WNT002A (5) and WNT002B (6) from circuit breaker (7).
- 3 Disconnect wire WNT002A (5) from MCS relay panel (para 8-19).
- 4 Remove two screws (8), two lockwashers (9), and circuit breaker (7) from relay box base (4). Discard lockwashers.



33pc003m

SECTION II. MCS WINTERIZATION KIT COMPONENTS - CONTINUED

12.1-3 MCS WINTERIZATION KIT RELAY BOX, COVER ASSEMBLY - CONTINUED

a. Disassembly - Continued

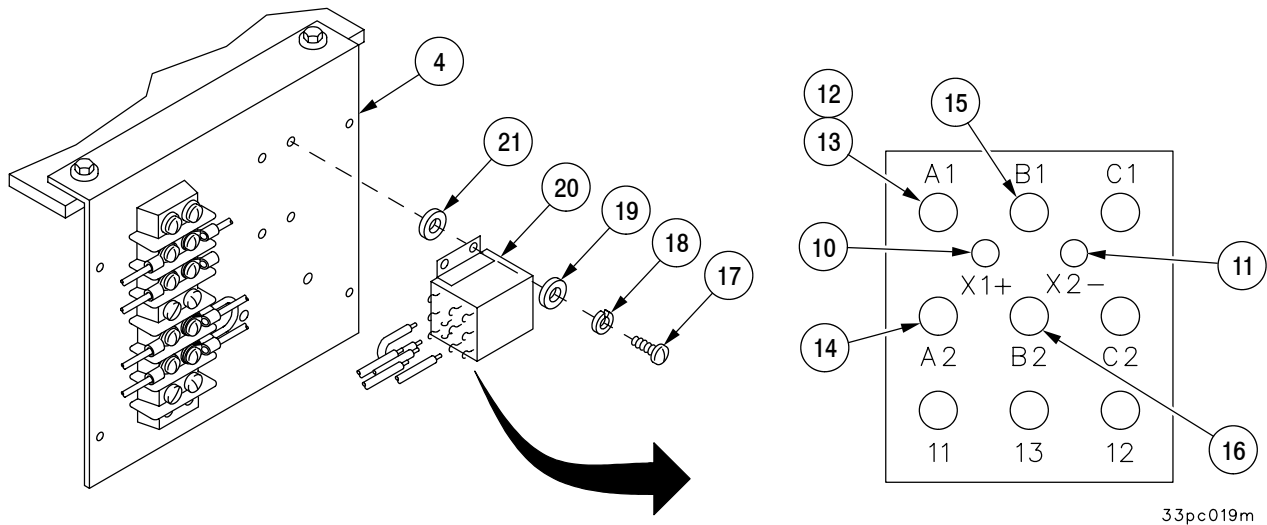
NOTE

Tag leads before disconnecting to aid in installation.

- 5 Unsolder and remove seven wires from relay terminals as follows:

Item	Relay	Wire No.	Notes
10	X1	WNT001	Connects to 1P2
11	X2	WNT001-70	Connects to terminal block terminal 4
12	A1	WNT002B	Connects to circuit breaker
13	A1	WNT002C	Connects to relay terminal B1
14	A2	WNT004A	Connects to terminal block terminal 2
15	B1	WNT002C	Connects to relay terminal A1
16	B2	WNT003A	Connects to terminal board terminal 1
-	C1	NC	-
-	C2	NC	-

- 6 Remove four screws (17), four lockwashers (18), four flat washers (19), relay (20), and four washers (21) from relay box base (4). Discard lockwashers.



33pc019m

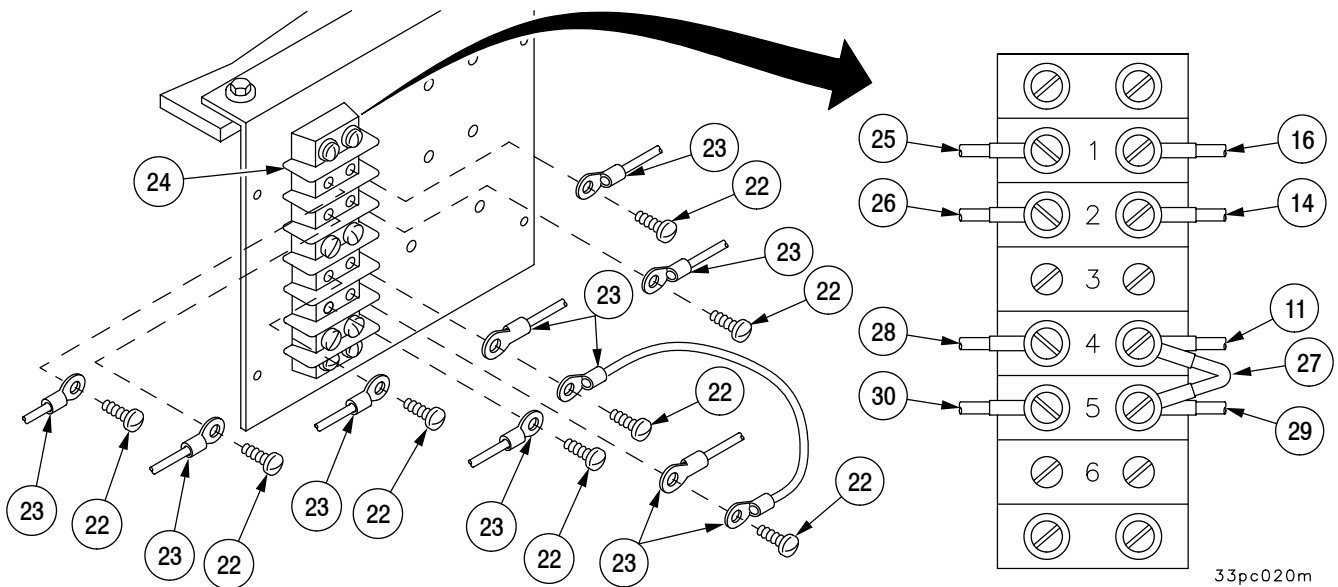
SECTION II. MCS WINTERIZATION KIT COMPONENTS - CONTINUED

12.1-3 MCS WINTERIZATION KIT RELAY BOX, COVER ASSEMBLY - CONTINUED

a. Disassembly - Continued

7 Remove eight screws (22) and ten terminals (23) with attached wires from terminal strip (24) as follows:

Item	Relay	Wire No.	Notes
16	1	WNT003A	Connects with relay terminal B2
25	1	WNT003B	Supplied with preheater rod WH1
14	2	WNT004A	Connects with relay terminal A2
26	2	WNT004B	Supplied with preheater rod WH2
-	3	NC	-
11	4	WNT001-70	Connects with relay terminal X2
27	4	WNT002-70B	Connects with terminal block terminal 5
28	4	WNT004-70	Supplied with preheater rod WH2
29	5	WNT002-70A	Connects with relay panel terminal board TB3-3 (para 8-19)
27	5	WNT002-70B	Connects with terminal block terminal 4
30	5	WNT003-70	Supplied with preheater rod WH1



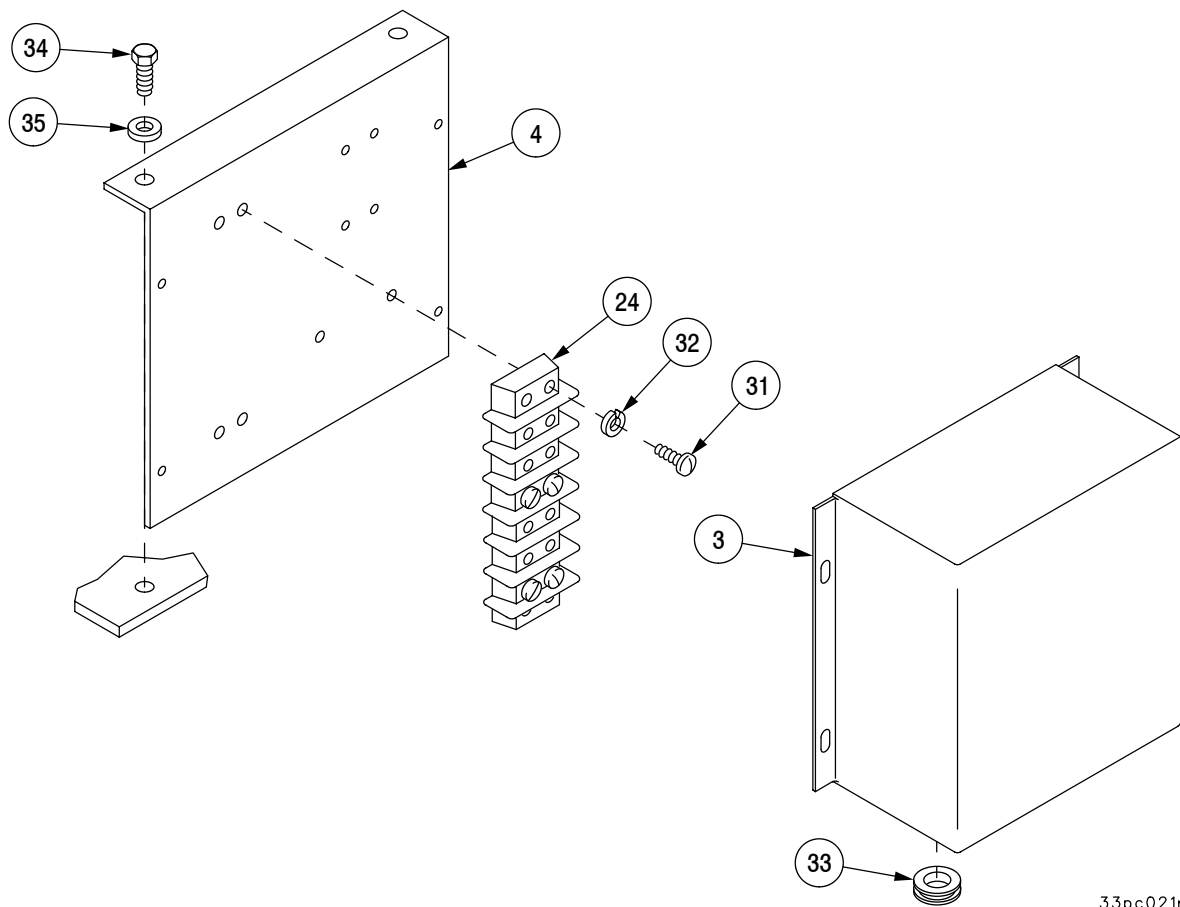
33pc020m

SECTION II. MCS WINTERIZATION KIT COMPONENTS - CONTINUED**12.1-3 MCS WINTERIZATION KIT RELAY BOX, COVER ASSEMBLY - CONTINUED****a. Disassembly - Continued**

- 8 Remove four screws (31), four lockwashers (32), and terminal strip (24) from relay box base (4). Discard lockwashers.
- 9 Remove grommet (33) from cover (3). Discard grommet.
- 10 Remove two screws (34), two flat washers (35), and relay box base (4) from MCS unit.

b. Assembly.

- 1 Install relay box base (4) to MCS unit with two screws (34) and two flat washers (35).
- 2 Install new grommet (33) to cover (3).
- 3 Install terminal strip (24) on relay box base (4) with four screws (31) and four new lockwashers (32).



33pc021m

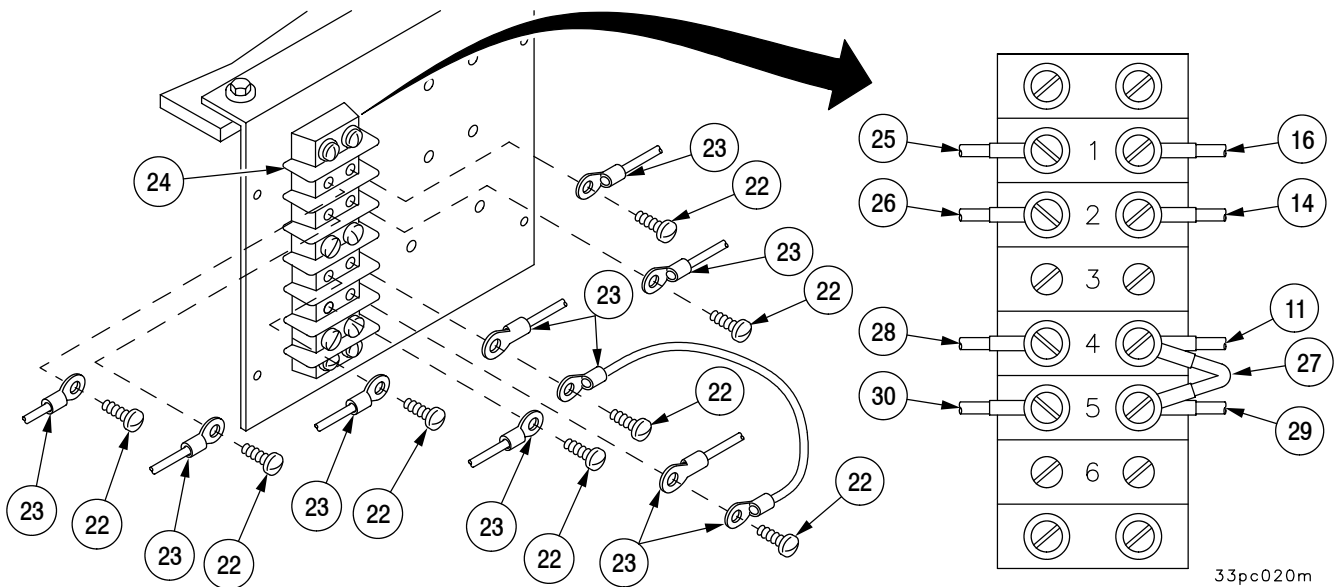
SECTION II. MCS WINTERIZATION KIT COMPONENTS - CONTINUED

12.1-3 MCS WINTERIZATION KIT RELAY BOX, COVER ASSEMBLY - CONTINUED

b. Assembly - Continued

4 Install ten terminals (23) with attached wires on terminal strip (24) with eight screws (22) as follows:

Item	Relay	Wire No.	Notes
30	5	WNT003-70	Supplied with preheater rod WH1
27	5	WNT002-70B	Connects with terminal block terminal 4
29	5	WNT002-70A	Connects with relay panel terminal board TB3-3 (para 8-19)
28	4	WNT004-70	Supplies with preheater rod WH2
27	4	WNT002-70B	Connect with terminal block terminal 5
11	4	WNT001-70	Connects with relay terminal X2
-	3	NC	-
26	2	WNT004B	Supplied with preheater rod WH2
14	2	WNT004A	Connects with replay terminal A2
25	1	WNT003B	Supplies with preheater rod WH1
16	1	WNT003A	Connect with relay terminal B2



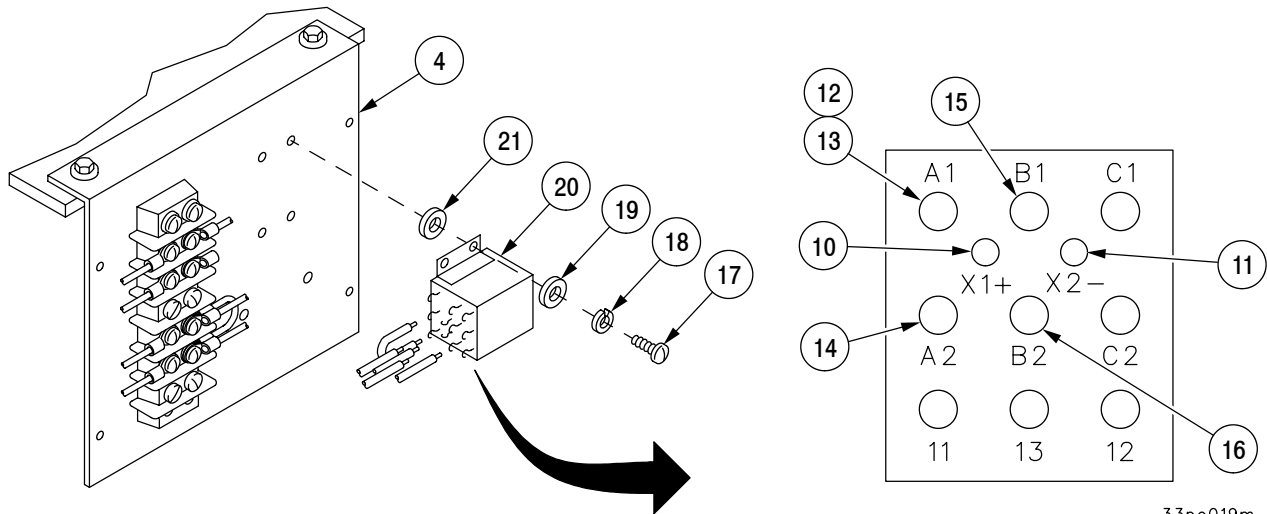
SECTION II. MCS WINTERIZATION KIT COMPONENTS - CONTINUED

12.1-3 MCS WINTERIZATION KIT RELAY BOX, COVER ASSEMBLY - CONTINUED

b. Assembly - Continued

- 5 Install relay (20) on relay box base (4) with four screws (17), four new lockwashers (18), four flat washers (19), and four flat washers (21).
- 6 Connect seven wires to relay terminals as follows:

Item	Relay	Wire No.	Notes
-	C2	NC	-
-	C1	NC	-
16	B2	WNT003A	Connects to terminal board terminal 1
15	B1	WNT002C	Connects to relay terminal A1
14	A2	WNT004A	Connects to terminal block terminal 2
13	A1	WNT002C	Connects to relay terminal B1
12	A1	WNT002B	Connects to circuit breaker
11	X2	WNT001-70	Connects to terminal block terminal 4
10	X1	WNT001	Connects to 1P2



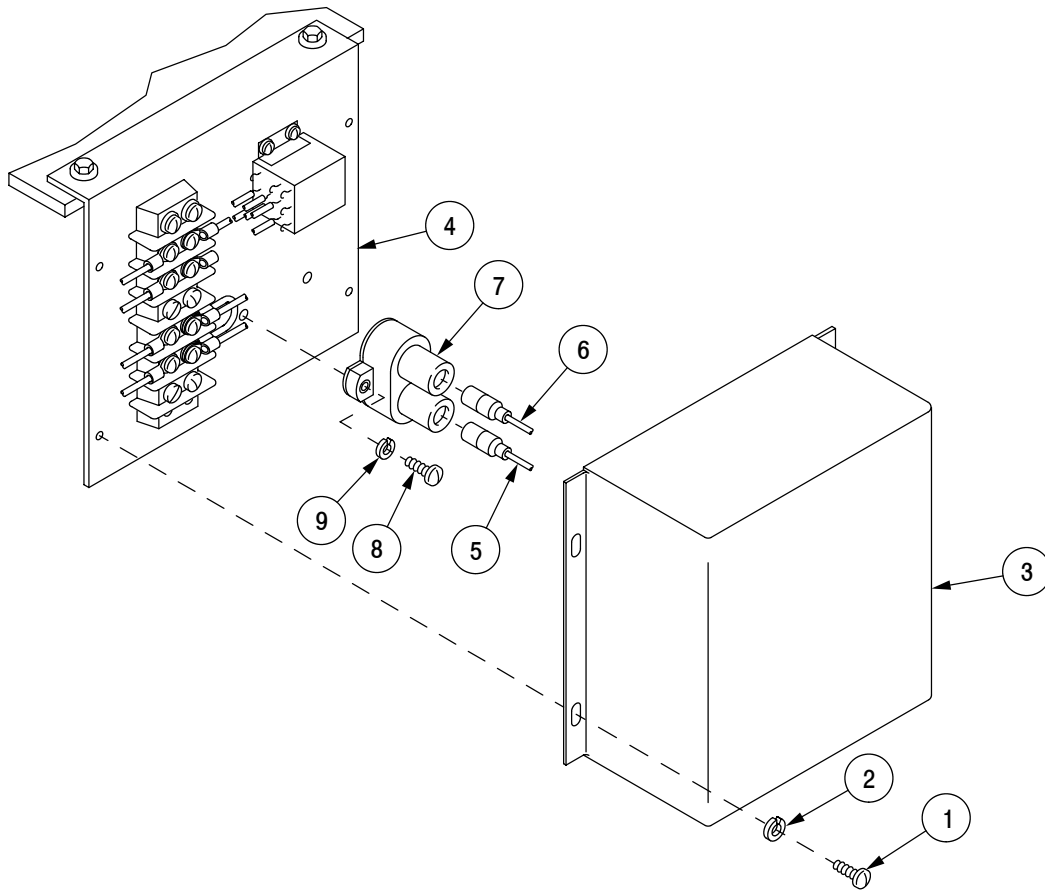
33pc019m

SECTION II. MCS WINTERIZATION KIT COMPONENTS - CONTINUED

12.1-3 MCS WINTERIZATION KIT RELAY BOX, COVER ASSEMBLY - CONTINUED

b. Assembly - Continued

- 7 Install circuit breaker (7) on relay box base (4) with two screws (8) and two new lockwashers (9).
- 8 Connect WNT002A (5) to MCS relay panel (para 8-19).
- 9 Connect two wires WNT002B (6) and WNT002A (5) to circuit breaker (7).
- 10 Install cover (3) on relay box base (4) with four screws (1) and four new lockwashers (2).



33pc022m

CHAPTER 13

GENERAL SUPPORT MAINTENANCE

GENERAL

This chapter illustrates and describes the repair performed by general support maintenance on the major components listed below.

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Section I. CANNON AND MOUNT - CONTINUED

13-2 ACTUATOR ASSEMBLY.

This task covers: a. Disassembly b. Inspection
c. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Vernier calipers (item 6, Appx F)
Drill (item 10, Appx F)
Twist drill set (item 44, Appx F)

Materials/Parts

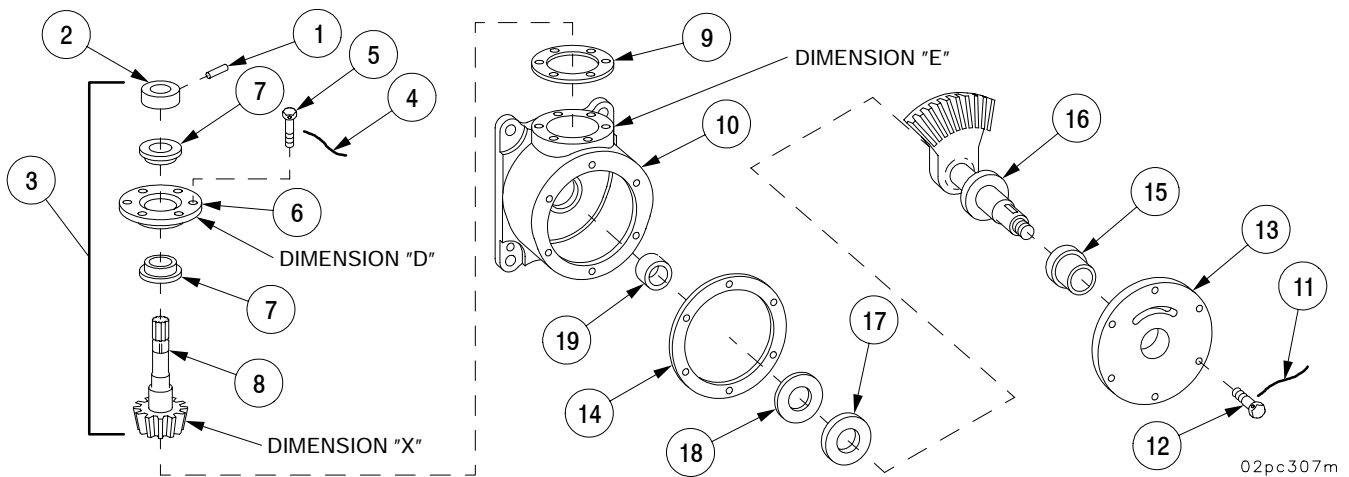
Spring pin (item 17, Appx E)
Lockwire (item 83, Appx B)

Equipment Conditions

Actuator assembly removed
(para 4-7)

a. Disassembly.

- 1 Remove spring pin (1) and spacer (2) from bevel gearshaft assembly (3). Discard spring pin.
- 2 Remove lockwire (4) and six screws (5) from cover (6). Discard lockwire.
- 3 Withdraw bevel gearshaft assembly (3) from actuator.
- 4 Remove two sleeve bearings (7) and cover (6) from bevel gearshaft (8). Note arrows on gears.
- 5 Remove shim (s) (9), if any. Measure thickness. Note dimension D etched on cover (6), dimension X etched on bevel gearshaft (8), and dimension E etched on actuator housing (10).
- 6 Remove lockwire (11) and six screws (12). Discard lockwire.
- 7 Withdraw cover (13), cover shim (14), sector gearshaft sleeve bearing (15), sector gearshaft assembly (16), thrust bearing (17), thrust bearing shim (18), and sleeve bearing (19) from actuator housing (10).

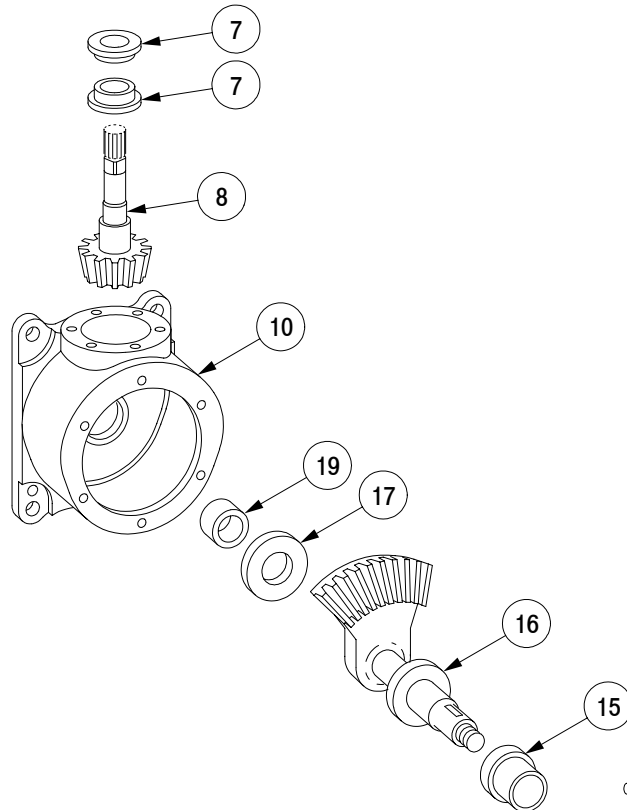


Section I. CANNON AND MOUNT - CONTINUED

13-2 ACTUATOR ASSEMBLY - CONTINUED

b. Inspection.

- 1 Inspect bevel gearshaft (8). Replace if cracked or distorted. Measure outside diameter of bearing journal. Replace if outside diameter is less than 0.9995 inch (25.38 mm).
- 2 Measure inside diameter of two sleeve bearings (7). Replace if inside diameter is greater than 1.0005 inch (25.41mm).
- 3 Inspect actuator housing (10). Replace if cracked or distorted.
- 4 Measure inside diameter of sleeve bearing (19). Replace if inside diameter is greater than 1.0010 inches (25.42 mm) (installed and reamed).
- 5 Measure thickness of thrust bearing (17). Replace if thinner than 0.12 inch (3 mm).
- 6 Inspect sector gearshaft (16). Replace if cracked or distorted. Measure outside diameter of bearing journals. Replace if outside diameter is less than 0.998 inch (25.34 mm). Measure housing end and cover end. Replace if outside diameter is less than 1.123 inches (28.52 mm).
- 7 Measure inside diameter of sector gearshaft sleeve bearing (15). Replace if inside diameter is greater than 1.126 inches (28.60 mm).



02pc308m

Section I. CANNON AND MOUNT - CONTINUED

13-2 ACTUATOR ASSEMBLY - CONTINUED

c. Assembly.

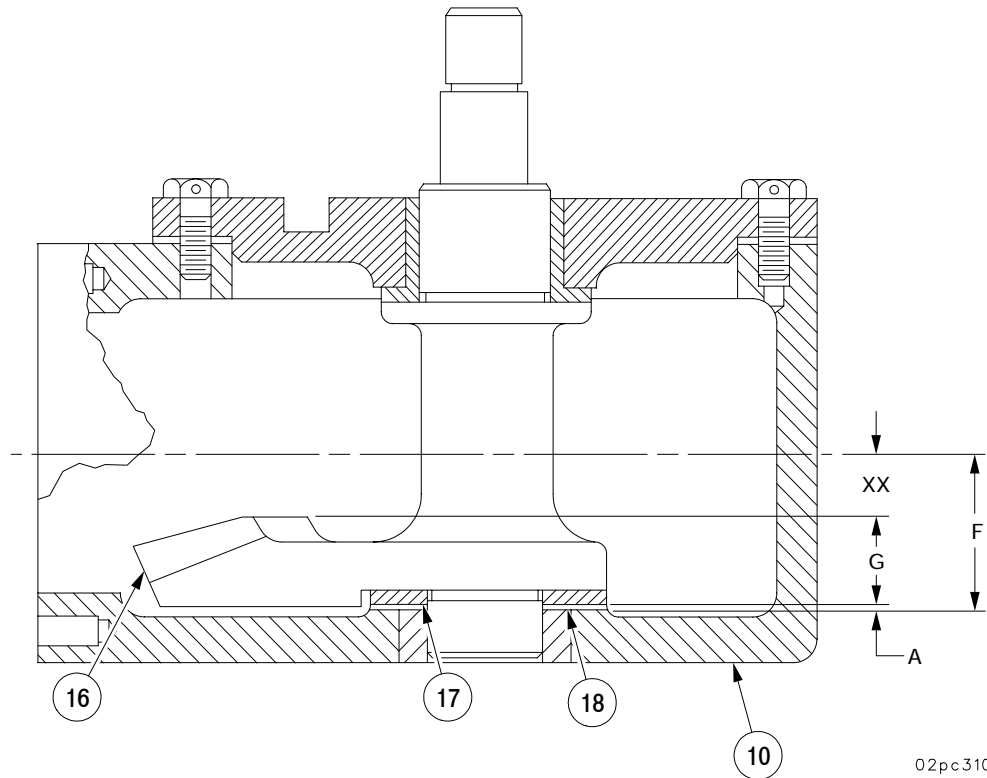
- 1 Determine dimension A of thrust bearing shim (18). Assemble thrust bearing (17) to sector gearshaft (16) outside actuator housing (10). Measure dimension G.
- 2 Add dimension G to dimension XX (etched on sector gear (16)). Subtract sum of G and XX from F (smaller dimensions etched on actuator housing).

