

*This publication supersedes TM 9-2320-209-34-1, TM 9-2320-209-4-2-1, TM 9-2320-209-34-2-2, and TM 9-2320-209-34-2-3, 20 May 1981, applicable information to M44A2 series vehicles. Retain all TM 9-2320-209-34 publications for reference pertaining to M44 and M44A1 series trucks.

**TECHNICAL MANUAL
DIRECT SUPPORT AND GENERAL
SUPPORT MAINTENANCE
FOR
2-1 /2-TON, 6X6, M44A2
SERIES TRUCKS (MULTIFUEL)**

Model		NSN Without Winch	NSN With Winch
Truck, Cargo	M35A2	2320-00-077-1616	2320-00-077-1617
	M35A2C	2320-00-926-0873	2320-00-926-0875
	M36A2	2320-00-077-1618	2320-00-077-1619
TRUCK, Tank, Fuel	M49A2C	2320-00-077-1631	2320-00-077-1632
Truck, Tank, Water	M50A2	2320-00-077-1633	2320-00-077-1634
	M50A3	2320-00-937-4036	2320-00-937-5264
Truck, Van, Shop	M109A3	2320-00-077-1636	2320-00-077-1637
Truck, Instrument Repair Shop	M185A3	4940-00-077-1638	4940-00-077-1639
Truck, Tractor	M275A2	2320-00-077-1640	2320-00-077-1641
Truck, Dump	M342A2	2320-00-077-1643	2320-00-077-1644
Truck, Maintenance, Pipeline Construction	M756A2		2320-00-904-3277
Truck, Maintenance, Earth Boring and Polesetting	M764		2320-00-937-5980

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WARNING

EXHAUST GASES CAN KILL

- 1 DO NOT operate your vehicle engine in enclosed area.
- 2 DO NOT idle vehicle engine with cab windows closed.
- 3 DO NOT drive vehicle with inspection plates or cover plates removed.
- 4 BE ALERT at all times for exhaust odors.
- 5 BE ALERT for exhaust poisoning symptoms. They are:

. H E A D A C H E

- Dizziness
- Sleepiness
- . Loss of muscular control

- 6 If YOU SEE another person with exhaust poisoning symptoms:
 - Remove person from area
 - Expose to open air
 - Keep person warm
 - . Do not permit person to move
 - . Administer artificial respiration, if necessary*

* For artificial respiration, refer to FM 21-11.

WARNING SUMMARY

- Exhaust gases can kill, do not operate personnel heater in enclosed area. Ensure work area is well-ventilated and exhaust fumes are directed away from area. Failure to do this may result in injury or death to personnel.
- Do not operate a deadlined vehicle without preliminary inspection. Failure to do so may cause further damage to a disabled component and possible injury to personnel.
- Compressed air source will not exceed 30 psi (207 kPa). When cleaning with compressed air, eyeshields must be worn. Failure to wear eyeshields may result in injury to personnel.
- Ensure fuel shutoff valve and ignition switch are OFF before cranking engine. Failure to do so may result in injury to personnel.
- All personnel must stand away from engine during crank test to clear fluid from cylinders. Eye protection is required during crank test. Failure to stand clear and wear eye protection may cause injury to personnel.
- Eye protection is required during inspection of fuel injection pump and drive gear input shaft seal with engine operating. Oil may spray or splash from gear area. Failure to wear eye protection may result in injury to personnel.

WARNING SUMMARY (Contd)

- Stay clear of drive gear area during inspection of input shaft seal when engine is operating. Failure to stay clear of drive gear area may result in injury to personnel.
- Fuel is flammable. Do not perform troubleshooting checks near open flame, sparks, or electricity. Injury to personnel may result.
- Eye protection is required when performing fuel system troubleshooting checks. Failure to wear eye protection may result in injury to personnel.
- Ignition switch must remain off during fuel system troubleshooting checks. Failure to verify that ignition system is turned off may result in injury to personnel.
- When rod clevis position is not tight against cover window bearing screw, fuel shutoff rod maybe binding. Verify fuel shutoff rod travels freely before adjusting clearance between rod clevis and bearing screw. Failure to verify fuel shutoff rod condition may result in governor sticking under acceleration and injury to personnel.
- Hot coolant is under pressure. Care should be used when removing radiator filler cap or inspecting hot engine coolant leaks. Steam or hot coolant under pressure may cause severe injury to personnel.
- Overhead lifting device capacity must exceed dump body weight. A shifting or falling load may cause injury to personnel.
- Bleed hydraulic pressure before cracking hydraulic lines. Failure to do so may result in injury to personnel or damage to equipment.
- Use properly rated hydraulic hose when performing hydraulic system checks on vehicles not equipped with dump body lock. Failure to do so may result in injury to personnel.
- Overhead lifting device must remain attached to dump body until troubleshooting is completed.
- All personnel must stand clear of dump body during lowering test. Falling dump body may cause injury to personnel.
- Eye protection is required when inspecting internal clutch case operation on vehicle. Failure to do so may result in fluid contacting eyes and injury to personnel.
- Eye protection is required when performing hydraulic systems checks. Failure to do so may result in injury to personnel.
- Improper cleaning methods and use of unauthorized cleaning solvents may cause injury to personnel or damage to equipment.
- Hand protection must be worn during nut retightening. Engine surface is hot and can cause injury to personnel.
- Flywheel is heavy. Use care when removing flywheel. Failure to do so may result in injury to personnel or damage to equipment.
- Disconnect battery ground cable prior to performing valve adjustment procedure. Failure to do so may cause injury to personnel.
- Axle is heavy. Ensure axle is balanced and body parts are clear before lowering axle. Failure to do so may result in injury to personnel.
- Tandem axle is heavy. Support tandem axle during removal. Failure to do so may result in injury to personnel.
- Do not perform fuel system or heater testing procedures while smoking or within 50 feet of sparks or open flame. Fuel is flammable and can explode, causing injury or death to personnel and damage to equipment.
- Support main drive idler gear housing before removing hardware. Failure to do so may result in injury to personnel or damage to equipment.
- Ensure lifting capacity of hoist is greater than the weight of the component being raised. Failure to do so may result in injury to personnel.
- Toolbox is heavy. Support toolbox during removal and installation. Failure to do so may result in injury to personnel.
- Power divider is heavy. Support power divider during removal and installation. Failure to do so may result in injury to personnel.

WARNING SUMMARY (Contd)

.All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

.Use prybar to free engine/transfer case/transmission during lifting operations. Failure to do so may cause injury to personnel.

.Drycleaning solvent is flammable and will not be used near open flame. Use only in well-ventilated places. Failure to do this may result in injury to personnel.

.Do not detach hoist chain from engine until all engine weight is equally distributed and engine is stable. An improperly supported engine may cause injury to personnel.

.Do not disconnect air lines before draining air reservoirs. Small parts under pressure may shoot out with high velocity, causing injury to personnel.

Do not work under vehicle that is supported by jack only. Jack may slip, causing vehicle to fall, and result in injury or death to personnel.

.Be careful when working under vehicle body which is placed on supports. Failure to do so may result in injury to personnel.

.Weight of vehicle must be supported on jack stands at all times. Do not attempt to support weight of vehicle on hydraulic jack. Injury or death to personnel may result if jack fails.

.Lifting device must have weight capacity greater than the weight of the engine and transmission to prevent injury to personnel and damage to equipment.

.Ensure engine compartment is free of all tools and working materials before starting engine. Failure to do so may cause damage to equipment and injury to personnel.

.Hand protection must be worn at all times when working with heated parts. Failure to do so may result in injury to personnel.

.Diesel fuel is flammable. Do not perform fuel system procedures near open flame. Injury to personnel may result.

.Ensure transfer case is securely mounted to jack with safety chain or strap during removal/installation. Failure to do so may result in injury to personnel.

.Transfer case is heavy and bulky. Allow adequate clearance to remove transfer case from vehicle. Failure to do so may result in injury to personnel.

.Do not use compressed air or dry brush for cleaning when working in areas of vehicle where asbestos brake lining dust may accumulate. Remove asbestos dust and other residue from these areas using a soft bristle brush or cloth soaked with water. Breathing asbestos dust may cause injury to personnel.

.Eye protection must be worn when removing or installing springs under tension. Failure to do so may result in injury to personnel.

.Plunger rack is under spring tension. Keep hands clear of plunger rack during removal. Failure to do so may cause injury to personnel.

.Never work under dump body until safety braces are properly positioned. Injury or death to personnel may occur if dump body suddenly lowers.

.Ensure dump control lever is in neutral at all times. Injury or death to personnel may result if lift cylinder is operated when not secured.

.When using steam cleaning equipment, do not come in direct contact with spray. Burns or severe injury to personnel may result.

.Discharge valve internal spring is compressed. Eye protection must be worn during bonnet removal/installation from valve housing. Failure to do so may result in injury to personnel.

.Eye protection must be worn during discharge valve internal spring load test. Failure to do so may result in injury to personnel.

.Gloves, eyeshields, and dust mask must be worn during panel removal and installation. Failure to do so may result in injury to personnel.

.During removal and installation, only two teeth of worm leveling gear support derrick are in horizontal position. Do not lower derrick below horizontal or derrick may fall and cause injury or death to personnel.

WARNING SUMMARY (Contd)

- Derrick tube is heavy. Provide adequate support for derrick tube during removal and installation over rack bar. Failure to do so may result in injury or death to personnel.
- Ensure auger rack bar is balanced on chain during removal and installation. Failure to do so may cause auger rack bar to slip from chain, causing injury to personnel or damage to equipment.
- Before removing horizontal or vertical leveling worm gear housing, place supports under intermediate case to prevent case from turning. If intermediate case turns, injury to personnel and/or damage to equipment may result.
- Be prepared to support clutch and brake otherwise it may fall and cause injury to personnel and/or damage to equipment.
- Use lifting device and chains during repair of winches to prevent injury to personnel.
- Eye protection is required when using wire brush for cleaning. Failure to do so may result in injury to personnel.
- Allow time for heater to cool before removing from test equipment. Failure to do so may result in injury to personnel or damage to equipment.
- Eye protection is required when working with hydraulic hoses. Failure to wear eye protection may result in injury to personnel.
- Eye protection is required when removing plugs. Failure to wear eye protection may result in injury to personnel.
- Eye protection must be worn during welding procedures. Failure to wear eye protection may result in injury to personnel.
- Welding procedures may produce poisonous fumes. Perform welding in well-ventilated areas. Failure to do so may result in injury to personnel.

*** ARMY TM 9-2320-361-34
AIR FORCE TO 36A12-1B-1094-12**

**TECHNICAL MANUAL
NO. 9-2320-361-34**

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D.C., 8 MAY 1992

**TECHNICAL ORDER
NO. 36A12-1B-1094-12**

**TECHNICAL MANUAL
DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE
FOR
2-1 /2-TON, 6X6, M44A2 SERIES TRUCKS
(MULTIFUEL)**

Model		NSN Without Winch	NSN With Winch
Truck, Cargo	M35A2	2320-00-077-1616	2320-00-077-1617
	M35A2C	2320-00-926-0873	2320-00-926-0875
	M36A2	2320-00-077-1618	2320-00-077-1619
Truck, Tank, Fuel	M49A2C	2320-00-077-1631	2320-00-077-1632
Truck, Tank, Water	M50A2	2320-00-077-1633	2320-00-077-1634
	M50A3	2320-00-937-4036	2320-00-937-5264
Truck, Van, Shop	M109A3	2320-00-077-1636	2320-00-077-1637
Truck, Instrument Repair Shop	M185A3	4940-00-077-1638	4940-00-077-1639
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Truck, Maintenance, Pipeline Construction	M756A2		2320-00-904-3277
Truck, Maintenance, Earth Boring and Polesetting	M764		2320-00-937-5980

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**DISTRIBUTION STATEMENT A. Approved for public release;
distribution is unlimited.**

REPORTING OF ERRORS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to: Commander, U.S. Army Tank-Automotive Command, ATTN: AMSTA-MB, Warren, MI 48397-5000. A reply will be furnished to you.

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HOW TO USE THIS MANUAL

ABOUT YOUR MANUAL

Spend some time looking through this manual. You'll find that it has a new look, different than most of the TM'S you've been using.

New features added to improve the convenience of this manual and increase your efficiency are:

- a. **Accessing Information** – These include features such as the bleed-to-edge locators on the cover and edge of the manual. Extensive troubleshooting guides for specific systems lead directly to step-by-step directions for problem solving and maintenance tasks.
- b. **Illustrations** – A variety of methods are used to make locating and fixing components much easier. Locator illustrations with keyed text, exploded views, and cut-away diagrams make the information in this manual easier to understand and follow.
- c. **Keying Text With Illustrations** - Illustrations/text are located on facing pages that show the specific task you are working on. In some cases, the task steps and illustrations are located side by side. Continue reading for an example of modular text and illustrations.
- d. **General Features** – Your TM is the best source available for providing information and data critical to vehicle operation and maintenance:
 - Safety warning summary (pages a through d)
 - General information, equipment descriptions, and data (chapter 1)
 - Mechanical troubleshooting (chapter 2, section II)
 - Detailed maintenance procedures (chapters 3 through 17)
 - References (appendix A)
 - Common and special tools list (appendix B)
 - Expendable/durable supplies and materials list (appendix C)
 - Illustrated list of manufactured items (appendix D)
 - Torque limits (appendix E)
 - Mandatory replacement items (appendix F)

A typical example of how to use this manual is provided on the following pages.

USING YOUR MANUAL: AN EXAMPLE

TASK The direct and general support maintenance mechanic of an M44A2 series vehicle reports that the engine will not crank. The vehicle has been assigned to you for repair.

TROUBLESHOOTING STEPS:

1. Look at the cover of this manual. You'll see chapter/section titles listed from top to bottom on the right-hand side.
2. Look at the right edge of the manual. On some of the pages you'll see edge indicators (black bars) that are aligned with the chapter/section bars on the cover. These are the locations of the chapter/section in the text.
3. Look for "SERVICE AND TROUBLESHOOTING INSTRUCTIONS" in the chapter list on the cover. This is where the troubleshooting information is located.
4. Turn to those pages with the edge indicator matching the black bar for service and troubleshooting instructions. Page numbers are also listed next to chapter/section titles.
5. One of the first pages having service and troubleshooting instructions edge indicators is the "MECHANICAL TROUBLESHOOTING INDEX."
6. Look down the list until you find "ENGINE." Beneath that heading you will find the symptoms noted by the maintenance mechanic: "Engine will not crank."
7. Turn to the page indicated: 2-6.
8. On page 2-6, steps/tests relating to resolving the problem of "Engine will not crank" are found.

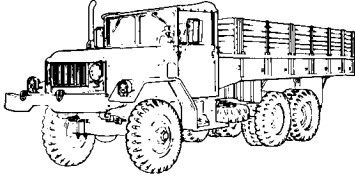
You inspect the oil pump and find that it is defective and must be replaced. Paragraph 3-12 is referenced.

The rest of the inspection shows no other cause for the problem.

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TRUCK, CARGO: 2-1/2-TON, 6X6, M35A2, M35A2C, M36A2;
 TRUCK, TANK, FUEL: 2-1/2-TON, 6X6, M49A2C;
 TRUCK, TANK, WATER: 2-1/2-TON, 6X6, M50A2, M50A3;
 TRUCK, VAN, SHOP: 2-1/2-TON, 6X6, M109A3;
 TRUCK, INSTRUMENT REPAIR SHOP: 2-1/2-TON, 6X6, M185A3;
 TRUCK, TRACTOR: 2-1/2-TON, 6X6, M275A2;
 TRUCK, DUMP: 2-1/2-TON, 6X6, M342A2;
 TRUCK, MAINTENANCE, PIPELINE
 CONSTRUCTION: 2-1/2-TON, 6X6, M756A2;
 TRUCK, MAINTENANCE, EARTH BORING AND POLESETTING:
 2-1/2-TON, 6X6, M764

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DEPARTMENTS OF THE ARMY AND THE AIR FORCE

TM 9-2320-361-34

MECHANICAL SYSTEMS TROUBLESHOOTING SYMPTOM INDEX

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Table 2-1. Mechanical Troubleshooting.

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
ENGINE	
NOTE	
Engine should be test run after each completed action.	
1. ENGINE WILL NOT CRANK	
Step 1.	Check fuel injection pump for seizure. Remove drive gear access cover from engine timing gear cover (para. 3-4). Remove injection pump drive gear (para. 5-4). Manually turn injection pump shaft at center hub screw. If shaft will not rotate, replace (para. 5-4) and repair fuel injection pump (TM 9-2815-210-34-9-2).
WARNING	
<ul style="list-style-type: none"> • Ensure fuel shutoff valve and ignition switch are OFF before cranking engine. Failure to do so may result in injury to personnel. • All personnel must stand away from engine during crank test to clear fluid from cylinders. Eye protection is required during crank test. Failure to stand clear and wear eye protection may cause injury to personnel. 	
Step 2.	Check engine cylinders for fluid-locked pistons. Remove all fuel injector nozzles (para. 5-2). Crank engine with starter. <ul style="list-style-type: none"> a. If crankshaft turns freely, identify any fluid expelled from cylinders. If fluid sample is identified as coolant, proceed to step 9. If fluid sample is identified as fuel, proceed to malfunction 21. b. If engine crankshaft will not turn or turns hard, check internal engine components for seizure. Remove oil pan (para. 3-11) and inspect crankshaft for nicks, burns, grooves, scuffs, or discoloration due to overheating. If nicked, burned, grooved, scuffed, or discolored, replace engine (para. 3-10).
Step 3.	Install fuel injector nozzles (para. 5-2).
Step 4.	Check oil pump for seizure. Remove oil pump (para. 3-12) and manually turn oil pump drive gear. If drive gear will not turn, replace oil pump (para. 3-12).
Step 5.	Check air intake manifold for presence of water. If water is present within air cleaner, disassemble and drain air intake manifold (para. 3-17).
CAUTION	
Starting engine after correcting piston fluid-locked condition must be done with care. When pistons have been fluid-locked within cylinders, connecting rods may have been damaged and can be identified during test run by abnormal vibration or noise. Do not operate engine when these conditions exist. Permanent engine damage may result.	
Step 6.	Test run engine if water was present and removed from air induction system. If engine operates with unusual sounds or vibrations, perform malfunction 16 and/or 17.

2-6

9. To locate paragraph 3-12 refer to the first page of chapter 3, section I (page 3-1). Find "Oil Pump Maintenance" in the "In-Vehicle Engine Maintenance Index." You are directed to page 3-36.

10. Turn to paragraph 3-12 on page 3-36. Here you will find the detailed procedure for removing the old oil pump and replacing it with a new one.

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CHAPTER 3
ENGINE MAINTENANCE

Section I. In-Vehicle Engine Maintenance (page 3-1)
Section II. Engine Replacement (page 3-56)
Section I. IN-VEHICLE ENGINE MAINTENANCE

3-1. IN-VEHICLE ENGINE MAINTENANCE INDEX

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3-2. ENGINE FRONT AND REAR MOUNTING BRACKETS REPLACEMENT

THIS TASK COVERS:

a. Front Mounting Bracket Removal	c. Rear Mounting Bracket Removal
b. Front Mounting Bracket Installation	d. Rear Mounting Bracket Installation

INITIAL SETUP

APPLICABLE MODELS	REFERENCES (TM)
All	TM 9-2320-361-10
	TM 9-2320-361-20
	TM 9-2320-361-34P
TOOLS	EQUIPMENT CONDITION
General mechanic's tool kit (Appendix B, Item 1)	• Hood raised and secured (TM 9-2320-361-10).
Torque wrench, 3/4-in. dr. (Appendix B, Item 6)	• Wheels chocked (TM 9-2320-361-10).
1-1/8-in. socket, 3/4-in. dr. (Appendix B, Item 36)	• Battery ground cable disconnected (TM 9-2320-361-20).
1-1/4-in. socket, 3/4-in. dr. (Appendix B, Item 40)	• Primary fuel filter removed (right front side mount only) (TM 9-2320-361-20).
Breaker bar, 3/4-in. dr. (Appendix B, Item 37)	• Steering gear removed (left front mount only) (para. 12-2).
MATERIALS/PARTS	GENERAL SAFETY INSTRUCTIONS
Three locknuts (front bracket) (Appendix F, Item 119)	• All personnel must stand clear during lifting operations.
Lockscrew (front bracket) (Appendix F, Item 120)	• Do not detach lifting device from engine until all engine weight is equally distributed and engine is stable.
Lockscrew (front bracket) (Appendix F, Item 121)	• Lifting device must have weight capacity greater than the weight of the engine and transmission.
Four locknuts (rear bracket) (Appendix F, Item 86)	
PERSONNEL REQUIRED	
Two	

3-1

TM 9-2320-361-34

3-12. OIL PUMP MAINTENANCE

THIS TASK COVERS:

a. Removal	c. Installation
b. Inspection	

INITIAL SETUP

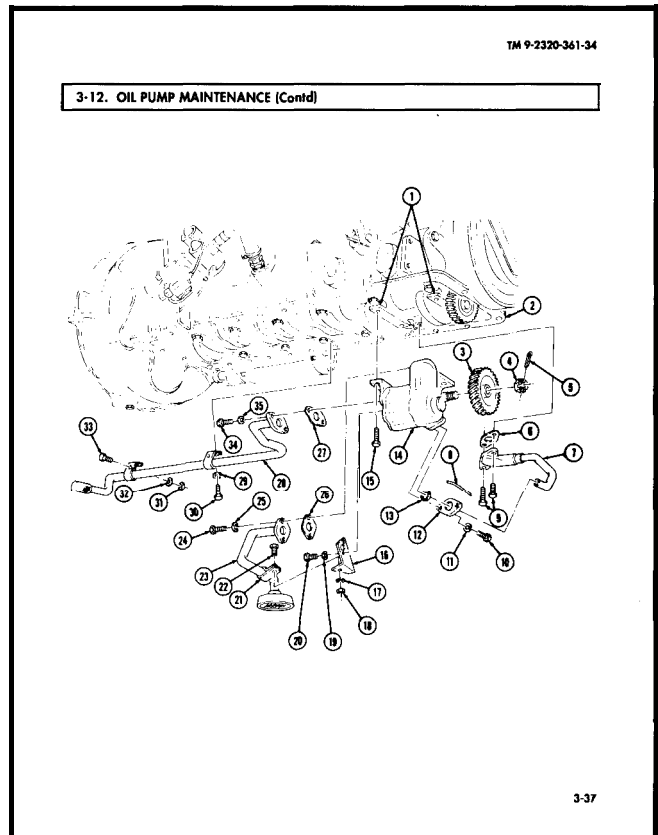
APPLICABLE MODELS	MATERIALS/PARTS
All	Three locknuts (Appendix F, Item 128)
	Gasket (Appendix F, Item 35)
TOOLS	Gasket (Appendix F, Item 36)
General mechanic's tool kit (Appendix B, Item 1)	Preformed packing (Appendix F, Item 193)
Mechanical puller kit (Appendix B, Item 23)	Thirteen lockwashers (Appendix F, Item 130)
6-in. Extension, 3/8-in. dr. (Appendix B, Item 58)	Cotter pin (Appendix F, Item 2)
Universal joint, 3/8-in. (Appendix B, Item 18)	Safety wire (Appendix C, Item 31)
Adapter, 1/2-in. male, 3/8-in. female (Appendix B, Item 18)	Lubricating oil, OE/HDO 30 (Appendix C, Item 13)
SPECIAL TOOLS	REFERENCES (TM)
5/8-in. crowfoot adapter (Appendix B, Item 60)	TM 9-2320-361-34P
	EQUIPMENT CONDITION
	Oil pan removed (para. 3-11).

NOTE
Have drainage container ready to catch excess oil.

a. Removal

- Remove safety wire (8) from two screws (9). Discard safety wire (8).
- Remove two screws (9), outlet tube (7), and gasket (6) from engine block (2) and flange (12). Discard gasket (6).
- Remove two screws (10), lockwashers (11), flange (12), and packing (13) from oil pump (14). Discard lockwashers (11) and packing (13).
- Remove nut (18), lockwasher (17), and screw (22) from pickup tube clamp (21) and brace (18). Discard lockwasher (17).
- Remove two screws (24), lockwashers (25), pickup tube (23), and gasket (26) from oil pump (14). Discard lockwashers (25) and gasket (26).
- Remove two screws (30) and lockwashers (29) from scavenger tube (28) and engine block (2). Discard lockwashers (29).
- Remove two screws (34), lockwashers (35), scavenger tube (28), and gasket (27) from oil pump (14). Discard lockwashers (35) and gasket (27).
- Remove two screws (20), lockwashers (19), and brace (16) from oil pump (14). Discard lockwashers (19).
- Remove three locknuts (15) and oil pump (14) from two bearing caps (1). Discard locknuts (15).
- Remove cotter pin (5), nut (4), and gear (3) from pump (14). Discard cotter pin (5).
- Remove gear (3) from pump (14) with mechanical puller.
- Remove two nuts (31), lockwashers (32), and screws (33) from scavenger tube (28). Discard lockwashers (32).

3-36



DETAILED MAINTENANCE PROCEDURES:

11. Detailed procedures: Include everything you must do to accomplish a basic maintenance task.
 - a. Before beginning the maintenance task, look through the procedure. You must familiarize yourself with the entire maintenance procedure before beginning the maintenance task. The entire procedure of paragraph 3-12: "Oil Pump Maintenance" includes: a. Removal, b. Inspection, and c. Installation.
 - b. The eight basic headings listed under "INITIAL SETUP" outline special tools, materials, personnel requirements, and special conditions. Headings will not be listed if there are no entries. The headings are:
 - **APPLICABLE MODELS** Any model(s) that require that particular maintenance task.
 - **TEST EQUIPMENT** Test equipment needed to complete the task.
 - **SPECIAL TOOLS** Special tools needed to complete the task.
 - **TOOLS** Common tools, not in the General Mechanic's Tool Kit, needed to complete the task.
 - **MATERIALS/PARTS** All parts or materials needed to complete the task.
 - **PERSONNEL REQUIRED** The number of personnel needed to perform the task. If only one mechanic is needed, this heading will not be used. If you think that you need more help to correctly or safely complete a task (perhaps as the result of unusual conditions, etc.), alert your supervisor and ask for help.
 - **REFERENCES (TM)** Additional manuals needed to complete the task.
 - **EQUIPMENT CONDITION** Notes the conditions that must exist before starting the task.
 - **GENERAL SAFETY INSTRUCTIONS** Summarizes all safety warnings for the maintenance task.
 - c. A step-by-step maintenance procedure follows the "INITIAL SETUP" and gives detailed instructions for the procedure. These instructions give part name and action performed. The numbers in parentheses correspond to the part's callout number in the accompanying illustration. Warnings, cautions, and notes give additional information.
 - **WARNINGS**- Indicate conditions, practices, or procedures which must be observed to avoid personnel injury, loss of life, or long-term health hazard.
 - **CAUTIONS**- Indicate conditions, practices, or procedures which must be observed to avoid damage to equipment or destruction of equipment.
 - **NOTES** - Include essential information of special importance, interest, or aid in job performance.
 - d. At the end of a procedure, "FOLLOW-ON TASK(S)" will list the additional task(s) that must be performed to complete the procedure.
12. You can also use the Table of Contents (page ii) to find more information about the vehicle.
13. Refer to TM 9-2320-361-34P, Direct Support and General Support Maintenance Repair Parts and Special Tools List for Truck, 2-1/2-Ton, 6x6, M44A2 Series, when requisitioning parts, special tools, and equipment for direct support and general support maintenance.
14. Your manual is easier to use once you understand its design. We hope it will encourage you to use it more often as an aid to maintenance support for M44A2 series vehicles.

CHAPTER 1

INTRODUCTION

Section I. General Information (page 1-1)
Section II. Equipment Description and Data (page 1-2)

Section 1. GENERAL INFORMATION

a. This technical manual contains instructions for direct support and general support maintenance of 2-1/2-ton, 6x6, multifuel, M44A2 series vehicles.

b. The vehicle model numbers and equipment names are:

- (1) M35A2 Cargo Truck, WO/W and WIW
- (2) M35A2C Cargo Truck With Dropsides, WO/W and W/W
- (3) M36A2 Cargo Truck With Extra Long Wheel Base, WO/W and W/W
- (4) M49A2C Fuel Tank Truck, WO/W and W/W
- (5) M50A2 Water Tank Truck (400- and 600-Gallon Tanks), WO/W and W/W
- (6) M50A3 Water Tank Truck (Two 500-Gallon Tanks), WO/W and W/W
- (7) M109A3 Shop Van Truck, WO/W and W/W
- (8) M185A3 Instrument Repair Shop Truck, WO/W and W/W
- (9) M275A2 Tractor Truck, WO/W and W/W
- (10) M342A2 Dump Truck, WO/W and W/W
- (11) M756A2 Pipeline Construction Maintenance Truck, W/W
- (12) M764 Earth Boring and Polesetting Maintenance Truck, W/W

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, The Army Maintenance Management System (TAMMS).

1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Procedures for destruction of Army materiel to prevent enemy use are found in TM 750-244-6.

1-4. PREPARATION FOR STORAGE OR SHIPMENT

Storage and shipment instructions are in TM 9-2320-361-20. Additional information can be found in TM 746-10, Marking, Packaging and Shipment of Supplies and Equipment: General Packaging Instructions for Field Use.

1-5. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS

The nomenclature, names, and designations used in this manual are in accordance with MIL-HDBK-63038-2.

1-6. REPORTING QUALITY DEFICIENCIES, IDEAS, AND EQUIPMENT IMPROVEMENT RECOMMENDATIONS

If your 2-1/2-ton, M44A2 series vehicle needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail in accordance with DA-PAM 738-750.

1-7. EQUIPMENT IMPROVEMENT REPORT AND MAINTENANCE DIGEST (EIR MD)

The quarterly Equipment Improvement Report and Maintenance Digest, TB 43-0001-39 series, contains valuable field information on the equipment covered in this manual. The information in TB 43-0001-39 series is compiled from some of the Equipment Improvement Reports (EIR's) that you prepared on the vehicles covered in this manual. Many of these articles resulted from comments, suggestions, and improvement recommendations that you submitted to the EIR program. The TB 43-0001-39 series contains information on equipment improvements, minor alterations, proposed Modification Work Orders (MWO'S), warranties (if applicable), actions taken on some of your DA Form 2028's (Recommended Changes to Publications), and advance information on proposed changes that may affect this manual. The information will help you in doing your job better and will help in keeping you advised of the latest changes to this manual. Also refer to DA Pam 25-30, Consolidated Index of Army Publications and Blank Forms, and Appendix A, References, in this manual.

1-8. WARRANTY INFORMATION

The transfer case, transmission, transmission shaft, front axle assembly, rear axle assembly, differential carrier, air hydraulic cylinder, steering gear, cargo body, winch, power takeoff assembly, and delivery pump are warranted in accordance with TB 9-2320-209-14 for the M35A2 and M35A2C cargo trucks, M49A2C fuel tank truck, M50A3 water tank truck, and M275A2 tractor truck. The warranty starts on the date found in block 23, DA Form 2408-9, in the logbook. Report all defects in material or workmanship to your supervisor, who will take appropriate action.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-9. EQUIPMENT DESCRIPTION AND DATA

Detailed descriptions covering the 2-1/2-ton, 6x6, M44A2 series vehicles are in TM 9-2320-361-10 and TM 9-2320-361-20.

CHAPTER 2

SERVICE AND TROUBLESHOOTING INSTRUCTIONS

- Section I. Repair Parts, Special Tools, Test, Measurement, and Diagnostic Equipment (TMDE), and Support Equipment (page 2-1)
 Section II. Troubleshooting (page 2-1)
 Section III. General Maintenance Instructions (page 2-32)

Section 1. REPAIR PARTS, SPECIAL TOOLS, TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE), AND SUPPORT EQUIPMENT

2-1. COMMON TOOLS AND EQUIPMENT

Refer to Modified Table of Organization and Equipment (MTOE) for authorized common tools and equipment applicable to your unit.

2-2. SPECIAL TOOLS AND SUPPORT EQUIPMENT

Special tools and support equipment are listed and illustrated in TM 9-2320-361-34P.

2-3. TEST MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE)

Calibrate all measuring and test equipment used to determine equipment conformance in accordance with MIL-STD-120, MIL-C-45662, and MIL-L-45607.

2-4. FABRICATED TOOLS

Fabricated tools needed to maintain the equipment mentioned in this manual can be found in Appendix D. These tools are not available for issue; therefore, each one must be fabricated and applied by direct or general support personnel.

2-5. REPAIR PARTS

Repair parts are listed and illustrated in TM 9-2320-361-34P.

Section II. TROUBLESHOOTING

2-6. GENERAL TROUBLESHOOTING INSTRUCTIONS

WARNING

Do not operate a deadlined vehicle without preliminary inspection. Failure to do so may cause further damage to a disabled component and possible injury to personnel.

b. Do the easiest and most obvious troubleshooting and corrections first. Most malfunctions are easily corrected. For example:

- (1) Low power problems are generally caused by loose throttle linkage or dirty fuel filters.
- (2) Excessive oil consumption is generally caused by leaky gaskets or loose line connections.

2-6. GENERAL TROUBLESHOOTING INSTRUCTIONS (Contd)

c. Double check before disassembly. The source of most engine problems can be traced to more than one part in a system. For example:

(1) Excessive fuel consumption may not be caused by the fuel pump alone. In addition, the trouble could be a clogged air cleaner reducing air inflow or a restricted exhaust passage causing abnormally high back pressure.

(2) Engines often are disassembled in search of a complaint and the real evidence of the problem is destroyed. Check again to be sure an easier solution to the problem has not been overlooked.

(3) Check all tags, service request forms, and vehicle logbook for repair history. This may help lead to source of problems.

d. Before attempting to correct a problem, diagnose the cause of the problem. Do not allow the same failure to occur again.

e. This troubleshooting covers in-vehicle engine repair. For out-vehicle engine repair, refer to TM 9-2815-210-34-1,-2-1, 2-2, and -34P.

MECHANICAL SYSTEMS TROUBLESHOOTING SYMPTOM INDEX

MALFUNCTION NO.	MALFUNCTION	TROUBLESHOOTING PROCEDURE PAGE
ENGINE		
1.	Engine will not crank	2-6
2.	Starter cranks engine slowly	2-7
3.	Engine cranks but will not start	2-7
4.	Engine starts but stops when accelerator is operated	2-8
5.	Engine stops when accelerator is returned to idle position.	2-8
6.	Poor acceleration and/or lack of power.	2-8
7.	Engine delivers excessive black exhaust smoke	2-8
8.	Engine surges	2-8
9.	Engine misfires during operation.	2-9
10.	Engine stops during normal operation.	2-9
11.	Exhaust color blue during normal operation	2-9
12.	Exhaust color white during normal operation and idle	2-10
13.	Engine oil pressure low or zero at normal operating temperature.	2-11
14.	Engine oil pressure extremely high at normal operating temperature.	2-12
15.	Engine oil loss during normal operation	2-13
16.	Engine noise abnormal	2-13
17.	Engine vibration abnormal	2-14
FUEL SYSTEM		
18.	No fuel at fuel injectors	2-14
19.	Low fuel supply at injector nozzles.	2-16
20.	Fuel injectors inoperative	2-16
21.	Fuel injectors deliver excess fuel into engine	2-16
COOLING SYSTEM		
22.	Coolant loss during normal operation	2-17
23.	Coolant temperature excessive.	2-17
CLUTCH		
24.	Vehicle will not move or engine stalls with clutch engaged.	2-17
25.	Burning odor evident with clutch engaged.	2-18
26.	Clutch noisy during engagement and disengagement	2-18
27.	Vibration during clutch engagement.	2-19
28.	Clutch pedal will not travel depress	2-19
TRANSMISSION		
29.	Transmission oily.	2-19
30.	Transmission leaks oil	2-19
31.	Transmission grinds and/or pops out of gear during shifting	2-20
TRANSFER CASE		
32.	Transfer case will not operate front differential	2-20
33.	Transfer case will not operate rear differential.	2-20
34.	Transfer case leaks oil	2-20
35.	Transfer case noisy	2-21
36.	Transfer case grinds or pops out of gear during normal vehicle operation	2-21

MECHANICAL SYSTEMS TROUBLESHOOTING SYMPTOM INDEX (Contd)

MALFUNCTION NO.	MALFUNCTION	TROUBLESHOOTING PROCEDURE PAGE
DIFFERENTIAL		
37.	Differential noisy	2-21
38.	Differential clunks during turns or initial takeoff.	2-21
39.	Differential leaks oil	2-21
40.	Abnormal tirewear(front axle)	2-22
41.	Abnormal tirewear(rear axle)	2-22
STEERING GEAR		
42.	Excessive play in steering	2-22
43.	Steering gear leaking oil	2-22
44.	Steering wheel hard to turn	2-22
POWER TAKEOFF		
45.	(Transmission-driven) Power takeoff inoperative	2-23
46.	(Transfer-driven) Power takeoff inoperative.	2-23
47.	Transmission power takeoff leaks oil.	2-23
48.	Transfer power takeoff leaks oil.. . . .	2-23
DUMP BODY (M342A2)		
49.	Dump body will not raise	2-24
50.	Dump body will not lower	2-25
51.	Dump body will not hold in raised position	2-25
FUEL TANK (M49A2C)		
52.	Fuel will not pump from compartments or pumps slowly.	2-25
53.	Fuel will not gravity drain from selected compartments	2-26
54.	Fuel tank compartments cannot be suction filled	2-26
55.	Fuel mixed with water when dispensed.	2-26
WATER TANK (M50A2 AND M50A3)		
56.	Water will not pump from compartments or pumps slowly	2-26
57.	Water will not gravity drain from selected compartments	2-27
58.	Water tank compartments cannot be suction filled.	2-27
EARTH BORING AND POLESETTING (M764)		
59.	Earth boring machine drive inoperative	2-27
60.	Earth boring machine feed inoperative	2-27
61.	Earth boring machine brake inoperative	2-28
62.	Earth boring machine will not move vertically.	2-28
63.	Earth boring machine will not move horizontally.	2-28
64.	Earth boring machine excessively noisy	2-28
OUTRIGGERS		
65.	Outriggers inoperative	2-29
66.	Outriggers operate unevenly	2-29
67.	Outriggers will not hold in extended position.	2-29

MECHANICAL SYSTEMS TROUBLESHOOTING SYMPTOM INDEX (Contd)

MALFUNCTION NO.	MALFUNCTION	TROUBLESHOOTING PROCEDURE PAGE
WINCHES		
68.	Clutch will not engage drum.....	2-30
69.	Winch noisy when under load	2-30
70.	Drum overruns cable or cable coils loosen when paying out cable.	2-30
71.	Winch does not hold load when power released	2-30
72.	Winch leaks oil	2-30
WINTERIZATION KITS		
73.	Heater fails to turn on	2-31
74.	Heater overheats – overheat switch is good	2-31
75.	Heater overheats –continues to run	2-31
76.	Heater output too low	2-31
77.	Heater smokes and bangs when starting.	2-31
78.	Blower will not stop after turn off.	2-31
79.	Odor of fuel in ventilating air.....	2-32
80.	Blower runs but heater fails to ignite	2-32
81.	Heater smokes during normal operation	2-32

Table 2-1. Mechanical Troubleshooting.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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ENGINE

NOTE

Engine should be test run after each completed action.

1. ENGINE WILL NOT CRANK

- Step 1. Check fuel injection pump for seizure. Remove drive gear access cover from engine timing gear cover (para. 5-4). Remove injection pump drive gear (para. 5-4). Manually turn injection pump shaft at center hub screw.
If shaft will not rotate, replace (para. 5-4) and repair fuel injection pump (TM 9-2815-210-34-2-2).

WARNING

- Ensure fuel shutoff valve and ignition switch are OFF before cranking engine. Failure to do so may result in injury to personnel.
- All personnel must stand away from engine during crank test to clear fluid from cylinders. Eye protection is required during crank test. Failure to stand clear and wear eye protection may cause injury to personnel.

- Step 2. Check engine cylinders for fluid-locked pistons. Remove all fuel injector nozzles (para. 5-2). Crank engine with starter.

- a. If crankshaft turns freely, identify any fluid expelled from cylinders. If fluid sample is identified as coolant, proceed to step 9. If fluid sample is identified as fuel, proceed to malfunction 21.
- b. If engine crankshaft will not turn or turns hard, check internal engine components for seizure. Remove oil pan (para. 3-11) and inspect crankshaft for nicks, burns, grooves, scuffs, or discoloration due to overheating. If nicked, burned, grooved, scuffed, or discolored, replace engine (para. 3-18).

- Step 3. Install fuel injector nozzles (para. 5-2).

- Step 4. Check oil pump for seizure. Remove oil pump (para. 3-12) and manually turn oil pump drive gear.

If drive gear will not turn, replace oil pump (para. 3-12).

- Step 5. Check air intake manifold for presence of water.

If water is present within air cleaner, disassemble and drain air intake manifold (para. 3-17).

CAUTION

Starting engine after correcting piston fluid-locked condition must be done with care. When pistons have been fluid-locked within cylinders, connecting rods may have been damaged and can be identified during test run by abnormal vibration or noise. Do not operate engine when these conditions exist. Permanent engine damage may result.

- Step 6. Test run engine if water was present and removed from air induction system.

If engine operates with unusual sounds or vibrations, perform malfunction 16 and/or 17.

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	<i>Step 7.</i>	Check turbocharger housing for presence of water, identified by water on turbocharger fins or hub. If water is present, replace turbocharger (para. 5-6).
	<i>Step 8.</i>	Test run engine. If engine operates with unusual sounds or vibrations, perform malfunction 16 and/or 17.
	<i>Step 9.</i>	Check intake manifold and gasket. Remove intake manifold and gasket and inspect for defects (para. 3-17). If intake manifold is defective, replace (para. 3-17).
	<i>Step 10.</i>	Test run engine. a. If engine operates with unusual sounds or vibrations, perform malfunction 16 and/or 17. b. If engine exhaust color remains white during test run, check cylinder heads and gaskets. Remove cylinder heads and gaskets and inspect for defects (para. 3-3). If cylinder heads or gaskets are defective, replace (para. 3-3).
	<i>Step 11.</i>	Test run engine. If engine exhaust color remains white during test run, replace engine (para. 3-18).
END OF TESTING!		
2. STARTER CRANKS ENGINE SLOWLY		
	<i>Step 1.</i>	Check electrical systems (TM 9-2320-361-20).
	<i>Step 2.</i>	Check fuel injection pump for seizure (malfunction 1, step 1).
	<i>Step 3.</i>	Check internal engine components for seizure (malfunction 1, steps 2b and 4).
END OF TESTING!		
3. ENGINE CRANKS BUT WILL NOT START		
	<i>Step 1.</i>	Check fuel delivery systems (malfunctions 18 through 21).
	<i>Step 2.</i>	Visually check valve train operation and that valve lash is within specifications (para. 3-7). a. If valve train is not operating, check camshaft and crankshaft gears for damaged or missing teeth. Remove timing cover (para. 3-8) and replace both gears (TM 9-2815-210-34-2-1) if either gear is damaged. b. If valve lash is not within specifications, adjust valve lash (para. 3-7). c. If valve lash cannot be adjusted within specifications, check valve train components for wear or defects (para. 3-7). Replace worn or defective components.
	<i>Step 3.</i>	Check engine cylinders for low compression readings (malfunction 11, steps 1 and 2). a. If compression readings are low or zero, perform wet compression check (malfunction 11, steps 1 and 2). b. If wet compression readings increase 50 psi (345 kPa) or more, piston rings or cylinder bores may be worn. Replace engine (para. 3-18).
END OF TESTING!		

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4. ENGINE STARTS BUT STOPS WHEN ACCELERATOR IS OPERATED		
	Step 1. Check fuel leakage at inlet side of fuel supply pump (mounted on fuel injection pump) (malfunction 18, step 4).	
	Step 2. Check fuel delivery systems (malfunction 18).	
	END OF TESTING!	
5. ENGINE STOPS WHEN ACCELERATOR IS RETURNED TO IDLE POSITION		
	Check fuel delivery systems (malfunction 18).	
	END OF TESTING!	
6. POOR ACCELERATION AND/OR LACK OF POWER		
	Step 1. Check vehicle clutch system for slippage (malfunction 25).	
	Step 2. Perform fuel delivery malfunction 18, steps 1,2, and 3.	
	Step 3. Check fuel injection pump timing is set within engine specifications (para. 5-4).	
	If fuel injection pump timing is incorrect, adjust (para. 5-4).	
	Step 4. Check turbocharger operation. Remove plug from top of inlet manifold. Install low pressure gage with adapter into plug opening. Start engine and accelerate engine to fill throttle and immediately decelerate. Observe pressure gage readings.	
	If no gage movement or only a small pressure increase by gage is evident, replace defective turbocharger (para. 5-6).	
	Step 5. Check turbocharger outlet hose, intake manifold elbow, and gasket for leaks (para. 5-6). Tighten base screws and clamps. Replace any missing screws or clamps (TM 9-2320-361-20) .	
	If no improvement during test run, remove and inspect turbocharger hoses, intake manifold elbow, and gasket for defects (para. 5-6). Replace defective components (para. 5-6 and TM 9-2320-361-20).	
	Step 6. Check engine valve train operation and valve lash adjustment (malfunction 3, step 2).	
	Step 7. Check engine cylinder compression (malfunction 11, steps 1 and 2).	
	END OF TESTING!	
7. ENGINE DELIVERS EXCESSIVE BLACK EXHAUST SMOKE		
	Complete troubleshooting malfunction 21.	
	END OF TESTING!	
8. ENGINE SURGES		
	Step 1. Check fuel supply pump (mounted on fuel injection pump) operation (malfunction 18, step 4).	
	Step 2. Check fuel injector nozzles operation (malfunction 18, step 2).	
	Step 3. Check fuel shutoff system for correct operation and adjustment (malfunction 18, step 1).	
	END OF TESTING!	

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
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9. ENGINE MISFIRES DURING OPERATION

Step 1. Verify fuel injector nozzle feed lines are correctly installed in fuel injector pump hydraulic head (para. 5-3).

If fuel injector nozzle feed lines are incorrectly installed, remove and install in correct location (para. 5-3).

Step 2. Check fuel injector nozzle operation (malfunction 18, step 2).

Step 3. Check fuel injection pump operation (malfunction 18, step 6).

Step 4. Check engine valve train operation and valve lash adjustment (malfunction 3, step 2).

Step 5. Check engine cylinders compression readings (malfunction 11, steps 1 and 2).

END OF TESTING!

10. ENGINE STOPS DURING NORMAL OPERATION

Step 1. Perform engine troubleshooting malfunction 4.

Step 2. Perform engine troubleshooting malfunction 1, step 2.

END OF TESTING!

11. EXHAUST COLOR BLUE DURING NORMAL OPERATION

NOTE

Blue exhaust indicates presence of excess engine oil in cylinder combustion chamber.

Step 1. Engine cylinder compression test,

a. Preparation: Check for proper valve and rocker arms movement and ensure they are adjusted to specifications (para. 3-7); cutoff fuel supply at fuel pump (TM 9-2320-361-20); ensure batteries are fully charged and starter operates normally; and remove all plugs in cylinder heads.

b. Connect compression gage and necessary adapter to plug port of number 1 cylinder. Crank engine through at least five compression strokes or until gage stops rising. Record cylinder number and maximum gage reading. Remove gage from number 1 cylinder. This is the "dry" test.

c. Repeat step 1b for remaining cylinders.

d. Add 1 to 1-1/2 oz (29-44 ml) of clean engine oil through plug port for each cylinder before connecting compression gage. Repeat steps 1b and 1c. This is the "wet" test. Record gage readings for "wet" test beside readings for "dry" test for each cylinder.

Step 2. Analysis of compression test results.

a. Compute compression loss for "dry" test for each cylinder compared to cylinder with highest reading using the following formula:

$$\frac{\text{Highest Cylinder Reading} - \text{Sample Cylinder Reading}}{\text{Highest Cylinder Reading}} \times 100 = \% \text{ Compression Loss}$$

b. If one or more cylinders has an 8-10% or greater compression loss in "dry" test, but improved to acceptable (less than 8%) loss in "wet" test, piston, piston rings, or cylinder liner problem is indicated. Remove head(s) and inspect pistons, piston rings, and cylinder liner for breaks, wear, and scoring. If damaged, replace engine (para. 3-18).

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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- c. If one or more cylinders had an 8-10% or greater loss in both “wet” and “dry” tests, the compression loss is on top of engine. Remove head(s) and inspect valves, valve seats and guides, and cylinder head gasket(s). Repair (TM 9-2815-210-34-2-2) or replace defective parts (para. 3-3).
- d. If repairs of b and/or c do not sufficiently restore engine to normal operation, remove rocker arm covers (para. 3-6), inspect for camshaft, tappets, and pushrod defects. Repair (TM 9-2815-210-34-2-2) or replace defective parts (paras. 3-7,3-8, and 3-10).
- e. Replace valve seals and guides (para. 3-3 and TM 9-2815-210-34-2-2) if compression test readings are within limits for all cylinders and engine develops normal power but still shows blue exhaust.

Step 3. Perform engine oil consumption test. Operate vehicle and closely check engine oil level until oil level reaches one quart low. Stop vehicle operation.

Step 4. Record vehicle mileage. Calculate engine oil consumption by subtracting mileage when engine oil level was topped off from current mileage recorded when engine oil level was one quart low. The difference is the mileage using one quart of oil.

- a. If the mileage is less than 60 mi (96 km) check for and repair all oil leaks.
- b. If there were no oil leaks, proceed to step 7.

Step 5. Repeat steps 3 and 4 of engine oil consumption test except steps 4a and 4b.

- a. If engine oil consumption remains less than 60 mi (96 km) for a one quart oil, check all oil seals.
- b. If engine oil consumption is greater than or equal to 60 mi (96 km) for one quart oil, oil consumption is acceptable.

Step 6. Check valve seats, valve guides, and cylinder head gaskets for defects. Remove cylinder heads and disassemble (TM 9-2815-210-34-2-1,-2-2, and para. 3-3).

If valve seats, valve guides, or cylinder heads are defective, replace (TM 9-2815-210-34-2-2 and para. 3-3).

Step 7. Repeat steps 4 and 5 of oil consumption test except steps 4a and 4b.

- a. If oil consumption remains more than one quart for every 60 mi (96 km), piston rings or cylinder bores may be worn or defective.
- b. Perform compression test of malfunction 11, steps 1 and 2. If the wet compression test, malfunction 11, step 1d, raises compression readings more than 50 psi (345 kPa), a piston ring or cylinder bore problem is indicated. Remove engine (para. 3-18), disassemble, and repair defective parts (TM 9-2815-210-34-2-1 and -2-2).

END OF TESTING!

12. EXHAUST COLOR WHITE DURING NORMAL OPERATION AND IDLE

CAUTION

Thick white smoke indicates coolant is present in engine combustion chambers during operation. When this condition is evident, shut engine down immediately and determine cause. Continued engine operation may result in permanent engine damage.

Step 1. Check engine temperature. Ensure engine temperature is at specified level (TM9-2320-361-10).

If engine temperature is above operating level, perform malfunction 1, steps 9 and 10.

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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WARNING

Hot coolant is under pressure. Care should be used when removing coolant filler cap or inspecting hot engine coolant leaks. Steam or hot coolant under pressure may cause severe injury to personnel.

- Step 2.** Pressure test warm engine cooling system (TM 750-254). Observe pressure tester reading.
- If pressure tester reading declines and there are no indications of external leaks, coolant is leaking internally into engine or combustion chambers. Remove oil dipstick and check engine oil for presence of coolant.
 - If coolant is present on oil dipstick, check intake manifold and gasket for defects (malfunction 1, step 9). Check cylinder heads and gaskets for defects (malfunction 1, step 10b).

NOTE

When engine exhaust color remains white during test run after cylinder heads or gaskets replacement, internal engine block cooling jacket failure is indicated.

- Replace engine (para. 3-18).

END OF TESTING!

13. ENGINE OIL PRESSURE LOW OR ZERO AT NORMAL OPERATING TEMPERATURE**CAUTION**

Do not operate engine except during testing when condition of no oil pressure is evident. Continued operation may damage engine internally.

- Step 1.** Check oil pressure regulator for leaks or defective operation. Remove oil pressure regulator and inspect (para. 3-13).
If oil pressure regulator is defective, replace (para. 3-13).

NOTE

When oil pump operation or condition becomes defective, usually there is a lack of oil supply or restriction from oil sludge.

- Step 2.** Check oil pump operation and condition. Remove oil pan and oil pump (paras. 3-11 and 3-12). Inspect oil pump (TM 9-2815-210-34-2-2).
If oil pump is defective, replace (para. 3-12) or repair oil pump (TM 9-2815-210-34-2-2). Do not install oil pickup or oil pan.
- Step 3.** Check oil pickup for restrictions.
If oil pickup is restricted, clean or replace (para. 3-12). Do not install oil pan.

NOTE

Lack of oil supply due to oil pickup restrictions reducing or cutting off oil supply may cause damage to main and rod bearings, crankshaft, and rods.

- Step 4.** Inspect crankshaft for nicks, burns, grooves, scuffs or discoloration due to overheating. If damaged, replace engine (para. 3-18).

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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- Step 5. Check oil cooler for leaks, restrictions, or defects. Remove and inspect oil cooler (para.3-14).
 - a. If oil cooler is restricted, clean.
 - b. If oil cooler gasket is defective, replace (para. 3-14).
- Step 6. Check turbocharger for internal and external oil leaks. Remove and inspect turbocharger (para. 5-6).
 If oil is present inside turbocharger housing, on hub fins, or externally on housing, but not in the area of oil inlet or outlet ports, replace turbocharger (para. 5-6).
- Step 7. Check fuel injection pump for external oil leaks.
 If fuel injection pump is leaking oil, replace (para. 5-4) and repair fuel injection pump (TM9-2815-210-34-2-2).
- Step 8. Check fuel injection pump for internal oil leaks at drive gear input shaft. Remove drive gear access cover (para. 5-4).

WARNING

- Eye protection is required during inspection of fuel injection pump and drive gear input shaft seal with engine operating. Oil may spray or splash from gear area. Failure to wear eye protection may result in injury to personnel.
- Stay clear of drive gear area during inspection of input shaft seal when engine is operating. Failure to stay clear of drive gear area may result in injury to personnel.
- Step 9. Clean all existing oil traces from drive gear area of timing cover housing. Operate engine and visually check for oil flow from drive gear housing or timing cover.
 If oil flow is rapid from drive gear area, replace fuel injection pump (para. 5-4) and repair fuel injection pump (TM9-2815-210-34-2-2).
- Step 10. Check camshaft and bearings for wear or defects.
 If camshaft or bearings are worn or defective, replace engine (para. 3-18) and repair engine (TM9-2815-210-34-2-2).

NOTE

When engine oil pressure remains low after completing troubleshooting, internal engine block oil passage failure is indicated.

- Step 11. Replace engine (para. 3-18).

END OF TESTING!

14. ENGINE OIL PRESSURE EXTREMELY HIGH AT NORMAL OPERATING TEMPERATURE

- Step 1. Check oil pressure regulator for leaks or defective operation. Remove oil pressure regulator and inspect (para. 3-13).
 If oil pressure regulator is defective, replace (para. 3-13).

NOTE

Continued high oil pressure may indicate that internal engine bearings are spun, the engine block oil feed is restricted, or the return passages are restricted.

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 2.	Disassemble engine and check for spun bearings or restricted oil passages (TM 9-2815-210-34-2-1 and -2-2).	If, during inspection, evidence of spun engine bearings or restricted oil passages is found, replace engine (para. 3-18).
END OF TESTING!		
15 ENGINE OIL LOSS DURING NORMAL OPERATION		
Step 1. Complete troubleshooting malfunction 13, steps 1 and 5 through 7.		
Step 2. Complete troubleshooting malfunction 11.		
END OF TESTING!		
16. ENGINE NOISE ABNORMAL		
NOTE		
When abnormal engine noise is evident, engine should be checked and location of noise determined to ensure that engine will not be permanently damaged.		
Step 1.	When a knocking noise is located at front of engine, check camshaft gear, crankshaft gear, or fuel injection pump gear for damage, excessive backlash, or loose fit. Check excessive camshaft end play. Remove timing gear cover (para. 3-8). a. If gears are loose on shafts, tighten or replace gears (TM 9-2815-210-34-2-1 and -2-2). b. If gears are worn, defective, or have excessive backlash, replace (TM 9-2815-210-34-2-1 and -2-2). c. If camshaft end play is excessive, replace camshaft thrust plate (TM 9-2815 -210-34-2-1 and -2-2).	
Step 2.	When a knocking noise is located at top of engine, remove rocker arm covers (para. 3-6) and check valve train components mounted on cylinder heads for wear, defects, or incorrect adjustment (para. 3-7). a. If valve train components are worn excessively or are defective, replace (paras. 3-7, 3-8, and 3-10). b. If valve train components are out of adjustment, adjust (para. 3-7).	
Step 3.	When knocking noise is located at side of engine, remove side tappet chamber covers, valve covers, valve train components, and tappets (paras. 3-9 and 3-10). Check valve train components and tappets for defects or wear (TM 9-2815 -210-34-2-1 and -2-2). If valve train components are excessively worn or defective, replace (paras. 3-7,3-8, and 3-10).	
NOTE		
When flywheel is loose on crankshaft, damage to flywheel/crankshaft mating surfaces can occur. Inspection of mating surfaces should be performed prior to tightening flywheel screws.		
Step 4.	When a knocking noise is located at bottom or rear of engine, check flywheel for loose condition. Position in neutral, start engine, and press and release clutch a number of times. If noise changes, remove transmission (para. 8-2) and clutch (para. 4-1) and check flywheel screws for loose condition. Tighten loose screws or replace damaged or defective flywheel components (para. 3-5).	

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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Step 5. When a knocking noise is located at bottom of engine, remove oil pan (para. 3-11) and check condition of bearings, crankshaft, and rods for wear or defects.

- a. If bearings are worn or defective, replace engine (para. 3-18) and repair (TM 9-2815-210-34-2-1 and -2-2).
- b. If crankshaft or connecting rods are defective or damaged, replace engine (para. 3-18), repair crankshaft or connecting rods (TM 9-2815-210-34-2-1 and -2-2).
- c. If no defects are found, replace engine (para. 3-18). Remove pistons and rods and check connecting rod wrist pins and pistons for wear or defects. Replace defective components (TM 9-2815-210-34-2-1 and -2-2).

END OF TESTING!

17. ENGINE VIBRATION ABNORMAL

Step 1. Check for loose or defective vibration damper. Inspect vibration damper (para. 3-4).

- a. If vibration damper is loose, check woodruff key and crankshaft/vibration damper mating surfaces for damages. Replace damaged components (para. 3-4).
- b. If vibration damper is defective, replace (para. 3-4).

Step 2. Check for crossed fuel injector lines (para. 5-3).

If fuel injector lines are crossed, remove lines and install in correct locations (para. 5-3).

NOTE

If, after correctly installing crossed fuel injector lines, the engine continues to vibrate excessively, pistons may have been burned within engine combustion chambers. This condition cannot be corrected unless affected piston(s) are replaced.

Step 3. Check engine cylinders compression readings (malfunction 11, steps 1 and 2).

Step 4. Complete troubleshooting malfunction 9.

END OF TESTING!

FUEL SYSTEM

WARNING

- Fuel is flammable. Do not perform troubleshooting checks near open flame, sparks, or electricity. Injury to personnel may result.
- Eye protection is required when performing fuel system troubleshooting checks. Failure to wear eye protection may result in injury to personnel.
- Ignition switch must remain off during fuel system troubleshooting checks. Failure to verify that ignition system is turned off may result in injury to personnel.

18. NO FUEL AT FUEL INJECTORS

Step 1. Check fuel injection pump fuel shutoff operation and adjustment (TM 9-2815-210-34-2-1 and -2-2 or TM 9-2910-226-34). Place fuel shutoff cable control on instrument panel in RUN position. Remove timing cover on fuel injection pump (para. 5-4). Visually inspect that fuel shutoff clevis is tight against timing cover window bearing screw (para. 5-4).

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
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WARNING

If rod clevis is not positioned tightly against cover window bearing screw, fuel shutoff rod may be binding. Verify fuel shutoff rod travels freely before adjusting clearance between rod clevis and bearing screw. Failure to verify fuel shutoff rod condition may result in governor sticking under acceleration and injury to personnel.

- a. If clearance between rod clevis and screw exists, check fuel shutoff rod condition (TM9-2910-226-34).
- b. If clearance between rod clevis and bearing screw exists, adjust operating cable (TM9-2910-226-34).

CAUTION

Shutoff rod cover installation will require fuel shutoff rod clevis operating cable to be placed in the RUN position and governor linkage in the LOW IDLE position. Incorrect positioning of governor linkage and/or fuel shutoff cable may result in jamming of governor linkage in FULL FUEL LOAD position. Engine will run wide open when started and may cause damage to engine.

- c. If fuel shutoff rod is damaged or defective, replace fuel shutoff assembly (TM9-2910-226-34).

NOTE

Air entering fuel delivery lines may block fuel flow. Air can enter line(s) when fitting(s) is loose or line(s) or fitting(s) is defective. This is indicated by leaking fuel.

- Step 2. Check operation of fuel injector nozzles. Remove fuel injector nozzles (para. 5-2) and bench test fuel injector nozzles (TM 9-2815-210-34- 1,-2-1 and, -2-2).
 - a. If fuel injector nozzles operation is incorrect, clean, adjust, and retest (TM9-2815-210-34-1 and -2-2).
 - b. If fuel injector nozzles are internally defective, replace (para. 5-2).
- Step 3. Check fuel delivery lines mounted on, and from, fuel injection pump (TM 9-2320-361-20 and para. 5-3).
If fuel delivery line(s) is leaking or restricted, tighten line(s) or fitting(s), repair fuel delivery line(s), or replace fitting(s) (para. 5-3). Bleed air from fuel injection system (TM9-2320-361-20).
- Step 4. Check fuel supply pump (mounted on fuel injection pump) operation (TM9-2910-226-34). Clean dirt, grease, and paint from fuel delivery line fitting at the final fuel filters which are mounted in fuel supply pump. Operate in-tank fuel pump and crank engine. Observe the green port of fuel supply pump.
If no fuel flows from outlet port of fuel supply pump, replace fuel supply pump (TM9-2910-226-34).
- Step 5. Check fuel density compensator operation (TM9-2910-226-34). Clean dirt, grease, and paint from fuel delivery line and hydraulic head. Loosen fuel delivery line fitting in hydraulic head. Operate in-tank fuel pump and crank engine. Observe loose fitting in hydraulic head.
If no fuel flows from fitting location, replace fuel injection pump (para. 5-4) and repair fuel injection pump (TM9-2910-226-34).

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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Step 6. Check fuel injection pump delivery operation. Loosen one injector line nut in hydraulic head. Operate in-tank fuel pump and crank engine. Observe location of loose injector line nut in hydraulic head.

If some traces of fuel, or no fuel pressure, is evident, replace fuel injection pump (para. 5-4) and repair fuel injection pump (TM 9-2910-226-34).

END OF TESTING!

19. LOW FUEL SUPPLY AT INJECTOR NOZZLES

Step 1. Check fuel injection pump timing to engine (para. 5-4).

If fuel injection pump timing to engine is incorrect, adjust to specifications (para. 5-4).

Step 2. Perform troubleshooting malfunction 18.

Step 3. Check fuel injection pump internal timing.

WARNING

Ensure fuel shutoff valve is OFF and remove throttle cable before cranking engine. Failure to do so may result in injury to personnel.

- a. Ensure fuel shutoff valve is OFF.
- b. Remove radiator (TM9-2320-361-20).
- c. Slowly rotate crankshaft in clockwise direction (TM 9-2815-210-34-1). Stop crankshaft rotation when correct timing mark on crankshaft damper is 2 in. (50.8 mm) before engine timing pointer.
- d. Place fuel shutoff cable in RUN position and governor lever in FUEL LOAD position.
- e. Remove plug from hydraulic head delivery valve.
- f. Remove valve spring and install plug in delivery valve.
- g. Remove no. 1 injector fuel delivery line from no. 1 injector.
- h. Remove timing cover located on fuel injector advance unit (para. 5-4).
- i. Operate in-tank fuel pump.
- j. Slowly turn engine crankshaft in clockwise direction. Fuel flow should be evident from no. 1 injector fuel delivery line until damper timing mark aligns with engine timing pointer.
- k. If no fuel flows or fuel continues to flow from no. 1 injector line when advance unit hub timing mark is 1/16 in. (1.6 mm) from advance unit timing pointer (TM 9-2910-226-34), replace (para. 5-4) and repair defective fuel injection pump (TM 9-2910-226-34).

END OF TESTING!

20. FUEL INJECTORS INOPERATIVE

Step 1. Check fuel injector nozzles operation (malfunction 18, step 2).

Step 2. Perform troubleshooting malfunction 18.

END OF TESTING!

21. FUEL INJECTORS DELIVER EXCESS FUEL INTO ENGINE

Step 1. Check fuel injection pump fuel return line.

If fuel return line is bent, kinked, or restricted, replace fuel return line (TM 9-2320-361-20).

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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Step 2. Check fuel injection pump timing to engine (para. 5-4).

If fuel injection pump timing to engine is incorrect, adjust to specifications (para. 5-4).

Step 3. Check fuel injection pump internal timing (malfunction 19, step 3).

Step 4. Check fuel injector nozzles operation (malfunction 18, steps 1 and 2).

Step 5. Perform troubleshooting malfunction 3.

END OF TESTING!

COOLING SYSTEM

WARNING

- Hot coolant is under pressure. Care should be used when removing radiator filler cap or inspecting hot engine coolant leaks. Steam or hot coolant under pressure may cause severe injury to personnel.
- Wear hand protection at all times when working with heated parts. Failure to do so may result in injury to personnel.

22. COOLANT LOSS DURING NORMAL OPERATION

Flow-test warm engine cooling system (TM 750-254). Observe flow-test reading.

- a. If flow-test reading declines and there are no indications of external leaks, coolant is leaking internally into engine or combustion chambers. Remove oil dipstick and check engine oil for presence of coolant.
- b. If coolant is present on oil dipstick, replace engine (para. 3-18).

END OF TESTING!

23. COOLANT TEMPERATURE EXCESSIVE

Perform troubleshooting malfunction 1, steps 9 and 10.

END OF TESTING!

CLUTCH

24. VEHICLE WILL NOT MOVE OR ENGINE STALLS WITH CLUTCH ENGAGED

Check transmission condition. Place transfer case in neutral and transmission in first gear. Engage clutch and observe transmission-to-transfer propeller shaft for evidence of rotation.

- a. If engine stalls, disconnect transmission-to-transfer case propeller shaft from transmission. Verify problem in transmission or transfer case.
- b. Place transmission in neutral. If transmission output shaft will not turn, replace (para. 8-2) and repair transmission (TM 9-2520-246-34-1).
- c. If transmission-to-transfer case propeller shaft will not spin, remove transmission (para. 8-2). Remove pressure plate and clutch disc from flywheel (para. 4-1). Check pressure plate and clutch disc for defects. Verify flywheel condition (para. 3-5).
- d. If pressure plate and clutch disc are defective, replace (para. 4-1).
- e. Check flywheel condition (para. 3-5). If flywheel is burned or damaged, replace (para. 3-5) and repair flywheel (TM 9-2815-210-34-2-2).

END OF TESTING!

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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25. BURNING ODOR EVIDENT WITH CLUTCH ENGAGED

CAUTION

- Clutch engagement followed by a burning odor indicates clutch improperly engaged and slipping. When this condition is evident, inspection of vehicle clutch operation is required immediately. Prolonged operation of vehicle under these conditions may result in damaged clutch disc, pressure plate, and flywheel.
- Clutch slippage due to improper clutch disc operation may result in damage to pressure plate, clutch disc, and flywheel contact surface.

NOTE

Light surface discoloration of pressure plate and flywheel contact surfaces may be removed with crocus cloth. Deeper discoloration and hard spots on flywheel may require replacement of part.

Check clutch assembly condition. Remove transmission (para. 8-2). Remove pressure plate and clutch disc for inspection (para. 4-1). Remove release bearing for inspection (para. 8-4).

- a. If flywheel or pressure plate surface is only slightly discolored or damaged, clean with crocus cloth. If damage is greater, replace and repair (paras. 4-1 and 3-5).
- b. If evidence of burned or hard spots on flywheel exist, replace (para. 3-5).
- c. Clutch disc and release bearing defects require replacement of parts (paras. 8-4 and 4-1).

END OF TESTING!

26. CLUTCH NOISY DURING ENGAGEMENT AND DISENGAGEMENT

Step 1. Check clutch noise. Place transmission in neutral. Start engine and push clutch pedal to floor and release.

If noise increases when pedal is depressed and released, remove transmission (para. 8-2).

- a. Check release bearing for defects (para. 8-4).
- b. Check clutch pressure plate levers (TM 9-2815-210-34-2-2 and adjust if necessary).

Step 2. Place transmission in first gear, start engine, and engage clutch.

- a. If clutch noise increased when engaged, remove transmission (para. 8-2).
- b. Remove and inspect pressure plate and clutch disc for defects (para. 4-1).
If pressure plate or clutch disc are defective, replace (para. 4-1).
- c. Check flywheel condition (para. 3-5).
If flywheel is burned or damaged, replace and repair (para. 3-5).

END OF TESTING!

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
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27. VIBRATION DURING CLUTCH ENGAGEMENTCAUTION

Vibration during clutch engagement indicates a warped and/or burned pressure plate and flywheel. When this condition is evident, immediate vehicle clutch inspection is required. Prolonged vehicle operation may result in permanent damage of flywheel and unnecessary damage to transmission.

Check clutch assembly. Remove transmission (para. 8-2). Remove and inspect pressure plate, flywheel, and clutch disc (paras. 3-5 and 4-1).

- a. If pressure plate and clutch disc are defective, replace (para. 4-1).
- b. Check flywheel condition (para. 3-5). If flywheel is burned or damaged, replace and repair (para 3-5).
- c. Check clutch pressure plate levers (TM 9-2815-210-34-2-2) and adjust if necessary.
- d. Check pilot bushing condition (para. 4-1). If pilot bushing is damaged or defective, replace (para. 4-1).

END OF TESTING!

28. CLUTCH PEDAL WILL NOT TRAVEL OR DEPRESS

Check clutch release bearing and yoke condition. Remove transmission (para. 8-2) and inspect housing pivot. Remove release bearing and inspect bearing (para. 8-4) and yoke (para. 8-2).

- a. If transmission housing pivot is damaged, replace and repair (para. 8-2).
- b. If release bearing is defective, replace (para. 8-4).
- c. If transmission yoke is defective, replace (para. 8-2).

END OF TESTING!

TRANSMISSION**29. TRANSMISSION NOISY**

Step 1. Check clutch condition (malfunction 26).

Step 2. Remove transmission for inspection (para. 8-2).

If transmission is defective or damaged, replace and repair (para. 8-2).

Step 3. Check transfer case condition (malfunction 35, step 2 and malfunction 36).

END OF TESTING!

30. TRANSMISSION LEAKS OIL

Check and verify approximate location of oil leak(s).

- a. If transmission top cover gasket is leaking, replace gasket (para. 8-3).
- b. If transmission PTO gasket is leaking, replace gasket in vehicle (TM 9-2520-246-34-1).
- c. If transmission countershaft rear bearing cover gasket is leaking, replace in vehicle (TM9-2520-246-34-1).
- d. If transmission rear companion flange oil seal is leaking, replace seal in vehicle (TM9-2520-246-34-1).
- e. If transmission bearing cap gasket is leaking, replace gasket in vehicle (TM9-2520-246-34-1).
- f. If transmission leak(s) continues, replace (para. 8-2) and repair (TM 9-2520-246-34-1) transmission.

END OF TESTING!

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
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31. TRANSMISSION GRINDS AND/OR POPS OUT OF GEAR DURING SHIFTING

Remove transmission top cover exposing shift forks and synchronizers (para. 8-3).

- a. If any shift fork position is incorrect, adjust (TM 9-2520-246-34-1).
- b. If synchronizers are damaged or defective, replace (para. 8-2) and repair (TM 9-2520-246-34-1) transmission.

END OF TESTING!

TRANSFER CASE

32. TRANSFER CASE WILL NOT OPERATE FRONT DIFFERENTIAL

Step 1. Check sprag air cylinder operation (TM 9-2520-246-34-1) and test using outside air source with engine stopped.

If sprag air cylinder operation is defective, replace sprag cylinder (para. 9-2).

Step 2. With air tanks full and engine off, loosen air lines at sprag air cylinder and listen for sprag clutch engagement in transfer sprag unit.

- a. If forward and reverse sprag engagements are not heard, replace transfer sprag air cylinder (para. 9-3).
- b. If sprag engagement is heard, repair sprag unit in transfer case (TM 9-2520-246-34-1).

END OF TESTING!

33. TRANSFER CASE WILL NOT OPERATE REAR DIFFERENTIAL

Step 1. Confirm transmission-to-transfer propeller shaft turns.

- a. Proceed to step 2 if transmission-to-transfer propeller shaft can be turned with transmission and transfer assembly in neutral.
- b. If transmission-to-transfer propeller shaft will not turn with transmission and transfer assembly in neutral. Repair or replace transfer case (para. 9-2).

Step 2. Confirm transfer-to-forward rear axle propeller shaft can be turned. Place transfer shifter into neutral and raise both rear wheels on one side of vehicle (TM 9-2320-361-20).

- a. Remove and repair transfer assembly if propeller shaft turns (para. 9-2).
- b. If rear axle propeller shaft will not turn, proceed to differential and rear axle mechanical troubleshooting sections of TM 9-2320-361-20. If propeller and axles turn freely replace transfer case (para. 9-2).

END OF TESTING!

34. TRANSFER CASE LEAKS OIL

Check and verify approximate location of oil leak(s).

- a. If transfer case front output shaft cover gasket is leaking, remove transfer case and replace gasket (para. 9-2).
- b. If transfer case housing gasket is leaking, remove transfer case and replace gasket (para. 9-2).
- c. If transfer case input flange oil seal is leaking, replace seal (TM 9-2520-246-34-1).
- d. If transfer case front output flange oil seal is leaking, replace seal (TM 9-2520-246-34-1).
- e. If transfer case input shaft bearing cover gasket is leaking, replace gasket (TM 9-2520-246-34-1).
- f. If transfer case rear output bearing cover gasket is leaking, replace gasket (TM 9-2520-246-34-1).

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
		<ul style="list-style-type: none"> g. If countershaft rear bearing cover gasket is leaking, remove transfer case and replace gasket (para. 9-2 and TM 9-2520-246-34-1). h. If rear output shaft oil seal is leaking, remove transfer case (para. 9-2) and replace seal (TM 9-2520-246-34-1). i. If rear output shaft bearing retainer gasket is leaking, remove transfer case (para. 9-2) and replace gasket (TM 9-2520-246-34-1). j. If top cover gasket is leaking, replace (TM 9-2520-246-34-1). k. If PTO is leaking oil, repair (malfunction 47). l. If transfer case oil leak(s) continues, remove transfer case (para. 9-2) and disassemble (TM 9-2520-246-34-1). Check transfer housing halves for defects. Replace defective components (TM 9-2520-246-34-1). <p style="text-align: center;">END OF TESTING!</p>
35. TRANSFER CASE NOISY		<p>Step 1 Drain transfer case fluid (LO 9-2320-209-12-1) and check for signs of broken gears, metal shavings, and contamination. If broken gears, metal shavings, or contamination are found in transfer case or on magnetic drain plug, repair or replace transfer case (para 9-2).</p> <p>Step 2. Check transfer case operation in high and low range and in neutral. If transfer case is defective, repair or replace (para. 9-2).</p> <p style="text-align: center;">END OF TESTING!</p>
36. TRANSFER CASE GRINDS OR POPS OUT OF GEAR DURING NORMAL VEHICLE OPERATION		<p>Replace and repair transfer case (para. 9-2).</p> <p style="text-align: center;">END OF TESTING!</p> <p style="text-align: center;">DIFFERENTIAL</p>
37. DIFFERENTIAL NOISY		<p>Step 1. Check transfer case operation and noise (malfunction 35).</p> <p>Step 2. Check differential operation. Remove differential drive propeller shaft(s) (TM 9-2320-361-20). Raise wheels (TM 9-2320-361-20) and manually turn wheels and observe differential operation. If tires still will not rotate, remove differential assembly and replace and repair (para. 10-3 or 10-4).</p> <p style="text-align: center;">END OF TESTING!</p>
38. DIFFERENTIAL CLUNKS DURING TURNS OR INITIAL TAKEOFF		<p>Check differential internal operation. Remove differential and disassemble (para. 10-3 or 10-4). Replace and repair defective components (para. 10-3 or 10-4).</p> <p style="text-align: center;">END OF TESTING!</p>
39. DIFFERENTIAL LEAKS OIL		<p>Step 1. Check differential shafts seals condition. Inspect for presence of gear oil at gaskets and companion flange areas.</p> <ul style="list-style-type: none"> a. If oil is present, replace seals and gaskets (para. 10-5). b. If repeated seal replacements does not correct problem and leak continues, remove differential (para. 10-3) and repair (para. 10-4).

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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- Step 2. Check axle housing condition. Inspect axle housing for external evidence of gear oil.
- a. If axle housing has pinhole leaks, repair (TM 9-237) or replace axle housing (paras. 10-2 and 10-8).
 - b. If axle housing is cracked or damaged, replace (paras. 10-2 and 10-8).

END OF TESTING!

40. ABNORMAL TIRE WEAR (FRONT AXLE)

- Check steering knuckle sleeve bushings condition and end play (para. 10-6).
- a. If steering knuckle sleeve bushings are defective, replace (para. 10-6).
 - b. If steering knuckle end play is excessive, adjust (replace with correct shim) (para. 10-6).
 - c. If steering knuckle end play remains excessive, replace sleeves or axle housing (para. 10-6 or 10-2).

END OF TESTING!

41. ABNORMAL TIRE WEAR (REAR AXLE)

- Check rear end frame and suspension alinement (para. 13-3).
If alinement is incorrect, adjust (para. 13-3).

END OF TESTING!

STEERING GEAR

42. EXCESSIVE PLAY IN STEERING

- Step 1. Check steering knuckle condition for defects (malfunction 40).
- Step 2. Check steering gear condition for defects. Inspect for excessive play (TM 9-2320-361-20 and para. 12-3).
- a. If steering gear play is excessive, adjust (TM 9-2320-361-20).
 - b. If steering gear play remains excessive, replace or repair (para. 12-2 or 12-3).

END OF TESTING!

43. STEERING GEAR LEAKING OIL

- Check oil leak and verify location.
- a. If oil leak is at cover gasket, replace gasket (para. 12-3).
 - b. If oil leak is at pitman shaft oil seal, disassemble steering gear and inspect pitman shaft and bushing (para. 12-3). Replace defective components (para. 12-3).

END OF TESTING!

44. STEERING WHEEL HARD TO TURN

- Check front axle for defective steering knuckle bushings (para. 10-6).
Replace steering knuckle bushings if defective (para. 10-6).

END OF TESTING!

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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POWER TAKEOFF

45. (TRANSMISSION-DRIVEN) POWER TAKEOFF INOPERATIVE

Step 1. Check power takeoff. Engage power takeoff and visually confirm output propeller shaft rotation.

If propeller shaft is not rotating (but power takeoff is in engaged position), remove transmission (para. 8-2) with power takeoff. Remove and inspect power takeoff. Repair (TM 9-2520-246-34-1) or replace power takeoff (para. 16-20).

Step 2. Visually inspect transmission power takeoff drive gear for damage.

If drive gear is damaged, repair (TM 9-2520-246-34-1) or replace power takeoff (para. 16-20).

END OF TESTING!

46. (TRANSFER-DRIVEN) POWER TAKEOFF INOPERATIVE

If power takeoff is inoperable, replace (para. 16-20) and repair (TM 9-2320-246-34-1). Engage and visually confirm output propeller shaft rotation.

a. If transfer case half is defective, replace (para. 9-2) or repair (TM 9-2520-246-34-1).

b. If power takeoff is defective, replace (para. 16-20) or repair (TM 9-2520-246-34-1).

END OF TESTING!

47. TRANSMISSION POWER TAKEOFF LEAKS OIL

Determine oil leak location.

a. If power takeoff cover gasket is leaking, replace gasket in vehicle (para. 16-22).

CAUTION

. When replacing gaskets between power takeoff and transmission housing, replace with the exact number of gaskets removed. Failure to use the correct number of new gaskets will affect power takeoff-to-transmission gears spacing and gear backlash. With incorrect gear backlash, equipment may be damaged.

• When power takeoff requires bearing or gear replacement, transmission must be removed in order to adjust power takeoff gear and transmission gear backlash. Failure to adjust backlash may result in damage to equipment.

b. If power takeoff shifter shaft seal, rear output shaft seal, input shaft seal, rear output shaft housing gasket, or input shaft bearing cover gasket is leaking oil, remove power takeoff from transmission and replace defective parts (para. 16-20).

c. If power takeoff gears or bearings require replacement, remove transmission para. 8-2). Remove power takeoff from transmission and replace (para. 16-20) and repair” (TM9-2520-246-34-1).

END OF TESTING!

48. TRANSFER POWER TAKEOFF LEAKS OIL

Check oil feed line between transfer case and power takeoff for loose fittings or damaged line (para. 16-21).

a. If oil line fittings are loose, tighten. If damaged, replace (paras. 9-2 and 16-21).

b. If gaskets or seals on power takeoff are leaking, replace gaskets or seals (para. 16-21).

END OF TESTING!

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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DUMP BODY (M342A2)

49. DUMP BODY WILL NOT RAISE

WARNING

- Overhead lifting device capacity must exceed dump body weight. A shifting, swinging, or falling load may cause injury to personnel.
- . Bleed hydraulic pressure before cracking hydraulic lines. Failure to do so may result in damage to equipment and injury to personnel.

Step 1. Apply parking brake (TM 9-2320-361-10).

NOTE

Some vehicles may not be updated to use dump body hydraulic lock system. When vehicles do not have this system, substitute hydraulic hose will be needed to take the place of existing hydraulic hose on lock system called out in hydraulic system checks.

Step 2. Check hydraulic lock operation. Operate controls to raise dump body (TM 9-2320-361-10). Observe hydraulic lock operation.

If hydraulic lock will not release, manually open hydraulic lock and secure in open position. Operate dump body to raise. If dump body raises, replace hydraulic lock cylinder or lock assembly (para. 16-13).

Step 3. Check hydraulic system for leaks.

WARNING

Use properly rated hydraulic hose when performing hydraulic system checks on vehicles not equipped with dump body lock. Failure to do this may result in injury to personnel.

NOTE

Tag hydraulic hose ends of hydraulic lock system before removal for installation.

Step 4. Attach overhead lifting device to dump body and secure dump body hydraulic lock. Raise dump body with lifting device until dump body is in fully raised position. Secure dump body with safety braces (TM 9-2320-36 1-10).

Step 5. Remove all hydraulic hose ends from upper and lower control box manifolds. Install tee fitting into one of three open ports of upper manifold and plug two ports in upper and lower manifold. Install high pressure gage into tee. Remove one hydraulic hose from lock cylinder and adapt ends so that one end can connect to tee and the other end to open port on lower manifold (para. 16-7).

Step 6. Operate dump body with main control lever set in D position (TM 9-2320-361-10). Maintain engine speed at 1,000 rpm for 10 seconds and observe pressure gage.

If pressure reading is uneven or zero, replace hydraulic pump (para. 16-12).

Step 7. Check pump spacer for cracks or defects (para. 16-12).

If spacer is cracked or defective, replace (para. 16-12).

Step 8. Replace control valve if pressure readings decrease slowly (para. 16-10).

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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- Step 9. Remove tee fitting from upper manifold. Install all hydraulic hoses in correct locations (para. 16-7).
- Step 10. Check hydraulic cylinders operation. Lower dump body until seated on subframe. Remove lifting device. Operate dump body to raised position (TM 9-2320-361-10).
If dump body still will not work, replace hydraulic cylinders (para. 16-8).

END OF TESTING!

50. DUMP BODY WILL NOT LOWER

WARNING

- Overhead lifting device capacity must be greater than dump body weight. Overhead lifting device must remain attached to dump body until troubleshooting is completed. A shifting, swinging, or falling load may cause injury to personnel.
- All personnel must stand clear of dump body during lowering test. Falling dump body may cause injury to personnel.

NOTE

Dump body lowering operation should be checked after each completed troubleshooting check.

- Step 1. Apply parking brake (TM9-2320-361-10).
- Step 2. Attach overhead lifting device to dump body with sufficient slack to show slight downward movement.
- Step 3. Check hydraulic lock cylinder hose valve to ensure that each shutoff is open at upper manifold.
- Step 4. Perform troubleshooting malfunction 49, step 2.
- Step 5. Check control valve for restrictions. Remove and inspect (para. 16-10).
If control valve is restricted, clean or replace (para. 16-10).
- Step 6. Check hydraulic cylinders (malfunction 49, step 10).
If hydraulic cylinders are defective, replace or repair (para. 16-8 or 16-9).

END OF TESTING!

51. DUMP BODY WILL NOT HOLD IN RAISED POSITION

- Step 1. Perform troubleshooting checks malfunction 49, steps 3 through 8.
- Step 2. Check hydraulic cylinders (malfunction 49, step 10).
If hydraulic cylinders are defective, replace or repair (para. 16-8 or 16-9).

END OF TESTING!

FUEL TANK (M49A2C)

WARNING

Do not perform this procedure while smoking or within 50 ft (15 m) of sparks or open flame. Fuel is flammable and can explode easily, causing injury or death to personnel and damage to equipment.

52. FUEL WILL NOT PUMP FROM COMPARTMENTS OR PUMPS SLOWLY

- Step 1. Check transfer case power takeoff operation.
If transfer case power takeoff is not operating, check operation (malfunction 46).

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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Step 2. Check discharge valve operation for selected compartment.

- a. If discharge valve operation is defective, remove and inspect discharge valve internal components (para. 15-13).
- b. If discharge valve internal components are defective, replace (para. 15-13).

Step 3. Check delivery pump operation.

- a. If delivery pump screen and filter separator are not restricted, remove and inspect delivery pump internal components (para. 15-12).
- b. If delivery pump internal components are defective, replace components (para. 15-12).

END OF TESTING!

53. FUEL WILL NOT GRAVITY DRAIN FROM SELECTED COMPARTMENTS

Complete troubleshooting malfunction 52, step 2.

END OF TESTING!

54. FUEL TANK COMPARTMENTS CANNOT BE SUCTION FILLED

Complete troubleshooting malfunction 52, steps 1 and 3.

END OF TESTING!

55. FUEL MIXED WITH WATER WHEN DISPENSED

If dump drain valves operation is defective, remove sump assembly and replace dump drain valve(s) (TM9-2320-361-20).

- a. If drain valves operation is not defective, disassemble sump valve assembly and inspect internal components (para. 15-13).
- b. If sump valve components are defective, replace components (para. 15-13).

END OF TESTING!

WATER TANK (M50A2 AND M50A3)

56. WATER WILL NOT PUMP FROM COMPARTMENTS OR PUMPS SLOWLY

Step 1. Check transfer case power takeoff operation.

If transfer case power takeoff is not operating, check transfer case (malfunctions 32 through 36).

Step 2. Check discharge valve operation for selected compartment.

- a. If discharge valve operation is defective, remove and inspect discharge valve internal components (para. 15-10 or 15-11).
- b. If discharge valve internal components are defective, replace (para. 15-10 or 15-11).

Step 3. Check delivery pump operation.

- a. If delivery pump screen and filter separator are not restricted, remove and inspect delivery pump internal components (para. 15-12).
- b. If delivery pump internal components are defective, replace components (para. 15-12).

END OF TESTING!

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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57. WATER WILL NOT GRAVITY DRAIN FROM SELECTED COMPARTMENTS

Complete troubleshooting malfunction 56, step 2.

END OF TESTING!

58. WATER TANK COMPARTMENTS CANNOT BE SUCTION FILLED

Complete troubleshooting malfunction 56, steps 1 and 3.

END OF TESTING!

EARTH BORING AND POLESETTING (M764)

59. EARTH BORING MACHINE DRIVE INOPERATIVE

WARNING

Eye protection is required when inspecting internal clutch case operation on vehicle. Failure to do this may result in fluid contacting eyes and injury to personnel.

- Step 1. Check clutch case internal drive hubs. Remove top plug from clutch case housing. Operate earth boring machine with drive engaged and feed in neutral (TM9-2320-361-10). Looking through plug hole, observe drive hubs for rotation.
 - a. If rotation of drive hubs is evident, check and replace idler gears (para. 15-43).
 - b. If no rotation of drive hubs is evident, repair or replace clutch case assembly (para. 15-44).
 - Step 2. Check intermediate case drive gears. Operate earth boring machine power leveler (TM9-2320-361-10).
If power leveler will not operate, replace or repair intermediate gear assembly (para. 15-42).
 - Step 3. Check boring case. Remove inspection cover of boring case. Manually rotate rack bar clockwise and observe boring case gears operation.
If rack bar will not turn, replace or repair boring case (para. 15-38).
- END OF TESTING!

60. EARTH BORING MACHINE FEED INOPERATIVE

WARNING

Eye protection is required when inspecting clutch case operation on vehicle. Failure to do this may result in injury to personnel.

NOTE

Earth boring machine auger feed cannot be moved up or down manually without vehicle power to aid operation.

- Step 1. Check clutch case internal feed hubs. Remove top breather and adapter from clutch case housing. Operate earth boring machine with feed engaged and drive in neutral (TM9-2320-361-10).
 - a. If rotation of feed hubs is evident, replace or repair clutch case assembly (para. 15-44).
 - b. If no rotation of feed hubs is evident, check and replace defective idler gears (para. 15-43).

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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- Step 2. Check boring case. Remove inspection cover from boring case. Operate earth boring machine with feed engaged and drive in neutral (TM9-2320-361-10).
- a. If no internal gear movement is evident, replace or repair intermediate gear assembly (para. 15-42).
 - b. If internal gear movement is evident, remove boring case from intermediate case and replace or repair boring case (para. 15-38).

END OF TESTING!

61. EARTH BORING MACHINE BRAKE INOPERATIVE

Replace or repair defective clutch brake case assembly (para. 15-44).

END OF TESTING!

62. EARTH BORING MACHINE WILL NOT MOVE VERTICALLY

Step 1. Check power leveler. Operate power leveler vertical control (TM9-2320-361-10). Observe power leveler output shaft rotation.

If power leveler top output shaft does not rotate, remove power leveler and replace or repair (para. 15-41).

CAUTION

When power leveler-to-intermediate case drive gear is damaged, intermediate case gear should be checked for damage or defects. Failure to check intermediate case gears may damage new power leveler drive gear.

Step 2. Replace or repair defective intermediate case gears (para. 15-42).

END OF TESTING!

63. EARTH BORING MACHINE WILL NOT MOVE HORIZONTALLY

Perform troubleshooting malfunction 62.

END OF TESTING!

64. EARTH BORING MACHINE EXCESSIVELY NOISY

Step 1. Check backlash between feed idler gear and rack feed spur pinion gear (para. 15-43).

If backlash is incorrect, adjust shims on boring case gears (para. 15-38).

Step 2. Check earth boring machine internal gears backlash (paras. 15-41 through 15-42).

If backlash is incorrect, adjust shims on boring case gears (paras. 15-38 through 15-42).

END OF TESTING!

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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OUTRIGGERS

WARNING

- Hydraulic fluid is under high pressure. When additional components are required to perform troubleshooting, use equally rated hydraulic components. Failure to use correctly rated components may result in component failure and injury to personnel.
- Eye protection is required when performing hydraulic systems checks. Failure to do this may result in fluid contacting eyes and injury to personnel.

NOTE

Tag hydraulic hoses for installation.

65. OUTRIGGERS INOPERATIVE

- Step 1. Check hydraulic pump. Remove hydraulic hose from tee fitting below check valve. Install test hydraulic tee into check valve hydraulic tee and install high pressure gage into test tee. Operate outrigger control lever (TM9-2320-361-10).
- If pressure gage reading is uneven, replace regulator valve (para. 15-46).
 - If pressure gage reading is low and uneven, replace hydraulic pump (para. 15-45).
- Step 2. Remove test hydraulic tee and high pressure gage. Install hydraulic hose in check valve tee.
- Step 3. Check control valve. Remove four hydraulic hoses from control valve. Install one tee in each of four open ports of control valve. Install one pressure gage in each of four tees. Install hydraulic hoses in correct tee on proper port of control valve (para. 15-46).
- Step 4. Operate earth boring machine hydraulic pump and outrigger control to extend outriggers (TM9-2320-361-10). Observe pressure gages readings.
- If pressure reading on all gages decreases, replace control valve (para. 15-46).
 - If pressure reading on one or more gages is normal and even, repair hydraulic cylinder(s) as appropriate (para. 15-48).

END OF TESTING!

66. OUTRIGGERS OPERATE UNEVENLY

- Step 1. Perform troubleshooting malfunction 65, steps 3 and 4.
- Step 2. Replace or repair hydraulic cylinders (para. 15-48).

END OF TESTING!

67. OUTRIGGERS WILL NOT HOLD IN EXTENDED POSITION

- Complete troubleshooting malfunction 65, steps 3 and 4.

END OF TESTING!

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
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WINCHES

68. CLUTCH WILL NOT ENGAGE DRUM

Step 1. Check shifter shaft and clutch.

- a. Remove end case and disassemble (para. 16-2, 16-3, or 16-4).
- b. Remove rust and dried lubricant from end case, reassemble, and install (para. 16-2, 16-3, or 16-4).

Step 2. Check for mechanical obstruction if clutch handle moves short distance, then clatters.

Remove end case and disassemble. Inspect clutch and drum jaws for burrs, breaks, and misalignment. Repair winch if defective (para. 16-2, 16-3, or 16-4).

END OF TESTING!

69. WINCH NOISY WHEN UNDER LOAD

Step 1. Check drum for radial free play.

Replace bushings if radial free play is present (para. 16-2, 16-3, or 16-4).

Step 2. Check wormshaft radial free play.

Disassemble gearcase, inspect parts, and replace parts if defective (para. 16-2, 16-3, or 16-4).

Step 3. Check automatic brake.

Replace brakeshoe if defective (para. 16-2, 16-3, or 16-4).

END OF TESTING!

70. DRUM OVERRUNS CABLE OR CABLE COILS LOOSEN WHEN PAYING OUT CABLE

Check drag brake adjustment (TM9-2320-361-20).

Replace drag brake if noisy or no adjustment remains (para. 16-2, 16-3, or 16-4).

END OF TESTING!

71. WINCH DOES NOT HOLD LOAD WHEN POWER RELEASED

Step 1. Check for presence of burned odor.

Replace automatic brakeshoe if defective (para. 16-2, 16-3, or 16-4).

Step 2. Automatic brake does not hold load after adjustment.

Replace automatic brakeshoe if defective and inspect drum (para. 16-2, 16-3, or 16-4).

END OF TESTING!

72. WINCH LEAKS OIL

Step 1. Check for defective oil seals and gaskets.

Replace oil seals and gaskets if defective (para. 16-2, 16-3, or 16-4).

Step 2. Check for cracked covers and housings.

Replace covers and housings if cracked (para. 16-2, 16-3, or 16-4).

END OF TESTING!

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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WINTERIZATION KITS

NOTE

Mechanical troubleshooting for personnel and engine coolant heaters are the same. The following is for fuel burning personnel heaters.

73. HEATER FAILS TO TURN ON

Bench test for defective control parts (para. 17-19 or 17-20).

If defective, replace control parts (paras. 17-2 through 17-18, as necessary).

END OF TESTING!

74. HEATER OVERHEATS - OVERHEAT SWITCH IS GOOD

Step 1. Check for obstructed air flow.

If obstructed, clear obstructions from fuel supply air and ventilating air passages (para. 17-8 or 17-14).

Step 2. Check fuel control valve (para. 17-19 or 17-20).

Replace fuel control valve if defective (para. 17-6 or 17-12).

END OF TESTING!

75. HEATER OVERHEATS - CONTINUES TO RUN

Test overheat switch (para. 17-19 or 17-20).

Replace overheat switch if defective (para. 17-7 or 17-17).

END OF TESTING!

76. HEATER OUTPUT TOO LOW

Step 1. Check for obstructed fuel lines or contaminated fuel supply.

a. If obstructed, clear fuel supply lines (para. 17-8 or 17-14 for internal fuel supply and TM 9-2320-361-20 for external fuel supply).

b. Drain fuel control valve (para. 17-19 or 17-20).

Replace fuel control valve if defective (para. 17-6 or 17-12).

Step 2. Check fuel control valve (para. 17-19 or 17-20).

Replace fuel control valve if defective (para. 17-6 or 17-12).

END OF TESTING!

77. HEATER SMOKES AND BANGS WHEN STARTING

Perform malfunction 76, step 2.

END OF TESTING!

78. BLOWER WILL NOT STOP AFTER TURN OFF

Check flame detector switch condition (para. 17-19 or 17-20).

Replace flame detector switch if defective (para. 17-2 or 17-15).

END OF TESTING!

Table 2-1. Mechanical Troubleshooting (Contd).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

79. ODOR OF FUEL IN VENTILATING AIR

- Step 1. Check for leaking fuel connections at stand pipe and fuel valve.
Tighten connections if loose (para. 17-8 or 17-14).
 - Step 2. Check burner preformed packing and gasket (para. 17-9 or 17-16).
Replace preformed packing and gasket if defective (para. 17-9 or 17-16).
- END OF TESTING!

80. BLOWER RUNS BUT HEATER FAILS TO IGNITE

- Step 1. Test igniter (para. 17-19 or 17-20).
Replace igniter if defective (para. 17-7 or 17-13).
 - Step 2. Check fuel control valve (para. 17-19 or 17-20).
Replace fuel control valve if defective (para. 17-6 or 17-12).
 - Step 3. Check for obstructed ignition air passages.
Clear ignition air passages of obstruction.
- END OF TESTING!

81. HEATER SMOKES DURING NORMAL OPERATION

- Step 1. Check for slow blower motor operation (para. 17-19 or 17-20).
Replace blower motor if defective (para. 17-3 or 17-11).
 - Step 2. Test fuel control valve (para. 17-19 or 17-20).
Replace fuel control valve if defective, (para. 17-6 or 17-12).
- END OF TESTING!

Section III. GENERAL MAINTENANCE INSTRUCTIONS

2-7. GENERAL MAINTENANCE INSTRUCTIONS INDEX

Publications which provide additional information on general shop practice techniques, preservation, welding, sheet metal work, etc., are listed in Appendix A, References, of this manual. To find a particular general maintenance instruction, use the instruction index below.

PARA. NO.	TITLE	PAGE NO.
2-8.	Cleaning	2-33
2-9.	Inspection	2-34
2-10.	Repair	2-35
2-11.	Assembly - Precautionary Rules	2-36

2-8. CLEANING

a. General Instructions. Cleaning procedures will be the same for the majority of parts and components which make up the vehicle subassemblies. General cleaning procedures are detailed in “b” through “k.”

b. The Importance of Cleaning. Great care and effort are required in all cleaning operations. The presence of dirt and foreign material is a constant threat to satisfactory vehicle operation and maintenance. The following will apply to all cleaning operations:

- (1) Clean all parts before inspection, after repair, and before assembly.
- (2) Hands must be kept free of large amounts of grease, which can collect dust and grit.
- (3) After cleaning, all parts must be covered or wrapped in plastic or paper to protect them from dust and/or dirt.

WARNING

Compressed air source will not exceed 30 psi (207 kPa). When cleaning with compressed air, eyeshields must be worn. Failure to wear eyeshields may result in injury to personnel.

c. External Engine Cleaning. All electrical equipment and other parts that could be damaged by steam cleaning or moisture must be removed and all openings covered before cleaning. Dry with compressed air.

d. Disassembled Parts Cleaning.

- (1) Place all disassembled parts in wire basket(s) for cleaning.
- (2) Dry and cover all cleaned parts.
- (3) Place on or in “racks” and hold for inspection or repair.
- (4) All parts subject to rusting must be lightly oiled and wrapped.
- (5) Keep all related parts and components together. Do not mix parts.

WARNING

Improper cleaning methods and use of unauthorized cleaning solvents may cause damage to equipment or injury to personnel. Refer to TM 9-247 for cleaning method information.

e. Castings.

- (1) Clean inner and outer surfaces of castings, and all areas likely to collect grease and oil, with cleaning solvents (TM 9-247).
- (2) Use a stiff brush to remove sludge and gum deposits.

WARNING

Compressed air source will not exceed 30 psi (207 kPa). When cleaning with compressed air, eyeshields must be worn. Failure to wear eyeshields may result in injury to personnel.

- (3) Use compressed air to blow out all tapped screw holes and to dry castings after cleaning.

f. Oil Passages. Particular attention must be given to all oil passages in castings and machined parts. Oil passages must be kept clean and free of any obstructions.

- (1) Clean passages with wire probes to break up any sludge or gum deposits.
- (2) Wash passages by flushing with cleaning solvents (TM 9-247).
- (3) Dry passages with compressed air.

CAUTION

Do not allow drycleaning solvents to come in contact with seals, cables, or flexible hoses. These cleaners cause leather, rubber, and synthetic materials to dry out, rot, and lose pliability, making them unserviceable.

g. Oil Seals, Electrical Cables, and Flexible Hoses. Clean with soap and water.

2-8. CLEANING (Contd)

h. Bearings.

(1) Bearings require special cleaning. After removing surface oil and gum deposits, place bearings in hot oil 140F (60°C) to loosen congealed oil and grease. Wipe bearings dry; do not use compressed air. After cleaning, coat bearings with oil, wrap in paper, and hold for inspection.

(2) Refer to TM 9-214 for information on care of bearings.

WARNING

. Drycleaning solvent is flammable and will not be used near open flame. Use only in well-ventilated places. Failure to do so may result in injury to personnel.

• Compressed air source will not exceed 30 psi (207 kPa). When cleaning with compressed air, eyeshields must be worn. Failure to wear eyeshields may result in injury to personnel.

i. Machine Tooled Parts. Clean with drycleaning solvent and dry with compressed air.

j. Machined Surfaces. Clean with drycleaning solvent and dry with lint-free cloth.

k. Mating Surfaces. Use compressed air to blow out all tapped screw holes when cleaning gasket material (ex: cylinder head gasket cleaning).

2-9. INSPECTION

a. General Instructions. Procedures for inspections will be the same for many parts and components which make up the vehicle subassemblies. General procedures are detailed in “b” through “p.” Dimensional standards for parts have been fixed at extremely close tolerances, so use specification tables. Use specified inspection equipment for inspections where cracks and other damage cannot be spotted visually. Exercise extreme care in all phases of inspection.

b. Castings.

(1) Inspect all ferrous and nonferrous castings for cracks using a magnifying glass and strong light.

(2) Refer to MIL-I-6866, Inspection, Liquid Penetrant Methods, and MIL-I-6868, Inspection Process, Magnetic Particles.

(3) Particularly check areas around studs, pipe plugs, threaded inserts, and sharp corners. Replace all cracked castings.

(4) Inspect machined surfaces for nicks, burrs, or raised metal. Mark damaged areas for repair or replacement.

(5) Inspect all pipe plugs, pipe plug openings, screws, and screw openings for damaged or stripped threads.

(6) Check all gasket mating surfaces, flanges on housings, and supports for warpage with a straightedge or surface plate. Visually inspect mating flanges for discolorations. This may indicate persistent oil leakage.

(7) Check all castings for conformance to applicable repair standards.

c. Bearings. Refer to TM 9-214 for inspection of bearings. Check all bearings for conformance to applicable repair standards.

d. Studs, Bolts, and Screws. Replace if threads are damaged, bent, loose, or stretched.

e. Gears.

NOTE

When gear teeth wear limits are not established, good judgement is required to determine if gear replacement is necessary.

(1) Inspect all gears for cracks using a magnifying glass and strong light. No cracks are allowed.

(2) Inspect gear teeth for wear, sharp fins, burrs, and galled or pitted surfaces.

(3) Check keyway slots for wear and/or damage.

2-9. INSPECTION(Contd)

f. Bushings and Bushing Type Bearings.

(1) Check all bushings and bushing-type bearings for secure fit, evidence of overheating, wear, burrs, nicks, and out-of-round condition.

(2) Check for dirt in lubrication holes or grooves. Holes and grooves must be clean and free from damage.

g. Oil Seals. Oil seals are mandatory replacement items.

h. Core Hole Expansion Plugs. Inspect for leakage. Replace plugs when leakage is present.

i. Machine Tooled Parts. Inspect for cracks, breaks, elongated holes, wear, and chips.

j. Machined Surfaces. Inspect for cracks, evidence of wear, galled or pitted surface, burrs, nicks, and scratches.

k. Mated Surfaces. Inspect for remains of old gasket, seal, evidence of leakage, pitting, and secure fit.

l. Rusted Surfaces. Inspect for pitting, holes, and severe damage.

m. Oil Bathed Internal Parts. Inspect for cracks, nicks, burrs, evidence of overheating, and wear.

n. Air-Actuated Internal Parts. Inspect for cracks, nicks, burrs, evidence of overheating, and wear.

o. Externally Exposed Parts. Inspect for breaks, cracks, rust damage, and wear.

p. Springs. Inspect for broken, collapsed, and twisted coils.

2-10. REPAIRS

a. General Instructions. Repair of most parts and components is limited to general procedures outlined in applicable maintenance instructions and the following procedures, "b" through "h."

CAUTION

Repaired items must be thoroughly cleaned to remove metal chips and abrasives. Metal chips and abrasives can enter working parts of vehicle and cause damage to equipment.

b. Castings.

(1) All cracked castings will be replaced.

(2) Only minor repairs to machined surfaces, flanges, and gasket mating surfaces are permitted. Remove minor nicks, burrs, and/or scratches with:

(a) Fine mill file.

(b) Crocus cloth dipped in cleaning solvent.

(c) Lapping across a surface plate.

(3) Remachining of machined surfaces to repair damage, warpage, or uneven surfaces is not permitted. Replace castings.

(4) Repair damaged threaded pipe plug and/or screw threads with a tap. Repair oversize holes with threaded inserts.

c. Bearings. Refer b TM 9-214.

d. Studs. Replace all bent and stretched studs. Repair minor thread damage with a thread die. Replace studs having stripped or damaged threads as outlined below:

(1) Remove using a stud remover. Back studs out slowly to avoid heat buildup and seizure which can cause stud to break off.

CAUTION

Refer to TM 9-237, Welding Instructions, to avoid damage to castings if welding method is used.

(2) If studs break off too short to use a stud remover, use a stud extractor to remove, or use "welding method."

2-10. REPAIR (Contd)

(3) Broken studs can be removed by welding a nut or bar stock to stud and removing with wrench.

NOTE

Standard studs may have a coarse thread on one end and a fine thread on the other end. The coarse thread end is installed in the aluminum casting. Studs having coarse threads on both ends are used in some applications. The short threaded end goes into the casting. Refer to TM 9-2320-361-34P for correct part numbers.

(4) Replacement studs have a special coating and must have a small amount of antiseize compound (MILA-907) applied on threads before stud is installed. Install replacement stud slowly to prevent heat buildup and snapping off.

e. Gears.

(1) Remove gears using pullers.

(2) Use the same methods described in paragraph 2-10b to remove minor nicks, burrs, or scratches on gear teeth.

(3) If keyways are worn or enlarged, replace gear.

f. **Bushings and Bushing-Type Bearings.** When bushings and bushing-type bearings seize to a shaft and spin in the bore, the associated part must also be replaced.

g. Oil Seals.

(1) Remove oil seals by pressing or prying out. Be careful not to damage casting or adapter bore.

(2) Always install new seal in bore using proper seal replacing tool.

h. **Cylinder Head - Cylinder Block.** Repair of cylinder head and cylinder block is limited to procedures outlined in TM 9-2815-210-34-2-2.

2-11. ASSEMBLY - PRECAUTIONARY RULES

a. Cleanliness is essential in all component assembly operations. Dirt and dust, even in small quantities, are abrasive. Parts must be cleaned as specified and kept clean. Wrap or cover parts and components when assembly procedures are not immediately completed.

b. Coat all bearings and contact surfaces with operating oil (axle oil for axle parts, transmission oil for transmission parts, etc.) to ensure lubrication of parts during initial operation after repair.

c. Use new gaskets and preformed packings during assembly of all components.

CHAPTER 3 ENGINE MAINTENANCE

Section I. In-Vehicle Engine Maintenance (page 3-1)

Section II. Engine Replacement (page 3-56)

Section 1. IN-VEHICLE ENGINE MAINTENANCE

3-1. IN-VEHICLE ENGINE MAINTENANCE INDEX

PARA NO.	TITLE	PAGE NO.
3 - 2	Engine Front and Rear Mounting Brackets Replacement	3-1
3 - 3	Cylinder Head Maintenance	3-4
3 - 4	Vibration Damper and Seal Maintenance	3-10
3 - 5	Flywheel and Transmission Adapter Plate Maintenance	3-14
3 - 6	Rocker Arm Covers Replacement	3-16
3 - 7	Rocker Arms and Pushrods Maintenance	3-20
3 - 8	Timing Gears Cover and Gasket Replacement	3-28
3 - 9	Tappet Chamber Cover and Gasket Replacement	3-30
3 - 10	Valve Tappets Maintenance	3-32
3 - 11	Oil Pan Replacement	3-34
3 - 12	Oil Pump Maintenance	3-36
3 - 13	Oil Pressure Regulator Housing Maintenance	3-40
3 - 14	Engine Oil Cooler Replacement	3-46
3 - 15	Engine Oil Cooler and Oil Filter Housing Maintenance	3-48
3 - 16	Air Compressor Support and Gasket Replacement	3-50
3 - 17	Intake and Exhaust Manifolds Maintenance	3-52

3-2. ENGINE FRONT AND REAR MOUNTING BRACKETS REPLACEMENT

THIS TASK COVERS:

- a. Front Mounting Bracket Removal**
- b. Front Mounting Bracket Installation**

- c. Rear Mounting Bracket Removal**
- d. Rear Mounting Bracket Installation**

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Torque wrench, 3/4-in. dr. (Appendix B, Item 6)
- 1-1/8-in. socket, 3/4-in. dr. (Appendix B, Item 33)
- 1-1/4-in. socket, 3/4-in. dr. (Appendix B, Item 37)
- Breaker bar, 3/4-in. dr. (Appendix B, Item 34)

MATERIALS/PARTS

- Three lockscrews (front bracket) (Appendix F, Item 115)
- Lockscrew (front bracket) (Appendix F, Item 116)
- Lockscrew (front bracket) (Appendix F, Item 117)
- Four locknuts (rear bracket) (Appendix F, Item 88)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

- TM 9-2320-361-10
- TM 9-2320-361-20
- TM 9-2320-361-34P

EQUIPMENT CONDITION

- Hood raised and secured (TM 9-2320-361-10).
- Wheels chocked (TM 9-2320-361-10).
- Battery ground cable disconnected (TM 9-2320-361-20).
- Primary fuel filter removed (right front mount only) (TM 9-2320-361-20).
- Steering gear removed (left front mount only) (para. 12-2).

GENERAL SAFETY INSTRUCTIONS

- All personnel must stand clear during lifting operations.
- Do not detach lifting device from engine until all engine weight is equally distributed and engine is stable.
- Lifting device must have weight capacity greater than the weight of the engine and transmission.

3-2. ENGINE FRONT AND REAR MOUNTING BRACKETS REPLACEMENT (Contd)

WARNING

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
- Do not detach lifting device from engine until all engine weight is equally distributed and engine is stable. An improperly supported engine may cause injury to personnel.
- Lifting device must have a weight capacity greater than the weight of the engine and transmission to prevent damage to equipment and injury to personnel.

CAUTION

Closely observe all engine and transmission attachments during removal to prevent damage to equipment.

NOTE

Assistant will help with lifting operations.

a. Front Mounting Bracket Removal

1. Attach lifting device to front engine lifting bracket (10). Raise lifting device enough to remove slack.
2. Remove three lockscrews (7) and washers (8) from front bracket (5) and mounting plate (9). Discard lockscrews (7).
3. Remove lock screw (4), washer (2), lock screw (3), washer (2), and front bracket (5) from engine block (6). Discard lockscrews (3) and (4).

b. Front Mounting Bracket Installation

1. Install front bracket (5) on engine block (6) with washer (2), new lock screw (3), washer (2), and new lock screw (4). Tighten lock screws (4) and (3) 200-250 lb-ft (271-339 N.m).
2. Install front bracket (5) on mounting plate (9) with three washers (8) and new lock screws (7). Tighten three lock screws (7) 25-27 lb-ft (34-37 N.m).
3. Lower lifting device and remove from front engine lifting bracket (10).

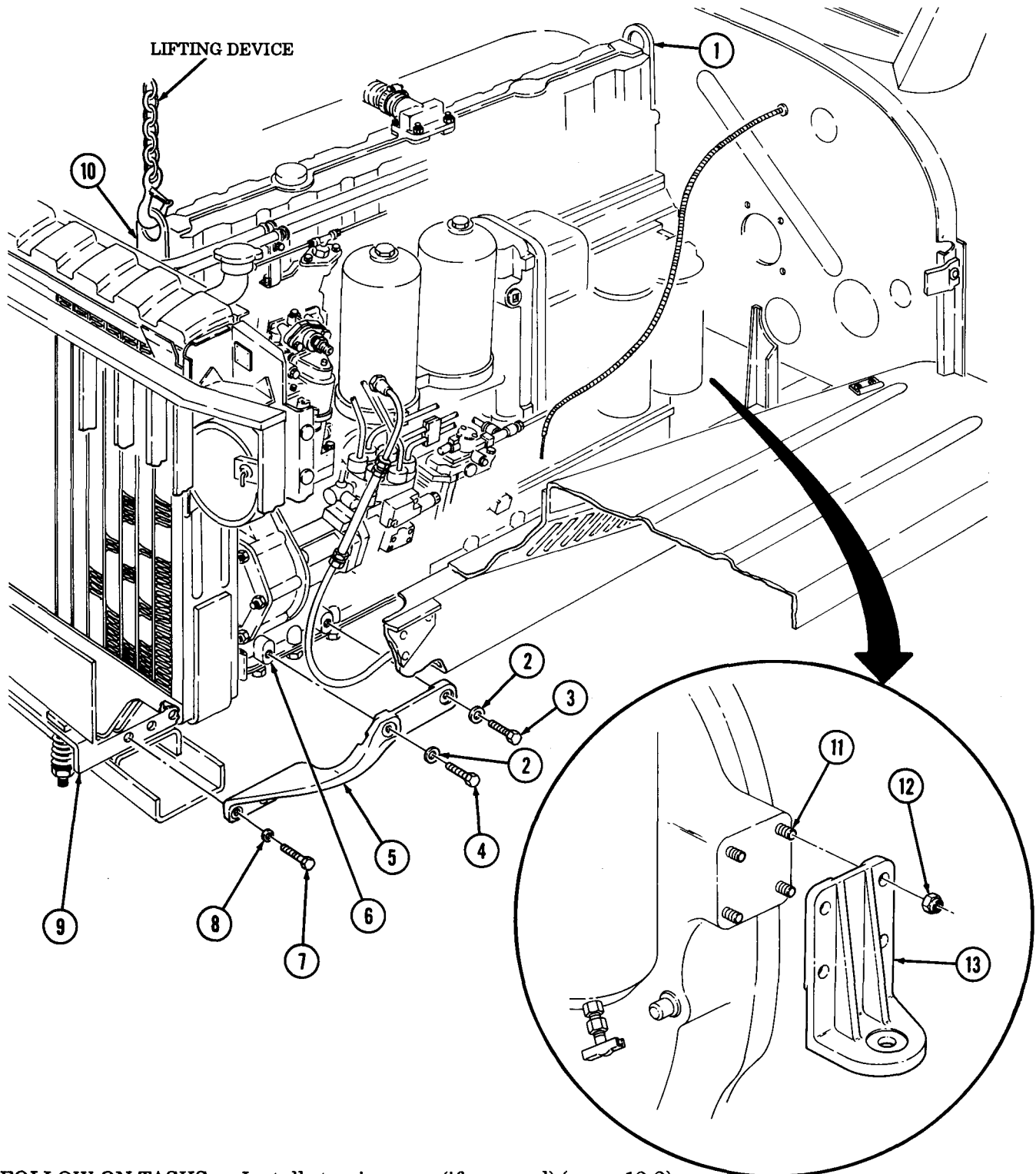
c. Rear Mounting Bracket Removal

1. Attach lifting device to rear engine lifting bracket (1). Raise lifting device enough to remove slack.
2. Remove rear engine mount pad (TM 9-2320-361-20).
3. Remove four locknuts (12) and rear bracket (13) from flywheel housing studs (11). Discard locknuts (12).

d. Rear Mounting Bracket Installation

1. Install rear bracket (13) on flywheel housing studs (11) with four new locknuts (12). Tighten locknuts (12) 45-55 lb-ft (61-75 N.m).
2. Install rear engine mount pad (TM 9-2320-361-20).
3. Lower lifting device and remove lifting device from rear engine lifting bracket (1).

3-2. ENGINE FRONT AND REAR MOUNTING BRACKETS REPLACEMENT (Contd)



- FOLLOW-ON TASKS:**
- Install steering gear (if removed) (para. 12-2).
 - Install primary fuel filter (if removed) (TM 9-2320-361-20).
 - Connect battery ground cable (TM 9-2320-361-20).
 - Unchock wheels (TM 9-2320-361-10).

3-3. CYLINDER HEAD MAINTENANCE

THIS TASK COVERS:

- | | |
|--|-------------------------------|
| <p>a. Removal
 b. Cleaning, Inspection, and Repair</p> | <p>c. Installation</p> |
|--|-------------------------------|

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 Torque wrench, 1/2-in. dr.
 (Appendix B, Item 7)

SPECIAL TOOLS

Cylinder head wrench (Appendix B, Item 62)

MATERIALS/PARTS

Gasket (Appendix F, Item 36)
 Two lockwashers (Appendix F, Item 129)
 Lubricating oil (Appendix C, Item 13)
 Sealing compound, gasket forming
 (Appendix C, Item 19)

REFERENCES (TM)

TM 9-2320-361-10
 TM 9-2320-361-20
 TM 9-2320-361-34P
 TM 9-2815-210-34-2-2

EQUIPMENT CONDITION

- .Battery ground cable disconnected
 (TM 9-2320-361-20).
- Air intake tube and cap removed
 (TM 9-2320-361-20).
- Rocker arms and pushrods removed (para. 3-7).
- Fuel injector nozzles and holders removed
 (para. 5-2).
- Intake and exhaust manifolds removed
 (para. 3-17).

GENERAL SAFETY INSTRUCTIONS

- Ensure engine compartment is free of all tools and working materials before starting engine.
- Hand protection must be worn during nut retightening. Engine components are hot.

a. Removal

1. Remove two screws (8), lockwashers (7), bracket (6), and lifting bracket (9) from cylinder head (2). Discard lockwashers (7).
2. Using cylinder head wrench, remove fourteen nuts (1) and washers (10) from studs (5).

CAUTION

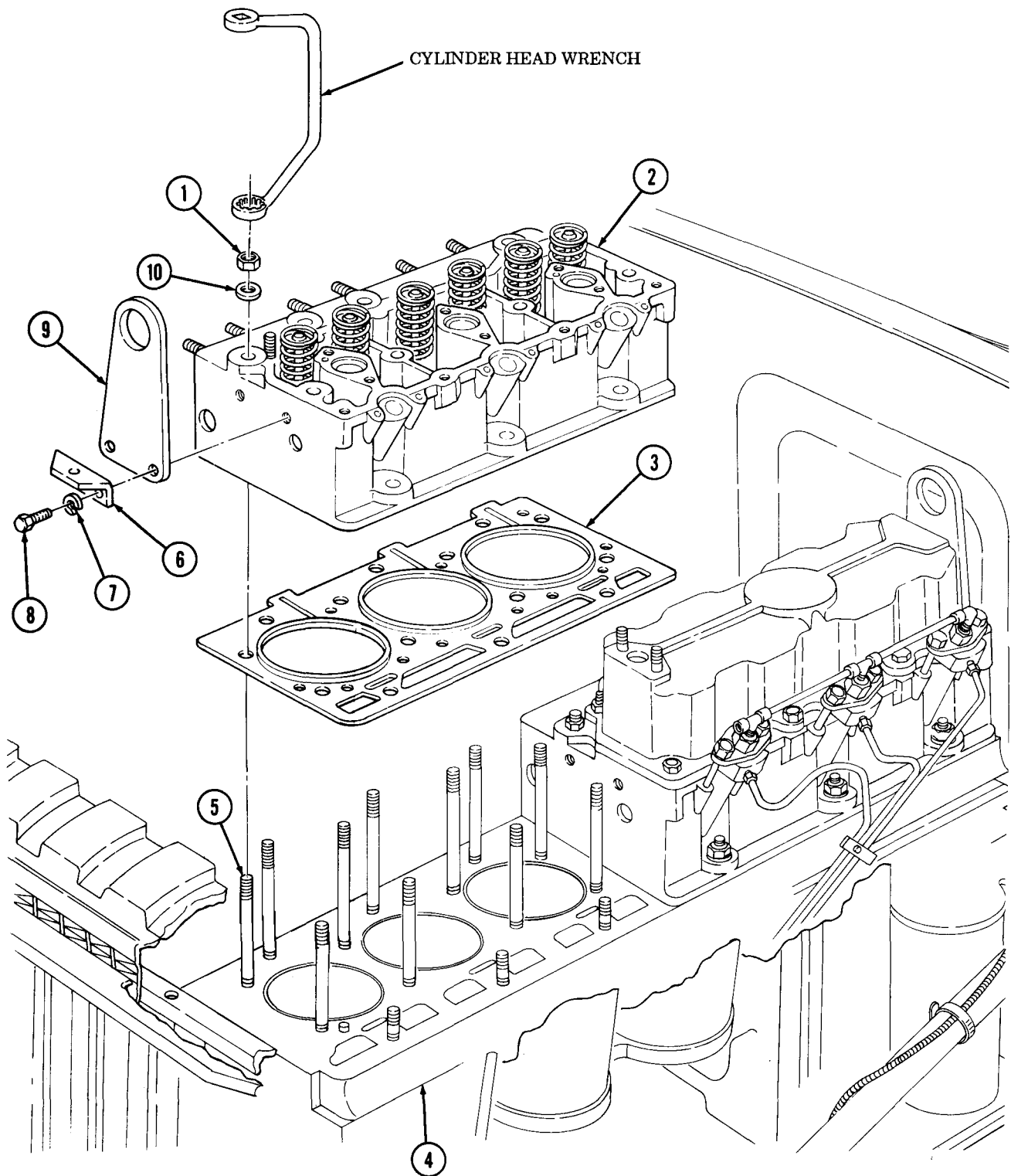
Uneven lifting and binding of cylinder head may damage studs and cause misalignment of cylinder head during installation.

NOTE

Cylinder head is heavy and may require the use of a lifting device during removal.

3. Remove cylinder head (2) and gasket (3) from engine block (4). Discard gasket (3).

3-3. CYLINDER HEAD MAINTENANCE (Contd)



3-3. CYLINDER HEAD MAINTENANCE (Contd)

b. Cleaning, Inspection, and Repair

1. For general cleaning instructions, refer to para. 2-8.
2. Remove all excess gasket material from engine block (4) and cylinder head (2).
3. For general inspection instructions, refer to para. 2-9. For stud repair, refer to para. 2-10.
4. Refer to TM 9-2815-210-34-2-2 for cylinder head repair.

c. Installation

CAUTION

Do not allow lubricating oil to contact the surface on engine block where cylinder head gasket bonds. Cylinder head gasket may become contaminated with oil and fail to seal on engine block and cylinder head.

1. Apply a thin coat of new engine oil on threads of fourteen studs (5) and nuts (1) facings.
2. Locate point (11) on new gasket (3) approximately 2 in. (51 mm) above edge (13). Begin at point (11) and apply a thin, uniform coat of sealing compound approximately 0.5 in. (12.7 mm) wide along edge (13) on both sides of gasket (3) until reaching point (12) as shown.

CAUTION

Do not bind cylinder head against studs during installation. Bending of studs may cause cylinder head misalignment to guide pins. Cylinder head cannot be installed on engine block when this condition exists.

3. Install new gasket (3) and cylinder head (2) on fourteen studs (5) and engine block (4) with fourteen washers (10) and nuts (1).

NOTE

If studs rotate when torquing nuts, remove cylinder head (task a) and replace or repair studs (para. 2-10).

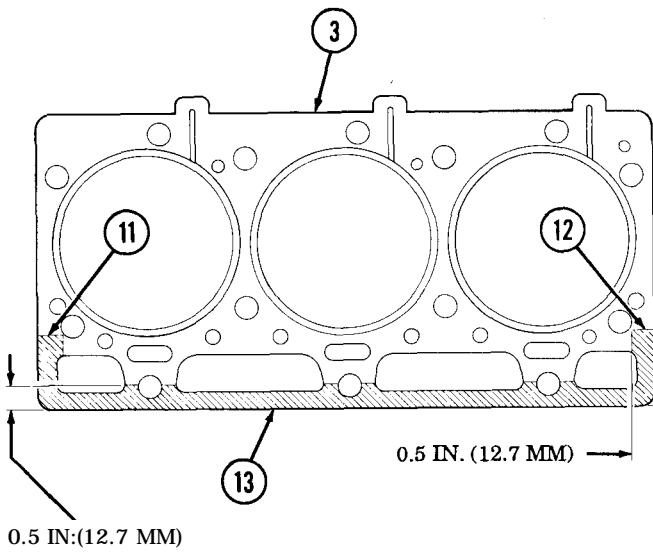
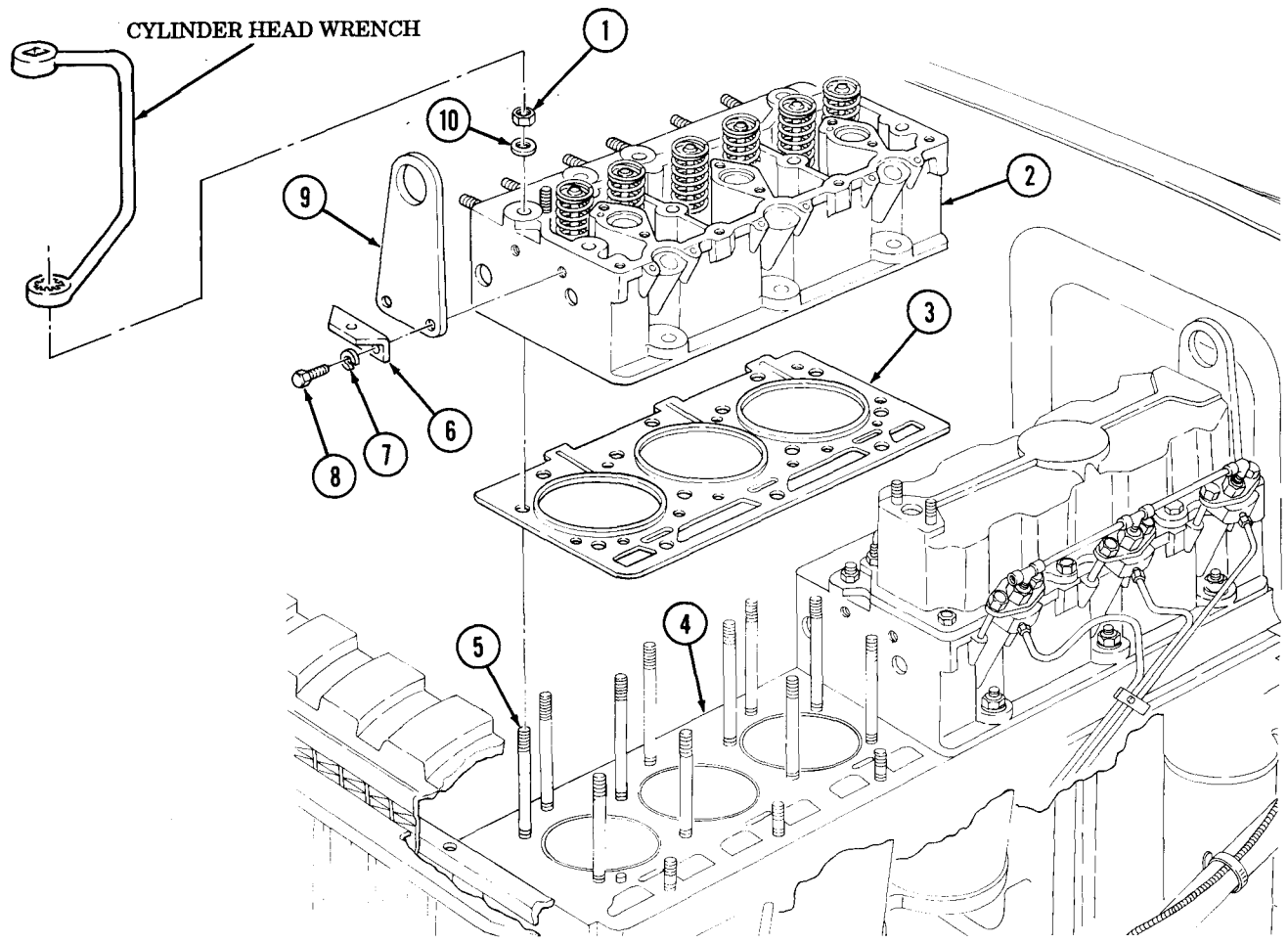
4. Tighten fourteen nuts (1) to 40 lb-ft (54 N.m) in torque sequence shown.
 - a. Using torque sequence, tighten nuts (1) to 80 lb-ft (109 N.m).
 - b. Using torque sequence, tighten nuts (1) to 110 lb-ft (149 N.m).
 - c. Using torque sequence, tighten nuts (1) to 130 lb-ft (176 N.m).
5. Install lifting bracket (9) and bracket (6) on cylinder head (2) with two new lockwashers (7) and screws (8).
7. Install intake and exhaust manifolds (para. 3-17).
8. Install and adjust rocker arms and pushrods (para. 3-7).

NOTE

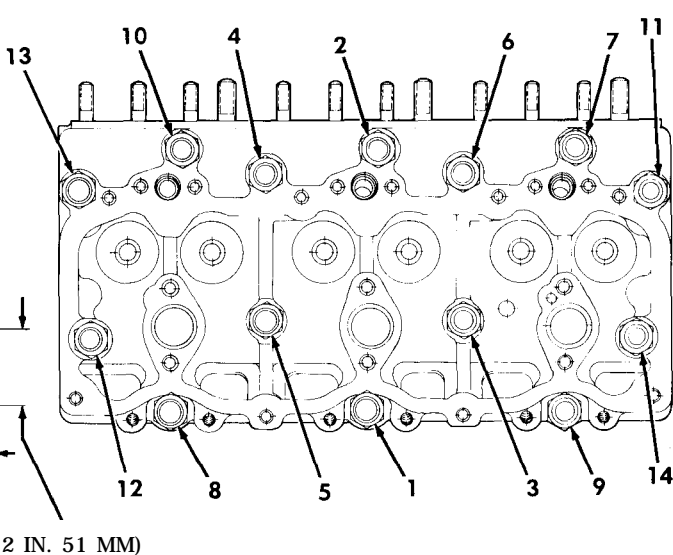
Do not apply sealing compound on rocker arm cover gasket at this time.

9. Install rocker arm cover and gasket (para. 3-6).
10. Install fuel injector nozzles and holders (para. 5-2).
11. Install air intake tube and cap (TM 9-2320-361-20).
12. Connect battery ground cable (TM 9-2320-361-20).

3-3. CYLINDER HEAD MAINTENANCE (Contd)



SEALANT DIAGRAM



TORQUE SEQUENCE

3-3. CYLINDER HEAD MAINTENANCE (Contd)

WARNING

Ensure engine compartment is free of all tools and working materials before starting engine. Failure to do this may result in damage to equipment and injury to personnel.

12. Start engine (TM 9-2320-36 1-10). Idle engine until coolant temperature reaches a minimum of 175°F (79C) before engine shutdown.
13. Remove no. 1 through no. 3 injector tubes (para. 5-3).
14. Remove rocker arm cover and gasket (para. 3-6).
15. Remove rocker arm assembly (para. 3-7).

WARNING

Hand protection must be worn during nut retightening. Engine surface is hot and can cause injury to personnel.

CAUTION

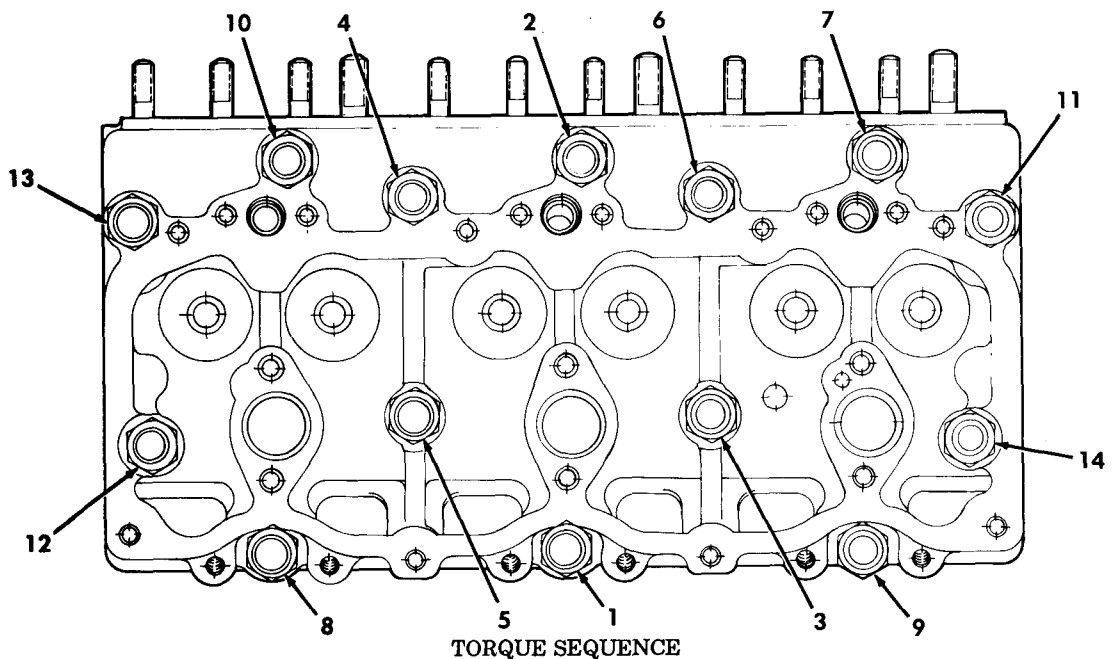
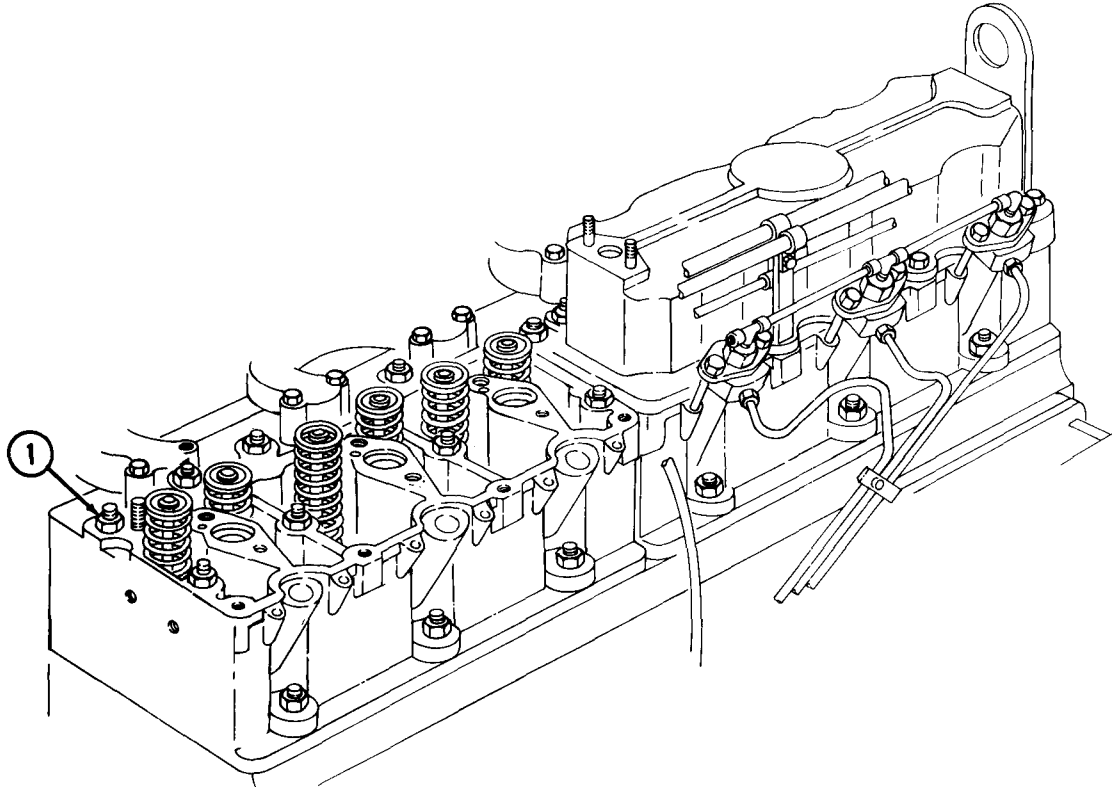
- All nuts must rotate during tightening recheck. Failure of nut(s) to rotate may result in improper torque setting, cylinder head warpage, and gasket failure.
- During nuts tightening recheck, engine coolant temperature must remain 170F (77C) or above to maintain cylinder head expansion. Tightening of nuts when coolant is below 170F (77°C) may result in cylinder head warpage and gasket failure.

NOTE

If studs rotate when torquing nuts, remove cylinder head (task a) and repair or replace studs (para. 2-10).

16. Tighten fourteen nuts (1) to 130 lb-ft (176 N.m) in torque sequence shown.

3-3. CYLINDER HEAD MAINTENANCE (Contd)



TORQUE SEQUENCE

- FOLLOW-ON TASKS:**
- Install rocker arm assembly and adjust valve clearance (para. 3-7).
 - Install rocker arm cover and gasket (para. 3-6).
 - Install injector tubes (para. 5-3).

3-4. VIBRATION DAMPER AND SEAL MAINTENANCE

THIS TASK COVERS:

- a. Removal**
- b. Cleaning and Inspection**

- c. Installation**

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Torque wrench, 3/4-in. dr. (Appendix B, Item 6)
- 1-5/8-in. socket, 3/4-in. dr. (Appendix B, Item 45)
- Handle, socket wrench, 3/4-in. dr. (Appendix B, Item 46)
- Mechanical puller (Appendix B, Item 22)
- Magnetic particle equipment (Appendix B, Item 63)

SPECIAL TOOLS

- Crankshaft driver (Appendix B, Item 48)
- Oil seal inserter (Appendix B, Item 47)

MATERIALS/PARTS

- Seal (Appendix F, Item 220)
- Two lockwashers (Appendix F, Item 123)
- Lubricating oil OE/HDO 30 (Appendix C, Item 13)

REFERENCES

- TM 9-2320-361-10
- TM 9-2320-361-20
- TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Fuel shutoff valve disconnected (TM 9-2320-361-10).
- Vehicle in fifth gear (TM 9-2320-361-10).
- Battery ground cable disconnected (TM 9-2320-361-20).
- Radiator removed (TM 9-2320-361-20).
- Drivebelts removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

Hand protection must be worn at all times when handling heated vibration damper and pulley.

a. Removal

1. Remove two screws (9), lockwashers (10), and lockplate (8) from vibration damper and pulley (6). Discard lockwashers (10).
2. Remove retainer bolt (7) and washer (1) from crankshaft (4) and vibration damper and pulley (6).
3. Remove vibration damper and pulley (6) from crankshaft (4) and timing cover (5).
4. Remove plug (2) from key way (3) of crankshaft (4).
5. Install retainer bolt (7) in end of crankshaft (4) and turn until key (3) position is approximately 12 o'clock. Remove retainer bolt (7).
6. Using mechanical puller, remove oil seal (11) from timing cover (5). Discard oil seal (11).

b. Cleaning and Inspection

1. For general cleaning instructions, refer to para. 2-8
2. Visually inspect vibration damper and pulley (6) for nicks, cracks, or damage. Replace vibration damper and pulley (6) if damaged.
3. Inspect exposed section of key (3) on crankshaft (4) for looseness or damage. Remove engine (para. 3-20) and replace crankshaft (4) if defective.
4. Hold rear half of vibration damper (6) on floor with your feet. Try to turn vibration damper and pulley (6). Replace vibration damper and pulley (6) if loose.
5. Inspect threads of two puller screw holes for damage. Fix minor thread damage with tap if damaged. Replace vibration damper and pulley (6) if damaged beyond repair.
6. Inspect lockplate (8) for cracks or damage. Replace lockplate (8) if cracked or damaged.

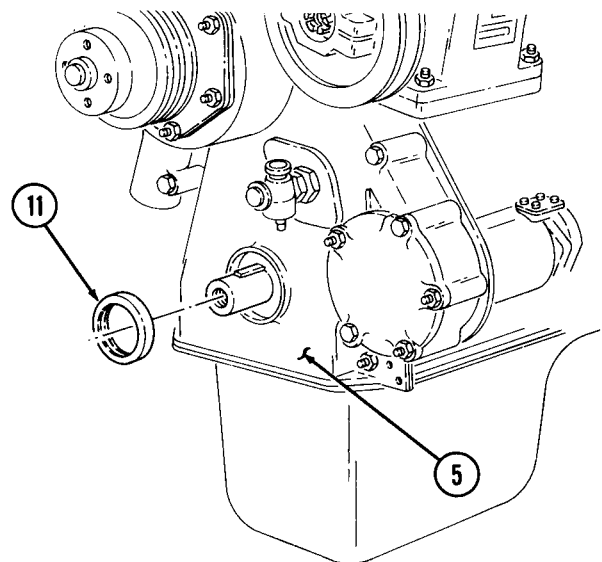
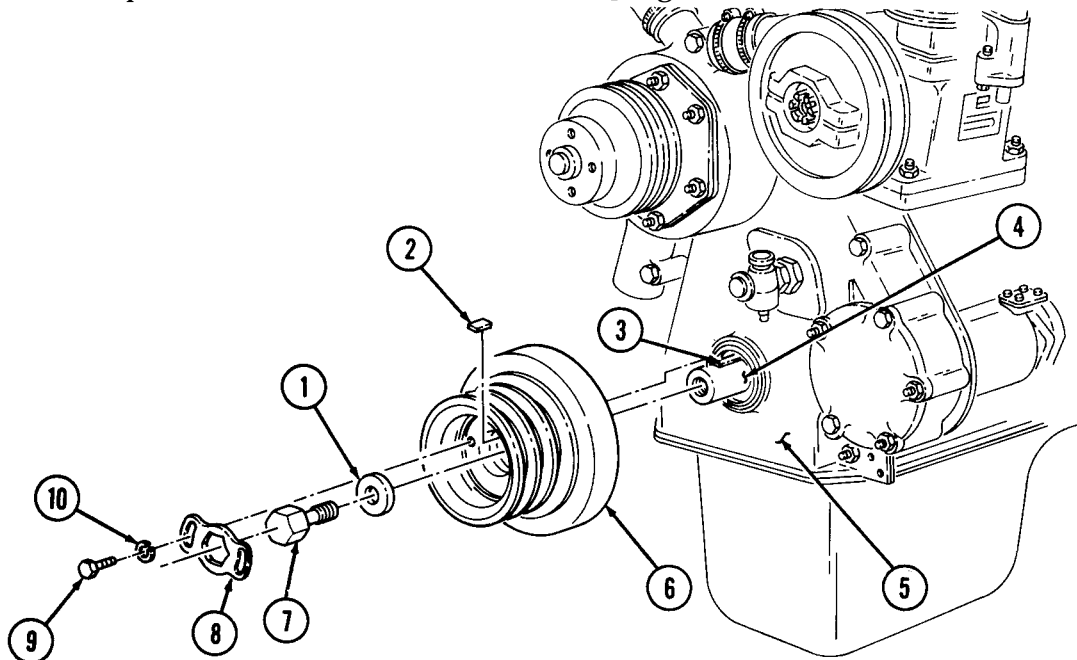
3-4. VIBRATION DAMPER AND SEAL MAINTENANCE (Contd)

7. Inspect rubber insert in vibration damper and pulley (6) for cracks. Replace vibration damper and pulley (6) if cracked.
8. Ensure rubber insert in vibration damper and pulley (6) has not pulled away from vibration damper and pulley (6). Replace vibration damper and pulley (6) if damaged.

NOTE

- Perform step 9 for LDS-465-2 engines.
- Perform step 10 for engines other than LDS-465-2.

9. Inspect liquid deflector for looseness and damage. Replace liquid deflector if loose or damaged.
10. Using magnetic particle equipment, inspect exposed section of crankshaft (4) for cracks or damage. Replace crankshaft (4) if cracked or damaged.



3-4. VIBRATION DAMPER AND SEAL MAINTENANCE (Contd)

c. Installation

1. Assemble vibration damper pulley bolt (10), washer (6), and adapter to form oil seal inserter.

NOTE

Oil seal must be installed with lip of oil seal facing out and extended steel body towards vibration damper. Open side of oil seal is positioned towards timing cover. Failure to install oil seal correctly may result in oil leak.

2. Install new oil seal (1) in timing cover (2) with oil seal inserter on crankshaft (3). Tighten vibration damper bolt until adapter contacts timing cover (2).
3. Remove vibration damper pulley bolt, washer, and adapter from timing cover (2) and crankshaft. (3).
4. Lightly coat the lip surface of oil seal (1) with new engine oil.

CAUTION

Vibration damper and pulley must be installed slowly on crankshaft and into new oil seal. Do not crimp oil seal lip with end of vibration damper and pulley assembly. Crimping of oil seal lip may permanently damage oil seal and result in oil leak.

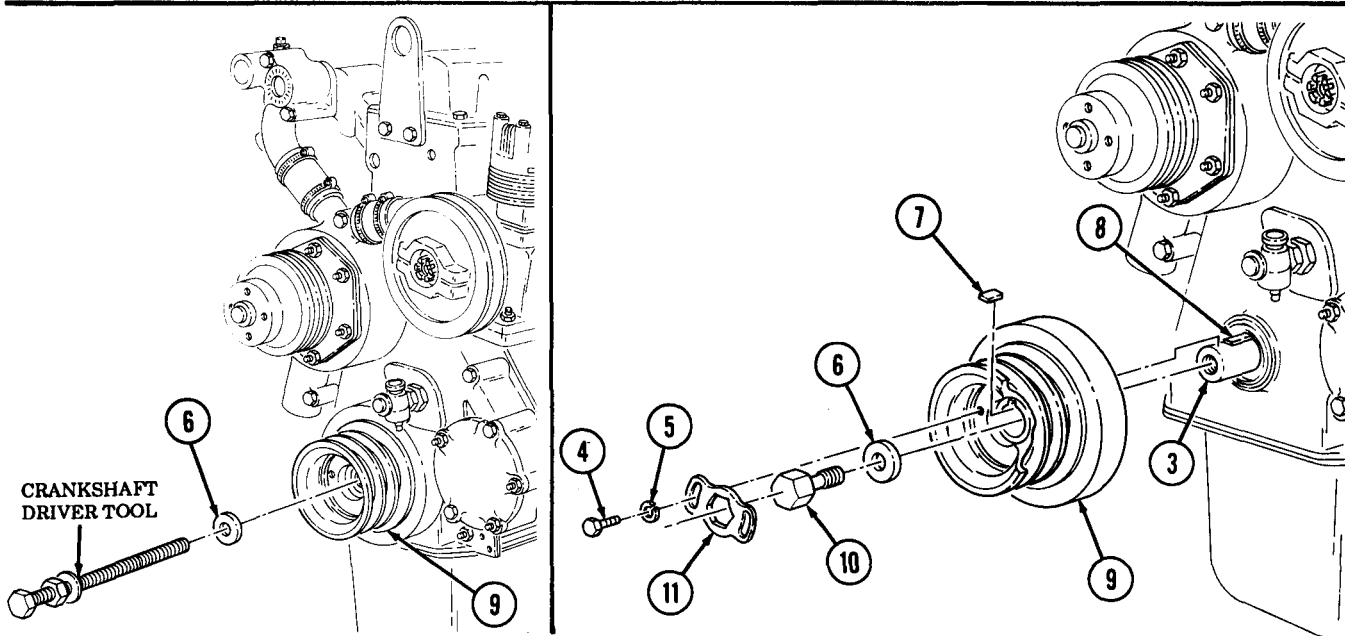
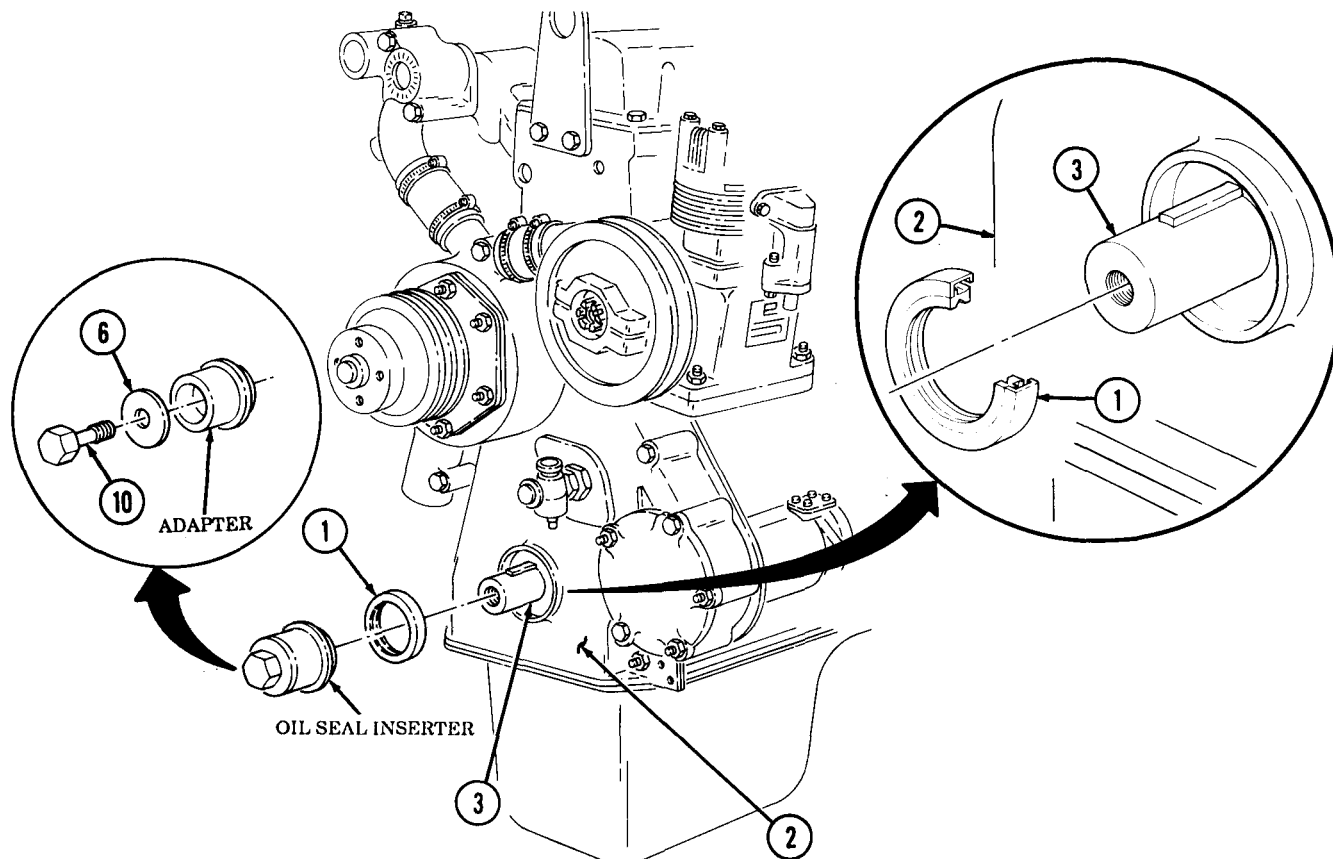
5. Install plug (7) in key way (8) of crankshaft (3).
6. Heat vibration damper and pulley (9) for thirty minutes at 200F (93.3°C).

WARNING

Hand protection must be worn at all times when handling heated vibration damper and pulley. Failure to do so may cause injury to personnel.

7. Aline plug (7) and key way (8) in vibration damper and pulley (9) and install vibration damper and pulley (9) on crankshaft (3) until seated.
8. Assemble crankshaft driver tool as shown.
9. Install washer (6) against vibration damper and pulley (9) with crankshaft driver tool threaded into end of crankshaft. (3).
10. Hold bolt and turn nut on driver tool clockwise until vibration damper and pulley (9) is seated on crankshaft (3).
11. Loosen nut and remove crankshaft driver tool and washer (6) from crankshaft (3) and vibration damper and pulley (9).
12. Install washer (6) and retainer bolt (10) against vibration damper and pulley (9) and crankshaft (3). Tighten retainer bolt (10) 225-250 lb-ft (305-339 N.m).
13. Install lockplate (11) around retainer bolt (10) on vibration damper and pulley (9) with two new lockwashers (5) and screws (4).

3-4. VIBRATION DAMPER AND SEAL MAINTENANCE (Contd)



- FOLLOW-ON TASKS:**
- Install drivebelts (TM 9-2320-361-20).
 - Install radiator (TM 9-2320-361-20).
 - Connect battery ground cable (TM 9-2320-361-20).
 - Connect fuel shutoff valve (TM 9-2320-361-10).

3-5. FLYWHEEL AND TRANSMISSION ADAPTER PLATE MAINTENANCE

THIS TASK COVERS:

- | | |
|--|--|
| <p>a. Adapter Plate Removal</p> <p>b. Flywheel Removal</p> <p>c. Cleaning, Inspection, and Repair</p> | <p>d. Flywheel Installation</p> <p>e. Adapter Plate Installation</p> |
|--|--|

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Torque wrench, 1/2-in. dr. (Appendix B, Item 7)

FABRICATED TOOLS

Flywheel guide screw (Appendix D, Item 3)

MATERIALS/PARTS

Six lock screws (Appendix F, Item 114)
Thirteen lock washers (Appendix F, Item 123)
Gasket (Appendix F, Item 38)

REFERENCES (TM)

TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-361-34P
TM 9-2815-210-34-2-2

EQUIPMENT CONDITION

- . Wheels chocked (TM 9-2320-361-10).
- Battery ground cable disconnected (TM 9-2320-361-20).
- . Pressure plate and clutch disc removed (para. 4-1).

GENERAL SAFETY INSTRUCTIONS

Flywheel is heavy. Use care when removing flywheel.

a. Adapter Plate Removal

1. Remove thirteen nuts (6) and lock washers (5) from adapter plate (7) and flywheel housing studs (2). Discard lock washers (5).
2. Remove adapter plate (7) and gasket (4) from flywheel housing (1). Discard gasket (4).

b. Flywheel Removal

WARNING

Flywheel is heavy. Use care when removing flywheel. Failure to do so may result in injury to personnel.

1. Remove one of six lock screws (8) from approximately six o'clock position on flywheel (10). Discard lock screw (8).
2. Install guide screw through flywheel (10) in crankshaft (3).
3. Remove five remaining lock screws (8) from flywheel (10). Discard lock screws (8).
4. Remove flywheel (10) from crankshaft (3) and guide screw.
5. Remove guide screw from crankshaft (3).

c. Cleaning, Inspection, and Repair

1. For general cleaning instruction, refer to para. 2-8.
2. For general inspection instructions, refer to para. 2-9.
3. For repair of flywheel and components, refer to TM 9-2815-210-34-2-2.

d. Flywheel Installation

1. Locate the X (11) marked on crankshaft (3) above one of six screw holes and install guide screw in marked hole.

3-5. FLYWHEEL AND TRANSMISSION ADAPTER PLATE MAINTENANCE (Contd)

CAUTION

Alinement mark on flywheel must be matched with X marked on crankshaft during installation. Incorrect positioning of flywheel on crankshaft will not allow installation of all six screws in flywheel and crankshaft. Do not attempt to install screws if screws will not turn easily when starting in threaded holes in crankshaft. Serious damage to equipment may result when engine is operated.

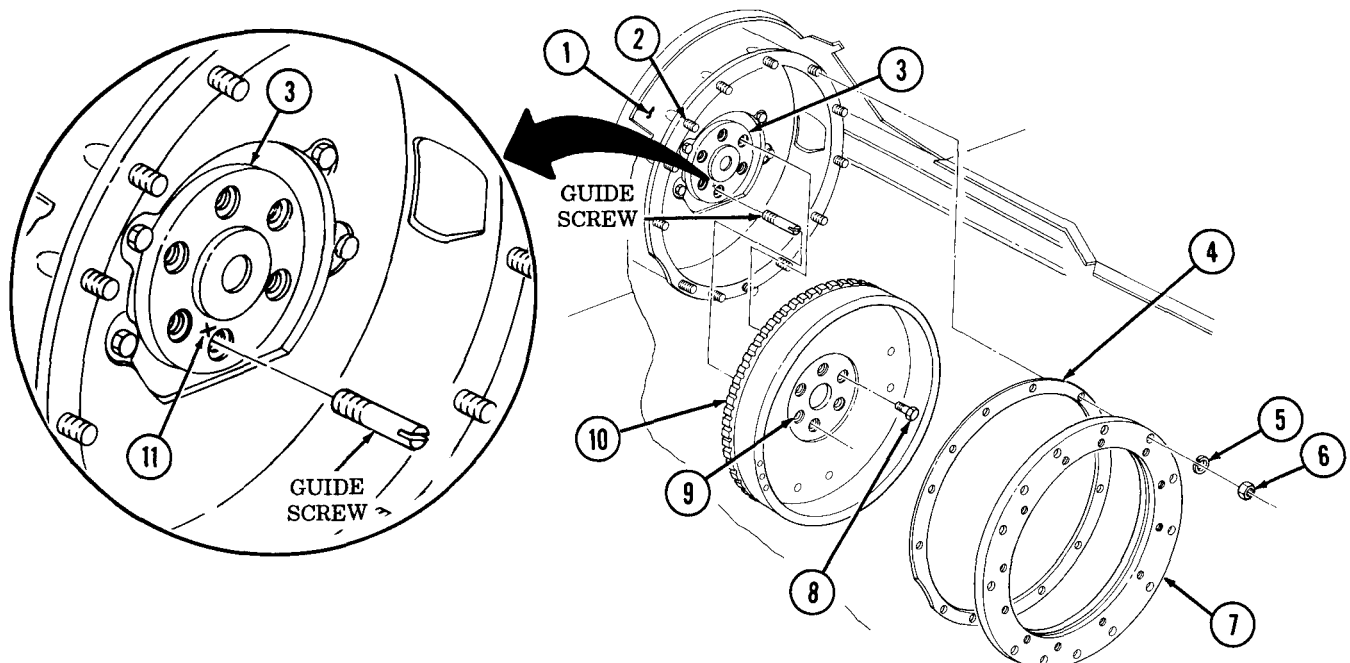
NOTE

An alinement drill point or punch mark can be located on the backside of flywheel approximately two and one-half inches out from one of six screw holes.

2. Locate alinement mark on the backside of flywheel (10). Use an erasable marking device and mark the corresponding hole (9) at the clutch disc side of flywheel (10).
3. Aline the marked hole (9) with guide screw and seat flywheel (10) against crankshaft (3)
4. Install five of six new lock screws (8) in flywheel (10) and crankshaft (3).
5. Remove guide screw from crankshaft (3) and flywheel (10).
6. Install new lock screw (8) in flywheel (10) and crankshaft (3).
7. Tighten six lock screws (8) 80-90 lb-ft (109-122 N.m). Repeat tightening until 115-120 lb-ft (156-163 N.m) is achieved.

e. Adapter Plate Installation

1. Position new gasket (4) on flywheel housing studs (2).
2. Install adapter plate (7) on flywheel housing(1) with thirteen new lockwashers (5) and nuts (6).



- FOLLOW-ON TASKS: . Install clutch disc and pressure plate (para. 4-1).
- Connect battery ground cable (TM 9-2320-361-20).
 - Wheels unchoked (TM 9-2320-361-10).

3-6. ROCKER ARM COVERS REPLACEMENT

THIS TASK COVERS:

- a. Front Rocker Arm Cover Removal
- b. Rear Rocker Arm Cover Removal

- c. Front Rocker Arm Cover Installation
- d. Rear Rocker Arm Cover Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit (Appendix B, Item 1)
Torque wrench, 3/8-in. dr. (Appendix B, Item 8)

MATERIALS/PARTS

Two gaskets (Appendix F, Item 37)
Two locknuts (Appendix F, Item 92)
Locknut (Appendix F, Item 95)
Fourteen lockscrews (Appendix F, Item 118)
Sealing compound, gasket forming (Appendix C, Item 19)
Sealing compound, thread locking (Appendix C, Item 18)

REFERENCES (TM)

TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

Crankcase breather tube adapter removed (TM 9-2320-361-20).

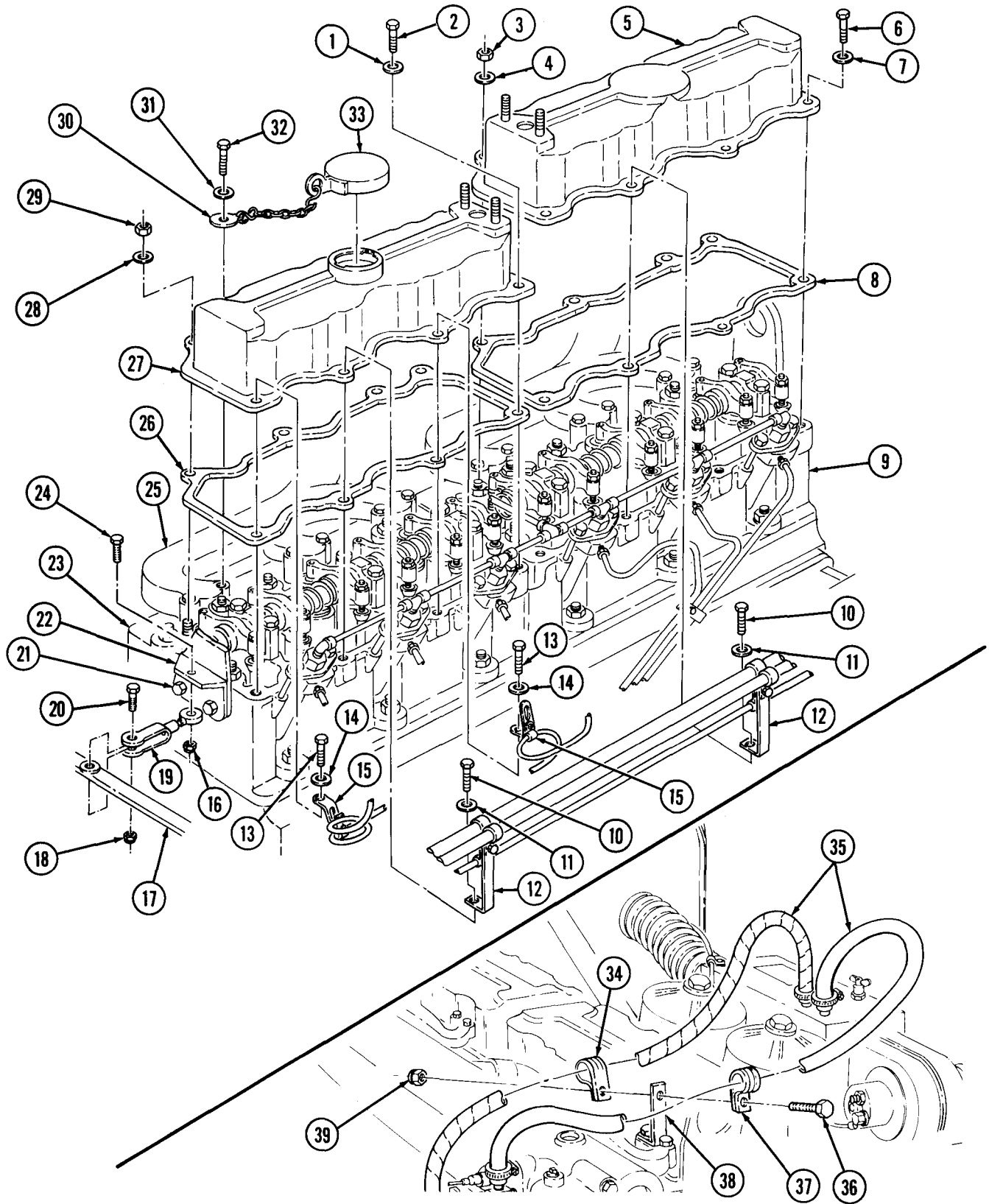
a. Front Rocker Arm Cover Removal

1. Remove screw (32), washer (31), and retainer (30) from water outlet manifold (25). Remove oil cap (33) from rocker arm cover (27).
2. Remove locknut (39), clamp (34), screw (36), clamp (37), and personnel heater hoses (35) from bracket (38). Discard locknut (39).
3. Remove two lockscrews (13) and washers (14) from hangers (15). Rotate hangers (15) away from rocker arm cover (27). Discard lockscrews (13).
4. Remove two lockscrews (10) and washers (11) from brackets (12). Discard lockscrews (10). Secure brackets (12) away from rocker arm covers (27) and (5).
5. Remove four lockscrews (2) and washers (1) from rocker arm cover (27). Discard lockscrews (2).
6. Remove locknut (29) and washer (28) horn rocker arm cover (27). Discard locknut (29).
7. Remove nuts (16) and (18), screws (20) and (24), and clevis (19) from bracket (17) and front lifting bracket (22).
8. Loosen two screws (21) and front lifting bracket (22).
9. Remove rocker arm cover (27) and gasket (26) from cylinder head (23). Discard gasket (26).
10. Remove all remaining gasket material from cylinder head (23) and rocker arm cover (27).

b. Rear Rocker Arm Cover Removal

1. Remove two lockscrews (10) and washers (11) from brackets (12). Discard lockscrews (10). Secure bracket (12) away from rocker arm cover (5).
2. Remove six lockscrews (6) and washers (7) from rocker arm cover (5). Discard lockscrews (6).
3. Remove locknut (3) and washer (4) from rocker arm cover (5). Discard locknut (3).
4. Remove rocker arm cover (5) and gasket (8) from cylinder head (9). Discard gasket (8).
5. Remove all remaining gasket material from cylinder head (9) and rocker arm cover (5).

3-6. ROCKER ARM COVERS REPLACEMENT (Contd)



3-6. ROCKER ARM COVERS REPLACEMENT (Contd)

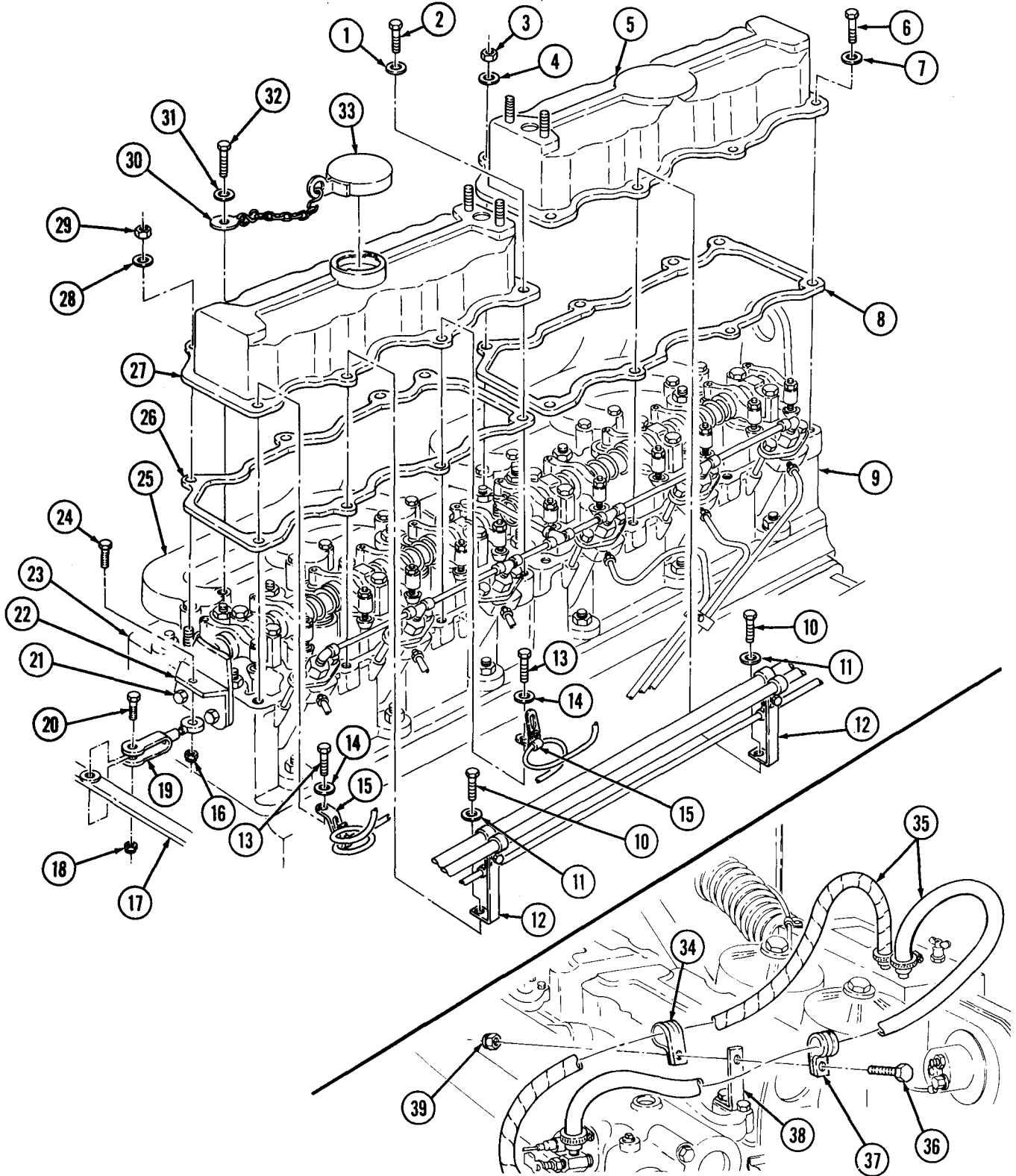
c. Front Rocker Arm Cover Installation

1. Apply a thin coat of sealing compound on both sides of new gasket (26).
2. Apply a thin coat of sealing compound on threads of new lockscrews (2), (13), and (10).
3. Install new gasket (26) and rocker arm cover (27) on cylinder head (23) with washer (28) and new locknut (29). Do not tighten locknut (29).
4. Install four washers (1) and new lockscrews (2) on rocker arm cover (27). Do not tighten lockscrews (2).
5. Install two brackets (12) on rocker arm covers (27) and (5) with washers (11) and new lockscrews (10). Do not tighten lock screw (10).
6. Install two hangers (15) on rocker arm cover (27) with washers (14) and new lockscrews (13).
7. Install retainer (30) on water outlet manifold (25) with new lockwasher (31) and screw (32). Install oil cap (33) on rocker arm cover (27).
8. Tighten lockscrews (2), (13), and (10) and locknut (29) 30 lb-in. (3.4 N.m). Repeat tightening until 50-60 lb-in. (5.7-6.8 N.m) is achieved.
9. Tighten two screws (21) on front lifting bracket (22).
10. Install clevis (19) on bracket (17) and front lifting bracket (22) with screws (24) and (21) and nuts (16) and (18).
11. Install personnel heater hoses (35) on bracket (38) with clamp (37), screw (36), clamp (34), and new locknut (39).

d. Rear Rocker Arm Cover Installation

1. Apply a thin coat of sealing compound on both sides of new gasket (8).
2. Apply a thin coat of sealing compound on the threads of lockscrews (6) and (10).
3. Install new gasket (8) and rocker arm cover (5) on cylinder head (9) with washer (4) and new locknut (3). Do not tighten locknut (3).
4. Install rocker arm cover (5) on cylinder head (9) with six washers (7) and new lockscrews (6). Do not tighten lockscrews (6).
5. Install two brackets (12) on rocker arm covers (5) and (27) with washers (11) and new lockscrews (10). Do not tighten lockscrews (10).
6. Tighten lockscrews (6) and (10) and locknut (3) 30 lb-in. (3.4 N.m). Repeat tightening until 50-60 lb-in. (5.7-6.8 N.m) is achieved.

3-6. ROCKER ARM COVERS REPLACEMENT (Ccntd)



FOLLOW-ON TASK: Install crankcase breather tube adapter (TM 9-2320-361-20).

3-7. ROCKER ARMS AND PUSHRODS MAINTENANCE

THIS TASK COVERS:

- | | |
|---|--|
| <p>a. Removal
 b. Rocker Arm Disassembly
 c. Cleaning and Inspection</p> | <p>d. Rocker Arm Assembly
 e. Installation
 f. Adjustment</p> |
|---|--|

INITIAL SETUP

APPLICABLE MODELS

All

PERSONNEL REQUIRED

Two

TOOLS

General mechanic's tool kit (Appendix B, Item 1)
 Torque wrench, 3/4-in. dr. (Appendix B, Item 6)
 Micrometer, inside (Appendix B, Item 16)
 Micrometer, outside (Appendix B, Item 17)
 1-5/8-in. socket, 3/4-in. dr.
 (Appendix B, Item 45)
 Handle, socket wrench, 3/4-in. dr.
 (Appendix B, Item 46)

REFERENCES (TM)

TM 9-2320-361-10
 TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

Rocker arm cover(s) removed (para. 3-6).

GENERAL SAFETY INSTRUCTIONS

Disconnect battery ground cable prior to performing valve adjustment procedure.

MATERIALS/PARTS

Six lockwashers (Appendix F, Item 123)
 Two retainers (Appendix F, Item 203)

NOTE

Front and rear rocker arm assemblies are identical and are replaced and repaired the same. This procedure covers the front rocker arm assembly.

a. Removal

NOTE

Tag components for installation.

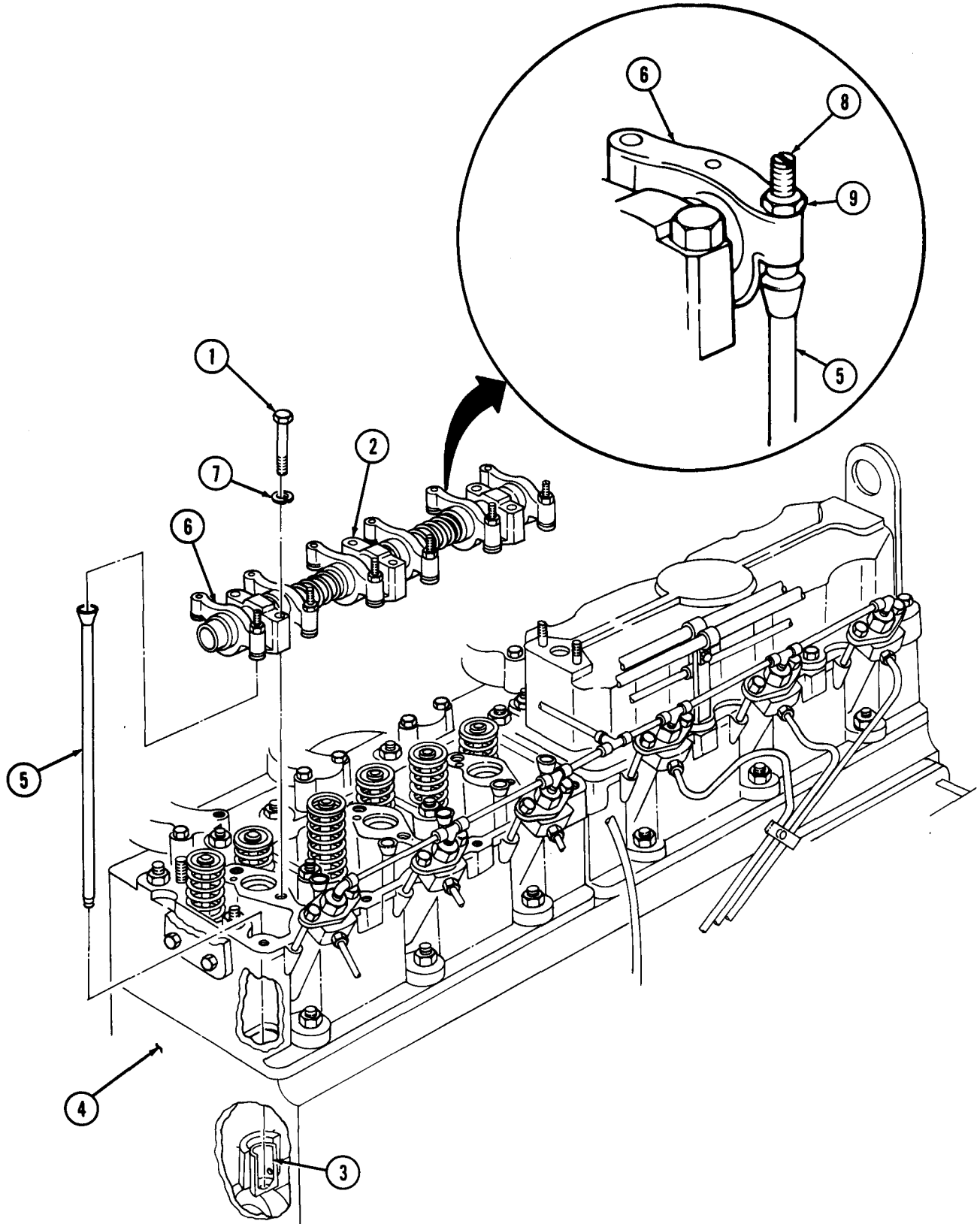
1. Loosen six nuts (9) while holding adjustment screws (8).
2. Turn adjustment screw (8) counterclockwise until rocker arm (6) is loose against pushrod (5) end. Repeat for remaining five screws (8).
3. Remove six screws (1), lockwashers (7), and three supports (2) with six rocker arms (6) from cylinder head (4) and six pushrods (5). Discard lockwashers (7).

CAUTION

Engine oil may cause a suction between pushrods and tappets. Pushrods must be removed from tappets using a sharp upward snap motion. Failure to do this may result in tappets becoming dislodged from bores in engine block.

4. Remove six pushrods (5) from tappets (3) and cylinder head (4).

3-7. ROCKER ARMS AND PUSHRODS MAINTENANCE (Contd)



3-7. ROCKER ARMS AND PUSHRODS MAINTENANCE (Contd)

b. Rocker Arm Disassembly

NOTE

Tag components for assembly.

1. Remove retainer (13) and thrust washer (14) from shaft (17). Discard retainer (13).
2. Remove rocker arm (15) from support (12) and shaft (17).
3. Remove retainer (1) and thrust washer (2) from shaft (17). Discard retainer (1).
4. Remove rocker arm (3), support (4), rocker arm (5), spring (6), rocker arm (7), support (8), rocker arm (9), spring (10), rocker arm (11), and support (12) from shaft (17).
5. Remove nut (19) from adjustment screw (20).
6. Remove adjustment screw (20) from rocker arm (15).
7. Repeat steps 5 and 6 for each rocker arm (3), (5), (7), (9), and (11), as necessary.

c. Cleaning and Inspection

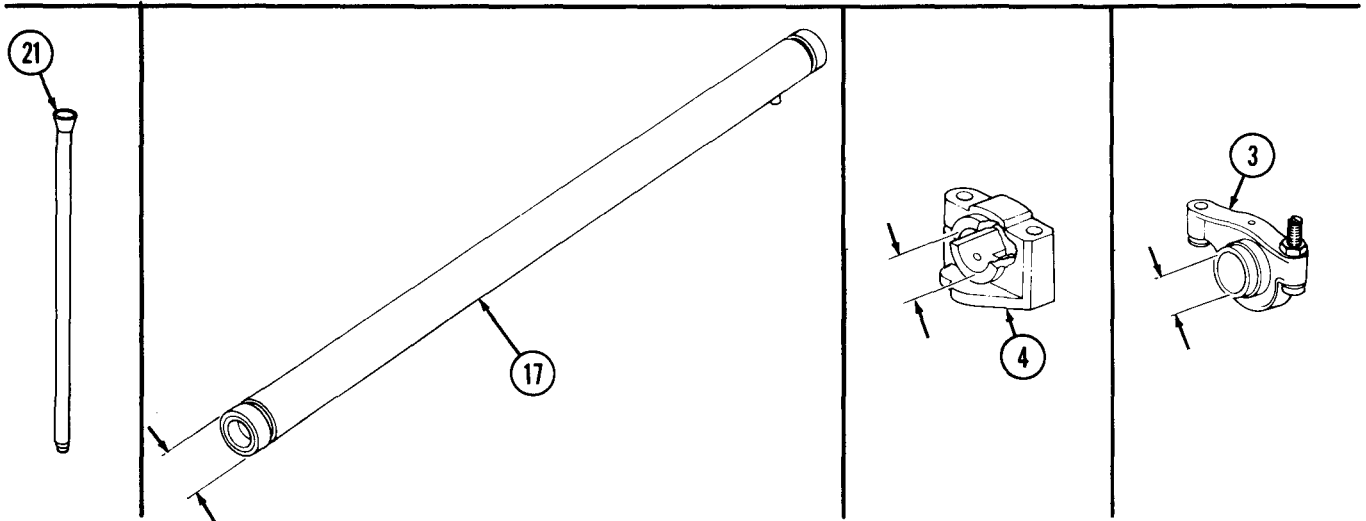
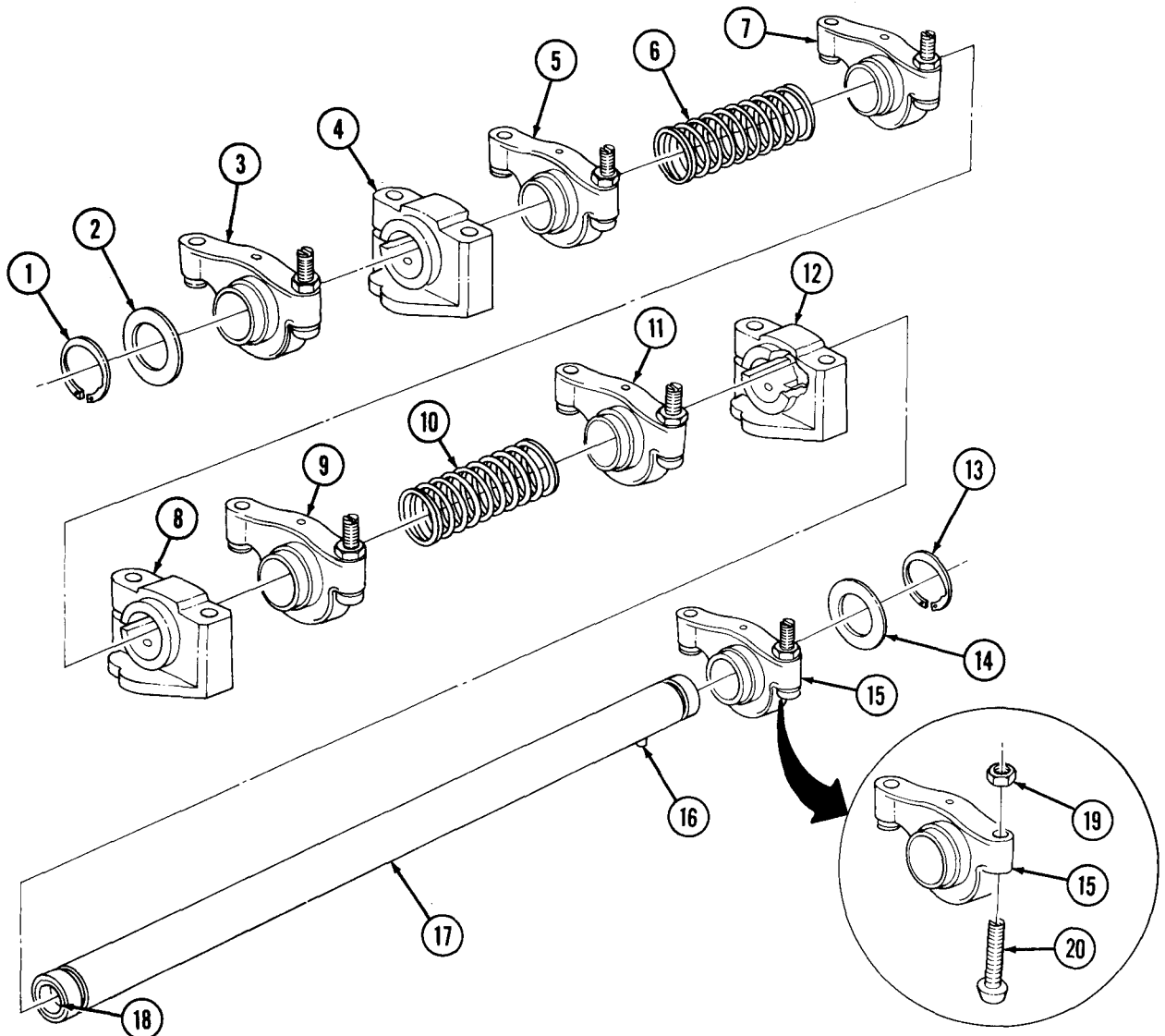
1. For general cleaning instructions, refer to para. 2-8.
2. For general inspection instructions, refer to para. 2-9.

Table 3-1. Rocker Arm Assembly Wear Limits

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMIT/TOLERANCES	
		INCHES	MILLIMETERS
3, 5, 7, 9 11, 15	Rocker arms (inside diameter)	0.98-1.02	24.89-26.11
4, 8, 12	Supports (inside diameter)	0.99-1.01	25.20-25.76
17	Shaft (outside diameter)	0.97-1.01	24.84-25.65

3. Remove oil deposits from oil passages inside components.
4. Inspect dowel pin (16) in shaft (17) for looseness. Replace if loose.
5. Inspect two plugs (18) in shaft (17) ends for evidence of oil leakage. Replace if oil leakage is present.
6. Inspect shaft (17) for scoring or wear. Refer to table 3-1, Rocker Arm Assembly Wear Limits, for measurements. Replace if damaged or worn past limits.
7. Inspect supports (4), (8), and (12) for surface scoring or wear on shaft and rocker arm riding surfaces. Refer to table 3-1, Rocker Arm Assembly Wear Limits, for measurements. Replace if damaged or worn past limits.
8. Inspect rocker arms (3), (5), (7), (9), (11), and (15) for surface scoring or wear on shaft and support riding surfaces. Refer to table 3-1, Rocker Arm Assembly Wear Limits, for measurements. Replace if damaged or worn past limits.
9. Inspect rocker arms (3) (5), (7), (9), (11), and (15) for thread or valve stem riding surface damage. Replace if damaged.
10. Inspect thrust washers (2) and (14) for cracks or grooving. Replace if damaged.
11. Inspect springs (6) and (10) for distortion. Replace if damaged.
12. Inspect six pushrods (21) for scored or grooved ends and sides, cracks, and straightness. Replace if damaged.
13. Inspect six adjustment screws (20) for head damage, grooving, or scoring. Replace if damaged.

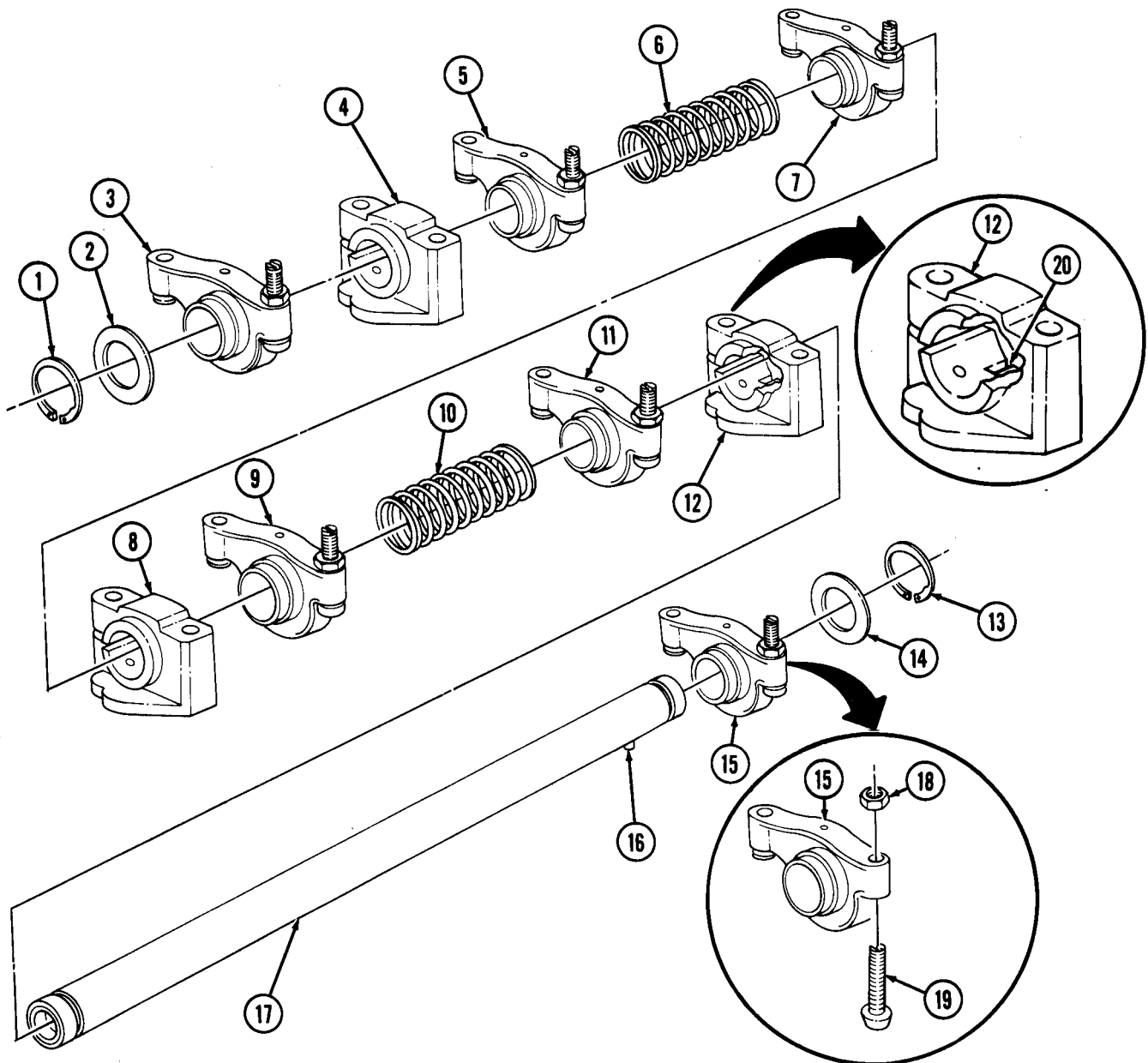
3-7. ROCKER ARMS AND PUSHRODS MAINTENANCE (Contd)



3-7. ROCKER ARMS AND PUSHRODS MAINTENANCE (Contd)

d. Rocker Arm Assembly

1. Install adjustment screw (19) in rocker arm (15) until seated.
2. Install nut (18) on adjustment screw (19). Do not tighten nut (18).
3. Repeat steps 1 and 2 for each rocker arm (3), (5), (7), (9), and (11), as necessary.
4. Position support (12) on shaft (17) with dowel slot (20) over dowel pin (16).
5. Install rocker arm (11), spring (10), rocker arm (9), support (8), rocker arm (7), spring (6), rocker arm (5), support (4), rocker arm (3), and thrust washer (2) on shaft (17) with new retainer (1).
6. Install rocker arm (15) on shaft (17) against support (12) with thrust washer (14) and new retainer (13).



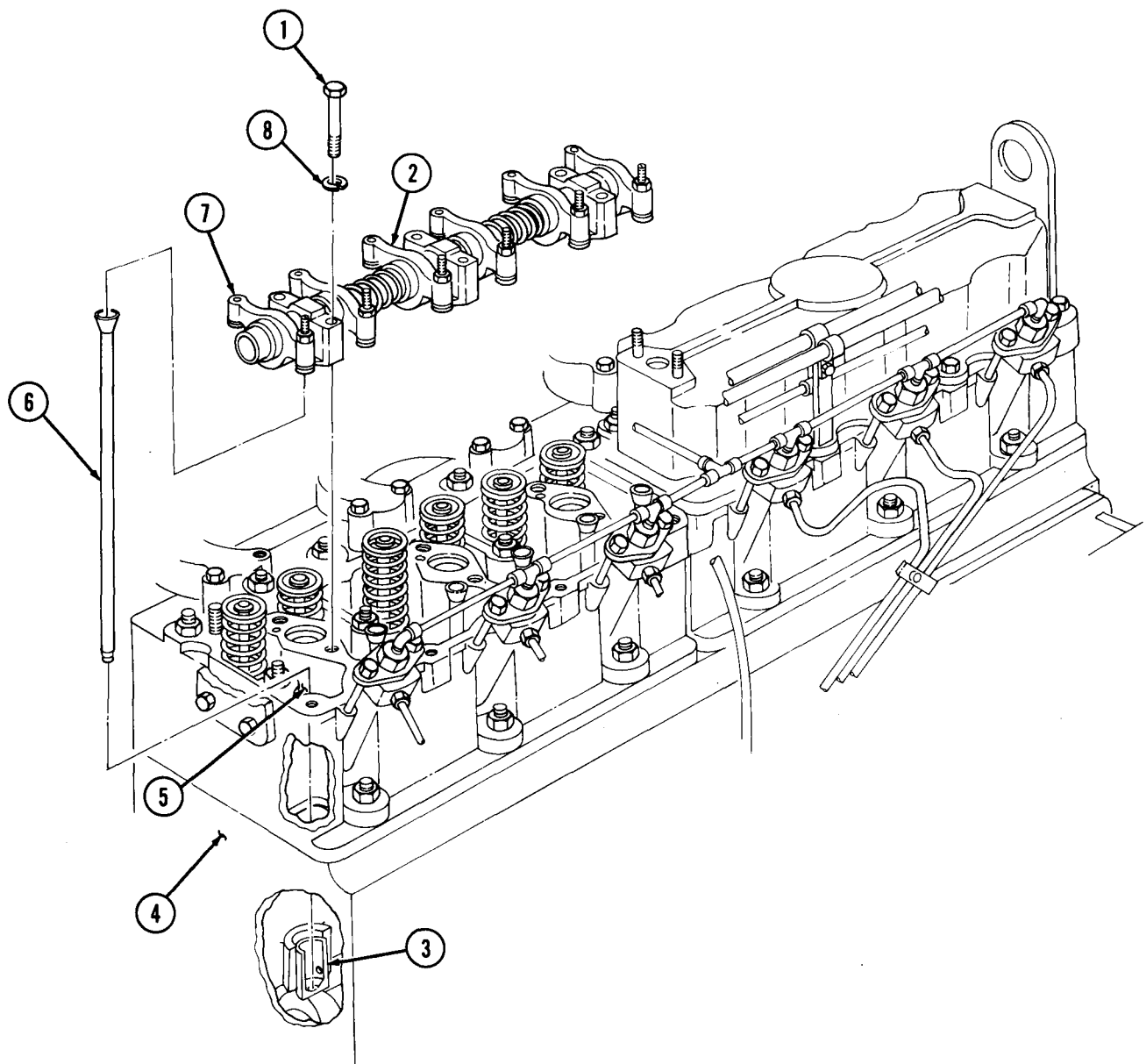
3-7. ROCKER ARMS AND PUSHRODS MAINTENANCE (Contd)

e. Installation

CAUTION

All rocker arm adjusting screws must be backed off flush with rocker arm body before installation on cylinder head. Failure to do so may bend pushrods and damage rocker arms.

1. Position six pushrods (6) in channels (5) through cylinder head (4) and seat in six tappets (3).
2. Position six rocker arms (7) on pushrods (6) and three supports (2) on cylinder head (4).
3. Install three supports (2) on cylinder head (4) with six new lockwashers (8) and screws (1).
4. Tighten six screws (1) 28 lb-ft (38 N•m).



3-7. ROCKER ARMS AND PUSHRODS MAINTENANCE (Contd)

f. Adjustment

WARNING

Disconnect battery ground cable prior to performing valve adjustment procedure. Failure to do so may cause injury to personnel.

1. Disconnect battery ground cable (TM 9-2320-361-20).

NOTE

- The intake valve is the front valve and the exhaust valve is the rear valve in each cylinder.
- Cylinders are numbered from the front of the truck to the rear.
- Assistant will help with this procedure.

2. Remove radiator (TM 9-2320-361-20).
3. Rotate crankshaft bolt (1) clockwise until rocker arm (2), No. 1 cylinder intake valve, is fully open.
4. Adjust valves to proper clearance. Refer to table 3-2, Valve Clearance Limits, for measurements. Perform steps 5 through 8.

Table 3-2. Valve Clearance Limits

CYLINDER NUMBER	VALVES ADJUSTED IN STEP 4	VALVES ADJUSTED IN STEP 11
1	E	I
2	I AND E	
3	I	E
4	E	I
5		I AND E
6	I	E
<p>VALVE CLEARANCE SETTING</p> <p>I = Intake valve gap 0.010 in. (0.254 mm)</p> <p>E = Exhaust valve gap 0.025 in. (0.635 mm)</p>		

NOTE

All rocker levers are adjusted the same way.

5. Loosen nut (6) and turn adjustment screw (5) two full turns counterclockwise.
6. Place feeler gage between rocker arm head (4) and valve stem (7).
7. Tighten or loosen adjustment screw (5) until a slight drag is felt on feeler gage.
8. Hold adjustment screw (5) stationary and tighten nut (6).
9. When all valves in step 4 are adjusted, perform steps 10 and 11.
10. Rotate crankshaft bolt (1) 360° clockwise until rocker arm (3), No. 6 cylinder intake valve, is fully open.
11. Adjust remaining valves to proper clearance. Refer to table 3-2, Valve Clearance Limits, for measurements. Repeat steps 5 through 8 to adjust remaining valves.

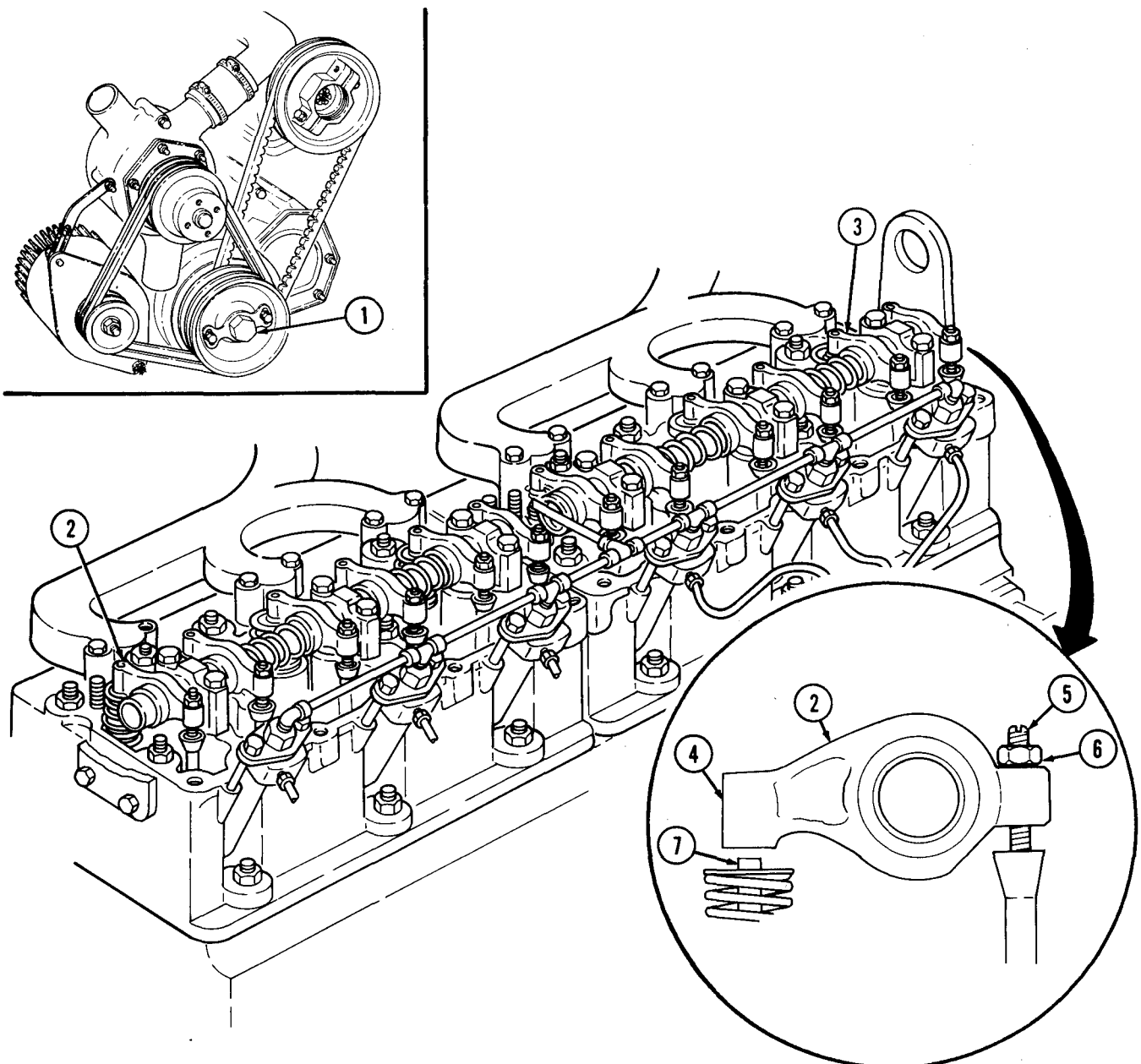
3-7. ROCKER ARMS AND PUSHRODS MAINTENANCE (Contd)

12. Install radiator (TM 9-2320-361-20).
13. Connect battery ground cable (TM 9-2320-361-20).
14. Install rocker arm cover(s) (para. 3-6).

CAUTION

When engine is started, if any unusual noises are heard, stop engine immediately and check valve clearances. Failure to do so may result in damage to equipment.

15. Start engine (TM 9-2320-361-10). Allow engine to reach normal operating temperature (TM 9-2320-361-10). Stop engine.



3-8. TIMING GEARS COVER AND GASKET REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Gasket (Appendix F, Item 45)
Eighteen lockwashers (Appendix F, Item 123)
Gasket (Appendix F, Item 28)
Lockwasher (Appendix F, Item 128)
Sealing compound, thread locking
(Appendix C, Item 18)
Sealing compound, gasket forming
(Appendix C, Item 19)

REFERENCES (TM)

TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

- Vibration damper removed (para. 3-4).
- Tachometer cable adapter removed (TM 9-2320-361-20).
- Water pump and housing removed (TM 9-2320-361-20).

a. Removal

1. Remove nut (21) and lockwasher (20) from timing cover stud (23).
2. Remove four nuts (12), lockwashers (11), screws (22), access cover (19) and gasket (18). Discard lockwashers (11) and gasket (18).
3. Remove seven screws (25) and lockwashers (24) from adapter plate (13) and timing cover (4). Discard lockwashers (23).
4. Remove nut (8), lockwasher (7), nut (10), lockwasher (9), and screws (1) and (26) from adapter plate (13) and timing cover (4). Discard lockwashers (7) and (9).
5. Remove nut (2) and lockwasher (3) from timing cover (4) and stud (6). Discard lockwasher (3).
6. Remove four screws (16) and lockwashers (17) from timing cover (4) and oil pan (14). Discard lockwashers (17).

CAUTION

Oil pan gasket may stick to timing cover. Use care when removing timing cover from oil pan. Failure to do this may damage oil pan gasket.

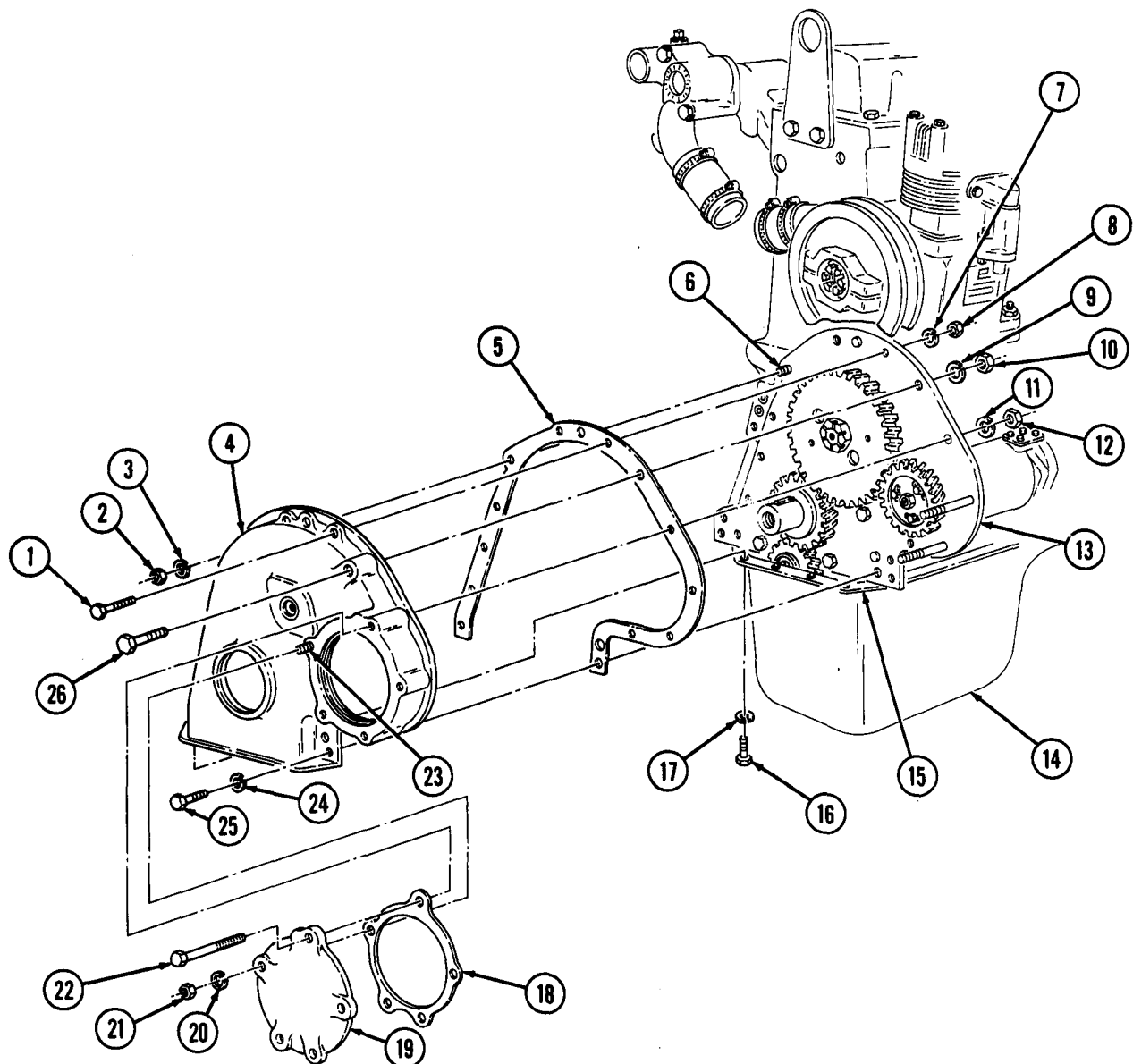
7. Remove timing cover (4) and gasket (5) from adapter plate (13) and oil pan gasket (15). Discard gasket (5).
8. Remove all remaining gasket (5) material from timing cover (4) and adapter plate (13).

b. Installation

1. With new gasket (5) laying flat on timing cover (4), trim bottom edges of gasket (5) even with the bottom edge of timing cover (4).
2. Apply a thin, even coat of gasket sealing compound on both sides of new timing cover gasket (5) and exposed surface of oil pan gasket (15).

3-8. TIMING GEARS COVER AND GASKET REPLACEMENT (Contd)

3. Apply a thin coat of thread locking sealing compound on the threads of seven screws (25).
4. Install new gasket (5) and timing cover (4) on adapter plate (13) with seven new lockwashers (24) and screws (25).
5. Install screws (1) and (26) through timing cover (4) and adapter plate (13) with new lockwashers (7) and (9) and nuts (8) and (10).
6. Install new lockwasher (3) and nut (2) on stud (6) and timing cover (4).
7. Install timing cover (4) on oil pan (14) with four new lockwashers (17) and screws (16).
8. Install new gasket (18) and access cover (19) on timing cover (4) with new lockwasher (20), nut (21), four screws (22), new lockwashers (11) and nuts (12).



- FOLLOW-ON TASKS:
- Install water pump and housing (TM 9-2320-361-20).
 - Install tachometer cable adapter (TM 9-2320-361-20).
 - Install vibration damper (para. 3-4).

3-9. TAPPET CHAMBER COVER AND GASKET REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Gasket (Appendix F, Item 46)
Sealing compound, thread locking
(Appendix C, Item 18)
Sealing compound, gasket forming
(Appendix C, Item 19)

REFERENCES (TM)

TM 9-2320-361-10
TM 9-2320-361-34P

EQUIPMENT CONDITION

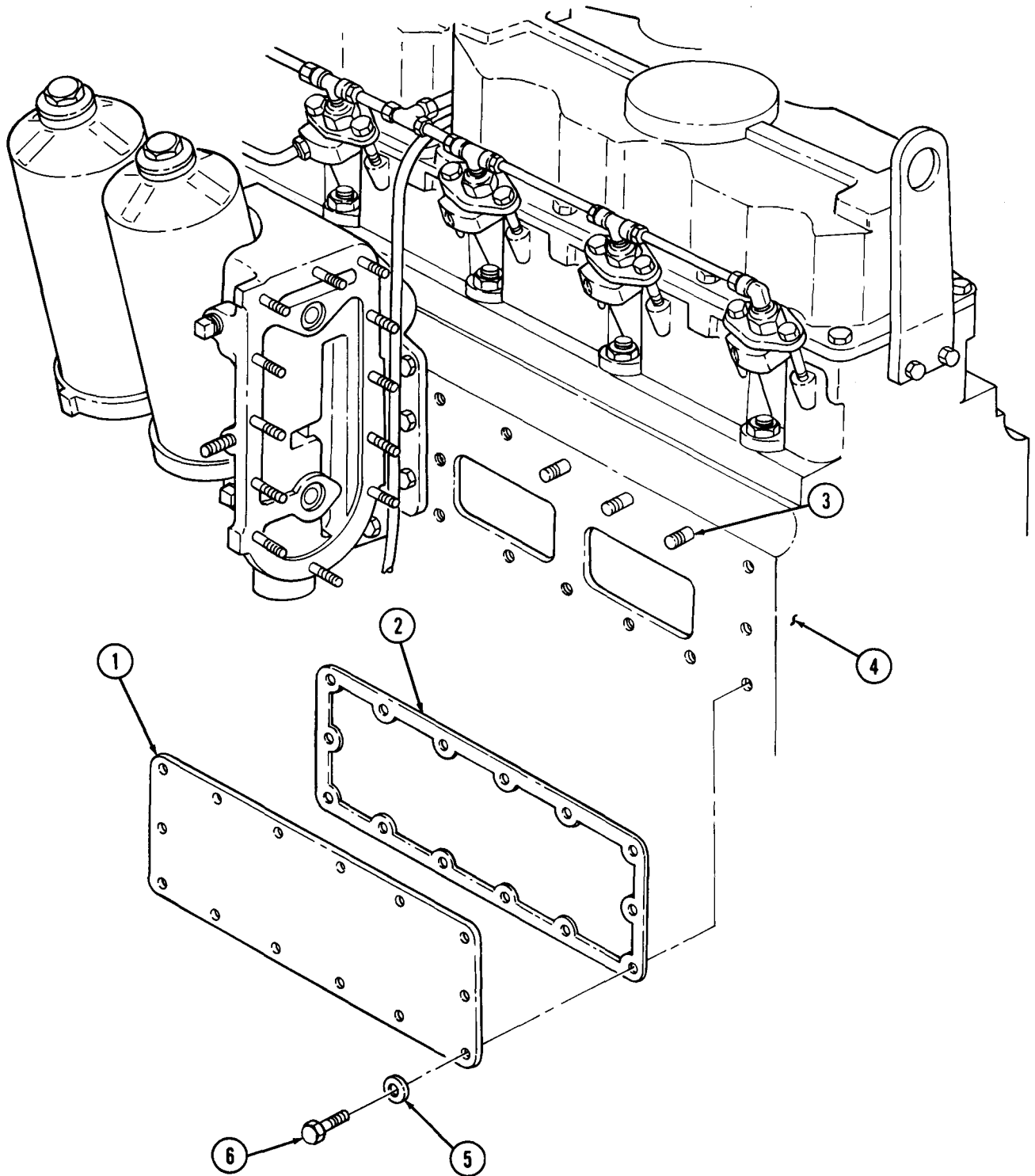
" Parking brake set (TM 9-2320-361-10).
• Engine-oil cooler removed (para. 3-13).

1. Remove eleven screws (6), washers (5), cover (1), and gasket (2) from three studs (3) and engine block (4). Discard gasket (2).
2. Remove all remaining gasket (2) material from cover (1) and engine block (4).

b. Installation

1. Apply a light, even coat of sealing compound on both sides of new gasket (2).
2. Apply a light coat of thread locking sealing compound on the threads of eleven screws (6).
3. Install new gasket (2) and cover (1) on three studs (3) and engine block (4) with eleven washers (5) and screws (6).

3-9. TAPPET CHAMBER COVER AND GASKET REPLACEMENT (Contd)



FOLLOW-ON TASK: Install engine oil cooler (para. 3-13).

3-10. VALVE TAPPETS MAINTENANCE

THIS TASK COVERS:

- | | |
|---|------------------------|
| <p>a. Removal</p> <p>b. Cleaning and Inspection</p> | <p>c. Installation</p> |
|---|------------------------|

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Lubricating oil, OE/HDO 30
(Appendix C, Item 13)

REFERENCES (TM)

TM 9-2320-361-10
TM 9-2320-361-34P
TM 9-2815-210-34-2-2

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Air compressor support removed (front only) (para. 3-15).
- Oil cooler and oil cooler filter housing removed, front only (para. 3-14).
- Tappet chamber cover removed (rear only) (para. 3-9).
- Rocker arms and pushrods removed (para. 3-7).

a. Removal

CAUTION

Camshaft and tappets are a matched set. All tappets removed must be tagged for installation. Failure to do this may result in damage to tappets or camshaft.

NOTE

Sludge from engine oil may build upon external surfaces of tappets. When this condition exists, drycleaning solvent maybe applied to tappets while working tappets up and down to loosen sludge and aid removal.

Remove and tag twelve tappets (2) from tappet bores (1) in engine block (3).

b. Cleaning and Inspection

1. For general cleaning instructions, refer to para. 2-8.

NOTE

Normal tappet and camshaft lobe wear is indicated by a slight inward coning or dishing effect of the cam contact surface on tappets.

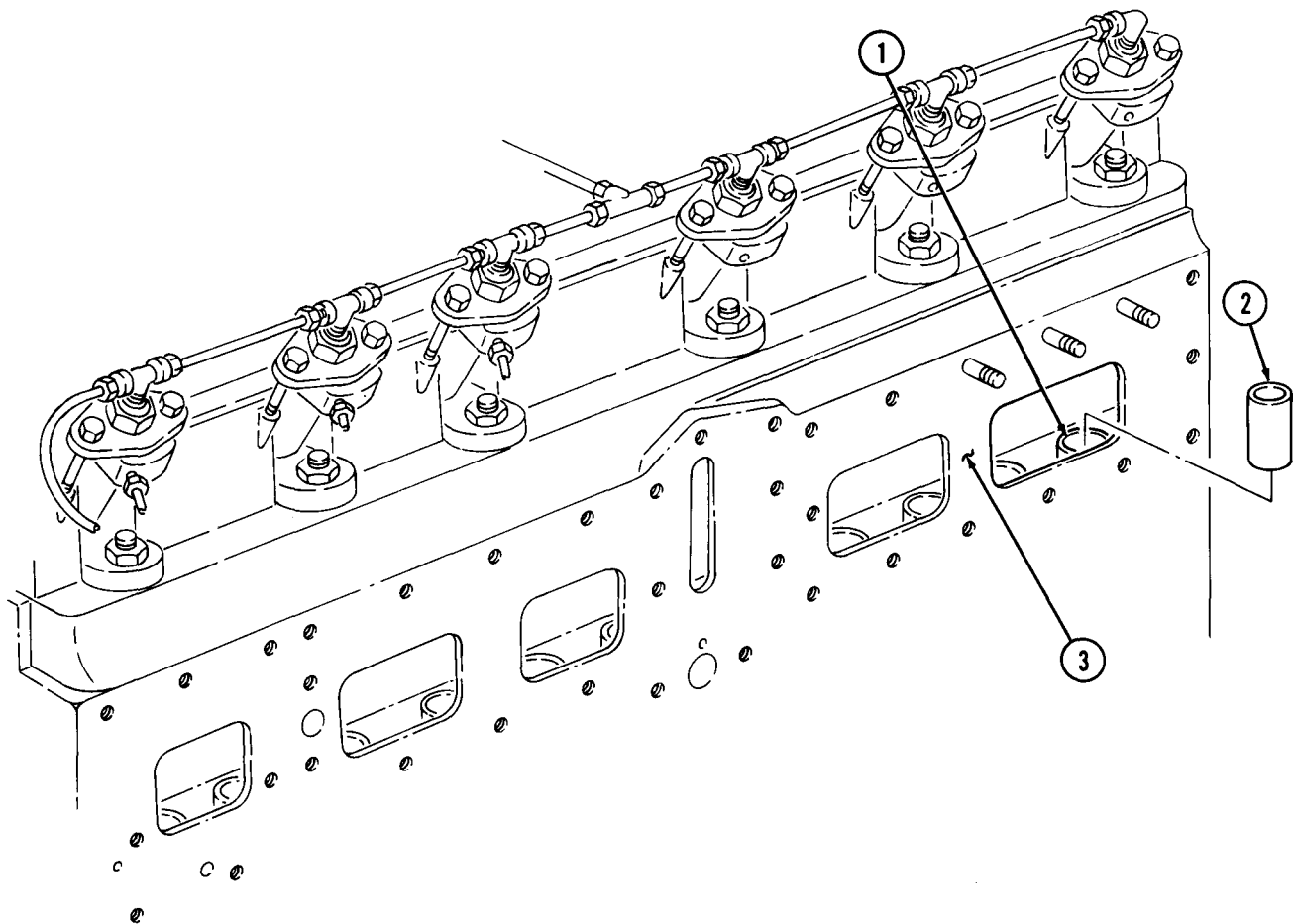
2. Inspect tappets (2) for coned, scored, or grooved cam contact. Minor surface coning is acceptable when cam contact surface is free of grooving and scoring, otherwise replace.
3. Inspect machined sides of twelve tappets (2) for grooving or scoring. Replace if defective.
4. If tappets (2) need replacement, inspect twelve tappet bores (1) and lobe surfaces of camshaft. Refer to TM 9-2815-210-34-2-2 for inspection.

3-10. VALVE TAPPETS MAINTENANCE (Contd)

CAUTION

Tappets exterior must be coated with new engine oil prior to installation. This provides for initial lubrication when engine is started. Failure to oil tappets may result in damage to tappet bores, tappets, or camshaft lobes.

1. Coat twelve tappets (2) with new engine oil.
2. Install and seat twelve tappets (2) in tappet bores (1) of engine block (3).



- FOLLOW-ON TASKS:**
- Install rocker arms and pushrods (para. 3-7).
 - Install tappet chamber cover (if removed) (para. 3-9).
 - Install oil cooler and oil filter housing (if removed) (para. 3-14).
 - Install air compressor support (if removed) (para. 3-15).

3-11. OIL PAN REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit

(Appendix B, Item 1)

Hydraulic jack

Jack stands

MATERIALS/PARTS

Thirty lockwashers (Appendix F, Item 123)

Gasket (Appendix F, Item 47)

Sealing compound, gasket forming

(Appendix C, Item 19)

REFERENCES (TM)

LO 9-2320-209-12-1

TM 9-2320-361-10

TM 9-2320-361-34P

EQUIPMENT CONDITION

. Wheels chocked (TM 9-2320-361-10).

• Parking brake set (TM 9-2320-361-10).

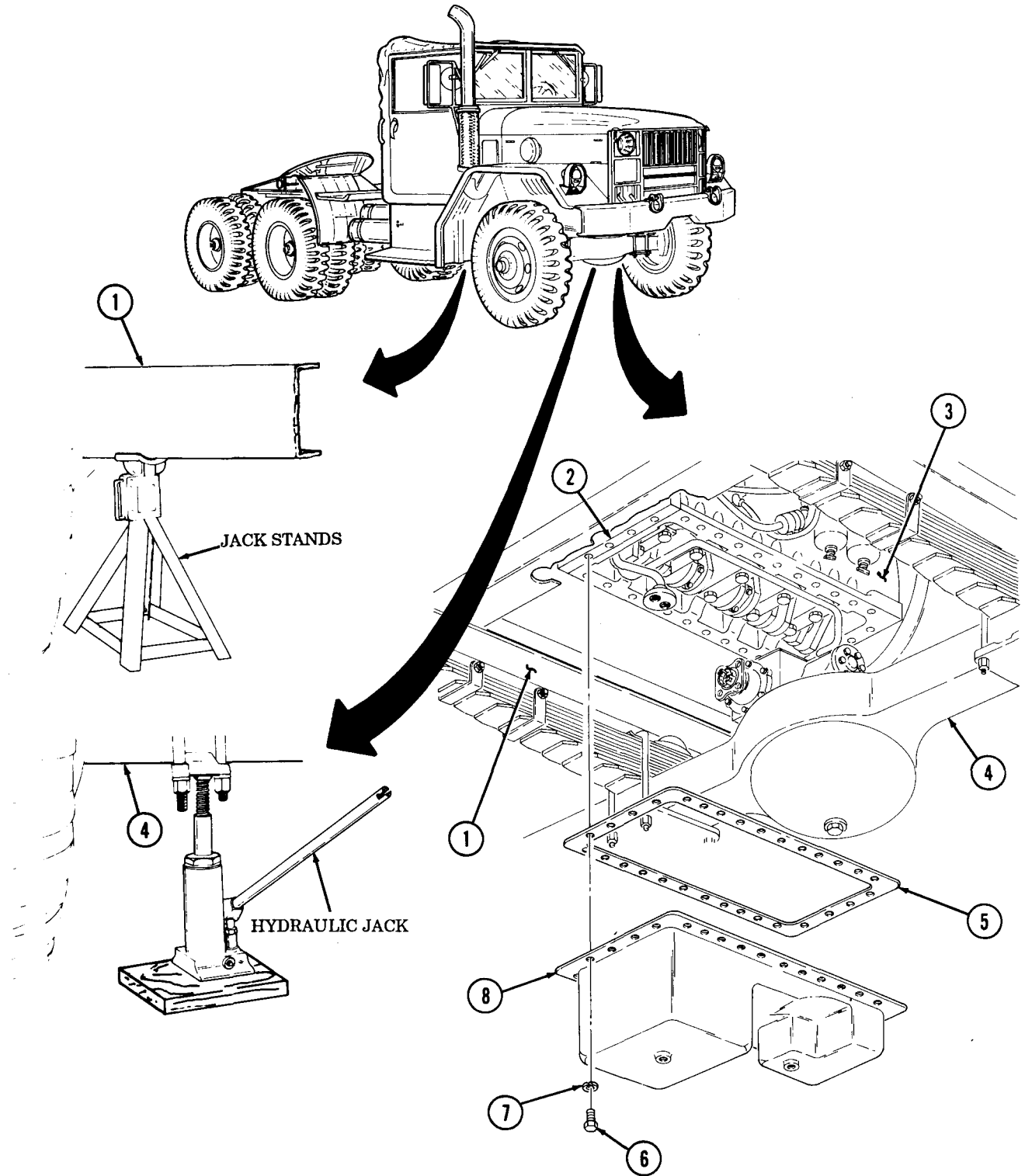
• Engine oil drained (LO 9-2320-209-12-1).

1. Place hydraulic jack under driver's side front axle (4) and raise vehicle.
2. Place jack stand under driver's side frame (1) and lower hydraulic jack.
3. Remove thirty screws (6), lockwashers (7), oil pan (8), and gasket (5) from engine block (3) and timing cover (2). Discard lockwashers (7) and gasket (5).
4. Remove gasket remains from oil pan (8), engine block (3), and timing cover (2).

b. Installation

1. Apply light coat of sealing compound to new gasket (5).
2. Install new gasket (5) and oil pan (8) on engine block (3) and timing cover (2) with thirty new lockwashers (7) and screws (6).
3. Place hydraulic jack under driver's (left) side front axle (4) and raise vehicle.
4. Remove jack stand from under frame (1).
5. Remove hydraulic jack.

3-11. OIL PAN REPLACEMENT (Contd)



FOLLOW-ON TASK: Replace engine oil to required level (LO 9-2320-209-12-1).

3-12. OIL PUMP MAINTENANCE

THIS TASK COVERS:

- a. Removal**
b. Inspection

- c. Installation**
-

INITIAL SETUPAPPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 Mechanical puller kit (Appendix B, Item 22)
 6-in. Extension, 3/8-in. dr.
 (Appendix B, Item 54)
 Universal joint, 3/8-in. (Appendix B, Item 18)
 Adapter, 1/2-in. male, 3/8-in. female
 (Appendix B, Item 18)

SPECIAL TOOLS

5/8-in. crowfoot adapter (Appendix B, Item 56)

MATERIALS/PARTS

Three lockscrews (Appendix F, Item 120)
 Gasket (Appendix F, Item 39)
 Gasket (Appendix F, Item 40)
 Gasket (Appendix F, Item 41)
 Preformed packing (Appendix F, Item 179)
 Thirteen lockwashers (Appendix F, Item 121)
 Cotter pin (Appendix F, Item 4)
 Safety wire (Appendix C, Item 31)
 Lubricating oil, OE/HDO 30 (Appendix C, Item 13)

REFERENCES (TM)

TM 9-2320-361-34P

EQUIPMENT CONDITION

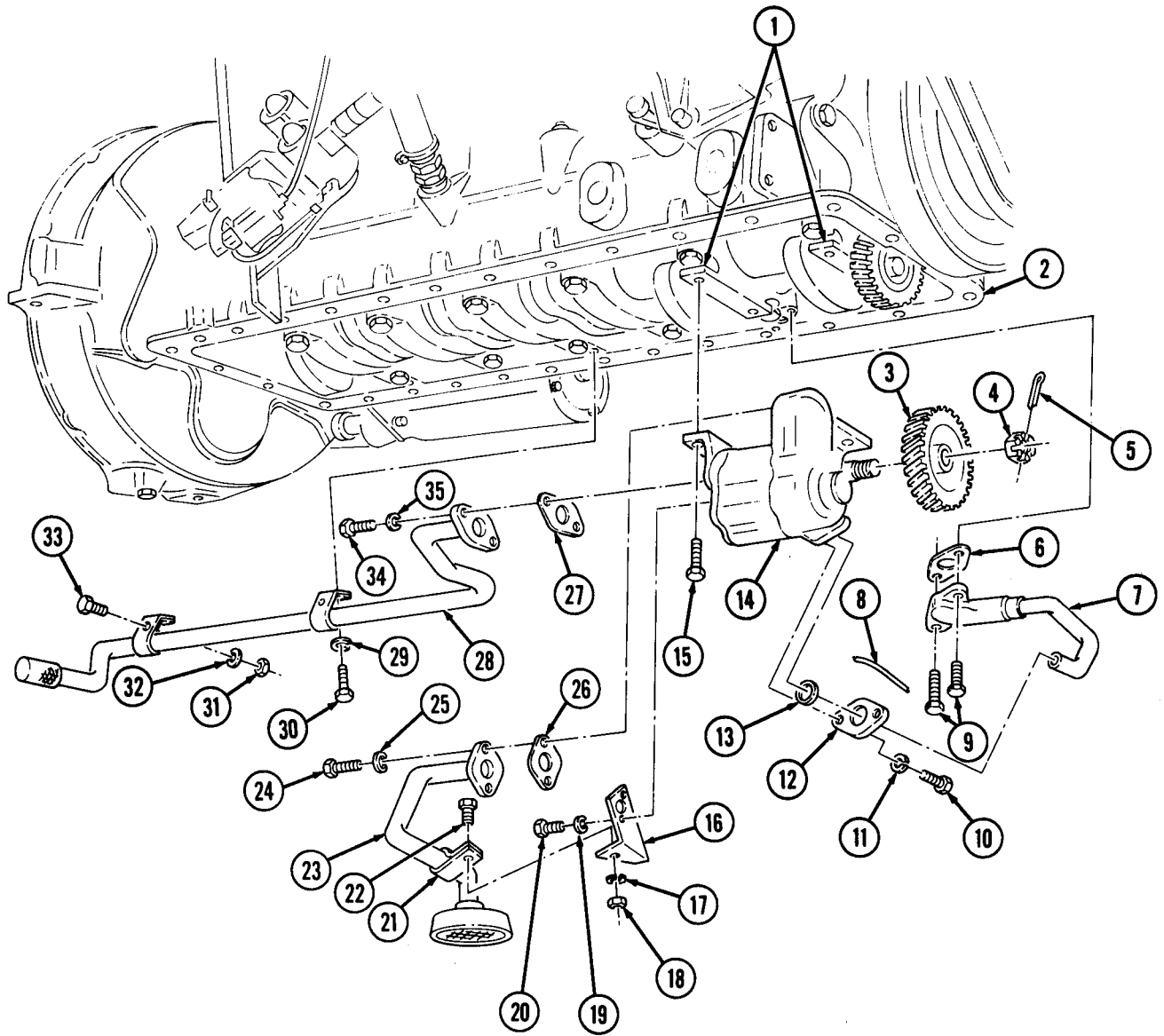
Oil pan removed para. 3-11).

NOTE

Have drainage container ready to catch excess oil.

1. Remove safety wire (8) from two screws (9). Discard safety wire (8).
2. Remove two screws (9), outlet tube (7), and gasket (6) from engine block (2) and flange (12). Discard gasket (6).
3. Remove two screws (10), lockwashers (11), flange (12), and packing (13) from oil pump (14). Discard lockwashers (11) and packing (13).
4. Remove nut (18), lockwasher (17), and screw (22) from pickup tube clamp (21) and brace (16). Discard lockwasher (17).
5. Remove two screws (24), lockwashers (25), pickup tube (23), and gasket (26) from oil pump (14). Discard lockwashers (25) and gasket (26).
6. Remove two screws (30) and lockwashers (29) from scavenger tube (28) and engine block (2). Discard lockwashers (29).
7. Remove two screws (34), lockwashers (35), scavenger tube (28), and gasket (27) from oil pump (14). Discard lockwashers (35) and gasket (27).
8. Remove two screws (20), lockwashers (19), and brace (16) from oil pump (14). Discard lockwashers (19).
9. Remove three lockscrews (15) and oil pump (14) from two bearing caps (1). Discard lockscrews (15).
10. Remove cotter pin (5), nut (4), and gear (3) from pump (14). Discard cotter pin (5).
11. Remove gear (3) from pump (14) with mechanical puller.
12. Remove two nuts (31), lockwashers (32), and screws (33) from scavenger tube (28). Discard lockwashers (32).

3-12. OIL PUMP MAINTENANCE (Contd)

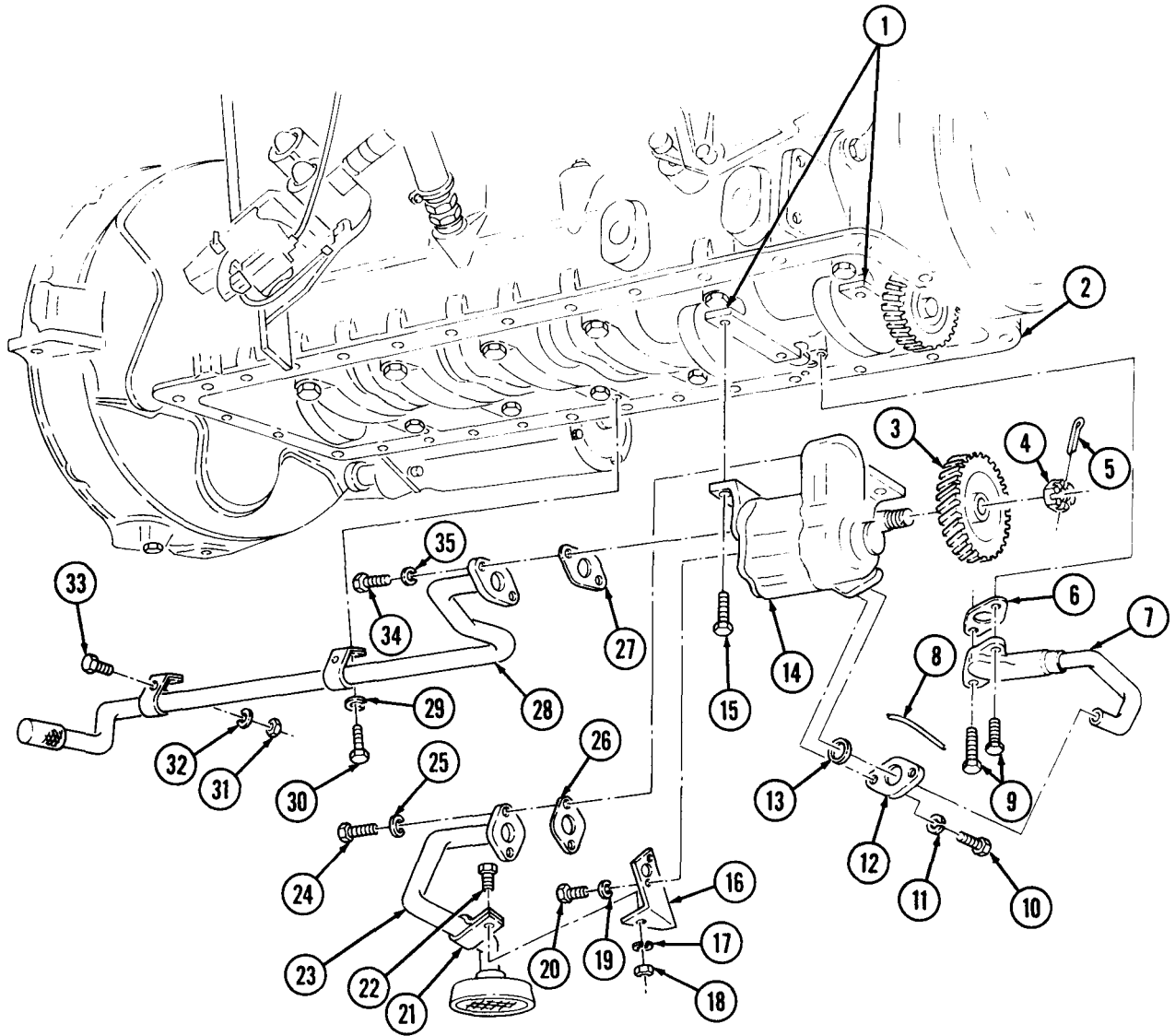


3-12. OIL PUMP MAINTENANCE (Contd)

b. Inspection

1. Inspect gear (3) for damaged teeth or scored bearing surfaces. Remove minor burrs with fine mill file. If damage is beyond repair, replace.
 2. Inspect all tubes (7), (23), and (28) for dents, cracks, bent flanges, flattened areas, and cracked, torn, or loose screen. If damaged, replace.
-
1. Install gear (3) on oil pump (14) with nut (4).
 2. Prime oil pump (14) with oil.
 3. Install oil pump (14) on two bearing caps (1) with three new lockscrews (15), Tighten lock-screws (15) 53-58 lb-ft (72-79 N.m).
 4. Tighten nut (4) 44-46 lb-ft (60-62 N.m) and install new cotter pin (5).
 5. Install new gasket (27) and scavenger tube (28) on oil pump (14) with two new lockwashers (35) and screws (34). Tighten screws (34) 75-100 lb-in. (8-11 N.m).
 6. Install two new lockwashers (29) and screws (30) on scavenger tube (28) and engine block (2). Tighten screws (30) 150-175 lb-in. (17-20 N.m).
 7. Install two screws (33) on scavenger tube (28) with two new lockwashers (32) and nuts (31). Tighten nuts (31) 75-100 lb-in. (8-11 N.m).
 8. Install brace (16) on oil pump (14) with two new lockwashers (19) and screws (20). Tighten screws (20) 75-100 lb-in. (8-11 N.m).
 9. Install new gasket (26) and pickup tube (23) on oil pump (14) with two new lockwashers (25) and screws (24). Tighten screws (24) 75-100 lb-in. (8-11 N.m).
 10. Install screw (22) through pickup tube clamp (21) and brace (16) with new lockwasher (17) and nut (18). Tighten nut (18) 75-100 lb-in. (8-11 N.m).
 11. Install new packing (13) and flange (12) on outlet tube (7) and oil pump (14) with two new lock-washers (11) and screws (10). Tighten screws (10) 75-100 lb-in. (8- 11 N.m).
 12. Install new gasket (6) and outlet tube (7) on engine block (2) with two screws (9). Tighten screws (9) 150-175 lb-in. (17-20 N.m).
 13. Install new safety wire (8) on screws (9).

3-12. OIL PUMP MAINTENANCE (Contd)



FOLLOW-ON TASK: Install oil pan (para. 3-11).

3-13. OIL PRESSURE REGULATOR HOUSING MAINTENANCE

THIS TASK COVERS:

- | | |
|--|---|
| <p>a. Removal
 b. Disassembly
 c. Cleaning and Inspection</p> | <p>d. Assembly
 e. Installation</p> |
|--|---|

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Spring tester (Appendix B, Item 38)
- Inside micrometer (Appendix B, Item 16)
- Outside micrometer (Appendix B, Item 17)
- Torque wrench, 1/2-in. dr. (Appendix B, Item 7)

MATERIALS/PARTS

- Gasket (Appendix F, Item 83)
- Two gaskets (Appendix F, Item 51)
- Four lockwashers (Appendix F, Item 123)
- Crocus cloth (Appendix C, Item 7)

REFERENCES (TM)

- TM 9-2320-361-10
- TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Hood raised and secured (TM 9-2320-361-10).

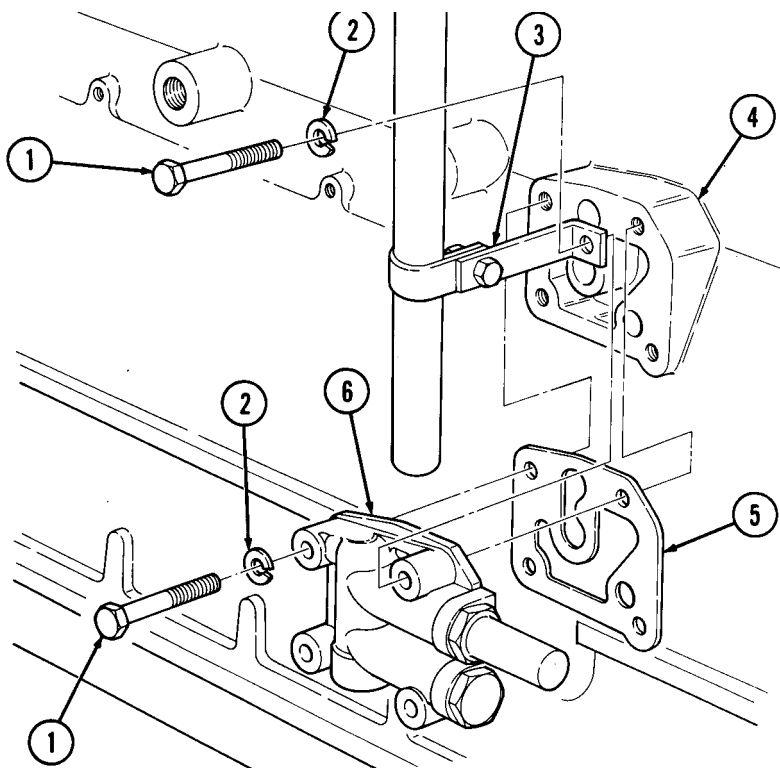
a. Removal

NOTE

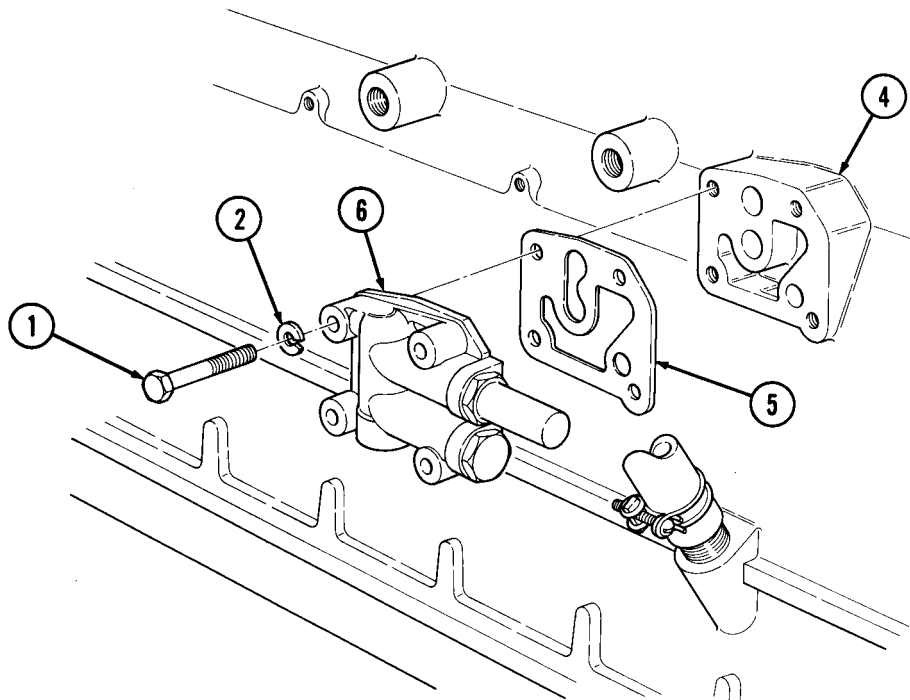
- Perform steps 1 and 2 for vehicles equipped with engine models LD-465-1 and LD-465-1C.
- Perform step 3 for vehicles equipped with engine models LDT-465-1C and LDT-465-1D.

1. Remove screw (1) and lockwasher (2) from bracket (3) and engine (4). Discard lockwasher (2).
2. Remove three screws (1), lockwashers (2), regulator valve housing (6) and gasket (5) from engine (4). Discard gasket (5) and lockwashers (2).
3. Remove four screws (1), lockwashers (2), regulator valve housing (6) and gasket (5) from engine (4). Discard gasket (5) and lockwashers (2).

3-13. OIL PRESSURE REGULATOR HOUSING MAINTENANCE (Contd)



LD-465-1 and LD-465-1 C
MODELS



LDT-465-1 C and LDT-465-1 D
MODELS

3-13. OIL PRESSURE REGULATOR HOUSING MAINTENANCE (Contd)

b. Disassembly

1. Remove oil pressure regulator valve plug (6) and gasket (5) from regulator valve housing (1) Discard gasket (5).
2. Remove oil pressure regulator spring (4) and plunger (3) from regulator valve housing (1).
3. Remove piston oil cooling control valve plug (7) and gasket (8) from regulator valve housing (1). Discard gasket (8).
4. Remove piston oil cooling control valve spring (9) and plunger (3) from regulator valve housing (1).
5. Remove plug (10) from regulator valve housing (1).

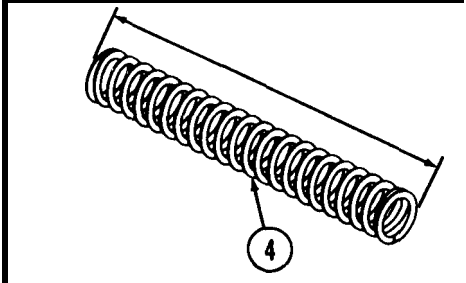
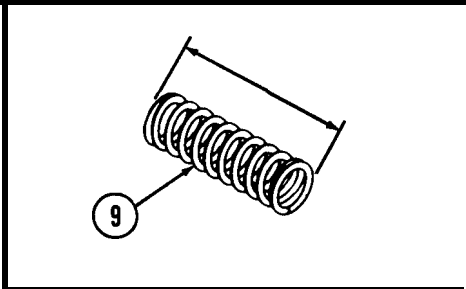
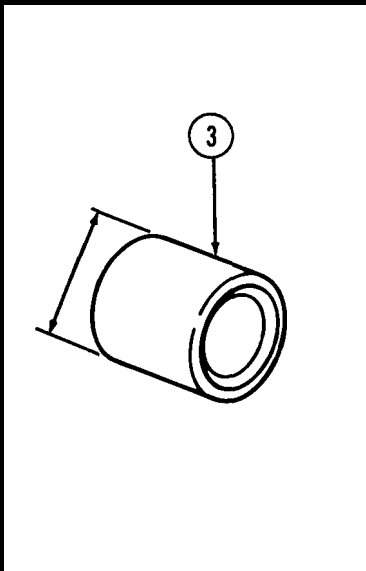
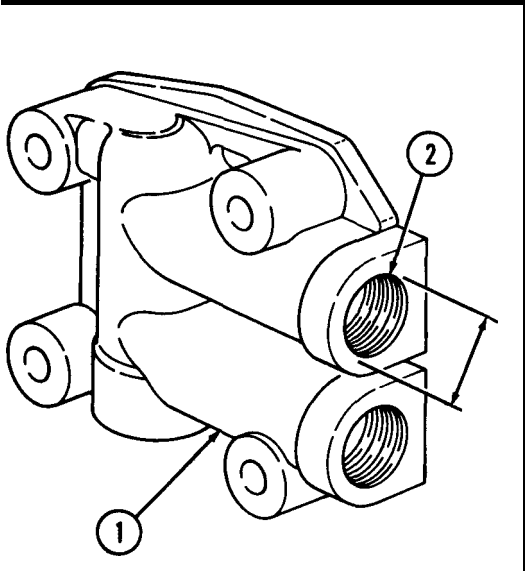
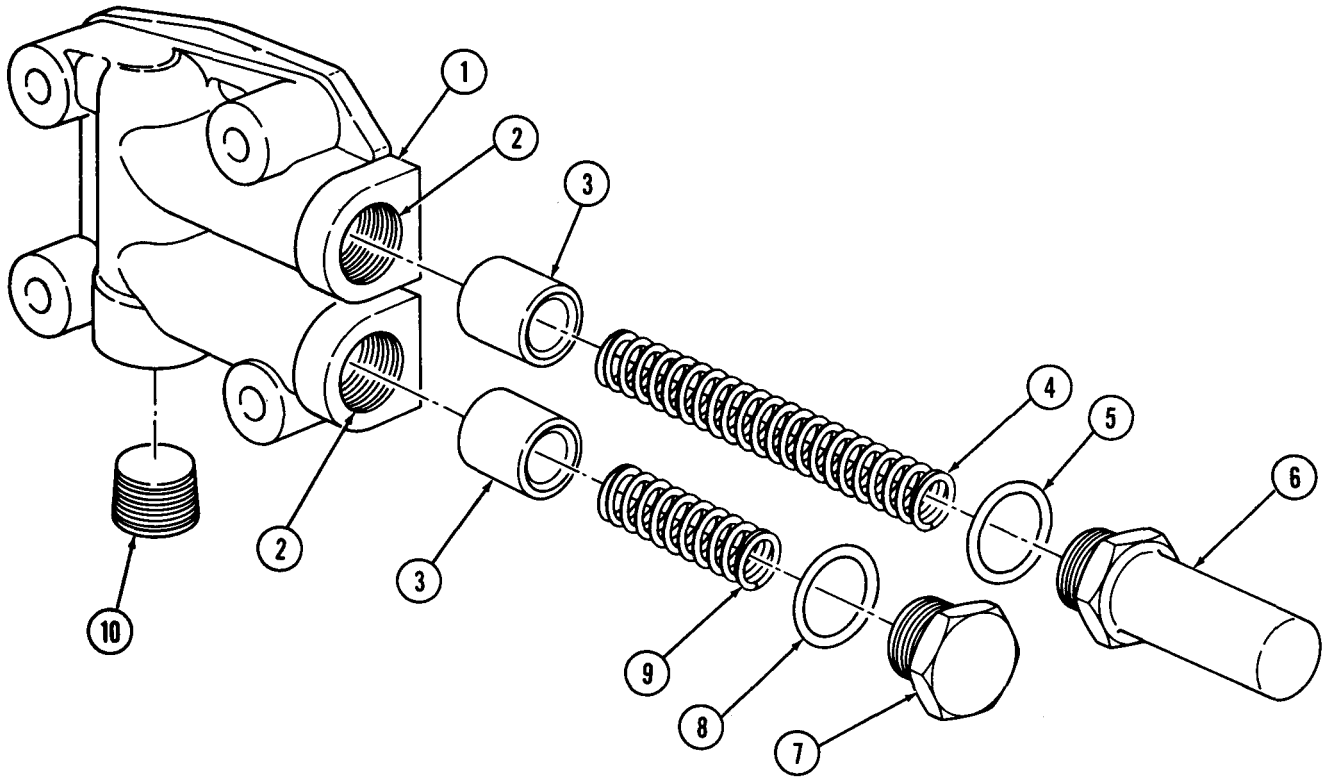
c. Cleaning and Inspection

1. For general cleaning instructions, refer to para. 2-9.
2. For general inspection instructions, refer to para. 2-10.
3. Inspect bores (2) for burrs, scratches, or wear. Refer to table 3-3, Oil Pressure Regulator Wear Limits, for measurements. Remove burrs and scratches with crocus cloth. Replace if excessively burred, scratched, or worn.
4. Inspect oil pressure regulator spring (4) for distortion, cracks, and collapsed coils. Refer to table 3-3, Oil Pressure Regulator Wear Limits, for measurements. Replace oil pressure regulator spring (4) if distorted, cracked, coils are collapsed, or worn.
5. Using spring tester, compress oil pressure regulator spring (4) to 3.44 in. (87.38 mm). Load measured should be 24.6 -28.6 lb (11.17 -13.0 kg), Replace oil pressure regulator spring (4) if not within limits.
6. Inspect piston cooling relief valve spring (9) for distortion, cracks, collapsed coils, or wear. Refer to table 3-3, Oil Pressure Regulator Wear Limits, for measurements. Replace piston cooling relief valve spring (9) if distorted, cracked, coils are collapsed, or worn.
7. Using spring tester, compress piston cooling relief valve spring (9) to 1.38 in. (35.05 mm), Load measured should be 6.95-8.35 lb (3.16-3.79 kg). Replace piston cooling relief valve spring (9) if not within limits.
8. Inspect two plungers (3) for nicks, burrs, or scratches. Refer to table 3-3, Oil Pressure Regulator Wear Limits, for measurements. Replace plungers (3) if nicked, burred, scratched, or worn.

Table 3-3. Oil Pressure Regulator Wear Limits.

Item No.	Item/Point of Measurement	Wear Limits/Tolerance	
		Inches	Millimeters
2	Inside Diameter of Plunger Bores in Housing	0.803-0.804	20.40-20.42
3,10	Outside Diameter of Plunger	0.8000-0.801	2.032-20.35
4	Piston Cooling Relief Valve Spring Free Length	1.6200	41.14
9	Oil Pressure Regulator Spring Free Length	4.650	118.11

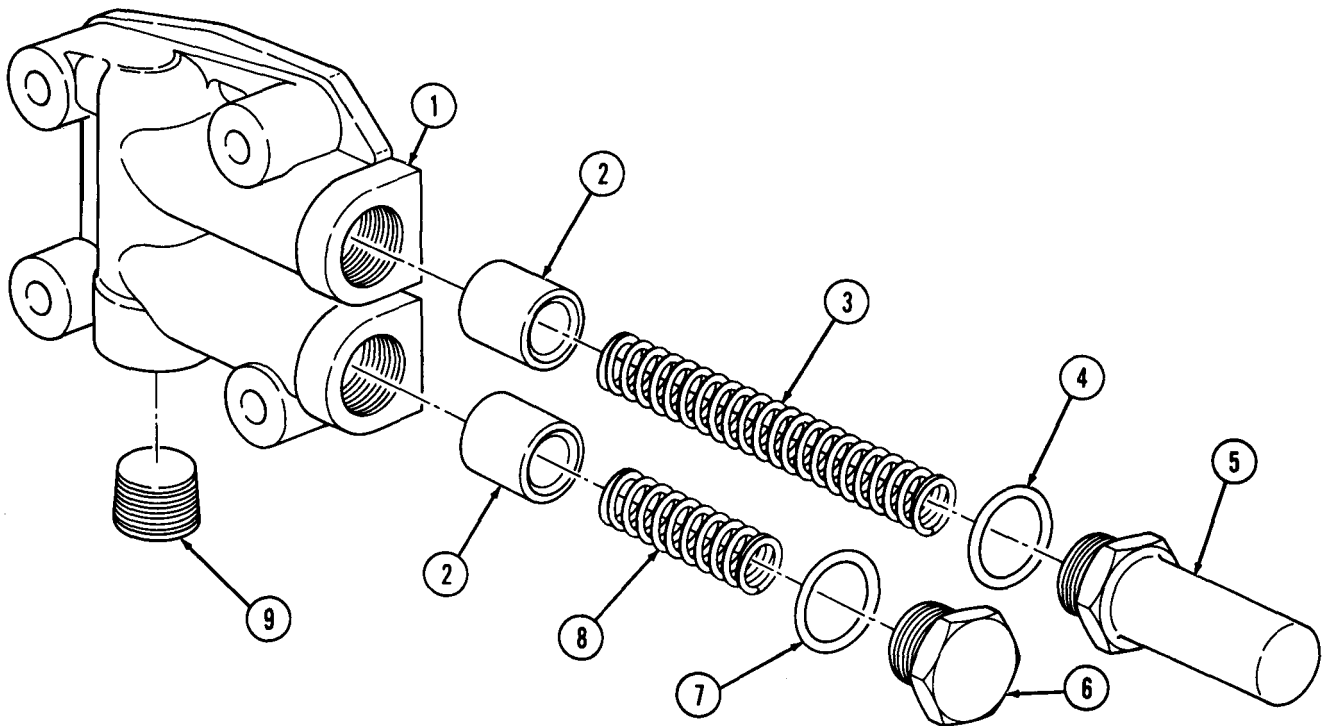
3-13. OIL PRESSURE REGULATOR HOUSING MAINTENANCE (Contd)



3-13. OIL PRESSURE REGULATOR HOUSING MAINTENANCE (Contd)

d. Assembly

1. Install plunger (2) and piston oil cooling control valve spring (8) in regulator valve housing (1).
2. Install new gasket (7) and piston oil cooling control valve plug (6) in regulator valve housing (1).
3. Install plunger (2) and oil pressure regulator spring (3) in regulator valve housing (1)
4. Install new gasket (4) and oil pressure regulator valve plug (5) in regulator valve housing (1).
5. Install plug (9) in regulator valve housing (1).



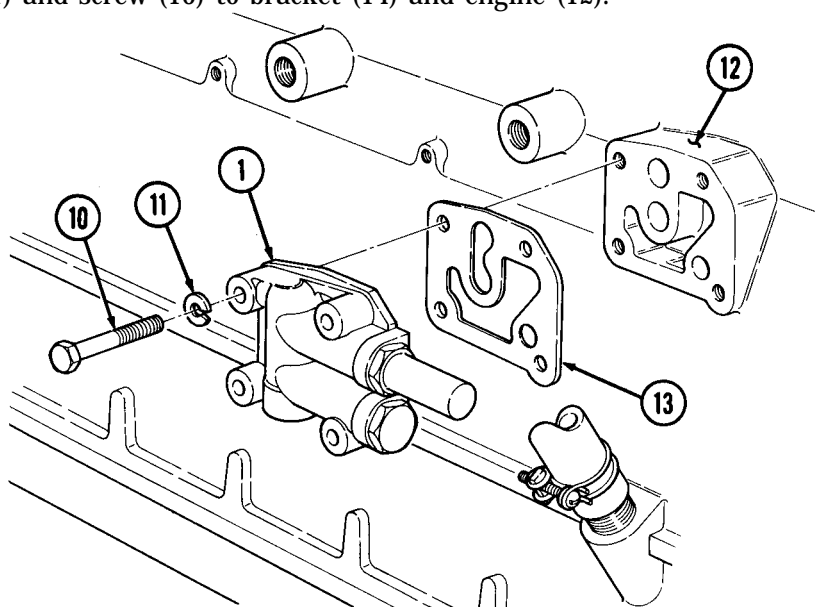
3-13. OIL PRESSURE REGULATOR HOUSING MAINTENANCE (Contd)

e. Installation

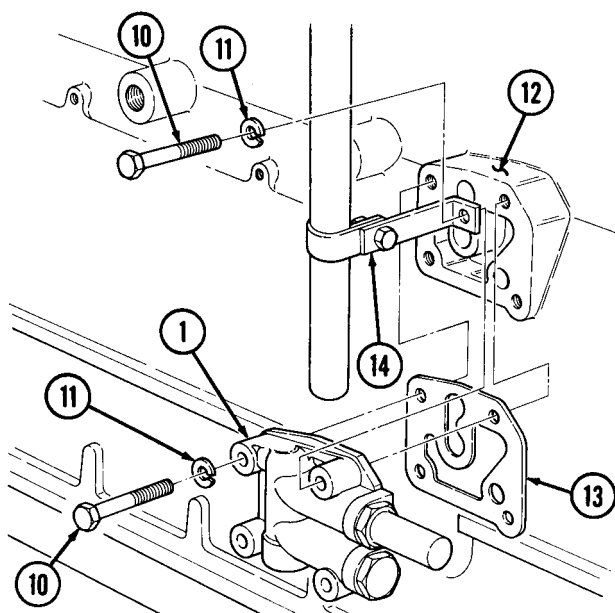
NOTE

- Perform step 1 for vehicles equipped with engine models LDT-465-1C and LDT-465-1D.
 - Perform steps 2 and 3 for vehicles equipped with engine models LD-465-1 and LD-465-1C.
1. Install new gasket (13) and oil pressure regulator valve housing (1) on engine (12) with four new lockwashers (11) and screws (10).
 2. Install new gasket (13) and oil pressure regulator valve housing (1) on engine (12) with three new lockwashers (11) and screws (10).
 3. Install new lockwasher (11) and screw (10) to bracket (14) and engine (12).

LDT-465-1C and LDT-465-1D
MODEL 5



LD-465-1 and LD-465-1C
MODEL 5



3-14. ENGINE OIL COOLER REPLACEMENT
--

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
11/16-in. flare wrench (Appendix B, Item 52)

MATERIALS/PARTS

Thirteen lockwashers (Appendix F, Item 121)
Two preformed packings (Appendix F, Item 179)
Gasket (Appendix F, Item 48)
Gasket (Appendix F, Item 49)
Cap and plug set (Appendix C, Item 5)
Sealing compound (Appendix C, Item 17)

REFERENCES (TM)

TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

. Engine coolant drained (TM 9-2320-361-20).
. Secondary fuel filter head removed
(TM 9-2320-361-20).

CAUTION

Cap or plug all openings immediately after disconnecting lines and hoses to prevent contamination. Remove caps or plugs prior to installation. Failure to do so may result in damage to equipment.

a. Removal

1. Remove nut (3) and lockwasher (4) from stud (20). Discard lockwasher (4).
2. Remove four dust covers (1) from injector ports (22) and slide up injector line (23) and three lines (2).
3. Remove two locknuts (27), screws (26), washers (25), and clamps (24) from injector line (23).

NOTE

Tag injector lines for installation.

4. Remove injector line (23) from injector pump port (22).
5. Remove three injector lines (2) from injector pump ports (22) and injectors (9) and remove injector line retainer clamp (5) and washer (21) from stud (20).
6. Remove nut (14), lockwasher (13), and clamp (12) from stud (8). Discard lockwasher (13).

NOTE

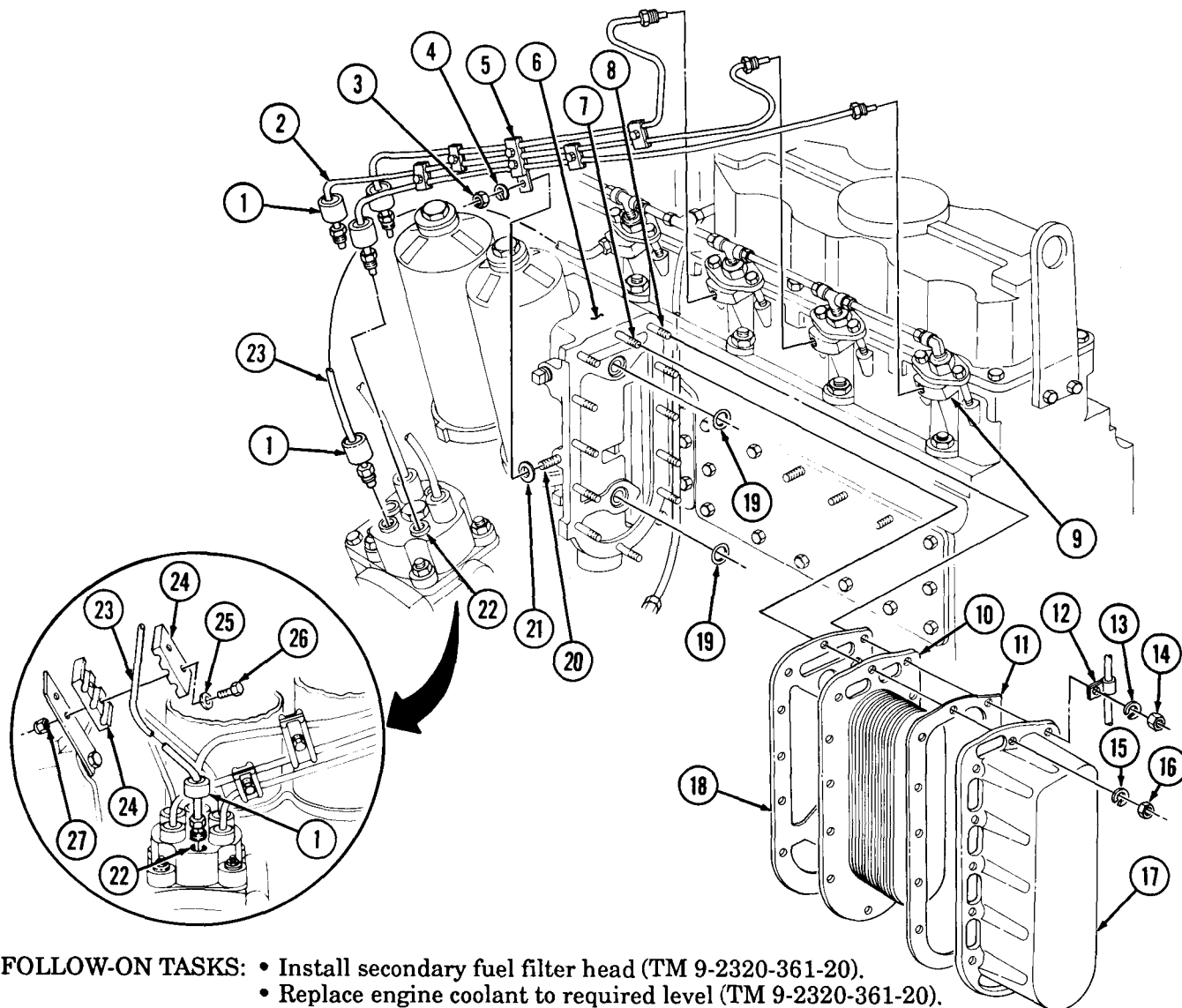
Have drainage container ready to catch coolant.

7. Remove eleven nuts (16), lockwashers (15), cover (17), gasket (11), oil cooler (10), gasket (18), and two preformed packings (19) from oil cooler housing (6), and studs (7) and (8). Discard gaskets (11) and (18), preformed packings (19), and lockwashers (15).
8. Remove gasket remains from cover (17), oil cooler (10), and oil cooler housing (6).

3-14. ENGINE OIL COOLER REPLACEMENT (Contd)

b. Installation

1. Apply light coat of sealing compound to new gasket (18) and new gasket (11).
2. Install two new preformed packings (19), new gasket (18), oil cooler (10), new gasket (11), and cover (17) on oil cooler housing (6), eleven studs (7), and stud (8) with eleven new lockwashers (15) and nuts (16).
3. Install clamp (12) on stud (8) and cover (17) with new lockwasher (13) and nut (14).
4. Install washer (21) and injector line retainer clamp (5) on stud (20) with new lockwasher (4) and nut (3).
5. Install three injector lines (2) on three injector pump ports (22) and injectors (9).
6. Install injector line (23) and dust cover (1) on injector pump port (22).
7. Install two clamps (24), washers (25), screws (26), and new locknuts (27) on injector line (23).
8. Install three dust covers (1) over three injector pump ports (22).



FOLLOW-ON TASKS:

- Install secondary fuel filter head (TM 9-2320-361-20).
- Replace engine coolant to required level (TM 9-2320-361-20).

3-15. ENGINE OIL COOLER AND OIL FILTER HOUSING MAINTENANCE

THIS TASK COVERS:

- a. Removal**
- b. Disassembly**
- c. Inspection**

- d. Assembly**
- e. Installation**

INITIAL SETUPAPPLICABLE MODELS

All

TOOLS

General mechanic's tool kit (Appendix B, Item 1)
 1/2-in. allen wrench (Appendix B, Item 49)
 1-1/4-in. open end wrench
 (Appendix B, Item 50)

MATERIALS/PARTS

Two gaskets (Appendix F, Item 51)
 Gasket (Appendix F, Item 52)
 Hose (Appendix F, Item 85)

MATERIALS/PARTS (CONTD)

Sealing compound, thread locking
 (Appendix C, Item 18)
 Sealing compound, gasket forming
 (Appendix C, Item 19)

REFERENCES (TM)

TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

- Engine oil filters removed (TM 9-2320-361-20).
- Engine oil cooler removed (para. 3-13).

NOTE

Have drainage container ready to catch oil and coolant.

a. Removal

1. Remove plug (15). Allow coolant to drain.
2. Loosen two clamps (1).
3. Remove seventeen screws (10) and washers (9) from engine block (2) and housing (4).
4. Remove housing (4) and gasket (17) from hose (19) and engine block (2). Discard gasket (17).
5. Remove two clamps (1) and hose (19) from coolant tube (18). Discard hose (19).

b. Disassembly

1. Remove two oil pressure plugs (12), gaskets (11), springs (13), and valves (14) from housing (4). Discard gaskets (11).
2. Remove two adapter bushings (3) from housing (4).
3. Remove plug (16) from housing (4).
4. Remove draincock (7) and adapter (6) from housing (4).

c. Inspection

1. Refer to para. 2-9 for inspection instructions.
2. Inspect twelve studs (5) and stud (8) for damage. If stud(s) is damaged, replace.
3. Inspect housing (4) for cracks. If housing (4) is damaged, replace.

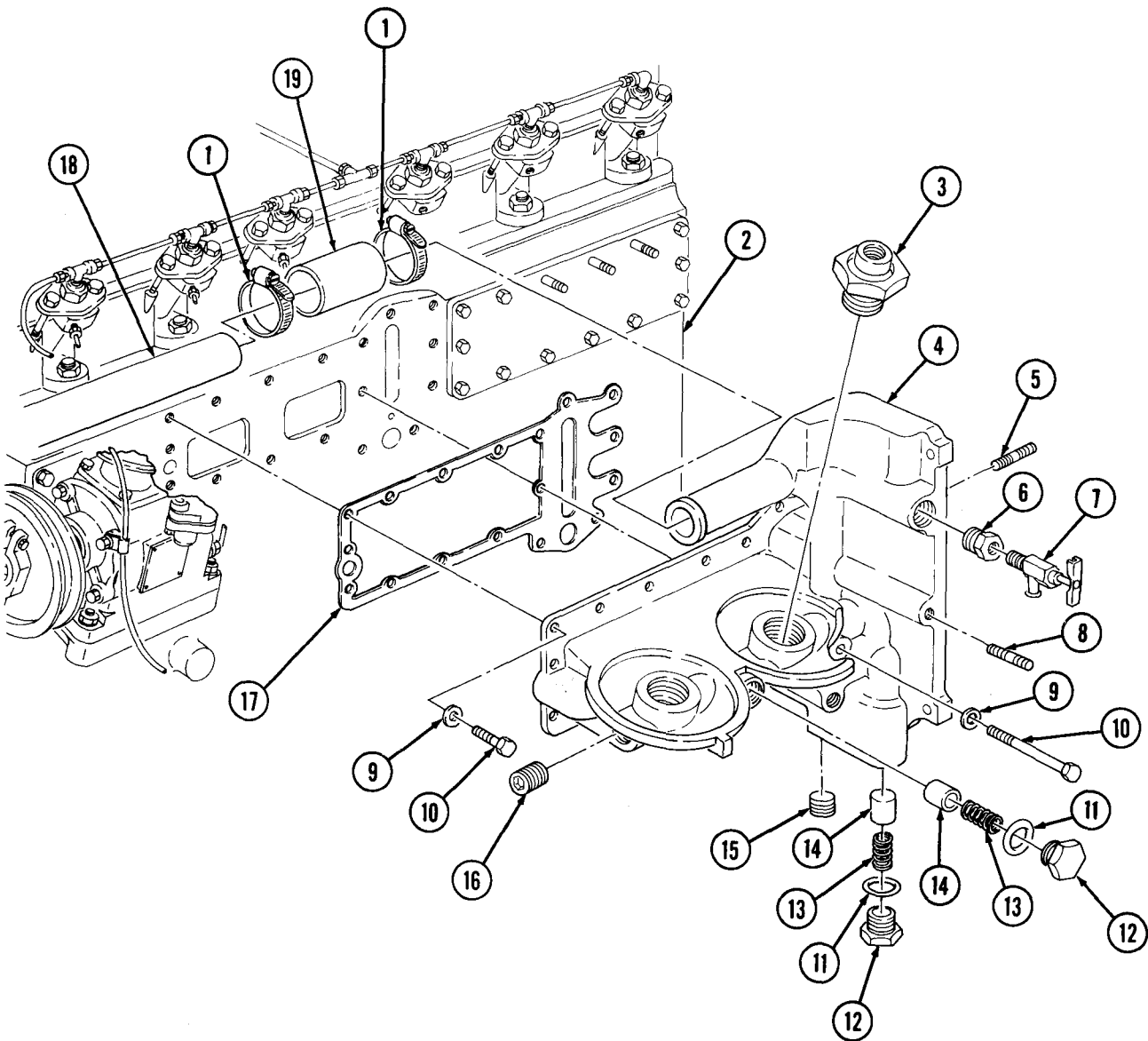
d. Assembly

1. Install adapter (6) and draincock (7) in housing (4).
2. Install plugs (16) and (15) in housing (4).
3. Coat outer threads of two bushings (3) with sealing compound.
4. Install two adapter bushings (3) in housing (4).
5. Install two valves (14), springs (13), new gaskets (11), and oil pressure plugs (12) in housing (4).

3-15. ENGINE OIL COOLER AND OIL FILTER HOUSING MAINTENANCE (Contd)

e. Installation

1. Install new hose (19) and two clamps (1) on coolant tube (18). Do not tighten clamps (1).
2. Apply light coat of sealing compound to threads of seventeen screws (10).
3. Apply light coat of sealing compound to new gasket (17).
4. Install new gasket (17) and housing (4) on engine block (2) with seventeen washers (9) and screws (10).
5. Install hose (19) on housing (4) and tighten two hose clamps (1).



FOLLOW-ON TASKS: •Install engine oil cooler (para. 3-13).
 •Install engine oil filters (TM 9-2320-361-20).

3-16. AIR COMPRESSOR SUPPORT AND GASKET REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Gasket (Appendix F, Item 42)
Sealing compound, thread locking
(Appendix C, Item 18)
Sealing compound, gasket forming
(Appendix C, Item 19)

REFERENCES (TM)

TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Air compressor removed (TM 9-2320-361-20).

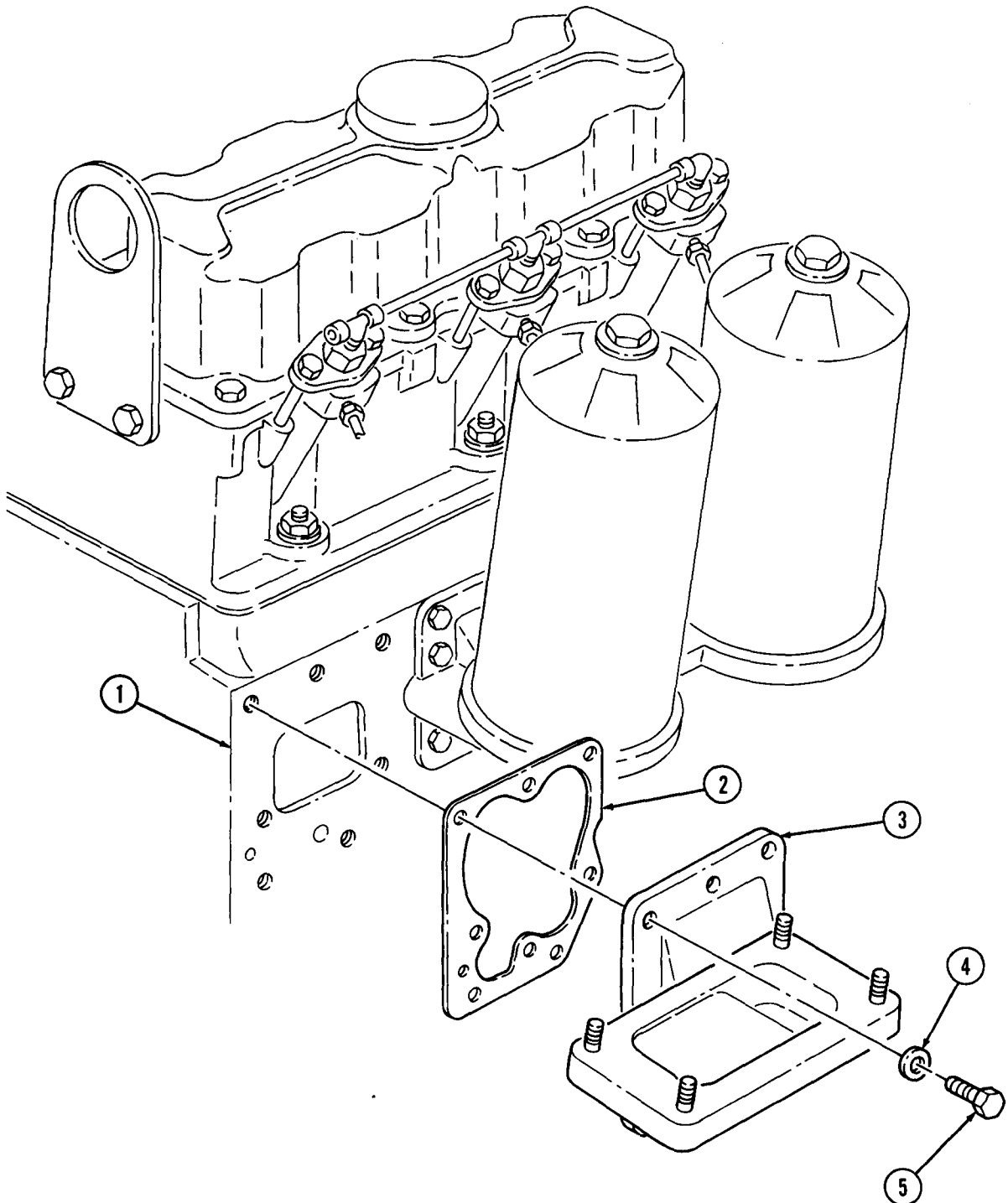
a. Removal

1. Remove seven screws (5), washers (4), support (3), and gasket (2) from engine block (1). Discard gasket (2).
2. Remove all excess gasket (2) material from engine block (1) and support (3).
3. Remove sealer from threads of seven screws (5).

b. Installation

1. Apply a thin coat of sealing compound on threads of seven screws (5).
2. Apply a thin, even coat of sealing compound on both sides of gasket (2).
3. Install new gasket (2) and support (3) on engine block (1) with seven washers (4) and screws (5).

3-16. AIR COMPRESSOR SUPPORT AND GASKET REPLACEMENT (Contd)



FOLLOW-ON TASK: Install air compressor (TM 9-2320-361-20).

3-17. INTAKE AND EXHAUST MANIFOLDS MAINTENANCE

THIS TASK COVERS:

- | | |
|--|---|
| <p>a. Intake and Exhaust Manifolds Removal</p> <p>b. Exhaust Manifold Disassembly</p> <p>c. Cleaning and Inspection</p> | <p>d. Exhaust Manifold Assembly</p> <p>e. Intake and Exhaust Manifolds Installation</p> |
|--|---|

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Two gaskets (Appendix F, Item 27)
Six seal rings (Appendix F, Item 241)
Twelve locknuts (Appendix F, Item 90)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

- Thermostat and housing removed (TM 9-2320-361-20).
- Personnel heater hoses removed (TM 9-2320-361-20).
- Oil dipstick tube removed (TM 9-2320-361-20).
- Turbocharger removed (para. 5-5).
- Uncovered manifold heater removed, if installed (TM 9-2320-361-20).
- Covered manifold heater removed, if installed (TM 9-2320-361-20).
- Water outlet manifolds removed (TM 9-2320-361-20).
- Engine temperature sending unit removed (TM 9-2320:361-20).
- Air cleaner assembly removed (TM 9-2320-361-20).

a. Intake and Exhaust Manifolds Removal

1. Remove drain valve (7) and plug (8) from intake manifold (4).
2. Remove sixteen nuts (6) and washers (5) from intake manifold (4).
3. Remove twelve locknuts (11) and washers (10) from exhaust manifold (9). Discard locknuts (11).
4. Loosen two screws (17) on starter solenoid bracket (18).

NOTE

Assistant will help with steps 5 and 6.

5. Remove intake manifold (4), exhaust manifold (9), and two gaskets (3) from cylinder heads (1) and (2). Discard gaskets (3).
6. Remove excess gasket (3) material from cylinder heads (1) and (2), intake manifold (4), and exhaust manifold (9).

b. Exhaust Manifold Disassembly

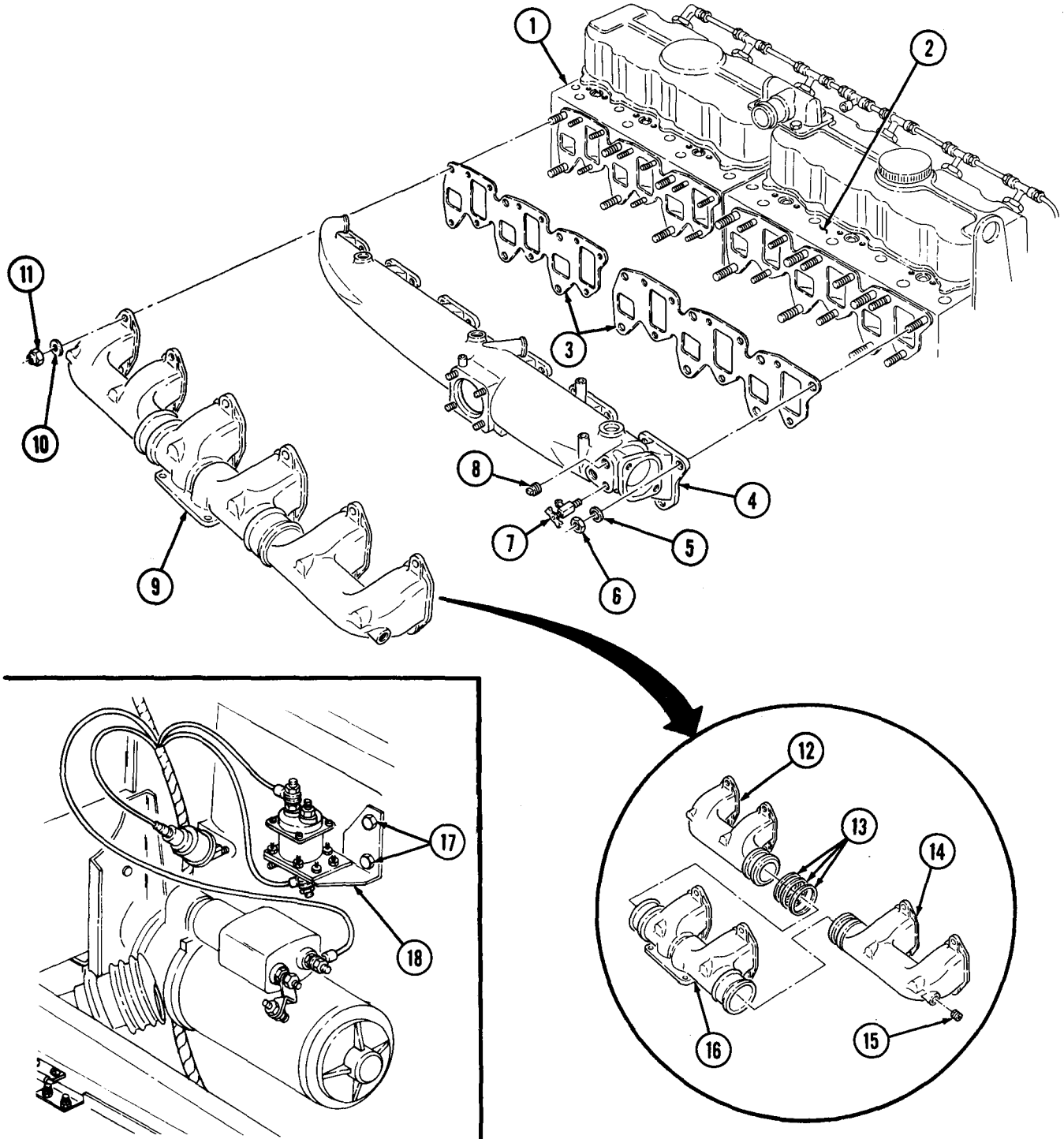
1. Remove manifold sections (12) and (14) from manifold section (16).
2. Remove six flange seal rings (13) from manifold sections (12) and (14). Discard seal rings (13).
3. Remove two plugs (15) from exhaust manifold sections (12) and (14).

c. Cleaning and Inspection

1. For general cleaning instructions, refer to para. 2-8.
2. For general inspection instructions, refer to para. 2-9.
3. Inspect three expansion plugs (13) for looseness, leaking or damage. If loose or damaged, replace,

3-17. INTAKE AND EXHAUST MANIFOLDS MAINTENANCE (Contd)

4. Inspect four studs (12) for looseness, stripped, cross-threaded, or other damage. Repair thread damage. If more repair is required, replace intake manifolds (4).
5. Inspect gasket surfaces on intake manifold (4) and intake manifold (9) for nicks, burrs, or scratches. Repair with fine mill file or crocus cloth.
6. Inspect intake manifold (4) and exhaust manifold (9) for cracks or bends. If damaged, replace.



3-17. INTAKE AND EXHAUST MANIFOLDS MAINTENANCE (Contd)

d. Exhaust Manifold Assembly

1. Install six new flange seal rings (14) on manifold sections (13) and (15).
2. Install manifold sections (13) and (15) in manifold section (17).
3. Install two plugs (16) in exhaust manifold sections (13) and (15).

e. Intake and Exhaust Manifolds Installation

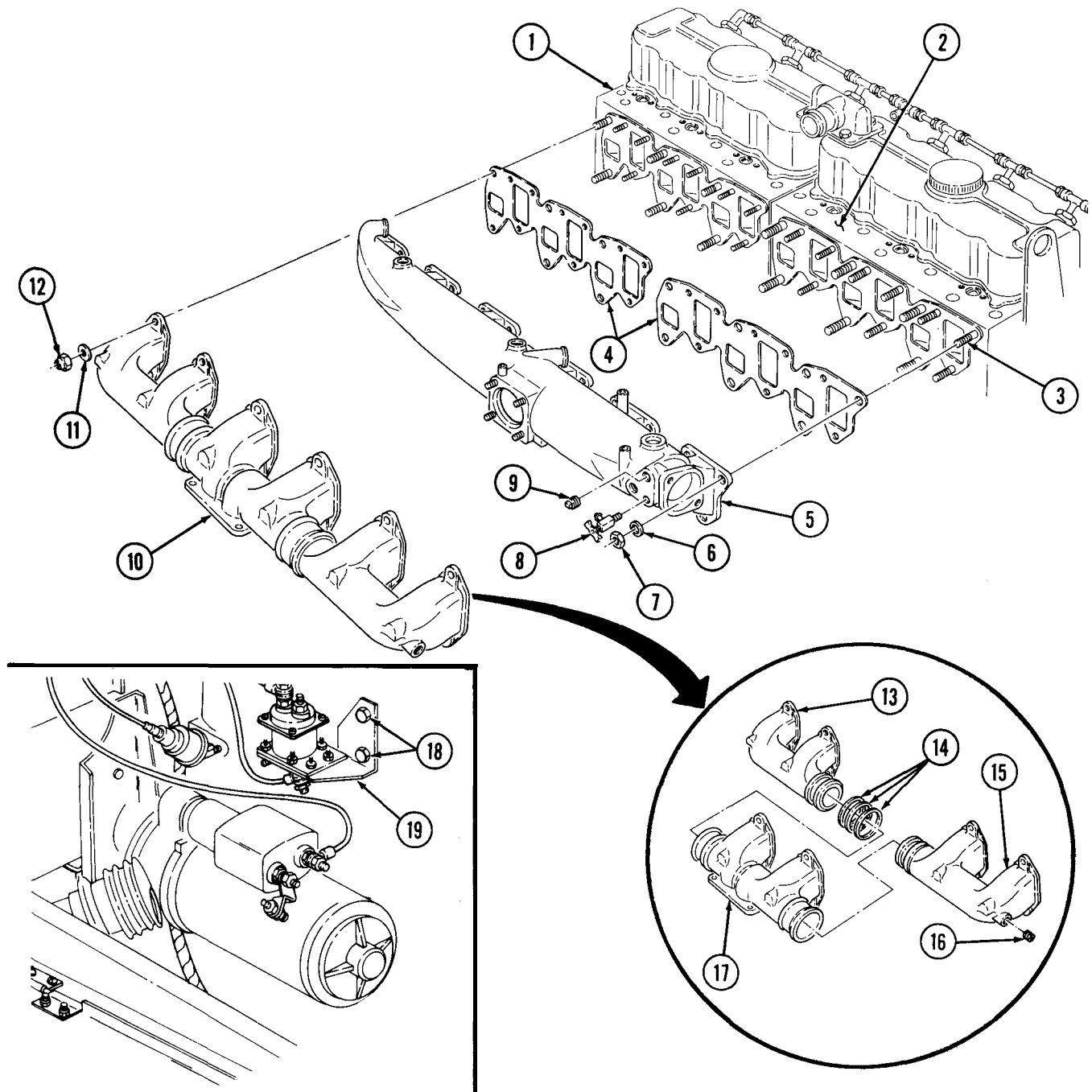
1. Position two gaskets (4) on thirty studs (3).

NOTE

Assistant will help with steps 2 and 3.

2. Install exhaust manifold (10) on twelve studs (3) and cylinder head (1) with twelve washers (11) and new locknuts (12). Do not tighten locknuts (12).
3. Hold exhaust manifold (10). Install intake manifold (5) on cylinder head (2) with sixteen washers (6) and nuts (7),
4. Tighten twelve locknuts (12).
5. Install plug (9) and drain valve (8) on intake manifold (5).
6. Tighten two screws (18) on starter solenoid bracket (19).

3-17. INTAKE AND EXHAUST MANIFOLDS MAINTENANCE (Contd)



- FOLLOW-ON TASKS:
- Install air cleaner assembly (TM 9-2320-361-20).
 - Install engine temperature sending unit (TM 9-2320-361-20).
 - Install water outlet manifolds (TM 9-2320-361-20).
 - Install covered manifold heater, if removed (TM 9-2320-361-20).
 - Install uncovered manifold heater, if removed (TM 9-2320-361-20).
 - Install turbocharger (para. 5-5).
 - Install oil dipstick tube (TM 9-2320-361-20).
 - Install personnel heater hoses (TM 9-2320-361-20).
 - Install thermostat and housing (TM 9-2320-361-20).

Section II. ENGINE REPLACEMENT

3-18. ENGINE REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Torque wrench, 3/8-in. dr. (Appendix B, Item 8)
- 1-1/8-in. socket, 3/4-in. dr. (Appendix B, Item 33)
- Sling (Appendix B, Item 14)
- 1-1/4-in. box wrench (Appendix B, Item 51)
- Bar, breaking, 3/4-in. dr. (Appendix B, Item 34)
- Torque wrench, 3/4-in. dr. (Appendix B, Item 6)
- Lifting device
- Transmission jack

MATERIALS/PARTS

- Eight locknuts (Appendix F, Item 88)
- Four locknuts (Appendix F, Item 102)
- Two locknuts (Appendix F, Item 91)
- Locknut (Appendix F, Item 97)
- Locknut (Appendix F, Item 96)
- Lockwasher (Appendix F, Item 150)
- Two lockwashers (Appendix F, Item 131)
- Twelve screw-assembled lockwashers (Appendix F, Item 155)
- Lockwasher (Appendix F, Item 124)
- Cotter pin (Appendix F, Item 16)
- Gasket (Appendix F, Item 31)
- Gasket (Appendix F, Item 80)
- Cap and plug set (Appendix C, Item 5)
- Adhesive sealant (Appendix C, Item 2)
- Antiseize tape (Appendix C, Item 25)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

- LO 9-2320-209-12-1
- TM 9-2320-361-10
- TM 9-2320-361-20
- TM 9-2320-361-34P

EQUIPMENT CONDITION

- . Parking brake set (TM 9-2320-361-10).
- . Wheels chocked (TM 9-2320-361-10).
- . Battery ground cable disconnected (TM 9-2320-361-20).
- Air reservoirs drained (TM 9-2320-361-10).
- Engine oil drained (LO 9-2320-209-12-1).
- Propeller shaft removed (TM 9-2320-361-20).
- Air cleaner assembly removed (TM 9-2320-361-20).
- Cab tunnel panel removed (TM 9-2320-361-20).
- . Transmission gearshift lever removed (TM 9-2320-361-20).
- Radiator and brackets removed (TM 9-2320-361-20).
- Front winch propeller shaft removed, if installed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- . All personnel must stand clear of engine during lifting operations. A swinging or shifting load may cause injury to personnel.
- Do not detach chain from engine until all engine weight is supported on engine stand.
- Do not disconnect air lines before draining air reservoirs. Small parts under pressure may shoot out with high velocity, causing injury to personnel.
- . Use prybar to free engine during lifting operations.
- Do not put hands between frame and engine supports during lifting operations.
- . Lifting device must have weight capacity greater than the weight of engine and transmission to prevent damage to equipment and injury to personnel.
- Diesel fuel is flammable. Do not perform this task near open flames.

3-18. ENGINE REPLACEMENT (Contd)

WARNING

Diesel fuel is flammable. Do not perform fuel system procedures near open flame. Injury to personnel may result.

CAUTION

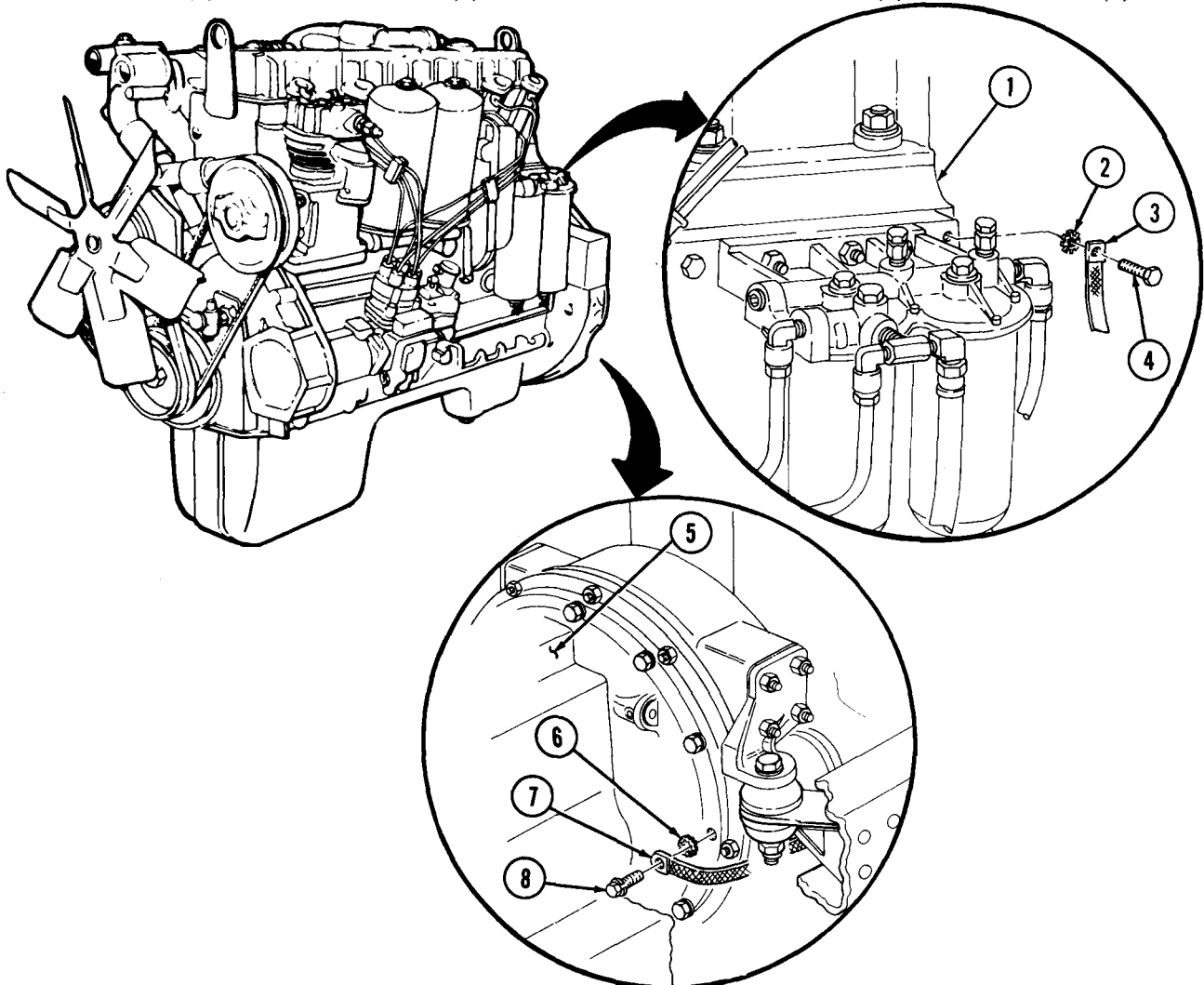
Cap or plug all openings immediately after disconnecting lines and hoses to prevent contamination. Remove cap or plugs prior to installation. Failure to do so may result in damage to equipment.

a. Removal

NOTE

- Prior to removal, tag wires, hoses, and tubes for installation.
- Secure wires, hoses, and tubes away from engine after removal or disconnection.

1. Remove screw (4), ground strap (3), and washer (2) from rear of engine (1).
2. Remove screw-assembled lockwasher (8), ground strap (7), and lockwasher (6) from transmission (5). Install lockwasher (6) and screw-assembled lockwasher (8) in transmission (5).



3-18. ENGINE REPLACEMENT (Contd)

3. Remove screw (1), lockwasher (2), and clamp (3) from fuel injector pump (5). Discard lockwasher (2).
4. Loosen screw (7) and remove engine stop control cable (4) from swivel (6).
5. Remove throttle return spring (15) from swivel (14) and throttle return clip (17).
6. Remove cotter pin (9), pin (16), and swivel (14) from pump lever (8). Discard cotter pin (11).
7. Remove screw (10), connector (11), and throttle control cable (12) from accelerator rod (13).

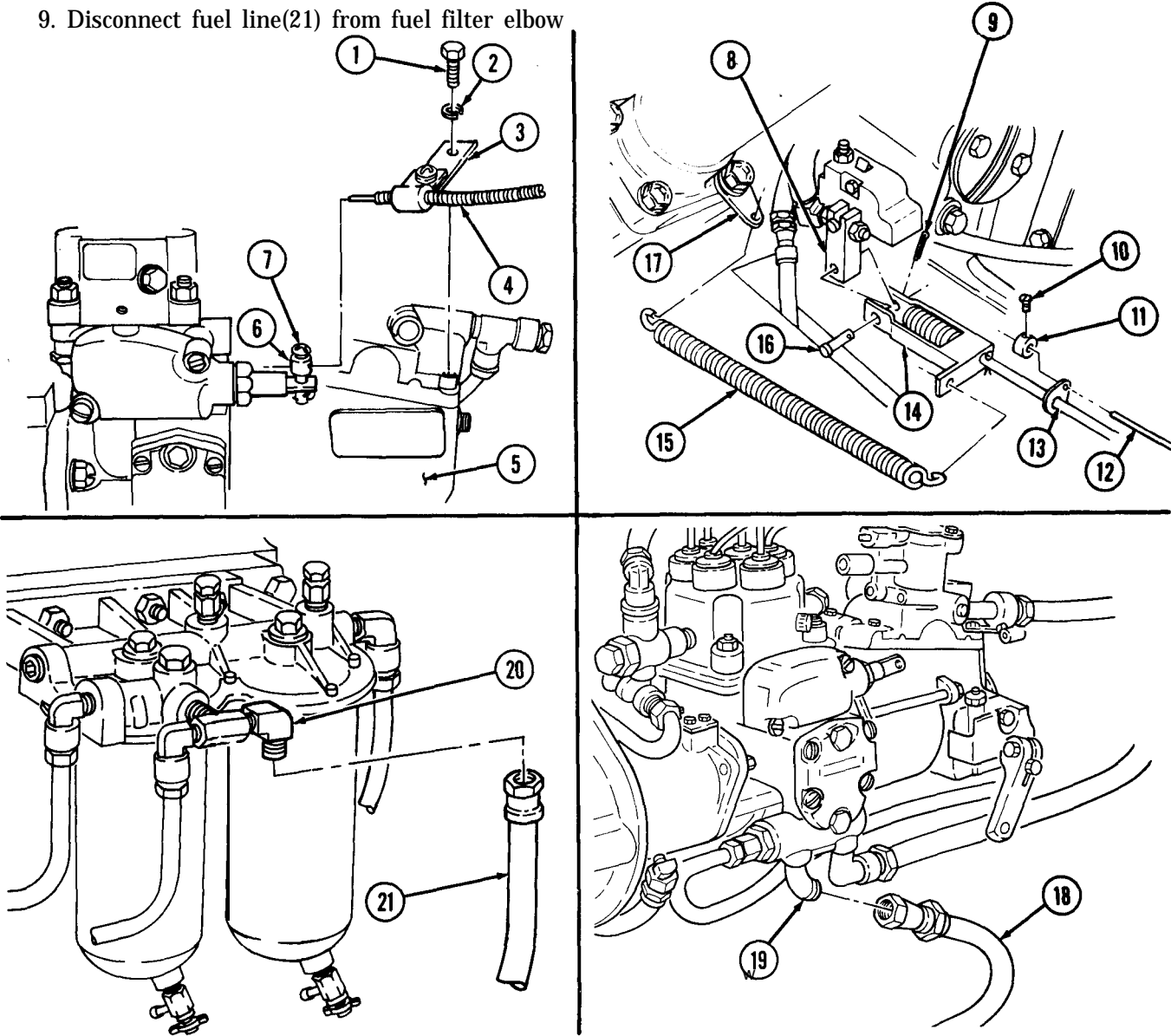
WARNING

Diesel fuel is flammable. Do not perform fuel system procedures near open flame. Injury to personnel may result.

NOTE

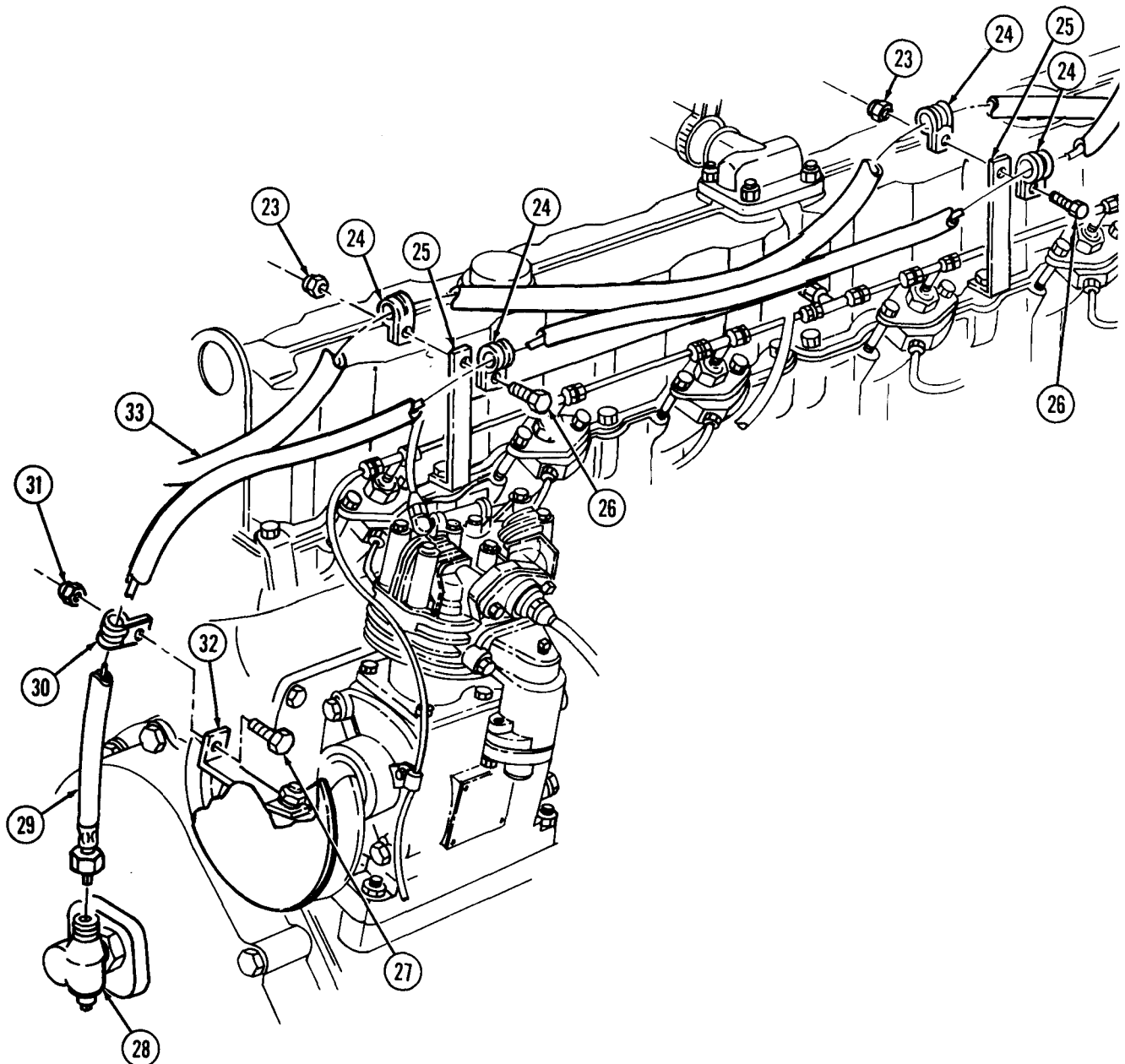
Have fuel drainage container ready to catch excess fuel.

8. Disconnect fuel line (18) from fuel pump elbow (19).
9. Disconnect fuel line(21) from fuel filter elbow



3-18. ENGINE REPLACEMENT (Contd)

10. Disconnect tachometer driveshaft (29) from tachometer drive unit (28).
11. Remove locknut (31), screw (27), clamp (30), and tachometer driveshaft (29) from bracket (32). Discard locknut (31).
12. Remove two locknuts (23), screws (26), four clamps (24), tachometer driveshaft (29), and wiring harness (33) from two brackets (25). Discard locknuts (23).



3-18. ENGINE REPLACEMENT (Contd)

WARNING

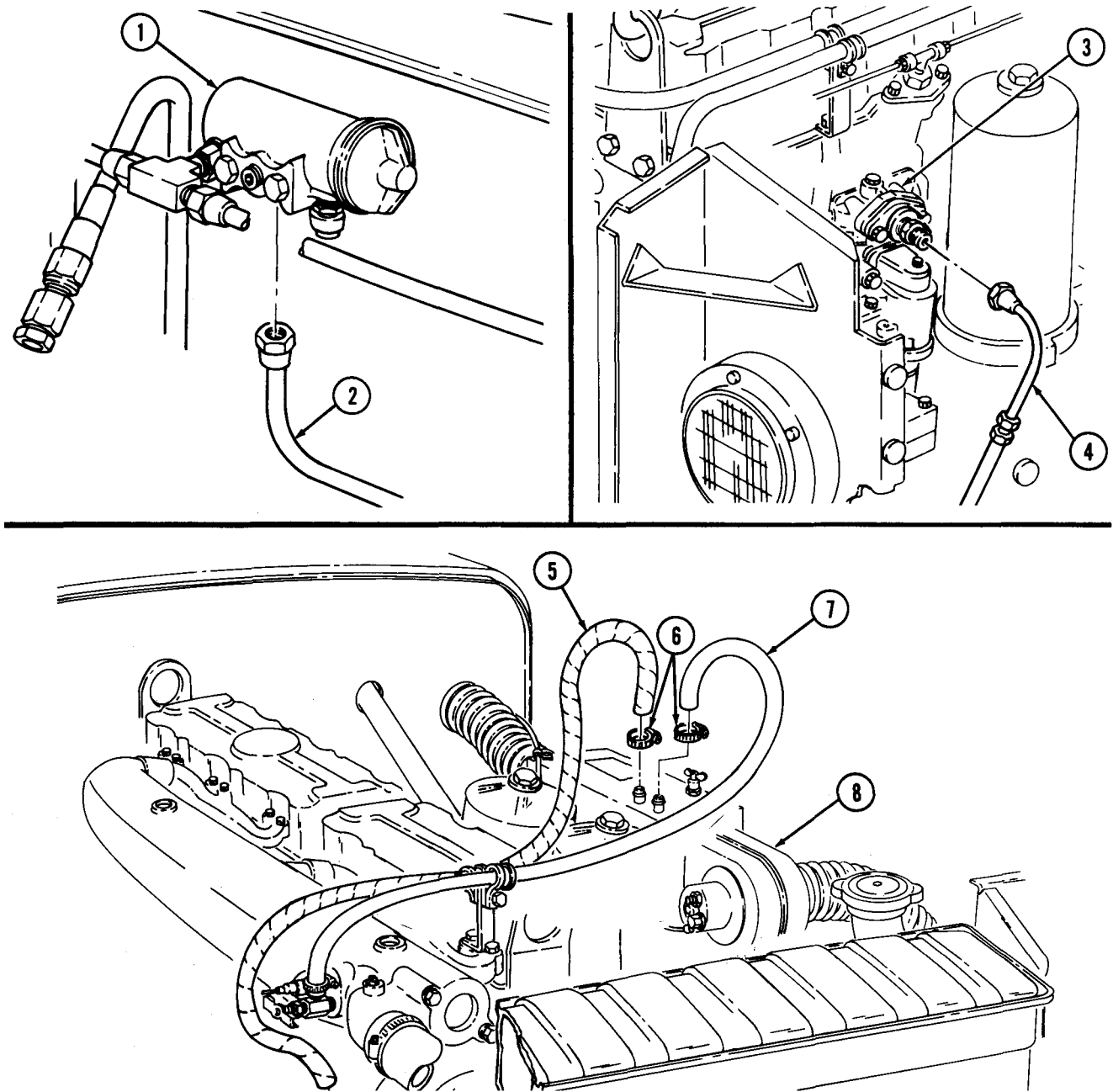
Do not disconnect air lines before draining air reservoirs. Small parts under pressure may shoot out with high velocity, causing injury to personnel.

- 13. Disconnect air line (2) from air governor (1).
- 14. Disconnect air line (4) from air compressor (3).

NOTE

Have drainage container ready to catch excess water.

- 15. Remove two clamps (6), inlet hose (5), and outlet hose (7) from hot water personnel heater (8).



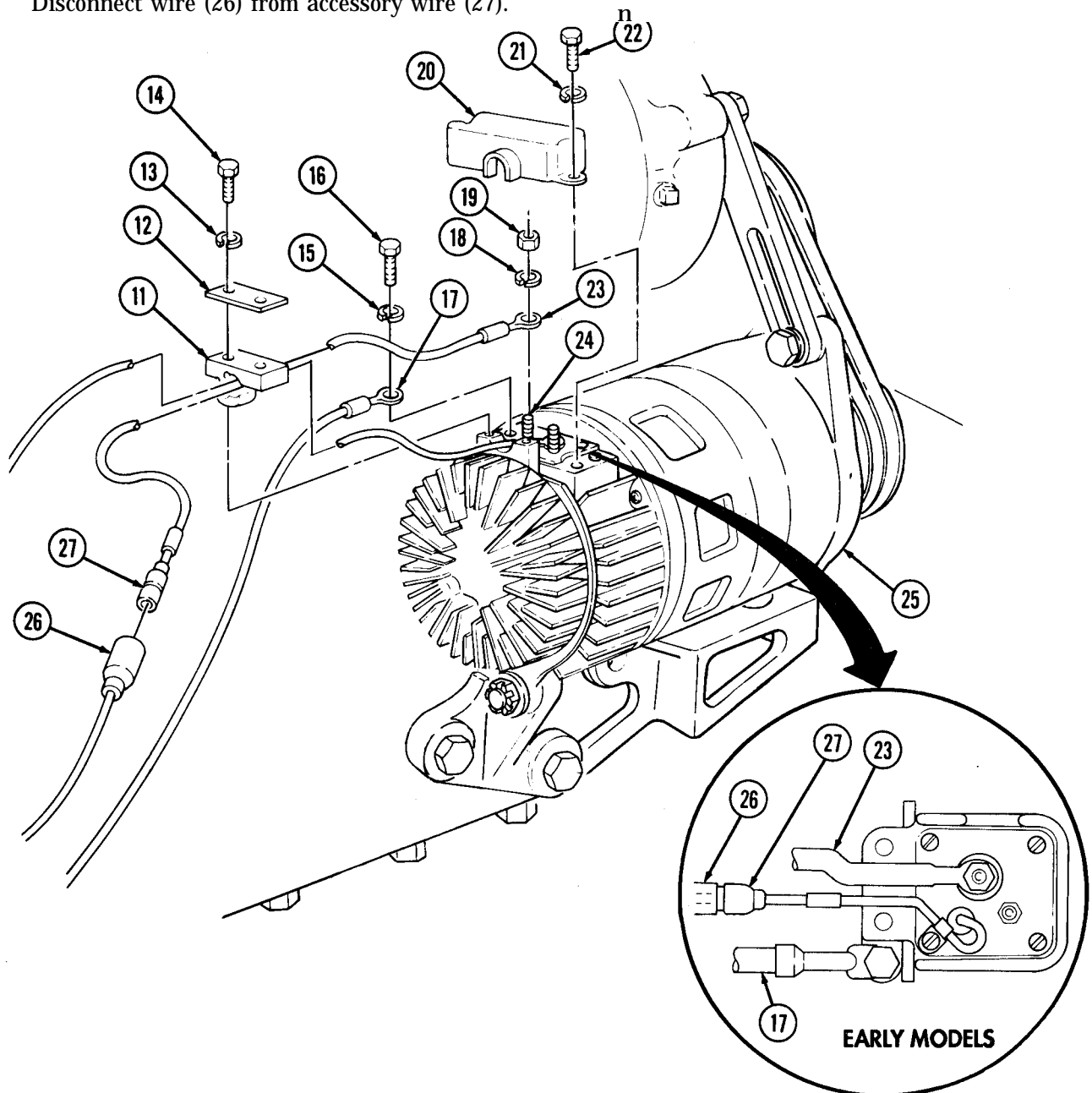
3-18. ENGINE REPLACEMENT (Contd)

16. Remove two screws (22) and lockwashers (21) from terminal cover (20).
17. Remove terminal cover (20) and water proofing sealant from alternator (25).
18. Remove two screws (14), lockwashers (13), wire retaining strap (12), and spacer (11) from alternator (25).

NOTE

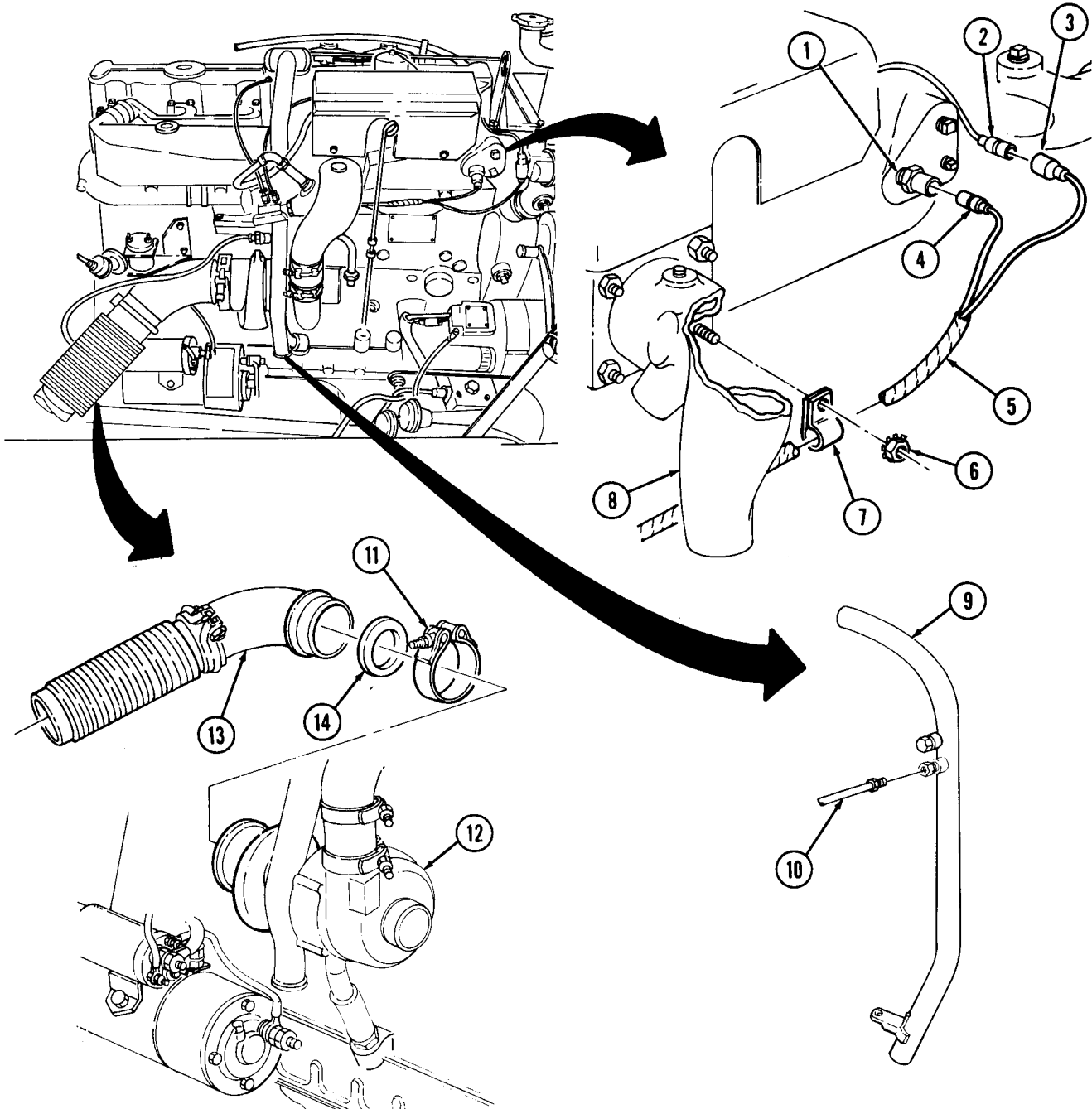
Never alternators have an extra stud not used on M44A2 series trucks.

19. Remove screw (16), lockwasher (15), and ground wire (17) from alternator (25).
20. Remove nut (19), lockwasher (18), and positive wire (23) from alternator stud (24).
21. Disconnect wire (26) from accessory wire (27).



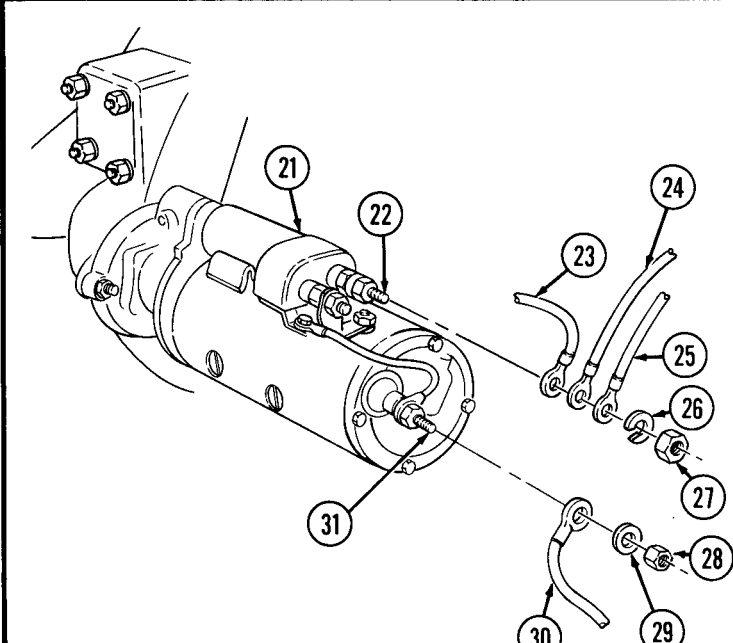
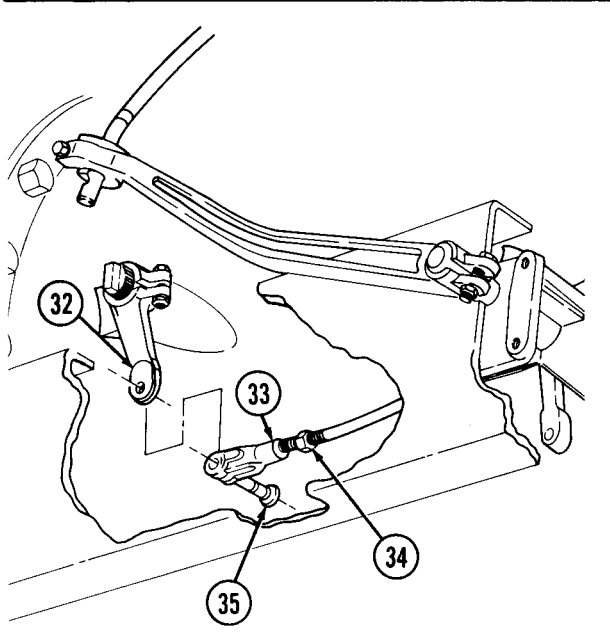
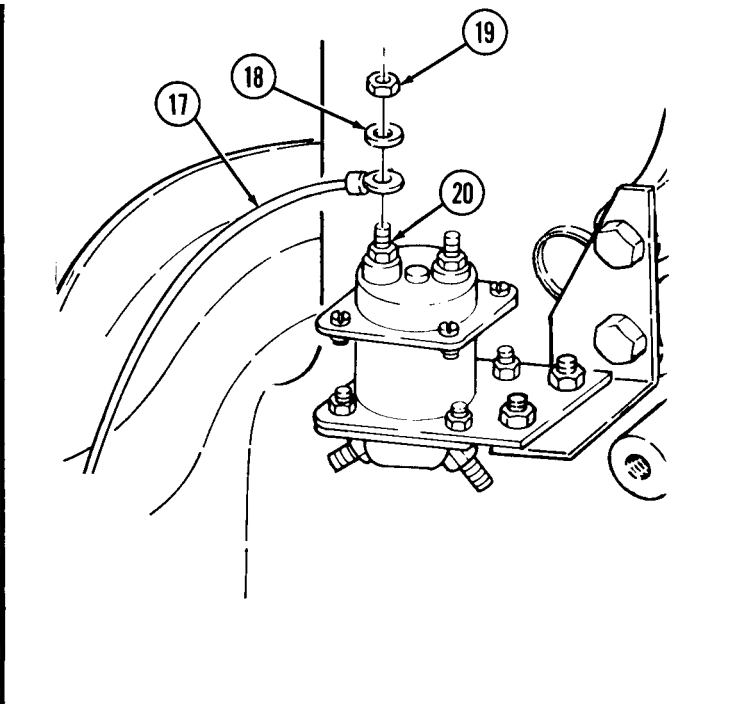
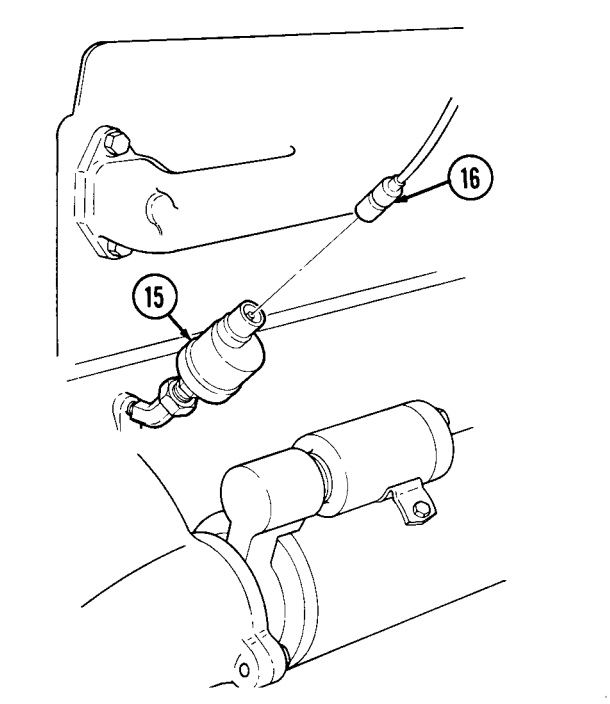
3-18. ENGINE REPLACEMENT (Contd)

22. Disconnect wire (4) from engine temperature sending unit (1).
23. Disconnect wire (3) from manifold heater harness (2).
24. Remove nut-assembled lockwasher (6), clamp (7), and front wiring harness (5) from intake manifold (8). Discard nut-assembled lockwasher (6).
25. Disconnect vent tube (10) from crankcase breather tube (9).
26. Loosen clamp (11) and remove elbow (13), clamp (11), and gasket (14) from turbocharger (12). Discard gasket (14).



3-18. ENGINE REPLACEMENT (Contd)

- 27. Disconnect wire (16) from oil pressure sending unit (15).
- 28. Remove nut (19), washer (18), and wire (17) from starter relay stud (20).
- 29. Remove nut (27), lockwasher (26), wires (25) and (24), and cable (23) from solenoid stud (22). Discard lockwasher (26).
- 30. Remove nut (28), lockwasher (29), and ground cable (30) from ground stud (31) on starter motor (21). Discard lockwasher (29).
- 31. Loosen nut (34), Pull pin (35) to side of clevis (33), and disconnect clevis (33) from remote control lever (32).



3-18. ENGINE REPLACEMENT (Contd)

NOTE

- Do not remove spring-loaded pin from clevis. Bearing will fall free from clevis if pin is removed.
- Step 32 applies to vehicles equipped with transmission power takeoff.

32. Pull pin (10) to one side of clevis (11) and remove clevis (11) from power takeoff arm (8).
33. Install chain to lifting eye (5) with two washers (3), screw (2), and nut (4).
34. Connect lifting device to sling.
35. Connect sling to lifting eye (1) and chain.
36. Remove two locknuts (15), washers (14), lower mounting pads (13), screws (6), and washers (7) from frame (12). Discard locknuts (15).
37. Remove two locknuts (16), washers (17), lower mounting pads (18), screws (23), and washers (22) from support plate (21) and crossmember (19). Discard locknuts (16).

WARNING

- Lifting device must have a weight capacity greater than the weight of the engine and transmission to prevent damage to equipment and injury to personnel.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
- Use prybar to free engine during lifting operations. Failure to do so may cause injury to personnel.
- Do not detach chain from engine until engine is supported on engine stand. An improperly supported engine may cause injury to personnel.

CAUTION

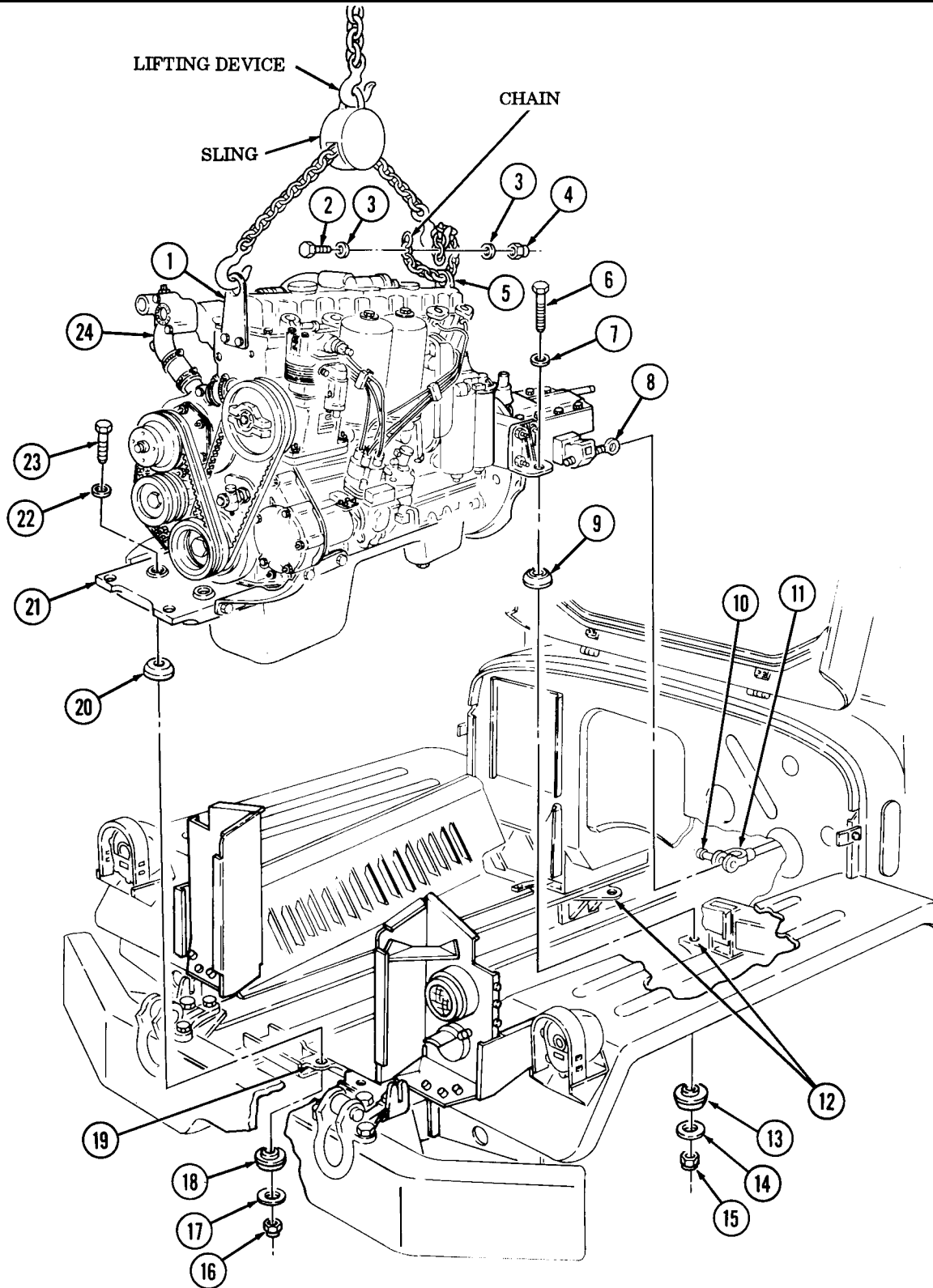
Closely observe all engine and transmission attachments during removal to prevent damage to equipment.

NOTE

- Assistant will help with step 38.
- Engine angle must be adjusted constantly during engine removal.

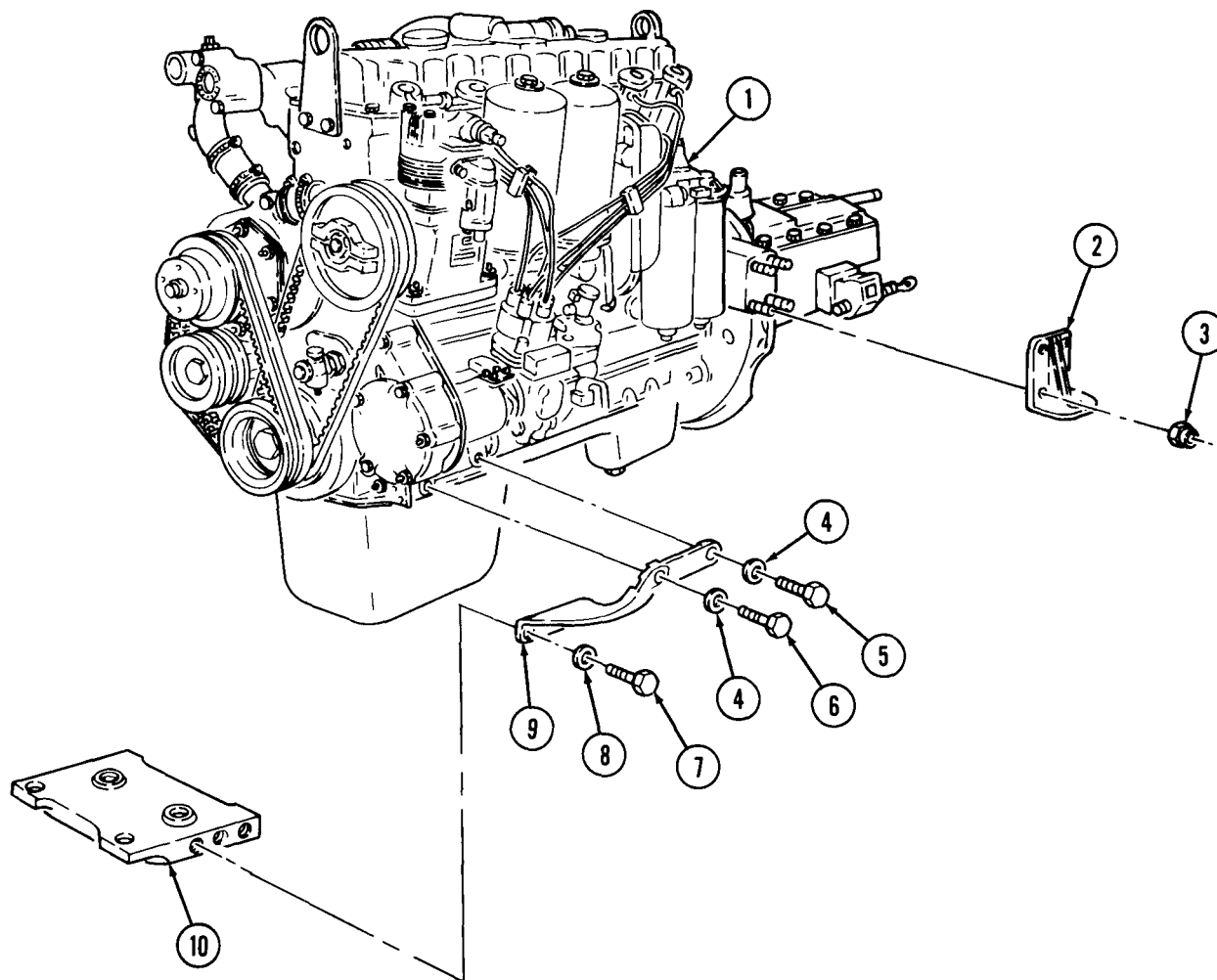
38. Raise engine (24) from engine compartment.
39. Lower engine (24) and position on supports.
40. Remove lifting device and sling from chain and lifting eye (1).
41. Remove nut (4), screw (2), two washers (3), and chain from lifting eye (5).
42. Remove two mounting pads (9) and (20) from frame (12) and crossmember (19).

3-18. ENGINE REPLACEMENT (Contd)



3-18. ENGINE REPLACEMENT (Contd)

43. Remove six screws (7), washers (8), and support plate (10) from two front engine supports (9).
44. Remove two screws (5), screws (6), washers (4), and two front engine supports (9) from engine (1).
45. Remove eight locknuts (3) and two rear engine supports (2) from engine (1). Discard locknuts (3).



3-18. ENGINE REPLACEMENT (Contd)

CAUTION

Before removing transmission, ensure transmission is properly supported. Failure to do so may result in damage to equipment.

46. Position transmission jack or wooden supports under transmission (13).
47. Remove twelve screw-assembled lockwashers (12) from transmission (13) and flywheel housing (11). Discard screw-assembled lockwashers (12).
48. Remove transmission (13) and gasket (14) from flywheel housing (11). Discard gasket (14).

NOTE

If clutch replacement is required, perform step 49.

49. Remove pressure plate and clutch (para. 4-1).

b. Installation

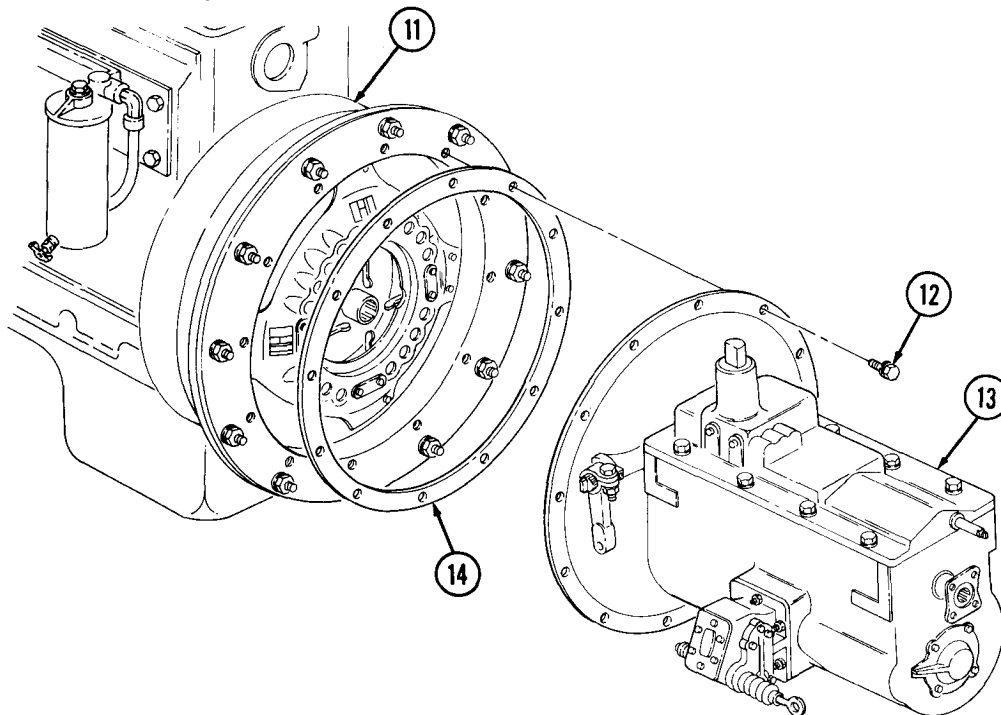
CAUTION

Remove all plugs or caps prior to installation. Failure to do so may result in damage to equipment.

NOTE

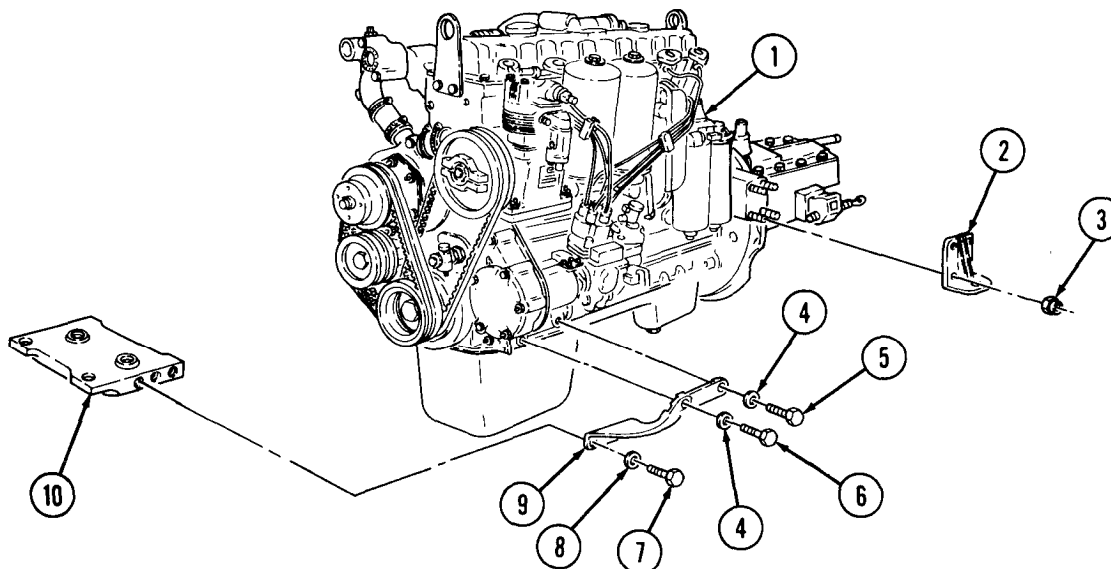
Perform step 1 if clutch and pressure plate were removed.

1. Install pressure plate and clutch (para. 4-1).
2. Position transmission (13) to flywheel housing (11) with transmission jack.
3. Install new gasket (14) and transmission (13) on flywheel housing (11) with twelve new screw-assembled lockwashers (12). Tighten screw-assembled lockwashers (12) 23-26 lb-ft (31-35 N.m).
4. Remove transmission jack from transmission (13).



3-18. ENGINE REPLACEMENT (Contd)

5. Install two rear engine supports (2) on engine (1) with eight new locknuts (3). Tighten locknuts (3) 45-55 lb-ft (61-75 N.m).
6. Install two front engine supports (9) on engine (1) with four washers (4), two screws (5), and screws (6). Tighten screws (5) and (6) 200-250 lb-ft (271-339 N.m).
7. Install support plate (10) on two front engine supports (9) with six washers (8) and screws (7). Tighten screws (7) 24-27 lb-ft (33-37 N.m).



8. Install chain on lifting eye (16) with washers (14) and (13), screw (16), and nut (15).
9. Connect lifting device to sling.
10. Connect sling to lifiing eye (11) and chain.

WARNING

- Lifting device must have a weight capacity greater than the weight of the engine and transmission to prevent damage to equipment and injury to personnel.
- All personnel must stand clear during lifting operations. A swinging or shifling load may cause injury to personnel.
- Use prybar to free engine during lifting operations. Failure to do so may cause injury to personnel.
- Do not detach chain from engine until all engine weight is equally distributed and engine is stable. A improperly supported engine may cause injury to personnel.

11. Raise engine (1) from supports.

NOTE

- Two assistants will help with step 12.
- Engine angle must be adjusted constantly during engine installation.

12. Lower engine (1) into engine compartment. Do not lower completely.

3-18. ENGINE REPLACEMENT (Contd)

WARNING

Keep hands clear of supported engine during placement of engine mounts. Failure to do so may result in injury to personnel.

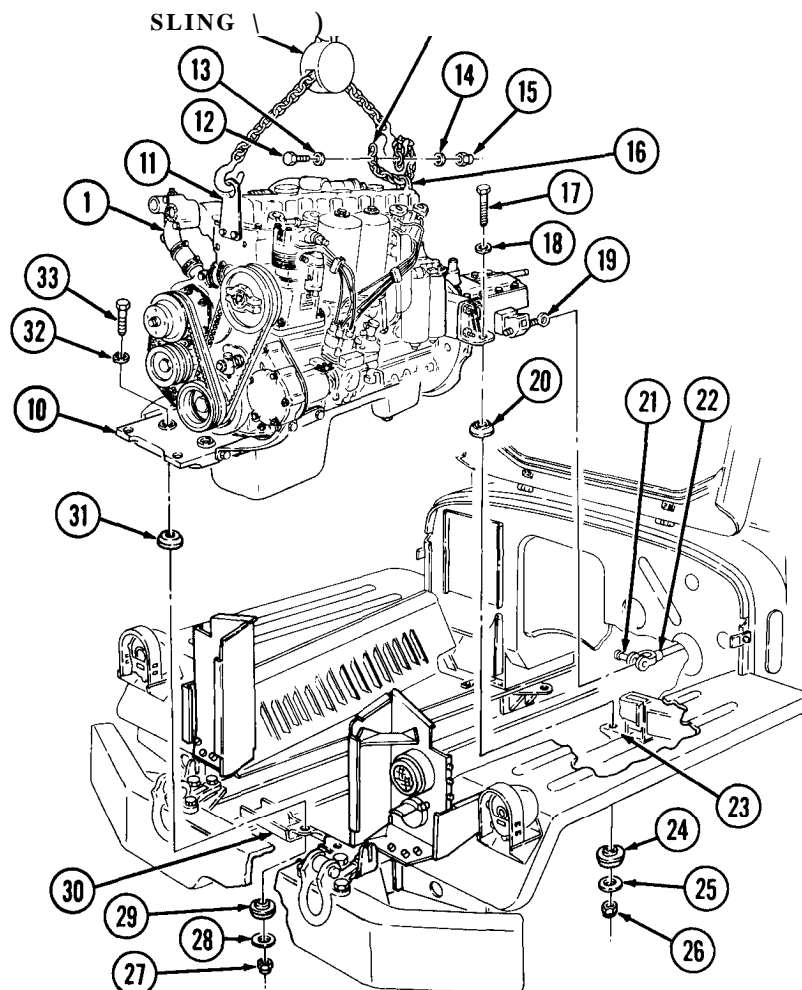
13. Position two mounting pads (20) and (31) on frame (23) and crossmember (30).
14. Lower engine (1) until it rests on frame (23) and crossmember (30). Ensure mounting holes are aligned.
15. Install two washers (32), screws (33), lower mounting pads (29), washers (28), and new locknuts (27) on support plate (10) and crossmember (30). Tighten locknuts (30) 65-70 lb-ft (88-95 N.m).
16. Install two washers (18), screws (17), lower mounting pads (24), washers (25), and new locknuts (26) on frame (23). Finger tighten locknuts (26).
17. Tighten locknuts (26) 65-70 lb-ft (88-95 N.m).
18. Remove lifting device and sling from chain and lifting eye (11).
19. Remove nut (15), screw (16), washers (14) and (13), and chain from lifting eye (16).

NOTE

Perform step 20 if vehicle is equipped with transmission power takeoff.

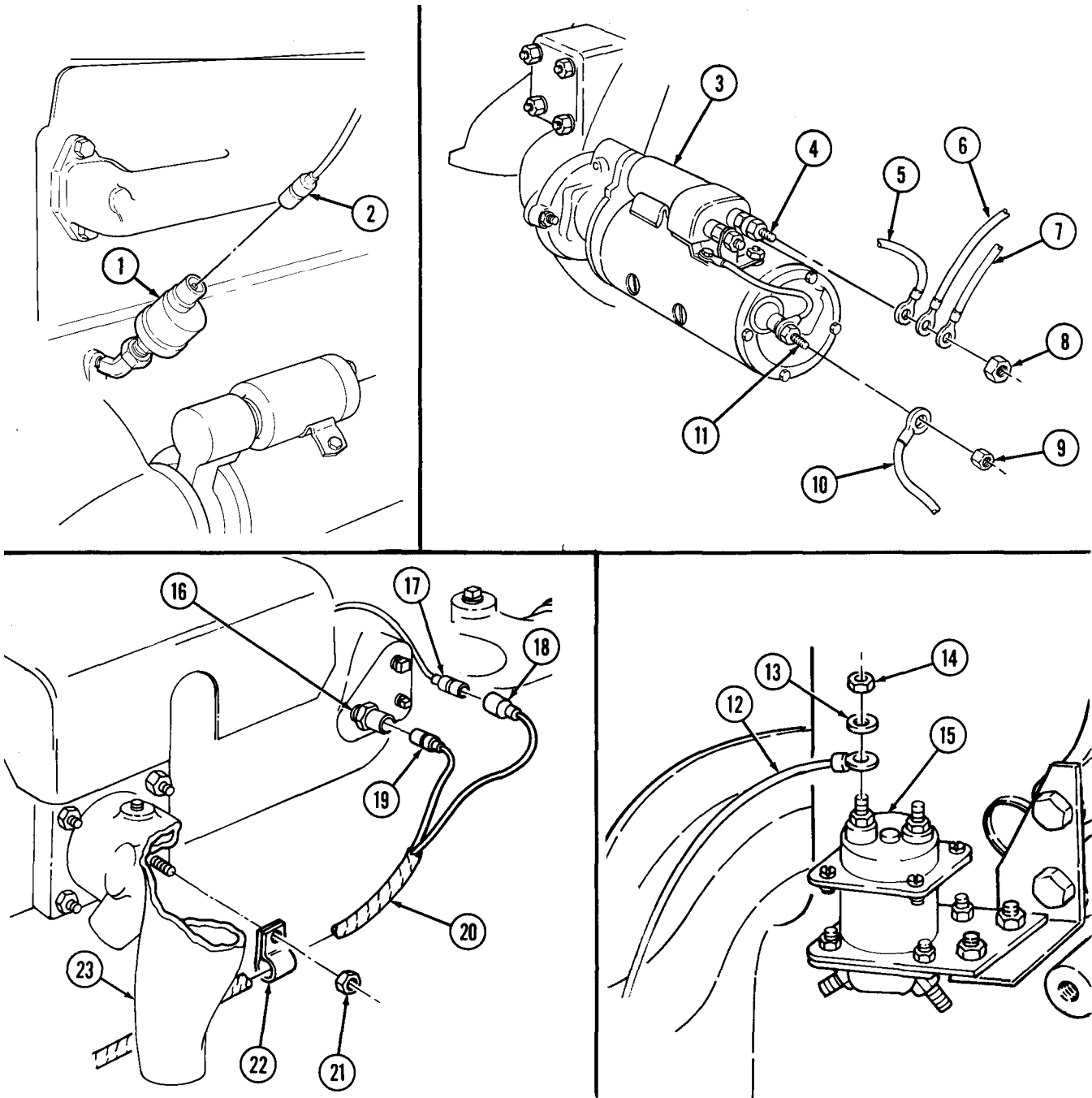
20. Position clevis (22) on power takeoff arm (19) and push pin (21) in clevis (22) until head of pin (21) seats against clevis (22).

LIFTING DEVICE



3-18. ENGINE REPLACEMENT (Contd)

21. Connect wire (2) to oil pressure sending unit (1).
22. Install ground wire (10) on ground stud (11) and starter motor (3) with new locknut (9).
23. Install cable (5) and wires (6) and (7) on solenoid stud (4) with new locknut (8).
24. Install wire (12) on starter relay (15) with washer (13) and nut (14).
25. Connect wire (19) to engine temperature sending unit (16).
26. Connect wire (18) to manifold heater harness (17).
27. Install front wiring harness (20) and clamp (22) on intake manifold (23) with new locknut (21).



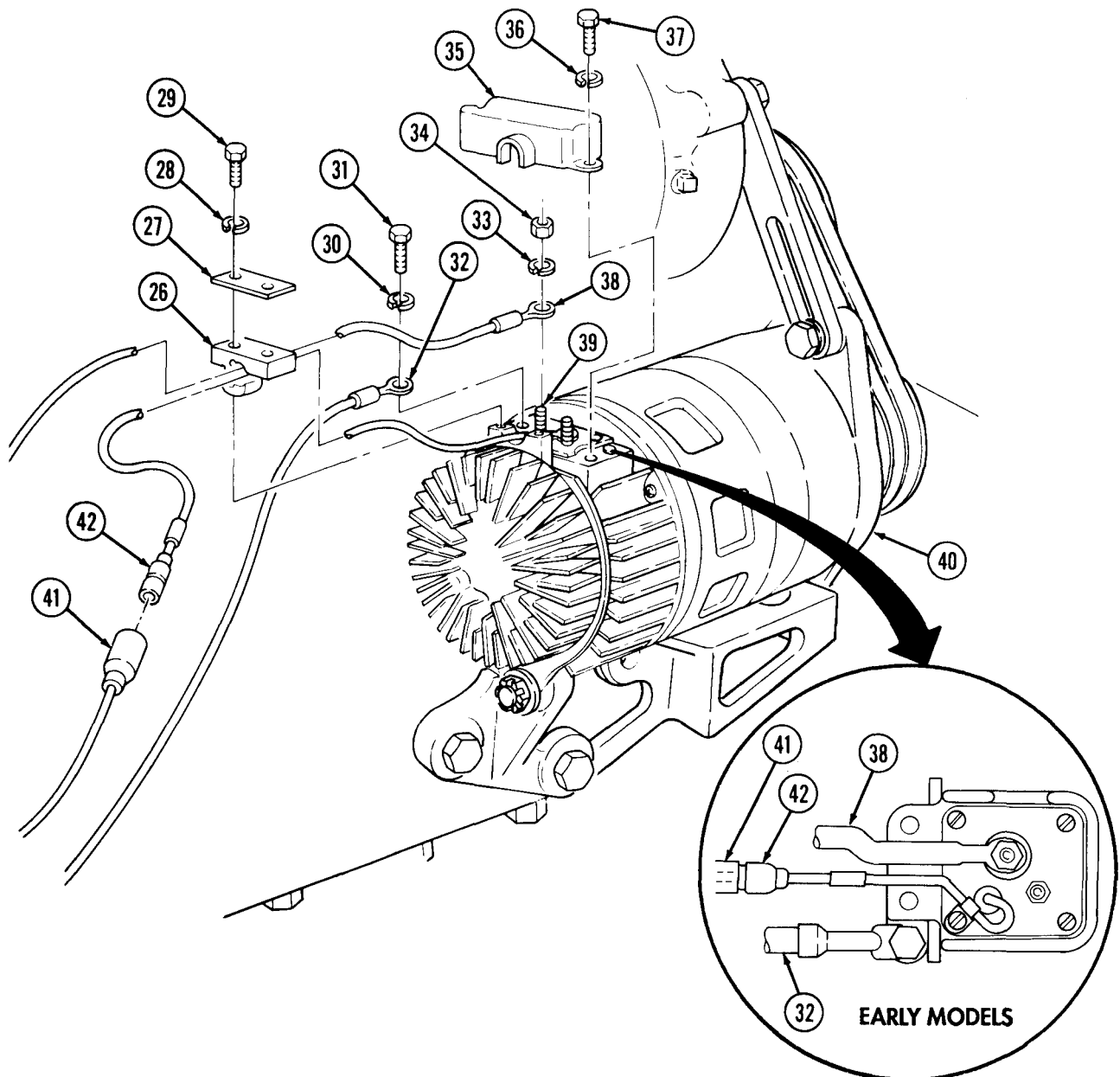
3-18. ENGINE REPLACEMENT (Contd)

28. Connect wire (41) to accessory wire (42).

NOTE

Ensure terminals are clean before connections are made.

29. Install positive wire (38) on alternator (40) with new lockwasher (33) and nut (34). Tighten nut (34) 45-55 lb-in. (5-6 N.m).
30. Install ground wire (32) on alternator (40) with new lockwasher (30) and screw (31). Tighten screw (31) 82-102 lb-in. (9-12 N.m).
31. Install spacer (26) in alternator (40) and wire retaining strap (27) on terminal (39) with two new lockwashers (28) and screws (29). Tighten screws (29) 30-35 lb-in. (3-4 N.m).
32. Seal terminal (39) and terminal cover (35) completely with adhesive sealant.
33. Install terminal cover (35) on alternator (40) with two new lockwashers (36) and screws (37).



3-18. ENGINE REPLACEMENT (Contd)

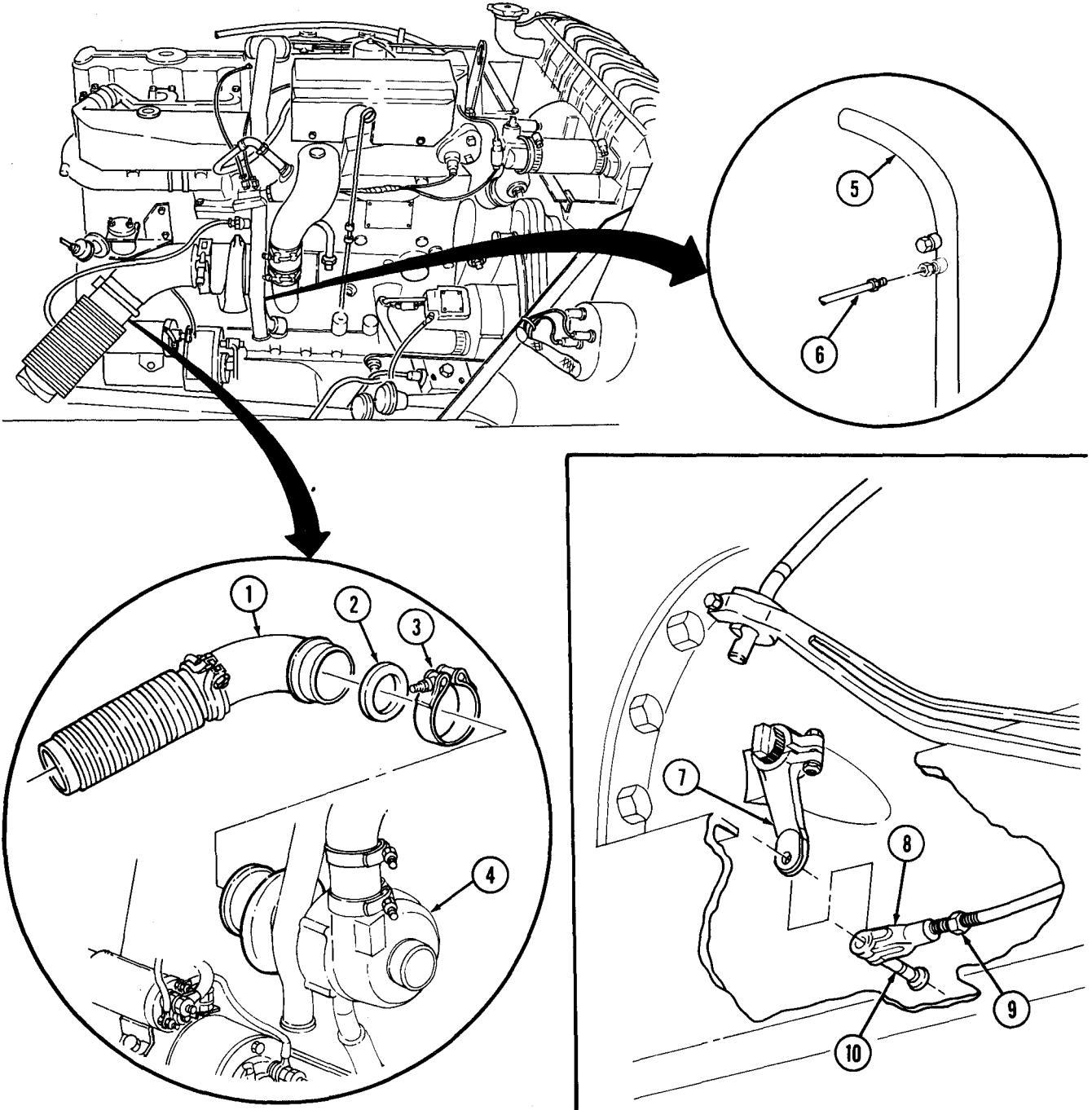
34. Install new gasket (2) and elbow (1) on turbocharger (4) with clamp (3).

NOTE

Vent line threads must be wrapped with antiseize tape prior to installation.

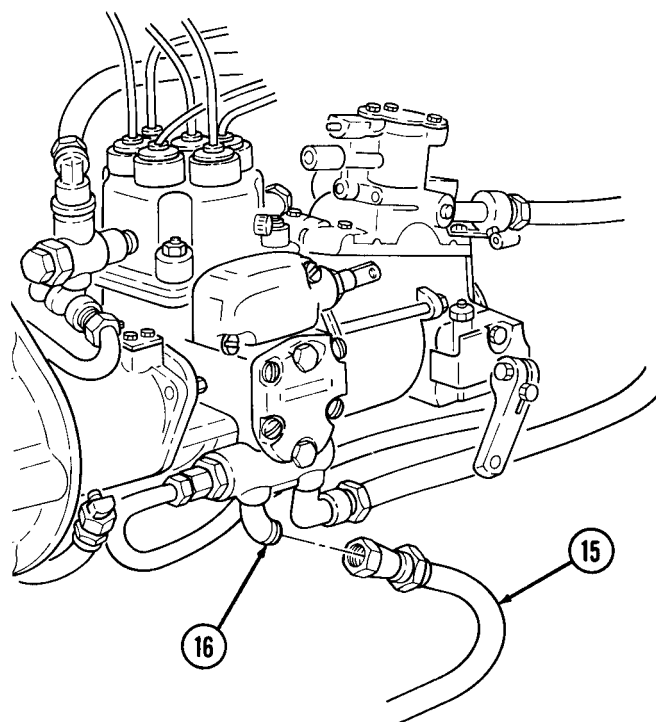
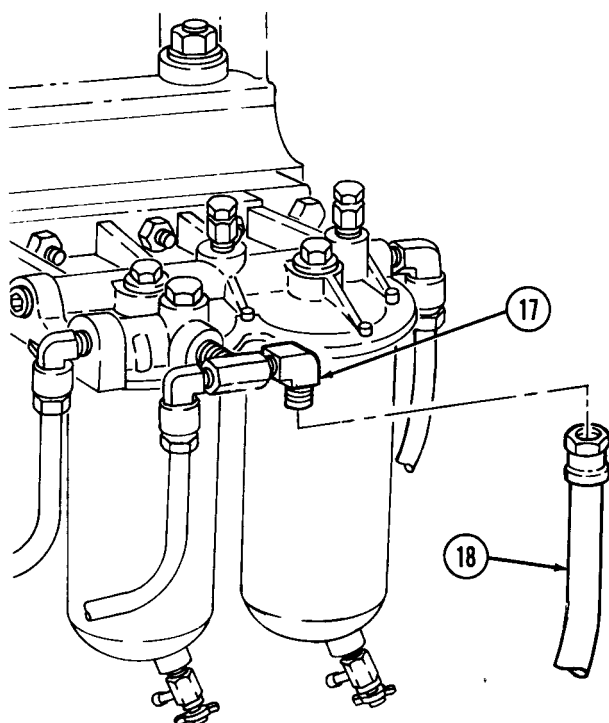
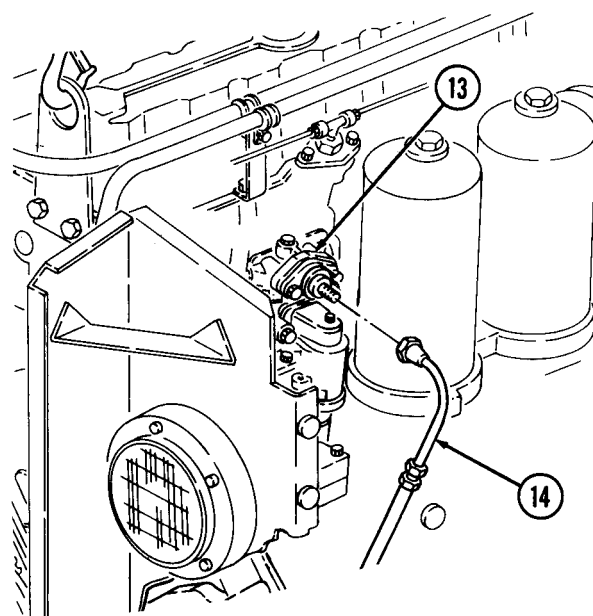
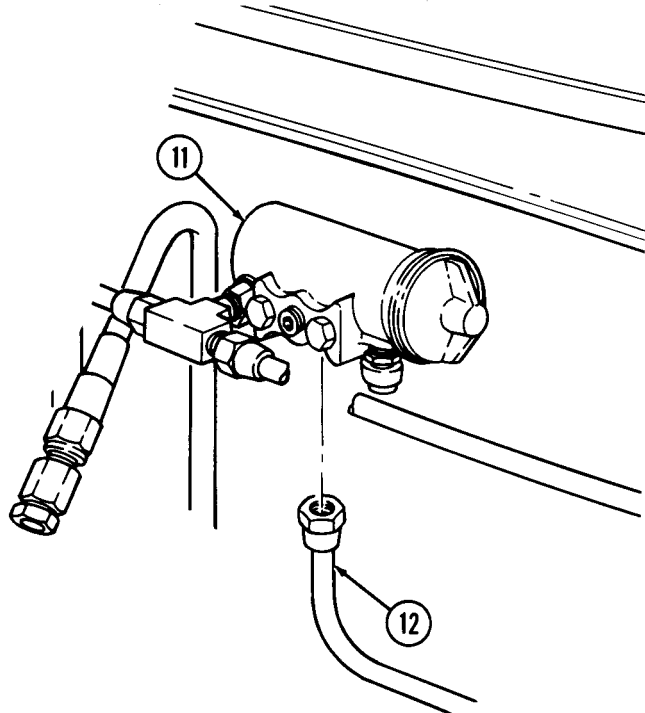
35. Connect vent tube (6) on crankcase breather tube (5).

36. Position clevis (8) on remote control lever (7). push pin (1) in Clevis (8) until head of pin (10) seats against clevis (8). Tighten nut (9).



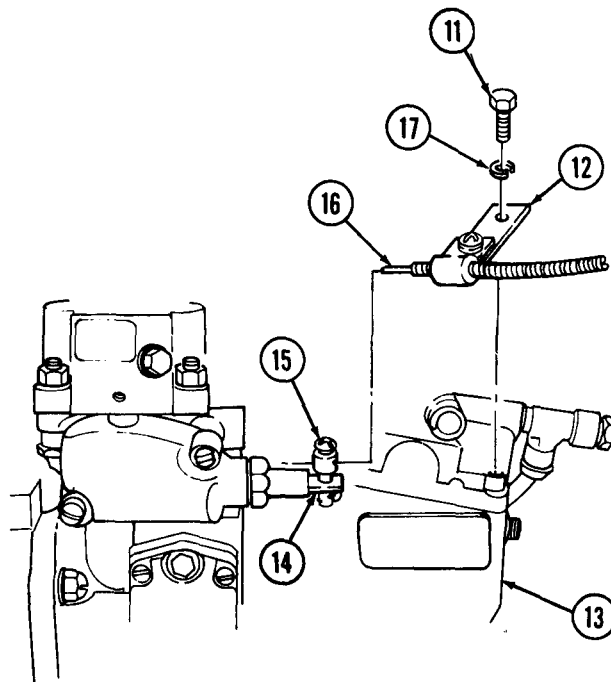
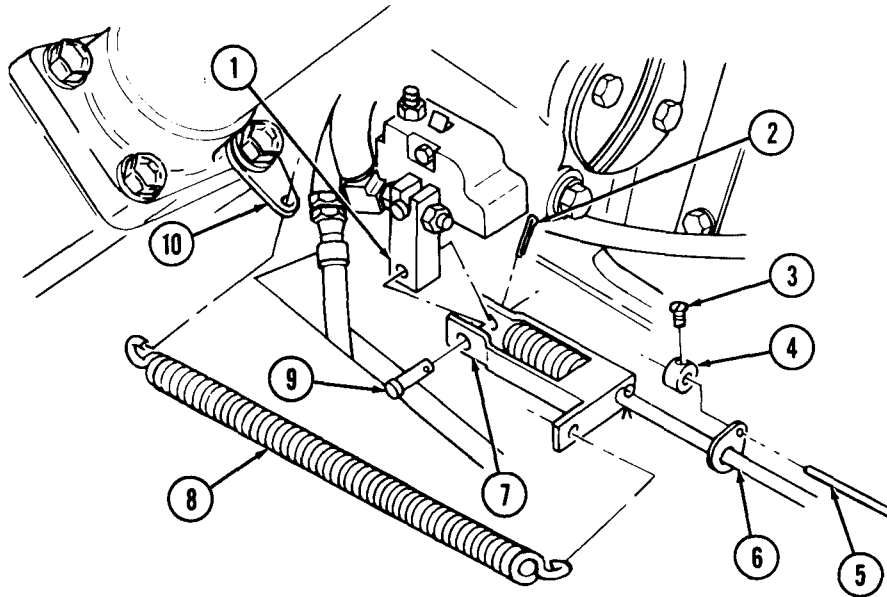
3-18. ENGINE REPLACEMENT (Contd)

37. Connect air line (12) to air governor (11).
38. Connect air line (14) to air compressor (13).
39. Connect fuel line (15) to fuel pump elbow (16).
40. Connect fuel line (18) to fuel filter elbow (17).



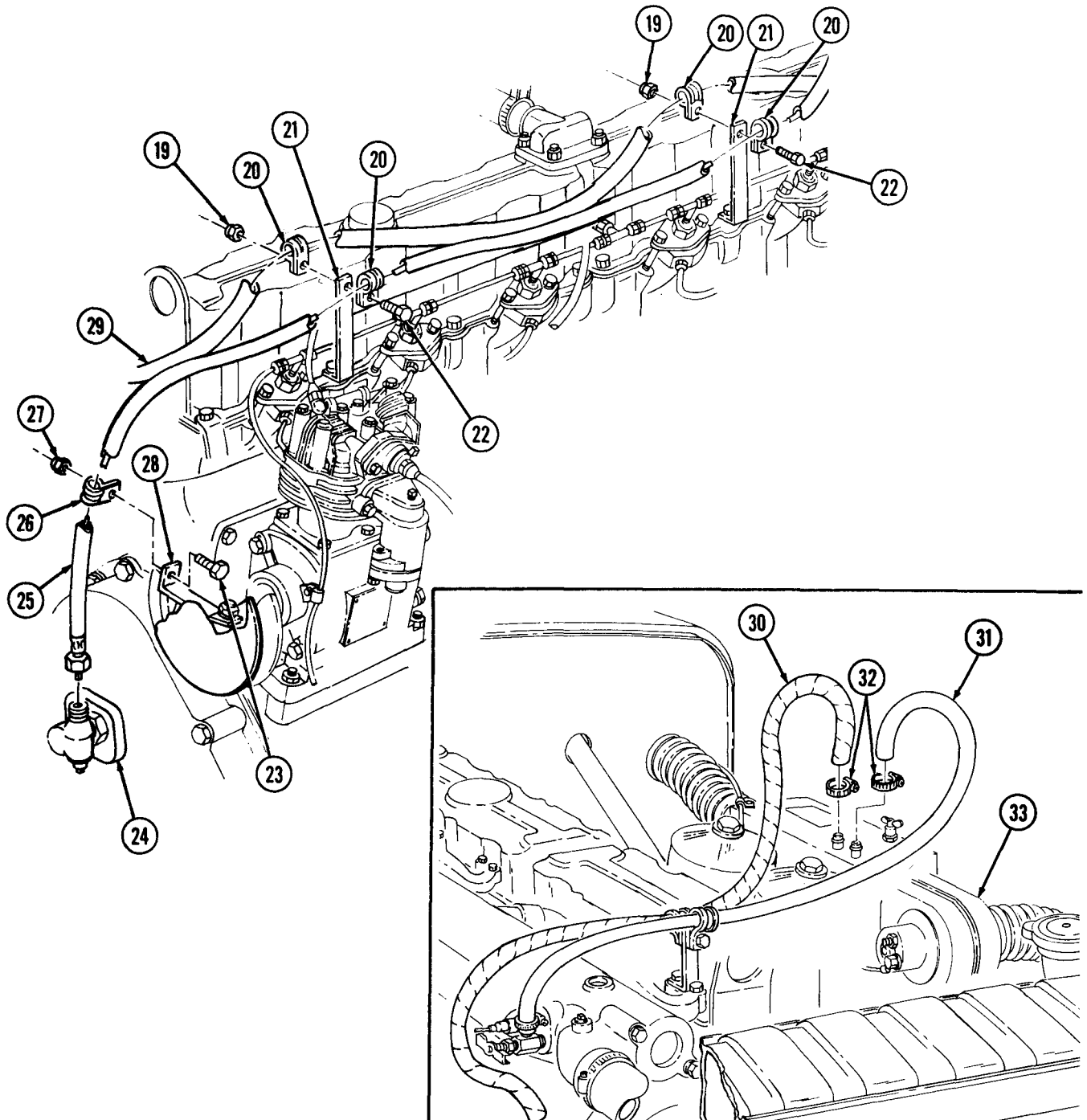
3-18. ENGINE REPLACEMENT (Contd)

41. Install swivel (7) on pump lever (1) with pin (9) and new cotter pin (2).
42. Insert throttle control cable (5) through flange on accelerator rod (6) and install with connector (4) and screw (3). Do not tighten screw (3). Position connector (4) 1/8 in. (3 mm) from flange on accelerator rod (6) and tighten screw (3).
43. Install throttle return spring (8) on swivel (7) and throttle return clip (10).
44. Insert cable control wire (16) through swivel (14). Do not tighten screw (15).
45. Install clamp (12) on fuel injector pump (13) with new lockwasher (17) and screw (11).



3-18. ENGINE REPLACEMENT (Contd)

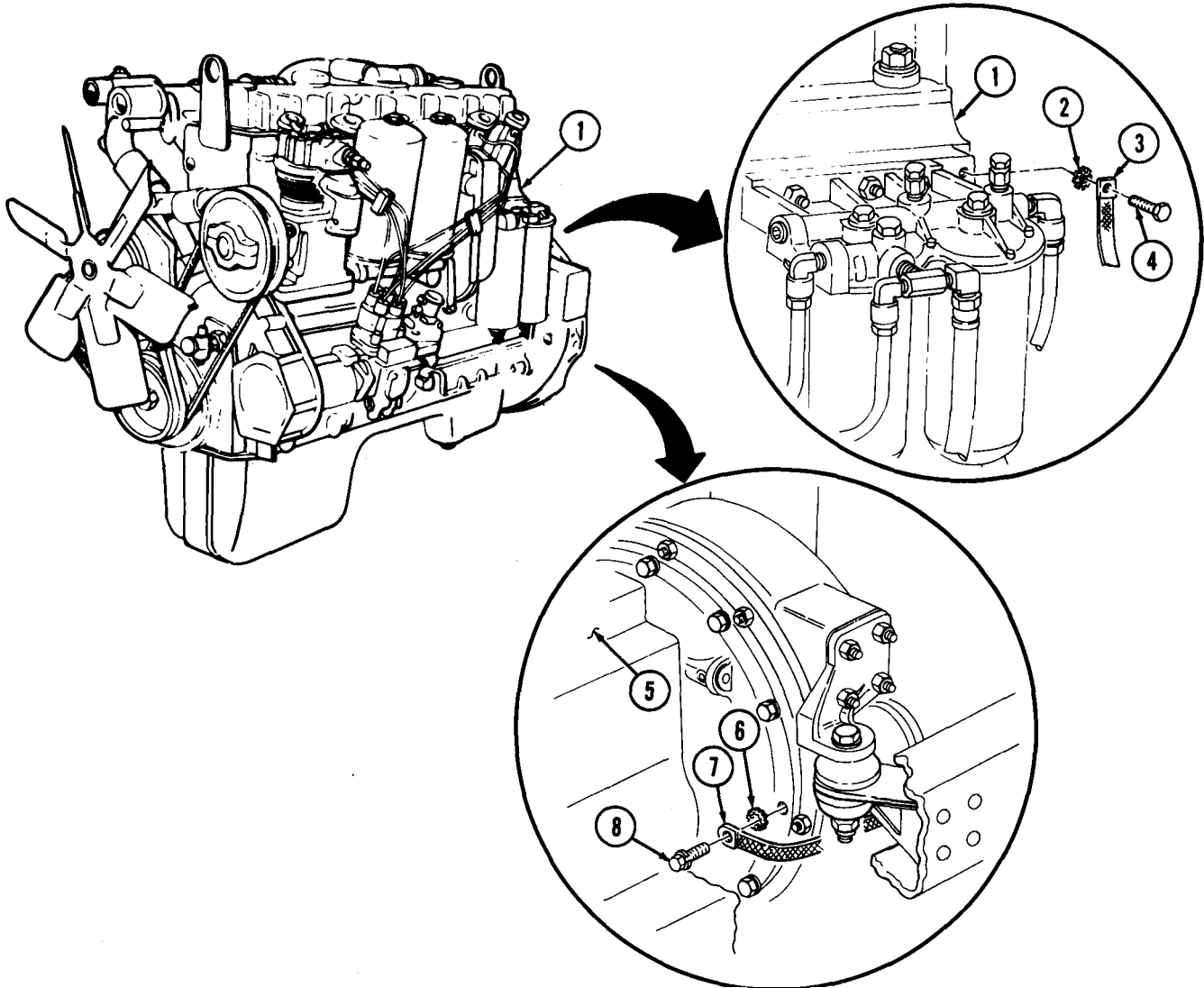
46. Connect tachometer driveshaft (25) on tachometer drive unit (24).
47. Install tachometer driveshaft (24) and clamp (26) on bracket (28) with screw (23) and new locknut (27).
48. Install wiring harness (29), tachometer driveshaft (25), and four clamps (20) on two brackets (21) with two screws (22) and new locknuts (19).
49. Install inlet hose (30) and outlet hose (31) on hot water personnel heater (33) with two clamps (32).



3-18. ENGINE REPLACEMENT (Contd)

50. Remove screw-assembled lockwasher (8) and lockwasher (6) from transmission (5) and install lockwasher (6) and ground strap (7) on transmission (5) with screw-assembled lockwasher (8). Tighten screw-assembled lockwasher (8) 23-26 lb-ft (31-35 N.m).

51. Remove screw (4) from engine (1) and install washer (2) and ground strap (3) on engine (1) with screw (4).



- FOLLOW-ON TASKS:
- Install air cleaner assembly (TM 9-2320-361-20).
 - Install transmission gearshift lever (TM 9-2320-361-20).
 - Install radiator and brackets (TM 9-2320-361-20).
 - Install cab tunnel panel (TM 9-2320-361-20).
 - Install front winch propeller shaft, if equipped (TM 9-2320-361-20).
 - Install propeller shaft (TM 9-2320-361-20).
 - Fill engine crankcase to proper oil level (LO 9-2320-209-12-1).
 - Adjust hand throttle control cable (TM 9-2320-361-20).
 - Adjust engine stop control cable (TM 9-2320-361-20).
 - Adjust accelerator linkage (TM 9-2320-361-20),
 - Adjust clutch control linkage (TM 9-2320-361-20).
 - Connect battery ground cable (TM 9-2320-361-20).

CHAPTER 4

CLUTCH SYSTEM MAINTENANCE

4-1. CLUTCH MAINTENANCE

THIS TASK COVERS:

- | | |
|---|-------------------------------|
| <p>a. Removal</p> <p>b. Cleaning and Inspection</p> | <p>c. Installation</p> |
|---|-------------------------------|

INITIAL SETUP

APPLICABLE MOOELS

All

TOOLS

General mechanic's tool kit (Appendix B, Item 1)
 Clutch alinement kit (Appendix B, Item 4)
 'Ibrque wrench, 3/8-in. dr. (Appendix B, Item 8)
 Mechanical puller (Appendix B, Item 65)
 Bearing installer (Appendix B, Item 66)

MATERIALS/PARTS

Eight lockwashers (Appendix F, Item 132)

REFERENCES (TM)

TM 9-2320-361-34P

EQUIPMENT CONDITION

Transmission removed (para. 8-2).

GENERAL SAFETY INSTRUCTIONS

Ressure plate is heavy. Support pressure plate during removal.

4-1. CLUTCH MAINTENANCE (Contd)

a. Removal

WARNING

Pressure plate is heavy. Support pressure plate during removal. Failure to do so may result in injury to personnel.

NOTE

New and old clutch pressure plates are replaced the same. The difference between the two is that the new clutch plate has three release levers as opposed to four found in the old clutch plates. This procedure covers old clutch pressure plates.

Remove eight screws (7), lockwashers (8), pressure plate (6), and clutch disc (4) from flywheel (1). Discard lockwashers (8).

b. Cleaning and Inspection

1. Check clutch face of flywheel (1) for grooves, scuff marks, and overheating discoloration. Replace flywheel (1) if damaged (para. 3-5).
2. Check clutch pilot bearing (3) from flywheel end of crankshaft (2) for scoring, nicks, or cracks. Replace clutch pilot bearing (3) if damaged.

NOTE

Perform steps 3 and 4 if pilot bearing is damaged.

3. Using bearing puller, remove clutch pilot bearing (3) from flywheel end of crankshaft (2) and remove any debris from clutch pilot bearing hole in crankshaft (2).
4. Using bearing installer, install new clutch pilot bearing (3) in flywheel end of crankshaft. (2) flush with counter bored area of crankshaft (2).

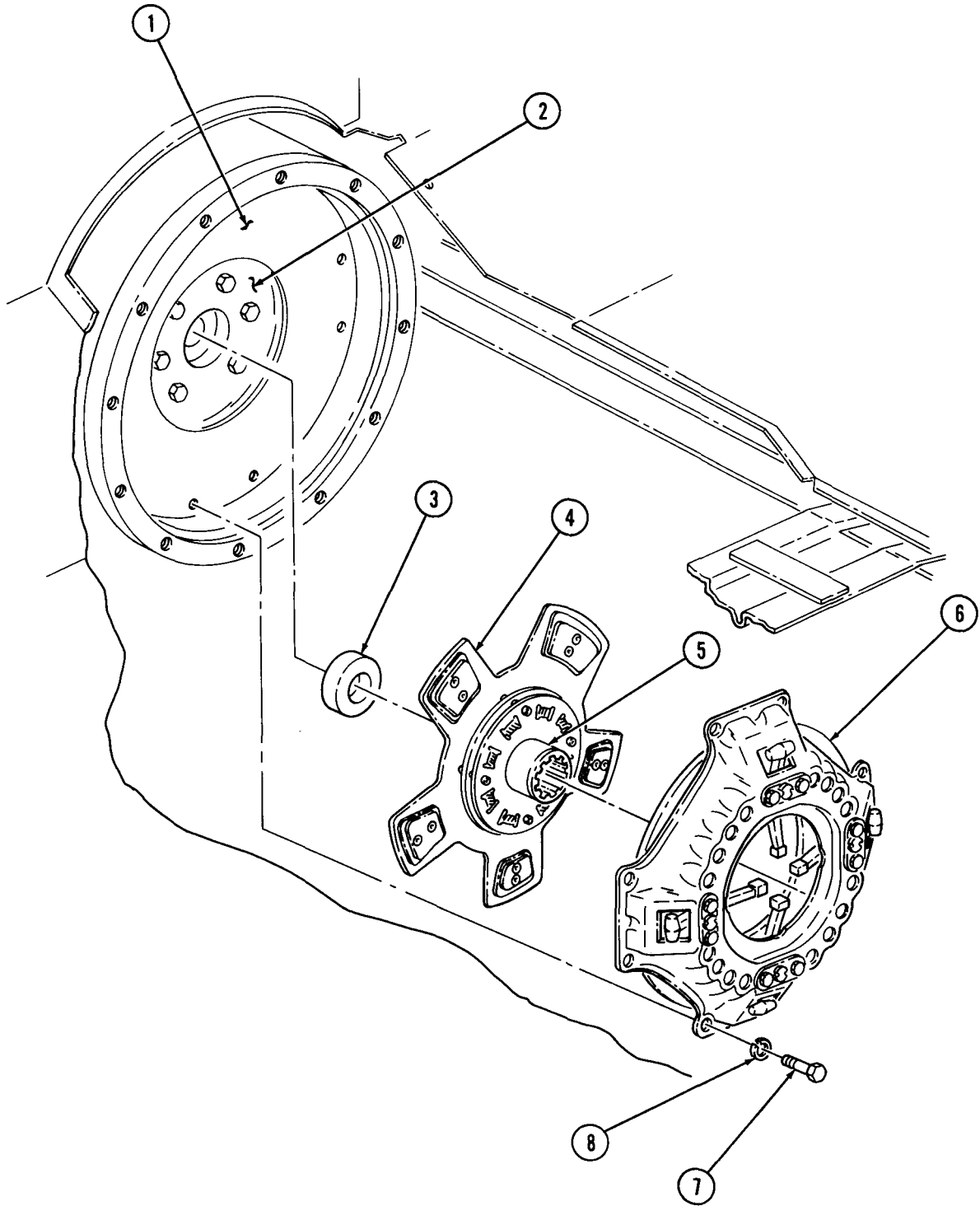
c. Installation

CAUTION

Clutch disc and clutch pilot bearing must be alined prior to installation (TM 9-28 15-210-34-2-2). Failure to do so may result in damage to equipment.

1. Position clutch disc (4) on flywheel (1) with long end of drive hub (5) facing away from flywheel (1).
2. Insert clutch alinement tool through clutch disc (4) and crankshaft (2).
3. Position pressure plate (6) against flywheel (1) and clutch disc (4) and aline holes of pressure plate (6) with holes of clutch disc (4).
4. Install eight new lockwashers (8) and screws (7) on pressure plate (6). Tighten eight screws (7) 23-27 lb-ft (31-37 N.m).
5. Remove clutch alinement tool from clutch disc (4) and crankshaft (1).

4-1. CLUTCH MAINTENANCE (Contd)



FOLLOW-ON TASK: Install transmission (para. 8-2).

CHAPTER 5 FUEL SYSTEM MAINTENANCE

5-1 FUEL SYSTEM MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
5-2.	Fuel Injector Nozzle and Holder Replacement	5-1
5-3.	Fuel Injector Tubes Maintenance	5-4
5-4.	Fuel Injection Pump Replacement	5-8
5-5.	Turbocharger Maintenance	5-16

5-2. FUEL INJECTOR NOZZLE AND HOLDER REPLACEMENT

THIS TASK COVERS:

- a. Removal
- b. Repair

- c. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

- General mechanic's tool kit
(Appendix B, Item 1)
- Torque Wrench, 1/2-in. dr. (Appendix B, Item 7)

MATERIALS/PARTS

- Two lockwashers (Appendix F, Item 124)
- Dust seal (Appendix F, Item 237)
- Locknut (Appendix F, Item 101)
- Cap and plug set (Appendix C, Item 5)
- Silicone compound (Amendix C. Item 21)

REFERENCES (TM)

- TM 9-2320-361-10
- TM 9-2320-361-20
- TM 9-2320-361-34P
- TM 9-2815-210-34-2-2

EQUIPMENT CONDITION

Fuel return tees and tubes removed
(TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

Diesel fuel is flammable. Do not perform this task near open flames.

5-2. FUEL INJECTOR NOZZLE AND HOLDER REPLACEMENT(Contd)

WARNING

Diesel fuel is flammable. Do not perform fuel system procedures near open flame. Injury to personnel may result.

CAUTION

Cap or plug all openings immediately after disconnecting lines and hoses to prevent contamination. Remove caps or plugs prior to installation. Failure to do so may result in damage to equipment.

NOTE

All fuel injector nozzle and holder assemblies are removed and installed basically the same. This procedure covers no. 4 cylinder injector nozzle.

a. Removal

1. Loosen tube nut (12) on fuel injector tube (6) and disconnect from fuel injector nozzle (4).
2. Remove locknut (11), screw (9), washer (8), two retainers (7), and cushions (10) from injector tubes (5) and (6). Discard locknut (11).
3. Remove two screws (1), lockwashers (2), fuel injector holder (3), and fuel injector nozzle (4) from engine (13). Discard lockwashers (2).
4. Remove dust seal (14) from fuel injector nozzle body (15). Retain dust seal (14) if serviceable.

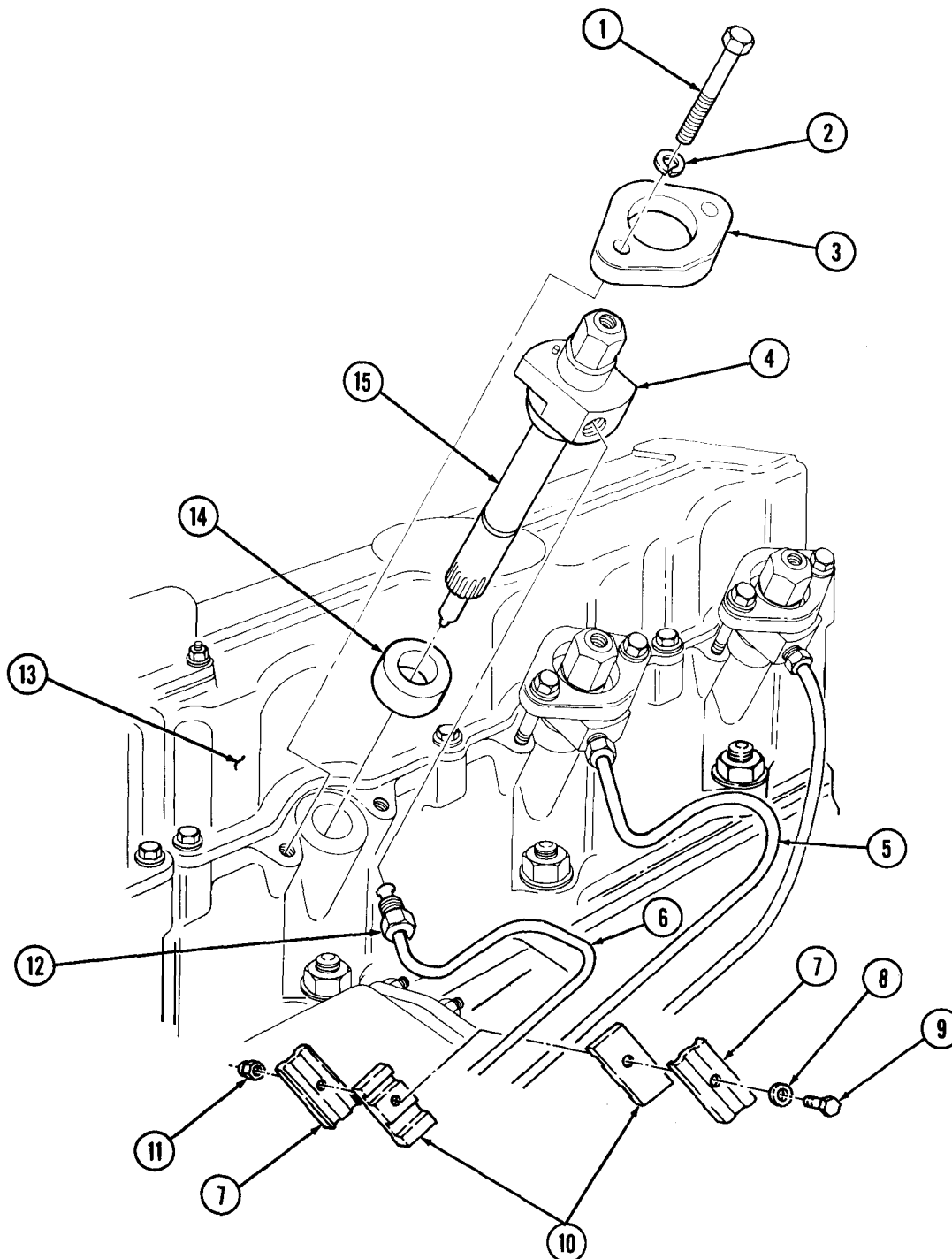
b. Repair

For fuel injector nozzle cleaning, inspection, and repair procedures, refer to TM 9-2815-210-34-2-2.

C. Installation

1. Apply a coat of silicone compound to fuel injector nozzle body (15).
2. Install dust seal (14) onto fuel injector nozzle body (15).
3. Install fuel injector nozzle (4) and holder (3) into engine (13) with two new lockwashers (2) and screws (1).
4. Evenly tighten two screws (1) 13-15 lb-ft (17-20 N.m).
5. Connect fuel injector tube (6) to fuel injector nozzle (4) with tube nut (12).
6. Install two cushions (10) and retainers (7) on fuel injector tubes (5) and (6) with washer (8), screw (9), and new locknut (11).

5-2. FUEL INJECTOR NOZZLE AND HOLDER REPLACEMENT (Contd)



- FOLLOW-ON TASKS:**
- Install fuel return tees and tubes (TM 9-2320-361-20).
 - Bleed fuel system (TM 9-2320-361-20).
 - Start engine (TM 9-2320-361-10) and check for fuel leaks.

5-3. FUEL INJECTOR TUBES MAINTENANCE

THIS TASK COVERS:

- a. Removal**
- b. Inspection**

- c. Installation**

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

- General mechanic's tool kit
(Appendix B, Item 1)
- 11/16-in. flare wrench, 12 pt.
(Appendix B, Item 41)

FABRICATED TOOLS

- Fuel line dust cap assembly tool
(Appendix D, Item 2)

MATERIALS/PARTS

- Eight locknuts (Appendix F, Item 101)
- Two locknuts (Appendix F, Item 100)
- Cap and plug set (Appendix C, Item 5)

REFERENCES (TM)

- TM 9-2320-361-10
- TM 9-2320-361-20
- TM 9-2320-361-34P

EQUIPMENT CONDITION

- . Hood raised and secured (TM 9-2320-361-10).
- Fuel burning personnel heater removed (if equipped) (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

Diesel fuel is flammable. Do not perform this task near open flames.

WARNING

Diesel fuel is flammable. Do not perform fuel system procedures near open flame. Injury to personnel may result.

CAUTION

Cap or plug all hoses, connections, and openings immediately after disconnection or component removal to prevent contamination. Remove caps or plugs prior to installation. Failure to do so may result in damage to equipment.

NOTE

- Perform steps 1 through 5 for fuel injectors 2, 4, and 6.
- Perform steps 6 through 10 for fuel injectors 1, 3, and 5.

a. Removal

1. Remove two locknuts (18), screws (25), washers (9), and two retainers (17) from fuel injector tubes (21), (22), and (24) and bracket (19). Discard locknuts (18).
2. Remove two locknuts (2), screws (23), and clamps (20) from brackets (1). Discard locknuts (2).

NOTE

- Tag fuel injector tubes for installation.
- Have fuel drainage container ready to catch excess fuel.

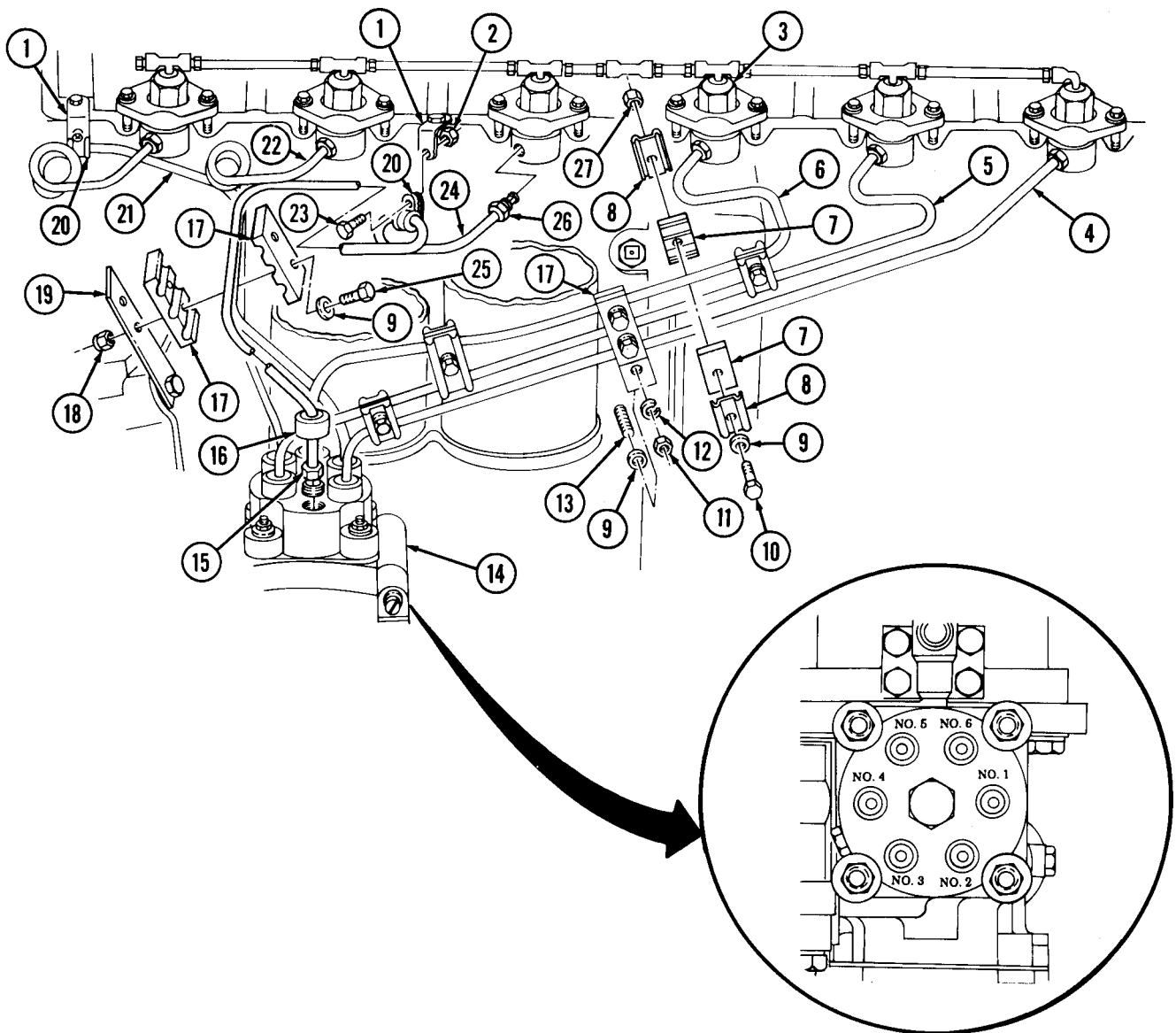
3. Lift three dust caps (16) for fuel injector tubes (21), (22), and (24).
4. Loosen three nuts (15) and remove fuel injector tubes (21), (22), and (24) from fuel injector pump (14).
5. Loosen three nuts (26) and remove three fuel injector tubes (21), (22), and (24) from injector nozzles (3).

5-3. FUEL INJECTOR TUBES MAINTENANCE (Contd)

6. Remove nut (11),lockwasher (12), two retiner halves (17), and washer (9) from stud(13).
7. Remove six locknuts (27), ten retainers (8), eight cushion halves (7), six washers (9), and screws (10) from fuel injector tubes (4), (5), and (6). Discard six locknuts (27).
8. Lift three dust caps (16) for fuel injector tubes (4), (5), and (6).
9. Loosen three nuts (15) and remove fuel injector tubes (4), (5), and (6) from fuel injector pump (14).
10. Loosen three nuts (26) and remove three fuel injector tubes (4), (5), and (6) from injector nozzles (3).

b. Inspection

1. Inspect injector tubes (4), (5), (6), (21), (22), and (24) for cracks, bends, or damaged flaring. Replace if cracked, bent, or damaged.
2. Inspect six dust caps (16) for damage. Using fabricated tool, replace dust caps (16) if damaged.



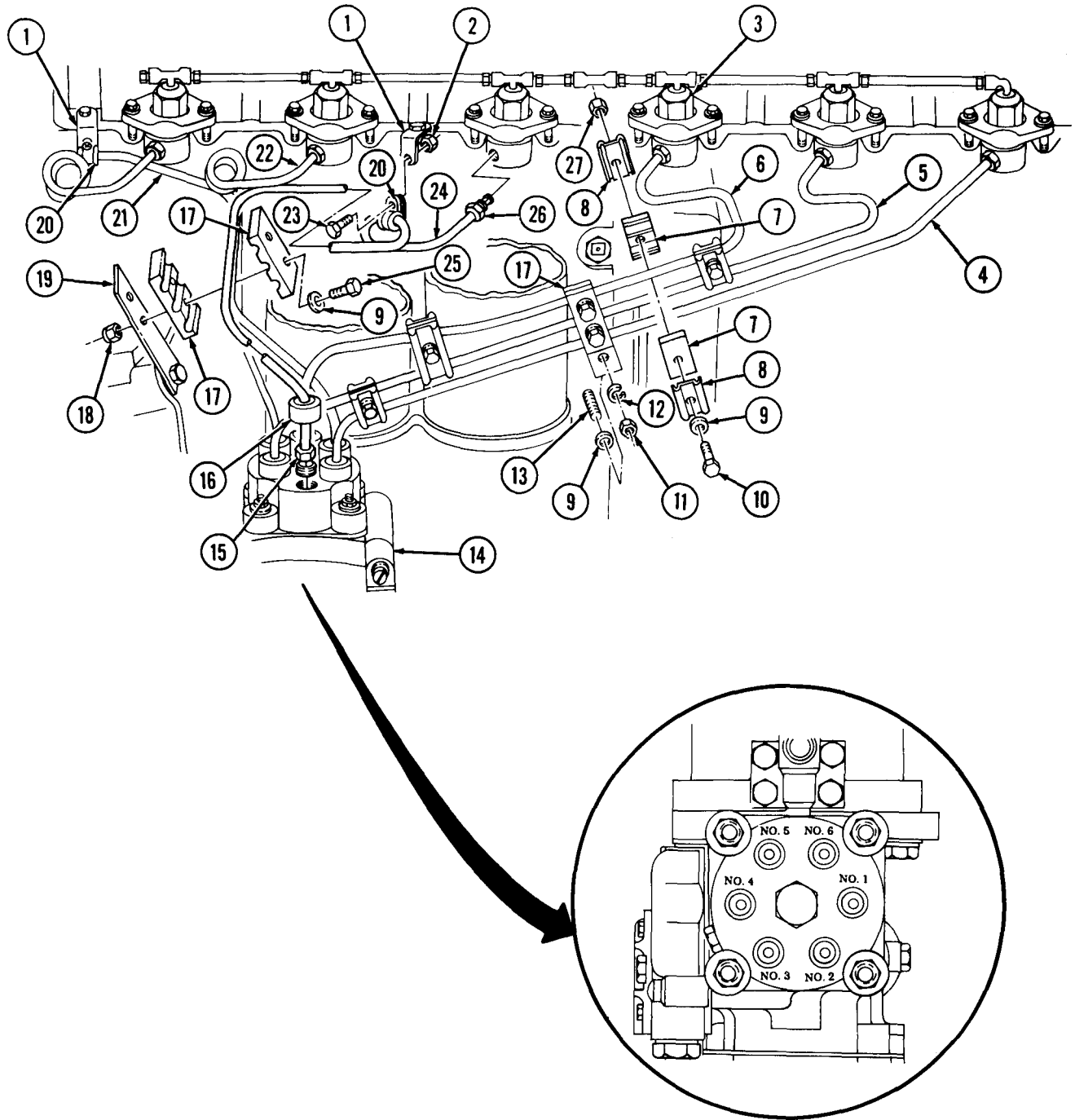
5-3. FUEL INJECTOR TUBES MAINTENANCE (Contd)**c. Installation**

NOTE

- Perform steps 1 through 5 for fuel injectors 2, 4, and 6.
- Perform steps 6 through 11 for fuel injectors 1, 3, and 5.

1. Install three fuel injector tubes (21), (22), and (24) on fuel injector nozzles (3) with three nuts (26).
2. Install three fuel injector tubes (21), (22), and (24) on fuel injection pump (14) ports no. 2, no. 6, and no. 4 respectively with three nuts (15). Do not tighten nuts (15).
3. Install two retainer halves (17) and three fuel injector tubes (21), (22), and (24) on bracket (19) with two screws (25), washers (9), and nuts (18).
4. Install two clamps (20) on brackets (1) with screws (23) and new locknuts (2).
5. Install three fuel injector tubes (21), (22), and (24) on fuel injector nozzles (3) with three nuts (26). Tighten nuts (26) 23-25 lb-ft (31-34 N.m).
6. Tighten nuts (15) 23-25 lb-ft (31-34 N.m) and lower dust caps (16) over nuts (15).
7. Install three fuel injector tubes (4), (5), and (6) on fuel injector pump (14) ports no. 3, no. 5, and no. 1 respectively with three nuts (15). Do not tighten nuts (15).
8. Install three fuel injector tubes on injector nozzles (3) with three nuts (26). Do not tighten nuts (26).
9. Install eight retainer halves (8) and cushion halves (7) on fuel injector tubes (4), (5), and (6) with four screws (10), washers (9), and new locknuts (27).
10. Install washer (9), two retainer halves (17), and fuel injector tubes (4), (5), and (6) on stud (13) with new locknut (11).
11. Tighten three nuts (15) and (26) 23-35 lb-ft (31-34 N.m).
12. Lower dust caps (16) over nuts (15).

5-3. FUEL INJECTOR TUBES MAINTENANCE (Contd)



- FOLLOW-ON TASKS:
- Install fuel burning personnel heater (if equipped) (TM 9-2320-361-20).
 - Bleed fuel system (TM 9-2320-361-20).

5-4. FUEL INJECTION PUMP REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

SPECIAL TOOLS

Crowfoot attachment
(Appendix B, Item 63)

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Mechanical puller kit (Appendix B, Item 21)

FABRICATED TOOLS

Fuel injection pump gear hub wrench
(Appendix D, Item 1)

MATERIALS/PARTS

Lockplate (Appendix F, Item 113)
Gasket (Appendix F, Item 34)
Gasket (Appendix F, Item 35)
Six lockwashers (Appendix F, Item 131)
Six lockwashers (Appendix F, Item 123)
Three lockwashers (Appendix F, Item 124)
Six lockwashers (Appendix F, Item 130)
Gasket (Appendix F, Item 30)

MATERIALS/PARTS (Contd)

Gasket (Appendix F, Item 28)
Cap and plug set (Appendix C, Item 5)
Sealing compound (Appendix C, Item 1)
Sealing compound, gasket forming
(Appendix C, Item 18)

REFERENCES (TM)

TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-36 1-34P

EQUIPMENT CONDITION

- Hood raised and secured (TM 9-2320-361-10).
- Radiator removed (TM 9-2320-361-20).
- Engine stop control cable disconnected
(TM 9-2320-361-20).
- Accelerator cable removed (TM 9-2320-361-20).
- Fuel injector tubes removed (para. 5-3).
- Fuel burning personnel heater removed (if
installed) (TM 9-2320-36 1-20).

GENERAL SAFETY INSTRUCTIONS

Diesel fuel is flammable. Do not perform this task near open flames.

WARNING

Diesel fuel is flammable. Do not perform fuel system procedures near open flame. Injury to personnel may result.

CAUTION

Cap or plug all openings immediately after disconnecting lines and hoses to prevent contamination. Remove caps or plugs prior to installation. Failure to do so may result in damage to equipment.

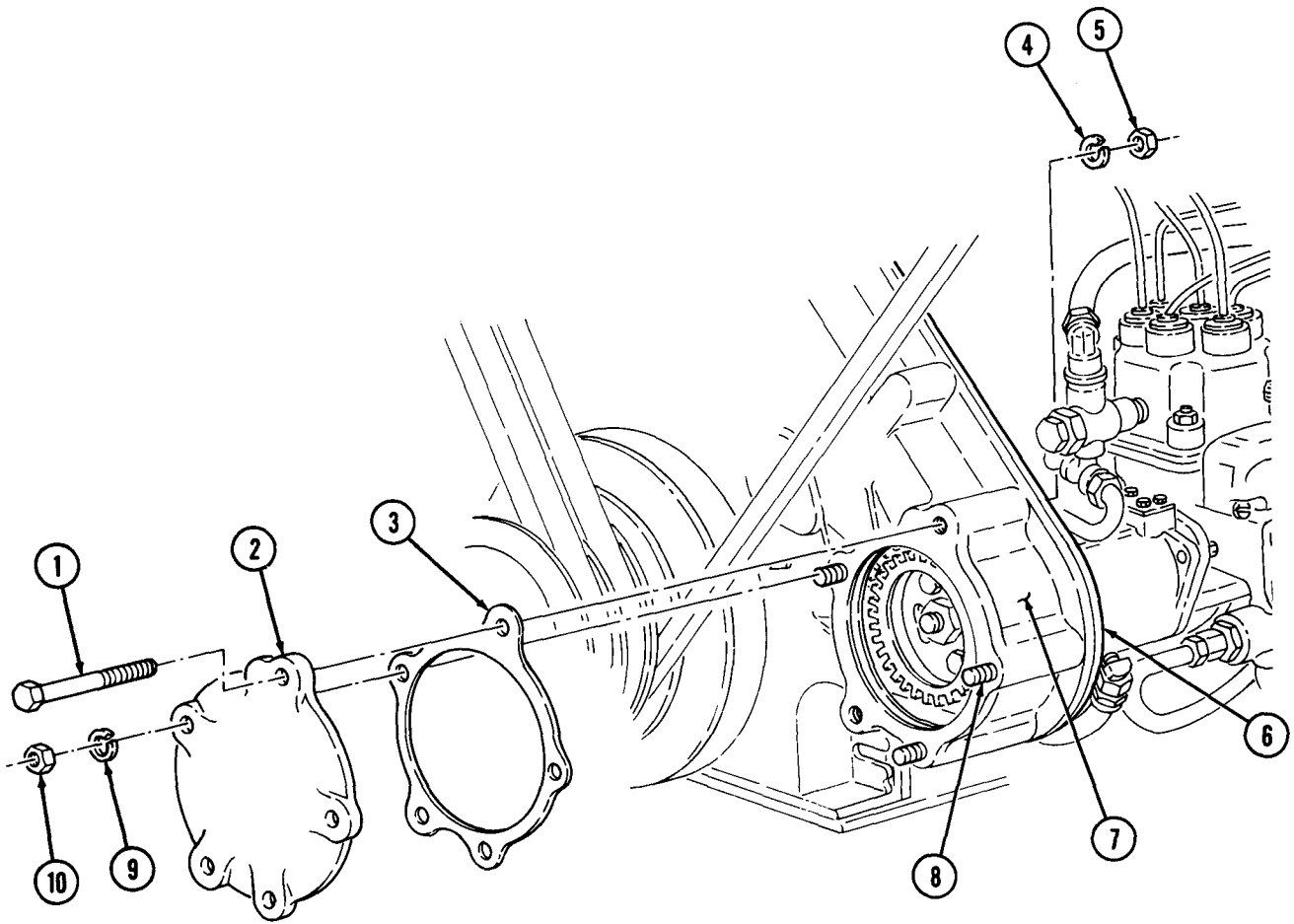
NOTE

- . Have drainage container ready to catch excess fuel.
- . Tag tubes for installation.

a. Removal

1. Remove two nuts (5), lockwashers (4), and screws (1) from adapter plate (6), timing cover (7), and access cover (2). Discard lockwashers (4).
2. Remove three nuts (10), lockwashers (9), access cover (2), and gasket (3) from timing cover studs (8). Discard lockwashers (9) and gasket (3).
3. Remove all remaining gasket (3) material from timing cover (7) and access cover (2).

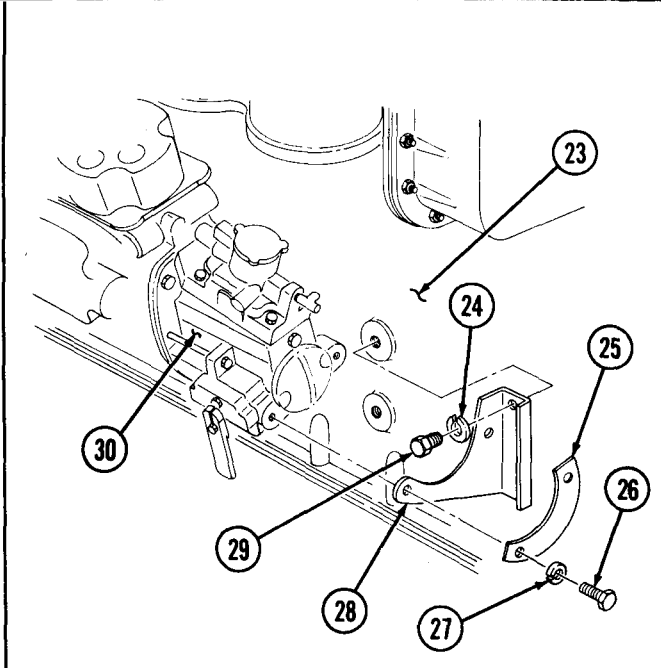
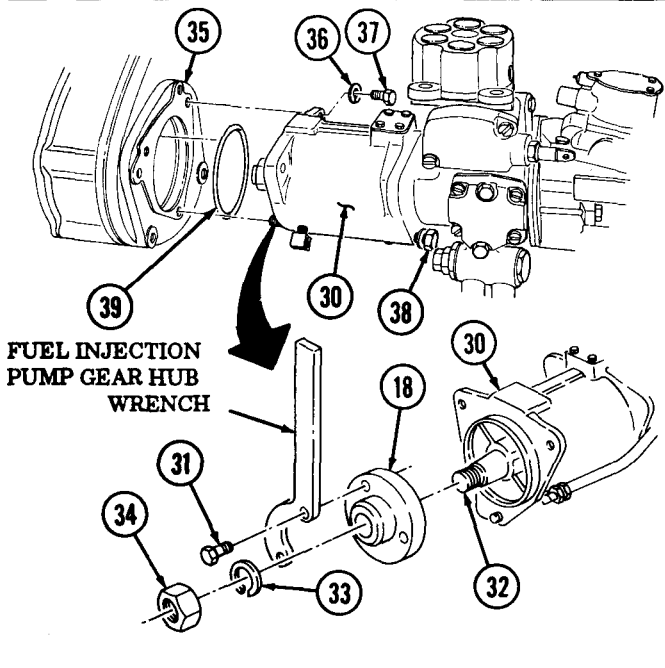
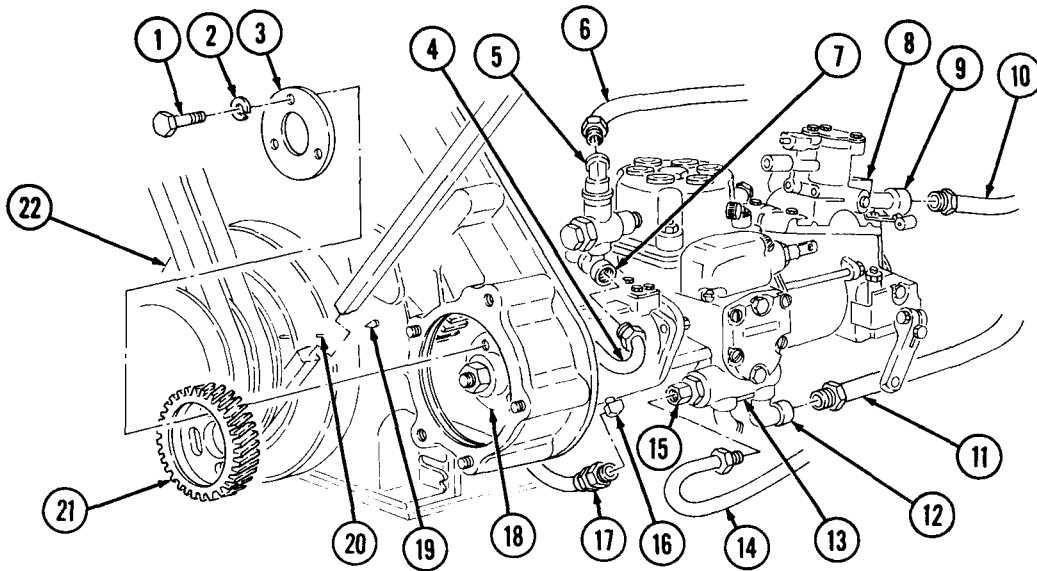
5-4. FUEL INJECTION PUMP REPLACEMENT (Contd)



5-4. FUEL INJECTION PUMP REPLACEMENT (Contd)

4. Disconnect crankcase-to-fuel injection pump pressure oil hose (17) from tee (16) at bottom of fuel injection pump (30).
5. Disconnect fuel return-to-fuel injection pump overflow valve tube (4) from tee (7).
6. Disconnect fuel filter outlet-to-fuel density compensate inlet tube (10) from tee (9) at compensator (8).
7. Disconnect fuel transfer pump-to-fuel filter inlet tube (11) from elbow (12) at transfer pump (13).
8. Disconnect fuel injection pump-to-fuel filter fuel return tube (6) from elbow (5).
9. Disconnect transfer pump-to-flame heater fuel filter tube (14) from adapter (15).
10. Align timing mark (20) on crankshaft damper (22) with timing pointer (19).
11. Remove three screws (1), lockwashers (2), retaining plate (3), and drive gear (21) from drive gear hub (18). Discard lockwashers (2).
12. Straighten lockplate (25) and remove two screws (26), lockwashers (27), and lockplate (25) from bracket (28) and fuel injection pump (30). Discard lockwashers (27) and lockplate (29).
13. Remove two screws (29), lockwashers (24), and bracket (28) from crankcase (23). Discard lockwashers (24).
14. Remove two screws (37), lockwashers (36), screw (38), and fuel injection pump (30) from adapter (35). Discard lockwashers (36).
15. Install fabricated tool on hub (18) with two screws (31).
16. Hold hub (18) and remove nut (34) and lockwasher (33) from fuel injection pump. Discard lockwasher (33). Remove two screws (31) and tool.
17. Remove drive gear hub (18) from timing device shaft (32).
18. Remove gasket (39) from adapter (35). Discard gasket (39).

5-4. FUEL INJECTION PUMP REPLACEMENT (Contd)



5-4. FUEL INJECTION PUMP REPLACEMENT (Contd)

CAUTION

Remove caps or plugs from hoses, connections, and openings before reconnection. Failure to do so may result in damage to equipment.

b. Installation

1. Aline timing marks (6) on crankshaft damper (8) with timing pointer (5).
2. Install drive gear hub (4) on fuel injection pump (10) with new lockwasher (11) and nut (12).
3. Install fabricated tool on drive gear hub (4) with two screws (13). Tighten nut (12) 66-71 lb-ft (90-96 N-m). Remove screws (13) and tool.
4. Remove four screws (14), lockwashers (15), timing cover (16), and gasket (17) from fuel injection pump (10). Discard lockwashers (15) and gasket (17).
5. Remove two screws (22), lockwashers (23), timing window cover (21), and gasket (20) from fuel injection pump (10). Discard lockwashers (23) and gasket (20).

NOTE

The fuel injection pump camshaft contains an over-center lobe which may prevent the timing mark on the hub from remaining in line with the pointer. The pump mark must be alined with the pointer when installing the fuel injection pump drive gear and retaining plate.

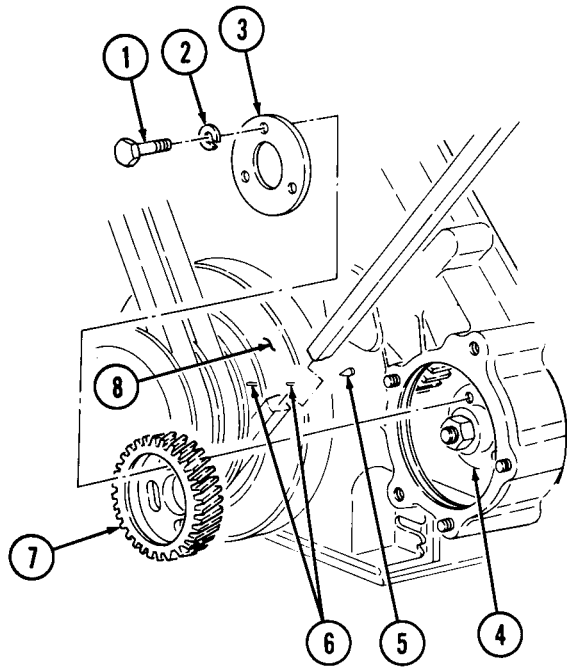
6. Aline timing mark (18) on drive gear hub (4) with pointer (19) when the marked tooth (24) in the timing window (25) is visible.
7. Install new gasket (30) and fuel injection pump (10) on adapter (31) with two new lockwashers (26), screws (27), and screw (29).
8. Install bracket (34) and new lockplate (37) on fuel injection pump (10) and crankcase (32) with two new lockwashers (33), screws (38), new lockwashers (36), and screws (35). Bend lockplate ends (37) over screws (35).
9. Install drive gear (7) on drive gear hub (4).

NOTE

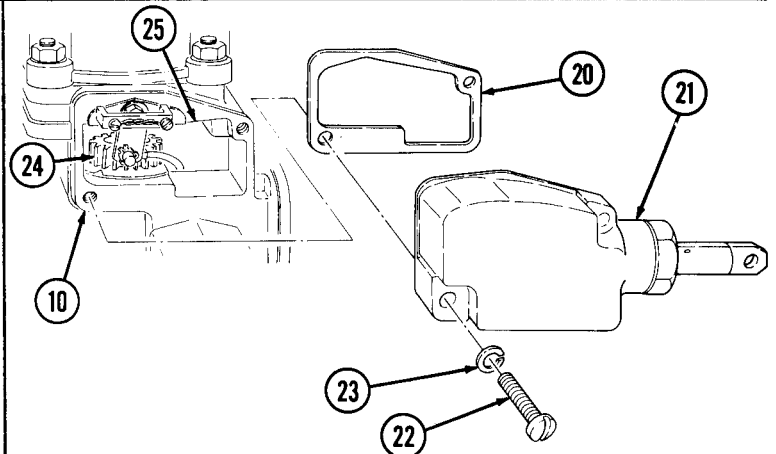
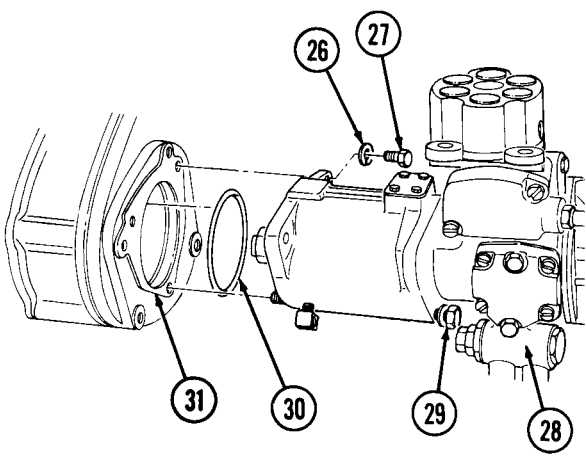
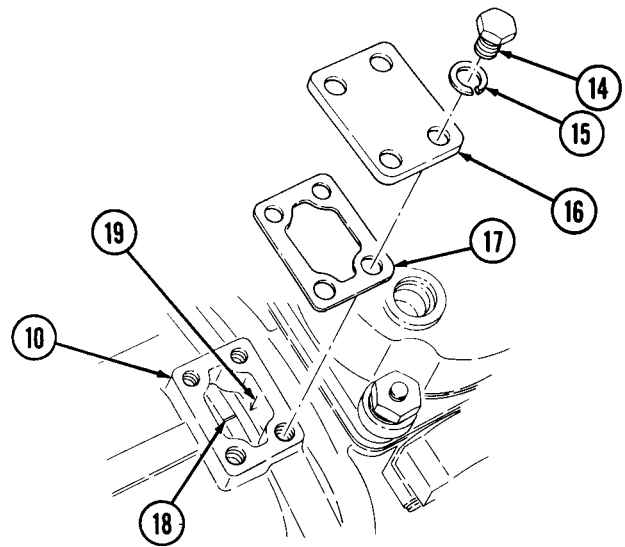
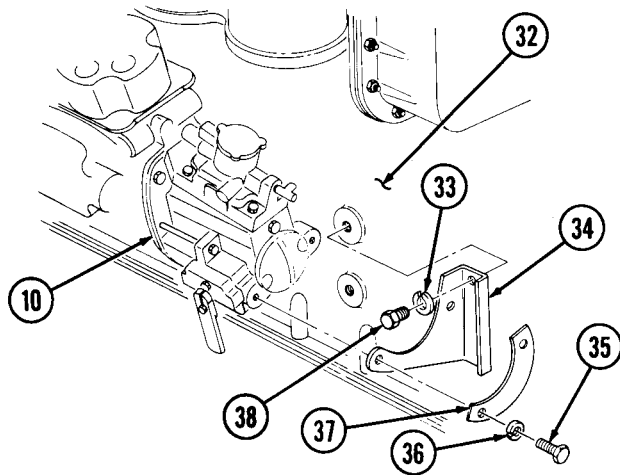
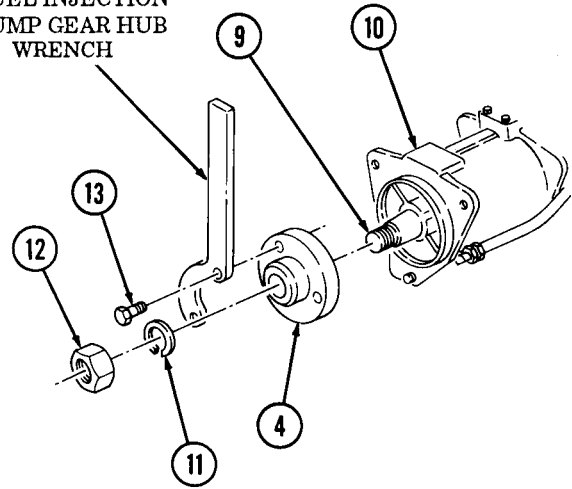
The three elongated holes in the fuel injection pump drive gear allow about 20° free rotation around the injection pump drive gear hub. In cases where the alinement mark will not aline with pointer, it will be necessary to remove drive gear retaining plate and drive gear to reposition the gear on hub.

10. Install retaining plate (3) on drive gear (7) with three new lockwashers (2) and screws (1). Do not tighten screws (1).
11. Rotate shaft (9) clockwise, as necessary, to aline timing mark (18) on drive gear hub (4) with point (19).
12. Hold shaft (9), in alined position, and tighten three screws (1) 23-27 lb-ft (31-37 N-m).
13. Aline timing marks (6) on crankshaft damper (8) with timing pointer (5).
14. Install new gasket (20) and timing window cover (21) with two new lockwashers (23) and screws (22).
15. Install new gasket (17) and timing cover (16) on fuel injection pump with four new lockwashers (15) and screws (14).

5-4. FUEL INJECTION PUMP REPLACEMENT (Contd)



FUEL INJECTION PUMP GEAR HUB WRENCH

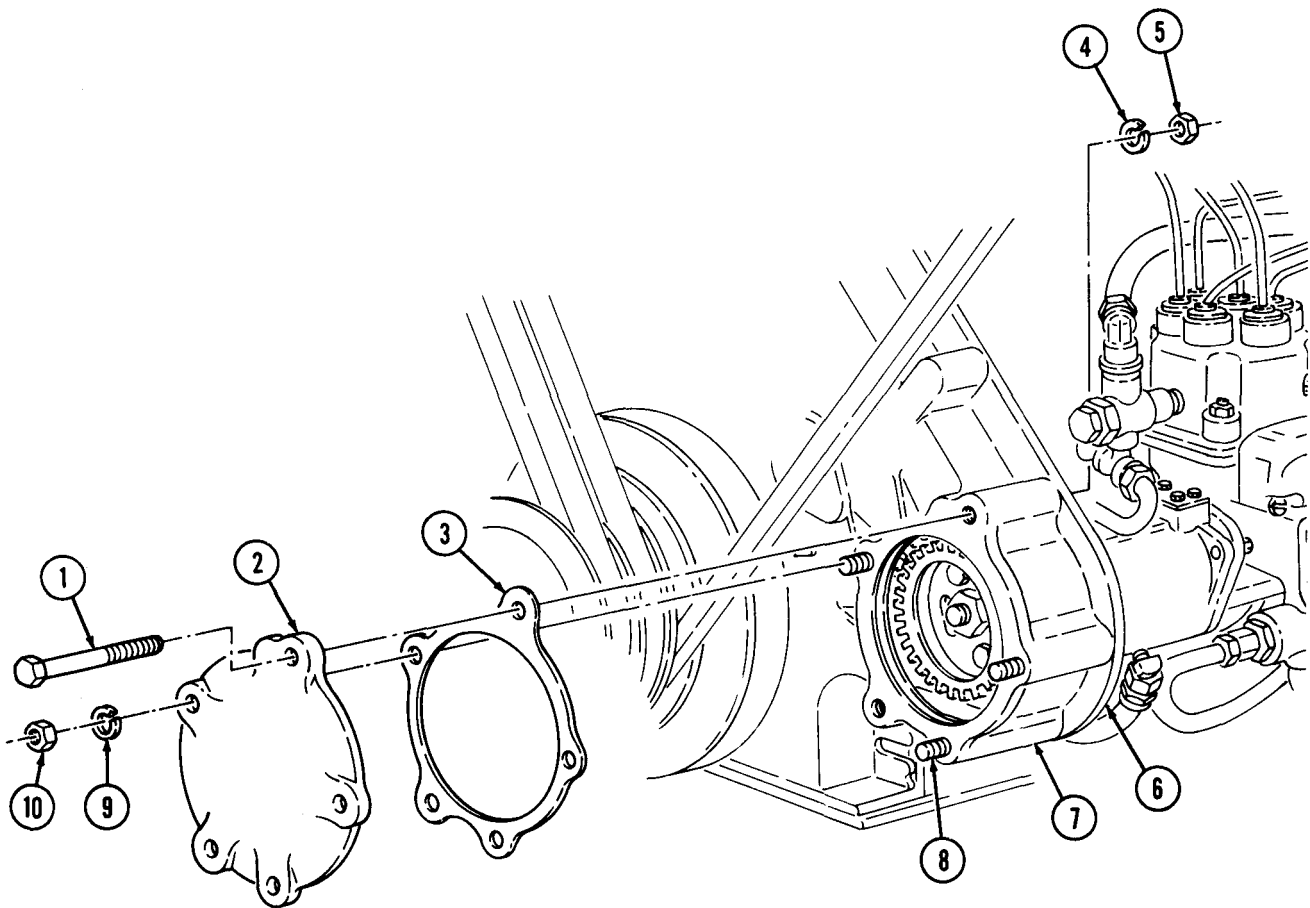


5-4. FUEL INJECTION PUMP REPLACEMENT (Contd)

CAUTION

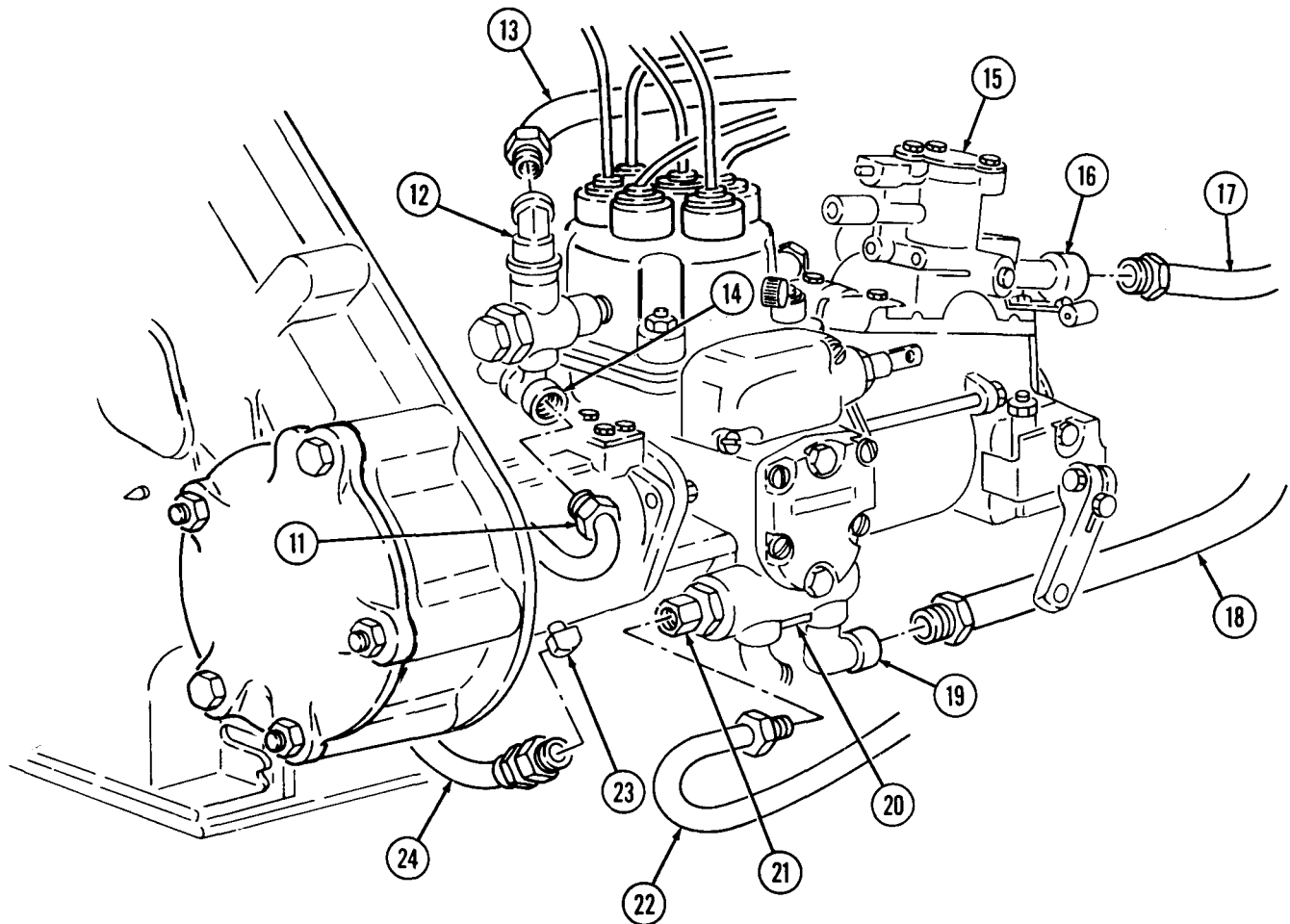
All gasket(s) must be blotted to remove excess sealing compound.
Excess sealing compound can damage engine.

16. Apply a light, even coat of sealing compound on both sides of new gasket (3).
17. Apply sealing compound on the threads of three nuts (10), two screws (1), and two nuts (5).
18. Install new gasket (3) and access cover (2) on timing cover studs (8) with three new lockwashers (9) and nuts (10).
19. Install two screws (1) through access cover (2), new gasket (3), timing cover (7), and adapter plate (6) with two new lockwashers (4) and nuts (5).



5-4. FUEL INJECTION PUMP REPLACEMENT (Contd)

20. Install injector tubes (para. 5-3).
21. Connect fuel injection pump-to-fuel filter fuel return tube (13) on elbow (12).
22. Connect transfer pump-to-flame heater fuel filter tube (22) on adapter (21).
23. Connect fuel transfer pump-to-fuel filter inlet tube (18) on elbow (19) at transfer pump (20).
24. Connect fuel filter outlet-to-fuel density compensator inlet tube (17) on tee (16) at compensator (15).
25. Connect fuel return-to-fuel injection pump overflow valve tube (11) on tee (14).
26. Connect crankcase-to-fuel injection pump pressure oil hose (22) on tee (21).



- FOLLOW-ON TASKS:**
- Install accelerator cable (TM 9-2320-361-20).
 - Install engine stop control cable (TM 9-2320-361-20).
 - Install radiator (TM 9-2320-361-20).
 - Install fuel burning personnel heater (if removed) (TM 9-2320-361-20).
 - Bleed fuel system (TM 9-2320-361-20).
 - Start engine (TM 9-2320-361-10) and check for fuel leaks.

5-5. TURBOCHARGER REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Gasket (Appendix F, Item 29)
Gasket (Appendix F, Item 31)
Gasket (Appendix F, Item 50)
Four locknuts (Appendix F, Item 93)
Locknut (Appendix F, Item 94)
Cap and plug set (Appendix C, Item 5)
Lubricating oil, OE/HDO 10
(Appendix C, Item 12)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-361-34P
TM 9-2815 -210-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Battery ground cable disconnected (TM 9-2320-361-20).
- Air intake tube removed (TM 9-2320-361-20).
- Manifold heater removed (TM 9-2320-361-20).
- Crankcase breather tube removed (TM 9-2320-361-20).
- Turbocharger oil drain tube, hose, and adapter removed (TM 9-2320-361-20).
- Turbocharger oil inlet tube and adapter removed (TM 9-2320-361-20).

CAUTION

Cap or plug all openings immediately after disconnecting lines and hoses to prevent contamination. Remove caps or plugs prior to installation. Failure to do so may result in turbocharger and/or engine damage.

a. Removal

1. Remove locknut (12) and screw (9) from coupling (11). Discard locknut (12).
2. Remove coupling (11), gasket (13), and elbow (8) from flex tube (10). Discard gasket (13).
3. Loosen clamp (7) and remove elbow (8), clamp (7), and gasket (6) from turbocharger (5). Discard gasket (6).

NOTE

Assistant will help with step 4.

4. Remove four locknuts (3), two screws (2), turbocharger (5), and gasket (14) from exhaust manifold (1). Discard locknuts (3) and gasket (14).

b. Installation

NOTE

Assistant will help with step 1.

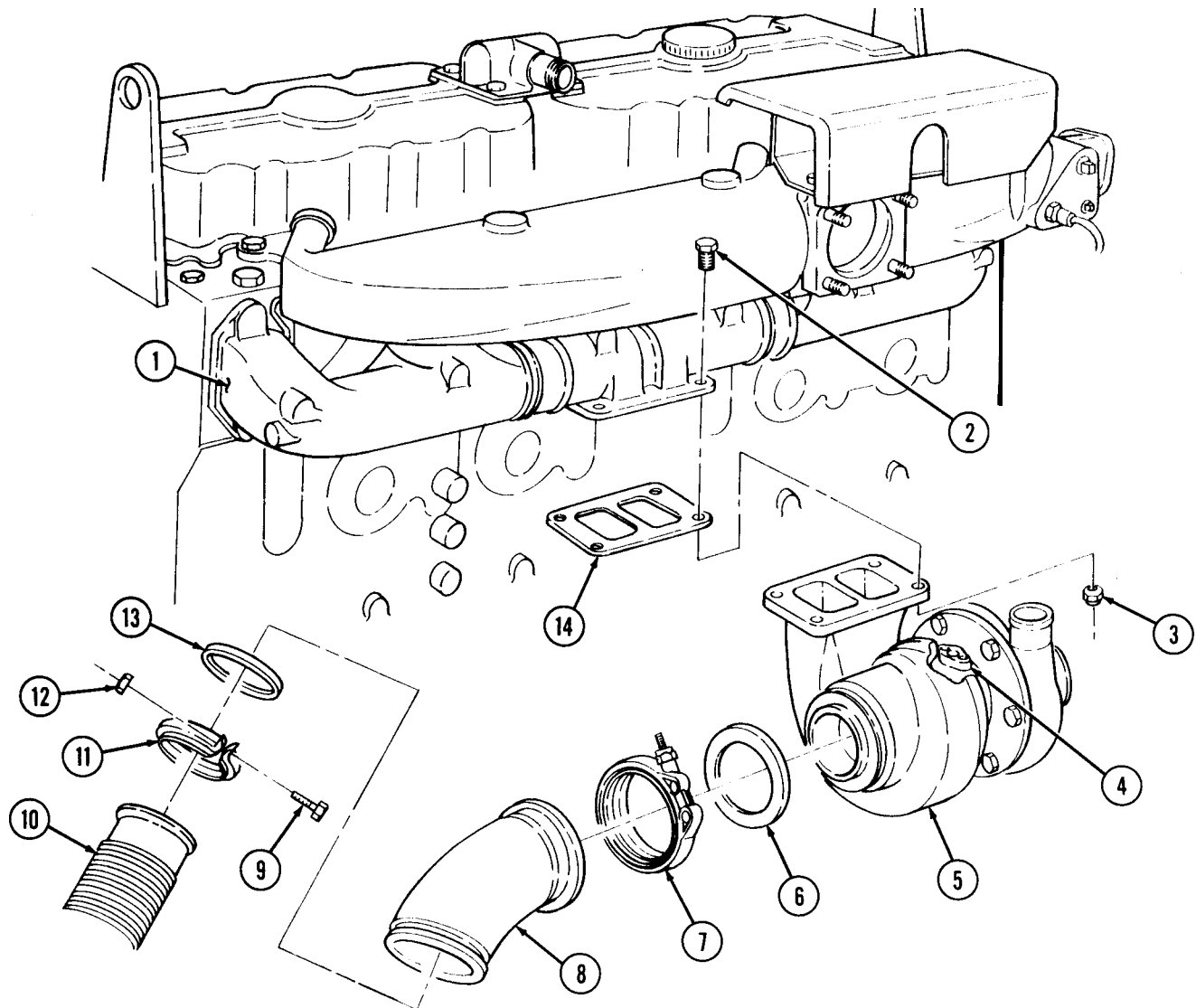
1. Install new gasket (14) and turbocharger (5) on exhaust manifold (1) with two screws (2) and four new locknuts (3).
2. Install new gasket (6), clamp (7), and elbow (8) on turbocharger (5). Do not tighten clamp (7).
3. Install new gasket (13) on elbow (8).
4. Install elbow (8) on flex tube (10) with coupling (11), screw (9), and new locknut (12).
5. Tighten clamp (7).

5-5. TURBOCHARGER REPLACEMENT (Contd)

CAUTION

Ensure oil is added before operating engine. Failure to do so may result in damage to turbocharger bearings.

6. Pour 2 oz (59 ml) of lubricating oil into turbocharger (5) through oil inlet tube port (4).



FOLLOW-ON TASKS: . Install turbocharger oil drain tube, hose, and adapter (TM 9-2320-361-20).

- Install turbocharger oil inlet tube and adapter (TM 9-2320-361-20).
- Install crankcase breather tube (TM 9-2320-361-20).
- Install manifold heater (TM 9-2320-361-20).
- Install air intake tube (TM 9-2320-361-20).
- Connect battery ground cable (TM 9-2320-361-20).

CHAPTER 6

COOLING SYSTEM MAINTENANCE

6-1. RADIATOR MAINTENANCE

THIS TASK COVERS:

a. Cleaning and Inspection

b. Test and Repair

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Soldering iron
(Appendix B, Item 13)

MATERIALS/PARTS

Solder (Appendix C, Item 23)

REFERENCES (TM)

TM 9-2320-361-20
TM 9-2320-361-34P
TM 750-254

EQUIPMENT CONDITION

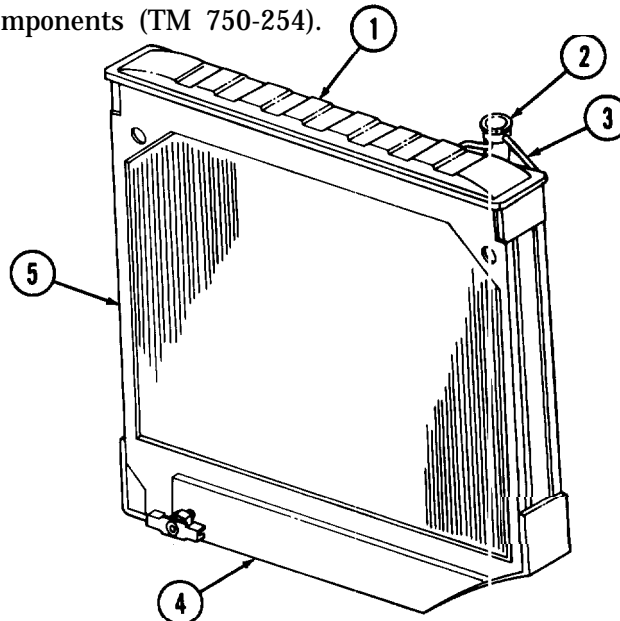
Radiator and brackets removed (TM 9-2320-361-20).

a. Cleaning and Inspection

1. Clean radiator (5) (TM 750-254).
2. Inspect radiator (5) for cracked, broken, or damaged components.
3. Inspect radiator upper tank (1), lower tank (4), filler neck (2), and overflow pipe (3) for obvious defects. Repair or replace if defective (TM 750-254).

b. Test and Repair

1. Pressure test radiator (5) for leaks (TM 750-254).
2. Repair defective radiator components (TM 750-254).



FOLLOW-ON TASK: Install radiator and brackets (TM 9-2320-361-20).

CHAPTER 7 ELECTRICAL SYSTEM MAINTENANCE

7-1. ELECTRICAL SYSTEM MAINTENANCE INDEX

PARA NO.	TITLE	PAGE NO.
7-2.	60 Ampere Alternator Repair	7-1
7-3.	Front Wiring Harness Replacement	7-19
7-4.	Rear Wiring Harness Replacement	7-35

7-2. 60 AMPERE ALTERNATOR REPAIR

THIS TASK COVERS:

- | | |
|---|--|
| <ul style="list-style-type: none"> a. Disassembly b. Cleaning | <ul style="list-style-type: none"> c. Inspection d. Assembly |
|---|--|

INITIAL SETUP

APPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

SPECIAL TOOLS

Torx socket TLE60 (Appendix B, Item 36)

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Tool kit, electrical (Appendix B, Item 2)
- Soldering iron (Appendix B, Item 13)
- Torque wrench, 3/8-in. dr. (Appendix B, Item 8)
- Arbor press

MATERIALS/PARTS

- Generator parts kit (Appendix F, Item 187)
- Generator parts kit (Appendix F, Item 188)
- Tiedown strap (Appendix C, Item 15)
- Adhesive sealant (Appendix C, Item 2)
- GAA grease (Appendix C, Item 8)
- Insulating compound (Appendix C, Item 10)
- Lubricating oil, OE/HDO 30 (Appendix C, Item 13)
- Silicone compound (Appendix C, Item 22)
- Solder (Appendix C, Item 28)

REFERENCES (TM)

- TM 9-214
- TM 9-237
- TM 9-2320-361-20
- TM 9-2920-225-34P

EQUIPMENT CONDITION

Alternator removed (TM 9-2320-361-20).

7-2. 60 AMPERE ALTERNATOR REPAIR(Contd)

NOTE

Tag leads for assembly.

a. Disassembly

1. Remove access plug (7) from endhousing (4).
2. Remove six screws (1), end cover (2), and O-ring (3) from end housing (4). Discard O-ring (3).

NOTE

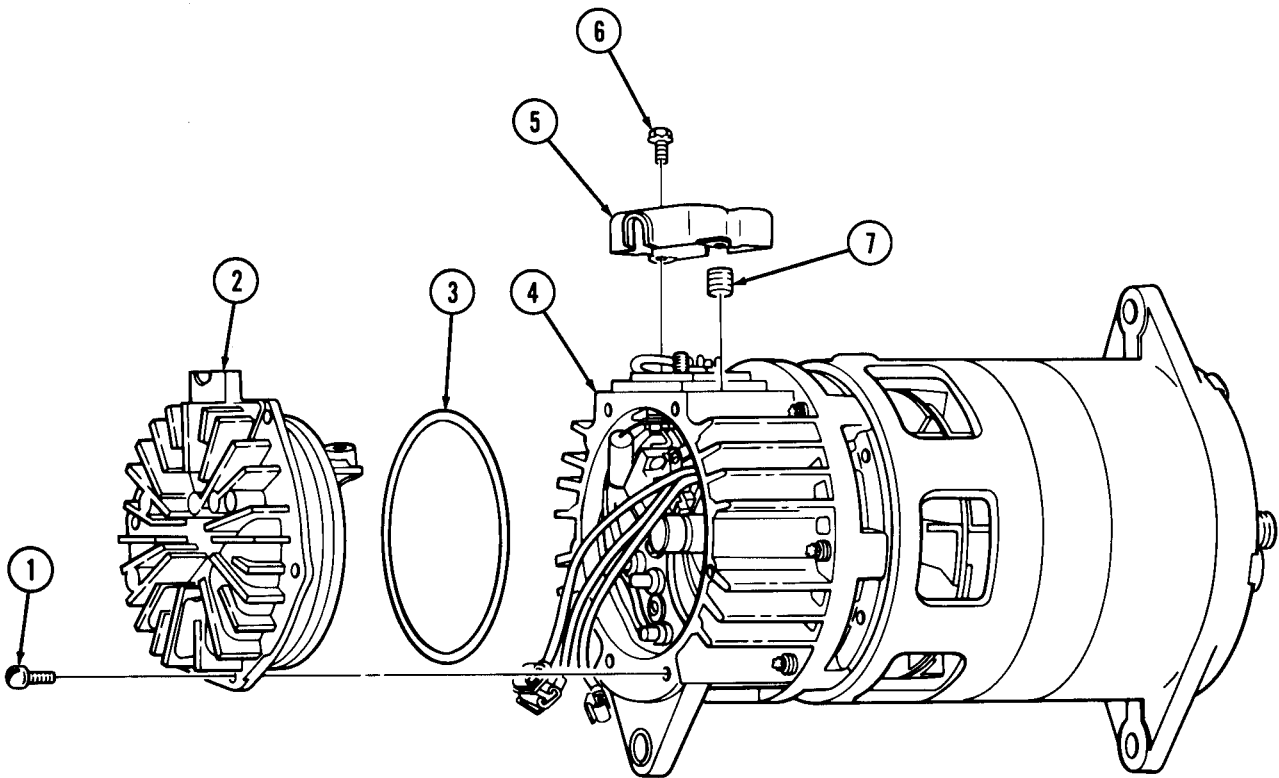
Regulator is part of end cover; do not disassemble.

3. Disconnect three leads (10) from three terminals (11) on regulator (12).
4. Remove two screw-assembled lockwashers (6) and output plate cover (5) from end housing (4). Discard screw-assembled lockwashers (6).
5. Remove sealer from three stator leads (8).

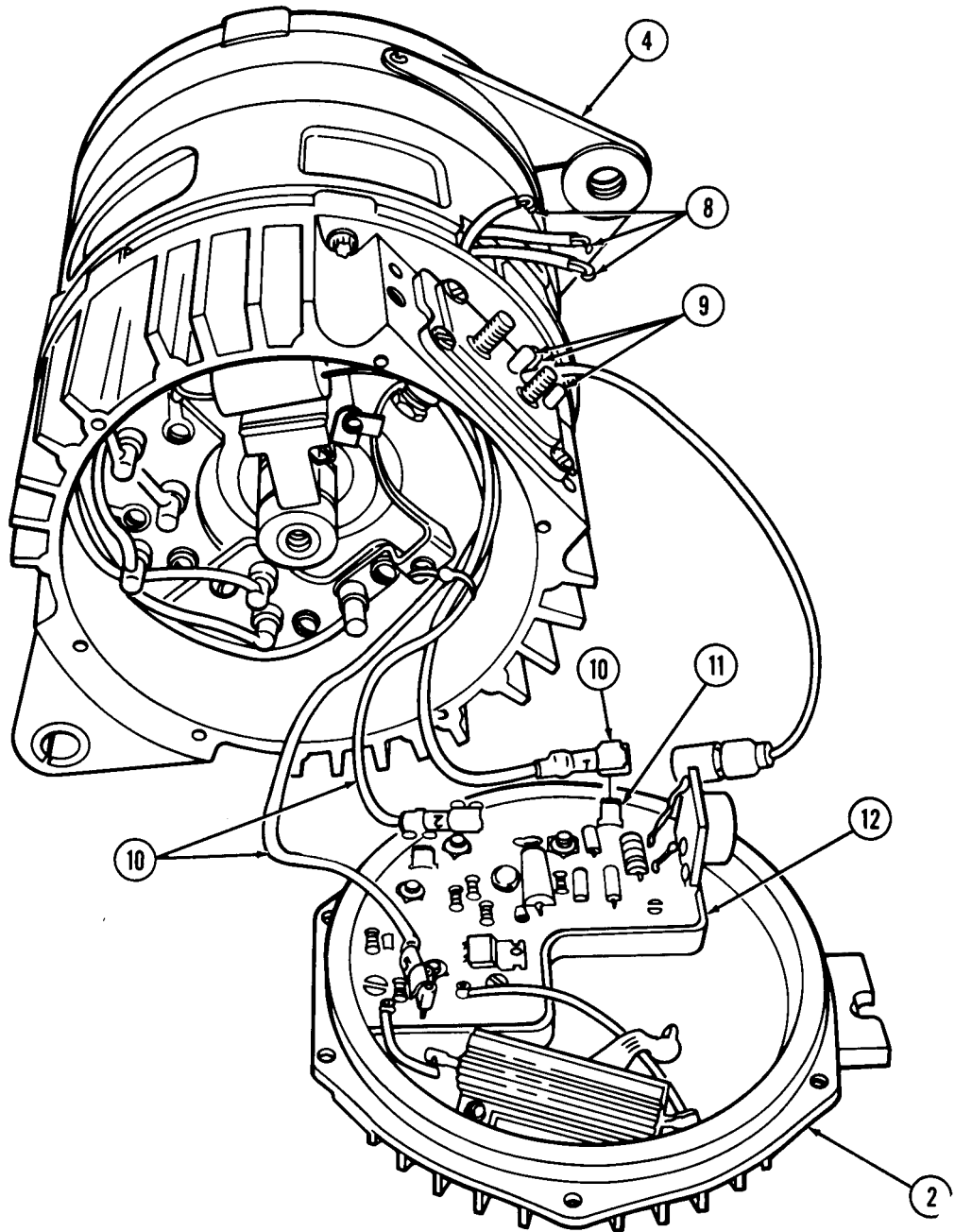
CAUTION

Use heat sink when resoldering leads. Failure to do so may result in damage to equipment.

6. Desolder and disconnect three stator leads (8) from three stator lead terminals (9).



7-2. 60 AMPERE ALTERNATOR REPAIR (Contd)



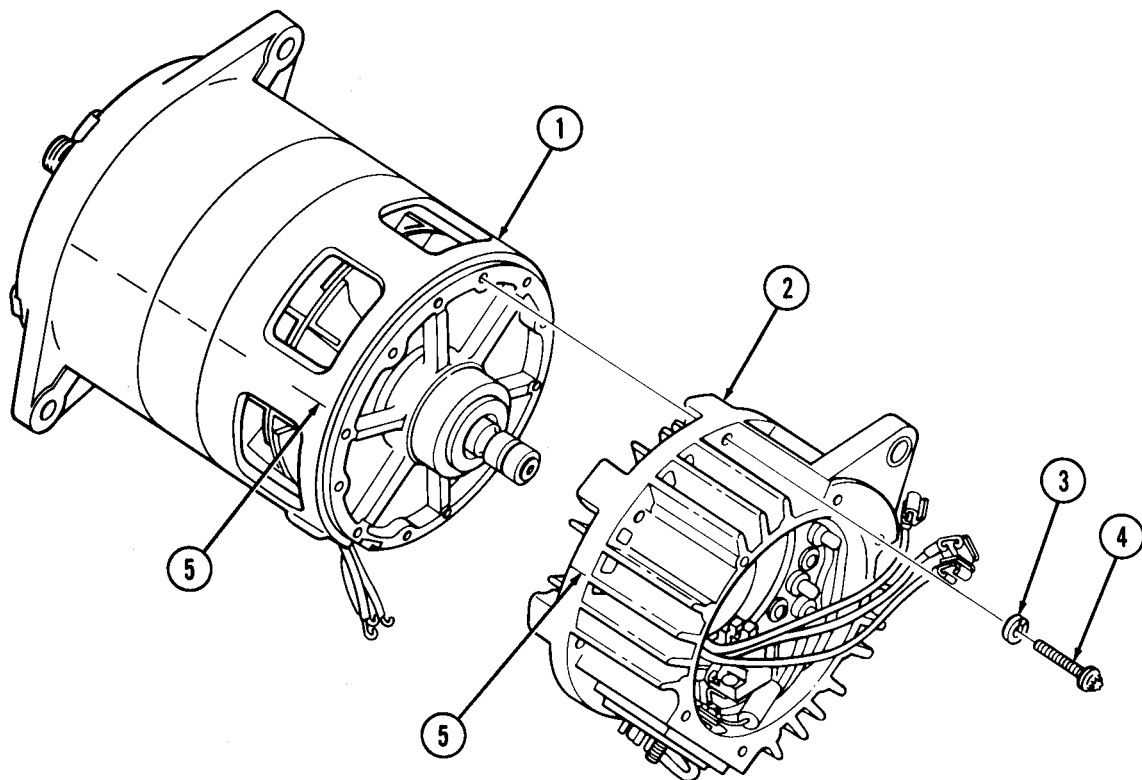
7-2. 60 AMPERE ALTERNATOR REPAIR (Contd)

7. Scribe a locating mark (5) on end housing (2) and intermediate housing (1).

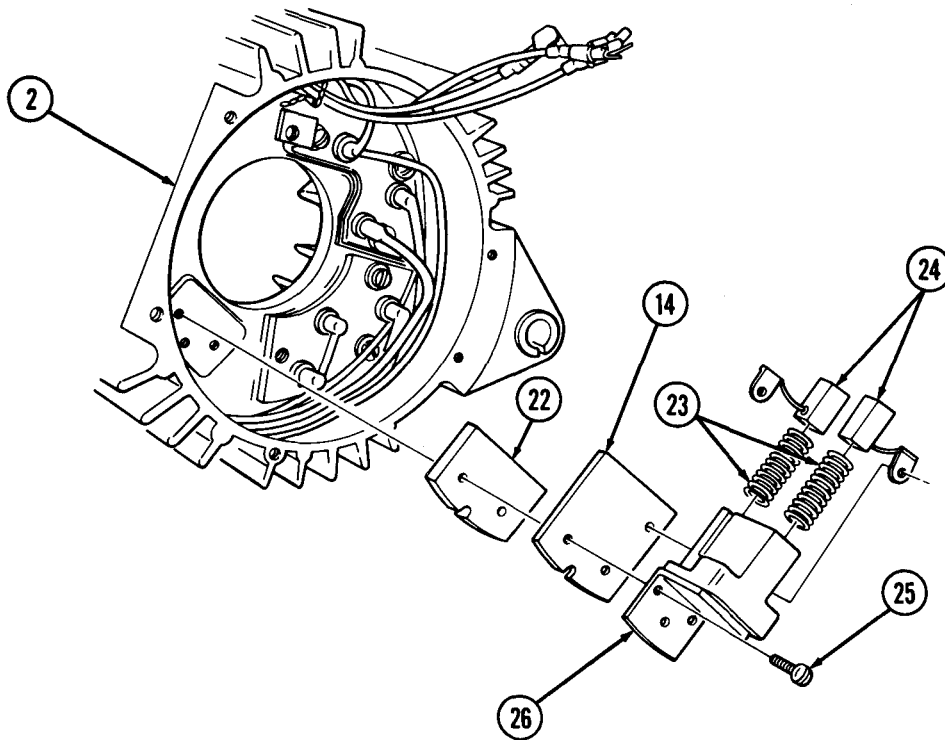
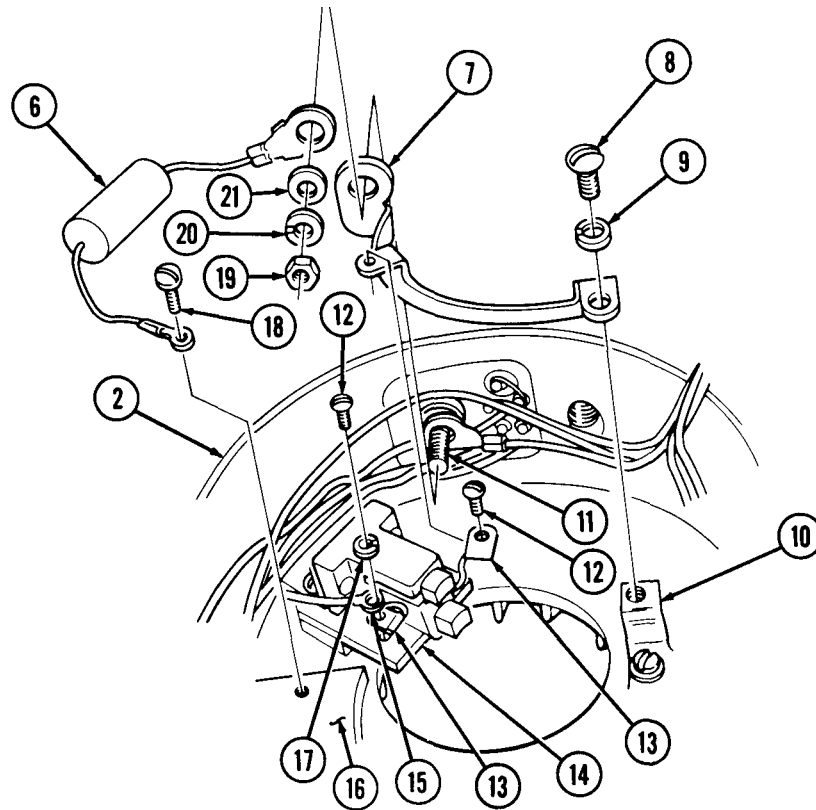
NOTE

Brush springs will fall free when end housing is removed from intermediate housing.

8. Using torx socket, remove six torx head screws (4), lockwashers (3), and end housing (2) from intermediate housing (1). Discard lockwashers (3).
9. Remove insulating compound from capacitor (6).
10. Remove screw (18), nut (19), lockwasher (20), washer (21), and capacitor (6) from negative rectifier plate (16) and output plate stud (11). Discard lockwasher (20).
11. Remove two screws (12), lockwasher (17), two brush leads (13), and lead (15) from insulator (14) and output strap (7). Discard lockwasher (17).
12. Remove two brushes (24) and springs (23) from brush holder (26).
13. Remove three screws (25), brush holder (26), insulator (14), and shim (22) from end housing (2).
14. Remove screw (8), lockwasher (9), and output strap (7) from positive rectifier plate (10) and output plate stud (11). Discard lockwasher (9).



7-2. 60 AMPERE ALTERNATOR REPAIR (Contd)



7-2. 60 AMPERE ALTERNATOR REPAIR (Contd)

- 15. Remove tiedown strap (1) from three leads (2). Discard tiedown strap (1).
- 16. Disconnect lead (20) from output plate stud (6).
- 17. Remove insulating compound from four rectifier terminals (10) and three rectifier terminals (16).

CAUTION

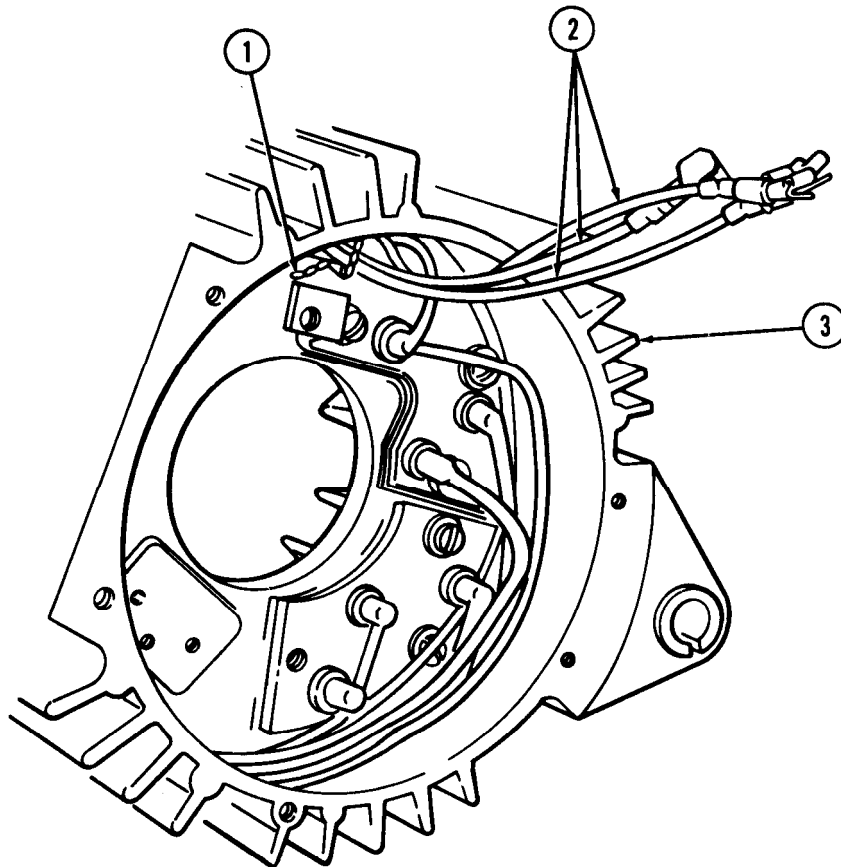
Use heat sink when resoldering leads. Failure to do so may result in damage

- 18. Desolder and disconnect six positive rectifier leads (11) from four positive rectifier terminals (10).
- 19. Remove three screws (12), washers (13), nylon washers (14), positive rectifier plate (9), and positive rectifier insulator (8) from end housing (3).

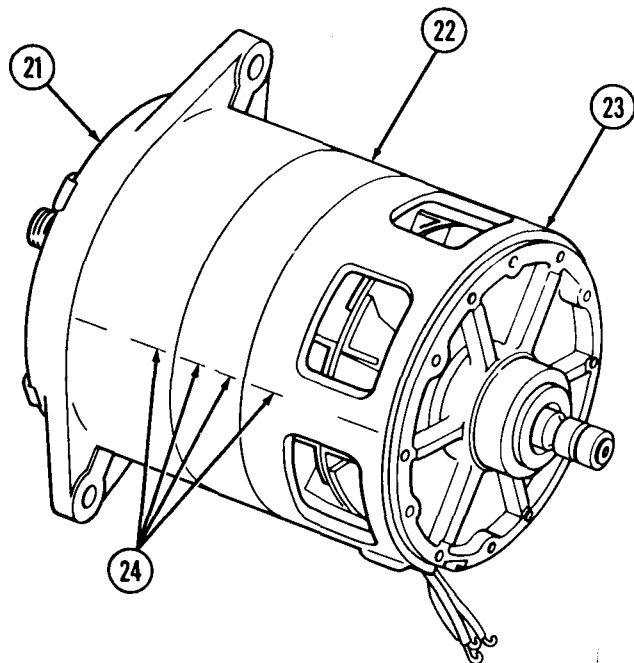
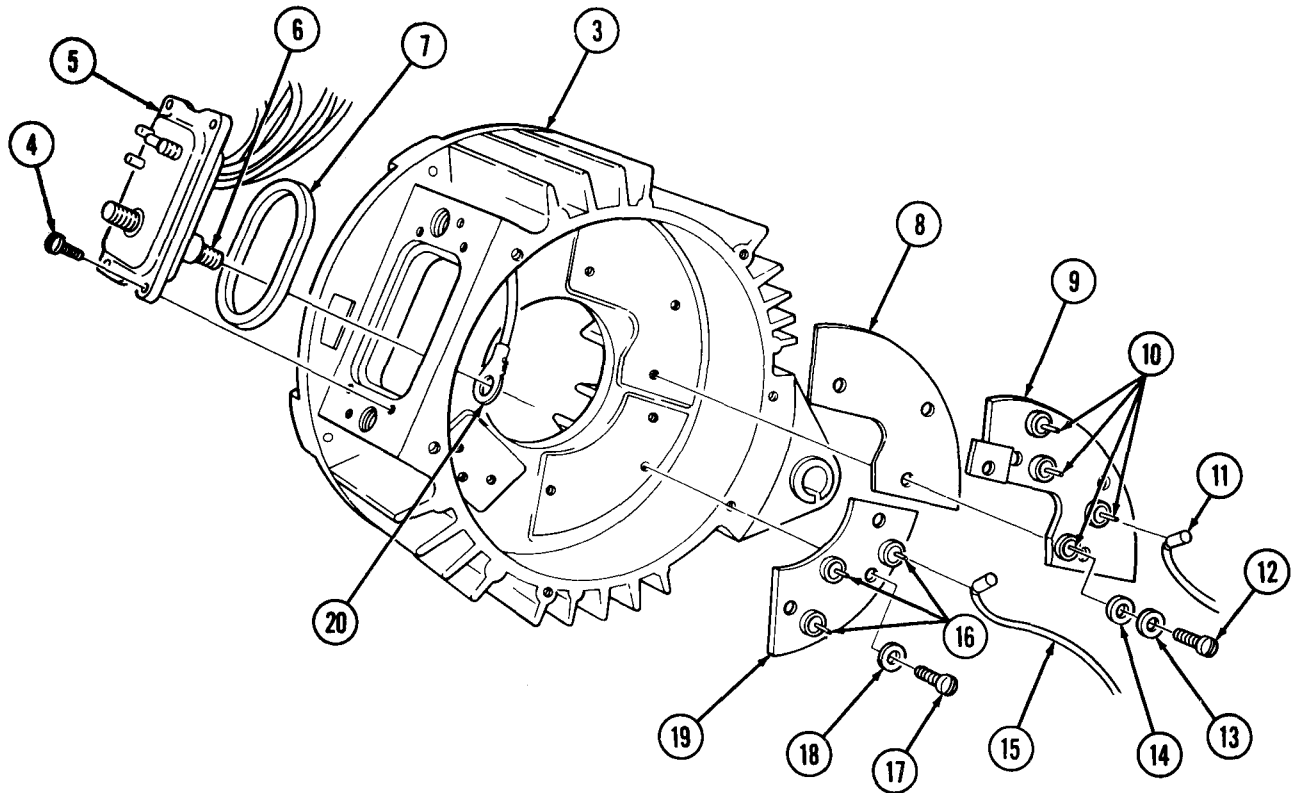
CAUTION

Use heat sink when desoldering leads. Failure to do so may result in damage to equipment.

- 20. Desolder and disconnect three negative rectifier leads (15) from three negative rectifier terminals (16).
- 21. Remove two screws (17), washers (18), and negative rectifier plate (19) from end housing (3).
- 22. Remove four screws (4), output plate (5), O-ring (7), six positive rectifier leads (11), three negative rectifier leads (15), and leads (2) from end housing (3). Discard O-ring (7).
- 23. Scribe locating marks (24) on intermediate housing (23), stator (22), and drive end housing (21).

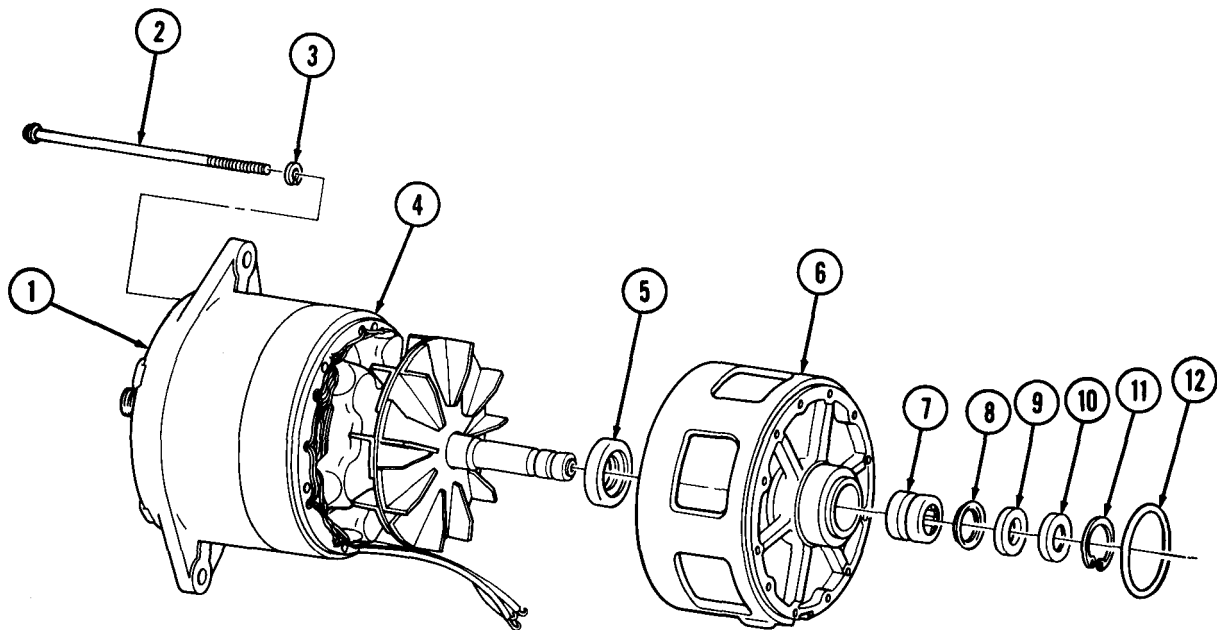


7-2. 60 AMPERE ALTERNATOR REPAIR (Contd)

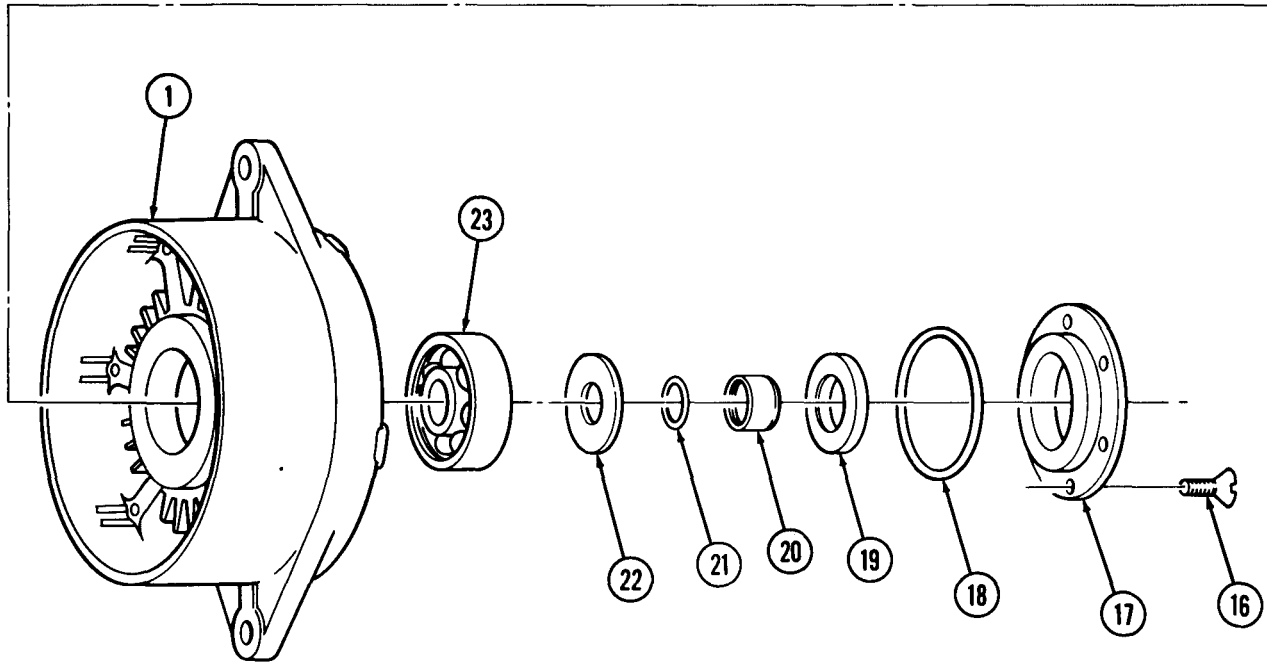
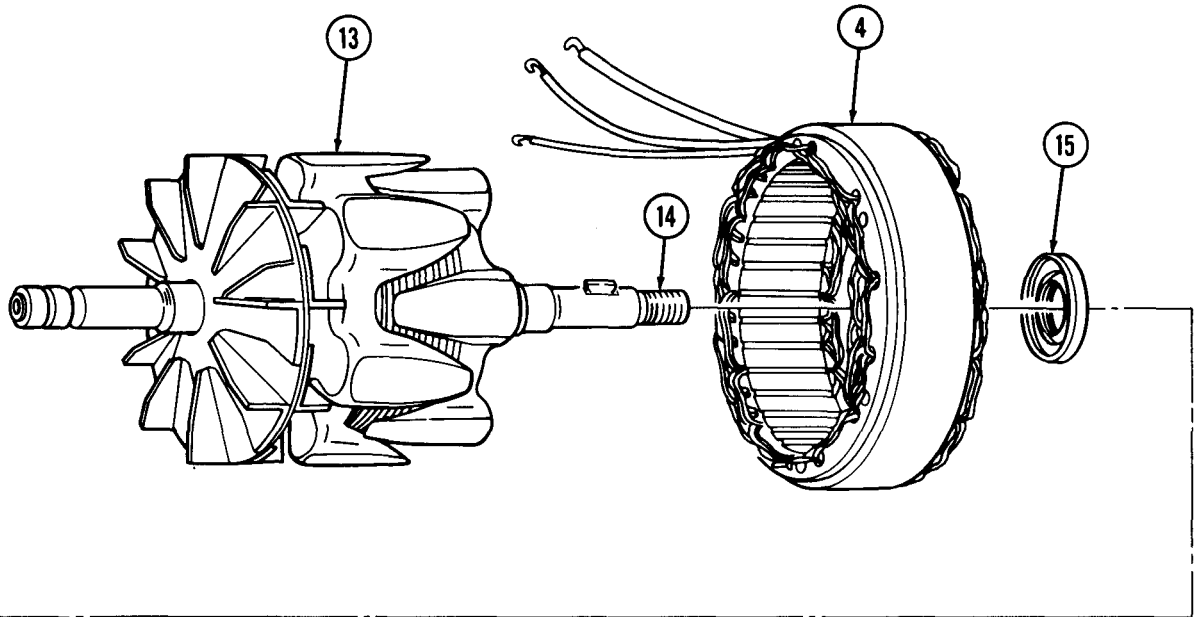


7-2. 60 AMPERE ALTERNATOR REPAIR (Contd)

24. Remove O-ring (12) from intermediate housing (6). Discard O-ring (12).
25. Using torx socket, remove six torx head screws (2), lockwashers (3), and intermediate housing (6) from stator (4) and drive end housing (1). Discard lockwashers (3).
26. Remove snapping (11), felt retainer (10), felt seal (9), and felt retainer (8) from intermediate housing (6). Discard snapping (11), felt retainers (10) and (8), and felt seal (9).
27. Remove seal (5) from intermediate housing (6). Discard seal (5).
28. Press bearing (7) out of intermediate housing (6). Discard bearing (7).
29. Remove six screws (16), bearing retainer (17), and O-ring (18). Discard O-ring (18).
30. Remove sleeve spacer seal (19) from bearing retainer (17). Discard sleeve spacer seal (19).
31. Remove sleeve spacer (20), O-ring (21), and washer (22) from rotor shaft (14). Discard O-ring (21).
32. Position drive end housing (1) in press and press rotor and fan assembly (13) out of drive end housing (1).
33. Remove stator (4) from drive end housing (1).
34. Remove bearing (23) and seal (15) from drive end housing (1). Discard seal (15) and bearing (23).



7-2. 60 AMPERE ALTERNATOR REPAIR (Contd)



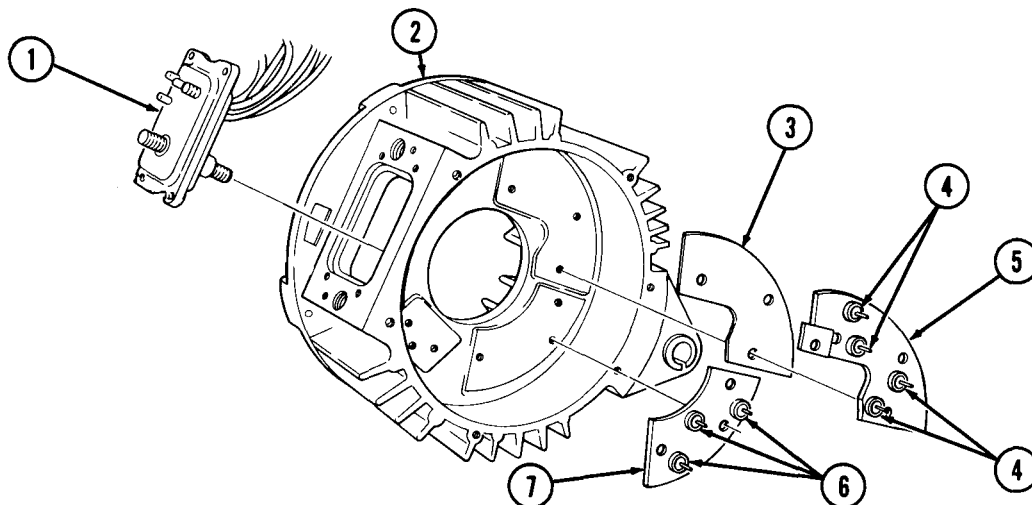
7-2. 60 AMPERE ALTERNATOR REPAIR (Contd)

b. Cleaning

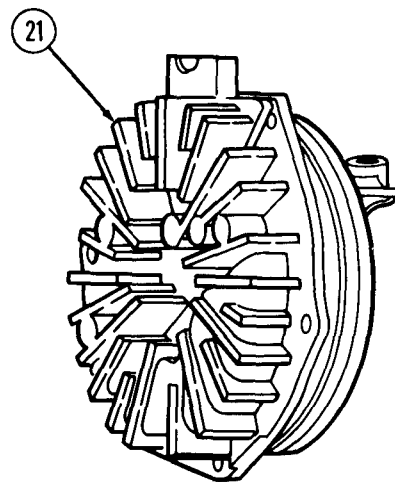
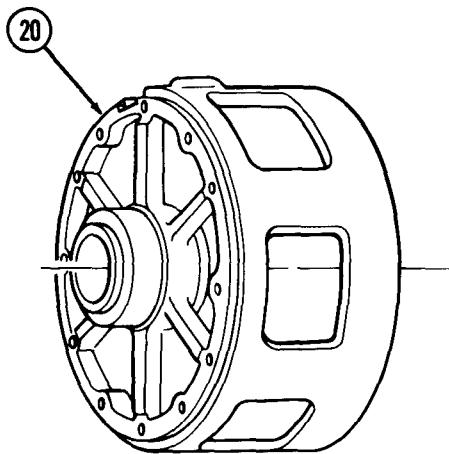
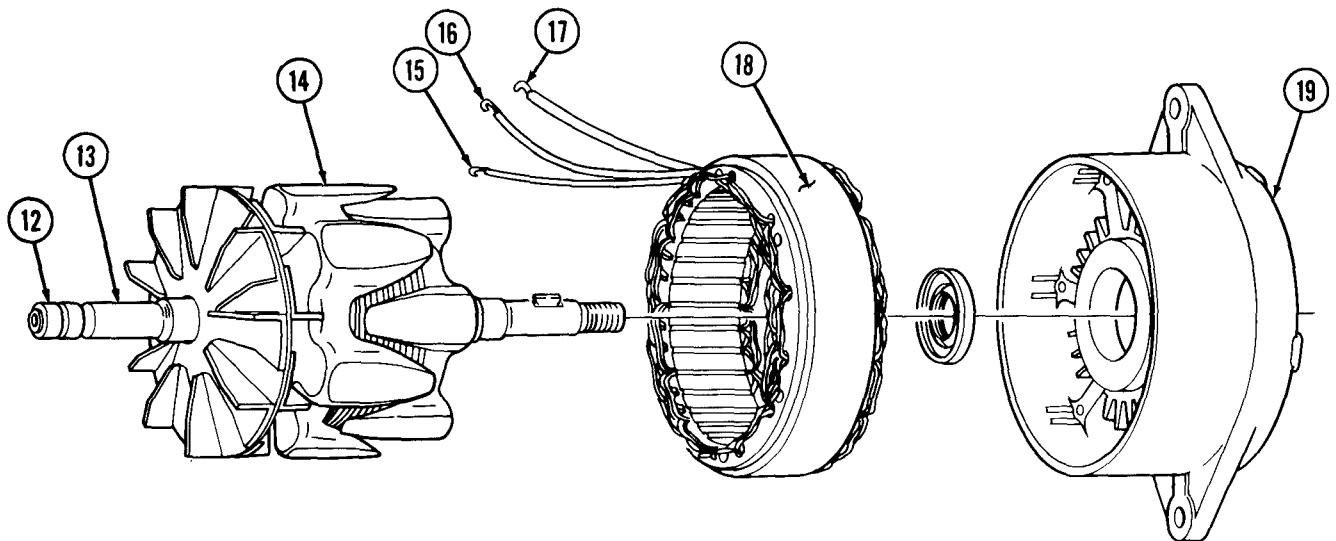
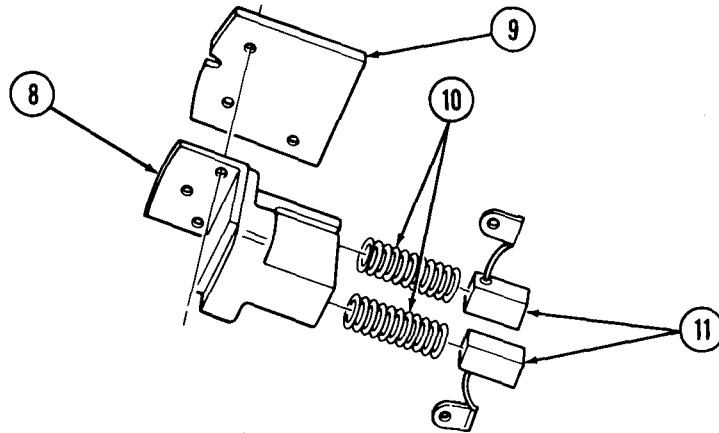
For general cleaning instructions, refer to para. 2-8.

c. Inspection

1. For general inspection instructions, refer to para. 2-9.
2. Inspect end housing (2) for cracks, breaks, and stripped threads. Replace end housing (2) if defective.
3. Check brushes (11) for roughness, galling, and wear. Replace brushes (11) if rough, worn, or brush length is less than 0.250 in. (6.35 mm).
4. Check brush holder (8), brush holder insulator (9), and positive rectifier insulator (3) for cracks and breaks. Replace brush holder (8), brush holder insulator (9), or positive rectifier insulator (3) if cracked or broken.
5. Check brush springs (10) for damage. Replace brush springs (10) if damaged.
6. Check output plate (1) for burned, frayed, or broken wiring. Replace output plate (1) if defective.
7. Check rectifier terminals (4) and (6) in rectifier plates (5) and (7) for continuity in one direction and infinite resistance in opposite direction. Replace rectifier terminals (4) or (6) if defective. Check for shorts from rectifier terminals (4) and (6) to rectifier plates (5) and (7). Replace rectifier plate (5) or (7) if defective.
8. Check stator (18) for grounds. Touch multimeter negative probe to stator (18) and positive probe to the following stator leads: (a) lead (15), (b) lead (16), and (c) lead (17). If continuity is present in any check, stator (18) is grounded; replace alternator.
9. Check stator (18) for open circuits. Touch multimeter probes to the following stator leads: (a) leads (15) and (16), (b) leads (16) and (17), and (c) leads (15) and (17). If continuity is NOT present in any check, replace alternator.
10. Check rotor (14) for grounds. Touch multimeter probe to rotor shaft (13) and other probe to slipring (12). If ohmmeter does not read over 10,000 ohms, replace alternator.
11. Inspect rotor (14) bearing surfaces (TM 9-214). If bearing is defective, replace.
12. Inspect intermediate housing (20) for cracks, breaks, and stripped threads. Replace alternator if cracked, broken, or threads are stripped.
13. Inspect drive end housing (19) for cracks and breaks. Replace alternator if housing (19) is cracked or broken.
14. Replace end cover (21) if all components pass testing and problem remains.



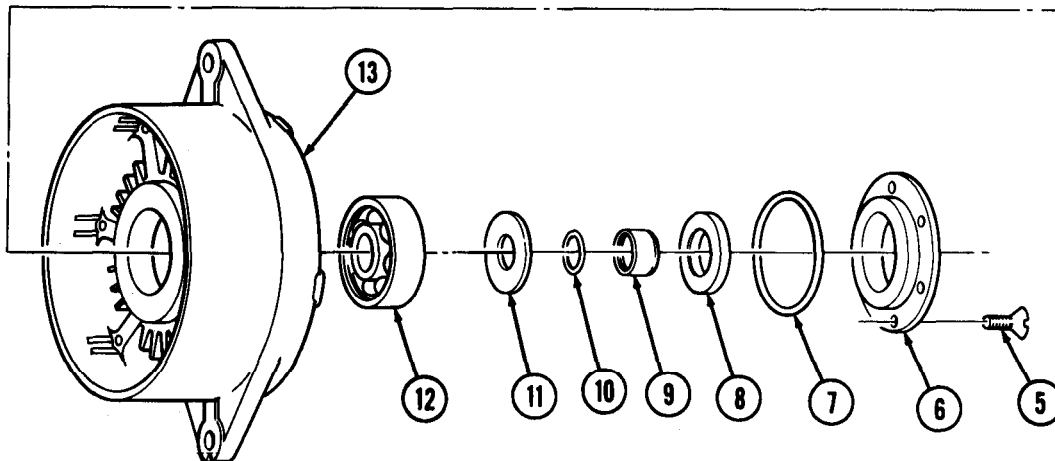
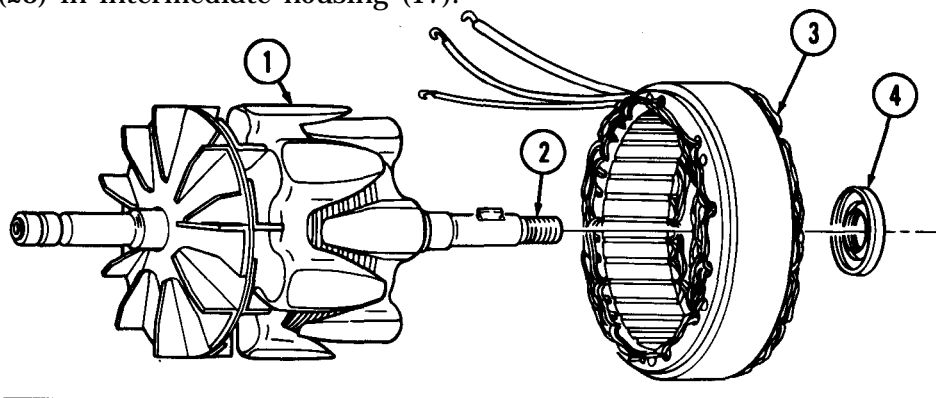
7-2 .60 AMPERE ALTERNATOR REPAIR (Ccntd)



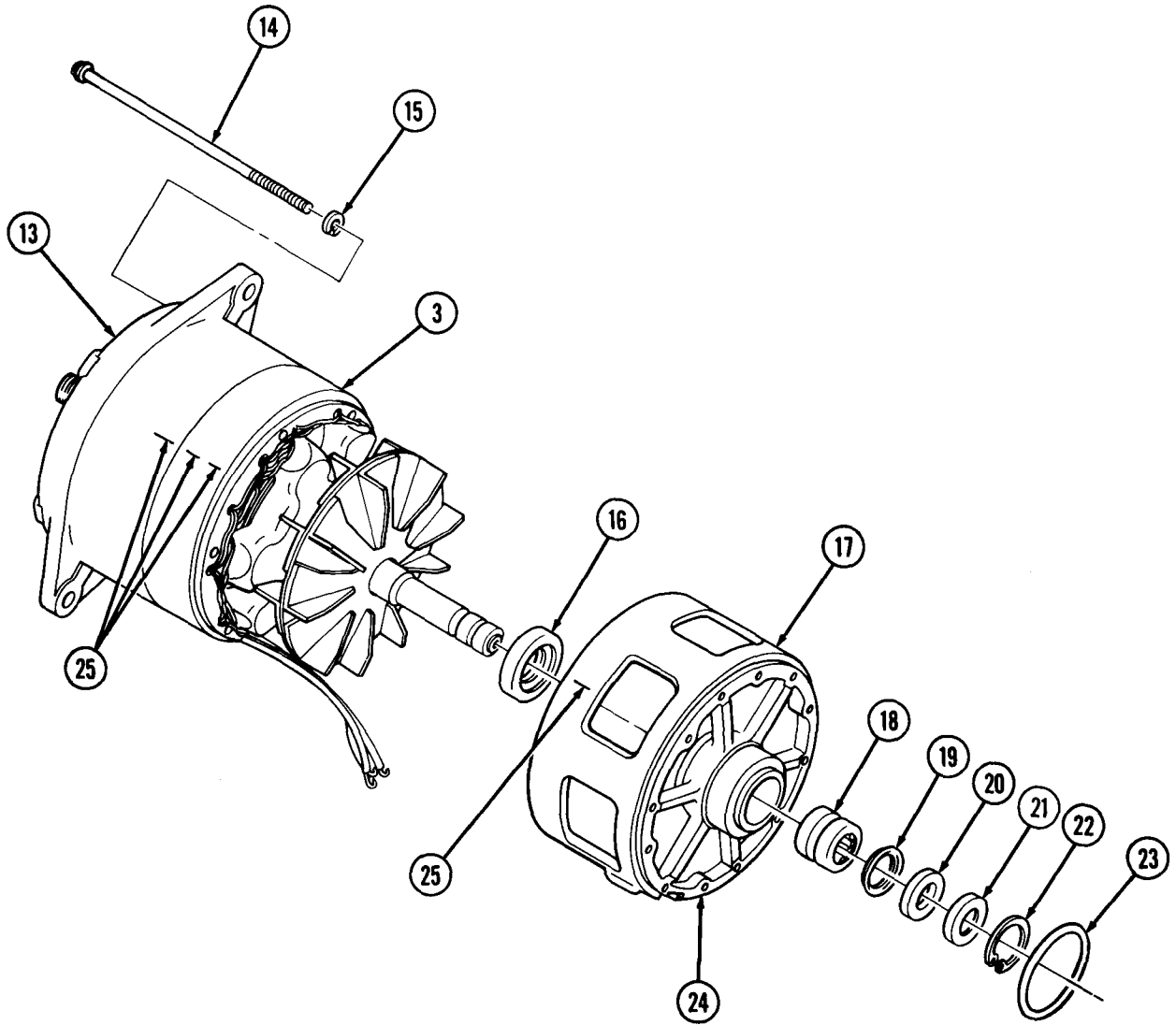
7-2. 60 AMPERE ALTERNATOR REPAIR (Contd)

d. Assembly

1. Install new bearing (12) and new seal (4) into drive end housing (13). Apply thin film of grease to lip of new seal (4).
2. Aline locating scribe marks (25) and install stator (3) into drive end housing (13).
3. Press rotor and fan assembly (1) into new bearing (12) inside of stator (3) and drive end housing (13).
4. Install washer (11), new O-ring (10), and sleeve spacer (9) on rotor shaft (2).
5. Install new sleeve spacer seal (8) and new O-ring (7) on bearing retainer (6). Apply thin film of grease to lip of new spacer seal (8).
6. Install bearing retainer (6) on drive end housing (13) with six screws (5).
7. Press new bearing (18) into intermediate housing (17).
8. Install new seal (16) into intermediate housing (17).
9. Install new felt retainer (19) into intermediate housing (17).
10. Saturate new felt seal (20) with lubricating oil and install into intermediate housing (17).
11. Install new felt retainer (21) into intermediate housing (17) with new snapping (22).
12. Aline locating scribe marks (25) on drive end housing (13), stator (3), and intermediate housing (17).
13. Insert stator (3) wires through holes (24) in intermediate housing (17).
14. Install intermediate housing (17) on stator (3) and drive end housing (13) with six new lockwashers (15) and torx head screws (14).
15. Install new O-ring (23) in intermediate housing (17).



7-2. 60 AMPERE ALTERNATOR REPAIR (Contd)



7-2. 60 AMPERE ALTERNATOR REPAIR (Contd)

16. Install new O-ring (4), three negative rectifier leads (13), six positive rectifier leads (9), three leads (20), and output plate (2) into end housing (5) with four screws (1).
17. Apply silicone compound to negative rectifier plate (17).
18. Install negative rectifier plate (17) on end housing (5) with two washers (16) and screws (15).

CAUTION

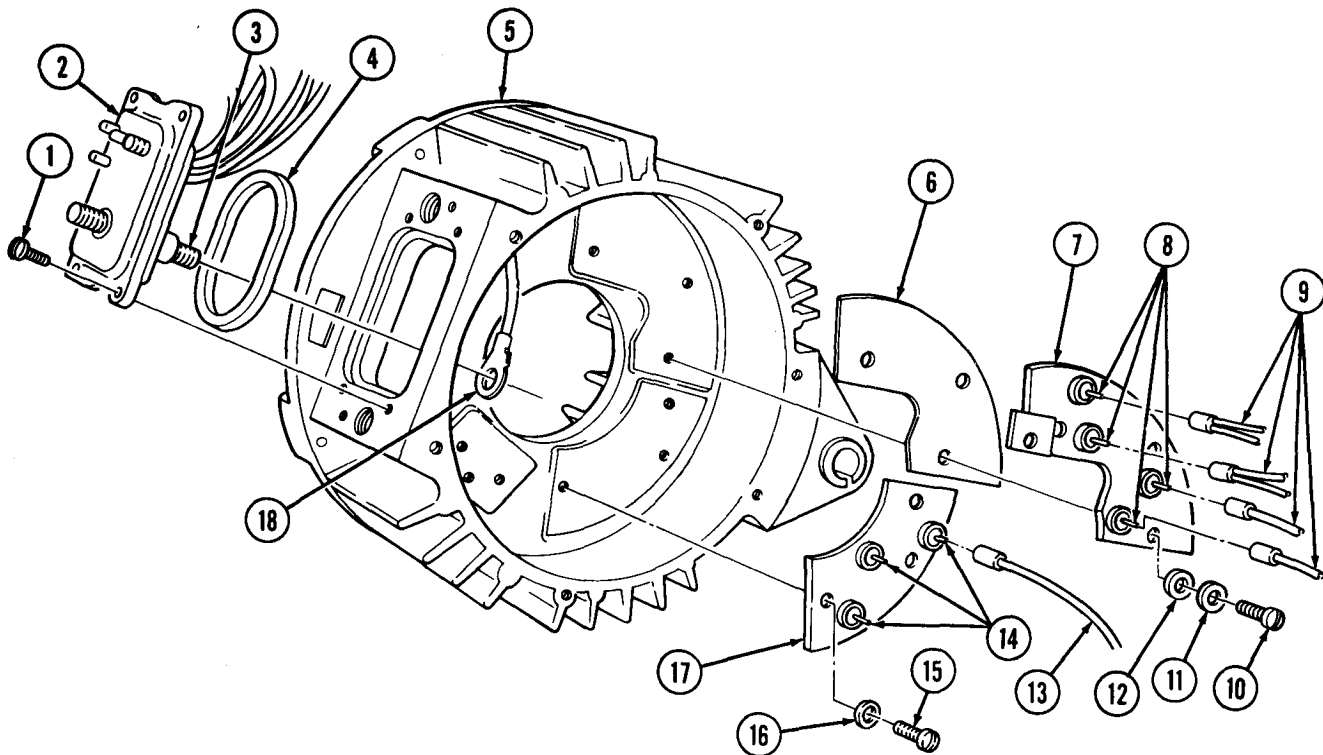
- Do not overheat rectifier leads when soldering to rectifier terminals. Damage to rectifiers may result.
- Use heat sink when soldering. Failure to do so may result in damage to equipment.

19. Connect and solder three negative rectifier leads (13) to three negative rectifier terminals (14).
20. Apply silicone compound to insulator (6) and positive rectifier plate (7).
21. Install insulator (6) and positive rectifier plate (7) on end housing (5) with three nylon washers (12), washers (11), and screws (10).

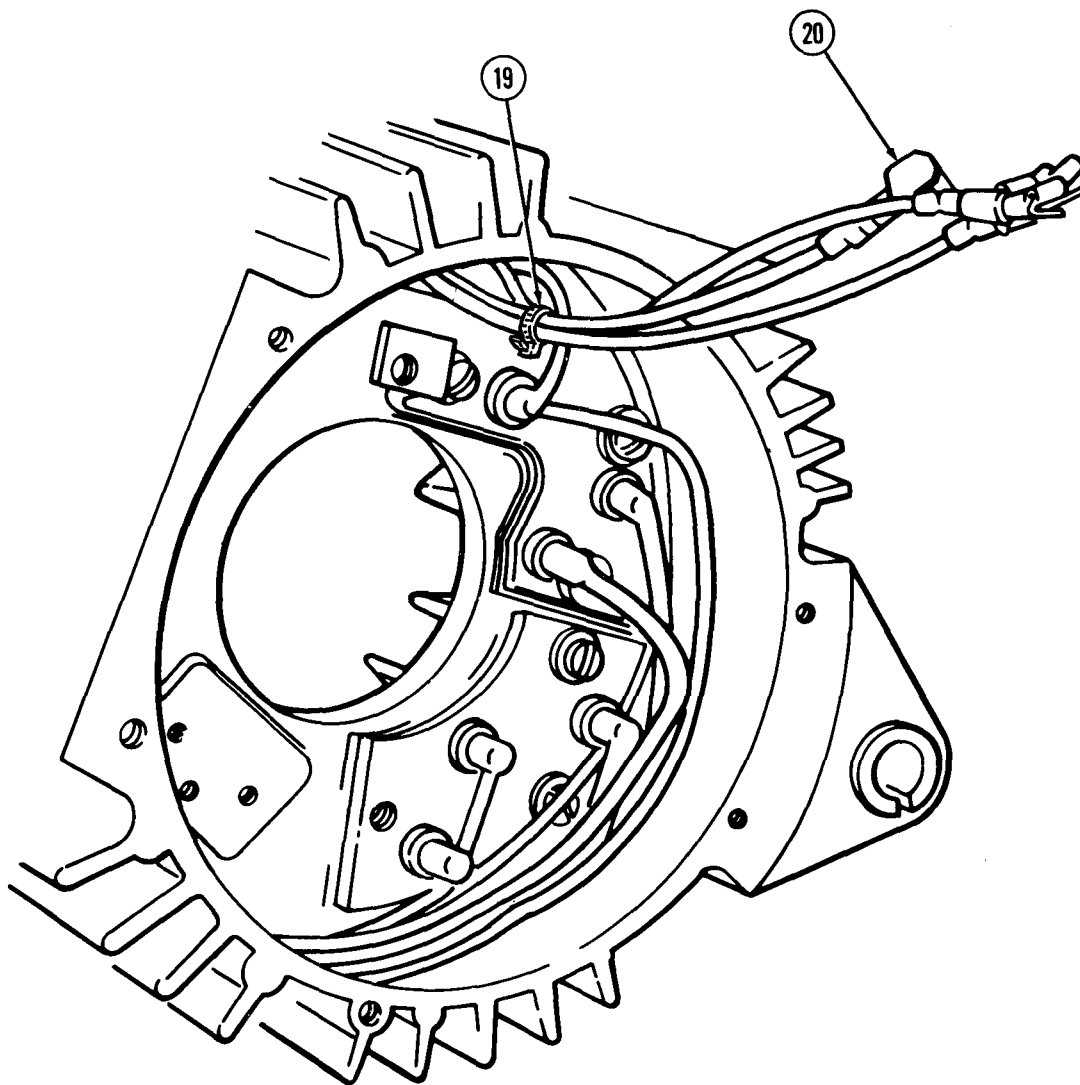
CAUTION

- Do not overheat rectifier leads when soldering to rectifier terminals. Damage to rectifiers may result.
- Use heat sink when soldering. Failure to do so may result in damage to equipment.

22. Connect and solder six positive rectifier leads (9) to four positive rectifier terminals (8).
23. Apply insulating compound to three rectifier terminals (14) and four rectifier terminals (8).
24. Connect lead (18) to output plate stud (3).
25. Install new tiedown strap (19) to four leads (20).

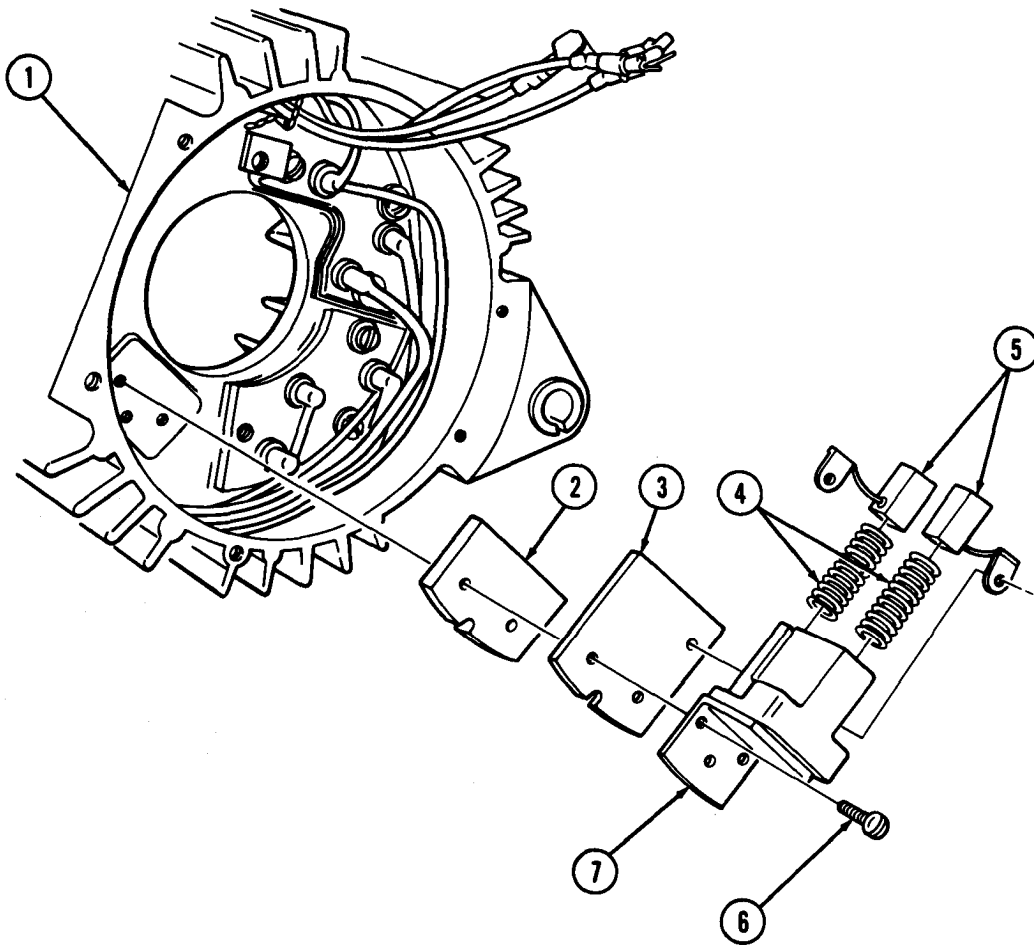


7-2. 60 AMPERE ALTERNATOR REPAIR (Contd)

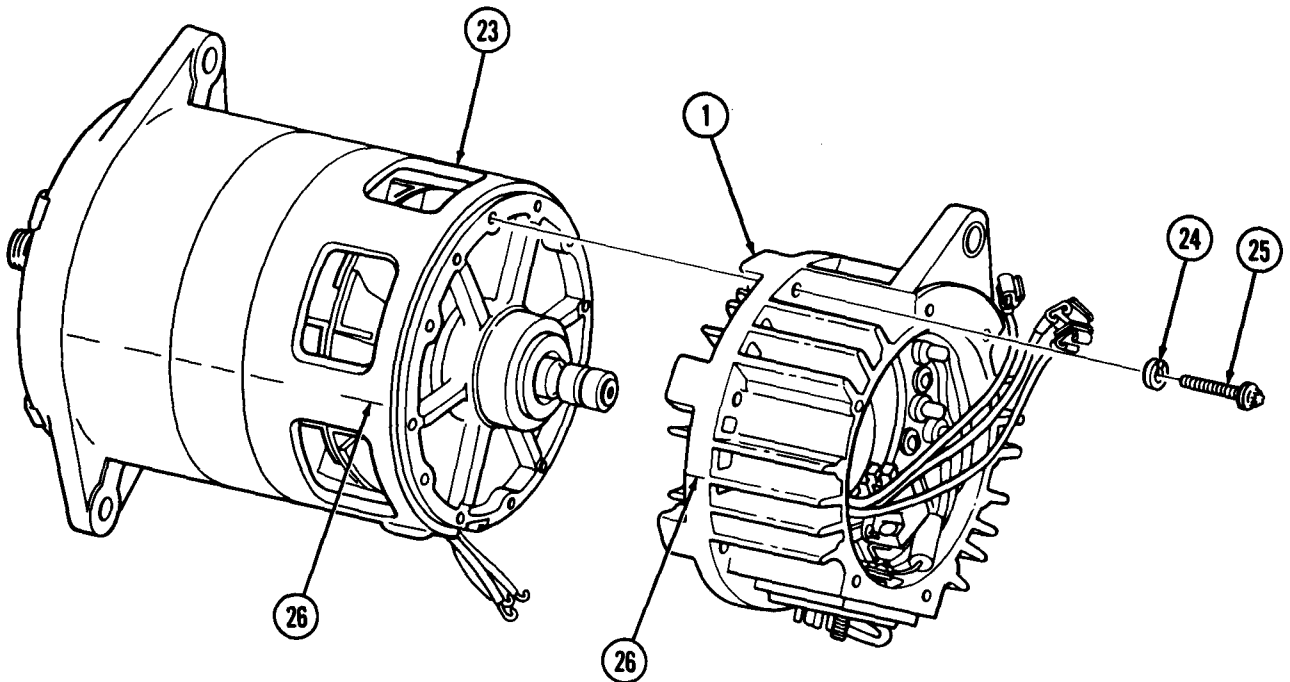
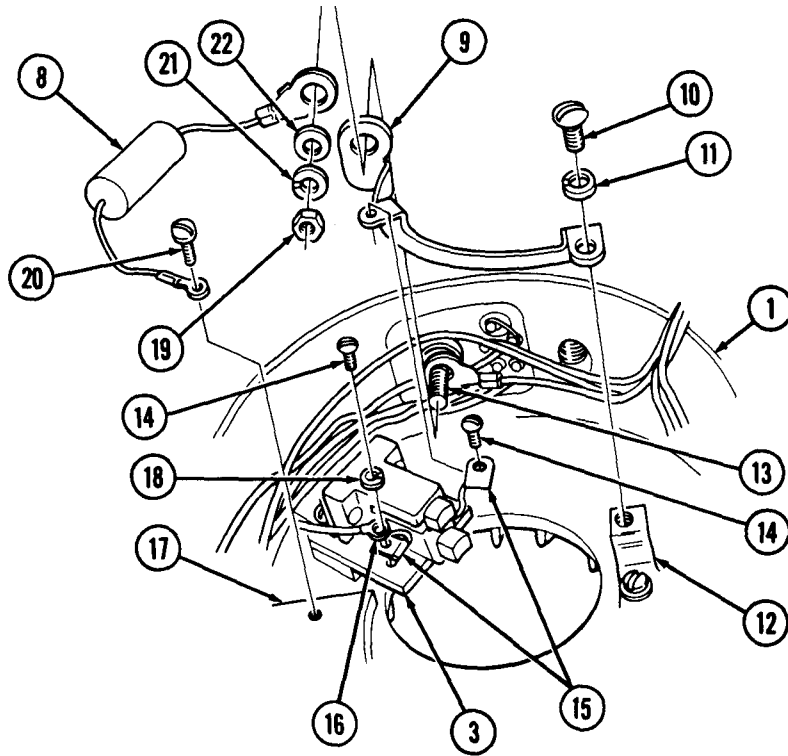


7-2. 60 AMPERE ALTERNATOR REPAIR (Contd)

26. Install shim (2), insulator (3), and brush holder (7) on end housing (1) with three screws (6).
27. Position positive output strap (9) on output plate stud (13) and install on positive rectifier plate (12) with new lockwasher (11) and screw (10).
28. Install two springs (4) into brush holder (7).
29. Install two brush leads (15) and lead (16) on insulator (3) and output strap (9) with new lockwasher (18) and two screws (14).
30. Install capacitor (8) on output plate stud (13) and negative rectifier plate (17) with washer (22), new lockwasher (21), nut (19), and screw (20).
31. Position capacitor (8) on end housing (1) with insulating compound.
32. Install brushes (5) in brush holder (7) against springs (4). Hold in position.
33. Install end housing (1) on intermediate housing (23) with six new lockwashers (24) and torx head screws (25).
34. Aline locating scribe marks (26) on intermediate housing (23) and end housing (1).



7-2. 60 AMPERE ALTERNATOR REPAIR (Contd)

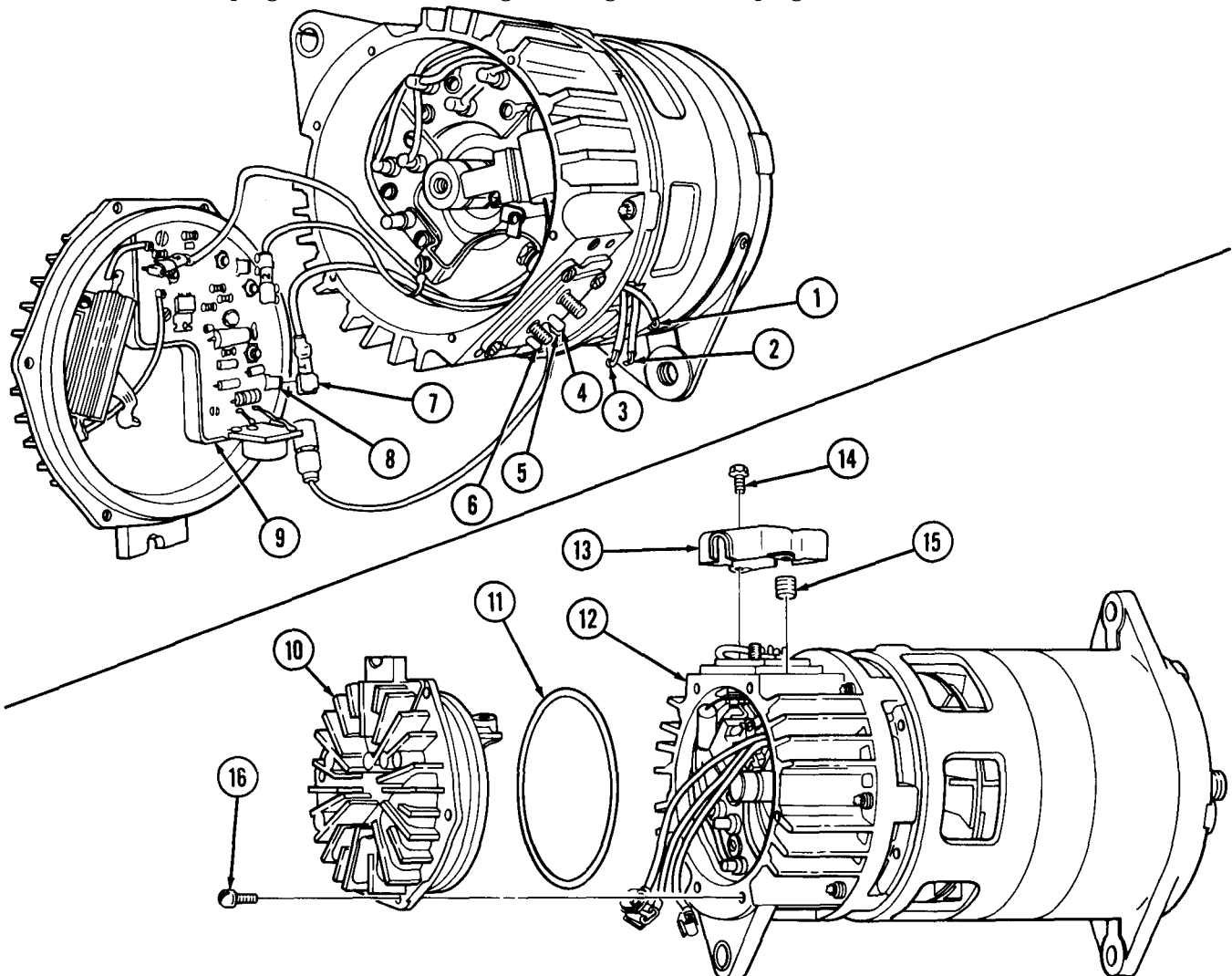


7-2. 60 AMPERE ALTERNATOR REPAIR(Contd)

CAUTION

- Do not overheat stator leads when soldering to stator terminals.
Damage to stator may result.
- Use heat sink when soldering. Failure to do so may result in
damage to equipment.

35. Connect and solder stator leads (1), (2), and (3) to stator terminals (4), (5), and (6).
36. Seal leads (1), (2), and (3) to terminals (4), (5), and (6) with adhesive sealant.
37. Install output plate cover (13) on end housing (12) with two new screw-assembled lockwashers (14).
38. Install new O-ring (11) on end housing (12).
39. Connect three leads (7) to three terminals (8) on regulator (9).
40. Install end cover (10) on end housing (12) with six screws (16).
41. Install access plug (15) on end housing (12). Tighten access plug (15) 24-36 lb-in. (3-4 N.m).



FOLLOW-ON TASKS: . Install alternator (TM 9-2320-361-20).
 . Adjust alternator (TM 9-2320-361-20).

7-3. FRONT WIRING HARNESS REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit

(Appendix B, Item 1)

Tool kit, electrical

(Appendix B, Item 2)

Torque wrench, 3/8-in. dr.

(Appendix B, Item 8)

MATERIALS/PARTS

Six lockwashers (Appendix F, Item 132)

Lockwasher (Appendix F, Item 124)

Six locknuts (Appendix F, Item 95)

Three locknuts (Appendix F, Item 89)

Two tiedown straps (Appendix C, Item 15)

Adhesive sealant (Appendix C, Item 2)

REFERENCES (TM)

TM 9-2320-361-20

TM 9-2320-361-34P

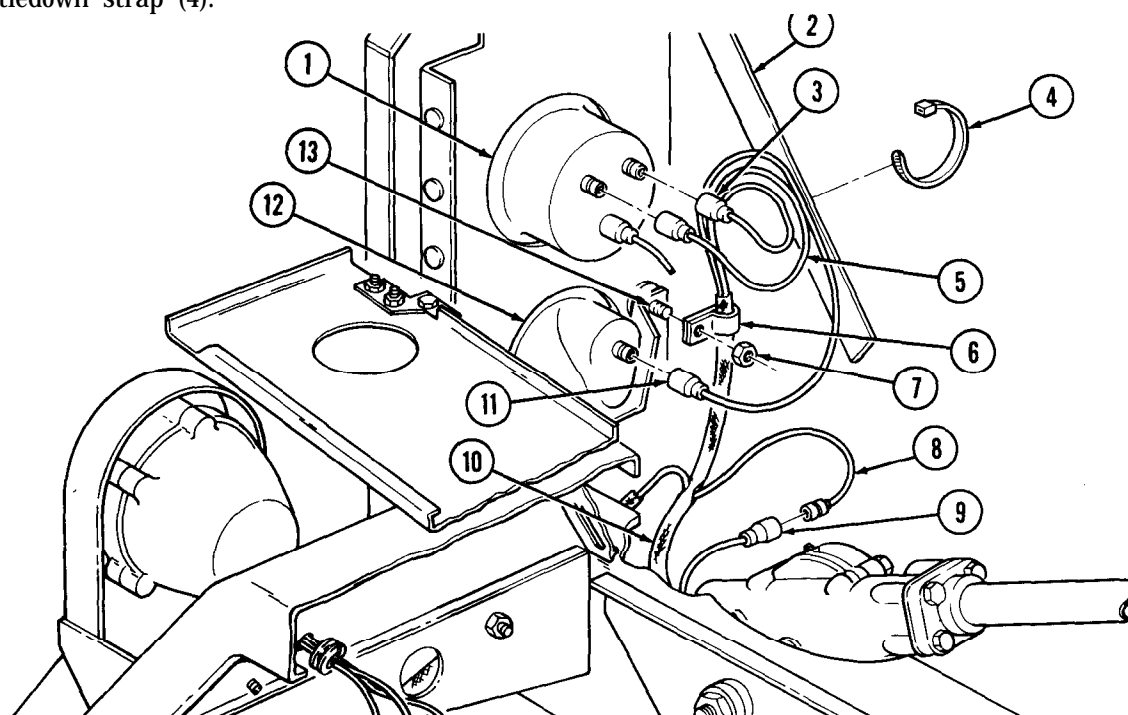
EQUIPMENT CONDITION

Accessory switch removed (TM 9-2320-361-20).

NOTE

Tag wires for installation.

1. Disconnect wire (9) from horn wire (8).
2. Disconnect wires (3) and (5) from left headlamp (1).
3. Disconnect wire (11) from blackout drive lamp (12).
4. Remove nut (7) and clamp (6) from front wiring harness (10) and stud (13).
5. Remove tiedown strap (4) from front wiring harness (10) and brush guard support (2). Discard tiedown strap (4).

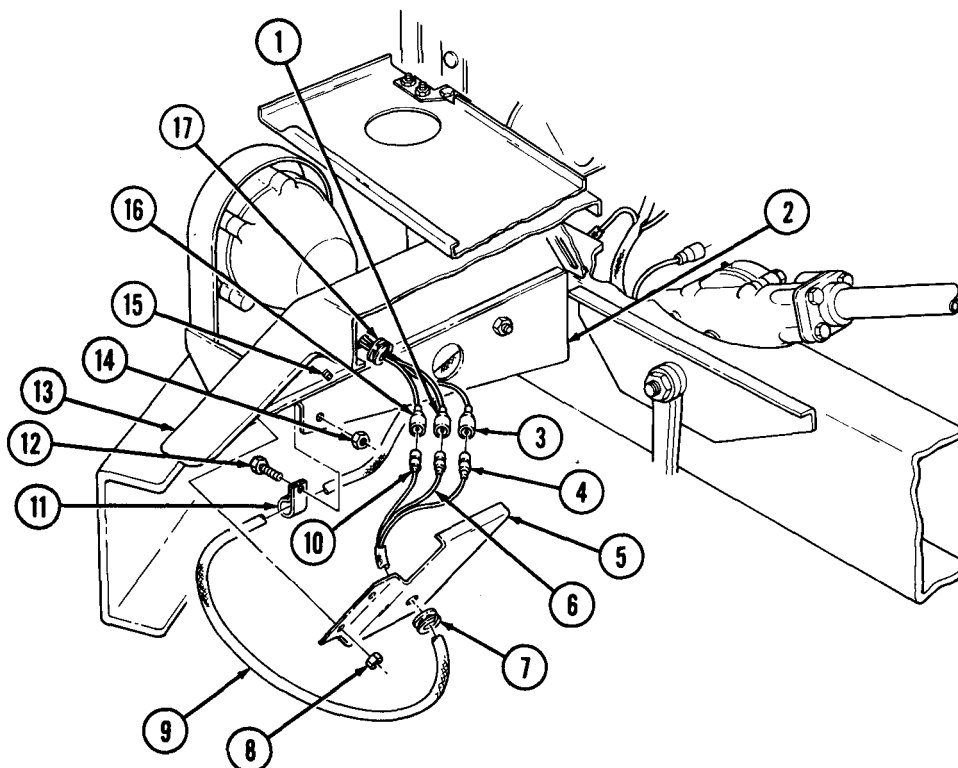


7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)

NOTE

Steps 6 through 9 cover the left side front composite lights.

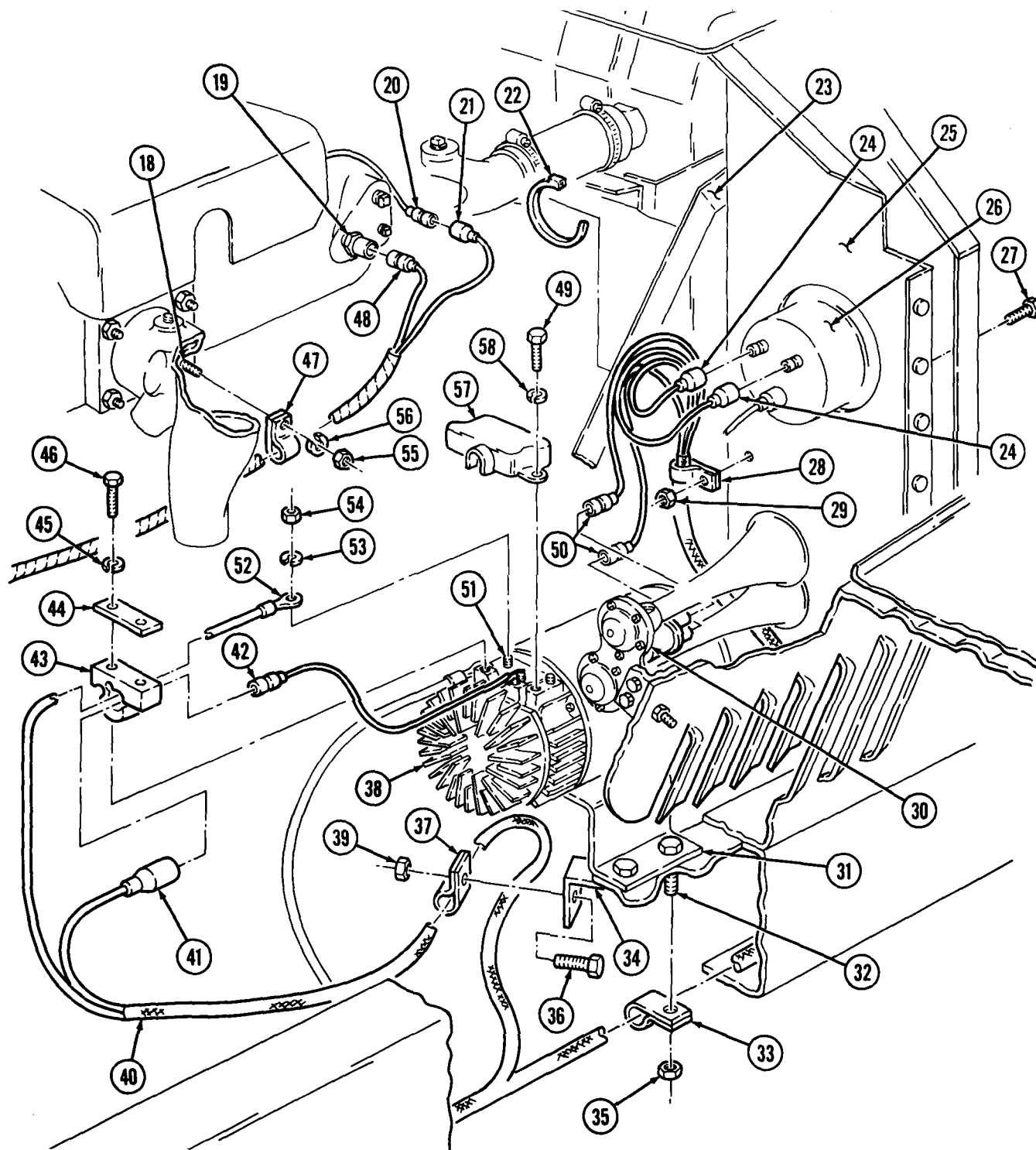
6. Remove four nuts (8) and plate (5) from four screws (15).
7. Disconnect wires (4), (6), and (10) from left composite light wires (3), (1), and (16) and remove plate (5) from wires (4), (6), and (10).
8. Remove grommet (7) from plate (5) and grommet (17) from fender (13).
9. Remove two nuts (14), screws (12), and clamps (11) from fender support (2) and front wiring harness (9).
10. Repeat steps 6 through 9 for right side front composite lights.



11. Remove two screws (49), lockwashers (58), and cover (57) from alternator (38).
12. Remove two screws (46), lockwashers (45), plate (44), and spacer (43) from alternator (34).
13. Disconnect wire (41) from alternator wire (42).
14. Remove sealant from nut (54).
15. Remove nut (54), lockwasher (53), and wire (52) from terminal (51).
16. Disconnect wire (48) from temperature sending unit (19).
17. Disconnect wire (21) from preheater wire (20).
18. Disconnect two wires (50) from horn (30).
19. Disconnect two wires (24) from right headlamp (30),
20. Remove tiedown strap (22) from front wiring harness (40) and brush guard support (23). Discard tiedown strap (22).

7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)

21. Remove four nuts (29), screws (27), and clamps (28) from front wiring harness (40), headlamp panel (25), and cable bracket (34).
22. Remove nut (55), lockwasher (56), and clamp (47) from stud (18) and front wiring harness (40). Discard lockwasher (56).



7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)

NOTE

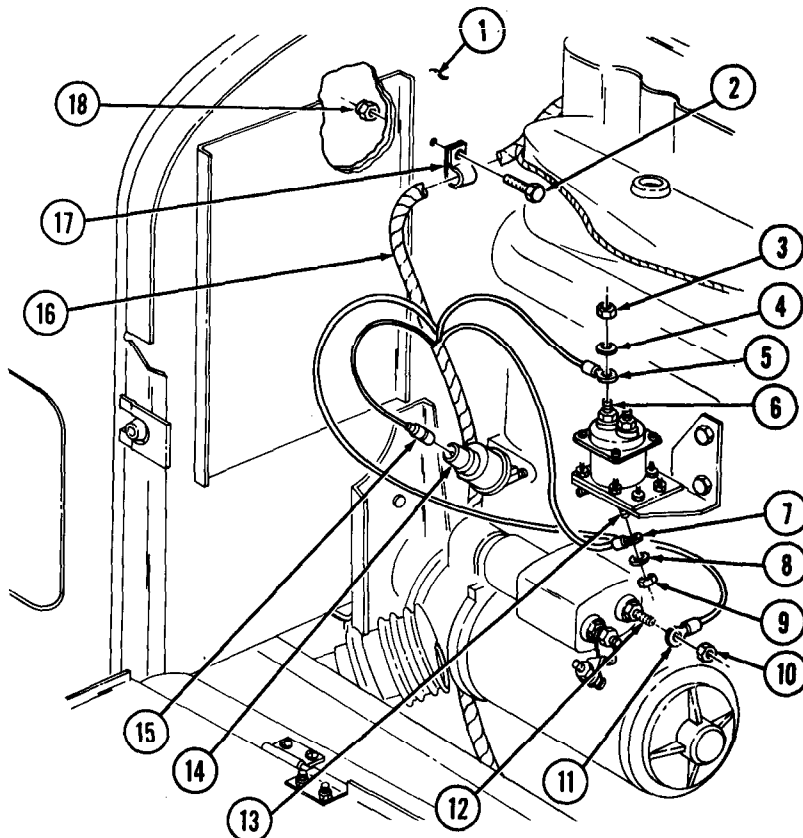
Perform step 23 for all vehicles except M756A2, M50A2, M50A3, M49A2C, and M49A2.

23. Remove nut (10) and wire (11) from starter terminal (12).
24. Remove nut (3), washer (4), and wire (5) from relay terminal (6).
25. Remove nut (9), washer (8), and wire (7) from relay terminal (13).
26. Disconnect wire (15) from oil pressure sending unit (14).

NOTE

Assistant will help with step 27.

27. Remove locknut (18), screw (2), and clamp (17) from firewall (1) and wiring harness (16). Discard locknut (18).



28. Remove nut (39), lockwasher (38), wire (37), screw (36), and lockwasher (35) from flasher unit (34). Discard lockwashers (38) and (35).
29. Remove plug (33) from flasher unit (34).

NOTE

Perform steps 30 and 31 for M275A2 vehicles.

30. Remove locknut (46), screw (48), and clamp (47) from firewall (1) and wiring harness (16). Discard locknut (46).
31. Disconnect wires (44) and (49) from auxiliary circuit breaker (45).
32. Disconnect wires (26) and (27) from circuit breaker (25).
33. Disconnect wires (30), (29), and (28) from beam selector switch (31).

7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)

NOTE

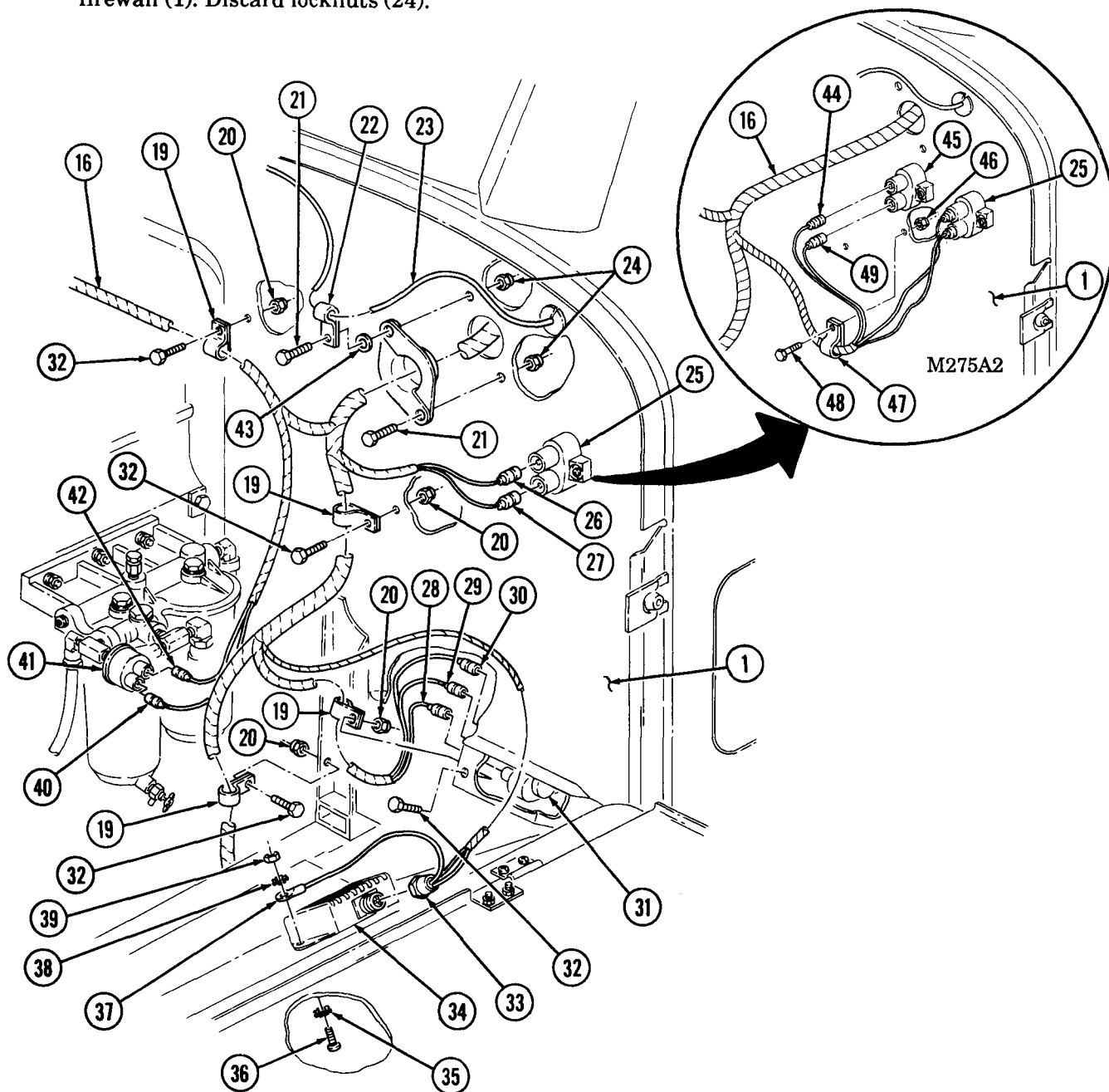
Perform step 34 if vehicle is equipped with fuel pressure switch.

34. Disconnect wires (40) and (42) from fuel pressure sending unit (41).

NOTE

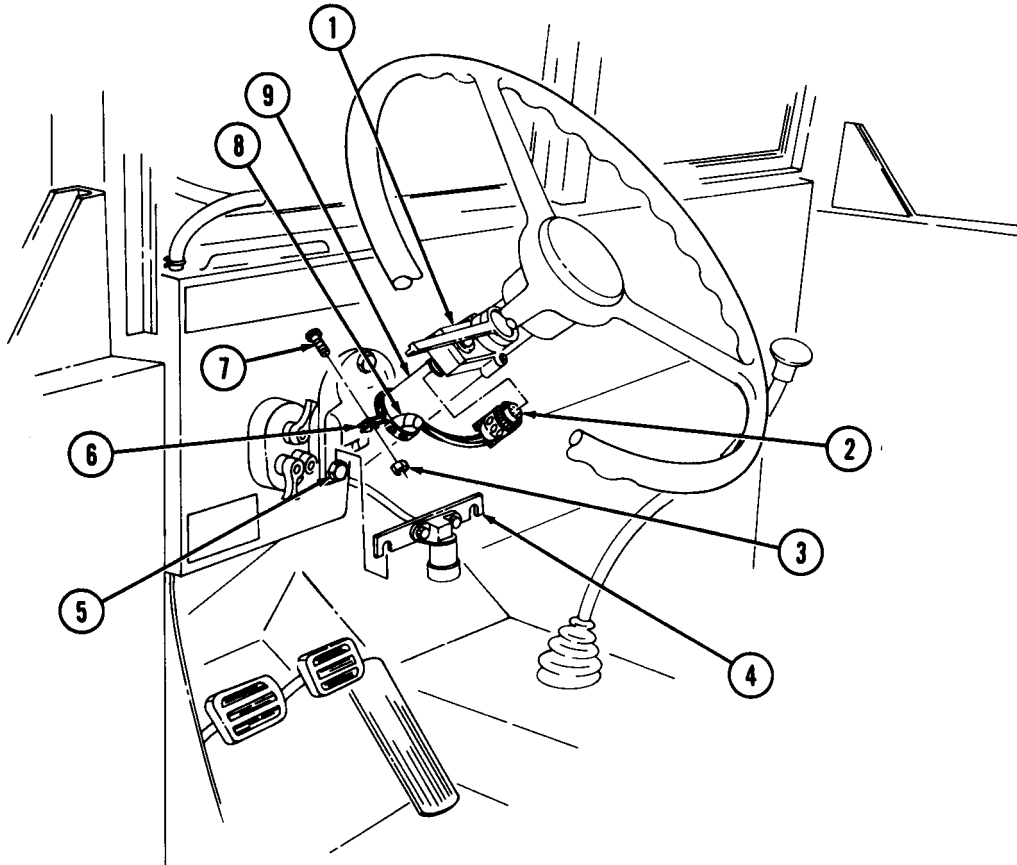
Assistant will help with steps 35 and 36.

35. Remove four locknuts (20), screws (32), and clamps (19) from front wiring harness (16) and firewall (1). Discard locknuts (20).
36. Remove two locknuts (24), screws (21), washer (43), clamp (22), and two clamp halves (23) from firewall (1). Discard locknuts (24).



7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)

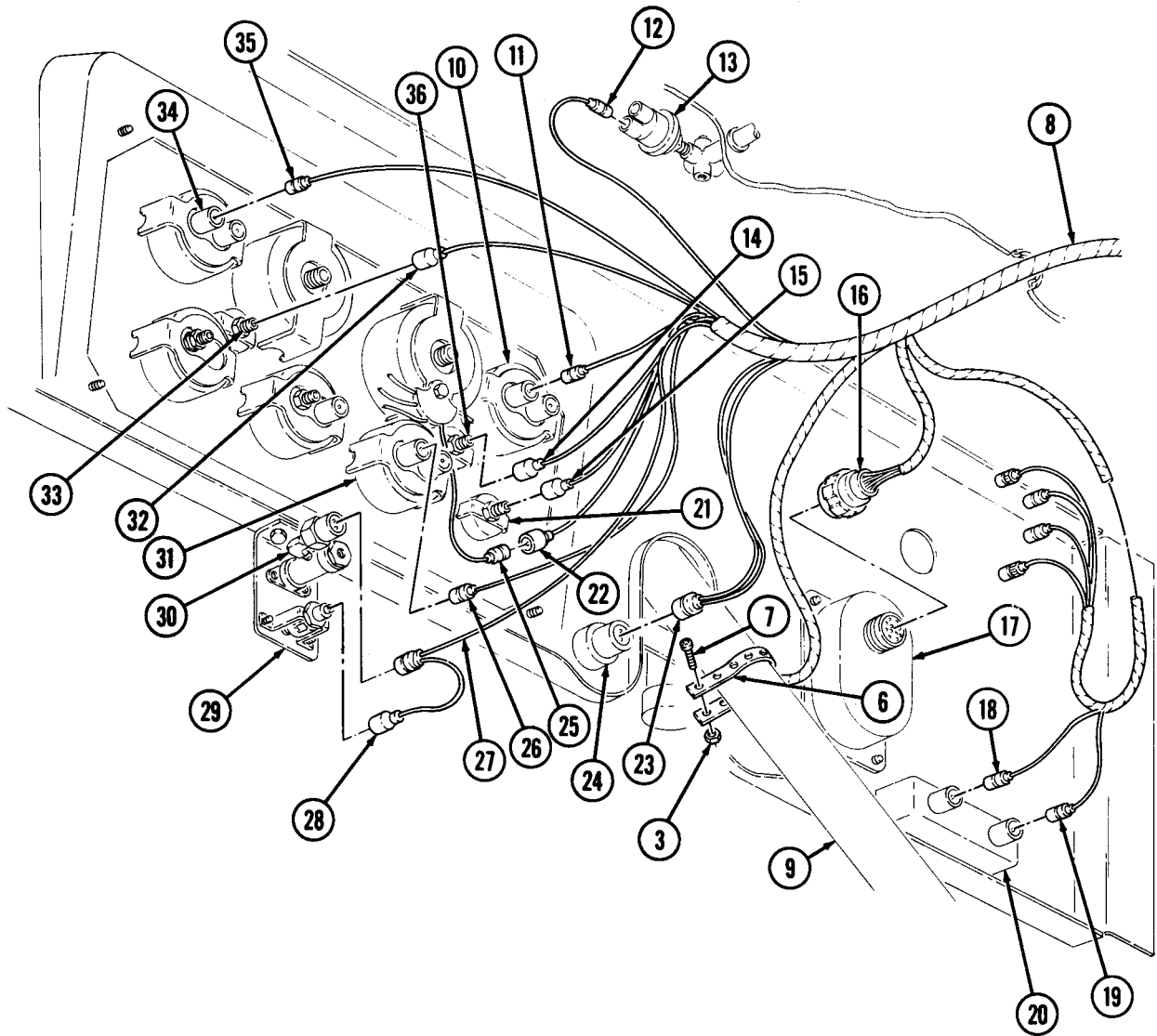
37. Loosen two screws (5) and position bracket (4) so that plug (2) may be removed.
38. Disconnect plug (2) from turn signal switch (1).
39. Remove nut (3), screw (7), and clamp (6) from steering column (9) and front wiring harness (8).



40. Disconnect wire (12) from low air buzzer switch (13).
41. Disconnect wires (27) and (28) from transfer switch (30) and lamp (29).
42. Disconnect wire (15) from high beam indicator lamp (21).
43. Disconnect wire (14) from panel lamp (36).
44. Disconnect wire (32) from panel lamp (33).
45. Disconnect wire (22) from wire (25).
46. Disconnect wire (35) from coolant temperature gage (34).
47. Disconnect wire (11) from fuel gage (10).
48. Disconnect wire (26) from oil gage (31).
49. Disconnect plug (23) from starter switch (24).

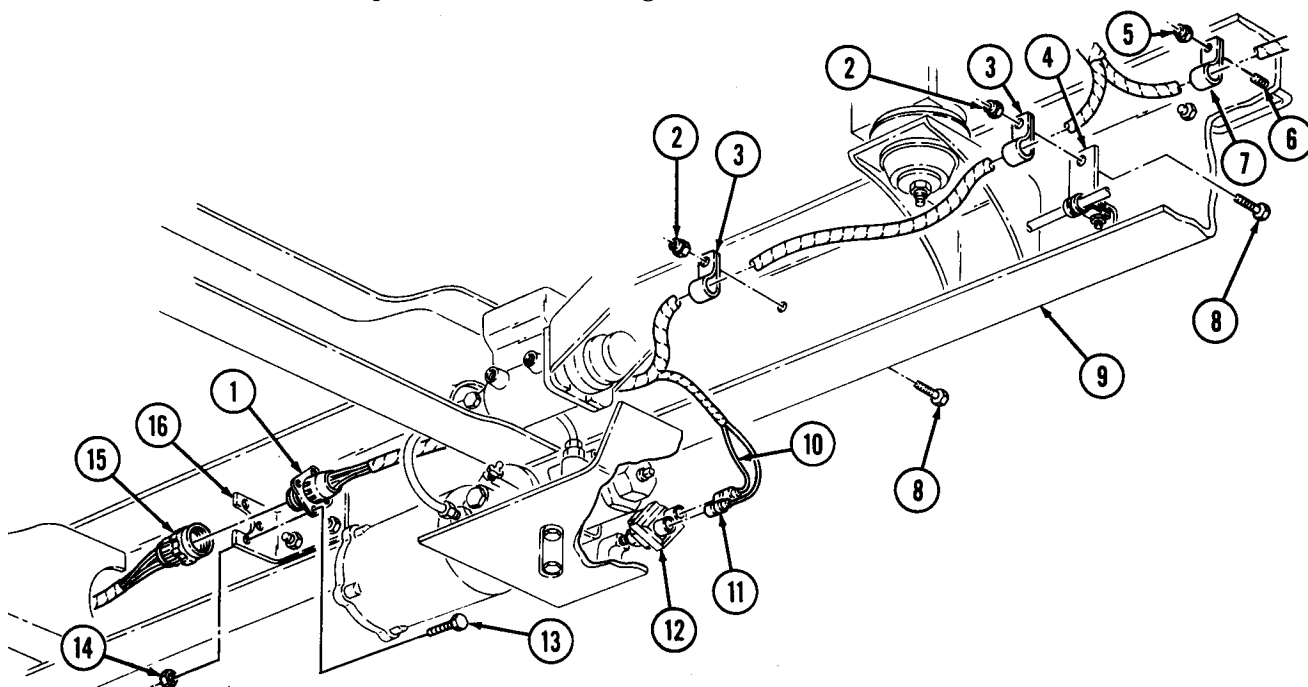
7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)

- 50. Disconnect wires (18) and (19) from preheater switch (20).
- 51. Disconnect plug (16) from lamp selector switch (17).



7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)

52. Disconnect wires (10) and (11) from stoplight switch (12).
53. Remove two nuts (14), screws (13), and front wiring harness (1) horn rear wiring harness (15) and brace (16).
54. Remove two locknuts (2), screws (8), and clamps (3) from brace (4), front wiring harness (1), and frame (9). Discard locknuts (2).
55. Remove nut (5) and clamp (7) from front wiring harness (1) and U-bolt (6).



CAUTION

- Prior to removal of wiring harness, ensure all clamps and disconnections have been performed. Failure to do so may result in damage to equipment.
- Use care when removing front wiring harness. Snagging and pulling may cause damage to harness.

56. Remove front wiring harness (1) from left side frame (17), right side frame (18), over steering column (19), and through firewall (21).

b. Installation

CAUTION

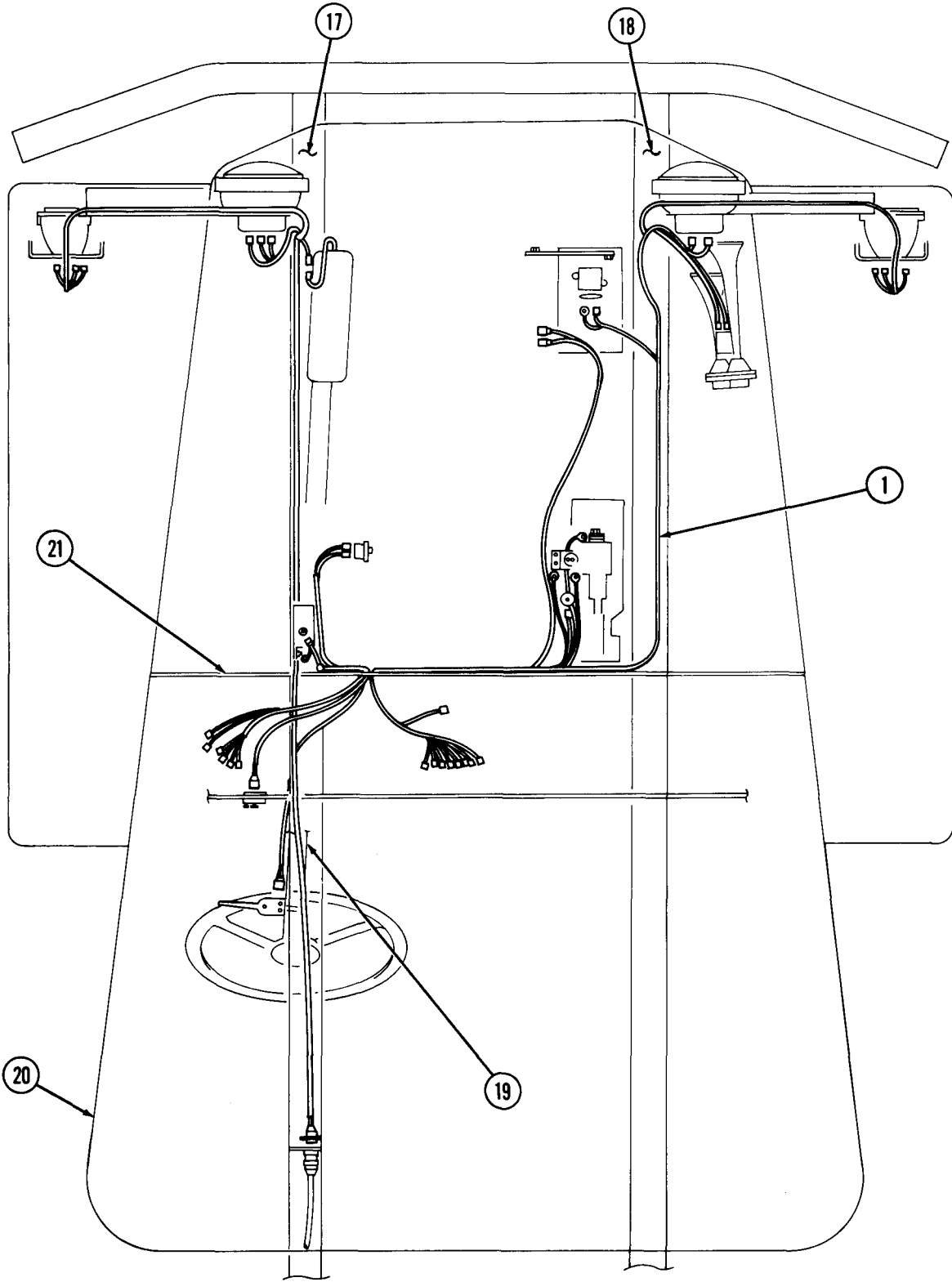
Use care when routing front wiring harness. Snagging and pulling may cause damage to front wiring harness.

NOTE

- If new wiring harness is to be installed, remove tags from old harness and install on new harness.
- For additional wiring harness installation information, refer to Electrical System Wiring Diagram (TM 9-2320-361-20).

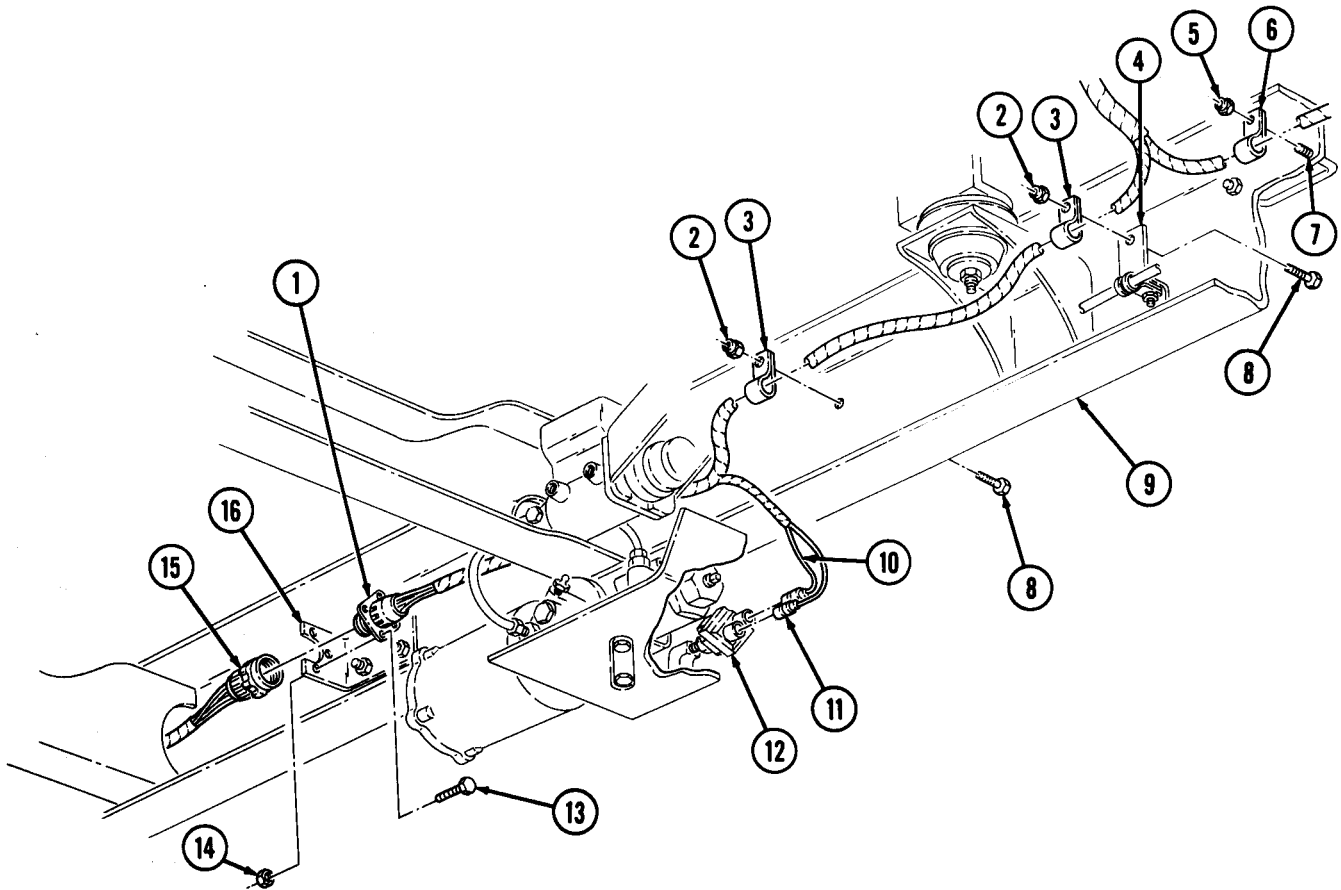
1. Install front wiring harness (1) through firewall (21), left side frame (17), and right side frame (18), over steering column (19), and under cab (20).

7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)



7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)

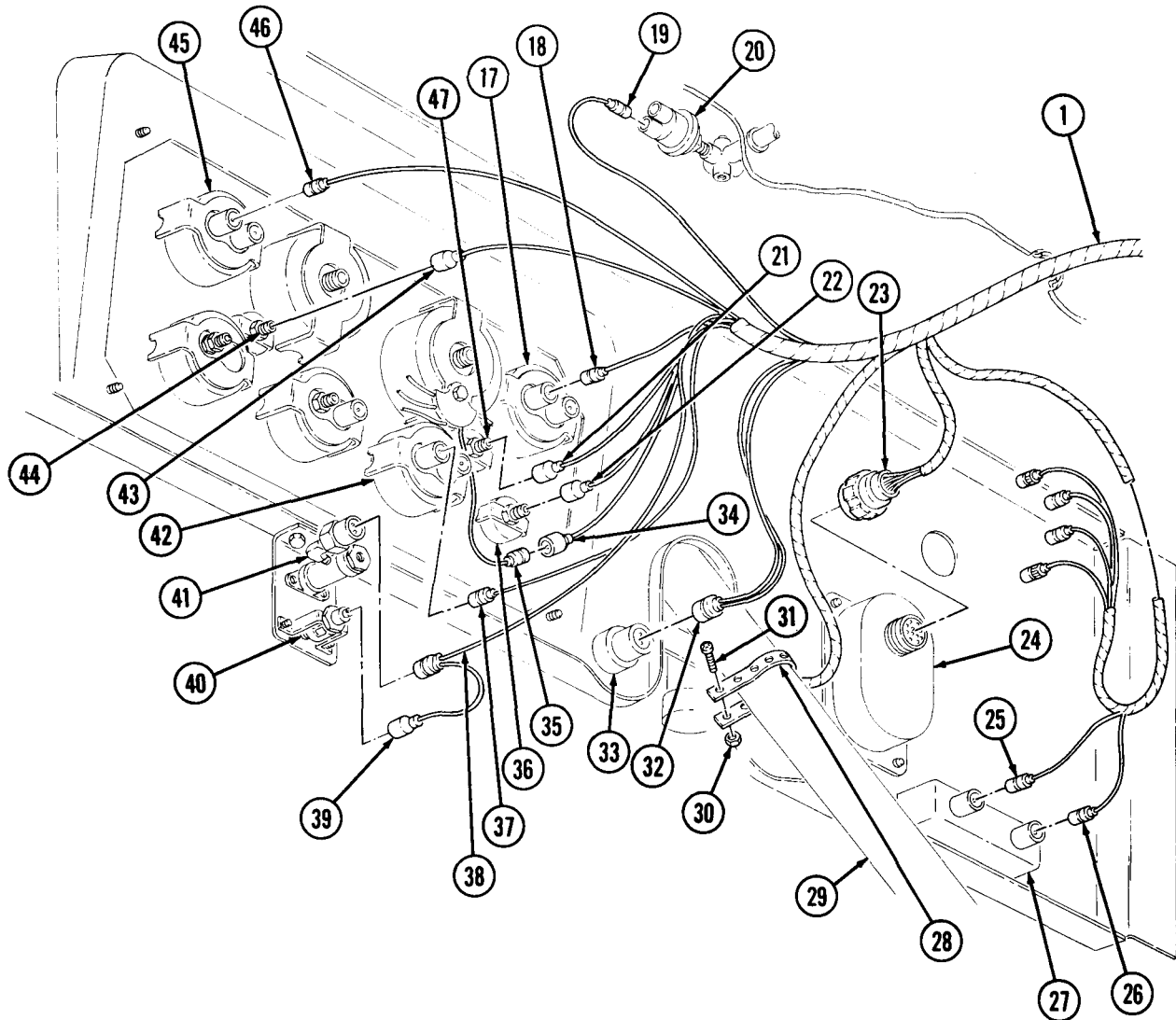
2. Connect front wiring harness (1) to rear wiring harness (15).
3. Install front wiring harness (1) on brace (16) with two screws (13) and new locknuts (14).
4. Connect wires (11) and (10) to stoplight switch (12).
5. Remove slack from front wiring harness (1).
6. Install two clamps (3) on front wiring harness (1), brace (4), and frame (9) with two screws (8) and new locknuts (2).
7. Install clamp (6) on front wiring harness (1) and U-bolt(7) with nut(5).



8. Install clamp (28) on steering column (29) and front wiring harness (1) with screw (31) and nut (30).
9. Connect wire (19) to low air buzzer switch (20).
10. Connect wires (38) and (39) to transfer switch (41) and lamp (40).
11. Connect wire (22) to high beam indicator lamp (36).
12. Connect wire (43) to panel lamp (44).
13. Connect wire (21) to panel lamp (47).
14. Connect wire (34) to wire (35).
15. Connect wire (46) to coolant temperature gage (45).
16. Connect wire (18) to fuel gage (17).
17. Connect wire (37) to oil gage (42).
18. Connect plug (32) to starter switch (33).

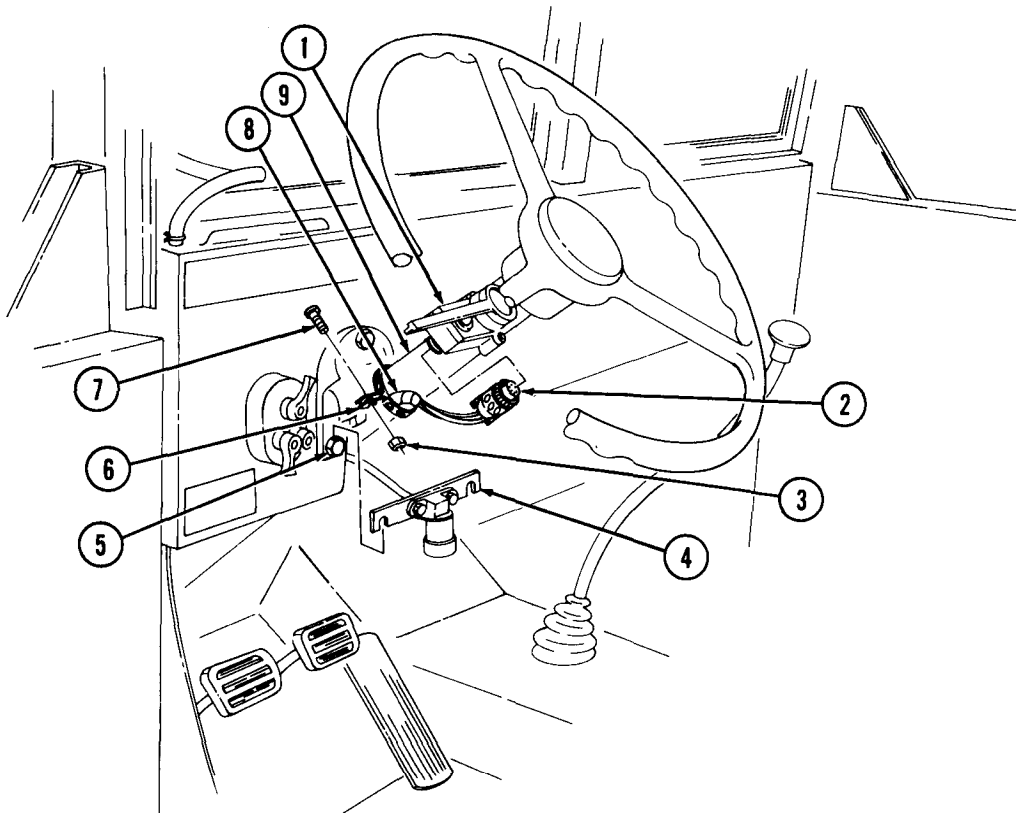
7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)

19. Connect wires (25) and (26) to preheater switch (27).
20. Connect plug (23) to lamp selector switch (24).
21. Install clamp (28) on steering column (29) and front wiring harness (1) with screw (31) and nut (30).



7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)

22. Position bracket (4) on two screws (5) so that front wiring harness (8) is between bracket (4) and steering column (9). Tighten two screws (5).
23. Connect plug (2) to signal switch (1).
24. Install clamp (6) on steering column (9) and front wiring harness (8) with screw (7) and nut (3).



25. Install wire (28) on flasher unit (25) with new lockwasher (26), screw (27), new lockwasher (29), and nut (30).
26. Connect plug (24) to flasher unit (25).

NOTE

Perform step 27 for vehicles equipped with fuel pressure sending units.

27. Connect wires (32) and (34) to fuel pressure sending unit (33).
28. Connect wires (18), (19), and (20) to beam selector switch (22).
29. Connect wires (16) and (17) to circuit breaker (15).

NOTE

Perform steps 30 and 31 for M275A2 vehicles.

30. Connect wires (36) and (41) to auxiliary circuit breaker (37).
31. Install clamp (39) on firewall (21) and wiring harness (8) with screw (40) and locknut (38).

NOTE

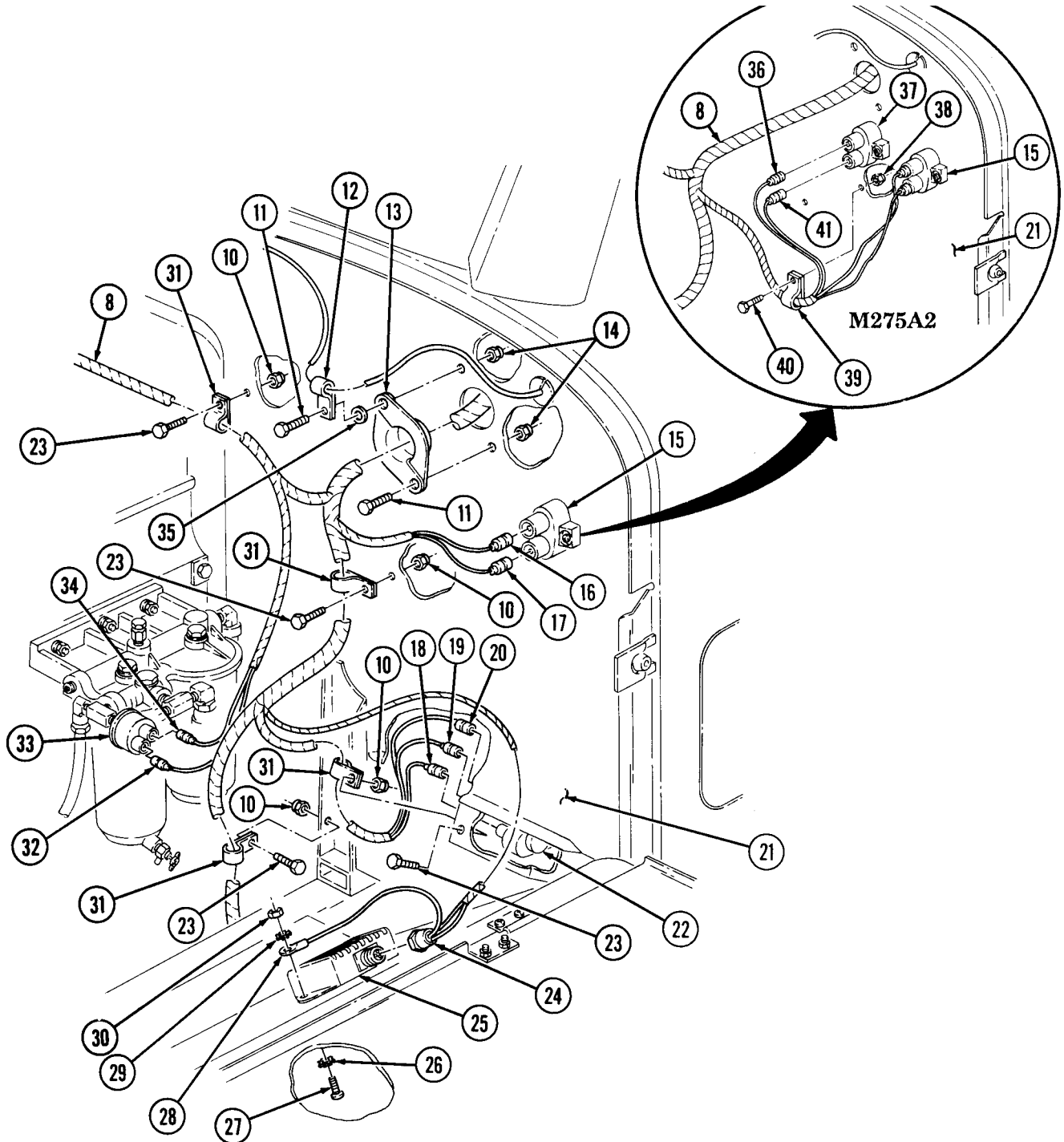
Assistant will help with steps 32 through 34.

32. Install two clamp halves (13) on firewall (21) with washer (35), clamp (12), two screws (11), and new locknuts (14).

7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)

33. Remove slack from front wiring harness (8).

34. Install four clamps (31) on front wiring harness (8) and firewall (21) with four screws (23) and new locknuts (10).

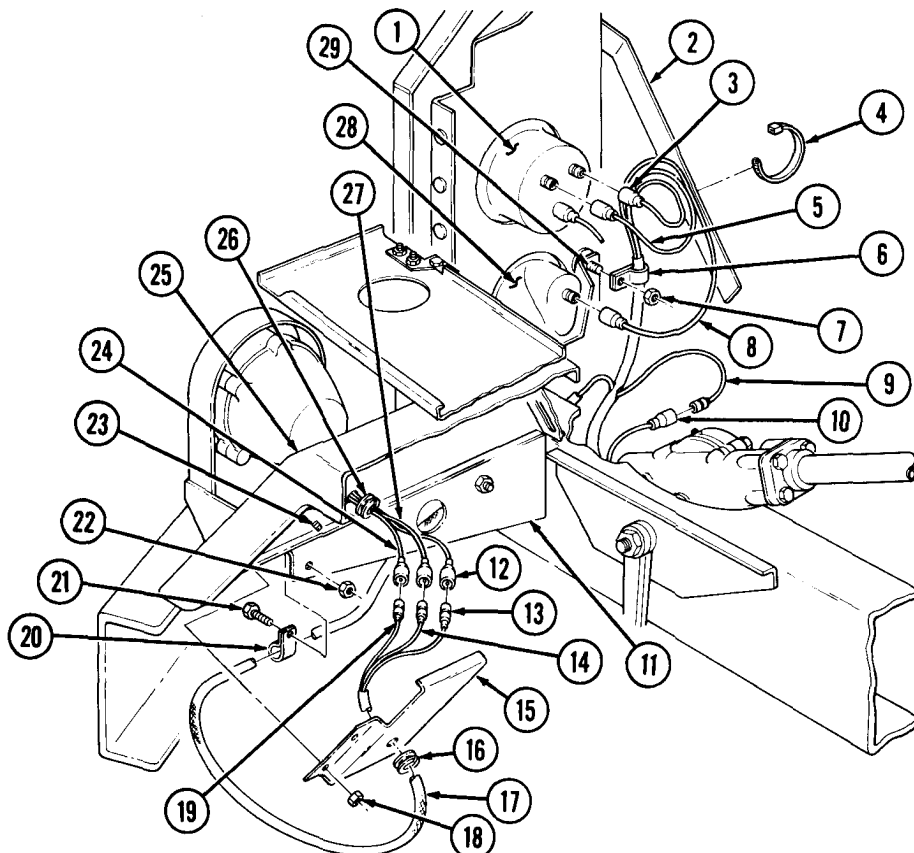


7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)

NOTE

Steps 35 through 39 cover the left side front composite lights.

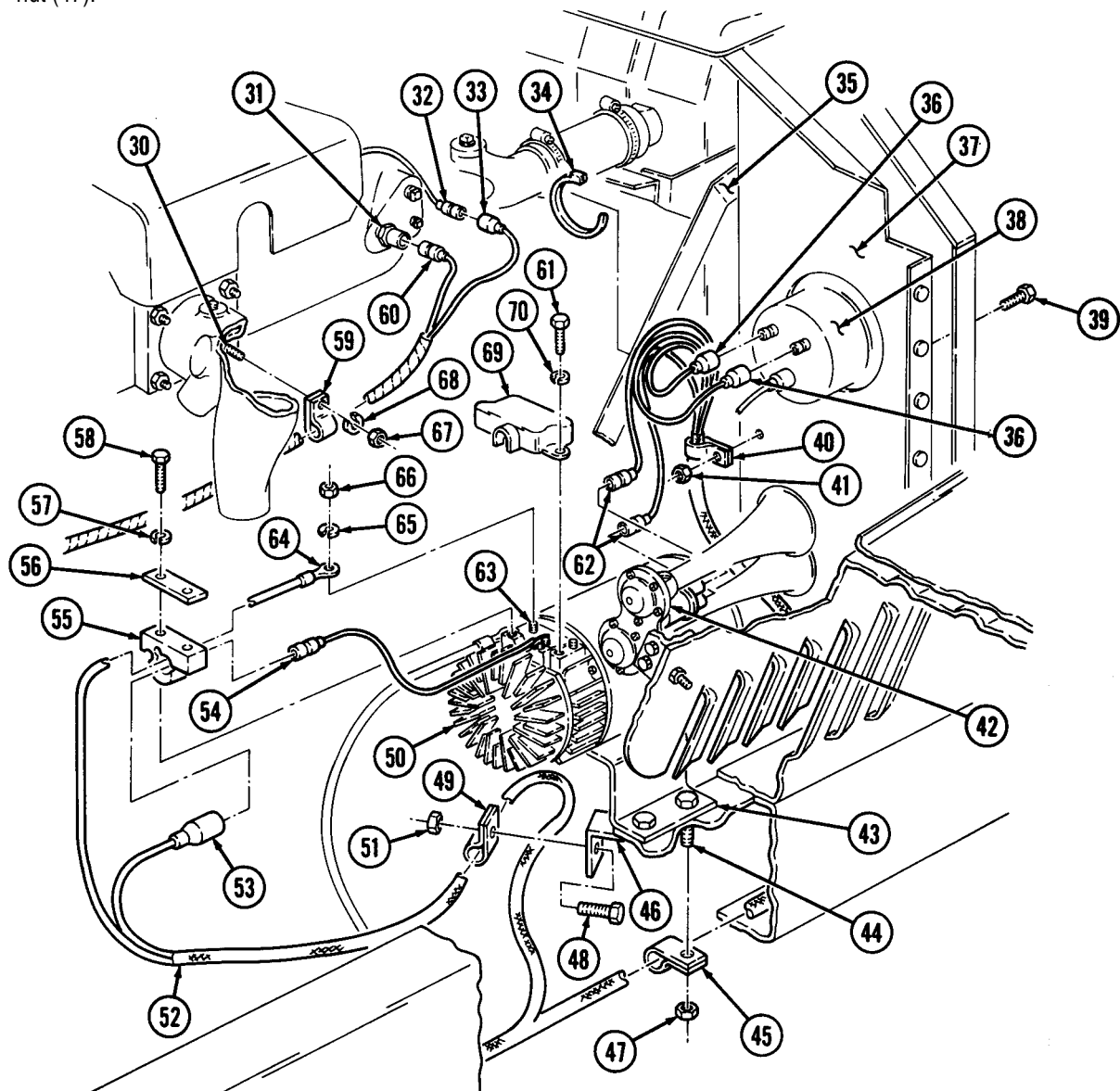
35. Route wires (13), (14), and (19) through plate (15).
36. Install grommet (16) in plate (15) and grommet (26) in fender (25).
37. Connect wires (13), (14), and (19) to wires (12), (27), and (24).
38. Install plate (15) on four screws (23) with four nuts (18).
39. Install two clamps (20) on front wiring harness (17) and fender support (11) with two screws (21) and nuts (22).
40. Repeat steps 35 through 39 for right side front composite lights.
41. Connect wire (9) to horn wire (10).
42. Connect wire (8) to blackout lamp (28).
43. Connect wires (3) and (5) to left headlamp (1).
44. Remove slack from front wiring harness (17).
45. Install clamp (6) on front wiring harness (17) and stud (29) with nut (7).
46. Install wires (3), (5), and (8) on brush guard support (2) with new tiedown strap (4).



47. Connect wires (43) and (64) to horn (44).
48. Connect wires (36) and (40) to right headlamp (38).
49. Connect wire (63) to temperature sending unit (31).
50. Connect wire (33) to preheater wire (32).

7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)

51. Install plate (56) and spacer (55) on alternator (50) with two new lockwashers (57) and screws (58).
52. Install wire (64) through spacer (55) and on alternator terminal (63) with new lockwasher (65) and nut (66). Tighten nut (66) 45-55 lb-in. (5-6 N-m).
53. Install wire (53) through spacer (55) and to alternator wire (54).
54. Coat wire (64) and bottom of cover (69) with sealant.
55. Install cover (69) on alternator (50) with two new lockwashers (70) and screws (61).
56. Remove slack from front wiring harness (52).
57. Install two wires (62) and (36) on brush guard support (35) with new tiedown strap (34).
58. Install clamps (49) and (40) on front wiring harness (52), cable bracket (46), and headlamp panel (37) with screws (39) and (48) and nuts (41) and (51).
59. Install clamp (59) on front wiring harness (52) and stud (30) with new lockwasher (68) and nut (67).
60. Install clamp (45) on front wiring harness (52) and alternator support plate (43) with screw (44) and nut (47).



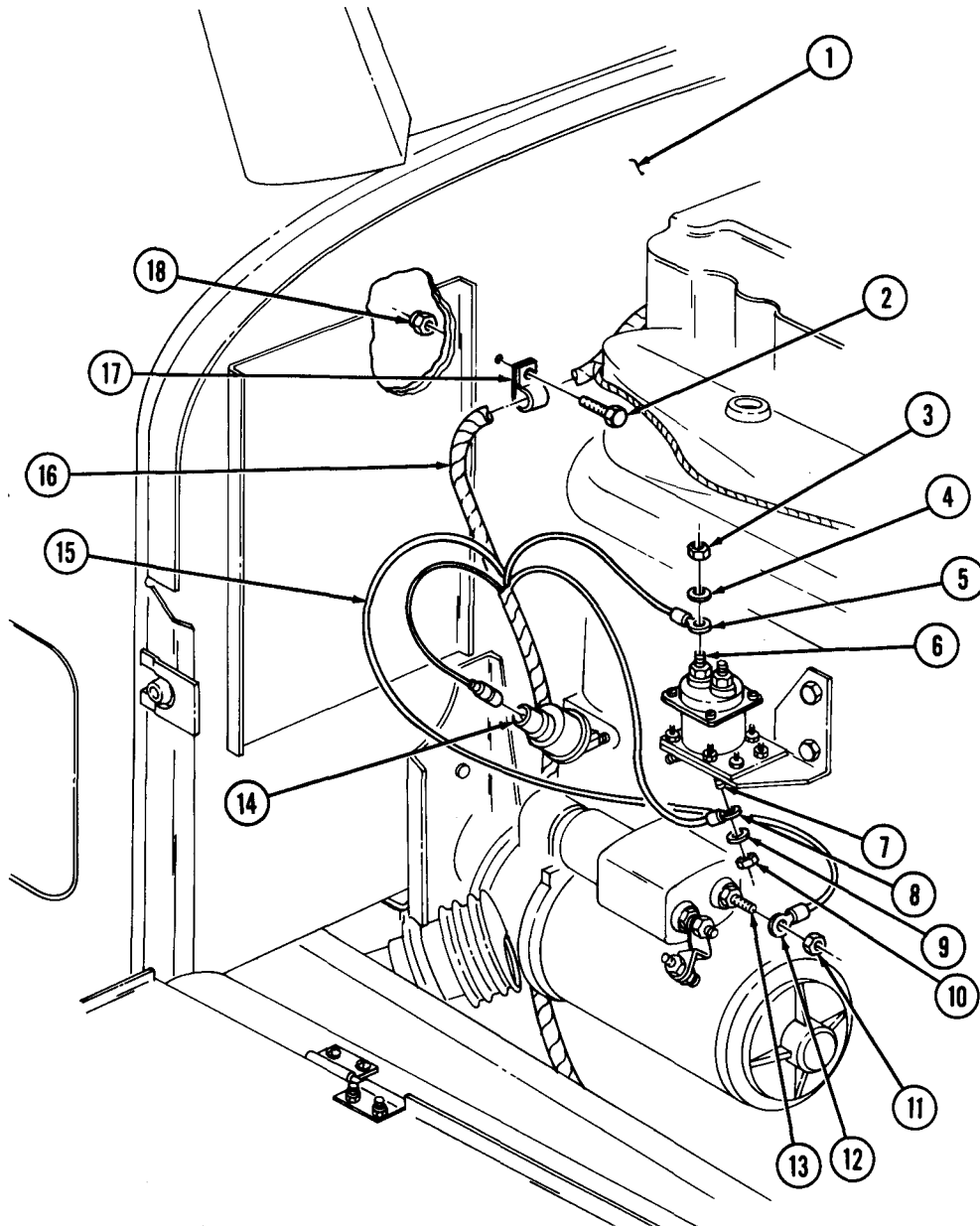
7-3. FRONT WIRING HARNESS REPLACEMENT (Contd)

60. Install wire (12) on starter terminal (13) with nut (11).
61. Install wire (8) on starter relay terminal (7) with washer (9) and nut (10).
62. Install wire (5) on starter relay terminal (6) with washer (4) and nut (3).
63. Connect wire (15) to oil pressure sending unit (14).
64. Remove slack from front wiring harness (16).

NOTE

Assistant will help with step 65.

65. Install clamp (17) on front wiring harness (16) and firewall (1) with screw (2) and new locknut (18).



FOLLOW-ON TASK: Install accessory switch (TM 9-2320-361-20).

7-4. REAR WIRING HARNESS REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Tool kit, electrical (Appendix B, Item 2)

MATERIALS/PARTS

Fifteen locknuts (Appendix F, Item 89)
Six locknuts (M275A2) (Appendix F, Item 95)

MATERIALS/PARTS (Contd)

Two locknuts (M756A2) (Appendix F, Item 95)
Twelve locknuts (M764) (Appendix F, Item 95)
Two lockwashers (Appendix F, Item 138)
Five lockwashers (M275A2) (Appendix F, Item 134)
Five tiedown straps (Appendix C, Item 15)

REFERENCES (TM)

TM 9-2320-361-20
TM 9-2320-361-34P

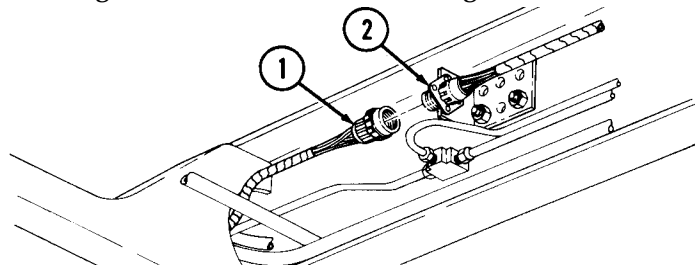
EQUIPMENT CONDITION

Battery ground cable disconnected
(TM 9-2320-361-20).

NOTE

Tag wires for installation.

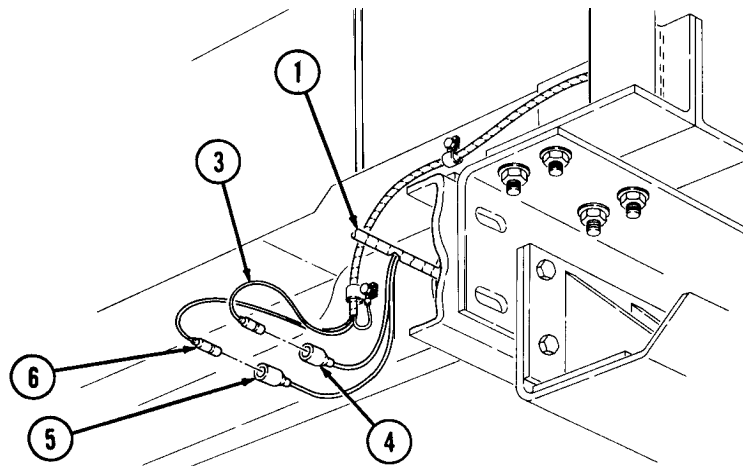
1. Disconnect rear wiring harness (1) from front wiring harness (2).



NOTE

Perform step 2 for M756A2 vehicles.

2. Disconnect wires (3) and (6) from rear wiring harness wires (4) and (5).



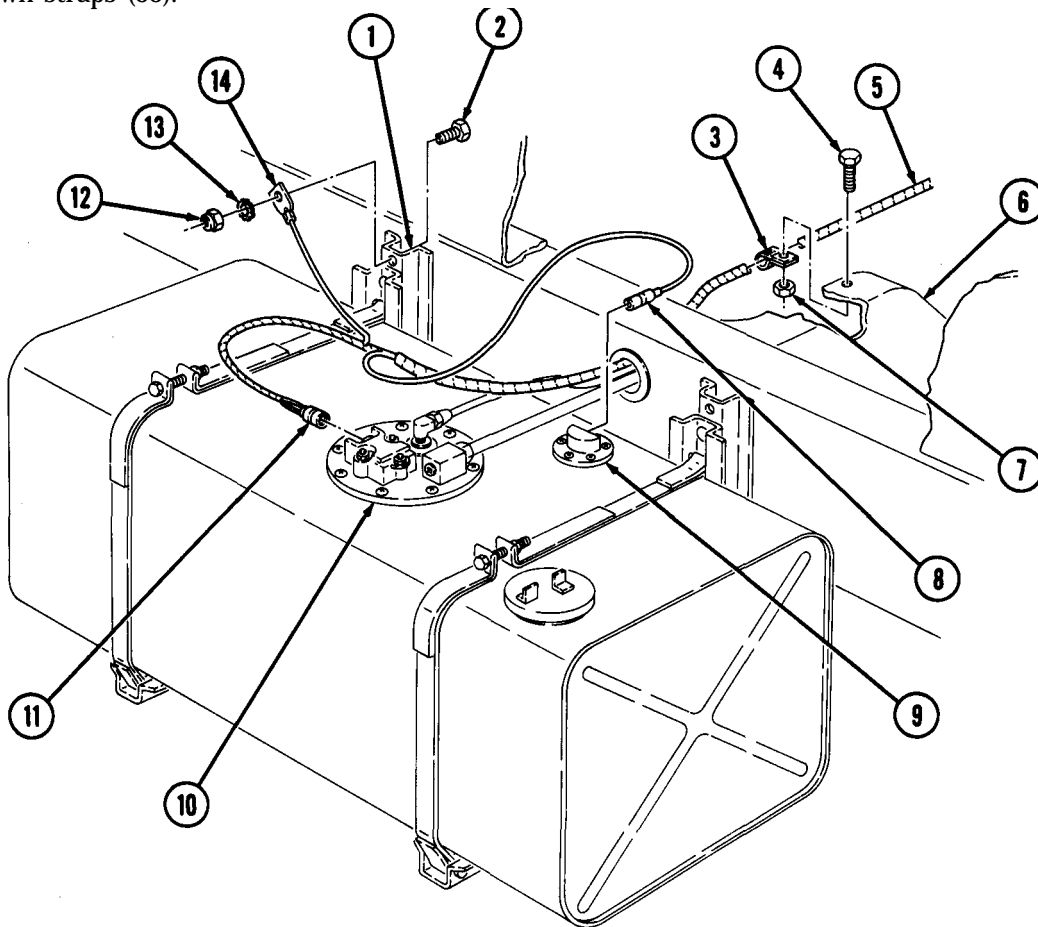
7-4. REAR WIRING HARNESS REPLACEMENT (Contd)

3. Remove locknut (12), lockwasher (13), ground wire (14), and screw (2) from support (1). Discard locknut (12) and lockwasher (13).
4. Disconnect plug (11) from fuel pump (10).
5. Disconnect wire (8) from fuel level sending unit (9).
6. Remove two locknuts (7), screws (4), and clamps (3) from rear wiring harness (5) and crossmember (6). Discard locknuts (7).