Formula is as follows:

$$F - (G + XX) = \text{dimension A, which is the required thrust bearing shim (18) thickness.}$$

THRUST BEARING SHIM THICKNESSES ARE AS FOLLOWS:

PART NUMBER	COVER SHIM THICKNESS
10895663	0.001 inch (0.02 mm)
10895664	0.002 inch (0.05 mm)
10895665	0.005 inch (0.12 mm)



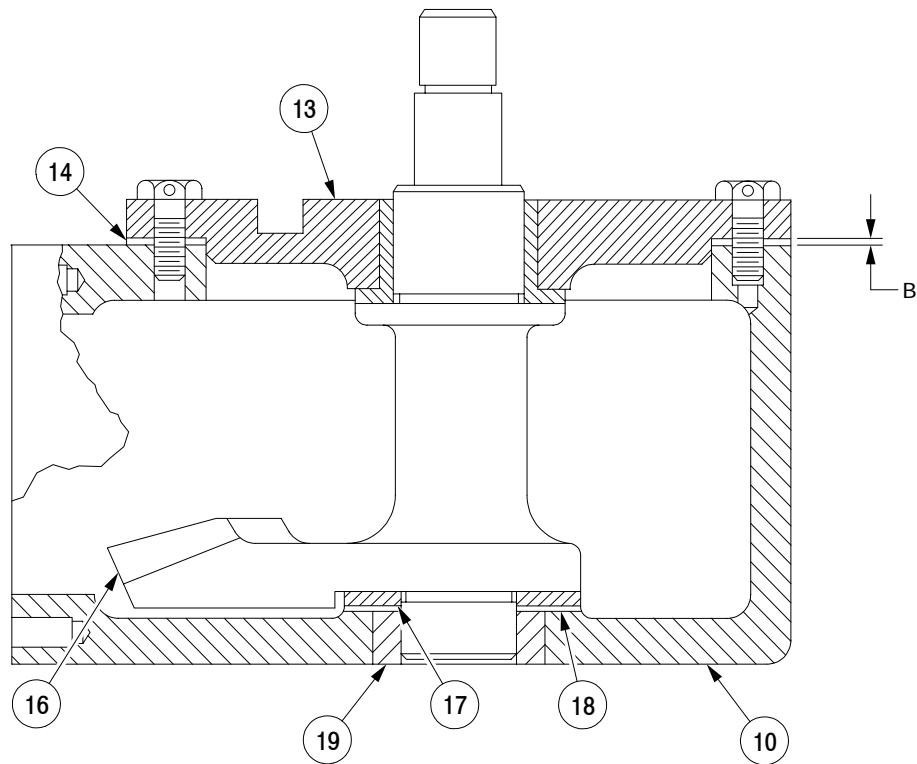
Section I. CANNON AND MOUNT - CONTINUED

13-2 ACTUATOR ASSEMBLY - CONTINUED

c. Assembly - Continued

- 3 Determine dimension B of cover shim (14).
- 4 Assemble sleeve bearing (19), thrust bearing shim (18), thrust bearing (17), sector gearshaft (16), and cover (13) in actuator housing (10).
- 5 Measure distance B at several points around cover (13). Measurements should not vary. Select a cover shim (14) equal to dimension B plus 0.002 - 0.004 inch (0.005 - 0.10 mm). Cover shim thicknesses are as follows:

PART NUMBER	COVER SHIM THICKNESS
10895660	0.001 inch (0.02 mm)
10895661	0.002 inch (0.05 mm)
10895662	0.005 inch (0.12 mm)



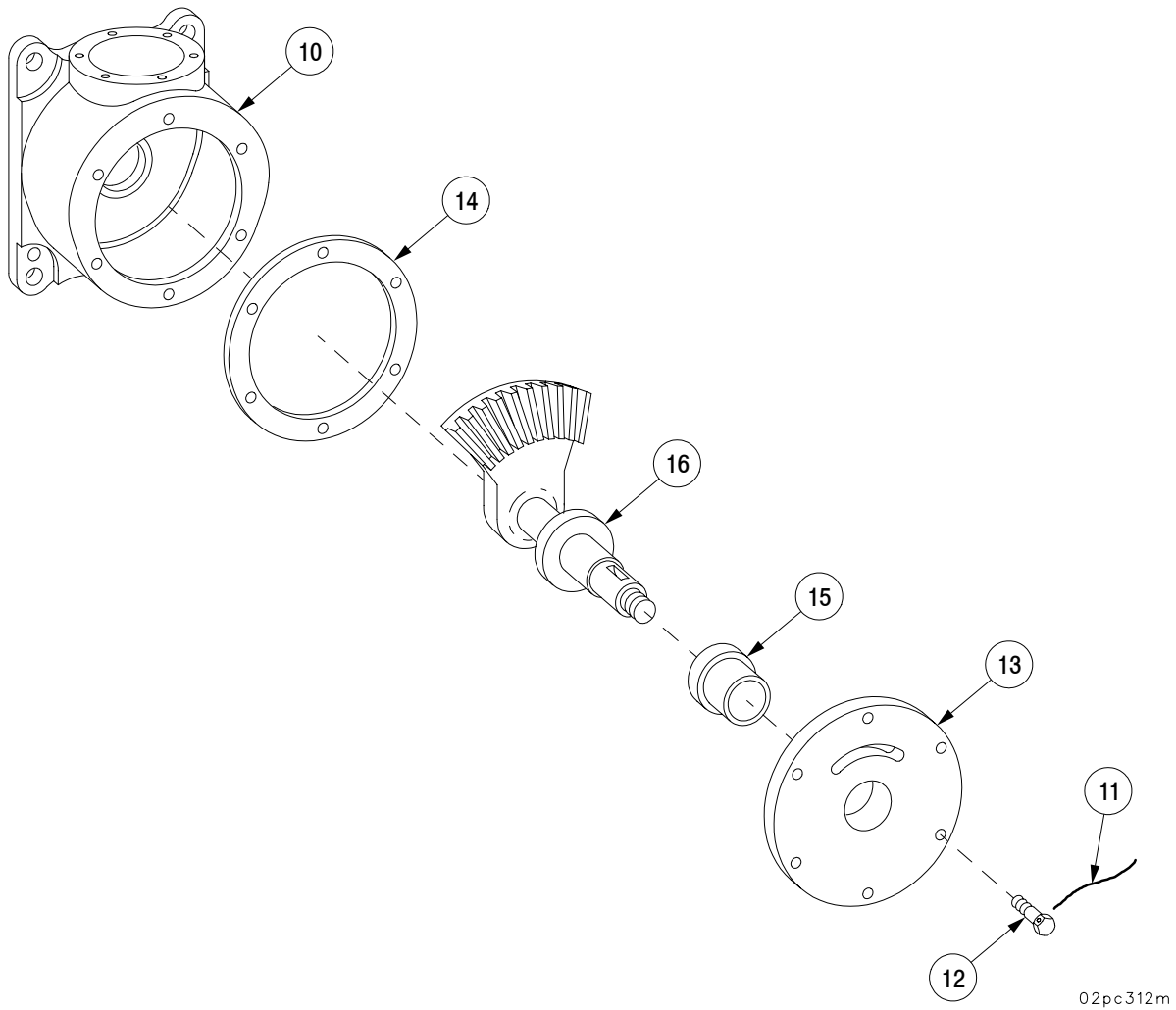
02pc311m

Section I. CANNON AND MOUNT - CONTINUED

13-2 ACTUATOR ASSEMBLY - CONTINUED

c. Assembly - Continued

- 6 Lift cover (13) and install sector gearshaft sleeve bearing (15) on sector gearshaft (16).
- 7 Install cover shim (14) and cover (13) onto actuator housing (10).
- 8 Install six screws (12) and new lockwire (11).



Section I. CANNON AND MOUNT - CONTINUED

13-2 ACTUATOR ASSEMBLY - CONTINUED

c. Assembly - Continued

- 9 When installing new bevel gearshaft (3) position spacer (2) to give 0.002 - 0.004 inch (0.05 - 0.10 mm) clearance between spacer (2) and sleeve bearing (7). Drill spring pin hole accordingly. Note matching arrows on bevel gear (8) and sector gear (16).
- 10 Check noted dimension E etched on actuator housing (10), dimension X etched on sector gear (16) and dimension D etched on cover (13). Make sure thickness of shim(s) (9) matches noted dimension. Install shim(s) (9).
- 11 Backlash between gears should be 0.004-0.006 inch (0.10-0.15 mm). Add dimension D to dimension X. Subtract dimension E from the sum. Remaining dimension is required shim.

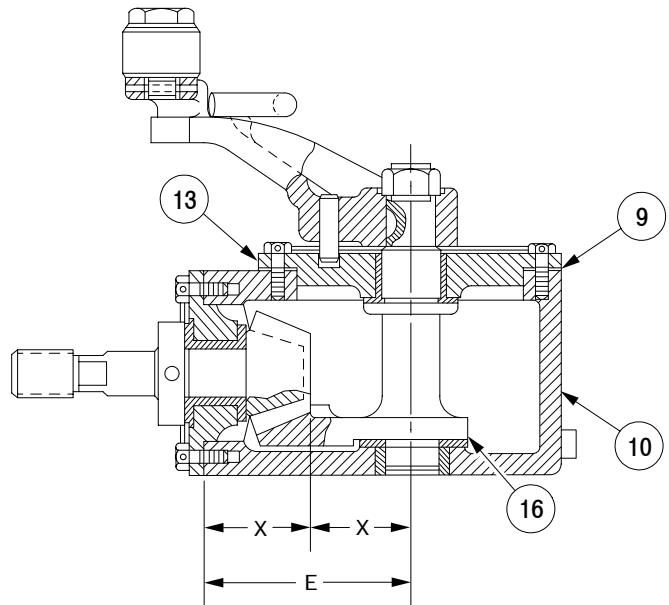
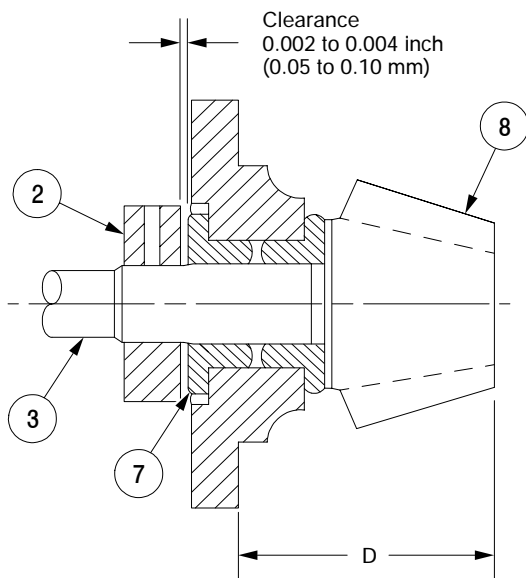
Formula is as follows:

$$(D + X) - E = \text{Required shim}$$

Cover shim thicknesses are as follows:

PART NUMBER	THICKNESS
10895666	0.001 INCH (0.02 mm)
10895667	0.002 INCH (0.05 mm)
10895668	0.005 INCH (0.12 mm)

Make sure thickness of shim(s) (9) matches noted dimension.



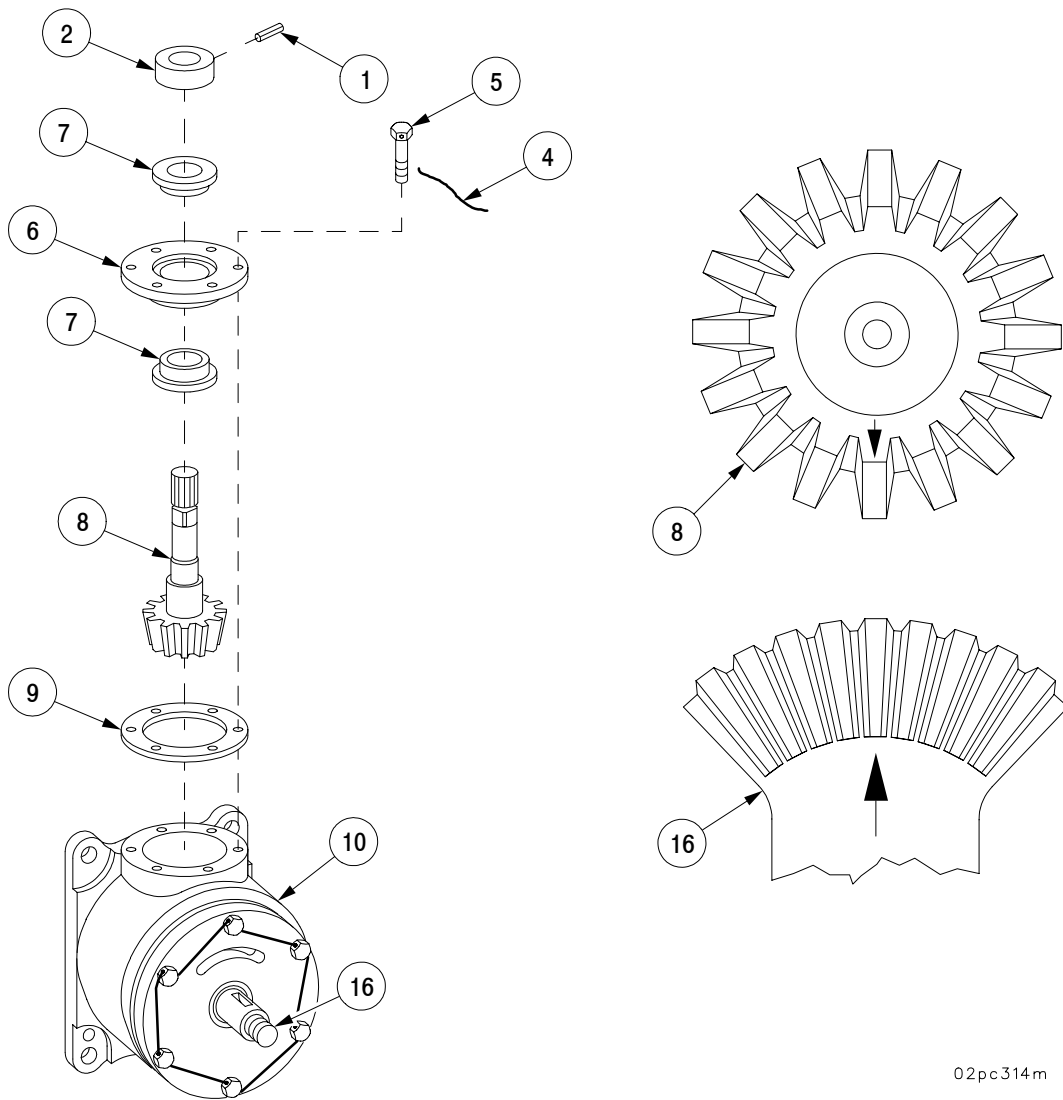
02pc313m

Section I. CANNON AND MOUNT - CONTINUED

13-2 ACTUATOR ASSEMBLY - CONTINUED

c. Assembly - Continued

- 12 Install two new sleeve bearings (7) and cover (6) onto bevel gearshaft (8).
- 13 Install spacer (2) and spring pin (1) to bevel gearshaft (8).
- 14 Install bevel gearshaft (8) and shim(s) (9) to actuator housing (10) making sure that the arrows on the bevel gearshaft (8) and the sector gear (16) are aligned.
- 15 Install six screws (5), and new lockwire (4).



02pc314m

Section I. CANNON AND MOUNT - CONTINUED

13-3 ACTUATOR LEVER ASSEMBLY.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)

Equipment Conditions

Actuator lever assembly removed
(para 4-6)

Materials/Parts

Spring pin (item 14, Appx E)

a. Disassembly.

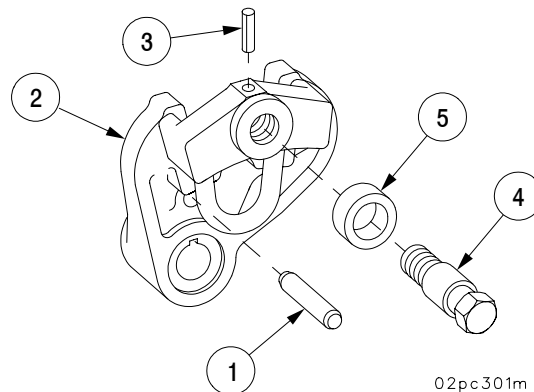
- 1 Remove limiting pin (1) from actuator lever assembly (2).
- 2 Remove and discard spring pin (3) from actuator lever assembly (2)
- 3 Remove shoulder bolt (4) and roller (5) from actuator lever assembly (2).

NOTE

If installing a new shoulder bolt or new cam lever, it will be necessary to drill spring pin hole in cam lever and shoulder bolt when assembling.

b. Assembly.

- 1 Install roller (5) and shoulder bolt (4) to actuator lever assembly (2).
- 2 Install new spring pin (3) to actuator lever assembly (2).
- 3 Install limiting pin (1) to actuator lever assembly (2).



Section II. SIGHTING EQUIPMENT.

13-4 M140/M140A1 ALIGNMENT DEVICE MOUNT AND BRACKET.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC 5180-95-A12)
Drill (item 10, Appx F)
Torque wrench (item 73, Appx F)

Materials/Parts

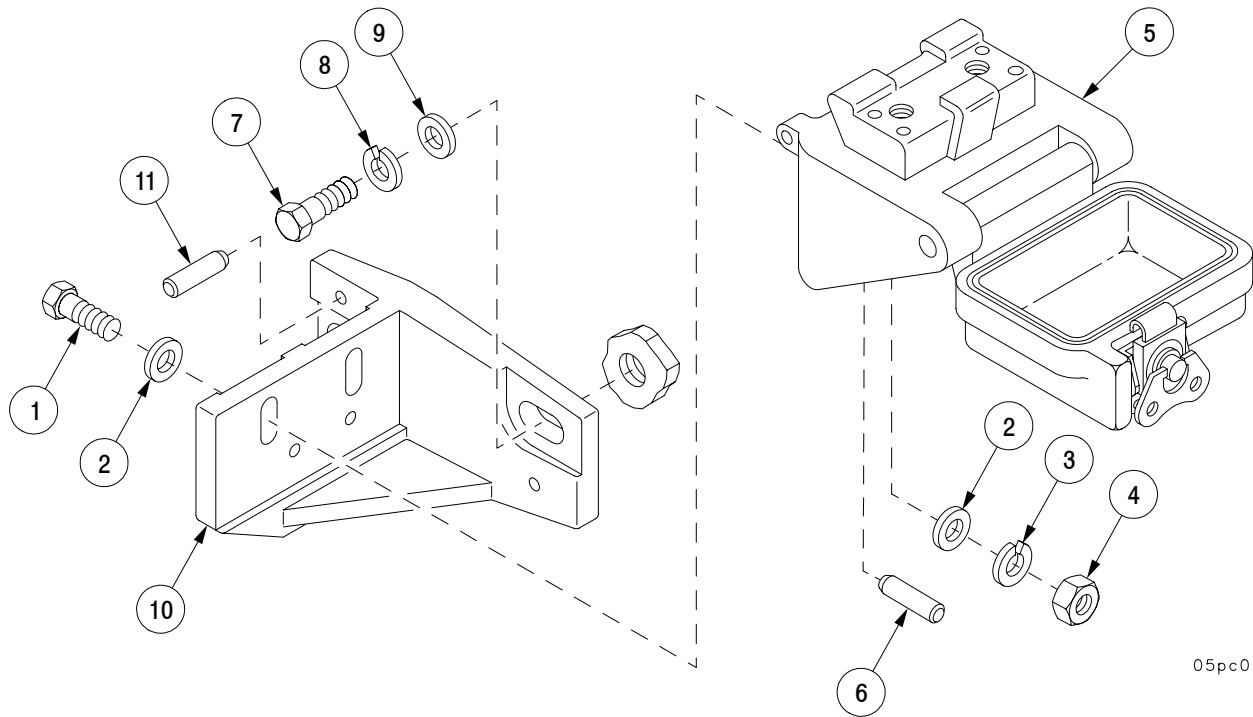
Lockwashers (2) (item 106, Appx E)
Lockwashers (2) (item 107, Appx E)

References

TM 9-2350-314-10

a. Removal.

- 1 Remove two screws (1), four flat washers (2), two lockwashers (3), two nuts (4) and mount (5). Discard lockwashers.
- 2 Remove two pins (6) from mount (5).
- 3 Remove two screws (7), two lockwashers (8), two flat washers (9) and bracket (10). Discard lockwashers.
- 4 Remove two pins (11) from bracket (10).



05pc051m

Section II. SIGHTING EQUIPMENT - CONTINUED

13-4 M140/M140A1 ALIGNMENT DEVICE MOUNT AND BRACKET - CONTINUED

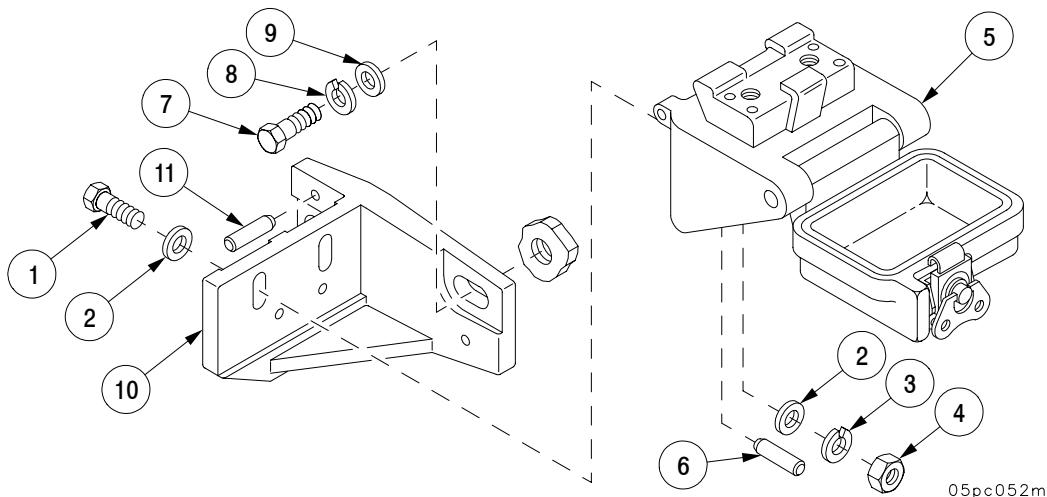
b. Installation.

- 1 Using existing holes in old bracket (10) as locator, mark two holes in new bracket (10) for pins (11).
- 2 Drill two holes in bracket (10) .2495 ± .0005 inches diameter.

NOTE

When pins are installed in bracket, they must line up with existing holes.

- 3 Install bracket (10) with two screws (7), two new lockwashers (8), and two flat washers (9). Torque screws 45-55 lb-ft (61-74 N•m).
- 4 Install mount (5) with two screws (1), four flat washers (2), two new lockwashers (3) and two nuts (4).
- 5 Install M140/M140A1 alignment device (TM 9-2350-314-10).
- 6 With an observer viewing through M117A2 telescope, align mount (5) until the reticle of the M140 alignment device coincides with the aperture of the M117A2 telescope.
- 7 Torque two nuts (4) 45-55 lb-ft (61-74 N•m),
- 8 Drill two holes .2495 ± .0005 inches diameter through mount (5) and bracket (10).
- 9 Install two pins (6).
- 10 Recheck coincidence of reticles which must be within 0.25 mils.
- 11 Remove M140 alignment device (TM 9-2350-314-10).



Section III. CAB HYDRAULICS.

13-5 TRAVERSE MOTOR ASSEMBLY.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
 SC 5180-95-A12
 Torque wrench (item 71, Appx F)

Materials/Parts

Preformed packing (item 133, Appx E)
 Preformed packing (item 134, Appx E)
 Preformed packing (item 135, Appx E)
 Preformed packing (item 139, Appx E)
 Preformed packing (item 148, Appx E)
 Preformed packings (2) (item 4, Appx E)
 Preformed packing (item 149, Appx E)
 Preformed packing (item 205, Appx E)

Materials/Parts - Continued

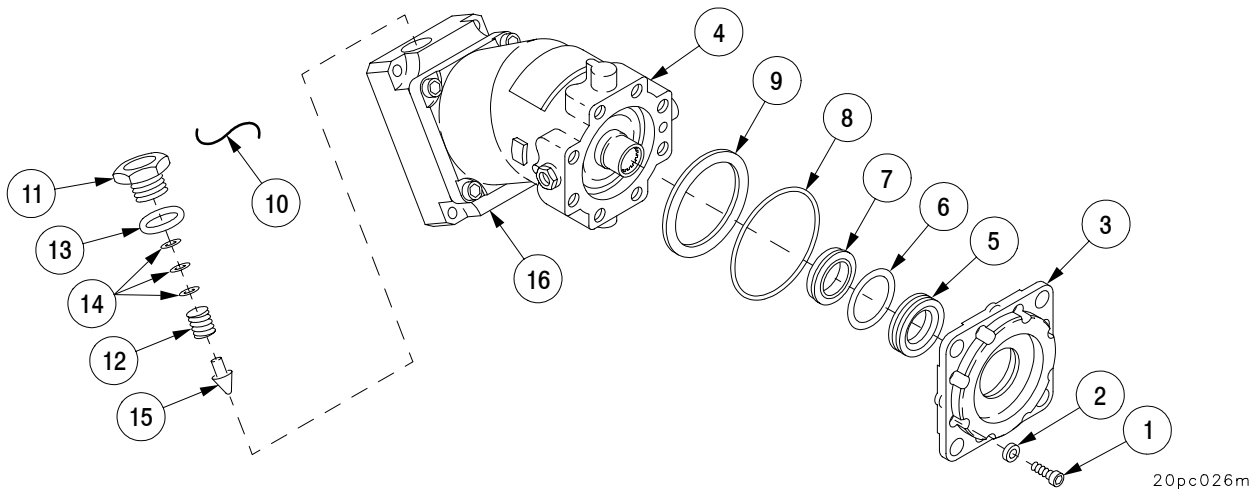
Plain encased seal assembly (item 198, Appx E)
 Lockwire (item 82, Appx B)
 Dust protective plug (item 59, Appx B)
 Plastic bag (item 14, Appx B)
 Hydraulic fluid (item 42, Appx B)
 Sealing compound (item 37, Appx B)
 Adhesive (item 7, Appx B)
 Dry-cleaning solvent (item 69, Appx B)

Equipment Conditions

Hydraulic motor removed
 (para 10-2)

a. Disassembly.

- 1 Remove eight screws (1), eight flat washers (2) and flange (3) from housing (4).
- 2 Remove mating ring (5), preformed packing (6), seal assembly (7), preformed packing (8) and spacer (9). Discard seal assembly and preformed packings.
- 3 Remove and discard lockwire (10) from two plugs (11).
- 4 Remove two plugs (11), two springs (12) and two preformed packings (13), shims (14) and two pistons (15) from relief valve (16). Discard preformed packings.



Section III. CAB HYDRAULICS - CONTINUED

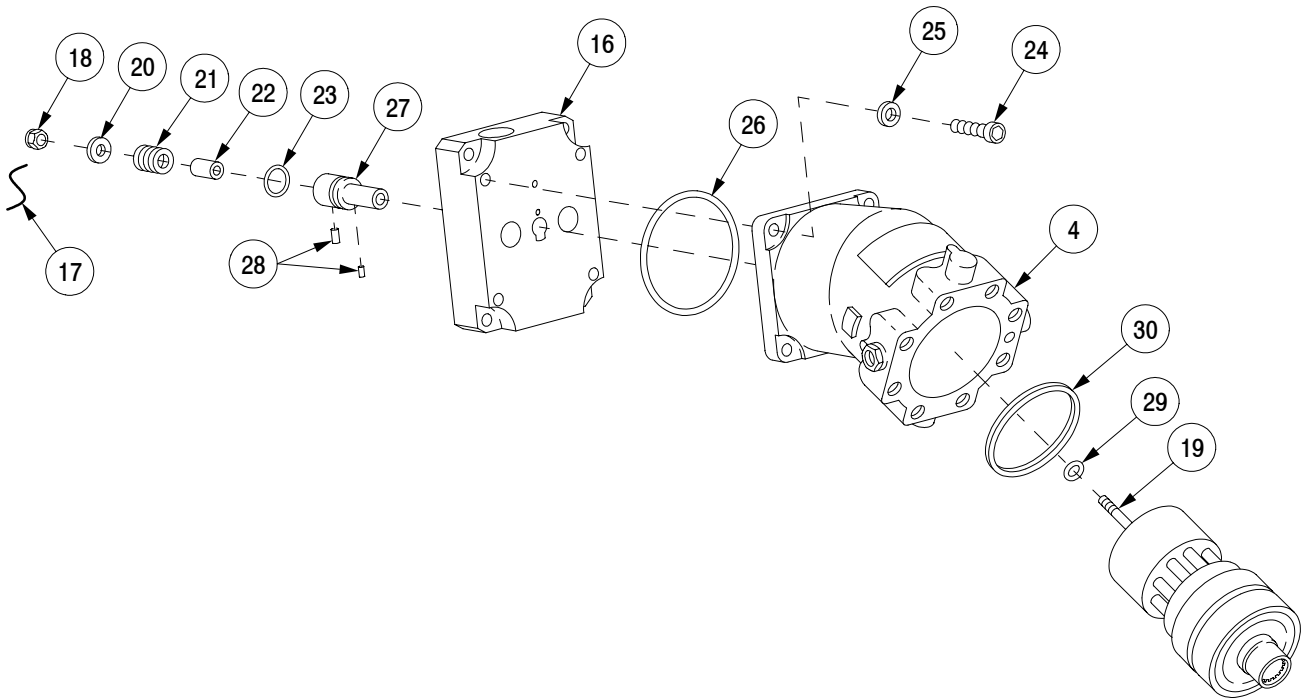
13-5 TRAVERSE MOTOR ASSEMBLY - CONTINUED

a. Disassembly - Continued

CAUTION

If extreme care is not used, the rotating group can come apart.