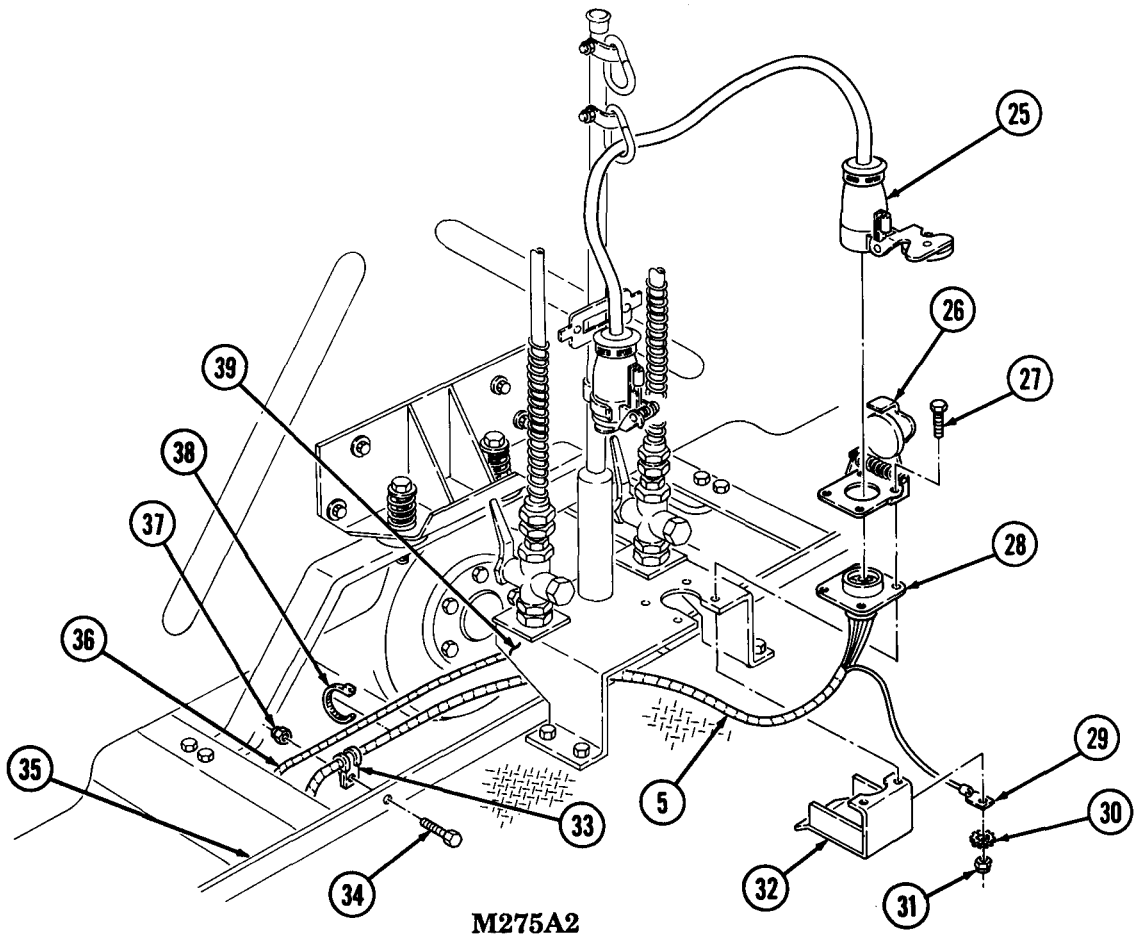
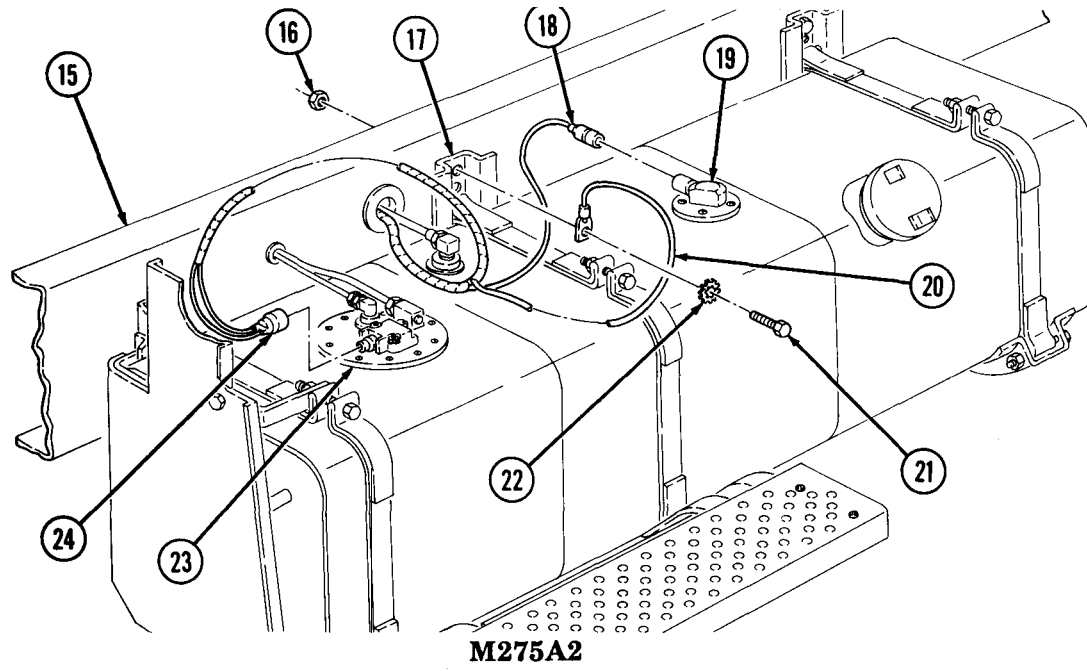
NOTE

Perform steps 7 through 13 for M275A2 vehicles.

7. Remove locknut (16), screw (21), lockwasher (22), and ground wire (20) from support (17) and frame (15). Discard locknut (16) and lockwasher (22).
8. Disconnect plug (24) from fuel pump (23).
9. Disconnect wire (18) from fuel level sending unit (19).
10. Disconnect trailer coupling harness (25) from receptacle (28).
11. Remove four locknuts (31), lockwashers (30), ground wire (29), guard (32), four screws (27), cap (26), and receptacle (28) from support (39). Discard locknuts (31) and lockwashers (30).
12. Remove locknut (37), screw (34), and clamp (33) from rear wiring harness (5) and deck (35). Discard locknut (37).
13. Remove five tiedown straps (38) from rear wiring harness (5) and fuel and brake leads (36). Discard tiedown straps (38).



7-4. REAR WIRING HARNESS REPLACEMENT (Contd)



7-4. REAR WIRING HARNESS REPLACEMENT (Contd)

NOTE

Perform steps 14 through 17 for M756A2 vehicles.

14. Disconnect wires (2) and (1) from front clearance light wires (3) and (4).
15. Remove locknut (9), screw (7), and clamp (8) from rear wiring harness (6) and frame (5). Discard locknut (9).
16. Disconnect wires (16) and (12) from rear clearance light wires (10) and (11).
17. Remove locknut (15), screw (13), and clamp (14) from subframe (17) and rear wiring harness (6). Discard locknut (15).

NOTE

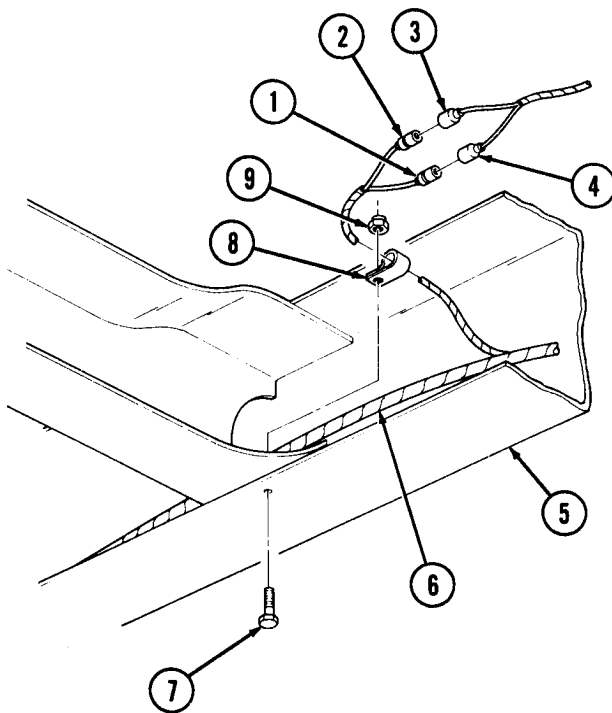
Steps 18 and 19 cover left side composite light.

18. Disconnect wires (25), (26), (27), and (28) from composite light wires (24), (23), (22), and (21).
19. Remove locknut (29), screw (19), and clamp (18) from bracket (20) and rear wiring harness (6). Discard locknut (29).
20. Repeat steps 18 and 19 for right side composite light.

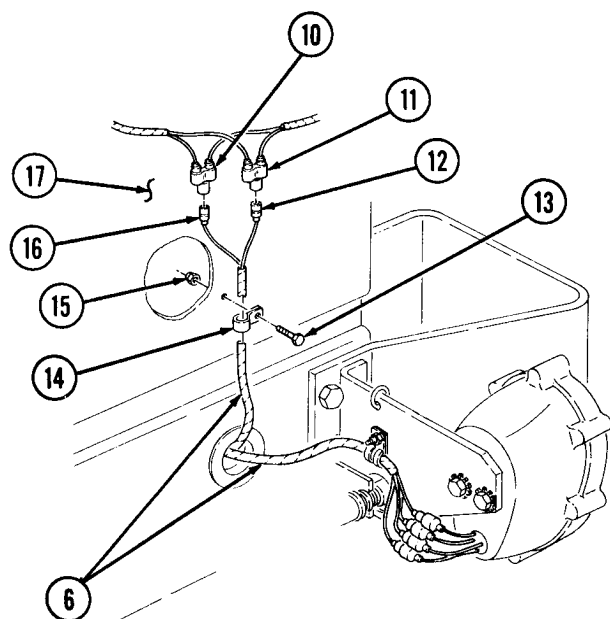
NOTE

All trailer receptacles are removed basically the same.

21. Remove four locknuts (45), lockwasher (44), ground wire (31), four screws (41), cap (40), and receptacle (30) from bracket (43). Discard locknuts (45) and lockwasher (44).
22. Remove two locknuts (37), screws (42), and clamps (38) from tail frame (39) and rear wiring harness (7). Discard locknuts (37).
23. Remove four locknuts (32), screws (34), nut (36), and five clamps (33) from frame (5), stud (35), and rear wiring harness (7). Discard locknuts (32).

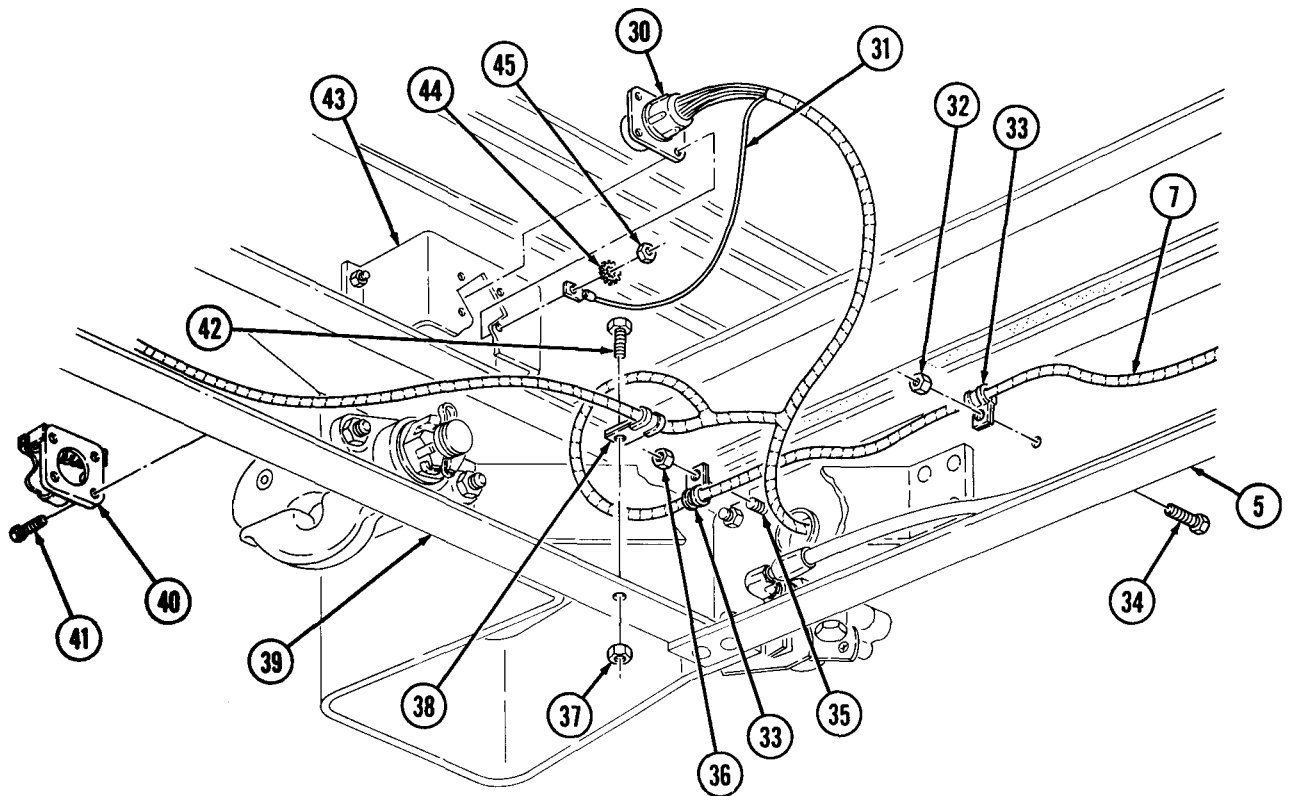
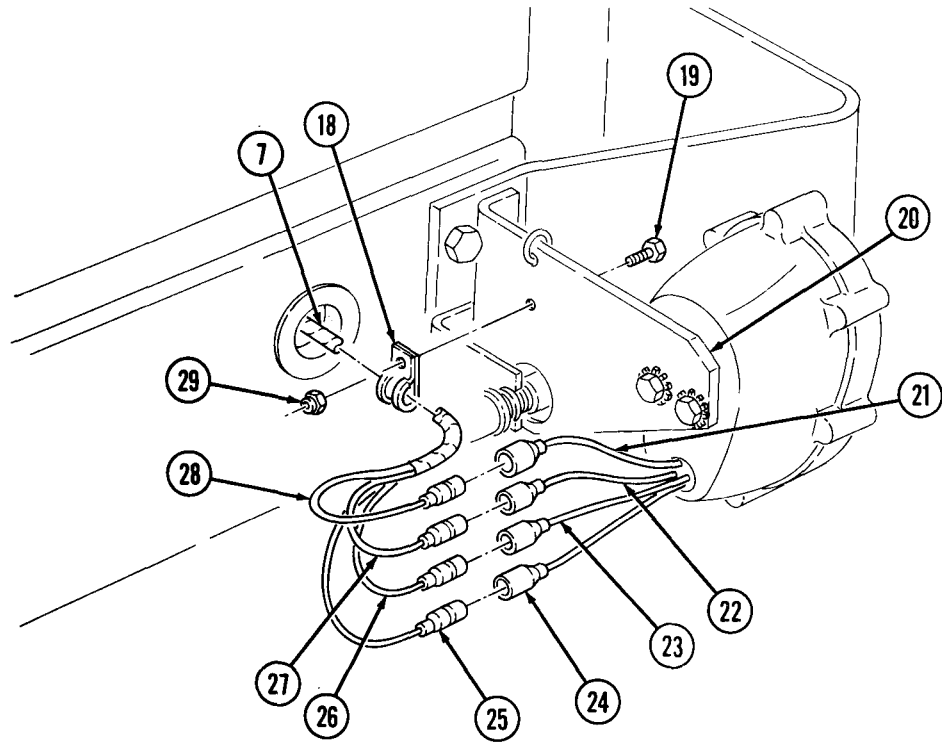


M756A2



M756A2

7-4. REAR WIRING HARNESS REPLACEMENT (Contd)



7-4. REAR WIRING HARNESS REPLACEMENT (Contd)

NOTE

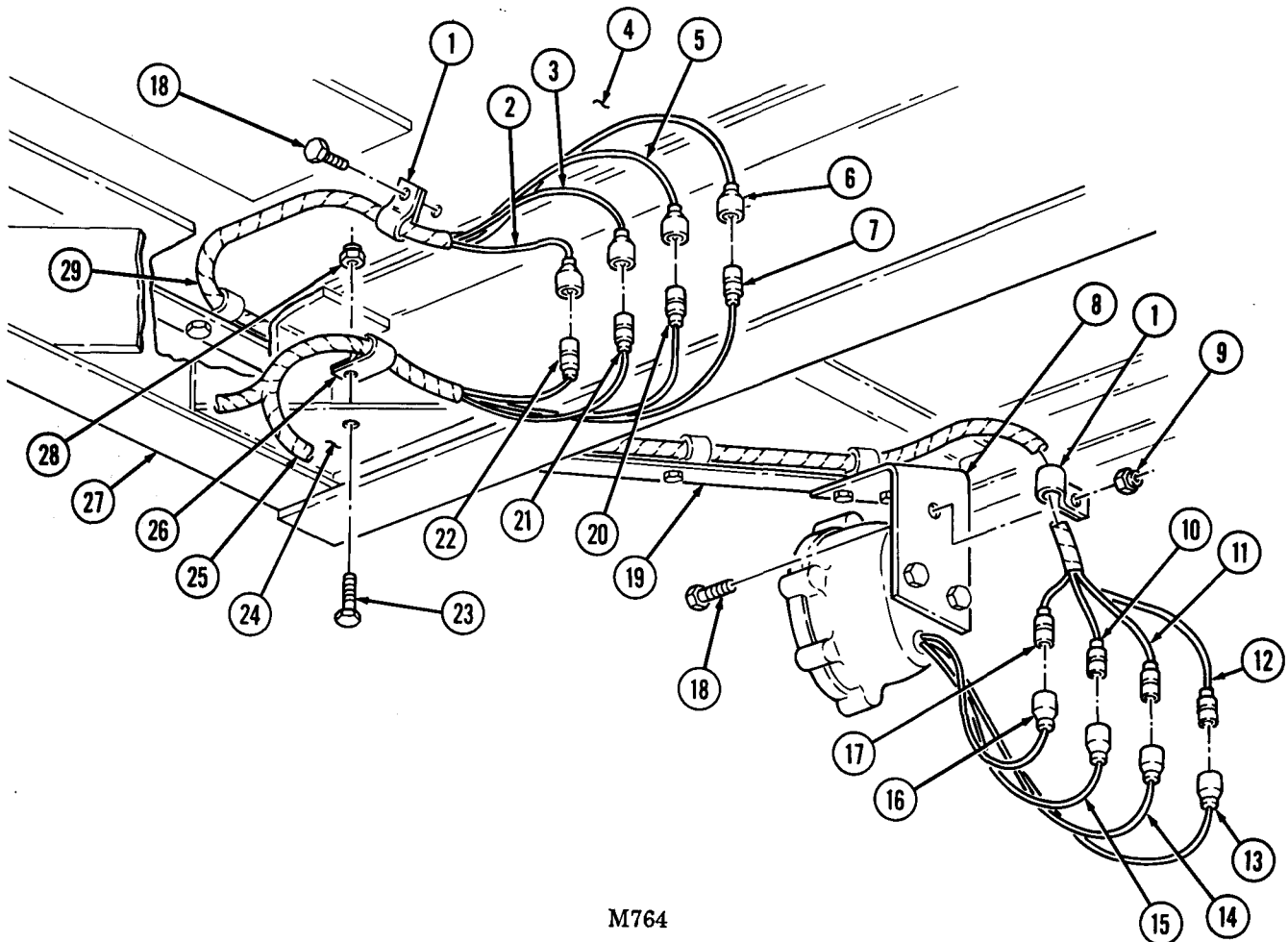
- Perform steps 24 through 27 for M764 vehicles.
- Steps 24 through 27 cover the left side composite light extensions.

24. Disconnect wires (2), (3), (5), and (6) from extension wires (22), (21), (20), and (7).
25. Disconnect extension wires (17), (10), (11), and (12) from rear composite light wires (16), (15), (14), and (13).
26. Remove five locknuts (9), six screws (18), and clamps (1) from bracket (19), composite light bracket (8), subframe (4), tail frame (27), and two extension wires (29). Discard locknuts (9).
27. Remove locknut (28), screw (23), and clamp (26) from rear wiring harness (25) and brace (24). Discard locknut (28).
28. Repeat steps 24 through 27 for M764 right side composite light extensions.

NOTE

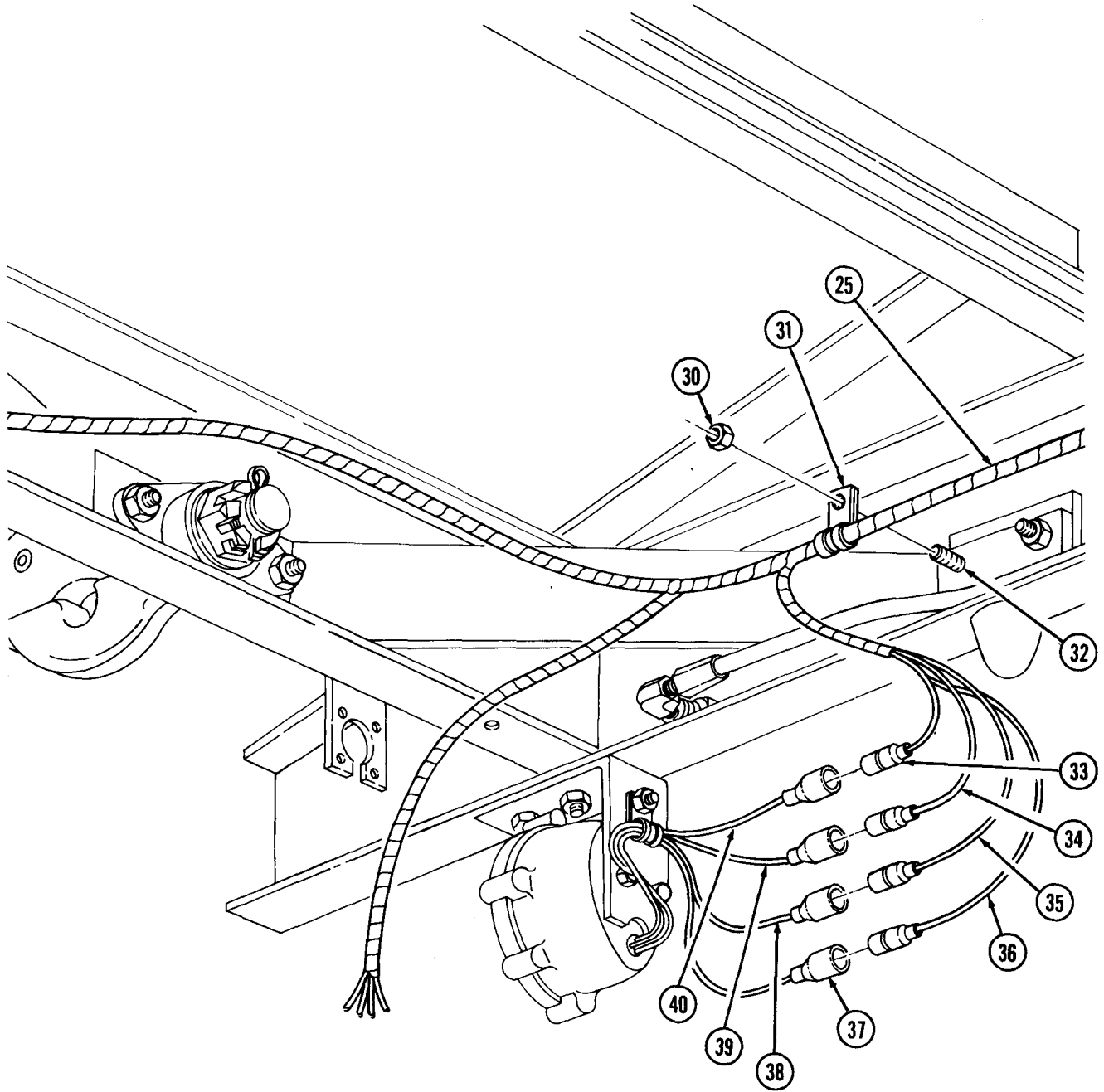
- Perform steps 29 and 30 for M275A2 vehicles.
- Steps 29 and 30 cover the left rear composite light disconnection.

29. Disconnect wires (33), (34), (35), and (36) from rear composite light wires (40), (39), (38), and (37).
30. Remove nut (30) and clamp (31) from stud (32) and rear wiring harness (25).
31. Repeat steps 29 and 30 for M275A2 right rear composite light disconnection.



M764

7-4. REAR WIRING HARNESS REPLACEMENT (Contd)



M275A2

7-4. REAR WIRING HARNESS REPLACEMENT (Contd)

CAUTION

- Prior to removal of wiring harness, ensure all clamp removals and wire disconnections have been performed. Failure to do so may result in damage to equipment.
- Use care when removing or installing rear wiring harness. Snagging and pulling may cause damage to rear wiring harness.

NOTE

Perform step 32 for all vehicles except M275A2

32. Remove rear wiring harness (1) from left side frame (5) and four cross braces (2) and through two holes (4) and hole (3).

NOTE

Perform step 33 for M275A2 vehicles.

33. Remove rear wiring harness (1) from left side frame (5) and five cross braces (6) and through holes (3) and (4).

b. Installation

NOTE

Perform step 1 for all vehicles except M275A2.

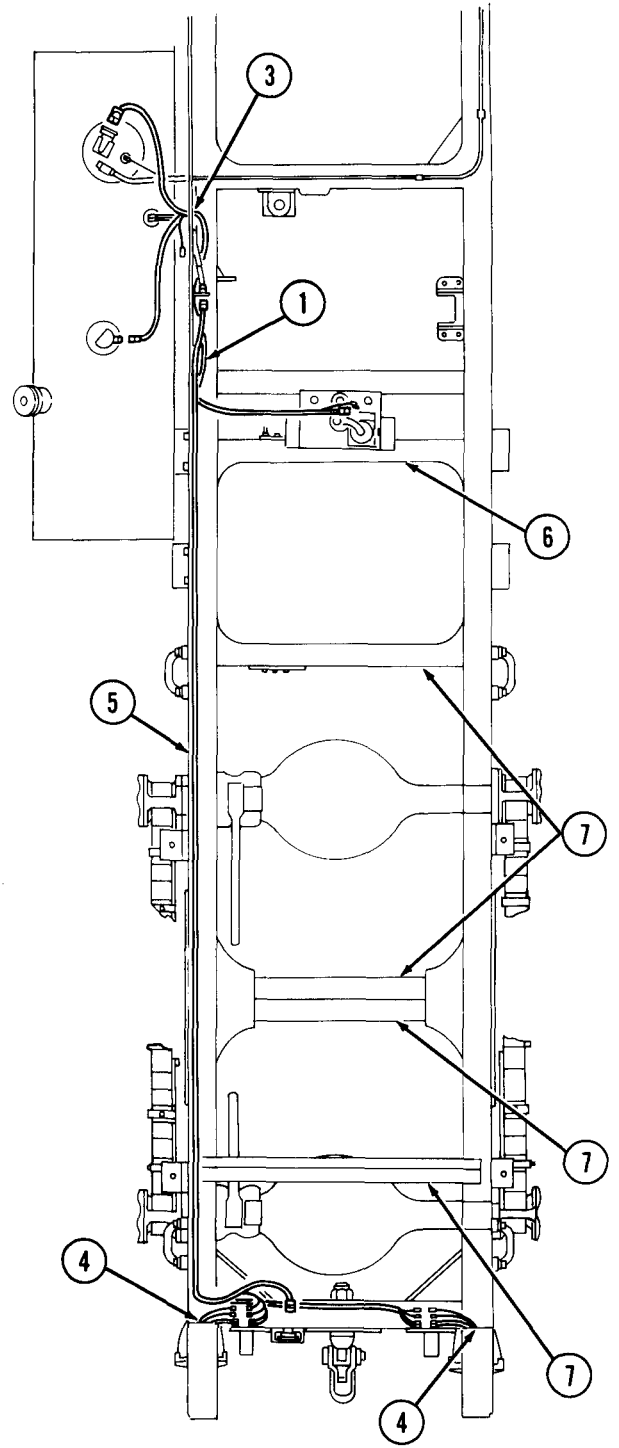
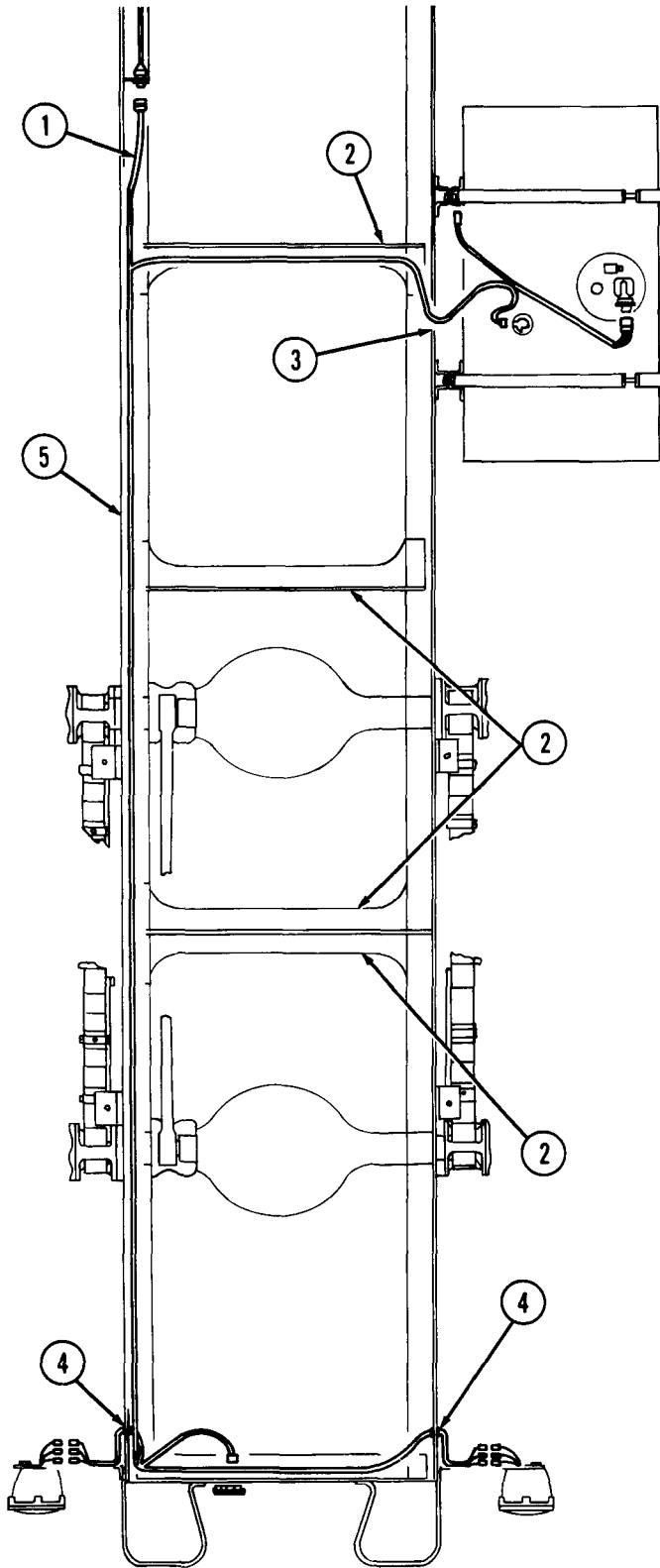
1. Route rear wiring harness (1) between front left side frame (5) and four cross braces (2) and through two holes (4) and hole (3).

NOTE

Perform step 2 for M275A2 vehicles.

2. Route rear wiring harness (1) between left side frame (5) and five cross braces (6) and through hole (3) and hole (4).

7-4. REAR WIRING HARNESS REPLACEMENT (Contd)



M275A2

7-4. REAR WIRING HARNESS Replacement (Contd)

NOTE

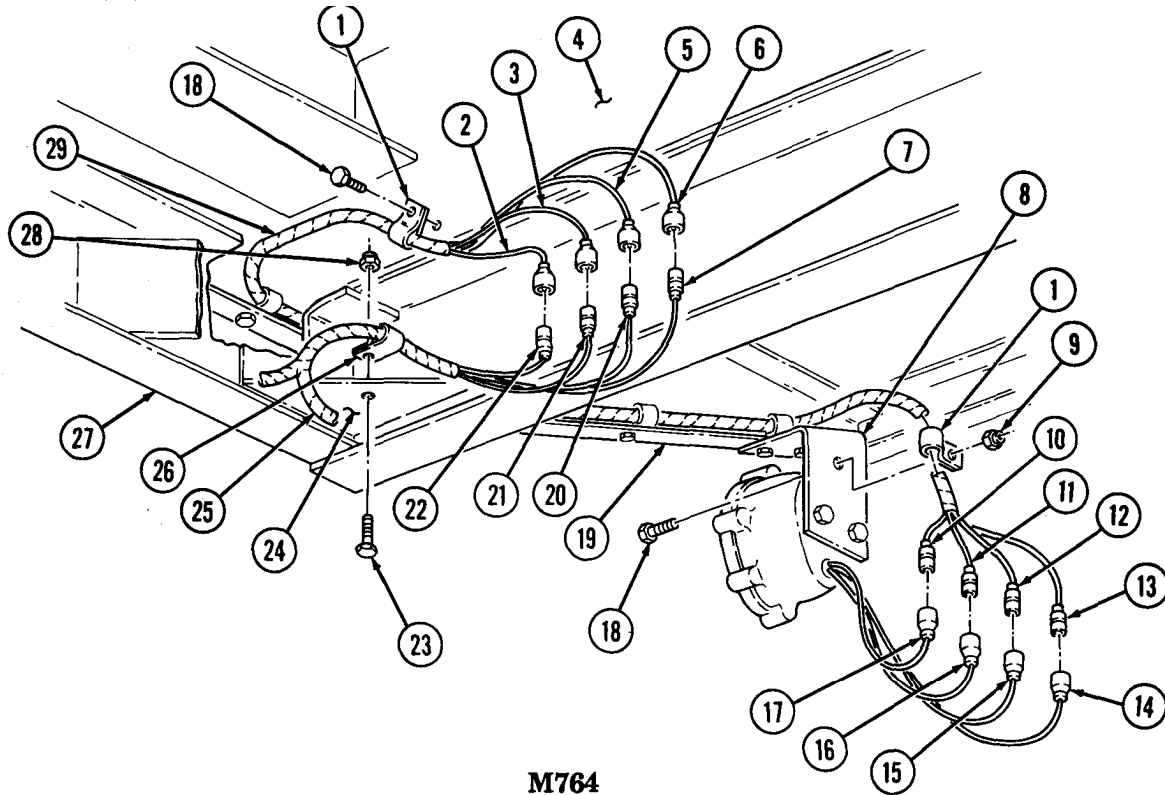
- . Perform steps 3 through 6 for M764 vehicles.
- Steps 3 through 6 cover the left side composite light extensions.

3. Install two sets of extension wires (29) on each rear composite light bracket (8), bracket (19), tail frame (27), and subframe (4) with six clamps (1), screws (18), and five new locknuts (9).
4. Connect wires (10), (11), (12), and (13) to rear composite light wires (17), (16), (15), and (14).
5. Connect wires (2), (3), (5), and (6) to wiring harness wires (22), (21), (20), and (7).
6. Install clamp (26) on rear wiring harness (25) and brace (24) with screw (23) and new locknut (28).
7. Repeat steps 3 through 6 for M764 right side composite light extensions.

NOTE

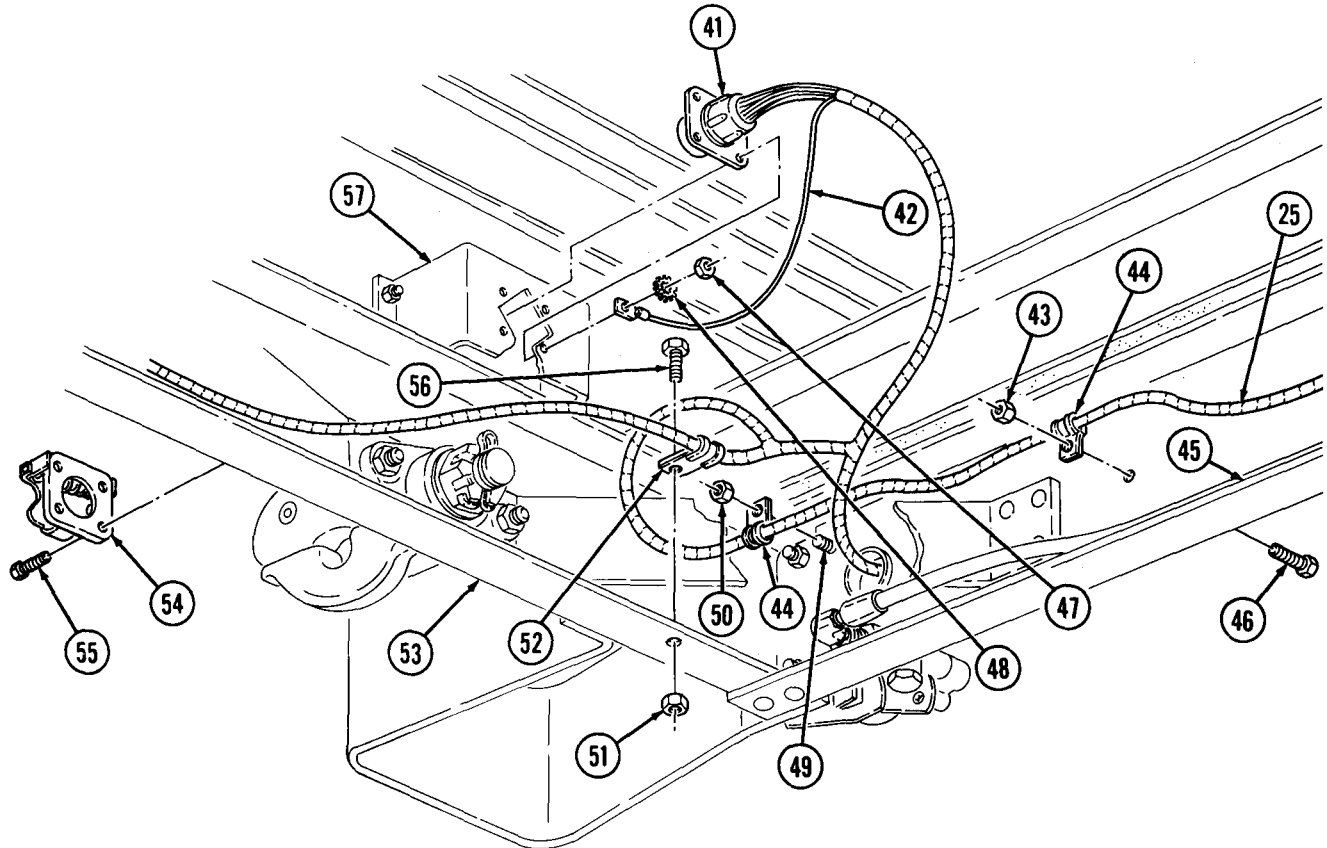
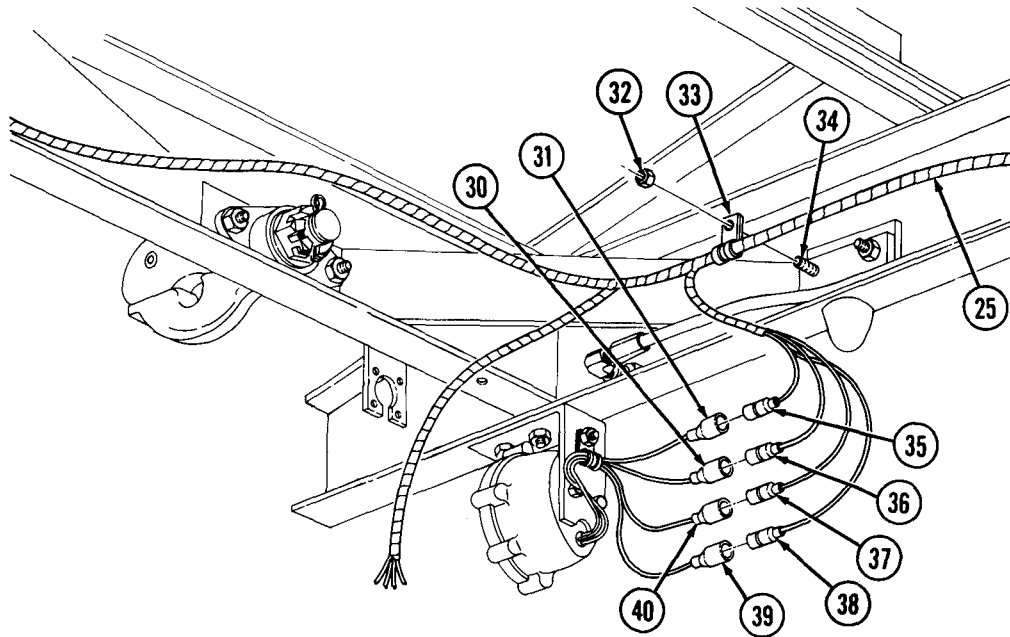
- Perform steps 8 and 9 for M275A2 vehicles.
- Steps 8 and 9 cover the left rear composite lights.

8. Connect wires (35), (36), (37), and (38) to rear composite light wires (31), (30), (40), and (39).
9. Install clamp (33) on rear wiring harness (25) and stud (34) with nut (32).
10. Repeat steps 8 and 9 for M275A2 right rear composite lights.
11. Install receptacle (41) and cap (54) on bracket (57) with four screws (55), ground wire (42), new lockwasher (48), and four new locknuts (47).
12. Remove slack from rear wiring harness (25) and install five clamps (44) on rear wiring harness (25), stud (49), and left side frame (45) with four screws (46), new locknuts (43), and nut (50).
13. Install rear wiring harness (25) on tail frame (53) with two clamps (52), screws (56), and new locknuts (51).



7-4. REAR WIRING HARNESS REPLACEMENT (Contd)

M275A2



7-4. REAR WIRING HARNESS REPLACEMENT (Contd)

NOTE

Steps 14 and 15 cover the left side rear composite lights.

14. Connect wires (9), (10), (11), and (12) to rear composite light wires (8), (7), (6), and (5).
15. Remove slack from rear wiring harness (1) and install clamp (2) and rear wiring harness (1) on bracket (4) with screw (3) and new locknut (13).
16. Repeat steps 14 and 15 for right rear composite lights.

NOTE

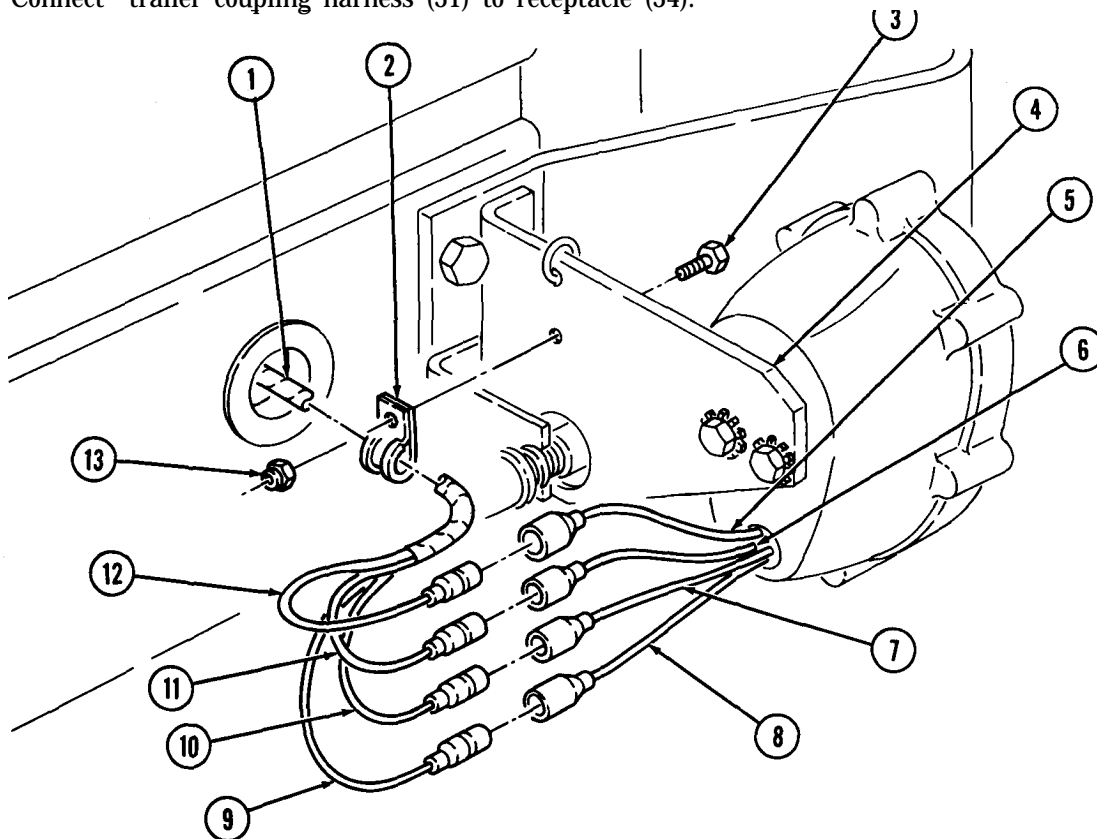
Perform steps 17 through 20 for M756A2 vehicles.

17. Connect wires (20) and (16) to rear clearance light wires (14) and (15).
18. Install clamp (18) on subframe (21) and rear wiring harness (1) with screw (17) and new locknut (19).
19. Connect wires (24) and (23) to front clearance wires (25) and (26).
20. Install clamp (29) on rear wiring harness (1) and frame (27) with screw (28) and new locknut (22).

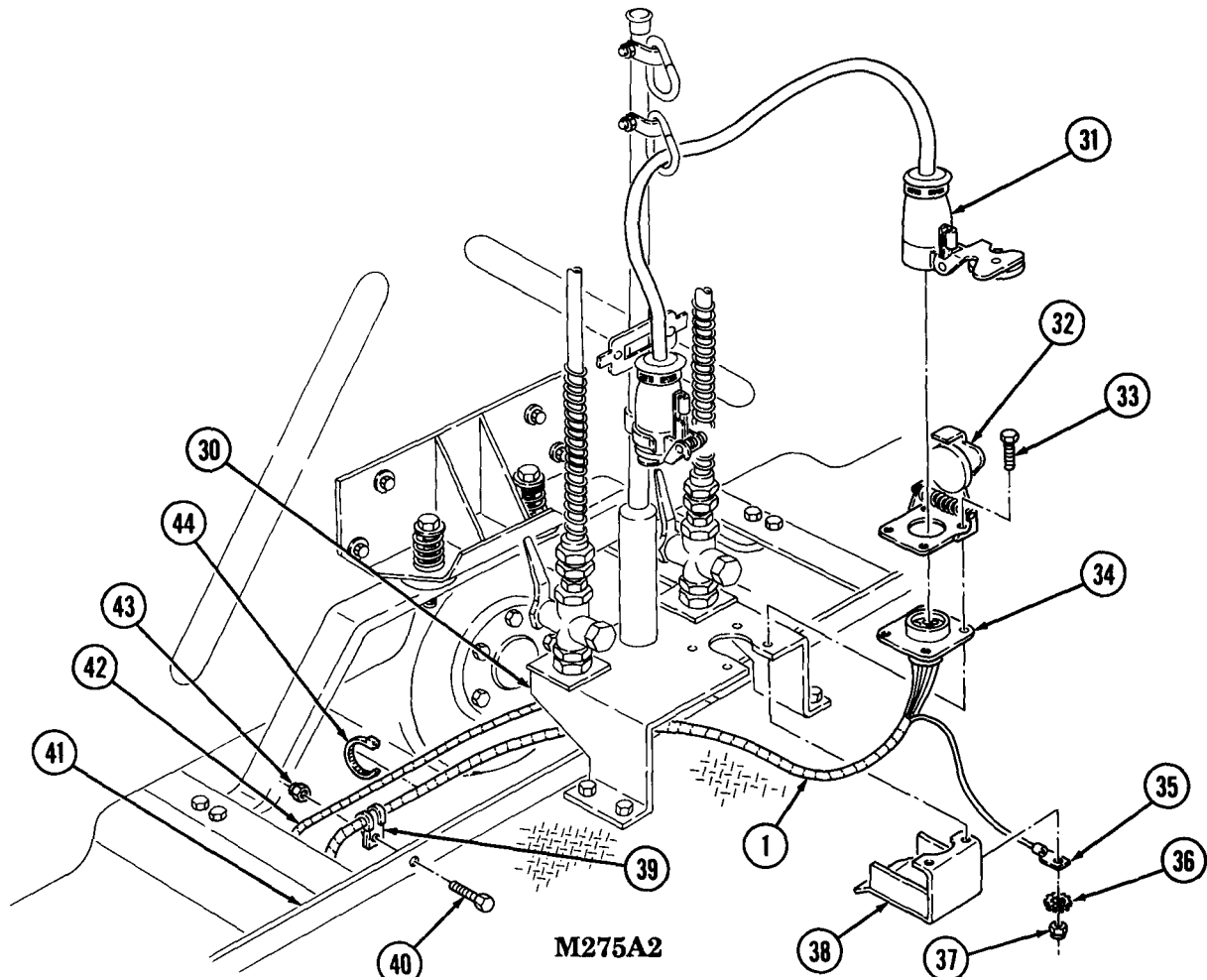
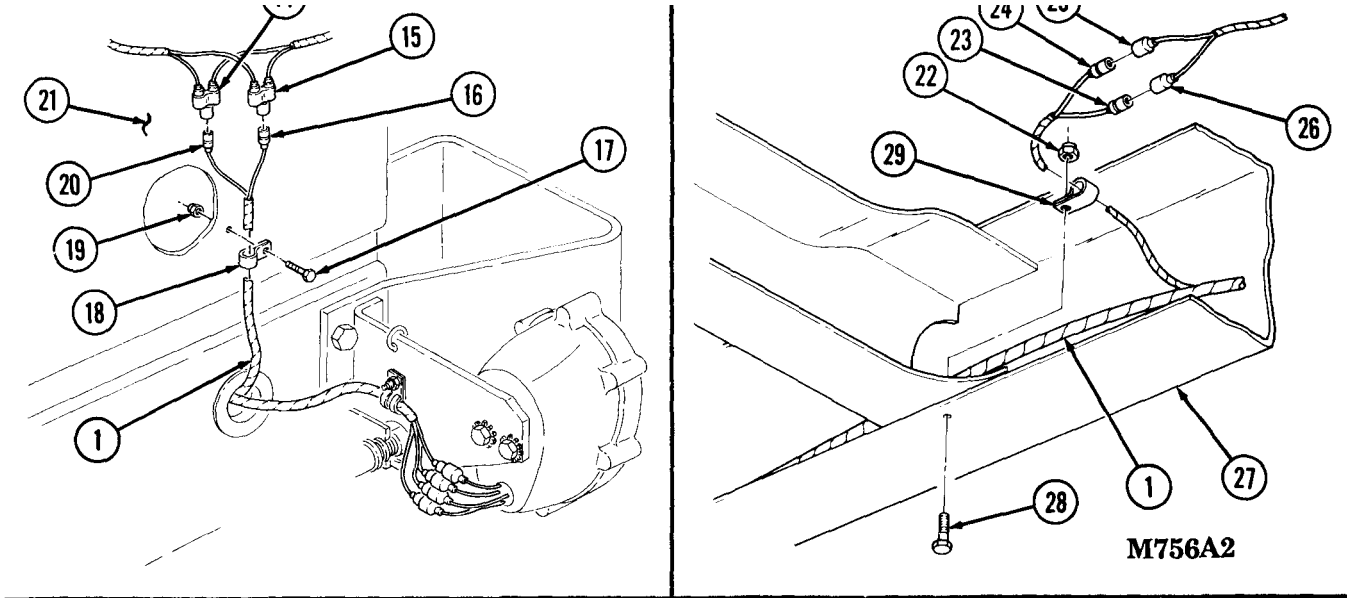
NOTE

Perform steps 21 through 24 for M275A2 vehicles.

21. Install receptacle (34), cap (32), guard (38), and ground wire (35) on support (30) with four screws (33), new lockwashers (36), and new locknuts (37).
22. Remove slack from rear wiring harness (1) and install clamp (39) on rear wiring harness (1) and deck (41) with screw (40) and new locknut (43).
23. Install five tiedown straps (44) on rear wiring harness (1) and fuel and brake leads (42).
24. Connect trailer coupling harness (31) to receptacle (34).



7-4. REAR WIRING HARNESS REPLACEMENT (Contd)



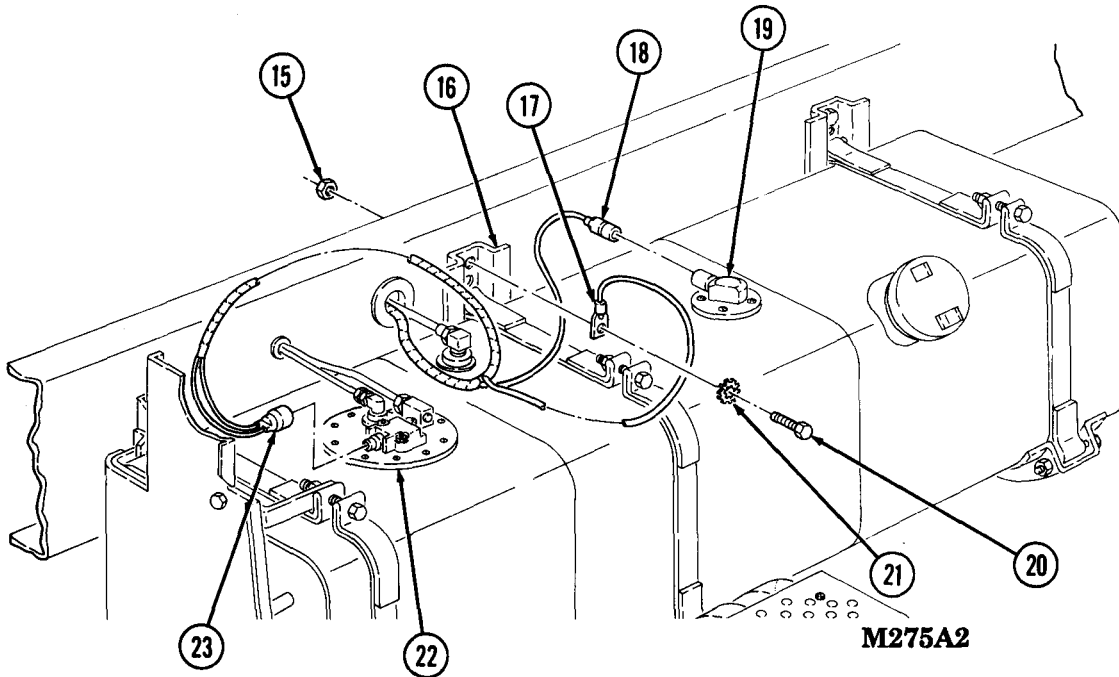
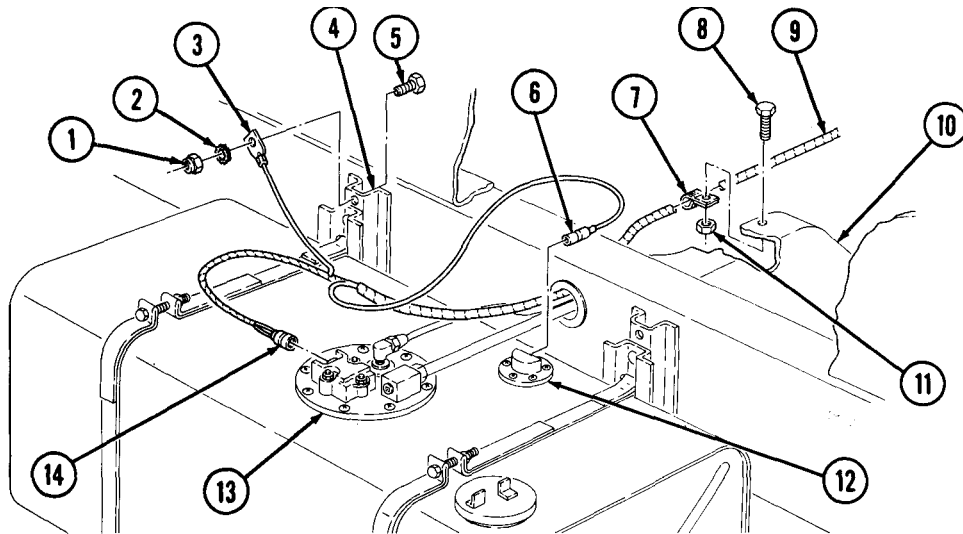
7-4. REAR WIRING HARNESS REPLACEMENT (Contd)

25. Connect wire (6) to fuel sending unit (12).
26. Connect plug (14) to fuel pump (13).
27. Install ground wire (3) on support (4) with new lockwasher (2), screw (5), and new locknut (1).
28. Remove slack from rear wiring harness (9) and install two clamps (7) on rear wiring harness (9) and crossmember (10) with two screws (8) and new locknuts (11).

NOTE

Perform steps 29 through 31 for M275A2 vehicles.

29. Connect wire (18) to fuel sending unit (19).
30. Connect plug (23) to fuel pump (22).
31. Install ground wire (17) to support (16) with new lockwasher (21), screw (20), and new locknut (15).

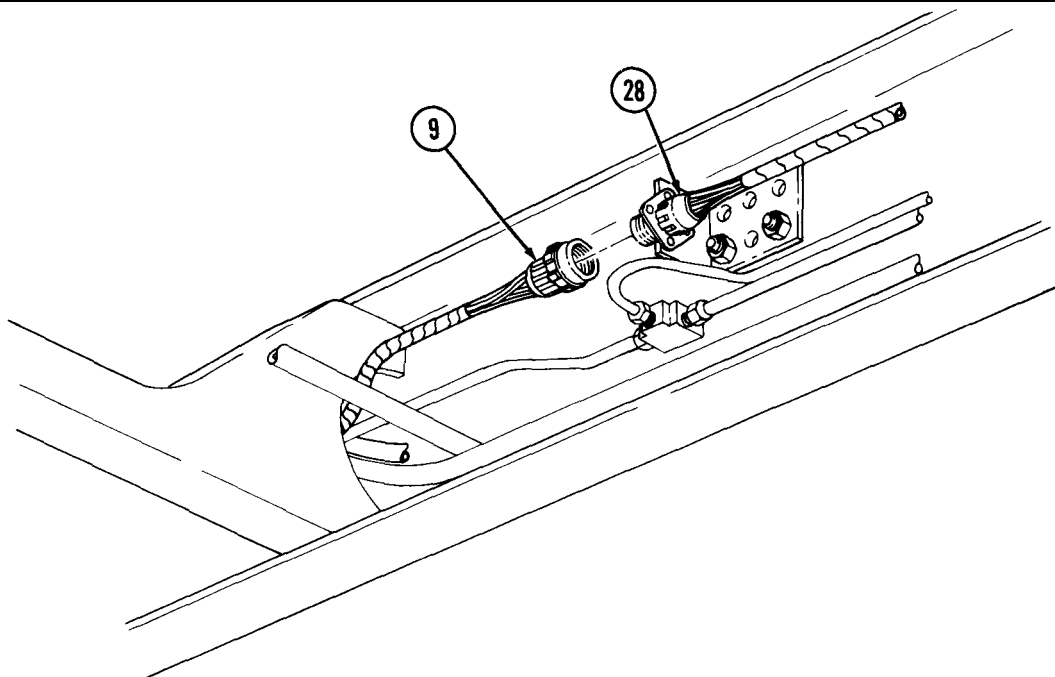
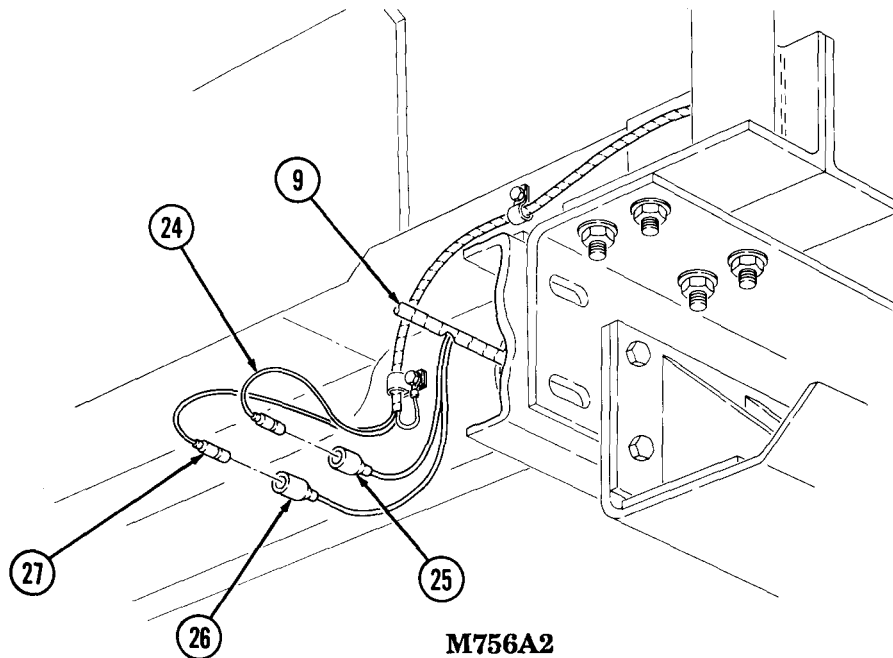


7-4. REAR WIRING HARNESS REPLACEMENT (Contd)

NOTE

Perform step 32 for M756A2 vehicles.

32. Connect wires (27) and (24) to rear wiring harness wires (26) and (25).
33. Connect rear wiring harness (9) to front wiring harness (28).



FOLLOW-ON TASK: Connect battery ground cable (TM 9-2320-361-20).

CHAPTER 8 TRANSMISSION MAINTENANCE

8-1. TRANSMISSION MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
8-2.	Transmission Maintenance	8-1
8-3.	Clutch Release Bearing, Shaft, and Fork Replacement	8-6
8-4.	Transmission Top Cover Replacement	8-8

8-2. TRANSMISSION MAINTENANCE

THIS TASK COVERS:

- | | |
|---|-------------------------------|
| <p>a. Removal</p> <p>b. Inspection and Repair</p> | <p>c. Installation</p> |
|---|-------------------------------|

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

- General mechanic's tool kit
(Appendix B, Item 1)
- Sling (Appendix B, Item 14)
- Breaker bar, 1/2-in. dr. (Appendix B, Item 15)
- Torque wrench, 1/2-in. dr. (Appendix B, Item 7)
- Lifting device
- Two chains
 - Four screws (Appendix F, Item 217)
 - Four washers (Appendix F, Item 271)

MATERIALS/PARTS

- Twelve screw-assembled lockwashers
(Appendix F, Item 156)
- Four screw-assembled lockwashers
(Appendix F, Item 157)
- Two locknuts (Appendix F, Item 96)
- Gasket (Appendix F, Item 80)
- Lockwasher (Appendix F, Item 128)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

- LO 9-2320-209-12-1
- TM 9-2320-361-10
- TM 9-2320-361-20
- TM 9-2320-361-34P
- TM 9-2520-246-34-1

EQUIPMENT CONDITION

- Battery negative ground cable disconnected
(TM 9-2320-361-20).
- Cab top removed (if overhead lifting device is used)
(TM 9-2320-361-10).
- Transmission gearshift lever removed
(TM 9-2320-361-20).
- Cab tunnels removed (TM 9-2320-361-20).
- Power takeoff propeller shaft removed (vehicles
w/PTO installed) (TM 9-2320-361-20).
- Transfer case to transmission propeller shaft
removed (TM 9-2320-361-20).
- Transfer case to differential propeller shaft
removed (TM 9-2320-361-20).
- Transmission oil drained (LO 9-2320-209-12-1).

GENERAL SAFETY INSTRUCTIONS

- Use prybar to free transmission during lifting
operations.
- All personnel must stand clear during lifting
operations.

8-2. TRANSMISSION MAINTENANCE (Contd)

a. Removal

1. Remove clutch return spring (2) from clutch shaft lever (1) and frame (3).
2. Remove locknut (4), screw (5), and rod (6) from shaft lever (1). Discard locknut (4).

NOTE

. Do not remove spring-loaded pin from clevis. Bearing will fall free from clevis if pin is removed.

Step 3 applies to vehicles with transmission power takeoff installed.

3. Pull pin (16) to one side of clevis (18) on power takeoff shift lever (17) and remove PTO shift lever (17) from PTO arm (19).
4. Pull pin (7) to one side of clevis (8) on rod (6) and remove rod (6) from lever (9).

NOTE

Mark position of lever and shaft for installation.

5. Remove locknut (22), screw (23), and lever (9) from shaft (21). Discard locknut (22).

NOTE

Screw-assembled lockwashers must be reinstalled in transmission if transmission requires replacement.

6. Remove four screw-assembled lockwashers (14) from transmission (15). Discard screw-assembled lockwashers (14).
7. Install utility chains on transmission (15) with four washers (13) and screws (12).
8. Attach utility chains to sling. Attach sling to lifting device.

WARNING

- Use prybar to free transmission during lifting operations. Failure to do so may result in injury to personnel or damage to equipment.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

NOTE

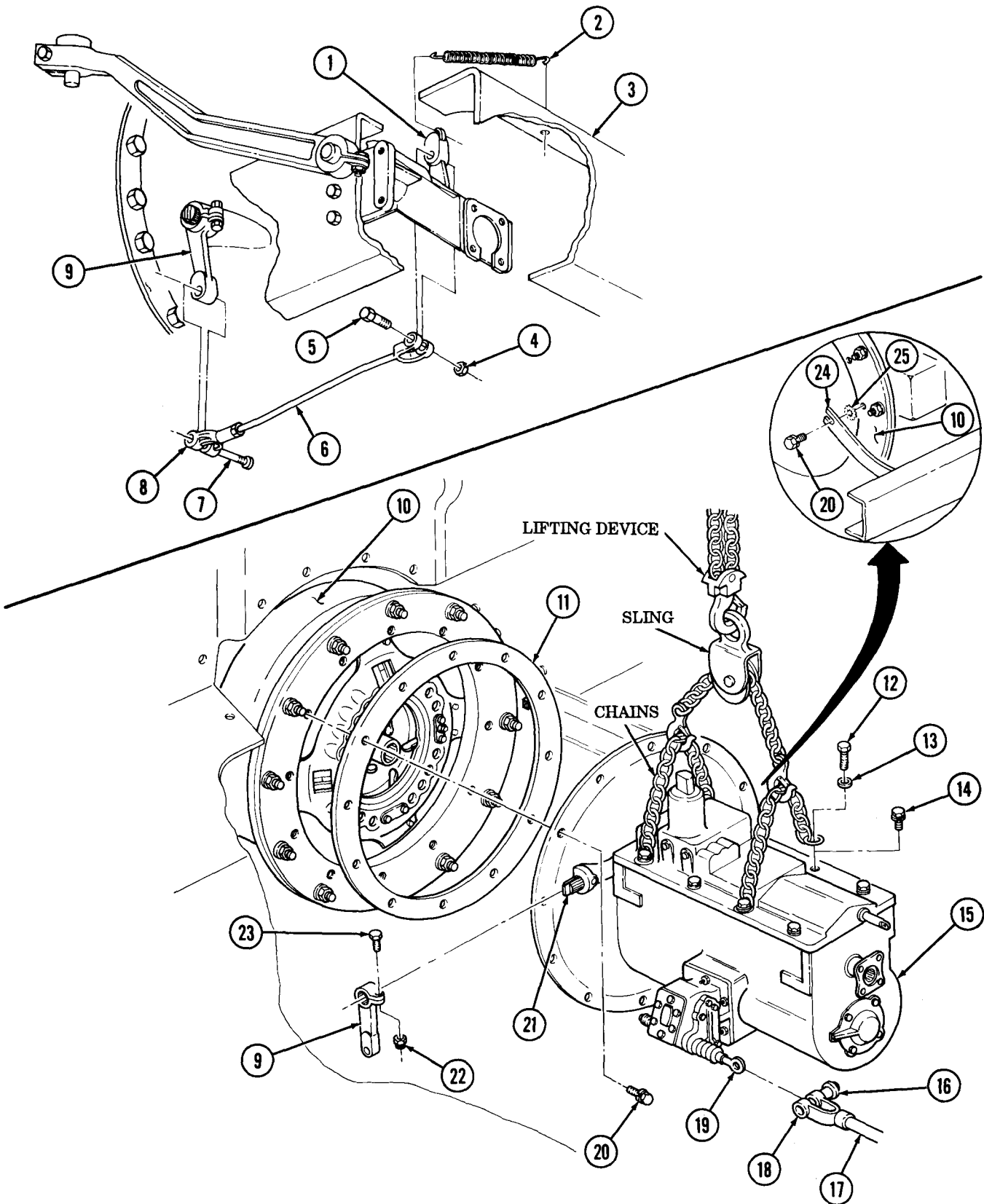
If a new transmission is not being installed, the adapter plate may be removed and installed with the transmission.

9. Remove twelve screw-assembled lockwashers (20), ground strap (24), and lockwasher (25) from flange of transmission (15). Discard screw-assembled lockwashers (20) and lockwasher (25).
10. Remove transmission (15) and gasket (11) from flywheel housing (10) and lower transmission (15). Discard gasket (11).
11. Remove lifting device from sling. Remove sling from utility chains.
12. Remove four screws (12), washers (13), and utility chains from transmission (15).

b. Inspection and Repair

1. Remove top cover (para. 8-4).
2. Visually inspect internal components for damage or seized bearings. Replace transmission (15) if damaged.
3. For transmission repair, refer to TM 9-2520-246-34-1.

8-2. TRANSMISSION MAINTENANCE (Contd)



8-2. TRANSMISSION MAINTENANCE (Contd)

c. Installation

1. Install utility chains on transmission (6) with four washers (4) and screws (3).
2. Attach sling to utility chains. Attach lifting device to sling.
3. Position transmission (6) under vehicle and raise transmission (6).

WARNING

- Use prybar to free transmission during lifting operations. Failure to do so may result in injury to personnel or damage to equipment.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

CAUTION

Ensure transmission is alined with clutch and pilot bearing. Failure to do so may result in damage to equipment.

4. Install new gasket (2) and transmission (6) on flywheel housing (1) with eleven new screw-assembled lockwashers (11). Tighten screw-assembled lockwashers (11) 23-26 lb-ft (31-35 N.m).
5. Install new lockwasher (17) and ground strap (16) on transmission (6) with new screw-assembled lockwasher (11). Tighten screw-assembled lockwasher (11) 23-26 lb-ft (31-35 N.m).
6. Remove lifting device from sling. Remove sling from utility chains.
7. Remove four screws (3), washers (4), and utility chains from transmission (6).
8. Install four new screw-assembled lockwashers (5) on transmission (6). Tighten screw-assembled lockwashers (5) 25-32 lb-ft (34-43 N.m).
9. Aline mark on lever (14) with shaft (12) and install lever (14) on shaft (12) with screw (15) and new locknut (13).

NOTE

If mark does not exist on shaft or lever, position lever on spline to rear of shaft centerline.

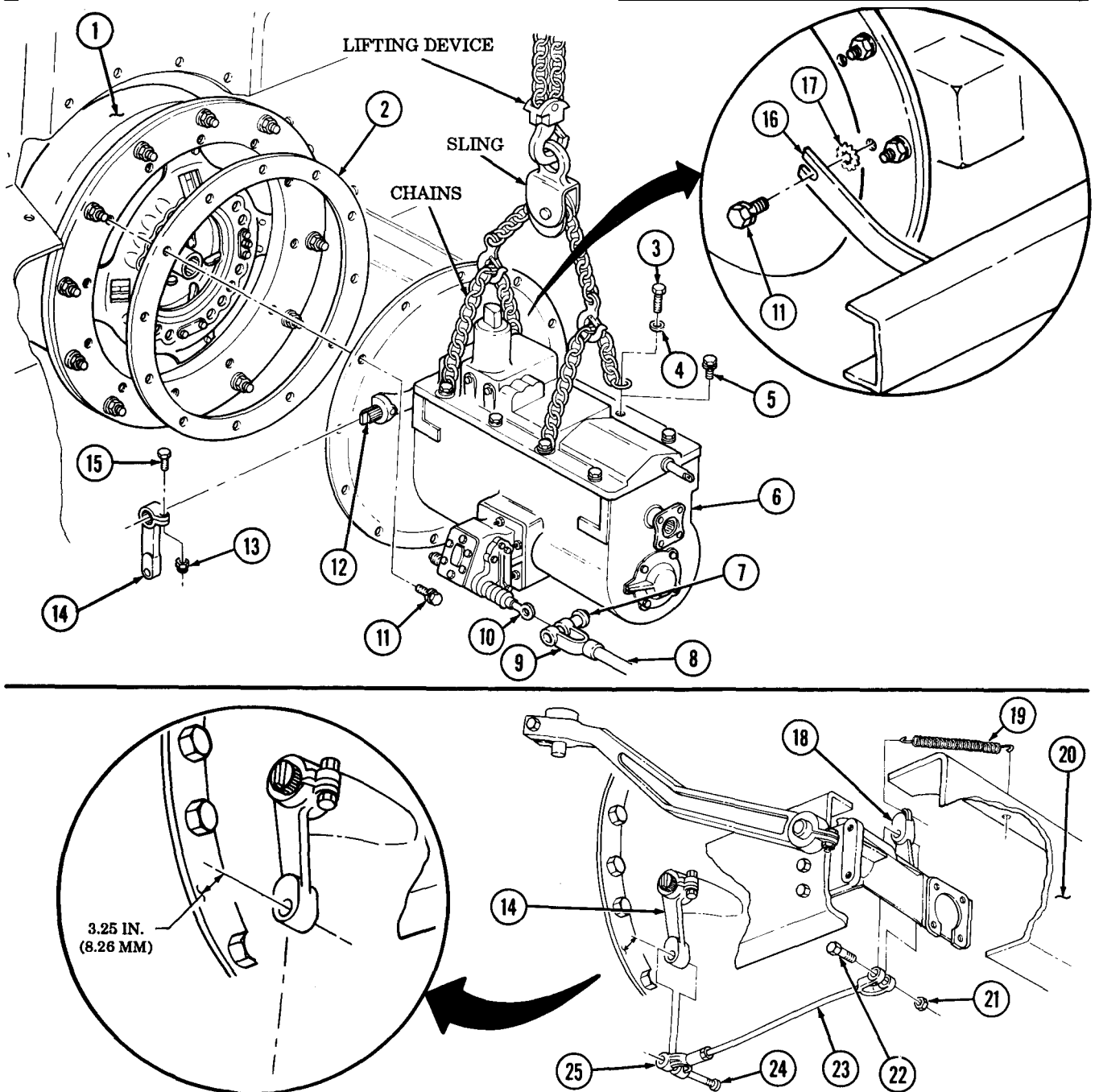
10. Push lower end of lever (14) forward until resistance is felt. Measure distance from center of hole on lever (14) to flange of transmission (6). Measurement should be 3.25 in. (8.26 cm). Rotate lever (14) one spline at a time if necessary to obtain 3.25 in. (8.26 cm) measurement. Tighten locknut (13).

NOTE

Perform step 11 if PTO is installed.

11. Attach power takeoff shift lever (8) on PTO arm (10) and push pin (7) in clevis (9) until head of pin (7) seats against clevis (9).
12. Install rod (23) on clutch shaft lever (18) with screw (22) and new locknut (21).
13. Install clevis (25) on lever (14).
14. Push pin (24) in clevis (25) until head of pin (24) seats against clevis (25).
15. Install clutch return spring (19) on clutch shaft lever (18) and frame (20).

8-2. TRANSMISSION MAINTENANCE (Contd)



- FOLLOW-ON TASKS:**
- Fill transmission to proper fluid level (LO 9-2320-209-12-1).
 - Install transfer case to differential propeller shaft (TM 9-2320-361-20).
 - Install transfer case to transmission propeller shaft (TM 9-2320-361-20).
 - Install power takeoff propeller shaft (if removed) (TM 9-2320-361-20).
 - Install cab tunnels (TM 9-2320-361-20).
 - Install transmission gearshift lever (TM 9-2320-361-20).
 - Install cab top (if removed) (TM 9-2320-361-10).
 - Connect battery negative ground cable (TM 9-2320-361-20).
 - Adjust clutch pedal free play (TM 9-2320-361-20).

8-3. CLUTCH RELEASE BEARING, SHAFT, AND FORK REPLACEMENT

THIS TASK COVERS:

- a. Removal
- b. Inspection

- c. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Torque wrench, 1/2-in. dr. (Appendix B, Item 7)

REFERENCES (TM)

LO 9-2320-209-12-1
TM 9-214
TM 9-2320-361-34P

EQUIPMENT CONDITION

Transmission removed (para. 8-2).

MATERIALS/PARTS

Two lockwashers (Appendix F, Item 135)
Seal (Appendix F, Item 221)

a. Removal

1. Remove two support springs (9) from clutch release bearing assembly (8) and clutch release fork (7).
2. Remove clutch release bearing assembly (8) from input shaft (10).
3. Remove two screws (6), lockwashers (5), and thrust washers (4) from clutch release fork (7). Discard lockwashers (5).
4. Slide clutch release shaft (3) out of clutch release fork (7).
5. Remove clutch release fork (7) and clutch release shaft (3) from transmission (1).
6. Remove seal (2) from bell housing of transmission (1). Discard seal (2).

NOTE

Perform step 7 if bearing requires replacement.

7. Remove grease fitting (13), two buttons (14), and bearing (12) from clutch release housing (11).

b. Inspection

1. Inspect bearing (12) (TM 9-214). Replace bearing (12) if damaged.
2. Visually inspect shaft (3) and clutch release fork (7) for wear or damage. Replace shaft (3) or fork (7) if damaged.

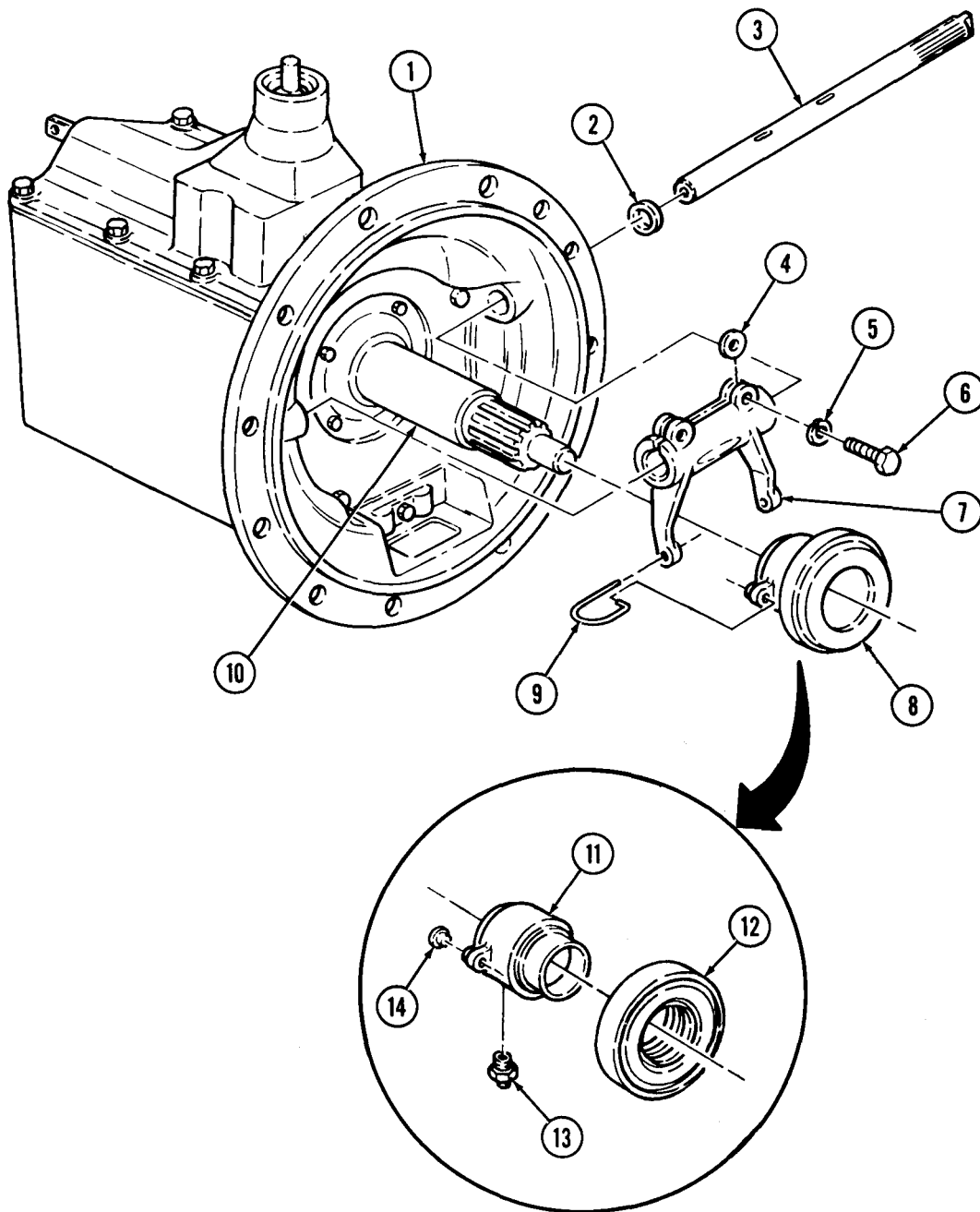
c. Installation

NOTE

Perform step 1 if bearing was replaced.

1. Install bearing (12), two buttons (14), and grease fitting (13) on clutch release bearing housing (11).
2. Install new seal (2) on bell housing of transmission (1).
3. Slide clutch release shaft (3) through transmission (1) and clutch release fork (7). Aline holes in fork (7) with slots in shaft (3).
4. Install two thrust washers (4) on clutch release fork (7) with two new lockwashers (5) and screws (6). Tighten screws (6) 40-50 lb-ft (54-68 N.m).
5. Position clutch release bearing assembly (8) on input shaft (10) and clutch release fork (7).
6. Install clutch release bearing assembly (8) on clutch release fork (7) with two support springs (9).

8-3. CLUTCH RELEASE BEARING, SHAFT, AND FORK REPLACEMENT (Contd)



- FOLLOW-ON TASKS:
- . Lubricate clutch release bearing (LO 9-2320-209-12-1).
 - Lubricate clutch release shaft (LO 9-2320-209-12-1).
 - . Install transmission (para. 8-2).

8-4. TRANSMISSION TOP COVER REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 Torque wrench, 1/2-in. dr. (Appendix B, Item 7)

MATERIALS/PARTS

Gasket (Appendix F, Item 81)
 Eight screw-assembled lockwashers
 (Appendix F, Item 157)

REFERENCES (TM)

TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

- Transmission gearshift lever removed (TM 9-2320-361-20).
- Cab tunnel cover removed (TM 9-2320-361-20).

a. Removal

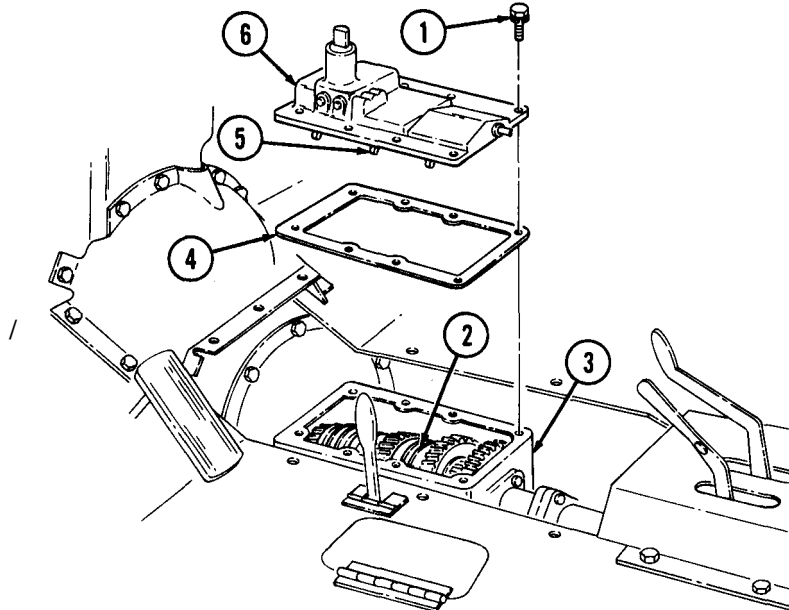
CAUTION

Prevent dirt from entering transmission when performing this task.
 Failure to do so may damage equipment.

Remove eight screw-assembled lockwashers (1), transmission top cover (6), and gasket (4) from transmission (3). Discard screw-assembled lockwashers (1) and gasket (4).

b. Installation

1. Aline shifter forks (5) with synchronizers (2).
2. Install new gasket (4) and transmission top cover (6) on transmission (3) with eight new screw-assembled lockwashers (1). Tighten screw-assembled lockwashers (1) 25-32 lb-ft (34-43 N-m).



FOLLOW-ON TASKS: . Install cab tunnel cover (TM 9-2320-361-20).
 • Install transmission gearshift lever (TM 9-2320-361-20).

CHAPTER 9 TRANSFER CASE MAINTENANCE

9-1. TRANSFER CASE MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
9-2.	Transfer Case Maintenance	9-1
9-3.	Front Axle Engagement Air Cylinder Maintenance	9-6

9-2. TRANSFER CASE MAINTENANCE

THIS TASK COVERS:

- | | |
|---|-------------------------------|
| <p>a. Removal</p> <p>b. Inspection and Repair</p> | <p>c. Installation</p> |
|---|-------------------------------|

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Torque wrench, 1/2-in. dr. (Appendix B, Item 7)
1-1/8-in. socket, 1/2-in. dr. (Appendix B, Item 10)
1-1/16-in. socket, 1/2-in. dr. (Appendix B, Item 11)
Lift, transmission, and differential

MATERIALS/PARTS

Seven locknuts (Appendix F, Item 102)
Six locknuts (Appendix F, Item 103)
Locknut (Appendix F, Item 95)
Two lockwashers (Appendix F, Item 135)
Lockwasher (Appendix F, Item 136)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

LO 9-2320-209-12-1
TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-361-34P
TM 9-2520-246-34-1

EQUIPMENT CONDITION

- Wheels chocked (TM 9-2320-361-10).
- Transfer case drained (LO 9-2320-209-12-1).
- Spare wheel removed (TM 9-2320-361-10).
- Air reservoir drained (TM 9-2320-361-10).
- Cab tunnels removed (TM 9-2320-361-20).
- Front axle propeller shaft removed (TM 9-2320-361-20).
- Transmission to transfer propeller shaft removed (TM 9-2320-361-20).
- Forward rear axle propeller shaft removed (TM 9-2320-361-20).
- Power takeoff propeller shaft removed (vehicles with PTO installed) (TM 9-2320-361-20).
- Rear winch drive chain removed (M756A2 only) (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- Transfer case is heavy and bulky. Allow adequate clearance to remove transfer case from vehicle.
- Ensure transfer case is securely mounted to jack stands with safety chain or strap.
- Use prybar to free transfer case during lifting

9-2. TRANSFER CASE MAINTENANCE (Contd)

a. Removal

1. Remove spring (31) from parking brake lever (30) and bracket (35).

NOTE

Mark threaded end of parking brake cable nut for installation.

2. Remove nut (32) from threaded end (6) of parking brake cable (9) and slide parking brake cable (9) out of parking brake lever (30).
3. Remove screw (5), lockwasher (4), and parking brake cable (9) from parking brake bracket (3) on transfer case (25). Discard lockwasher (4).
4. Remove air line (16) from air cylinder (24) on front of transfer case (25).
5. Remove speedometer drive shaft (38), adapter (37), and adapter drive shaft (36) from transfer case (25).

NOTE

Step 6 applies to vehicles with transfer case PTO installed.

6. Remove locknut (10) from ball pivot end (1) and PTO shift arm (2). Discard locknut (10).

WARNING

- Use prybar to free transfer case during lifting operations. Failure to do so may result in injury to personnel.
 - Ensure transfer case is securely mounted to jack with safety chain or strap. Failure to do so may result in injury to personnel.
 - Transfer case is heavy and bulky. Allow adequate clearance to remove transfer case from vehicle. Failure to do so may result in injury to personnel.
7. Position transfer case jack stand under transfer case (25) and secure transfer case (25) to jack stand with safety chain or strap.
 8. Remove four locknuts (26) and screws (20) from support (28) and mounting plate (18). Discard locknuts (26).
 9. Remove two locknuts (23), washers (22), four bushings (19), two screws (17), and mounting plate (18) from support brackets (21). Discard locknuts (23).
 10. Remove locknut (33), washer (34), two bushings (12), and screw (13) from support brackets (15) and (11). Lower jack stand and remove transfer case (25) from vehicle. Discard locknut (33).
 11. Remove two screws (7), lockwashers (8), and parking brake bracket (3) from transfer case (25). Discard lockwashers (8).
 12. Remove four locknuts (27) and left transfer case support (28) from four studs (29) on transfer case (25). Discard locknuts (27).
 13. Remove two locknuts (14) and right transfer case support (15) from two studs (29) on transfer case (25). Discard locknuts (14).

NOTE

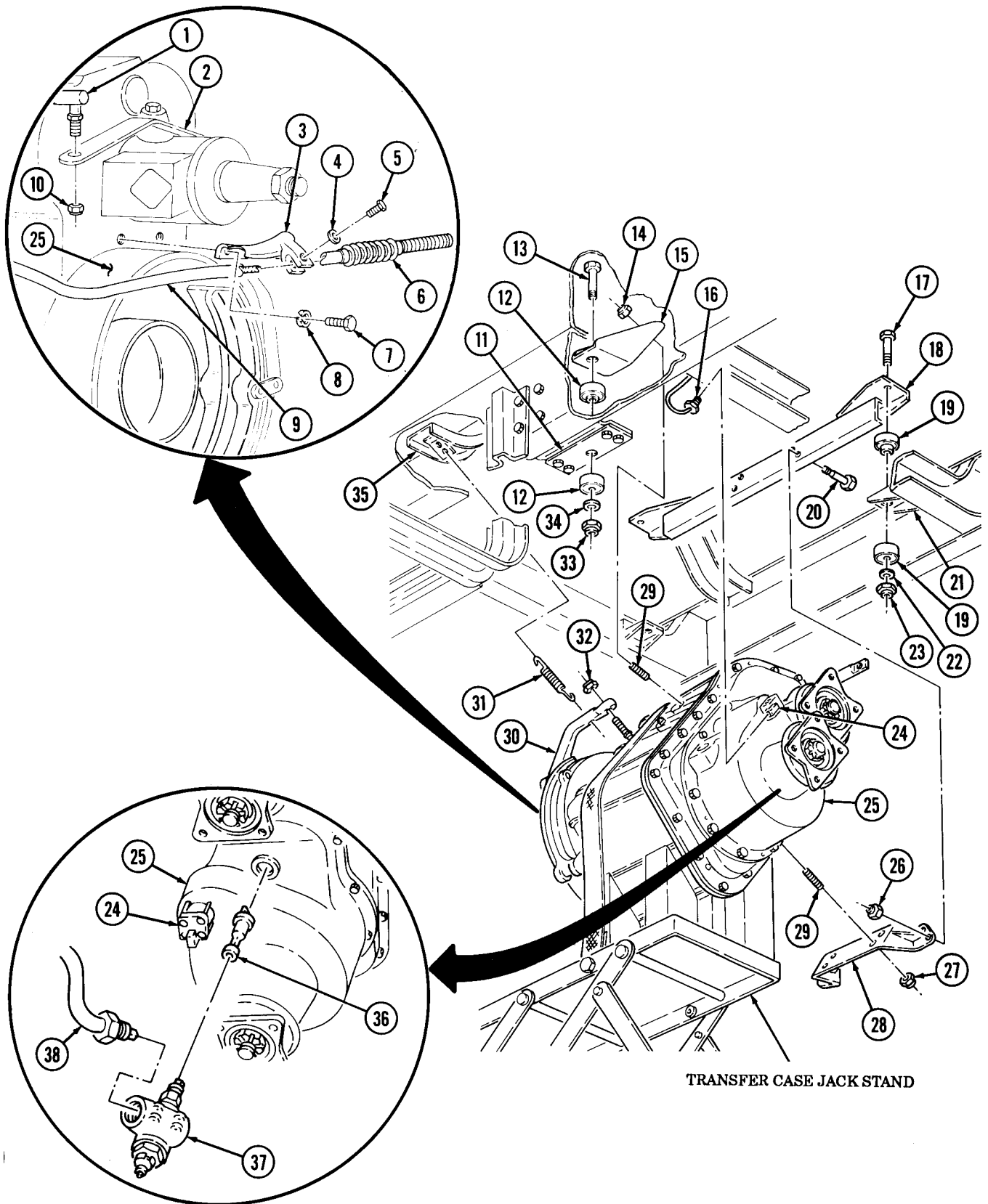
Perform step 14 if stud(s) is damaged.

14. Remove threaded stud(s) (29) from transfer case (25).

b. Inspection and Repair

Inspect and, if necessary, repair transfer case (TM 9-2520-246-34-1).

9-2. TRANSFER CASE MAINTENANCE (Contd)



9-2. TRANSFER CASE MAINTENANCE (Contd)

c. Installation

NOTE

Perform step 1 if stud(s) was removed.

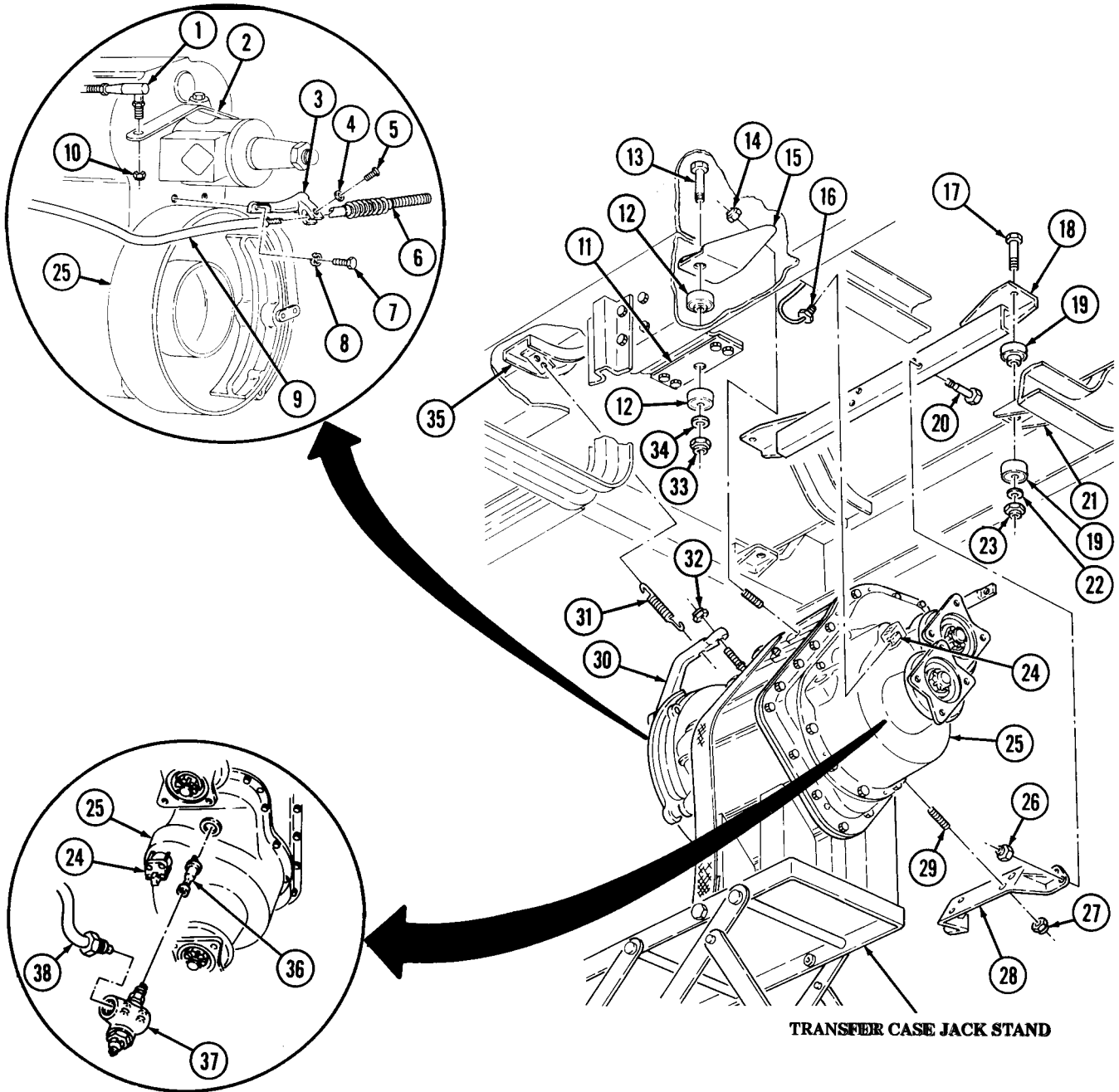
1. Install threaded stud(s) (29) on transfer case (25). Tighten stud(s) (29) 125-135 lb-ft (170-183 N.m).
2. Place transfer case (25) on transfer case jack stand (30). Secure transfer case (25) with safety chain or strap.
3. Install right transfer case support (15) on transfer case studs (29) with two new locknuts (14). Tighten locknuts (14) 125-135 lb-ft (170-183 N.m).
4. Install left transfer case support (28) on transfer case studs (29) with four new locknuts (27). Tighten locknuts (27) 125-135 lb-ft (170-183 N.m).
5. Install parking brake bracket (3) on transfer case (25) with two new lockwashers (8) and screws (7). Tighten screws (7) 60-77 lb-ft (81-104 N.m).
6. Raise transfer case (25) into mounting position underneath vehicle.
7. Install mounting plate (18) on two support brackets (21) with four bushings (19), two washers (22), screws (17), and new locknuts (23). Tighten locknuts (23) 65-75 lb-ft (88-102 N.m).
8. Install left transfer case support (28) on mounting plate (18) with four screws (20) and new locknuts (26). Tighten locknuts (26) 65-70 lb-ft (88-95 N.m).
9. Install right transfer case support (15) to support bracket (11) with screw (13), two bushings (12), washer (34), and new locknut (33). Tighten locknut (33) 65-70 lb-ft (88-95 N.m).
10. Install adapter drive shaft (36), adapter (37), and speedometer shaft (39) on transfer case (25).
11. Install spring (31) on parking brake lever (30) and bracket (35).
12. Slide parking brake cable (9) in parking brake lever (30) and install nut (32) on threaded end (6) of parking brake cable (9).
13. Install parking brake cable (9) on parking brake bracket (3) with new lockwasher (4) and screw (5).
14. Connect air line (16) to air cylinder (24) on front of transfer case (25).

NOTE

Step 15 applies to vehicles with transfer case PTO installed.

15. Install ball pivot end (1) on PTO shift arm (2) with new locknut (10).

9-2. TRANSFER CASE MAINTENANCE (Contd)



TRANSFER CASE JACK STAND

- FOLLOW-ON TASKS:**
- . Install rear winch drive chain (M756A2 only) (TM 9-2320-361-20).
 - . Install power takeoff propeller shaft (vehicles w/PTO) (TM 9-2320-361-20).
 - Install forward rear axle propeller shaft (TM 9-2320-361-20).
 - . Install transmission to transfer propeller shaft (TM 9-2320-361-20).
 - . Install front axle propeller shaft (TM 9-2320-361-20).
 - Install cab tunnels (TM 9-2320-361-20).
 - Install spare wheel (TM 9-2320-361-10).
 - Fill transfer case to proper fluid level (LO 9-2320-209-12-1).
 - Adjust hand brake (TM 9-2320-361-20).

9-3. FRONT AXLE ENGAGEMENT AIR CYLINDER MAINTENANCE

THIS TASK COVERS:

- | | |
|--|-------------------------------|
| <p>a. Removal
b. Cleaning and Inspection</p> | <p>c. Installation</p> |
|--|-------------------------------|

INITIAL SETUP

APPLICABLE MODELS

All

REFERENCES (TM)

TM 9-2320-361-34P

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

EQUIPMENT CONDITION

Transfer case removed (para. 9-2).

MATERIALS/PARTS

Air cylinder parts kit (Appendix F, Item 186)
GM grease (Appendix C, Item 8)

1. Bend four locktabs (4) down and remove four screws (5), locktabs (4), air cylinder cover (3), and brass ring (6) from transfer case (2). Discard locktabs (4) and brass ring (6).
2. Remove air cylinder (11) from transfer case (2).
3. Remove nut (7), washer (8), piston (10), washer (8), and brass ring (6) from shifter shaft (1). Discard washers (8) and brass ring (6).
4. Remove seal (9) from piston (10). Discard seal (9).

b. Cleaning and Inspection

Clean and inspect air cylinder cover (3), air cylinder (11), and piston (10) (paras. 2-8 and 2-9).

C. Installation

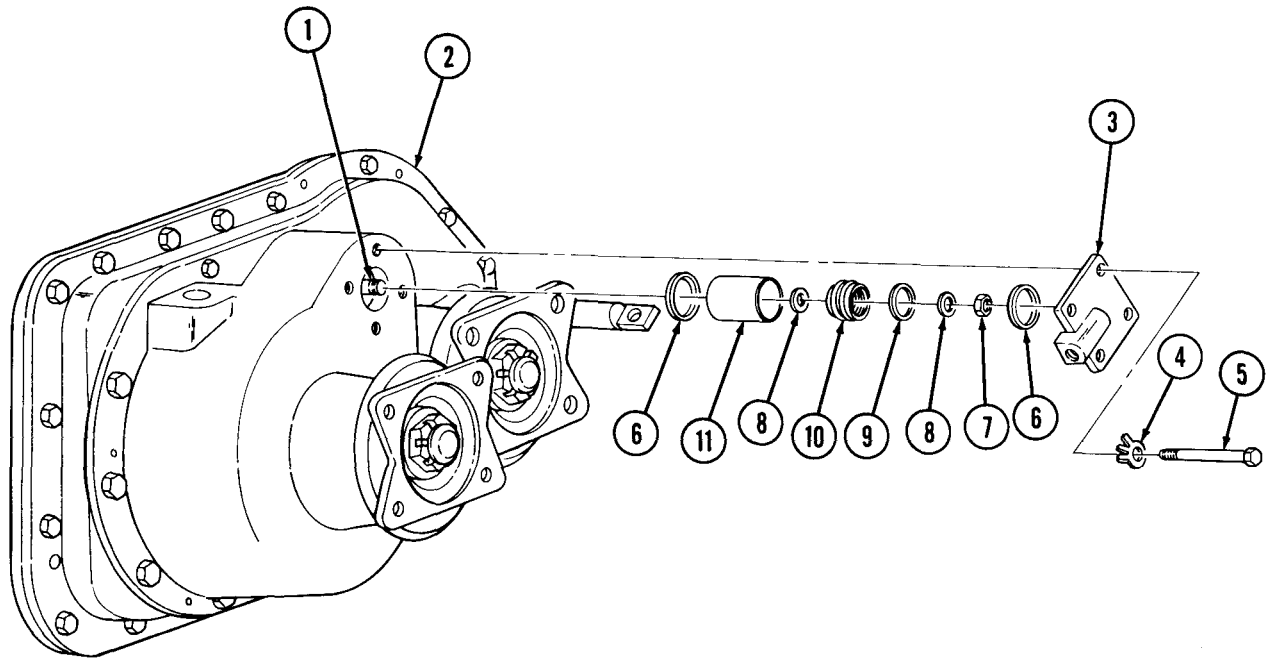
1. Apply a small amount of GAA grease on new seal (9) and install on piston (10).
2. Install piston (10) on shifter shaft (1) with two new washers (8) and nut (7). Tighten nut (7) 48-61 lb-ft (65-83 N.m).

NOTE

Ensure air cylinder cover is installed with air line opening positioned toward bottom of transfer case.

3. Install new brass ring (6), air cylinder (11), new brass ring (6), air cylinder cover (3), four new locktabs (4), and screws (5) on transfer case (2). Tighten screws (5) 5-8 lb-ft (7-11 N.m).
4. Bend locktabs (4) down on transfer case (2) and bend locktabs (4) upon air cylinder screws (5).

9-3. FRONT AXLE ENGAGEMENT AIR CYLINDER MAINTENANCE (Contd)



FOLLOW-ON TASK: Install transfer case (para. 9-2).

CHAPTER 10 AXLES AND SUSPENSION MAINTENANCE

Section I. Front Axle Maintenance (page 10-1)
Section II Rear Axle and Suspension Maintenance (page 10-43)

Section 1. FRONT AXLE MAINTENANCE

10-1. FRONT AXLE MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
10-2.	Front Axle Replacement	10-1
10-3.	Differential Carrier Replacement	10-4
10-4.	Differential Carner Repair	10-6
10-5.	Front and Rear Differential Oil Seal Replacement	10-34
10-6.	Steering Knuckle and Steering Arm Maintenance	10-36

10-2. FRONT AXLE REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Torque wrench, 3/4-in. dr. (Appendix B, Item 6)
- Hydraulic jack
- Jack stands

MATERIALS/PARTS

Eight lockwashers (Appendix F, Item 148)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

- LO 9-2320-209-12-1
- TM 9-2320-361-10
- TM 9-2320-361-20
- TM 9-2320-361-34P

EQUIPMENT CONDITION

- " Parking brake set (TM 9-2-20-36 1-10) .
- Front wheels removed (TM9-2320-361-20).
- Front propeller shaft removed (TM 9-2320-361-20).
- Drag link removed (TM 9-2320-361-20).
- Brake line removed at tee fitting on front axle (TM 9-2320-361-20).
- Front shock absorbers removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- Weight of vehicle must be supported on jack stands at all times.
- Ensure axle is balanced and personnel are clear before lowering axle.

10-2. FRONT AXLE REPLACEMENT (Contd)

WARNING

Weight of vehicle must be supported on jack stands at all times. Do not attempt to support weight of vehicle on hydraulic jack. Injury or death to personnel may result if jack fails.

a. Removal

1. Raise axle (4) with hydraulic jack under differential (3) and place two jack stands under left and right springs (10) between axle (4) and spring (10) hangers.
2. Remove eight nuts (6), lockwashers (7), and two clamp plates (8) from axle (4). Discard lockwashers (7).
3. Remove four U-bolts (1) and two saddle plates (2).

NOTE

Two assistants will help with step 4.

4. Lower axle (4) until it clears vehicle. Remove axle (4) from under vehicle and place on jack stands.

b. Installation

WARNING

Axle is heavy. Ensure axle is balanced and personnel are clear before lowering axle. Failure to do so may result in injury to personnel.

NOTE

Two assistants will help with installation.

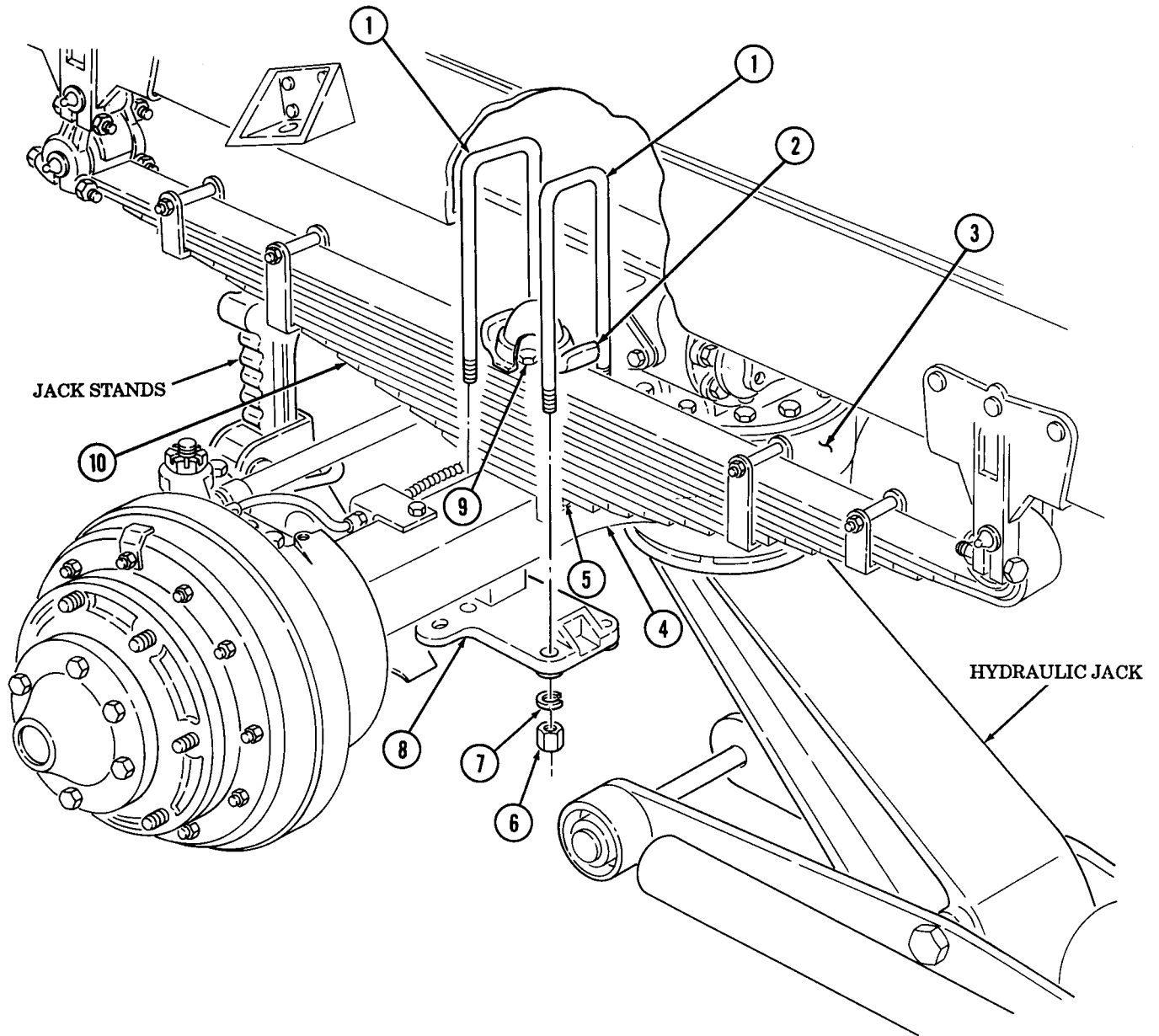
1. Remove axle (4) from jack stands and place under vehicle.
2. Nine spring seats (5) on axle (4) under springs (10).
3. Raise axle (4) until holes in spring seats (5) meet spring centering bolts (9).
4. Install four U-bolts (1) on two saddle plates (2).

NOTE

Install clamp plates with shock absorber mounting holes on outside, toward rear of vehicle, and angled down.

5. Install two clamp plates (8) on four U-bolts (1) with eight new lockwashers (7) and nuts (6). Tighten nuts (6) 190-230 lb-ft (258-312 N.m).

10-2. FRONT AXLE REPLACEMENT (Contd)



- FOLLOW-ON TASKS:**
- . Install front shock absorbers (TM 9-2320-361-20).
 - Install brake line at tee fitting on front axle (TM 9-2320-361-20).
 - Install drag link (TM 9-2320-361-20).
 - . Install front propeller shaft (TM 9-2320-361-20).
 - . Install front wheels (TM 9-2320-361-20).
 - . Fill axle housing with GO 80/90 (LO 9-2320-209-12-1).

10-3. DIFFERENTIAL CARRIER REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

PERSONNEL REQUIRED

Two

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

Torque wrench, 1/2-in. dr.
(Appendix B, Item 7)

Lifting device
Chains

REFERENCES (TM)

LO 9-2320-209-12-1

TM 9-2320-361-20

TM 9-2320-361-34P

EQUIPMENT CONDITION

- . Axle shafts removed (TM 9-2320-361-20).
- Axle assembly removed (para. 10-2 or 10-8).

MATERIALS/PARTS

Gasket (Appendix F, Item 79)

Lubricating oil, GO 80/90 (Appendix C, Item 11)

GENERAL SAFETY INSTRUCTIONS

Personnel must stand clear during lifting operations.

CAUTION

Work area should be clean, well-ventilated, and free from blowing dust and dirt. Damage to equipment could result if the area is not clean.

NOTE

Have drainage container ready to catch oil.

a. Removal

1. Remove drain plug (12) from bottom of housing (6) and drain gear oil.
2. Remove eight nuts (1) and washers (2) from eight studs (3).
3. Loosen four remaining nuts (10) on studs (8).
4. Remove screw (5) and washer (4) from carrier (7).

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

CAUTION

When lifting differential carrier out of axle housing, use care not to damage mounting studs.

NOTE

Assistant will help with steps 5 through 7.

5. Install chains on carrier (7) with washer (4) and screw (5). Attach lifting device on chains.
6. Using lifting device, raise carrier (7) 1/2 in. (1.3 cm) out of housing (6) and remove four remaining nuts (10) and washers (9) from studs (8).
7. Remove carrier (7) from housing (6).
8. Remove gasket (11) from housing (6). Discard gasket (11).
9. Lower carrier (7) to workbench and remove lifting device from chains.
10. Remove screw (5), washer (4), and chains from carrier (7).

10-3. DIFFERENTIAL CARRIER REPLACEMENT (Contd)

b. Installation

1. Install chains on carrier (7) with washer (4) and screw (5).
2. Install new gasket (11) on housing (6).
3. Install lifting device on chain.

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

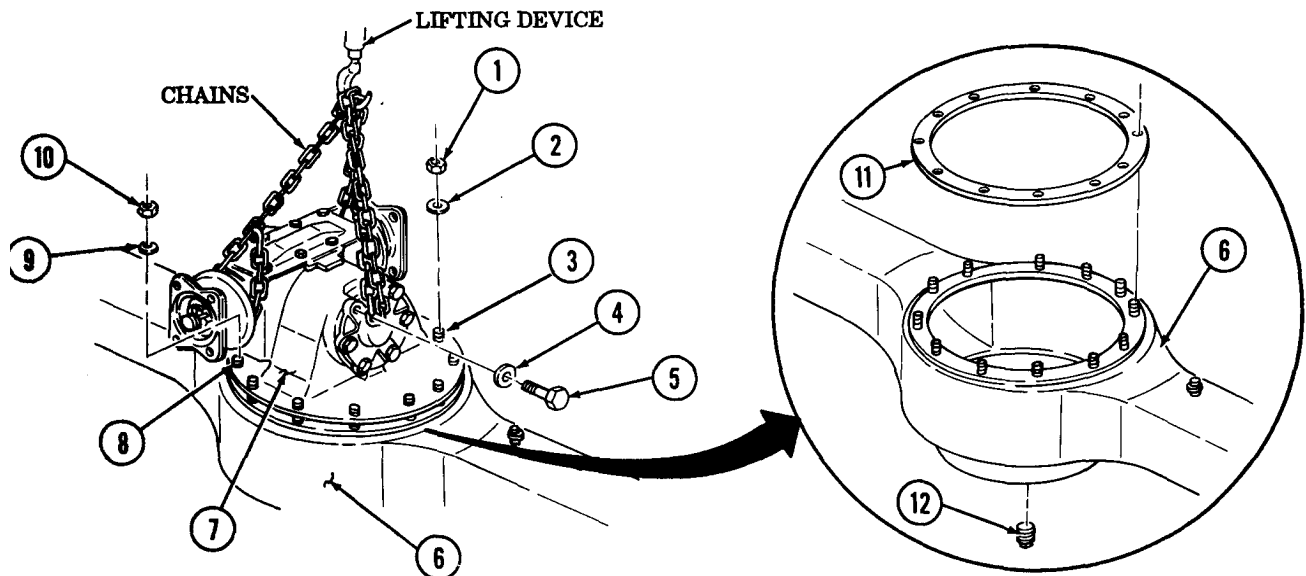
CAUTION

When lowering differential carrier onto axle housing, use care not to damage mounting studs.

NOTE

Assistant will help with steps 4 and 5.

4. Using lifting device, install carrier (7) on housing (6) leaving 1/2 in. (1.3 cm) gap between carrier (7) and housing (6).
5. Install four washers (9) and nuts (10) on studs (8) and lower carrier (7) onto housing (6).
6. Install eight remaining washers (2) and nuts (1) on eight studs (3).
7. Alternately tighten nuts (10) and (1).
8. Remove lifting device from chain.
9. Remove screw (5), washer (4), and chain from carrier (7).
10. Install washer (4) and screw (5) on carrier (7). Tighten screw (5) 65-85 lb-ft (88-115 N.m).
11. Install drain plug (12) on bottom of housing (6). Tighten drain plug (12) 35 lb-ft (48 N.m).



- FOLLOW-ON TASKS:**
- Install axle assembly (para. 10-2 or 10-8).
 - Install axle shafts (TM 9-2320-361-20).
 - Fill axle housing with GO 80/90 oil (LO 9-2320-209-12-1).

10-4. DIFFERENTIAL CARRIER REPAIR

THIS TASK COVERS:

- a. Disassembly
- b. Cleaning and Inspection

- c. Assembly and Adjustment

INITIAL SETUP

APPLICABLE MODELS

All

SPECIAL TOOLS

- Handle (Appendix B, Item 23)
- Oil seal replacer (Appendix B, Item 25)
- Oil seal remover (Appendix B, Item 28)
- Bearing sleeve remover/replacer (Appendix B, Item 24)
- Bearing replacer (Appendix B, Item 26)
- Two puller screws (Appendix B, Item 29)
- Screw (Appendix B, Item 27)

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Mechanical puller kit (Appendix B, Item 23)
- Torque wrench, 1/2-in. dr. (Appendix B, Item 7)
- Torque wrench, 3/4-in. dr. (Appendix B, Item 6)
- Dial indicator (Appendix B, Item 21)
- Inside caliper micrometer (Appendix B, Item 16)
- Outside caliper micrometer (Appendix B, Item 17)
- Gage, force, mechanical (Appendix B, Item 53)
- Arbor press
- Vise

MATERIALS/PARTS

- Eight lockwashers (Appendix F, Item 125)
- Six lockwashers (Appendix F, Item 138)
- Two cotter pins (Appendix F, Item 13)
- Two oil seals (Appendix F, Item 240)
- Gasket and shim set (Appendix F, Item 84)
- Woodruff key (Appendix F, Item 297)
- Blue pigment (Appendix C, Item 14)
- Lubricating oil GO 80/90 (Appendix C, Item 11)
- GAA grease (Appendix C, Item 8)
- Sealing compound (Appendix C, Item 19)
- Safety wire (Appendix C, Item 30)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

- TM 9-214
- TM 9-2320-361-34P

EQUIPMENT CONDITION

Differential carrier removed (para. 10-3).

a. Disassembly

CAUTION

Scribe or center punch different marks on each side of carrier for easy identification. Improper installation will result in damage to parts.

1. Scribe or center punch alignment marks on bearing caps (1) and carrier (17).
2. Remove two safety wires (5), two screws (3), and adjusting nut locks (2) from bearing caps (1). Discard safety wires (5).
3. Remove four screws (4), washers (6), and two bearing caps (1) from carrier (17).

CAUTION

Scribe or center punch different marks on case halves and helical drive gear. Marks should match those placed on bearing caps. Improper installation will result in damage to equipment.

4. Scribe or center punch alignment marks on case halves (12) and (22) and helical drive gear (19).

10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

6. Secure differential gear assembly (18) in vise.
7. Remove safety wire (20), eight nuts (21), and screws (14) from case halves (12) and (22). Discard safety wire (20).
8. Remove case half (12) from helical drive gear (19).
9. Remove spider (7) with four thrust washers (9), pinion gears (8), two side gears (10), and thrust washers (11) from case half (22).

NOTE

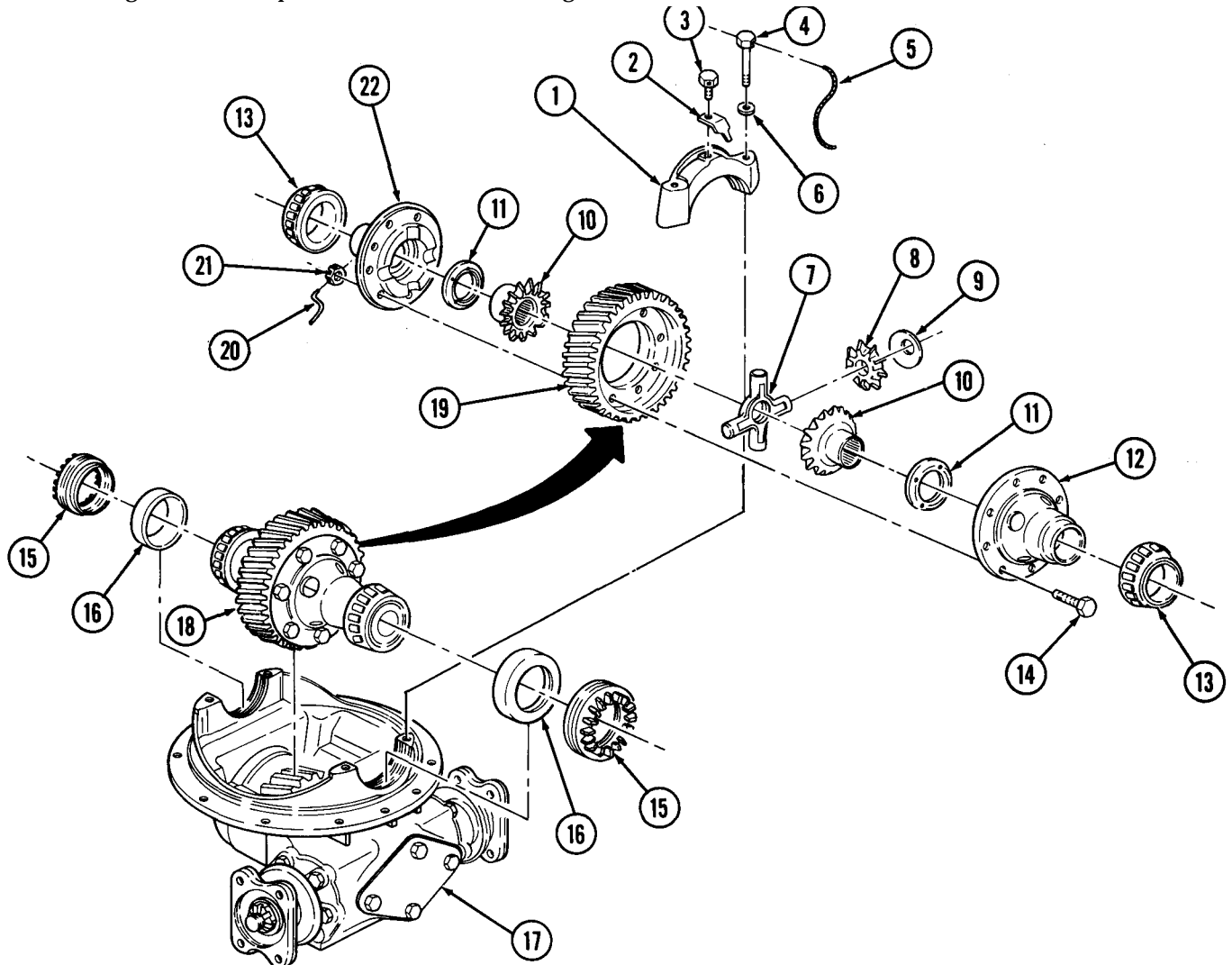
If washers, gears, and spider are not to be replaced, retain them together and proceed to step 12.

10. Remove four thrust washers (9) and pinion gears (8) from spider (7).
11. Remove two side gears (10) and thrust washers (11) from spider (7).
12. Remove helical drive gear (19) from case half (22).

NOTE

Tag bearings for installation.

13. Using mechanical puller, remove two bearings (13) from case halves (12) and (22).



10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

14. Remove eight screws (2), lockwashers (1), top cover (3), and gasket (4) from earner (5). Discard lockwashers (1) and gasket (4).
15. Remove four screws (9), washers (8), inspection cover (7), and gasket (6) from carrier (5). Discard gasket (6).

NOTE

Ensure flanges are secured in vise for easy removal of nuts and washers.

16. Remove two cotter pins (10), nuts (11), and washers (12) from shaft (24). Discard cotter pins (10).
17. Using mechanical puller, remove two flanges (13) with dirt deflectors (14) from shaft (24).

NOTE

Perform step 18 if dirt deflectors are damaged or flanges require replacement.

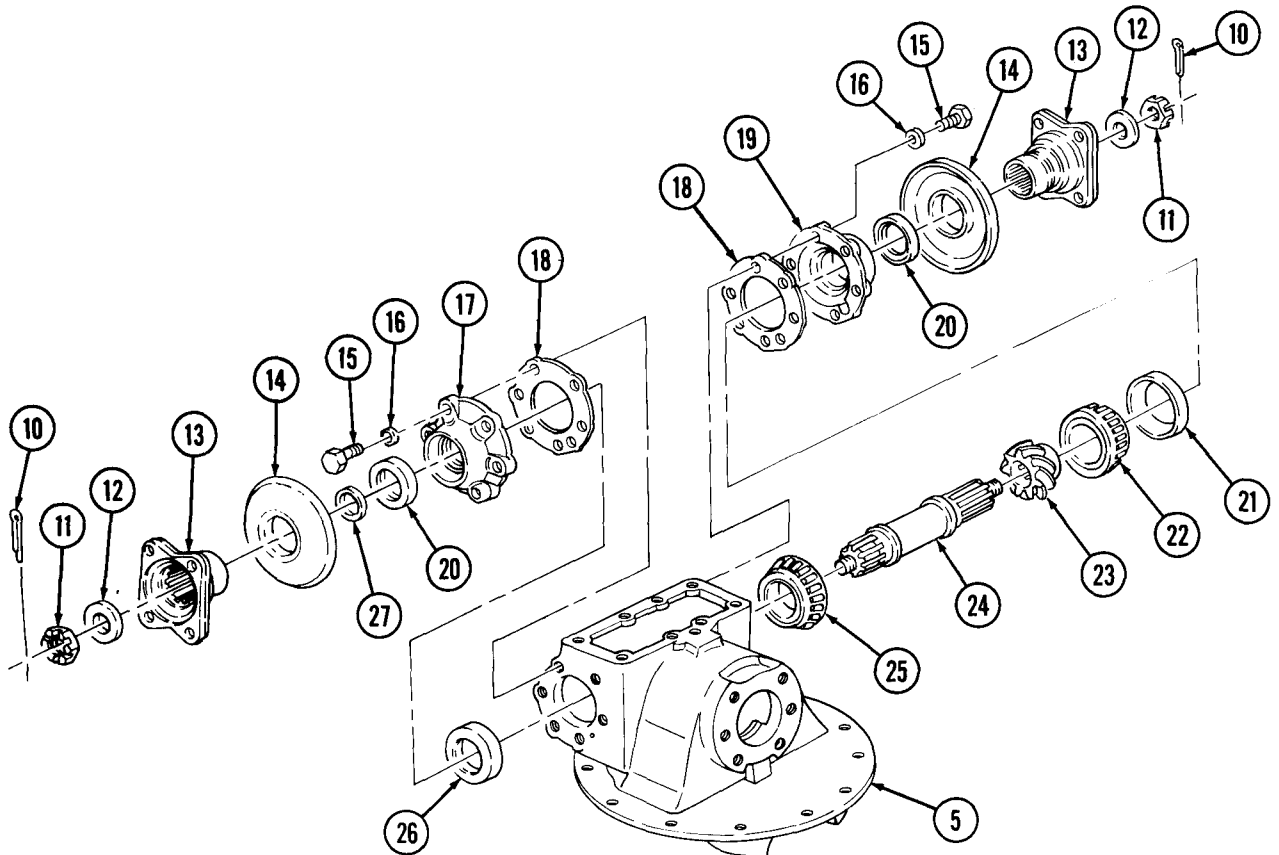
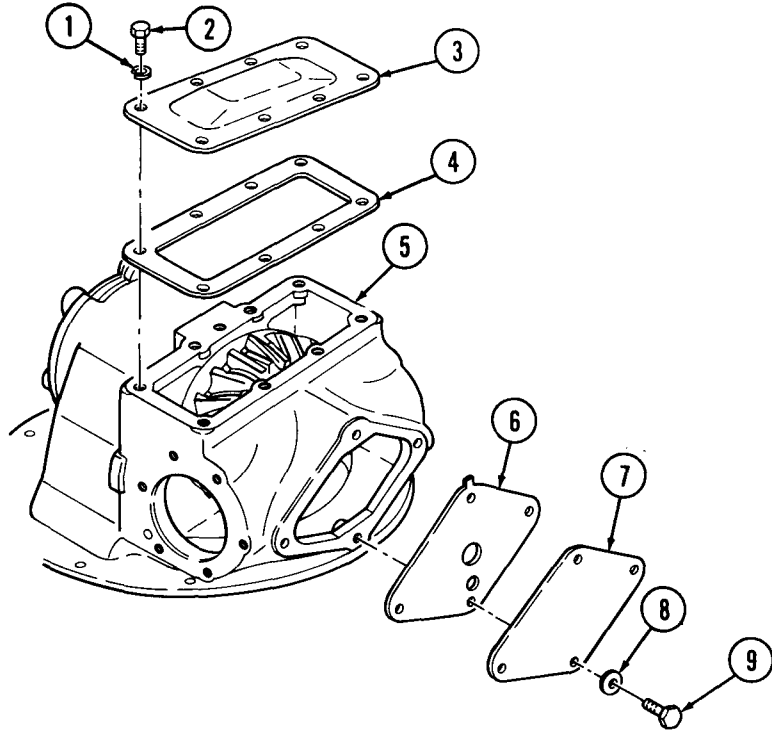
18. Remove two dirt deflectors (14) from flanges (13).
19. Remove twelve screws (15), washers (16), front retainer (17), rear retainer (19), and shims (18) from carrier (5). Record number/thickness of shims (18) removed from front retainer (17) and rear retainer (19). Tie shims (18) to front retainer (17) and rear retainer (19).
20. Remove spacer (27) from shaft (24).
21. Using oil seal remover, remove two oil seals (20) from retainers (17) and (19). Discard oil seals (20).

CAUTION

Use brass drift to remove shaft and bearing seat. Failure to do so may result in damage to shaft and bearing seat.

22. Remove shaft (24) and bearing seat (21) through rear of carrier (5).
23. Remove bearing seat (26) from front of carrier (5).
24. Remove front bearing (25) and pinion (23) with rear bearing (22) from shaft (24).
25. Remove rear bearing (22) from hub of pinion (23).

10-4. DIFFERENTIAL CARRIER REPAIR (Contd)



10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

26. Remove six screws (5), lockwashers (4), bearing cover (3), and shims (2) from carrier (1). Discard lockwashers (4). Record number/thickness of shims (2) removed. Tie shims (2) to bearing cover (3).

NOTE

Use brass drift to hold bevel gear in place while removing screws.

27. Remove safety wire (8), two screws (7), and plate (6) from helical pinion shaft (11). Discard safety wire (8).

CAUTION

Puller screws must be turned evenly until bearing cage is free from earner. Failure to remove cage evenly will result in damage to bearing cage, bearings, and carrier.

28. Remove bearing cage (9) and shims (10) from carrier (1) with two puller screws. Record number/thickness of shims (10) removed. Tie shims (10) to bearing cage (9).

CAUTION

Use brass drift to remove bearings and bearing seat from bearing cage. Failure to do so may result in damage to bearings and bearing seat.

29. Remove bearing seat (12), bearings (13) and (14), and bearing seat (15) from bearing cage (9).

CAUTION

- Support beveled gear with soft spacers. Failure to do so may result in damage to equipment.
- When removing pinion shaft ensure shaft does not become caught on carrier housing. Failure to do so may result in damage to pinion shaft.

30. Press helical pinion shaft (11) from bevel gear (16).

31. Remove woodruff key (21) from helical pinion shaft (11). Discard woodruff key (21).

CAUTION

Use brass drift to remove bevel gear, bearing, and spacer from carrier. Failure to do so may result in damage to gear, bearings, or spacer.

32. Remove bevel gear (16), bearing (20), and spacer (19) from carrier (1).

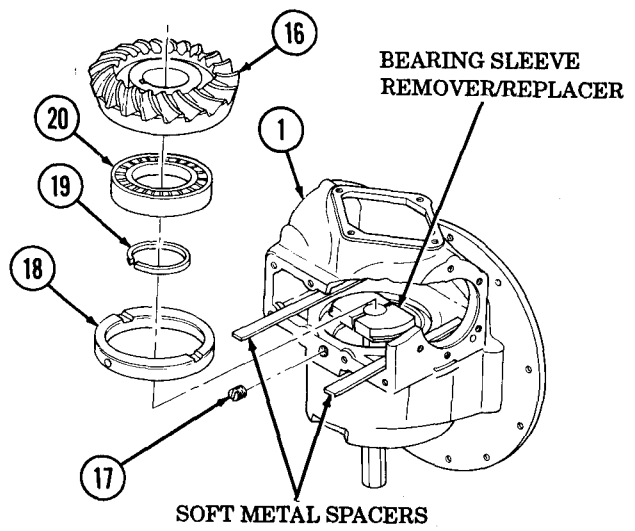
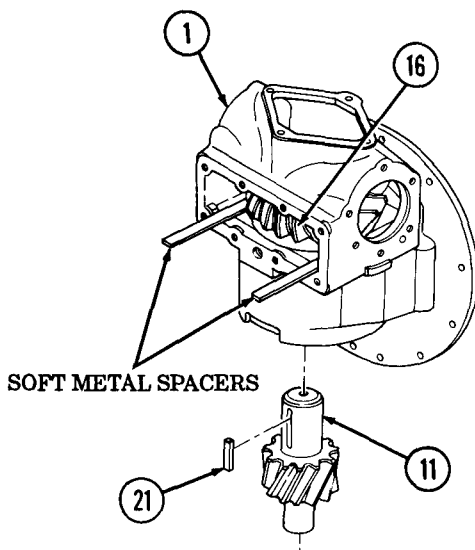
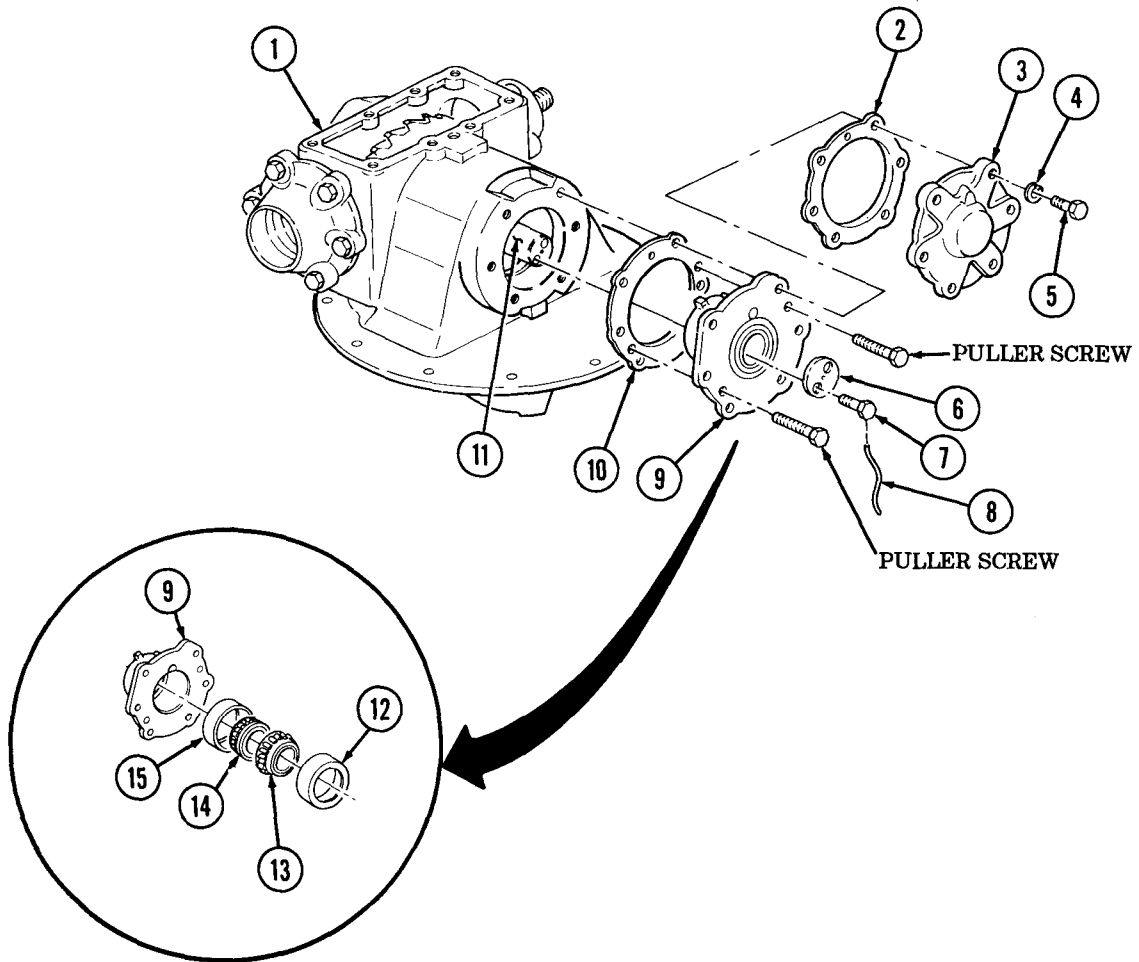
33. Remove spacer (19) from bearing (20).

34. Remove bearing (20) from bevel gear (16).

35. Remove setscrew (17) from carrier (1).

36. Using bearing sleeve remover/replacer, remove sleeve (18) from carrier (1).

10-4. DIFFERENTIAL CARRIER REPAIR (Contd)



10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

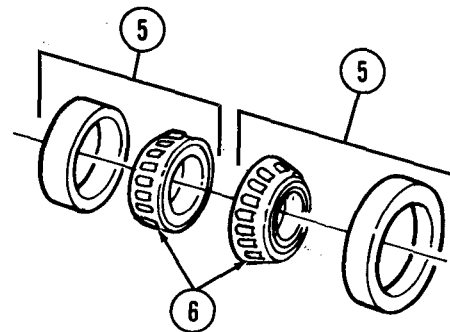
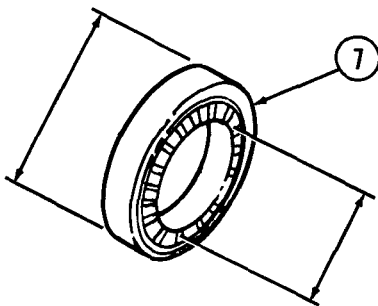
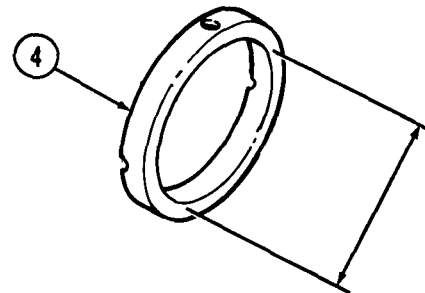
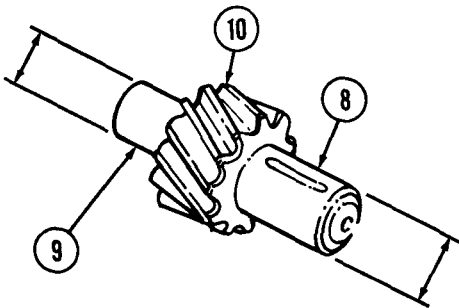
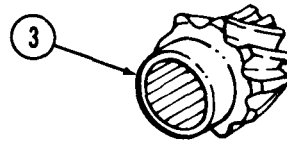
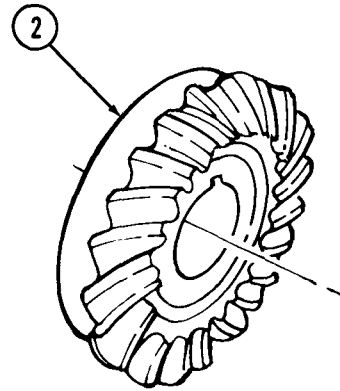
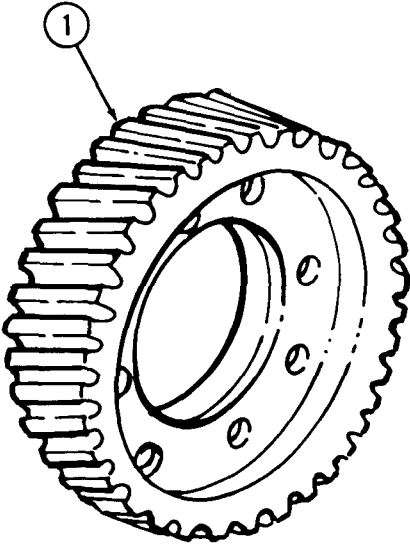
b. Cleaning and Inspection

1. For general cleaning instructions, refer to para. 2-8.
2. Inspect two bearing assemblies (5) and bearing (7) (TM 9-214). Replace bearing assemblies (5) or bearing (7) if damaged.
3. Measure inside diameter of inner race on two bearings (6). Refer to table 10-1, Wear Limits, for measurements. Replace bearings (6) if not within wear limits.
4. Measure inside diameter of bearing (7). Refer to table 10-1, Wear Limits, for measurements. Replace bearing (7) if not within wear limits.
5. Measure outside diameter of bearing (7). Refer to table 10-1, Wear Limits, for measurements. Replace bearing (7) if not within wear limits.
6. Inspect helical pinion gear (10) for chips, breaks, cracks, burrs, or uneven wear. Replace helical pinion gear (10) and helical drive gear (1) if chipped, broken, cracked, burred, or worn unevenly.
7. Measure outside diameter of smaller helical pinion shaft (9). Refer to table 10-1, Wear Limits, for measurements. Replace helical pinion gear (10) and helical drive gear (1) if not within wear limits.
8. Measure outside diameter of larger helical pinion shaft (8). Refer to table 10-1, Wear Limits, for measurements. Replace helical pinion gear (10), bevel gear (2), and pinion (3) if not within wear limits.
9. Inspect bevel gear (2) for chips, breaks, cracks, burrs, or uneven wear. Replace bevel gear (2) and pinion (3) if chipped, broken, cracked, burred, or worn unevenly.
10. Inspect sleeve (4) for chips, cracks, or distortion. Replace sleeve (4) if chipped, cracked, or distorted.
11. Measure inside diameter of sleeve (4). Refer to table 10-1, Wear Limits, for measurements. Replace sleeve (4) if not within wear limits.

Table 10-1. Wear Limits.

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		INCHES	MILLIMETERS
8	Pinion shaft (outside diameter of larger shaft)		
	Used	2.953-2.954	75.01-75.03
	New	2.951-2.952	74.96-75.00
9	Pinion shaft (outside diameter of smaller shaft)	1.625-1.626	41.28-41.30
4	Sleeve (inside diameter)	5.122-5.123	130.10-130.12
7	Bearing		
	Outside diameter	5.117-5.118	129.97-130.00
	Inside diameter	2.9522-2.9528	74.99-75.00
6	Bearing (inside diameter of inner race)	1.6250-1.6255	41.28-41.29

10-4. DIFFERENTIAL CARRIER REPAIR (Contd)



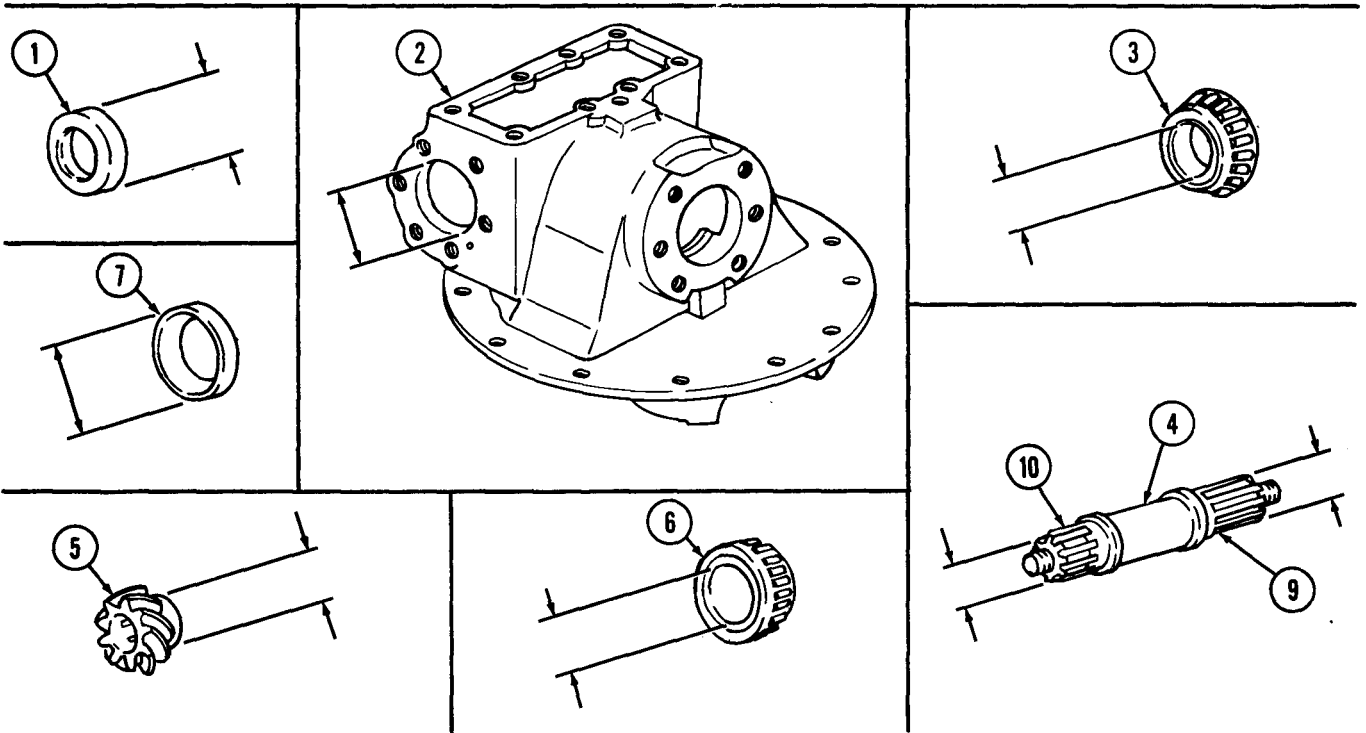
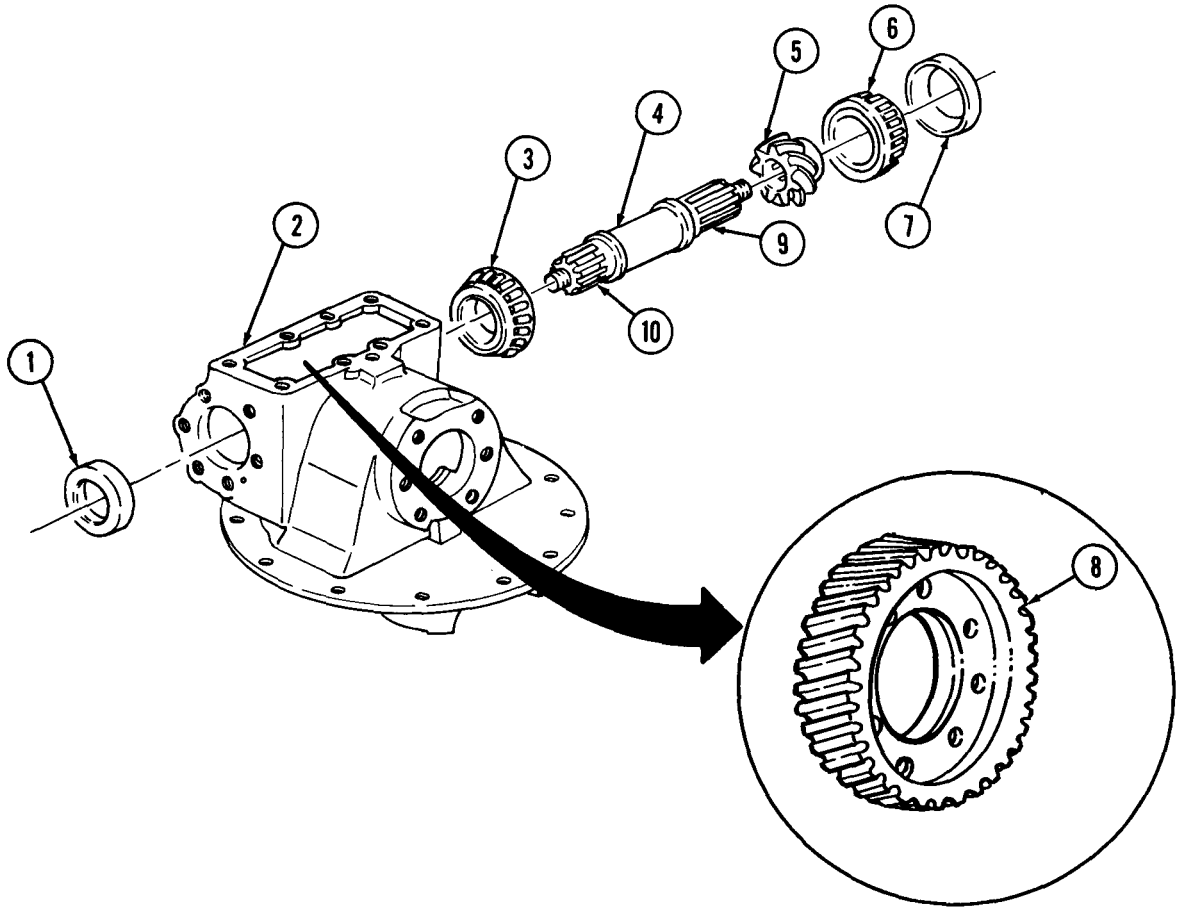
10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

12. Inspect pinion (5) for chips, breaks, cracks, burrs, or uneven wear. Replace pinion (5) and helical drive gear (8) if chipped, broken, cracked, burred, or worn unevenly.
13. Measure outside diameter of hub on pinion (5). Refer to table 10-2, Wear Limits, for measurements. Replace pinion (5) and helical drive gear (8) if not within wear limits.
14. Inspect rear bearing (6) for chips or distortion. Replace bearing (6) if chipped or distorted.
15. Measure inside diameter of inner race on rear bearing (6). Refer to table 10-2, Wear Limits, for measurements. Replace if not within wear limits.
16. Inspect shaft (4) for chips, breaks, cracks, burrs, or uneven wear. Replace if chipped, broken, cracked, burred, or worn unevenly.
17. Measure outside diameter of shaft (4) at spline (10) where front bearing (3) fits. Refer to table 10-2, Wear Limits, for measurements. Replace if not within wear limits.
18. Measure outside diameter of shaft (4) at spline (9) where pinion (5) fits. Refer to table 10-2, Wear Limits, for measurements. Replace if not within wear limits.
19. Inspect bearing (3) for chips or distortion. Replace if chipped or distorted.
20. Measure inside diameter of inner race on front bearing (3). Refer to table 10-2, Wear Limits, for measurements. Replace bearing (3) if not within wear limits.
21. Measure outside diameter of bearing seat (1). Refer to table 10-2, Wear Limits, for measurements. Replace bearing (3) and bearing seat (1) if not within wear limits.
22. Measure outside diameter of bearing seat (7). Refer to table 10-2, Wear Limits, for measurements. Replace rear bearing (6) and bearing seat (7) if not within wear limits.
23. Measure diameter of bearing seats (1) and (7) openings in carrier housing (2). Refer to table 10-2, Wear Limits, for measurements. Replace housing and cap assembly (2) if not within wear limits.

Table 10-2. Wear Limits.

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		INCHES	MILLIMETERS
1	Bearing seat (outside diameter)	3.250-3.251	82.55-82.58
2	Carrier housing (inside diameter):		
	Outer race (1) opening	3.250-3.251	82.55-82.58
	Outer race (7) opening	4.331-4.332	110.01-110.03
3	Bearing (inside diameter of inner race)	1.687-1.688	42.85-42.88
4	Shaft:		
	Outside diameter at front bearing (10) end	1.688-1.689	42.88-42.90
	Outside diameter at pinion (9) end	1.626-1.627	41.30-41.33
5	Pinion (outside diameter of hub)	2.50-2.51	63.51-63.75
6	Bearing (inside diameter of inner race)	2.500-2.501	63.50-63.53
7	Bearing seat (outside diameter)	4.331-4.332	110.01-110.03

10-4. DIFFERENTIAL CARRIER REPAIR (Contd)



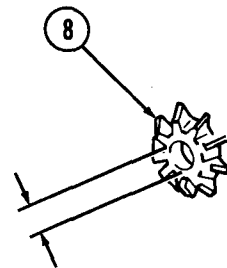
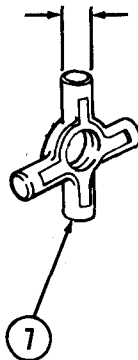
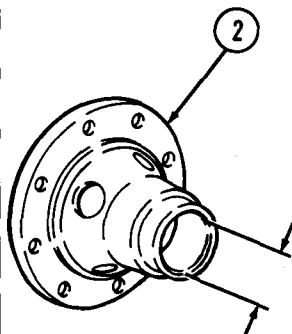
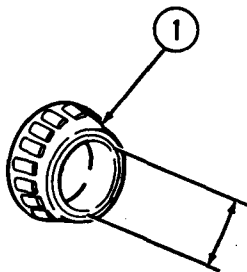
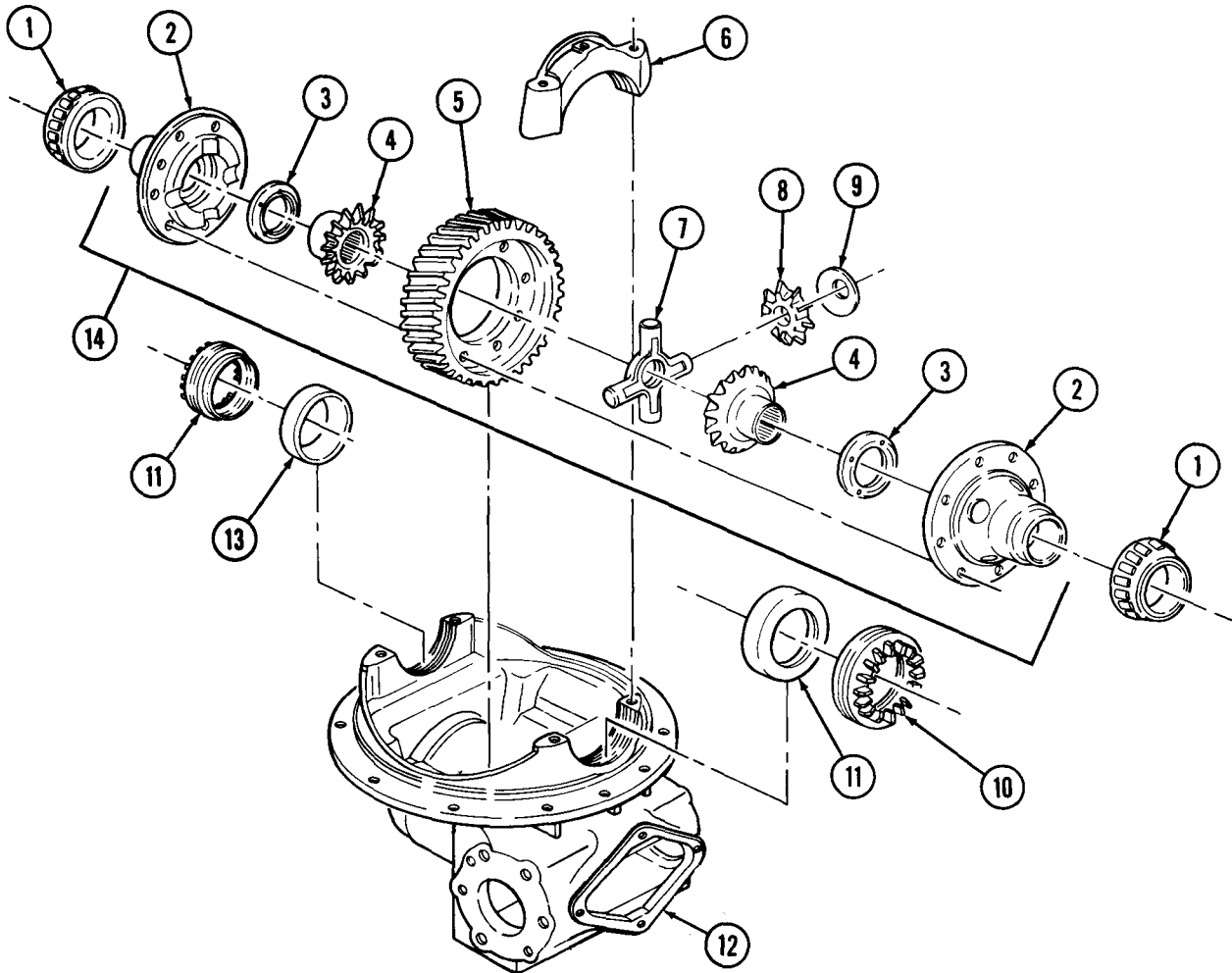
10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

24. Inspect carrier housing (12), two bearing caps (6), and adjusting nuts (10). Replace carrier housing (12) if bearing caps (6) are cracked or distorted. Replace carrier housing (12) or adjusting nuts (10) if cracked, cross-threaded, or stripped.
25. Inspect two bearings (1) and bearing seats (11) and (13) for chips or distortion. Replace bearings (1) or bearing seats (11) and (13) if chipped or distorted.
26. Measure inside diameter of inner race on two bearings (1). Refer to table 10-3, Wear Limits, for measurements. Replace bearings (1) if not within wear limits.
27. Inspect two case halves (2) for chips, cracks, or distortion. Replace differential assembly (14) if case halves are chipped, cracked, or distorted.
28. Measure outside diameter of case halves (2) at point where bearing (1) inner race fits. Refer to table 10-3, Wear Limits, for measurements. Replace differential assembly (14) if case halves (2) are not within wear limits.
29. Inspect helical drive gear (5) teeth for chips, breaks, cracks, burrs, or uneven wear. Replace helical drive gear (5) if teeth are chipped, broken, cracked, burred, or worn unevenly.
30. Inspect two thrust washers (3), side gears (4), four thrust washers (9), pinion gears (8), and spider (7) for chips, breaks, cracks, burrs, or uneven wear. Replace two thrust washers (3), side gears (4), four thrust washers (9), pinion gears (8), and spider (7) if any are chipped, broken, cracked, burred, or worn unevenly.
31. Measure inside diameter of four pinion gears (8). Refer to table 10-3, Wear Limits, for measurements. Replace two thrust washers (3), side gears (4), four thrust washers (9), pinion gears (8), and spider (7) if any pinion gear (8) is not within wear limits.
32. Measure outside diameter of each arm of spider (7). Refer to table 10-3, Wear Limits, for measurements. Replace two thrust washers (3), side gears (4), four thrust washers (9), pinion gears (8), and spider (7) if any arm of spider (7) is not within wear limits.

Table 10-3. Wear Limits.

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		INCHES	MILLIMETERS
1	Bearing (inside diameter of inner race)	2.500-2.501	63.50-63.53
2	Case half (outside diameter)	2.504-2.505	63.60-63.63
7	Spider (outside diameter of arms)	0.87-0.88	22.10-22.35
8	Pinion gear (inside diameter)	0.877-0.879	22.28-22.33

10-4. DIFFERENTIAL CARRIER REPAIR(Contd)



10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

NOTE

Lubricate all parts before assembly.

C. Assembly and Adjustment

1. Press pinion (9) on long end of shaft (10).
2. Press bearing (8) on hub of pinion (9).
3. Press bearing (11) on shaft (10).
4. Install shaft (10) in carrier (12) through opening in rear of carrier (12).

CAUTION

Use brass drift to insert bearing seats in carrier. Failure to do so may result in damage to bearing seats.

5. Install bearing seats (7) and (13) on carrier (12) over bearings (8) and (11).
6. Using oil seal replacer and handle, install new oil seal (6) in front retainer (3) and new oil seal (6) in rear retainer (5).

NOTE

Begin installation of shims with same thickness of shims on front and rear retainer as removed during disassembly.

7. Align holes in shims (4) with holes in retainers (3) and (5) and install shims (4), front retainer (3), shims (4), and rear retainer (5) on carrier (12) with twelve washers (2) and screws (1). Tighten screws (1) 65-85 lb-ft (88-115 N.m).
8. Wrap cable of bearing preload tester around shaft (10) and pull on tester until shaft (10) turns. Proper bearing preload measurement is 7.44-34.04 lb (3.37-15.44 kg).
9. If bearing preload is correct, go to step 14.
10. Remove six screws (1), washers (2), and either retainer (3) or (5) from carrier (12).

NOTE

- If measurement is more than limit, add a shim or use a thicker shim.
- If measurement is less than limit, remove a shim or use a thinner shim.

11. Add or remove shims (4) as necessary.
12. Install retainer (3) or (5) on carrier (12) with six screws (1) and washers (2). Tighten screws (1) 65-85 lb-ft (88-115 N.m).
13. Repeat step 8.
14. Remove six screws (1), washers (2), rear retainer (5), and shims (4) from carrier (12). Tie shims (4) to retainer (6).

CAUTION

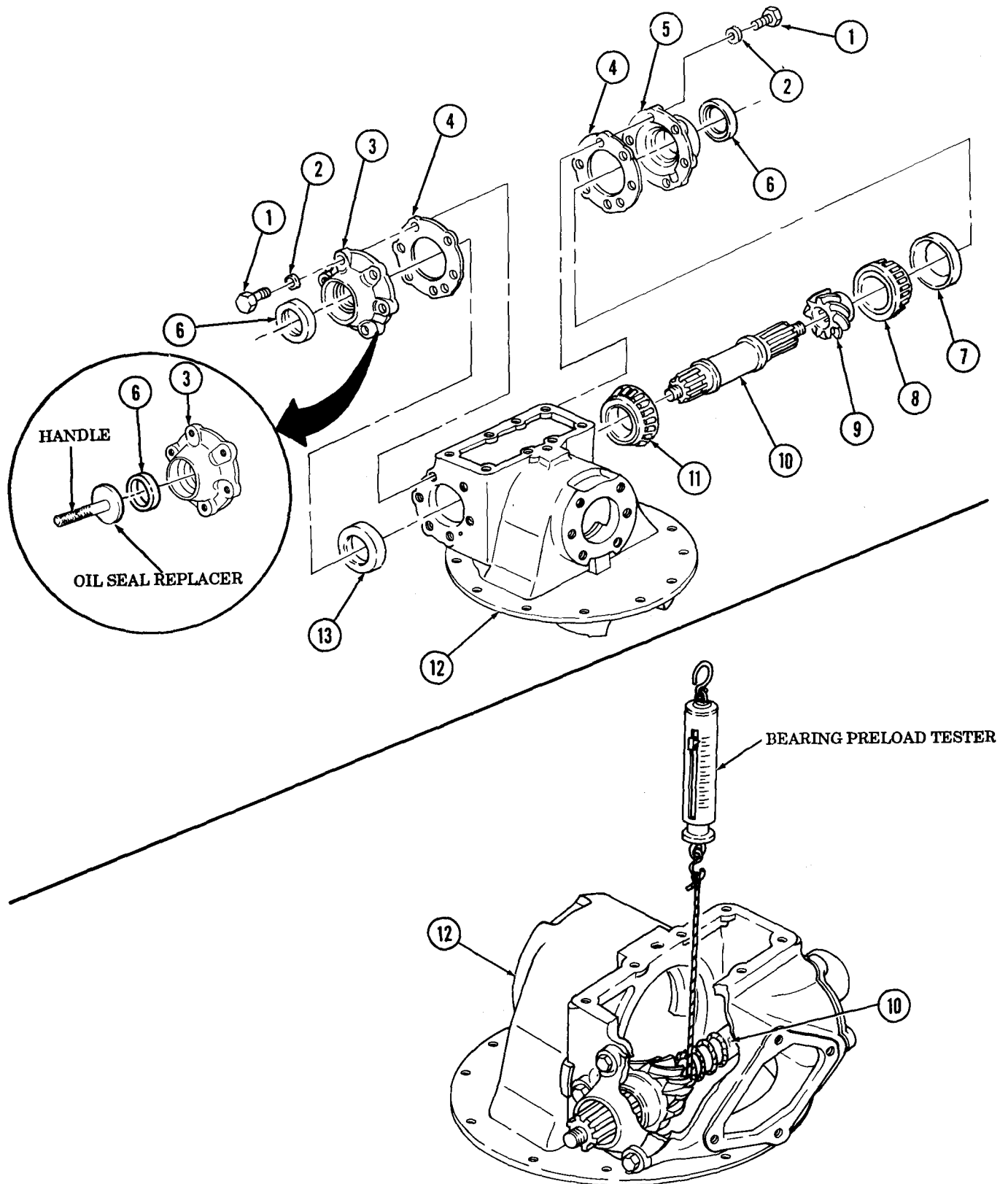
Use brass drift to remove shaft from carrier. Failure to do so may result in damage to shaft.

NOTE

Do not remove bearings or pinion from shaft.

15. Remove bearing seat (7) and shaft (10) through hole in rear of carrier (12).

10-4. DIFFERENTIAL CARRIER REPAIR (Contd)



10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

16. Using bearing sleeve remover/replacer and screw, align hole in sleeve (1) with setscrew (7) hole in carrier (2) and install sleeve (1) in carrier (2).
17. Install setscrew (7) in carrier (2) and sleeve (1).

NOTE

Install bearing with beveled side toward gear.

18. Press bearing (4) on bevel gear (3).
19. Install spacer (8) on bevel gear (3) until seated against bearing (4).

CAUTION

Use brass drift to install bevel gear. Failure to do so may result in damage to gear.

20. Install bevel gear (3) in carrier (2) so bevel gear (3) rests in sleeve (1).
21. Install key (6) on helical pinion shaft (5).

CAUTION

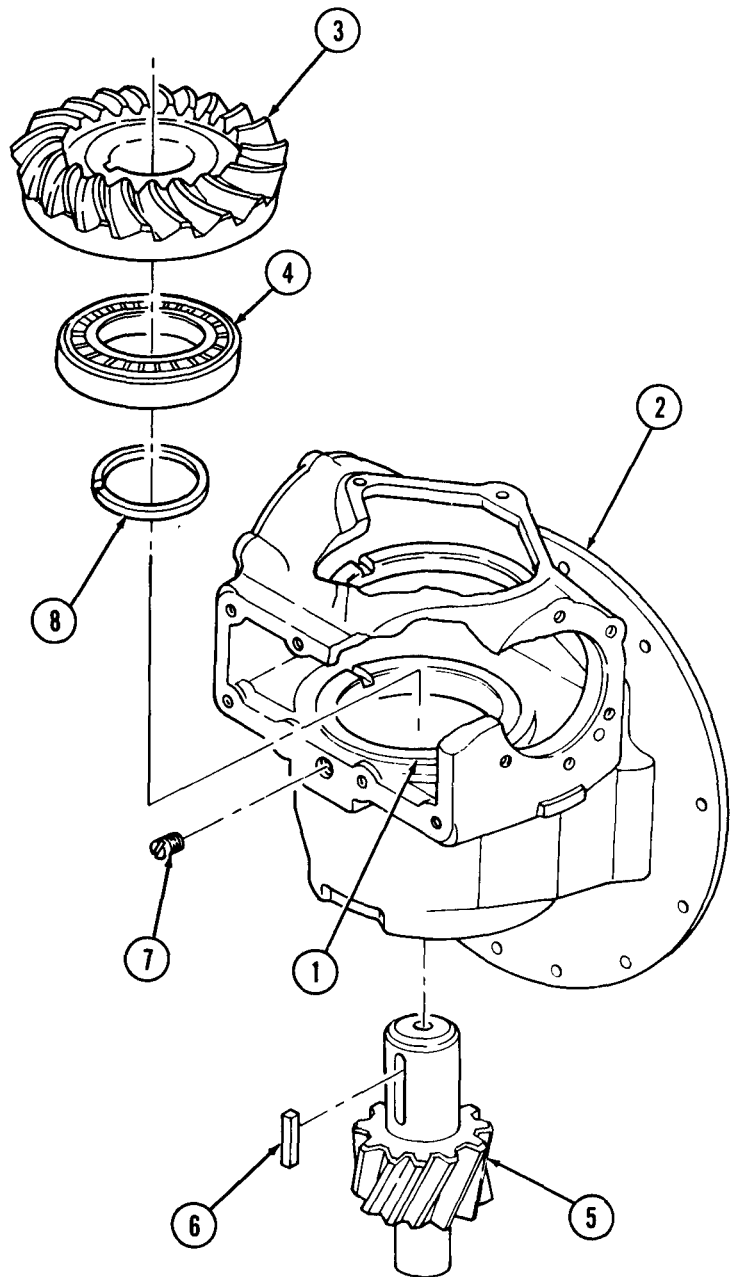
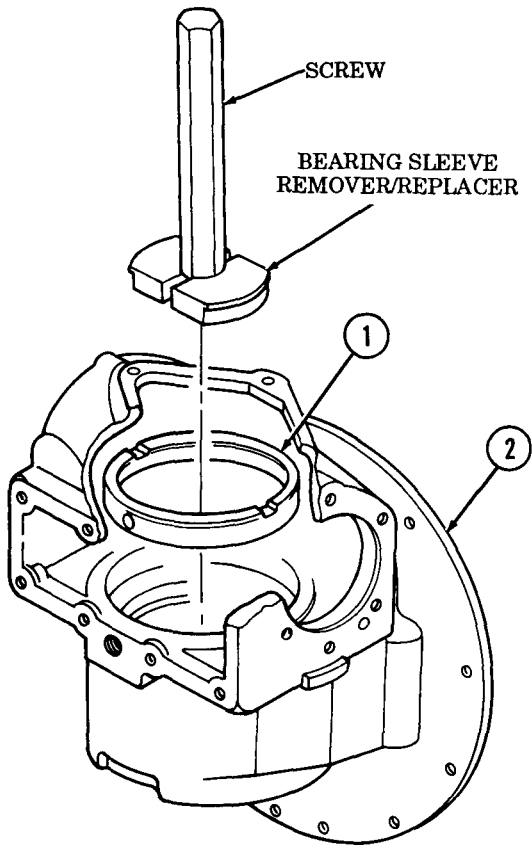
Use soft metal spacers to securely support bevel gear on sleeve during installation. The bevel gear must not be able to move within the housing. Failure to do so may result in damage to bevel gear and/or housing.

NOTE

Ensure alignment of key in helical pinion shaft with keyway in bevel gear.

22. Press pinion shaft (5) through carrier (2) into bevel gear (3).

10-4. DIFFERENTIAL CARRIER REPAIR (Contd)



10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

23. Seat bearing seat (17) in bearing cage (13).

NOTE

- Begin installation of shims with same thickness of shims on carrier as removed during disassembly.
- When installing cage, bearings, and races, hold bevel gear in place with soft spacers.

24. Aline holes in shims (14) with holes in bearing cage (13) and install shims (14) and bearing cage (13) on carrier (16).
25. Using bearing replacer and arbor press, install bearings (18) and (20) and bearing seat (19) in bearing cage (13).

NOTE

Secure bevel gear with brass drift to prevent rotation.

26. Install plate (11) on helical pinion shaft (15) with two screws (12). Tighten screws (12) 60-77 lb-ft (81-104 N.m).
27. Inspect carrier (16) for metal shavings. Clean carrier (16) of all shavings.
28. Aline holes in shims (8) with holes in bearing cover (9).

NOTE

- Ensure even installation of bearing cage by evenly tightening screws.
- Begin installation with same thickness of shims on cage as removed during disassembly.

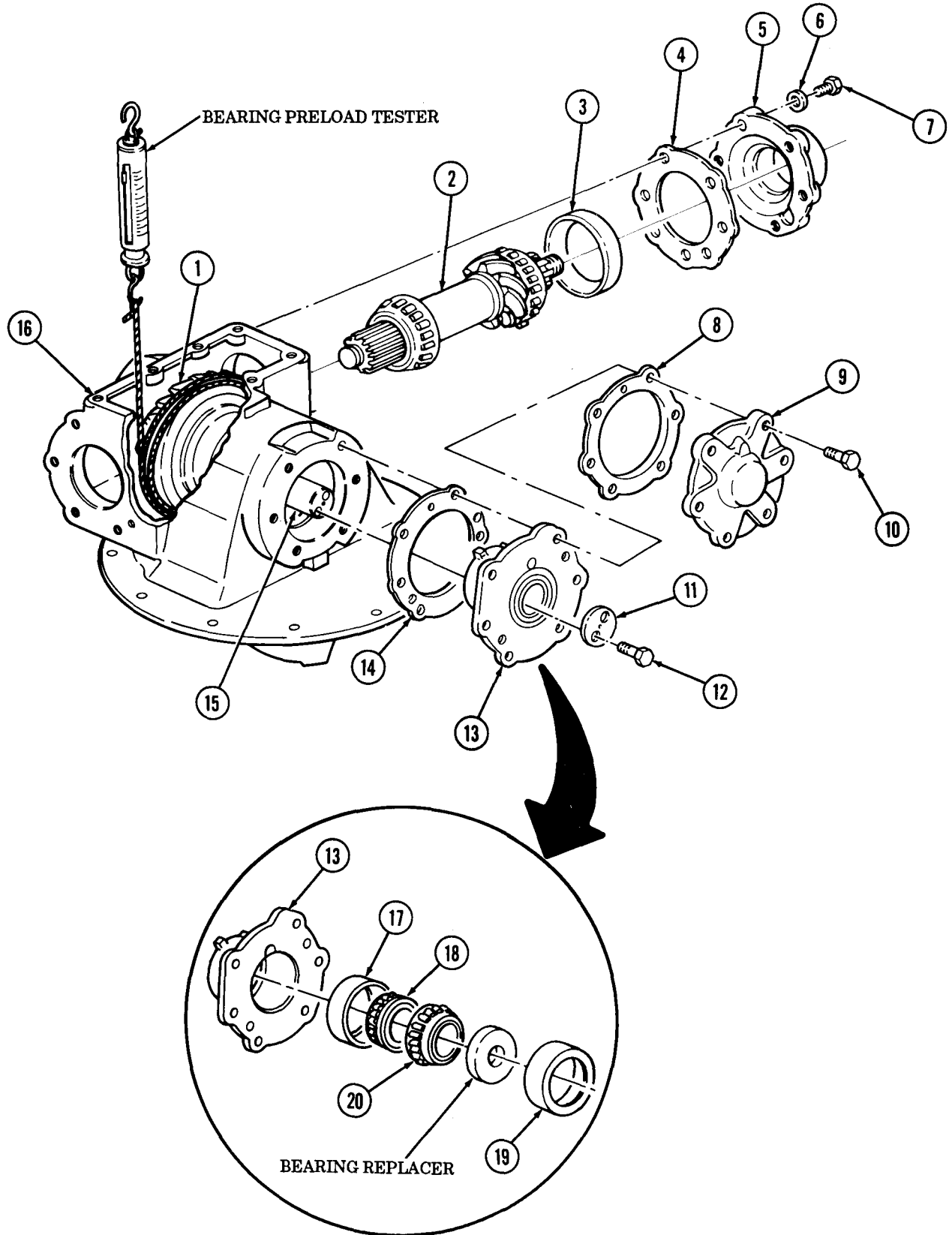
29. Install shims (8) and bearing cover (9) on bearing cage (13) and carrier (16) with six screws (10). Tighten screws (10) 65-85 lb-ft (88-115 N.m).
30. Wrap cable of bearing preload tester around bevel gear (1) and pull on tester until helical pinion shaft (15) turns. Record measurement. Proper measurement is 2.4-7.1 lbs (1.1-3.2 kg).
31. If bearing preload is correct, go to step 35.
32. Remove six screws (10) and bearing cover (9) from bearing cage (13) and carrier (16).

NOTE

- If measurement in step 30 is more than limit, add a shim or use a thicker shim.
- If measurement in step 30 is less than limit, remove a shim or use a thinner shim.

33. Add or remove shims (8) as necessary.
34. Repeat steps 29 and 30.
35. Install shaft (2) and bearing seat (3) in carrier (16) through opening in rear of carrier (16).
36. Install shims (4) and retainer (5) on carrier (16) with six washers (6) and screws (7). Tighten screws (7) 65-85 lb-ft (88-115 N.m).

10-4. DIFFERENTIAL CARRIER REPAIR (Contd)



10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

NOTE

Ensure pinion shaft is secured to prevent rotation.

37. Install dial indicator on carrier (1) and position plunger against tooth of bevel gear (2).
38. Measure backlash between bevel gear (2) and helical pinion (3). Proper backlash is 0.005-0.015 in. (0.013-0.038 cm).
39. If backlash is correct, go to step 48.
40. Remove six screws (6), bearing cover (5), and shims (4) from carrier (1). Tie shims (4) to bearing cover (3).

NOTE

Secure bevel gear with brass drift to prevent rotation of bevel gear.

41. Remove two screws (8) and plate (9) from helical pinion shaft (12).
42. Remove bearing cage (10) from carrier (1) with two puller screws.

NOTE

- If backlash is greater than 0.015 in. (0.038 cm), remove a shim or use a thinner shim.
- If backlash is less than 0.005 in. (0.013 cm), add a shim or use a thicker shim.
- Ensure even installation of bearing cage by evenly tightening screws.

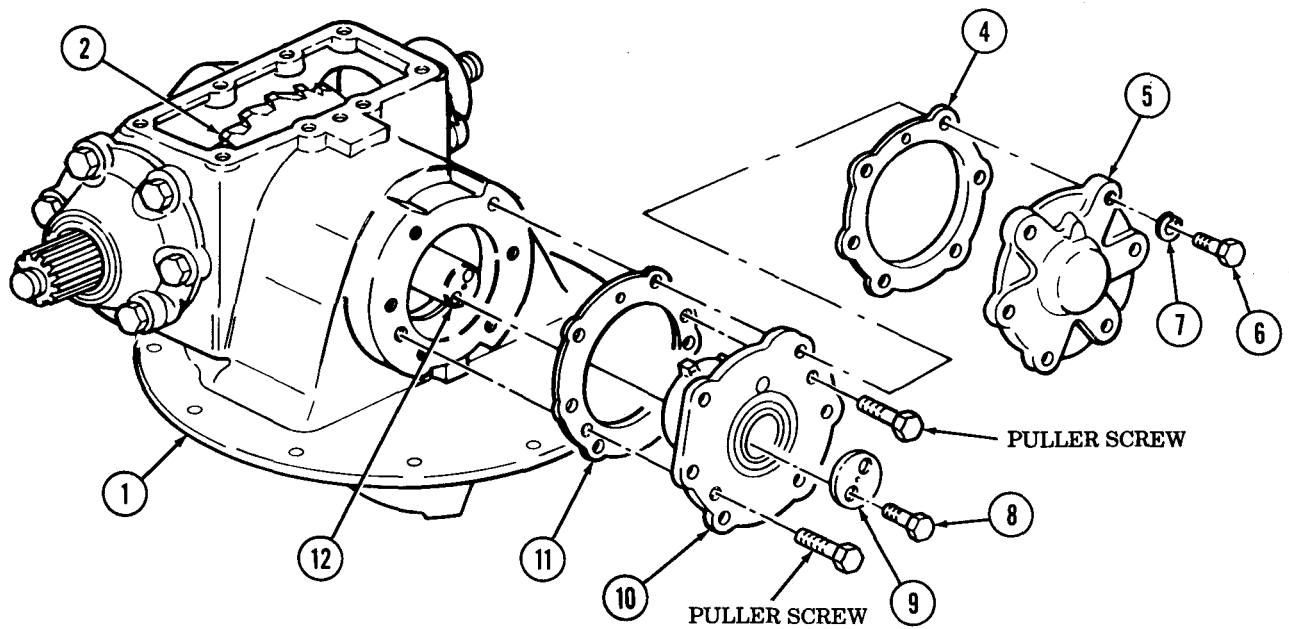
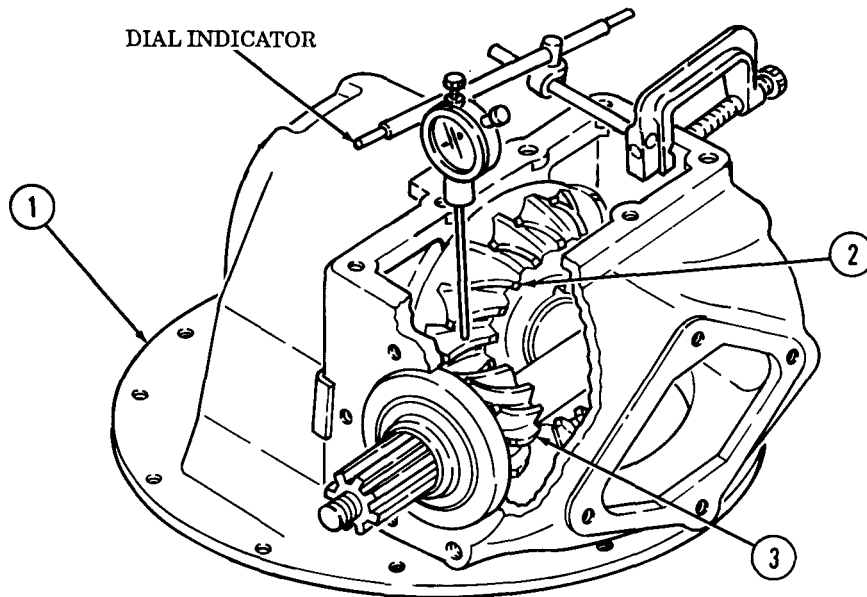
43. Add or remove shims (11) as necessary.
44. Aline hole in shims (11) with holes in bearing cage (10) and install bearing cage (10) and shim (11) and two puller screws on carrier (1).

NOTE

Secure bevel gear with brass drift to prevent rotation of bevel gear.

45. Install plate (9) on helical pinion shaft (12) with two screws (8). Tighten screws (8) 60-77 lb-ft. (81-104 N.m).
46. Aline holes in shims (4) with holes in bearing cover (5), and install shims (4) and bearing cover (5) on carrier (1) with screws (6). Tighten screws (6) 65-85 lb-ft (88-115 N.m).
47. Repeat steps 37 and 38.
48. Remove dial indicator from carrier (1).

10-4. DIFFERENTIAL CARRIER REPAIR (Contd)



10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

49. Coat teeth of pinion (7) with blue pigment.
50. Install flange (10) on pinion (7) end of shaft (8).
51. Turn flange (10) clockwise one-half to one turn.
52. Inspect teeth of bevel gear (2). Note pattern of contact marks. Pattern "A" shows correct tooth contact.

CAUTION

When correcting tooth contact, always add or remove equal number and thickness of shims for each end of shaft with pinion gear. Bearing preload will change if shims are interchanged unequally.

53. If tooth contact pattern is correct, clean blue pigment from teeth of pinion (7) and bevel gear (2) and go to step 64.
54. Remove six screws (13), bearing cover (12), and shims (11) from carrier (1). Tie shims (11) to bearing cover (12).

NOTE

Secure bevel gear with brass drift to prevent rotation of bevel gear.

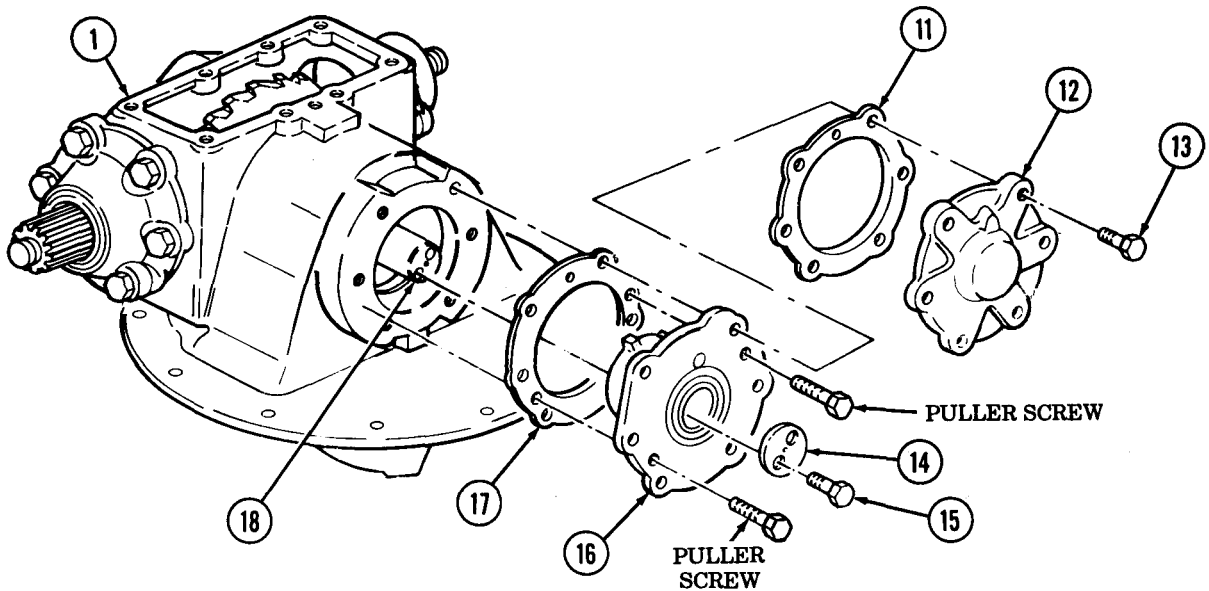
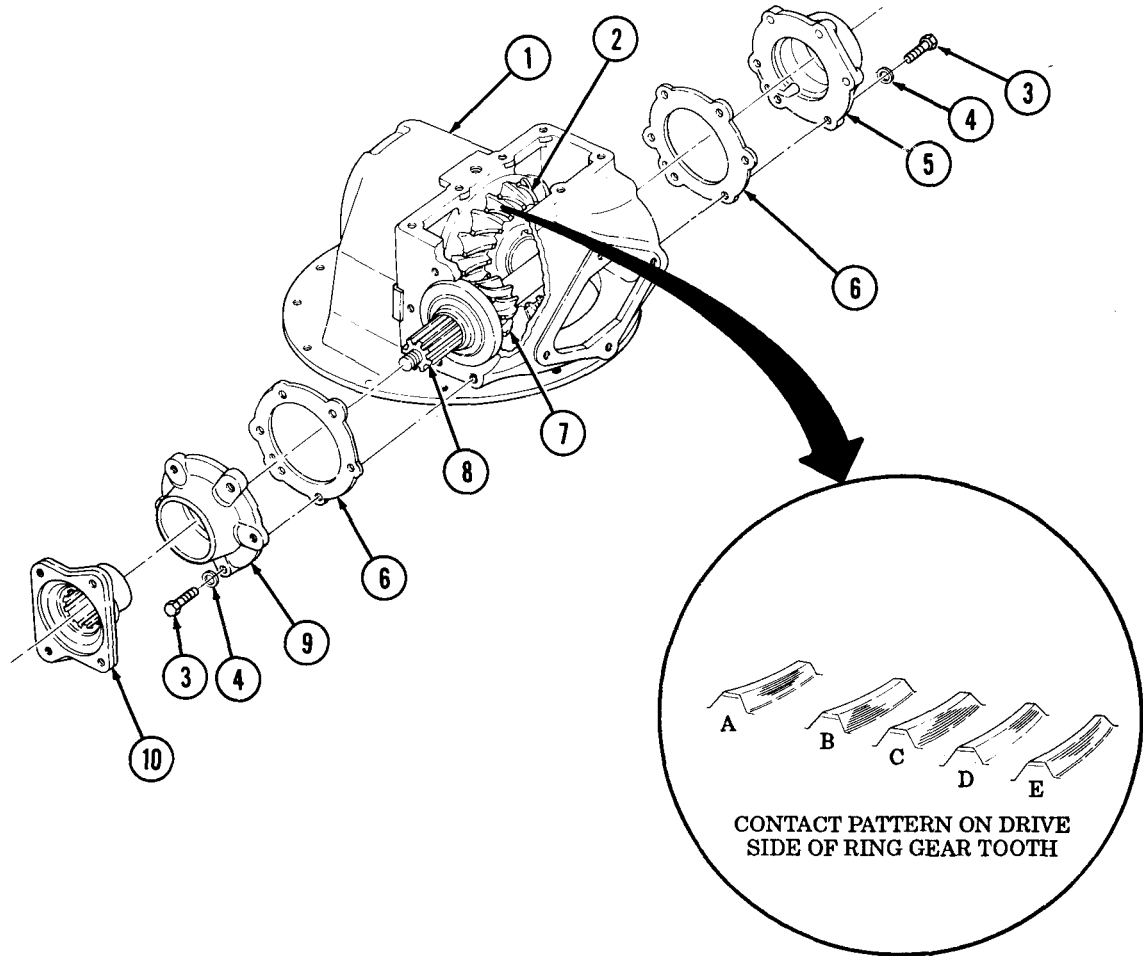
55. Remove two screws (15) and plate (14) from pinion shaft (19).
56. Remove bearing cage (16) from carrier (1) with two puller screws.
57. Remove flange (10), six screws (3), washers (4), rear retainer (9), and shims (6) from carrier (1). Tie shims (6) to rear retainer (9).
58. Remove six screws (3), washers (4), front retainer (5), and shims (6) from carrier (1). Tie shims (6) to front retainer (5).

NOTE

- If tooth contact pattern is "B," remove a shim from rear retainer, and add a shim to front retainer. Add a shim to bearing cage.
- If tooth contact pattern is "C," remove a shim from rear retainer and add a shim to front retainer. Remove a shim from bearing cage.
- If tooth contact pattern is "D," remove a shim from front retainer and add a shim to rear retainer. Add a shim to bearing cage.
- If tooth contact pattern is "E," remove a shim from front retainer and add a shim to rear retainer. Remove a shim from bearing cage.

59. Remove or add shims (6) and/or (16) to front retainer (5), rear retainer (9), and bearing cage (15), as necessary.
60. Aline holes in shims (17) and bearing cage (16), and install shims (17), bearing cage (16), shims (11), and bearing cover (12) (steps 24 and 26 through 29) on carrier (1).
61. Aline holes in shims (6) with holes in retainers (5) and (9) and install shims (6), front retainer (5), shims (6), and rear retainer (9) on carrier (1) with twelve washers (4) and screws (3).
62. Clean blue pigment from teeth of pinion (7) and bevel gear (2).
63. Repeat steps 49 through 52.
64. Remove six screws (13), bearing cover (12), and shims (11) from carrier (1).

10-4. DIFFERENTIAL CARRIER REPAIR (Contd)



10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

65. Install new safety wire (11) on two screws (10).
66. Install bearing cover (8) and shims (9) on carrier (12) with six new lockwashers (6) and screws (7). Tighten screws (7) 65-85 lb-ft (88-115 N.m).
67. Remove flange (4) from pinion end of shaft (13).
68. Perform step 69 if dirt deflectors (5) were removed.
69. Install two dirt deflectors (5) on two flanges (4).

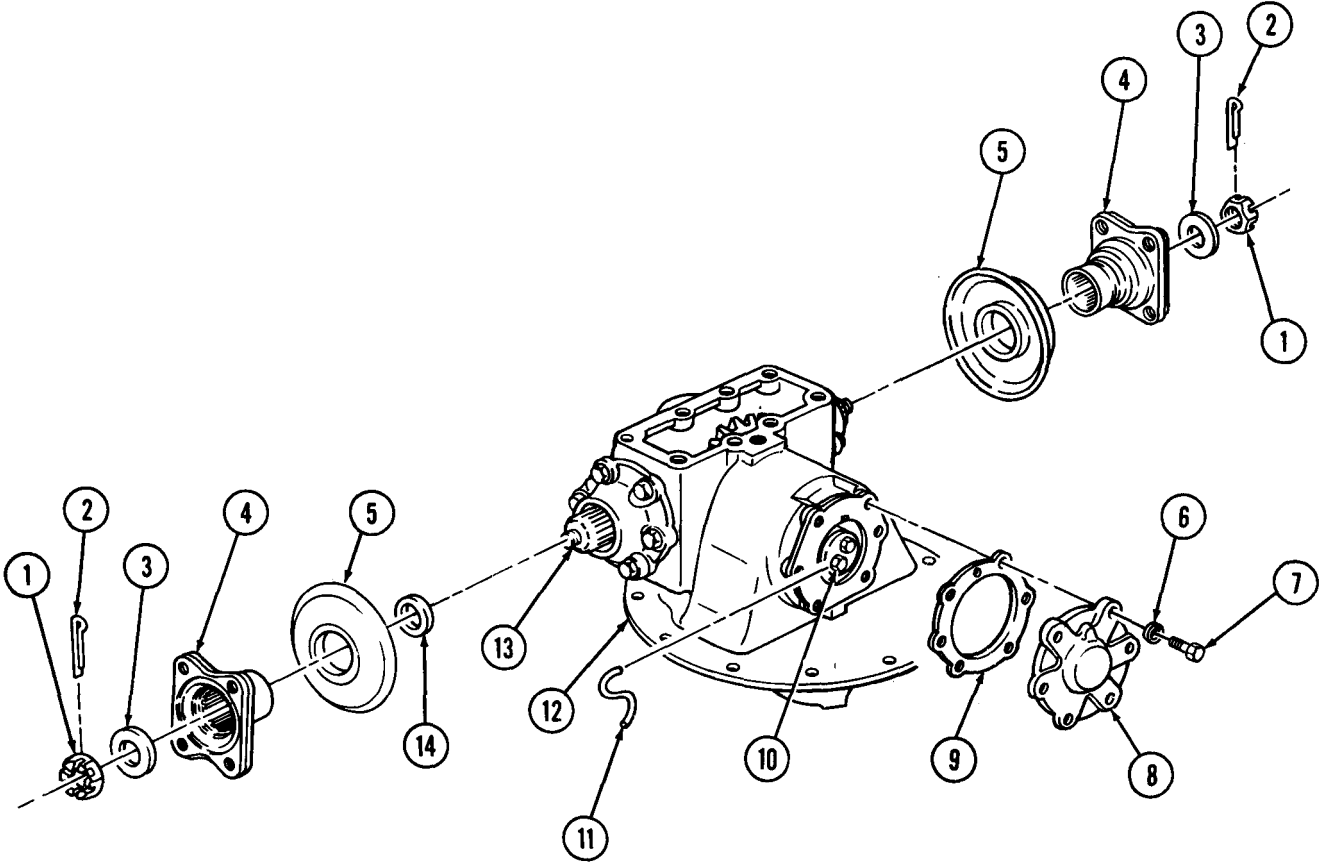
NOTE

\ Apply light coat of GM grease to splines of flanges before installation.

- Flanges must be installed with four holes alined.
- Before tightening nuts, secure flanges in vise.
- Ensure cotter pin holes are alined before removing carrier from vise.

70. Install spacer (14) and two flanges (4) on carrier (12) with two washers (3) and nuts (1). Tighten nuts (1) 300-600 lb-ft (407-814 N.m).
71. Install two new cotter pins (2) in two nuts (1).

10-4. DIFFERENTIAL CARRIER REPAIR (Contd)



10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

NOTE

Ensure wide end of taper on bearings faces case halves.

72. Press two bearings (1) on case halves (2).
73. If spider (9), thrust washers (11) and (3), pinion gears (10), and side gears (4) were not replaced, proceed in step 77.
74. Install thrust washer (3) and side gear (4) in case half (2).
75. Install four pinion gears (10) and thrust washers (11) on spider (9).
76. Install thrust washer (3) and side gear (4) on spider (9).
77. Install spider (9), four pinion gears (10), side gear (4), four thrust washers (11), and thrust washer (3) in case half (2).

NOTE

Aline marks on helical drive gear and case halves.

78. Install helical drive gear (5) on case half (2).

NOTE

Gear assembly should be in vise when tightening nuts.

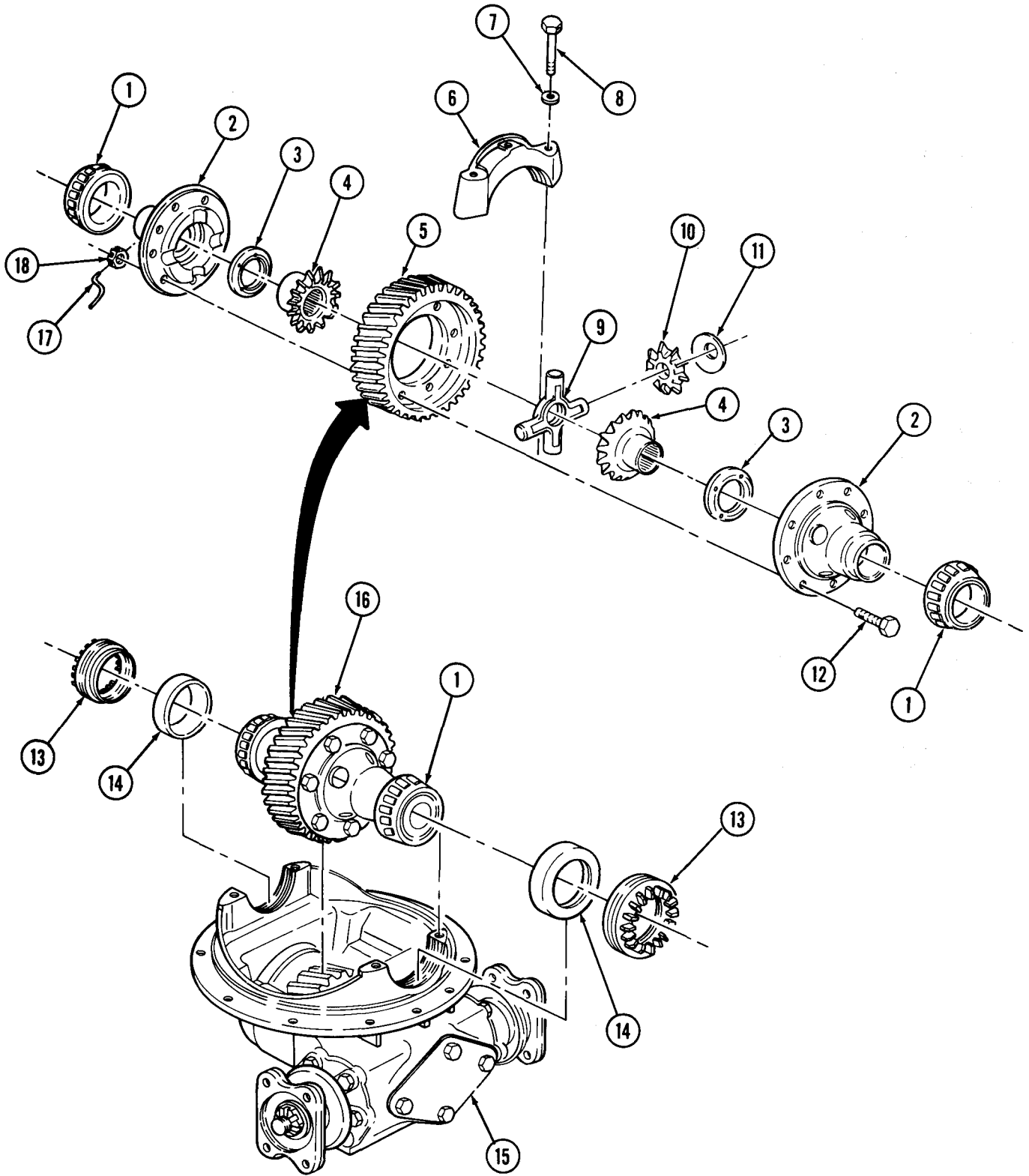
79. Install other case half (2) on gear assembly with eight screws (12) and nuts (18). Tighten nuts (18) 130-167 lb (176-227 N.m). Aline holes in screws and nuts for installation of safety wire (17).
80. Install new safety wire (17) through eight nuts (18).

NOTE

- Differential gear is installed as an assembly with case halves and bearings, thrust washers, side gears, spider, and pinion gears attached to helical drive gear.
- Install bearing seats and adjusting nuts as tagged for installation.

81. Install bearing seats (14) on bearings (1).
82. Install differential gear assembly (16) on carrier (15).
83. Position two adjusting nuts (13) on carrier (15) until seated against bearing seats (14).
84. Install two bearing caps (6) on carrier (15) with four washers (7) and screws (8). Finger tighten screws (8), and alternately tighten two adjusting nuts (13) to contact bearing seats (14).

10-4. DIFFERENTIAL CARRIER REPAIR (Contd)



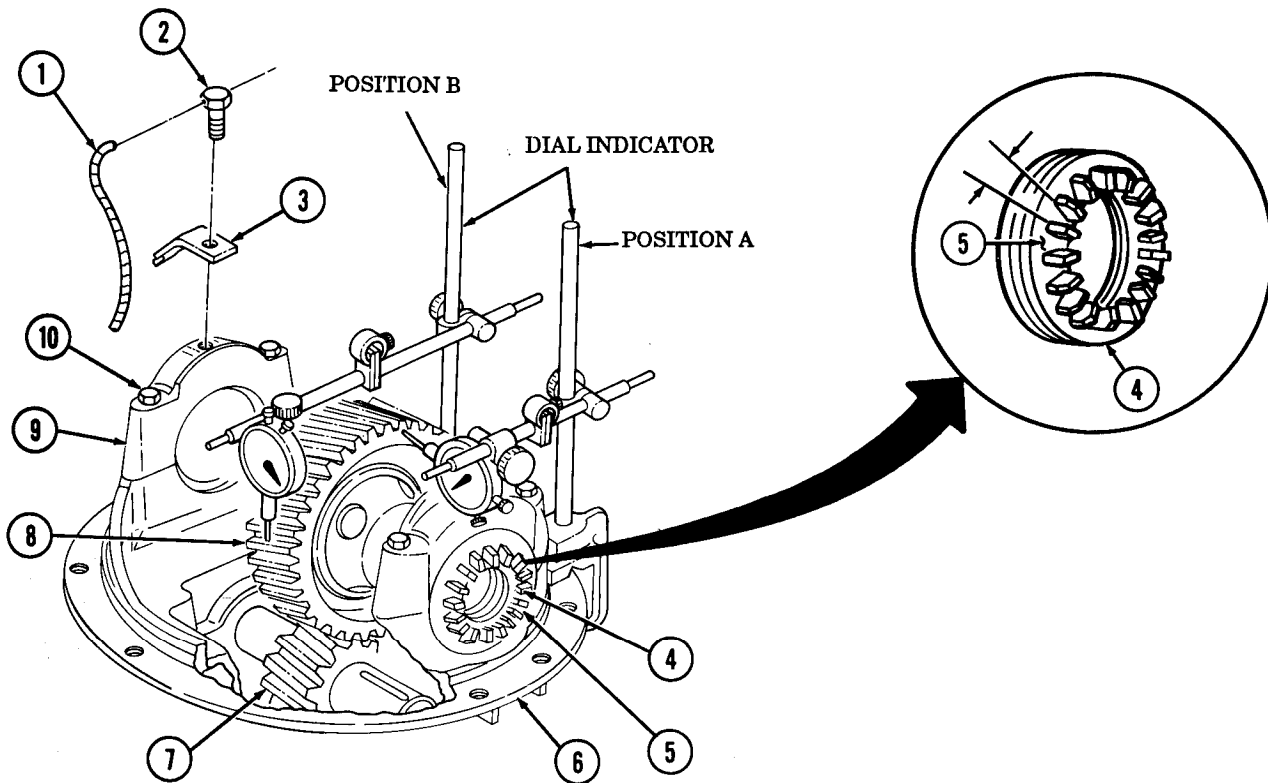
10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

85. Turn helical drive gear (8) several times to seat bearings.
86. Install dial indicator (position A) on carrier (6) so plunger is against side face of helical drive gear (8).
87. Push and pull helical drive gear (8) and check reading on dial indicator (position A).
88. Alternately tighten two adjusting nuts (4) one notch width (5) at a time until dial indicator (position A) reads 0.000 in. (0.00 mm) when helical drive gear (8) is push/pulled.
89. To ensure bearing preload, continue alternately turning adjusting nuts (4) to aline notches for lock tabs (3) up to 1.75-7.5 in. (4.45-19.05 cm) notch widths (5) for both sides.
90. Rotate helical drive gear (8) in one direction to check for runout of 0.008 in. (0.203 mm) or less. If runout is more than 0.008 in. (0.203 mm) replace helical drive gear (8) and pinion gear (7).
91. Install dial indicator (position B) on carrier (6) so plunger is on flat side of tooth of helical drive gear (8).

NOTE

Hold pinion shaft or gear to prevent turning.

92. Rotate helical drive gear (8) to set teeth tight on pinion gear teeth (7) and zero dial indicator (position B).
93. Rotate helical drive gear (8) in opposite direction. Gear backlash should be 0.007-0.014 in. (0.178-0.356 mm). If reading is out of range, replace pinion gear (7) and helical drive gear (8).
94. Tighten four screws (10) 116-149 lb-ft (157-202 N.m).
95. Install two lock tabs (3) on bearing caps (9) with two screws (2). Tighten screws (2) 16-20 lb-ft (22-27 N.m).
96. Install new safety wire (1) on four screws (10) and two screws (2). Ensure lock tabs (3) are bent in notches (5).



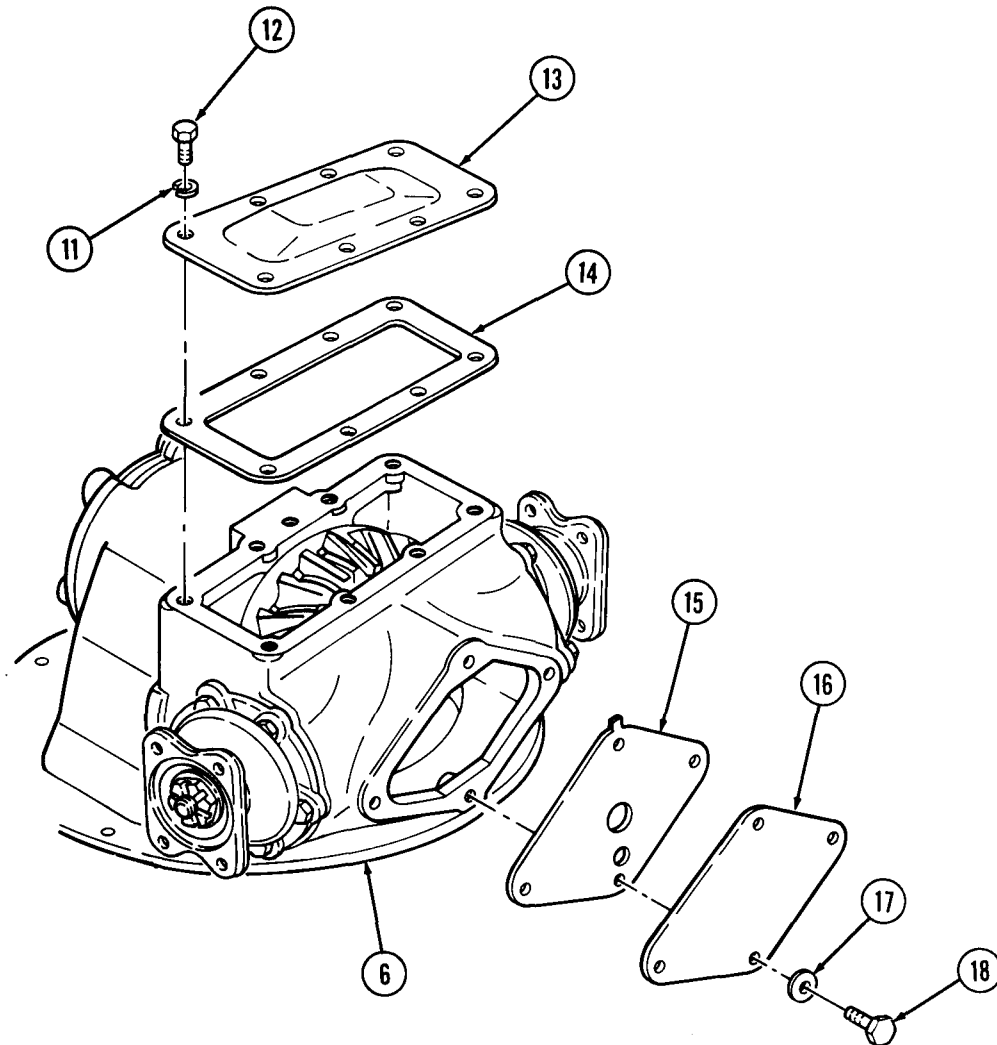
10-4. DIFFERENTIAL CARRIER REPAIR (Contd)

97. Install new gasket (14) and cover (13) on carrier (6) with eight new lockwashers (11) and screws (12). Tighten screws (12) 20-35 lb-ft (27-47 N.m).

NOTE

Install gasket with tab toward top of carrier.

98. Install new gasket (15) and cover (16) on carrier (6) with four washers (17) and screws (18). Tighten SCREWS (18) 20-35 lb-ft (27-47 N.m).



FOLLOW-ON TASK: Install differential carrier (para. 10-3).

10-5. FRONT AND REAR DIFFERENTIAL OIL SEAL REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

SPECIAL TOOLS

Replacer, oil seal (Appendix B, Item 25)

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Mechanical puller (Appendix B, Item 22)
Torque wrench, 3/4-in. dr.
(Appendix B, Item 6)

MATERIALS/PARTS

Oil seal (Appendix F, Item 240)
Cotter pin (Appendix F, Item 13)

REFERENCES (TM)

TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

Propeller shaft removed (if installed)
(TM 9-2320-361-20).

a. Removal

1. Remove cotter pin (12), nut (1), and washer (2) from shaft (8). Discard cotter pin (12).
2. Remove flange (3) from shaft (8).

NOTE

Perform step 3 if replacing dirt deflectors.

3. Remove dirt deflector (4) from flange (3).
4. Remove six screws (11) and washers (10) from retainer (6).

NOTE

Count and record number of shims for installation.

5. Remove retainer (6) and shims (7) from carrier (9).
6. Remove oil seal (5) from retainer (6). Discard oil seal (5).

b. Installation

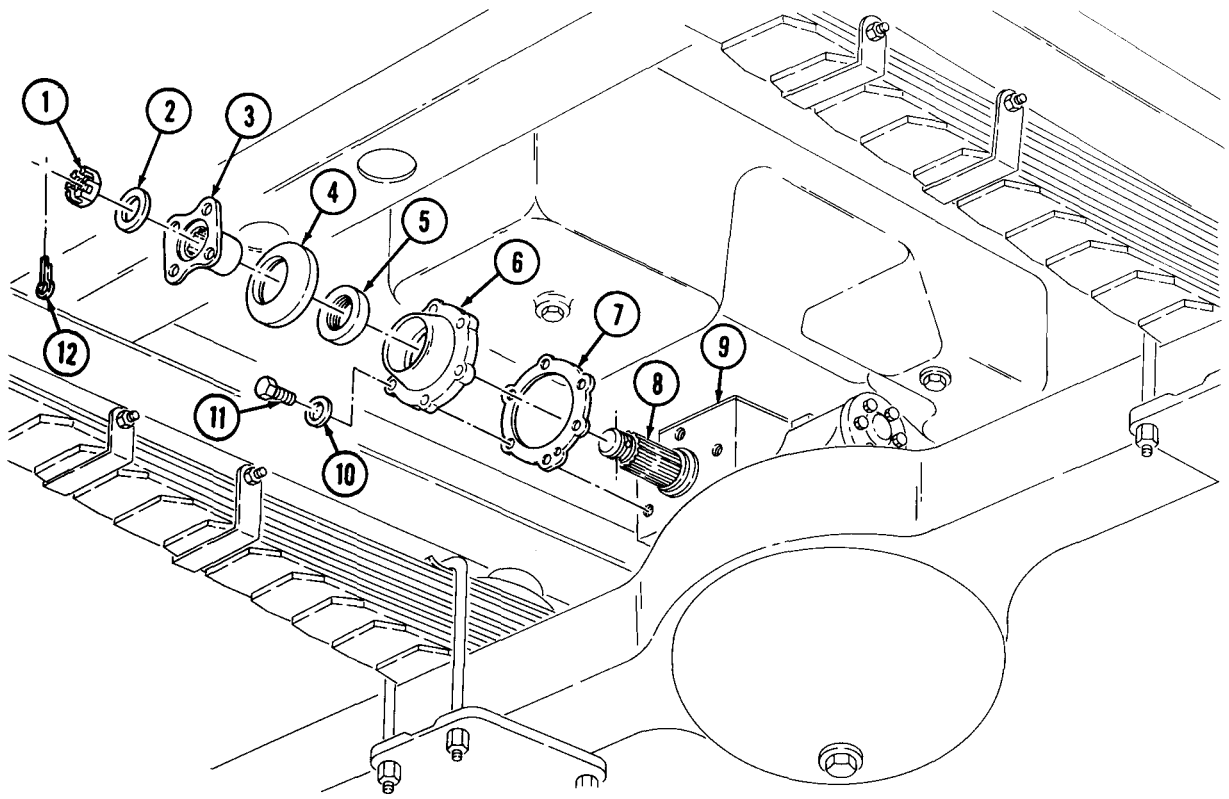
1. Install new oil seal (5) in retainer (6).
2. Install shims (7) and retainer (6) on carrier (9) with six washers (10) and screws (11). Tighten screws (11) 65-85 lb-ft (88-115 N.m).

NOTE

Perform step 3 if replacing dirt deflectors.

3. Install dirt deflector (4) on flange (3) and install flange (3) on shaft (8).
4. Install washer (2) and nut (1) on shaft (8). Tighten nut (1) 300-600 lb-ft (407-814 N.m).
5. Install new cotter pin (12) on nut (1) and shaft (8).

10-5. FRONT AND REAR DIFFERENTIAL OIL SEAL REPLACEMENT (Contd)



FOLLOW-ON TASK: Install propeller shaft (if removed) (TM 9-2320-361-20).

10-6. STEERING KNUCKLE AND STEERING ARM MAINTENANCE

THIS TASK COVERS:

- | | |
|--|--|
| <ul style="list-style-type: none"> a. Steering Arm Removal b. Steering Knuckle Removal c. Cleaning and Inspection d. Steering Knuckle Installation | <ul style="list-style-type: none"> e. Steering Arm Installation f. End Play Test g. Turn Angle Screw Adjustment |
|--|--|

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Mechanical puller (Appendix B, Item 22)
Inside micrometer
(Appendix B, Item 16)
Outside micrometer
(Appendix B, Item 17)
1-5/16-in. socket, 3/4-in. dr.
(Appendix B, Item 31)
Wheel alinement indicator
(Appendix B, Item 32)
Dial indicator (Appendix B, Item 21)
Torque wrench, 3/4-in. dr.
(Appendix B, Item 6)
Jack stands

MATERIALS/PARTS

Four lockwashers (Appendix F, Item 149)
Six lockwashers (Appendix F, Item 130)
Four bushings (Appendix F, Item 1)
Lubricating oil, GO 80/90 (Appendix C, Item 11)

REFERENCES (TM)

TM 9-237
TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

- Front axle shaft removed (TM 9-232-361-20).
- . Steering knuckle boot removed (TM 9-2320-361-20).
- . Tie rod removed (TM 9-2320-361-20).
- Drag link removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- Wear hand protection at all times when working with heated parts.
- . Eye protection must be worn during welding procedures.
- Welding procedures may produce poisonous fumes. Perform welding in well-ventilated area.

a. Steering Arm Removal

1. Remove lubrication fitting (4) from steering arm (5).
2. Remove four nuts (2) and lockwashers (3) from steering arm (5). Discard lockwashers (3).
3. Tap steering arm (5) at point "A" to loosen four bushings (1).
4. Remove four bushings (1) and steering arm (5) from steering knuckle (8). Discard four bushings (1).
5. Remove four bushings (1) from steering arm (5).

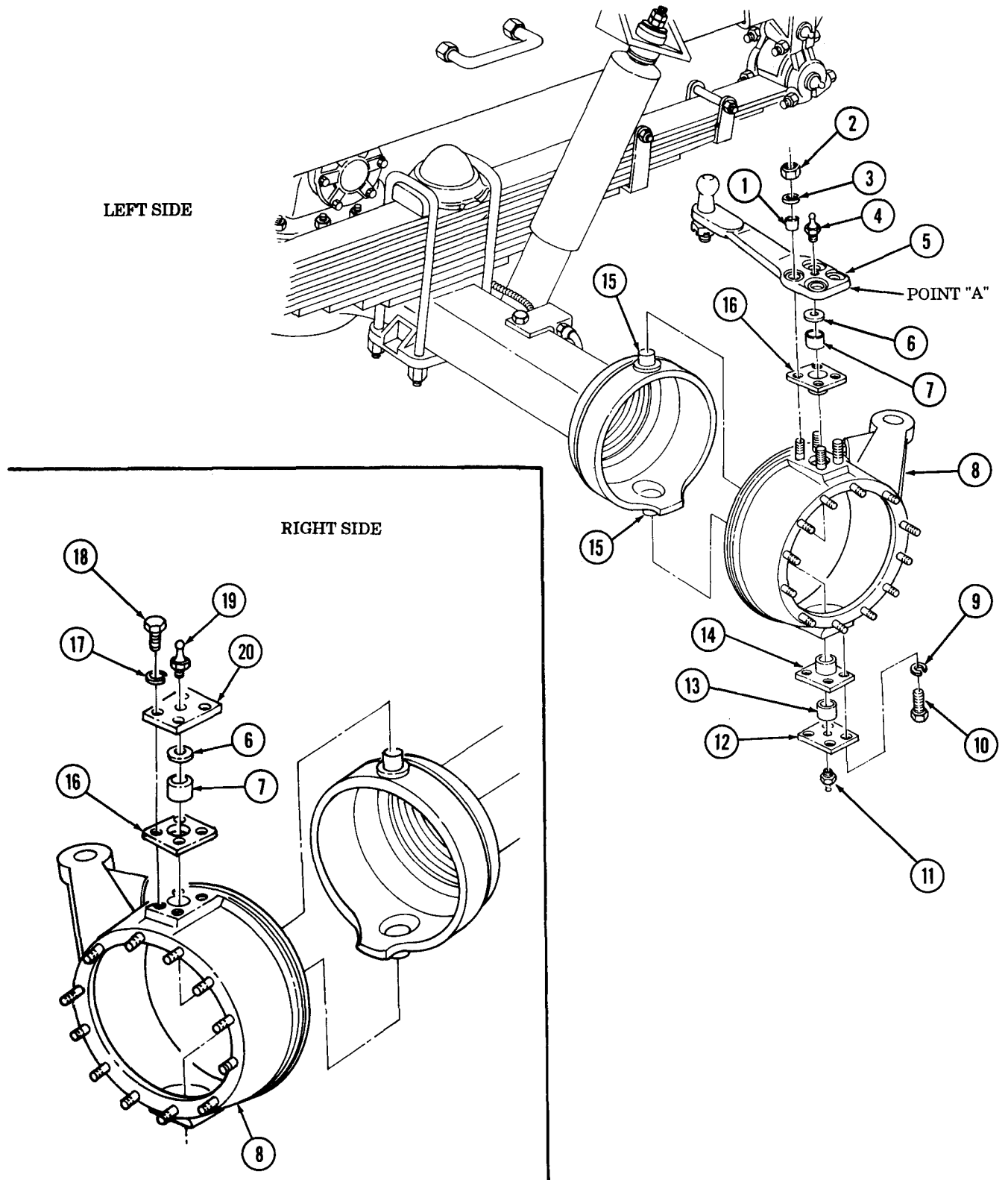
b. Steering Knuckle Removal

NOTE

Perform step 1 for left steering knuckle. Perform step 2 for right steering knuckle.

1. Remove lubrication fitting (11) from steering knuckle (8).
2. Remove lubrication fitting (19), two screws (18), lockwashers (17), and plate (20) from steering knuckle (8). Discard lockwashers (17).
3. Remove spacer (6), bearing (7), and sleeve (16) from left and right steering knuckles (8).
4. Remove two screws (10), lockwashers (9), plate (12), sleeve (14), and bearing (13) from left and right steering knuckles (8). Discard lockwashers (9).
5. Remove left and right steering knuckles (8) from two pins (15).

10-6. STEERING KNUCKLE AND STEERING ARM MAINTENANCE



10-6 STEERING KNUCKLE AND STEERING ARM MAINTENANCE (Contd)

c. Cleaning and Inspection

For general cleaning instructions, refer to para. 2-8.

2. Measure outside diameter of ball stud (21). Replace ball stud (21) if outside diameter is less than 1.24 in. (3.15 cm).
3. Visually inspect ball stud (21) for nicks, scratches, pits, scores, or scratches. Replace ball stud (21) if damaged.
4. Measure outside diameter of steering knuckle pins (18). Replace front axle if outside diameter of steering knuckle is less than 1.123 in. (2.852 cm).
5. Inspect steering knuckle pins (18) for nicks, scratches, pitting, scores, and cracks. Replace front axle if pins (18) are nicked, scratched, pitted, scored, or cracked.
6. Inspect sleeves (17) and (20) for nicks, scratches, scores, cracks, and signs of wear. Replace sleeve (17) or (20) and bearing (16) or (9) if nicked, scratched, scored, cracked, or worn.
7. Measure inside diameter of bearings (9) and (16). Replace bearing (9) or (16) if inside diameter is greater than 1.126 in. (2.860 cm).
8. Inspect bearings (9) and (16) for nicks, scratches, pitting, scores or cracks. Replace if nicked, scratched, pitted, scored, or cracked.
9. Inspect four studs (19) and twelve studs (11) for bends or stripped threads. Replace stud(s) (19) or (11) if bent or threads are stripped.
10. Inspect turn angle screw (7) for bends. Replace angle screw (7) if damaged.

d. Steering Knuckle Installation

1. Install left and right steering knuckles (10) on pins (18) with studs (19) facing up.
2. Install sleeve (17), plate (15), and bearing (16) on left and right steering knuckles (10) with two new lockwashers (12) and screws (13). Tighten screws (13) 116-149 lb-ft (157-202 N.m).
3. Install sleeve (20), bearing (9), and spacer (8) on left. and right steering knuckles (10).

NOTE

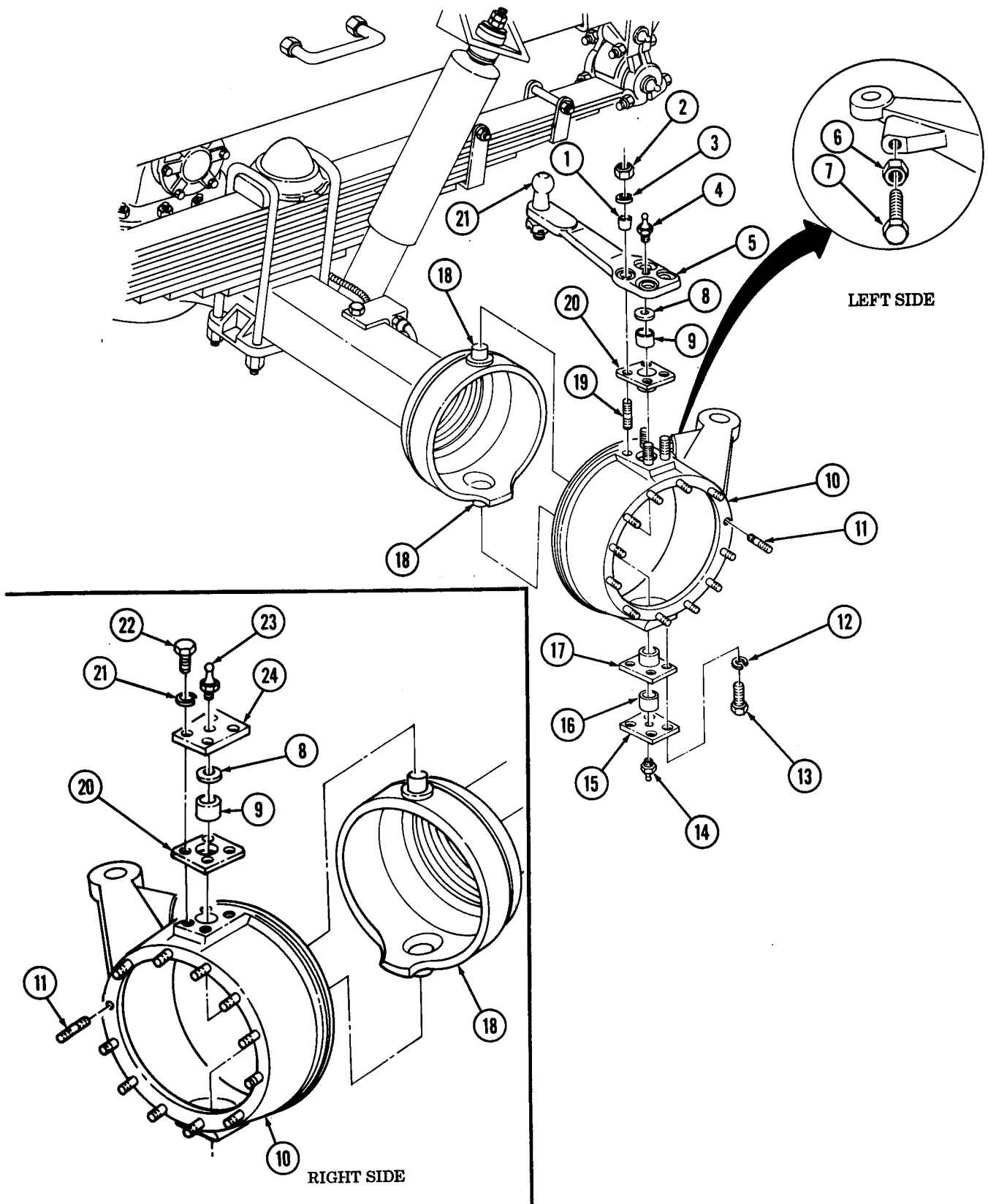
Perform steps 4 and 5 for right steering knuckle. Perform step 6 for left steering knuckle.

4. Install plate (24) with two new lockwashers (26) and screws (22) on steering knuckle (10). Tighten screws (22) 116-149 lb-ft (157-202 N.m).
5. Install lubrication fitting (23) on plate (24) and lubrication fitting (25) on plate (15).
6. Install lubrication fitting (14) on steering knuckle (10).

e. Steering Arm Installation

1. Install four new bushings (1) on steering arm (5).
2. Install steering arm (5) on four studs (19) with four new lockwashers (3) and nuts (2). Tighten nuts (2) 130-167 lb-ft (176-226 N.m).
3. Install lubrication fitting(4) on steering arm (5).

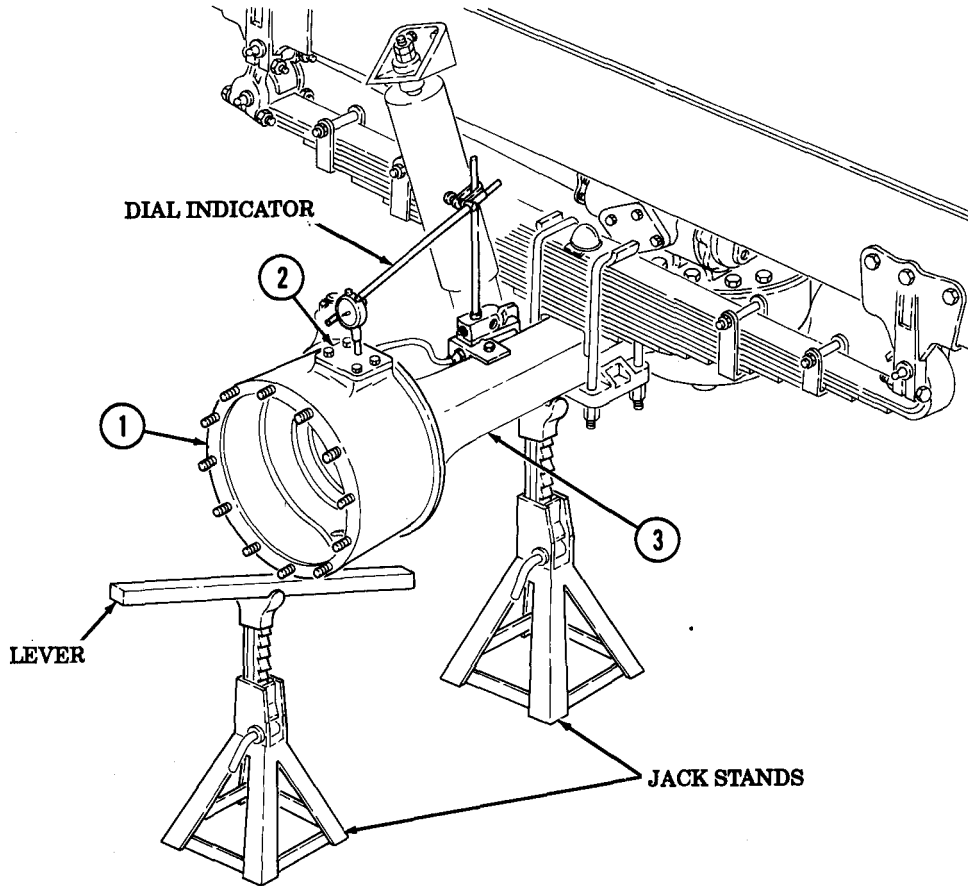
10-6. STEERING KNUCKLE AND STEERING ARM MAINTENANCE (Contd)



10-6 STEERING KNUCKLE AND STEERING ARM MAINTENANCE (Contd).

f. End Play Test

1. Install dial indicator on front axle housing (3) so measuring point touches steering arm mounting plate (2).
2. Install lever and support under steering knuckle (1).
3. Pry upward with lever and support and observe dial indicator. Correct reading is 0.004-0.014 in. (0.102-0.356 mm).



NOTE

- If dial indicator reading is correct, proceed to step 14.
- Perform steps 4 through 13 if dial indicator reading is incorrect.
- Steps 4 through 6 apply to left steering knuckle.
- Step 7 applies to right steering knuckle.

Remove lubrication fitting (6), two nuts (4), and lockwashers (5) from steering arm (7). Discard lockwashers (5).

Tap steering arm (7) at point "A" to loosen steering arm (7).

Remove steering arm (7) from steering knuckle (1).

Remove lubrication fitting (11), two screws (10), lockwashers (12), and plate (2) from steering knuckle (1). Discard lockwashers (12).

10-6. STEERING KNUCKLE AND STEERING ARM MAINTENANCE (Contd)

8. Remove spacer (8) from left and right steering knuckles (3).

NOTE

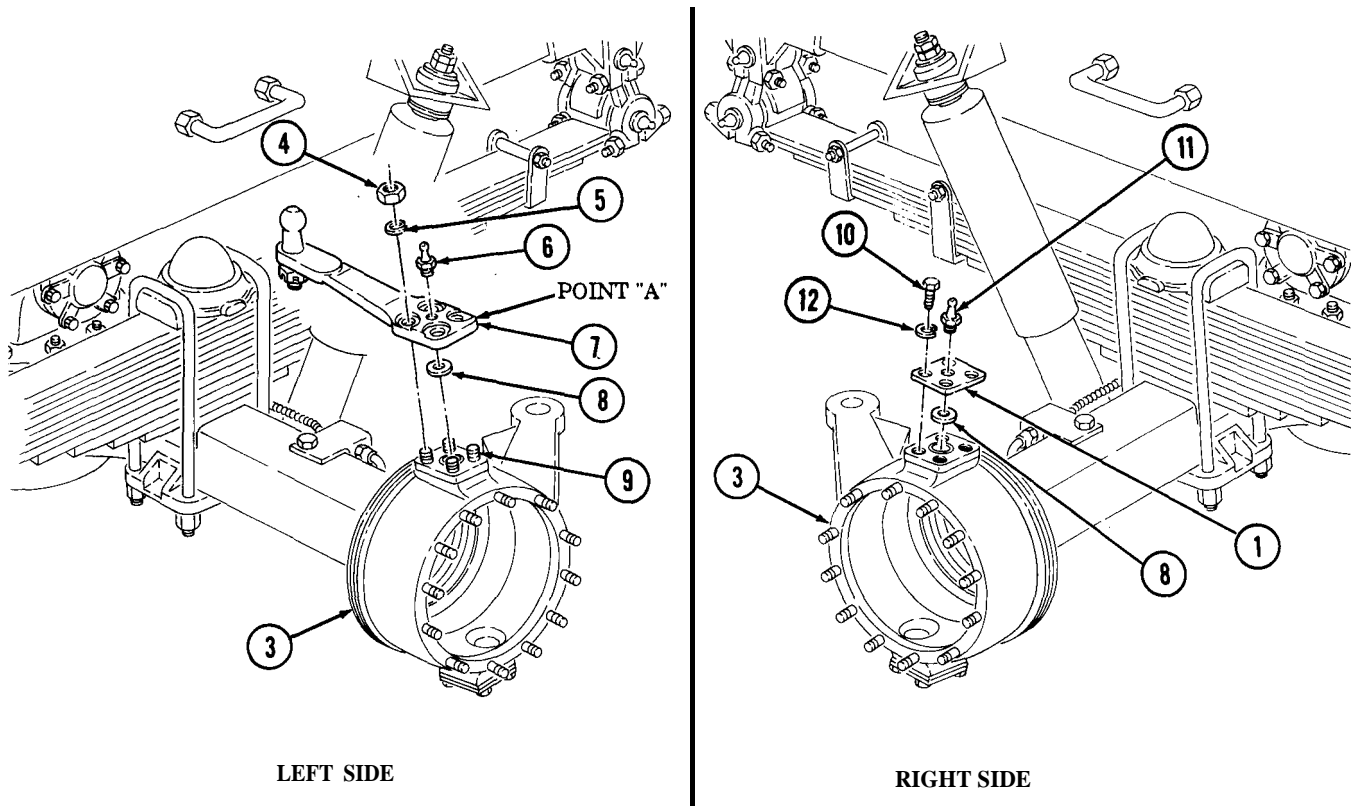
- If dial indicator reading was less than 0.004 in. (0.102 mm), install smaller spacer.
- If dial indicator reading was more than 0.014 in. (0.356 mm), install larger spacer.

9. Install spacer (8) on left and right steering knuckles (3).

NOTE

- Step 10 applies to right steering knuckle.
- Steps 11 and 12 apply to left steering knuckle.

10. Install plate (1), two new lockwashers (12), screws (10), and lubrication fitting (11) on steering knuckle (3). Tighten screws (10) 116-149 lb-ft, (157-202 N.m).
11. Install steering arm (7) on four studs (9) with four new lockwashers (5) and nuts (4). Tighten nuts (4) 130-167 lb-ft (176-226 N.m).
12. Install lubrication fitting (6) on steering arm (7).
13. Check endplay (steps 1 through 3).
14. Install drag link (TM 9-2320-361-20).
15. Install tie rod (TM 9-2320-361-20).
16. Install steering knuckle boot (TM 9-2320-361-20).
17. Install front axle shaft (TM 9-2320-361-20).



10-6. STEERING KNUCKLE AND STEERING ARM MAINTENANCE (Contd)

g. Turn Angle Screw Adjustment

1. Count number of threads showing on screw (2) above nut (3) and record.
2. Break welds and remove screw (2) and nut (3) from steering knuckle (4). Discard screw (2) and nut (3).
3. Install new nut (3) and new screw (2) on steering knuckle (4) with same number of threads showing above nut (3) as in step 1.

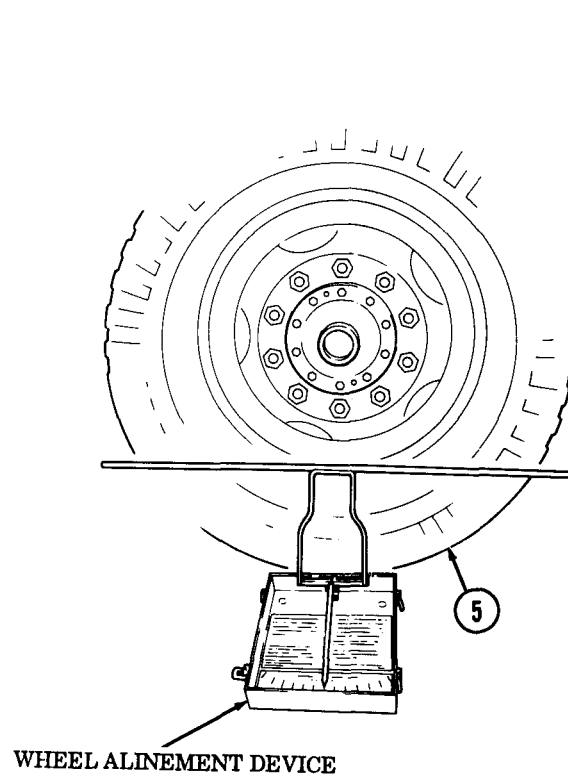
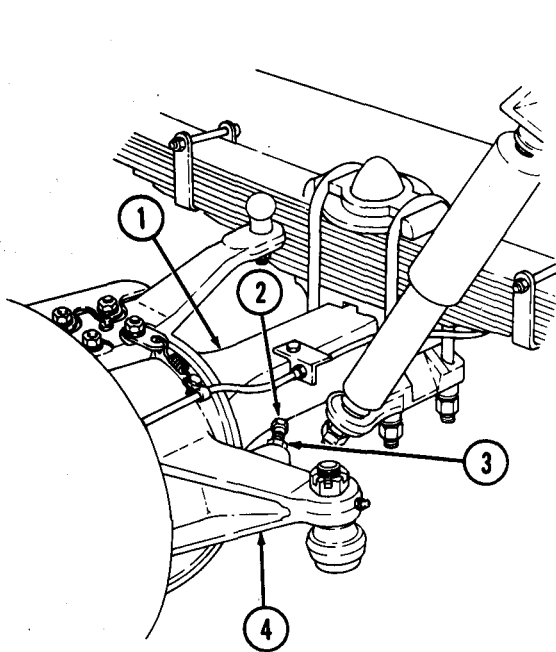
NOTE

Ensure wheels are in straight position.

4. Place wheel alinement device 3 in. (7.6 cm) from outer tire surface and place turning radius gage against outer tire surface.
5. Aline pointer with center of wheel (5) and zero degree mark on alinement device.
6. Turn wheel (5) outward and read degrees of travel. Correct travel is 27-28 degrees.
7. Adjust screw (2) until head contacts axle housing (1) and tighten nut (3) 94-120 lb-ft (127-163 N.m).

WARNING

- Wear hand protection at all times when working with heated parts. Failure to do so may result in injury to personnel.
 - Eye protection must be worn during welding procedures. Failure to wear eye protection may result in injury to personnel.
 - Welding procedures may produce poisonous fumes. Perform welding in well-ventilated areas. Failure to do so may result in injury to personnel.
8. Tack weld nut (3) to screw (2) and steering knuckle (4) (TM 9-237).



Section II. REAR AXLE AND SUSPENSION MAINTENANCE

10-7. REAR AXLE AND SUSPENSION MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
10-8.	Forward-Rear and Rear-Rear Axle Assembly Replacement	10-43
10-9.	Tandem Axle Replacement	10-48

10-8. FORWARD-REAR AND REAR-REAR AXLE ASSEMBLY REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- 1-1/8-in. socket, 3/4-in. dr. (Appendix B, Item 33)
- Torque wrench, 3/4-in. dr. (Appendix B, Item 6)
- Breaker bar, 3/4-in. dr. (Appendix B, Item 34)
- Handle, socket wrench, 3/4-in. dr. (Appendix B, Item 35)
- Jack stands
- Hydraulic jack

MATERIALS/PARTS

- Twelve lockwashers (Appendix F, Item 148)
- Three locknuts (Appendix F, Item 89)
- Four seal washers (Appendix F, Item 243)
- Brake fluid (Appendix C, Item 4)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

- TM 9-2320-361-10
- TM 9-2320-361-20
- TM 9-2320-361-34P

EQUIPMENT CONDITION

- Inner and outer wheels removed (as required) (TM 9-2320-361-20).
- Propeller shafts removed (if installed) (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- Weight of vehicle must be supported on jack stands at all times.
- Ensure axle is balanced and personnel are clear before lowering axle.

10-8. FORWARD-REAR AND REAR-REAR AXLE ASSEMBLY REPLACEMENT (Contd)

NOTE

- The rear-rear and forward-rear axles are replaced basically the same. This procedure covers the rear-rear axle.
- Ensure front wheels are chocked before raising vehicle (TM 9-2320-361-10).

1. Place hydraulic jack under differential housing (8) on axle (7) and raise vehicle enough to move two jack stands from under axle (7) to under tandem axle spring seats (18).
2. Place two jack stands under tandem axle spring seats (18).
3. Lower hydraulic jack enough to relieve tension on springs (19).

NOTE

Have drainage container ready to catch coolant.

4. Remove two screws (32), hose connectors (34), and four seal washers (33) from two wheel cylinders (20). Discard seal washers (33).
5. Remove two locknuts (30), screws (31), clamps (22), and brake line (23) from two brackets (1). Discard locknuts (30).
6. Remove nut (29), washer (28), clamp (27), and brake line (23) from differential carrier (8).
7. Disconnect hose (26) from tee (25).
8. Remove locknut (21), screw (24), and tee (25) from bracket (6). Discard locknut (21).

NOTE

Step 9 applies to left side.

9. Remove four nuts (9), lockwashers (10), screws (5), two brackets (6), plate (11), and bracket (4) from axle (7). Tie upper torque rod (3) out of the way. Discard lockwashers (10).
10. Remove eight nuts (16), lockwashers (17), screws (2), and two brackets (1) from two brackets (15). Lower two brackets (15). Discard lockwashers (17).
11. Remove two axle spring seats (12) from four guide pins (14) and axle (7).
12. Remove two seats (13) from axle (7).

WARNING

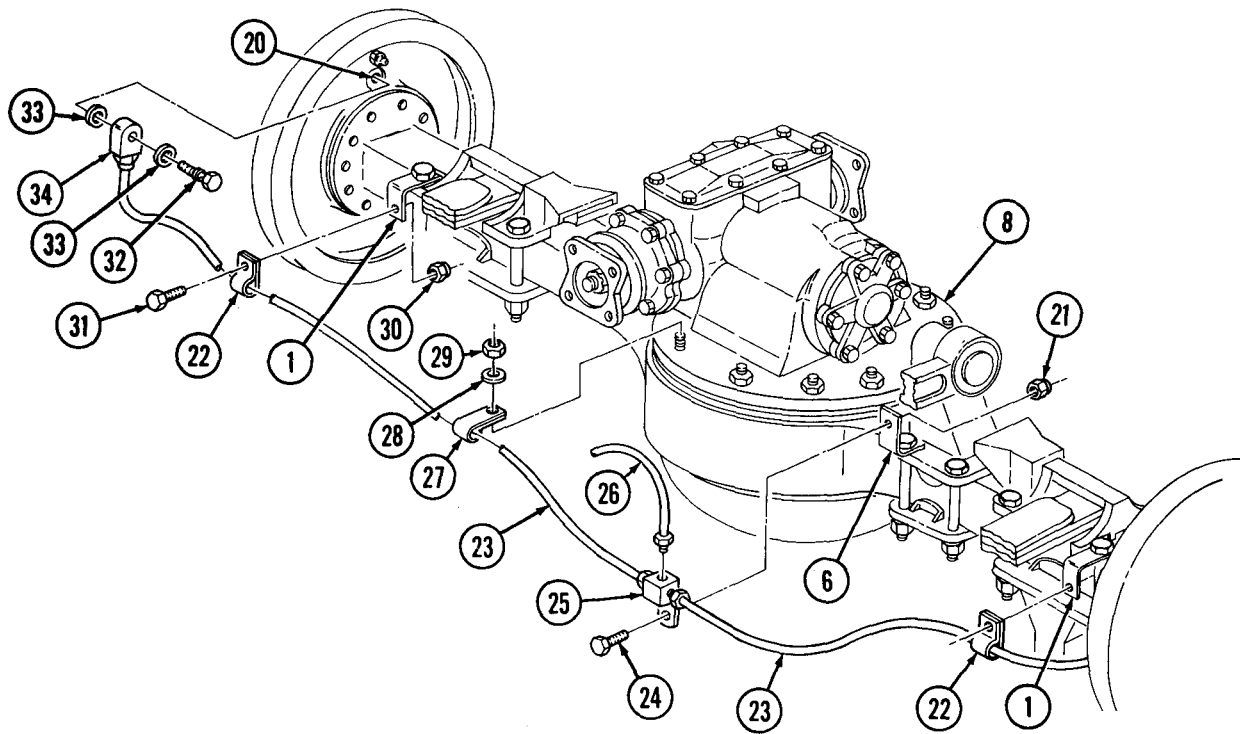
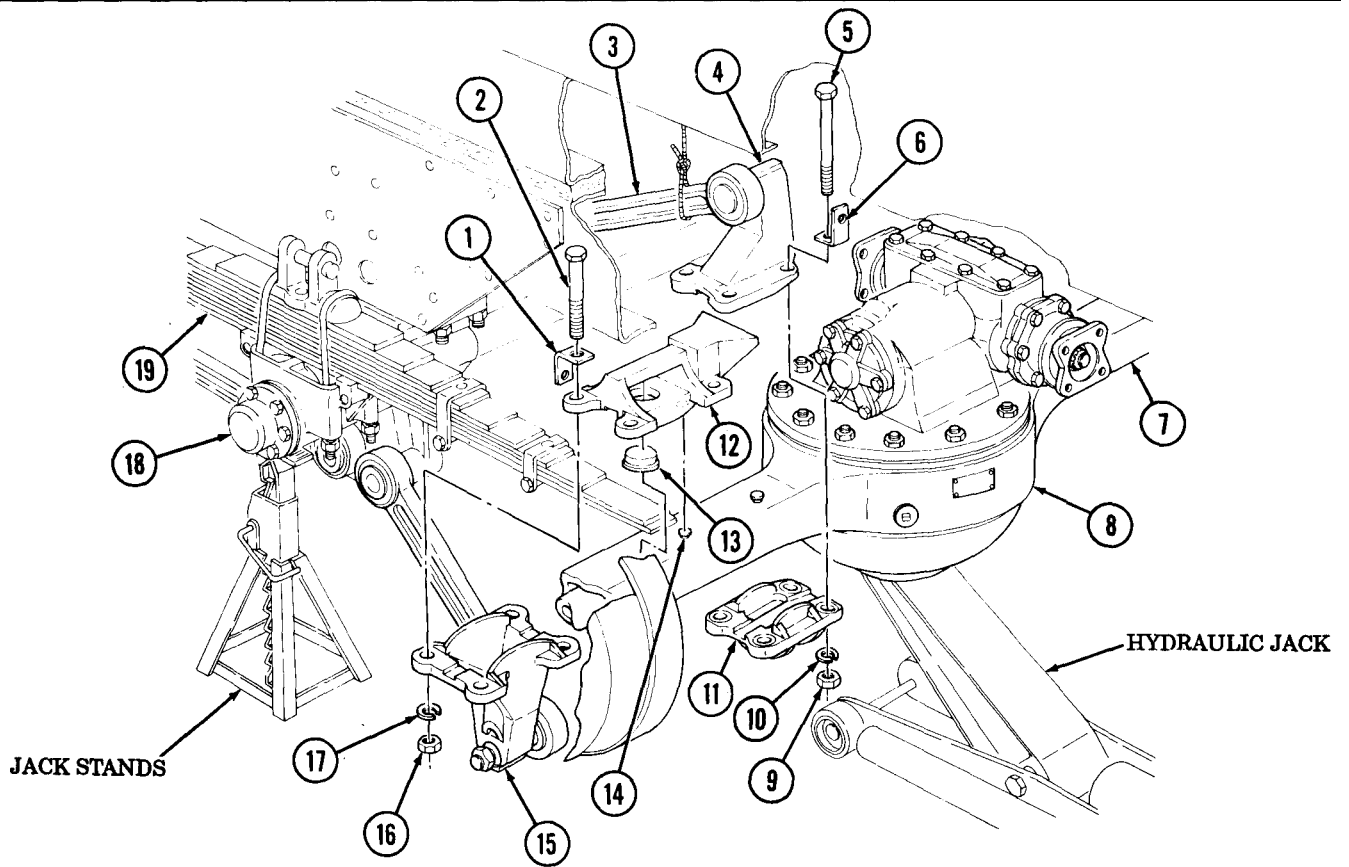
Axle is heavy. Ensure axle is balanced and personnel are clear before lowering axle. Failure to do so may result in injury to personnel.

NOTE

Assistant will help with step 13.

13. Lower hydraulic jack and remove axle (7) from vehicle.

10-8 FORWARD-REAR AND REAR-REAR AXLE ASSEMBLY REPLACEMENT (CONT'd)



10-8. FORWARD-REAR AND REAR-REAR AXLE ASSEMBLY REPLACEMENT (Contd)**WARNING**

Axle is heavy. Ensure axle is balanced and personnel are clear before raising axle. Failure to do so may result in injury to personnel.

NOTE

Assistant will help with step 1.

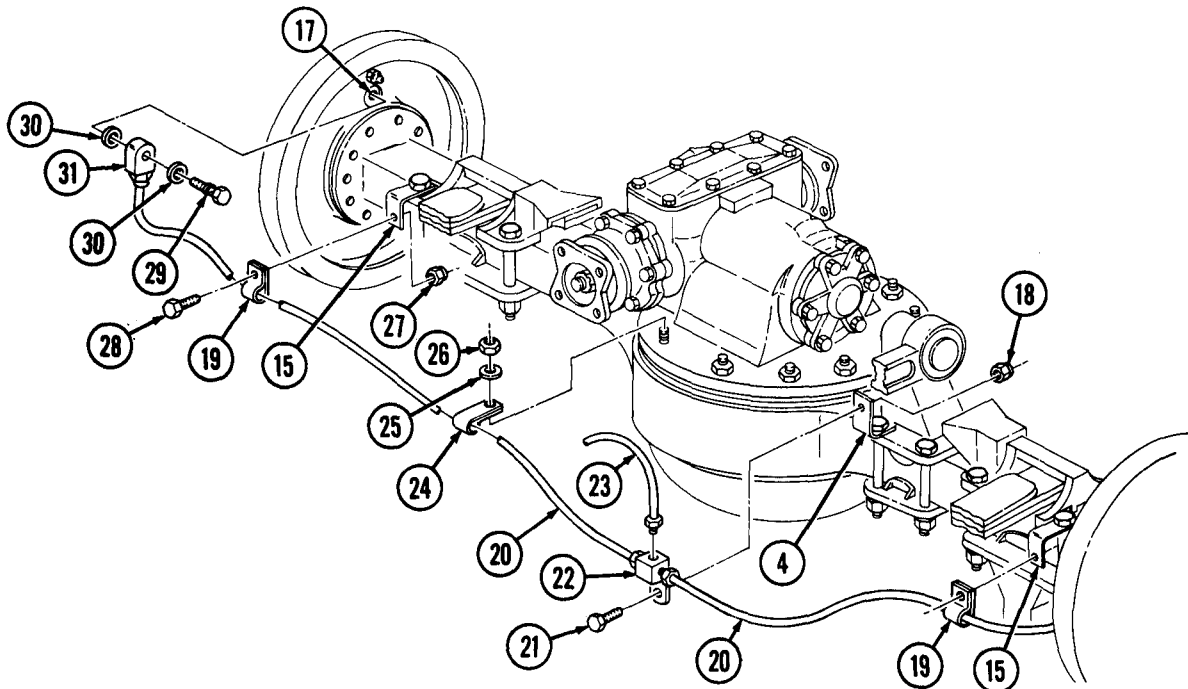
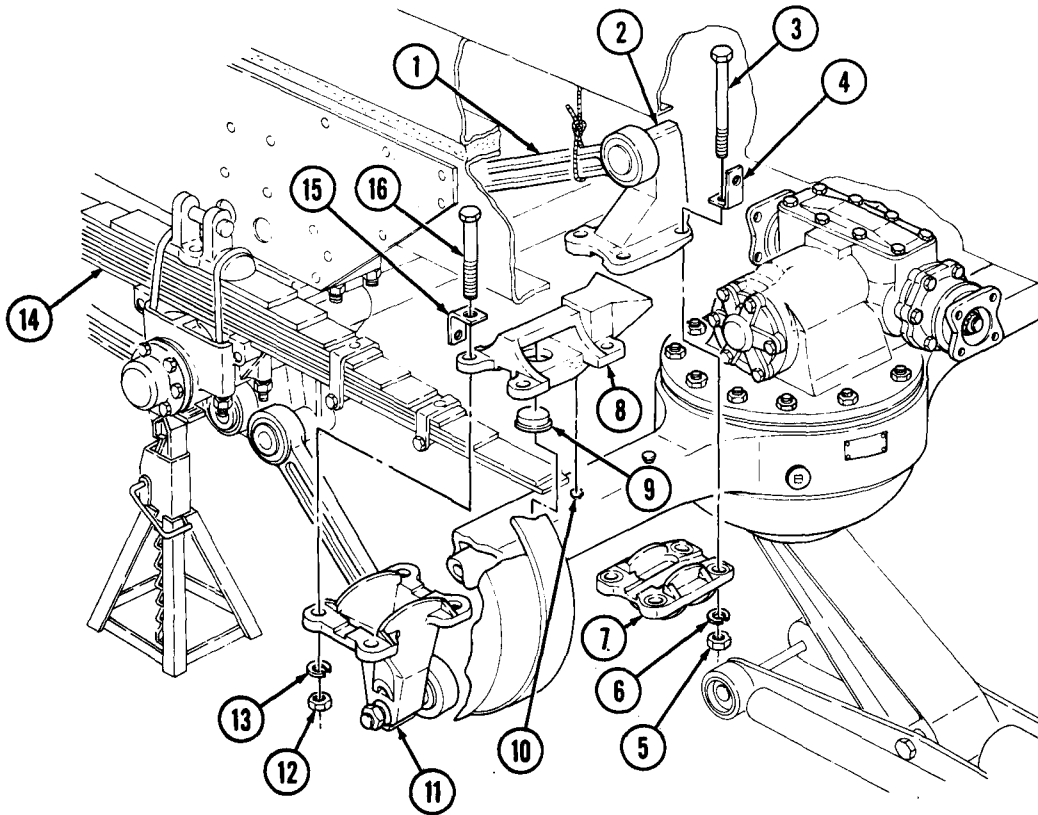
1. Place hydraulic jack and axle under vehicle and position two axle spring seats (8) over ends of spring (14).
2. Raise hydraulic jack until springs (14) meet brackets (11) and align holes in axle spring seats (8) with guide pins (10) on axle.
3. Place two seats (9) in axle.
4. Align two brackets (11) with axle spring seats (8) and install on axle with eight screws (16), two brackets (15), eight new lockwashers (13), and nuts (12). Tighten nuts (12) 200-275 lb-ft (271-373 N.m).

NOTE

Step 5 applies to left side.

5. Align upper torque rod (1) and bracket (2) with plate (7) and install on axle with four screws (3), two brackets (4), four new lockwashers (6), and nuts (5). Tighten nuts (5) 200-275 lb-ft (271-373 N.m).
6. Install tee (22) on bracket (4) with screw (21) and new locknut (18).
7. Install hose (23) in tee (22)
8. Install four new seal washers (30) and two hose connectors (31) on two wheel cylinders (17) with two screws (29).
9. Install brake line (20) and two clamps (19) on two brackets (15) with two screws (28) and new locknuts (27).
10. Install brake line (20) and clamp (24) on differential housing with washer (25) and nut (26). Tighten nut (26) 53-76 lb-ft (72-103 N.m).
11. Raise vehicle enough to move two jack stands from under tandem axle spring seats (14) to under axle.
12. Place jack stands under axle.
13. Remove hydraulic jack from under vehicle.

10-8. FORWARD-REAR AND REAR-REAR AXLE ASSEMBLY REPLACEMENT (Contd)



- FOLLOW-ON TASKS: . Install propeller shaft (as required) (TM 9-2320-361-20).
 •Install inner and outer wheels (as required) (TM 9-2320-361-20).
 •Bleed service brakes (TM 9-2320-361-20).

10-9. TANDEM AXLE REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 Torque wrench, 3/4-in. dr. (Appendix B, Item 6)
 1-5/16-in. socket, 3/4-in. dr.
 (Appendix B, Item 31)
 Handle, socket wrench, 3/4-in. dr.
 (Appendix B, Item 35)
 Jack stands

MATERIALS/PARTS

Twelve locknuts (Appendix F, Item 104)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

- Lower torque rods removed (tandem axle end only)
 (TM 9-2320-361-20).
- . Rear spring seats removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- Weight of vehicle must be supported on jack stands at all times.
- . Tandem axle is heavy. Support tandem axle during removal and installation.

WARNING

Weight of vehicle must be supported on jack stands at all times. Do not attempt to support weight of vehicle on hydraulic jack. Injury or death to personnel may result if jack fails.

a. Removal

1. Install jack stands under frame of vehicle behind rear-rear axle (3).
2. Position hydraulic jack under center of tandem axle bracket (5).

WARNING

Tandem axle is heavy. Support tandem axle during installation. Failure to do so may result in injury to personnel or damage to equipment.

3. Remove twelve locknuts (4) and screws (1) from tandem axle bracket (5) and two rear axle bogie supports (2). Discard locknuts (4).

NOTE

Assistant will help with step 4.

4. Lower hydraulic jack and remove tandem axle bracket (5) from vehicle.

10-9. TANDEM AXLE REPLACEMENT (Contd)

WARNING

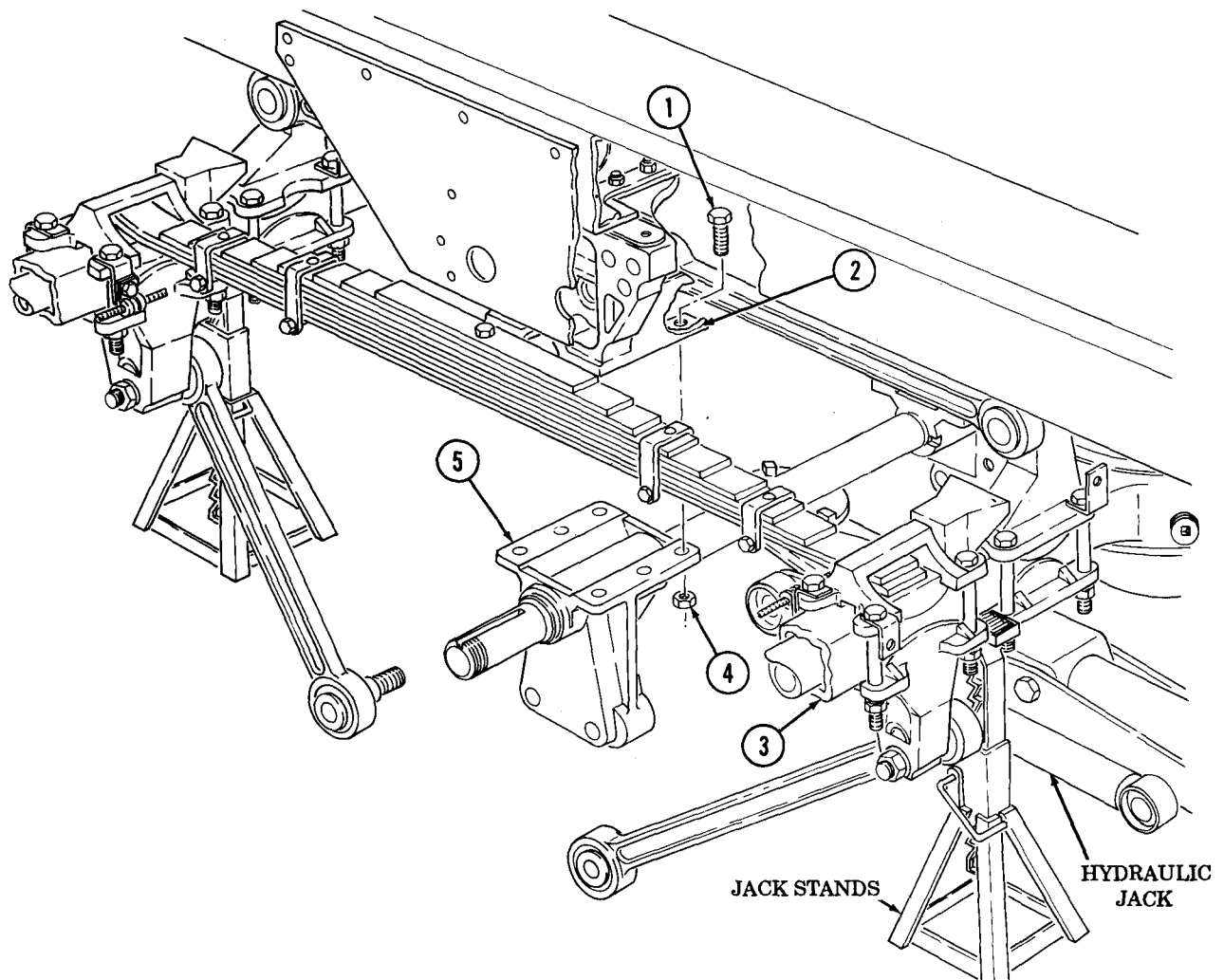
Tandem axle is heavy. Support tandem axle during installation.
Failure to do so may result in injury to personnel.

NOTE

Assistant will help with step 1.

b. Installation

1. Using hydraulic jack, lift tandem axle bracket (5) into position under vehicle.
2. Install tandem axle bracket (5) on two rear axle bogie supports (2) with twelve screws (1) and new locknuts (4). Tighten locknuts (4) 180-220 lb-ft (244-298 N.m).
3. Remove hydraulic jack from under vehicle.



- FOLLOW-ON TASKS: . Install rear spring seats (TM 9-2320-361-20).
• Connect lower torque rods (TM 9-2320-361-20).

CHAPTER 11 BRAKE SYSTEM MAINTENANCE

11-1. BRAKE SYSTEM MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
11-2.	Parking and Service Brakedrum Repair	11-1
11-3.	Parking and Service Brakeshoe Repair	11-4

11-2. PARKING AND SERVICE BRAKEDRUM REPAIR

THIS TASK COVERS:

a. Cleaning and Inspection

b. Repair

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Brake reliner (Appendix B, Item 12)

MATERIALS/PARTS

Drycleaning solvent (Appendix C, Item 24)

REFERENCES (TM)

TM 9-2320-361-20
TM 9-2320-361-34P
TM 9-4910-482-10

EQUIPMENT CONDITION

Parking or service brakedrums removed
(TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- Do not use compressed air or dry brush for cleaning in areas where asbestos brake lining dust may accumulate.
- Keep fire extinguisher nearby when using drycleaning solvent.



11-2. PARKING AND SERVICE BRAKEDRUM REPAIR (Contd)

a. Cleaning and Inspection

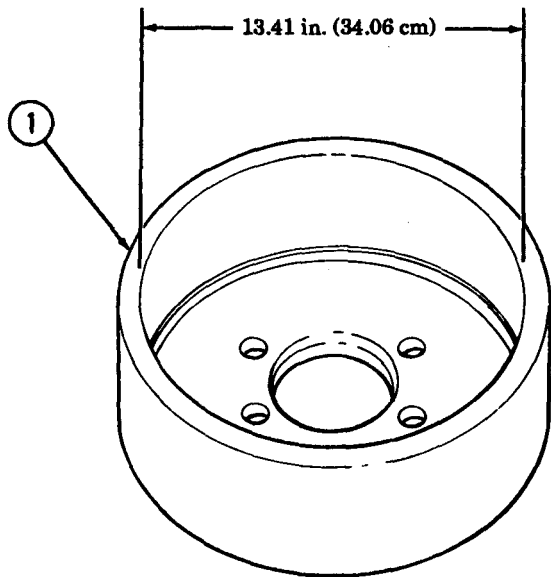
WARNING

- Do not use compressed air or dry brush for cleaning when working in areas of vehicle where asbestos brake lining dust may accumulate. Remove asbestos dust and other residue from these areas using a soft bristle brush or cloth soaked with water. Breathing asbestos dust may cause injury to personnel.
 - Drycleaning solvent is flammable and will not be used near open flame. Use only in well-ventilated places. Failure to do so may result in injury or death to personnel.
1. Wash parking or service brakedrums (1) or (2) with water and soft bristle brush. Allow to air dry. Clean with drycleaning solvent.
 2. Inspect parking or service brakedrums (1) or (2) for warps or cracks. Replace if warped or cracked.
 3. Inspect parking or service brakedrums (1) or (2) for scores or pits. If scored or pitted, measure inside diameter.
 - a. Replace parking brakedrum (1) if inside diameter is greater than 13.41 in. (34.06 cm).
 - b. Replace service brakedrum (2) if inside diameter is greater than 15.0 in. (38.1 cm).
 4. If inside diameter is less than 13.41 in. (34.06 cm) for parking brakedrum (1) or less than 15.0 in. (38.1 cm) for service brakedrum (2), repair (1) or (2), as necessary.

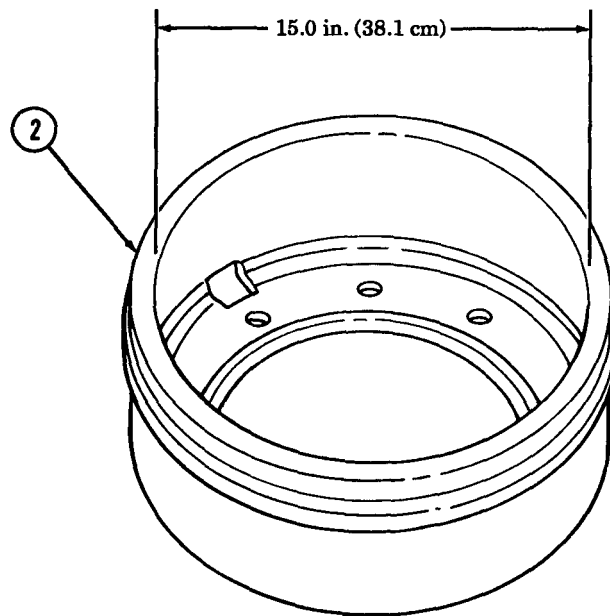
b. Repair

1. Remove scores or pits from parking brakedrum (1) or service brakedrum (2) by machining (TM9-4910-482-10).
2. If parking brakedrum (1) or service brakedrum (2) were machined, measure inside diameter. If inside diameter measurement is greater than limits, replace parking brakedrum (1) or service brakedrum (2).

11-2. PARKING AND SERVICE BRAKEDRUM REPAIR (Contd)



PARKING BRAKEDRUM



SERVICE BRAKEDRUM

FOLLOW-ON TASK: Install service or parking brakedrums (TM 9-2320-361-20).

11-3. PARKING AND SERVICE BRAKESHOE REPAIR

THIS TASK COVERS:

- | | |
|--|--------------------|
| <p>a. Disassembly
b. Cleaning and Inspection</p> | <p>c. Assembly</p> |
|--|--------------------|
-

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Brake reliner (Appendix B, Item 12)

MATERIALS/PARTS

Service brakeshoe parts kit
(Appendix F, Item 190)
Parking brakeshoe parts kit
(Appendix F, Item 189)
Drycleaning solvent (Appendix C, Item 24)

REFERENCES (TM)

TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

Parking or service brakeshoes removed
(TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- Do not use compressed air or dry brush for cleaning in areas where asbestos brake lining dust may accumulate.
 - Keep fire extinguisher nearby when using drycleaning solvent.
-

NOTE

- Parking and service brakeshoes are repaired basically the same. This task covers service brakeshoe repair.
- All service and parking brakeshoe linings must be replaced as matched sets.

Remove fourteen rivets (4) and lining (2) from service brakeshoe (1). Discard rivets (4).

b. Cleaning and Inspection

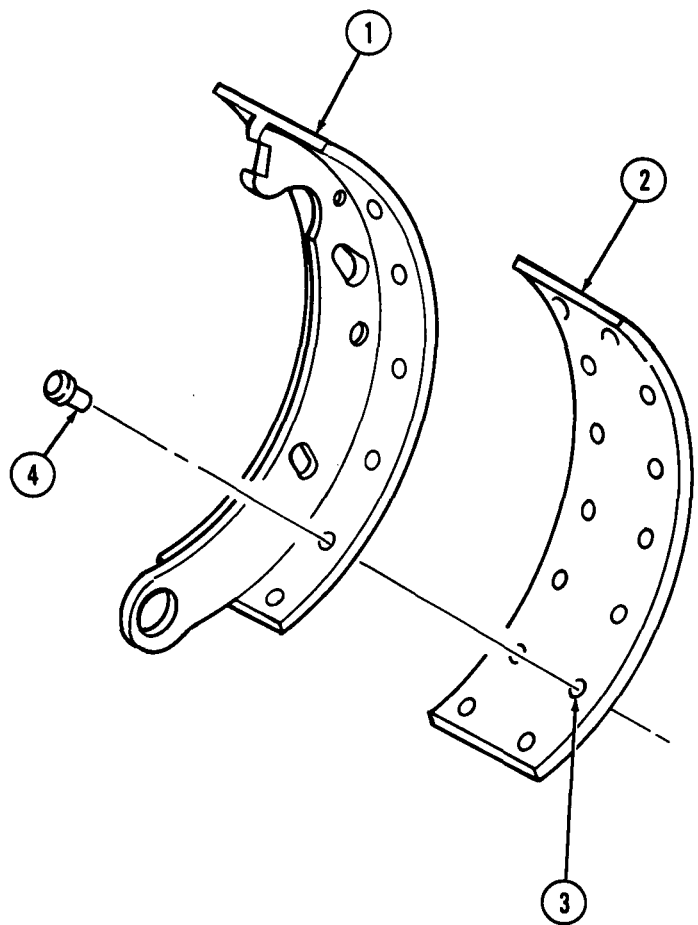
WARNING

- Do not use compressed air or dry brush for cleaning when working in areas of vehicle where asbestos brake lining dust may accumulate. Remove asbestos dust and other residue from these areas using a soft bristle brush or cloth soaked with water. Breathing asbestos dust may cause injury to personnel.
 - Drycleaning solvent is flammable and will not be used near open flame. Use only in well-ventilated places. Failure to do so may result in injury or death to personnel.
1. Clean brakeshoe (1) with water and soft bristle brush. Allow to air dry. Clean with drycleaning solvent.
 2. Check brakeshoe (1) for cracks, warps, flat spots on faces, and out-of-round rivet holes (3). Replace if cracked, warped, flat, or holes are out-of-round.

c. Assembly

Install lining (2) on service brakeshoe (1) with fourteen new rivets (4).

11-3. PARKING AND SERVICE BRAKESHOE REPAIR (Contd)



CHAPTER 12 STEERING GEAR MAINTENANCE

12-1. STEERING GEAR MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
12-2.	Steering Gear Replacement	12-1
12-3.	Steering Gear Repair	12-6

12-2. STEERING GEAR REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Torque wrench, 1/2-in. dr. (Appendix B, Item 7)

MATERIALS/PARTS

Screw-assembled lockwasher
(Appendix F, Item 155)
Four lockscrews (Appendix F, Item 119)
Four locknuts (Appendix F, Item 95)
Tiedown strap (Appendix C, Item 15)

REFERENCES (TM)

LO 9-2320-209-12-1
TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

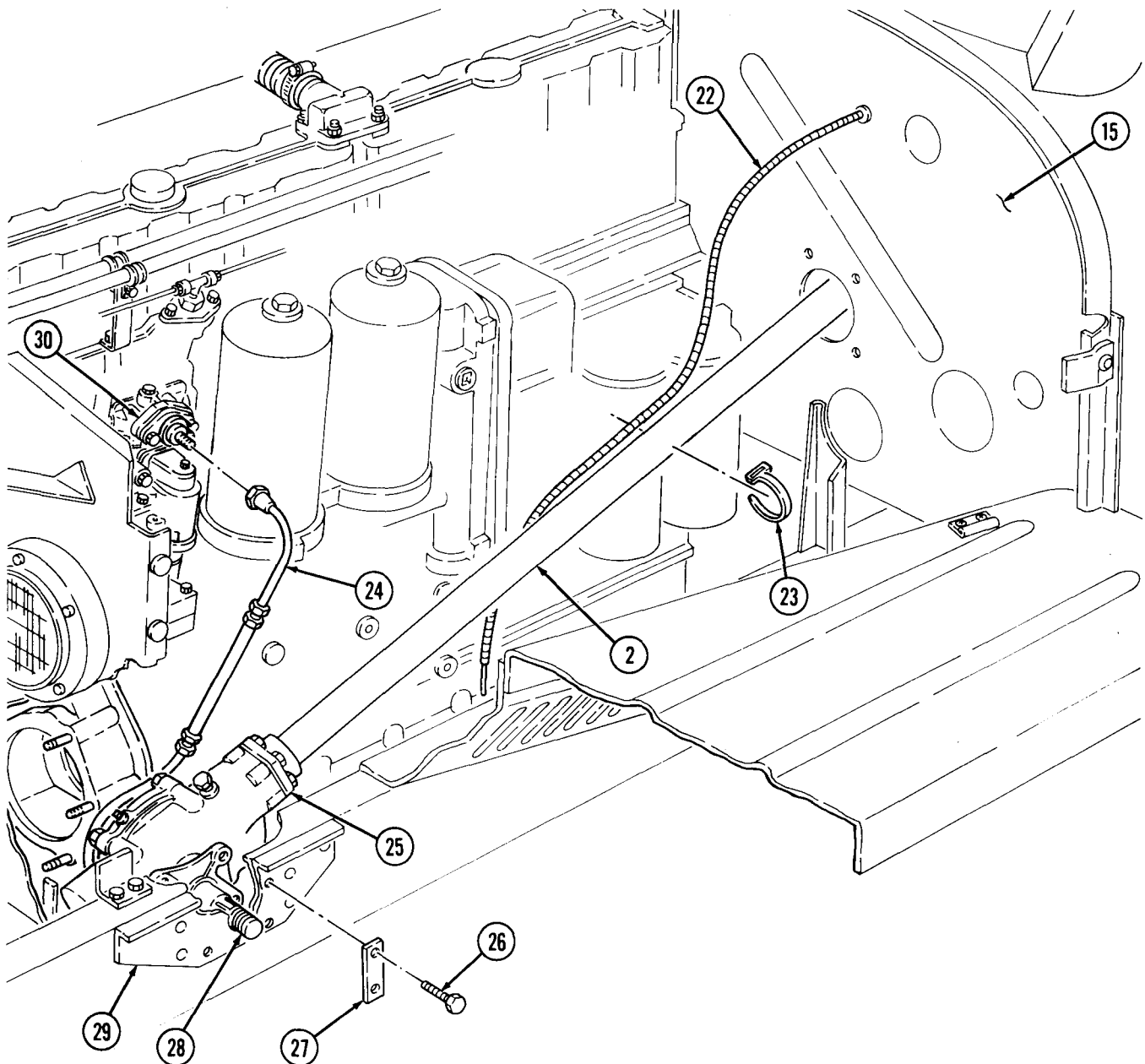
- Steering wheel removed (TM 9-2320-361-20).
- Horn cable removed (TM 9-2320-361-20).
- Turn signal control removed (TM 9-2320-361-20).
- Airbrake hand control valve removed (if installed) (TM 9-2320-361-20).
- Personnel heater removed (TM 9-2320-361-20).
- Front winch propeller shaft removed, if installed (TM 9-2320-361-20).
- Fuel injection pump removed (para. 5-4).
- Left front engine mount bracket removed (para. 3-2).
- Pitman arm removed (TM 9-2320-361-20).
- Steering gear drained (LO 9-2320-209-12-1).

12-2. STEERING GEAR REPIACEMENT(Contd)

CAUTION

Do not bind or bend steering column. Permanent damage to column may result.

9. Remove tiedown strap (23) and engine stop control cable (22) from steering column (3). Discard tiedown strap (23).
10. Remove air line (24) from air compressor (30).
11. Remove four lockscrews (26) and two spacers (27) from frame support (29) and steering gear (25). Discard lockscrews (26).
12. Remove pitman shaft end (28) from hole in frame support (29).
13. Remove steering gear (25) and steering column (3) from firewall (15).

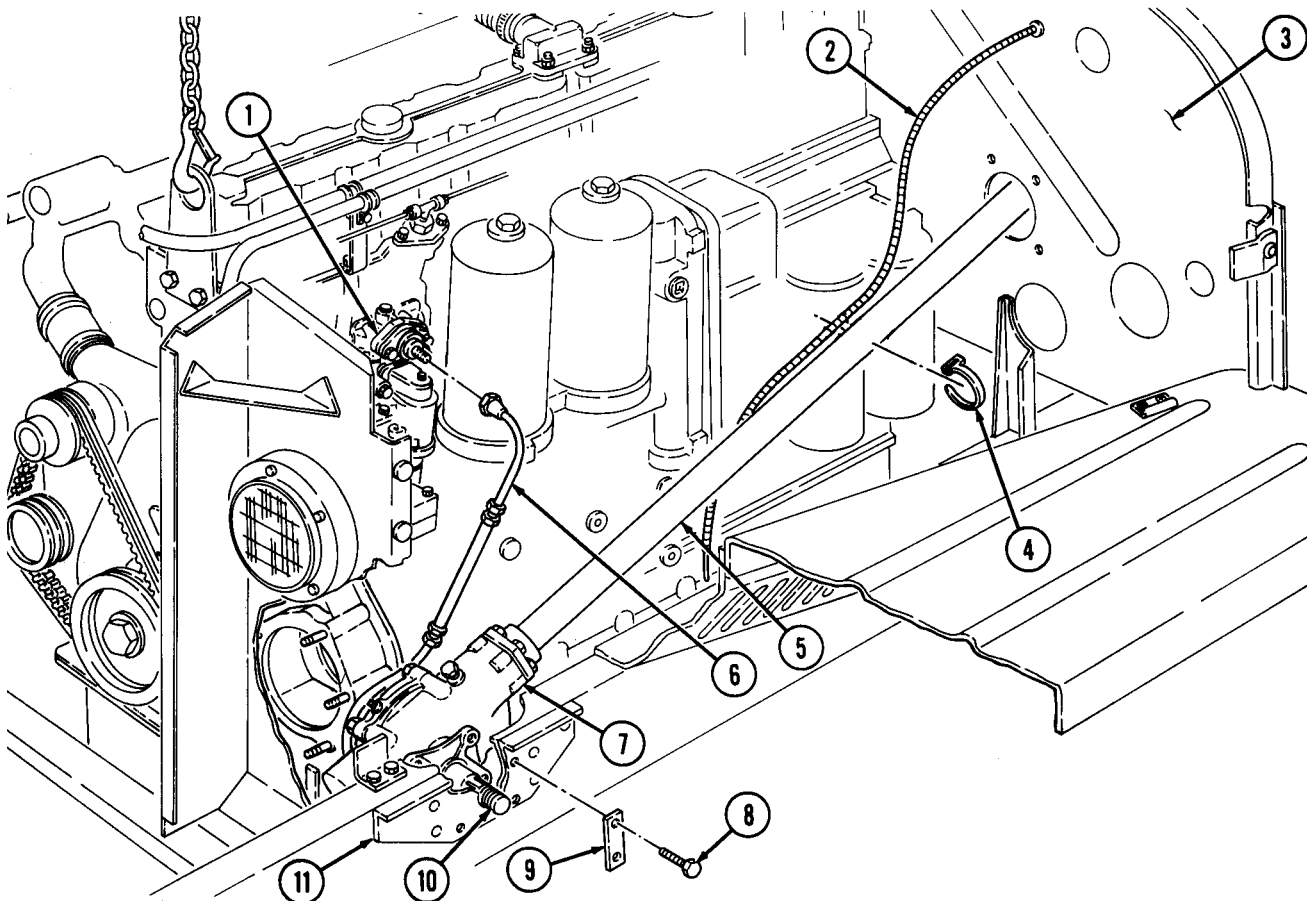


12-2. STEERING GEAR REPLACEMENT (Contd)

CAUTION

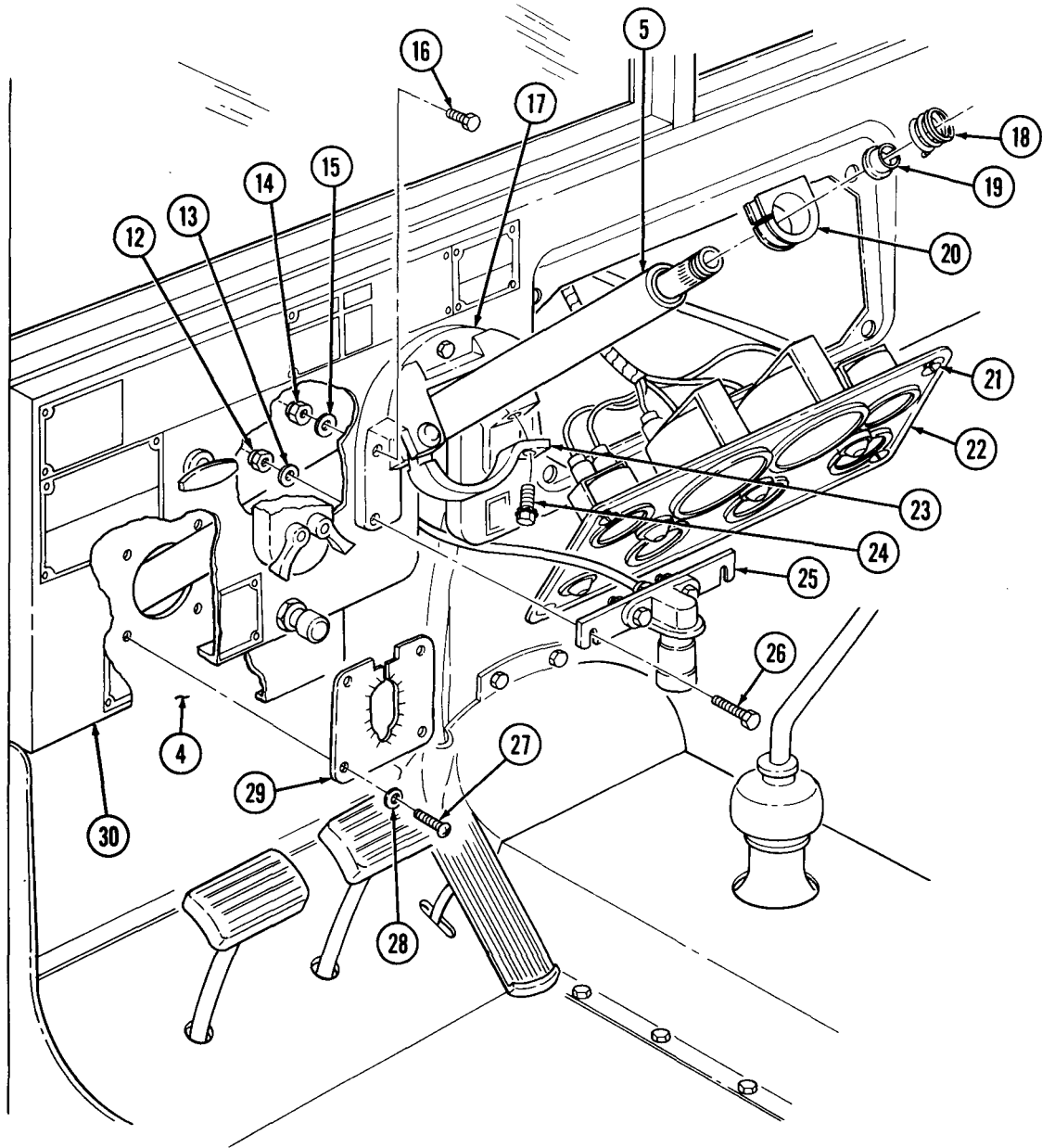
Do not bind or bend steering column. Permanent damage to column may result.

1. Install steering column (5) through firewall (4).
2. Insert pitman shaft end (10) through frame support (11).
3. Install steering gear (7) on frame support (11) with two spacers (9) and four new lockscrews (8). Tighten four lockscrews (8) 62-68 lb-ft (84-92 N.m).
4. Install air line (6) on air compressor (1).
5. Install new tiedown strap (4) around engine stop control cable (2) and steering column (5).



6. Install bushing (20) over steering column (5) into collar (17) and fasten bracket (23) with new screw-assembled lockwasher (24).
7. Install two screws (16) through collar (17) and instrument panel (4) with two washers (15) and new locknuts (14).
8. Install bracket (25) on collar (17) with two screws (26), washers (13), and new locknuts (12).
9. Install pad (29) on steering column (5) and firewall (30) with four washers (28) and screws (27).
10. Position instrument cluster (22) on instrument panel (4) and lock in place by turning four studs (21) 1/4 turn to right.
11. Install retainer (19) and spring (18) on steering column (5).

12-2. STEERING GEAR REPLACEMENT (Contd)



- FOLLOW-ON TASKS:**
- . Fill steering gear to proper oil level (LO 9-2320-209-12-1).
 - . Install pitman arm (TM 9-2320-361-20).
 - Install left front engine mount bracket (para. 3-2).
 - . Install fuel injection pump (para. 5-4).
 - Install front winch propeller shaft, if removed (TM 9-2320-361-20),
 - Install personnel heater (TM 9-2320-361-20),
 - Install airbrake hand control, if removed (TM 9-2320-361-20).
 - Install turn signal control (TM 9-2320-361-20).
 - Install horn cable (TM 9-2320-361-20).
 - Install steering wheel (TM 9-2320-361-20).
 - Adjust steering gear (TM 9-2320-361-20).

12-3. STEERING GEAR REPAIR

THIS TASK COVERS:

- a. Disassembly**
b. Cleaning and Inspection

- c. Assembly**

INITIAL SETUPAPPLICABLE MODELS

All

TOOLS

General mechanic's tool kit (Appendix B, Item 1)
 Inside micrometer (Appendix B, Item 16)
 Outside micrometer (Appendix B, Item 17)
 Torque wrench, 1/2-in. dr. (Appendix B, Item 7)
 Torque wrench, 3/8-in. dr. (Appendix B, Item 8)
 1-1/4-in. socket, 1/2-in. dr. (Appendix B, Item 19)

SPECIAL TOOLS

Bushing remover and replacer
 (Appendix B, Item 59)
 Sleeve bearing hand burnisher
 (Appendix B, Item 60)
 Screw, remover and replacer
 (Appendix B, Item 64)

MATERIALS/PARTS

Steering gear repair kit (Appendix F, Item 191)
 Gasket (Appendix F, Item 33)
 Seal (Appendix F, Item 238)
 Two gaskets (Appendix F, Item 32)
 Lubricating oil, GO 80/90 (Appendix C, Item 11)

REFERENCES (TM)

TM 9-214
 TM 9-2320-361-34P

EQUIPMENT CONDITION

Steering gear removed (para. 12-2).

a. Disassembly

1. Remove six screws (11), washers (12), side cover (13), and gasket (7) from gear housing (4). Discard gasket (7).
2. Remove plug (8), nut (10), and preload screw (9) from side cover (13).
3. Clamp gear housing mounting flange (3) in vise with gear tube (14) in up position.

CAUTION

All dirt and grease must be removed from exposed pitman shaft end prior to removal. Failure to clean pitman shaft end may result in scoring of shaft bushings.

4. Remove pitman shaft (6) from gear housing (4).

NOTE

Steering gear may have one or more shims under tube cover. Tag shim(s) in order removed for installation.

5. Remove four screws (15), washers (16), gear tube cover (17), gear tube (14), gasket (18), shim(s) (19), and gasket (18) from cam (22). Discard gaskets (18).

CAUTION

When removing cam from bearing cup bores, do not chip cam grooves, or wedge cam bearings against gear housing. Damage to cam, cam bearings, or gear housing may result.

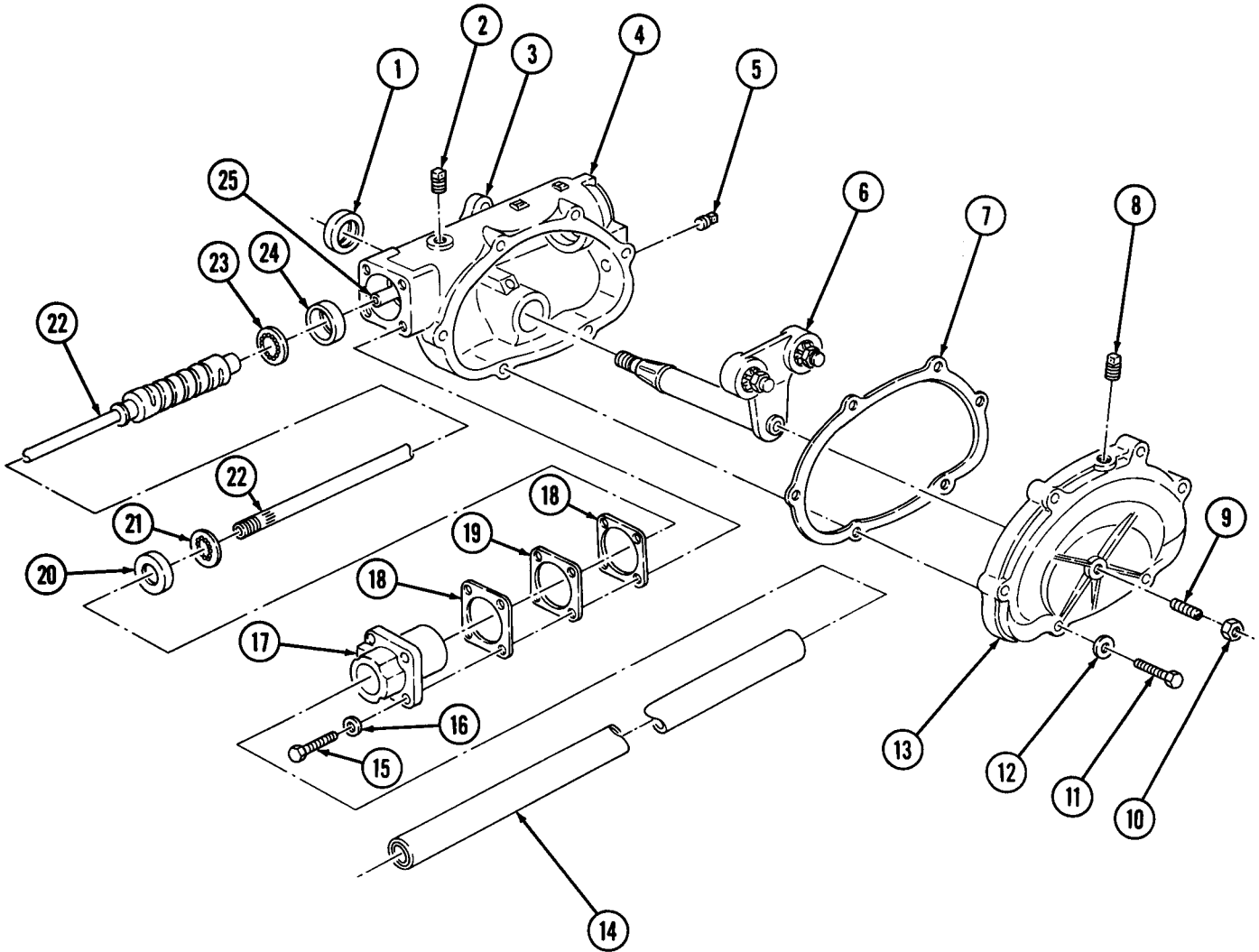
6. Remove cam (22) from gear housing (4) and end cover tube (25).
7. Remove cam bearing (21) and cup (20) from cam (22).
8. Remove cam bearing (23) and cup (24) from cam (22).

12-3. STEERING GEAR REPAIR (Contd)

CAUTION

Do not score pitman shaft bushings when removing oil seal from gear housing. Damaged bushings may score pitman shaft.

- 9. Remove seal (1) from gear housing (4). Discard seal (1).
- 10. Remove plugs (2) and (5) from gear housing (4).