- 5 Remove and discard lockwire (17) securing nut (18) to rotating group (19) shaft.
- 6 Remove nut (18), retaining washer (20), spring (21), spacer (22), and preformed packing (23) from rotating group (19) shaft. Discard preformed packing.
- 7 Remove four screws (24), four flat washers (25) and relief valve (16) from housing (4).
- 8 Remove rotating group (19) from housing (4).
- 9 Remove and discard preformed packing (26) from housing (4).
- 10 Twist and remove sleeve (27) from relief valve (16).
- 11 Remove two pins (28) from sleeve (27).
- 12 Remove and discard preformed packing (29) and shim (30) from rotating group (19).



20pc027m

Section III. CAB HYDRAULICS - CONTINUED

13-5 TRAVERSE MOTOR ASSEMBLY - CONTINUED

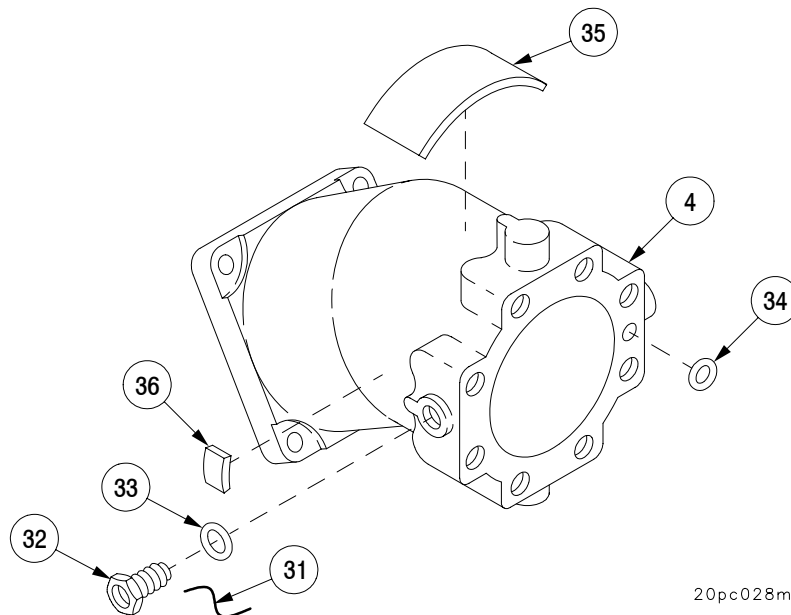
a. Disassembly - Continued

- 13 Remove lockwire (31), fill plug (32) and preformed packing (33) from housing (4). Discard lockwire and preformed packing.
- 14 Remove and discard preformed packing (34) from housing (4).

WARNING

Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause **SERIOUS INJURY**. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (ref. FM 21-11).

- 15 Remove identification plate (35) and clean adhesive from housing (4).
- 16 Remove instruction plate (36) and clean adhesive from housing (4).



Section III. CAB HYDRAULICS - CONTINUED

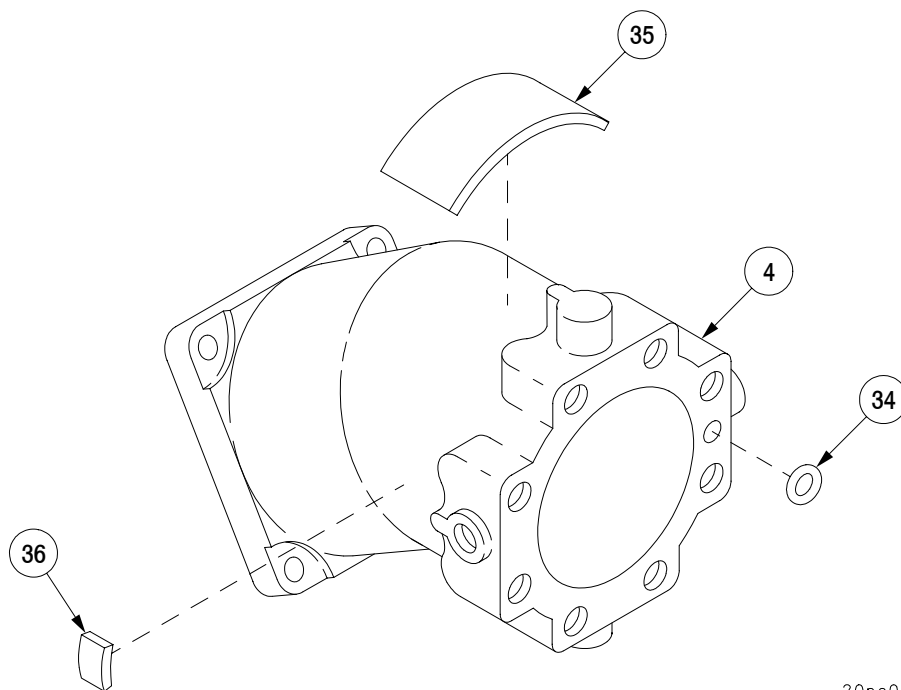
13-5 TRAVERSE MOTOR ASSEMBLY - CONTINUED

b. Assembly.

NOTE

A thin, even coat of clean hydraulic fluid must be applied to ALL new packing material to form a good seal between hydraulic components during assembly.

- 1 Apply adhesive to instruction plate (36) and install on housing (4).
- 2 Apply adhesive to identification plate (35) and install on housing (4).
- 3 Install new preformed packing (34) to housing (4).



20pc029m

Section III. CAB HYDRAULICS - CONTINUED

13-5 TRAVERSE MOTOR ASSEMBLY - CONTINUED

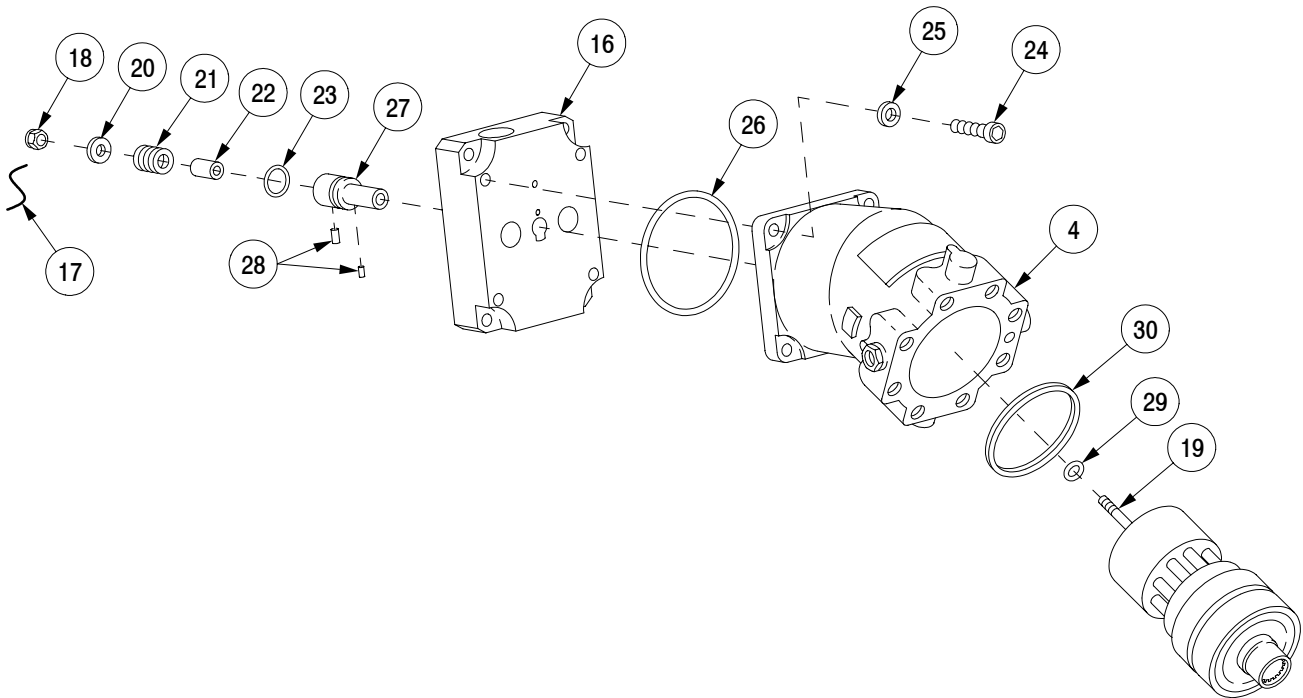
b. Assembly - Continued

- 4 Install new preformed packing (29) and shim (30) on rotating group (19).
- 5 Install two pins (28) to sleeve (27).
- 6 Insert sleeve (27) into relief valve (16) and twist to secure.
- 7 Install new preformed packing (26) into housing (4).

CAUTION

If extreme care is not used, the rotating group can come apart.

- 8 Install rotating group (19) into housing (4).
- 9 Install relief valve (16) to housing (4) with four flat washers (25) and four screws (24). Torque screws to 15-16 lb-ft (20-21 N·m).
- 10 Install new preformed packing (23), spacer (22), spring (21), retaining washer (20) and nut (18) onto rotating group (19) shaft.
- 11 Tighten nut (18) until no end play exists between spacer (22) and retaining washer (20). Turn nut (18) one-sixth (1/6) turn to one-half (1/2) turn clockwise.
- 12 Secure nut (18) to rotating group (19) shaft with new lockwire (17).



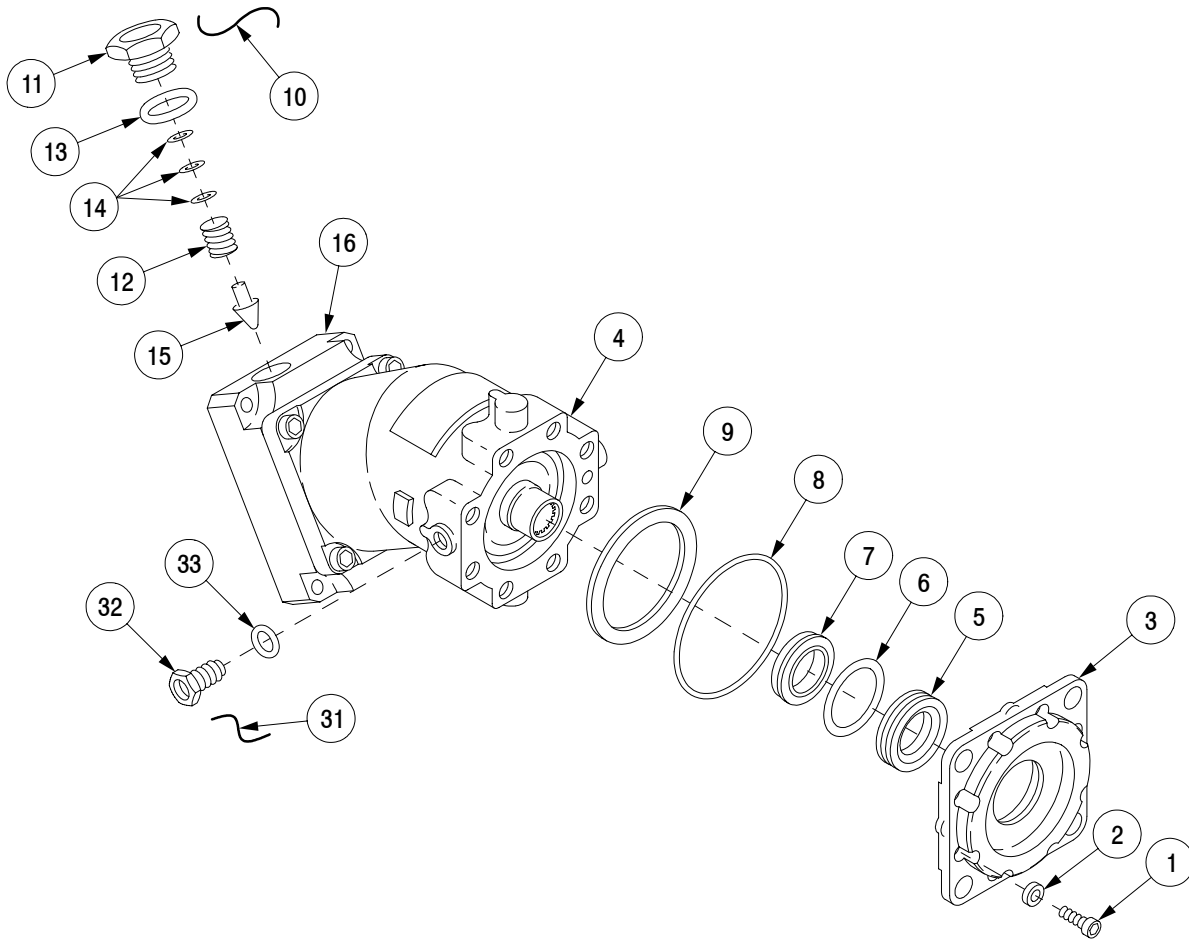
20pc027m

Section III. CAB HYDRAULICS - CONTINUED

13-5 TRAVERSE MOTOR ASSEMBLY - CONTINUED

b. Assembly - Continued

- 13 Install two pistons (15), two springs (12), shims (14), two new preformed packings (13), and two plugs (11) to relief valve (16).
- 14 Secure two plugs (11) to relief valve (16) by installing new lockwire (10).
- 15 Install spacer (9), new preformed packing (8), new seal assembly (7), new preformed packing (6), and mating ring (5) to housing (4).
- 16 Install flange (3) to housing (4) with eight flat washers (2) and eight screws (1). Torque screws to 6-8 lb-ft (8-10 N·m).
- 17 Fill housing (4) with hydraulic fluid to level of fill plug opening.
- 18 Install fill plug (32) and new preformed packing (33) to housing (4).
- 19 Secure fill plug (32) by installing new lockwire (31).



20pc030m

Section IV. TRAVERSE MECHANISM ASSEMBLY.

13-6 TRAVERSE MECHANISM.

This task covers: a. Disassembly b. Inspection and Repair c. Assembly

INITIAL SETUP

Tools

Artillery and turret mechanic's tool kit
(SC-5180-95-A12)
Arbor press (item 38, Appx F)
Dial indicator (item 26, Appx F)

Materials/Parts

Seals (2) (item 122, Appx E)
Lockwire (item 83, Appx B)
Gasket (item 163, Appx E)
Gasket (item 167, Appx E)
Gaskets (2) (item 162, Appx E)
Gasket (item 179, Appx E)
Keywasher (item 28, Appx E)

Materials/Parts - Continued

Keywasher (item 29, Appx E)
Keywasher (item 30, Appx E)
Keywashers (2) (item 31, Appx E)
Keywasher (item 32, Appx E)
Marking tag (item 71, Appx B)
Sealing compound (item 41.1, Appx B)

Equipment Conditions

Traversing mechanism removed
(para 11-4)

References

TM 9-214

Section IV. TRAVERSE MECHANISM ASSEMBLY - CONTINUED

13-6 TRAVERSE MECHANISM - CONTINUED

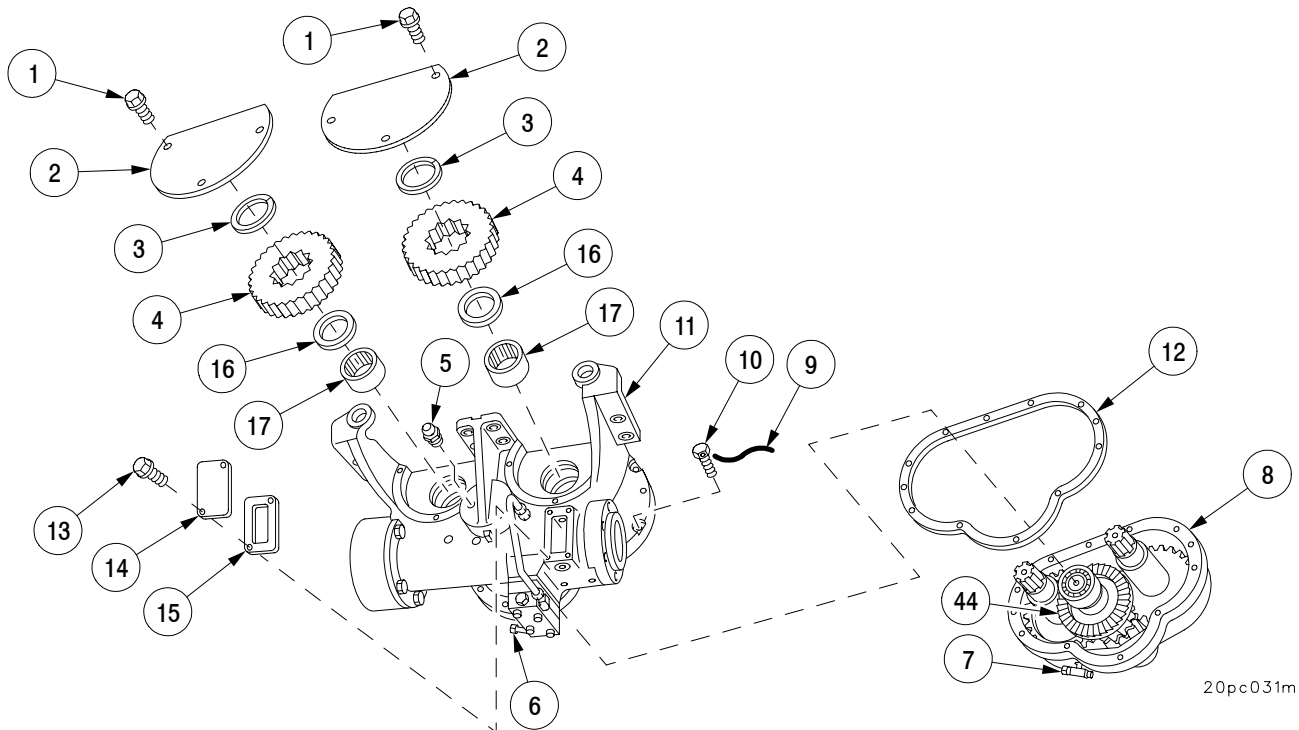
a. Disassembly.

- 1 Remove six bolts (1) and two spur gear covers (2).
- 2 Remove two retainer rings (3) and two spur gears (4).
- 3 Remove lubrication fitting (5).
- 4 Remove hydraulic tube (6) from tee (7) on lower housing assembly (8).
- 5 Remove and discard lockwire (9) from 10 capscrews (10).
- 6 Remove 10 capscrews (10).

NOTE

Threaded holes exist on traversing mechanism upper housing, four cap screws removed in step 6 can be inserted into these threaded holes to make separation of traversing mechanism upper and lower housings easier.

- 7 Separate upper housing assembly (11) from lower housing assembly (8).
- 8 Remove and discard gasket (12).
- 9 Remove two bolts (13) and cover (14).
- 10 Remove and discard gasket (15).
- 11 Remove two seals (16) and two bearings (17). Discard seals.

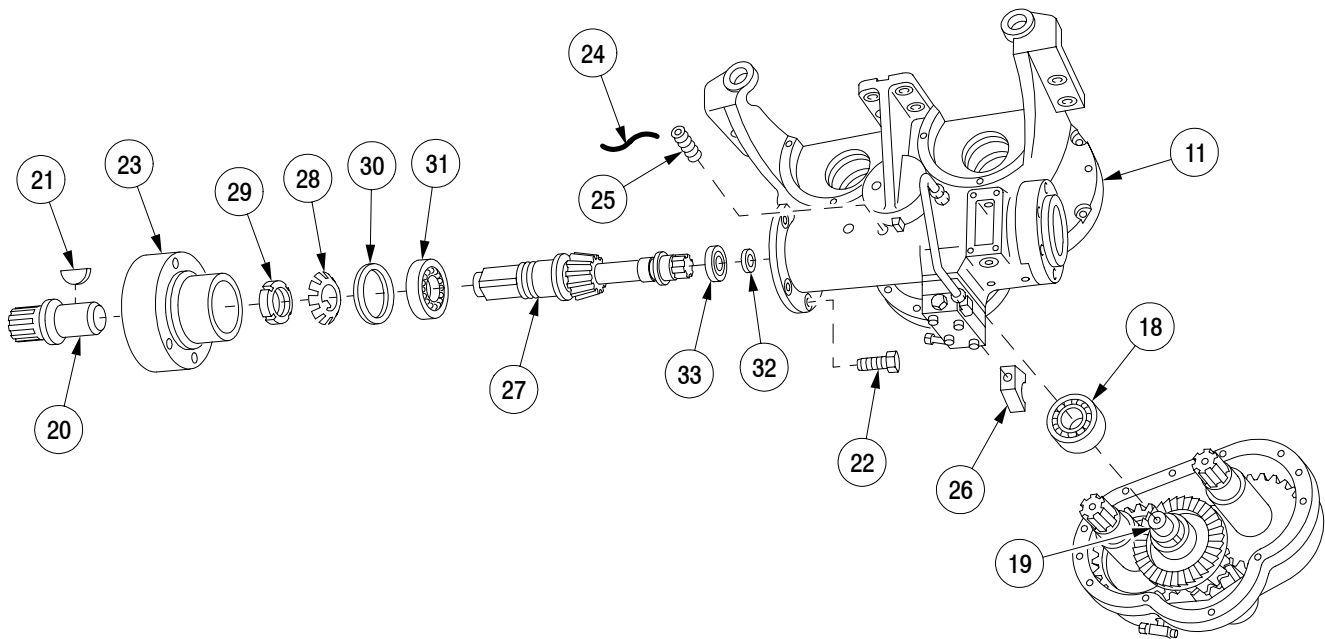


Section IV. TRAVERSE MECHANISM ASSEMBLY - CONTINUED

13-6 TRAVERSE MECHANISM - CONTINUED

a. Disassembly - Continued

- 12 Remove bearing (18) from lower housing gearshaft (19).
- 13 Remove drive coupling (20) and woodruff key (21).
- 14 Remove five screws (22) and adapter (23).
- 15 Remove and discard lockwire (24) from setscrew (25).
- 16 Remove setscrew (25) and pressure block (26) from upper housing assembly (11).
- 17 Remove gearshaft (27) from upper housing assembly (11).
- 18 Straighten locking tabs on keywasher (28).
- 19 Remove nut (29), keywasher (28), shim(s) (30), and bearing (31) from gearshaft (27). Discard keywasher and tag shim(s) for reuse at installation.
- 20 Remove retaining ring (32) and bearing (33) from gearshaft (27).



20pc032m

Section IV. TRAVERSE MECHANISM ASSEMBLY - CONTINUED

13-6 TRAVERSE MECHANISM - CONTINUED

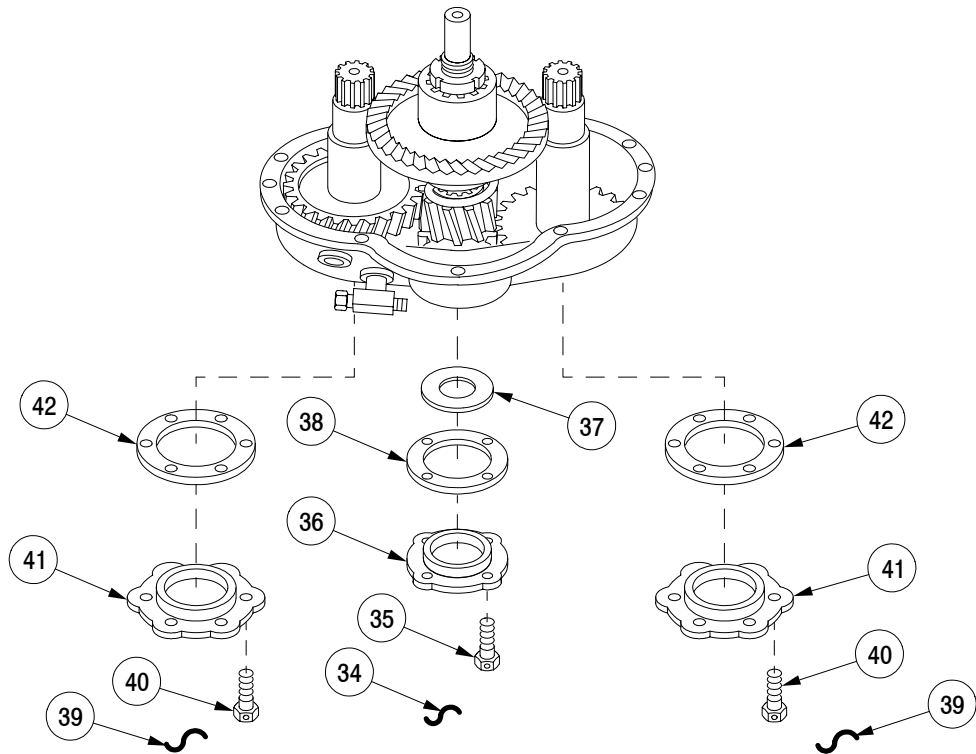
a. Disassembly - Continued

- 21 Remove and discard lockwire (34) from four screws (35).
- 22 Remove four screws (35) and (center) drive shaft cover (36).

NOTE

Shim (37) may or may not be installed in the traverse mechanism.

- 23 Remove shim (37) and gasket (38). Discard gasket and shim (37), if installed.
- 24 Remove and discard two lockwires (39) from 12 screws (40) on left and right shaft covers (41).
- 25 Remove 12 screws (40) and left and right shaft covers (41).
- 26 Remove and discard two gaskets (42).



20pc033m

Section IV. TRAVERSE MECHANISM ASSEMBLY - CONTINUED

13-6 TRAVERSE MECHANISM - CONTINUED

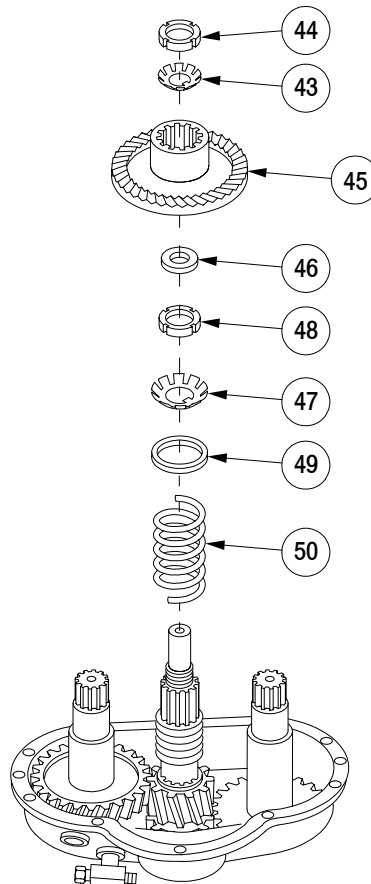
a. Disassembly - Continued

- 27 Disengage tabs of keywasher (43) from round, slotted locknut (44).
- 28 Remove round, slotted locknut (44) and keywasher (43). Discard keywasher.
- 29 Remove bevel gear (45) and shim(s) (46). Tag shims to aid at installation.
- 30 Disengage tabs of keywasher (47) from round, slotted locknut (48).

WARNING

Antibacklash spring is held under compression by locknut. Restrain spring while removing locknut to prevent serious injury.

- 31 Remove round, slotted locknut (48), keywasher (47), flat washer (49), and antibacklash spring (50). Discard keywasher.



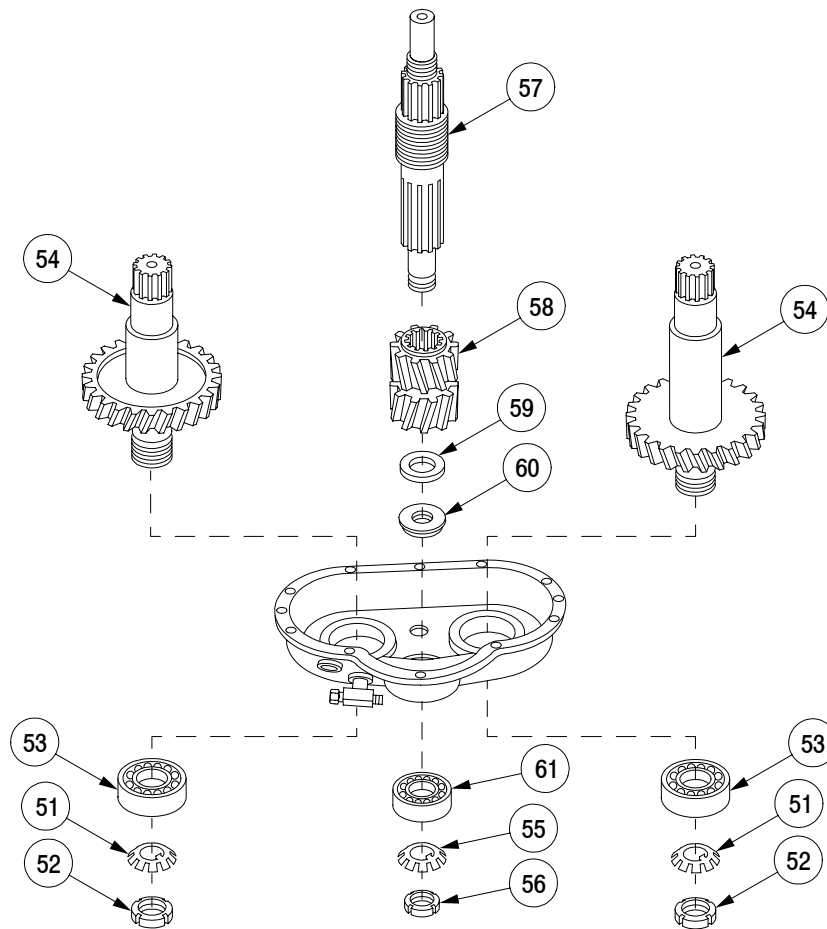
20pc034m

Section IV. TRAVERSE MECHANISM ASSEMBLY - CONTINUED

13-6 TRAVERSE MECHANISM - CONTINUED

a. Disassembly - Continued

- 32 Disengage tabs of two keywashers (51) from two locknuts (52).
- 33 Remove two locknuts (52), two keywashers (51), two bearings (53), and two helical gearshafts (54). Discard keywashers.
- 34 Disengage tab of keywasher (55) from locknut (56).
- 35 Remove locknut (56) and keywasher (55). Discard keywasher.
- 36 Withdraw shouldered shaft (57).
- 37 Remove helical cluster gear (58), spacer (59), and shouldered washer (60).
- 38 Remove bearing (61).