12-3. STEERING GEAR REPAIR (Contd)

b. Cleaning and Inspection

NOTE

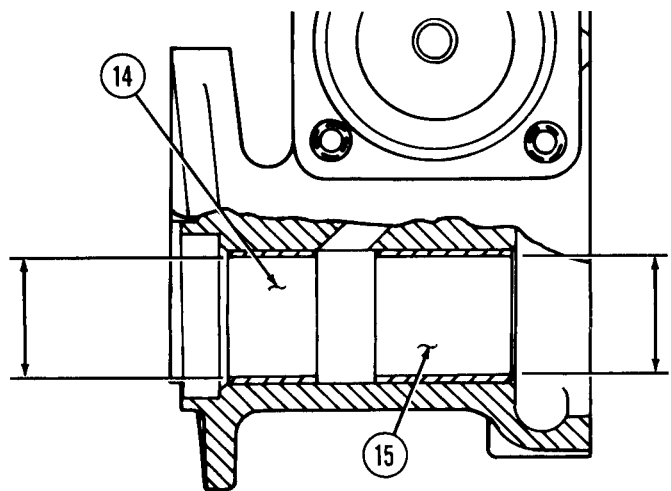
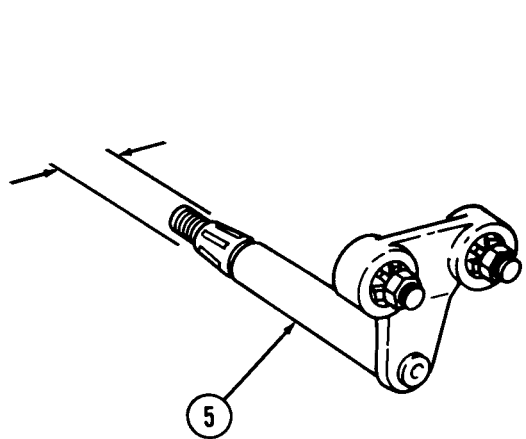
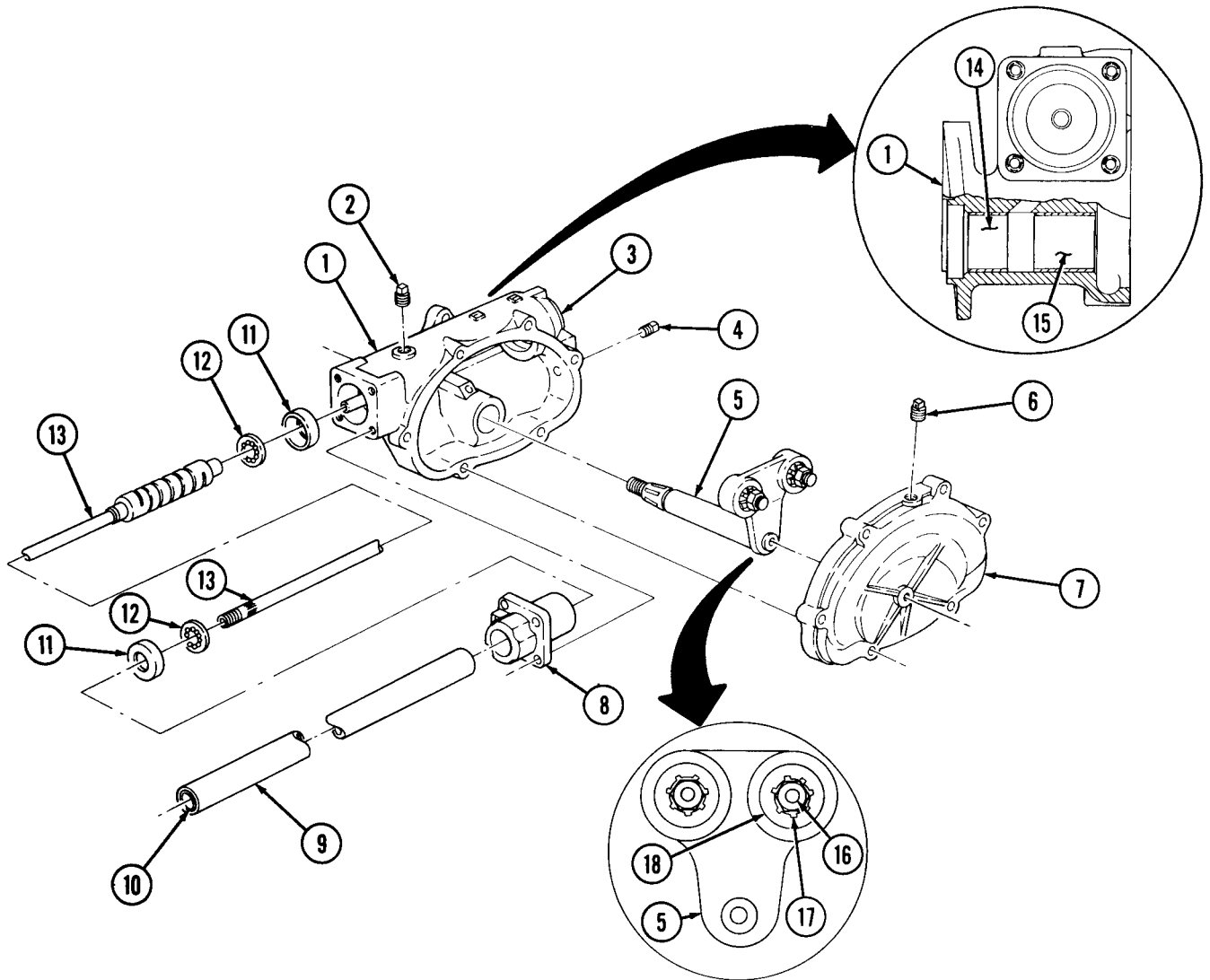
Magnifying glass is recommended for detailed parts inspection.

1. For general cleaning instructions, refer to para. 2-8.
2. Inspect plugs (2), (4), and (6) (para. 2-9). Replace if defective.
3. Inspect side cover (7) and gasket mating surface for cracks or other damage. Replace if defective.
4. Inspect wear limits on pitman shaft (5). For measurements, refer to Table 12-1, Steering Gear Wear Limits. Replace pitman shaft (5) if worn past limits.
5. Inspect pitman shaft (5) for scoring, bends, and wear. Replace if defective.
6. Inspect gear tube (9) for bends or damage. Replace if defective.
7. Inspect gear tube cover (8) for cracks or breaks. Replace if defective.
8. Inspect cam (13) for bends or cracks. Replace if defective.
9. Inspect cam (13) for chipped, cracked, or scored bearing races and cam grooves. Replace if defective.
10. Inspect cam bearings (12) and cups (11) for cracks or scoring. Replace if defective.
11. Inspect gear housing (1) and gasket surfaces for cracks or other damage. Replace if defective.
12. Inspect end cover (3) in gear housing (1) for oil leaks or damage. Replace if defective.
13. Inspect tube bearing (10) for wear (TM 9-214). Replace if defective.
14. Inspect pitman shaft taper stud bearings (12) for wear (TM 9-214). Replace if defective.
15. Bend tang washer tabs (17) down on each bearing (18) and release nut (16). Check each nut (16) for bearing preload. Each bearing preload is 2.5-6 lb-in. (0.28-0.68 N.m) with rotating bearing. Replace if bearing(s) (18) will not rotate after correct preload is set.
16. Inspect wear limits on pitman shaft bushings (14) and (15). For measurements, refer to Table 12-1, Steering Gear Wear Limits. Replace bushings (14) and (15) if worn past limits.
17. Inspect pitman shaft bushings (14) and (15) in gear housing (1) for scoring, wear, or other damage. Replace if defective. Perform steps 17 through 19.

Table 12-1. Steering Gear Wear Limits.

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		INCHES	MILLIMETERS
5	Pitman shaft (outside diameter)	1.372-1.373	34.85-34.87
14& 15	Pitman shaft bushing(s) (inner diameter)	1.373-1.375	34.87-34.93

12-3. STEERING GEAR REPAIR (Contd)



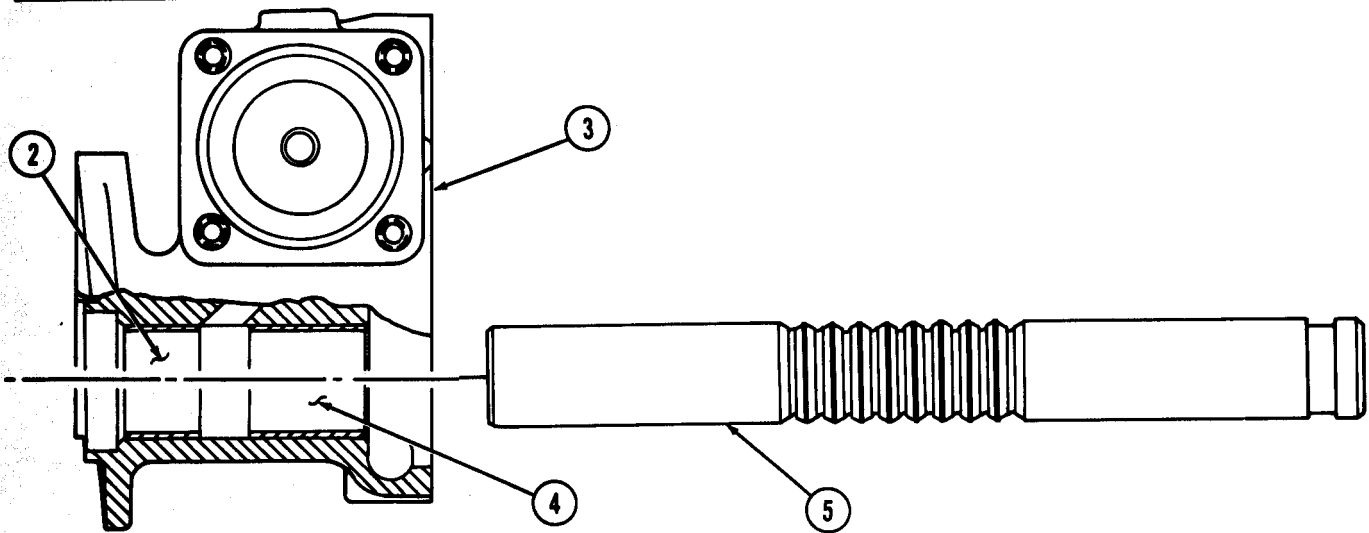
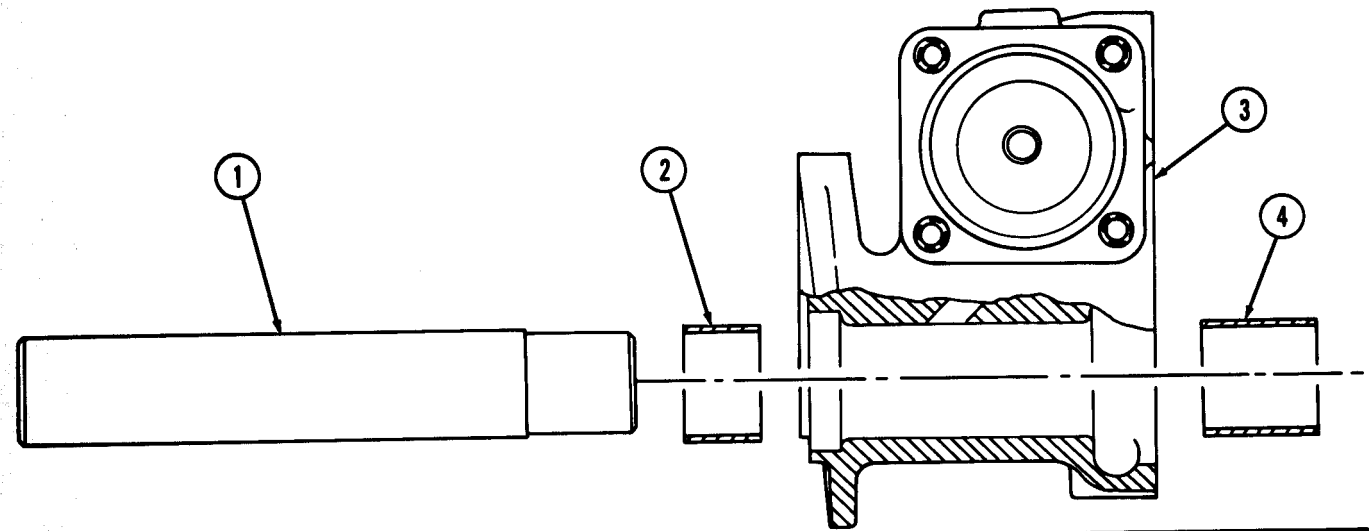
12-3. STEERING GEAR REPAIR (CONT'd)

18. Remove pitman shaft bushings (2) and (4) from gear housing (3) with bushing remover (1).
19. Install new pitman shaft bushings (2) and (4) in gear housing (3) with bushing replacer (1).

NOTE

- Pitman shaft to bushing clearance when installed is 0.001-0.003 in. (0.03-0.08 mm). To establish initial clearance, subtract outer diameter of pitman shaft from inner diameter of each bushing in housing. If bushing(s) require resizing, perform step 19.
- Inside bushing(s) diameter cannot exceed 1.375 in. (34.93 mm).

20. Ream and burnish new bushings (2) and (4) in gear housing (3) with sleeve bearing hand burnisher.



c. Assembly

CAUTION

Assembly area must be free of dirt and grease. Dirt or grease may damage internal steering gear components.

1. Install new seal (9) in gear housing(3).

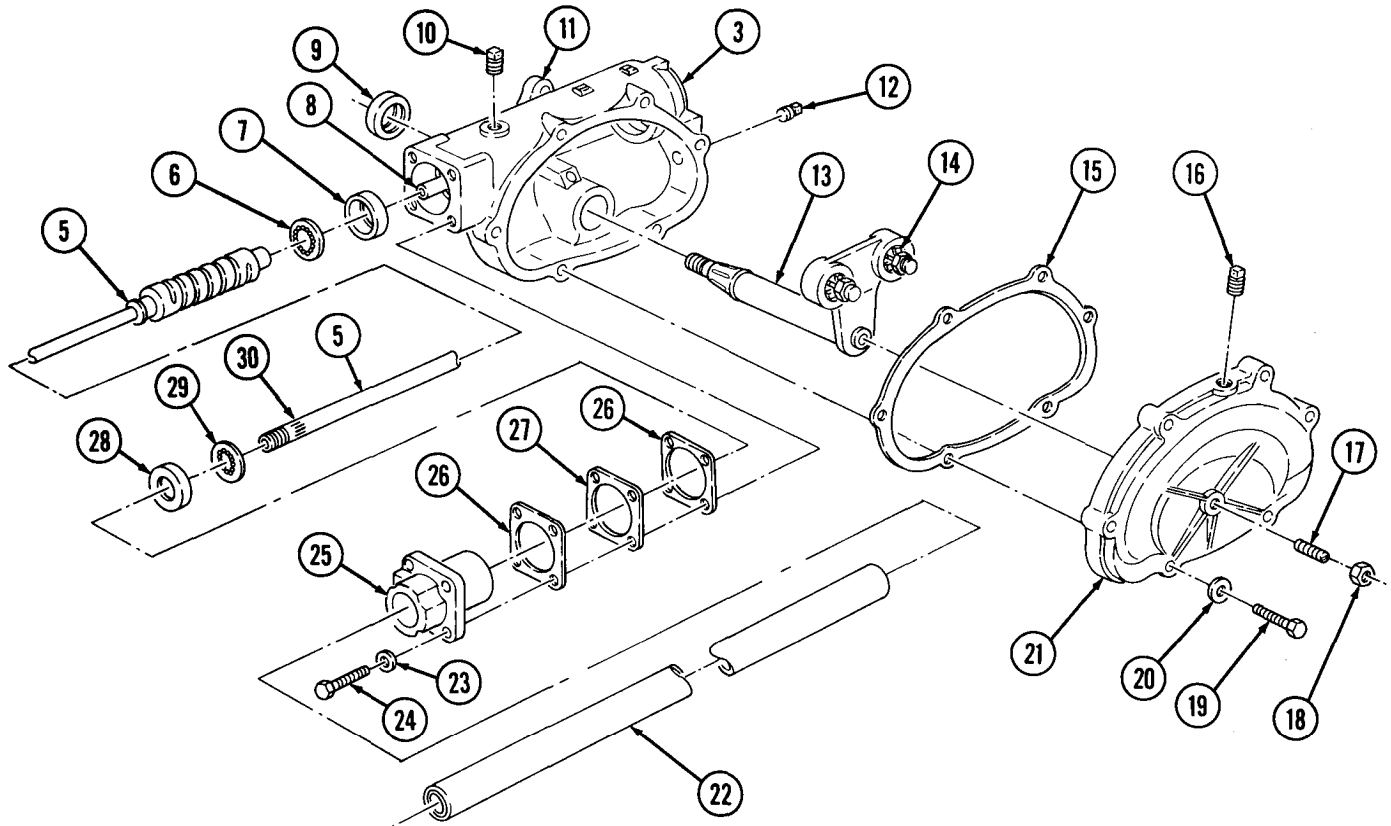
12-3. STEERING GEAR REPAIR (Contd)

2. Clamp gear housing mounting seal (11) in vise with cam (5) bore positioned up.
3. Install cup (7) over end cover tube (8) and seat in gear housing (3).
4. Lubricate cam bearings (29) and (6) with oil prior to cam (5) installation.
5. Install cam bearings (29) and (6) and cup (28) on cam (5).
6. Install cam (5) over end cover tube (8) through gear housing (3) and seat bearing (6) on cup (7).
7. Install plugs (10), (12), and (16) in gear housing (3) and side cover (21).
8. Position new gasket (26), shim(s) (27), new gasket (26), gear tube cover (25), and gear tube (22) over cam (5) on gear housing (3) and install with four washers (23) and new screws (24). Tighten screws (24) 35 lb-ft (47.5 N.m).
9. Ensure rotational drag on cam end (30) is 3-8 lb-in. (0.3-0.9 N.m).

NOTE

If rotational drag on shaft is not within specifications, add or remove smallest shim for each adjustment until specifications are met.

10. Lubricate pitman shaft bearings (14) with gear oil prior to pitman shaft (13) installation.
11. Install pitman shaft (13) in gear housing (3).
12. Install new gasket (15) and side cover (21) on gear housing (3) with six washers (20) and screws (19).
13. Install preload screw (17) with nut (18) in side cover (21). Do not tighten screw (17) or nut (18).



FOLLOW-ON TASK :Install steering gear (para. 12-2).

CHAPTER 13

FRAME MAINTENANCE

13-1. FRAME MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
13-2.	General	13-1
13-3.	Frame Alinement Inspection	13-1
13-4.	Fifth Wheel Maintenance	13-12

13-2. GENERAL

Refer to technical bulletin TB 9-2300-247-40, Tactical Wheeled Vehicles: "Repair of Frames," for authorized repair of frames used on M44A2 series vehicles.

13-3. FRAME ALINEMENT INSPECTION

THIS TASK COVERS:

- | | |
|---|---|
| <p>a. Frame Leveling</p> <p>b. Horizontal Bow Inspection, Frames 20 Ft (6 M) or Less</p> <p>c. Horizontal Bow Inspection, Frames 20 Ft (6 M) or More</p> | <p>d. Frame Squareness</p> <p>e. Vertical Bow Inspection, Frames 20 Ft (6 M) or Less</p> <p>f. Vertical Bow Inspection, Frames 20 Ft (6 M) or More</p> |
|---|---|

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Plumb bob (Appendix B, Item 5)
Tape measure (Appendix B, Item 30)
Two straight edges (Appendix B, Item 52)
Jack stands
Hydraulic jack

MATERIALS/PARTS

Twine (Appendix C, Item 29)
Chalk (Appendix C, Item 6)
Tape, masking (Appendix C, Item 27)
Tape, transparent (Appendix C, Item 28)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TB 9-2300-247-40
TM 9-2320-361-10
TM 9-2320-361-34P

EQUIPMENT CONDITION

- Vehicle undercarriage clean and free of mud and debris.
- . Tires checked for proper air pressure (TM 9-2320-361-10).

13-3. FRAME ALINEMENT INSPECTION (Contd)

NOTE

- Any loose or missing cross member rivets, loose or broken crossmembers, or damaged frame rails must be repaired prior to inspection.
- Ensure inspection procedure is performed on a flat level surface.

a. Frame Leveling

1. Drive truck into inspection position from a 12 ft (3.7 m) straight line of travel. Apply parking brake (TM 9-2320-361-10) and chock wheels (TM 9-2320-361-10).
2. Using tape measure, determine distance from floor (3) to bottom of front frame rails (1) in front of crossmember (4). If one frame rail (1) is lower, use hydraulic jack and raise one side of front axle to level frame rails (1) to within 1/8 in. (3 mm) of each other.
3. Using tape measure, determine distance from floor (3) to bottom of rear frame rails (1) at cross-member (2). If one frame rail (1) is lower, use hydraulic jack and raise one side of rear-rear axle to level frame rails (1) to within 1/8-5/16 in. (3-8 mm) of each other.

b. Horizontal Bow Inspection, Frames 20 Ft (6 M) or Less

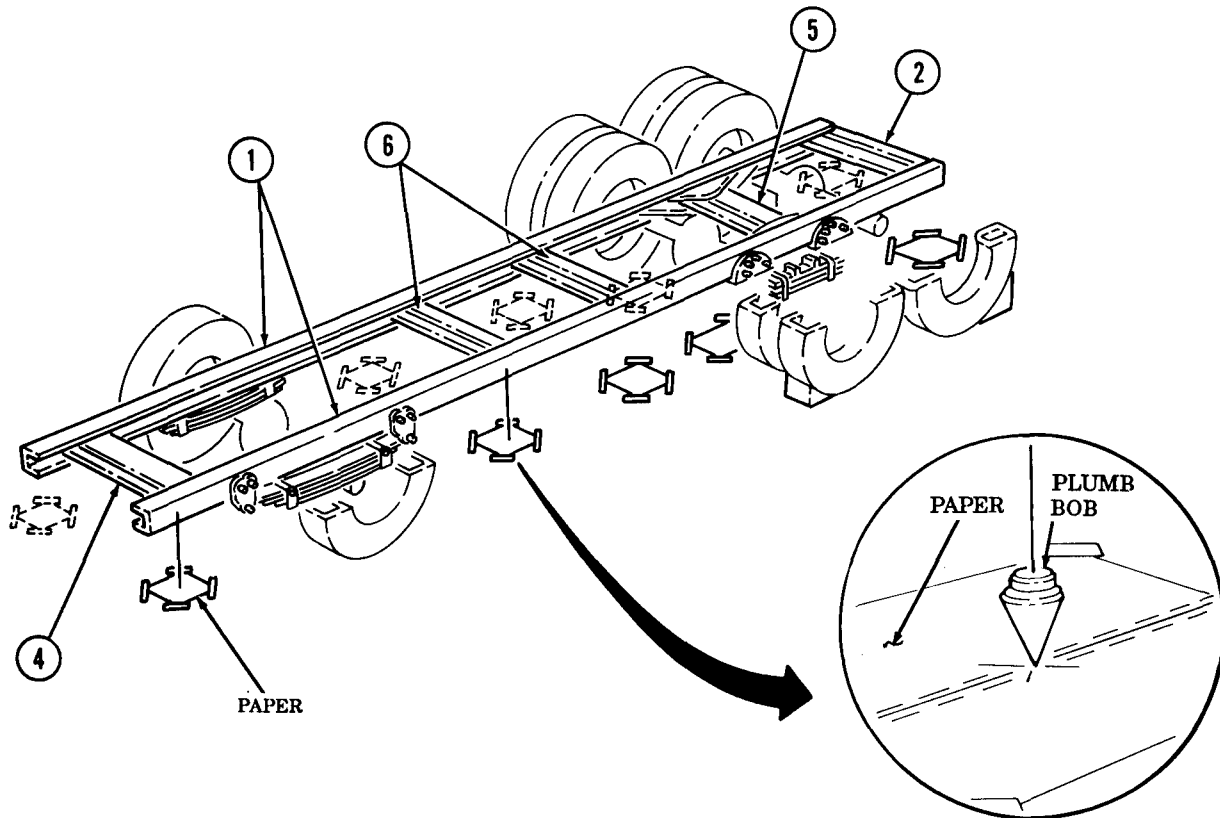
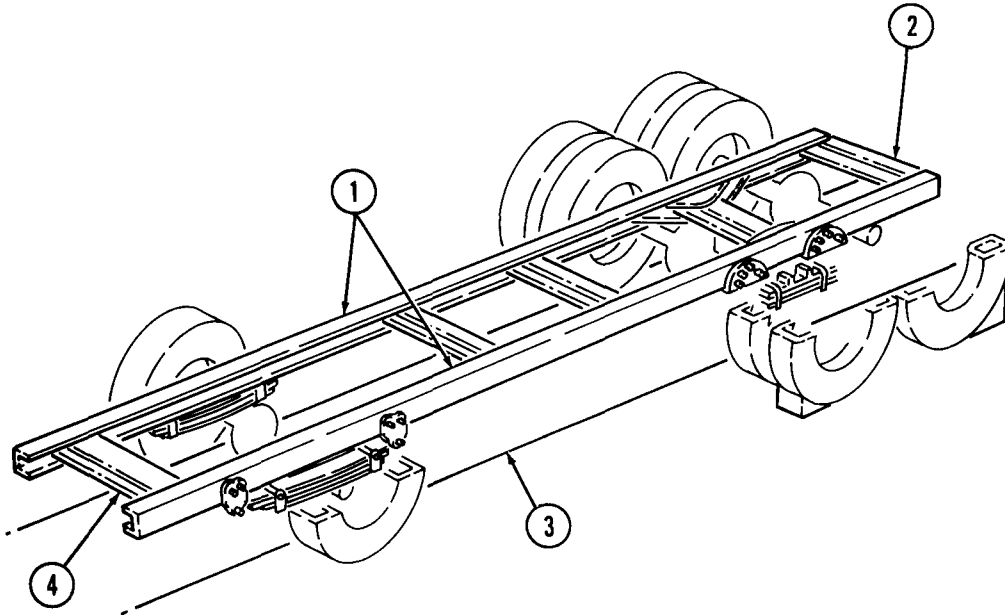
1. Tape one 8 x 10-1/2 in. (20x 27 cm) sheet of white paper to floor (3) under each end of frame crossmembers (6) and in front of crossmember (4) where attached to frame rails (1).
2. Tape one 8 x 10-1/2 in. (20x 27 cm) sheet of white paper to floor (3) under each front bogie bracket (5).

NOTE

Ensure plumb bob string is placed flat against frame rails free of obstructions such as bolts, rivets, brackets, and rear springs. Allow plumb bob to stop swinging before making mark on paper.

3. Hold string with plumb bob to outside of frame rails (1), above paper, and 4 in. (10 cm) up from bottom of frame rails (1). Accurately locate point of paper directly below plumb bob.
4. Carefully mark spot on each paper directly below plumb point.

13-3. FRAME ALINEMENT INSPECTION (Contd)



13-3. FRAME ALINEMENT INSPECTION (Contd)

NOTE

Strings used for horizontal bow measurement will remain in place until procedure d, frame squareness, is completed. On frames longer than 20 ft (6 m), the two front and rear strings will be used.

5. Stretch string tightly on floor (5) between front and rear plumb bob marks (2) under each frame rail (1). Place weights on string to keep it taut or tie ends of string to jack stands.

NOTE

For frame rail sections with added fishplate, subtract 5/16 in. (7.94 mm) from plumb bob marks to compensate for the fishplate added to frame rail.

6. Measure distance between string and each plumb bob mark (2). If distance is more than 1/2 in. (13 mm) from bow (3), or 1/2 in. (13 mm) from bow (4), frame rails (1) are out of tolerance.

NOTE

If measured frame rails are out of tolerance, notify supervisor. If frame rails are verified to be out of tolerance, truck will be classified as unserviceable.

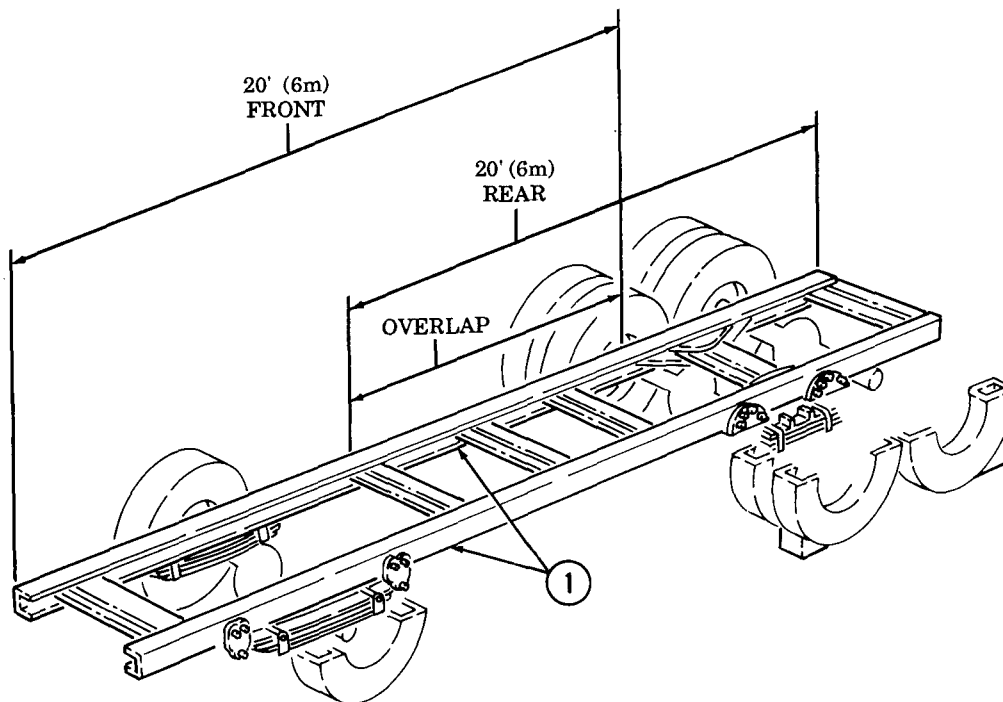
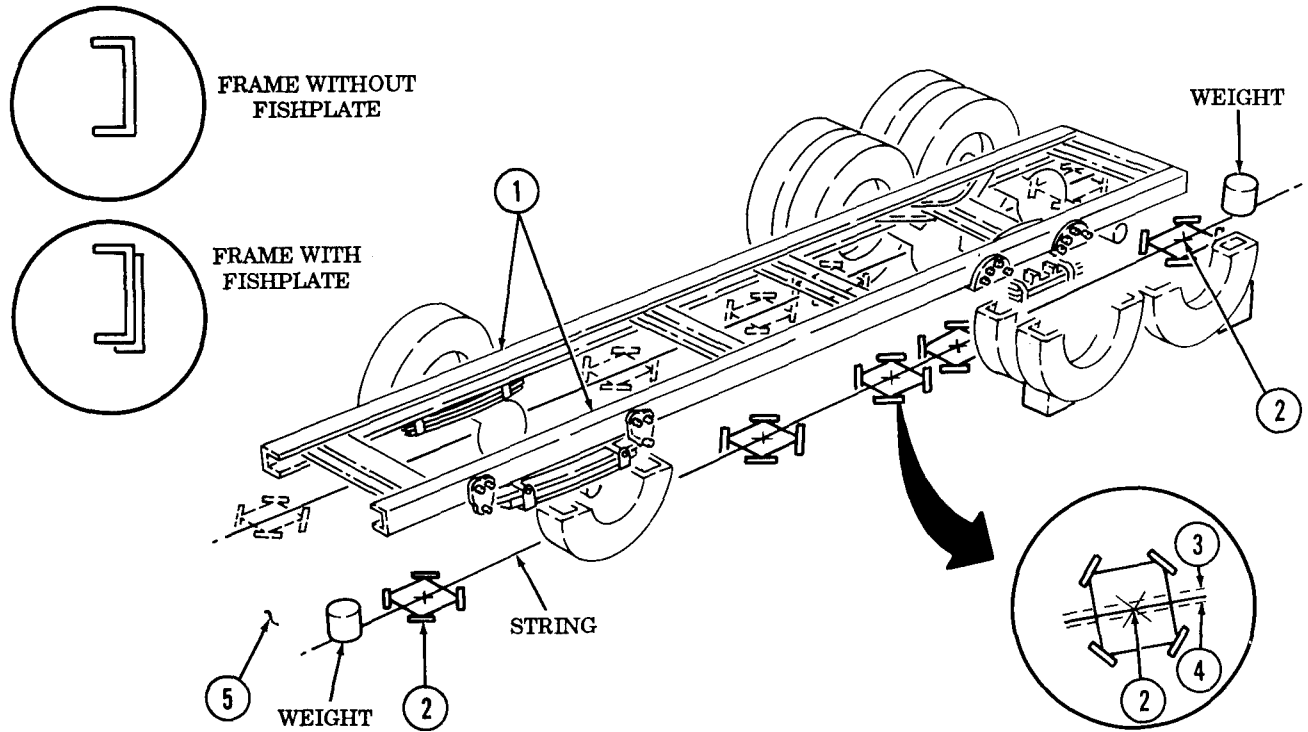
c. Horizontal Bow Inspection, Frames 20 Ft (6 M) or More

NOTE

On trucks with a frame longer than 20 ft (6 m), the front 20 ft (6 m) of frame rail (measured from front to rear) and the rear 20 ft (6 m) of frame rail (measured from rear to front) are measured separately. This will cause an overlap in measurement.

Perform procedure b for each 20 ft (6 m) section of left and right frame rails (1).

13-3. FRAME ALINEMENT INSPECTION (Contd)



13-3. FRAME ALINEMENT INSPECTION (Contd)

d. Frame Squareness

1. Locate and clean two front grease fittings (2) on right and left front spring shackles (1).
2. Tape an 8 x 10-1/2 in. (20x 27 cm) sheet of white paper to floor (4) under right and left front spring shackles (1).

NOTE

Ensure plumb bob is placed toward front of truck on both right and left grease fittings. If not, inaccurate measurement of frame squareness will result.

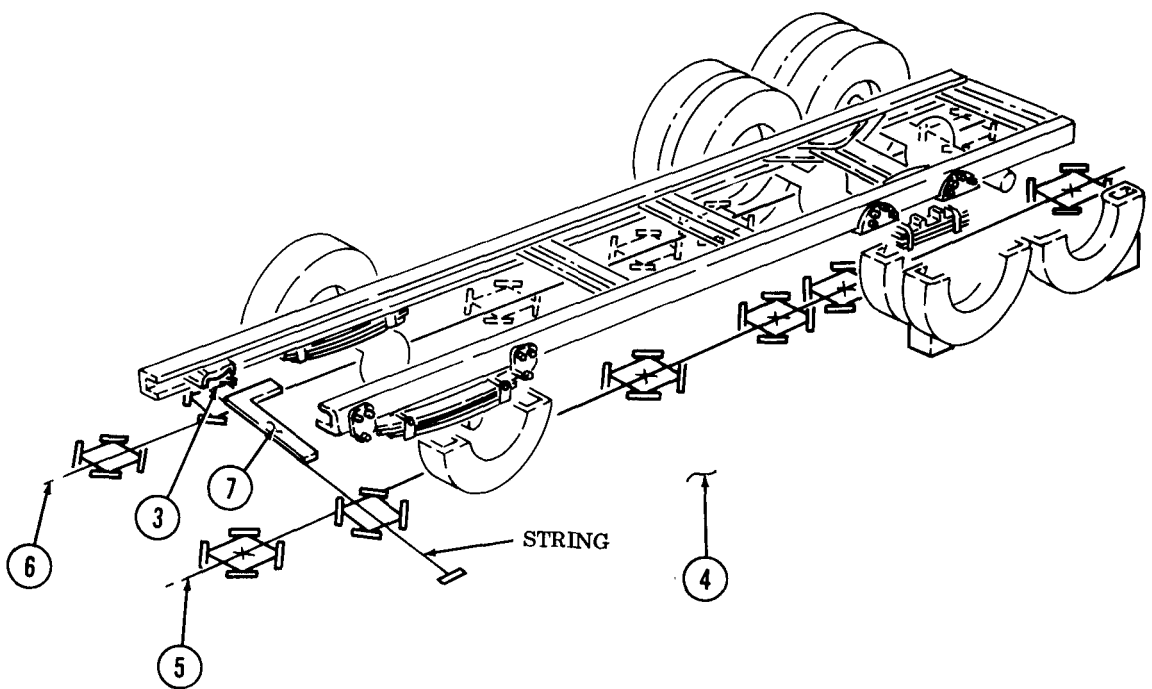
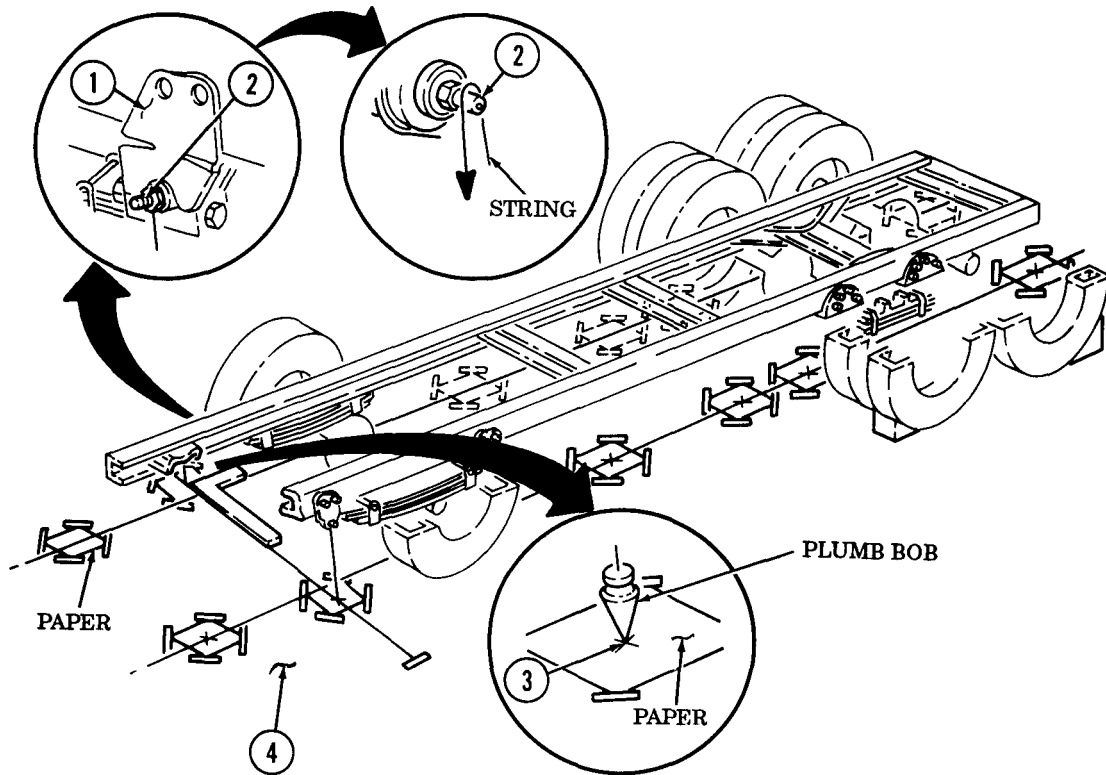
3. Place string over grease fitting (2) on right front spring shackle (1) with plumb bob toward front of truck. Lower plumb bob and locate a point on paper below spring shackle (1).

NOTE

Do not mark paper until plumb bob has stopped swinging and is close to, but not touching, paper.

4. Carefully mark spot (3) on paper directly below plumb bob point.
5. Place one edge of square (7) along horizontal line (6) used to measure horizontal bow on right side of truck and other edge of square (7) touching plumb bob mark (3).
6. Stretch string along edge of square (7) to left side of truck. Allow string to extend 6 in. (15 cm) beyond left horizontal line (5). Tape or secure string to floor (4).

13-3. FRAME ALINEMENT INSPECTION (Contd)



13-3. FRAME ALINEMENT INSPECTION (Contd)

NOTE

Ensure plumb bob is placed toward front of truck on both right and left grease fittings. If not, inaccurate measurement of frame squareness will result.

7. Place string over grease fitting (2) on left front spring shackle (1) with plumb bob toward front of truck. Lower plumb bob and locate a point on paper below spring shackle (1).

NOTE

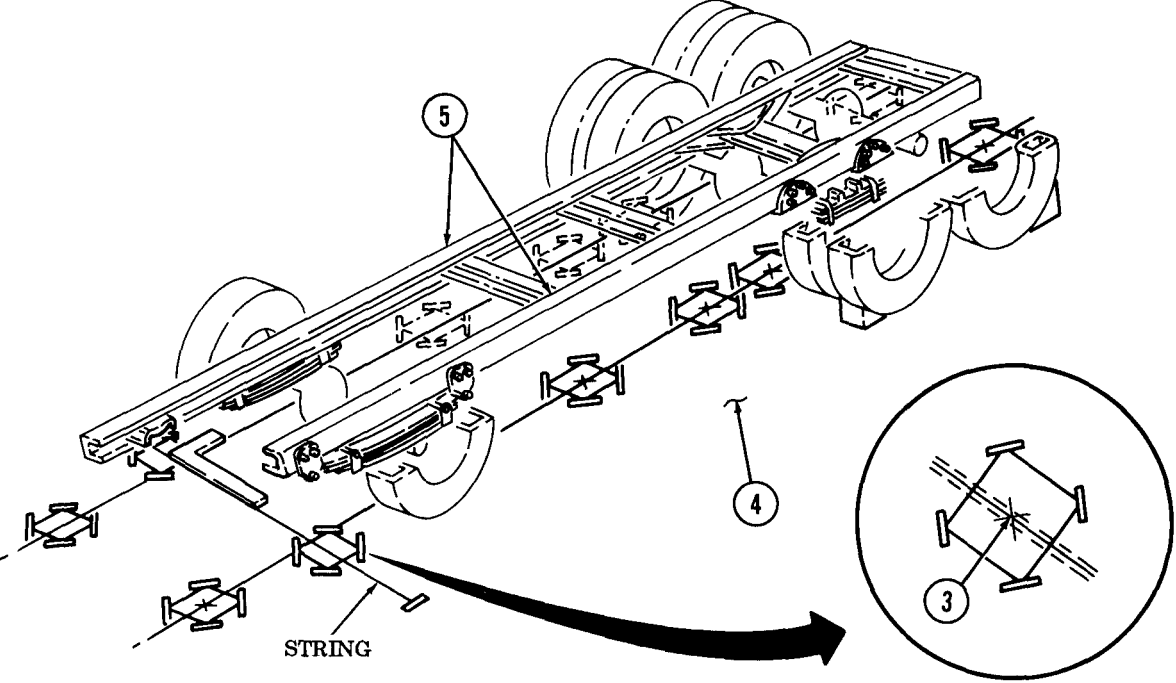
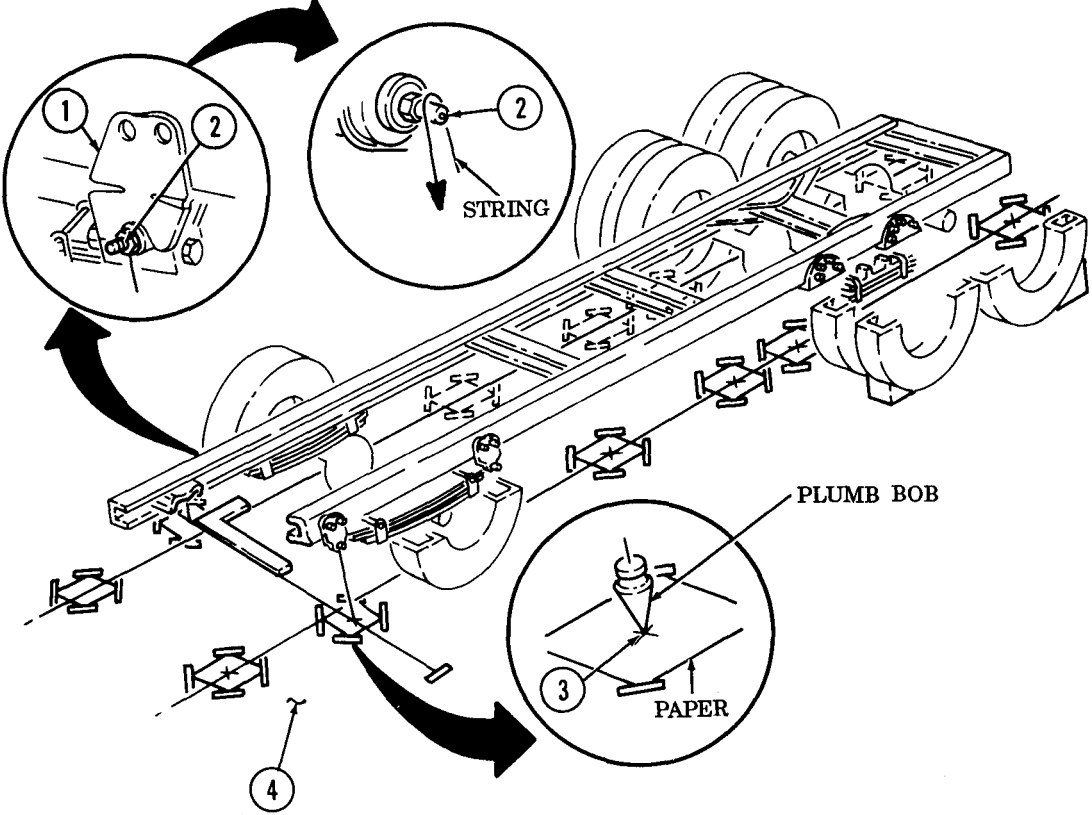
Do not make mark on paper until plumb bob has stopped swinging and is close to, but not touching, paper.

8. Carefully mark spot (3) on paper directly below plumb bob point.
9. Measure distance between left side plumb bob mark (3) and string on floor (4). If distance is more than 1/4 in. (6 mm), frame rails (5) are out of tolerance.

NOTE

- If measured frame rails are out of tolerance, notify supervisor. If frame rails are verified to be out of tolerance, truck will be classified as unserviceable.
- At end of inspection, remove plumb bob and string.

13-3 FRAME ALINEMENT INSPECTION (Contd)



13-3. FRAME ALINEMENT INSPECTION (Contd)

e. Vertical Bow Inspection, Frames 20 Ft (6 M) or Less

1. Stretch string on floor and position weight under bottom and at front of frame rail (1) or tie ends of string to jack stands. Pull string tight. Position weights or jack stands at 20 ft (6 m) measurement.
2. Measure distance between string and bottom of frame rail (1) at closest point to each weight or jack stand. Adjust string height until each measurement is the same and the entire length of string is unobstructed.
3. Measure distance between string and bottom of frame rail (1) near crossmembers (2) and as close to the midway point as possible. If frame rail (1) bows more than 1/8-5/16 in. (3-8 mm) up or down, the frame rail (1) is out of tolerance.

NOTE

If measured frame rails are out of tolerance, notify supervisor. If frame rails are verified to be out of tolerance, truck will be classified as unserviceable.

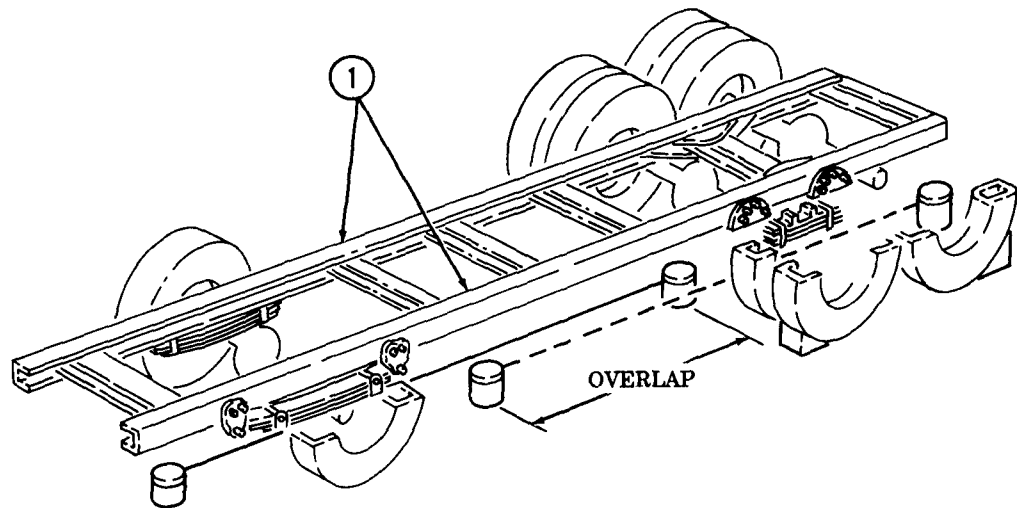
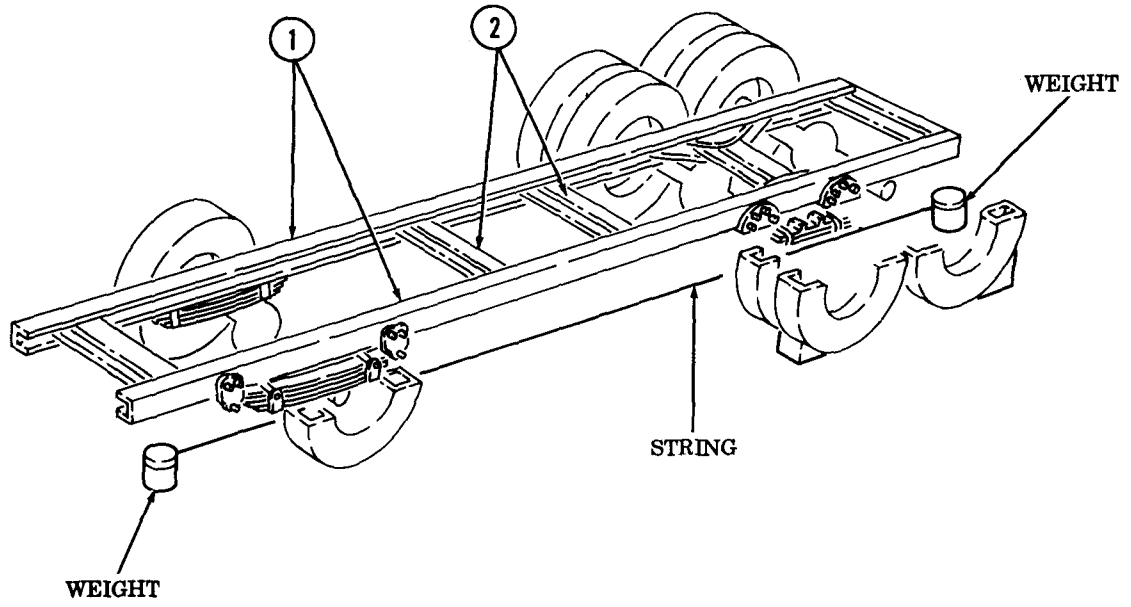
f. Vertical Bow Inspection, Frames 20 Ft (6 M) or More

NOTE

On trucks with a frame longer than 20 ft (6 m), the front 20 ft (6 m) of frame rail (measured from front to rear) and the rear 20 ft (6 m) of frame rail (measured from rear to front) are measured separately. This will cause an overlap in measurement.

Perform subtask e for each 20 ft (6 m) section of left and right frame rails (1).

13-3. FRAME ALINEMENT INSPECTION (Contd)



13-4. FIFTH WHEEL MAINTENANCE

THIS TASK COVERS:

- a. Disassembly**
- b. Cleaning and Inspection**

- c. Assembly**

INITIAL SETUP

APPLICABLE MODELS

M275A2

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Torque wrench, 3/4-in. dr. (Appendix B, Item 6)
- Caliper, vernier (Appendix B, Item 9)
- Lifting device
 - Four washers (Appendix F, Item 268)
 - Two screws (Appendix F, Item 212)
 - Two locknuts (Appendix F, Item 99)

MATERIALS/PARTS

- Cotter pin (Appendix F, Item 3)
- Cotter pin (Appendix F, Item 5)
- Two locknuts (Appendix F, Item 96)
- Locknut (Appendix F, Item 97)
- Locknut (Appendix F, Item 98)
- Two lockwashers (Appendix F, Item 126)
- Lockwasher (Appendix F, Item 127)
- Safety wire (Appendix C, Item 30)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

- LO 9-2320-209-12-1
- TM 9-2320-361-34P

EQUIPMENT CONDITION

Fifth wheel removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- . All personnel must stand clear during lifting operations.
- . Eye protection must be worn when removing or installing springs under tension.
- Personnel must stand clear during release of plunger rack.

a. Disassembly

1. Attach chain to fifth wheel housing (1) with four washers (2), two screws (5), and locknuts (3).
2. Attach lifting device to chain. Apply tension to chain.
3. Remove two lubrication fittings (4) from fifth wheel housing (1).

CAUTION

Do not use heat to remove pivot pins from fifth wheel housing. Damage to equipment will result.

4. Remove two retaining pins (7) and pivot pins (8) from fifth wheel housing (1) and base (6).

WARNING

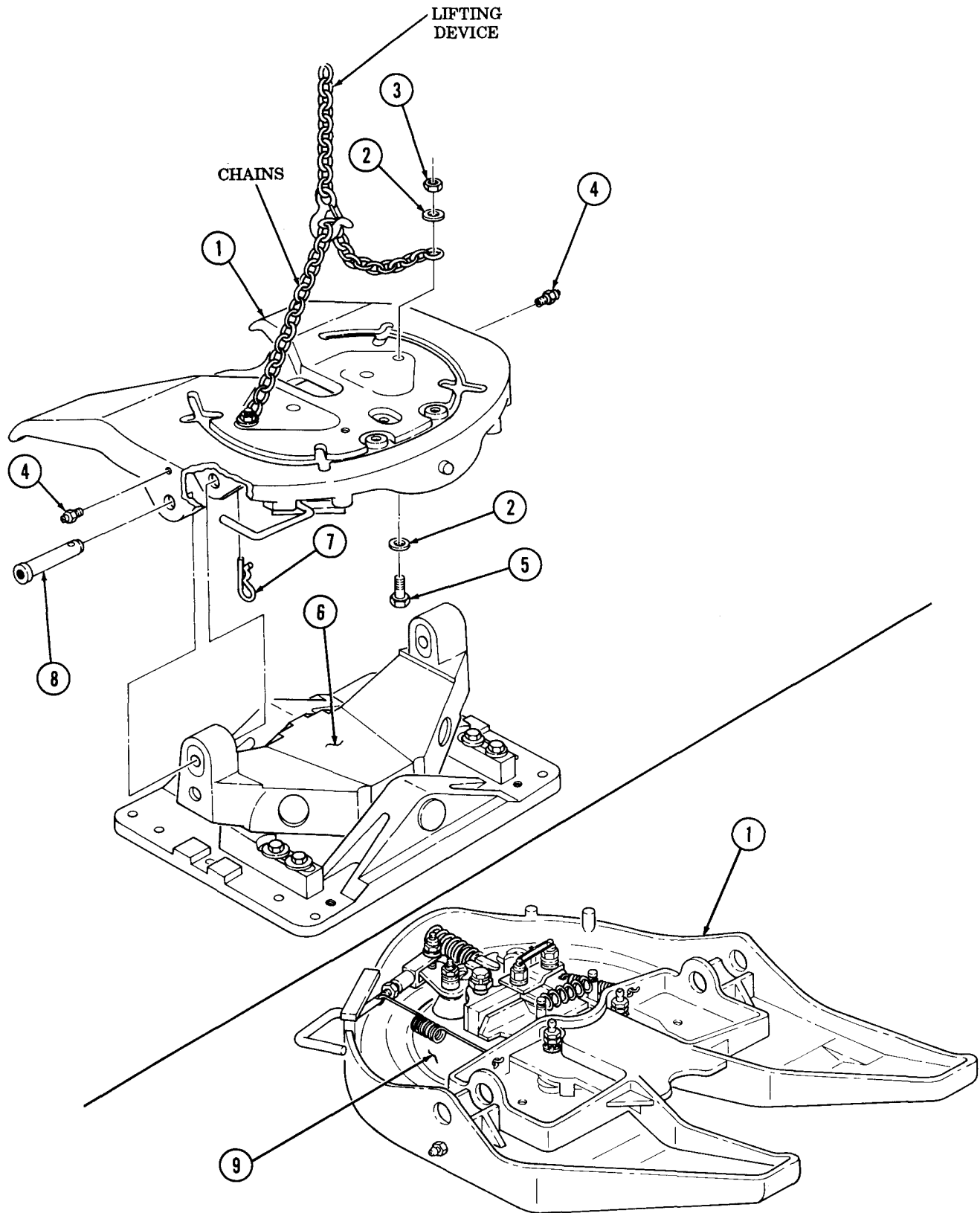
All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

5. Remove fifth wheel housing (1) from base (6).

NOTE

- Assistant will help with step 6.
 - Fifth wheel housing must be 6 in. (15.2 cm) above workbench for bushing removal.
6. Position fifth wheel housing (1) on workbench with trailer mating surface (9) side down.

13-4. FIFTH WHEEL MAINTENANCE (Contd)



13-4. FIFTH WHEEL MAINTENANCE (Contd)

WARNING

Eye protection must be worn when removing or installing springs under tension. Failure to do so may result in injury to personnel.

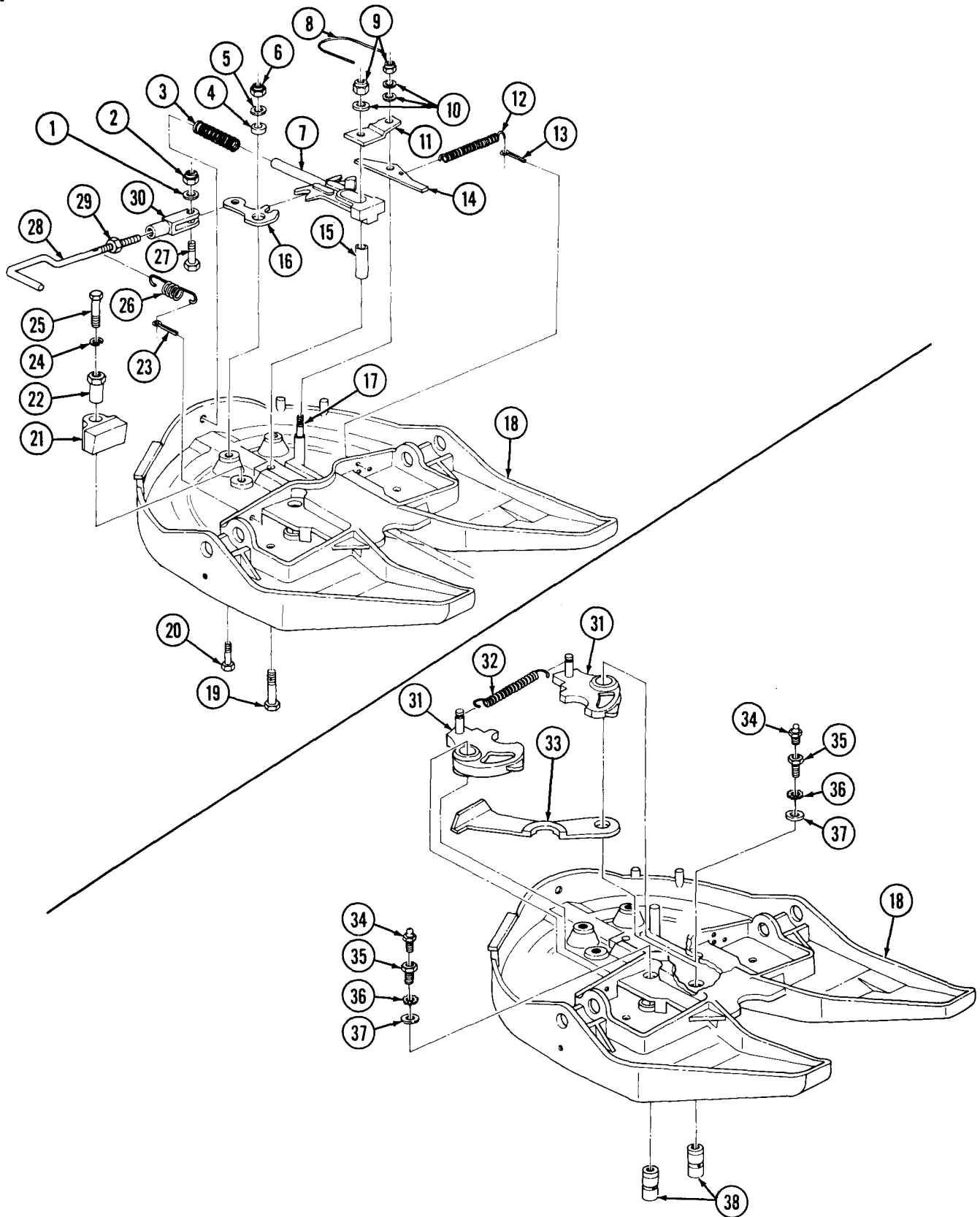
7. Remove spring (26) and cotter pin (23) from fifth wheel housing (18) and handle (28). Discard cotter pin (23).
8. Remove two lubrication fittings (34), screws (35), lockwashers (36), and washers (37) from two coupler jaws (31). Discard lockwashers (36).
9. Remove spring (32) from two coupler jaws (31).

WARNING

Plunger rack is under spring tension. Keep hands clear of plunger rack during removal. Failure to do so may cause injury to personnel.

10. Release plunger rack latch (14) and allow plunger rack (7) to slide to unloaded position.
11. Remove spring (12) from plunger rack latch (14) and cotter pin (13).
12. Remove cotter pin (13) from fifth wheel housing (18). Discard cotter pin (13).
13. Remove safety wire (8), two locknuts (9), three washers (10), bracket (11), and plunger rack latch (14) from stud (17), screw (19), and fifth wheel housing (18). Discard safety wire (8) and locknuts (9).
14. Remove spring (3), plunger rack (7), screw (19), and spacer (15) from fifth wheel housing (18).
15. Remove screw (25), lockwasher (24), cam (22), and bushing (21) from fifth wheel housing (18). Discard lockwasher (24).
16. Remove two coupler jaws (31), compression arm (33), and two bushings (38) from fifth wheel housing (18).
17. Remove locknut (2), washer (1), screw (27), and yoke (30) from pinion gear (16). Discard locknut (2).
18. Remove handle (28) from fifth wheel housing (18).
19. Loosen jamnut (29) and remove handle (28) from yoke (30).
20. Remove locknut (6), screw (20), washer (5), spacer (4), and pinion gear (16) from fifth wheel housing (18). Discard locknut (6).
21. Remove jamnut (29) from handle (28).

13-4. FIFTH WHEEL MAINTENANCE (Contd)



13-4. FIFTH WHEEL MAINTENANCE (Contd)

b. Cleaning and Inspection

1. For general cleaning instructions, refer to para 2-8.
2. Inspect two coupler jaws (12) for cracks and breaks. Replace if cracked or broken.
3. Inspect cam (10) for grooves and breaks. Replace if grooved or broken.
4. Inspect springs (2), (5), (11), and (13) for bends, breaks, and collapsed coils. Measure spring lengths. Refer to table 13-1, Fifth Wheel Spring Length, for measurements. Replace if bent, broken, or coils are collapsed.
5. Inspect pinion gear (6) for damaged gear teeth. Replace if damaged.
6. Inspect plunger rack (3) for cracks and breaks. Replace if cracked or broken.
7. Inspect handle (1) for bends and cracks. Replace if bent or cracked.
8. Inspect fifth wheel housing surface (8) for grooves, gouges, and breaks in metal. Replace if damaged or broken.
9. Inspect plunger rack latch (4) for bends and scoring. Replace if bent or scored.
10. Inspect stud (7) for breaks, cracks, and stripped threads. Replace if damaged.
11. Inspect bushings (15) for cuts, wear, or damage. Replace if damaged.
12. Inspect compression arm (14) for cracks, breaks, and bends. Replace if cracked, broken, or bent.
13. Inspect plunger rack (3), pivot pin (9), and cam (10) for wear. Measure plunger rack (3), pivot pin (9), and cam (10). Refer to table 13-2, Fifth Wheel Wear Limits, for measurements. Replace if worn.

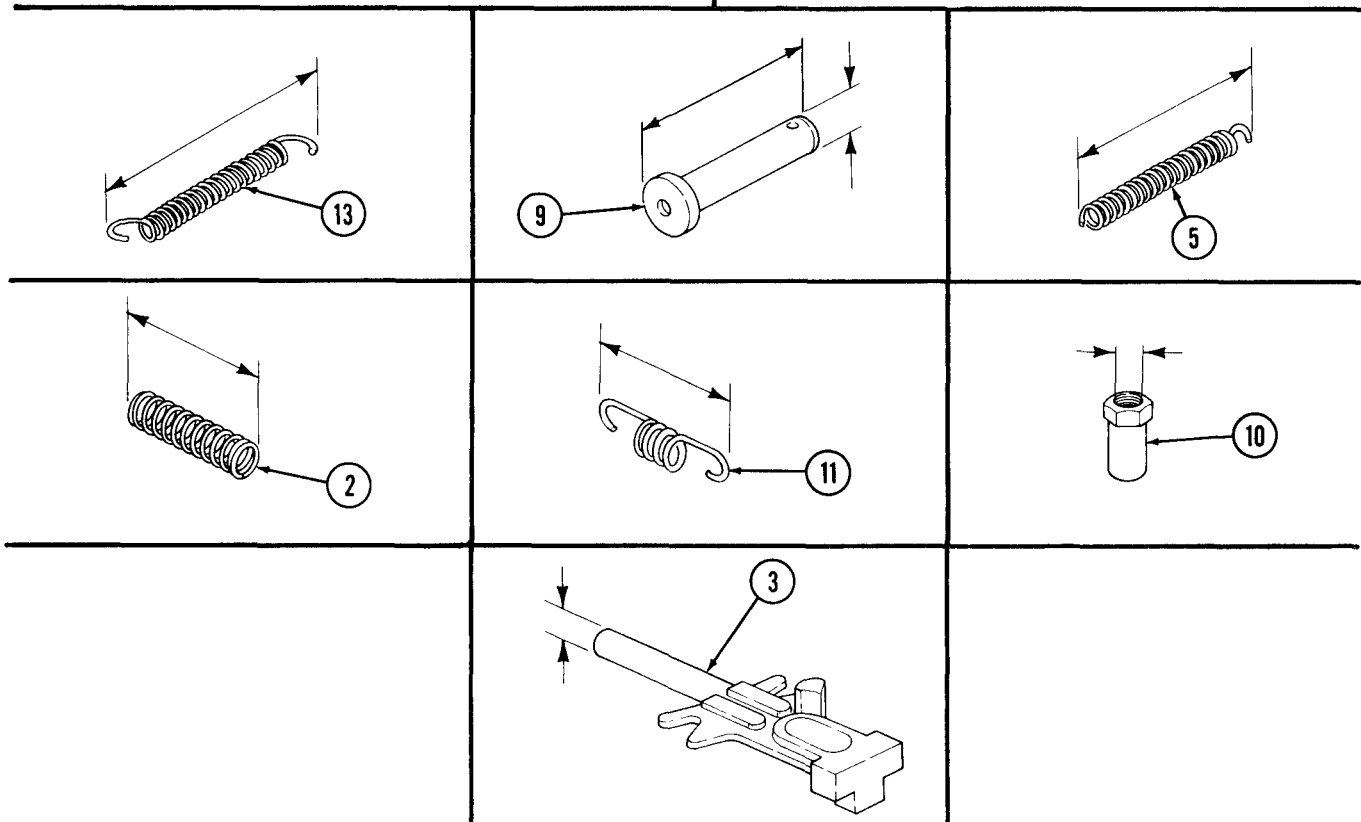
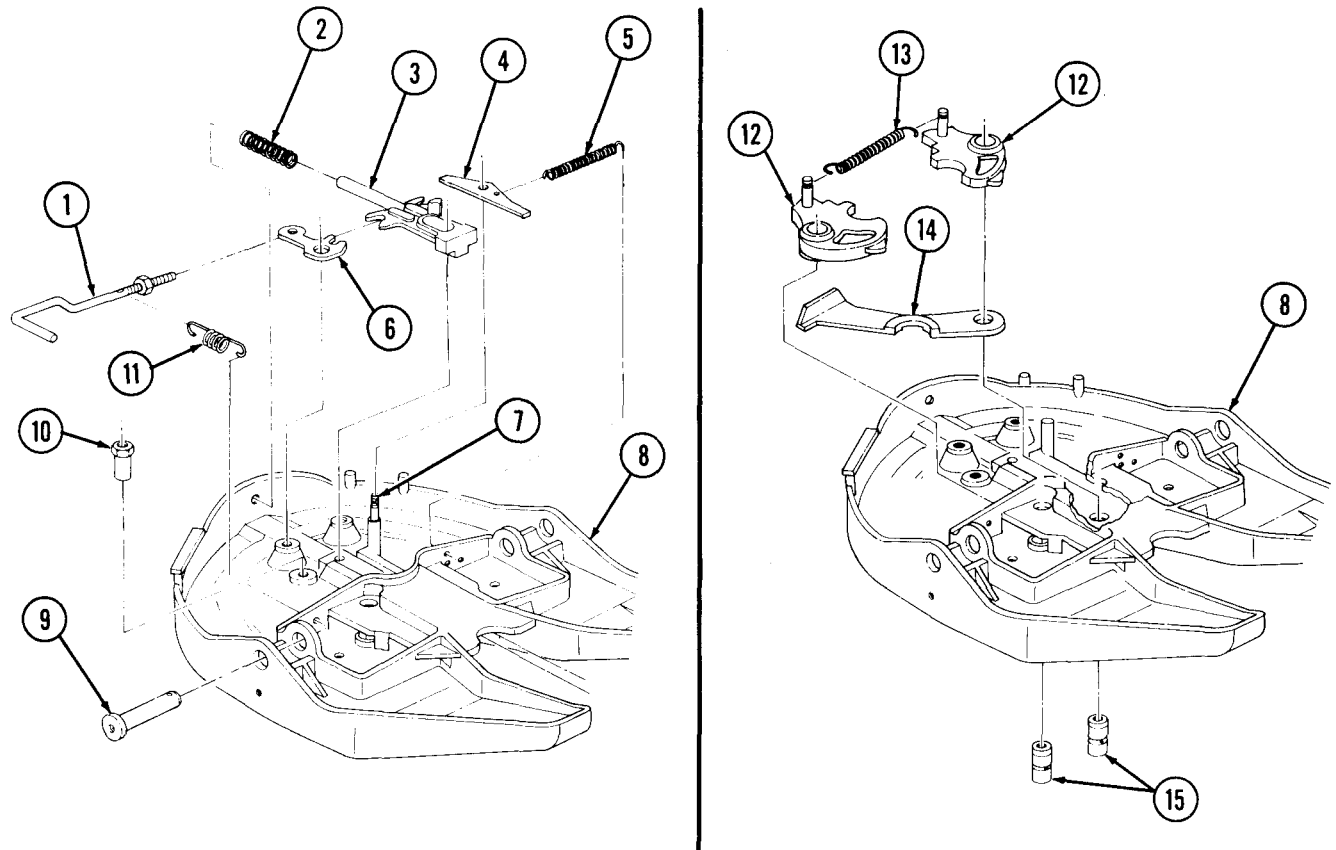
Table 13-1. Fifth Wheel Spring Length.

ITEM NO.	ITEM/POINT OF MEASUREMENT	SPRING FREE LENGTH	
		INCHES	MILLIMETERS
2	Plunger rack spring	7.25	184.15
5	Plunger rack latch spring	2.06	52.32
11	Handle spring	6.00	152.4
13	Coupler jaw spring	2.31	58.67

Table 13-2. Fifth Wheel Wear Limits.

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		INCHES	MILLIMETERS
3	Plunger rack, outer diameter	2.874-2.878	72.999-73.101
9	Pivot pin		
	Outer diameter	1.47 -1.53	37.34-38.86
	Length	6.44-6.59	163.57-167.38
10	Cam, inner diameter	1.093-1.099	27.76-27.91

13-4. FIFTH WHEEL MAINTENANCE (Contd)



<p>13-4. FIFTH WHEEL MAINTENANCE (Contd)</p>
--

c. Assembly

1. Install pinion gear (16) on fifth wheel housing (18) with screw (20), spacer (4), washer (5), and new locknut (6).
2. Install jamnut (29) and handle (28) on yoke (30).
3. Install yoke (30) on pinion gear (16) with screw (27), washer (1), and new locknut (2).
4. Align hole in compression arm (33) with hole in fifth wheel housing (18).
5. Install compression arm (33) and two coupler jaws (31) in fifth wheel housing (18) with two bushings (38).
6. Install bushing (21) and cam (22) on fifth wheel housing (18) with new lockwasher (24) and screw (25).
7. Place spring (3) on plunger rack (7).
8. Install screw (19), spacer (15), and plunger rack (7) on fifth wheel housing (18).

NOTE

Add washers as needed to obtain proper height on plunger rack latch. Latch must set level with latch on plunger rack.

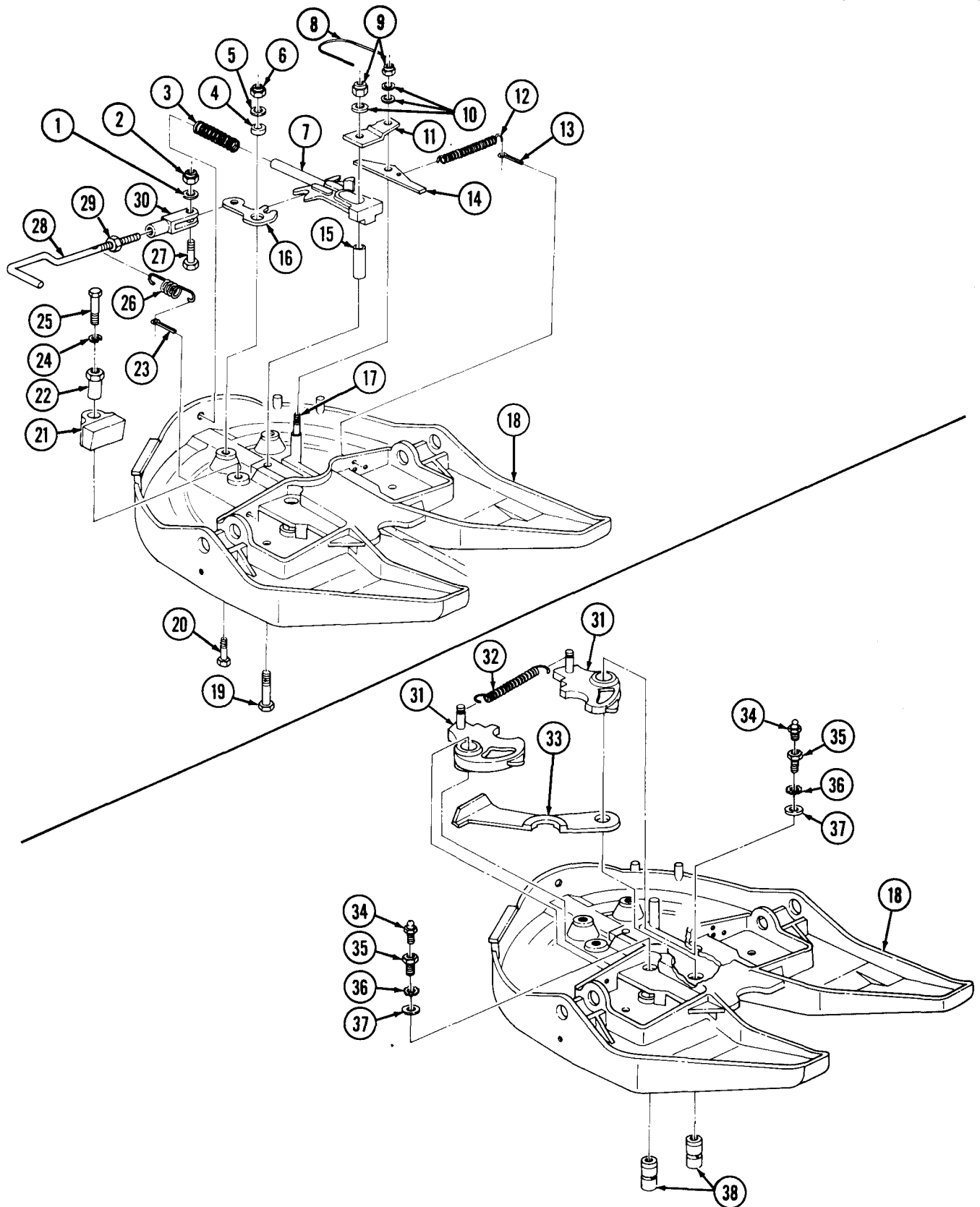
9. Install plunger rack latch (14), bracket (11), three washers (10), two new locknuts (9), and new safety wire (8) on screw (19) and stud (17).
10. Install new cotter pin (13) in fifth wheel housing (18) with eye of cotter pin (13) facing back of fifth wheel housing (18).

WARNING

Eye protection must be worn when removing or installing springs under tension. Failure to do so may result in injury to personnel.

11. Install spring (12) on plunger rack latch (14) and cotter pin (13).
12. Install spring (32) on two coupler jaws (31).
13. Install two washers (37), new lockwashers (36), screws (35), and lubrication fittings (34) on two bushings (38). Tighten screws (35) 150-200 lb-ft (203-271 N.m).
14. Install new cotter pin (23) in fifth wheel housing (18).
15. Install spring (26) on handle (28) and cotter pin (23).

13-4. FIFTH WHEEL MAINTENANCE (Contd)

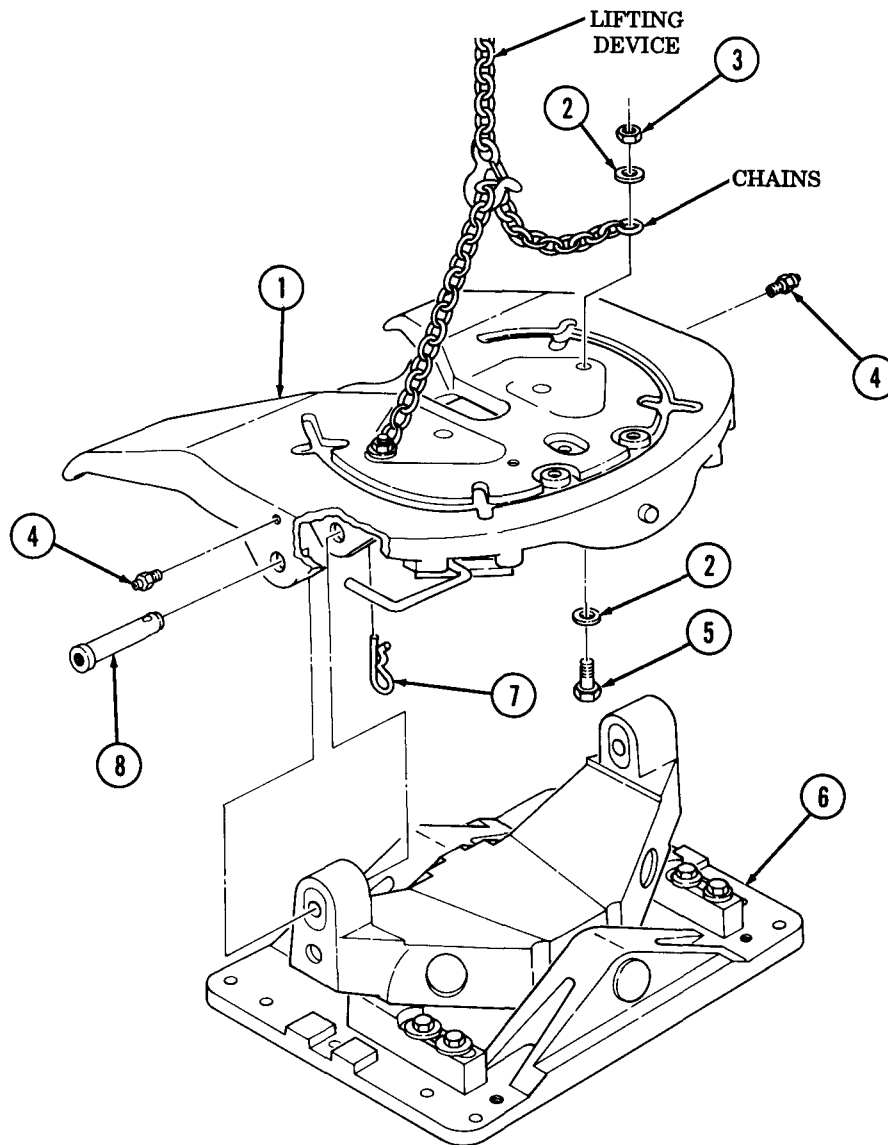


13-4. FIFTH WHEEL MAINTENANCE (Contd)

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

16. Remove fifth wheel housing (1) from workstand.
17. Position fifth wheel housing (1) on base (6).
18. Insert two pivot pins (8) through fifth wheel housing (1) and base (6) and install with two retaining pins (7).
19. Install two lubrication fittings (4) in fifth wheel housing (1).
20. Remove lifting device, two locknuts(3),screws (5), four washers (2), and chain from fifth wheel housing (1).



FOLLOW-ON TASKS: . Install fifth wheel (TM 9-2320-361-20).
 . Lubricate fifth wheel (LO 9-2320-209-12-1).

CHAPTER 14

BODY, CAB, AND HOOD MAINTENANCE

14-1. BODY, CAB, AND HOOD MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
14-2.	General Information	14-1
14-3.	Cab Replacement	14-1
14-4.	Windshield Glass Replacement	14-2
14-5.	Door Glass Replacement	14-4
14-6.	Door Glass Channel Replacement	14-5

14-2. GENERAL INFORMATION

a. The M44A2 series, 6x6, 2-1/2-ton vehicles use common cab, hood, and fender components. All major body components are composed of steel and are subject to common welding and metal body repair procedures.

b. Refer to TM 9-237 for welding body repair and to TC 9-510 for metal body repair instructions. Refer to TM 43-0139 for preparation of body components and painting instructions. Refer to TB 43-0209 for camouflage painting and military marking instructions.

14-3. CAB REPLACEMENT

Refer to cab replacement kit (P/N 12300779, NSN 2510-01-161-2127) for cab replacement instructions.

14-4. WINDSHIELD GLASS REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Two lockwashers (Appendix F, Item 139)
Filler strip (Appendix F, Item 264)
Filler strip (Appendix F, Item 265)
Adhesive (Appendix C, Item 1)

REFERENCES (TM)

TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

- . Windshield assembly removed (TM 9-2320-361-20).
- Windshield arm, glass, and handle removed (TM 9-2320-361-20).

a. Removal

1. Remove six screws (1), two nuts (4), four washers (9), and two lockwashers (3) from windshield frame (8). Discard lockwashers (3).
2. Remove crosspiece (2) from windshield frame (8).

NOTE

Measure old frame filler strips for installation.

3. Remove crosspiece filler strip (5) from crosspiece (2). Discard crosspiece filler strip (5).
4. Remove glass (6) and frame filler strips (7) from windshield frame (8). Discard frame filler strips (7).

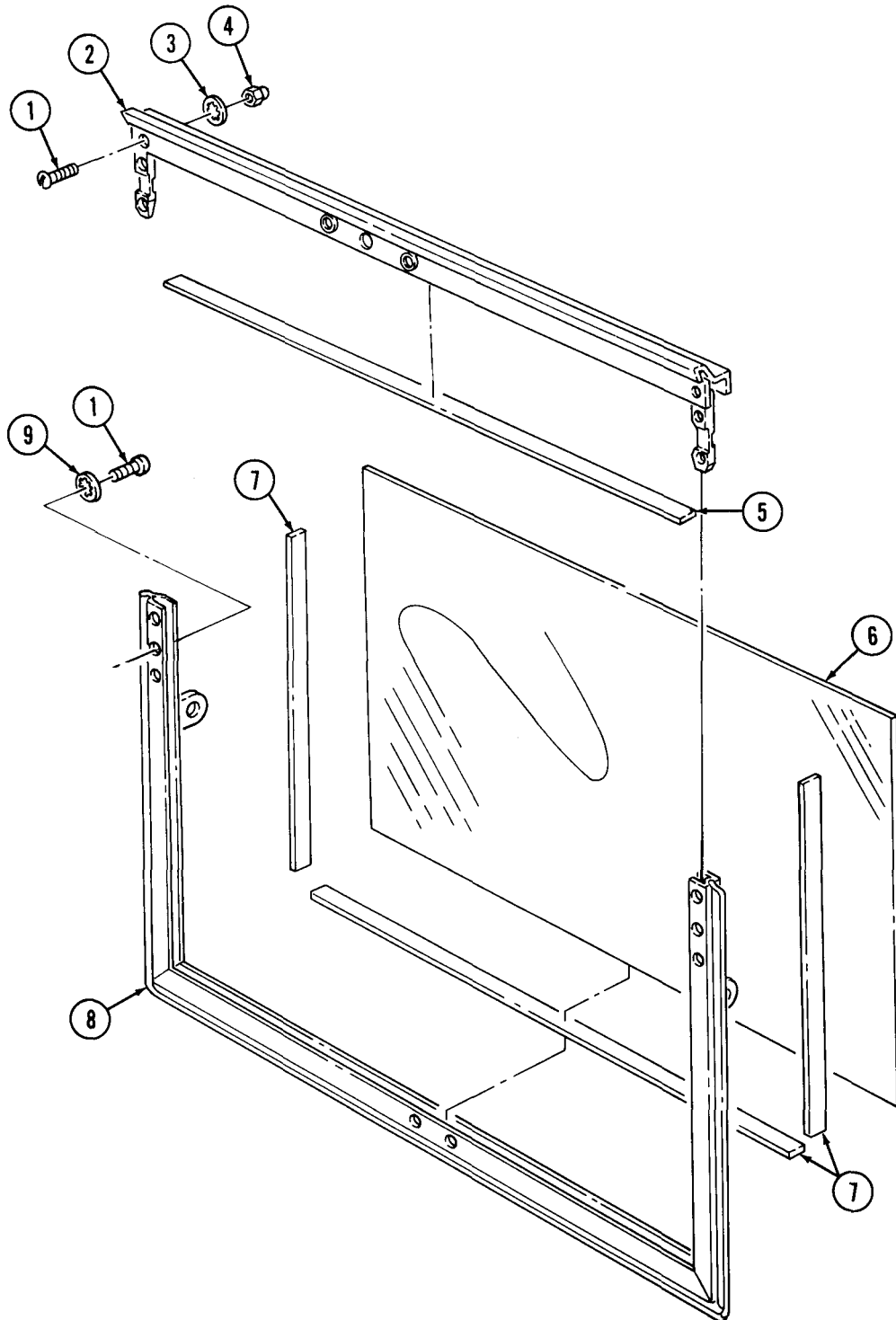
b. Installation

NOTE

Cut four new filler strips to size.

1. Apply adhesive to new frame filler strips (7). Install new frame filler strips (7) on glass (6).
2. Install glass (6) in windshield frame (8). Tap glass (6) gently into position.
3. Apply adhesive to new crosspiece filler strip (5). Install new crosspiece filler strip (5) on glass (6).
4. Install crosspiece (2) on windshield frame (8) and gently tap until screw holes align.
5. Install crosspiece (2) on windshield frame (8) with six screws (1), four washers (9), two new lockwashers (3), and nuts (4). Trim excess filler strips (7) and (5) and adhesive from around glass (6).

14-4. WINDSHIELD GLASS REPLACEMENT (Contd)



- FOLLOW-ON TASKS: . Install windshield arm, glass, and handle (TM 9-2320-361-20).
 • Install windshield assembly (TM 9-2320-361-20).

14-5. DOOR GLASS REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Frame seal (Appendix F, Item 238)
Channel lift seal (Appendix F, Item 235)
Channel lift filler (Appendix F, Item 236)

REFERENCES (TM)

TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

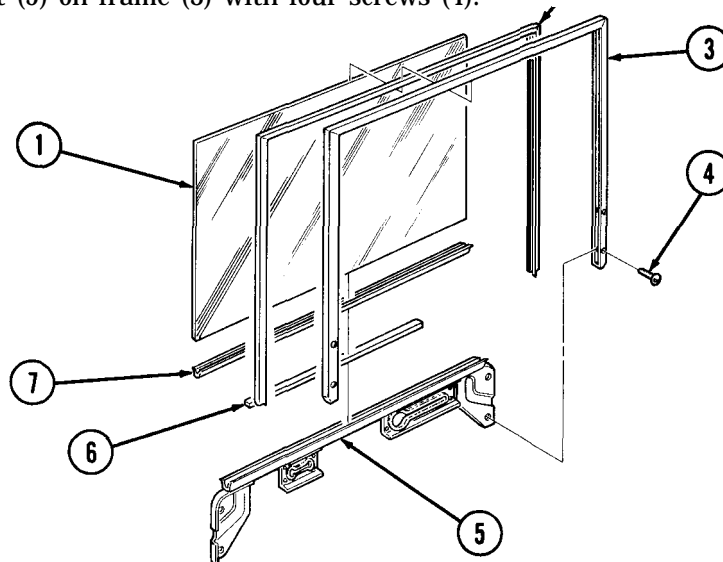
Cab door glass and frame removed
(TM 9-2320-361-20).

a. Removal

1. Remove four screws (4) from channel lift (5) and frame (3).
2. Remove channel lift (5), channel lift filler (6), and channel lift seal (7) from frame (3). Discard channel lift filler (6) and channel lift seal (7).
3. Slide glass (1) out of frame (3).
4. Remove frame seal (2) from frame (3). Discard frame seal (2).

b. Installation

1. Install new frame seal (2) in frame (3).
2. Install glass (1) in frame (3). Tap glass (1) gently into position.
3. Install new channel lift seal (7) on bottom of glass (1).
4. Install new channel lift filler (6) on channel lift (5).
5. Install channel lift (5) on frame (3) with four screws (4).



FOLLOW-ON TASK: Install cab door glass and frame (TM 9-2320-361-20).

14-6. DOOR GLASS CHANNEL REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit (Appendix B, Item 1)
Riveting tool (Appendix B, Item 20)

MATERIALS/PARTS

Pop rivet (Appendix F, Item 207)

REFERENCES (TM)

TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

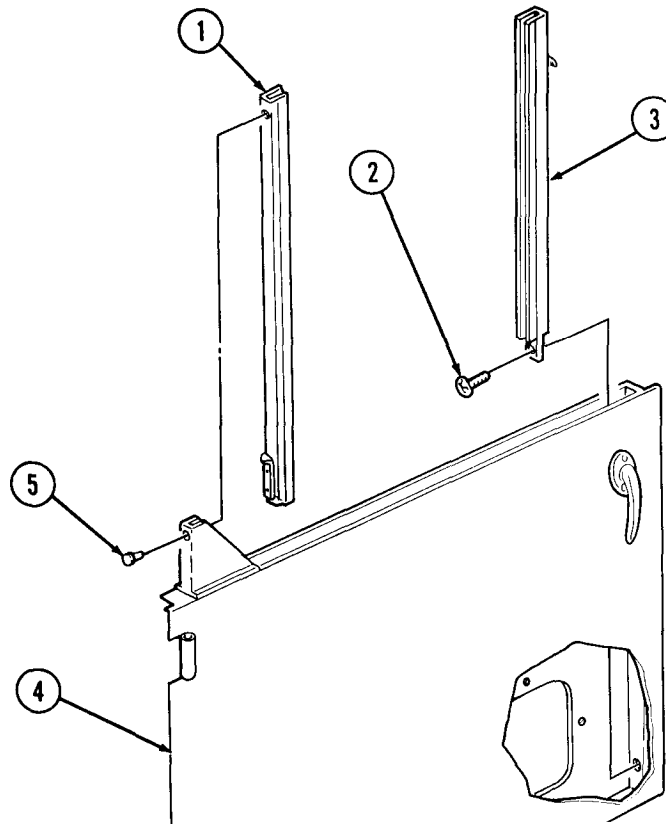
Cab door glass and frame removed
(TM 9-2320-361-20).

a. Removal

1. Remove screw (2) and channel (3) from cab door (4).
2. Remove pop rivet (5) and channel (1) from cab door (4). Discard pop rivet (5).

b. Installation

1. Install channel (1) in cab door (4) with new pop rivet (5).
2. Install channel (3) in cab door (4) with screw (2).



FOLLOW-ON TASK.: Install cab door glass and frame (TM 9-2320-361-20).

CHAPTER 15

SPECIAL PURPOSE BODIES MAINTENANCE

- Section I. Cargo Bodies Maintenance (page 15-1)
 Section II. Dump Body Maintenance (page 15-8)
 Section III. Fuel Tank and Water Tank Bodies Maintenance (page 15-24)
 Section IV. Van and Repair Shop Bodies Maintenance (page 15-63)
 Section V. Earth Boring and Polesetting Bodies Maintenance (page 15-122)
 Section VI. Pipeline Construction Body Maintenance (page 15-215)

Section 1. CARGO BODIES MAINTENANCE

15-1. CARGO BODIES MAINTENANCE

THIS TASK COVERS:

- | | |
|--|--------------------------------------|
| <p>a. Removal
b. Cleaning and Inspection</p> | <p>c. Repair
d. Installation</p> |
|--|--------------------------------------|
-

INITIAL SETUP

APPLICABLE MODELS

M35A2, M35A2C, and M36A2

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 1-1/8-in. socket, 3/4-in. dr.
 (Appendix B, Item 33)
 1-1/16-in. socket, 3/4-in. dr.
 (Appendix B, Item 61)
 Torque wrench, 3/4-in. dr.
 (Appendix B, Item 6)
 Breaker bar, 3/4-in. dr. (Appendix B, Item 34)
 Handle, socket wrench, 3/4-in. dr.
 (Appendix B, Item 35)
 Lifting device

MATERIALS/PARTS

Four locknuts (Appendix F, Item 95)
 Four locknuts (Appendix F, Item 103)
 Four locknuts (Appendix F, Item 105)
 Six locknuts (Appendix F, Item 104)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TB 43-0209
 TC 9-510
 TM 9-2320-361-20
 TM 9-2320-361-34P
 TM 9-237
 TM 43-0139

EQUIPMENT CONDITION

- Cargo body side racks and troop seat removed (M35A2C, M36A2) (TM 9-2320-361-20).
- Cargo body front rack removed (M35A2C, M36A2) (TM 9-2320-361-20).
- Cargo body front splash guards removed (M35A2C, M36A2) (TM 9-2320-361-20).
- Cargo body upper and lower rear splash guards removed (M35A2C) (TM 9-2320-361-20).
- Reflectors removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- All personnel must stand clear during lifting operations.
 - Ensure lifting capacity is greater than weight of cargo body.
-

15-1. CARGO BODIES MAINTENANCE (Contd)

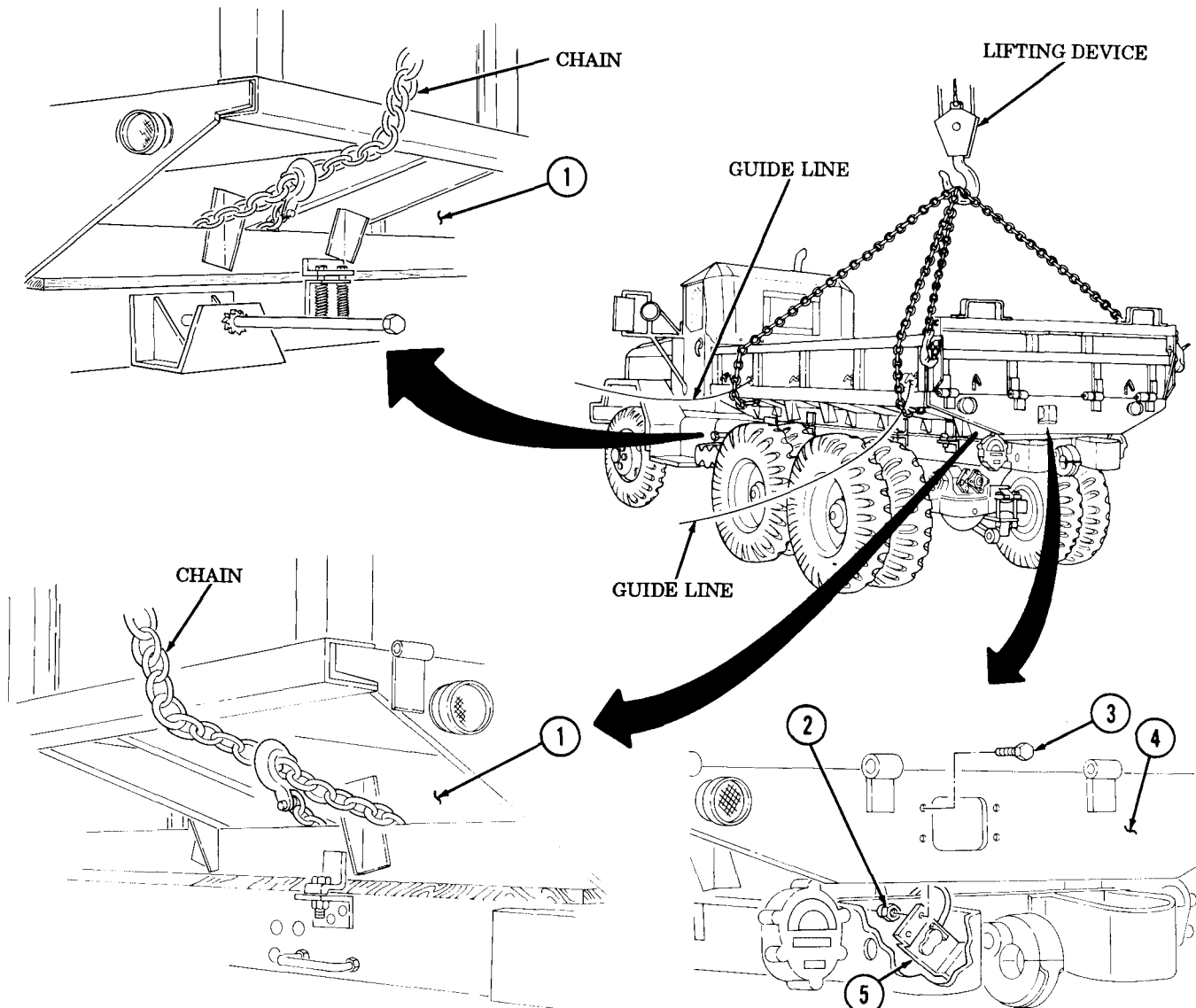
a. Removal

1. Remove four locknuts (2), screws (3), and trailer receptacle (5) from cargo body (4). Discard locknuts (2).
2. Attach chains around subframe (1) with chain hooks between chain links.

WARNING

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
- Ensure lifting capacity is greater than weight of cargo body. Failure to do so may result in injury to personnel or damage to equipment.

3. Attach lifting device in center of chains and raise lifting device to remove slack in chains.
4. Attach two guide lines to lashing hooks,



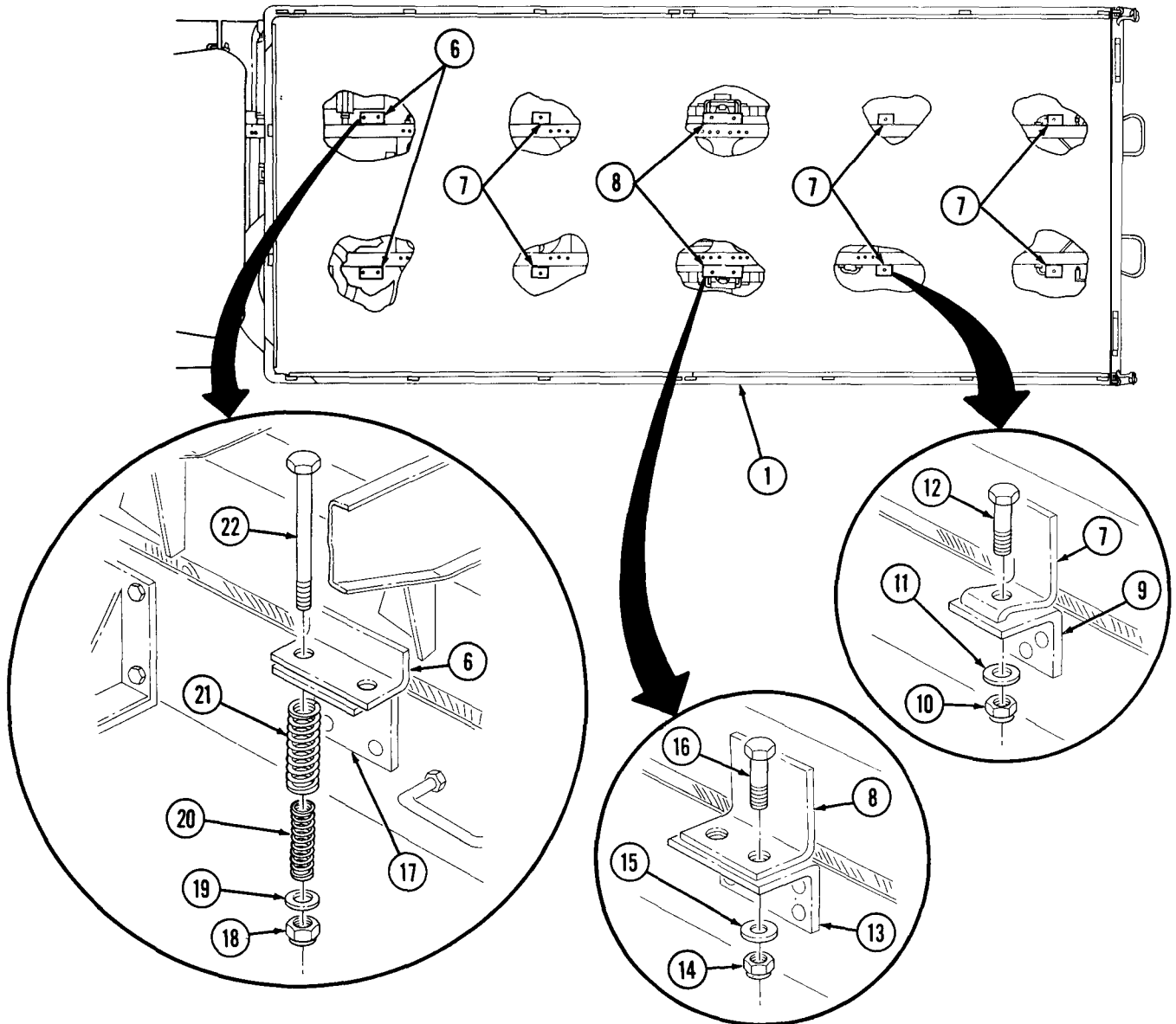
15-1. CARGO BODIES MAINTENANCE (Contd)

5. Remove four locknuts (18), washers (19), springs (20) and (21), and screws (22) from two brackets (6) and brackets (17). Discard locknuts (18).
6. Remove six locknuts (10), washers (11), and screws (12) from six brackets (7) and brackets (9).

NOTE

M36A2 long wheelbase models have two additional sets of body and frame brackets. For hardware removal, perform step 7.

7. Remove four locknuts (14), washers (15), and screws (16) from two brackets (8) and brackets (13). Discard locknuts (14).



M36A2

15-1. **CARGO BODIES MAINTENANCE (Contd)**

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

NOTE

Assistant will help guide cargo body during lifting operations.

8. Remove cargo body (1) and place on wooden supports.

NOTE

Perform steps 9 and 10 if replacing cargo body.

9. Remove cargo body tailgate (3) (TM 9-2320-361-20).
10. Remove cargo body dropside (2) (M35A2C) (TM 9-2320-361-20).
11. Remove one frame sill (4) from each frame rail (5) for inspection.

b. Cleaning and Inspection

1. For general cleaning instructions of cargo body (1), refer to para. 2-8.
2. Inspect all screws, washers, and springs for defects. Replace if defective.
3. Inspect frame sills (4) for end splits or rotting. Replace if end split(s) exceeds width of frame sill or frame sill is rotting.
4. Inspect cargo body (1) for structural damage or rust. Replace if damage or rust is severe and exceeds available repair procedures.

c. Repair

1. Remove and install lashing hooks and/or data plates in area(s) to be repaired (TM 9-2320-361-20).
2. Remove paint and/or rust from area(s) to be welded or repaired (TM 9-237).
3. Repair cargo body (1) (TM 9-237 and TC 9-510).
4. Paint cargo body as necessary (TM 43-0139 and TB 43-0209).

d. Installation

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

NOTE

. Use breaker bar to aline body and frame brackets.

•Assistant will help guide cargo body during lifting operations.

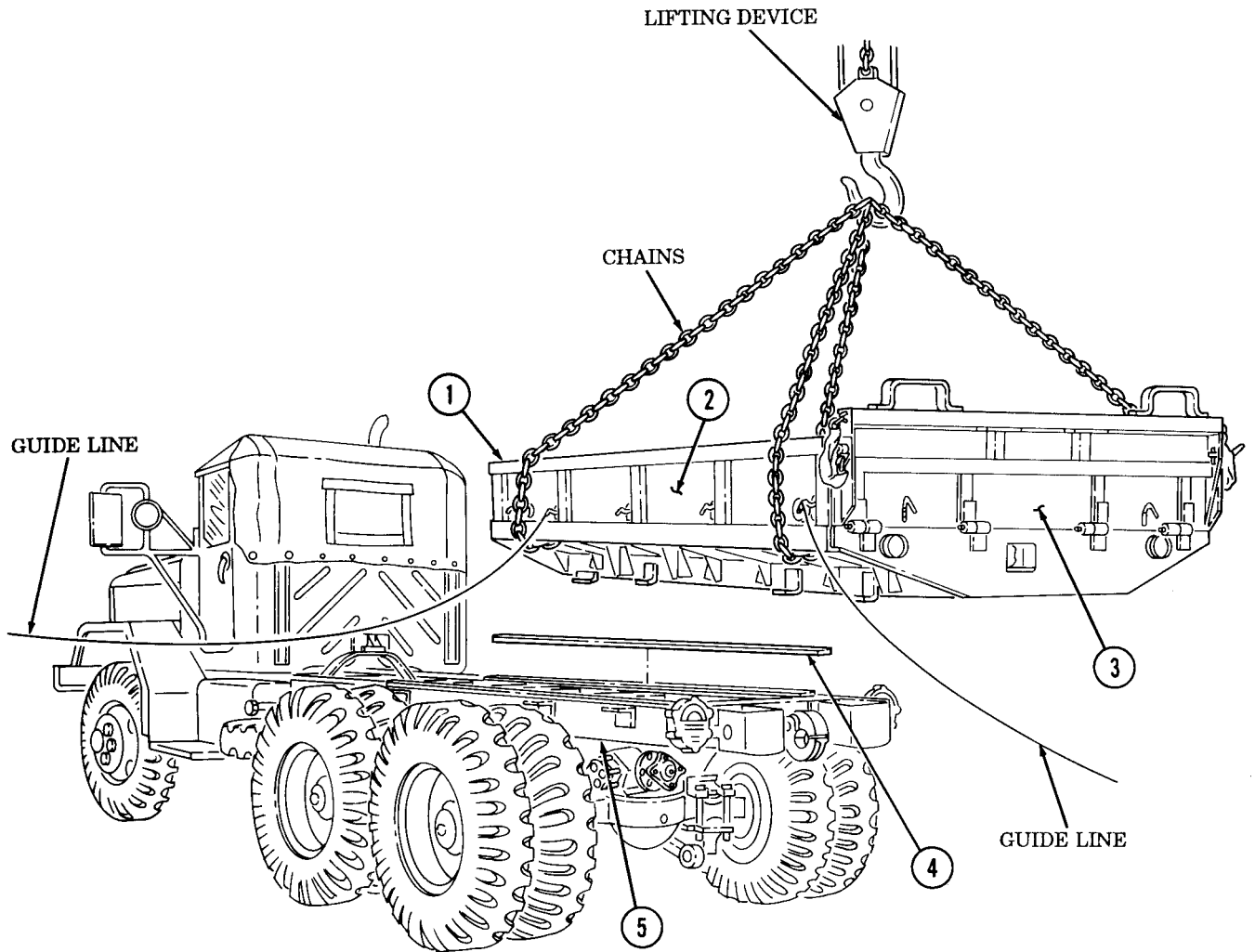
1. Place one frame sill (4) on each frame rail (5).

NOTE

Perform steps 2 and 3 if installing new cargo body.

2. Install cargo body dropside (2) (M35A2C) (TM 9-2320-361-20).
3. Install cargo body tailgate (3) (TM 9-2320-361-20).
4. Lift cargo body (1) off supports and lower onto frame rails (5).

15-1. CARGO BODIES MAINTENANCE (Contd)



15-1. CARGO BODIES MAINTENANCE (Contd)

5. Install trailer receptacle (3) behind cargo body (2) with four screws (1) and new locknuts (4).

NOTE

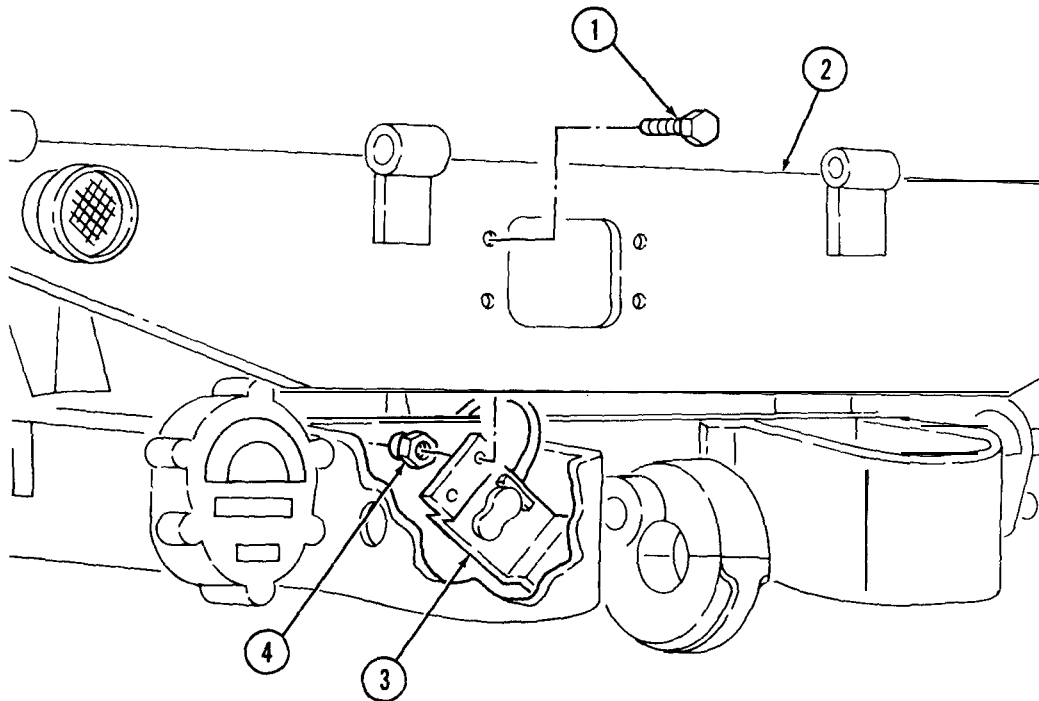
M35A2 front left side bracket mounting screws secure two sets of springs positioned on top of body brackets. Right side spring sets are the same and are secured below frame brackets.

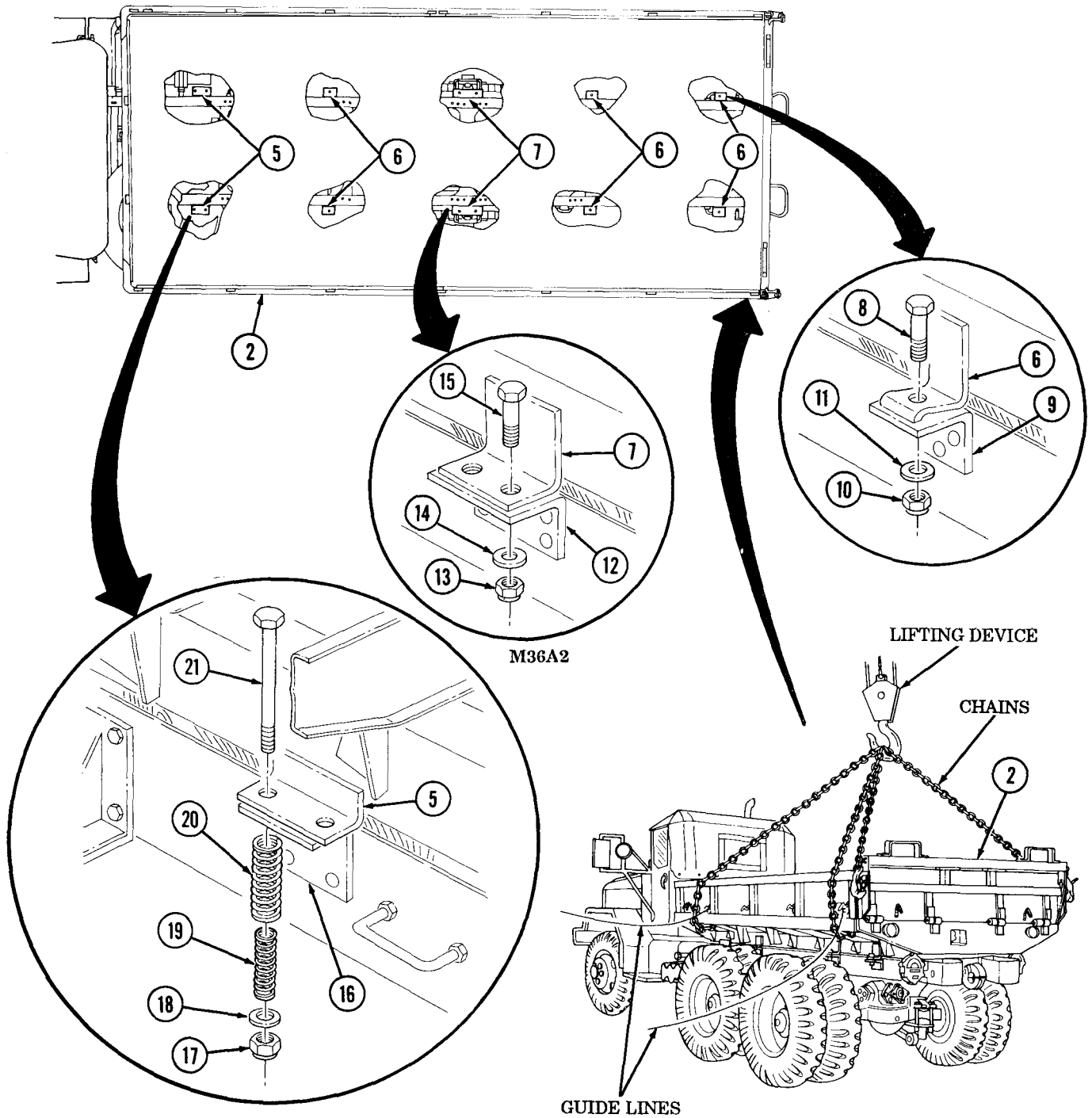
6. Install four screws (21) in two brackets (5) and brackets (16). Install four springs (19) inside four springs (20) and over four screws (21) with four washers (18) and new locknuts (17).
7. Adjust spring screws (21) to set springs (19) and (20) height to 6.375 in. (16.19 cm).

NOTE

M36A2 long wheelbase models have two additional body and frame brackets. Perform step 8 for hardware installation.

8. Install four screws (15) in two brackets (7) and brackets (12) with four washers (14) and new locknuts (13). Tighten locknuts (13) 105-145 lb-ft (142-197 N.m).
9. Install six screws (8) to six brackets (6) and brackets (9) with six washers (11) and new locknuts (10). Tighten locknuts (10) 125-165 lb-ft (170-224 N.m).
10. Remove lifting device, chains, and guide lines from cargo body (2).





- FOLLOW-ON TASKS:**
- . Install reflectors (TM 9-2320-361-20).
 - Install cargo body upper and lower rear splash guards (M35A2C) (TM 9-2320-361-20).
 - Install cargo body front splash guards (M35A2C, M36A2) (TM 9-2320-361-20).
 - . Install cargo body front rack (M35A2C, M36A2) (TM 9-2320-361-20).
 - . Install cargo body side racks and troop seat (M35A2C, M36A2) (TM 9-2320-361-20).

Section II. DUMP BODY MAINTENANCE

15-2. DUMP BODY MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
15-3.	Control Lever and Lock Replacement	15-8
15-4.	Dump Body Maintenance	15-11
15-5.	Tailgate Control Linkage Maintenance	15-16
15-6.	Cab Protector Maintenance	15-20

15-3. CONTROL LEVER AND LOCK REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M342A2

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Five locknuts (Appendix F, Item 89)
Locknut (Appendix F, Item 106)
Woodruff key (Appendix F, Item 272)
Cotter pin (Appendix F, Item 6)

REFERENCES (TM)

LO 9-2320-209-12-1
TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-361-34P

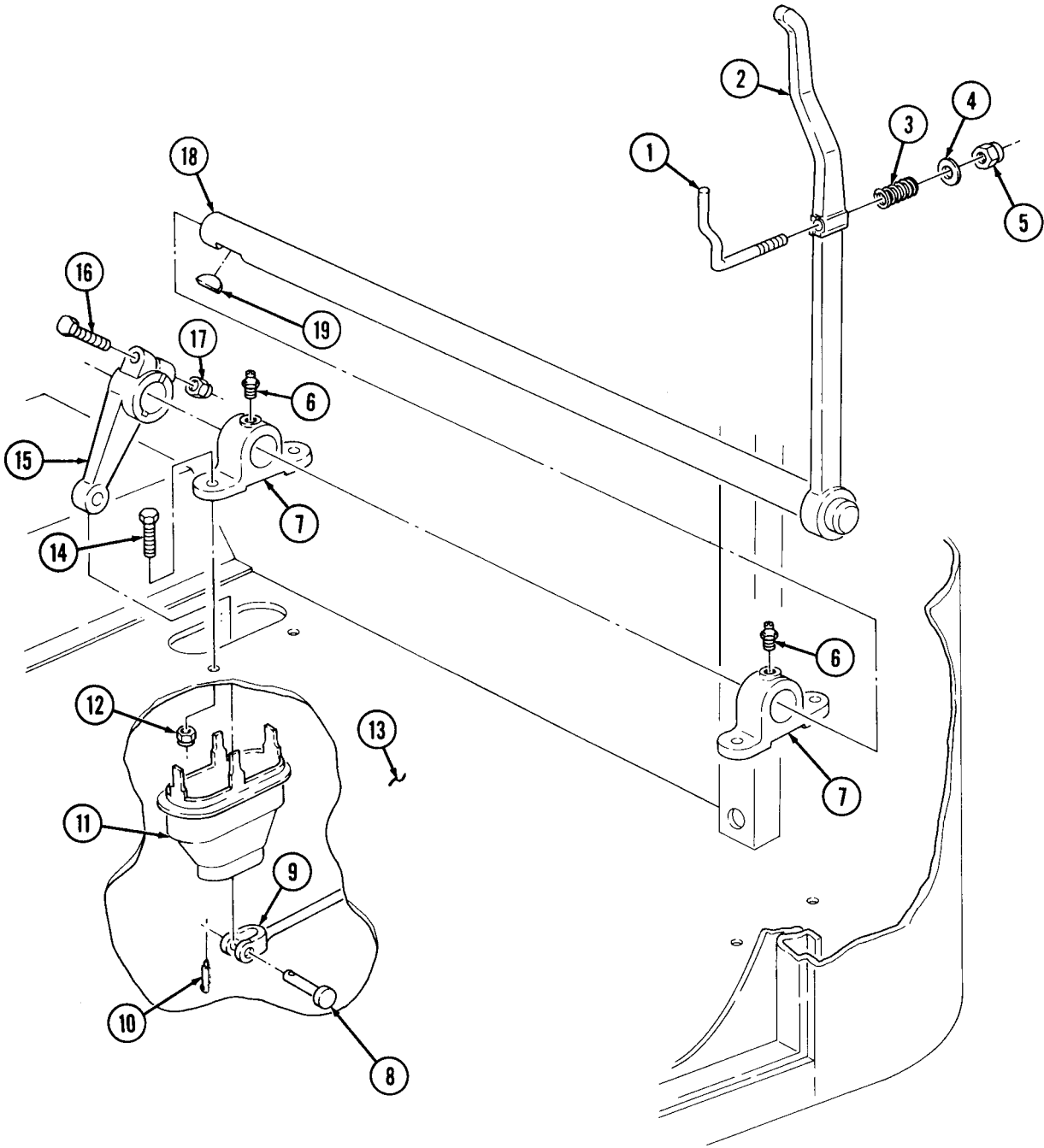
EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Driver's seat removed (TM 9-2320-361-20).

a. Removal

1. Remove cotter pin (10), clevis pin (8), and linkage (9) from lever (15). Discard cotter pin (10).
2. Remove four locknuts (12) and screws (14) from two brackets (7) and floor (13). Discard locknuts (12).
3. Remove shaft (18), brackets (7), and boot (11) from floor (13).
4. Remove locknut (17), screw (16), and lever (15) from shaft (18). Discard locknut (17).
5. Remove woodruff key (19) from shaft (18). Discard woodruff key (19).
6. Remove two brackets (7) from shaft (18).
7. Remove two lubrication fittings (6) from brackets (7).
8. Remove locknut (5), washer (4), spring (3), and lock (1) from lever handle (2). Discard locknut (5).

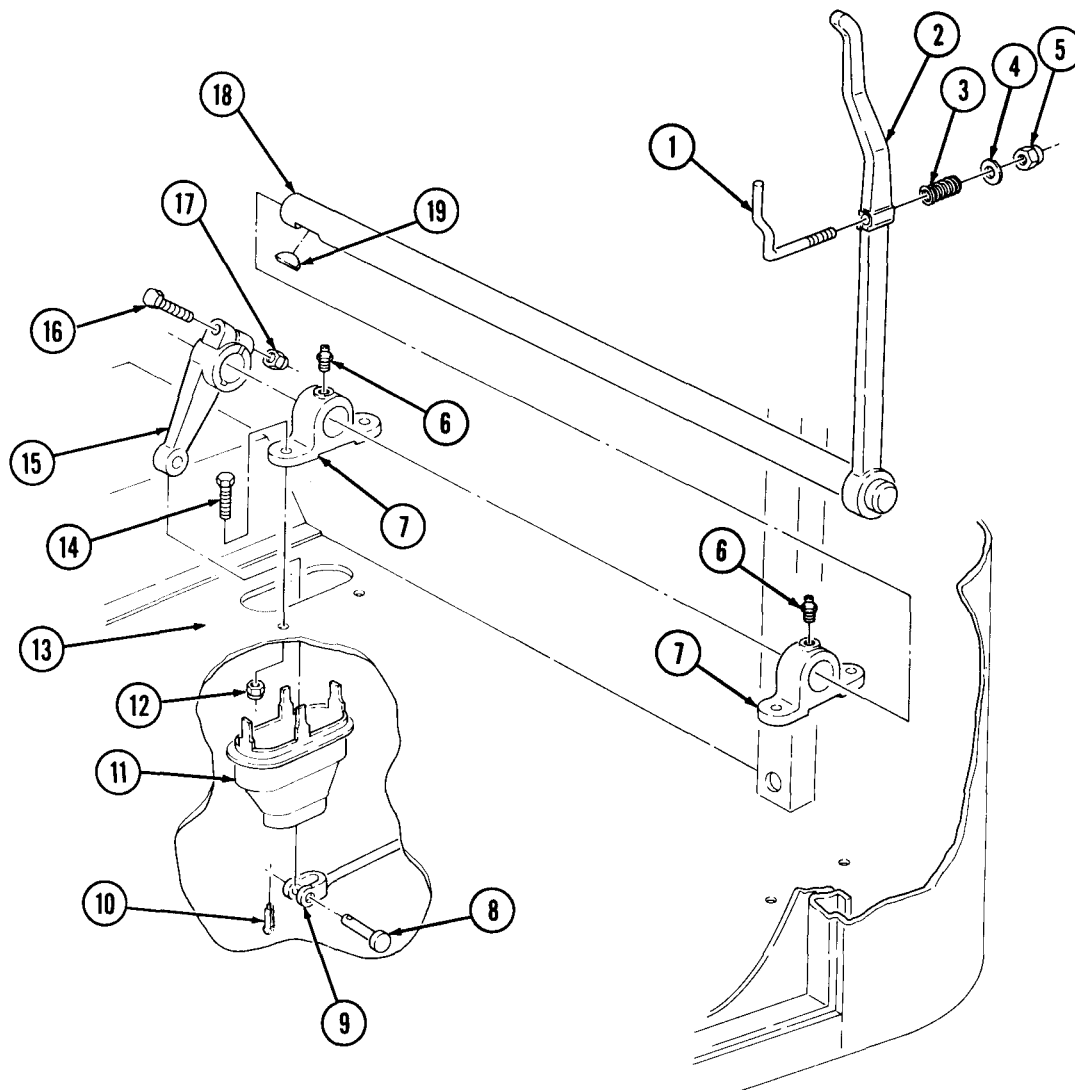
15-3. CONTROL LEVER AND LOCK REPLACEMENT



15-3. CONTROL LEVER AND LOCK REPLACEMENT (Contd)

b. Installation

1. Install lock (1), spring (3), washer (4), and new locknut (5) on lever handle (2).
2. Install two lubrication fittings (6) on brackets (7).
3. Install two brackets (7) on shaft (18).
4. Install new woodruff key (19) on shaft (18).
5. Install lever (15) on shaft (18) with new locknut (17) and screw (16).
6. Install lever (15), shaft (18), lever handle (2), boot (11), and two brackets (7) on floor (13) with four new locknuts (12) and screws (14).
7. Install linkage (9) on lever (15) with clevis pin (8) and new cotter pin (10).



FOLLOW-ON TASKS: •Lubricate lever and lock (LO 9-2320-209-12-1).
 . Install driver's seat (TM 9-2320-361-20).

15-4. DUMP BODY MAINTENANCE

THIS TASK COVERS:**a. Removal****b. Inspection and Repair****c. Installation**INITIAL SETUPAPPLICABLE MODELS

M342A2

TOOLS

General mechanic's tool kit

(Appendix B, Item 1)

1-1/8-in. socket, 1/2-in. dr.

(Appendix B, Item 10)

1-1/16-in. socket, 1/2-in. dr.

(Appendix B, Item 11)

Lifting device

MATERIALS/PARTS

Twelve locknuts (Appendix F, Item 89)

Two locknuts (Appendix F, Item 105)

Two locknuts (Appendix F, Item 99)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

LO 9-2320-209-12-1

TB 43-0209

TC 9-510

TM 9-237

TM 9-2320-361-10

TM 9-2320-361-34P

TM 43-0139

EQUIPMENT CONDITION

. Parking brake set (TM 9-2320-361-10).

• Wheels chocked (TM 9-2320-361-10).

• Dump body raised and safety braces in place (TM 9-2320-361-10).

• Cab protector removed (para. 15-6).

GENERAL SAFETY INSTRUCTIONS

• Position safety braces before working under raised dump body.

. Do not operate dump controls when dump body is removed.

. All personnel must stand clear during lifting operations.

15-4. DUMP BODY MAINTENANCE (Contd)

a. Removal

WARNING

Never work under dump body until safety braces are properly positioned. Injury or death to personnel may occur if dump body suddenly lowers.

1. Remove two lubrication fittings (1) from two thrust plate pins (2).
2. Remove two locknuts (5) and screws (6) from two thrust plate pins (2). Discard locknuts (5).
3. Lower two safety braces (3).

CAUTION

Wooden supports must be able to hold weight of dump body.

NOTE

Ensure block support is in place before lowering dump body or lockdown latch may latch on dump body.

4. Install wooden support between subframe (9) and dump body (8).
5. Lower dump body (8) onto wooden support.
6. Attach two chains to four corners of dump body (8). Attach two guide lines to dump body (8).
7. Attach lifting device to chains and remove slack from chains.

WARNING

Ensure dump control lever is in neutral at all times. Injury or death to personnel may result if lift cylinder is operated when not secured.

8. Remove two thrust plate pins (2) from roller arms (7) and thrust plates (4).
9. Remove twelve locknuts (10) and screws (12) from two hinge brackets (17) and dump body (8). Discard locknuts (10).
10. Remove two locknuts (16) and screws (11) from two hinge brackets (17). Remove two hinge brackets (17) from dump body (8) and pivot pins (14). Discard locknuts (16).
11. Remove two lubrication fittings (15) from pivot pins (14).

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

NOTE

Assistant will help guide dump body during lifting operations.

12. Raise dump body (8) clear of vehicle.

CAUTION

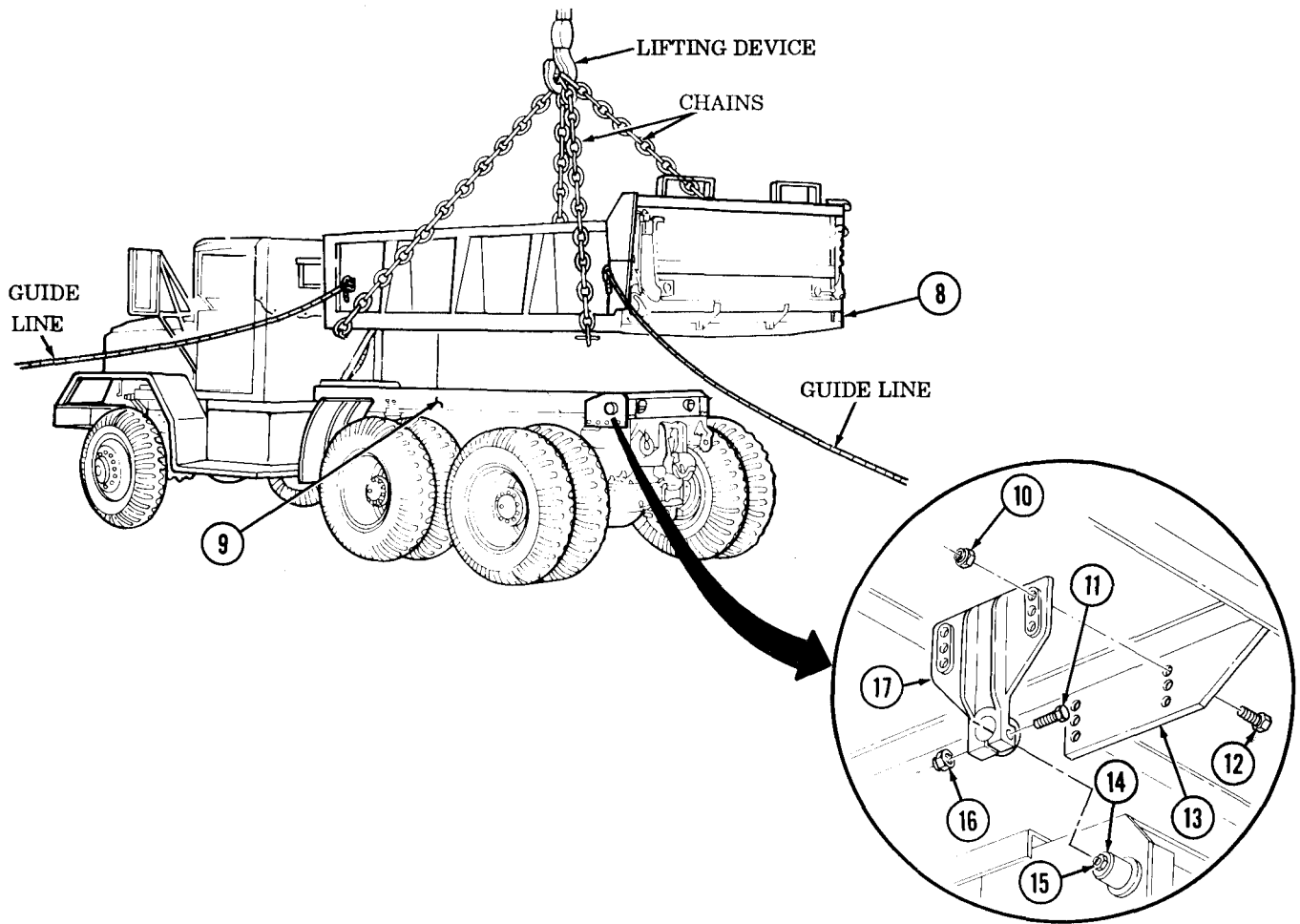
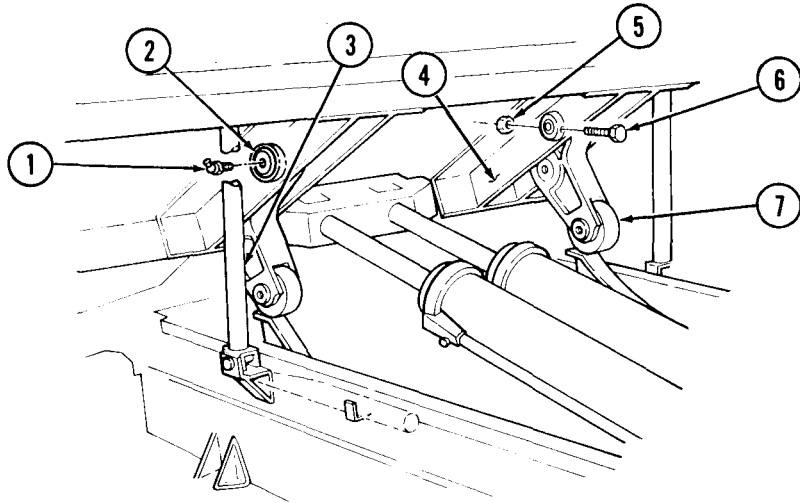
Wooden supports must be able to hold weight of dump body.

13. Lower dump body (8) and place on wooden supports.
14. Remove lifting device, two chains, and guide lines from dump body (8).

15-4. DUMP BODY MAINTENANCE (Contd)

b. Inspection and Repair

1. Inspect dump body (8) for dents, cracks, and rust. Repair if damaged (FM 43-2 and TM 9-237).
2. Clean and paint as necessary (TM 43-0139 and TB 43-0209).



15-4. DUMP BODY MAINTENANCE (Contd)

1. Attach two chains to four corners of dump body (1) and attach lifting device to two chains.
2. Attach two guide lines to dump body (1).

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

NOTE

Two assistants will help guide dump body during lifting operations.

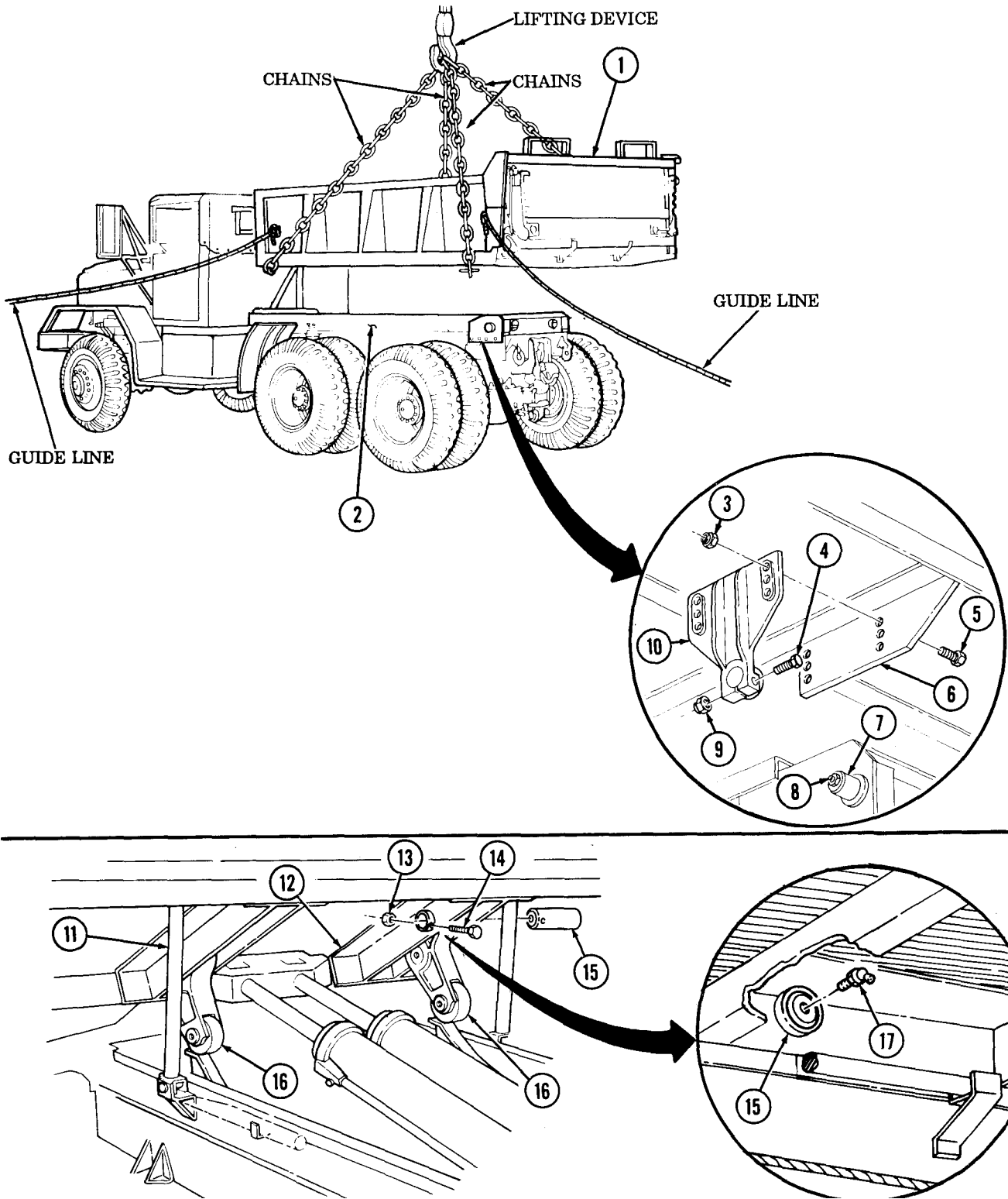
3. Raise dump body (1) and position on subframe (2).
4. Install two lubrication fittings (8) on pivot pins (7).
5. Install two hinge brackets (10) on two pivot pins (7) and dump body(1) with twelve screws (5) and new locknuts (3).
6. Install two screws (4) and new locknuts (9) on two hinge brackets (10).
7. Install two thrust plate pins (15) in two roller arms (16) and thrust plates (12).
8. Install two lubrication fittings (17) on thrust plate pins (15).
9. Remove lifting device, two chains, and guide lines from dump body (1).

WARNING

Never work under dump body until safety braces are positioned properly. Injury or death to personnel may occur if dump body suddenly lowers.

10. Raise dump body (1) (TM 9-2320-361-10).
11. Raise two safety braces (11) to upright position.
12. Install two screws (14) and new locknuts (13) on two thrust plate pins (15).
13. Return safety braces (11) to stowed position.
14. Lower dump body (1) (TM 9-2320-361-10).

15-4. DUMP BODY MAINTENANCE (Contd)



FOLLOW-ON TASKS: . Lubricate dump body (LO 9-2320-209-12-1).
 • Install cab protector (para. 15-6).

15-5. TAILGATE CONTROL LINKAGE MAINTENANCE

THIS TASK COVERS:

- a. **Removal**
- b. **Inspection, Cleaning, and Repair**

- c. **Installation**

INITIAL SETUP

APPLICABLE MODELS

M342A2

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Six locknuts (Appendix F, Item 96)
Three locknuts (Appendix F, Item 105)
Two woodruff keys (Appendix F, Item 272)

REFERENCES (TM)

TB 43-0209
TM 9-214
TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-361-34P
TM 43-0139

EQUIPMENT CONDITION

- . Parking brake set (TM 9-2320-361-10).
- Dump body raised and safety braces in place (TM 9-2320-361-10).
- . Open tailgate (TM 9-2320-361-10).

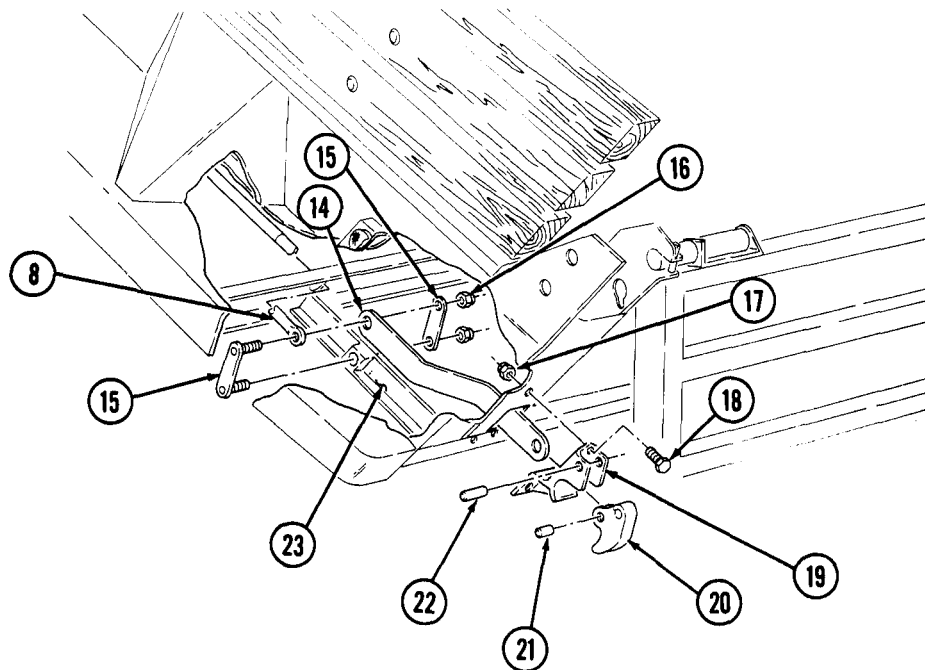
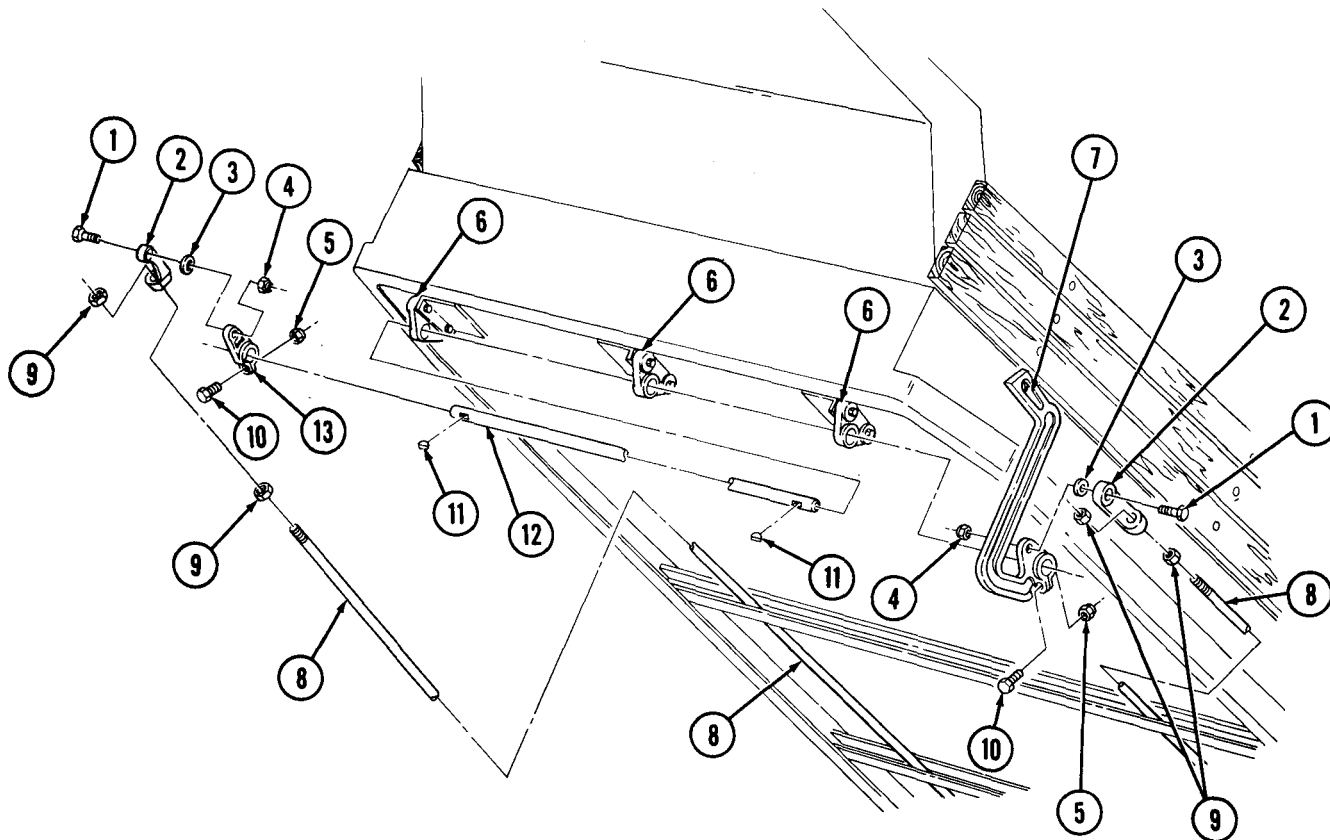
a. Removal

1. Remove two locknuts (4), screws (1), and washers (3) from two clevises (2) and levers (13) and (7). Discard locknuts (4).
2. Remove two locknuts (5) and screws (10) from levers (13) and (7). Discard locknuts (5).
3. Remove two levers (13) and (7) from cross-shaft (12).
4. Remove two woodruff keys (11) from cross-shaft (12). Discard woodruff keys (11).
5. Remove cross-shaft (12) from three bearings (6).
6. Remove four nuts (9) and two clevises (2) from two control rods (8).
7. Remove two locknuts (16) and link plates (15) from control rods (8), control bar (14), and dump body (23). Discard locknuts (16).
8. Remove control rod (8) from dump body (23).
9. Remove three locknuts (17), screws (18), and tailgate latch (19) with control bar (14) from dump body (23). Discard locknuts (17).
10. Remove pin (22) and control bar (14) from tailgate latches (19).
11. Remove pin (21) and pawl (20) from tailgate latch (19).
12. Repeat steps 7 through 11 for left side control bar and panel removal.

b. Inspection, Cleaning, and Repair

1. Inspect all parts for rust, bends, cracks, and heavily worn areas. Replace if damaged beyond repair.
2. Clean and paint parts as necessary (TB 43-0209 and TM 43-0139).
3. Slide bearings (6) on cross-shaft (12). Twist and check for excessive play. Inspect bearings (6) for wear (TM 9-214). Replace bearing(s) (6) if damaged.

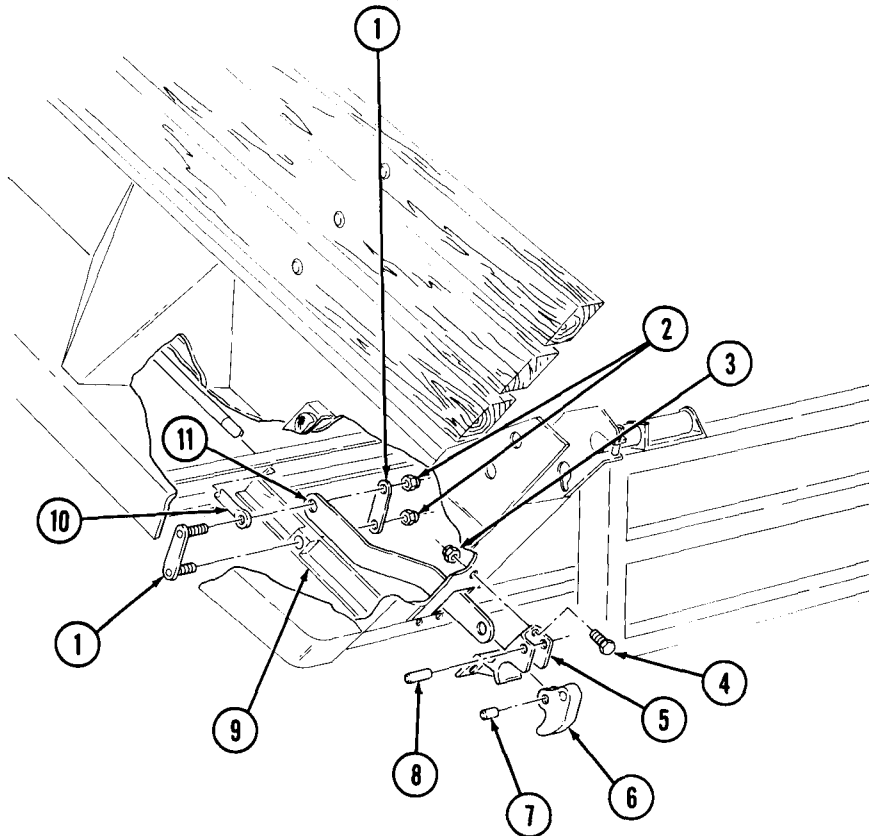
15-5. TAILGATE CONTROL LINKAGE MAINTENANCE (Contd)



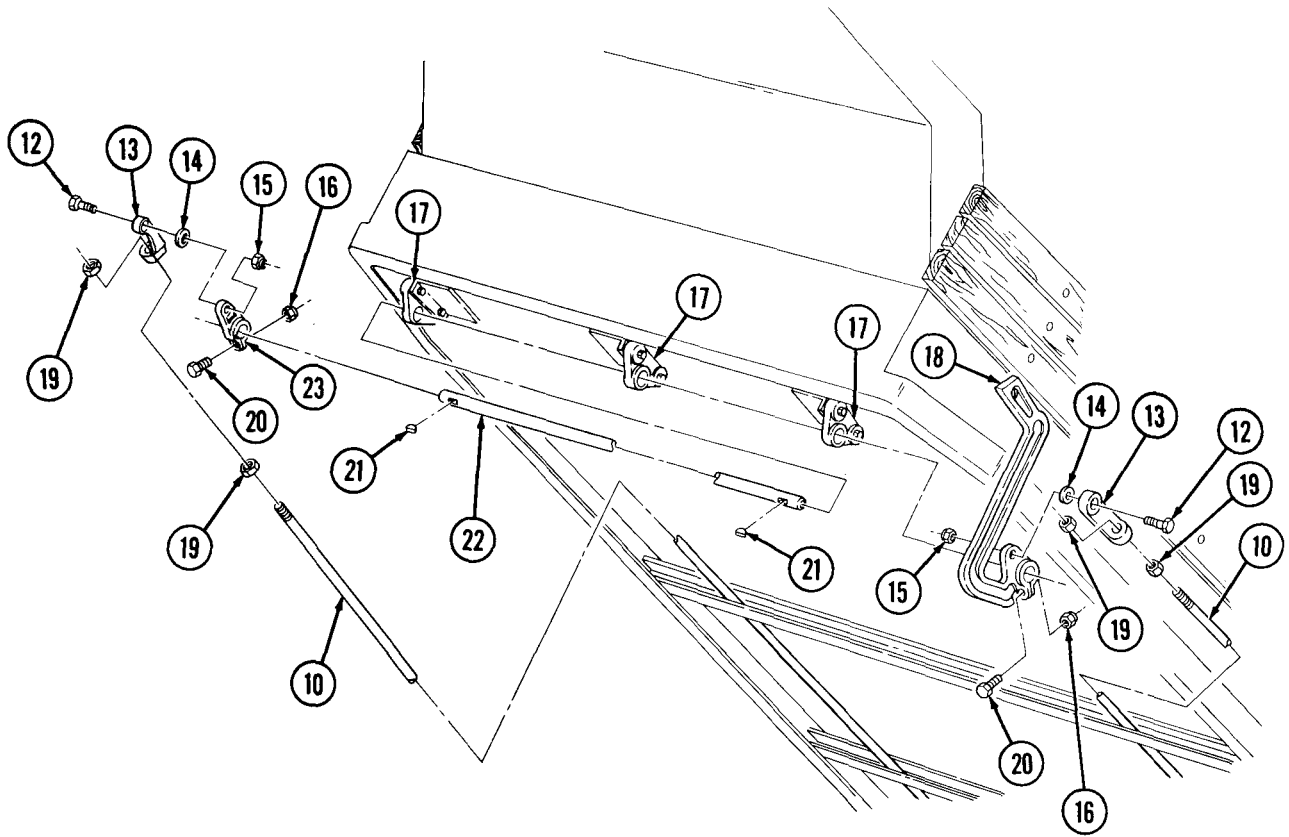
15-5. TAILGATE CONTROL LINKAGE MAINTENANCE (Contd)

c. Installation

1. Install control bar (11) on tailgate latch (5) with pin (8).
2. Install pawl (6) on tailgate latch (5) with pin (7).
3. Install control bar (11) on dump body (9).
4. Install tailgate latch (5) and control bar (11) on dump body (9) with three screws (4) and new locknuts (3).
5. Install two link plates (1) on control rod (10), control bar (11), and dump body (9) with two new locknuts (2).
6. Install two clevises (13) on two control rods (10) with four nuts (19).
7. Insert cross-shaft (22) through three bearings (17).
8. Install two new woodruff keys (21) on cross-shaft (22).
9. Install levers (23) and (18) on cross-shaft (22) with two screws (20) and new locknuts (16).
10. Install two clevises (13) and control rods (10) on levers (23) and (18) with two screws (12), washers (14), and new locknuts (15).



15-5. TAILGATE CONTROL LINKAGE MAINTENANCE (Contd)



- FOLLOW-ON TASKS: . Close tailgate (TM 9-2320-361-10).
- Lower dump body and safety braces (TM 9-2320-361-10).
 - Adjust tailgate linkage (TM 9-2320-361-20).

15-6. CAB PROTECTOR MAINTENANCE

THIS TASK COVERS:

- a. Removal**
- b. Cleaning and Inspection**

c. Installation

INITIAL SETUP

APPLICABLE MODELS

M342A2

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Lifting device
 - Two screws (Appendix F, Item 213)
 - Two locknuts (Appendix F, Item 106)
 - Four washers (Appendix F, Item 268)

MATERIALS/PARTS

- Fifteen locknuts (Appendix F, Item 105)
- Four cotter pins (Appendix F, Item 7)

PERSONNEL REQUIRED

T W O

REFERENCES (TM)

- FM 43-2
- TB 43-0209
- TM 9-237
- TM 9-2320-361-10
- TM 9-2320-361-34P
- TM 43-0139

EQUIPMENT CONDITION

Parking brake set (TM 9-2320-361-10).

GENERAL SAFETY INSTRUCTIONS

All personnel must stand clear during lifting operations.

a. Removal

1. Remove three screws (6) and locknuts (7) from cab protector (10) and dump body (20). Discard locknuts (7).
2. Remove four screws (19) and locknuts (18) from upper and lower cab protector brackets (13). Discard locknuts (18).

NOTE

Assistant will help with step 3.

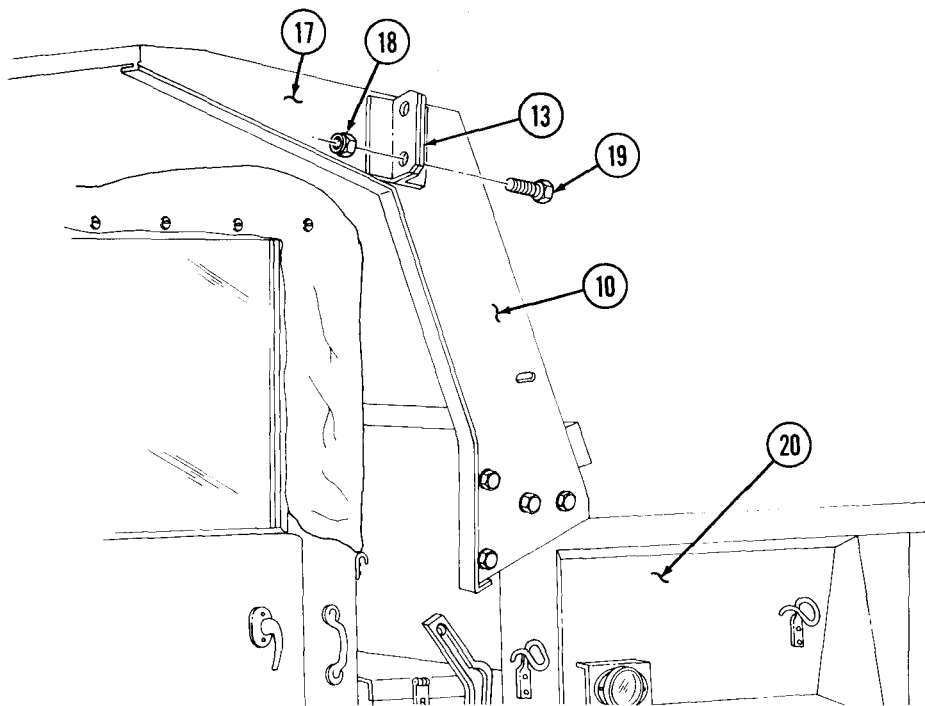
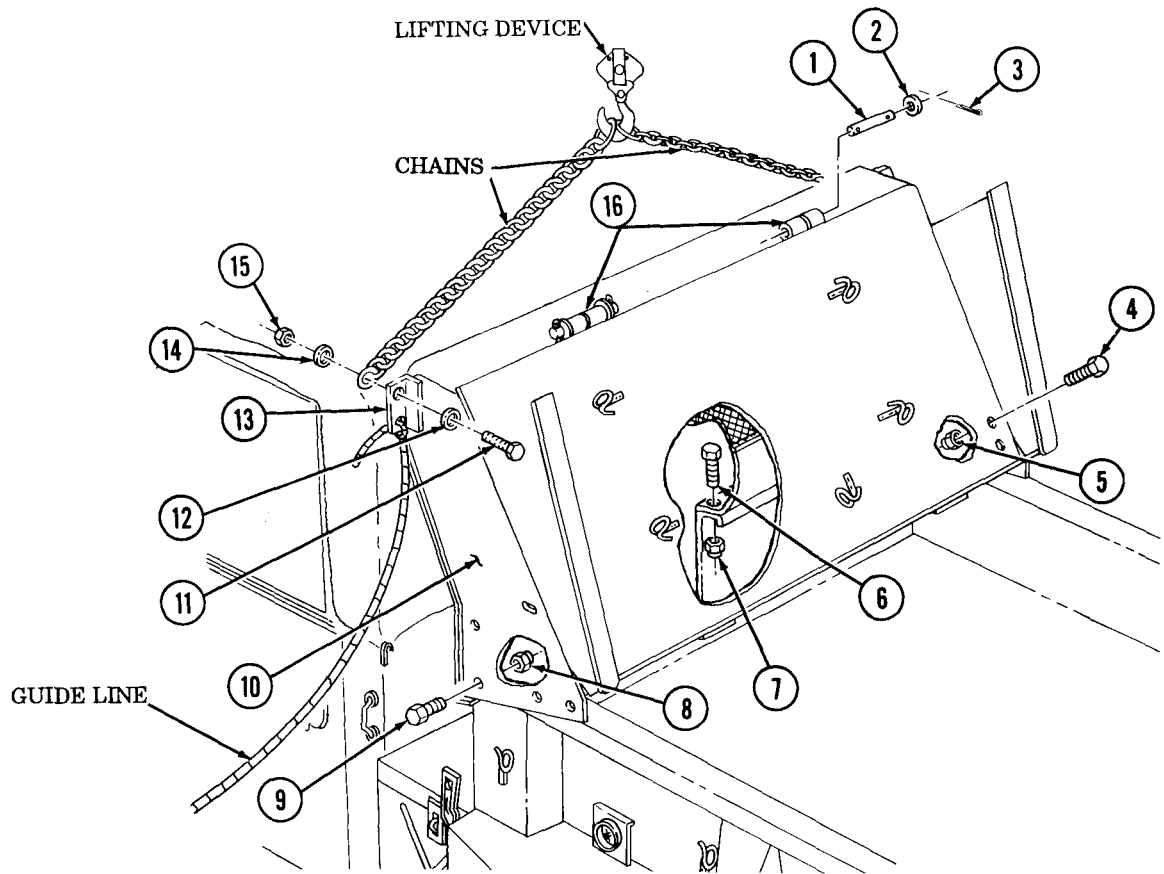
3. Tilt upper cab protector (17) over top of lower cab protector (10) and install on lower cab protector (10) with four screws (4) and nuts (5).
4. Install chain on lower cab protector brackets (13) with two screws (11), washers (12), washers (14), and locknuts (15).
5. Install guide line on cab protector (17).
6. Install lifting device on chain and remove slack from chain.
7. Remove eight screws (9) and locknuts (8) from lower cab protector (10) and dump body (20). Discard locknuts (8).

WARNING

All personnel must stand clear during lifting operations. A shifting or swinging load may cause injury to personnel.

8. Remove upper and lower cab protectors (17) and (10) from dump body (20) and place on wooden supports.
9. Remove four nuts (5) and screws (4) from upper and lower cab protectors (17) and (10).
10. Remove four cotter pins (3), washers (2), and two pins (1) from two hinges (16). Discard cotter pins (3).
11. Lift upper cab protector (17) away from lower cab protector (10) and place on wooden supports.
12. Remove lifting device from chain. Remove two nuts (15), screws (11), two washers (14), washers (12) and chain from lower cab protector brackets (13).
13. Remove guide line from cab protector (17).

15-6. CAB PROTECTOR MAINTENANCE (Contd)



15-6. CAB PROTECTOR MAINTENANCE (Contd)

b. Cleaning and Inspection

1. Inspect cab protectors (17) and (11) for cracks, dents, and rust. Repair if damaged (FM 43-2 and TM 9-237).
2. Clean and paint as necessary (TB 43-0209 and TM 43-0139).

c. Installation

1. Install chains on cab protector brackets (14) with two screws (12), washers (13), and nuts (15). Install lifting device on chains.
2. Install guide line on cab protector bracket (14).
3. Position upper cab protector (17) on lower cab protector (11) and install two pins (1), four washers (2), and new cotter pins (3) through two hinges (16).
4. Install upper cab protector (17) on lower cab protector (11) with four screws (4) and nuts (5).

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

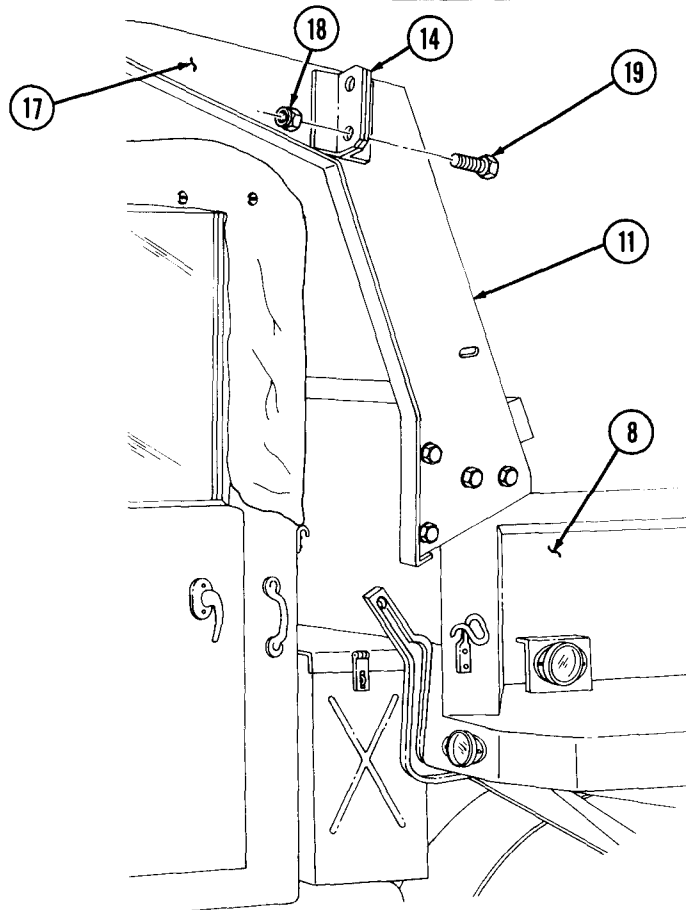
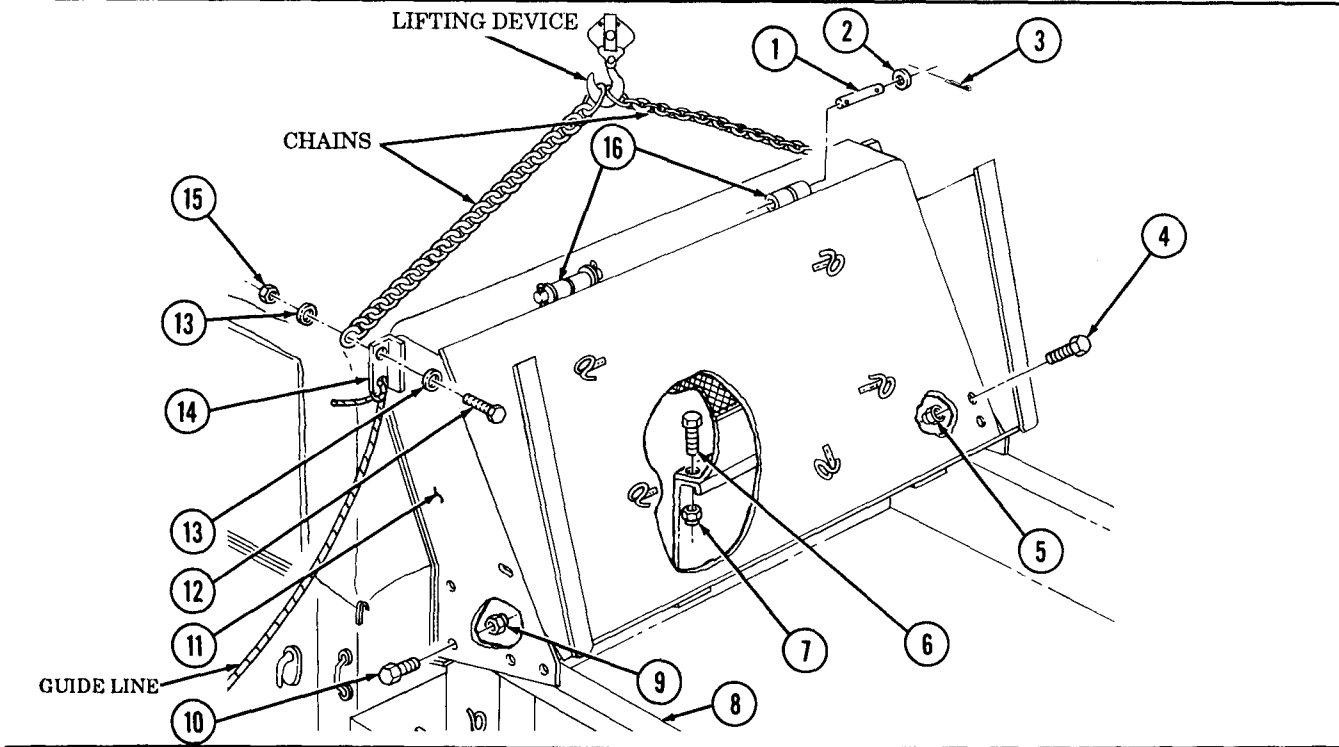
5. Position upper and lower cab protectors (17) and (11) on dump body (8).
6. Install lower cab protector (11) on dump body (8) with eight screws (10) and new locknuts (9).
7. Remove lifting device from chain. Remove two nuts (15), washers (13), screws (12), and chains from cab protector brackets (14).
8. Remove guide line from cab protector bracket (14).
9. Remove four screws (4) and nuts (5) from upper and lower cab protectors (17) and (11).

NOTE

Assistant will help with step 10.

10. Tilt upper cab protector (17) over cab.
11. Install four screws (19) and new locknuts (18) on upper and lower cab protector brackets (14).
12. Install three screws (6) and new locknuts (7) on lower cab protector (11) and dump body (8).

15-6. CAB PROTECTOR MAINTENANCE (Contd)



Section III. FUEL TANK AND WATER TANK BODIES MAINTENANCE

15-7. FUEL TANK AND WATER TANK BODIES MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
15-8.	Fuel and Water Tank Bodies Maintenance	15-25
15-9.	Tank Bodies Frame Sill Maintenance	15-32
15-10.	Discharge Valve Repair (M50A2)	15-36
15-11.	Discharge Valve Repair (M49A2C and M50A3)	15-42
15-12.	Delivery Pump Repair	15-48
15-13.	Sump Valve, Drain Valves, and Drain Tubes Maintenance (M49A2C)	15-56

15-8. FUEL AND WATER TANK BODIES MAINTENANCE

THIS TASK COVERS:

- | | |
|---|---|
| <p>a. Removal</p> <p>b. Cleaning and Inspection</p> | <p>c. Repair</p> <p>d. Installation</p> |
|---|---|

INITIAL SETUP

APPLICABLE MODELS

M49A2C, M50A2, and M50A3

TOOLS

General mechanic's tool kit

(Appendix B, Item 1)

Torque wrench, 1/2-in. dr. (Appendix B, Item 7)

Torque wrench, 3/4-in. dr. (Appendix B, Item 6)

1-1/8-in. socket, 3/4-in. dr. (Appendix B, Item 33)

1-1/4-in. socket, 3/4-in. dr. (Appendix B, Item 37)

Handle, 3/4-in. dr. (Appendix B, Item 35)

Breaker bar, 3/4-in. dr. (Appendix B, Item 34)

Lifting device

MATERIALS/PARTS

Four locknuts (M50A2 and M50A3)

(Appendix F, Item 103)

Four locknuts (M50A2 and M50A3)

(Appendix F, Item 105)

Four locknuts (M49A2C) (Appendix F, Item 105)

Six locknuts (Appendix F, Item 103)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TB 43-0212

TC 9-510

TM 9-2320-361-10

TM 9-2320-361-20

TM 9-2320-361-34P

TM 9-237

TM 43-0139

TM 43-0209

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Tank body drained (TM 9-2320-361-10).
- Tank body purged (M49A2C) (TB 43-0212).
- Tank body upper and lower splash guards removed (TM 9-2320-361-20).
- Tank body front splash guards removed (TM 9-2320-361-20).
- Manhole cover removed (M50A3) (TM 9-2320-361-20).
- Water tank filler cover removed (M50A2 and M50A3) (TM 9-2320-361-20).

EQUIPMENT CONDITION [Contd]

- Nozzle holder removed (M49A2C) (TM 9-2320-361-20).
- Exhaust system removed (M50A2 and M50A3) (TM 9-2320-361-20).
- Tank body rear compartment doors removed (TM 9-2320-361-20).
- Water tank discharge tubes and valves removed (M50A2 and M50A3) (TM 9-2320-361-20).
- Fuel tank discharge valves removed (M49A2C) (TM 9-2320-361-20).
- Fuel tank discharge tubes removed (M49A2C) (TM 9-2320-361-20).
- Delivery pump rear propeller shaft removed (TM 9-2320-361-20).
- Delivery pump front propeller shaft removed (TM 9-2320-361-20).
- Static reel removed (M49A2C) (TM 9-2320-361-20).
- Discharge valve control levers removed (TM 9-2320-361-20).
- Gallon meter removed (M49A2C) (TM 9-2320-361-20).
- Delivery pump strainer removed (TM 9-2320-361-20).
- Filter separator removed (M49A2C) (TM 9-2320-361-20).
- Sump assembly, drain valves, and tubes removed (M49A2C) (para. 15-13).
- Gate valves removed (TM 9-2320-361-20).
- Water tank pump manifold removed (M50A2 and M50A3) (TM 9-2320-361-20).
- Overturn tubes removed (M49A2C) (TM 9-2320-361-20).
- Water or fuel cans and brackets removed (TM 9-2320-361-20).
- Fire extinguishers removed (M49A2C) (TM 9-2310-361-20).

GENERAL SAFETY INSTRUCTIONS

- All personnel must stand clear during lifting operations.
- Do not come in direct contact of spray during tank steam cleaning.
- Eye protection must be worn when removing or installing springs under tension.
- Lifting and support capacity must be greater than weight of tank body.

15-8. FUEL AND WATER TANK BODIES MAINTENANCE (Contd)

a. Removal

WARNING

Eye protection must be worn when removing or installing springs under tension. Failure to do so may result in injury to personnel.

NOTE

The fuel (M49A2C) and water tank bodies (M50A2, M50A3) are replaced basically the same. The fuel tank body has two additional sets of body and frame brackets. This procedure covers the water tank body.

1. Remove four locknuts (5), washers (6), two springs (7) and (8), and four screws (3) from two brackets (1) and brackets (4). Discard locknuts (5).
2. Remove four locknuts (12), washers (11), and screws (9) from four brackets (2) and brackets (10). Discard locknuts (12).
3. Attach chains to tank body (1) and position lifting device in center of chains. Raise lifting device and remove slack in chains.
4. Attach guide lines on lashing hooks (2).

WARNING

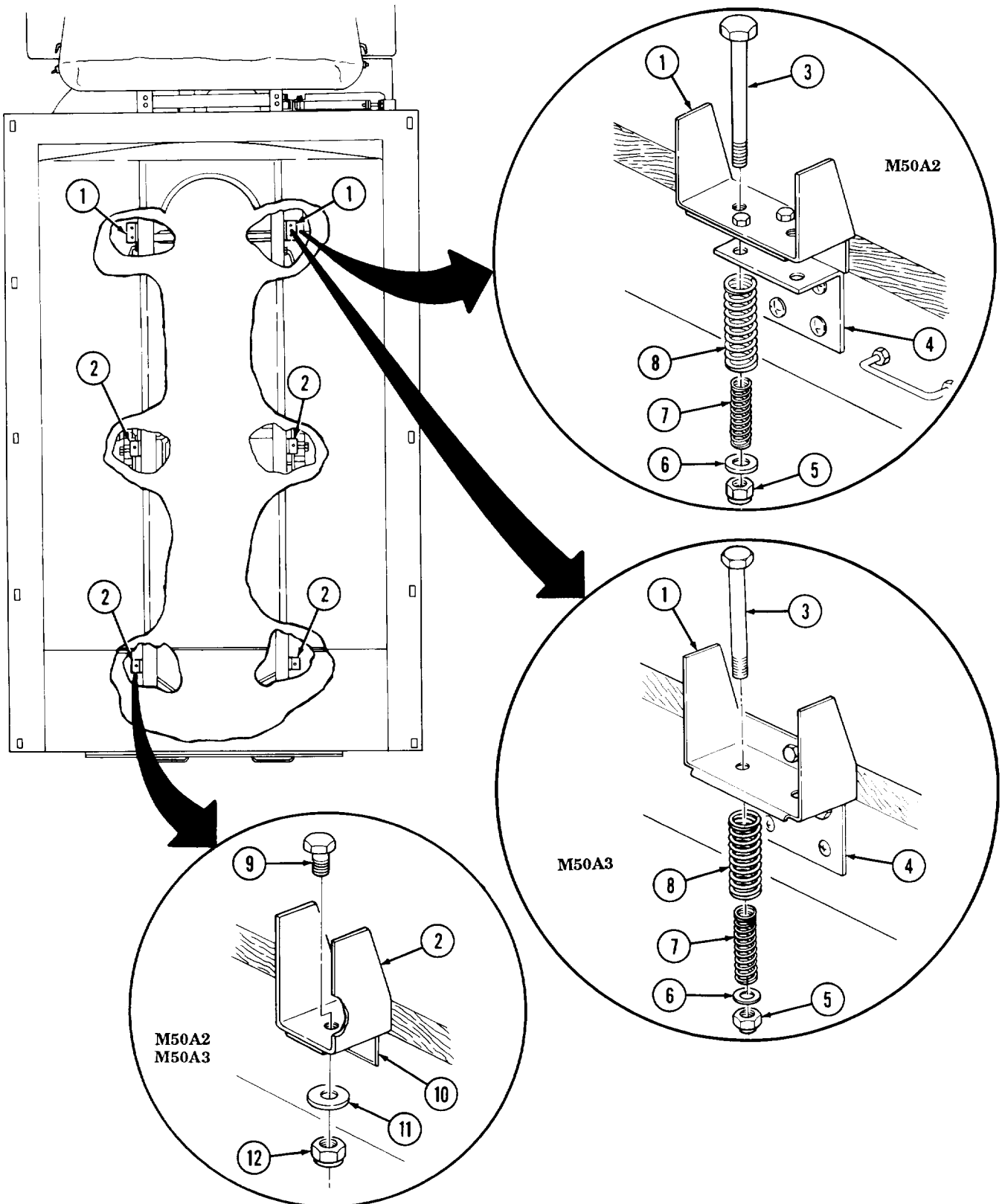
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
- Ensure lifting and support capacity are greater than weight of tank body. Failure to do so may result in injury to personnel or damage to equipment.

NOTE

Assistant will help guide tank body during lifting operations.

5. Remove tank body (1) and place on wooden supports.
6. Remove lifting device, chains, and guide lines from tank body (1).

15-8. FUEL AND WATER TANK BODIES MAINTENANCE (Contd)



15-8. FUEL AND WATER TANK BODIES MAINTENANCE (Contd)

b. Cleaning and Inspection

WARNING

When using steam cleaning equipment, do not come in direct contact of spray. Burns or severe injury to personnel may result.

CAUTION

When steam cleaning tank body, do not apply steam on rustproofing unless area needs repair.

NOTE

- Refer to TB 43-0212 for internal cleaning of fuel tank.
- Perform steps 1 through 3 for internal cleaning of water tank.

1. Place steam nozzle in manhole and direct spray within compartment(s) from top to bottom.
2. Wash all sludge and scale down to bottom of each compartment and remove. Rinse inside of each compartment thoroughly with fresh water,
3. Inspect tank body (1) for damage or rust. Replace tank body (1) if damage or rust on tank body (1) is excessive and beyond available repair procedures.
4. Inspect frame sills (para. 15-9).

c. Repair

1. Remove and install lashing hooks and data plates in area(s) to be repaired (TM 9-2320-361-20).
2. Remove paint or rust from area(s) to be welded or repaired (TM 9-237).
3. Repair tank body (1) (TM 9-237 and TC 9-510).
4. Paint tank body as necessary (TM 43-0139 and TB 43-0209).

d. Installation

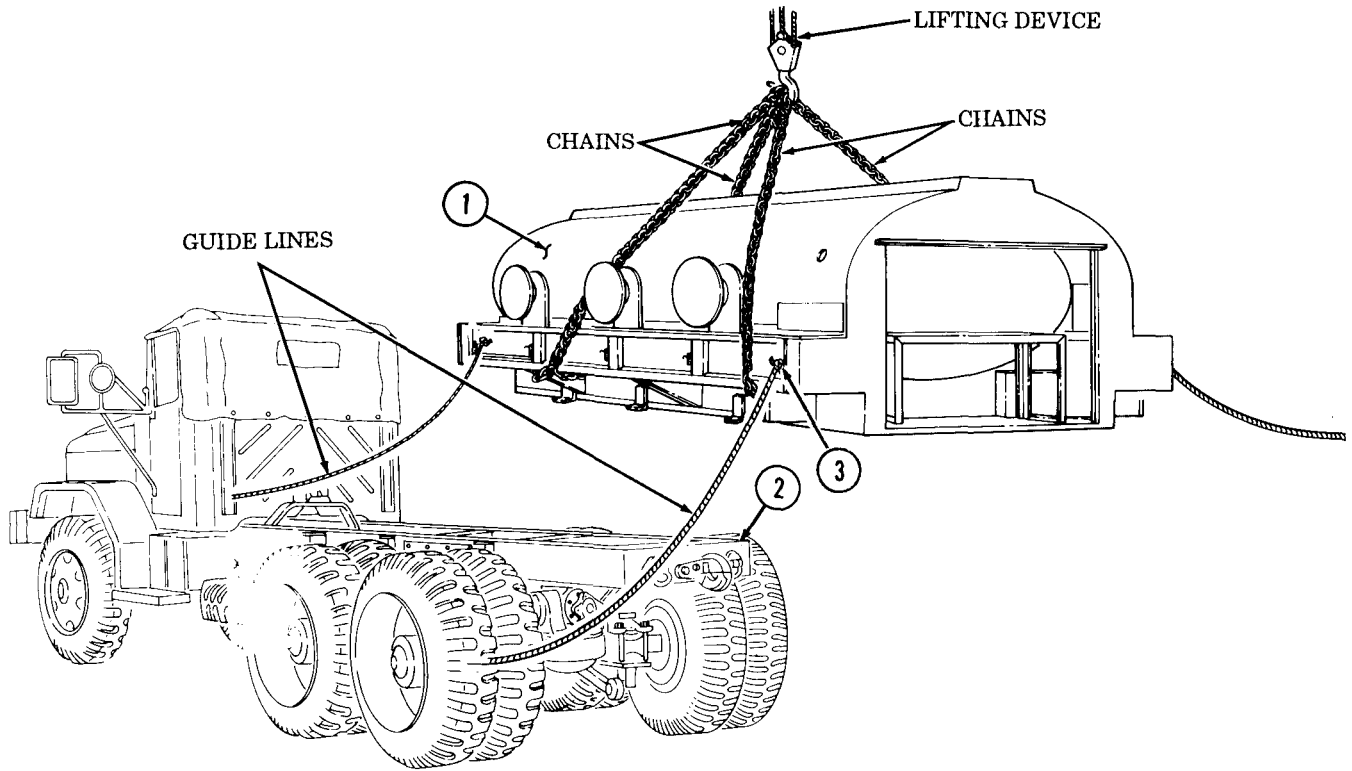
WARNING

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
- Ensure lifting capacity is greater than weight of tank body. Failure to do so may result in injury to personnel.

NOTE

- Use breaker bar to aline body and frame brackets.
 - Assistant will help guide tank body during lifting operations.
1. Attach chains to tank body (1).
 2. Attach lifting device to chains and install guide lines to tank body (1).
 3. Lift tank body (1) off wooden supports and lower onto vehicle frame (2).
 4. Remove lifting device from chains. Remove chains from tank body (1).
 5. Remove guide lines from lashing hooks (3).

15-8. FUEL AND WATER TANK BODIES MAINTENANCE (Contd)



15-8. FUEL AND WATER TANK BODIES MAINTENANCE (contd)

NOTE

Fuel tank models have two additional sets of body and frame brackets.

6. Install four screws (11) in four brackets (15) and brackets (12) with four washers (13) and new locknuts (14). Tighten locknuts (14) 105-145 lb-ft (142-197 N.m).

WARNING

Eye protection must be worn when installing springs under tension.
Failure to do so may result in injury to personnel.

7. Place four screws (5) in two brackets (4) and brackets (6). Install springs (9) inside springs (10) and over screws (5) with four washers (8) and new locknuts (7).

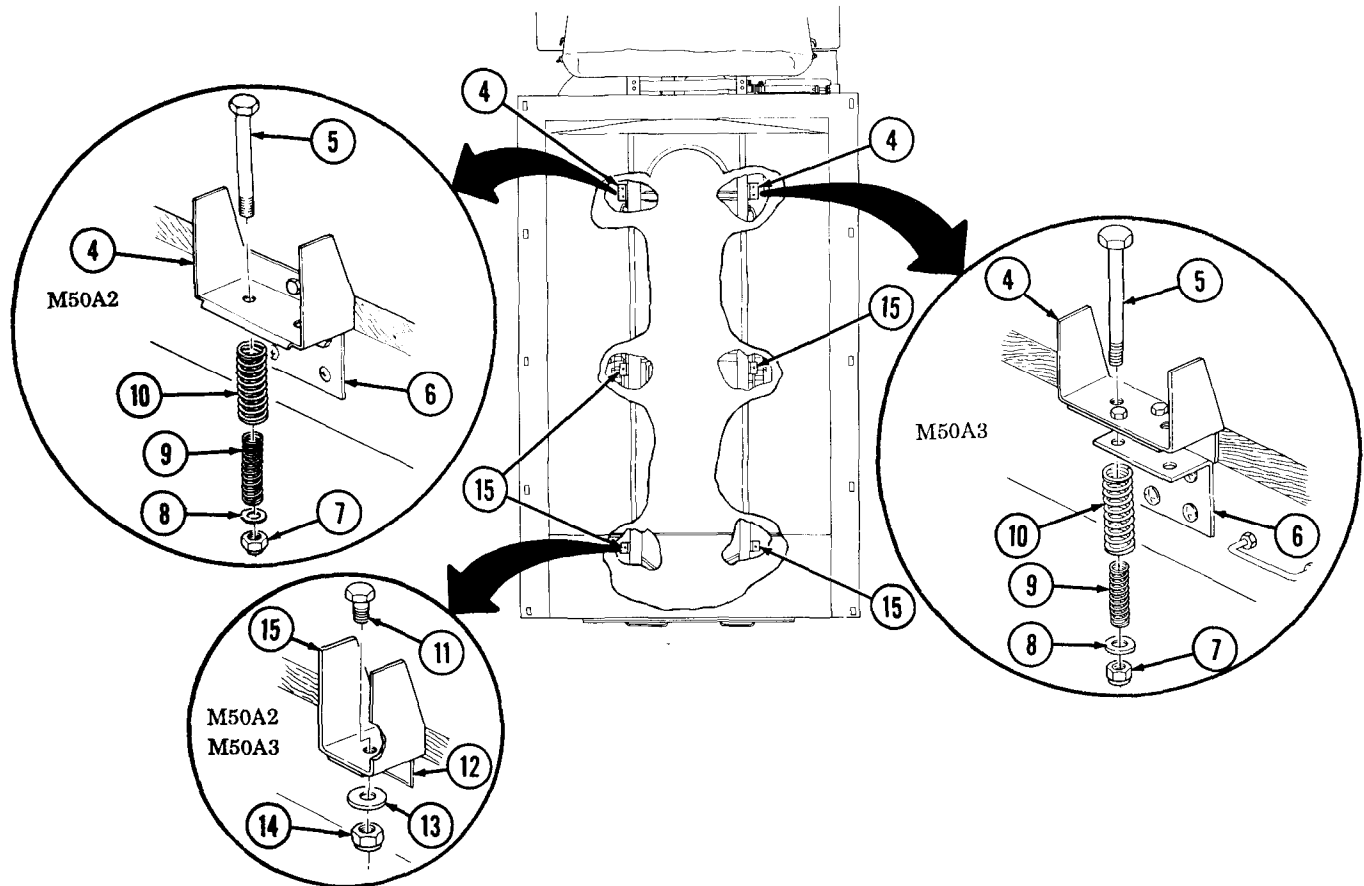
NOTE

“ Fuel tank bracket springs installed height is 6.4 in. (163 mm).

• Water tank bracket springs installed height is 6.5 in. (165 mm).

8. Tighten four locknuts (7) and adjust springs (9) and (10) to height specification.

15-8. FUEL AND WATER TANK BODIES MAINTENANCE (Contd)



- FOLLOW-ON TASKS:**
- . Install fire extinguishers (M49A2C) (TM 9-2320-361-20).
 - Install water or fuel cans and brackets (TM 9-2320-361-20).
 - Install overturn tubes (M49A2C) (TM 9-2320-361-20).
 - Install water tank pump manifold (M50A2 and M50A3) (TM 9-2320-361-20).
 - Install gate valves (TM 9-2320-361-20).
 - Install sump assembly, drain valves, and tubes (M49A2C (para. 15-13).
 - Install filter separator (M49A2C) (TM 9-2320-361-20).
 - Install delivery pump strainer (TM 9-2320-361-20).
 - Install gallon meter (M49A2C) (TM 9-2320-361-20).
 - Install discharge valve control levers (TM 9-2320-361-20).
 - . Install static reel (M49A2C) (TM 9-2320-361-20).
 - . Install delivery pump front propeller shaft (TM 9-2320-361-20).
 - Install delivery pump rear propeller shaft (TM 9-2320-361-20).
 - Install fuel tank discharge tubes (M49A2C) (TM 9-2320-361-20).
 - Install fuel tank discharge valves (M49A2C) (TM 9-2320-361-20).
 - Install water tank discharge tubes and valves (M50A2 and M50A3) (TM 9-2320-361-20).
 - Install exhaust system (M50A2 and M50A3) (TM 9-2320-361-20).
 - Install tank body rear compartment doors (TM 9-2320-361-20).
 - . Install nozzle holder (M49A2C) (TM 9-2320-361-20).
 - Install water tank filler cover (M50A2 and M50A3) (TM 9-2320-361-20).
 - Install manhole cover (M50A3) (TM 9-2320-361-20).
 - Install tank body front splash guards (TM 9-2320-361-20).
 - Install tank body upper and lower splash guards (TM 9-2320-361-20).

15-9. TANK BODIES FRAME SILL MAINTENANCE

THIS TASK COVERS:

- | | |
|--|------------------------|
| <p>a. Removal</p> <p>b. Inspection</p> | <p>c. Installation</p> |
|--|------------------------|

INITIAL SETUP

APPLICABLE MODELS

M49A2C, M50A2, and M50A3

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 Breaker bar, 1/2-in. dr. (Appendix B, Item 15)
 1-1/8-in. socket, 1/2-in. dr. (Appendix B, Item 10)
 1-1/4-in. socket, 1/2-in. dr. (Appendix B, Item 19)
 Torque wrench, 1/2-in. dr. (Appendix B, Item 7)

MATERIALS/PARTS

Two locknuts (M49A2C and M50A3)
 (Appendix F, Item 89)
 Three locknuts (M50A2) (Appendix F, Item 89)

REFERENCES (TM)

TM 9-2320-361-34P

EQUIPMENT CONDITION

Tank body removed (para. 15-8).

GENERAL SAFETY INSTRUCTIONS

- Use care when working under tank body.
- Ensure lifting capacity is greater than weight of tank body.

WARNING

- Be careful when working under tank body placed on supports. Tank body may fall causing injury to personnel.
- Ensure lifting capacity is greater than weight of tank body. Failure to do so may cause injury to personnel.

a. Removal

NOTE

- Perform steps 1 through 3 for M50A2 sill removal.
- Perform step 4 for M49A2C sill removal.
- Perform steps 5 and 6 for M50A3 sill removal.

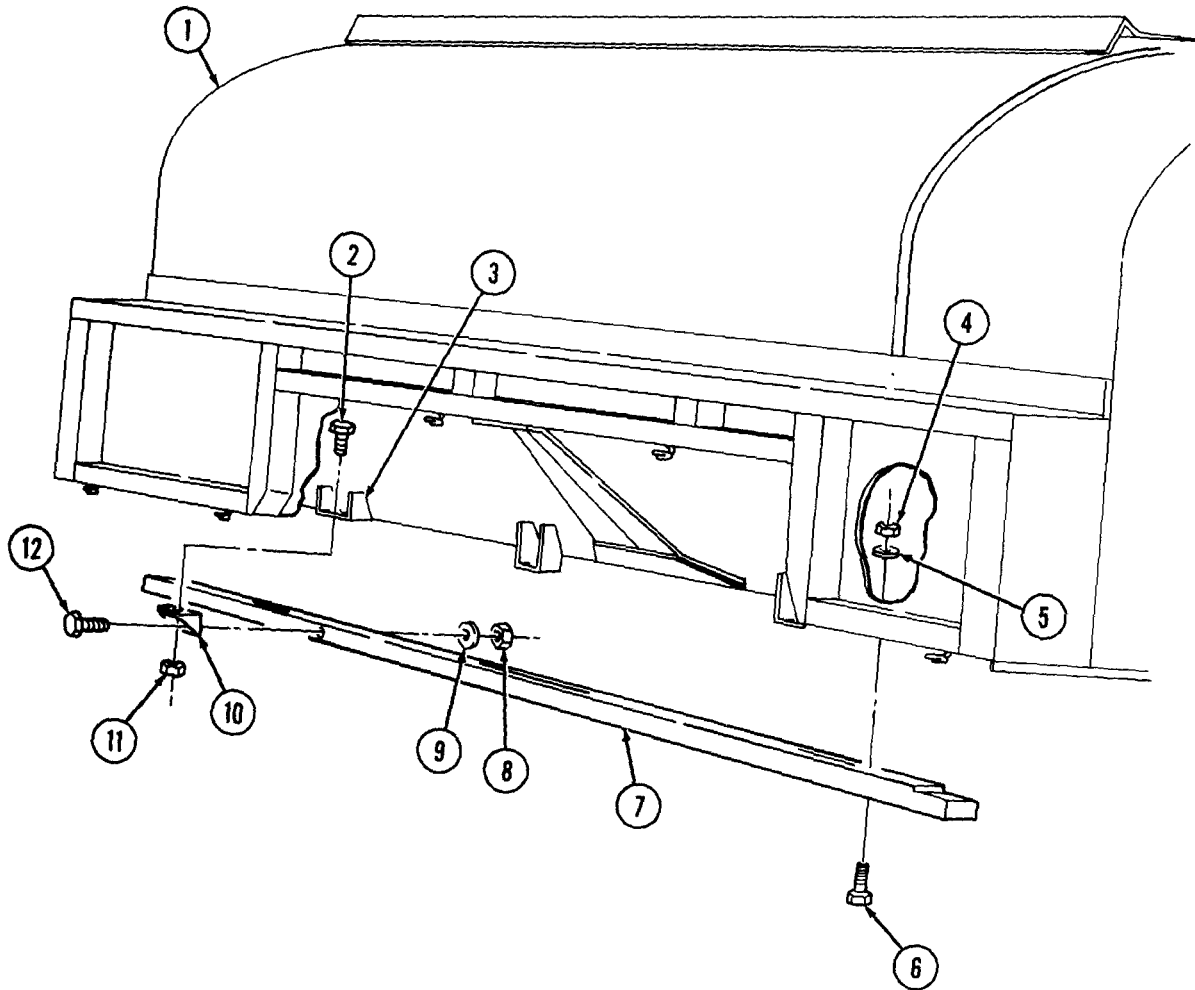
1. Remove locknut (8), washer (9), and screw (12) from frame sill (7). Discard locknut (8).
2. Remove locknut (11), screw (2), and bracket (10) from bracket (3). Discard locknut (11).

NOTE

Assistants will help remove frame sill.

3. Remove locknut (4), washer (5), screw (6), and frame sill (7) from tank body (1). Discard locknut (4).

15-9. TANK BODIES FRAME SILL MAINTENANCE (Contd)



M50A2

15-9. TANK BODIES FRAME SILL MAINTENANCE (Contd)

4. Remove two locknuts (2), washers (3), screws (4), and frame sill (5) from tank body (1). Discard locknuts (2).
5. Remove locknut (11), washer (12), and screw (13) from bracket (14) and frame sill (10). Discard locknut (11).
6. Remove locknut (7), washer (8), screw (9), and frame sill (10) from tank body (6). Discard locknut (7).

b. Inspection

Inspect each frame sill (19), (5), or (10) for end splits or rotting. Replace if end split exceeds width of frame sill (19), (5), or (10) or frame sill (19), (5), or (10) is damaged.

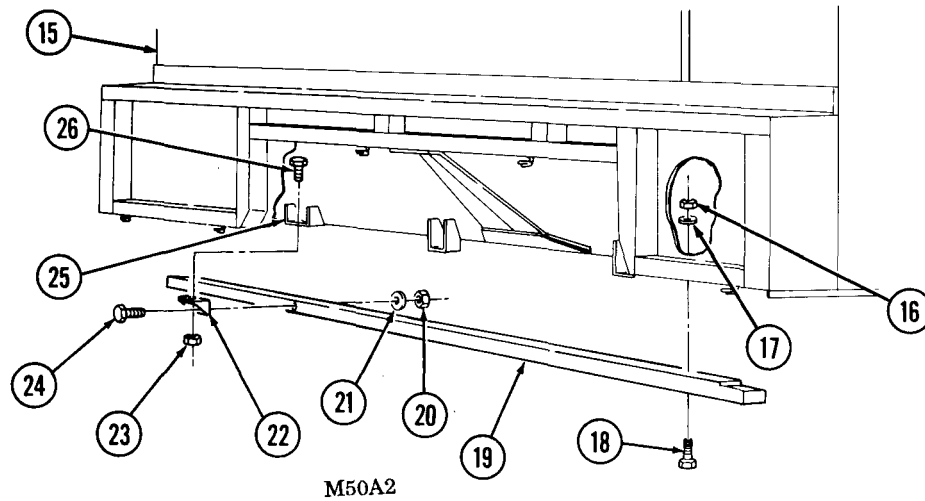
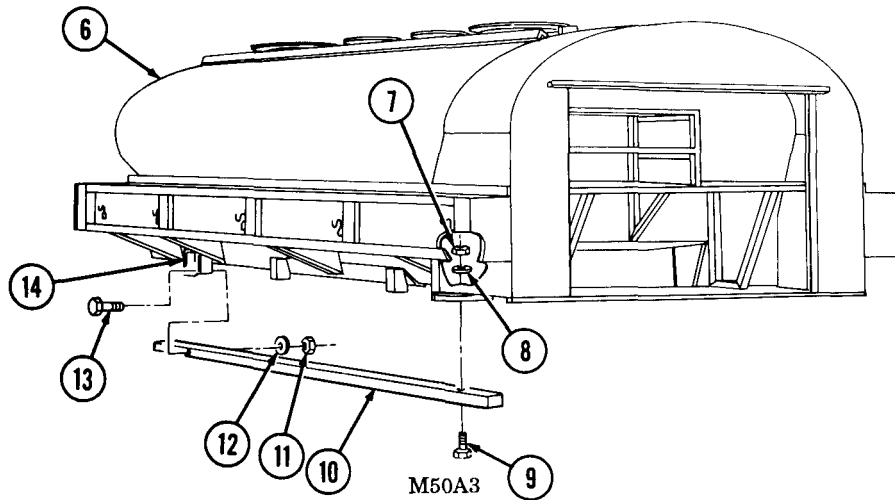
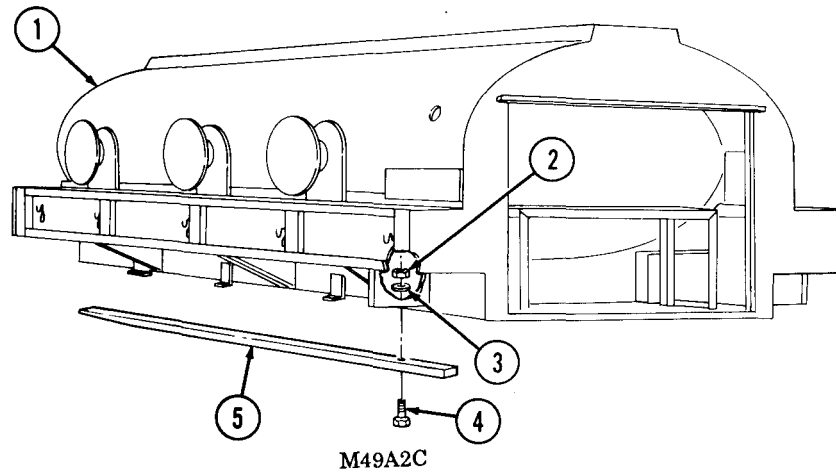
c. Installation

NOTE

- Perform steps 1 through 3 for M50A2 sill installation.
- . Perform step 4 for M49A2C sill installation.
- . Perform steps 5 and 6 for M50A3 sill installation.
- . Assistant will help with installation of frame sill.

1. Install frame sill (19) on tank body (15) with screw (18), washer (17), and new locknut (16).
2. Install bracket (22) on frame sill (19) with screw (24), washer (21), and new locknut (20). Do not tighten locknut (20).
3. Install bracket (22) on bracket (25) with screw (26) and new locknut (23). Tighten locknut (20).
4. Install frame sill (5) on tank body (1) with two screws (4), washers (3), and new locknuts (2).
5. Install frame sill (10) end on tank body (6) with screw (9), washer (8), and new locknut (7).
6. Install frame sill (10) end on tank body (6) and bracket (14) with screw (13), washer (12), and new locknut (11).

15-9. TANK BODIES FRAME SILL MAINTENANCE (Contd)



FOLLOW-ON TASK: Install tank body (para. 15-8).

15-10. DISCHARGE VALVE REPAIR (M50A2)

THIS TASK COVERS:

- a. Disassembly
- b. Cleaning and Inspection

- c. Assembly

INITIAL SETUP

APPLICABLE MODELS

M50A2

TEST EQUIPMENT

Micrometer (Appendix B, Item 3)

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Handle, socket wrench, 1-in. dr. (Appendix B, Item 43)
- Spring tester (Appendix B, Item 38)
- Torque wrench, 1/2-in. dr. (Appendix B, Item 7)
- Pipe wrench (Appendix B, Item 39)
- 2-1/4-in. socket, 1-in. dr. (Appendix B, Item 57)
- Adjustable wrench (Appendix B, Item 62)

MATERIALS/PARTS

- Packing (Appendix F, Item 179)
- Disc (Appendix F, Item 25)
- Cotter pin (Appendix F, Item 8)
- Rags (Appendix C, Item 16)

REFERENCES (TM)

- TM 9-2320-361-20
- TM 9-2320-361-34P

EQUIPMENT CONDITION

Discharge valve removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

Eye protection must be worn when working with discharge valve internal spring.

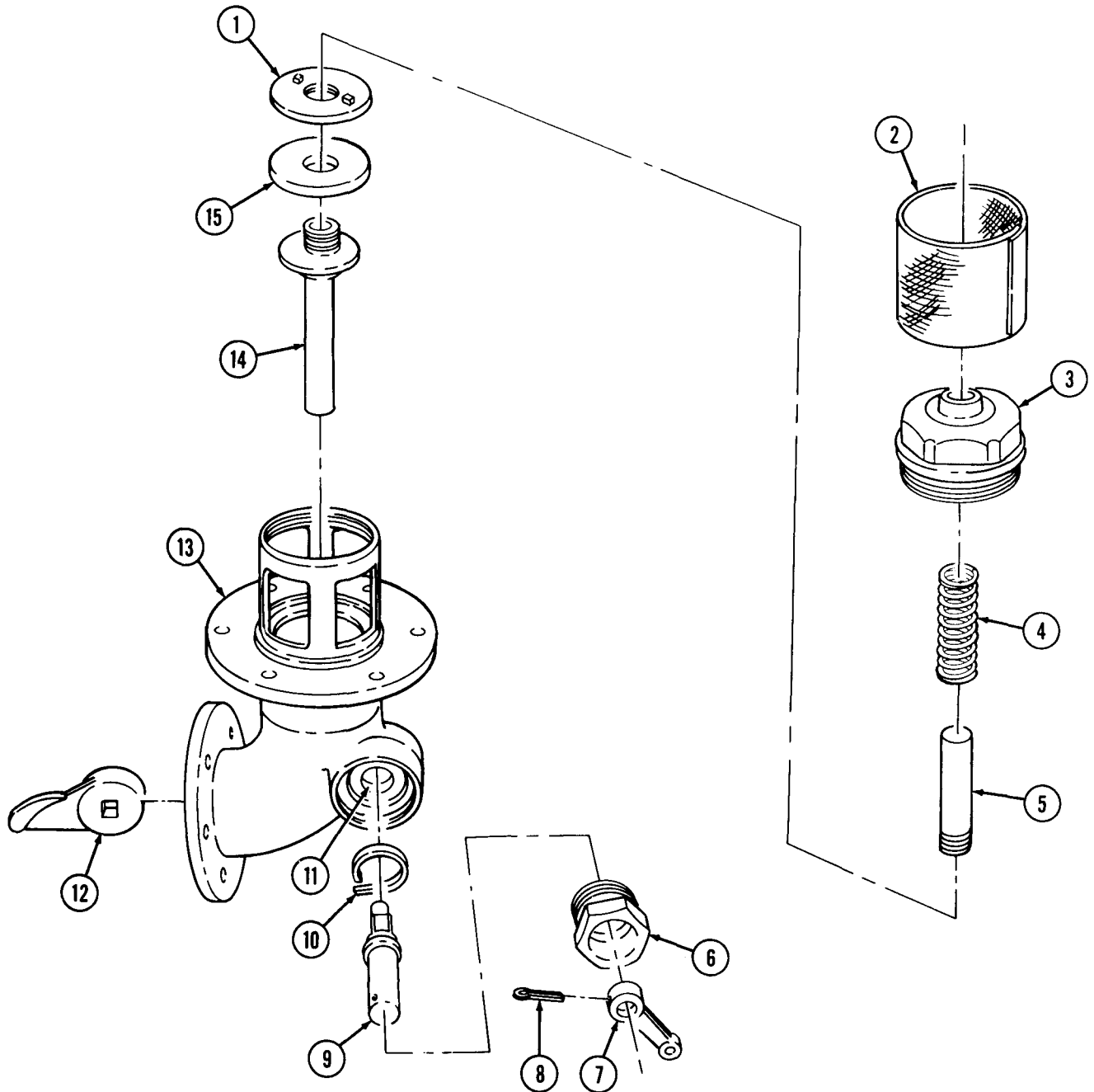
a. Disassembly

WARNING

Discharge valve internal spring is compressed by bonnet. Eye protection must be worn during bonnet removal from valve housing. Failure to do so may result in injury to personnel.

1. Remove strainer (2) from discharge valve housing (13).
2. Remove bonnet (3) from valve housing (13) and upper plunger (5).
3. Remove spring (4) and upper plunger (5) with nut (1), disc (15), and lower plunger (14) from valve housing (13).
4. Remove nut (1) and disc (15) from lower plunger (14) and upper plunger (5). Discard disc (15).
5. Remove upper plunger (5) from lower plunger (14).
6. Remove cotter pin (8) from lever arm (7) and stem (9). Discard cotter pin (8).
7. Remove lever arm (7) from stem (9).
8. Remove plug (6) from valve housing (13) and stem (9).
9. Remove stem (9) from cam (12) and stem bore (11) of valve housing (13).
10. Remove cam (12) horn valve housing (13).
11. Remove packing (10) from stem bore (11). Discard packing (10).

15-10. DISCHARGE VALVE REPAIR (M50A2) (Contd)



15-10. DISCHARGE VALVE REPAIR (M50A2) (Contd)

b. Cleaning and Inspection

1. Wash all parts with soap and hot water. Rinse all parts with hot water and dry using a clean, soft rag.

Table 15-1. Discharge Valve Wear Limits.

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		STANDARD	METRIC
2	Upper plunger (bonnet end diameter)	0.48-0.51 in.	12.19-12.95 mm
3	Bonnet (plunger hole diameter)	0.50-0.51 in.	12.70-12.95 mm
4	Spring		
	Free length	5.18-5.43 in.	131.6 -137.9 mm
	Compressed to 2.43 in. (61.7 mm)	22-28 lb-in.	2.5- 3.2 N.m
5	Plug (stem hole diameter)	0.65-0.66 in.	16.51-16.76 mm
8	Cam stem:		
	Inside stem bore end diameter	0.42-0.43 in.	10.67-10.92 mm
	Plug end diameter	0.644-0.648 in.	16.36-16.46 mm
	Machined with square	0.49-0.50 in.	12.44-12.70 mm
9	Lower plunger (length)	3.23-3.26 in.	82.64-82.80 mm
10	Discharge valve housing		
	Inside stem bore/inner diameter	0.43-0.44 in.	10.67-11.18 mm
	Outer stem bore/inner diameter	0.65-0.66 in.	16.51-16.76 mm

2. Inspect discharge valve housing (10) for scoring, cracks, or thread and mating surface damage and wear. Refer to table 15-1, Discharge Valve Wear Limits, for measurements. Replace if damaged or worn past limits.
3. Inspect bonnet (3) for cracks, thread damage, and wear at plunger hole. Refer to table 15-1, Discharge Valve Wear Limits, for measurements. Replace bonnet (3) if damaged or worn past limits.
4. Inspect upper plunger (2) for wear, bends, cracks, and thread damage. Refer to table 15-1, Discharge Valve Wear Limits, for measurements. Replace upper plunger (2) if damaged or worn past limits.
5. Inspect lower plunger (9) for wear, bends, cracks, and thread damage. Refer to table 15-1, Discharge Valve Wear Limits, for measurements. Replace lower plunger (9) if damaged or worn past limits.
6. Inspect nut (1) for thread and mating surface damage. Replace if damaged.
7. Inspect cam (7) for mating surface damage at lower plunger. Replace if damaged.
8. Inspect cam stem (8) for bends, cracks, and machined surface wear. Refer to table 15-1, Discharge Valve Wear Limits, for measurements. Replace cam stem (8) if damaged or worn past limits.
9. Inspect plug (5) for wear and thread damage. Refer to table 15-1, Discharge Valve Wear Limits, for measurements. Replace plug (5) if damaged or worn past limits.
10. Inspect lever arm (6) for cracks or pinhole damage. Replace if damaged.
11. Inspect spring (4) for collapsed coils or breakage. Replace if damaged.
12. Inspect spring (4) length. Refer to table 15-1, Discharge Valve Wear Limits, for measurements. Replace spring (4) if worn past limits.

15-10. DISCHARGE VALVE REPAIR (M50A2) (Contd)

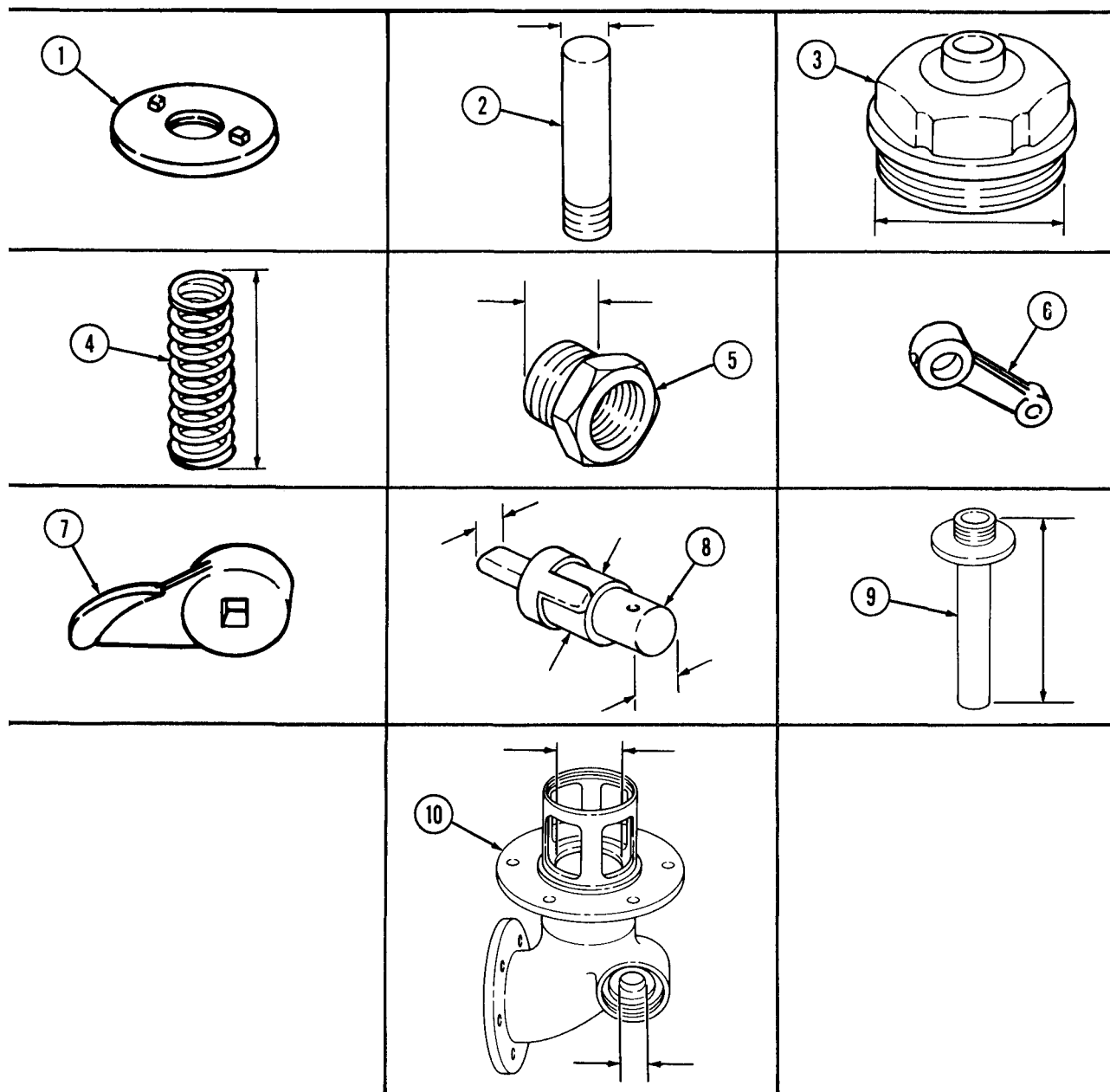
WARNING

Eye protection must be worn during discharge valve internal spring load test. Failure to do so may result in injury to personnel.

NOTE

Perform step 13 for testing new or used discharge valve internal spring prior to assembly.

13. Check load on spring (4). Refer to table 15-1, Discharge Valve Wear Limits, for measurements. Replace spring (4) if load is incorrect.



15-10. DISCHARGE VALVE REPAIR (M50A2) (Contd)

c. Assembly

1. Install new packing (11) in bore (12) of valve housing (15).
2. Place cam (14) in valve housing (15) with outward rounded edge positioned up.
3. Install cam stem (10) through packing (11), bore (12), and cam (14).
4. Install plug (6) over cam stem (10) into valve housing (15).
5. Install new disc (17), with sealing edge positioned down, and nut (1) on lower plunger (16).
6. Install upper plunger (5) in lower plunger (16).
7. Install upper plunger (5) with nut (1), new disc (17), and lower plunger (16) in valve housing (15).
8. Install spring (4) over upper plunger (5) and seat on nut (1).

WARNING

Eye protection must be worn during spring compression/bonnet installation. Failure to do this may result in injury to personnel.

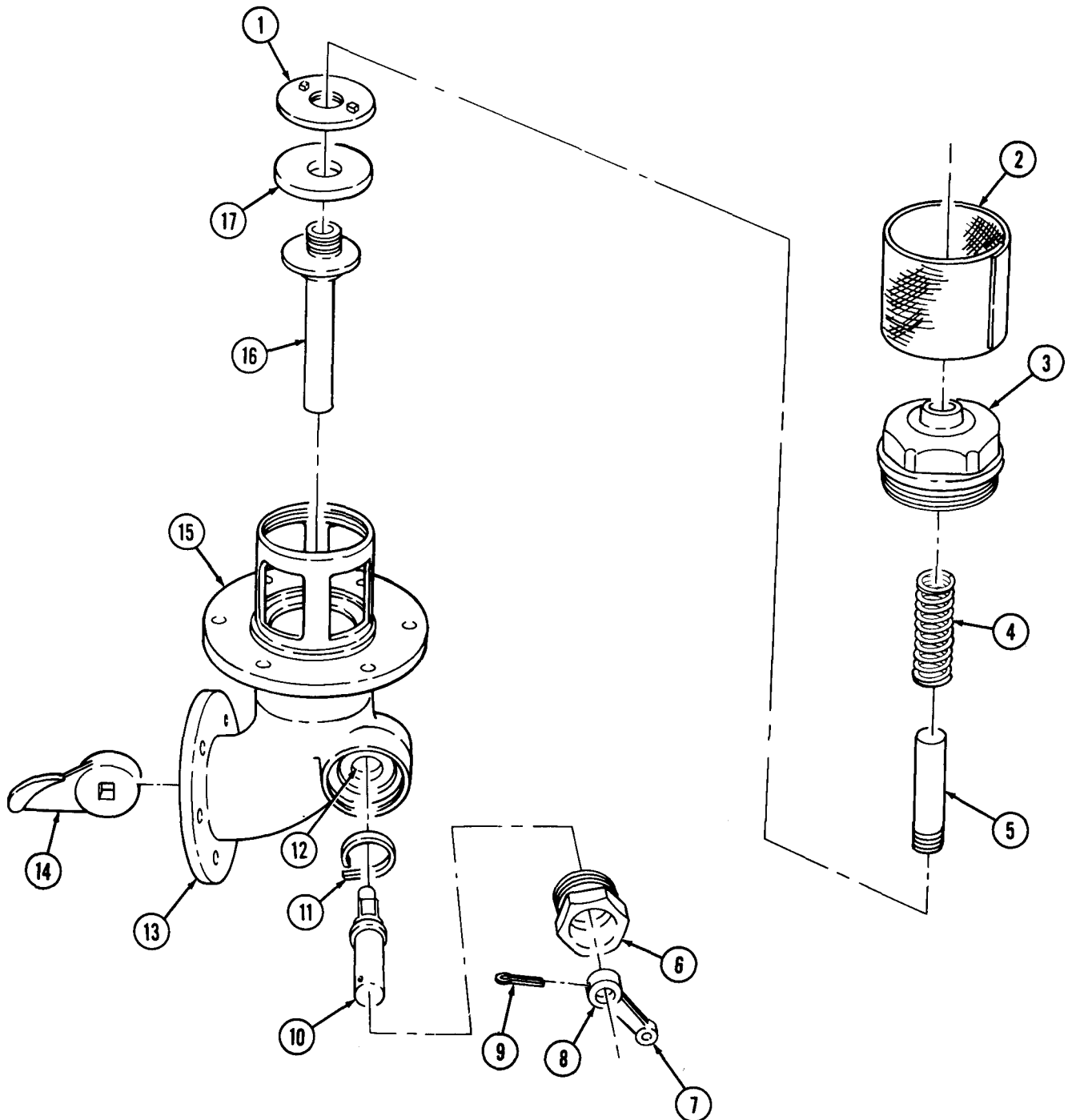
9. Install bonnet (3) over upper plunger (5) into valve housing (15).

NOTE

If cam stem replacement is required, perform steps 10 through 12.

10. Place valve housing tube flange (13) on flat surface. Place lever arm (7) on cam stem (10).
11. Position lever arm (7) end hole center (8) 5.219 in. (132.6 mm) above flat surface.
12. Drill 0.25 in. (6.4 mm) hole in center of slot in lever arm (7) through cam stem (10).
13. Install lever arm (7) on cam stem (10) with new cotter pin (9). Bend cotter pin (9) legs even with lever arm (7).
14. Install strainer (2) on valve housing (15).

15-10. DISCHARGE VALVE REPAIR (M50A2) (Contd)



FOLLOW-ON TASK: Install discharge valve (TM 9-2320-361-20).

15-11. DISCHARGE VALVE REPAIR (M49A2C AND M50A3)

THIS TASK COVERS:

- a. Disassembly**
b. Cleaning and Inspection

- c. Assembly**

INITIAL SETUPAPPLICABLE MODELS

M49A2C and M50A3

TEST EQUIPMENT

Micrometer (Appendix B, Item 3)

TOOLS

General mechanic's tool kit

(Appendix B, Item 1)

Torque wrench, 1/2-in. dr. (Appendix B, Item 8)

Spring tester (Appendix B, Item 38)

MATERIALS/PARTS

Two seals (Appendix F, Item 222)

Packing (Appendix F, Item 179)

Disc (Appendix F, Item 24)

Antiseize tape (Appendix C, Item 25)

Rag (Appendix C, Item 16)

Drycleaning solvent (Appendix C, Item 24)

REFERENCES (TM)

TM 9-2320-361-20

TM 9-2320-361-34P

EQUIPMENT CONDITION

Discharge valve removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- Eye protection must be worn when removing or installing valve housing cover and during load test of internal spring.
- Keep fire extinguisher nearby when using drycleaning solvent.

a. Disassembly

WARNING

Discharge valve internal spring is compressed in cap. Eye protection must be worn when removing screws and cap from valve housing. Failure to do this may cause injury to personnel.

1. Remove strainer (2) from valve housing (7).
2. Remove four setscrews (15) from valve housing (7).
3. Remove cap (3) and spring (4) from stem (5).
4. Remove stem (5) with holder (1), disc (17), and retainer (16) from valve housing (7).
5. Remove retainer (16), disc (17), and holder (1) from stem (5). Discard disc (17).
6. Remove nut (13) from bore (8) in valve housing (7).
7. Remove seals (11) and (14) from bore (12) in nut (13). Discard seals (11) and (14).
8. Remove cam stem (10) from cam (6) and valve housing (7).
9. Remove cam (6) from valve housing (7).
10. Remove packing (9) from bore (8) in valve housing (7). Discard packing (9).

15-11. DISCHARGE VALVE REPAIR (M49A2C AND M50A3) (Contd)

b. Cleaning and Inspection

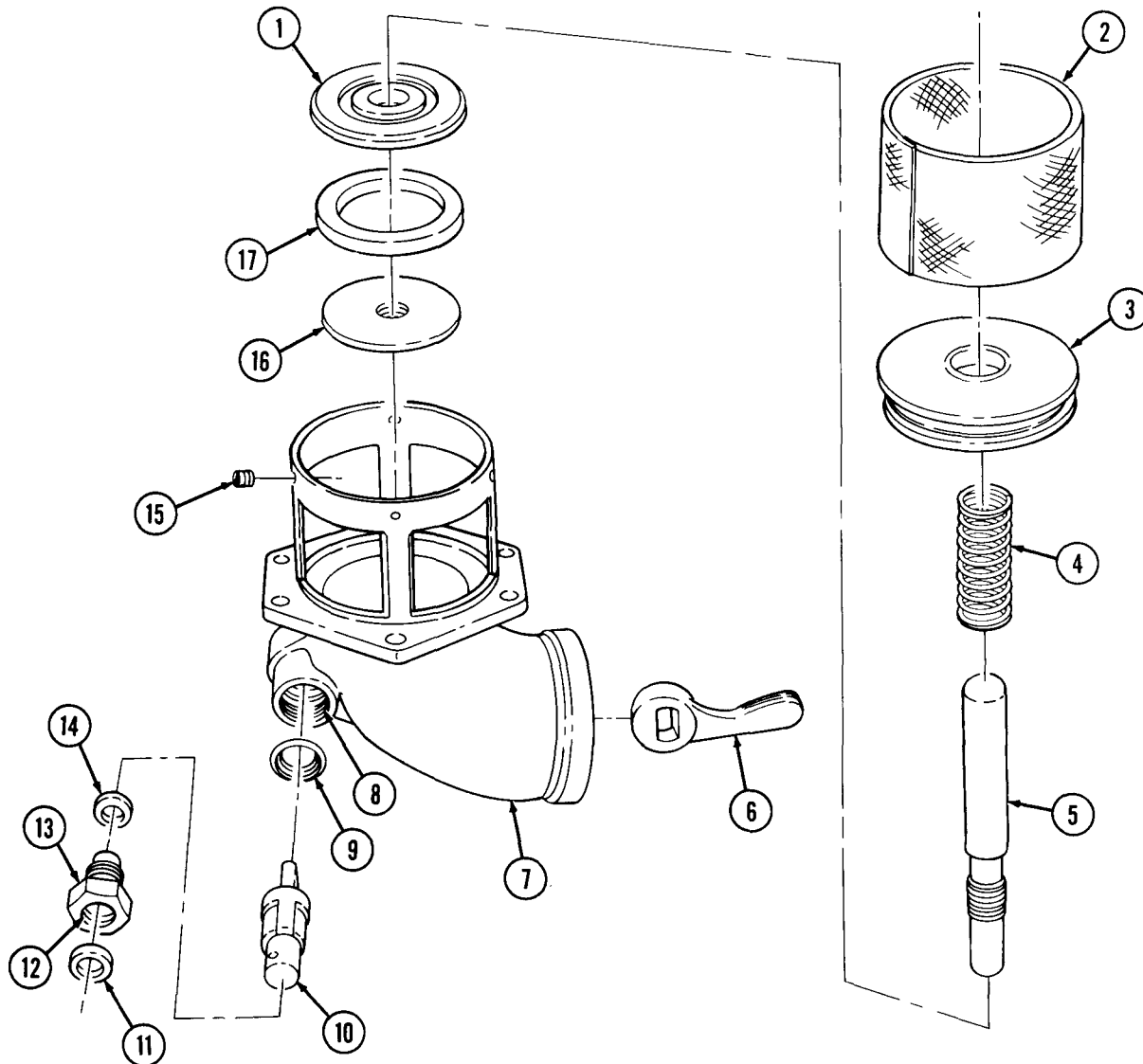
WARNING

Drycleaning solvent is flammable and will not be used near open flame. Use only in well-ventilated places. Failure to do so may result in injury or death to personnel.

NOTE

- Perform step 1 for cleaning M49A2C fuel tank discharge valves.
- Perform step 2 for cleaning M50A3 water tank discharge valves.

1. Wash all parts with drycleaning solvent and allow to air dry.
2. Wash all parts with soap and hot water. Rinse all parts with hot water and dry using a clean, soft rag.



15-11. DISCHARGE VALVE REPAIR (M49A2C AND M50A3) (Contd)

Table 15-2. Discharge Valve Wear Limits.

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		INCHES	MILLIMETERS
4	Spring (flee length)	5.0	127.0
7	Cam stem:		
	Inside stem bore end diameter	0.422-0.437	10.72-11.09
	Plug end diameter	0.644-0.648	16.36-16.46
	Machined with square	0.497-0.500	12.62-12.70
9	Discharge valve housing:		
	Inside stem bore/inner diameter	0.433-0.443	10.99-11.25
	Outer stem bore/inner diameter	0.651-0.661	16.53-16.79

3. Inspect cam stem (7) for scoring or cracks and wear. Refer to table 15-2, Discharge Valve Wear Limits, for measurements. Replace if damaged or worn past limits.
4. Inspect strainer (2) for tears. Replace if damaged.
5. Inspect valve housing (9) for cracks, stripped threads, scoring, or worn bores. Refer to table 15-2, Discharge Valve Wear Limits, for measurements. Replace if damaged or worn past limits.
6. Inspect cap (3) for wear or cracks at stem hole. Replace if damaged.
7. Inspect holder (1) for wear or cracks at tapered stem hole. Replace if damaged.
8. Inspect retainer (10) for cracks or damaged threads. Replace if damaged.
9. Inspect stem (5) for cracks, scoring, damaged threads, or wear. Replace if damaged or worn.
10. Inspect cam (6) for wear at stem hole and curved driving surface. Replace if worn.
11. Inspect nut (8) for wear at stem hole and thread damage. Replace if damaged or worn.
12. Inspect spring (4) for weak or collapsed coils. Replace if damaged.
13. Inspect spring (4) free length. Refer to table 15-2, Discharge Valve Wear Limits, for measurements. Replace spring (4) if worn past limits.

WARNING

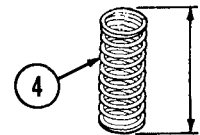
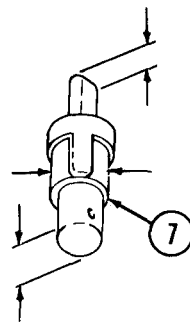
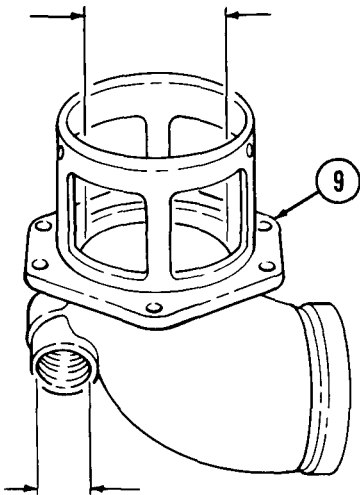
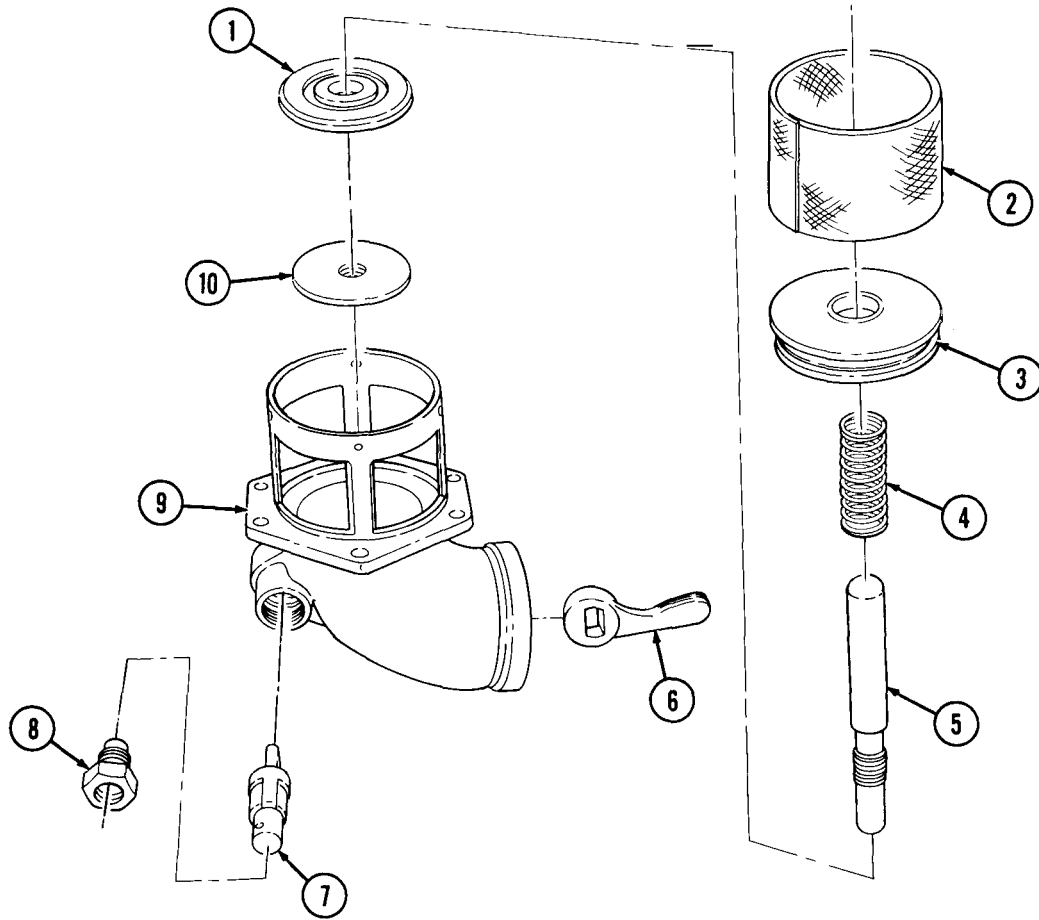
Eye protection must be worn during load test of internal spring.
Failure to do this may cause injury to personnel.

NOTE

Perform step 14 for test of new or used internal spring prior to assembly.

14. Check load on spring (4). Spring load must be 5.5-6.4 lb-ft (7.5-8.7 N.m) when compressed to 3 in. (76.2 mm).

15-11. DISCHARGE VALVE REPAIR (M49A2C AND M50A3) (Contd)



15-11. DISCHARGE VALVE REPAIR (M49A2C AND M50A3) (Contd)

c. Assembly

1. Install new packing (9) in bore (8) of valve housing (7).
2. Position cam (6) inside valve housing (7) with rounded edge facing up.
3. Insert cam stem (10) in bore (8) through cam (6) until seated.
4. Install two new seals (12) and (14) in bore (11) of nut (13). Wrap nut (13) threads with antiseize tape and install nut (13) over cam stem (10) into valve housing (7).
5. Install holder (1) and new disc (17) on stem (5) with retainer (16).
6. Position stem (5) with holder (1), new disc (17), and retainer (16) in valve housing (7) until seated.

WARNING

Eye protection must be worn during spring and cap installation.
Failure to do this may result in injury to personnel.

7. Position spring (4) over stem (5) on holder (1).
8. Install cap (3) on stem (5), compressing spring (4) into valve housing (7), with four setscrews (15).
9. Install strainer (2) over valve housing (7).

15-12. DELIVERY PUMP REPAIR

THIS TASK COVERS:

- a. Disassembly
- b. Cleaning

- c. Inspection
- d. Assembly

INITIAL SETUP

APPLICABLE MODELS

M49A2C, M50A2, and M50A3

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Snapping pliers (Appendix B, Item 40)

MATERIALS/PARTS

Two O-ring seals (Appendix F, Item 177)
Two snaprings (Appendix F, Item 263)
Five seals (Appendix F, Item 233)
Two gaskets (Appendix F, Item 54)
Gasket (Appendix F, Item 43)
Gasket (Appendix F, Item 44)
Gasket (Appendix F, Item 53)
Thirty-two lockwashers (Appendix F, Item 146)
GAA grease (Appendix C, Item 8)
Rag (Appendix C, Item 16)

REFERENCES (TM)

LO 9-2320-209-12-1
TM 9-214
TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

- Delivery pump drain cock removed, if installed (TM 9-2320-361-20).
- Delivery pump removed (TM 9-2320-361-20).
- Strainer element removed (TM 9-2320-361-20).

SPECIAL ENVIRONMENTAL CONDITIONS

Work area must be clean and free from blowing dirt and dust.

a. Disassembly

1. Remove four screws (3), lockwashers (2), strainer body (1), and gasket (46) from pump body (40). Discard lockwashers (2) and gasket (46).
2. Remove valve cap (7) and gasket (6) from setscrew (5). Discard gasket (6).
3. Place a locator mark on setscrew (5) threads where threads meet cover (4). Remove setscrew (5).
4. Remove four screws (8), lockwashers (9), cover (4), and gasket (10) from pump body (40). Discard lockwashers (9) and gasket (10).
5. Remove spring guide (11), spring (12), and bypass valve (13) from pump body (40).
6. Remove grease fittings (23) and (32) and fittings (25) and (31) from covers (24) and (30).
7. Remove four screws (26), Lockwashers (27), cover (24), and gasket (22) from pump head (16). Discard lockwashers (27) and gasket (22).

NOTE

Liner pins may stay with pump heads or liner during removal of pump heads.

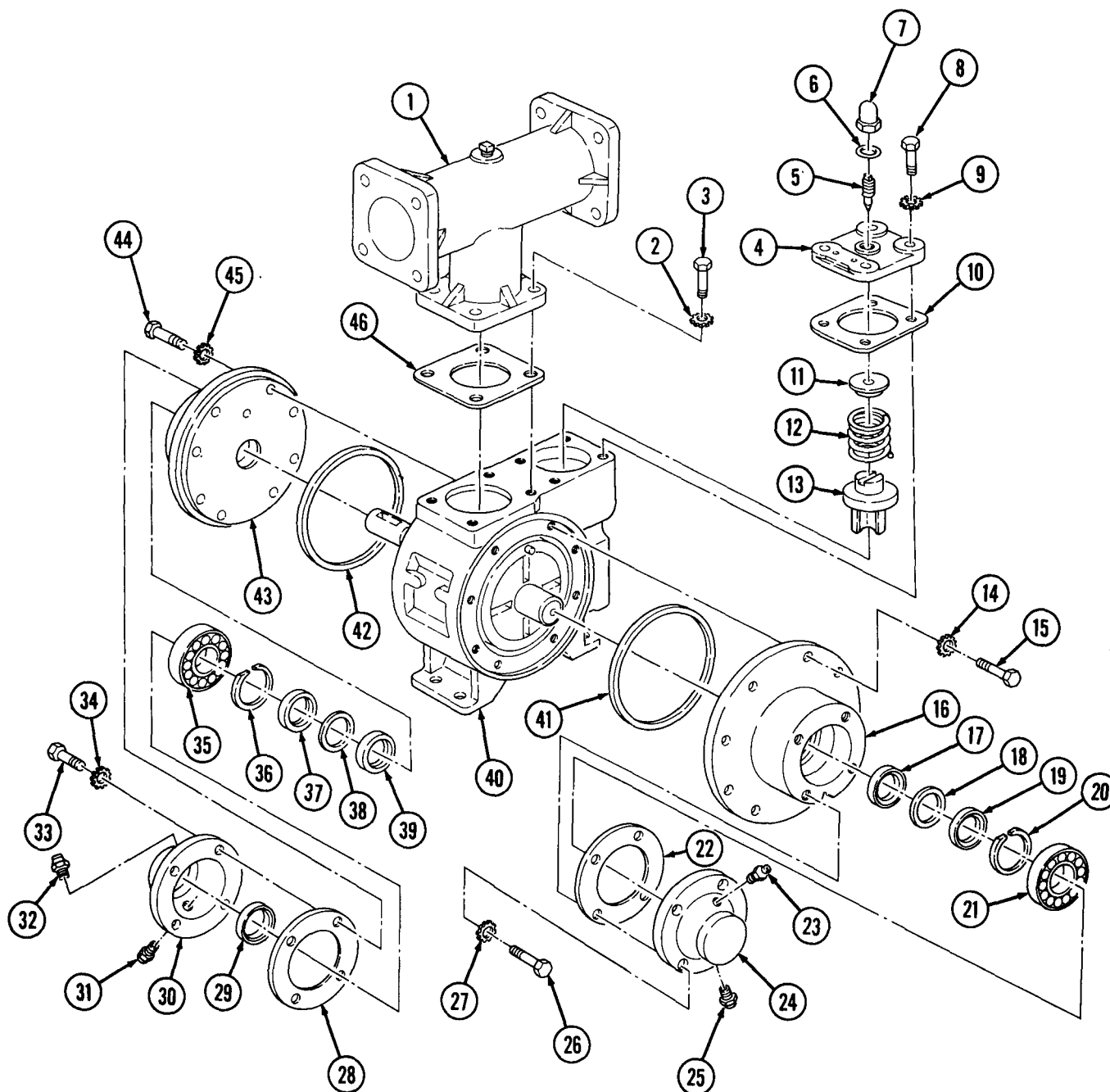
8. Remove eight screws (15), lockwashers (14), pump head (16), and O-ring seal (41) from pump body (40). Discard lockwashers (14) and O-ring seal (41).
9. Remove four screws (33), lockwashers (34), cover (30), and gasket (28) from pump head (43). Discard lockwashers (34) and gasket (28).
10. Remove eight screws (44), lockwashers (45), pump head (43), and O-ring seal (42) from pump body (40). Discard lockwashers (45) and O-ring seal (42).
11. Remove seal (29) from cover (30). Discard seal (29).

15-12. DELIVERY PUMP REPAIR (Contd)

NOTE

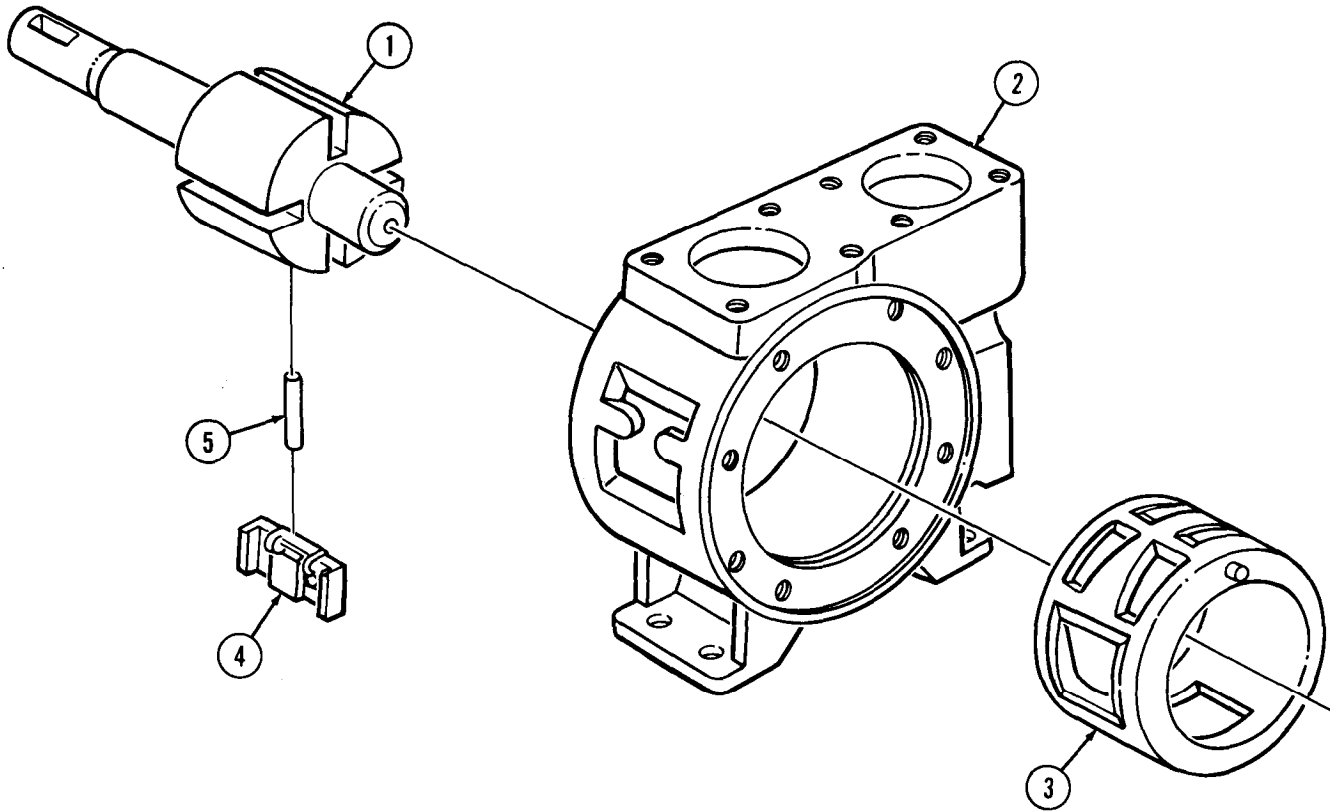
Rotor bearings are snug fit in pump heads. Rotor bearings must be removed to gain access to snaprings in pump heads.

- 12. Remove rotor bearings (21) and (35) from pump heads (16) and (43).
- 13. Remove snaprings (20) and (36), seals (19) and (37), washers (18) and (38), and seals (17) and (39) from pump heads (16) and (43). Discard snaprings (20) and (36) and seals (17), (19), (39), and (37).



15-12. DELIVERY PUMP REPAIR (Contd)

14. Remove rotor (1) from liner (3).
15. Remove four vanes (4) and two rods (5) from rotor (1).
16. Mark liner (3) and pump body (2) for alinement during assembly.
17. Remove liner (3) from pump body (2).



b. Cleaning

1. For general cleaning instructions, refer to para. 2-8.

NOTE

Refer to steps 2 and 3 for final cleaning of (M50A2 and M50A3) delivery pump internal components.

2. Wash delivery pump internal components with soap and hot water. Rinse internal components thoroughly with hot water.
3. Dry internal components using a clean, soft rag.

15-12. DELIVERY PUMP REPAIR (Contd)

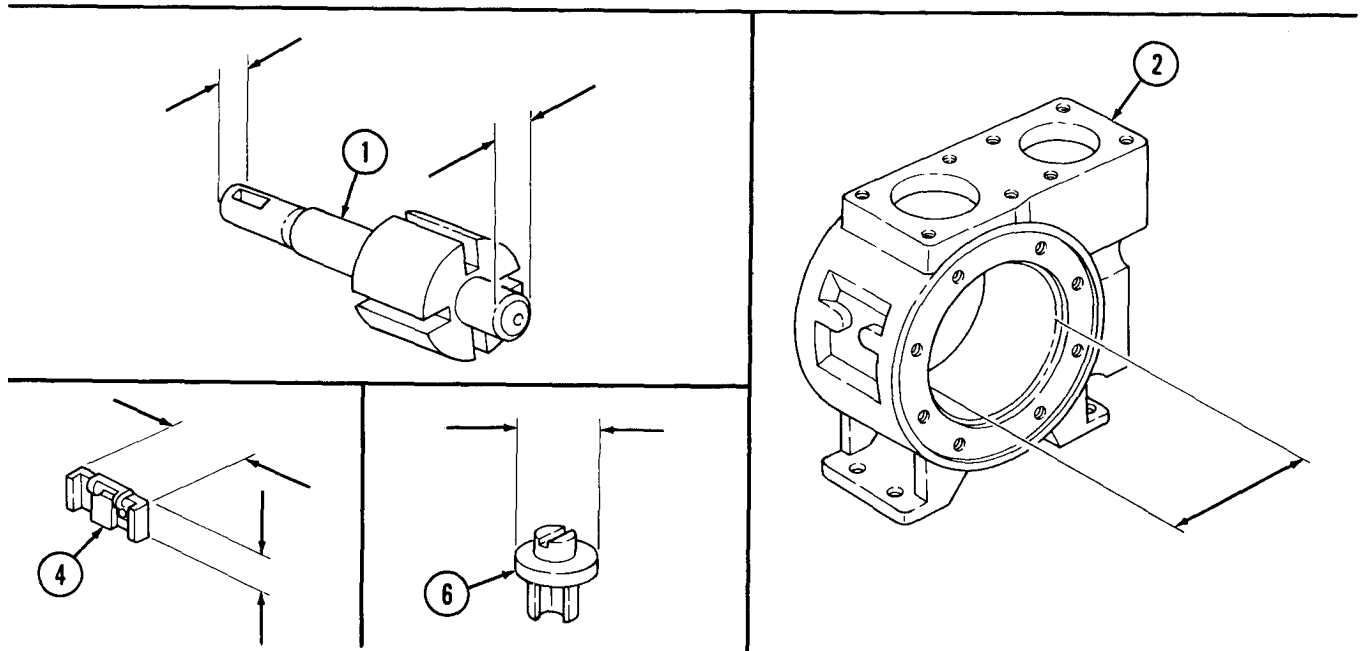
c. Inspection

1. For general inspection instructions, refer to para. 2-9.

Table 15-3. Delivery Pump Wear Limits.

ITEM NO	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/ TOLERANCES		
		INCHES	MILLIMETERS	
1	Rotor:			
	Shaft diameter at seals	1.18	29.97	
2	Vane slot width	0.50	12.7	
		1.25	31.75	
4	Vane:			
		Thickness	0.48-0.49	12.19-12.45
		Width	1.20-1.21	30.48-30.73
		Clearance when installed in rotor	0.01-0.02	0.25-0.51
6	Bypass valve (diameter)	1.24	31.50	

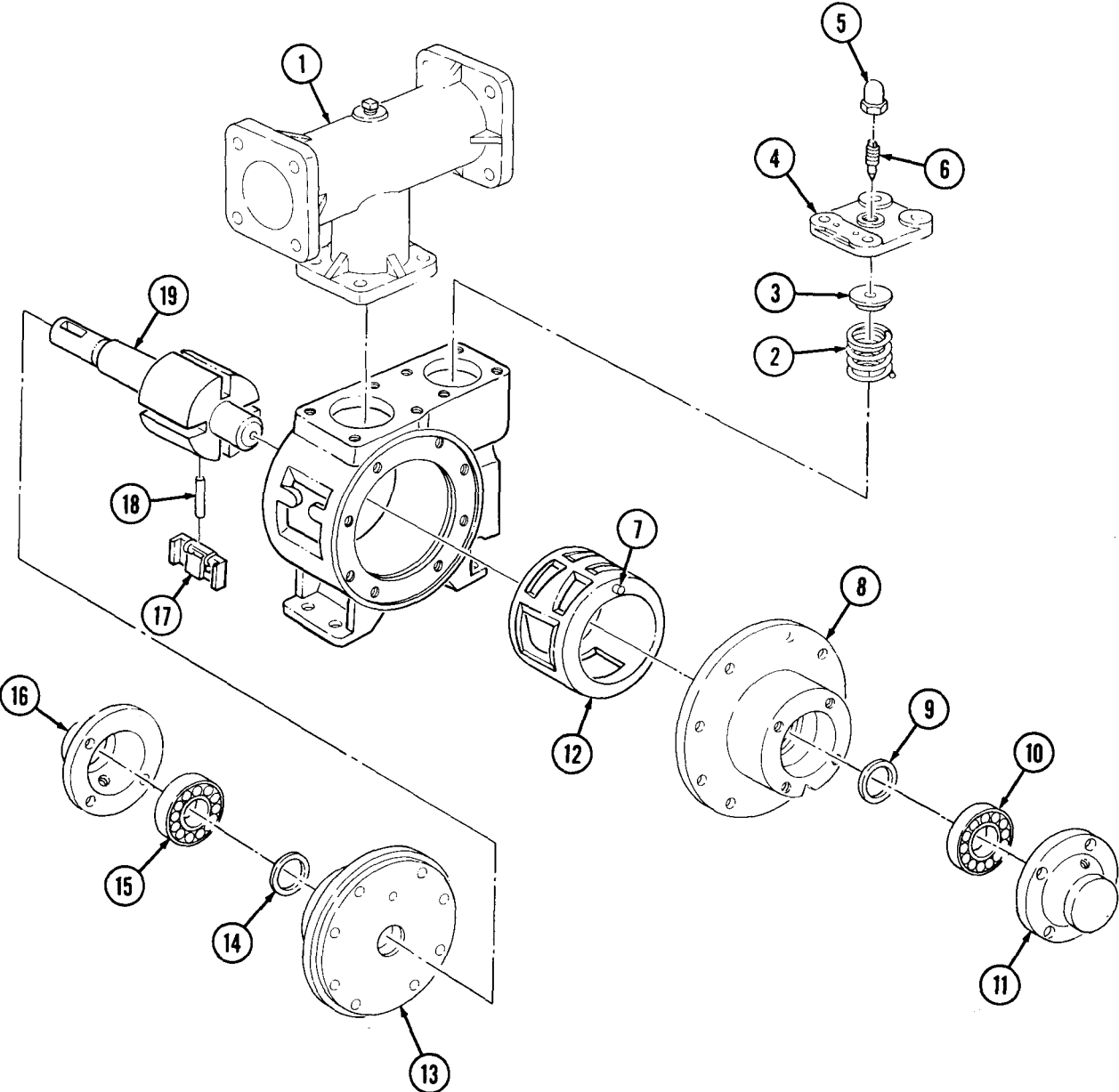
2. Inspect pump body (2) for cracks, damaged threads, wear, or defects. Refer to table 15-3, Delivery Pump Wear Limits, for measurements. Replace if damaged or worn past limits.
3. Inspect rotor (1) for bent shaft, scoring or wear at shaft, key slot, or vane slot. Refer to table 15-3, Delivery Pump Wear Limits, for measurements. Replace if damaged or worn past limits.
4. Inspect four vanes (4) for bends, cracks, scoring, or wear. Refer to table 15-3, Delivery Pump Wear Limits, for measurements. Replace if damaged or worn past limits.
5. Inspect bypass valve (6) for breakage, scoring, or wear. Refer to table 15-3, Delivery Pump Wear Limits, for measurements. Replace if damaged or worn past limits.



15-12. DELIVERY PUMP REPAIR (Contd)

6. Inspect liner (12) for cracks, scoring, or worn chrome plating. Replace if damaged or worn.
7. Inspect two rods (18), rotor (19), and four vanes (17) for bends or scoring. Replace if damaged.
8. Inspect washers (9) and (14) for grooves and cracks. Replace if damaged.
9. Inspect pump heads (8) and (13) for cracks or thread damage. Replace if damaged.
10. Inspect rotor bearings (10) and (15) (TM 9-214). Replace if damaged.
11. Inspect covers (11) and (16) for cracks or thread damage. Replace if damaged.
12. Inspect spring guide (3) for cracks. Replace if damaged.
13. Inspect spring (2) for collapsed coils or breakage. Replace if damaged.
14. Inspect cover (4) for cracks or thread damage. Replace if damaged.
15. Inspect strainer body (1) for cracks or other damage. Replace if damaged.
16. Inspect valve cap (5) for thread or gasket contact surface damage. Replace if damaged.
17. Inspect setscrew (6) for threads or tip damage. Replace if damaged.
18. Inspect two pins (7) in either the liner (12) or heads (8) and (13) for looseness or other damage. Replace if damaged.

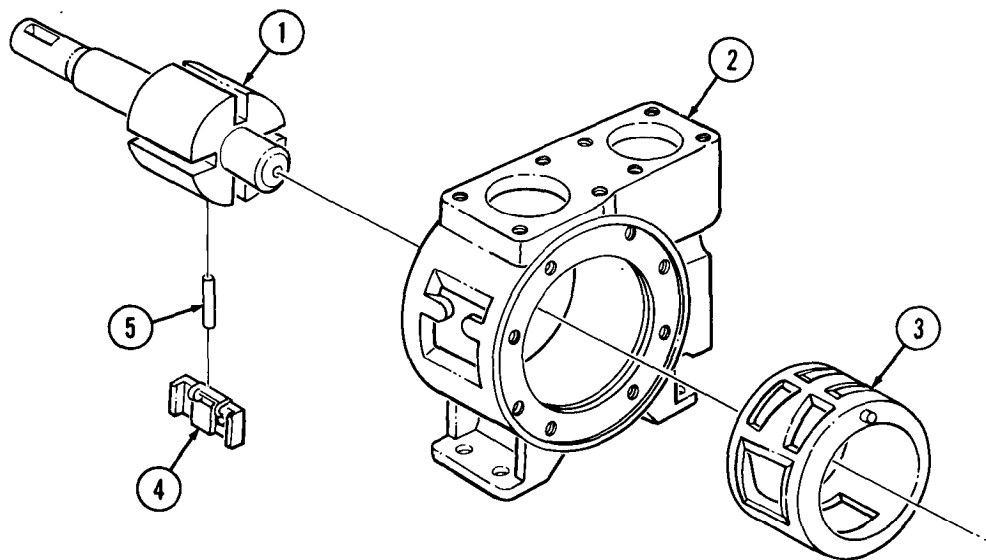
15-12. DELIVERY PUMP REPAIR (Contd)



15-12. DELIVERY PUMP REPAIR (Contd)

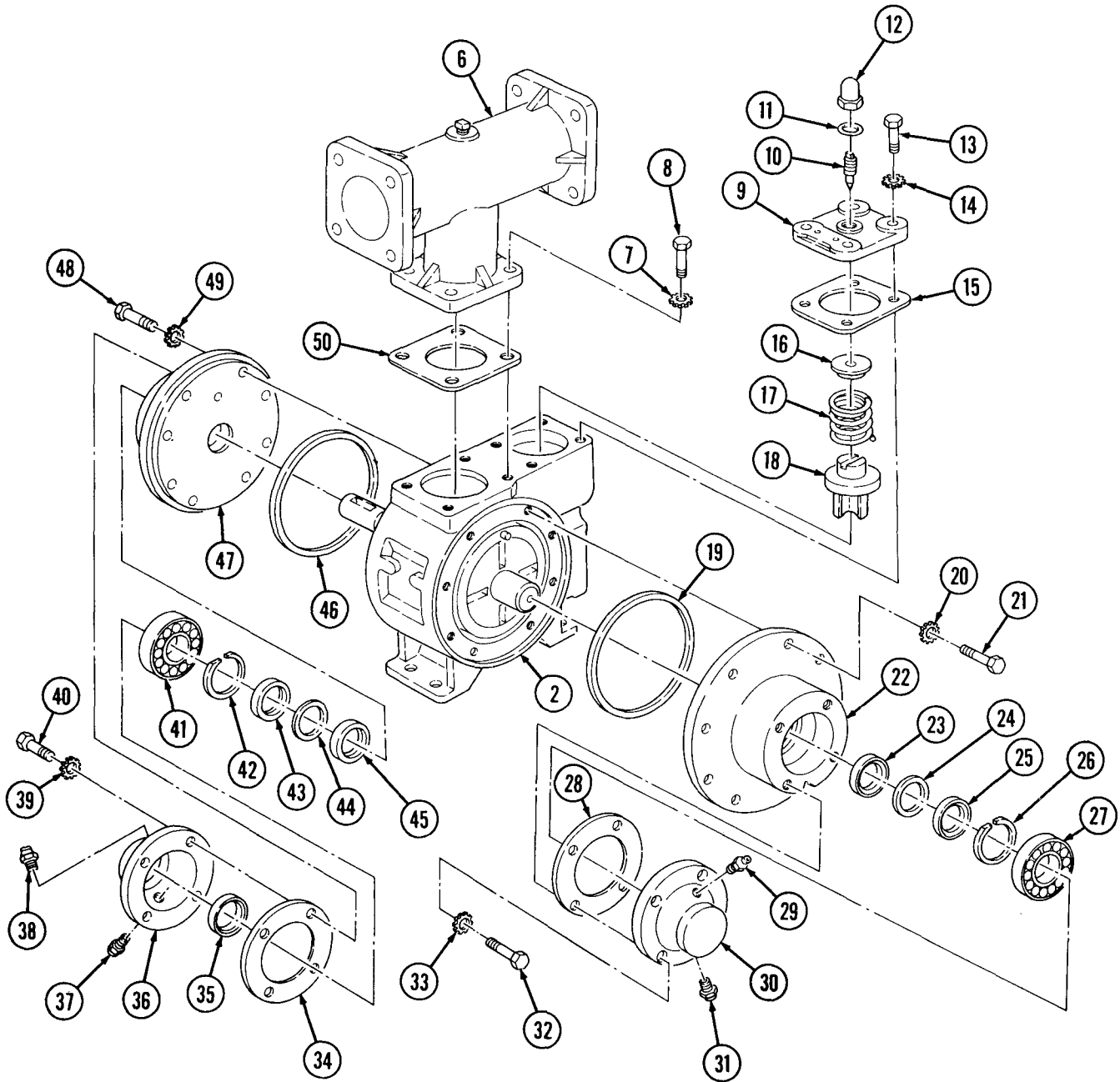
d. Assembly

1. Aline locator marks and install liner (3) in pump body (2).
2. Install two rods (5) and four vanes (4) in rotor (1).
3. Position rotor (1) in liner (3).



4. Install new O-ring seal (19) and pump head (22) on pump body (2) with eight new lockwashers (20) and screws (21).
5. Install new O-ring seal (46) and pump head (47) on pump body (2) with eight new lockwashers (49) and screws (48).
6. Install new seal (23), washer (24), and new seal (25) in pump head (22) with new snapping (26).
7. Install bearing (27) in pump head (22).
8. Install new gasket (28) and cover (30) on pump head (22) with four new lockwashers (33) and screws (32).
9. Install new seal (45), washer (44), and new seal (43) in pump head (47) with new snapping (42).
10. Install bearing (41) in pump head (47).
11. Install new seal (35) in cover (36).
12. Install new gasket (34) and cover (36) on pump head (47) with four new lockwashers (39) and screws (40).
13. Install grease fittings (29) and (38) and fittings (31) and (37) in covers (30) and (36).
14. Position bypass valve (18), spring (17), and spring guide (16) in pump body (2).
15. Install new gasket (15) and cover (9) over spring guide (16) on pump body (2) with four new lockwashers (14) and screws (13).
16. Install setscrew (10) in cover (9) with locator mark even with cover (9).
17. Install new gasket (11) on setscrew (10) and cover (9) with valve cap (12).
18. Install new gasket (50) and strainer body (6) on pump body (2) with four new lockwashers (7) and screws (8).

15-12. DELIVERY PUMP REPAIR (Contd)



- FOLLOW-ON TASKS: . Install strainer element (TM 9-2320-361-20).
- Install delivery pump (TM 9-2320-361-20).
 - . Install delivery pump draincock, if removed (TM 9-2320-361-20).
 - Lubricate delivery pump covers (LO 9-2320-209-12-1).

15-13. SUMP VALVE, DRAIN VALVES, AND DRAIN TUBES MAINTENANCE (M49A2C)

THIS TASK COVERS:

- | | |
|--|--|
| <p>a. Sump Valve Removal
 b. Drain Tubes and Drain Valves Removal
 c. Sump Valve Disassembly
 d. Cleaning and Inspection</p> | <p>e. Sump Valve Assembly
 f. Drain Tubes and Drain Valves Installation
 g. Sump Valve Installation</p> |
|--|--|
-

INITIAL SETUP

APPLICABLE MODELS

M49A2C

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)

MATERIALS/PARTS

Six locknuts (Appendix F, Item 89)
 Gasket (Appendix F, Item 55)
 Six cotter pins (Appendix F, Item 23)
 Valve seat (Appendix F, Item 244)
 Antiseize tape (Appendix C, Item 25)
 Drycleaning solvent (Appendix C, Item 24)

REFERENCES (TM)

TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

Filter separator-to-sump pipe removed
 (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

Keep fire extinguisher nearby when using
 drycleaning solvent.

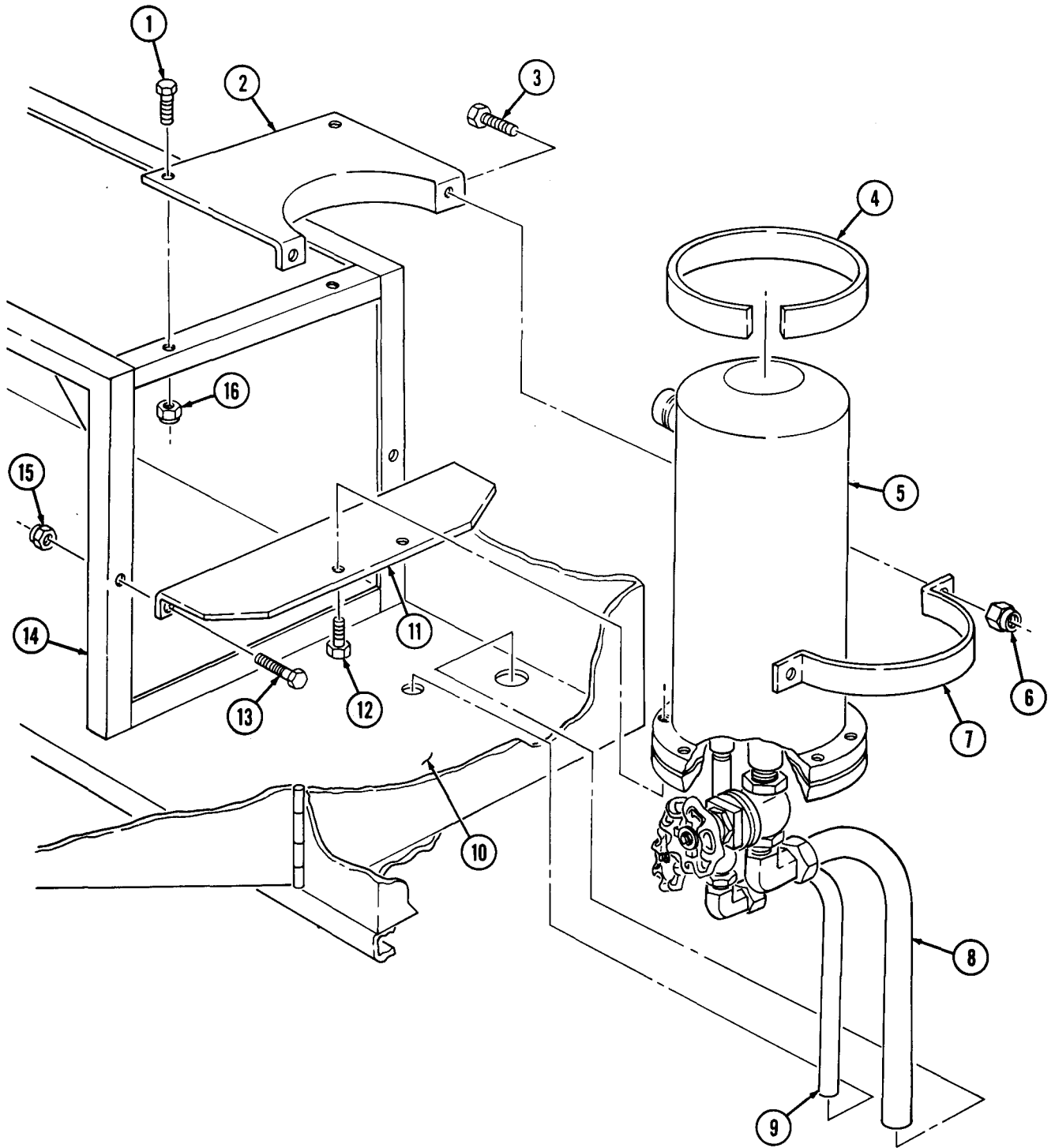
a. Sump Valve Removal

NOTE

Mark location of two holes in sump cover, where support attaches,
 for assembly.

1. Remove two screws (12) from sump valve (5) and support (11).
2. Remove two locknuts (15), screws (13), and support (11) from cabinet (14). Discard locknuts (15).
3. Remove two locknuts (6), screws (3), collar (7), and pad (4) from sump valve (5) and bracket (2). Discard locknuts (6).
4. Remove two locknuts (16), screws (1), and bracket (2) from cabinet (14). Discard locknuts (16).
5. Remove sump valve (5) and drain tubes (8) and (9) from cabinet floor (10).

**15-13. SUMP VALVE, DRAIN VALVES, AND DRAIN TUBES MAINTENANCE
(M49A2C) (Contd)**



**15-13. SUMP VALVE, DRAIN VALVES, AND DRAIN TUBES MAINTENANCE
(M49A2C) (Contd)**

b. Drain Tubes and Drain Valves Removal

1. Disconnect tube nuts (7) and (11) from elbows (5) and (13).
2. Remove tubes (8) and (10) with tube nuts (7) and (11) and sleeves (6) and (12).
3. Remove valve (14) from drain valve housing (15).
4. Remove elbow (13), drain valve housing (15), and nipple (1) from tank (3).

NOTE

The short nipple should be removed if defective or damaged.

5. Remove elbow (5) and drain valve (4) from nipple (9).

c. Sump Valve Disassembly

1. Remove six screws (19), cover (18), and gasket (17) from tank (3). Discard gasket (17).
2. Remove sump valve (16) from cover (18).
3. Remove six cotter pins (23) from six pins (25). Discard cotter pins (23).
4. Remove six pins (25), link (21) with float (20), float lever (22), lever links (24) and (30), valve lever (29), and needle valve (26) from frame (28).
5. Remove link (21) from float (20).
6. Remove valve seat (27) from frame (28). Discard valve seat (27).

d. Cleaning and Inspecticm

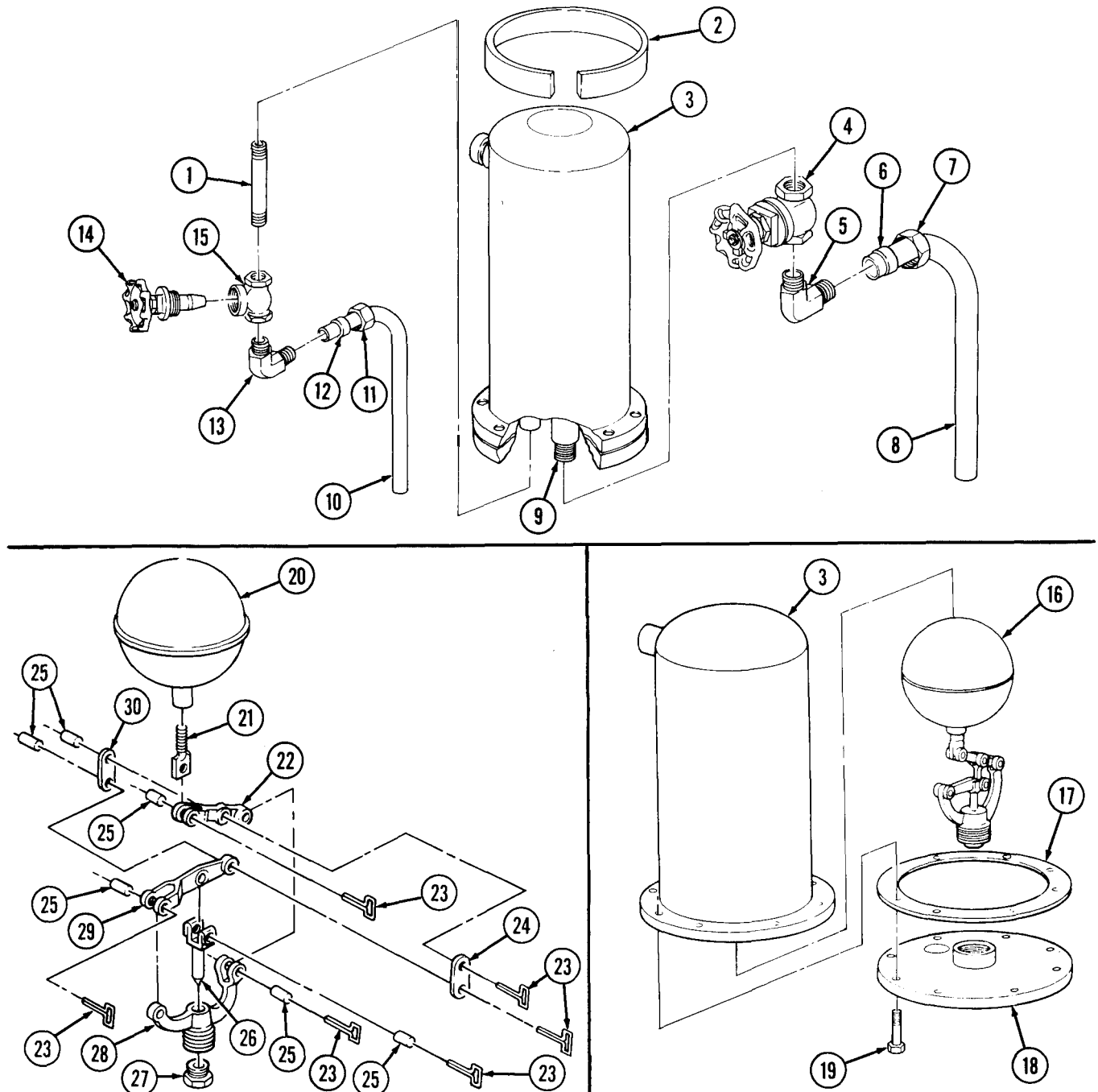
1. For general cleaning instructions, refer to para. 2-8.
2. For general inspection instructions, refer to para. 2-9.
3. Inspect pad (2) for tears or dry rot. Replace pad (2) if damaged.
4. Inspect tank (3) for cracks or damaged threads. Replace tank (3) if damaged.
5. Inspect cover (18) for cracks or damaged threads. Replace cover (18) if damaged.
6. Inspect drain valve (4), drain valve housing (15), and valve (14) for damaged threads, leakage, or cracks. Replace drain valve (4), drain valve housing (15), or valve (14) if damaged.
7. Inspect nipple (9) in cover (18) and nipple (1) for damaged threads or cracks. Replace cover (18) or nipple if damaged.
8. Inspect elbows (5) and (13) for cracks, damaged sleeve contact surface, or damaged threads. Replace elbow (5) or (13) if damaged.
9. Inspect tube nuts (7) and (11) on tubes (8) and (10) for cracks or damaged sleeve contact surfaces or damaged threads. Replace tube (8) or (10) if damaged.
10. Inspect sleeves (6) and (12) on tubes (8) and (10) for cracks or defects. Remove sleeves (6) and (12) from tubes (8) and (10) and replace if damaged.
11. Inspect tubes (8) and (10) for kinks, cracks, or other damage. Replace tube (8) or (10) if damaged.

**15-13. SUMP VALVE, DRAIN VALVES, AND DRAIN TUBES MAINTENANCE
(M49A2C) (Contd)**

WARNING

Drycleaning solvent is flammable and will not be used near open flame. Use only in well-ventilated places. Failure to do so may result in injury or death to personnel.

12. Submerge float (20) in solvent and check for internal leakage. Replace if damaged.



15-13. SUMP VALVE, DRAIN VALVES, AND DRAIN TUBES MAINTENANCE (M49A2C) (Contd)

e. Sump Valve Assembly

1. Wrap sealing tape on the threaded portion of frame (15) and new valve seat (14).
2. Install new valve seat (14) in frame (15) and tighten 30 lb-ft (41 N.).

CAUTION

All cotter pin legs must be spread flush with pin ends. Failure to bend legs correctly may result in valve binding or sticking during operation.

3. Install valve lever (17) on frame (15) with pin (18) and new cotter pin (16).
4. Install needle valve (13) in frame (15) and on valve lever (17) with pin (10) and new cotter pin (9).
5. Install lever links (2) and (7) on valve lever (17) and float lever (5) with two pins (1) and new cotter pins (8).
6. Install float lever (5) on frame (15) with pin (12) and new cotter pin (11).
7. Install link (4) in float (3) and tighten 3-5 lb-ft (4-7 N.m).
8. Install link (4) on float lever (5) with pin (19) and new cotter pin (6).
9. Install sump valve (21) on cover (23).

CAUTION

Do not install screws in two marked holes of cover where support attaches. If screws are in place, sump valve cannot be attached on support.

10. Install new gasket (22) and cover (23) on tank (20) with six screws (24).

NOTE

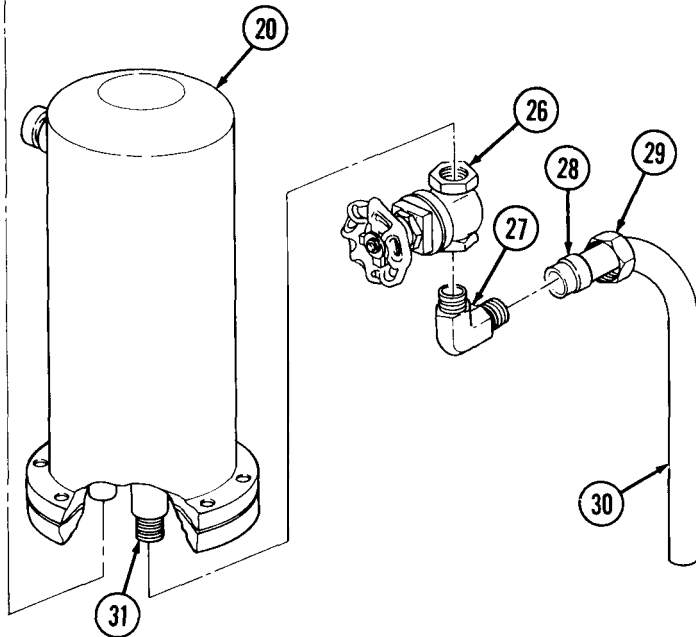
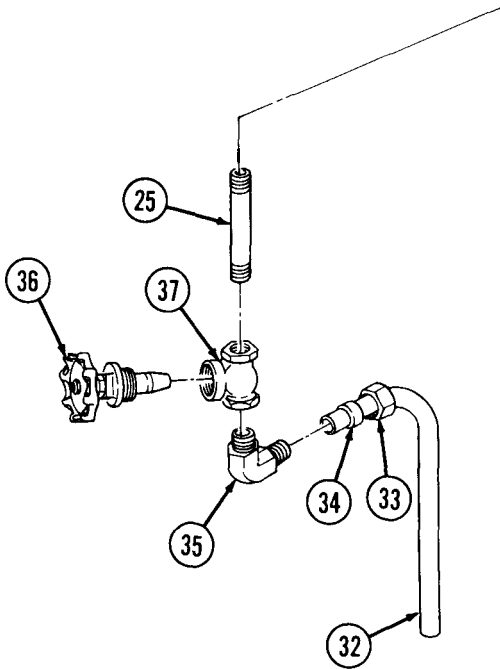
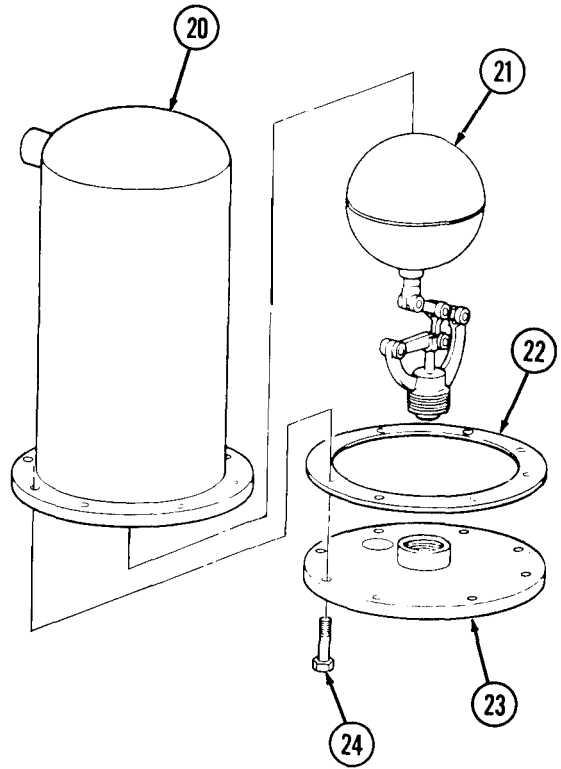
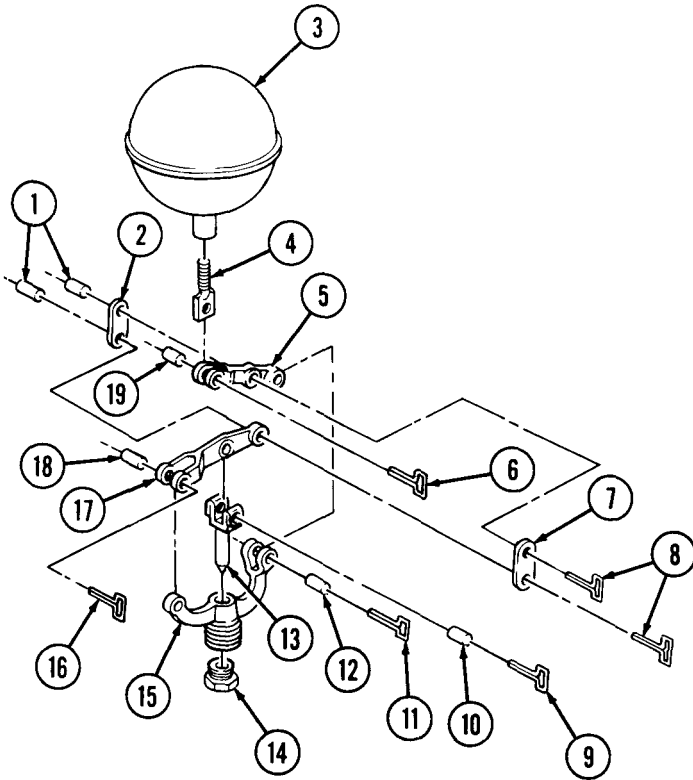
A new sump tank will require decal installation on exterior.

11. Install new decal(s) (TM 9-2320-361-20).

f. Drain Tubes and Drain Valves Installation

1. Wrap antiseize tape on all exposed pipe and fitting threads.
2. Install nipple (25) on tank (20).
3. Install valve (26) and valve housing (37) on nipples (31) and (25).
4. Install elbows (27) and (35) on valve (26) and valve housing (37).
5. Install valve (26) on valve housing (37).
6. Position sleeves (28) and (34), with tubes (30) and (32) attached, on elbows (27) and (35).
7. Install tubes (30) and (32) on elbows (27) and (35) with tube nuts (29) and (33).

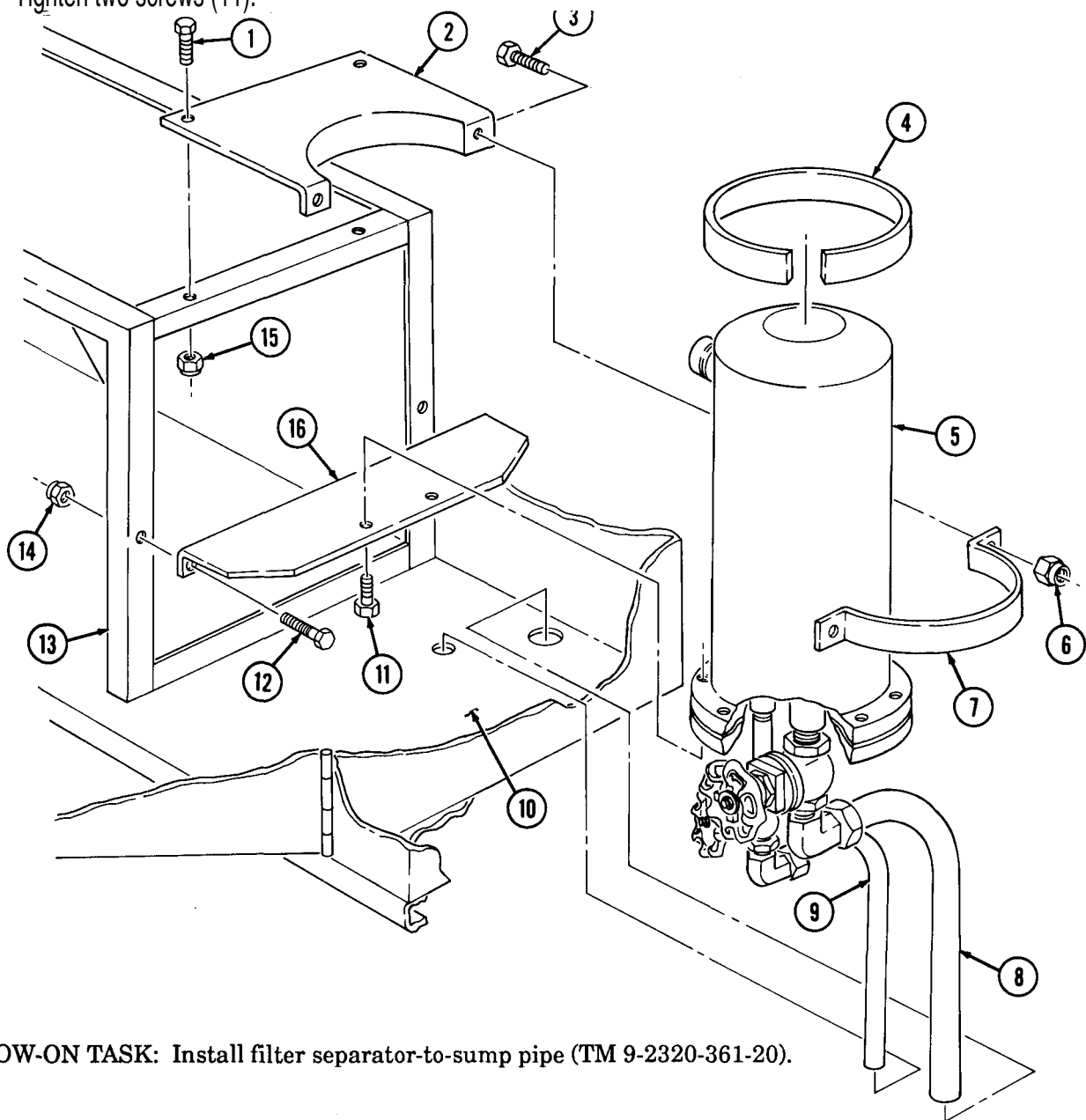
15-13. SUMP VALVE, DRAIN VALVES, AND DRAIN TUBES MAINTENANCE
(M49A2C) (Contd)



**15-13. SUMP VALVE, DRAIN VALVES, AND DRAIN TUBES MAINTENANCE
(M49A2C) (Contd)**

g. Sump Valve Installation

1. Install support (16) on cabinet (13) with two screws (12) and new locknuts (14).
2. Place sump valve (5) on support (16) with drain tubes (8) and (9) through two holes in cabinet floor (10).
3. Install sump valve (5) on support (16) with two screws (11). Do not tighten two screws (11).
4. Position pad (4) around sump valve (5).
5. Install bracket (2) on cabinet (13) against pad (4) with two screws (1) and new locknuts (15).
6. Install collar (7) around pad (4) and on bracket (2) with two screws (3) and new locknuts (6).
7. Tighten two screws (11).



FOLLOW-ON TASK: Install filter separator-to-sump pipe (TM 9-2320-361-20).

Section IV. VAN BODY MAINTENANCE

15-14. VAN BODY MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
15-15.	Van Body Cabinet and Work Bench Table Replacement	15-63
15-16.	Van Body Ceiling Panel Replacement	15-66
15-17.	Van Body Side Panel Replacement	15-68
15-18.	115-Volt AC Receptacle Replacement	15-70
15-19.	24-Volt DC Receptacle Replacement (M185A3)	15-72
15-20.	115-Volt Receptacle Replacement	15-74
15-21.	115-Volt Receptacle Strip Replacement	15-76
15-22.	115-Volt Wiring Harness Replacement	15-77
15-23.	Wire Plug Wiring Harness Replacement	15-78
15-24.	115- and 24-Volt Wiring Harness Replacement	15-80
15-25.	Blackout Switch Replacement	15-100
15-26.	Multibreaker Box Replacement	15-102
15-27.	Safety Switch Box Replacement	15-104
15-28.	Circuit Breaker Harness Replacement	15-108
15-29.	Front Window Sash Maintenance	15-110
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15-31.	Access Door Replacement	15-114
15-32.	Access Plate, Access Cover, and Retainer Assembly Replacement	15-116
15-33.	Van Body Replacement	15-118

15-15. VAN BODY CABINET AND WORK BENCH TABLE REPLACEMENT**THIS TASK COVERS:**

- | | |
|--------------------------------|-------------------------------------|
| a. Bracket Removal | e. Shelf Table Installation |
| b. Cabinet Removal | f. Drawer Table Installation |
| c. Drawer Table Removal | g. Cabinet Installation |
| d. Shelf Table Removal | h. Bracket Installation |

INITIAL SETUP**APPLICABLE MODELS**

M185A3 and M109A3

TOOLSGeneral mechanic's tool kit
(Appendix B, Item 1)**MATERIALS/PARTS**Twelve locknuts (Appendix F, Item 110)
Four lockwashers (Appendix F, Item 131)
Twelve locknuts (Appendix F, Item 89)
Eight lockwashers (Appendix F, Item 127)**PERSONNEL REQUIRED**

T w o

REFERENCES (TM)TM 9-2320-361-10
TM 9-2320-361-34P**EQUIPMENT CONDITION**

Parking brake set (TM 9-2320-361-10).

15-15. VAN BODY CABINET AND WORK BENCH TABLE REPLACEMENT (Contd)

a. Bracket Removal

1. Remove twelve screws (7), washers (6), washers (4), and locknuts (3) from bracket (5) and van wall (8). Discard locknuts (3).
2. Remove eight screws (22), lockwashers (23), washers (24), and bracket (5) from cabinet (14), drawer table (21), and shelf table (2). Discard lockwashers (23).

b. Cabinet Removal

1. Remove bottom cabinet drawer (17) and four screws (27) from van body floor (16).
2. Remove four nuts (9), lockwashers (10), washers (11), screws (13), brackets (12), cabinet (14), and spacer (15) from van body floor (16). Discard lockwashers (10).

c. Drawer Table Removal

NOTE

- Locknuts are removed from underside of van body.
- Assistant will help with drawer table removal.

Remove six locknuts (18), washers (19), screws (20), and drawer table (21) from van body floor (16). Discard locknuts (18).

d. Shelf Table Removal

NOTE

- Locknuts are removed from underside of van body.
- Assistant will help with shelf table removal.

Remove six locknuts (26), washers (25), screws (1), and shelf table (2) from van body floor (16). Discard locknuts (26).

e. Shelf Table Installation

NOTE

- Locknuts are installed from underside of van body.
- Assistant will help with shelf table installation.

Install shelf table (2) on van body floor (16) with six screws (1), washers (25), and new locknuts (26).

f. Drawer Table Installation

NOTE

- Locknuts are installed from underside of van body.
- Assistant will help with drawer table installation.

Install drawer table (21) on van body floor (16) with six screws (20), washers (19), and new locknuts (18).

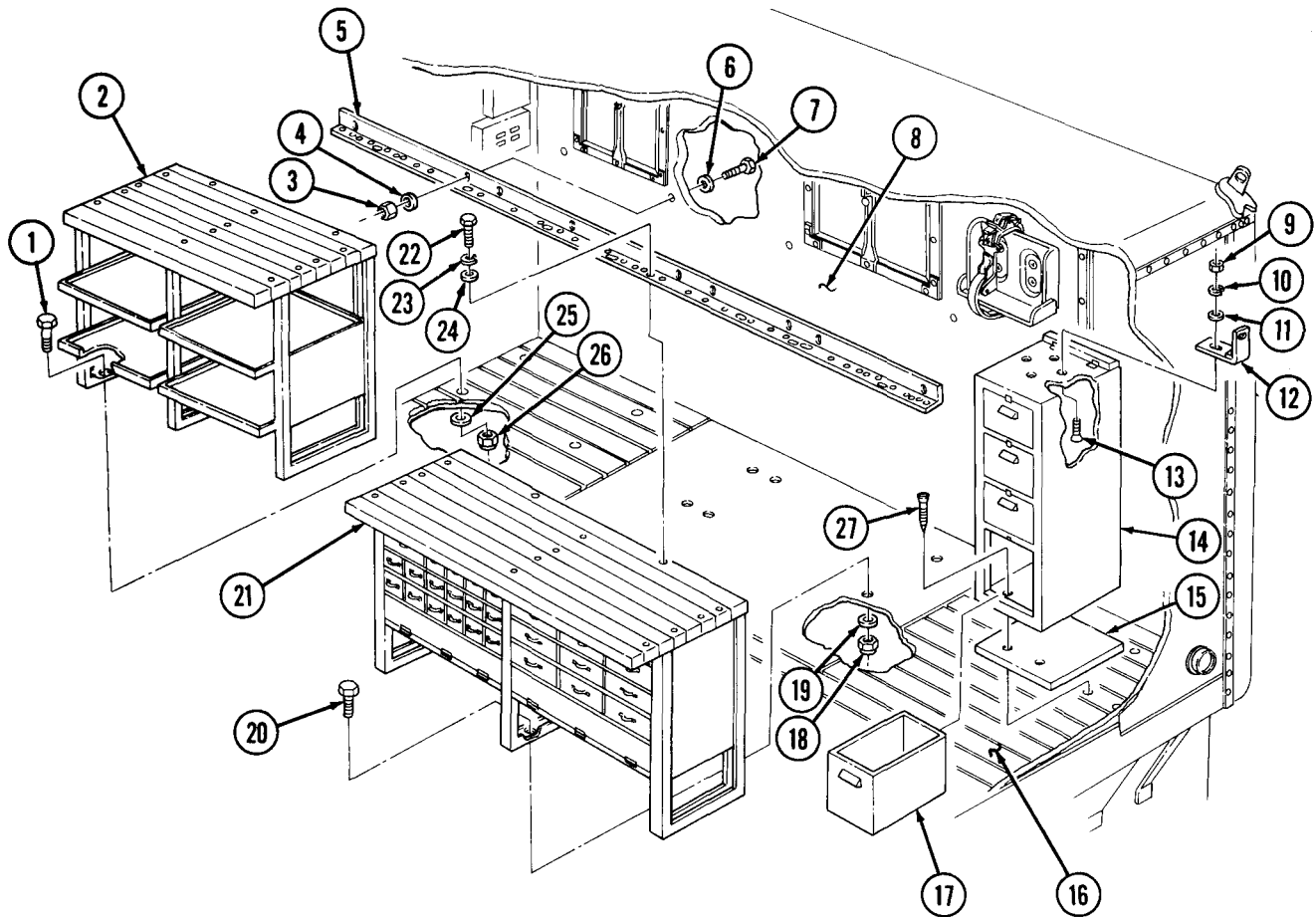
15-15. VAN BODY CABINET AND WORK BENCH TABLE REPLACEMENT (Contd)

g. Cabinet Installation

1. Install spacer (15) and cabinet (14) on van body floor (16) with four screws (13), brackets (12), washers (11), new lockwashers (10), nuts (9), and screws (27).
2. Install lower cabinet drawer (17) in cabinet (14).

h. Bracket Installation

1. Install bracket (5) on cabinet (14), drawer table (21), and shelf table (2) with eight washers (24), new lockwashers (23), and screws (22).
2. Install twelve screws (7), washers (6), washers (4), and new locknuts (3) in bracket (5) and van wall (8).



15-16. VAN BODY CEILING PANEL REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).

EQUIPMENT CONDITION (Contd)

- . Dome lights removed (TM 9-2320-361-20).
- . Front and side window sashes removed (paras. 15-29 and 15-30).
- Exhaust blower motor and bracket removed (TM 9-2320-361-20).
- Multibreaker and safety switch boxes removed (paras. 15-26 and 15-27).
- . 115-volt receptacle strip removed (para. 15-21).
- Primary or secondary van body heaters removed (if installed) (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

Gloves, eyeshields, and dust mask must be worn during panel removal and installation.

WARNING

Gloves, eyeshields, and dust mask must be worn during panel removal and installation. Failure to do so may result in injury to personnel.

NOTE

Ceiling panels on both sides of van ceiling are removed and installed basically the same. This procedure covers one side.