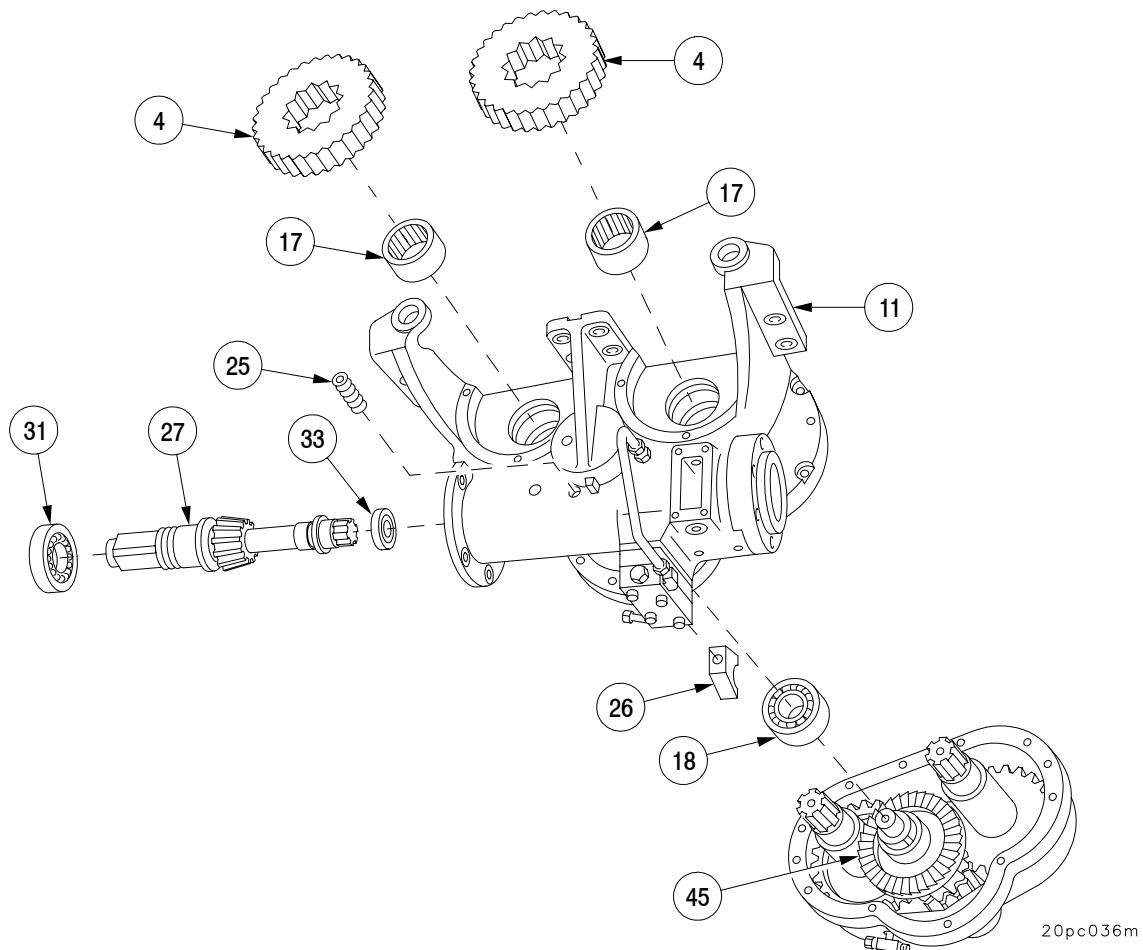
20pc035m

Section IV. TRAVERSE MECHANISM ASSEMBLY - CONTINUED

13-6 TRAVERSE MECHANISM - CONTINUED

b. Inspection and Repair.

- 1 Inspect two spur gears (4). Replace if teeth are cracked or broken.
- 2 Inspect bearings (17, 18, 31, and 33) (TM 9-214).
- 3 Inspect gearshaft (27). If teeth are cracked or broken, replace gearshaft (27) and bevel gear (44) as a matched set.
- 4 Inspect upper housing assembly (11). If upper housing assembly (11) is cracked, replace entire traversing mechanism.
- 5 Inspect setscrew (25). Replace if damaged.
- 6 Inspect pressure block (26). Replace if damaged or worn to less than 7/16 in. (1.1 cm).

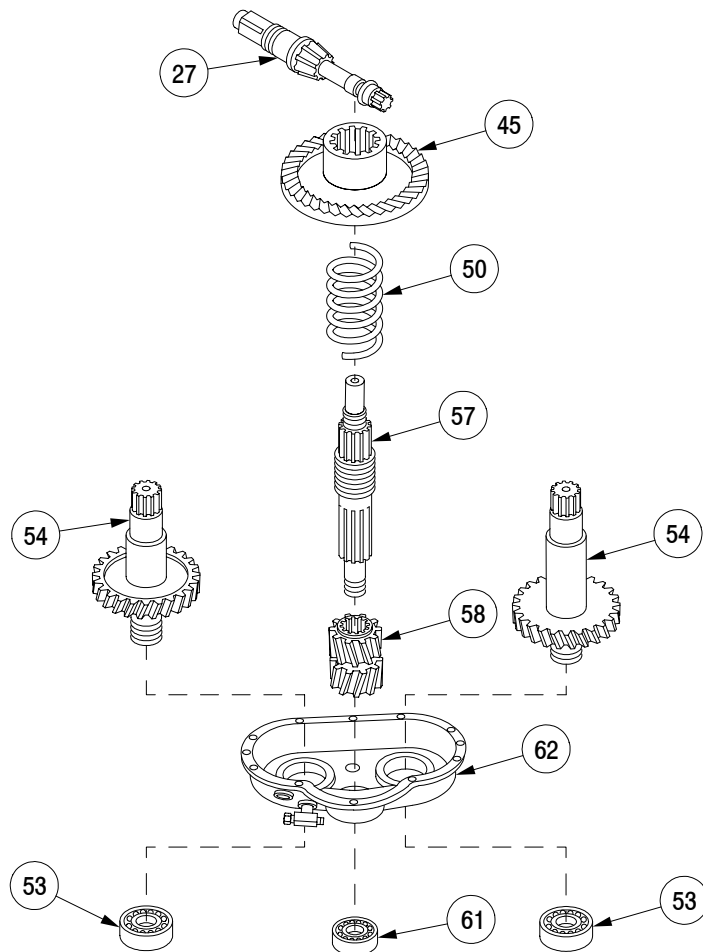


Section IV. TRAVERSE MECHANISM ASSEMBLY - CONTINUED

13-6 TRAVERSE MECHANISM - CONTINUED

b. Inspection and Repair - Continued

- 7 Inspect two bearings (53) and bearing (61) (TM 9-214).
- 8 Inspect lower housing (62). If lower housing (62) is cracked, replace entire traversing mechanism.
- 9 Inspect gear teeth of two helical gearshafts (54). Replace if teeth are cracked or broken.
- 10 Inspect helical cluster gear (58). Replace if teeth are cracked or broken.
- 11 Inspect threads and splines of shouldered shaft (57). Repair damaged threads. Replace gearshaft (27) if splines are cracked or broken.
- 12 Inspect antibacklash spring (50). Replace if cracked, scratched, nicked or distorted.
- 13 Inspect bevel gear (45). If teeth are broken or damaged, replace bevel gear (45) and gearshaft (27) as a matched set.



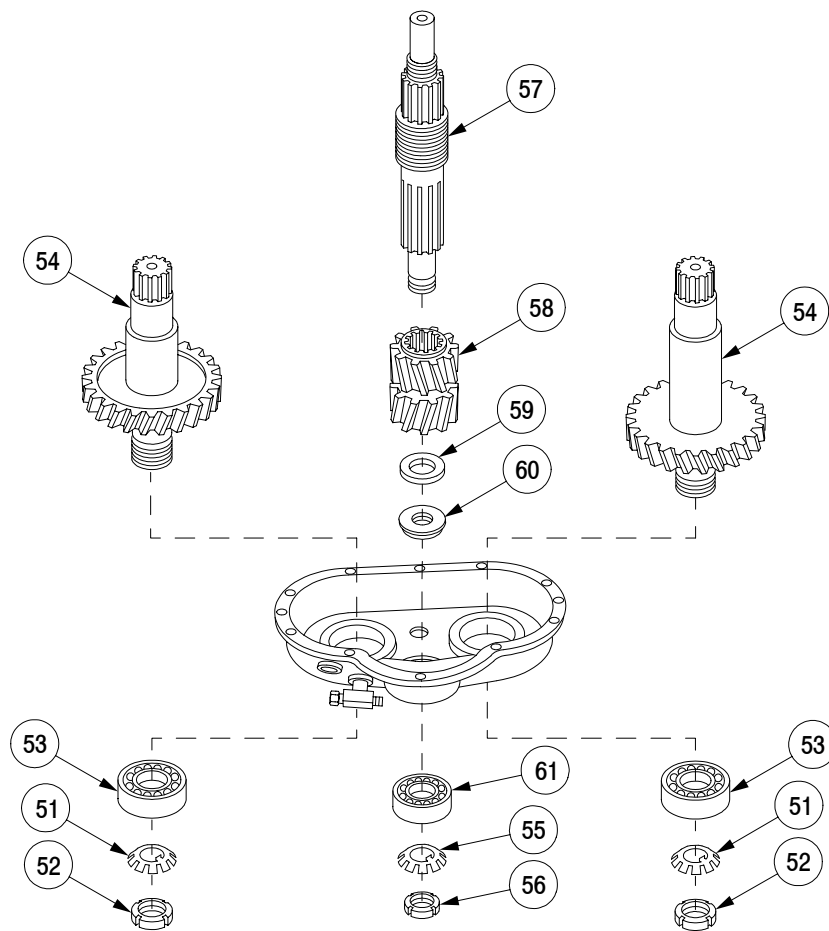
20pc037m

Section IV. TRAVERSE MECHANISM ASSEMBLY - CONTINUED

13-6 TRAVERSE MECHANISM - CONTINUED

c. Assembly.

- 1 Install bearing (61).
- 2 Install helical cluster gear (58), shouldered washer (60), spacer (59) on shouldered shaft (57).
- 3 Install shouldered shaft (57), new keywasher (56), and locknut (56).
- 4 Bend tab of keywasher (55) to secure locknut (56).
- 5 Install two helical gearshafts (54), two bearings (53), two new keywashers (51), and two locknuts (52).
- 6 Bend tabs of two keywashers (51) to secure locknuts (52).
- 7 Using a dial indicator, check backlash of two helical gearshafts (54) with helical cluster gear (58). Replace if backlash is greater than 0.010 in. (0.25 mm).



20pc035m

Section IV. TRAVERSE MECHANISM ASSEMBLY - CONTINUED

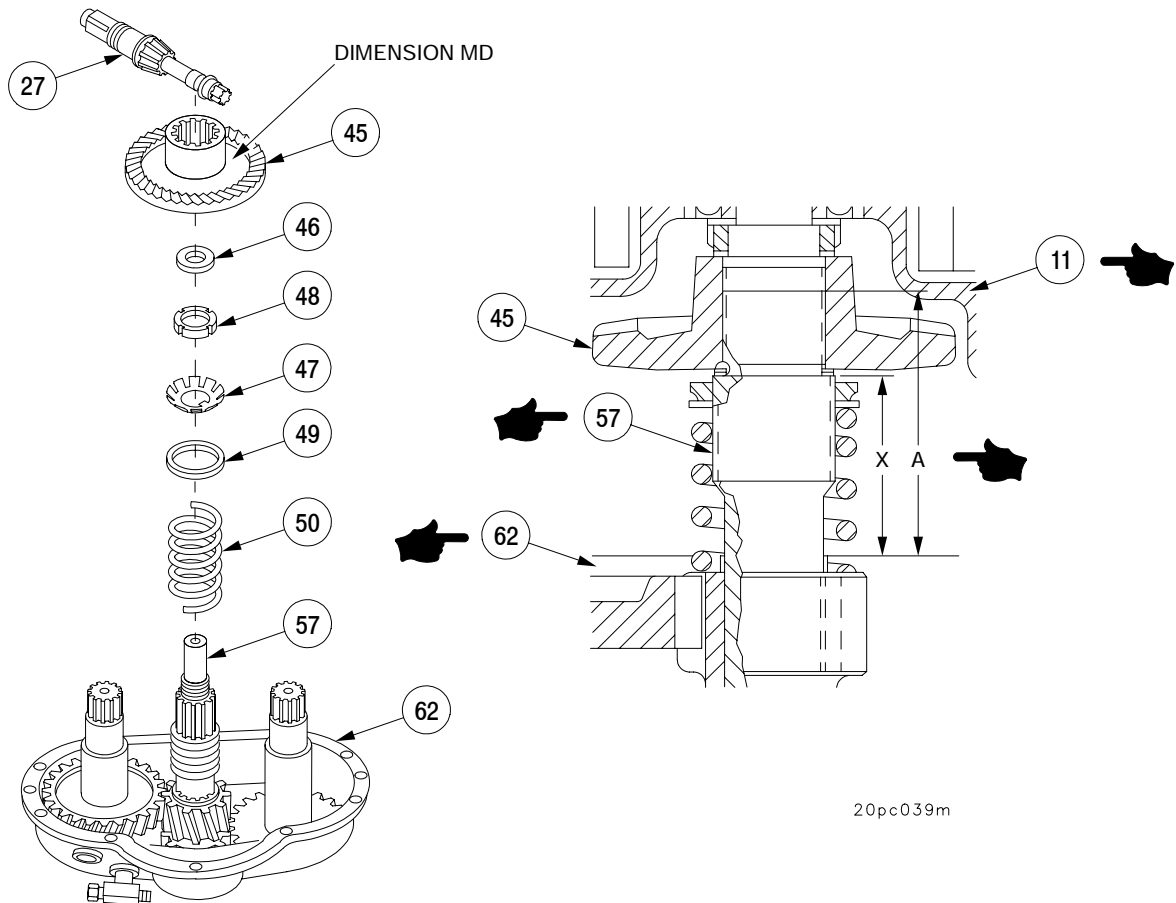
13-6 TRAVERSE MECHANISM - CONTINUED

c. Assembly - Continued

WARNING

Antibacklash spring is held under compression by locknut. To avoid injury, restrain spring while installing locknut.

- 8 Install antibacklash spring (50), flat washer (49), new keywasher (47), and round, slotted locknut (48).
- 9 Bend tabs of keywasher (47) to secure round, slotted locknut (48).
- 10 Install bevel gear (45) and shim(s) (46) on shouldered shaft (57). If new bevel gear (45) is used, it must be installed with gearshaft (27) as matched set. Use original shim(s) (46) from disassembly whenever possible. Thickness of shim(s) = $A + 0.003 \text{ in. (0.08 mm) - MD} + X$; where A is stamped on upper housing assembly (11), MD is stamped or etched on bevel gear (45) and X is measured between shouldered shaft (57) and shoulder and gasket face of lower housing (62).



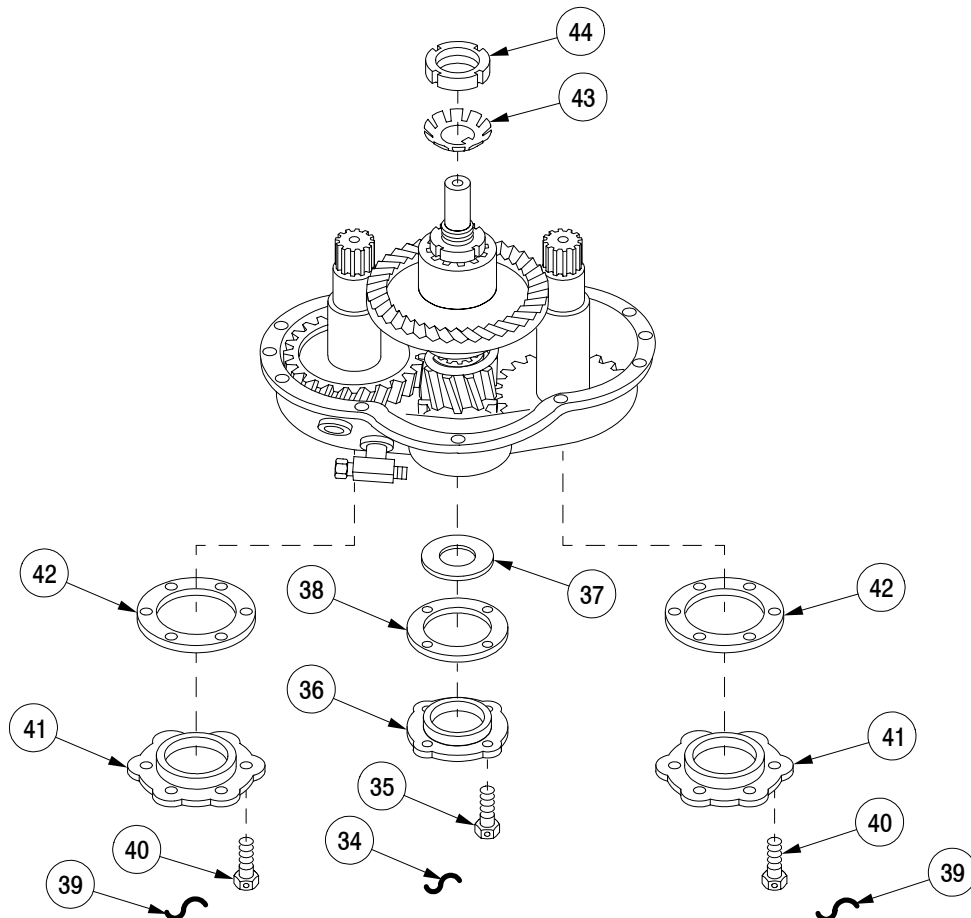
20pc039m

Section IV. TRAVERSE MECHANISM ASSEMBLY - CONTINUED

13-6 TRAVERSE MECHANISM - CONTINUED

c. Assembly - Continued

- 11 Install new keywasher (43) and round, slotted locknut (44).
- 12 Bend tab of keywasher (43) to secure round, slotted locknut (44).
- 13 Install two new gaskets (42), left and right shaft covers (41), and 12 screws (40).
- 14 Install two new lockwires (39) to secure 12 screws (40) and left and right shaft covers (41).
- 15 Install new gasket (38), new shim (37), (center) drive shaft cover (36), and four screws (35).
- 16 Install new lockwire (34) to secure four screws (35) on (center) drive shaft cover (36).



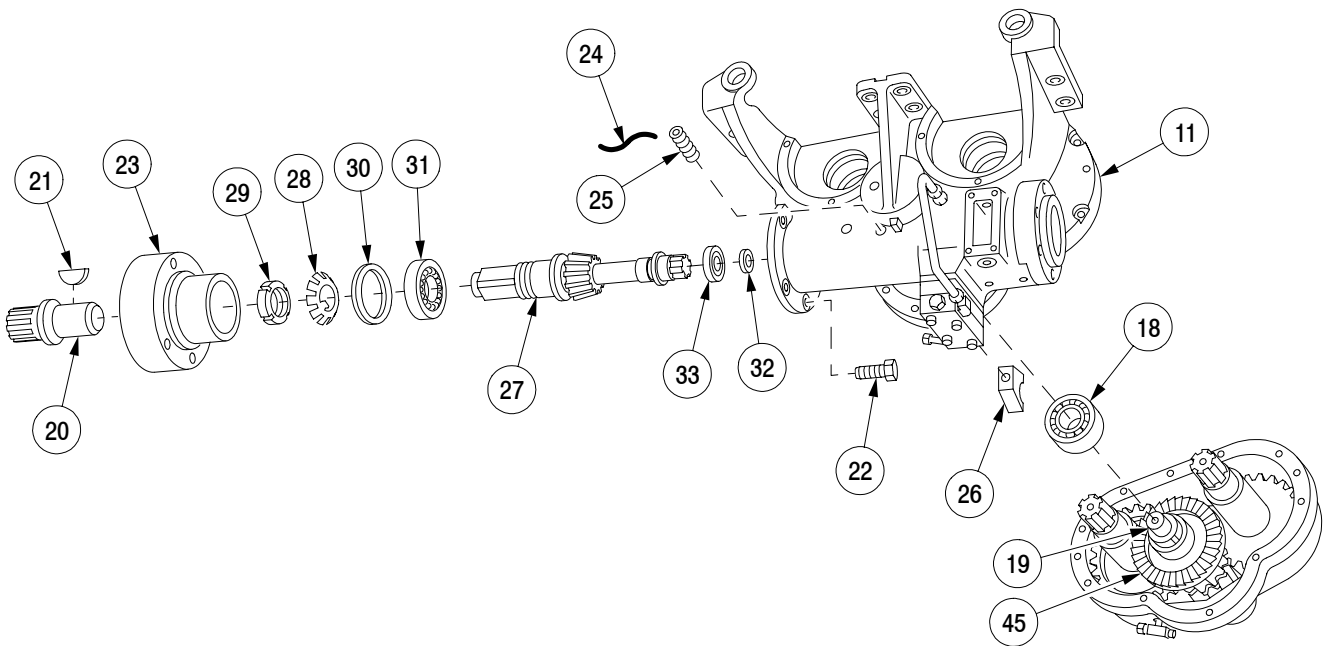
20pc038m

Section IV. TRAVERSE MECHANISM ASSEMBLY - CONTINUED

13-6 TRAVERSE MECHANISM - CONTINUED

c. Assembly - Continued

- 17 Install bearing (33) and retaining ring (32) on gearshaft (27).
- 18 Install bearing (31), shim(s) (30), new keywasher (28), and nut (29) on gearshaft (27). (Gearshaft (27) must be installed with bevel gear (44) as a matched set.)
- 19 Bend tab of keywasher (28) to secure nut (29).
- 20 Install gearshaft (27) in upper housing assembly (11).
- 21 Install pressure block (26) and setscrew (25) in upper housing assembly (11). Adjust setscrew (25) so that pressure block (26) allows drive bevel pinion gearshaft to move with slight drag.
- 22 Secure setscrew (25) with new lockwire (24).
- 23 Install adapter (23) with five screws (22).
- 24 Install drive coupling (20) and woodruff key (21).
- 25 Install bearing (18) on lower housing gear shaft (19).



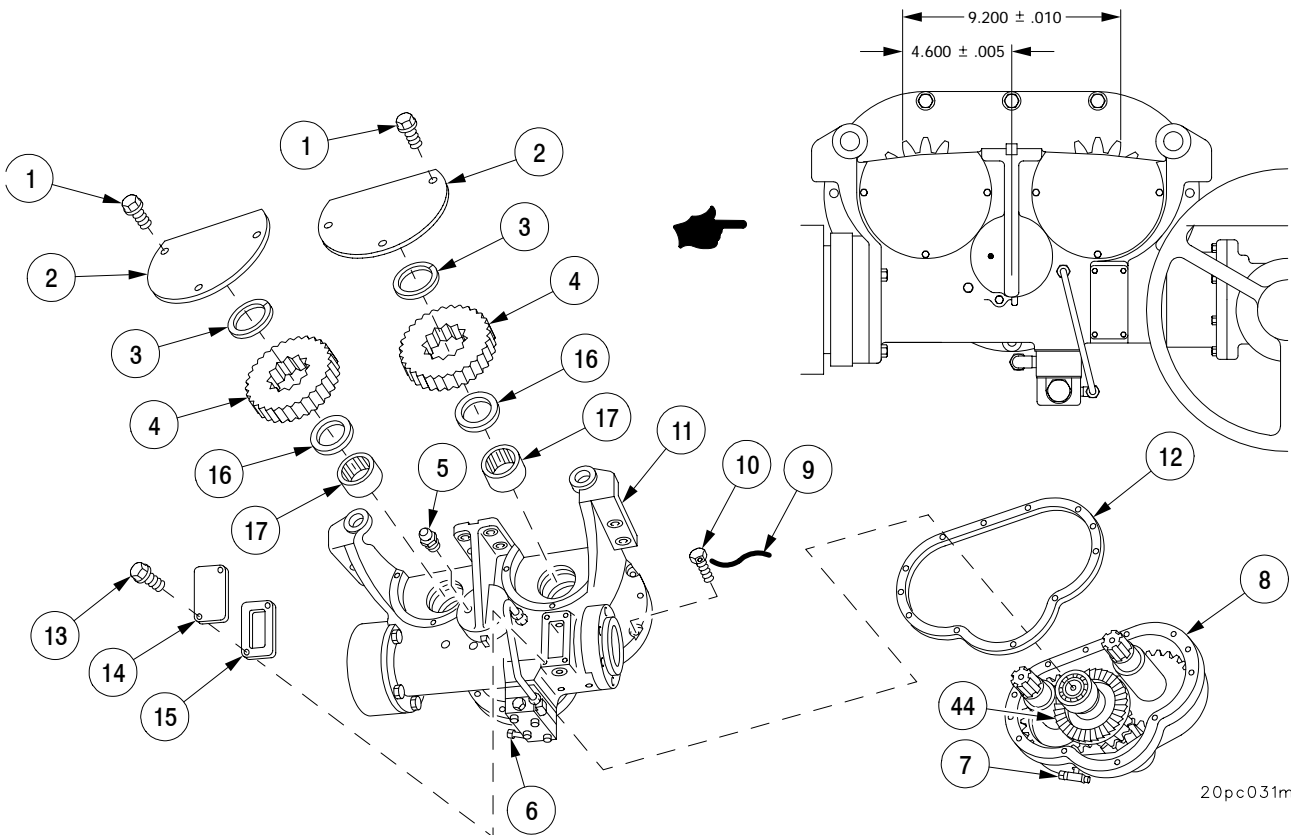
20pc040m

Section IV. TRAVERSE MECHANISM ASSEMBLY - CONTINUED

13-6 TRAVERSE MECHANISM - CONTINUED

c. Assembly - Continued

- 25.1 Apply sealing compound to two new seals (16).
- 26 Install two bearings (17) and two new seals (16).
- 27 Install new gasket (15), cover (14), and two bolts (13).
- 28 Install new gasket (12) on lower housing assembly (8). If gasket (12) does not exactly match shape of housing, dipping gasket in hot water for 1 to 2 minutes will restore proper contour. Pat gasket (12) dry and install on lower housing assembly (8). Repeat as necessary.
- 29 Install upper assembly (11) and 10 capscrews (10) to lower housing assembly (8). Check backlash between bevel gear (44) and gearshaft (27). If backlash exists, shim as required.
- 30 Install new lockwire (9) to secure 10 capscrews (10).
- 31 Install hydraulic tube (6) to tee (7) on lower housing assembly (8).
- 32 Install two lubrication fittings (5).
- 33 Install two spur gears (4) and two retainer rings (3).
- 33.1 Spacing requirements for two spur gears (4) are shown below.
- 34 Install two spur gear covers (2) and six bolts (1).



APPENDIX A

REFERENCES

A-1 PUBLICATION INDEXES.

The following publications constitute a listing of forms and publications applicable to maintenance for material covered in this technical manual. Appropriate indexes should be consulted frequently for latest applicable changes, revisions, and additions.

Index of Army Motion Pictures and Related Audio Visual Aids	DOD Reg 5040.2
Consolidated Index of Publications and Blank Forms	DA PAM 310-1
Index of Blank Forms	DA PAM 310-2
The Army Maintenance Management System	DA PAM 738-750
Charging System Troubleshooting	DA PAM 750-33

A-2 REGULATIONS.

Malfunctions Involving Ammunition and Explosives	AR 75-1
Dictionary of United States Army Terms	AR 310-25
Authorized Abbreviations and Brevity Codes	AR 310-50
Accident Reporting and Records	AR 385-40
Prevention of Motor Vehicle Accidents	AR 385-55
Maintenance Assistance and Instruction Team Program	AR 750-51

A-3 FORMS.

Accident Report	DA Form 285
Recommended Changes to Publications	DA Form 2028
Recommended Changes to Equipment Technical Manuals	DA Form 2028-2
Exchange Tag	DA Form 2402
Equipment Inspection and Maintenance Worksheet	DA Form 2404
Maintenance Request	DA Form 2407
Oil Analysis Log	DA Form 2408-20
Weapon Record Data	DA Form 2408-4
Report of Damaged or Improper Shipment	DD Form 6
Processing and Deprocessing Record for Shipment, Storage, and Issue of Vehicles and Spare Engines	DD Form 1397
Report of Deficiencies	SF Form 364
Quality Deficiency Report	SF Form 368

A-4 MANUALS.

Nuclear, Biological and Chemical Decontamination and Reconnaissance Operations	FM 3-87
Explosives and Demolition	FM 5-25
Operation and Maintenance of Ordnance Material in Cold Weather	FM 9-207
First Aid for Soldiers	FM 21-11
Basic Cold Weather Manual	FM 31-70
Storage Serviceability Standard: Tracked Vehicles, Wheeled Vehicles, and Component Parts	SB 740-98-1
Solder and Soldering	TB SIG 222
Color, Marking, and Camouflage Painting	TB 43-0209
Exercising of Recoil Mechanism and Equilibrators	TB 9-1000-234-30
Inspection, Care, and Maintenance of Antifriction Bearings	TM 9-214

A-4 MANUALS - CONTINUED

Operator's Manual: Welding Theory and Application	TM 9-237
Materials Used in Cleaning	TM 9-247
General Maintenance Procedures for Fire Control Material	TM 9-254
Operator's Manual: Machine Gun, Cal. 50, Browning, Heavy Barrel, Flexible ...	TM 9-1005-213-10
Organizational, DS, GS and Depot Maintenance Manual Including Repair Parts and Special Tool Lists: Machine Gun, Cal. 50, Browning, M2, Heavy Barrel Flexible	TM 9-1005-213-25
Operator, Organizational, DS and GS Maintenance Manual Including Repair Parts and Special Tool Lists (Including Depot Maintenance Repair Parts and Special Tools): Various Machine Gun Mounts and Combinations Used on Tactical and Armored Vehicles	TM 9-1005-245-13&P
Direct Support and General Support Maintenance Manual Including Repair Parts and Special Tools Lists for Automatic Fire Control System; Consisting of Display Unit; Prognostic/Diagnostic Interface Unit; VMS Modem; and Power Conditioning Unit	TM 9-1200-215-34&P
Direct Support and General Support Maintenance Manual Including Repair Parts and Special Tools Lists for Collimator, Infinity Aiming Reference: M1A1 (Radioactive)	TM 9-1240-324-34&P
Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools and Depot Maintenance Repair Parts Lists) for Telescope Mount: M146 (1240-00-864-0348), Elbow Telescope: M118A2 (1240-01-092-2693), Elbow Telescope: M118A3 (1240-01-317-9241), Telescope Mount: M145 (1240-00-871-2969), Telescope Mount: M145A1 (1240-01-313-6842), Panoramic Telescope: M117 (1240-00-864-2930), Panoramic Telescope: M117A2 (1240-00-106-7754), Fire Control Quadrant: M15 (1290-00-896-2236), Periscope: M42 (1240-00-864-2933), Linkage Assembly (1240-00-871-5475), and Linkage Assembly (1030-01-317-9117) .	TM 9-1240-401-34&P
Quadrant, Fire Control Gunners: M1A1/M1A2	TM 9-1290-200-14&P
Operator's Manual: Howitzer, Medium, Self-Propelled: 155MM, M109A6	TM 9-2350-314-10
Hand Receipt for Howitzer, Medium Self-Propelled: 155MM, M109A6	TM 9-2350-314-HR
Unit Maintenance Manual for Hull Systems and Components, Howitzer, Medium Self-Propelled: 155MM, M109A6	TM 9-2350-314-20-1
Unit Maintenance Manual for Cab Systems and Components	TM 9-2350-314-20-2
Unit, DS and GS Maintenance Repair Parts and Special Tools List for Hull and Associated Components, Howitzer, Medium, Self-Propelled:155MM, M109A6	TM 9-2350-314-24P-1
Unit, DS and GS Maintenance Repair Parts and Special Tools List for Cab Associated Components Used on Howitzer, Medium, Self-Propelled: 155MM M109A6	TM 9-2350-314-24P-2
Direct Support and General Support Maintenance Manual for Hull Systems and Components	TM 9-2350-314-34-1
Operator, Organizational, Direct Support and General Support Maintenance Manual Including Repair Parts and Special Tools Lists for Alinement Device: M139 & M140 (w/case)	TM 9-4931-710-14&P
Operator's and Organizational Maintenance Manual Including Repair Parts and Special Tools Lists: Intercommunication Set AN/VIC-1	TM 11-5830-340-12
Operator's Organizational, DS, GS, and Depot Maintenance Manual: Multimeter	TM 11-6625-366-15
Preservation, Packaging and Packing of Military Supplies and Equipment (Volume 2)	TS-352 B/U TM 38-230-2

A-4 MANUALS - CONTINUED

Procedure for Destruction of Improved Conventional Munitions (ICM) to Prevent
 Enemy Use TM 43-0002-33
 Painting Instructions for Field Use TM 43-0139
 Administrative Storage of Equipment TM 740-90-1
 Storage and Materiels Handling TM 743-200
 General Procedures for Purging and Charging of Fire Control Instruments TM 750-116
 Procedures for Rapid Deployment, Redeployment and Retrograde for Combat
 Vehicles TM 750-138
 Destruction of Conventional Ammunition to Prevent Enemy Use TM 750-244-5-1
 Procedures for Destruction of Tank Automotive Equipment to Prevent
 Enemy Use TM 750-244-6

A-5 MILITARY AND FEDERAL SPECIFICATIONS.

Lockwire, Standard MIL-STD-33540
 Brazing of Steels, Copper, Copper Alloys, Nickel Alloys, Aluminum, and
 Aluminum Alloys MIL-B-007883
 Walkway Compound, Nonslip (Note: Used in place of MIL-E-52789 or
 MIL-E-52855) MIL-W-5044
 Safety Wiring and Cotter Pinning Practices MS33540
 Alkyd, Gloss TT-E-489
 Primer Coating, Zinc Chromate (Note: Supersedes TT-P-666) TT-P-1757

APPENDIX B

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

B-1 SCOPE.

This appendix lists expendable/durable supplies and materials needed to operate and maintain the M109A6 155MM self-propelled howitzer at intermediate direct and intermediate general support levels. This listing is for informational purposes only. It is not authority to requisition listed items. These items are authorized by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts and Heraldic Items) or CTA 8-100, Army Medical Department Expendable/Durable Items.

B-2 EXPLANATION OF COLUMNS.

- a. Column (1) -- Item Number. This number is assigned to entry in listing and is referenced in narrative instructions to identify material (e.g., "Use adhesive, item 2, Appx B").
- b. Column (2) -- Level. This column identifies lowest level of maintenance that requires listed item. Intermediate Direct Support/Intermediate General Support.
- c. Column (3) -- National Stock Number. This is National Stock Number (NSN) assigned to item. Use it to request or requisition item.
- d. Column (4) -- Description. Indicates federal item name and, if required, a description to identify item. The last line for each item indicates Federal Supply Code for Manufacturer (FSCM) in parentheses followed by part number.
- e. Column (5) -- Unit of Measure (U/M). Indicates measure used in performing actual maintenance function. This measure is expressed by two-character alphabetical abbreviation (e.g., ea, in., pr). If unit of measure differs from unit of issue, requisition lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE AND DURABLE ITEMS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) (U/M)/ (U/I)
1	F	8040-01-125-4675	Adhesive BOSTIK1096 (70707)	GL
2	F	8040-01-376-0468	Adhesive 45404 (05972)	TU
3	F		Adhesive 759625-1	
4	F		Adhesive 759625-2	
5	F	8040-01-100-2432	Adhesive 759640 (30554)	CN
6	F	8040-00-142-9207	Adhesive MIL-A-8623 (81349)	CN
7	F	8040-00-664-4318	Adhesive MMM-A-1617 (81348)	PT
8	F	8040-00-298-1946	Adhesive MMM-A-1617 TY3 (80244)	CN
9	F	8030-00-174-2599	Adhesive MIL-S-8802 (81349)	KT
10	F	8040-01-370-1542	Agent, curing BOSCODUR 9R (70707)	GL
11	F	6810-00-286-5435	Alcohol, isopropyl TTI735 (81348)	GL
12	F	6810-01-190-2538	Alcohol, isopropyl TT-I-735 (81348)	CN
13	F	6810-00-292-9676	Alcohol, methyl O-M-232 (81348)	QT
14	F	8105-00-837-7754	Bag, plastic A-A-1799 (58536)	MX
15	F	8105-00-299-8532	Bag, plastic (100 each) A-A-1668 (58536)	BX
16	F	8115-00-190-5020	Box, shipping (10 each, bdl) PPP-B-636 (81348)	BD
17	F	3439-00-483-0007	Braze alloy, silver Grade IV 0.063 AMS4770 (81349)	TO
18	F		Braze, silver	CN
19	F	7920-00-223-8005	Brush, acid swabbing H-B-643 (81348)	GR
20	F	5340-01-183-0961	Cap, dust protective 3/8 inch MIL-C-5501 (81349)	EA
21	F	5340-01-326-2579	Cap, dust protective 1/2 inch MIL-C-5501/7-F8 (81349)	EA
22	F	5340-00-727-4778	Cap, dust protective 3/4 inch M5501/11-F12 (81349)	EA
23	F	5350-00-221-0872	Cloth, abrasive A-A-1206 (58536)	PG
24	F	8040-00-266-0818	Coating EC776SR MMM-A-250 (81348)	GL
25	F	8010-01-314-4498	Coating, kit, epoxy M22750-11-CLEAR (81349)	KT
26	F	8010-00-229-4813	Coating, primer MIL-P-23377 TY1CL1 (80244)	KT
27	F	8010-00-515-2208	Coating, primer TT-P-1757 (81348)	GL
28	F	8030-00-082-2508	Coating, primer 545194-2 (73030)	BT
29	F	8010-00-551-0128	Coating, primer MIL-P-30501	TU
30	F	5970-00-180-9481	Compound, caulking MIL-I-81550 (81349)	KT
31	F	8030-00-275-8114	Compound, sealing MIL-S-11030 TY1 (81349)	PT
32	F	8030-00-067-6744	Compound, sealing MIL-S-22473 GRA (81349)	BT

Section II. EXPENDABLE AND DURABLE ITEMS LIST - CONTINUED

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) (U/M)/ (U/I)
33	F	8030-00-823-7917	Compound, sealing MIL-S-22473 GRC (80244)	BT
34	F	8030-00-081-2330	Compound, sealing MIL-S-22473 GRCV (80244)	BT
35	F	8030-00-551-1059	Compound, sealing MIL-S-45180 TY2 (80244)	TU
36	F	8030-00-111-6404	Compound, sealing MIL-R-46082 TY2 (80244)	BT
37	F	8030-00-333-7495	Compound, sealing MIL-S-46163 (80244)	BT
38	F	8030-01-158-6070	Compound, sealing MIL-S-46163 TY1GRK (80244)	BT
39	F	8030-01-054-3968	Compound, sealing MIL-S-46163 TY2GRM (80244)	BT
39.1	F		Compound, sealing SAE AMS 3265, CLASS A	BT
39.2	F	8030-00-174-2598	Compound, sealing MIL-S-8802 TY2CLB-4 (80244)	BT
40	F	8030-01-137-6964	Compound, sealing 51531 (05972)	BT
41	F	8030-00-964-7537	Compound, sealing 545193-5 (73030)	BT
41.1	F	8030-01-361-1814	Compound, sealing MIL-PRF-81733 TY1CL1 GRA-1/2	CA
42	F	9150-00-935-9808	Fluid, hydraulic MIL-PRF-6083 (81349)	GL
43	F	3439-00-162-8388	Flux, soldering liquid MILF14256 (81349)	GL
44	F		Gloves, patient, exam (package of 100) (89875)	PG
		6515-01-150-2976	E-010 Size small	
		6515-01-150-2978	E-012 Size medium	
		6515-01-150-2977	E-011 Size large	
45	F	9150-01-197-7689	Grease MIL-PRF-10924 (81349)	CN
46	F	9150-00-935-4017	Grease MILG23827 (81349)	CA
47	F	5640-00-237-4779	Insulation MIL-P-15280 (81349)	SH
48	F	7810-00-982-5654	Line, fishing 2212 (94452)	SL
49	F	9150-01-031-9645	Lubricant, SUNISO 5GS (78369)	GL
50	F	9150-00-543-7220	Lubricant, oil molybdenum DOD-L-25681 (81349)	LB
51	F		Lubricant, refrigerant MIL-L-2140	
51.1	F	9150-00-754-2595	Lubricant, thread MOLITHN02 MOLY (73219)	CN
52	F	9150-00-058-2301	Lubricant, vacuum pump 1-1-04A (80011)	QT
53	F	6830-00-292-0131	Nitrogen BB-N-411 (81348)	CY
54	F	9150-00-001-9395	Oil, gear MIL-PRF-2105 (81349)	CN
55	F		Paint, white semi-gloss enamel (No 17875)	GL
56	F	9150-00-250-0926	Petrolatum, Technical 14P1 (82146)	CN
57	F	5340-00-682-1857	Plug, dust, protective 3/8 inch MIL-C-5501 (81349)	HD
58	F	5340-00-286-4161	Plug, dust protective 1/2 inch MIL-C-5501 (81349)	EA
59	F	5340-01-167-9320	Plug, dust protective 5/8 inch MIL-C-5501 (81349)	EA
60	F	8040-00-598-5164	Primer BOSTIK1007 (70707)	QT
61	F	6830-01-439-0614	Refrigerant, R134A (4V886)	CY

Section II. EXPENDABLE AND DURABLE ITEMS LIST - CONTINUED

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) (U/M)/ (U/I)
62	F	8030-01-375-5844	Sealant KR377-62 (18965)	TU
63	F		Sealant 12979820 (19200)	CN
64	F	5970-01-014-6666	Sleeving, insulation 571028-16-11 (73030)	FT
65	F	5970-00-812-2969	Sleeving, insulation M23053/5-104-0 (81349)	FT
66	F	3439-01-094-3338	Solder SN60WRAP1 (81348)	SL
67	F	3439-00-006-7764	Solder SN63WRAP3 (81348)	SL
68	F	3439-01-233-1124	Solder SN60WRMAP2 0.025 (81348)	SL
69	F	6850-00-285-8011	Solvent, dry-cleaning P-D-680 (81348)	DR
70	F	5940-00-532-3584	Splice 99126 (11384)	EA
71	F	9905-00-537-8954	Tag, marking MIL-T-12755 (81349)	BD
72	F	4020-01-367-9186	Tape, lacing cord 770435-1 (73030)	FT
73	F	7510-01-221-3335	Tape, pressure sensitive 5425 (52152)	RL
74	F	7510-01-146-7767	Tape, pressure sensitive PPP-T-60 (81348)	RO
75	F	5975-01-013-2742	Tiedown, electrical, strap MS3367-1-9 (96906)	HD
75.1	F	5975-00-156-3253	Tiedown, electrical, strap MS3367-2-9 (96906)	HD
76	F	5975-00-727-5153	Tiedown, electrical, strap MS3367-4-9 (96906)	HD
77	F	9330-01-089-0118	Tubing RT1150 3-4 (06090)	FT
78	F	5970-00-005-5287	Tubing, shrink MIL-I-23053/12 (81349)	FT
79	F	5970-00-016-1705	Tubing, shrink MIL-I-23053/2 (81349)	FT
80	F	6145-00-220-9660	Wire, braid 2174 (92194)	FT
81	F	9505-00-221-2650	Wire, non-electrical MS20995C20 (96906)	FT
82	F	9505-00-293-4208	Wire, non-electrical MS20995C32 (96906)	LB
83	F	9505-00-331-3275	Wire, non-electrical NASM20995C41 (96906)	LB
84	F	9505-00-555-8648	Wire, non-electrical MS20995C47 (96906)	SL
85	F	9505-01-236-9343	Wire, non-electrical MS20995C91 (96906)	LB
85.1	F		Wire non-electrical NASM 20995-C32 (96906)	LB
86	F	9505-00-684-4841	Wire, non-electrical QQW461 (81348)	LB
87	F	9505-00-684-4843	Wire, non-electrical MS20995F41 (96906)	LB
88	F	9505-00-248-9850	Wire, non-electrical MS20995F47 (96906)	LB
89	F	5510-01-143-8000	Wood 4x4x12 MM-L-736 (81348)	BF

APPENDIX C

ILLUSTRATED LIST OF MANUFACTURED ITEMS

C-1 SCOPE.

This appendix includes complete instructions for making items authorized to be manufactured, modified or fabricated at direct support and general support maintenance level. A part number index in alphanumeric order is provided for cross-referencing the part of the item to be manufactured to the figure which covers fabrication criteria. All bulk materials needed for manufacture of an item are listed on the illustration.

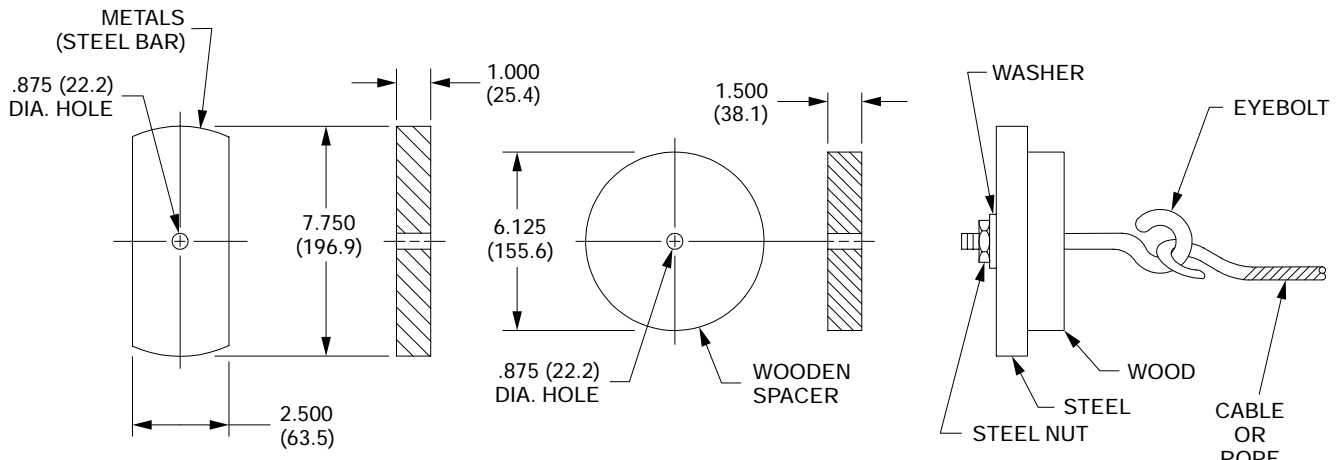
C-2 PART NUMBER INDEX LIST.

<u>ITEM</u>	<u>PART NUMBER</u>	<u>REFERENCE</u>
Eyebolt Assembly	MI 004	Figure 1
Cradle Mount Tripod	MI 011	Figure 2
Cannon Tube Hydraulic Tripod	MI 012	Figure 3
Breech Stand	MI 013	Figure 4
Cab Stand	MI 003	Figure 5
Bearing Puller	MI 014	Figure 6
Fabricated Spanner	TBD	Figure 7

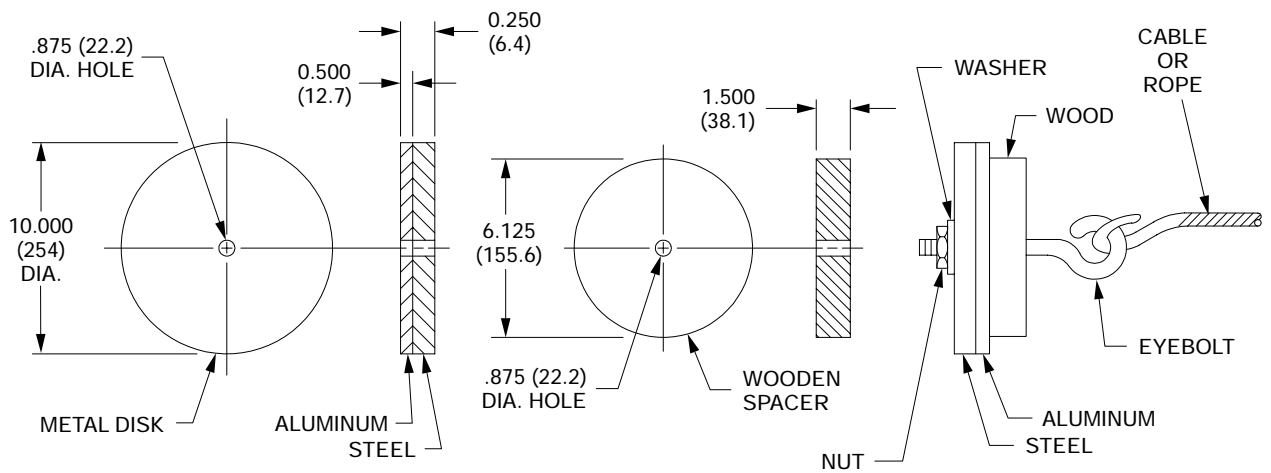
TM 9-2350-314-34-2
EYEBOLT ASSEMBLY

NOTE

All dimensions shown are in inches (millimeters).



A. REMOVAL



B. INSTALLATION

31pc001m

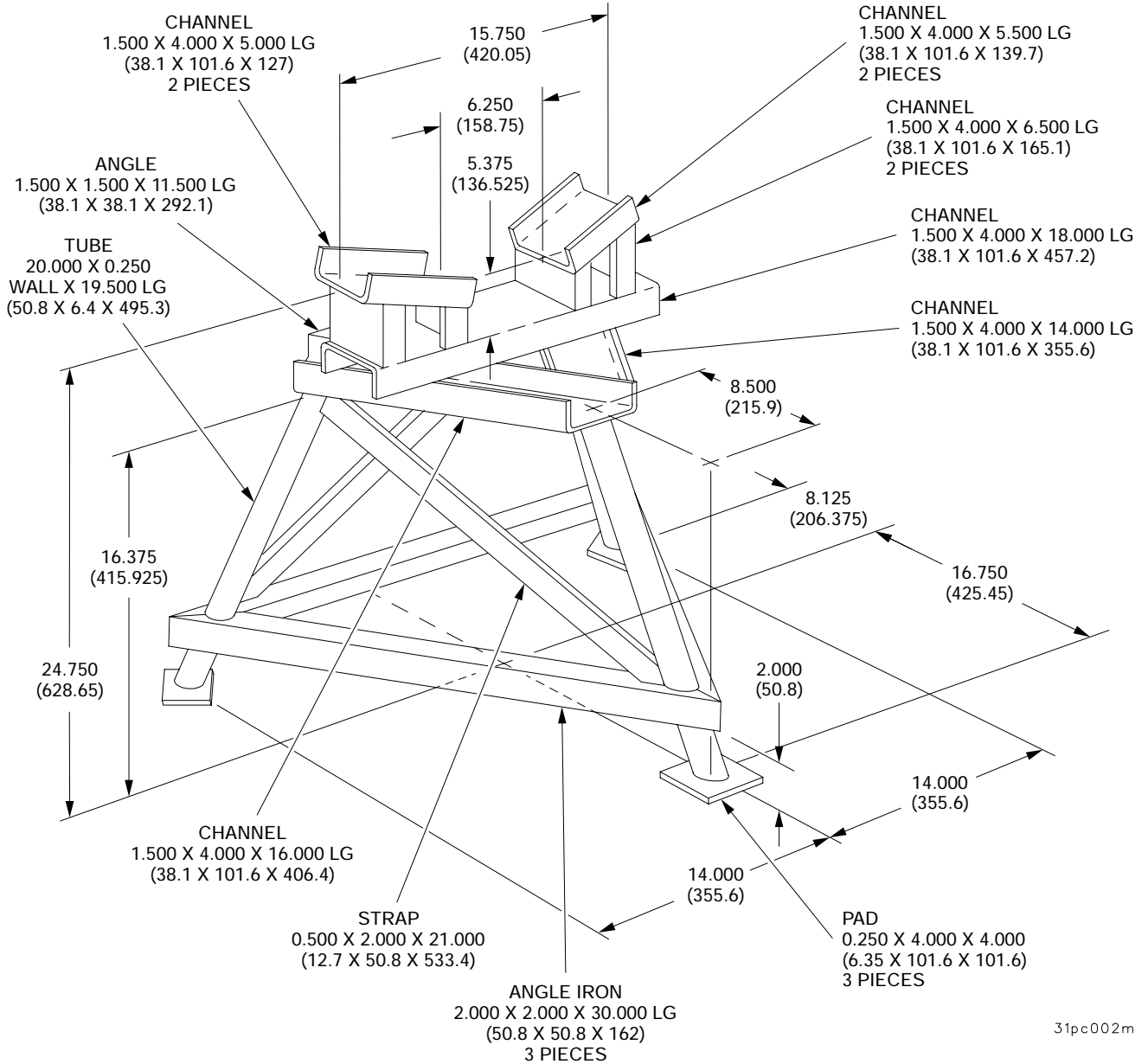
Figure 1 EYEBOLT ASSEMBLY

CRADLE MOUNT TRIPOD

NOTE

All dimensions shown are in inches (millimeters).

All joints to have 0.25 (6.35) fillet welds.



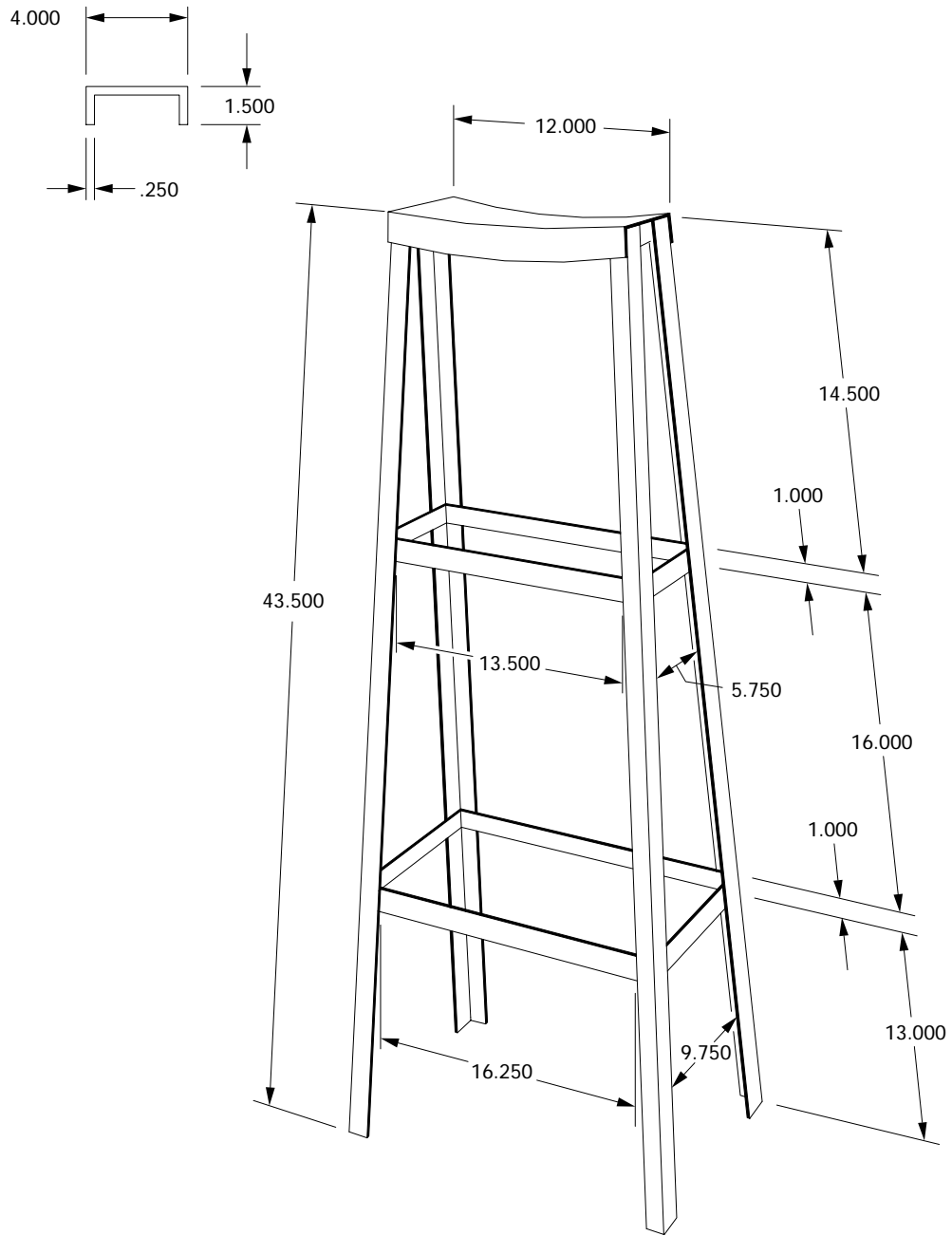
31pc002m

Figure 2 CRADLE MOUNT TRIPOD

BREECH STAND

NOTE

All dimensions shown are in inches



31pc004m

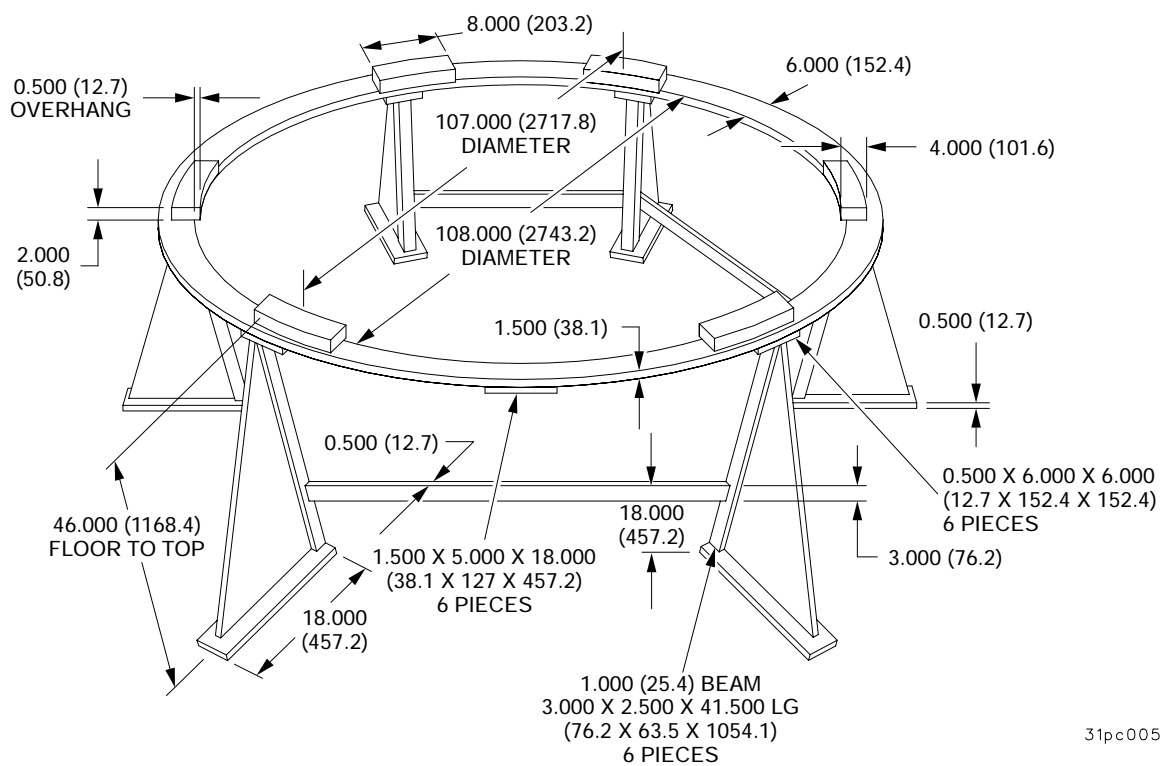
Figure 4 BREECH STAND

CAB STAND

NOTE

All dimensions shown are in inches (millimeters).

All joints to have 0.25 fillet welds.