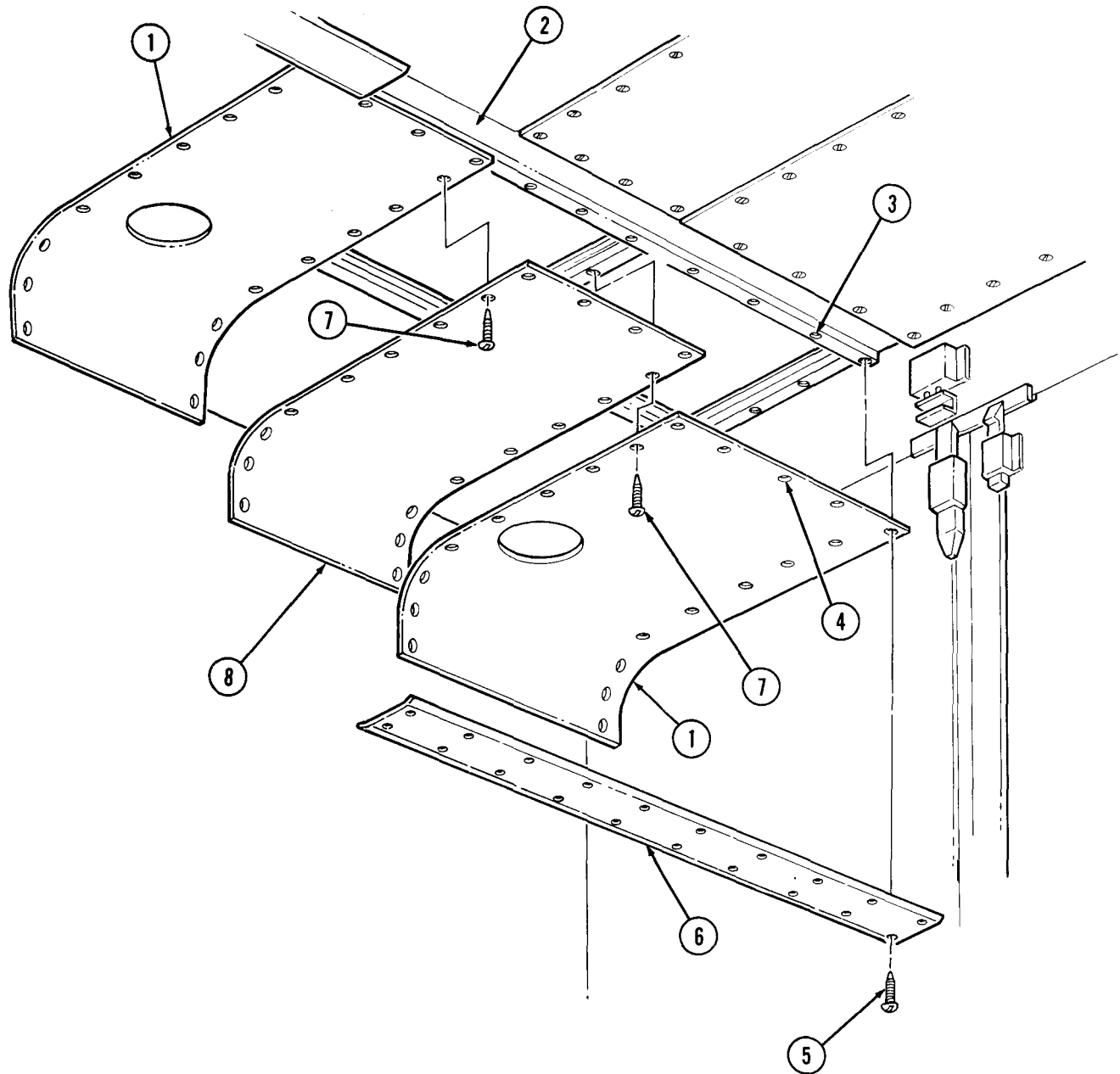
a. Removal

1. Remove twenty screws (5) and center ceiling panel (6) from two ceiling panels (1), ceiling panel (8), and frame (2).
2. Remove thirty-two screws (7), two ceiling panels (1), and ceiling panel (8) from frame (2).

b. Installation

1. Position two ceiling panels (1) and ceiling panel (8) on frame (2) and align panel (1) screw holes (4) with screw holes (3) in frame (2).
2. Install two ceiling panels (1) and ceiling panel (8) with thirty-two screws (7).
3. Install center ceiling panel (6) on frame (2), two ceiling panels (1), and ceiling panel (8) with twenty screws (5).

15-16. VAN BODY CEILING PANEL REPLACEMENT (Contd)



- FOLLOW-ON TASKS:**
- Install primary or secondary van body heaters (if removed) (TM 9-2320-361-20).
 - Install 115-volt receptacle strip (para. 15-21).
 - Install multibreaker and safety switch boxes (paras. 15-26 and 15-27).
 - Install exhaust blower motor and bracket (TM 9-2320-361-20).
 - Install front and side window sashes (paras. 15-29 and 15-30).
 - Install dome lights (TM 9-2320-361-20).

15-17. VAN BODY SIDE PANEL REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TM 9-2320-361-34P

EQUIPMENT CONDITION

Van body cabinet and work benches removed
(para. 15-15).

GENERAL SAFETY INSTRUCTIONS

Gloves, eyeshields, and dust mask must be worn
during panel removal and installation.

WARNING

Gloves, eyeshields, and dust mask must be worn during panel removal and installation. Failure to do so may result in injury to personnel.

NOTE

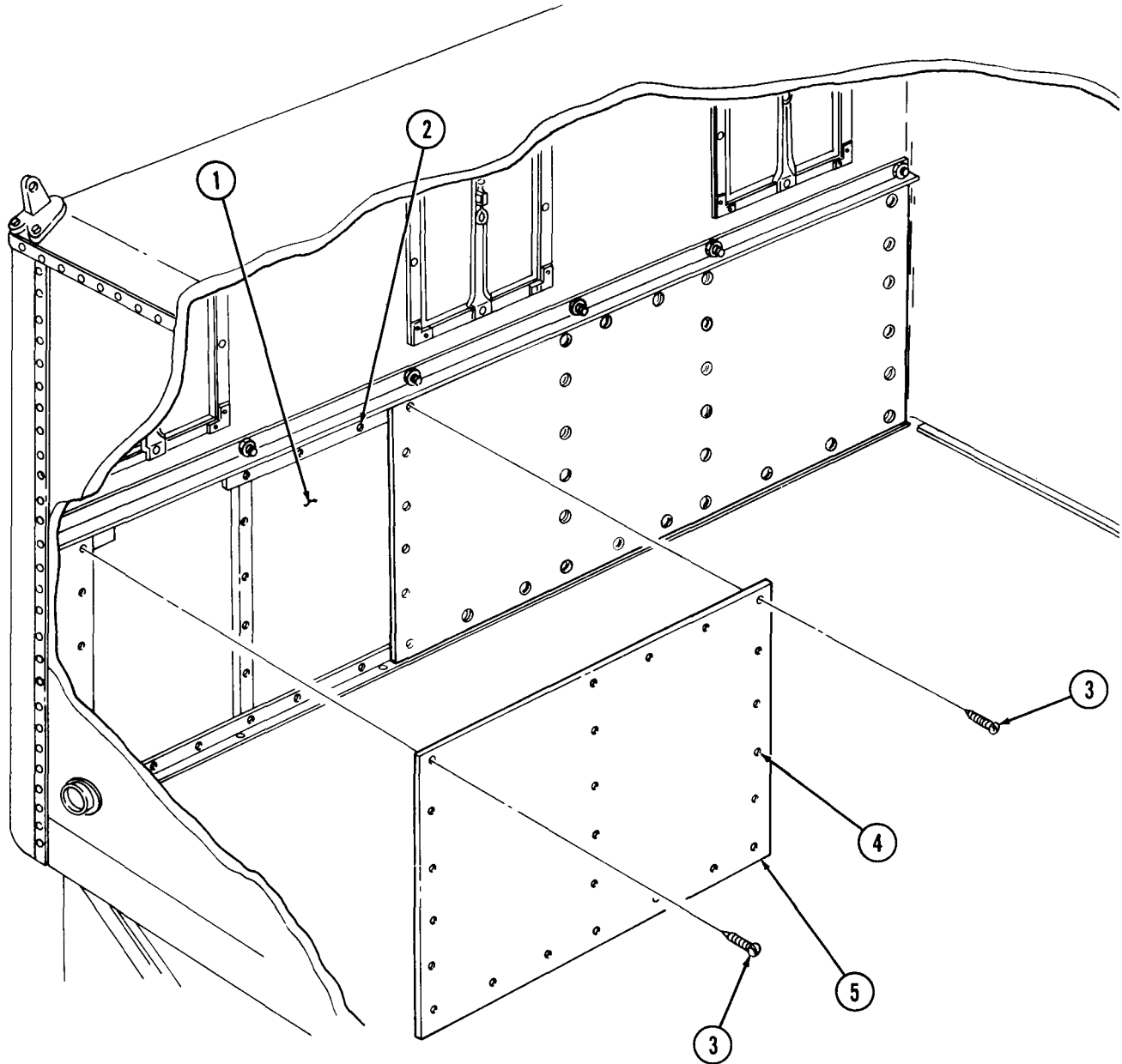
All van body side panels are removed and installed basically the same.

Remove twenty-four screws (3) and side panel (5) from van body wall (1).

b. Installation

1. Place side panel (5) on van body wall (1) and aline panel screw holes (4) with screw holes (2) in frame.
2. Install side panel (5) with twenty-four screws (3).

15-17. VAN BODY SIDE PANEL REPLACEMENT (Contd)



FOLLOW-ON TASK.: Install van body cabinet and work benches (para. 15-15).

15-18. 115-VOLT AC RECEPTACLE REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit (Appendix B, Item 1)

Tool kit, electrical (Appendix B, Item 2)

MATERIALS/PARTS

Gasket (Appendix F, Item 82)

Safety wire (Appendix C, Item 35)

Electrical tape (Appendix C, Item 26)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TM 9-2320-361-10

TM 9-2320-361-20

TM 9-2320-361-34P

EQUIPMENT CONDITION

. Parking brake set (TM 9-2320-361-10).

• Battery ground cable disconnected (TM 9-2320-361-20).

CAUTION

Use care when removing or installing wiring harness. Excessive snagging or pulling may damage wires.

NOTE

Tag wires and terminals for installation.

1. Slide handle (3) on safety switch box (2) to OFF position and open cover (5).

NOTE

- Perform step 2 for M109A3 vehicles. Perform step 3 for M185A3 vehicles.
- Safety wire must be attached to wires with electrical tape.

2. Loosen two screws (1) and remove two wires (4) from safety switch box (2).
3. Loosen two screws (7) and remove two wires (6) and wires (4) from safety switch box (2).
4. Attach safety wire (8) to two wires (4).
5. Remove four screws (11), receptacle (10), wires (4), and gasket (9) from van body (12). Discard gasket (9).
6. Remove two wires (4) from safety wire (8).

1. Attach safety wire (8) to two wires (4).

NOTE

Assistant will help with step 2.

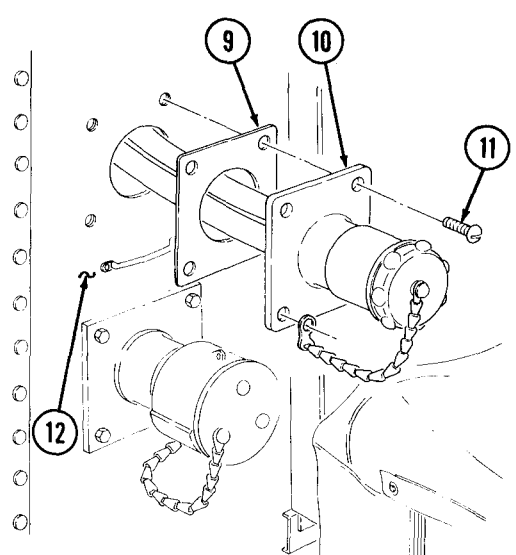
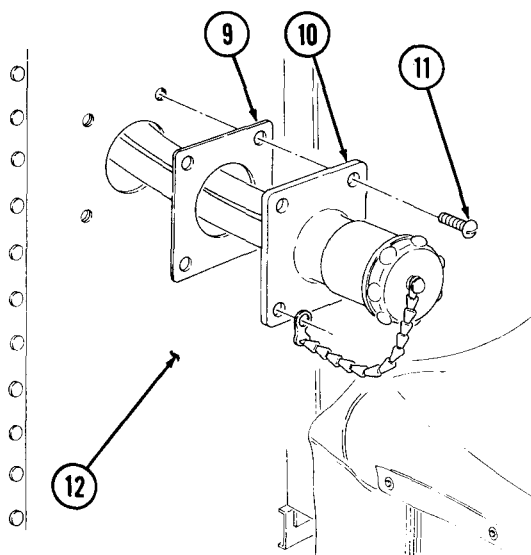
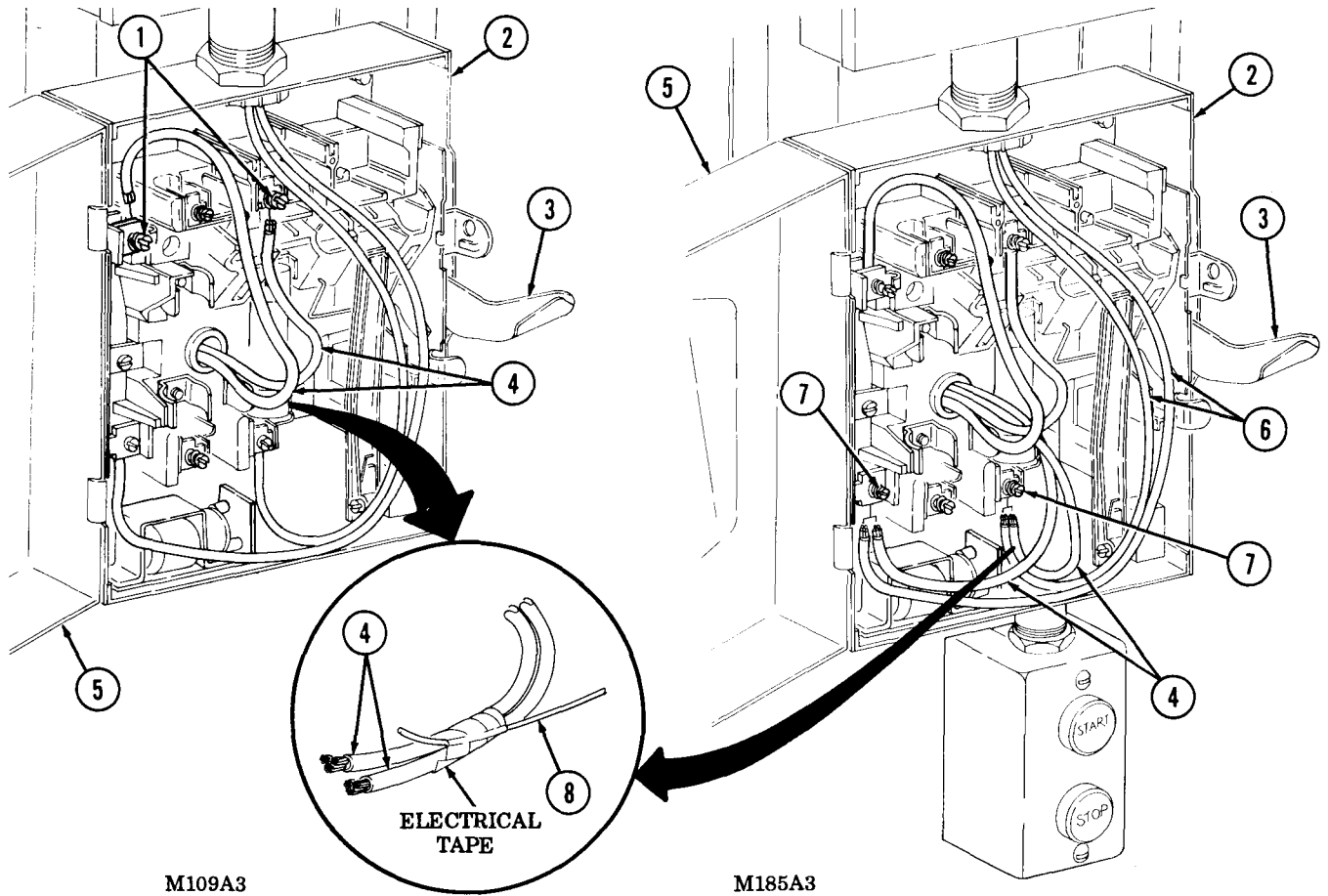
2. Pull safety wire (8) and two wires (4) through van body (12).
3. Install new gasket (9) and receptacle (10) on van body (12) with four screws (11).
4. Remove safety wire (8) from two wires (4).

NOTE

Perform step 5 for M185A3 vehicles. Perform step 6 for M109A3 vehicles.

5. Install two wires (4) and wires (6) on safety switch box (2) by tightening two screws (7).
6. Install two wires (4) on safety switch box (2) by tightening two screws (1).
7. Close cover (5) on safety switch box (2) and slide handle (3) to ON position.

15-18. 115-VOLT AC RECEPTACLE REPLACEMENT (Contd)



FOLLOW-ON TASK : Connect battery ground cable (TM 9-2320-361-20).

15-19. 24-VOLT DC RECEPTACLE REPLACEMENT (M185A3)

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M185A3

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit (Appendix B, Item 1)

Tool kit, electrical (Appendix B, Item 2)

MATERIALS/PARTS

Four lockwashers (Appendix F, Item 142)

Gasket (Appendix F, Item 82)

Safety wire (Appendix C, Item 31)

Electrical tape (Appendix C, Item 26)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TM 9-2320-361-10

TM 9-2320-361-20

TM 9-2320-361-34P

EQUIPMENT CONDITION

. Parking brake set (TM 9-2320-361-10).

• Battery ground cable disconnected (TM 9-2320-361-20).

CAUTION

Use care when removing or installing wiring harnesses. Excessive snagging or pulling may damage wires.

NOTE

Tag wires and terminals for installation.

1. Slide handle (4) on safety switch box (3) to OFF position and open cover (1).
2. Loosen two screws (2) and remove two wires (5) from safety switch box (3).
3. Remove two screws (10) and cover (9) from start/top switch (8).
4. Remove three screws (7) and wires (6) from start/top switch (8).

NOTE

Safety wire must be attached to wires with electrical tape.

5. Attach safety wire (11) to two wires (5) and three wires (6).
6. Remove four screws (15), lockwashers (14), receptacle (13), two wires (5), three wires (6), and gasket (12) from van body (16). Discard gasket (12) and lockwashers (14).
7. Remove two wires (5) and three wires (6) from safety wire (11).

b. Installation

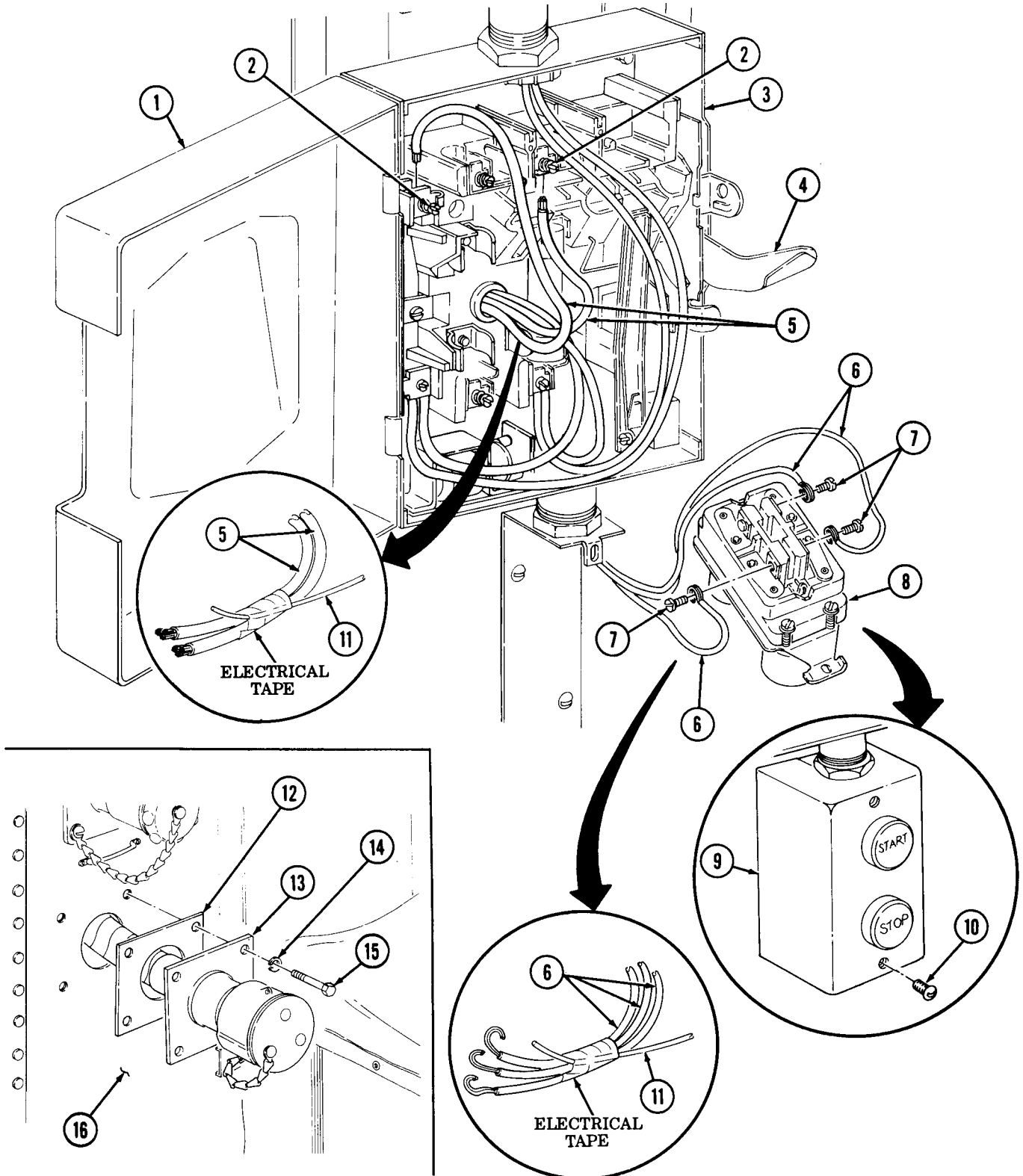
1. Attach safety wire (11) to two wires (5) and three wires (6).

NOTE

Assistant will help with step 2.

2. Pull two wires (5) and three wires (6) through van body (16).
3. Install new gasket (12) and receptacle (13) on van body (16) with four new lockwashers (14) and screws (15).
4. Remove safety wire (11) from two wires (4) and three wires (6).
5. Install two wires (5) on safety switch box (3) by tightening two screws (2).
6. Install three wires (6) on start/stop switch (8) with three screws (7).
7. Install cover (9) on start/stop switch (8) with two screws (10).
8. Close cover (1) on safety switch box (3) and slide handle (4) to ON position.

15-19. 24-VOLT DC RECEPTACLE REPLACEMENT (M1 8583) (Contd)



FOLLOW-ON TASK: Connect battery ground cable (TM 9-2320-361-20).

15-20. 115-VOLT RECEPTACLE REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

Tool kit, electrical (Appendix B, Item 2)

REFERENCES (TM)

TM 9-2320-361-10

TM 9-2320-361-20

TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Battery ground cable disconnected (TM 9-2320-361-20).
- Safety switch in OFF position (TM 9-2320-361-10).

NOTE

Tag wires, leads, terminals, and cables for installation.

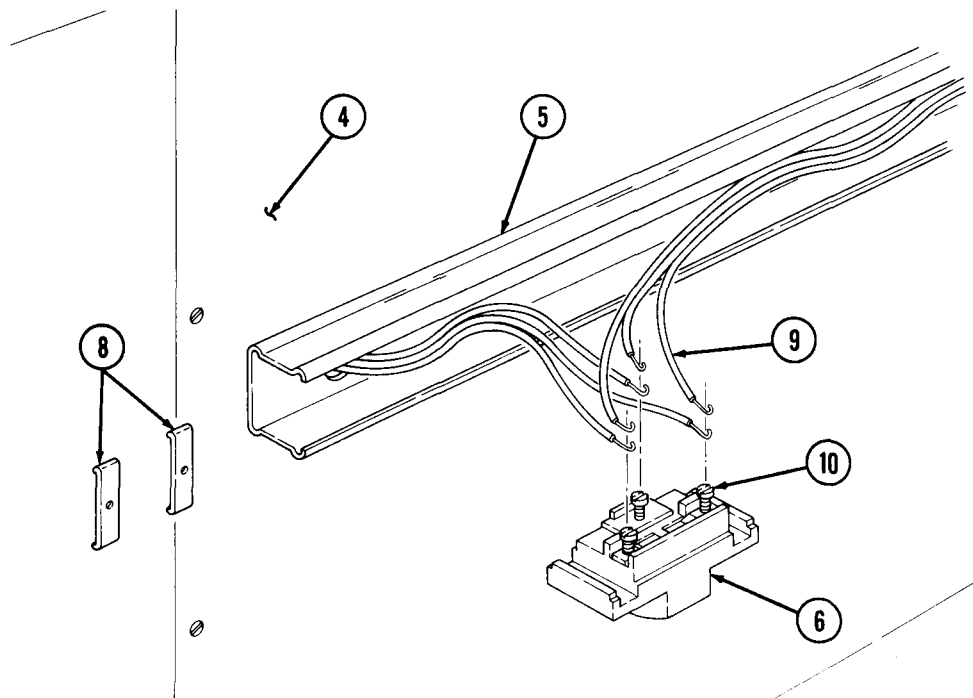
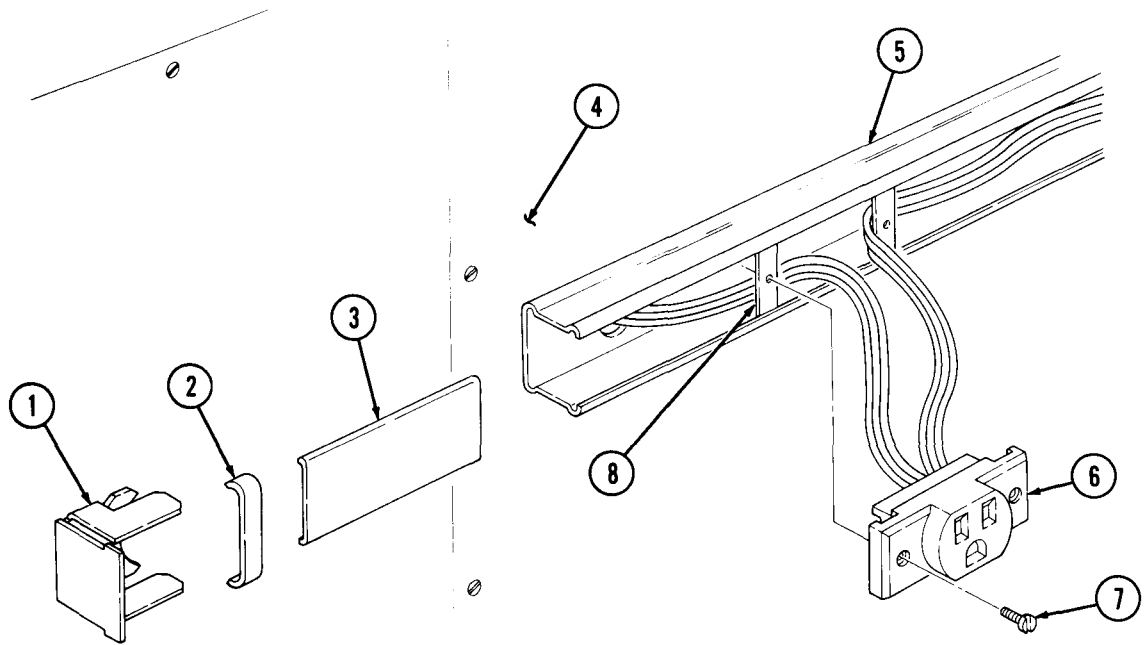
a. Removal

1. Remove cap (1), clip (2), and cover (3) from base (5) on van wall (4).
2. Remove two screws (7) from receptacle (6) and retainers (8).
3. Pull receptacle (6) away from van wall (4).
4. Loosen three screws (10) and remove six wire leads (9) from receptacle (6).
5. Remove receptacle (6) from van wall (4).
6. Remove two retainers (8) from base (5).

b. Installation

1. Install two retainers (8) on base (5).
2. Install six wire leads (9) on receptacle (6) by tightening three screws (10).
3. Install receptacle (6) on two retainers (8) with two screws (7).
4. Install cover (3), clip (2), and cap (1) on base (5).

15-20. 115-VOLT RECEPTACLE REPLACEMENT (Contd)



- FOLLOW-ON TASKS:
- Connect battery ground cable (TM 9-2320-361-20).
 - Place safety switch in ON position (TM 9-232-361-10).

15-21. 115-VOLT RECEPTACLE STRIP REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

REFERENCES (TM)

TM 9-2320-361-34P

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

EQUIPMENT CONDITION

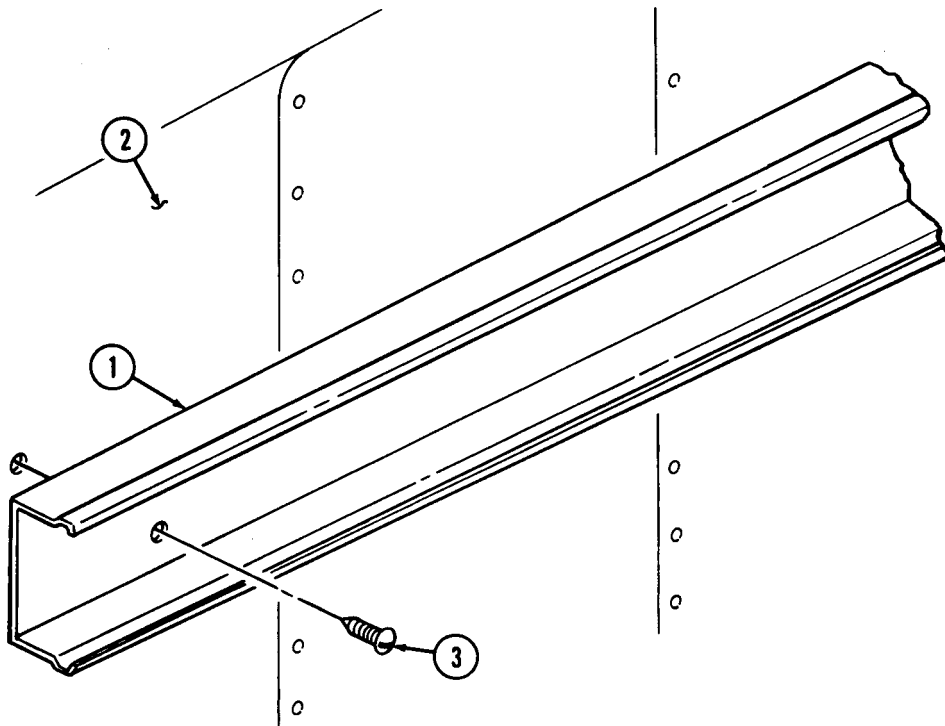
115-volt receptacles removed (para. 15-20).

a. Removal

1. Remove five screws (3) from receptacle strip (1).
2. Remove receptacle strip (1) from van wall (2).

b. Installation

1. Position receptacle strip (1) on van wall (2).
2. Install receptacle strip (1) on van wall (2) with five screws (3).



FOLLOW-ON TASK: Install 115-volt receptacles (para. 15-20).

15-22. 115-VOLT WIRING HARNESS REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

REFERENCES (TM)

TM 9-2320-361-34P

TOOLS

General mechanic's tool kit (Appendix B, Item 1)
Tool kit, electrical (Appendix B, Item 2)

EQUIPMENT CONDITION

115-volt receptacles removed (para. 15-20).

MATERIALS/PARTS

Electrical tape (Appendix C, Item 26)

NOTE

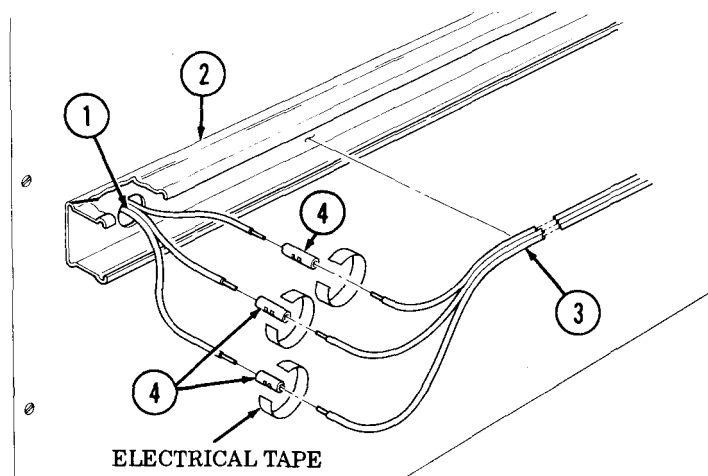
- Tag wires, leads, cables, and terminals for installation.
- Both 115-volt receptacle wiring harnesses are removed basically the same. This procedure covers one harness.

a. Removal

1. Remove electrical tape from connectors (4).
2. Cut receptacle wiring harness (3) from main wiring harness (1) at connectors (4).
3. Remove receptacle wiring harness (3) from receptacle strip (2).

b. Installation

1. Place receptacle wiring harness (3) in receptacle strip (2).
2. Connect receptacle wiring harness (3) to main wiring harness (1) at connectors (4).
3. Wrap connectors (4) with electrical tape.



FOLLOW-ON TASK: Install 115-volt receptacles (para. 15-20).

15-23. WIRE PLUG WIRING HARNESS REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Safety wire (Appendix C, Item 31)
Electrical tape (Appendix C, Item 26)

REFERENCES (TM)

TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Battery ground cable disconnected (TM 9-2320-361-20).
- Place safety switch in OFF position (TM 9-2320-361-10).

CAUTION

Use care when removing or installing wiring harnesses. Excessive snagging or pulling may damage wires.

NOTE

Tag wires, leads, cables, and terminals for installation.

a. Removal

1. Remove eight screws (1) from two housings (2) and van wall (3).
2. Remove two snaprings (8) from two wire plugs (7).
3. Remove two wire plugs (7) from two housings (2).

NOTE

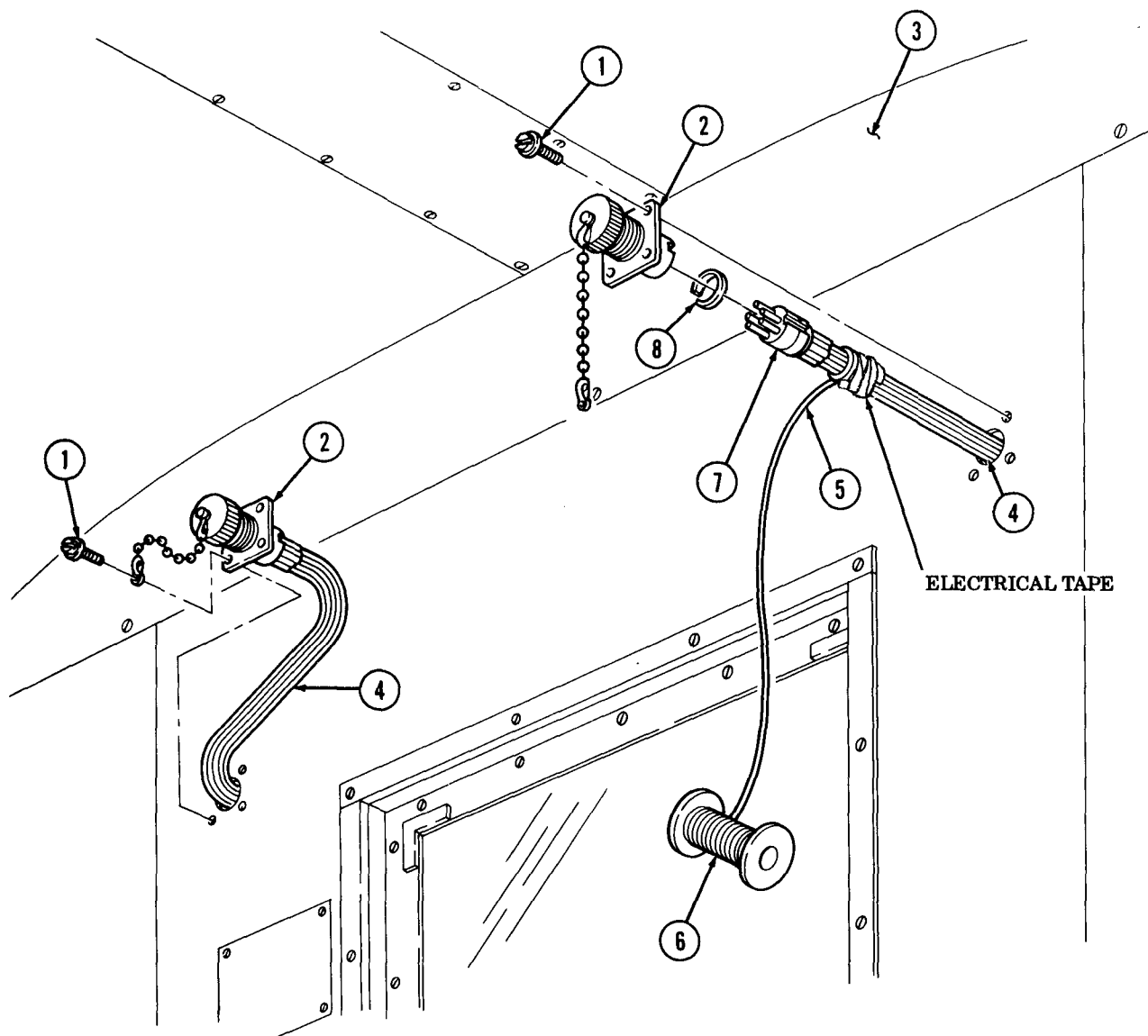
- Safety wire will be used to install new wiring harness. Do not cut safety wire from spool until wiring harness has been pulled through van wall and proper length has been obtained.
- Safety wire must be attached to wires with electrical tape.

4. Attach safety wire (5) to one end of wiring harness (4).
5. Pull on other end of wiring harness (4) and remove wiring harness (4) from van wall (3).
6. Remove wiring harness (4) from safety wire (5).
7. Cut safety wire (5) from spool (6).

b. Installation

1. Attach safety wire (5) to one end of wiring harness (4).
2. Pull safety wire (5) and wiring harness (4) through van wall (3).
3. Remove safety wire (5) from wiring harness (4).
4. Position two snaprings (8) on two wire plugs (7).
5. Install two snaprings (8) and two wire plugs (7) in two housings (2).
6. Install two housings (2) on van wall (3) with eight screws (1).

15-23. WIRE PLUG WIRING HARNESS REPLACEMENT (Contd)



- FOLLOW-ON TASKS:
- Connect battery ground cable (TM 9-2320-361-20).
 - Place safety switch in ON position (TM 9-2320-361-10).

15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Tool kit, electrical (Appendix B, Item 2)
- Pipe wrench (Appendix B, Item 39)
- Open-end wrench (Appendix B, Item 50)

MATERIALS/PARTS

- Sixteen lockwashers (Appendix F, Item 151)
- Electrical tape (Appendix C, Item 26)
- Safety wire (Appendix C, Item 31)

REFERENCES (TM)

- TM 9-2320-361-10
- TM 9-2320-361-20
- TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Battery ground cable disconnected (TM 9-2320-361-20).
- Lamp and domelight assemblies removed (TM 9-2320-361-20).
- 115-volt AC receptacle removed (para. 15-18).
- 24-volt DC receptacle removed (M185A3) (para. 15-19).
- Power switch removed (TM 9-2320-361-20).
- Blower motor receptacle removed (TM 9-2320-361-20).
- Converter receptacle removed (TM 9-2320-361-20).
- Blackout light switches removed (TM 9-2320-361-20).

CAUTION

Use care when removing wiring harnesses. Excessive snagging or pulling may damage wires.

NOTE

- Tag wires, leads, cables, and terminals for installation.
- Safety wire must be secured to wiring harness with electrical tape.

a. Removal

NOTE

All three ceiling panels are removed basically the same. This procedure covers the removal of one ceiling panel.

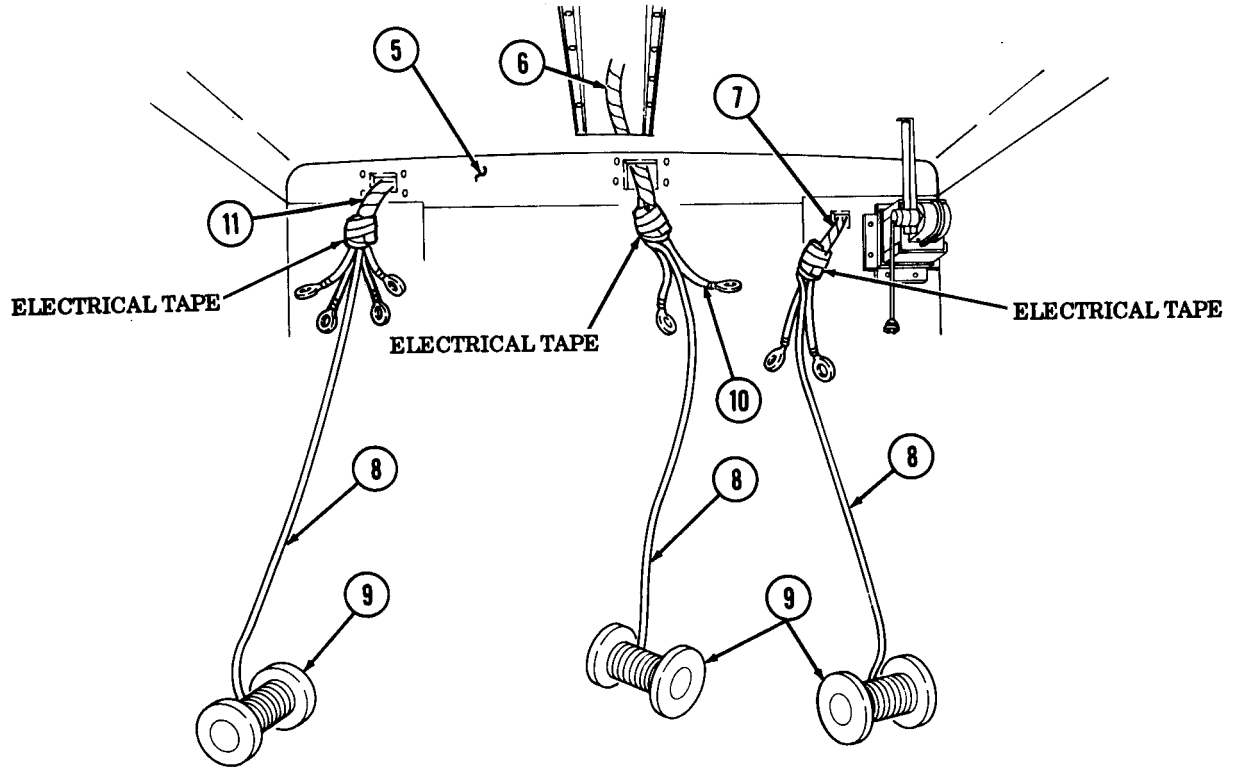
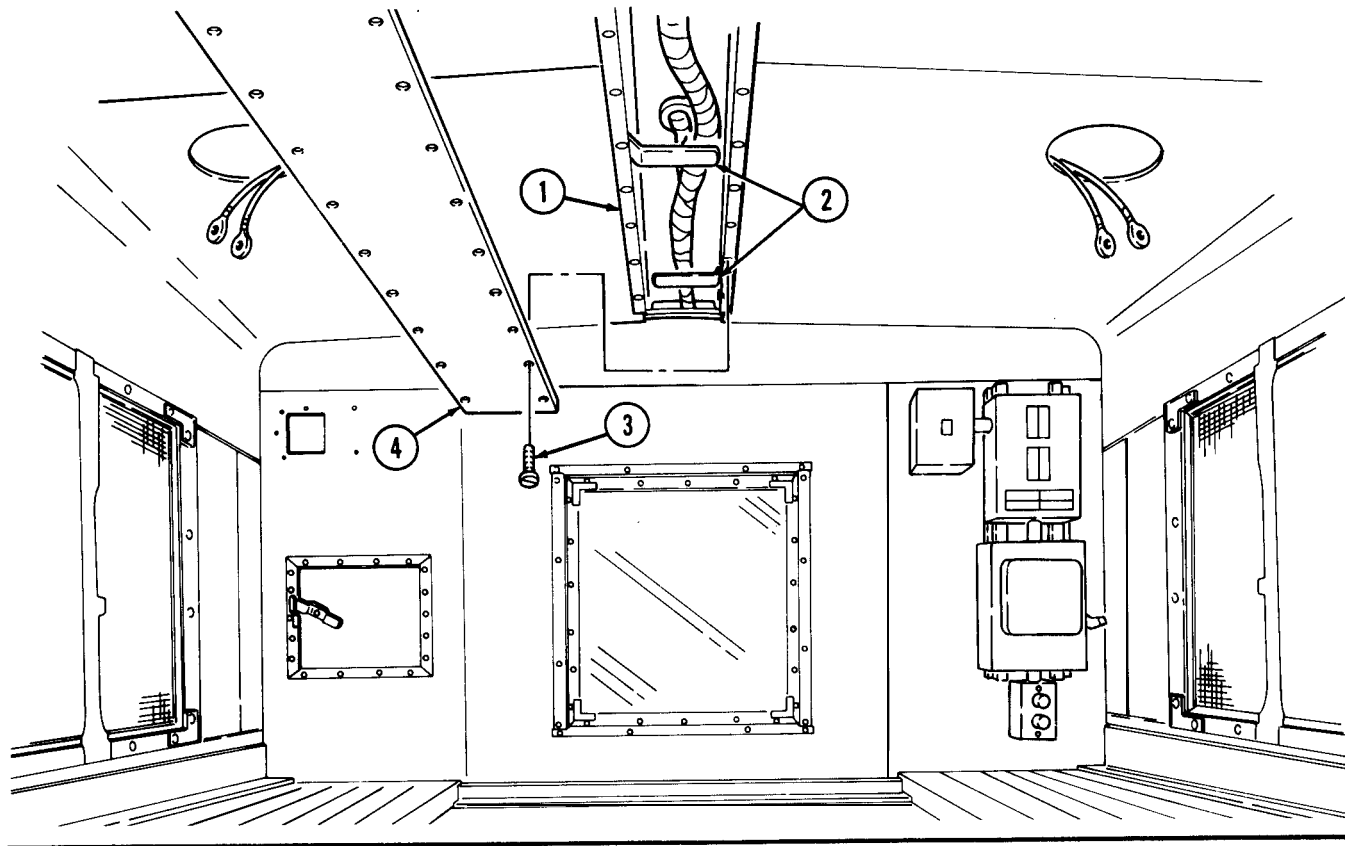
1. Remove ten screws (3) and center ceiling panel (4) from van body ceiling (1).

NOTE

- Safety wire will be used to install new wiring harness. Do not cut safety wire from spool until harness has been pulled from van and proper length has been obtained.
- Safety wire must be attached to wires with electrical tape.

2. Attach safety wire (8) to wires (7), (10), and (11).
3. Bend tabs (2) out of the way.
4. Pull wiring harness (6) out of van body rear wall (5).
5. Remove safety wires (8) from wires (7), (10), and (11).
6. Cut safety wires (8) from spools (9).

15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)



15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)

NOTE

Perform steps 6 and 7 on each side of van.

6. Remove cap (1), clip (2), and cover (3) from receptacle strip (4).
7. Pull receptacle wires (6) forward, remove electrical tape from connectors (7) and cut receptacle wires (6) from main wiring harness (5).

NOTE

Safety wire will be used to install new wiring harness. Do not cut safety wire from spool until harness has been pulled from van and proper length has been obtained.

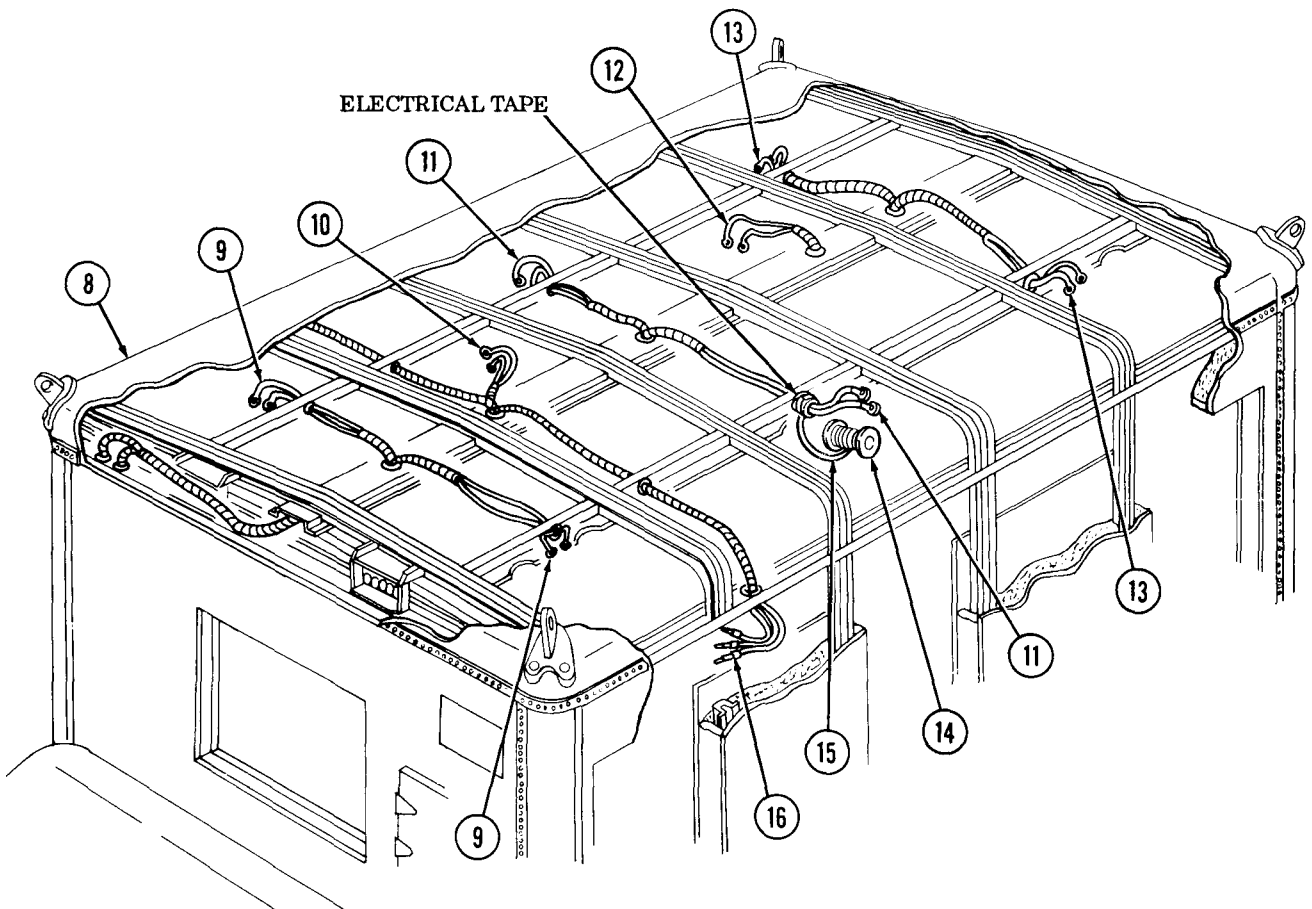
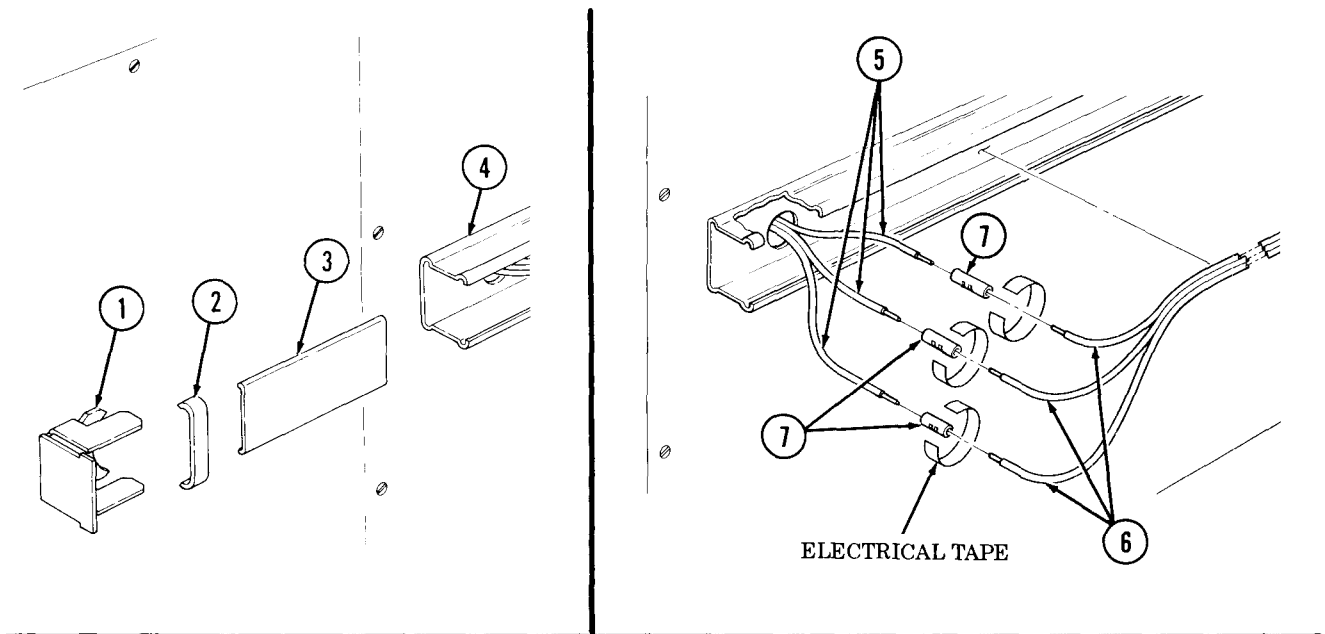
8. Attach safety wire (15) to 115-volt domelight wires (13).
9. Pull 115-volt domelight wires (13) out of van body (8).
10. Remove safety wire (15) from 115-volt domelight wires (13).
11. Cut safety wire (15) from spool (14).
12. Attach safety wire (15) to 24-volt domelight wires (12).
13. Pull 24-volt domelight wires (12) out of van body (8).
14. Remove safety wire (15) from 24-volt domelight wires (12).
15. Cut safety wire (15) from spool (14).
16. Attach safety wire (15) to 115-volt domelight wires (11).
17. Pull 115-volt domelight wires (11) out of van body (8).
18. Remove safety wire (15) from 115-volt domelight wires (11).
19. Cut safety wire (15) from spool (14).
20. Attach safety wire (15) to 24-volt domelight wires (10).

NOTE

Both 115-volt receptacle connections are removed the same. This procedure covers one connection.

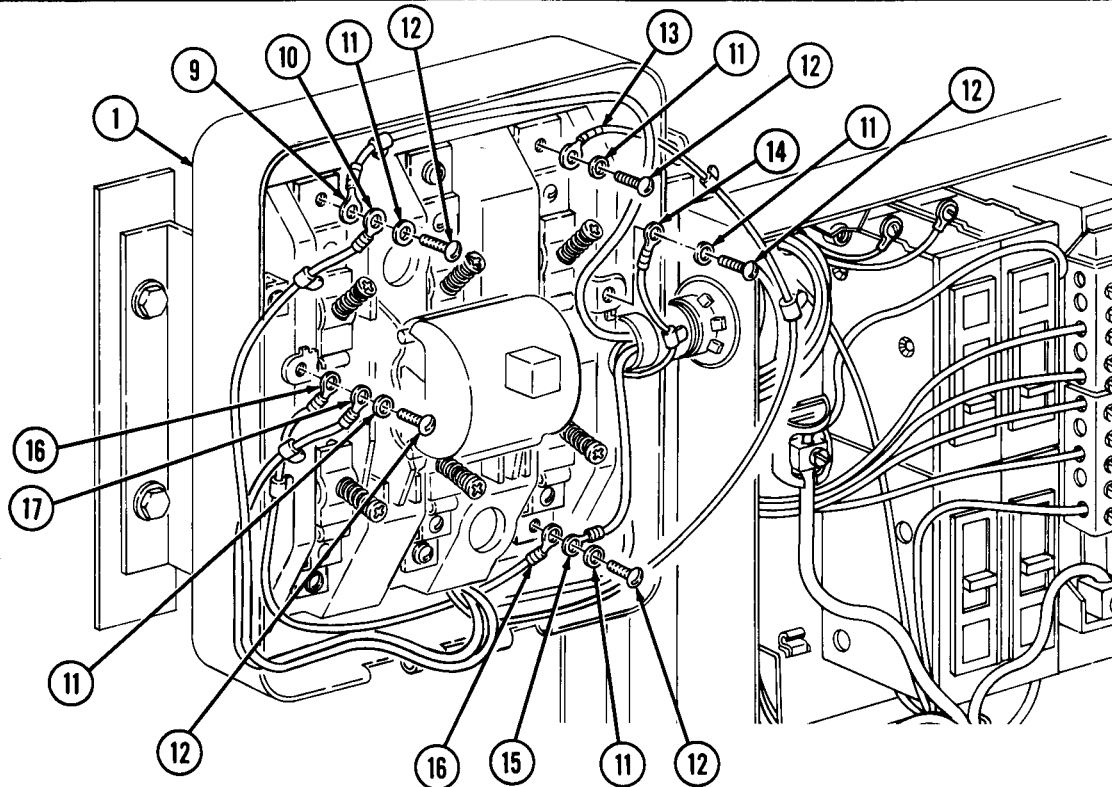
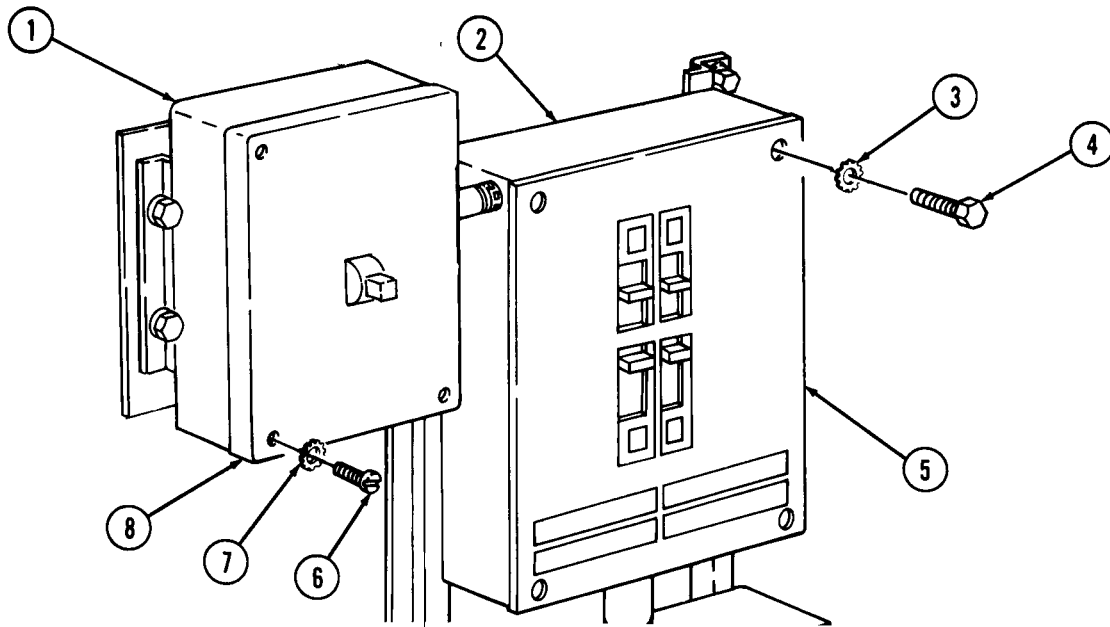
21. Attach safety wire (15) to 115-volt receptacle connections (16).
22. Pull 24-volt domelight wires (10) and 115-volt receptacle connections (16) out of van body (8).
23. Remove safety wire (15) from wires (10) and 115-volt receptacle connections (16).
24. Cut safety wire (15) from spool (14).
25. Attach safety wire (15) to 115-volt domelight wires (9).
26. Pull 115-volt domelight wires (9) out of van body (8).
27. Remove safety wire (15) from wires (9).
28. Cut safety wire (15) from spool (14).

15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)



15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)

- 29. Remove four screws (4), lockwashers (3), and cover (5) from multibreaker box (2). Discard lockwashers (3).
- 30. Remove four screws (6), lockwashers (7), and cover (8) from blackout switch (1). Discard lockwashers (7).
- 31. Remove five screws (12), lockwashers (11), and wires (9), (10), (13), (14), (15), (16), and (17) from blackout switch (1).



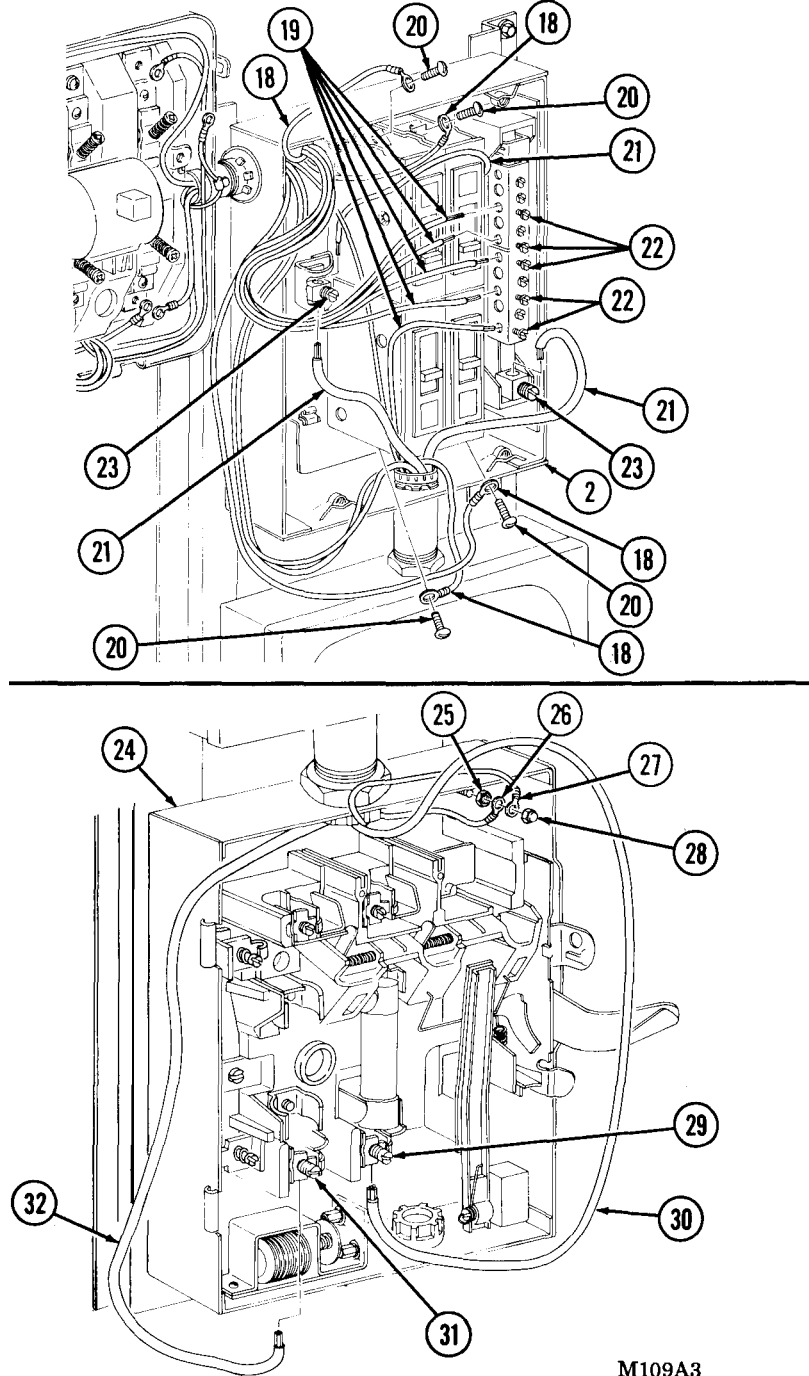
15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)

- 32. Remove four screws (20) and wires (18) from multibreaker box (2).
- 33. Loosen five screws (22) and remove five wires (19) from multibreaker box (2).
- 34. Loosen two screws (23) and remove three wires (21) from multibreaker box (2).
- 35. Remove capnut (28), wires (27) and (26), and nut (25) from safety switch box (24).

NOTE

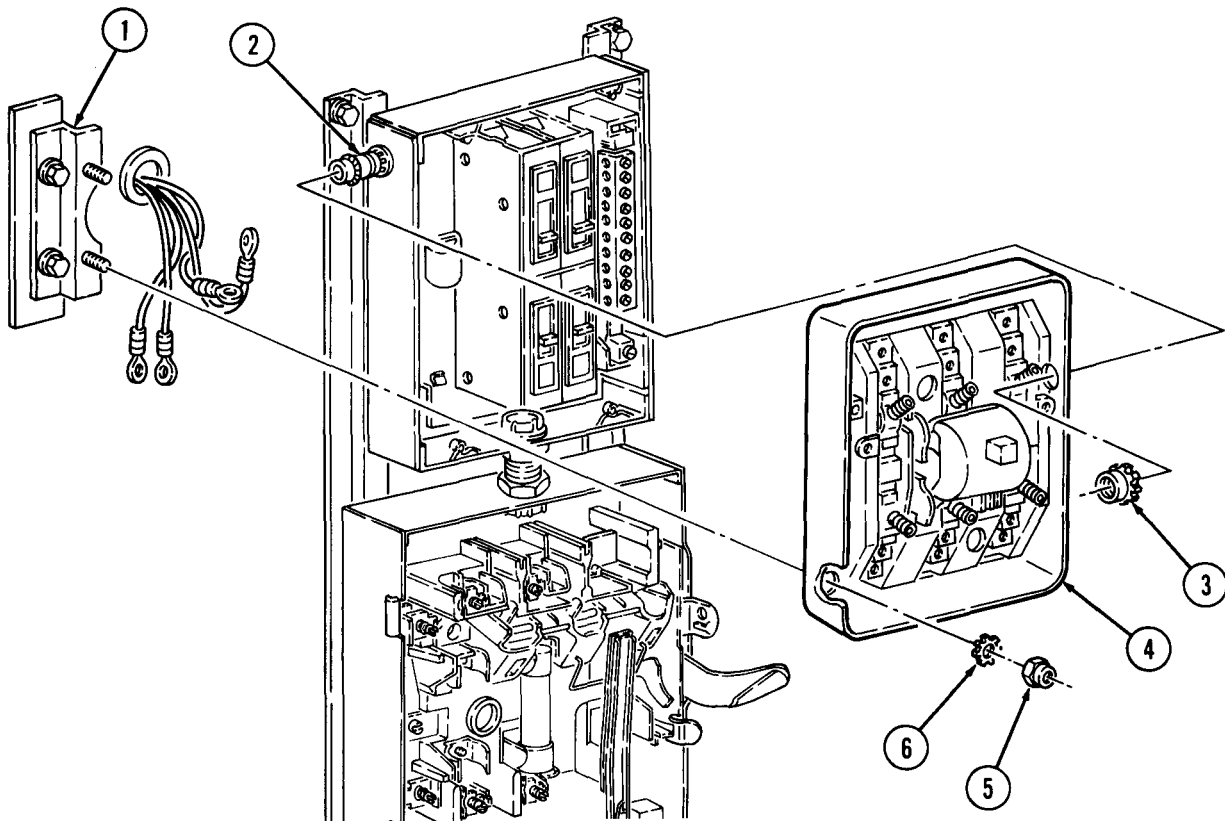
Perform step 36 for M109A3 vehicles.

- 36. Loosen two screws (29) and remove two wires (30) from safety switch box (24).

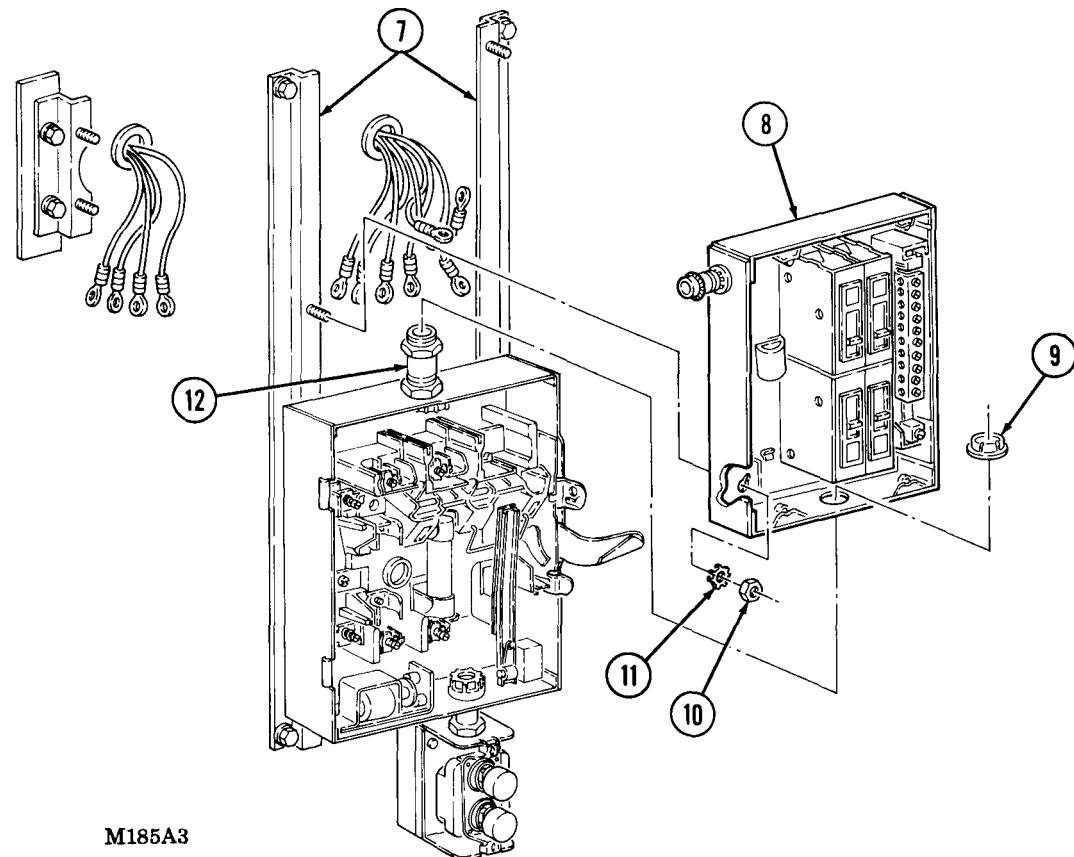
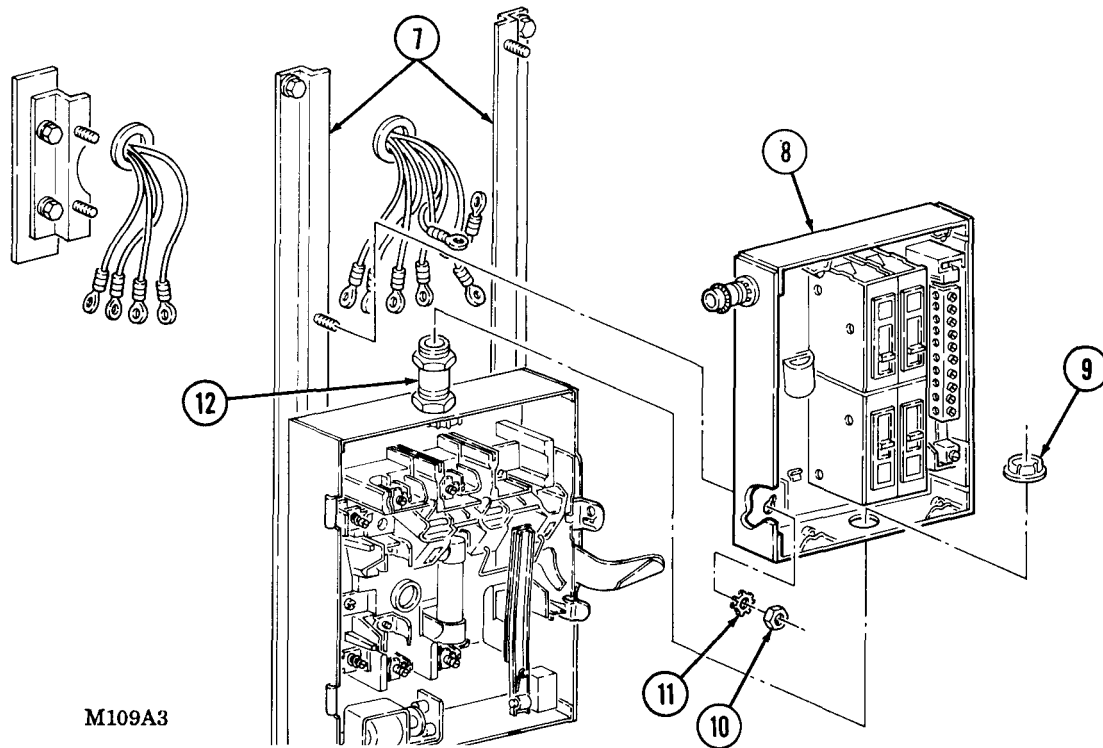


15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)

37. Remove bushing (3) from nipple (2) and blackout switch (4).
38. Remove two nuts (5), lockwashers (6), and blackout switch (4) from mounting bracket (1). Discard lockwashers (6).
39. Remove bushing (9) from nipple (12) and multibreaker box (8).
40. Remove two nuts (10), lockwashers (11), and multibreaker box (8) from mounting brackets (7) and nipple (12). Discard lockwasher (11).



15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)



15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)

NOTE

Perform steps 41 and 42 for M185A3 vehicles

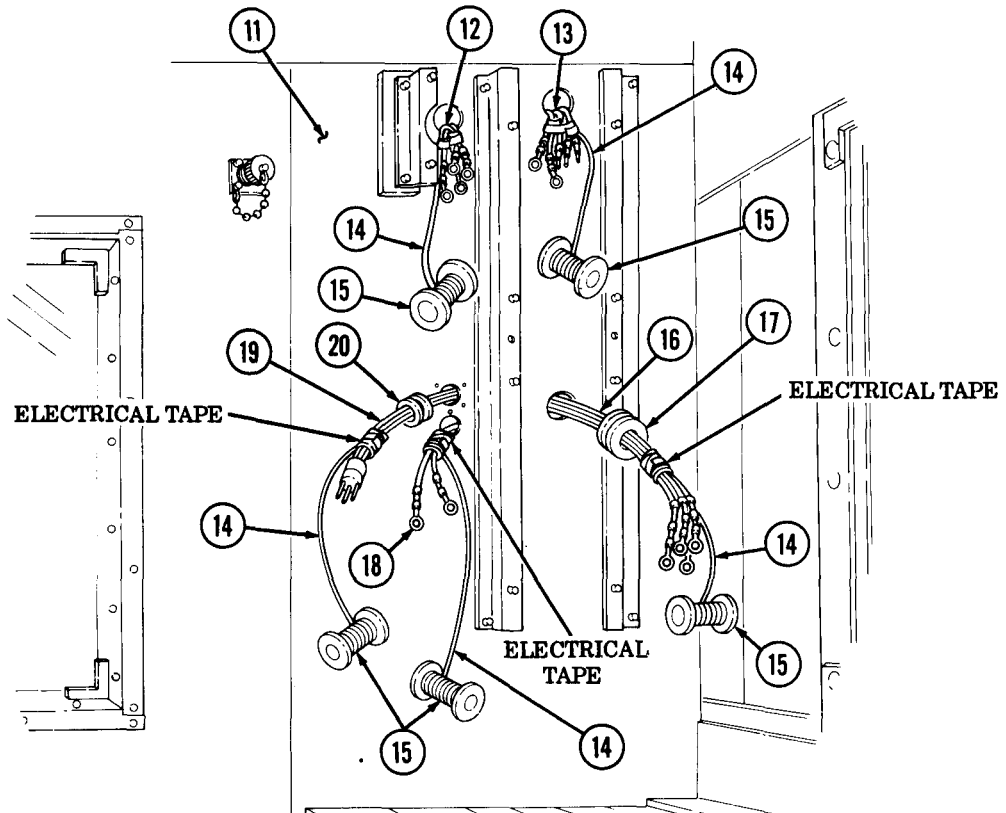
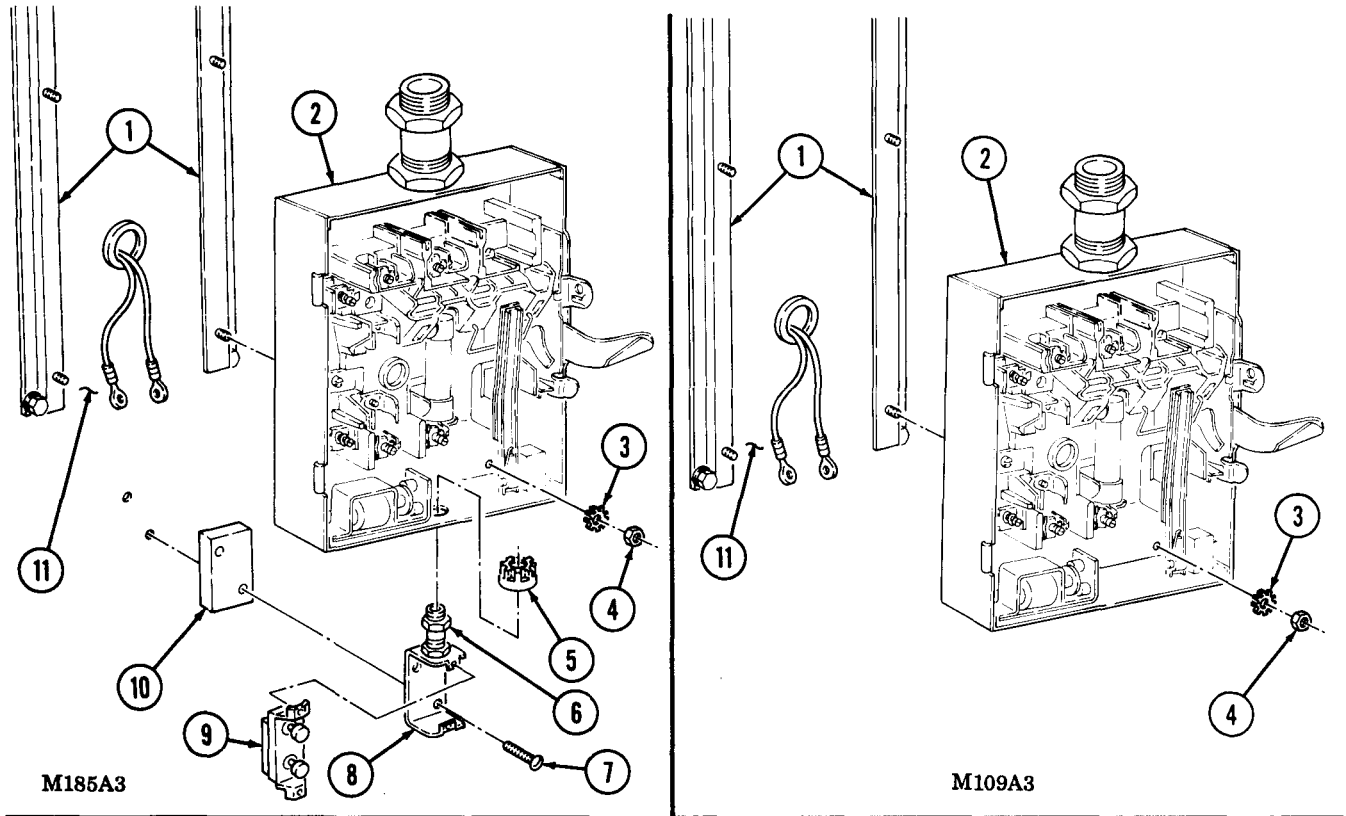
41. Remove bushing (5) from nipple (6) and safety switch box (2).
42. Remove start/stop switch (9), two screws (7), switch bracket (8), and spacer (10) from van wall (11).
43. Remove four nuts (4), lockwashers (3), and safety switch box (2) from two mounting brackets (1). Discard lockwashers (3).

NOTE

- Tag wires, cables, leads, and terminals for installation.
- Safety wire will be used to install new wiring harness. Do not cut safety wire from spool until harness has been pulled from van and proper length has been obtained.

44. Attach safety wires (14) to wire leads (12), (13), (16), (18), and (19).
45. Remove three grommets (17) from van wall (11) and wire leads (12), (13), and (16).
46. Remove two grommets (20) from van wall (11) and wire leads (18) and (19).
47. Pull wire leads (12), (13), (16), (18), and (19) out of van wall (11).
48. Remove safety wires (14) from wire leads (12), (13), (16), (18), and (20).
49. Cut safety wires (14) from spools (15).

15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)



15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)

CAUTION

Use care when installing wiring harnesses. Excessive snagging or pulling may damage wires.

NOTE

Safety wire must be secured to wiring harnesses with electrical tape.

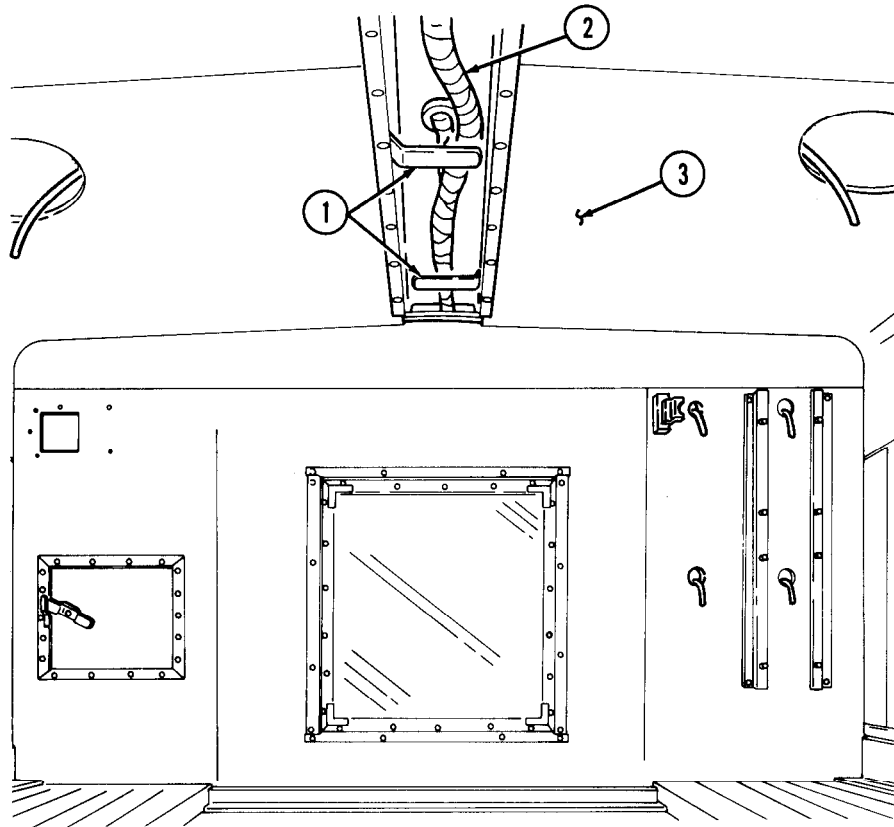
b. Installation

1. Position main wiring harness (2) in roof (3).
2. Secure main wiring harness (2) by closing tabs (1).
3. Install three grommets (9) and two grommets (13) in van wall (4).
4. Attach safety wires (7) to five wire leads (5), (6), (8), (11), and (12).

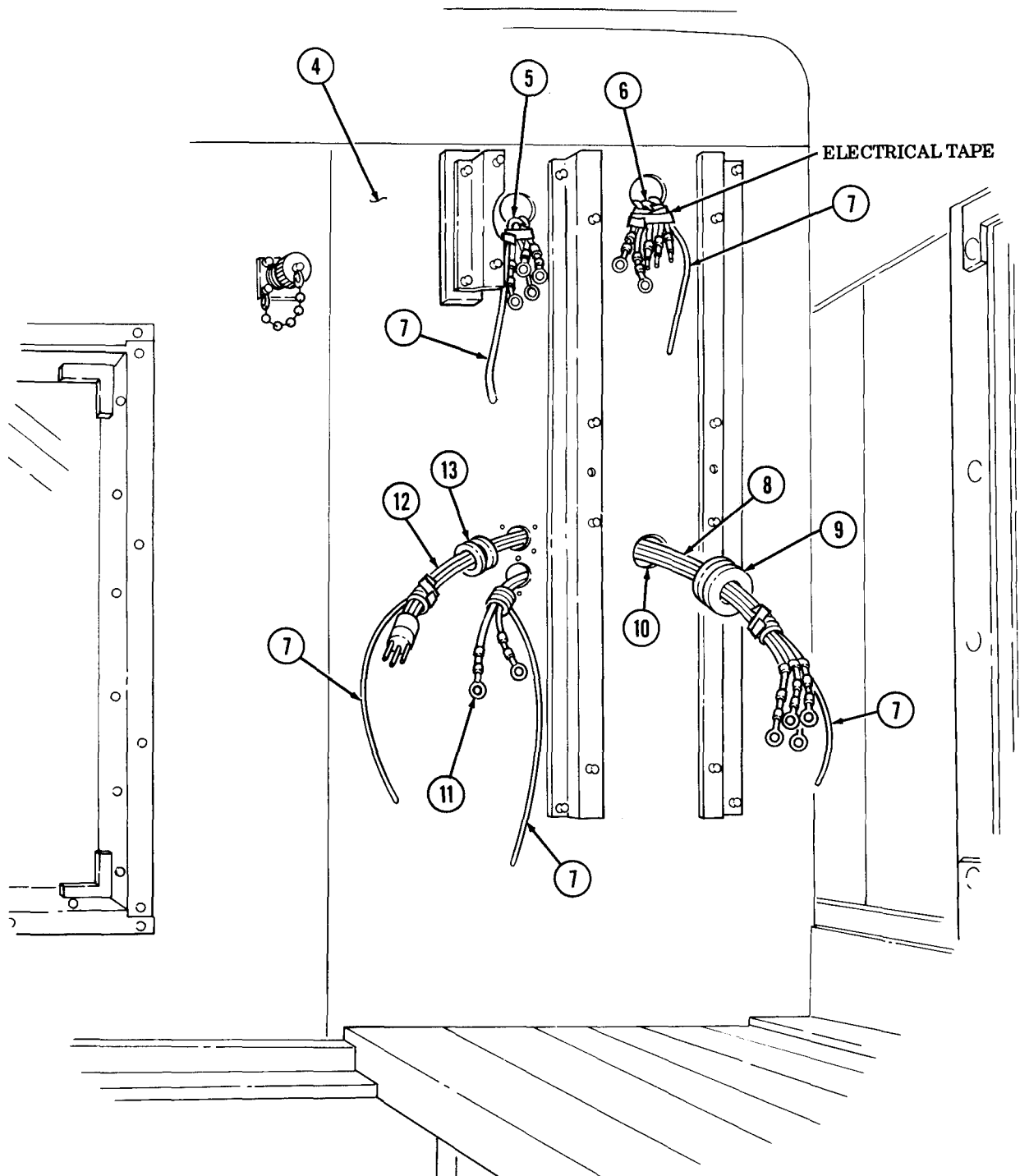
NOTE

Do not remove safety wire from wire leads until wires are connected.

5. Pull safety wires (7) so that wire leads (5), (6), (8), (11), and (12) are pulled through van wall (4).



15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)



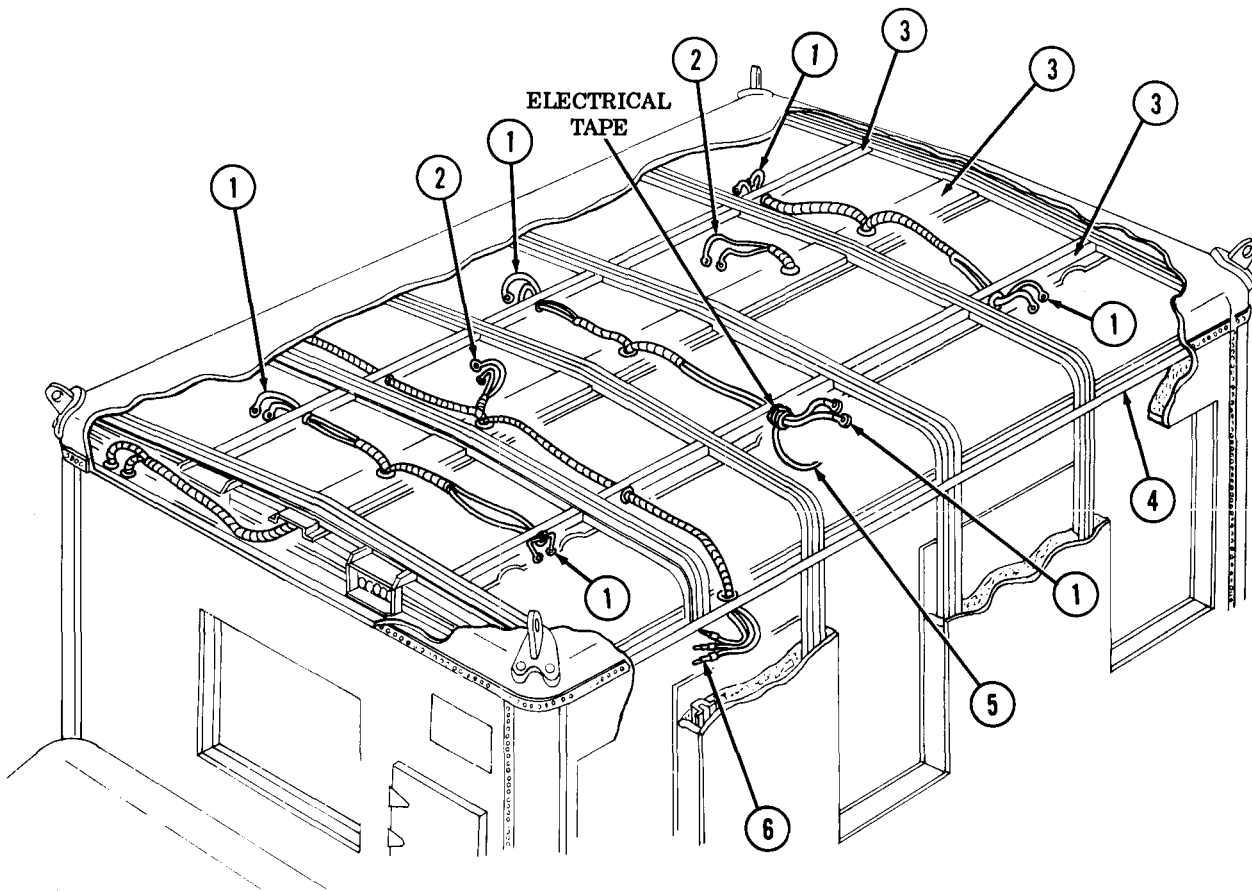
15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)

6. Attach safety wires (5) to six 115-volt domelight wire leads (1).
7. Attach safety wires (5) to two 24-volt domelight wire leads (2).
8. Attach safety wires (5) to two 115-volt receptacle connectors (6).

NOTE

Do not remove safety wire from wire leads until wire leads are connected.

9. Pull safety wires (5) so that six 115-volt domelight wire leads (1) and two 24-volt domelight wire leads (2) are pulled through van body ceiling rails (3) and two 115-volt receptacle connector wire leads (6) are pulled through van body ceiling rails (3) and side rails (4).

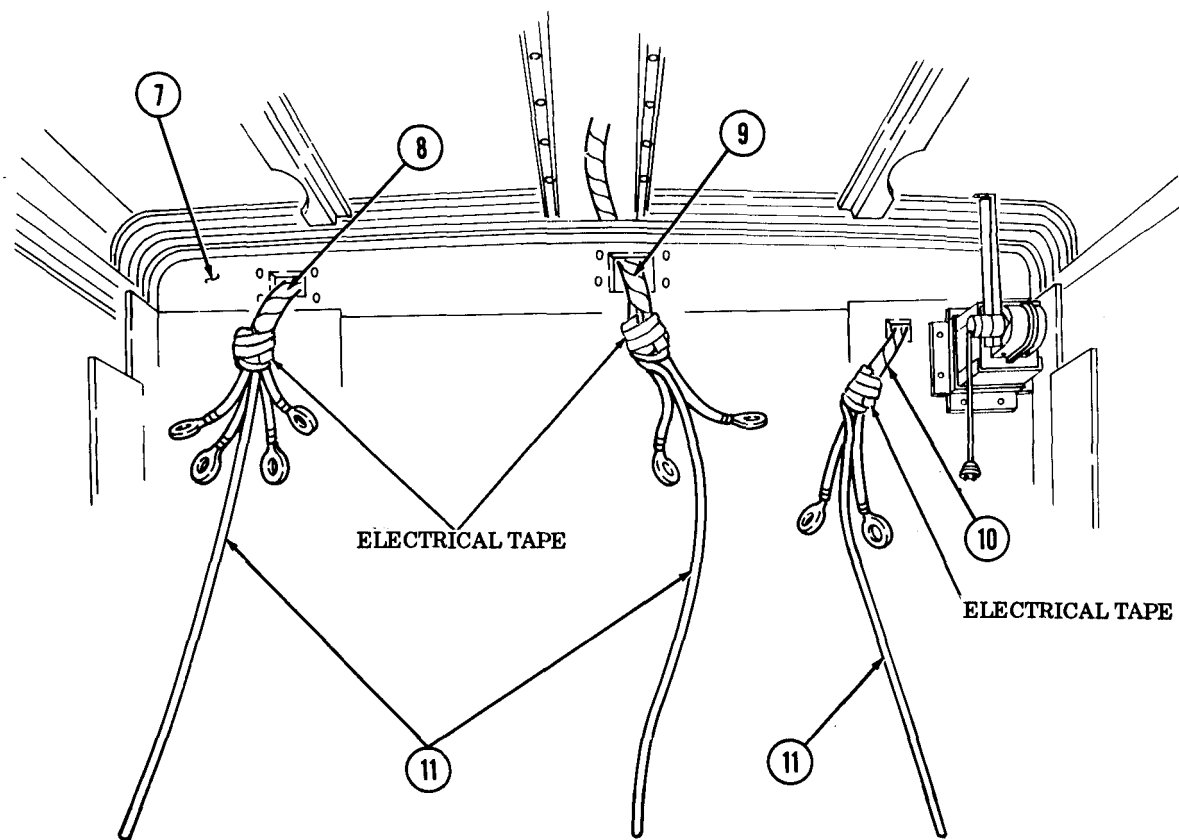


15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)

NOTE

Do not remove safety wire from wire leads until wire leads are connected.

10. Attach safety wires (11) to four power switch wires (8), two blackout switch wires (9), and blower receptacle wires (10).
11. Pull three safety wires (11) so that wires (8), (9), and (10) are pulled through van body rear wall (7).



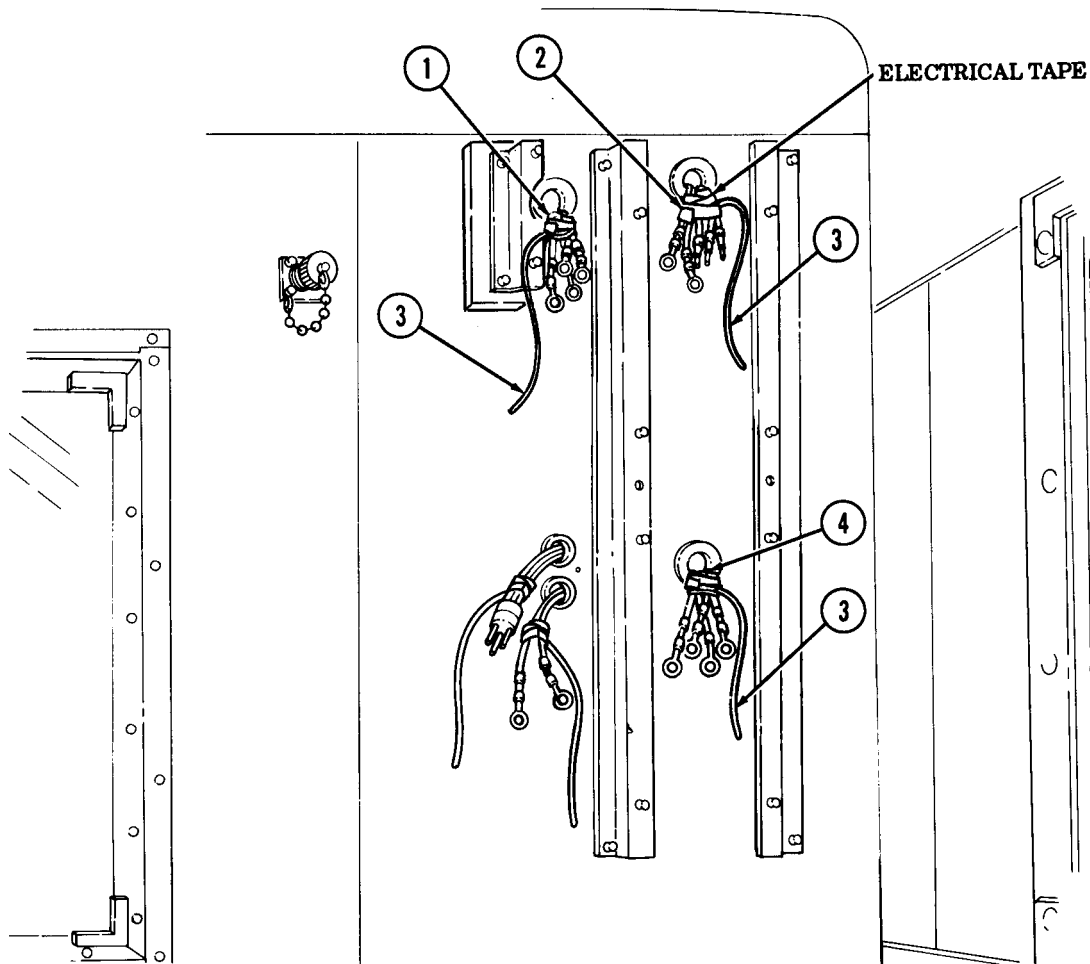
15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)

12. Remove safety wire (3) from wire bunches (1), (2), and (4).
13. Insert wires (4) through access hole in safety switch box (6).
14. Install safety switch box (6) on mounting brackets (5) with four new lockwashers (7) and nuts (8).

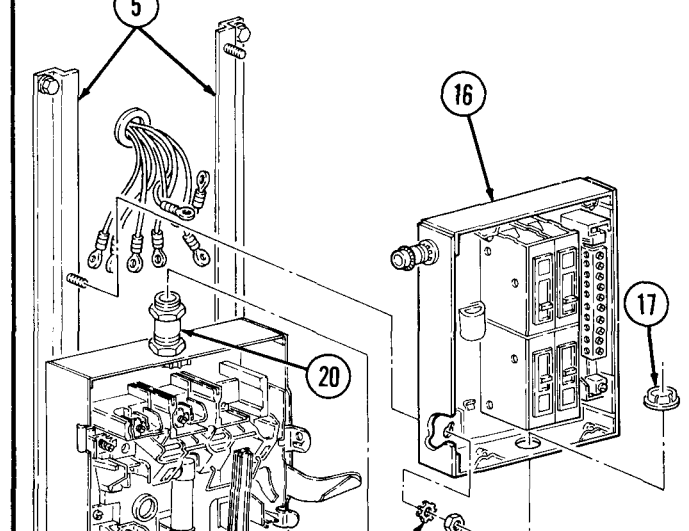
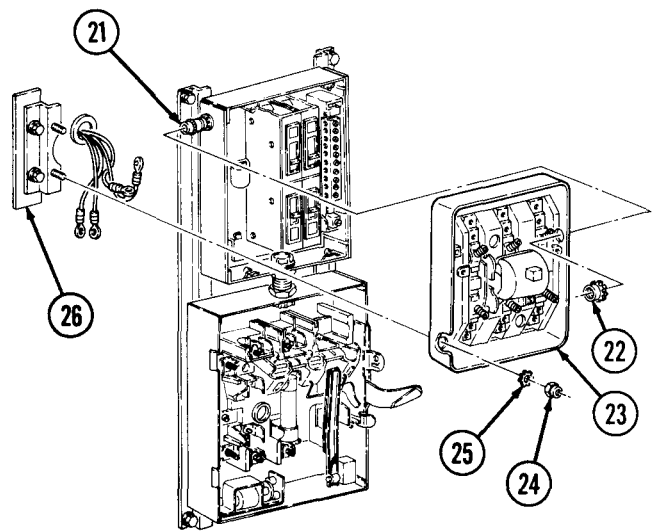
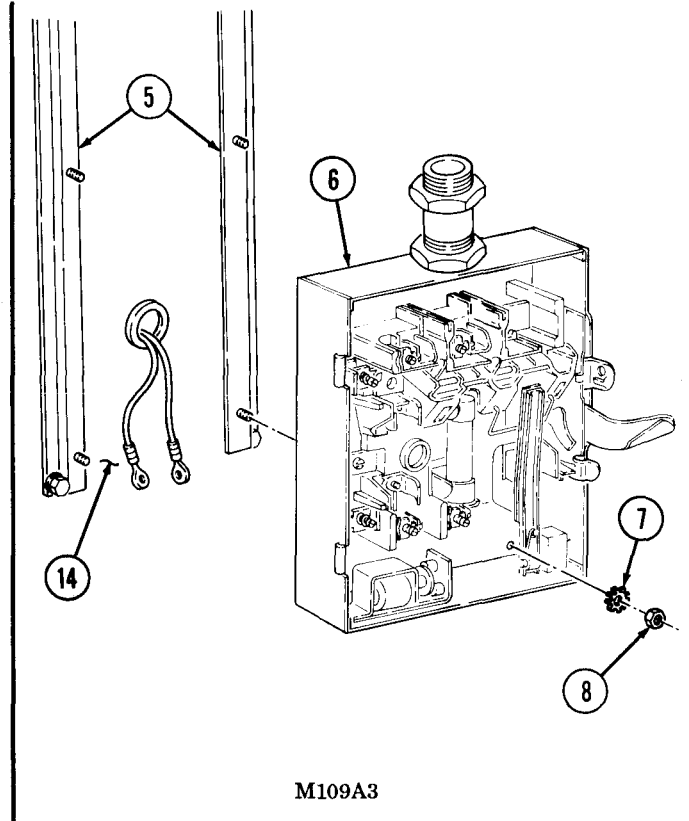
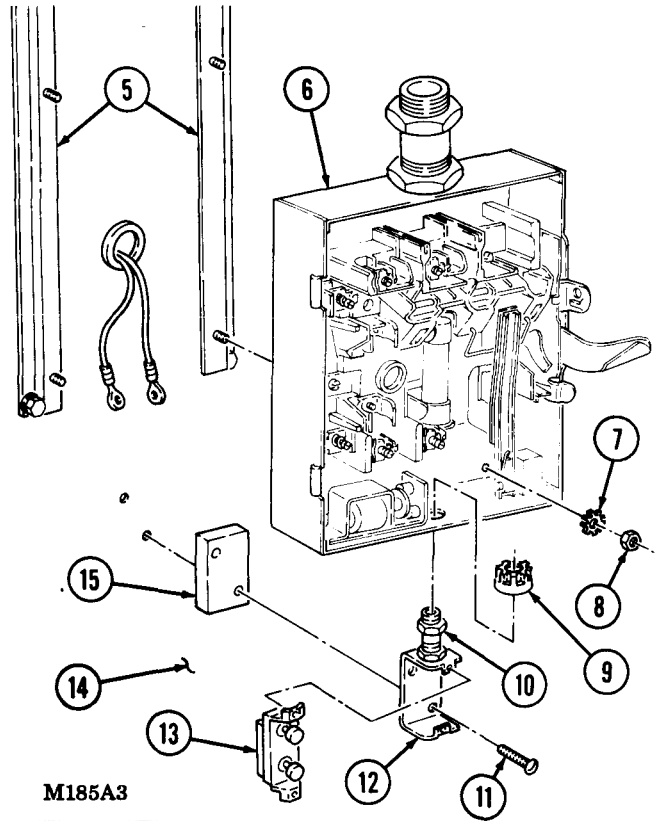
NOTE

Perform steps 15 through 17 for M185A3 vehicles.

15. Position nipple (10) with switch bracket (12) through safety switch box (6) and secure nipple (10) with bushing (9).
16. Install spacer (15) and switch bracket (12) on van wall (14) with two screws (11).
17. Install start/stop switch (13) into switch bracket (12).
18. Insert wires (2) in access hole of multibreaker box (16).
19. Secure multibreaker box (16) on nipple (20) with bushing (17).
20. Install multibreaker box (16) on mounting brackets (5) with two new lockwashers (19) and nuts (18).
21. Insert wires (1) through access hole in blackout switch (23).
22. Position blackout switch (23) on nipple (21) and secure with bushing (22).
23. Install blackout switch (23) on mounting bracket (26) with two new lockwashers (25) and nuts (24).

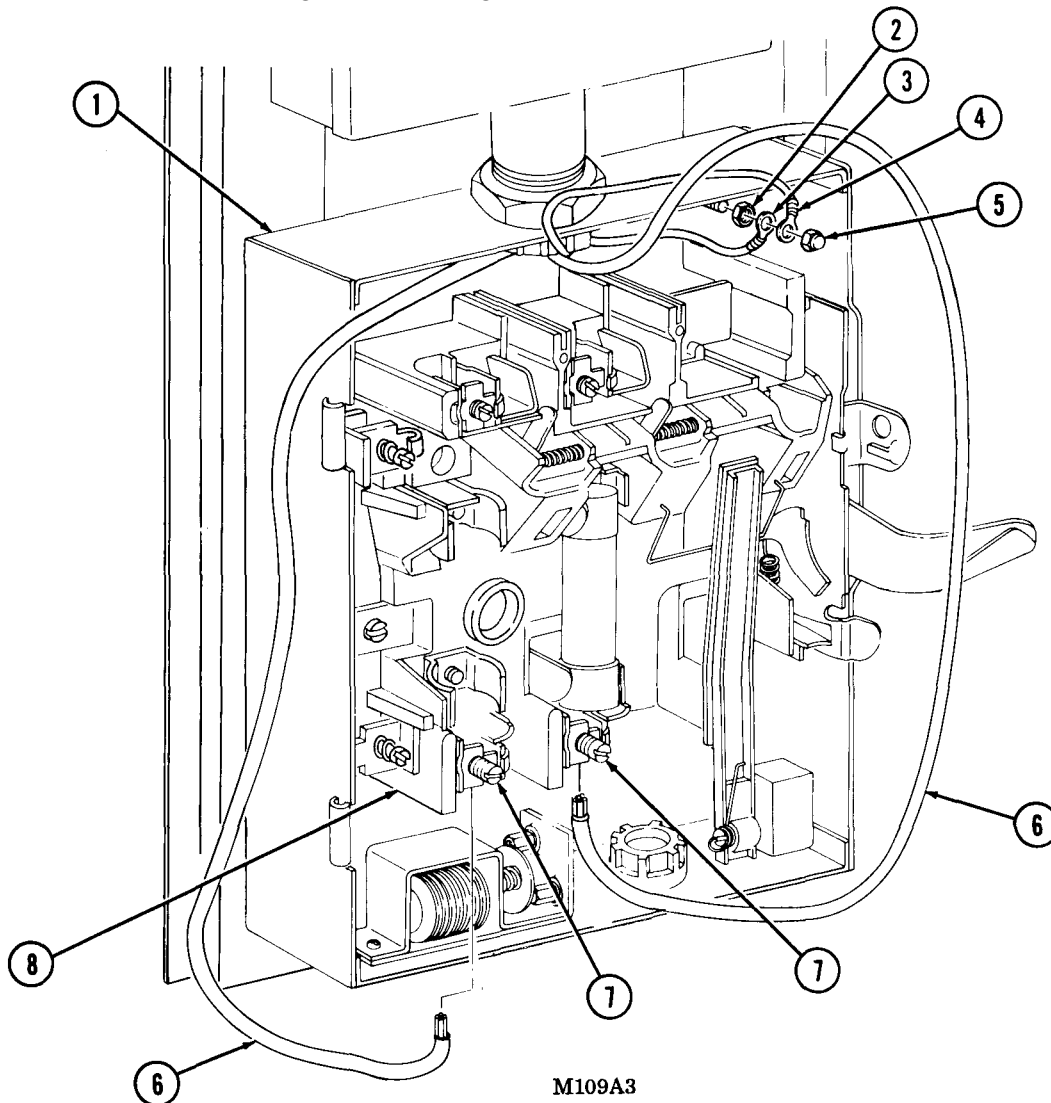


15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)

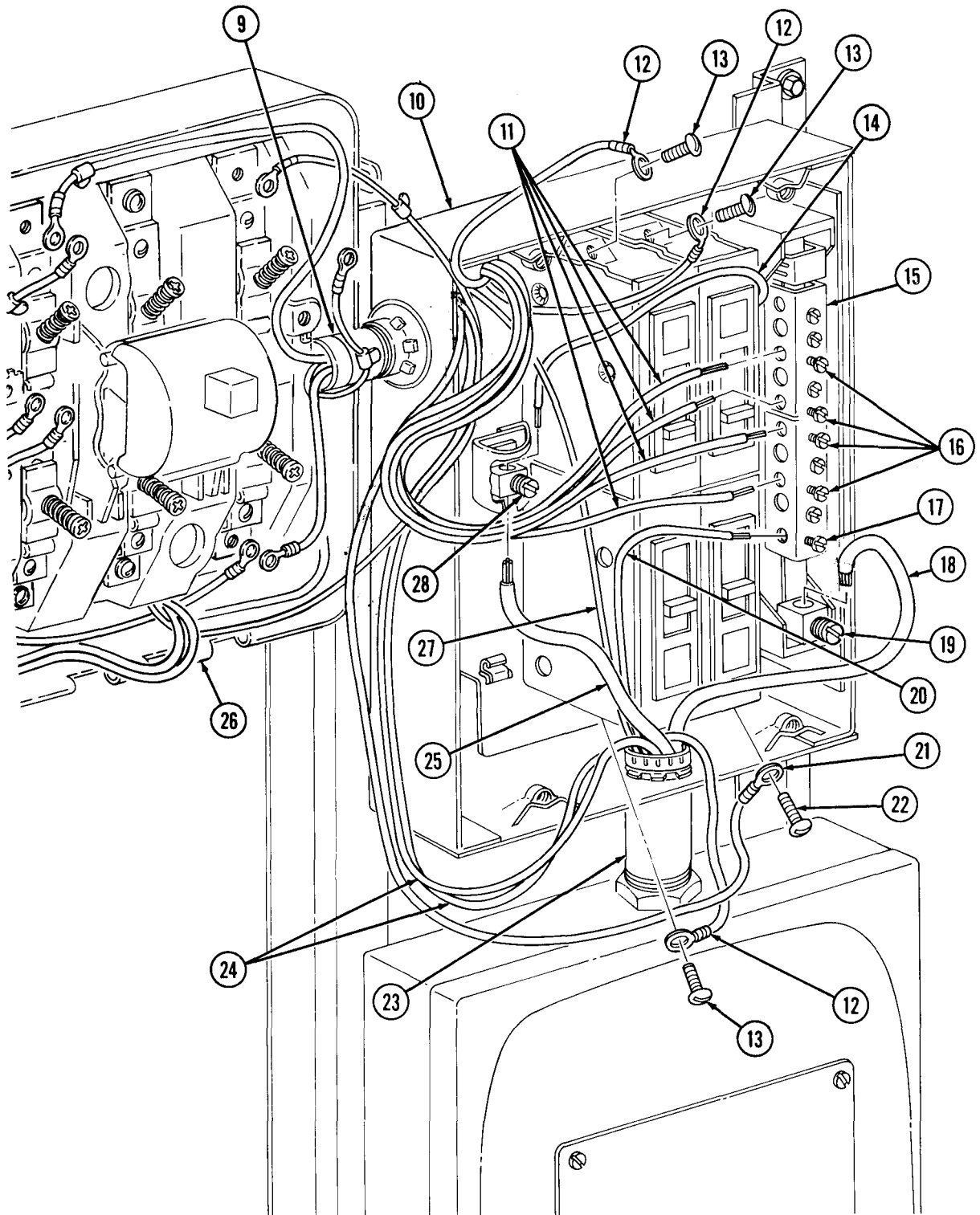


15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)

24. Install nut (2) and wires (3) and (4) on safety switch box (1) with capnut (5).
25. Back out nut (2) to tighten leads (3) and (4) against capnut (5).
26. Install two wires (6) on fuse block (8) and tighten two screws (7).
27. Insert wires (18) and (25) through nipple (23) and into multibreaker box (10).
28. Insert wire (27) through nipple (23), multibreaker box (10), nipple (9) and into blackout switch (26).
29. Insert wires (24) through nipple (23), multibreaker box (10), nipple (9), and into blackout switch (26).
30. Install wire (21) on multibreaker box (10) with screw (22).
31. Insert opposite end of wire (21) through nipple (9) and into blackout switch (26).
32. Position wire (18) in multibreaker box (10) and tighten screw (19).
33. Position wires (25) and (14) in multibreaker box (10) and tighten screw (28).
34. Insert wire (20) in bridge (15) and tighten screw (17).
35. Install three wires (12) on multibreaker box (10) with three screws (13).
36. Insert four wires (11) in bridge (15) and tighten four screws (16).

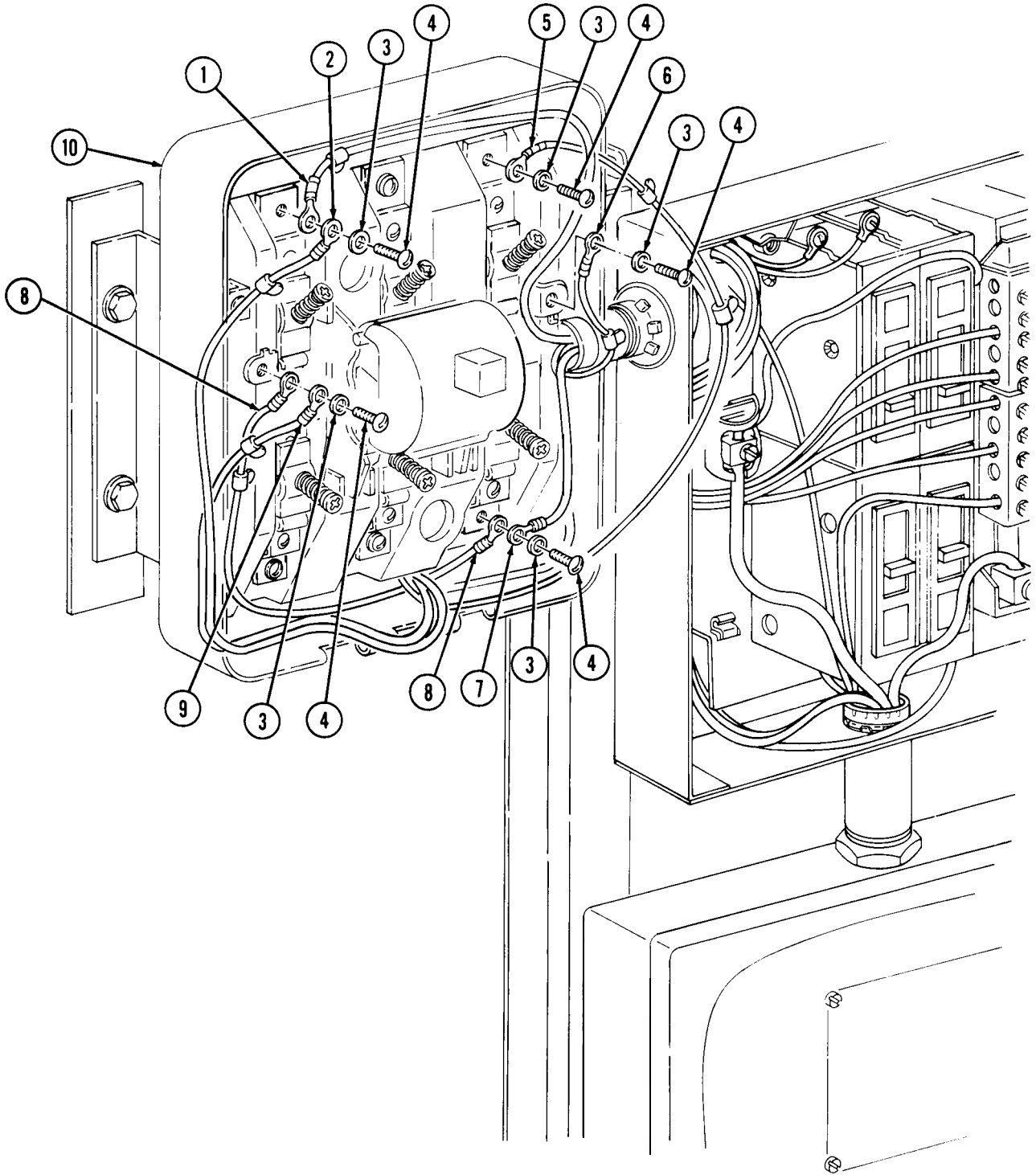


15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)



15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)

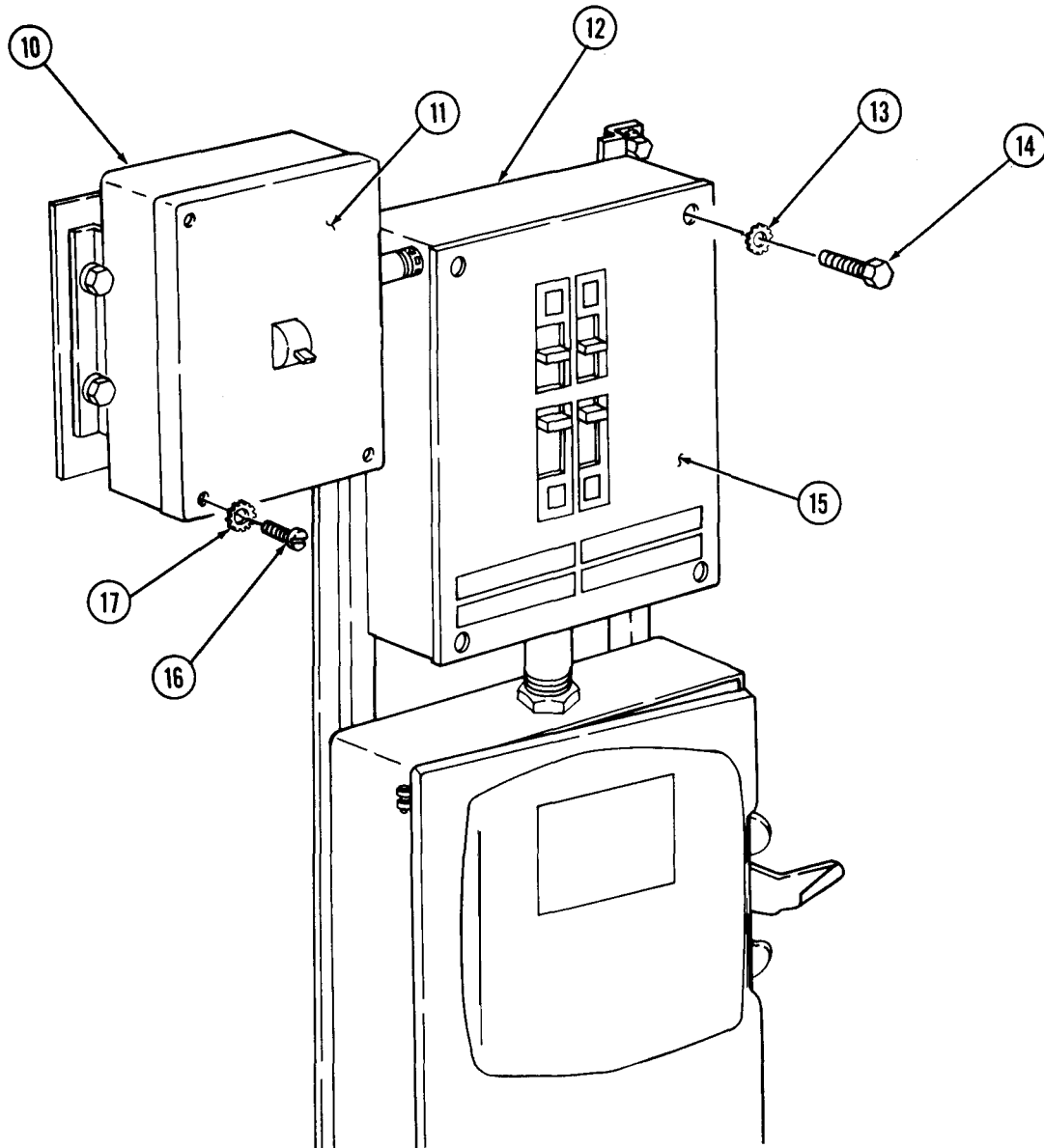
- 37. Install wires (1), (2), (5), (6), (7), and one end of wire (8) on blackout switch (10) with four lockwashers (3) and screws (4).
- 38. Install opposite end of wire (8) and wire (9) on blackout switch (10) with lockwasher (3) and screw (4).



15-24. 115- AND 24-VOLT WIRING HARNESS REPLACEMENT (Contd)

39. Install cover (15) on multibreaker box (12) with four new lockwashers (13) and screws (14).

40. Install cover (11) on blackout switch (10) with four new lockwashers (17) and screws (16).



- FOLLOW-ON TASKS:
- Install blackout light switch (TM 9-2320-361-20).
 - Install converter receptacle (TM 9-2320-361-20).
 - Install blower motor receptacle (TM 9-2320-361-20).
 - Install power switch (TM 9-2320-361-20).
 - Install 24-volt DC receptacle (M185A3) (para. 15-19).
 - Install 115-volt AC receptacle (para. 15-18).
 - Install lamp and domelight assemblies (TM 9-2320-361-20).
 - Connect battery ground cable (TM 9-2320-361-20).

15-25. BLACKOUT SWITCH REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Tool kit, electrical (Appendix B, Item 2)
Pipe wrench (Appendix B, Item 39)

MATERIALS/PARTS

Six lockwashers (Appendix F, Item 151)

REFERENCES (TM)

TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Battery ground cable disconnected (TM 9-2320-361-20).

NOTE

Tag wires, leads, and terminals for installation.

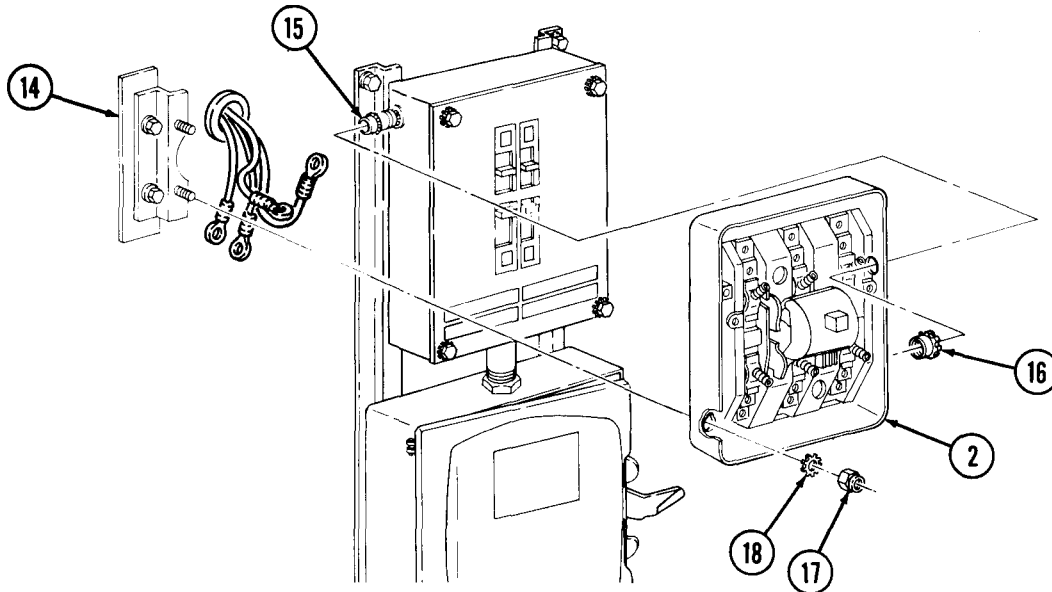
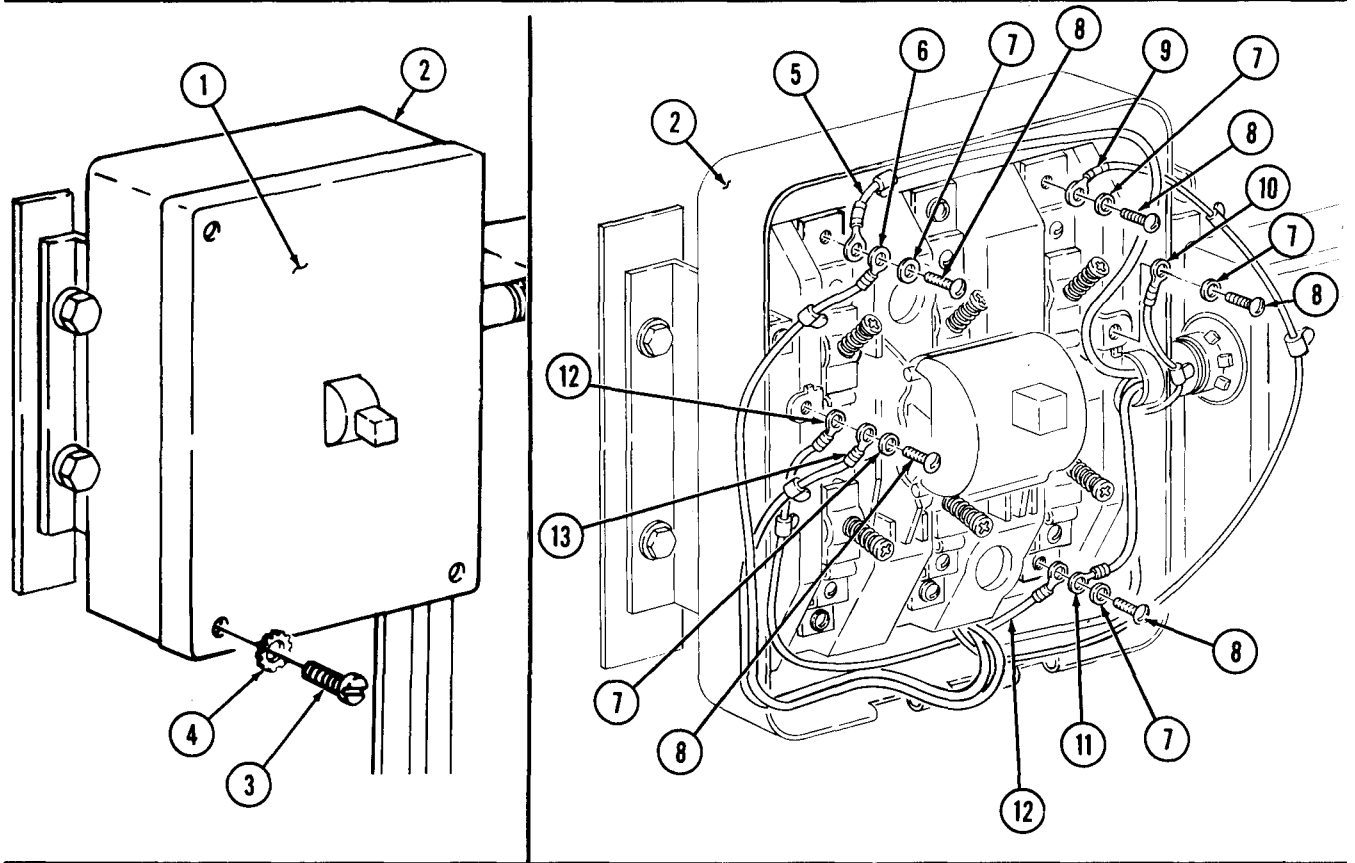
a. Removal

1. Remove four screws (3), lockwashers (4), and cover (1) from blackout switch (2). Discard lockwashers (4).
2. Remove five screws (8), lockwashers (7), and wires (5), (6), (9), (10), (11), (12), and (13) from blackout switch (2).
3. Remove bushing (16) from nipple (15).
4. Remove two nuts (17), lockwashers (18), and blackout switch (2) from mounting bracket (14). Discard lockwashers (18).

b. Installation

1. Install blackout switch (2) on mounting bracket (14) with two new lockwashers (18) and nuts (17).
2. Install blackout switch (2) on nipple (15) with bushing (16).
3. Install wires (5), (6), (9), (10), (11), and one end of (12) on blackout switch (2) with four lockwashers (7) and screws (8).
4. Install wire (13) and other end of wire (12) on blackout switch (2) with lockwasher (7) and screw (8).
5. Install cover (1) on blackout switch (2) with four new lockwashers (4) and screws (3).

15-25. BLACKOUT SWITCH REPLACEMENT



- FOLLOW-ON TASKS: •Connect battery ground cable (TM 9-2320-361-20).
 •Check blackout light operations (TM 9-2320-361-10).

15-26. MULTIBREAKER BOX REPLACEMENT
--

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit (Appendix B, Item 1)

Pipe wrench (Appendix B, Item 39)

1-1/4-in. open-end wrench (Appendix B, Item 50)

MATERIALS/PARTS

Six lockwashers (Appendix F, Item 151)

REFERENCES (TM)

TM 9-2320-361-10

TM 9-2320-361-20

TM 9-2320-361-34P

EQUIPMENT CONDITION

. Parking brake set (TM 9-2320-361-10).

• Battery ground cable disconnected (TM 9-2320-361-20).

• Safety switch in OFF position (TM 9-2320-361-10).

NOTE

Tag wires, leads, and terminals for installation.

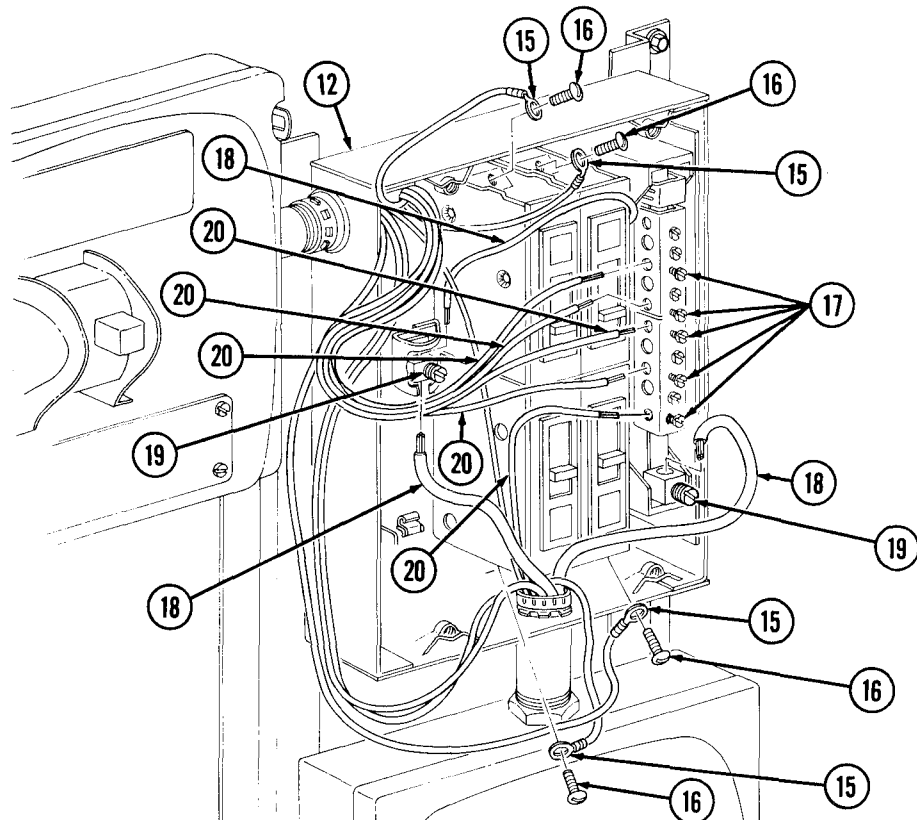
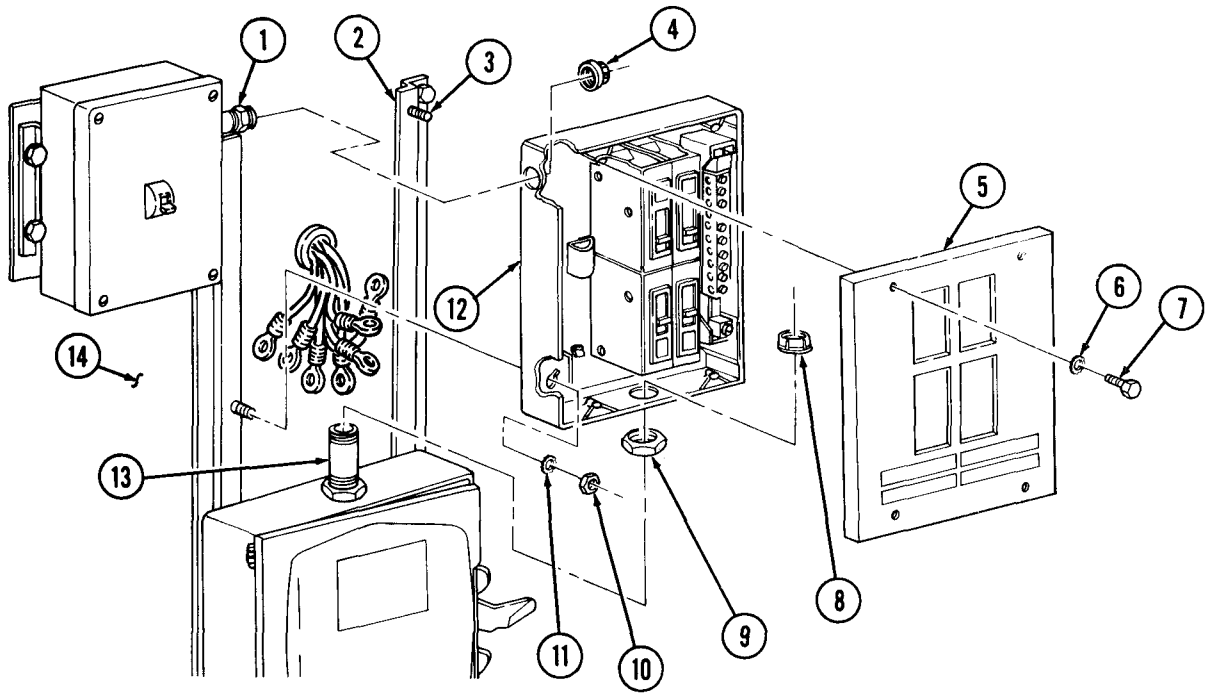
a. Removal

1. Remove four screws (7), lockwashers (6), and cover (5) from multibreaker box (12). Discard lockwashers (6).
2. Remove four screws (16) and wires (15) from multibreaker box (12).
3. Loosen five screws (17) and remove five wires (20).
4. Loosen two screws (19) and remove three wires (18).
5. Remove bushing (4) from nipple (1).
6. Remove bushing (8) from nipple (13).
7. Remove two nuts (10) and lockwashers (11) from studs (3) on mounting bracket (2).
8. Remove multibreaker box (12) and nut (9) from nipple (13) and van body (14). Discard lockwashers (11).

b. Installation

1. Route wires through access hole in multibreaker box (12).
2. Install nut (9) on nipple (13) and position multibreaker box (12) on nipples (13) and (1).
3. Install multibreaker box (12) on studs (3) of mounting bracket (2) and van body (14) with two new lockwashers (11) and nuts (10).
4. Install multibreaker box (12) on nipple (13) with bushing (8).
5. Install multibreaker box (12) on nipple (1) with bushing (4).
6. Install three wires (18) in multibreaker box (12) and tighten two screws (19).
7. Install five wires (20) in multibreaker box (12) by tightening five screws (17).
8. Install four wires (15) in multibreaker box (12) with four screws (16).
9. Install cover (5) on multibreaker box (12) with four new lockwashers (6) and screws (7).

15-26. MULTIBREAKER BOX REPLACEMENT (Contd)



FOLLOW-ON TASKS: . Connect battery ground cable (TM 9-2320-361-20).
 • Place safety switch in ON position (TM 9-2320-361-10).

15-27. SAFETY SWITCH BOX REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit (Appendix B, Item 1)
 Tool kit, electrical (Appendix B, Item 2)

MATERIALS/PARTS

Four lockwashers (Appendix F, Item 151)

REFERENCES [TM]

TM 9-2320-361-10

TM 9-2320-361-20

TM 9-2320-361-34P

EQUIPMENT CONDITION

- . Parking brake set (TM 9-2320-361-10).
- Battery ground cable disconnected (TM 9-2320-361-20).
- . Safety switch in OFF position (TM 9-2320-361-10).

NOTE

Tag wires, leads, cables, and terminals for proper installation.

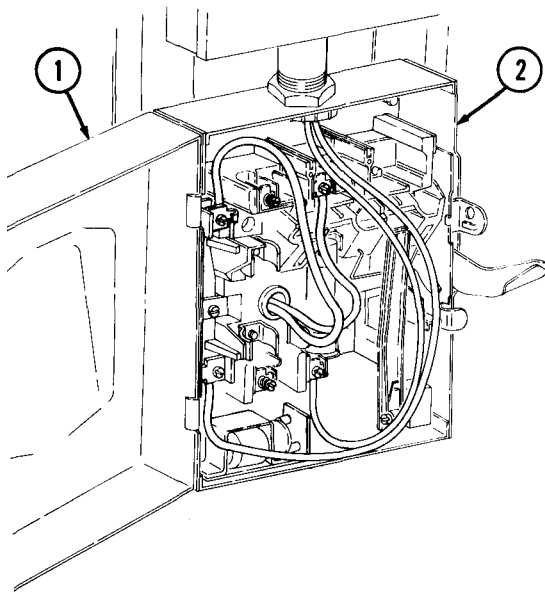
a. Removal

1. Open cover (1) on safety switch box (2).

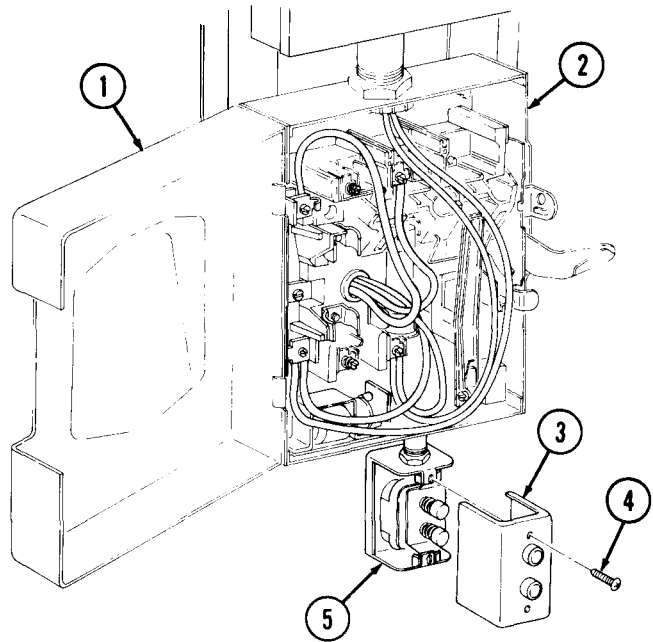
NOTE

Perform step 2 on M185A3 vehicles.

2. Remove two screws (4) and cover (3) from start/stop switch (5).



M109A3



M185A3

15-27. SAFETY SWITCH BOX REPLACEMENT (Contd)

NOTE

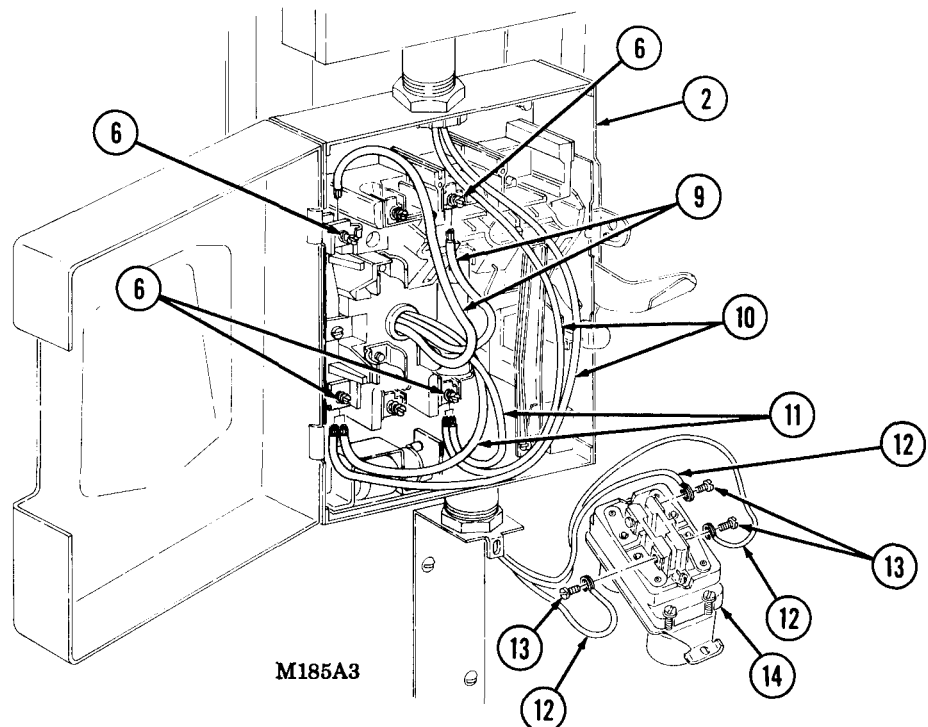
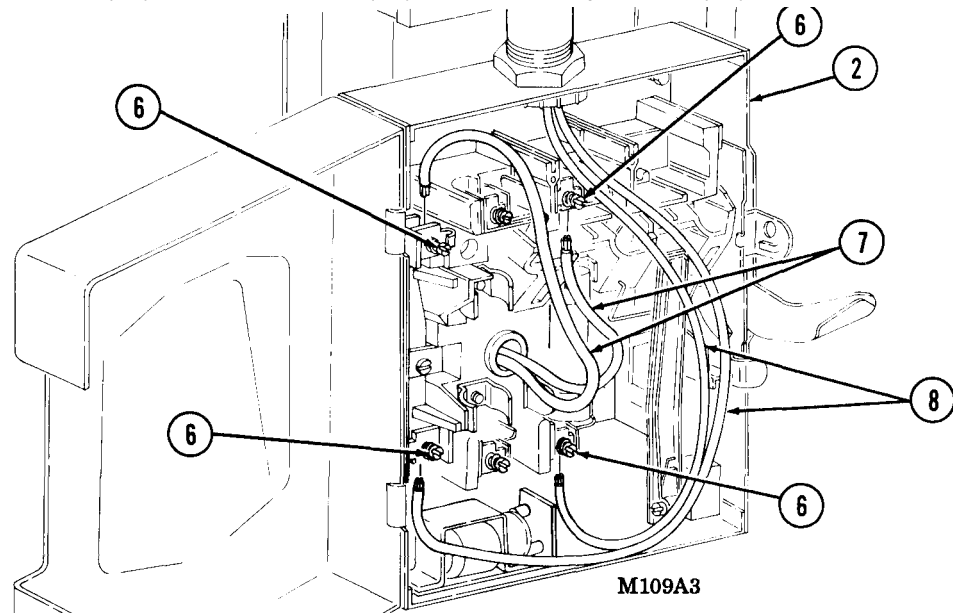
Perform step 3 for M109A3 vehicles.

- Loosen four screws (6) and remove two wires (7) and wires (8) from safety switch box (2).

NOTE

Perform steps 4 and 5 on M185A3 vehicles.

- Loosen four screws (6) and remove two wires (9), wires (10), and wires (11) from safety switch box (2).
- Remove three screws (13) and three wires (12) from start/stop switch (14).



15-27. SAFETY SWITCH BOX REPLACEMENT (Contd)

6. Remove bushing (3) from nipple (1) and safety switch box (4).
7. Remove four nuts (6) and lockwashers (5) from studs (2) and remove safety switch box (4) from mounting brackets (8) and van body wall (7). Discard lockwashers (5).

NOTE

Perform steps 8 through 10 on M185A3 vehicles.

8. Remove bushing (9) from nipple (10) and safety switch box (4).
9. Pull start/stop switch (13) from switch bracket (12).
10. Remove two screws (11), switch bracket (12), and spacer (14) from van body wall (7).

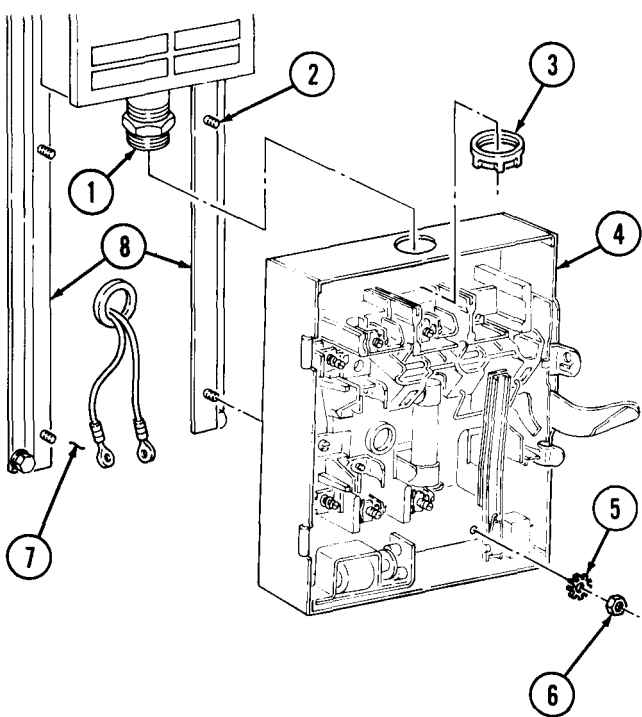
b. Installation

1. Pull wires through access hole in safety switch box (4).
2. Install safety switch box (4) on nipple (1) and studs (2) of mounting brackets (8) with bushing (3), four new lockwashers (5), and nuts (6).

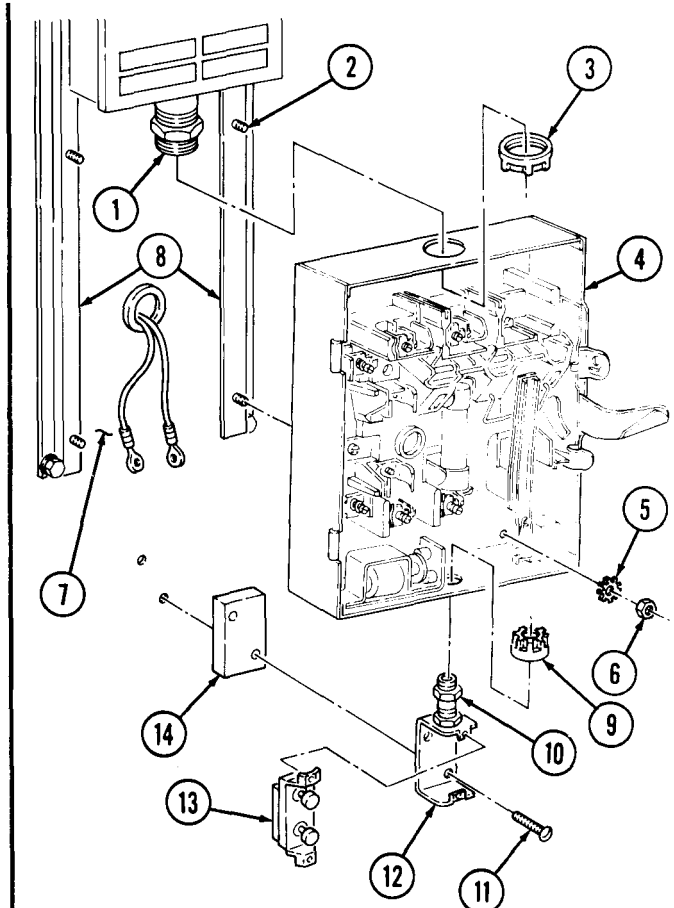
NOTE

Perform steps 3 through 7 on M185A3 vehicles.

3. Install spacer (14), switch bracket (12), and nipple (10) on safety switch box (4) and van body wall (7) with bushing (9) and two screws (11).
4. Install start/stop switch (13) in switch bracket (12).



M109A3



M185A3

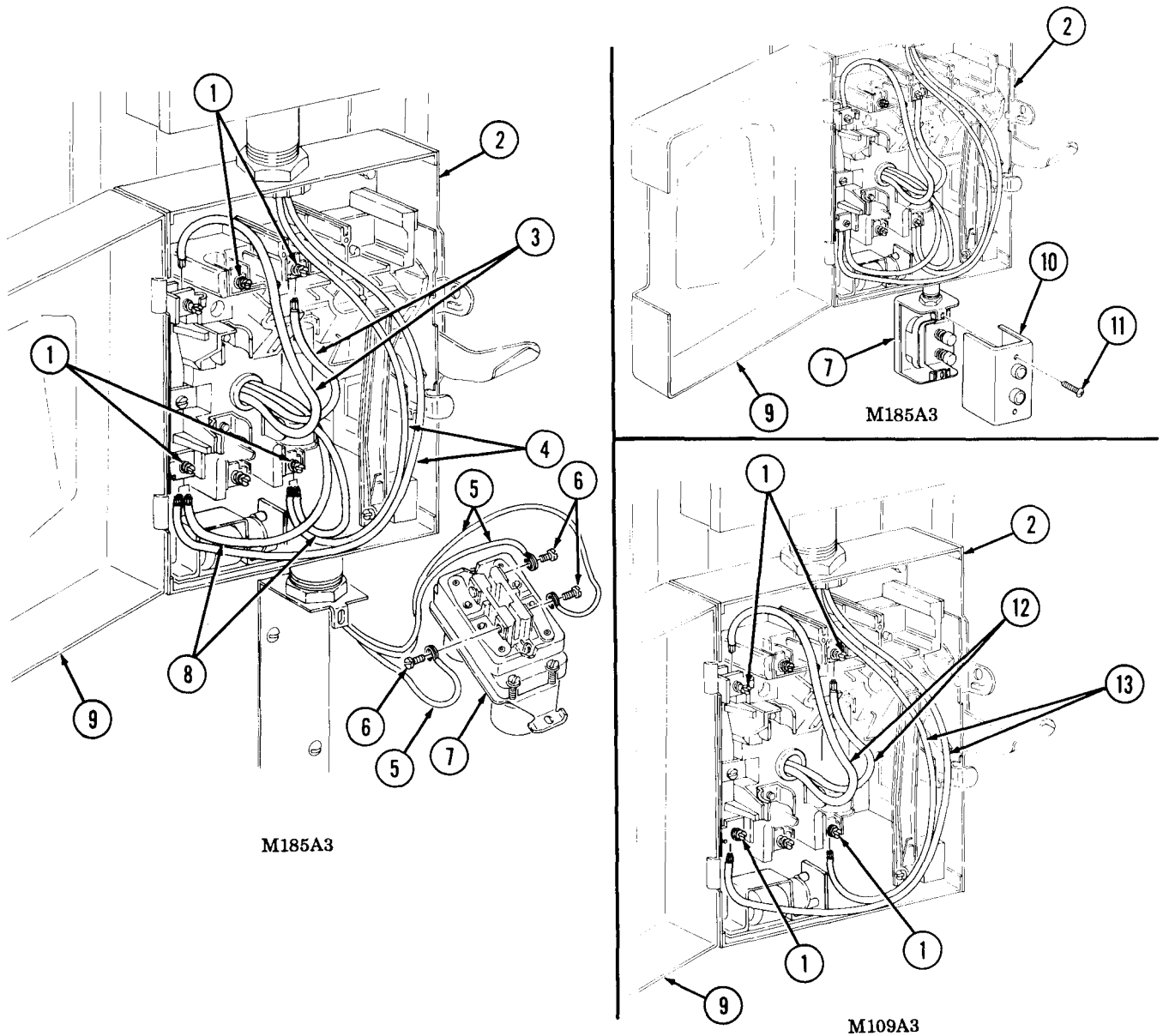
15-27. SAFETY SWITCH BOX REPLACEMENT (Contd)

5. Install two wires (16), wires (17), and wires (21) on safety switch box (4) by tightening four screws (15).
6. Install three wires (18) on start/stop switch (20) with three screws (19).
7. Install cover (23) on start/stop switch (20) with two screws (24).

NOTE

Perform step 8 on M109A3 vehicles

8. Install two wires (25) and wires (26) on safety switch box (4) by tightening four screws (15).
9. Close cover (22) on safety switch box (4).



- FOLLOW-ON TASKS:
- Connect battery ground cable (TM 9-2320-361-20).
 - Place safety switch in ON position (TM 9-2320-361-10).

15-28. CIRCUIT BREAKER HARNESS REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

REFERENCES (TM)

TM 9-2320-361-10

TM 9-2320-361-20

TM 9-2320-361-34P

EQUIPMENT CONDITION

• Parking brake set (TM 9-2320-361-10).

• Battery ground cable disconnected

TM 9-2320-361-20

a. Removal

NOTE

Tag wires for installation.

1. Remove harness (3) from receptacle (2).
2. Remove cables (6) and (7) from 24V circuit breaker (11).
3. Remove six screws (5), harness mounting clamps (4), and harness (3) from van body (1).
4. Disconnect cable (7) from battery terminal (8).

NOTE

Perform step 5 if van body heater fuel pump is installed on vehicle.

5. Remove cable (9) from fuel pump (10).

b. Installation

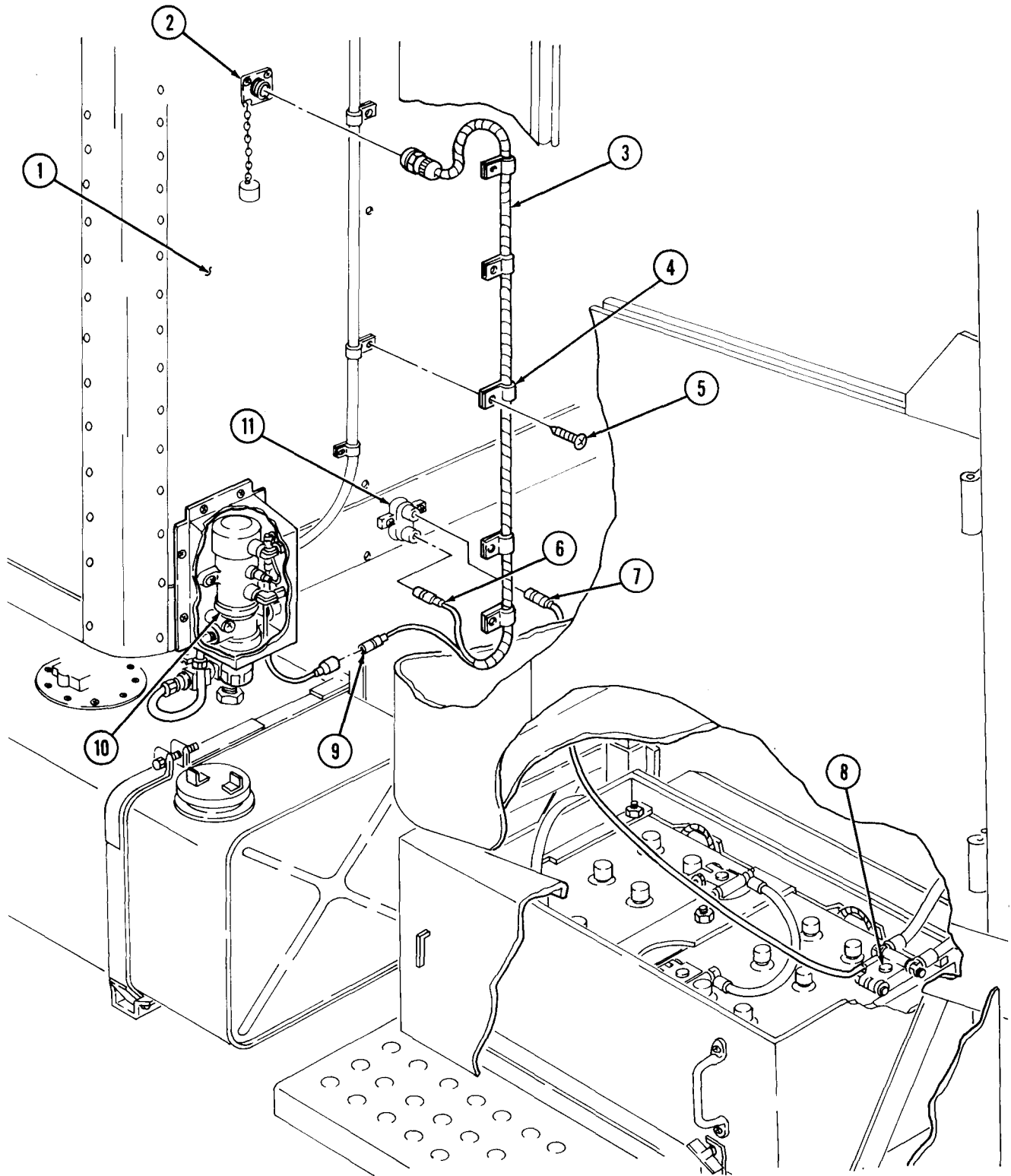
1. Install harness (3) on receptacle (2).
2. Install cables (6) and (7) on 24V circuit breaker (11).
3. Install six harness mounting clamps (4) and harness (3) on van body (1) with six screws (5).
4. Connect cable (7) to battery terminal (8).

NOTE

Perform step 5 if van body heater fuel pump is installed on vehicle.

5. Connect cable (9) to fuel pump (10).

15-28. CIRCUIT BREAKER HARNESS REPLACEMENT(Contd)



FOLLOW-ON TASK: Connect battery ground cable (TM 9-2320-361-20).

15-29. FRONT WINDOW SASH MAINTENANCE

THIS TASK COVERS:

- a. Removal**
- b. Inspection and Repair**

- c. Installation**

INITIAL SETUP

APPLICABLE MODELS
M185A3 and M109A3

TOOLS
General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS
Eighteen screw-assembled lockwashers
(Appendix F, Item 161)
Eight screw-assembled lockwashers
(Appendix F, Item 160)

REFERENCES (TM)
TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION
• Parking brake set (TM 9-2320-361-10).
• Canvas cab cover removed (if installed)
(TM 9-2320-361-20).

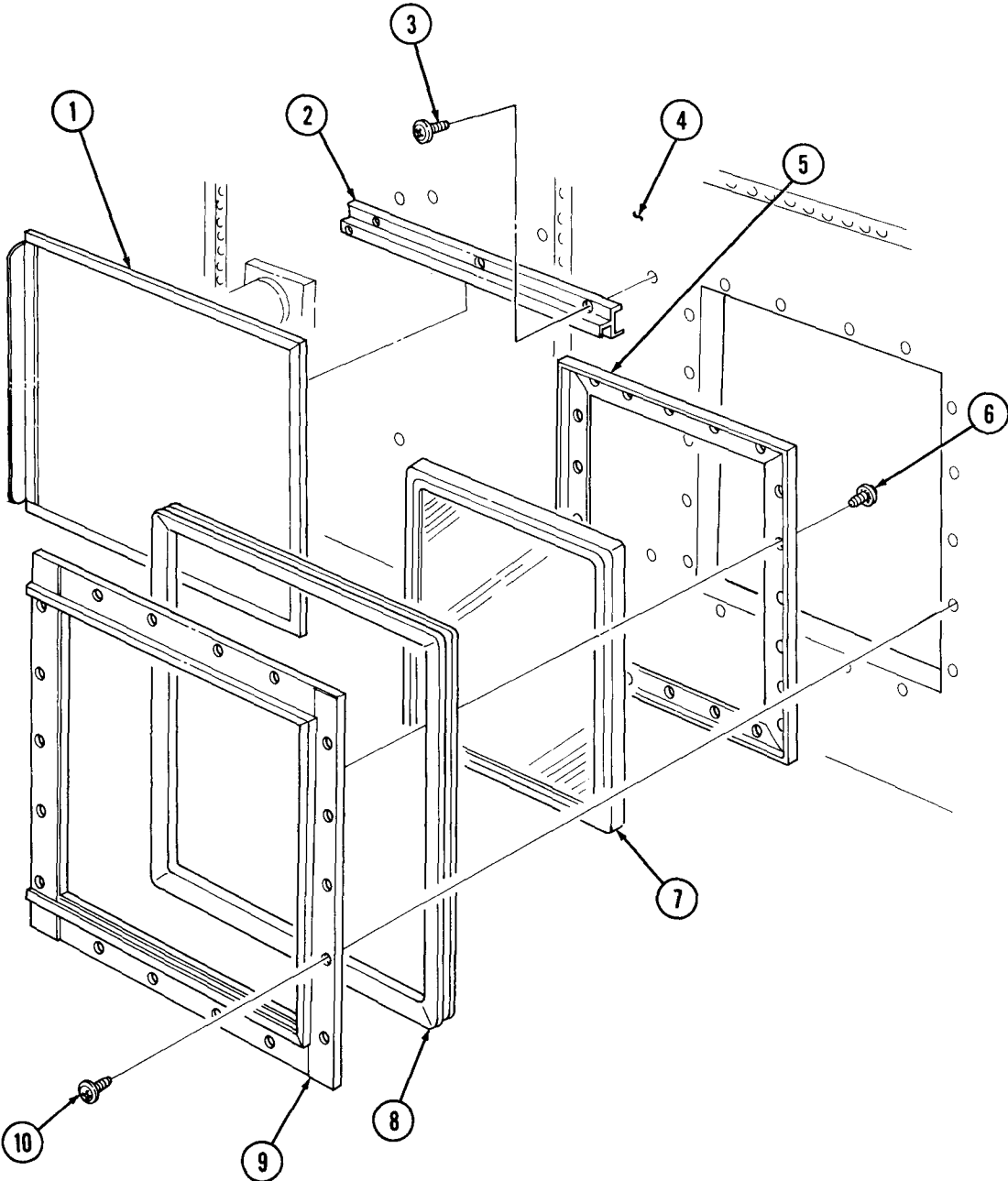
a. Removal

1. Slide blackout panel (1) open and remove eight screw-assembled lockwashers (3) and upper and lower guides (2), with blackout panel (1) attached, from van body wall (4). Discard screw-assembled lockwashers (3).
2. Remove eighteen screw-assembled lockwashers (10) and sash frames (5) and (9) from van body wall (4). Discard screw-assembled lockwashers (10).
3. Remove twenty-two screws (6), sash frame (5), weatherstrip (8), and window glass (7) from sash frame (9).

b. Inspection and Repair

1. Inspect blackout panel (1), guides (2), and sash frames (5) and (9) for bends, dents, and tears. Replace blackout panel (1), guide(s) (2), and sash frame(s) (5) and (9) if bent, dented, or torn.
 2. Inspect window glass (7) for cracks. Inspect weatherstrip (8) for tears and wear. Replace cracked window glass (7) and torn or worn weatherstrip (8).
-
1. Install weatherstrip (8) on window glass (7).
 2. Install window glass (7) between sash frames (5) and (9) with twenty-two screws (6).
 3. Install sash frames (5) and (9) on van body wall (4) with eighteen new screw-assembled lockwashers (10).
 4. Install upper and lower guides (2) with blackout panel (1) on van body wall (4) with eight new screw-assembled lockwashers (3).

15-29. FRONT WINDOW SASH MAINTENANCE (Contd)



FOLLOW-ON TASK: Install canvas cab cover (if removed) (TM 9-2320-361-20)

15-30. SIDE WINDOW SASH MAINTENANCE

THIS TASK COVERS:

- a. Removal**
- b. Inspection and Repair**

- c. Installation**

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

REFERENCES (TM)

TM 9-2320-361-10

TM 9-2320-361-34P

TOOLS

General mechanic's tool kit (Appendix B, Item 1)

Riveting tool (Appendix B, Item 20)

EQUIPMENT CONDITION

Parking brake set (TM 9-2320-361-10).

MATERIALS/PARTS

Eighteen screw-assembled lockwashers

(Appendix F, Item 162)

Tool screw-assembled lockwashers

(Appendix F, Item 163)

Rivet (Appendix F, Item 211)

Six screw-assembled lockwashers

(Appendix F, Item 164)

1. Remove lever ring (9), eighteen screw-assembled lockwashers (10), and screen (8) from sash frames (1) and (4). Discard screw-assembled lockwashers (10).

NOTE

Pull down blackout panel from outside van body.

2. Remove ten screw-assembled lockwashers (14), two guides (15), and blackout panel (16) from van body wall (6). Discard screw-assembled lockwashers (14).
3. Remove six screw-assembled lockwashers (12) and hinge (13) horn van body wall (6). Discard screw-assembled lockwashers (12).
4. Remove twenty-two screws (11), sash frames (1) and (4), weatherstrip (2), and window glass (3) from van body wall (6).
5. Drill rivet (5) out of arm (7) and remove arm (7) from sash frame (4). Discard rivet (5).

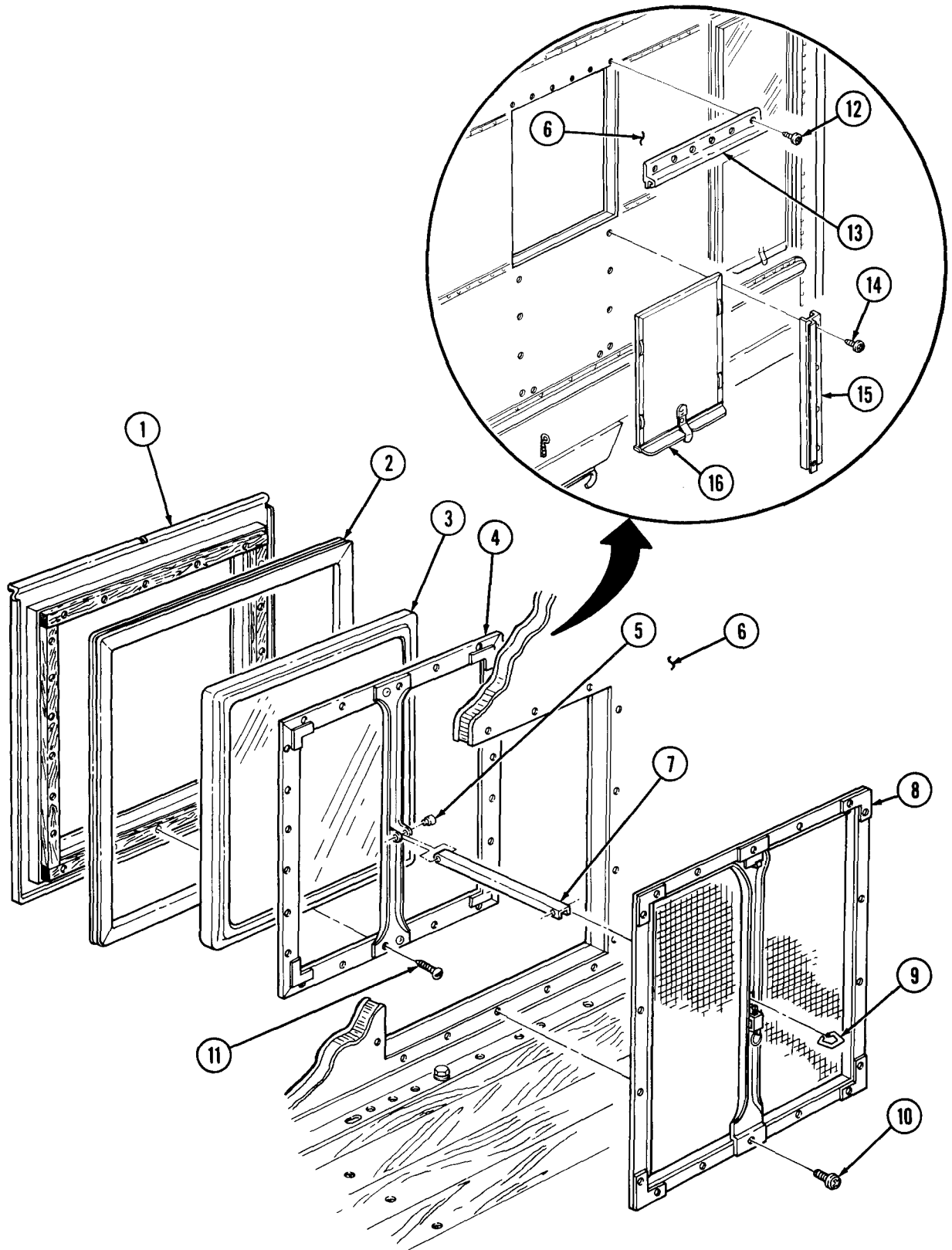
b. Inspection and Repair

Inspect screen (8), blackout panel (16), two guides (15), and window glass (3) for holes, bends, dents, or cracks. Repair screen (8) by patching. Replace cracked window glass (3). Replace blackout panel (16) or guide(s) (15) if bent, dented, or cracked.

c. Installation

1. Install arm (7) on sash frame (4) with new rivet (5).
2. Install weatherstrip (2) on window glass (3).
3. Install window glass (3) and sash frame (4) on sash frame (1) with twenty-two screws (11).
4. Install hinge (13) on van body wall (6) with six new screw-assembled lockwashers (12).
5. Install two guides (15) and blackout panel (16) on van body wall (6) with ten new screw-assembled lockwashers (14).
6. Install screen (8) on sash frames (1) and (4) with eighteen new screw-assembled lockwashers (10).
7. Install lever ring (9) on arm (7).

15-30. SIDE WINDOW SASH MAINTENANCE (Contd)



15-31. ACCESS DOOR REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS
M185A3 and M109A3

TOOLS

General mechanic's tool kit (Appendix B, Item 1)
Riveting tool (Appendix B, Item 20)

MATERIALS/PARTS

Five rivets (Appendix F, Item 211)
Five plugs (Appendix F, Item 202)

REFERENCES (TM)

TM 9-2320-361-34P

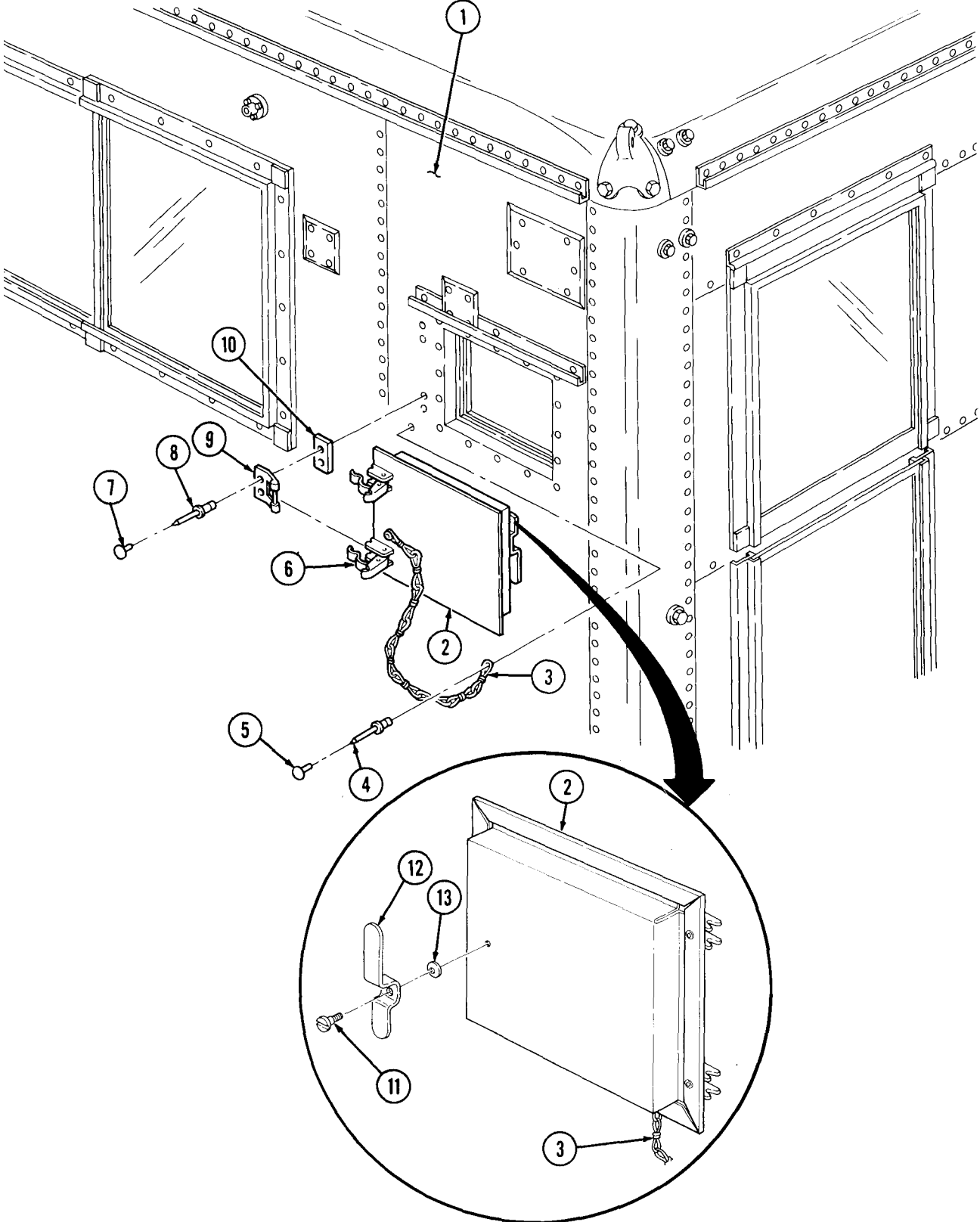
a. Removal

1. Open access door (2).
2. Drill plug (5) and rivet (4) out of van wall (1) and chain (3). Discard plug (5) and rivet (4).
3. Unfasten two hinges (6) from two latch locks (9).
4. Remove access door (2) from van wall (1).
5. Drill out four plugs (7) and rivets (8) from van wall (1) and latch locks (9). Discard plugs (7) and rivets (8).
6. Remove two latch locks (9) and spacers (10) from van wall (1).
7. Remove screw (11), handle (12), and washer (13) from access door (2).

b. Installation

1. Install washer (13) and handle (12) on access door (2) with screw (11).
2. Install two spacers (10) and latch locks (9) on van wall (1) with four new rivets (8) and new plugs (7).
3. Position access door (2) on van wall (1).
4. Fasten two hinges (6) on two latch locks (9).
5. Install new rivet (4) and new plug (5) through chain (3) and on van wall (1).
6. Close access door (2).

15-31. ACCESS DOOR REPLACEMENT (Contd)



15-32. ACCESS PLATE, ACCESS COVER, AND RETAINER ASSEMBLY REPLACEMENT

THIS TASK COVERS:

- | | |
|--|---|
| <ul style="list-style-type: none"> a. Access Plate Removal b. Access Plate Installation c. Access Cover Removal | <ul style="list-style-type: none"> d. Access Cover Installation e. Retainer Assembly Removal f. Retainer Assembly Installation |
|--|---|

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Eighteen screw-assembled lockwashers
(Appendix F, Item 167)
Six screw-assembled lockwashers
(Appendix F, Item 166)
Four screw-assembled lockwashers
(Appendix F, Item 165)

REFERENCES (TM)

TM 9-2320-361-34P

NOTE

All access plates and covers are removed and installed basically the same.

a. Access Plate Removal

Remove four screw-assembled lockwashers (2) and access plate (3) from van wall (4). Discard screw-assembled lockwashers (2).

b. Access Plate Installation

Install access plate (3) on van wall (4) with four new screw-assembled lockwashers (2).

c. Access Cover Removal

Remove six screw-assembled lockwashers (1) and access cover (10) from van wall (4). Discard screw-assembled lockwashers (1).

d. Access Cover Installation

Install access cover (10) on van wall (4) with six new screw-assembled lockwashers (1).

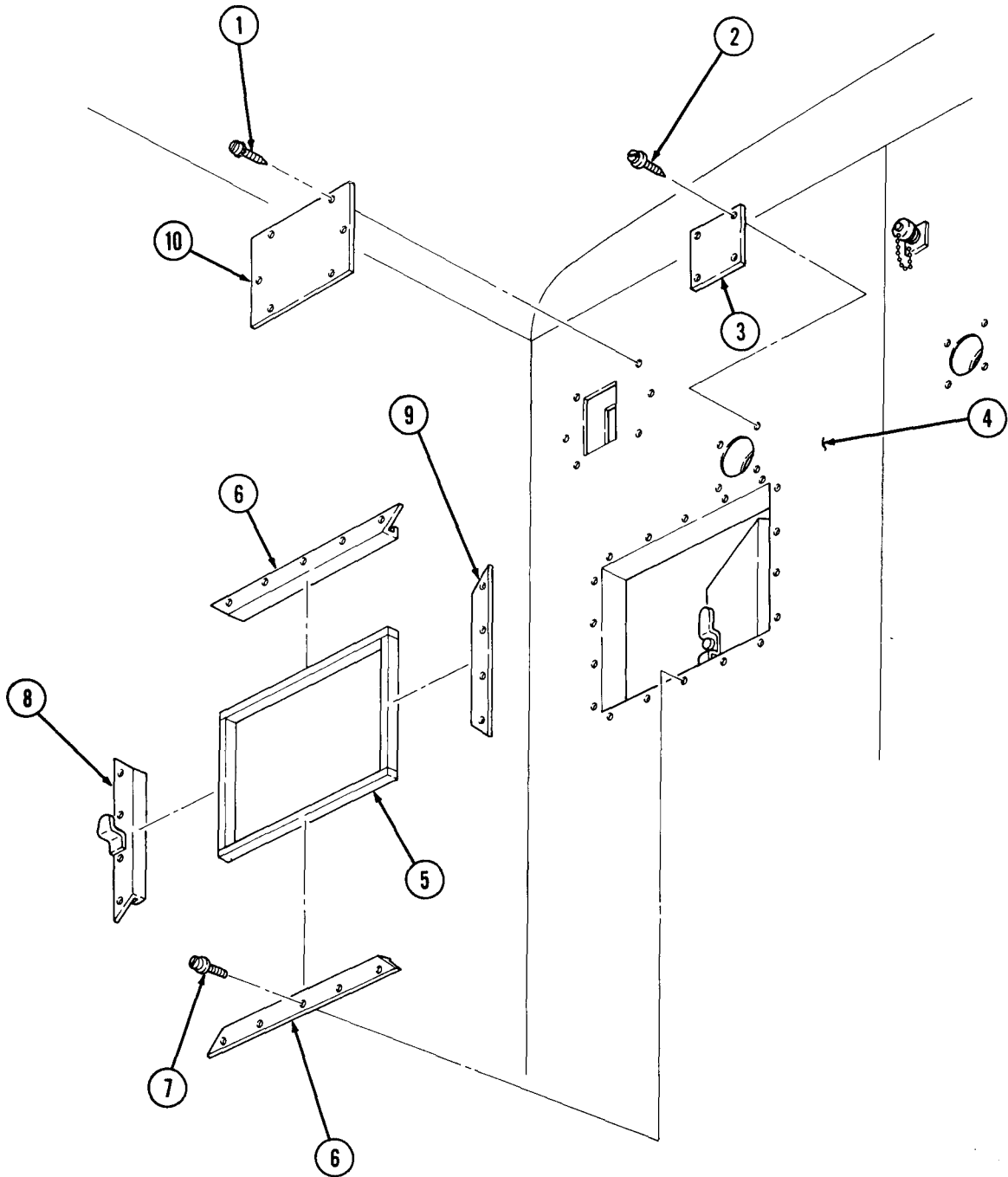
e. Retainer Assembly Removal

1. Remove ten screw-assembled lockwashers (7) and two retainers (6) from van wall (4). Discard screw-assembled lockwashers (7).
2. Remove four screw-assembled lockwashers (7) and retainer (9) from van wall (4). Discard screw-assembled lockwashers (7).
3. Remove four screw-assembled lockwashers (7), retainer with door catch (8), and weather seal (5) from van wall (4). Discard screw-assembled lockwashers (7).

f. Retainer Assembly Installation

1. Install weather seal (5) and retainer with door catch (8) on van wall (4) with four new screw-assembled lockwashers (7).
2. Install retainer (9) on van wall (4) with four new screw-assembled lockwashers (7).
3. Install two retainers (6) on van wall (4) with ten new screw-assembled lockwashers (7).

15-32. ACCESS PLATE, ACCESS COVER, AND RETAINER ASSEMBLY REPLACEMENT (Contd)



15-33. VAN BODY REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M185A3 and M109A3

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 1-1/8-in. socket, 1/2-in. dr. (Appendix B, Item 10)
 1-1/4-in. socket, 1/2-in. dr. (Appendix B, Item 19)
 Lifting device

MATERIALS/PARTS

Ten locknuts (Appendix F, Item 103)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TM 9-2320-361-10
 TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Battery ground cable disconnected (TM 9-2320-361-20).
- Front and rear splash shields removed (TM 9-2320-361-20).
- Ladders removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- All personnel must stand clear during lifting operations.
- Lifting capacity must exceed weight of van body.

a. Removal

1. Disconnect lead (7) from circuit breaker (2).
2. Remove screw (5) from clamp (6).
3. Remove screw (4) from bond assembly (3).

NOTE

- Perform step 4 if van body is equipped with heater.
- Have drainage container ready to catch fuel.

4. Loosen nut (9) and disconnect fuel line (8) from elbow (1). Allow excess fuel to drain into container.
5. Remove six locknuts (18) and screws (17) from six mounting brackets (16). Discard locknuts (18).

NOTE

Step 6 applies to M109A3 vehicles.

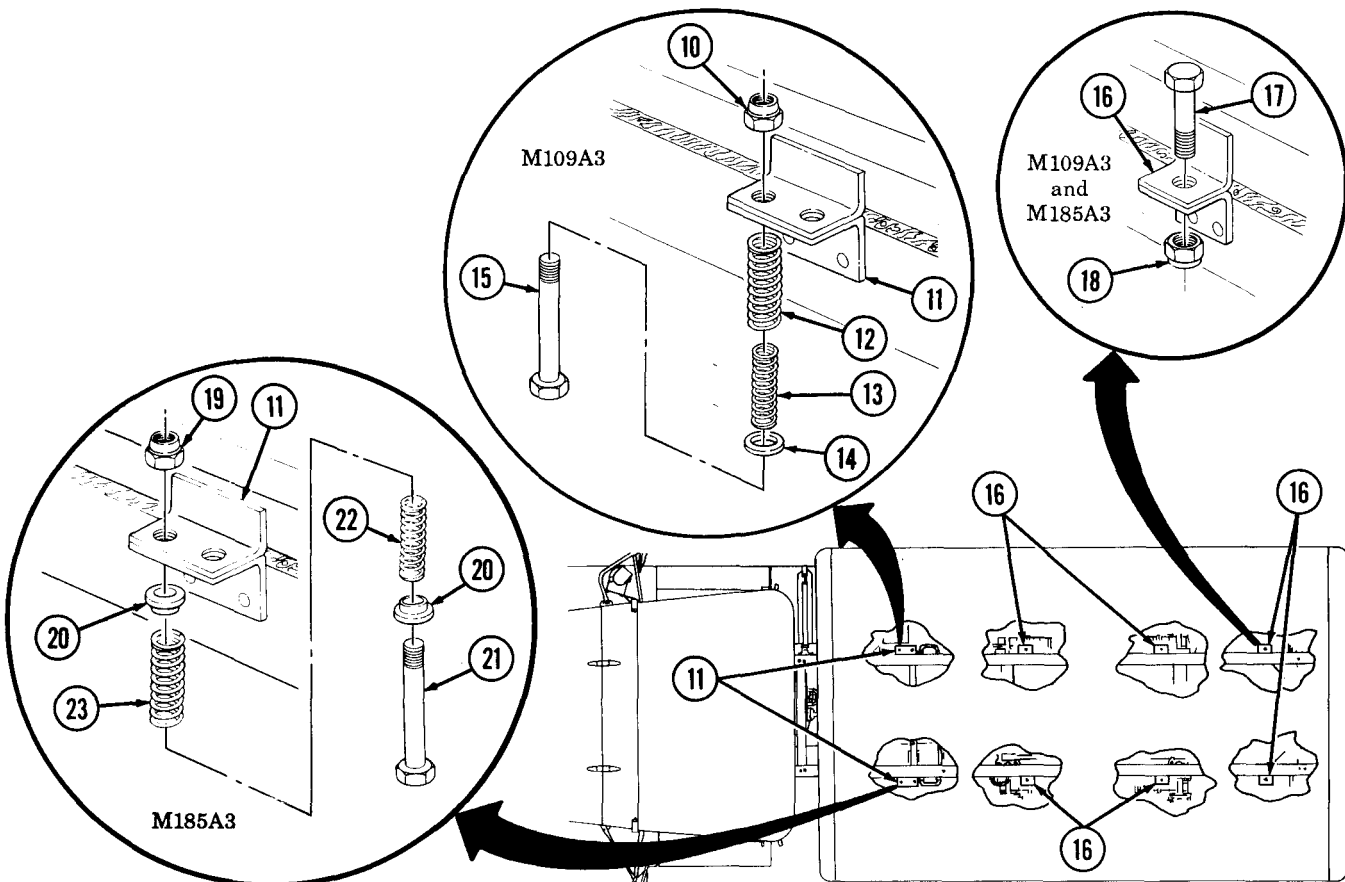
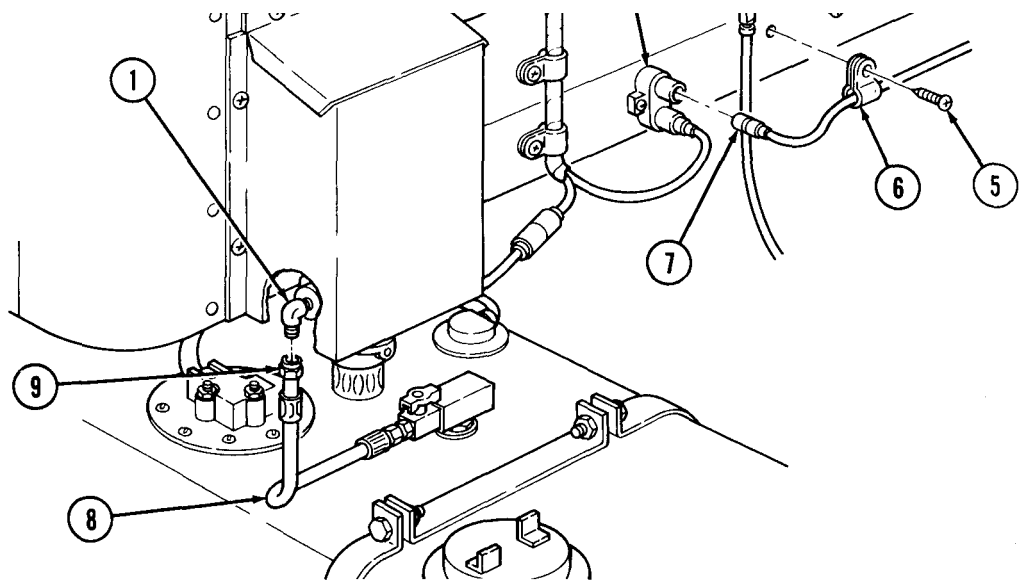
6. Remove four locknuts (10), screws (15), washers (14), and springs (13) and (12) from two mounting brackets (11). Discard locknuts (10).

NOTE

Step 7 applies to M185A3 vehicles.

7. Remove four locknuts (19), screws (21), eight spring keepers (20), four springs (22), and springs (23) from two mounting brackets (11). Discard locknuts (19).

15-33. VAN BODY REPLACEMENT (Contd]



15-33. VAN BODY REPLACEMENT (Contd)

WARNING

Lifting capacity must be greater than weight of van body. Failure to ensure this may result in injury to personnel or damage to equipment.

8. Install chains to four lifting shackles (1) and lifting device.
9. Attach guide lines to van body (2).

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

CAUTION

Support capacity must be greater than weight of van body. Ensure that support capacity is not less than 5,535 lb (2513 kg). Failure to do this may result in damage to equipment.

NOTE

Assistant will help with lifting operations.

10. Remove van body (2) and frame sills (4) from chassis (3) and lower van body (2) onto wooden supports.
11. Remove lifting device, chains, and guide lines from van body (2).

b. Installation

WARNING

Lifting capacity must be greater than weight of van body. Failure to ensure this may result in injury to personnel or damage to equipment.

1. Install chains to four lifting shackles (1) and lifting device.
2. Attach guide lines to van body (2).

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

3. Install two frame sills (4) and van body (2) on chassis (3).

NOTE

Step 4 applies to M185A3 vehicles.

4. Install eight spring keepers (10), four springs (13), springs (12), screws (11), and new locknuts (9) on two mounting brackets (5).

NOTE

Step 5 applies to M109A3 vehicles.

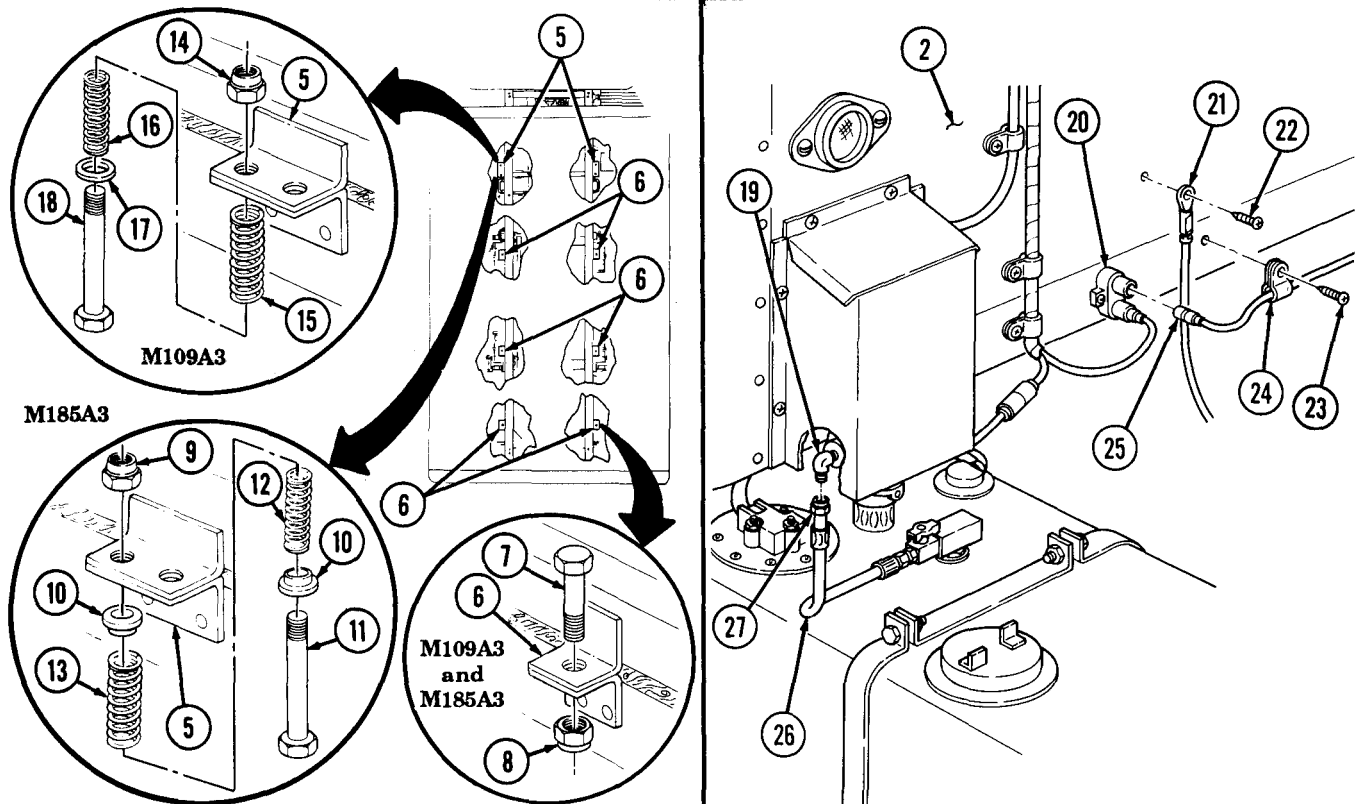
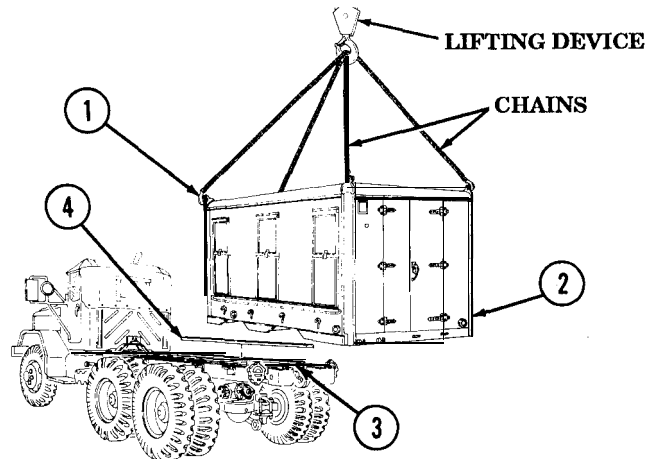
5. Install four springs (15), springs (16), washers (17), screws (18), and new locknuts (14) on two mounting brackets (5).
6. Install six screws (7) and new locknuts (8) on six mounting brackets (6).
7. Remove lifting device, chains, and guide lines from van body (2).

15-33. VAN BODY REPLACEMENT (Contd)

NOTE

Perform step 8 if van body is equipped with heater.

8. Connect fuel line (26) to elbow (19) by tightening nut (27).
9. Install bond assembly (21) on van body (2) with screw (22).
10. Install clamp (24) on van body (2) with screw (23).
11. Connect lead (25) to circuit breaker (20).



- FOLLOW-ON TASKS:
- Install ladders (TM 9-2320-361-20).
 - Install front and rear splash shields (TM 9-2320-361-20).
 - Connect battery ground cable (TM 9-2320-361-20).

Section V. EARTH BORING AND POLESETTING BODIES MAINTENANCE

15-34. EARTH BORING AND POLESETTIG BODIES MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
15-35.	Earth Boring Machine Replacement	15-122
15-36.	Integral Derrick Maintenance	15-126
15-37.	Derrick Sheave Maintenance	15-128
15-38.	Boring Case Maintenance	15-130
15-39.	Horizontal Leveling Worm Gear Maintenance	15-146
15-40.	Vertical Leveling Worm Gear Maintenance	15-152
15-41.	Power Leveler Maintenance	15-158
15-42.	Intermediate Case Maintenance	15-166
15-43.	Main Drive Idler Gear Maintenance	15-182
15-44.	Brake, Feed, and Drive Clutch Maintenance	15-186
15-45.	Hydraulic Pump Replacement	15-202
15-46.	Outrigger Control Valve Replacement	15-204
15-47.	Outrigger Leg Maintenance	15-206
15-48.	Hydraulic Cylinder Repair	15-210
15-49.	Earth Boring and Polesetting Body Maintenance	15-212

15-35. EARTH BORING MACHINE REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Lifting device

MATERIALS/PARTS

Four locknuts (Appendix F, Item 98)
Four lockwashers (Appendix F, Item 141)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

- .Parking brake set (TM 9-2320-361-10).
- Earth boring machine seat and backrest removed (TM 9-2320-361-20).
- Hydraulic pump universal joints removed (TM 9-2320-361-20).
- Integral derrick removed (para. 15-36).
- Auger rack bar removed (para. 15-38).

GENERAL SAFETY INSTRUCTIONS

- All personnel must stand clear during lifting operations.
- Ensure lifting capacity is greater than weight of earth boring machine.

15-35. EARTH BORING MACHINE REPLACEMENT (Contd)

NOTE

For proper balance of earth boring machine, boring case must be in vertical position during removal and installation.

a. Removal

1. Remove four locknuts (6), screws (8), and shaft flange (5) from clutch drive flange (7). Discard locknuts (6).
2. Install chain on earth boring machine (1) and attach chain to lifting device. Apply tension to chain.
3. Remove four screws (4) and lockwashers (3) from earth boring machine (1) and body (2). Discard lockwashers (3).

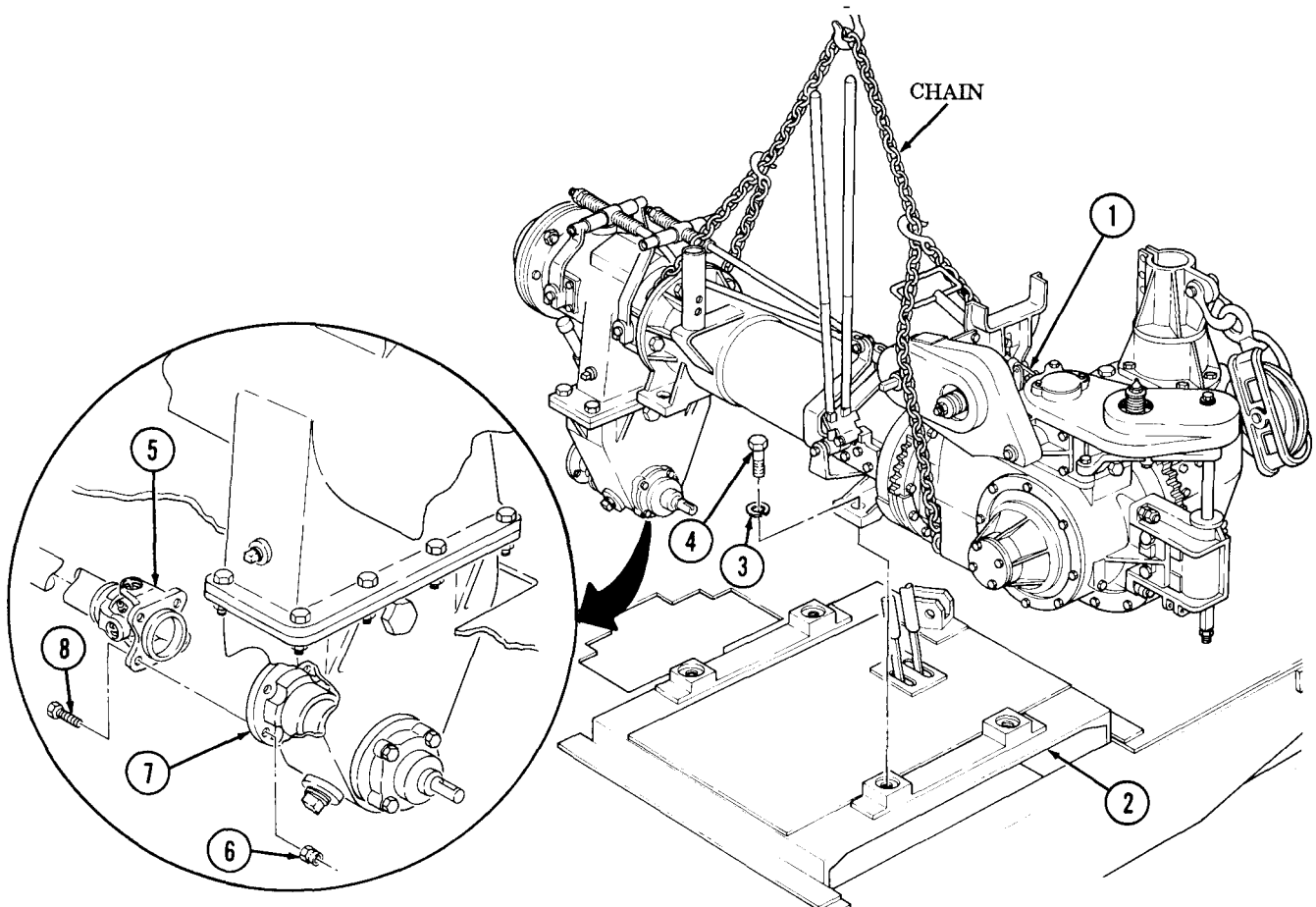
WARNING

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
- Earth boring machine is heavy. Ensure lifting capacity is greater than weight of earth boring machine. Failure to do so may result in damage to equipment or injury to personnel.

NOTE

Assistant will help with lifting operations.

4. Remove earth boring machine (1) from body (2) and place on wooden supports.
5. Remove lifting device and chain from earth boring machine (1).



15-35. EARTH BORING MACHINE REPLACEMENT (Contd)

b. Installation

1. Install chain on earth boring machine (1) and attach lifting device to chain.

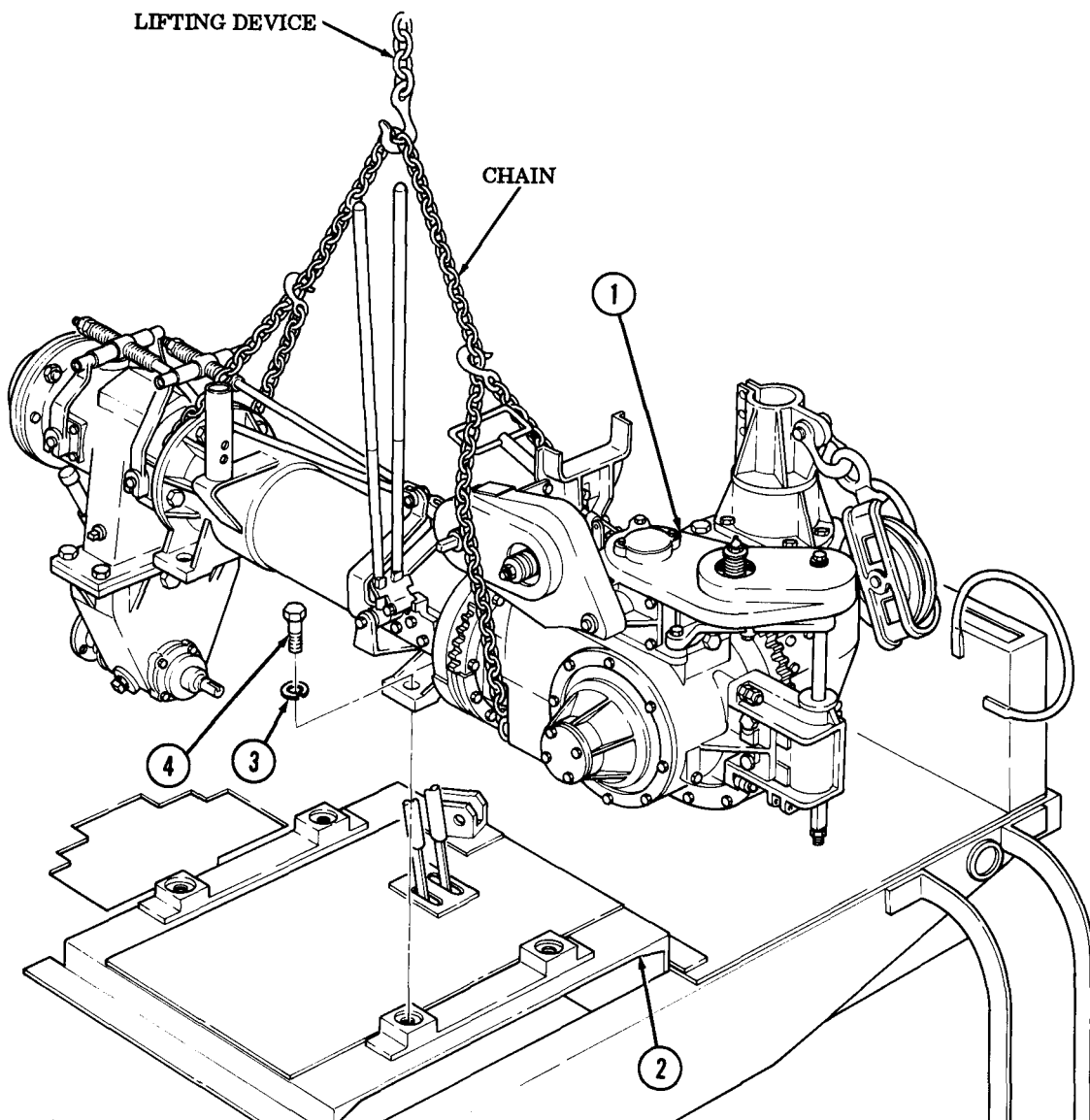
WARNING

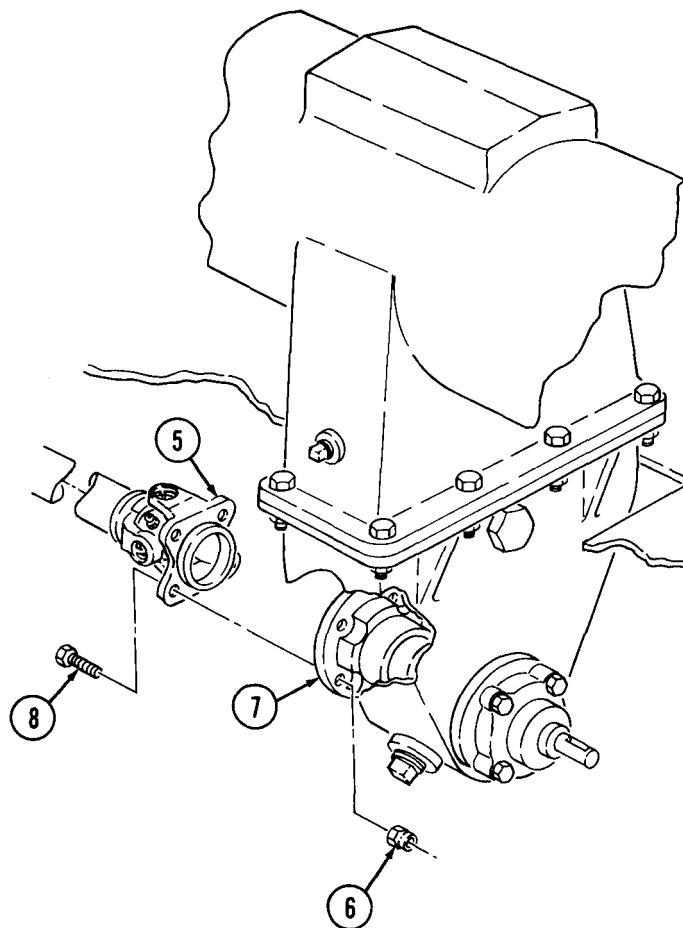
All personnel must stand clear during lifting operations.
A snapped chain, shifting or swinging load may cause injury to personnel.

NOTE

Assistant will help with lifting operations.

2. Install earth boring machine (1) on body (2) with four screws (4) and new lockwashers (3).
3. Remove lifting device and chain from earth boring machine (1).
4. Install shaft flange (5) on clutch drive flange (7) with four screws (8) and new locknuts (6).



15-35. EARTH BORING MACHINE REPLACEMENT (Contd)

- FOLLOW-ON TASKS:**
- Install auger rack bar (para. 15-38).
 - Install integral derrick (para. 15-36).
 - Install hydraulic pump universal joints (TM 9-2320-361-20).
 - Install earth boring machine seat and backrest (TM 9-2320-361-20).

15-36. INTEGRAL DERRICK MAINTENANCE

THIS TASK COVERS:

- a. Removal**
- b. Inspection**

c. Installation

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

GAA grease (Appendix C, Item 8)
Three locknuts (Appendix F, Item 105)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TM 9-2320-361-10
TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Outrigger arms lowered (TM 9-2320-361-10).
- Derrick sheave removed (para. 15-37).

GENERAL SAFETY INSTRUCTIONS

- Do not lower derrick below horizontal position.
- Derrick tube is heavy. Provide adequate support when removing or installing derrick tube.

WARNING

- During removal and installation, only two teeth of worm leveling gear support derrick in horizontal position. Do not lower derrick below horizontal or derrick may fall and cause injury or death to personnel.
- Derrick tube is heavy. Provide adequate support for derrick tube during removal and installation over rack bar. Failure to do so may result in injury or death to personnel.

NOTE

Before removal of derrick, ensure there is 20 ft (6 m) clearance to the right of vehicle and 6 ft (2 m) clearance to the left of the vehicle.

a. Removal

1. Lower derrick (7) to near horizontal and manually turn horizontal leveling worm gearshift (1) until derrick (7) is horizontal (TM 9-2320-361-10). Worm gear (10) will hold two teeth of worm wheel (9).

CAUTION

Do not feed rack bar more than 6 ft (2 m) from bottom of boring case while in horizontal position. Weight of rack bar may cause damage to pinions in boring gearcase.

2. Feed auger rack bar (8) 5 ft (1.5 m) out of derrick (7) (TM 9-2320-361-10).

NOTE

Assistant will help with step 3.

3. Loosen three locknuts (4) and screws (3) and remove derrick tube bar (5) from base (2) and auger rack bar (8). Discard locknuts (4).

15-36. INTEGRAL DERRICK MAINTENANCE (Contd)

b. Inspection

Inspect derrick tube (5) for bends, breaks, cracks, or flat spots. Straighten minor bends. Replace if derrick tube (5) is badly bent, broken, or cracked.

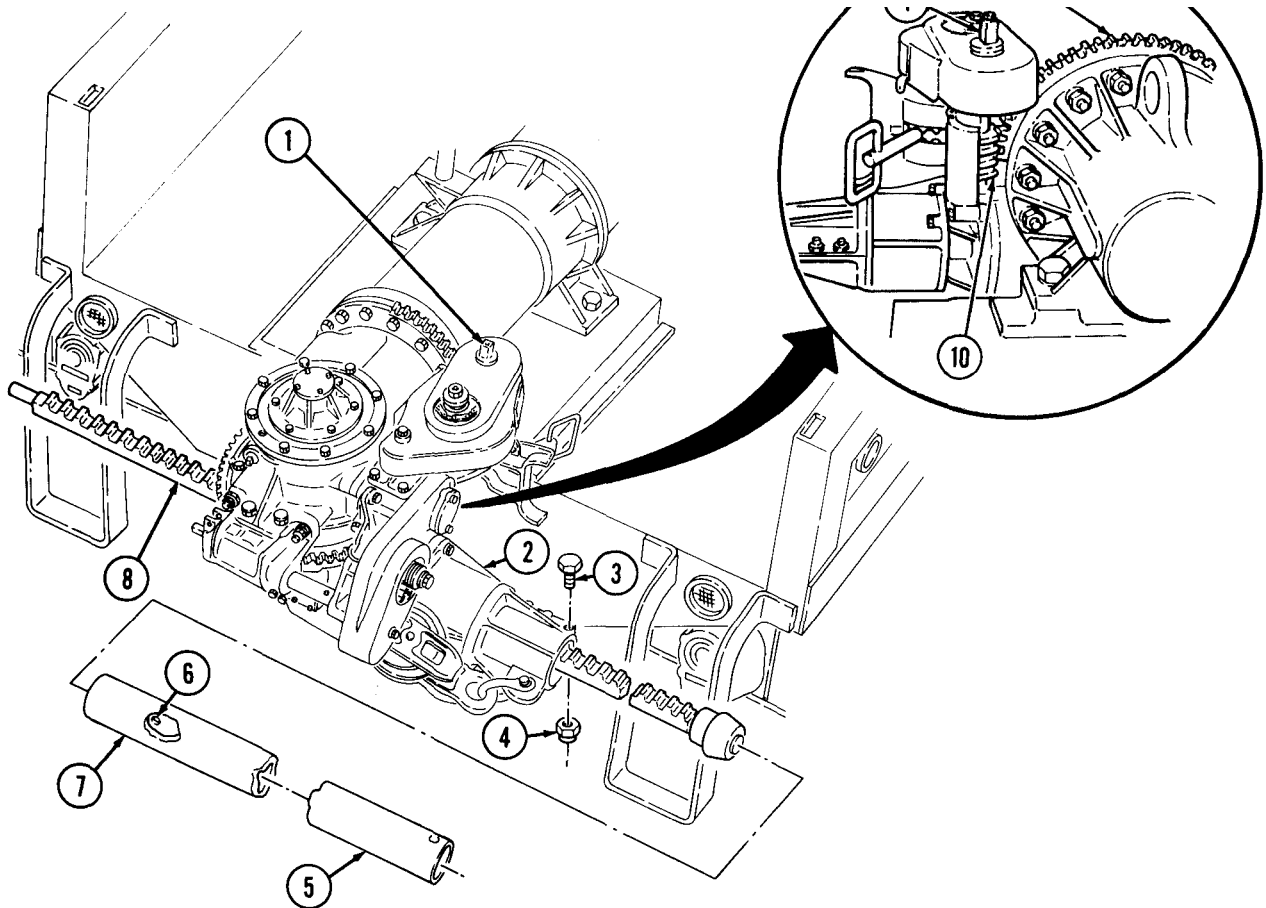
c. Installation

1. Apply a coat of GAA grease inside base (2).

NOTE

Assistant will help with steps 2 and 3.

2. Slide derrick tube (5) over auger rack bar (8) and into base (2).
3. Aline sighting hole (6) to face three screws (3). Tighten screws (3) and new locknuts (4) on base (2).
4. Retract auger rack bar (8) into derrick tube (5) (TM 9-2320-361-10).
5. Return derrick (7) to resting position (TM 9-2320-361-10).



FOLLOW-ON TASKS: . Install derrick sheave (para. 15-37).
 • Install earth boring machine seat and backrest (TM 9-2320-361-20).

15-37. DERRICK SHEAVE MAINTENANCE

THIS TASK COVERS:

- | | |
|-----------------------------------|------------------------|
| a. Removal | d. Assembly |
| b. Disassembly | e. Installation |
| c. Cleaning and Inspection | |

INITIAL SETUPAPPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Outside micrometer (Appendix B, Item 17)

MATERIALS/PARTS

Lockwasher (Appendix F, Item 141)
Two locknuts (Appendix F, Item 108)
Graphite grease (Appendix C, Item 9)

REFERENCES (TM)

TM 9-237
TM 9-2320-361-10
TM 9-2320-361-34P

EQUIPMENT CONDITION

Parking brake set (TM 9-2320-361-10).

a. Removal

Loosen two screws (11) and remove support block (4) from derrick tube (10).

b. Disassembly

1. Remove nut (6), lockwasher (5), screw (12), and pulley (1) from support block (4). Discard lockwasher (5).
2. Remove bearing sleeve (3) from pulley (1).
3. Remove two locknuts (7), screws (9), and sheave cover (8) from support block (4). Discard locknuts (7).

c. Cleaning and Inspection

1. Clean all parts (para. 2-8).
2. Check support block (4) for cracks and other damage. If cracked, repair support block (4) by welding (TM 9-237). Replace if otherwise damaged.
3. Check pulley (1) for cracks and other damage. Replace pulley (1) if worn or damaged.
4. Check bearing sleeve (3) for nicks, burrs, cracks, and wear. Outside diameter should be no less than 1.475 in. (37.5 mm). Raised metal can be removed with a fine mill file. Replace bearing sleeve (3) if worn or damaged.
5. Check sheave cover (8) for bends and other damage. Straighten if bent. Replace sheave cover (8) if damaged.

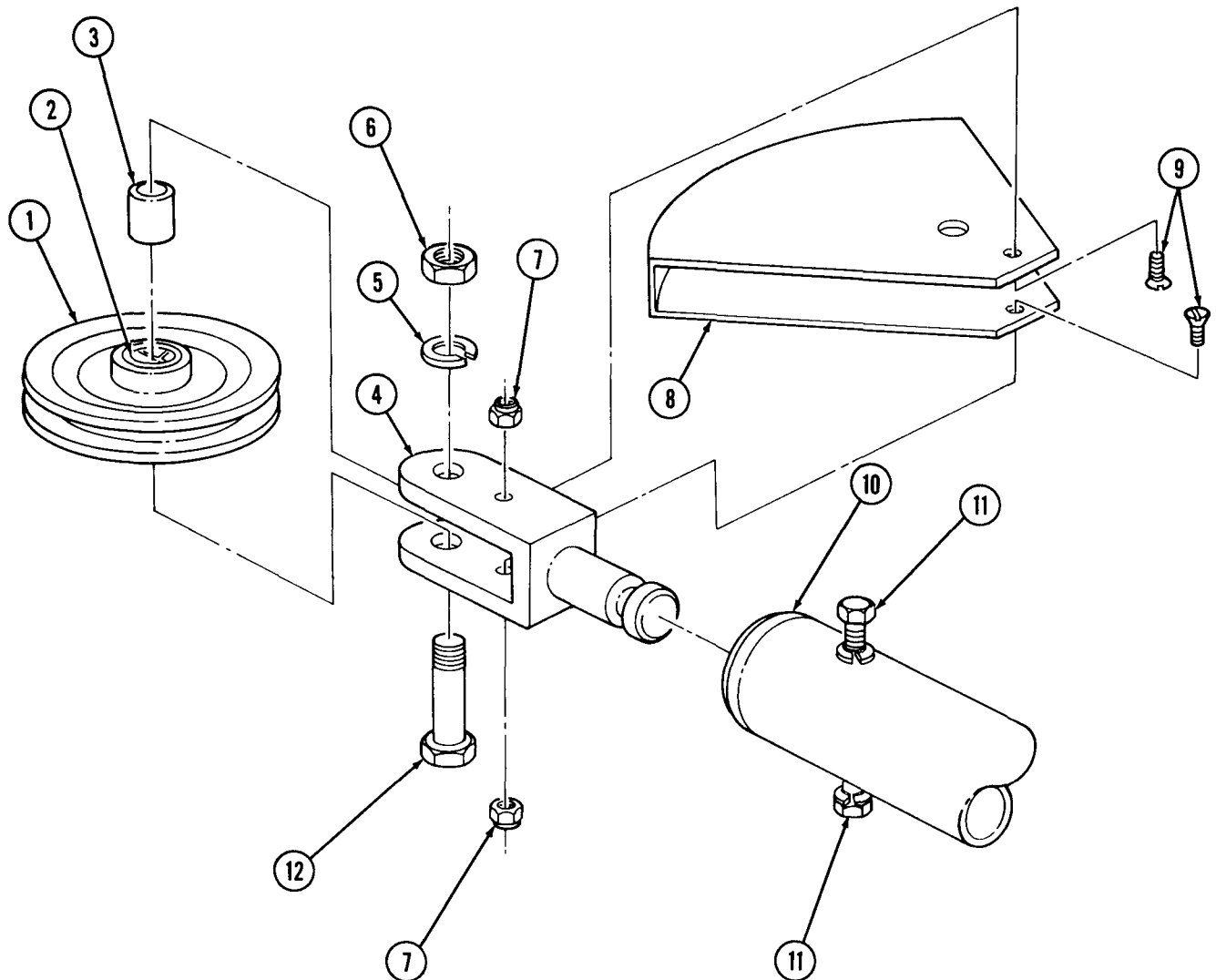
d. Assembly

1. Install sheave cover (8) on support block (4) with two screws (9) and new locknuts (7).
2. Apply graphite grease in bearing (2) and install bearing sleeve (3) in pulley (1).
3. Install pulley (1), screw (12), new lockwasher (5), and nut (6) in support block (4).

e. Installation

Install support block (4) in derrick tube (10) and tighten two screws (11).

15-37. DERRICK SHEAVE MAINTENANCE (Contd)



15-38. BORING CASE MAINTENANCE

THIS TASK COVERS:

- | | |
|--|---|
| <p>a. Auger Rack Bar Removal
 b. Boring Gear and Case Removal
 c. Boring Gear Disassembly
 d. Cleaning, Inspection, and Repair</p> | <p>e. Boring Gear Assembly
 f. Boring Gear and Case Installation
 g. Auger Rack Bar Installation</p> |
|--|---|

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Mechanical puller kit (Appendix B, Item 22)
- Dial indicator (Appendix B, Item 21)
- Inside micrometer (Appendix B, Item 16)
- Outside micrometer (Appendix B, Item 17)
- Two puller screws (Appendix F, Item 216)
- Lifting device
- Two screws (Appendix F, Item 215)
- Two washers (Appendix F, Item 270)

MATERIALS/PARTS

- Shim set, rack carrier bearings (Appendix F, Item 246)
- Shim set, rack feed idler gear bearings (Appendix F, Item 247)
- Shim set, rack drive gear (Appendix F, Item 248)
- Shim set, rack carrier upper nut (Appendix F, Item 245)
- Seal retainer (Appendix F, Item 204)
- Seal (Appendix F, Item 223)
- Two cotter pins (Appendix F, Item 9)
- Twelve lockwashers (Appendix F, Item 140)
- Lockwasher (Appendix F, Item 137)
- Ten lockwashers (Appendix F, Item 127)
- Nine lockwashers (Appendix F, Item 142)

MATERIALS/PARTS (CONTD)

- Lockwasher (Appendix F, Item 150)
- Two felt pads (Appendix F, Item 26)
- GAA grease (Appendix C, Item 8)
- Safety wire (Appendix C, Item 31)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

- LO 9-2320-209-12-1
- TM 9-214
- TM 9-2320-361-10
- TM 9-2320-361-20
- TM 9-2320-361-34P

EQUIPMENT CONDITION

- . Parking brake set (TM 9-2320-361-10).
- Integral derrick removed (para. 15-36).
- Snatch sleeve removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- Ensure auger rack bar is properly balanced on chain during removal and installation.
- All personnel must stand clear during lifting operations.
- Support boring case before removing hardware.
- Ensure lifting capacity is greater than weight of boring gears.

a. Auger Rack Bar Removal

1. Remove six screws (4), lockwashers (3), and derrick tube base (2) from boring case (16). Discard lockwashers (3).
2. Remove setscrew (7), lockwasher (6), retaining pin (5), and auger rack bar guide (8) from auger rack bar (1). Discard lockwasher (6).
3. Install chain on auger rack bar (1). Attach lifting device to chain.

WARNING

Ensure auger rack bar is balanced on chain during removal. Failure to do so may cause auger rack bar to slip from chain, causing injury to personnel or damage to equipment.

NOTE

Assistant will help with step 4.

4. Feed auger rack bar (1) out of boring case (16) until it disengages (TM 9-2320-361-10).

15-38. BORING CASE MAINTENANCE (Contd)

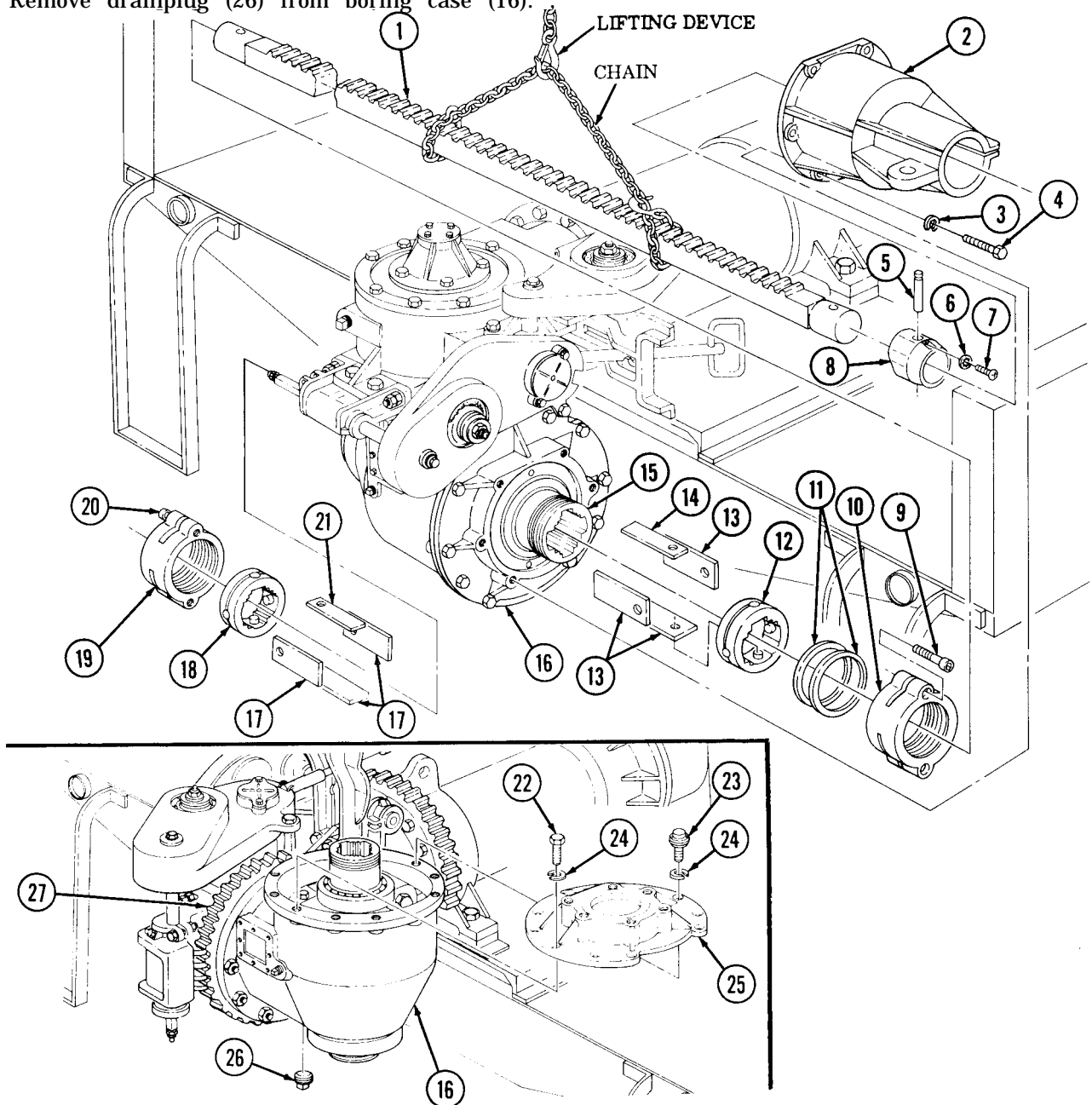
b. Boring Gear and Case Removal

1. Remove two screws (9), rack carrier nut (10), shims (11), thrust plate retainer (12), and thrust plates (13) and (14) from carrier (15). Record thickness of shims (11) and discard.
2. Loosen two screws (20) and remove rack carrier nut (19), thrust plate retainer (18), and thrust plates (17) and (21) from carrier (15).
3. Manually turn horizontal leveling worm gear (27) until boring case (16) is vertical (TM 9-2320-361-10).
4. Remove nine screws (22), circular level (23), ten lockwashers (24), and boring case cover (25) from boring case (16). Discard lockwashers (24)

NOTE

Have drainage container ready to catch oil.

5. Remove drainplug (26) from boring case (16).



15-38. BORING CASE MAINTENANCE (Contd)

6. Install rack carrier nut (1) on rack carrier (2).
7. Install chain on rack carrier nut (1) with two washers and screws.

WARNING

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
- Boring gears are heavy. Ensure lifting capacity is greater than weight of boring gears. Failure to do so may result in injury to personnel or damage to equipment.

NOTE

Assistant will help with step 8.

8. Attach lifting device to chain and remove rack carrier (2) from boring case (3).
9. Remove two screws, washers, and chain from rack carrier nut (1).
10. Remove rack carrier nut (1) from rack carrier (2).

NOTE

Assistant will help with steps 11 through 16.

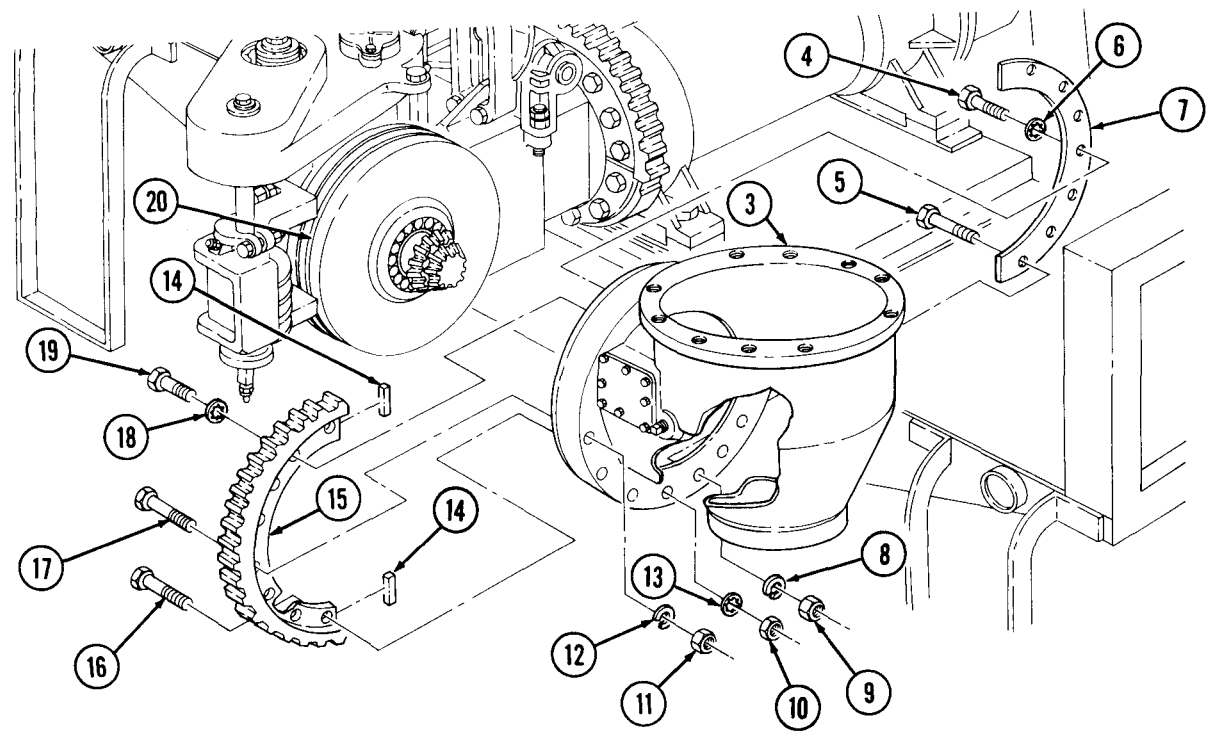
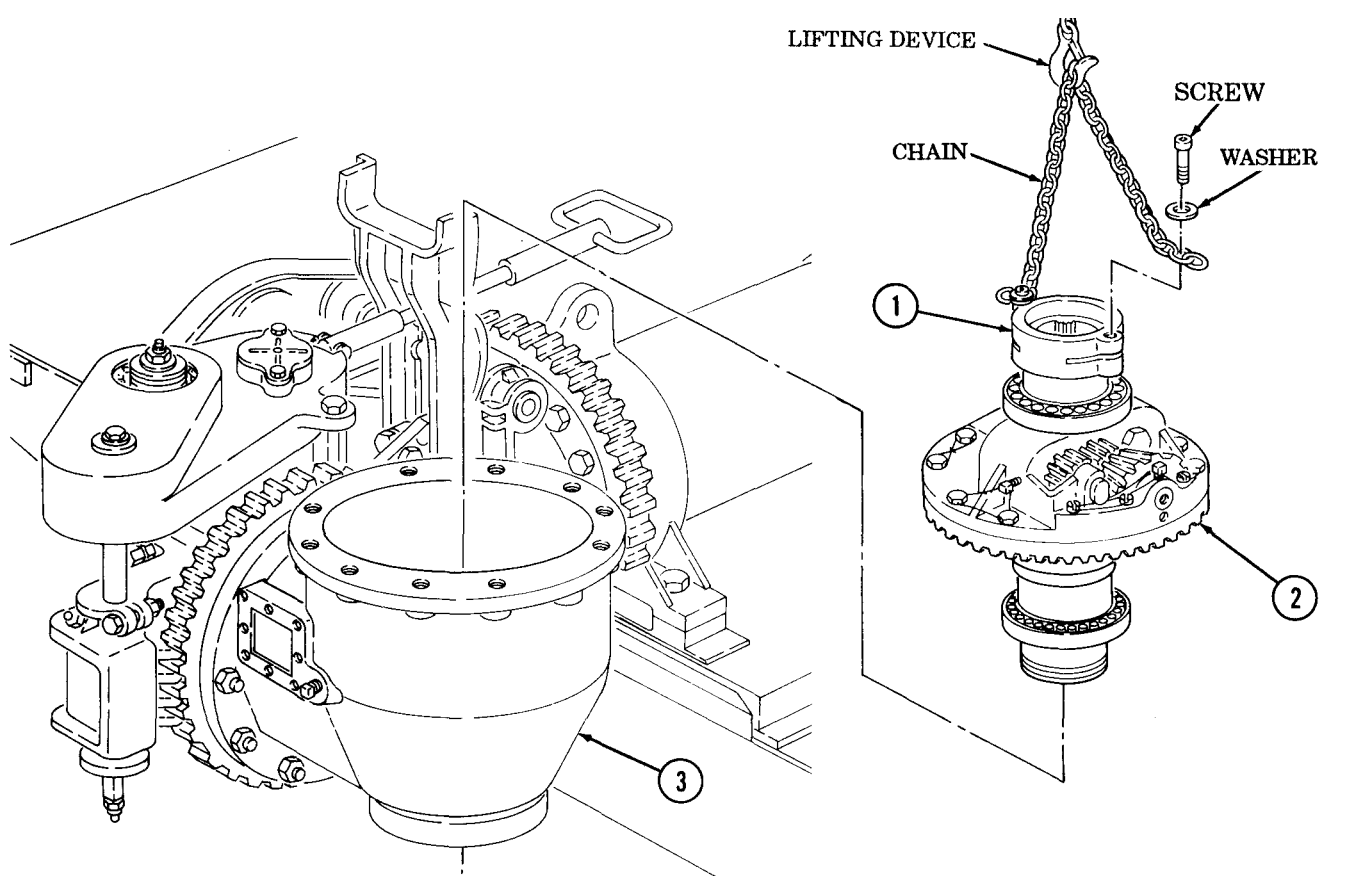
11. Remove three nuts (9), lockwashers (8), and screws (5) from retainer ring (7) and boring case (3). Discard lockwashers (8).
12. Remove four screws (4), lockwashers (6), retainer ring (7), and two felt pads (14) from boring case (3). Discard lockwashers (6) and felt pads (14).
13. Remove jamnut (10), lockwasher (13), and screw (16) from worm gear wheel (15) and boring case (3). Discard lockwasher (13).
14. Remove three nuts (11), lockwashers (12), and screws (17) from worm gear wheel (15) and boring case (3). Discard lockwashers (12).

WARNING

Support boring case before removing hardware. Failure to do so may result in injury to personnel or damage to equipment.

15. Remove four screws (19), lockwashers (18), and worm gear wheel (15) from boring case (3). Discard lockwashers (18).
16. Remove worm gear wheel (15) and boring case (3) from intermediate case (20).

15-38. BORING CASE MAINTENANCE (Contd)

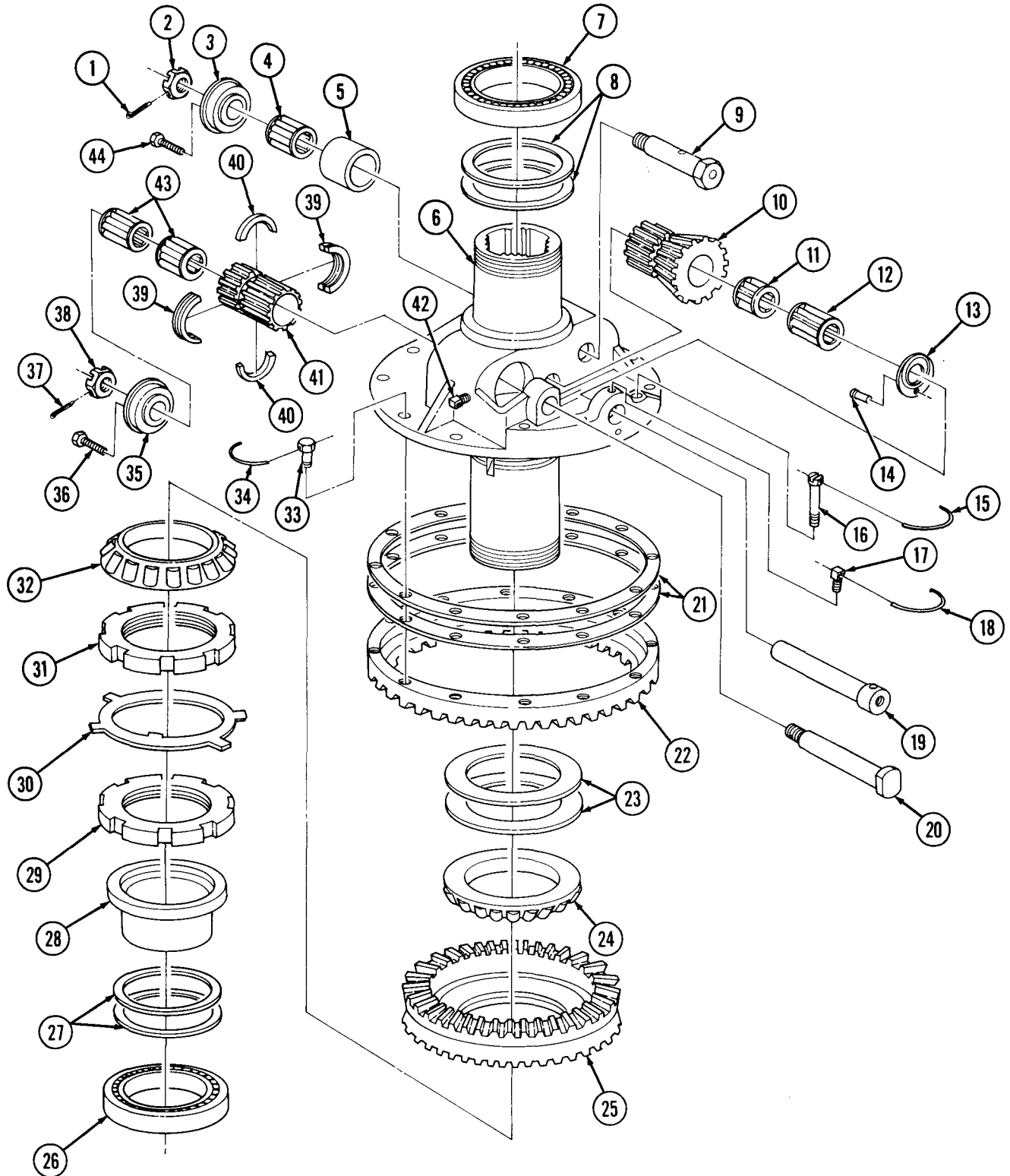


15-38. BORING CASE MAINTENANCE (Contd)

c. Boring Gear Disassembly

1. Remove roller bearing (7) and shims (8) from rack carrier (6). Record thickness of shims (8) and discard.
2. Remove cotter pin (1) and nut (2) from thrust roller shaft (9). Discard cotter pin (1).
3. Install two puller screws (44) in thrust bearing (3) and remove thrust bearing (3) from rack carrier (6).
4. Remove two puller screws (44) from thrust bearing (3).
5. Remove thrust roller shaft (9), rack thrust roller (5), and roller bearing (4) from rack carrier (6).
6. Remove cotter pin (37) and nut (38) from rack feed gearshaft (20). Discard cotter pin (37).
7. Install two puller screws (36) in thrust bearing (35) and remove thrust bearing (35) from rack carrier (6).
8. Remove two puller screws (36) from thrust bearing (35).
9. Remove safety wire (34) from screw (33) and setscrew (42), and loosen setscrew (42) in rack earner (6). Discard safety wire (34).
10. Remove rack feed gearshaft (20), rack feed gear (41), and two bearings (43) from rack carrier (6).
11. Remove seal retainer (39) and seal (40) from rack feed gear (41). Discard seal retainer (39) and seal (40).
12. Remove safety wire (18) and setscrew (17) from rack carrier (6). Discard safety wire (18).
13. Remove spur pinion shaft (19), spur pinion (10), inner bearing (11), outer bearing (12), thrust washer (13), and retaining pin (14) from rack carrier (6).
14. Remove safety wire (15) and three screws (16) from rack carrier (6). Discard safety wire (15).
15. Remove nine screws (33), rack drive gear (22), and shims (21) from rack carrier (6). Record thickness of shims (21). Discard shims (21) and safety wire (15).
16. Remove roller bearing (26) and shims (27) from rack carrier (6). Record thickness of shims (27) and discard.
17. Remove spacer sleeve (28) from rack carrier (6).
18. Straighten tabs on lockwasher (30) and remove adjusting nut (29), lockwasher (30), and adjusting nut (31) from rack carrier (6). Discard lockwasher (30).
19. Remove roller bearing (32), rack feed idler gear (25), roller bearing (24), and shims (23) from rack carrier (6). Record thickness of shims (23) and discard.

15-38. BORING CASE MAINTENANCE (Contd)



15-38. BORING CASE MAINTENANCE (Contd)

d. Cleaning, Inspection, and Repair

1. For general cleaning instructions, refer to para. 2-8.
2. Inspect rack feed gear (34), spur pinion (12), rack drive gear (24), rack feed idler gear (23), spur pinion shaft (19), rack feed gearshaft (20), thrust roller shaft, (11), and carrier (8) for burrs, chips, cracks, damaged teeth, or splines. Burrs maybe removed with a fine mill file. Replace component if damaged.

NOTE

Rack drive gear, rack feed idler gear, and rack feed spur pinion must each be replaced with associated pinion as a matched set.

3. Inspect thrust plates (9) and (10), rack thrust roller (5), thrust bearings (29) and (3), and thrust washer (15) for wear or other damage. Refer to table 15-4, Boring Case Wear Limits, for measurements. Replace if worn or otherwise damaged.
4. Inspect all bearings for wear or other damage (TM 9-214). Replace bearings if worn or damaged.

Table 15-4. Boring Case Wear Limits.

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		INCHES	MILLIMETERS
5	Rack thrust roller: Inside diameter	1.750-1.753	44.45-44.53
	Outside diameter	3.328-3.330	84.53-84.58
9	Thrust plate (thickness)	0.370-0.376	9.40-9.55
10	Thrust plate (thickness)	0.307-0.313	7.80-7.95
15	Thrust washer (thickness)	0.140-0.145	3.56-3.68
29&3	Thrust bearing (thickness)	0.734-0.765	18.64-19.43

e. Boring Gear Assembly

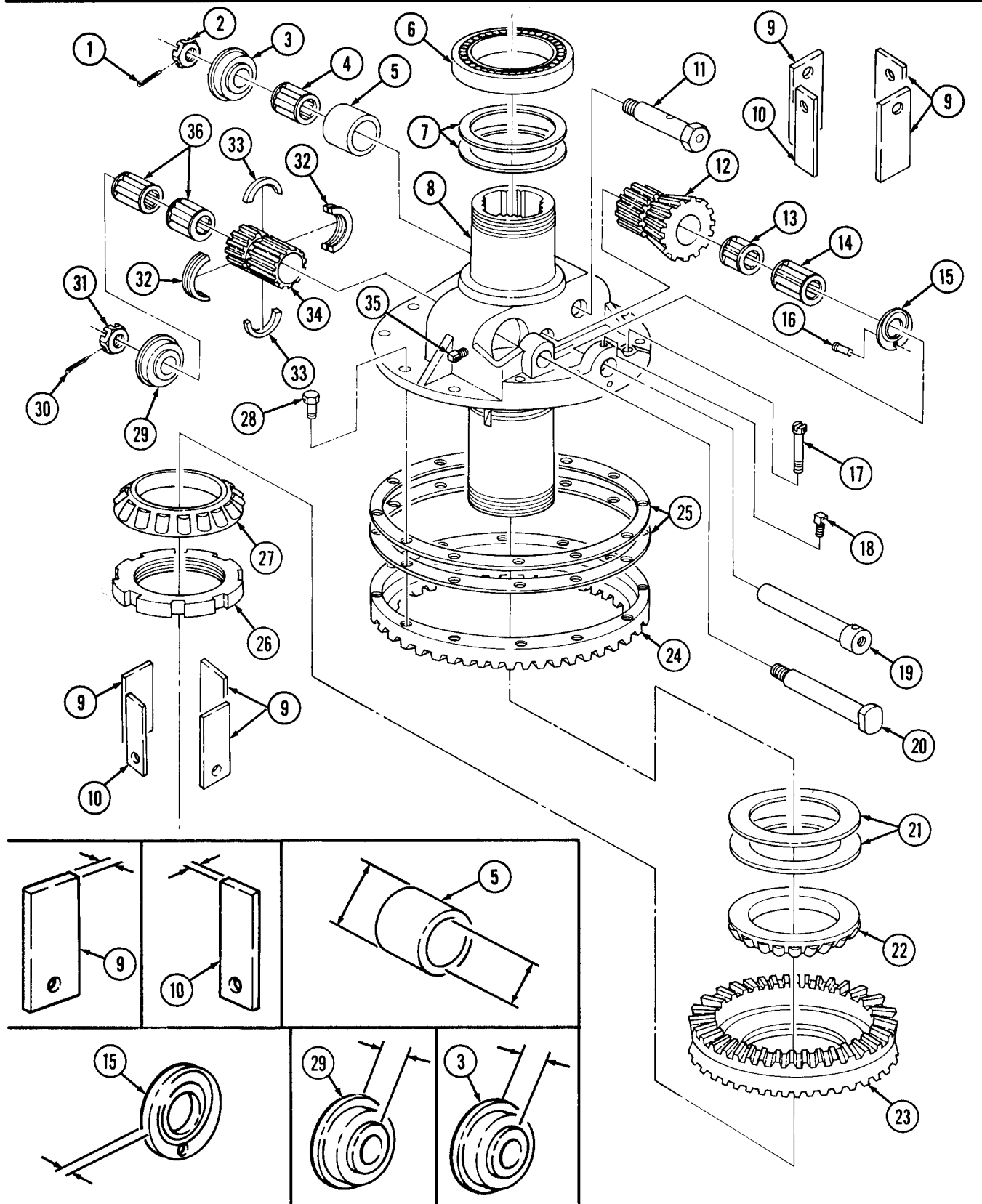
1. Pack inner bearing (13) and outer bearing (14) with GAA grease and install in spur pinion (12).
2. Install thrust washer (15), retaining pin (16), and spur pinion (12) in rack carrier (8) with spur pinion shaft (19) and setscrew (18).
3. Pack two bearings (36) with GAA grease and install on rack feed gear (34).
4. Install new seal (33) and new seal retainer (32) on rack feed gear (34).
5. Install rack feed gear (34) in rack carrier (8) with rack feed gearshaft (20), thrust bearing (29), nut (31), and new cotter pin (30). Tighten setscrew (35).
6. Pack bearing (4) with GAA grease and install in rack thrust roller (5).
7. Install rack thrust roller (5) in rack carrier (8) with thrust roller shaft (11), thrust bearing (3), nut (2), and new cotter pin (1).

NOTE

For steps 8 through 11, new shims must be the same thickness as recorded in removal.

8. Pack roller bearing (6) with GAA grease and install new shims (7) and roller bearing (6) on rack carrier (8).
9. Install new shims (25) and rack drive gear (24) on rack carrier (8) with three screws (17) and nine screws (28).
10. Pack roller bearings (22) and (27) with GAA grease.
11. Install new shims (21), roller bearing (22), rack feed idler gear (23), and roller bearing (27) on rack carrier (8) with adjusting nut (26).
12. Tighten adjusting nut (26) until rack feed idler gear (23) has no in and out play then back off adjusting nut (26) 1/8 turn.

15-38. BORING CASE MAINTENANCE (Contd)



15-38. BORING CASE MAINTENANCE (Contd)

- Place dial indicator against rack feed idler gear (1) and measure backlash between rack feed idler gear (1) and rack feed spur pinion (2).

NOTE

If backlash is 0.006-0.016 in. (0.15-0.41 mm), proceed to step 17. If backlash is outside limits, proceed to step 14.

- Remove bearing adjusting nut (11), roller bearing (12), rack feed idler gear (1), and roller bearing (5) from carrier (3).

NOTE

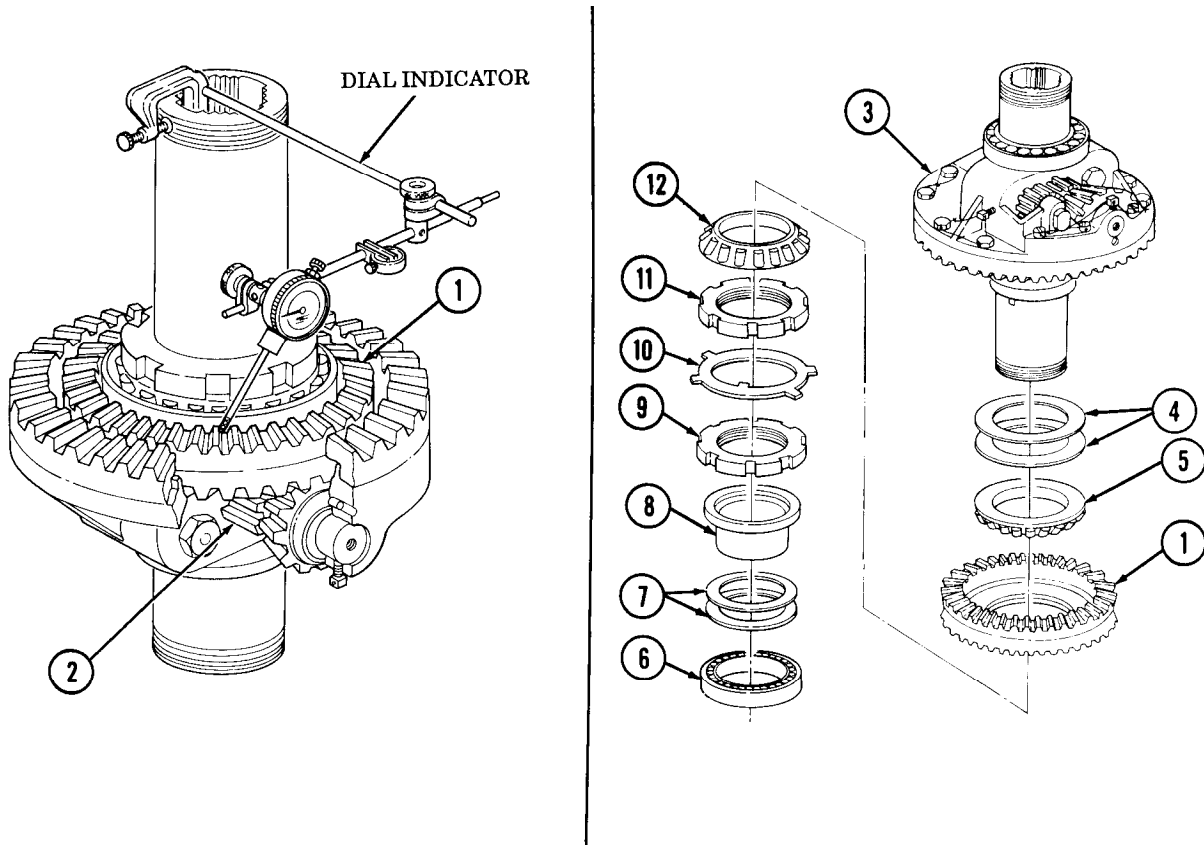
If dial indicator reading is not within limits, add or remove shims as required.

- Install or remove shims (4) as required, and install roller bearing (5), rack feed idler gear (1), roller bearing (12), and bearing adjusting nut (11) on rack carrier (3).
- Tighten bearing adjusting nut (11) until rack feed idler gear (1) has no in and out play, then back off bearing adjusting nut (11) 1/8 turn. Perform step 13.
- Install new lockwasher (10) and bearing adjusting nut (9) on carrier (3). Tighten bearing adjusting nut (9) and bend tabs of new lockwasher (10) against bearing adjusting nuts (11) and (9).
- Install sleeve spacer (8) on rack carrier (3).

NOTE

For step 19, shim must be same thickness as recorded during removal.

- Pack roller bearing (6) with GAA grease and install new shims (7) and roller bearing (6) on carrier (3).



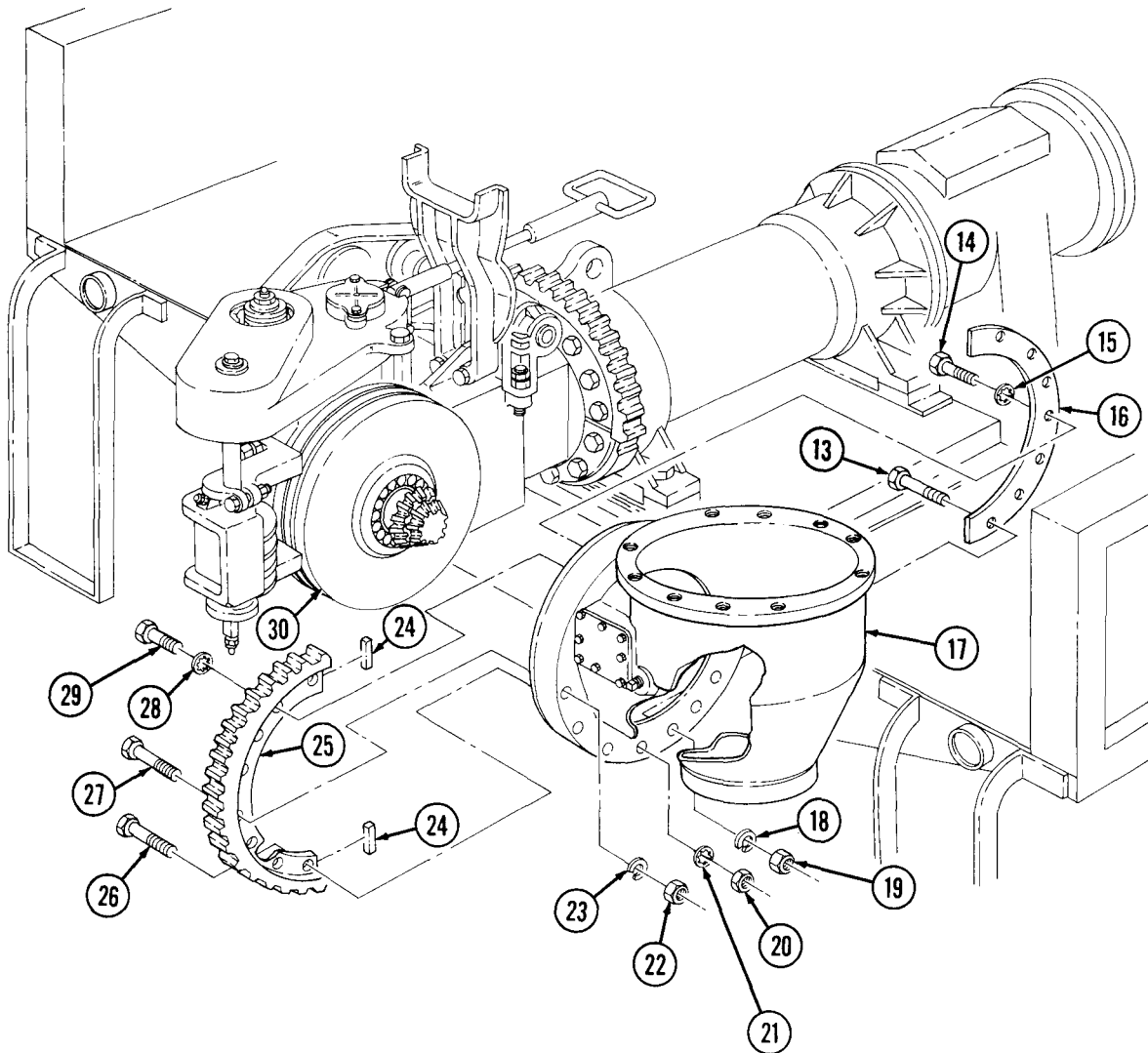
15-38. BORING CASE MAINTENANCE (Contd)

f. Boring Gear and Case Installation

NOTE

Assistant will help with steps 1 and 2.

1. Position worm gear wheel (25) and boring case (17) on intermediate case (30).
2. Install screw (26), new lockwasher (21), and jamnut (20) on boring case (17) and worm gear wheel (25).
3. Install three screws (27), new lockwashers (23), and nuts (22) on boring case (17) and worm gear wheel (25).
4. Install four new lockwashers (28) and screws (29) on boring case (17) and worm gear wheel (25).
5. Install two felt pads (24) and retainer ring (16) on boring case (17) with four new lockwashers (15), screws (14), three screws (13), lockwashers (18), and nuts (19).



15-38. BORING CASE MAINTENANCE (Contd)

6. Install rack carrier nut (1) on rack carrier (2).
7. Install chain on rack carrier nut (1) with two washers and screws.
8. Remove eight screws (7), lockwashers (6), inspection cover (5), and gasket (4) from boring case (3).
Discard lockwashers (6) and gasket (4).

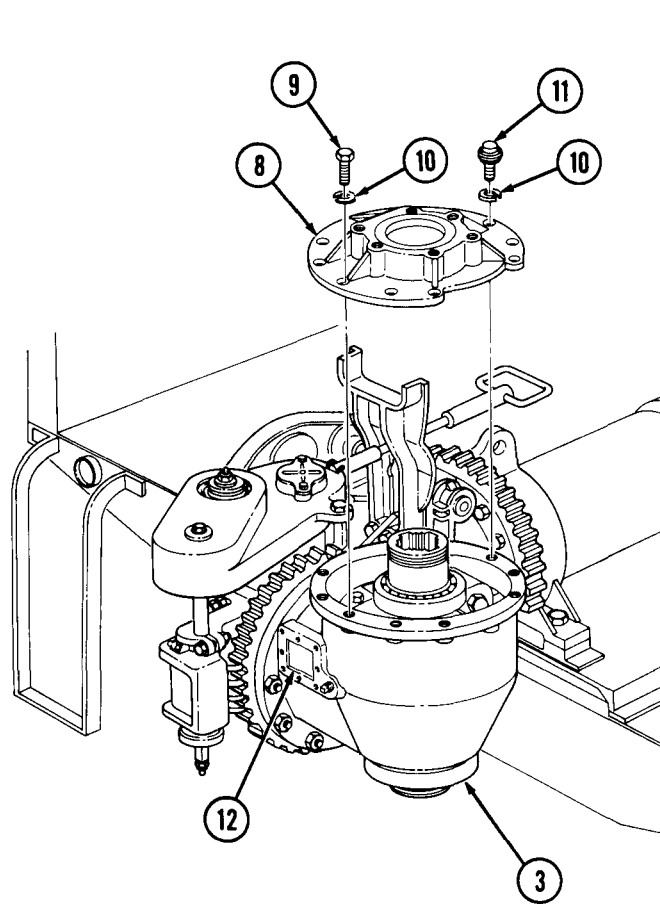
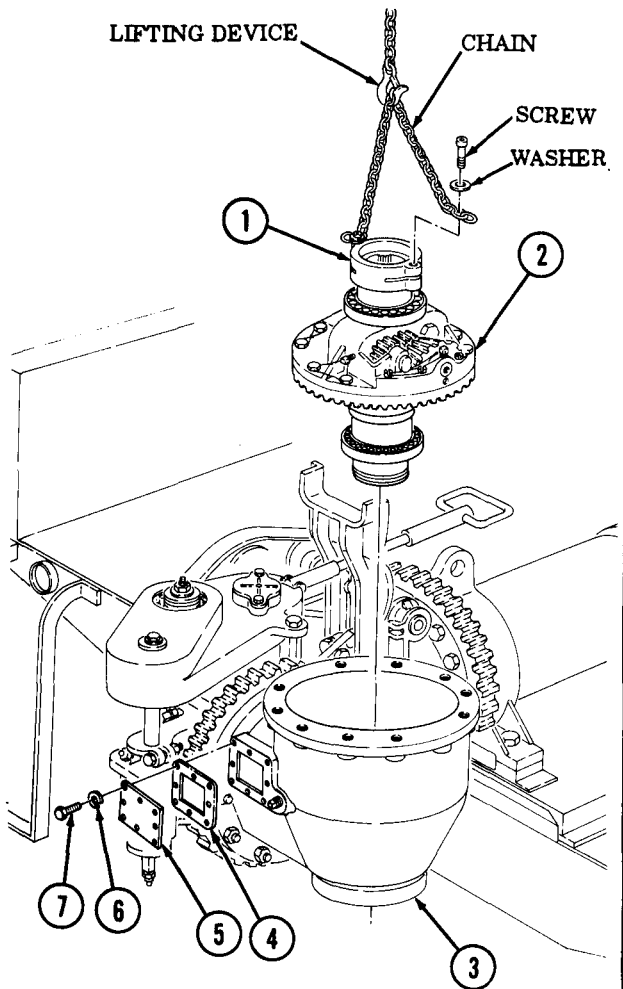
WARNING

All personnel must stand clear during lifting operations.
A swinging or shifting load may cause injury to personnel.

NOTE

Assistant will help with step 9.

9. Attach lifting device to chain and position rack carrier (2) in boring case (3).
10. Remove lifting device, two screws, washers, and chain from rack carrier nut (1).
11. Remove rack carrier nut (1) from rack carrier (2).
12. Install boring case cover (8) on boring case (3) with ten new lockwashers (10), nine screws (9), and circular level (11).
13. Rotate boring case (3) 90 degrees until inspection hole (12) is facing upwards.



15-38. BORING CASE MAINTENANCE (Contd)

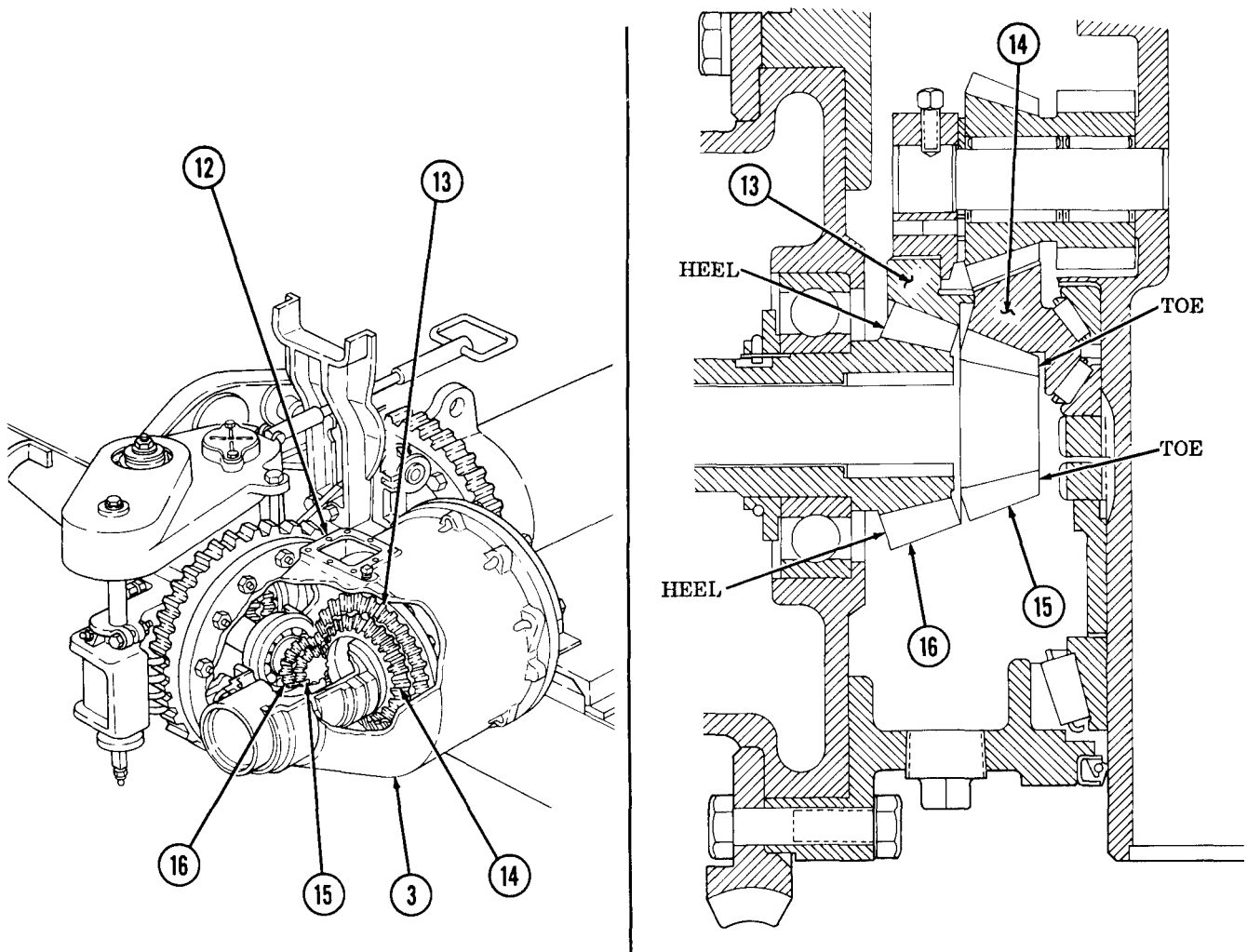
NOTE

Ensure that heel of second reduction drive pinion and toe of second reduction feed pinion are aligned with toe of rack drive gear and rack feed idler gear. If depth of second reduction drive and feed pinions are misaligned, adjust by removing or adding shims (para. 15-42).

14. Working through inspection hole (12), place dial indicator against rack drive gear (13) and measure backlash between rack drive gear (13) and second reduction drive pinion (16). Backlash should be 0.008-0.022 in. (0.20-0.56 mm).
15. Place dial indicator against rack feed idler gear (14) and measure backlash between rack feed idler gear (14) and secondary reduction feed pinion (15). Backlash should be 0.011-0.022 in. (0.28-0.56 mm).

NOTE

- Boring gear must be removed from boring case and disassembled in order to adjust the backlash of rack drive and idler gears. (subtasks a, b, and c).
- If backlash is within limits, proceed to step 20.
- If backlash of rack drive gear is incorrect, perform step 16.
- If backlash of idler gear is incorrect, perform steps 17 and 18.

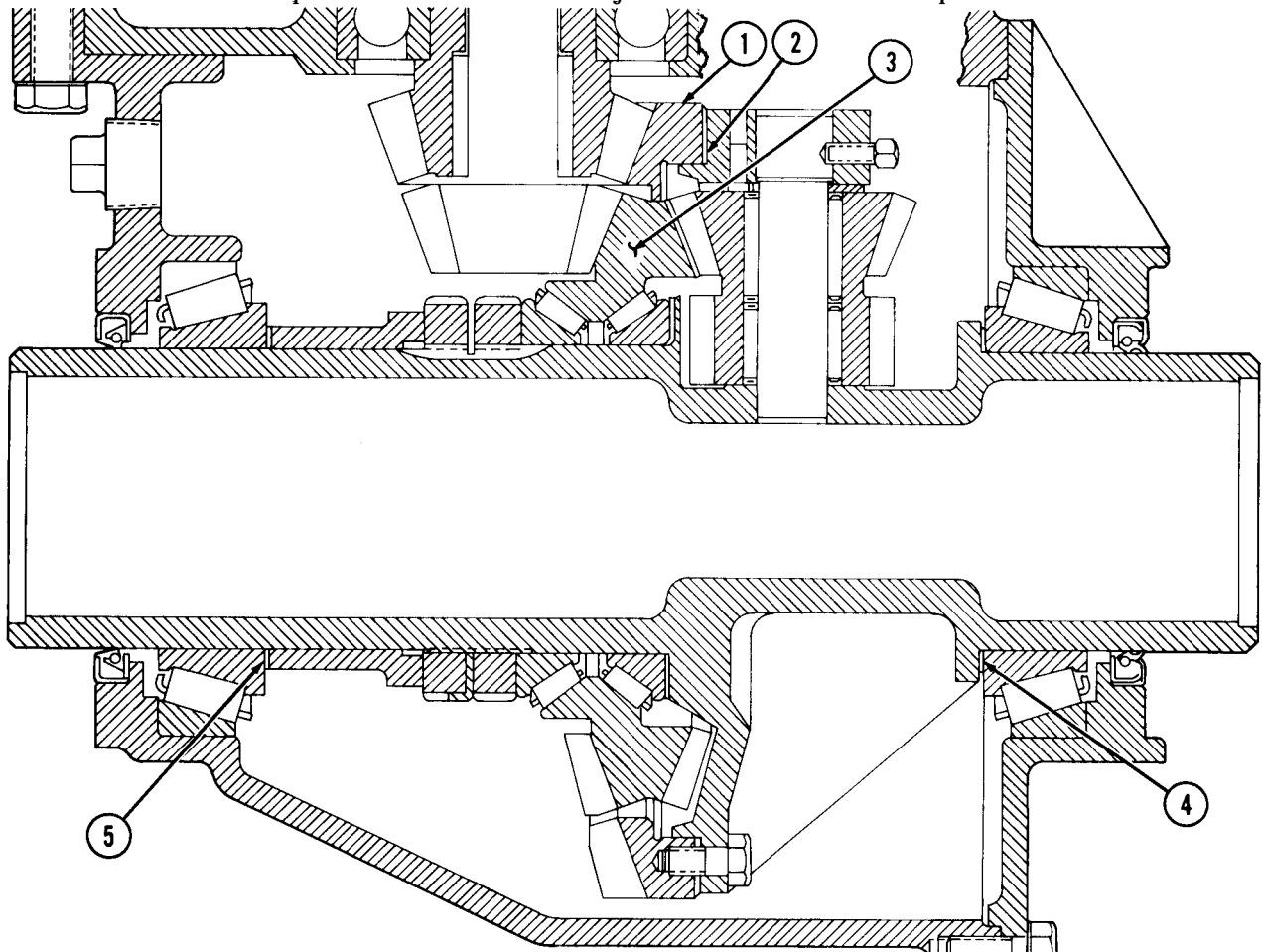


15-38. BORING CASE MAINTENANCE (Contd)

- 16. To increase backlash for rack drive gear (1), remove rack drive gear shim (2). To decrease backlash for rack drive gear (1), add rack drive gear shim (2).
- 17. To increase backlash for rack feed idler gear (3), add lower rack carrier bearing shim (5) and rack drive gear shim (2) and remove upper rack carrier bearing shim (4).
- 18. To decrease backlash for rack feed idler gear (3), remove lower rack carrier bearing shim (5) and rack drive gear shim (2), and add upper rack carrier bearing shim (4).
- 19. Assemble and install boring gear (subtasks e and f).

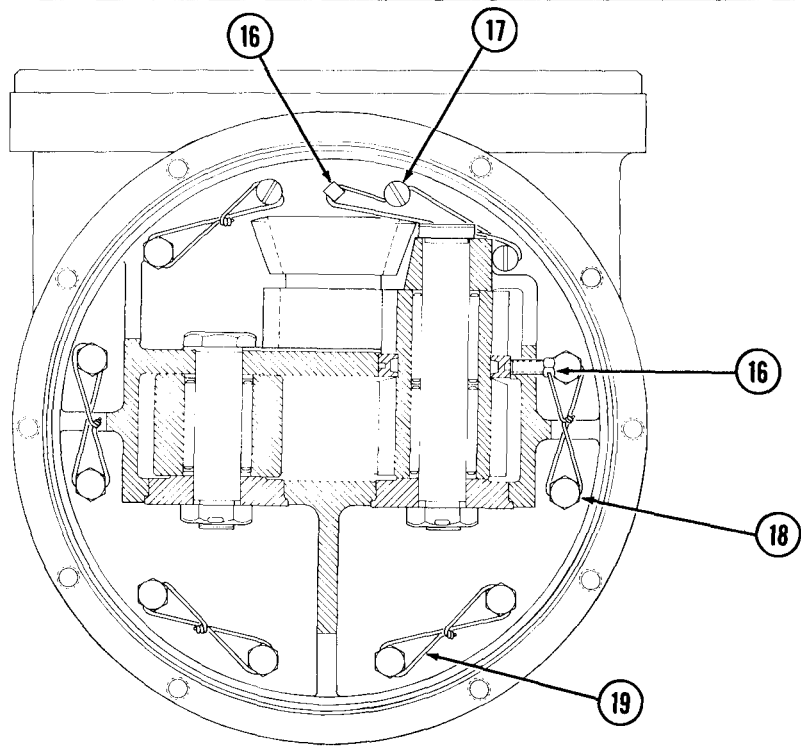
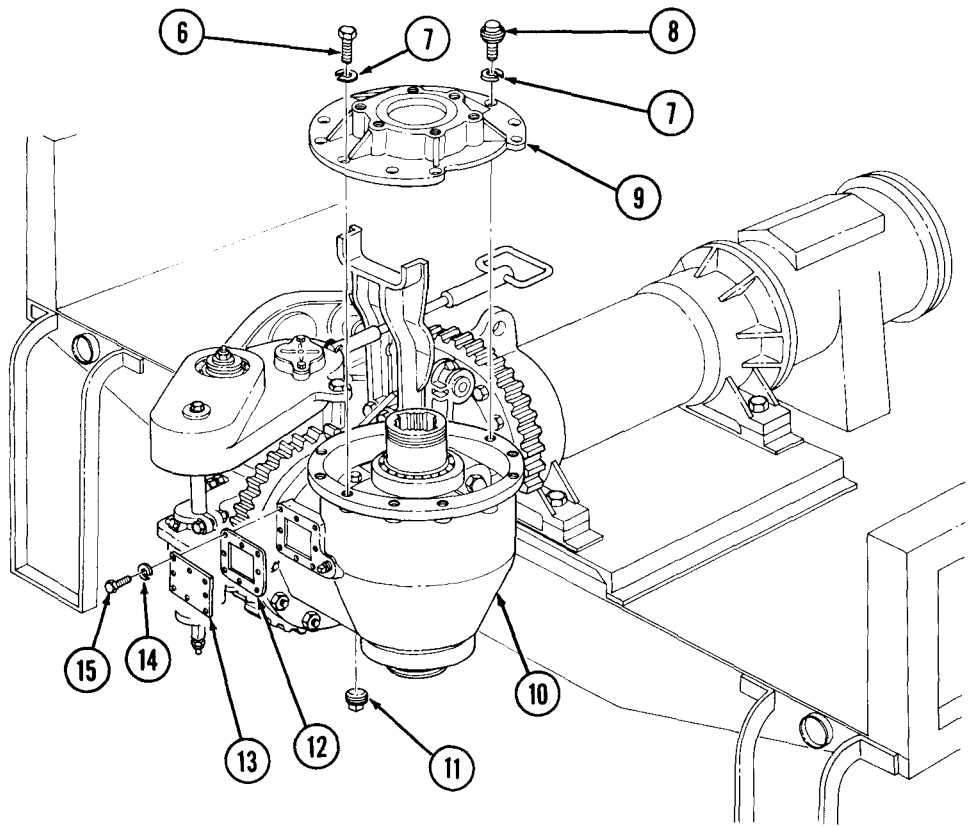
NOTE

If adjustment does not correct rack drive and feed gear backlash, refer to para. 15-42 for backlash adjustment of feed and drive pinions.



- 20. Rotate boring case (10) to upright position.
- 21. Install new gasket (12) and inspection hole cover (13) on boring case (10) with eight new lockwashers (14) and screws (15).
- 22. Remove circular level (8), nine screws (6), ten lockwashers (7), and boring case cover (9) from boring case (10). Discard lockwashers (7).
- 23. Install six new safety wires (19) on three screws (17), nine screws (18), and two setscrews (16).
- 24. Install boring case cover (9) on boring case (10) with ten new lockwashers (7), nine screws (6), and circular level (8).
- 25. Install drainplug (11) in boring case (10).

15-38. BORING CASE MAINTENANCE (Contd)



15-38. BORING CASE MAINTENANCE (Contd)

g. Auger Rack Bar Installation

1. Manually turn horizontal leveling worm gear (9) until boring case (16) is horizontal (TM 9-2320-361-10).
2. Coat auger rack bar (1) with GAA grease.
3. Place chain on auger rack bar (1) approximately 4ft (1.22 m) from left end.
4. Attach lifting device to chain.

WARNING

Ensure auger rack bar is balanced on chain during installation. Failure to do so may cause auger rack bar to slip from chain, causing injury to personnel or damage to equipment.

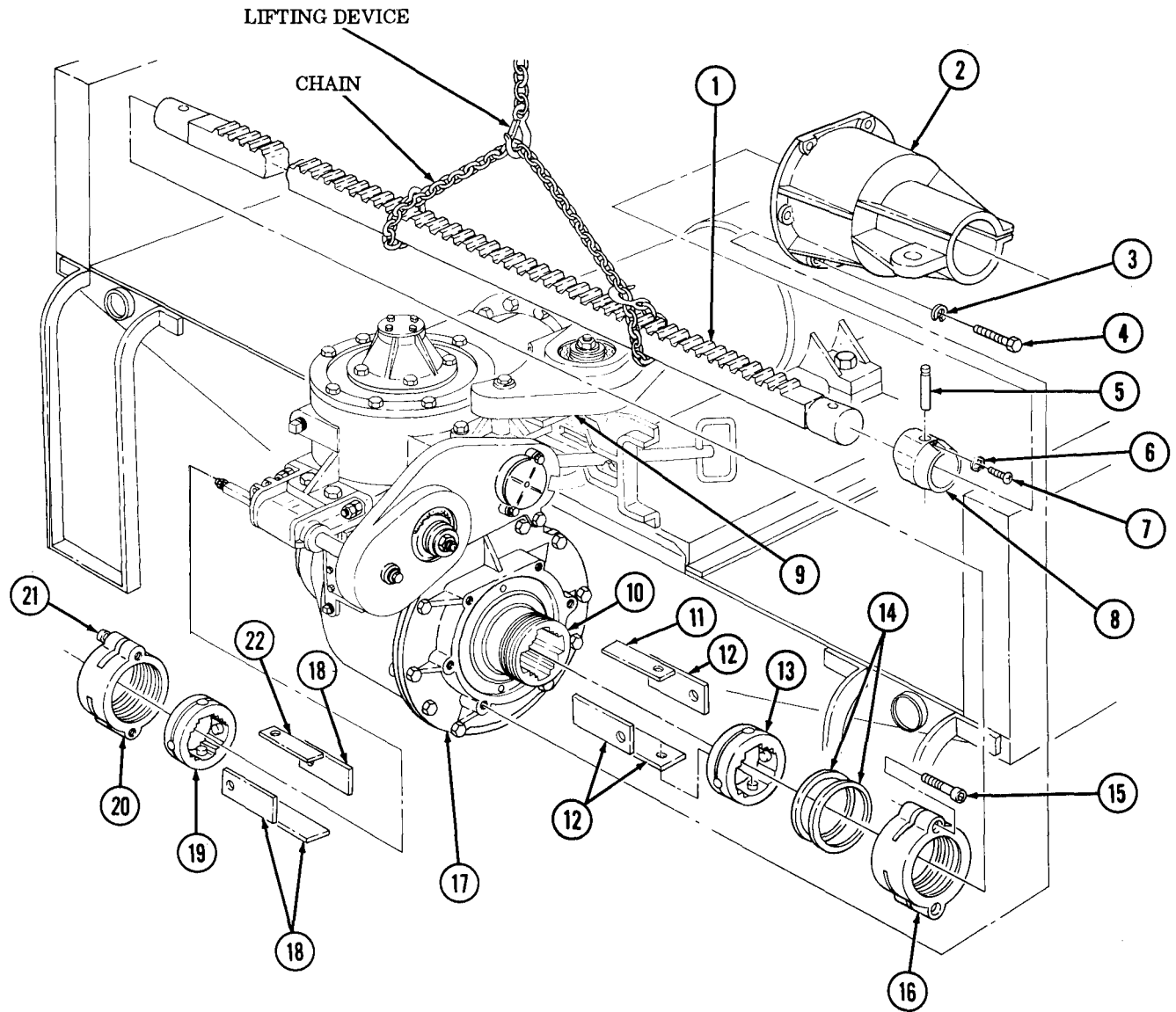
NOTE

- Ensure teeth of auger rack bar face to the right.
 - Assistant will help with step 5.
5. Insert auger rack bar (1) in boring case (17) until it engages. Continue feeding until it extends approximately two feet out of carrier (10). Remove lifting device and chain.

NOTE

- . Thinnest thrust plate is mounted on shortest stud of thrust plate retainer and installed against teeth of auger rack bar.
 - All shims are installed to previously recorded distance.
6. Place thrust plates (11) and (12) in thrust plate retainer (13) and install on carrier (10).
 7. Install new shims (14) and rack carrier nut (16) on carrier (10) with two screws (15).
 8. Place thrust plates (18) and (22) in thrust plate retainer (19) and install on carrier (10).
 9. Install rack carrier nut (20) on carrier (10). Tighten two screws (21).
 10. Install derrick tube case (2) on boring case (17) with six new lockwashers (3) and screws (4).
 11. Install auger rack bar guide (8) on auger rack bar (1) with retaining pin (5), new lockwasher (6), and setscrew (7).

15-38. BORING CASE MAINTENANCE (Contd)



- FOLLOW-ON TASKS: . Fill boring case to proper oil level (LO 9-2320-209-12-1).
- Install integral derrick (para. 15-36).
 - Install snatch sleeve (TM 9-2320-361-20).

15-39. HORIZONTAL LEVELING WORM GEAR MAINTENANCE

THIS TASK COVERS:

- | | |
|---|---|
| <p>a. Removal
 b. Disassembly
 c. Inspection</p> | <p>d. Assembly
 e. Installation</p> |
|---|---|

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Outside micrometer (Appendix B, Item 17)
- Inside micrometer (Appendix B, Item 16)

MATERIALS/PARTS

- Four cotter pins (Appendix F, Item 10)
- Shim set (Appendix F, Item 249)
- Shim set (Appendix F, Item 250)
- Shim set (Appendix F, Item 251)
- Four lockwashers (Appendix F, Item 138)
- Two lockwashers (Appendix F, Item 127)
- Woodruff key (Appendix F, Item 297)
- Woodruff key (Appendix F, Item 274)
- Safety wire (Appendix C, Item 31)

PERSONNEL REQUIRED

Two

REFERENCES [TM]

- LO 9-2320-209-12-1
- TM 9-237
- TM 9-2320-361-10
- TM 9-2320-361-20
- TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Horizontal leveling worm drivechain removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

Before removing horizontal leveling worm gear housing, support intermediate case to prevent from turning.

a. Removal

WARNING

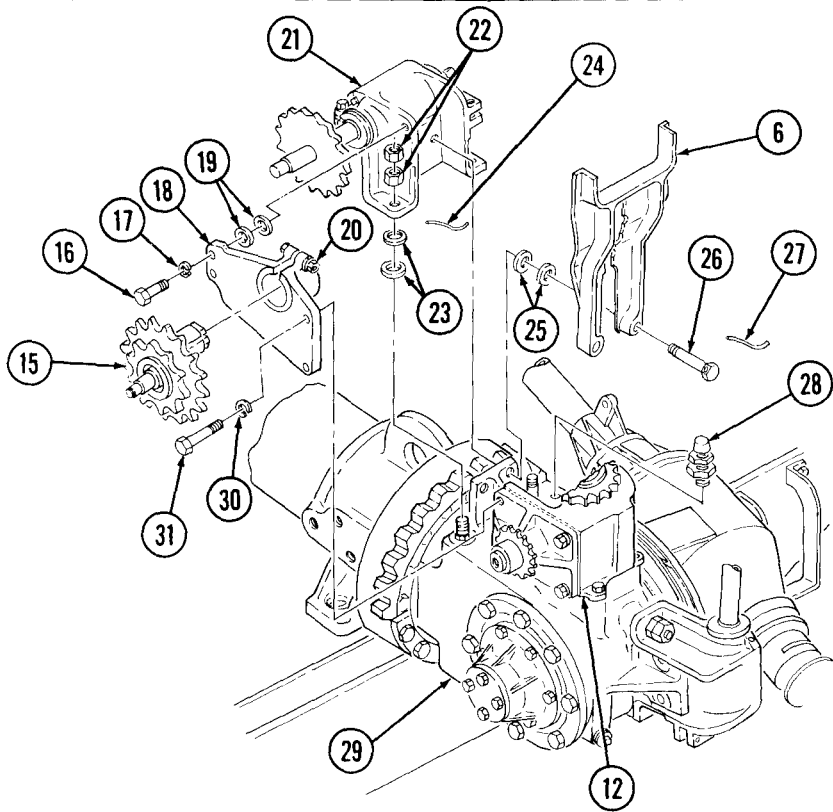
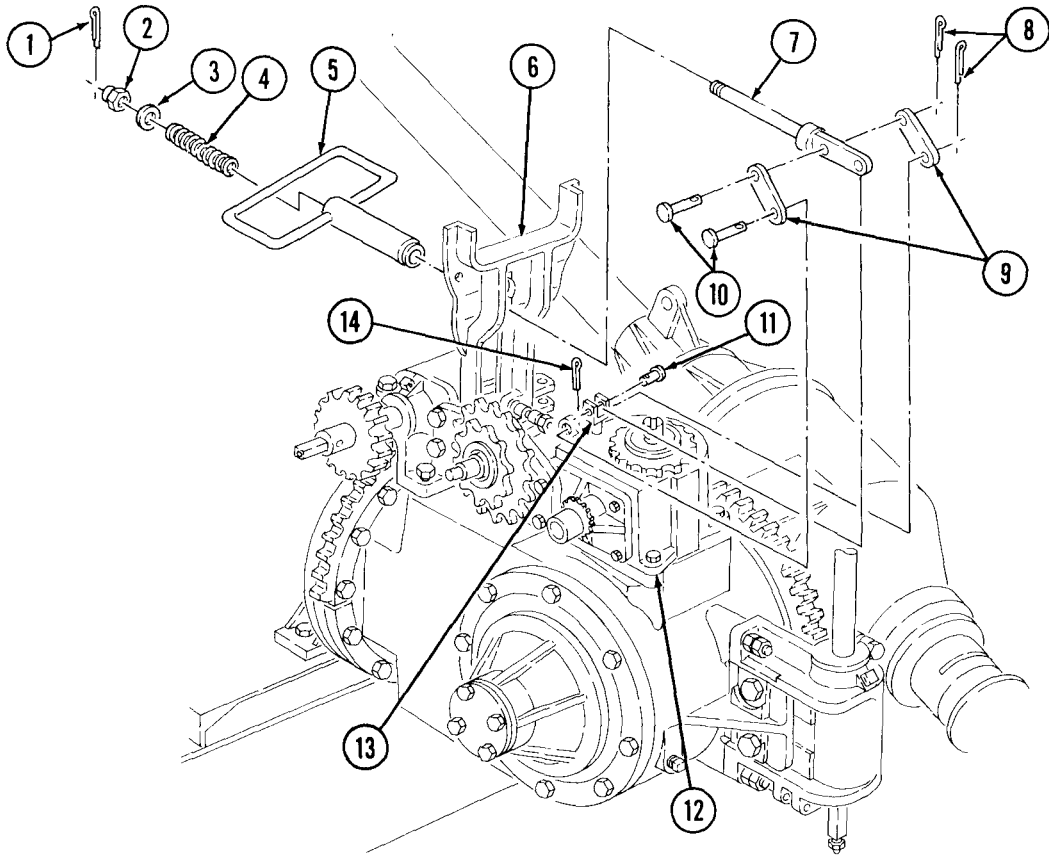
Before removing horizontal leveling worm gear housing, place supports under intermediate case to prevent case from turning. If intermediate case turns, injury to personnel and/or damage to equipment may result.

NOTE

Assistant will help with entire procedure.

1. Place handle (5) in center slot of bracket (6). Remove cotter pin (1), nut (2), washer (3), handle (5), and spring (4) from rod (7). Discard cotter pin (1).
2. Remove two cotter pins (8), clevis pins (10), and retaining links (9) from rod (7) and power leveler housing (12). Discard cotter pins (8).
3. Remove cotter pin (14), clevis pin (11), and rod (7) from shifter shaft (13). Discard cotter pin (14).
4. Loosen screw (20) and remove sprocket (15) from bracket (18).
5. Remove two screws (31) and lockwashers (30) from power leveler housing (12). Discard lockwashers (30).
6. Remove two screws (16), lockwashers (17), bracket (18), and shims (19) from worm gear housing (21). Record thickness of shims (19). Discard shims (19) and lockwashers (17).
7. Remove vent plug (28) from intermediate case (29).
8. Remove safety wire (27), two screws (26), bracket (6), and shims (25) from worm gear housing (21). Record thickness of shims (25). Discard shims (25) and safety wire (27).
9. Remove two safety wires (24), four nuts (22), worm gear housing (21), and shims (23) from intermediate case (29). Record thickness of shims (23). Discard shims (23) and safety wire (24).

15-39. HORIZONTAL LEVELING WORM GEAR MAINTENANCE (Contd)



15-39. HORIZONTAL LEVELING WORM GEAR MAINTENANCE (Contd)

b. Disassembly

1. Remove safety wire (8), loosen setscrew (9), and remove sprocket (10) and woodruff key (11) from worm gear shaft (6). Discard safety wire (8) and woodruff key (11).
2. Remove lubrication fitting (17) and bushing (16) from shaft (6).
3. Remove setscrews (1) and (4), two screws (2), and lockwashers (3) from worm gear housing (5). Discard lockwashers (3).

NOTE

Measure and record distance shaft extends from worm gear housing.

4. Loosen worm adjusting bearing (15).
5. Align woodruff key (12) in shaft (6) with keyway of thrust washer (13). Tap round end of shaft (6) and remove sleeve bearing (7), woodruff key (12), and shaft (6) from worm gear housing (5).
6. Remove thrust washer (13), worm gear (14), and adjusting bearing (15) from worm gear housing (5).
7. Remove woodruff key (12) and sleeve bearing (7) from shaft (6). Discard woodruff key (12).

c. Inspection

1. Check worm gear housing (5) for cracks or other damage. Repair by welding if cracked (TM 9-237). Replace if damaged.
2. Check all parts for small chips, burrs, and scratches. Raised metal can be removed with a fine mill file.
3. Check sprocket (10) and worm gear (14) for chipped and broken teeth. Replace if damaged.
4. Inspect adjusting bearing (15), shaft (6), sleeve bearing (7), and thrust washer (13) for wear or other damage. Refer to table 15-5, Horizontal Leveling Worm Gear Wear Limits, for measurements. Replace if worn or otherwise damaged.

Table 15-5. Horizontal Leveling Worm Gear Wear Limits.