31pc005m

Figure 5 CAB STAND

BEARING PULLER

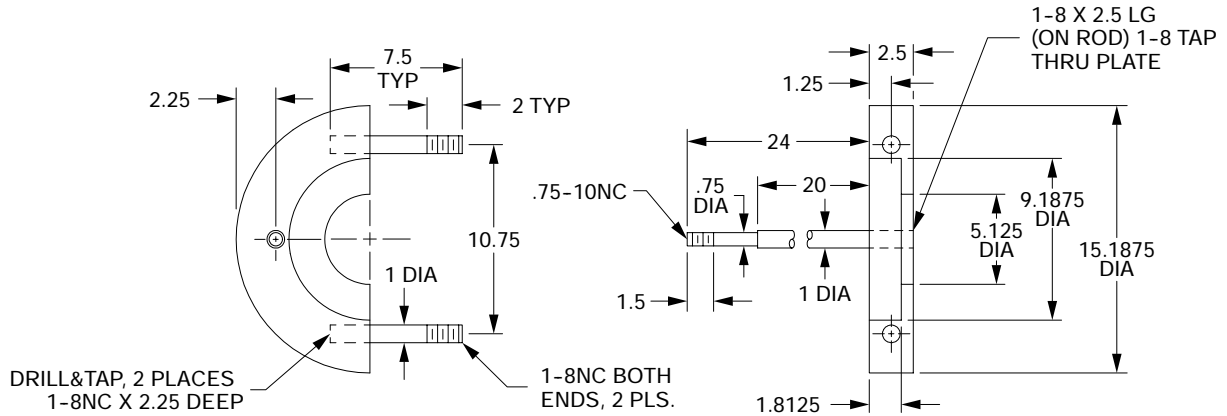
NOTE

All dimensions shown are in inches.

ITEM 1 (THIS PART MUST NEST WITH ITEM 2)

MAT'L: ROD-4140 STEEL; PLATE-T-1 STEEL

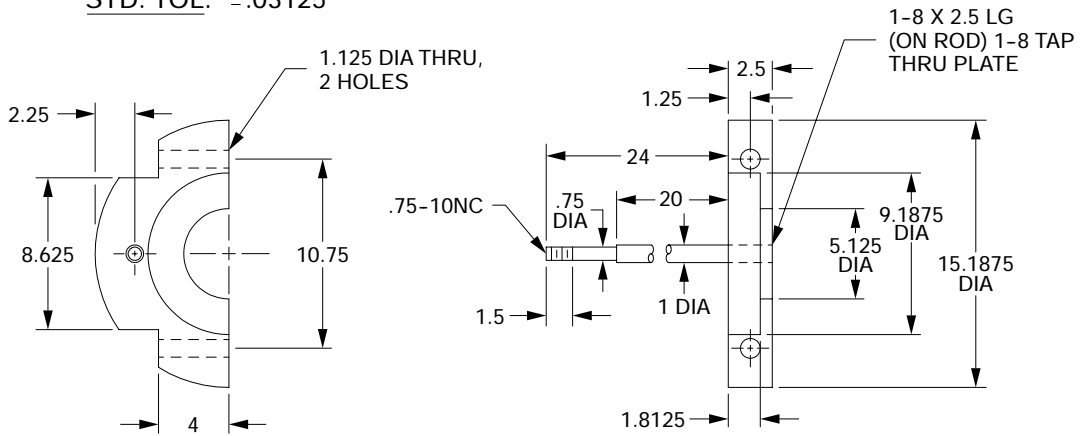
STD. TOL: ±.03125



ITEM 2 (THIS PART MUST NEST WITH ITEM 1)

MAT'L: ROD-4140 STEEL; PLATE-T-1 STEEL

STD. TOL: ±.03125



31pc006m

Figure 6 BEARING PULLER

BEARING PULLER (CONTINUED)

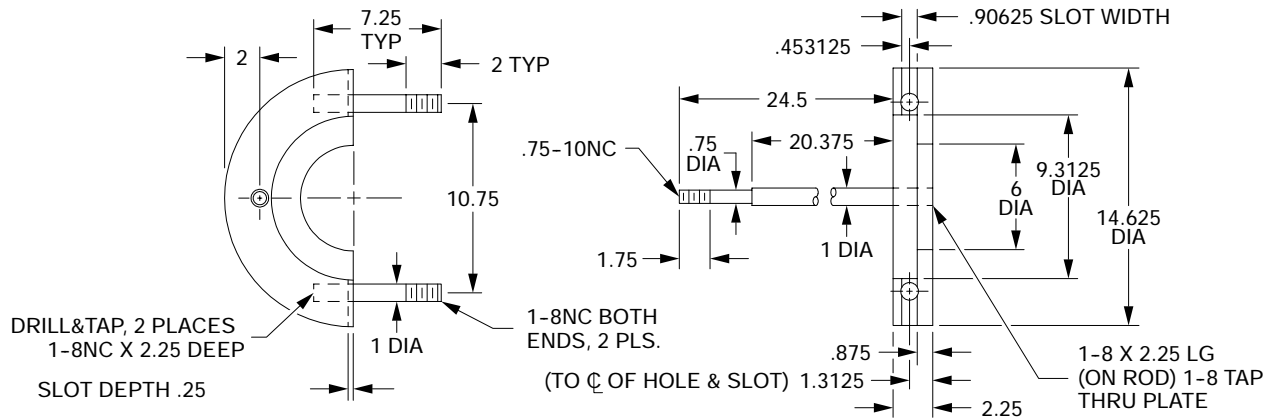
NOTE

All dimensions shown are in inches.

ITEM 3 (THIS PART MUST NEST WITH ITEM 4)

MAT'L: ROD-4140 STEEL; PLATE-T-1 STEEL

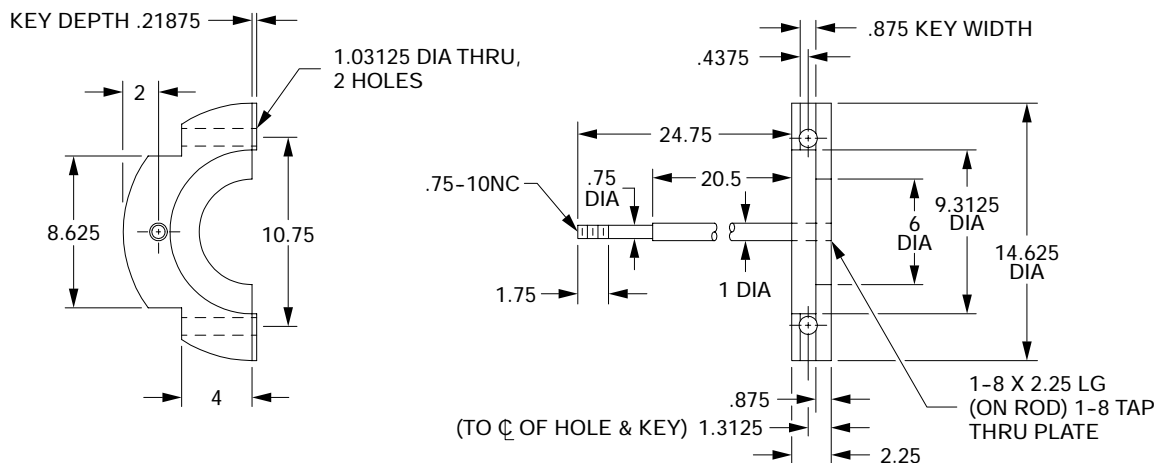
STD. TOL: ±.03125



ITEM 4 (THIS PART MUST NEST WITH ITEM 3)

MAT'L: ROD-4140 STEEL; PLATE-T-1 STEEL

STD. TOL: ±.03125



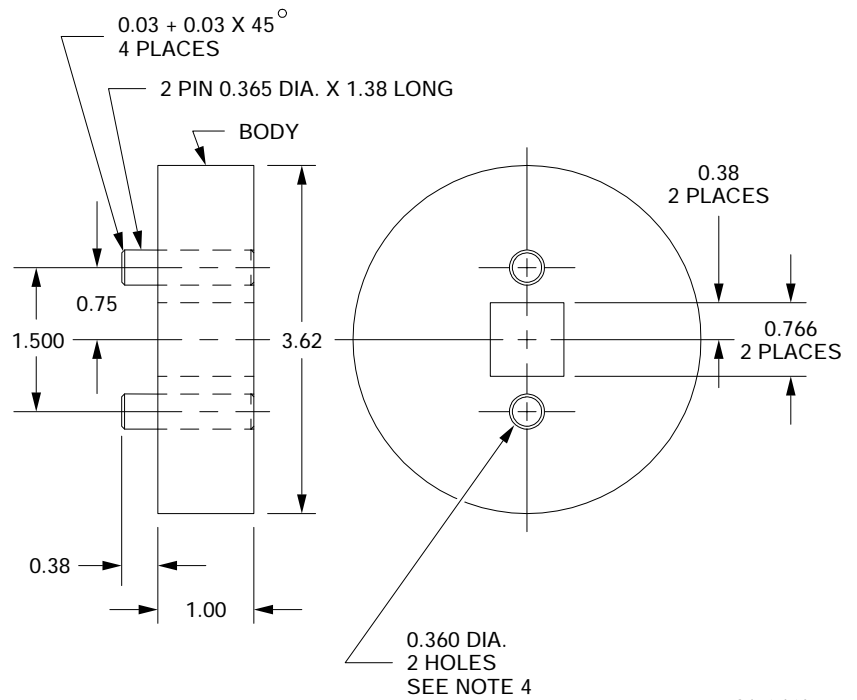
31pc007m

Figure 6 BEARING PULLER (continued)

FABRICATED SPANNER

NOTES:

1. MATERIAL: PIN AND BODY TOOL STEEL MEDIUM TO HIGH CARBON: QQ-S-634 OR QQ-S-631 SUITABLE.
2. FINISH $\sqrt{250}$ ALL OVER.
3. REMOVE SHARP EDGES.
4. CONTROL HOLE DIA. TO ATTAIN PRESS FIT WITH PINS.
5. ALL DIMENSIONS SHOWN ARE IN INCHES.
6. UNLESS OTHERWISE SPECIFIED:
THREE (3) PLACE DECIMALS ± 0.005 . TWO (2) PLACE DECIMALS ± 0.002 .
ANGLES $\pm 5^\circ$.



26ph010m

Figure 7 FABRICATED SPANNER

APPENDIX D

TORQUE LIMITS

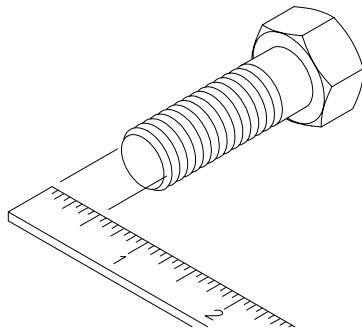
D-1 GENERAL.

This section provides general torque limits for screws used on the M109A6 vehicles. Special torque limits are indicated in the maintenance procedures for applicable components. The general torque limits given in this appendix shall be used when specific torque limits are not indicated in the maintenance procedure. These general torque limits cannot be applied to screws that retain rubber components. The rubber components will be damaged before the correct torque limit is reached. If a special torque limit is not given in the maintenance instructions, tighten the screw or nut until it touches the metal bracket, then tighten it one more turn.

D-2 TORQUE LIMITS.

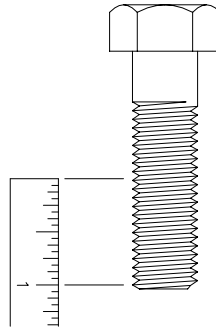
Table D-1 lists dry torque limits. Dry torque limits are used on screws that do not have lubricants applied to the threads. Table D-2 lists wet torque limits. Wet torque limits are used on screws that have high-pressure lubricants applied to the threads.

D-3 HOW TO USE TORQUE TABLE.



26ph008m

- a. Measure the diameter of the screw you are installing.



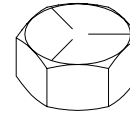
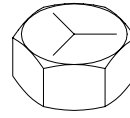
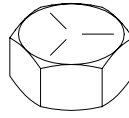
26ph009m

- b. Count the number of threads per inch or use a pitch gage.
- c. Under the heading **SIZE**, look down the left hand column until you find the diameter of the screw you are installing (there will usually be two lines beginning with the same size).
- d. In the second column under **SIZE**, find the number of threads per inch that matches the number of threads you counted in step b.

D-3 HOW TO USE TORQUE TABLE - CONTINUED

CAPSCREW HEAD MARKINGS

Manufacturer's marks may vary. These are all SAE Grade 5 (3 line)

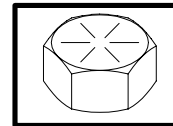
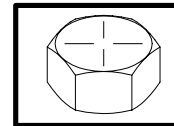
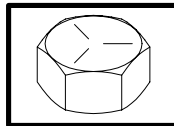
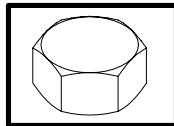


26ph007m

- e. To find the grade screw you are installing, match the markings on the head to the correct picture of CAPSCREW HEAD MARKINGS on the torque table.
- f. Look down the column under the picture you found in step e. until you find the torque limit (in lb-ft or N-m) for the diameter and threads per inch of the screw you are installing.

Table D-1. Torque Limits for Dry Fasteners

SAE CAPSCREW HEAD MARKINGS



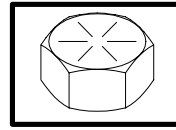
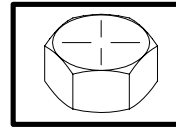
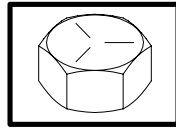
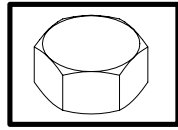
26ph006m

SIZE			TORQUE							
			SAE GRADE No. 1 or 2		SAE GRADE No. 5		SAE GRADE No. 6 or 7		SAE GRADE No. 9	
DIA. INS.	THREADS PER INCH	MMs	POUND- FEET	N-m	POUND- FEET	N-m	POUND- FEET	N-m	POUND- FEET	N-m
1/4	20	6.35	5	6.78	8.0	10.85	10	13.56	12.0	16.27
1/4	28	6.35	6	8.14	10.0	13.56	—	—	14.0	18.98
5/16	18	7.94	11	14.92	17.0	23.05	19	25.76	24.0	32.52
5/16	24	7.94	13	17.63	19.0	25.76	—	—	27.0	36.61
3/8	16	9.53	18	24.41	31.0	42.04	34	46.10	44.0	59.66
3/8	24	9.53	20	27.12	35.0	47.46	—	—	49.0	66.44
7/16	14	11.11	28	37.97	49.0	66.44	55	74.58	70.0	94.92
7/16	20	—	30	40.68	55.0	74.58	—	—	78.0	105.77
1/2	13	12.70	39	52.88	75.0	101.70	85	115.26	105.0	142.38
1/2	20	—	41	55.60	85.0	115.26	—	—	120.0	162.78
9/16	12	14.29	51	69.16	110.0	149.16	120	162.72	155.0	210.18
9/16	18	—	55	74.58	120.0	162.72	—	—	170.0	230.52
5/8	11	15.88	63	85.43	150.0	203.40	167	226.45	210.0	284.76
5/8	18	—	95	128.82	170.0	230.52	—	—	240.0	325.44
3/4	10	19.05	105	142.38	270.0	366.12	280	379.68	375.0	508.50
3/4	16	—	115	155.94	295.0	400.02	—	—	420.0	596.52
7/8	9	22.23	160	216.96	395.0	535.62	440	596.64	605.0	820.38
7/8	14	—	175	237.30	435.0	589.86	—	—	675.0	915.30
1	8	25.40	235	318.66	590.0	800.04	660	894.96	910.0	1233.96
1	14	—	250	339.00	660.0	894.96	—	—	990.0	1342.44
1-1/8	—	25.58	—	—	800.0	1064.8	—	—	1280.0	1735.7
					880.0	1193.3			1440.0	1952.8
1-1/4	—	31.75	—	—	—	—	—	—	1820.0	2467.9
									2000.0	2712.0
1-3/8	—	34.93	—	—	1460.0	1979.8	—	—	2380.0	3227.3
					1680.0	2278.1			2720.0	3688.3
1-1/2	—	38.10	—	—	1940.0	2630.6	—	—	3160.0	4285.0
					2200.0	2983.2			3560.0	4827.4

D-3 HOW TO USE TORQUE TABLE - CONTINUED

Table D-2. Torque Limits for Wet Fasteners

SAE CAPSCREW HEAD MARKINGS



26ph006m

SIZE			TORQUE							
			SAE GRADE No. 1 or 2		SAE GRADE No. 5		SAE GRADE No. 6 or 7		SAE GRADE No. 8	
DIA. INS.	THREADS PER INCH	MMs	POUND- FEET	N·m	POUND- FEET	N·m	POUND- FEET	N·m	POUND- FEET	N·m
1/4	20	6.35	4.9	6.10	7.2	9.76	9.0	12.20	10.8	14.64
1/4	28	6.35	5.4	7.33	9.0	12.20	—	—	12.6	17.08
5/16	18	7.94	9.9	13.34	15.3	22.54	17.1	23.18	21.6	29.27
5/16	24	7.94	11.7	15.87	17.1	23.18	—	—	24.3	32.95
3/8	16	9.53	16.2	21.97	27.9	37.84	30.6	41.49	39.6	53.69
3/8	24	9.53	18.0	24.41	31.5	42.71	—	—	44.1	59.80
7/16	14	11.11	25.2	34.17	44.1	59.80	49.5	67.12	63.0	85.42
7/16	20	—	27.0	36.61	49.5	67.12	—	—	70.2	95.19
1/2	13	12.70	35.1	47.59	67.5	91.53	76.5	103.73	94.5	128.14
1/2	20	—	36.9	50.04	76.5	103.73	—	—	108.0	146.50
9/16	12	14.29	45.9	62.24	99.0	134.24	108.0	146.45	139.5	189.16
9/16	18	—	49.5	67.12	108.0	146.45	—	—	153.0	207.47
5/8	11	15.88	56.7	76.89	135.0	183.06	150.3	203.80	189.0	256.28
5/8	18	—	85.5	115.94	153.0	207.47	—	—	216.0	296.90
3/4	10	19.05	94.5	128.14	243.0	329.51	252.0	341.71	337.5	457.65
3/4	16	—	103.5	140.35	265.5	360.2	—	—	378.0	536.87
7/8	9	22.23	144.0	195.26	355.5	482.06	396.0	536.98	544.5	738.34
7/8	14	—	157.5	213.57	391.5	530.87	—	—	607.5	823.77
1	8	25.40	211.5	286.79	531.0	720.04	594.0	805.46	819.0	1110.56
1	14	—	225.0	305.10	594.0	805.46	—	—	891.0	1208.20
1-1/8	—	25.58	—	—	720.0	976.32	—	—	1152.0	1562.13
1-1/8	—	—	—	—	792.0	1073.97	—	—	1296.0	1757.52
1-1/4	—	31.75	—	—	—	—	—	—	—	2221.11
1-1/4	—	—	—	—	—	—	—	—	—	2440.80
1-3/8	—	34.93	—	—	1314.0	1781.82	—	—	2142.0	2904.57
1-3/8	—	—	—	—	1512.0	2050.29	—	—	2448.0	3319.47
1-1/2	—	38.10	—	—	1746.0	2367.54	—	—	2844.0	3856.5
1-1/2	—	—	—	—	1980.0	2684.88	—	—	3204.0	4344.66

D-4 TIGHTENING METAL FASTENERS.

When torquing a fastener, select a wrench whose range (Table D-3) fits the required torque value. A torque wrench is most accurate from 25% to 75% of its stated range. A wrench with a stated range of 0 to 100 will be most accurate from 25 to 75 Pound-Feet. The accuracy of readings will decrease as you approach 0 Pound-Feet or 100 Pound-Feet. The following ranges (Table D-3) are based on this principle.

D-4 TIGHTENING METAL FASTENERS - CONTINUED

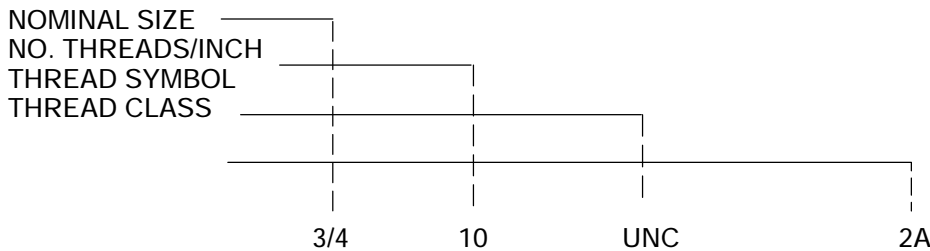
Table D-3. TORQUE RANGES	
STATED RANGE	MOST EFFECTIVE RANGE
0-2000 lb-in	4-13 lb-ft
0-600 lb-ft	50-450 lb-ft
0-170 lb-ft	44-131 lb-ft
15-75 lb-ft	30-60 lb-ft

D-5 FASTENER SIZE AND THREAD PATTERN.

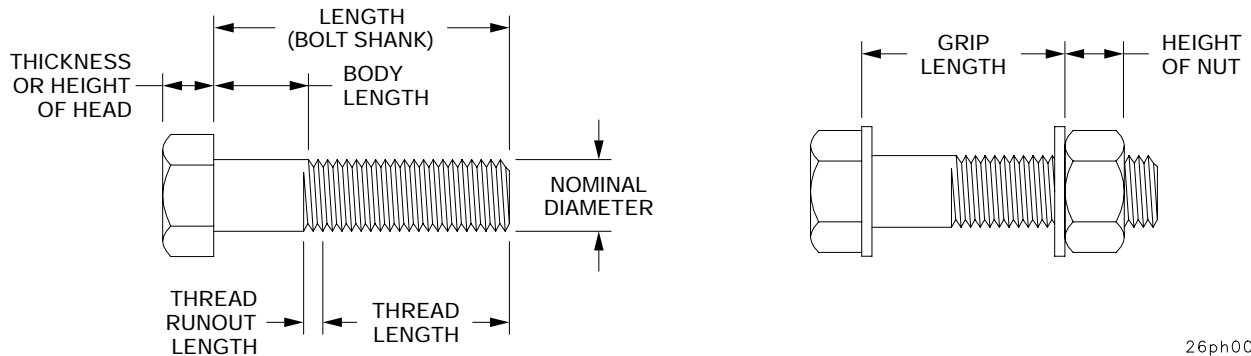
Threaded fasteners are categorized according to diameter of the fastener shank. Thread styles are divided into broad groups, the two most common being coarse (Unified Coarse-UNC) and fine (Unified Fine-UNF). These groups are defined by the number of threads per inch on the bolt shanks. In addition, threads are categorized by thread class (Table D-4), which is a measure of the degree of fit between the threads of the bolt or screw (external threads) and the threads of the attaching nut or tapped hole (internal threads). The most common thread class for bolts and screws is Class 2.

Table D-4. THREAD CLASSES AND DESCRIPTION		
EXTERNAL	INTERNAL	FIT
1A	1B	LOOSE FIT
2A	2B	MEDIUM FIT
3A	3B	CLOSE FIT

Thread patterns are designed as follows:



NOTE: Unless followed with -LH (e.g. 3/4-1 OUNC-2A-LH), threads are right hand.



26ph005m

D-6 FASTENER GRADE.

In addition to being classified by thread type, threaded fasteners are also classified by material. The most familiar fastener classification system is the SAE grading system (Table D-5).

Table D-5. SAE Screw and Bolt Markings	
SCREWS	BOLTS
SAE GRADE 2 NO MARKING	SAE GRADE 6 4 RADIAL DASHES 90° APART
SAE GRADE 3 2 RADIAL DASHES 180° APART	SAE GRADE 7 5 RADIAL DASHES 72° APART
SAE GRADE 5 3 RADIAL DASHES 120° APART	SAE GRADE 8 6 RADIAL DASHES 60° APART

Markings On Hex Locknuts

GRADE A - No Marks
 GRADE B - 3 Marks
 GRADE C - 6 Marks

GRADE A - No Mark
 GRADE B - Letter B
 GRADE C - Letter C

GRADE A - No Notches
 GRADE B - One Notch
 GRADE C - Two Notches

APPENDIX E

MANDATORY REPLACEMENT PARTS LIST

E-1 SCOPE.

This appendix is a cross-reference of item numbers to part numbers and is included for that purpose only.

E-2 EXPLANATION OF COLUMNS.

a. Column (1) - Item Number. This number is assigned to the entry in the listing for cross-referencing to the part number.

b. Column (2) - Part Number. Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specification, standards, and inspection requirements to identify an item or range of items.

c. Column (3) - Nomenclature. This column contains the nomenclature which appears on the first page of the task under the subheading "Materials/Parts".

MANDATORY REPLACEMENT PARTS LIST - CONTINUED

ITEM #	PART NUMBER	NOMENCLATURE
1	AN6227-5	Packing, Preformed
2	AN6227-6	Packing, Preformed
3	AS568-904	Packing, Preformed
4	AS568-908	Packing, Preformed
5	K271BBH-200EHF	Bearing, Ball
6	MS16555-60	Pin
7	MS16562-133	Pin, Spring
8	MS16562-135	Pin, Spring
9	MS16562-146	Pin, Spring
10	MS16562-220	Pin, Spring
11	MS16562-33	Pin, Spring
12	MS16562-35	Pin, Spring
13	MS16562-36	Pin, Spring
14	MS16562-39	Pin, Spring
15	MS16562-42	Pin, Spring
16	MS16562-44	Pin, Spring
17	MS16562-147	Pin, Spring
18	MS16562-60	Pin, Spring
19	MS16562-66	Pin, Spring
20	MS16624-1025	Ring, Retaining
21	MS16624-1043	Ring, Retaining
22	MS16624-5018	Ring, Retaining
23	MS16625-1118	Ring, Retaining
24	MS16998-44	Screw, Self-locking
25	MS16998-90	Screw, Self-locking
26	MS17571	Pin, Spring
27	MS19060-1018	Bearing, Ball
28	MS19070-062	Keywasher
29	MS19070-072	Keywasher
30	MS19070-082	Keywasher
31	MS19070-092	Keywasher
32	MS19070-102	Keywasher
33	MS19070-262	Keywasher
34	MS21044C08	Nut, Self-locking
35	MS21044C3	Nut, Self-locking
36	MS21044-C4	Nut, Self-locking
37	MS21044-C6	Nut, Self-locking
38	MS21044-N6	Nut, Self-locking
39	MS21083C08	Nut, Self-locking
40	MS21083-B3	Nut, Self-locking
41	MS21083N04	Nut, Self-locking

MANDATORY REPLACEMENT PARTS LIST - CONTINUED

ITEM #	PART NUMBER	NOMENCLATURE
42	MS21083N06	Nut, Self-locking
43	MS21083N12	Nut, Self-locking
44	MS21083N14	Nut, Self-locking
45	MS21083N3	Nut, Self-locking
46	B1821BH025F175L	Screw, Self-locking
47	MS21262-64	Screw, Self-locking
48	MS21318-20	Screw, Drive
49	MS21318-46	Screw, Drive
50	MS21318-7	Screw, Drive
51	MS21318-8	Screw, Drive
52	MS24665-153	Pin, Cotter
53	MS24665-283	Pin, Cotter
54	MS24665-625	Pin, Cotter
55	MS24685-1063	Spring
56	MS27595-440	Ring, Back-up
57	MS28774-014	Ring, Back-up
58	MS28774-015	Ring, Back-up
59	MS28774-016	Ring, Back-up
60	MS28774-018	Ring, Back-up
61	MS28774-023	Ring, Back-up
62	MS28774-026	Ring, Back-up
63	MS28775-005	Packing, Preformed
64	MS28775-008	Packing, Preformed
65	MS28775-010	Packing, Preformed
66	MS28775-011	Packing, Preformed
67	MS28775-014	Packing, Preformed
68	MS28775-015	Packing, Preformed
69	MS28775-016	Packing, Preformed
70	MS28775-017	Packing, Preformed
71	MS28775-022	Packing, Preformed
72	MS28775-110	Packing, Preformed
73	MS28775-235	Packing, Preformed
74	MS28778-10	Packing, Preformed
75	MS28778-12	Packing, Preformed
76	MS28778-2	Packing, Preformed
77	MS28778-3	Packing, Preformed
78	MS28778-4	Packing, Preformed
79	MS28778-6	Packing, Preformed
80	MS28778-8	Packing, Preformed
81	MS28782-11	Retainer, Packing

MANDATORY REPLACEMENT PARTS LIST - CONTINUED

ITEM #	PART NUMBER	NOMENCLATURE
82	MS28782-6	Retainer, Packing
83	101491/126	Packing, Preformed
84	101491/158	Packing, Preformed
85	101491/161	Packing, Preformed
86	MS3393-10	Packing, Preformed
87	MS3393-16	Packing, Preformed
88	MS3393-4	Packing, Preformed
89	MS3393-8	Packing, Preformed
90	MS35265-19	Screw, Assembled
91	MS35333-36	Washer, Lock
92	MS35333-44	Washer, Lock
93	MS35333-46	Washer, Lock
94	MS35333-73	Washer, Lock
95	MS35333-74	Washer, Lock
96	MS35335-58	Washer, Lock
97	MS35335-59	Washer, Lock
98	MS35336-27	Washer, Lock
99	MS35338-46	Washer, Lock
100	MS35338-44	Washer, Lock
101	MS35338-100	Washer, Lock
102	MS35338-101	Washer, Lock
103	MS35338-138	Washer, Lock
104	MS35338-139	Washer, Lock
105	MS35338-141	Washer, Lock
106	MS35338-143	Washer, Lock
106.1	MS35338-155	Washer, Lock
106.2	MS35338-156	Washer, Lock
106.3	MS35338-157	Washer, Lock
107	MS35338-24	Washer, Lock
108	MS35338-40	Washer, Lock
109	MS35338-41	Washer, Lock
110	MS35338-42	Washer, Lock
111	MS35338-43	Washer, Lock
112	MS35338-45	Washer, Lock
113	MS35338-48	Washer, Lock
114	MS35338-52	Washer, Lock
115	MS35338-65	Washer, Lock
116	MS35338-98	Washer, Lock
117	MS35340-47	Washer, Lock
118	MS35764-1605	Bolt, Self-locking
119	MS35764-1609	Bolt, Self-locking

MANDATORY REPLACEMENT PARTS LIST - CONTINUED

ITEM #	PART NUMBER	NOMENCLATURE
120	MS35764-1613	Bolt, Self-locking
120.1	MS35849-11	Grommet
121	MS39086-229	Pin, Spring
122	MS51001-271	Seal
123	MS39202-6	Elbow
124	MS39210-5	Sleeve
125	MS51848-10	Washer, Lock
126	MS51848-12	Washer, Lock
127	MS51848-9	Washer, Lock
128	MS16624-1081	Ring, Retaining
129	MS9048-104	Pin, Spring
130	MS16562-62	Pin, Spring
131	NAS561-8-26	Pin, Spring
132	M27426-1100B	Ring, Retaining
133	M83248/2-904	Packing, Preformed
134	M83461/1-007	Packing, Preformed
135	M83461/1-009	Packing, Preformed
136	M83461/1-011	Packing, Preformed
137	M83461/1-012	Packing, Preformed
138	M83461/1-014	Packing, Preformed
139	M83461/1-015	Packing, Preformed
140	M83461/1-016	Packing, Preformed
141	M83461/1-017	Packing, Preformed
142	M83461/1-018	Packing, Preformed
143	M83461/1-019	Packing, Preformed
144	M83461/1-023	Packing, Preformed
145	M83461/1-026	Packing, Preformed
146	M83461/1-111	Packing, Preformed
147	M83461/1-113	Packing, Preformed
148	M83461/1-130	Packing, Preformed
149	M83461/1-232	Packing, Preformed
150	M83461/1-237	Packing, Preformed
151	M83461/1-440	Packing, Preformed
152	M83461/1-444	Packing, Preformed
153	M83461/2-904	Packing, Preformed
154	M83528/0020-028	Gasket
155	NAS1351-12LE44P	Screw, Self-locking
156	NAS1423-14	Nut, Jam
157	NAS1523-04N	Packing, Preformed
158	NAS1523-5N	Packing, Preformed
159	NAS1523-6N	Packing, Preformed

MANDATORY REPLACEMENT PARTS LIST - CONTINUED

ITEM #	PART NUMBER	NOMENCLATURE
160	NAS1523-7N	Packing, Preformed
161	10888121	Tube
162	10888211	Gasket
163	10888219	Gasket
164	10888797	Gasket
165	10905016	Guide, Ring
166	10918677	Kit, Repair Parts
167	10925314	Gasket
168	10930644-3	Insert, Self-locking
169	10936118	Keywasher
170	11578346	Plunger
171	11580165	Screw
172	11604793	Gasket, Cover
173	MS35849-137	Grommet
174	11636076	Gasket
175	11636077	Gasket
176	11636078	Gasket
177	11636079	Gasket
178	11640256	Ring, Seal
179	11652493	Gasket
180	11784005	Kit, Parts
181	12010726	Seal
182	12012191	Ring, Retainer
183	12012358	Kit, Seal
184	12553607	Gasket
185	M6855/4-04L103	Tubing, Rubber
186	12553850-1	Seal
187	12553854	Gasket
188	12561807-4	Gasket
189	12561807-7	Gasket
190	12576008	Kit, Seal Replacement
191	12576009	Kit, Seal Replacement
192	12576056	Screw, Self-locking
193	12576071	Keywasher
194	12910461	Shim
195	12927813	Gasket
196	5910813	Kit, Repair Parts
197	210107-1	Assembly, "t" Seal
198	382584	Assembly, Seal
199	420A-36	Brushes, Electric
200	420A-39	Brushes, Electric

MANDATORY REPLACEMENT PARTS LIST - CONTINUED

ITEM #	PART NUMBER	NOMENCLATURE
201	49592	Seal
202	546940	Gasket
203	5703505	Parts Kit
204	5704210	Kit, Repair Parts
205	570678	Packing, Preformed
206	5910845	Kit, Seal
207	712306	Bearing
208	713512	Bearing
209	7328567	Ball
210	7363175	Keywasher
211	TM706	Washer, Lock
212	7973875	Bearing
213	MS51848-12	Washer, Lock
214	7997748	Washer, Lock
215	799930-1	Gasket
216	801102-1	O-ring
217	801104-1	Channel, Rubber
218	8346053	Washer, Lock
219	8712258	Ring, Retaining
220	8712289	Nut, Self-locking
221	8712289-3	Nut, Self-locking
222	8712289-4	Nut, Self-locking
223	8734031	Gasket
224	8740907	Seal
225	9363649	Gasket
226	9363651	Assembly, Packing
227	9363652	Seal
228	9363653	Seal
229	95354	Seal
230	95357	Gasket
231	99126	Splice Conductor
232	M83461/1-342	Packing, Preformed
233	12927776	Gasket
234	12927769	Gasket
235	MS3393-24	Packing, Preformed
236	M83461/1-220	Packing, Preformed
237	M83461/1-238	Packing, Preformed
238	MS3393-2	Packing, Preformed
239	MS35764-1611	Screw, Self-locking
240	MS17829-6F	Nut, Self-locking
241	12269104	Ball Bearing

MANDATORY REPLACEMENT PARTS LIST - CONTINUED

ITEM #	PART NUMBER	NOMENCLATURE
242	7328568	Ball Bearing
243	M83461/2-910	Packing, Preformed
244	M83461/2-912	Packing, Preformed

APPENDIX F

TOOL IDENTIFICATION LIST

ITEM	LEVEL	NOMENCLATURE	NSN	REFERENCE
1	F	Adapter, Socket Wrench 1/2" DR to 3/4" DR (A-A-2172)	5120-00-227-8088	TM 9-2350-314-24P-2
2	F	Adapter, Socket Wrench 1" male to 3/4" female (A-A-2172)	5120-00-227-8104	TM 9-2350-314-24P-2
3	F	Key Socket (GGG-W-541)	5120-00-683-8602	TM 9-2350-314-24P-2
4	F	Assembly, Fabricated Eyebolt And Cable (MI004)		TM 9-2350-314-34-2 Appx C
5	F	Borescope (8770505)	6650-00-318-4426	SC 4933-95-A12
6	F, H	Caliper, Vernier (123EMZ-12)	5210-00-293-2913	SC 4933-95-A12
7	F	Caps, Vise (404-4)	5120-00-221-1506	SC 4910-95-A31
8	F	Drift, Brass 3/4 inch x 12 inch (TCGX2TY1)	5120-00-241-3523	SC 5180-95-A12
9		Item Deleted		
10	F, H	Drill, Portable Electric (W-D-661)	5130-00-807-3009	SC 4910-95-A31
11	F, H	Drill, Variable Speed (171-6820)		SC 4933-95-A12
12	F	Extension, Socket Wrench, 3/4 Drive (L32)	5120-00-273-9208	SC 4910-95-A74
13	F	Eyebolt (MS51937-8)	5306-00-150-3075	TM 9-2350-314-24P-2
14	F	Eyebolt (1820129)	5306-00-337-4160	TM 9-2350-314-24P-2
15	F	Fixture, DRUH Alignment (12940849)	4933-01-381-7090	TM 9-2350-314-24P-2
16		Item Deleted		
17	H	Gun, Heater (500A)	4940-01-128-7493	TM 9-2350-314-24P-1
18	H	Gun, Lubrication (1142)	4930-00-253-2478	SC 4910-95-A62
19	F	Gun, Soldering (W-S-564)	3439-00-004-0915	SC 4910-95-A72
20	F	Hammer (GGG-H-33)	5120-00-187-1016	
21	F	Hammer, Sliding (4056H)	5120-00-313-9498	
22	F	Hammer, Soft-faced (GGG-H-33)	5120-00-902-0089	SC 4933-95-A12
23	F	Handle, Socket Wrench, 3/4 Drive (1940708)	5120-00-249-1076	SC 4910-95-A31
24	F	Handle, Socket Wrench, 3/4 Drive (41H1504-500)	5120-00-221-7957	SC 4910-95-A62
25	F	Hoist, Cab Lifting (MILH904)	3950-00-146-3728	
26	F	Indicator, Dial (399A)	5210-00-377-6525	TM 9-2350-314-24P-2

TOOL IDENTIFICATION LIST - CONTINUED

ITEM	LEVEL	NOMENCLATURE	NSN	REFERENCE
27	F	Iron, Soldering (WS570)	3439-00-223-2528	SC 4931-95-A07
28	F	Jack, Portable Hydraulic (2720XPC7)		SC 4910-95-A62
29	O, F	Kit, Electrical Connector Repair	5180-00-876-9336	SC 4910-95-A74
30	F	Kit, Fire Control Purging And Charging	4931-00-065-1110	SC 4931-95-CL-J54
31	F	Kit, Nitrogen Charging (8449334)	1025-01-070-3200	TM 9-2350-314-24P-2
32	F	Level, Striding (98-6)	5210-00-293-0005	TM 9-2350-314-24P-2
33	F	Measure, Liquid (MIL-M-43530)	7240-00-138-7985	SC 4910-95-A31
34	O, F	Multimeter, Digital (T00377)	6625-01-139-2512	SC 4910-95-A72
35	F	Pan, Drain (450)	4910-00-387-9592	SC 4910-95-A72
36	F	Pliers, Retaining Ring (407)	5120-00-595-9551	SC 4910-95-A62
37	F	Plumb Bob (GGGP501)	5210-00-234-8949	SC 4931-95-A07
38	F	Press, Arbor (26A49)	3444-00-449-7295	SC 4910-95-A31
39	H	Puller, Bearing, Fabricated (MI014)		TM 9-2350-314-34-2 Appx C
40	F	Pump, Vacuum (1400B)	4310-00-098-5272	
41	F	Regulator, Nitrogen (231P128058)	4935-00-040-9916	TM 9-2350-314-24P-2
42	F	Screw, 1 1/2 inch x 4-40 (MS35206-223)	5305-00-984-4980	MS35206
43	F, H	Reamer .4375 Dia. Reverse Cut (GGG-R-180)	5110-00-268-1258	SC 3470-95-A02
44	F, H	Set, Twist Drill (29A) Shop Equipment, Automotive Maintenance and Repair	5133-00-449-6775	SC 4910-95-A62
45	F	Sling, Endless Nylon (PD101-48)	3940-00-675-5002	TM 9-2350-314-24P-1
46	F	Sling, Endless Nylon (PD101-96)	3940-00-675-5003	TM 9-2350-314-24P-1
47	F	Sling, Gun Tube (8735440)	5340-00-699-9307	SC 4933-95-A12
48	F	Sling, Lifting (8387711)	4910-00-776-8906	TM 9-2350-314-24P-2
49	F	Stand, Breech, Fabricated (MI013)		TM 9-2350-314-34-2 Appx C
50	F	Stand, Cab, Fabricated (MI003)		TM 9-2350-314-34-2 Appx C
51	F	System, Freon Recovery (17500B)	4250-01-338-2707	
52	F	T-handle (9399097)	5340-01-318-0197	BII

TOOL IDENTIFICATION LIST - CONTINUED

ITEM	LEVEL	NOMENCLATURE	NSN	REFERENCE
53	O, F	TA-1 Probe Kit (12303622)	6625-01-102-6878	
54	F	Tool, End Cap Guide (12910864)	1025-01-355-6627	TM 9-2350-314-24P-2
55	F	Tool, Rod Guide (12910863)	1025-01-355-6626	TM 9-2350-314-24P-2
56	F	Tool, Seal Pusher (12910862)	5120-01-355-0860	TM 9-2350-314-24P-2
57	F	Tool Kit, Refrigeration Service	5180-00-596-1474	SC 5180-90-CL-N18
58	F	Tripod, Cannon Tube, Fabricated (MI012)		TM 9-2350-314-34-2 Appx C
59	F	Tripod, Cradle Mount, Fabricated (MI011)		TM 9-2350-314-34-2 Appx C
60	F	Valve, Extension (11605630)	4810-00-051-5566	TM 9-2350-314-24P-2
61	F	Vise, Machinist (11655782-3)	5120-00-293-1439	SC 4910-95-A72
62	F	Wrench, Pipe, Strap-type (GGG-W-651)	5120-00-262-8491	SC 4933-95-A12
63	F	Wrench, Spanner (GGG-W-665)	5120-00-293-0316	TM 9-2350-314-10
64	F	Wrench, Spanner (12910866)	5120-01-368-3847	TM 9-2350-314-24P-2
65	F	Wrench, Spanner, Adjustable Hook (5218469)	5120-00-277-9076	SC 4910-95-A31
66	F	Wrench, Socket (12910865)	5130-01-355-0819	TM 9-2350-314-24P-2
67	F	Wrench, Socket, 1-1/8 In., 3/4 Drive (R-36)	5120-01-278-8250	SC 4933-95-A12
68	F	Wrench, Socket, 1-1/2 In., 3/4 Drive (47148)	5120-00-293-0094	SC 4933-95-A12
69	F	Wrench, Socket, 2 In., 3/4 Drive (A-A-1394)	5120-00-199-7770	SC 4933-95-A12
70	F	Wrench, Strap (YA826)	5120-01-334-9858	TM 9-2350-314-24P-2
71	F, H	Wrench, Torque 1/2 Drive 0-150 Lbs/Ft (A-A-1274)	5120-00-247-2540	SC 4910-95-A74
72	F	Wrench, Torque 1/2 Drive 0-175 Lbs/Ft (A-A-2411)	5120-00-640-6364	SC 4933-95-A12
73	F	Wrench, Torque 3/4 Drive 0-420 Lbs/Ft (A-A-2411)	5120-00-242-3263	SC 4910-95-A72
74	F	Wrench, Torque 3/4 Drive 0-600 Lbs/Ft (A-A-2411)	5120-00-221-7983	SC 4931-95-A07
75	F	Wrench, Torque 3/8 Drive 0-50 Lbs/In (A-A-1274)	5120-00-684-0404	SC 4910-95-A74
76	F	Wrench, Torque 3/8 Drive 0-120 Lbs/In (A-A-1274)	5120-00-585-7706	SC 4910-95-A74

TOOL IDENTIFICATION LIST - CONTINUED

ITEM	LEVEL	NOMENCLATURE	NSN	REFERENCE
77	F	Wrench, Torque 3/8 Drive 0-150 Lbs/In (A-A-2411)	5120-00-230-6380	SC 4933-95-A12
78	F	Wrench, Torque 1/2 Drive 0-300 Lbs/In (A-A-1274)	5120-00-247-2536	SC 4910-95-A74
79	F	Cable Assembly (109008-1)	5995-00-139-1147	TM 9-2350-314-24P-2
80	F	Shackle (1019515)	4030-00-343-5433	TM 9-2350-314-24P-2
81	F	Sling, Cab, Lifting (52-6-9)	3940-01-385-6944	TM 9-2350-314-24P-2
82		Item Deleted		
83	F	Socket, Socket Wrench 1 inch Drive, 12 pt x 2 1/4 in. (A-A-1392)	5120-00-261-2843	SC 4910-95-A31

APPENDIX G

CORROSION PREVENTION AND CONTROL (CPC)

G-1 SCOPE.

This appendix contains unit level maintenance Corrosion Prevention and Control (CPC) information for various corrosion problems, treatments, tools, and available materials.

While corrosion is usually associated with rusting of metals, it can also include the deterioration of other materials such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.

It is important that any corrosion problem be reported. This will allow the problem to be corrected, and improvements made to prevent the problem on future items. Report identified corrosion problems on Standard Form 368, Quality Deficiency Report. Use of key words such as corrosion, rust, deteriorating, or cracking will assure that the information is identified as a CPC problem.

The form should be submitted to:

Department of the Army
U.S. Army Tank-automotive and Armaments Command
Armament Research, Development and Engineering Center
ATTN: AMSTA-AR-QAW-C
Rock Island, IL 61299-7300

G-2 GENERAL.

The Corrosion Prevention Control (CPC) program is a planned and organized effort to prevent damage to the M109A6 during its operation. This is accomplished by the proper and timely identification, documentation, and implementation of corrective actions. As the first line of defense, the mechanic will visually check the vehicle for corrosion and identify methods of treatment.

G-3 TYPES OF CORROSION PROBLEMS.

a. Corrosion. Corrosion is the chemical disintegration of metals caused by reaction with other elements in the environment. Corrosion destroys the usefulness of the metal by producing compounds that do not possess the physical characteristics of the metal from which they were formed. Listed and described below are four stages of corrosion to be found in metals.

(1) Stage I corrosion. Discoloration or staining. This stage of corrosion appears as a thin gray, black, or reddish film on ferrous metals; as a white or gray film on aluminum, magnesium, zinc, and their alloys; and in varied colors (green, blue-green, brown, or black) on copper and copper alloys. This is the initial stage of corrosion; it does not extend beyond the surface of the metals, and it is easily removed.

(2) Stage II corrosion. Etching. When rust or corrosion is removed, the surface of the metal is slightly roughened, but holes in the surface are not identifiable.

(3) Stage III corrosion. Pitting. In this type of corrosion, holes in the surface of the metal are visible after the corrosive coating is removed from the metal.

(4) Stage IV corrosion. Scales, pitting, and powdering. Corrosion in this stage has progressed to the point where fit, wear, function, or life of the part has been affected. Powdery or scaly conditions accompanied by deep pitting and/or irregular flaking of metal is encountered in this stage of corrosion.

G-3 TYPES OF CORROSION PROBLEMS - CONTINUED

b. Corrosion of Painted Surfaces. This type of corrosion occurs primarily on painted steel surfaces. The paint is often cracked and the area may have a reddish brown appearance. The size and location may vary from small spots to large areas. It may occur at mating parts such as where the suspension mates to the hull or around fasteners such as nuts, bolts, or washers.

c. Corrosion of Unpainted Moving Parts. This type of corrosion occurs on moving parts such as hinges, pins, and catches where the original protective finish was removed through use or exposure to weather. It also has a reddish brown appearance.

d. Stress Corrosion Cracks. Stress corrosion cracking is a form of corrosion that can occur in high strength steel and aluminum. It is found in the form of cracks or seams in areas where no parts are joined.

e. Selective Leaching. This type of corrosion occurs on brass or bronze components found primarily in electrical connectors. This has a spongy type appearance with much of the original metal removed.

G-4 TREATMENT PROCEDURES.

a. General. Keep the vehicle and its individual components clean. Dirt, grease, oil, and debris may conceal a serious problem. Clean components as needed. Use dry-cleaning solvent (item 69, Appx B) on all metal surfaces. Use mild soap and water to clean rubber and plastic parts.

Remove existing (old) lubricant with solvent or cleaner if possible. Corrosion or corrosion products should be carefully removed with a soft bristle brush or crocus cloth. Do not use stainless steel brush, steel wool or sand paper. Use care not to remove paint or protective finishes from other non-corroded parts. Thoroughly clean with solvent or cleaner.

Lubricate equipment in accordance with TM 9-2350-314-10.

Clean batteries in accordance with TM 9-6140-200-14.

b. Painted Surfaces. AR 750-1 limits unit-level painting to touch-up or spot painting only, refer to TM 43-0139 and TB 43-0147. Complete repainting is only done at General Support and Depot level maintenance.

c. Unpainted Surfaces. Clean the bore and breech mechanism in accordance with TM 9-2350-314-10 and lubricate per TM 9-2350-314-10. Coat unpainted metal surfaces with oil or grease as appropriate.

d. Stress Corrosion Cracks. The crack should be verified by probing into the metal, and not just checking cracked paint. If cracked, weld in accordance with aluminum welding MIL-STD-372 or steel welding MIL-STD-1943.

e. Rubber and Plastic Materials. The only repair to deteriorating rubber or plastic is to replace at Unit Maintenance or a higher level of maintenance (if required).

f. Hydraulic system and parts. The vehicle hydraulic system uses a petroleum base hydraulic fluid (OHT) and the system and parts are cleaned by flushing with petroleum base hydraulic fluid. During repair, it is desirable to provide interim protection of the parts or assemblies prior to reassembly. This protection may be provided by lightly coating parts with a film of hydraulic oil and placing in a plastic bag and plugging ports and/or covering openings.

f. Electrical parts. Solvents such as dry-cleaning solvent should not be used to clean electrical insulation, wires, cables, or wiring harnesses because of the damage effects of solvents on materials such as fibers and rubber. To clean these items, wipe clean with a damp cloth and immediately dry with a clean dry cloth. Clean contact points with fine abrasive paper and dust thoroughly after cleaning. If selective leaching or cracking is present on connectors, replace connectors at Unit Maintenance or a higher level of maintenance (if required).

G-5 TOOLS AND MATERIALS.

The tools and materials used by the mechanic in performing CPC on the M109A6 are listed in Appendix B (Expendable/Durable Supplies and Materials List) and Appendix F (Tool Identification List).

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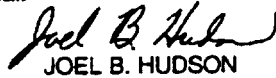
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Torque value of 250-350 lb-ft (28-39 N·m) in step 7(a) should be 250-350 lb-in (28-39 N·m)

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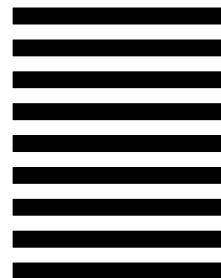


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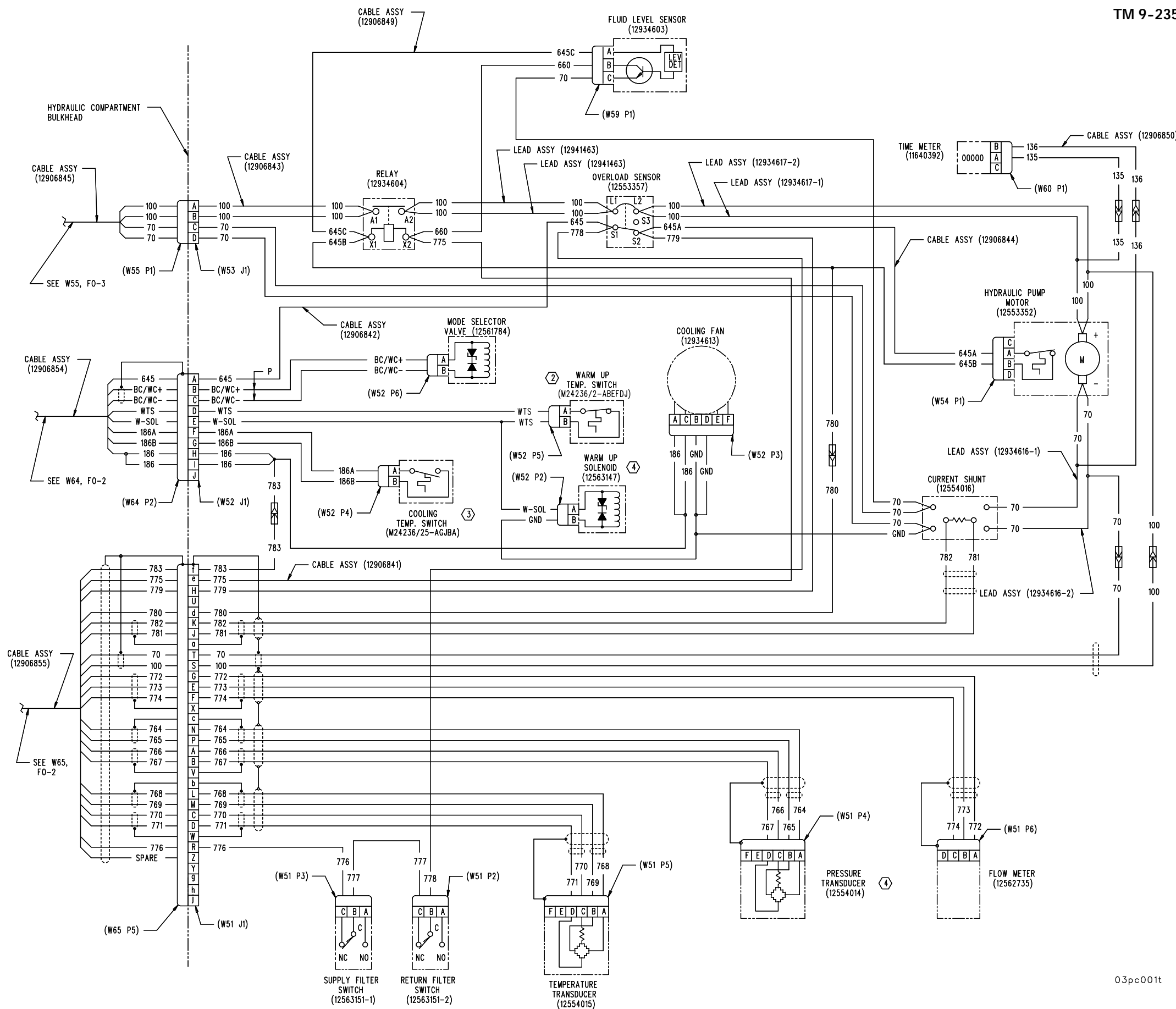


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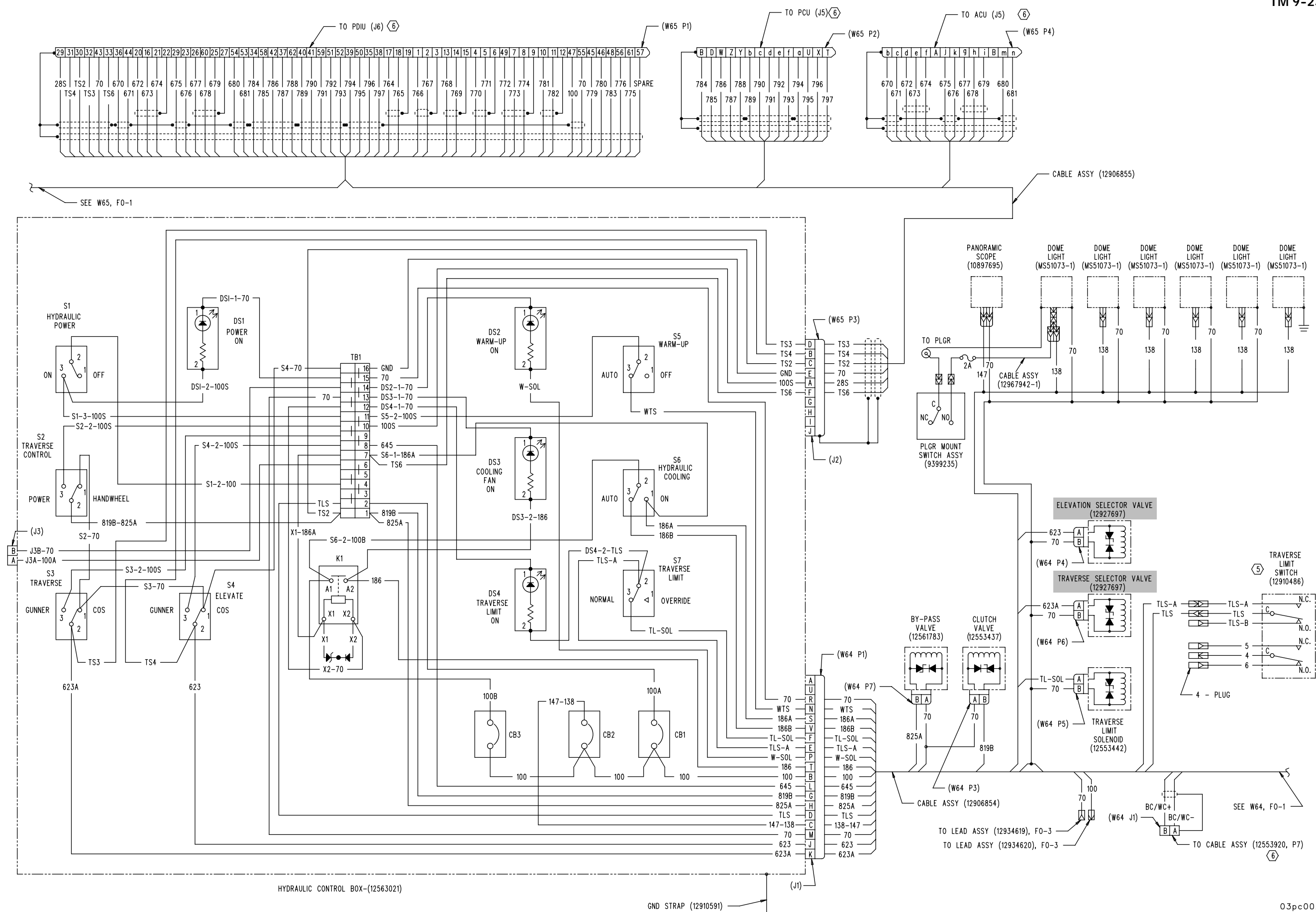
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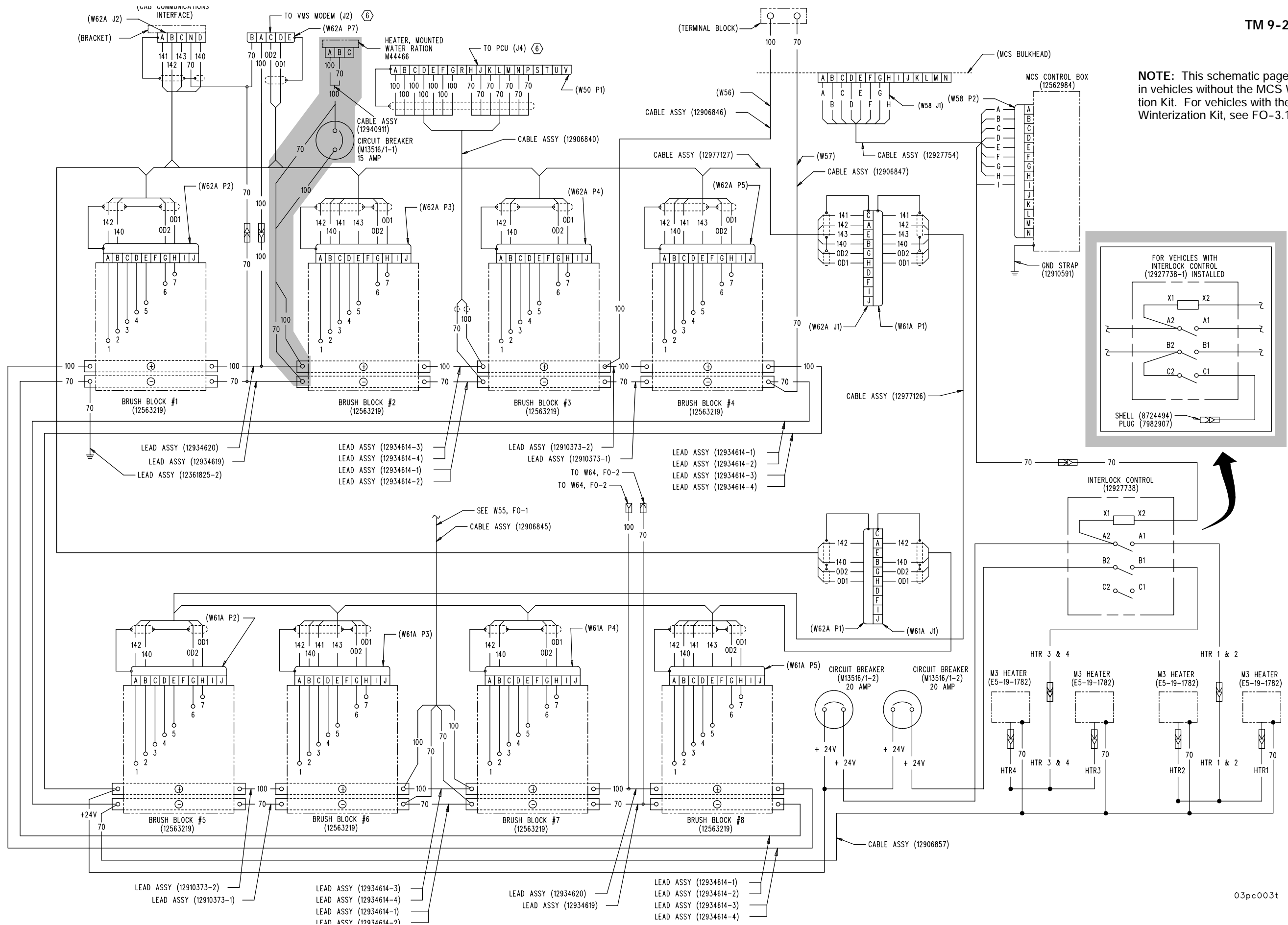
1. INTERPRET DRAWING IN ACCORDANCE WITH DOD-STD-100 AND ANSI Y14.5M - 1982.
2. SWITCH OPENS ON INCREASING TEMPERATURE ABOVE 15° F ± 5° F.
3. SWITCH CLOSSES ON INCREASING TEMPERATURE ABOVE 155° F ± 4° F.
4. SEE FILTER ASSY 12553354.
5. SWITCH SHOWN WITH GUN TUBE IN STOWED POSITION.
6. AUTOMATIC FIRE CONTROL SYSTEM.
7. FOR USE WITH MCS WINTERIZATION KIT ONLY.