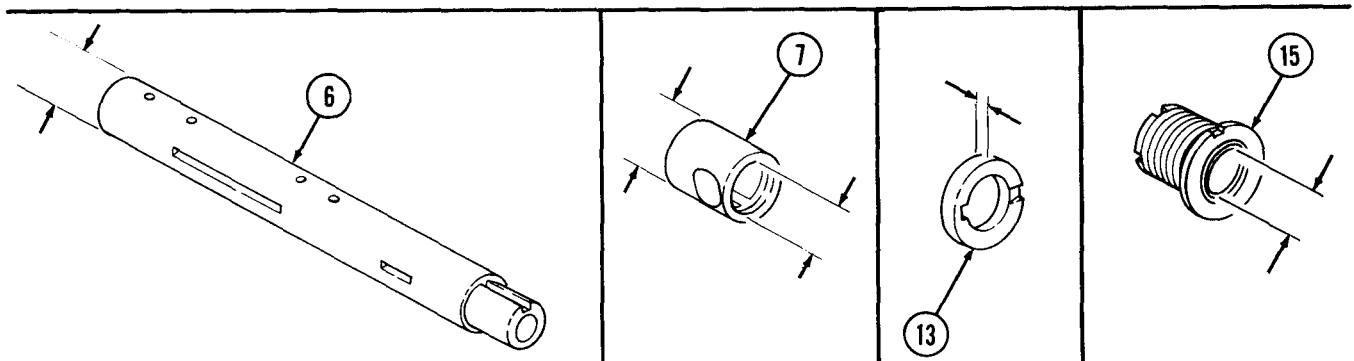
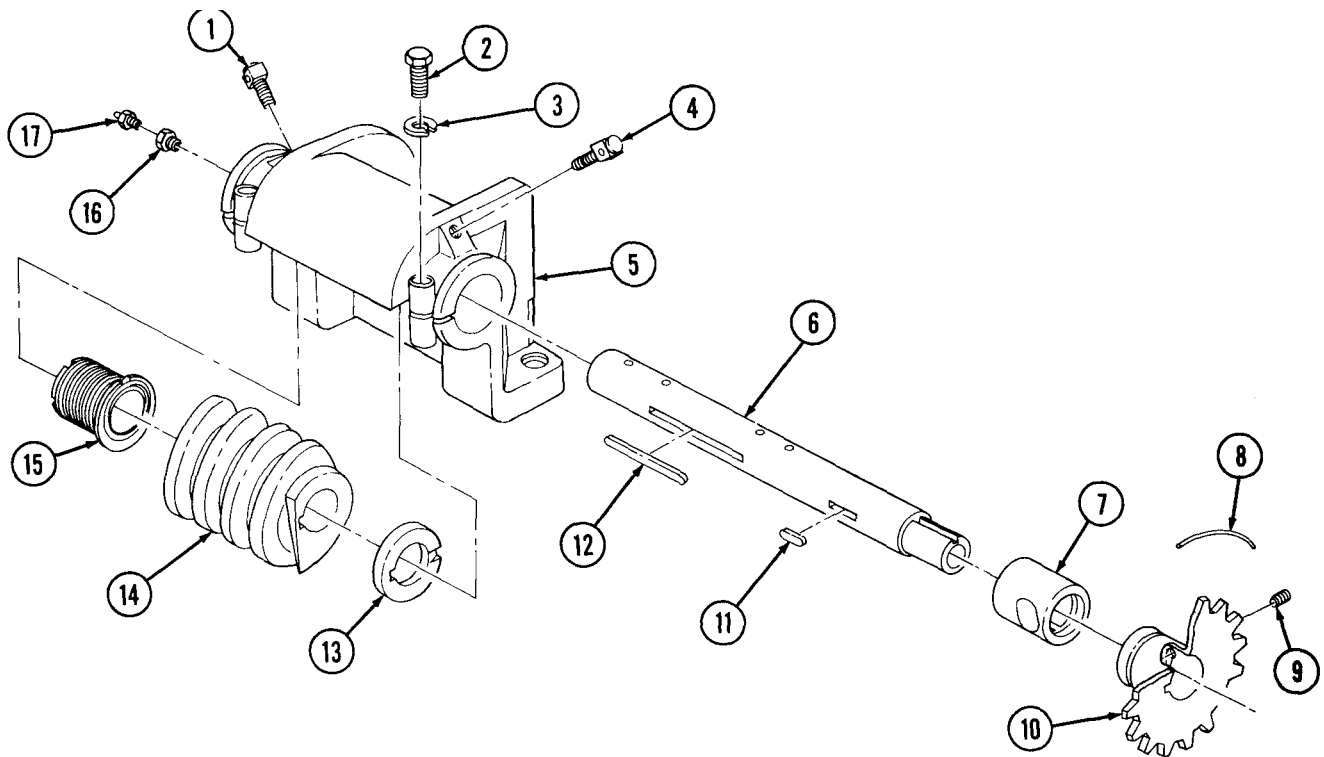
ITEM N O .	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		INCHES	MILLIMETERS
6	Shaft (diameter)	1.371-1.372	34.82-34.85
7	Sleeve bearing Inside diameter	1.376-1.378	34.95-35.00
		1.99-2.00	50.55-50.80
13	Thrust washer (thickness)	0.41	10.41
15	Bearing (inside diameter)	1.37-1.38	34.80-35.05

d. Assembly

1. Install adjusting bearing (15) and worm gear (14) in worm gear housing (5).
2. Install thrust washer (13) so that setscrew notch faces away from worm gear (14) and keyway aligns with keyway of worm gear (14).
3. Install new woodruff key (12) in shaft (6) and install shaft (6) in worm gear housing (5).

15-39. HORIZONTAL LEVELING WORM GEAR MAINTENANCE (Contd)

4. Install shaft (6) to extend from worm gear housing (5) as previously measured. Finger tighten adjusting bearing (15).
5. Install sleeve bearing (7) on shaft (6) and into worm gear housing (5). Aline sleeve bearing (7) so screw (2) will pass through slot.
6. Install two new lockwashers (3), screws (2), and setscrews (1) and (4) in worm gear housing (5). Do not tighten setscrews (1) and (4). Ensure that shaft (6) turns freely.
7. Turn shaft (6) until notch in thrust washer (13) is alined with setscrew (4). Tighten setscrew (4) until it touches thrust washer (13) then back off 1/4 turn.
8. Tighten adjusting bearing (15) until shaft (6) does not move from end to end. Ensure that shaft (6) turns freely.
9. Tighten setscrew (1) until it touches adjusting bearing (15) then back off 1/2 turn.
10. Instill bushing (16) and lubrication fitting (17) in shaft (6).
11. Install new woodruff key (11) and sprocket (10) on shaft (6). Install setscrew (9) and install new safety wire (8) on sprocket (10).



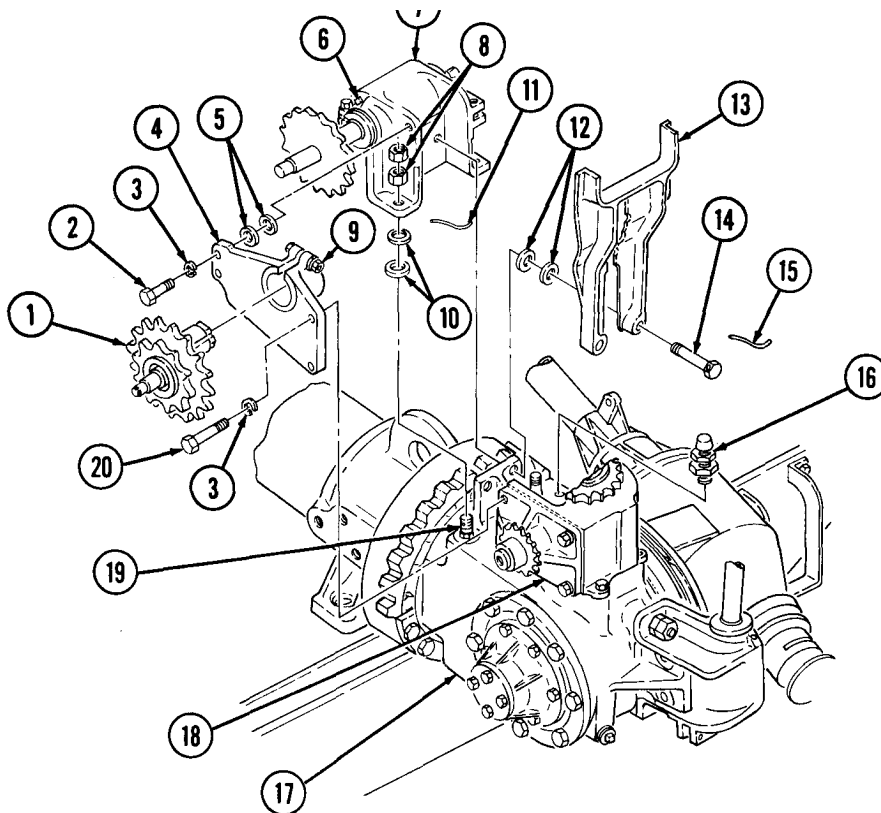
15-39. HORIZONTAL LEVELING WORM GEAR MAINTENANCE (Contd)

e. Installation

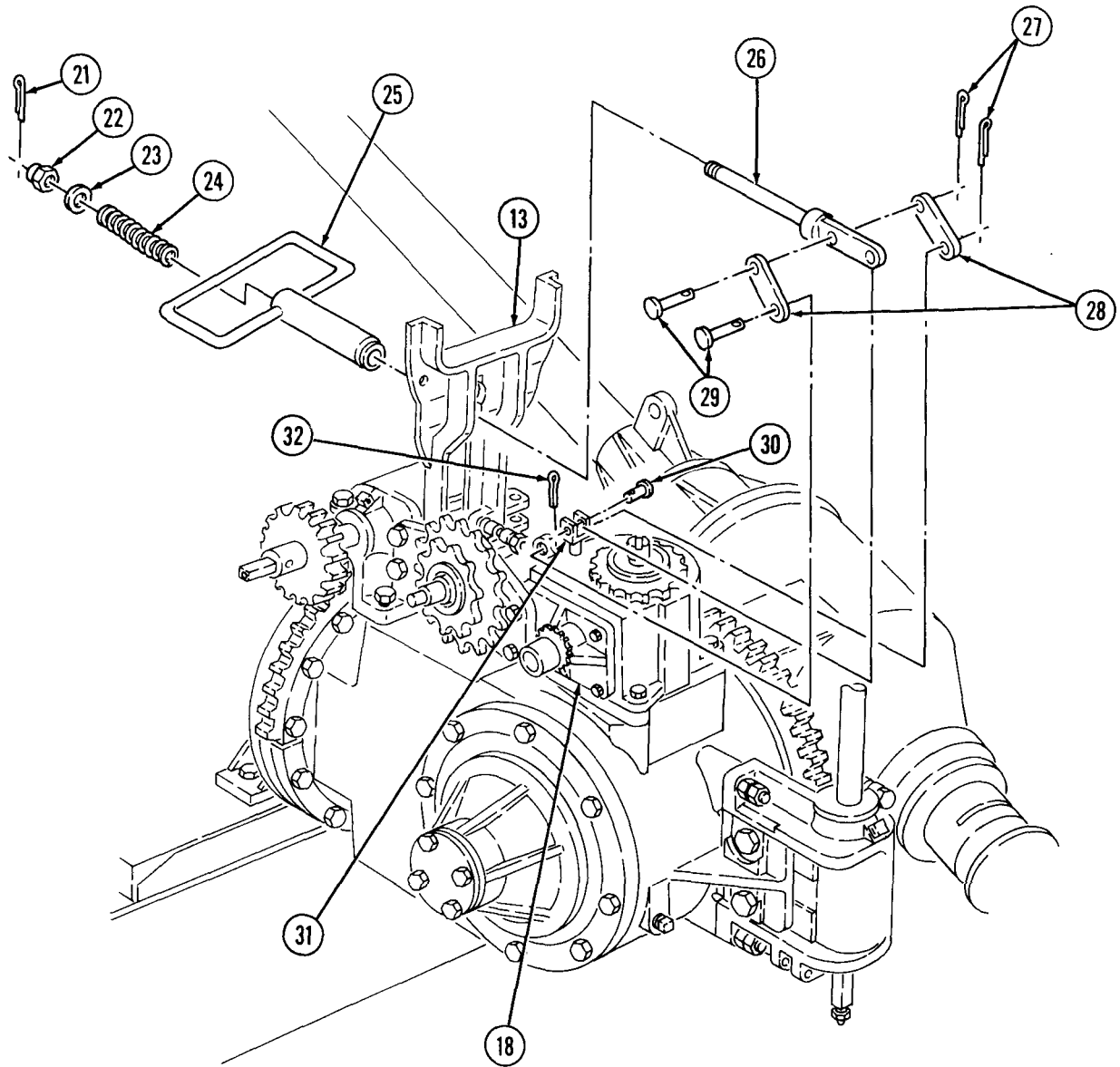
NOTE

- Install all shims to previously recorded thickness.
- When installing worm gear, check that gear is centered and teeth mesh with worm wheel. If misaligned, remove worm gear and adjust backlash by removing or adding shims.

1. Install new shims (10) and worm gear housing (7) on intermediate case studs (19) with four nuts (8).
2. Install new shims (12) and bracket (13) on intermediate case (17) with two screws (14).
3. Install two new safety wires (11) on intermediate case studs (19) and setscrews (6).
4. Install vent plug (16) on intermediate case (17).
5. Install two new safety wires (15) on screws (14).
6. Install new shims (5) and bracket (4) on worm gear housing (7) with two new lockwashers (3) and screws (2).
7. Install two new lockwashers (3) and screws (20) on power leveler housing (18).
8. Install sprocket (1) in bracket (4) and tighten screw (9).
9. Install rod (26) on shifter shaft (31) with clevis pin (30) and new cotter pin (32).
10. Install rod (26) on power leveler housing (18) with two retaining links (28), clevis pins (29), and new cotter pins (27).
11. Install handle (25), spring (24), washer (23), nut (22), and new cotter pin (21) on rod (26).



15-39. HORIZONTAL LEVELING WORM GEAR MAINTENANCE (Contd)



FOLLOW-ON TASKS: •Install horizontal leveling worm drivechain (TM 9-2320-361-20).
 •Lubricate worm gear shaft (LO 9-2320-209-12-1).

15-40. VERTICAL LEVELING WORM GEAR MAINTENANCE

THIS TASK COVERS:

- | | |
|---|---|
| <p>a. Removal
 b. Disassembly
 c. Inspection</p> | <p>d. Assembly
 e. Installation</p> |
|---|---|

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 1-1/4-in. socket, 1/2-in. dr.
 (Appendix B, Item 19)

MATERIALS/PARTS

Six lockwashers (Appendix F, Item 127)
 Shim set (Appendix F, Item 250)
 Shim set (Appendix F, Item 251)
 Shim set (Appendix F, Item 252)
 Woodruff key (Appendix F, Item 273)
 Woodruff key (Appendix F, Item 274)

REFERENCES (TM)

LO 9-2320-209-12-1
 TM 9-237
 TM 9-2320-361-10
 TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

. Parking brake set (TM 9-2320-361-10).
 . Vertical leveling worm drivechain removed
 (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

Place derrick in cradle or support boring case to prevent case from turning.

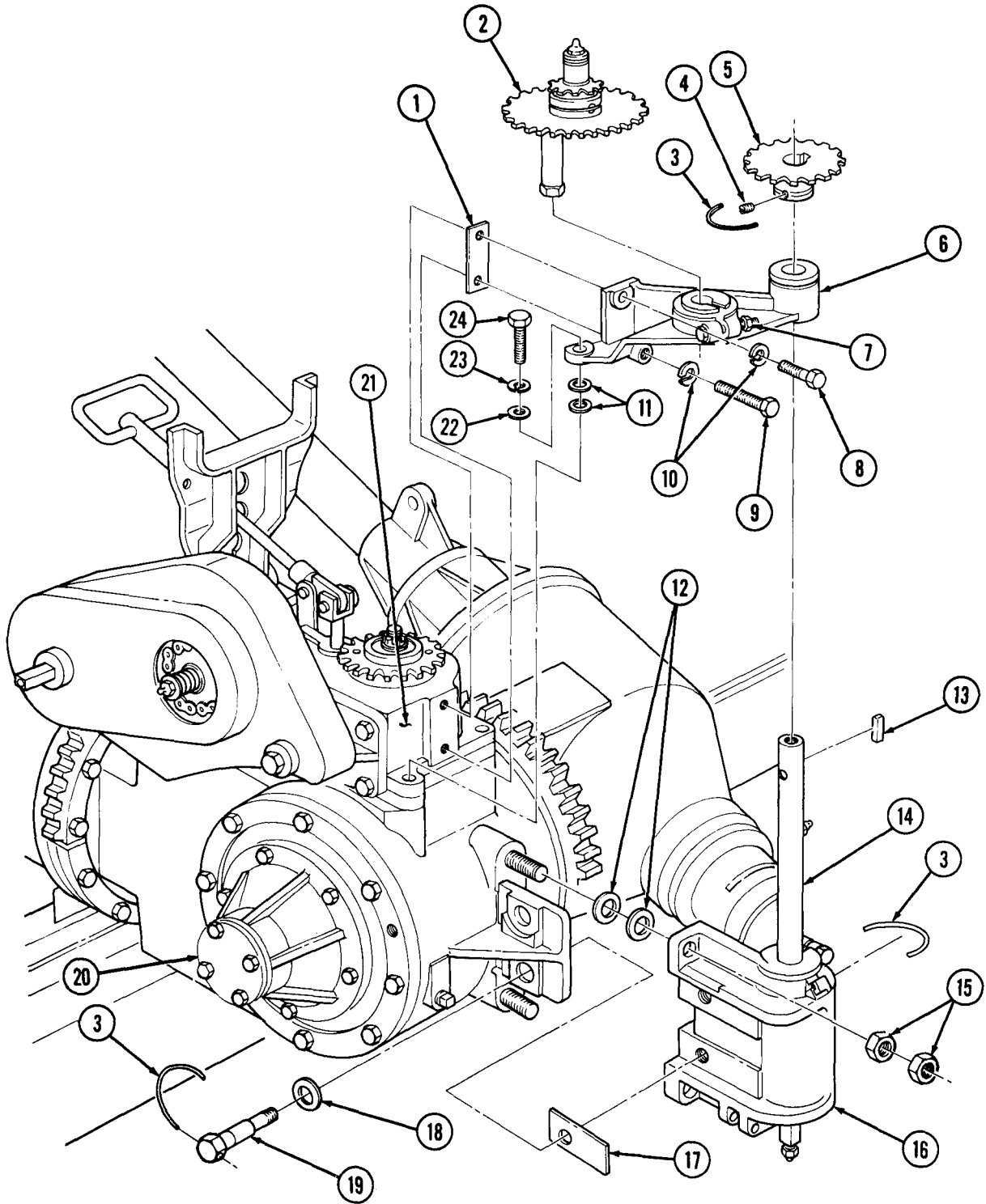
a. Removal

WARNING

Before removing vertical leveling worm gear housing, place derrick in cradle or place supports under boring case to prevent case from turning. If boring case turns, injury to personnel or damage to equipment may result.

1. Remove safety wire (3), loosen setscrew (4), and remove sprocket (5) and woodruff key (13) from shaft (14). Discard safety wire (3) and woodruff key (13).
2. Loosen nut (7) and remove sprocket (2) from bracket (6).
3. Remove safety wire (3), two screws (19), washers (18), and shims (17) from intermediate case (20) and worm gear housing (16). Record thickness of shims (17). Discard safety wire (3) and shims (17).
4. Remove two screws (24), lockwashers (23), and washers (22) from bracket (6) and power leveler housing (21). Discard lockwashers (23).
5. Remove screws (8) and (9), two lockwashers (10), bracket (6), and shims (1) and (11) from power leveler housing (23) and shaft (14). Discard shims (1) and (11) and lockwashers (10).
6. Remove safety wire (3), four nuts (15), worm gear housing (16), and shims (12) from intermediate case (20). Record thickness of shims (12) and discard.

15-40. VERTICAL LEVELING WORM GEAR MAINTENANCE (Contd)



15-40. VERTICAL LEVELING WORM GEAR MAINTENANCE (Contd)

b. Disassembly

1. Remove two lubrication fittings (8) from shaft (6).
2. Remove two screws (2), lockwashers (3), and setscrews (1) and (4) from housing (5) Discard lockwashers (3).

NOTE

Measure and record distance shaft extends from worm gear housing.

3. Loosen worm adjusting bearing (12).
4. Nine woodruff key (9) of shaft(6) with keyway of thrust washer (10). Tap square end of shaft (6) and remove sleeve bearing (7), woodruff key (9), and shaft (6) from worm gear housing (5).
5. Remove thrust washer (10), worm gear (11), and adjusting bearing (12) from worm gear housing (5).
6. Remove woodruff key (9) and sleeve bearing(7) from shaft (6). Discard woodruff key (9).

c. Inspection

1. Check worm gear housing (5) for cracks or other damage. Repair by welding if cracked (TM 9-237). Replace if damaged.
2. Check all parts for small chips, burrs, and scratches. Raised metal can be removed with a fine mill file.
3. Check worm gear (11) for chipped and broken teeth. Replace if damaged.
4. Inspect adjusting bearing (12), shaft (6), sleeve bearing(7), and thrust washer (10) for wear or other damage. Refer to table 15-6, Vertical Leveling Worm Gear Wear Limits, for measurements. Replace if worm or otherwise damaged.

Table 15-6. Vertical Leveling Worm Gear Wear Limits.

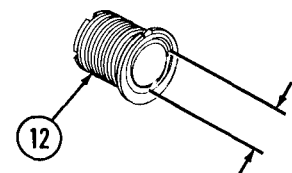
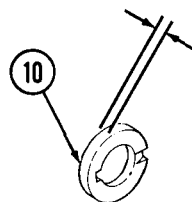
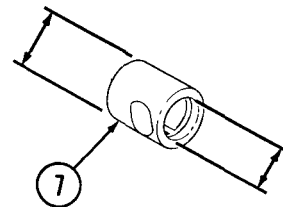
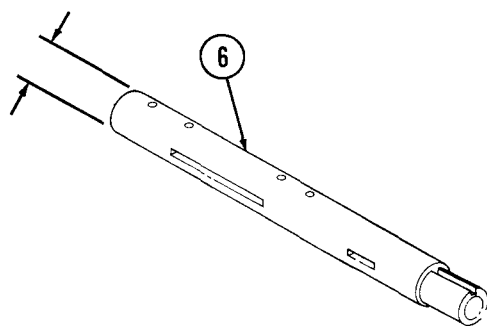
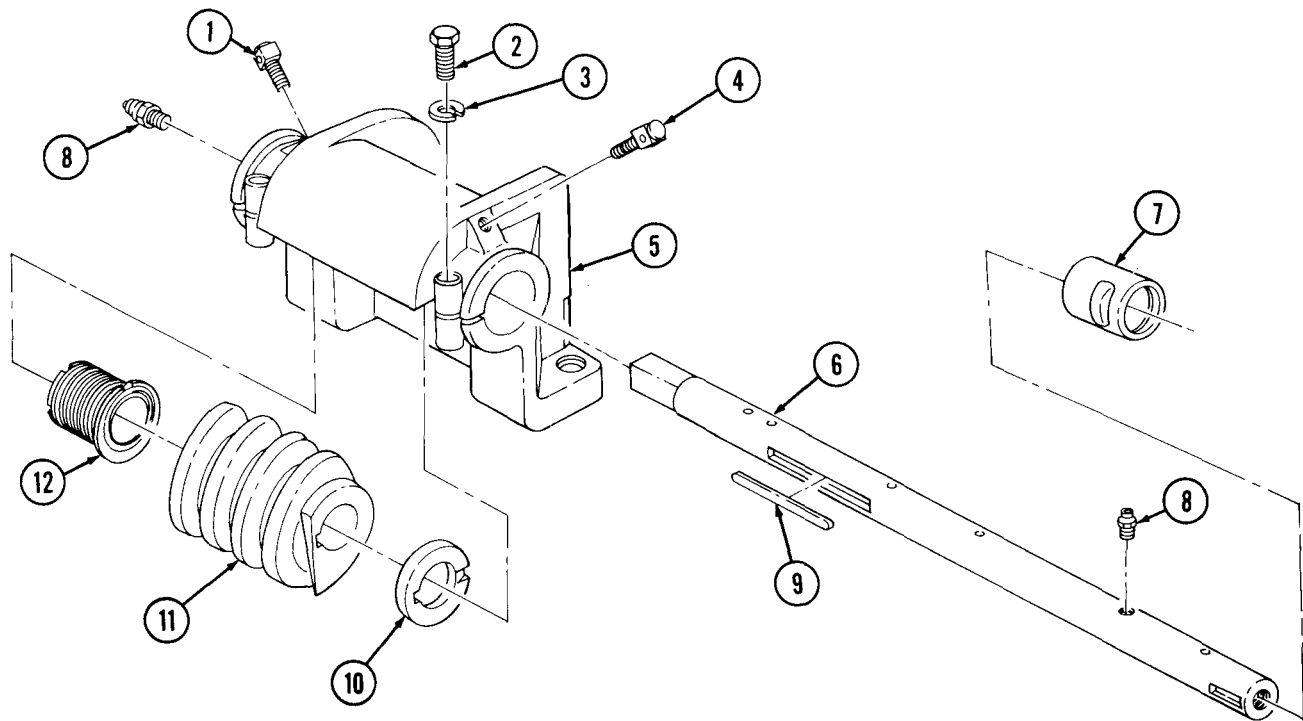
ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		INCHES	MILLIMETERS
6	Shaft (diameter)	1.371-1.372	34.82-34.85
7	Sleeve bearing		
	Inside diameter	1.376-1.378	34.95-35.00
	Outside diameter	1.999-2.000	50.77-50.80
10	Thrust washer (thickness)	0.406	10.31
12	Bearing (inside diameter)	1.376-1.378	34.95-35.00

d. Assembly

1. Install adjusting bearing (12) and worm gear (11) in worm gear housing (5).
2. Install thrust washer (10) in worm gear housing (5) so that setscrew notch faces away from worm gear (11) and keyway aligns with keyway of worm gear (11).
3. Install new woodruff key (9) in shaft (6) and install shaft(6) in worm gear housing(5).
4. Set shaft (6) to extend from worm gear housing (5) as previously measured. Finger tighten adjusting bearing (12).

15-40. VERTICAL LEVELING WORM GEAR MAINTENANCE (Contd)

5. Install sleeve bearing (7) on shaft (6) and into housing (5). Aline slot on sleeve bearing (7) so screw (2) will pass through slot.
6. Install two new lockwashers (3), screws (2), and setscrews (1) and (4) in worm gear housing (5). Do not tighten setscrews (1) and (4). Ensure that shaft (6) turns freely.
7. Turn shaft (6) until notch in thrust washer (10) is alined with setscrew (4). Tighten setscrew (4) until it touches thrust washer (10) then back off $1/4$ turn.
8. Tighten adjusting bearing (12) until shaft (6) does not move from end to end. Ensure that shaft (6) turns freely.
9. Tighten setscrew (1) until it touches adjusting bearing (12) then back off $1/2$ turn.
10. Install two lubrication fittings (8) on shaft (6).



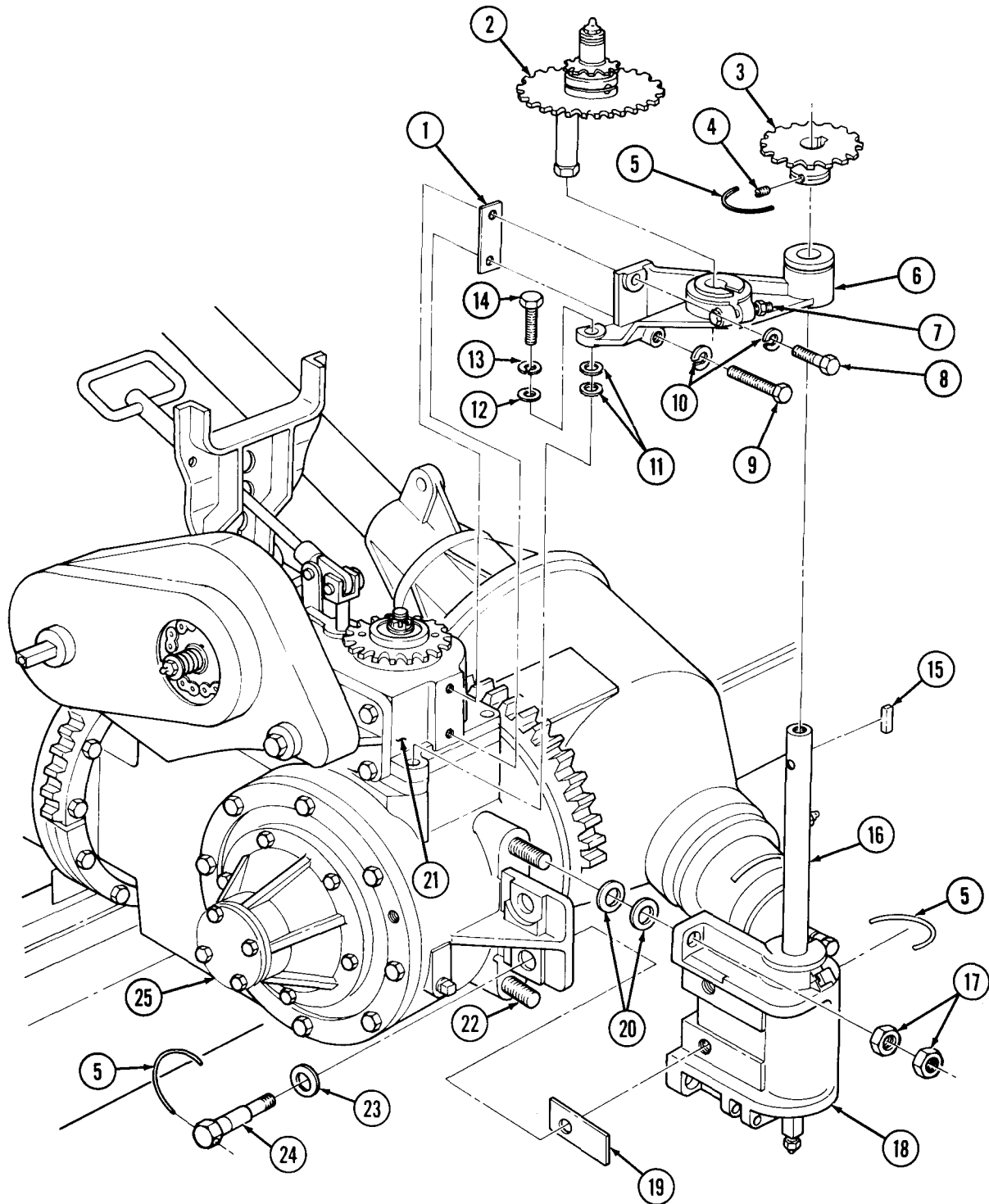
15-40. VERTICAL LEVELING WORM GEAR MAINTENANCE (Contd)

NOTE

- Install all shims to previously recorded thickness.
- When installing worm gear, check that gear is centered and teeth mesh with worm wheel. If misaligned, remove worm gear and adjust backlash by removing or adding shims.

1. Install new shims (20) and worm gear housing (18) on intermediate case mounting studs (22) with four nuts (17).
2. Install new shims (19), two washers (23), and screws (24) on worm gear housing (18) and intermediate case (25).
3. Install new shims (1) and (11) and bracket (6) on power leveler (21) and shaft (16) with two new lockwashers (10) and screws (8) and (9).
4. Install two washers (12), new lockwashers (13), and screws (14) on bracket (6).
5. Install new safety wire (5) on nuts (17).
6. Install sprockets (2) on bracket (6) and tighten nut (7).
7. Install new woodruff key (15) and sprocket (3) on shaft (16) and tighten setscrew (4).
8. Install new safety wire (5) on sprocket (3).

15-40. VERTICAL LEVELING WORM GEAR MAINTENANCE (Contd)



FOLLOW-ON TASKS: •Install vertical leveling worm drivechain (TM 9-2320-361-20).
 •Lubricate worm gear shaft (LO 9-2320-209-12-1).

15-41. POWER LEVELER MAINTENANCE

THIS TASK COVERS:

- | | |
|--|---|
| <p>a. Removal
 b. Disassembly
 c. Cleaning and Inspection</p> | <p>d. Assembly
 e. Installation</p> |
|--|---|

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 Mechanical puller kit (Appendix B, Item 22)

MATERIALS/PARTS

Three cotter pins (Appendix F, Item 8)
 Two cotter pins (Appendix F, Item 9)
 Cotter pin (Appendix F, Item 10)
 Two woodruff keys (Appendix F, Item 274)
 Woodruff key (Appendix F, Item 299)
 Two lockwashers (Appendix F, Item 138)
 Six lockwashers (Appendix F, Item 127)
 Shim set (Appendix F, Item 252)
 Shim set (Appendix F, Item 251)
 Shim set (Appendix F, Item 253)

MATERIALS/PARTS (Contd)

Shim set (Appendix F, Item 254)
 Safety wire (Appendix C, Item 31)
 GAA grease (Appendix C, Item 8)

REFERENCES (TM)

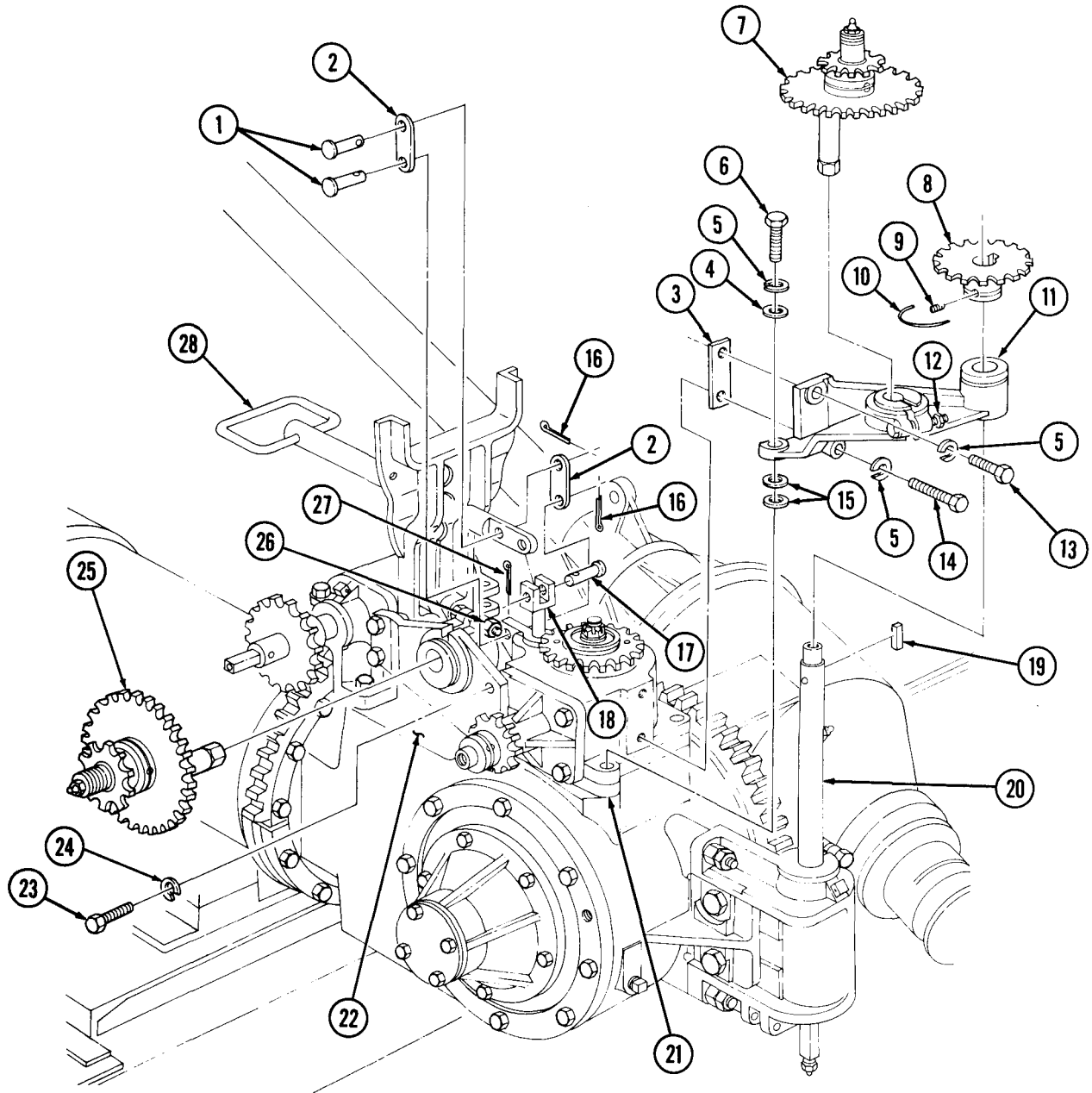
TM 9-214
 TM 9-2320-361-10
 TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Horizontal leveling worm drivechain removed (TM 9-2320-361-20).
- Vertical leveling worm drivechain removed (TM 9-2320-361-20).

1. Loosen nut (26) and remove sprocket (25) from bracket (22).
2. Remove two screws (23) and lockwashers (24) from bracket (22). Discard lockwashers (24).
3. Remove two cotter pins (16), clevis pins (1), and retaining links (2) from shifting rod (28) and power leveler housing (21). Discard cotter pins (16).
4. Remove cotter pin (27), clevis pin (17), and shifting rod (28) from shifter shaft (18). Discard cotter pin (27).
5. Remove safety wire (10), loosen setscrew (9), and remove sprocket (8) and woodruff key (19) from shaft (20). Discard safety wire (10) and woodruff key (19).
6. Loosen nut (12) and remove sprocket (7) from bracket (11).
7. Remove screws (13) and (14), two screws (6), four lockwashers (5), two washers (4), bracket (11), and shims (3) and (15) from power leveler housing (21). Record thickness of shims (3) and (15). Discard shims (3) and (15) and lockwashers (5).

15-41. POWER LEVELER MAINTENANCE (Contd)

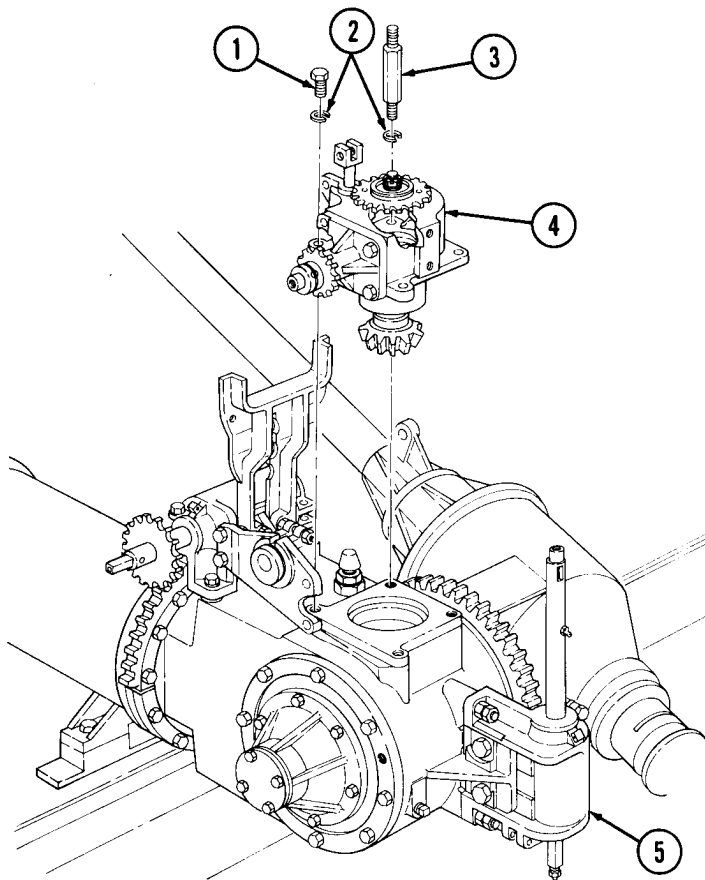


15-41. POWER LEVELER MAINTENANCE (Contd)

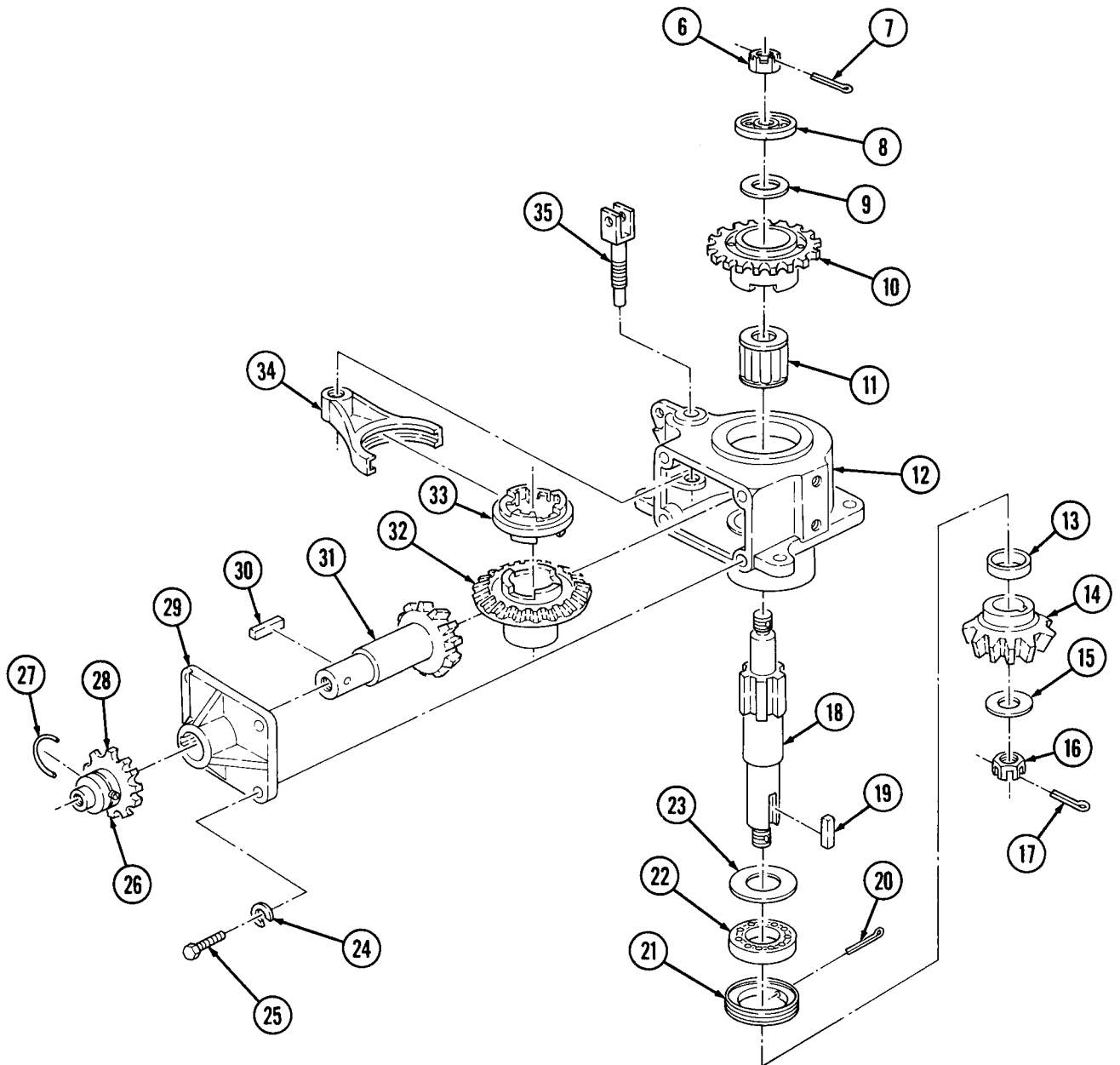
8. Remove screw (1), stud (3), two lockwashers (2), and power leveler housing (4) from intermediate case (5). Discard lockwashers (2).

b. Disassembly

1. Remove two screws (25), lockwashers (24), and housing cap (29) from housing (12). Discard lockwashers (24).
2. Remove safety wire (27), loosen setscrew (26), and remove sprocket (28) and woodruff key (30) from worm drive pinion (31).
3. Remove worm drive pinion (31) from housing cap (29).
4. Remove cotter pin (17), nut (16), washer (15), takeoff pinion (14), woodruff key (19), and spacer (13) from drive shaft (18). Discard cotter pin (17) and woodruff key (19).
5. Remove cotter pin (7), nut (6), bearing retainer (8), shims (9), sprocket (10), and bearing (11) from shaft (18). Record thickness of shims (9). Discard shims (9) and cotter pin (7).
6. Remove shaft (18) from housing (12).
7. Remove cotter pin (20), nut (21), bearing (22), and shims (23) from housing (12). Record thickness of shims (23). Discard shims (23) and cotter pin (20).
8. Remove shaft (35), yoke (34), clutch (33), and worm drive gear (32) from housing (12).



15-41. POWER LEVELER MAINTENANCE (Contd)



15-41. POWER LEVELER MAINTENANCE (Contd)

c. Cleaning and Inspection

1. Clean and inspect bearings (7) and (16) and housing (8) (TM 9-214). Replace if damaged.
2. Inspect all gears and sprockets for small chips, burrs, and scratches. Raised metal can be removed with a fine mill file.
3. Inspect all parts for cracks, breaks, and other damage. Replace if damaged.
4. Inspect sprocket (6), worm drive gear (28), worm drive pinion (10), shaft (19), bearing in housing cap (25), and bearings (31) and (32) in housing (8) for wear and other damage. Refer to table 15-7, Power Leveler Wear-Limits, for measurements. Replace if worn or damaged.

Table 15-7. Power Leveler Wear Limits.

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		INCHES	MILLIMETERS
6	Sprocket:		
	Inside diameter	1.751-1.753	44.48-44.53
	Outside diameter	2.873-2.874	72.97-73.00
10	Worm drive pinion (diameter)	1.376-1.377	34.95-34.98
19	Shaft:		
	Diameter "A"	1.249-1.250	31.72-31.75
	Diameter "B"	1.378-1.379	35.00-35.03
25	Bearing housing cap (inside diameter)	1.379-1.381	35.03-35.08
28	Worm drive gear (outside diameter)	2.247-2.249	57.07-57.12
31	Bearing (inside diameter)	2.875-2.876	73.03-73.05
32	Bearing (inside diameter)	2.250-2.251	57.15-57.18

d. Assembly

NOTE

Install all shims to measured distance.

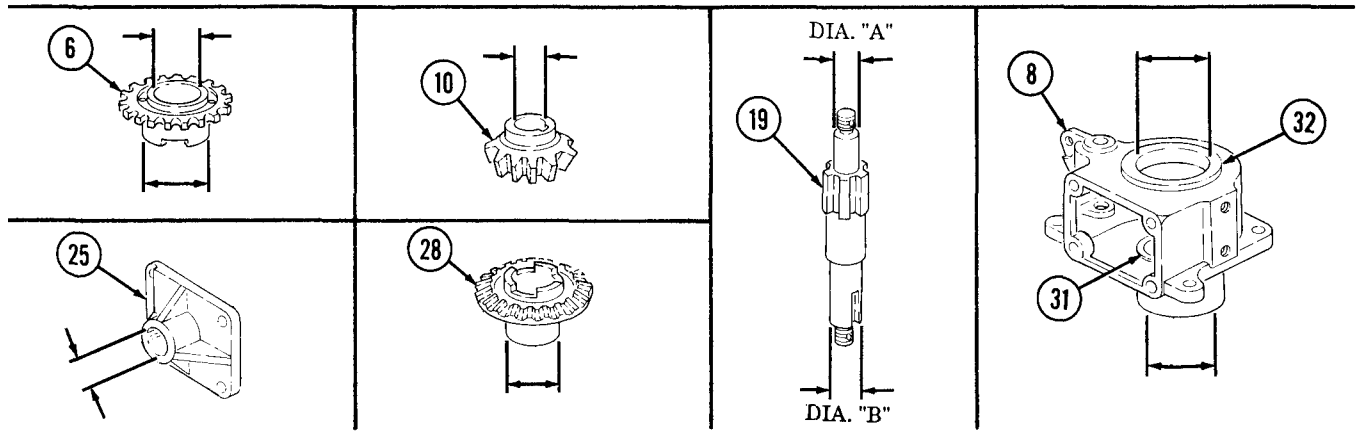
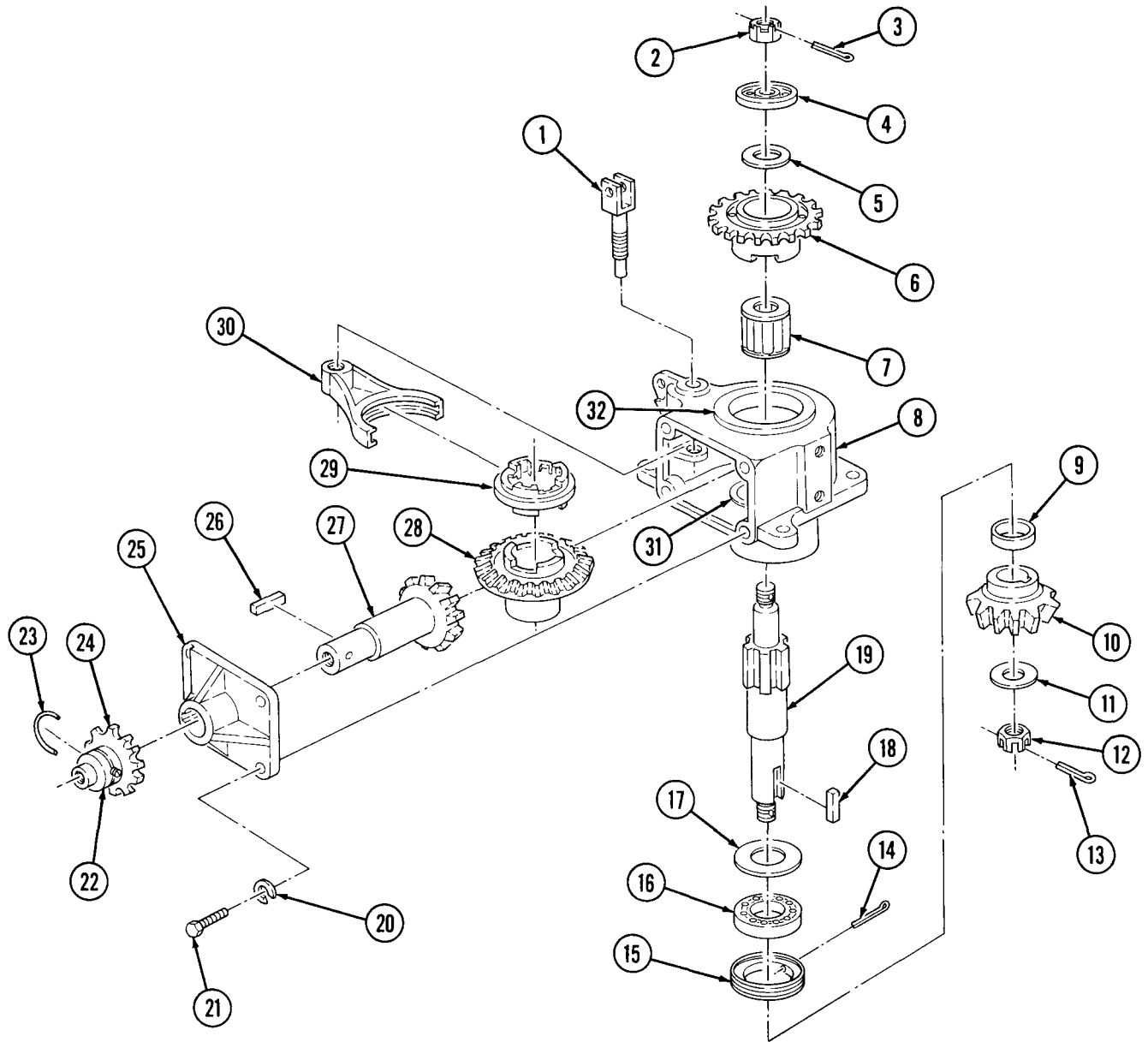
1. Pack bearings (7) and (16) with GAA grease.
2. Install new shim(s) (17), bearing (16), nut (15), and new cotter pin (14) in housing (8).
3. Install worm drive gear (28), clutch (29), yoke (30), and shaft (1) in housing (8).
4. Install shaft (19) in housing (8).
5. Install bearing (7), sprocket (6), new shim(s) (5), bearing retainer (4), nut (2), and new cotter pin (3) on shaft (19).
6. Install spacer (9), new woodruff key (18), takeoff pinion (10), washer (11), nut (12), and new cotter pin (13) on shaft (19).
7. Pack housing (8) with GAA grease.
8. Position worm drive pinion (27) in housing cap (25).

NOTE

Ensure teeth of worm drive pinion aline with teeth of worm drive gear.

9. Install new woodruff key (26) and sprocket (24) on worm drive pinion (27). Tighten setscrew (22) and install new safety wire (23).
10. Install housing cap (25) on housing (8) with two new lockwashers (20) and screws (21).

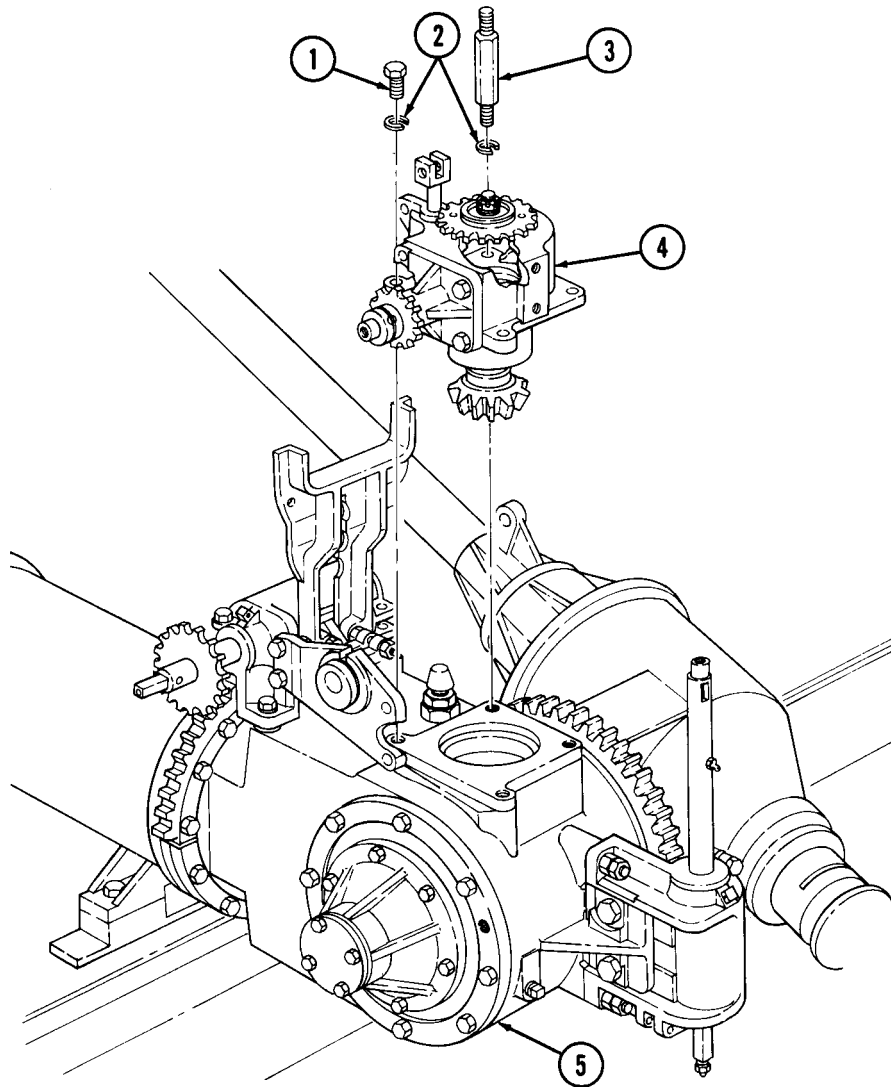
15-41. POWER LEVELER MAINTENANCE (Contd)



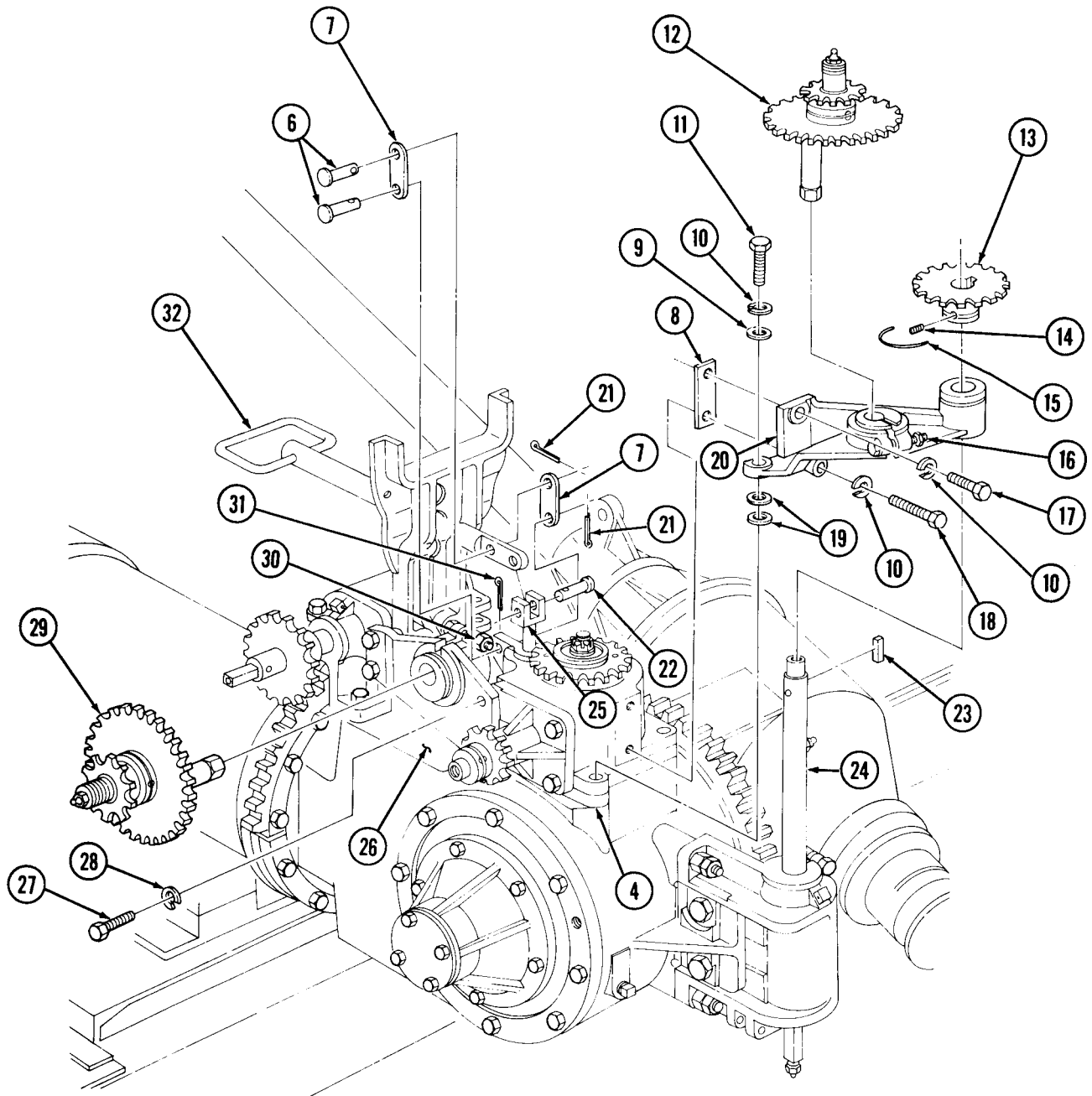
15-41. POWER LEVELER MAINTENANCE (Contd)

e. Installation

1. Install power leveler housing (4) on intermediate case (5) with two new lockwashers (2), stud (3), and screw (1).
2. Install new shim (8), two new shims (19), and bracket (20) on shaft (24) and power leveler housing (4) with two washers (9), four new lockwashers (10), two screws (11), and screws (17) and (18).
3. Install sprocket (12) in bracket (20) and tighten nut (16).
4. Install shifting rod (32), clevis pin (22), and new cotter pin (31) on shifter shaft (25).
5. Install two retaining links (7), clevis pins (6), and new cotter pins (21) on shifting rod (32) and power leveler housing (4).
6. Install two new lockwashers (28) and screws (27) on bracket (26).
7. Install sprocket (29) in bracket (26) and tighten nut (30).
8. Install new woodruff key (23) and sprocket (13) on shaft (24). Tighten setscrew (14) and install new safety wire (15).



15-41. POWER LEVELER MAINTENANCE (Contd)



FOLLOW-ON TASKS: . Install horizontal leveling worm drivechain (TM 9-2320-361-20).
 •Install vertical leveling worm drivechain (TM 9-2320-361-20).

15-42. INTERMEDIATE CASE MAINTENANCE

THIS TASK COVERS:

- | | |
|--|---|
| <p>a. Removal
 b. Intermediate Gear Disassembly
 c. Cleaning and Inspection
 d. Intermediate Gear Assembly
 e. Installation</p> | <p>f. Second Reduction Feed Pinion Adjustment
 g. Second Reduction Drive Pinion Adjustment
 h. Drive Gear Backlash Adjustment
 i. Feed Gear and Hub Backlash Adjustment</p> |
|--|---|

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Dial indicator (Appendix B, Item 21)
- 1-1/2-in. socket, 3/4-in. dr. (Appendix B, Item 41)
- Handle, socket wrench, 3/4-in. dr. (Appendix B, Item 35)
- Lifting device
 - Two screws (Appendix F, Item 214)
 - Two washers (Appendix F, Item 268)

MATERIALS/PARTS

- Fifteen lockwashers (Appendix F, Item 140)
- Six lockwashers (Appendix F, Item 138)
- Twelve lockwashers (Appendix F, Item 142)
- Cotter pin (Appendix F, Item 19)
- Two shim sets (Appendix F, Item 256)
- Shim set (Appendix F, Item 255)
- Shim set (Appendix F, Item 257)
- Two felt pads (Appendix F, Item 26)
- Sleeve (Appendix F, Item 261)
- Gasket (Appendix F, Item 56)

MATERIALS/PARTS (Contd)

- Gasket (Appendix F, Item 57)
- Two woodruff keys (Appendix F, Item 275)
- GAA grease (Appendix C, Item 8)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

- LO 9-2320 -209-12-1
- TM 9-214
- TM 9-2320-361-10
- TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Boring case removed (para. 15-38).
- Horizontal leveling worm gear removed (para. 15-39).
- Vertical leveling worm gear removed (para. 15-40).
- Power leveler removed (para. 15-41).

GENERAL SAFETY INSTRUCTIONS

All personnel must stand clear during lifting operations.

a. Removal

NOTE

Have drainage container ready to catch oil.

1. Remove two drainplugs (11) from intermediate case (8) and drain oil.
2. Manually rotate intermediate case (8) so bearing retainer (6) is on top.
3. Install lifting device and chain on bearing retainer (6) with two washers and screws.
4. Remove eight screws (4) and lockwashers (5) from bearing retainer (6) and intermediate case (8). Discard lockwashers (5).
5. Tighten two screws installed in step 3 until bearing retainer (6) comes free of intermediate case (8).

WARNING

All personnel must stand clear during lifting operations.
 A swinging or shifting load may cause injury to personnel.

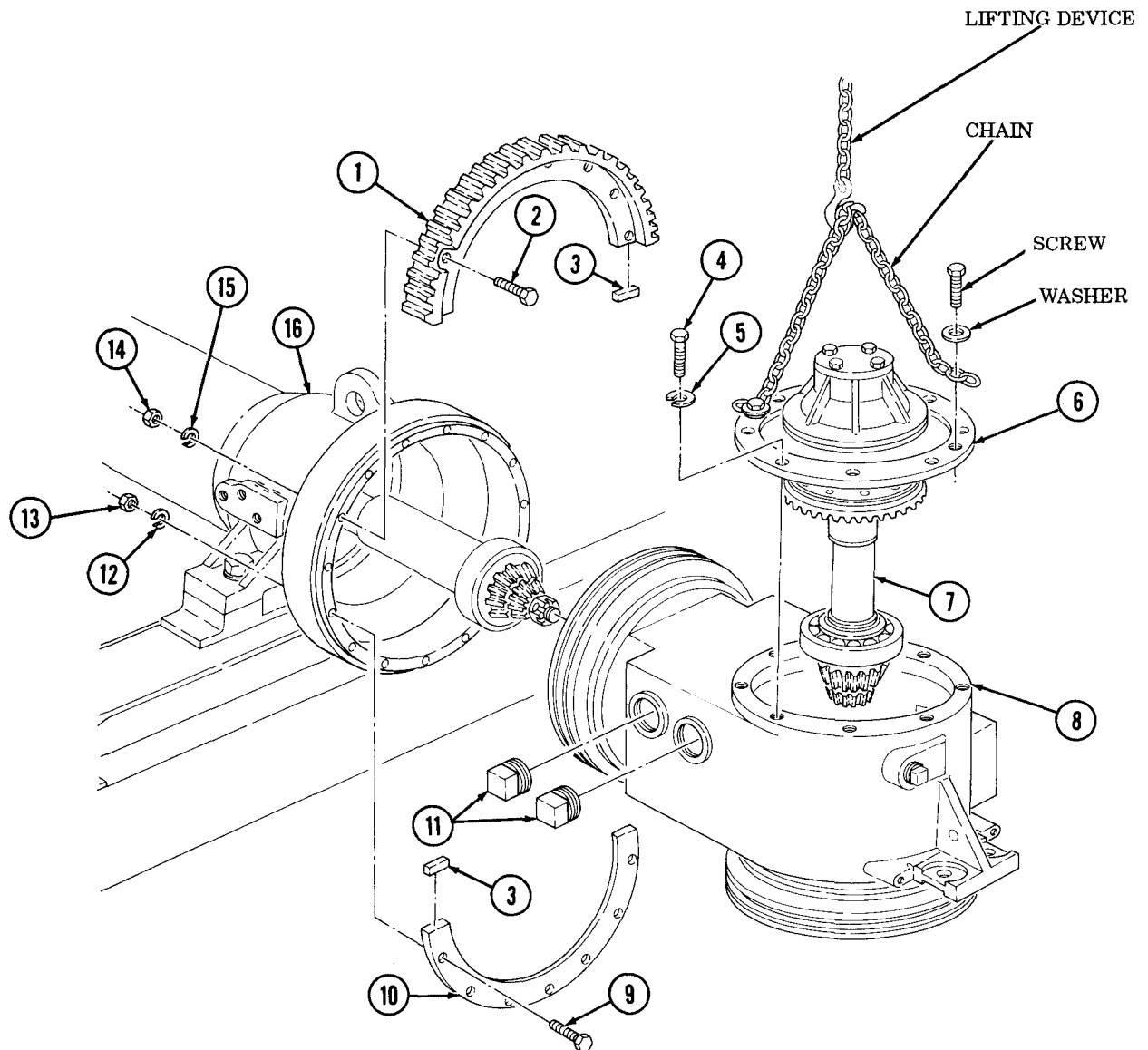
6. Remove intermediate gear assembly (7) from intermediate case (8).
7. Remove lifting device, two screws, washers, and chain from bearing retainer (6).

15-42. INTERMEDIATE CASE MAINTENANCE (Contd)

NOTE

Assistant will help with steps 8 and 9.

8. Remove seven nuts (13), lockwashers (12), screws (9), retaining ring (10), and two felt pads (3) from main support tube (16). Discard lockwashers (12) and felt pads (3).
9. Remove eight nuts (14), lockwashers (15), screws (2), worm gear (1), and intermediate case (8) from main support tube (16). Discard lockwashers (15).



15-42. INTERMEDIATE CASE MAINTENANCE (Contd)

b. Intermediate Gear Disassembly

1. Remove four screws (1), lockwashers (2), cap cover (3), and gasket (4) from cap (5). Discard lockwashers (2) and gasket (4).
2. Remove six screws (14), lockwashers (15), and cap (5) from bearing retainer (13). Discard lockwashers (15).
3. Remove cotter pin (7), nut (6), bearing (8), and shims (10) from shaft of second reduction feed pinion (32). Record thickness of shims (10) for assembly. Discard shims (10) and cotter pin (7).
4. Remove retaining ring (9), adjusting nut (11), bearing (12), retainer (13), and shims (16) from gear and hub (17). Record thickness of shims (16) for assembly. Discard shims (16).
5. Remove gear and hub (17) and shims (18) from shaft of second reduction drive pinion (30). Record thickness of shims (18) for assembly. Discard shims (18).

CAUTION

Bearing rollers are not held in place. When pulling second reduction feed pinion, be careful not to drop or lose any bearing rollers.

6. Remove second reduction feed pinion (32) and twenty-four bearing rollers (31) from second reduction drive pinion (30).
7. Remove retaining ring (20), adjusting nut (19), bearing (21), drive gear (22), two woodruff keys (29), shims (23), and spacer (24) from second reduction drive pinion (30). Record thickness of shims (23) for assembly. Discard shims (23) and woodruff keys (29).
8. Remove retaining ring (26), adjusting nut (25), bearing (27), and shims (28) from second reduction drive pinion (30). Record thickness of shims (28) for assembly. Discard shims (28).

c. Cleaning and Inspection

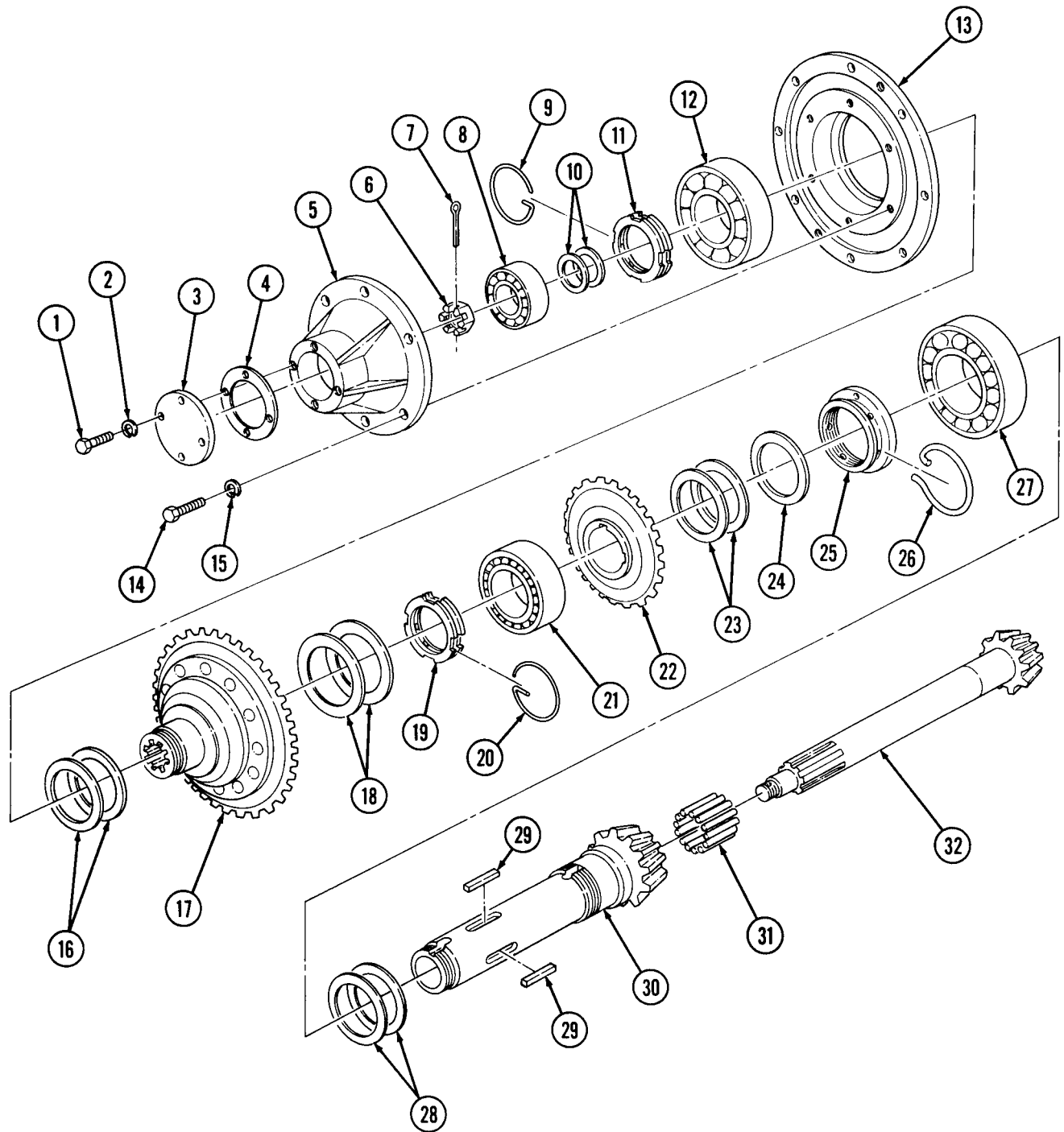
1. Clean all parts (para. 2-8).
2. Inspect cap cover (3), cap (5), and bearing retainer (13) for chips, cracks, and small holes. Replace if damaged.
3. Inspect gear and hub (17), drive gear (22), second reduction drive pinion (30), and second reduction feed pinion (32) for nicks, scratches, burrs, and damaged teeth. Small nicks, scratches, or burrs may be removed with a fine mill file. Replace if damaged.

NOTE

Gears and pinions must be replaced as matched sets with associated pinions and gears.

4. Inspect bearings (8), (12), (21), (27), and (31) for damage (TM 9-214). Replace if damaged.

15-42. INTERMEDIATE CASE MAINTENANCE (Contd)



15-42. INTERMEDIATE CASE MAINTENANCE (Contd)

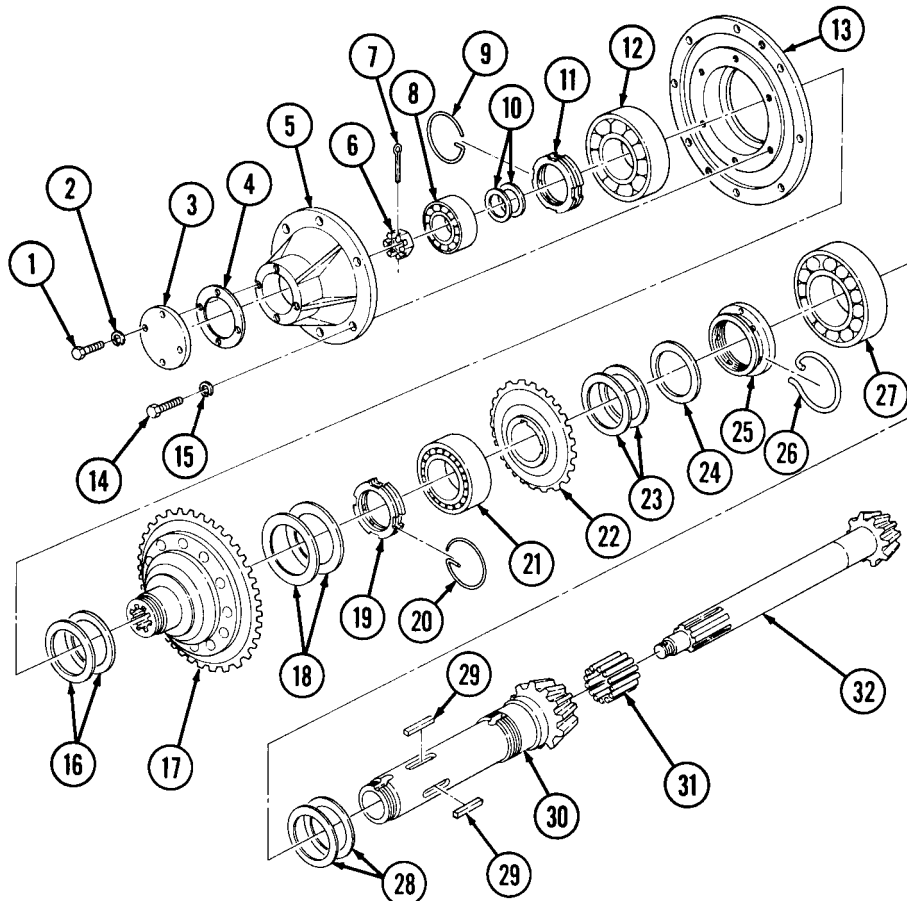
d. Intermediate Gear Assembly

1. Pack bearings (8), (12), (21), and (27) with GAA grease.

NOTE

- When bearing is installed, bearing shield must face gear.
- Install all new shims to thickness previously measured.

2. Install new shims (28), bearing (27), adjusting nut (25), and retaining ring (26) on second reduction drive pinion (30).
3. Install spacer (24), new shims (23), two new woodruff keys (29), drive gear (22), bearing (21), adjusting nut (19), and retaining ring (20) on second reduction drive pinion (30).
4. Pack twenty-four roller bearings (31) with GAA grease and install bearings (31) in second reduction drive pinion (30).
5. Install second reduction feed pinion (32) in second reduction drive pinion (30).
6. Install new shims (18) and gear and hub (17) on second reduction drive pinion (30).
7. Install new shims (16), bearing retainer (13), bearing (12), adjusting nut (11), and retaining ring (9) on gear and hub (17).
8. Install new shims (10), bearing (8), nut (6), and new cotter pin (7) on shaft of second reduction feed pinion (32).
9. Install cap (5) on bearing retainer (13) with six new lockwashers (15) and screws (14).
10. Install new gasket (4) and cap cover (3) on cap (5) with four new lockwashers (2) and screws (1).



15-42. INTERMEDIATE CASE MAINTENANCE (Contd)

e. Installation

NOTE

Assistant will help with steps 1 and 2.

1. Position intermediate case (40) and worm gear (33) on main support tube (48) and install with eight screws (34), new lockwashers (47), and nuts (46).
2. Install two new felt pads (35) and retaining ring (42) on main support tube (48) with seven screws (41), new lockwashers (44), and nuts (45).
3. Rotate intermediate case (40) so opening for bearing retainer (38) is on top.
4. Install chain, two washers, and screws on bearing retainer (38).

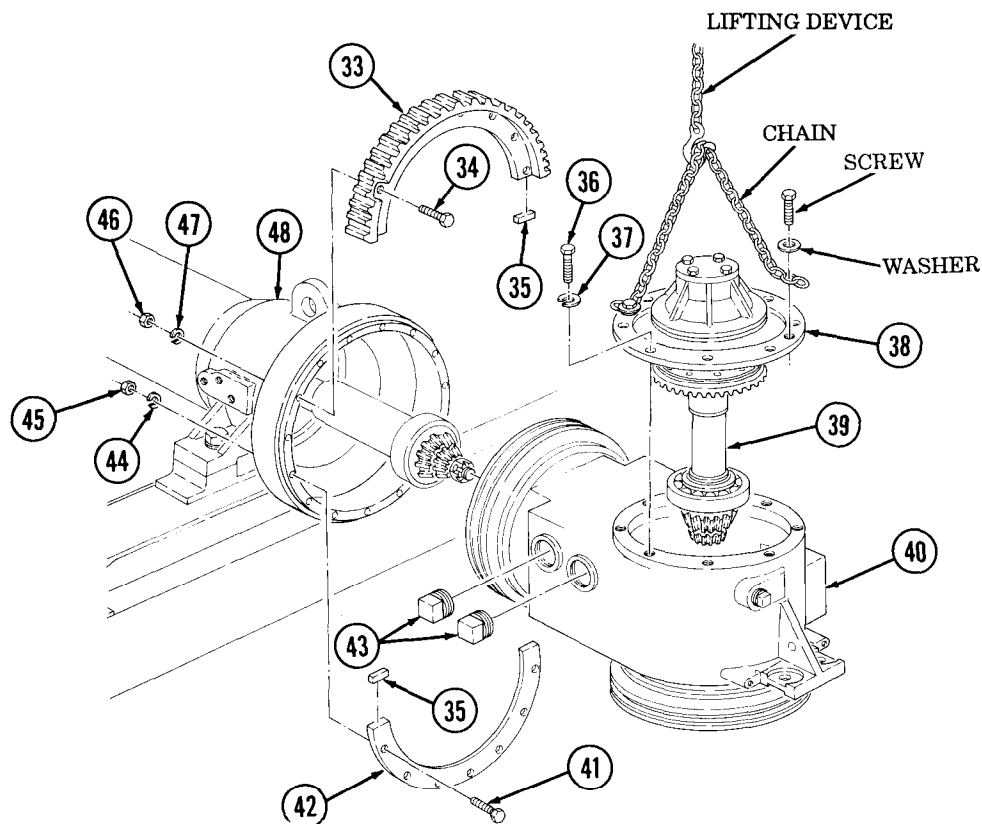
WARNING

All personnel must stand clear during lifting operations.
A snapped cable, shifting, or swinging load may cause injury to personnel.

NOTE

Assistant will help with step 5.

5. Attach lifting device to chain and position intermediate gear assembly (39) in intermediate case (40).
6. Install two new lockwashers (37) and screws (36) in bearing retainer (38). Remove lifting device, two screws, washers, and chain from bearing retainer (38).
7. Install two drainplugs (43) in intermediate case (40).



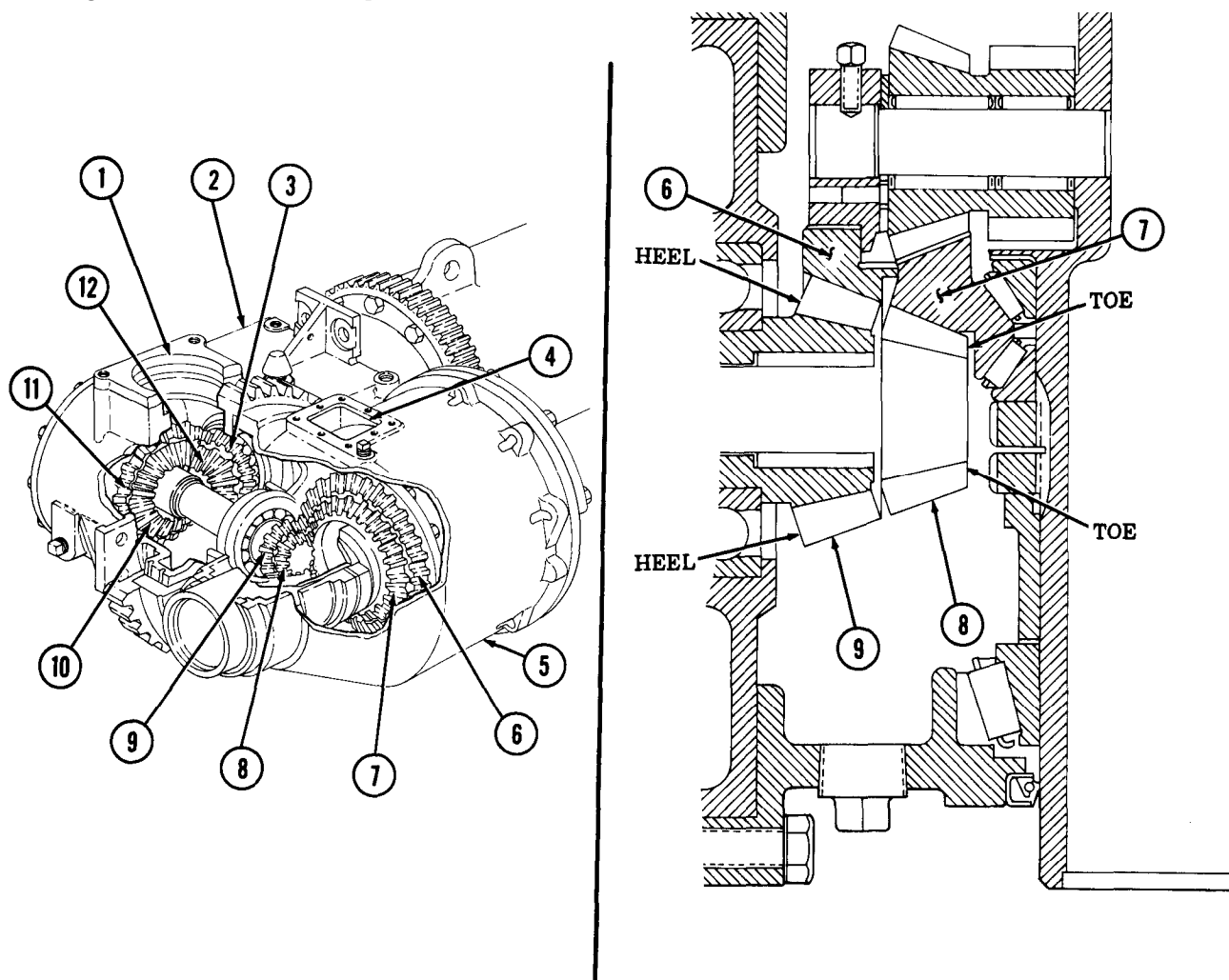
15-42. INTERMEDIATE CASE MAINTENANCE (Contd)

8. Install boring case (5) on intermediate case (2) (para. 15-38).
9. Look through inspection hole (4) of boring case (5) and ensure that heel of second reduction drive pinion (9) is alined with toe of rack drive gear (6), and toe of second reduction feed pinion (8) is alined with heel of rack feed idler gear (7). If adjustment of feed pinion (8) is required, refer to subtask of this paragraph. If adjustment of drive pinion (9) is required, refer to subtask g.
10. Look through power leveler shaft hole (1) on intermediate case (2) and ensure that toe of first reduction drive pinion (12) is alined with toe of drive gear (10) and heel of first reduction feed pinion (3) is alined with heel of gear and hub (11).

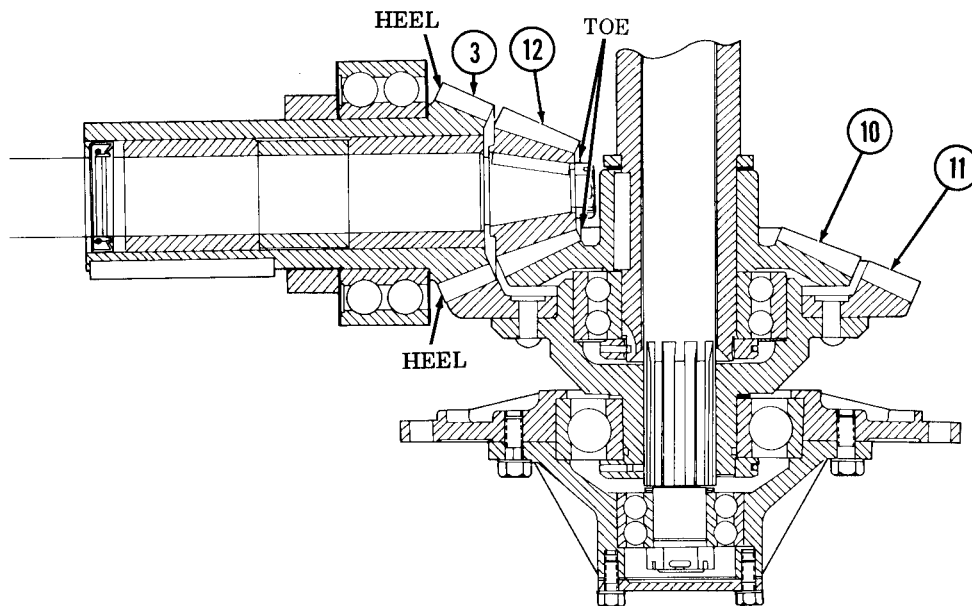
NOTE

Depth of first reduction feed and drive pinions are adjusted by adding or removing the appropriate shims (para. 15-38).

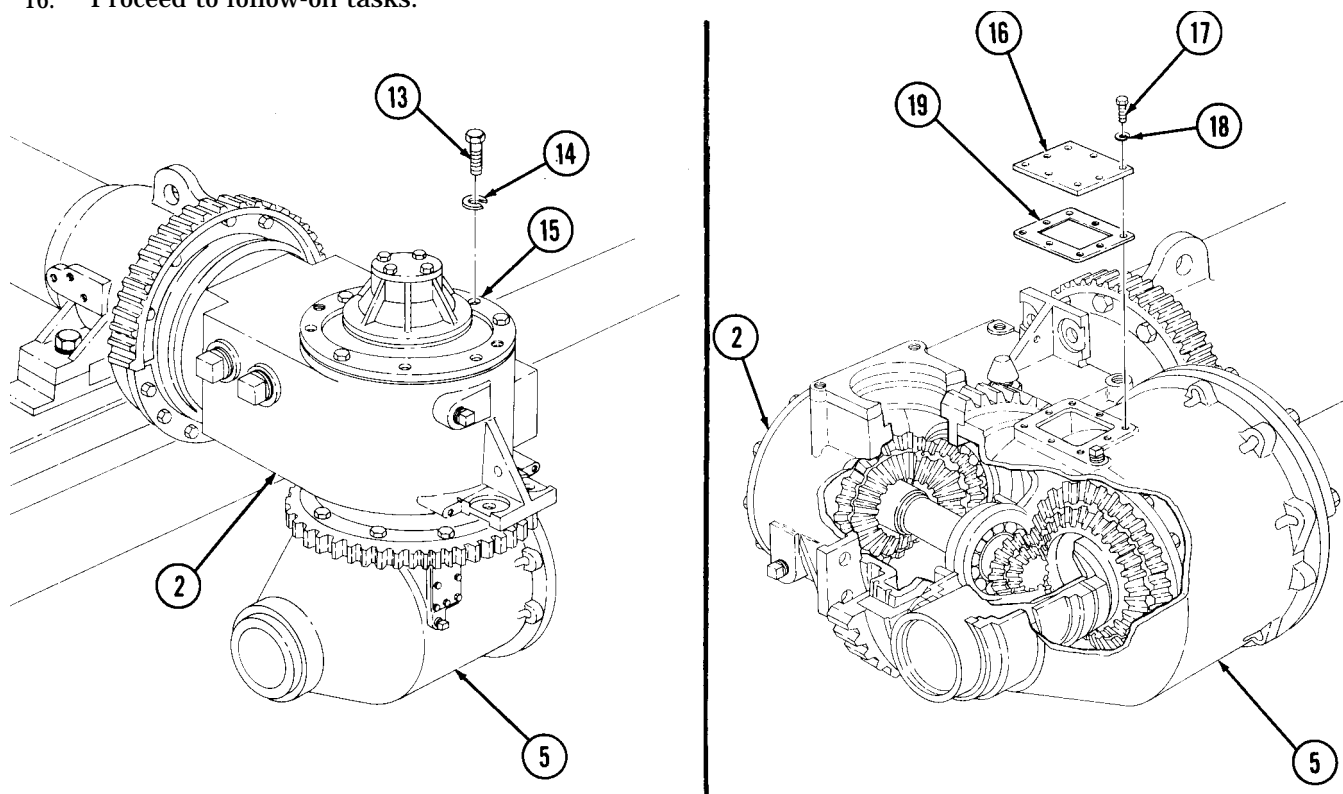
11. Position dial indicator through power leveler shaft hole (1) and against drive gear (10) and measure backlash between drive gear (10) and first reduction drive pinion (12). Backlash should be 0.006-0.016 in. (0.15-0.41 mm). If adjustment of drive gear (10) is required, refer to subtask h.
12. Place dial indicator against gear and hub (11) and measure backlash between gear and hub (11) and first reduction drive pinion (12). Backlash should be 0.006-0.016 in. (0.15-0.41 mm). If adjustment of gear and hub (11) is required, refer to subtask i.



15-42. INTERMEDIATE CASE MAINTENANCE (Contd)



13. If checks and measurements obtained in steps 9 through 12 are correct, perform steps 14 through 16.
14. Install bearing retainer (15) on intermediate case (2) with six new lockwashers (14) and screws (13).
15. Install new gasket (19) and inspection plate (16) on boring case (5) with eight new lockwashers (18) and screws (17).
16. Proceed to follow-on tasks.



15-42. INTERMEDIATE CASE MAINTENANCE (Contd)

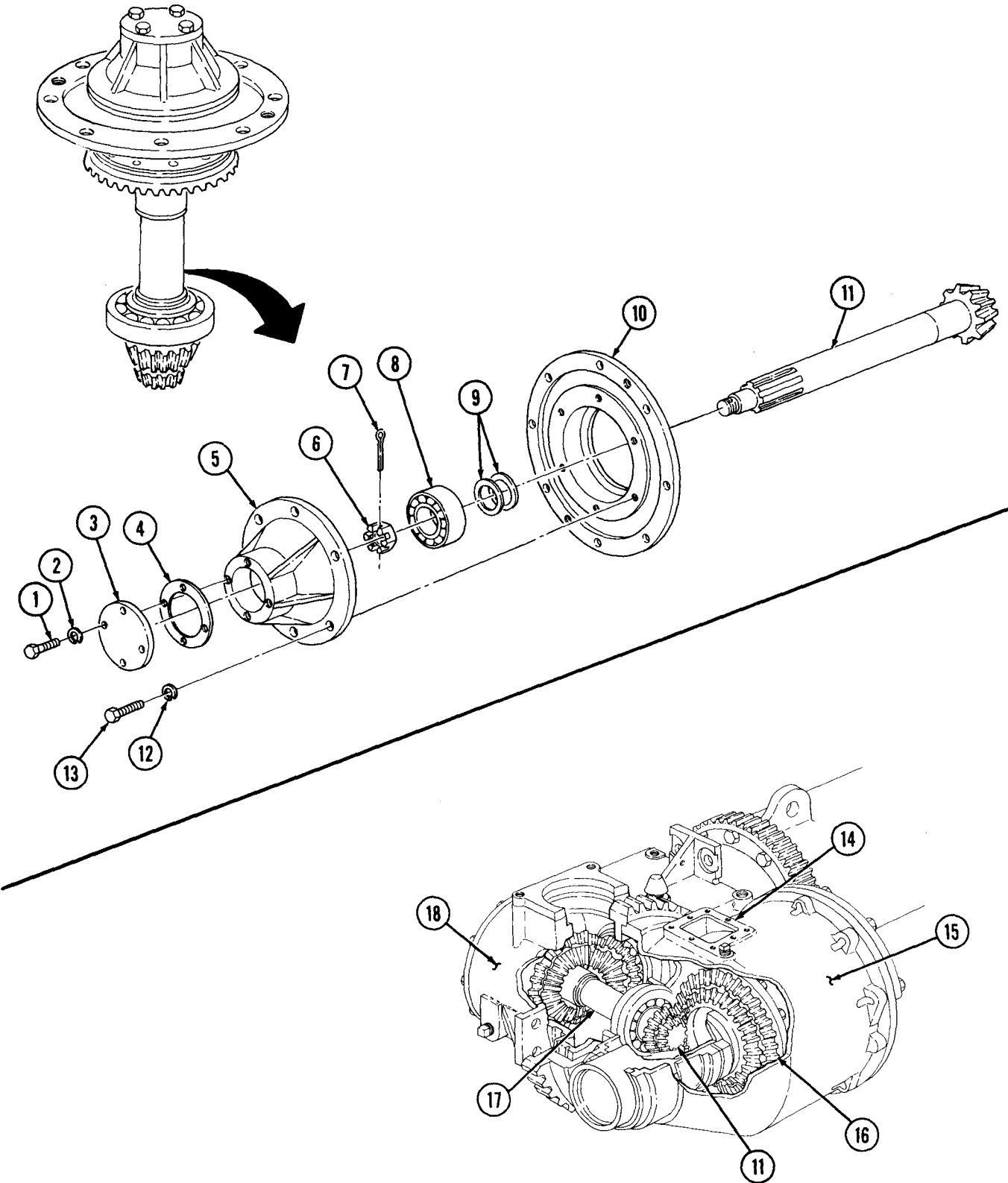
f. Second Reduction Feed Pinion Adjustment

NOTE

Intermediate gear assembly must be removed and disassembled in order to adjust the depth of second reduction feed pinion.

1. To increase or decrease the depth of second reduction feed pinion (11), add or remove shims (9); perform steps 2 through 10.
2. Remove second reduction gear assembly (17) from intermediate case (18) (subtask a, steps 3 through 7).
3. Remove four screws (1), lockwashers (2), cap cover (3), and gasket (4) from cap (5).
4. Remove six screws (13), lockwashers (12), and cap (5) from bearing retainer (10).
5. Remove cotter pin (7), nut (6), bearing (8), and shims (9) from shaft of second reduction feed pinion (11). Discard cotter pin (7).
6. Add shims (9) to increase depth or remove shims (9) to decrease depth in relation to rack drive gear (16).
7. Assemble second reduction gear assembly (17) (subtask d, steps 8 and 9).
8. Install second reduction gear assembly (17) into intermediate case (18) (subtask e, steps 3 through 6).
9. Looking through hole (14) in boring case (15), confirm that gear (11) aligns with gear (16).
10. If gear (11) does not align with gear (16), repeat steps 1 through 8 above. If gear (11) is in proper alignment with gear (16), perform subtask e, steps 14 and 15.

15-42. INTERMEDIATE CASE MAINTENANCE (Contd]



15-42. INTERMEDIATE CASE MAINTENANCE (Contd)
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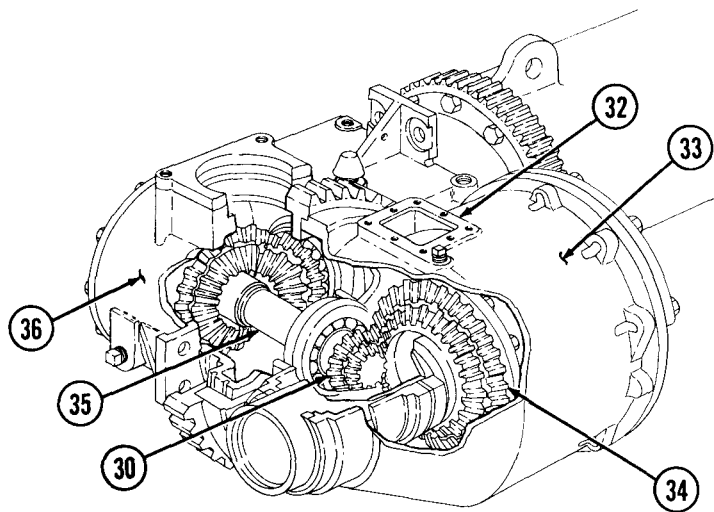
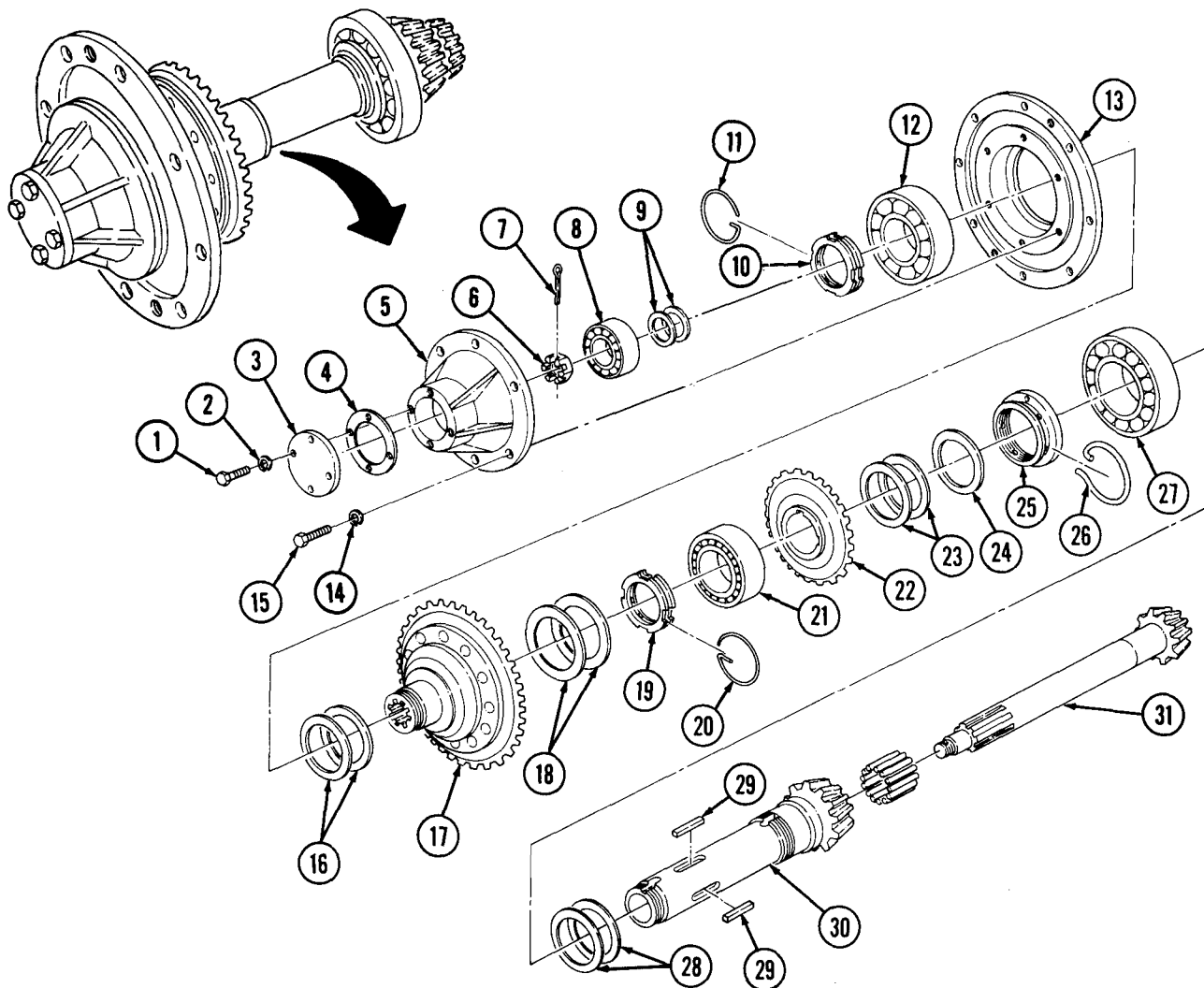
g. Second Reduction Drive Pinion Adjustment

NOTE

Intermediate gear assembly must be removed and disassembled in order to adjust depth of second reduction drive pinion.

1. To increase or decrease depth of second reduction drive pinion (30), add and remove equal amount of shims between shims (23) and (28); perform steps 2 through 15.
2. Remove second reduction gear assembly (35) from intermediate case (36) (subtask a, steps 3 through 7).
3. Remove four screws (1), lockwashers (2), cap cover (3), and gasket (4) from cap (5).
4. Remove six screws (15), lockwashers (14), and cap (5) from bearing retainer (13).
5. Remove cotter pin (7), nut (6), bearing (8), and shims (9) from shaft of second reduction feed pinion (31).
6. Remove retaining ring (11), adjusting nut (10), bearing (12), retainer (13), and shims (16) from gear and hub (17).
7. Remove gear and hub (17) and shims (18) from shaft of second reduction drive pinion (30).
8. Remove retaining ring (20), adjusting nut (19), bearing (21), drive gear (22), two woodruff keys (29), shims (23), and spacer (24) from second reduction drive pinion (30).
9. Remove retaining ring (26), adjusting nut (25), bearing (27), and shims (28) from second reduction drive pinion (30).
10. To increase depth of second reduction drive pinion (30), add shims (23) and remove shims (28) in equal amounts. To decrease depth of second reduction drive pinion (30), remove shims (23) and add shims (28) in equal amounts.
11. Assemble second reduction gear assembly (35) (subtask d, steps 2,3, and 6 through 10).
12. Install second reduction gear assembly (35) into intermediate case (36) (subtask e, steps 3 through 6).
13. Looking through hole (32) in boring case (33), confirm that gear (30) aligns with gear (34).
14. If gear (30) does not align with gear (34), repeat steps 1 through 12 above.
15. If gear (30) is in proper alignment with gear (34), perform subtask e, steps 14 and 15.

15-42. INTERMEDIATE CASE MAINTENANCE (Contd)



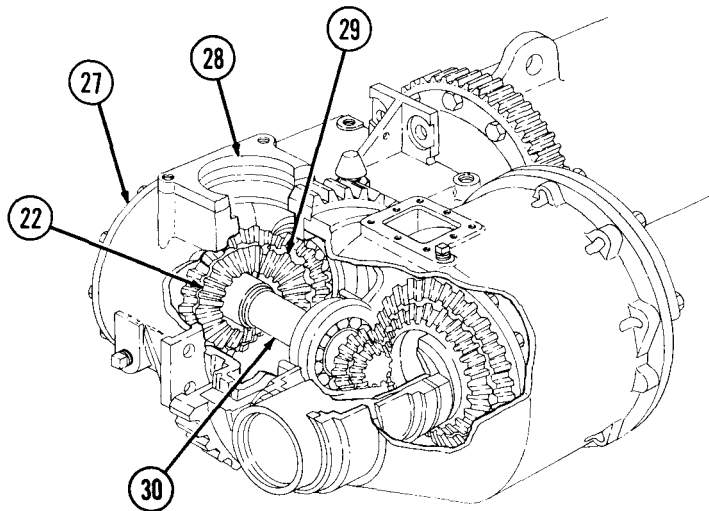
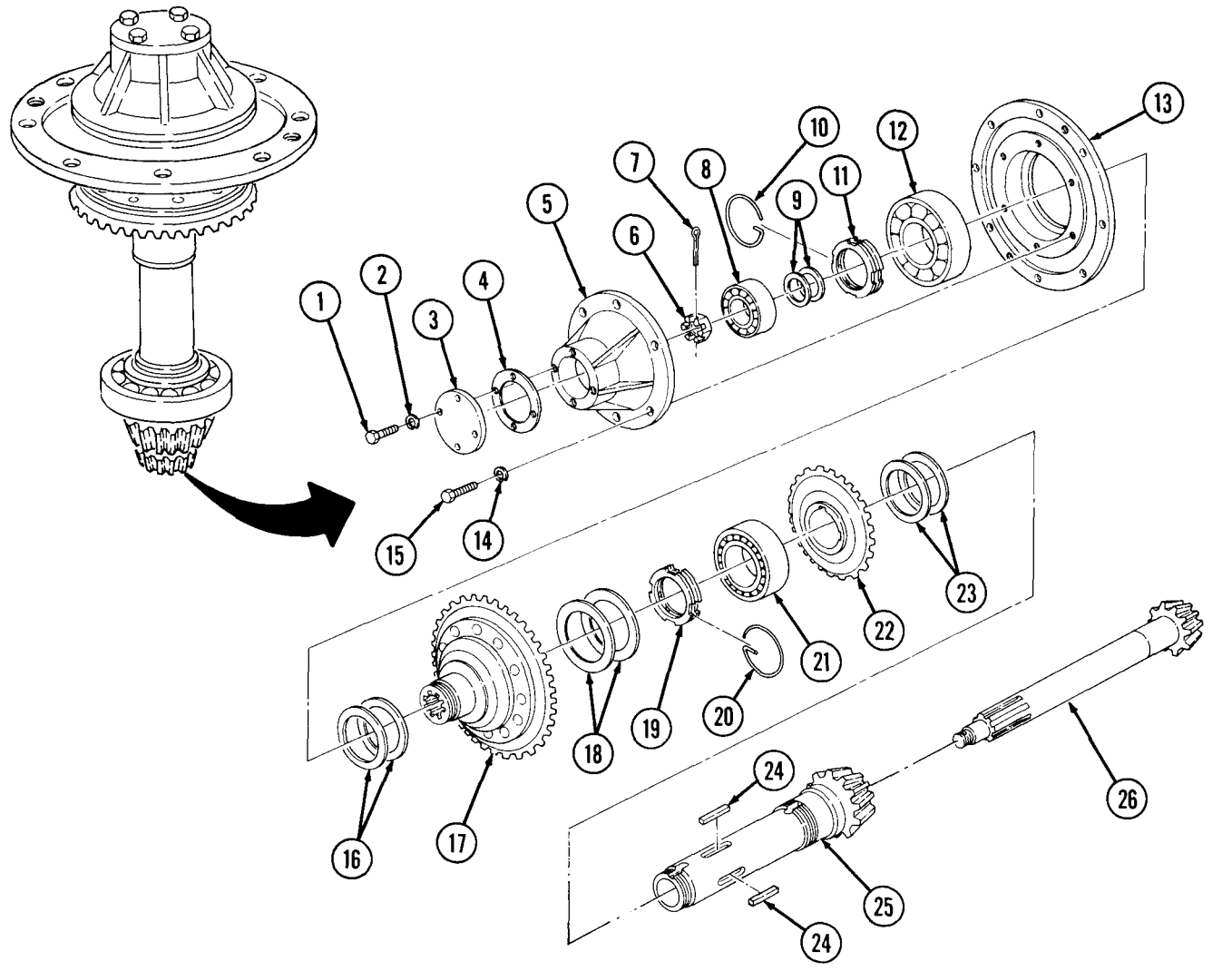
15-42. INTERMEDIATE CASE MAINTENANCE (Contd)**h. Drive Gear Backlash Adjuster**

NOTE

Intermediate gear assembly must be removed and disassembled in order to adjust the backlash of drive gear.

1. To adjust the backlash of drive gear (22) with reduction drive pinion gear (29), add and remove shims (23) and (18) in equal amounts; perform steps 2 through 14.
2. Remove second reduction gear assembly (30) from intermediate case (27), (subtask a, steps 3 through 7).
3. Remove four screws (1), lockwashers (2), cap cover (3), and gasket (4) from cap (5).
4. Remove six screws (15), lockwashers (14), and cap (5) from bearing retainer (13).
5. Remove cotter pin (7), nut (6), bearing (8), and shims (9) from shaft of second reduction feed pinion (26).
6. Remove retaining ring (10), adjusting nut (11), bearing (12), retainer (13), and shims (16) from gear and hub (17).
7. Remove gear and hub (17) and shims (18) from second reduction drive pinion (25).
8. Remove retaining ring (20), adjusting nut (19), bearing (21), drive gear (22), two woodruff keys (24), and shims (23) from second reduction drive pinion (25).
9. To increase backlash of drive gear (22), add shims (23) and remove shims (18) in equal amounts. To decrease backlash of drive gear (22), remove shims (23) and add shims (18) in equal amounts.
10. Assemble second reduction gear assembly (30) (subtask d, steps 3, 6, and 7 through 10).
11. Install second reduction gear assembly (30) into intermediate case (27) (subtask e, steps 3 through 6).
12. Set up dial indicator gage through hole (28) in intermediate case (27) and confirm backlash between drive gear (22) and reduction drive pinion gear (29) is 0.006-0.016 in. (0.15-0.41 mm).
13. If the backlash is not correct, repeat steps 1 through 12 above.
14. If the backlash is correct, perform subtask e, steps 14 and 15.

15-42. INTERMEDIATE CASE MAINTENANCE (Contd)

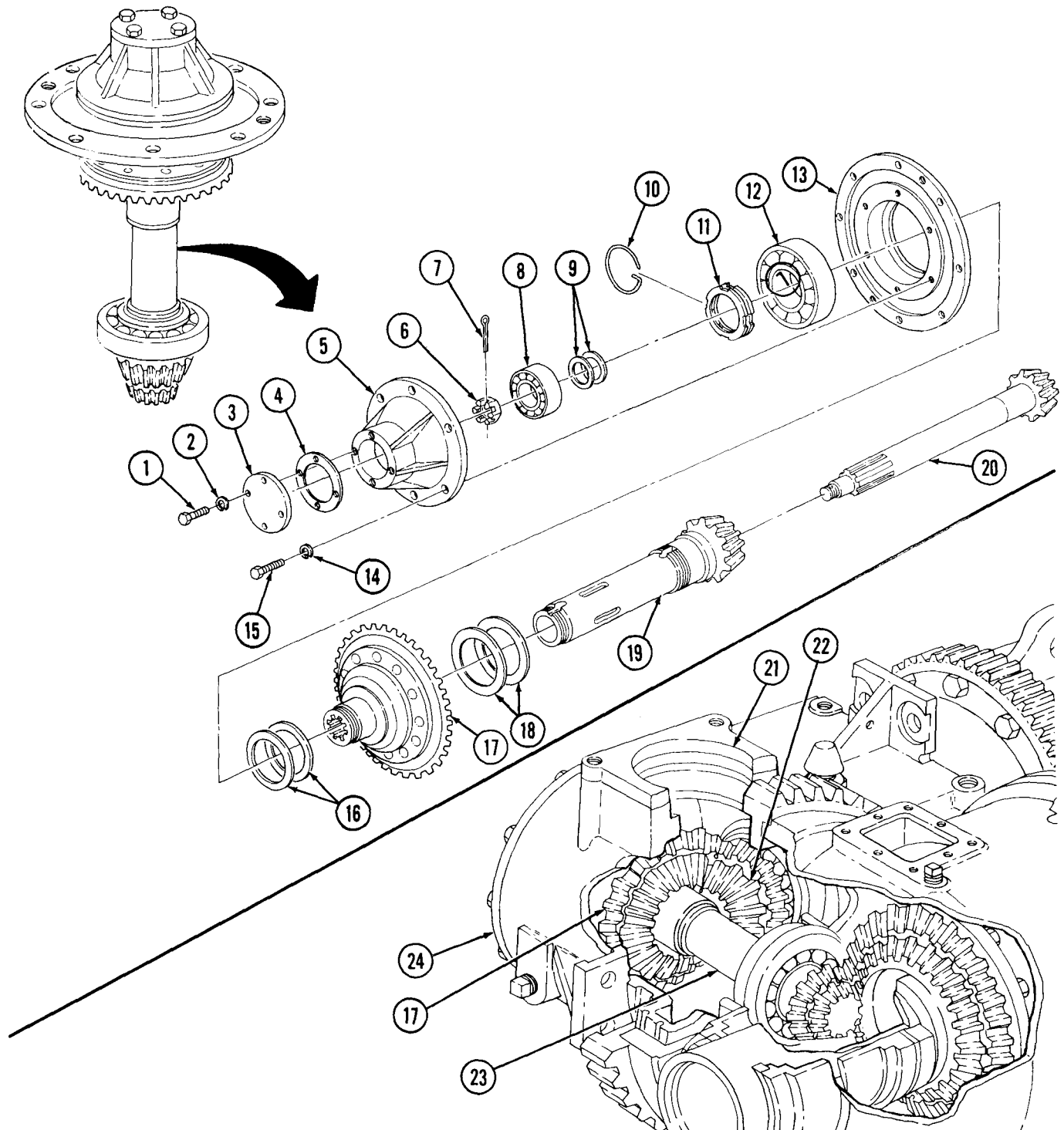


15-42. INTERMEDIATE CASE MAINTENANCE (Contd)**i. Feed Gear and Hub Backlash Adjustment****NOTE**

Intermediate gear assembly must be removed and disassembled in order to adjust feed gear and hub backlash.

1. To adjust the backlash of gear and hub (17) with reduction drive pinion gear (22), add and remove shims (16) and (18) in equal amounts; perform steps 2 through 13.
2. Remove second reduction gear assembly (23) from intermediate case (24) (subtask a, steps 3 through 7).
3. Remove four screws (1), lockwashers (2), cap cover (3), and gasket (4) from cap (5).
4. Remove six screws (15), lockwashers (14), and cap (5) from bearing retainer (13).
5. Remove cotter pin (7), nut (6), bearing (8), and shims (9) from second reduction feed pinion (20).
6. Remove retaining ring (10), adjusting nut (11), bearing (12), retainer (13), and shims (16) from gear and hub (17).
7. Remove gear and hub (17) and shims (18) from second reduction drive pinion (19).
8. To increase gear and hub (17) backlash, add shims (18) and remove shims (16) in equal amounts. To decrease backlash of gear and hub (17), remove shims (18) and add shims (16) in equal amounts.
9. Assemble second reduction gear assembly (23) (subtask d, steps 6 through 10).
10. Install second reduction gear assembly (23) into intermediate case (24) (subtask e, steps 4 through 6).
11. Set up dial indicator gage through hole (21) in intermediate case (24). Confirm that backlash between gear and hub (17) and reduction drive pinion gear (22) is 0.006-0.016 in. (0.15-0.41 mm).
12. If the backlash is not correct, repeat steps 1 through 11 above.
13. If the backlash is correct, go to subtask e, steps 14 and 15.

15-42. INTERMEDIATE CASE MAINTENANCE (Contd)



- FOLLOW-ON TASKS:**
- Install power leveler (para. 15-41).
 - Install vertical leveling worm rear (para. 15-40).
 - Install horizontal leveling worm gear (para. 15-39).
 - Complete boring case installation (para. 15-38).
 - Replace lubricant (LO 9-2320-209-12-1).

15-43. MAIN DRIVE IDLER GEAR MAINTENANCE

THIS TASK COVERS:

- | | |
|--|---|
| <p>a. Removal
 b. Disassembly
 c. Cleaning and Inspection</p> | <p>d. Assembly
 e. Installation</p> |
|--|---|

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit (Appendix B, Item 1)
 Mechanical puller kit (Appendix B, Item 22)

MATERIALS/PARTS

Sixteen lockwashers (Appendix F, Item 138)
 Cotter pin (Appendix F, Item 6)
 Cotter pin (Appendix F, Item 13)
 Gasket (Appendix F, Item 58)
 Gasket (Appendix F, Item 59)
 No gaskets (Appendix F, Item 60)
 Two O-rings (Appendix F, Item 170)
 O-ring (Appendix F, Item 171)
 Two woodruff keys (Appendix F, Item 276)
 Two oil seals (Appendix F, Item 239)
 Four locknuts (Appendix F, Item 98)
 Sealing compound (Appendix C, Item 17)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

LO 9-2320-209-12-1
 TM 9-214
 TM 9-2320-361-10
 TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

- . Parking brake set (TM 9-2320-361-10).
- . Hydraulic pump universal joint removed (TM 9-2320-361-20).
- Main drive idler gear housing drained (LO 9-2320-209-12-1).

GENERAL SAFETY INSTRUCTIONS

Support housing before removing hardware.

a. Removal

1. Remove four locknuts (18), screws (21), and shaft flange (20) from flange (19). Discard locknuts (18)

WARNING

Support main drive idler gear housing before removing hardware.
 Failure to do so may result in injury to personnel or damage to equipment.

2. Remove eight nuts (7), lockwashers (6), screws (2), housing (5), and gasket (3) from clutch case (1). Discard lockwashers (6) and gasket (3).

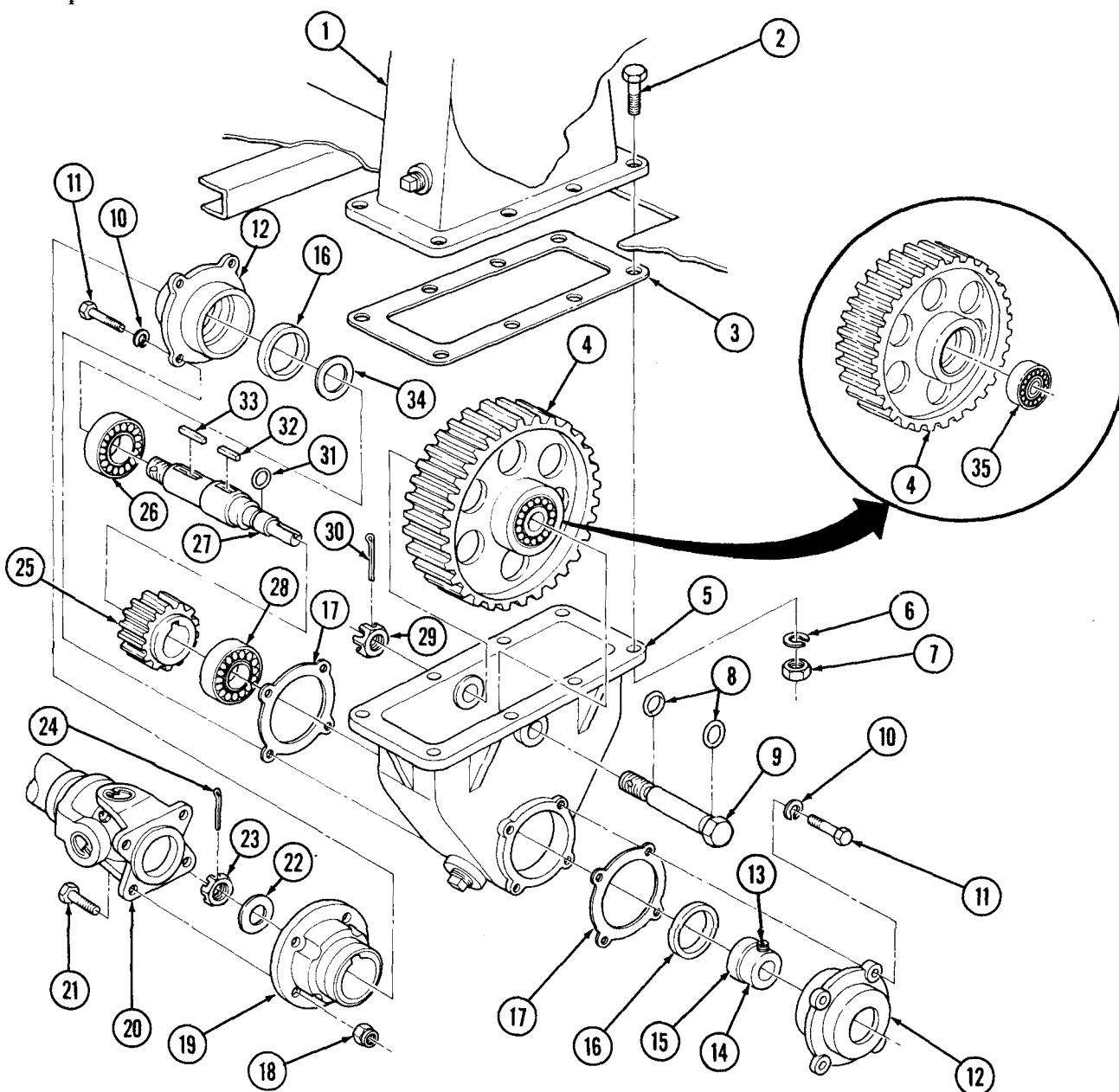
b. Disassembly

1. Remove cotter pin (30), nut (29), shaft (9), and idler gear (4) with bearings (35) from housing (5). Discard cotter pin (30).
2. Remove two O-rings (8) from shaft (9). Discard O-rings (8).
3. Remove cotter pin (24), nut (23), washer (22), flange (19), woodruff key (33), and gasket (34) from shaft (27). Discard cotter pin (24), woodruff key (33), and gasket (34).
4. Remove eight screws (11), lockwashers (10), two retainers (12), and gaskets (17) from housing (5). Discard lockwashers (10) and gaskets (17).
5. Press two oil seals (16) from retainers (12). Discard oil seals (16).
6. Loosen setscrew (13) and remove collar (14) and O-ring (31) from shaft (27). Discard O-ring (31).
7. Remove shaft (27) with bearings (26) and (28) and main drive gear (25) from housing (5).

15-43. MAIN DRIVE IDLER GEAR MAINTENANCE (Contd)

c. Cleaning and Inspection

1. Clean all parts (para. 2-8).
2. Inspect bearings (26) and (28) for damage (TM 9-214). Press from shaft (27) and replace if damaged.
3. Inspect main idler gear (4) for nicks, scratches, burrs, and chipped or broken teeth. Remove nicks, scratches, or burrs with a fine mill file. If teeth are chipped or broken, press two bearings (35) from main idler gear (4) and replace gear (4).
4. Inspect main drive gear (25) for nicks, scratches, burrs, and chipped or broken teeth. Remove nicks, scratches, or burrs with a fine mill file. If teeth are chipped or cracked, press main drive gear (25) and woodruff key (32) from shaft (27) and replace woodruff key (32) and gear (25).
5. Inspect collar (14), sleeve (15), and flange (19) for damage. Remove two sleeves (15) if damaged and press on new ones.



15-43. MAIN DRIVE IDLER GEAR MAINTENANCE (Contd)

d. Assembly

1. Press two new oil seals (15) in retainers (12).
2. Install shaft (25) with two bearings (24) and main drive gear (27) in housing (5).
3. Install new O-ring (28) and collar (14) on shaft (25). Tighten setscrew (13).
4. Apply sealant to gasket surfaces and install two new gaskets (16) and retainers (12) on housing (5) with eight new lockwashers (10) and screws (11).
5. Apply sealant to gasket surfaces and install new gasket (31), new woodruff key (26), and flange (18) on shaft (25) with washer (23), nut (22), and new cotter pin (21).
6. Install two new O-rings (8) on shaft (9).

NOTE

Ensure teeth of idler gear mesh with those of main drive gear during installation.

7. Install idler gear (4) in housing (5) with shaft (9), nut (30), and new cotter pin (29).

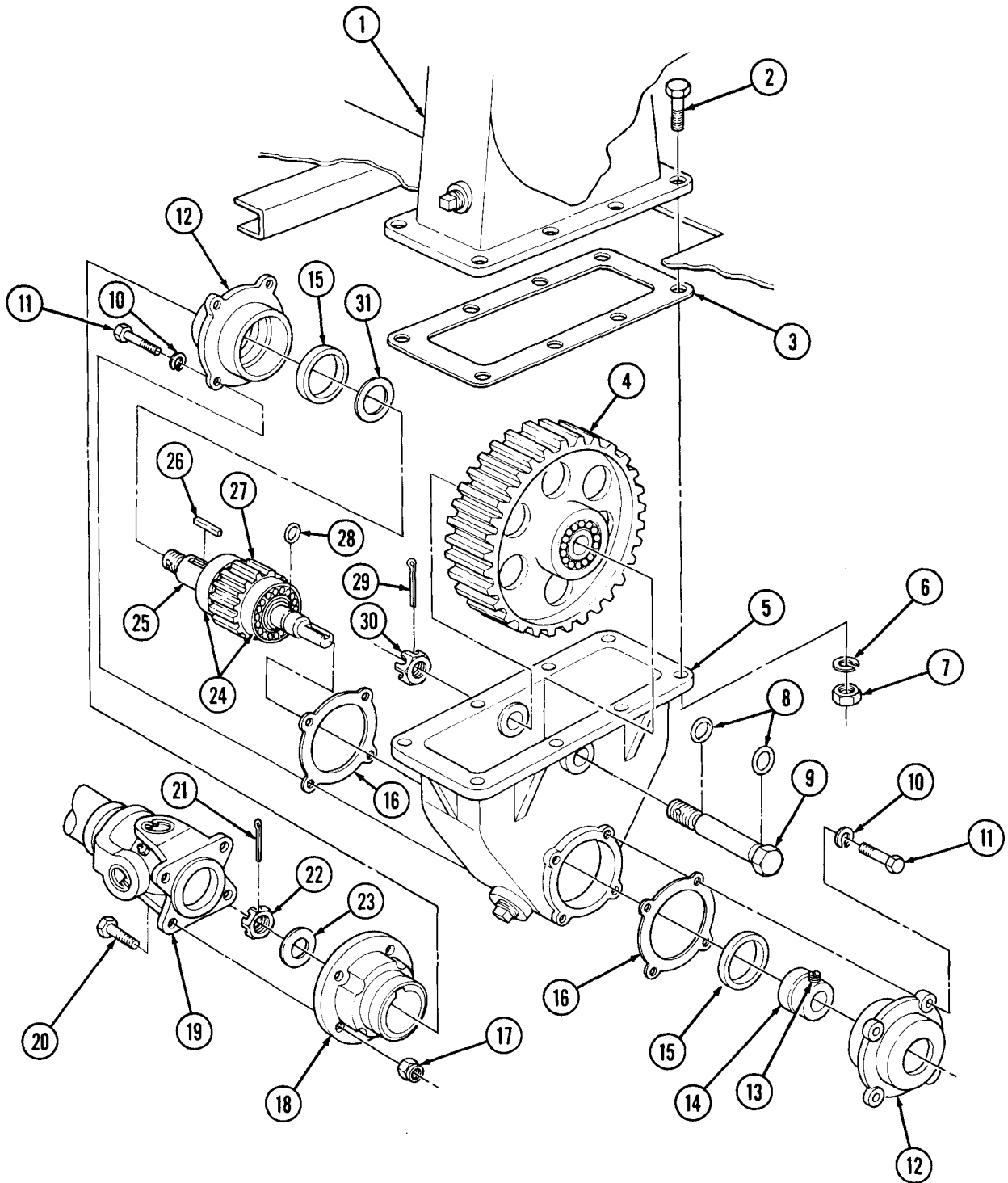
e. Installation

NOTE

Assistant will help with step 1.

1. Apply sealant to gasket surfaces and install new gasket (3) and housing (5) on clutch case (1) with eight screws (2), new lockwashers (6), and nuts (7).
2. Install shaft flange (19) on flange (18) with four screws (20) and new locknuts (17).

15-43. MAIN DRIVE IDLER GEAR MAINTENANCE (Contd)



FOLLOW-ON TASKS: . Install hydraulic pump universal joint (TM 9-2320-361-20).
 • Fill main drive idler gear housing with oil (LO 9-2320-209-12-1).

15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE

THIS TASK COVERS:

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit (Appendix B, Item 1)
 Mechanical puller kit (Appendix B, Item 22)
 Lifting device

MATERIALS/PARTS

Six lockwashers (Appendix F, Item 125)
 Four lockwashers (Appendix F, Item 138)
 Twenty-two lockwashers (Appendix F, Item 127)
 Four gaskets (Appendix F, Item 61)
 Four gaskets (Appendix F, Item 63)
 Gasket (Appendix F, Item 62)
 Four O-rings (Appendix F, Item 172)
 Shim set (Appendix F, Item 258)
 Shim set (Appendix F, Item 259)
 Shim set (Appendix F, Item 257)
 Four woodruff keys (Appendix F, Item 277)
 Woodruff key (Appendix F, Item 276)
 Cotter pin (Appendix F, Item 6)
 Seal (Appendix F, Item 224)
 GAA grease (Appendix C, Item 8)
 Sealing compound (Appendix C, Item 19)
 Safety wire (Appendix C, Item 31)
 Lubricating oil, OE/HDO 30 (Appendix C, Item 13)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

LO 9-2320-209-12-1
 TM 9-214
 TM 9-237
 TM 9-2320-361-10
 TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

. Parking brake set (TM 9-2320-361-10).
 • Clutch case drained (LO 9-2320-209-12-1).
 . Earth boring machine removed (para. 15-35).
 • Main drive idler gear removed (para. 15-43).
 • Intermediate case removed (para. 15-42).
 . Operation levers removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

. Be prepared to support clutch and brake.
 • All personnel must stand clear during lifting operations.

a. Disassembly

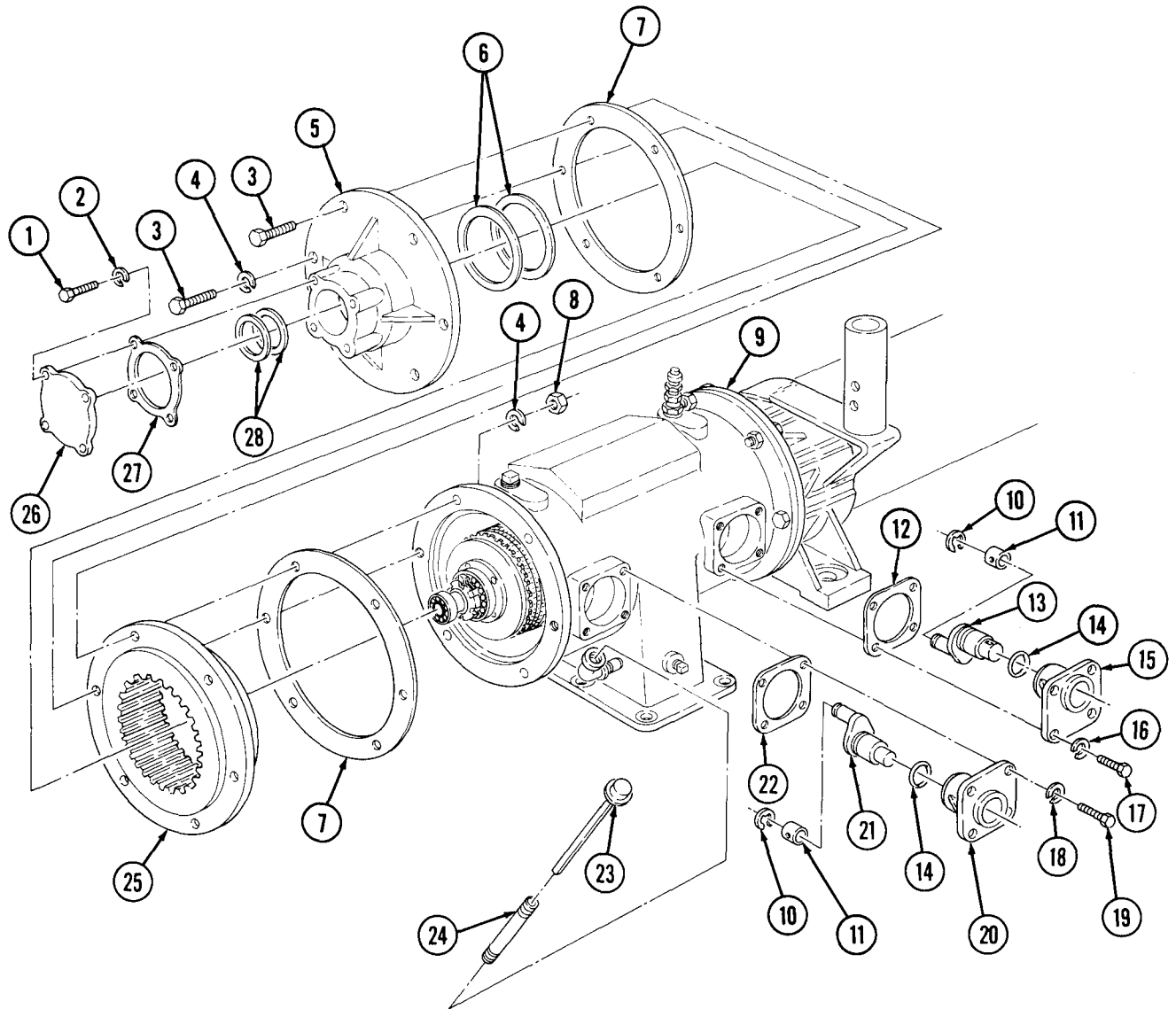
1. Remove dipstick (23) and nipple (24) from clutch case (9).
2. Remove eight screws (17), lockwashers (16), two cam housings (15), gaskets (12), and cams (13) from case (9). Discard lockwashers (16) and gaskets (12).
3. Remove eight screws (19), lockwashers (18), two cam housings (20), gaskets (22), and cams (21) from case (9). Discard lockwashers (18) and gaskets (22).
4. Remove four rings (10), sleeves (11), and O-rings (14) from two cams (21) and two cams (13). Discard O-rings (14).
5. Remove four screws (1), lockwashers (2), clutch case scap cover (26), gasket (27), and shims (28) from clutch case cap (5). Record thickness of shims (28). Discard shims (28), gasket (27), and lockwashers (2).

NOTE

Perform steps 6 through 11 if adjusting depth of feed pinion.

6. Remove six screws (3), lockwashers (4), four nuts (8), clutch case cap (5), two gaskets (7), brake shell (25), and shims (6) from case (9). Record thickness of shims (6). Discard shims (6), gaskets (7), and lockwashers (4).

15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)



15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)

7. Install chains on case (7), attach lifting device to chains, and apply tension to chains.
8. Remove four nuts (1), six screws (3), and lockwashers (2) from case (7) and clutch and brake (4). Discard lockwashers (2).

WARNING

- Be prepared to support clutch and brake otherwise it may fall and cause injury to personnel, and/or damage to equipment.
- All personnel must stand clear during lifting operations. A snapped chain, shifting or swinging load may cause injury to personnel.

NOTE

Assistant will help with lifting operations.

9. Slide case (7) and gasket (6) off clutch and brake (4). Discard gasket (6).
10. Remove lifting device and chains from case (7).
11. Remove bearing (30), drive sleeve (10) with clutch assembly (5), and woodruff key (13) from drive shaft (12). Discard woodruff key (13).

NOTE

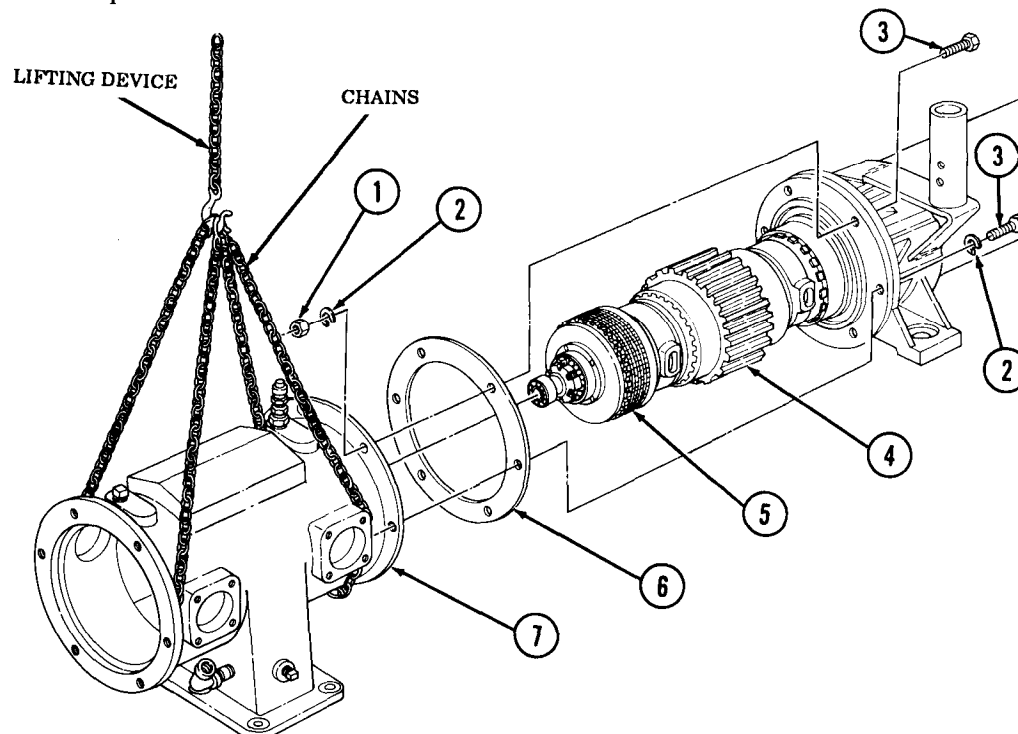
If adjusting depth of feed pinion, proceed to step 20.

12. Remove safety wire (21), loosen setscrew (22), and remove adjusting nut (29) and bearing (28) from drive sleeve (10). Discard safety wire (21).
13. Remove brake hub (27) with thirteen clutch plates (25) and (26) from drive sleeve (10).

NOTE

Note number and sequence of clutch plates before removing from brake hub.

14. Remove thirteen clutch plates (25) and (26) from brake hub (27). Tie clutch plates (25) and (26) together in sequence.



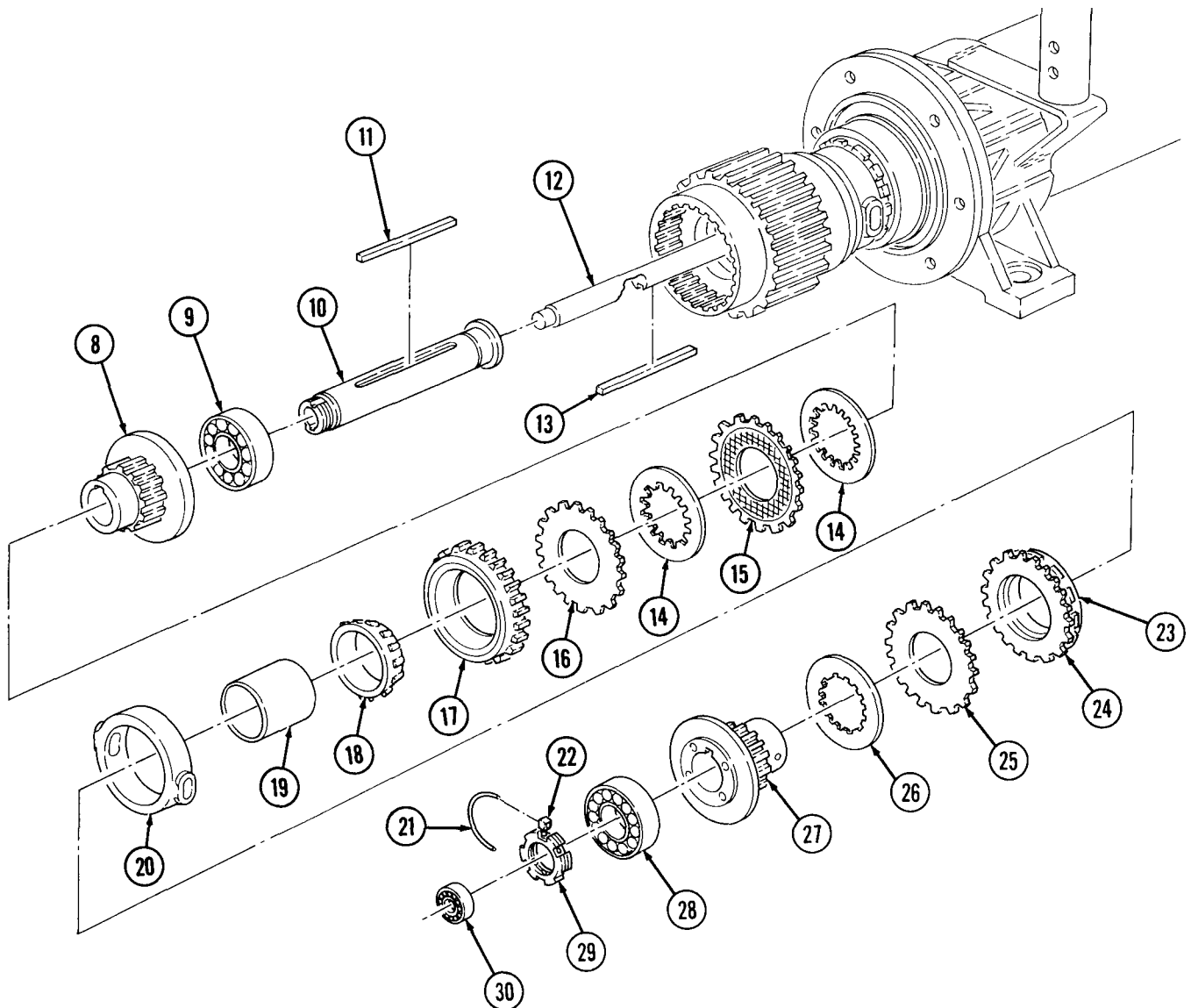
15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)

15. Loosen adjusting nut (23) and remove brake pressure plate (24), throw ring (20), and bearing (18) with clutch pressure plate (17) from sleeve bearing (19).
16. Remove sleeve bearing (19) from clutch hub (8).
17. Remove clutch hub (8) with clutch plates (14), (15), and (16) and woodruff key (11) from drive sleeve (10). Discard woodruff key (11).

NOTE

Note number and sequence of clutch plates before removing from clutch hub.

18. Remove clutch plate (16), nine clutch plates (14), and eight clutch plates (15) from clutch hub (8). Tie clutch plates (14), (15), and (16) together in sequence.
19. Remove bearing (9) from drive sleeve (10).



15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)

NOTE

Perform steps 20 through 22 and 24 through 26 only if adjusting depth of feed pinion.

20. Remove main drive gear (23) from bearing (19).
21. Remove safety wire (22), loosen setscrew (21), and remove adjusting nut (20) and bearing (19) from feed shaft (4). Discard safety wire (22).
22. Remove clutch hub (18) with clutch plates (16), (15), and (17) from feed shaft (4).

NOTE

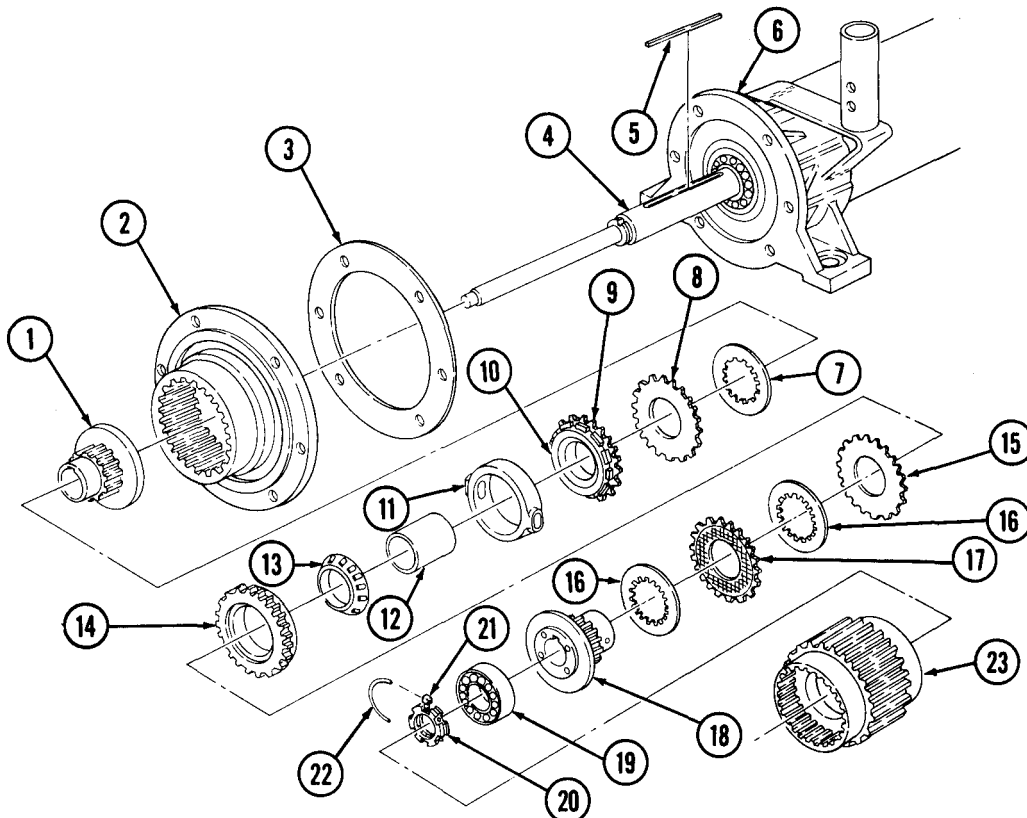
Note number and sequence of clutch plates before removing from clutch hub.

23. Remove clutch plate (15), nine clutch plates (16), and eight clutch plates (17) from clutch hub (18). Tie clutch plates together in sequence.
24. Remove clutch pressure plate (14), bearing (13), and throw ring (11) from pressure plate (9). Loosen adjusting nut (10) and remove brake pressure plate (9) from sleeve bearing (12).
25. Remove sleeve bearing (12) from brake hub (1).
26. Remove brake hub (1) with brake plates (7) and (8) and woodruff key (5) from feed shaft (4). Discard woodruff key (5).

NOTE

- Note number and sequence of clutch plates before removing from brake hub.
- If adjusting depth of feed pinion, proceed to step 31.

27. Remove thirteen clutch plates (8) and (7) from brake hub (1). Tie clutch plates together in sequence.
28. Remove brake shell (2) and gasket (3) from main support tube (6). Discard gasket (3).



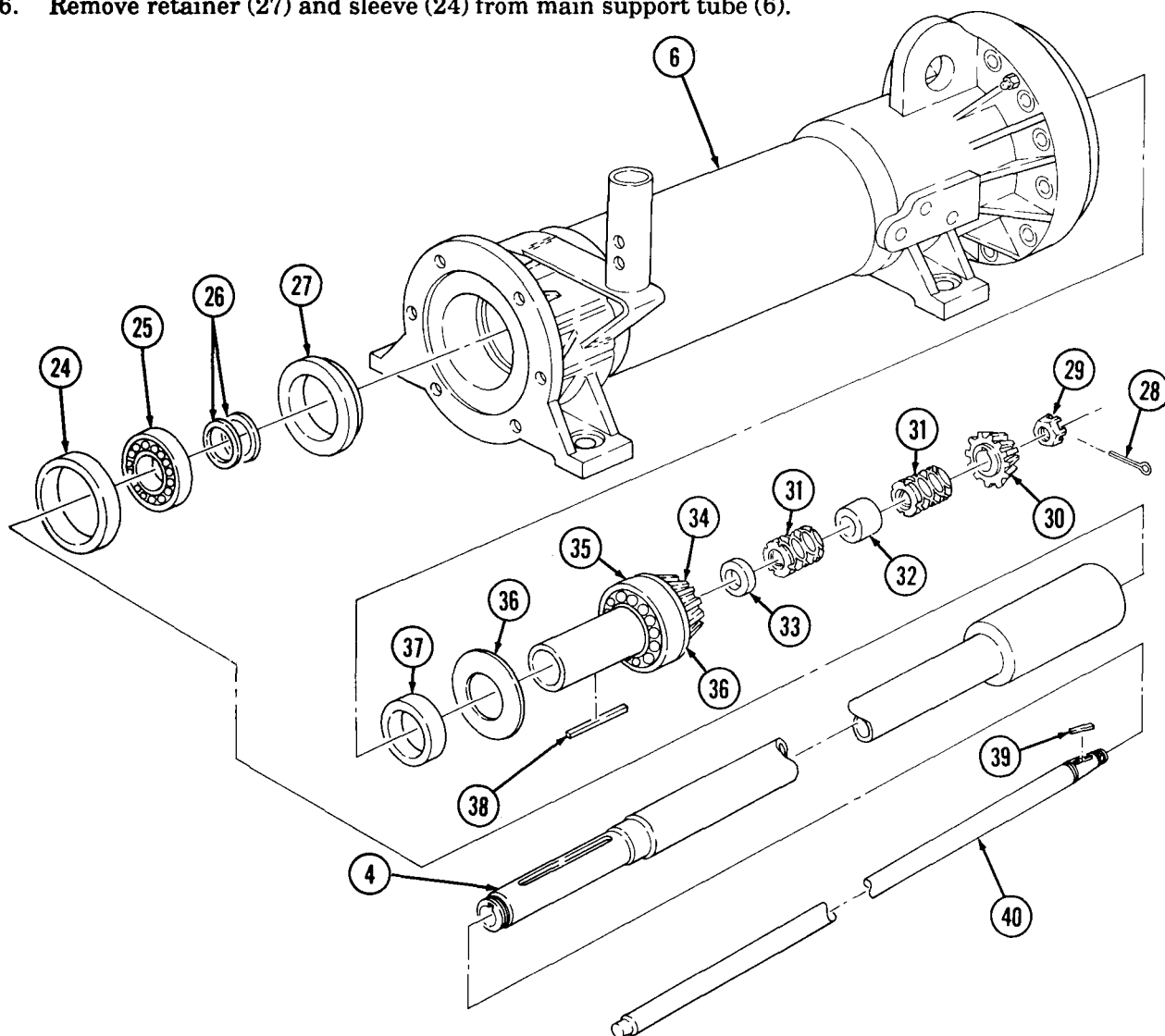
15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)

29. Remove cotter pin (28), nut (29), drive pinion (30), and woodruff key (39) from drive shaft (40).
- Discard cotter pin (28) and woodruff key (39).
30. Tap shaft (40) and remove from feed shaft (4).

NOTE

Perform steps 31, 35, and 36 if adjusting depth of feed pinion.

31. Tap feed shaft (4) and remove from main support tube (6).
32. Remove feed pinion (34) with bearing (35), two washers (36), and spacer (37), and woodruff key (38) from feed shaft (4). Discard woodruff key (38).
33. Remove spacer (37) and washer (36) from feed pinion (34).
34. Remove two bearings (31), spacer (32), and seal (33) from feed pinion (34). Discard seal (33).
35. Remove bearing (25) and shims (26) from main support tube (6). Record thickness of shims (26). Discard shims (26).
36. Remove retainer (27) and sleeve (24) from main support tube (6).



15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)

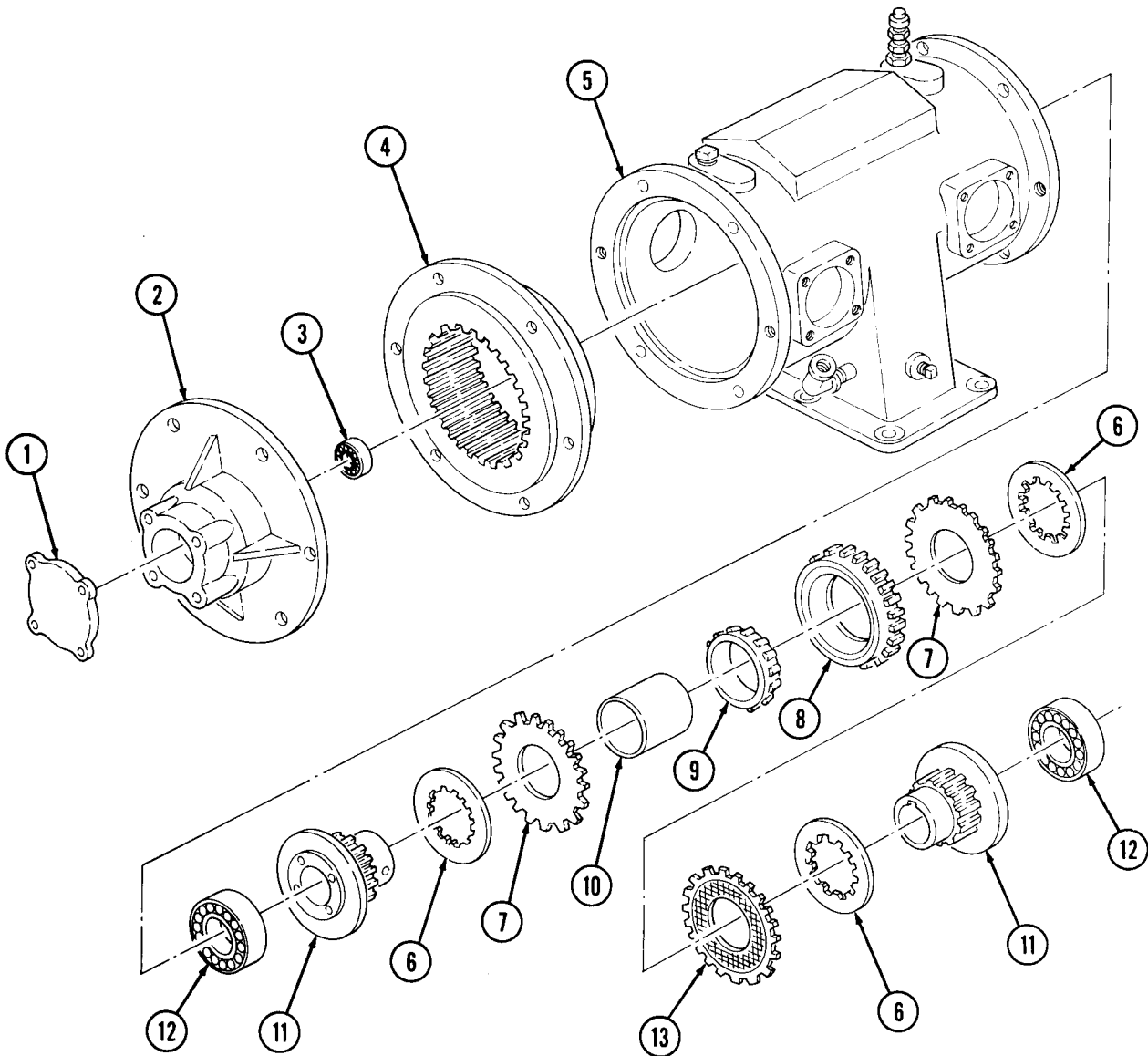
b. Inspection

1. For general inspection instructions, refer to para. 2-9.
2. Inspect two sleeve bearings (10), two roller bearings (9), four bearings (12), and bearings (3) and (17) (TM 9-214). Replace if damaged.

NOTE

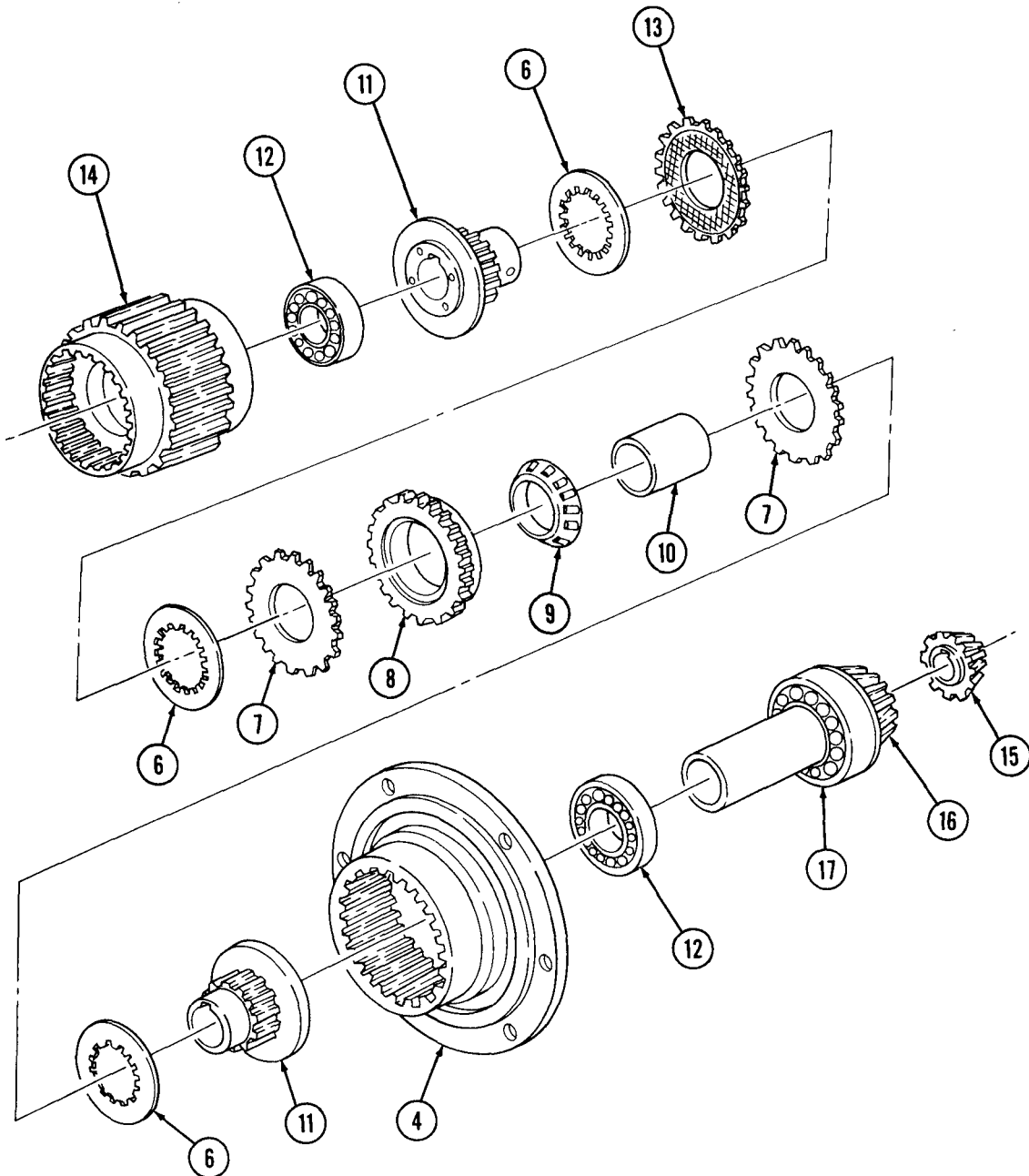
Feed pinion gear or drive pinion gear must be replaced with associated intermediate case ring gears as a matched set.

3. Inspect main drive gear (14), drive pinion (15), and feed pinion (16) for burrs, nicks, chips, cracks, and damaged teeth. Small nicks or burrs can be removed with a fine mill file. Replace if damaged.



15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)

4. Inspect two brake shells (4), four hubs (11), and main drive gear (14) for notching of splines. Replace if damaged.
5. Inspect all clutch plates (6), (7), and (13) for scoring and scorching. Replace all clutch plates if damaged.
6. Inspect lining of clutch plates (13) for damage and wear. Plate thickness should be 0.138-0.106 in. (3.50-2.69 mm). Place clutch plate (13) on clutch pressure plate (8) and check for coning by using feeler gage to measure gap at inside diameter. Gap should not exceed 0.15 in. (0.38 mm). Replace if worn or damaged.
7. Inspect clutch cap (5), clutch case cap (2), and clutch case cap cover (1) for chips, cracks, and small holes. Repair cracks or small holes by welding. Refer to TM 9-237. Replace if damaged.



<p>15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)</p>

c. Assembly

NOTE

- If adjusting depth of drive pinion, proceed to steps 40 and 44 through 47.
- If adjusting depth of feed pinion, perform steps 42 through 47.
- Coat all brake and clutch plates with oil before installation.
- Pack all bearings with GAA grease before assembly.

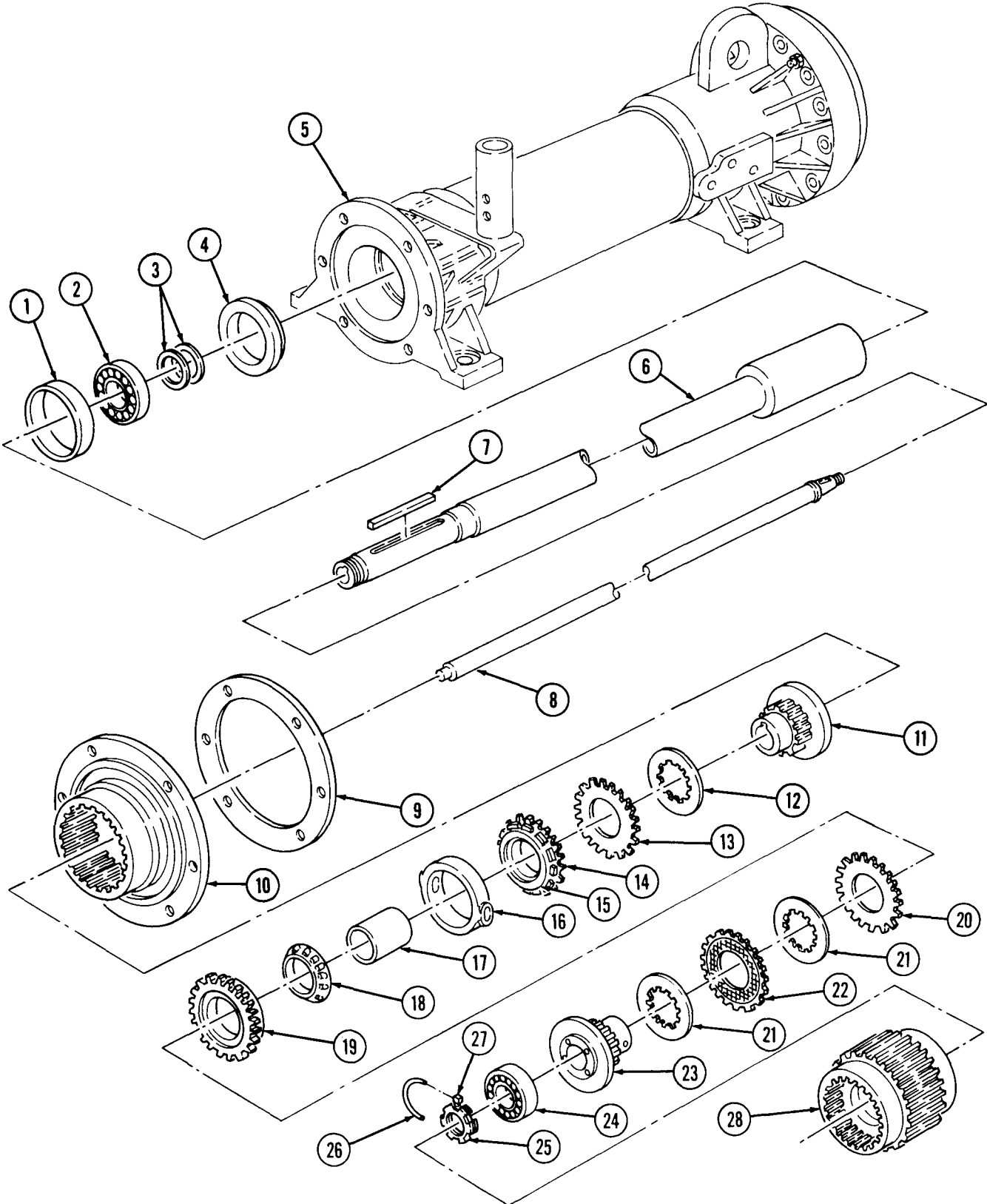
1. Install retainer (4) and sleeve (1) in main support tube (5).

NOTE

- . Apply sealing compound on gasket mating surfaces before installation.
- Install all shims to previous recorded distances.

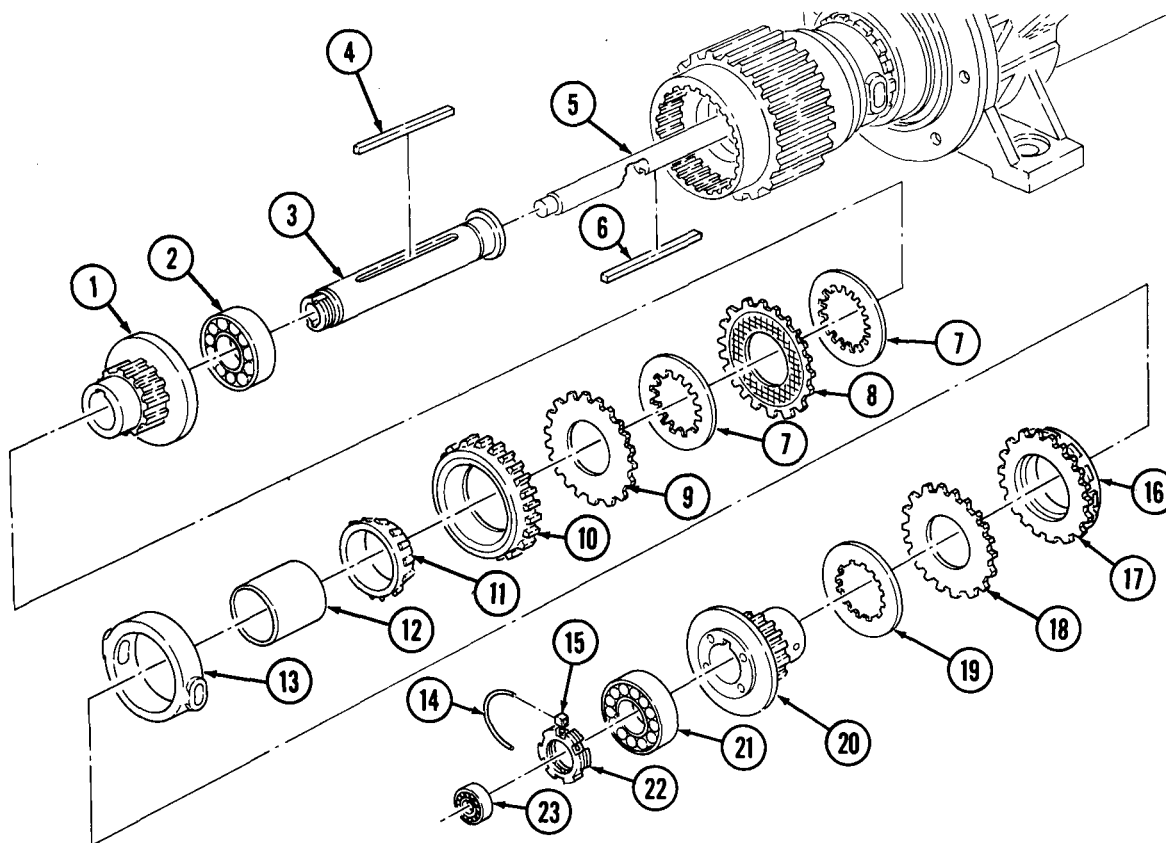
2. Place new gasket (9) and brake shell (10) on main support tube (5).
3. Install new shims (3) and bearing (2) on feed shaft (6) and insert feed shaft (6) through sleeve (1) and into main support tube (5).
4. Install thirteen clutch plates (12) and (13) on brake hub (11) in number and sequence noted.
5. Install new woodruff key (7) and brake hub (11) on feed shaft (6).
6. Install sleeve bearing (17) on brake hub (11).
7. Install brake pressure plate (14) with adjusting nut (15), throw ring (16), and bearing (18) with clutch pressure plate (19) on sleeve bearing (17).
8. Install clutch plates (20), (21), and (22) on clutch hub (23) in number and sequence noted.
9. Install clutch hub (23) on feed shaft (6).
10. Install bearing (24) and adjusting nut (25) on feed shaft (6).
11. Tighten adjusting nut (15) to eliminate end play of bearing (24) and hubs (11) and (23). Tighten setscrew (27) and install new safety wire (26).
12. Rotate adjusting nut (15) to apply pressure to brake pressure plate (14) until adjusting nut (15) becomes tight. Then back adjusting nut (15) off 3/8 turn (4 to 5 notches) until lock groove is engaged.
13. Install main drive gear (28) on bearing (24).
14. Install drive shaft (8) in feed shaft (6).

15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)



15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)

15. Install bearing (2) on drive sleeve (3).
16. Install nine clutch plates (7), eight clutch plates (8), and clutch plate (9) on clutch hub (1).
17. Install new woodruff key (4) and clutch hub (1) on drive sleeve (3).
18. Install sleeve bearing (12) on clutch hub (1).
19. Install clutch pressure plate (10) with bearing (11), throw ring (13), and brake pressure plate (17) with adjusting nut (16) on sleeve bearing (12).
20. Install thirteen clutch plates (18) and (19) on brake hub (20).
21. Install brake hub (20) on drive sleeve (3).
22. Install new woodruff key (6) and drive sleeve (3) on drive shaft (5).
23. Install bearing (21) and adjusting nut (22) on drive sleeve (3).
24. Tighten adjusting nut (22) to eliminate end play of bearings (2) and (21) and hubs (1) and (20). Tighten setscrew (15) and install safety wire (14).
25. Rotate adjusting nut (16) to apply pressure to brake pressure plate (17) until adjusting nut (16) is tight. Then back adjusting nut (16) off 3/8 turn (4 to 5 notches) until lock groove is engaged.
26. Install bearing (23) on drive shaft (5).



15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)

NOTE

Apply sealing compound to gasket mating surfaces before installation.

27. Install new gasket (26) on clutch case (29).
28. Install chains and lifting device on case (29).

WARNING

All personnel must stand clear during lifting operations. A snapped chain, shifting or swinging load may cause injury to personnel.

NOTE

Assistant will help with lifting operations.

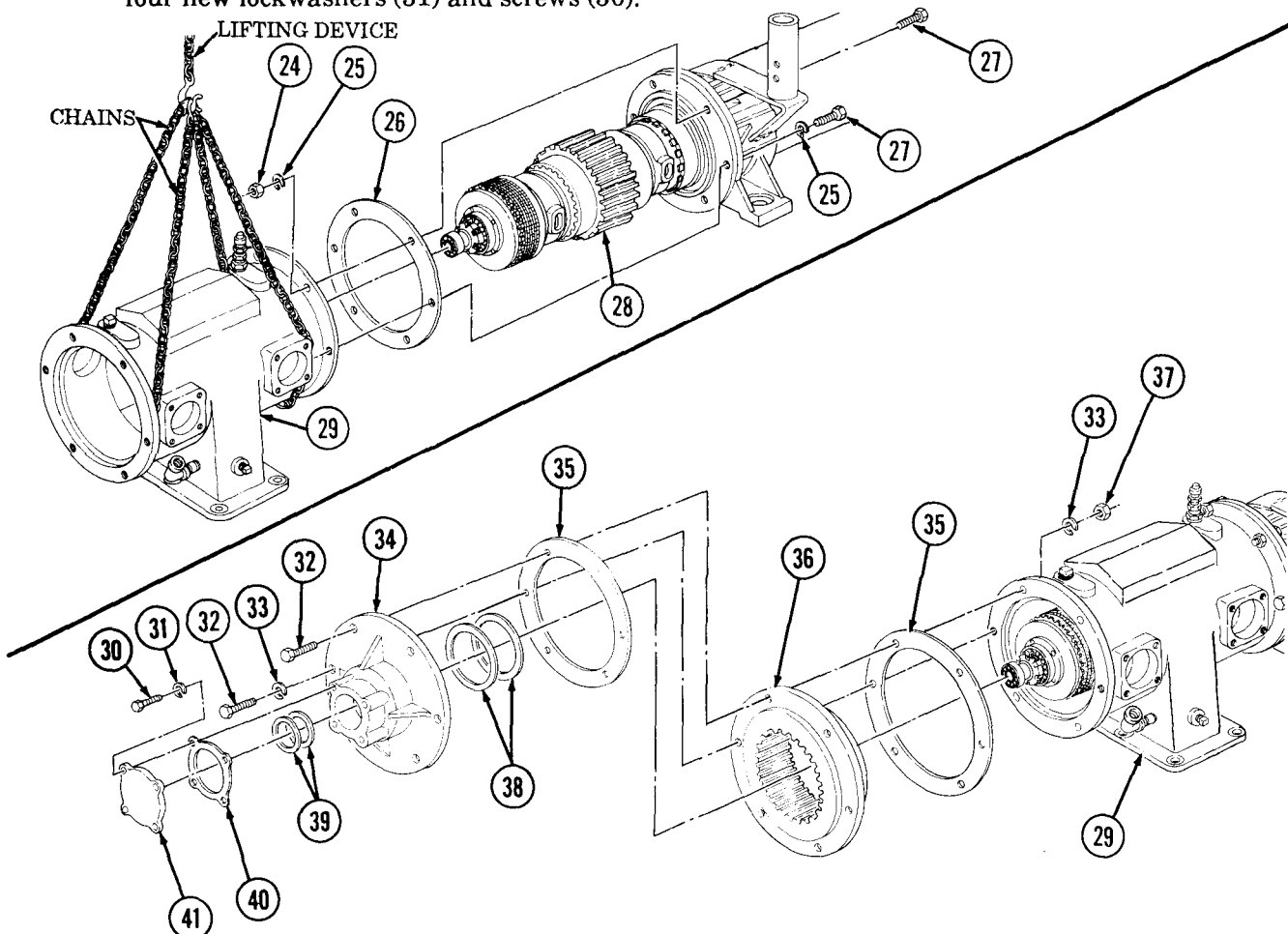
29. Position case (29) over clutch and brake (28) and install with six new lockwashers (25), screws (27), and four nuts (24).
30. Remove lifting device and chains from case (29).

NOTE

Apply sealing compound to gasket mating surfaces before installation.

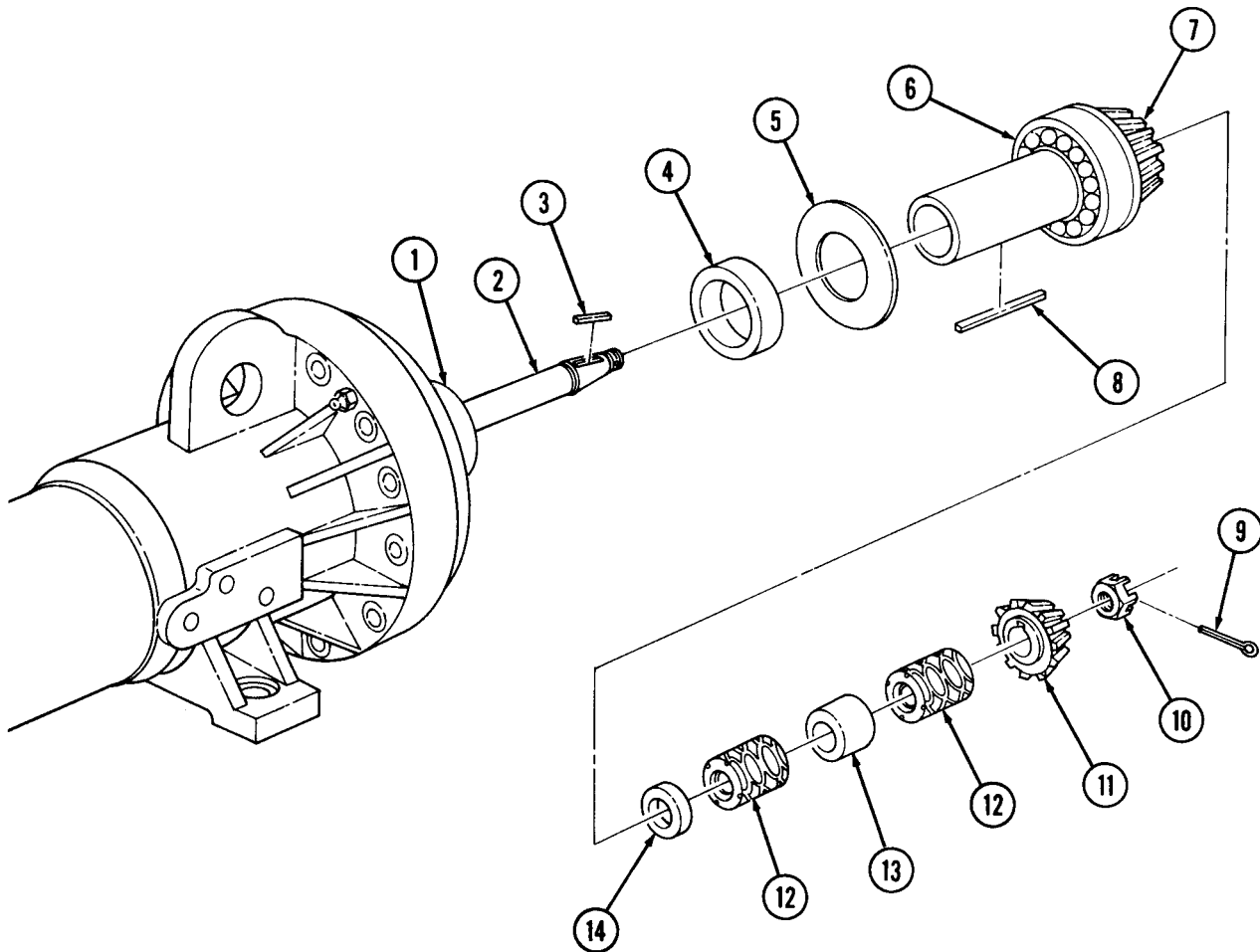
• Install all new shims to previously recorded thickness.

31. Install two new gaskets (35) and brake shell (36) on case (29).
32. Install new shims (38), clutch case cap (34), six new lockwashers (33), screws (32), and four nuts (37) on case (29).
33. Install new shims (39), new gasket (40), and clutch case cap cover (41) on clutch case cap (34) with four new lockwashers (31) and screws (30).

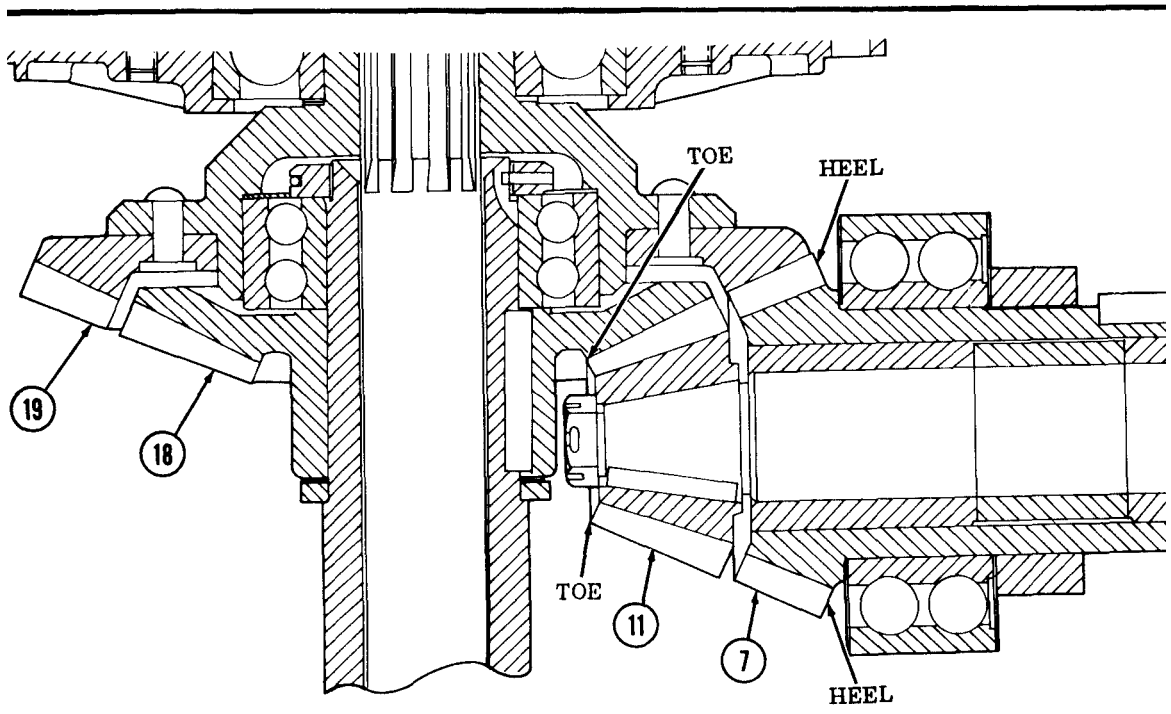
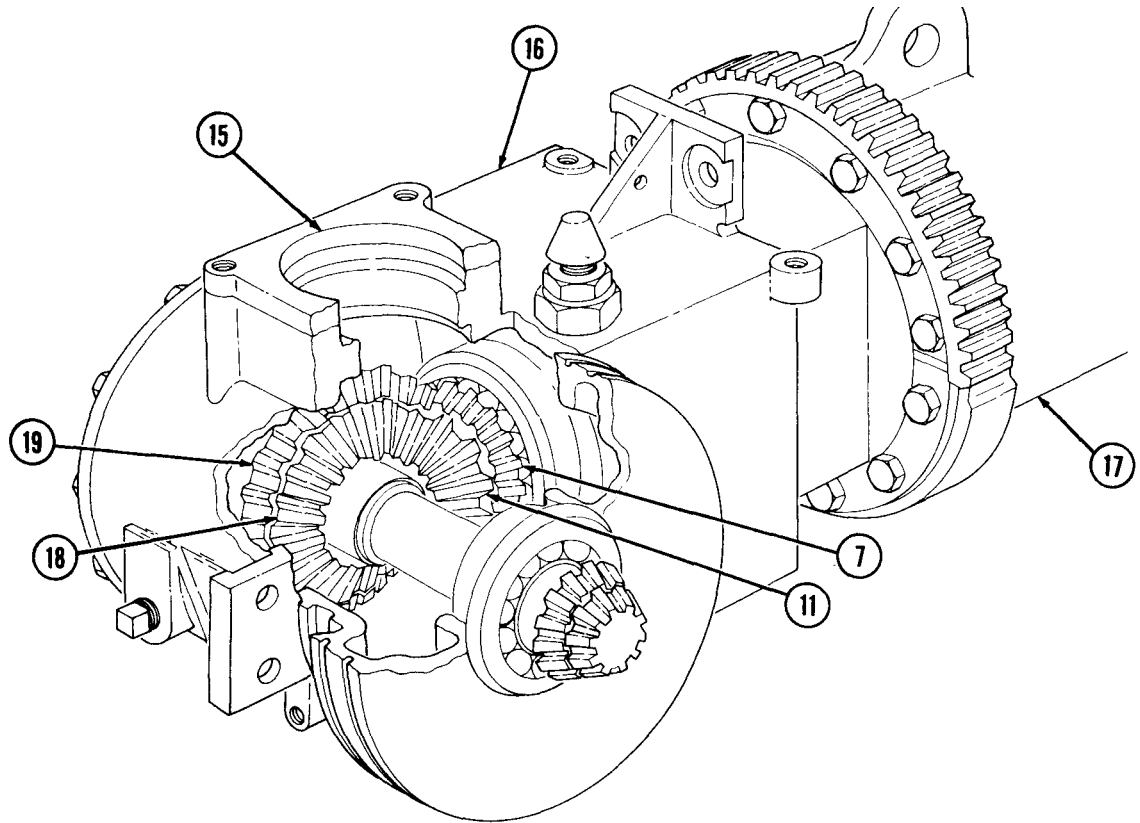


15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)

34. Install new seal (14) , two bearings (12), and spacer (13) on drive shaft (2).
35. Install washer (5) and spacer (4) on feed pinion (7).
36. Install feed pinion (7) with bearing (6) and new woodruff key (8) on feed shaft (1).
37. Install new woodruff key (3), drive pinion (11), nut (10) , and new cotter pin (9) on drive shaft (2).
38. Install intermediate gear and case (16) on main support tube (17) (para. 15-42).
39. Look through power leveler shaft hole (15) to ensure that toe of drive pinion (11) is alined with toe of drive gear (18) and heel of feed pinion (7) is alined with heel of hub and gear (19) .



15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)



15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)

NOTE

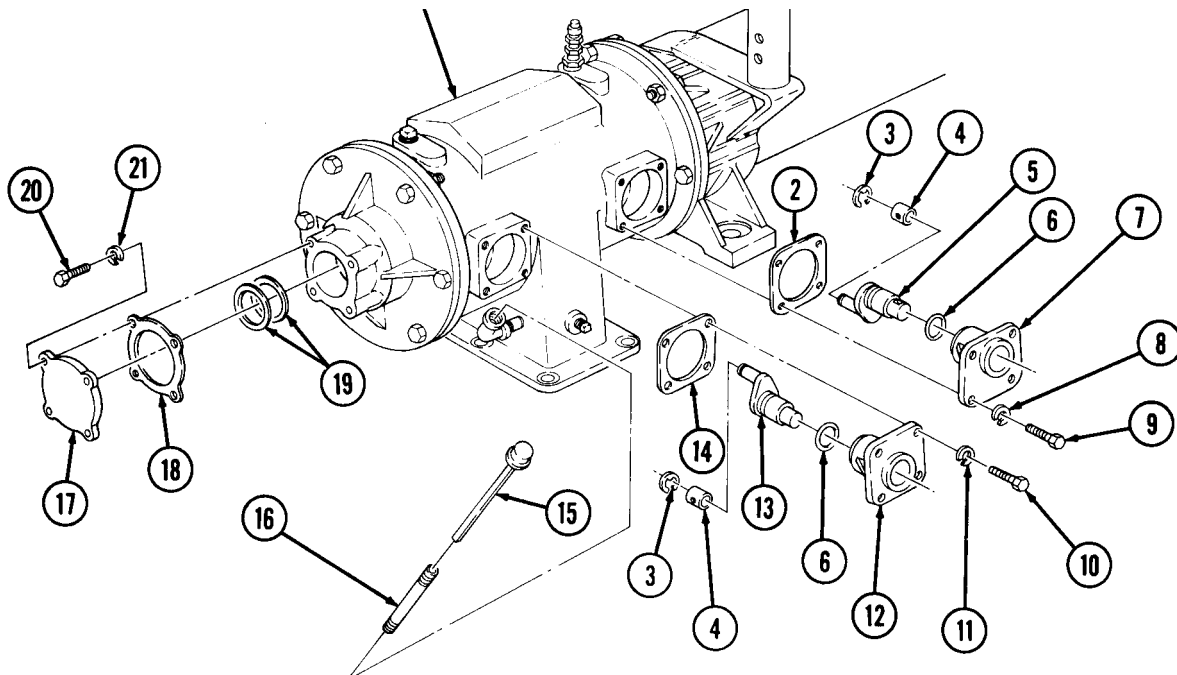
- If alignment is correct, proceed to step 44.
- If depth of drive pinion is incorrect, perform steps 40, 41, and 44 through 47.
- If depth of feed pinion is incorrect, perform steps 42 through 47.

40. Remove four screws (20), lockwashers (21), clutch case cap cover (17), and gasket (18) from clutch case (1). Discard lockwashers (21) and gasket (18).
41. To increase the depth of drive pinion (26), add shims (19). To decrease the depth of drive pinion (26), remove shims (19).

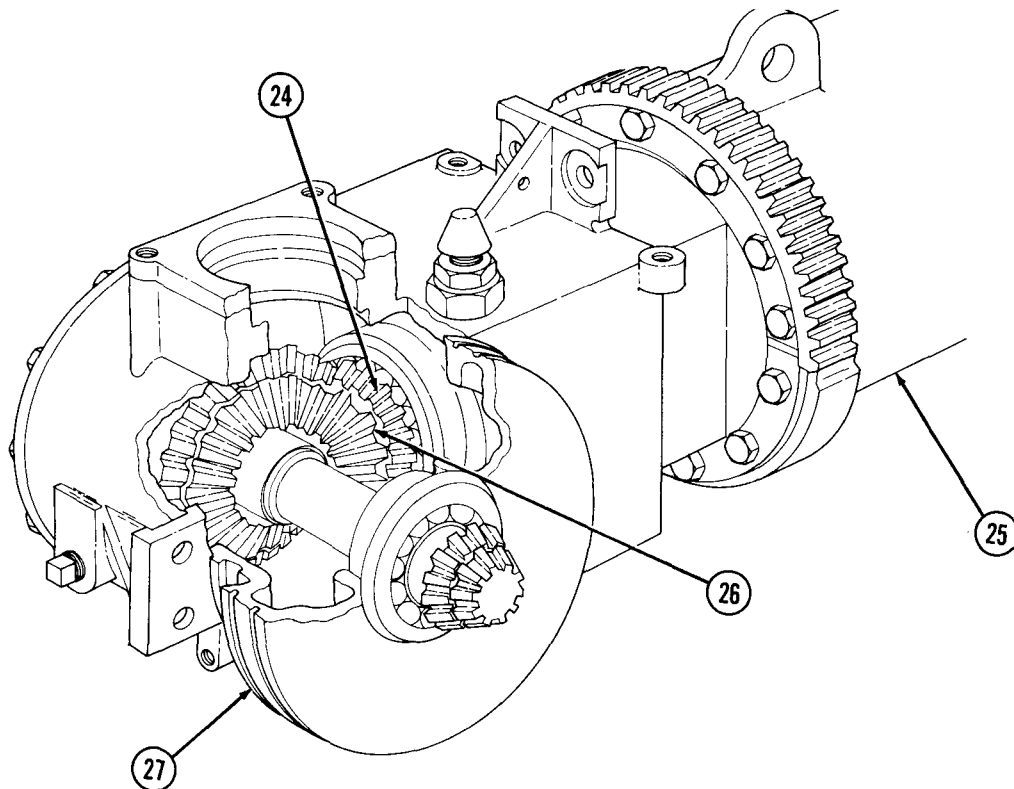
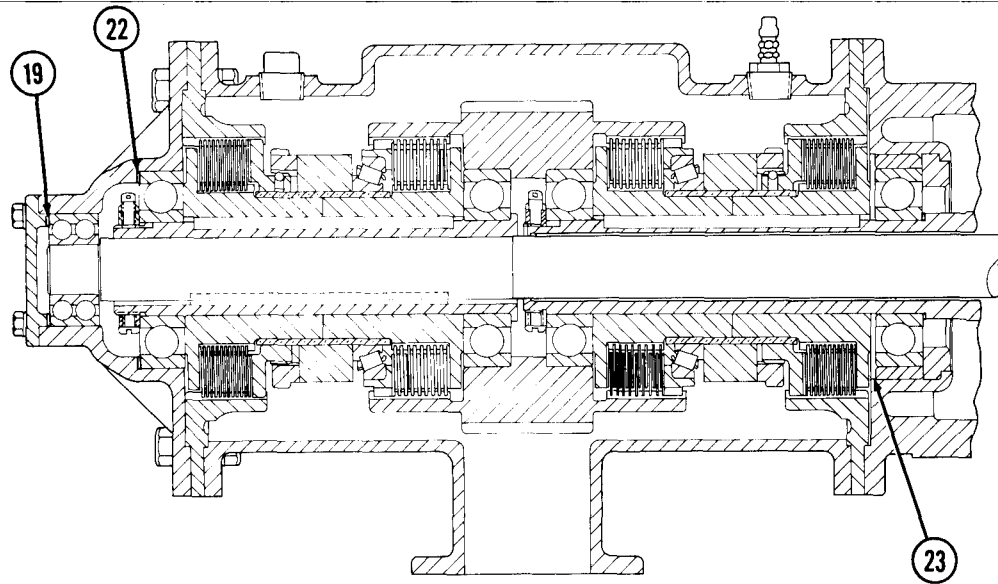
NOTE

- Apply sealing compound to gasket mating surfaces before installation.
- Intermediate gear and case must be removed from main support tube in order to adjust depth of feed pinion. Perform removal steps of para. 15-42, then disassemble brake, feed, and drive clutch and add or remove shims as necessary.

42. To increase depth of feed pinion (24), add shims (22) and remove shims (23) in equal thicknesses. To decrease depth, remove shims (22) and add shims (23) in equal thicknesses.
43. Install intermediate gear and case (27) on main support tube (25). Refer to installation steps of para. 15-42.
44. Install four new O-rings (6), sleeves (4), and rings (3) on two cams (5) and two cams (13).
45. Install two cams (5), new gaskets (2), and cam housings (7) on clutch case (1) with eight new lockwashers (8) and screws (9).
46. Install two cams (13), new gaskets (14), and cam housings (12) on clutch case (1) with eight new lockwashers (11) and screws (10).
47. Install nipple (16) and dipstick (15) on clutch case (1).



15-44. BRAKE, FEED, AND DRIVE CLUTCH MAINTENANCE (Contd)



- FOLLOW-ON TASKS:
- Install main drive idler gear (para. 15-43).
 - Fill clutch case with oil (LO 9-2320-209-12-1).
 - Install intermediate case (para. 15-42).
 - Install earth boring machine (para. 15-35).
 - Install operation levers (TM 9-2320-361-20).

15-45. HYDRAULIC PUMP REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit (Appendix B, Item 1)

MATERIALS/PARTS

Four locknuts (Appendix F, Item 89)
 Woodruff key (Appendix F, Item 278)
 Cap and plug set (Appendix C, Item 5)
 Antiseize tape (Appendix C, Item 25)

REFERENCES (TM)

LO 9-2320-209-12-1
 TM 9-2320-361-10
 TM 9-2320-361-34P

EQUIPMENT CONDITION

•Parking brake set (TM 9-2320-361-10).
 •Hydraulic tank drained (LO 9-2320-209-12-1).

CAUTION

When disconnecting hydraulic hoses, plug all openings to prevent dirt from entering and causing internal parts damage. Prior to installation, remove plugs from openings. Failure to do so may result in damage to equipment.

a. Removal

NOTE

- Tag all hoses for proper installation.
- Have drainage container ready to catch oil.

1. Remove hose (10) and adapter (8) from tee (7).
2. Remove hose (5) and elbow (6) from tee (7).
3. Remove hose (13) and check valve (14) from tee (15).
4. Remove hose (11) and adapter (12) from tee (15).
5. Remove tees (7) and (15) from pump (16).
6. Loosen setscrew (3) on universal joint (2).
7. Remove four locknuts (1), screws (4), pump (16), and woodruff key (9) from bracket (17) and universal joint (2). Discard locknuts (1) and woodruff key (9).

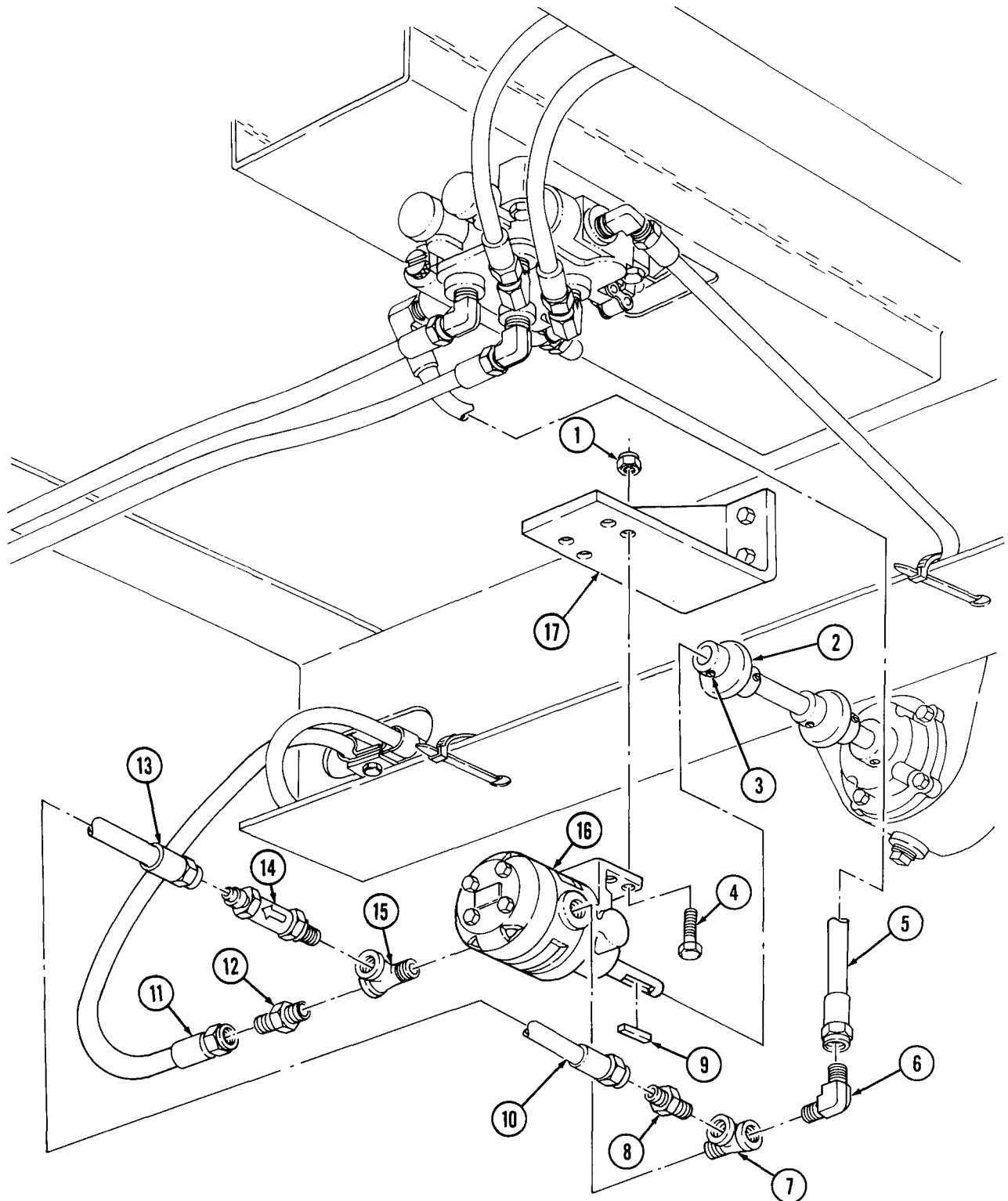
b. Installation

NOTE

Apply antiseize tape to male pipe threads before installation.

1. Install new woodruff key (9) on pump (16).
2. Install pump (16) on universal joint (2).
3. Install pump (16) on bracket (17) with four screws (4) and new locknuts (1).
4. Tighten setscrew (3) on universal joint (2).
5. Install tees (7) and (15) on pump (16).
6. Install adapter (12) and hose (11) on tee (15).
7. Install check valve (14) and hose (13) on tee (15). Ensure arrow of valve (14) points away from tee (15).
8. Install elbow (6) and hose (5) on tee (7).
9. Install adapter (8) and hose (10) on tee (7).

15-45. HYDRAULIC PUMP REPLACEMENT (Contd)



FOLLOW-ON TASK: Fill hydraulic tank (LO 9-2320-209-12-1) and check for leaks.

15-46. OUTRIGGER CONTROL VALVE REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Four cotter pins (Appendix F, Item 22)
Three lockwashers (Appendix F, Item 125)
Cap and plug set (Appendix C, Item 5)
Antiseize tape (Appendix C, Item 25)

REFERENCES (TM)

LO 9-2320-209-12-1
TM 9-2320-361-10
TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- . Hydraulic tank drained (LO 9-2320-209-12-1).

CAUTION

When disconnecting hydraulic lines, plug all openings to prevent dirt from entering and causing internal parts damage. Prior to installation, remove plugs from openings. Failure to do so may result in damage to equipment.

a. Removal

NOTE

- . Tag hoses for installation.
- Have drainage container ready to catch oil.

1. Remove six hoses (2) and elbows (7) from control valve (9).
2. Remove four cotter pins (5), straight pins (4), and two control levers (3) from control valve (9).
Discard cotter pins (5).
3. Remove three screws (6), lockwashers (8), and control valve (9) from body (1). Discard lockwashers (8).

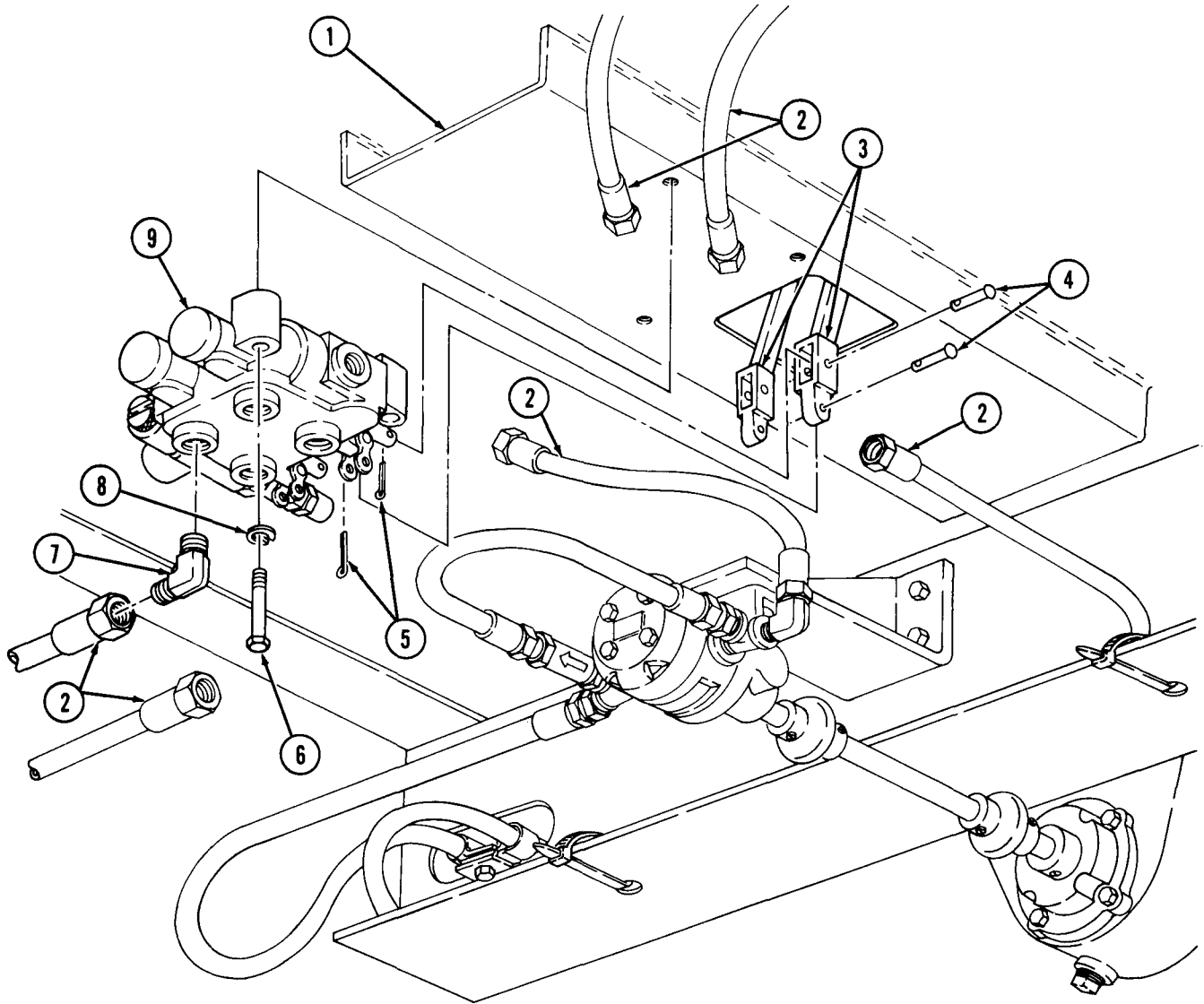
b. Installation

NOTE

Apply antiseize tape to male pipe threads before installation.

1. Install control valve (9), three new lockwashers (8), and screws (6) on body (1).
2. Install two control levers (3), four straight pins (4), and new cotter pins (5) on control valve (9).
3. Install six elbows (7) and hoses (2) on control valve (9).

15-46. OUTRIGGER CONTROL VALVE REPLACEMENT (Contd)



FOLLOW-ON TASK: Fill hydraulic tank (LO 9-2320-209-12-1) and check for leaks.

15-47. OUTRIGGER LEG MAINTENANCE

THIS TASK COVERS:

- | | |
|-----------------------|------------------------|
| a. Removal | c. Assembly |
| b. Disassembly | d. Installation |

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Twenty locknuts (Appendix F, Item 109)
Locknut (Appendix F, Item 89)
Cap and plug set (Appendix C, Item 5)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

LO 9-2320-209-12-1
TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Hydraulic tank drained (LO 9-2320-209-12-1).
- Rear splash guards removed (TM 9-2320-361-20).

CAUTION

- When disconnecting hydraulic hoses, plug all openings to prevent dirt from entering and causing internal parts damage. Prior to installation, remove plugs from opening. Failure to do so may result in damage to equipment.
- Use care when working on outrigger leg. Hydraulic tubes can be easily damaged.

NOTE

- Tag hoses for installation.
- Have drainage container ready to catch oil.

a. Removal

1. Remove two hoses (4) and adapters (3) from new cylinder tubes (5).
2. Remove locknut (6), screw (1), two clamps (2), and cylinder tubes (5) from bracket (7). Discard locknut (6).
3. Remove shoe (8) from bracket (19).

NOTE

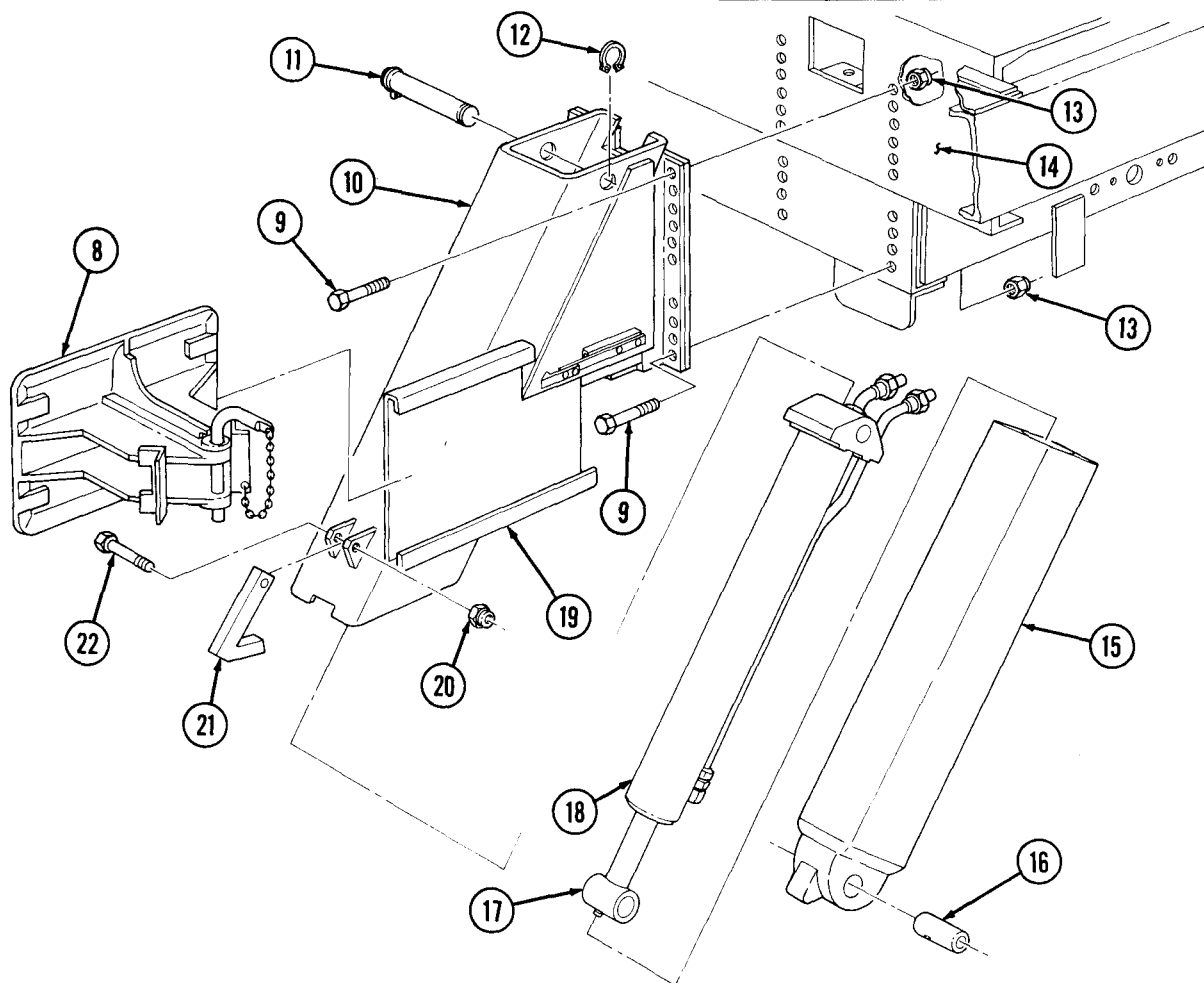
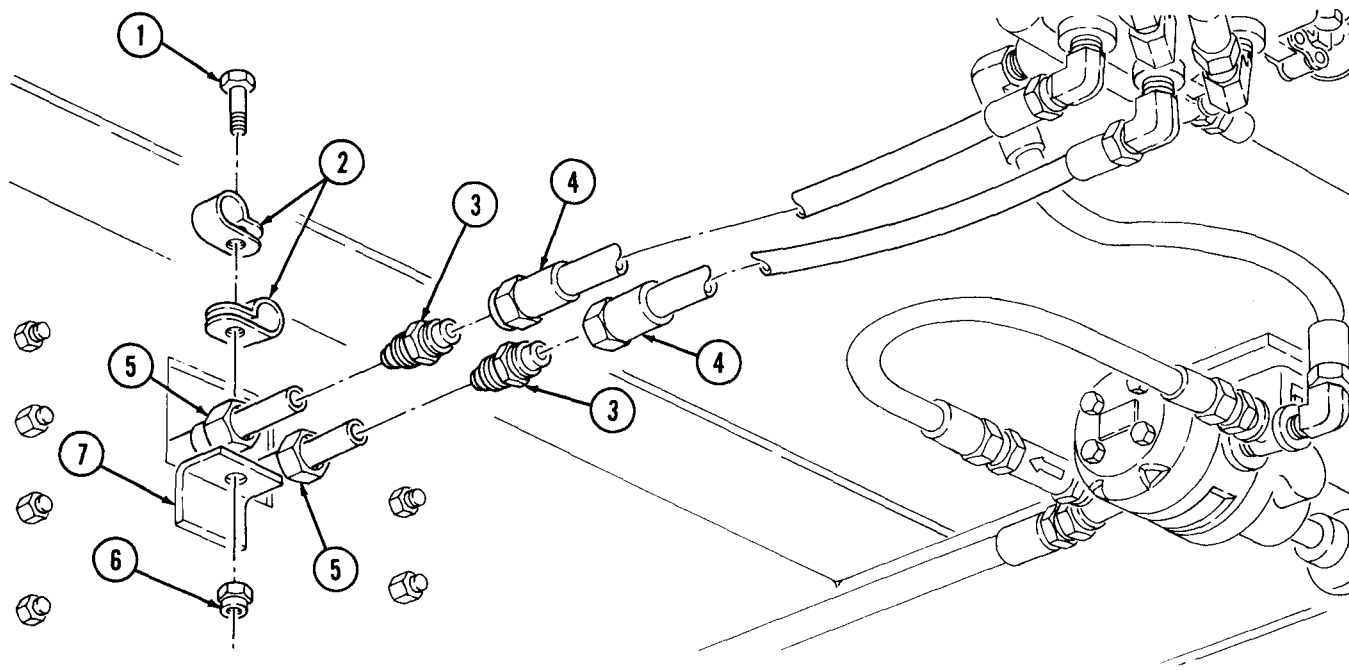
Assistant will help with steps 4 and 5.

4. Remove sixteen locknuts (13) and screws (9) from upper leg (10). Leave screw (9) and locknut (13) on each corner of upper leg (10) to keep it from shifting. Discard locknuts (13).
5. Remove four locknuts (13), screws (9), and upper leg (10) from body (14). Discard locknuts (13).

b. Disassembly

1. Remove ring (12) and pin (11) from upper leg (10) and cylinder (18).
2. Remove lower leg (15) with cylinder (18) from upper leg (10).
3. Remove locknut (20), screw (22), and latch (21) from upper leg (10). Discard locknut (20).
4. Loosen setscrew (17) and remove tube (16) and cylinder (18) from lower leg (15).

15-47. OUTRIGGER LEG MAINTENANCE (Contd)



15-47. OUTRIGGER LEG MAINTENANCE (Contd)

c. Assembly

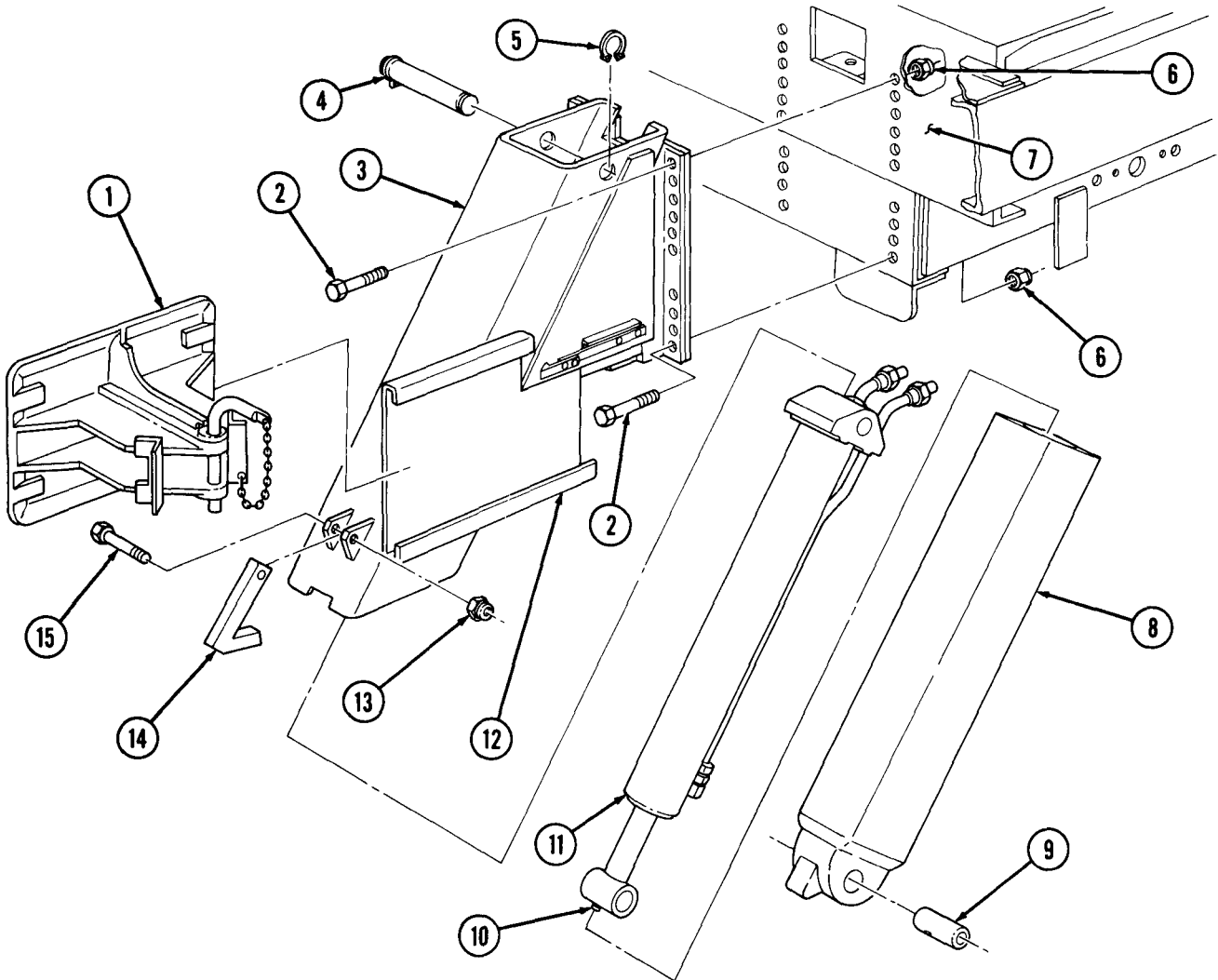
- 1.. Install cylinder (11) and tube (9) in lower leg (8). Tighten setscrew (10).
2. Install lower leg(8) in upper leg(3) with pin (4) and ring(5).
3. Install latch (14) on upper leg (3) with screw (15) and new locknut (13).

d. Installation

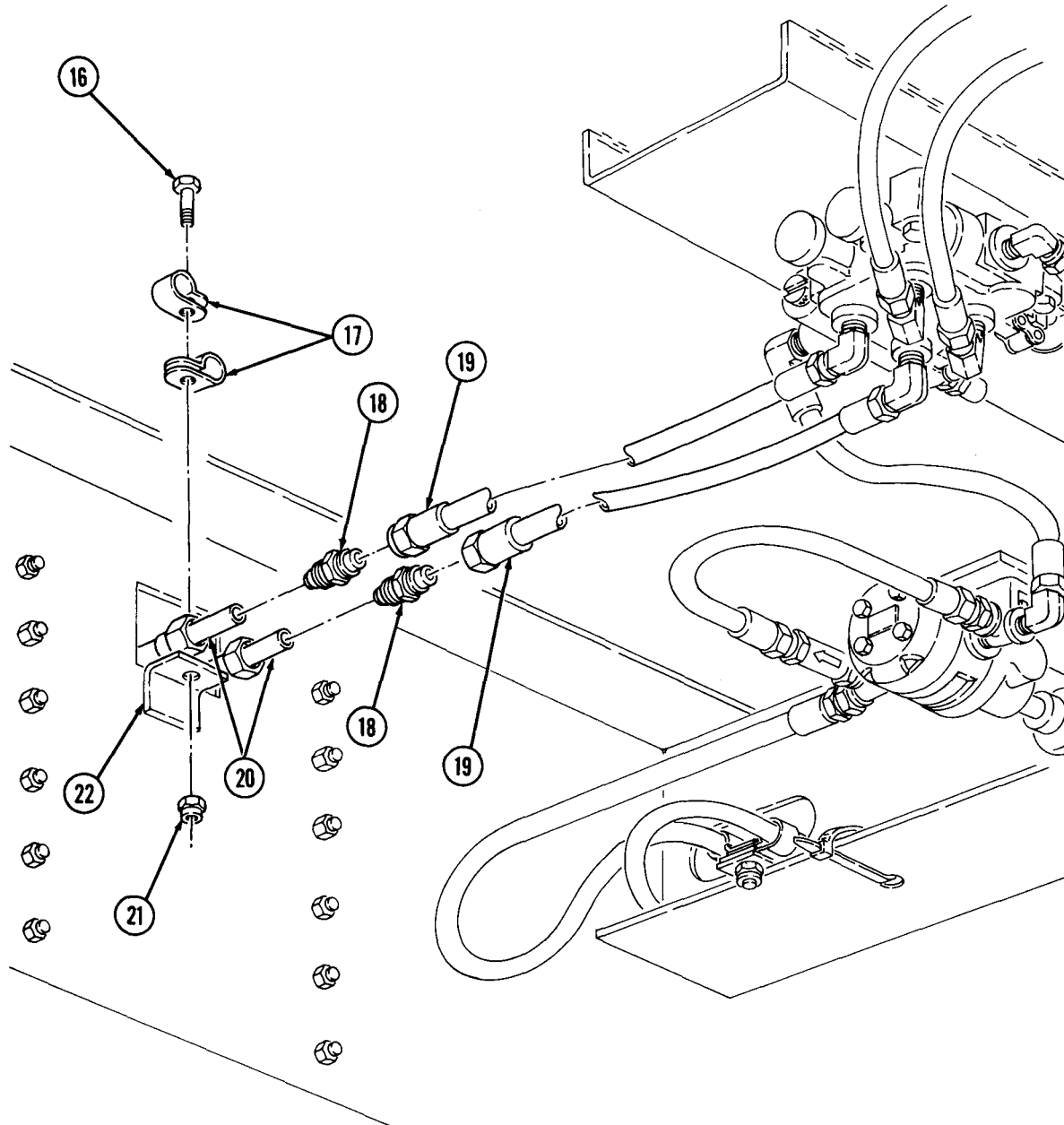
NOTE

Assistant will help with step 1.

1. Install upper leg (3), twenty screws (2), and new locknuts (6) on body (7).
2. Install shoe (1) in bracket (12).
3. Install cylinder tubes (20) on bracket (22) with two clamps (17), screw (16), and new 10cknut (21).
4. Connect two adapters (18) and hoses (19) on cylinder tubes (20).



15-47. OUTRIGGER LEG MAINTENANCE (Contd)



FOLLOW-ON TASKS: . Fill hydraulic tank (LO 9-2320-209-12-1) and check for leaks.
 •Install rear splash guards (TM 9-2320-361-20).

15-48. HYDRAULIC CYLINDER REPAIR

THIS TASK COVERS:

- a. Disassembly**
- b. Inspection**

- c. Assembly**

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Three lockwashers (Appendix F, Item 131)
O-ring (Appendix F, Item 173)
Cotter pin (Appendix F, Item 5)
Washer (Appendix F, Item 267)
Packing, preformed (Appendix F, Item 181)
Packing set (Appendix F, Item 185)
Lubricating oil, OE/HDO 30 (Appendix C, Item 13)

REFERENCES (TM)

LO 9-2320-209 -12-1
TM 9-2320-361-10
TM 9-2320-361-34P

EQUIPMENT CONDITION

" Parking brake set (TM 9-2320-361-10).
. Hydraulic tank drained (LO 9-2320-209-12-1).
• Outrigger leg removed and disassembled
(para. 15-47).

a. Disassembly

NOTE

Have drainage container ready to catch oil.

1. Pull rod (7) from cylinder (18) as far as possible and drain oil into container.
2. Remove tubes (16) and (19) and connectors (17) and (20) from cylinder (18).
3. Loosen cylinder head (8) and remove rod (7) from cylinder (18).
4. Remove cotter pin (15), nut (14), two retaining plates (10), two cups (12), follower (13), and preformed packing (11) from rod (7). Discard cotter pin (15) and preformed packing (11).
5. Remove cylinder head (8) from rod (7).
6. Remove O-ring (9) from cylinder head (8). Discard O-ring (9).
7. Remove three screws (6), lockwashers (5), retainer (3), and rod wiper (4) from cylinder head (8). Discard lockwashers (5).
8. Remove rod wiper (4) from retainer (3).
9. Remove packing set (2) and washer (1) from cylinder head (8). Discard packing set (2) and washer (1).

b. Inspection

Inspect all parts for bends, cracks, chips, grooves, burrs, and scoring. Replace if damaged.

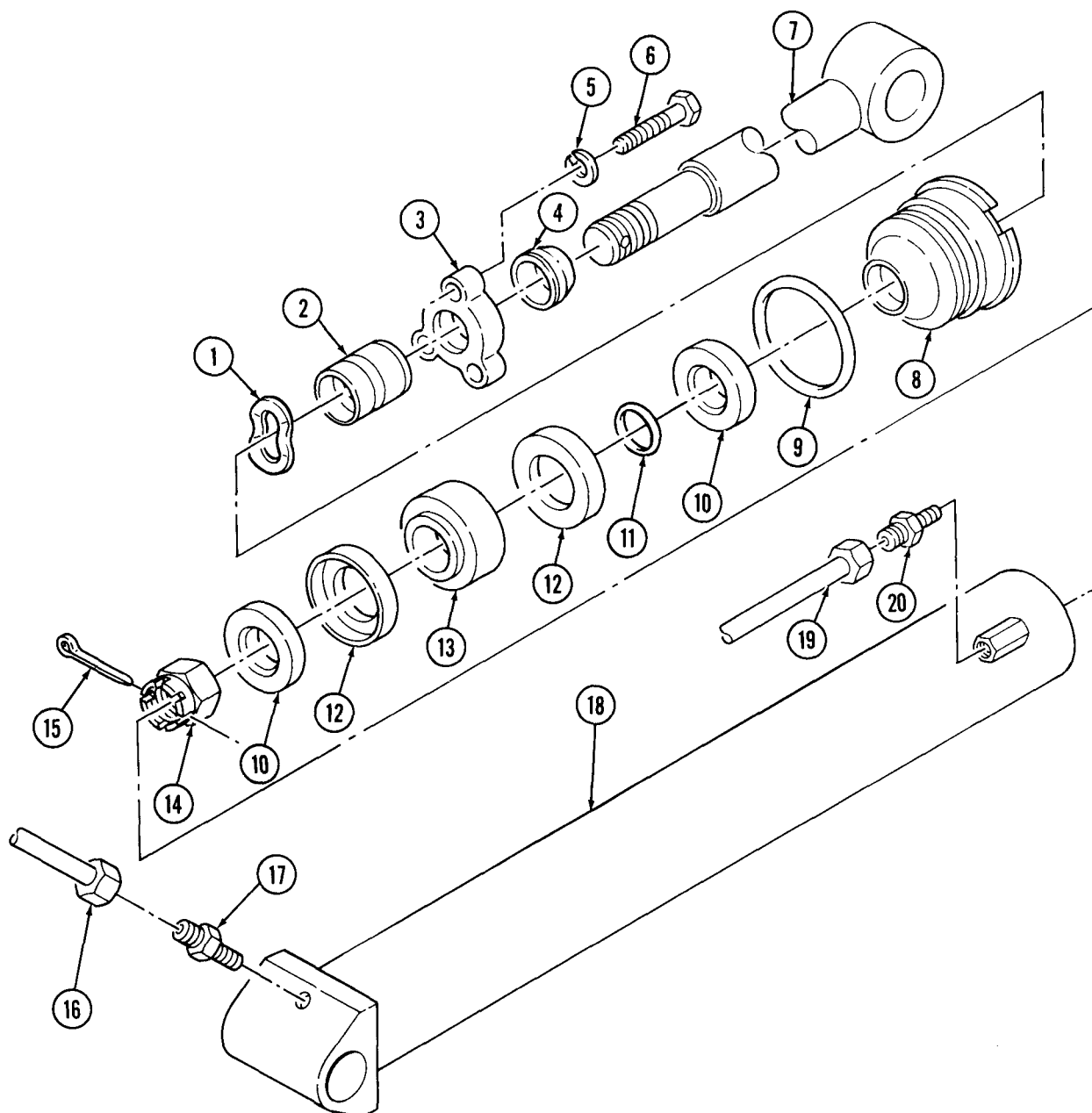
NOTE

Install packing set with tapered end toward washer.

1. Coat packing set (2) with oil and install new washer (1) and packing set (2) in cylinder head (8).
2. Install rod wiper (4) in retainer (3).
3. Install retainer (3), wiper (4), three new lockwashers (5), and screws (6) on cylinder head (8).

15-48. HYDRAULIC CYLINDER REPAIR (Contd)

4. Install new O-ring (9) on cylinder head (8).
5. Install cylinder head (8) on rod (7).
6. Install new preformed packing (11), two retaining plates (10), cups (12), follower (13), nut (14), and new cotter pin (15) on rod (7).
7. Install rod (7) in cylinder body (18) and tighten cylinder head (8).
8. Install connectors (17) and (20) and tubes (16) and (19) to cylinder (18).



FOLLOW-ON TASKS: •Assemble and install outrigger leg (para. 15-47).
 •Fill hydraulic tank (LO 9-2320-209-12-1) and check for leaks.

15-49. EARTH BORING AND POLESETTING BODY MAINTENANCE

THIS TASK COVERS:

- a. Removal
- b. Inspection

c. Installation

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit (Appendix B, Item 1)
 1-1/8-in. socket, 1/2-in. dr. (Appendix B, Item 10)
 1-1/16-in. socket, 1/2-in. dr. (Appendix B, Item 11)
 Torque wrench, 1/2-in. dr. (Appendix B, Item 7)
 Lifting device

MATERIALS/PARTS

Four locknuts (Appendix F, Item 105)
 Four locknuts (Appendix F, Item 104)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

FM 43-2
 TC 9-510
 TM 9-237
 TM 9-2320-361-10
 TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Earth auger bits removed (TM 9-2320-361-10).
- Cab protector removed (TM 9-2320-361-20).
- Outrigger hydraulic lines removed (TM 9-2320-361-20).
- Taillights removed (TM 9-2320-361-20).
- Taillight wiring harness removed (TM 9-2320-361-20).
- Pioneer tool bracket removed (TM 9-2320-361-20).
- Splash guards removed (TM 9-2320-361-20).
- Power divider removed (para. 16-15).
- Earth boring machine removed (para. 15-35).

GENERAL SAFETY INSTRUCTIONS

- All personnel must stand clear during lifting operations.
- Ensure lifting capacity is greater than weight of frame.

a. Removal

NOTE

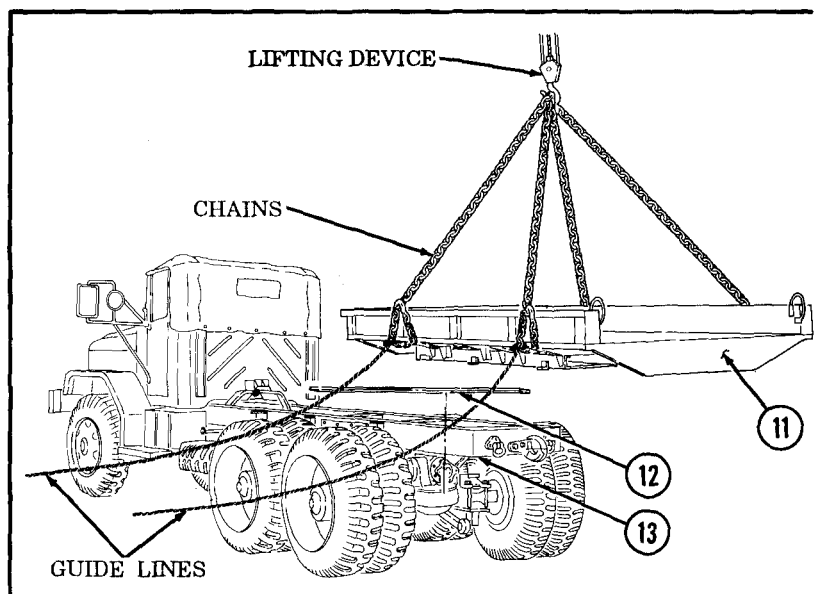
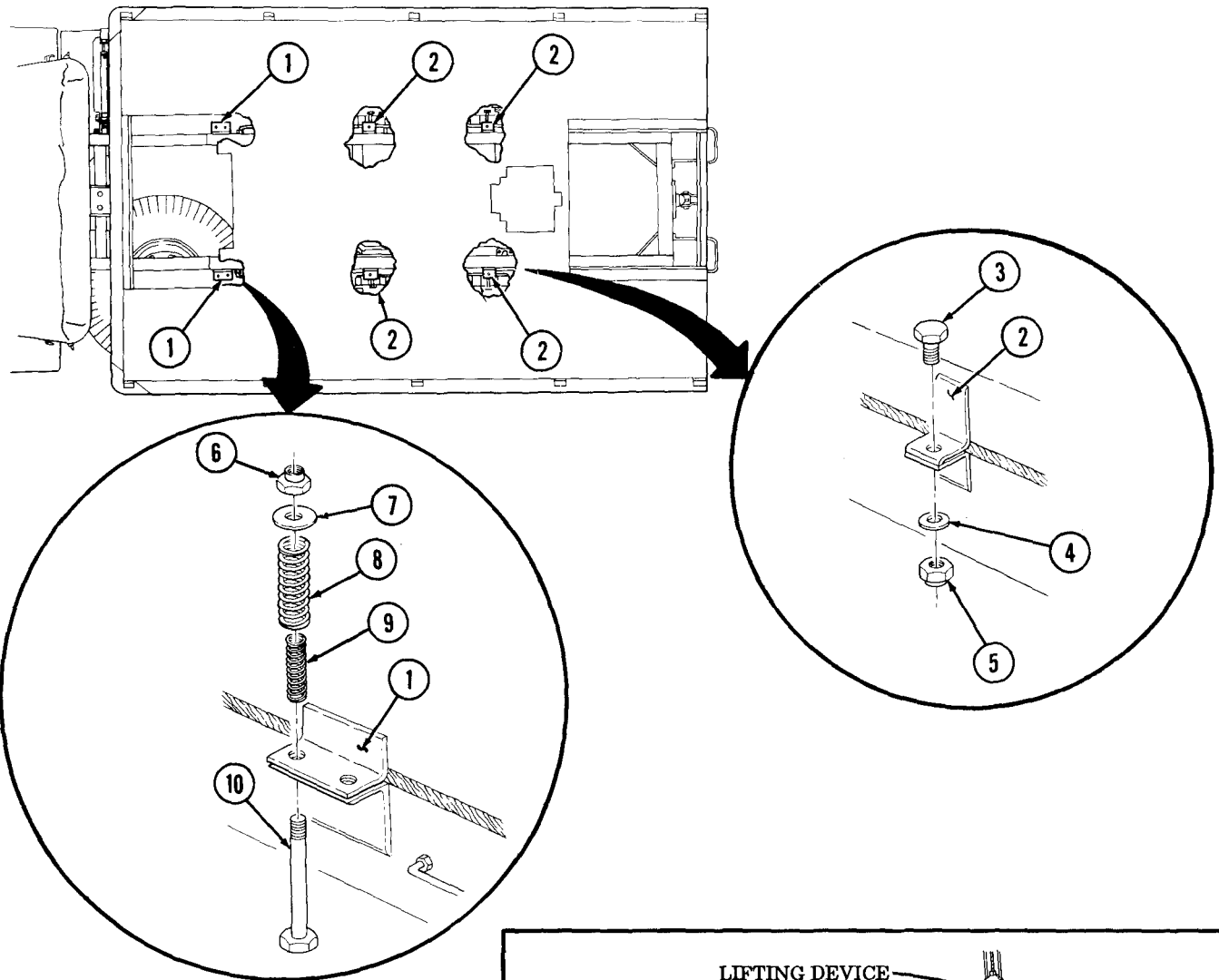
Assistant will help remove and install body.

1. Remove four locknuts (6), washers (7), screws (10), and springs (8) and (9) from brackets (1) of frame (13) and body (11). Discard locknuts (6).
2. Remove four locknuts (5), washers (4), and screws (3) from four brackets (2) of frame (13) and body (11). Discard locknuts (5).
3. Install two chains and guidelines on body (11) and attach lifting device to chains.

WARNING

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.
 - Ensure lifting capacity is greater than weight of frame. Failure to do so may result in injury to personnel or damage to equipment.
4. Remove body (11) from frame (13) and place on wooden supports.
 5. Remove two sills (12) from frame (13).
 6. Remove lifting device, chains, and guide lines from body (11).

15-49. EARTH BORING AND POLESETTING BODY MAINTENANCE (Contd)



15-49. EARTH BORING AND POLESETTING BODY MAINTENANCE (Contd)

b. Inspection

1. Inspect screws (10) and (3) for cracks, stripped threads, or other damage. Replace if damaged.
2. Inspect body (11) for bends, cracks, dents, or broken welds. Straighten if bent or dented (TC 9-510). Weld breaks or cracks (TM 9-237).
3. Inspect springs (8) and (9) for wear or broken coils. Replace if worn or damaged.

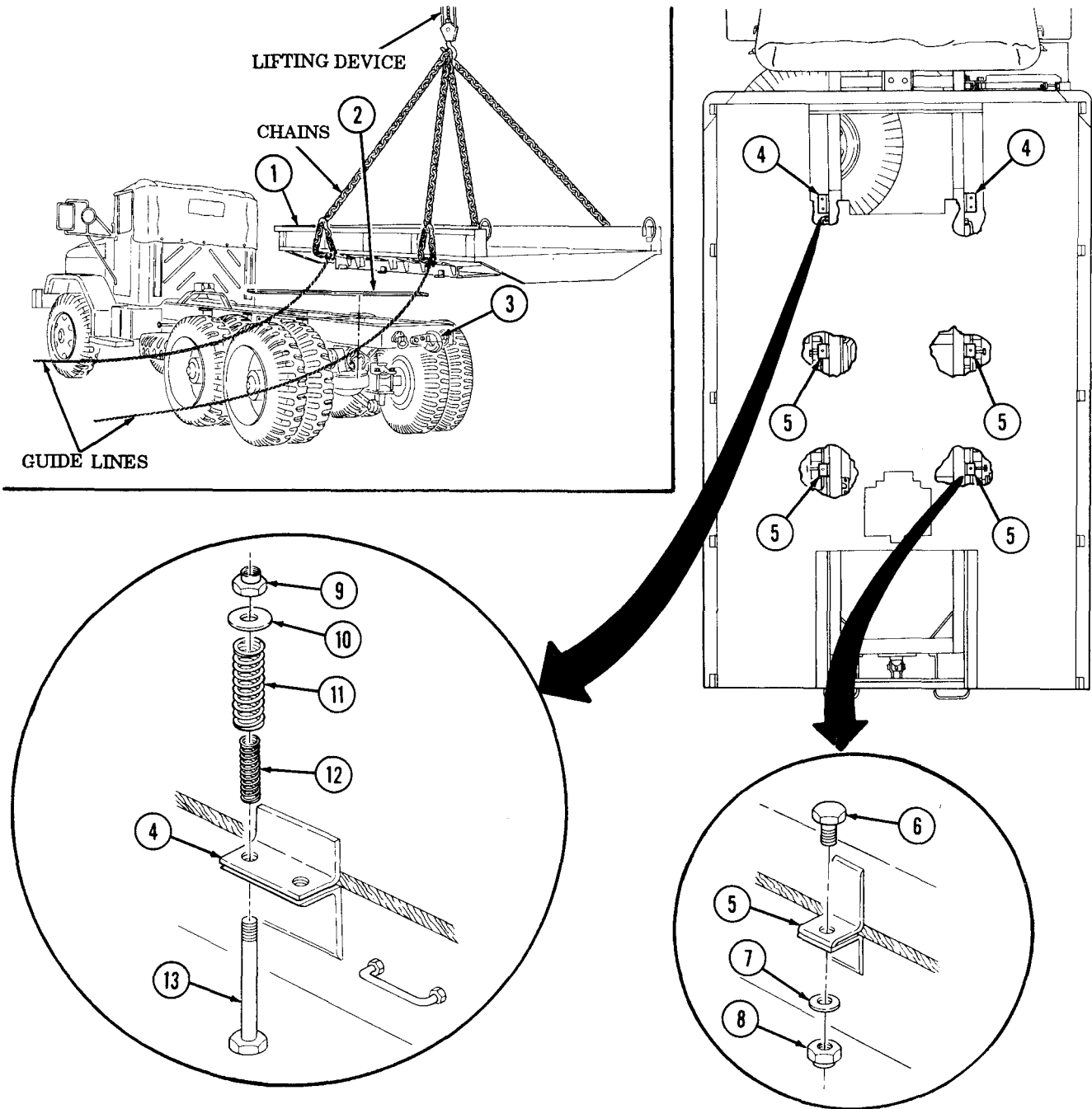
c. Installation

1. Position two sills (2) on frame (3).

WARNING

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
 - Ensure lifting capacity is greater than weight of frame. Failure to do so may result in injury to personnel or damage to equipment.
2. Install two guide lines and chains on body (1) and attach lifting device to chains.
 3. Position body (1) on frame (3) and align holes in brackets (4) and (5).
 4. Install four screws (13), springs (12), springs (11), washers (10), and new locknuts (9) on brackets (4) of frame (3) and body (1). Tighten screws (13) until springs (12) and (11) compress to 6.375 in. (161.93 mm).
 5. Install four screws (6), washers (7), and new locknuts (8) on brackets (5) of frame (3) and body (1). Tighten screws (6) 125-165 lb-ft (170-224 N.m).
 6. Remove lifting device, chains, and guidelines.

15-49. EARTH BORING AND POLESETTING BODY MAINTENANCE (Contd)



- FOLLOW-ON TASKS:
- . Install earth boring machine (para. 15-35).
 - . Install power divider (para. 16-15).
 - Install splash guards (TM 9-2320-361-20).
 - Install pioneer tool bracket (TM 9-2320-361-20).
 - Install taillight wiring harness (TM 9-2320-361-20).
 - . Install taillights (TM 9-2320-361-20).
 - Install outrigger hydraulic lines (TM 9-2320-361-20).
 - . Install cab protector (TM 9-2320-361-20).
 - Install earth auger bits (TM 9-2320-361-10).

Section VI. PIPELINE CONSTRUCTION BODY MAINTENANCE

15-50. PIPELINE CONSTRUCTION BODY MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
15-51.	Pipeline Construction Body Maintenance	15-215
15-52.	Pipeline Construction Tbolbox Maintenance	15-222
15-53.	Pipeline Construction Tailboard Roller Maintenance	15-226

15-51. PIPELINE CONSTRUCTION BODY MAINTENANCE

THIS TASK COVERS:

- a. Subframe Removal
- b. Flooring Removal
- c. Inspection

- d. Flooring Installation
- e. Subframe Installation

INITIAL SETUPAPPLICABLE MODELS

M756A2

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Torque wrench, 1/2-in. dr.
(Appendix B, Item 7)
1-1/8-in. socket, 1/2-in. dr.
(Appendix B, Item 10)
1-1/16-in. socket, 1/2-in. dr.
(Appendix B, Item 11)

MATERIALS/PARTS

Fifty-six locknuts (Appendix F, Item 110)
Six locknuts (Appendix F, Item 89)
Eight locknuts (Appendix F, Item 104)
Six locknuts (Appendix F, Item 103)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TB 43-0209
TM 9-2320-361-10
TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

- Bows and tarp removed (TM 9-2320-361-10).
- Side panels removed (TM 9-2320-361-20).
- Tailgate removed (TM 9-2320-361-20).
- Stiff leg jack removed (TM 9-2320-361-20).
- Gin pole removed (TM 9-2320-361-20).
- Front and rear splash guards removed (TM 9-2320-361-20).
- Step plate removed (TM 9-2320-361-20).
- Tailboard roller removed (para. 15-53).

GENERAL SAFETY INSTRUCTIONS

- All personnel must stand clear during lifting operations.
- Toolbox is heavy. Ensure toolbox is empty and supported before removal and installation.
- Toolbox and subframe are heavy. Ensure lifting capacity is greater than weight of the toolbox and subframe.

15-51. PIPELINE CONSTRUCTION BODY MAINTENANCE (Contd)

a. Subframe Removal

NOTE

Perform step 1 if installing new subframe.

1. Remove six locknuts (19), four screws (1), and two screws (3) from toolbox (20) and two brackets (2) from subframe (6). Discard locknuts (19).
2. Remove eight locknuts (13), washers (12), four screws (4), and screws (5) from two brackets (18), brackets (7), frame brackets (14), and frame brackets (15). Discard locknuts (13).
3. Remove six locknuts (9), four screws (17) and two screws (16) from two plates (8) and frame (11). Discard locknuts (9).
4. Attach chains, lifting device, and guide lines to subframe (9).

WARNING

- . All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
 - Toolbox and subframe are heavy. Ensure lifting device has a weight capacity greater than the weight of the toolbox and subframe. Failure to do so may result in injury to personnel or damage to equipment.
5. Remove subframe (6) from toolbox (20) and frame (11) and place on wooden supports.
 6. Remove lifting device and chains from subframe (6).

WARNING

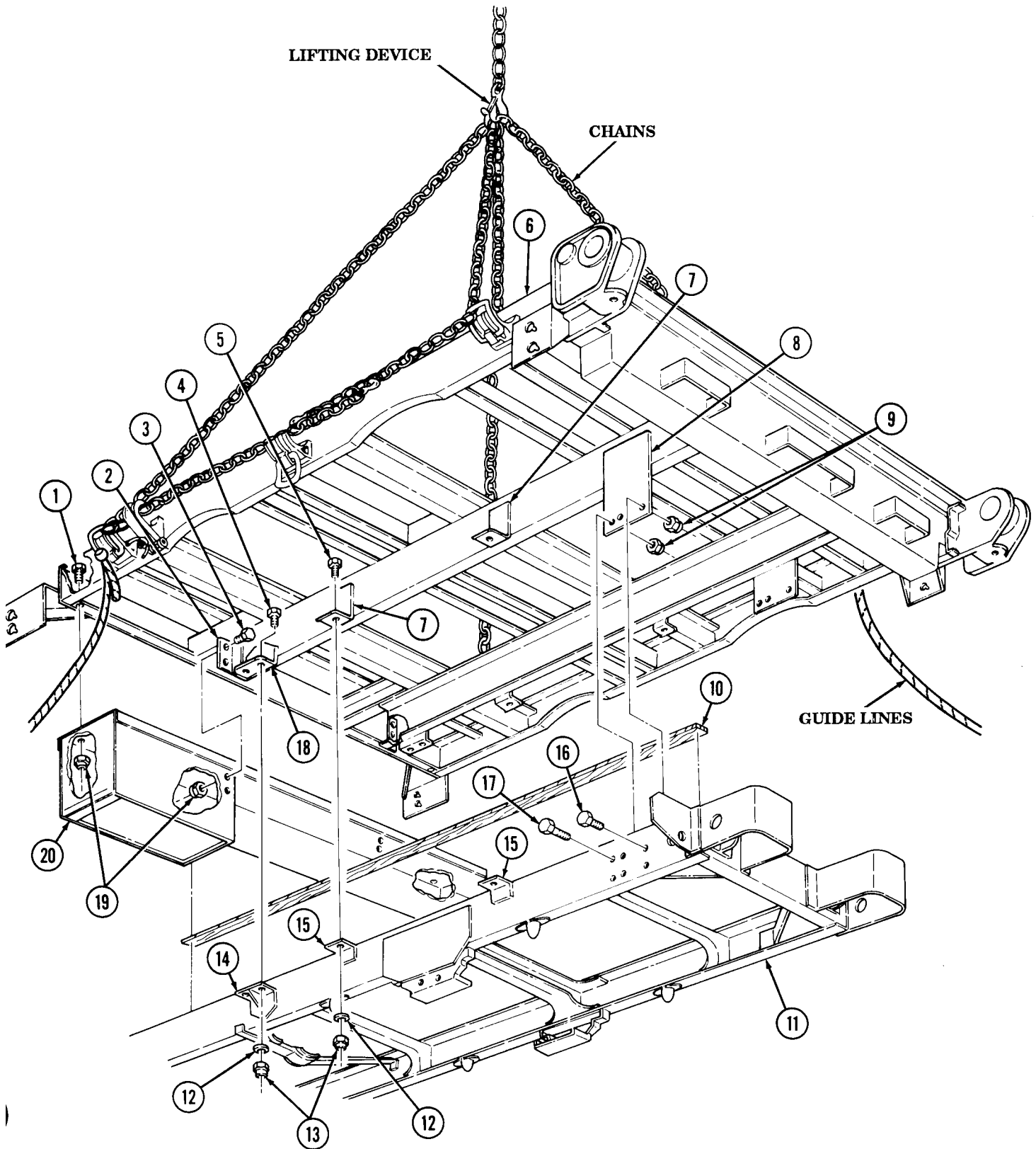
Toolbox is heavy. Ensure toolbox is empty before removing from frame. Support toolbox during removal. Failure to do so may result in injury to personnel.

NOTE

Perform step 7 if installing new subframe.

7. Remove toolbox (20) from frame (11).
8. Remove and inspect two fillers (10) for splitting and wear. Replace if split or worn.

15-51. PIPELINE CONSTRUCTION BODY MAINTENANCE (Contd)



15-51. PIPELINE CONSTRUCTION BODY MAINTENANCE (Contd)

b. Flooring Removal

NOTE

Mark location of floorboards for proper installation.

1. Remove fourteen screws (2), washers (3), locknuts (10), two slats (4), and board (1) from subframe (9). Discard locknuts (10).
2. Remove twenty-one screws (2), washers (3), locknuts (10), three slats (11), (6), and (4), two boards (5), board (7), and board (8) from subframe (9). Discard locknuts (10).
3. Remove twenty-one screws (2), washers (3), locknuts (10), four slats (4), and three boards (5) from subframe (9). Discard locknuts (10).

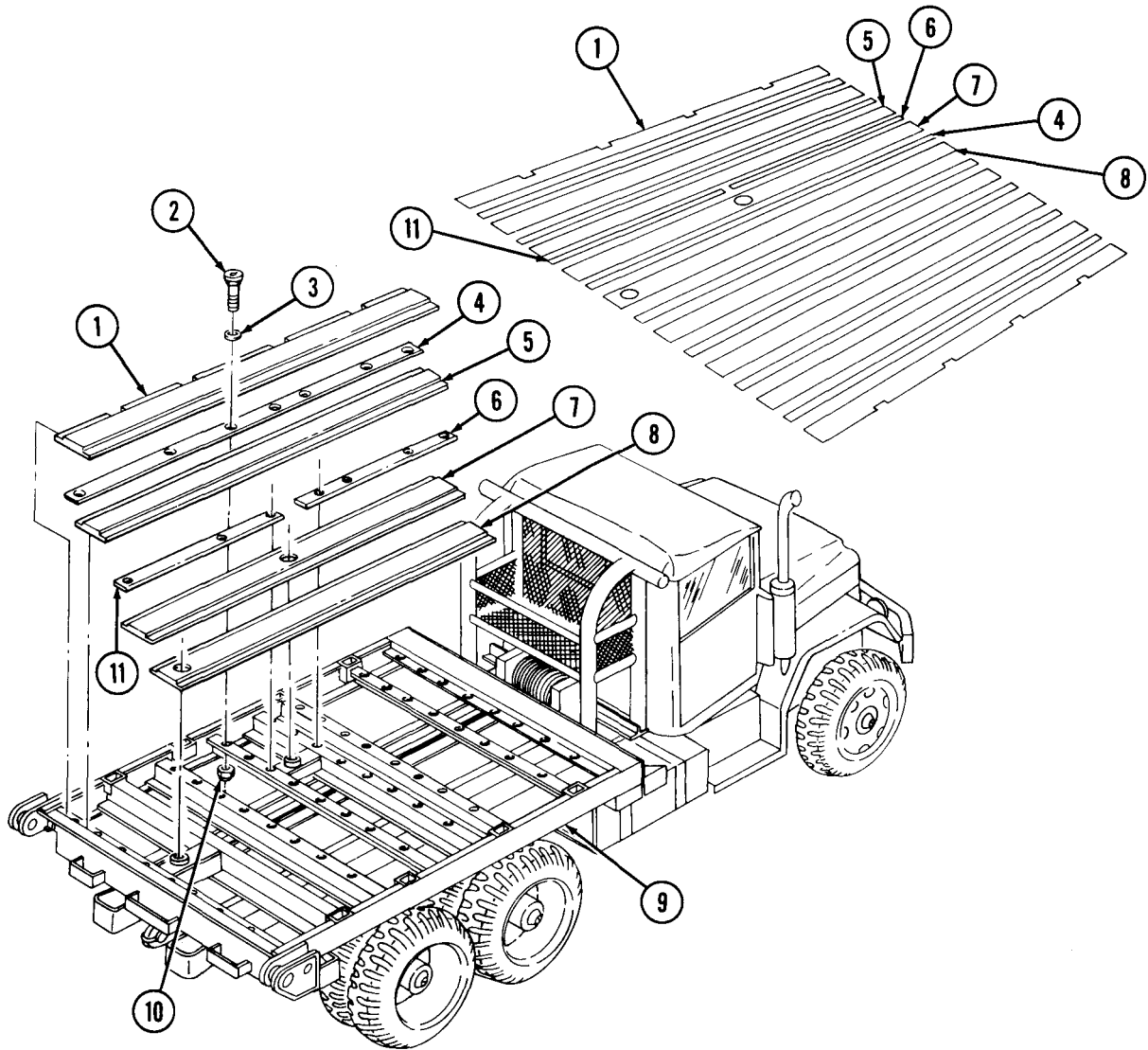
c. Inspection

1. Inspect boards (1), (5), (7), and (8) for warpage, rot, and splits that exceed board width. Replace if warped, rotted, or splits exceed board width. Inspect two boards (1) for 1.31 in. (3.33 cm) thickness. Replace if thickness is not correct.
2. Paint parts as needed (TB 43-0209).

e. Flooring Installation

1. Position two boards (1), boards (7) and (8), and five boards (5) on subframe (9) and install with seven slats (4), forty-nine screws (2), washers (3), and new locknuts (10).
2. Install two slats (11) and (6) on boards (7) and (5) and subframe (9) with seven screws (2), washers (3), and new locknuts (10).

15-51. PIPELINE CONSTRUCTION BODY MAINTENANCE (Contd)



15-51. PIPELINE CONSTRUCTION BODY MAINTENANCE (Contd)

e. Subframe Installation

1. Position two fillers (8) on frame (9).

WARNING

Toolbox is heavy. Support toolbox during installation. Failure to do so may result in injury to personnel.

NOTE

Perform step 2 if installing new subframe.

2. Position toolbox (20) on frame (9) and two fillers (8).
3. Attach chains and lifting device to subframe (4).

WARNING

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
- Toolbox and subframe are heavy. Ensure lifting device has lifting capacity greater than the weight of the toolbox and subframe. Failure to do so may result in injury to personnel or damage to equipment.

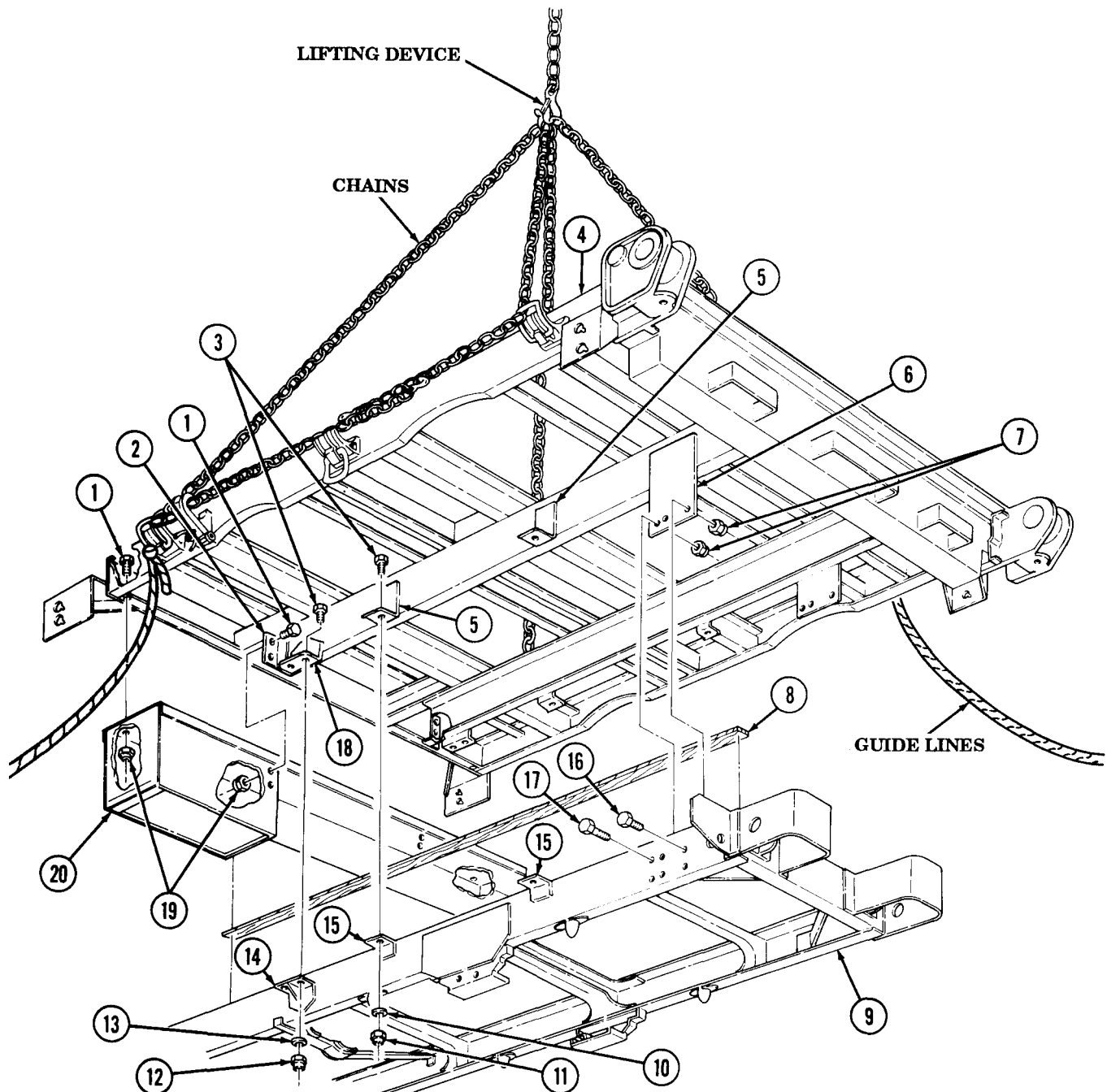
4. Position subframe (4) on frame (9) and align two subframe brackets (5) and bracket (18) with two frame brackets (15) and bracket (14).

NOTE

Perform step 5 if installing new subframe.

5. Install toolbox (20) on subframe (4) and two brackets (2) with six screws (1) and new locknuts (19).
6. Install two subframe brackets (18) and subframe brackets (5) on two frame brackets (14) and frame brackets (15) with eight screws (3), four washers (10), four washers (13), new locknuts (11), and new locknuts (12). Tighten four locknuts (11) 65-85 lb-ft (88-115 N.m). Tighten four locknuts (12) 125-165 lb-ft (170-224 N.m).
7. Install four screws (17), two screws (16), and six locknuts (7) on two plates (6) and frame (9).

15-51. PIPELINE CONSTRUCTION BODY MAINTENANCE (Contd)



- FOLLOW-ON TASKS:
- Place tools in toolbox, if removed.
 - Install tailboard roller (para. 15-53).
 - Install step plate (TM 9-2320-361-20).
 - Install front and rear splash guards (TM 9-2320-361-20).
 - Install gin pole (TM 9-2320-361-20).
 - Install stiff leg jack (TM 9-2320-361-20).
 - Install tailgate (TM 9-2320-361-20).
 - Install side panels (TM 9-2320-361-20).
 - Install bows and tarp (TM 9-2320-361-10).

15-52. PIPELINE CONSTRUCTION TOOLBOX REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M756A2 **www**

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 1-1/8-in. socket, 1/2-in. dr. (Appendix B, Item 10)
 1-1/16-in. socket, 1/2-in. dr. (Appendix B, Item 11)
 Torque wrench, 1/2-in. dr. (Appendix B, Item 7)
 Lifting device

MATERIALS/PARTS

Six locknuts (Appendix F, Item 89)
 Eight locknuts (Appendix F, Item 104)
 Six locknuts (Appendix F, Item 103)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TM 9-2320-361-10
 TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

- Bow and tarp kit removed (TM 9-2320-361-10).
- Side panels removed (TM 9-2320-361-20).
- Step plate removed (TM 9-2320-361-20).
- Front splash guard removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- All personnel must stand clear during lifting operations.
- Toolbox is heavy. Ensure toolbox is empty and supported before removal and installation.

a. Removal

1. Remove four locknuts (9), locknuts (11), eight washers (8), and screws (2) from two brackets (12) and four brackets (7). Discard locknuts (9) and (11).
2. Remove four locknuts (6) and screws (2) from two plates (4) and frame (10). Discard locknuts (6).
3. Loosen two locknuts (5).
4. Remove six locknuts (13) and screws (1) from toolbox (15) and two subframe brackets (14). Discard locknuts (13).

WARNING

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
- Toolbox is heavy. Ensure toolbox is empty before removing from frame. Support toolbox during removal. Failure to do so may result in injury to personnel.

CAUTION

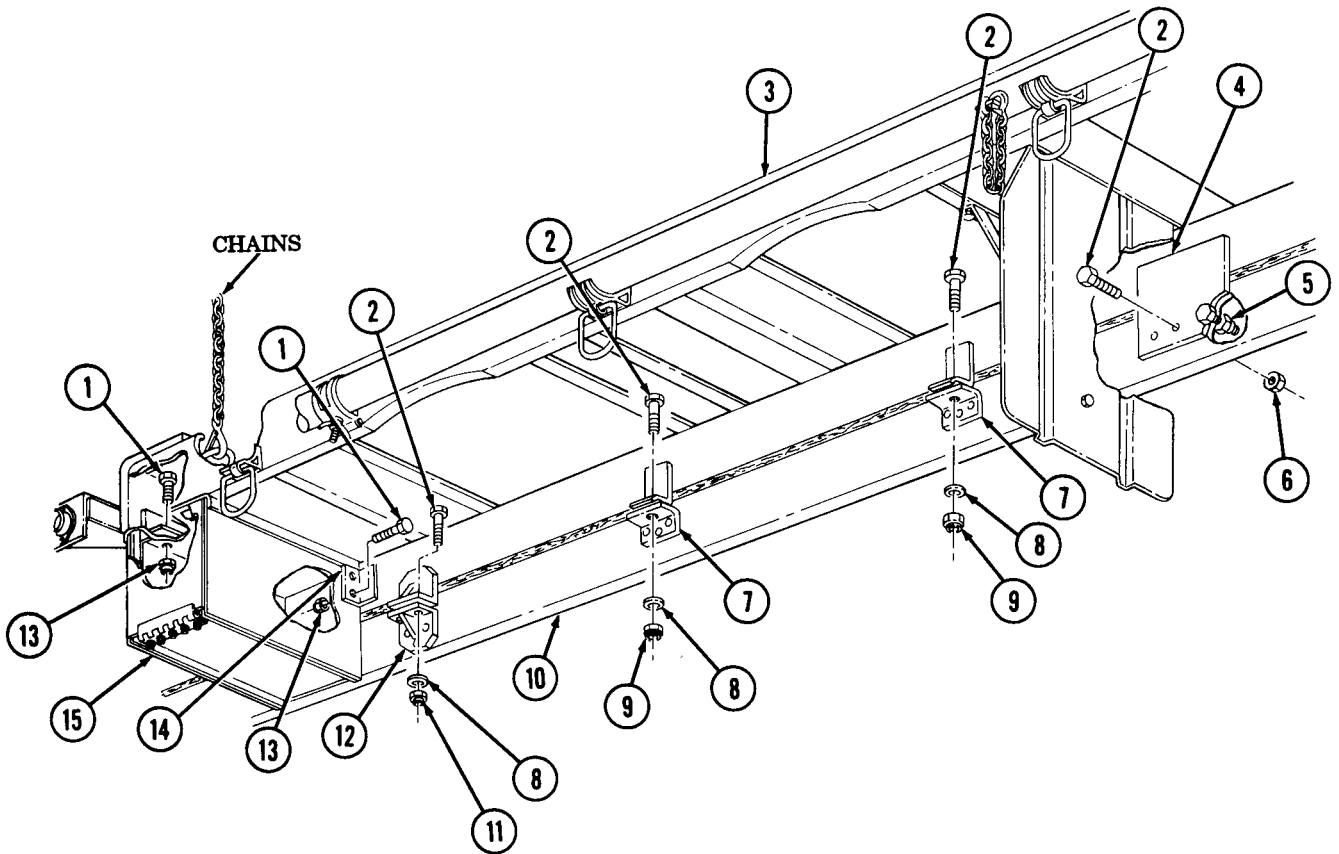
Do not lift, subframe 0.5 in. (1.27 cm) above frame. Damage to equipment may result.

NOTE

Assistant will help with lifting operations.

5. Attach lifting device and chains to subframe (3).
6. Raise subframe (3) from frame (10) 0.5 in. (1.27 cm) maximum.
7. Remove toolbox (15) from frame (10).
8. Lower subframe (3) and remove chains from lifting device and subframe (3).

15-52. PIPELINE CONSTRUCTION TOOLBOX REPLACEMENT (Contd)



15-52. PIPELINE CONSTRUCTION TOOLBOX REPLACEMENT (Contd)

b. Installation

WARNING

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
- Toolbox is heavy. Support toolbox during installation. Failure to do so may result in injury to personnel.

CAUTION

Do not lift subframe 0.5 in. (1.27 cm) above frame. Damage to equipment may result.

NOTE

Assistant will help with lifting operations.

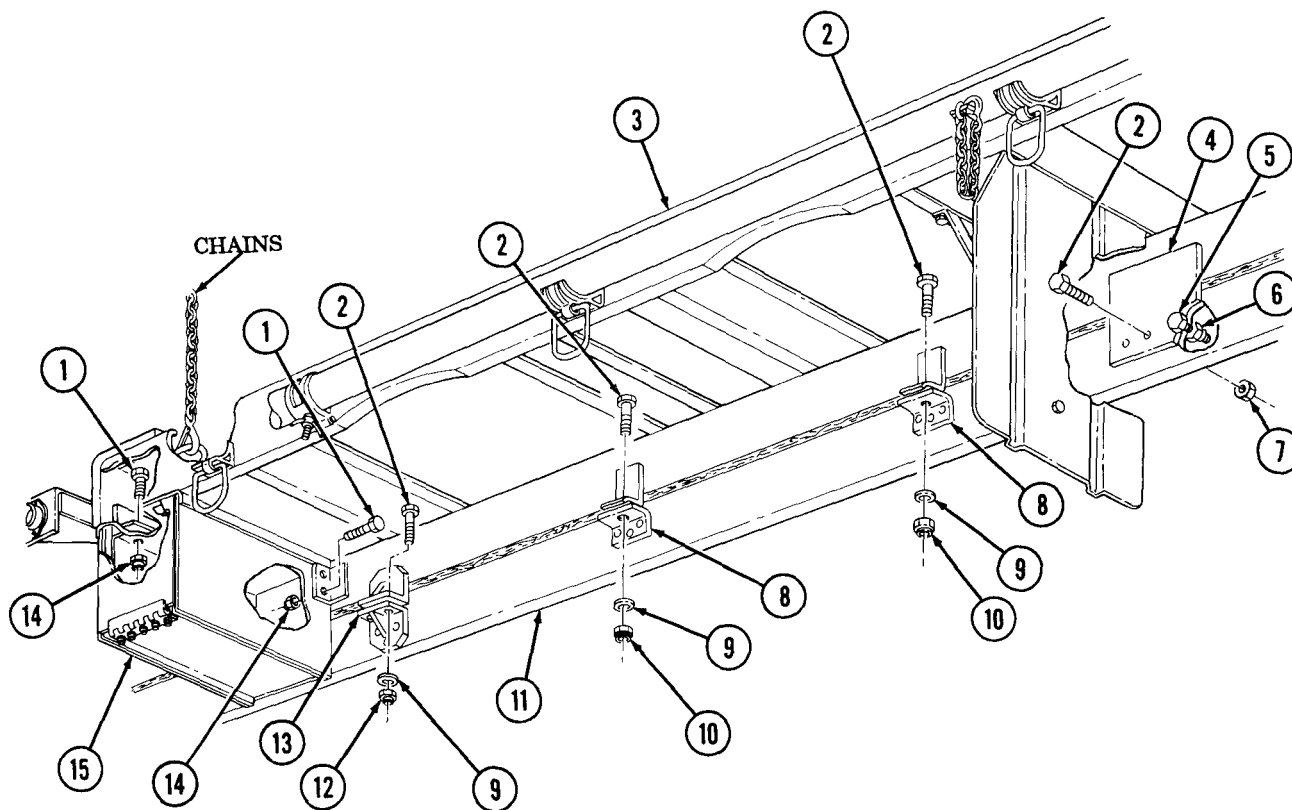
1. Attach chains to subframe (3) and lifting device.
2. Raise subframe (3) from frame (11) 0.5 in. (1.27 cm) maximum.

CAUTION

Use care when installing toolbox on frame and sills. Damage to equipment may result.

3. Position toolbox (15) on frame (11) and lower subframe (3) onto frame (11).
4. Install toolbox (15) on subframe (3) with six screws (1) and new locknuts (14).
5. Remove two locknuts (6) from two screws (5). Discard locknuts (6).
6. Ensure subframe (3) is correctly positioned on frame (11).
7. Install four screws (2), washers (9), and new locknuts (12) on two brackets (13). Tighten locknuts (12) 65-85 lb-ft (88-115 N.m).
8. Install four screws (2), washers (9), and new locknuts (10) on four brackets (8). Tighten locknuts (10) 125-165 lb-ft (170-224 N.m).
9. Install four screws (2) and new locknuts (7) on two plates (4).
10. Install two new locknuts (6) on two screws (5).
11. Remove chains and lifting device from subframe (3).

15-52. PIPELINE CONSTRUCTION TOOLBOX REPLACEMENT (Contd)



- FOLLOW-ON TASKS:
- Install front splash guard (TM 9-2320-361-20).
 - Install step plate (TM 9-2320-361-20).
 - Install side panels (TM 9-2320-361-20).
 - Install bow and tarp kit (TM 9-2320-361-10).

15-53. PIPELINE CONSTRUCTION TAILBOARD ROLLER MAINTENANCE

THIS TASK COVERS:

- | | |
|--|--|
| a. Removal
b. Disassembly
c. Inspection | d. Assembly
e. Installation |
|--|--|

INITIAL SETUP

APPLICABLE MODELS

M756A2 w/w

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 Mechanical puller (Appendix B, Item 22)
 Dial indicator (Appendix B, Item 21)

MATERIALS/PARTS

Shims (Appendix F, Item 260)
 Eight lockwashers (Appendix F, Item 142)
 Two seals (Appendix F, Item 231)
 Lubricating oil OE/HDO 10
 (Appendix C, Item 12)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TM 9-214
 TM 9-2320-361-10
 TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Tailgate removed (TM 9-2320-361-20).
- Side panels removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

All personnel must stand clear during lifting operations.

a. Removal

1. Attach lifting device and chain to roller (7) until supported.

NOTE

Count and record number of shims between two housings and pins before removal.

2. Remove eight screws (2), lockwashers (3), two pins (1), and shims (10) from housings (9) and roller (7). Discard lockwashers (3).

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

NOTE

Assistant will help with lifting operations.

3. Remove roller (7) from subframe (8).
4. Remove lifting device and chain from roller (7).

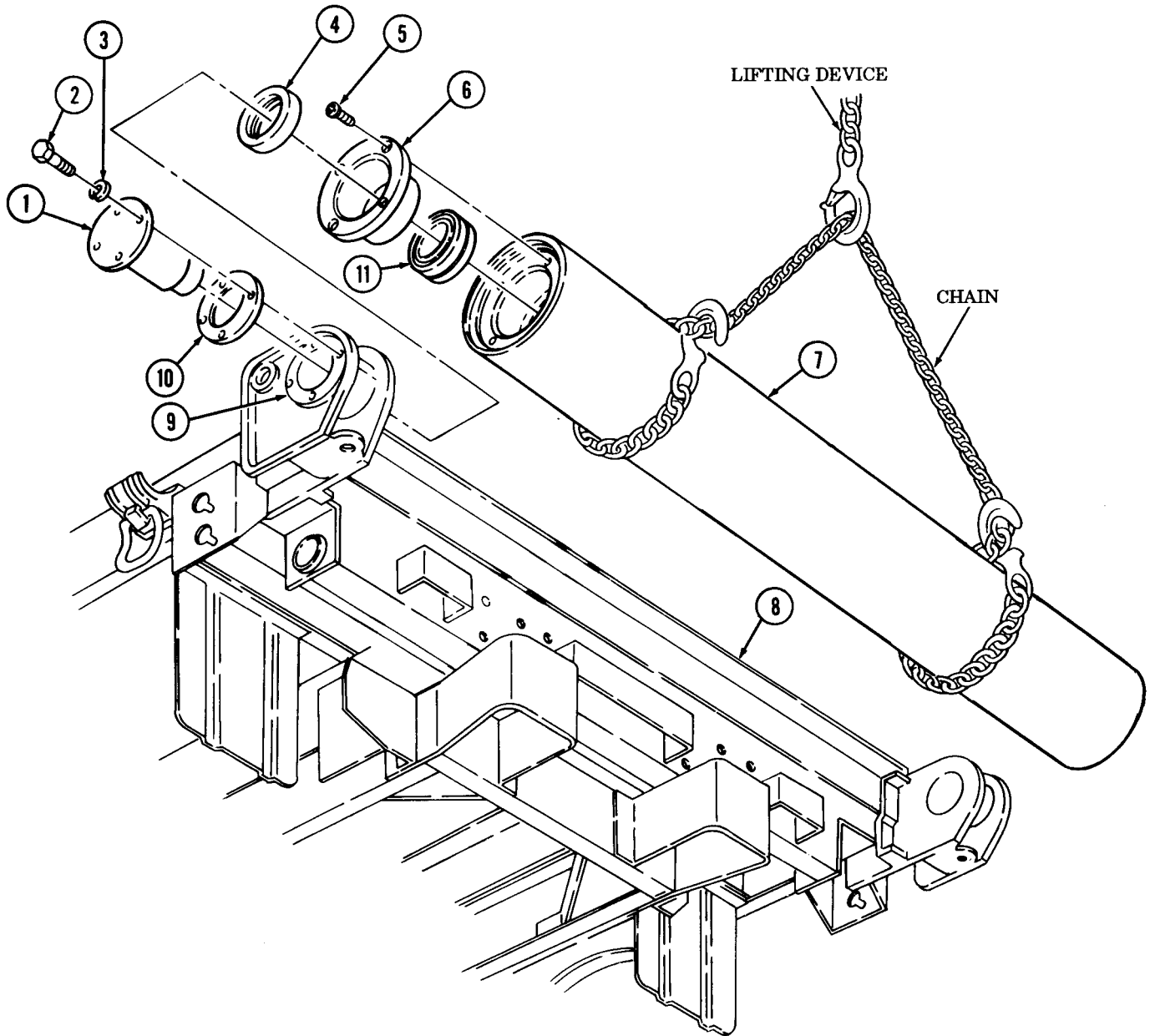
b. Disassembly

Remove two seals (4), eight screws (5), two seats (6), and bearings (11) from roller (7). Discard seals (4).

c. Inspection

Inspect two bearings (11) for wear (TM 9-214). Replace bearings (11) if damaged.

15-53. PIPELINE CONSTRUCTION TAILBOARD ROLLER MAINTENANCE (Contd)



15-53. PIPELINE CONSTRUCTION TAILBOARD ROLLER MAINTENANCE(Contd)

d. Assembly

NOTE

Lubricate bearings and seats before installation.

Install two bearings (11) and seats (6) on roller (7) with eight screws (5) and two new seals (4).

e. Installation

WARNING

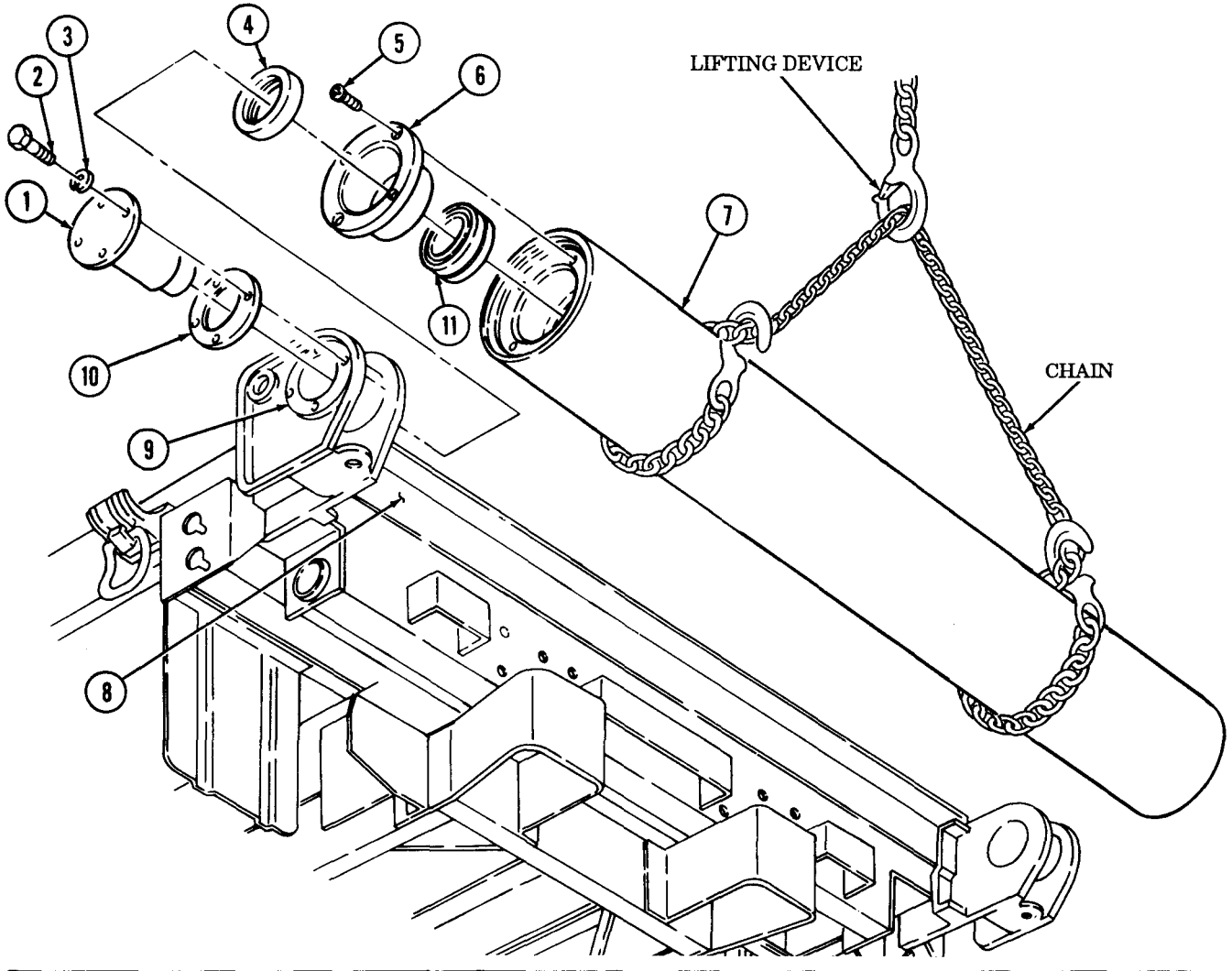
All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

NOTE

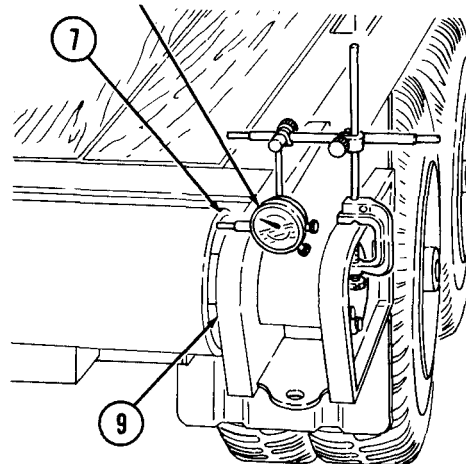
Assistant will help with lifting operations.

1. Attach lifting device and chain to roller (7).
2. Position roller (7) between two housings (9) on subframe (8).
3. Install roller (7) and recorded number of shims (10) on housings (9) with two pins (1), eight new lockwashers (3), and screws (2).
4. Use dial indicator to measure end play between roller (7) and housing (9).
5. Install or remove shims, as needed (step 3), to provide 0.03 in. (0.76 mm) minimum end play.
6. Remove lifting device and chain from roller (7).

15-53. PIPELINE CONSTRUCTION TAILBOARD ROLLER MAINTENANCE (Contd)



DIAL INDICATOR



- FOLLOW-ON TASKS: . Install side panels (TM 9-2320-361-20).
 • Install tailgate (TM 9-2320-361-20).

CHAPTER 16

WINCH, HOIST, AND POWER TAKEOFF MAINTENANCE

- Section I. Winch Maintenance (page 16-1)
 Section II. Hoist Maintenance (page 16-56)
 Section III. Power Takeoff Maintenance (page 16-95)

Section I. WINCH MAINTENANCE

16-1. WINCH MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
16-2.	Front Winch Repair	16-1
16-3.	Rear Winch Repair (M756A2)	16-12
16-4.	Rear Winch Repair (M764)	16-24
16-5.	Rear Winch Replacement (M764)	16-54

16-2. FRONT WINCH REPAIR

THIS TASK COVERS:

- | | |
|---|--|
| <ul style="list-style-type: none"> a. Front Winch Disassembly b. Front Winch End Frame Disassembly c. Front Winch Gearcase Disassembly d. Cleaning and Inspection | <ul style="list-style-type: none"> e. Front Winch Gearcase Assembly f. Front Winch End Frame Assembly g. Front Winch Assembly |
|---|--|

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 Mechanical puller kit (Appendix B, Item 22)
 Spring tester (Appendix B, Item 38)
 Torque wrench, 1/2-in. dr. (Appendix B, Item 7)
 Outside micrometer (Appendix B, Item 17)
 Inside micrometer (Appendix B, Item 16)
 Dial indicator (Appendix B, Item 21)

MATERIALS/PARTS

Locknut (Appendix F, Item 111)
 Twenty-seven lockwashers
 (Appendix F, Item 138)
 Seven lockwashers (Appendix F, Item 143)
 Lockwasher (Appendix F, Item 153)
 O-ring (Appendix F, Item 175)
 Seal (Appendix F, Item 225)
 Seal (Appendix F, Item 226)
 Seal (Appendix F, Item 227)

MATERIALS/PARTS (Cord)

Seal (Appendix F, Item 228)
 Seal (Appendix F, Item 229)
 Two gaskets (Appendix F, Item 65)
 Gasket (Appendix F, Item 66)
 Gasket (Appendix F, Item 64)
 Two woodruff keys (Appendix F, Item 279)
 Two woodruff keys (Appendix F, Item 281)
 Two woodruff keys (Appendix F, Item 279)
 Woodruff key (Appendix F, Item 280)
 Six screw-assembled lockwashers
 (Appendix F, Item 158)
 Pin (Appendix F, Item 194)
 Plug (Appendix F, Item 200)

REFERENCES [TM]

TM 9-214
 TM 9-2320-361-20
 TM 9-2320-361-34P
 TM 9-3830-206-35P

EQUIPMENT CONDITION

Front winch removed (TM 9-2320-361-20).

16-2. FRONT WINCH REPAIR (Contd)

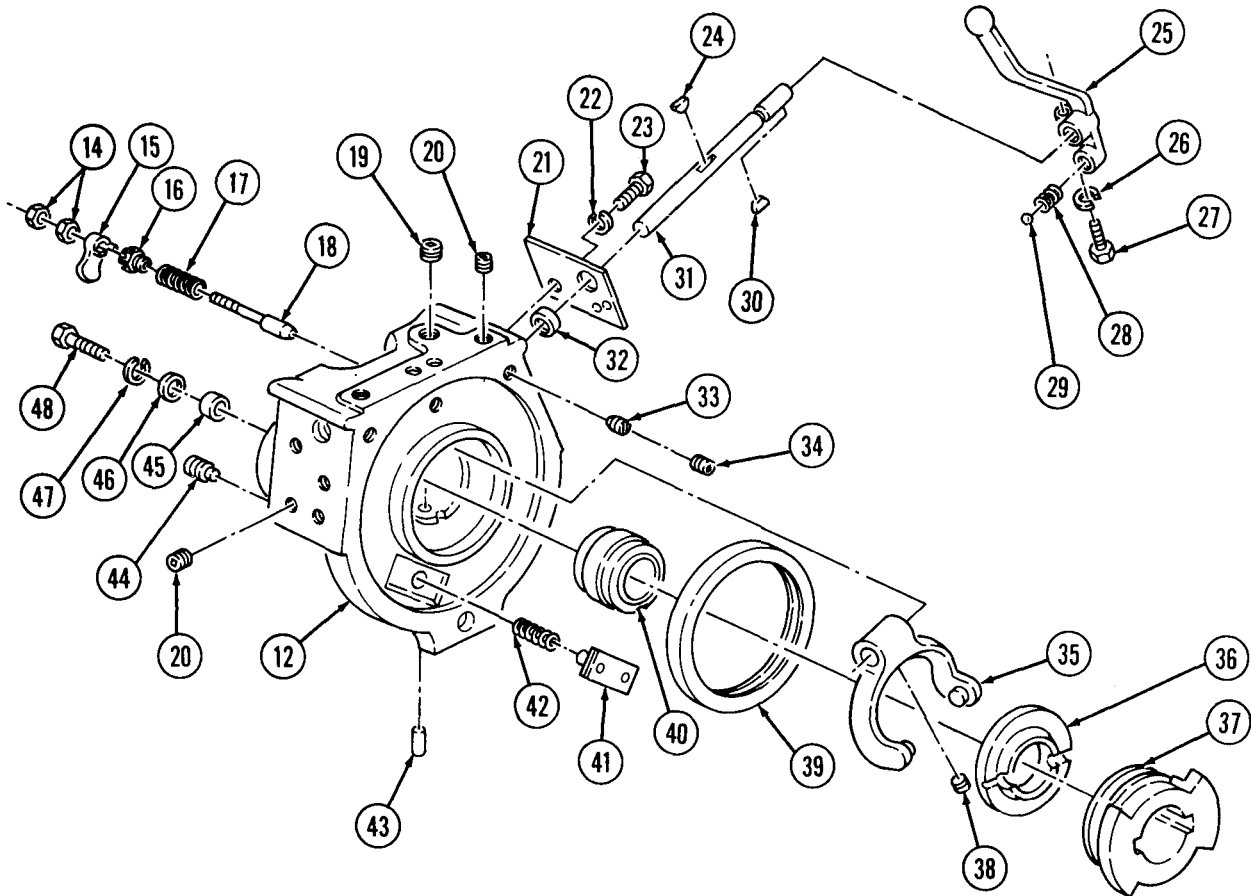
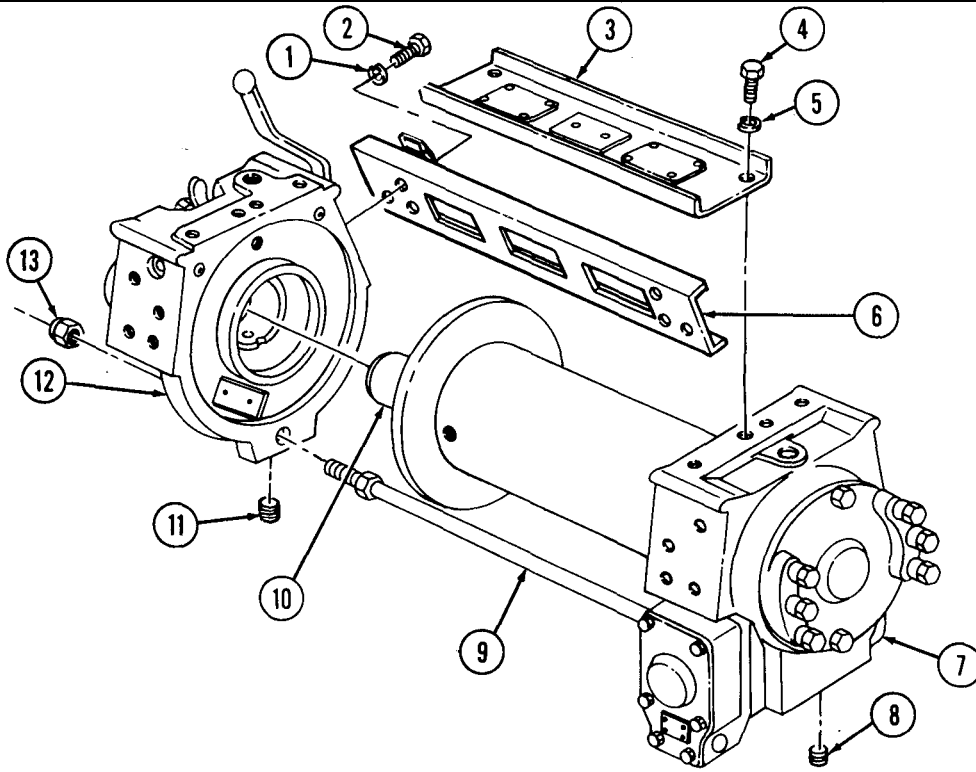
a. Front Winch Disassembly

1. Remove four screws (4), lockwashers (5), and channel (3) from gearcase (7) and end frame (12). Discard lockwashers (5).
2. Remove six screws (2), lockwashers (1), and channel (6) from gearcase (7) and end frame (12). Discard lockwashers (1).
3. Remove locknut (13) and end frame (12) from rod (9) and drum shaft (10). Discard locknut (13).
4. Remove plug (11) from end frame (12).
5. Remove plug (8) from gearcase (7).

b. Front Winch End Frame Disassembly

1. Remove six screws (48), lockwashers (47), washers (46), and spacers (45) from end frame (12). Discard lockwashers (47).
2. Remove drum sliding clutch (37), thrust ring (36), and seal (39) from end frame (12). Discard seal (39).
3. Remove adjusting screw (44), spring (42), and drag brakeshoe (41) from end frame (12).
4. Remove plug (34) and setscrew (33) from end frame (12).
5. Remove setscrew (38) from shifter fork (35).
6. Remove shifter fork (35) and woodruff key (24) from shifter shaft(31) while removing shifter shaft (31), ball (29), and spring (28) from end frame (12). Discard woodruff key (24).
7. Remove screw (27), lockwasher (26), lever (25), and woodruff key (30) from shifter shaft (31). Discard lockwasher (26) and woodruff key (30).
8. Remove screw (23), lockwasher (22), plate (21), and seal (32) horn end frame (12). Discard lockwasher (22) and seal (32).
9. Remove two nuts (14), poppet latch (15), poppet nut (16), spring (17), and poppet (18) from end frame (12).
10. Remove plug (19), three plugs (20), and pin (43) from end frame (12). Discard pin (43).
11. Remove sleeve (40) from end frame (12).

16-2. FRONT WINCH REPAIR (Contd)



16-2. FRONT WINCH REPAIR (Contd)

c. Front Winch Gearcase Disassembly

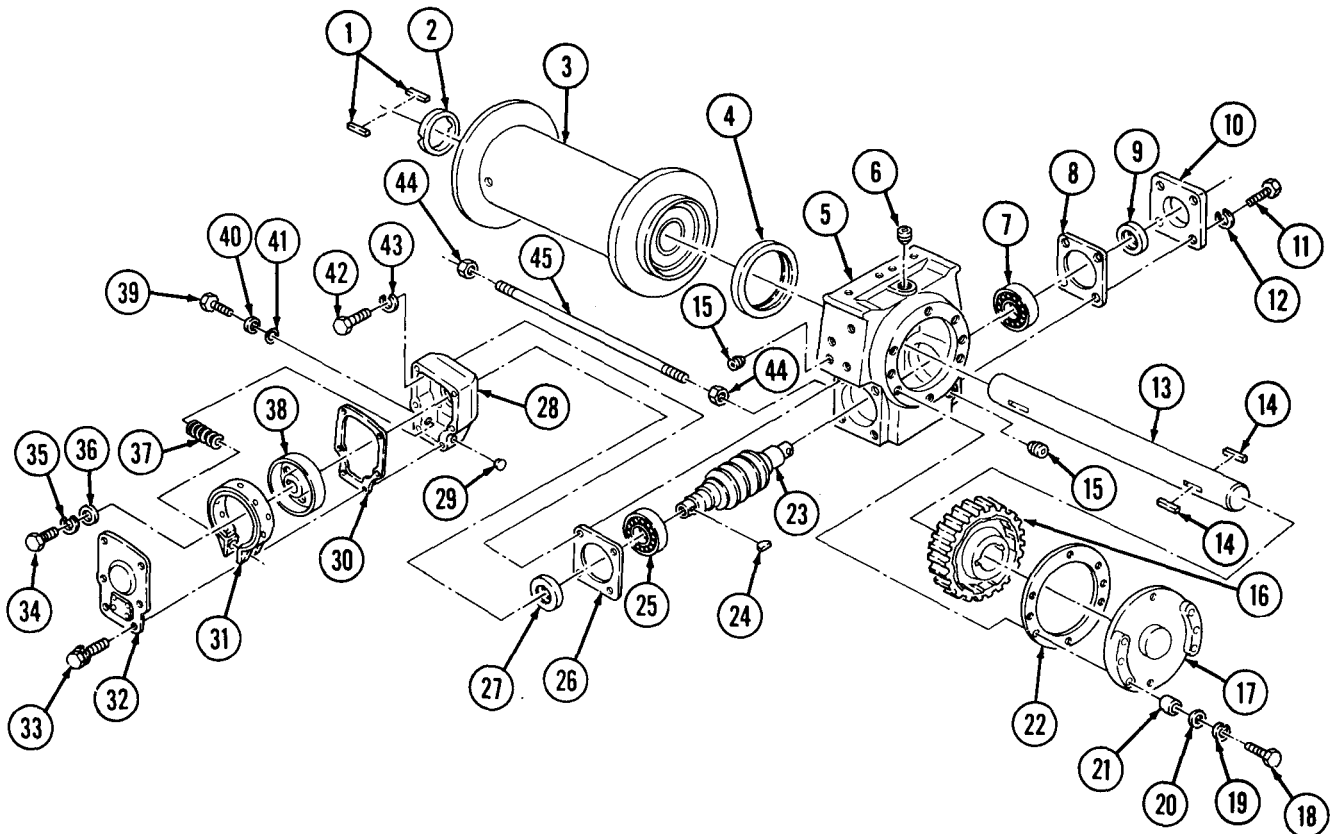
1. Remove two woodruff keys (1), drum thrust ring (2), and drum (3) from drum shaft (13). Discard woodruff keys (1).
2. Remove rod (45) from gearcase (5).
3. Remove two jamnuts (44) from rod (45).
4. Remove six screw-assembled lockwashers (33), brake cover (32), and gasket (30) from brakecase (28). Discard screw-assembled lockwashers (33) and gasket (30).
5. Remove screw (39), washer (40), O-ring (41), spring (37), and brakeband (31) from brakecase (28) and brakedrum (3). Discard O-ring (41).
6. Remove screw (34), lockwasher (35), washer (36), brakedrum (38), and woodruff key (24) from worm gear (23). Discard lockwasher (35) and woodruff key (24).
7. Remove four screws (42), lockwashers (43), brakecase (28), and gasket (26) from gearcase (5). Discard lockwashers (43) and gasket (26).
8. Remove seal (27) and plug (29) from brakecase (28). Discard seal (27) and plug (29).
9. Remove eight screws (18), lockwashers (19), six washers (20), spacers (21), cover (17), and gasket (22) from gearcase (5). Discard lockwashers (19) and gasket (22).
10. Remove drum shaft (13) from gearcase (5).
11. Remove spur gear (16) and two woodruff keys (14) from drum shaft (13). Discard woodruff keys (14).
12. Remove four screws (11), lockwashers (12), bearing cap (10), and gasket(8) from gearcase (5). Discard lockwashers (12) and gasket (8).
13. Remove seal (9) from bearing cap (10). Discard seal (9).

CAUTION

Excessive tapping may damage worm gear.

14. Tap worm gear (23) with bearing (7) from gearcase (5).
15. Remove bearing (7) from worm gear shaft (23).
16. Remove bearing (25) from gearcase (5).
17. Remove two setscrews (15) and plug (6) from gearcase (5).
18. Remove seal (4) from gearcase (5). Discard seal (4).

16-2. FRONT WINCH REPAIR (Contd)



16-2. FRONT WINCH REPAIR (Contd)

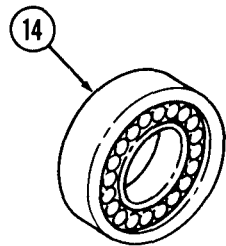
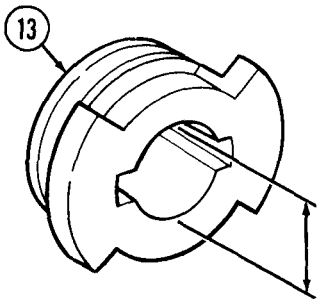
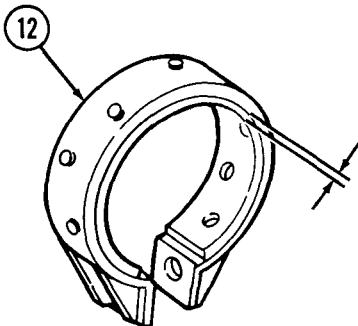
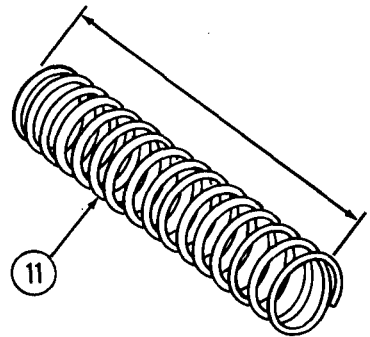
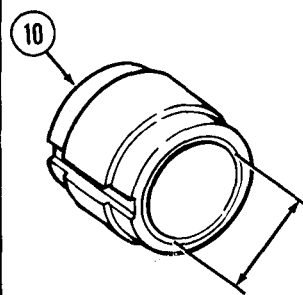
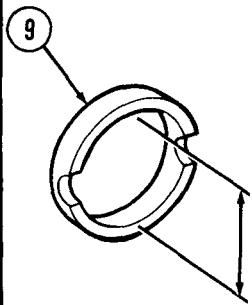
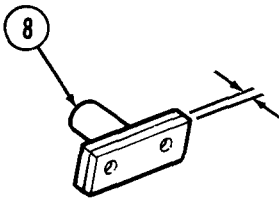
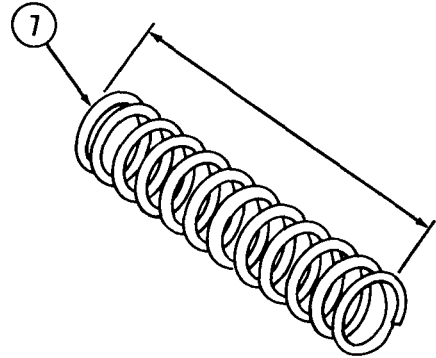
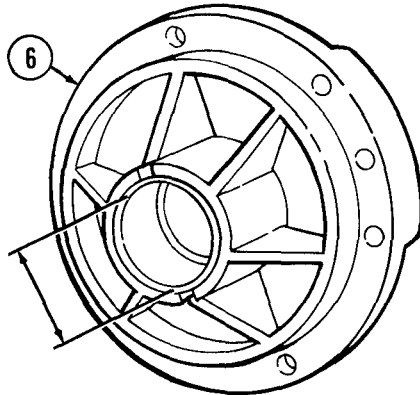
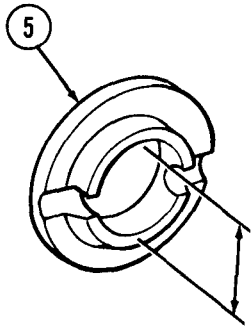
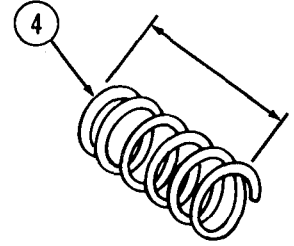
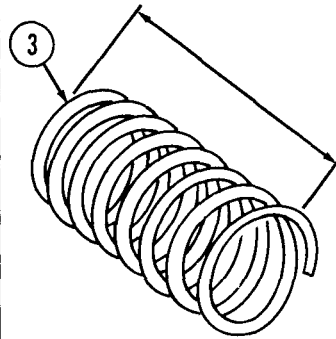
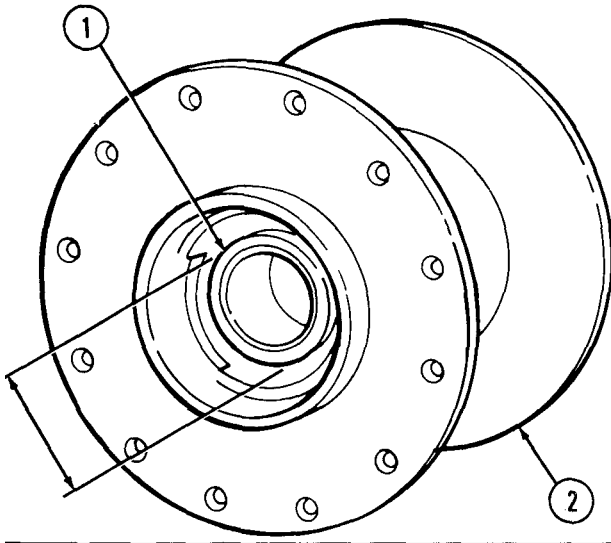
d. Cleaning and Inspection

1. For general cleaning instructions, refer to para. 2-8.
2. For general inspection instructions, refer to para. 2-9.
3. Inspect two bushings (1) of drum (2) for wear. Refer to table 16-1, Front Winch Wear Limits, for measurements. Replace if worn past limit.
4. Inspect two gearcase bushings (6) for wear. Refer to table 16-1, Front Winch Wear Limits, for measurements. Replace if worn past limit.
5. Inspect poppet spring (7), drag brake spring (11), automatic brake spring (3), and shift lever spring (4) for wear. Refer to table 16-1, Front Winch Wear Limits, for measurements. Replace if worn past limit.
6. Inspect drag brakeshoe (8) lining for wear. Refer to table 16-1, Front Winch Wear Limits, for measurements. Replace if worn past limit.
7. Inspect automatic brake (12) lining for wear. Refer to table 16-1, Front Winch Wear Limits, for measurements. Replace if worn past limit.
8. Inspect sliding clutch (13), end frame thrust ring (5), drum thrust ring (9), and sleeve (10) for wear. Refer to table 16-1, Front Winch Wear Limits, for measurements. Replace if worn past limit.
9. Visually inspect bearings (14) for damage or wear (TM 9-214). Replace bearings if worn or damaged.

Table 16-1. Front Winch Wear Limits

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		STANDARD	METRIC
1	Bushings (inner diameter)	1.877-1.880 in.	4.768-4.775 cm
3	Automatic brake spring:		
	Free length	1.5 in.	3.81 cm
	Compressed to 1 in. (2.54 cm)	52 lb-ft	70.51 N.m
4	Shift lever spring		
	Free length	0.6875 in.	1.746 cm
	Compressed to 0.625 in. (1.59 cm)	19.9 lb-ft	26.98 N.m
5	End frame thrust ring (inner diameter)	1.887-1.889 in.	4.793-4.798 cm
6	Gearcase bushings (inner diameter)	1.877-1.880 in.	4.768-4.775 cm
7	Poppet spring (free length)	1.906 in.	4.841 cm
8	Drag brakeshoe lining (thickness)	0.194-0.25 in.	0.493-0.635 cm
9	Drum thrust ring (inner diameter)	1.887-1.889 in.	4.793-4.798 cm
10	Sleeve (inner diameter)	1.887-1.889 in.	4.793-4.798 cm
11	Drag brake spring		
	Free length	2 in.	5.08 cm
	Compressed to 1.7 in. (4.3 cm)	48 lb-ft	65.09 N.m
12	Automatic brake lining (thickness)	0.17-0.19 in.	0.4318-0.4826 cm
13	Sliding clutch (inner diameter)	1.887-1.889 in.	4.793-4.798 cm

16-2. FRONT WINCH REPAIR (Contd)



16-2. FRONT WINCH REPAIR (Contd)

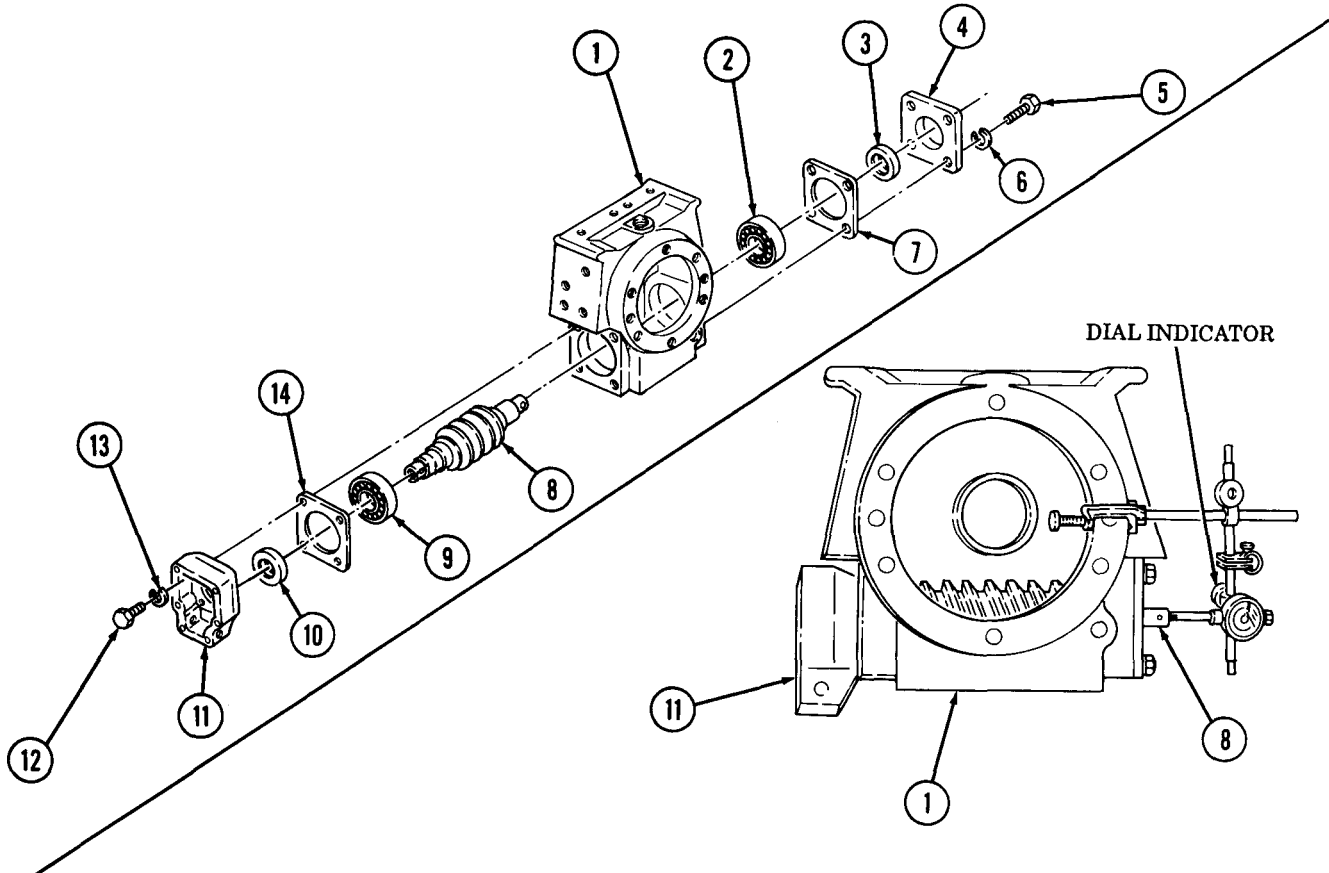
e. Front Winch Gearcase Assembly

1. Install bearing (9) in gearcase (1).
2. Install bearing (2) on worm gear shaft (8).
3. Position worm gear shaft (8) in gearcase (1) and through bearing (9). Tap bearing (2) until seated.
4. Install new seal (10) in brakecase (11).
5. Install new gasket (14) and brakecase (11) on gearcase (1) with four new lockwashers (13) and screws (12).
6. Install new seal (3) in bearing cap (4).
7. Install new gasket (7) and bearing cap (4) on gearcase (1) with four new lockwashers (6) and screws (5).
8. Install dial indicator on gearcase (1) with plunger positioned on the end of worm gear shaft (8).
9. Measure end play of worm gear shaft (8) by moving worm gear shaft(8) back and forth. End play should not be less than 0.005 in. (0.127 mm).
10. Remove dial indicator from gearcase (1).

NOTE

If end play is correct, go to step 13. If end play is incorrect, go to step 11.

11. Remove four screws (5), lockwashers (6), and bearing cap (4) from gearcase (1). Discard lockwashers (6).
12. Perform steps 7 through 10 to install additional gasket (7).



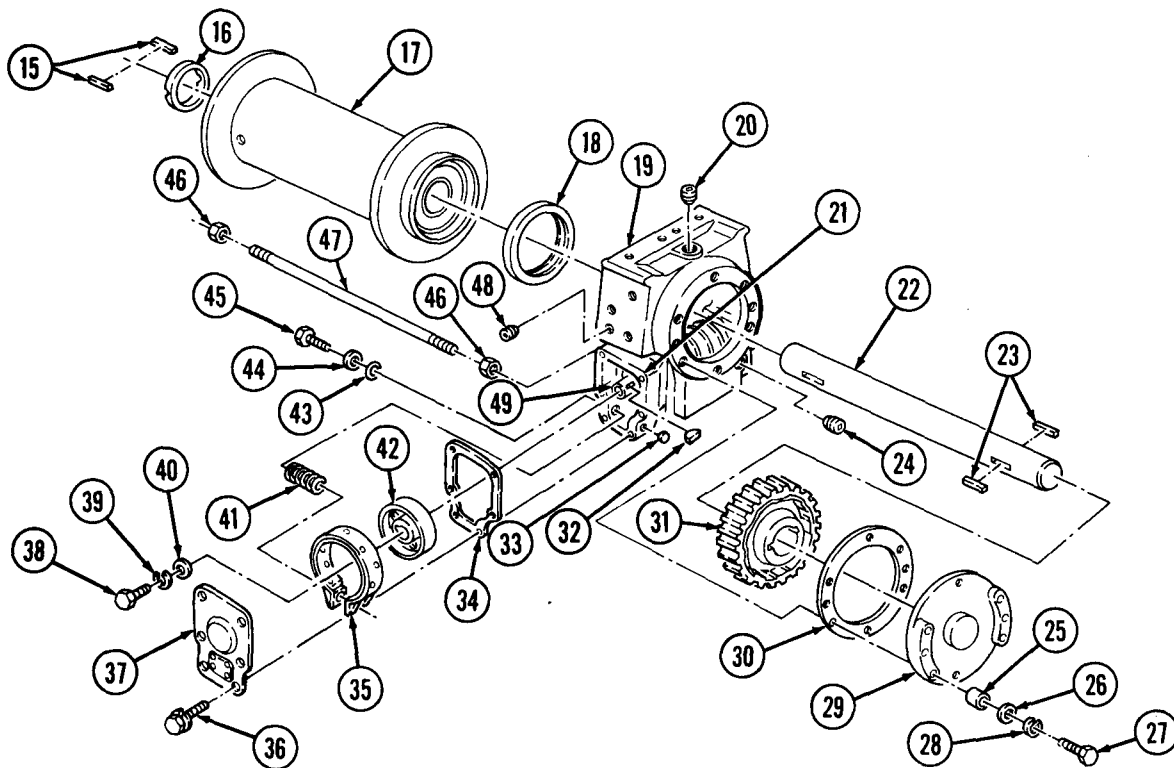
16-2. FRONT WINCH REPAIR (Contd)

NOTE

For assembly precautions, refer to para. 2-11.

f. Front Winch End Frame Assembly

1. Install drum shaft (22) in gearcase (19).
2. Install new seal (18) on gearcase (19).
3. Install two setscrews (48) and plugs (20) and (24) in gearcase (19).
4. Install two new woodruff keys (23) and spur gear (31) on drum shaft (22).
5. Install spur gear (31) in gearcase (19) and on worm gear (49).
6. Install new gasket (30) and cover (29) on gearcase (19) with six spacers (25), washers (26), eight new lockwashers (28), and screws (27).
7. Install new woodruff key (32) and brakedrum (42) on worm gear (49) with washer (40), new lockwasher (39), and screw (38).
8. Install new plug (33) in brakecase (21).
9. Install brakeband (35) on brakedrum (42) and brakecase (21) with spring (41), new O-ring (43), washer (44), and screw (45).
10. Install new gasket (34) and cover (37) on brakecase (21) with six new screw-assembled lockwashers (36).
11. Install two jamnuts (46) on rod (47) and install rod (47) on gearcase (19).
12. Install drum (17), thrust ring (16), and two new woodruff keys (15) on drum shaft (22).



16-2. FRONT WINCH REPAIR (Contd)

13. Install sleeve (27) in end frame (31).
14. Install three plugs (7), plug (6), and new pin (30) in end frame (31).
15. Install poppet (5) and spring (4) in end frame (31) with poppet nut (3).
16. Install poppet latch (2) on poppet nut (3) in lock position with two nuts (1).
17. Install new seal (19) on end frame (31) with plate (8), new lockwasher (9), and screw (10).
18. Install new woodruff key (17) and lever (12) on shifter shaft (18) with new lockwasher (13) and screw (14).
19. Position shifter shaft (18) in end frame (31) and install new woodruff key (11) on shifter shaft (18).
20. Pull shifter shaft (18) partially out of end frame (31) and position spring (15) and ball (16) in lever (12) and install shifter fork (22) on shifter shaft (18) with setscrew (25).
21. Install setscrew (20) and plug (21) in end frame (31).
22. Install drag brake (28) and spring (29) in end frame (31) with adjusting screw (32).
23. Install thrust ring (24), drum sliding clutch (23), and new seal (26) in end frame (31).
24. Install six spacers (33) on end frame (31) with six washers (34), new lockwashers (35), and screws (36).

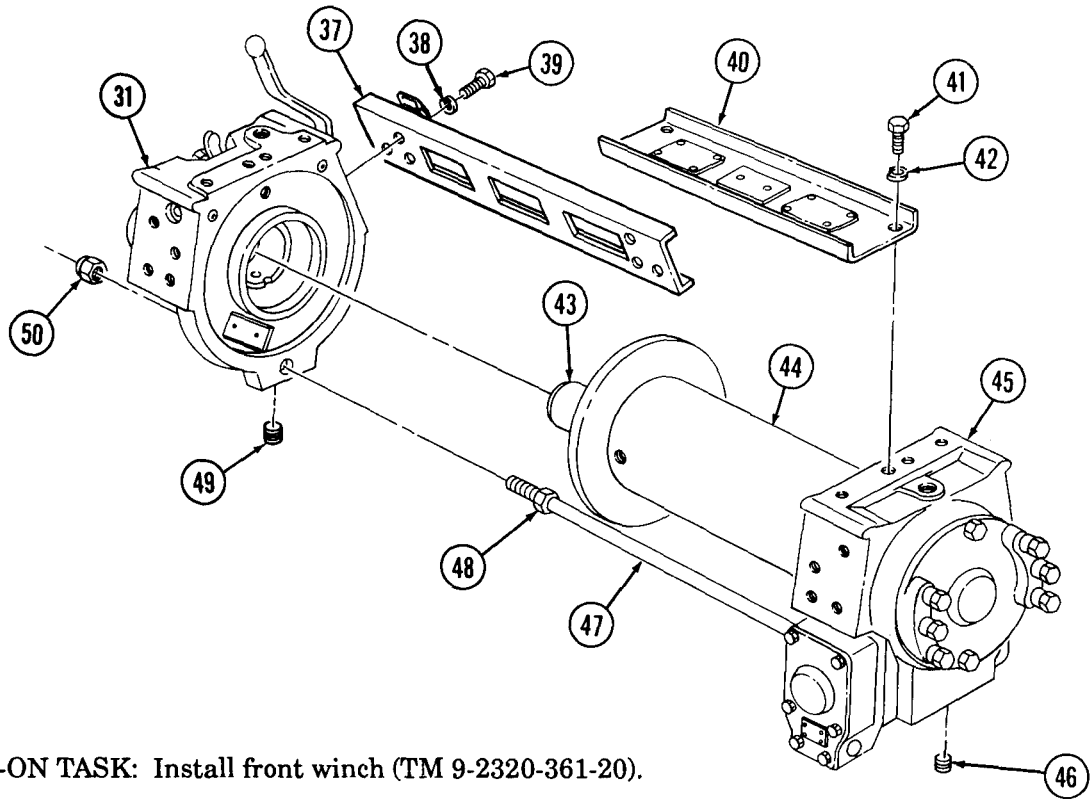
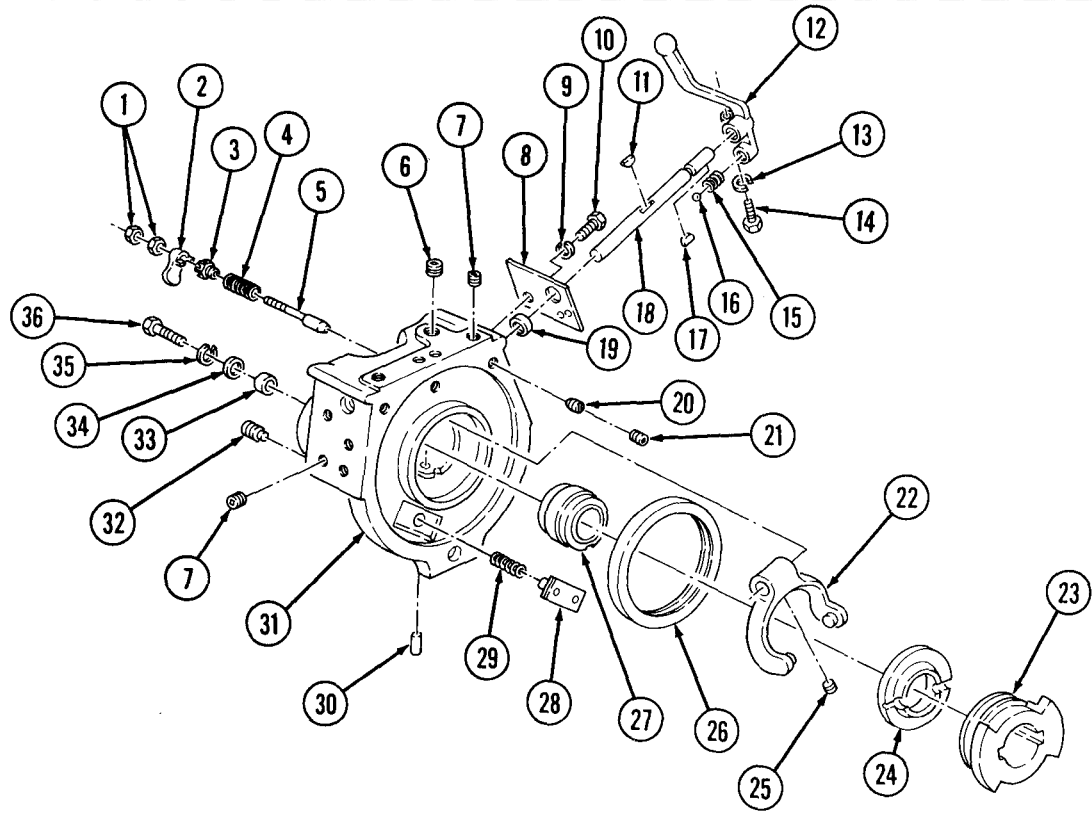
g. Front Winch Assembly

NOTE

Ensure sliding clutch and woodruff keys are properly aligned.

1. Install end frame (31) on rod (47) and drum shaft (43).
2. Install channel (37) on gearcase (45) and end frame (31) with six new lockwashers (38) and screws (39).
3. Install channel (40) on gearcase (45) and end frame (31) with four new lockwashers (42) and screws (41).
4. Install new locknut (50) on rod (47) and tighten two jamnuts (48).
5. Install plug (49) in end frame (31).
6. Install plug (46) in gearcase (45).

16-2. FRONT WINCH REPAIR (Contd)



FOLLOW-ON TASK: Install front winch (TM 9-2320-361-20).

16-3. REAR WINCH REPAIR (M756A2)

THIS TASK COVERS:

- | | |
|---|--|
| <p>a. Rear Winch Disassembly
 b. Rear Winch Gearcase Disassembly
 c. Rear Winch End Frame Disassembly
 d. Cleaning and Inspection</p> | <p>e. Rear Winch End Frame Assembly
 f. Rear Winch Gearcase Assembly
 g. Rear Winch Assembly</p> |
|---|--|

INITIAL SETUP

APPLICABLE MODELS

M756A2

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Spring tester (Appendix B, Item 38)
- Dial indicator (Appendix B, Item 21)
- Torque wrench, 1/2-in. dr. (Appendix B, Item 7)
- Inside micrometer (Appendix B, Item 16)
- Lifting device
- Chains

MATERIALS/PARTS

- Six screw-assembled lockwashers (Appendix F, Item 158)
- Two woodruff keys (Appendix F, Item 283)
- Woodruff key (Appendix F, Item 284)
- Woodruff key (Appendix F, Item 279)
- Woodruff key (Appendix F, Item 285)
- Seal (Appendix F, Item 228)
- Seal (Appendix F, Item 227)
- Seal (Appendix F, Item 226)
- Seal (Appendix F, Item 230)
- Seal (Appendix F, Item 229)
- Two gaskets (Appendix F, Item 68)

MATERIALS/PARTS (Contd)

- Gasket (Appendix F, Item 67)
- Gasket (Appendix F, Item 69)
- Eight lockwashers (Appendix F, Item 140)
- Five lockwashers (Appendix F, Item 138)
- Two lockwashers (Appendix F, Item 127)
- Plug (Appendix F, Item 201)
- Pin (Appendix F, Item 194)
- Sealing compound, thread locking (Appendix C, Item 18)

PERSONNEL REQUIRED

TWO

REFERENCES (TM)

- TM 9-214
- TM 9-2320-361-20
- TM 9-2320-361-34P

EQUIPMENT CONDITION

Rear winch removed (M756A2) (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- Use lifting device during repair.
- Support drum with overhead lifting device and chain.

WARNING

Use lifting device during repair. Failure to do so may result in injury to personnel.

a. Rear Winch Disassembly

1. Remove four screws (12), lockwashers (11), and channel (10) from end frame (13) and gearcase (7). Discard lockwashers (11).
2. Remove nut (14) from rod (9).

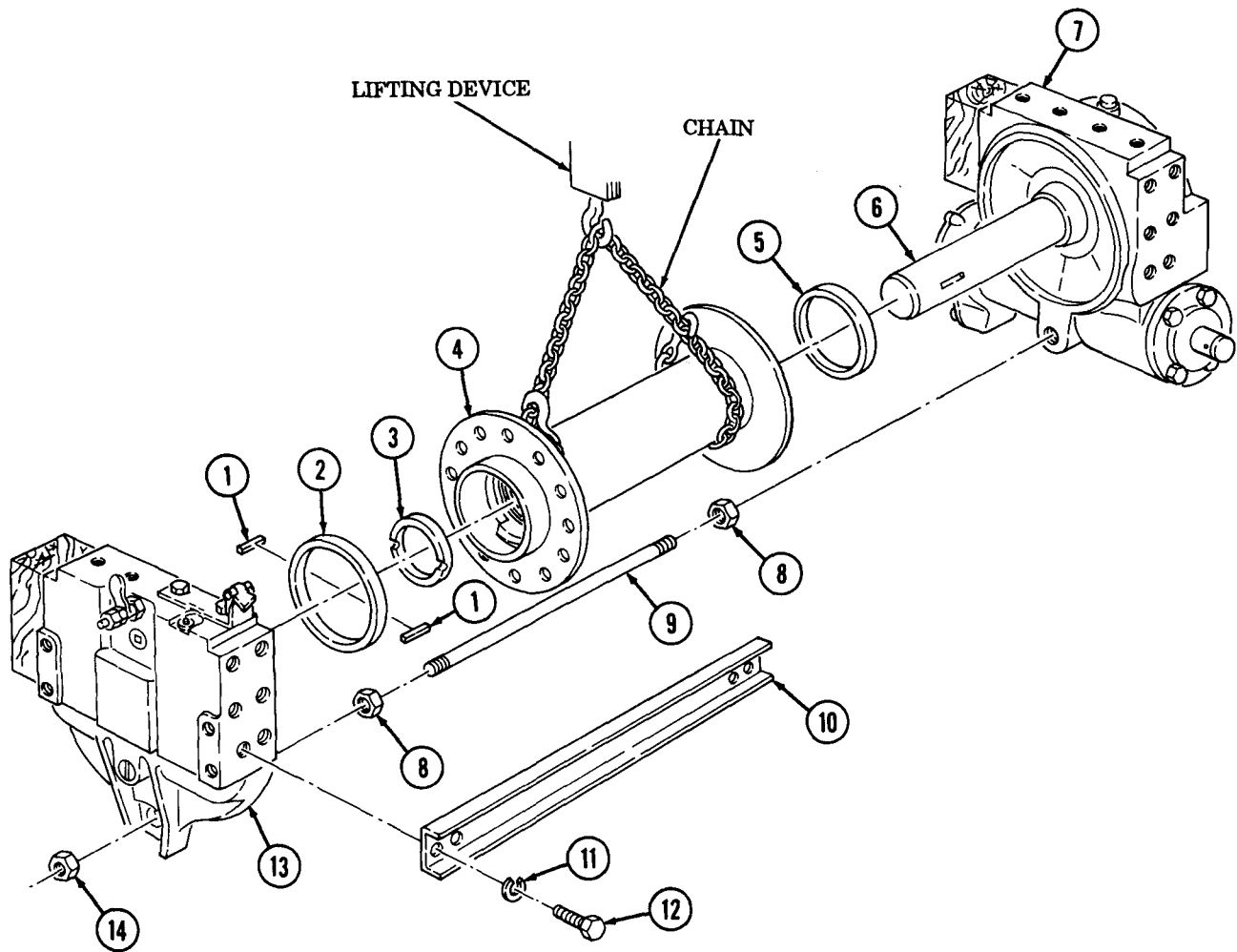
WARNING

Support drum with overhead lifting device and chain. Failure to do so may result in injury or death to personnel.

3. Separate end frame (13) from drum (4) and shaft (6).
4. Remove seal (2) from end frame (13). Discard seal (2).
5. Remove rod (9) from gearcase (7).
6. Remove two jamnuts (8) from rod (9).

16-3. REAR WINCH REPAIR (M756A2) (Contd)

7. Remove two woodruff keys (1), drum thrust ring (3), and drum (4) from shaft (6). Discard woodruff keys (1).
8. Remove seal (5) from drum (4). Discard seal (5).



16-3. REAR WINCH REPAIR (M756A2) (Contd)

b. Rear Winch Gearcase Disassembly

1. Remove four screws (34), cover (33), and gasket (32) from gearcase (7). Discard gasket (32).
2. Remove four screws (1), lockwashers (2), cap (3), and gasket (4) from gearcase (7). Discard lockwashers (2) and gasket (4).
3. Remove seal (38) from cap (3). Discard seal (38).
4. Remove six screw-assembled lockwashers (22), cover (23), and gasket (24) from brakecase (11). Discard screw-assembled lockwashers (22) and gasket (24).
5. Remove adjusting screw (14), washer (15), spring (16), and brakeband (17) from brakedrum (18).
6. Remove screw (25), lockwasher (26), washer (27), brakedrum (18), and woodruff key (28) from worm gear (29) and brakecase (11). Discard lockwasher (26) and woodruff key (28).

NOTE

Ensure gearcase and brakecase are marked for assembly.

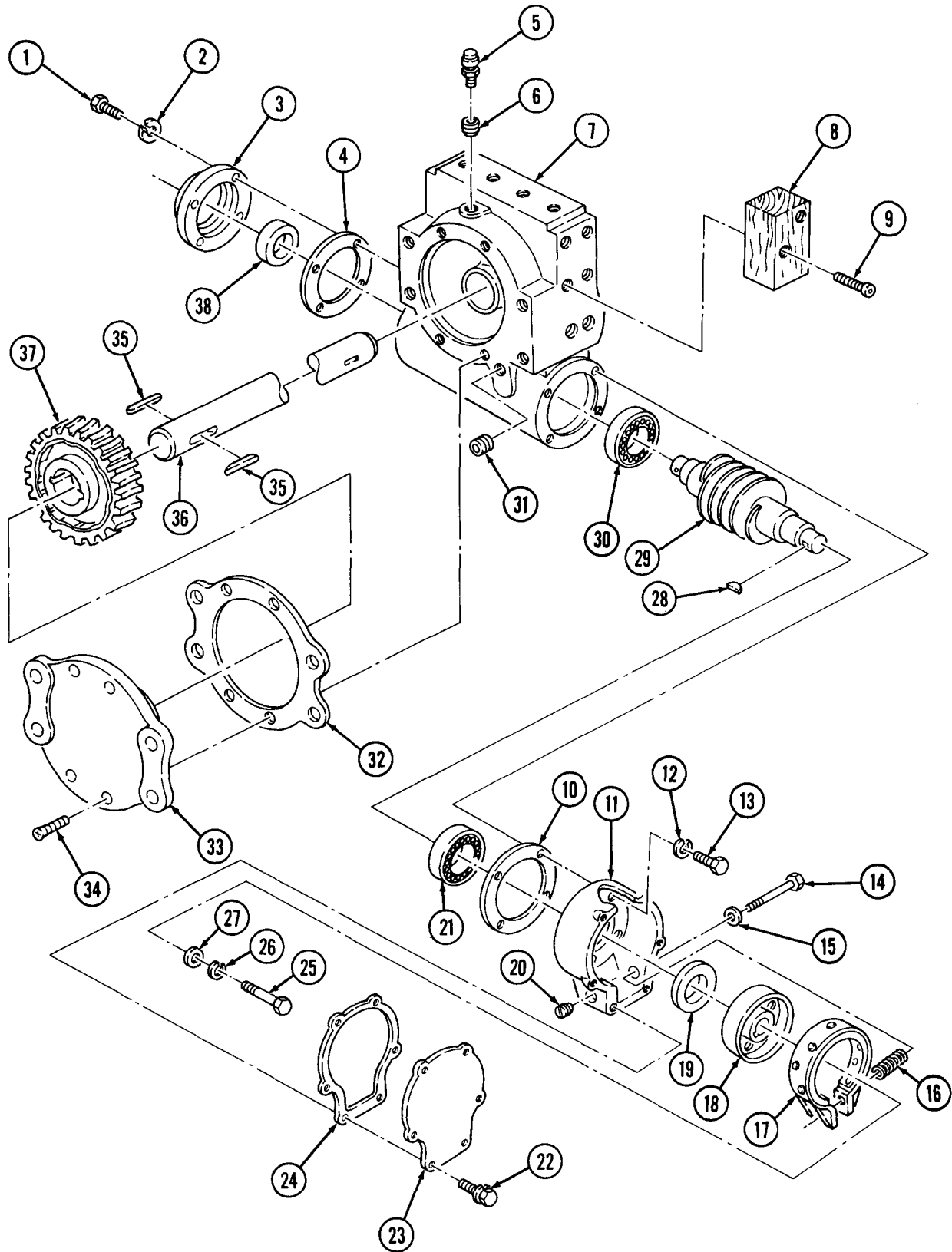
7. Remove four screws (13), lockwashers (12), brakecase (11), and gasket (10) from gearcase (7). Discard lockwashers (12) and gasket (10).
8. Remove seal (19) and plug (20) from brakecase (11). Discard seal (19) and plug (20).
9. Remove gear (37) and drum shaft (36) from worm gear (29) and gearcase (7).
10. Remove gear (37) and two woodruff keys (35) from drum shaft (36). Discard woodruff keys (35).

CAUTION

Excessive tapping may damage worm gear.

11. Tap worm gear (29) and bearing (30) from gearcase (7).
12. Remove bearing (30) from worm gear (29).
13. Remove bearing (21) from gearcase (7).
14. Remove breather (5) and bushing (6) from gearcase (7).
15. Remove two screws (9) and block (8) from gearcase (7).
16. Remove two plugs (31) from gearcase (7).

16-3. REAR WINCH REPAIR (M756A2) (Contd)

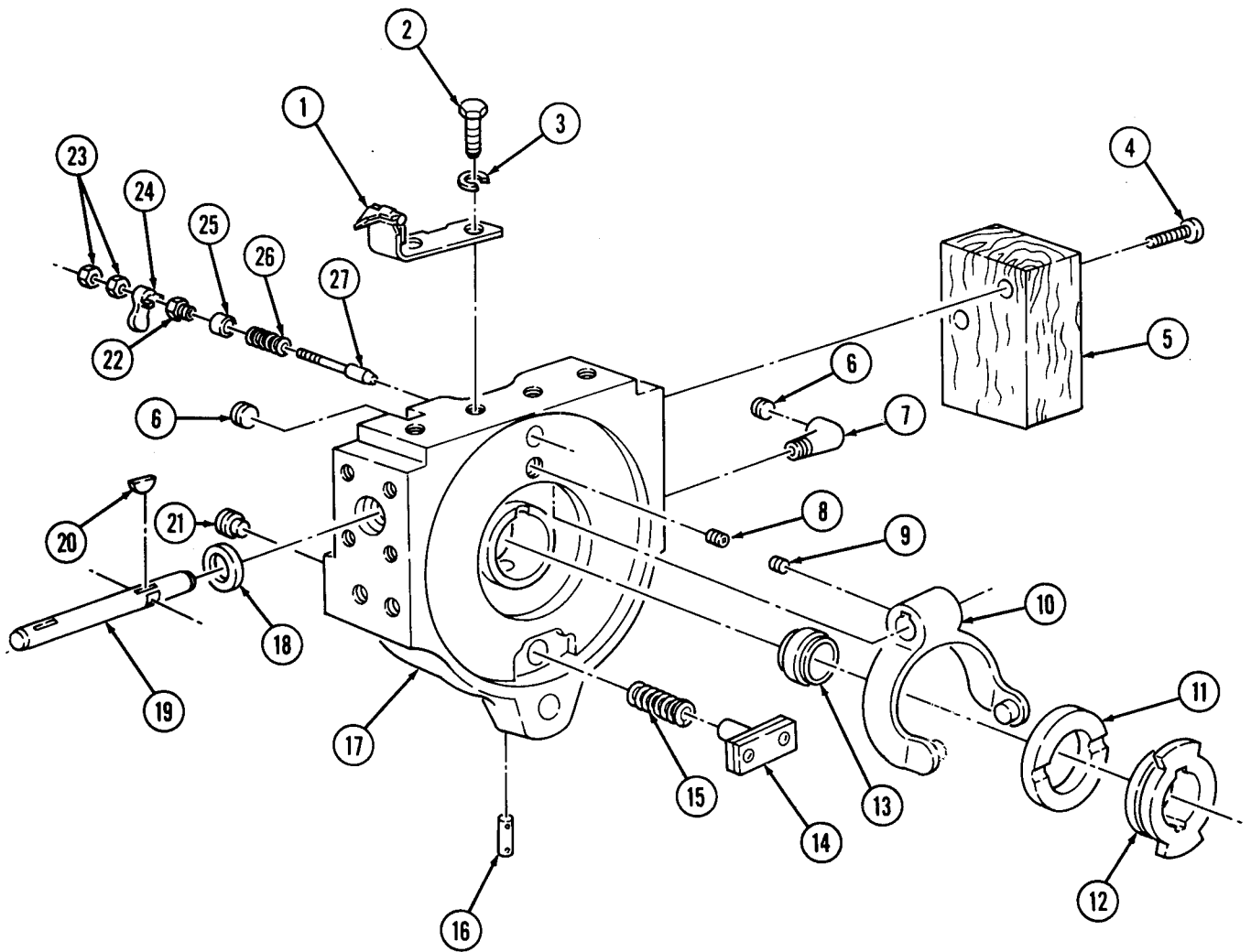


16-3. REAR WINCH REPAIR (M756A2) (Contd)

c. Rear Winch End Frame Disassembly

1. Remove drum sliding clutch (12), end frame thrust ring (11), and sleeve (13) from end frame (17).
2. Remove screw (21), drag brake (14), and spring (15) from end frame (17).
3. Remove three plugs (6) and plug (8) from end frame (17) and elbow (7).
4. Remove two screws (4) and block (5) from end frame (17).
5. Place poppet latch (24) in engaged position.
6. Remove two jamnuts (23), poppet latch (24), poppet nut (22), spacer (25), spring (26), and poppet (27) from end frame (17).
7. Remove two screws (2), lockwashers (3), and lock (1) from end frame (17). Discard lockwashers (3).
8. Remove setscrew (9) from shifter fork (10).
9. Remove shifter shaft (19) and woodruff key (20) from end frame (17). Discard woodruff key (20).
10. Remove shifter fork (10) from end frame (17).
11. Remove pin (16) from end frame (17). Discard pin (16).
12. Remove seal (18) from end frame (17). Discard seal (18).
13. Remove elbow (7) from end frame (17).

16-3. REAR WINCH REPAIR (M756A2) (Contd)



16-3. REAR WINCH (M756A2) REPAIR (Contd)

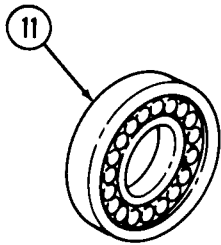
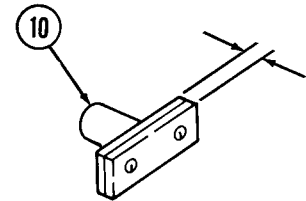
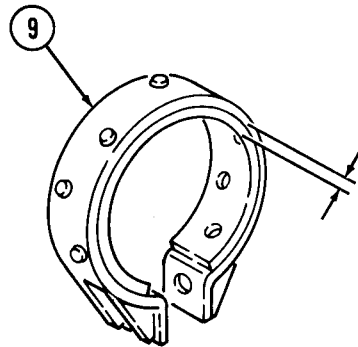
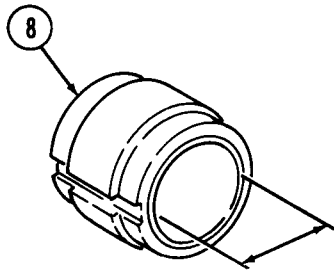
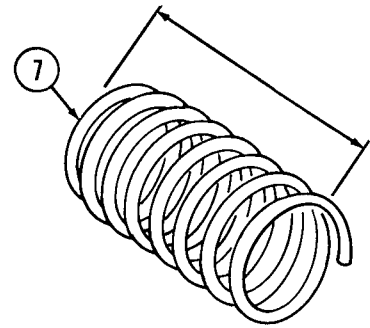
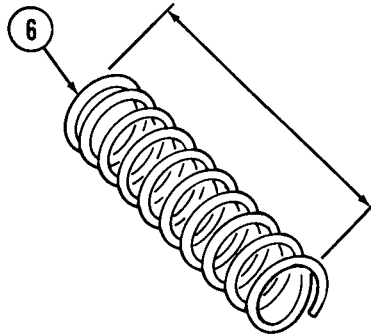
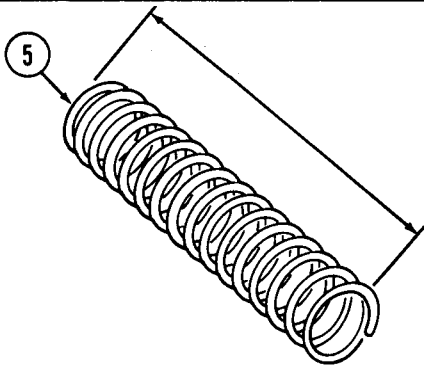
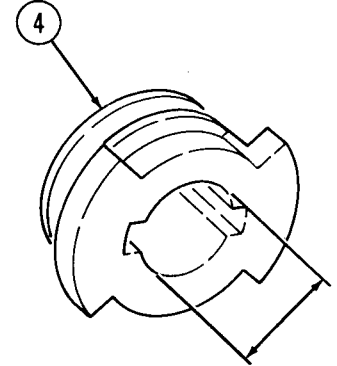
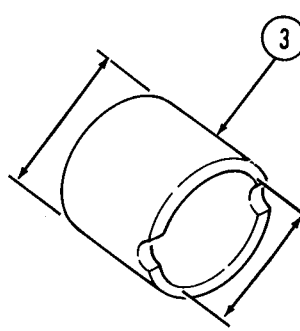
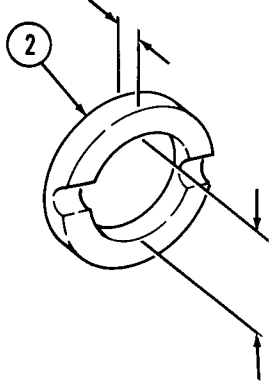
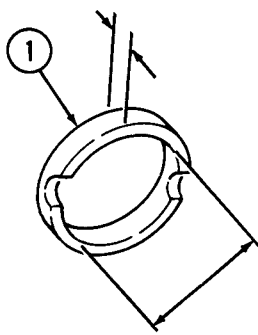
d. Cleaning and Inspection

1. For general cleaning instructions, refer to para. 2-8.
2. For general inspection instructions, refer to para. 2-9.
3. Inspect drum thrust ring (1) and end frame thrust ring (2) for wear. Refer to table 16-2, M756A2 Rear Winch Wear Limits, for measurements. Replace if worn past limit.
4. Inspect five drum shaft bushings (3) for wear. Refer to table 16-2, M756A2 Rear Winch Wear Limits, for measurements. Replace if worn past limit.
5. Inspect drum sliding clutch (4) for wear. Refer to table 16-2, M756A2 Rear Winch Wear Limits, for measurements. Replace if worn past limit.
6. Inspect poppet spring (5), drag brake spring (6), and automatic brake spring (7) for wear. Refer to table 16-2, M756A2 Rear Winch Wear Limits, for measurements. Replace if worn past limit.
7. Inspect end frame sleeve (8) for wear. Refer to table 16-2, M756A2 Rear Winch Wear Limits, for measurements. Replace if worn past limit.
8. Inspect brakeband (9) and drag brake (10) for wear. Refer to table 16-2, M756A2 Rear Winch Wear Limits, for measurements. Replace if worn past limit.
9. Inspect and clean bearing (11) (TM 9-214). Replace bearing if worn or damaged.

Table 16-2. M756A2 Rear Winch Wear Limits.

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		STANDARD	METRIC
1	Drum thrust ring		
	Inner diameter	2.13-2.14 in.	5.41-5.44 cm
	Thickness	0.48-0.49 in.	12.12-12.45 mm
2	End frame thrust ring		
	Inner diameter	2.13-2.14 in.	5.41-5.43 cm
	Thickness	0.49-0.51 in.	12.45-12.95 mm
3	Drum shaft bushings:		
	Steel, inner diameter	2.11-2.13 in.	5.36-5.41 cm
	Copper, inner diameter	2.13-2.131 in.	5.41-5.413 cm
4	Drum sliding clutch:		
	Inner diameter	2.133-2.135 in.	5.418-5.423 cm
	Key engagement slots	0.504-0.508 in.	12.802-12.903 mm
5	Poppet spring (free length)	1.91 in.	4.85 cm
6	Drag brake spring:		
	Free length	2 in.	5.08 cm
	Compressed to 1.0625 in. (2.699 cm)	52 lb-ft	70.51 N.m
7	Automatic brake spring:		
	Free length	1.5 in.	3.81 cm
	Compressed to 1 in. (2.54 cm)	48 lb-ft	65.09 N.m
8	End frame sleeve (inner diameter)	2.375-2.376 in.	6.033-6.035 cm
9	Brakeband (thickness)	0.1725-0.1875 in.	4.382-4.762 mm
10	Drag brake (thickness)	0.235-0.25 in.	5.969-6.35 mm

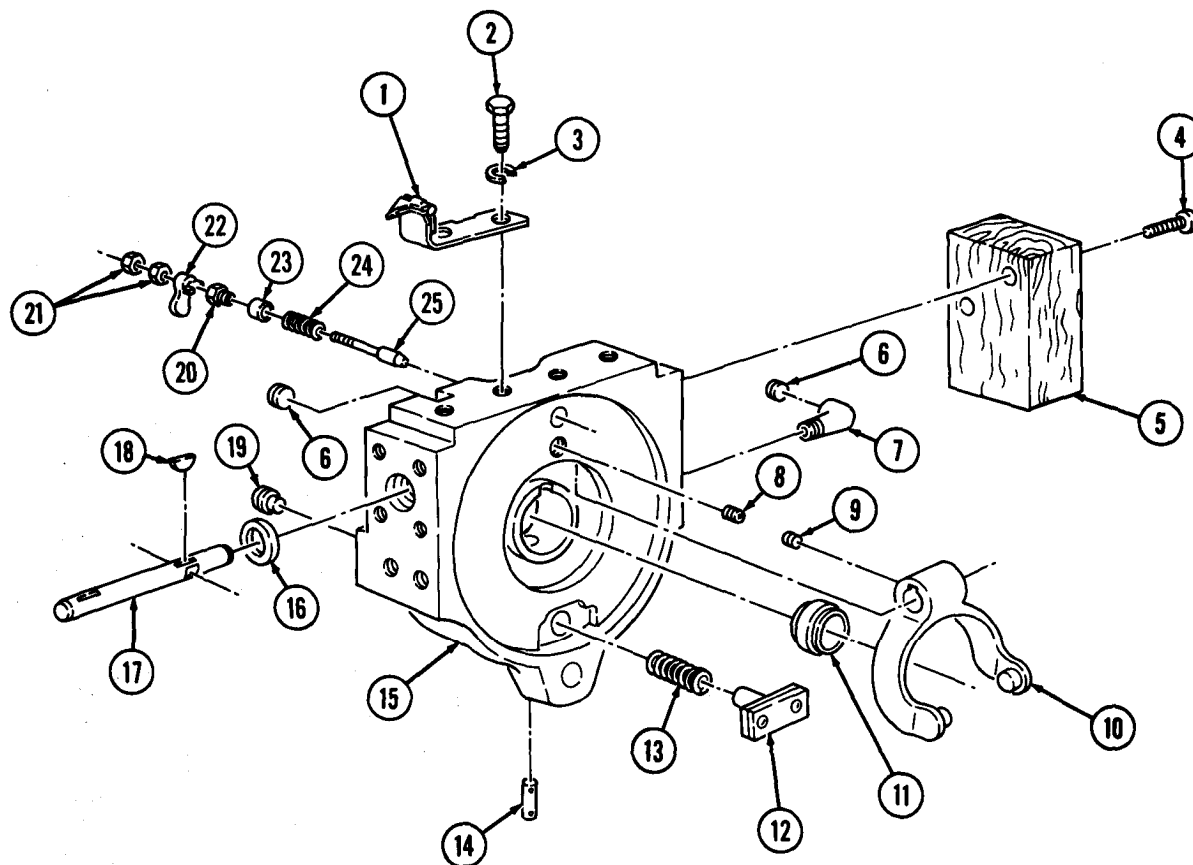
16-3. REAR WINCH REPAIR (M756A2) (Contd)



16-3. REAR WINCH REPAIR (M756A2) (Contd)

e. Rear Winch End Frame Assembly

1. Apply light coat of sealing compound to elbow (7) threads and install elbow (7) in end frame (15).
2. Apply light coat of sealing compound to outer diameter of new seal (16) and install seal (16) in end frame (15).
3. Position shifter fork (10) in end frame (15).
4. Position shifter shaft (17) through end frame (15), install new woodruff key (18) on shifter shaft (17), and install shifter shaft (17) in shifter fork (10).
5. Install setscrew (9) in shifter fork (10).
6. Install new pin (14) and sleeve (11) in end frame (15).
7. Install lock (1) on end frame (15) with two new lockwashers (3) and screws (2).
8. Install poppet (25), spring (24), and spacer (23) in end frame (15) with poppet nut (20).
9. Install poppet latch (22) in engaged position on poppet (25) with two jamnuts (21).
10. Install block (5) on end frame (15) with two screws (4).
11. Apply light coat of sealing compound to threads of three plugs (6) and plug (8) and install three plugs (6) and plug (8) on end frame (15) and elbow (7).
12. Install spring (13) and drag brake (12) in end frame (15) with screw (19).



16-3. REAR WINCH REPAIR (M756A2) (Contd)

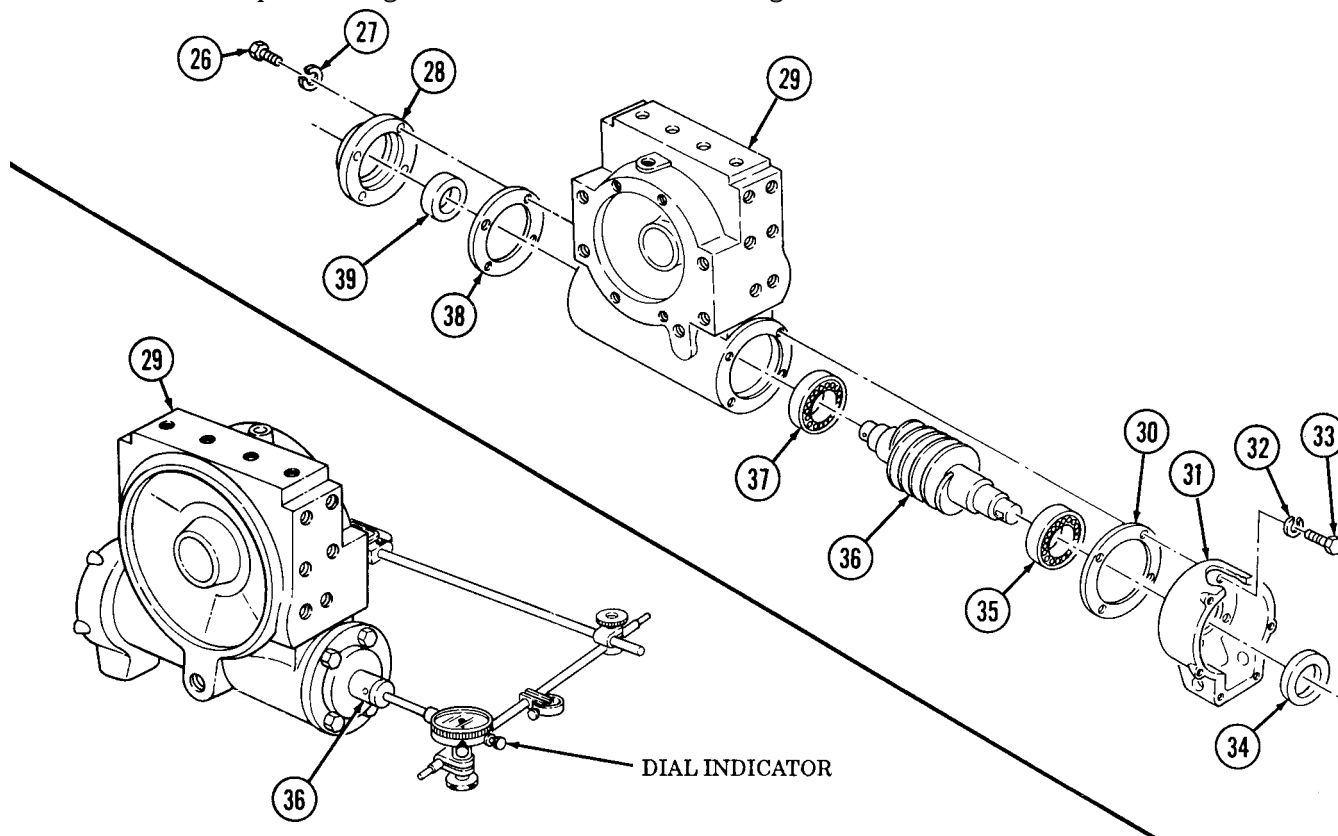
f. Rear Winch Gearcase Assembly

1. Install bearing (37) in gearcase (29).
2. Install bearing (35) on worm gear (36).
3. Install worm gear (36) and bearing (35) in gearcase (29).
4. Install new seal (34) in brakecase (31).
5. Install new gasket (30) and brakecase (31) on gearcase (29) with four new lockwashers (32) and screws (33).
6. Install new seal (39) in bearing cap (28).
7. Install new gasket (38) and bearing cap (28) on gearcase (29) with four new lockwashers (27) and screws (26).
8. Install dial indicator on gearcase (29) with plunger positioned on the end of worm gear (36).
9. Measure end play of worm gear (36) by moving worm gear (36) back and forth. End play should not be less than 0.005 in. (0.127 mm).
10. Remove dial indicator from gearcase (29).

NOTE

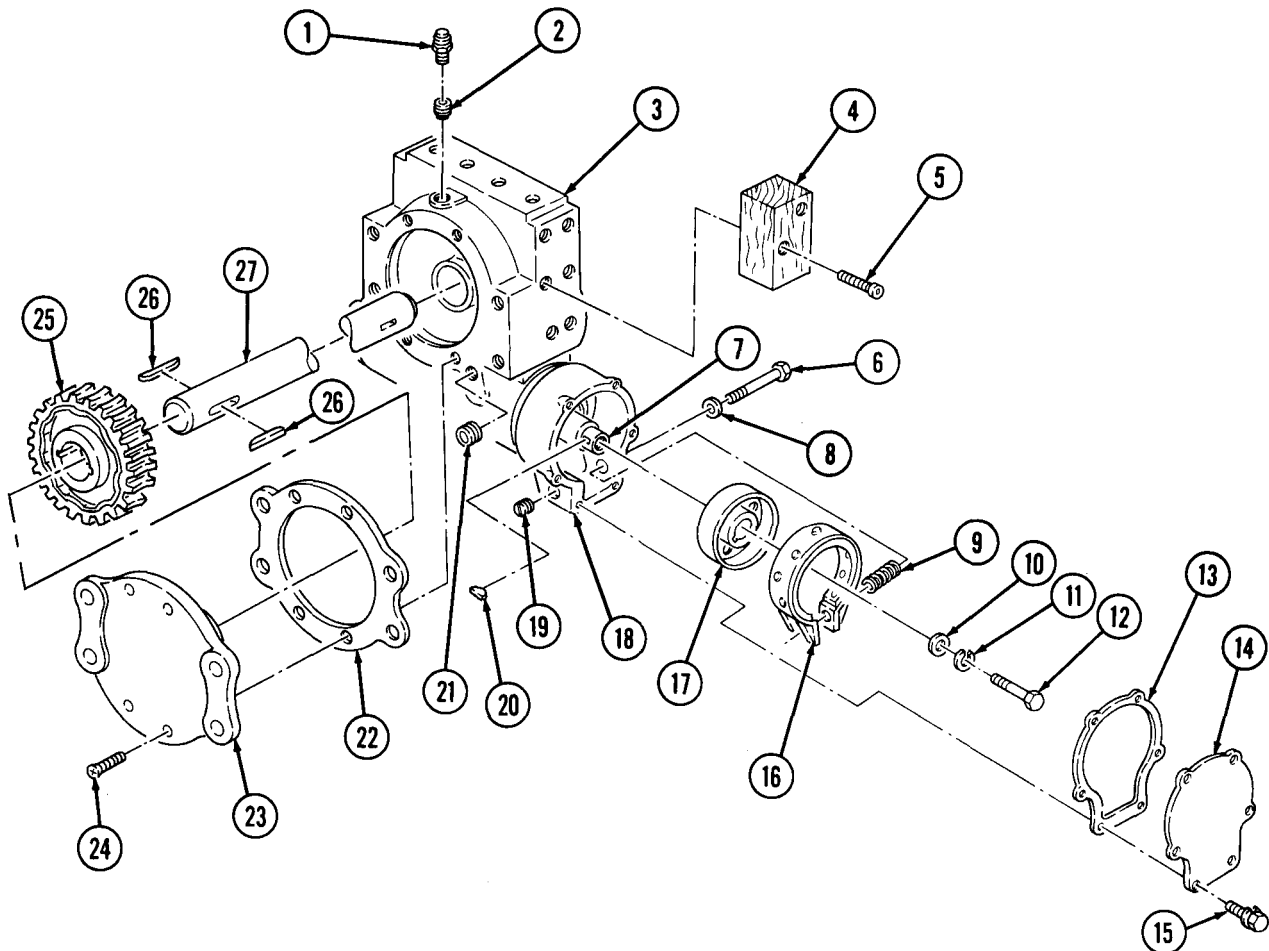
If end play is correct, go to step 13. If end play is incorrect, go to step 11.

11. Remove four screws (26), lockwashers (27), and bearing cap (28) from gearcase (29). Discard lockwashers (27).
12. Perform steps 7 through 10 to install additional new gasket (38).



16-3. REAR WINCH REPAIR (M756A2) (Contd)

13. Place new woodruff key (20) on worm gear (7) and install brakedrum (17) on worm gear (7) with washer (10), new lockwasher (11), and screw (12).
14. Install new plug (19) in brakecase (18).
15. Install brakeband (16) on brakedrum (17) and brakecase (18) with spring (9), washer (8), and adjusting screw (6).
16. Tighten adjusting screw (6) until spring (9) is compressed between 1.125-1.187 in. (2.86-3.02cm).
17. Install new gasket (13) and cover (14) on brakecase (18) with six new screw-assembled lockwashers (15).
18. Apply light coat of sealing compound to threads of bushing (2) and breather (1) and install bushing (2) and breather (1) on gearcase (3).
19. Position gear (25) in gearcase (3) and on worm gear (7).
20. Install two new woodruff keys (26) on drum shaft (27).
21. Install drum shaft (27) through gear (25) and gearcase (3).
22. Install new gasket (22) and cover (23) on gearcase (3) with four screws (24).
23. Apply light coat of sealing compound to threads of two plugs(21) and install two plugs (21) on gearcase (3).
24. Install block (4) on gearcase (3) with two screws (5).



16-3. REAR WINCH REPAIR (M756A2) (Contd)

g. Rear Winch Assembly

1. Apply thin coat of sealing compound to outer diameter of new seal (29) and install in drum (28).
2. Apply thin coat of sealing compound to outer diameter of new seal (40) and install in end frame (38).

WARNING

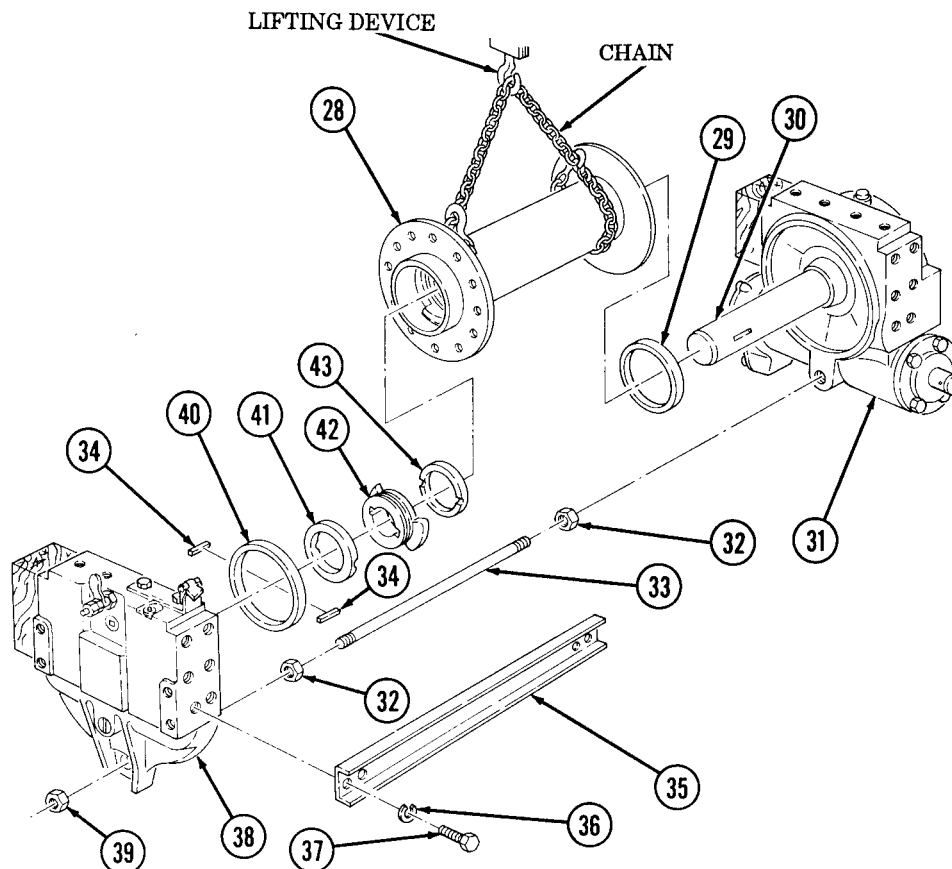
Support drum with overhead lifting device and chain. Failure to do so may result in injury to personnel or damage to equipment.

3. Install drum (28), drum thrust ring (43), two new woodruff keys (34), drum sliding clutch (42), and end frame thrust ring (41) on drum shaft (30).
4. Install two jamnuts (32) on rod (33) and install rod (33) on gearcase (31).

NOTE

Ensure shifter fork engages with sliding clutch when positioning end frame.

5. Position end frame (38) on rod (33) and drum shaft (30).
6. Install channel (35) on end frame (38) and gearcase (31) with four new lockwashers (36) and screws (37).
7. Install nut (39) on rod (33).
8. Tighten two jamnuts (32) to gearcase (31) and end frame (38).



FOLLOW-ON TASK: Install rear winch (M756A2) (TM 9-2320-361-20).

16-4. REAR WINCH REPAIR (M764)

THIS TASK COVERS:

- | | |
|---|---|
| <ul style="list-style-type: none"> a. Rear Winch Disassembly b. Worm Housing Disassembly c. Drum Disassembly d. Clutch Disassembly e. Carriage Disassembly f. Cleaning and Inspection | <ul style="list-style-type: none"> g. Carriage Assembly h. Clutch Assembly i. Drum Assembly J Worm Housing Assembly k. Rear Winch Assembly |
|---|---|

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Mechanical puller kit (Appendix B, Item 22)
- Riveting tool (Appendix B, Item 20)
- Outside micrometer (Appendix B, Item 17)
- Inside micrometer (Appendix B, Item 16)
- Dial indicator (Appendix B, Item 21)
- Lifting device

MATERIALS/PARTS

- Seventeen lockwashers (Appendix F, Item 138)
- Seventeen lockwashers (Appendix F, Item 127)
- Eleven lockwashers (Appendix F, Item 125)
- Four lockwashers (Appendix F, Item 139)
- Three lockwashers (Appendix F, Item 140)
- Lockwasher (Appendix F, Item 144)
- Five woodruff keys (Appendix F, Item 286)
- Two woodruff keys (Appendix F, Item 290)
- Two woodruff keys (Appendix F, Item 291)
- Woodruff key (Appendix F, Item 293)
- Woodruff key (Appendix F, Item 287)
- Woodruff key (Appendix F, Item 288)
- Woodruff key (Appendix F, Item 289)
- Four cotter pins (Appendix F, Item 10)
- Three cotter pins (Appendix F, Item 15)
- Two cotter pins (Appendix F, Item 13)
- Two cotter pins (Appendix F, Item 14)
- Two cotter pins (Appendix F, Item 16)
- Three gaskets (Appendix F, Item 72)
- Two gaskets (Appendix F, Item 70)
- Gasket (Appendix F, Item 71)
- Two pins (Appendix F, Item 197)

MATERIALS/PARTS (Contd)

- Five pins (Appendix F, Item 198)
- Pin (Appendix F, Item 199)
- Pin (Appendix F, Item 195)
- Pin (Appendix F, Item 196)
- Ten rivets (Appendix F, Item 209)
- Four rivets (Appendix F, Item 210)
- Rivet (Appendix F, Item 208)
- Nineteen locknuts (Appendix F, Item 106)
- Two locknuts (Appendix F, Item 99)
- Two clip rings (Appendix F, Item 2)
- Two packings (Appendix F, Item 178)
- Seal (Appendix F, Item 231)
- Seal (Appendix F, Item 239)
- Sealing compound (Appendix C, Item 19)
- Safety wire (Appendix C, Item 31)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

- TM 9-214
- TM 9-2320-361-20
- TM 9-2320-361-34P

EQUIPMENT CONDITION

- . Rear winch removed (M764) (para. 16-5).
- First reduction drivechain removed (M764) (TM 9-2320-361-20).
- Carriage cross chain removed (M764) (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

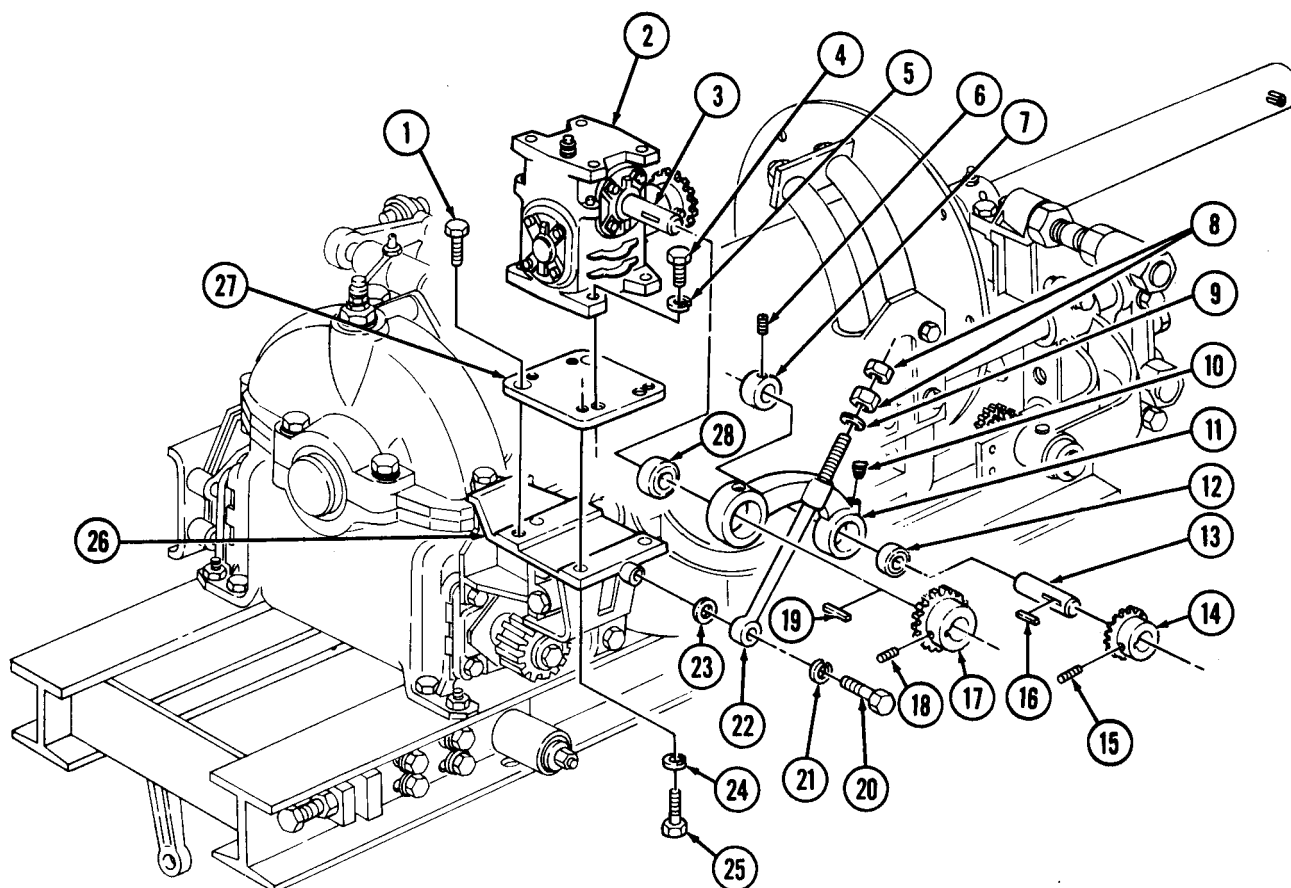
- All personnel must stand clear during lifting operations.
- . Wear eye protection when removing collar. Collar is under spring tension.

a. Rear Winch Disassembly

1. Remove screw (20), lockwasher (21), and washer (23) from rod (22) and bracket (26). Discard lockwasher (21).
2. Remove four screws (4), lockwashers (5), and speed reducer (2) from adapter (27). Discard lockwashers (5).

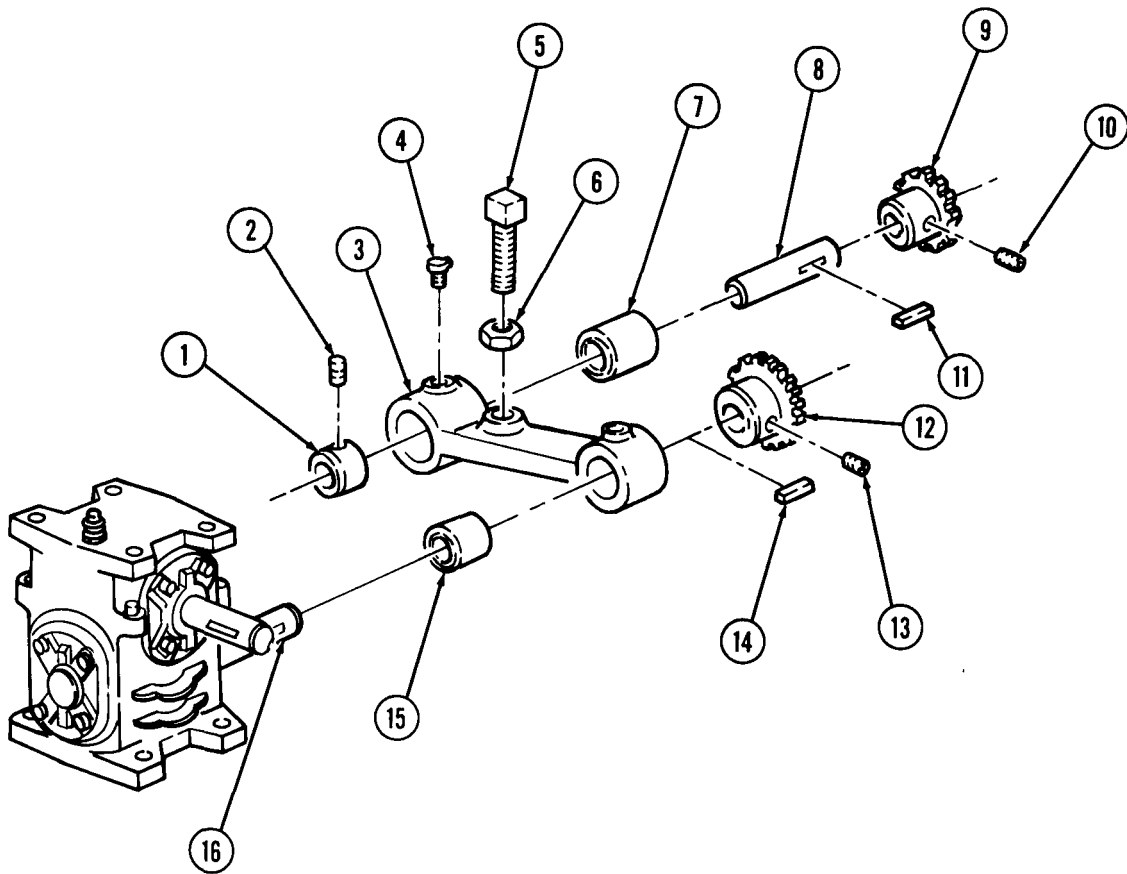
16-4. REAR WINCH REPAIR (M764) (Contd)

3. Remove two screws (1), screws (25), lockwashers (24), and adapter (27) from bracket (26). Discard lockwashers (24).
4. Remove setscrew (18) from sprocket (17).
5. Remove sprocket (17), woodruff key (19), and first idler bracket (11) from shaft (3). Discard woodruff key (19).
6. Remove bushing (28) from first idler bracket (11).
7. Remove setscrew (6) from collar (7).
8. Remove collar (7) from shaft (13).
9. Remove sprocket (14) and shaft (13) from first idler bracket (11).
10. Remove setscrew (15) from sprocket (14).
11. Remove sprocket (14) and woodruff key (16) from shaft (13). Discard woodruff key (16).
12. Remove bushing (12) from first idler bracket (11).
13. Remove two oil cups (10) from first idler bracket (11).
14. Remove two nuts (8), washer (9), and rod (22) from first idler bracket (11).



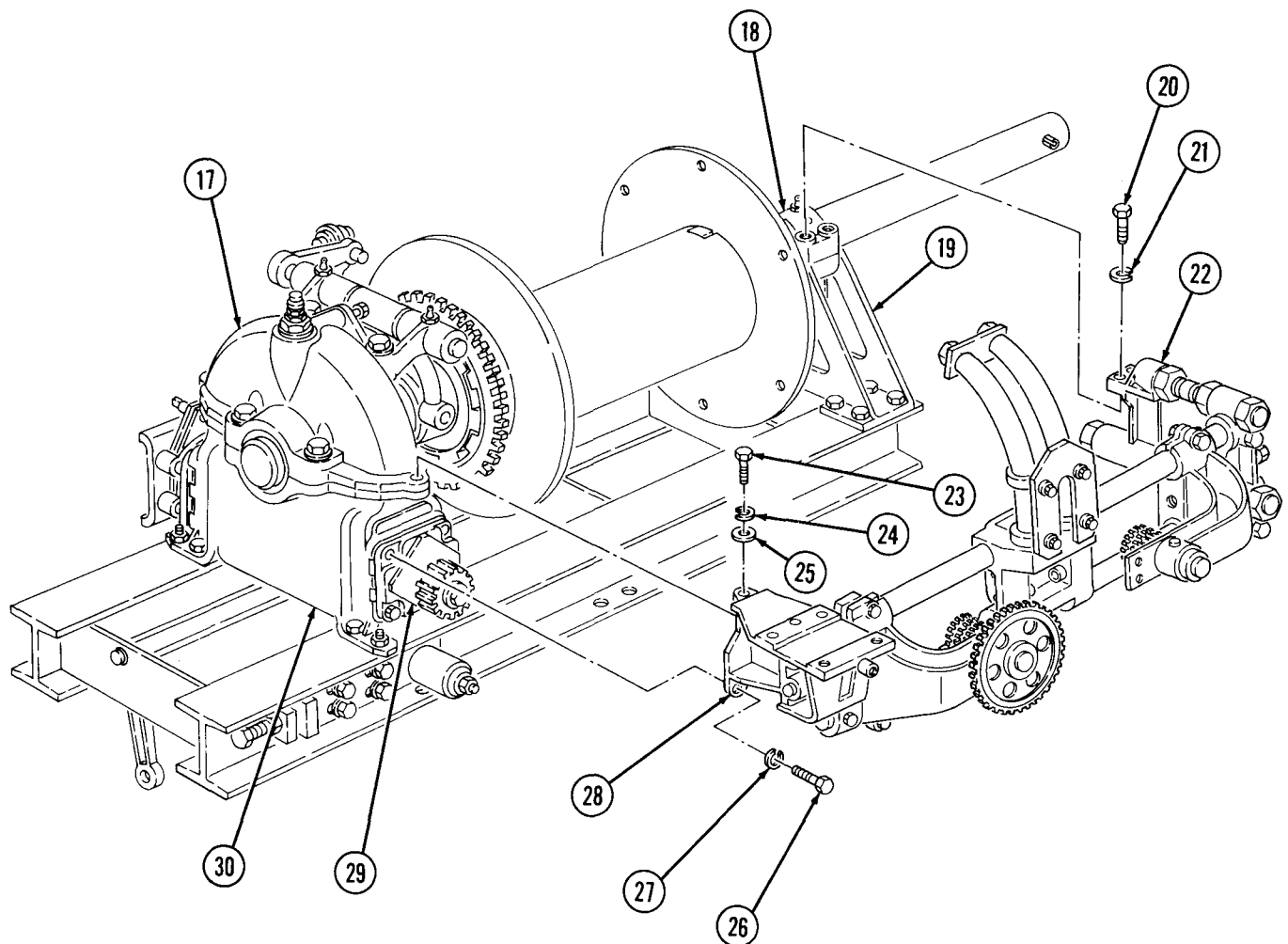
16-4. REAR WINCH REPAIR (M764) (Contd)

15. Remove setscrew (13) from sprocket (12).
16. Remove sprocket (12), woodruff key (14), and second idler bracket (3) from shaft (16). Discard woodruff key (14).
17. Remove bushing (15) from second idler bracket (3).
18. Remove setscrew (2) from collar (1).
19. Remove collar (1) and shaft (8) from second idler bracket (3).
20. Remove setscrew (10) from sprocket (9).
21. Remove sprocket (9) and woodruff key (11) from shaft (8). Discard woodruff key (11).
22. Remove bushing (7) from second idler bracket (3).
23. Remove two oil cups (4) from second idler bracket (3).
24. Remove screw (5) and nut (6) from second idler bracket (3).
25. Remove nut (6) from screw (5).



16-4. REAR WINCH REPAIR (M764) (Contd)

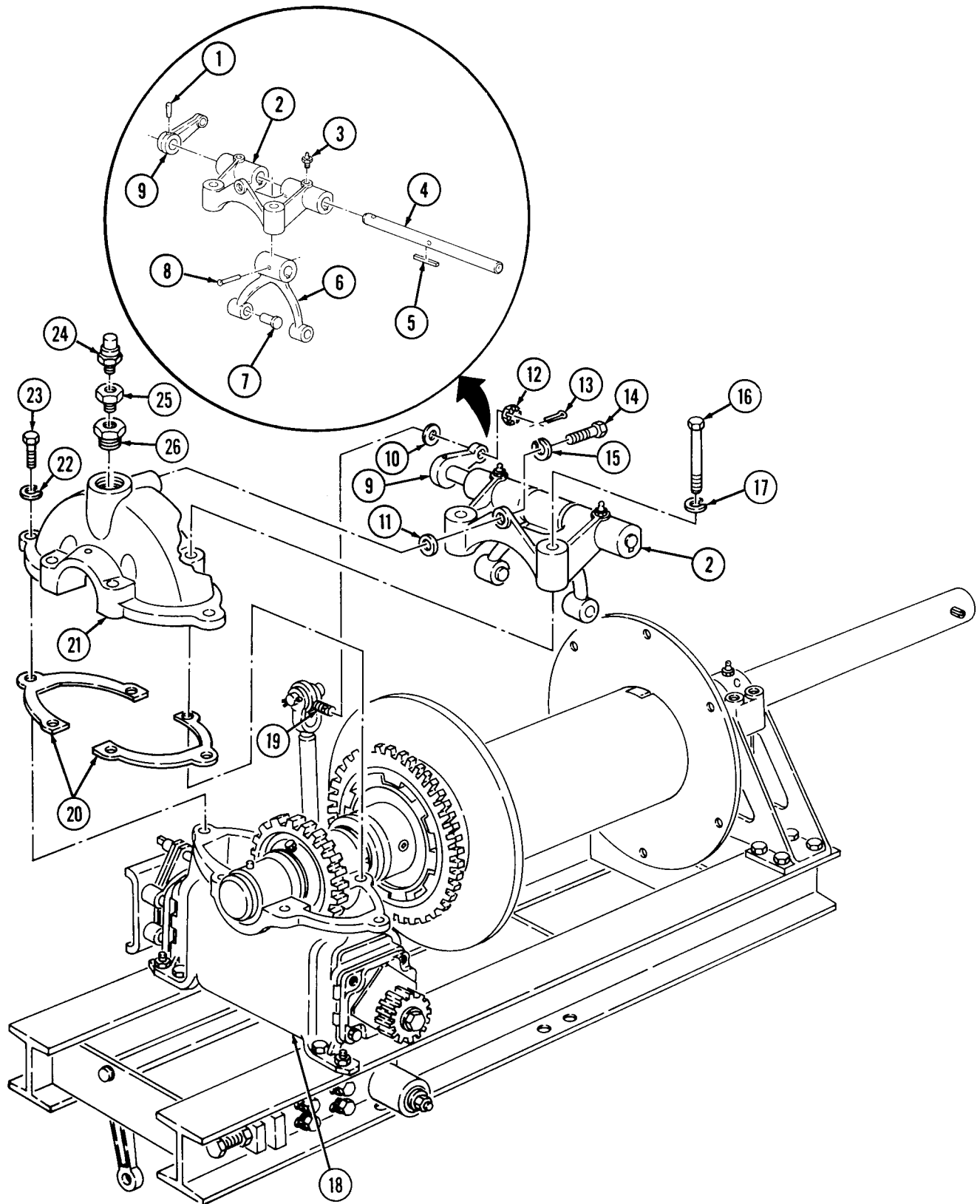
26. Remove two screws (20) and lockwashers (21) from tie rod bracket (22), drum support (19), and drum support cap (18). Discard lockwashers (21).
27. Remove two screws (26) and lockwashers (27) from speed reducer support (28), bearing cap (29), and worm gear housing (30). Discard lockwashers (27).
28. Remove screw (23), lockwasher (24), and washer (25) from speed reducer support (28), worm gear housing cap (17), and worm gear housing (30). Discard lockwasher (24).
29. Remove speed reducer support (28) and tie rod bracket (22) from worm gear housing cap (17) and drum support cap (18).



16-4. REAR WINCH REPAIR (M764) (Contd)

30. Remove cotter pin (13) and nut (12) from eyebolt (19). Discard cotter pin (13).
31. Remove eyebolt (19) and washer (10) from control lever (9).
32. Remove two screws (16) and lockwashers (17) from shifter fork bracket (2) and worm gear housing cap (21). Discard lockwashers (17).
33. Remove breather (24) and reducers (25) and (26) from worm gear housing cap (21).
34. Remove screw (14) and lockwasher (15) from shifter fork bracket (2) and worm gear housing cap (21). Discard lockwasher (15).
35. Remove shifter fork bracket (2) and washer (11) from worm gear housing cap (21).
36. Remove five screws (23), lockwashers (22), worm gear housing cap (21), and two gaskets (20) from worm gear housing (18). Discard lockwashers (22) and gaskets (20).
37. Remove pin (1) from control lever (9). Discard pin (1).
38. Remove control lever (9) from fork shaft (4).
39. Remove rivet (8) and two pins (7) from fork (6). Discard rivet (8).
40. Remove shifter fork bracket (2), fork (6), and woodruff key (5) from fork shaft (4). Discard woodruff key (5).
41. Remove two grease fittings (3) from shifter fork bracket (2).

16-4. REAR WINCH REPAIR (M764) (Contd)



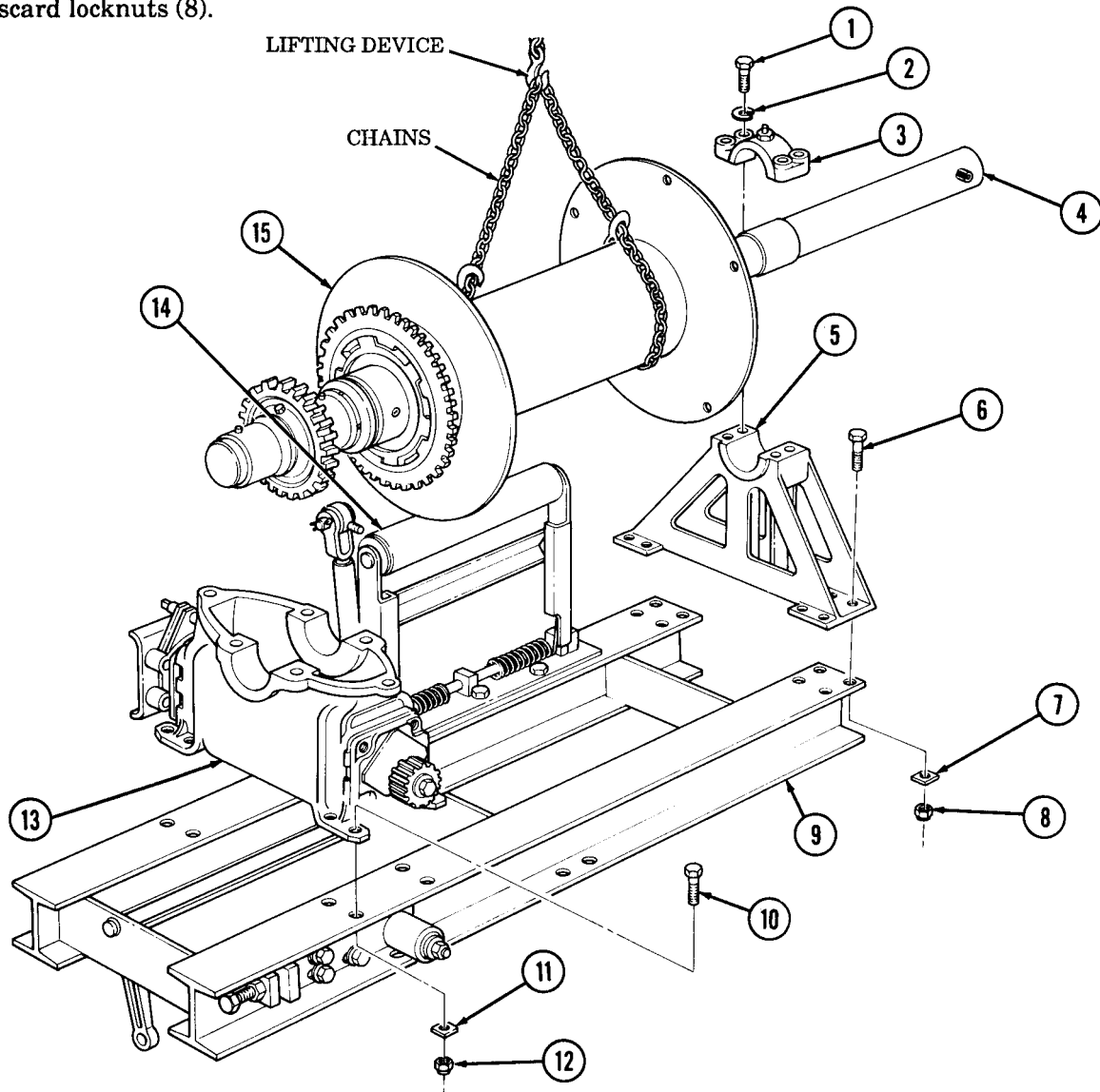
16-4. REAR WINCH REPAIR (M764) (Contd)

42. Remove four screws (1), lockwashers (2), and drum support cap (3) from drum support (5). Discard lockwashers (2).
43. Secure chain to winch drum (15) and lifting device.

WARNING

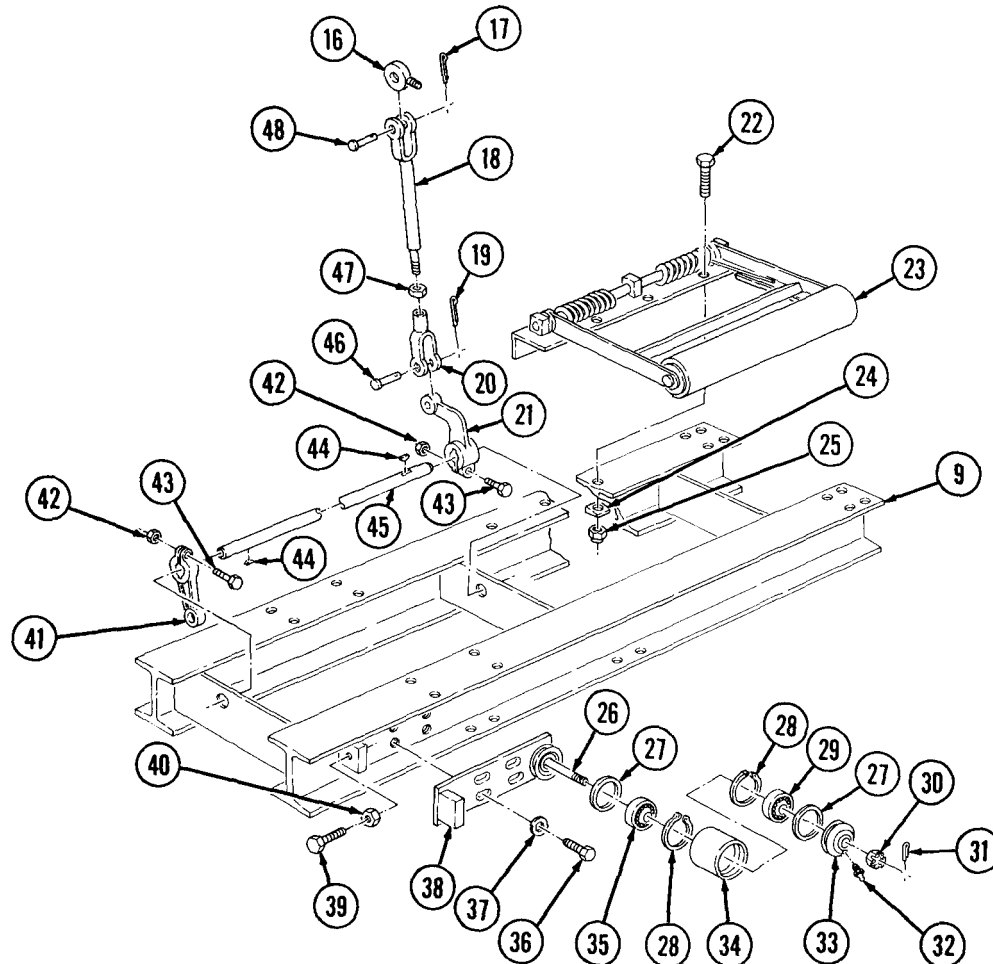
All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

44. Remove drum (15) and drum shaft (4) from worm gear housing (13) and drum support (5). Tension roller (14) will recoil.
45. Remove eight locknuts (12), bevel washers (11), screws (10), and worm gear housing (13) from frame (9). Discard locknuts (12).
46. Remove eight locknuts (8), bevel washers (7), screws (6), and drum support (5) from frame (9). Discard locknuts (8).



16-4. REAR WINCH REPAIR (M764) (Contd)

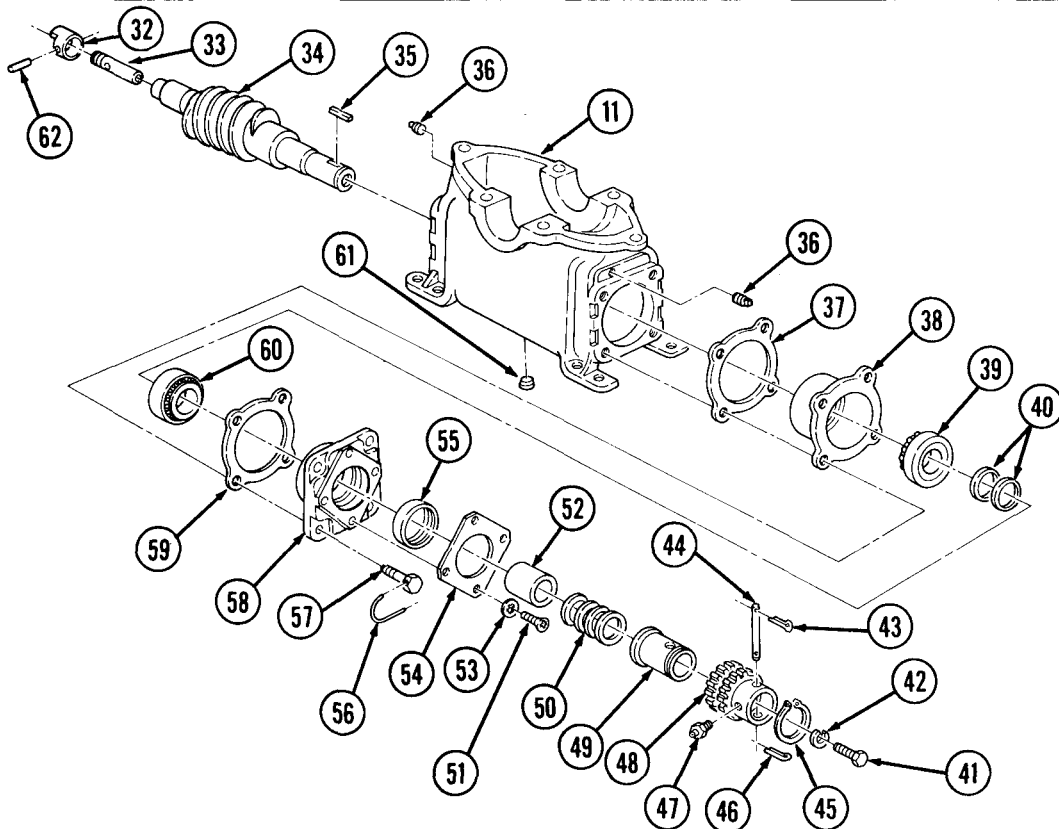
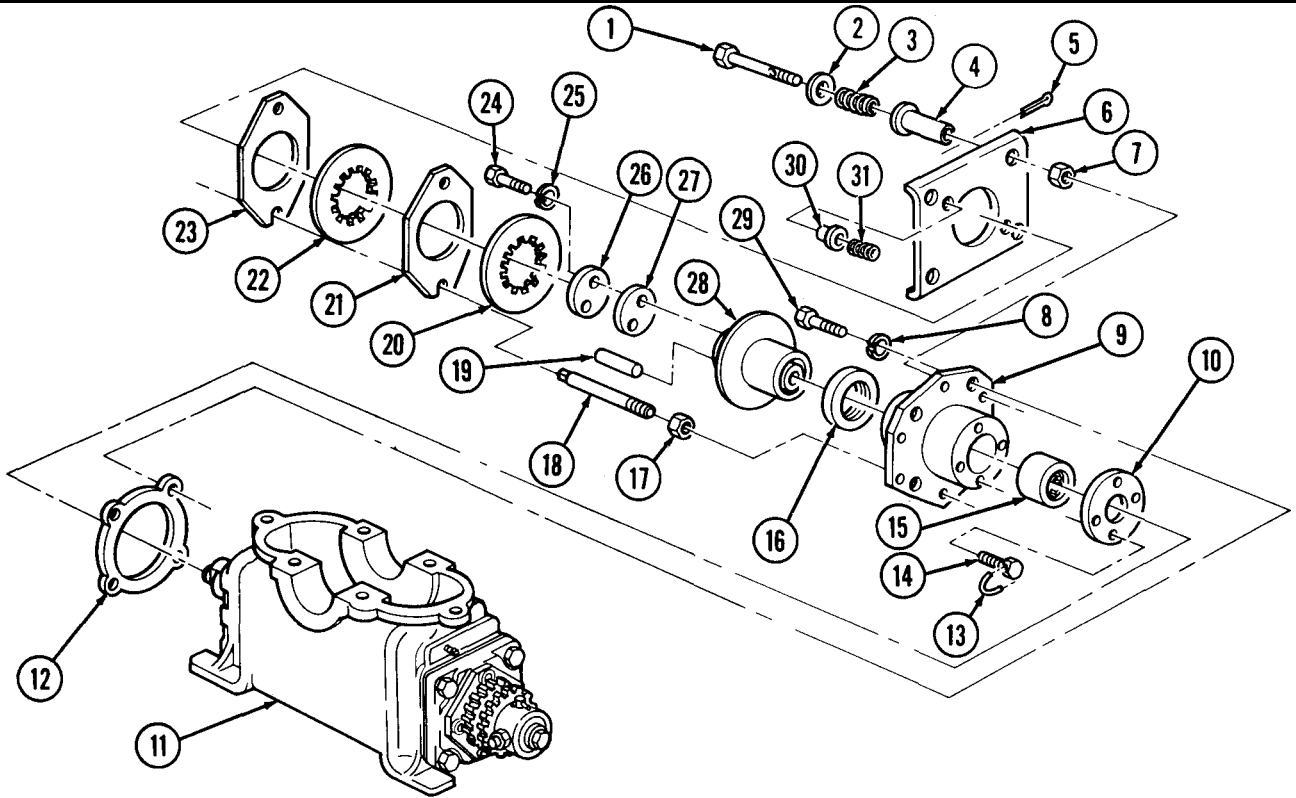
47. Remove three locknuts (25), bevel washers (24), screws (22), and tension roller (23) from frame (9). Discard locknuts (25).
48. Remove cotter pin (31), nut (30), retainer (33), bearing (29), two clip rings (28), bearing (35), and pulley (34) from shaft (26). Discard clip rings (28) and cotter pin (31).
49. Remove two packings (27) and grease fitting (32) from retainer (33) and shaft (26). Discard packings (27).
50. Remove four screws (36), washers (37), and idler bracket (38) from frame (9).
51. Remove adjusting screw (39) from frame (9).
52. Remove jamnut (40) from adjusting screw (39).
53. Remove cotter pin (17), clevis pin (48), and eyebolt (16) from control rod (18). Discard cotter pin (17).
54. Remove cotter pin (19), clevis pin (46), and control rod (18) from lever (21). Discard cotter pin (19).
55. Remove two locknuts (42) and screws (43) from levers (41) and (21). Discard locknuts (42).
56. Slide levers (21) and (41) to center of shaft (45) and remove two woodruff keys (44) from shaft (45). Discard woodruff keys (44).
57. Scribe position of jamnut (47) on control rod (18).
58. Remove clevis (20) and jamnut (47) from control rod (18).
59. Remove shaft (45) and levers (41) and (2) from frame (9).



16-4. REAR WINCH REPAIR (M764) (Contd)**b. Worm Housing Disassembly**

1. Remove two screws (24), lockwashers (25), washer (26), gasket (27), and pin (19) from worm brake (28). Discard gasket (27) and lockwashers (25).
2. Loosen four nuts (7) from four adjusting screws (1).
3. Remove four adjusting screws (1), plate (6), two thimbles (30), and springs (31) from cage housing (9).
4. Remove four cotter pins (5), nuts (7), plate (6), four thimbles (4), springs (3), and washers (2) from four adjusting screws (1). Discard cotter pins (5).
5. Remove brake plate (23), brake lining (22), brake plate (21), brake lining (20), and **worm brake (28)** from two studs (18) and cage housing (9).
6. Loosen two nuts (17) and remove two studs (18) from cage housing (9).
7. Remove four screws (29), lockwashers (8), cage housing (9), and gasket (12) from worm housing (11). Discard lockwashers (8) and gasket (12).
8. Remove safety wire (13) from four screws (14). Discard safety wire (13).
9. Remove four screws (14), plate (10), bearing (15), and seal (16) from cage housing (9). Discard seal (16).
10. Remove cotter pins (43) and (46) and pin (44) from sprocket (48). Discard cotter pins (43) and (46).
11. Remove retaining ring (45) and sprocket (48) from sleeve (49).
12. Remove screw (41), lockwasher (42), sleeve (49), woodruff key (35), shim set (50), and spacer (52) from worm gear (34). Discard lockwasher (42) and woodruff key (35).
13. Remove safety wire (56) from two screws (57). Discard safety wire (56).
14. Remove two screws (57), retainer (58), gasket (59), sleeve (38), and gasket (37) from worm housing (11). Discard gaskets (59) and (37).
15. Remove four screws (51), lockwashers (53), plate (54), and seal (55) from retainer (58). Discard lockwashers (53) and seal (55).
16. Remove worm gear (34) from worm housing (11).
17. Remove pin (62), brake stop (32), and stud (33) from worm gear (34). Discard pin (62).
18. Remove bearing (39), shims (40), and bearing (60) from retainer (38).
19. Remove grease fitting (47) from sprocket (48).
20. Remove plug (61) and two plugs (36) from worm housing (11).

16-4. REAR WINCH REPAIR (M764) (Contd)



16-4. REAR WINCH REPAIR (M764) (Contd)

c. Drum Disassembly

1. Remove pin (8) from drum shaft (7). Discard pin (8).
2. Remove pin (4) from bushing (5). Discard pin (4).
3. Remove bushing (5) from drum shaft (7).
4. Remove pin (3) from collar (6) and drum shaft (7). Discard pin (3).
5. Remove collar (6) and drum (2) from drum shaft (7).

WARNING

Wear eye protection when removing collar. Collar is installed under spring tension. Collar may spring out when pin is removed. Failure to wear eye protection may result in injury to personnel.

6. Remove pin (1) from collar (22) and drum shaft (7). Discard pin (1).
7. Remove collar (22) and spring (9) from drum shaft (7).
8. Remove pin (19) from bushing (18). Discard pin (19).
9. Remove bushing (18) and washer (17) from drum shaft (7).
10. Remove safety wire (21) from two screws (20). Discard safety wire (21).
11. Remove two screws (20) from gear (15).
12. Remove gear (15), two woodruff keys (16), and washer (14) from drum shaft (7). Discard woodruff keys (16).
13. Remove pin (12) from bushing (13). Discard pin (12).
14. Remove bushing (13) from drum shaft (7).
15. Remove screw (35) and lockwasher (36) from clutch plate (10). Discard lockwasher (36).
16. Remove screw (33) and lockwasher (34) from clutch plate (10). Discard lockwasher (34).
17. Move sleeve (24) to align with two balls (28) and remove two balls (28) from clutch plate (10).

NOTE

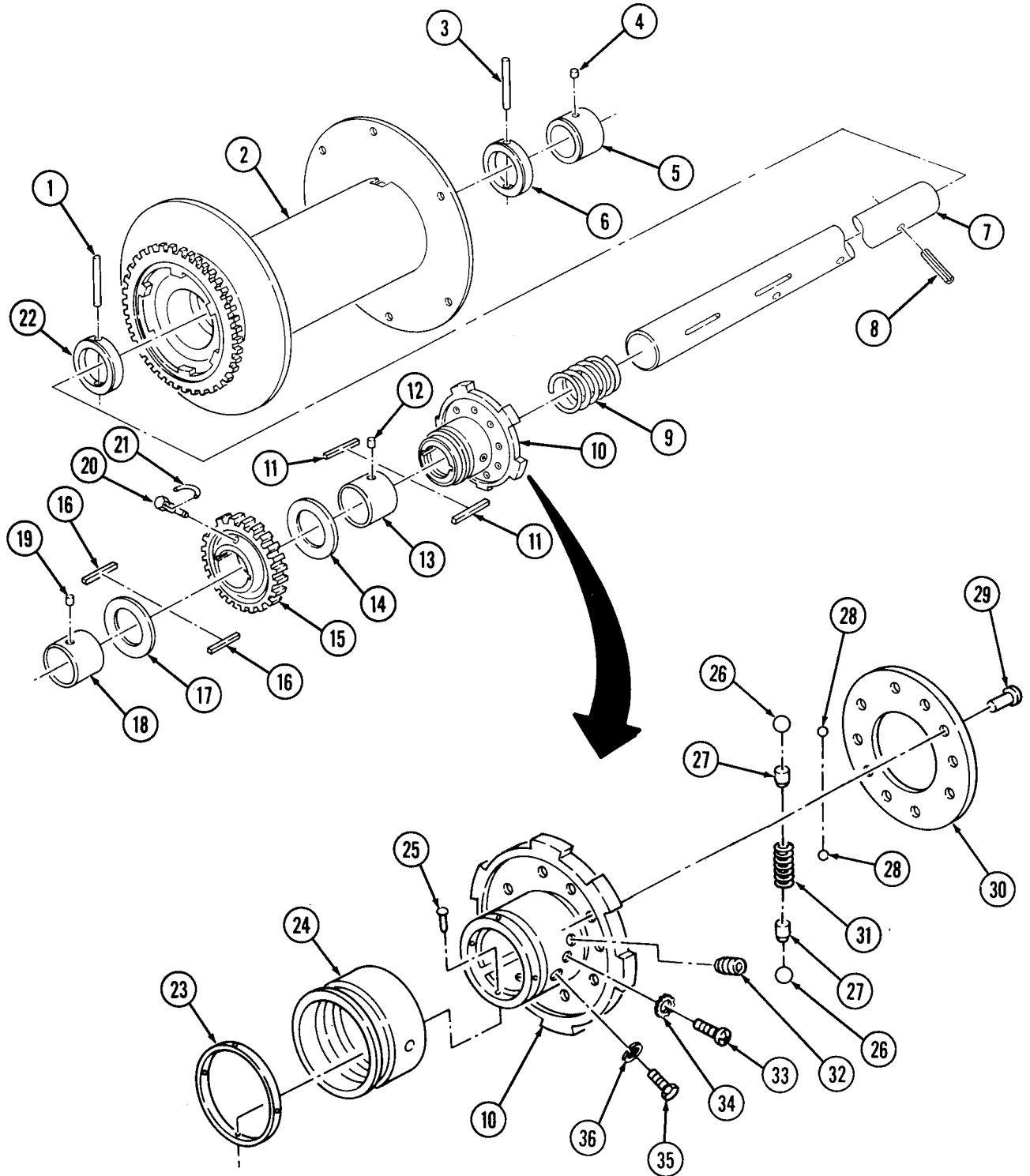
Balls and detents may spring out when plug is removed.

18. Remove plug (32) from clutch plate (10).
19. Align sleeve (24) with two balls (26) and remove two balls (26), detents (27), and spring (31) from drum shaft (7) and sleeve (24).
20. Remove clutch plate (10) and two woodruff keys (11) from drum shaft (7). Discard woodruff keys (11).

d. Clutch Disassembly

1. Remove four rivets (25) from ring (23) and clutch plate (10). Discard rivets (25).
2. Remove ring (23) and sleeve (24) from clutch plate (10).
3. Remove ten rivets (29) and clutch lining (30) from clutch plate (10). Discard rivets (29).

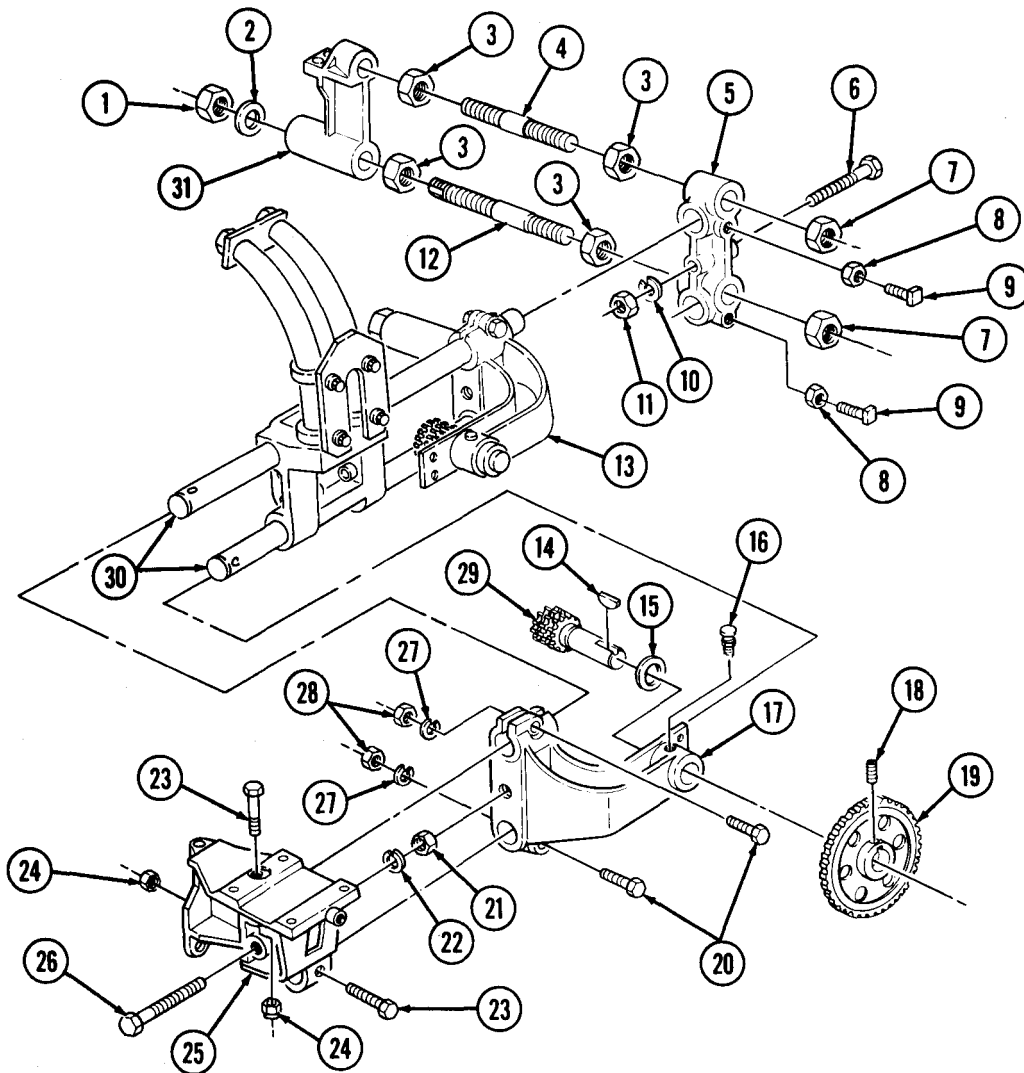
1-4. REAR WINCH REPAIR (M764) (Contd)



16-4. REAR WINCH REPAIR (M764) (Contd)

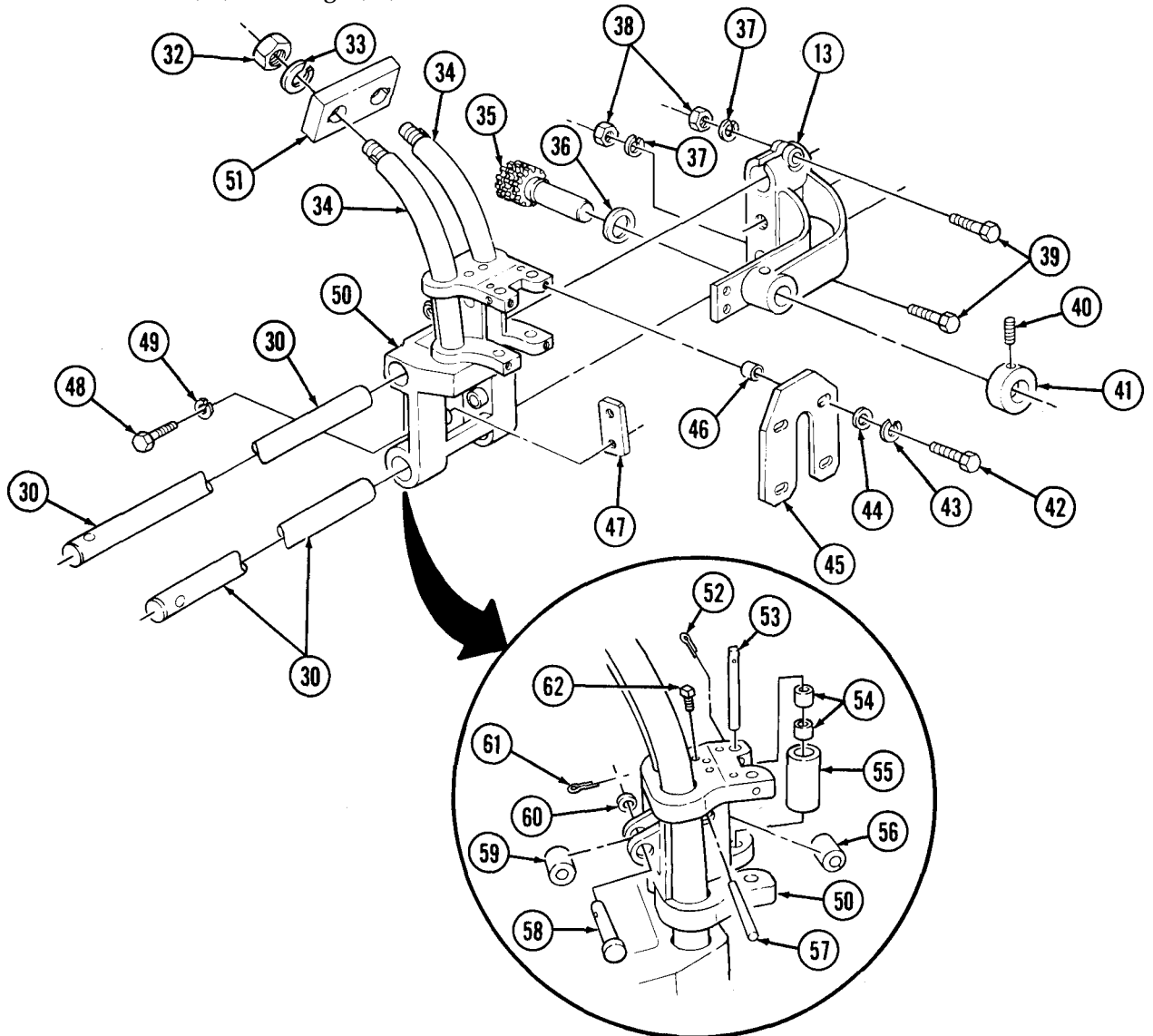
e. Carriage Disassembly

1. Loosen screw (26) on support (25).
2. Loosen two nuts (24) and remove two setscrews (23), nuts (24), and support (25) from two rods (30).
3. Remove nut (21), lockwasher (27), and screw (26) from support (25). Discard lockwasher (22).
4. Remove two nuts (28), lockwashers (27), screws (20), and bracket (17) from two rods (30). Discard lockwashers (27).
5. Remove setscrew (18), sprocket (19), woodruff key (14), sprocket (29), and washer (15) from bracket (17). Discard woodruff key (14).
6. Loosen screw (6) on bracket (5).
7. Loosen two nuts (8) and remove two screws (9) and bracket (5) from two rods (30).
8. Remove two nuts (7) and bracket (5) from studs (4) and (12).
9. Remove nut (1) and washer (2) from stud (12).
10. Remove studs (4) and (12) from bracket (31) and remove four nuts (3) from studs (4) and (12).
11. Remove nut (11), lockwasher (10), and screw (6) from bracket (5). Discard lockwasher (10).
12. Remove two oil caps (16) from brackets (17) and (13).



16-4. REAR WINCH REPAIR (M764) (Contd)

13. Remove two nuts (32), lockwashers (33), and plate (51) from two carriage horns (34). Discard lockwashers (33).
14. Remove four screws (42), lockwashers (43), washers (44), spacers (46), and guard (45) from cage (50). Discard lockwashers (43).
15. Remove setscrew (62), pin (57), and roller (56) from cage (50).
16. Remove cotter pin (61), washer (60), pin (58), and roller (59) from cage (50). Discard cotter pin (61).
17. Remove two cotter pins (52), shafts (53), and rollers (55) from cage (50). Discard cotter pins (61).
18. Remove four bearing sleeves (54) from two rollers (55).
19. Remove two nuts (38), lockwashers (37), screws (39), and bracket (13) from two rods (30). Discard lockwashers (37).
20. Remove setscrew (40), collar (41), sprocket (35), and washer (36) from bracket (13).
21. Remove four screws (48), lockwashers (49), and two wear guides (47) from cage (50). Discard lockwasher (49).
22. Remove two rods (30) from cage (50).



16-4. REAR WINCH REPAIR (M764) (Contd)

f. Cleaning and Inspectim

1. For general cleaning instructions, refer to para. 2-8.
2. For general inspection instructions, refer to para. 2-9.
3. Inspect two reduction bearing sleeves (1), second reduction bearing sleeve (2), and first reduction bearing sleeve (3) for wear. Refer to table 16-3, M764 Rear Winch Wear Limits, for measurements. Replace if worn past limits.
4. Inspect two drum bushings (4), drum shaft bushing (5), two thrust collars (6), and worm gear housing cap bushings (7) for wear. Refer to table 16-3, M764 Rear Winch Wear Limits, for measurements. Replace if worn past limits.
5. Inspect two horn sprocket bearing sleeves (8), horn roller bearing sleeves (9), and horn roller bearing sleeves (10) for wear. Refer to table 16-3, M764 Rear Winch Wear Limits, for measurements. Replace if worn past limits.
6. Inspect four thimble springs (11), thimble spring (12), detent spring (13), and clutch spring (14) for wear. Refer to table 16-3, M764 Rear Winch Wear Limits, for measurements. Replace if worn past limits.
7. Inspect two brake linings (15) and clutch lining (16) for wear. Refer to table 16-3, M764 Rear Winch Wear Limits, for measurements. Replace if worn past limits.
8. Inspect bearing (17) (TM 9-214). Replace bearing (17) if worn or damaged.

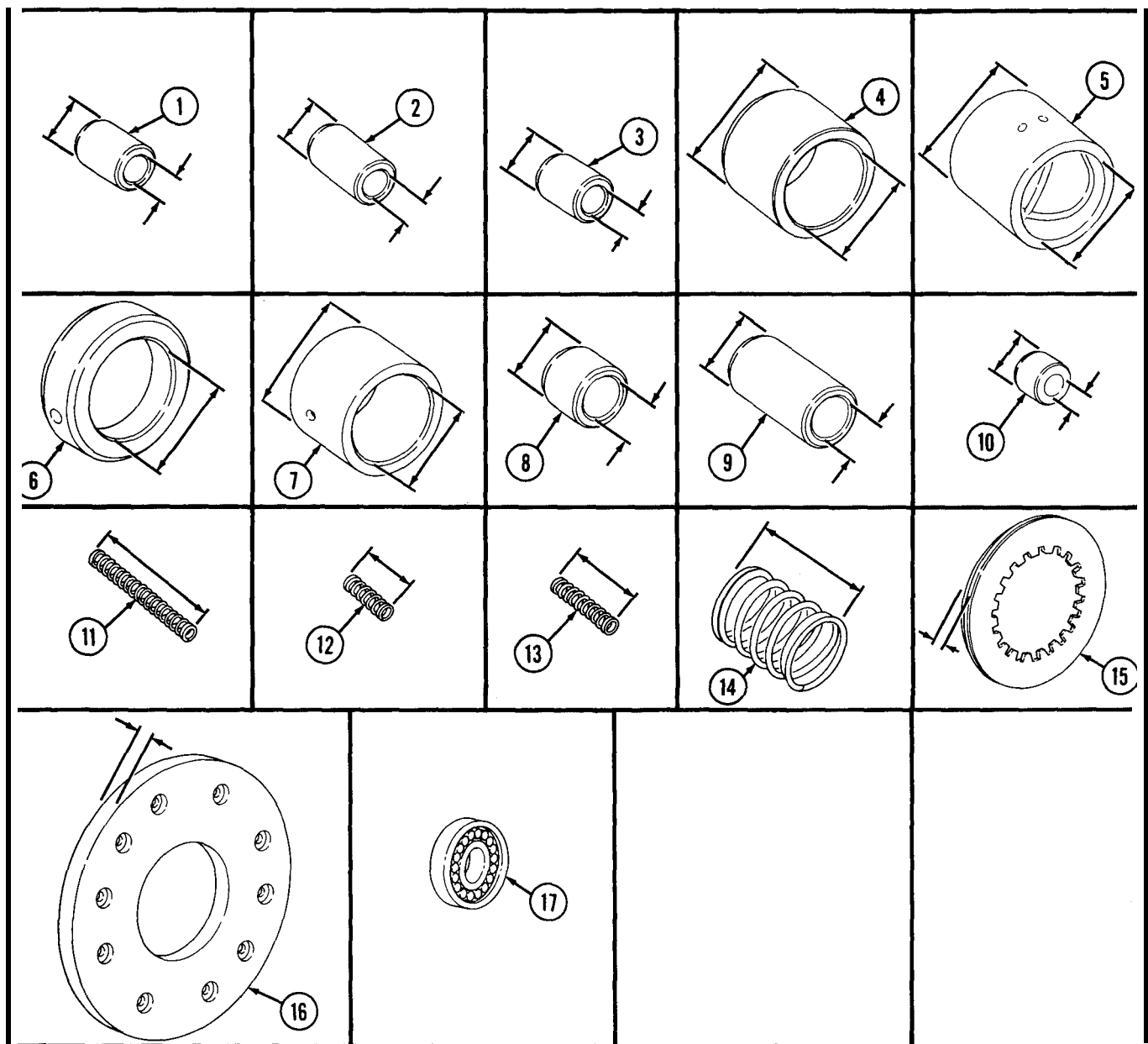
Table 16-3. M764 Rear Winch Wear Limits.

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		INCHES	MILLIMETERS
1	Reduction sleeves:		
	Inner diameter	0.875-0.876	22.22-22.25
2	Outer diameter	1.127-1.128	28.6-28.7
	Second reduction bearing sleeve:		
3	Inner diameter	1.00-1.001	25.4-25.42
	Outer diameter	1.127-1.128	28.6-28.65
4	First reduction bearing sleeve:		
	Inner diameter	0.752-0.753	19.10-19.13
5	Outer diameter	1.127-1.128	28.6-28.65
	Drum bushings:		
6	Inner diameter	2.446-2.448	62.13-62.18
	Outer diameter	3.001-3.002	76.23-76.25
7	Drum shaft bushing:		
	Inner diameter	2.446-2.448	62.13-62.18
8	Outer diameter	3.00-3.002	76.2-76.25
	Thrust collars (inside diameter)	2.439-2.442	61.95-62.02
9	Worm gear cap bushings:		
	Inner diameter	2.446-2.448	62.13-62.18
10	Outer diameter	3.00-3.002	76.2-76.25
	Horn sprocket bearing sleeves:		
11	Inner diameter	1.253-1.254	31.83-31.85
	Outer diameter	1.503-1.504	38.18-38.2
12	Horn roller bearing sleeves:		
	Inner diameter	0.501-0.502	12.73-12.75
13	Outer diameter	0.752-0.753	19.1-19.13
	Horn roller bearing sleeves:		
14	Inner diameter	0.51-0.53	12.95-13.46
	Outer diameter	1.0	25.4

16-4. REAR WINCH REPAIR (M764) (Contd)

Table 16-3. M764 Rear Winch Wear Limits (Contd).

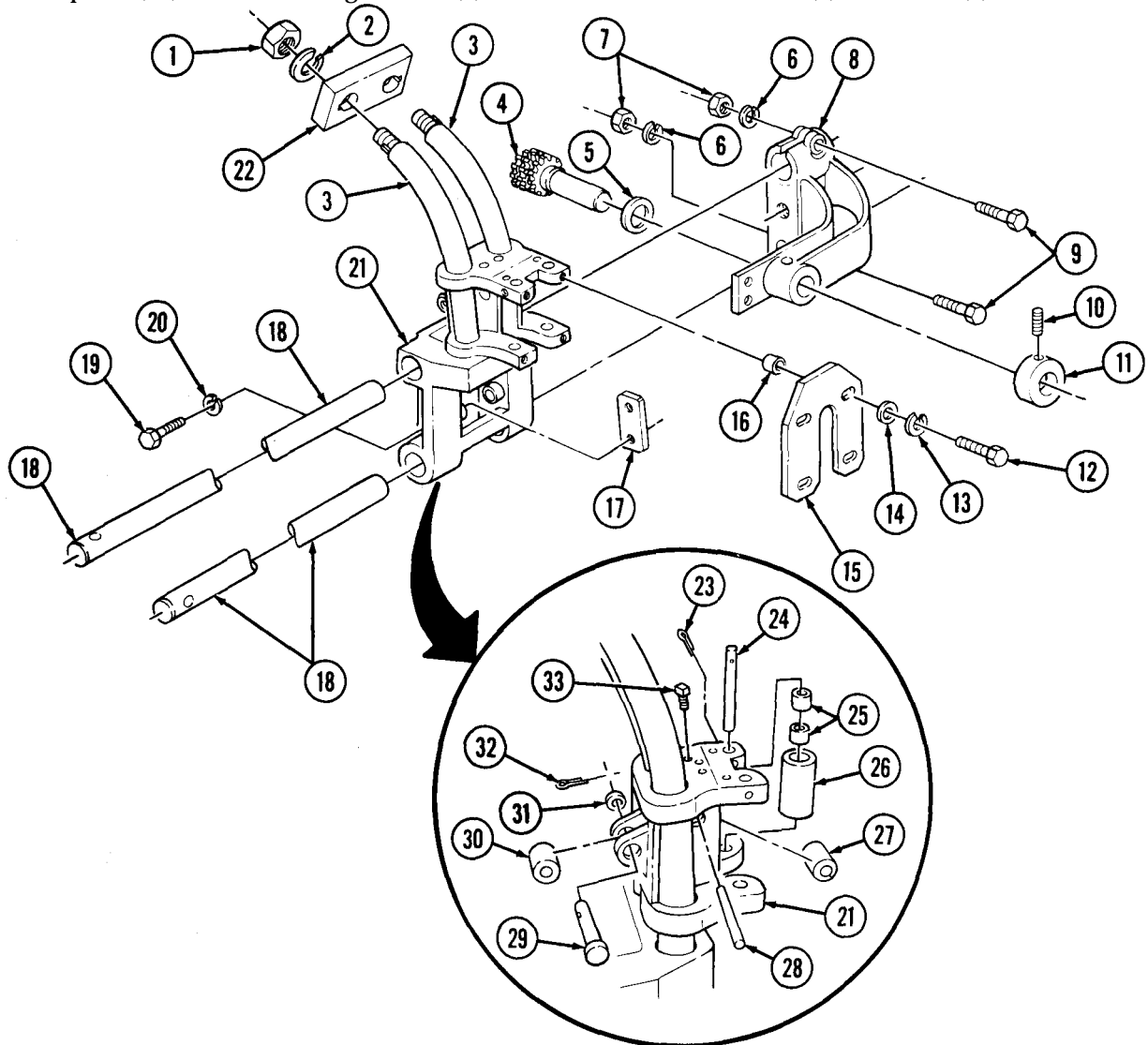
ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		INCHES	MILLIMETERS
11	Thimble springs (free length)	2.38-2.5	60.45 -63.5
12	Thimble spring (free length)	0.66-0.72	16.67-18.29
13	Detent spring (free length)	1.5	38.1
14	Clutch spring (free length)	4.25	107.9
15	Brake lining (thickness)	0.063-0.13	1.6- 3.3
16	Clutch lining (thickness)	0.168-0.38	4.27-9.65



16-4. REAR WINCH REPAIR (M764) (Contd)

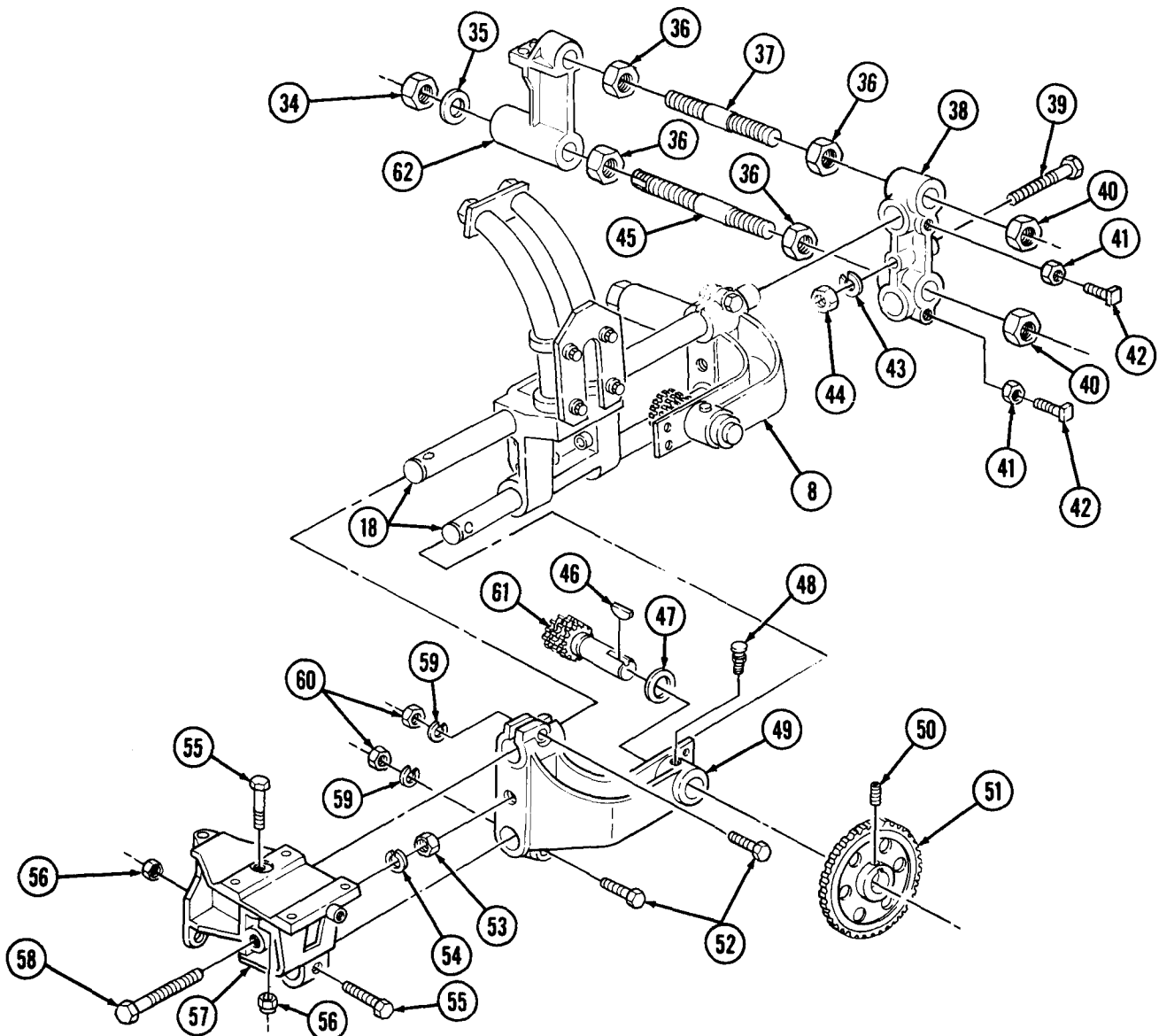
g. Carriage Assembly

1. Install two rods (18) in cage (21).
2. Install two wear guides (17) on cage (21) with four new lockwashers (20) and screws (19).
3. Install washer (5) and sprocket (4) on bracket (8) with collar (11) and setscrew (10).
4. Install bracket (8) on two rods (18) with two screws (9), new lockwashers (6), and nuts (7).
5. Install four bearing sleeves (25) in two rollers (26).
6. Install two rollers (26) in cage (21) with two shafts (24) and new cotter pins (23).
7. Install roller (30) in cage (21) with pin (29), washer (31), and new cotter pin (32).
8. Install roller (27) in cage (21) with pin (28) and setscrew (33).
9. Install four spacers (16) and guard (15) on cage (21) with four washers (14), new lockwashers (13), and screws (12).
10. Install plate (22) on two carriage horns (3) with two new lockwashers (2) and nuts (1).



16-4. REAR WINCH REPAIR (M764) (Contd)

11. Install two oil caps (48) on bracket (8) and bracket (49).
12. Install four nuts (36) on studs (37) and (45) and install studs (36) and (45) on bracket (62).
13. Install washer (35) on stud (45) with nut (34).
14. Install bracket (38) on studs (45) and (37) with two nuts (40).
15. Install bracket (38) on two rods (18) with two nuts (41) and screws (42).
16. Position screw (39) through bracket (38) and install new lockwasher (43) and nut (44) on screw (39).
17. Install bracket (38) on bracket (8) and tighten screw (39).
18. Install washer (47), sprocket (61), new woodruff key (46), and sprocket (51) on bracket (49) with setscrew (50).
19. Install bracket (49) on two rods (18) with two screws (52), new lockwashers (59), and nuts (60).
20. Install support (57) on two rods (18) with two setscrews (55) and nuts (56).
21. Position screw (58) through support (57) and install new lockwasher (54) and nut (53) on screw (58).
22. Install support (57) on bracket (49) and tighten screw (58).



16-4. REAR WINCH REPAIR (M764) (Contd)

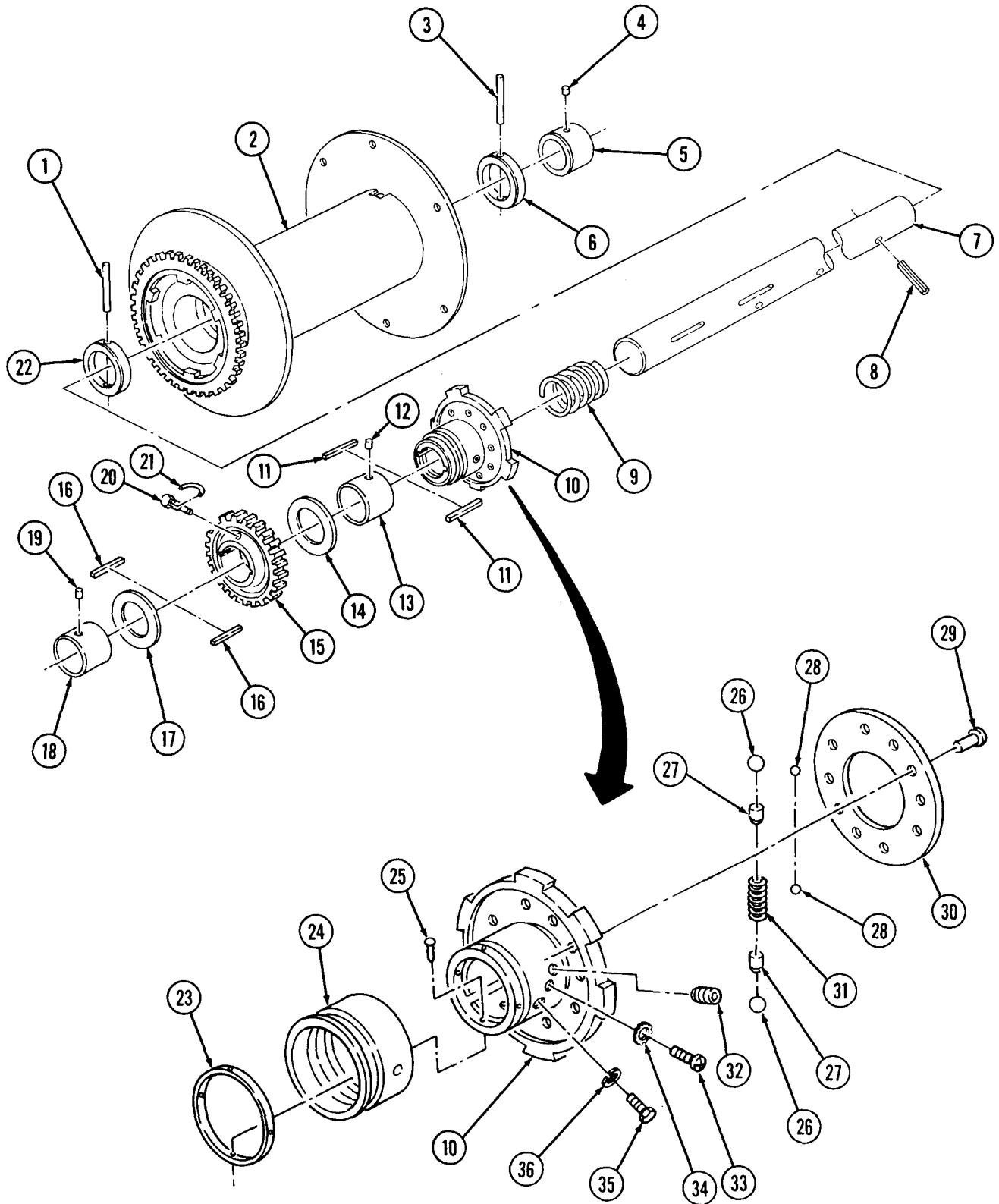
h. Clutch Assembly

1. Install clutch lining (30) on clutch plate (10) with ten new rivets (29).
2. Position sleeve (24) and ring (23) on clutch plate (10).
3. Install four new rivets (25) in ring (23) and clutch plate (10).

i. Drum Assembly

1. Install two new woodruff keys (11) and clutch plate (10) on drum shaft (7).
2. Aline sleeve (24) and clutch plate (10) and install two balls (28) in clutch plate (10) and sleeve (24) with new lockwasher (34) and screw (33).
3. Aline sleeve (24), clutch plate (10), and drum shaft (7) and install spring (31), two detents (27), and two balls (26) with plug (32).
4. Aline sleeve (24) with clutch plate (10) and install with new lockwasher (36) and screw (35).
5. Install spring (9) and collar (22) on drum shaft (7).
6. Aline collar (22) with drum shaft (7) and install new pin (1) in collar (22) and drum shaft (7).
7. Install drum (2) on drum shaft (7) with collar (6) and new pin (3).
8. Install bushing (5) on drum shaft (7) with new pin (4).
9. Install new pin (8) in drum shaft (7).
10. Install bushing (13) on drum shaft (7) with new pin (12).
11. Install washer (14), two new woodruff keys (16), and gear (15) on drum shaft (7) with two screws (20).
12. Lace two screws (20) with new safety wire (21).
13. Install washer (17) and bushing (18) on drum shaft (7) with new pin (19).

16-4. REAR WINCH REPAIR (M764) (Contd)



16-4. REAR WINCH REPAIR (M764) (Contd)

j. Worm Housing Assembly

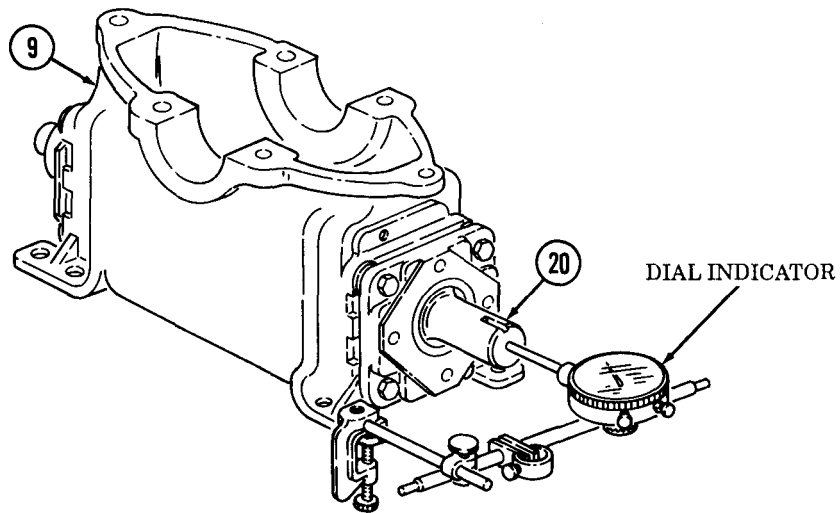
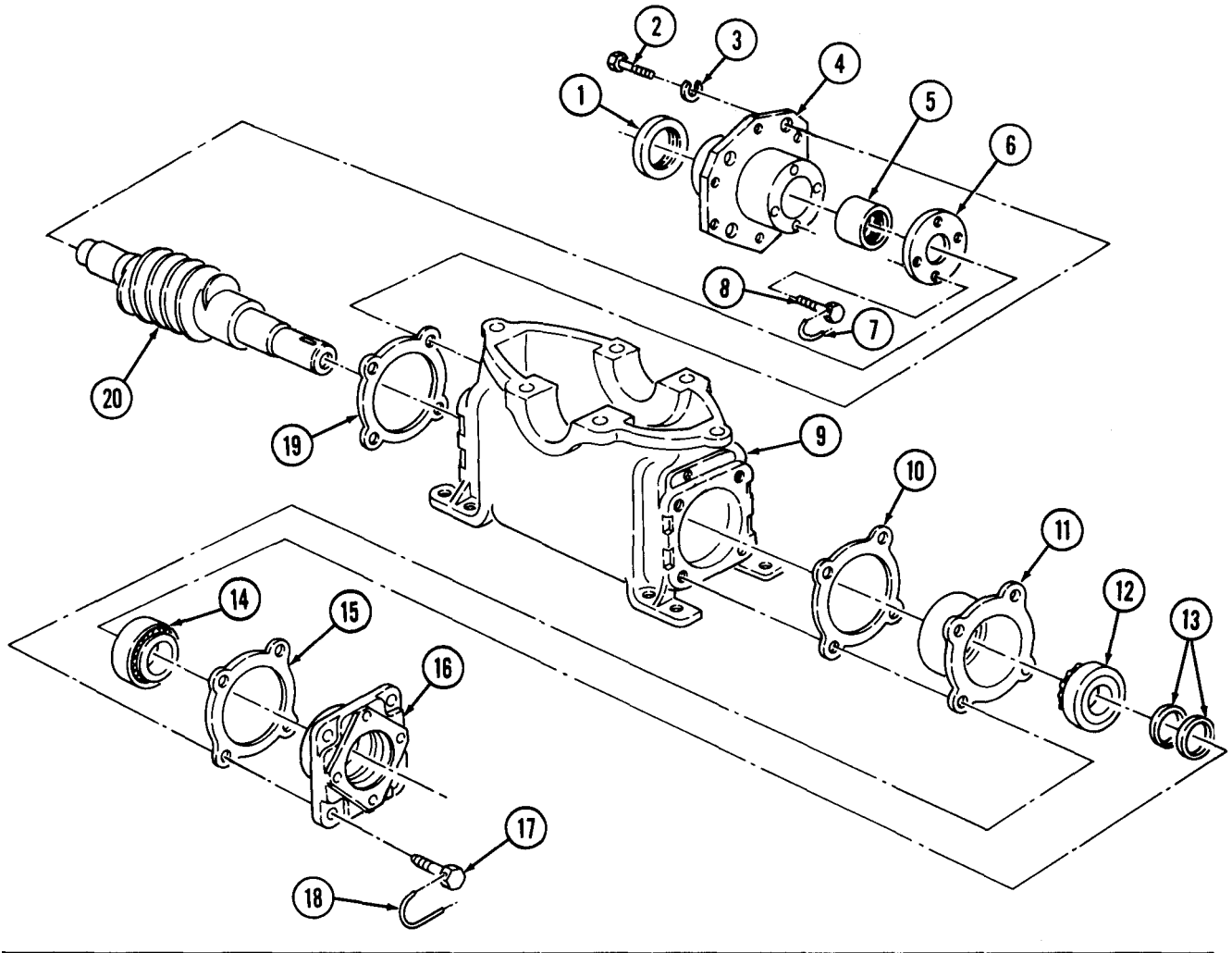
1. Apply light coat of sealing compound on outer diameter of new seal (1).
2. Install new seal (1) in cage (4).
3. Install bearing (5) in cage (4) with retainer (6) and four screws (8).
4. Lace four screws (8) together with new safety wire (7).
5. Apply light coat of sealing compound to outer diameter of cage (4).
6. Install new gasket (19) and cage (4) on worm gear housing (9) with four new lockwashers (3) and screws (2).
7. Install worm gear (20) in worm gear housing (9).
8. Install bearing (12), two shims (13), and bearing (14) in sleeve (11).
9. Install new gasket (10), sleeve (11), new gasket (13), and retainer (14) on worm gear housing (9) with four screws (17).
10. Install dial indicator on worm gear housing (9) with plunger positioned on the end of worm gear (20).
11. Measure end play of worm gear (20) by moving worm gear (20) back and forth. End play measurement should read 0.005-0.007 in. (0.127-0.178 mm).
12. Remove dial indicator from worm gear housing (9).

NOTE

If end play is correct, go to step 20. If end play is incorrect, go to step 13.

13. Remove four screws (17), retainer (16), gasket (15), sleeve (11), and gasket (10) from worm gear housing (9).
14. Remove bearing (14) from sleeve (11).
15. If end play is greater than 0.007 in. (0.178 mm), remove a shim (13) or use a thinner shim (13).
16. If end play is less than 0.005 in. (0.127 mm), add a shim (13) or use a thicker shim (13).
17. Install bearing (14) in sleeve (11).
18. Install gasket (10), sleeve (11), gasket (15), and retainer (16) on worm gear housing (9) with four screws (17).
19. Perform steps 10 through 12.
20. Lace four screws (17) together with new safety wire (18).

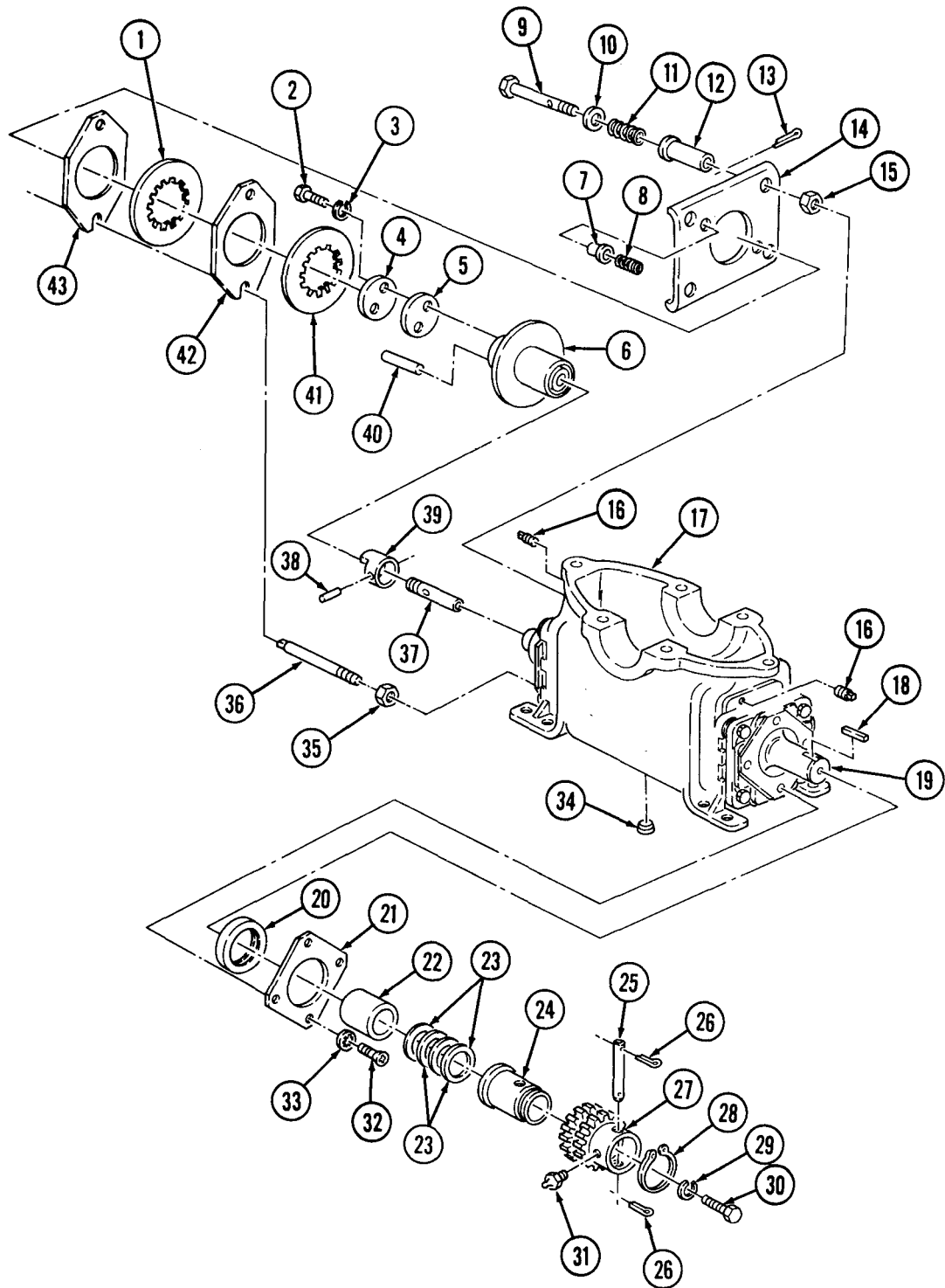
16-4. REAR WINCH REPAIR (M764) (Contd)



16-4. REAR WINCH REPAIR (M764) (Contd)

21. Install stud (37) on worm gear (19).
22. Install brake stop (39) on stud (37) with new pin (38).
23. Install two nuts (35) on two studs (36).
24. Install two studs (36) on worm gear housing (17) and tighten two nuts (35) to worm gear housing (17).
25. Position brake nut (6) and pin (40) on worm gear (19).
26. Apply light coat of sealing compound to front and back sides of new gasket (5).
27. Install new gasket (5) and washer (4) on brake nut (6) with two new lockwashers (3) and screws (2).
28. Install four springs (11), washers (10), and screws (9) in thimbles (12) with four new cotter pins (13).
29. Position lining (41), plate (42), lining (1), and plate (43) on brake nut (6) and two studs (36).
30. Install two springs (8) in two thimbles (7).
31. Install four nuts (15) on four screws (9).
32. Position two thimbles (7) in plate (14).
33. Install plate (14) on brake nut (6) with four screws (9). Tighten four nuts (15) to worm gear housing (17).
34. Install new seal (20) in worm gear housing (17) with plate (21), four new lockwashers (33), and screws (32).
35. Install spacer (22), four shims (23), new woodruff key (18), sleeve (24), and sprocket (27) on worm gear (19) with pin (25) and two new cotter pins (26).
36. Install retaining ring (28) on sleeve (24).
37. Install grease fitting (31) on sprocket (27).
38. Install new lockwasher (29) and screw (30) on worm gear (19). Tighten screw (30) 200-225 lb-ft (271-305 N.m).
39. Install plug (34) and two plugs (16) in worm gear housing (17).

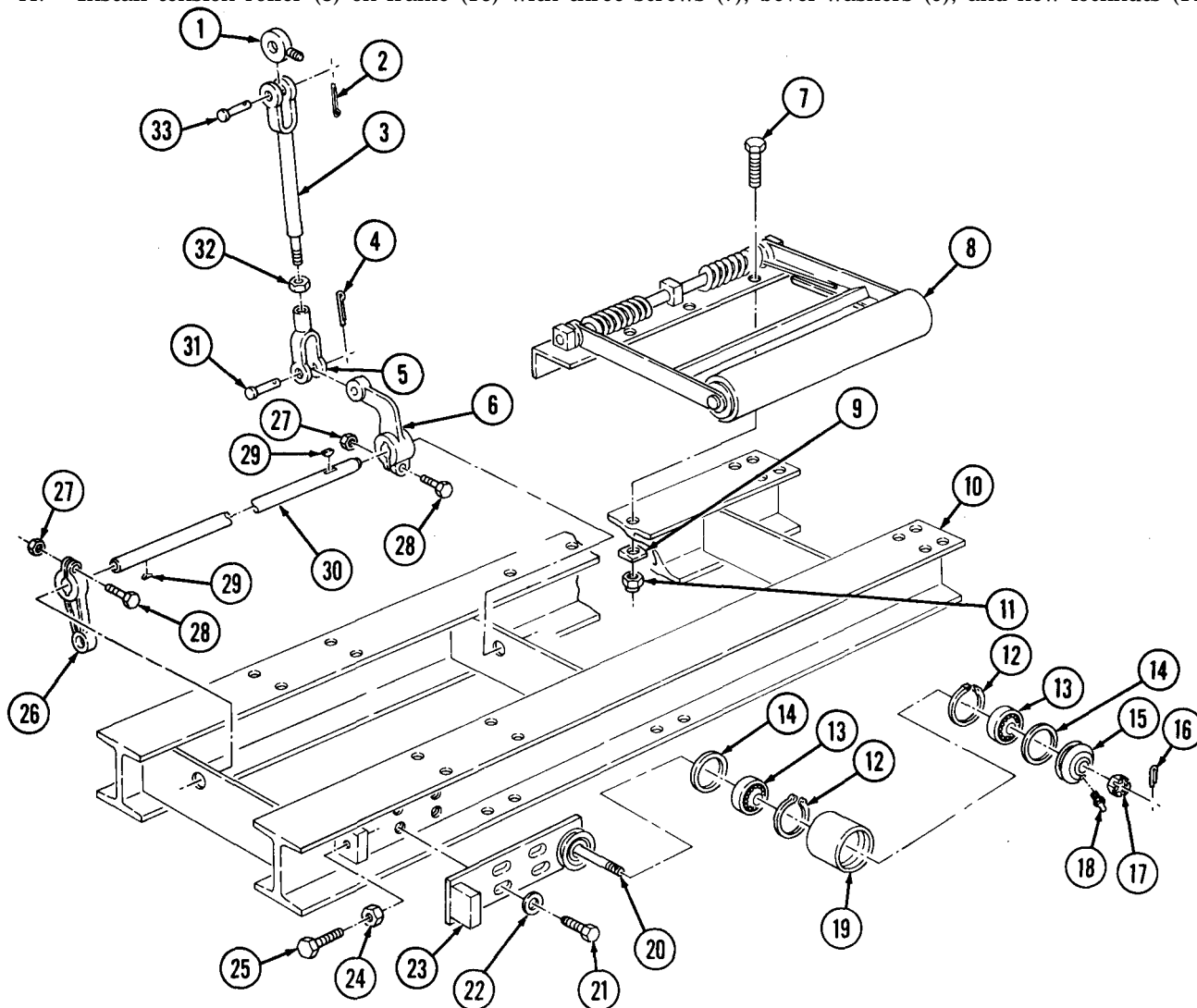
16-4. REAR WINCH REPAIR (M764) (Contd)



16-4. REAR WINCH REPAIR (M764) (Contd)

k. Rear Winch Assembly

1. Position shaft (30) partially through frame (10) and position lever (26) and lever (6) on shaft (30) and slide shaft (30) completely in place.
2. Install two new woodruff keys (29) on shaft (30) and position levers (26) and (6) over two new woodruff keys (29).
3. Install two screws (28) on levers (26) and (6) with two new locknuts (27).
4. Install jamnut (32) and clevis (5) on control lever (3) even with scribe mark.
5. Install control rod (3) on lever (6) with clevis pin (31) and new cotter pin (4).
6. Install eyebolt (1) on control rod (3) with clevis pin (33) and new cotter pin (2).
7. Install jamnut (24) on adjusting screw (25) and install adjusting screw (25) on frame (10).
8. Install idler bracket (23) on frame (10) with four washers (22) and screws (21).
9. Install two new packings (14) and grease fitting (18) on shaft (20) and retainer (15).
10. Install bearing (15), new clip ring (12), pulley (19), new clip ring (12), bearing (13), and retainer (15) on shaft (20) with nut (17) and new cotter pin (16).
11. Install tension roller (8) on frame (10) with three screws (7), bevel washers (9), and new locknuts (11).



16-4. REAR WINCH REPAIR (M764) (Contd)

12. Install drum support (38) on frame (10) with eight screws (39), beveled washers (40), and new locknuts (41).
13. Install worm gear housing (45) on frame (10) with eight screws (42), beveled washers (43), and new locknuts (44).
14. Secure chain to winch drum (47) and lifting device.

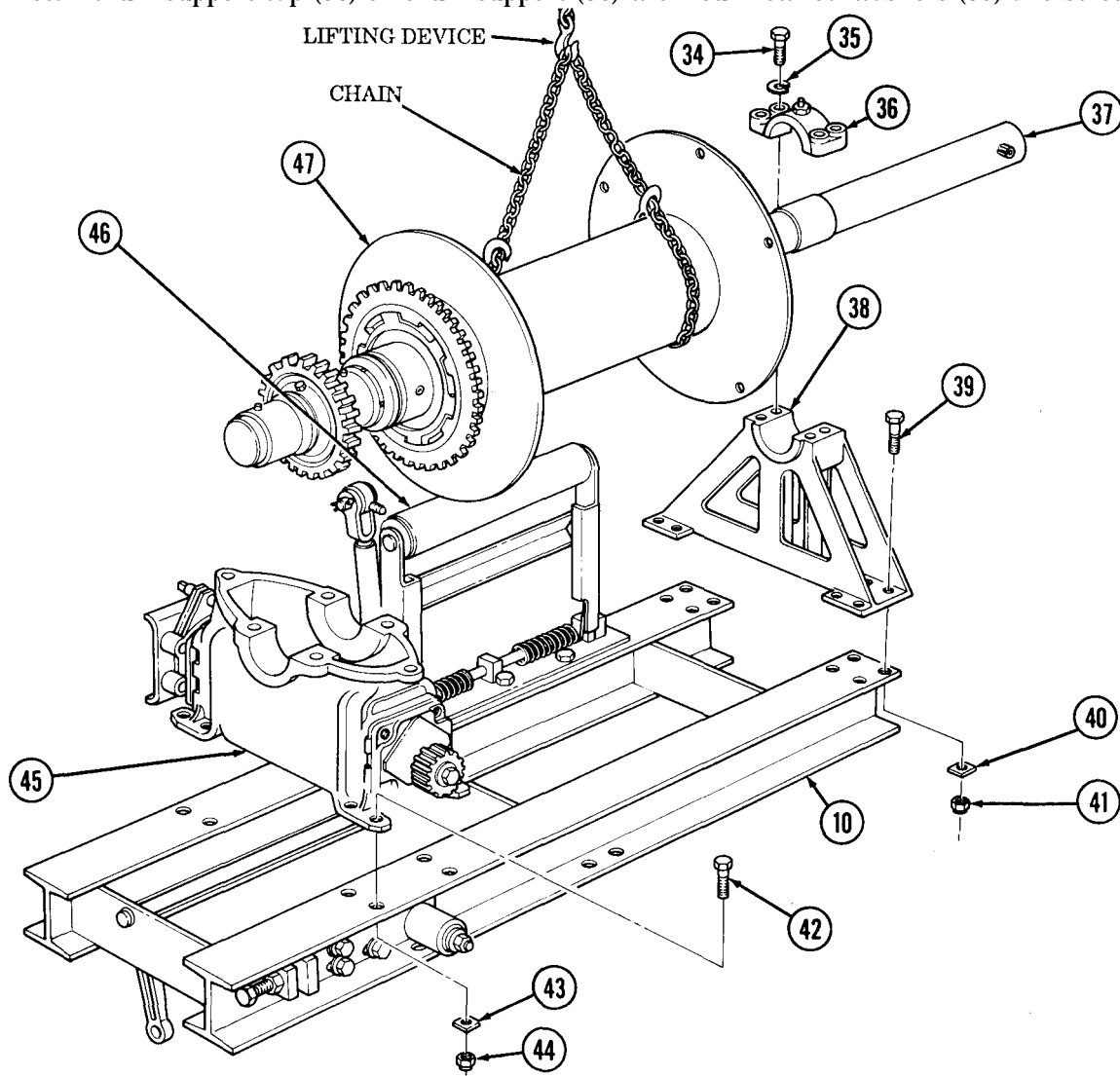
WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

NOTE

Drum shaft bushings must line up with drum support and worm gear housing.

15. Support tension roller (46) and position winch drum (47) and drum shaft (37) on worm gear housing (45) and drum support (38).
16. Install drum support cap (36) on drum support (38) with four new lockwashers (35) and screws (34).



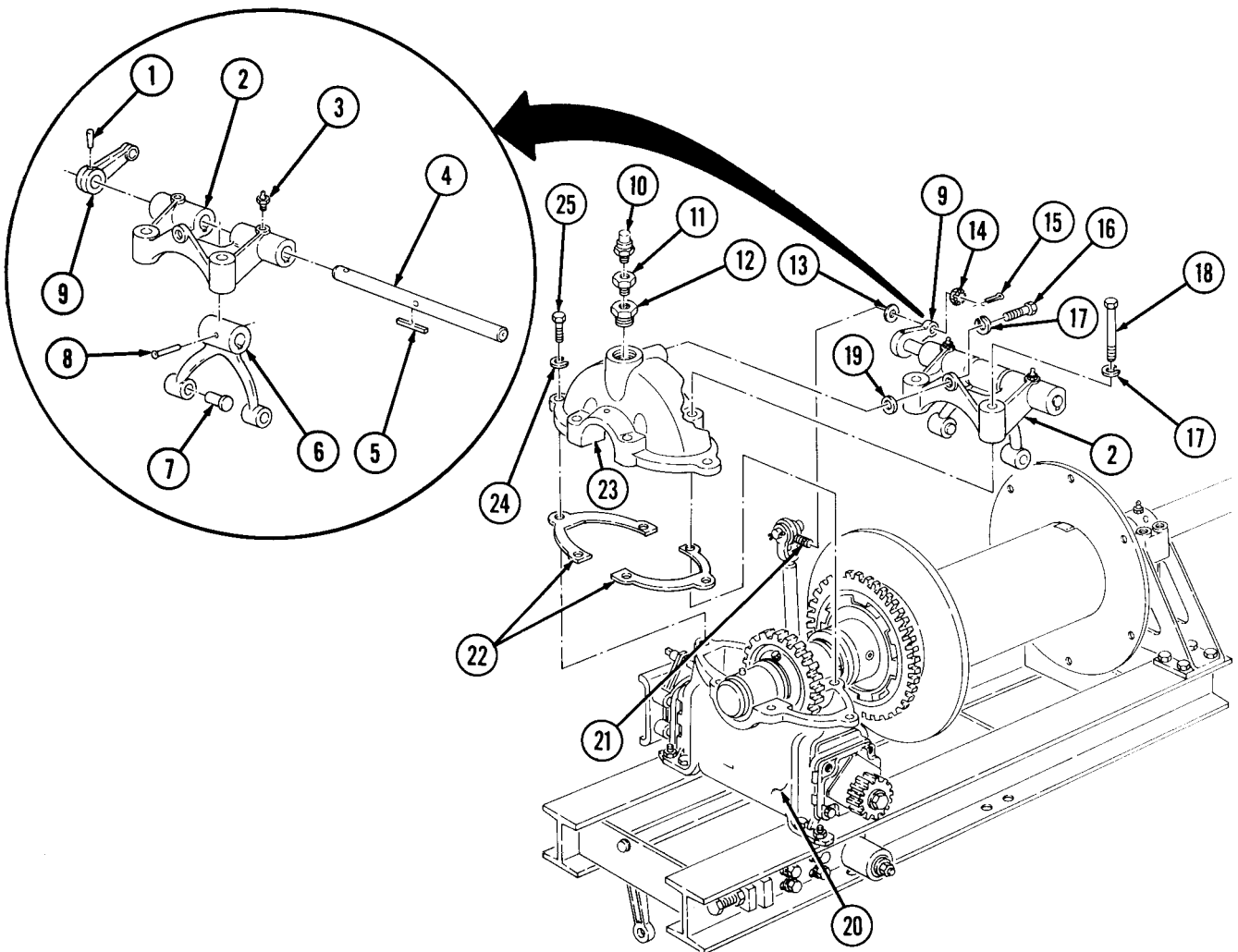
16-4. REAR WINCH REPAIR (M764) (Contd)

17. Install two grease fittings (3) in fork bracket (2).
18. Install new woodruff key (5) on fork shaft (4). Position fork (6) in fork bracket (2) and install fork shaft (4) through fork bracket (2) and fork (6).
19. Install two pins (7) and new rivet (8) in fork (6).
20. Install control lever (9) on fork shaft (4) with new pin (1).
21. Install adapters (12) and (11) and breather (10) on worm gear housing cap (23).
22. Install two new gaskets (22) and worm gear housing cap (23) on worm gear housing (20) with five new lockwashers (24) and screws (25).

NOTE

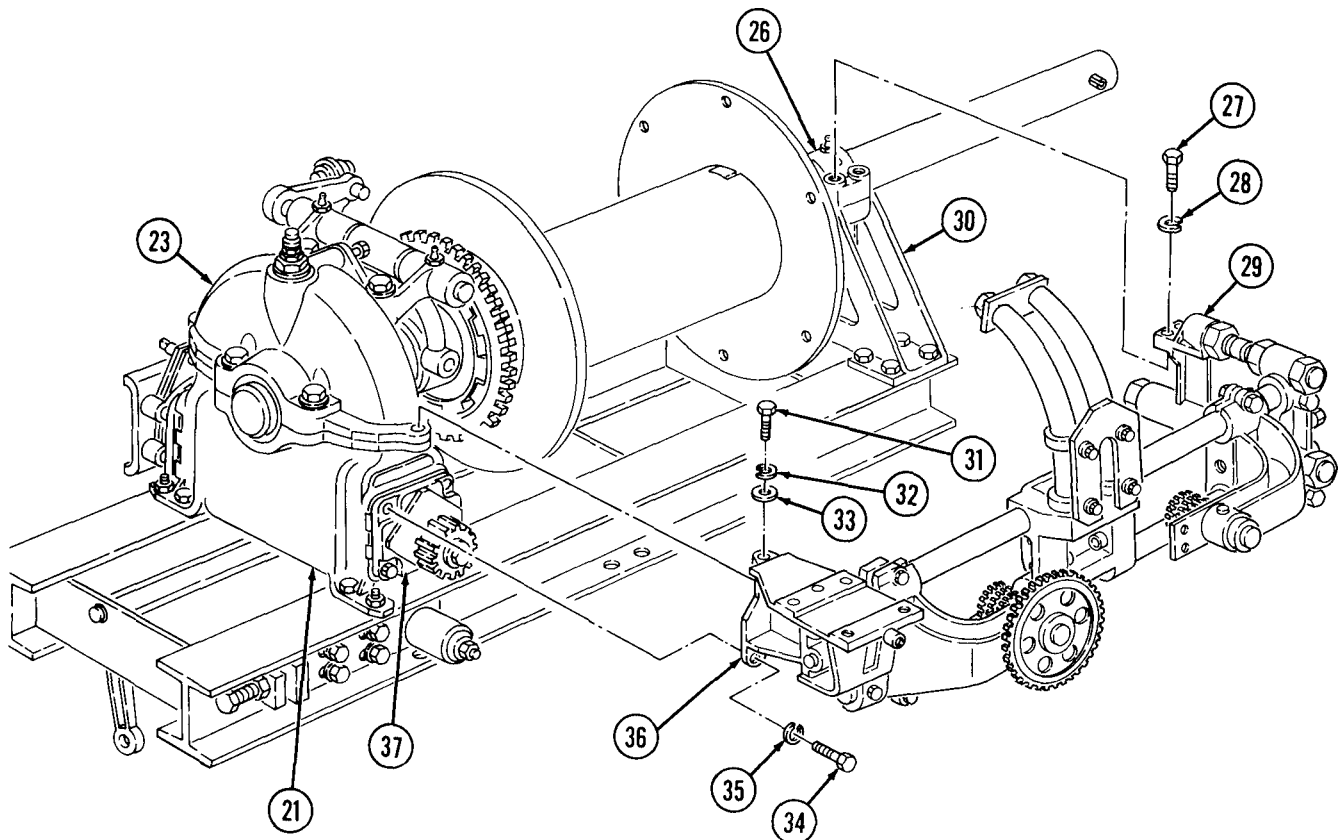
Ensure fork properly engages with clutch.

23. Install washer (19) and fork bracket (2) on worm gear housing cap (23) with new lockwasher (17) and screw (16).
24. Install two screws (18) and new lockwashers (17) on fork bracket (2) and worm gear housing cap (23).
25. Install washer (13) and eyebolt (21) on control lever (9) with nut (14) and new cotter pin (15).



16-4. REAR WINCH REPAIR (M764) (Contd)

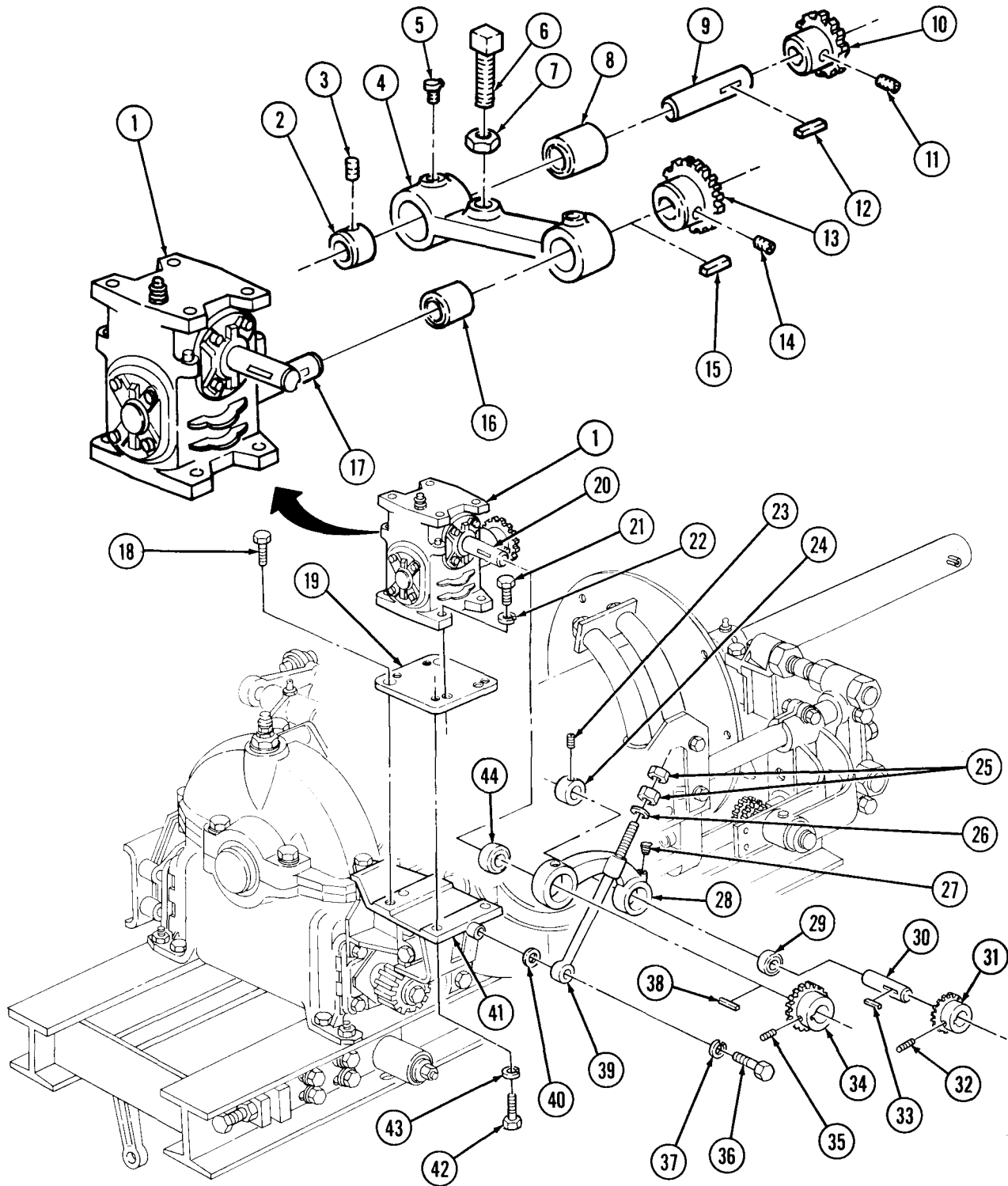
26. Position speed reducer support (36) and tie rod bracket (29) on worm gear housing cap (23) and drum support cap (26).
27. Install washer (33), new lockwasher (32), and screw (31) on speed reducer support (36), worm gear housing cap (23), and worm gear housing (21).
28. Install two new lockwashers (35) and screws (34) on speed reducer support (36), bearing cap (37), and worm gear housing (21).
29. Install two new lockwashers (28) and screws (27) on tie rod bracket (29), drum support cap (26), and drum support (30).



16-4. REAR WINCH REPAIR (M764) (Contd)

30. Install nut (7) on screw (6).
31. Install screw (6) and nut (7) on second reduction bracket (4).
32. Install two oil cups (5) on second reduction bracket (4).
33. Install bushing (8) in second reduction bracket (4).
34. Install new woodruff key (12) and sprocket (10) on shaft (9).
35. Install setscrew (11) in sprocket (10).
36. Install shaft (9) and collar (2) on second reduction bracket (4).
37. Install setscrew (3) in collar (2).
38. Install bushing (16) on second reduction bracket (4).
39. Install second reduction bracket (4), new woodruff key (15), and sprocket (13) on shaft (17).
40. Install setscrew (14) in sprocket (13).
41. Install rod (39) on first idler bracket (28) with washer (26) and two nuts (25).
42. Install two oil cups (27) on first idler bracket (28).
43. Install bushing (29) on first idler bracket (28).
44. Install new woodruff key (33) and sprocket (31) on shaft (30).
45. Install setscrew (32) in sprocket (31).
46. Install shaft (30) and sprocket (31) on first idler bracket (28).
47. Install collar (24) on shaft (30).
48. Install setscrew (23) on collar (24).
49. Install bushing (44) on first idler bracket (28).
50. Install first idler bracket (28), new woodruff key (38), and sprocket (34) on shaft (20).
51. Install setscrew (35) in sprocket (34).
52. Install adapter (19) on bracket (41) with two new lockwashers (43), screws (42), and screws (18).
53. Install speed reducer (1) on adapter (19) with four new lockwashers (22) and screws (21).
54. Install washer (40), new lockwasher (37), and screw (36) on rod (39) and bracket (41).

16-4. REAR WINCH REPAIR (M764) (Contd)



FOLLOW-ON TASKS:

- Install carriage cross chain (M764) (TM 9-2320-361-20).
- Install first reduction drive chain (M764) (TM 9-2320-361-20).
- Install rear winch (M764) (para. 16-5).

16-5. REAR WINCH REPLACEMENT (M764)

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 Sling (Appendix B, Item 14)
 Lifting device

MATERIALS/PARTS

Cotter pin (Appendix F, Item 10)
 Six locknuts (Appendix F, Item 89)
 Four locknuts (Appendix F, Item 112)
 Sixteen lockwashers (Appendix F, Item 138)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

- Rear winch oil drain tubes removed (M764) (TM 9-2320-361-20).
- Rear winch cable removed (TM 9-2320-361-20).
- Power divider removed (para. 16-15).
- Cab protector and mounting tubes removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- All personnel must stand clear during lifting operations.
- Ensure lifting capacity is greater than weight of winch.

a. Removal

1. Remove cotter pin (14), clevis pin (16), and winch control clevis (15) from winch lever (13). Discard cotter pin (16).
2. Remove six locknuts (2), screws (4), and cap (3) from body (5). Discard locknuts (2).
3. Remove four locknuts (18) and screws (17) from two rear winch frames (6) and subframe (8). Discard locknuts (18).
4. Remove sixteen nuts (12), lockwashers (11), screws (7), washers (9), and two power divider brackets (10) from two rear winch frames (6). Discard lockwashers (11).
5. Secure chain to rear winch (1) and lifting device.

WARNING

- All personnel must stand clear of winch during lifting operations. A swinging or shifting load may cause injury to personnel.
- Ensure lifting capacity is greater than the weight of winch. Failure to do so may result in injury to personnel or damage to equipment.

NOTE

Assistant will help with step 6.

6. Remove rear winch (1) from two subframes (8).

16-5. REAR WINCH REPLACEMENT (M764) (Contd)

b. Installation

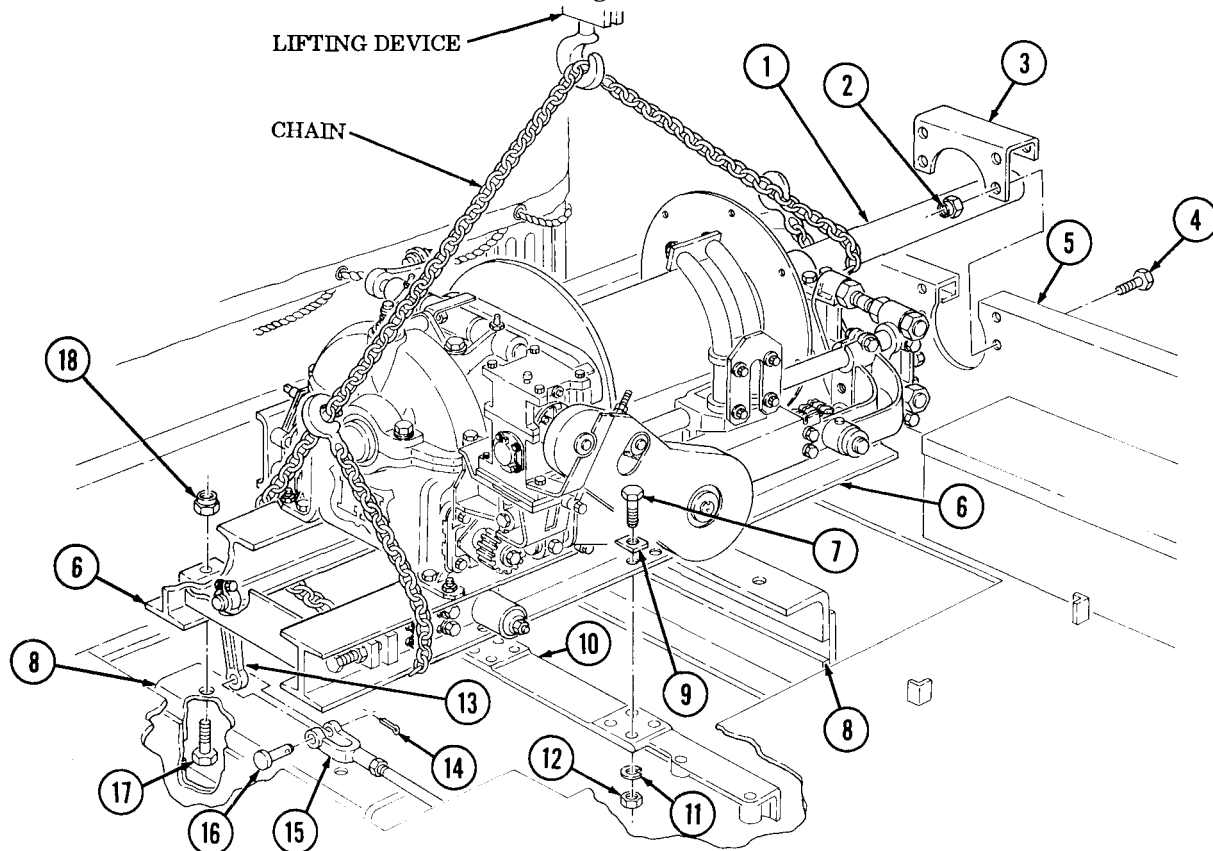
WARNING

All personnel must stand clear of winch during lifting operations.
A swinging or shifting load may cause injury to personnel.

NOTE

Assistant will help with steps 1 and 2.

1. Install chain on rear winch (1) and lifting device.
2. Lift rear winch (1) onto two subframes (8).
3. Install two power divider brackets (10) on two rear winch frames (6) with sixteen washers (9), screws (7), new lockwashers (11), and nuts (12).
4. Install four screws (17) and new locknuts (18) on two rear winch frames (6) and subframes (8).
5. Install cap (3) on body (5) with six screws (4) and new locknuts (2).
6. Install control clevis (15) on rear winch lever (13) with clevis pin (16) and new cotter pin (14).
7. Remove chain from rear winch (1) and lifting device.



- FOLLOW-ON TASKS:**
- Install cab protector and mounting tubes (TM 9-2320-361-20).
 - Install power divider (para. 16-15).
 - Install rear winch cable (M764) (TM 9-2320-361-20).
 - Install rear winch oil drain tubes (M764) (TM 9-2320-361-20).

Section II. HOIST MAINTENANCE

16-6. HOIST MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
16-7.	Hydraulic Line Replacement (M342A2)	16-56
16-8.	Hydraulic Cylinder Replacement (M342A2)	16-60
16-9.	Hydraulic Cylinder Repair (M342A2)	16-62
16-10.	Control Valve Replacement (M342A2)	16-66
16-11.	Control Box Replacement (M342A2)	16-68
16-12.	Hydraulic Pump Replacement (M342A2)	16-70
16-13.	Hydraulic Safety Latch Replacement (M342A2)	16-72
16-14.	Dump Body Subframe Maintenance	16-74
16-15.	Power Divider Replacement (M764)	16-78
16-16.	Power Divider Repair (M764)	16-80
16-17.	Power Divider Shaft Oil Seals Replacement (M764)	16-92
16-18.	Power Divider Drivebelt Replacement (M764)	16-94

16-7. HYDRAULIC LINE REPLACEMENT (M342A2)

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M342A2

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Lifting device
Chains

MATERIALS/PARTS

Cap and plug set (Appendix C, Item 5)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

LO 9-2320-209-12-1
TM 9-2320-361-10
TM 9-2320-361-34P

EQUIPMENT CONDITION

Parking brake set (TM 9-2320-361-10).

GENERAL SAFETY INSTRUCTIONS

- Position safety braces before working under raised dump body.
- All personnel must stand clear during lifting operations.
- Wear eye protection when working with fluid under pressure.

16-7. HYDRAULIC LINE REPLACEMENT (M342A2) (Contd)

NOTE

All hydraulic lines are removed the same. This procedure covers the dump hoist cylinder lines.

a. Removal

NOTE

Perform steps 1 through 3 for hydraulic cylinder lines.

1. Secure chain to dump body (1) and lifting device.

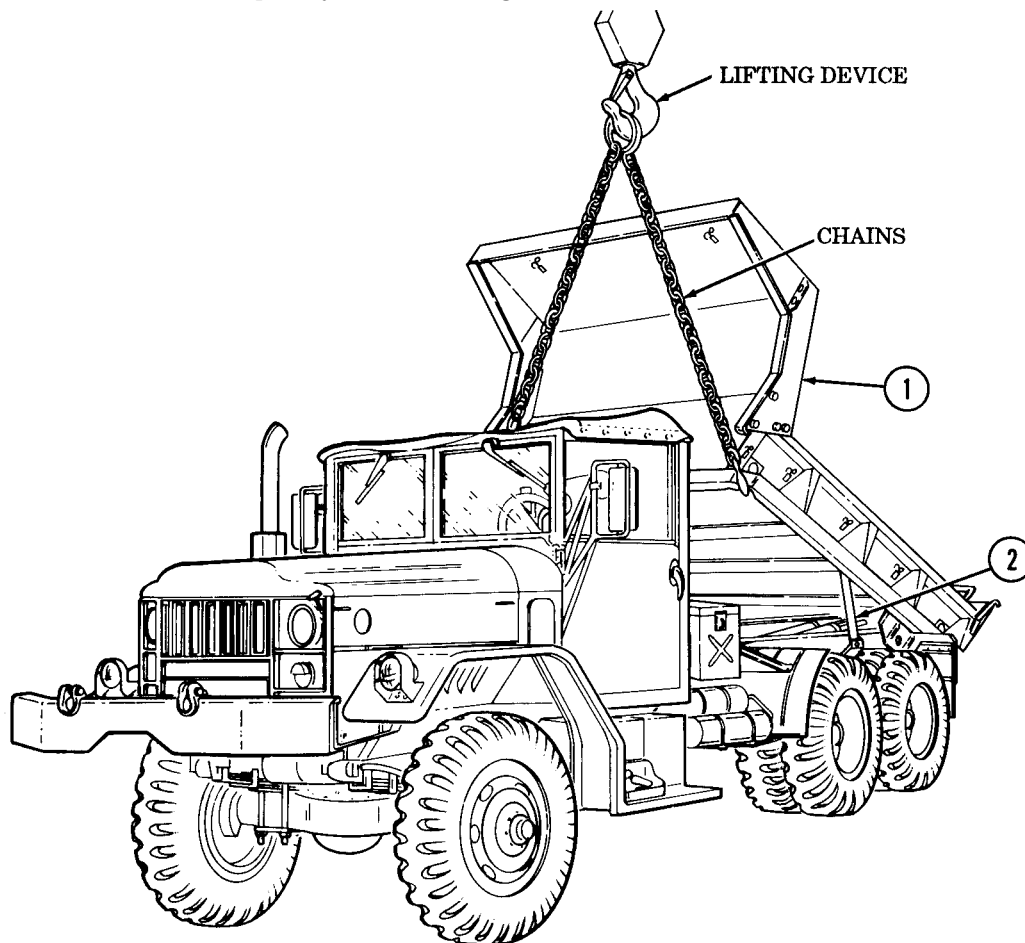
WARNING

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
- Never work under dump body until safety braces are properly positioned. Injury to personnel may occur if dump body suddenly lowers.

NOTE

Assistant will help with lifting operations.

2. Raise dump body (1) and position on two safety braces (2).
3. Remove chain from dump body (1) and lifting device.



16-7. HYDRAULIC LINE REPLACEMENT (M342A2) (Contd)

WARNING

Wear eye protection when working with hydraulic hoses. Fluid in hoses may be under pressure. Failure to wear eye protection may result in injury to personnel.

CAUTION

Cap or plug all openings immediately after disconnecting lines and hoses to prevent contamination. Remove caps or plugs prior to installation. Failure to do so may result in component damage.

NOTE

- Have drainage container ready to catch oil.
- Drain lines before plugging.
- Tag lines for installation.

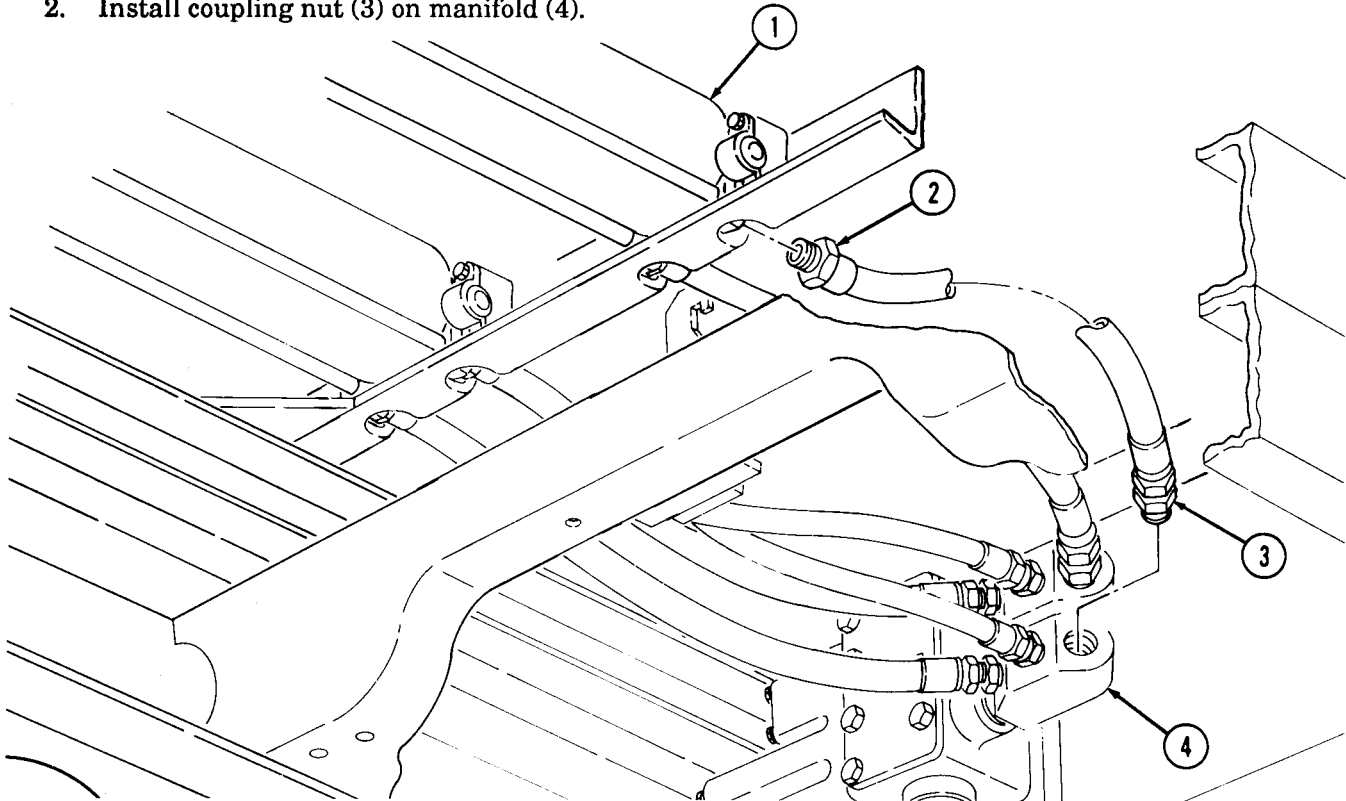
4. Remove coupling nut (3) from manifold (4).
5. Remove connecting nut (2) from hydraulic cylinder (1).

b. Installation

WARNING

Wear eye protection when working with hydraulic hoses. Fluid in hoses may be under pressure. Failure to wear eye protection may result in injury to personnel.

1. Install connecting nut (2) on hydraulic cylinder (1).
2. Install coupling nut (3) on manifold (4).



16-7. HYDRAULIC LINE REPLACEMENT (M342A2) (Contd)

NOTE

Perform steps 3 through 5 for hydraulic cylinder lines.

- 3 . Secure chain to dump body (5) and lifting device.

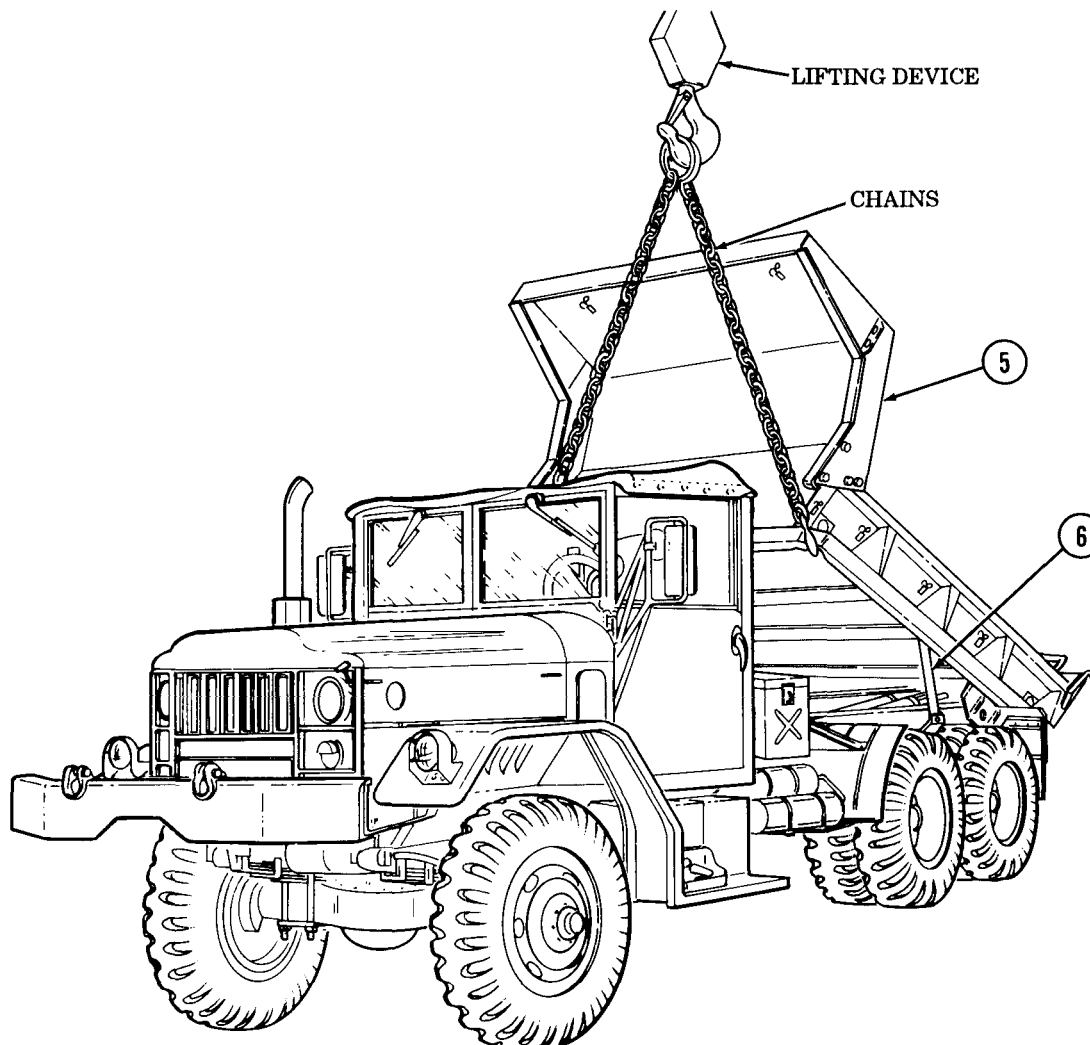
WARNING

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
- Never work under dump body until safety braces (6) are properly positioned. Injury to personnel may occur if dump body suddenly lowers.

NOTE

Assistant will help with lifting operations.

4. Raise dump body (5) and lower two safety braces (6).
5. Lower dump body (5) and remove chain from dump body (5) and lifting device.



FOLLOW-ON TASK: Fill hydraulic reservoir to proper level (LO 9-2320-209-12-1) and check dump body operation (TM 9-2320-361-10).

16-8. HYDRAULIC CYLINDER REPLACEMENT (M342A2)

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M342A2

TOOLS

General mechanic's tool kit (Appendix B, Item 1)
Lifting device
Chains

MATERIALS/PARTS

Six lockwashers (Appendix F, Item 140)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

LO 9-2320-209 -12-1
TM9-2320-361-10
TM9-2320-361-34P

EQUIPMENT CONDITION

Parking brake set (TM 9-2320-361-10).

GENERAL SAFETY INSTRUCTIONS

- . All personnel must stand clear during lifting operations.
- Position safety braces before working under raised dump body.
- Wear eye protection when working with fluid under pressure.

CAUTION

- Cap or plug all openings immediately after disconnecting lines and hoses to prevent contamination. Remove caps or plugs prior to installation. Failure to do so may result in damage to equipment.
- Bypass tubes on outside of hydraulic cylinder are easily damaged. Use care when replacing hydraulic cylinder.

NOTE

Assistant will help with lifting operations.

a. Removal

WARNING

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.
- Never work under dump body until safety braces are properly positioned. Injury to personnel may result if dump body suddenly lowers.

1. Secure chains to dump body (1) and lifting device.
2. Raise dump body (1) and position on two safety braces (2). Remove chains from dump body (1) and lifting device.

WARNING

Wear eye protection when working with hydraulic hoses. Fluid in hoses may be under pressure failure to wear eye protection may result in injury to personnel.

3. Disconnect two hydraulic lines (13) from cylinders (8).
4. Secure chain to hydraulic cylinder (8) and lifting device and remove as much slack as possible from chain.
5. Remove four screws (9), lockwashers (10), and two caps (11) from two frame braces (12). Discard lockwashers (10).
6. Remove two screws (3), lockwashers (4), and two retainer halves (5) from crosshead (6). Discard lockwashers (4).
7. Remove shaft (7) from crosshead (6) and slide shaft (7) into hydraulic cylinder (8).
8. Remove hydraulic cylinder (8) from two frame braces (12).
9. Remove chain from lifting device and hydraulic cylinder (8).

16-8. HYDRAULIC CYLINDER REPLACEMENT (M342A2) (Contd)

b. Installation

1. Secure chain to hydraulic cylinder (8) and lifting device.
2. Position hydraulic cylinder (8) on two frame braces (12).
3. Install two caps (11) on frame braces (12) with four new lockwashers (10) and screws (9).
4. Install shaft (7) in crosshead (6) with two retainer halves (5), new lockwashers (4), and screws (3).
5. Remove chain from hydraulic cylinder (8) and lifting device.

WARNING

Wear eye protection when working with hydraulic hoses. Fluid in hoses maybe under pressure. Failure to wear eye protection may result in injury to personnel.

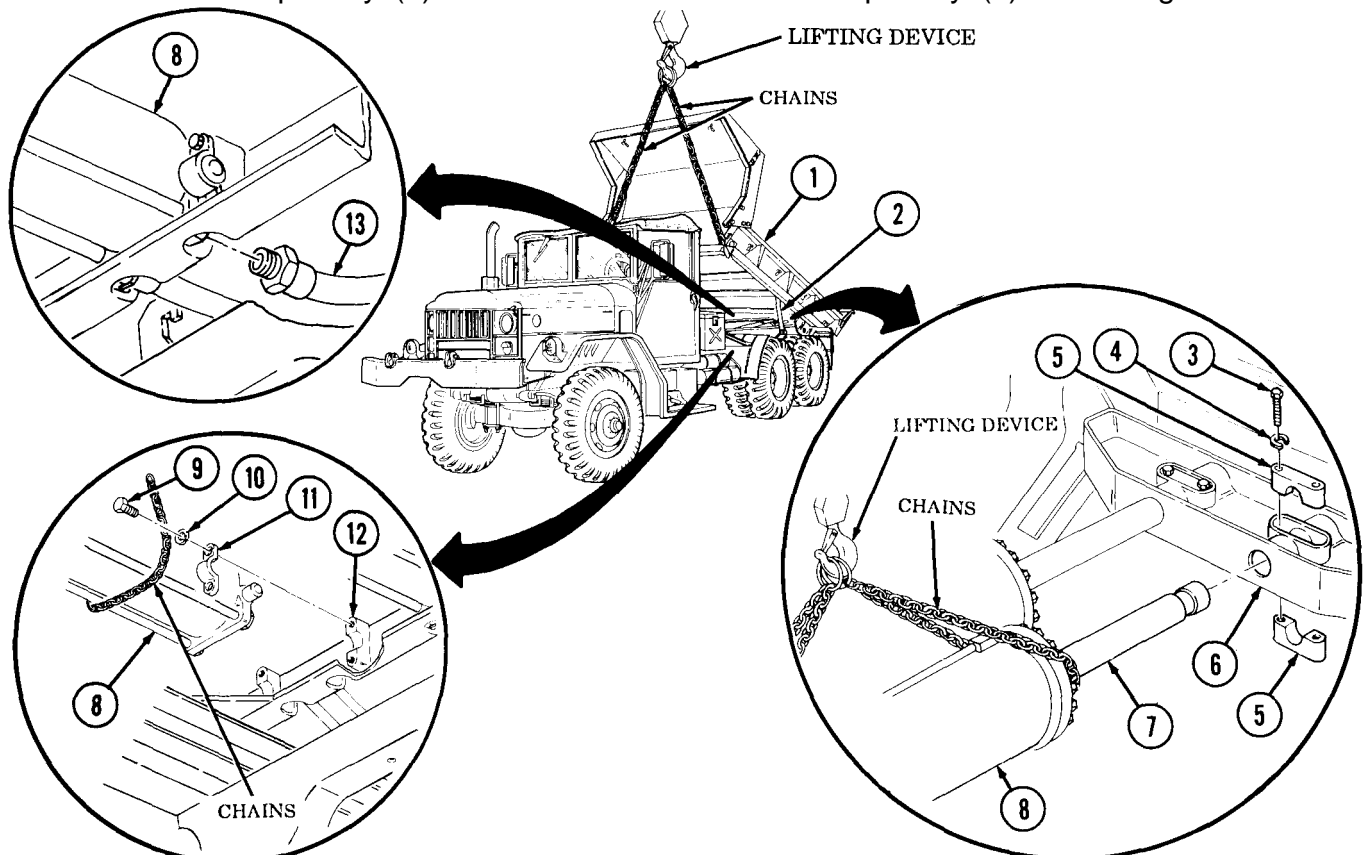
6. Connect two hydraulic lines (13) from hydraulic cylinders (8).

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

Never work under dump body until safety braces are properly positioned. Injury to opersonnel may result if dump body suddenly lowers.

7. Secure chain to dump body (1) and lifting device.
8. Raise dump body (1) and lower two safety braces (2).
9. Lower dump body (1) and remove chain from dump body (1) and lifting device.



FOLLOW-ON TASK: Fill hydraulic reservoir to proper level (LO 9-2320-209-12-1) and check for leaks.

16-9. HYDRAULIC CYLINDER REPAIR (M342A2)

THIS TASK COVERS:

- a. Disassembly
- b. Cleaning and Inspection

- c. Assembly

INITIAL SETUP

APPLICABLE MODELS

M342A2

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Inside micrometer (Appendix B, Item 16)
Torque wrench, 1/2-in. dr. (Appendix B, Item 7)

MATERIALS/PARTS

Cotter pin (Appendix F, Item 17)
O-ring (Appendix F, Item 176)
Preformed packing (Appendix F, Item 182)
Three piston rings (Appendix F, Item 205)
Ten lockwashers (Appendix F, Item 145)

MATERIALS/PARTS (CONTD)

Three lockwashers (Appendix F, Item 125)
Three spacer rings (Appendix F, Item 206)

REFERENCES (TM)

LO 9-2320-209-12-1
TM 9-2320-361-10
TM 9-2320-361-34P

EQUIPMENT CONDITION

Hydraulic cylinder removed (para. 16-8).

GENERAL SAFETY INSTRUCTIONS

Wear eye protection when removing plugs. Plugs are under spring tension.

a. Disassembly

1. Remove two adapters (6) and spacer rings (5) from hydraulic cylinder (1). Discard spacer rings (5).

WARNING

Wear eye protection when removing plugs. Plugs are under spring tension and may spring out during removal. Failure to wear eye protection may result in injury to personnel.

2. Remove three plugs (4), springs (3), and balls (2) from hydraulic cylinder (1).
3. Remove plug (7), spacer ring (8), and fluid restrictor (9) from hydraulic cylinder (1). Discard spacer ring (8).
4. Remove two setscrews (12) and pin (11) from hydraulic cylinder (1).
5. Remove fitting (10) from pin (11).
6. Remove three screws (23), lockwashers (22), gland (21), and preformed packing (20) from head (17). Discard lockwashers (22) and preformed packing (20).
7. Remove ten screws (19), lockwashers (18), head (17), and O-ring (16) from hydraulic cylinder (1). Discard lockwashers (18) and O-ring (16).
8. Remove piston rod (24) and piston (15) from hydraulic cylinder (1).
9. Remove three piston rings (25) from piston (15). Discard piston rings (25).
10. Remove cotter pin (13), nut (14), and piston (15) from piston rod (24). Discard cotter pin (13).

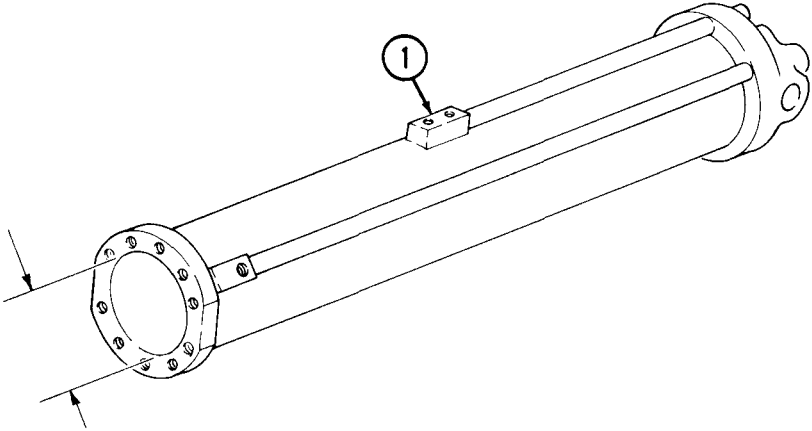
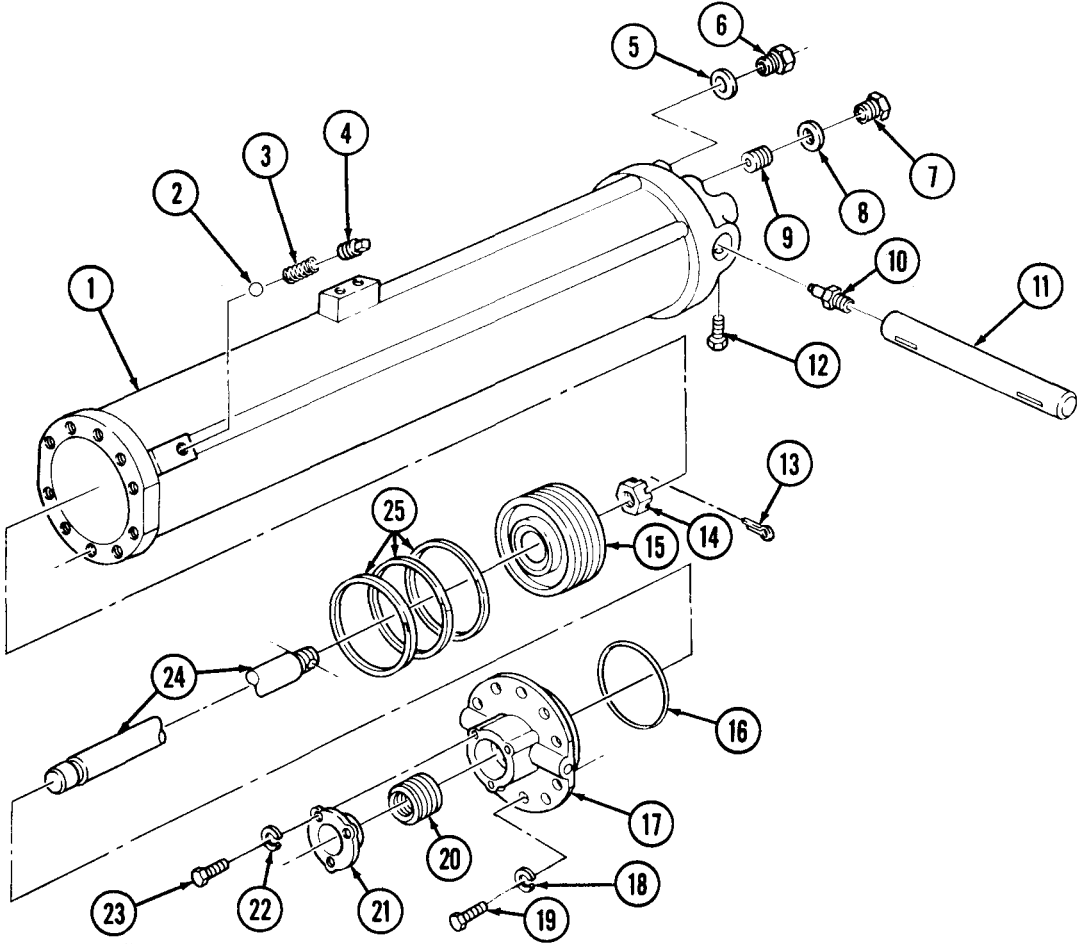
b. Cleaning and Inspection

1. For general cleaning instructions, refer to para. 2-8.
2. For general inspection instructions, refer to para. 2-9.
3. Inspect piston (15) for wear. Refer to table 16-4, M342A2 Hydraulic Cylinder Wear Limits, for measurements. Replace piston (15) if worn past limit.
4. Inspect hydraulic cylinder(1) for wear. Refer to table 16-4, M342A2 Hydraulic Cylinder Wear Limits, for measurements. Replace hydraulic cylinder (1) if worn past limit.

16-9. HYDRAULIC CYLINDER REPAIR (M342A2) (Contd)

Table 16-4. M342A2 Hydraulic Cylinder Wear Limits.

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		INCHES	CENTIMETERS
1	Hydraulic cylinder (inner diameter)	5.25-5.254	13.335-13.345
15	Piston (inner diameter)	5.241-5.244	13.312-13.320



16-9. HYDRAULIC CYLINDER REPAIR (M342A2) (Contd)

c. Assembly

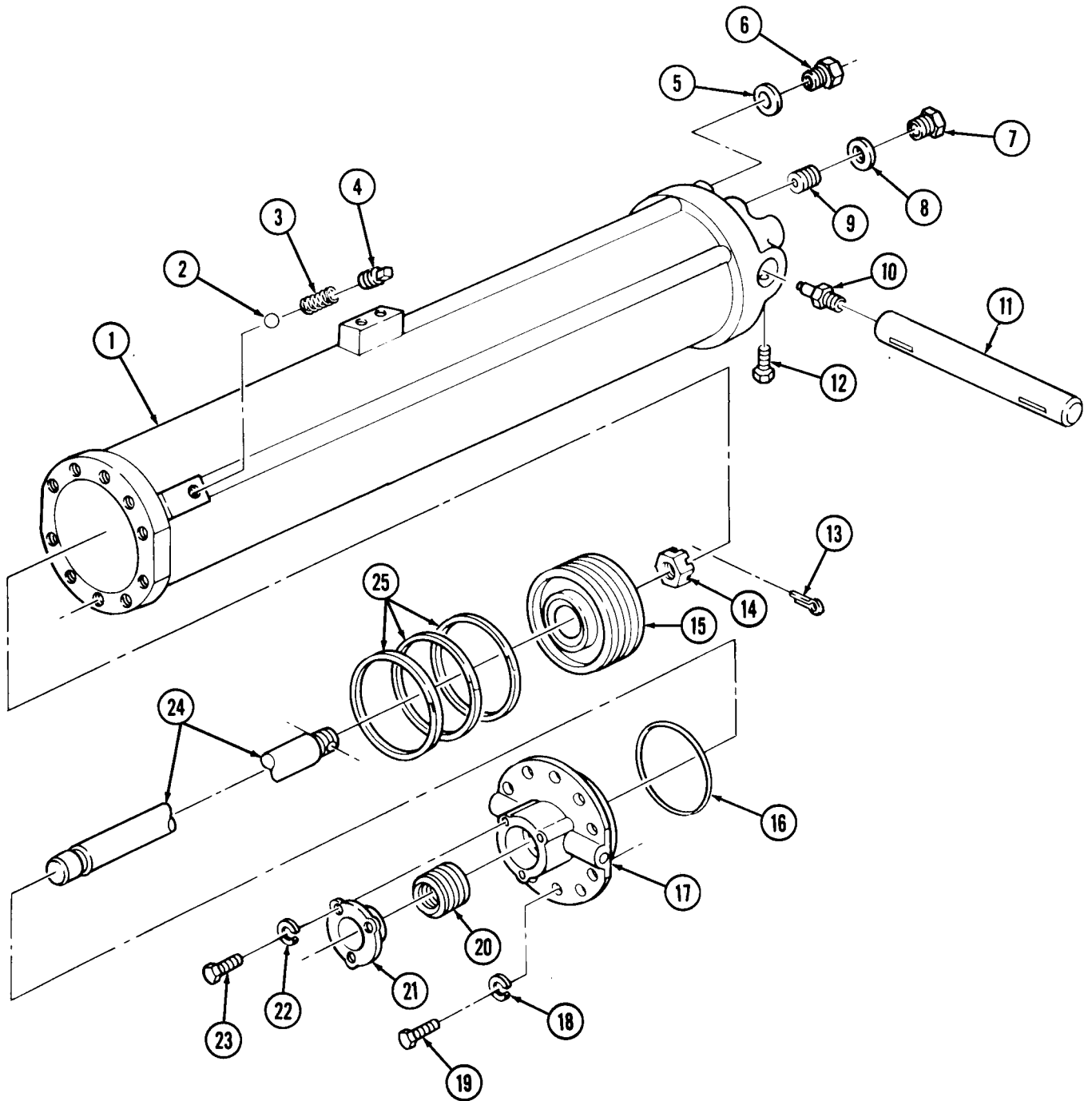
1. Install piston (15) on piston rod (24) with nut (14) and new cotter pin (13).

NOTE

When installing piston rings, piston ring gaps must be 90° from each other.

2. Install three new piston rings (25) on piston (15). Ensure gaps of piston rings (25) are 90° apart from each other.
3. Install piston (15) and piston rod (24) in hydraulic cylinder (1).
4. Install new O-ring (16) and head (17) on hydraulic cylinder (1) with ten new lockwashers (18) and screws (19).
5. Install new packing (20) and gland (21) on head (17) with three new lockwashers (22) and screws (23). Tighten screws (23) 8-10 lb-ft (11-14 N.m).
6. Install fitting (10) in pin (11).
7. Install pin (11) in hydraulic cylinder (1) with two setscrews (12).
8. Install fluid restrictor (9), new spacer ring (8), and plug (7) in hydraulic cylinder (1).
9. Install three balls (2) and springs (3) in hydraulic cylinder (1) with three plugs (4).
10. Install two new spacer rings (5) and adapters (6) in hydraulic cylinder (1).

16-9. HYDRAULIC CYLINDER REPAIR (M342A2) (Contd)



FOLLOW-ON TASK: Install hydraulic cylinder (para. 16-8).

16-10. CONTROL VALVE REPLACEMENT (M342A2)

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS
M342A2

TOOLS
General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS
Fifteen lockwashers (Appendix F, Item 125)
Two gaskets (Appendix F, Item 73)
Gasket (Appendix F, Item 74)

REFERENCES (TM)
TM 9-2320-361-34P

EQUIPMENT CONDITION
•Hydraulic pump removed (para. 16-12).
•Control box removed (para. 16-11).

GENERAL SAFETY INSTRUCTIONS
•Wear eye protection when working with hydraulic hoses.
•Wear eye protection when removing plugs.

WARNING

Wear eye protection when working with hydraulic hoses. Fluid in hoses may be under pressure. Failure to wear eye protection may result in injury to personnel.

CAUTION

Cap or plug all openings immediately after disconnecting lines and hoses to prevent contamination. Remove caps or plugs prior to installation. Failure to do so may result in damage to equipment.

a. Removal

NOTE

- Tag hydraulic lines for installation.
 - Have drainage container ready to catch hydraulic fluid.
1. Disconnect six hydraulic lines (5) from two manifolds (4).
 2. Remove seven screws (6), lockwashers (7), cover (8), gasket (10), valve (3), and gasket (2) from hydraulic tank (9). Discard lockwashers (7) and gaskets (2) and (10).
 3. Remove eight screws (1), lockwashers (13), adapter (12), and gasket (11) from valve (3). Discard lockwashers (13) and gasket (11).
 4. Remove two manifolds (4) from valve (3).

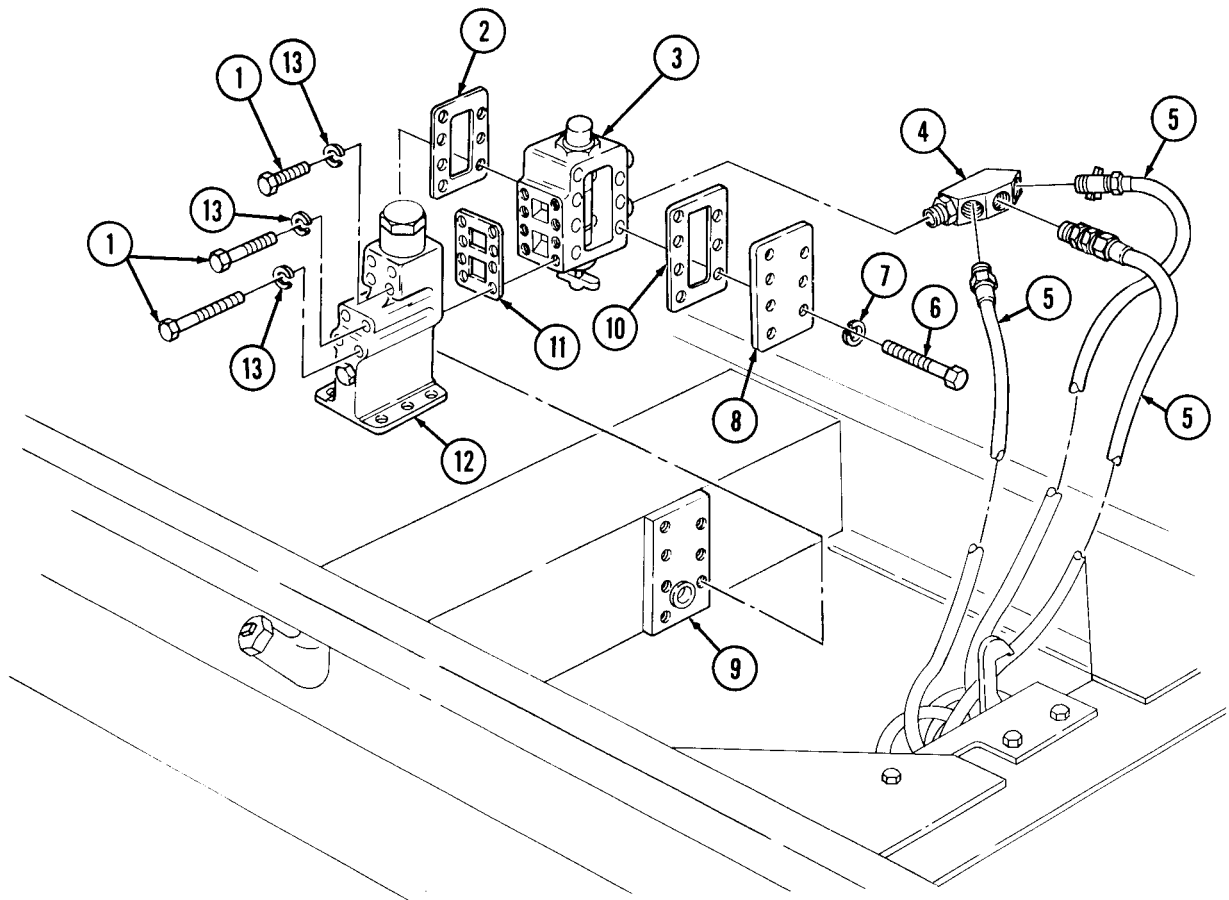
b. Installation

WARNING

Wear eye protection when removing plugs. Plugs are under spring tension and may spring out during removal. Failure to wear eye protection may result in injury to personnel.

1. Install two manifolds (4) on valve (3).
2. Install new gasket (11) and adapter (12) on valve (3) with eight new lockwashers (13) and screws (1).
3. Install new gasket (2) and valve (3) on hydraulic tank (9) with new gasket (10), cover (8), and seven new lockwashers (7) and screws (6).
4. Connect six hydraulic lines (5) on two manifolds (4).

16-10. CONTROL VALVE REPLACEMENT (M342A2) (Contd)



FOLLOW-ON TASKS: . Install control box (para. 16-11).
 . Install hydraulic pump (para. 16-12).

16-11. CONTROL BOX REPLACEMENT (M342A2)
--

THIS TASK COVERS:**a. Removal****b. Installation**INITIAL SETUPAPPLICABLE MODELS

M342A2

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Two cotter pins (Appendix F, Item 6)
Two lockwashers (Appendix F, Item 125)
Two lockwashers (Appendix F, Item 131)
Four woodruff keys (Appendix F, Item 294)
Two screw-assembled lockwashers
(Appendix F, Item 159)

REFERENCES (TM)

TM 9-2320-361-10
TM 9-2320-361-34P

EQUIPMENT CONDITION

Parking brake set (TM 9-2320-361-10).

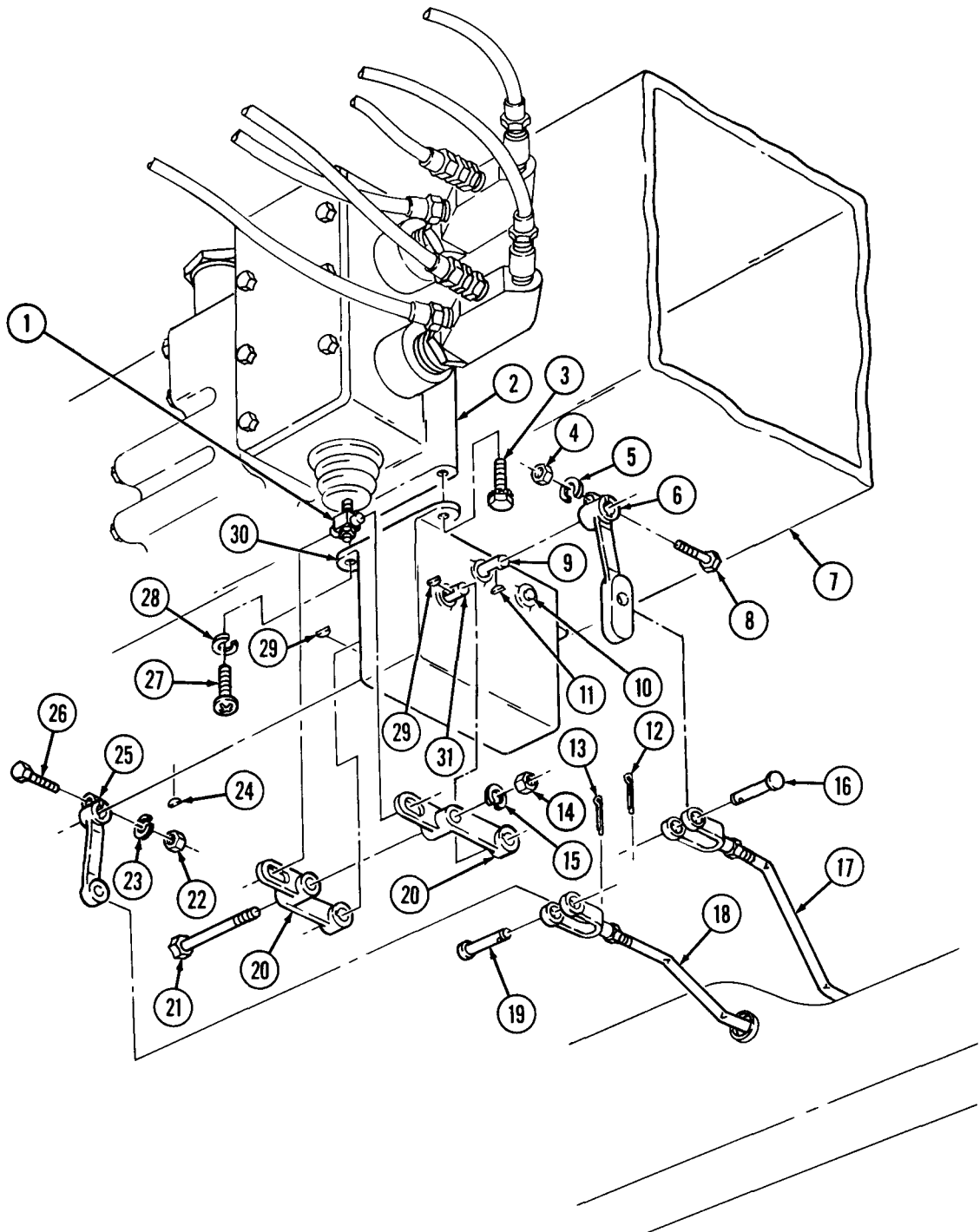
a. Removal

1. Remove cotter pin (12), pin (16), and control rod (17) from control rod lever (6). Discard cotter pin (12).
2. Remove cotter pin (13), pin (19), and control rod (18) from power takeoff lever (25). Discard cotter pin (13).
3. Remove nut (14), lockwasher (15), screw (21), two lever halves (20), and woodruff keys (29) from camshaft (31) and valve block (1). Discard lockwasher (15) and woodruff keys (29).
4. Remove two screw-assembled lockwashers (3), screw (27), lockwasher (28), and control box (30) from control valve (2) and hydraulic reservoir (7). Discard screw-assembled lockwashers (3) and lockwasher (28).
5. Remove nut(4), lockwasher (5), screw (8), control rod lever (6), and woodruff key (11) from shaft (9). Discard lockwasher (5) and woodruff key (11).
6. Remove nut (22), lockwasher (23), screw (26), power takeoff lever (25) and woodruff key (24) from shaft (10). Discard lockwasher (23) and woodruff key (24).

b. Installation

1. Install new woodruff key (24) and power takeoff lever (25) on shaft (10) with screw (26), new lockwasher (23), and nut (22).
2. Install new woodruff key (11) and control rod lever (6) on shaft (9) with screw (8), new lockwasher (5), and nut (4).
3. Install control box (30) on hydraulic reservoir (7) and control valve (2) with two new screw-assembled lockwashers (3), new lockwasher (28), and screw (27).
4. Install two new woodruff keys (29) and control lever halves (20) on valve block (1) and camshaft (31) with screw (21), new lockwasher (15), and nut (14).
5. Install control rod (18) on power takeoff lever (25) with pin (19) and new cotter pin (13).
6. Install control rod (17) on control rod lever (6) with pin (19) and new cotter pin (12).

16-11 .CONTROL BOX REPLACEMENT (M342A2)(Contd)



16-12. HYDRAULIC PUMP REPLACEMENT (M342A2)

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M342A2

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Twelve lockwashers (Appendix F, Item 138)
Two gaskets (Appendix F, Item 75)

REFERENCES (TM)

TM 9-2320-361-20
TM 9-2320-361-34P
LO 9-2320-209-12-1

EQUIPMENT CONDITION

- . Hydraulic reservoir drained (LO 9-2320-209-12-1).
- Hydraulic hoist propeller shaft removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- Wear eye protection when working with hydraulic hoses.
- Wear eye protection when removing plugs.

a. Removal

WARNING

Wear eye protection when working with hydraulic hoses. Fluid in hoses may be under pressure. Failure to wear eye protection may result in injury to personnel.

NOTE

- . Have drainage container ready to catch hydraulic fluid.
- Assistant will help with step 1.

1. Remove six screws (7), lockwashers (6), pump (5), and gasket (4) from spacer (3). Discard lockwashers (6) and gasket (4).
2. Remove six screws (9), lockwashers (8), spacer (3), and gasket (2) from adapter (1). Discard gasket (2) and lockwashers (8).

b. Installation

WARNING

Wear eye protection when removing plugs. Plugs are under spring tension and may spring out during removal. Failure to wear eye protection may result in injury to personnel.

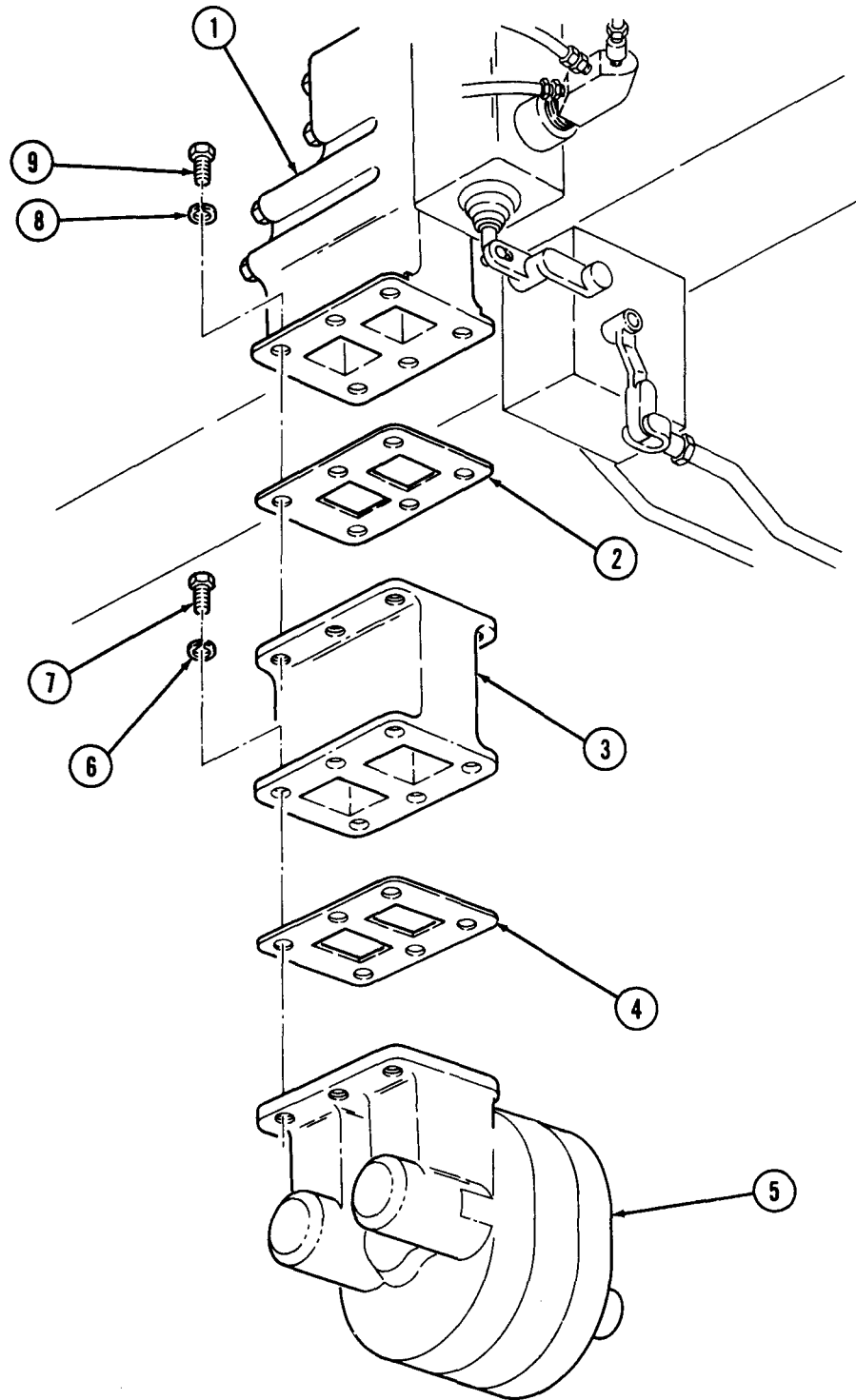
1. Install new gasket (2) and spacer (3) on adapter (1) with six new lockwashers (8) and screws (9).

NOTE

Assistant will help with step 2.

2. Install new gasket (4) and pump (5) on spacer (3) with six new lockwashers (6) and screws (7).

16-12. HYDRAULIC PUMP REPLACEMENT (M342A2) (Contd)



FOLLOW-ON TASKS: • Install hydraulic hoist propeller shaft (TM 9-2320-361-20).
 • Replace hydraulic oil to required level (LO 9-2320-209-12-1).

16-13. HYDRAULIC SAFETY LATCH REPLACEMENT (M342A2)

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M342A2

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Five locknuts (Appendix F, Item 98)
Two cotter pins (Appendix F, Item 21)
Cotter pin (Appendix F, Item 18)

REFERENCES (TM)

LO 9-2320-209-12-1
TM 9-2320-361-10
TM 9-2320-361-34P

EQUIPMENT CONDITION

Parking brake set (TM 9-2320-361-10).

GENERAL SAFETY INSTRUCTIONS

- Position safety braces before working under raised dump body.
- All personnel must stand clear during lifting operations.
- Wear eye protection when working with hydraulic hoses.

a. Removal

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

1. Secure chain to dump body (1) and lifting device.

WARNING

Never work under dump body until safety braces are properly positioned. Injury to personnel may occur if dump body suddenly lowers.

2. Raise dump body (1) and position two safety braces (2).
3. Remove chain from dump body (1) and lifting device.

WARNING

Wear eye protection when working with hydraulic hoses. Fluid in hoses may be under pressure. Failure to wear eye protection may result in injury to personnel.

4. Disconnect two hydraulic lines (4) from hydraulic cylinders (3).
5. Remove four locknuts (11), washers (10), screws (6), locknut (8), screw (7), and bracket (5) from sub-frame (9). Discard locknuts (8) and (11).
6. Remove two cotter pins (16), washers (15), pins (14), four washers (13), and latch cylinder (17) from bracket (5) and latch (22). Discard cotter pins (16).
7. Remove cotter pin (20), washer (19), latch (22), pin (12), and spring (23) horn bracket (5). Discard cotter pin (20).
8. Remove two grease fittings (18) and (21) from latch (22).

b. Installation

1. Install two grease fittings (18) and (21) in latch (22).
2. Install spring (23) on bracket (5) with pin (12), latch (22), washer (19), and new cotter pin (20).
3. Install latch cylinder (17) on bracket (5) and latch (22) with four washers (13), two pins (14), washers (15), and new cotter pins (16).

16-13. HYDRAULIC SAFETY LATCH REPLACEMENT (M342A2) (Contd)

- 4 Install bracket (5) on subframe (9) with four screws (6), washers (10), new locknuts (11), screw (7), and new locknut (8).
5. Secure chain to dump body (1) and lifting device.

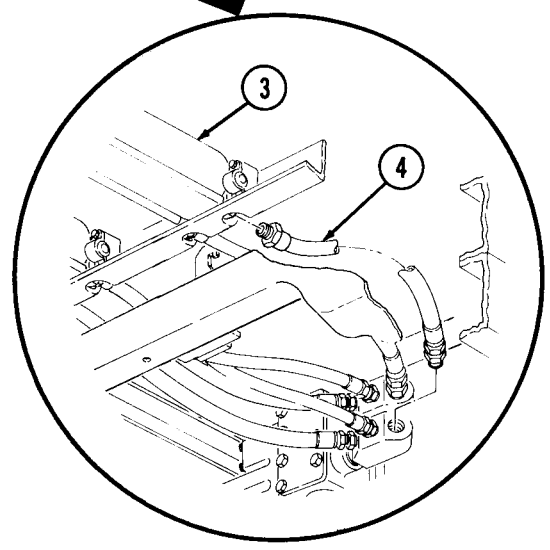
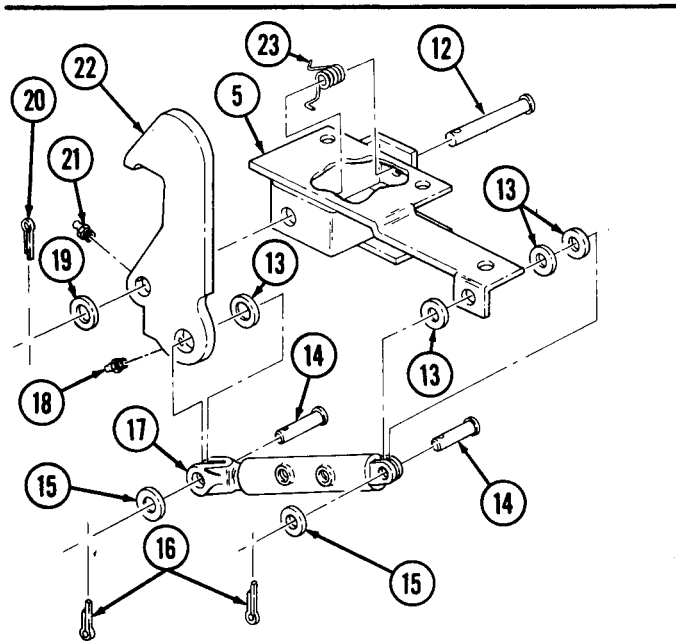
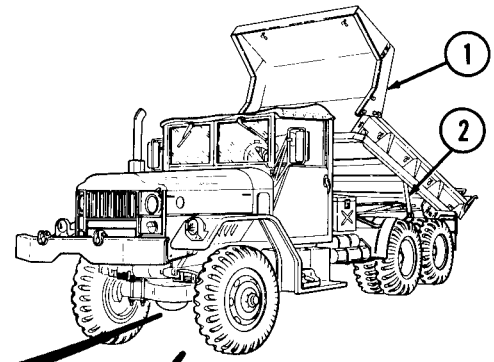
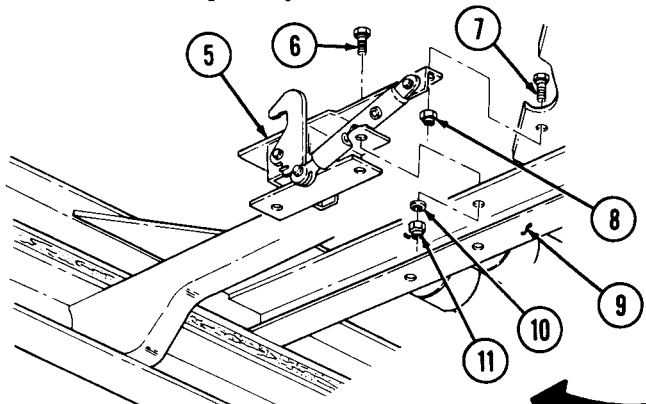
WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

NOTE

Assistant will help with lifting operations.

6. Connect two hydraulic lines (4) to hydraulic cylinders (3).
7. Raise dump body (1) and lower two safety braces (2).
8. Lower dump body (1) and remove chain from dump body (1).



- FOLLOW-ON TASKS:**
- . Lubricate latch grease fittings (LO 9-2320-209-12-1).
 - . Fill hydraulic reservoir to proper level (LO 9-2320-209-12-1).
 - Start engine (TM 9-2320-361-10), check for leaks.

16-14. DUMP BODY SUBFRAME MAINTENANCE

THIS TASK COVERS:

- a. Removal**
- b. Inspection**

c. Installation

INITIAL SETUP

APPLICABLE MODELS

M342A2

TOOLS

- 1-1/8-in. socket, 3/4-in. dr. (Appendix B, Item 33)
- 1-1/4-in. socket, 3/4-in. dr. (Appendix B, Item 37)
- Torque wrench, 3/4-in. dr. (Appendix B, Item 6)
- Handle, socket wrench, 3/4-in. dr. (Appendix B, Item 35)
- Lifting device
- Sling

MATERIALS/PARTS

- Six locknuts (Appendix F, Item 105)
- Four locknuts (Appendix F, Item 107)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

- TM 9-2320-361-10
- TM 9-2320-361-20
- TM 9-2320-361-34P

EQUIPMENT CONDITION

- Parking brake set (TM 9-2320-361-10).
- Hydraulic pump propeller shaft removed (TM 9-2320-361-20).
- Splash guards removed (TM 9-2320-361-20).
- Dump body removed (para. 15-3).

GENERAL SAFETY INSTRUCTIONS

All personnel must stand clear during lifting operations.

a. Removal

1. Remove six locknuts (5) and screws (7) from two subframe brackets (4) and frame (6). Discard locknuts (5).
2. Remove four locknuts (11), washers (12), screws (9), eight keepers (13) and, springs (14), and eight keepers (13) from two subframe brackets (1) and frame brackets (8). Discard locknuts (11).
3. Attach two chains to subframe channels (2). Attach lifting device to center two chains and remove slack from chains.
4. Attach two guide lines to front and rear of subframe (3).

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury to personnel.

NOTE

Assistant will help guide subframe during lifting operations.

5. Lift subframe (3) clear of frame sill (10) and frame (6) and place on wooden supports.
6. Disconnect lifting device from two chains.
7. Remove two chains from subframe channels (2).
8. Disconnect two guide lines from front and rear of subframe (3).

NOTE

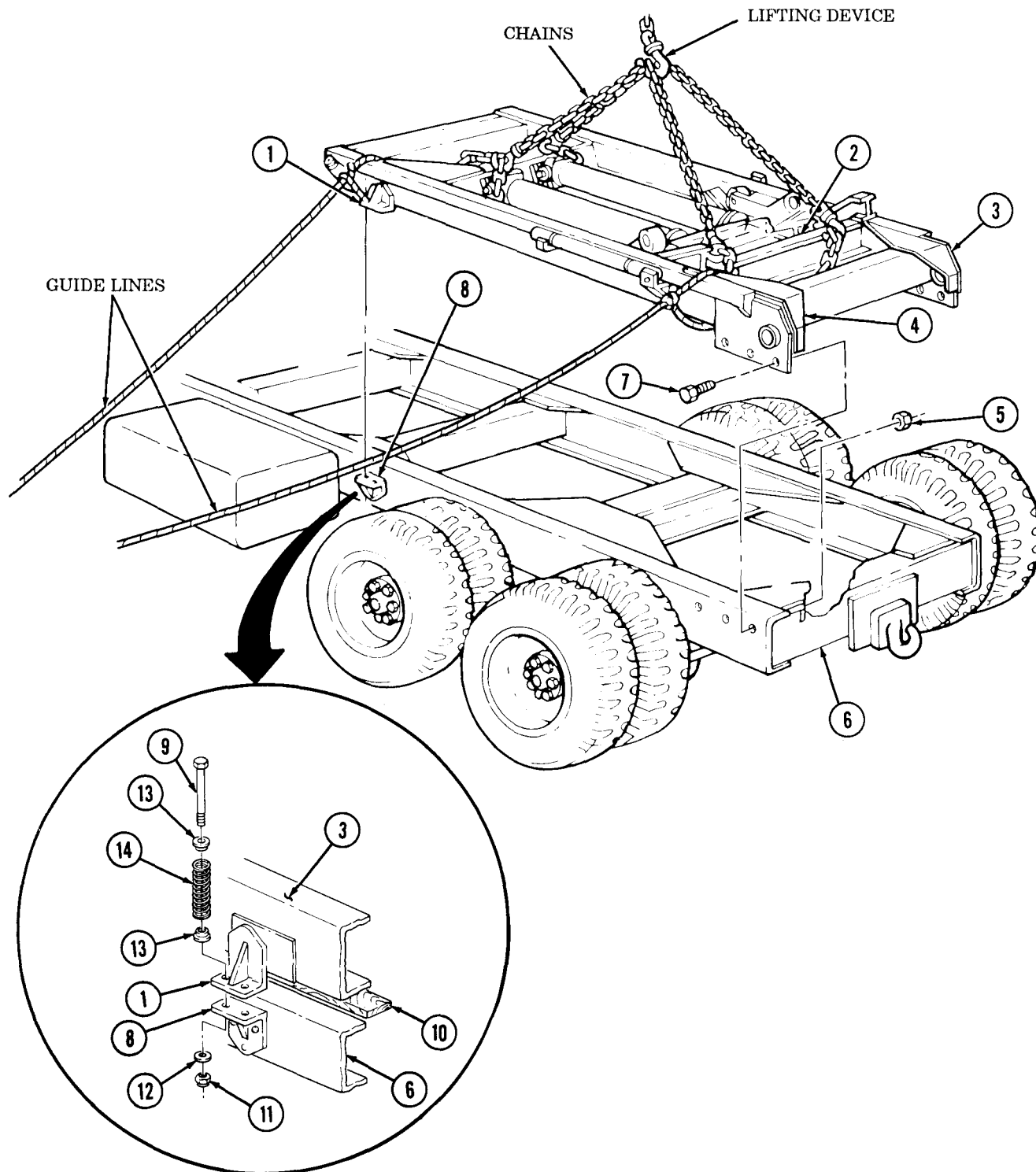
Perform steps 9 through 11 if replacing subframe with new subframe.

9. Remove control valve (para. 16-10).
10. Remove hydraulic cylinders (para. 16-8).
11. Remove hydraulic safety latch (para. 16-13).

16-14. DUMP BODY SUBFRAME MAINTENANCE (Contd)

b. Inspection

Inspect frame sill (10) and subframe channels (2) for splinters, warp, and excessive rotting. Replace if splinted, warped, or excessively rotted.



16-14. DUMP BODY SUBFRAME MAINTENANCE (Contd)

c. Installation

NOTE

Perform steps 1 through 3 if installing new subframe.

1. Install hydraulic safety latch (para. 16-13).
2. Install hydraulic cylinders (para. 16-8).
3. Install control valve (para. 16-10).
4. Attach two chains to subframe channels (2).
5. Attach lifting device to center of two chains.
6. Attach two guide lines to front and rear of subframe (3).

WARNING

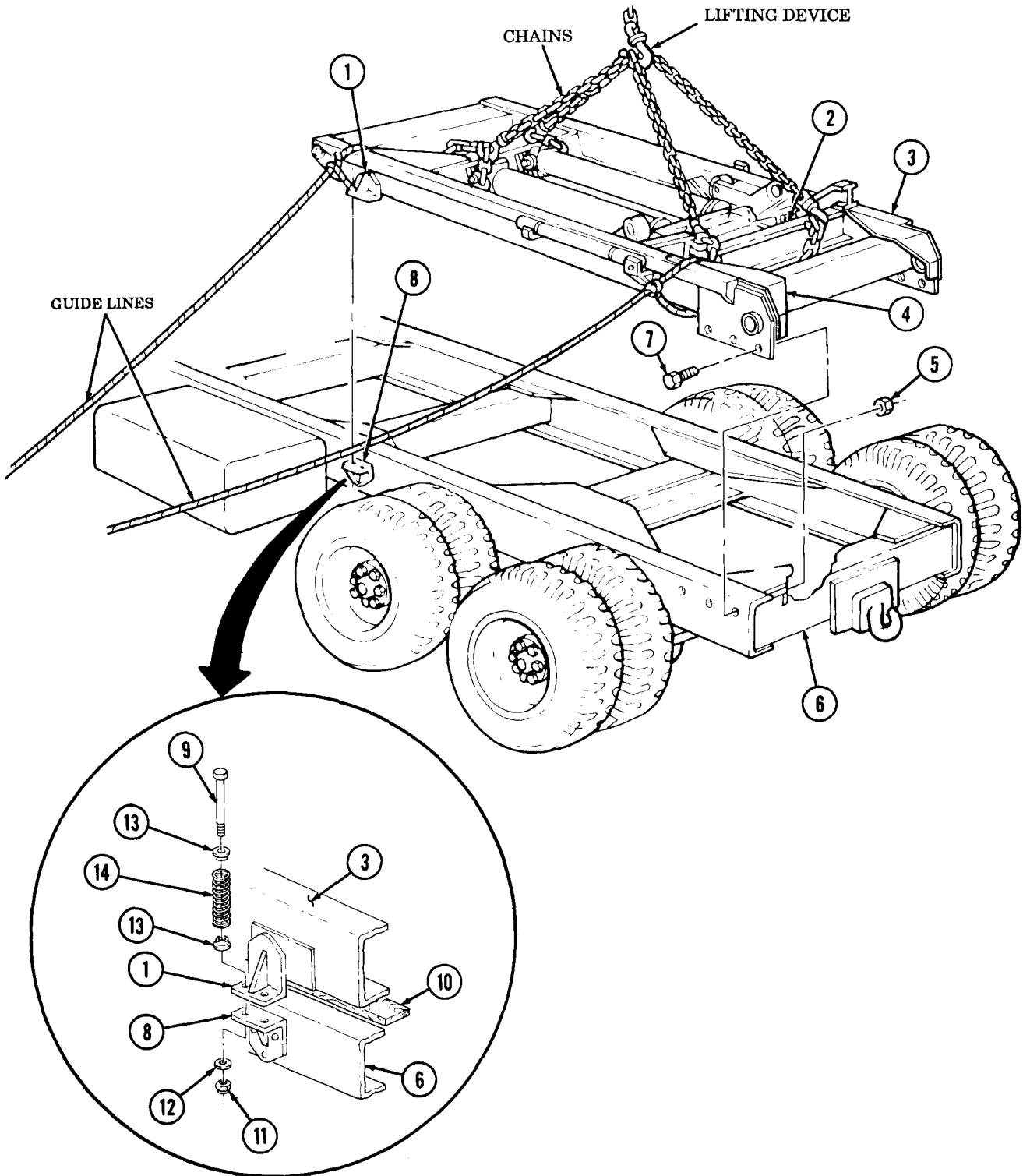
All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

NOTE

Assistant will help guide subframe during lifting operations.

7. Lift subframe (3) clear of wooden supports.
8. Lower subframe (3) on frame sill (10) and frame (6) with brackets (1) and (8) alined.
9. Install two subframe brackets (4) on frame (6) with six screws (7) and new locknuts (5).
10. Install two subframe brackets (1) to frame brackets (8) with four screws (9), four keepers (13), four springs (14), keepers (13), washers (12), and new locknuts (11).
11. Remove lifting device from two chains. Remove two chains from subframe channels (2).
12. Remove two guide lines from front and rear of subframe (3).

16-14. DUMP BODY SUBFRAME MAINTENANCE (Contd)



- FOLLOW-ON TASKS: . Install dump body (para. 15-5).
- Install hydraulic pump propeller shaft (TM 9-2320-361-20).
 - Install splash guards (TM 9-2320-361-20).

16-15. POWER DIVIDER REPLACEMENT (M764)

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit (Appendix B, Item 1)
 1-1/8-in. socket, 1/2-in. dr. (Appendix B, Item 10)
 1-3/4-in. socket, 1-in. dr. (Appendix B, Item 42)
 Handle, socket wrench, 1-in. dr.
 (Appendix B, Item 43)
 Transmission and differential lift

MATERIALS/PARTS

Two cotter pins (Appendix F, Item 19)
 Cotter pin (Appendix F, Item 10)
 Four lockwashers (Appendix F, Item 140)

PERSONNEL REQUIRED

Two

REFERENCES (TM)

LO 9-2320-209-12-1
 TM 9-214
 TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

- . Power divider drained (LO 9-2320-209-12-1).
- Power divider propeller shaft removed (TM 9-2320-361-20).
- Earth boring machine propeller shaft removed (TM 9-2320-361-20).
- . Air-hydraulic cylinder removed (TM 9-2320-361-20).
- . Power divider drivebelt removed (para. 16-18).

GENERAL SAFETY INSTRUCTIONS

Support power divider during removal and installation.

WARNING

Power divider is heavy. Support power divider during removal and installation. Failure to do so may result in injury to personnel.

a. Removal

1. Remove cotter pin (2), clevis pin (1), and control rod (18) from lever (17). Discard cotter pin (2).

NOTE

Assistant will help with step 2.

2. Remove four screws (11), lockwashers (10), and power divider (4) from two brackets (3). Discard lockwashers (10).
3. Remove cotter pin (13), nut (14), washer (15), and seal (12) from input shaft (16). Discard cotter pin (12).
4. Remove cotter pin (7), nut (6), washer (8), and seal (9) from output shaft (5). Discard cotter pin (7).

b. Installation

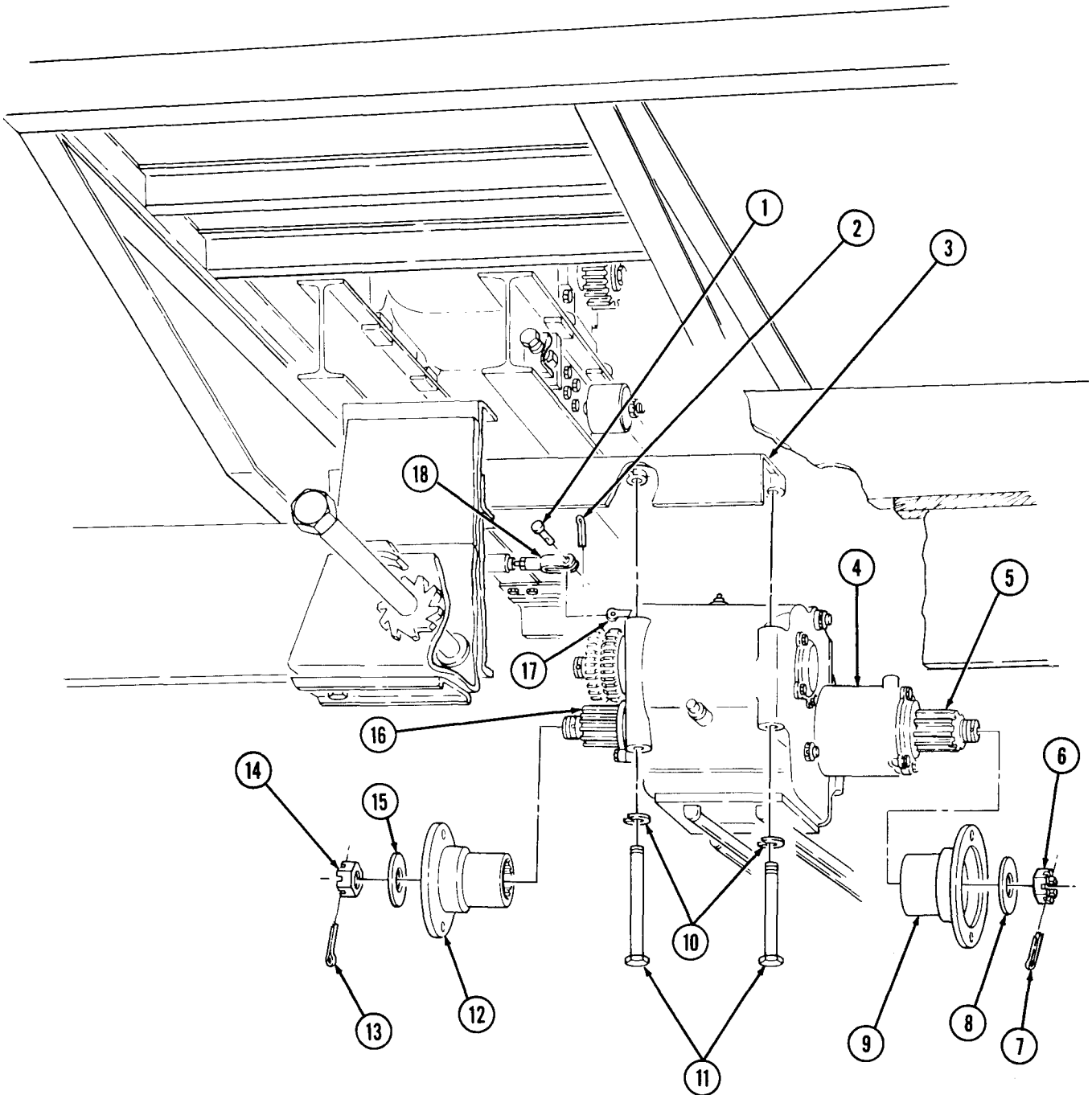
1. Install seal (9) on output shaft (5) with washer (8), nut (6), and new cotter pin (7).
2. Install seal (12) on input shaft (16) with washer (15), nut (14), and new cotter pin (13).

NOTE

Assistant will help with step 3.

3. Install power divider (4) on two brackets (3) with four new lockwashers (10) and screws (11).
4. Install control rod (18) on lever (17) with clevis pin (1) and new cotter pin (2).

16-15. POWER DIVIDER REPLACEMENT (M764) (Contd)



- FOLLOW-ON TASKS: . Install power divider drivebelt (para. 16-18).
- Install air-hydraulic cylinder (TM 9-2320-361-20).
 - Install earth boring machine propeller shaft. (TM 9-2320-361-20).
 - Install power divider propeller shaft (TM 9-2320-361-20).
 - Replace power divider oil to required level (LO 9-2320-209-12-1).

16-16. POWER DIVIDER REPAIR (M764)

THIS TASK COVERS:

- a. Disassembly**
b. Cleaning and Inspection

- c. Assembly**

INITIAL SETUPAPPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 Mechanical puller kit (Appendix B, Item 22)
 Inside micrometer (Appendix B, Item 16)
 Outside micrometer (Appendix B, Item 17)
 Dial indicator (Appendix B, Item 21)

MATERIALS/PARTS

Three cotter pins (Appendix F, Item 20)
 Cotter pin (Appendix F, Item 19)
 Twenty-five lockwashers
 (Appendix F, Item 125)
 Four lockwashers (Appendix F, Item 131)

MATERIALS/PARTS (CONTD)

Lockwasher (Appendix F, Item 140)
 Packing (Appendix F, Item 184)
 Packing (Appendix F, Item 183)
 Three shim sets (Appendix F, Item 260)
 Three seals (Appendix F, Item 232)
 Gasket (Appendix F, Item 76)
 Woodruff key (Appendix F, Item 295)
 Woodruff key (Appendix F, Item 292)

REFERENCES (TM)

TM 9-214
 TM 9-2320-361-34P

EQUIPMENT CONDITION

Power divider removed (para. 16-15).

a. Disassembly

1. Remove breather (1) and bushings (2) and (3) from housing (4).
2. Remove three plugs (48) from housing (4) and cover (50).
3. Remove cotter pin (26), nut (27), washer (25), sprocket (24), and woodruff key (33) from shoulder shaft (34). Discard cotter pin (26) and woodruff key (33).
4. Remove eight screws (5), lockwashers (6), cover (50), gasket (7), and two pins (49) from housing (4). Discard lockwashers (6) and gasket (7).
5. Place shifter fork (45) in third notch of straight rod (10).

NOTE

Measure thickness of shim(s) for assembly.

6. Remove four screws (47), lockwashers (46), cap (43), shim(s) (44), output shaft (41), and gear (35) from input shaft (20) and housing (4). Discard lockwashers (46) and shim(s) (44).
7. Remove bushing (40), bearing (39), spacers (38) and (37), and bearing (36) from output shaft (41).
8. Remove seal (42) from cap (43). Discard seal (42).

NOTE

Measure thickness of shim(s) for assembly.

9. Remove four screws (29), lockwashers (30), cap (31), and shim(s) (32) from housing (4). Discard lockwashers (30) and shim(s) (32).
10. Remove seal (28) from cap (31). Discard seal (28).
11. Remove bushing (22) and input shaft (20) from housing (4).
12. Remove spacer (23) and bearing (21) from input shaft (20).

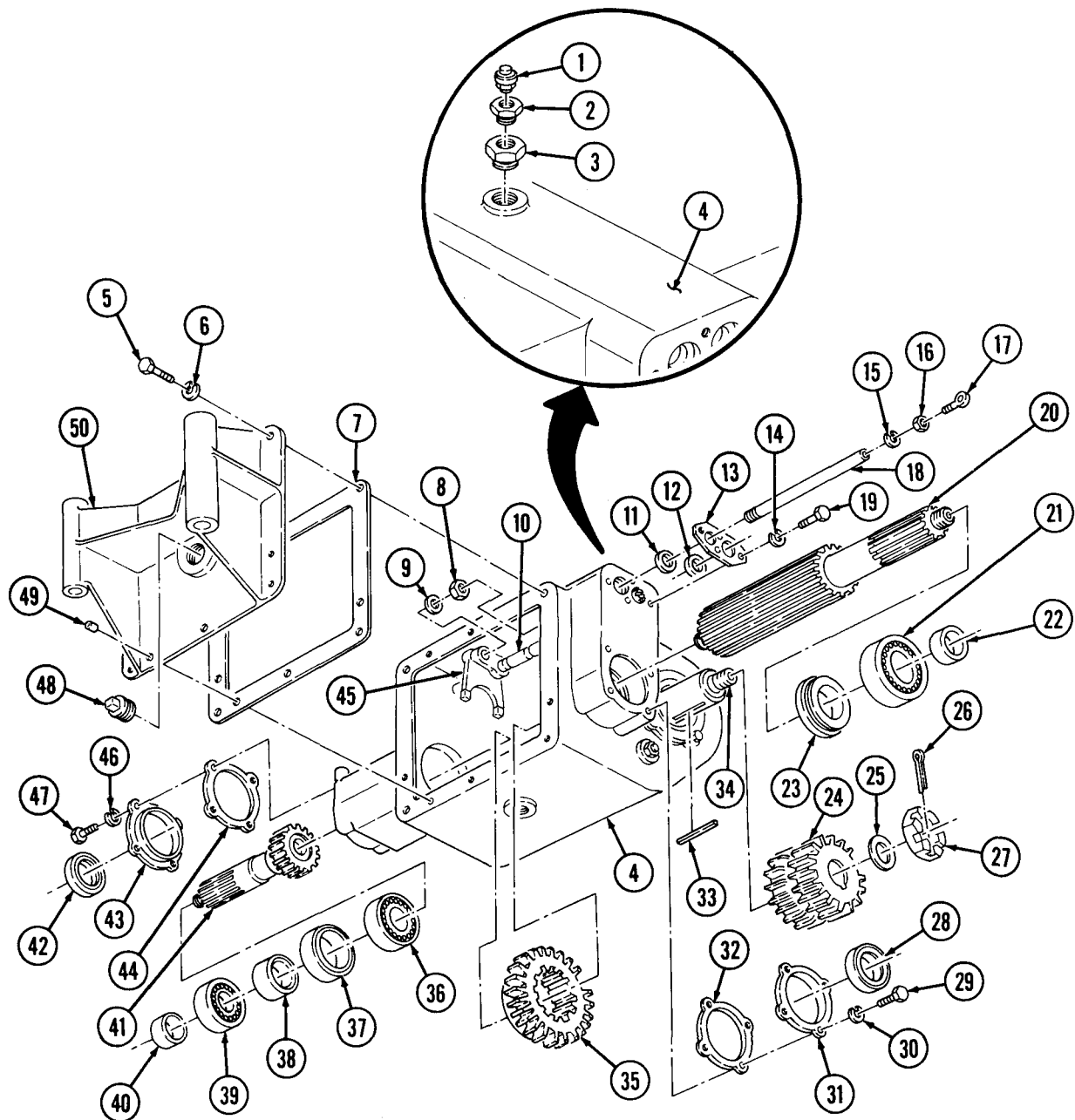
NOTE

Scribe positions of jamnuts on shifter rod and eyebolt for assembly.

13. Loosen jamnuts (8) and (16) on shifter rod (18) and eyebolt (17).

16-16. POWER DIVIDER REPAIR (M764) (Contd)

14. Remove shifter rod (18) from shifter fork (45).
15. Remove lockwasher (9) and jamnut (8) from shifter rod (18). Discard lockwasher (9).
16. Remove eyebolt (17), jamnut (16), and lockwasher (15) from shifter rod (18). Discard lockwasher (15).
17. Remove jamnut (16) from eyebolt (17).
18. Remove four screws (19), lockwashers (14), and packing plate (13) from housing (4). Discard lockwashers (14).
19. Remove packings (11) and (12) from packing plate (13). Discard packings (11) and (12).



16-16. POWER DIVIDER REPAIR (M764) (Contd)

NOTE

- Spring and detent will come out of shifter fork when shifter rod is removed.
- Scribe position of straight rod for assembly.

20. Remove nut (30), straight rod (3), shifter fork (1), spring (32), and detent (31) from housing (2).
21. Remove two cotter pins (12) and nuts (13) from idler shaft (14). Discard cotter pins (12).
22. Remove idler shaft (14) and gear (21) from housing (2).
23. Remove two washers (15), spacer (20), bearing (19), spacers (18) and (17), and bearing (16) from gear (21).
24. Remove four screws (24), lockwashers (23), and cap (22) from housing (2). Discard lockwashers (23).

NOTE

Measure thickness of shim(s) for assembly.

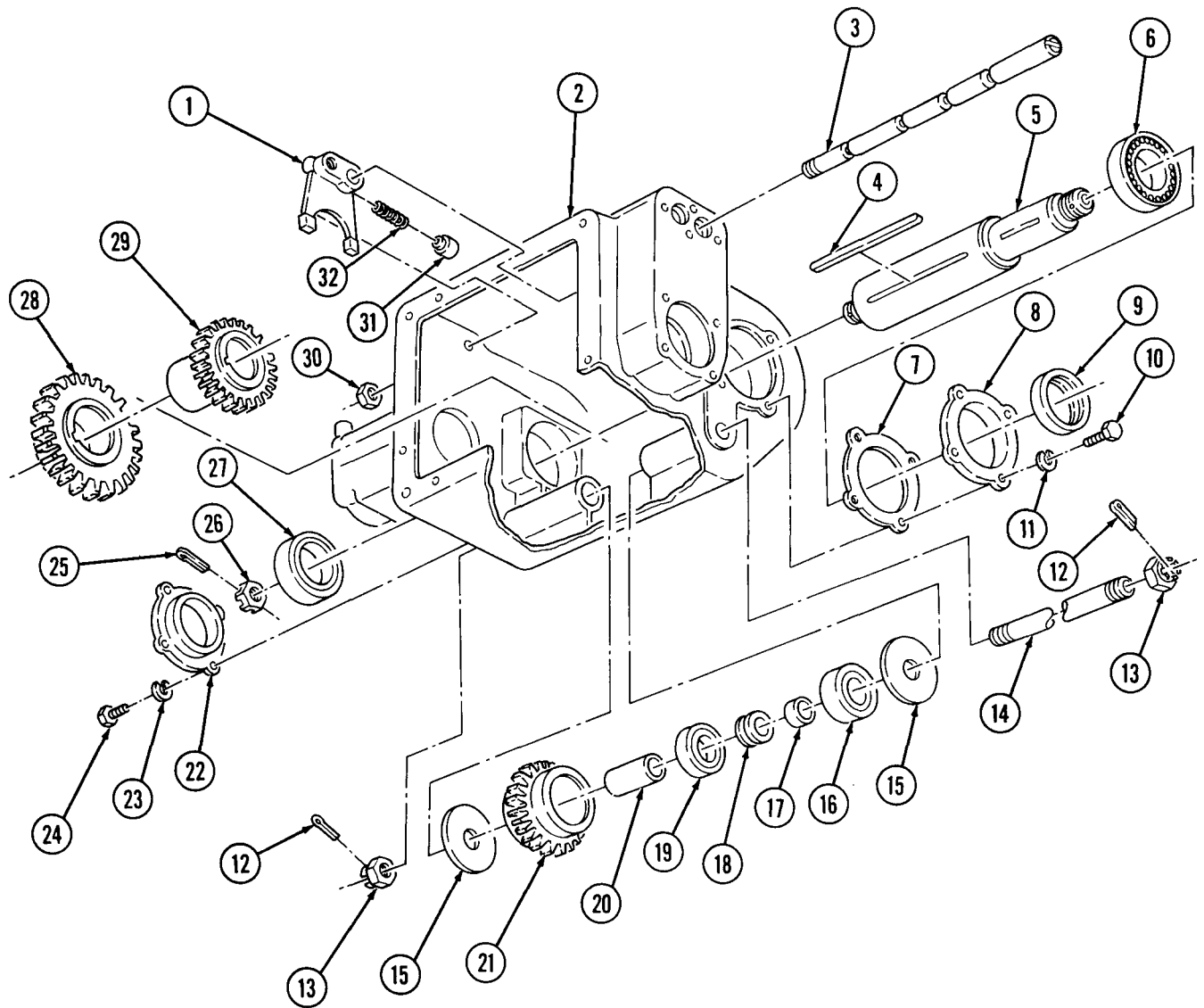
25. Remove four screws (10), lockwashers (11), cap (8), and shim(s) (7) from housing (2). Discard lockwashers (11) and shim(s) (7).
26. Remove seal (9) from cap (8). Discard seal (9).
27. Remove cotter pin (25) and nut (26) from shoulder shaft (5). Discard cotter pin (25).

CAUTION

Excessive tapping may damage threads of shoulder shaft.

28. Tap shoulder shaft (5) and bearing (6) out of housing (2) and remove gears (28) and (29) from housing (2).
29. Remove bearing (27) from housing (2).
30. Remove bearing (6) and woodruff key (4) from shoulder shaft (5). Discard woodruff key (4).

16-16. POWER DIVIDER REPAIR (M764) (Contd)



16-16. POWER DIVIDER REPAIR(M764) (Contd)

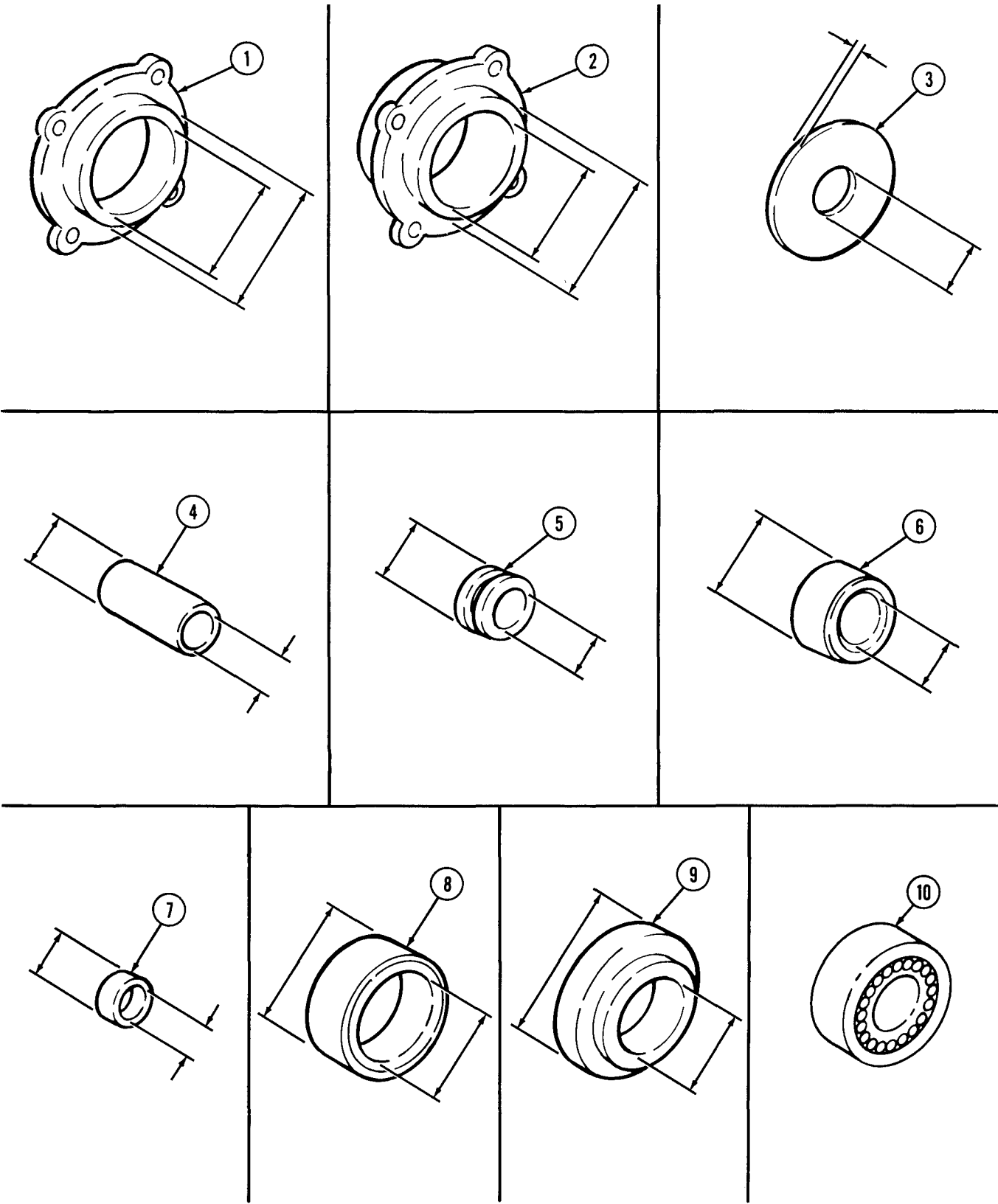
b. Cleaning and Inspection

1. For general cleaning instructions, refer to para. 2-8.
2. For general inspection instructions, refer to para. 2-9.
3. Inspect two caps (1) and cap (2) for cracks, breaks, and wear. Refer to table 16-5, Power Divider Wear Limits, for measurements. Replace caps (1) or (2) if damaged or worn past limits.
4. Inspect two washers (3) for cracks, bends, and thickness. Refer to table 16-5, Power Divider Wear Limits, for measurements. Replace washers (3) if damaged or worn past limits.
5. Inspect two bushings (6) for cracks, breaks, and wear. Refer to table 16-5, Power Divider Wear Limits, for measurements. Replace bushings (6) if damaged or worn past limits.
6. Inspect five spacers (4), (5), (7), (8), and (9) for cracks, brakes, and wear. Refer to table 16-5, Power Divider Wear Limits, for measurements. Replace spacers (4), (5), (7), (8), or (9) if damaged or worn past limits.
7. Inspect bearing (10) (TM 9-214). Replace bearing (10) if worn or damaged.

Table 16-5. Power Divider Wear Limits.

ITEM NO.	ITEM/POINT OF MEASUREMENT	WEAR LIMITS/TOLERANCES	
		INCHES	CENTIMETERS
1	Cap:		
	Inner diameter	2.999-3.001	7.617-7.623
	Outer diameter	3.342-3.345	8.489-8.496
2	Cap:		
	Inner diameter	2.75	6.985
	Outer diameter	3.328	8.453
3	Washer:		
	Thickness	0.120-0.125	0.305-0.318
	Inner diameter	0.982-0.984	2.494-2.499
4	Spacer:		
	Inner diameter	0.751-0.753	1.908-1.913
	Outer diameter	0.984-0.986	2.499-2.504
5	Spacer:		
	Inner diameter	1.50	3.81
	Outer diameter	2.031	5.159
6	Bushing:		
	Inner diameter	1.796	4.562
	Outer diameter	2.187	5.555
7	Spacer:		
	Inner diameter	1.000-1.015	2.54-2.578
	Outer diameter	1.25	3.175
8	Spacer:		
	Inner diameter	1.796	4.562
	Outer diameter	2.187	5.555
9	Spacer:		
	Inner diameter	1.775-1.785	4.509-4.534
	Outer diameter	2.75	6.985

16-16. POWER DIVIDER REPAIR (M764) (Contd)



16-16. POWER DIVIDER REPAIR (M764) (Contd)

c. Assembly

1. Press bearing (6) and install new woodruff key (4) on shoulder shaft (5).
2. Install gears (28) and (29) in housing (2) with shoulder shaft (5).
3. Press bearing (27) in housing (2).
4. Install nut (26) and new cotter pin (25) on shoulder shaft (5).
5. Install cap (22) on housing (2) with four new lockwashers (23) and screws (24).

NOTE

Step 6 establishes shim pack starting thickness.

6. Place cap (8) on housing (2) and measure distance between cap (8) and housing (2).
7. Remove cap (8) from housing (2) and install new seal (9) in cap (8).

NOTE

Use measurement obtained in step 6 plus a 0.015 in. (0.381 mm) shim for starting shim pack thickness.

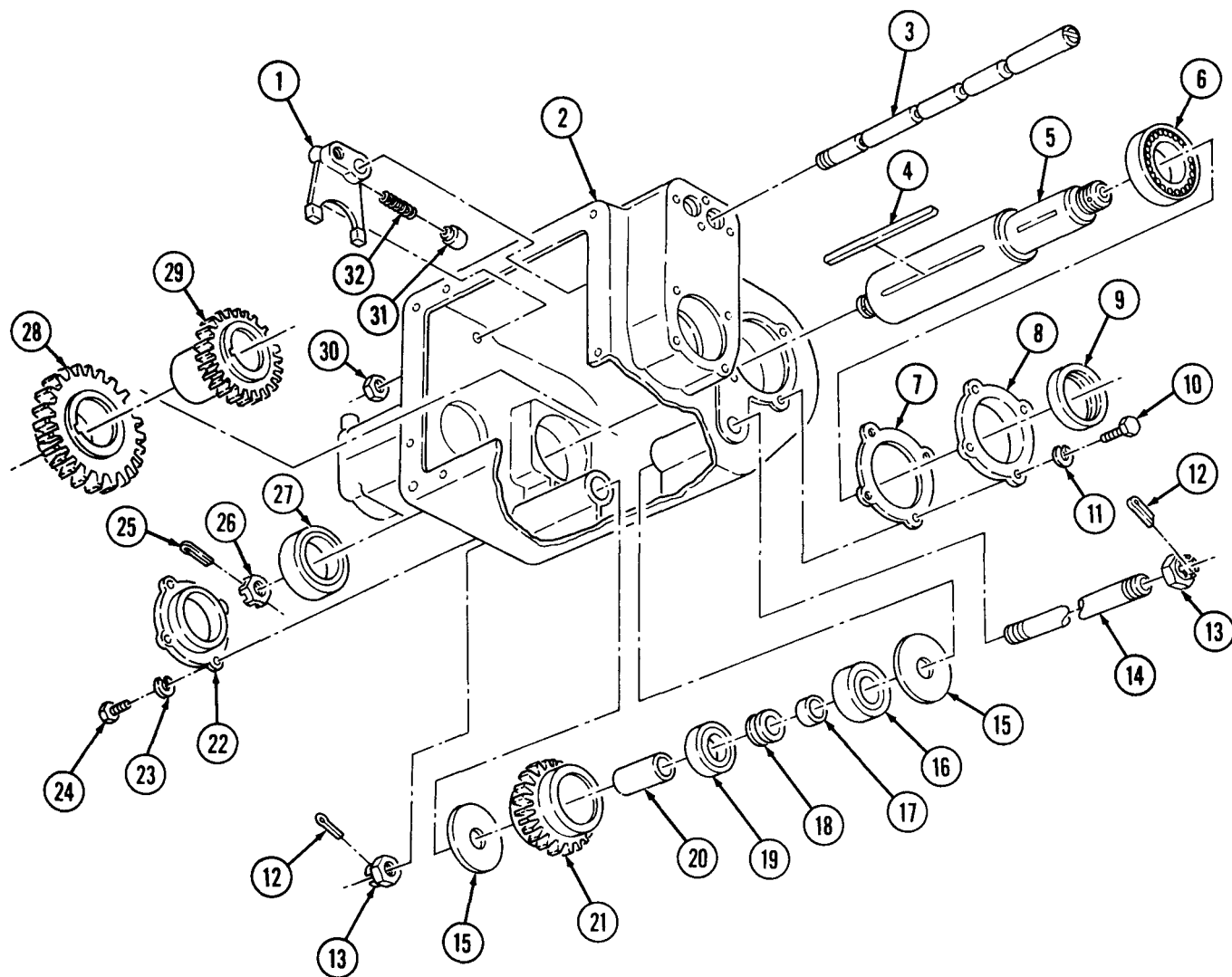
8. Install new shim(s) (7) and cap (8) on housing (2) with four new lockwashers (11) and screws (10).
9. Install bearing (16), spacer (20), bearing (19), spacers (18) and (17), and two washers (15) on gear (21).
10. Install gear (21) in housing (2) with idler shaft (14).
11. Install two nuts (13) and new cotter pins (12) on idler shaft (14).
12. Install spring (32) and detent (31) in shifter fork (1).

NOTE

Detent may spring out of shifter fork during assembly.

13. Install shifter fork (1) in housing (2) with straight rod (3).
14. Install nut (30) on straight rod (3).

16-16. POWER DIVIDER REPAIR (M764) (Contd)



16-16. POWER DIVIDER REPAIR (M764) (Contd)

15. Install two new packings (8) and (9) on straight rod (7) and housing (27).
16. Install plate (10) on housing (27) with four new lockwashers (16) and screws (15).
17. Install jamnut (13) on eyebolt (14).

NOTE

Prior to tightening jamnut, align eyebolt with scribe mark.

18. Install new lockwasher (12) and eyebolt (14) on shifter rod (11) and tighten jamnut (13).

NOTE

Prior to tightening jamnut, align shifter rod with scribe mark.

19. Position shifter rod (11) through new packing (9) and install jamnut (4) on shifter rod (11) and install new lockwasher (5) and shifter rod (11) on shifter fork (6).
20. Install spacer (20) and bearing (19) on input shaft (17).
21. Position gear (26) in shifter fork (6) and install input shaft (17) through gear (26) and housing (27).

NOTE

Step 22 establishes shim pack starting thickness.

22. Place cap (22) on housing (27) and measure distance between cap (22) and housing (27).
23. Remove cap (22) from housing (27) and install new seal (23) in cap (22).

NOTE

Use measurement obtained in step 22 plus a 0.015 in. (0.381 mm) shim for starting shim pack thickness.

24. Install spacer (18) on input shaft (17). Install shim(s) (21) and cap (22) on housing (27) with four new lockwashers (25) and screws (24).
25. Install bearing (28), spacers (29) and (30), bearing (31), and spacer (32) on output shaft (33).
26. Install output shaft (33) in housing (27) and input shaft (17).

NOTE

Step 27 establishes shim pack starting thickness.

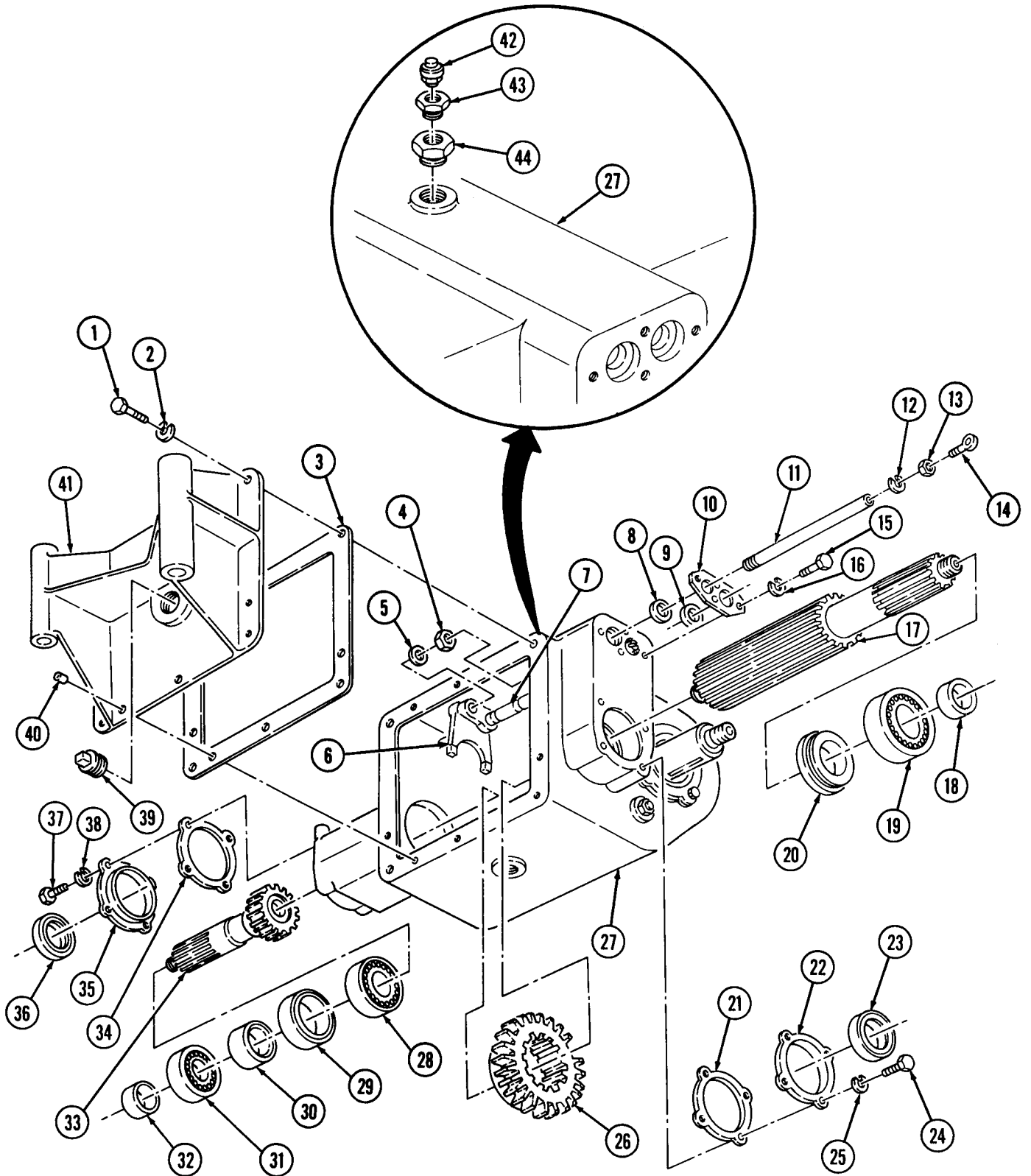
27. Place cap (35) on housing (27) and measure distance between cap (35) and housing (27).
28. Remove cap (35) from housing (27) and install new seal (36) in cap (35).

NOTE

Use measurement obtained in step 27 plus a 0.015 in. (0.381 mm) shim for starting shim pack thickness.

29. Install new shim(s) (34) and cap (35) on housing (27) with four new lockwashers (38) and screws (37).
30. Install two pins (40), new gasket (3), and cover (41) on housing (27) with eight new lockwashers (2) and screws (1).
31. Install three plugs (39) in housing (27) and cover (41).
32. Install bushings (44) and (43) and breather (42) on housing (27).

16-16. POWER DIVIDER REPAIR (M764) (Contd)



16-16. POWER DIVIDER REPAIR (M764) (Contd)

33. Install dial indicator on housing (1) and position plunger on end of input shaft (2).
34. Measure and record end play by pulling input shaft (2) back and forth. Proper end play reading is 0.0001-0.005 in. (0.00254-0.127 mm).

NOTE

If end play is correct, go to step 40. If end play is incorrect, go to step 35.

35. Remove dial indicator, four screws (12), lockwashers (11), and cap (10) from input shaft (2) and housing (1). Discard lockwashers (11).
36. If end play is greater than 0.005 in. (0.127 mm), remove a shim (9) or use a thinner shim (9).
37. If end play is less than 0.0001 in. (0.00254 mm), add a shim (9) or use a thicker shim (9).
38. Install cap (10) on housing (1) with four new lockwashers (11) and screws (12).
39. Perform steps 33 and 34. Perform procedure until correct end play is achieved.
40. Reposition dial indicator on housing (1) so that plunger is positioned on the end of output shaft (3).
41. Measure and record end play by pulling output shaft (3) back and forth. Proper end play reading is 0.0001-0.005 in. (0.00254-0.127 mm).

NOTE

If end play is correct, go to step 47. If end play is incorrect, go to step 42.