IDENTIFICATION CROSS REFERENCE		
PART NUMBER	DESCRIPTION	REF DESIGNATOR
12906840	CABLE ASSY	W50
12906841	CABLE ASSY	W51
12906842	CABLE ASSY	W52
12906843	CABLE ASSY	W53
12906844	CABLE ASSY	W54
12906845	CABLE ASSY	W55
12906846	CABLE ASSY	W56
12906847	CABLE ASSY	W57
12927754	CABLE ASSY	W58
12978164	CABLE ASSY	W58A
12906849	CABLE ASSY	W59
12906850	CABLE ASSY	W60
12977126	CABLE ASSY	W61A
12977127	CABLE ASSY	W62A
12906854	CABLE ASSY	W64
12906855	CABLE ASSY	W65
12906857	CABLE ASSY	W67
12967942	CABLE ASSY	

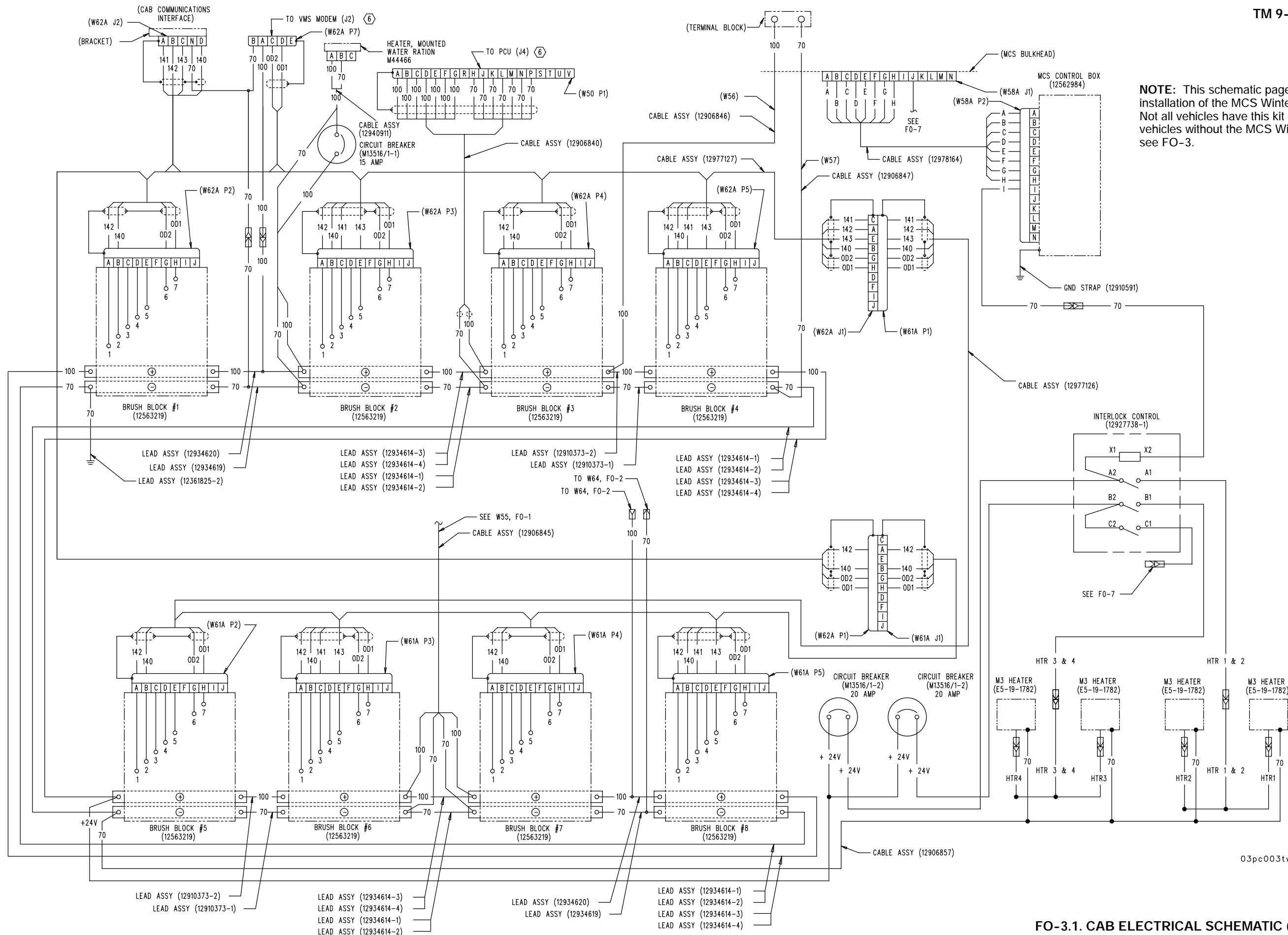
03pc001t





NOTE: This schematic page is for use in vehicles without the MCS Winterization Kit. For vehicles with the MCS Winterization Kit, see FO-3.1.

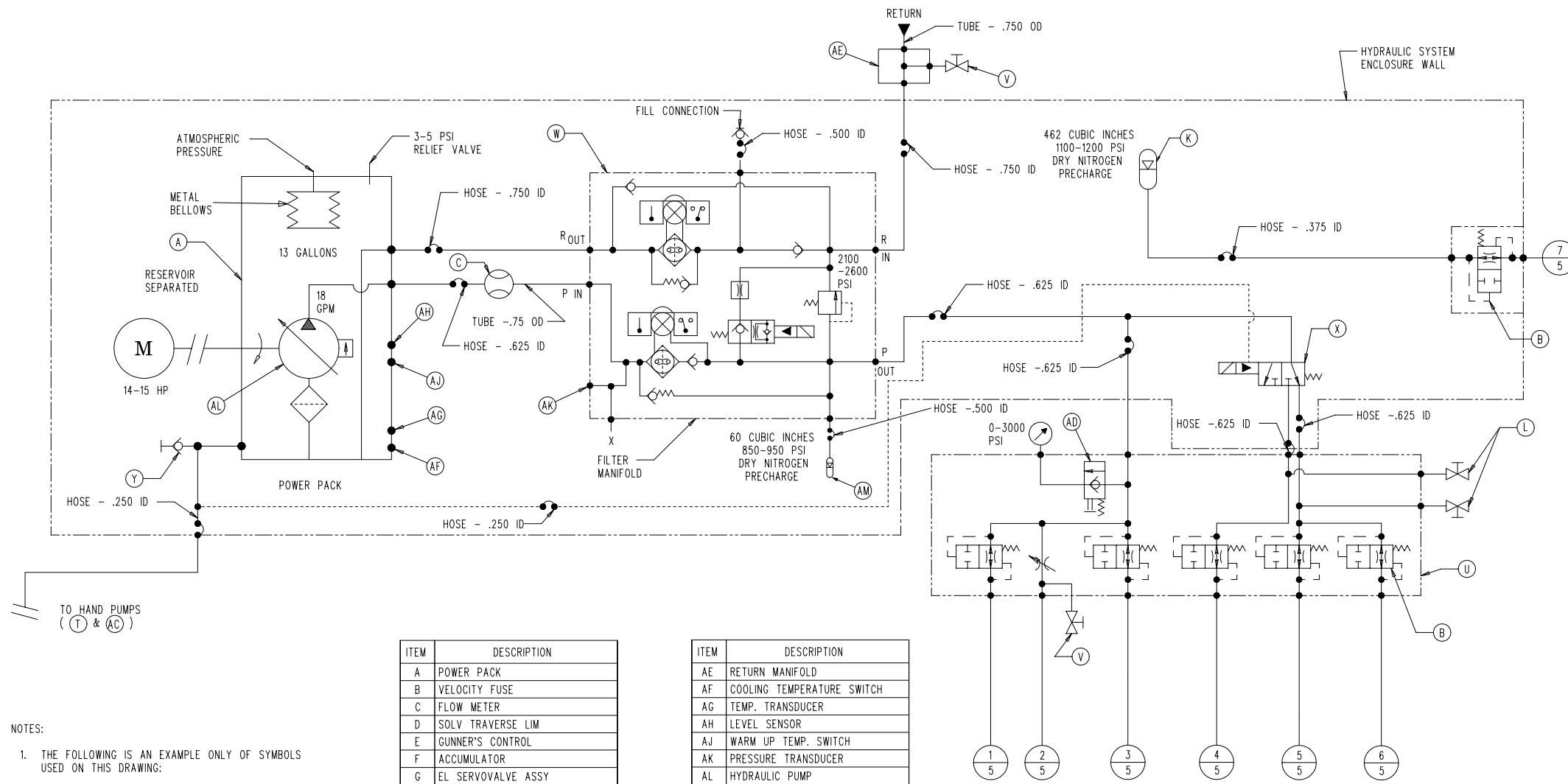
03pc003t



NOTE: This schematic page reflects installation of the MCS Winterization Kit. Not all vehicles have this kit installed. For vehicles without the MCS Winterization kit, see FO-3.

FO-3.1. CAB ELECTRICAL SCHEMATIC (SHEET 4 OF 4)

03pc003twk



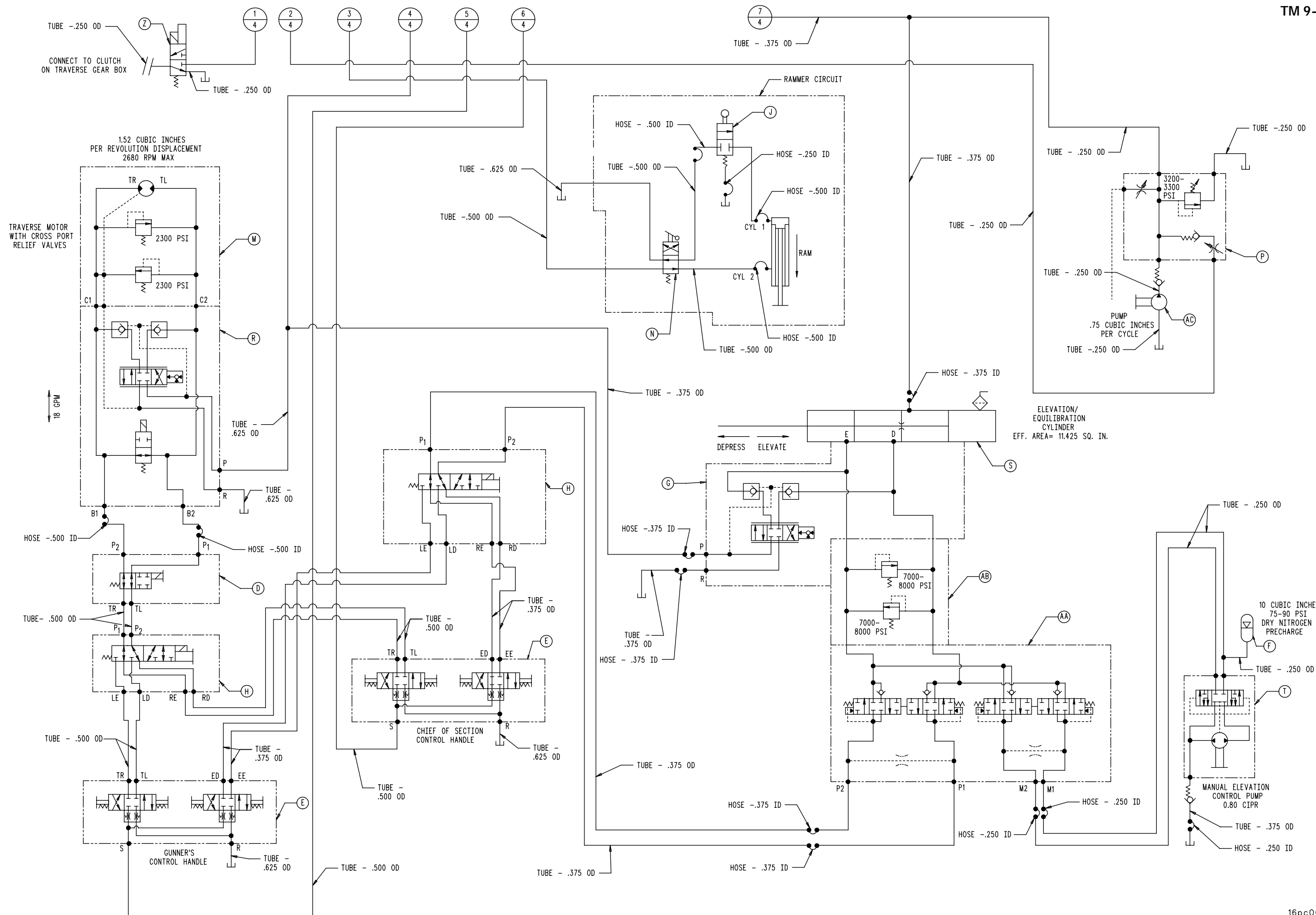
- NOTES:
- THE FOLLOWING IS AN EXAMPLE ONLY OF SYMBOLS USED ON THIS DRAWING:

 FIND NO.
 FOLD OUT NUMBER.
 LAST FIND NO. USED: 7
 - FOR INSTALLATION, SEE DRAWING 12553219.

ITEM	DESCRIPTION
A	POWER PACK
B	VELOCITY FUSE
C	FLOW METER
D	SOLV TRAVERSE LIM
E	GUNNER'S CONTROL
F	ACCUMULATOR
G	EL SERVOVALVE ASSY
H	SELECTOR VALVE
J	LOADER VALVE
K	ACCUMULATOR, EQUILIBRATION
L	BLEED VALVE
M	HYDRAULIC MOTOR
N	LOADER RAMMER VALVE
P	EQUILIBRATION MANF
R	AZ SERVOVALVE ASSY
S	EL/EQUILIBRATION CYL
T	EL ASSY, MANUAL
U	MANIFOLD, FUSE
V	SAMPLING-BLEED VALVE
W	FILTER ASSY
X	MODE SELECTOR VALVE
Y	QUICK DISC CPLG HALF
Z	CLUTCH VALVE
AA	LOCKING VALVE ASSY
AB	RELIEF VALVE
AC	EQUILIBRATION HANDPUMP
AD	MANUAL PULL VALVE

ITEM	DESCRIPTION
AE	RETURN MANIFOLD
AF	COOLING TEMPERATURE SWITCH
AG	TEMP. TRANSDUCER
AH	LEVEL SENSOR
AJ	WARM UP TEMP. SWITCH
AK	PRESSURE TRANSDUCER
AL	HYDRAULIC PUMP
AM	ACCUMULATOR

16pc008t

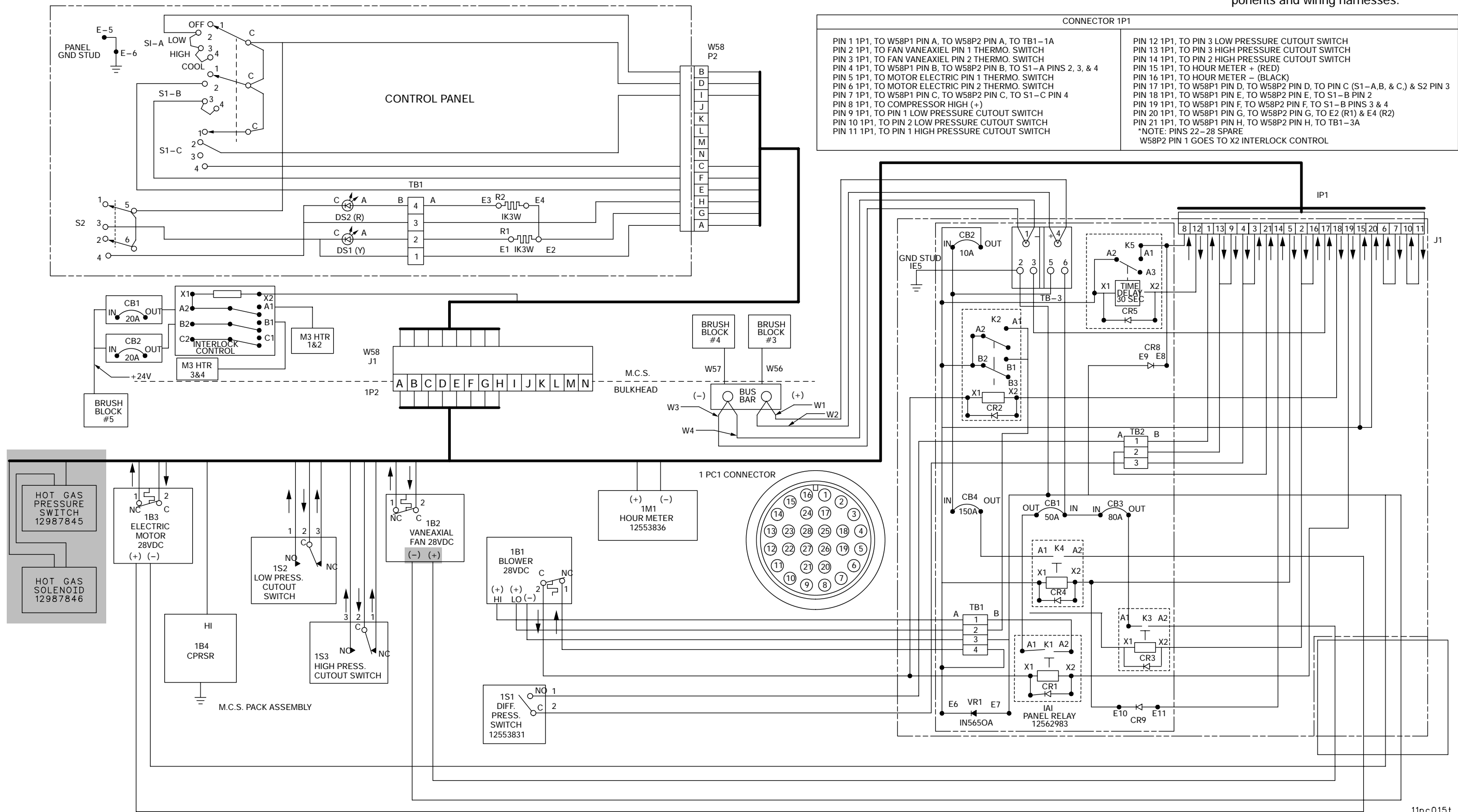


FO-5. CAB HYDRAULIC SCHEMATIC (SHEET 2 OF 2)

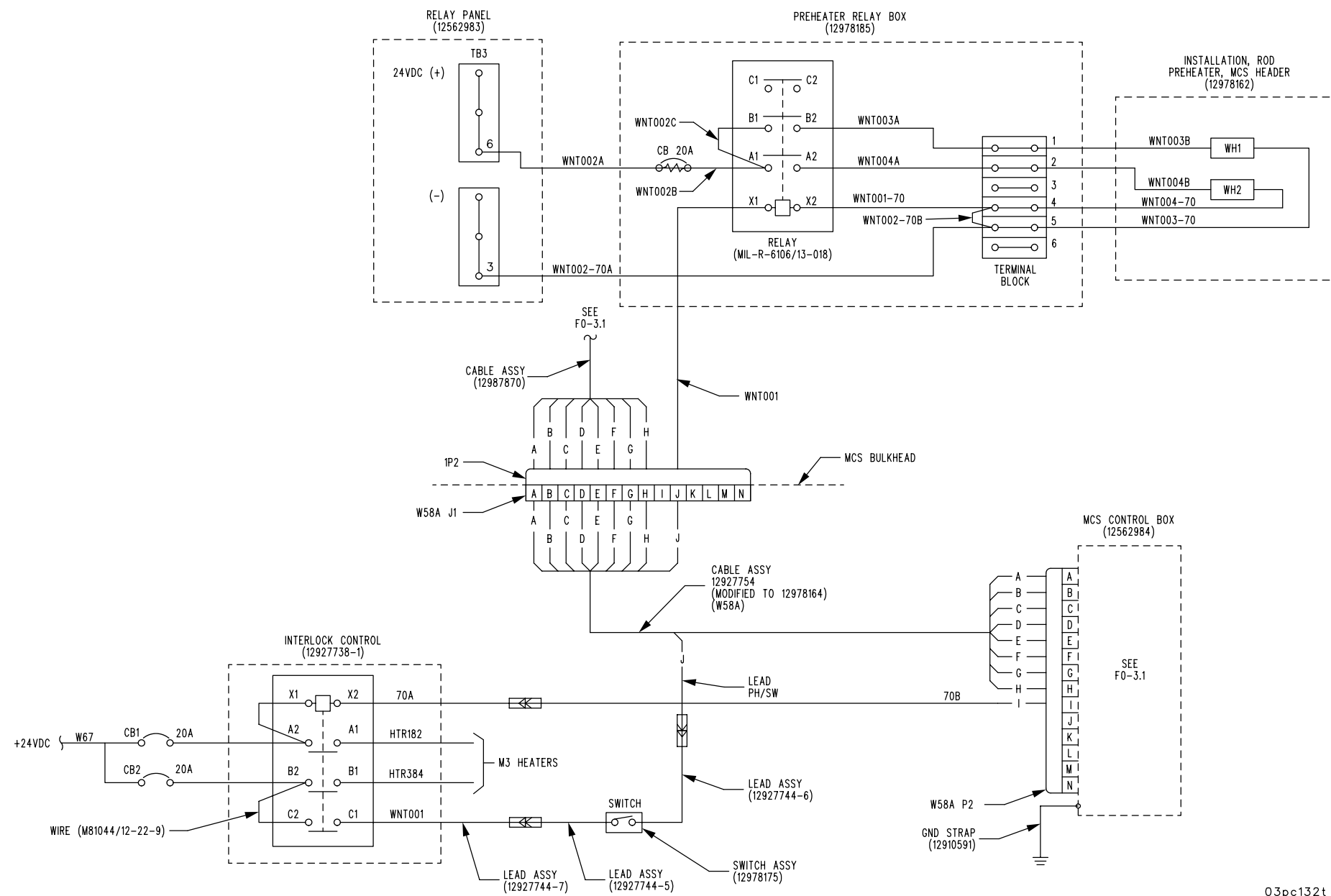
16pc009t

FP-9/(FP-10 blank)

NOTE: This schematic page is for use in all vehicles. For those vehicles with the MCS Winterization Kit installed, see FO-7 for components and wiring harnesses.



CONNECTOR 1P1	
PIN 1 1P1, TO W58P1 PIN A, TO W58P2 PIN A, TO TB1-1A	PIN 12 1P1, TO PIN 3 LOW PRESSURE CUTOOUT SWITCH
PIN 2 1P1, TO FAN VANEAXIEL PIN 1 THERMO. SWITCH	PIN 13 1P1, TO PIN 3 HIGH PRESSURE CUTOOUT SWITCH
PIN 3 1P1, TO FAN VANEAXIEL PIN 2 THERMO. SWITCH	PIN 14 1P1, TO PIN 2 HIGH PRESSURE CUTOOUT SWITCH
PIN 4 1P1, TO W58P1 PIN B, TO W58P2 PIN B, TO S1-A PINS 2, 3, & 4	PIN 15 1P1, TO HOUR METER + (RED)
PIN 5 1P1, TO MOTOR ELECTRIC PIN 1 THERMO. SWITCH	PIN 16 1P1, TO HOUR METER - (BLACK)
PIN 6 1P1, TO MOTOR ELECTRIC PIN 2 THERMO. SWITCH	PIN 17 1P1, TO W58P1 PIN D, TO W58P2 PIN D, TO PIN C (S1-A, B, & C.) & S2 PIN 3
PIN 7 1P1, TO W58P1 PIN C, TO W58P2 PIN C, TO S1-C PIN 4	PIN 18 1P1, TO W58P1 PIN E, TO W58P2 PIN E, TO S1-B PIN 2
PIN 8 1P1, TO COMPRESSOR HIGH (+)	PIN 19 1P1, TO W58P1 PIN F, TO W58P2 PIN F, TO S1-B PINS 3 & 4
PIN 9 1P1, TO PIN 1 LOW PRESSURE CUTOOUT SWITCH	PIN 20 1P1, TO W58P1 PIN G, TO W58P2 PIN G, TO E2 (R1) & E4 (R2)
PIN 10 1P1, TO PIN 2 LOW PRESSURE CUTOOUT SWITCH	PIN 21 1P1, TO W58P1 PIN H, TO W58P2 PIN H, TO TB1-3A
PIN 11 1P1, TO PIN 1 HIGH PRESSURE CUTOOUT SWITCH	*NOTE: PINS 22-28 SPARE
	W58P2 PIN 1 GOES TO X2 INTERLOCK CONTROL



03pc132t

CONVERSION TABLE

inch	decimal	mm	inch	decimal	mm	inch	decimal	mm
1/64	0.015625	0.3969	23/64	0.359375	9.1281			
1/32	0.031250	0.7938	3/8	0.375000	9.5250	45/64	0.703125	17.8594
3/64	0.046875	1.1906				23/32	0.718750	18.2562
1/16	0.062500	1.5875	25/64	0.390625	9.9219	47/64	0.734375	18.6531
			13/32	0.406250	10.3188	3/4	0.750000	19.050
5/64	0.078125	1.9844	27/64	0.421875	10.7156			
3/32	0.093750	2.3812	7/16	0.437500	11.1125	49/64	0.765625	19.4469
7/64	0.109375	2.7781				25/32	0.781250	19.8437
1/8	0.125000	3.1750	29/64	0.453125	11.5094	51/64	0.796875	20.2406
			15/32	0.468750	11.9062	13/16	0.812500	20.6375
9/64	0.140625	3.5719	31/64	0.484375	12.3031			
5/32	0.156250	3.9688	1/2	0.500000	12.7000	53/64	0.828125	21.0344
11/64	0.171875	4.3656				27/32	0.843750	21.4312
3/16	0.187500	4.7625	33/64	0.515625	13.0969	55/64	0.859375	21.8281
			17/32	0.531250	13.4938	7/8	0.875000	22.2250
13/64	0.203125	5.1594	35/64	0.546875	13.8906			
7/32	0.218750	5.5562	9/16	0.562500	14.2875	57/64	0.890625	22.6219
15/64	0.234375	5.9531				29/32	0.906250	23.0188
1/4	0.250000	6.3500	37/64	0.578125	14.6844	59/64	0.921875	23.4156
			19/32	0.593750	15.0812	15/16	0.937500	23.8125
17/64	0.265625	6.7469	39/64	0.609375	15.4781			
9/32	0.281250	7.1438	5/8	0.625000	15.8750	61/64	0.953125	24.2094
19/64	0.296875	7.5406				31/32	0.967500	24.6062
5/16	0.312500	7.9375	41/64	0.640625	16.2719	63/64	0.984375	25.0031
			21/32	0.656250	16.6688			
21/64	0.328125	8.3344	43/64	0.671875	17.0656			
11/32	0.343750	8.7312	11/16	0.687500	17.4625	1	1.000000	25.4000

THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

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

WEIGHTS

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

LIQUID MEASURE

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

SQUARE MEASURE

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

CUBIC MEASURE

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

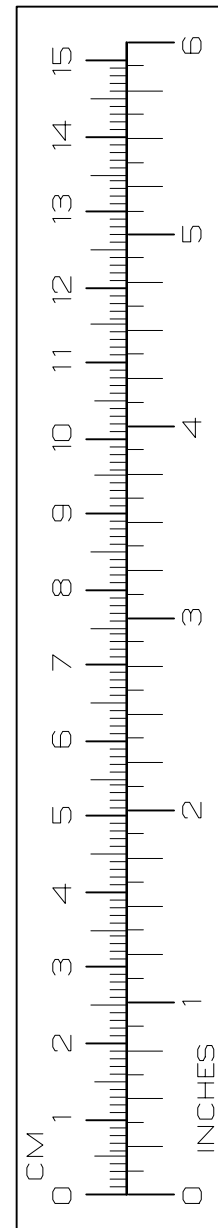
TEMPERATURE

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

APPROXIMATE CONVERSION FACTORS

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

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



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