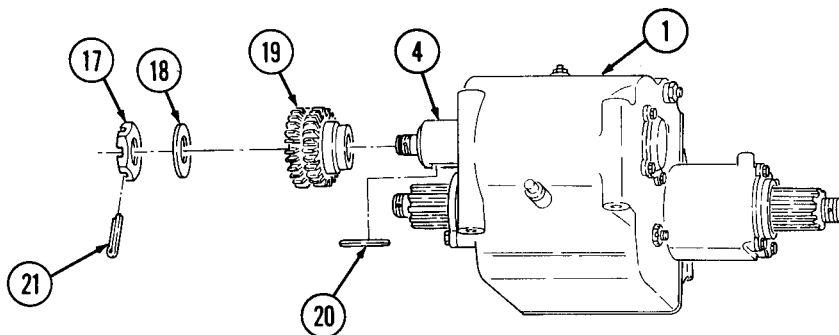
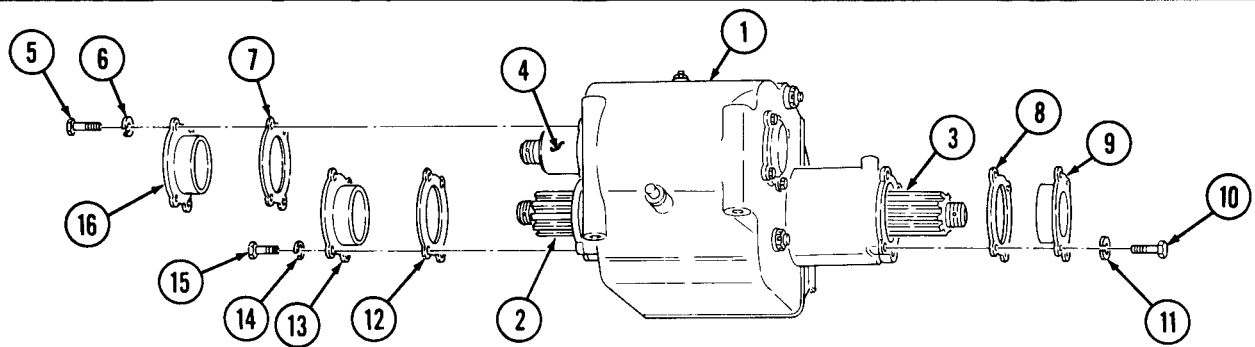
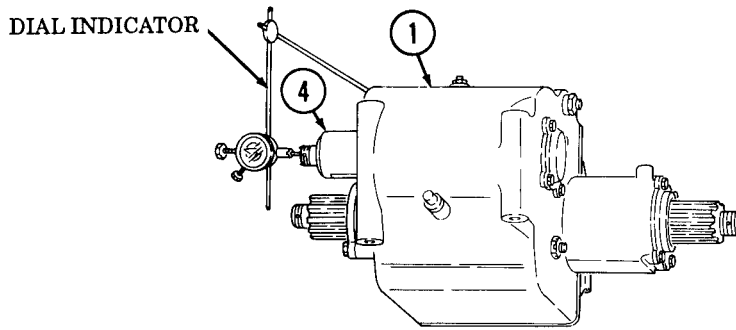
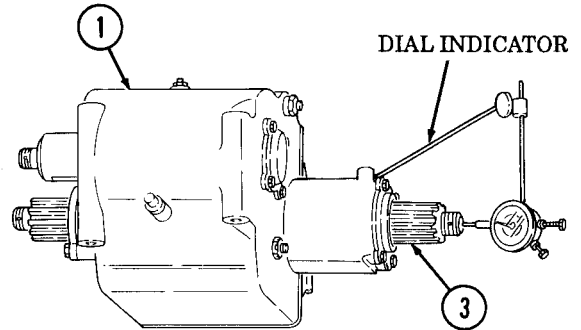
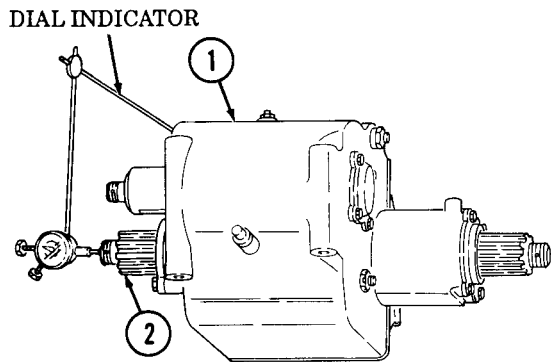
42. Remove dial indicator, four screws (7), lockwashers (8), and cap (6) from housing (1) and output shaft (3). Discard lockwashers (8).
43. If end play is greater than 0.005 in. (0.127 mm), remove a shim (5) or use a thinner shim (5).
44. If end play is less than 0.0001 in. (0.00254 mm), add a shim (5) or use a thicker shim (5).
45. Install cap (6) on housing (1) with four new lockwashers (8) and screws (7).
46. Perform steps 40 and 41.
47. Reposition dial indicator on housing (1) so that plunger is positioned on the end of shoulder shaft (4).
48. Measure end play by pulling shoulder shaft (4) back and forth. Proper end play reading is 0.0001-0.005 in. (0.00254-0.127 mm).

NOTE

If end play is correct, go to step 54. If end play is incorrect, go to step 49.

49. Remove dial indicator, four screws (5), lockwashers (6), and cap (13) from housing (1) and shoulder shaft (4). Discard lockwashers (6).
50. If end play is greater than 0.005 in. (0.127 mm), remove a shim (7) or use a thinner shim (7).
51. If end play is less than 0.0001 in. (0.00254 mm), add a shim or use a thicker shim (7).
52. Install cap (13) on housing (1) with four new lockwashers (6) and screws (5).
53. Perform steps 47 and 48. Perform procedure until correct end play is achieved.
54. Install new woodruff key (20) and sprocket (19) on shoulder shaft (4) with washer (18), nut (17), and new cotter pin (21).

16-16. POWER DIVIDER REPAIR (M764) (Contd)



FOLLOW-ON TASK: Install power divider (para. 16-14).

16-17. POWER DIVIDER SHAFT OIL SEALS REPLACEMENT (M764)
--

THIS TASK COVERS:**a. Removal****b. Installation**INITIAL SETUPAPPLICABLE MODELS

M764

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

Mechanical puller (Appendix B, Item 22)

MATERIALS / PARTS

Cotter pin (Appendix F, Item 19)

Oil seal (Appendix F, Item 232)

REFERENCES (TM)

LO 9-2320-209-12-1

TM 9-2320-361-20

TM 9-2320-361-34P

EQUIPMENT CONDITION

- . Power divider drained (LO 9-2320-209-12-1).
- . Power divider propeller shaft removed (if input oil seal is to be replaced) (TM 9-2320-361-20).
- Earth boring machine propeller shaft removed (TM 9-2320-361-20).
- Power divider drivebelt removed (if shoulder shaft oil seal is to be replaced) (para. 16-18).

a. Removal

NOTE

Input and output shoulder shaft seals are removed the same. This procedure covers the output shoulder shaft seal.

1. Remove cotter pin (4), nut (3), washer (2), and bushing (6) from output shoulder shaft (1) and flange (5). Discard cotter pin (4).
2. Using mechanical puller, remove flange (5) from output shoulder shaft (1).

NOTE

Input, output, and shoulder shaft oil seals are removed the same. This procedure covers the output shoulder shaft oil seal.

3. Remove output shoulder shaft oil seal (7) from bearing cap (8). Discard output shoulder shaft oil seal (7).

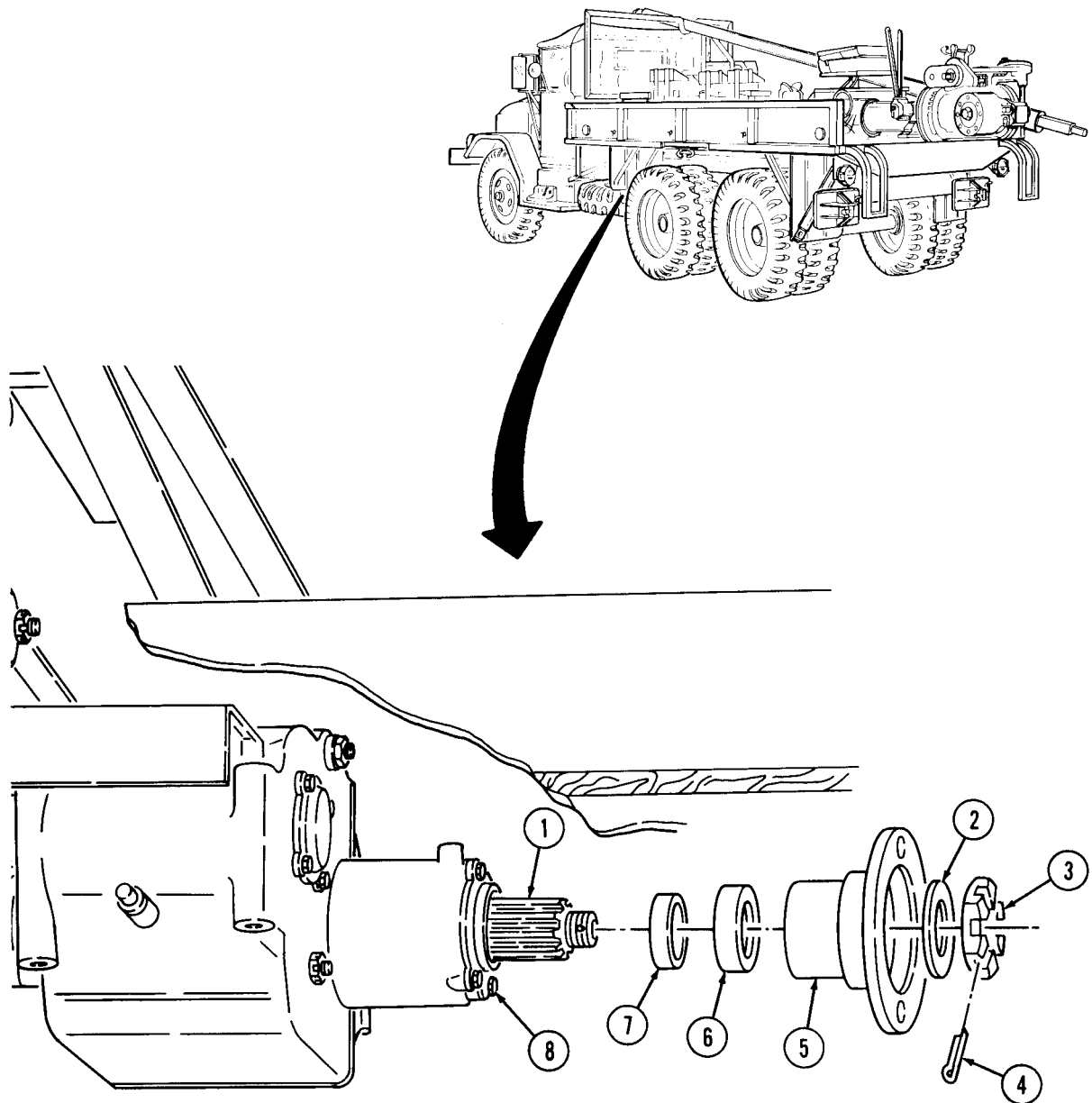
b. Installation

NOTE

Input, output, and shoulder shaft oil seals are installed the same. This procedure covers the output shoulder shaft seal.

1. Install new output shoulder shaft oil seal (7) in bearing cap (8).
2. Install flange (5) on output shoulder shaft (1) with washer (2), nut (3), and new cotter pin (4).

16-17. POWER DIVIDER SHAFT OIL SEALS REPLACEMENT (M764) (Contd)



- FOLLOW-ON TASKS:**
- . Install power divider drivebelt (if removed) (para. 16-18).
 - Install earth boring machine propeller shaft (if removed) (TM 9-2320-361-20).
 - Install power divider propeller shaft (if removed) (TM 9-2320-361-20).
 - . Fill power divider oil to required level (LO 9-2320-209-12-1).

16-18. POWER DIVIDER DRIVEBELT REPLACEMENT (M764)

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

M764

REFERENCES (TM)

TM 9-2320-361-10

TM 9-2320-361-34P

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

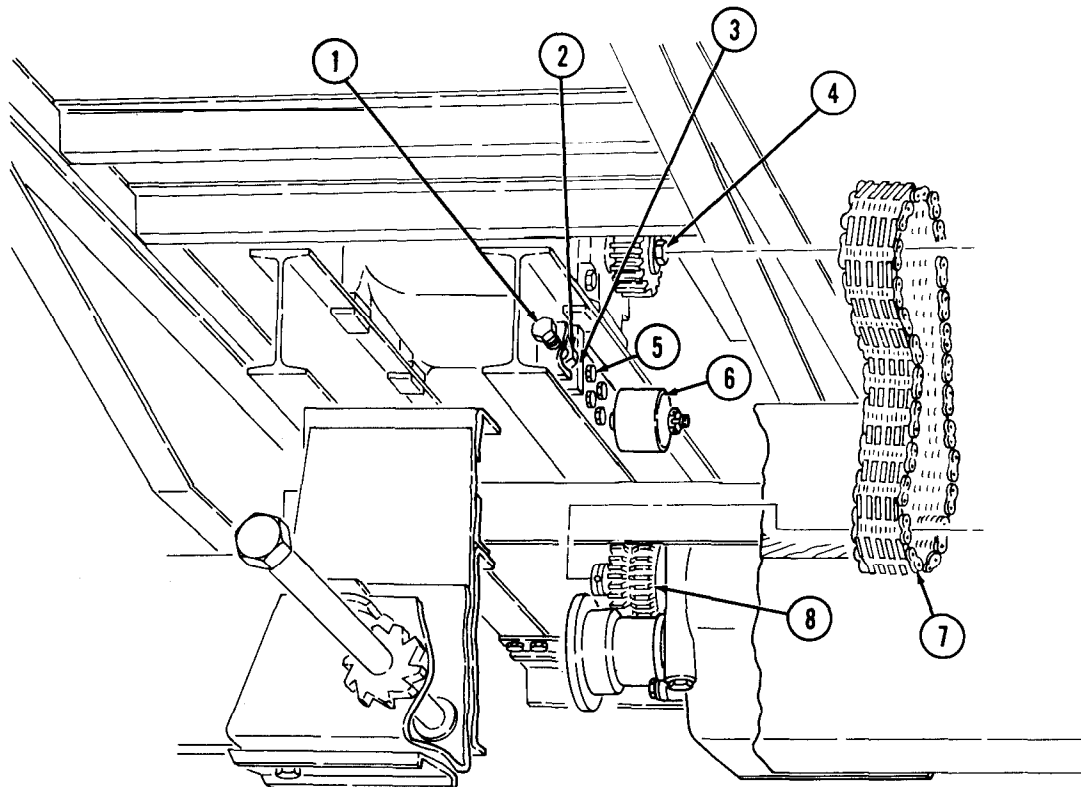
EQUIPMENT CONDITION

Parking brake set (TM 9-2320-361-10).

1. Loosen four screws (5) from idler bracket (3).
2. Loosen jamnut (2) and turn adjusting screw (1) out enough for removal of drivebelt (7).
3. Remove drivebelt (7) from worm gear sprocket (4), power divider sprocket (8), and idler wheel (6).

b. Installation

1. Install drivebelt (7) on worm gear sprocket (4), power divider sprocket (8), and idler wheel (6).
2. Turn adjusting screw (1) until slack is removed from drivebelt (7) and tighten jamnut (2).
3. Tighten four screws (5) on idler bracket (3).



Section III. POWER TAKEOFF MAINTENANCE

16-19. POWER TAKEOFF (PTO) MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
16-20.	Transmission Power Takeoff (PTO) Maintenance	16-95
16-21.	Transfer Case Power Takeoff (PTO) Maintenance	16-98
16-22.	Transmission Power Takeoff (PTO) Cover and Gasket Replacement	16-100

16-20. TRANSMISSION POWER TAKEOFF (PTO) MAINTENANCE

THIS TASK COVERS:

- a. Removal
- b. Cleaning

- c. Inspection and Repair
- d. Installation

INITIAL SETUP

APPLICABLE MODELS

All vehicles except M342A2

TOOLS

- General mechanic's tool kit (Appendix B, Item 1)
- Dial indicator (Appendix B, Item 21)
- Torque wrench, 1/2-in. dr. (Appendix B, Item 7)

MATERIALS/PARTS

- Six lockwashers (Appendix F, Item 125)
- Gasket (Appendix F, Item 77)
- Sealing compound (Appendix C, Item 20)

REFERENCES (TM)

- TM 9-2320-361-10
- TM 9-2320-361-34P
- TM 9-2520-246-34-1
- TM 9-2520-246-34P

EQUIPMENT CONDITION

- Transmission power takeoff cover and gasket removed (para. 16-22).
- . Transmission top cover removed (para. 8-3).

16-20. TRANSMISSION POWER TAKEOFF (PTO) MAINTENANCE (Ccntd)

CAUTION

Prevent dirt from entering transmission and power takeoff when performing this task. Failure to do so may cause damage to equipment.

a. Removal

Remove six nuts (6), lockwashers (7), power takeoff (PTO) (5), and gasket (4) from transmission (1). Discard gasket (4) and lockwashers (7).

b. Cleaning

Remove gasket material and debris from transmission (1) and PTO (5) mating surfaces.

c. Inspection and Repair

1. Check PTO (5) and transmission (1) mating surfaces for scratches, cracks, and galling. Refer to TM 9-2520-246-34-1 if scratched, cracked, or galled.
2. Check transmission gear teeth (2) for wear, cracks, and discoloration. Refer to TM 9-2520-246-34-1 if gear teeth are worn, cracked, or discolored.
3. Inspect stud(s) (3). Replace stud(s) (3) if damaged (para. 2-9).

d. Installation

NOTE

Ensure transmission output gear is stabilized while measuring backlash.

1. Shift into second gear (TM 9-2320-361-10).
2. Install new gasket (4) and PTO (5) on transmission (1) with six nuts (6). Tighten nuts (6) 15-20 lb-ft (20-27 N.m).
3. Set dial indicator on PTO (5) to measure PTO input gear (8) backlash.
 - a. Check PTO backlash. Backlash should be 0.008-0.012 in. (0.203-0.305 mm).
 - b. If backlash is 0.008-0.012 in. (0.203-0.305 mm), perform steps 5 through 7.

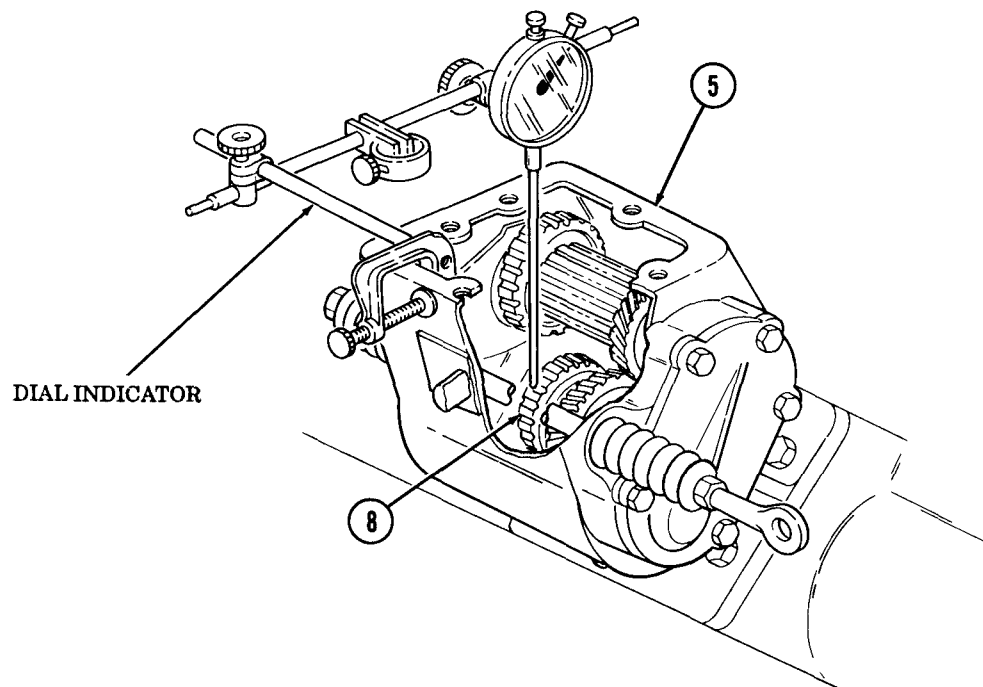
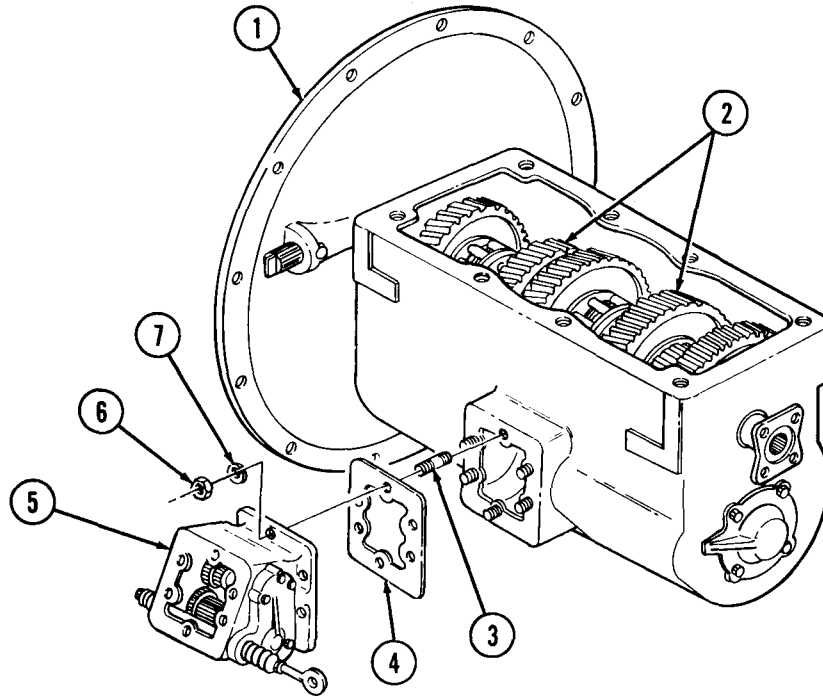
NOTE

It maybe necessary to use more than one gasket to obtain 0.008-0.012 in. (0.203-0.305 mm) backlash. Each gasket will change backlash approximately 0.006 in. (0.152 mm).

- c. If backlash is less than 0.008 in. (0.203 mm), remove dial indicator and PTO (5) from transmission (1) and continue with step 7 using two new gaskets (4) to obtain 0.008-0.012 in. (0.203-0.305 mm) measurement.
- d. If 0.008-0.012 in. (0.203-0.305 mm) backlash measurement cannot be obtained, replace (para. 8-2) and repair (TM 9-2520-246-34-1) transmission (1).
4. Remove dial indicator from PTO (5).
5. Remove six nuts (6), PTO (5), and gasket (4) from transmission (1).

16-20. TRANSMISSION POWER TAKEOFF (PTO) MAINTENANCE (Contd)

6. Apply sealing compound on gasket (4) and transmission (1) mating surfaces.
7. Install new gasket(s) (4) and PTO (5) on transmission (1) with six new lockwashers (7) and nuts (6). Tighten nuts (6) 15-20 lb-ft (20-27 N.m).



- FOLLOW-ON TASKS: .Install transmission top cover (para. 8-3).
 •Install transmission power takeoff cover and gasket (para. 16-22).

16-21. TRANSFER CASE POWER TAKEOFF (PTO) MAINTENANCE

THIS TASK COVERS:

- a. Removal
- b. Cleaning

- c. Inspection and Repair
- d. Installation

INITIAL SETUP

APPLICABLE MODELS

M49A2C, M50A2, M50A3,
M756A2, and M764

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Torque wrench, 3/4-in. dr.
(Appendix B, Item 6)
Mechanical puller kit
(Appendix B, Item 22)
1-1/2-in. socket, 3/4-in. dr.
(Appendix B, Item 41)

MATERIALS/PARTS

Six lockwashers (Appendix F, Item 147)
Gasket (Appendix F, Item 78)
Cotter pin (Appendix F, Item 6)
Two studs (Appendix F, Item 266)
Woodruff key (Appendix F, Item 296)
Sealing compound (Appendix C, Item 17)

REFERENCES (TM)

TM 9-2320-361-34P
TM 9-2520-246-34-1
TM 9-2520-246-34P

EQUIPMENT CONDITION

Transfer case removed (para. 9-2).

a. Removal

NOTE

Perform step 1 for M756A2 vehicles.

1. Remove cotter pin (9), nut (8), sprocket (21), and woodruff key (11) from power takeoff (PTO) spindle (10). Discard cotter pin (9) and woodruff key (11).
2. Loosen setscrew (6) and remove cotter pin (9), nut (8), yoke (7), and woodruff key (11) from PTO spindle (10). Discard cotter pin (9) and woodruff key (11).
3. Disconnect line (1) from oil pump (12).
4. Remove four screws (13), lockwashers (14), two nuts (4), lockwashers (3), PTO (5), and gasket (15) from transfer case (2). Discard lockwashers (14) and (3) and gasket (15).
5. Remove screw (19), washer (18), and clamp (17) from transfer case (2).
6. Remove line (1) and elbow (16) from transfer case (2).

b. Cleaning

Remove gasket material and debris from transfer case (2) and PTO (5) mating surface.

c. Inspection and Repair

1. Check PTO (5) and transfer case (2) mating surface for scratches, cracks, and galling. Refer to TM 9-2520-246-34-1 if scratched, cracked, or galled.
2. Check PTO gear for wear, cracks, and discoloration. Refer to TM 9-2520-246-34-1 if gear teeth are worn, cracked, or discolored.
3. Inspect studs (20). Replace studs (20) if damaged (para. 2-9).

16-21. TRANSFER CASE POWER TAKEOFF (PTO) MAINTENANCE (Contd)

d. Installation

NOTE

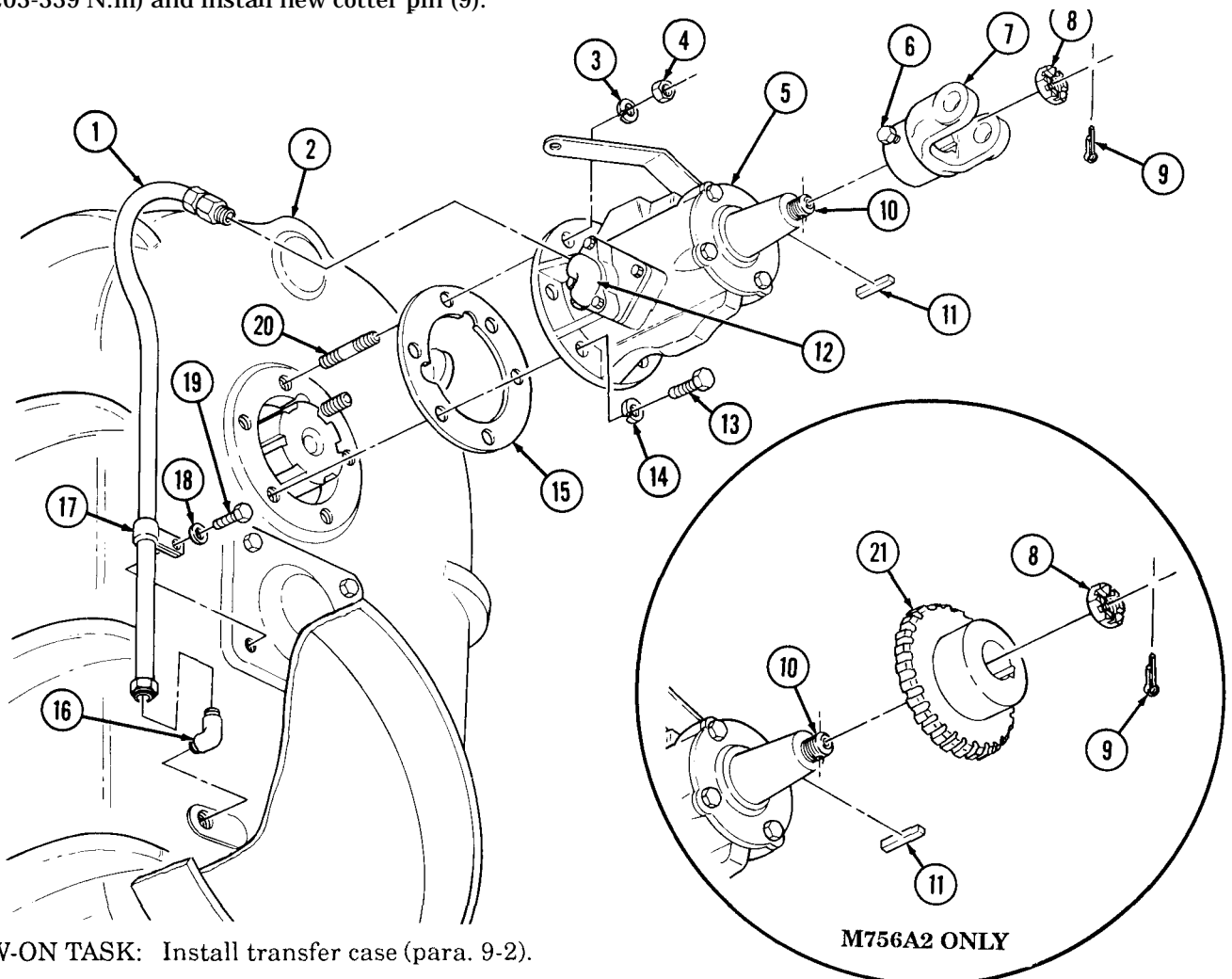
Coat threads of sealing compound prior to installation.

1. Install elbow (16) on transfer case (2).
2. Connect line (1) to elbow (16) and install line (1) on transfer case (2) with clamp (17), washer (18), and screw (19). Tighten screw (19) 60-77 lb-ft (81-104 N.m).
3. Install new gasket (15) and PTO (5) on transfer case (2) with two new lockwashers (3), nuts (4), four new lockwashers (14), and screws (13). Tighten nuts (4) 32-40 lb-ft (43-54 N.m). Tighten screws (13) 60-77 lb-ft (81-104 N.m).
4. Connect line (1) on oil pump (12).
5. Install new woodruff key (11), yoke (7), and nut (8) on spindle (10). Tighten nut (8) 150-250 lb-ft (203-339 N.m) and install new cotter pin (9) and tighten setscrew (6).

NOTE

Perform step 6 for M756A2 vehicles.

6. Install new woodruff key (11), sprocket (21), and nut (8) on spindle (10). Tighten nut (8) 150-250 lb-ft (203-339 N.m) and install new cotter pin (9).



FOLLOW-ON TASK: Install transfer case (para. 9-2).

M756A2 ONLY

16-22. TRANSMISSION POWER TAKEOFF (PTO) COVER AND GASKET REPLACEMENT

THIS TASK COVERS:

- a. Removal
- b. Cleaning

c. Installation

INITIAL SETUP

APPLICABLE MODELS

All vehicles except M342A2

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

MATERIALS/PARTS

Six lockwashers (Appendix F, Item 146)
Gasket (Appendix F, Item 77)

REFERENCES (TM)

TM 9-2320-361-10
TM 9-2320-361-34P
TM 9-2520-246-34P
LO 9-2320-209-12-1

EQUIPMENT CONDITION

- Parking brake set (TM 2320-361-10).
- Wheels chocked (TM 9-2320-361-10).
- Transmission oil drained (LO 9-2320-209-12-1).

a. Removal

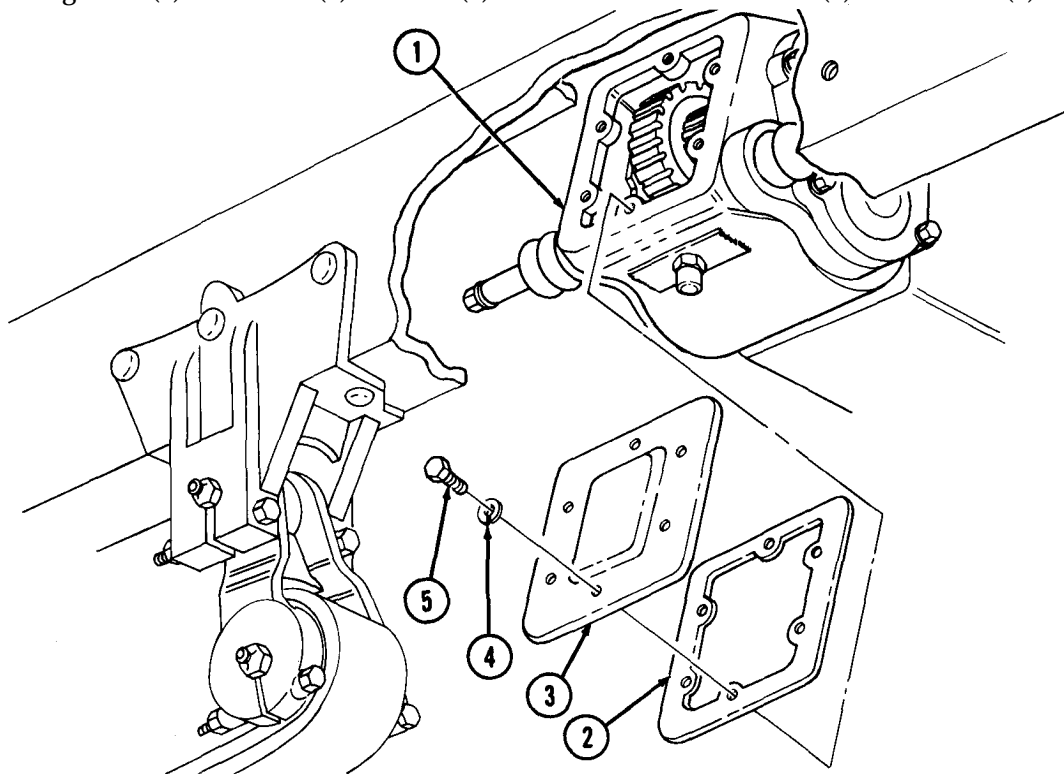
Remove six screws (5), lockwashers (4), cover (3), and gasket (2) from transmission power takeoff (PTO) (1). Discard gasket (2) and lockwashers (4).

b. Cleaning

Clean mating surface between cover (3) and PTO (1).

c. Installation

Install new gasket (2) and cover (3) on PTO (1) with six new lockwashers (4) and screws (5).



FOLLOW-ON TASK: Fill transmission to proper fluid level (LO 9-2320-209-12-1).

CHAPTER 17

SPECIAL PURPOSE KITS MAINTENANCE

17-1. SPECIAL PURPOSE KITS MAINTENANCE INDEX

PARA. NO.	TITLE	PAGE NO.
17-2.	Engine Coolant Heater Flame Detector Switch Maintenance	17-2
17-3.	Engine Coolant Heater Blower Motor Maintenance	17-6
17-4.	Engine Coolant Heater Restriction Thermostat Maintenance	17-8
17-5.	Engine Coolant Heater Component Bracket Maintenance	17-10
17-6.	Engine Coolant Heater Fuel Control Valve Replacement	17-14
17-7.	Engine Coolant Heater Overheat Switch and Igniter Replacement	17-16
17-8.	Engine Coolant Heater Fuel Tube and Preheat Resistor Replacement	17-20
17-9.	Engine Coolant Heater Burner Maintenance	17-22
17-10.	Engine Coolant Heater Housing Maintenance	17-24
17-11.	Personnel Heater Guard and Blower Motor Replacement	17-26
17-12.	Personnel Heater Fuel Control Valve Replacement	17-28
17-13.	Personnel Heater Igniter and Ignition Control Unit Replacement	17-30
17-14.	Personnel Heater Fuel Line and Blower Housing Replacement	17-34
17-15.	Personnel Heater Flame Detector Switch Maintenance	17-36
17-16.	Personnel Heater Burner Maintenance	17-40
17-17.	Personnel Heater Overheat Switch and Receptacle Replacement	17-44
17-18.	Personnel Heater Heat Exchanger Replacement	17-47
17-19.	Engine Coolant Heater Testing	17-48
17-20.	Fuel Burning Personnel Heater Testing	17-56
17-21.	Hardtop Rear Panel Window Maintenance	17-62

17-2. ENGINE COOLANT HEATER FLAME DETECTOR SWITCH MAINTENANCE

THIS TASK COVERS:

- | | |
|---|---|
| <p>a. Removal
 b. Disassembly
 c. Inspection</p> | <p>d. Assembly
 e. Installation</p> |
|---|---|

INITIAL SETUP

APPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 Tool kit, electrical (Appendix B, Item 2)

MATERIALS/PARTS

Sleeve (Appendix F, Item 261)

REFERENCES (TM)

TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

Engine coolant heater removed (TM 9-2320-361-20).

NOTE

a. Removal

Tag wires for installation.

1. Remove four screws (6) and guard (7) from heater housing (8).
2. Remove nut-assembled lockwasher (2), ground lead (3), air tube (4), and elbows (1) and (5) from heater housing (8).
3. Remove five screw-assembled lockwashers (11) and six leads (12) from flame detector switch (10).
4. Loosen nut (9) and remove flame detector switch (10) from heater housing (8).

b. Disassembly

1. Remove adjusting screw (15), washer (16), and spring (17) from switch bracket (24) and mount (18).

CAUTION

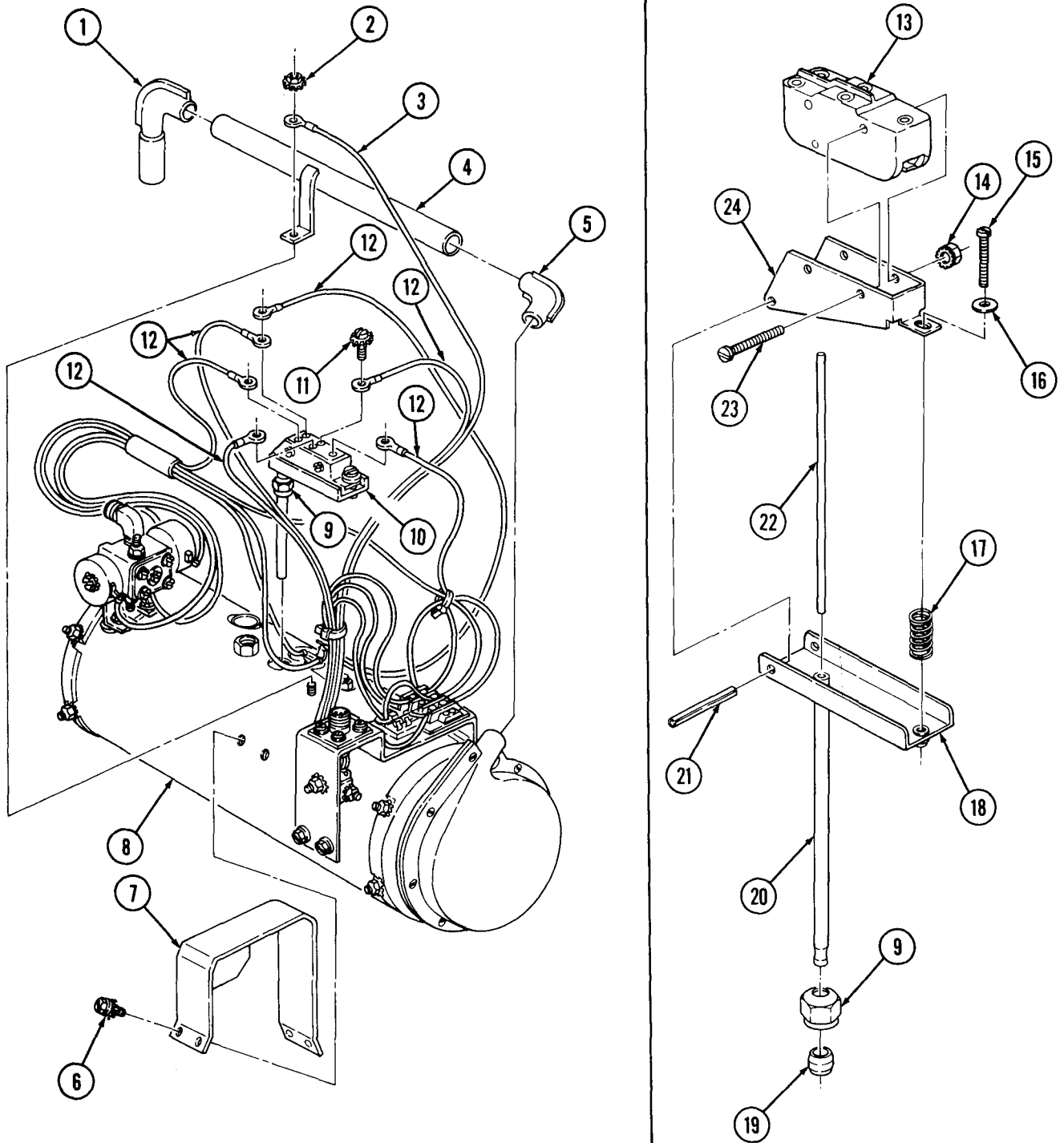
Ceramic rod is very brittle and is easily broken; handle carefully.

2. Tilt microswitch (13) back on switch bracket (24), invert, and remove ceramic rod (22) from probe (20).
3. Remove two nut-assembled lockwashers (14), screws (23), and microswitch (13) from switch bracket (24).
4. Remove split roll pin (21) and switch bracket (24) from mount (18).
5. Remove sleeve (19) and nut (9) from probe (20).

c. Inspection

1. Inspect flame detector switch (10) for broken ceramic rod (22) or bent probe (20). Replace ceramic rod (22) if broken. Replace flame detector switch (10) if probe (20) is bent.
2. Inspect flame detector switch (10) for carbon buildup and corrosion. Remove carbon buildup or corrosion.

17-2. ENGINE COOLANT HEATER FLAME DETECTOR SWITCH MAINTENANCE (Contd)



17-2. ENGINE COOLANT HEATER FLAME DETECTOR SWITCH MAINTENANCE (Contd)

d. Assembly

1. Install nut (7) and new sleeve (8) on probe (9).
2. Install switch bracket (13) on mount (6) with split roll pin (10).
3. Install microswitch (1) on switch bracket (13) with two screws (12) and nut-assembled lockwashers (2).

CAUTION

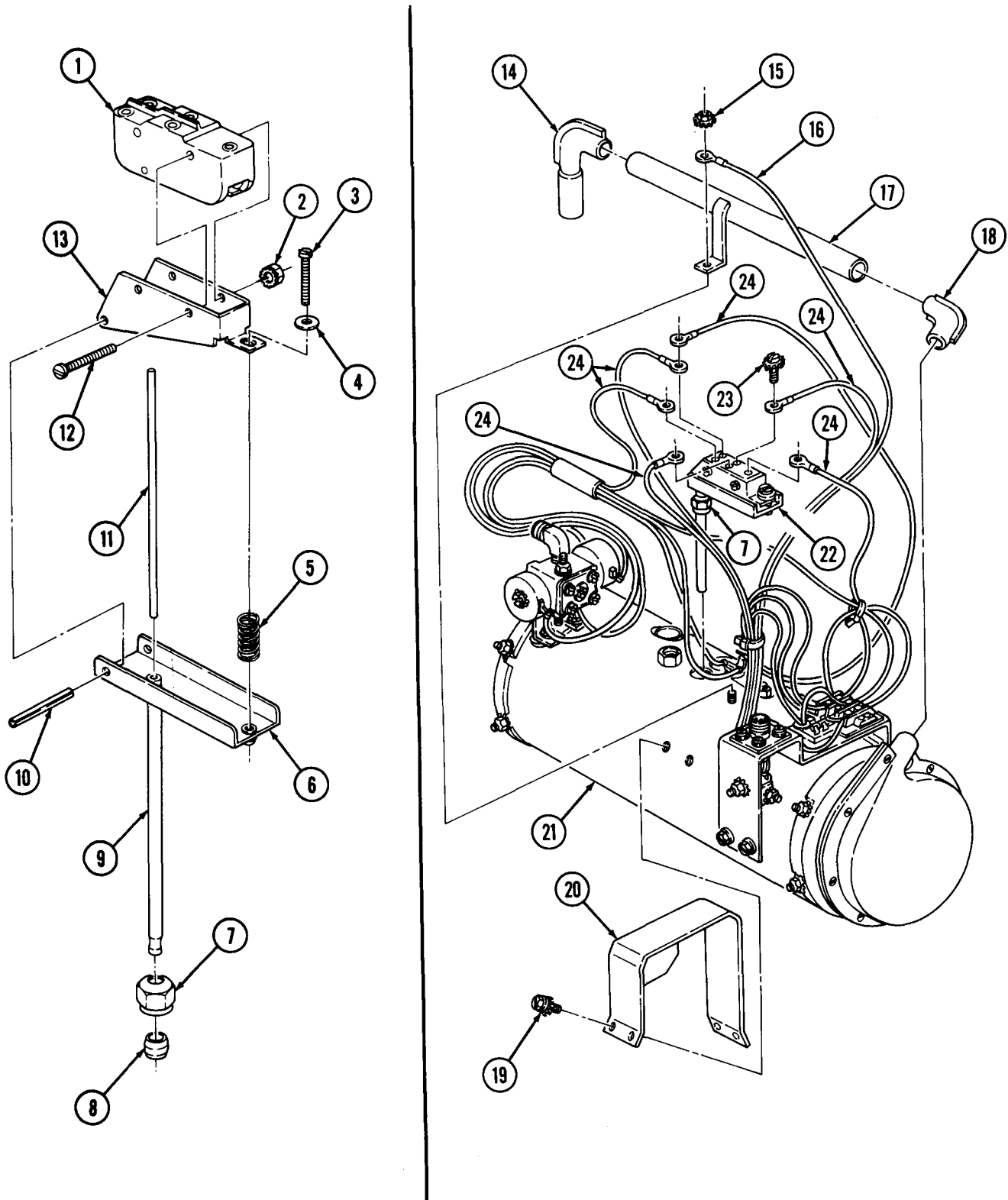
Ceramic rod is very brittle and is easily broken; handle carefully.

4. Tilt microswitch (1) and switch bracket (13) back on mount (6) and insert ceramic rod (11) into probe (9).
5. Rotate microswitch (1) back on mount (6) and install spring (5), washer (4), and adjusting screw (3) on switch bracket (13) and mount (6).
6. Tighten adjusting screw (3) until microswitch (1) clicks. Then continue 3/4 turn past click point.

e. Installation

1. Install flame detector switch (22) on heater housing (21) and tighten nut (7).
2. Install six leads (24) on flame detector switch (22) with five screw-assembled lockwashers (23).
3. Install air tube (17), elbows (14) and (18) and ground lead (16) on heater housing (21) with nut-assembled lockwasher (15).
4. Install guard (20) on heater housing (21) with four screws (19).

17-2. ENGINE COOLANT HEATER FLAME DETECTOR SWITCH MAINTENANCE (Contd)



FOLLOW-ON TASK: Test engine coolant heater (para. 17-19).

17-3. ENGINE COOLANT HEATER BLOWER MOTOR MAINTENANCE

THIS TASK COVERS:

- a. Removal**
b. Cleaning and Inspection

- c. Installation**

INITIAL SETUPAPPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit
 (Appendix B, Item 1)
 Tool kit, electrical
 (Appendix B, Item 2)

MATERIAIS/PARTS

Tiedown strap (Appendix C, Item 15)
 Drycleaning solvent (Appendix C, Item 24)
 Rag (Appendix C, Item 16)

REFERENCES (TM)

TM 9-2320-361-20
 TM 9-2320-361-34P

EQUIPMENT CONDITION

Engine coolant heater removed (TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- Keep fire extinguisher nearby when using drycleaning solvent.
- Compressed air source will not exceed 30 psi (207 kPa).
- Eyeshields must be worn when cleaning with compressed air.

NOTE

Tag wires for installation.

a. Removal

1. Remove four screws (11) and guard (12) from heater housing (13).
2. Remove tiedown strap (6) from heater wiring. Discard tiedown strap (6).
3. Remove nut-assembled lockwasher (2), ground lead (3), air tube (4), and elbows (1) and (5) from heater housing (13).
4. Remove screw-assembled lockwasher (8) and wire (7) from heater component bracket (14).
5. Remove four nut-assembled lockwashers (10) and blower motor (9) from heater housing (13).

b. Cleaning and Inspection

1. Inspect blower motor (9) for dirt, grease, and carbon.

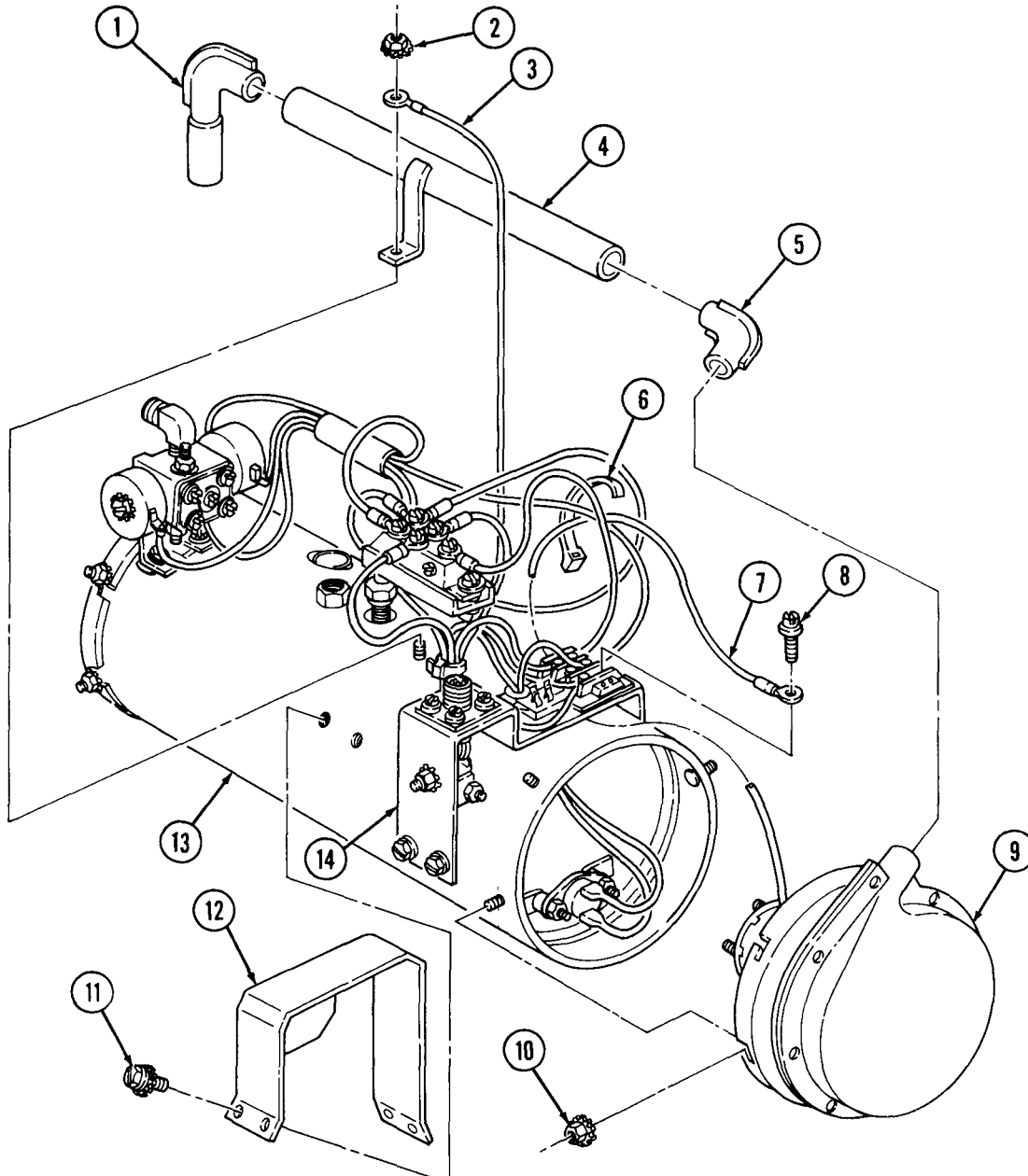
WARNING

- Drycleaning solvent is flammable and will not be used near open flame. Use only in well-ventilated places. Failure to do so may result in injury to personnel.
 - Compressed air source will not exceed 30 psi (207 kPa). When cleaning with compressed air, eyeshields must be worn. Failure to wear eyeshields may result in injury to personnel.
2. Clean housing (13) surface with drycleaning solvent and dry with clean rag or compressed air. Do not immerse in solvent.

17-3. ENGINE COOLANT HEATER BLOWER MOTOR MAINTENANCE (Contd)

c. Installation

1. Install blower motor (9) on heater housing (13) with four nut-assembled lockwashers (10).
2. Install wire (7) on heater component bracket (14) with screw-assembled lockwasher (8).
3. Install elbows (1) and (5), air tube (4), and ground lead (3) on heater housing (13) with nut-assembled lockwasher (2).
4. Place new tiedown strap (6) around heater wiring.
5. Install guard (12) on heater housing (13) with four screws (11).



FOLLOW-ON TASK: Test engine coolant heater (para 17-19).

17-4. ENGINE COOLANT HEATER RESTRICTION THERMOSTAT MAINTENANCE

THIS TASK COVERS:

- a. Removal
- b. Inspection

- c. Installation

INITIAL SETUP

APPLICABLE MODELS

All

REFERENCES (TM)

TM 9-2320-361-34P

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

EQUIPMENT CONDITION

Engine coolant heater blower motor removed (para. 17-3).

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Tool kit, electrical (Appendix B, Item 2)

a. Removal

NOTE

Tag wires for installation.

1. Disconnect two leads (1) from restriction thermostat (3).
2. Remove two nut-assembled lockwashers (2), restriction thermostat (3), and two spacers (4) from two studs (5).

b. Inspection

1. Inspect restriction thermostat (3) for corrosion and bends. Replace if corroded or bent.
2. Check thermostat continuity at room temperature. If continuity exists, replace thermostat (3).

CAUTION

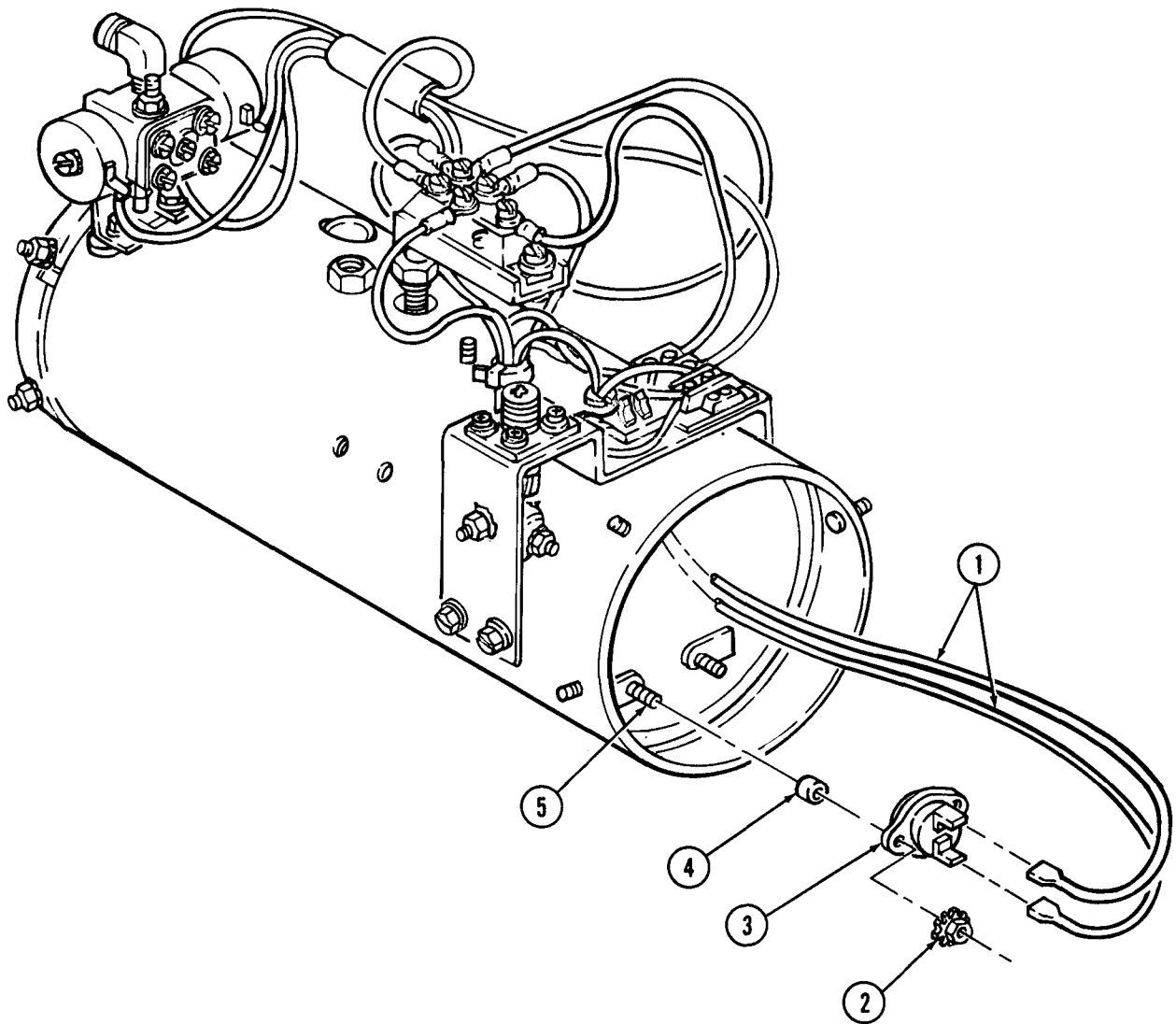
Do not place thermostat in liquid for cooling. Placing thermostat in liquid will cause damage to equipment.

3. Cool thermostat to 20F (-6.7°C). Check thermostat continuity. If continuity does not exist, replace thermostat.

c. Installation

1. Install restriction thermostat (3) and two spacers (4) on two studs (5) with two nut-assembled lockwashers (2).
2. Connect two leads (1) to restriction thermostat (3).

17-4. ENGINE COOLANT HEATER RESTRICTION THERMOSTAT MAINTENANCE (Contd)



FOLLOW-ON TASK: Install engine coolant heater blower motor (para. 17-3).

17-5. ENGINE COOLANT HEATER COMPONENT BRACKET MAINTENANCE
--

THIS TASK COVERS:

- a. Removal**
- b. Disassembly**
- c. Inspection**

- d. Assembly**
- e. Installation**

INITIAL SETUP

APPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Tool kit, electrical (Appendix B, Item 2)

MATERIALS/PARTS

Tiedown strap (Appendix C, Item 15)

REFERENCES (TM)

TM 9-2320-361-34P

EQUIPMENT CONDITION

Engine coolant heater blower motor removed
(para. 17-3).

NOTE

Tag wires for installation.

a. Removal

1. Remove tiedown strap (1) from wires. Discard tiedown strap (1).
2. Remove two screw-assembled lockwashers (4), and leads (2), (3), and (5) from heater component bracket (6).
3. Remove leads (8) and (3) from restriction thermostat (9).
4. Remove grommet (11) from leads (3) and (8) and heater housing (10).
5. Remove three screw-assembled lockwashers (16) and leads (13), (14), (15), and (17) from flame detector switch (12).
6. Remove four screws (7) and heater component bracket (6) from heater housing (10).

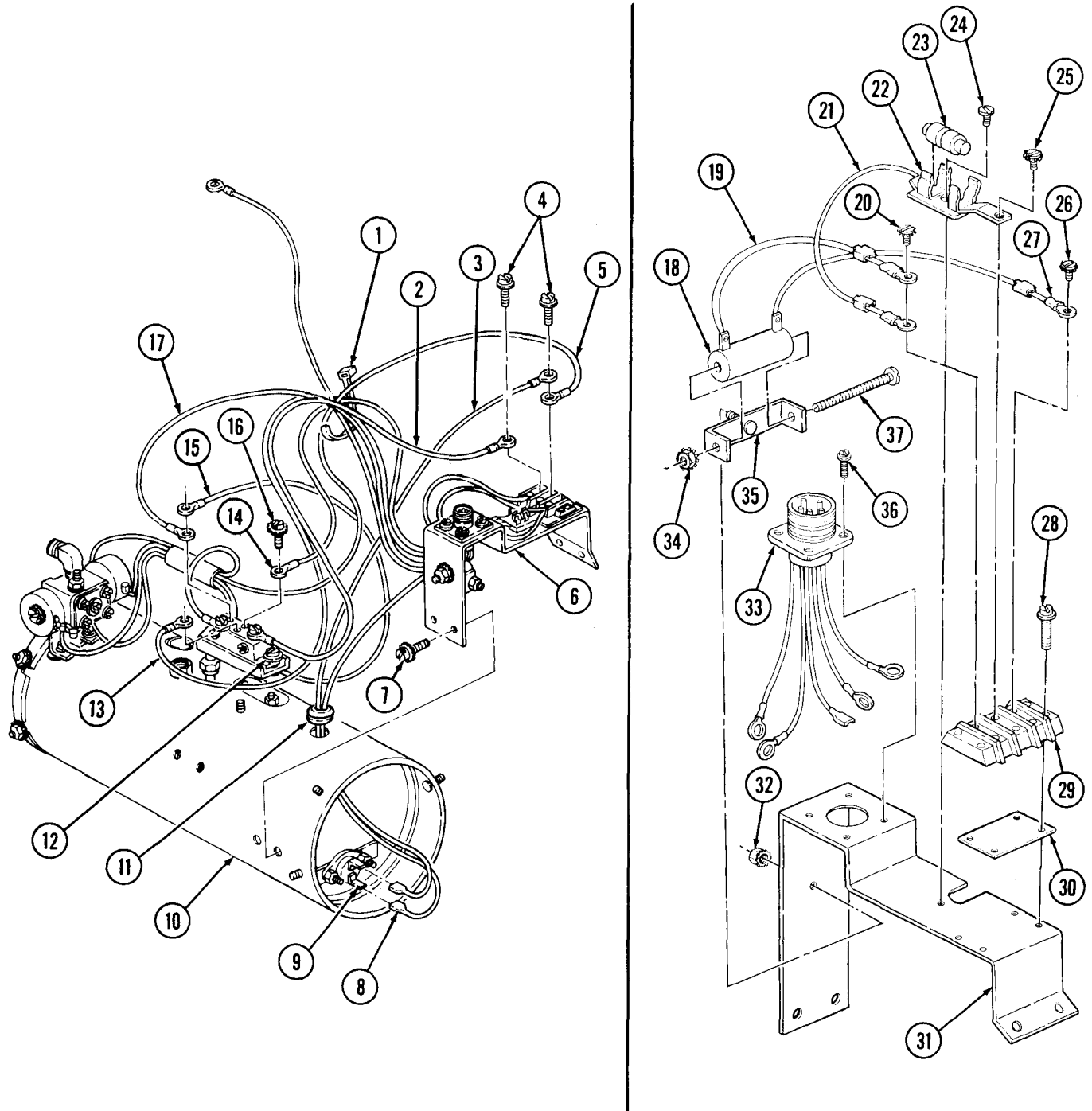
NOTE

Note direction of arrow on diode for installation.

1. Remove diode (23) from diode holder (22).
2. Remove screw-assembled lockwashers (20) and (26), resistor leads (19) and (27), and diode lead (21) from terminal strip (29).
3. Remove screw-assembled lockwasher (25) from diode holder (22) and terminal strip (29).
4. Remove screw (24) and diode holder (22) from heater component bracket (31).
5. Remove four screw-assembled lockwashers (28), terminal strip (29), and plate (30) from heater component bracket (31).
6. Remove nut-assembled lockwasher (34), screw (37), and resistor (18) from resistor holder (35).
7. Remove four screw-assembled lockwashers (36) and receptacle (33) from heater component bracket (31).
8. Remove nut-assembled lockwasher (32) and resistor holder (35) from heater component bracket (31).

17-5. ENGINE COOLANT HEATER COMPONENT BRACKET MAINTENANCE (Contd)

1. Check diode (23) for continuity. Reverse leads on diode (23) and check for continuity. If circuit is open in both test conditions or closed in both test conditions, replace diode (23).
2. Check resistor (18) for continuity. If continuity does not exist, replace resistor (18).



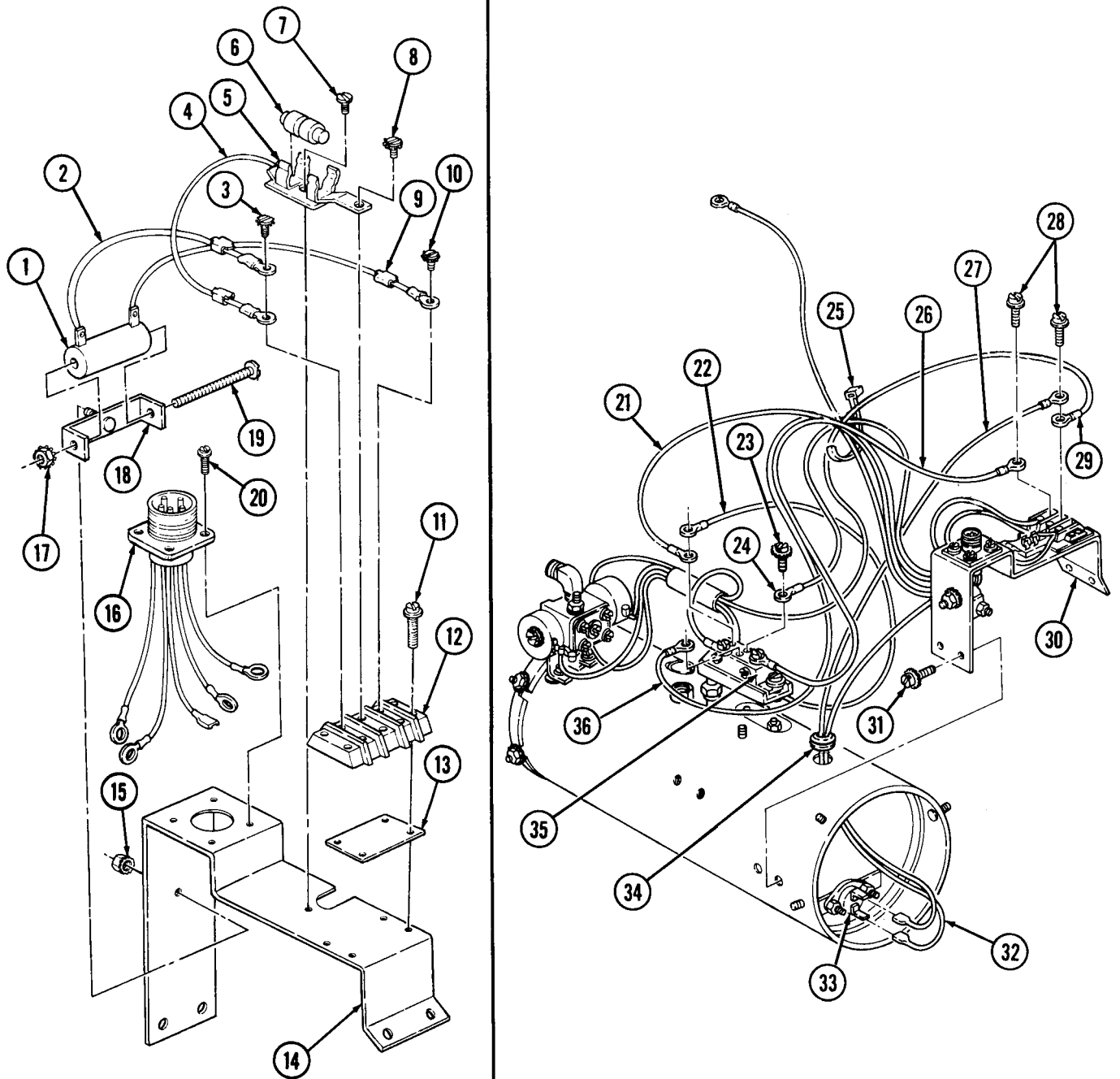
17-5. ENGINE COOLANT HEATER COMPONENT BRACKET MAINTENANCE (Contd)

1. Install receptacle (15) on heater component bracket (13) with four screw-assembled lockwashers (1).
2. Install resistor holder (17) on heater component bracket (13) with screws (17) with nut-assembled lockwasher (16).
3. Install resistor (18) on resistor holder (17) with screw (19) and nut-assembled lockwasher (16).
4. Install terminal strip (11) on heater component bracket (13) with four screw-assembled lockwashers (19).
5. Install diode holder (4) on heater component bracket (13) with screw (6).
6. Install diode (5) on diode holder (4) with arrow pointed in direction previously noted.
7. Install resistor leads (2) and (8), diode lead (3), and diode holder (4) on terminal strip (11) with screw-assembled lockwashers (20), (9), and (7).

e. Installation

1. Install heater component bracket (30) on heater housing (35) with four screws (31).
2. Install leads (26), (27), and (29) on heater component bracket (30) with two screw-assembled lockwashers (28).
3. Place grommet (34) on leads (27) and (32) and install on heater housing (35).
4. Install leads (21), (22), (24), and (37) on flame detector switch (36) with three screw-assembled lockwashers (23).
5. Install leads (32) and (27) on restriction **thermostat** (33).
6. Install tiedown strap (25) around wires.

17-5. ENGINE COOLANT HEATER COMPONENT BRACKET MAINTENANCE (Contd)



FOLLOW-ON TASK: Install engine coolant heater blower motor (para. 17-3).

17-6. ENGINE COOLANT HEATER FUEL CONTROL VALVE REPLACEMENT
--

THIS TASK COVERS:**a. Removal****b. Installation**INITIAL SETUPAPPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLSGeneral mechanic's tool kit
(Appendix B, Item 1)

Tool kit, electrical (Appendix B, Item 2)

REFERENCES (TM)

TM 9-2320-361-20

TM 9-2320-361-34P

EQUIPMENT CONDITION

Engine coolant heater removed (TM 9-2320-361-20).

NOTE

Tag wires for installation.

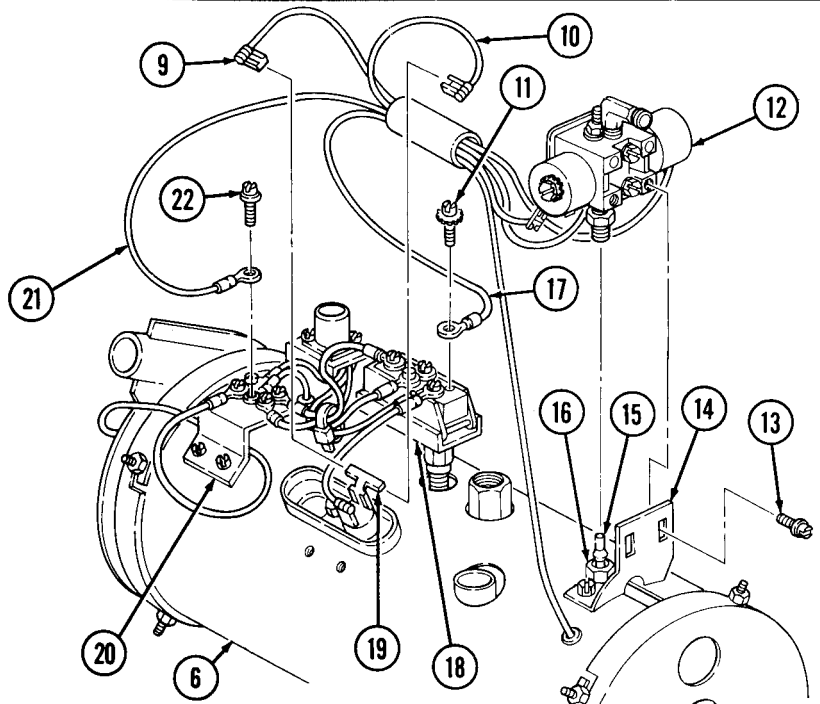
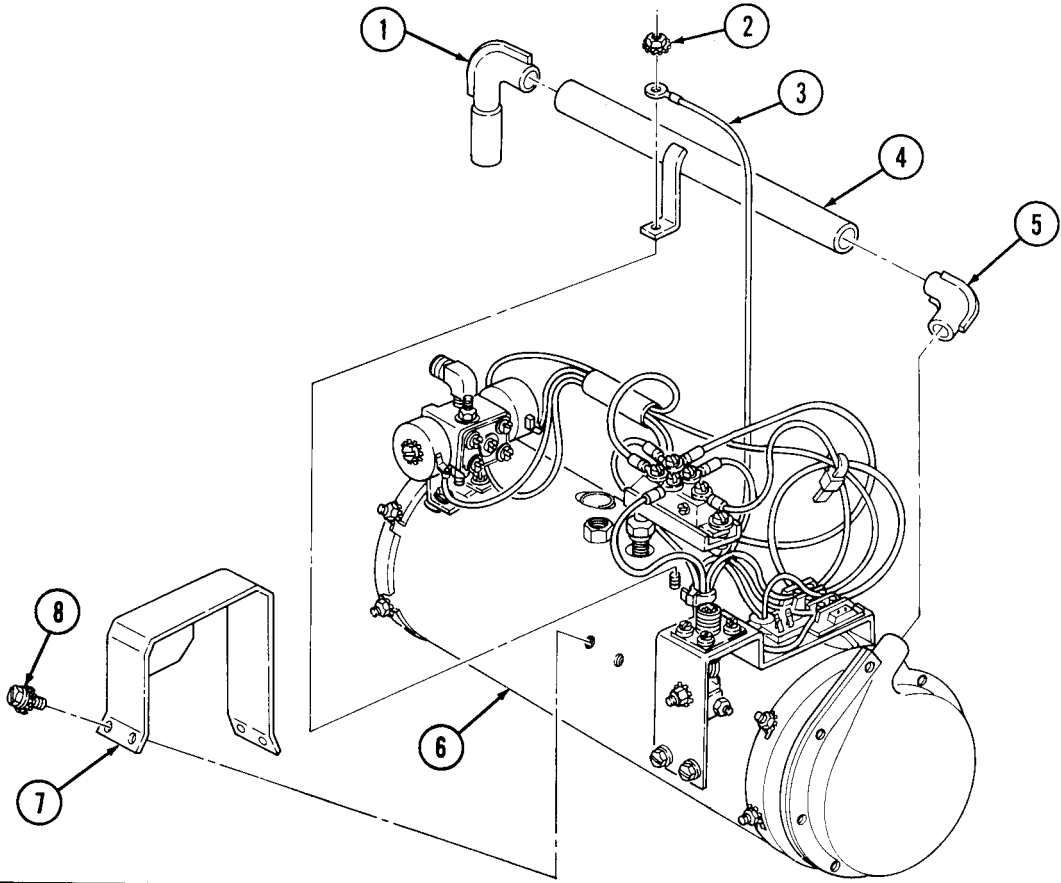
a. Removal

1. Remove four screws (8) and guard (7) from heater housing (6).
2. Remove nut-assembled lockwasher (2), ground lead (3), air tube (4), and elbows (1) and (5) from heater housing (6).
3. Disconnect fuel control valve leads (9) and (10) from tab connector (19).
4. Loosen nut (16) and slide down fuel tube (15).
5. Remove screw-assembled lockwasher (22) and lead (21) from heater component bracket (20).
6. Remove screw-assembled lockwasher (11) and lead (17) from flame detector switch (18).
7. Remove two screw-assembled lockwashers (13) and fuel control valve (12) from bracket (14).

b. Installation

1. Position fuel control valve (12) on fuel tube (15) and bracket (14).
2. Tighten nut (16) and install fuel control valve (12) on bracket (14) with two screw-assembled lockwashers (13).
3. Install lead (21) on heater component bracket (20) with screw-assembled lockwasher (22).
4. Install lead (17) on flame detector switch (18) with screw-assembled lockwasher (11).
5. Connect fuel control leads (9) and (10) on tab connector (19).
6. Install air tube (4), elbows (1) and (5), and ground lead (3) on heater housing (6) with nut-assembled lockwasher (2).
7. Install guard (7) on heater housing (6) with four screws (8).

17-6. ENGINE COOLANT HEATER FUEL CONTROL VALVE REPLACEMENT (Contd)



FOLLOW-ON TASK: Install engine coolant heater (TM 9-2320-361-20).

17-7. ENGINE COOLANT HEATER OVERHEAT SWITCH AND IGNITER REPLACEMENT

THIS TASK COVERS:

- a. Overheat Switch Removal
- b. Igniter Removal
- c. Inspection

- d. Igniter Installation
- e. Overheat Switch Installation

INITIAL SETUP

APPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Tool kit, electrical (Appendix B, Item 2)

MATERIALS/PARTS

Igniter (Appendix F, Item 87)

REFERENCES (TM)

TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

Engine coolant heater removed (TM 9-2320-361-20).

NOTE

Tag all leads for installation.

a. Overheat Switch Removal

1. Remove four screws (6) and guard (7) from heater housing (8).
2. Remove nut-assembled lockwasher (2), ground lead (3), air tube (4), and elbows (1) and (5) from heater housing (8).
3. Disconnect lead (9) from overheat switch (13).
4. Disconnect leads (10) and (12) from tab connector (11) and tab connector (11) from overheat switch (13).
5. Remove nut (33), lockwasher (32), retainer (31), overheat switch (13), washer (14), and O-ring (15) from heater housing (8).

b. Igniter Removal

1. Remove four nut-assembled lockwashers (27) and end plate (26) from heater housing (8).
2. Remove screw-assembled lockwasher (21), ground strap (22), igniter lead (23), and lockwasher (24) from burner (16).
3. Remove nut (28), ground strap (22), and lockwasher (29) from stud (30).

CAUTION

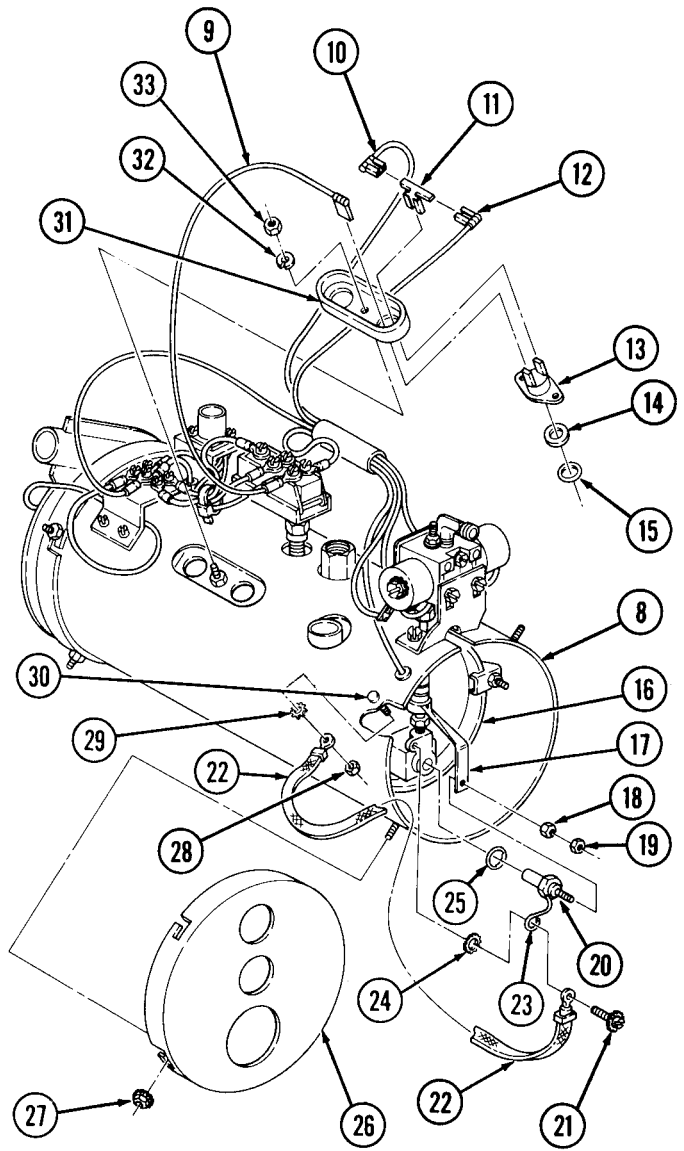
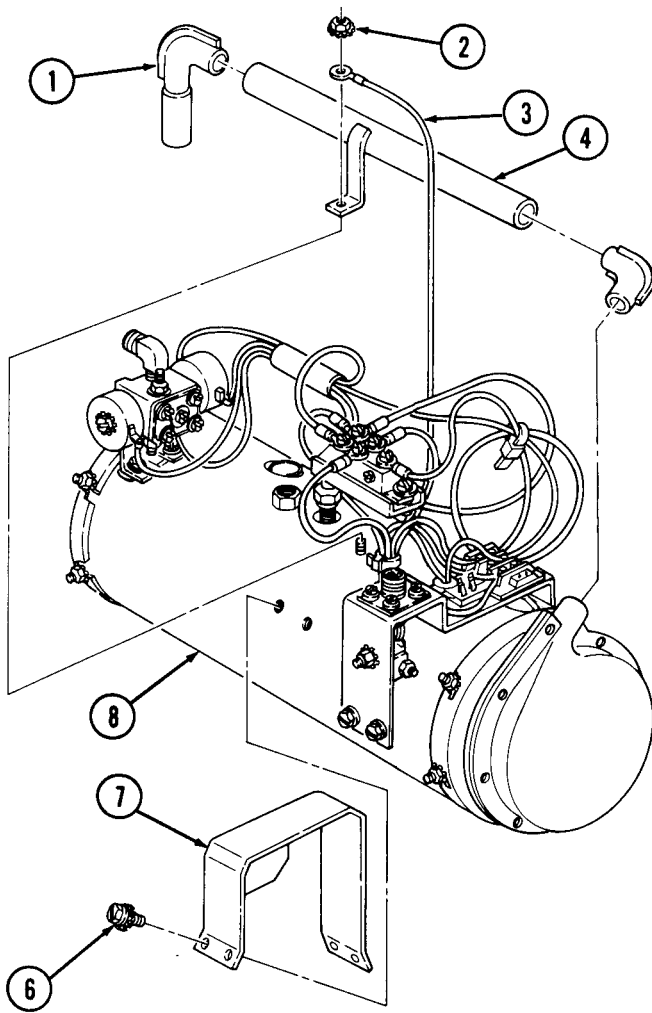
Igniter is fragile. Use care when removing igniter. Failure to do so may result in damage to equipment.

4. Remove nuts (19) and (18), preheater resistor strap (17), igniter (20), and gasket (25) from burner (16). Discard igniter (20).

C. Inspection

Test overheat switch (13) for continuity. If continuity does not exist, replace overheat switch (13).

17-7. ENGINE COOLANT HEATER OVERHEAT SWITCH AND IGNITER REPLACEMENT (Contd)



17-7. ENGINE COOLANT HEATER OVERHEAT SWITCH AND IGNITER REPLACEMENT (Contd)

d. Igniter Installation

CAUTION

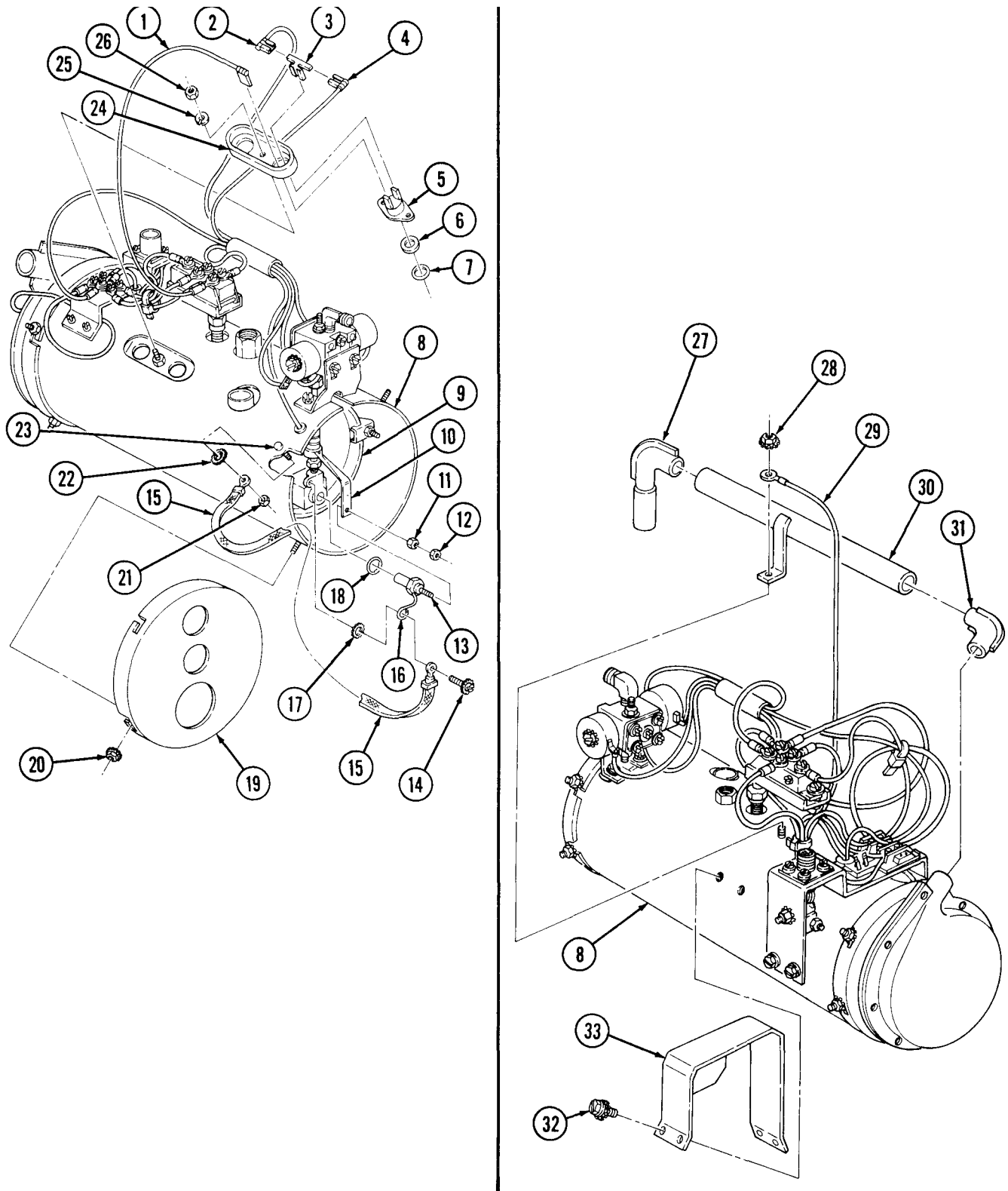
Igniter is fragile. Use care when installing igniter. Failure to do so may result in damage to equipment.

1. Install gasket (18) and new igniter (13) on burner (9).
2. Place preheater resistor strap (10) on igniter (13) and install with two nuts (11) and (12).
3. Install lockwasher (22) and ground strap (15) on stud (23) with nut (21).
4. Install ground strap (15), igniter lead (16), and lockwasher (17) on burner (9) with screw-assembled lockwasher (14).
5. Install end plate (19) on heater housing (8) with four nut-assembled lockwashers (20).

e. Overheat Switch Installation

1. Install O-ring (7), washer (6), overheat switch (5), and retainer (24) on heater housing (8) with lockwasher (25) and nut (26).
2. Install leads (2) and (4) on tab connector (3) and install tab connector (3) on overheat switch (5).
3. Install lead (1) on overheat switch (5).
4. Install air tube (29), elbows (26) and (30), and ground lead (28) on heater housing (8) with nut-assembled lockwasher (27).
5. Install guard (32) on heater housing (8) with four screws (31).

17-7. ENGINE COOLANT HEATER OVERHEAT SWITCH AND IGNITER REPLACEMENT (Contd)



FOLLOW-ON TASK: Test engine coolant heater (para. 17-19).

17-8. ENGINE COOLANT HEATER FUEL TUBE AND PREHEAT RESISTOR REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Tool kit, electrical (Appendix B, Item 2)

MATERIALS/PARTS

Sleeve (Appendix F, Item 262)

REFERENCES (TM)

TM 9-2320-361-34P

EQUIPMENT CONDITION

Engine coolant heater overheat switch and igniter removed (para. 17-7).

NOTE

Tag wires for installation.

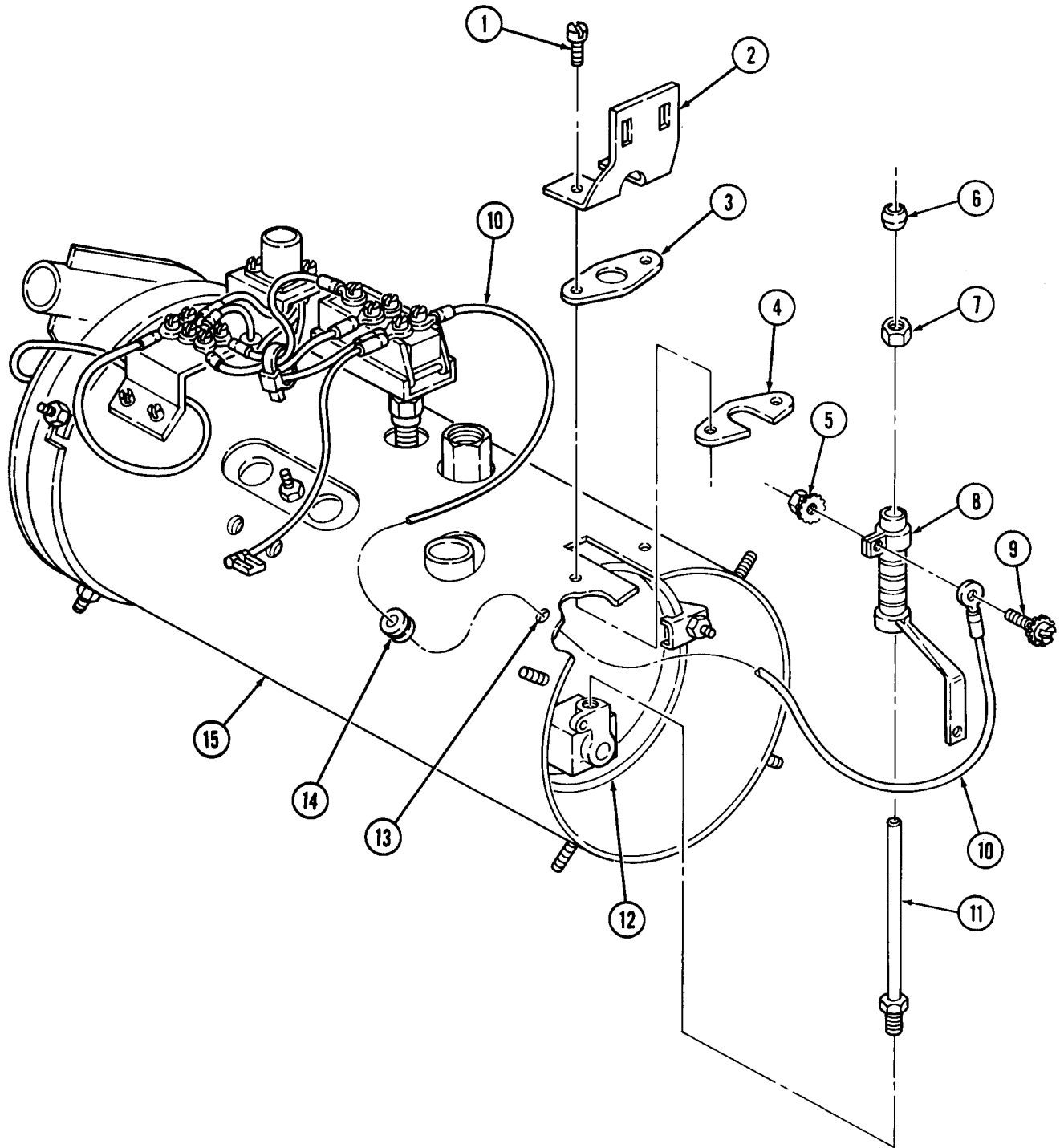
a. Removal

1. Remove two screws (1), bracket (2), flange (3), and tapping plate (4) from heater housing (15).
2. Remove grommet (14) from hole (13) in heater housing (15) and slide up on lead (10).
3. Remove nut-assembled lockwasher (5), screw-assembled lockwasher (9), and lead (10) from preheater resistor (8).
4. Remove fuel tube (11) with preheat resistor (8) from burner (12).
5. Remove sleeve (6), nut (7), and preheat resistor (8) from fuel tube (11). Discard sleeve (6).

b. Installation

1. Install preheater resistor (8), nut (7), and new sleeve (6) on fuel tube (11).
2. Install fuel tube (11) with preheater resistor (8) on burner (12).
3. Insert lead (10) through hole (13) in heater housing (15) and install on preheater resistor (8) with screw-assembled lockwasher (9) and nut-assembled lockwasher (5).
4. Install grommet (14) in hole (13) on heater housing (15).
5. Position tapping plate (4), flange (3), and bracket (2) on heater housing (15) and install with two screws (1).

17-8. ENGINE COOLANT HEATER FUEL TUBE AND PREHEAT RESISTOR REPLACEMENT (Contd)



FOLLOW-ON TASK: Install engine coolant heater overheat switch and igniter (para. 17-7).

17-9. ENGINE COOLANT HEATER BURNER MAINTENANCE

THIS TASK COVERS:

- a. Removal
- b. Cleaning and Inspection

- c. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Tool kit, electrical (Appendix B, Item 2)

REFERENCES (TM)

TM 9-2320-361-34P

MATERIALS/PARTS

Gasket (Appendix F, Item 47)
O-ring (Appendix F, Item 174)
Drycleaning solvent (Appendix C, Item 24)

EQUIPMENT CONDITION

Engine coolant heater fuel tube and preheat resistor removed (para. 17-8).

GENERAL SAFETY INSTRUCTIONS

- Keep fire extinguisher nearby when using drycleaning solvent.
- Compressed air source will not exceed 30 psi (207 kPa).
- Eyeshields must be worn when cleaning with compressed air.

a. Removal

Remove four nuts (5), clamps (6), hook bolts (7), burner (4), O-ring (3), and gasket (2) from heater exchanger (1). Discard O-ring (3) and gasket (2).

b. Cleaning and Inspection

WARNING

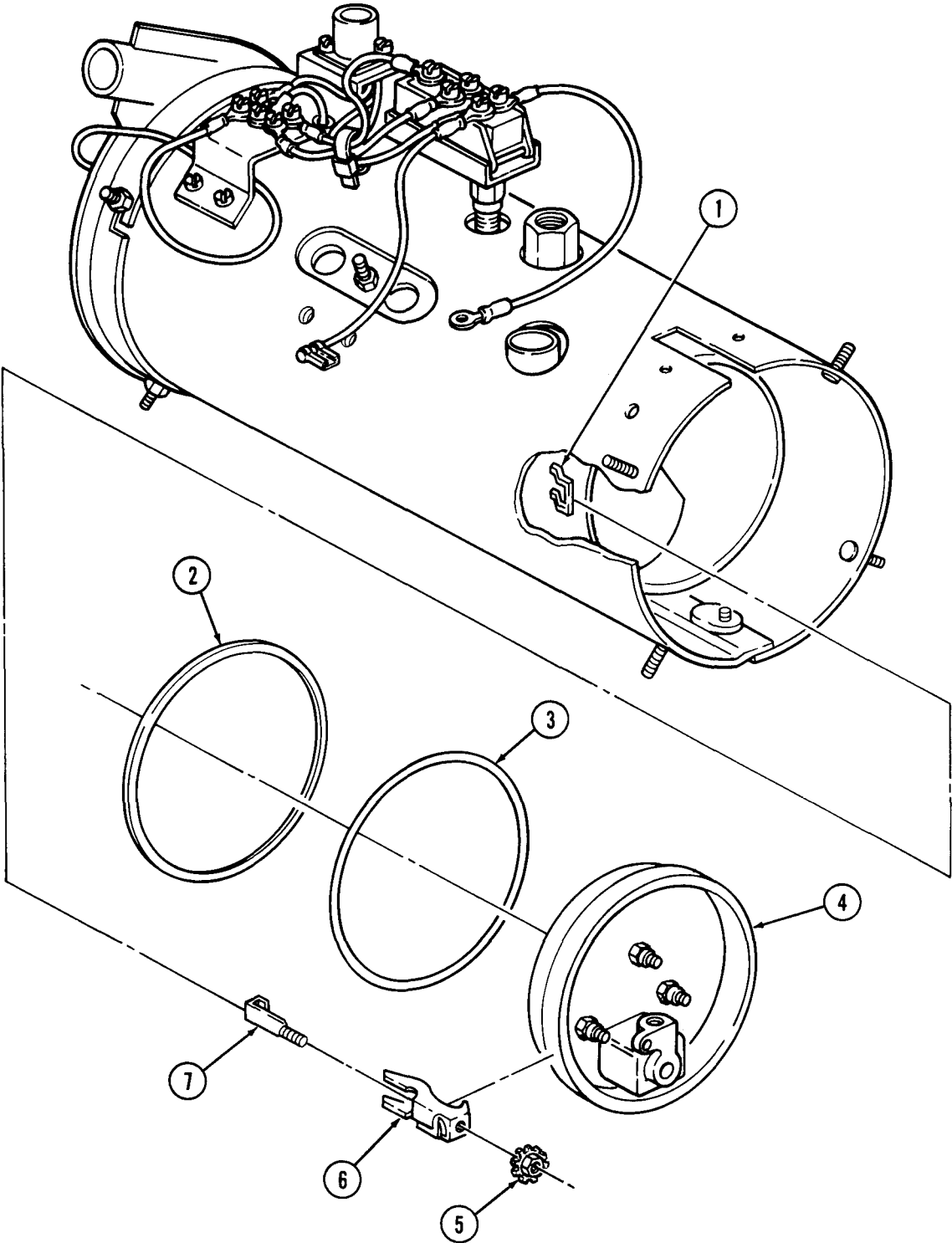
- Drycleaning solvent is flammable and will not be used near open flame. Use only in well-ventilated places. Failure to do so may result in injury to personnel.
- Compressed air source will not exceed 30 psi (207 kPa). When cleaning with compressed air, eyeshields must be worn. Failure to wear eyeshields may result in injury to personnel.

Inspect burner (4) for scorched and charred surfaces. If scorched or charred, clean burner (4) surfaces with wire brush, wipe clean with drycleaning solvent, and dry. Replace burner (4) if insulating pad is charred or parts are missing.

c. Installation

Position new gasket (2), new O-ring (3), and burner (4) on heat exchanger (1) and install with four hook bolts (7), clamps (6), and nuts (5).

17-9. ENGINE COOLANT HEATER BURNER MAINTENANCE (Contd)



FOLLWW-ON TASK: Install engine Coolant heater fuel tube and preheater resistor (para. 17-8).

17-10. ENGINE COOLANT HEATER HOUSING MAINTENANCE

THIS TASK COVERS:

- a. Removal
- b. Cleaning and Inspection
- c. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit (Appendix B, Item 1)

REFERENCES (TM)

TM 9-2320-361-34P

EQUIPMENT CONDITION

- Engine coolant heater flame detector switch removed (para. 17-2).
- Engine coolant heater restriction thermostat removed (para. 17-4).
- Engine coolant heater burner removed (para. 17-9).

GENERAL SAFETY INSTRUCTIONS

- Compressed air source will not exceed 30 psi (207 kpa).
- Eyeshields must be worn when cleaning with

a. Removal

1. Remove three screws (2) from heater housing (1).
2. Separate heater housing (1) and remove heat exchanger (5) from heater housing (1).

b. Cleaning and Inspection

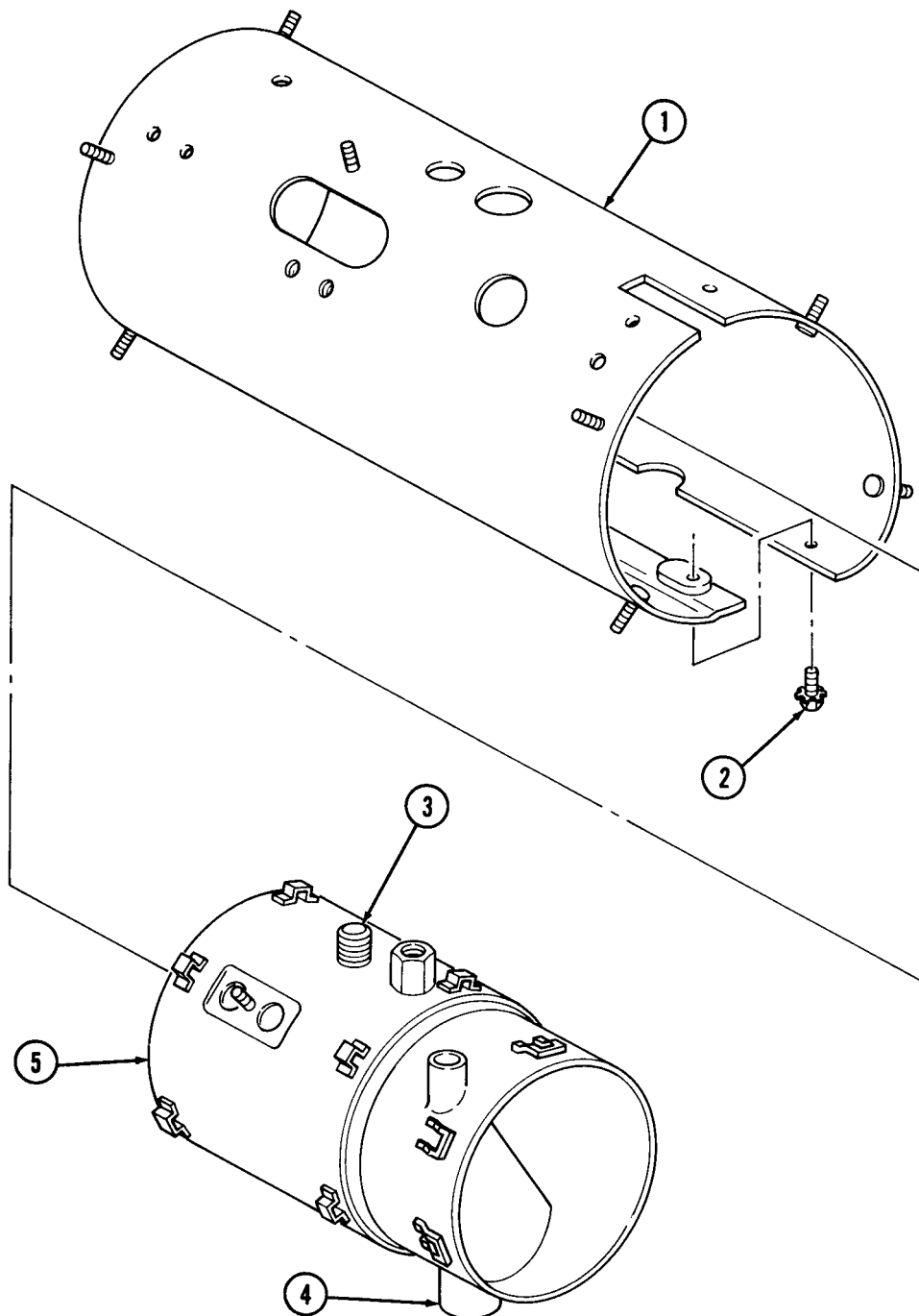
WARNING

Compressed air source will not exceed 30 psi (207 kPa). When cleaning with compressed air, eyeshields must be worn. Failure to wear eyeshields may result in injury to personnel.

Inspect heat exchanger (5) for exterior damage, leaks, and corrosion. Replace if damaged, heavily corroded, or leaks are present. To remove carbon from heat exchanger, soak in water for a short time and dry with compressed air.

c. Installation

Ensure flame detector adapter (3) and exhaust tube (4) are alined and install heat exchanger (5) in heater housing (1) with three screws (2).

17-10. ENGINE COOLANT HEATER HOUSING MAINTENANCE (Contd)

FOLLOW-ON TASKS: .Install burner (para. 17-9).
•Install restriction thermostat (para. 17-4).
•Install flame detector switch (para. 17-2).

17-11. PERSONNEL HEATER GUARD AND BLOWER MOTOR REPLACEMENT

a. Guard Removal

b. Blower Motor Removal

c. Blower Motor Installation

d. Guard Installation

INITIAL SETUP

APPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Tool kit, electrical (Appendix B, Item 2)

MATERIALS/PARTS

Screw-assembled lockwasher
(Appendix F, Item 169)

REFERENCES (TM)

TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

Fuel burning personnel heater removed
(TM 9-2320-361-20).

NOTE

Tag wires for installation.

a. Guard Removal

Release two dzus fasteners (10) and remove guard (1) from heater housing (7).

b. Blower Motor Removal

1. Remove screw-assembled lockwasher (2) and blower motor lead (3) from flame detector switch (4). Discard screw-assembled lockwasher (2).
2. Remove screw (5) and nut-assembled lockwasher (9) from clamp (6) and ignition control unit (8).
3. Remove grommet (11) from heater housing (7).
4. Loosen four screw-assembled lockwashers (12) and remove blower motor (13) from heater housing (7).

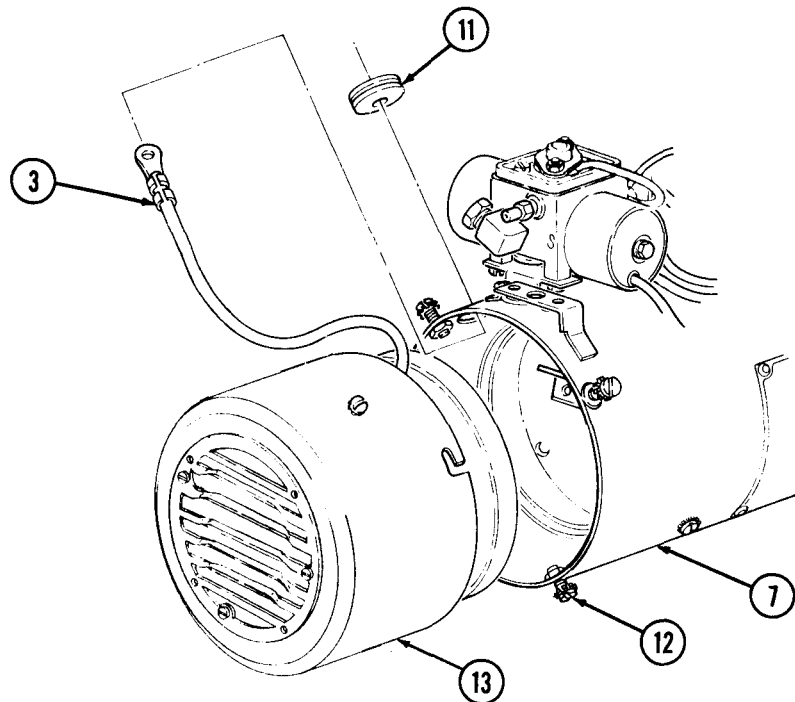
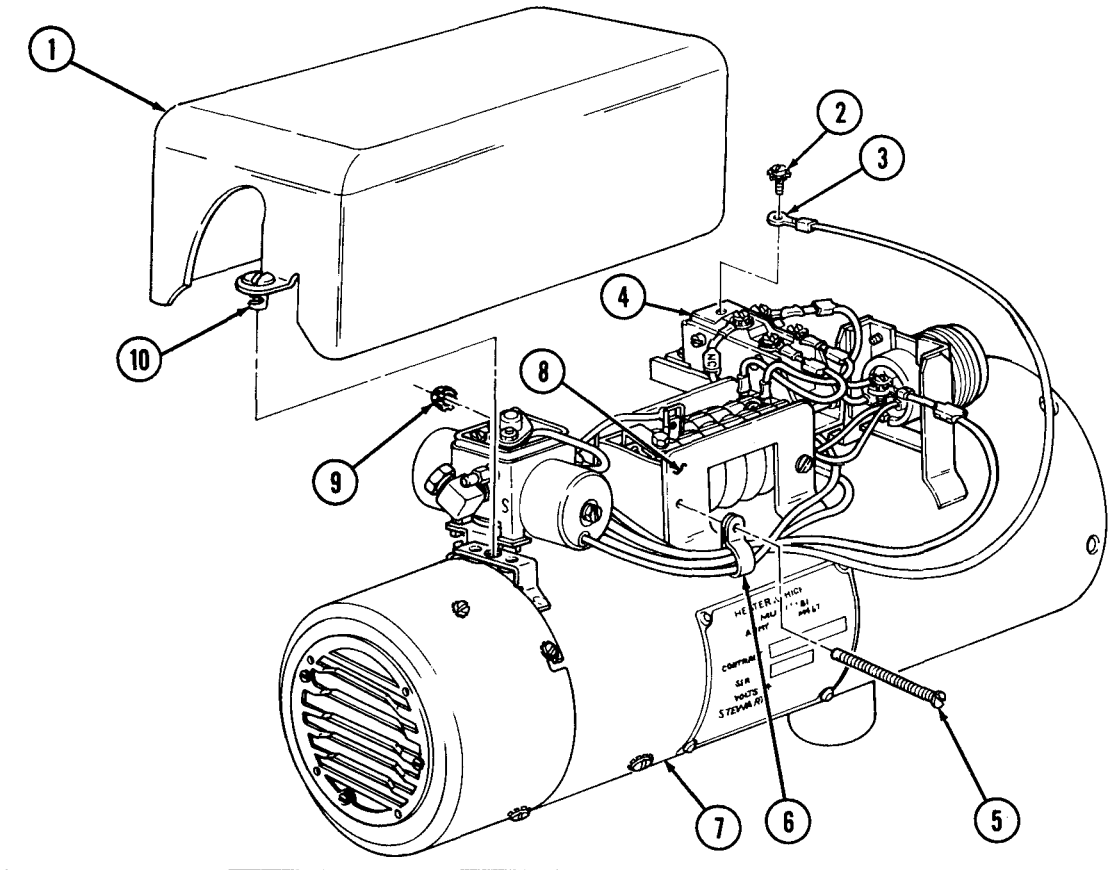
c. Blower Motor Installation

1. Install grommet (11) in heater housing (7).
2. Route blower motor lead (3) through grommet (11) in heater housing (7).
3. Install blower motor (13) on heater housing (7) by tightening four screw-assembled lockwashers (12).
4. Install blower motor lead (3) on flame detector switch (4) with new screw-assembled lockwasher (2).
5. Install clamp (6) on ignition control unit (8) with screw (5) and nut-assembled lockwasher (9).

d. Guard Installation

Position guard (1) on heater housing (7) and hold in place with two dzus fasteners (10).

17-11. PERSONNEL HEATER GUARD AND BLOWER MOTOR REPLACEMENT (Contd)



FOLLOW-ON TASK: Test fuel burning personnel heater (para. 17-20).

17-12. PERSONNEL HEATER FUEL CONTROL VALVE REPLACEMENT

THIS TASK COVERS:

- a. Removal**
- b. Inspection**

c. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

Tool kit, electrical (Appendix B, Item 2)

MATERIALS/PARTS

Two nut-assembled lockwashers
(Appendix F, Item 154)

Screw-assembled lockwasher
(Appendix F, Item 169)

REFERENCES (TM)

TM 9-2320-361-34P

EQUIPMENT CONDITION

Personnel heater guard removed (para. 17-11).

a. Removal

NOTE

Tag wires for installation.

1. Remove nut-assembled lockwasher (8), screw (4), and clamp (5) from ignition control unit (9).
2. Remove elbow (12) and nipple (11) from fuel control valve (10).
3. Remove screw-assembled lockwasher (1) and restriction solenoid lead (2) from receptacle (3). Discard screw-assembled lockwasher (1).
4. Remove nut-assembled lockwasher (21) and shutoff valve lead (6) from overheat switch (17). Discard nut-assembled lockwasher (21).
5. Remove nut-assembled lockwasher (20), thermostat lead (19), receptacle lead (7), and ignition control lead (18) from overheat switch (17). Discard nut-assembled lockwasher (20).
6. Remove clamp (5) from wires (6), (2), and (7).
7. Loosen nut (16) and disconnect fuel line (15) from fuel control valve (10).
8. Remove four screws (13) and fuel control valve (10) from heater housing (14).

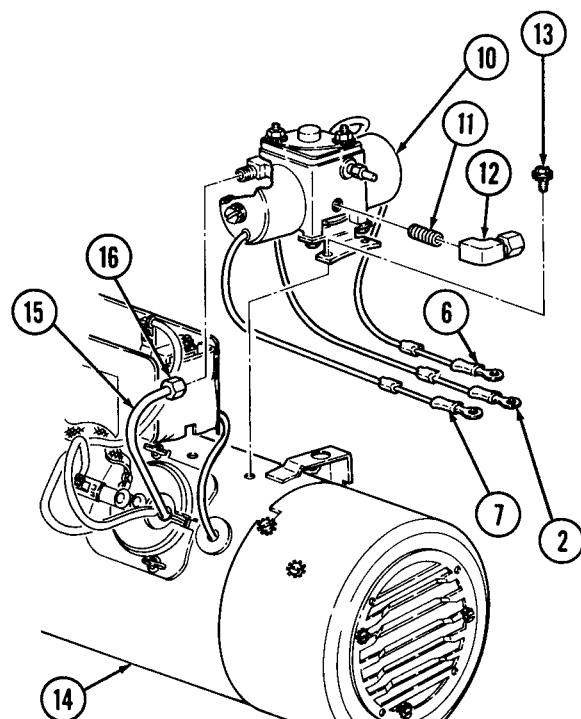
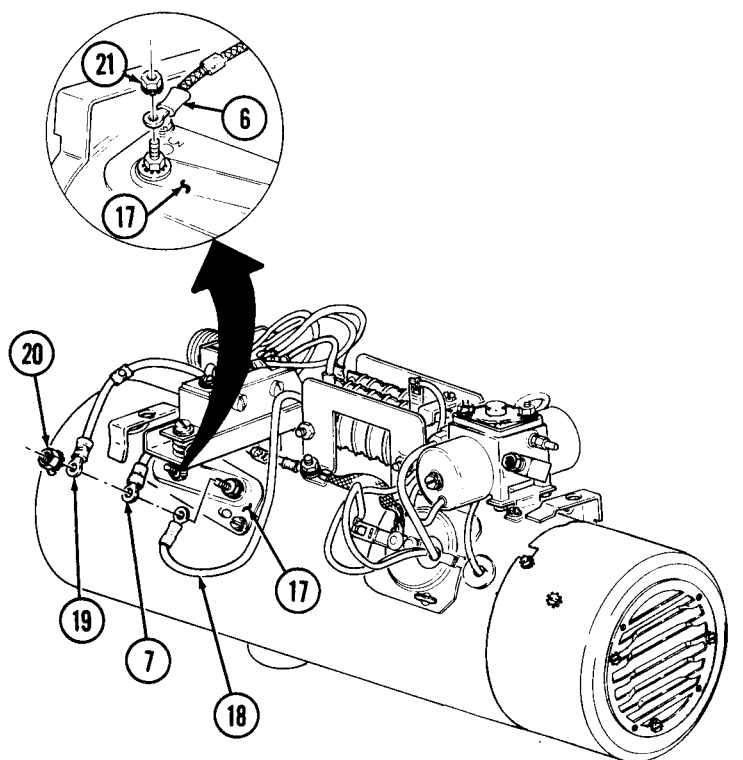
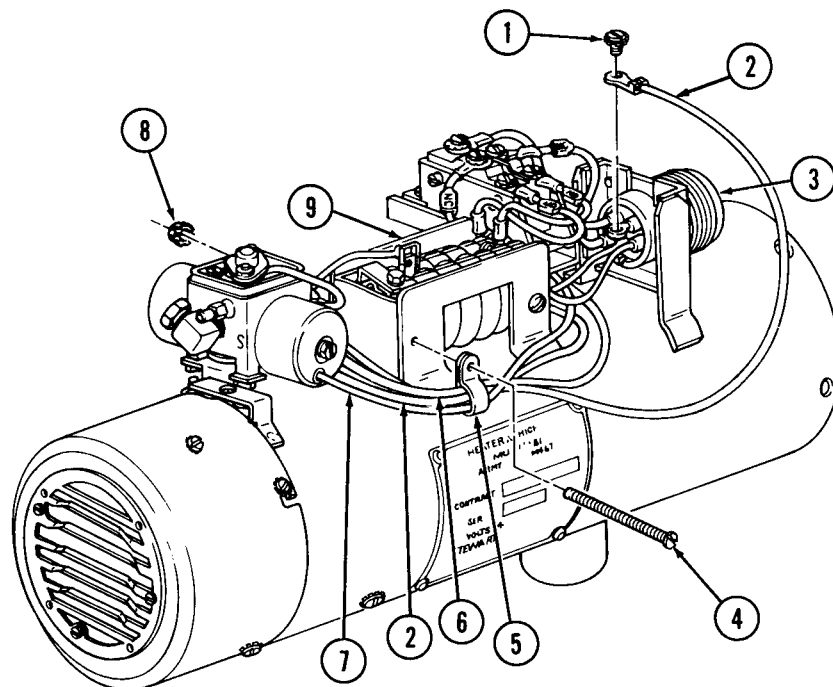
b. Inspection

Visually inspect fuel control valve (10) for dents or loose wires. Replace fuel control valve (10) if damaged.

c. Installation

1. Install fuel control valve (10) on heater housing (14) with four screws (13).
2. Install fuel line (15) on fuel control valve (10). Tighten nut (16).
3. Slide clamp (5) over wires (6), (2), and (7).
4. Install restriction solenoid lead (2) on receptacle (3) with new screw-assembled lockwasher (1).
5. Install ignition control lead (18), receptacle lead (7), and thermostat lead (19) on overheat switch (17) with new nut-assembled lockwasher (20).
6. Install shutoff valve lead (6) on overheat switch (17) with new nut-assembled lockwasher (21).
7. Install clamp (5) on ignition control unit (9) with screw (4) and new nut-assembled lockwasher (8).
8. Install nipple (11) and elbow (12) on fuel control valve (10).

17-12. PERSONNEL HEATER FUEL CONTROL VALVE REPLACEMENT (Contd)



FOLLOW-ON TASK: Install personnel heater guard (para. 17-11).

17-13. PERSONNEL HEATER IGNITER AND IGNITION CONTROL UNIT REPLACEMENT

THIS TASK COVERS:

a. Igniter Removal

b. Ignition Control Unit Removal

c. Ignition Control Unit Installation

d. Igniter Installation

INITIAL SETUP

APPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

Tool kit, electrical (Appendix B, Item 2)

MATERIALS/PARTS

Two screw-assembled lockwashers
(Appendix F, Item 169)

MATERIALS/PARTS (Contd)

Nut-assembled lockwasher
(Appendix F, Item 154)

Igniter (Appendix F, Item 86)

Two lockwashers (Appendix F, Item 122)

REFERENCES (TM)

TM 9-2320-361-34P

EQUIPMENT CONDITION

Personnel heater guard and blower motor removed
(para. 17-11).

NOTE

Tag wires for installation.

a. Igniter Removal

1. Remove nut (6), receptacle ground lead (13), ground strap (12), and lockwasher (11) from ignition control unit (8). Discard lockwasher (11).
2. Disconnect igniter leads (7) and (10) from ignition control unit (8) and igniter hatch cover (9).
3. Release two fly screws (14) and remove igniter hatch cover (9) from heater housing (15).

CAUTION

Igniter is fragile. Use care when removing igniter. Failure to do so may result in damage to equipment.

4. Press and turn igniter (18) 1/4 turn left and remove from igniter tube (17). Discard igniter (18).
5. Remove screw (16) and igniter tube (17) from heater housing (15).

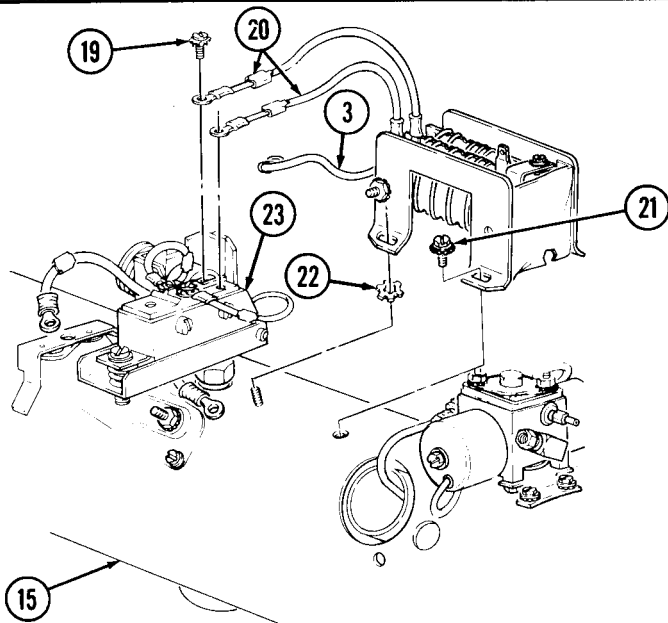
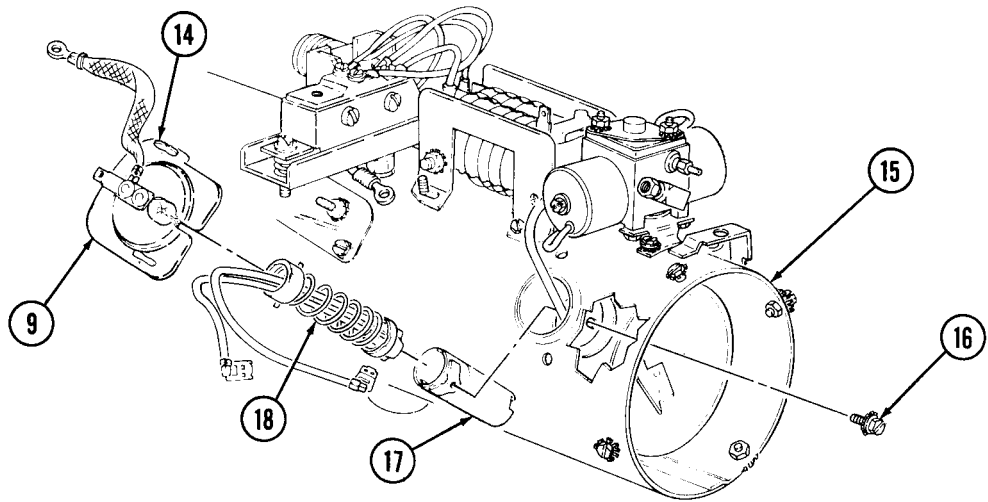
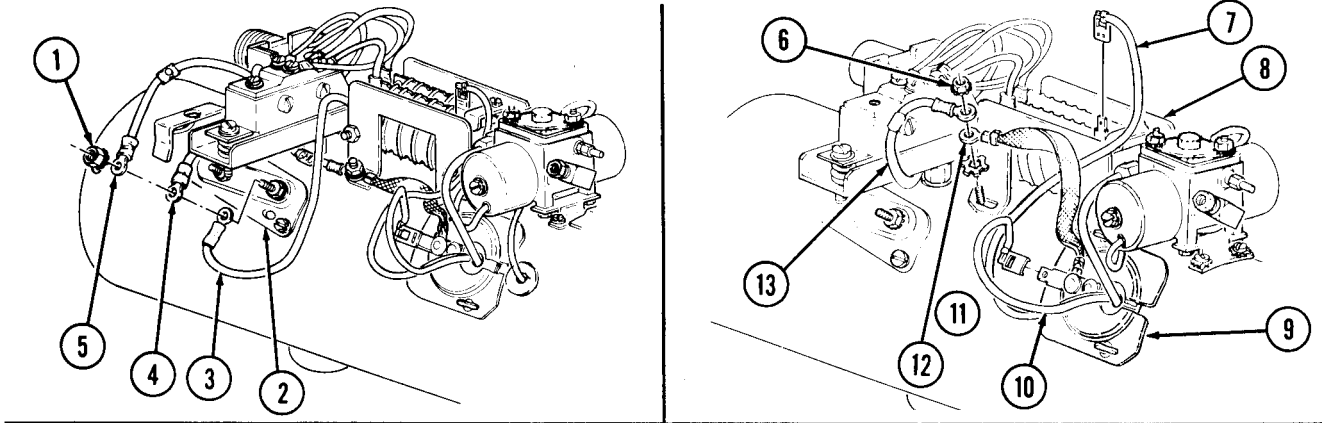
b. Ignition Control Unit Removal

NOTE

Remove igniter before removing ignition control unit (subtask a).

1. Remove nut-assembled lockwasher (1), thermostat lead (5), receptacle lead (4), and ignition control lead (3) from overheat switch (2). Discard nut-assembled lockwasher (1).
2. Remove two screw-assembled lockwashers (19) and ignition control leads (20) from flame detector switch (23). Discard screw-assembled lockwashers (19).
3. Remove three screws (21), ignition control unit (8), and lockwasher (22) from heater housing (15). Discard lockwasher (22).

17-13. PERSONNEL HEATER IGNITER AND IGNITION CONTROL UNIT REPLACEMENT (Contd)



17-13. PERSONNEL HEATER IGNITER AND IGNITION CONTROL UNIT REPLACEMENT (Contd)

c. Ignition Control Unit Installation

1. Install new lockwasher (6) and ignition control unit (4) on heater housing (5) with three new screws (3).
2. Install two ignition control leads (2) on flame detector switch (7) with two new screw-assembled lockwashers (1).
3. Install ignition control lead (8), receptacle lead (9), and thermostat lead (10) on overheating switch (7) with new nut-assembled lockwasher (6).

d. Igniter Installation

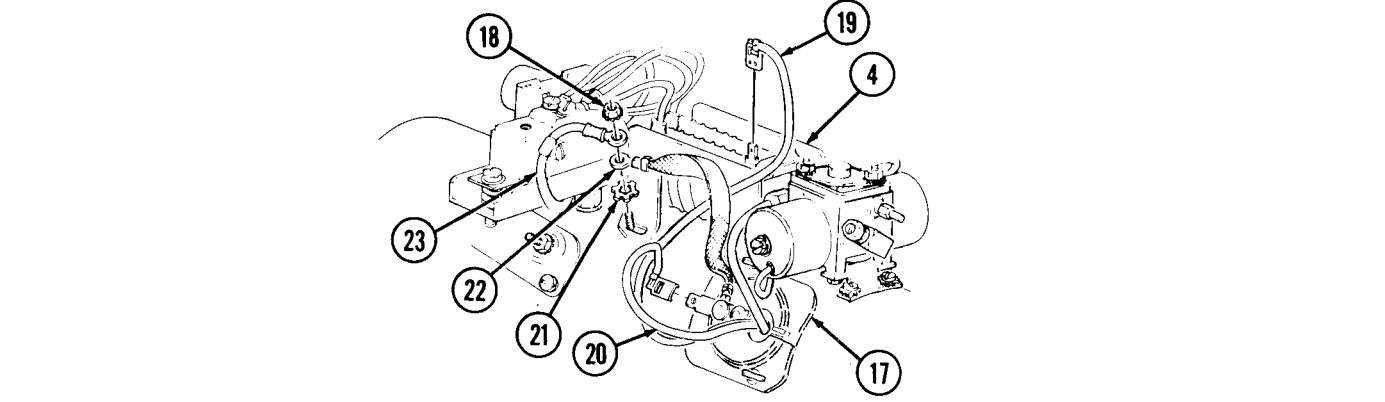
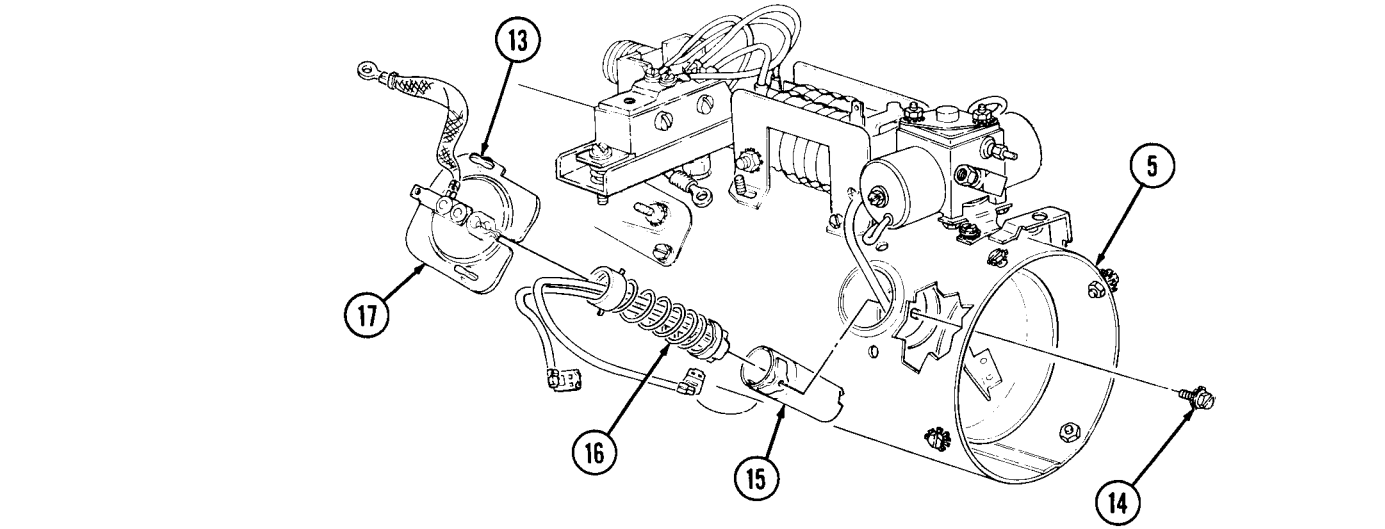
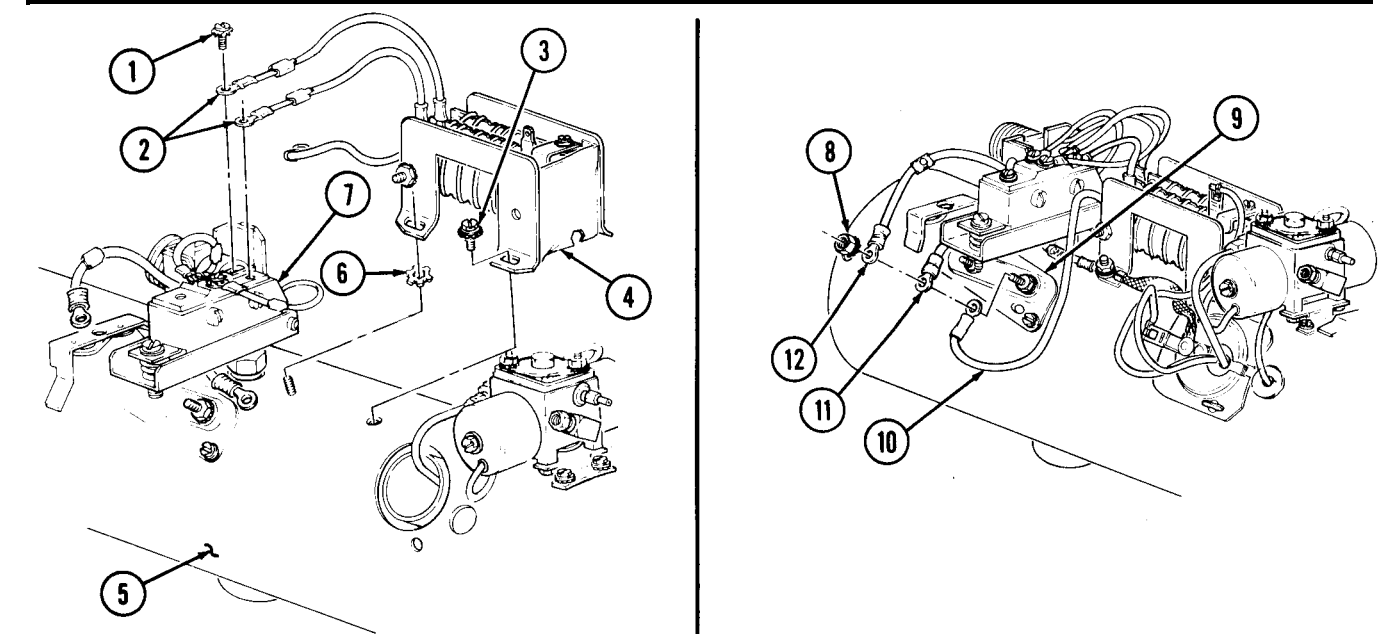
1. Install igniter tube (17) in blower housing (15) with new screw (16).

CAUTION

Igniter is fragile. Use care when removing igniter. Failure to do so may result in damage to equipment.

2. Install new igniter (16) in igniter tube (15) and press and turn 1/4-turn to right to hold in place.
3. Install igniter hatch cover (17) on heater housing (5) and hold in place with two fly screws (13).
4. Connect igniter leads (19) and (20) on ignition control unit (4) and igniter hatch cover (17).
5. Install new lockwasher (21), ground strap (22), and receptacle ground lead (23) on ignition control unit (4) with nut (18).

17-13. PERSONNEL HEATER IGNITER AND IGNITION CONTROL UNIT REPLACEMENT (Contd)



FOLLOW-ON TASK: Install personnel heater guard and blower motor (para. 17-11).

17-14. PERSONNEL HEATER FUEL LINE AND BLOWER HOUSING REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

REFERENCES (TM)

TM 9-2320-361-34P

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

EQUIPMENT CONDITION

Personnel heater igniter removed (para. 17-13).

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

Tool kit, electrical (Appendix B, Item 2)

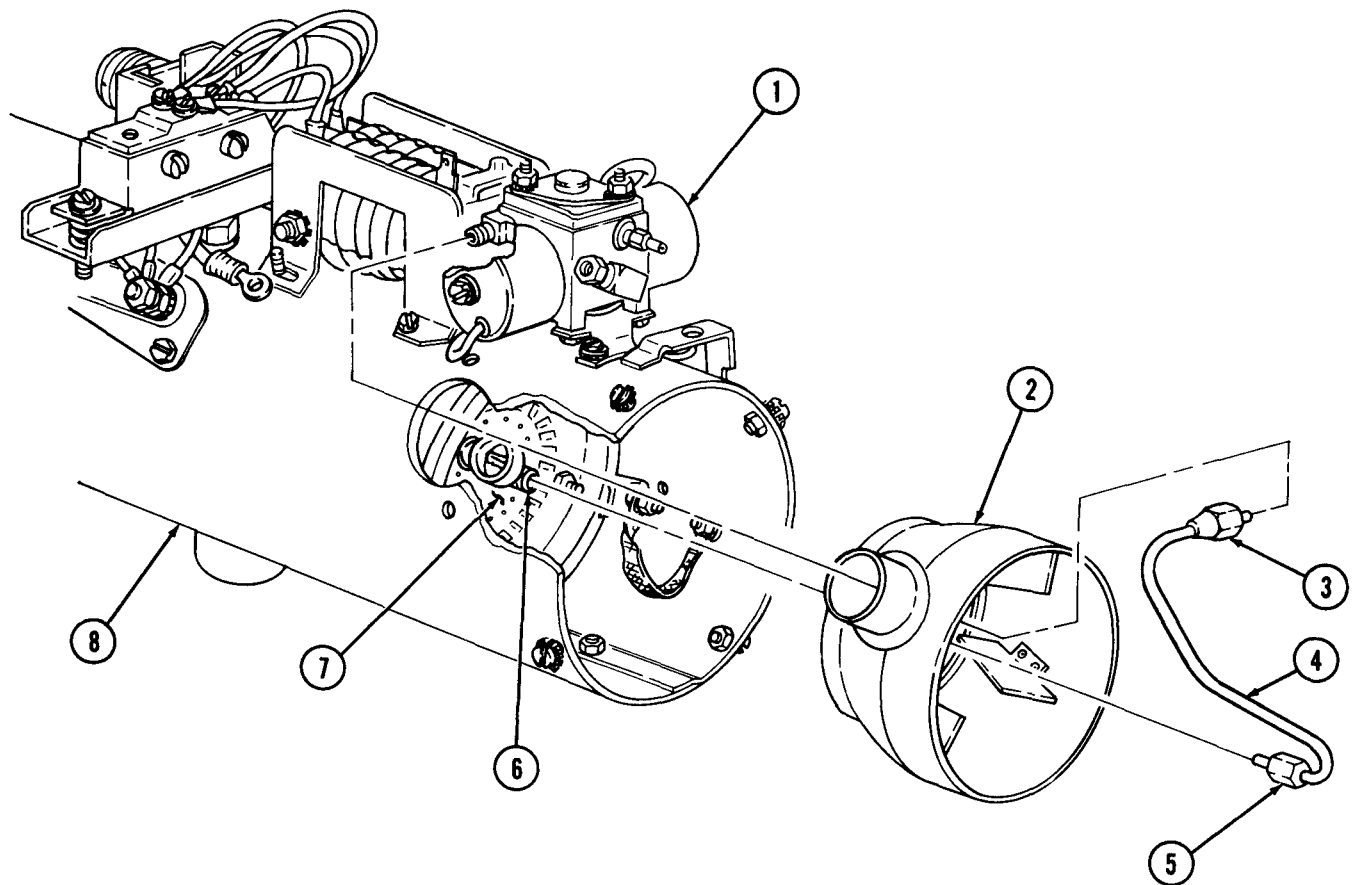
a. Removal

1. Loosen nut (3) and remove fuel line (4) from fuel control valve (1).
2. Loosen nut (5) and remove fuel line (4) from burner fuel inlet (6).
3. Remove blower housing (2) from heat exchanger (7) and heater housing (8).

b. Installation

1. Place blower housing (2) in heater housing (8).
2. Install fuel line (4) on burner fuel inlet (6) through blower housing (2). Do not fully tighten nut (5).
3. Install fuel line (4) on fuel control valve (1). Finger tighten nut(3).

17-14. PERSONNEL HEATER FUEL LINE AND BLOWER HOUSING REPLACEMENT (Contd)



FOLLOW-ON TASK: Install personnel heater igniter (para. 17-13).

17-15. PERSONNEL HEATER FLAME DETECTOR SWITCH MAINTENANCE

THIS TASK COVERS:

- | | |
|--|--|
| <ul style="list-style-type: none"> a. Removal b. Disassembly c. Cleaning and Inspection | <ul style="list-style-type: none"> d. Assembly e. Installation |
|--|--|

INITIAL SETUP

APPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Tool kit, electrical (Appendix B, Item 2)

MATERIALS/PARTS

Five screw-assembled lockwashers
(Appendix F, Item 169)

REFERENCES (TM)

TM 9-2320-361-34P

EQUIPMENT CONDITION

Personnel heater guard removed (para. 17-11).

NOTE

Tag wires for installation.

a. Removal

1. Remove two screw-assembled lockwashers (8) and ignition control leads (4) from flame detector switch (7). Discard screw-assembled lockwashers (8).
2. Remove screw-assembled lockwasher (1) and blower motor lead (9) from flame detector switch (7). Discard screw-assembled lockwasher (1).
3. Remove two screw-assembled lockwashers (2) and receptacle leads (3) from flame detector switch (7). Discard screw-assembled lockwashers (2).
4. Loosen nut (6) and remove flame detector switch (7) from heater housing (5).

b. Disassembly

1. Remove adjusting screw (10), washer (11), and spring (17) from microswitch (12) and mount (13).

CAUTION

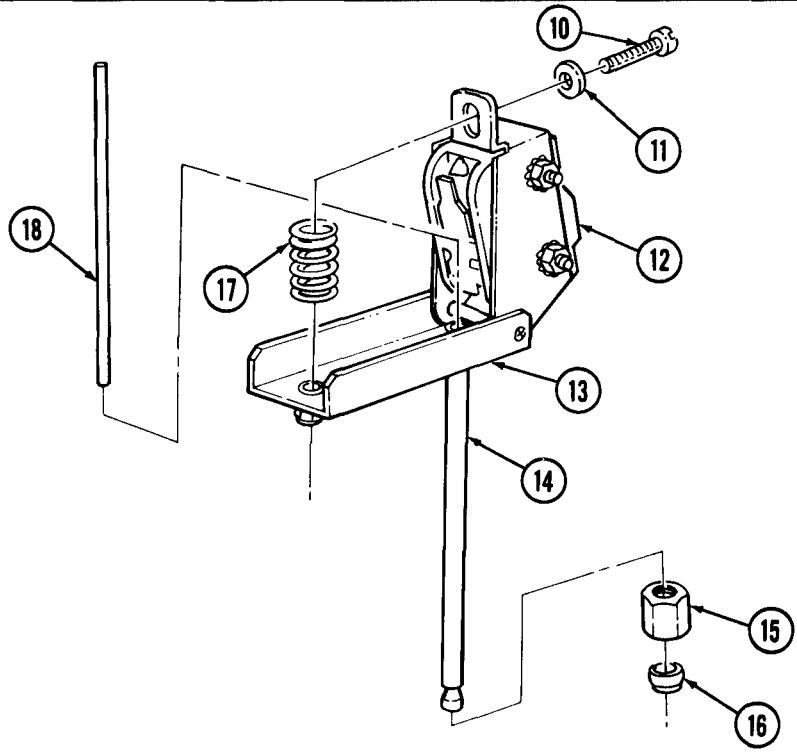
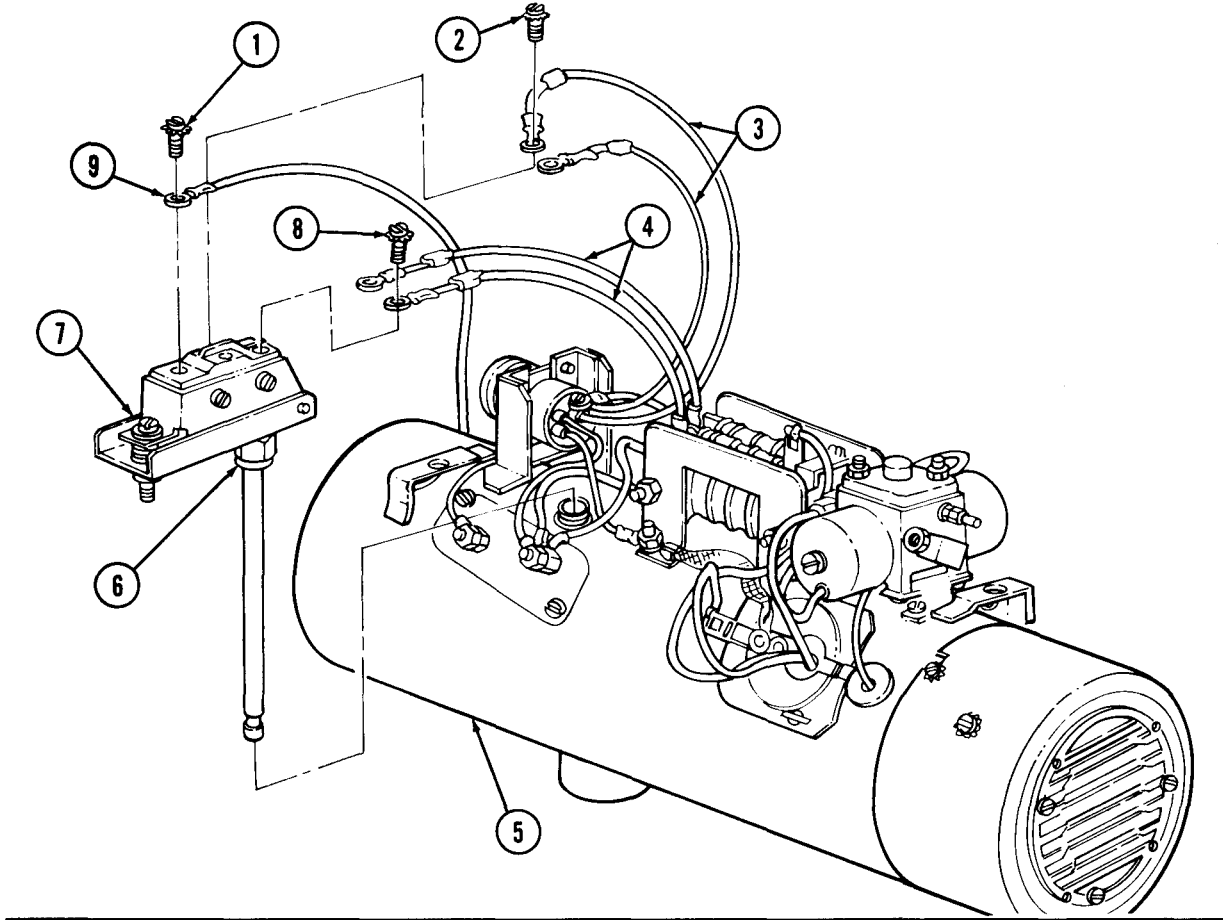
Ceramic rod is very brittle and is easily broken; handle carefully.

2. Tilt microswitch (12) back on mount (13).
3. Invert microswitch (12) and remove ceramic rod (18) from probe (14).
4. Remove nut (15) and sleeve (16) from probe (14).

c. Cleaning and Inspection

Inspect flame detector switch (7) for oxidation and dirt, broken ceramic rod (18), and bent or distorted probe (14). If oxidized or dirty, clean by removing ceramic rod (18) and lightly rapping side of probe (14) to loosen oxides and dirt. Replace flame detector switch (7) if ceramic rod (18) is broken or probe (14) is damaged.

17-15. PERSONNEL HEATER FIAME DETECTOR SWITCH MAINTENANCE (Contd)



17-15. PERSONNEL HEATER FLAME DETECTOR SWITCH MAINTENANCE (Contd)

d. Assembly

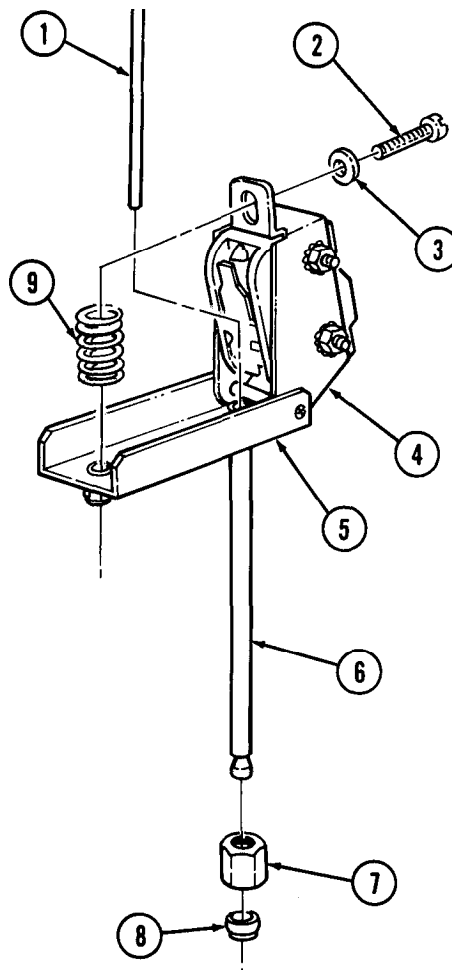
CAUTION

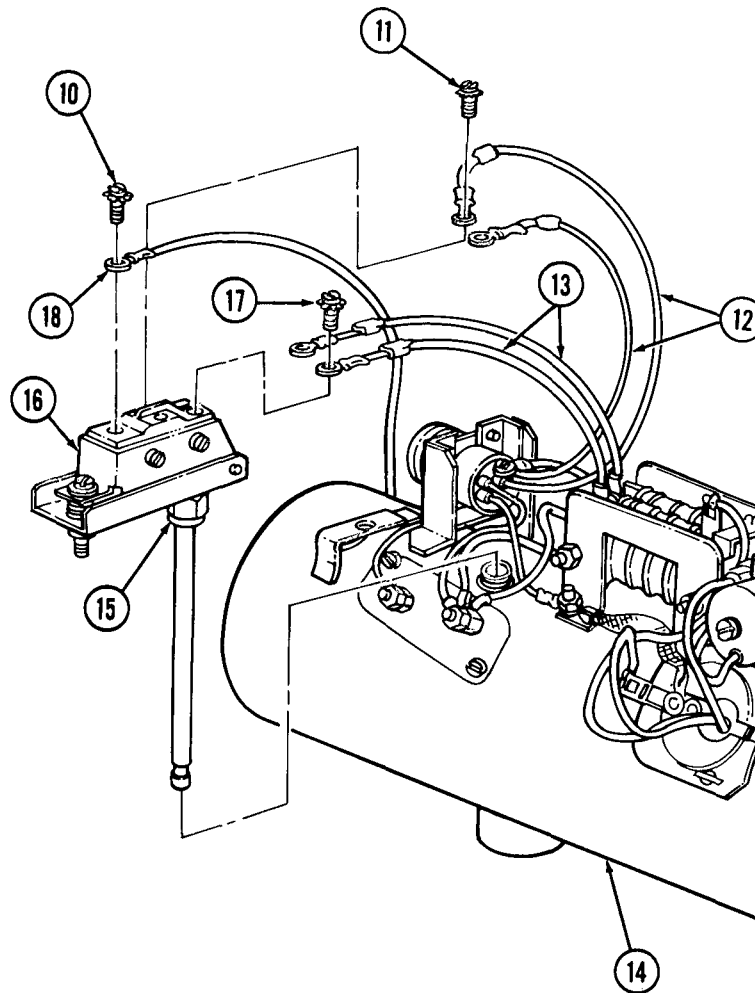
Ceramic rod is very brittle and is easily broken; handle carefully.

1. Tilt microswitch (4) back on mount (5) and insert ceramic rod (1) in probe (6).
2. Position spring (9) in place and tilt microswitch (4) back into position.
3. Install washer (3) and adjusting screw (2) until microswitch (4) clicks, then continue an additional 3/4 turn.
4. Install sleeve (8) and nut (7) on probe (6).

e. Installation

1. Install flame detector switch (16) on heater housing (14). Tighten nut (15).
2. Install receptacle leads (12) on flame detector switch (16) with two new screw-assembled lock-washers (11).
3. Install blower motor lead (18) on flame detector switch (16) with new screw-assembled lock-washer (10).
4. Install ignition control leads (13) on flame detector switch (16) with two new screw-assembled lock-washers (17).



17-15. PERSONNEL HEATER FLAME DETECTOR SWITCH MAINTENANCE (Contd)

FOLLOW-ON TASK: Install personnel heater guard (para 17-11).

17-16. PERSONNEL HEATER BURNER MAINTENANCE

THIS TASK COVERS:

- | | |
|---|--|
| <ul style="list-style-type: none"> a. Removal b. Disassembly c. Cleaning and Inspection | <ul style="list-style-type: none"> d. Assembly e. Installation |
|---|--|

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Tool kit, electrical (Appendix B, Item 2)

MATERIALS/PARTS

Vehicular heater parts kit
(Appendix F, Item 193)
Vehicular heater parts kit
(Appendix F, Item 192)
Lockwasher (Appendix F, Item 122)
Rag (Appendix C, Item 16)
Drycleaning solvent (Appendix C, Item 24)

REFERENCES (TM)

TM 9-2320-361-34P

EQUIPMENT CONDITION

Personnel heater fuel line and blower housing removed (para. 17-14).

GENERAL SAFETY INSTRUCTIONS

- Keep fire extinguisher nearby when using drycleaning solvent.
- Eye protection is required when using wire brush for cleaning.

a. Removal

1. Remove screw (7), nut-assembled lockwasher (4), nut-assembled lockwasher (3), ground strap (5), and lockwasher (6) from heater housing (9) and heat exchanger (10). Discard nut-assembled lockwasher (4) and lockwasher (6).
2. Loosen four nut-assembled lockwashers (2) and remove four hook bolts and clamps (1) from burner (8) and heat exchanger (10).
3. Remove burner (8) from heat exchanger (10).
4. Remove O-ring (11) and preformed packing (12) from burner (8). Discard preformed packing (12) and O-ring (11).

b. Disassembly

1. Remove three nuts (14) and lockwashers (15) and separate burner cup (13) from header (23). Discard lockwashers (15).
2. Remove screw (22), shield (21), washers (20) and (19), vaporizer (18), and fiber washer (17) from burner cup (13). Discard fiber washer (17).
3. Remove wick (16) from burner cup (13). Discard wick (16).

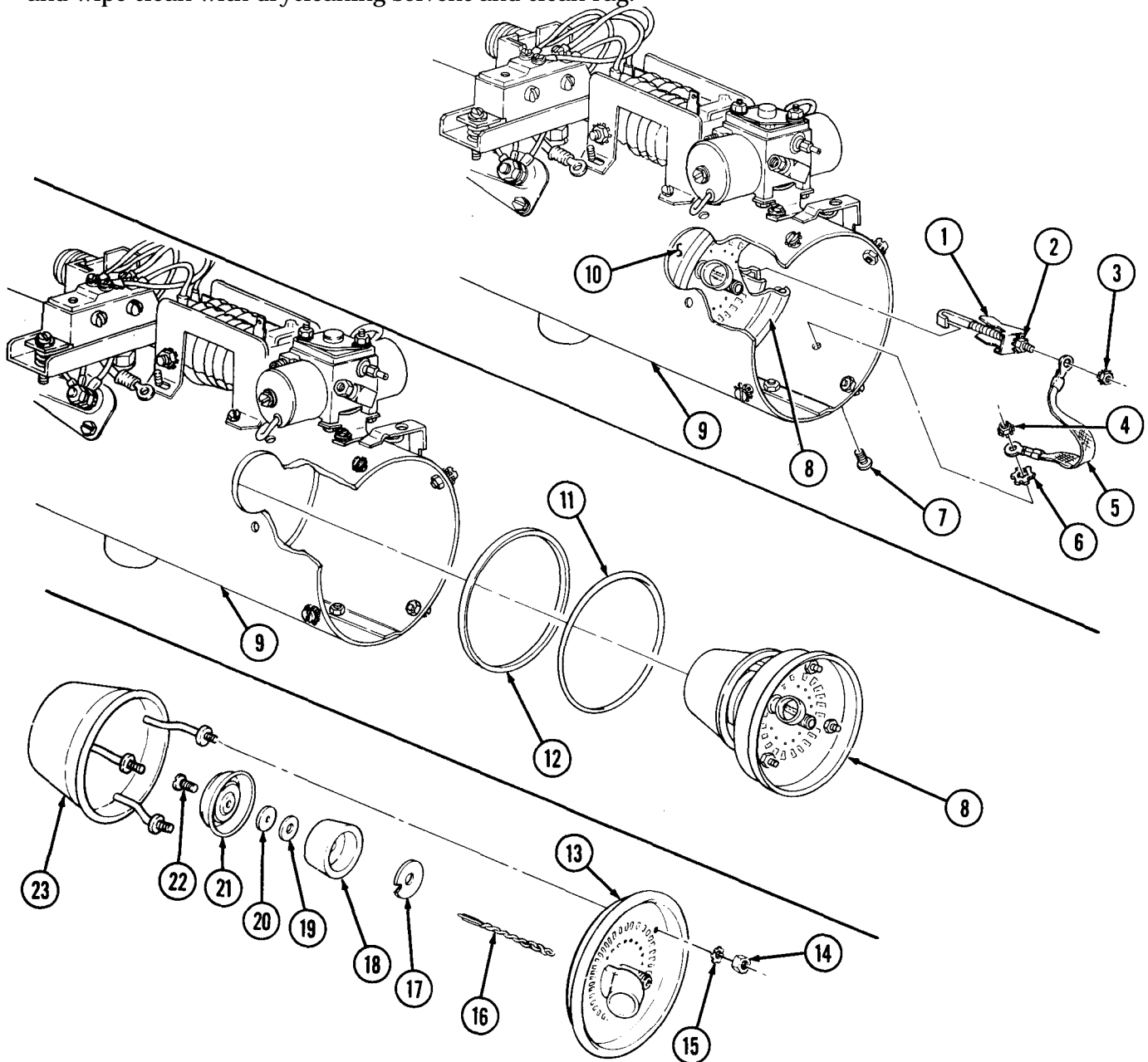
17-16. PERSONNEL HEATER BURNER MAINTENANCE (Contd)

c. Cleaning and Inspection

WARNING

- Drycleaning solvent is flammable and will not be used near open flame. Use only in well-ventilated places. Failure to do so may result in injury to personnel.
- Eye protection is required when using wire brush for cleaning. Failure to do this may result in injury to personnel.

Inspect burner (8) for scorched and charred surfaces. If scorched or charred, clean surfaces with wire brush and wipe clean with drycleaning solvent and clean rag.



17-16. PERSONNEL HEATER BURNER MAINTENANCE (Contd)

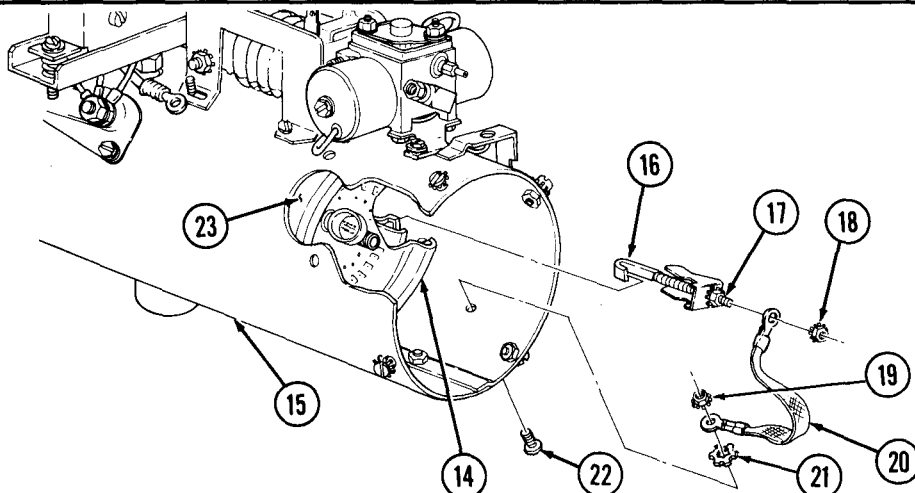
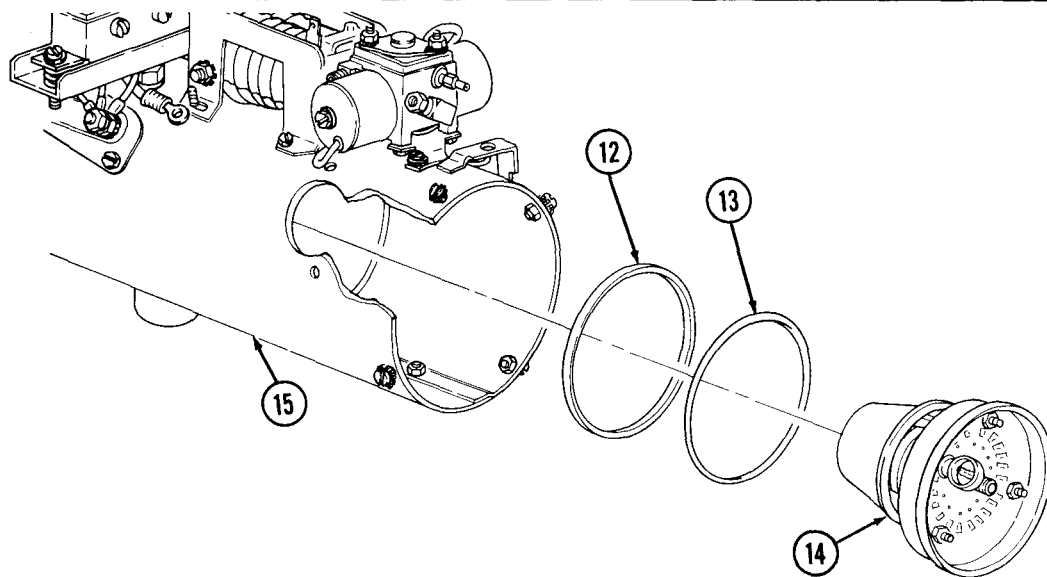
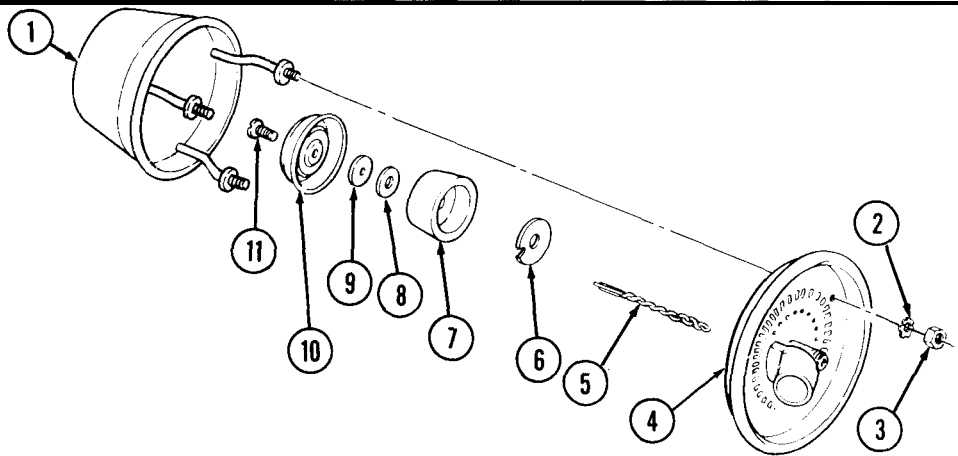
d. Assembly

1. Insert new wick (5) in burner cup (4). Do not twist wick (5).
2. Lay strands of wick (5) in notches of fiber washer (6).
3. Install new fiber washer (6), vaporizer (7), washers (8) and (9), shield (10), and screw (11) on burner cup (4).
4. Position burner cup (4) on header (1) and secure with three new lockwashers (2) and nuts (3).

e. Installation

1. Position new preformed packing (12), new O-ring (13), and burner (14) on heat exchanger (23) and install with four clamp and hook bolts (16). Tighten nut-assembled lockwasher (17).
2. Install new lockwasher (21) and ground strap (20) on heater housing (15) and hook bolt (16) with screw (22), new nut-assembled lockwasher (18) and nut-assembled lockwasher (19).

17-16. PERSONNEL HEATER BURNER MAINTENANCE (Contd)



FOLLOW-ON TASK: Install personnel heater fuel line and blower housing (para. 17-14).

17-17. PERSONNEL HEATER OVERHEAT SWITCH AND RECEPTACLE REPLACEMENT

THIS TASK COVERS:

- a. Overheat Switch Removal
- b. Receptacle Removal

- c. Receptacle Installation
- d. Overheat Switch Installation

INITIAL SETUP

APPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)
Tool kit, electrical (Appendix B, Item 2)

MATERIALS/PARTS

Three nut-assembled lockwashers
(Appendix F, Item 154)

MATERIALS/PARTS (Contd)

Two screw-assembled lockwashers
(Appendix F, Item 169)
Four screw-assembled lockwashers
(Appendix F, Item 168)

REFERENCES (TM)

TM 9-2320-361-34P

EQUIPMENT CONDITION

Personnel heater guard removed (para. 17-11).

NOTE

Tag wires for installation.

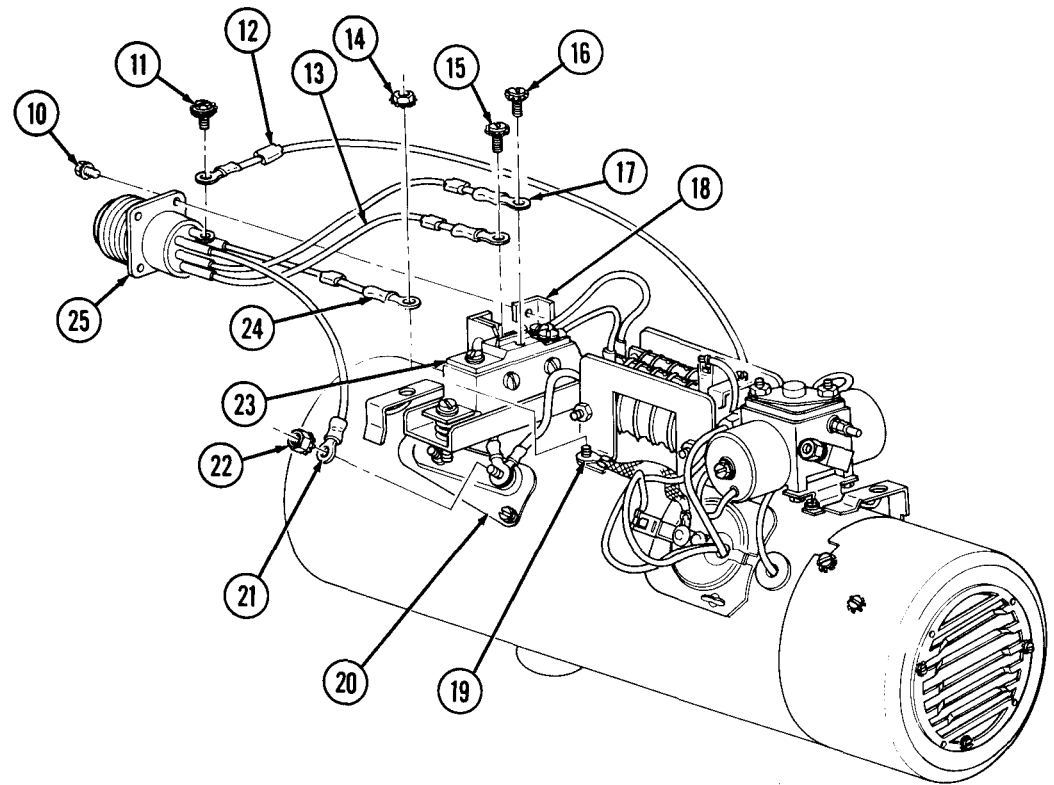
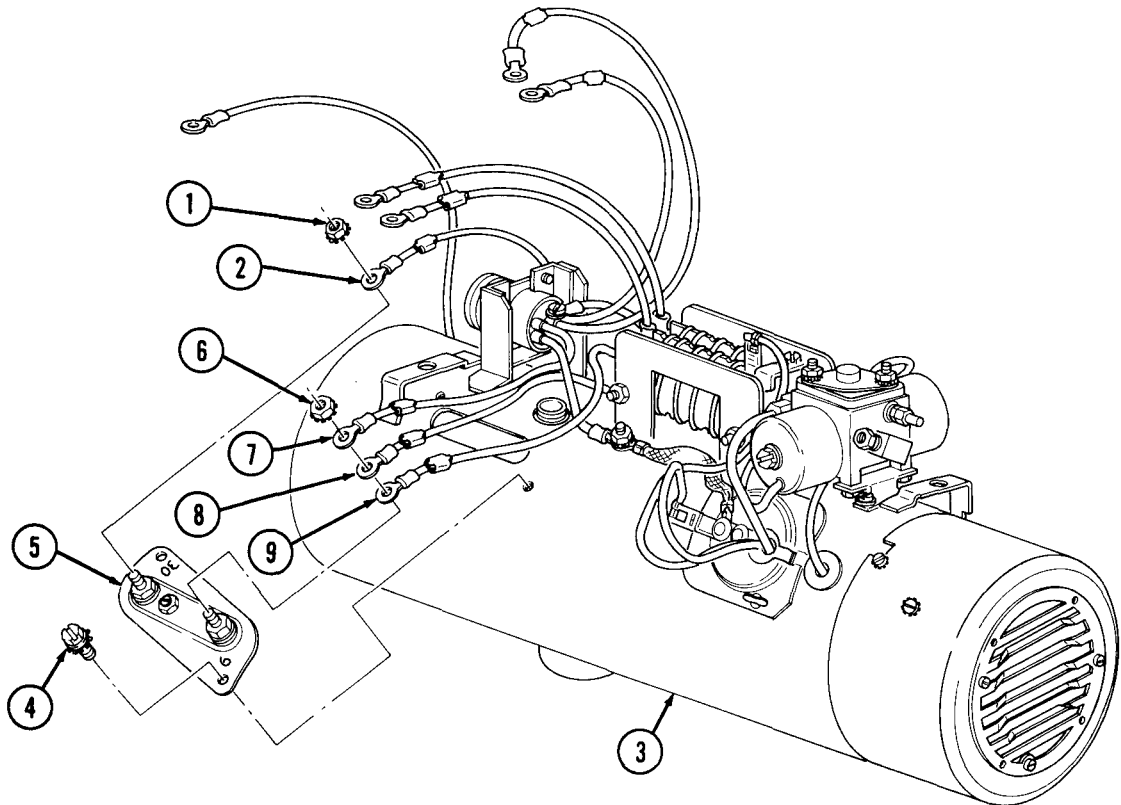
a. Overheat Switch Removal

1. Remove nut-assembled lockwasher (1) and shutoff valve lead (2) from overheat switch (5). Discard nut-assembled lockwasher (1).
2. Remove nut-assembled lockwasher (6), receptacle lead (7), thermostat lead (8), and ignition control lead (9) from overheat switch (5). Discard nut-assembled lockwasher (6).
3. Remove two screw-assembled lockwashers (4) and overheat switch (5) from heater housing (3).

b. Receptacle Removal

1. Remove screw-assembled lockwasher (11) and restriction solenoid lead (12) from receptacle (25). Discard screw-assembled lockwasher (11).
2. Remove nut-assembled lockwasher (22) and thermostat lead (21) from overheat switch (20). Discard nut-assembled lockwasher (22).
3. Remove screw-assembled lockwashers (15) and (16) and leads (17) and (13) from flame detector switch (23). Discard screw-assembled lockwashers (15) and (16).
4. Remove nut (14) and receptacle ground lead (24) from stud (19).
5. Remove four screw-assembled lockwashers (10) and receptacle (25) from bracket (18). Discard screw-assembled lockwashers (10).

17-17. PERSONNEL HEATER OVERHEAT SWITCH AND RECEPTACLE REPLACEMENT (Contd)



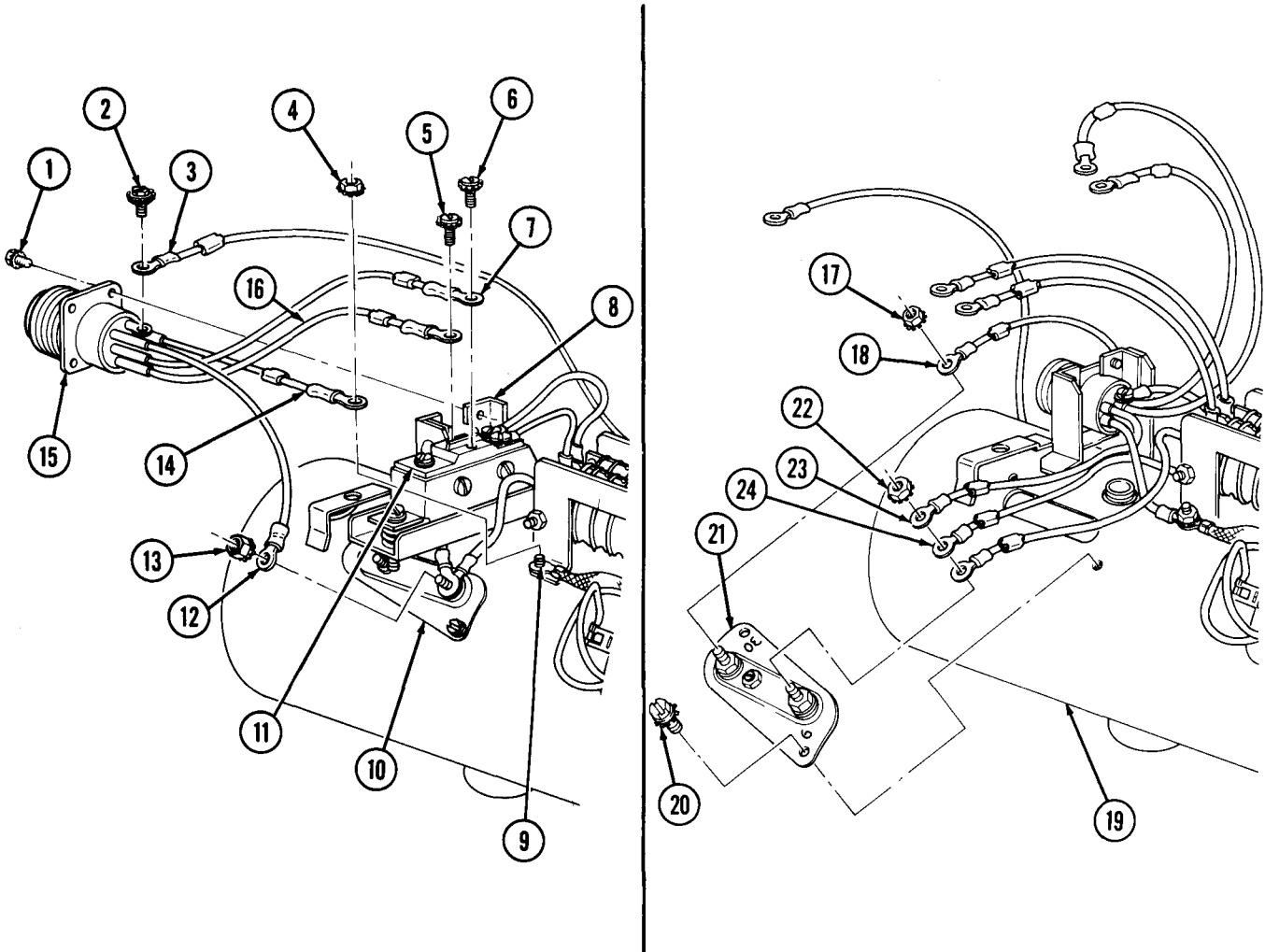
17-17. PERSONNEL HEATER OVERHEAT SWITCH AND RECEPTACLE REPLACEMENT (Contd)

c. Receptacle Installation

1. Install receptacle (15) on bracket (8) with four new screw-assembled lockwashers (1).
2. Install receptacle ground lead (14) on stud (9) with nut (4).
3. Install leads (16) and (7) on flame detector switch (11) with new screw-assembled lockwashers (5) and (6).
4. Install receptacle lead (12) on overheating switch (10) with new nut-assembled lockwasher (13).
5. Install restriction solenoid lead (3) on receptacle (15) with new screw-assembled lockwasher (2).

d. Overheat Switch Installation

1. Install overheat switch (21) on heater housing (19) with two screw-assembled lockwashers (20).
2. Install ignition control lead (25), thermostat lead (24), and receptacle lead (23) on overheat switch (21) with new nut-assembled lockwasher (22).
3. Install shutoff valve lead (18) on overheat switch (21) with new nut-assembled lockwasher (17).



FOLLOW-ON TASK: Install personnel heater guard (para. 17-11).

17-18. PERSONNEL HEATER HEAT EXCHANGER REPLACEMENT

THIS TASK COVERS:

a. Removal

b. Installation

INITIAL SETUP

APPLICABLE MODELS

All

TEST EQUIPMENT

Multimeter (Appendix B, Item 3)

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

Tool kit, electrical (Appendix B, Item 2)

REFERENCES (TM)

TM 9-2320-361-34P

EQUIPMENT CONDITION

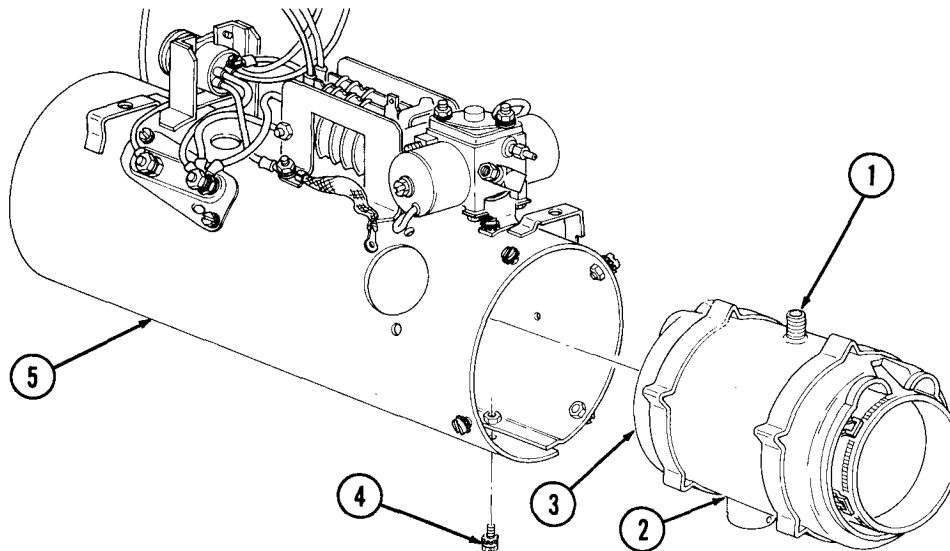
- Personnel heater blower motor removed (para. 17-11).
- Personnel heater burner removed (para. 17-16).
- Personnel heater flame detector switch removed (para. 17-15).

a. Removal

1. Remove three screws (4).
2. Separate heater housing (5).
3. Remove heat exchanger (3) from heater housing (5).

b. Installation

1. Separate heater housing (5) and install heat exchanger (3) in heater housing (5) with three screws (4).
2. Ensure exhaust tube (2) and flame detector adapter (1) extend through holes of heater housing (5).



FOLLOW-ON

- TASKS: • Install personnel heater flame detector switch (para. 17-15).
 • Install personnel heater burner (para. 17-16).
 • Install personnel heater blower motor (para. 17-11).

17-19. ENGINE COOLANT HEATER TESTING

THIS TASK COVERS:

- | | |
|--|--|
| <ul style="list-style-type: none"> a. Preparation b. Igniter Test c. Flame Detector Switch Test d. Fuel Control Valve Test | <ul style="list-style-type: none"> e. Blower Motor Test f. Restriction Thermostat Test g. Overheat Switch Test h. Test Equipment Removal |
|--|--|

INITIAL SETUP

APPLICABLE MODELS

All

REFERENCES

TM 9-2320-361-20
 TM 9-2320-361-34P

TEST EQUIPMENT

24-volt DC power source
 Fuel container
 Coolant container (5gal.)
 Test stand
 Thermometer
 Flowmeter
 Multimeter (Appendix B, Item 3)

EQUIPMENT CONDITION

Engine coolant heater removed
 (TM 9-2320-361-20).

MATERIALS/PARTS

Antifreeze (Appendix C, Item 3)

GENERAL SAFETY INSTRUCTIONS

- Keep fire extinguisher nearby when working with open fuel lines.
- Do not perform procedure near open flame, smoking, or sparking object.
- Do not perform procedure in enclosed areas.
- Allow time for heater to cool before removing from test equipment.

a. Preparation

WARNING

- Do not perform this procedure while smoking or within 50 feet of sparks or open flame. Fuel is flammable and can explode easily, causing injury or death to personnel and damage to equipment.
- Exhaust gases can kill. Do not operate personnel heater in enclosed areas. Ensure work area is well-ventilated and exhaust fumes are directed away from test area.

NOTE

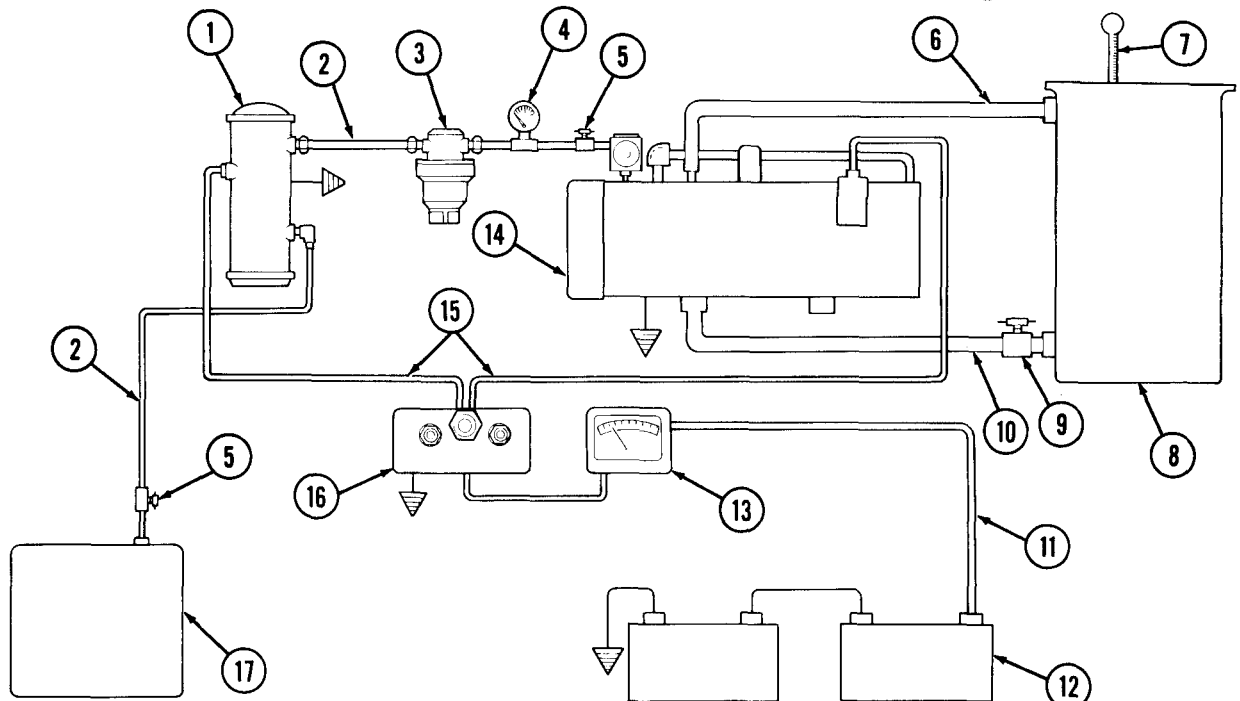
- Perform “preparation” subtask before performing any test and perform “test equipment removal” after each test is complete.
- Heater must be tested in same position as mounted on vehicle.
- Use proper coolant required for engines which are being heated. Water cannot be used because the overheat switch and restriction thermostat are set for temperatures above the boiling point of water.

1. Connect coolant heater (13) to test equipment using schematic on next page.

NOTE

- Coolant container must be vented and raised above the test apparatus in order for thermosyphon circulation to occur.
- Fuel pump, fuel filter, heater, wiring harness, fuel tubing, control box, and coolant must be the same type used on vehicle.

17-19. ENGINE COOLANT HEATER TESTING (Contd)



KEY TO TEST EQUIPMENT ARRANGEMENT

- | | |
|--------------------------|-----------------------------|
| 1. Electric fuel pump | 10. Coolant inlet hose |
| 2. Fuel tubing | 11. Power source lead |
| 3. Fuel filter | 12. 24-volt DC power source |
| 4. Fuel flowmeter | 13. Multimeter |
| 5. Fuel shutoff valve | 14. Coolant heater assembly |
| 6. Coolant outlet hose | 15. Wiring harness |
| 7. Thermometer | 16. Control box |
| 8. Coolant container | 17. Fuel tank |
| 9. Coolant shutoff valve | |

17-19. ENGINE COOLANT HEATER TESTING (Contd)

2. Remove four screws (2) and guard (1) from heater (9).
3. Disconnect lead (16) from 24-volt power source (17).
4. Remove screw-assembled lockwasher (11) and igniter lead (12) from flame detector switch (10).
5. Disconnect fuel control valve leads (6) and (8) from overheat switch (7).
6. Connect hose (4) to bleed screw (13) on fuel control valve (3) and place other end of hose (4) in container (5).
7. Open two fuel shutoff valves (14).

NOTE

Have drainage container ready to catch fuel.

8. Connect lead (16) to power source (17).
9. Ensure switch (21) is in LO position. Place switch (19) in START position and hold. Open bleed screw (13) and let fuel flow until no air bubbles are observed in fuel flowing into container (5).
10. Place switch (19) in OFF position. Close bleed screw (13).
11. Disconnect lead (16) from power source (17).
12. Install igniter lead (12) on flame detector switch (10) with screw-assembled lockwasher (11).
13. Connect fuel control valve leads (6) and (8) on overheat switch (7).
14. Open coolant shutoff valve (15).
15. Check for signs of coolant leaks. Tighten loose connections or replace damaged parts if leaking (paras. 17-2 through 17-10, as necessary).
16. Close coolant shutoff valve (15).

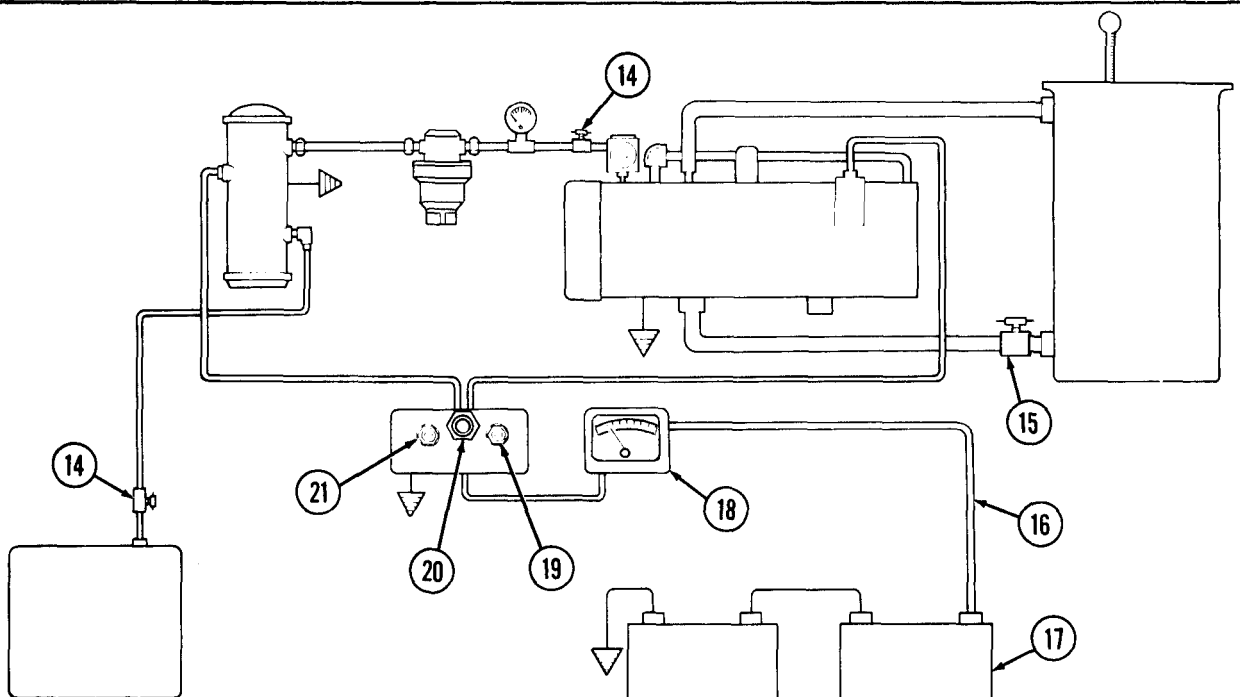
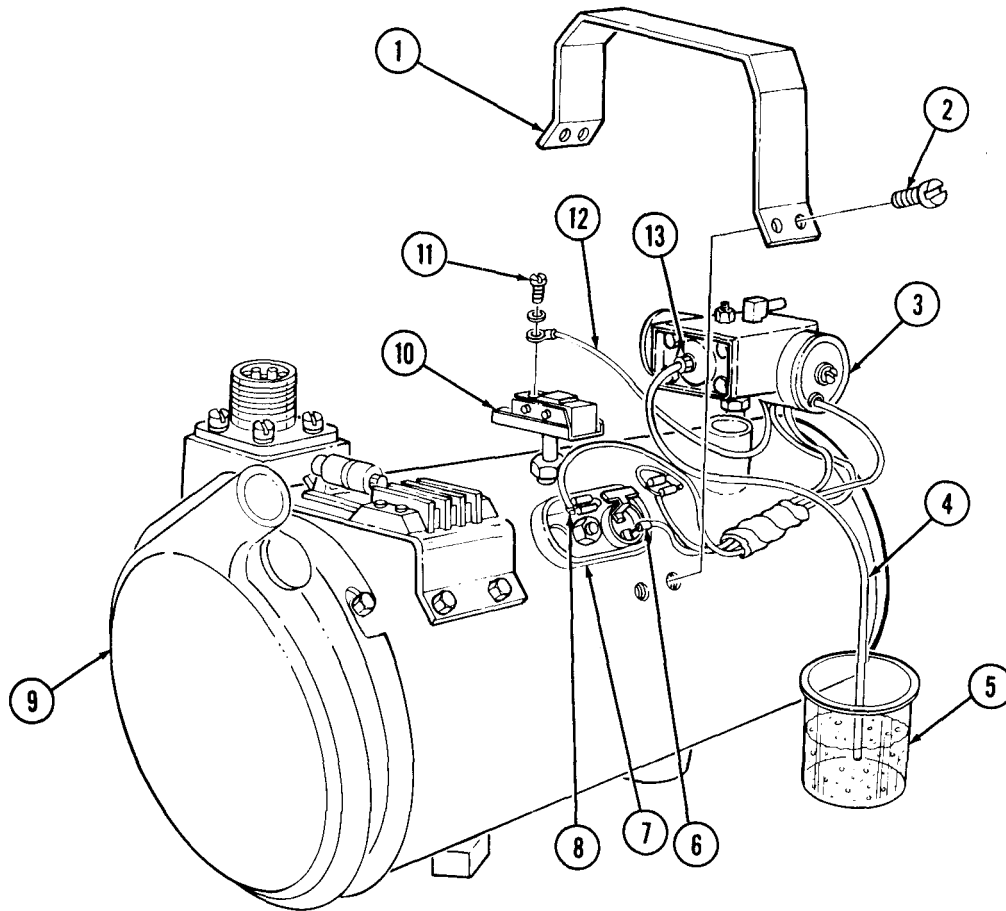
b. Igniter Test

NOTE

Ignition time is the interval from activating control box switch to START position until indicator lamp illuminates.

1. Place switch (19) in START position and hold. Record time interval from activating switch (19) until indicator lamp (20) illuminates. During this time interval, record ignition amperage on ammeter (18).
2. If ignition time exceeds three minutes, or if ignition amperage exceeds 15 amperes, check fuel flow components (paras. 17-2 through 17-10, as necessary).
3. Place switch (19) in OFF position.

17-19. ENGINE COOLANT HEATER TESTING (Contd)



17-19. ENGINE COOLANT HEATER TESTING (Contd)

c. Flame Detector Switch Test

1. Place switch (3) in START position.
2. When indicator lamp (4) illuminates, place switch (3) in RUN position.
3. If indicator lamp (4) does not light, adjust or replace flame detector switch (6) (para. 17-2).
4. Place switch (3) in OFF position.

d. Fuel Control Valve Test

1. Place switch (3) in START position.
2. When indicator lamp (4) illuminates, place switch (3) in RUN position.
3. Check fuel consumption at flowmeter (1). Fuel consumption should be 8-11 cc/min at low heat, and 14-19 cc/min at high heat. Replace fuel control valve (2) if fuel consumption rate is not within limits (para. 17-6).
4. Check operating amperage on ammeter (2). If operating amperage exceeds 4 amperes, check heater wiring. Replace damaged parts (paras. 17-2 through 17-10, as necessary).
5. Move switch (5) from LO to HI position. Burning in heater (8) should intensify or decrease. Replace fuel control valve (7) if burning in heater (8) does not intensify or decrease (para. 17-6).
6. Place switch (5) in LO position.
7. Place switch (3) in OFF position.

e. Blower Motor Test

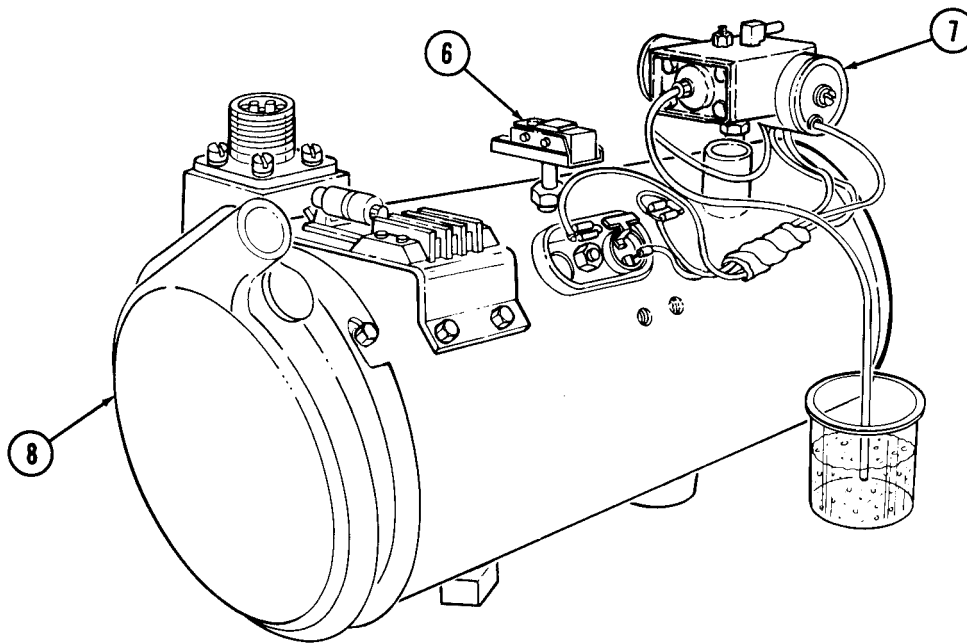
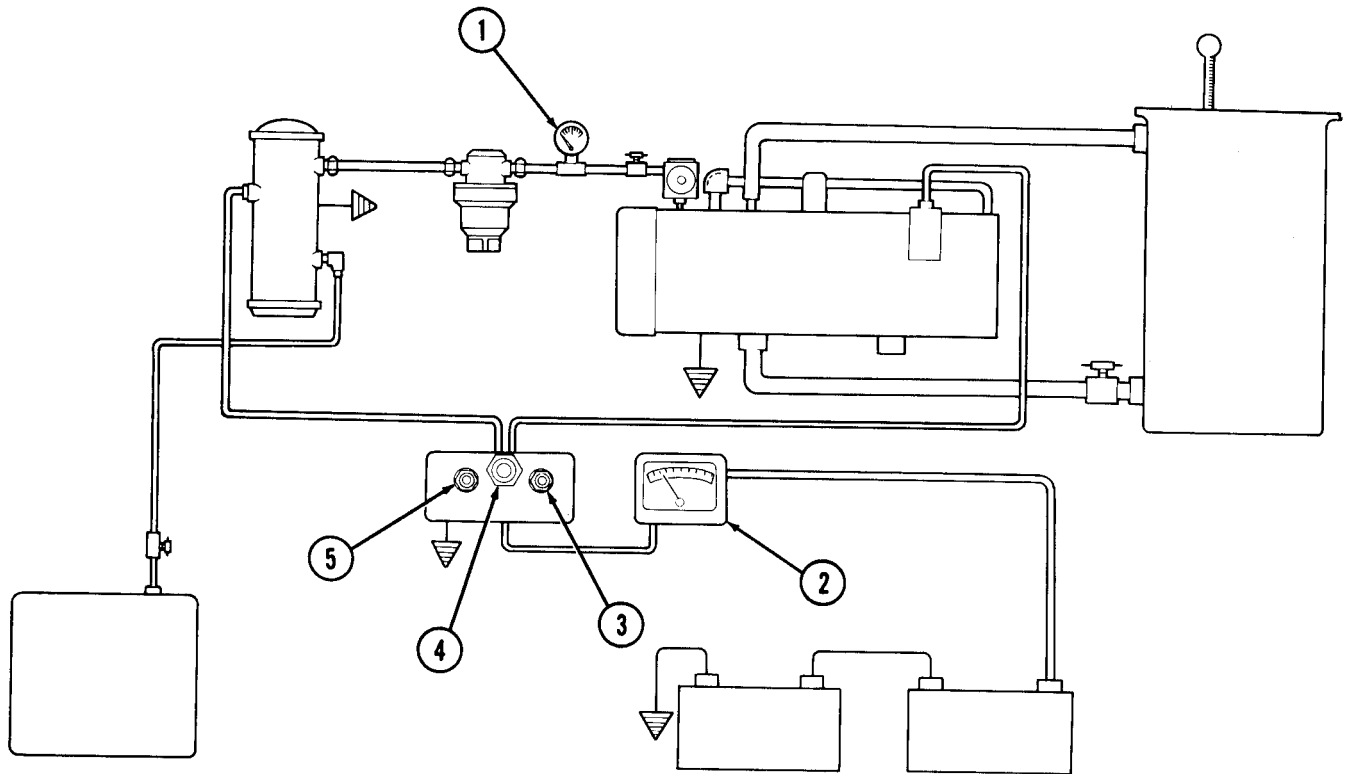
1. Place switch (3) in START position.
2. When indicator lamp (4) illuminates, place switch (3) in RUN position. Allow heater to run for a few minutes.

NOTE

Purge time is the interval from turning control box to OFF position until the indicator lamp goes out.

3. Place switch (3) in OFF position and record purge time. Burning should stop within thirty seconds; blower motor should continue to run up to three minutes. Replace or adjust flame detector switch (6) (para. 17-2) if purge time exceeds three minutes.

17-19. ENGINE COOLANT HEATER TESTING (Contd)



17-19. ENGINE COOLANT HEATER TESTING (Contd)

f. Restriction Thermostat Test

1. Place switch (4) in START position.
2. When indicator lamp (5) illuminates, place switch (4) in RUN position. Allow heater to run.
3. Check temperature of coolant at thermometer (1). Temperature should be 140-170° F (60.0-76.7° C).
Replace restriction thermostat if coolant temperature is not within limits (para. 17-4).
4. Place switch (4) in OFF position.

g. Overheat Switch Test

1. Place switch (4) in START position.
2. When indicator lamp (5) illuminates, place switch (4) in RUN position. Allow heater (8) to run.
3. Partially restrict air inlet with a sheet of cardboard or sheet metal. Overheat switch (9) should activate and shut down heater (8) within five minutes. Replace overheat switch (9) if heater (8) does not shut down after five minutes (para. 17-7).
4. Check temperature of coolant at thermometer (1). Temperature should be 220-250° F (104.4-121.1° C).
5. Replace overheat switch (9) if coolant temperature is not within limits (para. 17-7).
6. Place switch (4) in OFF position.

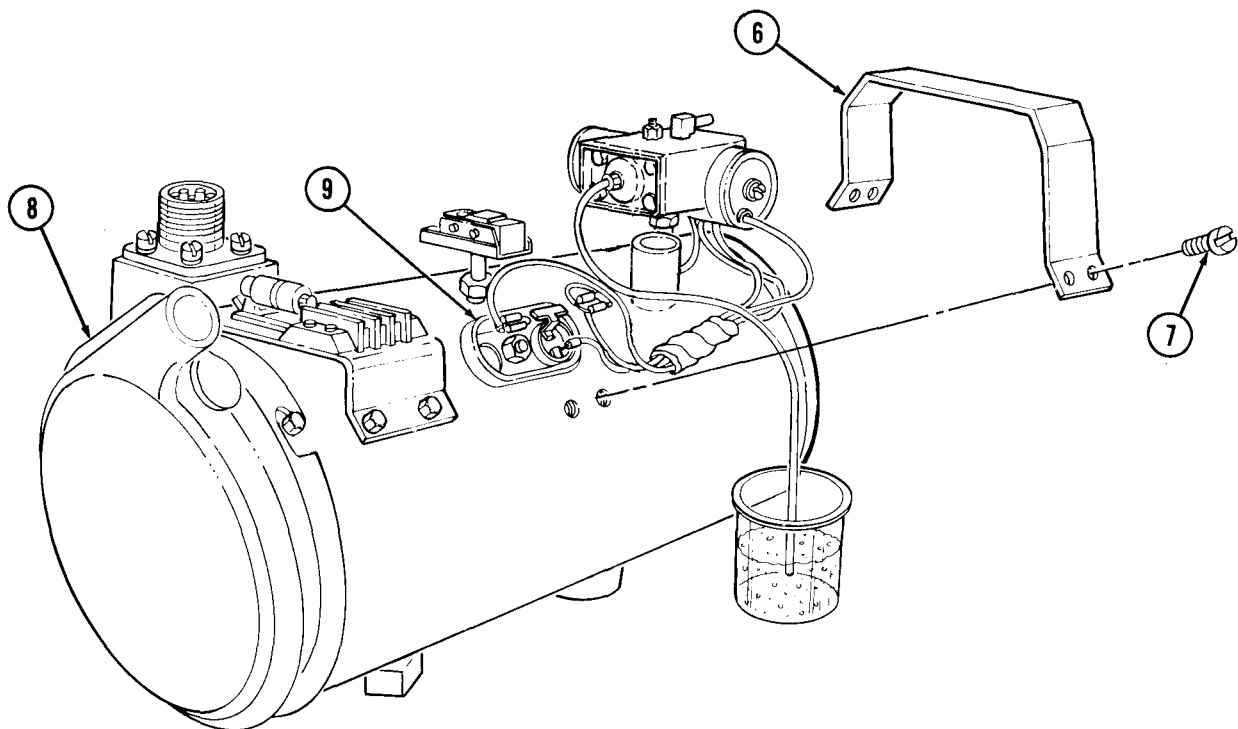
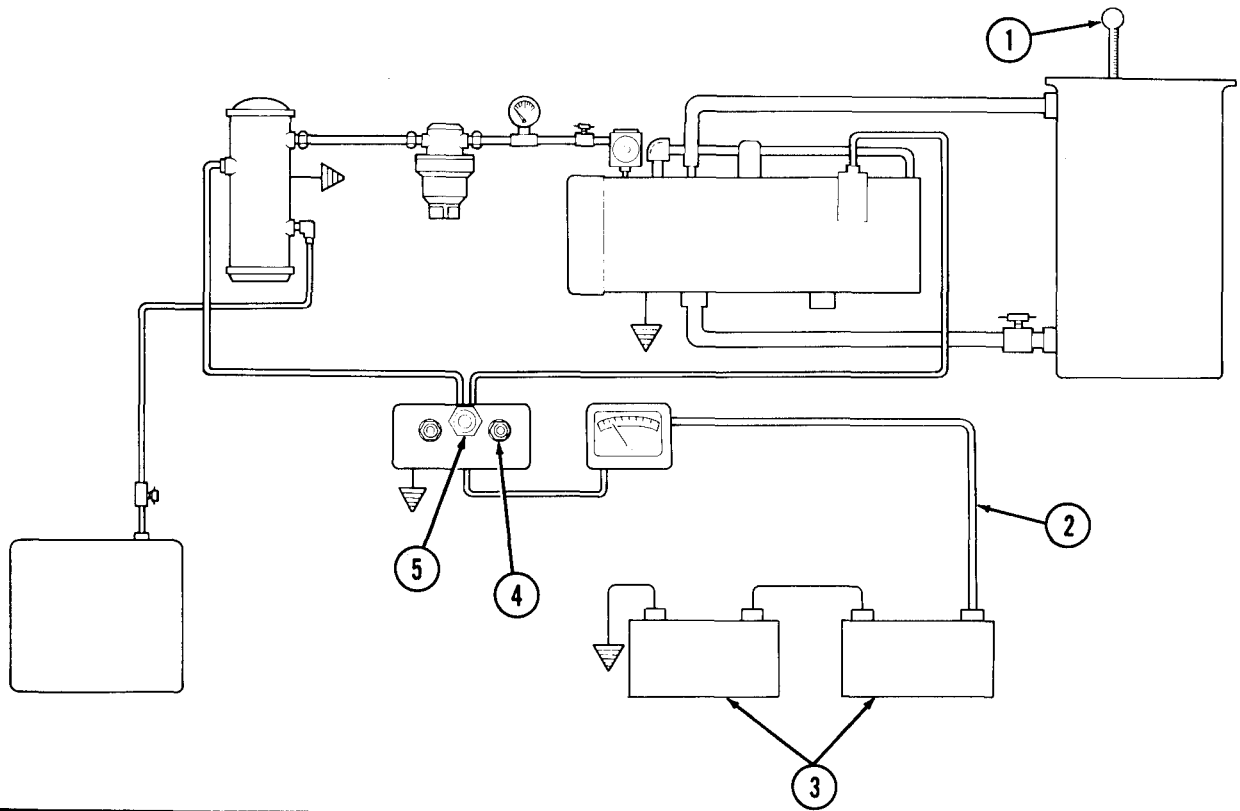
h. Test Equipment Removal

WARNING

Allow time for heater to cool before removing from test equipment.
Failure to do so may result in injury to personnel or damage to equipment.

1. Disconnect lead (2) from 24-volt power source (3).
2. Install guard (6) on heater (8) with four screws (7).
3. Remove heater (8) from test equipment.

17-19. ENGINE COOLANT HEATER TESTING (Contd)



FOLLOW-ON TASK: Install engine coolant heater (TM 9-2320-361-20).

17-20. FUEL BURNING PERSONNEL HEATER TESTING

THIS TASK COVERS:

- a. Preparation
- b. Flame Detector Switch Test
- c. Fuel Control Valve Test

- d. Flame Detector Switch Test
- e. Overheat Switch Test
- f. Test Equipment Removal

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General mechanic's tool kit
(Appendix B, Item 1)

TEST EQUIPMENT

Test stand
Flowmeter
Multimeter (Appendix B, Item 3)

MATERIALS/PARTS

Two nut-assembled lockwashers
(Appendix F, Item 154)

REFERENCES

TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

Fuel burning personnel heater removed
(TM 9-2320-361-20).

GENERAL SAFETY INSTRUCTIONS

- Do not perform procedure in enclosed areas.
- Keep fire extinguisher nearby when working with open fuel lines.
- Do not perform procedure near open flame, smoking, or sparking object.
- Allow time for heater to cool before removing from test equipment.

a. Preparation

WARNING

- Do not perform this procedure while smoking or within 50 feet of sparks or open flame. Fuel is flammable and can explode, causing injury or death to personnel and damage to equipment.
- Exhaust gases can kill. Do not operate personnel heater in enclosed areas. Ensure work area is well-ventilated and exhaust fumes are directed away from test area.

NOTE

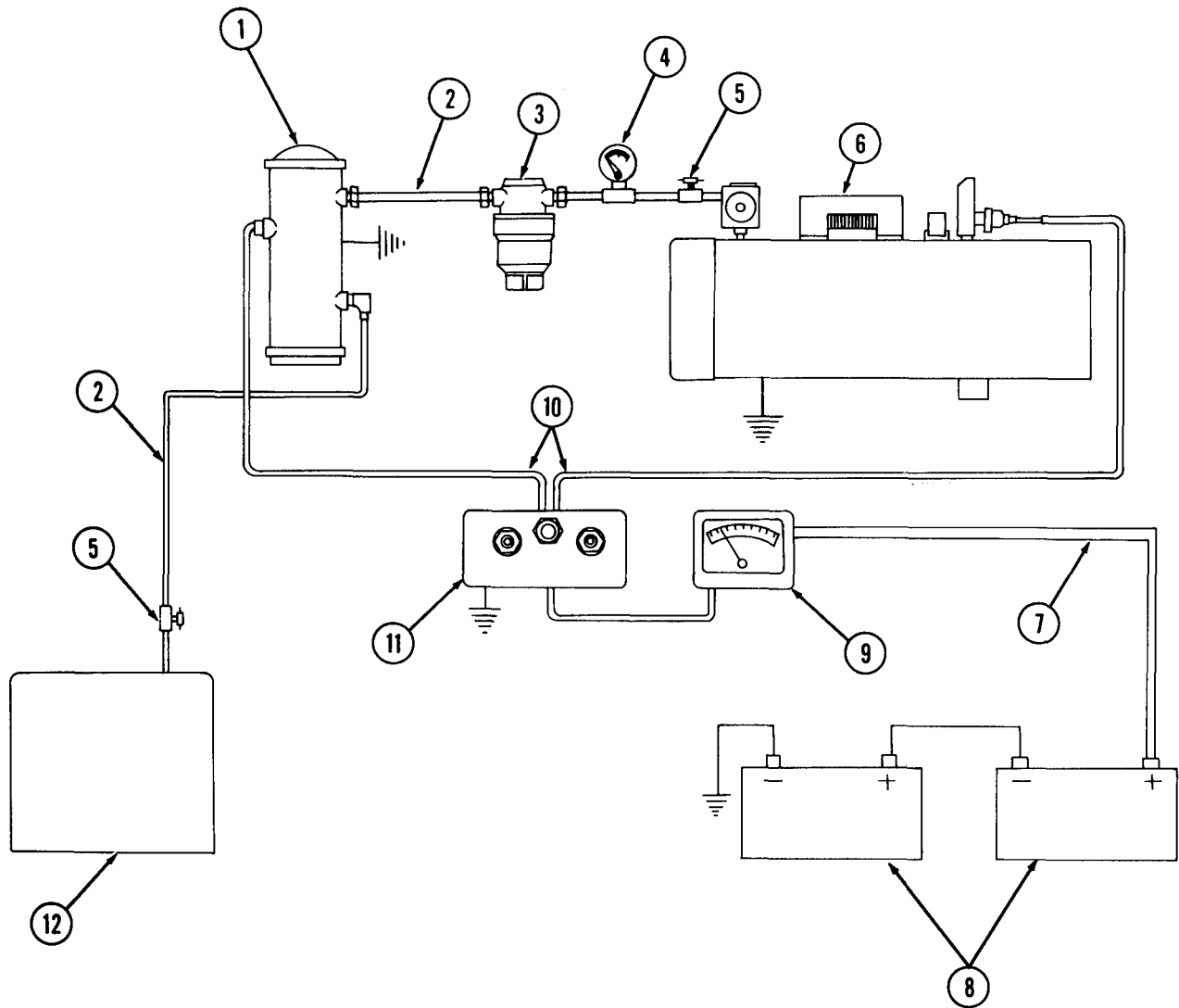
- Perform "preparation" subtask before performing any test and perform "test equipment removal" after each test is complete.
- Heater must be tested in same position as mounted on vehicle.
- The cargo body, van primary, and van secondary personnel heaters are tested the same way.

1. Connect heater (6) to test equipment using schematic on next page.

NOTE

Fuel pump, fuel filter, heater, wiring harness, fuel tubing, and control box must be the same type installed in vehicle.

17-20. FUEL BURNING PERSONNEL HEATER TESTING (Contd)



KEY TO TEST SCHEMATIC

- | | |
|-----------------------|----------------------------|
| 1. Electric fuel pump | 7. Power source lead |
| 2. Fuel tubing | 8. 24-volt DC power source |
| 3. Fuel filter | 9. Multimeter |
| 4. Fuel flowmeter | 10. Wiring harness |
| 5. Fuel shutoff valve | 11. Control box |
| 6. Heater assembly | 12. Fuel tank |

17-20. FUEL BURNING PERSONNEL HEATER TESTING (Contd)

2. Turn two dzus fasteners (11) and remove guard (5) from heater (13).
3. Disconnect lead (18) from 24-volt power source (20).
4. Disconnect igniter lead (7) from ignition control unit (6).
5. Remove nut-assembled lockwasher (1), shutoff valve lead (2), nut-assembled lockwasher (15), and thermostat lead (14) from overheat switch (3). Discard nut-assembled lockwashers (1) and (15).
6. Connect hose (10) to bleed screw (8) on fuel control valve (9) and place other end of hose (10) in container (12).
7. Connect lead (18) to 24-volt power source (20).
8. Open fuel shutoff valves (17).

NOTE

Have drainage container ready to catch fuel.

9. Place switch (23) in LO position. Place switch (21) in START position and hold. Open bleed screw (8) and let fuel flow from bleed screw (8) until no air bubbles are observed in fuel.
10. Place switch (21) in OFF position. Close bleed screw (8).
11. Install thermostat lead (14) and shutoff valve lead (2) on overheat switch (3) with new nut-assembled lockwashers (15) and (1).
12. Connect igniter lead (7) on ignition control unit (6).

NOTE

Ignition time is the interval from activating control box switch to START position until indicator lamp illuminates.

13. Place switch (21) in START position and hold. Record time interval from activating switch (21) until indicator lamp (22) illuminates. During this time interval, record ignition amperage on ammeter (19). Place switch (21) in OFF position.
14. If ignition time exceeds three minutes, or if ignition amperage exceeds 15 amperes, check fuel flow and replace damaged parts (paras. 17-11 through 17-18, as necessary).

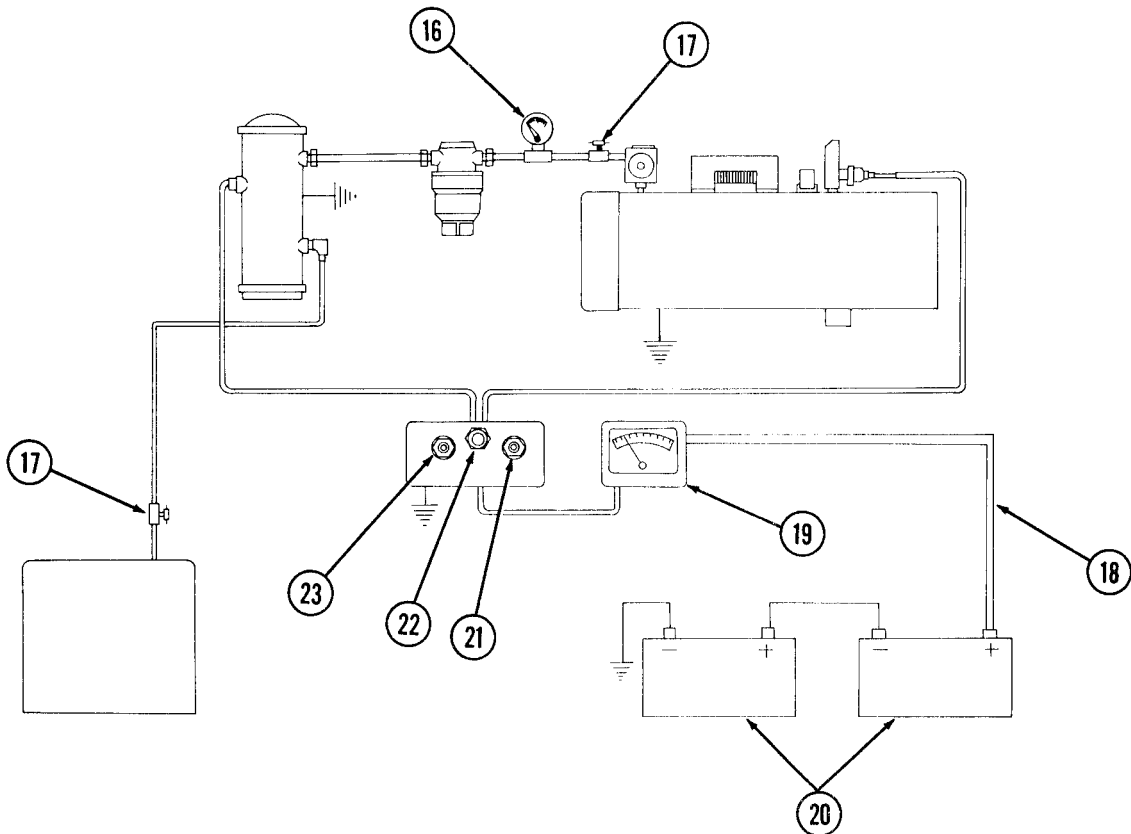
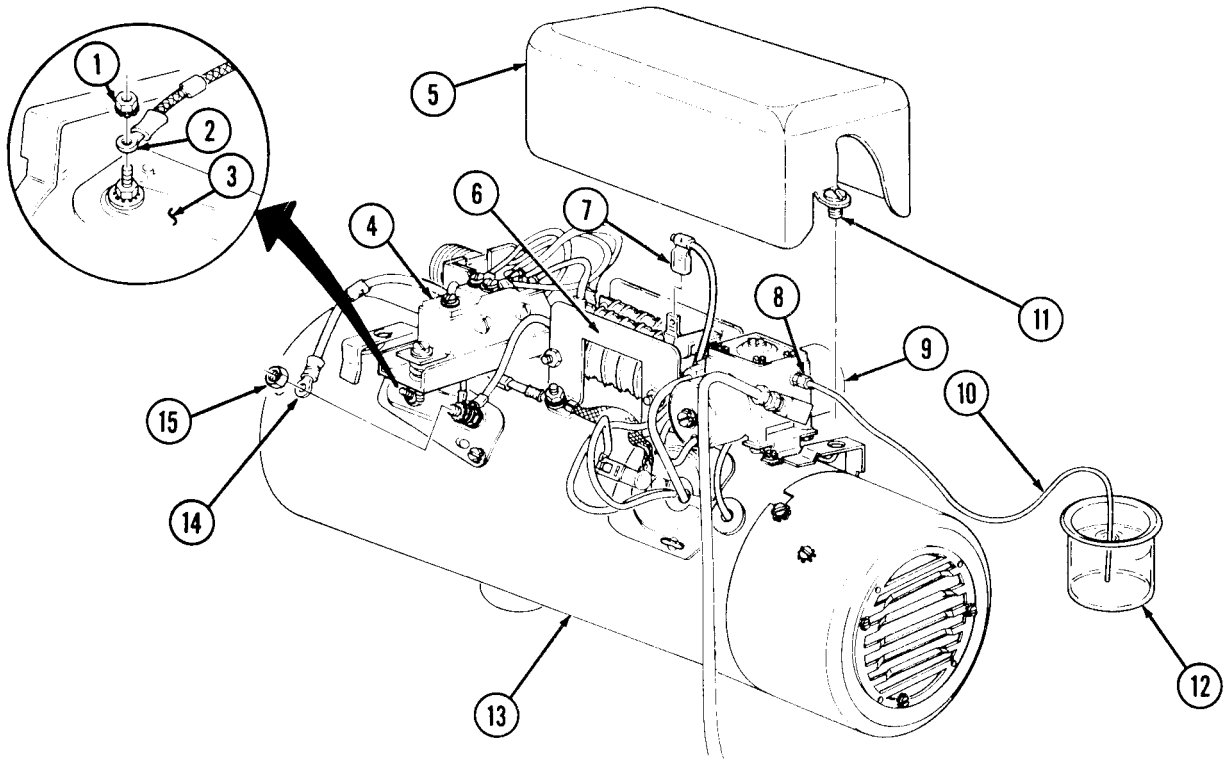
b. Flame Detector Switch Test

1. Place switch (21) in START position.
2. When indicator lamp (22) illuminates, place switch (21) in RUN position.
3. If indicator lamp (22) does not light, adjust or replace flame detector switch (4) (para. 17-15).
4. Place switch (21) in OFF position.

c. Fuel Control Valve Testing

1. Place switch (21) in START position.
2. When indicator lamp (22) illuminates, place switch (21) in RUN position.
3. Check fuel consumption at flowmeter (16). Fuel consumption should be 10-13 cc/min at low heat, and 19-24 cc/min at high heat. If fuel consumption rate is not within limits, replace fuel control valve (9) (para. 17-12).
4. Check operating amperage at ammeter (19). If operating amperage exceeds 10 amperes, check heater wiring and replace damaged parts (para. 17-11 through 17-18, as necessary).
5. Place switch (21) in OFF position.

17-20. FUEL BURNING PERSONNEL HEATER TESTING (Contd)



17-20. FUEL BURNING PERSONNEL HEATER TESTING (Contd)

d. Flame Detector Switch Test

1. Place switch (4) in START position.

NOTE

Purge time is the interval from turning control box switch to OFF position until indicator lamp goes out.

2. Place switch (4) in OFF position and record purge time. Burning should stop within thirty seconds and blower motor (9) should continue to run up to three minutes. If purge time exceeds three minutes, replace or adjust flame detector switch (6) (para. 17-15). Place switch (4) in OFF position.

e. Overheat Switch Test

1. Place switch (4) in START position.
2. When indicator lamp (5) illuminates, place switch (4) in RUN position and allow heater (10) to operate for one minute.
3. Partially restrict air inlet with a sheet of cardboard or sheet metal. Overheat switch (11) should activate and shut down heater (10) within five minutes.
4. If heater (10) does not shut down after five minutes, replace overheat switch (11) (para. 17-17).

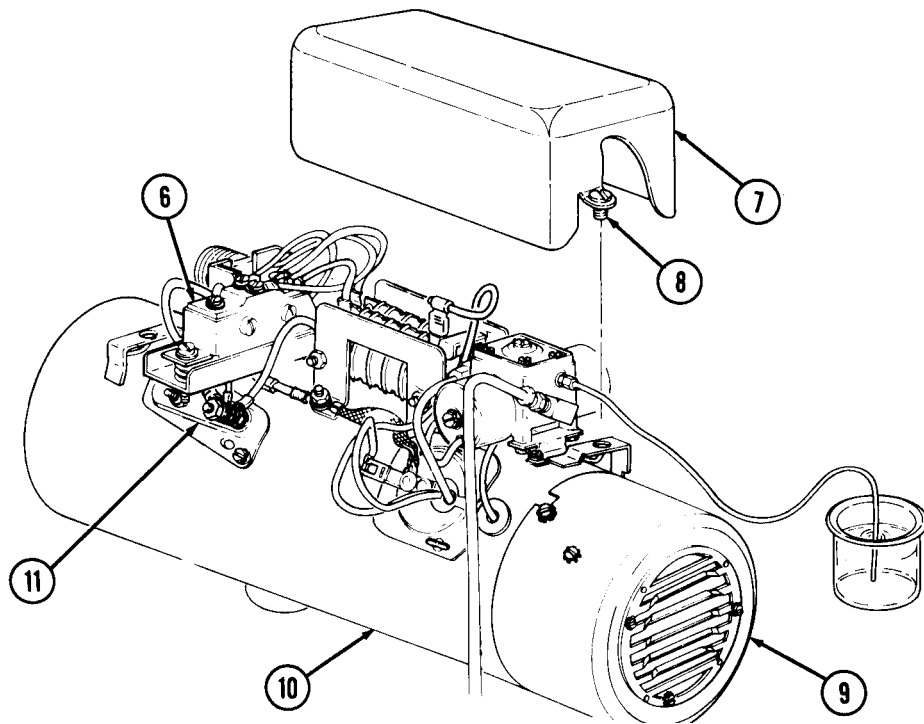
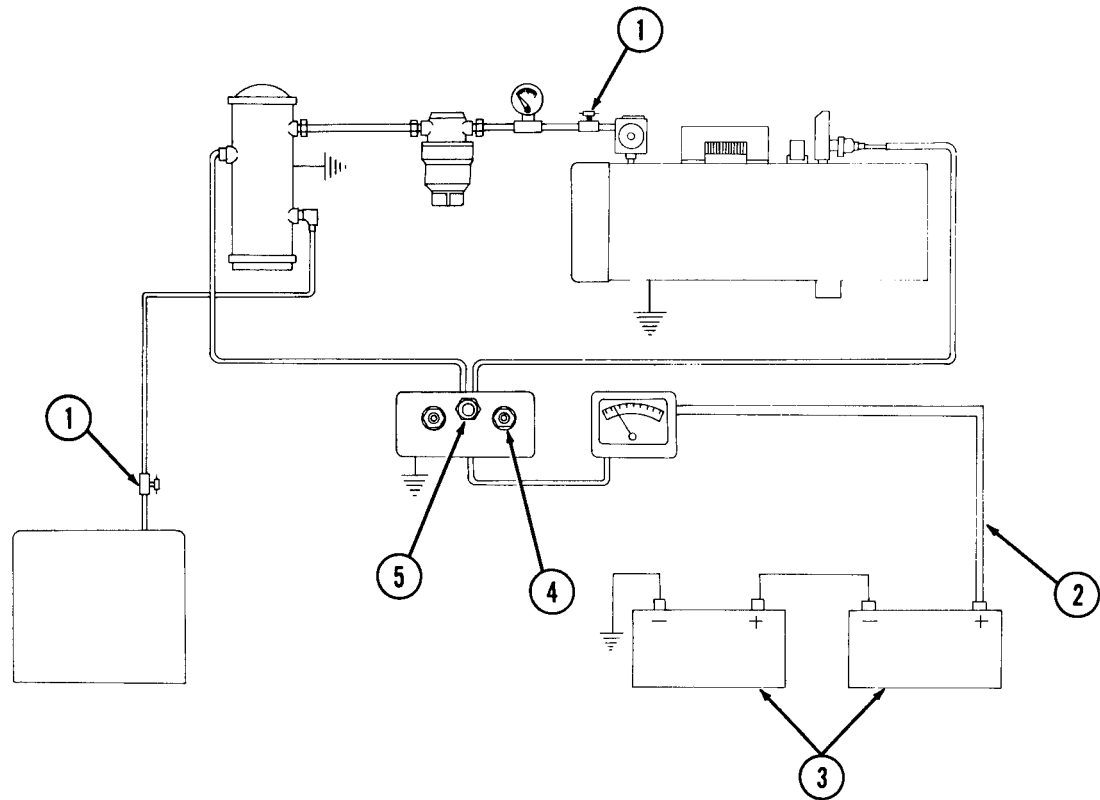
f. Test Equipment Removal

WARNING

Allow time for heater to cool before removing from test equipment. Failure to do so may result in injury to personnel or damage to equipment.

1. Close fuel shutoff valves (1).
2. Disconnect lead (2) from power source (3).
3. Remove heater (10) from test equipment.
4. Place guard (7) on heater (10) and turn two dzus fasteners (8) to secure.

17-20. FUEL BURNING PERSONNEL HEATER TESTING (Contd)



FOLLOW-ON TASK: Install fuel burning personnel heater (TM 9-2320-361-20).

17-21. HARDTOP REAR PANEL WINDOW MAINTENANCE

THIS TASK COVERS:

a. Disassembly

b. Assembly

INITIAL SETUP

APPLICABLE MODELS

All

TOOLS

General Mechanic's Tool Kit
(Appendix B, Item 1)

MATERIALS/PARTS

Two rubber seals (Appendix F, Item 242)

REFERENCES

TM 9-2320-361-20
TM 9-2320-361-34P

EQUIPMENT CONDITION

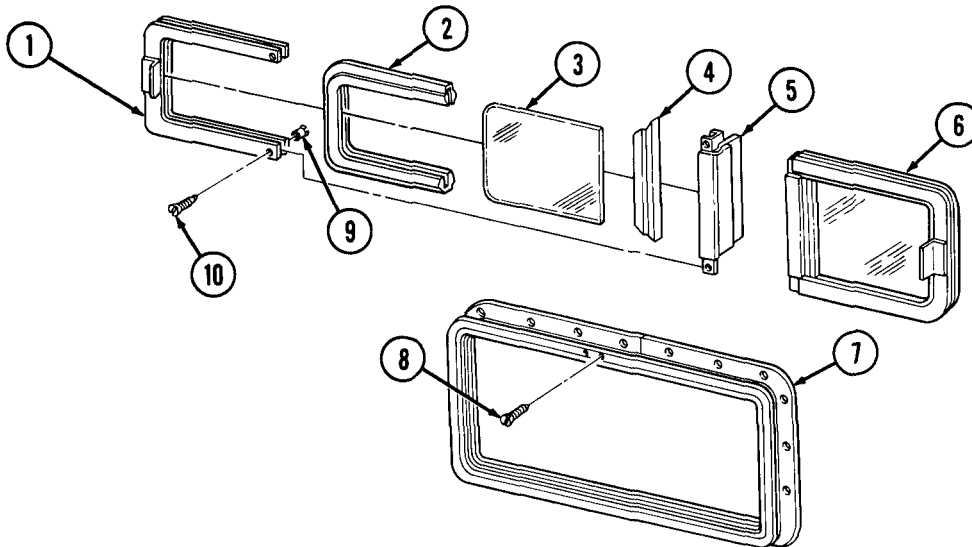
Rear panel window removed (TM 9-2320-361-20).

a. Disassembly

1. Remove two screws (8), separate window frame (7), and remove two sashes (6) from window frame (7).
2. Remove two screws (10), sleeves (9), frame rail (5), and glass (3) from sash frame (1).
3. Remove rubber seals (2) and (4) from glass (3) and frame rail (5). Discard seals (2) and (4).

b. Assembly

1. Install new rubber seal (4) in frame rail (5).
2. Place new rubber seal (2) around glass (3).
3. Install glass (3) and frame rail (5) on sash frame (1) with two screws (10) and sleeves (9).
4. Install two sashes (6) in window frame (7) with two screws (8).



FOLLOW-ON TASK: Install rear panel window (TM 9-2320-361-20).

APPENDIX A REFERENCES

A-1. SCOPE

This appendix lists all forms, manuals, and technical manuals for use with this vehicle.

A-2. PUBLICATION INDEX

The following should be consulted frequently for latest changes to, or revisions of, references given in this appendix and for new publications or instructions relating to material covered in this manual.

Consolidated Index of Army Publications and Blank Forms DA PAM 25-30

A-3. FORMS

Equipment Control Record DA Form 2408.9
 Exchange Tag DA Form 2402
 Maintenance Request DA Form 2407
 Maintenance Request-Continuation Sheet DA Form 2407.1
 Maintenance Request Register DA Form 2405
 Materiel Condition Status Report DA Form 2406
 Operator Report Motor Vehicle Accidents SF Form 91
 Organizational Control Record for Equipment DA Form 2401
 Preventive Maintenance Schedule and Record DD Form 314
 Processing and Reprocessing Record for Shipment, Storage, and Issue of Vehicles and
 Spare Engines DD Form 1397
 Product Quality Deficiency Report SF Form 368
 Recommended Changes to Publications and Blank Forms DA Form 2028
 The Army Maintenance Management System (TAMMS) DA PAM 738-750
 U. S. Army Accident Investigation Report DA Form 285
 U.S. Government Motor Vehicle Operator's Identification Card OF 346

A-4. FIELD MANUALS

Basic Cold Weather Manual FM 31-70
 Combat Vehicles and Tactical Support Vehicles:
 Metal Body Repair FM 43-2
 First Aid for Soldiers FM 21-11
 Manual for the Wheeled Vehicle Driver FM 21-305
 Northern Operations FM 31-71
 Operation and Maintenance of Army Materiel in Extreme
 Cold Weather (0°F to 65°F) FM 9-207
 Petroleum Supply Point Equipment and Operations FM 10-69

A-5. TECHNICAL MANUALS

Administrative Storage of Equipment TM 740-90-1
 Care, Maintenance, and Repair of Pneumatic Tires, Inner Tubes, and
 Radial Tires TM 9-2610-200-24
 Chemical Agent Alarm Maintenance, Automatic, Portable TM 3-6665-225-12
 Cooling Systems, Tactical Vehicles TM 750-254
 Decontaminating Apparatus Maintenance, Portable, DS2 TM 3-4230-204-12&P
 Deepwater Fording of Ordnance Materiel TM 9-238
 Destruction of Tank-Automotive Equipment to Prevent Enemy Use TM 750-244-6

APPENDIX A (Contd)

A-5. TECHNICAL MANUALS (Contd)

Direct and General Support Repair Parts and Special Tools Lists,
 Truck, 2-1/2-Ton, 6x6, Multifuel, M44A2 Series TM 9-2320-361-34P

Direct Support and General Support Maintenance Manual,
 Starter, Leece.Neville TM9-2920-243-34

Direct Support, General Support, and Depot Maintenance Manual,
 Starter, Delco TM 9-2920-242-35

Direct Support, General Support, and Depot Maintenance Manual,
 Starter, Prestolite TM 9-2920-248-35

Fuel Pump Metering and Distributing Assembly TM 9-2910-226-34

Generator Assembly Maintenance TM 9-2920-225-34

General Packing Instructions TM 746-10

Grinding Machine, Valve Face, Bench Mounting TM 9-4910-484-10

Inspection and Classification of Tires TM 9-2610-201-14

Inspection and Repair of Transfer Case, Transmission, and Power Takeoff TM 9-2520-246-34-1

Inspection, Care, and Maintenance of Antifriction Bearings TM 9-214

Lead-Acid Storage Battery Maintenance TM 9-6140-200-14

Lubrication Order, Truck, 2-1/2-Ton, 6x6, Multifuel, M44A2 Series LO 9-2320-209-12-1

Maintenance, Direct Support and General Support
 Level Engine Assembly Diesel (Multifuel) TM 9-2815-210-34-2-1

Maintenance, Direct Support and General Support
 Level Engine Assembly, Diesel (Multifuel) TM 9-2815-210-34-2-2

Materials Used for Cleaning, Preserving, Abrading, and Cementing TM 9-247

Operator, Organizational, Direct Support and General Support
 Maintenance Manual (including Repair Parts and Special Tools List) TM 9-4910-387-14&P

Operator's Manual, Truck, 2-1/2-Ton, 6x6, Multifuel, M44A2 Series TM 9-2320-361-10

Operator's Manual: Welding Theory and Application TM 9-237

Organizational Maintenance Manual, Truck, 2-1/2-Ton, 6x6,
 Multifuel, M44A2 Series TM 9-2320-361-20

Organizational Maintenance Repair Parts, Truck, 2-1/2-Ton, 6x6,
 Multifuel, M44A2 Series TM 9-2320-361-20P

Painting Instructions for Field Use TM 43-0139

Preservation, Packaging, and Packing of Military Supplies
 and Equipment TM 38-230-1 and TM 38-230-2

Principles of Automotive Vehicles TM 9-8000

Railcar Loading Procedures TM55.601

Simplified Test Equipment for Internal Combustion Engines TM 9-4910-571-12&P

Storage and Matetials Handling TM9-743-2001

Troubleshooting, Direct Support and General Support
 Level Engine Assembly Diesel (Multifuel) TM 9-2815-210-34-1

Turbocharger Maintenance and Repair TM 9-2990-201-40&P

A-6. TECHNICAL BULLETINS

Color, Marking, and Camouflage Painting of Military Vehicles, Construction
 Equipment, and Materials Handling Equipment TB43-0209

Description, Use, Bonding Techniques, and Properties of Adhesives TB ORD 1032

Functional Grouping Codes TB 750-93-1

Load-Testing Vehicles Used to Handle Missiles and Rockets TB 9-352

Major Vehicle Mechanical Components Warranty TB 9-2320-209-14

APPENDIX A (Contd)

A-6. TECHNICAL BULLETINS (Contd)

Mandatory Brake Hose Inspection and Replacement	TB 9-2300-405-14
Purging, Cleaning, and Coating Interior Ferrous and Terne Sheet Vehicle Fuel Tanks	TB 43-0212
Rustproofing Procedures	TB 43-0213
Safety Inspection and Testing of Lifting Devices	TB 43-0142
Security of Tactical Wheeled Vehicles	TB 9-2300-422-20
Standards for Oversea Shipment and Domestic Issue of Combat, Tactical, and Special Purpose Vehicles	TB 9-2300-281-35
Tactical Wheeled Vehicles: Repair of Frames	TB 9-2300-247-40
Use of Antifreeze Solutions and Cleaning Compounds in Engine Cooling Systems	TB 750-651
Warranty Program for 2-1/2 Ton, 6x6, M44A2 Series Trucks	TB 9-2320-209-14

A-7. OTHER PUBLICATIONS

Antiseize Compound, High Temperature	MIL-A.907
Calibration Systems Requirements	MIL-C-45662
Gage Inspection	MIL-STD-120
Inspection Equipment, Acquisition, Maintenance, and Disposition	MIL-I-45607
Inspection Process, Magnetic Particle	MIL-I-6868
Marking for Shipment and Storage	MIL-STD-129
Methods of Preservation	MIL-P-116
Official Nomenclature, Names, and Designations	MIL-HDBK-63038-2
Personnel Heater and Winterization Kit Policy for Army Tank-Automotive Materiel	SB 9-16
Preparation for Shipment and Storage of Basic Issue Items	MIL-B-12841
Shipment and Limited Storage	MIL-V-62038
Softwood Lumber	MM-L-751

A-8. ARMY REGULATIONS

Accident Reporting and Records	385.40
Packaging of Materiel	AR 700-15
Prevention of Motor Vehicle Accidents	385.55

A-9. TECHNICAL CATALOG

Camouflage. Pattern Painting	TC5-200
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A-10. COMMON TABLE OF ALLOWANCES

Army Medical Department Expendable/Durable Items	CTA 8-100
Expendable/Durable Items (except Medical, Class V, Repair Parts, and Heraldic Items)	CTA 50-970

APPENDIX B COMMON AND SPECIAL TOOLS LIST

B-1 . SCOPE

This appendix lists special and common tools outside the General Mechanic's Tool Kit which you will need when servicing the M44A2 series vehicles.

B-2. EXPLANATION OF COLUMNS

a. Column (1) - Reference Code Number. This number is assigned to each entry in the listing and is referenced in the "Initial Setup" of applicable tasks under the heading of "Special Tools," "Test Equipment," or "Tools."

b. Column (2) - Nomenclature. Name or identification of special tool or common tool.

c. Column (3) - Part Number. This identifies the manufacturer's part number or catalog number assigned to each tool or kit.

d. Column (4) - National/NATO Stock Number. This is the National Stock Number assigned to each tool or kit; use it to request or requisition the tool or kit.

e. Column (5) - Supply Catalog. This is the supply catalog number in which the common tool can be found. Special tools are not found in supply catalogs.

COMMON AND SPECIAL TOOLS LIST

(1) Reference CODE NUMBER	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL/NATO STOCK NUMBER	(5) SUPPLY CATALOG
1	General Mechanic's Tool Kit	SC5180-90-CL-N26	5180-00-177-7033	
2	Tool Kit, Electrical	7550526	5180-00-876-9336	4910-95-CL-A31
3	Multimeter	ANURM105C	6625-00-999-6282	4910-95-CL-A31
4	Clutch Alinement Kit	A37M	5180-00-449-3785	4910-95-CL-A31
5	Plum Bob	MS 15747-8	5120-00-238-3299	4910-95-CL-A02
6	Torque Wrench, 3/4-in. dr.	TESI800A	5120-01-118-3679	4910-95-CL-A31
7	Torque Wrench, 1/2-in. dr.	A-A-2411	5120-00-640-6364	4910-95-CL-A31
8	Torque Wrench, 3/8-in. dr.	TE-12A	5120-00-230-6380	4910-95-CL-A31
9	Caliper, Vernier	6420	5210-01-113-1548	4910-95-CL-A31
10	1-1/8-in. Socket, 1/2-in. dr.	11677025-10	5120-00-189-7914	5180-90-CL-N05
11	1-1/16-in. Socket, 1/2-in. dr.	11677025-8	5120-00-189-7913	5180-90-CL-N05
12	Brake Reliner	MILR13495TY1CL1	4910-00-173-5310	4940-95-B20
13	Soldering Gun	8200G3	3439-00-542-0396	4910-95 -CL-A31
14	Sling	1806	4910-00-944-4915	4910-95-CL-A3 1
15	Bar, Breaker, 1/2-in. dr.	MLK7101998-12	5120-00-224-1393	4910-95-CL-A31
16	Inside Micrometer	124B	5120-00-221-1921	4910-95-A63
17	Outside Micrometer	GGG-C-105TY1CL1STA	5210-00-554-7134	4910-95-CL-A63
18	Adapter, 1/2-in. Male - 3/8-in. Female	SJ409- ZANDN02DRIFTPIN	5130-00-449-7698	4910-95-CL-A31
19	1-1/4-in. Socket, 1/2-in. dr.	5216	5120-00-237-0977	5180-90-CL-N05
20	Riveting Tool	250K	5120-00-017-2849	4910-95-A74
21	Indicator, Dial	196A	5120-00-277-8840	4910-95-A63
22	Mechanical Puller Kit	PE12	5120-00-423-1596	4910-95-CL-A31
23	Handle	7083241	5340-00-708-3241	Special Tool
24	Bearing Sleeve Remover/ Replacer	7083246	5120-00-708-3246	Special Tool
25	Oil Seal Replacer	7083256	5120-00-708-3256	Special Tool
26	Bearing Replacer	7083252	5120-00-708-3252	Special Tool
27	Screw	7083216	5120-00-708-3216	Special Tool
28	Oil Seal Remover	7083250	5120-00-708-3250	Special Tool
29	Puller Screw	8366689	5120-00-836-6689	Special Tool
30	Tape Measure	GGG-T- 106TY2CLBCAVST3	5210-00-234-6745	4910-95 -CL-A31
31	1-5/16-in. Socket, 3/4-in. dr.	1242	5120-00-232-5681	4910-95-CL-A31
32	Wheel Alinement Indicator	AR40	4910-00-221-2472	4910-95-CL-A31
33	1-1/8-in. Socket, 3/4-in. dr.	1818	5120-00-239-0021	4910-95-CL-A3 1
34	Bar, Breaker, 3/4-in. dr.	NPB124	5120-00-224-1393	4910-95-CL-A3 1
35	Handle, Socket Wrench, 3/4-in. dr.	1940708	5120-00-249-1076	4910-95-CL-A31
36	Torx Socket	TLE60	5120-00-227-3159	Special Tool
37	1-1/4-in. Socket, 3/4-in. dr.	F3105A	5120-00-235-5871	4910-95-CL-A3 1
38	Spring Tester	SPT	6635-00-641-7346	4910-95-A63

COMMON AND SPECIAL TOOLS LIST (Contd)

(1) REFERENCE CODE NUMBER	(2) NOMENCLATURE	(3) NUMBER	(4) NATIONAL/NATO STOCK NUMBER	(5) CATALOG
39	Pipe Wrench	TKCX1H	5120-00-277-1486	4910-95-CL-A31
40	Snapping Pliers	4440R	5120-00-789-0492	5180-90-CL-N05
41	1-1/2-in. Socket, 3/4-in. dr.	47148	5120-00-293-0094	4910-95-CL-A31
42	1-3/4-in. Socket, 1-in. dr.	8156	5120-00-261-2837	4910-95-CL-A31
43	Handle, Socket Wrench, 1-in. dr.	14-906	5120-00-221-7968	4910-95-CL-A31
44	11/16-in. Flare Wrench, 12 pt.	11655785-2	5120-00-224-3141	4910-95-CL-N05
45	1-5/8-in. Socket, 3/4-in. dr.	5552	5120-00-199-7765	4910-95-CL-A31
46	Handle, Socket Wrench, 3/4-in. dr.	5668	5120-00-221-7959	4910-95-CL-A31
47	Oil Seal Insertor	11642003	5120-00-134-7481	Special Tool
48	Crankshaft Driver	11642010	5120-00-134-7464	Special Tool
49	1/2-in. Allen Wrench	024-0067-00	5120-00-198-5391	4910-95-CL-A31
50	1-1/4-in. Open-End Wrench	1037	5120-00-187-7134	4910-95-CL-A01
51	1-1/4-in. Box Wrench	GGG-W-636	5120-00-184-8677	4910-95-A62
52	Straightedge	564000-36	6675-00-224-8807	4910-95-A63
53	Gage, Force, Mechanical	AAA-S-133	6670-00-254-4634	4910-95-CL-A72
54	12-in. Extension, 3/8-in. dr.	35W198	5120-00-243-1691	4910-95-CL-A31
55	Universal Joint, 3/8-in. dr.	1060775	5120-00-224-9215	4910-95-CL-A31
56	5/8-in. Crowfoot Adapter	11642001	5120-00-134-7459	Special Tool
57	2-1/4-in. Socket, 1-in. dr.	B107.1CL1STA	5120-00-261-2843	4910-95-CL-A31
58	Wrench, Box, Cylinder Head Nuts	10951485	5120-00-930-6346	Special Tool
59	Bushing Remover/Replacer	7083248	5120-00-708-3248	Special Tool
60	Sleeve Bearing Hand Burnisher	7083238	5120-00-708-3238	Special Tool
61	1-1/16-in. Socket, 3/4-in. dr.	A-A-1394	5120-00-189-7928	4910-95-CL-A31
62	Adjustable Wrench	2117080	5120-00-264-3793	4910-95-A74
63	Crowfoot Attachment	11642001	5120-00-134-7459	Special Tool
64	Screw, Remover/ Replacer	7083216	5120-00-708-3216	Special Tool
65	Puller, Mechanical	GGGP00781	5120-00-449-3769	4910-95-CL-A31
66	Puller Kit, Universal	A57QB	5180-00-089-3660	

APPENDIX C

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. Introduction (page C-1)

Section II. Expendable/Durable Supplies and Materials List (page C-2)

Section I. INTRODUCTION

C-1. SCOPE

This appendix lists expendable/durable supplies and materials you will need to maintain M44A2 series vehicles. This listing is for informational purposes only and is not authority to requisition listed items. These items are authorized to you 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.

C-2. EXPLANATION OF COLUMNS

a. Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the "INITIAL SETUP" of applicable tasks under the heading of "Materials/Parts."

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

- C — Operator/Crew
- O — Unit Maintenance
- F — Direct Support Maintenance
- H — General Support Maintenance

c. Column (3) - National Stock Number. This is the National Stock Number assigned to the item; use it to request or requisition the item.

d. Column (4) - Description. This column indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parenthesis followed by the part number.

e. Column (5) - Unit of Measure (U/M). This column indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., EA, GL, OZ). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements. Adjust when higher category maintenance requirements are involved.

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIAL LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	0	8040-00-262-9028	ADHESIVE: reclaimed rubber (19203) 829899 1-Pint Can	PT
2	0	8040-00-833-9563	ADHESIVE: silicone rubber, non-hardening (94833) 52498 1 Kit	KT
3	0	6850-00-181-7929 6850-00-181-7933 6850-00-181-7940	ANTIFREEZE: permanent, ethylene glycol [-60° F (-51° C)] inhibited (0-A-548) type I, heavy-duty, (81349) MIL-A-46153 1-Gallon Container 5-Gallon Can 55-Gallon Drum	GL GL GL
4	c	9150-01-102-9455 9150-01-123-3152 9150-01-072-8379	BRAKE FLUID, AUTOMOTIVE: silicone, all weather, operational and preservative (81349) MIL-B-46176 1-Gallon Can 5-Gallon Can 55-Gallon Drum	GL GL GL
5	0	5340-00-450-5718	CAP AND PLUG SET (19207) 10935405 1 Set	EA
6	0	7510-00-164-8893	CHALK marking, white (81348) SS-C-266 1 Gross	GR
7	F	5350-00-221-0872	CLOTH, ABRASIVE (CROCUS CLOTH): abrasive (crocus) 9 inch x 11 inch sheets, (58536) A-A-1206 50 Sheets/Package	SH
8	C	9150-00-935-1017 9150-00-190-0904 9150-00-190-0905	GREASE, AUTOMOTIVE AND ARTILLERY (81349) MIL-G-10924 14-Ounce Cartridge 1-3/4-Pound Can 6-1/2-Pound Can	OZ LB LB
9	F	9150-00-190-0919	GREASE, GRAPHITE: (81348) W-G-671 6-1/2-Pound Can	LB

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (Contd)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
10	F		INSULATING COMPOUND KIT, ELECTRICAL: (76381) Scotchcast 10,20 Pound	
		5970-00-186-6529	20-Pound Can	LB
11	C		LUBRICATING OIL, GEAR: GO 80/90, multi-purpose, (81349) MIL-L-2105	
		9150-01-035-5392	1-Quart Can	QT
		9150-01-035-5393	5-Gallon Drum	GL
		9150-01-035-5394	55-Gallon Drum	GL
12	C		LUBRICATING OIL, ENGINE: OE/HDO 10, (81349) MIL-L-2104	
		9150-00-189-6727	1-Quart Can	QT
		9150-00-186-6668	5-Gallon Drum	GL
		9150-00-191-2772	55-Gallon Drum	GL
		9150-00-183-7807	Bulk	GL
13	C		LUBRICATING OIL, ENGINE: OE/HDO 30, (81349) MIL-L-2104	
		9150-00-186-6681	1-Quart Can	QT
		9150-00-188-9858	5-Gallon Drum	GL
		9150-00-189-6729	55-Gallon Drum	GL
		9150-00-183-7808	Bulk	GL
14	H		PIGMENT, PAINT PRODUCTS: ultramarine, blue (96906) MS35740-1	
		8010-00-247-8707	1/2-Pint Can	PT
15	O		PLASTIC STRAP, TIEDOWN, ELECTRICAL COMPONENTS: nylon, self-locking, type I, 10 inches long (96906) MS3367-7-9	
		5975-00-570-9598	1 Hundred	EA
16	C		RAG, WIPING: unbleached cotton and cotton-synthetic, mixed colors (58536) A-A-531	
		7920-00-205-1711	50-Pound Bale	EA
17	F		SEALING COMPOUND: (79225) Permatex 1	
		8030-00-247-2525	11-Ounce Tube	TU

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (Contd)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
18	F	8030-00-081-2325	SEALING COMPOUND: thread locking (05972) 078-31 50-Cubic Centimeter Bottle	CC
19	O	8030-00-252-3391	SEALING COMPOUND: non-hardening, gasket forming cement, type II (80064) 1756371 11-Ounce Tube	OZ
20	F	8030-00-543-4384	SEALING COMPOUND: (81349) MIL-S-7916 1-Pint Can	PT
21	H	6850-00-177-5094	SILICONE COMPOUND: (D2222) MIL-S-8660-2UNZENTUBE 2-Ounce Tube	Oz
22	F	6850-01-137-8525	SILICONE COMPOUND: (71984) DC 340 2-Ounce Package	Oz
		6850-00-927-9461	5-Ounce Tube	Oz
23	F	3439-00-224-3567	SOLDER, TIN ALLOY rosin core (81348) SN6WRAP3 0.0945LB 5-Pound	LB
24	c	6850-00-110-4498	SOLVENT, DRYCLEANING: type II (81348) P-D-680, ASTM D235-87 1-Pint Can	PT
		6850-00-274-5421	5-Gallon Drum	GL
		6850-00-285-8012	55-Gallon Drum	GL
		6850-00-637-6135	Bulk	GL
25	O	8030-00-889-3535	TAPE, ANTISEIZING: white, 0.05-in. wide x 260-in. long x 0.0035-in. thick, with snap-on shell (81755) P5025-2R, MIL-T-27730 1 Each (Spool)	EA
26	O	5970-00-419-4291	TAPE, INSULATION, ELECTRICAL: (75037) 17 3-4 IN BLACK 108-Foot Roll	FT

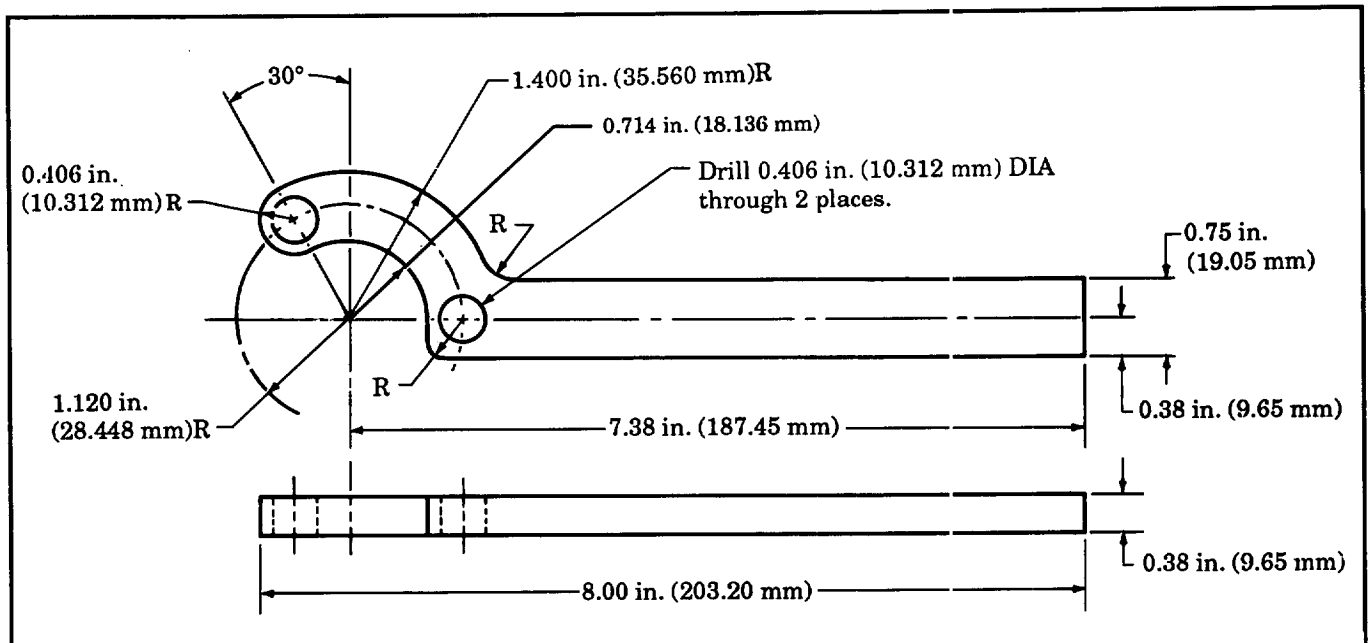
Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (Contd)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
27	F	7150-00-290-2023	TAPE, PRESSURE SENSITIVE ADHESIVE: 60-yard roll 1/2-inch wide, tan in color (81348) PPP-T-42 60-Yard Roll	YD
28	F	7510-00-283-0612	TAPE, PRESSURE SENSITIVE ADHESIVE: polyester film, opaque 1 inch wide, 2 mil thick (19203) 8790710 60-Yard Roll	YD
29	F	4020-00-446-1053	TWINE: (96599) 4PLY40Z12 60-Yard Roll	YD
30	F	9505-00-198-9125	WIRE, NON-ELECTRICAL: (80244) 22-W-1642-125 1 Pound	LB
31	F	9525-00-990-7799	WIRE, NON-ELECTRICAL (SAFETY WIRE): (96906) MS20995NC40 1 Pound	LB
32	H	9505-00-248-9850	WIRE, NON-ELECTRICAL: (96906) MS20995F47 1 Pound	LB

APPENDIX D ILLUSTRATED LIST OF MANUFACTURED ITEMS

This appendix includes complete instructions for making items authorized to be manufactured or fabricated at direct and general support maintenance levels.

FIG. NO.	TITLE	PAGE NO.
D-1.	Fuel Injection Pump Gear Hub Wrench	D-1
D-2.	Fuel Line Dust Cap Assembly Tool	D-2
D-3.	Flywheel Guide Screw	D-3

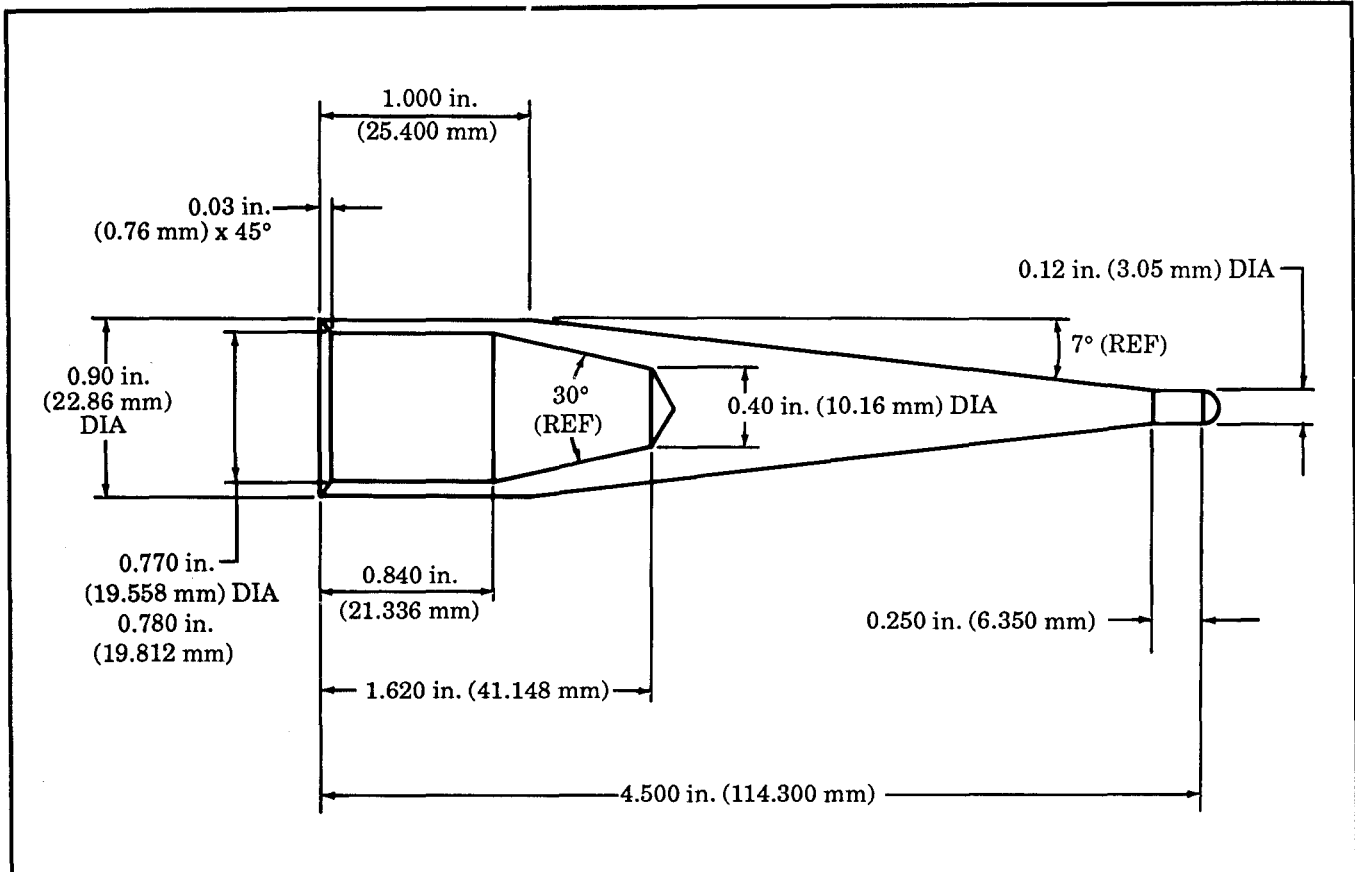


Notes:

1. Fabricate from NSN 9510-00-596-2063, QQS634, carbon steel bar, 8 in. (203.20 mm) x 2 in. (50.8 mm) x 0.38 in. (9.65 mm).
2. The tolerance on all three place decimal dimensions is ± 0.005 in. (0.127 mm) and the tolerance on all two place decimal dimensions is ± 0.03 in. (0.76 mm).
3. Trim steel to specifications per above diagram.
4. Drill two holes to specifications per above diagram.
5. Tool is used for removal of hub on fuel injection pump.

Figure D-1. Fuel Injection Pump Gear Hub Wrench.

APPENDIX D (Contd)

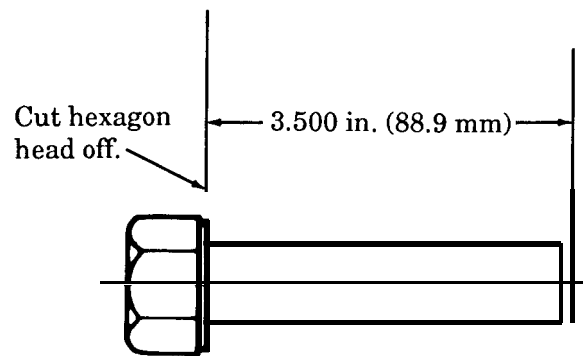


Notes:

1. Fabricate from NSN 9510-00-224-1691, MS500106-015, carbon steel cylinder, 5.000 in. (127.000 mm) in. length and 0.90 in. (22.86 mm) in diameter.
2. The tolerance on all three place decimal dimensions is +0.005 in. (0.127 mm) and the tolerance on all two place decimal dimensions is +0.03 in. (0.76 mm).
3. Trim steel to specifications per above diagram.
4. Drill one hole to specifications per above diagram.
5. Tool is used for installation of dust caps on fuel injector tubes.

Figure D-2. Fuel Line Dust Cap Assembly Tool.

APPENDIX D (Contd)



Notes:

1. Fabricate from NSN 5305-00-716-8179, MS 90726-121, 1/2-20 UNF 2A x 3.500 in. (88.9 mm) screw.
2. The tolerance on all three place decimal dimensions is + 0.005 in. (0.127 mm).
3. Cut off hexagon head of screw per above diagram.
4. Grind sharp edges from cut end.
5. Tool is used for removal and installation of flywheel.

Figure D-3. Flywheel Guide Screw.

APPENDIX E TORQUE LIMITS

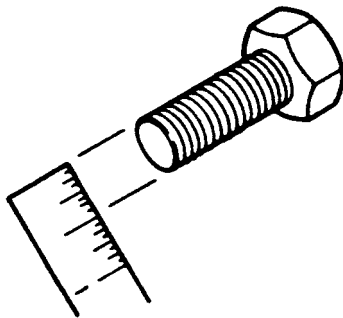
E-1. GENERAL

This section provides general torque limits for screws used on the M44A2 series 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.

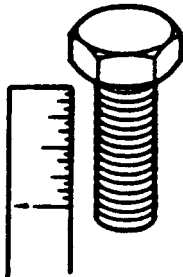
E-2. TORQUE LIMITS

Table E-1 lists dry torque limits. Dry torque limits are used on screws that do not have lubricants applied to the threads. Table E-2 lists wet torque limits. Wet torque limits are used on screws that have high pressure lubricants applied to the threads.

E-3. HOW TO USE TORQUE TABLE



a. Measure the diameter of the screw you are installing.



b. count the number of threads per inch.

- 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.

CAPSCREW HEAD MARKINGS

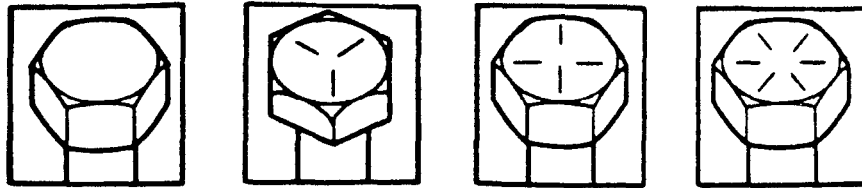
Manufacturer's marks may vary.
These are all SAE Grade 5
(3-line).



- 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.

Table E-1. Torque Limits for Dry Fasteners.

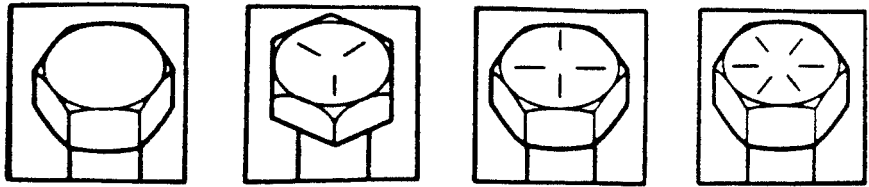
CAPSCREW HEAD MARKINGS



SIZE			TORQUE							
			SAE GRADE No. 1 or 2		5AE GRADE No. 5		SAE GRADE NO. 6 or 7		SAE GRADE NO. 8	
DIA. INCHES	THREADS PER INCH	DIA. MILLIMETERS	POUND NEWTON		POUND NEWTON		POUND NEWTON		POUND NEWTON	
			FEET	METERS	FEET	METERS	FEET	METERS	FEET	METERS
1/4	20	6.35	5	6.78	8	10.85	10	13.56	12	16.27
1/4	28	6.35	6	8.14	10	13.56	-	-	14	18.98
5/16	18	7.94	11	14.92	17	23.05	19	25.76	24	32.52
5/16	24	7.94	13	17.63	19	25.76	-	-	27	36.61
3/8	16	9.53	18	24.41	31	42.04	34	46.10	44	59.66
3/8	24	9.53	20	27.12	35	47.46	-	-	49	66.44
7/16	14	11.11	28	37.97	49	66.44	55	74.58	70	94.92
7/16	20	11.11	30	40.68	55	74.58	-	-	78	105.77
1/2	13	12.70	39	52.88	75	101.70	85	115.26	105	142.38
1/2	20	12.70	41	55.60	85	115.26	-	-	120	162.72
9/16	12	14.29	51	69.16	110	149.16	120	162.72	155	210.18
9/16	18	14.29	55	74.58	120	162.72	-	-	170	230.52
5/8	11	15.88	63	85.43	150	203.40	167	226.45	210	284.76
5/8	18	15.88	95	128.82	170	230.52	-	-	240	325.44
3/4	10	19.05	105	142.38	270	366.12	280	379.68	375	508.50
3/4	16	19.05	115	155.94	295	400.02	-	-	420	569.52
7/8	9	22.23	160	216.96	395	535.62	440	596.64	605	820.38
7/8	14	22.23	175	237.30	435	589.86	-	-	675	915.30
1	8	25.40	235	318.66	590	800.04	660	894.96	910	1233.96
1	14	25.40	250	339.00	660	894.96	-	-	990	1342.44
1/8	-	25.58	-	-	800- 880	1084.8 1193.3	-	-	1280 1440	1735.7 1952.6
1/4	-	31.75	-	-	-	-	-	-	1820 2000	2467.9 2712.0
1-3/8	-	34.93	-	-	1460. 1680	1979.8 2278.1	-	-	2380- 2720	3227.3 3688.3
1/2	-	38.10	-	-	1940 2200	2630.6 2983.2	-	-	3160 3560	4285.0- 4827.4

Table E-2 Torque Limits for Wet Fasteners

CAPSCREW HEAD MARKINGS



SIZE			TORQUE							
			SAE GRADE No. 1 or 2		SAE GRADE No. 5		SEA GRADE NO. 6 or 7		SAE GRADE NO. 8	
DIA INCHES	THREADS PER INCH	DIA. MILLIMETERS	POUND FEET	NEWTON METERS	POUND FEET	NEWTON METERS	POUND FEET	NEWTON METERS	POUND FEET	NEWTON METERS
1/4	20	6.35	4.5	6.1	7.2	9.76	9.0	12.20	10.8	14.64
1/4	28	6.35	5.4	7.32	9.0	12.20	-	—	12.6	17.09
5/16	18	7.94	9.9	13.42	15.3	20.75	17.1	23.19	21.6	29.29
5/16	24	7.94	11.7	15.87	17.1	23.19	-	-	24.3	32.95
3/8	16	9.53	16.2	21.97	27.9	37.83	30.6	41.49	39.6	53.70
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	85.43
7/16	20	11.11	27.0	36.61	49.5	67.12	-	-	70.2	95.19
1/2	13	12.70	35.1	47.60	67.5	91.53	76.5	103.73	94.5	128.14
1/2	20	12.70	36.9	50.04	76.5	103.73	-	—	108.0	146.4
9/16	12	14.29	45.9	62.24	99.0	134.24	108.0	146.45	139.5	189.16
9/16	18	14.29	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	203.81	189.0	254.28
5/8	18	15.88	85.5	115.94	153.0	207.47	-	-	216.0	292.90
3/4	10	19.05	94.5	128.14	243.0	329.51	252.0	341.71	337.5	457.65
3/4	16	19.05	103.5	140.35	265.5	360.02	-	-	378.0	512.57
7/8	9	22.23	144.0	195.26	355.5	482.06	396.0	536.98	544.5	738.34
7/8	14	22.23	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	25.40	225.0	305.10	594.0	805.46	-	-	891.0	1208.20
1-1/8	-	25.58	-	-	720.0-792.0	976.32-1073.95	-	-	1152.0-1296.0	1562.11-1757.38
1-1/4	—	31.75	-	-	-	-	-	-	1637.99-1800.00	2221.11-2440.80
1-3/8	-	34.93	-	-	1314.0-1512.0	1781.78-2050.27	—	-	2142.0-2448.0	2904.55-3319.49
1-1/2	-	38.10	-	-	1746.0-1980.0	2367.58-2684.88	—	-	2844.0-3204.0	3856.5-4344.62

APPENDIX E (Contd)

Tubing Application Tightening Assembly Instructions

Slide tubing over barbed insert until it bottoms on fitting.

MINI-BARB



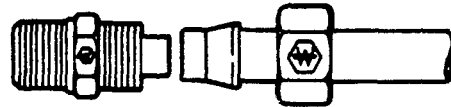
1. Slide nut and then sleeve on tubing.
2. Slide I.D. of tubing onto fitting insert until it bottoms.
3. Assemble nut b fitting body.
4. Tighten assembly finger tight to cover body

KNURL-ON



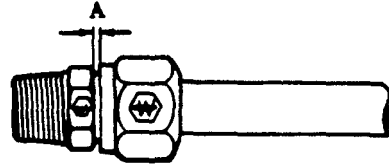
1. Slide nut and then sleeve on tubing.
2. Slide I.D. of tubing onto fitting insert until it bottoms.
3. Assemble nut to fitting body.
4. Tighten assembly finger tight to cover body threads.

SELF-ALINE-PTF



1. Cut tubing to desired length. Ensure ends are cut reasonably square.
2. Slide tubing into the preassembled fitting and push until tube bottoms.
3. Tighten nut as indicated in chart. Another check on proper assembly is dimension "A," when nut is fully tightened.

NYLON TUBING FOR AIRBRAKE



DISASSEMBLY — Remove nut and pull tubing out of fitting body. Insert will remain on tubing.

REASSEMBLY- Push tubing and insert into fitting body until it bottoms. Thread nut onto fitting body and tighten as in step 3.

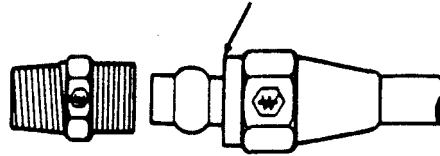
TUBE O.D.	TIGHTEN NUT TO:	A
1/4	85 - 115 lb-in. (9.6 - 13.0 N.m)	.085/.105
3/8	12 - 17 lb-ft (16.3 - 23.1 N.m)	.125/.145
1/2	25 - 33 lb-ft (33.9 - 44.7 N.m)	.100/.120
5/8	26 - 35 lb-ft (35.3 - 47.5 N.m)	.115/.135
3/4	38 - 50 lb-ft (51.5 - 67.8 N.m)	.180/.200

APPENDIX E (Contd)

Tubing Application Tightening Assembly Instructions (Contd)

1. Slide nut and then sleeve on tubing. Threaded end of nut (C) must face out.
2. Insert tubing into fitting. Ensure tubing is bottomed on fitting shoulder.
3. Thread nut onto fitting body until it is hand tight.
4. From that point, tighten with a wench the number of turns indicated at right.

COPPER TUBING
FOR AIRBRAKE



TUBE SIZE	ADDITIONAL NUMBER OF TURNS FROM HAND TIGHT
1/4, 3/8	1-3/4
1/2, 5/8, 3/4	3-1/4

E-4. TORQUE WRENCH ADAPTERS

Some tasks require the use of a torque wrench adapter when the nut or screw cannot be reached with a regular socket on the end of the torque wrench. These adapters add to the overall length of the torque wrench and make the dial or scale reading less than the actual torque applied to the nut or screw. To prevent overtightening and damage to equipment, calculate correct dial or scale reading using Conversion Formula (para. E-5).

APPENDIX E (Contd)

E-5. CONVERSION FORMULA

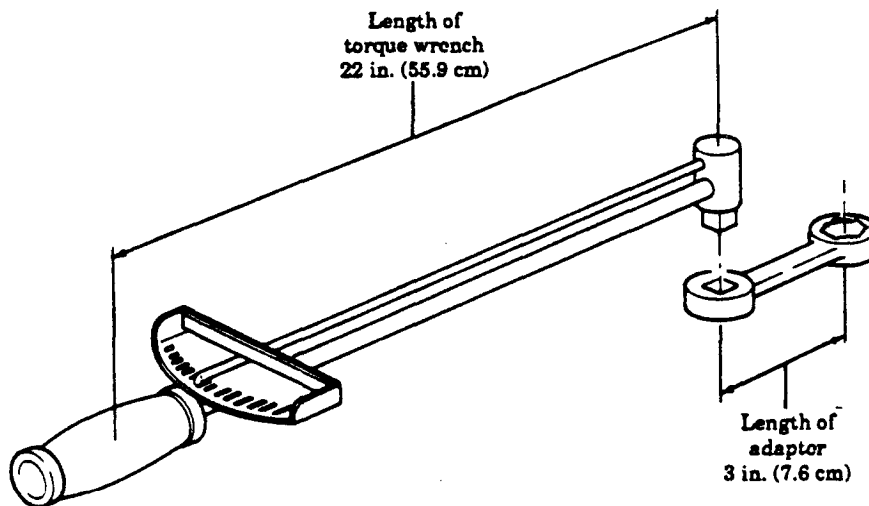
Corrected dial or scale readings are determined by the use of the following formula:

$$\text{Corrected reading} = \text{Required torque value} + \frac{\text{Length of torque wrench} + \text{Length of adapter}}{\text{Length of torque wrench}}$$

NOW

The length of the torque wrench is measured from the center of the handle to the center of the drive. The length of the adapter is measured from the center of the drive to the center of the wrench.

Example:



In this example, the torque wrench measures 22 in. (55.9 cm) and the adapter is 3 in. (7.6 cm). The required torque is 19 lb-ft (25.8 N.m)

$$\text{Corrected reading} = 19 \text{ lb-ft (25.8 N.m)} + \frac{22 \text{ in. (55.9 cm)} + 3 \text{ in. (7.6 cm)}}{22 \text{ in. (55.9 cm)}}$$

$$\text{Corrected reading} = 19 \text{ lb-ft (25.8 N.m)} + \frac{25 \text{ (63.5 m)}}{22 \text{ in. (55.9 cm)}}$$

$$\text{Corrected reading} = 19 \text{ lb-ft (25.8 N.m)} + 1.14$$

$$\text{Corrected reading} = 17 \text{ lb-ft (23.1 N.m)}$$

APPENDIX F

MANDATORY REPLACEMENT PARTS

Section I. Introduction (page F-1)

Section II. Mandatory Replacement Parts (page F-2)

Section I. INTRODUCTION

This appendix lists mandatory replacement parts you will need to maintain M44A2 series vehicles.

F-2. EXPLANATION OF COLUMNS

a. Column (1) - Item Number. This number is assigned to each entry in the listing and is referenced in the “Initial Setup” of applicable tasks under the heading of “Materials/Parts.”

b. Column (2) - Nomenclature. Name or identification of the part.

c. Column (3) - Part Number. The manufacturer’s part number.

d. Column (4) - National Stock Number. The national stock number of the part.

Section II. MANDATORY REPLACEMENT PARTS

(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL/NATO STOCK NUMBER
1	Bushing, Tapered	7521964	2805-00-752-1964
2	Clip Ring	MS16625-193	5365-00-995-8674
3	Cotter Pin	MS24665-493	5315-00-018-7988
4	Cotter Pin	MS24665-304	5315-00-241-7330
5	Cotter Pin	MS24665-625	5315-00-209-7273
6	Cotter Pin	MS24665-357	5315-00-298-1481
7	Cotter Pin	137185	5315-00-839-5822
8	Cotter Pin	MS24665-566	5315-00-843-0138
9	Cotter Pin	MS24665-495	5315-00-234-1664
10	Cotter Pin	MS24665-283	5315-00-842-3044
11	Cotter Pin	MS24665-289	5315-00-845-7787
12	Cotter Pin	MS24665-287	5315-00-011-9120
13	Cotter Pin	MS24665-359	5315-00-013-7214
14	Cotter Pin	MS24665-285	5315-00-005-0442
15	Cotter Pin	MS24665-353	5315-00-839-5822
16	Cotter Pin	MS24665-134	5315-00-839-5820
17	Cotter Pin	MS24665-498	5315-00-849-9854
18	Cotter Pin	MS9245-95	5315-01-127-7201
19	Cotter Pin	MS24665-360	5315-00-298-1499
20	Cotter Pin	MS24665-355	5315-00-012-0123
21	Cotter Pin	MS24665-372	5315-00-059-0491
22	Cotter Pin	MS24665-151	5315-00-815-1405
23	Cotter Pin	11640540	
24	Disc	8330136	4820-00-321-6425
25	Disc	7326259	4820-00-536-9718
26	Felt Pad	11623258	
27	Gasket	10935652	5330-00-908-6340
28	Gasket	10889724	5330-00-862-9065
29	Gasket	11609349-2	5330-00-127-5417
30	Gasket	10889723	5330-00-862-9064
31	Gasket	11677119	5330-00-106-8555
32	Gasket	7368502	5330-00-298-1398
33	Gasket	7521485	5330-00-752-1485
34	Gasket	7748854	5330-00-871-5425
35	Gasket	11662856	5330-00-419-9467
36	Gasket	10951428	5330-00-930-0980
37	Gasket	10899080	5330-00-885-5723
38	Gasket	10899062	5330-00-863-3165
39	Gasket	10935201	5330-00-078-8998
40	Gasket	10935199	5330-00-075-1768
41	Gasket	10935197	5330-00-078-8997
42	Gasket	10889933	5330-00-860-0574
43	Gasket	8327848	5330-00-832-7848
44	Gasket	8327849	5330-01-017-2535
45	Gasket	10889736	5330-00-860-0560
46	Gasket	10889940	5330-00-056-0194
47	Gasket	10889730	5330-00-885-3422

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(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL/NATO STOCK NUMBER
48	Gasket	10889862	5330-00-860-9141
49	Gasket	10889857	5330-00-860-9140
50	Gasket	11641832	5330-01-153-8231
51	Gasket	MS35769-18	5330-00-834-2912
52	Gasket	10889858	5330-01-018-7153
53	Gasket	8327846	5330-00-832-7846
54	Gasket	8327847	5330-00-832-7847
55	Gasket	10937245	5330-00-489-8346
56	Gasket	7005092	5330-00-700-5092
57	Gasket	11623235	5330-00-143-7439
58	Gasket	11623196	5330-00-410-9801
59	Gasket	11623154	5330-00-143-7497
60	Gasket	11623184	5330-00-143-7498
61	Gasket	11623181	5330-00-410-5833
62	Gasket	11623182	5330-00-143-7486
63	Gasket	11623183	5330-00-143-7490
64	Gasket	7538736	5330-00-753-8736
65	Gasket	7538728	5330-00-753-8728
66	Gasket	7538737	5330-00-753-8737
67	Gasket	7409821	5330-00-740-9821
68	Gasket	7409822	5330-00-057-3823
69	Gasket	7973339	5330-00-895-3424
70	Gasket	7701753	5330-00-770-1753
71	Gasket	7735524	5330-00-196-2741
72	Gasket	7701749	5330-00-770-1749
73	Gasket	7409089	5330-00-740-9089
74	Gasket	7409081	5330-00-740-9081
75	Gasket	7409082	5330-00-242-5587
76	Gasket	7374032	5330-00-737-4032
77	Gasket	8327322	5330-00-234-3317
78	Gasket	8344200-1	5330-00-522-8428
79	Gasket	7521782	5330-00-752-1782
80	Gasket	7520959	5330-00-752-0959
81	Gasket	7521061	5330-00-752-1061
82	Gasket	10897087	5330-00-406-1543
83	Gasket	11609963	5330-00-930-9229
84	Gasket and Shim Set	7521764	5330-00-752-1764
85	Hose	8357967-5	4720-01-270-0426
86	Igniter	CS-4520-SV-0705	4520-00-217-5782
87	Igniter	G484055	4520-00-312-2017
88	Locknut	MS51943-39	5310-00-488-3889
89	Locknut	MS51922-21	5310-00-959-1488
90	Locknut	400D612	5310-00-998-7385
91	Locknut	MS51922-5	5310-00-959-7600
92	Locknut	MS51943-33	5310-00-814-0673
93	Locknut	11641656	5310-00-791-9525
94	Locknut	11609727-2	5310-00-176-6690

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(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL/NATO STOCK NUMBER
95	Locknut	MS21044N4	5310-00-877-5796
96	Locknut	MS21044N8	5310-00-877-5795
97	Locknut	MS21045-10	5310-00-982-5009
98	Locknut	MS21045-8	5310-00-062-4954
99	Locknut	MS51922-13	5310-00-984-3807
100	Locknut	MS21042-3	5310-00-807-1467
101	Locknut	MS21042-4	5310-00-807-1468
102	Locknut	MS51943-40	5310-00-935-3750
103	Locknut	MS51943-44	5310-00-241-6664
104	Locknut	MS51943-46	5310-00-935-3569
105	Locknut	MS51922-53	5310-00-225-6408
106	Locknut	MS51922-37	5310-00-067-9507
107	Locknut	MS51922-61	5310-00-832-9719
108	Locknut	MS51922-17	5310-00-087-4652
109	Locknut	MS51943-38	5310-00-994-1006
110	Locknut	MS51922-9	5310-00-984-3806
111	Locknut	272629	5310-00-014-5843
112	Locknut	MS51943-48	5310-00-241-6665
113	Lockplate	11610207	5340-00-101-5600
114	Lockscrew	10898724	5306-00-850-3884
115	Lockscrew	MS35764-1295	5306-01-015-5675
116	Lockscrew	MS35764-1579	5306-01-129-7590
117	Lockscrew	MS35764-1575	5306-01-131-9474
118	Lockscrew	10912494	5306-00-081-9812
119	Lockscrew	MS35764-852	5306-00-241-6592
120	Lockscrew	MS35764-248	5306-01-118-3134
121	Lockwasher	MS35340-44	5310-00-682-5930
122	Lockwasher	MS45904-57	5310-00-061-0004
123	Lockwasher	MS35340-46	5310-00-959-4675
124	Lockwasher	MS35340-45	5310-00-959-4679
125	Lockwasher	MS35338-46	5310-00-637-9541
126	Lockwasher	MS35335-40	5310-00-275-3683
127	Lockwasher	MS35338-50	5310-00-820-6653
128	Lockwasher	MS35340-48	5310-00-834-7606
129	Lockwasher	MS35340-47	5310-00-655-9370
130	Lockwasher	MS35338-49	5310-00-167-0680
131	Lockwasher	MS35338-44	5310-00-582-5965
132	Lockwasher	MS45904-61	5310-00-889-2769
133	Lockwasher	MS45904-69	5310-00-067-6357
134	Lockwasher	MS45904-68	5310-00-889-2528
135	Lockwasher	MS35338-47	5310-00-209-0965
136	Lockwasher	MS35335-34	5310-00-514-6674
137	Lockwasher	MS35333-40	5310-00-550-1130
138	Lockwasher	MS35338-48	5310-00-584-5272
139	Lockwasher	MS35333-39	5310-00-576-5752
140	Lockwasher	MS35338-51	5310-01-004-9012
141	Lockwasher	MS35338-53	5310-00-584-7889

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ITEM	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL/NATO STOCK NUMBER
	Lockwasher	MS35338-45	5310-00-407-9566
	Lockwasher	MS35339-30	5310-00-013-1139
144	Lockwasher	MS35335-37	5310-00-209-5116
145	Lockwasher	MS35338-42	5310-00-045-3299
146	Lockwasher	MS35335-35	5310-00-627-6128
147	Lockwasher	MS35338-108	5310-00-680-6823
148	Lockwasher	MS35340-51	5310-00-052-6454
149	Lockwasher	MS35335-38	5310-00-616-6354
150	Lockwasher	MS35335-31	5310-00-596-7693
151	Lockwasher	MS35335-33	5310-00-209-0786
152	Lockwasher	121574	5310-00-012-1574
153	Lockwasher	7005141	5310-00-426-3143
154	Lockwasher, Nut-Assembled	511-061800-00	5310-00-603-7360
155	Lockwasher, Screw-Assembled	423571	5305-00-042-3571
156	Lockwasher, Screw-Assembled	594119	5305-00-317-3102
157	Lockwasher, Screw-Assembled	11668680	5305-01-128-5656
158	Lockwasher, Screw-Assembled	187527	5306-00-018-7527
159	Lockwasher, Screw-Assembled	425601	5305-00-042-5601
160	Lockwasher, Screw-Assembled	7092434	5305-00-508-1954
161	Lockwasher, Screw-Assembled	7092443	5305-00-237-6259
162	Lockwasher, Screw-Assembled	7092435	5305-00-144-1509
163	Lockwasher, Screw-Assembled	7092436	5305-01-163-9566
164	Lockwasher, Screw-Assembled	7092437	5305-01-014-5115
165	Lockwasher, Screw-Assembled	7092446	5305-01-268-9486
166	Lockwasher, Screw-Assembled	7092445	
167	Lockwasher, Screw-Assembled	7092438	5305-00-494-2708
168	Lockwasher, Screw-Assembled	8359533	5305-00-135-3032
169	Lockwasher, Screw-Assembled	170677	5305-00-456-2582
170	O-ring	MS2956 1-210	5330-00-690-9594
171	O-ring	MS2956 1-214	5330-00-618-2517
172	O-ring	MS29561-222	5330-00-618-2518
173	O-ring	MS28775-334	5330-00-292-0578
174	O-ring	718768-22	5330-00-179-0247
175	O-ring	MS28775-12	5330-01-311-4628
176	O-ring	8327984	5330-00-291-2439
177	O-ring	MS29513-258	5330-00-599-3072
178	Packing	11623070	5330-00-194-4791
179	Packing	8330888	5330-00-318-4323
180	Packing, Preformed	MS9388-210	5330-00-864-7183
	Packing, Preformed	MS28775-214	5330-00-579-3163
	Packing, Preformed	11609215	5330-00-269-4953
	Packing, Preformed	7374041	5330-00-472-5213
	Packing, Preformed	11622902	5330-00-143-7664
185	Packing Set	11623667	5330-01-289-7848
	Parts Kit, Air Cylinder	5704159	2520-00-394-9718
	Parts Kit, Generator	90-2532	2920-01-168-4130
	Parts Kit, Generator	90-2531	2920-01-168-4129

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(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL/NATO STOCK NUMBER
189	Parts Kit, Parking Brakeshoe	12356756	2530-01-281-5224
190	Parts Kit, Service Brakeshoe	5704531	2530-01-217-8427
191	Parts Kit, Steering Gear	7521486	2530-00-752-1486
192	Parts Kit, Vehicular, Heater	5704051	2540-00-201-3474
193	Parts Kit, Vehicular, Heater	5704052	2540-00-200-4249
194	Pin	590029	5315-00-059-0029
195	Pin	MS24692-331	5315-00-198-5986
196	Pin	11623055	5315-00-145-1872
197	Pin	11623022	5315-00-409-6583
198	Pin	MS24692-388	5315-00-054-5552
199	Pin	117869	5315-00-011-7869
200	Plug	501511	5340-00-050-1511
201	Plug	MS35648-3	5340-00-050-1589
202	Plug	11608954	5320-01-176-9407
203	Retainer	MS16626-1100	5365-00-281-9885
204	Retainer, Seal	EA2433	5330-00-700-5135
205	Ring, Piston	8327985	4310-00-287-8126
206	Ring, Spacer	7409080	5365-00-182-9635
207	Rivet	7B5049	5320-00-262-6492
208	Rivet	MS20613-8P28	5320-00-051-8614
209	Rivet	MS16536-180	5320-00-058-9886
210	Rivet	MS20613-8P10	5320-00-067-5840
211	Rivet	11608955	5320-01-176-9396
212	Screw	MS90726-172	5305-00-725-4145
213	Screw	MS90727-170	5350-00-726-2557
214	Screw	MS90727-78	5305-00-269-4531
215	Screw	MS90727-162	5305-00-727-2283
216	Screw	MS35308-378	5305-00-406-7781
217	Screw	MS90727-70	5305-00-269-3246
218	Screw	MS90725-65	5305-00-269-3215
219	Screw	MS16998-102	5305-00-983-8076
220	Seal	10912514	5330-00-081-3416
221	Seal	13610A	5330-00-178-4668
222	Seal	8330909	5330-00-318-4326
223	Seal	11623381	5330-00-134-5158
224	Seal	500294	5330-00-286-8225
225	Seal	206555	5330-00-286-8149
226	Seal	7538704	5330-00-695-1170
227	Seal	7538694	5330-00-696-0279
228	Seal	7538693	5330-00-286-8154
229	Seal	7461	5330-00-291-1554
230	Seal	17657/55-542465	5330-01-150-9691
231	Seal	500117	5330-00-286-7051
232	Seal	MS51000-129-2	5330-00-113-6237
233	Seal	8675783	5330-00-566-0794
234	Seal	5342937	5330-00-534-2937
235	Seal, Channel Lift	7373301	9390-00-737-3301

Section II. MANDATORY REPLACEMENT PARTS (Contd)

(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL/NATO STOCK NUMBER
236	Seal, Channel Lift Filler	10906350	2510-00-179-5708
237	Seal, Dust	10951475	5330-00-930-5961
238	Seal, Frame	7373300	9390-00-737-3300
239	Seal, Oil	11662941	5365-01-064-2805
240	Seal, Oil	7521241	5330-00-143-8666
241	Seal, Ring	10889757	5330-00-899-6726
242	Seal, Rubber	7085399	5330-00-174-8634
243	Seal, Washer	5160323	5310-00-209-1761
244	Seat, Valve	11640548	
245	Shim Set	7005129	5365-00-700-5129
246	Shim Set	7005140	5365-00-700-5140
247	Shim Set	7005142	5365-00-700-5142
248	Shim Set	7005136	5365-00-700-5136
249	Shim Set	11623244	5365-01-179-9229
250	Shim Set	7005176	5365-01-235-4692
251	Shim Set	7005168	5365-00-700-5168
252	Shim Set	11623245	5365-01-179-9231
253	Shim Set	11623246	5365-00-252-5671
254	Shim Set	11623242	5365-01-179-9230
255	Shim Set	7005154	5365-00-700-5154
256	Shim Set	7005152	5365-00-700-5152
257	Shim Set	7005153	5365-00-700-5153
258	Shim Set	11623178	5365-01-179-9228
259	Shim Set	7374009	5365-01-151-2748
260	Shim Set	7374033	5365-00-737-4033
261	Sleeve	222-652	4730-01-193-7390
262	Sleeve	476624	4730-00-701-7737
263	Snapping	7363055	5365-00-698-4346
264	Strip, Filler	7373325	5330-00-737-3325
265	Strip, Filler	7005421	5330-00-700-5421
266	Stud	8328010	5307-00-500-3787
267	Washer	11662511	5310-00-236-0592
268	Washer	MS15795-825	5310-00-902-6659
269	Washer	MS27183-13	5310-00-087-7493
270	Washer	MS15795-819	5310-00-656-0114
271	Washer	MS15795-814	5310-00-773-7618
272	Woodruff Key	MS35756-14	5315-00-616-5520
273	Woodruff Key	7005174	5315-00-426-3138
274	Woodruff Key	11623807	5315-00-177-0708
275	Woodruff Key	607722	3020-00-281-7917
276	Woodruff Key	7005157	5315-00-700-5157
277	Woodruff Key	11623169-1	5315-00-177-0709
278	Woodruff Key	MS20066-187	5315-00-264-3099
279	Woodruff Key	8330519	5315-01-035-4214
280	Woodruff Key	MS35756-12	5315-00-616-5522
281	Woodruff Key	8328341	5315-00-281-7651
282	Woodruff Key	MS35756-11	5315-00-616-5523

Section II. MANDATORY REPLACEMENT PARTS (Contd)

(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL/NATO STOCK NUMBER
283	Woodruff Key	8327443	5315-00-281-7650
284	Woodruff Key	7409197	
285	Woodruff Key	MS35756-13	5315-00-616-5521
286	Woodruff Key	MS35756-15	5315-00-616-5530
287	Woodruff Key	MS20066-252	5315-00-990-2630
288	Woodruff Key	MS20066-261	5315-00-732-2835
289	Woodruff Key	MS20066-304	5315-00-732-0578
290	Woodruff Key	MS20068-364	5315-00-951-8695
291	Woodruff Key	MS20068-366	5315-00-781-2036
292	Woodruff Key	MS20068-202	5315-00-150-4080
293	Woodruff Key	MS35756-18	5315-00-616-5527
294	Woodruff Key	110731	5315-00-011-0731
295	Woodruff Key	MS20068-207	5315-00-150-4079
296	Woodruff Key	5168861	5315-00-032-1872
297	Woodruff Key	7521791	5315-00-696-0271
298	Woodruff Key	7748817	5315-00-406-3419
299	Woodruff Key	MS20066-379	5315-00-849-7237

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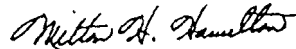
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Illustration callout number (29) is too large
cross-hatch - should show frame
stiffen bracket.

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THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT. FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

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8 May 92

PUBLICATION TITLE

DIRECT SUPPORT AND
GENERAL SUPPORT MAINTENANCE

BE EXACT . . . PIN-POINT WHERE IT IS

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

PAGE
NO.

PARA-
GRAPH

FIGURE
NO.

TABLE
NO.

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBERS

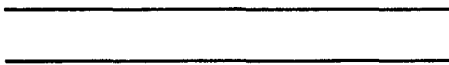
SIGN HERE:

FILL IN YOUR
UNIT'S ADDRESS



FOLD BACK

DEPARTMENT OF THE ARMY



OFFICIAL BUSINESS

COMMANDER
U.S. ARMY TANK-AUTOMOTIVE COMMAND
ATTN: AMSTA-MB
WARREN, MI 48397-5000

THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
 1 Meter = 100 Centimeters = 1,000 Millimeters = 39.37 Inches
 1 Kilometer = 1,000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1,000 Milligrams = 0.035 Ounces
 1 Kilogram = 1,000 Grams = 2.2 Lb
 1 Metric Ton = 1,000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
 1 Liter = 1,000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

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

CUBIC MEASURE

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

TEMPERATURE

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

APPROXIMATE CONVERSION FACTORS

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

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

